BLISS-A10-001-11-001

Permit Modification Application

Fort Bliss, TX

Municipal Solid Waste Landfill Facility
Permit 1422

U.S. Army Corps of Engineers
Fort Worth District
819 Taylor Street
Fort worth, TX 76012

September 2011

This document is released for the purpose of Fort Bliss ED Review under the authority of Francisco Xavier Urueta P.E. #99473 on 5-25-2011. It is not to be used for construction or bidding purposes.

zia engineering & environmental consultants, llc

ARCADIS MALCOLM PIRNIE
Infrastructure · Water · Environment · Buildings

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Prepared for:
U.S. Army Corps of Engineers

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Project Engineer

Jeffrey Rusch, P.E., LEED AP
Staff Engineer

Our Ref.:
Bliss-A10-001 06400003.0000

Date:
September 2011

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ARCADIS MALCOLM PIRNIE

STATE OF TEXAS
FRANCISCO XAVIER URUETA
99473
LICENSED
PROFESSIONAL ENGINEER

10/4/11

Francisco X. Urueta, P.E.
Project Engineer

10/5/11

Jeffrey Rusch, P.E., LEED AP
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STATE OF TEXAS
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LICENSED
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Appendices

(There are no redlines for Appendices B, I, and L because the new documents completely replace the previous documents and Appendix Q will be a new appendix to the permit document)

1.0 PERMIT MODIFICATION NARRATIVE

1.1 Background and Description of Proposed Change

The Fort Bliss Municipal Solid Waste Landfill is an approximately 106 acre facility consisting of several cells as follows:

- An active 10.6-acre Subtitle D Type I Cell;
- A closed 3-acre Non-Subtitle D Type I Cell (TCEQ closure approval received February 24, 1999);
- An active 5-acre Non-Subtitle D Type IV C&D Cell;
- Approximately 83 acres of 1970's era previously filled and operationally closed areas;
- Approximately 7 acres designated for landfill roads, access areas, and guard shack/scale house, etc.

In March 2008, a permit modification application was submitted to TCEQ for vertically extending the height of the Subtitle D cell by 10 feet. This permit modification was approved, issued, and effective on March 11, 2009. The permit modification approval included final cover designs for all the landfill cells. For the Subtitle D cell the approved cover design is as follows (from top to bottom):

- Six inches of 1-inch to 4-inch diameter cobbles;
- A 12-inch drainage layer, $k \geq 1 \times 10^{-2}$ cm/sec;
- Geocomposite drainage net;
- 60-mil textured High Density Polyethylene(HDPE) or Linear Low Density Polyethylene (LLDPE) geomembrane; and
- 18-inch clayey material layer, $k \leq 1 \times 10^{-5}$ cm/sec.

For the previously filled and operationally closed areas and the Non-Subtitle D Type IV C&D cell, the approved cover design included an 18-inch thick (minimum) compacted low permeability soil layer (i.e., compacted clay) overlain by six inches of soil capable of sustaining native plant growth.

The Non-Subtitle D Type I cell was closed in 1999 with a non-Subtitle D final cover that complied with the closure plan for that cell and for which TCEQ closure approval was obtained in 1999.

Both the active Subtitle D and Non-Subtitle D Type IV C&D cell are nearing capacity and are scheduled to close in 2012. In addition, the 1970's era inactive areas have inadequate low permeability in-place final cover. The low permeability soil material required for the approved final cover systems for these cells is not readily available in the area and will need to be imported at considerable expense. Accordingly, Fort Bliss is seeking a permit modification to provide an alternative closure design that replaces the final cover systems described above with an Evapotranspiration (ET) Final Cover System.

The TCEQ Municipal Solid Waste (MSW) Permitting Program uses a 25-inch average annual precipitation line as defined by Title 30 of the Texas Administrative Code (TAC) Rule §330.5(b)(1)(D)) to delineate areas of the State defined as arid. El Paso lies to the west of the 25-inch average annual precipitation line and therefore has been deemed arid for the purposes of considering an alternative landfill design and modeling without calibration.

The proposed ET Final Cover System will consist of a 3.5-foot layered soil cap comprised of (from top to bottom) the following:

- 12-inch thick Vegetative Surface Layer that serves as a medium for seed germination and plant growth, and provides protection against erosion and desiccation;
- 12-inch thick Storage Layer providing storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials;
- 6-inch thick Capillary Break Layer which will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break layer. The additional water stored within the Storage Layer will help promote the establishment and development of surface vegetation, contribute to greater evapotranspiration, and reduce surface erosion; and,
- 12-inch thick Intermediate Cover Layer to provide additional water retention storage volume.

The alternative ET landfill cover final grading plan doesn't significantly alter the final grades presented in the 2008 permit modification; rather, the ET landfill cover final grading plan adjusts the final grades to generally conform to the grades developed during filling operations to provide more easily constructible ridges, swales, and slopes.

The final grading and drainage plan remains consistent with the previously approved 2008 permit modification. Final drainage patterns at the landfill will consist mostly of overland flow paths and shallow concentrated flow leading off the ET cover landfill side slopes. Swales provide flow paths for internal watersheds to the existing landfill perimeter swales. Surface water runoff flows off the landfill into the existing shallow perimeter drainage swales that discharge to the natural flow patterns of the surrounding area, generally towards the southwest and southeast corners of the landfill.

Conventional landfill covers typically include a gas collection layer and passive gas vents to relieve landfill gas pressures on the overlying impermeable geomembrane and minimize slope stability concerns. The alternative ET landfill cover will only consist of course-grained permeable soil; therefore, no passive gas venting system is proposed as part of the final ET landfill cover design. Rather, the ET cover soils will naturally and effectively vent landfill gas, similar to the existing conditions and the daily/intermediate cover soil at the site. Additionally, the microbes in the ET cover soil will oxidize some of the methane as it vents, creating more environmentally friendly emissions. While the venting of the landfill gas may affect vegetative growth on the landfill cover, the ET cover system was designed to be effective with only 10% vegetative coverage. Based on the operational and regulatory history of the landfill (83 acres of 1970's era waste), significant landfill gas generation is not expected. Should excessive methane concentrations be detected in perimeter landfill gas monitoring probes or ambient landfill air during routine landfill gas monitoring, corrective venting and reporting procedures are outlined in the Fort Bliss Guidance Document titled *Procedures Following a Methane Exceedance*.

1.2 Purpose of Change and Provision Under Which Modification is Sought

The purpose of the proposed ET Final Cover System is to provide a more cost effective closure that offers equivalent environmental protections as those provided by the closure design previously approved. Accordingly, per Title 30 TAC §305.70(k)(10), the purpose of this permit modification application is to request approval of an ET Final Cover System as an alternative final cover system for closure of the Fort Bliss Landfill.

1.3 Permit Modification Application Organization and Structure

In accordance with Title 30 TAC §305.70(e), this permit modification application consists of a new TCEQ Core Data form and Part I form, a description of the proposed permit changes, revisions to existing applicable permit documents (including strikeout and clean copies), and an updated landowners map and landowners list as required under Title 30 TAC §330.59(c)(3).
This application is organized as follows:

- Appendix A – TCEQ Core Data form
- Appendix B – TCEQ Part I form
- Appendix C - Redline/Strikeout Copy Replacement Pages. This appendix includes redline/strikeout replacement pages to the *Permit Modification Application, Fort Bliss Municipal Solid Waste Landfill, Permit 1422* (March 2008, Malcolm Pirnie, Inc.) document which reflect the inclusion of the ET Final Cover System Design
- Appendix D – Clean Copy Replacement Pages. This appendix includes clean copy replacement pages of the changes reflected in Appendix C
- Appendix E – Adjacent Landowner Information. This appendix includes a list and map of adjacent property owners for notice as required by Title 30 TAC §330.59(c)(3)

APPENDIX A

TCEQ Core Data form

TCEQ

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission (*If other is checked please describe in space provided)*

☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☒ Other **MSW Permit 1422 Modification**

2. Attachments **Describe Any Attachments:** *(ex. Title V Application, Waste Transporter Application, etc.)*

☒Yes ☐No Permit Modification for Alternative ET Cover Closure Design

3. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	4. Regulated Entity Reference Number *(if issued)*
CN 600126262		RN 100210095

SECTION II: Customer Information

5. Effective Date for Customer Information Updates (mm/dd/yyyy)	

6. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check only one of the following:*

☐Owner ☐ Operator ☒ Owner & Operator
☐Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐Other: ____________

7. General Customer Information

☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐Change in Legal Name (Verifiable with the Texas Secretary of State) ☒ No Change**

*****If "No Change" and Section I is complete, skip to Section III – Regulated Entity Information.***

8. Type of Customer:	☐ Corporation	☐ Individual	☐ Sole Proprietorship- D.B.A
☐ City Government	☐ County Government	☐ Federal Government	☐ State Government
☐ Other Government	☐ General Partnership	☐ Limited Partnership	☐ Other: ____________

9. Customer Legal Name *(If an individual, print last name first: ex: Doe, John)*	*If new Customer, enter previous Customer below*	*End Date:*

10. Mailing Address:							
	City		State		ZIP		ZIP + 4

11. Country Mailing Information *(if outside USA)*	12. E-Mail Address *(if applicable)*

13. Telephone Number	14. Extension or Code	15. Fax Number *(if applicable)*
( ) -		( ) -

16. Federal Tax ID *(9 digits)*	17. TX State Franchise Tax ID *(11 digits)*	18. DUNS Number *(if applicable)*	19. TX SOS Filing Number *(if applicable)*

20. Number of Employees	21. Independently Owned and Operated?
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher	☐ Yes ☐ No

SECTION III: Regulated Entity Information

22. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information ☒ No Change** *(See below)*

****If "NO CHANGE" is checked and Section I is complete, skip to Section IV, Preparer Information.**

23. Regulated Entity Name *(name of the site where the regulated action is taking place)*

24. Street Address of the Regulated Entity: *(No P.O. Boxes)*							
	City		**State**		**ZIP**		**ZIP + 4**
25. Mailing Address:							
	City		**State**		**ZIP**		**ZIP + 4**
26. E-Mail Address:							

27. Telephone Number	**28. Extension or Code**	**29. Fax Number** *(if applicable)*
( ) -		( ) -

30. Primary SIC Code (4 digits)	**31. Secondary SIC Code** (4 digits)	**32. Primary NAICS Code** (5 or 6 digits)	**33. Secondary NAICS Code** (5 or 6 digits)

34. What is the Primary Business of this entity? *(Please do not repeat the SIC or NAICS description.)*

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:	

36. Nearest City	**County**	**State**	**Nearest ZIP Code**

37. Latitude (N) In Decimal:			**38. Longitude (W) In Decimal:**		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☐ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☒ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
	2865			
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Lilia Lenhart	**41. Title:**	Solid Waste Program Manager

42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(915) 568-5724		(915) 568-1333	lilia.a.lenhart.civ@mail.mil

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	U.S. Army Fort Bliss	**Job Title:**	Director of Public Works
Name*(In Print)* **:**	Alfredo J. Riera, P.E.	**Phone:**	(915) 568-6200
Signature:		**Date:**	

24. Street Address of the Regulated Entity: *(No P.O. Boxes)*							
	City		State		ZIP		ZIP + 4

25. Mailing Address:							
	City		State		ZIP		ZIP + 4

26. E-Mail Address:	

27. Telephone Number	28. Extension or Code	29. Fax Number *(if applicable)*
( ) -		( ) -

30. Primary SIC Code (4 digits)	31. Secondary SIC Code (4 digits)	32. Primary NAICS Code (5 or 6 digits)	33. Secondary NAICS Code (5 or 6 digits)

34. What is the Primary Business of this entity? *(Please do not repeat the SIC or NAICS description.)*

Questions 34 – 37 address geographic location. Please refer to the instructions for applicability.

35. Description to Physical Location:	

36. Nearest City	County	State	Nearest ZIP Code

37. Latitude (N) In Decimal:			38. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form or the updates may not be made. If your Program is not listed, check other and write it in. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Industrial Hazardous Waste	☐ Municipal Solid Waste
☐ New Source Review – Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS	☐ Sludge
☐ Stormwater	☒ Title V – Air	☐ Tires	☐ Used Oil	☐ Utilities
	2865			
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Lilia Lenhart	41. Title:	Solid Waste Program Manager

42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(915) 568-5724		(915) 568-1333	lilia.a.lenhart.civ@mail.mil

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46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 9 and/or as required for the updates to the ID numbers identified in field 39.

(See the Core Data Form instructions for more information on who should sign this form.)

Company:	U.S. Army Fort Bliss	Job Title:	Director of Public Works
Name *(In Print)*:	Alfredo J. Riera, P.E.	Phone:	(915) 568-6200
Signature:	[signature]	Date:	10/19/11

APPENDIX B

TCEQ Part I form

APPENDIX C

Redline/Strikeout Copy
Replacement Pages

Texas Commission on Environmental Quality
Permit or Registration Application for Municipal Solid Waste Facility

Part I

A. General Information

Facility Name:	Fort Bliss Solid Waste Landfill			
Physical or Street Address (if available):	Building 367, Landfill Road			
(City) (County)(State)(Zip Code):	Fort Bliss	El Paso	TX	79913-0058
(Area Code) Telephone Number:	915-568-5919			
Charter Number:	N/A			

If the application is submitted on behalf of a corporation, provide the Charter Number as recorded with the Office of the Secretary of State for Texas.

Operator Name[1]:	U.S. Army Garrison, Fort Bliss IMWE-BLS-PW			
Mailing Address:	Building 777			
(City) (County)(State)(Zip Code):	Fort Bliss	El Paso	TX	79916
(Area Code) Telephone Number:	915-568-5919			
(Area Code) FAX Number:	915-568-3943			
Charter Number:	N/A			

If the permittee is the same as the operator, type "Same as Operator".

Permittee Name:	Headquarters, U.S. Army Garrison, Fort Bliss IMWE-BLS-PW			
Physical or Street Address (if available):	Same as Operator			
(City) (County)(State)(Zip Code):			TX	
(Area Code) Telephone Number:				
Charter Number:				

If the application is submitted by a corporation or by a person residing out of state, the applicant must register an Agent in Service or Agent of Service with the Texas Secretary of State's office and provide a complete mailing address for the agent. The agent must be a Texas resident.

Agent Name:	N/A			
Mailing Address:				
(City) (County)(State)(Zip Code):				
(Area Code) Telephone Number:				
(Area Code) FAX Number:				

Application Type:

☒	Permit	☐	Major Amendment	☐	Minor Amendment
☐	Registration	☒	Modification	☐	Temporary Authorization
		☒	w/Public Notice		
		☐	w/out Public Notice	☐	Notice of Deficiency Response

[1] The operator has the duty to submit an application if the facility is owned by one person and operated by another [30 TAC 305.43(b)]. The permit will specify the operator and the owner who is listed on this application [Section 361.087 Texas Health and Safety Code].

Facility Classification:

☒	Type I	☒	Type IV	☐	Type V	☐	Type IX
☐	Type I AE	☐	Type IV AE	☐	Type VI		

Activities covered by this application (check all that apply):

☐	Storage	☐	Processing	☒	Disposal

Waste management units covered by this application (check all that apply):

☐	Containers	☐	Tanks	☐	Surface Impoundments	☒	Landfills
☐	Incinerators	☐	Composting	☐	Type IV Demonstration Unit	☐	Type IX Energy/Material Recovery
☒	Other (Specify)	C&D Debris		☐	Other (Specify)		
☒	Other (Specify)	Mulching		☐	Other (Specify)		

Is this submittal part of a Consolidated Permit Processing request, in accordance with 30 TAC Chapter 33?
☐ Yes ☒ No

If yes, state the other TCEQ program authorizations requested.

Provide a brief description of the portion of the facility covered by this application. For amendments, modifications, and temporary authorizations, provide a brief description of the exact changes to the permit or registration conditions and supporting documents referenced by the permit or registration. Also, provide an explanation of why the amendment, modification, or temporary authorization is requested.

Does the application contain confidential Material?	☐ Yes ☒ No

If yes, cross-reference the confidential material *throughout the application* and submit as a separate document or binder conspicuously marked “CONFIDENTIAL.”

Alternative Language Notice Instructions

For certain permit applications, public notice in an alternate language is required. If an elementary school or middle school nearest to the facility offers a bilingual program, notice may be required to be published in an alternative language. The Texas Education Code, upon which the TCEQ alternative language notice requirements are based, trigger a bilingual education program to apply to an entire school district should the requisite alternative language speaking student population exist. However, there may not exist any bilingual students at a particular school within a district which is required to offer the bilingual education program. For this reason, the requirement to publish notice in an alternative language is triggered if the nearest elementary or middle school, as a part of a larger school district, is required to make a bilingual education program available to qualifying students and either the school has students enrolled at such a program on-site, or has students who attend such a program at another location in satisfaction of the school's obligation to provide such a program as a member of a triggered district.

If it is determined that an alternative language notice is required, the applicant is responsible for ensuring that the publication in the alternate language is complete and accurate in that language. Electronic versions of the Spanish template examples are available from the TCEQ to help the applicant complete the publication in the alternative language.

Alternative Language Notice Application Form:

Alternative language notice confirmation for this application:

1. Is a bilingual program required by the Texas Education Code in the school district where the facility is located? ☒ YES ☐ NO

   (If NO, alternative language notice publication not required)

2. If YES to question 1, are students enrolled in a bilingual education program at either the elementary school or the middle school nearest to the facility? ☒ YES ☐ NO

(IF YES to questions 1 and 2, alternative language publication is required; If NO to question 2, then consider the next question)

3. If YES to question 1, are there students enrolled at either the elementary school or the middle school nearest to the facility who attend a bilingual education program at another location? ☐ YES ☐ NO

(If Yes to questions 1 and 3, alternative language publication is required; If NO to question 3, then consider the next question)

4. If YES to question 1, would either the elementary school or the middle school nearest to the facility be required to provide a bilingual education program but for the fact that it secured a waiver from this requirement, as available under 19 TAC §89.1205(g)?
   ☐ YES ☐ NO

(If Yes to questions 1 and 4, alternative language publication is required; If NO to question 4, alternative language notice publication not required)

If a bilingual education program(s) is provided by either the elementary school or the middle school nearest to the facility, which language(s) is required by the bilingual program?

Note: Applicants for new permits and major amendments must make a copy of the administratively complete application available at a public place in the county where the facility is, or will be, located for review and copying by the public.

Public place where administratively complete permit application will be located.				
Public Place (e.g., public library, county court house, city hall, etc.):	El Paso Public Library			
Mailing Address:	501 North Oregon Street			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79901-0058
(Area Code) Telephone Number:	915-543-5433			

B. Facility Location

Except for Type I AE and Type IV AE landfill facilities, for permits, registrations, amendments, and modifications requiring public notice, provide the URL address of a publicly accessible internet web site where the application and all revisions to that application will be posted.
https://www.bliss.army.mil/DPW/Environmental/EISDocuments2.html

Local Government Jurisdiction:	N/A
Within City Limits of:	N/A
Within Extraterritorial Jurisdiction of City of:	N/A
Is the proposed municipal or industrial solid waste disposal or processing facility located in an area in which the governing body of the municipality or county has prohibited the disposal or processing of municipal or industrial solid waste? (If YES, provide a copy of the ordinance or order):	
☐ YES ☒ NO	

Provide a description of the location of the facility with respect to known or easily identifiable landmarks.
The landfill is located on Fort Bliss property near the Union Southern Pacific Railroad tracks along Sanitary Rill Road, approximately 4 miles north of the intersection with Fred Wilson Road

Detail the access routes from the nearest United States or state highway to the facility.
The paved landfill access road, referred to as Sanitary Road, is located on Fort Bliss property running south from the landfill site, parallel to the Union Southern Pacific Railroad tracks, to Fred Wilson Road. Fred Wilson Road is located approximately 4 miles south of the landfill site. The Sanitary Fill Road is a two-lane asphalt concrete paved road. The road is 30-ft wide with road shoulder on both sides. The access road is owned and maintained by Fort Bliss.

Provide the latitudinal and longitudinal geographic coordinates of the facility.

Latitude	**N 31° 52.70’**
Longitude	**W 106° 22.60’**
Elevation (above msl)	3930

Is the facility within the Coastal Management Program boundary?	☐ Yes ☒ No

Texas Department of Transportation District Location:

TXDOT District Name & Number:	El Paso District #4			
District Engineer’s Name:	Charles H. Berry, Jr., PE			
Street or P. O. Box:	13301 Gateway East			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79928
(Area Code) Telephone Number:	915-790-4203			
(Area Code) FAX Number:	915-790-4311			

The local governmental authority or agency responsible for road maintenance:

Agency Name	Fort Bliss			
Contact Person’s Name:	John Ghim			
Street or P. O. Box:	IMWE-BLS-PW, Building 777			
(City) (County)(State)(Zip Code):	Fort Bliss	El Paso	TX	79916
(Area Code) Telephone Number:	915-568-5201			
(Area Code) FAX Number:	915-568-3943			

State Representative:

District Number:	79			
State Representative's Name:	Joe Pickett			
District Office Address:	1790 Lee Trevino #307			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79936
(Area Code) Telephone Number:	915-590-4349			
(Area Code) FAX Number:	915-590-4726			

State Senator:

District Number:	29			
State Senator's Name:	The Honorable Jose Rodriquez			
District Office Address:	911 Dallas Street			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79902
(Area Code) Telephone Number:	915-521-3500			
(Area Code) FAX Number:	No fax listed			

Council of Government (COG) Information:

COG Name:	Rio Grande Council of Governments			
COG Representative's Name:	Michael Ada			
COG Representative's Title:	Director, Environmental Services			
Street or P. O. Box:	1100 N. Stanton St. Suite 610			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79902
(Area Code) Telephone Number:	915-533-0998 x 121			
(Area Code) FAX Number:	915-532-9382			

River Basin Information:

River Authority:	International Boundary & Water Commission			
Contact Person's Name:	Gilbert Anaya			
Watershed Sub-Basin Name:	Tularosa Closed Basin			
Street or P. O. Box:	4171 N. Mesa, Suite C-100			
(City) (County)(State)(Zip Code):	El Paso	El Paso	TX	79902
(Area Code) Telephone Number:	915-832-4702			
(Area Code) FAX Number:	915-832-4190			

This site is located in the following District of the U.S. Army Corps of Engineers:			
☐ Albuquerque, NM	☒ Ft. Worth, TX	☐ Galveston, TX	☐ Tulsa, OK

C. Maps

General

For permits, registrations, and amendments only, submit a topographic map, ownership map, county highway map, or a map prepared by a registered professional engineer or a registered surveyor which shows the facility and each of its intake and discharge structures and any other structure or location regarding the regulated facility and associated activities. Maps must be of material suitable for a permanent record, and shall be on sheets 8-1/2 inches by 14 inches or folded to that size, and shall be on a scale of not less than one inch equals one mile. The map shall depict the approximate boundaries of the tract of land owned or to be used by the applicant and shall extend at least one mile beyond the tract boundaries sufficient to show the following:

each well, spring, and surface water body or other water in the state within the map area;

the general character of the areas adjacent to the facility, including public roads, towns and the nature of development of adjacent lands such as residential, commercial, agricultural, recreational, undeveloped, etc;

the location of any waste disposal activities conducted on the tract not included in the application; and

the ownership of tracts of land adjacent to the facility and within a reasonable distance from the proposed point or points of discharge, deposit, injection, or other place of disposal or activity.

General location maps

For permits, registrations, and amendments only, submit at least one general location map at a scale of one-half inch equals one mile. This map shall be all or a portion of a county map prepared by Texas Department of Transportation (TxDOT). If TxDOT publishes more detailed maps of the proposed facility area, the more detailed maps shall also be included in Part I. Use the latest revision of all maps.

Land ownership map

Provide a map that locates the property owned by adjacent and potentially affected landowners. The maps should show all property ownership within 1/4 mile of the facility, on-site facility easement holders, and all mineral interest ownership under the facility.

Landowners list

Provide the adjacent and potentially affected landowners' list, keyed to the land ownership map with each property owner's name and mailing address. The list shall include all property owners within 1/4 mile of the facility, easement holders, and all mineral interest ownership under the facility. Provide the property, easement holders', and mineral interest owners' names and mailing addresses derived from the real property appraisal records as listed on the date that the application is filed. Provide the list in electronic form, as well.

D. Property owner information

For permits, registrations, amendments, and modifications that change the legal description, a change in owner, or a change in operator only, provide the following:

(1) the legal description of the facility;

(A) the abstract number as maintained by the Texas General Land Office for the surveyed tract of land;

(B) the legal description of the property and the county, book, and page number or other generally accepted identifying reference of the current ownership record;

(C) for property that is platted, the county, book, and page number or other generally accepted identifying reference of the final plat record that includes the acreage encompassed in the application and a copy of the final plat, in addition to a written legal description;

(D) a boundary metes and bounds description of the facility signed and sealed by a registered professional land surveyor;

(E) on-site easements at the facility, and

(F) drawings of the boundary metes and bounds description; and

(2) a property owner affidavit signed by the owner.

E. Legal authority

Provide verification of the legal status of the owner and operator, such as a one-page certificate of incorporation issued by the secretary of state. List all persons having over a 20% ownership in the proposed facility.

Indicate Ownership status of the facility:									
☐	Private	☐	Corporation	☐	Partnership	☐	Proprietorship	☐	Non-Profit Organization
☐	Public	☒	Federal	☐	Military	☐	State	☐	Regional
☐	County	☐	Municipal	☐	Other (Specify)				

Does the operator own the facility units and the facility property?	☒ Yes ☐ No

If "No," for permits, registrations, amendments, and modifications that changes the legal description, a change in owner, or a change in operators submit a copy of the lease for the use of or the option to buy the facility units or facility property, as appropriate, and identify:				
Owner Name:				
Street or P. O. Box:				
(City) (County)(State)(Zip Code):				
(Area Code) Telephone Number:				
(Area Code) FAX Number:				
Charter Number:				

F. Evidence of competency

For permits, registrations, amendments, and modifications that change the legal description, a change in owner, or a change in operators submit a list of all Texas solid waste sites that the owner and operator have owned or operated within the last ten years.				
Site Name	Site Type	Permit/Reg. No.	County	Dates of Operation
N/A				

Submit a list of all solid waste sites in all states, territories, or countries in which the owner and operator have a direct financial interest.			
Site Name	Location	Dates of Operation	Regulatory Agency (Name & Address)
N/A			

A licensed solid waste facility supervisor, as defined in 30 TAC Chapter 30, Occupational Licenses and Registrations will be employed before commencing facility operation.

Provide the names of the principals and supervisors of the owner's and operator's organization, together with previous affiliations with other organizations engaged in solid waste activities.		
Name	Previous Affiliation	Other Organization
Manuel Talamantes	N/A	Moore Services, Inc.

For landfill permit applications only, evidence of competency to operate the facility shall also include landfilling and earthmoving experience if applicable, and other pertinent experience, or licenses as described in 30 TAC Chapter 30 possessed by key personnel. The number and size of each type of equipment to be dedicated to facility operation will be specified in greater detail on Part IV of the application within the site operating plan.

Landfilling/Earthmoving Equipment Types	Personnel Experience or Licenses
N/A	

For mobile liquid waste processing units, submit a list of all solid waste, liquid waste, or mobile waste units that the owner and operator have owned or operated within the past five years. Submit a list of any final enforcement orders, court judgments, consent decrees, and criminal convictions of this state and the federal government within the last five years relating to compliance with applicable legal requirements relating to the handling of solid or liquid waste under the jurisdiction of the commission or the United States Environmental Protection Agency. Applicable legal requirement means an environmental law, regulation, permit, order, consent decree, or other requirement.

Solid waste, liquid waste, or mobile waste units owned or operated within past 5 years	Texas and federal final enforcement orders, court judgments, consent decrees, and criminal convictions
N/A	

G. Appointments

Provide documentation that the person signing the application meets the requirements of 30 TAC §305.44, Signatories to Applications. If the authority has been delegated, provide a copy of the document issued by the governing body of the owner or operator authorizing the person that signed the application to act as agent for the owner or operator.

H. Application Fees

For a new permit, registration, amendment, modification, or temporary authorization, submit a $150 application fee.

For authorization to construct an enclosed structure over an old, closed municipal solid waste landfill in accordance with 30 TAC 330 Subchapter T, submit a $2,500 application fee.

If paying by check, send payment to:

Texas Commission on Environmental Quality
Financial Administration Division, MC 214
P. O. Box 13087
Austin, Texas 78711-3087

Payment maybe made online using TCEQ e-pay at www.tceq.state.tx.us/e-services/	
E-pay confirmation number	

PROPERTY OWNER AFFIDAVIT

"I, ____,
(property owner)
acknowledge that the State of Texas may hold me either jointly or severally responsible for the operation, maintenance, and closure and post-closure care of the facility. For a facility where waste will remain after closure, I acknowledge that I have a responsibility to file with the county deed records an affidavit to the public advising that the land will be used for a solid waste facility prior to the time that the facility actually begins operating as a municipal solid waste landfill facility, and to file a final recording upon completion of disposal operations and closure of the landfill units in accordance with Title 30 Texas Administrative Code §330.19, Deed Recordation. I further acknowledge that I or the operator and the State of Texas shall have access to the property during the active life and post-closure care period, if required, after closure for the purpose of inspection and maintenance."

______________________________	______________________________
(Owner signature)	(Date)

PROPERTY OWNER AFFIDAVIT

"I, Alfredo J. Riera,
(property owner)
acknowledge that the State of Texas may hold me either jointly or severally responsible for the operation, maintenance, and closure and post-closure care of the facility. For a facility where waste will remain after closure, I acknowledge that I have a responsibility to file with the county deed records an affidavit to the public advising that the land will be used for a solid waste facility prior to the time that the facility actually begins operating as a municipal solid waste landfill facility, and to file a final recording upon completion of disposal operations and closure of the landfill units in accordance with Title 30 Texas Administrative Code §330.19, Deed Recordation. I further acknowledge that I or the operator and the State of Texas shall have access to the property during the active life and post-closure care period, if required, after closure for the purpose of inspection and maintenance."

(Owner signature)

10/19/11
(Date)

Signature Page

I, ______________________________________, ___________________________________,
(Operator) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: __________________________________ Date: _________________

- -

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, ______________________________________, hereby designate ______________________________
(Print or Type Operator Name) (Print or Type Representative Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____
Printed or Typed Name of Operator or Principal Executive Officer

____
Signature

- -

SUBSCRIBED AND SWORN to before me by the said _______________________________________

On this ______________day of ____________________, __________

My commission expires on the _____________________day of _____________________, __________

____
Notary Public in and for

______________________________ County, Texas

(Note: Application Must Bear Signature & Seal of Notary Public)

Signature Page

I, Alfredo J. Riera, Director of Public Works,
(Operator) (Title)

certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: [signature] Date: 10/19/11

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, ______________________, hereby designate ______________________
(Print or Type Operator Name) (Print or Type Representative Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.

____
Printed or Typed Name of Operator or Principal Executive Officer

____
Signature

SUBSCRIBED AND SWORN to before me by the said Alfredo J. Riera

On this 19th day of October, 2011

My commission expires on the 15 day of June, 2012

NOTARY PUBLIC STATE OF TEXAS ALEJANDRO FIGUEROA My Commission Expires June 15, 2012

Alejandro Figueroa
Notary Public in and for

El Paso County, Texas

(Note: Application Must Bear Signature & Seal of Notary Public)

APPENDIX C-1

Replacement Pages Summary Table

INTRODUCTION

The following table identifies replacement or new pages that have been developed to be inserted into the Fort Bliss Municipal Solid Waste Landfill Permit No. 1422

REPLACEMENT/ADDITIONAL PAGE NUMBER	REVISION/EXPLANATION
Part I Form	
- Part I form	New Part I form included as part of this permit modification application
Fort Bliss Municipal Solid Waste Landfill, Permit No. 1422 – Appendices	
Appendix B – Landfill Modification and Closure Design Drawings	March 2008 closure drawings replaced with updated existing conditions topographic survey sheet T-1 and sheets C-2 through C-5 detailing ET Final Cover Design
Appendix I – Slope Stability and Settlement Analysis	March 2008 *Slope Stability & Settlement Analysis Report* replaced with May 2011 *Slope Stability and Settlement Analyses Report (Revised)* reflecting ET Final Cover design
Appendix L – Facility Surface Water Drainage Report	March 2008 Facility Surface Water Drainage Report replaced with May 2011 *Facility Surface Water Drainage Report* reflecting ET Final Cover design
Appendix O - Closure Plan	
- Cover Sheet and Table of Contents	Revised to reflect revision date and addition of ET Cover information
- Engineering Certification	Professional Engineer certification updated
- Page 1-1	Fort Bliss Department of Public Works contact information updated
- Pages 2-1 and 2-2	Revised to reflect ET Final Cover as replacement to existing permitted cover requirements. Includes ET Final Cover description
- Page 2-2	Section 2.2 added summarizing final cover area
- Page 3-1	Maximum inventory of waste updated based on recent waste acceptance rates and ET Final Cover design
- Pages 4-1 through 4-3	Revised to reflect ET Final Cover as replacement to existing permitted cover requirements. Includes ET Final Cover description
- Pages 5-1 through 5-4	Revised to reflect ET Final Cover construction requirements and Construction Quality Control Plan (CQCP) for ET cover soils
- Pages 5-4 through 5-10	Revised to reflect ET Final Cover Vegetation Establishment Plan and ET Documentation requirements

REPLACEMENT/ADDITIONAL PAGE NUMBER	REVISION/EXPLANATION
- Page 6-1 *[2008 Closure Plan]*	Section 6 Construction Procedures incorporated into Section 5 Construction Quality Control Plan
- Page 6-1 *[2011 Closure Plan]*	Closure schedule revised based on BRAC realignment process. ET Final Cover closure requirements added to closure schedule.
Appendix P – Post-Closure Plan	
- Cover Sheet and Table of Contents	Revised to reflect revision date and addition of ET Cover information
- Engineering Certification	Professional Engineer certification updated
- Pages 2-3	Revised to include ET Final Cover vegetation monitoring
Appendix Q – Evapotranspiration Cover Design Report	New appendix added detailing proposed ET cover design and demonstration of performance

APPENDIX C-2

Appendix O – Closure Plan
[redline]

APPENDIX O
CLOSURE PLAN – STRIKEOUT COPY

U.S. Army Corps of Engineers, Fort Worth District
819 Taylor Street, Forth Worth, TX 76102

Final Closure Plan

Fort Bliss
Municipal Solid Waste Landfill Facility
(Permit #1422)

~~March 2008~~Revised September 2011

Prepared By:

Malcolm Pirnie, Inc.

44 South Broadway
15th Floor
White Plains, NY 10601
~~70 N.E. Loop 410~~
~~Suite 1150~~
~~San Antonio, TX 78216~~

6400003~~4285061~~

Engineering Certification

I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title ~~Part~~ 30 of the Texas Administrative Code (Title 30 TAC) Chapter §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer:	~~Michele Lea Feenstra~~Jeffrey Rusch, P.E.
State:	Texas
Registration Number:	~~87697~~109130

Signature: ______________________________

Certification Date: ______________________________

Engineering Seal:

Contents

List of Tables

Attachments

1. Introduction

The final closure plan has been prepared to provide a general guidance for the Fort Bliss Municipal Solid Waste Landfill (MSWLF) in meeting the Texas Commission on Environmental Quality (TCEQ) rules listed in Title 30 of the Texas Administrative Code Chapter Chapter 330.457 (Title 30 TAC §330.457) in reference to the closure requirements for MSWLF units.

If any questions arise regarding the Fort Bliss MSWLF final closure methods or requirements, he or she should consult with: (1) the ~~Directorate of Environment (DOE)~~Department of Public Works – Environmental (DPW-ENV) of Fort Bliss or (2) the TCEQ.

The DOE may be contacted at the following address:

~~Directorate of Environment~~Department of Public Works – Environmental (DPW-ENV)
Fort Bliss
IMWE-BLS-PW~~E~~
Fort Bliss, TX 79916
Tel. (915) 568-5724~~/7930~~

The TCEQ Municipal Solid Waste Division is located at the following address:

Texas Commission on Environmental Quality
Municipal Solid Waste Division
MC 124
P.O. Box 13087
Austin, Texas 78711-3087
Tel. (512) 239-6784

Additionally, the Region 6 TCEQ staff at El Paso can be reached at the following address:

Texas Commission on Environmental Quality
Region 6
401 E. Franklin Ave., Ste. 560
El Paso, Texas 79901-1212
Tel. (915) 834-4949

2. Final Cover Requirements

2.1. Final Cover Design

Title 30 TAC §330.457(a)

The Fort Bliss MSWLF was permitted on November 1, 1982 for a total area of 106.03 acres. Currently, approximately 80% of the MSWLF has been operationally closed or is inactive. Three acres of the MSWLF have been closed as a Type I landfill unit. Ten and a half acres of the remaining portion of the landfill ~~is~~ are designed to meet both USEPA Subtitle D and the Texas Municipal Solid Waste regulations. The remaining landfill area is classified as a Type IV construction and demolition debris cell.

The currently permitted ~~F~~final cover requirements for the MSWLF are summarized as follows:

Table 2-1

Fort Bliss MSWLF Final Cover Requirements (Title 30 TAC §330.457(e)(2))

Area*	Cover Requirements	Current Status
~~80~~ 83 Acres	24" Clean Soil	Operationally Closed/Inactive
10.~~5~~ 6 Acres (Type I)	Subtitle D Cover	Active
3 Acres (Type I)	Non-Subtitle D Cover	Closed 1999
5 Acres (Type IV)	24" Clean Soil	Active
7 Acres **	N/A	N/A

* Acreage is approximate and for estimation purposes only.

** Designed landfill access area.

Pursuant to Title 30 TAC §330.70(k)(10), an alternative final cover design may be approved as long as the alternative design achieves an equivalent reduction in infiltration as the clay-rich soil specified in 30 TAC §330.457(a)(2) and provides equivalent protection from wind and water erosion as the erosion layer specified in Title 30 TAC §330.457(a)(3). As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell was closed in 1999 with a final cover that complied with the closure plan for that cell and for which TCEQ closure approval was obtained on February 24, 1999. However, the remainder of the facility will be closed with an alternative evapotranspiration (ET) final cover designed to be equivalent with the currently permitted final cover system.

The ET Final Cover System will consist of a 3.5-foot layered soil cap comprised of (from top to bottom) the following:

- 12-inch thick Vegetative Surface Layer that serves as a medium for seed germination and plant growth, and provides protection against erosion and desiccation;
- 12-inch thick Storage Layer providing storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials;
- 6-inch thick Capillary Break Layer which will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break layer. The additional water stored within the Storage Layer will help promote the establishment and development of surface vegetation, contribute to greater evapotranspiration, and reduce surface erosion; and,
- 12-inch thick Intermediate Cover Layer to provide additional water retention storage volume.

2.2. Final Cover Area

As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell was closed in 1999. However, the remainder of the facility will be closed with an alternative evapotranspiration (ET) landfill cover. The total area to be capped and closed with the ET landfill cover includes the 1970's era inactive cells, the 10.6-acre Type I cell, and the 5-acre Type IV C&D cell, and encompasses approximately 98.6 acres.

3. Maximum Inventory of Waste

Title 30 TAC §330.457(e)(3)

Based on the approved 1995 final landfill contours, the total permitted waste capacity of the Fort Bliss MSWLF is 5.9 million cubic yards. The 2008 permit modification for the 10-foot height increase in the Subtitle-D cell added an additional 180,000 cubic yards of landfill capacity. The alternative ET landfill cover final grading plan doesn't significantly alter the final grades presented in the 2008 permit modification; however, the ET landfill cover final grading plan generally conforms to the grades developed during filling operations (based on the 2010 topographic survey) to provide more easily constructible ridges, swales, and slopes. ~~The current volume of waste in place is about 5.1 million cubic yards.~~ As of 2008, the current volume of in-place waste was about 5.1 million cubic yards. The Annual Solid Waste Reports from FY 2009 and FY 2010 and the most recent Daily Landfill Log from FY 2011 document an additional 85,000 cubic yards of in-place waste. Based on the existing landfill grades and the ET landfill cover final grading plan, the ~~R~~remaining capacity in the active Type I and Type IV cells is ~~10899,000~~100,200 cubic yards ~~and the proposed 10-foot height increase which will accommodate 180,000 cubic yards capacity will result in an estimated total in-place waste volume of approximately 5.4 million cubic yards~~. Therefore, at the time of closure the maximum in-place waste volume is expected to be 5,285,200 cubic yards.

~~Please see Appendix C of the permit modification application for details.~~

4. Final Cover Design

Title 30 TAC §330.457(e)(1)

The final cover systems of the MSWLF will be designed and constructed to meet the requirements listed in Title 30 TAC §330.457. The Fort Bliss MSWLF is comprised of five distinct areas:

1. 1970’s era inactive cells that consist of 30-foot deep trenches with two feet of clean soil cover. These cells cover an ~~80~~ 83 acre area and are unlined and without leachate collection. The permit does not allow further placement of MSW on these cells. According to the March 1995 Final Closure Plan and Cost Estimate these 80 acres are closed; however, formal TCEQ approval documentation has not been located in the DOE or TCEQ files.
2. A three-acre Type 1 cell with final cover in place (non-Subtitle D) that complies with the closure plan and TCEQ closure requirements. TCEQ approval was received February 24, 1999 (see Attachment 1).
3. A 10.6~~5~~-acre Type I active cell meeting Subtitle D requirements. This cell is lined and has a leachate collection system. This cell is nearing permitted capacity and is anticipated to be full by ~~mid-2007~~January 2012.
4. A 5-acre active Type IV construction debris cell. This cell is unlined and without leachate collection. This cell is also anticipated to reach capacity by ~~mid-2007~~July 2012.
5. Seven acres designated for landfill roads, access areas, gatehouse, etc.

4.1. 1970’s Inactive Cells

The ~~cover of the~~ 1970’s era inactive areas are covered with 24-inch thick clean soil, as indicated in the March 1995 Final Closure Plan and Cost Estimate sealed by Mr. John Karlsruher of Cardenas-Salcedo and Associates, Inc. These landfill areas are also indicated as closed in the May 1999 Final Cover Quality Control Plan for the 3-acre Type 1 cell. However, this area is described as in interim closure by Fort Bliss DPW-ENV~~OE~~ and no TCEQ approval or Texas P.E. certification of closure has been found in TCEQ or Fort Bliss DPW-ENV~~OE~~ records. Accordingly, an ET Final Cover System as described in Section 4.3 will be installed.

~~The final cover system shall be composed of no less than two feet of soil. The first 18 inches or more of cover shall be of clayey soil, compacted in layers of no more than six inches to minimize the potential for water infiltration. The final six inches of cover shall be of suitable topsoil that is capable of sustaining native plant growth and shall be seeded~~

~~or sodded immediately following the application of the final cover in order to minimize erosion.~~ Side slopes of the final cover for ~~all above-ground disposal areas (aerial fills) shall not exceed a 25% grade (four feet horizontal to one foot vertical). Side slopes for the final cover in excess of 25% may be authorized by the executive director, provided that controlled drainage such as flumes, diversion terraces, spillways, or other acceptable methods are incorporated into the final cover system design in the site development plan and submitted to the executive director for review and approval. The final cover for the topmost portion of a unit or facility shall have a gradient of not less than 2.0% and not greater than 6.0%, and shall possess a sufficient minimum grade to preclude ponding of surface water when total fill height and expected subsidence are taken into consideration.~~the 1970's era cells –vary between 2% and 25% based on site constraints and drainage features. All cells will be crowned at the top to promote positive drainage off the landfill and preclude ponding of surface water when total fill height and expected subsidence are taken into consideration.

4.2. Non-Subtitle D Area (Type I)

The TCEQ approval letter dated February 24, 1999 of the final cover for this 3-acre unit is provided as Attachment 1.

4.3. Subtitle D Area (Type I)

Fort Bliss will install a final cover system for the Subtitle D cell that will be designed and constructed to minimize infiltration and erosion. Fort Bliss shall place a copy of the Final Cover System Evaluation Report in the operating record. ~~The Subtitle D cell final cover at the Fort Bliss MSWLF has been designed as follows (top to bottom):~~

~~Six inches of 1-inch to 4-inch diameter cobbles~~

~~A 12-inch drainage layer,~~ $\cancel{K \geq 1 \times 10^{-2}}$ ~~cm/sec.~~

~~Geocomposite drainage net~~

~~60-mil textured HDPE or LLDPE geomembrane~~

~~18-inch clayey material layer,~~ $\cancel{K \leq 1 \times 10^{-5}}$ ~~cm/sec.~~

~~The cobbles will not sustain native plant growth but will provide an aesthetic cover that will reduce erosion.~~

Fort Bliss will install an ET Final Cover System that consists of a 3.5-foot layered soil cap comprised of (from top to bottom) the following:

- 12-inch thick Vegetative Surface Layer consisting of stockpiled Silty Sand (Unifed Soil Classification System (USCS) SM) material compacted to 75% of the Modified Proctor maximum dry density and seeded. The Vegetative Surface Layer serves as a medium for seed germination and plant growth, and provides protection against erosion and desiccation;
- 12-inch thick Storage Layer consisting of stockpiled Silty Sand (SM) material compacted to 75% of the Modified Proctor maximum dry density . The Storage Layer will provide storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials;
- 6-inch thick Capillary Break Layer consisting of well-graded, fine to coarse grained sand. The Capillary Break Layer will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break layer. The additional water stored within the Storage Layer will help promote the establishment and development of surface vegetation, contribute to greater evapotranspiration, and reduce surface erosion; and,
- 12-inch thick Intermediate Cover Layer consisting of existing cover material and/or additional stockpiled Silty Sand (SM) material compacted to 75% of the Modified Proctor maximum dry density to provide additional water retention storage volume.

The final grading of the Subtitle-D cell will consist of a landfill crown set at a 2% slope transitioning to 25% side slopes.

4.4. Non-Subtitle D Area (Type IV)

The final cover for the Type IV Non-Subtitle D area at the MSWLF will be the ET Final Cover System as described in Section 4.3 above. The final grading of the Non-Subtitle D cell consists of a landfill crown with 2% sideslopes. ~~is designed to have a 24-inch thick cover to 95% of maximum density (D1557). The bottom 18 inches or more of cover soil will be clayey soils compacted in layers no more than six inches thick and is intended to water infiltration. The top six inches of cover soil will be topsoil suitable for sustaining native plant growth. This layer will be seeded or sodded immediately following the placement of the clayey cover to minimize erosion. The erosion layer may be placed using any appropriate equipment capable of accomplishing the work and should receive only the minimal compaction required for stability. The planting of native species seed mix and mulch/crimp treatment will be performed periodically until full seed pattern growth is attained.~~

5. ~~Quality Control Testing~~Construction Quality Assurance

5.1. Introduction

Title 30 TAC §330.457(e)(1)

Construction of the Subtitle D cell final cover system will be performed by using equipment that is suitable for completing the construction in accordance with current standards imposed by TCEQ.

The TCEQ Municipal Solid Waste (MSW) Permitting Program uses a 25-inch average annual precipitation line as defined by Title 30 TAC §330.5(b)(1)(D) to delineate areas of the State defined as arid. El Paso lies to the west of the 25-inch average annual precipitation line and therefore has been deemed arid for the purposes of considering an alternative landfill design and modeling and constructing without model calibration.

5.2. Construction Quality Control Plan (CQCP)

This section addresses the construction of the soil components of the alternative ET final cover system and outlines the Construction Quality Control Plan (CQCP) to be implemented with regard to material selection and evaluation, laboratory test requirements, and field test requirements.

5.2.1. Source Material Evaluation

Material evaluations shall be performed on stockpiled or delivered material to ascertain its acceptability for the intended purpose. All material shall be sampled and tested by the Contractor in accordance with the requirements summarized in the following subsections. Stockpile materials shall not be altered in any manner, including adding or taking material, until the results from the material testing laboratory have been received and reviewed. Copies of the laboratory inspection testing results will be submitted to the Engineer of Record and will also be included in the Final Cover System Evaluation Report (FCSER).

Standards referenced in this Section are:

- ASTM D422, Test Method for Particle Size Analysis of Soils
- ASTM D1557, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)

- ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D5084 – Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
- ASTM D6836 - Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using a Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, and/or Centrifuge
- ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

5.2.2. Intermediate Cover Layer

The Intermediate Cover Layer will consist of twelve-inches of existing placed cover material or stock-piled cover material (SM) placed over the waste and compacted to approximately 75% of the Modified Proctor maximum dry density. In most instances, this material will consist of the existing intermediate cover soil placed in accordance with the Site Operating Plan. The Contractor will re-work the existing cover soil to provide a smooth uniformly graded surface. The cover soil will be free of rock and debris greater than 2-inches in diameter. Existing intermediate cover material shall be probed to verify that a minimum of 12-inches of cover soil is in place.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed on a sample collected from each soil type of the existing and/or stockpiled and installed intermediate cover material. The intermediate cover layer will be re-worked, where required, to provide the specified density. The minimum frequency of field density testing (ASTM D6938) for the existing and/or re-worked intermediate cover material shall be 2 tests per acre.

5.2.3. Capillary Break Layer

The Capillary Break Layer will be installed over the Intermediate Cover Layer as approved by the Engineer of Record and will consist of 6-inches of well-graded, fine to coarse grained sand (SW). Sand shall be a fine granular material produced by the crushing of rock, gravel, or naturally produced by disintegration of rock and shall be free of organic material, mica, loam, clay and other deleterious substances.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed on a sample collected from each source of capillary break material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every source of capillary break material to verify the van Genuchten parameters and saturated hydraulic properties of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the capillary break layer.

5.2.4. Storage Layer

The Storage Layer will be installed over the capillary break layer as approved by the Engineer of Record and will consist of a minimum of 12-inches of stockpiled SM material compacted to 75% of the Modified Proctor maximum dry density. The soil will be inspected as placed to be free of debris and rocks greater than 2-inches in diameter. The Storage Layer will be placed as a single lift and compacted to the specified density.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed for every 10,000 cubic yards of stockpiled and installed storage layer material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every 20,000 cubic yards of stockpiled and installed storage layer material to verify the saturated hydraulic properties and van Genuchten parameters of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the storage layer.

5.2.5. Vegetative Surface Layer

The vegetative Surface layer will be installed over the storage layer as approved by the Engineer of Record and will consist of a minimum of 12-inches of stockpiled SM material compacted to 75% of the Modified Proctor maximum dry density. The soil will be inspected as placed to be free of debris and rocks greater than 2-inches in diameter. The Storage Layer will be placed as a single lift and compacted to the specified density.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed for every 10,000 cubic yards of stockpiled and installed storage layer material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every 20,000 cubic yards of stockpiled and installed storage layer material to verify the saturated hydraulic properties and van Genuchten parameters of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the surface layer. The surface of the vegetative surface layer will be tilled parallel to the final grades in preparation for seeding in accordance with Section 5.3.

5.3. Vegetation Planting Plan

The purpose of this plan is to detail the procedures to be used for soil preparation and initial planting on the ET Cover. This plan sets forth use a specified native seed mix for permanent cover which includes the two target grass species from the genus *Sporobolus* for permanent establishment, but also allows for use of non-native and cultivated seed mixes per TxDOT specifications which are designed for temporary cover to achieve soil stabilization in the event final grading is completed outside of the germination period for target species (May 15 – November).

5.3.1. Soil Preparation and Seeding

All seeds must conform to the requirements of the USDA rules and regulations set forth in the Federal Seed Act and Texas seed law. Utilization of local soils stockpiled on-site will constitute the 12-inch thick Vegetative Surface Layer. These soils consist of silty sand (SM) and will be compacted to 75% of the Modified Proctor maximum dry density prior to seedbed preparation as discussed in Section 5.2.5.

Seedbed preparation will start as soon as possible after completion of the Vegetative Surface Layer to the lines and grades specified in the construction plans. The vegetated area will be cultivated to a typical depth of 4-inches before placement of seed or seed mix. If temporary seeding is utilized, the area covered with temporary grass will be cultivated to a typical depth of 4 inches before application of permanent seeds.

Table 5-1 includes the schedule and species for seeding as well as the seed application rate of pure live seed (PLS) per acre. The schedule is subject to potentially change depending on the availability of grass species specified as well as due to unexpected climatic conditions during and immediately after final cover construction are encountered.

Table 5-1
Fort Bliss MSWLF ET Cover Seeding Schedule

Dates	**Seed Type to Use**	**Seed Species to Use (Common Name)**	**Seed Species to Use (Latin Name)**	**Rates (lb Pure Live Seed/ac)**
February 1 – May 15	Perennial (Native Species Seed Mix)	Green Sprangletop	*Leptochloa Dubia*	0.3
		Sand Dropseed	***Sporobolus cryptandrus***	0.4
		Alkali Sacaton	***S. airoides***	0.9
		Blue Grama	*Bouteloua gracilis*	1.0
		Indian Ricegrass	*Oryzopsis hymenoides*	1.6
		Purple Prairieclover	*Dalea purpurea*	0.5
May 16 – August 31	Temporary Warm (Summer) Season (A Native Species and A Cultivated Species)	Buffalo Grass	*Buchloe dactyloides*	50
September 1 – November 30	Temporary Cool (Winter) Season (Introduced Species)	Plains Bristlegrass	*Setaria vulpiseta*	4.0

Plant seeding may utilize one or a combination of the following methods, as suggested by the Texas Department of Transportation *Specifications Book.*

1. Broadcast Seeding. Distribute seed/mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil. When seed and water are to be distributed as a slurry during hydroseeding, apply the mixture to the area to be seeded within 30 minutes of placement of components in the equipment. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slope.

2. Straw or Hay Mulch Seeding. Use Broadcast Seeding method to plant seed. Immediately after planting the seed/mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

3. Cellulose Fiber Mulch Seeding. Plant seed using broadcast seeding. Immediately after planting seed/mixture, apply cellulose fiber mulch uniformly over the seeded area at the following rates:
   - Clay soils with slopes of 3:1 or less – 2,000 lbs per acre
   - Clay soils with slopes greater than 3:1 – 2,300 lbs per acre
   - Sandy soils with slopes of 3:1 or less – 2,500 lbs per acre
   - Sandy soils with slopes greater than 3:1 – 3,000 lbs per acre
4. Drill Seeding. Using a pasture or rangeland type drill, plant seed/mixture uniformly over the area at a depth of 1/4 inch to 1/3 inch. Plant seed along the contour of the slopes.
5. Straw or Hay Mulching. Apply straw or hay mulch uniformly over the area as indicated on the plans. Apply hay mulch at 1.5 to 2 tons per acre. Apply straw at 2 to 2.5 tons per acre. Use a tacking method over the mulched area.

5.3.2. Fertilizer Recommendations

The installed vegetation layer will be tested for fertilizer need prior to seeding. Except for broadcast seeding, initial fertilization will occur prior to seeding. Fertilizer needs for the installed vegetation layer will be determined by collecting one soil sample per every 10 acres of installed vegetation layer, (for the purpose of this plan only one vegetation layer is proposed). Soil nutrient needs will be tested by a qualified agronomic testing laboratory (e.g. Texas A&M University Soil, Water and Forage Testing Laboratory). The laboratory testing report will determine macro and micro nutrient needs and may also contain suggestions for soil inoculants, organic matter, etc. for the installed vegetation layer. The nitrogen, phosphoric acid and potash ratio is 2:1:1, and will be applied at a rate of 100 pounds of nitrogen, 50 pounds of phosphoric acid and 50 pounds of potash per acre, unless laboratory testing results mandate higher rates. At a minimum, micronutrients will be applied at a minimum rate of 1 pound per acre of boron, calcium and magnesium.

Seed and fertilizer may be distributed simultaneously during Broadcast Seeding operations, provided each component is applied at the specified rate. When temporary and permanent seeding are both specified for the same area, apply half of the amount of fertilizer during temporary seeding operation and the other half during the permanent seeding operation. Fertilization will occur at intervals of no more than six week after initial seeding and until vegetation is established. To prevent damage to established vegetation, turf type line equipment will be used to apply fertilizer.

Unless otherwise specified on the plans, use a fertilizer containing nitrogen, phosphoric acid and potash nutrients. Similar to urea-based and plastic resin-coated fertilizers, at least 50 percent of the nitrogen component must be of a slow release formulation unless otherwise dictated by the soils laboratory. The vegetation establishment contractor will ensure that fertilizer is in an acceptable condition for distribution in containers labeled with the analysis. Fertilizer is subject to testing by the Texas A&M Feed and Fertilizer Control Service in accordance with the Texas Fertilizer Law.

5.4. Vegetation Establishment Verification Plan

5.4.1. Introduction

The Vegetation Establishment Verification Plan will ensure that the vegetation is established consistent with the parameters used in the ET Alternative Final Cover Demonstration and includes the following subsections:

- Vegetation Establishment Period
- Maintenance Activities to be Completed During the Vegetation Establishment Period
- Vegetation Performance Specification

5.4.2. Vegetation Establishment Period

The maintenance period will start immediately after seeding is conducted and will continue until TCEQ approves the vegetation establishment verification. The specified vegetative cover will be established allowing for 50% of bare areas during the maintenance period as it is assumed that re-use of local stockpiled soils containing native plant seed stock will significantly aide in facilitating vegetative growth. A bare area is defined as zero plants within a square meter quadrant (~10.76 square feet). In addition, establishment of vegetative cover will also require that at least 10% of the matured vegetative species belong to the *Sporobolus* genus.

The vegetation establishment period begins after the Final Cover System Evaluation Report is approved by TCEQ and ends when the Vegetation Establishment Report is approved by TCEQ. The standard timeframe is 2 to 3 years. The facility will establish the vegetation consistent with the parameters specified in the Vegetation Planting Plan.

5.4.3. Maintenance Activities to be Completed during the Vegetation Establishment Period

The following maintenance activities ensure that the planted vegetation will meet the vegetation performance specification:

- Following application of perennial seed mix, if greater than 50% of bare areas are determined to exist, re-seeding of the percentage of areas that will amount to achieving 50% coverage will need to be completed prior to May 15.

- Following application of a temporary seed mix, if greater than 50% of bare areas are determined to exist, re-seeding of the percentage of areas that will amount to achieving 50% coverage will need to be completed prior to November 30 to avoid over-winter exposure of said bare areas.
- Additional landfill gas extraction wells will be installed in any specific vegetative area where landfill gas poses a detrimental threat.
- Areas of significant differential settlement will be re-graded and re-seeded.
- Depending on the season, vegetation will be maintained and mowed as appropriate. No mowing will be allowed until grasses establish mature seeds.
- The facility will irrigate and fertilize the ET final cover area to stimulate and promote vegetative.
- Erosion and sediment controls will be added to areas that experience erosion.

5.4.4. Vegetation Performance Specification

The vegetation layer will be evaluated at the end of the vegetation establishment period by a Texas Licensed Professional Engineer to determine if the vegetation is established in accordance with the Evapotranspiration Cover Design Report. The performance specification for the vegetation layer is summarized herein:

- Root Penetration – The minimum root depth required of 12" is based on achieving 10% vegetative cover entirely comprised of two *Sporobolus* species as an input parameter for completing the UNSAT-H model demonstration. This root depth will ensure that these two grass species are established and will survive drought conditions.
- Percent Vegetation Cover – An 50% vegetative cover will be based on experience of a satisfactory population of mature plants, defined as 50% ground cover with at least 10% of the matured vegetative species belong to the *Sporobolus* genus, and no bare areas larger than one square meter of the established species.

5.5. Documentation

5.5.1. Final Cover System Evaluation Report (FCSER)

Following the installation of the ET cover system, a Final Cover System Evaluation Report will be submitted certifying that the ET soils were constructed in accordance with the construction methods and test procedures in the Final Cover Quality Control Program. The FCSER will be signed and sealed by a Professional Engineer in the State of Texas and include, at a minimum:

- Completed report forms required by TCEQ
- Summary of construction activities

- Summary of the initial installation of vegetation
- Summary of all laboratory and field test results
- Drawings showing sample and test locations
- Field and laboratory test results
- As-built drawings
- A description of significant construction problems and the resolution of these problems
- A statement of compliance with the Final Cover Quality Control Program

The Final Cover Evaluation Report will be signed and sealed by the Resident Engineer, signed by the site operator, and submitted to the MSW Permits Section of Waste Permits Division of the TCEQ for acceptance. Upon acceptance of the Final Cover Evaluation Report, the vegetation establishment period will begin as noted in the Vegetation Establishment Verification Plan. After the acceptance of the Final Cover Evaluation Report and during the vegetation establishment period, the applicant will request closure of the site in accordance with this Report. Since the vegetation establishment period timeframe is 2 to 3 years, closure of the site will occur prior to the completion of the vegetation establishment period.

5.5.2. *Vegetation Establishment Verification Report*

At the end of the vegetation establishment period, a Vegetation Establishment Verification Report will be completed as described in the Vegetation Establishment Verification Plan. A quarterly report will be submitted to TCEQ during the vegetation establishment period. The quarterly report will include the status of vegetation establishment activities (fertilizer application, watering, reseeding, etc.) and any other activities that are related to installed final cover or vegetation

The Vegetation Establishment Verification Report will be prepared and submitted to TCEQ for approval at the end of the vegetation establishment period. The report will be prepared by a Texas Licensed Professional Engineer and include the following:

- Documentation of the root penetration performance. A hand auger or drive cylinder will be driven at a frequency of every acre within vegetative cover areas consisting of either *Sporobolus* species to a depth of 12 inches to determine and verify the rooting depth. In addition, each core obtained will be examined by the certifying engineer to observe that the *Sporobolus* roots are denser in the upper portion of the soul profile and extend to 12 inches in depth. Each sample location will be shown on design drawings.
- Documentation that the percent vegetative cover is in accordance with the ground cover determination procedures included in this plan. This documentation will

include the engineers' assessment of the vegetation cover and photographs that document compliance with the performance specification.

- The certifying engineer will also provide a statement indicating that the vegetation layer of the ET final cover system has been maintained consistent with the parameters used in the UNSAT-H analysis.

~~**§330.457(c)**~~

~~Fort Bliss will conduct laboratory and field tests for all materials installed as part of the ET Final Cover System. test the 18 inches of compacted clay-rich soil cover of the Subtitle D Cell for its coefficient of permeability at a frequency of no less than one test per surface acre of final cover. Permeability conformance testing shall be performed on field samples obtained in accordance with ASTM D1587. Three duplicate samples shall be obtained from each test location. Each test location will be representative of the soil cover production and compaction process. Permeability testing will be performed by a qualified laboratory and in accordance with ASTM D5048 or Appendix VII (Method 7) of the Corps of Engineers Manual EM1110-2-1906, November 30, 1970 (Backpressure Saturation Method). Quality control testing of final cover will be performed during the construction of the final cover. Permeability data will be submitted to the TCEQ.~~

~~Soil Materials~~

~~Test Methods~~

~~Standards referenced in this Section are:~~

- ~~ASTM D422, Test Method for Particle Size Analysis of Soils.~~
- ~~ASTM D1557, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).~~
- ~~ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.~~
- ~~ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).~~

~~Source material Evaluation~~

~~6. Construction Procedures~~

~~§330.457(e)(1)~~

~~Construction of the Subtitle D cell final cover system will be performed by using equipment that is suitable for completing the construction in accordance with current standards imposed by TCEQ.~~

~~7.~~6. Schedule for Closure Activities

~~**§330.457(e)(4)**~~

~~Fort Bliss will conduct periodic closure activities as needed throughout the active life of the MSWLF. For closure of any area, and ultimately for the final closure of the entire facility, the following are required:~~

6.1. Closure Schedule

Title 30 TAC §330.457(e)(4)

An overall timetable for the closure of the Fort Bliss MSWLF is presented following this section. This schedule is based on the current BRAC realignment process at Fort Bliss and the regulatory closure requirements described in subsequent sections.

~~7.1.~~6.2. Final Contour Map

Title 30 TAC §330.457(e)(5)

A final contour map depicting the proposed final contours, top slopes, and side slopes, and proposed surface drainage features is provided as Sheet 3 in Appendix B of the permit modification application. The MSWLF is not within a 100-year flood plain.

~~7.2.~~6.3. Location of Plan

Title 30 TAC §330.457(f)(1)

Fort Bliss ~~DOE~~ DPW-ENV shall maintain a copy of the closure plan in the operating record.

~~7.3.~~6.4. Written Notification

Title 30 TAC §330.457(f)(2)

No later than 45 days prior to the initiation of closure activities for any area or final closure of the facility, Fort Bliss shall provide written notification to the ~~executive~~ Executive D~~d~~irector of the intent to close the unit or facility and place this notice of intent in the operating record.

No later than 90 days prior to the initiation of a final facility closure, Fort Bliss shall, through a public notice in the newspaper(s) of largest circulation in the vicinity of the facility, provide public notice for final facility closure. This notice shall provide the following information:

- Facility Name
- Facility Address
- Physical Location of the Facility
- The Permit Number
- Last Date of Intended Receipt of Waste.

~~7.4.~~6.5. Start of Final Closure Activities

Title 30 TAC §330.457(f)(3)

Fort Bliss shall begin final closure activities for each unit or facility no later than 30 days after the date on which the unit or facility receives the known final receipt of wastes or, if the unit or facility has remaining capacity and there is a reasonable likelihood that the unit or facility will receive additional wastes, no later than one year after the most recent receipt of wastes. A request for an extension beyond the one-year deadline for the initiation of closure may be submitted to the executive director for review and approval and shall include all applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste and that Fort Bliss has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSWLF.

~~7.5.~~6.6. Completion of Final Closure Activities

Title 30 TAC §330.457(f)(4)

Fort Bliss shall complete final closure activities for the unit or facility in accordance with the approved final closure plan within 180 days following the initiation or final closure activities. A request for an extension for the completion of final closure activities may be submitted to the ~~executive~~ Executive ~~director~~ Director for review and approval and shall include all applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days and all steps have been taken and will continue to be taken to prevent threats to human health and the environment from the unclosed MSWLF unit.

~~7.6.~~6.7. Certification

Title 30 TAC §330.457(f)(5)

Following final closure of the MSWLF unit or facility, the owner or operator shall submit to the ~~executive~~ Executive ~~director~~ Director for review and approval a Final Cover

System Evaluation Report (FCSER), a Vegetation Establishment Report, ~~certification,~~ signed by an independent licensed professional engineer, verifying that final closure has been completed in ~~a~~ accordance with the approved final closure plan. The submittal to the E~~e~~xecutive D~~d~~irector shall include all applicable documentation necessary for certification of closure. Once approved, this certification shall be placed in the operating record.

~~7.7.~~6.8. Inspection Report

§330.457(f)(6)

Following receipt of the required final closure documents, as applicable, and an inspection report from the commission's district office verifying proper closure of the MSWLF unit or facility according to the approved final closure plan, the executive director may acknowledge the termination of operation and closure of the unit or facility and deem it properly closed.

~~7.8.~~6.9. Affidavit to the Public

§330.457(g)

Upon notification to the executive director, Fort Bliss shall post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons who may utilize~~d~~ the facility of the date on closing for specific unit(s) or the entire facility and the prohibition against further receipt of waste materials after the stated date.

Within 10 days after completion of final closure of the MSWLF unit or facility, Fort Bliss shall submit to the executive director a certified copy of an "Affidavit to the Public" in accordance with the requirements of Title 30 TAC §330.19 and place a copy of the affidavit in the operating record. In addition, a certified notation of the deed to the facility property, or on some other instrument that is normally examined during title search, needs to be recorded. This is intended so that in perpetuity any potential purchaser of the property is notified that the land has been used as a landfill facility and use of the land is restricted.

Post-closure care maintenance specified in Title 30 TAC §330.463(b) (relating to Post-Closure Care Requirements) shall begin immediately upon the date of final closure as approved by the executive director.

6.10. Post-Closure Care

Following the professional engineer certification of the completion of closure as accepted by the Executive Director of the TCEQ Waste Permits Division, Fort Bliss DPW-ENV shall commence the 30-year post-closure care period. A Vegetation Establishment Report shall be submitted semi-annually during the cover vegetation start-up period indicating the type and quantity of vegetation established, the percent vegetative cover, and the vegetative root structure. If the type or quantity of vegetation or root structure does not meet specifications, then corrective action shall be taken to improve the vegetation consistent with the ET final cover design. Post-closure care requirements are discussed in the *Post Closure Plan.*

~~8.~~7. Closure Cost Estimate

Title 30 TAC §330.63(j)

As an agency of the Federal Government, Fort Bliss is not required to complete financial assurance mechanism requirements. Therefore, a closure cost estimate is not required per Title 30 TAC § 330.5.

~~**ATTACHMENT 1 –**~~

~~**TCEQ CLOSURE APPROVAL LETTER FOR 3-ACRE TYPE 1 UNIT**~~

APPENDIX C-3

Appendix P – Post-Closure Plan

[redline]

APPENDIX P
POST-CLOSURE PLAN – STRIKEOUT COPY

U.S. Army Corps of Engineers, Fort Worth District

819 Taylor Street, Fort Worth, TX 76102

Post-Closure Care Plan

Fort Bliss
Municipal Solid Waste Landfill Facility
(Permit #1422)

~~March 2008~~Revised September 2011

Report Prepared By:

Malcolm Pirnie, Inc.

