Forsyth Co

34062004

NC DENR
Division of Waste Management
Solid Waste Section

Fax Transmittal

To: Mike Lloyd. WM

Phone: 864-439-8426
Fax: 864-439-0097

From: Grant Little
Phone: 919-733-0692 ext 266
Fax: 919-733-4810

Date: 12-28-04

Pages Including Cover Page: -10-

Hard copy to follow by mail.

Grant

Please call if any pages of this transmittal are not received clearly.

File Copy

NCDENR

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Dexter R. Matthews, Director
Division of Waste Management
Michael F. Easley, Governor
William G. Ross Jr., Secretary

December 28, 2004

Mike Loyd, P. G.
Market Area Engineer
Waste Management
251 New Hope Road
Wellford, South Carolina 29385

Re: Determination of Final Closure
Final Closure Phase 2, Vol. I & II, October 2004
Final Closure Southern and Eastern Sideslopes, November 2003
Permit No. 34-06
Piedmont Landfill
Forsyth County, North Carolina

Dear Mr. Loyd:

The Solid Waste Section (the Section) has received and reviewed the documents referenced above certifying the completion of final closure construction of the Piedmont Landfill. Based on the CQA Reports certified by Geosyntec Consultants, the Section has determined that closure activities were substantially completed on October 29, 2004, and that the construction was in general accordance with the CQA plan and permit conditions. The submittals satisfy the requirement of Rule .1627(c)(7).

Based on the referenced certification reports, the Piedmont Landfill municipal solid waste facility is hereby entered into Post Closure care in accordance with Rule .1627(d) as of October 29, 2004, for a period of 30 years except as may be adjusted as provided in Rule .1627(d)(2).

As such, the lined municipal solid waste landfill units at the above referenced facility is hereby subject to the Post Closure conditions contained in the attached Closure Letter and North Carolina Solid Waste Rule .1627. Below is a summary of the general conditions relating to Post Closure.

General Conditions

- Waste Management and its successors are responsible for compliance with the Post Closure conditions including continued monitoring of ground water quality, leachate and landfill gas management and the physical integrity of the final cap system.

- This determination does not relieve Waste Management nor its successors from the completion of any closure requirements, duties, or responsibilities that may be found deficient at any point during the Post Closure period.

- This determination does relieve Waste Management from the Financial Assurance requirements for Closure as required under Rule .1628(b). However, for the duration of the Post Closure period, Waste Management and its successors shall maintain adequate Financial Assurance for Post Closure as required under Rule .1628(c) and Financial Assurance for Corrective Action, if applicable during Post Closure, as required under Rule .1628(d).

For tracking purposes, below is a summary of submittals and rules relating to closure of the site.

Rules For Municipal Solid Waste (MSW) Landfill Closure

- Requirements for closure are contained in 15A NCAC 13B .1627 (or Rule .1627).

Approved Closure Plans

- Construction Quality Assurance Plan for Final Cover dated July 19, 1996, was granted approval on July 31, 1996. (This is a typographical correction to reference No. 10, Attachment 3, in Facility Permit No. 34-06 dated January 13, 2003.
- Request to Revise Final Contours dated June 1997.
- Request for Approval of Alternate Geosynthetic Materials for Piedmont Landfill Final Cover System dated February 18, 2004, and March 8, 2004, and approved March 26, 2004.

Additional Actions Required of the Permittee

- Please provide topographical survey for the closed facility.
- This closure letter and Post Closure conditions must be recorded in accordance with Condition #6 of the attached Closure Letter and a copy of this recorded document returned to the Solid Waste Section at the following address:

DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
1646 MAIL SERVICE CENTER
RALEIGH, NORTH CAROLINA 27699-1646
ATTN: Geof Little

The entire attached Closure Letter should be recorded against the following tract of property as referenced by the deed and permit issue to Waste Management of Carolinas, Inc., Piedmont Landfill, on February 23, 1989, and revised most recently January 13, 2003.

The Solid Waste Section files indicate that certified copy of Permit No.34-06 February 16, 1995, Revision issued to Waste Management of Carolinas, Inc., was recorded in Forsyth County Register of Deeds Book 1849 Pages 1759 through 1771.

Forsyth County Tax Office web site shows the landfill property to be recorded in Deed Book 2139 Page 3782, Deed Date of 10/25/2000.

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
1646 MAIL SERVICE CENTER; RALEIGH, N.C. 27699-1646

MUNICIPAL SOLID WASTE LANDFILL FACILITY LETTER OF CLOSURE

WASTE MANAGEMENT OF CAROLINAS, INC.
(Waste Management)
and its Successors

is hereby issued a

LETTER OF CLOSURE

for the

PIEDMONT LANDFILL

A MUNICIPAL SOLID WASTE LINED LANDFILL FACILITY

located on Freeman Road north of Kernersville, Forsyth County, North Carolina in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this letter of closure.

James C. Coffey

James C. Coffey, Chief
Solid Waste Section
Division of Waste Management

Please contact me at (919) 733-0692 extension 266 should you have any questions regarding this letter or wish to arrange a meeting to further discuss the matter.

Sincerely,

Geoffrey H. Little
Environmental Engineer
Solid Waste Section

c: Jim Coffey, DWM
Jim Barber, DWM
Mark Poindexter, DWM
Brent Rockett, DWM
Jason Watkins, DWM
Larry Rose, DWM

POST CLOSURE CONDITIONS
PIEDMONT LANDFILL

GENERAL CONDITIONS

(1) Waste Management shall conduct Post Closure maintenance and care for the subject facility in compliance with the conditions contained in Rule .1627(d). The permittee shall be responsible for all requirements of the Post Closure period including ground water monitoring, leachate and landfill gas management, and repairs to the final cap system for a period of 30 years except as provided under Rule .1627(d)(2). The Post Closure period shall commence upon the closure date of October 29, 2004, as determined in the certification document dated October 2004 from Geosyntec Consulting in accordance with the Section .1600 rules.

(2) Waste Management shall maintain the integrity and effectiveness of the approved cap system including making timely repairs to the cover as necessary to address settlement, subsidence, erosion, or other events, and to preventing stormwater run-on and run-off from eroding or otherwise damaging the cap system in compliance with Rule .1627(d)(1)(A).

(3) Waste Management shall maintain and operate the leachate collection system in accordance with the requirements in Rule .1627(d)(1)(B). The Division may allow Waste Management to cease managing leachate if Waste Management satisfactorily demonstrates that the facility leachate does not pose a threat to human health and the environment.

(4) Waste Management shall maintain and, at a minimum, perform semi-annual sampling and analysis of the approved ground water monitoring and surface water system in compliance with Rule .1627(d)(1)(C).

(5) Waste Management shall maintain and operate the gas monitoring system in compliance with Rule .1627(d)(1)(D) to ensure that:

(a) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures (excluding gas control or recovery system components); and

(b) The concentration of methane gas does not exceed the lower explosive limit for methane at the facility property boundary.

If methane gas levels exceeding these limits are detected, Waste Management shall take all steps required in Rule .1626(4)(c).

(6) Waste Management shall ensure that the MSWLF units do not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or

promulgated by the U.S. EPA Administrator pursuant to Section 110 of the Clean Air Act, as amended.

RECORDATION

(7) Rule .1627(c)(8) requires that following closure of the MSWLF unit, Waste Management to have a notation recorded on the landfill facility property deed recorded in Deed Book 2139 Page 3782, Deed Date of 10/25/2000 or some other instrument that is normally examined during title search, and notify the Division that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that:

(a) The land has been used as a landfill facility; and

(b) Its use is restricted under the closure plan approved by the Division.

(c) The attached certified copy of the closure letter shall be recorded by the Register of Deeds and indexed in the grantor index under the name of the landowner. The certified copy affixed with the Register's seal and the date, book and page number of the recording shall be returned to the Solid Waste Section.

FINANCIAL ASSURANCE

(8) Waste Management shall provide continuous coverage for Post Closure care in accordance with Rule .1628(c) until released from financial assurance requirements for Post Closure care by demonstrating compliance with Rule .1627(d)(3).

(9) Waste Management shall provide continuous coverage for corrective action in accordance with Rule .1628(d) as may be necessary.

(10) Waste Management shall annually adjust the Post Closure cost estimate for inflation or other associated cost factors within 60 days before the anniversary date of the establishment of the financial instrument(s). For owners and operators using the local government financial test, the Post Closure cost estimate shall be updated for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Division.

(11) Waste Management shall increase the Post Closure care cost estimate and the amount of financial assurance provided under Rule .1628(c)(2), when changes in the Post Closure plan or MSWLF unit conditions increase the maximum costs of Post Closure care.

(12) Waste Management may reduce the Post Closure cost estimate and the amount of financial assurance provided under Rule .1628(c)(2) if the cost estimate exceeds the

maximum costs of Post Closure care remaining over the Post Closure care period. Prior to any reduction of the Post Closure cost estimate by the Waste Management, a written justification for the reduction shall be submitted to the Division. No reduction of the Post Closure cost estimate shall be allowed without Division approval. The reduction justification and the Division approval shall be placed in the MSWLF's operating record.

POST CLOSURE USES

(13) Post closure use of the property shall not disturb the integrity of the containment system, or the function of the monitoring systems unless specifically approved by the Division. The Division may approve disturbance of the cap system, base liner system, or other component of the containment system including the removal of waste if Waste Management satisfactorily demonstrates that the disturbance will not cause or potentially threaten harm to human health or safety, or the environment.

COMPLETION OF THE POST CLOSURE CARE PERIOD

(14) Following completion of the Post Closure care period for each MSWLF unit, Waste Management shall notify the Division that a certification, signed by a registered professional engineer, verifying that Post Closure care has been completed in accordance with the Post Closure plan, has been placed in the operating record in compliance with Rule .1627(d)(3).

ONGOING SOLID WASTE MANAGEMENT ACTIVITIES

(15) Continuing solid waste management activities within the MSWLF facility shall be conducted in accordance with all pertinent requirements and permit conditions and shall not violate any Post Closure conditions. Any new solid waste activities must be approved by the Solid Waste Section and included as part of the comprehensive Facility Plan.

GROUND WATER MONITORING CONDITIONS

(16) In accordance with .1630(c), ground water monitoring shall be conducted throughout the Post Closure care period for the MSWLF unit in accordance with the requirements of Rules .1631 through .1637. Monitoring of the surface water shall be in accordance with the requirements of Rule .0602.

(17) Detection monitoring is required at all ground water monitoring wells that are part of the detection monitoring system as established in the approved monitoring plan. At a minimum, the detection monitoring program shall include monitoring for the constituents listed in Appendix I of 40 CFR Part 258.

(18) The monitoring frequency for all Appendix I detection monitoring constituents shall be at least semiannual during the Post Closure period. At least one sample from each well (background and down gradient) shall be collected and analyzed during semiannual sampling events.

(19) When a statistically significant increase over background for one or more of the constituents listed in Appendix I or whenever a violation of the North Carolina ground water quality standards (15A NCAC 2L, .0202) occurs at any monitoring well, Waste Management:

(a) Shall, within 14 days of this finding, report to the Division and place a notice in the operating record indicating which constituents have shown statistically significant changes from background levels.

(b) Shall, within 90 days of this finding, establish an assessment monitoring program in accordance with Rule .1634 except as provided for in Rule .1633(c)(3).

(c) Shall, within 90 days of finding that any of the constituents listed in Appendix II have been detected at a statistically significant level exceeding the ground water protection standards, initiate an assessment of corrective action measures in accordance with Rule .1635.

(d) Shall select a remedy based on the results of the corrective measures assessment that, at a minimum, meets the standards listed in Rule.1636(b).

(e) Within 14 days of selecting a remedy, the permittee shall submit an application to modify the permit describing the selected remedy to the Division for evaluation and approval. The application shall be subject to the processing requirements set forth in Rule .1604(c). The application shall include the demonstrations necessary to comply with the financial assurance requirements set forth in Paragraph (d) of Rule .1628.

(f) Shall, based on the approved schedule for initiation and completion of remedial activities, establish and implement a corrective action ground water monitoring program, implement the approved corrective action remedy; and take any interim measures necessary to ensure the protection of human health and the environment in accordance with Rule .1637.

(20) The ground water monitoring program shall include consistent sampling and analysis procedures in accordance with Rule .1632 that are designed to ensure that monitoring results provide an accurate representation of ground water quality at the background and down gradient wells.

CERTIFIED COPY OF CLOSURE LETTER

I do hereby certify that the attached CLOSURE LETTER is an exact and true copy of the closure letter for the Waste Management of the Carolinas, Inc., Piedmont Landfill Municipal Solid Waste Lined Landfill Unit, Permit Number 34-06.

James C. Coffey

James C. Coffey, Chief
Solid Waste Section
Division of Waste Management

Wake County, North Carolina

I, B.J. STANFIELD, Notary Public for said County and State, do hereby certify that James C. Coffey, of the Solid Waste Section, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal,

this the 28th day of December, 2004

OFFICIAL SEAL

B. J. STANFIELD NOTARY PUBLIC WAKE COUNTY, N.C.

B.J. Stanfield

NOTARY PUBLIC

My commission expires December 29, 2004

Note to Register of Deeds: The certified copy of the closure letter shall be recorded by the Register of Deeds and indexed in the grantor index under the name of the land owner. The certified copy affixed with the Register's seal and the date, book, and page number of the recording shall be returned to James C. Coffey, Division of Waste Management, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Central Files

PALMETTO LANDFILL
A WASTE MANAGEMENT COMPANY

251 New Hope Road
Wellford, South Carolina 29385
(864) 439-9184
(864) 439-0097 Fax

December 20, 2004

Mr Geoffrey Little
NCDENR
Environmental Engineer
Solid Waste Section
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Piedmont Landfill and Recycling Center
Permit # 34-06
Kernersville, NC Soil Stockpile Utilization

Dear Mr Little

In response to our recent discussion regarding the use of the soil stockpile located in Guilford County adjacent to the Town of Kernersville, NC landfill which is located in Forsyth County. The Piedmont Landfill originally requested to use that stockpile in the event that there was not enough suitable soil material on site to complete the cap and closure activities during 2004.

However, there was enough material in our on-site soil borrow pit to complete the work. Thus the borrow pit located on the town of Kernersville property across Freeman Road from the landfill was never needed nor used.

If you have any further questions please call me at 864-439-8426.

Sincerely,

Mike Loyd
Market Area Engineer
Piedmont Landfill and Recycling Center

CC: Piedmont LF Operating record

34-06

- Page Break -

9/14/04

WMI Piedmont Landfill and Recycling Center

CF
34-06

WASTE MANAGEMENT

September 14, 2004

Received
SEP 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos-containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Guilford County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By: _____
John Van Gessel, Vice President

Sworn to and subscribed before me this
the 15th day of Sept, 2004.

Margaret Anne Ab
Notary Public

My Commission Expires: _____

MARGARET ANNE AB
MY COMMISSION EXPIRES
SEPT. 24 2007
COBB COUNTY, GEORGIA
NOTARY PUBLIC

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

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(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page .....

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

..... Secretary (Corporate Seal)

Beulah C. Barrow (SEAL)
BEULAH C. BARROW (Widow)

Gideon H. Barrow (SEAL)
GIDEON H. BARROW

Joanne Barrow (SEAL)
JOANNE BARROW

..... (SEAL)

SEAL-STAMP

NOTARY PUBLIC • OFFICIAL SEAL
COUNTY OF FORSYTH
SHARON R. STAMPER
NORTH CAROLINA

Use Black Ink

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that BEULAH C. BARROW, (Widow) GIDEON H. BARROW, and wife, JOANNE BARROW Grantors personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 22 day of March, 19 89

My commission expires: September 28, 1993 Sharon R. Stamper Notary Public

SEAL-STAMP

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that .....

personally came before me this day and acknowledged that ..... he is ..... Secretary of ..... a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its ..... President, sealed with its corporate seal and attested by ..... as its ..... Secretary.

Witness my hand and official stamp or seal, this ..... day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of .....

Sharon R. Stamper N.P.

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

KAY R. PATSEAVOURAS REGISTER OF DEEDS FOR GUILFORD COUNTY

By ..... Deputy/Assistant - Register of Deeds

BK3726 PG 221

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 — James Williams & Co., Inc., Box 127, Wilmington, N. C. 28402

PAGE 13/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

EXHIBIT "A"

All that piece, parcel or tract of land lying and being in counties of Forsyth, Belews Creek Township and Guilford, Oak Ridge Township, state of North Carolina, the same being shown and delineated as Parcel A, having a total of 100.81 acres on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 5, 1987, and according to said plat having the following courses and distances to-wit: From a stone located at the original southwest corner of the Barrows tract being common to lands formerly of Dwiggins, now Duke Power Co., and lands formerly of Peeples, now Duke Power Co., thence N 89-35 E for a distance of 173.99 ft. to an iron pipe at the point of beginning thence turning and running N 32-29 W along lands now of Duke Power Co. formerly Barrows for a distance of 44.85 ft. to an iron thence continuing along lands of Duke Power the following courses and distances: N 26-53 W for a distance of 295.00 ft. to an iron thence N 5-01 W for a distance of 171.10 ft. to an iron then N 00-30 W for a distance of 23.71 ft. to an iron thence N 24-30 E for a distance of 93.03 ft. to an iron thence N 9-25 W for a distance of 62.06 ft. to an iron thence N 51-02 W for a distance of 38.20 ft. to an iron thence N 02-34 W for a distance of 91.18 ft. to an iron located on the North side of Freeman Road then turning and running along the northern side of said road the following courses and distances: S 56-37 E for a distance of 99.95 ft. to a point thence S 44-08 E for a distance of 100.00 ft. to a point thence S 42-46 E for a distance of 100.00 ft. to an iron thence S 60-55 E for a distance of 150.08 ft. to an iron thence S 77-43 E for a distance of 119.71 ft. to an iron thence S 89-49 E for a distance of 80.33 ft. to an iron thence N 5-44 E for a distance of 666.14 ft. to an iron thence S 81-19 W for a distance of 214.49 ft. to an iron thence S 81-15 W for a distance of 183.66 ft. to an iron thence S 89-34 W for a distance of 22[illegible].59 ft. to an iron located along lands of Reynolds thence turning and continuing along lands of Reynolds N 0-14 W for a distance of 225.09 ft. to an old stone being the northwest corner of the Barrows tract thence S 85-52 E for a distance of 869.11 ft. to a stone thence N 03-36 W for a distance of 200.04 ft. to an iron located along lands now of Duke Power Co., formerly C. H. Russell thence along lands of Duke Power Co. S 85-46 E for a distance of 295.61 ft. to an iron thence N 01-41 W for a distance of 265.19 ft. to an iron thence S 85-12 E for a distance of 131.56 ft. to an iron thence S 85-01 E for a distance of 8.19 ft. to an iron located along lands of Carl H. Russell and Florrie S. Russell thence continuing along lands of Russell S 85-06 E for a distance of 175.99 ft. to an iron thence S 3-29 W for a distance of 506.30 ft. to an iron thence S 87-34 E for a distance of 167[illegible].61 ft. to a stone at the original northeast corner of Barrows tract thence S 05-19 E for a total distance of 462.29 ft. to a point thence S 40-07 E for a distance of 113.50 ft. to an iron thence S 01-56 E for a distance of 232.00 ft. to a monument located along land of the town of

(continued)

PAGE 14/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

Legal Description
EXHIBIT A,
Page Two

Kernersville thence continuing along land of the town of Kernersville S 02-06 W for a distance of 831.15 ft. to a monument at the original southeast corner of the Barrows tract thence N 84-39 W for a distance of 210.63 ft. to an iron located at the Forsyth-Guilford County line thence N 85-15 W for a distance of 592.34 ft. to an axle thence N 84-36 W for a distance of 378.36 ft. to a monument located at lands of Denver B. and Minnie A. Cottingham thence N 87-28 W for a distance of 650.08 ft. to a stone located along lands of Alexander J. and Bertha P. Cottingham thence along lands of Cottingham N 44-08 W for a distance of 627.86 to an iron thence N 86-28 W for a distance of 307.19 ft. to an iron located at lands of Duke Power Co., formerly W. V. Dwiggins, thence N 86-27 W for a distance of 302.48 ft. to a stone thence continuing along lands of Duke Power Co. S 01-30 W for a distance of 70.60 ft. to a stone thence S 89-35 W for a distance of 134.53 ft. to an iron pipe at the point of beginning.

Also included is a ±3.0 area shown as Freeman Road (SR 2140) and Goodwill Church Road (SR 2027).

Excluded from this is a parcel of land containing 1.01 acres show as Parcel D on said plat being more fully described as follows: "Beginning at an iron located on the south side of Freeman Road thence N 83-41 E for a distance of 209.97 ft. to an iron thence S 6-19 E for a distance of 209.80 ft. to an iron thence S 83-35 W for a distance of 209.97 ft. to an iron thence N 6-19 W for a distance of 209.98 ft. to an iron at the point of beginning." Being bounded on the north by Freeman Rd. and on the east, south and west by lands now or formerly of Barrow.

Tax Block 5243, Lot 2J and being all of that real property as conveyed unto Charles M. Barrow and wife, Beulah C. Barrow in Deed Book 384, Page 110, Forsyth County Registry.

PAGE 15/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos–containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

ALL-STATE LEGAL®

A

83

STATE OF NORTH CAROLINA

Real Estate Excise Tax

MAR 23 1989

PRESENTED FOR REGISTRATION AND RECORDED

MAR 23 1 45 PM '89

L.E. SPEAS
REGISTER OF DEEDS
FORSYTH CTY, N C

$12.00pd

Excise Tax

Recording Time, Book and Page

Tax Lot No. ..... Parcel Identifier No. .....

Verified by ..... County on the ..... day of ....., 19 ....

by .....

Mail after recording to WOLFE AND COLLINS BOX

.....

This instrument was prepared by John G. Wolfe, III

Brief description for the Index

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 23 day of March, 1989, by and between

GRANTOR	GRANTEE
BEULAH C. BARROW (WIDOW), GIDEON H. BARROW AND WIFE JOANNE BARROW	WASTE MANAGEMENT OF CAROLINAS, INC.

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of ....., ... Township, ... County, North Carolina and more particularly described as follows:

SEE EXHIBIT A ATTACHED HERETO AND INCOPORATED HEREIN AS IF FULLY SET OUT HEREIN.

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 – James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. – 1981

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page .....

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

.....

..... Secretary (Corporate Seal)

Beulah C. Barrow (SEAL)
BEULAH C. BARROW

Gideon H. Barrow (SEAL)
GIDEON H. BARROW

Joanne Barrow (SEAL)
JOANNE BARROW

..... (SEAL)

NOTARY PUBLIC - OFFICIAL SEAL
SEAL-STAMP
COUNTY OF FORSYTH
SHARON R. STAMPER
NORTH CAROLINA

Use Black Ink

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that BEULAH C. BARROW, GIDEON H. BARROW, JOANNE BARROW Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23 day of March, 19 89.

My commission expires: September 28, 1993 Sharon R. Stamper Notary Public

---

SEAL-STAMP

Use Black Ink

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that .....,

personally came before me this day and acknowledged that ____ he is ..... Secretary of

..... a North Carolina corporation, and that by authority duly

given and as the act of the corporation, the foregoing instrument was signed in its name by its .....

President, sealed with its corporate seal and attested by ..... as its ..... Secretary.

