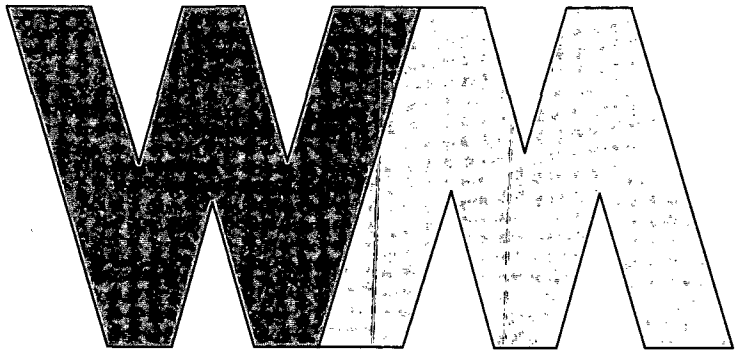
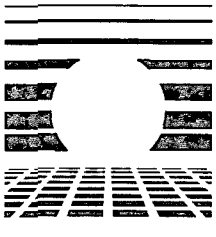
PERMIT DOCUMENTS
FOR
TRAIL RIDGE LANDFILL
THIRD RAI RESPONSE

PREPARED FOR:



TRAIL RIDGE LANDFILL, INC.

PREPARED BY:



England-Thims & Miller, Inc.
Consulting & Design Engineers
14775 St. Augustine Road
Jacksonville, Florida 32258
Certificate of Authorization Number: 2584
Phone Number (904) 642-8990

MAY 15, 2003

PROJECT NUMBER: E 02-025

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • GIS • LANDSCAPE ARCHITECTS

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May 15, 2003

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

RE: Trail Ridge Landfill – Second Permit Renewal
FDEP Permit Numbers 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
Third Request for Additional Information
ETM No. 02-025-3

Dear Ms. Nogas:

We have received your letter dated April 4, 2003 regarding the referenced project. On behalf of Trail Ridge Landfill, Inc., please find the following response to your request for additional information. Please note that only the items for which the Department requested a response are included.

Attachment No. 1 – Memorandum Prepared by Julia Boesch Dated April 3, 2003

*4. & 7. **According to your submittal, one spotter can inspect forty 8.45-ton trucks per hour, while a laborer can manage waste (remove) from 24 trucks each hour. This appears to be an extremely high amount of waste for one individual to be able to effectively spot. Please provide documentation to support your numbers, or revise your matrix.***

The proposed number of spotters and laborers is based upon current operations as shown in the revised matrix in **Attachment A**. It should be noted that the equipment operators are typically trained operators and they also spot the waste during the pushing and compaction of the waste. We believe that the facility's record stands for itself and we invite the Department to come review the operation.

In your comment number 4, you indicate that the matrix was developed based upon the number of trucks and waste received, while the number of spotters and laborers that are currently being provided appear to not be included in its development. Please address.

The proposed number of spotters and laborers is based upon current operations.

In your response when you indicate that the number of spotters and laborers needed are to one decimal point, i.e., 1.2, will you provide the minimum number of people rounded up, i.e., 2 people? Please address.

Please see the revised matrix in **Attachment A**, which has been revised to roundup to whole numbers as requested.

RE: Trail Ridge Landfill – Permit Renewal
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9. ***Please clarify if batteries received at the site will be stored on pallets in the existing concrete storage area.***

Yes, batteries are stored on pallets in the existing concrete storage area.

In the event that more water is collecting than evaporating, what measures will you implement to prevent water from reaching the elevation of the pallets?

The water will be pumped out and handled as leachate. The water level in the storage area will be checked on a weekly basis.

Please note, drawing sheet 4 reflects various future areas. Please note that those areas were not reviewed in this application.

Comment is noted.

14. ***In your response, you indicate that contaminated soil you will use as initial cover will be stored within the landfill lined area on top of existing in-place waste. Please clarity if you intend to store this material in waste areas that have received initial, intermediate and/or final cover on it and address. How will you remove the soil for initial cover without also removing waste or portions of the existing in-place underlying cover material?***

The storage areas will have intermediate cover. During the removal process, the material is removed to the elevation of the surrounding ground and then holes will be dug to determine the thickness of the remaining material. The material will not be excavated below the thickness of the soil material. Once the material is removed a final check will be made (by digging holes) to ensure 12" of intermediate cover. Generally, holes will be dug on a 100' grid to check the thickness. If necessary, soil will be added to ensure a minimum of 12 inches of intermediate cover.

Please note, your proposal is not acceptable, as you are not proposing to provide the department with analytics of contaminated soil prior to its disposal or reuse, i.e., as initial cover at the facility. Please propose to do so. Please develop and provide a soil-screening matrix that will reflect the cases in which you will or will not provide the department with analytical results prior to its use or disposal at the facility.

First, the operator has agreed to obtain Department approval on a case-by-case basis before any contaminated soil is used for initial cover. Second, the operator does not accept soil without sampling and analysis of the material. Finally, only the material that is demonstrated to be below the commercial levels of Chapter 62-777, F.A.C. will be accepted at the facility.

19. ***You indicate that leachate flows will be recorded Monday through Friday. Please note that they also should be recorded on Saturday and Sunday. Please propose to provide and maintain recording flow meters and address. Please show in the site plan their location. Please note your proposal to not notify the department of an exceedance unless the maximum rate is exceeded for more than 5 consecutive days is not acceptable. Please propose to notify the department if the maximum rate is ever exceeded and to notify the department by telephone within 24 hours of the discovery and in a follow-up report within 7***

RE: Trail Ridge Landfill – Permit Renewal
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days. Additionally, if the allowable rate is exceeded even on just one day, please propose to conduct an investigation and implement remedial actions if warranted.

The regulations do not require recording flow meters. Flow meters have been installed and are being operated and maintained at each pump station. The flow meters provide continuous recording of the flow. The operator has been recording the flow for ten years, Monday through Friday. It is agreed that the Department will be notified within 24 hours with a follow-up report within 7 days of an exceedance of the "leakage action rate" for one day. This condition applies to each individual cell. If an exceedance is noted, an investigation will be conducted to determine what, if any, remedial action is required.

What is the storage capacity of the sumps and can they handle the proposed leachate action rate? Please address. Please confirm that the pumps are operated automatically. Also, please propose to maintain logs recording when a pump is out of service for repairs/maintenance and when replaced. Please propose to provide such logs to the department.

The capacity of the primary and secondary sumps is approximately 8,350 gallons. However, since the pumps operate automatically at a minimum of 35 gallons per minute, each pump can pump over 50,400 gallons per day, which far exceeds the "leakage action rate". Each pump is checked on a daily basis, Monday through Friday. The log of these inspections is available at the site for Department review upon request.

Please clarify what you mean by "cell" in Attachment C.

A cell is the area served by a pump station. The pump stations are located on the east and the site was constructed so leachate flows from west to east. Therefore, there are eight cells defined as follows:

Pump Station 1A – Phases 1A and IIA
Pump Station 1B – Phases 1B and IIB
Pump Station 1C – Phases 1C and IIC
Pump Station IIIA – Phases IIIA and IVA
Pump Station IIIB – Phases IIIB and IVB
Pump Station IIIC – Phases IIIC and IVC
Pump Station VA – Phases VA and VC
Pump Station VB – Phases VC and VD

Please see revised Drawing No. 7, which includes the location of all the pump stations.

Are you able to measure the leachate flow from each cell? Please address.

Yes. There are two flow meters at each pump station, which measure the flow from the primary and the secondary sumps of each cell.

Please provide all supporting calculations including those you conducted to determine Q. Also, please indicate and justify how you determine each of the values factored into the equations, i.e., h, B, beta, geonet thickness, and etc. Please also clarify what each factor

RE: Trail Ridge Landfill – Permit Renewal
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represents. For example Q stands for flow rate. Additionally, please justify all equations used. Finally, please note that a trigger rate 5 times the determined rate appears excessive. Please either justify that rate or propose a new one.

Please see the calculations in **Attachment B**. As stated in the meeting on April 28, 2003, the trigger rate of five times the determined rate is based upon a telephone conversation with you.

Do you have backup pumps at each of the pumping stations? If a pump is out for service, how does that affect the system.

There are no backup pumps at each pump station. Nevertheless, the operator always maintains at least one backup pump on site or has access to a backup pump that can be installed within hours of discovery that a pump is not operating. It should be noted that each pump station is equipped with a visual and audible alarm to notify the operator if the leachate elevation in a sump is exceeded, which could be the result of an inoperable pump.

51. ***Please note that the department does not find a factor of safety of 1.5 acceptable for this site. In evaluating whether a factor is adequate for a site, various factors should be considered. Two of which are 1) the potential consequence of a slope failure and 2) the confidence of the selected values. Both of these factors appear to have not been considered in your selection of the factor of safety thereby indicating it is too low. Regarding the selected values, it appears that neither the impact of seepage on the driving force or the long-term condition cohesion was accounted for in your evaluation, which reduces the department's confidence in them. Please either select a higher factor of safety in which these factors are accounted for and provide a discussion on your selection, or propose additional testing to determine these values and address.***

Please see the response from MACTEC in **Attachment C**.

Please revise the Quality Assurance/Quality Control Plan for Side Slope Closure, Attachment E, page 4, in which you propose to provide a factor of safety of 1.5, considering the department's concern and provide.

Please see the response from MACTEC in **Attachment C**.

Also, please propose and review the plan to indicate that all interfaces of the final cover system, including the clay with the intermediate cover, will be tested for shear strength. Please address and revise the plan to include the internal friction angle tests that will be conducted on the other materials of the final cover system as well.

The QA/QC Plan has been revised as requested and in provided in **Attachment D**.

Please revise the Quality Assurance/Quality Control Plan For Side Slope Closure, Attachment E, page 4, to indicate that the shear testing will be conducted in wetted/saturated and unconfined conditions by an approved third party qualified laboratory. In other words, testing shall be conducted in a manner that will allow the clay to swell in submerged, close to saturated conditions, to emulate conditions similar to that of a long storm.

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Please see the response from MACTEC in **Attachment C**.

Please also amend the QA/QC plan to indicate that the clay and other material, if applicable, will be tested for its cohesion as well as adhesion values and what values they must exhibit to be considered acceptable. Please also describe and identify the testing that will be conducted.

Please see the response from MACTEC in **Attachment C**.

Your table 2 lists the angle of internal friction but does not also list the interface friction angle; please address.

Please see the response from MACTEC in **Attachment C**.

Please identify and justify the equations used.

Please see the response from MACTEC in **Attachment C**.

In your analysis please also evaluate the potential for deep-seated rotational or translational failures through the final cover system and waste.

Please see the response from MACTEC in **Attachment C**.

Please show the surface boundary you are modeling. Also, please show the failure surfaces and the points of convergence at a minimum.

Please see the response from MACTEC in **Attachment C**.

How will the gas management system, especially the header pipes you are proposing to install above grade, impact slope stability?

Please see the response from MACTEC in **Attachment C**.

54. ***Drawing sheets 14 and 15, provided September 2003, reflect gas wells but do not appear to reflect the header pipes you refer to. Please clarify when the header pipes will be constructed. Furthermore, it is not clear what you mean by temporary extraction wells and headers. Will they be removed or will they remain and become part of the permanent gas management system? Please clarify. Are you still proposing interim wells? If so, please address. If the header pipes will not be installed until after the final cover system is in place, impact to the cover system is of concern. What vehicles, if any, will be allowed to drive over the cover system during header pipe construction? What measures will you implement during their installation to minimize final cover system impact? Please address. Also, neither the Quality Assurance/Quality Control Plan for Side Slope Closure or the Quality Assurance/Quality Control Plan for Long-term care includes the construction or repairs to the temporary nor permanent gas management system, respectively. Please include and provide.***

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The temporary header pipes are installed when the temporary wells are installed which provides the means to connect the temporary wells to the vacuum system. The temporary wells and headers on the system are installed in areas that have not received final cover. When these areas are covered with additional waste, the header pipe may, over time, become inoperable due to settlement. When this occurs, the header is severed from the header system and abandoned and a new header pipe is installed to connect the existing wells to the vacuum system. The wells are extended vertically as the additional waste is placed around them. If a temporary well is abandoned, the well will be grouted full, cut at least 18 inches below ground surface, and cover with a minimum of 18 inches of clean fill. The operator is still proposing to install these temporary wells and headers in areas that have not received final cover but have triggered NSPS requirements.

During the construction of final cover, the permanent wells are installed and the corresponding permanent header is installed. However, the header pipe is installed on top of the clay barrier layer (during the closure construction) and covered with the vegetative (top soil) cover material. The gas header pipe is generally installed with heavy equipment (back hoe) and placed in immediate contact with the barrier soil layer. The heavy equipment is the same equipment used to place the barrier soil material. The barrier soil material will not be impacted by having header pipe (HDPE pipe) and then vegetative soil placed over the layer. Remember the construction of the final cover and permanent header and wells are one construction project. If the barrier layer was damaged, the Quality Control Monitor is on site observing the operation and would require repair.

Regarding a QA/QC Plan for the gas management system, please see the revised Side Slope Closure QA/QC Plan in **Attachment D.** Since the expansion of the gas management system typically coincides with a side slope closure, the gas management system QA/QC has been added to that plan. However, if the gas management system were expanded independent of a closure, the gas management system elements of the plan would still be utilized in the construction and certification. With regards to long-term care, please see the revised Long Term Care QA/QC Plan in **Attachment E**

Furthermore, please note that the design for the temporary system will need to be provided to the department's solid waste section and approval obtained by the permittee prior to the installation. Please provide details of both the temporary and proposed systems and how they will be installed relative to the final cover system.

As stated above, the temporary gas management system (gas wells and header) is not installed in the areas that have received final cover. Any existing temporary wells will be plugged (grouted full) and abandoned, prior to placement of final cover and installation of the permanent gas wells. The location of all permanent wells and header pipe has been provided to the Department on Drawing No. 9A. All construction of the gas management system (temporary and permanent) will be certified upon completion and a copy of the certification will be provided to the Department. We believe that should be sufficient.

Finally, please note that the department understands that you are proposing to install the gas collection system and manage the gas condensate as permitted in accordance with specific condition number 17 of the existing system. Please confirm or deny. If this assumption is incorrect, please address.

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It is agreed that the system will be installed and managed in accordance with Specific Condition No. 17 of the current permit.

Please revise the Quality Assurance/Quality Control Plan for Long-Term care to include how the horizontal extent of impact to the cover system in addition to the vertical extent of impact will be determined.

As stated above, the temporary gas wells and header are installed outside the final cover limits and therefore, there are no impacts to the final cover. The permanent gas wells and headers are installed during the final cover construction and monitored during that construction. Please see the revised Long-Term Care QA/QC Plan as requested in **Attachment E**.

57. ***Please note that quarterly inspections are too infrequent while 14 days to initiate repairs is too excessive. Also, the inspection checklist did not include a category for the active areas. Please note erosion, ponding of leachate, hot spots, etc. are some of the conditions the facility shall inspect for.***

The inspections will be conducted monthly. If during inspections, an item is found to need repair and/or replacement, the work will be initiated within 7 days if possible. If the work cannot be initiated within 7 days, the Department will be notified and an action plan will be presented to the Department.

The Inspection Checklist has been revised as requested, **Attachment F**.

59. ***You indicate that you may use plastic pipes to stake the grades and slopes. Will they have elevations marked on them? Will the field personnel be trained to know how to read the stakes and to know when waste is placed at its final grade? Please address. What measures will the facility employ to maintain these stakes at their staked location?***

The pipes are cut to the desired elevation and painted at the top. The field personnel have used this method successfully for years and new personnel are instructed accordingly. The operator maintains the pipes as needed.

If the facility discovers during the re-staking that its slopes and grades allow for additional waste placement, please address the measures the facility will implement in re-contouring the slopes and ensuring they will be stable.

If an area does not meet grade, additional waste or fill dirt is placed and compacted in lifts to bring the area up to design grades for placement of final cover. This would be no different than typical waste placement.

60. ***You indicate that during wet weather an area within the lined area that is accessible will be used. Will you limit yourself to interior slopes? How will you minimize the ponding of leachate in waste and also prevent the mixing of leachate in stormwater if you continue to operate during wet weather? Who will select the area? Will you limit yourself to areas that have initial but not intermediate cover? How will you manage the wet weather area; will you apply initial cover; intermediate cover?***

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To the extent possible, the wet weather area will be limited to interior slopes. During wet weather, as well as all operations, the active face is sloped and drainage is provided to direct runoff and stormwater away from the active face. The facility has a "wet weather area" on the landfill because the operator never knows when there will be a rain that affects the normal operating area. The General Manager and Lead Operator designate the "wet weather area". The area can have either initial or intermediate cover and will receive initial cover or a tarp at the end of the day and intermediate cover when require by rule.

61. ***Please note that the department intends to include a specific condition to the permit that will require the facility to record the sources from where slag is accepted and the location where slag from a specific source is used.***

The comment is noted.