44 South Broadway
15th Floor
White Plains, NY 10601
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~~Suite 1150~~
~~San Antonio, TX 78216~~

~~4285061~~6400003

MALCOLM PIRNIE

Engineering Certification

I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 of the Texas Administrative Code ~~Part~~(~~–~~Title 30 TAC) Chapter §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer:	~~Michele Lea Feenstra~~Jeffrey Rusch, P.E.
State:	Texas
Registration Number:	109130~~87697~~

Signature: ______________________________

Certification Date: ______________________________

Engineering Seal:

List of Tables

1. Introduction

This Post–Closure Care Plan has been prepared to provide general guidance for Fort Bliss in meeting the Texas Commission on Environmental Quality (TCEQ) rules listed in Title 30 of the Texas Administrative Code Chapter 330.463 (Title 30 TAC §330.463) in reference to the post-closure care maintenance requirements for MSWLF units. A copy of this Post-Closure Care Plan will be maintained in the operating record.

If any questions arise regarding the Fort Bliss MSWLF post-closure care maintenance methods or requirements, he or she should consult with: (1) the Directorate of Public Works (DPW) – Environmental Division of Fort Bliss, and (2) the TCEQ.

The DPW – Environmental Division may be contacted at the following address:

Directorate of Public Works – Environmental Division
Fort Bliss
IMWE-BLS-PWE
Fort Bliss, TX 79916
Tel. (915) 568-5724

The TCEQ Municipal Solid Waste Division is located at the following address:

Texas Commission on Environmental Quality
Municipal Solid Waste Permit Division
MC 124
P.O. Box 13087
Austin, Texas 78711-3087
Tel. (512)239-6784

Additionally, the Region 6 TCEQ staff at El Paso can be reached at the following address:

Texas Commission on Environmental Quality
Region 6
401 E. Franklin Ave., Ste. 560
El Paso, Texas 79901-1212
Tel. (915) 834-4949

2. Maintenance and Monitoring

2.1. Maintenance and Requirements

2.1.1. Rights of Entry

Title 30 TAC §330.463(a)(1)

Fort Bliss shall retain the right of entry to and maintain all rights-of-way of the closed municipal solid waste management unit in order to conduct periodic inspections of the closed unit. Fort Bliss shall correct, as needed, the erosion of cover material, lack of vegetative growth, leachate or methane migration, and subsidence or ponding of water on the unit. If any of these problems occur after the end of the five year~~-year~~ post-closure period or persist for longer than the first five years of post-closure care, Fort Bliss shall be responsible for their correction until the executive director determines that all problems have been adequately resolved. The executive director may reduce the post-closure period for the unit if all wastes and waste residues have been removed during closure.

2.1.2. Monitoring Programs

Title 30 TAC §330.463(a)(2)

Any monitoring programs (groundwater monitoring, resistivity surveys, methane monitoring, etc.) in effect during the life of the unit shall be continued during the post-closure care period.

2.1.3. Evidence of Release

Title 30 TAC §330.463(a)(3)

If there is any evidence of release from a municipal solid waste unit, the executive director may require an investigation into the nature and extent of the release and an assessment of the measures necessary to correct an impact to groundwater.

2.2. Post-Closure Care

Title 30 TAC §330.463(b)(1)

After professional engineer certification of the completion of closure requirements for the MSWLF is accepted by the executive director, Fort Bliss shall begin conducting post-closure care maintenance for 30 years unless the executive director specifies otherwise.

2.2.1. General Maintenance

Title 30 TAC §330.463(b)(1)(A)

Fort Bliss (the owner) or operator ~~(Contractor)~~ shall retain the right of entry to the closed unit or facility and shall maintain all rights-of-way and conduct maintenance and/or remediation activities as needed, in order to maintain the integrity and effectiveness of all final cover and drainage control system(s); to correct any effects of settlement, subsidence, ponded water, erosion, or other events or failures detrimental to the integrity of the closed unit or facility; and to prevent surface run-on and run-off from eroding or otherwise damaging the final cover system.

2.2.2. Leachate Collection System Monitoring

Title 30 TAC §330.463(b)(1)(B)

Fort Bliss shall maintain and operate the leachate collection system (LCS) in accordance with the requirements listed in Title 30 TAC §330.331 and §330.333 (relating to Design Criteria and Leachate Collection System, respectively).

Leachate shall be measured at least once a year by a scaled dip stick into the on-site vertical leachate monitoring pipe. The watermark on the stick measures the depth of leachate that collected on the liner. If the leachate is more than 12 inches (30 centimeters) deep in the landfill, it will be pumped out through the leachate transfer pipe and spread on the Subtitle D cell for evaporation.

The leachate measurement shall be kept in the site operating record. These measurements shall also be reported to the TCEQ. The executive director may allow Fort Bliss to stop managing leachate if Fort Bliss demonstrates to the approval of the executive director that leachate no longer poses a threat to human health and the environment.

2.2.3. Groundwater Monitoring

Title 30 TAC §330.463(b)(1)(C)

Ground-water monitoring requirements under Title 30 TAC §330.403 (relating to Ground-Water Monitoring Systems), §330.405 (relating to Groundwater Sampling and Analysis Requirements), §330.407 (relating to Detection Monitoring Program for Type I Landfills), and §330.409 (relating to Assessment Monitoring Program) were suspended by the executive director on May 22, 1996, since Fort Bliss demonstrated that there is no potential for migration of hazardous constituents from the MSWLF unit to the uppermost aquifer as defined in Title 30 TAC §330.3 (relating to Definitions) during the active life and the closure and post-closure care period of the unit. A copy of the May 22, 1996 letter is provided in Appendix F of the permit modification application.

2.2.4. Gas Monitoring

Title 30 TAC §330.463(b)(1)(D)

Fort Bliss shall maintain and operate the gas monitoring system in accordance with the requirements listed in 30 TAC §330 Subchapter I and the current approved Landfill Gas Management Plan.

2.2.5. Electrical Resistivity Surveys

Title 30 TAC §330.463(b)(1)(E)

Fort Bliss is not subject to electrical resistivity surveys.

2.2.6. Vegetation Establishment Monitoring

A Vegetation Establishment Report shall be submitted semi-annually during the cover vegetation start-up period indicating the type and quantity of vegetation established, the percent vegetative cover, and the vegetative root structure. If the type or quantity of vegetation or root structure does not meet specifications, then corrective action shall be taken to improve the vegetation consistent with the ET final cover design in accordance with the Fort Bliss MSWLF Closure Plan.

~~2.2.6.~~2.2.7. Schedule

Title 30 TAC §330.463(b)(3)(A)

Post-closure activities required for the MSWLF are described below:

Table 2-1.
Post-Closure Monitoring and Inspection Activities

Items	Inspection period	Action	Remark
Erosion	Quarterly and after any major storm	Correct	-----
Methane	Quarterly	Report to TCEQ	Monitoring
Leachate	Annually	Report to TCEQ	Measuring
Vegetation Establishment	Quarterly during establishment period	Report to TCEQ	Monitoring/Measuring

~~2.2.7.~~2.2.8. Post Closure Care Period

Title 30 TAC §330.463(b)(2)

Following the professional engineer certification of the completion of closure as accepted by the executive director of the TCEQ Waste Permits Division, Fort Bliss DPW-ENV shall commence the 30-year post-closure care period. The length of the Post-Closure Care maintenance period of the MSWLF may be decreased by the executive director if

Fort Bliss submits to the executive director for review and approval a documented certification, signed by an independent registered professional engineer and including all applicable documentation necessary to support the certification that demonstrates that the reduced period is sufficient to protect human health and the environment. The post-closure maintenance period may be increased by the executive director if it is determined that the lengthened period is necessary to protect human health and the environment. If there is evidence of a release from the MSWLF, the executive director may require an investigation into the nature and extent to the release and an assessment of measures necessary to correct an impact to groundwater.

3. Post - Closure Cost Estimate

Title 30 TAC §330.463(b)(3)(D)

As an agency of the Federal Government, Fort Bliss is not required to complete financial assurance mechanism requirements. Therefore, a post-closure cost estimate is not required per Title 30 TAC §330.5.

4. Completion of Post - Closure Care

Title 30 TAC §330.465

Following completion of the post-closure care maintenance period for the MSWLF, Fort Bliss will submit to the executive director for review and approval a documented certification, signed by an independent registered professional engineer verifying that post-closure care maintenance has been completed in accordance with the approved post-closure care plan. The submittal to the executive director shall include all applicable and supporting documentation necessary for the certification of completion of post-closure care maintenance.

Upon completion of the post-closure care period for the MSWLF Fort Bliss shall also submit to the executive director a request for voluntary revocation of the facility permit.

Title 30 TAC §330.463(b)(3)(C)

Fort Bliss has no foreseeable future land use plan for the landfill property at this time. However, if such a land use plan is needed, it will be made in accordance with Title 30 TAC§330.463

APPENDIX D
Clean Copy Replacement Pages

APPENDIX D-1

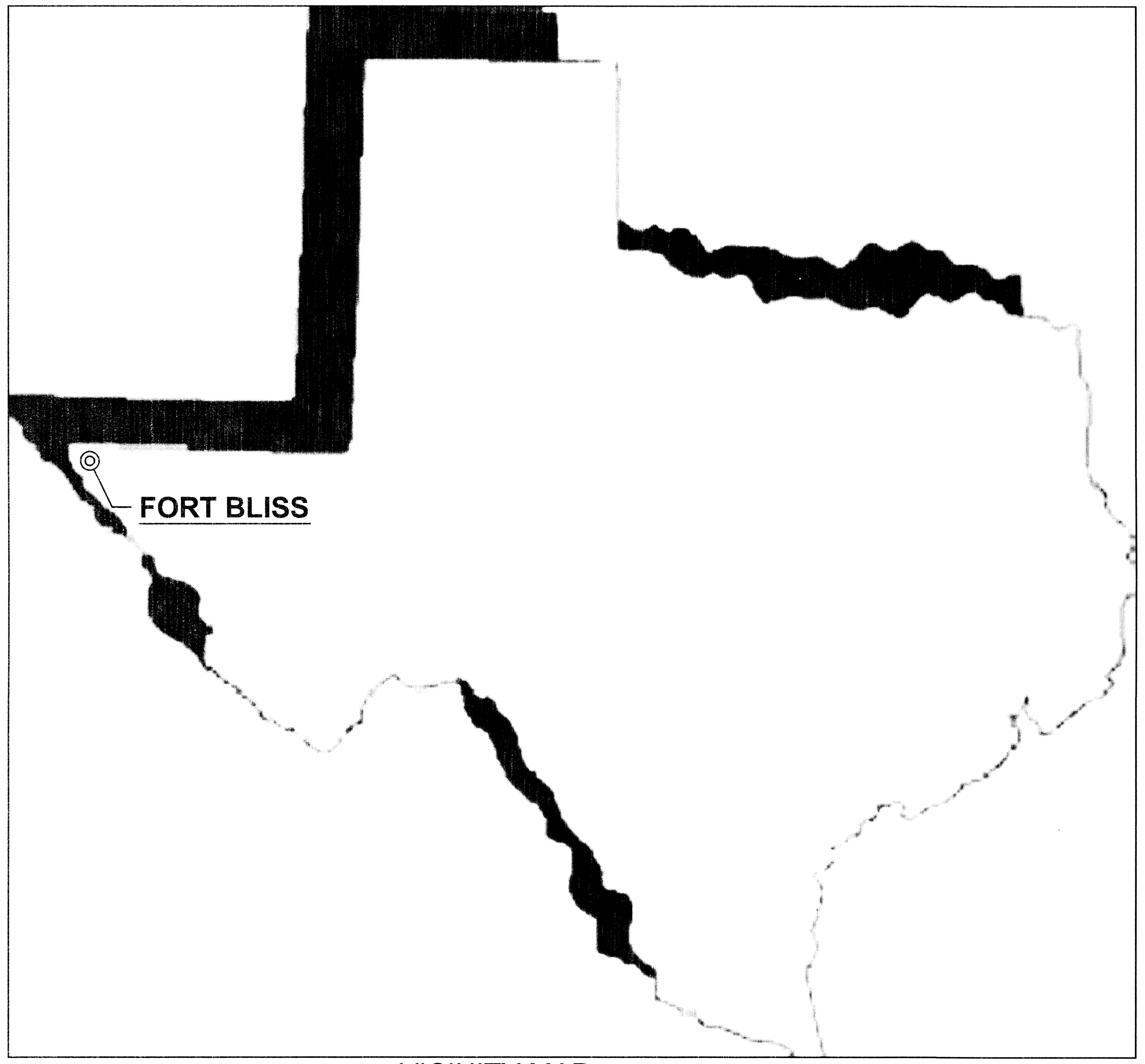
Appendix B – Landfill Modification and Closure Design Drawings

APPENDIX B – LANDFILL ET COVER AND CLOSURE DESIGN DRAWINGS

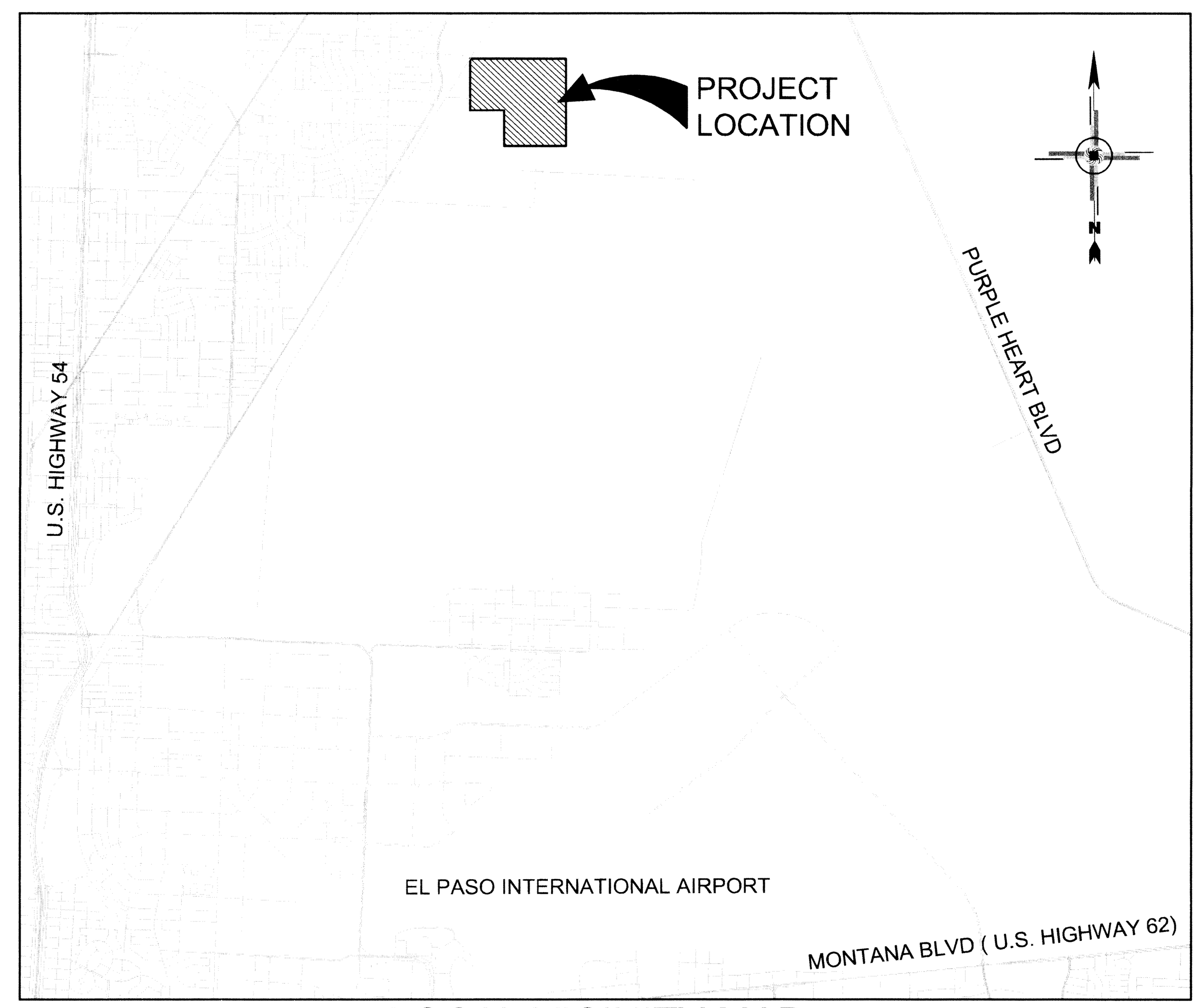
FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
FOR
FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
BLISS-A10-001

EL PASO , EL PASO COUNTY, TEXAS

MAY, 2011



VICINITY MAP
N.T.S.



LOCAL VICINITY MAP
N.T.S.

SHEET INDEX:

LIST OF ABBREVIATIONS:

@ = AT
A.D. = ALGEBRAIC DIFFERENCE
ASTM = AMERICAN SOCIETY FOR TESTING AND MATERIALS
BM = BENCHMARK
BP = BEGIN POINT
BVCE = BEGINNING OF VERTICAL CURVE ELEVATION
BVCS = BEGINNING OF VERTICAL CURVE STATION
CL = CENTERLINE
DIA = DIAMETER
E = EAST OR EASTING
EG = EXISTING GRADE ELEVATION
ELEV = ELEVATION
EP = END POINT
EVCE = END OF VERTICAL CURVE ELEVATION
EVCS = END OF VERTICAL CURVE STATION
FFE = FINISH FLOOR ELEVATION
FG = FINISH GRADE ELEVATION
FL = FLOW LINE ELEVATION
INV = INVERT ELEVATION
K = VERTICAL CURVE K-VALUE
LF = LINEAL FEET
LT = LEFT
MAX = MAXIMUM
MIN = MINIMUM
MUTCD = MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES
N = NORTH OR NORTHING
N.E.C. = NATIONAL ELECTRICAL CODE
NMOC = NEW MEXICO ONE CALL SERVICE
N.T.S. = NOT TO SCALE
O.C. = ON CENTER
PC = POINT OF CURVE
PB = PULL BOX
P.E. = PROFESSIONAL ENGINEER
PI = POINT OF INTERSECTION
PLS = PROFESSIONAL LAND SURVEYOR
PNM = PUBLIC SERVICE COMPANY OF NEW MEXICO
P.S.I = POUNDS PER SQUARE INCH
PT = POINT OF TANGENT
PVC = POLYVINYL CHLORIDE
PVI = POINT OF VERTICAL INTERSECTION
R = RADIUS LENGTH
RE = REFERENCE
RT = RIGHT
SF = SQUARE FEET
STA = STATION
S = SOUTH
TC = TOP OF CURB ELEVATION
TF = TOP OF FOOTING ELEVATION
TW = TOP OF WALL ELEVATION
TYP = TYPICAL
UE = UNDERGROUND ELECTRIC
VC = VERTICAL CURVE LENGTH
VOR = VILLAGE OF RUIDOSO
W = WEST

CLIENT:

US ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT,
CONTRACTING DIVISION –
SERVICE AND SUPPLY BRANCH
819 TAYLOR STREET ROOM 2A19
FORT WORTH, TEXAS 76102-0300

PROFESSIONAL LAND SURVEYOR:

KERY W. GREINER, P.L.S.
ZIA ENGINEERING & ENVIRONMENTAL
CONSULTANTS, LLC
755 S. TELSHOR BLVD., SUITE F-201
LAS CRUCES, NEW MEXICO 88011
PHONE: (575) 532 1526
FAX: (575) 532-1587

ENGINEER OF RECORD:

FRANCISCO XAVIER URUETA P.E. #99473
ZIA ENGINEERING & ENVIRONMENTAL
CONSULTANTS, LLC
755 S. TELSHOR BLVD., SUITE F-201
LAS CRUCES, NEW MEXICO 88011
PHONE: (575) 532-1526
FAX: (575) 532-1587

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THESE DRAWINGS ARE THE INSTRUMENT OF SERVICE OF ZIA ENGINEERING AND SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN THE REFERENCED PROJECT FOR WHICH THESE DRAWINGS WERE CREATED.

PROPERTY LOCATED OUTSIDE CORPORATE LIMITS IN AN UNIDENTIFIED ZONE PER FLOOD INSURANCE RATE MAP NUMBER 4802140025B, EFFECTIVE DATE OF OCTOBER 15, 1982.

PROJECT BENCHMARK BM:
PROJECT BENCHMARK IS SUB D1, ORTEGA, BRASS CAP IN CONCRETE. ELEVATION = 3921.81 NAVD = 88

Field By:		REVISIONS	
Drawn By:	AH	Date:	Comment
Approved By:	AF / FXU	05/10/11	
Date:			

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File ID: BLISS-A10-001

STATE OF TEXAS
FRANCISCO XAVIER URUETA
99473
LICENSED
PROFESSIONAL ENGINEER

Date: 5-10-11

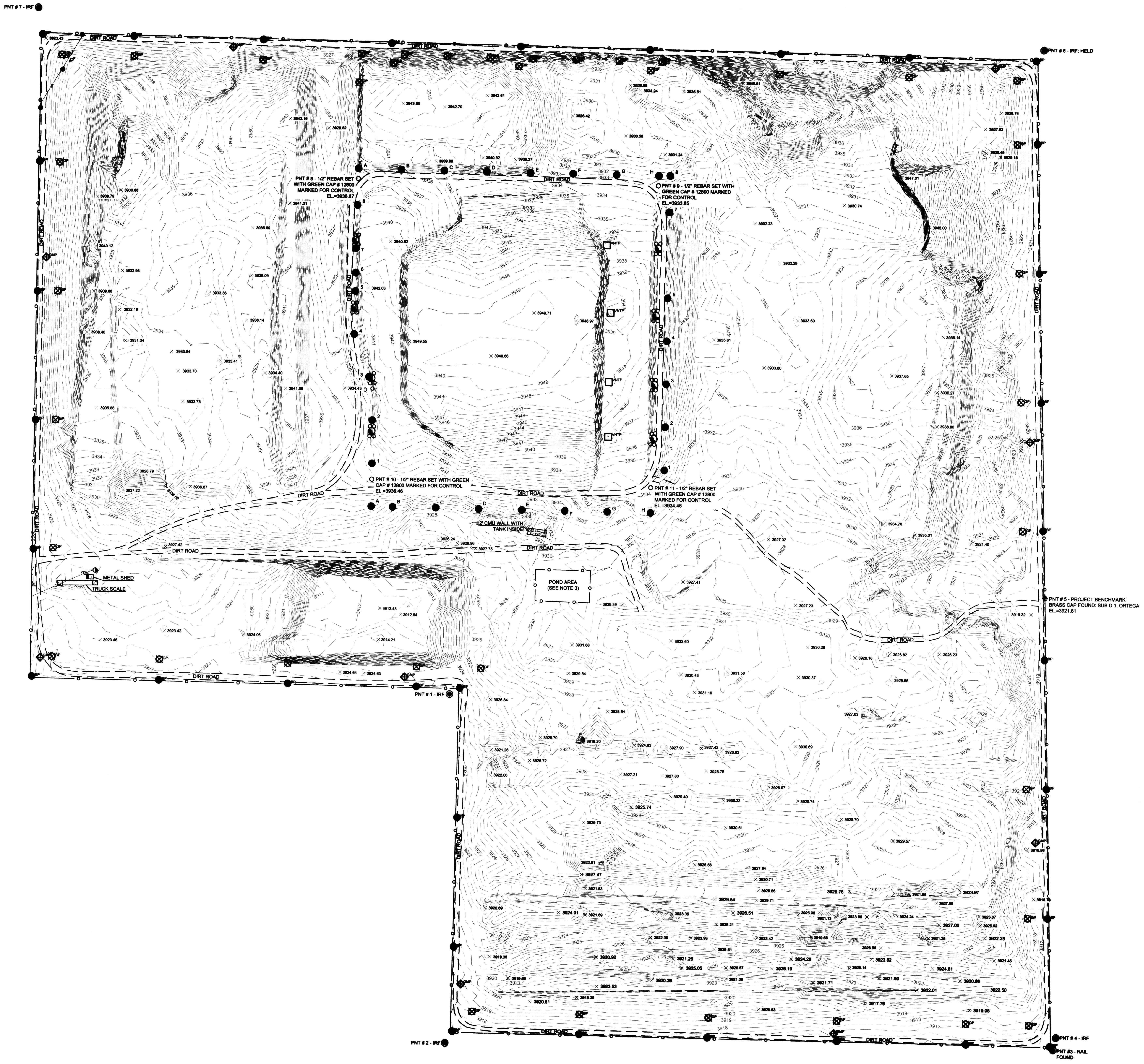
Sheet Title:
COVER SHEET
Project Name:
FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
Client:
U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT

Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587
Texas Board of Professional Engineers
Certificate of Registration # F-11907

DRAWING NO:
G-1

SHEET 1 OF 6

FORT BLISS SOLID WASTE LANDFILL,
FORT BLISS DIRECTORATE OF PUBLIC WORKS -
ENVIRONMENTAL DIVISION
FORT BLISS, EL PASO COUNTY, TEXAS
DECEMBER 17, 2010



COORDINATE TABLE				
POINT #	DESCRIPTION	NORTHING	EASTING	ELEVATION
1	IRON ROD FOUND	11574649.800	1207909.248	3923.98
2	IRON ROD FOUND	11573837.999	1207905.907	3917.39
3	NAIL FOUND	11573835.249	1209322.878	3916.10
4	IRON ROD FOUND	11573863.748	1209328.971	3916.33
5	BRASS CAP	11574885.940	1209292.663	3921.81
6	IRON ROD FOUND	11576161.054	1209278.251	3921.87
7	IRON ROD FOUND	11576239.677	1206940.339	3923.25
8	1/2" REBAR SET	11575847.372	1207687.866	3936.87
9	1/2" REBAR SET	11575836.853	1208386.114	3933.85
10	1/2" REBAR SET	11575134.798	1208373.686	3936.46
11	1/2" REBAR SET	11575148.234	1207724.201	3934.46

LEGEND

- MONUMENT FOUND AS NOTED
- IRON ROD SET AS NOTED
- PROJECT BENCHMARK
- GREEN PIPE
- BP BOUNDARY POST
- GP GRID POST
- GRID POST-CELL "D"
- LEACHATE COLLECTION PIPES
- BOLLARD
- VNTP VENT
- ANCHOR
- POWER POLE
- GMP GAS MONITOR
- LADDER
- OHE OVERHEAD POWER LINE
- CHAIN LINK FENCE
- EDGE OF ROAD
- × ELEVATION SPOT ELEVATION AT GRADE
- 3900 CONTOUR LABEL
- MAJOR CONTOUR
- MINOR CONTOUR
- EXISTING CONCRETE

NOTES:

1. ELEVATIONS BASED ON PROJECT BENCHMARK PROVIDED BY CLIENT: SUB D 1, ORTEGA, BRASS CAP IN CONCRETE, ELEVATION = 3921.81', NAVD 88.
2. FIELD DATA COLLECTED OCTOBER 21 THROUGH OCTOBER 27, 2010, USING GPS RTK METHODS. VERTICAL DATUM = NAVD88, AS PER NOTE 3, HORIZONTAL DATUM BASED UPON MONUMENTS FOUND AND ADJUSTED TO THIS SURVEY, AS PER DRAWING PROVIDED TO THIS SURVEYOR LABELED AS "FORT BLISS LANDFILL MODIFICATION TO SUBTITLE D LANDFILL AREA EXISTING SITE PLAN" AS SHEET No. 2 BY MALCOLM PIRNIE AND DATED MARCH 2008.
3. POND AREA NOT SHOT DUE TO HIGH WATER LEVEL.

REVISIONS

DATE:	COMMENT
XX/XX/XX	REVISION

DESIGNED BY: N/A
DRAWN BY: RLB
APPROVED BY: RCN
DATE: 12/17/10

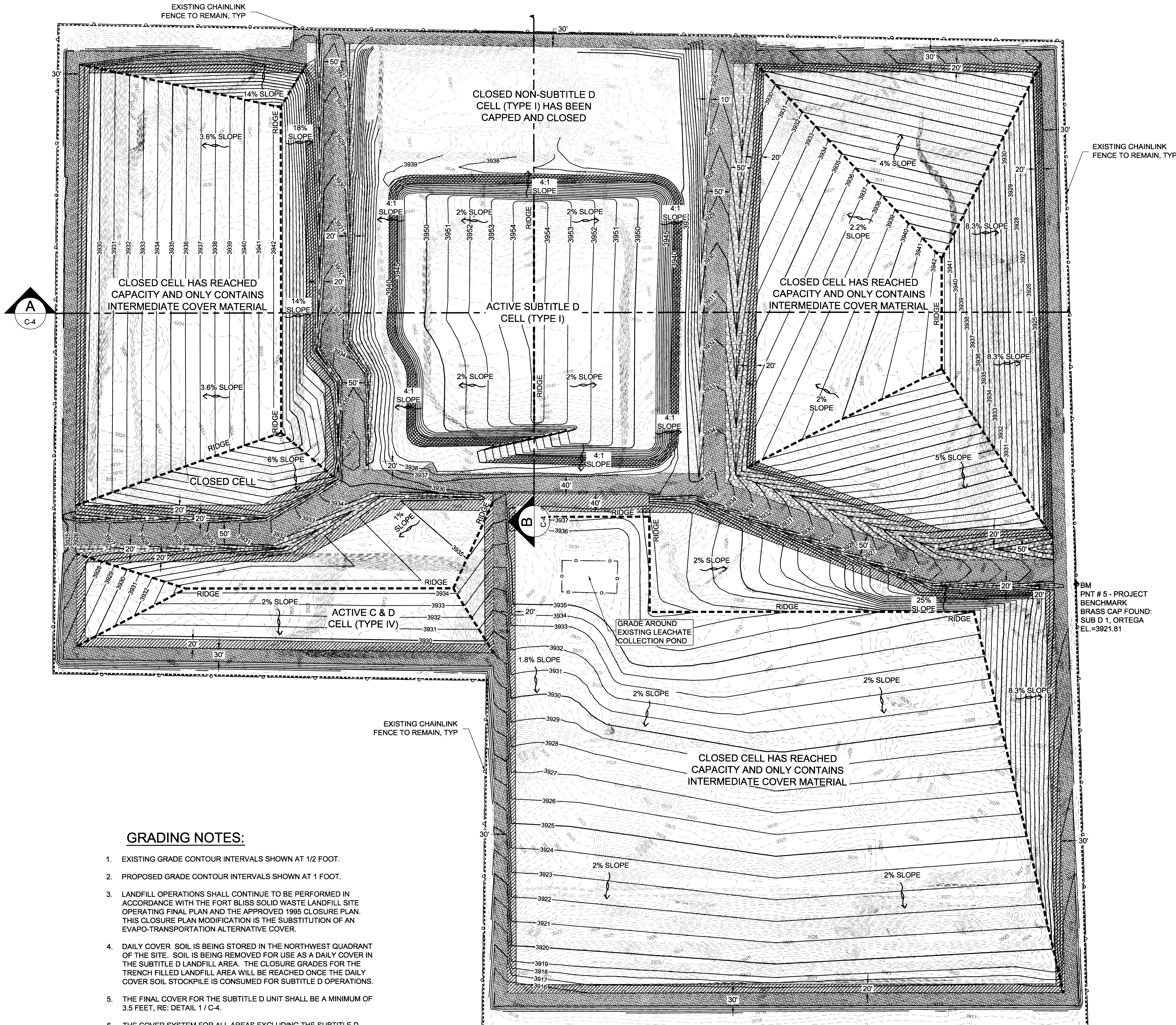
PREPARED BY AND UNDER THE SUPERVISION OF
KERY W. GREINER,
TX R.P.L.S. # ~~1500~~ 5098 KG
Seal:
STATE OF TEXAS REGISTERED KERY W. GREINER 5098 PROFESSIONAL LAND SURVEYOR
Kery W. Greiner 12-17-10

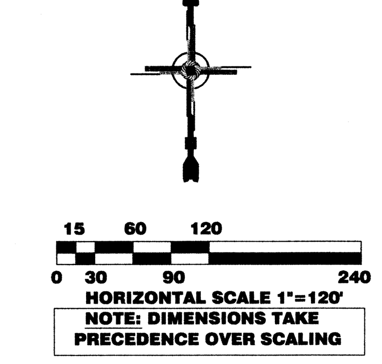
BLISS A10-001

ZIA ENGINEERING & ENVIRONMENTAL CONSULTANTS, LLC.
755 S. TELSHOR BLVD., SUITE F-201
LAS CRUCES, NEW MEXICO 88011
PHONE: (575) 532-1526
FAX: (575) 532-1587

TOPOGRAPHIC SURVEY
FORT BLISS SOLID WASTE LANDFILL SURVEY
FORT BLISS DIRECTORATE OF PUBLIC WORKS
ENVIRONMENTAL DIVISION
FORT BLISS, EL PASO COUNTY, TEXAS

T-1





LEGEND

- LIMITS OF CONSTRUCTION
- PROJECT BENCHMARK
- EXISTING CHAIN LINK FENCE TO REMAIN
- 3900 CONTOUR LABEL
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 3900 CONTOUR LABEL
- RIDGE
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- ACCESS ROAD
- SWALE, RE: DETAIL 3 / C-4
- OPTIMIZED EVAPOTRANSPIRATION COVER SYSTEM TRANSITION AREA, RE: DETAIL 2 / C-4

GRADING NOTES:

1. EXISTING GRADE CONTOUR INTERVALS SHOWN AT 1/2 FOOT.
2. PROPOSED GRADE CONTOUR INTERVALS SHOWN AT 1 FOOT.
3. LANDFILL OPERATIONS SHALL CONTINUE TO BE PERFORMED IN ACCORDANCE WITH THE FORT BLISS SOLID WASTE LANDFILL SITE OPERATING FINAL PLAN AND THE APPROVED 1995 CLOSURE PLAN. THIS CLOSURE PLAN MODIFICATION IS THE SUBSTITUTION OF AN EVAPO-TRANSPORTATION ALTERNATIVE COVER.
4. DAILY COVER SOIL IS BEING STORED IN THE NORTHWEST QUADRANT OF THE SITE. SOIL IS BEING REMOVED FOR USE AS A DAILY COVER IN THE SUBTITLE D LANDFILL AREA. THE CLOSURE GRADES FOR THE TRENCH FILLED LANDFILL AREA WILL BE REACHED ONCE THE DAILY COVER SOIL STOCKPILE IS CONSUMED FOR SUBTITLE D OPERATIONS.
5. THE FINAL COVER FOR THE SUBTITLE D UNIT SHALL BE A MINIMUM OF 3.5 FEET, RE: DETAIL 1 / C-4.
6. THE COVER SYSTEM FOR ALL AREAS EXCLUDING THE SUBTITLE D UNIT SHALL BE A MINIMUM OF 3.5 FEET, RE: DETAIL 1 / C-4
7. TYPICAL WASTE PLACEMENT DETAILS FOR WASTE OPERATIONS ARE SHOWN ON DETAIL 1 / C-4.
8. ALL WEATHER ACCESS ROADS SHALL BE MAINTAINED THROUGHOUT THE SUBTITLE D OPERATIONS.

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PROJECT BENCHMARK BM:

PROJECT BENCHMARK IS SUB D1, ORTEGA, BRASS CAP IN CONCRETE. ELEVATION = 3921.81 NAVD = 88

REVISIONS	
Date:	Comment
05/10/11	

File ID: BLISS-A10-001

Field By:
Drawn By: AH
Approved By: AF/FXU
Date:

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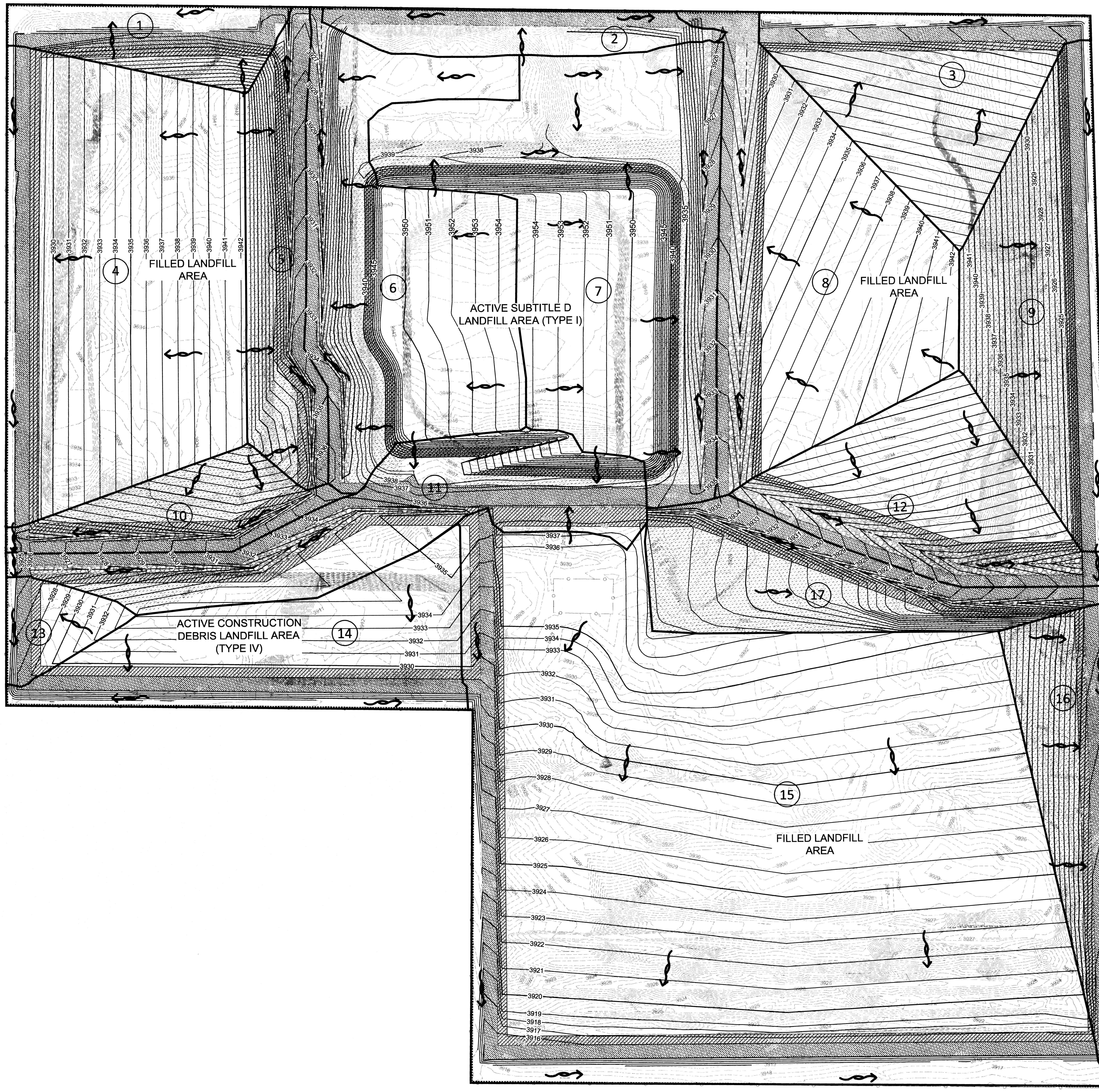
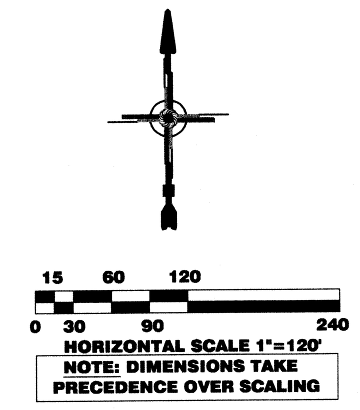
FRANCISCO XAVIER URUETA
99473
LICENSED
PROFESSIONAL ENGINEER
5-10-11

Sheet Title:
FORT BLISS MSW LANDFILL FINAL SITE GRADING PLAN
Project Name:
FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
Client:
U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT

Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587
Texas Board of Professional Engineers
Certificate of Registration # F-11907

DRAWING NO: C-2
SHEET 3 OF 6





LEGEND

- BM — PROJECT BENCHMARK
- LIMITS OF CONSTRUCTION
- EXISTING CHAIN LINK FENCE TO REMAIN
- 3900 — CONTOUR LABEL
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- 3900 — CONTOUR LABEL
- WATERSHED BOUNDARY
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- ACCESS ROAD
- SWALE, RE: DETAIL 3 / C-4
- EROSION CONTROL BLANKET, ECOBLANKET, FLEXTERRA, OR EQUAL
- OPTIMIZED EVAPOTRANSPIRATION COVER SYSTEM TRANSITION AREA, RE: DETAIL 2 / C-4
- STORM WATER FLOW DIRECTION
- 7 — WATERSHED LABEL

TOTAL WATERSHED PEAK DISCHARGE RUNOFF AND FLOW VELOCITY AT DRAINAGE INTERCEPTORS*

Watershed No.	Area (Acres)	Time of Concentration (Hours)	Peak Discharge (cfs)	Runoff Volume (ac-ft)	Normal Depth of Flow in Swale (ft)	Velocity in Swale(s) (ft/s)
1	1.8	0.14	3.3	0.3	-	-
2	1.6	0.10	3.0	0.2	-	-
3	4.4	0.10	8.0	0.6	-	-
4	10.6	0.17	19.4	1.6	-	-
5	3.0	0.17	5.5	0.4	0.6	2.1
6	7.5	0.16	13.7	1.1	0.9	2.6
7	10.1	0.12	18.5	1.5	0.8	3.9
8	7.9	0.14	14.5	1.2	0.8	3.5
9	5.1	0.17	9.3	0.8	-	-
10	2.1	0.09	3.9	0.3	0.5	2.6
11	5.0	0.21	8.3	0.7	0.7	2.6
12	4.5	0.09	8.3	0.7	0.6	3.6
13	0.9	0.10	1.7	0.1	-	-
14	4.9	0.10	8.9	0.7	-	-
15	29.7	0.31	42.2	4.4	-	-
16	3.2	0.17	5.9	0.5	-	-
17	3.7	0.13	6.9	0.6	0.5	3.3

*DETAILED CALCULATIONS ARE PROVIDED IN THE FACILITY SURFACE WATER DRAINAGE REPORT

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PROJECT BENCHMARK BM:
PROJECT BENCHMARK IS SUB D1, ORTEGA, BRASS CAP IN CONCRETE. ELEVATION = 3921.81 NAVD = 88

REVISIONS	
Date:	Comment
05/10/11	

Designed By: CA
Drawn By: FI
Approved By: FU
Date:

NM One Call Utility Locate-Statewide 1-800-321-2537 Call 48 hours before you dig.

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99473
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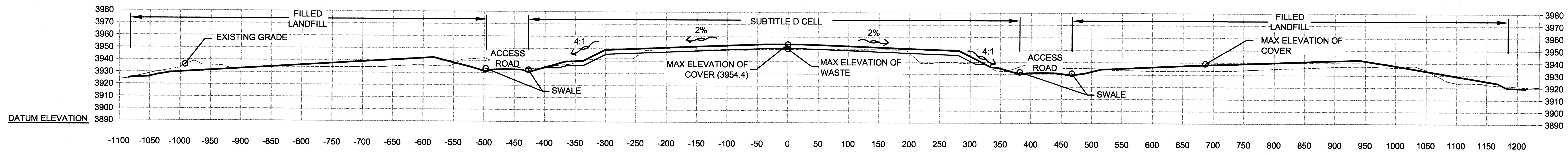
PROFESSIONAL ENGINEER
5-10-11

Sheet Title:
FORT BLISS MSW LANDFILL WATERSHED AND STORMWATER FLOW DIRECTION
Project Name:
FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
Client:
U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT

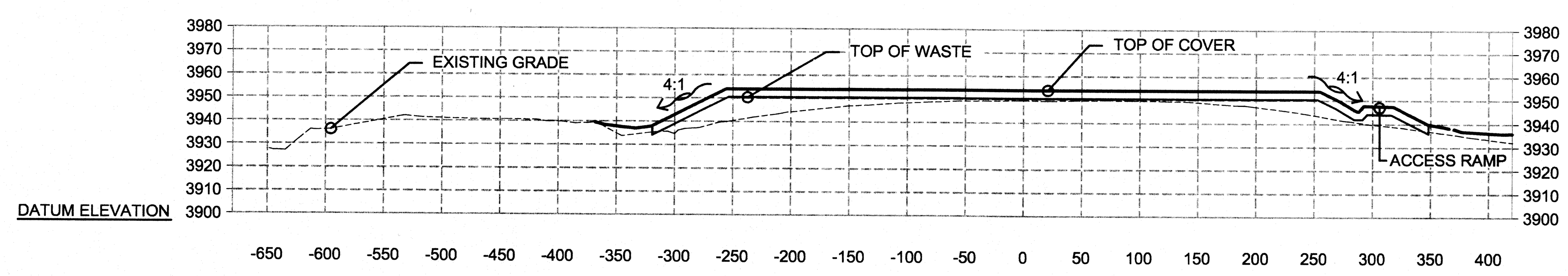
Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587
Texas Board of Professional Engineers
Certificate of Registration # F-11907

DRAWING NO: C-3
SHEET 4 OF 6



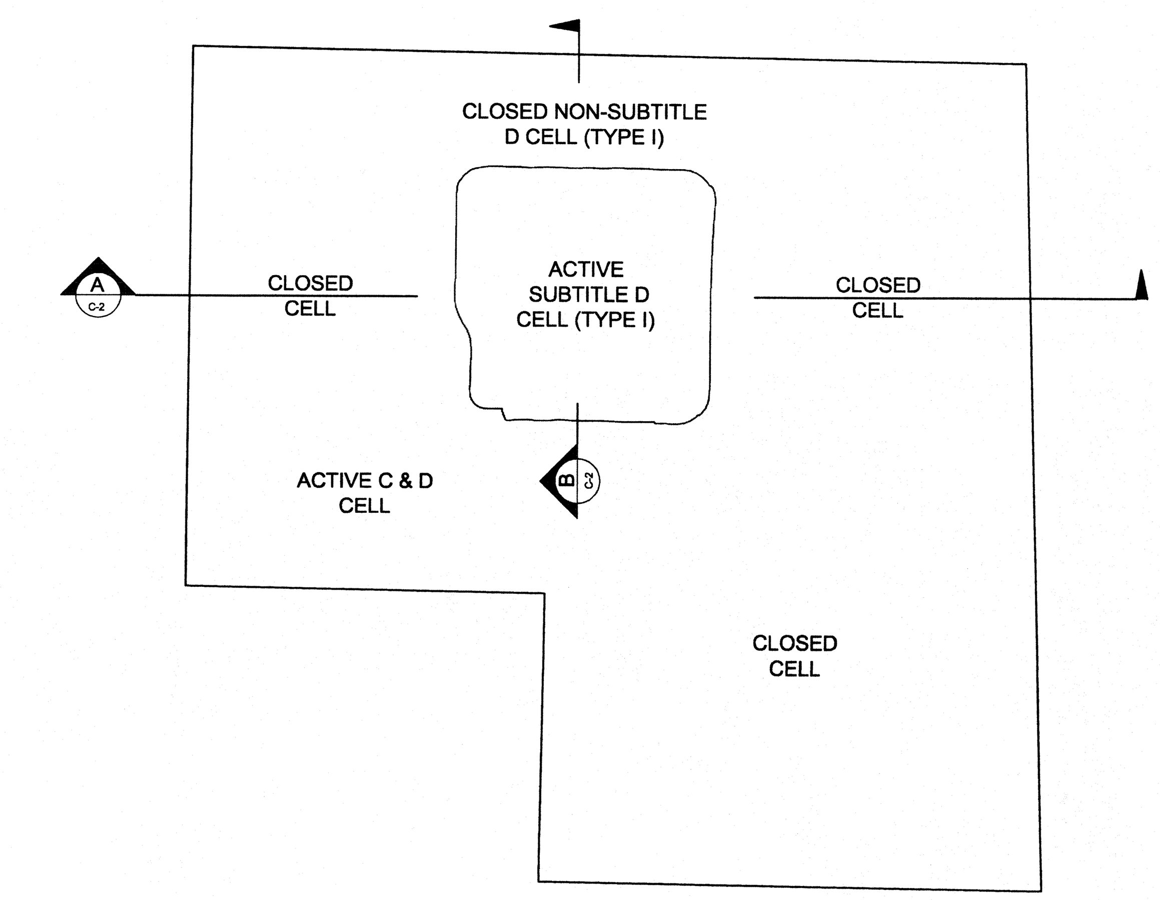
A / C-2 GRADING CROSS SECTION

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 50'

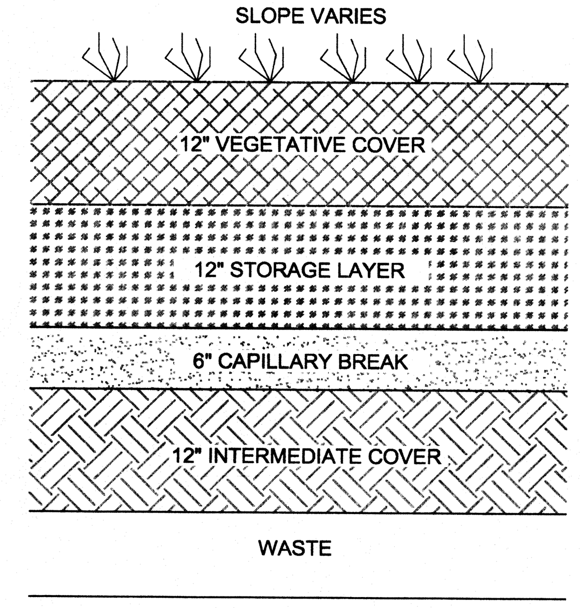


B / C-2 GRADING CROSS SECTION

HORIZONTAL SCALE: 1" = 100'
VERTICAL SCALE: 1" = 50'



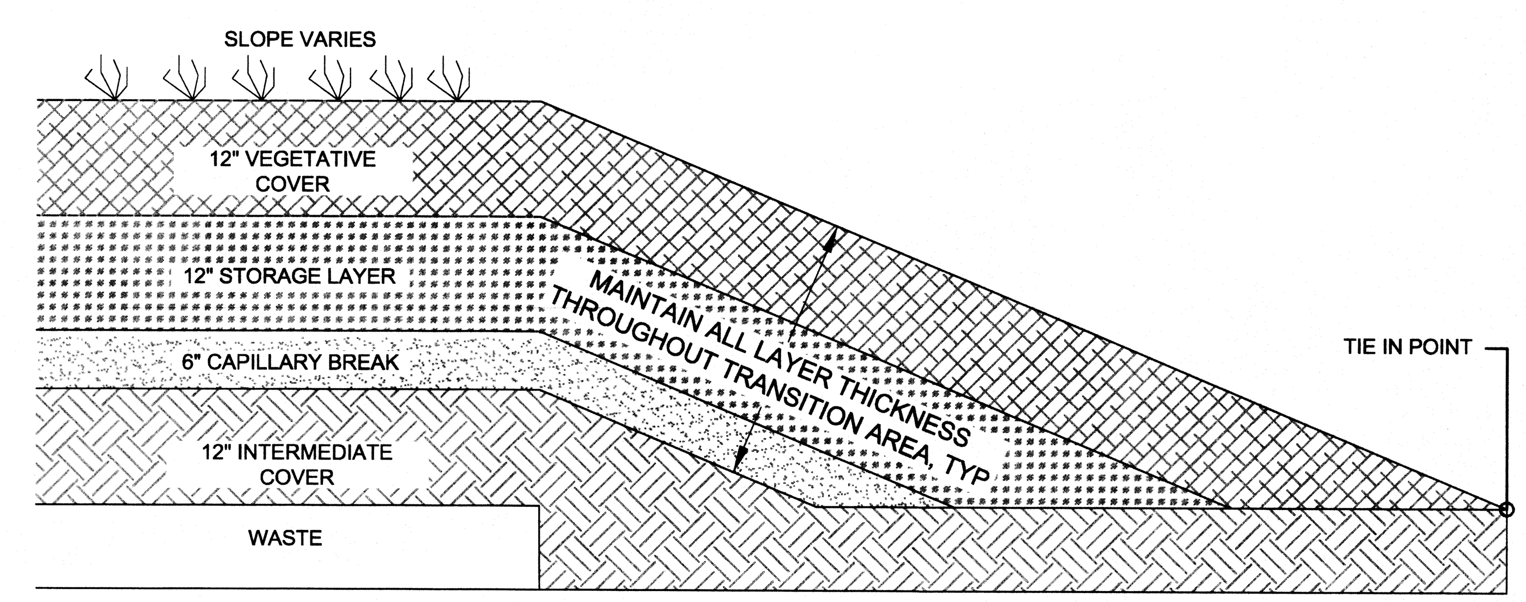
KEY PLAN
N.T.S.



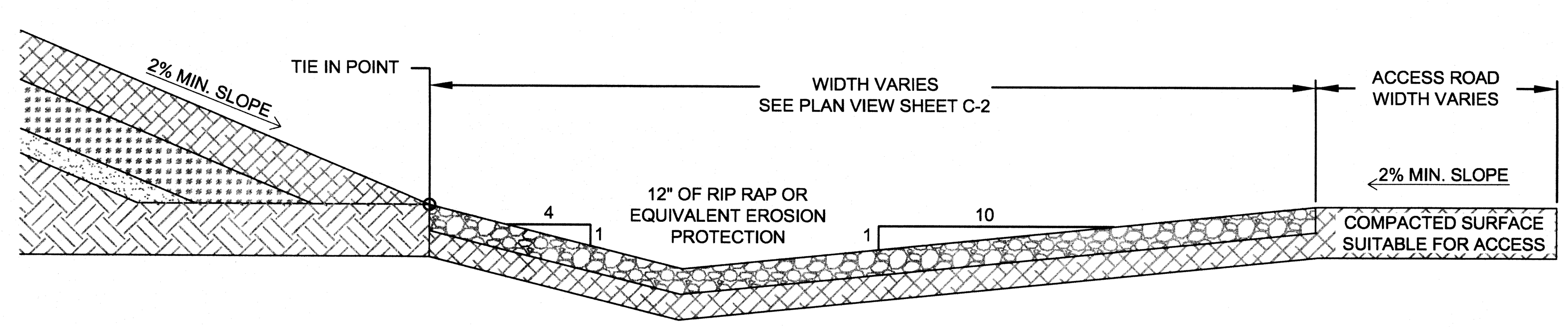
NOTE:

VEGETATIVE COVER FOR THE PROPOSED ET COVER SYSTEM WILL BE ACHIEVED BY SEEDING WITH A BALANCED MIXTURE OF NATIVE HERBACEOUS AND VASCULAR PLANTS THAT ARE INDIGENOUS SPECIES OF THE AREA, SUCH AS ALKALI SACATON AND SAND DROPSEED.

1 / -- OPTIMIZED EVAPOTRANSPIRATION COVER SYSTEM SECTION
N.T.S.



2 / C-2 OPTIMIZED EVAPOTRANSPIRATION COVER SYSTEM TRANSITION DETAIL
N.T.S.



3 / C-2 SWALE DETAIL
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PROJECT BENCHMARK BM:

PROJECT BENCHMARK IS SUB D1, ORTEGA, BRASS CAP IN CONCRETE. ELEVATION = 3921.81 NAVD = 88

REVISIONS		
Date:	Comment	
05/10/11		

Field By:
Drawn By: AH
Approved By: AF / FXU
Date:

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File ID: BLISS-A10-001

STATE OF TEXAS
FRANCISCO XAVIER URUETA
99473
LICENSED
PROFESSIONAL ENGINEER

5-10-11

Sheet Title:
FORT BLISS MSW LANDFILL CROSS SECTIONS AND DETAILS
Project Name:
FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
Client:
U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT

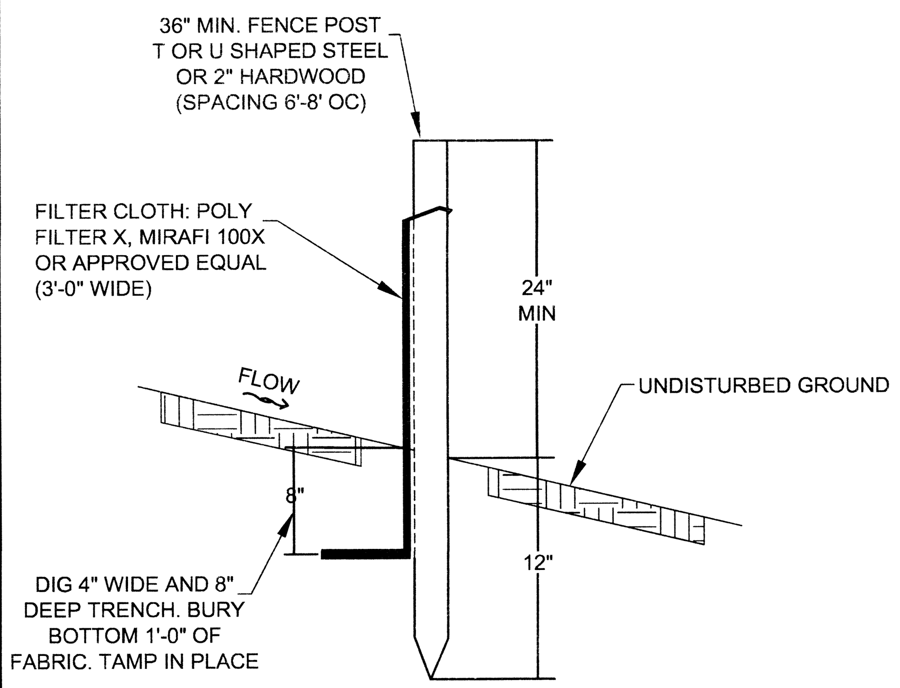
Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587
Texas Board of Professional Engineers
Certificate of Registration # F-11907

DRAWING NO: C-4

SHEET 5 OF 6

NOTE:

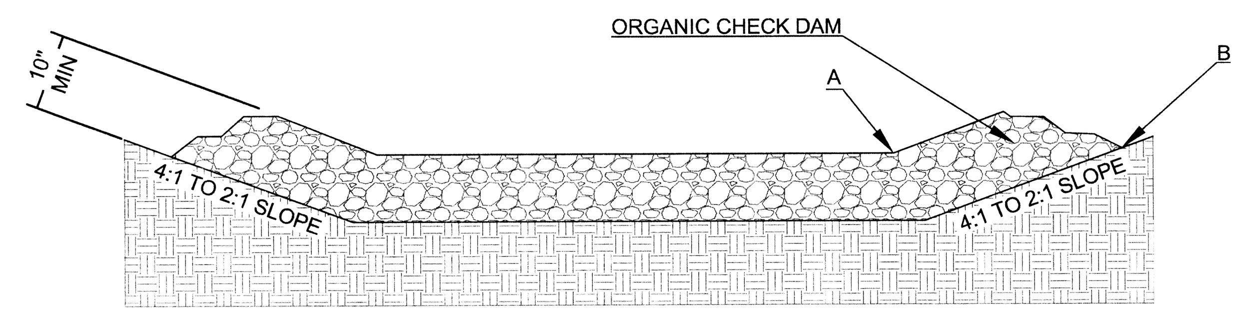
WHENEVER DIRT ROCK, OR OTHER MATERIALS ARE IMPORTED TO THE CONSTRUCTION SITE OR EXPORTED FOR PLACEMENT IN AREAS OFF OF THE PRIMARY CONSTRUCTION SITE, THE SITE OPERATOR / GENERAL CONTRACTOR IS RESPONSIBLE FOR DETERMINING THAT ALL STORM WATER PERMITTING AND POLLUTION CONTROL REQUIREMENTS ARE MET FOR EACH AND EVERY SITE WHICH RECEIVES SUCH MATERIALS OR FROM WHICH SUCH MATERIALS ARE TAKEN. PRIOR TO THE DISTURBANCE OF ANY SUCH SITE, THE SITE OPERATOR / GENERAL CONTRACTOR WILL FURNISH THE OWNER WITH A COPY OF THE STORM WATER PERMIT ISSUED FOR EACH SITE, AS WELL AS THE COPY OF THE OFF-SITE OWNERS CERTIFICATION STATEMENT AGREEING TO IMPLEMENT NECESSARY STORM WATER POLLUTION PREVENTION MEASURES. THE SITE OPERATOR / GENERAL CONTRACTOR WILL FURNISH A COPY OF THE SWPPP FOR EACH SITE, INCLUDING A DESCRIPTION OF THE EROSION CONTROL MEASURES, WHICH WILL BE APPLIED. REFER TO THE STORM WATER POLLUTION PREVENTION PLAN.



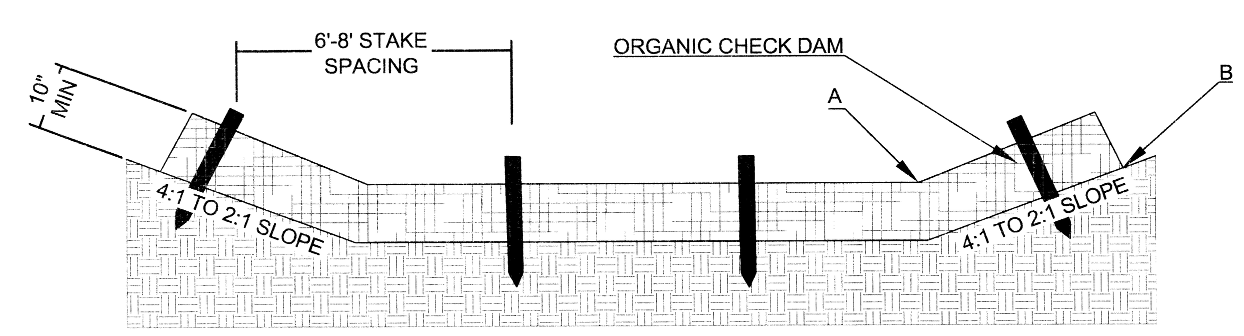
TYPICAL SILT FENCE DETAIL

CONSTRUCTION NOTES FOR FABRICATED SILT FENCE

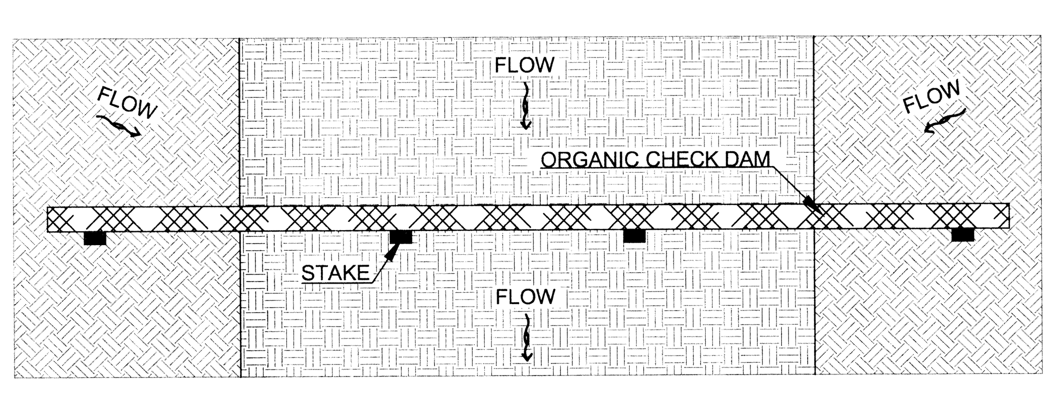
1. FILTER CLOTH TO BE FASTENED SECURELY TO FENCE POST WITH WIRE TIES OR STAPLES
2. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE
4. DURING INTERIM CONSTRUCTION PHASES, A COMBINATION OF SILT FENCES AND SEDIMENT BERMS WILL BE REQUIRED AROUND STOCKPILES UNLESS SUFFICIENT VEGETATION IS ESTABLISHED TO STABILIZE THE STOCKPILE.



UPSTREAM SECTION VIEW

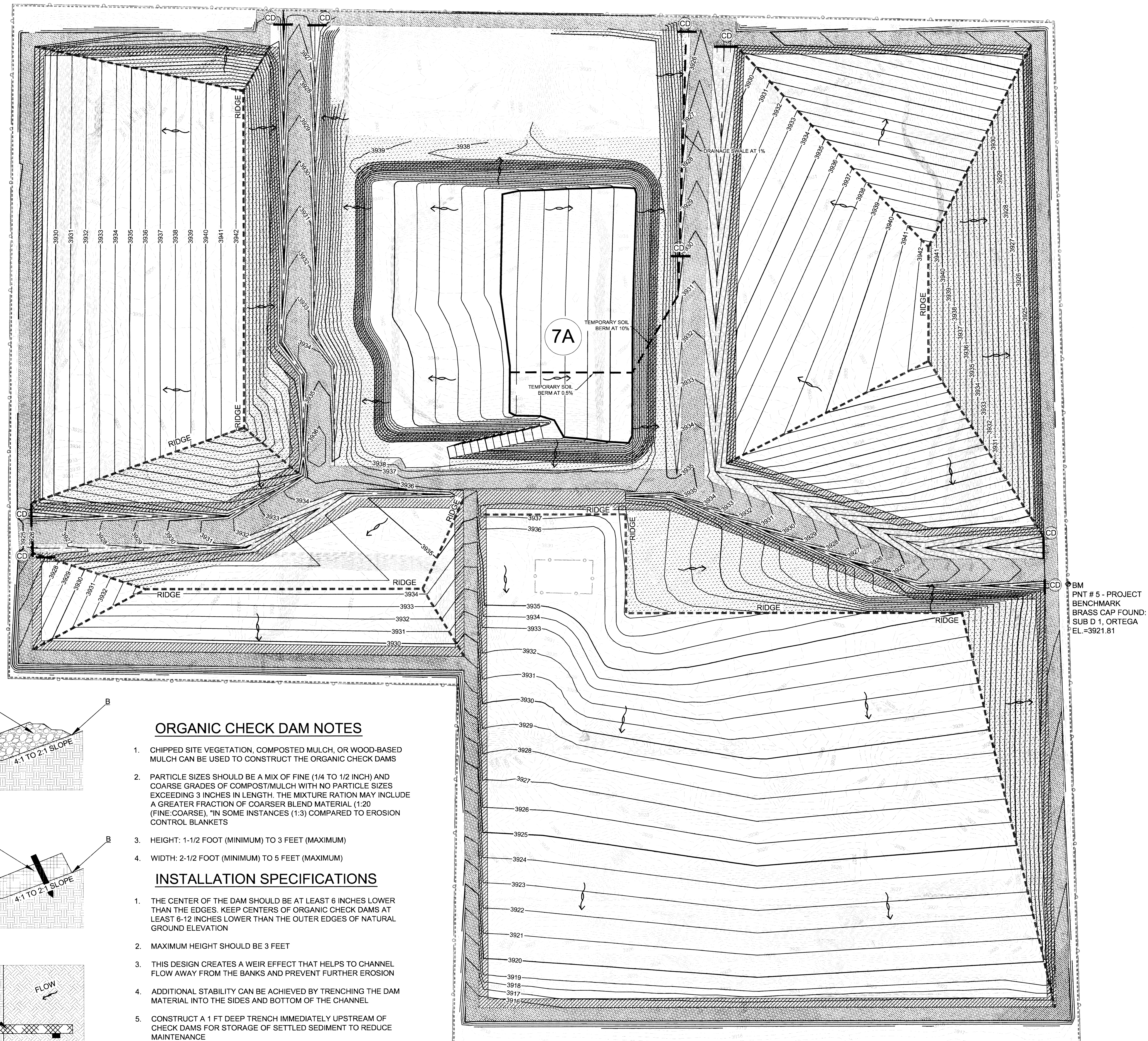


DOWNSTREAM SECTION VIEW



NOTE:
1. POINT "B" MUST BE HIGHER THAN POINT "A."
2. STAKE CHECK DAM ON DOWNHILL SIDE AS NECESSARY.

1 / -- ORGANIC CHECK DAMS N.T.S.