Witness my hand and official stamp or seal, this ..... day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of Sharon R. Stamper N.P. Forsyth Cy NC.

is/~~are~~ certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

L. E. SPEAS, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY

By Jessie Golden Deputy/~~Assistant~~ Register of Deeds

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 — James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. — 1981

EXHIBIT A

All that piece, parcel or tract of land lying and being in counties of Forsyth, Belews Creek Township and Guilford, Oak Ridge Township, state of North Carolina, the same being shown and delineated as Parcel A, having a total of 100.81 acres on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 5, 1987, and according to said plat having the following courses and distances to-wit: From a stone located at the original southwest corner of the Barrows tract being common to lands formerly of Dwiggins, now Duke Power Co., and lands formerly of Peeples, now Duke Power Co., thence N 89-35 E for a distance of 173.99 ft. to an iron pipe at the point of beginning thence turning and running N 32-29 W along lands now of Duke Power Co. formerly Barrows for a distance of 44.85 ft. to an iron thence continuing along lands of Duke Power the following courses and distances: N 26-53 W for a distance of 295.00 ft. to an iron thence N 5-01 W for a distance of 171.10 ft. to an iron then N 00-30 W for a distance of 23.71 ft. to an iron thence N 24-30 E for a distance of 93.03 ft. to an iron thence N 9-25 W for a distance of 62.06 ft. to an iron thence N 51-02 W for a distance of 38.20 ft. to an iron thence N 02-34 W for a distance of 91.18 ft. to an iron located on the North side of Freeman Road then turning and running along the northern side of said road the following courses and distances: S 56-37 E for a distance of 99.95 ft. to a point thence S 44-08 E for a distance of 100.00 ft. to a point thence S 42-46 E for a distance of 100.00 ft. to an iron thence S 60-55 E for a distance of 150.08 ft. to an iron thence S 77-43 E for a distance of 119.71 ft. to an iron thence S 89-49 E for a distance of 80.33 ft. to an iron thence N 5-44 E for a distance of 666.14 ft. to an iron thence S 81-19 W for a distance of 214.49 ft. to an iron thence S 81-15 W for a distance of 183.66 ft. to an iron thence S 89-34 W for a distance of 221.59 ft. to an iron located along lands of Reynolds thence turning and continuing along lands of Reynolds N 0-14 W for a distance of 225.09 ft. to an old stone being the northwest corner of the Barrows tract thence S 85-52 E for a distance of 869.11 ft. to a stone thence N 03-36 W for a distance of 200.04 ft. to an iron located along lands now of Duke Power Co., formerly C. H. Russell thence along lands of Duke Power Co. S 85-46 E for a distance of 295.61 ft. to an iron thence N 01-41 W for a distance of 265.19 ft. to an iron thence S 85-12 E for a distance of 131.56 ft. to an iron thence S 85-01 E for a distance of 8.19 ft. to an iron located along lands of Carl H. Russell and Florrie S. Russell thence continuing along lands of Russell S 85-06 E for a distance of 175.99 ft. to an iron thence S 3-29 W for a distance of 506.30 ft. to an iron thence S 87-34 E for a distance of 1670.61 ft. to a stone at the original northeast corner of Barrows tract thence S 05-19 E for a total distance of 462.29 ft. to a point thence S 40-07 E for a distance of 113.50 ft. to an iron thence S 01-56 E for a distance of 232.00 ft. to a monument located along land of the town of

(continued)

Legal Description
EXHIBIT A,
Page Two

Kernersville thence continuing along land of the town of Kernersville S 02-06 W for a distance of 831.15 ft. to a monument at the original southeast corner of the Barrows tract thence N 84-39 W for a distance of 210.63 ft. to an iron located at the Forsyth-Guilford County line thence N 85-15 W for a distance of 592.34 ft. to an axle thence N 84-36 W for a distance of 378.36 ft. to a monument located at lands of Denver B. and Minnie A. Cottingham thence N 87-28 W for a distance of 650.08 ft. to a stone located along lands of Alexander J. and Bertha P. Cottingham thence along lands of Cottingham N 44-08 W for a distance of 627.86 to an iron thence N 86-28 W for a distance of 307.19 ft. to an iron located at lands of Duke Power Co., formerly W. V. Dwiggins, thence N 86-27 W for a distance of 302.48 ft. to a stone thence continuing along lands of Duke Power Co. S 01-30 W for a distance of 70.60 ft. to a stone thence S 89-35 W for a distance of 134.53 ft. to an iron pipe at the point of beginning.

Also included is a ±3.0 area shown as Freeman Road (SR 2140) and Goodwill Church Road (SR 2027).

Excluded from this is a parcel of land containing 1.01 acres show as Parcel D on said plat being more fully described as follows: "Beginning at an iron located on the south side of Freeman Road thence N 83-41 E for a distance of 209.97 ft. to an iron thence S 6-19 E for a distance of 209.80 ft. to an iron thence S 83-35 W for a distance of 209.97 ft. to an iron thence N 6-19 W for a distance of 209.98 ft. to an iron at the point of beginning." Being bounded on the north by Freeman Rd. and on the east, south and west by lands now or formerly of Barrow.

Tax Block 5243, Lot 2J and being all of that real property as conveyed unto Charles M. Barrow and wife, Beulah C. Barrow in Deed Book 384, Page 110, Forsyth County Registry.

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B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos–containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

Mail to: _____

This instrument was prepared by: A. L. Collins, Attorney at Law

QUITCLAIM DEED — QD-1

Printed and for sale by James Williams & Co., Inc., P. O. Box 127, Yadkinville, N. C. 27055

STATE OF NORTH CAROLINA, FORSYTH **County.**

THIS DEED, Made and entered into this 23rd day of March 19 89 by and between BEULAH C. BARROW, widow, ~~GIDEON H. BARROW and wife, JOANNE BARROW; ALDEAN HARDY and wife, SHIRLEY HARDY; JULIAN STEPHENSON and wife, REBECCA H. STEPHENSON; and RICKY W. BALLARD, and wife, PAMELA~~ S. BALLARD

of Forsyth County and State of North Carolina, hereinafter called Grantor, and WASTE MANAGEMENT OF CAROLINAS, INC., a North Carolina Corporation

of XXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXX, hereinafter called Grantee, whose permanent mailing address is _____;

WITNESSETH:

ALL-STATE LEGAL® A

That said Grantor, for and in consideration of the sum of Ten Dollars ($10.00) to him in hand paid, the receipt of which is hereby acknowledged, has remised and released and by these presents does remise, release, convey, and forever quitclaim unto the Grantee, his heirs and/or successors and assigns, all right, title, claim and interest of the Grantor in and to a certain lot or parcel of land lying and being in Belews Creek Township, Forsyth County, North Carolina, and more particularly described as follows:

See Exhibit A attached hereto and incorporated herein as if fully set forth herein.

FOR REVENUE STAMPS SEE DEED BOOK 1663 , PAGES 1964, 1968,1970,1972

The purpose of this Deed is to insure that the Grantee herein is conveyed all that property heretofore conveyed unto Charles M. Barrow and wife, Beulah C. Barrow, in Deed Book 384, Page 110, Forysth County Registry and includes Lots 2J, 2H, 2D, and 2E of Block 5243, Forsyth County Tax Maps.

To have and to hold the aforesaid lot or parcel of land and all privileges thereunto belonging to him, the Grantee, his heirs and/or successors and assigns, free and discharged from all right, title, claim or interest of the Grantor or anyone claiming by, through or under him.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

Beulah C. Barrow (SEAL)
Beulah C. Barrow

Gideon H. Barrow (SEAL)
Gideon H. Barrow

Aldean Hardy (SEAL)
Aldean Hardy

Joanne Barrow (SEAL)
Joanne Barrow

Shirley Hardy (SEAL)
Shirley Hardy

Julian Stephenson (SEAL)
Julian Stephenson

Ricky W. Ballard (SEAL)
Ricky W. Ballard

Rebecca H. Stephenson (SEAL)
Rebecca H. Stephenson

Pamela S. Ballard (SEAL)
Pamela S. Ballard

SEAL-STAMP

SYLVIA S. SAYLOR NOTARY PUBLIC FORSYTH COUNTY, N.C.

NORTH CAROLINA, FORSYTH COUNTY.

I, a Notary Public of the County and State aforesaid, certify that BEULAH C. BARROW, widow; GIDEON H. BARROW and wife, JOANNE BARROW; and RICKY W. BALLARD, and wife, PAMELA S. BALLARD personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23rd day of March, 19 89

My Commission expires: December 13, 1991 Sylvia S. Saylor Notary Public

SEAL-STAMP

SYLVIA S. SAYLOR NOTARY PUBLIC FORSYTH COUNTY, N.C.

NORTH CAROLINA, FORSYTH COUNTY.

I, a Notary Public of the County and State aforesaid, certify that JULIAN STEPHENSON and wife, REBECCA H. STEPHENSON and ALDEAN HARDY and wife, SHIRLEY HARDY personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23rd day of March, 19 89.

My Commission expires: December 13, 1991 Sylvia S. Saylor Notary Public

SEAL-STAMP

NORTH CAROLINA, _____ COUNTY.

I, a Notary Public of the County and State aforesaid, certify that _____, personally came before me this day and acknowledged that ____ he is _____ Secretary of _____ a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its _____ President, sealed with its corporate seal and attested by _____ as its _____ Secretary.

Witness my hand and official stamp or seal, this _____ day of _____, 19____.

My commission expires: _____ _____ Notary Public

The foregoing Certificate(s) of Sylvia S. Saylor N.P. Forsyth Cy NC

~~is~~ are certified to be correct. This instrument and this certificate are duly registered this 23 day of March, 19 89, at _____ A.M., P.M., Book _____, Page _____.

L. E. SPEAS, REGISTER OF DEEDS Register of Deeds for FORSYTH County, North Carolina.

By Jessie Golden Deputy/~~Assistant~~ Register of Deeds.

PRESENTED FOR REGISTRATION AND RECORDED

MAR 23 2 09 PM '89

L.E. SPEAS REGISTER OF DEEDS FORSYTH CTY. N.C.

Dated the _____ day of _____

Consideration $

To

BOOK 1 33 P 994

QUITCLAIM DEED

EXHIBIT A
Legal Description
Parcels A, B, C, D

All that piece, parcel or tract of land lying and being in counties of Forsyth, Belews Creek Township and Guilford, Oak Ridge Township, state of North Carolina, the same being shown and delineated as Parcels A, B, C, and D, having a total of 108.81 acres on a plat for Waste Management of Carolinas, Inc. by Survey and Mapping Services of South Carolina, Inc. dated June 5, 1987, and according to said plat having the following courses and distances to-wit: From a stone located at the original southwest corner of the Barrows tract being common to lands formerly of Dwiggins, now Duke Power Co., and lands formerly of Peeples, now Duke Power Co., thence N 89-35 E for a distance of 173.99 ft. to an iron pipe at the point of beginning thence turning and running N 32-29 W along lands now of Duke Power Co. formerly Barrows for a distance of 44.85 ft. to an iron thence continuing along lands of Duke Power the following courses and distances: N 26-53 W for a distance of 295.00 ft. to an iron thence N 5-01 W for a distance of 171.10 ft. to an iron then N 00-30 W for a distance of 23.71 ft. to an iron thence N 24-30 E for a distance of 93.03 ft. to an iron thence N 9-25 W for a distance of 62.06 ft. to an iron thence N 51-02 W for a distance of 38.20 ft. to an iron thence N 02-34 W for a distance of 91.18 ft. along lands now of Duke Power Co. formerly Cole to an iron thence N 0-10 E for a distance of 301.94 to an iron located along lands now or formerly of J. H. Reynold thence continuing along lands of Reynolds N 0-14 W for a distance of 225.09 ft. to an old stone being the northwest corner of the Barrows tract thence S 85-52 E for a distance of 869.11 ft. to a stone thence N 03-36 W for a distance of 200.04 ft. to an iron located along lands now of Duke Powur Co., formerly C. H. Russell thence along lands of Duke Power Co. S 85-46 E for a distance of 295.61 ft. to an iron thence N 01-41 W for a distance of 265.19 ft. to an iron thence S 85-12 E for a distance of 131.56 ft. to an iron thence S 85-01 E for a distance of 8.19 ft. to an iron located along lands of Carl H. Russell and Florrie S. Russell thence continuing along lands of Russell S 85-06 E for a distance of 175.99 ft. to an iron thence S 3-29 W for a distance of 506.30 ft. to an iron thence S 87-34 E for a distance of 1670.61 ft. to a stone at the original northeast corner of Barrows tract thence S 05-19 E for a total distance of 462.29 ft. to a point thence S 40-07 E for a distance of 113.50 ft. to an iron thence S 01-56 E for a distance of 232.00 ft. to a monument located along land of the town of Kernersville thence continuing along land of the town of Kernersville S 02-06 W for a distance of 831.15 ft. to a monument at the original southeast corner of the Barrows tract thence N 84-39 W for a distance of 210.63 ft. to an iron located at the Forsyth-Guilford County line thence N 85-15 W for a distance of 592.34 ft. to an axle thence N 84-36 W for a distance of 378.36 ft. to a monument located at lands of Denver B. and Minnie A. Cottingham thence N 87-28 W for a distance of 650.08 ft. to a stone located along lands of Alexander J. and Bertha P. Cottingham thence along lands of Cottingham N 44-08 W for a distance of 627.86 to an iron thence N 86-28 W for a distance of 307.19 ft. to an iron located at lands of Duke Power Co., formerly W. V. Dwiggins, thence N 86-27 W for a distance of 302.48 ft. to a stone thence continuing along lands of Duke Power Co. S 01-30 W for a distance of 70.60 ft. to a stone thence S 89-35 W for a distance of 134.53 ft. to an iron pipe at the point of beginning.

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B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos–containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

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(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

THIS INSTRUMENT DRAFTED BY:
(Signature of Draftsman)

86

ALL-STATE LEGAL®

A

STATE OF NORTH CAROLINA
Real Estate Excise Tax
MAR 23 '89
$ 40.00

PRESENTED FOR REGISTRATION AND RECORDED
MAR 23 1 47 PM '89
L.E. SPEAS
REGISTER OF DEEDS
FORSYTH CTY. N.C.

$8.00 pd
KP

Excise Tax

Recording Time, Book and Page

Tax Lot No. 2H Parcel Identifier No. 5243

Verified by County on the day of , 19

by

Mail after recording to

This instrument was prepared by

Brief description for the Index Lot 2H, Block 5243

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 23 day of March, 19 89, by and between

GRANTOR	GRANTEE
ALDEAN HARDY and wife, SHIRLEY HARDY	WASTE MANAGEMENT OF CAROLINAS, INC.

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of , Belews Creek Township, Forsyth County, North Carolina and more particularly described as follows:

BEGINNING at a new iron pipe in the southern right of way of Freeman Road, State Road 1971, said new iron pipe being South 58° 00' 28" East 102.02 feet from an existing iron pipe in the southeastern corner of the Deborah Ann Stephenson property as recorded in Deed Book 1466, Page 1698, Forsyth County Registry, thence from said beginning point along the southern right of way of Freeman Road, North 84° 09' 34" East 210.00 feet to a new iron pipe thence South 5° 50' 26" East 210.00 feet to a new iron pipe thence South 84° 09' 04" West 210.00 feet to a new iron pipe thence North 5° 50' 26" West 210.00 feet to a new iron pipe, the point and place of BEGINNING, being 1.012 acres more or less of the Beulah C. Barrow property as recorded in Deed Book 384, Page 110, Forsyth County Registry, according to an unrecorded Map or Plat by Fulton and Associates, Land Surveyors, dated October 1, 1985.

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 — James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. – 1981

PAGE 2/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page .....

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

.....

..... Secretary (Corporate Seal)

Aldean Hardy (SEAL)
ALDEAN HARDY

Shirley Hardy (SEAL)
SHIRLEY HARDY

..... (SEAL)

..... (SEAL)

SEAL-STAMP

SYLVIA S. SAYLOR NOTARY PUBLIC FORSYTH COUNTY, N. C.

Use Black Ink

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that ALDEAN HARDY and wife, SHIRLEY HARDY Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23rd day of March, 1989.

My commission expires: 12/31/88 Sylvia S. Saylor Notary Public

SEAL-STAMP

Use Black Ink

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that .....; personally came before me this day and acknowledged that ..... he is ..... Secretary of ..... a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its ..... President, sealed with its corporate seal and attested by ..... as its ..... Secretary.

Witness my hand and official stamp or seal, this ..... day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of Sylvia S. Saylor N.P. Forsyth Co. N.C.

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

L. E. SPEAS, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY

By Jeane Golden Deputy/~~Assistant~~ - Register of Deeds

PAGE 3/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos-containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

84

STATE OF NORTH CAROLINA
MAR 23 '89
Real Estate Excise Tax
$20.00
PB. 10723

Excise Tax

ALL-STATE LEGAL®
A

PRESENTED FOR REGISTRATION AND RECORDED
MAR 23 1 46 PM '89
L.E. SPEAS
REGISTER OF DEEDS
FORSYTH COUNTY, N.C.

$8.00pd

Recording Time, Book and Page

Tax Lot No. 2D Parcel Identifier No. Block 5243

Verified by County on the day of , 19

by

Mail after recording to

This instrument was prepared by A. L. Collins, Attorney at Law

Brief description for the Index Lot 2D, Block 5243

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 23 day of March, 19 89, by and between

GRANTOR	GRANTEE
RICKY WAYNE BALLARD and wife PAMELA S. BALLARD	WASTE MANAGEMENT OF CAROLINAS, INC.

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of , Belews Creek Township, Forsyth County, North Carolina and more particularly described as follows:

BEGINNING at an iron stake in the Northeastern right of way line of State Road 1971, also known as Freeman Mill Road, said iron being the Southeastern corner of property owned by Duke Power Company, thence with the Eastern line of said Duke Power property, North 04° 00' East 301.94 feet to an iron, said iron being the Southwest corner of property now or formerly owned by Beulah Barrow; thence with Beulah Barrow's Southern line South 86° 31' 36" East 221.59 feet to an iron; said iron being the Northeast corner of property now or formerly owned by Julian Stephenson; thence with Julian Stephenson's Western line, South 04° 00' West 503.51 feet to an iron lying in the Northeastern margin of the right of way of State Road 1971 also known as Freeman Road; thence with the Northeastern margin of the right of way of State Road 1971 North 38° 56' West 100 feet to a point; thence continuing with the Northeastern margin of the right of way of State Road 1971, North 40° 18' West 100 feet to a point; thence continuing with the Northeastern margin of the right of way of State Road 1971 North 52° 47' 16" West 99.95 feet to an iron, the point and place of BEGINNING containing 1.994 acres, more or less, according to an unrecorded map and survey by Clay V. Fulton, R.L.S., dated 9-5-86. Said property is designated as Tax Block 5243 Lot 2D.

1968

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 — James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. – 1981

BOOK 1663 PAGE 1968

PAGE 4/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page.....

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

.....

..... Secretary (Corporate Seal)

Ricky Wayne Ballard (SEAL)
RICKY WAYNE BALLARD

Pamela S. Ballard (SEAL)
PAMELA S. BALLARD

..... (SEAL)

..... (SEAL)

SEAL-STAMP

NOTARY PUBLIC OFFICIAL SEAL
COUNTY OF FORSYTH
SHARON R. STAMPER
NORTH CAROLINA

Use Black Ink

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that RICKY WAYNE BALLARD & PAMELA S. BALLARD Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23 day of March, 1989.

My commission expires: September 28, 1993 Sharon R. Stamper Notary Public

SEAL-STAMP

Use Black Ink

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that .....,
personally came before me this day and acknowledged that ..... he is ..... Secretary of
..... a North Carolina corporation, and that by authority duly
given and as the act of the corporation, the foregoing instrument was signed in its name by its .....
President, sealed with its corporate seal and attested by ..... as its ..... Secretary.
Witness my hand and official stamp or seal, this ..... day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of Sharon R. Stamper N.P. Forsyth Co, N.C.

.....

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

L. E. SPEAS, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY

By Jesse Gaddis Deputy/Assistant - Register of Deeds

PAGE 5/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos–containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

ALL-STATE LEGAL®

A

85

STATE OF NORTH CAROLINA

Real Estate Excise Tax

MAR 23 '89

$50.00

PRESENTED FOR REGISTRATION AND RECORDED

MAR 23 1 46 PM '89

L.E. SPEAS
REGISTER OF DEEDS
FORSYTH CTY, N.C.

$8.00 pd

Excise Tax

Recording Time, Book and Page

Tax Lot No. 2E Parcel Identifier No. Block 5243

Verified by County on the day of , 19

by

Mail after recording to

This instrument was prepared by A. L. Collins, Attorney at Law

Brief description for the Index Lot 2E, Block 5243

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 23 day of March, 19 89, by and between

GRANTOR	GRANTEE
JULIAN STEPHENSON, and wife, REBECCA H. STEPHENSON	WASTE MANANAGEMENT OF CAROLINAS, INC.

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of , Belews Creek Township, Forsyth County, North Carolina and more particularly described as follows:

BEGINNING at an iron stake in the north margin of the right of way of Freeman Road, also designated as State Road No. 1971 at the Southeast corner of the property of Ervin E. Smith as described in Deed Book 1407 at Page 1327, Forsyth County Registry; thence with the east line of Ervin E. Smith, North 0° 06' East 503.42 ft. to an iron stake; thence a new line with Beulah C. Barrow property, North 81° 17' East 398.05 ft. to an iron stake; thence still with Beulah C. Barrow property, South 05° 43' 45" West 668.29 ft. to an iron stake in the North margin of the right of way of Freeman Road; thence with the North margin of the right of way of Freeman Road, three courses and distances as follows: North 89° 17' 40" West 80.30 ft. to an iron stake; thence North 77° 16' West 119.70 ft. to an iron stake; thence North 60° 30' 45" West 150 ft. to the point and place of BEGINNING, containing 5 acres, more or less, and further being a part of Tax Lot 2E, Block 5243, Belews Creek Township, on the Forsyth County Tax Maps.

PAGE 6/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page.....

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

.....

..... Secretary (Corporate Seal)

Julian Stephenson (SEAL)
JULIAN STEPHENSON

Rebecca H. Stephenson (SEAL)
REBECCA H. STEPHENSON

..... (SEAL)

..... (SEAL)

SEAL-STAMP

SYLVIA S. SAYLOR NOTARY PUBLIC FORSYTH COUNTY, N. C.

Use Black Ink

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that JULIAN STEPHENSON and wife, REBECCA H. STEPHENSON Grantor,S

personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 23 day of March, 1989.

My commission expires: 12/13/91 Sylvia S. Saylor Notary Public

---

SEAL-STAMP

Use Black Ink

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that .....,

personally came before me this day and acknowledged that ..... he is ..... Secretary of

..... a North Carolina corporation, and that by authority duly

given and as the act of the corporation, the foregoing instrument was signed in its name by its .....

President, sealed with its corporate seal and attested by ..... as its ..... Secretary.