65. ***Please clarify that the waste excavated to control a fire will be replaced after it is extinguished and any waste on fire will not be placed in contact with other waste. Additionally, you propose to discharge a hot load within the active lined area where there is a minimum of 12 inches of cover. Are you referring to areas that have intermediate cover? If so, how will that impact the intermediate cover and grade of slope? Will you remove the waste once extinguished to the active area? Will you repair the intermediate cover where needed? Please further address the managing of hotloads and address the comments at a minimum in your response.***

It is agreed that the waste excavated to control a fire will be replaced after it is extinguished and any waste on fire will not be placed in contact with other waste. The load will be discharged over a minimum of 12 inches of cover to provide separation from the in-place waste. This may or may not be intermediate cover. In fact, a twelve-inch layer of soil may be placed near the active face and the load discharged onto this 12-inch soil pad. After the load is distinguished, the waste will be moved to the active face for disposal. Therefore, it will not affect the grade and if the intermediate cover is disturbed, it will be restored to the 12-inch thickness.

I sincerely hope this response will provide the Department all the necessary information. I would respectfully request that any questions regarding this application be directed to me.

Sincerely,

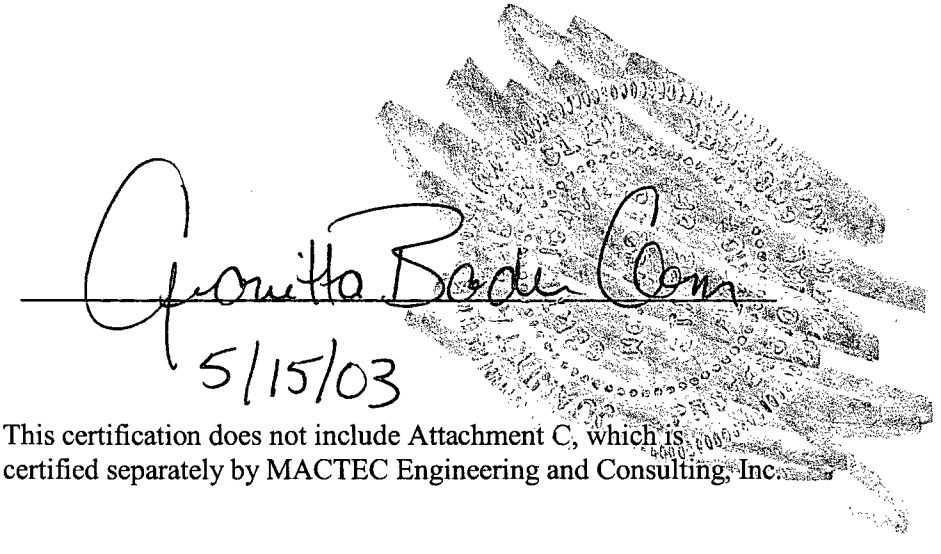
ENGLAND, THIMS & MILLER, INC.

Juanita Bader Clem, P.E.
Vice President

Attachments

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

LIST OF ATTACHMENTS



5/15/03

This certification does not include Attachment C, which is certified separately by MACTEC Engineering and Consulting, Inc.

ATTACHMENT A

Matrix of Personnel Requirements

TRAIL RIDGE LANDFILL
EVALUATION OF PERSONNEL REQUIRMENTS

Time	Trucks/Hr [a] Current	Tons/Hr [b]	Tonnage Current	Proposed Trucks/Hr	Proposed Trucks/Hr	Proposed Trucks/Hr	Proposed Trucks/Hr	Spotter [c] Trucks/Hr	Laborer [d] Trucks/Hr	Equip. Op.[e] Trucks/Hr
				3,500/Day	4,000/Day	4,500/Day	5,000/Day			
6:00 - 7:00 AM	40.8	344.6	344.6	47.8	54.6	61.4	68.2	40	24	20
7:00 - 10:00 AM	25.3	213.7	641.0	29.6	33.8	38.1	42.3	40	24	20
10:00 AM - 3:00 PM	37.3	315.0	1575.1	43.7	49.9	56.1	62.4	40	24	20
3:00 - 5:00 PM	19.1	161.3	322.6	22.4	25.6	28.7	31.9	40	24	20
5:00 - 7:00 PM	6.3	53.2	106.4	7.4	8.4	9.5	10.5	40	24	20
			2989.7							

	3,000/Day			3,500/Day			4,000/Day		
Time	Spotters Required	Laborers Required	Equip. Op. Required	Spotters Required	Laborers Required	Equip. Op. Required	Spotters Required	Laborers Required	Equip. Op. Required
6:00 - 7:00 AM	2	2	2	2	2	3	2	3	3
7:00 - 10:00 AM	1	2	2	1	2	2	1	2	2
10:00 AM - 3:00 PM	1	2	2	2	2	3	2	3	3
3:00 - 5:00 PM	1	1	1	1	1	2	1	2	2
5:00 - 7:00 PM	1	1	1	1	1	1	1	1	1

	4,500/Day			5,000/Day		
Time	Spotters Required	Laborers Required	Equip. Op. Required	Spotters Required	Laborers Required	Equip. Op. Required
6:00 - 7:00 AM	2	3	4	2	3	4
7:00 - 10:00 AM	1	2	2	2	2	3
10:00 AM - 3:00 PM	2	3	3	2	3	4
3:00 - 5:00 PM	1	2	2	1	2	2
5:00 - 7:00 PM	1	1	1	1	1	1

a. Based upon facility records.
b. Based upon an average of 8.45 tons per truck.
c. Based upon 1.5 minutes per load.
d. Based upon 2.5 minutes per load.
e. Based upon 3 minutes per load.

Note: Spotter means a trained spotter per Rule 62-701.320(15), FAC.

5/2/2003

ATTACHMENT B

Evaluation of Primary Liner Leakage

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:
- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2)\sqrt{2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec\ \text{(per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)}$$

Check to make sure the geonet can handle the leakage.

$$\frac{D}{T} = \frac{Q/B}{\theta \sin \beta}$$ (J.P. Giroud, 1992)

Where:
- D = Flow Thickness
- T = Thickness of the drainage layer
- Q = Flow rate (m^3/sec)
- B = Flow width (m)
- θ = Hydraulic transmissivity of the drainage layer (m^2/sec)
- β = Slope (degrees)

Say:

Q	=	3.17×10^{-6} m^3/sec (the flow per hole)
B	=	1 meter (conservatively, normally 1-5 meters)
θ	=	2.26×10^{-3} m^2/sec
$\text{Sin}\ \beta$	=	0.02
T	=	200 mil

Therefore:

$$\frac{D}{T} = \frac{3.17 \times 10^{-6} / 1}{(2.26 \times 10^{-3})\ (0.02)}$$

$$\frac{D}{T} \Rightarrow 0.07$$

$$D = 14 \text{ mil}$$

Since the geonet has a thickness of 200 mil, the geonet can handle the flow.

The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 72.51 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7 \text{ ac}$$

$$\Rightarrow 1{,}283.4 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Assume the flow is at a failure rate at 5 times this rate.

$$Q_{Max} = 6{,}417 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

ATTACHMENT C

Response Letter from MACTEC

(With Slope Stability Analysis)

MACTEC

May 15, 2003

Ms. Juanitta Clem, P.E.
Vice President
England, Thims & Miller
14775 St. Augustine Road
Jacksonville, Florida 32258

Subject: **Responses to FDEP Requests**
Trail Ridge Landfill
City of Jacksonville
Jacksonville, Florida
MACTEC Project No. 6734-03-8666

Dear Ms. Clem:

Pursuant to your request made on April 7, 2003, MACTEC Engineering and Consulting of Georgia, Inc. (MACTEC), formerly known as Law Engineering and Environmental Services, Inc. has completed preparation of responses to requests related to soil issues made by the Florida Department of Environmental Protection (FDEP) during a meeting held on April 28, 2003. The responses have been paired to the numbered FDEP requests. In, addition, an analysis of global stability has been performed. The associated graphs and computer printouts for each analysis are attached.

We have enjoyed assisting you and look forward to serving as your geotechnical and construction materials testing consultant on the remainder of this project and on future projects. If you have any questions concerning this information, please contact us.

Sincerely,

MACTEC ENGINEERING AND CONSULTING OF GEORGIA, INC.
f/k/a Law Engineering and Environmental Services, Inc.

Jeffrey S. Samuels, P.E.
Staff Geotechnical Engineer

James A. Horton, P.E.
Principal Engineer
Registered, Florida 23315

JSS/JAH:ag

Distribution: Ms. Juanitta Clem, P.E. (4)
File (1)

MACTEC Engineering and Consulting, Inc.
3901 Carmichael Avenue • Jacksonville, FL 32207
904-396-5173 • Fax: 904-396-5703

TRAIL RIDGE LANDFILL
MACTEC Project No. 6734-03-8666

FDEP Requests & Responses

(FDEP Requests are italicized)

51. a) Please note that the department does not find a factor of safety of 1.5 acceptable for this site. In evaluating whether a factor of safety is adequate for a site, various factors should be considered. Two of which are 1) the potential consequence of a slope failure, and 2) the confidence of the selected values. Both of these factors appear to have not been considered in your selection of the factor of safety thereby indicating it is too low. Regarding the selected values, it appears that neither the impact of seepage on the driving force or the long-term condition cohesion was accounted for in your evaluation, which reduces the department's confidence in them. Please either select a higher factor of safety in which these factors are accounted for and provide a discussion on your selection, or propose additional testing to determine these values and address.

Factor of Safety Upon further review of available resources as discussed in our meeting on April 28, 2003, the value of 1.5 was determined to be appropriate for this application. Specifically, with respect to "Table 2 – Recommended Minimum Values of Factor of Safety For Slope Stability Analysis", EPA Guide to Technical Resources for the Design of Land Disposal Facilities which was provided by the FDEP during the April 28 meeting, the value of 1.5 is considered appropriate because of the relatively low degree of uncertainty resulting from planned soil strength testing associated with side slope cover material selection.

Seepage Considerations The impact of seepage on the sliding stability of the side slope cover layers is considered negligible due to the presence of vegetative cover which acts to prevent infiltration as well as the relatively steep angle of the slope which also tends to preclude water infiltration.

b) Please revise the Quality Assurance/Quality Control Plan For Side Slope Closure, Attachment E, page 4, in which you propose to provide a factor of safety of 1.5 considering the department's concern and provide.

Please refer to the response for Request 51 a).

c) Also, please propose and revise the plan to indicate that all interfaces of the final cover system, including the clay with the intermediate cover, will be tested for shear strength. Please address and revise the plan to include the internal friction angle tests that will be conducted on the other materials of the final cover system as well.

The QA/QC has been modified.

d) Please revise the Quality Assurance/Quality Control Plan For Side Slope Closure, Attachment E, page 4, to indicate that the shear testing will be conducted

in wetted/saturated and unconfined conditions by an approved third party qualified in the laboratory. In other words, testing shall be conducted in a manner that will allow the clay to swell in submerged, close to saturated conditions, to emulate conditions similar to that of a long storm.

As discussed during the April 28 meeting, testing in a saturated environment does not accurately simulate the environment resulting from a storm event. In our opinion, the materials placed at the moisture content and density anticipated in the field tested by direct shear in a submerged shear box would be appropriate.

e) *Please also amend the QA/QC plan to indicate that the clay and other material, if applicable, will be tested for its cohesion as well as adhesion values and what values they must exhibit to be considered acceptable. Please also describe and identify the testing that will be conducted*

Direct shear testing is proposed for the cohesion parameter. As discussed during the April 28 meeting, adhesion is a correction with cohesion and the specific materials and therefore, is not a parameter that can be tested.

f) *Your table 2 lists the angle of internal friction but does not also list the interface friction angle; please address.*

The angle of internal friction is the interface friction angle for all cases listed in Table 2 of the March 17, 2003 letter report to Ms. Juanitta Clem, P.E. (ETM).

g) *Please identify and justify the equations used.*

Clarification of Analytical Approach for Side Slope Additional block diagrams and notations have been added to our previous calculations that were submitted with our March 17, 2003 letter report to Ms. Juanitta Clem, P.E. (ETM). These are attached.

h) *In your analysis please also evaluate the potential for deep-seated rotational or translational failures through the final cover system and waste.*

Global Slope Stability Because there has not been (or will be) strength testing of the materials involved in the global stability analysis, a factor of safety of 2 or greater was selected. Graphs which depict the 10 most critical Factors of Safety as well as the associated printouts are attached for waste internal friction angles of 27 and 30 degrees. The angle of 30 degrees was chosen because it is the mean of the reorganized values. The angle of 27 degrees was determined to be the minimum angle necessary to achieve a Factor of Safety of 2. The Factor of Safety corresponding to a waste internal friction angle of 30 degrees is 2.2. The values of 27 and 30 degrees used for the waste friction angle are considered to be conservative. Similar relatively conservative strength values were estimated for the underlying soil profile. Accordingly, in our opinion, the landfill configuration is acceptable with respect to global slope stability.

i) *Please show the surface boundary you are modeling. Also, please show the failure surfaces and the points of convergence at a minimum.*

Please refer to the attached graph for global slope stability.

j) *How will the gas management system, especially the header pipes you are proposing to install above grade, impact slope stability?*

The header pipes are considered to have no impact on side slope stability.

MACTEC

MACTEC Engineering and Consulting, Inc.
901 Carmichael Avenue
Jacksonville, FL 32207

JOB NO. 6734-03-8666 SHEET 1 OF 3

PHASE _____ TASK CALCULATIONS FOR SLIDING SLOPE STABILITY

JOB NAME TRAIL RIDGE LANDFILL

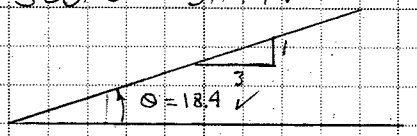
BY J.S.S. DATE 4-28-03

CHECKED BY BSA DATE 5-9-03

SAND OVER SAND CASE — (REF. S.L. 9-18-96)
(TOPSOIL) (TOPSOIL)

- USE FACTOR OF SAFETY (FS) = 1.5, COHESION = 0

SLOPE = 3H : 1V

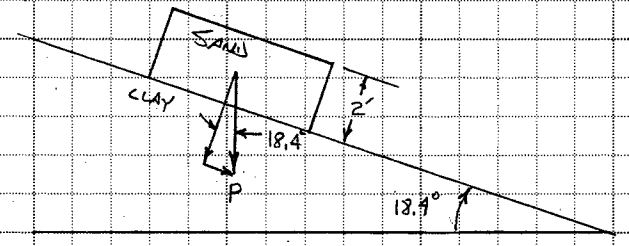


$\tan^{-1}\left(\frac{1}{3}\right) = \theta = 18.4^\circ$ ✓

$\phi_{SAND-SAND}$ = ANGLE OF INTERNAL FRICTION

$FS = 1.5 = \frac{\tan\phi}{\tan\theta} = \frac{\tan\phi}{\tan 18.4} = \frac{\tan\phi}{.333}$ $\tan\phi = .5$ $\phi = 26.6^\circ$ ✓

SAND OVER CLAY CASE (REF. S.L. 9-18-96)
(TOPSOIL)



$\phi_{SAND-CLAY} = 0$

COHESION CLAY = 500 PSF = C

α = ADHESION FACTOR = .5

TOPSOIL BLOCK = 1'·1'·2' TOPSOIL UNIT WEIGHT = 100 lb/ft³

BLOCK WEIGHT = PL·1·1·2·100 = 200 lbs ✓

DRIVING FORCE = 200 · sin 18.4 = 63 lbs. ✓

RESISTING FORCE = $\alpha \cdot C = (0.5)\,500 = 250$ lbs. ✓

$FS_{SLIDING} = \frac{\text{RESISTING FORCE}}{\text{DRIVING FORCE}} = \frac{250}{63} = 3.96$

FIND C FOR A $FS_{SLIDING} = 1.5$

$FS_{SLIDING} = 1.5 = \frac{\alpha \cdot C}{63}$ $\alpha = .5$ $C = \frac{63 \cdot 1.5}{.5} = 189 \Rightarrow 190$ PSF ✓

MACTEC Engineering and Consulting, Inc.
901 Carmichael Avenue
Jacksonville, FL 32207

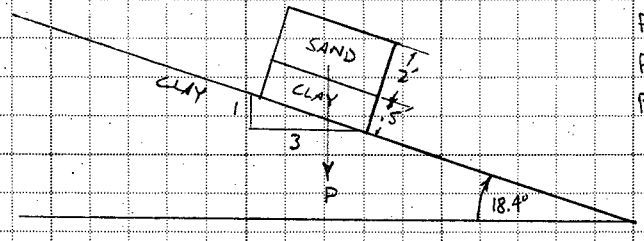
JOB NO. 6734-03-8666 SHEET 2 OF 3
PHASE _____ TASK _____
JOB NAME TRAIL RIDGE LANDFILL
BY JSS DATE 4-30-03
CHECKED BY BSN DATE 5-9-03

FOR CLAY OVER CLAY CASE

	T.P. #4*	T.P. #5*	T.P. #8*
γ MAX. DRY DENSITY (PCF)	108.9	77.9	109.2
MOIST. CONTENT @ COMPACTION	21.3	44	20.9
COMPACTION	93%	91%	94%
γ (PCF)	122.8	102	124

AVERAGE $\gamma = (122.8 + 102 + 124)/3 = 116$ PCF ✓ $\alpha = 1$ ✓

ASSUME BLOCK SLIDES @ MIDPOINT OF CLAY LAYER



$P_{SAND} = 200$ lbs
$P_{CLAY} = 1.1 \cdot 5 \cdot 116 = 58$ lbs
$P_{BLOCK} = 200 + 58 = 258$ lbs

DRIVING FORCE $= 258 \cdot \sin 18.9^\circ = 81.4$ lb. ✓

RESISTING FORCE $= \alpha \cdot C = 1 \cdot 500 = 500$ psf, $1' \cdot 1' = 500$ lbs. ✓

$FS = \frac{500}{81.4} = 6.14$ FOR $FS = 1.5 = \frac{C}{81.4}$ $C = 122.1$ psf ✓

* LETTER TO JUANITTA CLEM, P.E. (FTM) DATED JANUARY 4, 2002 ATTACHED
SUBJECT: CLAY BORROW SOURCE PRE-QUALIFICATION

MACTEC

MACTEC Engineering and Consulting, Inc.
01 Carmichael Avenue
Jacksonville, FL 32207

JOB NO. 6734-03-8666 SHEET 3 OF 3

PHASE _____ TASK _____

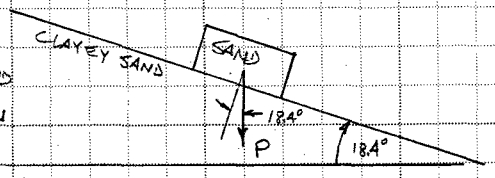
JOB NAME TRAIL RIDGE LANDFILL

BY JSS DATE 4-30-03

CHECKED BY BSA DATE 5-9-03

FOR SAND OVER CLAYEY SAND CASE - (REF. S.L. 9-18-96)

THE CLAYEY SAND EXHIBITS A COMPONENT OF COHESION AND A COMPONENT OF FRICTION IN THE RESISTING FORCE.