ORGANIC CHECK DAM NOTES

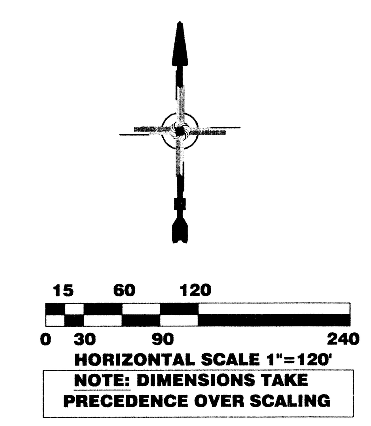
1. CHIPPED SITE VEGETATION, COMPOSTED MULCH, OR WOOD-BASED MULCH CAN BE USED TO CONSTRUCT THE ORGANIC CHECK DAMS
2. PARTICLE SIZES SHOULD BE A MIX OF FINE (1/4 TO 1/2 INCH) AND COARSE GRADES OF COMPOST/MULCH WITH NO PARTICLE SIZES EXCEEDING 3 INCHES IN LENGTH. THE MIXTURE RATION MAY INCLUDE A GREATER FRACTION OF COARSER BLEND MATERIAL (1:20 (FINE:COARSE), "IN SOME INSTANCES (1:3) COMPARED TO EROSION CONTROL BLANKETS
3. HEIGHT: 1-1/2 FOOT (MINIMUM) TO 3 FEET (MAXIMUM)
4. WIDTH: 2-1/2 FOOT (MINIMUM) TO 5 FEET (MAXIMUM)

INSTALLATION SPECIFICATIONS

1. THE CENTER OF THE DAM SHOULD BE AT LEAST 6 INCHES LOWER THAN THE EDGES. KEEP CENTERS OF ORGANIC CHECK DAMS AT LEAST 6-12 INCHES LOWER THAN THE OUTER EDGES OF NATURAL GROUND ELEVATION
2. MAXIMUM HEIGHT SHOULD BE 3 FEET
3. THIS DESIGN CREATES A WEIR EFFECT THAT HELPS TO CHANNEL FLOW AWAY FROM THE BANKS AND PREVENT FURTHER EROSION
4. ADDITIONAL STABILITY CAN BE ACHIEVED BY TRENCHING THE DAM MATERIAL INTO THE SIDES AND BOTTOM OF THE CHANNEL
5. CONSTRUCT A 1 FT DEEP TRENCH IMMEDIATELY UPSTREAM OF CHECK DAMS FOR STORAGE OF SETTLED SEDIMENT TO REDUCE MAINTENANCE

MAINTENANCE STANDARDS

1. ORGANIC CHECK DAMS SHOULD BE MONITORED FOR PERFORMANCE AND SEDIMENT ACCUMULATION
2. REMOVE ACCUMULATED LEAVES AND SEDIMENTS FROM BEHIND DAM WHEN THEY REACH A DEPTH OF 1/2 OF THE ORIGINAL HEIGHT OF THE DAM
3. RESTORE MATERIALS AS NECESSARY FOR THE ORGANIC CHECK DAMS TO MAINTAIN THEIR CORRECT HEIGHT



LEGEND

BM	PROJECT BENCHMARK
	LIMITS OF CONSTRUCTION
	EXISTING CHAIN LINK FENCE TO REMAIN
3900	CONTOUR LABEL
	EXISTING MAJOR CONTOUR
	EXISTING MINOR CONTOUR
3900	CONTOUR LABEL
	RIDGE
	PROPOSED MAJOR CONTOUR
	PROPOSED MINOR CONTOUR
	ACCESS ROAD
	SWALE, RE: DETAIL 3 / C-4
	EROSION CONTROL BLANKET, ECOBLANKET, FLEXTERRA, OR EQUAL
	OPTIMIZED EVAPOTRANSPIRATION COVER SYSTEM TRANSITION AREA, RE: DETAIL 2 / C-4
CD	PROPOSED ORGANIC CHECK DAM, RE: DETAIL 1 / THIS SHEET
	STORM WATER FLOW DIRECTION
7A	WATERSHED AREA DESIGNATION
	SOIL LOSS ESTIMATION SLOPE

Texas811 Know what's below. Call before you dig.

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF REVIEW UNDER THE AUTHORITY OF FRANCISCO XAVIER URUETA P.E. #99473 ON MAY 10, 2011. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING PURPOSES.

PROPERTY LOCATED OUTSIDE CORPORATE LIMITS IN AN UNIDENTIFIED ZONE PER FLOOD INSURANCE RATE MAP NUMBER 4802140025B, EFFECTIVE DATE OF OCTOBER 15, 1982.

STIPULATION FOR REUSE OR ALTERATION

THESE DRAWINGS ARE THE INSTRUMENT OF SERVICE OF ZIA ENGINEERING AND SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN THE REFERENCED PROJECT FOR WHICH THESE DRAWINGS WERE CREATED.

PROJECT BENCHMARK BM:
PROJECT BENCHMARK IS SUB D1, ORTEGA, BRASS CAP IN CONCRETE. ELEVATION = 3921.81 NAVD = 88

REVISIONS		
Date:	Comment	
05/10/11		

File ID: BLISS-A10-001

Field By:
Drawn By: AH
Approved By: AF/FXU
Date:

Call TEXAS811 Call 48 hours before you dig.

STATE OF TEXAS — FRANCISCO XAVIER URUETA — 99473 — LICENSED PROFESSIONAL ENGINEER
5-10-11

Sheet Title: FORT BLISS MSW LANDFILL EROSION CONTROL PLAN
Project Name: FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION
Client: U.S. ARMY CORPS OF ENGINEERS, FORT WORTH DISTRICT

Zia Engineering & Environmental Consultants, Inc.
755 S. Telshor Blvd., Suite F-201
Las Cruces, New Mexico 88011
Phone: (575) 532-1526
Fax: (575) 532-1587
Texas Board of Professional Engineers Certificate of Registration # F-11907

DRAWING NO: C-5
SHEET 6 OF 6

APPENDIX D-2

Appendix I – Slope Stability and Settlement Analysis

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
TCEQ PERMIT NO. 1422
PERMIT MODIFICATION APPLICATION
ALTERNATIVE ET COVER CLOSURE DESIGN

APPENDIX I –
SLOPE STABILITY AND SETTLEMENT ANALYSIS

SLOPE STABILITY AND SETTLEMENT CALCULATIONS

FORT BLISS DESIGN AND PERMIT MODIFICATION APPLICATION
BLISS-A10-001

April, 2011

zia
engineering
& environmental
consultants, llc

755 South Telshor Blvd, Suite F-201 ● Las Cruces, New Mexico 88011 ● phone (575) 532-1526 ● fax (575) 532-1587
Texas Board of Professional Engineers Certificate of Registration #F-11907

Slope Stability and Settlement Analyses Report

Fort Bliss Municipal Solid Waste Landfill

Subtitle D Cell Closure

El Paso County, Texas

April 5, 2011

Terracon Project No. 65115803

Prepared for:

Zia Engineering and Environmental Consultants
Las Cruces, New Mexico

Prepared by:

Terracon Consultants, Inc.
Phoenix, Arizona

April 5, 2011

Terracon

Zia Engineering and Environmental Consultants, LLC
755 South Telshor Boulevard, Suite F-201
Las Cruces, NM 88011

Attn: Mr. Kelly Fort, P.E.
P: 575-532-1526 Ext 741
F: 575-532-1587

Re: Slope Stability and Settlement Engineering Analyses Report
Fort Bliss Municipal Solid Waste Landfill
Subtitle D Cell Closure
El Paso County, Texas
Terracon Project No. 65115803

Dear Mr. Fort:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. These services were performed in general accordance with our proposal number P65110046 dated February 7, 2011. This report presents the results of the slope stability and settlement analyses concerning the proposed closure of the Type I (EPA Subtitle D) cell for the existing Fort Bliss Municipal Solid Waste Landfill (MSWL).

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Aderson M. Vieira, Ph.D., P.E.
Project Manager

STATE OF TEXAS
TOM MANDO KAPITA
98080
LICENSED
PROFESSIONAL ENGINEER

Tom Mando Kapita, P.E.
Senior Associate

Donald R. Clark, P.E., V.P.
Senior Principal

Copies to: Addressee (1 via email, 3 via mail)

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SLOPE STABILITY AND SETTLEMENT ANALYSES REPORT
FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
SUBTITLE D CELL CLOSURE
EL PASO COUNTY, TEXAS

Terracon Project No. 65115803
April 5, 2011

1.0 INTRODUCTION

This report presents the results of our slope stability and settlement analyses performed for the Type I/Subtitle D Cell Closure of the Fort Bliss Municipal Solid Waste (MSW) landfill located in El Paso County, Texas. The purpose of these services is to provide settlement information and slope stability factors of safety relative to the proposed closure of the Type I/Subtitle D cell for the existing Fort Bliss Municipal Solid Waste Landfill (MSWL).

The scope of work for this project included review of existing geotechnical information for the project, and performance of slope stability and settlement analyses for selected critical sections.

The site plan of the landfill Type I/Subtitle D cell and cross section drawings are shown in Exhibits A-1 and A-2 in Appendix A. The results of the slope stability and settlement analyses performed on the selected critical sections of the landfill are included in Appendices B and C of this report.

2.0 REFERENCE DOCUMENTS

Our engineering analyses included in this report have been based on information and documents provided for our review by Zia Engineering and Environmental Consultants, LLC (Zia). The documents used for our engineering evaluation included the following:

- Danny R. Anderson Consultants, Inc. (DRA), **"Geotechnical and Subsurface Soil Investigation for the Design of The Modifications to the Fort Bliss Landfill"**, dated December 22, 1993;
- Coupland – Moran Consulting Engineers, Inc., **"Modification to Fort Bliss Landfill Plan"**, Sheet 6, revision dated April 20, 1994;
- Malcolm Pirnie, **"Permit Modification Application for Fort Bliss Municipal Solid Waste Landfill Permit 1422",** Fort Bliss, Texas, dated March 2008;
- Malcolm Pirnie, **"Slope Stability and Settlement Analysis for Fort Bliss Municipal Solid Waste Landfill",** Fort Bliss, Texas, Project No. 4285061, dated March 2008;

- Malcolm Pirnie, **"Fort Bliss Landfill Modification to Subtitle D Landfill Area"**, Fort Bliss, Texas, Project No. 4285052, revised plans dated August 6, 2008;
- Malcolm Pirnie, **Cover Investigation Report for Fort Bliss Municipal Solid Waste Landfill,** Fort Bliss, Texas, dated January 2009;
- Zia Engineering and Environmental Consultants, LLC (Zia), **"Sketched Proposed Evapotranspiration Cover Cross Section for Type I/Subtitle D Cell of Fort Bliss MSW Landfill"** received via email dated February 17, 2011; and,
- Zia Engineering and Environmental Consultants, LLC (Zia), **"AutoCAD files with Existing and Proposed Grades for Subtille D Cell of Fort Bliss MSWL"**, download from Zia FTP site on February 22, 2011.

3.0 PROJECT INFORMATION AND SITE DESCRIPTION

The following table presents a summary of project information and a site description based on our review of the documentation provided.

SUMMARY OF PROJECT INFORMATION AND SITE DESCRIPTION

ITEM	DESCRIPTION
Location	Northwest of Biggs Army Airfield and 300 feet east of the Southern Pacific Railroad tracks in El Paso County, Texas
Landfill Area*	The landfill area totals approximately 105.5 acres and comprises five areas: • An 80-acre 1970's inactive cell; • A 3-acre inactive Type 1/Non-Subtitle D cell with final cover in place; • A 10.5-acre active Type 1/Subtitle D cell for MSW; • A 5-acre Type IV construction and demolition debris cell; and, • 7-acres of road, access and facility areas.
Area to be analyzed: Active Landfill Cell Type I/Subtitle D	The landfill area where the slope stability and settlement analyses were performed consists of the active Type I Cell meeting USEPA Subtitle D to be capped with a proposed alternative cover.
Structures	We understand there will not be any structures or construction on top of the Type I/Subtitle D landfill cell area.
Proposed finished landfill elevation (top of cap)*	Proposed maximum finished landfill elevation is 3954 feet MSL.

SUMMARY OF PROJECT INFORMATION AND SITE DESCRIPTION	
ITEM	**DESCRIPTION**
Estimated Maximum Additional Landfill Fill*	Based on the final topography shown on the proposed grading plan, as referenced herein, fills from 3.5 feet to up to approximately 17 feet in height will be required in portions of the proposed Type I/Subtitle D landfill cell to bring the site to final closure grade.
***These quantities have been presented for exclusive use of this report only and should not be used for bid purposes**	

4.0 SUBSURFACE AND EXISTING/PROPOSED LANDFILL CONDITIONS

4.1 SUBSURFACE CONDITIONS

Based on our review of available geotechnical information as presented in the Geotechnical and Subsurface Soil Investigation by Danny R. Anderson Consultants, Inc. (DRA), there are four boring logs located in close proximity to the Type I/Subtitle D landfill cell area. The borings were drilled on October 14, 1993 to a maximum depth of 51.5 feet. The borings were designated Borings No. 1, No. 2, No. 3, and No. 4 in the DRA report. A review of these boring logs indicates that the soils underlying the landfill are mainly silty sands, clayey sands and sands, fine to coarse grained, and of medium dense to dense relative density. One of the boring logs (Boring No. 3) indicates the presence of two thin (one to one and half foot thick) sandy clay layers. Clay layers were not present in the other three borings. Additionally, no groundwater has been reported on the boring logs. The geotechnical documentation provided indicates groundwater occur at depths of 300 feet or more beneath the site.

Based on our review of the referenced borings, subsurface conditions at the Type I/Subtitle D landfill cell site were generalized for use in our settlement analyses as presented in the following table. For slope stability analyses, silty sand soil was conservatively considered as the landfill foundation.

GENERALIZED SUBSURFACE CONDITIONS

Description	Depth of Soil Under Landfill Cell (feet)	Material Encountered Based on Review of Existing Geotechnical Information	Consistency/Relative Density
Stratum 1	0 to 5	Silty sand, fine to medium grained.	Medium Dense to Dense
Stratum 2	5 to 16	Silty sand, fine to medium grained	Loose to Medium Dense
Stratum 3	16 to 20	Silty sand, fine to coarse grained, poorly graded	Medium Dense to Dense
Stratum 4	20 to 50	Sand coarse, poorly graded	Dense
Stratum 5	50 to 51.5	Sandy Clay	Very Stiff

4.2 EXISTING/PROPOSED LANDFILL CONDITIONS

Based on our on information provided by Zia for the Type I/Subtitle D landfill cell site, the following generalized landfill characteristics were assumed in our settlement/slope stability analyses:

EXISTING/PROPOSED LANDFILL CONDITIONS

Landfill Cell Area	Description	Approximate Depth from Top of MSWL (feet)	Proposed/Encountered Material	Consistency/Density
Proposed Final Evapo-Transpiration Cover	Vegetative Surface Layer	0 to 1	Loam***	Soft to Medium Stiff***
	Capillary Break Layer	1 to 1.5	Silty Sand/Sand****	Loose to Medium Dense***
	Storage Layer	1.5 to 2.5	Clayey/Silty Sand****	Medium Dense***
	Intermediate Layer	2.5 to 3.5	Clayey/Silty Sand****	Medium Dense***
Solid Waste	Fresh Waste to be filled	3.5 to 17 (Section B)or 4 to 13.5* (Section A)	Municipal Solid Waste	Compacted
	Existing Waste	17 to 51.5**	Municipal Solid Waste	Compacted
Existing Liner	Protective Layer	51.5 to 53.5	Sand+	Compacted
	60-mil HDPE Smooth/Textured	53.5	Geosynthetic	
	Secondary Liner	53.5 to 55.5	Shale or Betonite Treated Caliche+	Compacted

* Fresh waste fill thickness varies within the provided range in each section.
** This value represents the average thickness of the existing solid waste based on Section 1 and 2 of the Malcolm Pirnie Subtitle D Landfill Permit Modification Plans, Sheet 5, revision dated August 6, 2008
***Assumed
****Assumed values based on the Cover Investigation Report by Malcolm Pirnie, dated January 2009.
+Based on details show on sheet 6 of the Modification To Fort Bliss Landfill Plan by Coupland-Moran Consulting Engineers, Inc.

5.0 SLOPE STABILITY AND SETTLEMENT ANALYSES

The settlement and slope stability analyses performed for the proposed closure of the Type I/Subtitle D Cell for Fort Bliss MSWL site have been based upon geotechnical conditions encountered in the existing test borings as previously discussed and on information included in the referenced documentation.

Subsurface conditions on the Type I/Subtitle D landfill cell site were generalized for use in our settlement analyses as previously discussed. For slope stability analyses, silty sand soils were considered as the landfill foundation.

5.1 SLOPE STABILITY ANALYSES

5.1.1 Slope Stability Analyses Description

Slope stability analyses have been performed on one selected cross section in order to determine the global stability factors of safety for the proposed closure configuration of the Type I/Subtitle D cell for this project.

The selection of the cross section analyzed was based on considering slope heights and slope inclination for the proposed final landfill grading plan. The referenced documentation indicates that the groundwater elevation is located 300 feet or more in depth at the site. At this depth, groundwater will not affect the slope stability and it has not been considered in the analyses.

The selected cross section, Cross Section B, runs from east to west across the landfill cell as shown on the site plan, Exhibit A-1 in Appendix A. The slope configurations vary along the length of the cross section. As proposed, the steepest slope cap configuration for the landfill will be 4H:1V (Horizontal:Vertical) with a maximum height above finished grade of approximately 19 feet. The plans indicate that the steepest bottom liner slope for this section is 3H:1V. We have assumed in our analyses that no external loads (i.e., structures, traffic, etc.) will be applied to the cross section after the final grades have been achieved.

Slope-W 2007 program Version 7.17 by Geo-Slope International, Ltd was used to perform our slope stability analyses. The General Limit Equilibrium (GLE) method developed by Fredlund at the University of Saskatchewan in the 1970's (Geo-Slope Manual, 2007) was used in our analyses. The GLE formulations are based on moment and force equilibrium conditions and allows for a range of interslice shear-normal force conditions. The GLE method also allows the analyses of different translational and rotational slip surfaces.

Terracon has performed the global stability analyses for the selected section considering static conditions, and translational and rotational slip surfaces. The geotechnical information provided for our review has not explicitly included shear strength (*i.e.* friction angle and cohesion) and unit weight parameters for the development of slope stability analyses. For purposes of the slope stability analyses, we have estimated unit weights and shear strength parameters based on the subsurface profile and descriptions and on our experience with similar materials. The following material strength parameters were assumed for the purpose of the slope stability analyses:

Assumed Geotechnical Parameters			
Soil/Material Type	Moist Unit Weight (γ) pcf	Cohesion psf	Effective Friction Angle Degrees
Foundation Native Soil	120	0	32
Secondary Liner – Shale or Betonite Treated Caliche	120	0	24
BOTTOM LINER – 60-mil HDPE Smooth/Compacted Clay (soil-geosynthetic interface friction angle)	65	0	12
SLOPED BOTTOM LINER AREAS– 60-mil HDPE Textured/Compacted Clay (soil-geosynthetic interface friction angle)	65	0	18
Liner – Sand Protective Layer	120	0	30
Liner – Compacted Clay Fill	120	0	24
Solid Waste	65	0	32
CAP (Top Vegetative Layer-Loam)	115	0	26
CAP – Capillary Break – Sand/Gravel	120	0	30
CAP –Storage/Intermediate Layer Silty-Clayey Sand	120	0	30

5.1.2 Slope Stability Analyses Results

Two slope scenarios, Cases 1 and 2, have been analyzed for global stability. Case 1 was simulated using the slope at the western portion of the Section B as shown on Exhibits A-1 and A-2 in Appendix A. Case 2 was simulated using the slope at the eastern portion of the Section B. For each case, associated shallow, deep and translational potential surfaces of failure were analyzed. The results of the global stability analyses performed by Terracon are summarized in the following table. Graphical presentations of the results are provided on Exhibits B-1 through B-6 in Appendix B.

Results of the Slope Stability Analyses			
Cross Section based on Grading Plan by Zia		Minimum Factor of Safety (F.S.) per U.S. Army Corps of Engineers Recommendation	Slope Stability Analyses: Minimum Factor of Safety (F.S.)
		Static	Static
Case 1	Section B – Western Portion	1.4	2.0
Case 2	Section B – Eastern Portion	1.4	2.0

Based on the results of the global stability analyses, the minimum factors of safety as recommended by U.S. Army Corps of Engineers (Corps of Engineers) Manual EM1110-2-1913 (2000) of 1.4 for static conditions of the proposed slope have been achieved as currently designed. The other landfill areas are expected to have a factor of safety equal to or greater than 2.0 since load and geometry conditions are more favorable, *i.e.*, shorter slope heights and lower slope inclinations. This assumes that geotechnical conditions do not differ from those assumed for our analyses.

5.2 SETTLEMENT ANALYSES DESCRIPTION AND RESULTS

Settlement analyses have been performed for two selected cross sections for the proposed closure of the Type I/Subtitle D landfill cell. Cross Sections A and B, as shown on Exhibits A-1 and A-2 in Appendix A, have been selected based on the maximum and minimum differences between the proposed and existing grade elevations. The analyses have been performed to estimate the material deformation at the foundation and at the top of the landfill cell due to the additional waste and landfill final cover surcharges. A surcharge load of up to 17 feet of waste/cover material has been considered in our analyses. The settlement analyses were evaluated for three time periods of 1 year, 2 years and 30 years after construction of the final cover as presently planned.

Settlement associated with the consolidation of the natural soil underlying the landfill cell is considered in the Landfill Foundation Settlement section. Settlement associated with consolidation of the liner, existing waste, fresh waste and cover is considered in the Landfill Waste Settlement section of this report.

5.2.1 Landfill Foundation Settlement

The settlement analyses of the foundation landfill have been based on the soil profile described in Section 4. Since in-situ soil information at depths of 51.5 feet or below are unavailable, we assumed the subsurface condition below a depth of 51.5 feet consists of sand soils up to a vertical distance of 100 ft below the bottom of the landfill. We have assumed that there will not be significant settlement in the soil below a depth of 100 ft. Thus, the foundation settlement below 100 ft was not directly determined in our analyses.

Fresh solid waste/soils within the landfill cell were assumed to have an average unit weight of 65 pcf. Consolidation tests on native soils beneath the landfill have not been provided or were unavailable at the preparation of this report. The soils underlying the landfill cell were considered normally consolidated; therefore, compression rebound coefficients were not used in our analyses. Compression rates of the soils have been estimated by the use of a modified Hough method (FHWA-SA-02-054, 2002) for cohesionless soils and published correlations for the clay layer (FHWA NHI-06-088, 2006). The following table presents the geotechnical parameters used in the settlement analyses:

GENERALIZED SUBSURFACE CONDITIONS USED IN THE SETTLEMENT ANALYSES

Description	Depth of Soil Under Landfill Cell (feet)	Material Encountered Based on Review of Existing Geotechnical Information	Unit Weight, γ, (pcf)	Coefficient of Primary Compression, $C_{\varepsilon c}$	Coefficient of Secondary Compression, C_α
Stratum 1	0 to 5	Silty sand, fine to medium.	120	0.003	N/A
Stratum 2	5 to 16	Silty sand, fine to medium	120	0.02	N/A
Stratum 3	16 to 20	Silty sand, fine to coarse, poorly graded	120	0.015	N/A
Stratum 4	20 to 50	Sand coarse, poorly graded	120	0.004	N/A
Stratum 5	50 to 51.5	Sandy Clay	120	0.012	0.004
Stratum 6	51.5 to 100	Sand	125	0.003	N/A

Total and differential settlements analyses have been performed using an internal Terracon program, Squish (a Microsoft Excel Visual Basic program), and incorporating soil parameters as previously determined. Squish uses a finite difference calculation method in order to determine excess pore water pressures and to determine stress variations with time. Squish calculates primary and secondary consolidation using a classical soil mechanics approach. The results of our analyses are included in Appendix C. The foundation settlement analyses resulted in an estimated total and differential settlements, including primary and secondary consolidation, of approximately 1 inch or less.

5.2.2 Landfill Waste Settlement

The settlement of the solid waste was estimated assuming that compression behavior of the material obeys classical soil mechanics consolidation theory. This simplification assumes that the municipal solid waste behaves as a compressible cohesive soil. Settlement was estimated at several intervals along the proposed selected Cross Sections A and B using one-dimensional primary and secondary consolidation theory. Primary and secondary compression rates were selected based on a range of published data from existing MSW landfills. The compression rates were considered constant for the entire depth of the landfill cell. The geotechnical parameters used for the waste materials in the settlement are presented in the following table:

SOLID WASTE CHARACTERISTICS USED IN THE SETTLEMENT ANALYSES				
Description	Material	Average Values		
		Unit Weight, γ, (pcf)	Primary Compression Rate, Cεc	Secondary Compression Rate, Cα
Maximum Averaged Value	Solid Waste	65	0.262	0.081
Minimum Averaged Value	Solid Waste	65	0.148	0.014

A summary of the analysis results of the total settlement is presented in the following table:

SUMMARY OF TOTAL SETTLEMENT ANALYSIS RESULTS				
Cross Section	Approximate Station (in Feet)	Approximate Period of Time After Construction (in years)	Estimated Settlement (in inches) Total	
			Min.	Max.
A	0+00	1	6	10
		2	8	14
		30	18	64
	2+63	1	11	20
		2	13	23
		30	20	60
B	0+00	1	15	26
		2	26	31
		30	26	73
	-2+70	1	16	28
		2	18	32
		30	25	69

Total settlements of landfill cell sections selected in accordance with the criteria previously outlined are estimated to be approximately 73 inches or less in a 30-year time period after the final cover placement.

A summary of the analysis results of the differential settlement is presented in the following table:

SUMMARY OF DIFFERENTIAL SETTLEMENT ANALYSIS RESULTS			
Cross Section	Approximate Period of Time After Construction (in years)	Estimated Settlement (in inches) Differential For Slope	
		Min.	Max.
A	1	8 inches over 59 feet	14 inches over 59 feet
	2	9 inches over 59 feet	16 inches over 59 feet
	30	14 inches over 59 feet	45 inches over 59 feet
B	1	15 inches over 89 feet	26 inches over 89 feet
	2	17 inches over 89 feet	29 inches over 89 feet
	30	24 inches over 89 feet	66 inches over 89 feet

Differential settlement between adjacent slope areas should be approximately 66 inches or less over 89 feet. Total settlements including foundation settlement will be approximately 74 inches or less in a 30-year time period after final cover placement.

Given the engineering characteristics of granular soils when compared with the waste materials, settlement of the final cover by itself is anticipated to be negligible. Consequently, analysis of settlement of the final cap and cover was not determined.

5.2.3 Landfill Waste Settlement Statistical Analyses

Consolidation characteristics of a solid waste landfill are variable and are dependent on the landfill composition, moisture content, local weather, bio-chemical degradation rate and compaction, among other unpredictable factors. Specific consolidation information for the Fort Bliss MSW landfill was not available at the time of preparation of this report. Therefore in order to account for some of these unpredictable variations, a statistical analysis was performed based on primary and secondary compression ratios determined from our review of the literature from existing MSW landfills and laboratory tests. Our statistical analyses were based on 23 published primary compression ratios and 28 published secondary compression ratios listed in the literature. The following table presents the values used in the statistical analyses:

SOLID WASTE CHARACTERISTICS USED IN THE SETTLEMENT STATISTICAL ANALYSES						
Description	Material	Estimated Standard Deviation 3xσ (%) For:		Average Values		
		Primary Compression ratio	Secondary Compression ratio	Unit Weight, γ, (pcf)	Primary Compression Rate, Cεc	Secondary Compression Rate, Cα
Maximum Averaged Value	Solid Waste	26.7	36.6	65	0.262	0.081
Maximum Averaged Value Including 3 Standard Deviation	Solid Waste			65	0.331	0.109

A summary of the analysis results of the total settlement based on this statistical approach is presented in the following table:

SUMMARY OF TOTAL SETTLEMENT STATISTICAL ANALYSIS			
Cross Section	Approximate Station (in Feet)	Approximate Period of Time After Construction (in years)	Estimated Settlement Including 3 Standard Deviation in the Compression Ratios (in inches) Total Max
A	0+00	1	13
		2	18
		30	85
	2+63	1	25
		2	29
		30	79
B	0+00	1	33
		2	39
		30	96
	-2+70	1	35
		2	41
		30	91

Total settlement of landfill cell sections selected in accordance with the statistical analysis criteria previously discussed are estimated to be approximately 96 inches or less in a 30-year time period after the final cover placement. Total settlements including foundation settlement are estimated to be approximately 97 inches or less in a 30-year time period after final cover placement.

This statistical approach represents the lower case bound of estimated settlement using the variance in the primary and secondary compression ratios. Actual landfill settlement is expected to be in the range of values represented by the classic approach previously described in this report and the results of the statistical evaluation presented in this section.

6.0 GENERAL COMMENTS

The analyses presented in this report are based upon the data obtained from the documentation provided for our review, existing boring data and from other information discussed in this report. This report does not reflect variations that may occur between borings across the site, waste composition, or due to the modifying effects of construction or weather. Total and differential settlements may exceed predicted values if water from any source infiltrates the foundation soils, if there is an acceleration of the solid waste bio-chemical processes, if migration of fines into large voids occurs, if loss of strength leading to volume reduction of large voided containers within the landfill cell occurs. Therefore, settlement monitoring and proper maintenance is recommended during construction, and during the post-construction period. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided. At your request, Terracon is available to discuss and provide recommendations for a settlement monitoring program for the landfill cell closure.

In conducting these slope stability and settlement analyses, Terracon has assumed that the design issues, including, but not limited to, water level conditions, design loading, design restrictions, slope geometry and all other pertinent data as represented by the Fort Bliss MSW landfill documents provided to us, as initially referenced, accurately represent the conditions at the site and those that may occur in the future. Any deviations from the design conditions as provided for in the grading plans developed by Zia should be brought to the attention of Terracon for modification of our opinions outlined in this report.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

7.0 REFERENCES

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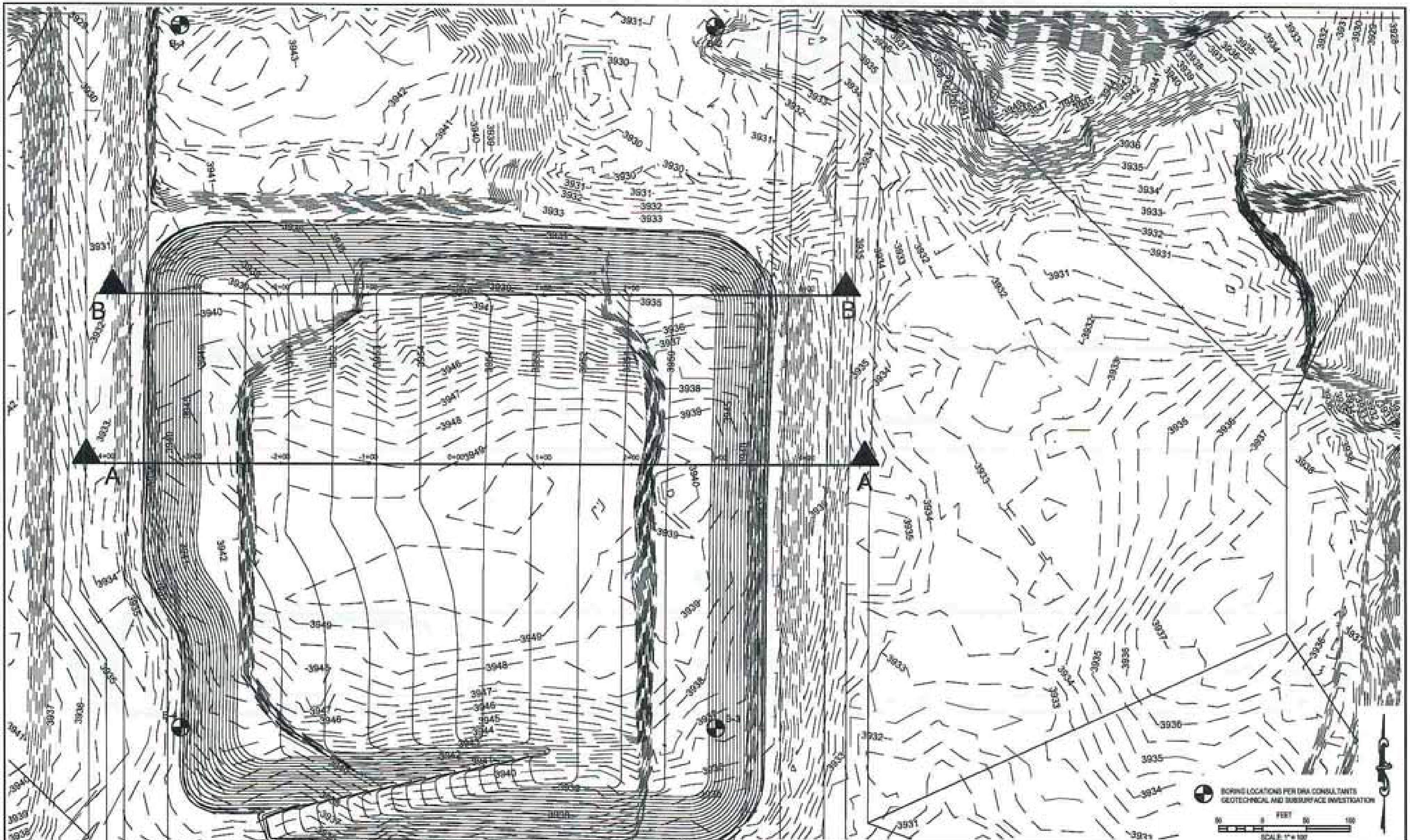
APPENDIX A SITE PLAN AND CROSS SECTIONS

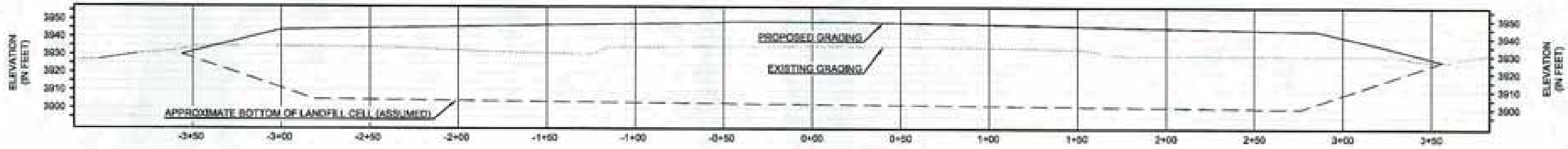


NOTE: SITE PLAN BASE MAP PROVIDED BY ZIA ENGINEERING AND ENVIRONMENTAL CONSULTANTS, LLC

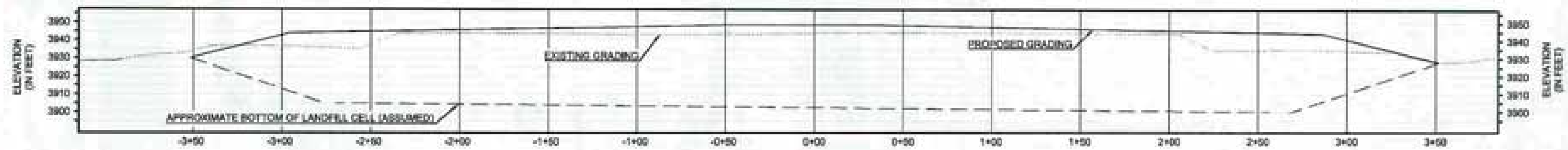
Project Mngr: AMV	Project No. 65115803	**Terracon** Consulting Engineers and Scientists	SITE PLAN AND BORING LOCATION(S)
Drawn By: AMV	Scale: AS SHOWN		TYPE I/SUBTITLE D CELL- FORT BLISS LANDFILL
Checked By: TMK/DRC	File No. SITE PLAN.DWG		EL PASO COUNTY, TEXAS
Approved By: TMK/DRC	Date: 03/21/2011		

EXHIBIT NO.

A-1



CROSS SECTION B



CROSS SECTION A

FEET
30 0 30 60
SCALE: 1" = 60'

Project Mngr: AMV	Project No. 65115803
Drawn By: AMV	Scale: AS SHOWN
Checked By: TMK/DRC	File No. X-SECTIONS.DWG
Approved By: TMK/DRC	Date: 03/21/2011

Terracon
Consulting Engineers and Scientists

CROSS SECTIONS A AND B

TYPE I/SUBTITLE D CELL- FORT BLISS LANDFILL
EL PASO COUNTY, TEXAS

EXHIBIT NO.
A-2

NOTE: CROSS SECTIONS BASED ON GRADING PLAN PROVIDED BY ZIA ENGINEERING AND ENVIRONMENTAL CONSULTANTS, LLC

APPENDIX B SLOPE STABILITY ANALYSES

CASE 1- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL

Terracon Project No. 65115803

Name: TRANSLATIONAL Shallow Date: 3/15/2011
Time: 3:07:02 PM

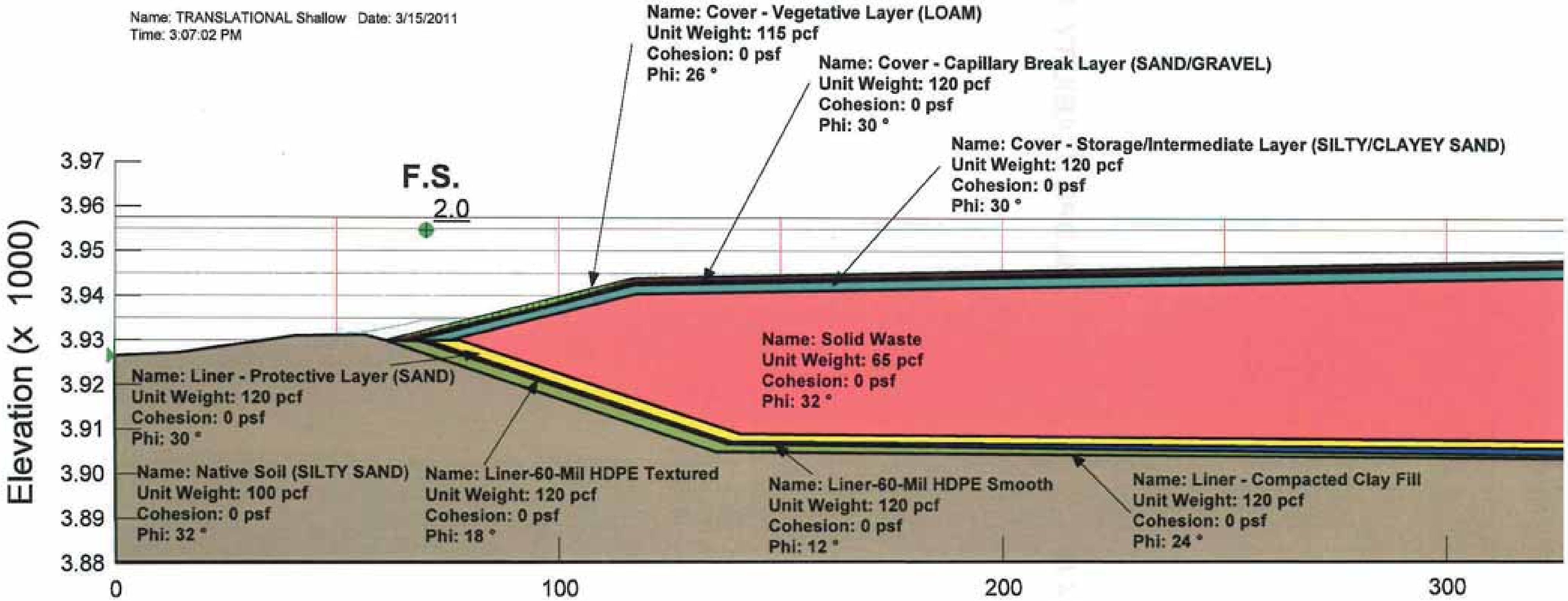
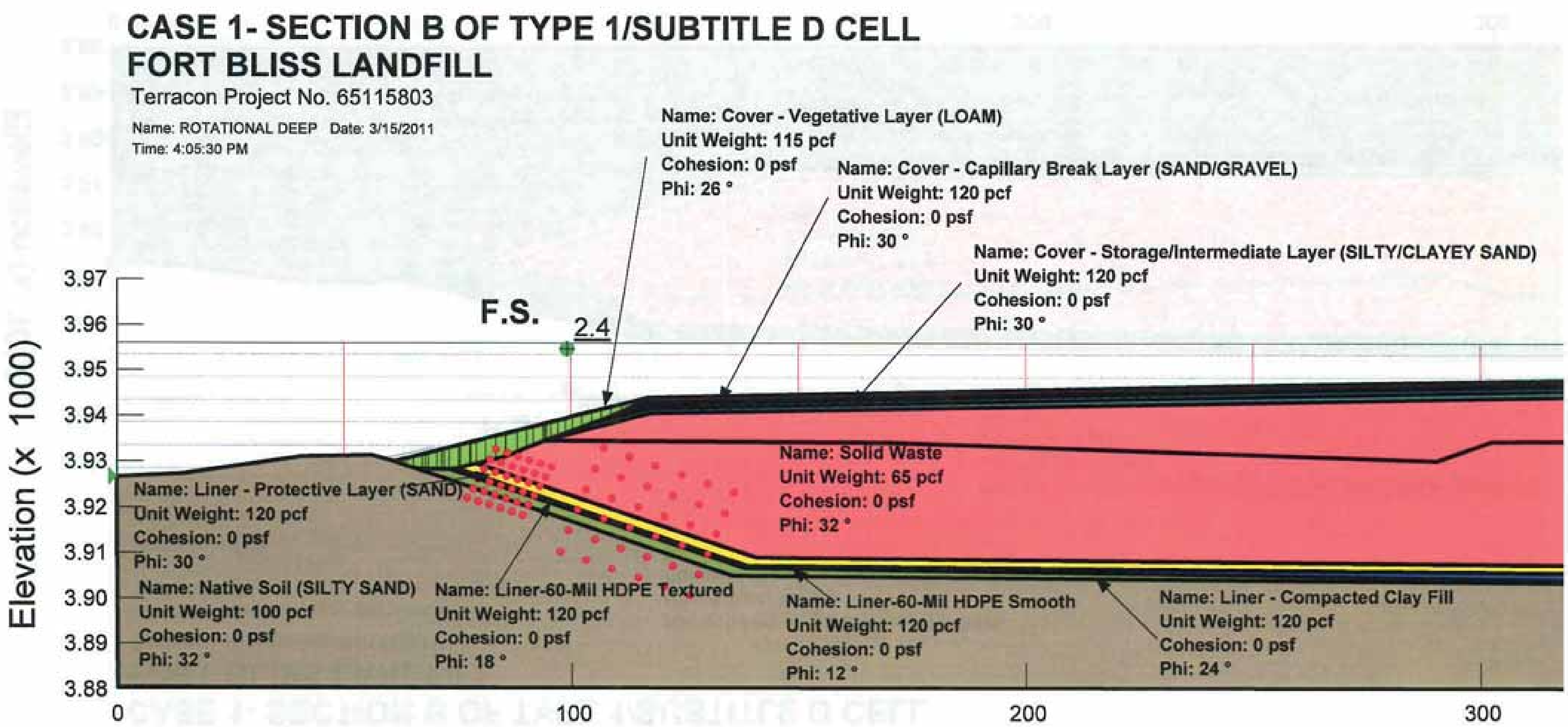


Exhibit B-1



CASE 1- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL
Terracon Project No. 65115803
Name: ROTATIONAL DEEP Date: 3/15/2011
Time: 4:05:30 PM
F.S.
2.4
Name: Cover - Vegetative Layer (LOAM)
Unit Weight: 115 pcf
Cohesion: 0 psf
Phi: 26 °
Name: Cover - Capillary Break Layer (SAND/GRAVEL)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Name: Cover - Storage/Intermediate Layer (SILTY/CLAYEY SAND)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Name: Solid Waste
Unit Weight: 65 pcf
Cohesion: 0 psf
Phi: 32 °
Name: Liner - Protective Layer (SAND)
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Name: Native Soil (SILTY SAND)
Unit Weight: 100 pcf
Cohesion: 0 psf
Phi: 32 °
Name: Liner-60-Mil HDPE Textured
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 18 °
Name: Liner-60-Mil HDPE Smooth
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 12 °
Name: Liner - Compacted Clay Fill
Unit Weight: 120 pcf
Cohesion: 0 psf
Phi: 24 °
Elevation (x 1000)
3.97
3.96
3.95
3.94
3.93
3.92
3.91
3.90
3.89
3.88
0
100
200
300

Exhibit B-2

CASE 1- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL

Terracon Project No. 65115803

Name: TRANSLATIONAL DEEP Date: 3/15/2011
Time: 4:05:30 PM

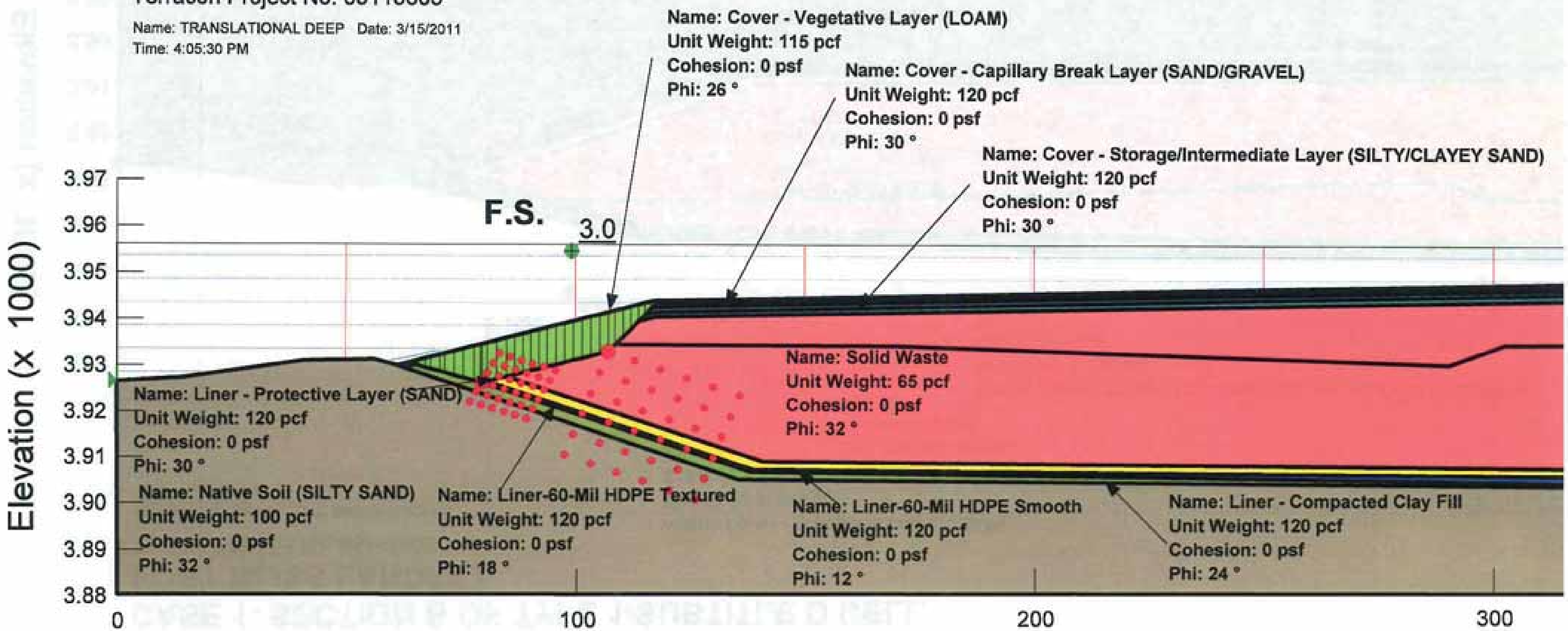


Exhibit B-3

CASE 2- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL

Terracon Project No. 65115803
Name: TRANSLATIONAL SHALLOW Date: 3/15/2011
Time: 4:20:12 PM

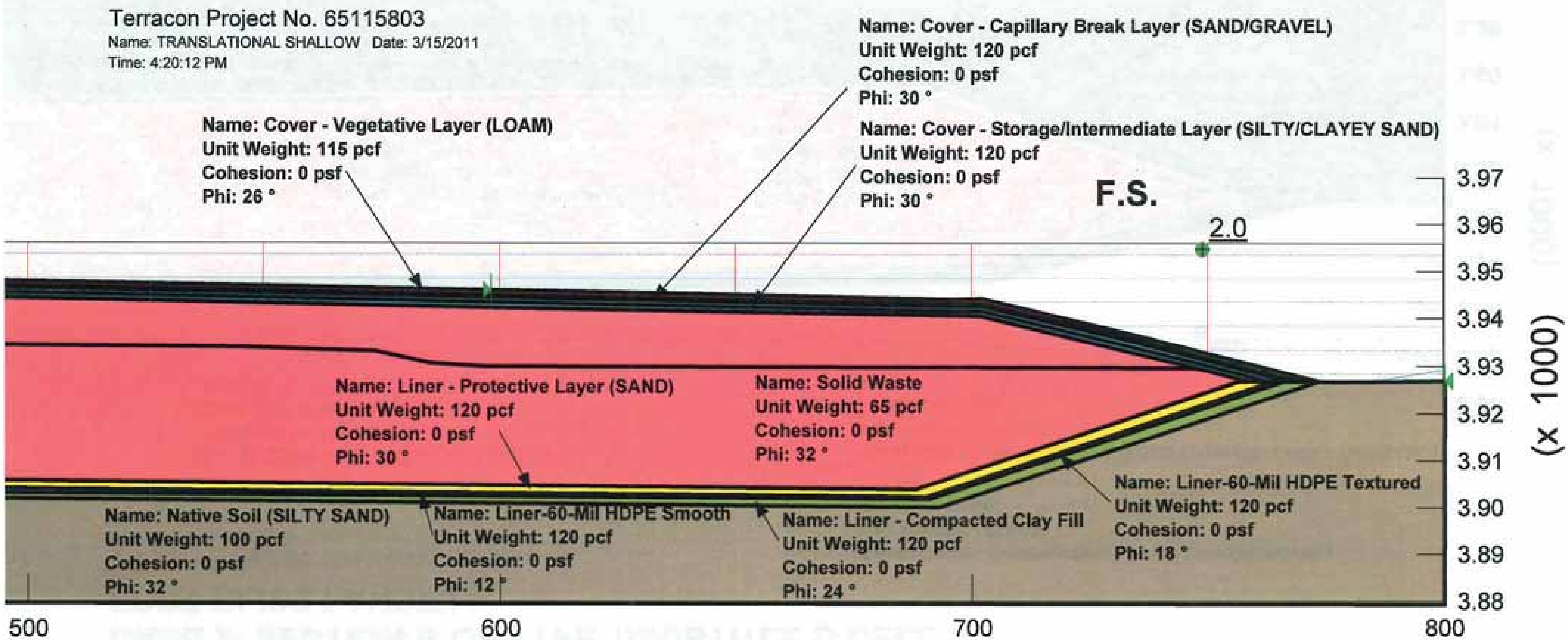


Exhibit B-4

CASE 2- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL

Terracon Project No. 65115803
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Time: 3:48:10 PM

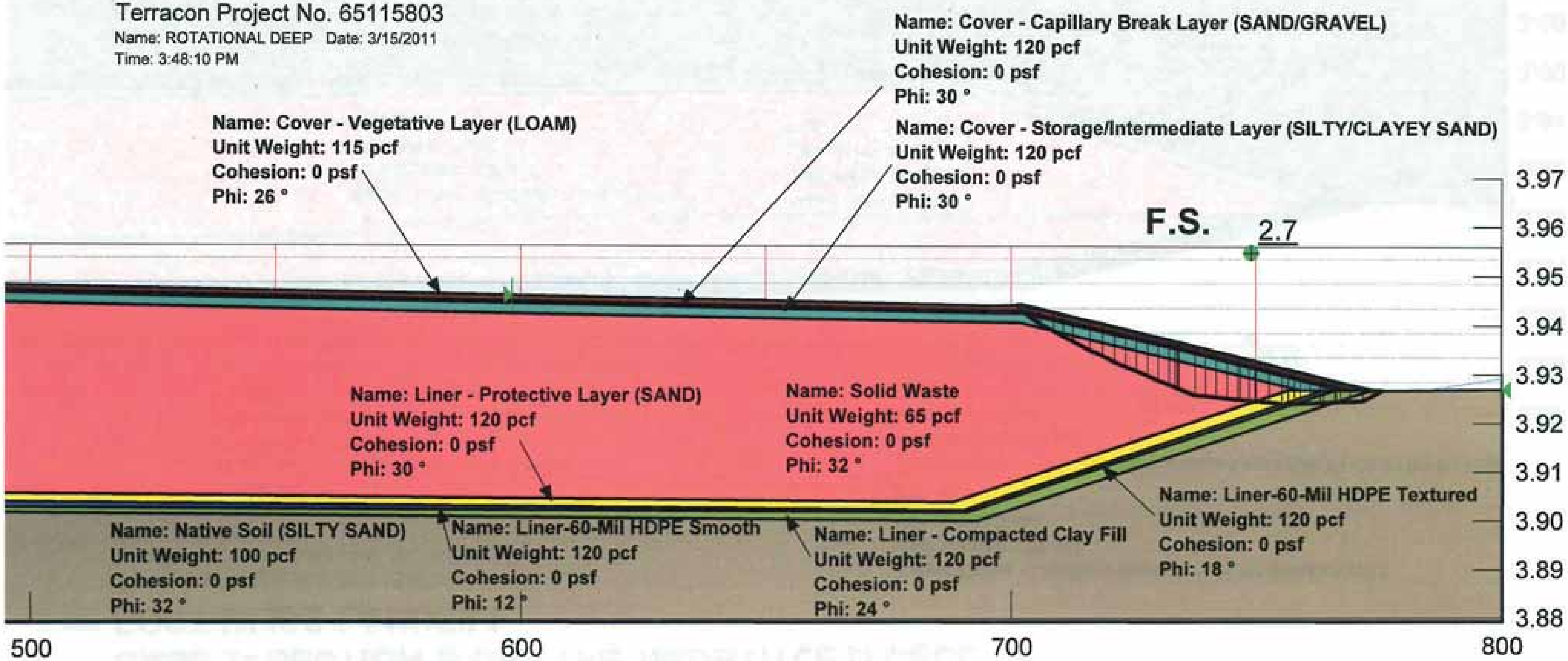
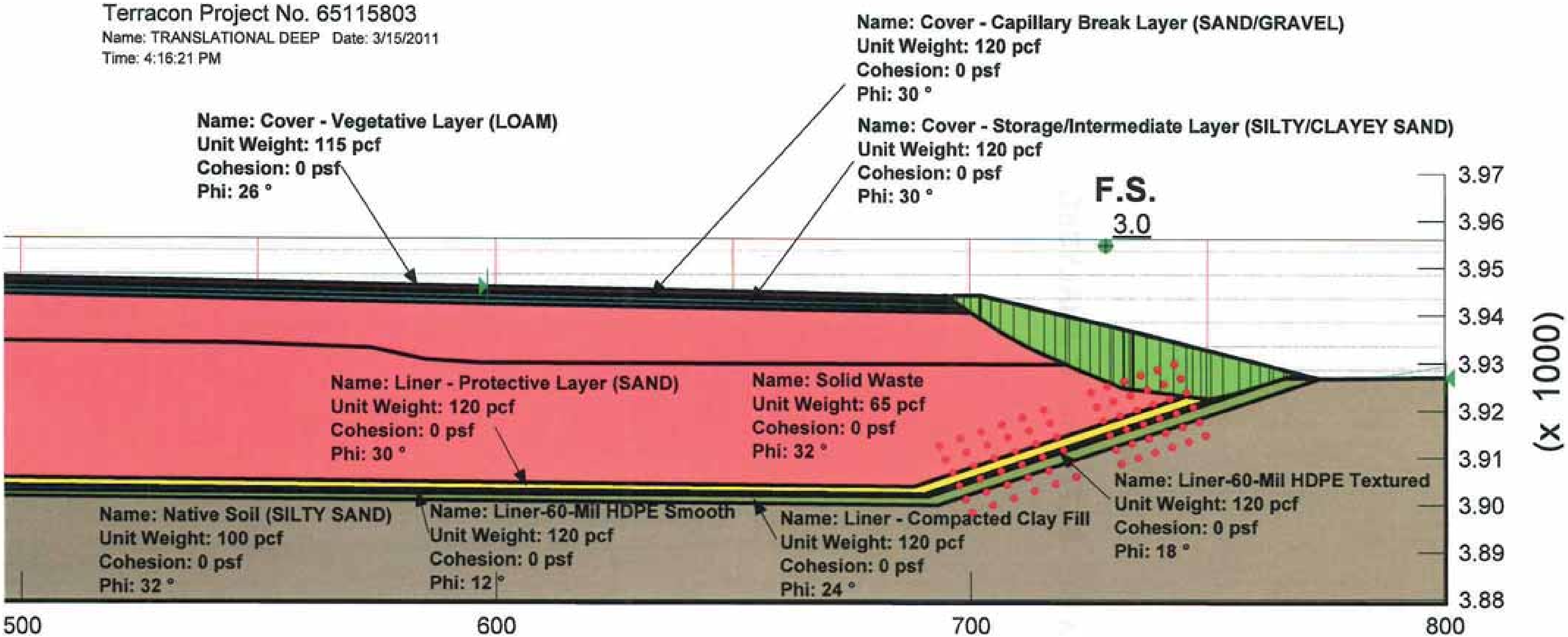


Exhibit B-5

CASE 2- SECTION B OF TYPE 1/SUBTITLE D CELL
FORT BLISS LANDFILL

Terracon Project No. 65115803
Name: TRANSLATIONAL DEEP Date: 3/15/2011
Time: 4:16:21 PM



APPENDIX C SETTLEMENT ANALYSES

Squish - Cover Sheet and Input Summary

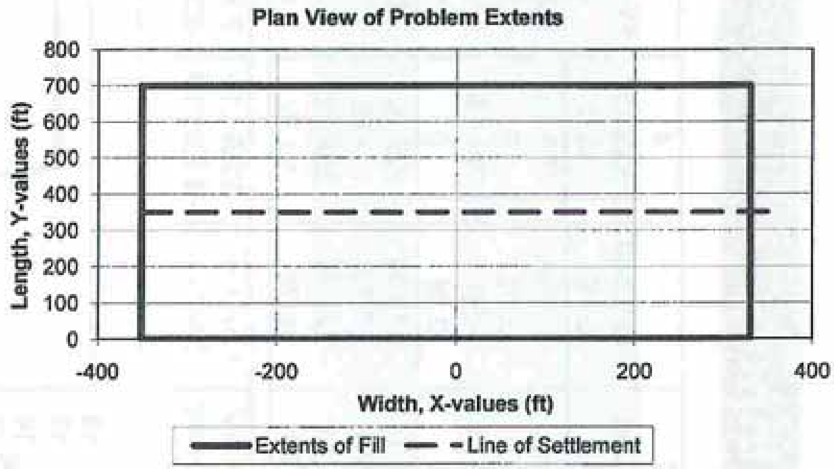
PROJECT INFORMATION

Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section AA Within the Waste MAX SETTLEMENT**
Date of Analysis:	**March 2, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types:	Existing = 2	Proposed = 3	Surcharge = 0
Line of Settlement Calcs:	Beginning X = -351	Ending X = 351	
(25 points along this line.)	Beginning Y = 350	Ending Y = 350	

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Time Dependent Soil Layers	2

Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR

Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

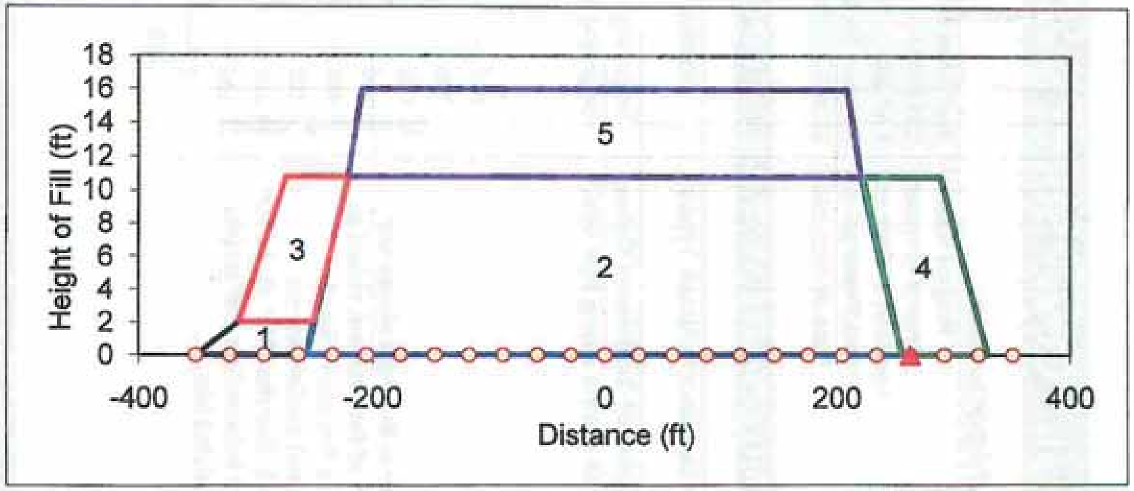
	Block Number	1	2	3	4	5
	Fill Type	Existing	Existing	Proposed	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-351	-255.71	-313.81	255.71	-220.71
	Left Z	0	0	2.05	0	10.79
	Right X	-255.71	255.71	-250	329.65	220.71
	Right Z	0	0	2.05	0	10.79
Top of Block (ft)	Left X	-313.81	-220.71	-273.81	222.52	-208.65
	Left Z	2.05	10.79	10.79	10.79	15.98
	Right X	-250	220.71	-220.27	288.74	208.65
	Right Z	2.05	10.79	10.79	10.79	15.98
Calculated Slopes	Left Side Slope	18.14H:1V	3.24H:1V	4.58H:1V	-3.08H:1V	2.32H:1V
	Right Side Slope	2.79H:1V	-3.24H:1V	3.4H:1V	-3.79H:1V	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-351
	Left Y	350
	Left X	351
	Left Y	350
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

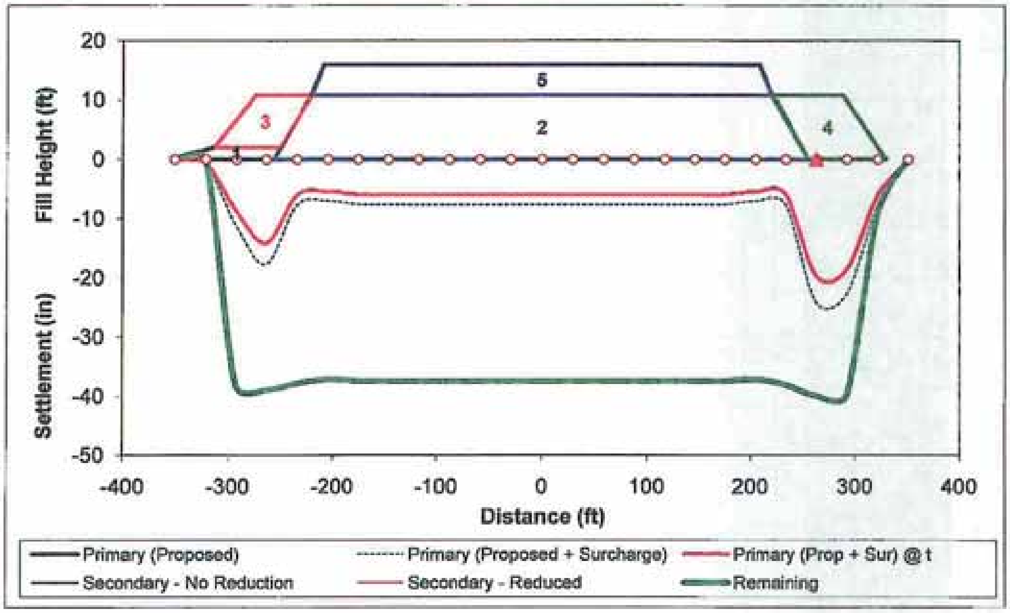
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{c\varepsilon}$	$C_{r\varepsilon}$	OCR	$C_{\alpha\varepsilon}$	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_r (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	30	65	0.262	0.000	1.0	0.081	0.0000	Yes	1	0.7	No	Yes			
30	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 360.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 360 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 360 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 360 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***24.1***	***36.4***	***4.5***	***36.4***	***40.0***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	0.8	0.0	0.1	0.0	0.1
-292.5	350	11.2	35.7	2.5	35.7	38.2
-263.3	350	17.7	35.4	3.6	35.4	39.0
-234.0	350	7.7	36.2	1.7	36.2	37.9
-204.8	350	7.0	35.7	1.6	35.7	37.2
-175.5	350	7.6	35.8	1.7	35.8	37.5
-146.3	350	7.6	35.8	1.7	35.8	37.5
-117.0	350	7.6	35.8	1.7	35.8	37.5
-87.8	350	7.6	35.8	1.7	35.8	37.5
-58.5	350	7.6	35.8	1.7	35.8	37.5
-29.3	350	7.6	35.8	1.7	35.8	37.5
0.0	350	7.6	35.8	1.7	35.8	37.5
29.3	350	7.6	35.8	1.7	35.8	37.5
58.5	350	7.6	35.8	1.7	35.8	37.5
87.8	350	7.6	35.8	1.7	35.8	37.5
117.0	350	7.6	35.8	1.7	35.8	37.5
146.3	350	7.6	35.8	1.7	35.8	37.5
175.5	350	7.6	35.8	1.7	35.8	37.5
204.8	350	7.0	35.7	1.6	35.7	37.2
234.0	350	7.6	36.4	1.7	36.4	38.1
263.3	350	24.1	35.5	4.5	35.5	40.0
292.5	350	22.8	35.5	4.3	35.5	39.8
321.8	350	8.0	7.3	1.9	7.3	9.2
351.0	350	0.4	0.0	0.1	0.0	0.1

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 360.0 days

	Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.				Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 69%	19.6	4.5	35.5	40.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	85%	0.2	0.0	0.1	0.1
1 - 2	2.4	750	1.1	3.5	70%	2.0	0.4	1.1	1.5
2 - 3	2.0	750	1.1	3.1	70%	1.6	0.4	1.1	1.5
3 - 4	1.7	750	1.1	2.8	70%	1.4	0.3	1.1	1.5
4 - 5	1.5	750	1.1	2.6	69%	1.2	0.3	1.1	1.4
5 - 6	1.3	750	1.1	2.5	69%	1.1	0.3	1.1	1.4
6 - 7	1.2	750	1.1	2.3	70%	0.9	0.3	1.1	1.4
7 - 8	1.1	750	1.1	2.2	70%	0.9	0.3	1.1	1.4
8 - 9	1.0	750	1.1	2.1	70%	0.8	0.2	1.1	1.4
9 - 10	0.9	750	1.1	2.1	70%	0.7	0.2	1.1	1.3
10 - 11	0.9	750	1.1	2.0	71%	0.7	0.2	1.1	1.3
11 - 12	0.8	750	1.1	1.9	71%	0.6	0.2	1.1	1.3
12 - 13	0.8	750	1.1	1.9	72%	0.6	0.2	1.1	1.3
13 - 14	0.7	750	1.1	1.8	73%	0.6	0.2	1.1	1.3
14 - 15	0.7	750	1.1	1.8	74%	0.5	0.1	1.1	1.3
15 - 16	0.6	750	1.1	1.8	75%	0.5	0.1	1.1	1.3
16 - 17	0.6	750	1.1	1.7	76%	0.5	0.1	1.1	1.3
17 - 18	0.6	750	1.1	1.7	77%	0.5	0.1	1.1	1.2
18 - 19	0.5	750	1.1	1.7	78%	0.4	0.1	1.1	1.2
19 - 20	0.5	735	1.1	1.7	80%	0.4	0.1	1.1	1.2
20 - 21	0.5	714	1.2	1.6	81%	0.4	0.1	1.2	1.2
21 - 22	0.5	690	1.2	1.6	83%	0.4	0.1	1.2	1.2
22 - 23	0.4	661	1.2	1.6	85%	0.4	0.1	1.2	1.2
23 - 24	0.4	628	1.2	1.6	86%	0.4	0.1	1.2	1.3
24 - 25	0.4	587	1.2	1.6	88%	0.4	0.0	1.2	1.3
25 - 26	0.4	538	1.3	1.7	90%	0.4	0.0	1.3	1.3
26 - 27	0.4	474	1.3	1.7	92%	0.4	0.0	1.3	1.4
27 - 28	0.4	387	1.4	1.8	94%	0.3	0.0	1.4	1.4
28 - 29	0.3	253	1.6	1.9	97%	0.3	0.0	1.6	1.6
29 - 30	0.3	38	2.4	2.7	99%	0.3	0.0	2.4	2.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 69%	19.6	4.5	35.5	40.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