Witness my hand and official stamp or seal, this .....day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of Sylvia S. Saylor N.P. Forsyth Co. NC

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

L. E. SPEAS, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY

By Jessie Gaddin Deputy/~~Assistant~~ Register of Deeds

PAGE 7/21 * RCVD AT 9/9/2004 12:26:48 PM [Eastern Daylight Time] * SVR:RIRIGHTFAX/11 * DNIS:33213 * CSID:630 268 9521 * DURATION (mm-ss):16-48

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos–containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

FORSYTH

01-28-93

$2235.00

STATE OF NORTH CAROLINA

Real Estate Excise Tax

Excise Tax

BK 1.69 P2309

PRESENTED FOR ANALYSIS

'93 JAN 28 P3:43 $10.00 pd

L.E. SPEAS
REGISTER OF DEEDS
FORSYTH CO. N.C.

116

Recording Time, Book and Page

ALL-STATE LEGAL®

A

Tax Lot No. ..... Parcel Identifier No. .....

Verified by ..... County on the ..... day of ..... , 19

by .....

Mail after recording to Wolfe and Collins Box

This instrument was prepared by W. McNair Tornow, Attorney (No Title Search)

Brief description for the Index Acreage:Lot 3B, Block 5243

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 28th day of January, 1993, by and between

GRANTOR	GRANTEE
Florrie S. Russell (Widow)	Waste Management of Carolinas, Inc.

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of Winston-Salem, Belews Township, Forsyth County, North Carolina and more particularly described as follows:

FOR PROPERTY DESCRIPTION SEE EXHIBIT A ATTACHED HERETO AND INCORPORATED HEREIN BY REFERENCE.

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 – James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. – 1981

The property hereinabove described was acquired by Grantor by instrument recorded in .....

.....

A map showing the above described property is recorded in Plat Book ..... page ..... .

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging t the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to conve the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant an defend the title against the lawful claims of all persons whomsoever except for the exceptions hereinafter stated.
Title to the property hereinabove described is subject to the following exceptions:

Except easements, conditions, and restrictions of record, if any, and 1992 Ad Valorem Property Taxes to be prorated.

IN WITNESS WHEREOF, the Grantor has hereunto set his hand and seal, or if corporate, has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

USE BLACK INK ONLY

..... (Corporate Name)

By: .....

..... President

ATTEST:

.....

..... Secretary (Corporate Seal)

Florrie S. Russell (SEAL)
Florrie S. Russell (Widow)

..... (SEAL)

..... (SEAL)

..... (SEAL)

SEAL-STAMP

OFFICIAL SEAL
Notary Public, North Carolina
COUNTY OF FORSYTH
HELENE G. CRESON

NORTH CAROLINA, Forsyth County.

I, a Notary Public of the County and State aforesaid, certify that Florrie S. Russell Grantor, personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 20th day of November, 19 92

My commission expires: 5/26/97 Helene G. Creson Notary Public

Use Black Ink

SEAL-STAMP

NORTH CAROLINA, ... County.

I, a Notary Public of the County and State aforesaid, certify that ..... personally came before me this day and acknowledged that ..... he is ..... Secretary of ..... a North Carolina corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its ..... President, sealed with its corporate seal and attested by ..... as its ..... Secretary.

Witness my hand and official stamp or seal, this ..... day of ....., 19.....

My commission expires: ..... Notary Public

The foregoing Certificate(s) of Helene G. Creson N.P. Forsyth Cty NC

is ~~are~~ certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

L.E. SPEAS, REGISTER OF DEEDS

..... REGISTER OF DEEDS FOR FORSYTH COUNTY

By Jessie Holden Deputy/~~Assistant~~ Register of Deeds

N. C. Bar Assoc. Form No. 3 © 1976, Revised © 1977 — James Williams & Co., Inc., Box 127, Yadkinville, N. C. 27055
Printed by Agreement with the N. C. Bar Assoc. - 1981

EXHIBIT A

BEGINNING at a new iron pipe lying in the common boundary line dividing Forsyth and Guilford County, said iron pipe being the Northeast corner of property deeded unto Waste Management of Carolinas, Inc. in Deed Book 1663, Page 1964, Forsyth County Registry, said iron being distant North 02° 08' 07" East 851.28 feet from an old county line monument lying in the Northern margin of the right of way of Goodwill Church Road (S.R. #2027), having the N.C.G.S coordinates N = 891513.80, E=1693875.26; thence from said beginning iron with the Northern boundary line of Waste Management of Carolinas, Inc. North 87° 30' 50" West 1612.24 feet to a rebar; thence continuing with the boundary of Waste Management of Carolinas Inc. North 03° 32' 47" East 506.21 feet to an existing iron pipe; thence North 85° 01' 33" West 176.0 feet to an existing iron pipe lying in the Southern line of property conveyed unto Duke Power Company, Inc. in Deed Book 1038 at Page 1031; thence with the Eastern line of Duke Power Company, Inc., the following causes and distances: North 84° 31' 35" East 83.51 feet to a point; South 88° 07' 32" East 268.27 feet to a point; South 78° 19' 13" East 77.66 feet to a point; South 89° 11' 08" East 75.09 feet to a point; South 63° 34' 32" East 54.12 feet to a point; South 87° 32' 50" East 78.52 feet to a point; South 76° 32' 02" East 119.30 feet to a point; South 68° 15' 20" East 152.37 feet to a point; South 81° 57' 15" East 241.40 feet to a point; North 25° 06' 57" East 21.10 feet to a point; North 66° 28' 28" West 110.90 feet to a point; North 87° 56' 28" West 139.32 feet to a point; North 72° 16' 23" West 159.59 feet to a point; North 79° 35' 49" West 232.30 feet to a point; North 72° 45' 10" West 179.72 feet to a point; North 64° 13' 38" West 304.49 feet to a point; North 35° 50' 37" West 155.37 feet to a point; North 10° 23' 09" West 314.58 feet to a point; North 04° 25' 20" East 50.13 feet to a point; said iron pipe being the Southwest corner of property deeded unto Duke Power Company in Deed Book 1008, Page 801, Forsyth County Registry; thence with the Southern line of Duke Power Company North 50° 29' 17" East 607.49 feet to an existing iron pipe; thence North 43° 53' 19" East 469.42 feet to an existing iron pipe; thence North 49° 12' 14" East 196.23 feet to an axle; thence North 79° 03' 47" East 183.83 feet to a concrete monument; thence North 65° 04' 08" East 693.37 feet to an existing iron pipe lying within the center line of Benefit Church Road (S.R. #1970); thence with said road North 65° 19' 05" East 190.30 feet to a new iron pipe, lying in the corner boundary of Forsyth and Guilford County; thence with the county line, South 02° 08' 07" West 14.57 feet to a set rebar, in the centerline of Benefit Church Road; thence continuing with the county line South 02° 08' 07" West 33.55 feet to a new iron pipe lying in the Southern margin of the right of way of Benefit Church Road; thence continuing with the county line South 02° 08' 07" West 2470.58 feet to a new iron pipe, the point and place of beginning containing 78.360 acres more or less according to an unrecorded map and survey by Larry L. Callahan RLS dated 6/8/92 and being tax lot 3B of Block 5243.

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos-containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

FORSYTH CO,NC 102 FEE:$ 12.00
PRESENTED & RECORDED: 10/25/2000 2:24PM
DICKIE C. WOOD REGISTER OF DEEDS BY:HOODVA
STATE OF NC REAL ESTATE EXTX:$ 70.00
BK2139 P3782 - P3784

ALL-STATE LEGAL®

A

Excise Tax

Filing and Probate Fees $_____ Paid
Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the _____ day of _____, 2000
by _____

Mail after recording to: Bell, Davis & Pitt, (Box 106)

This instrument was prepared by: Frank M. Bell, Jr.

Brief description for the index:

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this the 28th day of September, 2000, by and between

GRANTOR	GRANTEE
Joyce H. Reynolds (Widow) 9550 Freeman Road Kernersville, NC 27284	Waste Management of the Carolinas, Inc. 9900 Freeman Road Kernersville, NC 27284

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall inclu singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in the City of Kernersville, Forsyth County, North Carolina and more particularly described as follows:

SEE EXHIBIT A ATTACHED HERETO
AND INCORPORATED HEREIN BY REFERENCE.

The herein described Property is conveyed without warranty as to access to a public right-of-way and also without warranty as to compliance with Forsyth County Zoning and Subdivision Regulations. The said Property is adjacent to other property owned by Grantee. Any recombination, or other actions, which may be required to comply with applicable subdivision ordinances shall be the sole responsibility of Grantee.

The above described Property is conveyed subject to the restrictions that (i) the Property shall not be used as a fill area for waste or similar material, and (ii) no building improvements may be located on the Property other than (a) a chain link fence and (b) monitoring wells which may be installed by the Grantee, or its successors and assigns.

The property described above is conveyed to Grantee in its "as is" conditions and without any representations or warrant expressed or implied, with respect to the physical condition or characteristics of the property or the status of title.

The property hereinabove described was acquired by Grantor by instrument recorded in Book , at Page .

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Gran in fee simple.

And the Grantor covenants with the Grantee, that Grantor is seized of the premises in fee simple, has the right to convey the same fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title aga the lawful claims of all persons whomsoever except for the exceptions hereinafter stated. Title to the property hereinabove descrit is subject to the following exceptions: **Easements and rights of way of record and matters visible from an inspection of t property; and further subject to 2000 property taxes prorated to the date of closing.**

IN WITNESS WHEREOF, the Grantor has caused this instrument to be signed in its corporate name by its duly authorized offic as of the day and year first above written.

By: Joyce H Reynolds (SEAL)
Joyce H. Reynolds (Widow)

Notary Stamp

NOTARY PUBLIC
GINA K. MOTSINGER
FORSYTH COUNTY, NC
My Commission Expires _____

NORTH CAROLINA - Forsyth County
I, a Notary Public of the County and State aforesaid, certify that Joyce H. Reynolds (Widow) Grantor(s), personally appeared before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this 28th day of September, 2000

My Commission expires: 9/8/2002 Gina K Motsinger Notary Publi

The foregoing Certificate(s) of Gina K. Motsinger

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Boo and Page shown on the first page hereof.

DICKIE C. WOOD, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY
By: _____ Deputy/Assistant Register of Deeds

#153181
8/31/00

Exhibit "A"

Begin at an existing iron pin, said iron pin being North 84°06'42" East, 117.03' from Piedmont Landfill Control Monument "P-2" having North Carolina State Plan Ground Coordinates Northing: 892,515.6938 and Easting: 1,691,620.4629, and the southeast corner of Joyce Reynolds property (Deed Book 1414, Page 600); thence with Joyce Reynolds southern line North 85°51'31" West, 869.05' to an existing iron rod; thence Joyce Reynolds eastern line South 00°12'48" East, 225.09' to a new iron pin; thence with Duke Power Company's (Deed Book, 1005 Page 272) northern line North 87°12'59" West, 100.14' to a new iron pin; thence four new lines on Joyce Reynolds property: (1) North 00°12'48" West, 327.76' to a new iron pin, (2) South 85°51'31" East, 862.25' to a new iron pin, (3) North 03°41'35" West, 99.08' to a new iron pin, and (4) South 85°49'31" East, 100.95' to an existing iron pin on Joyce Reynolds (Deed Book 1414, Page 600) line and south west corner of Duke Power Company (Deed Book 1038, Page 1031); and thence South 03°41'35" East, 199.96' to the point and place of beginning, containing 2.965 acres.

This description is in accordance with a survey prepared by Abaco Surveying, dated May 16, 2000, and last revised October 7, 2000, carrying Project No. 0004007F to which reference is made for a more certain identification.

#152107

ALL-STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos-containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

Prepared by:
Julie Beddingfield, Esq.

After Recording Please Return to:
Julie Beddingfield, Esq.
Hunton & Williams
421 Fayetteville Street Mall, Suite 1400
P.O. Box 109
Raleigh, North Carolina 27601

NOTICE OF ASBESTOS-CONTAINING MATERIAL

Regarding: Property located in Forsyth County as more particularly described in Attachment A attached hereto (the "Property").

Property Owner: Waste Management of the Carolinas, Inc.

Pursuant to 40 CFR. § 61.151, Notice is hereby given in perpetuity to any potential purchaser of the Property of the following:

(1) That the Property has been used for the disposal of asbestos-containing waste material;
(2) That a record of the location and quantity of asbestos-containing waste material disposed of on the Property required by 40 CFR § 61.154(f) has been filed with the Administrator as set forth in the attached letter (Attachment B); and
(3) That the Property is subject to 40 CFR part 61, subpart M.

Waste Management of the Carolinas, Inc.

By:_____
J. Tyler Fitzgerald, Director of Operations

STATE OF NORTH CAROLINA
WAKE COUNTY

I, KELLY M. JONES, a Notary Public, certify that J. TYLER FITZGERALD, personally came before me and acknowledged that (s)he is Director of Operations for Waste Management of Carolinas, Inc., and acknowledged on behalf of the corporation, the due execution of the foregoing instrument.

Witness my hand and official seal, this the 17th day of September, 2004.

Kelly M. Jones
Notary Public

My Commission Expires: 7-30-05

KELLY M. JONES
NOTARY PUBLIC
JOHNSTON COUNTY, N.C.
My Commission Expires 7-30-05

ALL-STATE LEGAL® A

FORSYTH CO,NC 308 FEE:$ 14.00
PRESENTED & RECORDED: 12/29/2000 3:49PM
DICKIE C. WOOD REGISTER OF DEEDS BY:WILLIA
STATE OF NC REAL ESTATE EXTX:$ 8.00
BK2148 P4061 - P4064

Project No. 7310
Disposal Request No. 111737

Excise Tax $8.00 Recording Time, Book and Page

Tax Lot No.: _____ Parcel Identifier No. _____
Verified by _____ County on the _____ day of _____, 2000 _____
by_____

Mail after recording to: BELL BOX (106)

This instrument was prepared by Kennedy Covington Lobdell & Hickman, L.L.P. (PAB)

Brief Description for the Index

0.9921 ± acre fronting
Freeman Road (SR 2140)/
Belews Creek Township

NORTH CAROLINA SPECIAL WARRANTY DEED

THIS DEED made this 15th day of AUGUST, 2000, by and between

GRANTOR	GRANTEE
DUKE ENERGY CORPORATION (Formerly known as Duke Power Company) P.O. Box 1007 Charlotte, North Carolina 28201-1007	WASTE MANAGEMENT OF THE CAROLINAS, INC. 9900 Freeman Road Kernersville, North Carolina 27284

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in Belews Creek Township, Forsyth County, North Carolina (the "Property"), more particularly described as follows:

All that certain tract, piece, parcel or lot of land located in Belews Creek Township, Forsyth County, North Carolina, containing 0.9921 ± acre and being more particularly shown on a plat of survey (the "Plat") entitled "0.9921 Acre Out Parcel: Duke Power Property/Deed Book 1005, Page 272" dated May 24, 2000, and prepared by Clinton B. Osborne, P.L.S., and recorded in Plat Book 43 at Page 88 in the Office of the Register of Deeds for Forsyth

1834152.01
LIB: CH

FORM 1570764.01
6/4/98

County (the "Registry"); AND BEING a portion of the land conveyed to Grantor by Robert Edwin Cole and wife, Dorothy E. Cole, by deed recorded in Deed Book 1005 at Page 272 in the Registry.

Provided, however, Grantor reserves certain easement rights as set forth below.

DISTRIBUTION LINE RIGHT OF WAY

Grantor reserves for itself, its successors and assigns, a perpetual easement and right of way for the purposes hereinbelow set out, over and across the portions of the Property lying within a right of way strip 30 feet in width, lying 15 feet on each side of the centerline of existing overhead utility lines, such overhead utility lines being shown on the Plat as a line labeled "Overhead Electric." Said right of way strip is also labeled "30' Duke Power Utility Easement" on the Plat. Within the right of way strip above referred, Grantor shall have the right to construct, maintain and operate with poles, crossarms, wires, guys, anchors, cables, transformers and other necessary apparatus and appliances, an overhead line for the purpose of transporting electricity and for the communications purposes of Grantor and its assigns. The following rights are also reserved by Grantor: the right to enter said right of way strip to inspect said line, to perform necessary maintenance and repairs, and to make alterations and additions thereto; to remove from the right of way strip, now or at any time in the future, trees, structures or other obstructions that may endanger the proper maintenance and operation of said line and trees of any species that Grantor determines will grow at maturity to a height that will endanger the proper maintenance and operation of said line; to trim or remove and to keep trimmed or removed dead, diseased, weak or leaning trees or limbs outside of the right of way strip which, in the opinion of Grantor, might interfere with or fall upon the electric or communication facilities within the right of way strip; and to install guy wires and anchors extending beyond the limits of the right of way strip when determined necessary by Grantor.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

And the Grantor covenants with the Grantee, that Grantor has done nothing to impair such title as Grantor received, and Grantor will warrant and defend the title against the lawful claims of all persons claiming by, under or through Grantor, except for the exceptions hereinafter stated.

Title to the Property hereinabove described is subject to the following exceptions:

1. Public streets and roads, visual easements, restrictions and rights of way as may be apparent from a visual inspection of the Property.

2. All matters of survey and recorded plats (including matters that would be revealed by a current, accurate physical survey of the Property).

3. All easements, restrictions and rights of way of record.

4. Lien of the first and refunded mortgage given to Chase Manhattan Bank, successor Trustee to Morgan Guaranty Trust Company, dated December 1, 1927, recorded in Book D.T. 234 at Page 1 in the Registry (as amended). Grantor will apply for and obtain a Release of Mortgage within one (1) year from the date of recordation of this deed.

5. Distribution line right of way and associated easement rights hereinabove reserved by Grantor.

[SIGNATURES BEGIN ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Grantor has caused this instrument to be signed in its corporate name by its duly authorized officers and its seal to be hereunto affixed by authority of its Board of Directors, the day and year first above written.

[CORPORATE SEAL]

ATTEST:

Assistant Secretary

DUKE ENERGY CORPORATION

By: Larry G. Bost

Name: Larry G. Bost

Title: General Manager, Facility and Real Estate Services Division

SEAL STAMP

NORTH CAROLINA, UNION **COUNTY**

I, JOHN W. CROSS III, Notary Public for said County and State, certify that SUE C. HARRINGTON personally came before me this day and acknowledged that s/he is Assistant Secretary of Duke Energy Corporation, a North Carolina corporation, and that by authority duly given and as the act of the corporation the foregoing instrument was signed in its name by its General Manager, Facility and Real Estate Services Division, sealed with its corporate seal, and attested by himself/herself as its Assistant Secretary.

Witness my hand and official seal this 15th day of AUGUST, 2000.

Notary Public

My Commission Expires: SEPT. 16, 2000

The foregoing Certificate(s) of John W. Cross, III

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page shown on the first page hereof.

DICKIE C. WOOD, REGISTER OF DEEDS REGISTER OF DEEDS FOR FORSYTH COUNTY

By _____ ~~Deputy/Assistant~~ Register of Deeds.

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LIB: CH

FORM 1570764.01
6/4/98

ASSISTANT SECRETARY CERTIFICATE

I, SUE C. HARRINGTON, Assistant Secretary of Duke Energy Corporation, do hereby certify that the following is a true and correct excerpt of a Resolution adopted September 22, 1997, by the Management Committee of the Board of Directors of Duke Energy Corporation, and that said quoted Resolution has not been rescinded or amended:

> FURTHER RESOLVED, That the General Manager of the Facility and Real Estate Services Division, be and hereby is authorized, to execute any contract, lease, deed or other instrument relating to real property without further action or approval by the Board of Directors of this Committee when deemed by said General Manager to be necessary or desirable in the operation of the Company's business, subject, however, to a monetary limit of $1,500,000.00 consideration or value in any single transaction, and to execute such documents in any such transaction which is approved by a resolution of this Committee.
>
> FURTHER RESOLVED, That the Secretary or any Assistant Secretary be and hereby is authorized to attest and affix the Corporate seal to any contracts, leases, deeds or other instruments executed under authority of this resolution and may execute any certificate that may be required to certify the incumbency and authority of the officer or manager executing such documents.

I further certify that on AUG. 15, 2000, Larry G. Bost was the General Manager, Facility and Real Estate Services Division, and by reason of holding said position and pursuant to the above quoted Management Committee's Resolution, had full authority to represent and act on behalf of Duke Energy Corporation with respect to the execution of a deed between Duke Energy Corporation and Waste Management of the Carolinas, Inc. for 0.9921 ± acre located in Belews Creek Township, Forsyth County, North Carolina and to execute on behalf of Duke Energy Corporation all documents and instruments relating in any way thereto.

WITNESS my hand and official seal of said Company this 15th day of AUG, 2000.

DUKE ENERGY CORPORATION SEAL CHARLOTTE, N.C.

Sue C Harrington
Assistant Secretary

1834281.01
LIB: CH

FORM 1569532.01
6/4/98

ALL STATE LEGAL®

B

WASTE MANAGEMENT

September 14, 2004

Roy Gremmell
Environmental Specialist IV
Forsyth County Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101

Re: WMI Piedmont Landfill and Recycling Center
Kernersville, North Carolina
Landfill Closure – Asbestos Notification

Dear Mr. Gremmell:

In accordance with 40CFR 61.151, notification is hereby given that this site is now inactive as of July 19, 2004 and subject to 40 CFR Part 61, Subpart M. Asbestos-containing wastes were disposed at the site during its operation. As required by 40 CFR 61.151, within 60 days of the site becoming inactive, a notation to the deed for this property was filed with the Clerk of the Court, Register of Deeds Office in Forsyth County covering the requirements. Attached is a property description per our discussions on September 8 and 13, 2004 covering the areas of asbestos disposal. It is our understanding that you have access to the total amount of asbestos disposed during the life of the landfill and that this information is not required. The entire site was used for disposal during its operation.

If you have any questions or comments, or need additional information, please feel free to contact me at 910-798-1225.

Sincerely,

Jim Dail

Jim Dail
Environmental Protection Manager

cc: Sherri Coghill – NCDENR, Raleigh
Jeff Dellinger - NCDHHS
Tyler Fitzgerald – Market Area Operations Director – WMI
Michael Loyd, Division Engineer – WMI

Attachments

North Carolina Environmental Department
3920 River Road, Wilmington, NC 28412 ◆ (910) 798-1225 ◆ Fax: (910) 799-5249

34-06

-End of Page Break-

9/14/04

WMI Piedmont Landfill and Recycling Center

[redacted]

NCDENR

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

June 23, 2004

Mike Loyd
Market Area Engineer
Piedmont Landfill and Recycling Center
251 New Hope Road
Wellford, SC 29385

Re: Permit Review
Piedmont Landfill and Recycling Center
Permit No. 34-06

Dear Mr. Loyd:

The Solid Waste Section has considered your request of May 14, 2004 for extension of closure date for the landfill. Based on information provided regarding remaining landfill capacity and status of capping activities, the Section has determined that Waste Management of Carolinas, Inc. may continue to accept waste at the Piedmont Landfill and Recycling Center in accordance with the current conditions of permit until September 30, 2004.

If you have any questions or comments, please contact Sherri Coghill at (919) 733-0692, ext. 259.

Sincerely,

James C Coffey

James C. Coffey, Chief
Solid Waste Section

cc: Brent Rockett, DWM
Tim Jewett, DWM
Wendy Simmons, DWM

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-733-4996 \ FAX 919-715-3605 \ Internet http://wastenotnc.org
An Equal Opportunity / Affirmative Action Employer – Printed on Dual Purpose Recycled Paper

WM

Palmetto Landfill

251 New Hope Road
Wellford, South Carolina 29385
Phone: (864) 439-8426 Fax: (864) 439-0097

FAX TRANSMISSION COVER SHEET

Date: 6-21-04

To: Attention Sharon Cogill

Company NCDENR

Fax: 919-733 4910

Sender Mike Lord

YOU SHOULD RECEIVE 3 PAGE(S),

INCLUDING THIS COVER SHEET. IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL (864) 439-8426.