BLOCK WEIGHT = P = 200 lb.

$\phi_{SAND-CLAYEY\,SAND}$ = 25° = FRICTION ANGLE @ CONTACT

$\mu = \tan\phi = \tan 25 = .47$ $\alpha = .5$ $c = 250$

DRIVING FORCE = $200 \cdot \sin 18.4 = 63$ lb. ✓

RESISTING FORCE = $\alpha \cdot C + \mu \cdot 200 \cdot \cos 18.4$ → FORMULA USED IN TABLE 2, LETTER TO JUANITA CLEM, P.E. (EM) DATED 7-17-03

(COHESION) (FRICTION)

$= .5 \cdot 250 + .47 \cdot 200 \cdot .95 = 214.3$

→ 214.19

F.S. = $\frac{214.3}{63} = 3.4$ → FOR TYPICAL C AND ϕ VALUES ✓

LAWGIBB GROUP

January 4, 2002

Ms. Juanitta Clem, P.E.
England, Thims & Miller, Inc.
14775 St. Augustine Road
Jacksonville, Florida 32258

Subject: **Clay Borrow Source Pre-Qualification**
Trail Ridge Landfill
Incremental Closure and Landfill Gas System Expansion
Jacksonville, FL
LAW Project Number 40562-1-4214

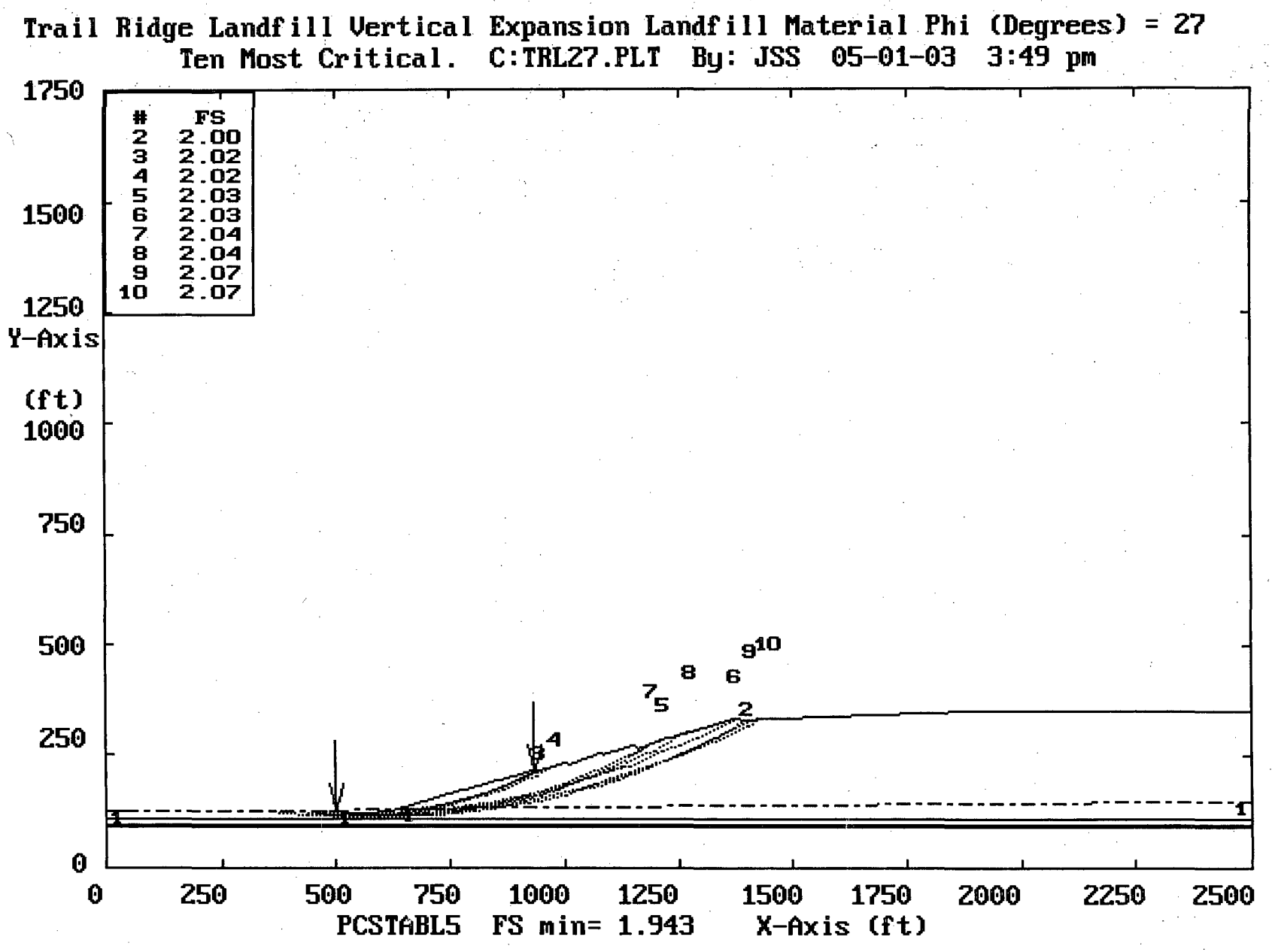
Dear Ms. Clem:

Law Engineering and Environmental Services, Inc. (LAW) has completed the pre-qualification testing of the potential clay borrow source. Attached are a site location map, Field Exploration Plan (FEP), completed pre-qualification form and Standard Proctor test results.

In summary, the proposed borrow source is located south of County Road 225, and approximately three miles west of the town of Lawtey in Bradford County, Florida. As part of the site evaluation designated the Gaskins Pit, eight test pits were excavated. The approximate locations of the test pits are shown on the FEP. The test pits initially encountered from ½ to 3 feet of fine sandy overburden soils. The underlying clayey soils consisted on two strata. The upper material, which varied in thickness from 4 to 5 ½ feet, consisted of red, orange, and gray very clayey sand to sandy clay. This material was underlain by 2 to 2 ½ feet of blue gray slightly sandy to sandy clay. Both strata contain sand seams of varying thickness. Three samples were submitted for Standard Proctors and permeability testing. The results of this testing are as follows:

	Test Pit 4 Sample 2 (Upper Clay Stratum)	**Test Pit 5 Sample 2 (Lower Clay Stratum)**	**Test Pit 8 Sample 1 (Upper Clay Stratum)**
Encountered from:	4' to 7 ½'	6 ½' to 9'	1 ½' to 7 ½'
Maximum Dry Density (Standard Proctor)	108.9 pcf	77.9 pcf	109.2 pcf
Optimum Moisture Content (Standard Proctor)	17.1%	36.3%	16.51%
Plasticity Index	58	107	27
Percent Fines	48	88	49
Coefficient of Permeability	1.1×10^{-8} cm/sec	6.0×10^{-9} cm/sec	3.6×10^{-9} cm/sec
Percent Compaction (Standard Proctor)	93%	91%	94%
Moisture Content at compaction	21.3%	44.0%	20.9%

LAW Engineering and Environmental Services, Inc.
3901 Carmichael Avenue • Jacksonville, Florida 32207
904-396-5173 • Fax: 904-396-5703


Trail Ridge Landfill Vertical Expansion Landfill Material Phi (Degrees) = 27
Ten Most Critical. C:TRL27.PLT By: JSS 05-01-03 3:49 pm
FS
2 2.00
3 2.02
4 2.02
5 2.03
6 2.03
7 2.04
8 2.04
9 2.07
10 2.07
1750
1500
1250
Y-Axis
(ft)
1000
750
500
250
0
0 250 500 750 1000 1250 1500 1750 2000 2250 2500
PCSTABL5 FS min= 1.943 X-Axis (ft)

** PCSTABL5 **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	05-01-03
Time of Run:	3:49 pm
Run By:	JSS
Input Data Filename:	C:TRL27
Output Filename:	C:TRL27.OUT
Plotted Output Filename:	C:TRL27.PLT

✓MBW 5/15/03

PROBLEM DESCRIPTION Trail Ridge Landfill Vertical Expansion
Landfill Material Phi (Degrees) = 27

BOUNDARY COORDINATES

23 Top Boundaries
27 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	122.00	500.00	123.00	2
2	500.00	123.00	640.00	125.00	2
3	640.00	125.00	780.00	171.80	1
4	780.00	171.80	787.50	169.30	1
5	787.50	169.30	855.00	191.80	1
6	855.00	191.80	862.50	189.30	1
7	862.50	189.30	930.00	211.80	1
8	930.00	211.80	937.50	209.30	1
9	937.50	209.30	1005.00	231.80	1
10	1005.00	231.80	1012.50	229.30	1
11	1012.50	229.30	1080.00	251.80	1
12	1080.00	251.80	1087.50	249.30	1
13	1087.50	249.30	1155.00	271.80	1
14	1155.00	271.80	1162.50	263.30	1
15	1162.50	263.30	1230.00	291.80	1
16	1230.00	291.80	1237.50	289.30	1
17	1237.50	289.30	1305.00	311.80	1
18	1305.00	311.80	1312.50	309.30	1
19	1312.50	309.30	1374.60	330.00	1
20	1374.60	330.00	1384.60	330.00	1
21	1384.60	330.00	1393.60	327.00	1
22	1393.60	327.00	1921.00	349.30	1
23	1921.00	349.30	2500.00	349.30	1
24	640.00	125.00	2500.00	143.00	2
25	.00	102.50	2500.00	102.50	3
26	.00	93.00	2500.00	93.00	4
27	.00	87.00	2500.00	87.00	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	70.0	70.0	.0	27.0	.00	.0	1
2	110.0	115.0	.0	30.0	.00	.0	1
3	112.0	120.0	1000.0	28.0	.00	.0	1
4	105.0	112.0	.0	29.0	.00	.0	1
5	115.0	120.0	.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	122.00
2	500.00	123.00
3	640.00	125.00
4	2500.00	145.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

4000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 40 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 500.00 ft.

Each Surface Terminates Between X = 600.00 ft.
and X =2500.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

40.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	500.00	123.00
2	539.89	119.97
3	579.88	119.09
4	619.86	120.38
5	659.71	123.82
6	699.32	129.40
7	738.56	137.12
8	777.34	146.94
9	815.53	158.84
10	853.02	172.78
11	889.71	188.72
12	925.48	206.62
13	932.88	210.84

*** 1.943 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	487.18	122.97
2	526.97	118.86
3	566.86	115.88
4	606.81	114.03
5	646.81	113.33
6	686.81	113.75
7	726.78	115.32
8	766.68	118.02
9	806.50	121.85
10	846.19	126.81
11	885.72	132.90
12	925.07	140.11
13	964.19	148.44
14	1003.06	157.87
15	1041.65	168.41
16	1079.92	180.04
17	1117.85	192.75
18	1155.40	206.54
19	1192.54	221.38
20	1229.25	237.28
21	1265.49	254.21

22	1301.23	272.17
23	1336.45	291.13
24	1371.12	311.09
25	1397.27	327.16

*** 1.996 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.19	119.25
3	554.15	117.56
4	594.15	117.88
5	634.08	120.20
6	673.85	124.52
7	713.35	130.83
8	752.48	139.11
9	791.15	149.35
10	829.26	161.52
11	866.70	175.58
12	903.40	191.50
13	939.25	209.24
14	942.09	210.83

*** 2.021 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.17	119.06
3	554.12	117.12
4	594.12	117.13
5	634.08	119.09
6	673.88	122.99
7	713.46	128.83
8	752.70	136.59
9	791.51	146.25
10	829.81	157.79
11	867.50	171.19
12	904.50	186.40
13	940.70	203.40
14	976.04	222.15
15	976.04	222.15

*** 2.022 ***

1

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.05	117.94
3	553.89	114.42
4	593.84	112.39
5	633.83	111.84
6	673.82	112.78
7	713.75	115.22
8	753.56	119.13
9	793.19	124.53
10	832.60	131.40
11	871.72	139.74
12	910.50	149.52
13	948.90	160.75
14	986.84	173.39
15	1024.30	187.44
16	1061.20	202.88
17	1097.50	219.68
18	1133.15	237.82
19	1168.10	257.28
20	1202.30	278.02
21	1211.10	283.82

*** 2.029 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.97	122.72
2	398.82	119.21
3	438.74	116.62
4	478.70	114.94
5	518.69	114.18
6	558.69	114.33
7	598.68	115.40
8	638.63	117.39
9	678.53	120.29
10	718.34	124.10
11	758.06	128.82
12	797.67	134.45
13	837.13	140.98
14	876.43	148.42
15	915.55	156.75
16	954.47	165.98
17	993.17	176.09
18	1031.63	187.09
19	1069.83	198.97
20	1107.74	211.72
21	1145.36	225.33
22	1182.65	239.80

23	1219.60	255.12
24	1256.19	271.28
25	1292.40	288.27
26	1328.21	306.09
27	1363.60	324.73
28	1370.81	328.74

*** 2.030 ***

1

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	448.72	122.90
2	488.47	118.45
3	528.35	115.37
4	568.32	113.66
5	608.31	113.33
6	648.30	114.37
7	688.23	116.79
8	728.05	120.57
9	767.71	125.72
10	807.18	132.23
11	846.40	140.10
12	885.33	149.30
13	923.91	159.84
14	962.12	171.70
15	999.89	184.86
16	1037.19	199.31
17	1073.96	215.04
18	1110.18	232.02
19	1145.79	250.24
20	1180.76	269.66
21	1188.26	274.18

*** 2.035 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	423.08	122.85
2	462.85	118.59
3	502.73	115.51
4	542.69	113.61
5	582.68	112.91
6	622.68	113.39
7	662.64	115.06
8	702.54	117.92
9	742.34	121.95
10	781.99	127.17
11	821.48	133.57

12	860.76	141.13
13	899.80	149.85
14	938.56	159.74
15	977.01	170.76
16	1015.11	182.93
17	1052.84	196.22
18	1090.16	210.62
19	1127.03	226.13
20	1163.42	242.72
21	1199.31	260.39
22	1234.66	279.11
23	1269.43	298.88
24	1273.31	301.24

*** 2.037 ***

1

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.97	122.72
2	398.71	118.10
3	438.54	114.42
4	478.44	111.69
5	518.40	109.90
6	558.40	109.07
7	598.40	109.18
8	638.38	110.24
9	678.33	112.25
10	718.22	115.21
11	758.03	119.11
12	797.74	123.96
13	837.32	129.75
14	876.75	136.47
15	916.01	144.13
16	955.07	152.71
17	993.93	162.22
18	1032.54	172.65
19	1070.90	183.99
20	1108.98	196.24
21	1146.76	209.39
22	1184.21	223.43
23	1221.32	238.36
24	1258.07	254.16
25	1294.43	270.83
26	1330.39	288.35
27	1365.92	306.73
28	1401.00	325.94
29	1403.56	327.42