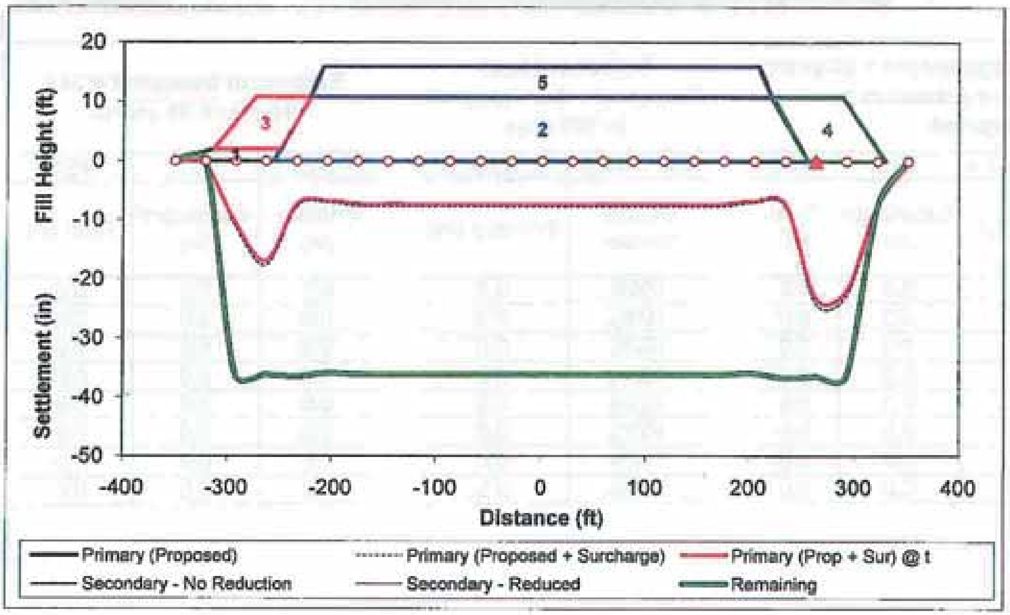
View results at: X=263.3, Y=350

Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 69%	19.6	4.5	35.5	40.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***24.1***	***36.4***	***1.0***	***36.4***	***36.8***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	0.8	0.0	0.0	0.0	0.0
-292.5	350	11.2	35.7	0.6	35.7	36.3
-263.3	350	17.7	35.4	0.8	35.4	36.2
-234.0	350	7.7	36.2	0.4	36.2	36.6
-204.8	350	7.0	35.7	0.4	35.7	36.0
-175.5	350	7.6	35.8	0.4	35.8	36.2
-146.3	350	7.6	35.8	0.4	35.8	36.2
-117.0	350	7.6	35.8	0.4	35.8	36.2
-87.8	350	7.6	35.8	0.4	35.8	36.2
-58.5	350	7.6	35.8	0.4	35.8	36.2
-29.3	350	7.6	35.8	0.4	35.8	36.2
0.0	350	7.6	35.8	0.4	35.8	36.2
29.3	350	7.6	35.8	0.4	35.8	36.2
58.5	350	7.6	35.8	0.4	35.8	36.2
87.8	350	7.6	35.8	0.4	35.8	36.2
117.0	350	7.6	35.8	0.4	35.8	36.2
146.3	350	7.6	35.8	0.4	35.8	36.2
175.5	350	7.6	35.8	0.4	35.8	36.2
204.8	350	7.0	35.7	0.4	35.7	36.0
234.0	350	7.6	36.4	0.4	36.4	36.8
263.3	350	24.1	35.5	1.0	35.5	36.5
292.5	350	22.8	35.5	0.9	35.5	36.4
321.8	350	8.0	7.3	0.4	7.3	7.7
351.0	350	0.4	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/2/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 93%	23.1	1.0	35.5	36.5
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	97%	0.2	0.0	0.1	0.1
1 - 2	2.4	750	1.1	3.5	93%	2.3	0.1	1.1	1.2
2 - 3	2.0	750	1.1	3.1	93%	1.9	0.1	1.1	1.2
3 - 4	1.7	750	1.1	2.8	93%	1.6	0.1	1.1	1.2
4 - 5	1.5	750	1.1	2.6	93%	1.4	0.1	1.1	1.2
5 - 6	1.3	750	1.1	2.5	93%	1.3	0.1	1.1	1.2
6 - 7	1.2	750	1.1	2.3	93%	1.2	0.1	1.1	1.2
7 - 8	1.1	750	1.1	2.2	93%	1.1	0.1	1.1	1.2
8 - 9	1.0	750	1.1	2.1	93%	1.0	0.1	1.1	1.2
9 - 10	0.9	750	1.1	2.1	93%	0.9	0.0	1.1	1.2
10 - 11	0.9	750	1.1	2.0	93%	0.8	0.0	1.1	1.2
11 - 12	0.8	750	1.1	1.9	93%	0.8	0.0	1.1	1.2
12 - 13	0.8	750	1.1	1.9	93%	0.7	0.0	1.1	1.2
13 - 14	0.7	750	1.1	1.8	94%	0.7	0.0	1.1	1.2
14 - 15	0.7	750	1.1	1.8	94%	0.6	0.0	1.1	1.2
15 - 16	0.6	750	1.1	1.8	94%	0.6	0.0	1.1	1.2
16 - 17	0.6	750	1.1	1.7	94%	0.6	0.0	1.1	1.2
17 - 18	0.6	750	1.1	1.7	95%	0.5	0.0	1.1	1.2
18 - 19	0.5	750	1.1	1.7	95%	0.5	0.0	1.1	1.2
19 - 20	0.5	735	1.1	1.7	95%	0.5	0.0	1.1	1.2
20 - 21	0.5	714	1.2	1.6	96%	0.5	0.0	1.2	1.2
21 - 22	0.5	690	1.2	1.6	96%	0.5	0.0	1.2	1.2
22 - 23	0.4	661	1.2	1.6	96%	0.4	0.0	1.2	1.2
23 - 24	0.4	628	1.2	1.6	97%	0.4	0.0	1.2	1.2
24 - 25	0.4	587	1.2	1.6	97%	0.4	0.0	1.2	1.2
25 - 26	0.4	538	1.3	1.7	98%	0.4	0.0	1.3	1.3
26 - 27	0.4	474	1.3	1.7	98%	0.4	0.0	1.3	1.3
27 - 28	0.4	387	1.4	1.8	99%	0.4	0.0	1.4	1.4
28 - 29	0.3	253	1.6	1.9	99%	0.3	0.0	1.6	1.6
29 - 30	0.3	38	2.4	2.7	100%	0.3	0.0	2.4	2.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 93%	23.1	1.0	35.5	36.5
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	24.1	Secondary =	35.5	59.6	Min = 93%	23.1	1.0	35.5	36.5
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

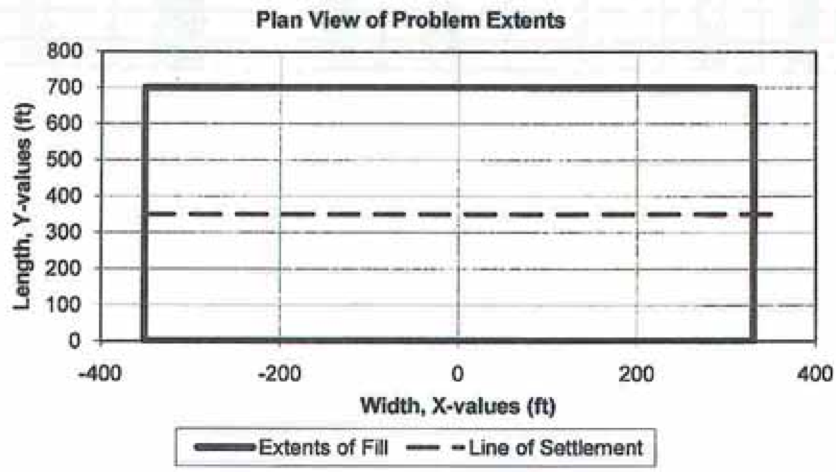
Project Name:	Fort Bliss MSW Landfill
Project Number:	65115803
Location or Station:	Fort Bliss, Texas
Notes/Description:	Section AA Within the Waste MIN SETTLEMENT
Date of Analysis:	March 2, 2011

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 2 Proposed = 3 Surcharge = 0

Line of Settlement Calcs: Beginning X = -351 Ending X = 351
(25 points along this line.) Beginning Y = 350 Ending Y = 350

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

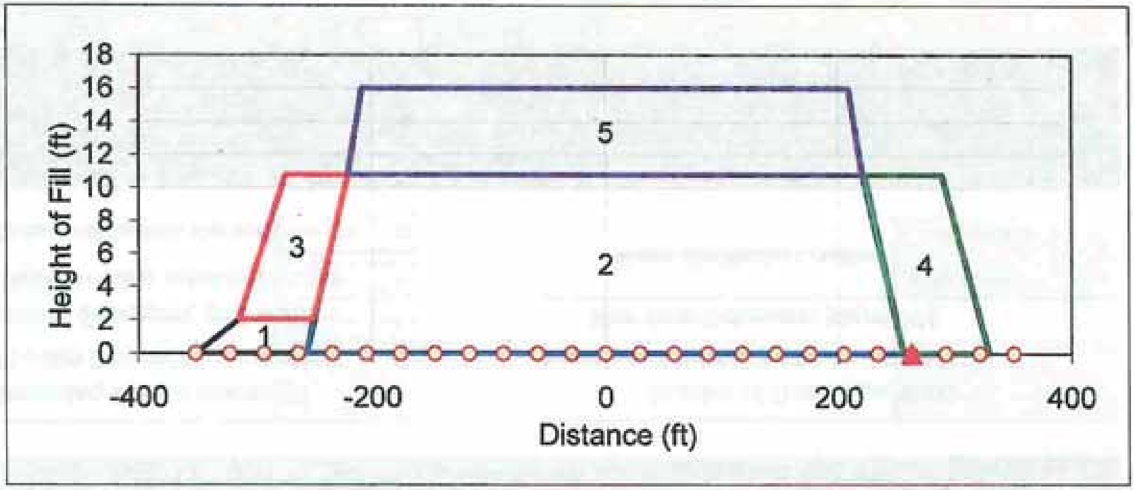
	Block Number	1	2	3	4	5
	Fill Type	Existing	Existing	Proposed	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-351	-255.71	-313.81	255.71	-220.71
	Left Z	0	0	2.05	0	10.79
	Right X	-255.71	255.71	-250	329.65	220.71
	Right Z	0	0	2.05	0	10.79
Top of Block (ft)	Left X	-313.81	-220.71	-273.81	222.52	-208.65
	Left Z	2.05	10.79	10.79	10.79	15.98
	Right X	-250	220.71	-220.27	288.74	208.65
	Right Z	2.05	10.79	10.79	10.79	15.98
Calculated Slopes	Left Side Slope	18.14H:1V	3.24H:1V	4.58H:1V	-3.08H:1V	2.32H:1V
	Right Side Slope	2.79H:1V	-3.24H:1V	3.4H:1V	-3.79H:1V	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-351
	Left Y	350
	Left X	351
	Left Y	350
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

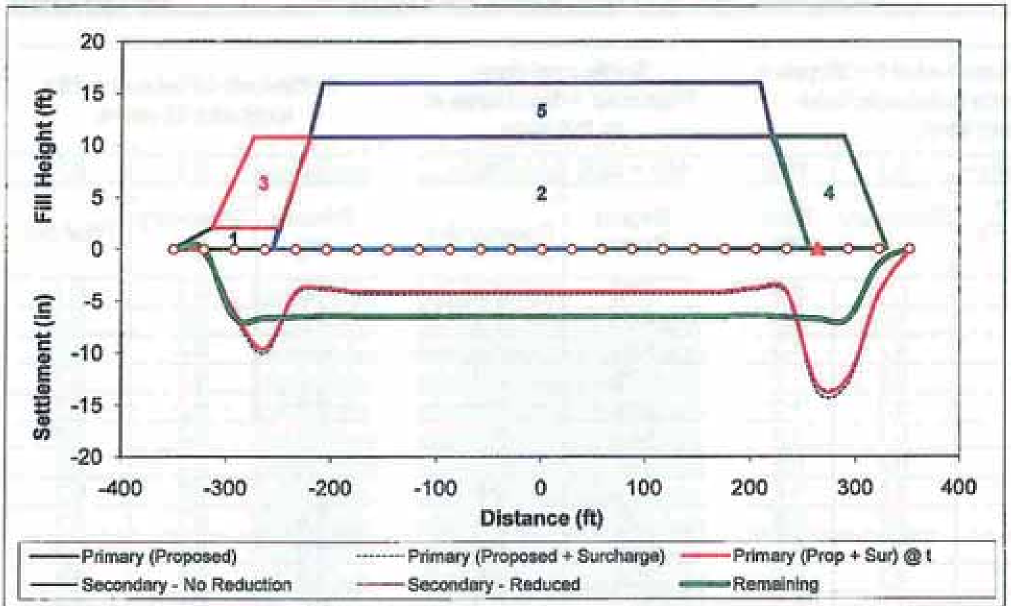
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	(●) Boussinesq / ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_{α}	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	30	65	0.148	0.000	1.0	0.014	0.0000	Yes	1	0.7	No	Yes			
30	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***13.7***	***6.3***	***0.6***	***6.3***	***6.7***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	0.5	0.0	0.0	0.0	0.0
-292.5	350	6.4	6.2	0.3	6.2	6.5
-263.3	350	10.0	6.2	0.5	6.2	6.6
-234.0	350	4.4	6.3	0.2	6.3	6.5
-204.8	350	4.0	6.2	0.2	6.2	6.4
-175.5	350	4.3	6.2	0.2	6.2	6.5
-146.3	350	4.3	6.2	0.2	6.2	6.5
-117.0	350	4.3	6.2	0.2	6.2	6.5
-87.8	350	4.3	6.2	0.2	6.2	6.5
-58.5	350	4.3	6.2	0.2	6.2	6.5
-29.3	350	4.3	6.2	0.2	6.2	6.5
0.0	350	4.3	6.2	0.2	6.2	6.5
29.3	350	4.3	6.2	0.2	6.2	6.5
58.5	350	4.3	6.2	0.2	6.2	6.5
87.8	350	4.3	6.2	0.2	6.2	6.5
117.0	350	4.3	6.2	0.2	6.2	6.5
146.3	350	4.3	6.2	0.2	6.2	6.5
175.5	350	4.3	6.2	0.2	6.2	6.5
204.8	350	4.0	6.2	0.2	6.2	6.4
234.0	350	4.3	6.3	0.2	6.3	6.6
263.3	350	13.7	6.2	0.6	6.2	6.7
292.5	350	13.0	6.2	0.5	6.2	6.7
321.8	350	4.6	1.3	0.2	1.3	1.5
351.0	350	0.2	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 93%	13.2	0.6	6.2	6.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	97%	0.2	0.0	0.1	0.1
1 - 2	1.3	750	0.2	1.5	93%	1.3	0.0	0.2	0.2
2 - 3	1.1	750	0.2	1.3	93%	1.1	0.0	0.2	0.2
3 - 4	1.0	750	0.2	1.2	93%	0.9	0.0	0.2	0.2
4 - 5	0.8	750	0.2	1.0	93%	0.8	0.0	0.2	0.2
5 - 6	0.8	750	0.2	1.0	93%	0.7	0.0	0.2	0.2
6 - 7	0.7	750	0.2	0.9	93%	0.7	0.0	0.2	0.2
7 - 8	0.6	750	0.2	0.8	93%	0.6	0.0	0.2	0.2
8 - 9	0.6	750	0.2	0.8	93%	0.5	0.0	0.2	0.2
9 - 10	0.5	750	0.2	0.7	93%	0.5	0.0	0.2	0.2
10 - 11	0.5	750	0.2	0.7	93%	0.5	0.0	0.2	0.2
11 - 12	0.5	750	0.2	0.7	93%	0.4	0.0	0.2	0.2
12 - 13	0.4	750	0.2	0.6	93%	0.4	0.0	0.2	0.2
13 - 14	0.4	750	0.2	0.6	94%	0.4	0.0	0.2	0.2
14 - 15	0.4	750	0.2	0.6	94%	0.4	0.0	0.2	0.2
15 - 16	0.4	750	0.2	0.6	94%	0.3	0.0	0.2	0.2
16 - 17	0.3	750	0.2	0.5	94%	0.3	0.0	0.2	0.2
17 - 18	0.3	750	0.2	0.5	95%	0.3	0.0	0.2	0.2
18 - 19	0.3	750	0.2	0.5	95%	0.3	0.0	0.2	0.2
19 - 20	0.3	735	0.2	0.5	95%	0.3	0.0	0.2	0.2
20 - 21	0.3	714	0.2	0.5	96%	0.3	0.0	0.2	0.2
21 - 22	0.3	690	0.2	0.5	96%	0.3	0.0	0.2	0.2
22 - 23	0.3	661	0.2	0.5	96%	0.2	0.0	0.2	0.2
23 - 24	0.2	628	0.2	0.4	97%	0.2	0.0	0.2	0.2
24 - 25	0.2	587	0.2	0.4	97%	0.2	0.0	0.2	0.2
25 - 26	0.2	538	0.2	0.4	98%	0.2	0.0	0.2	0.2
26 - 27	0.2	474	0.2	0.4	98%	0.2	0.0	0.2	0.2
27 - 28	0.2	387	0.2	0.4	99%	0.2	0.0	0.2	0.2
28 - 29	0.2	253	0.3	0.5	99%	0.2	0.0	0.3	0.3
29 - 30	0.2	38	0.4	0.6	100%	0.2	0.0	0.4	0.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 93%	13.2	0.6	6.2	6.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

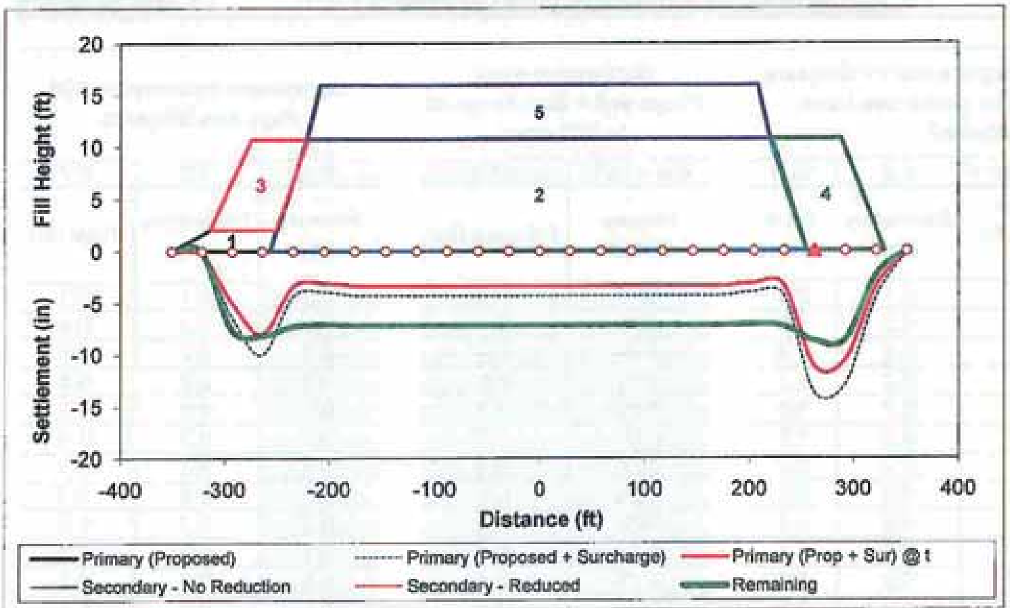
Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 93%	13.2	0.6	6.2	6.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 360.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 360 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 360 days							
Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 360 days and 30 years.			
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***13.7***	***6.3***	***2.5***	***6.3***	***8.7***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	0.5	0.0	0.1	0.0	0.1
-292.5	350	6.4	6.2	1.4	6.2	7.6
-263.3	350	10.0	6.2	2.0	6.2	8.2
-234.0	350	4.4	6.3	1.0	6.3	7.3
-204.8	350	4.0	6.2	0.9	6.2	7.1
-175.5	350	4.3	6.2	1.0	6.2	7.2
-146.3	350	4.3	6.2	1.0	6.2	7.2
-117.0	350	4.3	6.2	1.0	6.2	7.2
-87.8	350	4.3	6.2	1.0	6.2	7.2
-58.5	350	4.3	6.2	1.0	6.2	7.2
-29.3	350	4.3	6.2	1.0	6.2	7.2
0.0	350	4.3	6.2	1.0	6.2	7.2
29.3	350	4.3	6.2	1.0	6.2	7.2
58.5	350	4.3	6.2	1.0	6.2	7.2
87.8	350	4.3	6.2	1.0	6.2	7.2
117.0	350	4.3	6.2	1.0	6.2	7.2
146.3	350	4.3	6.2	1.0	6.2	7.2
175.5	350	4.3	6.2	1.0	6.2	7.2
204.8	350	4.0	6.2	0.9	6.2	7.1
234.0	350	4.3	6.3	1.0	6.3	7.3
263.3	350	13.7	6.2	2.5	6.2	8.7
292.5	350	13.0	6.2	2.4	6.2	8.6
321.8	350	4.6	1.3	1.1	1.3	2.4
351.0	350	0.2	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 Evaluate Settlement at t = 360.0 days

	Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.				Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 69%	11.2	2.5	6.2	8.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	85%	0.2	0.0	0.1	0.1
1 - 2	1.3	750	0.2	1.5	70%	1.1	0.2	0.2	0.4
2 - 3	1.1	750	0.2	1.3	70%	0.9	0.2	0.2	0.4
3 - 4	1.0	750	0.2	1.2	70%	0.8	0.2	0.2	0.4
4 - 5	0.8	750	0.2	1.0	69%	0.7	0.2	0.2	0.4
5 - 6	0.8	750	0.2	1.0	69%	0.6	0.2	0.2	0.4
6 - 7	0.7	750	0.2	0.9	70%	0.5	0.2	0.2	0.3
7 - 8	0.6	750	0.2	0.8	70%	0.5	0.1	0.2	0.3
8 - 9	0.6	750	0.2	0.8	70%	0.4	0.1	0.2	0.3
9 - 10	0.5	750	0.2	0.7	70%	0.4	0.1	0.2	0.3
10 - 11	0.5	750	0.2	0.7	71%	0.4	0.1	0.2	0.3
11 - 12	0.5	750	0.2	0.7	71%	0.4	0.1	0.2	0.3
12 - 13	0.4	750	0.2	0.6	72%	0.3	0.1	0.2	0.3
13 - 14	0.4	750	0.2	0.6	73%	0.3	0.1	0.2	0.3
14 - 15	0.4	750	0.2	0.6	74%	0.3	0.1	0.2	0.3
15 - 16	0.4	750	0.2	0.6	75%	0.3	0.1	0.2	0.3
16 - 17	0.3	750	0.2	0.5	76%	0.3	0.1	0.2	0.3
17 - 18	0.3	750	0.2	0.5	77%	0.3	0.1	0.2	0.3
18 - 19	0.3	750	0.2	0.5	78%	0.2	0.1	0.2	0.3
19 - 20	0.3	735	0.2	0.5	80%	0.2	0.1	0.2	0.2
20 - 21	0.3	714	0.2	0.5	81%	0.2	0.0	0.2	0.2
21 - 22	0.3	690	0.2	0.5	83%	0.2	0.0	0.2	0.2
22 - 23	0.3	661	0.2	0.5	85%	0.2	0.0	0.2	0.2
23 - 24	0.2	628	0.2	0.4	86%	0.2	0.0	0.2	0.2
24 - 25	0.2	587	0.2	0.4	88%	0.2	0.0	0.2	0.2
25 - 26	0.2	538	0.2	0.4	90%	0.2	0.0	0.2	0.2
26 - 27	0.2	474	0.2	0.4	92%	0.2	0.0	0.2	0.2
27 - 28	0.2	387	0.2	0.4	94%	0.2	0.0	0.2	0.3
28 - 29	0.2	253	0.3	0.5	97%	0.2	0.0	0.3	0.3
29 - 30	0.2	38	0.4	0.6	99%	0.2	0.0	0.4	0.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 69%	11.2	2.5	6.2	8.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	13.7	Secondary =	6.2	19.9	Min = 69%	11.2	2.5	6.2	8.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

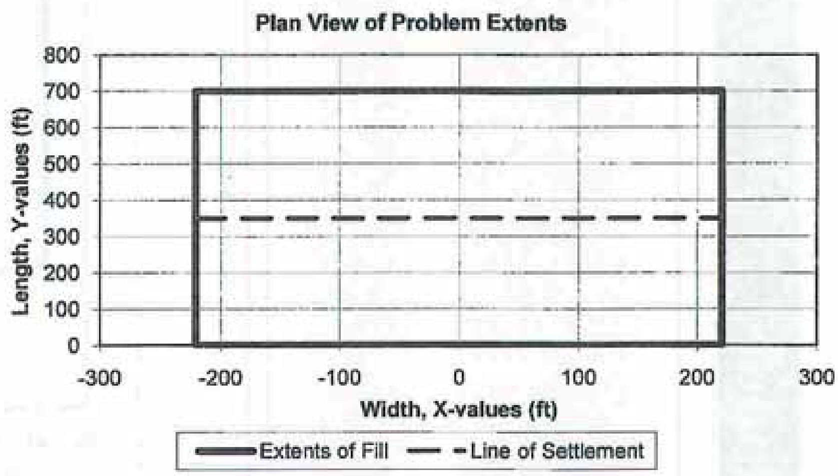
PROJECT INFORMATION

Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section AA Within the Waste MAX SETTLEMENT @ TOP LAYER**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types:	Existing = 0	Proposed = 1	Surcharge = 0
Line of Settlement Calcs:	Beginning X = -220.71	Ending X = 220.71	
(25 points along this line.)	Beginning Y = 350	Ending Y = 350	

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers	2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-220.71
	Left Z	0
	Right X	220.71
	Right Z	0
Top of Block (ft)	Left X	-208.65
	Left Z	5.19
	Right X	208.65
	Right Z	5.19

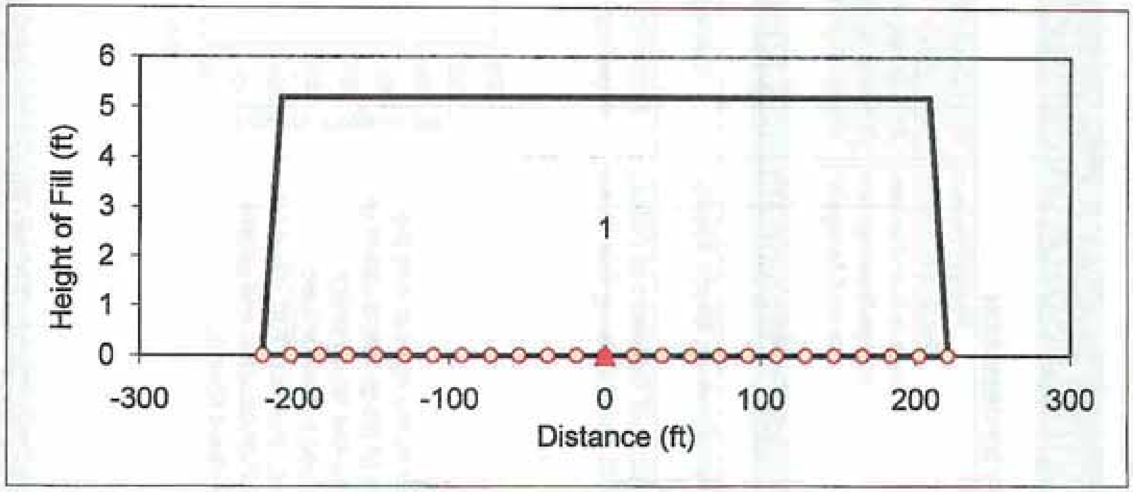
Calculated Slopes	Left Side Slope	2.32H:1V
	Right Side Slope	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-220.71
	Left Y	350
	Left X	220.71
	Left Y	350
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

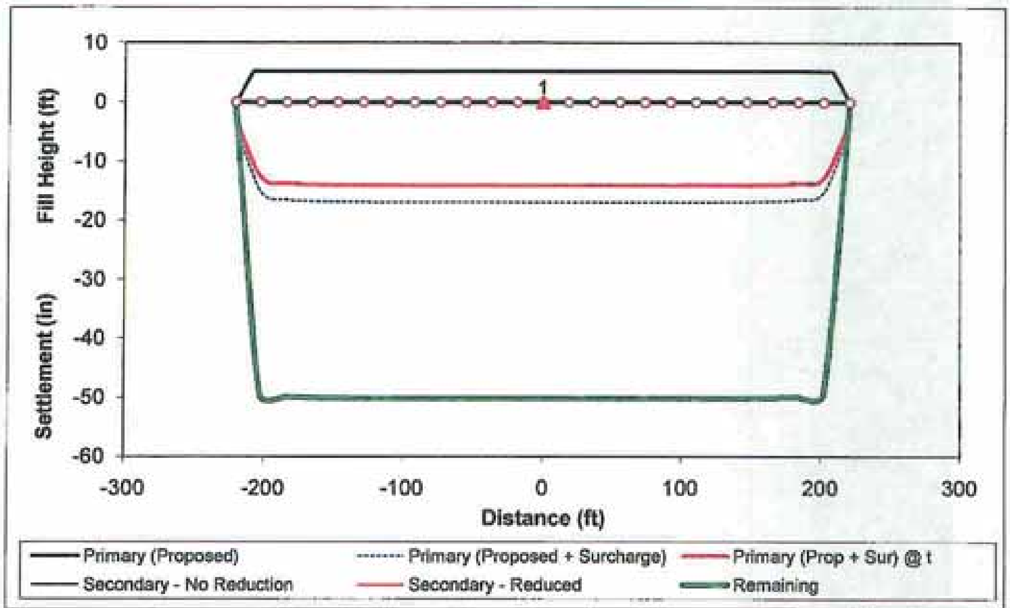
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	$C_{\alpha\varepsilon}$	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_r (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	41	65	0.262	0.000	1.0	0.081	0.0000	Yes	1	0.7	No	Yes			
41	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***17.0***	***47.4***	***2.9***	***47.4***	***50.3***
-220.7	350	4.3	0.0	1.1	0.0	1.1
-202.3	350	15.3	47.0	2.5	47.0	49.6
-183.9	350	16.5	47.2	2.8	47.2	50.0
-165.5	350	16.8	47.3	2.9	47.3	50.1
-147.1	350	16.9	47.3	2.9	47.3	50.2
-128.7	350	16.9	47.3	2.9	47.3	50.2
-110.4	350	16.9	47.3	2.9	47.3	50.2
-92.0	350	16.9	47.3	2.9	47.3	50.2
-73.6	350	16.9	47.4	2.9	47.4	50.2
-55.2	350	16.9	47.4	2.9	47.4	50.2
-36.8	350	17.0	47.4	2.9	47.4	50.2
-18.4	350	17.0	47.4	2.9	47.4	50.3
0.0	350	17.0	47.4	2.9	47.4	50.3
18.4	350	17.0	47.4	2.9	47.4	50.3
36.8	350	17.0	47.4	2.9	47.4	50.2
55.2	350	16.9	47.4	2.9	47.4	50.2
73.6	350	16.9	47.4	2.9	47.4	50.2
92.0	350	16.9	47.3	2.9	47.3	50.2
110.4	350	16.9	47.3	2.9	47.3	50.2
128.7	350	16.9	47.3	2.9	47.3	50.2
147.1	350	16.9	47.3	2.9	47.3	50.2
165.5	350	16.8	47.3	2.9	47.3	50.1
183.9	350	16.5	47.2	2.8	47.2	50.0
202.3	350	15.3	47.0	2.5	47.0	49.6
220.7	350	4.3	0.0	1.1	0.0	1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 75%	14.1	2.9	47.4	50.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	88%	0.2	0.0	0.1	0.1
1 - 2	1.6	750	1.1	2.7	76%	1.3	0.3	1.1	1.4
2 - 3	1.3	750	1.1	2.4	75%	1.1	0.2	1.1	1.4
3 - 4	1.1	750	1.1	2.2	75%	0.9	0.2	1.1	1.3
4 - 5	0.9	750	1.1	2.1	75%	0.7	0.2	1.1	1.3
5 - 6	0.8	750	1.1	1.9	75%	0.7	0.2	1.1	1.3
6 - 7	0.7	750	1.1	1.9	75%	0.6	0.1	1.1	1.3
7 - 8	0.7	750	1.1	1.8	75%	0.5	0.1	1.1	1.3
8 - 9	0.6	750	1.1	1.7	75%	0.5	0.1	1.1	1.3
9 - 10	0.6	750	1.1	1.7	75%	0.4	0.1	1.1	1.3
10 - 11	0.5	750	1.1	1.6	75%	0.4	0.1	1.1	1.2
11 - 12	0.5	750	1.1	1.6	76%	0.4	0.1	1.1	1.2
12 - 13	0.4	750	1.1	1.6	76%	0.4	0.1	1.1	1.2
13 - 14	0.4	750	1.1	1.6	76%	0.3	0.1	1.1	1.2
14 - 15	0.4	750	1.1	1.5	77%	0.3	0.1	1.1	1.2
15 - 16	0.4	750	1.1	1.5	77%	0.3	0.1	1.1	1.2
16 - 17	0.4	750	1.1	1.5	77%	0.3	0.1	1.1	1.2
17 - 18	0.3	750	1.1	1.5	78%	0.3	0.1	1.1	1.2
18 - 19	0.3	750	1.1	1.5	79%	0.3	0.1	1.1	1.2
19 - 20	0.3	750	1.1	1.4	79%	0.3	0.1	1.1	1.2
20 - 21	0.3	750	1.1	1.4	80%	0.2	0.1	1.1	1.2
21 - 22	0.3	750	1.1	1.4	80%	0.2	0.1	1.1	1.2
22 - 23	0.3	750	1.1	1.4	81%	0.2	0.0	1.1	1.2
23 - 24	0.3	750	1.1	1.4	82%	0.2	0.0	1.1	1.2
24 - 25	0.3	750	1.1	1.4	83%	0.2	0.0	1.1	1.2
25 - 26	0.2	750	1.1	1.4	84%	0.2	0.0	1.1	1.2
26 - 27	0.2	750	1.1	1.4	85%	0.2	0.0	1.1	1.2
27 - 28	0.2	750	1.1	1.4	85%	0.2	0.0	1.1	1.2
28 - 29	0.2	750	1.1	1.4	86%	0.2	0.0	1.1	1.2
29 - 30	0.2	750	1.1	1.3	87%	0.2	0.0	1.1	1.2
30 - 31	0.2	750	1.1	1.3	88%	0.2	0.0	1.1	1.2
31 - 32	0.2	750	1.1	1.3	89%	0.2	0.0	1.1	1.2
32 - 33	0.2	750	1.1	1.3	90%	0.2	0.0	1.1	1.1
33 - 34	0.2	750	1.1	1.3	92%	0.2	0.0	1.1	1.1
34 - 35	0.2	750	1.1	1.3	93%	0.2	0.0	1.1	1.1
35 - 36	0.2	750	1.1	1.3	94%	0.2	0.0	1.1	1.1
36 - 37	0.2	750	1.1	1.3	95%	0.2	0.0	1.1	1.1
37 - 38	0.2	645	1.2	1.4	96%	0.2	0.0	1.2	1.2
38 - 39	0.2	486	1.3	1.5	97%	0.2	0.0	1.3	1.3
39 - 40	0.2	258	1.6	1.7	98%	0.2	0.0	1.6	1.6
40 - 41	0.2	32	2.5	2.6	99%	0.2	0.0	2.5	2.5
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 75%	14.1	2.9	47.4	50.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

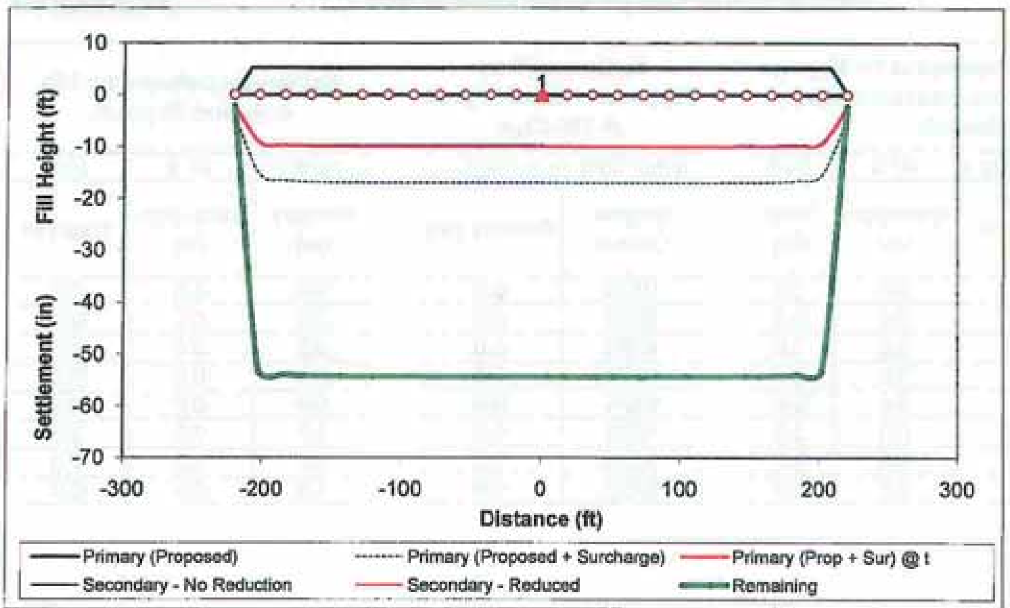
Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 75%	14.1	2.9	47.4	50.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 360.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- [ ] Proposed Only
- [x] Final P + S
- [x] P+S at t = 360 days

Secondary Consolidation

- [ ] No Reduction
- [ ] With Reduction
- [x] **Total Remaining**

Calculations are based on effective stress present at t = 360 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 360 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***17.0***	***47.4***	***7.0***	***47.4***	***54.4***
-220.7	350	4.3	0.0	2.1	0.0	2.1
-202.3	350	15.3	47.0	6.1	47.0	53.1
-183.9	350	16.5	47.2	6.8	47.2	54.0
-165.5	350	16.8	47.3	6.9	47.3	54.2
-147.1	350	16.9	47.3	7.0	47.3	54.3
-128.7	350	16.9	47.3	7.0	47.3	54.3
-110.4	350	16.9	47.3	7.0	47.3	54.3
-92.0	350	16.9	47.3	7.0	47.3	54.4
-73.6	350	16.9	47.4	7.0	47.4	54.4
-55.2	350	16.9	47.4	7.0	47.4	54.4
-36.8	350	17.0	47.4	7.0	47.4	54.4
-18.4	350	17.0	47.4	7.0	47.4	54.4
0.0	350	17.0	47.4	7.0	47.4	54.4
18.4	350	17.0	47.4	7.0	47.4	54.4
36.8	350	17.0	47.4	7.0	47.4	54.4
55.2	350	16.9	47.4	7.0	47.4	54.4
73.6	350	16.9	47.4	7.0	47.4	54.4
92.0	350	16.9	47.3	7.0	47.3	54.4
110.4	350	16.9	47.3	7.0	47.3	54.3
128.7	350	16.9	47.3	7.0	47.3	54.3
147.1	350	16.9	47.3	7.0	47.3	54.3
165.5	350	16.8	47.3	6.9	47.3	54.2
183.9	350	16.5	47.2	6.8	47.2	54.0
202.3	350	15.3	47.0	6.1	47.0	53.1
220.7	350	4.3	0.0	2.1	0.0	2.1

Squish - Detailed Settlement Results

View results at: X=0, Y=350 Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 43%	9.9	7.0	47.4	54.4
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	73%	0.2	0.0	0.1	0.1
1 - 2	1.6	750	1.1	2.7	45%	0.9	0.6	1.1	1.8
2 - 3	1.3	750	1.1	2.4	45%	0.7	0.6	1.1	1.7
3 - 4	1.1	750	1.1	2.2	44%	0.6	0.5	1.1	1.6
4 - 5	0.9	750	1.1	2.1	44%	0.5	0.4	1.1	1.6
5 - 6	0.8	750	1.1	1.9	44%	0.4	0.4	1.1	1.5
6 - 7	0.7	750	1.1	1.9	43%	0.4	0.4	1.1	1.5
7 - 8	0.7	750	1.1	1.8	43%	0.3	0.3	1.1	1.5
8 - 9	0.6	750	1.1	1.7	44%	0.3	0.3	1.1	1.4
9 - 10	0.6	750	1.1	1.7	44%	0.3	0.3	1.1	1.4
10 - 11	0.5	750	1.1	1.6	44%	0.3	0.3	1.1	1.4
11 - 12	0.5	750	1.1	1.6	45%	0.2	0.2	1.1	1.4
12 - 13	0.4	750	1.1	1.6	45%	0.2	0.2	1.1	1.4
13 - 14	0.4	750	1.1	1.6	46%	0.2	0.2	1.1	1.3
14 - 15	0.4	750	1.1	1.5	47%	0.2	0.2	1.1	1.3
15 - 16	0.4	750	1.1	1.5	48%	0.2	0.2	1.1	1.3
16 - 17	0.4	750	1.1	1.5	49%	0.2	0.2	1.1	1.3
17 - 18	0.3	750	1.1	1.5	50%	0.2	0.2	1.1	1.3
18 - 19	0.3	750	1.1	1.5	51%	0.2	0.1	1.1	1.3
19 - 20	0.3	750	1.1	1.4	53%	0.2	0.1	1.1	1.3
20 - 21	0.3	750	1.1	1.4	54%	0.2	0.1	1.1	1.3
21 - 22	0.3	750	1.1	1.4	56%	0.2	0.1	1.1	1.3
22 - 23	0.3	750	1.1	1.4	57%	0.2	0.1	1.1	1.2
23 - 24	0.3	750	1.1	1.4	59%	0.2	0.1	1.1	1.2
24 - 25	0.3	750	1.1	1.4	61%	0.2	0.1	1.1	1.2
25 - 26	0.2	750	1.1	1.4	63%	0.2	0.1	1.1	1.2
26 - 27	0.2	750	1.1	1.4	65%	0.2	0.1	1.1	1.2
27 - 28	0.2	750	1.1	1.4	67%	0.2	0.1	1.1	1.2
28 - 29	0.2	750	1.1	1.4	69%	0.2	0.1	1.1	1.2
29 - 30	0.2	750	1.1	1.3	71%	0.2	0.1	1.1	1.2
30 - 31	0.2	750	1.1	1.3	74%	0.2	0.1	1.1	1.2
31 - 32	0.2	750	1.1	1.3	76%	0.2	0.0	1.1	1.2
32 - 33	0.2	750	1.1	1.3	78%	0.2	0.0	1.1	1.2
33 - 34	0.2	750	1.1	1.3	81%	0.2	0.0	1.1	1.2
34 - 35	0.2	750	1.1	1.3	83%	0.2	0.0	1.1	1.2
35 - 36	0.2	750	1.1	1.3	86%	0.2	0.0	1.1	1.2
36 - 37	0.2	750	1.1	1.3	88%	0.2	0.0	1.1	1.2
37 - 38	0.2	645	1.2	1.4	91%	0.2	0.0	1.2	1.2
38 - 39	0.2	486	1.3	1.5	93%	0.2	0.0	1.3	1.3
39 - 40	0.2	258	1.6	1.7	96%	0.2	0.0	1.6	1.6
40 - 41	0.2	32	2.5	2.6	99%	0.2	0.0	2.5	2.5
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 43%	9.9	7.0	47.4	54.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	17.0	Secondary =	47.4	64.3	Min = 43%	9.9	7.0	47.4	54.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

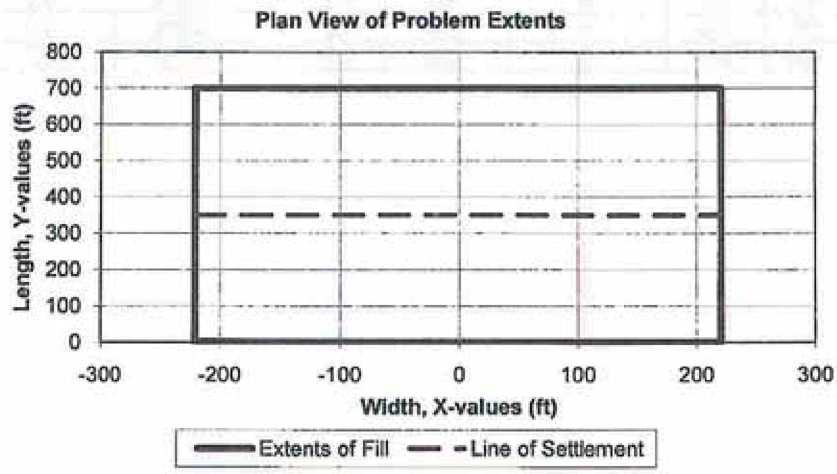
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section AA Within the Waste MIN SETTLEMENT @ TOP LAYER**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 0 Proposed = 1 Surcharge = 0

Line of Settlement Calcs:	Beginning X = -220.71	Ending X = 220.71
(25 points along this line.)	Beginning Y = 350	Ending Y = 350

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-220.71
	Left Z	0
	Right X	220.71
	Right Z	0
Top of Block (ft)	Left X	-208.65
	Left Z	5.19
	Right X	208.65
	Right Z	5.19

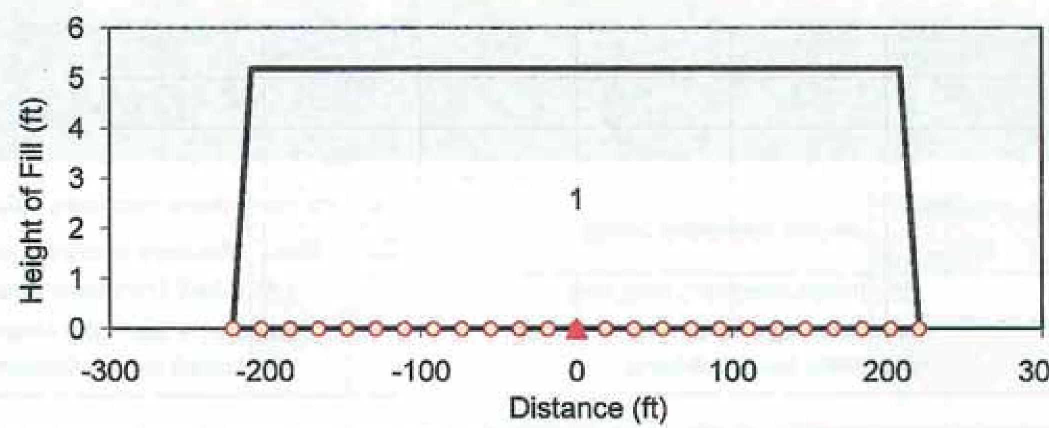
Calculated Slopes	Left Side Slope	2.32H:1V
	Right Side Slope	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-220.71
	Left Y	350
	Left X	220.71
	Left Y	350
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

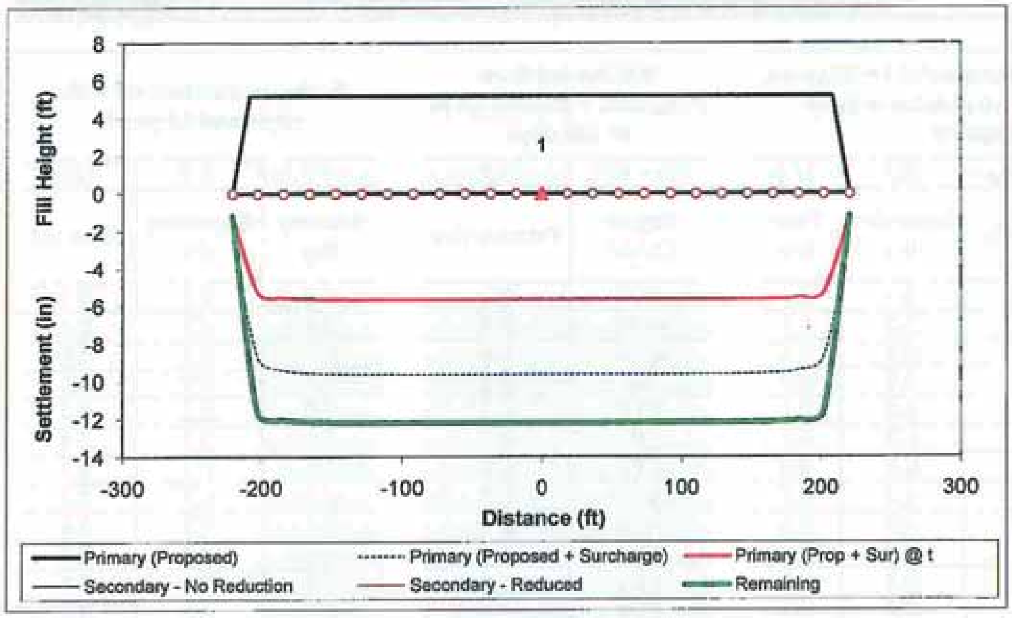
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma'$ to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		*Settlement Parameters*						*Time Rate of Settlement Values*					*Wicks*	*Strength Values*	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_{α}	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	41	65	0.148	0.000	1.0	0.014	0.0000	Yes	1	0.7	No	Yes			
41	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 350.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation
- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 360 days

Secondary Consolidation
- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 360 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 360 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***9.7***	***8.2***	***4.0***	***8.2***	***12.2***
-220.7	350	2.5	0.0	1.2	0.0	1.2
-202.3	350	8.7	8.2	3.5	8.2	11.6
-183.9	350	9.4	8.2	3.8	8.2	12.0
-165.5	350	9.6	8.2	3.9	8.2	12.1
-147.1	350	9.6	8.2	4.0	8.2	12.2
-128.7	350	9.6	8.2	4.0	8.2	12.2
-110.4	350	9.6	8.2	4.0	8.2	12.2
-92.0	350	9.6	8.2	4.0	8.2	12.2
-73.6	350	9.7	8.2	4.0	8.2	12.2
-55.2	350	9.7	8.2	4.0	8.2	12.2
-36.8	350	9.7	8.2	4.0	8.2	12.2
-18.4	350	9.7	8.2	4.0	8.2	12.2
0.0	350	9.7	8.2	4.0	8.2	12.2
18.4	350	9.7	8.2	4.0	8.2	12.2
36.8	350	9.7	8.2	4.0	8.2	12.2
55.2	350	9.7	8.2	4.0	8.2	12.2
73.6	350	9.7	8.2	4.0	8.2	12.2
92.0	350	9.6	8.2	4.0	8.2	12.2
110.4	350	9.6	8.2	4.0	8.2	12.2
128.7	350	9.6	8.2	4.0	8.2	12.2
147.1	350	9.6	8.2	4.0	8.2	12.2
165.5	350	9.6	8.2	3.9	8.2	12.1
183.9	350	9.4	8.2	3.8	8.2	12.0
202.3	350	8.7	8.2	3.5	8.2	11.6
220.7	350	2.5	0.0	1.2	0.0	1.2

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 43%	5.7	4.0	8.2	12.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	73%	0.2	0.0	0.1	0.1
1 - 2	0.9	750	0.2	1.1	45%	0.5	0.4	0.2	0.6
2 - 3	0.7	750	0.2	0.9	45%	0.4	0.3	0.2	0.5
3 - 4	0.6	750	0.2	0.8	44%	0.3	0.3	0.2	0.5
4 - 5	0.5	750	0.2	0.7	44%	0.3	0.3	0.2	0.4
5 - 6	0.5	750	0.2	0.7	44%	0.2	0.2	0.2	0.4
6 - 7	0.4	750	0.2	0.6	43%	0.2	0.2	0.2	0.4
7 - 8	0.4	750	0.2	0.6	43%	0.2	0.2	0.2	0.4
8 - 9	0.3	750	0.2	0.5	44%	0.2	0.2	0.2	0.4
9 - 10	0.3	750	0.2	0.5	44%	0.2	0.2	0.2	0.4
10 - 11	0.3	750	0.2	0.5	44%	0.1	0.1	0.2	0.3
11 - 12	0.3	750	0.2	0.5	45%	0.1	0.1	0.2	0.3
12 - 13	0.3	750	0.2	0.4	45%	0.1	0.1	0.2	0.3
13 - 14	0.2	750	0.2	0.4	46%	0.1	0.1	0.2	0.3
14 - 15	0.2	750	0.2	0.4	47%	0.1	0.1	0.2	0.3
15 - 16	0.2	750	0.2	0.4	48%	0.1	0.1	0.2	0.3
16 - 17	0.2	750	0.2	0.4	49%	0.1	0.1	0.2	0.3
17 - 18	0.2	750	0.2	0.4	50%	0.1	0.1	0.2	0.3
18 - 19	0.2	750	0.2	0.4	51%	0.1	0.1	0.2	0.3
19 - 20	0.2	750	0.2	0.4	53%	0.1	0.1	0.2	0.3
20 - 21	0.2	750	0.2	0.4	54%	0.1	0.1	0.2	0.3
21 - 22	0.2	750	0.2	0.4	56%	0.1	0.1	0.2	0.3
22 - 23	0.2	750	0.2	0.4	57%	0.1	0.1	0.2	0.3
23 - 24	0.1	750	0.2	0.3	59%	0.1	0.1	0.2	0.3
24 - 25	0.1	750	0.2	0.3	61%	0.1	0.1	0.2	0.2
25 - 26	0.1	750	0.2	0.3	63%	0.1	0.0	0.2	0.2
26 - 27	0.1	750	0.2	0.3	65%	0.1	0.0	0.2	0.2
27 - 28	0.1	750	0.2	0.3	67%	0.1	0.0	0.2	0.2
28 - 29	0.1	750	0.2	0.3	69%	0.1	0.0	0.2	0.2
29 - 30	0.1	750	0.2	0.3	71%	0.1	0.0	0.2	0.2
30 - 31	0.1	750	0.2	0.3	74%	0.1	0.0	0.2	0.2
31 - 32	0.1	750	0.2	0.3	76%	0.1	0.0	0.2	0.2
32 - 33	0.1	750	0.2	0.3	78%	0.1	0.0	0.2	0.2
33 - 34	0.1	750	0.2	0.3	81%	0.1	0.0	0.2	0.2
34 - 35	0.1	750	0.2	0.3	83%	0.1	0.0	0.2	0.2
35 - 36	0.1	750	0.2	0.3	86%	0.1	0.0	0.2	0.2
36 - 37	0.1	750	0.2	0.3	88%	0.1	0.0	0.2	0.2
37 - 38	0.1	645	0.2	0.3	91%	0.1	0.0	0.2	0.2
38 - 39	0.1	486	0.2	0.3	93%	0.1	0.0	0.2	0.2
39 - 40	0.1	258	0.3	0.4	96%	0.1	0.0	0.3	0.3
40 - 41	0.1	32	0.4	0.5	99%	0.1	0.0	0.4	0.4
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 — Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 43%	5.7	4.0	8.2	12.2
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

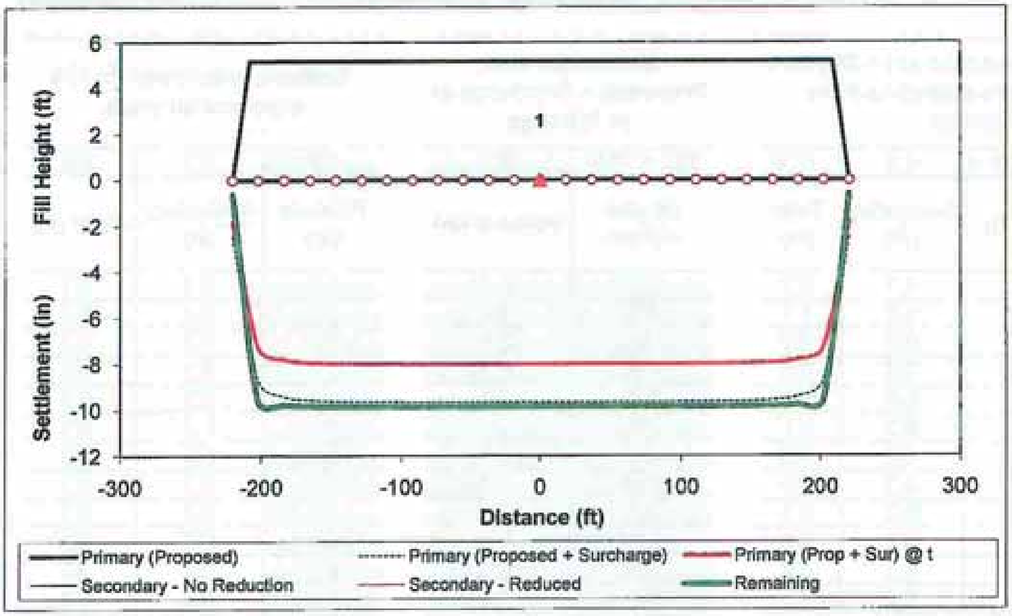
Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 360.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 360 days		Settlement between t = 360 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 43%	5.7	4.0	8.2	12.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation
- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation
- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***9.7***	***8.2***	***1.6***	***8.2***	***9.9***
-220.7	350	2.5	0.0	0.6	0.0	0.6
-202.3	350	8.7	8.2	1.4	8.2	9.6
-183.9	350	9.4	8.2	1.6	8.2	9.8
-165.5	350	9.6	8.2	1.6	8.2	9.8
-147.1	350	9.6	8.2	1.6	8.2	9.9
-128.7	350	9.6	8.2	1.6	8.2	9.9
-110.4	350	9.6	8.2	1.6	8.2	9.9
-92.0	350	9.6	8.2	1.6	8.2	9.9
-73.6	350	9.7	8.2	1.6	8.2	9.9
-55.2	350	9.7	8.2	1.6	8.2	9.9
-36.8	350	9.7	8.2	1.6	8.2	9.9
-18.4	350	9.7	8.2	1.6	8.2	9.9
0.0	350	9.7	8.2	1.6	8.2	9.9
18.4	350	9.7	8.2	1.6	8.2	9.9
36.8	350	9.7	8.2	1.6	8.2	9.9
55.2	350	9.7	8.2	1.6	8.2	9.9
73.6	350	9.7	8.2	1.6	8.2	9.9
92.0	350	9.6	8.2	1.6	8.2	9.9
110.4	350	9.6	8.2	1.6	8.2	9.9
128.7	350	9.6	8.2	1.6	8.2	9.9
147.1	350	9.6	8.2	1.6	8.2	9.9
165.5	350	9.6	8.2	1.6	8.2	9.8
183.9	350	9.4	8.2	1.6	8.2	9.8
202.3	350	8.7	8.2	1.4	8.2	9.6
220.7	350	2.5	0.0	0.6	0.0	0.6

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 75%	8.0	1.6	8.2	9.9
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	88%	0.2	0.0	0.1	0.1
1 - 2	0.9	750	0.2	1.1	76%	0.8	0.1	0.2	0.3
2 - 3	0.7	750	0.2	0.9	75%	0.6	0.1	0.2	0.3
3 - 4	0.6	750	0.2	0.8	75%	0.5	0.1	0.2	0.3
4 - 5	0.5	750	0.2	0.7	75%	0.4	0.1	0.2	0.3
5 - 6	0.5	750	0.2	0.7	75%	0.4	0.1	0.2	0.3
6 - 7	0.4	750	0.2	0.6	75%	0.3	0.1	0.2	0.3
7 - 8	0.4	750	0.2	0.6	75%	0.3	0.1	0.2	0.3
8 - 9	0.3	750	0.2	0.5	75%	0.3	0.1	0.2	0.3
9 - 10	0.3	750	0.2	0.5	75%	0.2	0.1	0.2	0.3
10 - 11	0.3	750	0.2	0.5	75%	0.2	0.1	0.2	0.3
11 - 12	0.3	750	0.2	0.5	76%	0.2	0.1	0.2	0.3
12 - 13	0.3	750	0.2	0.4	76%	0.2	0.1	0.2	0.2
13 - 14	0.2	750	0.2	0.4	76%	0.2	0.1	0.2	0.2
14 - 15	0.2	750	0.2	0.4	77%	0.2	0.0	0.2	0.2
15 - 16	0.2	750	0.2	0.4	77%	0.2	0.0	0.2	0.2
16 - 17	0.2	750	0.2	0.4	77%	0.2	0.0	0.2	0.2
17 - 18	0.2	750	0.2	0.4	78%	0.2	0.0	0.2	0.2
18 - 19	0.2	750	0.2	0.4	79%	0.1	0.0	0.2	0.2
19 - 20	0.2	750	0.2	0.4	79%	0.1	0.0	0.2	0.2
20 - 21	0.2	750	0.2	0.4	80%	0.1	0.0	0.2	0.2
21 - 22	0.2	750	0.2	0.4	80%	0.1	0.0	0.2	0.2
22 - 23	0.2	750	0.2	0.4	81%	0.1	0.0	0.2	0.2
23 - 24	0.1	750	0.2	0.3	82%	0.1	0.0	0.2	0.2
24 - 25	0.1	750	0.2	0.3	83%	0.1	0.0	0.2	0.2
25 - 26	0.1	750	0.2	0.3	84%	0.1	0.0	0.2	0.2
26 - 27	0.1	750	0.2	0.3	85%	0.1	0.0	0.2	0.2
27 - 28	0.1	750	0.2	0.3	85%	0.1	0.0	0.2	0.2
28 - 29	0.1	750	0.2	0.3	86%	0.1	0.0	0.2	0.2
29 - 30	0.1	750	0.2	0.3	87%	0.1	0.0	0.2	0.2
30 - 31	0.1	750	0.2	0.3	88%	0.1	0.0	0.2	0.2
31 - 32	0.1	750	0.2	0.3	89%	0.1	0.0	0.2	0.2
32 - 33	0.1	750	0.2	0.3	90%	0.1	0.0	0.2	0.2
33 - 34	0.1	750	0.2	0.3	92%	0.1	0.0	0.2	0.2
34 - 35	0.1	750	0.2	0.3	93%	0.1	0.0	0.2	0.2
35 - 36	0.1	750	0.2	0.3	94%	0.1	0.0	0.2	0.2
36 - 37	0.1	750	0.2	0.3	95%	0.1	0.0	0.2	0.2
37 - 38	0.1	645	0.2	0.3	96%	0.1	0.0	0.2	0.2
38 - 39	0.1	486	0.2	0.3	97%	0.1	0.0	0.2	0.2
39 - 40	0.1	258	0.3	0.4	98%	0.1	0.0	0.3	0.3
40 - 41	0.1	32	0.4	0.5	99%	0.1	0.0	0.4	0.4
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 75%	8.0	1.6	8.2	9.9
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	9.7	Secondary =	8.2	17.9	Min = 75%	8.0	1.6	8.2	9.9
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B Within the Waste MAX SETTLEMENT @ TOP CAP LAYER**
Date of Analysis:	**March 8, 2011**

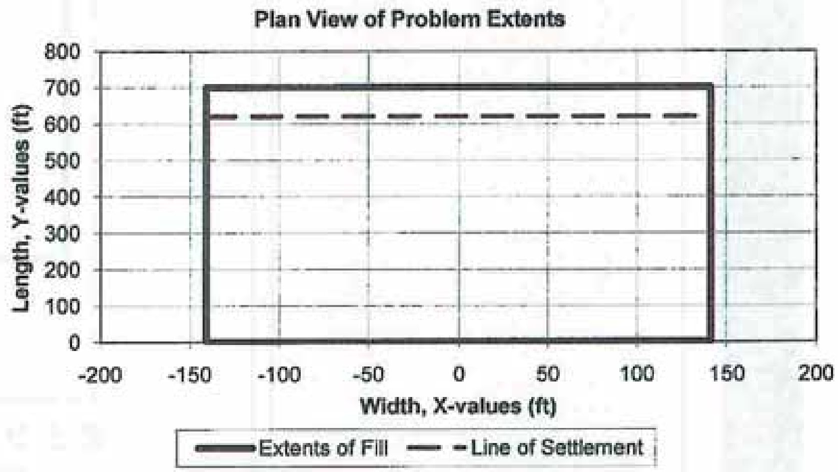
SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 0 Proposed = 1 Surcharge = 0

Line of Settlement Calcs: (15 points along this line.)