Message: FYI

Gene Styer

PALMETTO LANDFILL
A WASTE MANAGEMENT COMPANY

251 New Hope Road
Wellford, South Carolina 29385
(864) 439-9184
(864) 439-0097 Fax

May 14, 2004

Ms. Wendy Simmons
NCDENR
Solid Waste Section
585 Waughtown Street
Winston-Salem, NC. 27107

RE: Piedmont Landfill and Recycling Center
Permit # 34-06
Inspection Response

Dear Ms. Simmons:

In response to a recent inspection with Jack Long in which what appeared to be a leachate seep was identified. Piedmont Landfill has done some investigating and applied some corrective measures in the alleged seep area (near sump D). The synthetic cap in that area was exposed and lifted up to identify where the liquid was coming from. The soil layer beneath the synthetic cap was found to be dry with no evidence of leachate coming from beneath the cap. A closer review of the liquid source (using a track hoe), showed that it appeared to be stormwater draining off the geocomposite from the synthetic cap system and into the geocomposite of the cell liner system located outside the cell's perimeter berm. This cell liner geocomposite then is anchored into the cell's anchor trench which is located in the ditch outside the perimeter berm. When exit closure capping activites commence we will extend the synthetic cap into the ditch in this area to cover the entire cell anchor trench and prevent this confusion from occuring in the future.

The liquid is appearing in the ditch because it is taking the path of least resistance exiting the cell geocomposite, which is to seep out of the geocomposite into the flow line of the ditch before the geocomposite is entering the anchor trench and is covered with soil.

The water seen in your inspection has the typical iron stained appearance (from iron fixing bacteria), that comes from water that has percolated down through iron rich soils that are typically found at the Piedmont LF in the final cover system. But, since our investigation at the area of the seep shows it to be dry beneath the cap and liquid draining off the cap, we feel this liquid is not leachate.

An excavation of the waste adjacent to the seep area showed the waste inside the cell was dry adjacent to the seep area.

Based on current tonnages and remaining capacity we currently anticipate the landfill to close permanently around August 30, 2004. With this information in mind we would like to extend the landfill permit's expiration date to September 30, 2004. We look forward to your response and appreciate your assistance with this matter.

We will also commence final capping activities on about June 15, 2004.

If you have any further questions please call me at 864-439-8426.

Sincerely,

Mike Loyd
Market Area Engineer
Piedmont Landfill and Recycling Center

CC: Piedmont LF Operating record
Tyler Fitzgerald

CF
34-06

NCDENR

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

May 26, 2004

Mike Loyd, P.G.
Market Area Manager
Piedmont Landfill and Recycling Center
251 New Hope Road
Wellford, SC 29385

RE: Modification to Solid Waste Permit No. 34-06
Revision to Geosynthetic Materials for Final Cover
Piedmont Landfill and Recycling Center

Dear Mr. Loyd:

The Solid Waste Section hereby approves the requested modification to the final cover system at Piedmont MSW Landfill submitted on May 25, 2004 by GeoSyntec Consultants. The modification allows use of 50-mil minimum LLDPE structured geomembrane manufactured by Agru America, Inc. The enclosed list of approved documents for Permit No. 34-06 includes the request.

If you have any questions or comments regarding this correspondence, please contact Sherri Coghill at (919) 733-0692, ext. 259.

Sincerely,

James C. Coffey, Chief
Solid Waste Section

cc: Majdi A. Othman, Ph.D., P.E., GeoSyntec Consultants
Brent Rockett, DWM
Wendy Simmons, DWM
Tim Jewett, DWM

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-733-4996 \ FAX 919-715-3605 \ Internet http://wastenotnc.org
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ATTACHMENT 3

Approved Documents
(Revised May 26, 2004)

PART I: GENERAL FACILITY CONDITIONS
PART II: MUNICIPAL SOLID WASTE LANDFILL CONDITIONS

1. Transition Application and Permit Renewal, Piedmont Landfill and Recycling Center, *Kernersville, North Carolina*, 2 Volumes, Prepared by Rust Environment and Infrastructure, Waste Management of Carolinas, Inc. December 1993, Revised April 1994, July 1994, October 1994, and February 1995.
2. Transition Application and Permit Renewal Site Development Plans for Waste Management of Carolinas, Inc., Piedmont Landfill and Recycling Center, Forsyth County North Carolina, Permit No. 34-06, 21 Drawings, Prepared by Rust Environment and Infrastructure, December 1993, Revised April 1994. (Drawings also in Vol 2 of Ref 1)
3. Report for the Design Hydrogeologic Investigation, Piedmont Landfill and Recycling Center, *Kernersville, North Carolina,* Rust Environment and Infrastructure, April 1994. Revised July 1994.
4. Water Quality Monitoring Plan for the Unconstructed Portion of the Piedmont Landfill and Recycling Center, *Kernersville, North Carolina,* Rust Environment and Infrastructure, May 1994. Revised July 1994.
5. Construction Quality Assurance Report, Phase 3, Cell 1, Subcell 1, Piedmont Landfill and Recycling Center, Kernersville, NC, prepared by Rust Environment and Infrastructure, January, 1995.
6. Construction Quality Assurance Report, Phase 3, Cell 1, Subcell 1, Piedmont Landfill and Recycling Center, Kernersville, NC, prepared by Rust Environment and Infrastructure, and letter approving operation dated May 19, 1995.
7. Construction Quality Assurance Report, Phase 3, Cell 2, Subcell 1, Piedmont Landfill and Recycling Center, Kernersville, NC, prepared by Rust Environment and Infrastructure, and letter of approval to operate dated January 18, 1996.
8. Interim and Final Construction Quality Assurance Reports, Phase 3, Cell 2, Subcell 2, Piedmont Landfill and Recycling Center, Kernersville, NC, prepared by Rust Environment and Infrastructure, and letter of approval to operate dated July 7, 1997.
9. Request to revise gas collection system design, and Section approval granted on May22, 1996.
10. Request to utilize alternative daily cover, dated July 19, 1996, and Section approval granted on July 31, 1996.
11. Request to modify anchor trench detail, dated November 6, 1996, and approval dated November 7, 1996.
12. Request to reduce permitted service area, dated November 6, 1996, and Section approval granted November 13, 1996.
13. Request to revise final cover on north side of Module 1, Phase II, dated December 6, 1996, and approval letter dated December 19, 1996.

14. Request to revise configuration of Cell 2, Subcell 2, dated 1/27/97, and Section approval granted 1/29/97.
15. Request of March 3, 1997, to utilize tire chips as protective layer, and letter of approval dated March 27, 1997.
16. Request of June 1997, prepared by EcoLogic Associates to revise final contours.
17. Request to revise final cover slopes from 4:1 to 3:1 and approval letter of October 31, 1997.
18. Request of December 7, 1997 to revise service area.
19. Request of May 20, 1998, to revise footprint and final cover design, prepared by EcoLogic Associates.
20. Request of June 24, 2002 to modify gas extraction system.
21. Revisions to Facility Plan text and site plan drawing, Operation Plan text, and Closure and Post-Closure Plan text, revised by Joyce Engineering, Inc., submitted May 2002, as revised through December 2002.
22. Request for Continued Operation dated November 18, 2003.
23. Request for Approval of Alternate Geosynthetic Materials for the Piedmont Landfill Final Cover System, prepared by Geosyntec Consultants, received March 11, 2004.
24. Request for Approval of Alternate Geosynthetic Materials for the Piedmont Landfill Final Cover System, prepared by Geosyntec Consultants, received May 25, 2004.

PART III: CONSTRUCTION AND DEMOLITION LANDFILL CONDITIONS
(NOT APPLICABLE)

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL CONDITIONS
(NOT APPLICABLE)

PART V: YARD WASTE CONDITIONS
(NOT APPLICABLE)

PART VI: MISCELLANEOUS TREATMENT AND PROCESSING FACILITIES CONDITIONS
(NOT APPLICABLE)

-Page Break-

GEOSYNTEC CONSULTANTS

1100 Lake Hearn Drive, Suite 200
Atlanta, Georgia 30342-1523• USA
Tel. (404) 705-9500 • Fax (404) 705-9400

24 May 2004

Ms. Sherri Coghill
Environmental Engineer
Division of Waste Management
North Carolina Department of Environment and Natural Resources
1646 Mail Service Center
Raleigh, NC 27699

Subject: Alternate Geosynthetic Materials
Piedmont Landfill Final Cover System
Forsyth County, North Carolina

Dear Ms. Coghill:

GeoSyntec Consultants (GeoSyntec) submitted a request to the North Carolina Department of Environment and Natural Resources (NCDENR) on 18 February 2004 to allow the use of alternate final cover system geosynthetic materials for the Piedmont Landfill located in Forsyth County, North Carolina. On 26 March 2004, NCDENR approved this request. The alternate materials consisted of Agru America, Inc. (A/A) high density polyethylene (HDPE) Structured Geomembranes (i.e., HDPE Super Gripnet® Liner and HDPE Micro Drain™ Liner)

The A/A Structured Geomembranes can also be manufactured from linear low density polyethylene (LLDPE) resin. LLDPE geomembranes are often used in final cover systems because of their flexibility and ability to accommodate differential settlements. Therefore, GeoSyntec is requesting NCDENR approve the use of 50-mil minimum A/A LLDPE Structured Geomembranes (i.e., LLDPE Super Gripnet® Liner and LLDPE Micro Drain Liner) for the use in the Piedmont Landfill final cover system.

The remainder of this letter includes technical information about the A/A LLDPE Structured Geomembranes, including results of laboratory shear strength testing performed on a final cover system containing an LLDPE Micro Drain Liner to demonstrate suitability of the proposed alternate geosynthetic materials for use in the final cover system of the Piedmont Landfill.

APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
DATE 5/26/04 BY SLC
Permit No. 34-06
CF Copy

GD3294/ga040350.doc

RECYCLED AND RECYCLABLE

A/A LLPDE STRUCTURED GEOMEMBRANE TECHNICAL INFORMATION

Technical information about the LLDPE Structured Geomembranes (i.e., LLDPE Micro Drain and LLDPE Super Gripnet® Liner) is provided in Attachment 1. As can be seen from the product data sheets included in Attachment 1, the physical properties of these structured geomembranes are equivalent to other commercially available LLDPE geomembranes.

GeoSyntec performed site-specific laboratory shear strength testing to evaluate interfacial shear strength characteristics of the Piedmont landfill final cover system encompassing an A/A LLDPE Geomembrane. The test configuration included an A/A LLDPE Micro Drain geomembrane sandwiched between materials similar to the currently permitted final cover system materials. Specifically, the test configuration consisted, form top to bottom, of: (i) protective soil; (ii) 8 oz/yd^2 geotextile; (iii) A/A LLDPE Micro Drain geomembrane; (iv) Bentomat ST GCL; and (v) compacted soil layer. The results of the testing are included in Attachment 2 to this letter.

In the 18 February 2004 letter from GeoSyntec to NCDENR, final cover shear strength requirements to achieve adequate factors of safety were described. Figures 4 and 5 of Attachment 5 of the 18 February 2004 letter illustrated these requirements. These figures are reproduced herein as Figures 1 and 2. The results of the site-specific shear strength test described in this letter (i.e., for a final cover system containing an LLDPE Micro Drain Liner) are also shown in Figures 1 and 2. From these figures, it is concluded that a final cover system containing an A/A LLDPE Structured Geomembrane should be able to meet the minimum shear strength requirements.

In the February 2004 request letter, the results of transmissivity tests were presented for the HDPE Structured Geomembrane. Based on analyses performed in that request, the measured transmissivity for the HDPE Structured Geomembrane were adequate. Although transmissivity testing was not specifically performed on the LLDPE Structured Geomembranes, the results are not expected to be significantly different than those measured for the HDPE Structured Geomembranes as the height and spacing of the drainage studs are identical.

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CLOSURE

NCDENR is requested to approve the A/A LLDPE Structured Geomembranes, for use in the Piedmont Landfill final cover system, as it meets the project specifications and performance requirements. Please contact either of the undersigned if you have any questions or comments related to this letter.

Sincerely,

T. Elkady

Tamer Elkady, Ph.D.
Senior Staff Engineer

Majdi A. Othman, Ph.D., P.E.
Associate

Attachments

Copy to: Michael Loyd, Waste Management

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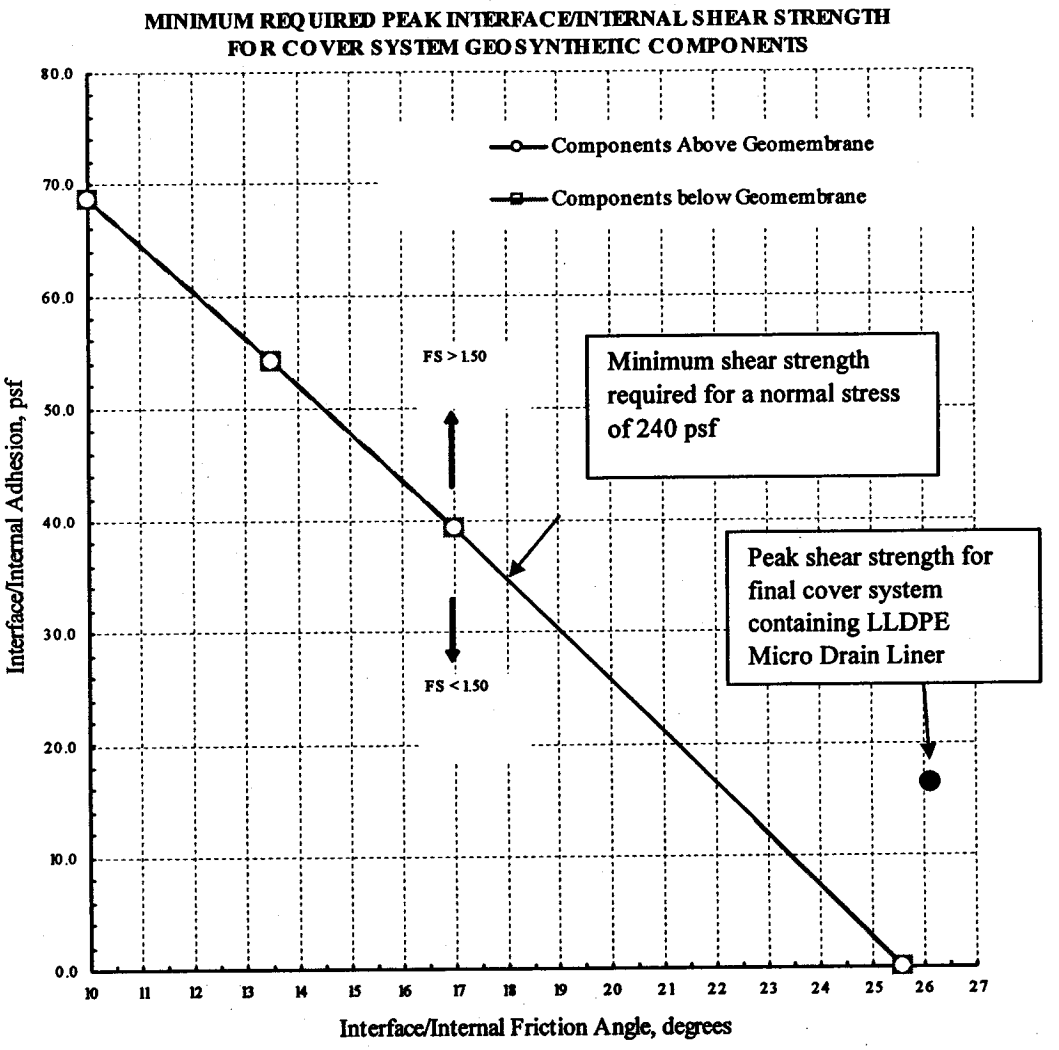

Figure 1. Peak Interface/Internal Shear Strength requirements for proposed final cover system

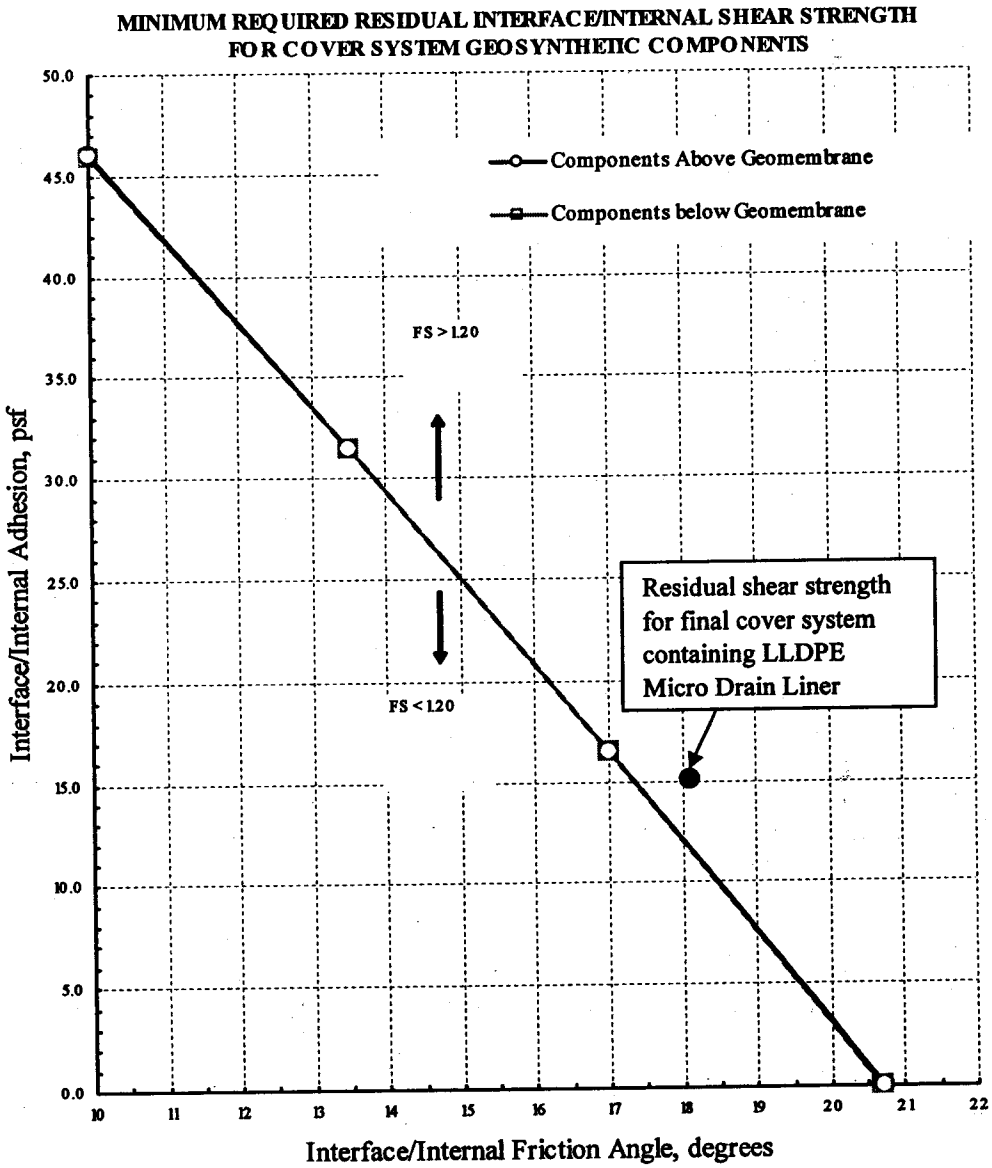

Figure 2. Residual Interface/Internal Shear Strength requirements for proposed final cover system

ATTACHMENT 1

AGRU/AMERICA, INC.
LLDPE STRUCTURED GEOMEMBRANE
TECHNICAL INFORMATION

LINEAR LOW DENSITY POLYETHYLENE SUPER GRIPNET® LINER

Product Data

Property	Test Method	Values			
Thickness (min. ave.), mil	ASTM D5994*	50	60	80	100
Thickness (lowest indiv.), mil	ASTM D5994*	50	54	72	90
Density, g/cc, minimum	**ASTM D792, Method B**	**0.92**	**0.92**	**0.92**	**0.92**
Tensile Properties (ave. both directions)	ASTM D6693, Type IV				
Strength @ Break (min. ave.), lb/in width	2 in/minute	105	126	168	210
Elongation @ Break (min. ave.), % (GL=2.0in)	5 specimens in each direction	300	300	300	300
Tear Resistance, lbs. (min. ave.)	**ASTM D1004**	**30**	**40**	**53**	**67**
Puncture Resistance, lbs. (min. ave.)	ASTM D4833	55	70	90	110
Carbon Black Content (range in %)	**ASTM D4218**	**2 - 3**	**2 - 3**	**2 - 3**	**2 - 3**
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3			
Oxidative Induction Time, minutes	**ASTM D3895, 200°C, 1 atm O_2**	**$\geq$ 100**	**$\geq$ 100**	**$\geq$ 100**	**$\geq$ 100**
Melt Flow Index, g / 10 minutes	ASTM D1238, 190°C, 2.16kg	$\leq$ 1.0	$\leq$ 1.0	$\leq$ 1.0	$\leq$ 1.0
Oven Aging	**ASTM D5721**				
with HP OIT, (% retained after 90 days)	**ASTM D5885, 150°C, 500psi O_2**	**60**	**60**	**60**	**60**
UV Resistance	GRI GM11	20hr. Cycle @ 75°C / 4 hr. dark condensation @ 60°C			
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O_2	35	35	35	35
2% Secant Modulus, lb/in. (max.)	**ASTM D5323**	**3000**	**3600**	**4800**	**6000**
Axi-Symmetric Break Resistance Strain, % (min.)	ASTM D5617	30	30	30	30

These product specifications meet or exceed GRI's GM-13

*** The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)**

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft^2	m^2	lbs	kg
50	1.25	23	7	197	60	4,531	420	2,060	934
60	1.5	23	7	197	60	4,531	420	2,060	934
80	2.0	23	7	165	50	3,795	350	1,973	895
100	2.5	23	7	165	50	3,795	350	2,418	1,096

Notes: 1.) All rolls are supplied with two slings. 2.) All rolls are wound on a 6 inch core. 3.) Special roll lengths are available on request.
4.) Standard rolls have a diameter of approximately 29 inches. 5.) A 40 foot standard container will hold 9 standard rolls. 6.) A 48 foot flatbed trailer will hold 12 standard rolls.