*** 2.068 ***

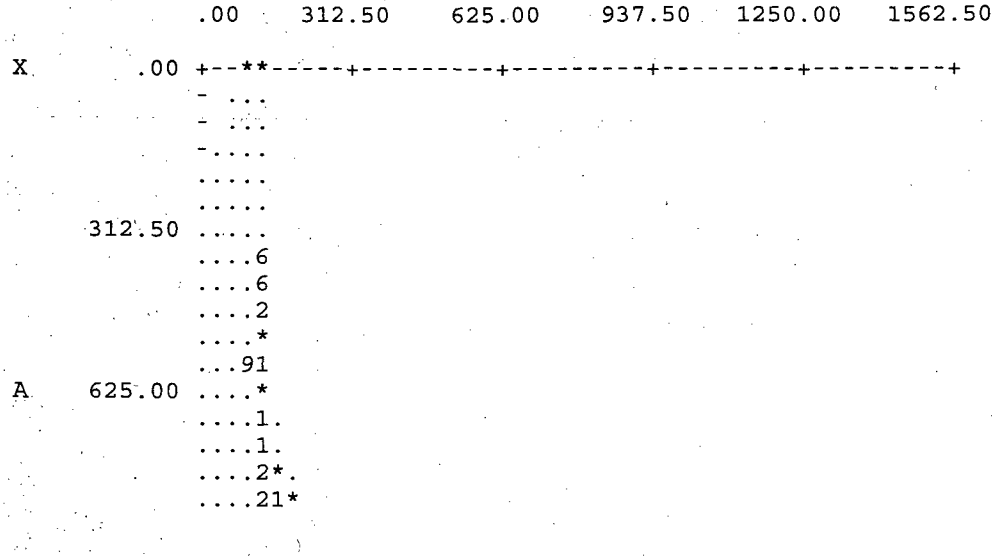
Failure Surface Specified By 29 Coordinate Points

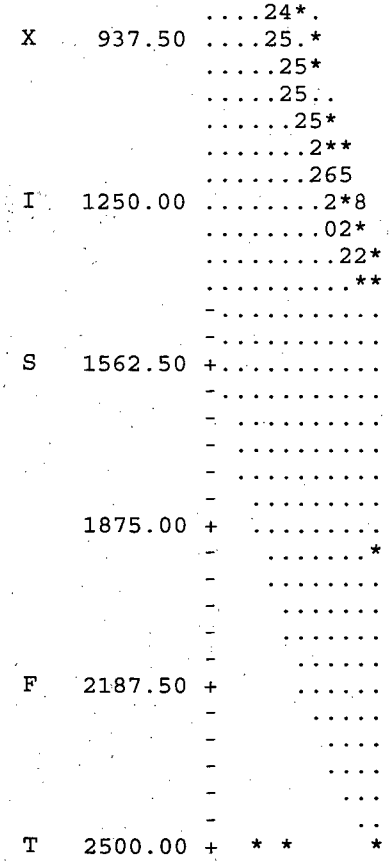
Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.97	122.72
2	398.77	118.64
3	438.64	115.44
4	478.57	113.12
5	518.54	111.67
6	558.54	111.09
7	598.54	111.40
8	638.52	112.57
9	678.47	114.63
10	718.36	117.56
11	758.18	121.36
12	797.91	126.03
13	837.52	131.58
14	877.00	137.99
15	916.34	145.26
16	955.50	153.39
17	994.48	162.38
18	1033.25	172.22
19	1071.79	182.91
20	1110.10	194.44
21	1148.14	206.81
22	1185.90	220.00
23	1223.36	234.02
24	1260.51	248.86
25	1297.32	264.51
26	1333.78	280.96
27	1369.87	298.21
28	1405.57	316.24
29	1428.53	328.48

*** 2.069 ***

1

Y A X I S F T

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S
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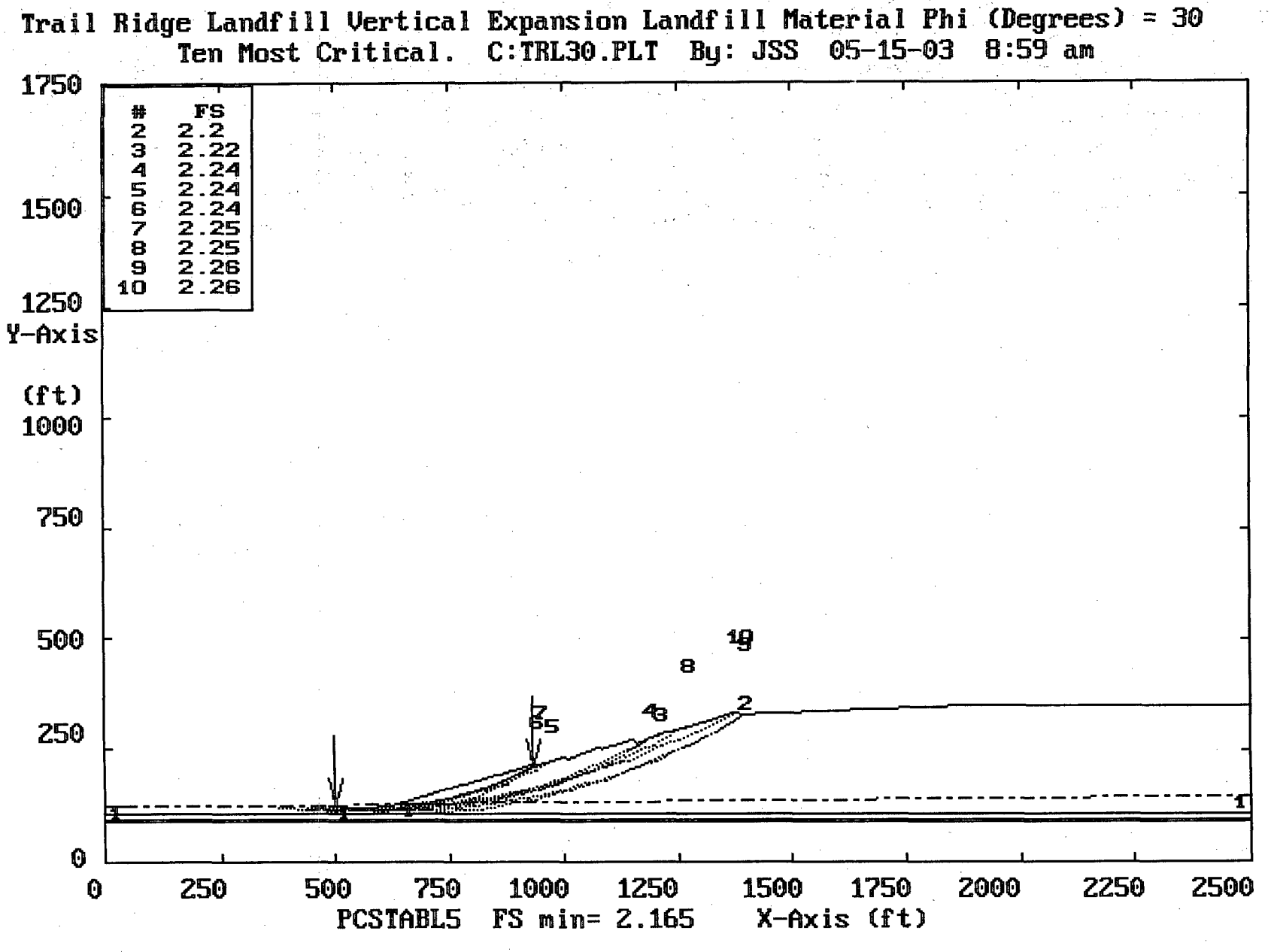
Trail Ridge Landfill Vertical Expansion Landfill Material Phi (Degrees) = 30
Ten Most Critical. C:TRL30.PLT By: JSS 05-15-03 8:59 am
FS
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3 2.22
4 2.24
5 2.24
6 2.24
7 2.25
8 2.25
9 2.26
10 2.26
1750
1500
1250
Y-Axis
(ft)
1000
750
500
250
0
0 250 500 750 1000 1250 1500 1750 2000 2250 2500
PCSTABL5 FS min= 2.165 X-Axis (ft)

** PCSTABL5 **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date:	05-15-03
Time of Run:	8:59 am
Run By:	JSS
Input Data Filename:	C:TRL30
Output Filename:	C:TRL30.OUT
Plotted Output Filename:	C:TRL30.PLT

✓ MBW 5/15/03

PROBLEM DESCRIPTION Trail Ridge Landfill Vertical Expansion
Landfill Material Phi (Degrees) = 30

BOUNDARY COORDINATES

23 Top Boundaries
27 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	122.00	500.00	123.00	2
2	500.00	123.00	640.00	125.00	2
3	640.00	125.00	780.00	171.80	1
4	780.00	171.80	787.50	169.30	1
5	787.50	169.30	855.00	191.80	1
6	855.00	191.80	862.50	189.30	1
7	862.50	189.30	930.00	211.80	1
8	930.00	211.80	937.50	209.30	1
9	937.50	209.30	1005.00	231.80	1
10	1005.00	231.80	1012.50	229.30	1
11	1012.50	229.30	1080.00	251.80	1
12	1080.00	251.80	1087.50	249.30	1
13	1087.50	249.30	1155.00	271.80	1
14	1155.00	271.80	1162.50	263.30	1
15	1162.50	263.30	1230.00	291.80	1
16	1230.00	291.80	1237.50	289.30	1
17	1237.50	289.30	1305.00	311.80	1
18	1305.00	311.80	1312.50	309.30	1
19	1312.50	309.30	1374.60	330.00	1
20	1374.60	330.00	1384.60	330.00	1
21	1384.60	330.00	1393.60	327.00	1
22	1393.60	327.00	1921.00	349.30	1
23	1921.00	349.30	2500.00	349.30	1
24	640.00	125.00	2500.00	143.00	2
25	.00	102.50	2500.00	102.50	3
26	.00	93.00	2500.00	93.00	4
27	.00	87.00	2500.00	87.00	5

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	70.0	70.0	.0	30.0	.00	.0	1
2	110.0	115.0	.0	30.0	.00	.0	1
3	112.0	120.0	1000.0	28.0	.00	.0	1
4	105.0	112.0	.0	29.0	.00	.0	1
5	115.0	120.0	.0	34.0	.00	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 4 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	122.00
2	500.00	123.00
3	640.00	125.00
4	2500.00	145.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

4000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 40 Points Equally Spaced Along The Ground Surface Between X = .00 ft.
and X = 500.00 ft.

Each Surface Terminates Between X = 600.00 ft.
and X =2500.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

40.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	500.00	123.00
2	539.89	119.97
3	579.88	119.09
4	619.86	120.38
5	659.71	123.82
6	699.32	129.40
7	738.56	137.12
8	777.34	146.94
9	815.53	158.84
10	853.02	172.78
11	889.71	188.72
12	925.48	206.62
13	932.88	210.84

*** 2.165 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	487.18	122.97
2	526.97	118.86
3	566.86	115.88
4	606.81	114.03
5	646.81	113.33
6	686.81	113.75
7	726.78	115.32
8	766.68	118.02
9	806.50	121.85
10	846.19	126.81
11	885.72	132.90
12	925.07	140.11
13	964.19	148.44
14	1003.06	157.87
15	1041.65	168.41
16	1079.92	180.04
17	1117.85	192.75
18	1155.40	206.54
19	1192.54	221.38
20	1229.25	237.28
21	1265.49	254.21

22	1301.23	272.17
23	1336.45	291.13
24	1371.12	311.09
25	1397.27	327.16

*** 2.195 ***

1

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.05	117.94
3	553.89	114.42
4	593.84	112.39
5	633.83	111.84
6	673.82	112.78
7	713.75	115.22
8	753.56	119.13
9	793.19	124.53
10	832.60	131.40
11	871.72	139.74
12	910.50	149.52
13	948.90	160.75
14	986.84	173.39
15	1024.30	187.44
16	1061.20	202.88
17	1097.50	219.68
18	1133.15	237.82
19	1168.10	257.28
20	1202.30	278.02
21	1211.10	283.82

*** 2.215 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	448.72	122.90
2	488.47	118.45
3	528.35	115.37
4	568.32	113.66
5	608.31	113.33
6	648.30	114.37
7	688.23	116.79
8	728.05	120.57
9	767.71	125.72
10	807.18	132.23
11	846.40	140.10
12	885.33	149.30
13	923.91	159.84

14	962.12	171.70
15	999.89	184.86
16	1037.19	199.31
17	1073.96	215.04
18	1110.18	232.02
19	1145.79	250.24
20	1180.76	269.66
21	1188.26	274.18

*** 2.237 ***

1

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.17	119.06
3	554.12	117.12
4	594.12	117.13
5	634.08	119.09
6	673.88	122.99
7	713.46	128.83
8	752.70	136.59
9	791.51	146.25
10	829.81	157.79
11	867.50	171.19
12	904.50	186.40
13	940.70	203.40
14	976.04	222.15
15	976.04	222.15

*** 2.238 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	474.36	122.95
2	514.19	119.25
3	554.15	117.56
4	594.15	117.88
5	634.08	120.20
6	673.85	124.52
7	713.35	130.83
8	752.48	139.11
9	791.15	149.35
10	829.26	161.52
11	866.70	175.58
12	903.40	191.50
13	939.25	209.24
14	942.09	210.83

*** 2.240 ***

1

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	487.18	122.97
2	526.58	116.05
3	566.34	111.75
4	606.31	110.09
5	646.30	111.08
6	686.13	114.71
7	725.64	120.97
8	764.65	129.84
9	802.98	141.26
10	840.47	155.20
11	876.96	171.59
12	912.29	190.35
13	946.29	211.42
14	948.43	212.94

*** 2.245 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	423.08	122.85
2	462.85	118.59
3	502.73	115.51
4	542.69	113.61
5	582.68	112.91
6	622.68	113.39
7	662.64	115.06
8	702.54	117.92
9	742.34	121.95
10	781.99	127.17
11	821.48	133.57
12	860.76	141.13
13	899.80	149.85
14	938.56	159.74
15	977.01	170.76
16	1015.11	182.93
17	1052.84	196.22
18	1090.16	210.62
19	1127.03	226.13
20	1163.42	242.72
21	1199.31	260.39
22	1234.66	279.11
23	1269.43	298.88
24	1273.31	301.24

*** 2.246 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	384.62	122.77
2	424.15	116.71
3	463.85	111.75
4	503.66	107.88
5	543.56	105.12
6	583.53	103.46
7	623.52	102.91
8	663.52	103.47
9	703.49	105.13
10	743.39	107.89
11	783.20	111.76
12	822.89	116.72
13	862.43	122.78
14	901.79	129.93
15	940.93	138.17
16	979.83	147.49
17	1018.46	157.87
18	1056.78	169.33
19	1094.78	181.83
20	1132.41	195.39
21	1169.66	209.97
22	1206.48	225.59
23	1242.87	242.21
24	1278.77	259.83
25	1314.18	278.44
26	1349.06	298.03
27	1383.39	318.56
28	1396.85	327.14

*** 2.255 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	358.97	122.72
2	398.82	119.21
3	438.74	116.62
4	478.70	114.94
5	518.69	114.18
6	558.69	114.33
7	598.68	115.40
8	638.63	117.39
9	678.53	120.29
10	718.34	124.10
11	758.06	128.82

12	797.67	134.45
13	837.13	140.98
14	876.43	148.42
15	915.55	156.75
16	954.47	165.98
17	993.17	176.09
18	1031.63	187.09
19	1069.83	198.97
20	1107.74	211.72
21	1145.36	225.33
22	1182.65	239.80
23	1219.60	255.12
24	1256.19	271.28
25	1292.40	288.27
26	1328.21	306.09
27	1363.60	324.73
28	1370.81	328.74

*** 2.264 ***

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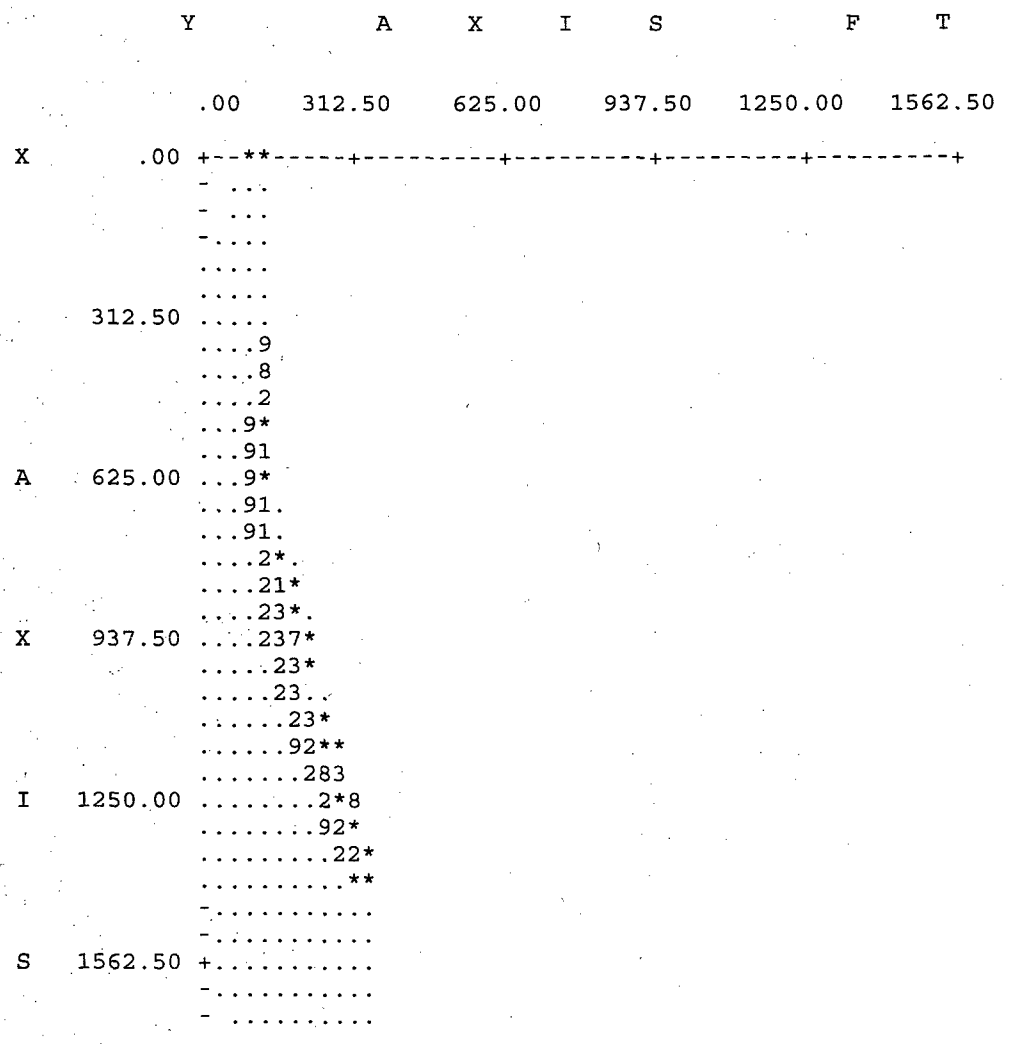

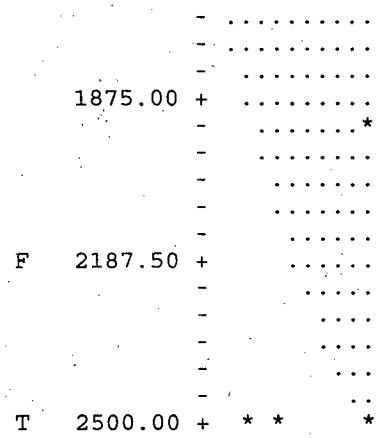
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ATTACHMENT D

Quality Assurance/Quality Control Plan

For Side Slope Closure

TRAIL RIDGE LANDFILL
INCREMENTAL SIDE SLOPE CLOSURE
QUALITY ASSURANCE/QUALITY CONTROL PLAN

This plan addresses the quality assurance and quality control (QA/QC) for the incremental closure (close-as-you-go) of Trail Ridge Landfill. This program delineates the quality procedures and standards for the construction. This plan includes the closure of the side slopes only (including the reconstruction of final cover on side slopes). The top area closure has a separate QA/QC Plan.