Beginning X = -141 Ending X = 141
Beginning Y = 620 Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-141
	Left Z	0
	Right X	141
	Right Z	0
Top of Block (ft)	Left X	-140
	Left Z	14.5
	Right X	140
	Right Z	14.5

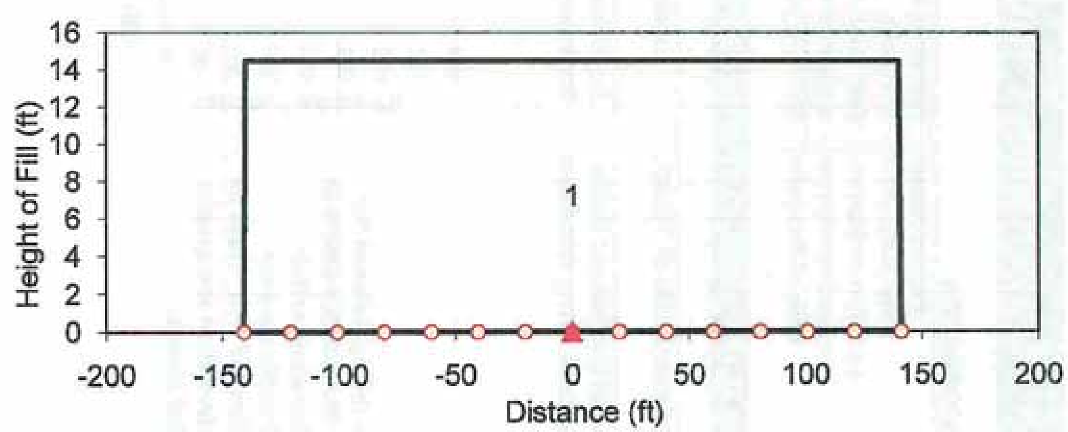
Calculated Slopes	Left Side Slope	0.07H:1V
	Right Side Slope	-0.07H:1V

Line of Settlement Calculations (ft)	Left X	-141
	Left Y	620
	Left X	141
	Left Y	620
	Number of Points	*15*

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

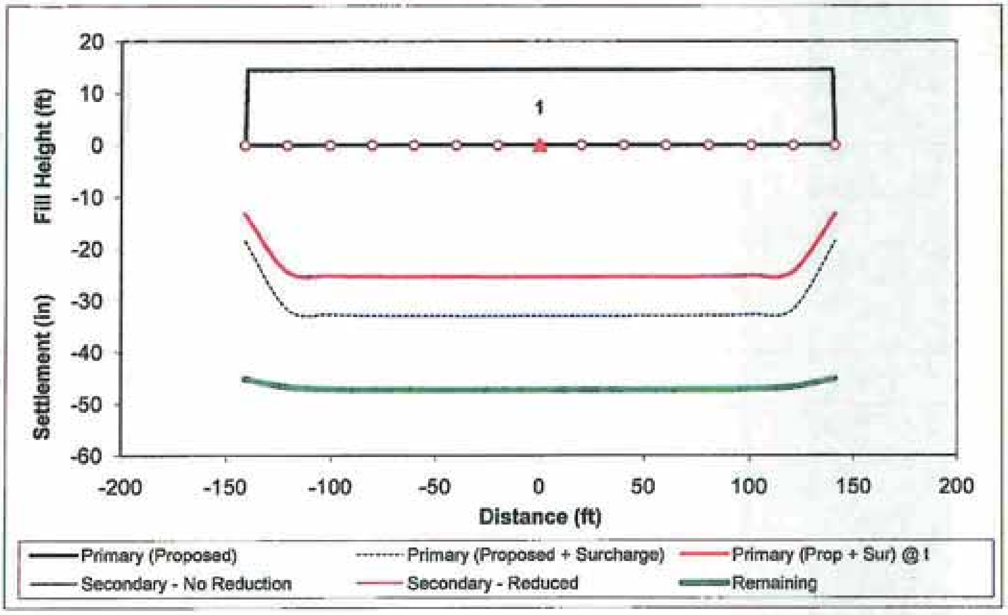
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_α	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	34	65	0.262	0.000	1.0	0.081	0.0000	Yes	1	0.7	No	Yes			
34	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***33.1***	***39.9***	***7.6***	***39.9***	***47.4***
-141.0	620	18.6	39.9	5.3	39.9	45.2
-120.9	620	31.8	39.5	7.3	39.5	46.8
-100.7	620	32.8	39.7	7.5	39.7	47.2
-80.6	620	33.0	39.7	7.6	39.7	47.3
-60.4	620	33.1	39.8	7.6	39.8	47.4
-40.3	620	33.1	39.8	7.6	39.8	47.4
-20.1	620	33.1	39.8	7.6	39.8	47.4
0.0	620	33.1	39.8	7.6	39.8	47.4
20.1	620	33.1	39.8	7.6	39.8	47.4
40.3	620	33.1	39.8	7.6	39.8	47.4
60.4	620	33.1	39.8	7.6	39.8	47.4
80.6	620	33.0	39.7	7.6	39.7	47.3
100.7	620	32.8	39.7	7.5	39.7	47.2
120.9	620	31.8	39.5	7.3	39.5	46.8
141.0	620	18.6	39.9	5.3	39.9	45.2

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 60%	25.5	7.6	39.8	47.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	80%	0.2	0.0	0.1	0.1
1 - 2	2.7	750	1.1	3.8	61%	2.1	0.6	1.1	1.7
2 - 3	2.3	750	1.1	3.4	60%	1.8	0.5	1.1	1.7
3 - 4	2.0	750	1.1	3.1	60%	1.5	0.5	1.1	1.6
4 - 5	1.8	750	1.1	2.9	60%	1.3	0.5	1.1	1.6
5 - 6	1.6	750	1.1	2.8	60%	1.2	0.4	1.1	1.6
6 - 7	1.5	750	1.1	2.6	60%	1.1	0.4	1.1	1.6
7 - 8	1.4	750	1.1	2.5	60%	1.0	0.4	1.1	1.5
8 - 9	1.3	750	1.1	2.4	61%	0.9	0.4	1.1	1.5
9 - 10	1.2	750	1.1	2.3	61%	0.8	0.4	1.1	1.5
10 - 11	1.1	750	1.1	2.3	62%	0.8	0.3	1.1	1.5
11 - 12	1.1	750	1.1	2.2	62%	0.7	0.3	1.1	1.4
12 - 13	1.0	750	1.1	2.1	63%	0.7	0.3	1.1	1.4
13 - 14	1.0	750	1.1	2.1	64%	0.7	0.3	1.1	1.4
14 - 15	0.9	750	1.1	2.0	65%	0.7	0.3	1.1	1.4
15 - 16	0.9	750	1.1	2.0	66%	0.6	0.2	1.1	1.4
16 - 17	0.8	750	1.1	2.0	67%	0.6	0.2	1.1	1.4
17 - 18	0.8	750	1.1	1.9	69%	0.6	0.2	1.1	1.3
18 - 19	0.8	750	1.1	1.9	70%	0.6	0.2	1.1	1.3
19 - 20	0.7	750	1.1	1.9	71%	0.6	0.2	1.1	1.3
20 - 21	0.7	750	1.1	1.8	73%	0.5	0.2	1.1	1.3
21 - 22	0.7	750	1.1	1.8	75%	0.5	0.1	1.1	1.3
22 - 23	0.7	750	1.1	1.8	76%	0.5	0.1	1.1	1.3
23 - 24	0.6	750	1.1	1.8	78%	0.5	0.1	1.1	1.2
24 - 25	0.6	750	1.1	1.7	80%	0.5	0.1	1.1	1.2
25 - 26	0.6	750	1.1	1.7	82%	0.5	0.1	1.1	1.2
26 - 27	0.6	750	1.1	1.7	84%	0.5	0.1	1.1	1.2
27 - 28	0.6	724	1.1	1.7	86%	0.5	0.1	1.1	1.2
28 - 29	0.5	670	1.2	1.7	88%	0.5	0.1	1.2	1.2
29 - 30	0.5	604	1.2	1.8	90%	0.5	0.0	1.2	1.3
30 - 31	0.5	520	1.3	1.8	92%	0.5	0.0	1.3	1.3
31 - 32	0.5	408	1.4	1.9	94%	0.5	0.0	1.4	1.4
32 - 33	0.5	239	1.6	2.1	97%	0.5	0.0	1.6	1.6
33 - 34	0.5	32	2.5	2.9	99%	0.5	0.0	2.5	2.5
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 60%	25.5	7.6	39.8	47.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

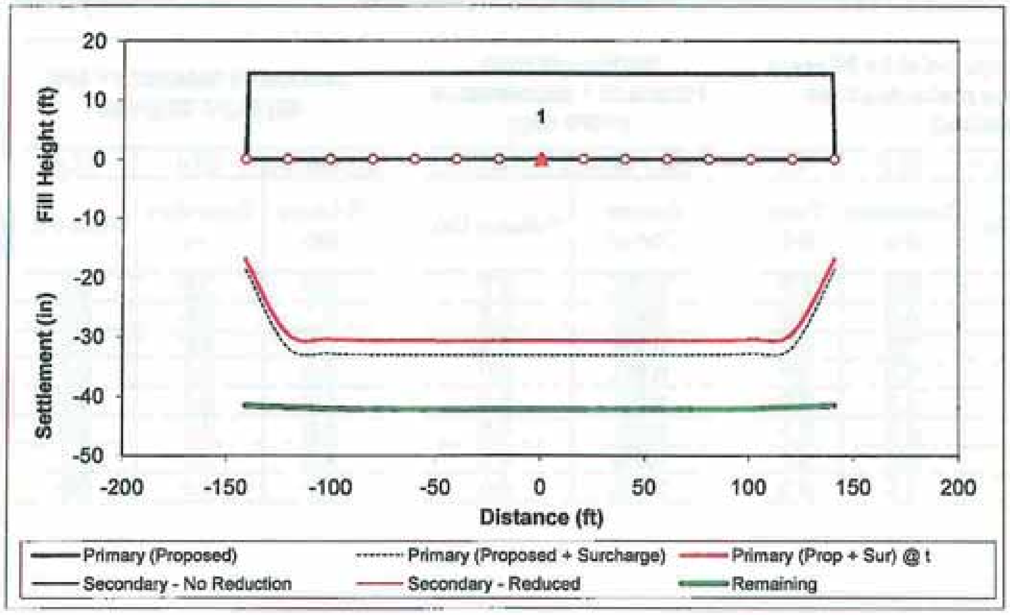
Squish - Detailed Settlement Results

View results at: X=0, Y=620 Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 60%	25.5	7.6	39.8	47.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 735.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation
- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 735 days

Secondary Consolidation
- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 735 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 735 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***33.1***	***39.9***	***2.4***	***39.9***	***42.2***
-141.0	620	18.6	39.9	1.7	39.9	41.6
-120.9	620	31.8	39.5	2.3	39.5	41.8
-100.7	620	32.8	39.7	2.4	39.7	42.1
-80.6	620	33.0	39.7	2.4	39.7	42.2
-60.4	620	33.1	39.8	2.4	39.8	42.2
-40.3	620	33.1	39.8	2.4	39.8	42.2
-20.1	620	33.1	39.8	2.4	39.8	42.2
0.0	620	33.1	39.8	2.4	39.8	42.2
20.1	620	33.1	39.8	2.4	39.8	42.2
40.3	620	33.1	39.8	2.4	39.8	42.2
60.4	620	33.1	39.8	2.4	39.8	42.2
80.6	620	33.0	39.7	2.4	39.7	42.2
100.7	620	32.8	39.7	2.4	39.7	42.1
120.9	620	31.8	39.5	2.3	39.5	41.8
141.0	620	18.6	39.9	1.7	39.9	41.6

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 86%	30.7	2.4	39.8	42.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	93%	0.3	0.0	0.1	0.1
1 - 2	2.7	750	1.1	3.8	86%	2.5	0.2	1.1	1.3
2 - 3	2.3	750	1.1	3.4	86%	2.1	0.2	1.1	1.3
3 - 4	2.0	750	1.1	3.1	86%	1.8	0.2	1.1	1.3
4 - 5	1.8	750	1.1	2.9	86%	1.6	0.1	1.1	1.3
5 - 6	1.6	750	1.1	2.8	86%	1.5	0.1	1.1	1.3
6 - 7	1.5	750	1.1	2.6	86%	1.4	0.1	1.1	1.3
7 - 8	1.4	750	1.1	2.5	86%	1.3	0.1	1.1	1.3
8 - 9	1.3	750	1.1	2.4	86%	1.2	0.1	1.1	1.2
9 - 10	1.2	750	1.1	2.3	87%	1.1	0.1	1.1	1.2
10 - 11	1.1	750	1.1	2.3	87%	1.0	0.1	1.1	1.2
11 - 12	1.1	750	1.1	2.2	87%	1.0	0.1	1.1	1.2
12 - 13	1.0	750	1.1	2.1	87%	0.9	0.1	1.1	1.2
13 - 14	1.0	750	1.1	2.1	88%	0.9	0.1	1.1	1.2
14 - 15	0.9	750	1.1	2.0	88%	0.8	0.1	1.1	1.2
15 - 16	0.9	750	1.1	2.0	88%	0.8	0.1	1.1	1.2
16 - 17	0.8	750	1.1	2.0	89%	0.8	0.1	1.1	1.2
17 - 18	0.8	750	1.1	1.9	89%	0.7	0.1	1.1	1.2
18 - 19	0.8	750	1.1	1.9	90%	0.7	0.1	1.1	1.2
19 - 20	0.7	750	1.1	1.9	90%	0.7	0.1	1.1	1.2
20 - 21	0.7	750	1.1	1.8	91%	0.7	0.1	1.1	1.2
21 - 22	0.7	750	1.1	1.8	91%	0.6	0.0	1.1	1.2
22 - 23	0.7	750	1.1	1.8	92%	0.6	0.0	1.1	1.2
23 - 24	0.6	750	1.1	1.8	92%	0.6	0.0	1.1	1.2
24 - 25	0.6	750	1.1	1.7	93%	0.6	0.0	1.1	1.2
25 - 26	0.6	750	1.1	1.7	94%	0.6	0.0	1.1	1.2
26 - 27	0.6	750	1.1	1.7	94%	0.6	0.0	1.1	1.2
27 - 28	0.6	724	1.1	1.7	95%	0.5	0.0	1.1	1.2
28 - 29	0.5	670	1.2	1.7	96%	0.5	0.0	1.2	1.2
29 - 30	0.5	604	1.2	1.8	97%	0.5	0.0	1.2	1.2
30 - 31	0.5	520	1.3	1.8	97%	0.5	0.0	1.3	1.3
31 - 32	0.5	408	1.4	1.9	98%	0.5	0.0	1.4	1.4
32 - 33	0.5	239	1.6	2.1	99%	0.5	0.0	1.6	1.6
33 - 34	0.5	32	2.5	2.9	100%	0.5	0.0	2.5	2.5
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 86%	30.7	2.4	39.8	42.2
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	33.1	Secondary =	39.8	72.9	Min = 86%	30.7	2.4	39.8	42.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

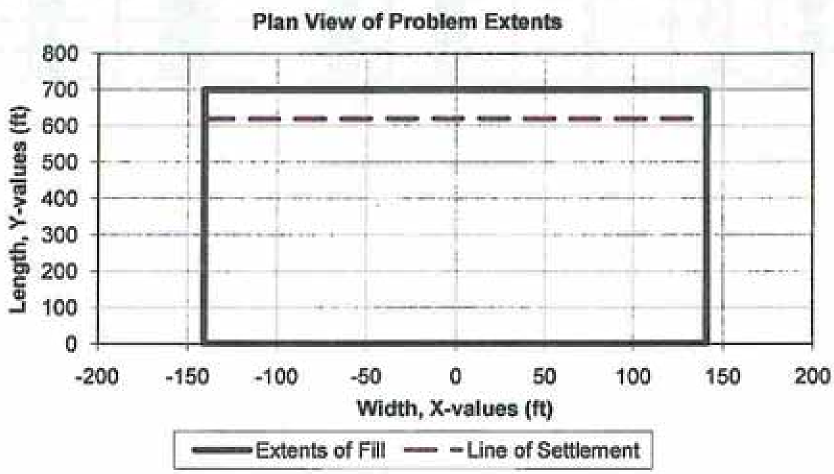
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B Within the Waste MIN SETTLEMENT @ TOP CAP LAYER**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 0 Proposed = 1 Surcharge = 0

Line of Settlement Calcs: Beginning X = -141 Ending X = 141
(15 points along this line.) Beginning Y = 620 Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-141
	Left Z	0
	Right X	141
	Right Z	0
Top of Block (ft)	Left X	-140
	Left Z	14.5
	Right X	140
	Right Z	14.5

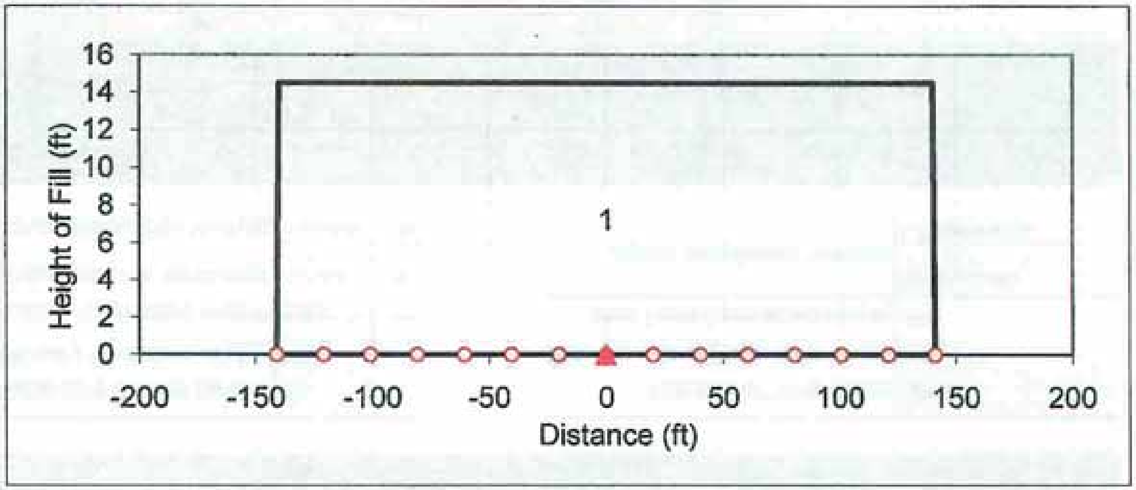
Calculated Slopes	Left Side Slope	0.07H:1V
	Right Side Slope	-0.07H:1V

Line of Settlement Calculations (ft)	Left X	-141
	Left Y	620
	Left X	141
	Left Y	620
	Number of Points	*15*

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	(●) Boussinesq ( ) Westergaard

Layer Thickness		*Settlement Parameters*						*Time Rate of Settlement Values*					*Wicks*	*Strength Values*	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_{α}	$C_{\alpha r}$	Time Dependent	Cv (ft^2/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft^2/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	34	65	0.148	0.000	1.0	0.014	0.0000	Yes	1	0.7	No	Yes			
34	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

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3/8/2011

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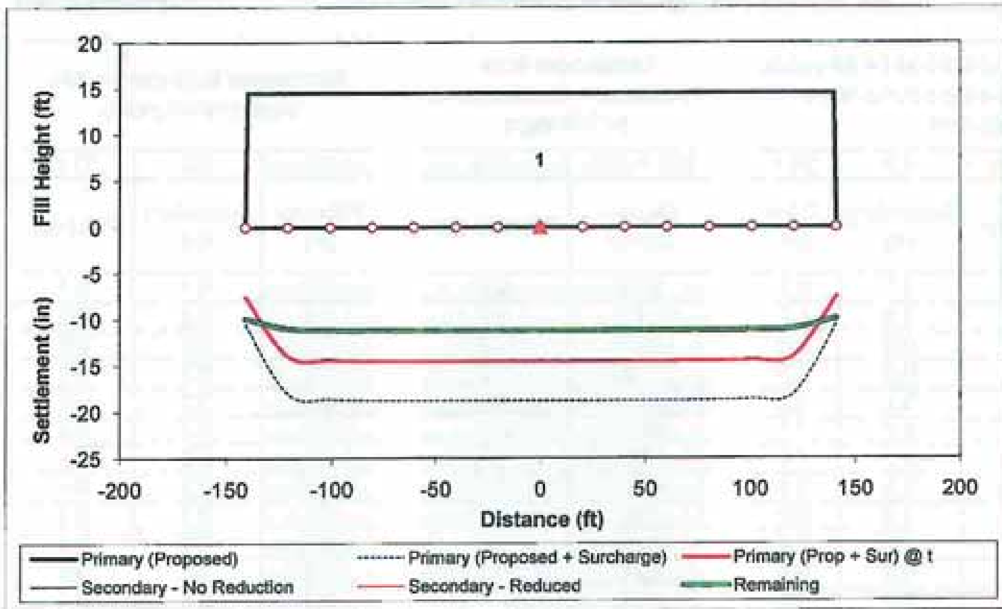
Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***18.8***	***6.9***	***4.3***	***6.9***	***11.2***
-141.0	620	10.6	6.9	3.0	6.9	9.9
-120.9	620	18.1	6.9	4.1	6.9	11.0
-100.7	620	18.6	6.9	4.3	6.9	11.2
-80.6	620	18.8	6.9	4.3	6.9	11.2
-60.4	620	18.8	6.9	4.3	6.9	11.2
-40.3	620	18.8	6.9	4.3	6.9	11.2
-20.1	620	18.8	6.9	4.3	6.9	11.2
0.0	620	18.8	6.9	4.3	6.9	11.2
20.1	620	18.8	6.9	4.3	6.9	11.2
40.3	620	18.8	6.9	4.3	6.9	11.2
60.4	620	18.8	6.9	4.3	6.9	11.2
80.6	620	18.8	6.9	4.3	6.9	11.2
100.7	620	18.6	6.9	4.3	6.9	11.2
120.9	620	18.1	6.9	4.1	6.9	11.0
141.0	620	10.6	6.9	3.0	6.9	9.9

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 60%	14.5	4.3	6.9	11.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	80%	0.2	0.0	0.1	0.1
1 - 2	1.5	750	0.2	1.7	61%	1.2	0.3	0.2	0.5
2 - 3	1.3	750	0.2	1.5	60%	1.0	0.3	0.2	0.5
3 - 4	1.1	750	0.2	1.3	60%	0.8	0.3	0.2	0.5
4 - 5	1.0	750	0.2	1.2	60%	0.7	0.3	0.2	0.5
5 - 6	0.9	750	0.2	1.1	60%	0.7	0.3	0.2	0.4
6 - 7	0.8	750	0.2	1.0	60%	0.6	0.2	0.2	0.4
7 - 8	0.8	750	0.2	1.0	60%	0.6	0.2	0.2	0.4
8 - 9	0.7	750	0.2	0.9	61%	0.5	0.2	0.2	0.4
9 - 10	0.7	750	0.2	0.9	61%	0.5	0.2	0.2	0.4
10 - 11	0.6	750	0.2	0.8	62%	0.4	0.2	0.2	0.4
11 - 12	0.6	750	0.2	0.8	62%	0.4	0.2	0.2	0.4
12 - 13	0.6	750	0.2	0.8	63%	0.4	0.2	0.2	0.4
13 - 14	0.5	750	0.2	0.7	64%	0.4	0.2	0.2	0.3
14 - 15	0.5	750	0.2	0.7	65%	0.4	0.1	0.2	0.3
15 - 16	0.5	750	0.2	0.7	66%	0.4	0.1	0.2	0.3
16 - 17	0.5	750	0.2	0.7	67%	0.3	0.1	0.2	0.3
17 - 18	0.4	750	0.2	0.6	69%	0.3	0.1	0.2	0.3
18 - 19	0.4	750	0.2	0.6	70%	0.3	0.1	0.2	0.3
19 - 20	0.4	750	0.2	0.6	71%	0.3	0.1	0.2	0.3
20 - 21	0.4	750	0.2	0.6	73%	0.3	0.1	0.2	0.3
21 - 22	0.4	750	0.2	0.6	75%	0.3	0.1	0.2	0.3
22 - 23	0.4	750	0.2	0.6	76%	0.3	0.1	0.2	0.3
23 - 24	0.4	750	0.2	0.6	78%	0.3	0.1	0.2	0.3
24 - 25	0.3	750	0.2	0.5	80%	0.3	0.1	0.2	0.3
25 - 26	0.3	750	0.2	0.5	82%	0.3	0.1	0.2	0.2
26 - 27	0.3	750	0.2	0.5	84%	0.3	0.0	0.2	0.2
27 - 28	0.3	724	0.2	0.5	86%	0.3	0.0	0.2	0.2
28 - 29	0.3	670	0.2	0.5	88%	0.3	0.0	0.2	0.2
29 - 30	0.3	604	0.2	0.5	90%	0.3	0.0	0.2	0.2
30 - 31	0.3	520	0.2	0.5	92%	0.3	0.0	0.2	0.2
31 - 32	0.3	408	0.2	0.5	94%	0.3	0.0	0.2	0.3
32 - 33	0.3	239	0.3	0.6	97%	0.3	0.0	0.3	0.3
33 - 34	0.3	32	0.4	0.7	99%	0.3	0.0	0.4	0.4
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=620 — Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 60%	14.5	4.3	6.9	11.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

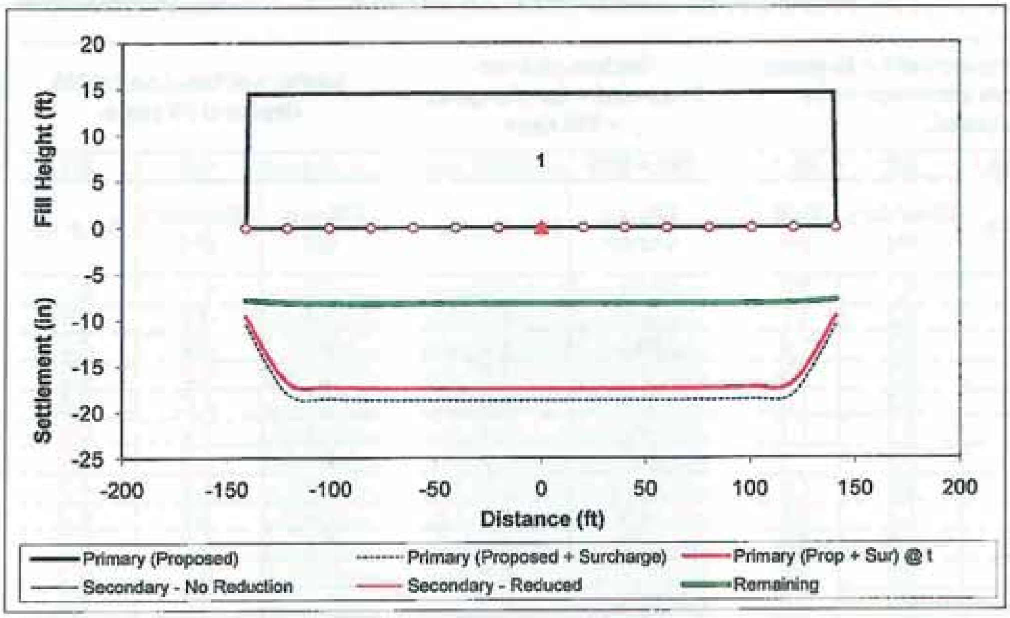
Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 60%	14.5	4.3	6.9	11.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 735.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 735 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 735 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 735 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***18.8***	***6.9***	***1.4***	***6.9***	***8.3***
-141.0	620	10.6	6.9	1.0	6.9	7.9
-120.9	620	18.1	6.9	1.3	6.9	8.2
-100.7	620	18.6	6.9	1.4	6.9	8.3
-80.6	620	18.8	6.9	1.4	6.9	8.3
-60.4	620	18.8	6.9	1.4	6.9	8.3
-40.3	620	18.8	6.9	1.4	6.9	8.3
-20.1	620	18.8	6.9	1.4	6.9	8.3
0.0	620	18.8	6.9	1.4	6.9	8.3
20.1	620	18.8	6.9	1.4	6.9	8.3
40.3	620	18.8	6.9	1.4	6.9	8.3
60.4	620	18.8	6.9	1.4	6.9	8.3
80.6	620	18.8	6.9	1.4	6.9	8.3
100.7	620	18.6	6.9	1.4	6.9	8.3
120.9	620	18.1	6.9	1.3	6.9	8.2
141.0	620	10.6	6.9	1.0	6.9	7.9

Squish - Detailed Settlement Results

View results at: X=0, Y=620   Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 86%	17.5	1.4	6.9	8.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	93%	0.3	0.0	0.1	0.1
1 - 2	1.5	750	0.2	1.7	86%	1.4	0.1	0.2	0.3
2 - 3	1.3	750	0.2	1.5	86%	1.2	0.1	0.2	0.3
3 - 4	1.1	750	0.2	1.3	86%	1.0	0.1	0.2	0.3
4 - 5	1.0	750	0.2	1.2	86%	0.9	0.1	0.2	0.3
5 - 6	0.9	750	0.2	1.1	86%	0.8	0.1	0.2	0.3
6 - 7	0.8	750	0.2	1.0	86%	0.8	0.1	0.2	0.3
7 - 8	0.8	750	0.2	1.0	86%	0.7	0.1	0.2	0.3
8 - 9	0.7	750	0.2	0.9	86%	0.7	0.1	0.2	0.3
9 - 10	0.7	750	0.2	0.9	87%	0.6	0.1	0.2	0.3
10 - 11	0.6	750	0.2	0.8	87%	0.6	0.1	0.2	0.3
11 - 12	0.6	750	0.2	0.8	87%	0.5	0.1	0.2	0.3
12 - 13	0.6	750	0.2	0.8	87%	0.5	0.1	0.2	0.2
13 - 14	0.5	750	0.2	0.7	88%	0.5	0.0	0.2	0.2
14 - 15	0.5	750	0.2	0.7	88%	0.5	0.0	0.2	0.2
15 - 16	0.5	750	0.2	0.7	88%	0.4	0.0	0.2	0.2
16 - 17	0.5	750	0.2	0.7	89%	0.4	0.0	0.2	0.2
17 - 18	0.4	750	0.2	0.6	89%	0.4	0.0	0.2	0.2
18 - 19	0.4	750	0.2	0.6	90%	0.4	0.0	0.2	0.2
19 - 20	0.4	750	0.2	0.6	90%	0.4	0.0	0.2	0.2
20 - 21	0.4	750	0.2	0.6	91%	0.4	0.0	0.2	0.2
21 - 22	0.4	750	0.2	0.6	91%	0.4	0.0	0.2	0.2
22 - 23	0.4	750	0.2	0.6	92%	0.3	0.0	0.2	0.2
23 - 24	0.4	750	0.2	0.6	92%	0.3	0.0	0.2	0.2
24 - 25	0.3	750	0.2	0.5	93%	0.3	0.0	0.2	0.2
25 - 26	0.3	750	0.2	0.5	94%	0.3	0.0	0.2	0.2
26 - 27	0.3	750	0.2	0.5	94%	0.3	0.0	0.2	0.2
27 - 28	0.3	724	0.2	0.5	95%	0.3	0.0	0.2	0.2
28 - 29	0.3	670	0.2	0.5	96%	0.3	0.0	0.2	0.2
29 - 30	0.3	604	0.2	0.5	97%	0.3	0.0	0.2	0.2
30 - 31	0.3	520	0.2	0.5	97%	0.3	0.0	0.2	0.2
31 - 32	0.3	408	0.2	0.5	98%	0.3	0.0	0.2	0.2
32 - 33	0.3	239	0.3	0.6	99%	0.3	0.0	0.3	0.3
33 - 34	0.3	32	0.4	0.7	100%	0.3	0.0	0.4	0.4
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 86%	17.5	1.4	6.9	8.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	18.8	Secondary =	6.9	25.7	Min = 86%	17.5	1.4	6.9	8.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

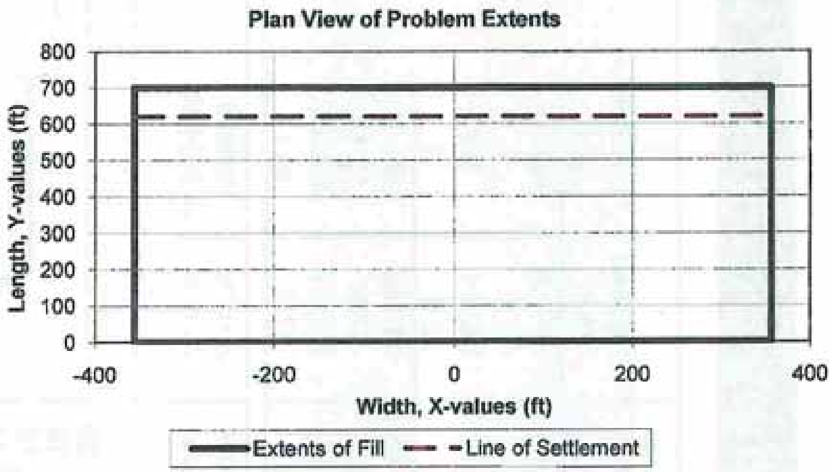
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B MIN SETTLEMENT @ BOTTOM OF PROPOSED WASTE FILL**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 1 Proposed = 3 Surcharge = 0

Line of Settlement Calcs: Beginning X = -356 Ending X = 356
(25 points along this line.) Beginning Y = 620 Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

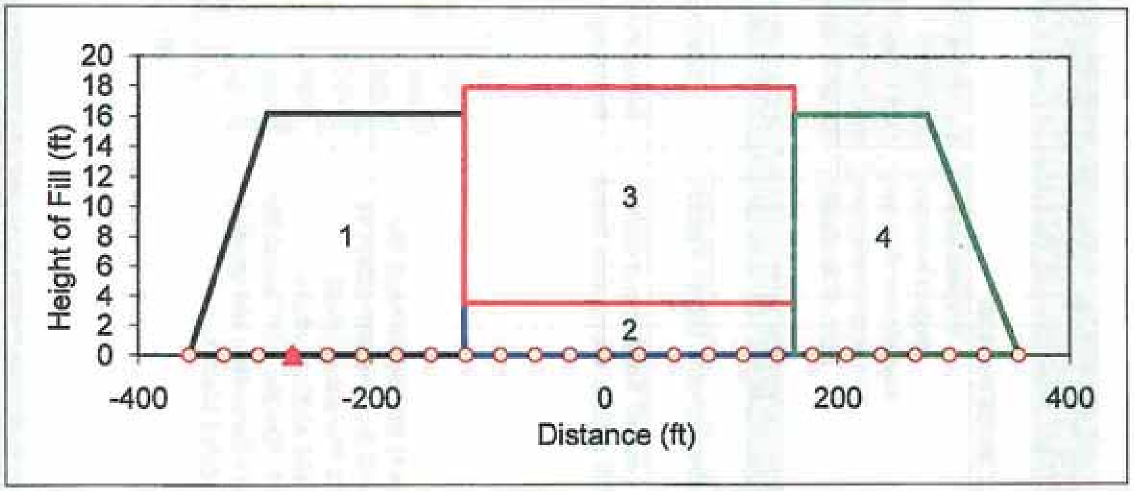
	Block Number	1	2	3	4
	Fill Type	Proposed	Existing	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-356	-119.66	-119.66	162.41
	Left Z	0	0	3.5	0
	Right X	-119.66	162.41	162.41	356
	Right Z	0	0	3.5	0
Top of Block (ft)	Left X	-289	-119.66	-119.66	162.41
	Left Z	16.14	3.5	17.9	16.11
	Right X	-119.66	162.41	162.41	276.85
	Right Z	16.14	3.5	17.9	16.11
Calculated Slopes	Left Side Slope	4.15H:1V	Vertical	Vertical	Vertical
	Right Side Slope	Vertical	Vertical	Vertical	-4.91H:1V

Line of Settlement Calculations (ft)	Left X	-356
	Left Y	620
	Left X	356
	Left Y	620
	Number of Points	*25*

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

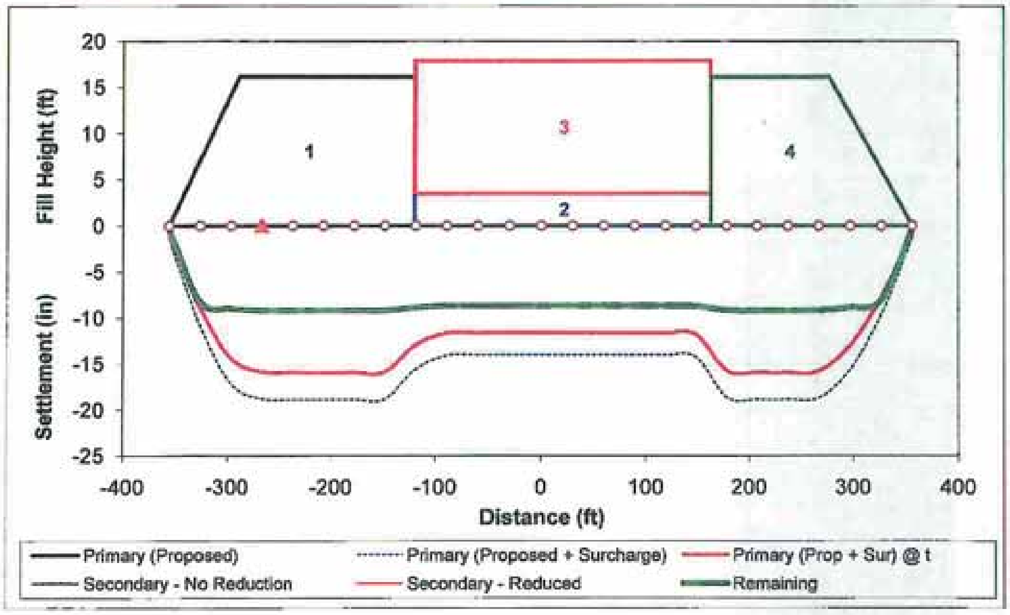
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma'$ to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_{α}	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_r (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	30	65	0.148	0.000	1.0	0.014	0.0000	Yes	1	0.7	No	Yes			
30	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 375 days							
Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.			
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***18.9***	***6.2***	***3.0***	***6.2***	***9.2***
-356.0	620	1.5	0.0	0.4	0.0	0.4
-326.3	620	10.9	6.2	2.0	6.2	8.3
-296.7	620	17.2	6.2	2.8	6.2	9.0
-267.0	620	18.8	6.2	3.0	6.2	9.2
-237.3	620	18.9	6.2	3.0	6.2	9.2
-207.7	620	18.9	6.2	3.0	6.2	9.2
-178.0	620	18.9	6.2	3.0	6.2	9.2
-148.3	620	18.9	6.2	3.0	6.2	9.2
-118.7	620	15.6	6.2	2.7	6.2	8.9
-89.0	620	14.1	6.2	2.5	6.2	8.7
-59.3	620	14.1	6.2	2.5	6.2	8.7
-29.7	620	14.1	6.2	2.5	6.2	8.7
0.0	620	14.1	6.2	2.5	6.2	8.7
29.7	620	14.1	6.2	2.5	6.2	8.7
59.3	620	14.1	6.2	2.5	6.2	8.7
89.0	620	14.1	6.2	2.5	6.2	8.7
118.7	620	14.1	6.2	2.5	6.2	8.7
148.3	620	14.3	6.2	2.5	6.2	8.7
178.0	620	18.7	6.2	3.0	6.2	9.2
207.7	620	18.9	6.2	3.0	6.2	9.2
237.3	620	18.9	6.2	3.0	6.2	9.2
267.0	620	18.7	6.2	3.0	6.2	9.2
296.7	620	15.6	6.2	2.6	6.2	8.9
326.3	620	9.7	6.2	1.9	6.2	8.1
356.0	620	1.3	0.0	0.4	0.0	0.4

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.2	25.1	Min = 70%	15.9	3.0	6.2	9.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	85%	0.3	0.0	0.1	0.1
1 - 2	1.6	750	0.2	1.8	70%	1.4	0.2	0.2	0.4
2 - 3	1.4	750	0.2	1.6	70%	1.1	0.2	0.2	0.4
3 - 4	1.2	750	0.2	1.4	70%	1.0	0.2	0.2	0.4
4 - 5	1.1	750	0.2	1.3	70%	0.9	0.2	0.2	0.4
5 - 6	1.0	750	0.2	1.2	70%	0.8	0.2	0.2	0.4
6 - 7	0.9	750	0.2	1.1	70%	0.7	0.2	0.2	0.4
7 - 8	0.8	750	0.2	1.0	71%	0.7	0.2	0.2	0.4
8 - 9	0.8	750	0.2	1.0	71%	0.6	0.2	0.2	0.4
9 - 10	0.7	750	0.2	0.9	71%	0.6	0.1	0.2	0.3
10 - 11	0.7	750	0.2	0.9	72%	0.5	0.1	0.2	0.3
11 - 12	0.6	750	0.2	0.8	73%	0.5	0.1	0.2	0.3
12 - 13	0.6	750	0.2	0.8	74%	0.5	0.1	0.2	0.3
13 - 14	0.6	750	0.2	0.8	74%	0.5	0.1	0.2	0.3
14 - 15	0.6	750	0.2	0.7	75%	0.4	0.1	0.2	0.3
15 - 16	0.5	750	0.2	0.7	77%	0.4	0.1	0.2	0.3
16 - 17	0.5	750	0.2	0.7	78%	0.4	0.1	0.2	0.3
17 - 18	0.5	750	0.2	0.7	79%	0.4	0.1	0.2	0.3
18 - 19	0.5	743	0.2	0.7	80%	0.4	0.1	0.2	0.3
19 - 20	0.4	723	0.2	0.6	82%	0.4	0.1	0.2	0.3
20 - 21	0.4	700	0.2	0.6	83%	0.4	0.1	0.2	0.3
21 - 22	0.4	674	0.2	0.6	85%	0.4	0.1	0.2	0.3
22 - 23	0.4	643	0.2	0.6	86%	0.4	0.0	0.2	0.3
23 - 24	0.4	608	0.2	0.6	88%	0.3	0.0	0.2	0.2
24 - 25	0.4	566	0.2	0.6	90%	0.3	0.0	0.2	0.2
25 - 26	0.4	515	0.2	0.6	92%	0.3	0.0	0.2	0.2
26 - 27	0.3	449	0.2	0.6	93%	0.3	0.0	0.2	0.3
27 - 28	0.3	361	0.2	0.6	95%	0.3	0.0	0.2	0.3
28 - 29	0.3	226	0.3	0.6	97%	0.3	0.0	0.3	0.3
29 - 30	0.3	33	0.4	0.7	99%	0.3	0.0	0.4	0.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
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Squish - Detailed Settlement Results

View results at: X=-267, Y=620   Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.2	25.1	Min = 70%	15.9	3.0	6.2	9.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

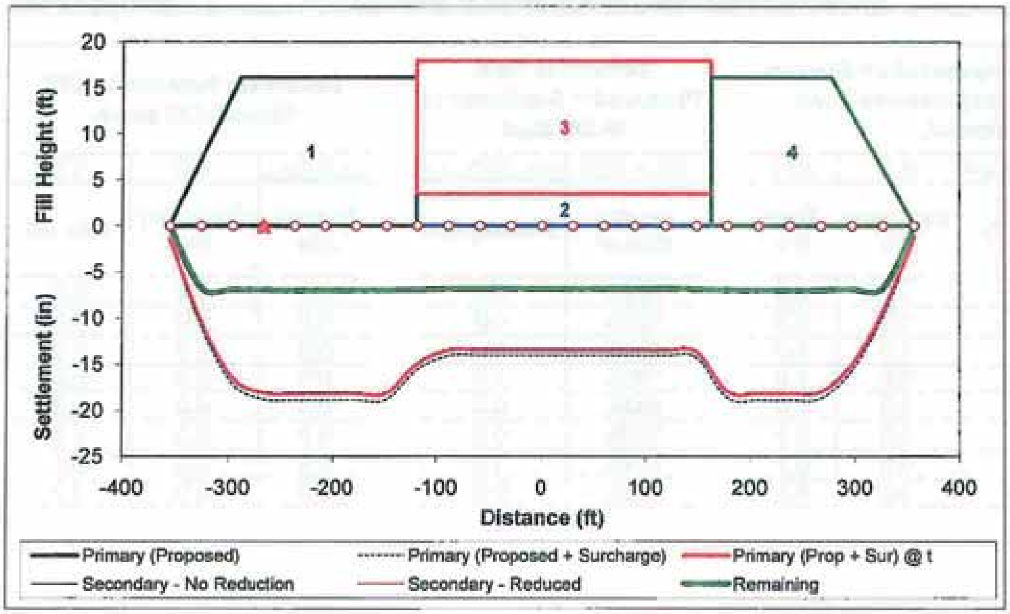
Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	18.8	Secondary =	6.2	25.1	Min = 70%	15.9	3.0	6.2	9.2
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 735.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 735 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 735 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 735 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***18.9***	***6.2***	***0.7***	***6.2***	***7.0***
-356.0	620	1.5	0.0	0.1	0.0	0.1
-326.3	620	10.9	6.2	0.5	6.2	6.7
-296.7	620	17.2	6.2	0.7	6.2	6.9
-267.0	620	18.8	6.2	0.7	6.2	7.0
-237.3	620	18.9	6.2	0.7	6.2	7.0
-207.7	620	18.9	6.2	0.7	6.2	7.0
-178.0	620	18.9	6.2	0.7	6.2	7.0
-148.3	620	18.9	6.2	0.7	6.2	7.0
-118.7	620	15.6	6.2	0.7	6.2	6.9
-89.0	620	14.1	6.2	0.6	6.2	6.9
-59.3	620	14.1	6.2	0.6	6.2	6.8
-29.7	620	14.1	6.2	0.6	6.2	6.8
0.0	620	14.1	6.2	0.6	6.2	6.8
29.7	620	14.1	6.2	0.6	6.2	6.8
59.3	620	14.1	6.2	0.6	6.2	6.8
89.0	620	14.1	6.2	0.6	6.2	6.8
118.7	620	14.1	6.2	0.6	6.2	6.8
148.3	620	14.3	6.2	0.6	6.2	6.9
178.0	620	18.7	6.2	0.7	6.2	7.0
207.7	620	18.9	6.2	0.7	6.2	7.0
237.3	620	18.9	6.2	0.7	6.2	7.0
267.0	620	18.7	6.2	0.7	6.2	6.9
296.7	620	15.6	6.2	0.6	6.2	6.9
326.3	620	9.7	6.2	0.5	6.2	6.7
356.0	620	1.3	0.0	0.1	0.0	0.1

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	18.8	Secondary =	6.2	25.1	Min = 92%	18.1	0.7	6.2	7.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	96%	0.3	0.0	0.1	0.1
1 - 2	1.6	750	0.2	1.8	92%	1.5	0.1	0.2	0.2
2 - 3	1.4	750	0.2	1.6	92%	1.3	0.1	0.2	0.2
3 - 4	1.2	750	0.2	1.4	92%	1.1	0.0	0.2	0.2
4 - 5	1.1	750	0.2	1.3	92%	1.0	0.0	0.2	0.2
5 - 6	1.0	750	0.2	1.2	92%	0.9	0.0	0.2	0.2
6 - 7	0.9	750	0.2	1.1	92%	0.9	0.0	0.2	0.2
7 - 8	0.8	750	0.2	1.0	92%	0.8	0.0	0.2	0.2
8 - 9	0.8	750	0.2	1.0	92%	0.7	0.0	0.2	0.2
9 - 10	0.7	750	0.2	0.9	93%	0.7	0.0	0.2	0.2
10 - 11	0.7	750	0.2	0.9	93%	0.6	0.0	0.2	0.2
11 - 12	0.6	750	0.2	0.8	93%	0.6	0.0	0.2	0.2
12 - 13	0.6	750	0.2	0.8	93%	0.6	0.0	0.2	0.2
13 - 14	0.6	750	0.2	0.8	93%	0.5	0.0	0.2	0.2
14 - 15	0.6	750	0.2	0.7	94%	0.5	0.0	0.2	0.2
15 - 16	0.5	750	0.2	0.7	94%	0.5	0.0	0.2	0.2
16 - 17	0.5	750	0.2	0.7	94%	0.5	0.0	0.2	0.2
17 - 18	0.5	750	0.2	0.7	95%	0.5	0.0	0.2	0.2
18 - 19	0.5	743	0.2	0.7	95%	0.4	0.0	0.2	0.2
19 - 20	0.4	723	0.2	0.6	95%	0.4	0.0	0.2	0.2
20 - 21	0.4	700	0.2	0.6	96%	0.4	0.0	0.2	0.2
21 - 22	0.4	674	0.2	0.6	96%	0.4	0.0	0.2	0.2
22 - 23	0.4	643	0.2	0.6	96%	0.4	0.0	0.2	0.2
23 - 24	0.4	608	0.2	0.6	97%	0.4	0.0	0.2	0.2
24 - 25	0.4	566	0.2	0.6	97%	0.4	0.0	0.2	0.2
25 - 26	0.4	515	0.2	0.6	98%	0.4	0.0	0.2	0.2
26 - 27	0.3	449	0.2	0.6	98%	0.3	0.0	0.2	0.2
27 - 28	0.3	361	0.2	0.6	99%	0.3	0.0	0.2	0.3
28 - 29	0.3	226	0.3	0.6	99%	0.3	0.0	0.3	0.3
29 - 30	0.3	33	0.4	0.7	100%	0.3	0.0	0.4	0.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	18.8	Secondary =	6.2	25.1	Min = 92%	18.1	0.7	6.2	7.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.				
Primary =	18.8	Secondary =	6.2	25.1
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0
93 - 94	0.0	0	0.0	0.0
94 - 95	0.0	0	0.0	0.0
95 - 96	0.0	0	0.0	0.0
96 - 97	0.0	0	0.0	0.0
97 - 98	0.0	0	0.0	0.0
98 - 99	0.0	0	0.0	0.0
99 - 100	0.0	0	0.0	0.0

Settlement from Proposed + Surcharge at t= 735 days	
Min = 92%	18.1
Degree Consol	Primary (in)
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0

Settlement between t = 735 days and 30 years.		
0.7	6.2	7.0
Primary (in)	Secondary (in)	Total (in)
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

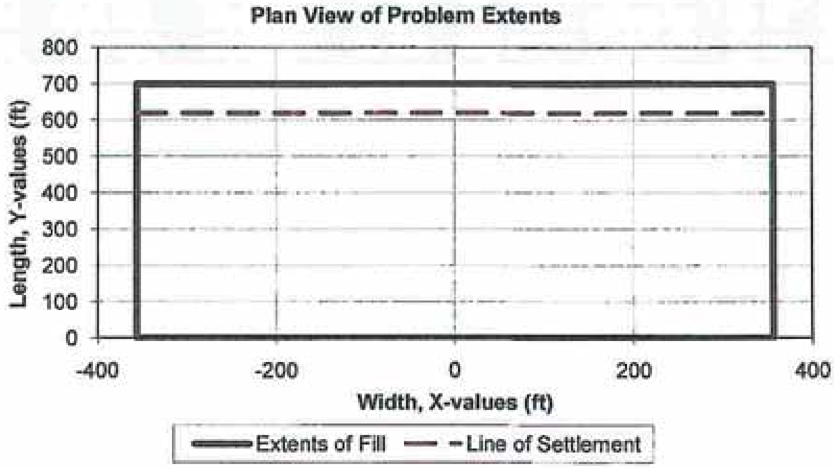
PROJECT INFORMATION

Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B FOUNDATION SETTLEMENT @ MIDDLE OF THE SECTION**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types:	Existing = 4	Proposed = 3	Surcharge = 0
Line of Settlement Calcs:	Beginning X = -356	Ending X = 356	
(25 points along this line.)	Beginning Y = 620	Ending Y = 620	

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	6
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	3000
Maximum Beta	0.5
Maximum Calculated Time (days)	1875
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers	1

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

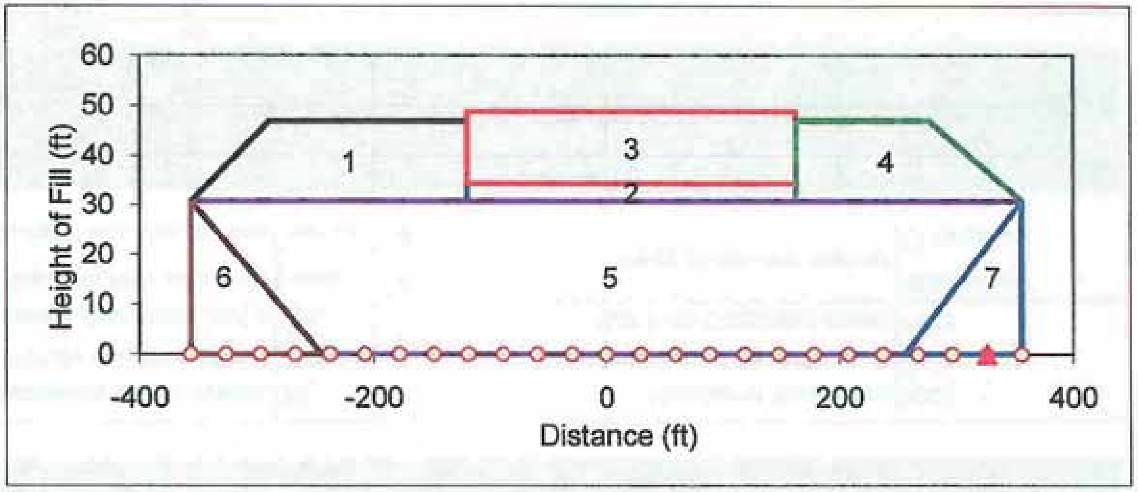
	Block Number	1	2	3	4	5	6	7
	Fill Type	Proposed	Existing	Proposed	Proposed	Existing	Existing	Existing
	γ (pcf)	65.0	65.0	65.0	65.0	65.0	125.0	125.0
Bottom of Block (ft)	Left X	-356	-119.66	-119.66	162.41	-244.26	-356	255.74
	Left Z	30.7	30.7	34.3	30.7	0	0	0
	Right X	-119.66	162.41	162.41	356	255.74	-244.26	356
	Right Z	30.7	30.7	34.3	30.7	0	0	0
Top of Block (ft)	Left X	-289	-119.66	-119.66	162.41	-356	-356	356
	Left Z	46.84	34.3	48.7	46.81	30.7	30.7	30.7
	Right X	-119.66	162.41	162.41	276.85	356	-356	356
	Right Z	46.84	34.3	48.7	46.81	30.7	30.7	30.7
Calculated Slopes	Left Side Slope	4.15H:1V	Vertical	Vertical	Vertical	-3.64H:1V	Vertical	3.27H:1V
	Right Side Slope	Vertical	Vertical	Vertical	-4.91H:1V	3.27H:1V	-3.64H:1V	Vertical

Line of Settlement Calculations (ft)	Left X	-356
	Left Y	620
	Left X	356
	Left Y	620
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft) 100
σ_p' Option OCR

Calculate Settlement and Time for Settlement

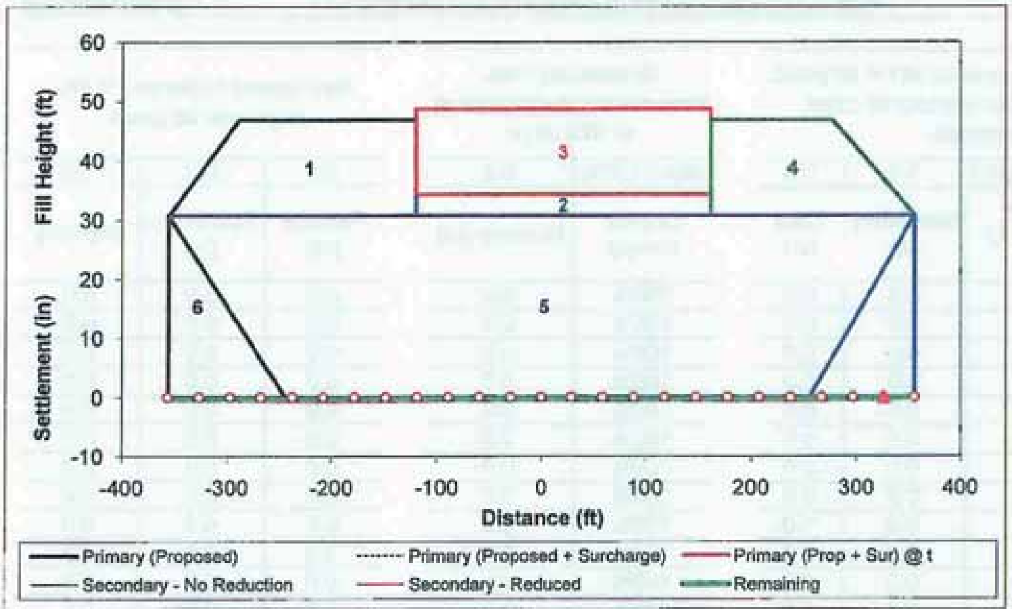
Time for Secondary Consol (years) 30
Assume Primary Complete at Ui = 95%
Min. $\Delta\sigma'$ to Induce Secondary (psf) = 200
Rebound after surcharge Exclude
Secondary Consol Reduction Method New OCR

Number of Time Steps 3000
Maximum Beta (finite difference) 0.5
Max Time Calculated (days) *1875*
Stress distribution method (●) Boussinesq ( ) Westergaard

Layer Thickness		*Settlement Parameters*						*Time Rate of Settlement Values*					*Wicks*	*Strength Values*	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\epsilon c}$	$C_{\epsilon r}$	OCR	C_α	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	5	120	0.003	0.000	1.0	0.000	0.0000	No							
5	16	120	0.020	0.000	1.0	0.000	0.0000	No							
16	20	120	0.015	0.000	1.0	0.000	0.0000	No							
20	50	120	0.004	0.000	1.0	0.000	0.0000	No							
50	52	120	0.012	0.000	1.0	0.004	0.0000	Yes	0.2	0.00028	Yes	Yes			
52	100	125	0.003	0.000	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed
5	Existing
6	Existing
7	Existing

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***0.6***	***0.3***	***0.0***	***0.3***	***0.3***
-356.0	620	0.1	0.3	0.0	0.3	0.3
-326.3	620	0.2	0.3	0.0	0.3	0.3
-296.7	620	0.4	0.3	0.0	0.3	0.3
-267.0	620	0.5	0.3	0.0	0.3	0.3
-237.3	620	0.6	0.3	0.0	0.3	0.3
-207.7	620	0.6	0.3	0.0	0.3	0.3
-178.0	620	0.6	0.3	0.0	0.3	0.3
-148.3	620	0.6	0.3	0.0	0.3	0.3
-118.7	620	0.6	0.3	0.0	0.3	0.3
-89.0	620	0.5	0.3	0.0	0.3	0.3
-59.3	620	0.5	0.3	0.0	0.3	0.3
-29.7	620	0.5	0.3	0.0	0.3	0.3
0.0	620	0.5	0.3	0.0	0.3	0.3
29.7	620	0.5	0.3	0.0	0.3	0.3
59.3	620	0.5	0.3	0.0	0.3	0.3
89.0	620	0.5	0.3	0.0	0.3	0.3
118.7	620	0.5	0.3	0.0	0.3	0.3
148.3	620	0.5	0.3	0.0	0.3	0.3
178.0	620	0.6	0.3	0.0	0.3	0.3
207.7	620	0.6	0.3	0.0	0.3	0.3
237.3	620	0.6	0.3	0.0	0.3	0.3
267.0	620	0.6	0.3	0.0	0.3	0.3
296.7	620	0.4	0.3	0.0	0.3	0.3
326.3	620	0.2	0.3	0.0	0.3	0.3
356.0	620	0.1	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 375.0 days

	Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.				Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
1 - 2	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
2 - 3	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
3 - 4	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
4 - 5	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
5 - 6	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
6 - 7	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
7 - 8	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
8 - 9	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
9 - 10	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
10 - 11	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
11 - 12	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
12 - 13	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
13 - 14	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
14 - 15	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
15 - 16	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
16 - 17	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
17 - 18	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
18 - 19	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
19 - 20	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
20 - 21	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
21 - 22	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
22 - 23	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
23 - 24	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
24 - 25	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
25 - 26	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
26 - 27	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
27 - 28	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
28 - 29	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
29 - 30	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	6	0.2	0.2	100%	0.0	0.0	0.2	0.2
51 - 52	0.0	6	0.2	0.2	100%	0.0	0.0	0.2	0.2
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

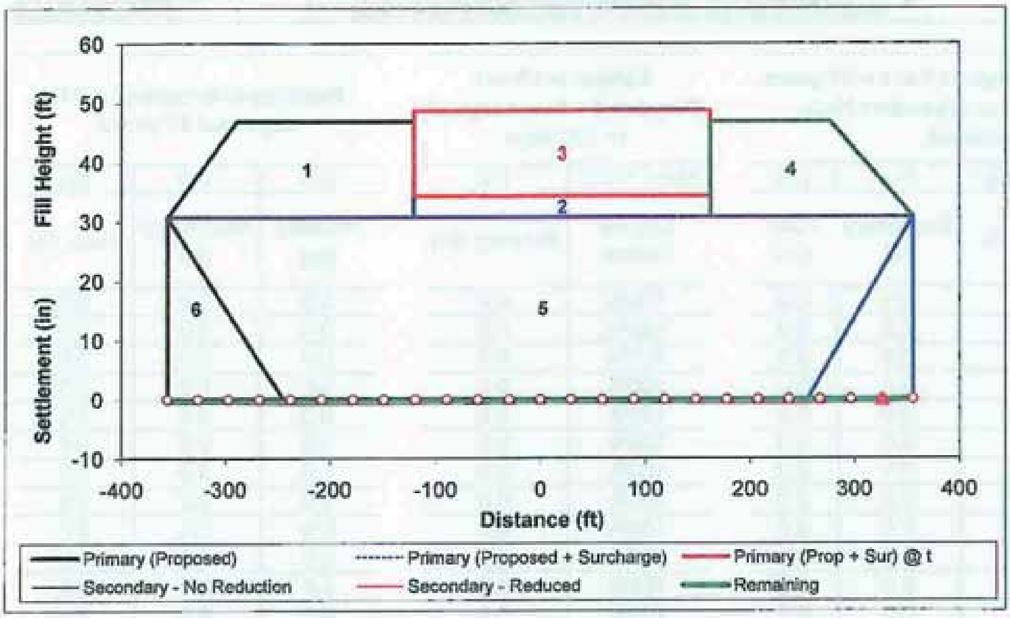
Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed
5	Existing
6	Existing
7	Existing

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***0.6***	***0.3***	***0.0***	***0.3***	***0.3***
-356.0	620	0.1	0.3	0.0	0.3	0.3
-326.3	620	0.2	0.3	0.0	0.3	0.3
-296.7	620	0.4	0.3	0.0	0.3	0.3
-267.0	620	0.5	0.3	0.0	0.3	0.3
-237.3	620	0.6	0.3	0.0	0.3	0.3
-207.7	620	0.6	0.3	0.0	0.3	0.3
-178.0	620	0.6	0.3	0.0	0.3	0.3
-148.3	620	0.6	0.3	0.0	0.3	0.3
-118.7	620	0.6	0.3	0.0	0.3	0.3
-89.0	620	0.5	0.3	0.0	0.3	0.3
-59.3	620	0.5	0.3	0.0	0.3	0.3
-29.7	620	0.5	0.3	0.0	0.3	0.3
0.0	620	0.5	0.3	0.0	0.3	0.3
29.7	620	0.5	0.3	0.0	0.3	0.3
59.3	620	0.5	0.3	0.0	0.3	0.3
89.0	620	0.5	0.3	0.0	0.3	0.3
118.7	620	0.5	0.3	0.0	0.3	0.3
148.3	620	0.5	0.3	0.0	0.3	0.3
178.0	620	0.6	0.3	0.0	0.3	0.3
207.7	620	0.6	0.3	0.0	0.3	0.3
237.3	620	0.6	0.3	0.0	0.3	0.3
267.0	620	0.6	0.3	0.0	0.3	0.3
296.7	620	0.4	0.3	0.0	0.3	0.3
326.3	620	0.2	0.3	0.0	0.3	0.3
356.0	620	0.1	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
1 - 2	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
2 - 3	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
3 - 4	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
4 - 5	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
5 - 6	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
6 - 7	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
7 - 8	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
8 - 9	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
9 - 10	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
10 - 11	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
11 - 12	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
12 - 13	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
13 - 14	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
14 - 15	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
15 - 16	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
16 - 17	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
17 - 18	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
18 - 19	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
19 - 20	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
20 - 21	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
21 - 22	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
22 - 23	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
23 - 24	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
24 - 25	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
25 - 26	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
26 - 27	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
27 - 28	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
28 - 29	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
29 - 30	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	6	0.2	0.2	100%	0.0	0.0	0.2	0.2
51 - 52	0.0	6	0.2	0.2	100%	0.0	0.0	0.2	0.2
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=326.3, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	0.2	Secondary =	0.3	0.5	Min = 100%	0.2	0.0	0.3	0.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

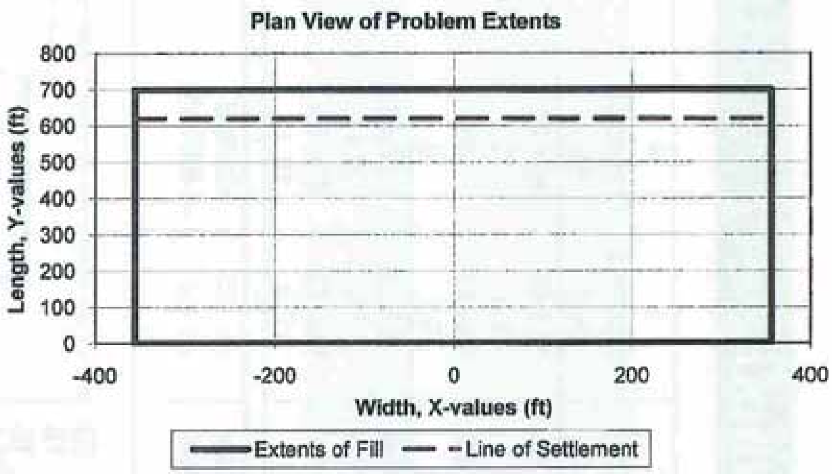
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B MAX SETTLEMENT @ BOTTOM OF PROPOSED WASTE FILL**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 1 Proposed = 3 Surcharge = 0

Line of Settlement Calcs: Beginning X = -356 Ending X = 356
(25 points along this line.) Beginning Y = 620 Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

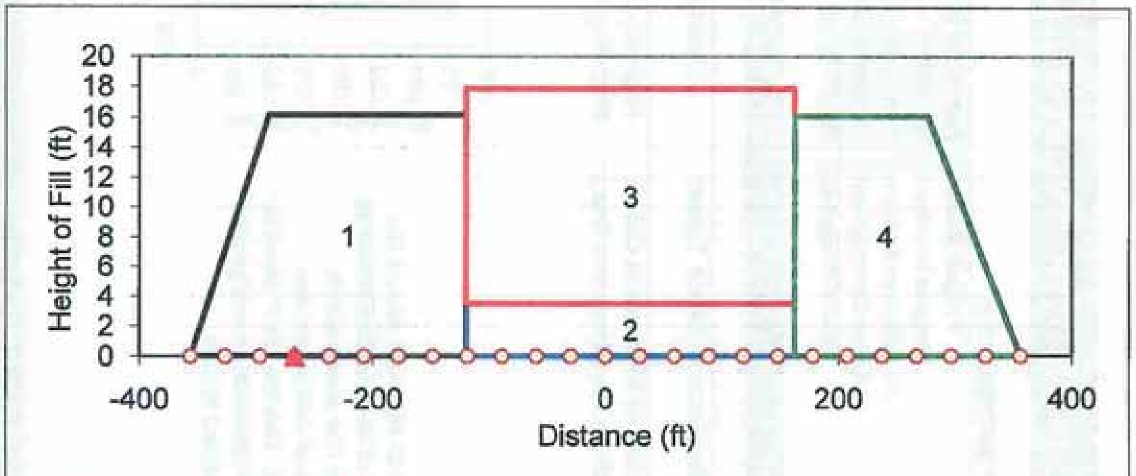
	Block Number	1	2	3	4
	Fill Type	Proposed	Existing	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-356	-119.66	-119.66	162.41
	Left Z	0	0	3.5	0
	Right X	-119.66	162.41	162.41	356
	Right Z	0	0	3.5	0
Top of Block (ft)	Left X	-289	-119.66	-119.66	162.41
	Left Z	16.14	3.5	17.9	16.11
	Right X	-119.66	162.41	162.41	276.85
	Right Z	16.14	3.5	17.9	16.11
Calculated Slopes	Left Side Slope	4.15H:1V	Vertical	Vertical	Vertical
	Right Side Slope	Vertical	Vertical	Vertical	-4.91H:1V

Line of Settlement Calculations (ft)	Left X	-356
	Left Y	620
	Left X	356
	Left Y	620
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

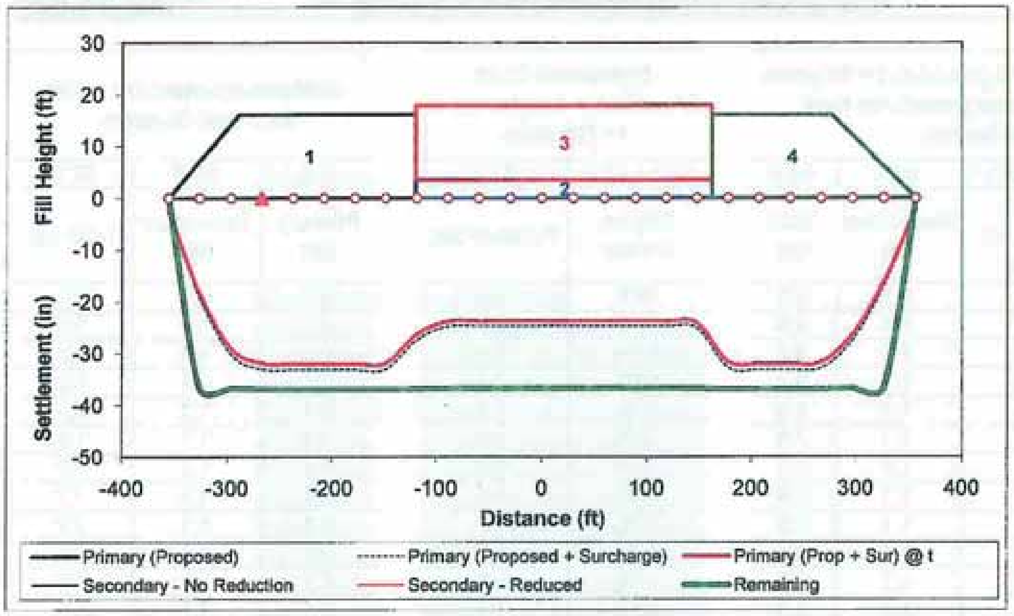
☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***33.3***	***35.9***	***1.2***	***35.9***	***37.0***
-356.0	620	2.7	0.0	0.2	0.0	0.2
-326.3	620	19.1	35.8	0.8	35.8	36.7
-296.7	620	30.3	35.7	1.1	35.7	36.8
-267.0	620	33.1	35.8	1.2	35.8	37.0
-237.3	620	33.3	35.8	1.2	35.8	37.0
-207.7	620	33.3	35.8	1.2	35.8	37.0
-178.0	620	33.3	35.8	1.2	35.8	37.0
-148.3	620	33.2	35.8	1.2	35.8	37.0
-118.7	620	27.5	35.8	1.1	35.8	36.9
-89.0	620	24.9	35.8	1.0	35.8	36.8
-59.3	620	24.8	35.8	1.0	35.8	36.8
-29.7	620	24.8	35.8	1.0	35.8	36.8
0.0	620	24.8	35.8	1.0	35.8	36.8
29.7	620	24.8	35.8	1.0	35.8	36.8
59.3	620	24.8	35.8	1.0	35.8	36.8
89.0	620	24.8	35.8	1.0	35.8	36.8
118.7	620	24.8	35.8	1.0	35.8	36.8
148.3	620	25.2	35.9	1.0	35.9	36.9
178.0	620	32.9	35.8	1.2	35.8	37.0
207.7	620	33.3	35.8	1.2	35.8	37.0
237.3	620	33.2	35.8	1.2	35.8	37.0
267.0	620	32.9	35.7	1.2	35.7	36.9
296.7	620	27.5	35.7	1.1	35.7	36.8
326.3	620	16.9	35.9	0.8	35.9	36.6
356.0	620	2.3	0.0	0.2	0.0	0.2

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 93%	31.9	1.2	35.8	37.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	96%	0.3	0.0	0.1	0.1
1 - 2	2.8	750	1.1	3.9	93%	2.7	0.1	1.1	1.2
2 - 3	2.4	750	1.1	3.5	93%	2.3	0.1	1.1	1.2
3 - 4	2.1	750	1.1	3.2	93%	2.0	0.1	1.1	1.2
4 - 5	1.9	750	1.1	3.0	93%	1.8	0.1	1.1	1.2
5 - 6	1.7	750	1.1	2.9	93%	1.6	0.1	1.1	1.2
6 - 7	1.6	750	1.1	2.7	93%	1.5	0.1	1.1	1.2
7 - 8	1.5	750	1.1	2.6	93%	1.4	0.1	1.1	1.2
8 - 9	1.4	750	1.1	2.5	93%	1.3	0.1	1.1	1.2
9 - 10	1.3	750	1.1	2.4	93%	1.2	0.1	1.1	1.2
10 - 11	1.2	750	1.1	2.3	93%	1.1	0.1	1.1	1.2
11 - 12	1.1	750	1.1	2.3	93%	1.1	0.1	1.1	1.2
12 - 13	1.1	750	1.1	2.2	93%	1.0	0.0	1.1	1.2
13 - 14	1.0	750	1.1	2.2	94%	1.0	0.0	1.1	1.2
14 - 15	1.0	750	1.1	2.1	94%	0.9	0.0	1.1	1.2
15 - 16	0.9	750	1.1	2.1	94%	0.9	0.0	1.1	1.2
16 - 17	0.9	750	1.1	2.0	94%	0.9	0.0	1.1	1.2
17 - 18	0.9	750	1.1	2.0	95%	0.8	0.0	1.1	1.2
18 - 19	0.8	743	1.1	2.0	95%	0.8	0.0	1.1	1.2
19 - 20	0.8	723	1.1	1.9	95%	0.8	0.0	1.1	1.2
20 - 21	0.8	700	1.2	1.9	96%	0.7	0.0	1.2	1.2
21 - 22	0.7	674	1.2	1.9	96%	0.7	0.0	1.2	1.2
22 - 23	0.7	643	1.2	1.9	97%	0.7	0.0	1.2	1.2
23 - 24	0.7	608	1.2	1.9	97%	0.7	0.0	1.2	1.2
24 - 25	0.7	566	1.3	1.9	97%	0.6	0.0	1.3	1.3
25 - 26	0.6	515	1.3	1.9	98%	0.6	0.0	1.3	1.3
26 - 27	0.6	449	1.3	2.0	98%	0.6	0.0	1.3	1.4
27 - 28	0.6	361	1.4	2.0	99%	0.6	0.0	1.4	1.4
28 - 29	0.6	226	1.6	2.2	99%	0.6	0.0	1.6	1.6
29 - 30	0.6	33	2.4	3.0	100%	0.6	0.0	2.4	2.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 93%	31.9	1.2	35.8	37.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