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond out control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

Executive Offices: 500 Garrison Road, Georgetown, SC 29440 843-546-0600 800-321-1379 Fax: 843-546-0516
Sales Office: 700 Rockmead, Suite 150, Kingwood, TX 77339 281-358-4741 800-373-2478 Fax: 281-358-5297
email: salesmkg@agruamerica.com

agru america

LINEAR LOW DENSITY POLYETHYLENE MICRO DRAIN™ LINER

Product Data

Property	Test Method	Values			
Thickness (min. ave.), mil	ASTM D5994*	50	57	76	95
Thickness (lowest indiv. for 8 of 10 spec.), mil	ASTM D5994*	50	54	72	90
Thickness (lowest indiv. for 1 of 10 spec.), mil	ASTM D5994*	50	51	68	85
Asperity Height (min. ave.), mil of textured side only	GRI GM-12	16	16	16	16
Density, g/cc, minimum	ASTM D792, Method B	0.92	0.92	0.92	0.92
Tensile Properties (ave. both directions)	ASTM D6693, Type IV				
Strength @ Break (min. ave.), lb/in width	2 in/minute	105	126	168	210
Elongation @ Break (min. ave.), % (GL=2.0in)	5 specimens in each direction	300	300	300	300
Tear Resistance, lbs. (min. ave.)	ASTM D1004	30	40	53	67
Puncture Resistance, lbs. (min. ave.)	ASTM D4833	55	70	90	110
Carbon Black Content (range in %)	ASTM D4218	2 - 3	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3			
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	≥ 100	≥ 100	≥ 100	≥ 100
Melt Flow Index, g / 10 minutes	ASTM D1238, 190°C, 2.16kg	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Oven Aging with HP OIT, (% retained after 90 days)	ASTM D5721 ASTM D5885, 150°C, 500psi O_2	60	60	60	60
UV Resistance	GRI GM11	20hr. Cycle @ 75°C / 4 hr. dark condensation @ 60°C			
with HP OIT, (% retained after 1600 hours)	ASTM D5885, 150°C, 500psi O_2	35	35	35	35
2% Secant Modulus, lb/in. (max.)	ASTM D5323	3000	3600	4800	6000
Axi-Symmetric Break Resistance Strain, % (min.)	ASTM D5617	30	30	30	30

These product specifications meet or exceed GRI's GM-13

*** The thickness values may be changed due to project specifications (i.e., absolute minimum thickness)**

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft^2	m^2	lbs	kg
50	1.25	23	7	197	60	4,531	420	2,060	934
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100	2.5	23	7	165	50	3,795	350	2,418	1,096

Notes: 1.) All rolls are supplied with two slings. 2.) All rolls are wound on a 6 inch core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of approximately 29 inches. 5.) A 40 foot standard container will hold 9 standard rolls. 6.) A 48 foot flatbed trailer will hold 12 standard rolls.

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond out control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

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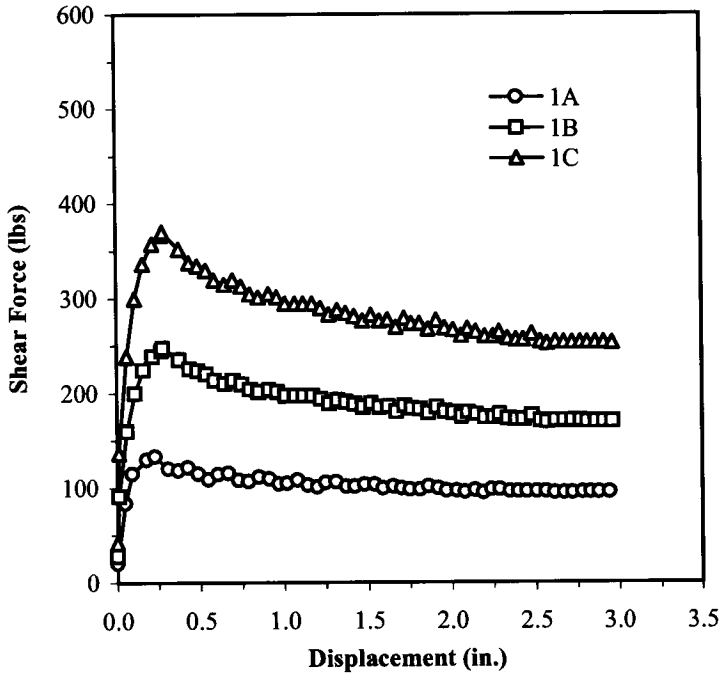
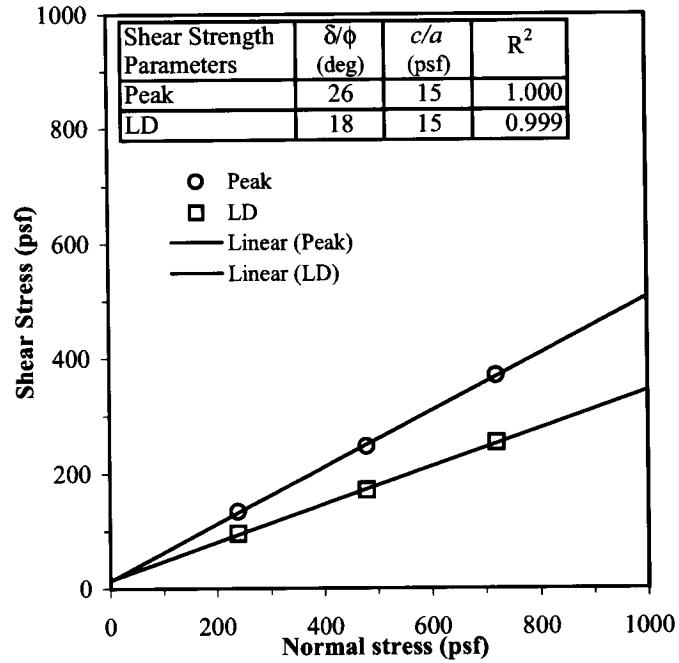
Sales Office: 700 Rockmead, Suite 150, Kingwood, TX 77339 281-358-4741 800-373-2478 Fax: 281-358-5297
email: salesmkg@agruamerica.com

ATTACHMENT 2
RESULTS OF LABORATORY SHEAR STRENGTH TESTING ON FINAL COVER SYSTEM CONTAINING AGRU/AMERICA, INC. LLDPE STRUCTURED GEOMEMBRANE

GEOSYNTEC CONSULTANTS, INC. - WMI/PIEDMONT LANDFILL
INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Test Series 1: site soil (SF-1) against wetted Nicolon S800 geotextile against wetted 50-mil (minimum) Agru MicroDrain LLDPE geomembrane (drainage cylinders up and Microspikes down) against woven geotextile side of prehydrated Bentomat ST GCL against wetted site soil (SF-1) under consolidated conditions





Shear Strength Parameters	δ/ϕ (deg)	c/a (psf)	R^2
Peak	26	15	1.000
LD	18	15	0.999

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Lower Soil			Upper Soil			GCL		Shear Stress		Failure Mode
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_{dl} (pcf)	ω_i (%)	ω_f (%)	γ_{dl} (pcf)	ω_i (%)	ω_f (%)	ω_i (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)	
1A	12 x 12	240	0.040	-	-	240	0.5	101.0	16.2	18.5	100.3	17.0	23.1	16.4	89.5	133	95	(1)
1B	12 x 12	480	0.040	-	-	480	0.5	100.8	16.5	18.2	100.2	17.2	22.7	16.4	88.4	247	170	(1)
1C	12 x 12	720	0.040	-	-	720	0.5	100.9	16.3	17.7	100.5	16.8	22.5	16.4	87.9	370	253	(1)

Notes: (1) Sliding (i.e., shear failure) occurred between the woven geotextile side of the Bentomat ST GCL and the Microspike side of the Agru Microdrain geomembrane during each test.
(2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test.

DATE OF TEST: 18 to 19 May 2004

SGI TESTING SERVICES, LLC

FIGURE NO.	A-1
PROJECT NO.	SGI4035
DOCUMENT NO.	SGI04048
FILE NO.	

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34-06

NCDENR

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

March 26, 2004

Mike Loyd, P.G.
Market Area Manager
Piedmont Landfill and Recycling Center
251 New Hope Road
Wellford, SC 29385

RE: Modification to Solid Waste Permit No. 34-06
Revision to Geosynthetic Materials for Final Cover
Piedmont Landfill and Recycling Center

Dear Mr. Loyd:

The Solid Waste Section has completed its review of the Request for Approval of Alternate Geosythetic Materials for the Piedmont Landfill Final Cover System, prepared by GeoSyntec Consultants, received March 11, 2004. The section has determined that the Piedmont Landfill and Recycling Center has adequately demonstrated that the alternatives presented meet the requirements of Rule .1627(c)(2)(A) and (B), and hereby approves your request. The list of approved documents for Permit No. 34-06 has been revised to include the above-referenced document, and is attached.

If you have any questions or comments regarding this correspondence, please contact Sherri Coghill at (919)733-0692, ext. 259.

Sincerely,

James C Coffey

James C. Coffey, Chief
Solid Waste Section

cc: Majdi A. Othman, Ph.D., P.E., GeoSyntec Consultants
Brent Rockett, DWM
Wendy Simmons, DWM
Tim Jewett, DWM

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
Phone 919-733-4996 \ FAX 919-715-3605 \ Internet http://wastenotnc.org

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ATTACHMENT 3

Approved Documents
(Revised March 26, 2004)

PART I: GENERAL FACILITY CONDITIONS
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11. Request to modify anchor trench detail, dated November 6, 1996, and approval dated November 7, 1996.
12. Request to reduce permitted service area, dated November 6, 1996, and Section approval granted November 13, 1996.
13. Request to revise final cover on north side of Module 1, Phase II, dated December 6, 1996, and approval letter dated December 19, 1996.

14. Request to revise configuration of Cell 2, Subcell 2, dated 1/27/97, and Section approval granted 1/29/97.
15. Request of March 3, 1997, to utilize tire chips as protective layer, and letter of approval dated March 27, 1997.
16. Request of June 1997, prepared by EcoLogic Associates to revise final contours.
17. Request to revise final cover slopes from 4:1 to 3:1 and approval letter of October 31, 1997.
18. Request of December 7, 1997 to revise service area.
19. Request of May 20, 1998, to revise footprint and final cover design, prepared by EcoLogic Associates.
20. Request of June 24, 2002 to modify gas extraction system.
21. Revisions to Facility Plan text and site plan drawing, Operation Plan text, and Closure and Post-Closure Plan text, revised by Joyce Engineering, Inc., submitted May 2002, as revised through December 2002.
22. Request for Continued Operation dated November 18, 2003.
23. Request for Approval of Alternate Geosyntehtic Materials for the Piedmont Landfill Final Cover System, prepared by Geosyntec Consultants, submitted March 11, 2004.

PART III: CONSTRUCTION AND DEMOLITION LANDFILL CONDITIONS
(NOT APPLICABLE)

PART IV: LAND CLEARING AND INERT DEBRIS LANDFILL CONDITIONS
(NOT APPLICABLE)

PART V: YARD WASTE CONDITIONS
(NOT APPLICABLE)

PART VI: MISCELLANEOUS TREATMENT AND PROCESSING FACILITIES CONDITIONS
(NOT APPLICABLE)

PALMETTO LANDFILL
A WASTE MANAGEMENT COMPANY

251 New Hope Road
Wellford, South Carolina 29385
(864) 439-9184
(864) 439-0097 Fax

March 8, 2004

Ms Sherri Coghill
North Carolina Department of Environment and Natural Resources
Division of Waste Management
401 Oberlin Road
Raleigh, N.C. 27611

RE: Request for Approval of Alternate Geosynthetic Materials for the Piedmont Landfill Final Cover System;
Piedmont Landfill and Recycling Center (PLFRC). Kernersville, NC

Dear Ms. Coghill:

Please find attached three copies of a request to use alternate geosynthetic materials in the final cover system at the Piedmont Landfill in Kernersville, N.C.

We look forward to your quick response.

If you have any questions feel free to contact me at 336-595-6677.

Sincerely,

Mike Loyd, P.G. 864-357-9926
Market Area Engineer
Piedmont Landfill and Recycling Center

CC: Tyler Fitzgerald
Operating Record

Received
MAR 2004
Waste Management

GEOSYNTEC CONSULTANTS

1100 Lake Hearn Drive, Suite 200
Atlanta, Georgia 30342-1523• USA
Tel. (404) 705-9500 • Fax (404) 705-9400

18 February 2004

Ms. Sherri Coghill
Environmental Engineer
Division of Waste Management
North Carolina Department of Environment and Natural Resources
1646 Mail Service Center
Raleigh, NC 27699

Subject: Request for Approval of Alternate Geosynthetic Materials for the Piedmont Landfill Final Cover System Forsyth County, North Carolina

Dear Ms. Coghill:

On behalf of Waste Management, Inc. (WM), GeoSyntec Consultants (GeoSyntec) is requesting the North Carolina Department of Environment and Natural Resources (NCDENR) approve alternate final cover system geosynthetic materials for the Piedmont Landfill located in Forsyth County, North Carolina. The geosynthetic components of the currently permitted final cover systems consist of a 40-mil thick geomembrane and a geocomposite drainage layer. The configuration of the final cover systems will not be altered, and the functional requirements of the geosynthetic layers will not be changed. It is only requested that an Agru/America, Inc. (A/A) Structured Geomembrane product (a geomembrane and drainage net in one) be used in the final cover system in lieu of using individual geomembrane and geocomposite drainage layer components.

The remainder of this letter is organized to present: (i) technical information about the A/A Structured Geomembrane, including results of laboratory shear strength and hydraulic transmissivity testing; and (ii) results of hydraulic performance and slope stability analyses performed by GeoSyntec to demonstrate suitability of the proposed alternate geosynthetic materials for use in the final cover system of the Piedmont Landfill.

GD3004/GA040081.doc

APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
DATE 3/26/04 BY SLC
Permit No. 34-06
CF Copy

Received
MAR 2004
Waste Management

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DESCRIPTION OF THE PIEDMONT LANDFILL FINAL COVER SYSTEMS

The currently permitted final cover systems for the Piedmont Landfill are described in a July 1996 report titled "Petition for Alternative Final Cover, Piedmont Landfill and Recycling Center", prepared by Rust Environment and Infrastructure (Rust). Figure 1 of this report shows schematics of the permitted final cover systems, and is attached to this letter. As shown in Figure 1, all of the permitted final cover systems include a geomembrane and a geocomposite drainage layer.

NCDENR is requested to approve the use of an A/A Structured Geomembrane and an 8 oz/yd2 geotextile filter as an alternate to the geomembrane and geocomposite drainage layer components of the final cover systems. The A/A Structured Geomembrane is a geomembrane liner and a drainage structure in one product. The resin is extruded homogeneously to provide a 60-mil thick geomembrane with solid stud drainage structures on top and texturing on the bottom. The texturing can be in the form of spikes (as for the Super Gripnet® Liner) or can be typical geomembrane texturing (as for the A/A Drain Liner). The texturing is intended to improve shear strength of the interface between the liner and the underlying barrier layer.

A/A STRUCTURED GEOMEMBRANE TECHNICAL INFORMATION

General Physical Characteristics

Technical information about the A/A Structured Geomembranes (i.e., Super Gripnet® Liner and A/A Drain Liner) is provided in Attachment 1. As can be seen from the product data sheets included in Attachment 1, the liner physical properties are equivalent to other commercially available HDPE geomembrane products. Using a 60-mil thick HDPE A/A Structured Geomembrane is an improvement over the currently permitted 40-mil thick polyethylene geomembrane.

Similar to other commercially available geomembranes, the A/A Structured Geomembrane is delivered to the site in rolls 22.5 ft wide and 197 ft long. Panels are welded together using the same equipment as other HDPE geomembranes, and

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construction quality assurance (CQA) testing of the seams is performed using the typical procedures and equipment in accordance with the site approved CQA Plan.

Hydraulic Transmissivity Characteristics

GeoSyntec performed hydraulic transmissivity tests on the A/A Structured Geomembrane (i.e., Super Gripnet® Liner) under a normal stress and range of hydraulic gradients and seating times that are applicable to the Piedmont Landfill final cover system. The results of the tests are included as Attachment 2. As shown in Attachment 2, the hydraulic transmissivity of the Super Gripnet® Liner ranged from 6.48×10^{-4} to 1.04×10^{-3} m^2/sec. The A/A Drain Liner should exhibit similar hydraulic transmissivity values as the Super Gripnet® Liner. These transmissivity values are within the range of transmissivities typical of most commercially available geosynthetic drainage layers.

GeoSyntec performed hydraulic analysis for a Piedmont Landfill final cover system that would contain an A/A Structured Geomembrane using the United States Environmental Protection Agency (USEPA) Hydrologic Evaluation of Landfill Performance (HELP) computer model. The hydraulic analysis assumptions and results are presented in Attachment 3. These results show that a final cover system which incorporates an A/A Structured Geomembrane has adequate hydraulic transmissivity to ensure proper drainage of water infiltrating through the overlying cover soil layer, and to limit hydraulic head buildup on the underlying barrier layer.

Shear Strength Characteristics

GeoSyntec performed laboratory shear strength testing to evaluate interfacial shear strength characteristics of a final cover system encompassing an A/A Structured Geomembrane. The test configuration consisted of a Super Gripnet® Liner sandwiched between materials similar to the currently permitted final cover system materials. The failure surface was allowed to occur at the weakest interface between the final cover system materials. The results of the testing are included as Attachment 4 to this letter. Based on these results, the shear strength of the Super Gripnet® Liner is relatively high (more than that represented by a friction angle of 33 degrees and a cohesion of 55 psf).

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GeoSyntec performed static and seismic slope stability analyses to estimate minimum required shear strength properties for the Piedmont Landfill final cover systems. These analyses are included as Attachment 5 to this letter. The results of the analyses show that the minimum required peak and residual shear strengths for the final cover system materials and interfaces are equivalent to friction angles of approximately 26 and 21 degrees, respectively. Based on the above described testing results, the final cover system containing an A/A Structured Geomembrane should be able to meet these minimum shear strength requirements.

CLOSURE

NCDENR is requested to approve the proposed geosynthetic product, Agru/America, Inc. Structured Geomembrane, for use in the Piedmont Landfill final cover system, as it meets the project specifications and performance requirements. Please contact the undersigned if you have any questions or comments related to this letter.

Sincerely,

Majdi A. Othman, Ph.D., P.E.
Associate

Attachments

Copy to: Michael Loyd, Waste Management

GD3004/GA040081.doc

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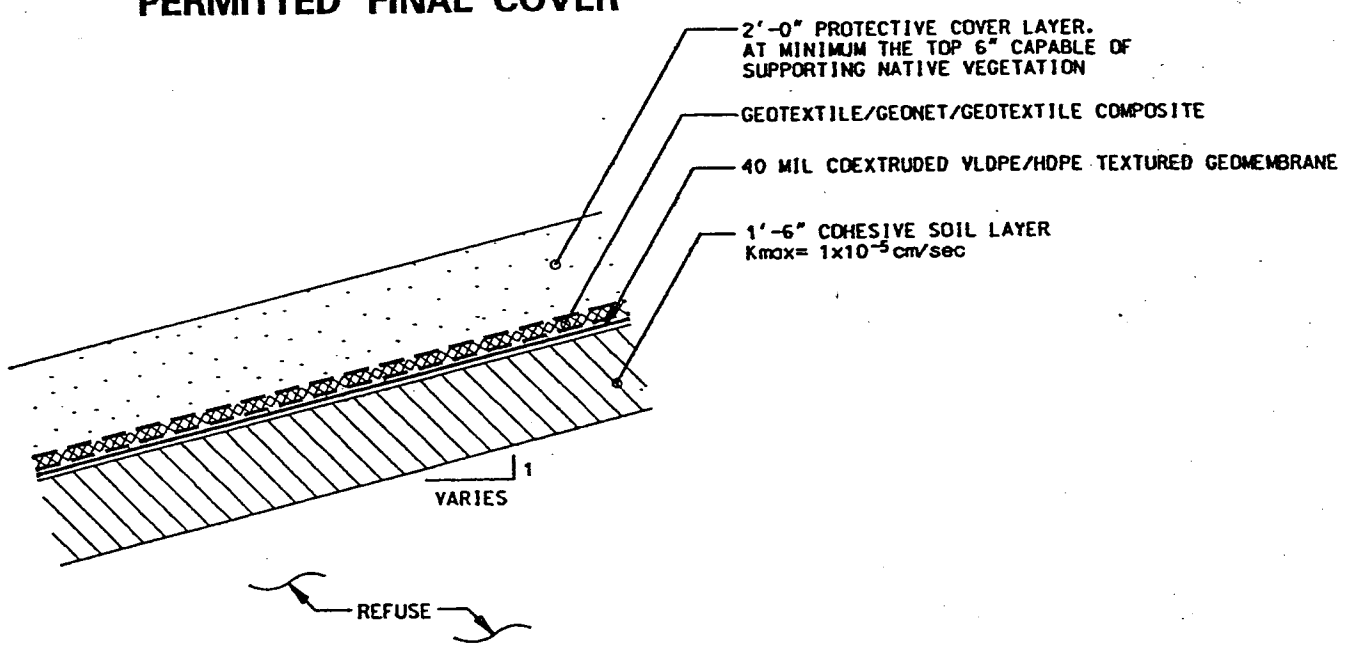
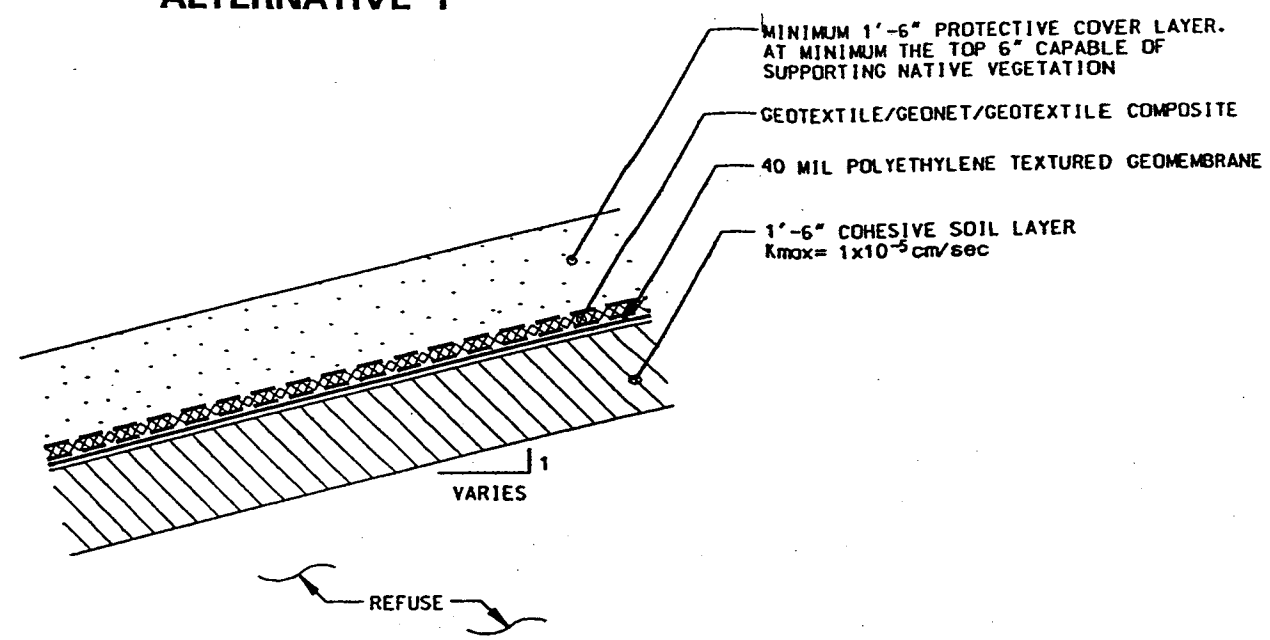
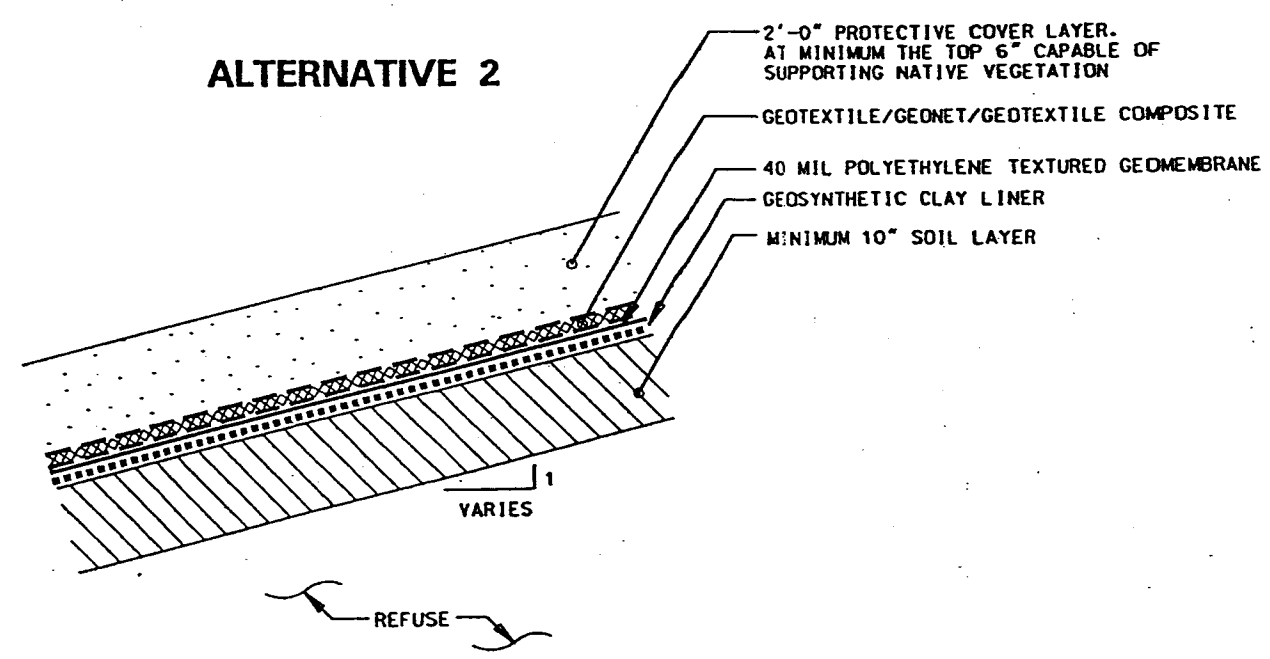
PERMITTED FINAL COVER



ALTERNATIVE 1



ALTERNATIVE 2



RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 1
FINAL COVER DETAILS

PIEDMONT LANDFILL AND RECYCLING CENTER
KERNERSVILLE, FORSYTH COUNTY, NORTH CAROLINA

7221FGR1.DGN

Attachment 1

Agru/America Inc.
Structured Geomembrane
Technical Information

AGRU/AMERICA, INC.