In the context of this plan, quality assurance and quality control are defined as follows:

Quality Assurance - A planned and systematic pattern of all means and actions designed to provide adequate confidence that items or services meet contractual and regulatory requirements and will perform satisfactorily in service.

Quality Control - Those actions which provide a means to measure and regulate the characteristics of an item or service to contract and regulatory requirements.

The City of Jacksonville, Florida is the owner of Trail Ridge Landfill. Trail Ridge Landfill, Inc. is the permittee and operates the landfill. England, Thims & Miller, Inc. is the design engineer. The name of the Contractor for each incremental closure shall be provided to the Department of Environmental Protection (DEP), prior to construction.

All QA/QC activities (including monitoring, sampling and testing) shall be directed and conducted by third parties, whom are independent of the Contractor.

The QA/QC Plan for this project includes General QA/QC and Soils QA/QC. The General QA/QC includes full-time services to periodically observe the contractor's work to verify substantial compliance with permits, plans, specifications and design concepts. These services will include the following:

General Quality Control Monitor - shall monitor the construction for compliance with the permits, plans, specifications and design including construction to proper lines and grades, maintain daily logs and weekly progress reports of the construction (including observation data sheets, problem identification and correction logs), make note of any construction deviations, coordinate qualifying and testing of materials, monitor any waste excavation, and monitor filling. This individual shall be experienced in civil site construction and solid waste regulations.

General Quality Assurance Engineer - shall supervise the construction monitoring and waste removal to verify compliance with permits, plans, specification and design concepts. This individual shall be experienced in civil site construction and solid waste regulations and shall be a registered Professional Engineer.

The General QA/QC Program includes monitoring the following activities:

1. General Earthwork
2. Storm Drainage Installation
3. General Construction Quality Control

The Soils QA/QC for this project includes soil material qualifying, sampling and testing to verify substantial compliance with the material standards. This work will include the following:

Soils Quality Control Monitor - shall pre-qualify soil materials, monitor the installation of soil materials, determine where in-place soil materials shall be tested, and test the in-place soil materials. This individual shall be responsible for assuring that all soil materials have been pre-qualified and have a chain-of-custody from the pre-qualified source to the project site, prior to installation. This individual shall be experienced in quality assurance of soil materials and the preparation of quality assurance documentation including quality assurance forms, reports, certification and manuals. This individual shall be experienced in civil site construction and soil testing standards and procedures and shall be certified by the Quality Assurance Engineer in the duties of the project.

Soils Quality Assurance Engineer - shall supervise the soil material pre-qualifying and testing of in-place soil materials to assure compliance with the test standards and testing frequency requirements, and verify compliance with the plans, specification and design. This individual shall be experienced in quality assurance of soil materials and the preparation of quality assurance documentation including quality assurance forms, reports, certification and manuals. This individual shall hold a B.S., M.S., or Ph.D degree in civil engineering or related fields, be experienced in civil site construction and soil testing procedures, be a registered Professional Engineer, and have worked on at least two other closure projects.

The QA/QC Plan including monitoring construction of the following:

A. Final Cover (Intermediate Cover, Compacted Clay Layer and Vegetative Cover (Top Soil))

Incremental side slope closure of Trail Ridge Landfill includes a final cover consisting of 12" of intermediate cover, 12" of clay, and 24" of vegetative cover. The clay layer of the final cover must be placed in two 6" (minimum) lifts. The Soils Quality Control Monitor shall observe the clay layer construction on a full-time (on-site) basis. The QA/QC for the final cover is as follows:

1. Intermediate Cover

a. Location - The fill material shall come from an off-site source. The Soils Quality Control Monitor shall visually inspect the fill material.

b. Standard - Soil shall be free of brush, weeds, and other litter; and free of roots, stumps, stones and any other extraneous or toxic matter.

The intermediate cover material shall be tested for shear strength in the laboratory (ASTM D-4767). The material shall only be

considered suitable if the material, as documented on laboratory test specimens, can be shown to provide a minimum safety factor of 1.5 against sliding.

The intermediate cover shall be a minimum of 12" thick.

Compacted to 90% of Modified Proctor maximum dry density (ASTM D 1557), unless the soil material contains 30.0% or greater passing the No. 200 sieve, then compacted to 90% of Standard Proctor maximum dry density (ASTM D-698).

c. Frequency - The shear strength shall be tested one time only based upon a representative sample of the material at the required density.

Depth measurements and density tests shall be conducted at the frequency of four per acre.

2. Clay Layer (referred to as Barrier Layer in Chapter 62-701, F.A.C.)

a. Borrow Source - Prior to clay layer installation, an appropriate borrow source shall be located. Suitability of the clay layer construction materials from that source shall be determined in accordance with the following:

(1) If demonstrated field experience is available from at least three prior successful projects of five or more acres each to document that a given borrow source can meet the requirements of the project specifications, then extensive laboratory testing of the borrow source will not be required. However, the source of material shall be geologically similar to and the methods of excavating and stockpiling the material shall be consistent with those used on the prior projects. Furthermore, a minimum of three representative samples from the appropriate thickness of the in-situ stratum or from stockpiles of the borrow material proposed for clay layer construction shall be submitted to the Owner's independent soil testing laboratory to document through index testing and shear strength testing that the proposed material is consistent with the material used on prior successful projects. At a minimum, index testing shall consist of percent fines, Atterberg limits and moisture content determinations and the shear testing shall consist of triaxial testing of the clay soil and direct shear testing of the interface between the intermediate cover and the clay as well as the interface between the clay and the proposed vegetative cover material.

(2) If demonstrated field experience as defined above is not available or cannot be documented, then the following requirements shall be met.

(a) A field exploration and laboratory testing program shall be conducted by the Owner's independent soil testing laboratory to document the horizontal and vertical extent and the homogeneity of the soil strata

proposed for use as clay layer material. A sufficient number of index tests from each potential borrow stratum shall be performed to quantify the variability of the borrow materials and to document that the proposed borrow material complies with specifications. At a minimum, the index tests shall consist of percent fines, Atterberg limits and moisture content determinations.

(b) Sufficient laboratory hydraulic conductivity tests shall be conducted on samples representative of the range invariability of the proposed borrow source (ASTM D-5084). For each such sample, test specimens shall be prepared and tested to cover the range of molding conditions (moisture content and dry density) required by project specifications. The hydraulic conductivity tests shall be conducted in triaxial type permeameters. The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured (ASTM D-5084). The borrow source will only be considered suitable if the hydraulic conductivity of the material, as documented on laboratory test specimens, can be shown to meet the requirements of the project specifications at the 98 percent confidence level.

(c) Sufficient shear strength testing of the clay material (ASTM D-4767) and direct shear testing of the interface between the intermediate cover and the clay as well as the interface between the clay and the proposed vegetative cover material (ASTM D-3080) shall be conducted on samples representative of the range in variability of the proposed borrow source. For each such sample, test specimens shall be prepared and tested to cover the range of molding conditions (moisture content and dry density) required by project specifications. The borrow source will only be considered suitable if the material, as documented on laboratory test specimens, can be shown to provide a minimum safety factor of 1.5 against sliding for both interfaces as well as the material itself.

(3) The Soils Quality Assurance Engineer shall review the pre-qualification data and shall approve or reject the clay layer material for use.

b. Test Strip - Prior to full-scale clay layer installation, a field test section or test strip shall be constructed at the site above a prepared subbase. The test strip shall be considered acceptable if the measured hydraulic conductivities of undisturbed samples from the test strip meet the requirements of the project specifications at the 98 percent confidence level. If the test section fails to achieve the desired results,

additional test sections shall be constructed in accordance with the following requirements:

(1) The test section shall be of sufficient size (40' wide x 60' long, at a minimum) such that full-scale clay layer installation procedures can be duplicated within the test section;

(2) The test section shall be constructed using the same equipment for spreading, kneading and compaction and the same construction procedures (e.g., number of passes, moisture addition and homogenization, if needed) that are anticipated for use during full-scale clay layer installation;

(3) At a minimum, the clay layer test section shall be subject to the following field and laboratory testing requirements by Soils Quality Control Monitor:

(a) A minimum of five random samples of the clay layer construction material delivered to the site during test section installation shall be tested for moisture content (ASTM D-2216), percent fines (ASTM D-1140) and Atterberg limits (ASTM D-4318);

(b) At least five field density and moisture determinations shall be performed on each lift of the compacted clay layer test section;

(c) Upon completion of the test section lift, the thickness of the lift shall be measured at a minimum of five random locations to check for thickness adequacy; and

(d) A minimum of five Shelby tube or drive cylinder (ASTM D-2937) samples shall be obtained from each lift of the test section for laboratory hydraulic conductivity testing. Laboratory hydraulic conductivity testing shall be conducted in triaxial type permeameters (ASTM D-5084). The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured (ASTM D-5084).

(e) The test strip shall meet or exceed the standards established below except the field density which shall be established by the QA Engineer, based upon the test strip results. If the test strip fails to meet these standards, the construction methods and/or material will be rejected and the test strip shall be performed again.

c. Final Cover Installation - Full scale final cover installation may begin only after completion of a successful test section. During clay layer construction, quality control testing shall be provided to document that the installed clay layer conforms to project specifications. The testing frequency for quality control testing is specified below; however, during construction of the first five acres, the frequencies shall be doubled. The clay layer shall be installed in two 6" lifts for a total minimum thickness of 12".

(1) Location - The clay layer shall be tested in place. The locations of testing shall be random locations as determined by the Soils Quality Control Monitor. If there are indications of a change in product quality or construction procedures during final cover construction, additional tests shall be performed to determine compliance.

(2) Standard

(a) Clay Layer Subgrade - Compacted to 90% of Modified Proctor maximum dry density (ASTM D-1557)D 1557), unless the soil material contains 30.0% or greater passing the No. 200 sieve, then compacted to 90% of Standard Proctor maximum dry density (ASTM D-698). (See Intermediate Cover above).

(b) Field Density - The field density shall be established by the QA Engineer based upon the test strip results and shall be determined by Standard Proctor Density (ASTM D-698). In no case shall the field density be less than 80% of Standard Proctor Density (ASTM D-698).

(c) Thickness - Each lift (two total) shall be a minimum of 6" thick.

(d) Hydraulic Conductivity - The compacted clay layer shall have an in-place hydraulic conductivity no greater than 6.67×10^{-8} cm/sec (ASTM D-5084).

(3) Field Testing Frequency

(a) Prior to the laying of the clay layer materials, the clay layer subgrade shall be compacted to the specified density. Density tests shall be conducted at a minimum rate of two tests per acre;

(b) A minimum of two moisture content and field density determinations shall be conducted per acre per lift of the compacted clay layer. The degree of compaction shall be checked using the one-point field Proctor test or other appropriate test procedures; and

(c) A minimum of four thickness measures shall be conducted per acre per lift of the compacted clay layer.

(4) Laboratory Testing Frequency

(a) Percent fines (ASTM D-1140) of the clay layer material shall be determined at a minimum frequency of two tests per acre per lift of installed clay layer;

(b) Atterberg limits determinations shall be performed on one sample per acre per lift of installed clay layer; and

(c) Hydraulic conductivity testing of Shelby tube or drive cylinder (ASTM D-2937) samples of the compacted clay layer shall be performed at a minimum frequency of one test per acre per lift. Laboratory hydraulic conductivity tests shall be conducted in triaxial type permeameters (ASTM D-5084). The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured.

(5) Deficiency - If the test data from a clay layer section does not meet the requirements of the project specifications, additional random samples shall be tested from that clay layer section. If such additional testing demonstrates that the thickness and hydraulic conductivity meet the requirements of the project specifications at the 95 percent confidence level, that clay layer section will be considered acceptable. If not, that clay layer section shall be reworked or reconstructed so that it does meet these requirements.

3. Clay Layer Tie-In (To Existing Clay Layer, Where Applicable)

a. Location - The edge of any existing final cover adjacent to the proposed final cover area.

b. Standard - The compacted clay layer of any existing final cover and the proposed final cover must be tied together to form one continuous seamless layer. At the interface, the existing and new clay layers shall be compacted to form a seamless connection.

c. Frequency - The Soils Quality Control Monitor shall monitor the tie-in by visual inspection on a continuous basis.

4. Vegetative Cover (Top Soil)

a. Location - The vegetative cover shall be tested in place for thickness. The location of testing shall be determined by the Soils Quality Control Monitor.

b. Standard - Top soil which is reasonably free of brush, weeds, and other litter; and relatively free of roots, stumps, stones and any other extraneous or toxic matter harmful to plant growth. Roots with a diameter greater than ⅜" shall be hand picked and removed.

The vegetative cover shall be at least 24" thick.

Prior to placement, the vegetative cover material shall be tested for shear strength in the laboratory (ASTM D-4767). The material shall only be considered suitable if the material, as documented on laboratory test specimens, can be shown to provide a minimum safety factor of 1.5 against sliding.

c. Frequency - The shear strength shall be tested one time only based upon a representative sample of the material.

Depth measurements shall be taken at the frequency of four per acre. The soil shall be monitored on a continuous basis for extraneous matter.

5. Final Cover Repairs (When Applicable)

If, during construction of the final cover system, damage is sustained on the final cover system (including the intermediate cover, clay layer and vegetative cover), the areas of damage shall be reconstructed and retested in accordance with corresponding section described above. All repair areas shall be tested at the frequencies prescribed above, unless more frequent testing is required at the discretion of the Soils Quality Assurance Engineer.

B. Downcomer Pipes

Downcomer pipes shall be installed in the final cover at the low point of the terraces, to intercept the stormwater between terraces. The downcomer pipes shall include the terrace side drains and terrace underdrain piping.

The downcomer pipes shall be constructed as shown on the Construction Drawings. The clay around the pipes shall be compacted into a uniform homogeneous material. Prior to placement of vegetative cover over the downcomer pipes, the pipe shall be inspected by the General Quality Control Monitor.

1. Location - The compacted clay layer shall be tested in place. The locations of testing shall be determined by the Soils Quality Control Monitor. If there are indications of a change in product quality or construction procedures during construction, additional tests shall be performed to determine compliance.

2. Standard –

   a. Clay Layer Subgrade - Compacted to 90% of Modified Proctor maximum dry density (ASTM D 1557)D 1557), unless the soil material contains 30.0% or greater passing the No. 200 sieve, then compacted to 90% of Standard Proctor maximum dry density (ASTM D-698) (12" thick minimum).

   b. Field Density - The field density of the clay layer shall be as established in Section A.2.c.(2)(b) above and shall be determined by Standard Proctor Density (ASTM D 698).

   c. Thickness - Twelve inches minimum below pipe.

   d. Hydraulic Conductivity - The compacted clay layer shall have an in-place hydraulic conductivity no greater than 6.67×10^{-8} cm/sec (ASTM D 5084).