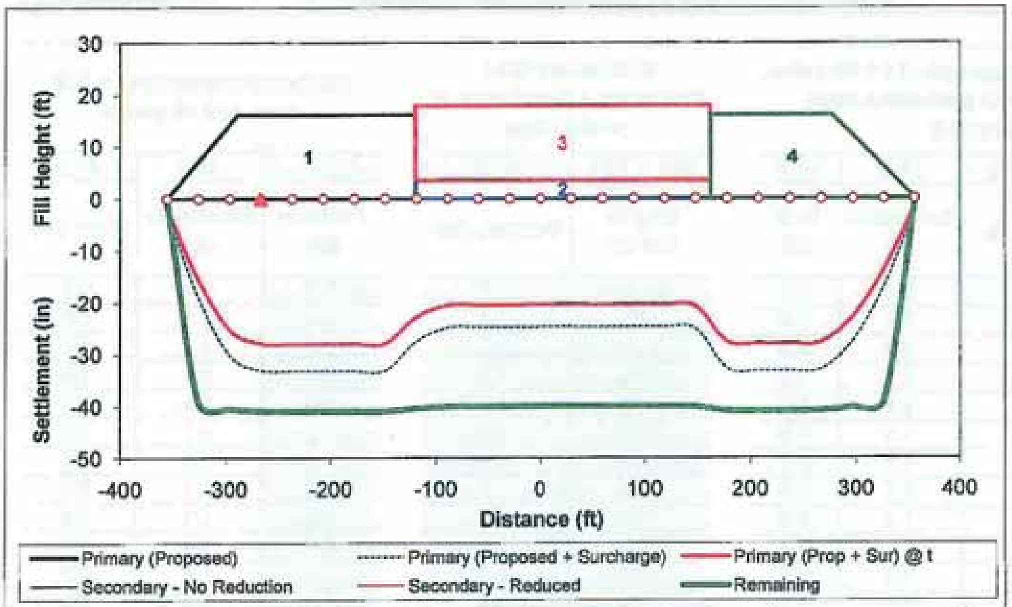
Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 93%	31.9	1.2	35.8	37.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***33.3***	***35.9***	***5.3***	***35.9***	***41.1***
-356.0	620	2.7	0.0	0.8	0.0	0.8
-326.3	620	19.1	35.8	3.6	35.8	39.4
-296.7	620	30.3	35.7	4.9	35.7	40.6
-267.0	620	33.1	35.8	5.3	35.8	41.0
-237.3	620	33.3	35.8	5.3	35.8	41.1
-207.7	620	33.3	35.8	5.3	35.8	41.1
-178.0	620	33.3	35.8	5.3	35.8	41.1
-148.3	620	33.2	35.8	5.3	35.8	41.1
-118.7	620	27.5	35.8	4.7	35.8	40.5
-89.0	620	24.9	35.8	4.4	35.8	40.2
-59.3	620	24.8	35.8	4.3	35.8	40.2
-29.7	620	24.8	35.8	4.3	35.8	40.2
0.0	620	24.8	35.8	4.3	35.8	40.2
29.7	620	24.8	35.8	4.3	35.8	40.2
59.3	620	24.8	35.8	4.3	35.8	40.2
89.0	620	24.8	35.8	4.3	35.8	40.2
118.7	620	24.8	35.8	4.3	35.8	40.2
148.3	620	25.2	35.9	4.4	35.9	40.3
178.0	620	32.9	35.8	5.2	35.8	41.0
207.7	620	33.3	35.8	5.3	35.8	41.1
237.3	620	33.2	35.8	5.3	35.8	41.1
267.0	620	32.9	35.7	5.2	35.7	40.9
296.7	620	27.5	35.7	4.7	35.7	40.4
326.3	620	16.9	35.9	3.3	35.9	39.2
356.0	620	2.3	0.0	0.7	0.0	0.7

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 70%	27.9	5.3	35.8	41.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	85%	0.3	0.0	0.1	0.1
1 - 2	2.8	750	1.1	3.9	70%	2.4	0.4	1.1	1.5
2 - 3	2.4	750	1.1	3.5	70%	2.0	0.4	1.1	1.5
3 - 4	2.1	750	1.1	3.2	70%	1.7	0.4	1.1	1.5
4 - 5	1.9	750	1.1	3.0	70%	1.5	0.3	1.1	1.5
5 - 6	1.7	750	1.1	2.9	70%	1.4	0.3	1.1	1.5
6 - 7	1.6	750	1.1	2.7	70%	1.3	0.3	1.1	1.4
7 - 8	1.5	750	1.1	2.6	71%	1.2	0.3	1.1	1.4
8 - 9	1.4	750	1.1	2.5	71%	1.1	0.3	1.1	1.4
9 - 10	1.3	750	1.1	2.4	71%	1.0	0.3	1.1	1.4
10 - 11	1.2	750	1.1	2.3	72%	1.0	0.2	1.1	1.4
11 - 12	1.1	750	1.1	2.3	73%	0.9	0.2	1.1	1.4
12 - 13	1.1	750	1.1	2.2	74%	0.9	0.2	1.1	1.3
13 - 14	1.0	750	1.1	2.2	74%	0.8	0.2	1.1	1.3
14 - 15	1.0	750	1.1	2.1	75%	0.8	0.2	1.1	1.3
15 - 16	0.9	750	1.1	2.1	77%	0.8	0.2	1.1	1.3
16 - 17	0.9	750	1.1	2.0	78%	0.7	0.2	1.1	1.3
17 - 18	0.9	750	1.1	2.0	79%	0.7	0.1	1.1	1.3
18 - 19	0.8	743	1.1	2.0	80%	0.7	0.1	1.1	1.3
19 - 20	0.8	723	1.1	1.9	82%	0.7	0.1	1.1	1.3
20 - 21	0.8	700	1.2	1.9	83%	0.7	0.1	1.2	1.3
21 - 22	0.7	674	1.2	1.9	85%	0.6	0.1	1.2	1.3
22 - 23	0.7	643	1.2	1.9	86%	0.6	0.1	1.2	1.3
23 - 24	0.7	608	1.2	1.9	88%	0.6	0.1	1.2	1.3
24 - 25	0.7	566	1.3	1.9	90%	0.6	0.1	1.3	1.3
25 - 26	0.6	515	1.3	1.9	92%	0.6	0.0	1.3	1.3
26 - 27	0.6	449	1.3	2.0	93%	0.6	0.0	1.3	1.4
27 - 28	0.6	361	1.4	2.0	95%	0.6	0.0	1.4	1.5
28 - 29	0.6	226	1.6	2.2	97%	0.6	0.0	1.6	1.7
29 - 30	0.6	33	2.4	3.0	99%	0.6	0.0	2.4	2.4
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 70%	27.9	5.3	35.8	41.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	33.1	Secondary =	35.8	68.9	Min = 70%	27.9	5.3	35.8	41.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

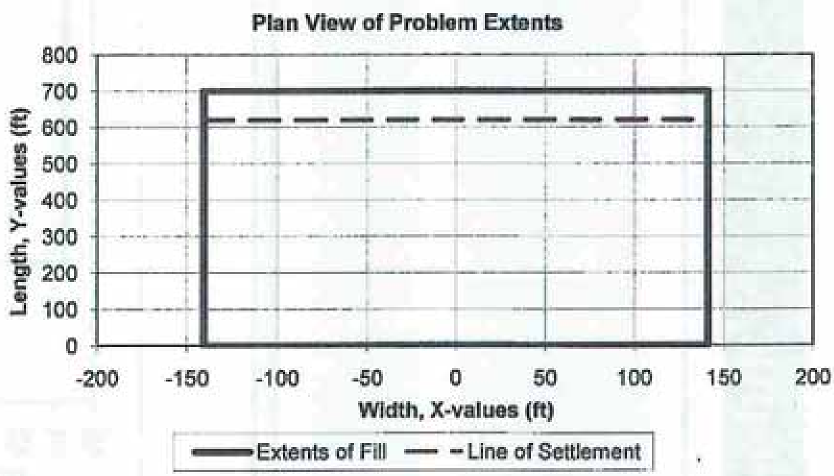
Project Name:	Fort Bliss MSW Landfill
Project Number:	65115803
Location or Station:	Fort Bliss, Texas
Notes/Description:	Section B Within the Waste 3xStandard Dev. SETTLEMENT @ TOP CAP
Date of Analysis:	March 8, 2011

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 0 Proposed = 1 Surcharge = 0

Line of Settlement Calcs:	Beginning X = -141	Ending X = 141
(15 points along this line.)	Beginning Y = 620	Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

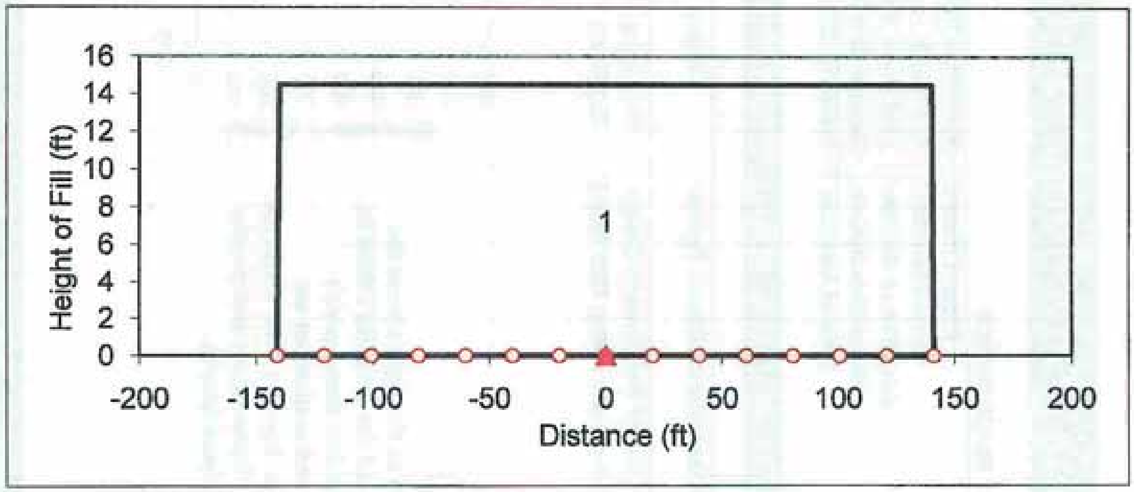
See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-141
	Left Z	0
	Right X	141
	Right Z	0
Top of Block (ft)	Left X	-140
	Left Z	14.5
	Right X	140
	Right Z	14.5
Calculated Slopes	Left Side Slope	0.07H:1V
	Right Side Slope	-0.07H:1V
Line of Settlement Calculations (ft)	Left X	-141
	Left Y	620
	Left X	141
	Left Y	620
	Number of Points	*15*
	Length of Embankment (ft)	700
	Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

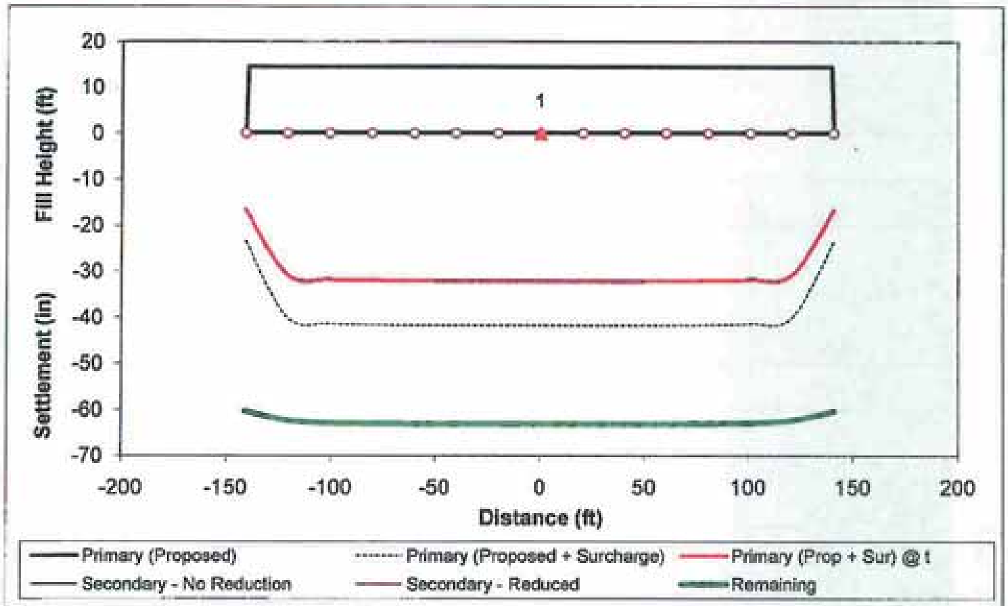
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	(selected) Boussinesq / Westergaard

Layer Thickness		*Settlement Parameters*						*Time Rate of Settlement Values*					*Wicks*	*Strength Values*	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_α	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_r (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	34	65	0.331	0.000	1.0	0.109	0.0000	Yes	1	0.7	No	Yes			
34	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation
- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation
- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***41.8***	***53.6***	***9.6***	***53.6***	***63.1***
-141.0	620	23.5	53.6	6.7	53.6	60.4
-120.9	620	40.0	53.1	9.2	53.1	62.3
-100.7	620	41.4	53.4	9.5	53.4	62.9
-80.6	620	41.6	53.5	9.6	53.5	63.0
-60.4	620	41.7	53.5	9.6	53.5	63.1
-40.3	620	41.7	53.5	9.6	53.5	63.1
-20.1	620	41.8	53.5	9.6	53.5	63.1
0.0	620	41.8	53.5	9.6	53.5	63.1
20.1	620	41.8	53.5	9.6	53.5	63.1
40.3	620	41.7	53.5	9.6	53.5	63.1
60.4	620	41.7	53.5	9.6	53.5	63.1
80.6	620	41.6	53.5	9.6	53.5	63.0
100.7	620	41.4	53.4	9.5	53.4	62.9
120.9	620	40.0	53.1	9.2	53.1	62.3
141.0	620	23.5	53.6	6.7	53.6	60.4

Squish - Detailed Settlement Results

View results at: X=0, Y=620 Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	41.8	Secondary =	53.5	95.3	Min = 60%	32.1	9.6	53.5	63.1
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	80%	0.2	0.0	0.1	0.1
1 - 2	3.4	750	1.5	4.9	61%	2.7	0.7	1.5	2.2
2 - 3	2.9	750	1.5	4.4	60%	2.2	0.7	1.5	2.2
3 - 4	2.5	750	1.5	4.1	60%	1.9	0.6	1.5	2.2
4 - 5	2.3	750	1.5	3.8	60%	1.7	0.6	1.5	2.1
5 - 6	2.1	750	1.5	3.6	60%	1.5	0.6	1.5	2.1
6 - 7	1.9	750	1.5	3.4	60%	1.3	0.5	1.5	2.1
7 - 8	1.7	750	1.5	3.3	60%	1.2	0.5	1.5	2.0
8 - 9	1.6	750	1.5	3.1	61%	1.1	0.5	1.5	2.0
9 - 10	1.5	750	1.5	3.0	61%	1.1	0.4	1.5	2.0
10 - 11	1.4	750	1.5	2.9	62%	1.0	0.4	1.5	1.9
11 - 12	1.3	750	1.5	2.9	62%	0.9	0.4	1.5	1.9
12 - 13	1.3	750	1.5	2.8	63%	0.9	0.4	1.5	1.9
13 - 14	1.2	750	1.5	2.7	64%	0.9	0.3	1.5	1.9
14 - 15	1.1	750	1.5	2.7	65%	0.8	0.3	1.5	1.8
15 - 16	1.1	750	1.5	2.6	66%	0.8	0.3	1.5	1.8
16 - 17	1.0	750	1.5	2.6	67%	0.8	0.3	1.5	1.8
17 - 18	1.0	750	1.5	2.5	69%	0.7	0.3	1.5	1.8
18 - 19	1.0	750	1.5	2.5	70%	0.7	0.2	1.5	1.8
19 - 20	0.9	750	1.5	2.4	71%	0.7	0.2	1.5	1.7
20 - 21	0.9	750	1.5	2.4	73%	0.7	0.2	1.5	1.7
21 - 22	0.9	750	1.5	2.4	75%	0.7	0.2	1.5	1.7
22 - 23	0.8	750	1.5	2.4	76%	0.7	0.2	1.5	1.7
23 - 24	0.8	750	1.5	2.3	78%	0.7	0.1	1.5	1.7
24 - 25	0.8	750	1.5	2.3	80%	0.6	0.1	1.5	1.7
25 - 26	0.8	750	1.5	2.3	82%	0.6	0.1	1.5	1.6
26 - 27	0.7	750	1.5	2.3	84%	0.6	0.1	1.5	1.6
27 - 28	0.7	724	1.5	2.3	86%	0.6	0.1	1.5	1.6
28 - 29	0.7	670	1.6	2.3	88%	0.6	0.1	1.6	1.7
29 - 30	0.7	604	1.6	2.3	90%	0.6	0.1	1.6	1.7
30 - 31	0.6	520	1.7	2.4	92%	0.6	0.0	1.7	1.8
31 - 32	0.6	408	1.9	2.5	94%	0.6	0.0	1.9	1.9
32 - 33	0.6	239	2.2	2.8	97%	0.6	0.0	2.2	2.2
33 - 34	0.6	32	3.3	3.9	99%	0.6	0.0	3.3	3.3
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	41.8	Secondary =	53.5	95.3	Min = 60%	32.1	9.6	53.5	63.1
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=620

Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.

Primary =	41.8	Secondary =	53.5	95.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0
93 - 94	0.0	0	0.0	0.0
94 - 95	0.0	0	0.0	0.0
95 - 96	0.0	0	0.0	0.0
96 - 97	0.0	0	0.0	0.0
97 - 98	0.0	0	0.0	0.0
98 - 99	0.0	0	0.0	0.0
99 - 100	0.0	0	0.0	0.0

Settlement from Proposed + Surcharge at t= 375 days

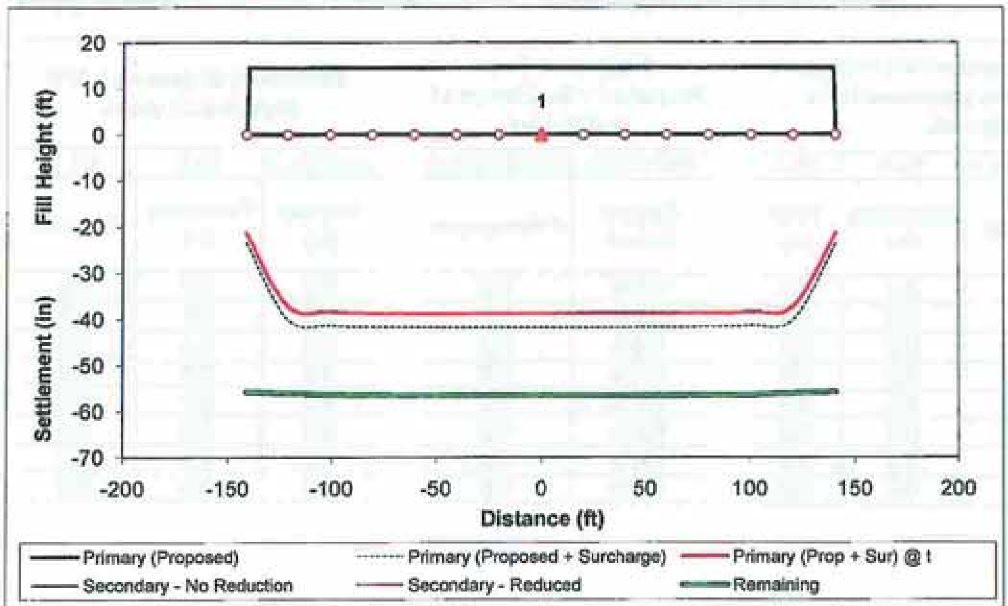
Min = 60%	32.1
Degree Consol	**Primary (in)**
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0
100%	0.0

Settlement between t = 375 days and 30 years.

9.6	53.5	63.1
Primary (in)	Secondary (in)	Total (in)
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0
0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 735.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 735 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 735 days						
Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 735 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***41.8***	***53.6***	***3.1***	***53.6***	***56.6***
-141.0	620	23.5	53.6	2.2	53.6	55.8
-120.9	620	40.0	53.1	2.9	53.1	56.1
-100.7	620	41.4	53.4	3.0	53.4	56.4
-80.6	620	41.6	53.5	3.0	53.5	56.5
-60.4	620	41.7	53.5	3.1	53.5	56.5
-40.3	620	41.7	53.5	3.1	53.5	56.6
-20.1	620	41.8	53.5	3.1	53.5	56.6
0.0	620	41.8	53.5	3.1	53.5	56.6
20.1	620	41.8	53.5	3.1	53.5	56.6
40.3	620	41.7	53.5	3.1	53.5	56.6
60.4	620	41.7	53.5	3.1	53.5	56.5
80.6	620	41.6	53.5	3.0	53.5	56.5
100.7	620	41.4	53.4	3.0	53.4	56.4
120.9	620	40.0	53.1	2.9	53.1	56.1
141.0	620	23.5	53.6	2.2	53.6	55.8

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=620   Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	41.8	Secondary =	53.5	95.3	Min = 86%	38.7	3.1	53.5	56.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	750	0.1	0.3	93%	0.3	0.0	0.1	0.1
1 - 2	3.4	750	1.5	4.9	86%	3.2	0.2	1.5	1.7
2 - 3	2.9	750	1.5	4.4	86%	2.7	0.2	1.5	1.7
3 - 4	2.5	750	1.5	4.1	86%	2.3	0.2	1.5	1.7
4 - 5	2.3	750	1.5	3.8	86%	2.1	0.2	1.5	1.7
5 - 6	2.1	750	1.5	3.6	86%	1.9	0.2	1.5	1.7
6 - 7	1.9	750	1.5	3.4	86%	1.7	0.2	1.5	1.7
7 - 8	1.7	750	1.5	3.3	86%	1.6	0.2	1.5	1.7
8 - 9	1.6	750	1.5	3.1	86%	1.5	0.1	1.5	1.7
9 - 10	1.5	750	1.5	3.0	87%	1.4	0.1	1.5	1.7
10 - 11	1.4	750	1.5	2.9	87%	1.3	0.1	1.5	1.7
11 - 12	1.3	750	1.5	2.9	87%	1.2	0.1	1.5	1.6
12 - 13	1.3	750	1.5	2.8	87%	1.1	0.1	1.5	1.6
13 - 14	1.2	750	1.5	2.7	88%	1.1	0.1	1.5	1.6
14 - 15	1.1	750	1.5	2.7	88%	1.0	0.1	1.5	1.6
15 - 16	1.1	750	1.5	2.6	88%	1.0	0.1	1.5	1.6
16 - 17	1.0	750	1.5	2.6	89%	1.0	0.1	1.5	1.6
17 - 18	1.0	750	1.5	2.5	89%	0.9	0.1	1.5	1.6
18 - 19	1.0	750	1.5	2.5	90%	0.9	0.1	1.5	1.6
19 - 20	0.9	750	1.5	2.4	90%	0.9	0.1	1.5	1.6
20 - 21	0.9	750	1.5	2.4	91%	0.8	0.1	1.5	1.6
21 - 22	0.9	750	1.5	2.4	91%	0.8	0.1	1.5	1.6
22 - 23	0.8	750	1.5	2.4	92%	0.8	0.1	1.5	1.6
23 - 24	0.8	750	1.5	2.3	92%	0.8	0.0	1.5	1.6
24 - 25	0.8	750	1.5	2.3	93%	0.7	0.0	1.5	1.6
25 - 26	0.8	750	1.5	2.3	94%	0.7	0.0	1.5	1.6
26 - 27	0.7	750	1.5	2.3	94%	0.7	0.0	1.5	1.6
27 - 28	0.7	724	1.5	2.3	95%	0.7	0.0	1.5	1.6
28 - 29	0.7	670	1.6	2.3	96%	0.7	0.0	1.6	1.6
29 - 30	0.7	604	1.6	2.3	97%	0.6	0.0	1.6	1.7
30 - 31	0.6	520	1.7	2.4	97%	0.6	0.0	1.7	1.7
31 - 32	0.6	408	1.9	2.5	98%	0.6	0.0	1.9	1.9
32 - 33	0.6	239	2.2	2.8	99%	0.6	0.0	2.2	2.2
33 - 34	0.6	32	3.3	3.9	100%	0.6	0.0	3.3	3.3
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=620 | Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	41.8	Secondary =	53.5	95.3	Min = 86%	38.7	3.1	53.5	56.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=620

Evaluate Settlement at t = 735.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 735 days		Settlement between t = 735 days and 30 years.		
Primary =	41.8	Secondary =	53.5	95.3	Min = 86%	38.7	3.1	53.5	56.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

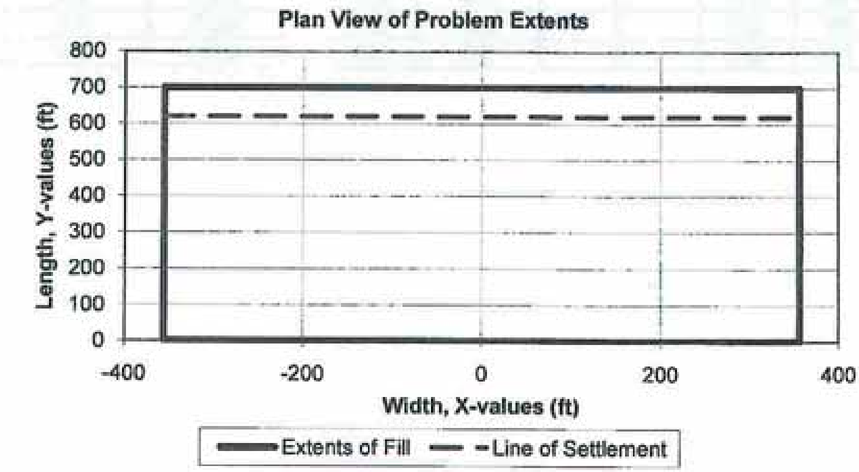
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section B Within Waste 3xSt Dev.@ BOTTOM OF PROPOSED WASTE FILL**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types:	Existing = 1	Proposed = 3	Surcharge = 0

Line of Settlement Calcs:	Beginning X = -356	Ending X = 356
(25 points along this line.)	Beginning Y = 620	Ending Y = 620

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3

Time Dependent Soil Layers	2

Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

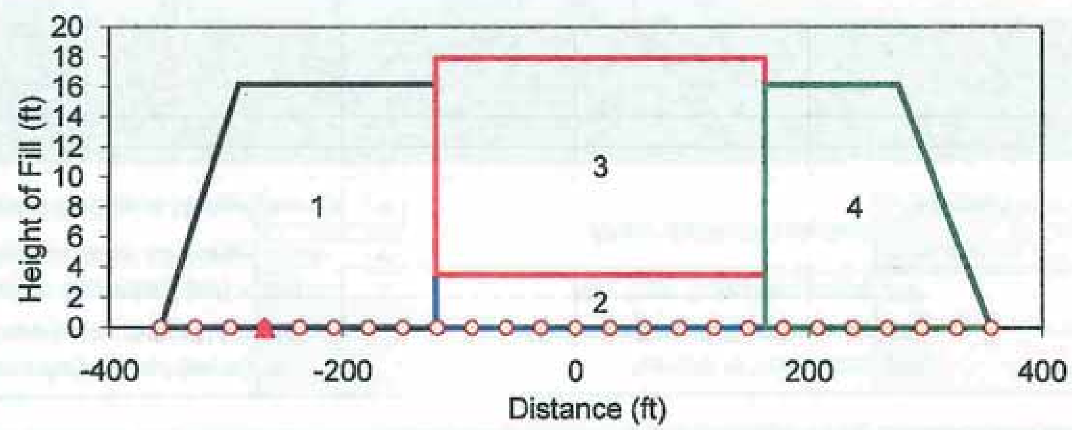
	Block Number	1	2	3	4
	Fill Type	Proposed	Existing	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-356	-119.66	-119.66	162.41
	Left Z	0	0	3.5	0
	Right X	-119.66	162.41	162.41	356
	Right Z	0	0	3.5	0
Top of Block (ft)	Left X	-289	-119.66	-119.66	162.41
	Left Z	16.14	3.5	17.9	16.11
	Right X	-119.66	162.41	162.41	276.85
	Right Z	16.14	3.5	17.9	16.11
Calculated Slopes	Left Side Slope	4.15H:1V	Vertical	Vertical	Vertical
	Right Side Slope	Vertical	Vertical	Vertical	-4.91H:1V

Line of Settlement Calculations (ft)	Left X	-356
	Left Y	620
	Left X	356
	Left Y	620
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

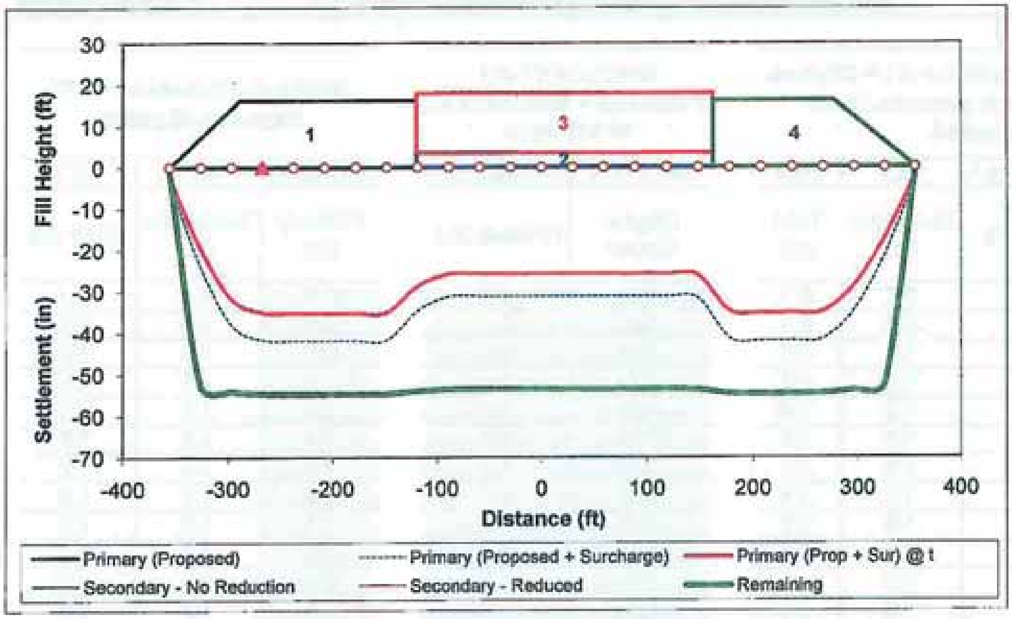
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma'$ to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	(●) Boussinesq ( ) Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\epsilon c}$	$C_{\epsilon r}$	OCR	C_{α}	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_r (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	30	65	0.331	0.000	1.0	0.109	0.0000	Yes	1	0.7	No	Yes			
30	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***42.0***	***48.2***	***6.7***	***48.2***	***54.8***
-356.0	620	3.4	0.0	1.0	0.0	1.0
-326.3	620	24.1	48.2	4.5	48.2	52.8
-296.7	620	38.1	48.0	6.2	48.0	54.2
-267.0	620	41.8	48.1	6.6	48.1	54.7
-237.3	620	42.0	48.2	6.7	48.2	54.8
-207.7	620	42.0	48.2	6.7	48.2	54.8
-178.0	620	42.0	48.2	6.7	48.2	54.8
-148.3	620	41.8	48.2	6.7	48.2	54.8
-118.7	620	34.7	48.2	5.9	48.2	54.1
-89.0	620	31.4	48.2	5.5	48.2	53.7
-59.3	620	31.3	48.2	5.5	48.2	53.7
-29.7	620	31.3	48.2	5.5	48.2	53.7
0.0	620	31.2	48.2	5.5	48.2	53.7
29.7	620	31.2	48.2	5.5	48.2	53.7
59.3	620	31.3	48.2	5.5	48.2	53.7
89.0	620	31.3	48.2	5.5	48.2	53.7
118.7	620	31.3	48.2	5.5	48.2	53.7
148.3	620	31.8	48.2	5.6	48.2	53.8
178.0	620	41.4	48.1	6.6	48.1	54.7
207.7	620	41.9	48.2	6.7	48.2	54.8
237.3	620	41.9	48.1	6.7	48.1	54.8
267.0	620	41.5	48.0	6.6	48.0	54.6
296.7	620	34.6	48.1	5.9	48.1	53.9
326.3	620	21.3	48.2	4.1	48.2	52.4
356.0	620	2.9	0.0	0.8	0.0	0.8

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 70%	35.1	6.6	48.1	54.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	85%	0.3	0.0	0.1	0.1
1 - 2	3.6	750	1.5	5.1	70%	3.0	0.5	1.5	2.0
2 - 3	3.0	750	1.5	4.6	70%	2.5	0.5	1.5	2.0
3 - 4	2.7	750	1.5	4.2	70%	2.2	0.5	1.5	2.0
4 - 5	2.4	750	1.5	3.9	70%	2.0	0.4	1.5	2.0
5 - 6	2.2	750	1.5	3.7	70%	1.8	0.4	1.5	1.9
6 - 7	2.0	750	1.5	3.5	70%	1.6	0.4	1.5	1.9
7 - 8	1.9	750	1.5	3.4	71%	1.5	0.4	1.5	1.9
8 - 9	1.7	750	1.5	3.2	71%	1.4	0.3	1.5	1.9
9 - 10	1.6	750	1.5	3.1	71%	1.3	0.3	1.5	1.9
10 - 11	1.5	750	1.5	3.0	72%	1.2	0.3	1.5	1.8
11 - 12	1.4	750	1.5	3.0	73%	1.1	0.3	1.5	1.8
12 - 13	1.4	750	1.5	2.9	74%	1.1	0.3	1.5	1.8
13 - 14	1.3	750	1.5	2.8	74%	1.0	0.2	1.5	1.8
14 - 15	1.2	750	1.5	2.8	75%	1.0	0.2	1.5	1.8
15 - 16	1.2	750	1.5	2.7	77%	1.0	0.2	1.5	1.7
16 - 17	1.1	750	1.5	2.6	78%	0.9	0.2	1.5	1.7
17 - 18	1.1	750	1.5	2.6	79%	0.9	0.2	1.5	1.7
18 - 19	1.0	743	1.5	2.6	80%	0.9	0.2	1.5	1.7
19 - 20	1.0	723	1.5	2.5	82%	0.8	0.1	1.5	1.7
20 - 21	1.0	700	1.6	2.5	83%	0.8	0.1	1.6	1.7
21 - 22	0.9	674	1.6	2.5	85%	0.8	0.1	1.6	1.7
22 - 23	0.9	643	1.6	2.5	86%	0.8	0.1	1.6	1.7
23 - 24	0.9	608	1.6	2.5	88%	0.8	0.1	1.6	1.7
24 - 25	0.8	566	1.7	2.5	90%	0.8	0.1	1.7	1.8
25 - 26	0.8	515	1.7	2.5	92%	0.7	0.1	1.7	1.8
26 - 27	0.8	449	1.8	2.6	93%	0.7	0.0	1.8	1.9
27 - 28	0.8	361	1.9	2.7	95%	0.7	0.0	1.9	2.0
28 - 29	0.7	226	2.2	2.9	97%	0.7	0.0	2.2	2.2
29 - 30	0.7	33	3.3	4.0	99%	0.7	0.0	3.3	3.3
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 70%	35.1	6.6	48.1	54.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

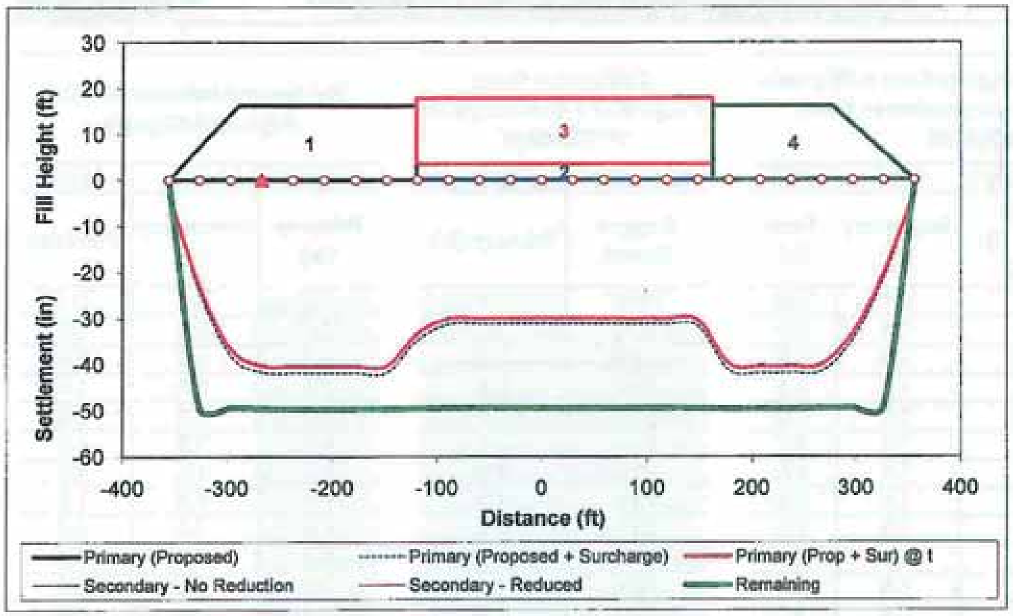
Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 70%	35.1	6.6	48.1	54.7
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed
2	Existing
3	Proposed
4	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 750 days						
Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***42.0***	***48.2***	***1.5***	***48.2***	***49.7***
-356.0	620	3.4	0.0	0.3	0.0	0.3
-326.3	620	24.1	48.2	1.1	48.2	49.3
-296.7	620	38.1	48.0	1.4	48.0	49.4
-267.0	620	41.8	48.1	1.5	48.1	49.6
-237.3	620	42.0	48.2	1.5	48.2	49.7
-207.7	620	42.0	48.2	1.5	48.2	49.7
-178.0	620	42.0	48.2	1.5	48.2	49.7
-148.3	620	41.8	48.2	1.5	48.2	49.7
-118.7	620	34.7	48.2	1.4	48.2	49.6
-89.0	620	31.4	48.2	1.3	48.2	49.5
-59.3	620	31.3	48.2	1.3	48.2	49.5
-29.7	620	31.3	48.2	1.3	48.2	49.5
0.0	620	31.2	48.2	1.3	48.2	49.5
29.7	620	31.2	48.2	1.3	48.2	49.5
59.3	620	31.3	48.2	1.3	48.2	49.5
89.0	620	31.3	48.2	1.3	48.2	49.5
118.7	620	31.3	48.2	1.3	48.2	49.5
148.3	620	31.8	48.2	1.3	48.2	49.5
178.0	620	41.4	48.1	1.5	48.1	49.6
207.7	620	41.9	48.2	1.5	48.2	49.7
237.3	620	41.9	48.1	1.5	48.1	49.7
267.0	620	41.5	48.0	1.5	48.0	49.6
296.7	620	34.6	48.1	1.4	48.1	49.4
326.3	620	21.3	48.2	1.0	48.2	49.2
356.0	620	2.9	0.0	0.2	0.0	0.2

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 93%	40.2	1.5	48.1	49.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.3	665	0.1	0.3	96%	0.3	0.0	0.1	0.1
1 - 2	3.6	750	1.5	5.1	93%	3.4	0.1	1.5	1.6
2 - 3	3.0	750	1.5	4.6	93%	2.9	0.1	1.5	1.6
3 - 4	2.7	750	1.5	4.2	93%	2.6	0.1	1.5	1.6
4 - 5	2.4	750	1.5	3.9	93%	2.3	0.1	1.5	1.6
5 - 6	2.2	750	1.5	3.7	93%	2.1	0.1	1.5	1.6
6 - 7	2.0	750	1.5	3.5	93%	1.9	0.1	1.5	1.6
7 - 8	1.9	750	1.5	3.4	93%	1.8	0.1	1.5	1.6
8 - 9	1.7	750	1.5	3.2	93%	1.6	0.1	1.5	1.6
9 - 10	1.6	750	1.5	3.1	93%	1.5	0.1	1.5	1.6
10 - 11	1.5	750	1.5	3.0	93%	1.4	0.1	1.5	1.6
11 - 12	1.4	750	1.5	3.0	93%	1.4	0.1	1.5	1.6
12 - 13	1.4	750	1.5	2.9	93%	1.3	0.1	1.5	1.6
13 - 14	1.3	750	1.5	2.8	94%	1.2	0.1	1.5	1.6
14 - 15	1.2	750	1.5	2.8	94%	1.2	0.1	1.5	1.6
15 - 16	1.2	750	1.5	2.7	94%	1.1	0.1	1.5	1.6
16 - 17	1.1	750	1.5	2.6	94%	1.1	0.0	1.5	1.6
17 - 18	1.1	750	1.5	2.6	95%	1.0	0.0	1.5	1.6
18 - 19	1.0	743	1.5	2.6	95%	1.0	0.0	1.5	1.6
19 - 20	1.0	723	1.5	2.5	95%	1.0	0.0	1.5	1.6
20 - 21	1.0	700	1.6	2.5	96%	0.9	0.0	1.6	1.6
21 - 22	0.9	674	1.6	2.5	96%	0.9	0.0	1.6	1.6
22 - 23	0.9	643	1.6	2.5	97%	0.9	0.0	1.6	1.6
23 - 24	0.9	608	1.6	2.5	97%	0.8	0.0	1.6	1.7
24 - 25	0.8	566	1.7	2.5	97%	0.8	0.0	1.7	1.7
25 - 26	0.8	515	1.7	2.5	98%	0.8	0.0	1.7	1.8
26 - 27	0.8	449	1.8	2.6	98%	0.8	0.0	1.8	1.8
27 - 28	0.8	361	1.9	2.7	99%	0.7	0.0	1.9	1.9
28 - 29	0.7	226	2.2	2.9	99%	0.7	0.0	2.2	2.2
29 - 30	0.7	33	3.3	4.0	100%	0.7	0.0	3.3	3.3
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 — Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 93%	40.2	1.5	48.1	49.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=-267, Y=620 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	41.8	Secondary =	48.1	89.9	Min = 93%	40.2	1.5	48.1	49.6
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section AA Within the Waste 3XSTANDARD DEV. MAX SETTLEMENT**
Date of Analysis:	**March 2, 2011**

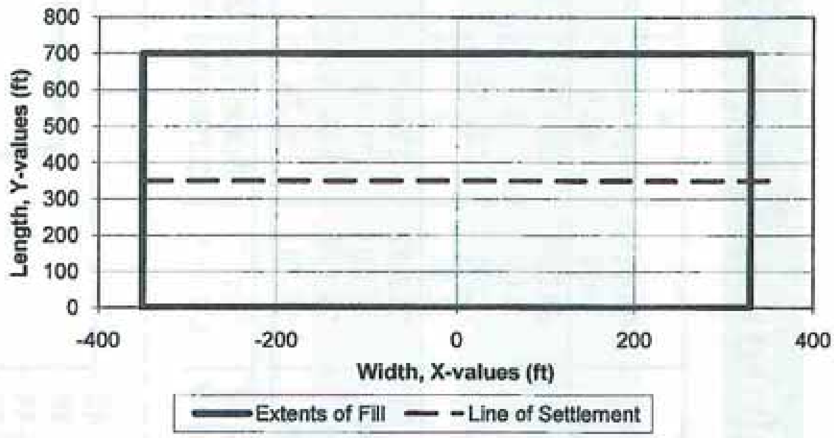
SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types: Existing = 2 Proposed = 3 Surcharge = 0

Line of Settlement Calcs:	Beginning X = -351	Ending X = 351
(25 points along this line.)	Beginning Y = 350	Ending Y = 350

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.

Plan View of Problem Extents



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Time Dependent Soil Layers	2

Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR

Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

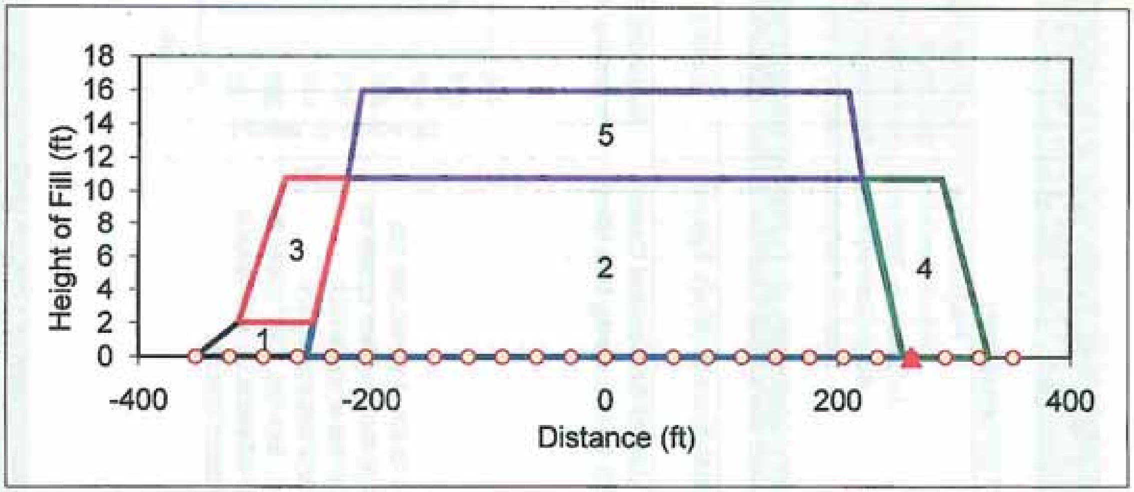
	Block Number	1	2	3	4	5
	Fill Type	Existing	Existing	Proposed	Proposed	Proposed
	γ (pcf)	65.0	65.0	65.0	65.0	65.0
Bottom of Block (ft)	Left X	-351	-255.71	-313.81	255.71	-220.71
	Left Z	0	0	2.05	0	10.79
	Right X	-255.71	255.71	-250	329.65	220.71
	Right Z	0	0	2.05	0	10.79
Top of Block (ft)	Left X	-313.81	-220.71	-273.81	222.52	-208.65
	Left Z	2.05	10.79	10.79	10.79	15.98
	Right X	-250	220.71	-220.27	288.74	208.65
	Right Z	2.05	10.79	10.79	10.79	15.98
Calculated Slopes	Left Side Slope	18.14H:1V	3.24H:1V	4.58H:1V	-3.08H:1V	2.32H:1V
	Right Side Slope	2.79H:1V	-3.24H:1V	3.4H:1V	-3.79H:1V	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-351
	Left Y	350
	Left X	351
	Left Y	350
	Number of Points	25

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

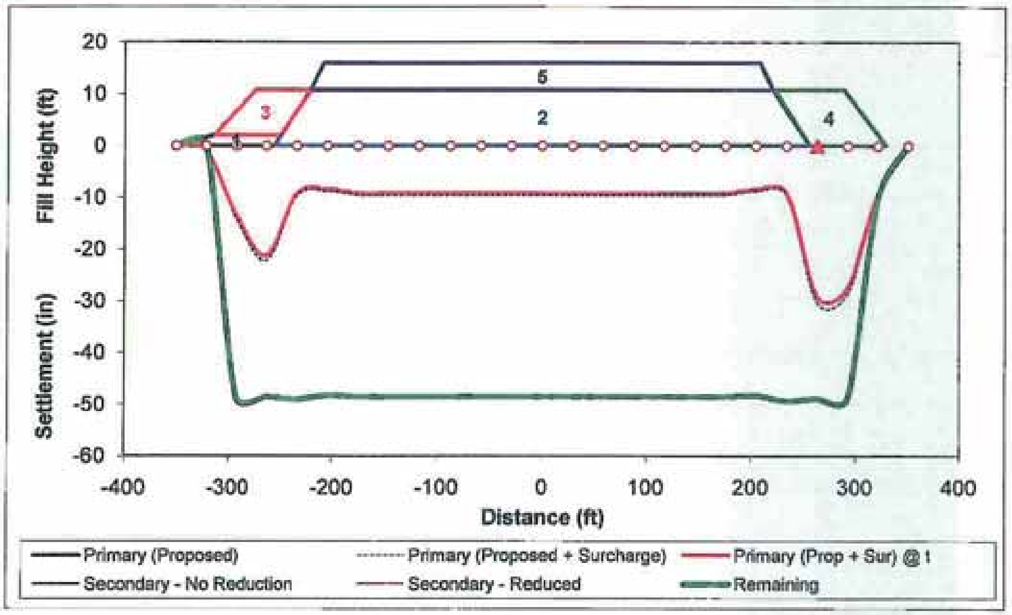
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	*750*
Stress distribution method	(●) Boussinesq / ( ) Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	$C_{\alpha\varepsilon}$	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	30	65	0.331	0.000	1.0	0.109	0.0000	Yes	1	0.7	No	Yes			
30	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ Total Remaining

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***30.4***	***48.9***	***1.2***	***48.9***	***49.4***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	1.0	0.0	0.1	0.0	0.1
-292.5	350	14.2	48.1	0.7	48.1	48.8
-263.3	350	22.3	47.7	1.0	47.7	48.7
-234.0	350	9.7	48.6	0.5	48.6	49.1
-204.8	350	8.8	48.0	0.5	48.0	48.4
-175.5	350	9.6	48.1	0.5	48.1	48.6
-146.3	350	9.6	48.2	0.5	48.2	48.7
-117.0	350	9.6	48.2	0.5	48.2	48.7
-87.8	350	9.6	48.2	0.5	48.2	48.7
-58.5	350	9.6	48.2	0.5	48.2	48.7
-29.3	350	9.6	48.2	0.5	48.2	48.7
0.0	350	9.6	48.2	0.5	48.2	48.7
29.3	350	9.6	48.2	0.5	48.2	48.7
58.5	350	9.6	48.2	0.5	48.2	48.7
87.8	350	9.6	48.2	0.5	48.2	48.7
117.0	350	9.6	48.2	0.5	48.2	48.7
146.3	350	9.6	48.2	0.5	48.2	48.7
175.5	350	9.6	48.1	0.5	48.1	48.6
204.8	350	8.8	48.0	0.5	48.0	48.4
234.0	350	9.6	48.9	0.5	48.9	49.4
263.3	350	30.4	47.8	1.2	47.8	49.0
292.5	350	28.7	47.7	1.2	47.7	48.9
321.8	350	10.0	9.8	0.6	9.8	10.4
351.0	350	0.5	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 93%	29.2	1.2	47.8	49.0
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	97%	0.2	0.0	0.1	0.1
1 - 2	3.0	750	1.5	4.5	93%	2.9	0.1	1.5	1.6
2 - 3	2.5	750	1.5	4.0	93%	2.4	0.1	1.5	1.6
3 - 4	2.1	750	1.5	3.7	93%	2.1	0.1	1.5	1.6
4 - 5	1.9	750	1.5	3.4	93%	1.8	0.1	1.5	1.6
5 - 6	1.7	750	1.5	3.2	93%	1.6	0.1	1.5	1.6
6 - 7	1.5	750	1.5	3.1	93%	1.5	0.1	1.5	1.6
7 - 8	1.4	750	1.5	2.9	93%	1.3	0.1	1.5	1.6
8 - 9	1.3	750	1.5	2.8	93%	1.2	0.1	1.5	1.6
9 - 10	1.2	750	1.5	2.7	93%	1.1	0.1	1.5	1.6
10 - 11	1.1	750	1.5	2.6	93%	1.0	0.1	1.5	1.6
11 - 12	1.0	750	1.5	2.6	93%	1.0	0.1	1.5	1.6
12 - 13	1.0	750	1.5	2.5	93%	0.9	0.0	1.5	1.6
13 - 14	0.9	750	1.5	2.4	94%	0.9	0.0	1.5	1.6
14 - 15	0.8	750	1.5	2.4	94%	0.8	0.0	1.5	1.6
15 - 16	0.8	750	1.5	2.3	94%	0.8	0.0	1.5	1.6
16 - 17	0.8	750	1.5	2.3	94%	0.7	0.0	1.5	1.6
17 - 18	0.7	750	1.5	2.2	95%	0.7	0.0	1.5	1.6
18 - 19	0.7	750	1.5	2.2	95%	0.7	0.0	1.5	1.6
19 - 20	0.6	735	1.5	2.2	95%	0.6	0.0	1.5	1.6
20 - 21	0.6	714	1.6	2.2	96%	0.6	0.0	1.6	1.6
21 - 22	0.6	690	1.6	2.2	96%	0.6	0.0	1.6	1.6
22 - 23	0.6	661	1.6	2.2	96%	0.5	0.0	1.6	1.6
23 - 24	0.5	628	1.6	2.2	97%	0.5	0.0	1.6	1.6
24 - 25	0.5	587	1.7	2.2	97%	0.5	0.0	1.7	1.7
25 - 26	0.5	538	1.7	2.2	98%	0.5	0.0	1.7	1.7
26 - 27	0.5	474	1.8	2.3	98%	0.5	0.0	1.8	1.8
27 - 28	0.5	387	1.9	2.4	99%	0.5	0.0	1.9	1.9
28 - 29	0.4	253	2.1	2.6	99%	0.4	0.0	2.1	2.1
29 - 30	0.4	38	3.2	3.6	100%	0.4	0.0	3.2	3.2
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 93%	29.2	1.2	47.8	49.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

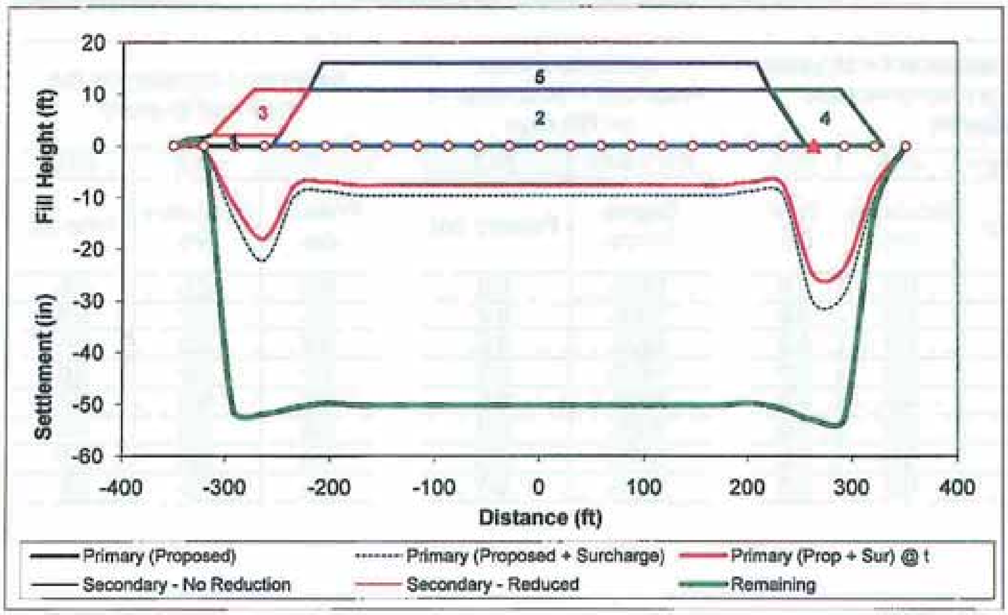
Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 93%	29.2	1.2	47.8	49.0
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Existing
2	Existing
3	Proposed
4	Proposed
5	Proposed

Items to Graph

Primary Consolidation

☐ Proposed Only

☑ Final P + S

☑ P+S at t = 375 days

Secondary Consolidation

☐ No Reduction

☐ With Reduction

☑ Total Remaining

Calculations are based on effective stress present at t = 375 days						
Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***30.4***	***48.9***	***5.3***	***48.9***	***53.1***
-351.0	350	0.1	0.0	0.0	0.0	0.0
-321.8	350	1.0	0.0	0.2	0.0	0.2
-292.5	350	14.2	48.1	3.0	48.1	51.0
-263.3	350	22.3	47.7	4.3	47.7	51.9
-234.0	350	9.7	48.6	2.1	48.6	50.7
-204.8	350	8.8	48.0	1.9	48.0	49.8
-175.5	350	9.6	48.1	2.0	48.1	50.2
-146.3	350	9.6	48.2	2.0	48.2	50.2
-117.0	350	9.6	48.2	2.0	48.2	50.2
-87.8	350	9.6	48.2	2.0	48.2	50.2
-58.5	350	9.6	48.2	2.0	48.2	50.2
-29.3	350	9.6	48.2	2.0	48.2	50.2
0.0	350	9.6	48.2	2.0	48.2	50.2
29.3	350	9.6	48.2	2.0	48.2	50.2
58.5	350	9.6	48.2	2.0	48.2	50.2
87.8	350	9.6	48.2	2.0	48.2	50.2
117.0	350	9.6	48.2	2.0	48.2	50.2
146.3	350	9.6	48.2	2.0	48.2	50.2
175.5	350	9.6	48.1	2.0	48.1	50.2
204.8	350	8.8	48.0	1.9	48.0	49.8
234.0	350	9.6	48.9	2.1	48.9	51.0
263.3	350	30.4	47.8	5.3	47.8	53.1
292.5	350	28.7	47.7	5.1	47.7	52.8
321.8	350	10.0	9.8	2.3	9.8	12.1
351.0	350	0.5	0.0	0.1	0.0	0.1

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 71%	25.1	5.3	47.8	53.1
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	654	0.1	0.3	86%	0.2	0.0	0.1	0.1
1 - 2	3.0	750	1.5	4.5	72%	2.5	0.5	1.5	2.0
2 - 3	2.5	750	1.5	4.0	71%	2.1	0.4	1.5	1.9
3 - 4	2.1	750	1.5	3.7	71%	1.7	0.4	1.5	1.9
4 - 5	1.9	750	1.5	3.4	71%	1.5	0.4	1.5	1.9
5 - 6	1.7	750	1.5	3.2	71%	1.4	0.3	1.5	1.9
6 - 7	1.5	750	1.5	3.1	71%	1.2	0.3	1.5	1.8
7 - 8	1.4	750	1.5	2.9	71%	1.1	0.3	1.5	1.8
8 - 9	1.3	750	1.5	2.8	72%	1.0	0.3	1.5	1.8
9 - 10	1.2	750	1.5	2.7	72%	0.9	0.3	1.5	1.8
10 - 11	1.1	750	1.5	2.6	72%	0.9	0.2	1.5	1.8
11 - 12	1.0	750	1.5	2.6	73%	0.8	0.2	1.5	1.7
12 - 13	1.0	750	1.5	2.5	74%	0.8	0.2	1.5	1.7
13 - 14	0.9	750	1.5	2.4	74%	0.7	0.2	1.5	1.7
14 - 15	0.8	750	1.5	2.4	75%	0.7	0.2	1.5	1.7
15 - 16	0.8	750	1.5	2.3	76%	0.6	0.2	1.5	1.7
16 - 17	0.8	750	1.5	2.3	77%	0.6	0.1	1.5	1.7
17 - 18	0.7	750	1.5	2.2	78%	0.6	0.1	1.5	1.7
18 - 19	0.7	750	1.5	2.2	80%	0.6	0.1	1.5	1.6
19 - 20	0.6	735	1.5	2.2	81%	0.5	0.1	1.5	1.6
20 - 21	0.6	714	1.6	2.2	82%	0.5	0.1	1.6	1.6
21 - 22	0.6	690	1.6	2.2	84%	0.5	0.1	1.6	1.7
22 - 23	0.6	661	1.6	2.2	85%	0.5	0.1	1.6	1.7
23 - 24	0.5	628	1.6	2.2	87%	0.5	0.1	1.6	1.7
24 - 25	0.5	587	1.7	2.2	89%	0.5	0.0	1.7	1.7
25 - 26	0.5	538	1.7	2.2	91%	0.5	0.0	1.7	1.8
26 - 27	0.5	474	1.8	2.3	93%	0.4	0.0	1.8	1.8
27 - 28	0.5	387	1.9	2.4	95%	0.4	0.0	1.9	1.9
28 - 29	0.4	253	2.1	2.6	97%	0.4	0.0	2.1	2.2
29 - 30	0.4	38	3.2	3.6	99%	0.4	0.0	3.2	3.2
30 - 31	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
31 - 32	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
32 - 33	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
33 - 34	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
34 - 35	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
35 - 36	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
36 - 37	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
37 - 38	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
38 - 39	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
39 - 40	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
40 - 41	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/2/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 71%	25.1	5.3	47.8	53.1
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=263.3, Y=350 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	30.4	Secondary =	47.8	78.2	Min = 71%	25.1	5.3	47.8	53.1
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Cover Sheet and Input Summary

PROJECT INFORMATION

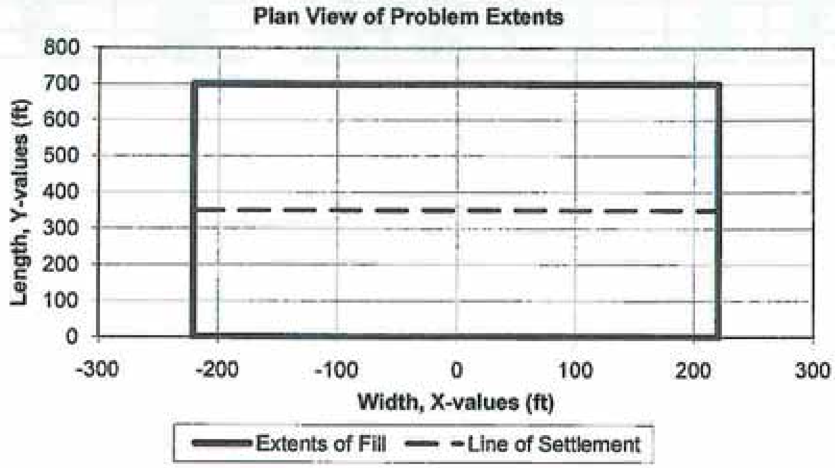
Project Name:	**Fort Bliss MSW Landfill**
Project Number:	**65115803**
Location or Station:	**Fort Bliss, Texas**
Notes/Description:	**Section AA Within Waste 3XSTD DEV MAX SETTLEMENT @ TOP LAYER**
Date of Analysis:	**March 8, 2011**

SUMMARY OF FILL/EMBANKMENT INPUT

Embankments Block Types:	Existing = 0	Proposed = 1	Surcharge = 0

Line of Settlement Calcs:	Beginning X = -220.71	Ending X = 220.71
(25 points along this line.)	Beginning Y = 350	Ending Y = 350

The graph to the right shows the plan view of the problem extent as well as the line along which stresses and settlement are calculated. See the "Fill" sheet for additional information and graphs of the modeled blocks.



SUMMARY OF SOIL INPUT

Total Number of Soil Layers	3
Timeframe for Secondary	30 years
Primary Assumed Complete at	95%
Stress to Induce Secondary	200 psf
Rebound after surcharge	Excluded
Secondary Reduction Method	New OCR
Total Number of Time Steps	6000
Maximum Beta	0.5
Maximum Calculated Time (days)	750
Preconsolidation Pressure Method	OCR
Stress Distribution Method	Boussinesq

Time Dependent Soil Layers 2

Secondary Reduction Method - Explanation

New OCR means that if a surcharge results in a new preconsolidation pressure (exceeds the previous one), the user input value for C-alpha-r will be used to calculate secondary settlement.

See the input and output sheets from Squish for additional information. The results of this program should be independently verified.

Squish - Embankment Fill Input

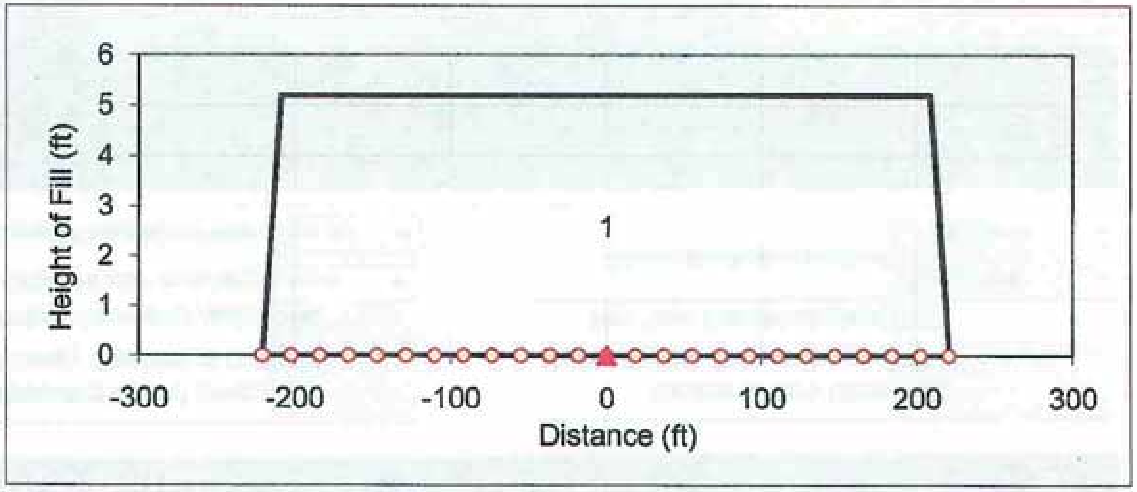
	Block Number	1
	Fill Type	Proposed
	γ (pcf)	65.0
Bottom of Block (ft)	Left X	-220.71
	Left Z	0
	Right X	220.71
	Right Z	0
Top of Block (ft)	Left X	-208.65
	Left Z	5.19
	Right X	208.65
	Right Z	5.19
Calculated Slopes	Left Side Slope	2.32H:1V
	Right Side Slope	-2.32H:1V

Line of Settlement Calculations (ft)	Left X	-220.71
	Left Y	350
	Left X	220.71
	Left Y	350
	Number of Points	*25*

Length of Embankment (ft)	700
Horizontal Slice Thickness (ft)	0.1

☑ Display the Block Numbers on the Graph?