SUPER GRIPNET® LINER

Drainage + Anchor Structure Liner

Extruded homogeneously to provide a minimum 60 mil (1.5 mm) containment liner with drainage and anchor structure capability.
These multi-structural products enhance steep composite slope designs with maximum interfacial shear resistance and superior drainage capacity.

Features/Benefits

- Superior interfacial friction with all soil types and conditions
- Allows steepest possible slopes

Product Data (Minimum Average Roll Values)

US. Patent - No. 5.258.217

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D751	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	114	152	190
Tensile Strength at Break (lbs/in. width)	Type I Specimen	126	168	210
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	200	200	200
Tear Resistance (lbs)	ASTM D1004 - Die C	40	53	67
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	±2	±2	±2
Environmental Stress Crack (hrs)	ASTM D1693	1500	1500	1500
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	75	100	125
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2

Supply Information (Standard Roll Dimensions)

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
60	1.5	22.5	6.86	197	60	4,433	412	2,060	934
80	2.0	22.5	6.86	165	50	3,713	343	1,973	895
100	2.5	22.5	6.86	165	50	3,713	343	2,418	1,096

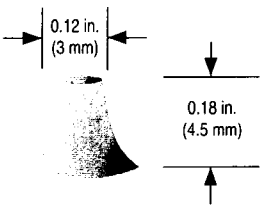
NOTES: *1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 rolls. 6.) A 48 foot flatbed will hold 14 rolls.*

All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, it is the user's responsibility to determine the suitability for their own use of the products described herein. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Agru/America as to the effects of such use or the results to be obtained, nor does Agru/America assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein contained is to be construed as permission or as a recommendation to infringe any patent.

AGRU/AMERICA, INC.

A/A DRAIN LINER®

Designed for Drainage and Anchor Performance

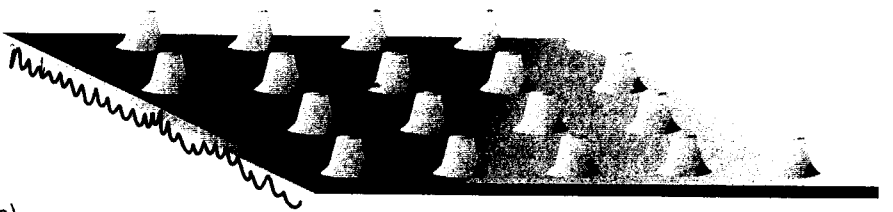


Extruded homogeneously to provide a minimum 60 mil (1.5 mm) containment liner with solid stud drainage structures at 0.8 inch (20 mm) centers.

When used in conjunction with a smooth or textured upper sheet, the composite provides an effective double liner system without the necessity of a geonet.

Features/Benefits

- Excellent interfacial friction with soils
- Excellent hydraulic transmissivity



Product Data (Minimum Average Roll Values)

Property	Test Method	Values		
Thickness (mils nominal)	ASTM D751	60	80	100
Melt Flow Index (g/10 minutes)	ASTM D1238 - E	.28	.28	.28
Density (g/cm³ min)	ASTM D792 or D1505	.948	.948	.948
Tensile Strength at Yield (lbs/in. width)	ASTM D638 (Modified)	120	160	200
Tensile Strength at Break (lbs/in. width)	Type I Specimen	132	176	220
Elongation at Yield (%)	Gauge length 2 in. break,	13	13	13
Elongation at Break (%)	1.3 in. yield, 2 ipm	200	200	200
Tear Resistance (lbs)	ASTM D1004 - Die C	50	67	83
Low Temperature Impact (°F max)	ASTM D746	-103	-103	-103
Dimensional Stability (% change max)	ASTM D1204, 1 hr @ 212°F	± 2	± 2	± 2
Puncture Resistance (lbs)	FTMS 101 - C, Method 2065	95	126	158
Carbon Black Content (%)	ASTM D1603	2 - 3	2 - 3	2 - 3
Carbon Black Dispersion	ASTM D3015	A2	A2	A2

Supply Information (Standard Roll Dimensions) 465 studs/ft² = 5,000 studs/m²

Thickness		Width		Length		Area		Weight	
mil	mm	ft	m	ft	m	ft²	m²	lbs	kg
60	1.5	22.5	6.86	263	80	5,917	550	2,295	1,041
80	2.0	22.5	6.86	230	70	5,175	480	2,489	1,129
100	2.5	22.5	6.86	197	60	4,433	412	2,637	1,196

NOTES: *1.) All rolls are supplied with two slings. 2.) All rolls are fitted with a 6 inch ID HDPE core. 3.) Special roll lengths are available on request. 4.) Standard rolls have a diameter of 29 inches (750 mm). 5.) A 40 foot standard container will hold 9 rolls. 6.) A 48 foot flatbed will hold 14 rolls.*

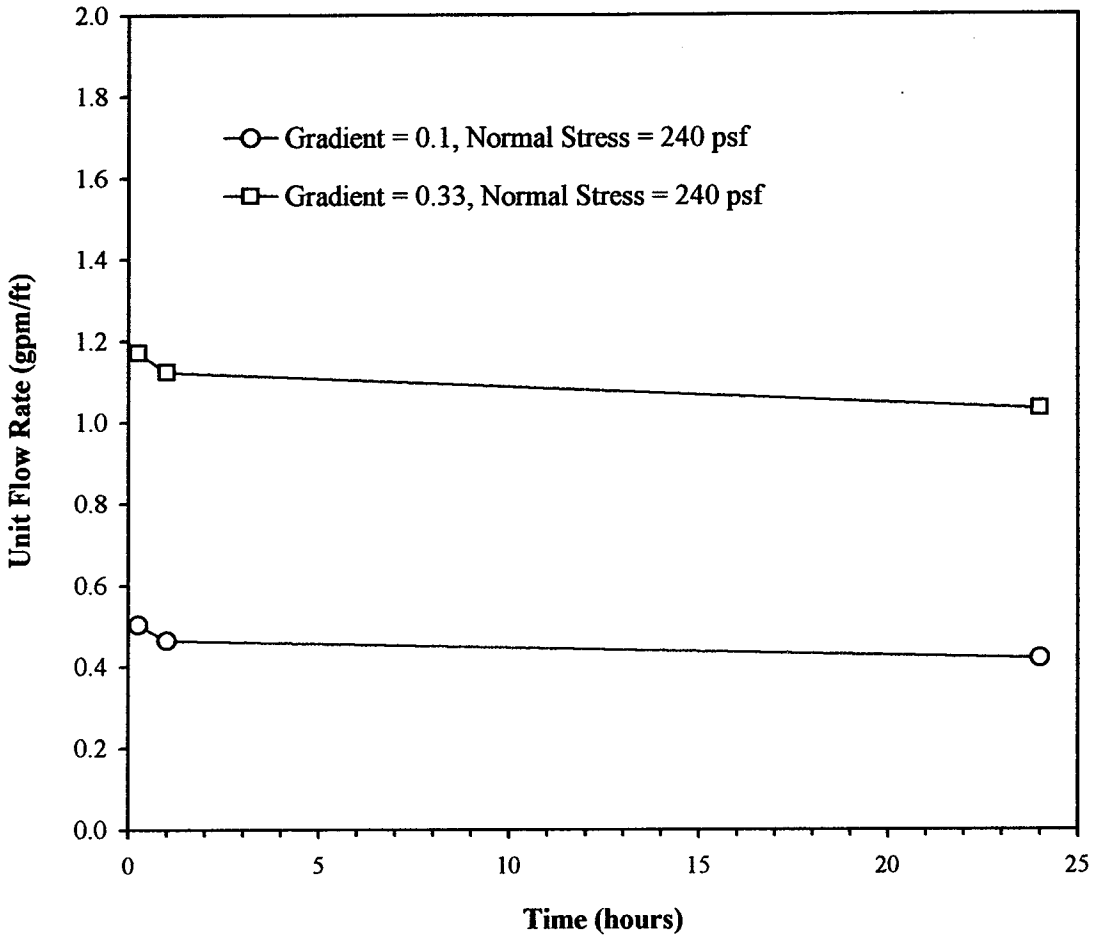
Attachment 2

Agru/America, Inc.
Structured Geomembrane
Hydraulic Transmissivity
Laboratory Testing
Results

HYDRAULIC TRANSMISSIVITY TESTING (ASTM D 4716)

Protective Cover Soil/ TNS E080 Geotextile /AGRU SuperGripNet Geomembrane

SGI Lab Sample ID: AL9365,9357,9358



Test No.	Flow Direction	Normal Stress (psf)	Seating Time (hour)	Hydraulic Gradient (-)	Transmissivity (m^2/sec)	Unit Flow Rate (gpm/ft)
1	MD	240	0.25	0.10	1.04E-03	0.50
2	MD	240	1.00	0.10	9.60E-04	0.46
3	MD	240	24.00	0.10	8.71E-04	0.42
4	MD	240	0.25	0.33	7.35E-04	1.17
5	MD	240	1.00	0.33	7.04E-04	1.12
6	MD	240	24.00	0.33	6.48E-04	1.03

Notes:

(1) Test configuration from top to bottom: Protective Cover soil / TNS E080 geotextile / Agru SuperGripNet geomembrane (cylinders up and spikes down) against Neoprene (replacement for Clay liner).

(2) Test Specimen Dimensions: length: 12 in., width = 12.0 in.

DATE REPORTED: 8/23/2002

SGI TESTING SERVICES, LLC

FIGURE NO.	A-2
PROJECT NO.	SGI2064
DOCUMENT NO.	SGI02106
FILE NO.	

Attachment 3

Hydraulic Performance Analysis of Final Cover System Containing Agru/America, Inc Structured Geomembrane

Written by: Tamer Y. Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

Client: WMI Project: Piedmont Landfill Project/Proposal No.: GD3294 Task No: 01

HYDRAULIC PERFORMANCE OF FINAL COVER SYSTEM FOR THE PIEDMONT LANDFILL

PURPOSE

The proposed modification to the Piedmont Landfill final cover system involves replacing the geosynthetics of the final cover system (i.e., geomembrane and geocomposite drainage layer) with an Agru America, Inc. (A/A) Structured Geomembrane (Super Gripnet® Liner or A/A Drain Liner) that acts as a geomembrane and a drainage structure at the same time. The analysis described herein was performed to evaluate the hydraulic performance of the final cover system consisting of an A/A Structured Geomembrane (referenced hereafter as the A/A final cover system).

METHOD OF ANALYSIS

Evaluation of the hydraulic performance of the A/A final cover system was performed using the Hydrologic Evaluation of Landfill Performance (HELP) model, version 3.07, developed for USEPA (Schroeder et al., 1994 a,b). The HELP program is a quasi two dimensional hydrologic model of water movement across, into, through, and out of landfills.

PARAMETERS USED IN THE ANALYSIS

The following input information was used with the HELP program:

Climatic data

The climatic data required by HELP were assumed to be similar to that used in the evaluation of alternative final cover systems prepared by Rust Environment and Infrastructure (Rust, 1996) and approved by the North Carolina Department of Environment and Natural Resources (NCDENR). A brief description of this climatic data is presented below.

- The climate was modeled for Greensboro, North Carolina using a synthetic daily weather generator computer option over a 20-year period.
- The evaporative zone depth was input as the thickness of the final cover system layers that overlay the barrier layer (i.e., 24 inches).

Final cover data

As indicated earlier, the configuration of the permitted final cover will not be changed except that the geosynthetics of the final cover system (i.e., geomemebrane and geocomposite drainage layer) will be replaced by an A/A Structured Geomembrane. Therefore, components of the A/A final cover system consist, from top to bottom, of:

- a 24-inch thick protective soil layer;
- an 8 oz/yd^2 geotextile filter;
- an A/A Structured Geomembrane consisting of a 60-mil thick high density polyethylene (HDPE) geomembrane with 0.18-inch thick drainage studs on the top; and
- an 18–inch compacted clay barrier with a hydraulic conductivity no greater than 1 x 10^{-5} cm/sec.

Therefore, the following data was used to represent the properties of the different layers for the A/A final cover system:

- The protective soil layer was modeled as soil with the following properties (default material texture # 8):

Thickness:	24 inches
Porosity:	0.463
Field capacity:	0.232
Wilting point:	0.116
Saturated hydraulic conductivity:	4x10^{-4} cm/sec

- The drainage layer of the final cover system was modeled as a material with the following properties:

Thickness:	0.18 inches
Porosity:	0.85
Field capacity:	0.01
Wilting point:	0.005

GeoSyntec Consultants have previously conducted tests on the proposed A/A Structured Geomembrane to evaluate its hydraulic transmissivity under different hydraulic gradients and seating times. Based on these test results, the hydraulic transmissivity for the drainage layer was found to range from approximately 6.5 x 10^{-4} m^2/sec to 1.0 x 10^{-3} m^2/sec. For the purpose of this analysis, data from the hydraulic transmissivity testing was extrapolated to estimate the hydraulic transmissivity of the drainage layer at the end of the post closure period (i.e., after 30 years) as shown in Figure 1. Based on Figure 1, the long-term hydraulic transmissivity of the drainage layer was conservatively assumed to be 4.8 x 10^{-4} m^2/sec. Therefore, the saturated hydraulic conductivity was calculated as follows:

$$\text{Saturated hydraulic conductivity} = \frac{4.8 \times 10^{-4}\ m^2/\text{sec} \times 10^4\ cm^2/m^2}{0.18\ \text{in} \times 2.54\ \text{cm/in}}$$
$$= 10\ \text{cm/sec}$$

- The 60-mil thick high density polyethylene (HDPE) geomembrane was modeled as a geosynthetic material texture # 35, with a hydraulic conductivity of 2 x 10^{-13} cm/sec. The geomembrane was assumed to have one hole per acre with a hole size of 0.16 in^2.

- The compacted clay barrier was modeled as a barrier layer with the following properties:

Thickness:	18 inches
Porosity:	0.419
Field capacity:	0.307
Wilting point:	0.180
Saturated hydraulic conductivity:	1 x 10^{-5} cm/sec

The drainage layer conditions applicable to the final cover system considered a critical slope of 25 percent (i.e., 4H:1V) and a drainage length of 115 ft which is the distance between surface water diversion berms. The final cover system was assumed to be vegetated with good grass and to allow runoff.

RESULTS AND CONCLUSIONS

The HELP Model output file is provided at the end of this calculation package. Based on the analysis results, the maximum head on top of the liner was estimated to be 0.047 inches which is considered small with respect to the thickness of the drainage layer (i.e., 0.18 inch). Therefore, the hydraulic performance of the A/A final cover system is deemed adequate.

REFERENCES

Rust Environment and Infrastructure (1996) *Petition for Alternative Final Cover, Piedmont Landfill and Recycling Center, Kernersville, North Carolina*, prepared for the North Carolina Department of Environment, Health and Natural Recources (NCDEHNR).

Schroeder. P.R., Lloyd, C.M., and Zappi, P.A. (1994a) "The Hydrologic Evaluation of Landfill Performance (HELP) Model, User's Guide for Version 3." U.S. Environmental Protection Agency, Office of Research and Development Washington, D.C., Report No. EPA/600/R094/168a.

Schroeder. P.R., Dozier, T.S., and Zappi, P.A., McEnroe, B.M., Sjostrom, J.W., and Peyton, R.L. (1994b) "The Hydrologic Evaluation of Landfill Performance (HELP) Model, Engineering Documentation for Version 3." U.S. Environmental Protection Agency, Office of Research and Development Washington, D.C., Report No. EPA/600/R-94/168b.

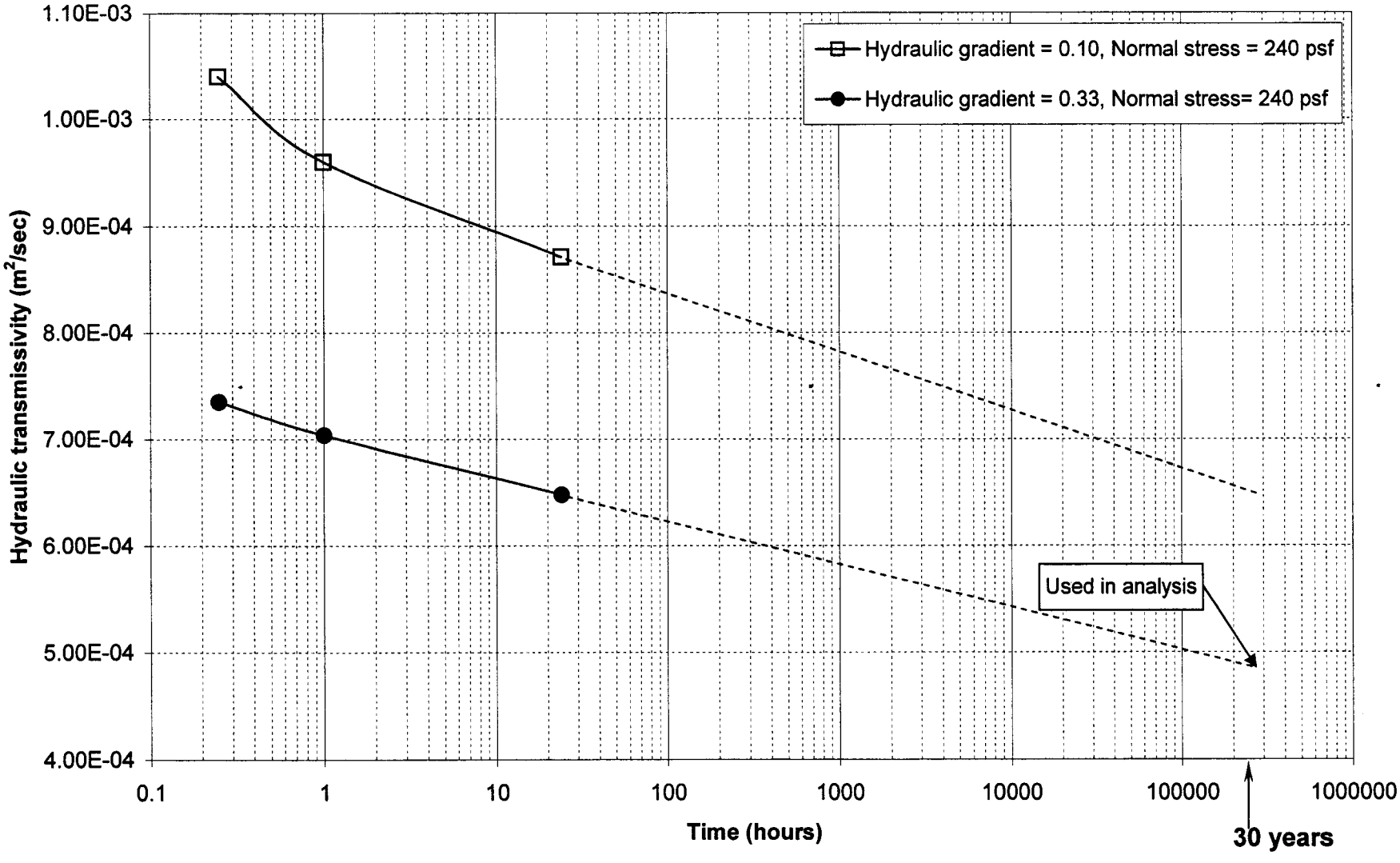


Figure 1: Estimation of the long-term hydraulic transmissivity for the drainage layer of a Super Gripnet® Liner

Written by: Tamer Y. Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

Client: WMI Project: Piedmont Landfill Project/Proposal No.: GD3294 Task No: 01

HELP Model Output File

PIEDLF

```
0
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP3.07\PIED4.D4
TEMPERATURE DATA FILE:       C:\HELP3.07\PIED7.D7
SOLAR RADIATION DATA FILE:   C:\HELP3.07\PIED13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3.07\PIED11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3.07\PIEDLF.D10
OUTPUT DATA FILE:            C:\HELP3.07\PIEDLF.OUT


TIME:  15:42     DATE:  11/11/2003


******************************************************************************

     TITLE:  Piedmont Landfill Final Cover Equivalency Demo

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   8
          THICKNESS                    =     24.00   INCHES
          POROSITY                     =      0.4630 VOL/VOL
          FIELD CAPACITY               =      0.2320 VOL/VOL
          WILTING POINT                =      0.1160 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.1962 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.369999994000E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  4.63
                 FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                  LAYER  2
                                  --------
```

TYPE 2 - LATERAL DRAINAGE LAYER
MATERIAL TEXTURE NUMBER 20

THICKNESS	=	0.18	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0198	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	10.0000000000	CM/SEC
SLOPE	=	25.00	PERCENT
DRAINAGE LENGTH	=	115.0	FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	0.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4190	VOL/VOL
FIELD CAPACITY	=	0.3070	VOL/VOL
WILTING POINT	=	0.1800	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4190	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.999999975000E-05	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A GOOD STAND OF GRASS, A SURFACE SLOPE OF 25.% AND A SLOPE LENGTH OF 115. FEET.