3. Field Testing Frequency -

   a. Prior to the laying of the compacted clay materials, the subbase shall be compacted to the specified density. Density tests and thickness shall be conducted at a minimum rate of one per 75 linear feet of pipe. (Minimum of one test between terraces).

   b. A minimum of one moisture content and field density determination of the compacted clay layer shall be conducted per 75 linear feet of pipe.

   c. A minimum of two thickness measures of the compacted clay layer shall be conducted per 75 linear feet of pipe.

4. Laboratory Testing Frequency -

   a. Hydraulic conductivity testing of Shelby tube or drive cylinder (ASTM D 2937) samples of the compacted clay layer shall be performed at a minimum frequency of one test per 75 linear feet of pipe (at least once between terraces). Laboratory hydraulic conductivity tests shall be conducted in triaxial type permeameters (ASTM D 5084). The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue

until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured.

5. Deficiency - If the test data from a compacted clay layer section does not meet the requirements of the project specifications, that section shall be reworked or reconstructed so that it does meet these requirements.

C. Underdrain Filter Sand

The underdrains in the terraces shall be surrounded by filter sand as shown on the Contract Drawings. The QA/QC for the filter sand is as follows:

1. Filter Sand

a. Location - The material shall be pre-qualified prior to installation.

If the testing is done at the borrow source, a chain of custody shall be provided.

b. Standard - Clean, uniformly graded sand with a uniformity coefficient of 1.5 or greater and an effective grain size of 0.2 mm to 0.5 mm. Grain size distribution shall be conducted as part of pre-qualification.

The sand shall have a hydraulic conductivity no less than 1.0×10^{-3} cm/sec at a density of 100 percent Modified Proctor. The hydraulic conductivity testing shall be by Constant Head method (ASTM D2434).

c. Frequency - The hydraulic conductivity of the sand shall be tested once per 500 cubic yards of sand material.

D. Gas Management System (Gas Wells and Headers)

Gas wells (temporary and permanent) shall be installed in accordance with the Construction Drawings. The QA/QC for gas well materials shall be as follows:

1. Gravel for Gas Wells

a. Location - The gravel shall be pre-qualified by certification by the supplier.

b. Standard - The gravel shall be clean gravel with no fines. The gravel shall be FDOT No. 3 Course Aggregate (ASTM D 448).

The gravel shall be non-calcareous (ASTM D 4373).

c. Frequency - The gravel shall be certified by the supplier. The gravel shall be tested once per 100 C.Y.

2. Bentonite for Gas Wells

a. Location - The material shall be pre-qualified with documentation from the supplier.

b. Standard - The material shall have a hydraulic conductivity no greater than 1.0×10^{-8} cm/sec (ASTM D 5084).

c. Frequency - The material shall be certified by the supplier, one time only.

3. Permanent Header Pipe

The permanent header pipe shall be placed in the areas of final cover and shall be placed on the barrier soil layer, as shown on the Construction Drawings. The header pipe shall not be placed until the barrier soil has been tested and approved. The placement of the header pipe over the barrier soil layer and covering of the header pipe shall be conducted in the presence of either the Soils Quality Control Monitor or the General Quality Control Monitor.

4. Temporary Header Pipe

The temporary header pipe shall be placed in areas that have not received final cover, shall be placed on a prepared subgrade and shall be backfilled with clean fill. The header pipe shall be installed in accordance with the Construction Drawings. The pipe subgrade as well as the backfill around the pipes shall be compacted. Prior to placement of cover over the pipe, the pipe shall be inspected by the General Quality Control Monitor. The QA/QC for the installation of the temporary header pipe is as follows:

a. Location - The compacted subgrade and backfill shall be tested in place. The locations of testing shall be determined by the Soils Quality Control Monitor.

b. Standard - The subgrade and backfill shall be compacted to 85% of Standard Proctor maximum dry density (ASTM D-698) and shall be placed in 12-inch maximum lifts.

The minimum cover (clean fill) over the header pipe shall be 12 inches.

c. Frequency – The density of the subgrade and backfill shall be tested once per 500 linear feet per lift. The thickness of the cover over the pipe shall be checked once per 500 linear feet.

ATTACHMENT E

Quality Assurance/Quality Control Plan

For Long Term Care

TRAIL RIDGE LANDFILL
LONG TERM CARE
QUALITY ASSURANCE/QUALITY CONTROL PLAN

This plan addresses the quality assurance and quality control (QA/QC) for the monitoring and repair of the final cover on the landfill after closure. This plan delineates the procedures and standards for the monitoring and repairs.

The City of Jacksonville is the owner of Trial Ridge Landfill and Trail Ridge Landfill, Inc. is the operator/permittee of the landfill. If erosion affects the integrity of the compacted clay layer (barrier soil layer), an independent third party soils consultant shall be obtained for the QA/QC for the compacted soil layer repair. If erosion does not appear to have affected the compacted soil layer, the operator's personnel shall provide the QA/QC for the repair.

A. Final Cover Monitoring

After every major storm event or at least on a quarterly basis, Trial Ridge Landfill, Inc. shall inspect the incremental closure areas and prepare an inspection report. The report shall include the status of the following: the final cover, terraces, downcomer pipes, perimeter ditches, and the grass cover.

Any noticeable erosion of 6" or greater shall be documented. The documentation shall include; the location of the erosion on a drawing, the approximate size (length and width), the depth (in inches), and the thickness of the compacted clay layer (if the erosion is greater than 18").

If the depth of erosion is determined to be 18" or greater, the thickness of the compacted clay layer shall be checked. The compacted clay layer was designed with a 12" thickness (minimum) and therefore, the thickness must be 12" or greater.

B. Final Cover Repairing

After an inspection, any erosion of 6" or greater shall be repaired promptly. If the compacted clay layer thickness was determined to be less than 12", the compacted clay layer will also be repaired. The repair of erosion that is 6"or greater in depth shall include replacement of soil and sod. The operator's personnel shall monitor the repair. The soil used for repairs shall be topsoil, which is reasonably free of brush, weeds, roots, stumps, stone and any other extraneous or toxic matter.

The repair of erosion that is determined to penetrate the compacted clay layer (i.e. the compacted clay layer thickness is less than 12 inches), shall be monitored/tested by a qualified soils technician (the "Monitor") under the direction of a Professional Engineer. The monitor shall be experienced in civil site construction and soil testing standards and procedures. Following the repairs, a QA report including test results and daily logs shall be prepared by the Professional Engineer.

The compacted clay layer replacement shall be tested by the Monitor, in-place at a frequency of once per erosion area or once per 20,000 square feet which ever is more often. The testing shall include:

1. Hydraulic Conductivity by falling head permeameter (ASTM D-5084);

2. Field density by Standard Proctor (ASTM D-698); and

3. Thickness.

The standards for the in-place compacted soil material are as follows:

1. Hydraulic Conductivity - The compacted clay layer shall have a maximum hydraulic conductivity of 6.67×10^{-8} cm/sec.

2. Density - The compacted soil layer shall be compacted to 80 percent of Standard Proctor density.

3. Thickness - The compacted soil layer shall have a minimum thickness of 12 inches. The vegetative cover over the compacted soil layer shall have a minimum thickness of 24 inches.

The Monitor shall be on-site to observe the repairing operation, take samples/tests, and prepare a daily log. After all repairs are completed, a report shall be prepared which documents the repair(s) and the area shall be sodded.

C. Gas Management System

The landfill has an active gas management system, which includes gas wells, and gas header pipes. If the system requires replacement or maintenance, the work shall be conducted in accordance with the following.

1. Gas Wells – If a gas well must be replace or abandoned for any reason, the existing well shall be pressure grouted and capped. Any new well shall include clean gravel with no fines that meet the FDOT No. 3 Course Aggregate (ASTM D 448), which shall be certified by the supplier, prior to placement. Finally, the annular space around any new well adjacent to the in-place final cover shall be filled with bentonite powder to a minimum thickness of 12 inches with a hydraulic conductivity no greater than 1.0×10^{-9} cm/sec (ASTM D 5084), which shall be certified by the supplier, prior to placement.

2. Gas Header Pipe – If a gas header pipe requires maintenance or repair and the barrier soil layer has been compromised, the barrier soil shall be repaired as described in Section B above. If the maintenance or repair does not compromise

the barrier soil layer, the operator shall ensure that cover with a minimum thickness of 18 inches is placed over the pipe and the vegetation is restored.

D. Recordkeeping

The operator shall compile monthly monitoring reports and any QA reports into an annual summary and shall submit the annual summary to the Department.

ATTACHMENT F

Sample Landfill Inspection Checklist

Trail Ridge Landfill
Landfill Inspection Checklist

Name of Inspector: _____ Date of Inspection: _____

If answered yes, attach additional comment pages or site plan as needed.

Section A: Fencing and Security	Yes	No	Not Applicable
1. Damage to fences, gates, or locks	____	____	____
2. Gates unlocked/locks missing	____	____	____
3. Signs of forced entry detected	____	____	____

Section B: Access Roads	Yes	No	Not Applicable
1. Access and site roads in poor condition	____	____	____

Section C: Final Cover System	Yes	No	Not Applicable
1. Settlement of cover	____	____	____
2. Evidence of erosion, cracks, gullies	____	____	____
3. Holes or damage to cover	____	____	____
4. Patches of dead grass on cover	____	____	____
5. Evidence of leachate seeps	____	____	____
6. Impacts due to settlement	____	____	____
7. Ponding of water in terraces	____	____	____

Section D: Gas Management System	Yes	No	Not Applicable
1. Visible damage to system components	____	____	____
2. Excessive release of odors	____	____	____
3. Gas flare operating	____	____	____

Trail Ridge Landfill
Landfill Inspection Checklist

Section E: Stormwater Management System	Yes	No	Not Applicable
1. Ponding of water			
2. Excessive silting due to lack of vegetation			
3. Inlets repair required			
4. Perimeter ditch or swale			
5. Retention pond damage			
6. Downcomer pipe repair required			
7. Leachate breakouts affecting water quality			
8. Ditches/Inlets/Culverts need cleaning			

Section F: Monitoring Devices	Yes	No	Not Applicable
1. Damage to groundwater monitoring wells			
2. Damage to gas wells			
3. Locks missing			
4. Damage to gas monitor probes			

Section G: Leachate Collection and Storage	Yes	No	Not Applicable
1. Leachate pumps operating			
2. Leachate flow meters operating			
3. Leachate control panels operating			
4. Control panel alarms operating			
5. Leachate storage tanks leaking			
6. Leachate containment area leaking			

Section H: Active Area	Yes	No	Not Applicable
1. Graded to provide drainage			
2. Leachate/stormwater ponding			
3. Any hot spots?			
4. Erosion of intermediate and/or initial cover			

Signature of Inspector:_____ Date:_____

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

Principals
James E. England, P.E., CEO
Douglas C. Miller, P.E., President
N. Hugh Mathews, P.E., Exec., V.P.
Joseph A. Tarver, Exec., V.P.
Juanitta Bader Clem, P.E., V.P.
Scott A. Wild, P.E., PSM, V.P.
Samuel R. Crissinger, CPA, V.P
Robert A. Mizell, Jr., P.E., V.P.
Bryan R. Stewart, V.P.

August 7, 2003

Ms. Julia Boesch
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

RE: Trail Ridge Landfill – Second Permit Renewal
FDEP Permit Numbers 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
ETM No. 02-025-3

Dear Ms. Boesch:

Please find herewith the revised Primary Liner Leakage calculations for the referenced project. I apologize for the conversion error in the previous calculations.

Please feel free to give me a call if you have any questions or require any additional information.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem, P.E.
Vice President

Attachment

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:
- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2) \sqrt{\ 2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec\ \text{(per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)}$$

Assume a trigger rate at 3.5 times this rate.

$$Q_{Max} = 253.8\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)} = 1.11 \times 10^{-5}\ m^3/sec\ \text{(per acre)}$$

Check to make sure the geonet can handle the trigger rate leakage.

$t_{LCL} = (Q / k)^{1/2}$ (J.P. Giroud, 1997)

Where:

k	=	θ/t
t_{LCL}	=	Minimum Thickness of Secondary Geonet
Q	=	Maximum Flow Rate for Secondary Geonet
k	=	Hydraulic Conductivity of Secondary Geonet
θ	=	Hydraulic Transmissivity of the Secondary Geonet (m^2/sec)
t	=	Thickness of Secondary Geonet

Say:

θ	=	2.26×10^{-3} m^2/sec
t	=	200 mil = 0.2 inches = 5.1×10^{-3} m
Q	=	1.11×10^{-5} m^3/sec

Therefore:

k	=	$(2.26 \times 10^{-3}$ m^2/sec) / $(5.1 \times 10^{-3}$ m) = 0.44 m/sec
t_{LCL}	=	$(1.11 \times 10^{-5}$ m^3/sec / 0.44 m/sec)$^{1/2}$ = 5.02×10^{-3} m
	=	197.7 mil

Since the geonet has a minimum thickness of 200 mil, the geonet can handle the flow.

The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 253.8 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7 \text{ ac}$$

$$\Rightarrow 4{,}492.3 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Boesch, Julia

From: Juanitta Clem [ClemJ@etminc.com]
Sent: Thursday, August 07, 2003 4:09 PM
To: Boesch, Julia
Cc: Achaya Kelapanda (E-mail); Greg Mathes (E-mail); Mark Behel (E-mail)
Subject: Trail Ridge Landfill

LeakageRevised2.doc

Dear Julia:

Please find herewith the revised Primary Liner Leakage calculations for the referenced project. I apologize for the conversion error in the previous calculations. I will have original copies delivered to you tomorrow morning.

Juanitta Clem
ENGLAND, THIMS & MILLER, INC.

<<LeakageRevised2.doc>>

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:
- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2) \sqrt{\ 2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec\ \text{(per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)}$$

Assume a trigger rate at 3.5 times this rate.

$$Q_{Max} = 253.8\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)} = 1.11 \times 10^{-5}\ m^3/sec\ \text{(per acre)}$$

Check to make sure the geonet can handle the trigger rate leakage.

$t_{LCL} = (Q / k)^{1/2}$ (J.P. Giroud, 1997)

Where:

k	=	θ/t
t_{LCL}	=	Minimum Thickness of Secondary Geonet
Q	=	Maximum Flow Rate for Secondary Geonet
k	=	Hydraulic Conductivity of Secondary Geonet
θ	=	Hydraulic Transmissivity of the Secondary Geonet (m^2/sec)
t	=	Thickness of Secondary Geonet

Say:

θ	=	2.26×10^{-3} m^2/sec
t	=	200 mil = 0.2 inches = 5.1×10^{-3} m
Q	=	1.11×10^{-5} m^3/sec

Therefore:

$k = (2.26 \times 10^{-3} \text{ m}^2/\text{sec}) / (5.1 \times 10^{-3} \text{ m}) = 0.44$ m/sec

$t_{LCL} = (1.11 \times 10^{-5} \text{ m}^3/\text{sec} / 0.44 \text{ m/sec})^{1/2} = 5.02 \times 10^{-3}$ m

$= 197.7$ mil

Since the geonet has a minimum thickness of 200 mil, the geonet can handle the flow.

The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 253.8 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7 \text{ ac}$$

$$\Rightarrow 4{,}492.3 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

July 11, 2003

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

RE: Trail Ridge Landfill – Second Permit Renewal
FDEP Permit Numbers 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
Fourth Request for Additional Information
ETM No. 02-025-3

Dear Ms. Nogas:

We have received your letter dated June 9, 2003 regarding the referenced project. On behalf of Trail Ridge Landfill, Inc., please find the following response to your request for additional information. Please note that only the items for which the Department requested a response are included.

Attachment No. 1 – Memorandum Prepared by Julia Boesch Dated June 9, 2003

19. ***The 1992 approach for ensuring that the geonet is not flooded was updated in 1997. Please readdress this issue with the updated approach and provide all supporting calculations. Please note that an action trigger rate five times the determined rate appears excessive.***

Please see the attached calculations, which have been revised to include the 1997 approach, as requested. Further, the action trigger rate has been revised to four times the determine rate. It is our understanding that the action trigger rate will only be used as a threshold for the facility to evaluate the cause of the elevated level. As you are well aware, levels above the action threshold rate may in most cases be attributable to equipment malfunction and other site-specific conditions.

I sincerely hope this response will provide the Department all the necessary information. Please feel free to give me a call if you have any questions or require any additional information.