Calculate Settlement and Time for Settlement to Occur



Squish - Subsurface Profile Input Values

Depth to Groundwater (ft)	100
σ_p' Option	OCR

Calculate Settlement and Time for Settlement

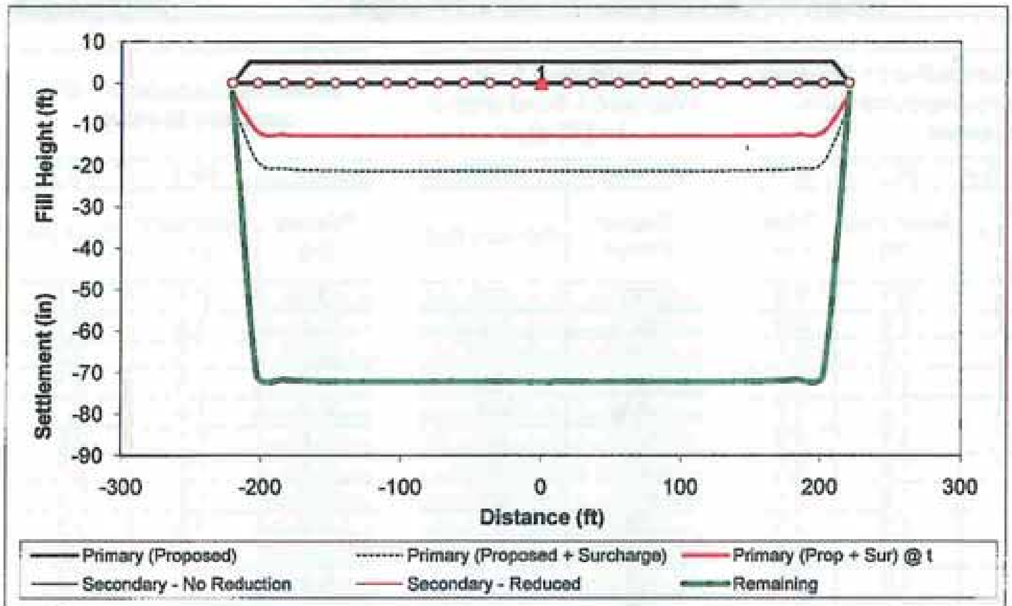
Time for Secondary Consol (years)	30
Assume Primary Complete at Ui =	95%
Min. $\Delta\sigma$' to Induce Secondary (psf) =	200
Rebound after surcharge	Exclude
Secondary Consol Reduction Method	New OCR

Number of Time Steps	6000
Maximum Beta (finite difference)	0.5
Max Time Calculated (days)	750
Stress distribution method	◉ Boussinesq ○ Westergaard

Layer Thickness		Settlement Parameters						Time Rate of Settlement Values					Wicks	Strength Values	
Top (ft)	Bottom (ft)	γ (pcf)	$C_{\varepsilon c}$	$C_{\varepsilon r}$	OCR	C_α	$C_{\alpha r}$	Time Dependent	Cv (ft²/day)	k (ft/day)	Top Drained	Bottom Drained	C_h (ft²/day)	s	m
0	1	120	0.018	0.000	1.0	0.004	0.0000	Yes	0.2	0.00864	Yes	No			
1	41	65	0.331	0.000	1.0	0.109	0.0000	Yes	1	0.7	No	Yes			
41	100	125	0.0003	0.00003	1.0	0.000	0.0000	No							

Squish - Settlement Results

Evaluate Effective Stresses at t = 375.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation

- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 375 days

Secondary Consolidation

- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 375 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 375 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***21.4***	***63.7***	***8.5***	***63.7***	***72.3***
-220.7	350	5.5	0.0	2.6	0.0	2.6
-202.3	350	19.3	63.2	7.4	63.2	70.7
-183.9	350	20.8	63.5	8.3	63.5	71.7
-165.5	350	21.2	63.6	8.4	63.6	72.0
-147.1	350	21.3	63.7	8.5	63.7	72.2
-128.7	350	21.3	63.7	8.5	63.7	72.2
-110.4	350	21.3	63.7	8.5	63.7	72.2
-92.0	350	21.4	63.7	8.5	63.7	72.2
-73.6	350	21.4	63.7	8.5	63.7	72.2
-55.2	350	21.4	63.7	8.5	63.7	72.3
-36.8	350	21.4	63.7	8.5	63.7	72.3
-18.4	350	21.4	63.7	8.5	63.7	72.3
0.0	350	21.4	63.7	8.5	63.7	72.3
18.4	350	21.4	63.7	8.5	63.7	72.3
36.8	350	21.4	63.7	8.5	63.7	72.3
55.2	350	21.4	63.7	8.5	63.7	72.3
73.6	350	21.4	63.7	8.5	63.7	72.2
92.0	350	21.4	63.7	8.5	63.7	72.2
110.4	350	21.3	63.7	8.5	63.7	72.2
128.7	350	21.3	63.7	8.5	63.7	72.2
147.1	350	21.3	63.7	8.5	63.7	72.2
165.5	350	21.2	63.6	8.4	63.6	72.0
183.9	350	20.8	63.5	8.3	63.5	71.7
202.3	350	19.3	63.2	7.4	63.2	70.7
220.7	350	5.5	0.0	2.6	0.0	2.6

Squish - Detailed Settlement Results

View results at: X=0, Y=350 Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 45%	12.8	8.5	63.7	72.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	73%	0.2	0.0	0.1	0.1
1 - 2	2.0	750	1.5	3.5	47%	1.2	0.8	1.5	2.3
2 - 3	1.6	750	1.5	3.1	46%	0.9	0.7	1.5	2.2
3 - 4	1.4	750	1.5	2.9	46%	0.8	0.6	1.5	2.1
4 - 5	1.2	750	1.5	2.7	45%	0.6	0.5	1.5	2.1
5 - 6	1.0	750	1.5	2.6	45%	0.5	0.5	1.5	2.0
6 - 7	0.9	750	1.5	2.4	45%	0.5	0.4	1.5	2.0
7 - 8	0.8	750	1.5	2.4	45%	0.4	0.4	1.5	1.9
8 - 9	0.8	750	1.5	2.3	45%	0.4	0.4	1.5	1.9
9 - 10	0.7	750	1.5	2.2	46%	0.4	0.3	1.5	1.9
10 - 11	0.7	750	1.5	2.2	46%	0.3	0.3	1.5	1.8
11 - 12	0.6	750	1.5	2.1	46%	0.3	0.3	1.5	1.8
12 - 13	0.6	750	1.5	2.1	47%	0.3	0.3	1.5	1.8
13 - 14	0.5	750	1.5	2.1	48%	0.3	0.3	1.5	1.8
14 - 15	0.5	750	1.5	2.0	48%	0.3	0.2	1.5	1.8
15 - 16	0.5	750	1.5	2.0	49%	0.3	0.2	1.5	1.7
16 - 17	0.5	750	1.5	2.0	50%	0.2	0.2	1.5	1.7
17 - 18	0.4	750	1.5	2.0	52%	0.2	0.2	1.5	1.7
18 - 19	0.4	750	1.5	1.9	53%	0.2	0.2	1.5	1.7
19 - 20	0.4	750	1.5	1.9	54%	0.2	0.2	1.5	1.7
20 - 21	0.4	750	1.5	1.9	55%	0.2	0.2	1.5	1.7
21 - 22	0.4	750	1.5	1.9	57%	0.2	0.1	1.5	1.7
22 - 23	0.3	750	1.5	1.9	59%	0.2	0.1	1.5	1.7
23 - 24	0.3	750	1.5	1.9	60%	0.2	0.1	1.5	1.6
24 - 25	0.3	750	1.5	1.8	62%	0.2	0.1	1.5	1.6
25 - 26	0.3	750	1.5	1.8	64%	0.2	0.1	1.5	1.6
26 - 27	0.3	750	1.5	1.8	66%	0.2	0.1	1.5	1.6
27 - 28	0.3	750	1.5	1.8	68%	0.2	0.1	1.5	1.6
28 - 29	0.3	750	1.5	1.8	70%	0.2	0.1	1.5	1.6
29 - 30	0.3	750	1.5	1.8	72%	0.2	0.1	1.5	1.6
30 - 31	0.3	750	1.5	1.8	74%	0.2	0.1	1.5	1.6
31 - 32	0.3	750	1.5	1.8	77%	0.2	0.1	1.5	1.6
32 - 33	0.2	750	1.5	1.8	79%	0.2	0.0	1.5	1.6
33 - 34	0.2	750	1.5	1.8	81%	0.2	0.0	1.5	1.6
34 - 35	0.2	750	1.5	1.8	84%	0.2	0.0	1.5	1.6
35 - 36	0.2	750	1.5	1.8	86%	0.2	0.0	1.5	1.6
36 - 37	0.2	750	1.5	1.7	89%	0.2	0.0	1.5	1.5
37 - 38	0.2	645	1.6	1.8	91%	0.2	0.0	1.6	1.6
38 - 39	0.2	486	1.8	2.0	94%	0.2	0.0	1.8	1.8
39 - 40	0.2	258	2.1	2.3	96%	0.2	0.0	2.1	2.1
40 - 41	0.2	32	3.3	3.5	99%	0.2	0.0	3.3	3.3
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Fort Bliss MSW Landfill
Fort Bliss, Texas
3/8/2011

Squish
Version 1.1

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 45%	12.8	8.5	63.7	72.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

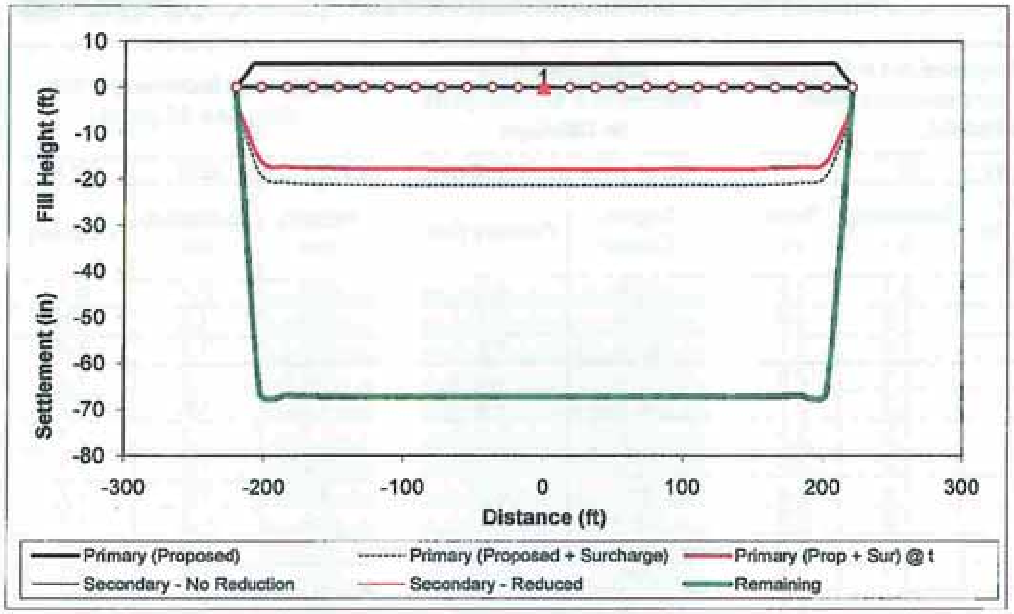
Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 375.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 375 days		Settlement between t = 375 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 45%	12.8	8.5	63.7	72.3
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Settlement Results

Evaluate Effective Stresses at t = 750.0 days



Block	Fill Type
1	Proposed

Items to Graph

Primary Consolidation
- ☐ Proposed Only
- ☑ Final P + S
- ☑ P+S at t = 750 days

Secondary Consolidation
- ☐ No Reduction
- ☐ With Reduction
- ☑ **Total Remaining**

Calculations are based on effective stress present at t = 750 days

Location of Point		Proposed Embankment (t = ∞)		Settlement between t = 750 days and 30 years.		
X (ft)	Y (ft)	Primary (in)	Secondary (in)	Primary (in)	Secondary (in)	Total (in)
Maximum Values		***21.4***	***63.7***	***3.7***	***63.7***	***67.4***
-220.7	350	5.5	0.0	1.4	0.0	1.4
-202.3	350	19.3	63.2	3.2	63.2	66.5
-183.9	350	20.8	63.5	3.5	63.5	67.0
-165.5	350	21.2	63.6	3.6	63.6	67.2
-147.1	350	21.3	63.7	3.6	63.7	67.3
-128.7	350	21.3	63.7	3.6	63.7	67.3
-110.4	350	21.3	63.7	3.6	63.7	67.3
-92.0	350	21.4	63.7	3.7	63.7	67.3
-73.6	350	21.4	63.7	3.7	63.7	67.4
-55.2	350	21.4	63.7	3.7	63.7	67.4
-36.8	350	21.4	63.7	3.7	63.7	67.4
-18.4	350	21.4	63.7	3.7	63.7	67.4
0.0	350	21.4	63.7	3.7	63.7	67.4
18.4	350	21.4	63.7	3.7	63.7	67.4
36.8	350	21.4	63.7	3.7	63.7	67.4
55.2	350	21.4	63.7	3.7	63.7	67.4
73.6	350	21.4	63.7	3.7	63.7	67.4
92.0	350	21.4	63.7	3.7	63.7	67.3
110.4	350	21.3	63.7	3.6	63.7	67.3
128.7	350	21.3	63.7	3.6	63.7	67.3
147.1	350	21.3	63.7	3.6	63.7	67.3
165.5	350	21.2	63.6	3.6	63.6	67.2
183.9	350	20.8	63.5	3.5	63.5	67.0
202.3	350	19.3	63.2	3.2	63.2	66.5
220.7	350	5.5	0.0	1.4	0.0	1.4

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

	Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.				Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 75%	17.7	3.7	63.7	67.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
0 - 1	0.2	750	0.1	0.2	88%	0.2	0.0	0.1	0.1
1 - 2	2.0	750	1.5	3.5	76%	1.7	0.3	1.5	1.8
2 - 3	1.6	750	1.5	3.1	75%	1.3	0.3	1.5	1.8
3 - 4	1.4	750	1.5	2.9	75%	1.1	0.2	1.5	1.8
4 - 5	1.2	750	1.5	2.7	75%	0.9	0.2	1.5	1.7
5 - 6	1.0	750	1.5	2.6	75%	0.8	0.2	1.5	1.7
6 - 7	0.9	750	1.5	2.4	75%	0.7	0.2	1.5	1.7
7 - 8	0.8	750	1.5	2.4	75%	0.7	0.2	1.5	1.7
8 - 9	0.8	750	1.5	2.3	75%	0.6	0.2	1.5	1.7
9 - 10	0.7	750	1.5	2.2	75%	0.6	0.1	1.5	1.7
10 - 11	0.7	750	1.5	2.2	75%	0.5	0.1	1.5	1.7
11 - 12	0.6	750	1.5	2.1	76%	0.5	0.1	1.5	1.7
12 - 13	0.6	750	1.5	2.1	76%	0.4	0.1	1.5	1.6
13 - 14	0.5	750	1.5	2.1	76%	0.4	0.1	1.5	1.6
14 - 15	0.5	750	1.5	2.0	77%	0.4	0.1	1.5	1.6
15 - 16	0.5	750	1.5	2.0	77%	0.4	0.1	1.5	1.6
16 - 17	0.5	750	1.5	2.0	77%	0.4	0.1	1.5	1.6
17 - 18	0.4	750	1.5	2.0	78%	0.3	0.1	1.5	1.6
18 - 19	0.4	750	1.5	1.9	79%	0.3	0.1	1.5	1.6
19 - 20	0.4	750	1.5	1.9	79%	0.3	0.1	1.5	1.6
20 - 21	0.4	750	1.5	1.9	80%	0.3	0.1	1.5	1.6
21 - 22	0.4	750	1.5	1.9	80%	0.3	0.1	1.5	1.6
22 - 23	0.3	750	1.5	1.9	81%	0.3	0.1	1.5	1.6
23 - 24	0.3	750	1.5	1.9	82%	0.3	0.1	1.5	1.6
24 - 25	0.3	750	1.5	1.8	83%	0.3	0.1	1.5	1.6
25 - 26	0.3	750	1.5	1.8	84%	0.3	0.0	1.5	1.6
26 - 27	0.3	750	1.5	1.8	85%	0.3	0.0	1.5	1.6
27 - 28	0.3	750	1.5	1.8	85%	0.3	0.0	1.5	1.6
28 - 29	0.3	750	1.5	1.8	86%	0.2	0.0	1.5	1.6
29 - 30	0.3	750	1.5	1.8	87%	0.2	0.0	1.5	1.6
30 - 31	0.3	750	1.5	1.8	88%	0.2	0.0	1.5	1.6
31 - 32	0.3	750	1.5	1.8	89%	0.2	0.0	1.5	1.5
32 - 33	0.2	750	1.5	1.8	90%	0.2	0.0	1.5	1.5
33 - 34	0.2	750	1.5	1.8	92%	0.2	0.0	1.5	1.5
34 - 35	0.2	750	1.5	1.8	93%	0.2	0.0	1.5	1.5
35 - 36	0.2	750	1.5	1.8	94%	0.2	0.0	1.5	1.5
36 - 37	0.2	750	1.5	1.7	95%	0.2	0.0	1.5	1.5
37 - 38	0.2	645	1.6	1.8	96%	0.2	0.0	1.6	1.6
38 - 39	0.2	486	1.8	2.0	97%	0.2	0.0	1.8	1.8
39 - 40	0.2	258	2.1	2.3	98%	0.2	0.0	2.1	2.1
40 - 41	0.2	32	3.3	3.5	99%	0.2	0.0	3.3	3.3
41 - 42	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
42 - 43	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
43 - 44	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
44 - 45	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
45 - 46	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 75%	17.7	3.7	63.7	67.4
Depth Interval (ft)	Primary (in)	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	Primary (in)	Primary (in)	Secondary (in)	Total (in)
46 - 47	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
47 - 48	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
48 - 49	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
49 - 50	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
50 - 51	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
51 - 52	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
52 - 53	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
53 - 54	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
54 - 55	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
55 - 56	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
56 - 57	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
57 - 58	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
58 - 59	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
59 - 60	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
60 - 61	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
61 - 62	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
62 - 63	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
63 - 64	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
64 - 65	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
65 - 66	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
66 - 67	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
67 - 68	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
68 - 69	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
69 - 70	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
70 - 71	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
71 - 72	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
72 - 73	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
73 - 74	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
74 - 75	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
75 - 76	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
76 - 77	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
77 - 78	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
78 - 79	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
79 - 80	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
80 - 81	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
81 - 82	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
82 - 83	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
83 - 84	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
84 - 85	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
85 - 86	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
86 - 87	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
87 - 88	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
88 - 89	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
89 - 90	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
90 - 91	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
91 - 92	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

Squish - Detailed Settlement Results

View results at: X=0, Y=350 | Evaluate Settlement at t = 750.0 days

Settlement from Proposed at t = 30 years. Assumes all pore pressures have dissipated.					Settlement from Proposed + Surcharge at t= 750 days		Settlement between t = 750 days and 30 years.		
Primary =	21.4	Secondary =	63.7	85.1	Min = 75%	17.7	3.7	63.7	67.4
Depth Interval (ft)	**Primary (in)**	Time for Primary, Tp (days)	Secondary (in)	Total (in)	Degree Consol	**Primary (in)**	**Primary (in)**	Secondary (in)	Total (in)
92 - 93	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
93 - 94	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
94 - 95	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
95 - 96	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
96 - 97	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
97 - 98	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
98 - 99	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0
99 - 100	0.0	0	0.0	0.0	100%	0.0	0.0	0.0	0.0

APPENDIX D-3

Appendix L – Facility Surface Water Drainage Report

APPENDIX L –
FACILITY SURFACE WATER DRAINAGE REPORT

FACILITY SURFACE WATER DRAINAGE REPORT

FORT BLISS FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION BLISS-A10-001

May 6, 2011

zia engineering & environmental consultants, llc

755 South Telshor Blvd, Suite F-201 • Las Cruces, New Mexico 88011 • phone (575) 532-1526 • fax (575) 532-1587
Texas Board of Professional Engineers Certificate of Registration #F-11907

FACILITY SURFACE WATER DRAINAGE REPORT

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL FINAL CLOSURE DESIGN AND PERMIT MODIFICATION APPLICATION FORT BLISS, TEXAS

Zia Project No. BLISS-A10-001

Prepared for:
U.S. Army Corps of Engineers, Fort Worth District
819 Taylor Street
Fort Worth, Texas 76102

Prepared and Certified by:
I attest that this Report has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 TAC §330.303. This document is released for the purpose of review. It is not to be used for construction or bidding purposes.

Certifying Engineer: Francisco X. Urueta
State: Texas
Registration Number: 99473

Signature:
Certification Date: 5/6/11
Engineers Seal:

STATE OF TEXAS
FRANCISCO XAVIER URUETA
99473
LICENSED
PROFESSIONAL ENGINEER

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Las Cruces, New Mexico 88011
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TABLE OF CONTENTS

1.0 INTRODUCTION

The Fort Bliss Municipal Solid Waste Landfill (MSWLF) includes active Subtitle D Type I and Type IV landfill cells that are currently in use to serve the United States Army Air Defense Artillery Center and Fort Bliss area. Permitted types of solid wastes disposed of at the Fort Bliss MSWLF are non-hazardous solid waste from military operations, bulky items, grass and tree trimmings, refuse from litter cans, construction debris, classified waste (dry), dead animals, Regulated Asbestos Containing Material (RACM), and empty oil cans (1-quart and 5-gallon sizes). The MSWLF does not receive hazardous waste nor does it recover incoming waste.

The landfill area is comprised of five distinct areas:

- 1970's-era inactive cells that cover approximately 80-acres that are considered closed.
- An approximately 3-acre Type I cell with final cover in place (non-Subtitle D) that complies with the 1995 closure plan and TCEQ requirements.
- An approximately 10.5-acre Type I active cell meeting Subtitle D requirements (Subtitle D Cell).
- An approximately 5-acre Type IV construction and demolition (C&D) debris cell.
- Approximately 7 acres designated for landfill roads, access areas, guard shack/scale house, etc.

This Facility Surface Water Drainage Report has been completed to meet the requirements of Title 30 of the Texas Administrative Code Chapter 330.63(c) (30 TAC §330.63(c)) as part of the final closure and permit modification application for an alternative cover design and grading plan. This report illustrates that the proposed modification does not adversely alter the existing (permitted) drainage patterns and that these drainage patterns can be retained for the modification.

This report also serves as the surface water drainage report required by 30 TAC § Subchapter G. The facility design complies with the requirements of 30 TAC § 330.303 relating to management of run-on and runoff. The surface water drainage analysis for the Fort Bliss MSWLF is presented in Section 2. An Erosion and Sediment Control Plan is included in Section 3. Section 4 presents the maintenance and inspection requirements.

1.1 General Geology and Soils

The Fort Bliss MSWLF is underlain by Hueco Bolson deposits of tertiary age and typically are composed of unconsolidated to slightly consolidated interbedded sands, clay, silt, gravel, and caliche. Individual beds are not well defined and range in thickness from a fraction of an inch to about 100 feet. The general geology and soils details for the MSWLF site are provided in Attachment 6 of this report.

1.2 General Climate and Weather

The MSWLF is located in west Texas where desert conditions exist; therefore, surface water flow near the MSWLF is limited. Maximum daytime summer temperatures range between 90 and 105 degrees Fahrenheit (°F) and winter temperatures range from 55 to 60°F. The surrounding area receives less than 10 inches of rain per year and relative humidity is very low. Depending upon the intensity and duration of each precipitation event, the water delivered by the occurrence may infiltrate into the soil or become surface runoff. The infiltrated water may percolate downward to the water table or return to the atmosphere via evapotranspiration.

1.3 Surface Water Bodies

No surface water bodies exist at or near the MSWLF. Given a large rain event, surface water runoff may flow downstream to the stormwater retention basin located approximately 2 miles south of the landfill, north of Fred Wilson Boulevard. Structural control measures to reduce sediment are described in the 2005 Storm Water Pollution Prevention Plan (Attachment 5). Further discussion on the surface water drainage and erosion and sedimentation controls are given in Sections 2 and 3 respectively.

2.0 FACILITY SURFACE WATER DRAINAGE ANALYSIS

The final grading/drainage plan for the approximately 106 acre landfill was modified to incorporate the reduced cover design and provide more easily constructible ridges, swales and slopes than provided in the previous (2008) permit modification. However, the drainage concept remains consistent with the previously approved site plans and consists of mostly overland and shallow concentrated flows leading off the landfill side slopes. Swales provide flow paths for internal watersheds to the perimeter. There are four pairs of drainage swales located along the edges of the access roads entering the site form the north, east, and west. Surface water runoff flows off the landfill into existing shallow perimeter drainage swales that discharge to the natural flow patterns of the surrounding area. In general, surrounding flow patterns drain towards the southwest and southeast corners of the landfill as shown on Sheet C-3 of Appendix D (Design Drawings) of the permit modification. The surrounding drainage patterns will not be adversely altered as a result of this alternative cover design and grading plan.

A hydrologic and hydraulic analysis was conducted on the final grading plan, shown on Sheet C-2 in Appendix D (Design Drawings) of the permit modification. The analysis incorporates the proposed alternative cover design and grading modifications to estimate the peak discharge and run-off volumes associated with the 25-year, 24-hour design storm event as required in 30 TAC §330.305(c). The runoff volumes and peak discharges show that the drainage is not adversely affected and that the previously designated storm water control features (i.e. landfill drainage swales down the side slopes) remain adequate.

Appendix D (Design Drawings) of the permit modification application provides the drainage areas, cross-sectional areas, and swale grades used in the analysis.

Per the *TCEQ Guidelines for Preparing a Surface Water Drainage Report for a Municipal Solid Waste Facility* (RG-417), the Rational Method described in Chapter 5, Section 6 of the Texas Department of Transportation's Hydraulic Design Manual (TxDOT 2004) was used to calculate the peak discharge flows. Use of USDA Natural Resources Conservation Service (NRCC) Technical Release 55 (TR-55) method has been approved by the Texas Commission on Environmental Quality (TCEQ) Executive Director for the calculation of the runoff volumes. The values for runoff volume, peak discharge, and flow velocity calculated in this analysis are used to design the erosion and sediment controls and to confirm that the existing drainage patterns for the landfill will not be adversely affected because of these modifications.

2.1 Runoff Volume

The volume of runoff from the landfill cover is dependent on the anticipated amount of precipitation and potential abstractions (principally infiltration) which depend on the soil type, vegetative cover, and the hydraulic conditions of the soil and proposed cover material.

The runoff volume from the landfill is calculated in accordance with 30 TAC §330.63(c)(i)(C) and §330.305(a) using the Curve Number (CN) Method, also known as the Soil Conservation Service (SCS Runoff Curve Number Method) method TR-55:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

Where: Q = runoff (inches over the watershed area)

P = precipitation for the 25-year/24-hour storm event (inches)

S = 1000/CN – 10 = potential maximum retention after runoff begins (inches)

CN = SCS curve number (Table 2-2, Chapter 2, TR-55)

The following assumptions were used to obtain the values above:

P = 3.5 inches (NOAA National Weather Service, Technical Paper 40, 1961)

CN = 82 (weighted average: 95 acres of CN 81 from Table 2.2d, fair herbaceous cover Hydrologic Soil Type C and 11 acres of CN 85 from Table 2.2a, Gravel access roads Hydrologic Soil Type B)

Therefore, the total runoff volume for the landfill during a 25-year, 24-hour storm event is:

S = 1000/82 – 10 = 2.2

Q = $(3.5 - 0.2*2.2)^2$ / (3.5 + 0.8*2.2) = 1.78 inches

Runoff Volume = Q*A = 1.78 inches (106 acres)/12 = 15.7 acre-feet (ac-ft).

A copy of Worksheet 2 from TR-55 is provided as Attachment 1 of this report.

Table 2-1: Summary of Runoff Volumes

Precipitation (P)	**Runoff (Q)**	**Total Runoff Volume (V)**
3.5 inches (25-year, 24-hour)	1.78 inches	15.7 ac-ft

The landfill was divided into 17 separate drainage (watershed) areas based on the final grading plan as shown on Sheet C-3 of Appendix D (Design Drawings) of the permit modification application. The following table summarizes the runoff volume for each watershed.

Table 2-2: Runoff Volumes by Watershed

Watershed No.	Area (acres)	Runoff Volume (ac-ft)
1	1.8	0.3
2	1.6	0.2
3	4.4	0.6
4	10.6	1.6
5	3.0	0.4
6	7.5	1.1
7	10.1	1.5
8	7.9	1.2
9	5.1	0.8
10	2.1	0.3
11	5.0	0.7
12	4.5	0.7
13	0.9	0.1
14	4.9	0.7
15	29.7	4.4
16	3.2	0.5
17	3.7	0.6
Total:	**105.8**	**15.7**

2.2 Peak Discharges

The peak discharge at any storm water control outlet or overland flow from a watershed area is dependent on the time of concentration of that watershed area or drainage swale outfall. The following paragraphs described the rational method and assumptions used to calculate the peak discharge flows for each of the 17 watershed areas shown on the final grading plan on Sheet C-3 of Appendix D (Design Drawings) in the permit modification.

2.2.1 Time of Concentration

The time of concentration (T_c) is the time required for a drop of water to travel from the most hydrological remote point in the watershed to the point of collection.

The time of concentration was calculated according to the procedures specified in TR-55 for each watershed area.

The steps for determining the time of concentration are summarized below:

1. The landfill was divided into 17 separate watershed areas based on the final grading plan as shown on Sheet C-3 of Appendix D (Design Drawings) of the permit modification application.

2. The area of each watershed was determined as summarized in Table 2-2.

3. The sheet flow, shallow concentrated flow, and channel flow lengths and slopes were determined for each watershed area using Sheet C-3 of Appendix D (Design Drawings) of the permit modification application.

4. The travel time (T_t) for the separate types of flow in each watershed area were calculated (Worksheet 3, Chapter 3, TR-55) using the following equations and then added together to compute the total T_c for the watershed area:

   T_c = Sheet Flow T_t + Shallow Concentrated Flow T_t + Channel Flow T_t

   a. Sheet flow travel time was calculated with a maximum flow length of 300-feet using Overton and Meadow's equation: $T_t = 0.007\ (nL)^{0.8} / (P_2)^{0.5}\ (S)^{0.4}$ (the value for "bare soil", 0.011, was used for the roughness coefficient n).

   b. Shallow concentrated flow travel time was calculated using the equation T_t = L/3600*V where the average flow velocity (V) was obtained from Figure 3.1 in Chapter 3 of TR-55 for unpaved surface at the specified watercourse slope.

   c. Channel flow travel time was also calculated using T_t = L/3600*V where the average flow velocity was calculated by the Manning's equation:

      $V = 1.49*(r^{2/3})\ (s^{½}) / n$. (0.022 was used for Manning's roughness coefficient for the grass swale, n). The following iteration was followed to determine the final T_t:

      i. Depth of flow, "y", is assumed.

      ii. Cross-section area, wetted perimeter, and hydraulic radius are calculated.

      iii. T_t is determined and the peak discharge is computed with TR-55.

      iv. The peak discharge is used in the Manning's equation to determine the depth of flow, "y".

      v. The computed depth of flow is compared with the assumed value. The assumed value is adjusted and the calculation reiterated until the calculated and assumed values are close in value.

2.2.2 Rational Method

The procedure for calculating the Rational Method described in Chapter 5, Section 6 of the Texas Department of Transportation's Hydraulic Design Manual (TxDOT 2004) was used to calculate the maximum rate of runoff. The Rational Method estimates the peak rate of runoff at any location in a watershed as a function of the drainage area, runoff coefficient, and mean rainfall intensity of duration equal to the time of concentration. The rational formula is expressed as:

$Q = CC_fIA$

Q = Maximum rate of runoff (cfs)

C = runoff coefficient (0.38 based on poor vegetative cover and relatively flat land)

C_f = Runoff Coefficient Adjustments (1.1 for the 25 year storm)

I = average rainfall intensity (in/hr) for the 25-year/24 hr and the time of concentration for each area as described in Section 2.2.1 above.

A = drainage area (acres)

Because most of the watersheds are small and had times of concentration less than 10.25 minutes (minimum time of concentration of 10 minutes recommended by 2004 TxDOT Hydraulic Manual), the rainfall intensity for the 25-year storm for most watersheds was 4.4 inches/hour. Watershed No. 11 has a time of concentration of 12.60 minutes and resulted in a rainfall intensity of 4.0 inches/hour. Watershed No. 15 has a time of concentration of 18.45 minutes and resulted in a rainfall intensity of 3.4 inches/hour. The runoff coefficient was calculated as a factor of the relief, soil infiltration characteristics, vegetative cover, and surface type in accordance with the Hydraulic Design Manual (TxDOT 2004). A runoff coefficient factor of 1.1 was used to adjust the runoff coefficient since these calculations are for the 25-year storm event. A sample calculation and the results of the peak discharge calculations for the 17 watersheds are provided in Attachment 1 and Table 2-3, respectively.

Table 2-3: Peak Discharges

Watershed No.	Area (acres)	Time of Concentration (hours)	Peak Discharge (cfs)
1	1.8	0.14	3.3
2	1.6	0.10	3.0
3	4.4	0.10	8.0
4	10.6	0.17	19.4
5	3.0	0.17	5.5
6	7.5	0.16	13.7
7	10.1	0.12	18.5
8	7.9	0.14	14.5
9	5.1	0.17	9.3
10	2.1	0.09	3.9
11	5.0	0.21	8.3
12	4.5	0.09	8.3
13	0.9	0.10	1.7
14	4.9	0.10	8.9
15	29.7	0.31	42.2
16	3.2	0.17	5.9
17	3.7	0.13	6.9

2.3 Peak Runoff Velocities Calculations

The general surface hydrology and stormwater runoff for the final cover grades are shown on Sheet C-3 in Appendix D (Design Drawings) of the permit modification. Stormwater from watersheds 1 through 4, 9, and 13 through 16 drain straight to the existing perimeter drainage swales, where as watersheds 5 though 8, 10 through 12, and 17 drain to erosion control lined swales and then out to the existing perimeter drainage swales. The existing site perimeter drainage swales discharge to the natural surrounding flow patterns and generally flow towards the southeast and southwest corners of the landfill.

The flow velocities and the flow depths for the eight landfill drainage swales are summarized below in Table 2-4. The typical swale is V-shaped, 1 to 1.5 feet deep with 10 (H): 1 (V) side slopes on side adjacent to access road and 4 (H): 1 (V) side slopes on opposite side. Details shown on Sheet C-4 in Appendix D (Design Drawings) of the permit modification were used for the hydraulic analysis of the landfill drainage swales. A sample calculation of the methodology used for determining the velocities and flow depths is provided in Attachment 1. As demonstrated in Table 2-4 flow depths of each swale are less than 1 foot, therefore all swales provide sufficient capacity to convey peak flow from the 25-year, 24-hour storm event.

Table 2-4: Velocities and Depths of Flow in Swales

Watershed Associated with Swale or Ditch	Peak Discharge (cfs)	Flow Depth (ft)	Velocity (ft/s)
5	5.5	0.6	2.1
6	13.7	0.9	2.6
7	18.5	0.8	3.9
8	14.5	0.8	3.5
10	3.9	0.5	2.6
11	8.3	0.7	2.6
12	8.3	0.6	3.6
17	6.9	0.5	3.3

2.4 Summary of Drainage Analysis

Table 2-5 summarizes the results from the pre-developed (permitted facility conditions per the approved 1995 Closure Plan) and post-developed conditions (final closure with alternative cover design and grading plan) to demonstrate that the proposed modification does not adversely affect the drainage patterns. The comparison helps to illustrate that the range of peak discharges and flow characteristics of the site drainage have not been significantly altered because of the proposed modification. The landfill surface area was not increased and the drainage patterns were not altered significantly so as to change the previously permitted drainage conditions of the site.

Table 2-5:
Comparison of Peak Discharges, Flow Depths, and Flow Velocities in Swales

Condition and Analysis	Range of Peak Discharge (cfs)	Range of Normal Depth of Flow, y (ft)	Range of Flow Velocities (ft/s)
Pre-Development (2005 Permitted)	10.9 – 73.6	0.7 – 1.1	1.9 – 3.9
Post-Development (Alternative Cover and Grading)	1.7 – 42.2	0.5 – 0.9	2.1 – 3.9

3.0 EROSION AND SEDIMENT CONTROL PLAN

This plan describes the design and operation considerations for erosion and sediment control measures specified and best management practices (BMPs) of the landfill facility in order to minimize erosion and provide effective erosional stability to top dome surfaces and external embankment side slopes during all phases of landfill operations in accordance with 30 TAC §330.305(d).

The plan layouts the erosion and sediment control measures for the three conditions of the Fort Bliss MSWLF: the active Subtitle D disposal areas, intermediate cover areas, and final cover areas. The installation of the proposed erosion and sediment control measures will be on going and include both temporary and permanent controls throughout the remaining duration of the landfill operation until closure is completed when all permanent controls are finally installed.

Landfill cover phases are defined as daily cover, intermediate cover, and final cover. The topography of the landfill changes over time as the landfill is operating and reaching closure grades. In order to comply with 30 TAC §330.305(d), top dome surfaces and external embankment side slopes are defined as areas of above graded slopes that drain to the existing perimeter drainage swale, areas that have received intermediate or final cover, and areas that have received their permitted elevation and will remain inactive for longer than 180 days. Slopes that drain to cells where waste is being placed are not considered external embankment side slopes.

Based on the above definitions, all areas of the Fort Bliss MSWLF will require erosion and sediment controls per 30 TAC §330.305(d) with the exception of active internal slopes within Subtitle D cell where waste and daily cover are being placed.

3.1 General Erosion and Soil Loss Assessment

Areas of the site most prone to erosion and soil loss are areas of soil disturbance for the landfill operations, areas with steep slopes for intermediate and final covers, and intermediate or permanent drainage swales that control stormwater discharges leaving the site. Therefore, the erosion and sediment control plan focuses on these sensitive areas and incorporates structural and non-structural controls to guard again soil loss from site.

During a rain event, stormwater falls on the top dome and embankment side slopes of the landfill where erosion is more susceptible. In areas of steeper slopes and embankment side slopes, structural BMPs such as temporary soil berms and swales are proposed to control the runoff and minimize erosion. The following sections, accompanied by the Permit Modification Drawings in Appendix D (Design Drawings) describe the design for structural erosion control measures proposed to avoid erosion and off-site discharge of sediments during the phases of landfill operation through final closure. Maintenance and inspections are addressed in Section 3.4 of this report.

3.2 Interim Construction Stages

This sub-section describes temporary and intermediate erosion control measures that will be used during the landfill interim construction stages to minimize erosion of top dome surfaces and external embankment side slopes as required by 30 TAC §330.305(e)(2). The erosion control measures were selected and designed based on velocity and soil erosion analyses. The temporary erosion control measures shall remain in place until the final cover installation is completed and all permanent erosion control measures have been installed.

3.2.1. Description of Phase Development

Interim construction phases include filling of waste and daily cover grading in Subtitle D and placement of intermediate soil cover in Subtitled D. The phased development for landfill cell construction and solid waste placement will be followed as specified in the typical fill operation cross section detail on Sheet C-4 in Appendix D (Design Drawings) of the permit modification. This sequencing will ensure adequate slope stability and limited erosion and soil loss during cell construction and installation of the intermediate and final cover systems.

During filling operations through installation of the final cover, the top dome of the daily and intermediate cover for Subtitle D shall be sloped at 2.0% and the external embankment side slopes will be 4(H):1(V) as shown on Sheet C-4 in Appendix D (Design Drawings). Stormwater shall be controlled with temporary soil berms, and drainage swales to avoid erosion of the embankment side slopes and maintain flow velocities at or below the permissible non-erodible velocity.

The temporary soil berms will be used near the crest of the external embankment side slope to divert runoff to the swales, located in the northeastern and southwestern corners of Subtitle D cell, as shown on Sheet C-5 in Appendix D (Design Drawings). The typical temporary soil berm design will be 2-foot high as measured from the invert of the channel to the top of berm, with the invert sloped at 0.5% minimum and 10% maximum in the direction of flow towards the drainage swales. The slopes of the soil berms will be stabilized with mulch or equal. (see Section 3.2.3 below)

Two swales will run along the existing Subtitle D cell access roads and will be constructed at the termination of the temporary soil berms as shown on Sheet C-4. The recommended minimum dimensions of the discharge swales are V-shaped, 1 to 1.5 feet deep with 10 (H): 1 (V) side slopes on side adjacent to access road and 4 (H): 1 (V) side slopes on opposite side. Stabilization of the swales shall be established using either Reno®Mattress, Armoflex®, riprap or equal.

The drainage swales will convey runoff off-site to the existing perimeter topography (not shown in the Appendix D drawings). Hydraulic analysis of the drainage swales is included in Attachment 1.

3.2.2. Erosion and Sediment Controls Design

The erosion and sedimentation controls described above where designed based on the following criteria outlined in 30 TAC §330.305(d), to ensure the stability of top dome surface and external embankment side slopes:

- The estimated peak runoff velocity should be less than the permissible non-erodible velocities under similar conditions. Typical permissible non-erodible flow velocities assumed for the design are:
  - Silty-sandy loam 3 ft/sec,
  - Coarse Gravels is 5 ft/sec,
  - 0.5 ft thick Reno®Mattress or Armoflex® 8 ft/sec

- The potential soil erosion loss should not exceed the permissible soil loss for comparable soil slope lengths and soil-cover conditions. The soil erosion loss of 50 tons/acre/year is selected as the permissible soil erosion loss for interim erosion and sediment controls.

Peak Runoff Velocities Calculations

To calculate the flow velocity being conveyed along the temporary soil berm and out the drainage swale as described above and shown on Sheet C-4 in Appendix D (Design Drawings), the interim peak discharge from watershed 7A, as shown on Sheet C-5, was calculated and is presented in Attachment 2. The flow velocity along the temporary soil berm is 1.4 ft/sec on the top dome and the flow velocity through the temporary soil berm along the embankment slope is 6.9 ft/sec Thereafter, the flow through the permanent discharge swale is 3.9 ft/sec as calculated in section 3 and presented in Table 2-4 and Attachment 1.

Drainage and conveyance channels were designed and sized to withstand erosive forces of water and not to exceed the permissible non-erodible velocities presented in section 3.2.2 and summarized in Table 3-1.

Table 3-1:
Comparison of Calculated Flow Velocities and Permissible Non-Erodible Velocities

Type	Velocity	Permissible Non-Erodible Velocity
Temp. Soil Berm - Top Dome	1.4 ft/sec	3 ft/sec (silty-loam)
Temp. Soil Berm - off Subtitle D Embankment	6.9 ft/sec	8 ft/s (Reno®Mattress)
Drainage Swale off Landfill	3.9 ft/sec	5 ft/sec (gravel lined swale)

To further reduce flow velocities and allow sediments and other pollutants to settle, organic check dams will be installed at the discharge points from the drainage swales adjacent to Subtitle D as shown on Sheet C-5 in Appendix D (Design Drawings).

The hydraulic calculation supporting this design of the temporary soil berm and discharge swale is included in Attachment 2. The hydraulic calculation supporting the design of the permanent drainage swale is included in Attachment 1.

Soil Loss Calculations

Soil erosion loss was estimated utilizing the Revised Universal Soil Loss Equation Version 2 (RUSLE2). RUSLE2 uses factors that represent the effects of climate (erosivity, precipitation, and temperature), soil erodibility, topography, cover management, and support practices to compute soil loss and erosion.

RUSLE2 is a mathematical model that uses a system of equations implemented in a computer program to estimate erosion rates. The other major component of RUSLE2 is a database containing an extensive array of site/county specific values (precipitation, R, EL, etc.) that are used by the RUSLE2 user to describe a site-specific condition so RUSLE2 can compute erosion values that directly reflect conditions at a particular site. The RUSLE2 computer program and its extensive database information were developed by the USDA-Agricultural Research Service (ARS), USDA-Natural Resources Conservation Service (NRCS) and the University of Tennessee. The horizontal length of 1,000 feet at an average slope of 2.7% was calculated using the following flow segments from Sheet C-5: 250 feet at 0.5%; 205 feet at 10%; and 545 feet at 1%.

Results show soil losses of 5.0 tons/acre/year. With the organic check dam installed at the discharge point of the drainage swale as a best management practice (BMP) for pollution prevention, the soil losses would be reduced to 2.4 tons/acre/year. The soil loss analyses demonstrate that proposed erosion and sedimentation controls can achieve effective erosional stability. Soil loss calculations are included in Attachment 2.

3.2.3 Soil Surface Stabilization – Interim Measures

The selected BMPs to be implemented during landfill operations, for soil stabilization and stormwater control, are ones that are proven and commonly used as described below.

Temporary stabilization of intermediate cover on top dome and external slopes will be completed within 180 days after installation and maintained until the final cover is placed and permanent stabilization controls implemented. Types of soil surface stabilization BMPs that will be implemented at the site are listed below:

The specific cover practices that will be implemented prior to installation of final closure:

- Mulch - Mulching is the application of a layer of organic, biodegradable material which is spread over areas where vegetation is not yet established. Types of mulch include compost, straw, wood chips, or manufactured products. Mulch application can be in dry or hydraulic forms. When applied dry, the thickness of the mulch will vary depending on the type of mulch applied. Primary-grind mulch (e.g. wood shreds that form a mass of intermixed fragments), which will be used primarily for erosion control, will be applied using spreading equipment, such as a bulldozer, at a minimum thickness of 2-inches. Compost material, which will consist of more finely ground mulch, will be applied using mechanical spreaders or sprayers. A tackifier or binder can be used to increase the strength and durability of the mulch. Hydraulic mulch applications consist of the use of hydromulch, bonded fiber matrix, Flexible Growth Medium (FGM), Flexterra®, as well as other commercially available products. Hydraulic mulch typically includes a tackifier or binder. Seeds can be applied to the soil first or mixed into the hydraulic mulch.

The application method and application rate of hydraulic mulch will be based on manufacturers' recommendations to ensure a uniform and complete coverage. A specification of the Flexterra® product and Ecoblanket is included in Attachment 4. Any mulch (dry or hydraulic) that is used shall be evaluated by site personnel to ensure it remains in place on the slopes during rain events or windy conditions.

For erosion control in drainage swales as shown on Sheet C-5 in Appendix D (Design Drawings), rolled-erosion control products (RECPs) can be used and are specified herein. The standard specification for rolled erosion control products published by the Erosion Control Technology Council is provided in Attachment 4.

For pollution prevention, organic/biodegradable check dams (organic check dam) are specified. These types of silt control structures are alternatives of traditional silt fences and straw bales. Organic check dams may be Organic Filter Tube Check Dams or Organic Filter Berm Check Dams. A typical biodegradable tube consists of mulch contained in a synthetic mesh sock or tube. The tubes are installed on the slope with stake anchors. Organic berms are typically constructed of compost/mulch. A specification for the organic check dam, published by the TCEQ, is included in Attachment 4.

For onsite stockpiles, some combination of silt fences, rock berms or soil berms will be required around the stockpiles to prevent the discharge of sediment-laden runoff from the stockpile area(s) unless vegetation is used to stabilize the stockpiles.

3.3 Final Cover Stage

Permanent erosion and sediment controls measures will be installed during the final cover phase, detailed on Sheet C-5 in Appendix D (Design Drawings) of the permit modification. These permanent erosion and sedimentation control measures include an erosion control layer (e.g topsoil and 1"-4" cobbles and drainage. Details of the measures are shown on Sheet C-5 in Appendix D (Design Drawings).

3.3.1 Erosion and Sedimentation Controls Design

The permanent erosion and sediment control measures were designed based on the peak flow velocities presented in Table 2-4 and soil loss analysis discussed below for the final cover design.

Peak Runoff Velocities Calculations

The flow velocity through the drainage swales where calculated in Section 2.3 and presented in Table 2-4. The drainage swales will have erosion control lining as specified on the drawings and therefore was compared to the permissible non-erodible velocity of 5 ft/sec. All the velocities presented in Table 2-4 compared to the permissible erodible velocities presented in Table 3-1 illustrate that the drainage and conveyance channels were designed and sized to withstand erosive forces of water and not to exceed the permissible non-erodible velocity of 3 ft/sec in the drainage ditch and 5 ft/sec in the drainage swales.

Soil Loss Calculations
RUSLE2 is a mathematical model was exercised to compute the soil loss analysis for the final cover surfaces. The Subtitle D area final cover slopes were analyzed: 250 feet at 2%; 95 feet at 25%; and 655 feet at 1%. The input data for management operations have been changed: riprap fill on the top surfaces of Subtitle D area added, etc. The results show soil losses of 4.9 tons/acre/year and reduction to 2.2, because of erosion control measures for Subtitle D cell. The soil loss analysis demonstrates that the landfill surfaces with proposed erosion and sedimentation controls can achieve recommended soil loss rate. (According to *Guidance for Addressing Erosional Stability During all Phases of Landfill Operation,* 30 TAC §330.63(c), §330.305(c), (d) and (e), 02/14/07, the soil erosion loss of 50 tons/acre/year is a permissible soil erosion loss rate and 2 to 3 tons/acre/year is a recommended rate for final cover phase).

Erosion calculations report is included in Attachment 3.

Based on velocity and soil erosion analyses, selections of BMPs are identified and general installation guidance is provided on Sheet C-3 and C-5 in Appendix D (Design Drawings) of the permit modification.

3.3.2 Soil Surface Stabilization – Permanent Measures

The selected BMPs that will be implemented for final cover and post closure landfill operations, to meet the soil stabilization and stormwater control requirements, are ones that are proven and commonly used as described below.

- Vegetation - Vegetative cover reduces erosion potential by shielding the soil surface from the direct erosive impact of raindrops, improving the soil's water storage porosity and capacity, so more water can infiltrate, slowing the runoff and allowing the sediment to drop out, and physically holding the soil in place with plant roots. Vegetative cover will consist of a balanced mixture of native herbaceous and vascular plants. Dr. Rafael Corral of the Fort Bliss Environmental Division and Leah Markiewitz with Zia provided an optimum vegetative design to utilize indigenous species of the area such as alkali sacaton and sand dropseed. This type of vegetation more suitable for the area and was selected in accordance with guidelines published by the state and other similar sources. The standard seeding specification published by the Texas Department of Transportation (TxDOT) is provided in Attachment 4.

- Erosion control protection such as rip rap or geosynthetic erosion control material will be installed in the swales as determined by Fort Bliss at the time of closure.

4.0 MAINTENANCE AND INSPECTIONS

In addition to the design and operational considerations as previously described in the Erosion and Sedimentation Control Plan, inspection and maintenance of the stormwater management system and erosion control measures are necessary to maintain the required effectiveness of the system components. The inspection, maintenance, and repair guidelines discussed in the following sections will be implemented into the employee training program as outlined in Site Operating Plan and Stormwater Pollution Prevention Plan 2005.

4.1 Stormwater Management System

The facility will be monitored to ensure the integrity and adequate operation of the stormwater collection and conveyance structures. On a weekly basis, and following major storm events, all temporary and permanent drainage facilities will be inspected. In the event of a washout or failure, the drainage system will be restored and repaired pursuant to 30 TAC §330.305(e) (1). Plans and actions will be developed to address and remediate the problem, to ensure protection to ground and surface waters.

Erosion of intermediate and final cover will be repaired pursuant to 30 TAC §330.165(g). Sediment and debris will be removed from ditches as needed to maintain the effectiveness of the stormwater management system. Minor maintenance requirements, such as the removal of excessive sediment and vegetation, will be undertaken as required.

In accordance with 30 TAC §330.305(g), Stormwater Pollution Prevention Plan 2005, describes inspections, maintenance, and record keeping frequencies and techniques for the phased development of the landfill. The plan discusses how the owner or operator will handle, store, treat, and dispose of surface or groundwater that has become contaminated by contact with the working face of the landfill or with leachate pursuant to §330.207 of this title (relating to Contaminated Water Management); and how storage areas for this contaminated water will be designed with regard to size, locations, and methods.

A Storm Water Pollution Prevention Plan was prepared for the site in 2005. The plan satisfies the control of erosion and sedimentation using interim controls for the phased development of the landfill as required by 30 TAC §330.63(c) (1) and §330.305(c), (d), and (e) until the landfill is closed per the regulations.

4.2 Landfill Cover Materials

Landfill cover soils are inspected on a regular basis. Daily cover soils are inspected and applied as part of the Site Operating Plan requirements. In addition, pursuant to the facility's SWPPP, during the active life of the site, daily, intermediate and final cover will be inspected weekly and after a significant rainfall event for areas of erosion, exposed waste, or other damage. During the post-closure maintenance period of the site, the final cover will be inspected quarterly. The inspections will include any temporary or permanent erosion measures that are in place at the time of the inspection.

Reports of these inspections will be documented in the Cover Application Log and will be maintained as part of the site operating record, in accordance with the Site Operating Plan. Damage to the cover system noted during these inspections will be repaired, as set forth below, and documented in the Cover Application Log. Any runoff from damaged or eroded areas that has met waste will be handled as contaminated water in accordance with SWPPP until the repairs are completed.

In accordance with 30 TAC §330.165(g), erosion gullies or washed-out areas deep enough to jeopardize the intermediate or final cover must be repaired within five days of detection. An eroded area is considered deep enough to jeopardize the intermediate or final cover if it exceeds four inches in depth as measured from the vertical plane from the erosion feature and the 90-degree intersection of this plane with the horizontal slope face or surface. Damage to any temporary or permanent erosion measures that are noted during the inspections, will be repaired or replaced within 14 days of detection. The repair schedule as outlined for the cover or the erosion measures may be extended due to inclement weather conditions or the severity of the condition requiring an extended repair schedule.

5.0 ATTACHMENTS

ATTACHMENT 1 – Peak Discharge Flow Sample Calculations Using Rational Method and Drainage Swale Design

ATTACHMENT 2 – Intermediate Erosion and Soil Control Design Calculations (Peak Runoff Velocity, Channel Design, and Soil Loss)

ATTACHMENT 3 – Final Erosion and Soil Control Design Calculations (Soil Loss)

ATTACHMENT 4 – Erosion and Soil Control Measures Specifications Information

ATTACHMENT 5 – 2005 Stormwater Pollution Prevention Plan (For Reference Only. Prepared by U.S. Army Center for Health Promotion and Preventive Medicine.)

ATTACHMENT 6 – Geohydrologic Site Characterization of the Municipal Solid Waste Landfill Facility, U.S. Army Air Defense Artillery Center and Fort Bliss, El Paso County, Texas

ATTACHMENT 1

Peak Discharge Flow Sample Calculations Using Rational Method and Drainage Swale Design

Worksheet 2: Runoff curve number and runoff

Project Fort Bliss	By C. Almy	Date 4/6/11
Location MSWLF	Checked	Date

Check one: ☐ Present ☒ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☒ acres ☐ mi^2 ☐ %	Product of CN x area
C	Fair – Herbaceous	81			95	7,695
B	Gravel – Access Roads	85			11	935
				Totals ➡	106	8,630

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8{,}630}{106} = 81.4$; Use CN ➡ $\boxed{82}$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	25		
Rainfall, P (24-hour)	in	3.5		
Runoff, Q	in	1.78		

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

$S = \frac{1000}{82} - 10 = 2.2$ $Q = \frac{(3.5-(0.2)(2.2))^2}{3.5+(0.8)(2.2)} = 1.78$

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project: Fort Bliss	By: C. Almy	Date: 4/6/11
Location: Watershed No. 12	Checked	Date

Check one: ☐ Present ☒ Developed

Check one: ☒ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	12a			
1. Surface description (table 3-1)	Bare			
2. Manning's roughness coefficient, n (table 3-1)	0.011			
3. Flow length, L (total L † 300 ft) ... ft	284			
4. Two-year 24-hour rainfall, P_2 ... in	1.5			
5. Land slope, s ... ft/ft	0.046			
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{\ 0.5}\ s^{0.4}}$ Compute T_t ... hr	0.049	+		= 0.049

Shallow concentrated flow

Segment ID	12b			
7. Surface description (paved or unpaved)	unpaved			
8. Flow length, L ... ft	125			
9. Watercourse slope, s ... ft/ft	0.056			
10. Average velocity, V (figure 3-1) ... ft/s	3.8			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr	0.009	+		= 0.009

Channel flow

Segment ID	12c			
12. Cross sectional flow area, a ... ft^2	3.78			
13. Wetted perimeter, p_w ... ft	13.52			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ... ft	0.28			
15 Channel slope, s ... ft/ft	0.008			
16. Manning's roughness coefficient, n	0.022			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ... ft/s	2.65			
18. ~~Flow~~ length, L ... ft	298			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr	0.031	+		= 0.031
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ... Hr				0.089

Peak Discharge Using The Rational Method
25-Year Storm Event

Equation: $Q = CC_fIA$

Watershed No.	Area (A; acres)	Time of Concentration (hrs)	Time of Concentration (min)	Intensity (I; in/hr)	Coefficient (C)	Coefficient Adjustment Factor (Cf)	Peak Flow (cfs)
1	1.8	0.14	10.0	4.4	0.38	1.1	3.3
2	1.6	0.10	10.0	4.4	0.38	1.1	3.0
3	4.4	0.10	10.0	4.4	0.38	1.1	8.0
4	10.6	0.17	10.1	4.4	0.38	1.1	19.4
5	3.0	0.17	10.2	4.4	0.38	1.1	5.5
6	7.5	0.16	10.0	4.4	0.38	1.1	13.7
7	10.1	0.12	10.0	4.4	0.38	1.1	18.5
8	7.9	0.14	10.0	4.4	0.38	1.1	14.5
9	5.1	0.17	10.0	4.4	0.38	1.1	9.3
10	2.1	0.09	10.0	4.4	0.38	1.1	3.9
11	5.0	0.21	12.6	4.0	0.38	1.1	8.3
12	4.5	0.09	10.0	4.4	0.38	1.1	8.3
13	0.9	0.10	10.0	4.4	0.38	1.1	1.7
14	4.9	0.10	10.0	4.4	0.38	1.1	8.9
15	29.7	0.31	18.4	3.4	0.38	1.1	42.2
16	3.2	0.17	10.2	4.4	0.38	1.1	5.9
17	3.7	0.13	10.0	4.4	0.38	1.1	6.9

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration Watershed No. 1 - 3, 6 - 10, 12 - 14, 17

County
El Paso
Eastland
Ector
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (in)	0.797	0.802	0.795	0.843	0.900	0.825
b	24	34	42	60	90	65
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (in/hr)*	2.2	2.9	3.6	4.4	5.6	5.6

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	57.1	72.4	91.4	112.5	141.5	142.4

* for time of Concentration = **10** mins

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration

Watershed No. 4

County	Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
El Paso	e (in)	0.797	0.802	0.795	0.843	0.900	0.825
	b	24	34	42	60	90	65
	d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
	Intensity (in/hr)*	2.2	2.8	3.6	4.4	5.5	5.6

Eastland
Ector
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	56.8	72.0	90.9	111.9	140.7	141.5

* for time of Concentration = **10.14** mins

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration

Watershed No. 5

County
El Paso
Eastland
Ector
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (in)	0.797	0.802	0.795	0.843	0.900	0.825
b	24	34	42	60	90	65
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (in/hr)*	2.2	2.8	3.6	4.4	5.5	5.5

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	56.6	71.7	90.6	111.5	140.1	140.9

* for time of Concentration = **10.25** mins

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration

Watershed No. 11

County	Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
El Paso	e (in)	0.797	0.802	0.795	0.843	0.900	0.825
	b	24	34	42	60	90	65
	d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
	Intensity (in/hr)*	2.0	2.6	3.3	4.0	5.0	5.1

Eastland
Ector
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	51.7	66.2	83.6	102.4	128.0	128.4

* for time of Concentration = **12.6** mins

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration

Watershed No. 15

County	Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
El Paso	e (in)	0.797	0.802	0.795	0.843	0.900	0.825
	b	24	34	42	60	90	65
	d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
	Intensity (in/hr)*	1.7	2.2	2.8	3.4	4.2	4.2

Eastland
Ector
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	42.9	55.8	70.6	85.6	105.6	105.8

* for time of Concentration = **18.45** mins

Rainfall Intensity-Duration-Frequency Coefficients for Texas Counties

1. Select your county. 2. Enter the time of concentration

Watershed No. 16

County	Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
El Paso	e (in)	0.797	0.802	0.795	0.843	0.900	0.825
	b	24	34	42	60	90	65
	d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
	Intensity (in/hr)*	2.2	2.8	3.6	4.4	5.5	5.6

Eastland
Ectror
Edwards
El Paso
Ellis
Erath
Falls
Fannin
Fayette

Coefficient	2-year	5-year	10-year	25-year	50-year	100-year
e (mm)	0.797	0.802	0.795	0.843	0.900	0.825
b	610	864	1067	1524	2286	1651
d (mins)	9.5	12.0	12.0	12.0	12.0	9.5
Intensity (mm/hr)*	56.8	72.0	90.9	111.9	140.6	141.4

* for time of Concentration = **10.16** mins

Runoff Coefficient

Hydraulic Design Manual (TxDOT)

	Value
Relief (C_r)	0.08
Soil Infiltration (C_i)	0.07
Vegetal Cover (C_v)	0.12
Surface (C_s)	0.11
Coefficient (C= Cr + Ci + Cv + Cs)	0.38
Coefficient Ajustment Factor (C_f)	1.1

Swale Hydraulic Analysis
25-Year Storm Event

Watershed Swale	Slope (ft/ft)	Manning Roughness, n	Side Slope 1 (z_1:1)	Side Slope 2 (z_2:1)	Depth (ft)	Area (ft^2)	Wetted Permitter (ft)	Hydraulic Radius (ft)	Avg Velocity (ft/s)	Flow (cfs)
5	0.005	0.022	10.0	4.0	0.61	2.65	8.71	0.30	2.07	5.47
6	0.004	0.022	10.0	4.0	0.87	5.32	12.35	0.43	2.59	13.75
7	0.011	0.022	10.0	4.0	0.83	4.78	11.72	0.41	3.86	18.48
8	0.010	0.022	10.0	4.0	0.77	4.16	10.92	0.38	3.49	14.50
10	0.011	0.022	10.0	4.0	0.46	1.46	6.47	0.23	2.64	3.86
11	0.006	0.022	10.0	4.0	0.68	3.25	9.65	0.34	2.56	8.31
12	0.015	0.022	10.0	4.0	0.57	2.30	8.13	0.28	3.60	8.29
17	0.014	0.022	10.0	4.0	0.54	2.06	7.69	0.27	3.34	6.88

ATTACHMENT 2

Intermediate Erosion and Soil Control Design Calculations

(Peak Runoff Velocity, Channel Design, and Soil Loss)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project Fort Bliss	By C. Almy	Date 4/6/11
Location Water Shed No. 7A	Checked	Date

Check one: ☐ Present ☐ Developed

Check one: ☐ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	7Aa			
1. Surface description (table 3-1)	Bare			
2. Manning's roughness coefficient, n (table 3-1)	0.011			
3. Flow length, L (total L † 300 ft) ... ft	145			
4. Two-year 24-hour rainfall, P_2 ... in	1.50			
5. Land slope, s ... ft/ft	0.017			
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ... hr	0.042	+		= 0.042

Shallow concentrated flow

Segment ID	7Ab			
7. Surface description (paved or unpaved)				
8. Flow length, L ... ft	150			
9. Watercourse slope, s ... ft/ft	0.02			
10. Average velocity, V (figure 3-1) ... ft/s	2.2			
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr	0.019	+		= 0.019

Channel flow

Segment ID	None			
12. Cross sectional flow area, a ... ft^2				
13. Wetted perimeter, p_w ... ft				
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ... ft				
15 Channel slope, s ... ft/ft				
16. Manning's roughness coefficient, n ...				
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ... ft/s				
18. ~~Flow length~~, L ... ft				
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ... hr		+		= 0

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ... Hr 0.061

Peak Discharge Using The Rational Method
25-Year Storm Event

Equation: $Q = CC_fIA$

Watershed No.	Area (A; acres)	Time of Concentration (hrs)	Time of Concentration (min)	Intensity (I; in/hr)	Coefficient (C)	Coefficient Adjustment Factor (Cf)	Peak Flow (cfs)
7A	3.5	0.06	10.0	4.4	0.38	1.1	6.50

Swale Hydraulic Analysis
25-Year Storm Event

Watershed Swale	Slope (ft/ft)	Manning Roughness, n	Side Slope 1 (z_1:1)	Side Slope 2 (z_2:1)	Depth (ft)	Area (ft^2)	Wetted Permitter (ft)	Hydraulic Radius (ft)	Avg Velocity (ft/s)	Flow (cfs)
Temp. Soil Berm - Top Dome	0.005	0.026	50	2	0.42	4.56	21.89	0.21	1.42	6.50
Temp. Soil Berm - Embankment	0.100	0.026	4	4	0.49	0.94	4.00	0.24	6.91	6.50

Manning's n-Values

Previous Top

Description	Manning's "n"
Pipes	
Reinforced concrete	0.013
Vitrified clay pipe	0.013
Smooth welded pipe	0.011
Corrugated metal pipe	0.023
Polyvinyl chloride (PVC)	0.010
Natural Channels	
Gravel beds, Straight	0.025
Gravel beds, large boulders	0.040
Earth, straight, some grass	0.026
Earth, winding, no vegetation	0.030
Earth, winding	0.050
Miscellaneous	
Smooth surfaces (concrete, asphalt, bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils	0.06-0.17
Short grass	0.15
Dense grass	0.24
Bermuda grass	0.41
Light underbrush woods	0.40
Dense underbrush woods	0.80

Source: Soil Conservation Service TR-55

RUSLE2 Expanded Profile Erosion Calculation Record

Info: ARS Core Data
Illustrates computing erosion for a convex profile for an overland flow path
Profile typical of landfills, long flat upper area that discharges runoff onto steep sideslope
GOOD DESIGN collects runoff at top of sideslope and moves it down the sideslope in stable channels

File: profiles\Highly disturbed land\TX landfill_interim

Inputs:
Location: El Paso county average (El Paso)
Soil: silt loam (l-m OM, m perm)
Horiz. overland flow path length: 1000 ft
Avg. slope steepness: 2.7 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*

Contouring: a up-and-down slope
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss erod. portion: 5.0 t/ac/yr
Detachment on slope: 4.8 t/ac/yr
Soil loss for cons. plan: 3.5 t/ac/yr
Sediment delivery: 2.4 t/ac/yr

Crit. slope length:
Surf. cover after planting: 0 %

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
4/15/0	Highly disturbed land\blade fill material		0
1/1/1	Highly disturbed land\blade cut material		0
1/1/1 default			

0

Period Start Date	*Operation*	*PLU*	*Avg. surf. cover, %*	*Avg. SC subfactor*	*Avg. CC subfactor*	*Avg. roughness, in.*	*Avg. SR subfactor*	*Avg. C factor*	*EI, %*
4/15/0	blade fill material	1.0	0	1.0	1.0	0.63	0.77	0.77	0.17
4/16/0		1.00	0	1.0	1.0	0.62	0.77	0.77	4.2
5/1/0		1.00	0	1.0	1.0	0.61	0.78	0.78	10
5/16/0		1.00	0	1.0	1.0	0.60	0.79	0.79	13
6/1/0		1.00	0	1.0	1.0	0.58	0.79	0.79	9.9
6/16/0		1.00	0	1.0	1.0	0.57	0.80	0.80	7.0
7/1/0		1.00	0	1.0	1.0	0.55	0.81	0.81	7.0
7/16/0		1.00	0	1.0	1.0	0.53	0.83	0.82	7.0
8/1/0		1.00	0	1.0	1.0	0.50	0.84	0.83	7.0
8/16/0		0.99	0	1.0	1.0	0.48	0.85	0.85	7.0
9/1/0		0.99	0	1.0	1.0	0.46	0.86	0.86	7.0
9/16/0		0.99	0	1.0	1.0	0.45	0.87	0.86	7.0
10/1/0		0.99	0	1.0	1.0	0.43	0.88	0.87	6.9
10/16/0		0.99	0	1.0	1.0	0.43	0.88	0.87	3.9
11/1/0		0.99	0	1.0	1.0	0.42	0.89	0.88	0.18
11/16/0		0.99	0	1.0	1.0	0.42	0.89	0.88	1.00
12/1/0		0.99	0	1.0	1.0	0.41	0.89	0.88	0
12/16/0		0.99	0	1.0	1.0	0.41	0.89	0.88	0
1/1/1	blade cut material								0
1/1/1	Man #2: default	0.98	0	1.0	1.0	0.41	0.89	0.88	0
1/16/1		0.98	0	1.0	1.0	0.40	0.89	0.88	0
2/1/1		0.98	0	1.0	1.0	0.40	0.90	0.88	0.036
2/15/1		0.98	0	1.0	1.0	0.40	0.90	0.88	1.0
3/1/1		0.98	0	1.0	1.0	0.40	0.90	0.88	0
3/16/1		0.98	0	1.0	1.0	0.40	0.90	0.88	0.033
4/1/1		0.98	0	1.0	1.0	0.39	0.90	0.88	0.90

Period Start Date, m/d/y	*Operation Name*	*Erosion rate, t/ac/yr*	*Average upslope erosion rate*	*EI, %*
4/15/0	blade fill material	0.58	0.58	0.17
4/16/0		0.98	0.98	4.2
5/1/0		2.5	2.5	10
5/16/0		3.1	3.1	13
6/1/0		3.3	3.3	9.9
6/16/0		3.0	3.0	7.0
7/1/0		4.0	4.0	7.0
7/16/0		4.1	4.1	7.0
8/1/0		4.9	4.9	7.0
8/16/0		4.5	4.5	7.0
9/1/0		4.6	4.6	7.0
9/16/0		4.2	4.2	7.0
10/1/0		2.9	2.9	6.9
10/16/0		1.3	1.3	3.9
11/1/0		0.053	0.053	0.18
11/16/0		0.31	0.31	1.00
12/1/0		0	0	0
12/16/0		0	0	0
1/1/1	blade cut material			0
1/1/1	Man #2: default	0	0	0
1/16/1		0	0	0
2/1/1		0.011	0.011	0.036
2/15/1		0.30	0.30	1.0
3/1/1		0	0	0
3/16/1		0.0065	0.0065	0.033
4/1/1		0.19	0.19	0.90

ATTACHMENT 3

Final Erosion and Soil Control Design Calculations (Soil Loss)

RUSLE2 Expanded Profile Erosion Calculation Record

Info: ARS Core Data
Illustrates computing erosion for a convex profile for an overland flow path
Profile typical of landfills, long flat upper area that discharges runoff onto steep sideslope
GOOD DESIGN collects runoff at top of sideslope and moves it down the sideslope in stable channels

File: profiles\Highly disturbed land\TX landfill_final

Inputs:
Location: El Paso county average (El Paso)
Soil: silt loam (l-m OM, m perm)
Horiz. overland flow path length: 1000 ft
Avg. slope steepness: 3.5 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*

Contouring: a up-and-down slope
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Subsurface drainage: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss erod. portion: 4.9 t/ac/yr
Detachment on slope: 4.6 t/ac/yr
Soil loss for cons. plan: 3.3 t/ac/yr
Sediment delivery: 2.2 t/ac/yr

Crit. slope length:
Surf. cover after planting: 0 %

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
4/15/0	Highly disturbed land\blade fill material		0
4/15/0	Highly disturbed land\add mulch		0
1/1/1	default		0

Period Start Date	*Operation*	*PLU*	*Avg. surf. cover, %*	*Avg. SC subfactor*	*Avg. CC subfactor*	*Avg. roughness, in.*	*Avg. SR subfactor*	*Avg. C factor*	*EI, %*
4/15/0	blade fill material								0
4/15/0	add mulch	1.0	0	0	1.0	0.63	0.77	0	0.17
4/16/0		1.00	0	0.017	1.0	0.62	0.77	0.014	4.2
5/1/0		1.00	0	0.043	1.0	0.61	0.78	0.034	10
5/16/0		1.00	0	0.070	1.0	0.60	0.79	0.055	13
6/1/0		1.00	0	0.097	1.0	0.58	0.79	0.077	9.9
6/16/0		1.00	0	0.12	1.0	0.57	0.80	0.098	7.0
7/1/0		1.00	0	0.15	1.0	0.55	0.81	0.12	7.0
7/16/0		1.00	0	0.17	1.0	0.53	0.83	0.14	7.0
8/1/0		1.00	0	0.20	1.0	0.50	0.84	0.16	7.0
8/16/0		0.99	0	0.22	1.0	0.48	0.85	0.19	7.0
9/1/0		0.99	0	0.24	1.0	0.46	0.86	0.21	7.0
9/16/0		0.99	0	0.26	1.0	0.45	0.87	0.23	7.0
10/1/0		0.99	0	0.28	1.0	0.43	0.88	0.25	6.9
10/16/0		0.99	0	0.30	1.0	0.43	0.88	0.26	3.9
11/1/0		0.99	0	0.32	1.0	0.42	0.89	0.28	0.18
11/16/0		0.99	0	0.34	1.0	0.42	0.89	0.30	1.00
12/1/0		0.99	0	0.36	1.0	0.41	0.89	0.32	0
12/16/0		0.99	0	0.38	1.0	0.41	0.89	0.33	0
1/1/1	Man #2: default	0.98	0	0.40	1.0	0.41	0.89	0.35	0
1/16/1		0.98	0	0.42	1.0	0.40	0.89	0.37	0
2/1/1		0.98	0	0.44	1.0	0.40	0.90	0.39	0.036
2/15/1		0.98	0	0.45	1.0	0.40	0.90	0.39	1.0
3/1/1		0.98	0	0.46	1.0	0.40	0.90	0.41	0
3/16/1		0.98	0	0.49	1.0	0.40	0.90	0.43	0.033
4/1/1		0.98	0	0.49	1.0	0.39	0.90	0.43	0.90

Period Start Date, m/d/y	*Operation Name*	*Erosion rate, t/ac/yr*	*Average upslope erosion rate*	*EI, %*
4/15/0	blade fill material			0
4/15/0	add mulch	0	0	0.17
4/16/0		0.078	0.078	4.2
5/1/0		0.48	0.48	10
5/16/0		1.0	1.0	13
6/1/0		1.5	1.5	9.9
6/16/0		1.7	1.7	7.0
7/1/0		2.7	2.7	7.0
7/16/0		3.2	3.2	7.0
8/1/0		4.4	4.4	7.0
8/16/0		4.5	4.5	7.0
9/1/0		5.0	5.0	7.0
9/16/0		5.0	5.0	7.0
10/1/0		3.7	3.7	6.9
10/16/0		1.8	1.8	3.9
11/1/0		0.078	0.078	0.18
11/16/0		0.48	0.48	1.00
12/1/0		0	0	0
12/16/0		0	0	0
1/1/1	Man #2: default	0	0	0
1/16/1		0	0	0
2/1/1		0.022	0.022	0.036
2/15/1		0.61	0.61	1.0
3/1/1		0	0	0
3/16/1		0.014	0.014	0.033
4/1/1		0.43	0.43	0.90

ATTACHMENT 4

Erosion and Soil Control Measures Specifications Information

Table 1 (continued)
Permanent Rural Seed Mix

District and Planting Dates	Clay Soils		Sandy Soils	
	Species and Rates (lb. PLS/ac.)		Species and Rates (lb. PLS/ac.)	
23 (Brownwood) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Haskell)	2.7	Bermudagrass	1.8
	Bermudagrass	0.6	Weeping Lovegrass (Ermelo)	0.6
	Blue Grama (Hachita)	0.9	Sand Lovegrass	0.6
	Galleta	2.1	Sand Dropseed	0.4
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
24 (El Paso) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (Butte)	2.7	Sand Dropseed	0.4
	Blue Grama (Hachita)	0.9	Lehmanns Lovegrass	0.9
	Galleta	2.1	Blue Grama (Hachita)	1.0
	Alkali Sacaton	0.4	Indian Ricegrass	1.6
	Illinois Bundleflower	1.0	Purple Prairieclover	0.5
25 (Childress) Feb. 1 – May 15	Green Sprangletop	0.3	Green Sprangletop	0.3
	Sideoats Grama (El Reno)	2.7	Weeping Lovegrass (Ermelo)	1.2
	Blue Grama (Hachita)	0.9	Sand Dropseed	0.5
	Western Wheatgrass	2.1	Sand Lovegrass	0.8
	Galleta	1.6	Purple Prairieclover	0.5
	Illinois Bundleflower	1.0		

Organic Check Dam

Description: Organic check dams are small, temporary, or permanent dams constructed across a swale or channel to lower the speed of concentrated flows for a certain design range of storm events. Organic check dams may be Organic Filter Tube Check Dams or Organic Filter Berm Check Dams.