SCS RUNOFF CURVE NUMBER	=	75.70	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	4.710	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	11.112	INCHES

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LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.784	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	12.255	INCHES
TOTAL INITIAL WATER	=	12.255	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
GREENSBORO NORTH CAROLINA

STATION LATITUDE	=	35.13	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.50	
START OF GROWING SEASON (JULIAN DATE)	=	90	
END OF GROWING SEASON (JULIAN DATE)	=	305	
EVAPORATIVE ZONE DEPTH	=	24.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	66.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	68.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	74.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	70.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.51	3.37	3.88	3.16	3.37	3.93
4.27	4.19	3.64	3.18	2.59	3.38

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
37.50	39.90	48.00	58.30	66.50	73.50
77.20	76.30	69.90	58.40	48.50	40.20

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR GREENSBORO NORTH CAROLINA
AND STATION LATITUDE = 35.13 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.70	3.27	4.10	2.81	3.05	3.96
	4.76	5.13	3.82	2.52	2.60	3.80
STD. DEVIATIONS	1.65	1.38	1.92	1.36	1.29	2.53
	1.98	2.38	2.39	1.71	1.91	1.80
RUNOFF						
TOTALS	0.020	0.025	0.087	0.008	0.001	0.036
	0.035	0.052	0.078	0.043	0.043	0.039
STD. DEVIATIONS	0.067	0.062	0.247	0.021	0.005	0.136
	0.102	0.122	0.129	0.090	0.184	0.078
EVAPOTRANSPIRATION						
TOTALS	0.955	1.264	2.299	2.872	3.972	3.347
	4.108	3.626	2.542	1.201	0.899	0.773
STD. DEVIATIONS	0.313	0.375	0.541	0.489	0.964	1.531
	1.469	1.211	1.187	0.394	0.228	0.219
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	1.7864	1.6875	2.1593	0.8184	0.4657	0.6773
	0.6998	0.7899	0.9016	1.0004	0.9212	2.1860
STD. DEVIATIONS	1.6939	0.9179	1.5454	0.7042	0.6396	0.8718
	0.7325	0.9025	0.8272	0.8180	1.1286	1.2995
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3						
AVERAGES	0.0005	0.0005	0.0006	0.0002	0.0001	0.0002
	0.0002	0.0002	0.0003	0.0003	0.0003	0.0006
STD. DEVIATIONS	0.0005	0.0003	0.0004	0.0002	0.0002	0.0003
	0.0002	0.0003	0.0002	0.0002	0.0003	0.0004

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 20

	INCHES		CU. FEET	PERCENT
PRECIPITATION	42.52	(7.072)	154363.9	100.00
RUNOFF	0.466	(0.3584)	1691.78	1.096
EVAPOTRANSPIRATION	27.859	(3.6012)	101128.41	65.513
LATERAL DRAINAGE COLLECTED FROM LAYER 2	14.09365	(4.16200)	51159.961	33.14243
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00001	(0.00000)	0.021	0.00001
AVERAGE HEAD ON TOP OF LAYER 3	0.000	(0.000)		
CHANGE IN WATER STORAGE	0.106	(1.1018)	383.74	0.249

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 20

	(INCHES)	(CU. FT.)
PRECIPITATION	3.76	13648.800
RUNOFF	1.058	3839.1340
DRAINAGE COLLECTED FROM LAYER 2	1.52679	5542.25293
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00128
AVERAGE HEAD ON TOP OF LAYER 3	0.013	
MAXIMUM HEAD ON TOP OF LAYER 3	0.047	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	2.87	10419.2432

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3791

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1160

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 20

LAYER	(INCHES)	(VOL/VOL)
1	6.8257	0.2844
2	0.0018	0.0100
3	0.0000	0.0000
4	7.5420	0.4190
SNOW WATER	0.000	

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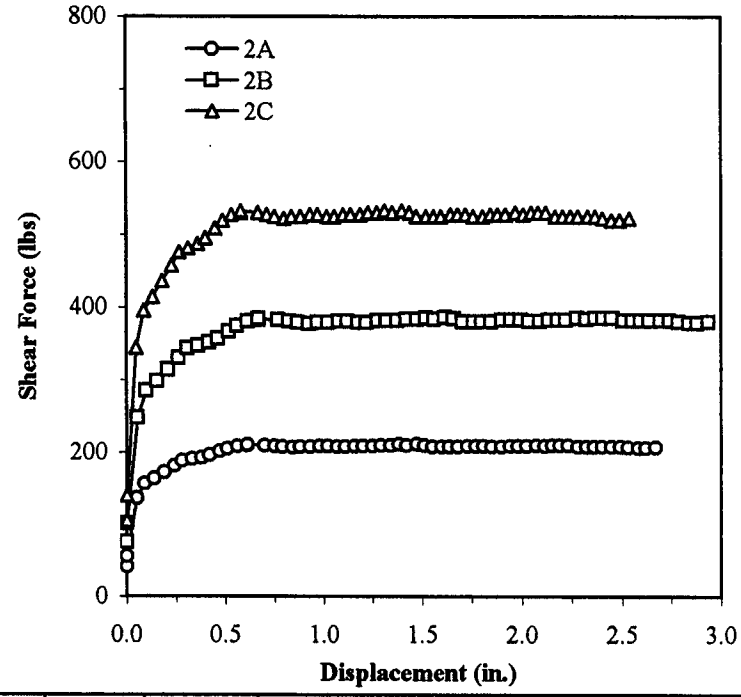
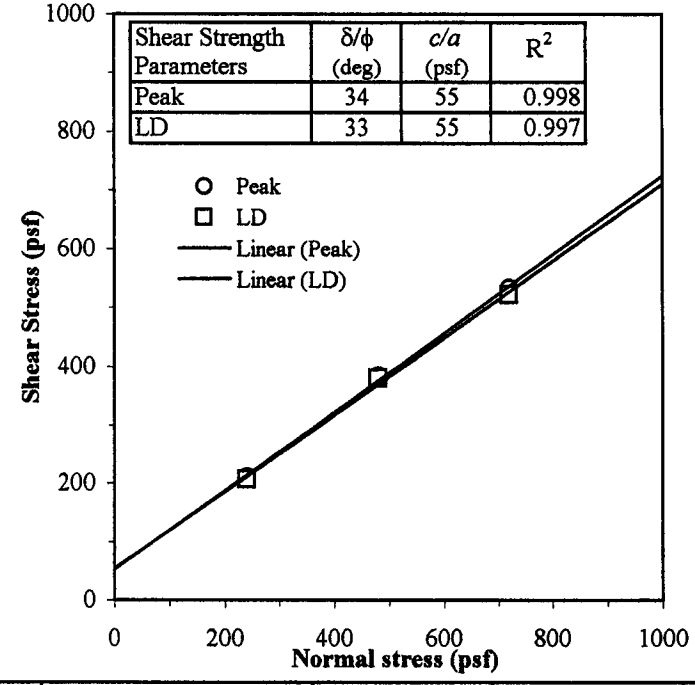
Attachment 4

Results of Laboratory Shear Strength Testing on Final Cover System Containing Agru/America, Inc. Structured Geomembrane

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Test Series 2: Protective Soil (PS-1) against TNS E080 geotextile against 60-mil Agru SuperGripNet liner HDPE geomembrane (cylinders up and spikes down) against Clay Liner (CL-1) under wetted and consolidated conditions





Shear Strength Parameters	δ/ϕ (deg)	c/a (psf)	R^2
Peak	34	55	0.998
LD	33	55	0.997

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking Stress (psf)	Soaking Time (hour)	Consolidation Stress (psf)	Consolidation Time (hour)	Lower Soil γ_{dl} (pcf)	Lower Soil ω_i (%)	Lower Soil ω_f (%)	Upper Soil γ_{dl} (pcf)	Upper Soil ω_i (%)	Upper Soil ω_f (%)	GCL ω_i (%)	GCL ω_f (%)	Shear Stress τ_p (psf)	Shear Stress τ_{LD} (psf)	Failure Mode
2A	12 x 12	240	0.040	-	-	240	0.5	105.4	18.0	19.6	TIP	4.4	15.6	-	-	211	207	(1)
2B	12 x 12	480	0.040	-	-	480	0.5	104.7	18.8	19.3	TIP	4.1	11.9	-	-	384	380	(1)
2C	12 x 12	720	0.040	-	-	720	0.5	104.9	18.6	19.0	TIP	4.9	9.3	-	-	533	522	(1)

Notes: (1) Sliding (i.e., shear failure) occurred between the protective soil and geotextile during each test.

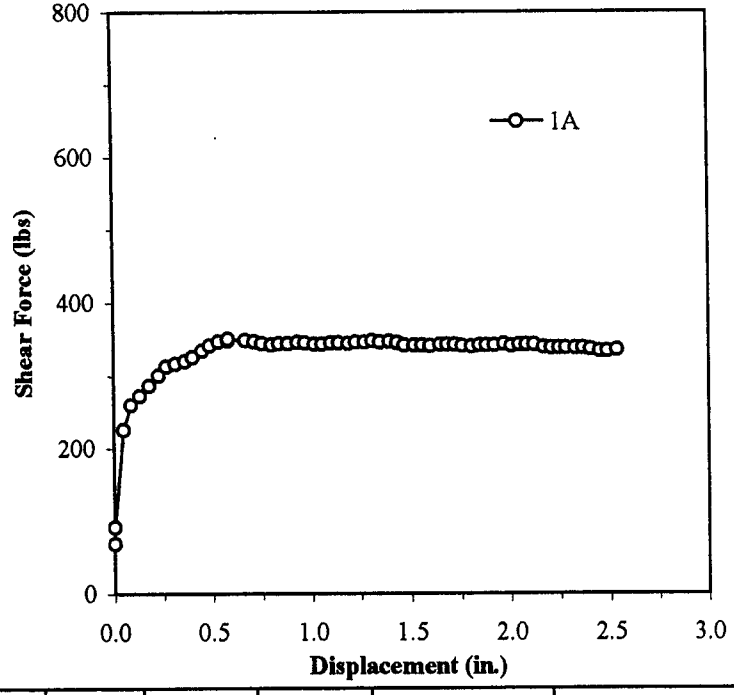
(2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test. TIP refers to the fact that the material was tamped in-place and its dry unit weight was not recorded.

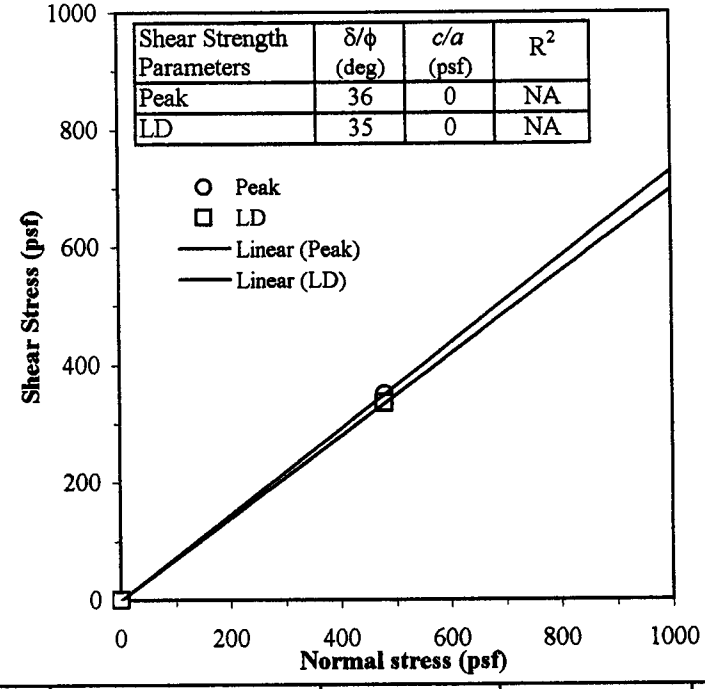
SGI TESTING SERVICES, LLC

DATE OF TEST:	17 July 2002
FIGURE NO.	A-4
PROJECT NO.	SGI2064
DOCUMENT NO.	SGI02106
FILE NO.	

INTERFACE DIRECT SHEAR TESTING (ASTM D 5321)

Test Series 1: Protective Soil (PS-1) against TNS E080 geotextile against 60-mil Agru SuperGripNet liner HDPE geomembrane (cylinders up and spikes down) against Clay Liner (CL-1) under wetted, consolidated, and slow shear conditions





Shear Strength Parameters	δ/ϕ (deg)	c/a (psf)	R^2
Peak	36	0	NA
LD	35	0	NA

Test No.	Shear Box Size (in. x in.)	Normal Stress (psf)	Shear Rate (in./min)	Soaking		Consolidation		Lower Soil			Upper Soil			GCL		Shear Stress		Failure Mode
				Stress (psf)	Time (hour)	Stress (psf)	Time (hour)	γ_{dl} (pcf)	ω_l (%)	ω_f (%)	γ_{dl} (pcf)	ω_l (%)	ω_f (%)	ω_l (%)	ω_f (%)	τ_p (psf)	τ_{LD} (psf)	
1A	12 x 12	480	0.004	-	-	480	24	105.2	18.3	16.9	TIP	4.4	10.2	-	-	350	335	(1)

Notes: (1) Sliding (i.e., shear failure) occurred between the protective soil and geotextile during the test.
(2) The reported total-stress parameters of friction angle and adhesion were determined from a best-fit line drawn through the test data. Caution should be exercised in using these strength parameters for applications involving normal stresses outside the range of the stresses covered by the test series. The large-displacement (LD) shear strength was calculated using the shear force measured at the end of the test. TIP refers to the fact that the material was tamped in-place and its dry unit weight was not recorded.

SGI TESTING SERVICES, LLC

DATE OF TEST:	15 to 16 July 2002
FIGURE NO.	A-3
PROJECT NO.	SGI2064
DOCUMENT NO.	SGI02106
FILE NO.	

Attachment 5

Static and Seismic Slope Stability Analyses of Final Cover System Containing Agra/America, Inc. Structured Geomembrane

Written by: Tamer Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

Client: WMI Project: Piedmont LF Project/Proposal No.: GD3294 Task No: 01

STABILITY ANALYSIS OF FINAL COVER SYSTEM FOR THE PIEDMONT LANDFILL

PURPOSE

The purpose of the analyses presented in this calculation package is to evaluate static and seismic stability of the final cover system that includes an Agru America, Inc. (A/A) Structured Geomembrane (i.e., Super Gripnet® Liner or A/A Drain Liner), referred to hereafter as the A/A final cover system.

METHOD OF ANALYSES

Static Stability Analysis:

Static slope stability of a landfill final cover system can be analyzed assuming infinite slope conditions or finite slope conditions. The infinite slope stability analysis method considers a slope of infinite length whereby the driving and resisting forces occur only along or parallel to an interface (i.e., slip plane). The finite slope stability analysis method considers a slope of finite length and additionally takes into account soil strength above a slip plane, primarily as a toe-buttressing effect. Since the final cover slopes at the Piedmont Landfill are relatively short, the finite slope stability analysis method is appropriate.

The finite slope stability factor of safety equation, as formulated by Giroud, et al. [1995], is:

$$FS = \left[\frac{\gamma_t(t-t_w)+\gamma_b t_w}{\gamma_t(t-t_w)+\gamma_{sat} t_w}\right]\frac{\tan\delta}{\tan\beta} + \frac{a/\sin\beta}{\gamma_t(t-t_w)+\gamma_{sat} t_w}$$
$$+\left[\frac{\gamma_t(t-t^*_w)+\gamma_b t^*_w}{\gamma_t(t-t_w)+\gamma_{sat} t_w}\right]\left[\frac{\tan\phi/(2\sin\beta\cos^2\beta)}{1-\tan\beta\tan\phi}\right]\frac{t}{h}$$
$$+\left[\frac{1}{\gamma_t(t-t_w)+\gamma_{sat} t_w}\right]\left[\frac{1/(\sin\beta\cos\beta)}{1-\tan\beta\tan\phi}\right]\frac{ct}{h} \qquad (1)$$

where:
- FS = factor of safety;
- δ = interface friction angle;
- a = apparent interface adhesion;
- ϕ = soil internal friction angle;
- c = apparent soil cohesion;

γ_t = moist soil unit weight;
γ_b = buoyant soil unit weight;
γ_{sat} = saturated soil unit weight;
t = depth of cover soil above critical interface;
t_w = water depth above critical interface;
t_w^* = water depth at slope toe;
β = slope inclination; and
h = vertical height of slope.

It should be noted that while the above equation is specifically for an interface above a geomembrane, or similar layers, it can also be applied to interfaces below the geomembrane by changing the coefficient of the first term, (i.e., the coefficient of $\tan\delta / \tan\beta$) to 1.0. The slope geometry, which is used to derive the above equation, is shown in Figure 1.

Seismic Stability Analysis:

A pseudo-static slope stability analysis is performed for the A/A final cover system. The pseudo-static factor of safety is estimated by performing an infinite slope stability analysis using Equation 2 [Matasović, 1991]:

$$FS = \frac{c/(\gamma z \cos^2\beta) + \tan\phi\ [1 - \gamma_w (z - d_w)/(\gamma z)] - k_s \tan\beta \tan\phi}{k_s + \tan\beta} \qquad (2)$$

where: FS = factor of safety;
k_s = peak average horizontal acceleration as a fraction of gravity;
γ = unit weight of slope material(s) in pcf;
γ_w = unit weight of water in pcf;
c = cohesion in psf;
β = slope angle in degrees;
ϕ = angle of internal friction on the assumed failure surface in degrees;
z = depth to the assumed failure surface in ft; and
d_w = depth to the water table (assumed parallel to the slope) in ft.

The peak horizontal acceleration at the top of the Piedmont Landfill is estimated using a chart (Figure 2) developed by Idriss [1990], as presented by Kavazanjian and Matasović [1994].

A calculated factor of safety greater than 1.0 suggests that no permanent seismic deformation is expected. A factor of safety less than 1.0, however, suggests permanent deformation can occur. The amount of seismic displacement can be computed based on k_s and the yield acceleration, K_y. The yield acceleration is the horizontal acceleration which results in a pseudo-static factor of safety of 1.0. The yield acceleration may be calculated using Equation 3 [Matasović, 1991]:

$$K_y = \frac{c/(\gamma \bullet z \bullet \cos^2\beta) + \tan\phi\,[1 - \gamma_w (z - d_w)/(\gamma \bullet z)] - \tan\beta}{1 + \tan\beta \tan\phi} \qquad (3)$$

The seismic displacement, corresponding to the computed K_y/k_s ratio, is estimated using the results presented by Hynes and Franklin [1984] and the "modified mean + one standard deviation curve" developed by GeoSyntec as presented in Figure 3. The "modified mean + one standard deviation curve" considers data associated with only large earthquakes, and therefore, is more conservative to use. This procedure is consistent with those given in the USEPA guidance document [USEPA; 1995].

TARGET FACTORS OF SAFETY

The target FS for the static stability analysis using peak and residual shear strength values are 1.5 and 1.2, respectively. For seismic analysis, the permanent deformation is considered acceptable if it is less than 6 to 12 in.

DESIGN PEAK GROUND ACCELERATION

The maximum horizontal acceleration (MHA) at the site was assumed to be the maximum expected horizontal acceleration depicted on a seismic hazard map, with a 90 percent or greater probability that the acceleration will not be exceeded in 250 years. Therefore, the MHA was selected to be 0.11g based on United States Geological Survey (USGS) map. Based on this value, the corresponding peak horizontal acceleration at the top of the Piedmont Landfill may be estimated using Figure 2 as 0.21 g.

FINAL COVER DATA

As stated earlier, the configurations of the currently permitted final cover systems will not change except that the geosynthetic components of the final cover systems (i.e., geomembrane and geocomposite drainage layer) will be replaced by an A/A Structured Geomembrane. The protective soil component of the proposed final cover system was

assumed to have a unit weight of 120 pcf and shear parameters of $c = 0$ and $\phi = 30^{\circ}$. Critical conditions for the evaluation of the stability of final cover system for the Piedmont Landfill considers a slope of 33.3 percent (3H:1V) and a length of 115 ft.

The water depth in the drainage layer above the geomembrane (t_w) was calculated using the HELP model [Schroeder, 1994] in the calculation package titled "*Hydraulic Performance Analysis of Final Cover System Containing Agru/America, Inc. Structured Geomembrane*". Based on the HELP analysis results, the average peak daily water depth was estimated to be 0.013 inches (0.0011 ft).

The final cover system static stability analyses were performed by solving the finite slope stability equation, (i.e., Equation 1) for various combinations of peak and residual internal/interface shear strength parameters (i.e., "δ" and "a" for above and below a geomembrane) based on the target factors of safety. The seismic stability analysis was performed assuming the final cover interfaces have the minimum peak interface/internal shear strength evaluated from the static stability analyses.

RESULTS AND CONCLUSIONS

Analyses were performed to estimate the minimum required peak and residual interface/internal shear strengths, expressed in terms of friction angle δ and adhesion a, that can achieve a static FS of 1.5 and 1.2, respectively. Equations used to calculate the FS above and below a geomembrane are coded in a spreadsheet presented herein as Tables 1 and 2, for peak and residual final cover shear strength parameters, respectively. The results of the static slope stability analyses are presented in Figures 4 and 5.

GeoSyntec have previously performed laboratory shear strength testing on a final cover system consisting of an A/A Structured Geomembrane (i.e., Super Gripnet® Liner). The Configuration for these tests includes a Super Gripnet® Liner sandwiched between a protective soil cover and a compacted clay liner. The results of these tests show the A/A final cover system has shear strength values that exceed the minimum requirements for peak and residual interface/internal shear strength parameters illustrated in Figure 4 and 5, respectively.

Results of the seismic stability analysis of the A/A final cover system using minimum peak interface/internal shear strength parameters are presented in Table 3. As illustrated in Table 3, calculated pseudo-static factors of safety for the final cover system were less than one, indicating permanent deformation can occur when subjected to the design earthquake event. However, the maximum calculated seismic deformation (illustrated in Figure 3) was 2.2 in., which is considered acceptable.

REFERENCES

Giroud, J.P., Bachus, R.C., and Bonaparte, R., "Influence of Water Flow on the Stability of Geosynthetic-Soil Layered Systems on Slopes," *Geosynthetics International*, Vol. 2, No. 6, 1995, pp. 1149-1180.

Hynes, M.E., and Franklin, A.G., "Rationalizing the Seismic Coefficient Method," *Miscellaneous Paper GL - 84 - 13,* U.S. Army Engineer Waterways Experiment Station, Vickburg, MS, 1984, pp. 34.