Sincerely,
ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem, P.E.
Vice President

Attachment

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

14775 ST. AUGUSTINE RD. • JACKSONVILLE, FL 32258 • TEL: (904) 642-8990 • FAX: (904) 646-9485

$2.66 \times 10^{-3}\ m \left| \frac{mil}{0.0000254\ m} \right| = 104\ mil$

t_{CL} ~~t_{CL}~~ $= 104\ mil$

geonet thickness is 200 mils

$t = 200\ mil \left| \frac{0.0000254\ m}{1\ mil} \right| = 5.08 \times 10^{-3}$

$200\ mil \left| \frac{inch}{1000\ mil} \right| \left| \frac{m}{39.37\ in} \right| = 5.08 \times 10^{-5}$

$Q = 3.16 \frac{m^3}{s} \times 10^{-6}$ (3.5) $k = 0.4448 \frac{}{}$

3.50 $= 11.06 \times 10^{-6} \frac{m^3}{s}$ $3.5 \left(\frac{72.5 \text{ gal}}{\text{day} \times \text{pc}}\right) =$

$t = \sqrt{\frac{11.06 \times 10^{-6}}{0.4448}} = \sqrt{2.47 \times 10^{-5}} = 4.96 \times 10^{-3} m$

$4.96 \times 10^{-3} m \left| \frac{m.i}{0.0000254 m} \right| = 195 m.i$

.00004

This is converted incorrectly

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:

- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2)\sqrt{2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec\ \text{(per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)}$$

Check to make sure the geonet can handle the leakage.

$$t_{LCL} = (Q / k)^{1/2} \qquad \text{(J.P. Giroud, 1997)}$$

Where:

- k = θ/t
- t_{LCL} = Minimum Thickness of Secondary Geonet
- Q = Maximum Flow Rate for Secondary Geonet
- k = Hydraulic Conductivity of Secondary Geonet
- θ = Hydraulic Transmissivity of the Secondary Geonet (m^2/sec)
- t = Thickness of Secondary Geonet

Say:

θ	=	2.26×10^{-3} m^2/sec
t	=	200 mil = 0.2 inches = 7.9×10^{-4} m
Q	=	3.17×10^{-6} m^3/sec

Therefore:

k	=	$(2.26 \times 10^{-3}$ m^2/sec) / $(7.9 \times 10^{-4}$ m) = 2.86 m/sec
t_{LCL}	=	$(3.17 \times 10^{-6}$ m^3/sec / 2.86 m/sec)$^{1/2}$ = 1.05×10^{-3} m
	=	41.4 mil

Since the geonet has a thickness of 200 mil, the geonet can handle the flow.

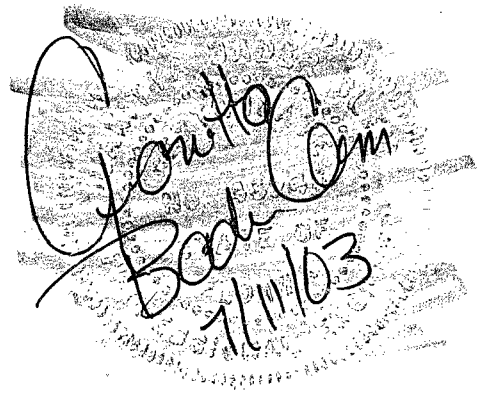
The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 72.51 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7 \text{ ac}$$

$$\Rightarrow 1{,}283.4 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Assume the flow is at a failure rate at 4 times this rate.

$$Q_{Max} = 5{,}134 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$



England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

July 11, 2003

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

RE: Trail Ridge Landfill – Second Permit Renewal
FDEP Permit Numbers 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
Fourth Request for Additional Information
ETM No. 02-025-3

Dear Ms. Nogas:

We have received your letter dated June 9, 2003 regarding the referenced project. On behalf of Trail Ridge Landfill, Inc., please find the following response to your request for additional information. Please note that only the items for which the Department requested a response are included.

Attachment No. 1 – Memorandum Prepared by Julia Boesch Dated June 9, 2003

19. ***The 1992 approach for ensuring that the geonet is not flooded was updated in 1997. Please readdress this issue with the updated approach and provide all supporting calculations. Please note that an action trigger rate five times the determined rate appears excessive.***

    Please see the attached calculations, which have been revised to include the 1997 approach, as requested. Further, the action trigger rate has been revised to four times the determine rate. It is our understanding that the action trigger rate will only be used as a threshold for the facility to evaluate the cause of the elevated level. As you are well aware, levels above the action threshold rate may in most cases be attributable to equipment malfunction and other site-specific conditions.

I sincerely hope this response will provide the Department all the necessary information. Please feel free to give me a call if you have any questions or require any additional information.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem, P.E.
Vice President

Attachment

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:
- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2)\sqrt{2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec\ \text{(per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}}\ \text{(per acre)}$$

Check to make sure the geonet can handle the leakage.

$$t_{LCL} = (Q / k)^{1/2} \qquad \text{(J.P. Giroud, 1997)}$$

Where:
- k = θ/t
- t_{LCL} = Minimum Thickness of Secondary Geonet
- Q = Maximum Flow Rate for Secondary Geonet
- k = Hydraulic Conductivity of Secondary Geonet
- θ = Hydraulic Transmissivity of the Secondary Geonet (m^2/sec)
- t = Thickness of Secondary Geonet

Say:

θ	=	2.26×10^{-3} m^2/sec
t	=	200 mil = 0.2 inches = 7.9×10^{-4} m
Q	=	3.17×10^{-6} m^3/sec

Therefore:

k	=	$(2.26 \times 10^{-3}$ m^2/sec) / $(7.9 \times 10^{-4}$ m) = 2.86 m/sec
t_{LCL}	=	$(3.17 \times 10^{-6}$ m^3/sec / 2.86 m/sec)$^{1/2}$ = 1.05×10^{-3} m
	=	41.4 mil

Since the geonet has a thickness of 200 mil, the geonet can handle the flow.

The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 72.51 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7 \text{ ac}$$

$$\Rightarrow 1{,}283.4 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Assume the flow is at a failure rate at 4 times this rate.

$$Q_{Max} = 5{,}134 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

July 11, 2003

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

RE: Trail Ridge Landfill – Second Permit Renewal
FDEP Permit Numbers 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
Fourth Request for Additional Information
ETM No. 02-025-3

Dear Ms. Nogas:

We have received your letter dated June 9, 2003 regarding the referenced project. On behalf of Trail Ridge Landfill, Inc., please find the following response to your request for additional information. Please note that only the items for which the Department requested a response are included.

Attachment No. 1 – Memorandum Prepared by Julia Boesch Dated June 9, 2003

19. ***The 1992 approach for ensuring that the geonet is not flooded was updated in 1997. Please readdress this issue with the updated approach and provide all supporting calculations. Please note that an action trigger rate five times the determined rate appears excessive.***

Please see the attached calculations, which have been revised to include the 1997 approach, as requested. Further, the action trigger rate has been revised to four times the determine rate. It is our understanding that the action trigger rate will only be used as a threshold for the facility to evaluate the cause of the elevated level. As you are well aware, levels above the action threshold rate may in most cases be attributable to equipment malfunction and other site-specific conditions.

I sincerely hope this response will provide the Department all the necessary information. Please feel free to give me a call if you have any questions or require any additional information.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem, P.E.
Vice President

Attachment

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

14775 ST. AUGUSTINE RD. • JACKSONVILLE, FL 32258 • TEL: (904) 642-8990 • FAX: (904) 646-9485

Trail Ridge Landfill
Primary Liner Leakage

Although geomembranes have very low permeability, they still allow some leakage. Leakage through geomembranes can occur due to pinholes and larger holes (holes larger than the geomembrane thickness). The leakage due to pinholes is negligible compared to the larger holes and is therefore ignored. The leakage due to large holes can be calculated by Bernoulli's equation for flow through an aperture, as follows:

$$Q = 0.6\ a\ \sqrt{2gh}$$

Where:

- Q = Leakage rate through one geomembrane hole
- a = Area of geomembrane hole
- g = Acceleration of gravity = 9.81 m/s^2
- h = Head of liquid on top of geomembrane

Say:

a = 1 cm^2 (per acre) = 1 x 10^{-4} m^2

h = 5.6 mil* = 0.0056 in = 1.42 x 10^{-4} m

* The maximum head on the liner as determined in the First Permit Renewal, Appendix E, October 28, 1996.

Therefore:

$$Q = (0.6)\ (1 \times 10^{-4}\ m^2)\sqrt{2\ (9.81\ m/s^2)\ (1.42 \times 10^{-4}\ m)}$$

$$Q = 3.17 \times 10^{-6}\ m^3/sec \text{ (per acre)}$$

$$Q = 72.51\ \frac{\text{gallons}}{\text{day}} \text{ (per acre)}$$

Check to make sure the geonet can handle the leakage.

$$t_{LCL} = (Q / k)^{1/2} \qquad \text{(J.P. Giroud, 1997)}$$

Where:

- k = θ/t
- t_{LCL} = Minimum Thickness of Secondary Geonet
- Q = Maximum Flow Rate for Secondary Geonet
- k = Hydraulic Conductivity of Secondary Geonet
- θ = Hydraulic Transmissivity of the Secondary Geonet (m^2/sec)
- t = Thickness of Secondary Geonet

Say:

θ = 2.26×10^{-3} m^2/sec

t = 200 mil = 0.2 inches = 7.9×10^{-4} m

Q = 3.17×10^{-6} m^3/sec

Therefore:

k = $(2.26 \times 10^{-3}\ m^2/sec) / (7.9 \times 10^{-4}\ m) = 2.86$ m/sec

t_{LCL} = $(3.17 \times 10^{-6}\ m^3/sec / 2.86\ m/sec)^{1/2} = 1.05 \times 10^{-3}$ m

= 41.4 mil

Since the geonet has a thickness of 200 mil, the geonet can handle the flow.

The smallest cell is 17.7 acres, so the flow per cell is:

$$Q_{Total} = 72.51 \frac{\text{gallons}}{\text{day} * \text{ac}} * 17.7\ \text{ac}$$

$$\Rightarrow 1{,}283.4 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Assume the flow is at a failure rate at 4 times this rate.

$$Q_{Max} = 5{,}134 \frac{\text{gallons}}{\text{day}} \text{ per cell}$$

Geomatrix Boulder Com 7/11/03

Boesch, Julia

From: Juanitta Clem [ClemJ@etminc.com]
Sent: Tuesday, December 27, 2005 9:22 AM
To: Boesch, Julia
Cc: gmathes@wm.com
Subject: Trail Ridge Landfill

Dear Julia -

Please see the attached first and last pages of the December 13, 2002 RAI response letter. The last page discusses the closure issues and references Attachments G and H. I have includes the certification in those attachments for your reference. Please let me know if you need anything more.

Juanitta Bader Clem, P.E.
England, Thims & Miller, Inc.
(904) 265-3181 (direct)
(904) 646-9485 (fax)

<<AR-M455N_20040830_062755.pdf>>

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • GIS • LANDSCAPE ARCHITECTS

Principals
James E. England, P.E., CEO
Douglas C. Miller, P.E., President
N. Hugh Mathews, P.E., Exec., V.P.
Joseph A. Tarver, Exec., V.P.
Juanitta Bader Clem, P.E., V.P.
Scott A. Wild, P.E., PSM, V.P.
Samuel R. Crissinger, CPA, V.P.
Robert A. Mizell, Jr., P.E., V.P.
Bryan R. Stewart, V.P.

December 13, 2002

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Reference: Trail Ridge Landfill - Second Permit Renewal
FDEP Permit No. 0013493-001 and 0013493-002
FDEP File Numbers 13493-010 and 13493-011
ET&M No. E02-25-3

Dear Ms. Nogas:

We have received your letter dated October 25, 2002 regarding the referenced project. On behalf of Trail Ridge Landfill, Inc., please find the following response to your request for additional information:

Attachment 1, Review Memorandum, dated October 25, 2002, prepared by Julia Boesch.

1. *Since you are proposing to recirculate leachate, please publish notice.*

The applicant hereby withdraws the request to recirculate leachate.

2. *Greg Mathis signed the application as a General Manager; however, the Florida Department of State, Division of Corporations web page does not list him as an officer/director. Please provide documentation demonstrating that he is an officer or director of Trail Ridge Landfill, Inc. or provide a letter from an officer/director giving him the required authorization.*

Charles Campagna, Vice President of Waste Management Holdings, Inc signed the application. Trail Ridge Landfill, Inc. is a wholly owned subsidiary of Waste Management Holdings, Inc. We recommend that the Department review the 09/16/2002 Corporate Annual Report which is a "Document Image" on the Florida Department of State, Division of Corporations web page for Trail Ridge Landfill, Inc. On the second page of the report, Mr. Charles J. Campagna is listed as Vice President, as stated on the application.

3. *If you wish to operate from 5:00 a.m. to 10:00 p.m., as indicated in item B 15 of the application form, please address how you will illuminate the site during the non-daylight hours. Please note that at least 3 candle-feet of illumination are required.*

Please be advised that this application is a permit renewal application. The above condition is an existing permit condition; the facility is in compliance with the existing permit condition and has on-site light plants to for use during non-daylight hours.

Reference: Trail Ridge Landfill - Second Permit Renewal
ET&M No. E02-25-3

72. *The following comments concern the cost estimates:*

a. *Concerning your cost estimates, you indicate in your application form that the disposal area is 148 acres, which equates to 716, 320 square yards; however, your estimates are for a smaller area. Please address and revise your estimates as appropriate.*

Please note that on Page 1 of the Financial Assurance Cost Estimate Form, 119 acres is the area used in the closure estimates. The reason 119 acres rather than 144 acres is used is because 25 acres have received final cover in accordance with the closure-as-you-go requirements. There have been four incremental closure projects at the site and each closure project has been documented and certified to the Department. Please see **Attachment G** which contains correspondence and the Closure QA/QC Plan associated with each closure project. Also, please note that Appendix M of the First Permit Renewal contained the QA/QC Plan for Side Slope Closure and Appendices J and K of the Second Permit Renewal (the current application) contains the QA/QC Plans for Side Slope Closure and Top Area Closure, respectively. Also, please see **Attachment H** which contains a letter from the Department accepting the Closure Construction Certification for Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20.

b. *Please check the amount of leachate expected to be collected during the long-term care period. Since you are proposing to recirculate leachate, the disposal area is expected to be wetter than normal and more leachate, therefore, may be collected after closure. Please revise your costs accordingly.*

The leachate recirculation has been withdrawn.

c. *Please confirm that all cost estimates are for third party costs that the department may incur if tasked with the responsibility of maintaining and monitoring the facility.*

The cost estimates are third party cost estimates.

I sincerely hope this response will provide the Department all the necessary information. I would respectfully request that any questions regarding this application be directed to me.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanita Bader Clem, P.E.
Vice President

Attachments

cc: Greg Mathes
Achaya Kelpenda
Chris Pearson

ATTACHMENT G

Closure Documentation

First Closure

Side Slope Units 5, 6, 7 (Partial) and 8 (Partial)

Certified February 3, 1994

England-Thims & Miller, Inc.
Consulting & Design Engineers
3131 St. Johns Bluff Road So. · Jacksonville, FL 32246
904-642-8990

PRINCIPALS
James E. England, P.E., President
Robert E. Thims, V.Pres., Sec.
Douglas C. Miller, P.E., V. Pres.
N. Hugh Mathews, P.E., V. Pres.

February 3, 1994

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Regulation
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Mr. Jai P. Prasad, P.E.
Stormwater Section
Department of Environmental Regulation
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Reference: Trail Ridge Landfill -Side Slope Closure
Side Slope Units 5, 6, 7 (Partial) and 8 (Partial)
FDER Permit No. SC16-184444
ET&M No. E93-143-3 (Certification File)

Dear Ms. Nogas and Mr. Prasad:

Please find herewith the Certification of Construction Completion for the Trail Ridge Landfill - Side Slope Closure. The construction Quality Assurance/Quality Control documentation and As-Built drawing are attached.

Subject to your site inspection, Trail Ridge Landfill, Inc. respectfully requests your written verification that this closure is accepted by the Department.

This is the certification for the Trail Ridge Landfill closure construction of Side Slope Units 5, 6, 7 (partial) and 8 (partial) which commenced on September 7, 1993. Should you have any questions concerning this certification, please do not hesitate to contact me or Juanitta Clem.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Douglas C. Miller, P.E.
Vice President

Attachments: Certification of Construction Completion
As-Built Drawing
Quality Assurance and Quality Control Documentation

cc: Greg Mathes w/attachments
Scott McCallister w/attachments
Chris Pierson w/attachments

DEP - 4 copies
City - 2 copies
Law Eng. - 1 copy

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

CERTIFICATION OF CONSTRUCTION COMPLETION
OF A SOLID WASTE MANAGEMENT FACILITY

DER Construction Permit No.: SC16-184444 County: Duval

Name of Project: Trail Ridge Landfill - Side Slope Closure of Units 5, 6, 7 & 8

Name of Owner: City of Jacksonville; Trail Ridge Landfill, Inc. - Operator/Permittee

Name of Engineer: England, Thims & Miller, Inc.

Type of Project: Class I Landfill - Incremental Closure
Closure of Units 5, 6, 7 (Partial) and 8 (Partial)

Cost: Estimated $ 870,950 Actual $ 738,700+/-

Site Design: Quantity: 2,600 (Avg) ton/day Site Acreage: 5.0+/- Acres

Population: 659,000+/-(1990) Dumping Fees: $ 55 /Ton

Deviations from Plans and Application Approved by DER: Deviations are shown on the As-Built Drawing and/or outlined in the attachment. The As-Built survey was prepared by Sunshine State Surveyors, Inc. and reviewed by England, Thims and Miller, Inc.

Water Monitoring Data Submitted to DER, Date: Quarterly

Address and Telephone No. of Site: 5110 U.S. Highway 301, Baldwin, FL 32234
Phone: (904) 289-9100

Name(s) of Site Supervisor: Greg Mathes

Date Site Inspection is requested: As soon as possible

This is to certify that, with the exception of deviation noted above, the construction of the project has been completed in accordance with the plans authorized by Construction Permit No.: SC16-184444 and Modifications Dated: 12-24-91

England, Thims & Miller relied upon the information and certifications provided by Law Engineering and Sunshine State Surveyors, Inc. in this certification.

Date: 2-4-94

Signature of Professional Engineer

TRAIL RIDGE LANDFILL
SIDE SLOPE CLOSURE - UNITS 5, 6, 7 AND 8
DEVIATIONS FROM PLANS AND APPLICATION

1. Downcomer Pipe D-21 was constructed with stubouts on the uphill (southern) side only. Since the terraces were constructed with a minimum 1% slope, stubouts on the downhill (western) side were deemed unnecessary.

2. Side Slope Units 7 and 8 could not be completed because the solid waste has not been placed to complete the units. (Note: Completion of Units 7 and 8 required waste disposal in Cell C which was only recently (Nov. 5, 1993) accepted by the Department). These units were completed to Sta. 96+25 as shown on the As-Built Drawing.

3. The invert on Downcomer Pipe D-21 in Structure S-21 was raised to Elevation 117.8 +/-. It should be noted that the crown of the pipe remains below the throat of the inlet.

4. Terrace 1 at Downcomer D-19 has a depth of 2.11 feet rather than the design depth of 2.5 feet. However, based upon a 25-year storm event and the drainage area of 0.62 acres, the terrace will have over 1.0 foot of freeboard and therefore, meets the design intent.

5. For safety reasons, the gas well was install with a 24-inch borehole.

Second Closure

Side Slope Units 9, 10 and 11

Certified April 17, 1995

England-Thims & Miller, Inc.
Consulting & Design Engineers
3131 St. Johns Bluff Road S., Jacksonville, FL 32246
Tel: (904) 642-8990 Fax: (904) 646-9485

Principals
James E. England, P.E., Pres.
Robert E. Thims, Exec. V.P.
Douglas C. Miller, P.E., Exec. V.P.
N. Hugh Mathews, P.E., Exec. V.P.

April 17, 1995

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Reference: Trail Ridge Landfill -Side Slope Closure
Side Slope Units 9,10 and 11
FDER Permit No. SC16-184444
ET&M No. E94-17-3 (Certification File)

Dear Ms. Nogas:

Please find herewith the Certification of Construction Completion for the Trail Ridge Landfill - Side Slope Closure. The Construction Quality Assurance/Quality Control documentation and As-Built drawings are attached.

We request a site inspection on May 1, 1995 at 9:00 A.M. Subject to your site inspection, Trail Ridge Landfill, Inc. respectfully requests your written verification that this closure is accepted by the Department.

This is the certification for the Trail Ridge Landfill Closure construction of Side Slope Units 9, 10 and 11 which commenced on May 23, 1994. Should you have any questions concerning this certification, please do not hesitate to contact me or Juanitta Clem.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Douglas C. Miller, P.E.
Vice President

DCM:cl

Attachments: Certification of Construction Completion
As-Built Drawing
Quality Assurance and Quality Control Documentation

cc: Greg Mathes w/attachments
Scott McCallister w/attachments
Chris Pierson w/attachments
DEP Stormwater Section w/attachments

Florida Department of Environmental Regulation

Twin Towers Office Bldg. 2600 Blair Stone Road Tallahassee, Florida 32399-2400

DER Form 17-701.900(7)
Form Title
Effective Date
DER Application No.
(Filled in by DER)

Certification of Construction Completion of a Solid Waste Management Facility

DER Construction Permit No: SC16-184444 County: Duval

Name of Project: Trail Ridge Landfill - Side Slope Closure of Units 9, 10 and 11

Name of Owner: City of Jacksonville; Trail Ridge Landfill, Inc. - Operator/Permittee

Name of Engineer: England, Thims & Miller, Inc.

Type of Project: Class I Landfill - Incremental Closure

Closure of Units 9, 10 and 11

Cost: Estimate $ N/A Actual $ 606,041 +/-

Site Design: Quantity: 2,600 (Avg) ton/day Site Acreage: 2.3 +/- Acres

Deviations from Plans and Application Approved by DER: Deviations are shown on the As-Built Drawing and/or outlined in the attachment. The As-Built survey was prepared by Sunshine State Surveyors, Inc. and reviewed by England, Thims & Miller, Inc.

Address and Telephone No. of Site: 5110 U.S. Highway 301, Baldwin, FL 32234

Phone (904) 289-9100

Name(s) of Site Supervisor: Greg Mathes

Date Site inspection is requested: May 1, 1995 @ 9:00 AM

This is to certify that, with the exception of any deviation noted above, the construction of the project has been completed in substantial accordance with the plans authorized by Construction Permit No.: SC16-184444 and Modifications Dated: 12-24-91

England, Thims & Miller relied upon the information and certifications provided by Law Engineering and Sunshine State surveyors, Inc. in this certification.

Date: 4/19/95

Signature of Professional Engineer

TRAIL RIDGE LANDFILL
SIDE SLOPE CLOSURE - UNITS 9, 10 AND 11
SUBSTANTIAL DEVIATIONS FROM PLANS AND APPLICATION

1. For safety reasons, the gas well was installed with a 24-inch borehole.

2. The screened interval on the gas well extends up to the top of daily cover (6" above the top of waste). Nevertheless, gas well will function properly as a passive vent.

Third Closure

Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20

Certified December 5, 1997

England-Thims & Miller, Inc.

ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

Principals
James E. England, P.E., Pres.
Robert E. Thims, Exec. V.P.
Douglas C. Miller, P.E., Exec. V.P.
N. Hugh Mathews, P.E., Exec. V.P.

December 5, 1997

Ms. Mary C. Nogas, P.E.
Waste Management Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Mr. David P. Apple, P.E.
Stormwater Section
Department of Environmental Protection
7825 Baymeadows Way, Suite 200B
Jacksonville, Florida 32256

Reference: Trail Ridge Landfill – Incremental Closure
Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20
FDEP Permit No. SC16-184444
ET&M No. E96-92-4

Dear Ms. Nogas and Mr. Apple:

Please find herewith the Certification of Construction Completion for the Trail Ridge Landfill, Incremental Closure as well as certification of the stormwater pond modification. The construction Quality Assurance/Quality Control documentation and As-Built drawings are attached.

Subject to your site inspection, Trail Ridge Landfill, Inc. respectfully requests your written verification that this closure and stormwater modification are accepted by the Department.

This is the certification for the Trail Ridge Landfill closure construction of Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20 which commenced on April 21, 1997. Should you have any questions regarding these certifications, please do not hesitate to give me a call.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem

Juanitta Bader Clem, P.E.
Vice President

Attachments: Certification of Construction Completion of a Solid Waste Management Facility
MSSW/Stormwater Certification
Quality Assurance and Quality Control Documentation
As-Built Drawings
Pump Test and Construction Drawing for Stormwater System Modification

cc: Greg Mathes w/attachments
Scott McCallister w/attachments
Chris Pearson w/attachments

3131 St. Johns Bluff Road S. • Jacksonville, FL 32246 • Tel: (904) 642-8990 • Fax: (904) 646-9485

Florida Department of Environmental Regulation

Twin Towers Office Bldg. 2600 Blair Stone Road Tallahassee, Florida 32399-2400

DER Form 17-701.900(7)
Form Title
Effective Date
DER Application No.
(Filled in by DER)

Certification of Construction Completion of a Solid Waste Management Facility

DER Construction Permit No: SC16-184444 County: Duval

Name of Project: Trail Ridge Landfill - Incremental Closure

Name of Owner: City of Jacksonville

Name of Engineer: England, Thims & Miller, Inc.

Type of Project: Class I Landfill - Incremental Closure

Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20

Cost: Estimate $ 1,800,000 Actual $ 1,569,240

Design: Quantity: 659,000 +/- (1990) ton/day Site Acreage: 12 +/- Acres

1-4 P
7-8 P

Deviations from Plans and Application Approved by DER:

Deviations are shown on the As-Built Drawing and/or outlined in the attachment. The As-Built Survey was prepared by Sunshine State Surveyors and reviewed by England, Thims & Miller, Inc.

Address and Telephone No. of Site: 5110 U.S. Highway 301, Baldwin, FL 32234

Phone: (904) 289-9100

Name(s) of Site Supervisor: Greg Mathes

Date Site inspection is requested: As soon as possible

This is to certify that, with the exception of any deviation noted above, the construction of the project has been completed in substantial accordance with the plans authorized by Construction Permit No.: SC16-184444 Dated: 12-24-91

England, Thims & Miller, Inc. relied upon the information and certifications provided by Law Engineering and Sunshine State Surveyors, Inc. in this certification.

Date: Dec. 3, 1997

Signature of Professional Engineer

REGfiles: 5/94

TRAIL RIDGE LANDFILL
INCREMENTAL CLOSURE
UNITS 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20

DEVIATIONS FROM PLANS AND APPLICATION

1. The final grades were adjusted to accommodate settlement during closure construction. Adjustments are noted on the As-Built drawings.

2. The gravel for the gas vents was modified from FDOT No. 4 Course Aggregate (1/2" - 2.5") to FDOT No. 3 Course Aggregate (3/8" - 2.0"). The bentonite for the gas well plug was modified from requiring at least 50 percent pass the No. 200 sieve to a hydraulic conductivity no greater than 1.0×10^{-8} cm/sec. As explained in the May 8, 1997 letter to the Department, these modifications do not change the design intent of the gravel and the QA/QC Plan was modified to correspond to this change.

3. The density testing of the initial cover material was revised to correlate to the type of soil material - sandy soil materials with a Modified Proctor and clayey soil materials with a Standard Proctor. Please see the revised QA/QC Plan in Section I.

Department of Environmental Protection

Lawton Chiles
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Virginia B. Wetherell
Secretary

January 28, 1998

Mr. Greg Mathes, Division President
Trail Ridge Landfill, Inc.
5110 U.S. Highway 301
Baldwin, Florida 32234

Dear Mr. Mathes:

Trail Ridge Landfill
Closure Construction Certification for Side Slope Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20
DEP Permit Number 0013493-002-SC
Duval County - Solid Waste

The Department acknowledges receipt of the following documents submitted to comply with the requirements of the subject permit and the requirements of Florida Administrative Code Chapter 62-701:

1. "Trail Ridge Landfill Incremental Closure Quality Assurance and Quality Control Documentation for Units 1-4 (Partial), 7-8 (Partial), 12-17 (Partial) and 18-20," prepared by England-Thims and Miller, Inc., and LAW Engineering and Environmental Services, Inc., dated December 5, 1997;

2. "Certification of Construction Completion of a Solid Waste Management Facility," signed and sealed on December 3, 1997 by Juanitta Bader Clem, P. E., received December 5, 1997; and

3. "Specific As-Built Survey of Trail Ridge Landfill Incremental Closure," prepared by Sunshine State Surveyors, Inc., signed and sealed on October 3, 1997 by Joseph Leslie Reynolds III, Registered Surveyor.

In addition, Department staff conducted a closure construction completion inspection of the subject side slope units on January 26, 1998. Based on the review of the above documents and the result of the inspection, closure construction of the subject side slope units, including construction of active gas extraction well numbers W-5, W-8, W-9, W-10 W-17, W-18, W-25 and W-35, has been found acceptable. The Permittee shall maintain the integrity of the side slope units, extraction wells and all associated structures as part of the facility's normal operation. Please contact me at the above letterhead address or at telephone number (904) 448-4320, if you have any questions regarding this matter.

Sincerely,

Mary C. Nogas, P. E.
Solid Waste Section Supervisor

MCN:fd
cc: Juanitta Bader Clem, P. E.
Fred Wick, DEP, Tallahassee

Forth Closure

Side Slope Units 1-4 (Complete) and 21-23

Certified July 26, 2002

England-Thims & Miller, Inc.
ENGINEERS • PLANNERS • SURVEYORS • LANDSCAPE ARCHITECTS

Principals
James E. England, P.E., CEO
Douglas C. Miller, P.E., President
N. Hugh Mathews, P.E., Exec. V.P.
Joseph A. Tarver, Exec., V.P.
Juanitta Bader Clem, P.E., V.P.
Scott A. Wild, P.E., PSM, V.P.
Samuel R. Crissinger, CPA, V.P.
Robert A. Mizell, Jr., P.E., V.P.
Bryan R. Stewart, V.P.

July 26, 2002

Ms. Mary C. Nogas, P. E.
Solid Waste Section
Department of Environmental Protection
7825 Baymeadows Way, Suite B-200
Jacksonville, Florida 32256

Reference: Trail Ridge Landfill – Incremental Closure
Side Slope Units 1-4 (Complete) and 21-23
FDEP Permit No. 0013493-002-SC
ET&M Project No. E00-117-04

Dear Ms. Nogas:

Please find herewith the Certification of Construction Completion for the Trail Ridge Landfill, Incremental Closure of Side Slope Units 1-4 (Complete) and 21-23. The Construction Quality Assurance/Quality Control documentation and As-Built Drawings are attached.

Subject to your site inspection, Trail Ridge Landfill, Inc. respectfully requests your written verification that the Department accepts this incremental closure.

This is the certification for the Trail Ridge Landfill closure construction of Side Slope Units 1-4 (complete) and 21-23, which commenced on November 12, 2001. Should you have any questions, please feel free to give me a call.

Sincerely,

ENGLAND, THIMS & MILLER, INC.

Juanitta Bader Clem

Juanitta Bader Clem, P. E.
Vice President

Attachments: Certification of Construction Completion of a Solid Waste Management Facility
Quality Assurance and Quality Control Documentation
As-Built Drawings

cc: Greg Mathes, with attachments
Chris Pearson, with attachments
Jim Horton, with attachments

14775 St. Augustine Rd. • Jacksonville, FL 32258 • Tel: (904) 642-8990 • Fax: (904) 646-9485

Florida Department of Environmental Protection
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

Effective Date _____
DEP Application No. _____ (Filled by DEP)

Certification of Construction Completion of a Solid Waste Management Facility

DEP Construction Permit No: 0013493-002-SC County: Duval

Name of Project: Trail Ridge Landfill - Incremental Closure

Name of Owner: City of Jacksonville

Name of Engineer: England, Thims & Miller, Inc.

Type of Project: Class I Landfill - Incremental Closure
Side Slope Units 1-4 (Complete) and 21-23

Cost: Estimate $_____ Actual $ 1,140,809

Site Design: Quantity: 3,500 ton/day Site Acreage: 4± Acres

Deviations from Plans and Application Approved by DEP:
Deviations are shown on the As-Built Drawing and/or outlined in the attachment.

The As-Built Survey was prepared by Robert M. Angas Associates, Inc. and reviewed by England, Thims & Miller, Inc.

Address and Telephone No. of Site: 5110 U.S. Highway 301, Baldwin, FL 32234
Phone: (904)289-9100

Name(s) of Site Supervisor: Greg Mathes

Date Site inspection is requested: As soon as possible

This is to certify that, with the exception of any deviation noted above, the construction of the project has been completed in substantial accordance with the plans authorized by Construction

Permit No.: 0013493-002-SC Dated: 11-25-97

England, Thims & Miller, Inc. relied upon the information and certifications provided by Law Engineering and Robert M. Angas Associates, Inc.

Date: 7/26/02 Signature of Professional Engineer

#43345

Northwest District
160 Governmental Center
Pensacola, FL 32501-5794
850-595-8360

Northeast District
7825 Baymeadows Way, Ste. B200
Jacksonville, FL 32256-7590
904-448-4300

Central District
3319 Maguire Blvd., Ste. 232
Orlando, FL 32803-3767
407-894-7555

Southwest District
3804 Coconut Palm Dr.
Tampa, FL 33619
813-744-6100

South District
2295 Victoria Ave., Ste. 364
Fort Myers, FL 33901-3881
941-332-6975

Southeast District
400 North Congress Ave.
West Palm Beach, FL 33401
561-681-6600

TRAIL RIDGE LANDFILL
INCREMENTAL CLOSURE
UNITS 1-4 (COMPLETE) AND 21-23

DEVIATIONS FROM PLANS AND SPECIFICATIONS

1. Some final grades were adjusted to accommodate settlement during closure construction. Adjustments are noted on the As-Built Drawings.

2. An alternate aggregate material in lieu of the specified FDOT No. 3 coarse aggregate was used to backfill Gas Wells W-26 and W-27. As explained in the attached December 3, 2001 letter to the Department, the modification does not change the design intent of the aggregate.

3. The side slope closure areas have been sodded but the sod has not been established. Due to the field conditions at the sod farms and the field conditions at the site when the sod was placed, the sod appears stressed. If the existing sod is not established, then additional measures will be taken to establish a stand of grass (either by resodding or seeding).

ATTACHMENT H

Department Letter of Acceptance for Side Slope Closure

Department of Environmental Protection

Lawton Chiles
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

Virginia B. Wetherell
Secretary

January 28, 1998

Mr. Greg Mathes, Division President
Trail Ridge Landfill, Inc.
5110 U.S. Highway 301
Baldwin, Florida 32234

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Sincerely,

MC Nogas

Mary C. Nogas, P. E.
Solid Waste Section Supervisor

MCN:fd
cc: Juanitta Bader Clem, P. E.
Fred Wick, DEP, Tallahassee

LARGE NUMBER

OF MAPS

SCANNED

SEPARATELY