Idriss, I. M., "Response of Soft Soil Sites During Earthquakes," *Seed Memorial Symposium Proceedings,* Vol. 2, BiTech Publications, Berkeley, CA 1990.

Kavazanjian, E., Jr., and Matasović, N., "Seismic Analysis of Solid waste Landfills" Accepted for publication, Proceedings, GeoEnvironment 2000, Geotechnical Special Publication, ASCE, New York, NY, 1994.

Matasović, N., "Selection of Method for Seismic Slope Stability Analysis," *Proceedings of the 2nd International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics,* Vol. 2, St. Louis, 1991, pp. 1057-62.

Schroeder, P. R., N. M., Lloyd, C. M. and Zappi, P.A. (1994) "The Hydrologic Evaluation of Landfill Performance (HELP) Model: User's Guide for Version 3," EPA/600/R-94/168a, September 1994, U. S. Environmental Protection Agency Office of Research and Development, Washington, D.C.

USEPA, "*RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*", Office of Research and Development, EPA/600/R-95/051, April 1995.

Written by: Tamer Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

Client: WMI Project: Piedmont LF Project/Proposal No.: GD3294 Task No: 01

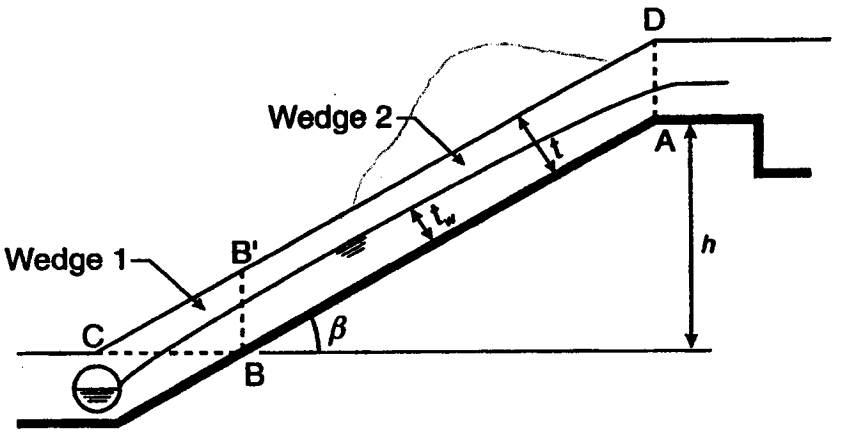


Figure 1. Slope Geometry Used to Derive the Finite Slope Stability Equation.

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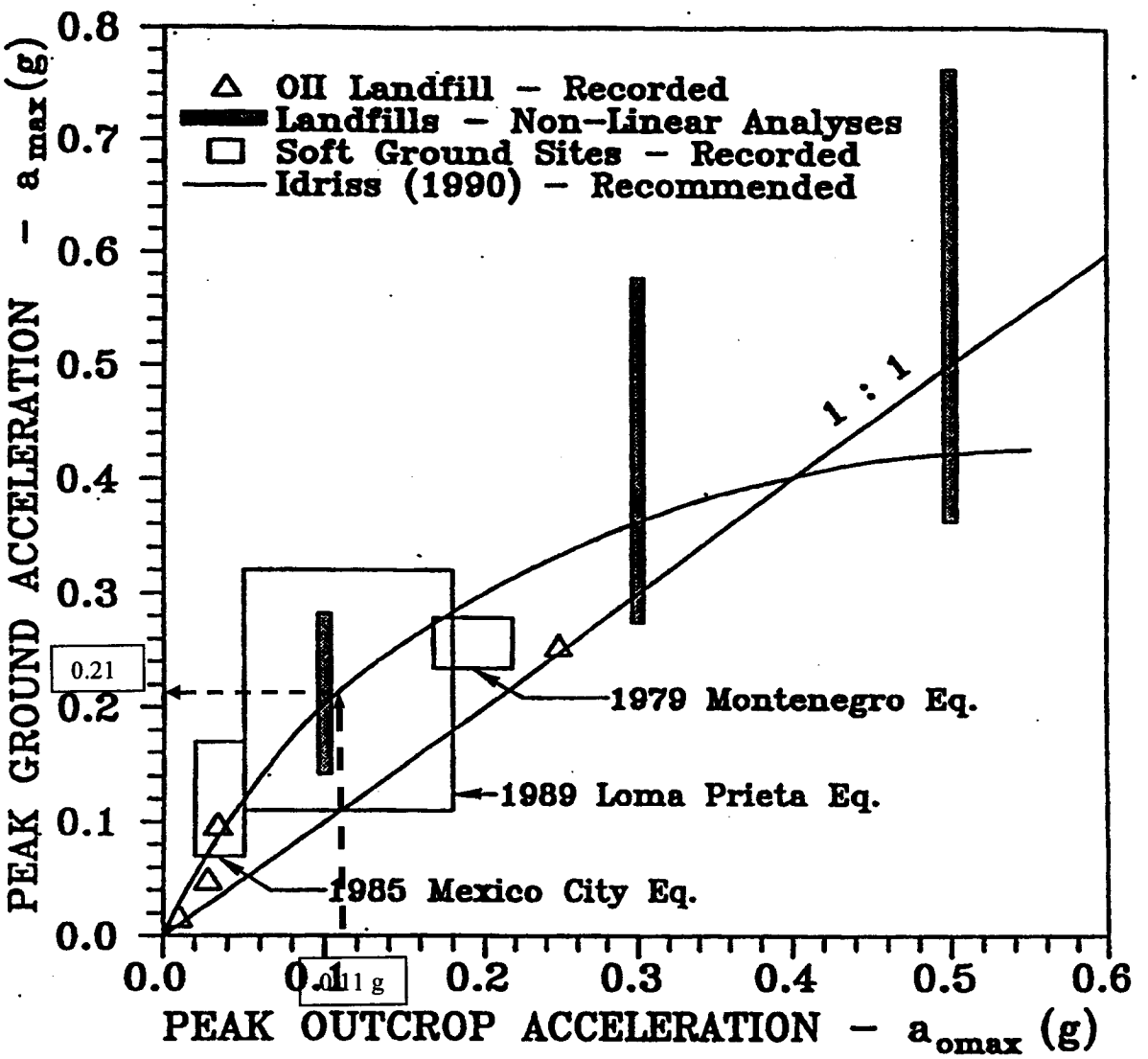

Observed Variations of Peak Horizontal Accelerations on Soft Soil and MSW Sites in Comparison to Rock Sites (Kavazanjian and Matasović, 1994).

Figure 2

Written by: Tamer Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

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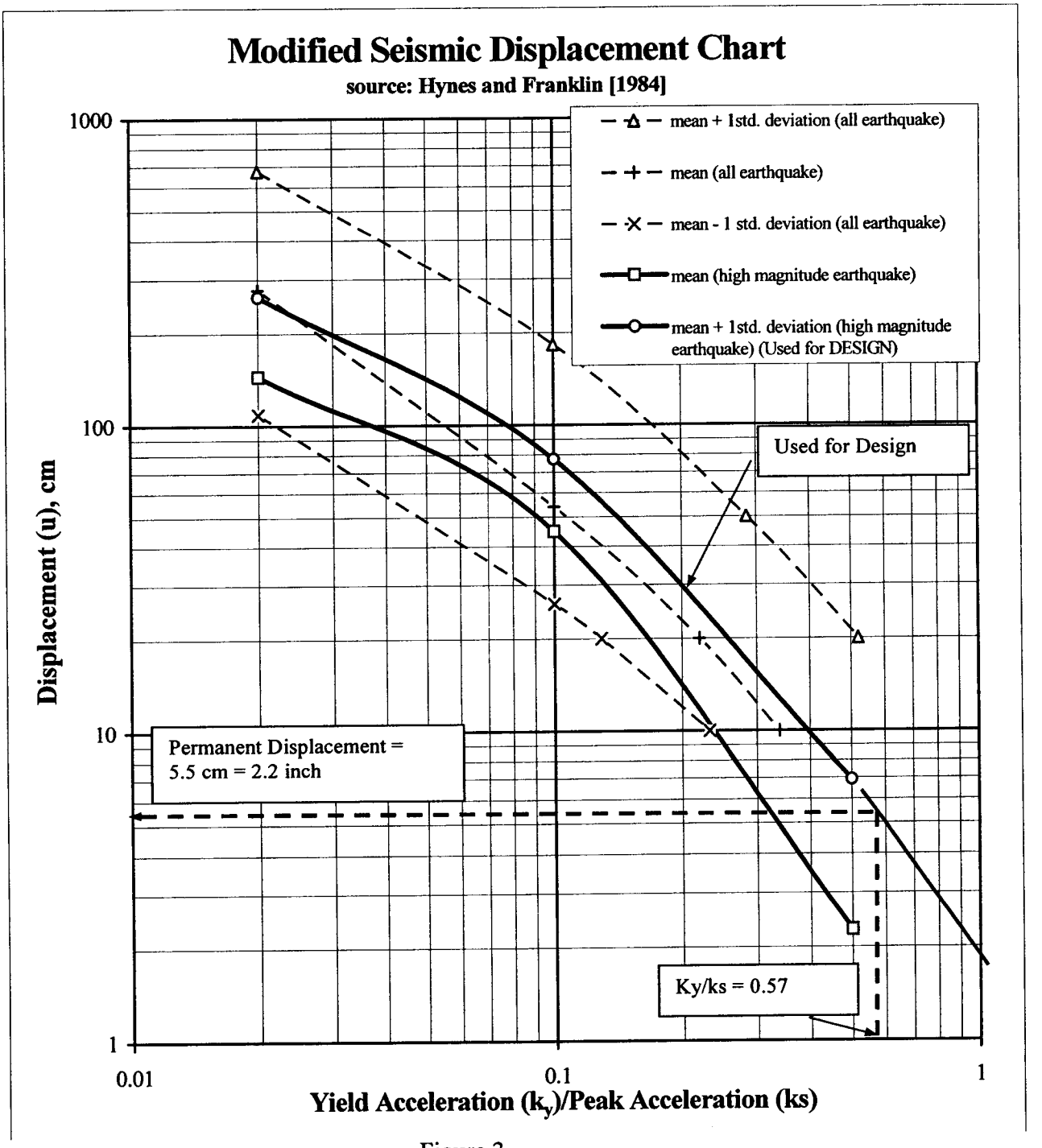

Figure 3

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Client: WMI Project: Piedmont LF Project/Proposal No.: GD3294 Task No: 01

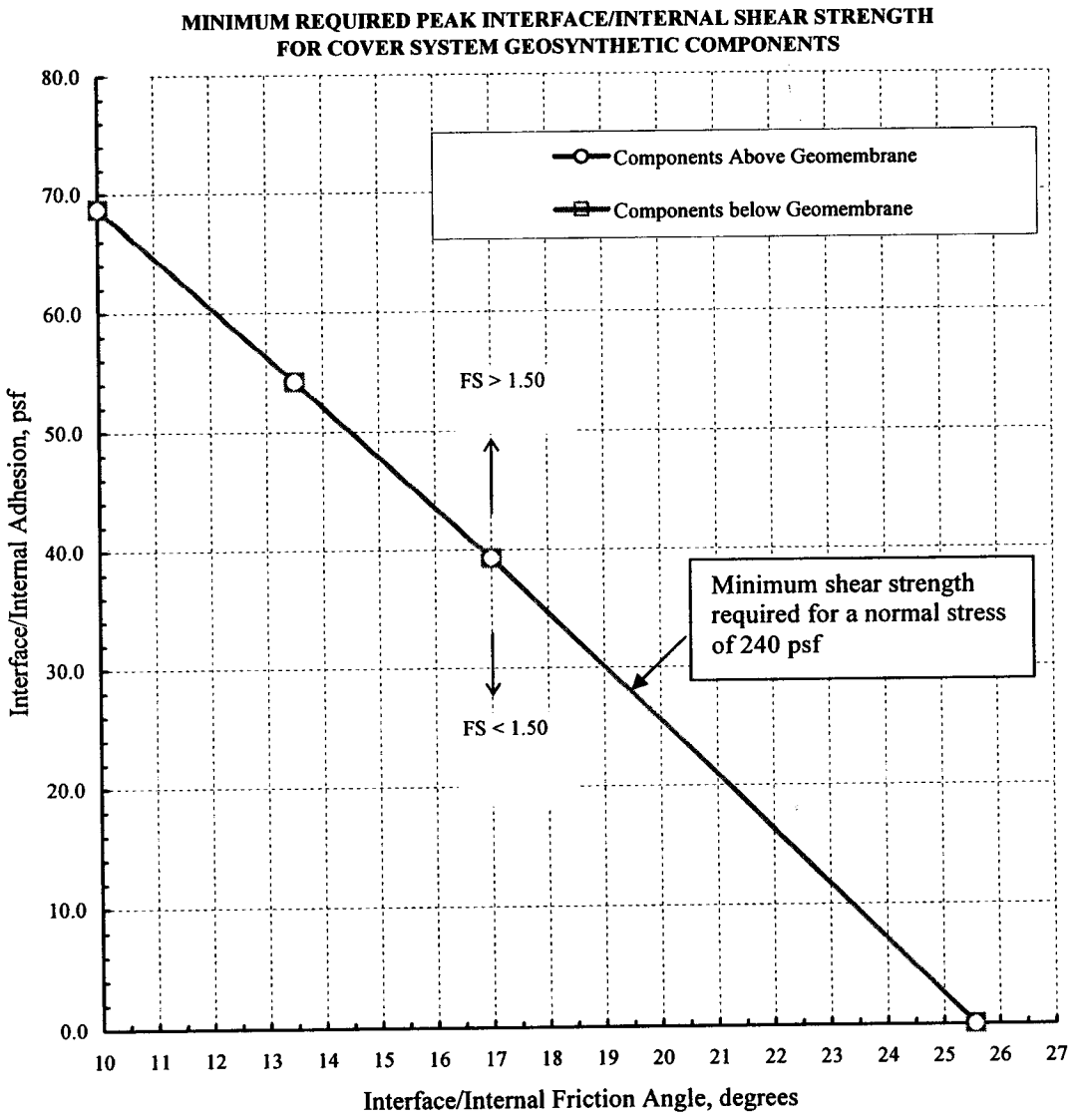

Figure 4. Peak Interface/Internal Shear Strength requirements for proposed final cover system

Written by: Tamer Elkady Date: 04 /2 /18 (YY MM DD) Reviewed by: Majdi Othman Date: 04/ 2 /18 (YY MM DD)

Client: WMI Project: Piedmont LF Project/Proposal No.: GD3294 Task No: 01

Table 1. Spreadsheet for the evaluation of peak interface/internal shear strength of proposed final cover system using Finite Slope Equation [Giroud et al., 1995].

FS Above GEOMEMBRANE		
Input Parameters:		
γ_t (Unit wt of soil):	120	pcf
γ_{sat} (Saturated unit wt of soil):	120	pcf
γ_w (Unit wt of water):	62.4	pcf
γ_b (Buoyant unit wt of soil):	57.6	pcf
t_w (water thickness):	0.001	ft
t* (water thickness at slope toe):	0.001	ft
δ (weakest interface friction angle):	25.6	deg
ϕ (friction angle of soil):	30	deg
a (interface adhesion)	0.0	psf
c (cohesion of soil above geomembrane)	0	psf
T (Tension in Geosynthetics)	0	psf
h (height of slope):	38.33	ft
t (thickness of soil layer)	2.0	ft
β (slope angle)	18.4	deg
FS	1.50	

FS Below GEOMEMBRANE		
Input Parameters:		
γ_t (Unit wt of soil):	120	pcf
γ_{sat} (Saturated unit wt of soil):	120	pcf
γ_w (Unit wt of water):	62.4	pcf
γ_b (Buoyant unit wt of soil):	57.6	pcf
t_w (water thickness):	0.001	ft
t* (water thickness at slope toe):	0.001	ft
δ (weakest interface friction angle):	25.6	deg
ϕ (friction angle of soil):	30	deg
a (interface adhesion)	0	psf
c (cohesion of soil above geomembrane)	0	psf
T (Tension in Geosynthetics)	0	psf
h (height of slope):	38.33	ft
t (thickness of soil layer)	2.0	ft
β (slope angle)	18.4	deg
FS	1.50	

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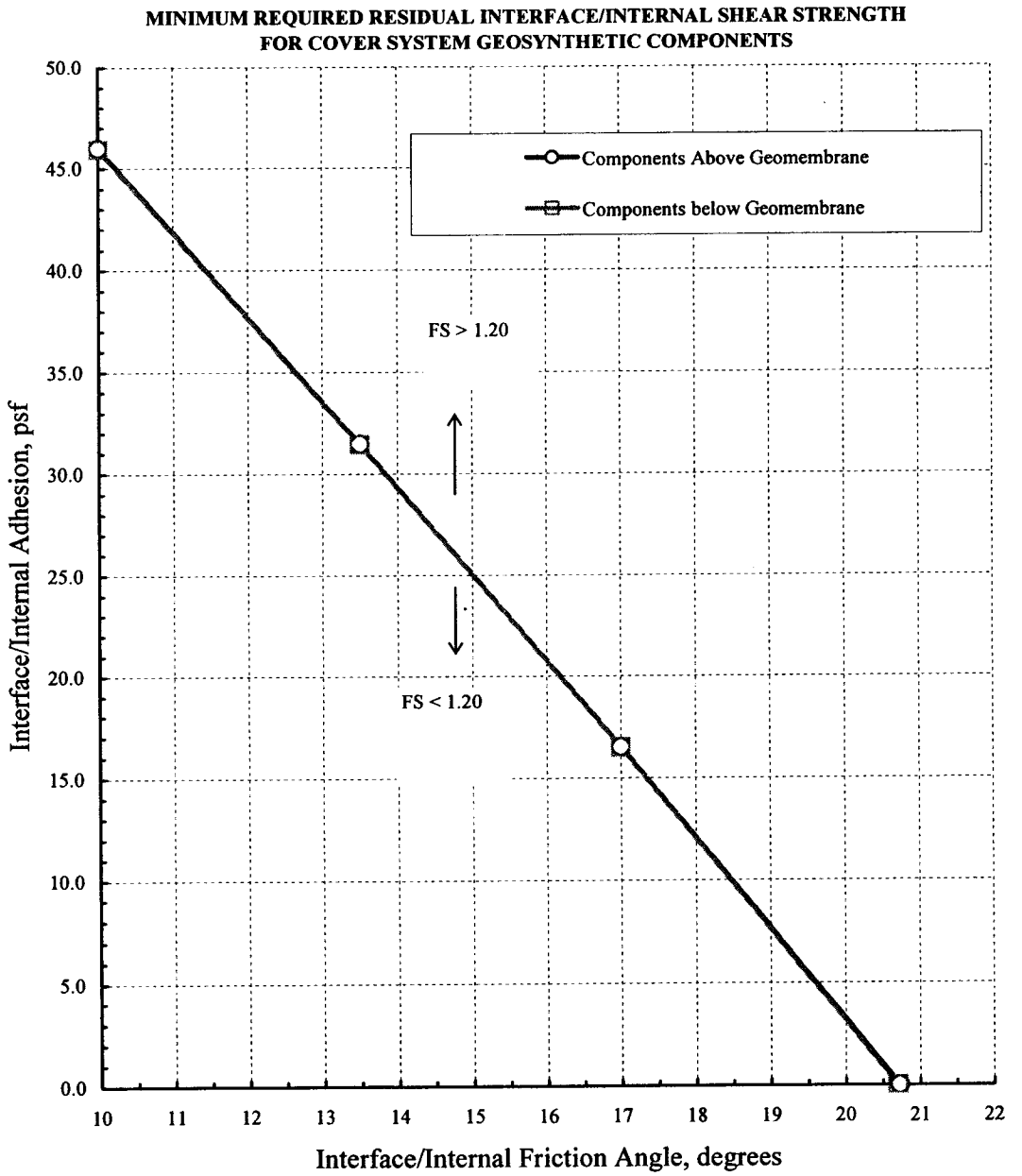

Figure 5. Residual Interface/Internal Shear Strength requirements for proposed final cover system

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Table 2. Spreadsheet for the evaluation of residual interface/internal shear strength of proposed final cover system using Finite Slope Equation [Giroud et al., 1995].

FS Above GEOMEMBRANE		
Input Parameters:		
γ_t (Unit wt of soil):	120	pcf
γ_{sat} (Saturated unit wt of soil):	120	pcf
γ_w (Unit wt of water):	62.4	pcf
γ_b (Buoyant unit wt of soil):	57.6	pcf
t_w (water thickness):	0.001	ft
t* (water thickness at slope toe):	0.001	ft
δ (weakest interface friction angle):	20.7	deg
ϕ (friction angle of soil):	30	deg
a (interface adhesion)	0.0	psf
c (cohesion of soil above geomembrane)	0	psf
T (Tension in Geosynthetics)	0	psf
h (height of slope):	38.33	ft
t (thickness of soil layer)	2.0	ft
β (slope angle)	18.4	deg
FS	1.20	

FS Below GEOMEMBRANE		
Input Parameters:		
γ_t (Unit wt of soil):	120	pcf
γ_{sat} (Saturated unit wt of soil):	120	pcf
γ_w (Unit wt of water):	62.4	pcf
γ_b (Buoyant unit wt of soil):	57.6	pcf
t_w (water thickness):	0.001	ft
t* (water thickness at slope toe):	0.001	ft
δ (weakest interface friction angle):	20.7	deg
ϕ (friction angle of soil):	30	deg
a (interface adhesion)	0	psf
c (cohesion of soil above geomembrane)	0	psf
T (Tension in Geosynthetics)	0	psf
h (height of slope):	38.33	ft
t (thickness of soil layer)	2.0	ft
β (slope angle)	18.4	deg
FS	1.20	

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Table 3. Seismic Analysis Using Peak Interface/Internal Shear Strength.

Calculation of Factor of Safety and Yield Acceleration
For Infinite Slope Conditions
Using Equation from Matasovic [1991]

$$FS=\frac{\left(\frac{c}{\gamma\, z\cos^2\beta}+\tan\phi\left(1-\frac{\gamma_w(z-d_w)}{\gamma z}\right)-K_s\tan\beta\tan\phi\right)}{Ks+\tan\beta}$$

$$k_y=\frac{\left(\frac{c}{\gamma z\cos^2\beta}+\tan\phi\left(1-\frac{\gamma_w(z-d_w)}{\gamma z}\right)-\tan\beta\right)}{1+\tan\beta\,\tan\phi}$$

Where:

k_y = yield acceleration, g.;
γ = unit weight of soil cover, pcf;
γ_w = unit weight of water, pcf;
c = cohesion along the assumed failure surface, psf;
ϕ = friction angle along the assumed failure surface, degrees;
β = slope angle, degrees;
z = depth of the assumed failure surface, ft; and
d_w = depth of water surface (assumed parallel to the slope), ft.
k_s = peak average horizontal acceleration for potential slide mass, g. = a_{max}

Input parameters:	
γ, pcf	*120*
z, ft	*2*
β, degrees	*18.43*
γ_w, pcf	*62.4*
d_w, ft	*1.953*
ks, g	*0.21*

ϕ (degrees)	c (psf)	FS	k_y (g)	k_y/a_{max}	
25.6	0	0.809	0.121	0.57	<== minimum
17	39.3	0.851	0.137	0.65	
13.5	54.2	0.868	0.143	0.68	
10	68.7	0.884	0.150	0.72	