Purpose:

$ To reduce the velocity of the water flowing through a swale or channel thereby reducing the erosion in the swale or channel.

$ Organic check dams also can be used to catch sediment from the channel itself or from the contributing drainage area as storm water runoff flows through the structure.

$ Reduces the velocity of the water in a channel and allows sediments and other pollutants to settle out and be retained.

Conditions of Use/Limitations:

$ Organic check dams are most effective when used in combination with other storm water and erosion and sediment control measures.

$ Organic check dams should not be used in live, flowing streams.

$ Mesh Bag Organic Check Dams should be used only in small open channels that drain 8 - 10 acres or less

$ Freestanding Organic Check Dams should be used only in small open channels that drain 4 - 5 acres or less.

Design & Material Specifications:

Organic Filter Tube Check Dam

$ Flow velocities: should not exceed 12 fps for a 10 year, 24 hour storm frequency; velocity of water should not exceed 1.5 fps along a swale of 200 ft in length during the water quality design storm.

$ Material:
- Chipped site vegetation, composted mulch, or wood-based mulch can be used to construct organic check dams.
- Particle sizes should be a mix of fine (1/4 to 1/2 inch) and coarse grades of compost/mulch with no particle sizes exceeding 3 inches in length. The mixture ratio may include a greater fraction of coarser blend material (1:2) (fine:coarse), "in some instances (1:3)", compared to ERC blankets.

Organic Filter Berm Check Dam

- $ Height: 1-1/2 foot (minimum) to 3 feet (maximum)
- $ Width: 2-1/2 foot (minimum) to 5 feet (maximum)
- $ Flow velocities: should not exceed 8 fps for a 10 year, 24 hour storm frequency; velocity of water should not exceed 1.5 fps along a swale of 150 ft in length during the water quality design storm
- $ Material:
  - o Chipped site vegetation, composted mulch, or wood-based mulch can be used to construct organic check dams
  - o Particulate sizes should be a mix of fine (1/4 to 1/2 inch) and coarse grades of compost/mulch with no particulate sizes exceeding 3-1/2 inches in length. The mixture ratio should be or may include a greater fraction of coarser blend material (1:2) (fine:coarse), "in some instances (1:3)", compared to erosion control blankets.

Installation Specifications:

- $ The center of the dam should be at least 6 inches lower than the edges. Keep centers of organic check dams at least 6 - 12 inches lower than the outer edges of natural ground elevation
- $ Maximum height should be 3 ft
- $ This design creates a weir effect that helps to channel flows away from the banks and prevent further erosion.
- $ Additional stability can be achieved by trenching the dam material into the sides and bottom of the channel.
- $ Construct a 1 ft deep trench immediately upstream of check dams for storage of settled sediment to reduce maintenance.

Maintenance Standards:

- $ Organic check dams should be monitored for performance and sediment accumulation
- $ Remove accumulated leaves and sediments from behind dam when they reach a depth of 1/2 the original height of the dam
- $ Restore materials as necessary for the organic check dams to maintain their correct height

Installation Guide for Rolled Erosion Control Products (RECPs) Including Mulch Control Nettings (MCNs), Open Weave Textiles (OWTs), Erosion Control Blankets (ECBs), and Turf Reinforcement Mats (TRMs)

This document is intended to provide general guidelines for the installation of RECPs and does not supersede manufacture's guidelines. The following sections summarize the general, accepted procedures for installation of RECPs and provide basic guidance for slope and channel installations. Detailed design/installation information should be obtained from the manufacturer.

General Procedure. Prepare a stable and firm soil surface free of rocks and other obstructions. Apply soil amendments as necessary to prepare seedbed. Place fertilizer, water, and seed in accordance with manufacturer, local/state regulations, or engineer/specifiers requirements. Typically, RECPs are unrolled parallel to the primary direction of flow. Ensure the product maintains intimate contact with the soil surface over the entirety of the installation. Do not stretch or allow material to bridge over surface inconsistencies. Staple/stake RECPs to soil such that each staple/stake is flush with underlying soil. Install anchor trenches, seams and terminal ends as specified.

Install RECPs after application of seed, fertilizer, mulches (if necessary) and other necessary soil amendments, unless soil in-filling of the TRM is required. For TRMs if soil in-filling, install TRM, apply seed, and other soil amendments lightly brush or rake 0.3 to 0.7 in. (8 to 18 mm) of topsoil into TRM matrix to fill the product thickness. If in-filling with a hydraulically-applied matrix or medium is required; install TRM, then install hydraulically-applied matrix or medium at the manufacturer's suggested application rate.

Apply MCNs (Materials Type 1.A., 2.A., 3.A.) immediately after dry mulch application.

Anchor Trenches, Seams and Terminal Ends

(A) Upslope Anchor – utilize one of the methods detailed below for initial anchoring of RECPs

(1) Staples. Install the RECPs 3 ft. (900 mm) beyond the shoulder of the slope onto flat final grade. Secure roll end with a single row of stakes/staples on 1 ft. (300-mm) centers.

(2) Anchor trench. Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the upslope terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. (300 mm) centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Fold product over compacted soil in anchor trench to overlap downslope material. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. (300 mm) centers.

(3) Staple check. Construct a stake/staple check slot along the top edge of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

(4) Single net product anchor trench. Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Position roll such that the leading end of the roll is downslope and upside down. Apply seed and necessary soil amendments. Extend product 1 ft. downslope of anchor trench and place material in anchor trench (upside down). Secure terminal end and material in anchor trench with staples at 1 ft. intervals. Fill anchor trench with soil and compact. Apply seed and necessary soil amendments to fill placed in anchor trench. Move remaining roll over and downslope of anchor trench and proceed unrolling RECP downslope (since roll was initially reversed, folding material over anchor trench will result in the net side up, and rolling correctly downslope over the anchor trench).

(B) Seams – utilize one of the methods detailed below for seaming of RECPs

(1) Adjacent seams. Overlap edges of adjacent RECPs by 2 to 4 in. (50 to 100 mm) or by abutting products as defined by manufacturer. Use a sufficient number of stakes or staples to prevent seam or abutted rolls from separating.

(2) Consecutive rolls. Shingle and overlap consecutive rolls 2 to 6 in. (50 to 150 mm) in the direction of flow. Secure staples through seam at 1 ft. (300 mm) intervals.
(3) Check seam. Construct a stake/staple check seam along the top edge of RECPs for slope application and at specified intervals in a channel by installing two staggered rows of stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.
(4) Slope interruption check slot. Excavate a trench measuring 6 in. wide by 6 in. deep (150 x 150 mm). Secure product to the bottom of the trench. Fold product over upslope material and fill and compact the trench on the downslope side of check slot and seed fill. Continue rolling material downslope over trench.

(C) Terminal Ends – utilize one of the methods detailed below for all terminal ends of RECPs

(1) Staples. Install the RECPs 3 ft. (900 mm) beyond the end of the channel and secure end with a single row of stakes/staples on 1 ft. (300-mm) centers. Stakes/staples for securing RECPS to the soil are typically 6 in. (150 mm) long.

(2) Anchor trench. Excavate a 6 in. by 6 in. (150 mm by 150 mm) anchor trench. Extend the terminal end of the RECPs 3 ft. (900 mm) past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. (300 mm) centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. (300 mm) terminal end of the RECPs. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. (300 mm) centers.
(3) Check slot. Construct a stake/staple check slot along the terminal end of the RECPs by installing two rows of staggered stakes/staples 4 in. (100 mm) apart on 4 in. (100 mm) centers.

Slope Installations. At the top of slope, anchor the RECPs according to one of the method detailed in Section (A) above. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of 1.3/yd^2 (1.5/m^2) within the body of the blanket. For the most effective RECP installation use stake/staple patterns and densities as recommended by the manufacturer. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed in Section (B) above. The terminal end of the RECPs installation must be anchored using one of the methods detailed in Section (C) above.

Channel Installations. Construct an anchor trench at the beginning of the channel across its entire width according to Section (A) (2) above. Follow the manufacturer's installation guidelines in constructing additional anchor trenches or stake/staple check slots at intervals along the channel reach and at the terminal end of the channel, according to paragraph (A) above respectively. Unroll RECPs down the center of the channel in the primary water flow direction. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of 1.7/yd^2 (1.5/m^2). Significantly higher anchor rates and longer stakes/staples may be necessary in sandy, loose, or wet soils and in severe applications. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed in Section (B) above. All terminal ends of the RECPs must be anchored using one of the methods detailed in Section (C) above.

With any RECP installation, ensure sufficient staples to resist uplift from hydraulics, wind, mowers, and foot traffic. For the most effective installation of RECPs, the ECTC recommends using stake/staple patterns and densities as recommended by the manufacturer.

Repair any damaged areas immediately by restoring soil to finished grade, re-applying soil amendments and seed, and replacing the RECPs.

Shoreline Installations. When required, lower the waterline as necessary and construct an anchor trench at the top of slope as described in Section (A) (2). Unroll the product down the slope and follow the manufacturer's installation guidelines in constructing additional anchor trenches or stake/staple check slots at intervals along the shoreline. Construct an anchor trench just below the mean water line at the terminal end of the shoreline, according to paragraph (C) (2) above. Securely fasten all RECPs along the shoreline to the soil by installing stakes/staples at a minimum rate of $1.7/yd^2$ ($1.5/m^2$) through the body of the rolled erosion control product. Significantly higher anchor rates and longer stakes/staples may be necessary in sandy, loose, or wet soils, below the waterline and in severe applications. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed in Section (B) above.

Flexterra® FGM

Flexterra®
Flexible Growth Medium™ (FGM™)

Setting a new standard of excellence for erosion control and growth establishment.

Flexterra® Flexible Growth Medium™ (FGM™) is designed using patented technology that immediately bonds to the soil, providing superior slope protection to rolled Erosion Control Blankets (ECBs) and Bonded Fiber Matrix (BFM) products—with the speed and cost savings of hydraulic seeding. Demonstrating unprecedented performance levels when evaluated by the most prominent slope erosion testing laboratories in North America, as well as in a range of field applications, Flexterra is proven:

- Effective upon application—bonds directly to the soil
- Superior erosion control—99% effectiveness (near perfection) at all major testing laboratories
- Fastest turf establishment—grows vegetation eight times faster than bare soil and twice as fast as rolled blankets

Composition

Thermally Processed Wood Fibers	74.5% ± 3.5%
Proprietary Crosslinked Hydro-Colloid Tackifiers and Activators	10% ± 1%
Proprietary Crimped, Interlocking Fibers	5% ± 1%
Moisture Content	10.5% ± 1.5%

Application Rates

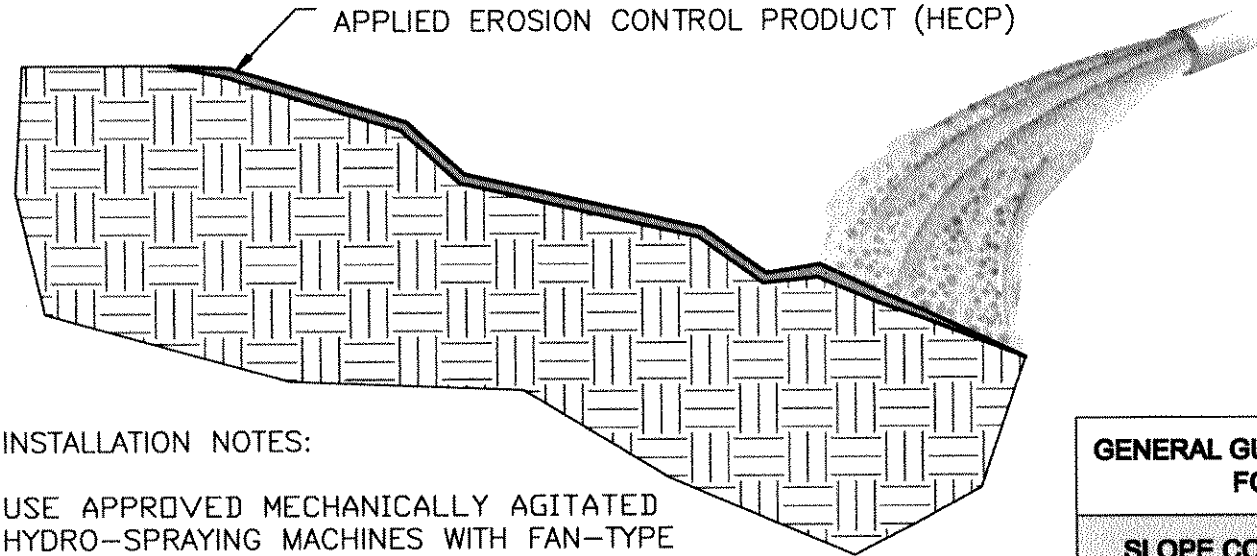
Slope Gradient/Condition	English	SI
≤ 3H to 1V	3000 lb/ac	3400 kg/ha
> 3H to 1V and ≤ 2H to 1V	3500 lb/ac	3900 kg/ha
> 2H to 1V and ≤ 1H to 1V	4000 lb/ac	4500 kg/ha
> 1H to 1V	4500 lb/ac	5100 kg/ha
Below ECB or TRM	1500 lb/ac	1700 kg/ha
As infill for TRM	3500 lb/ac	3900 kg/ha

Packaging

Bags: Net Weight—50 lb, UV and weather-resistant plastic film

Pallets: Weather-proof, stretch-wrapped with UV resistant pallet cover

40 bags/pallet or 1 ton/pallet



INSTALLATION NOTES:

USE APPROVED MECHANICALLY AGITATED HYDRO–SPRAYING MACHINES WITH FAN–TYPE NOZZLE (50–DEGREE TIP)

FOR MAXIMUM PERFORMANCE, APPLY FGM IN A 2 STEP PROCESS:

1. APPLY SEED, FERTILIZER AND OTHER SOIL AMENDMENTS WITH A SMALL AMOUNT OF FLEXTERRA® FOR VISUAL METERING

2. MIX AND APPLY 50 LB OF FGM PER 125 GALLONS OF WATER OVER FRESHLY SEEDED SURFACES AND DO NOT LEAVE SEEDED SURFACES UNPROTECTED; CONFIRM LOADING RATES WITH EQUIPMENT MANUFACTURER

TO ACHIEVE OPTIMUM SOIL SURFACE COVERAGE, APPLY FGM FROM OPPOSING DIRECTIONS

GENERAL GUIDELINES FOR APPLICATION RATES FOR SLOPE INSTALLATIONS

SLOPE CONDITION	APPLICATION RATE
≤ 3H:1V	3000 LB/ACRE
> 3H:1V AND ≤ 2H:1V	3500 LB/ACRE
> 2H:1V AND ≤ 1H:1V	4000 LB/ACRE
> 1H:1V	4500 LB/ACRE
BELOW ECB OR TRM	1500 LB/ACRE
AS INFILL FOR TRM	3500 LB/ACRE

Flexterra®

FLEXTERRA® PROFILE VIEW – SLOPE DETAIL

FILE NAME: Flexterra Profile View – Slope Detail.dwg

CONTACT NUMBER: 800–508–8681

WEB SITE: www.profileproducts.com

DRAWN BY: MDR DATE: 4/4/07

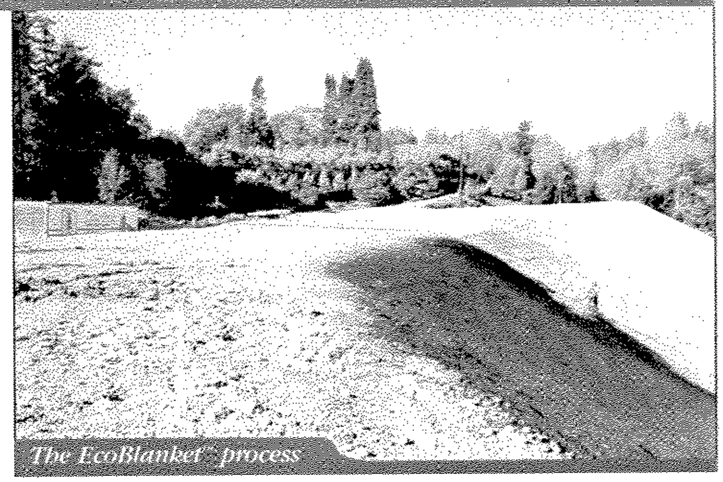
CHECKED BY: MST DATE: 4/5/07

Profile™ Your Trusted Partner In Soil Solutions™

SCALE: NOT TO SCALE

ECOBLANKET™

Keep Soil in its Place! *The Rexius EcoBlanket™ is rated one of the highest methods available for stopping erosion in its tracks. EcoBlanket™ replaces the natural layer of humus that already protects our undisturbed soils. Injected with Microblend™, the EcoBlanket™ has increased structural integrity along with the ability to aid in the degradation of hydrocarbons that are found on many construction sites. EcoBlanket™ is easily installed in a one step, low impact pneumatic process that can conform to about any terrain.*



The EcoBlanket™ process

ADVANTAGES

- *Over 99% Effective**

  In a Certified Erosion Control testing facility, an EcoBlanket™ has shown to be over 99% effective in reducing soil loss as an erosion control measure. These test results show that EcoBlanket™ compares with the highest rated BMP's in the industry for erosion control in similar conditions.

- *100% Soil Coverage*

  As an erosion control measure, EcoBlanket™ completely covers the denuded soil with a matrix of natural organic material active with beneficial microbes. Through pneumatic application, the EcoBlanket™ conforms to the varied contours of the soil surface providing an interlocking blanket with the soil beneath, holding soil particulates in place.

- *Can be Combined with a One Step Terraseeding™ Process*

  For establishment of permanent vegetation, whether it be grasses, wildflowers or native plants, the EcoBlanket™ can be injected with seed during the application process. The EcoBlanket™ material combined with Microblend™ makes an ideal growing media for seed while providing immediate erosion control.

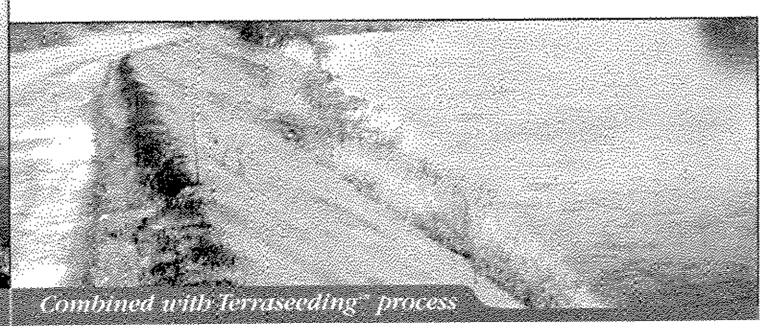
- *100% Organic, Recycled & Reusable*

  EcoBlanket™ uses no plastic materials in its construction. The fibrous matrix it forms with the help of the bonding capabilities of Microblend™ give the necessary structure needed without non-biodegradable reinforcements or netting. Made with recycled organics, the compost/mulch blend can be used as an earth friendly soil amendment at the completion of a project, or left as a permanent stabilizing organic layer to work into the topsoil over time.

Other Advantages of EcoBlanket™:

- Establishes a buffer to absorb rainfall energy
- Slows velocity of water run off, allowing natural percolation of rain water into soil
- Improves existing soil structure and biology
- Accessibility to remote and difficult to reach areas

One step application



Combined with Terraseeding™ process

*EcoBlanket™ and Microblend™ were tested at San Diego State University's Soil Erosion Research Laboratory and shown to reduce soil loss by over 99% in tested erosion control conditions. An S.T.A. approved independent microbiology laboratory, BBC Laboratories of Tempe, AZ, tested and showed that Microblend™ greatly increased the hydrocarbon degradation capabilities of the compost/mulch materials used in EcoBlanket™. Test results are available upon request.

REXIUS

International Erosion Control Association

SPECIFICATION FOR: ECOBLANKET™

Temporary Erosion/Sediment Control Surface Blanket

1.0 Description: This work shall consist of furnishing, constructing and maintaining an EcoBlanket™ to Rexius specifications. EcoBlanket™ is a ground cover (surface blanket) of the Rexius specified compost/mulch (Erosion Blend) combined with a special additive (Microblend™) constructed with a pneumatic blower to control and reduce soil erosion. An EcoBlanket™ stabilizes the soil, prevents splash, sheet and rill erosion, and removes suspended soil particles and contaminants from water moving off the site and into adjacent waterways or storm water conveyance systems.

2.0 Material: The EcoBlanket™ filtering material consists of the Rexius Erosion Blend of compost and mulch materials, according to the Rexius particle sizing specifications, in combination with the Rexius Microblend™ additive.

2.1. Particle size must meet exact specifications of the Rexius EcoBlanket™ Erosion Blend material supplied by a certified supplier/installer.

2.2.The compost portion of EcoBlanket™ shall be derived from well-decomposed organic matter source produced by controlled aerobic (biological) decomposition that has been sanitized through the generation of heat and stabilized to the point that it is appropriate for this particular application. Compost material shall be processed through proper thermophilic composting, meeting the US Environmental Protection Agency's definition for a 'process to further reduce pathogens' (PFRP). The compost portion shall meet the chemical, physical and biological properties outlined below. These and all other required properties for the performance of the EcoBlanket™ are included in the Rexius EcoBlanket™ Manufacture Guidelines followed by certified suppliers/installers.

Parameters[1,4]	*Reported as (units of measure)*	*EcoBlanket™ to be Vegetated*	*EcoBlanket™ to be left Un-vegetated*
PH[2]	pH units	5.0 - 8.5	N/A
Soluble Salt Concentration[2] (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5	N/A
Stability[3] Carbon Dioxide Evolution Rate	mg CO_2-C per g OM / day	< 8	N/A
Physical Contaminants (man-made inerts)	%, dry weight basis	< 1	< 1

1 Recommended test methodologies are provided in Test Methods for the Examination of Composting and Compost (TMECC,The US Composting Council)

2 Each specific plant species requires a specific pH range. Each plant also has a salinity tolerance rating, and maximum tolerable quantities are known. When specifying the establishment of any plant or turf species, it is important to understand their pH and soluble salt requirements, and how they relate to the compost in use.

3 Stability/Maturity rating is an area of compost science that is still evolving, and as such, other various test methods could be considered. Also, never base compost quality conclusions on the result of a single stability/maturity test.

4 Landscape architects and project (field) engineers may modify the allowable compost specification ranges based on specific field conditions and plant requirements.

2.3. Rexius Microblend™ additive shall be injected into Erosion Blend material at time of EcoBlanket™ construction.

2.4. A proof of certification as an EcoBlanket™ supplier shall be submitted to the engineer/landscape architect for approval prior to installation. Test results for EcoBlanket™ performance shall be made available upon request.

2.5. Where seeding or planting is planned, Erosion Blend material must meet Rexius' minimum specification requirements for seeding purposes.

3.0 Construction:

3.1. The EcoBlanket™ shall be placed as shown on the plans or as directed by the Engineer.

3.2. On areas with a slope of 1:2 or less, the EcoBlanket™ shall be uniformly applied directly at the soil surface with a pneumatic blower as specified by Rexius. EcoBlanket™ shall be applied at a depth of 2 inches and approximately 3 feet (91.5 cm) over the top of the slope, or overlap it into existing vegetation. In extreme conditions and where specified by the Engineer, EcoBerms shall be added and constructed at the top of the slope and in parallel intervals down the profile of the slope (20' to 30' apart) if necessary. (The Engineer shall specify berm requirements)

3.3. Rexius Microblend™ shall be applied/injected at a minimum rate of 550 lbs. per acre (or as specified by Rexius), to be confirmed by inspector/project manager.

3.4. EcoBlanket™ application depth may be modified based on specific site (e.g., soil characteristics, existing vegetation) and climatic conditions, as well as particular project related requirements. The severity of slope grade, as well as slope length will also influence the addition of EcoBerms and number of EcoBerm™ placements in combination with the EcoBlanket™.

3.5. If temporary or long-term vegetation is required, Erosion Blend material may be injected with seed during application. The Engineer/Landscape Architect shall specify seed requirements and the compost/mulch component shall abide by the minimum standards set by Rexius for seeding.

3.6. Where vegetation is to be established, slightly roughen (scarify) slopes and remove large clods, rocks, stumps, roots larger than 2 inches in diameter and debris on slopes. This soil preparation step may be eliminated where approved by the Project Engineer or Landscape Architect/Designer, or where seeding or planting is not planned. Where practical, track (compact) perpendicular to contours on the slope using a bulldozer before applying EcoBlanket™ injected with seed.

3.7. Do not use EcoBlankets in areas of concentrated flow (ie. ditches, streams, etc.)

3.8. Unless otherwise allowed by Engineer, seeding shall be performed within the local region's seeding deadlines.

4.0 Maintenance: The Contractor shall maintain the EcoBlanket™ in a functional condition at all times. Contractor shall make periodic inspections of the EcoBlanket™ for effectiveness and shall immediately correct all deficiencies. Where deficiencies exist, additional EcoBlanket™ material shall be installed immediately to required depth.

5.0 Method of Measurement: EcoBlanket™ shall be measured by the square foot, complete in place.

6.0 Performance:

6.1. Place EcoBlankets on denuded areas immediately or as directed by Engineer. EcoBerms and/or temporary or permanent vegetation shall be applied/established when necessary, along with other appropriate structural measures and controls, for additional erosion and sediment control.

6.2. The work specified in this Section consists of designing, providing, and maintaining erosion and sedimentation controls as necessary. All existing and foreseeable future conditions that affect the work inside and outside the site limits must be acknowledged as the Contractor's responsibility.

6.3. Contractor is responsible for providing effective sediment control measures based on performance. Contractor may, with approval from the Engineer, work outside the minimum construction requirements to establish a working erosion control system.

ATTACHMENT 5

2005 Stormwater Pollution Prevention Plan

(For Reference Only. Prepared by U.S. Army Center for Health Promotion and Preventive Medicine.)

OPTIONAL FORM 99 (7-90) Kelly's phone # ...

FAX TRANSMITTAL # of pages ▸ 8

To Michele Feenstra	From Lilia Lenhart
Dept./Agency M-P	Phone # 915.568.5724
Fax # 210-375-1550	Fax # .1333

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Storm Water Pollution Prevention Plan - 2005

Fort Bliss, Texas

November 2005
Project Number: 32-EE-2754-05

Prepared for:
Fort Bliss, Directorate of Environment
Fort Bliss, TX

Prepared by:
U.S. Army Center for Health Promotion and Preventive Medicine
ATTN: MCHB-TS-ESW, Building E-1675
5158 Blackhawk Road
Aberdeen Proving Ground, Maryland 21010

APPENDIX J. SANITARY LANDFILL SITE SWMU 1

Location: SWMU 1
Open Landfill
Phone: (915) 490-5860

Site Coordinator: Manny Telemates

1.0 INDUSTRIAL ACTIVITY DESCRIPTION

Sanitary Landfill Solid Waste Management Unit (SWMU) 1 at Fort Bliss meets the definition of an industrial activity due to the industrial wastes which it received or potentially received. This trench-and-fill landfill has been in operation since 1974 and encompasses approximately 105 acres. A chain-link fence surrounds the entire site and a guard is located at the entrance. Permitted waste materials at the landfill include household and commercial refuse, asbestos, and triple-rinsed empty POL containers. Other activities at this site include: light vehicle maintenance, such as oil changes or additions, and fuel dispensing for equipment. There is a WAP for POLs and antifreeze.

Sanitary Landfill SWMU 1 has not been capped and is surrounded by earthen berms. Storm water exits the site at a low area in the southwest corner of the site and typically ponds in the surrounding low-lying areas offsite. Given a large rain event, runoff from the landfill eventually enters a storm water collection system ending in a large evaporation retention pond south of the site, north of Fred Wilson Boulevard.

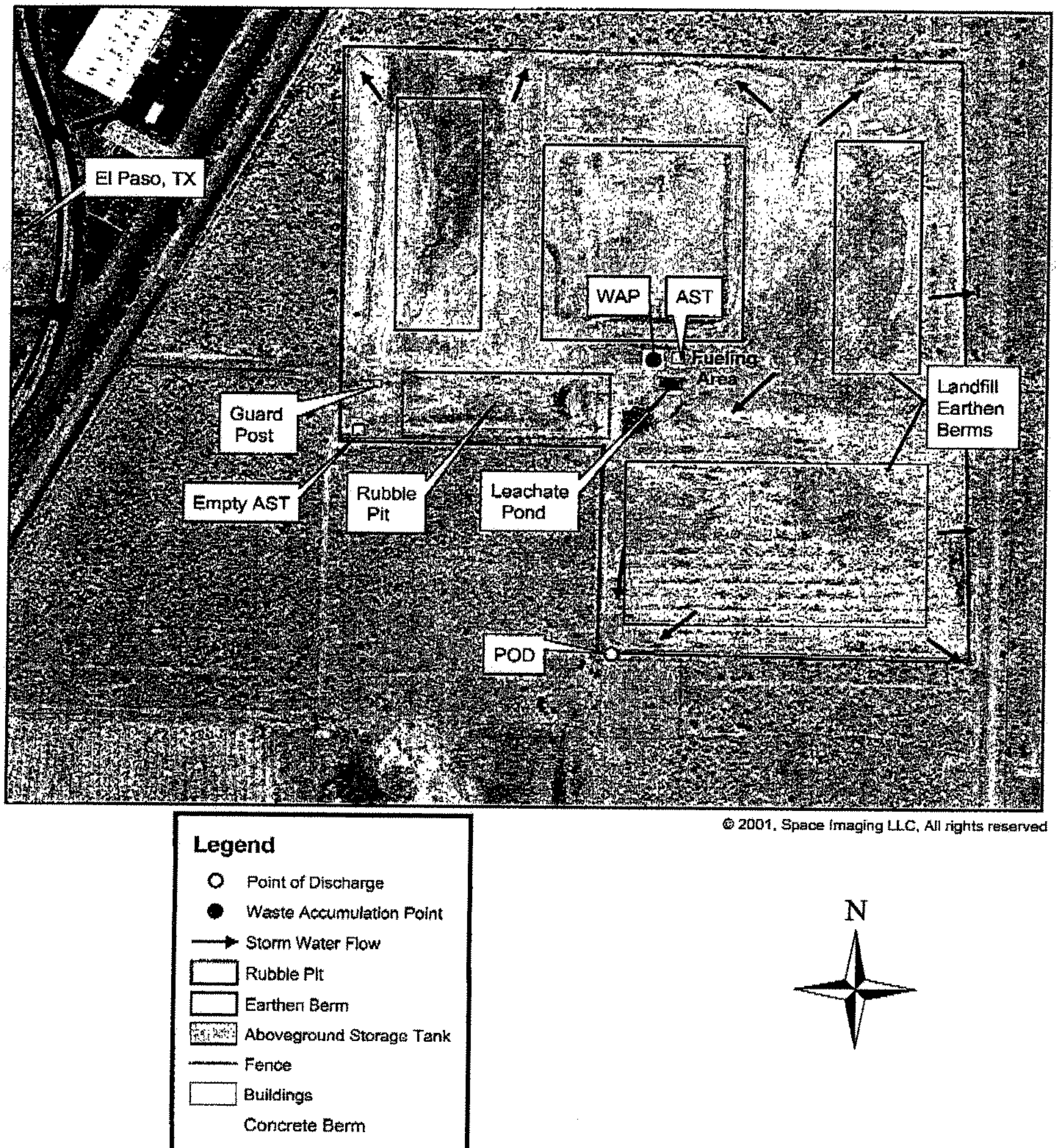
2.0 SITE MAP

Figure J-1 is a site map of the Sanitary Landfill SWMU 1. The location of storm water outfall is noted on the site map. Structural control measures to reduce pollutants, including earthen contour berms, were constructed surrounding the landfill pits. The site map notes the presence of these structural control measures. There are no surface water bodies at or near the site.

requirements, sampling requirements) are outlined in Sectors K and N of the MSGP. Copies of all analytical monitoring must be maintained onsite within this SWP3 (Appendix M). The monitoring location is noted on the site map, Figure I-1.

In addition to analytical monitoring, quarterly visual observations of storm water quality must also be conducted annually by the SWPPP Team. The examination must be of a grab sample collected at the new monitoring location identified on the site map within 30 minutes (or as soon thereafter as practical, but not to exceed 60 minutes) of when the runoff begins discharging. Samples must be collected within the seasonal periods: January through March; April through June; July through September; and October through December. The examination of storm water grab samples shall include any observations of color, odor, turbidity, floating solids, foam, oil sheen, or other obvious indicators of storm water pollution. Reports of the visual observation will include the examination date and time, examination personnel, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. A Summary of Quarterly Visual Observation form is included in Appendix M; it should be photocopied and completed as necessary. Copies of the Summary of Quarterly Visual Observation reports must be kept in the SWP3 (Appendix M) and submitted to the SWPPT Leader.

Figure J-1. SWMU 1 Sanitary Landfill



3.0 STORM WATER POLLUTION PREVENTION TEAM

The SWPPT Leader for Fort Bliss is the Storm Water Manager [Mr. Kelly Blough (915)-568-0794] who is responsible for SWP3 implementation, maintenance, and revision for this site, with the support of the site coordinator [Manny Telemantes (915) 490-5860]. The Storm Water Manager and the site coordinator have the responsibility to:

- Ensure good housekeeping practices.
- Conduct annual comprehensive site evaluations.
- Conduct quarterly visual observations of storm water runoff.
- Coordinate annual employee training programs.
- Conduct onsite preventive maintenance inspections.
- Update material inventories.
- Attend SWPPT meetings as necessary.

4.0 DESCRIPTION OF POTENTIAL POLLUTANT SOURCES

4.1 INVENTORY OF EXPOSED MATERIALS

Table J-1 describes the potential pollutant sources at the Sanitary Landfill SWMU 1. The site activities, materials, and physical features that could pollute to storm water are identified in the table. For each potential source, a contamination potential assessment is included. Additionally, visual observations and pollutants of concern are addressed for all potential sources. Table J-1 will be revised and reviewed annually.

Table J-1. Summary of Potential Pollutant Sources

Potential Pollutant Source	Pollutants of Concern	Visual Observations of Site	Contamination Potential
Uncapped Landfill	COD, Metals, TSS	The uncapped landfill areas are within the earthen berms and should not contaminate storm water.	Low
Leachate Pond	BOD, COD, Metals, TSS	Leachate is removed and placed in a lined retention pond until it evaporates. If the pond were to overflow, it would return back to the landfill.	Low
WAP	COD, Oil and Grease, TPH	POLs and antifreeze are on containment pallets on a concrete pad typically covered with a tarp. However, the tarp was not present during the last site visit.	Low
Fuel Dispensing Area	COD, Oil and Grease, TPH	Fuel dispensing area contains a diesel 750-gallon aboveground storage tank with secondary containment and a 55-gallon drum of antifreeze. Area was kept clean with no evidence of spills/leaks.	Low

Table J-1. Summary of Potential Pollutant Sources (continued)

Potential Pollutant Source	Pollutants of Concern	Visual Observations of Site	Contamination Potential
Maintenance Area	COD, Oil and Grease, TPH	An outdoor area north of the office building is used for light vehicle maintenance, such as adding oil to vehicles, as well as for temporary storage of equipment. Area was kept clean with no evidence of spills/leaks.	Low
Empty Aboveground Storage Tank	BOD, COD, Oil and Grease, TPH	This empty 10,000-gallon AST has no secondary containment and is old and rusty. It has been here for an unknown amount of time. It will be removed and used for bioremediation at another location in the future.	Low

4.2 SIGNIFICANT SPILLS AND LEAKS

No significant spills or leaks of toxic or hazardous substances have occurred at the site in the previous 5 years. Table J-2 will be updated annually to record all significant spills and leaks of toxic or hazardous pollutants that do occur.

Table J-2. Significant Spills and Leaks*

Date (month/day/year)	Description			Response Procedures	
	Location	Type of Material	Quantity	Amount Recovered	Material Still Exposed?
No spills or leaks occurred at the site in the 5 years prior to AUG 2005.	NA	NA	NA	NA	NA

* Significant spills include, but are not limited to, releases of oil or hazardous substances in excess of reportable quantities.

5.0 MEASURES AND CONTROLS

5.1 EXISTING BMPs

BMPs are defined as physical, structural, and/or managerial practices that, when used singly or in combination, prevent or reduce pollution of water. The existing BMPs incorporated at the Sanitary Landfill SWMU 1 are identified in Table J-3. All existing procedural BMPs presented in Table J-3 will continue to be implemented by site personnel.

Table J-3. Existing BMPs

Existing BMPs	Description
Good Housekeeping	
General good housekeeping	All landfill areas are maintained in a clean and orderly manner.
Containment of wastes	Waste materials are containerized and stored in the waste material storage area to reduce the risks of accidental spills and prevent contact with storm water runoff.
Security at critical points	Security measures are in place at the landfill to help prevent an accidental or intentional release of materials. The landfill is surrounded by a fence and locked during off-duty hours, and a patrol is stationed at the entrance during duty hours.
Preventive Maintenance	
Maintaining the secondary containment of the AST	Routine inspection and maintenance of the AST secondary containment (includes digging out contaminated soil that builds up along the base).
Maintaining earthen berms	Routine inspection and maintenance of the stabilization and structural erosion control measures, such as the earthen berms surrounding the landfill open pits.
Spill Prevention and Response Procedures	
Secondary containment for AST	The AST has proper secondary containment.
Emergency spill control station and supplies	A designated emergency spill control kit should be readily accessible in the fueling area.
Spill prevention and response signs	Signs posted explaining proper handling, disposal, and spill response procedures.
Inspections	
Weekly inspections	Landfill inspections are performed weekly. The condition of the following areas are noted during the inspections: storm water runon/runoff control, the presence of landfill leachate/seepage, leachate collection and treatment system, the presence of any discharges to surface waters.
Employee Training	
Storm water pollution prevention training provided to all activity personnel	Annual storm water pollution prevention training is provided for personnel at all levels of responsibility. Section 8.0 of this plan addresses the storm water training program at Fort Bliss.
Storm Water Diversion	
Diversion of storm water from PPMs	Contoured earthen berms surround the landfill to minimize storm water runoff and runon. The landfill is sufficiently stabilized and graded to divert storm water.
Sediment and Erosion Prevention	
Grading and stabilization of site surfaces to reduce erosion	The landfill is sufficiently graded or stabilized (swales/berms) to prevent erosion problems.
Sedimentation and storm water retention pond	In a large rain event, storm water from the landfill and the area south of it for several miles collects downstream in the sedimentation and storm water retention pond.
OTHER/ADVANCE POLLUTION PREVENTION	
Leachate Pond	Leachate is removed and placed in a lined retention pond until it evaporates. If the pond were to overflow, it would return back to the landfill.
Stabilization and grading of landfill surfaces to minimize storm water runon and runoff, and erosion	As previously discussed, landfill surfaces are stabilized and graded or have berms to minimize storm water runoff and runon and erosion.

5.2 PROPOSED BMPs

Table J-4 provides a summary of the baseline and advanced BMPs that are recommended for the Sanitary Landfill SWMU 1. A narrative description of the BMP, as well as a scheduled date of implementation, is also provided.

Table J-4. Proposed BMPs

Proposed BMP	Discussion	Scheduled Date of Implementation
Good Housekeeping		
None	NA	NA
Preventive Maintenance		
Tarp or cover for the waste accumulation area	A pallet with antifreeze and other products are exposed to storm water and should be covered minimally with a tarp or a shed.	1 September 2006
Spill Prevention and Response Procedures		
Remove empty AST	Remove the empty 10,000-gallon AST.	1 September 2006
Tag valve on WAP	Add embossed metal tag to valve that state valve should be maintained in the closed position. Also state contact info for inspection by hazardous waste pick up crew or PPT for determination of when to drain contained rainwater.	1 September 2006
Inspections		
None	NA	NA
Employee Training		
None	NA	NA
Storm Water Diversion		
Maintain earthen berms	Some of the earthen berms are deteriorating and need to be refurbished. Berms around the north fence line should be rebuilt.	1 September 2006
Sediment and Erosion Prevention		
Maintain earthen berms	See Storm Water Diversion BMP.	1 September 2006
Other/Advance Pollution Prevention		
Change sample collection location	Sample collection is currently several miles downstream of the site at the sedimentation retention pond area. By the time the landfill discharge reaches this location several other storm water inlets have contributed to the sample. The sample location should be moved to the landfill's northwest corner (see Figure J-1 POD) where the storm water actually discharges from the site.	1 September 2006

6.0 SAMPLING INFORMATION

The Sanitary Landfill SWMU 1 is subject to the storm water monitoring and reporting requirements outlined for Sector L – Landfills and Land Application Sites in the MSGP. Pollutants to be analyzed for include TSS and total recoverable iron. Quarterly sampling was conducted the second (1 Jan – 31 Dec 2004) and third period (1 Jan – 31 Dec 2005) of the permit. The Fort Bliss Directorate of Environment has decided to conduct benchmark sampling every year since it does not meet waiver requirements due to the sampling location. Specific monitoring requirements (including analytical detection limits, reporting requirements, and sampling requirements) are outlined in Sector L of the MSGP. Copies of all analytical monitoring must be maintained onsite within this SWP3 (Appendix L). The new monitoring location is shown on the site map, Figure J-1.

In addition to analytical monitoring, quarterly visual observations of storm water quality must be conducted at the site. The examination must be of a grab sample collected at the new monitoring location identified on the site map within 30 minutes (or as soon thereafter as practical, but not to exceed 60 minutes) of when the runoff begins discharging. Samples must be collected within the seasonal periods: January through March; April through June; July through September; and October through December. The examination of storm water grab samples shall include any observations of color, odor, turbidity, floating solids, foam, oil sheen, or other obvious indicators of storm water pollution. Reports of the visual observation will include: the examination date and time, examination personnel, visual quality of the storm water discharge, and probable sources of any observed storm water contamination. A Summary of Quarterly Visual Observation form is included in Appendix M; it should be photocopied and completed as necessary. Copies of the Summary of Quarterly Visual Observation reports must be kept in the SWP3 (Appendix M) and submitted to the SWPPT Leader.

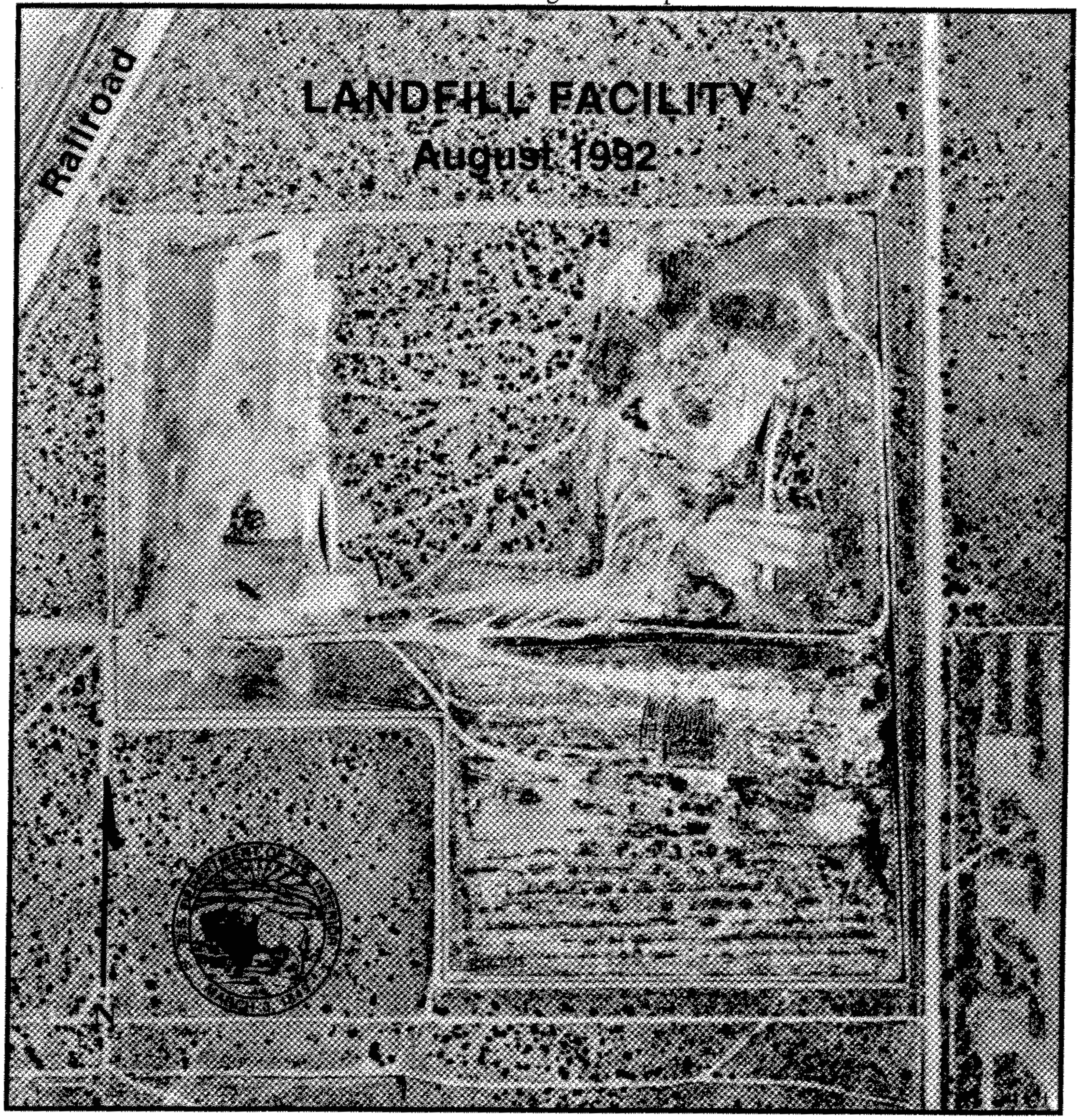
To date, all storm water sampling is conducted as required under Sector L of the MSGP at the remote sampling location several miles downstream. In the future, sampling must be conducted at the POD. Analytical results from storm water analytical monitoring are included in Appendix L of this SWP3.

ATTACHMENT 6

Geohydrologic Site Characterization of the Municipal Solid Waste Landfill Facility, U.S. Army Air Defense Artillery Center and Fort Bliss, El Paso County, Texas

GEOHYDROLOGIC SITE CHARACTERIZATION OF THE MUNICIPAL SOLID WASTE LANDFILL FACILITY, U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS, EL PASO COUNTY, TEXAS

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 95-4217



Prepared in cooperation with the
U.S. DEPARTMENT OF THE ARMY,
U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS

GEOHYDROLOGIC SITE CHARACTERIZATION OF THE MUNICIPAL SOLID WASTE LANDFILL FACILITY, U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS, EL PASO COUNTY, TEXAS

By Cynthia G. Abeyta

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 95-4217

Prepared in cooperation with the

U.S. DEPARTMENT OF THE ARMY,
U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS

Albuquerque, New Mexico
1996

U.S. DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, *Secretary*

U.S. GEOLOGICAL SURVEY

Gordon P. Eaton, *Director*

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U.S. Geological Survey
Water Resources Division
4501 Indian School Road NE, Suite 200
Albuquerque, New Mexico 87110-3929

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Box 25286, MS 517
Denver Federal Center
Denver, Colorado 80225

CONTENTS

FIGURES

FIGURES--Concluded

TABLES

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
inch	25.40	millimeter
foot	0.3048	meter
mile	1.609	kilometer
acre	4,047	square meter
quart	0.9464	liter
gallon	3.785	liter
gallon per minute	0.06309	liter per second
foot squared per day	0.09290	meter squared per day
ton	907.1848	kilogram

Temperature in degrees Celsius (°C) or degrees Fahrenheit (°F) can be converted as follows:

$$°F = 1.8\ (°C) + 32$$
$$°C = 5/9\ (°F - 32)$$

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929--a geodetic datum derived from a general adjustment of the first-order level nets of the United States and Canada, formerly called Sea Level Datum of 1929.

The use of trade names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

GEOHYDROLOGIC SITE CHARACTERIZATION OF THE MUNICIPAL SOLID WASTE LANDFILL FACILITY, U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS, EL PASO COUNTY, TEXAS

By Cynthia G. Abeyta

ABSTRACT

Geohydrologic conditions of the Municipal Solid Waste Landfill Facility (MSWLF) on the U.S. Army Air Defense Artillery Center and Fort Bliss, El Paso County, Texas, were evaluated by the U.S. Geological Survey in cooperation with the U.S. Army. The 106.03-acre MSWLF has been in operation since January 1974. The landfill contains household refuse, Post solid wastes, bulky items, grass and tree trimmings from family housing, refuse from litter cans, construction debris, classified waste (dry), dead animals, asbestos, and empty oil cans.

The MSWLF, located about 1,200 feet east of the nearest occupied structure, is estimated to receive an average of approximately 56 tons of municipal solid waste per day and, at a fill rate of 1-4 acres per year, is expected to reach its capacity by the year 2004. The MSWLF is located in the Hueco Bolson, 4 miles east of the Franklin Mountains. Elevations at the MSWLF range from 3,907 to 3,937 feet above sea level. The climate at the MSWLF and vicinity is arid continental, characterized by an abundance of sunny days, high summer temperatures, relatively cool winters typical of arid areas, scanty rainfall, and very low humidity throughout the year. Average annual temperature near the MSWLF and vicinity is 63.3 degrees Fahrenheit and annual precipitation is 7.8 inches. Potential evaporation in the El Paso area was estimated to be 65 inches per year. Soils at and adjacent to the MSWLF are nearly level to gently sloping, have a fine sandy loam subsoil, and are moderately deep over caliche.

The MSWLF is underlain by Hueco Bolson deposits of Tertiary age and typically are composed of unconsolidated to slightly consolidated interbedded sands, clay, silt, gravel, and caliche. Individual beds are not well defined and range in thickness from a fraction of an inch to about 100 feet. The primary source of ground water in the MSWLF area is in the deposits of the Hueco Bolson. A relatively thick vadose zone of approximately 300 feet overlies the aquifer of the Hueco Bolson deposits in the vicinity of the MSWLF. A deep water table prevails for all of the study area. Whether any perched water zones exist below the MSWLF is unknown. Under current conditions, extensive ground-water development by the City of El Paso encompasses the MSWLF. Hydraulic characteristics of the Hueco Bolson vary significantly as a result of the nonuniform nature of the individual beds. Wells in the vicinity of the MSWLF range in depth from about 600 feet to greater than 1,200 feet. Recharge resulting from direct infiltration of precipitation is minor due to the high evaporation and low precipitation rates. The hydraulic gradient in the vicinity of the MSWLF is generally to the south but may vary due to pumpage of a well located on the northeast corner of the perimeter boundary. Ground-water monitoring data for the MSWLF vicinity show a water-level decline of 55.65 feet from November 1958 to December 1987. Depth to water at the northeast corner of the MSWLF as of July 26, 1994, was 325.8 feet below land surface.

The city-operated Shearman Well Field, located north of the MSWLF, is a primary source of ground water for the City of El Paso. The test-pumping rate of well JL-49-05-914 (the well nearest to the MSWLF having test-pumping data) was 1,972 gallons per minute on July 20, 1992; the static water level prior to pumping was 317.54 feet below land surface. El Paso Water Utilities reports that the pumping level after 8 hours of pumping was 367.80 feet below land surface, resulting in a drawdown of 50.26 feet, transmissivity of 22,200 feet squared per day (166,000 gallons per day per foot), and specific capacity of 39.2 gallons per minute per foot of drawdown.

After the well was shut off, the well recovered to a static water level of 317.46 feet below land surface on July 21, 1992.

Ground water in the El Paso area is chemically suitable for most uses. El Paso Water Utilities reports that concentrations of dissolved solids in the vicinity of the MSWLF generally range from 297 to 625 milligrams per liter (wells JL-49-05-904 and JL-49-05-915, respectively).

INTRODUCTION

The U.S. Army Air Defense Artillery Center and Fort Bliss (USAADACENFB) is evaluating geohydrologic conditions of the Municipal Solid Waste Landfill Facility (MSWLF) to implement requirements of Federal and State of Texas regulatory programs. In 1994, the U.S. Geological Survey, in cooperation with the U.S. Army, initiated a study of the USAADACENFB MSWLF to identify geohydrologic conditions at the facility. Results of this study will be used by the U.S. Army to aid in fulfilling regulatory requirements at the facility as specified in Title 40 of the Federal Code of Regulations, Part 258 (40 CFR 258) and Part 30 of the Texas Administrative Code, Section 330 (30 TAC 330) (Texas Natural Resources Conservation Commission, 1993). The MSWLF is located in Texas, within El Paso County (fig. 1) on Federal land administered by the USAADACENFB.

Purpose and Scope

The primary objectives of this report are to: (1) present information on the boundaries, area, and contents of the MSWLF; (2) present information on the environmental setting of the MSWLF and vicinity, including a description of the physiography, climate, and soils; (3) describe geologic and hydrologic characteristics of the unsaturated zone and shallow aquifer; and (4) describe the ground-water quality in the vicinity of the MSWLF.

Information presented in this report will result in a better understanding of the hydrogeology at the MSWLF. The hydrogeology of the MSWLF is characterized on the basis of existing data. Water-level data were compiled for wells located in the vicinity of the MSWLF. Water-quality data were compiled for wells within a 1-mile radius of the MSWLF.

Description of the U.S. Army Air Defense Artillery Center and Fort Bliss and Municipal Solid Waste Landfill Facility

The USAADACENFB military reservation is located within the extraterritorial jurisdiction of the City of El Paso and extends into unincorporated portions of El Paso County, Texas, and the counties of Doña Ana and Otero in New Mexico (fig. 1). The primary missions of the USAADACENFB are air defense artillery training, senior noncommissioned officers training, administrative and logistical support of tenant activities, and provision of training facilities for reserve components.

The USAADACENFB military reservation serves a total Post population of more than 90,000 people (Population Performance Factors, March 1994, USAADACENFB, written commun., April 26, 1994). The total Post population includes military and civilian personnel (17,934 and 7,903 people, respectively), on- and off-Post family members (8,420 and 15,738 people, respectively), and retirees and retiree family members (14,502 and 26,465 people, respectively).

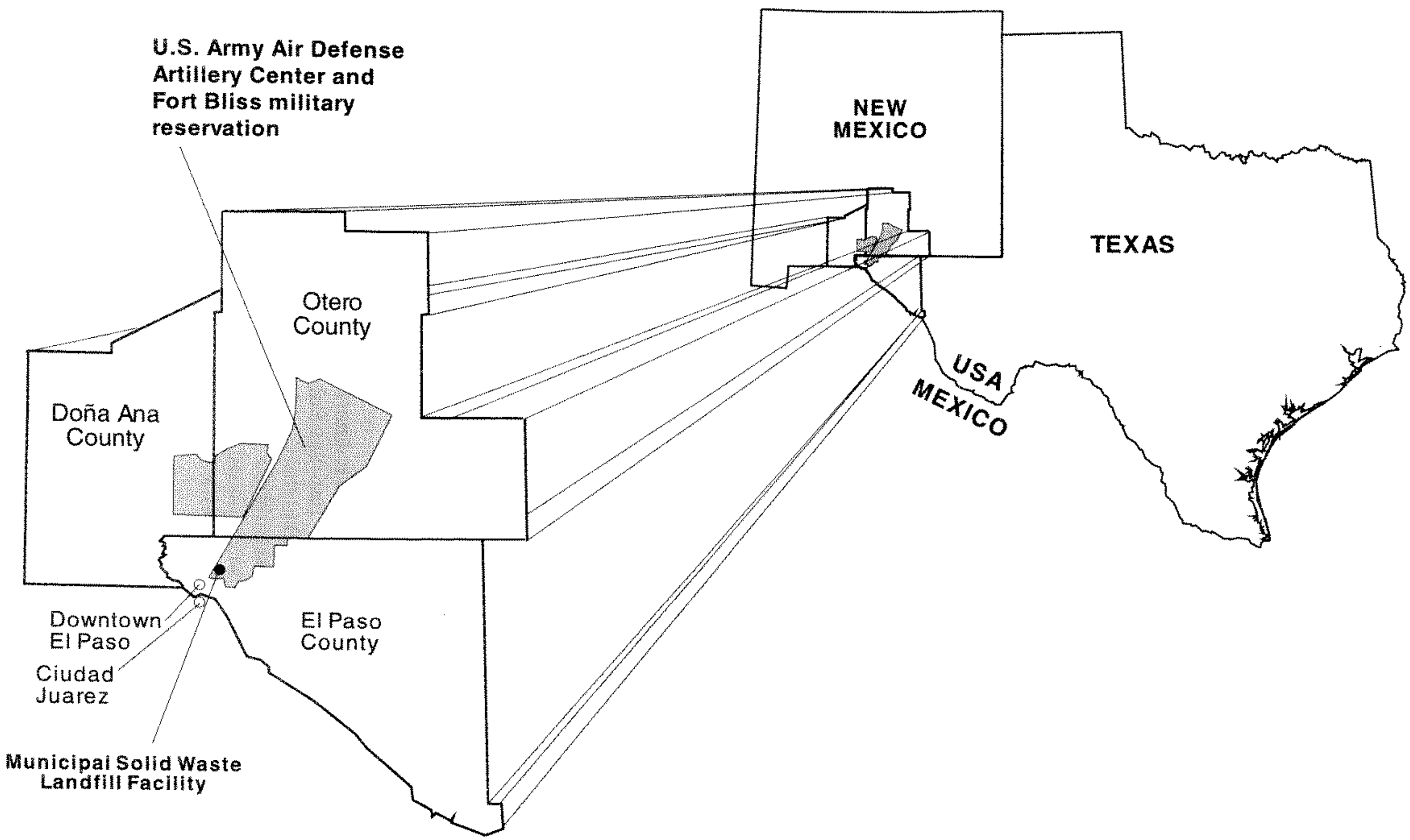


Figure 1.--Location of U.S. Army Air Defense Artillery Center and Fort Bliss military reservation, Texas and New Mexico.

On November 1, 1982, the USAADACENFB received Texas Department of Health Permit No. 1422 for operation of an existing Type I and Type IV municipal solid waste disposal facility. As defined by the TAC, a Type I facility is a standard landfill for the disposal of municipal solid waste; a Type IV facility is authorized for the disposal of brush, construction-demolition waste, and rubbish that are free of putrescible and household wastes (30 TAC §330.41.b and 30 TAC §330.41.e). The permit was issued pursuant to the provisions of the Texas Solid Waste Disposal Act and the Texas Department of Health Municipal Solid Waste Management Regulations for the 106.03-acre existing site.

The MSWLF is located northwest of Biggs Army Airfield, and 300 feet east of the Southern Pacific Railroad tracks, in El Paso County, Texas (fig. 2). The MSWLF is about 1,200 feet east of the nearest occupied structure. Occupied structures include residential and commercial areas located on the west side of the MSWLF (fig. 2). An all-weather road is accessible to the MSWLF year round. A 10-foot-high chain link fence with barbed wire outriggers surrounds the entire perimeter of the facility. A 6-foot 4-inch by 12-foot 4-inch by 10-foot-high enclosed guard shack is located on the facility near the entrance. No utilities are within the perimeter of the MSWLF. Existing boundary conditions of the MSWLF are shown in figure 3.

Types of solid wastes disposed of at the MSWLF include household refuse, Post solid wastes, bulky items, grass and tree trimmings from family housing, refuse from litter cans, construction debris, classified waste (dry), dead animals, asbestos, and empty oil cans (1-quart and 5-gallon sizes). The USAADACENFB Directorate of Public Works and Logistics manages contract operation of the MSWLF. Operation of the MSWLF is by a private contractor who also provides refuse collection and disposal services. The method of landfilling at the MSWLF is progressive trench where excavation and filling occur simultaneously in trenches 40 feet wide by 30 feet deep. Refuse is dumped at the end of the trench, then spread and covered by use of a crawler tractor. Daily cover of a minimum of 6 inches of compacted earth and a final cover of 2 to 3 feet are provided.

Two ground-water production wells are located about 350 feet north of the MSWLF. Well W3 has been in operation for several years; well W3A is a newly completed well located adjacent to W3 (figs. 2 and 3). These wells are used as public supply wells and are owned by the U.S. Army. To comply with Resource Conservation and Recovery Act (RCRA) and Texas Natural Resource Conservation Commission (TNRCC) regulations, a methane-gas monitoring network was installed at the MSWLF. Ten methane-gas monitoring probes were installed within the perimeter of the MSWLF. The methane-monitoring program is discussed in the Soils and Soil Gas section of this report.

The MSWLF was established in January 1974 and is estimated to receive an average of approximately 56 tons of municipal solid waste per day. The landfill fill rate is 1-4 acres per year; the MSWLF is expected to reach its capacity by the year 2004 at this fill rate (approximately 15 acres of the permitted area will not be filled).

A permit modification regarding soil and plastic liners has been approved by the TNRCC to construct a landfill cell within the MSWLF (labeled Subtitle D in fig. 3), complying with current federal requirements (RCRA, Subtitle D is discussed in the Federal Regulatory Program and Resource Conservation and Recovery Act Subtitle D and State of Texas Programs sections of this report). When construction of the cell is completed and approved in approximately October 1994, future wastes will be disposed of in the Subtitle D area (fig. 3).

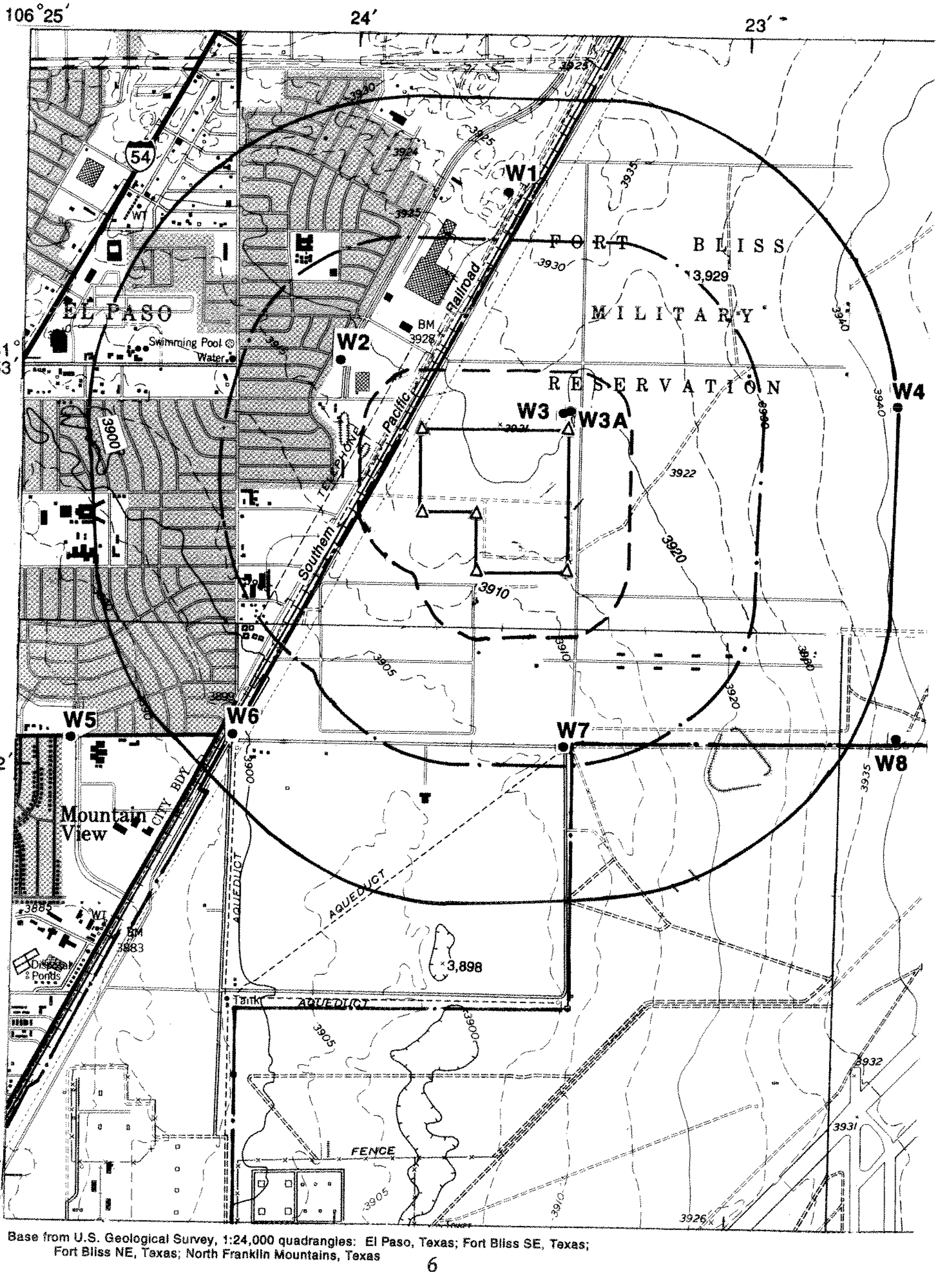
Federal Regulatory Program

In June 1980 the Department of Defense (DOD) issued Defense Environmental Quality Program Policy Memorandum 80-6, which mandated that hazardous waste material sites on DOD installations be identified. DOD policy is to identify and evaluate suspected problems associated with past hazardous contamination and to control hazards to the public health and welfare. The USAADACENFB implemented the DOD mandate in February 1983 by initiating an Installation Restoration Program (IRP) to identify the location and contents of past hazardous material disposal or spill sites and to control hazards to public health and the environment. The IRP is the basis for response actions on DOD installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, the Superfund Amendment and Reauthorization Act (SARA) of 1986, the RCRA of 1976, the Hazardous and Solid Waste Amendments of 1984, and Executive Order 12316. The SARA confirms that CERCLA is applicable to Federal facilities and defines the process by which Federal agencies are required to initiate remedial actions at their facilities.

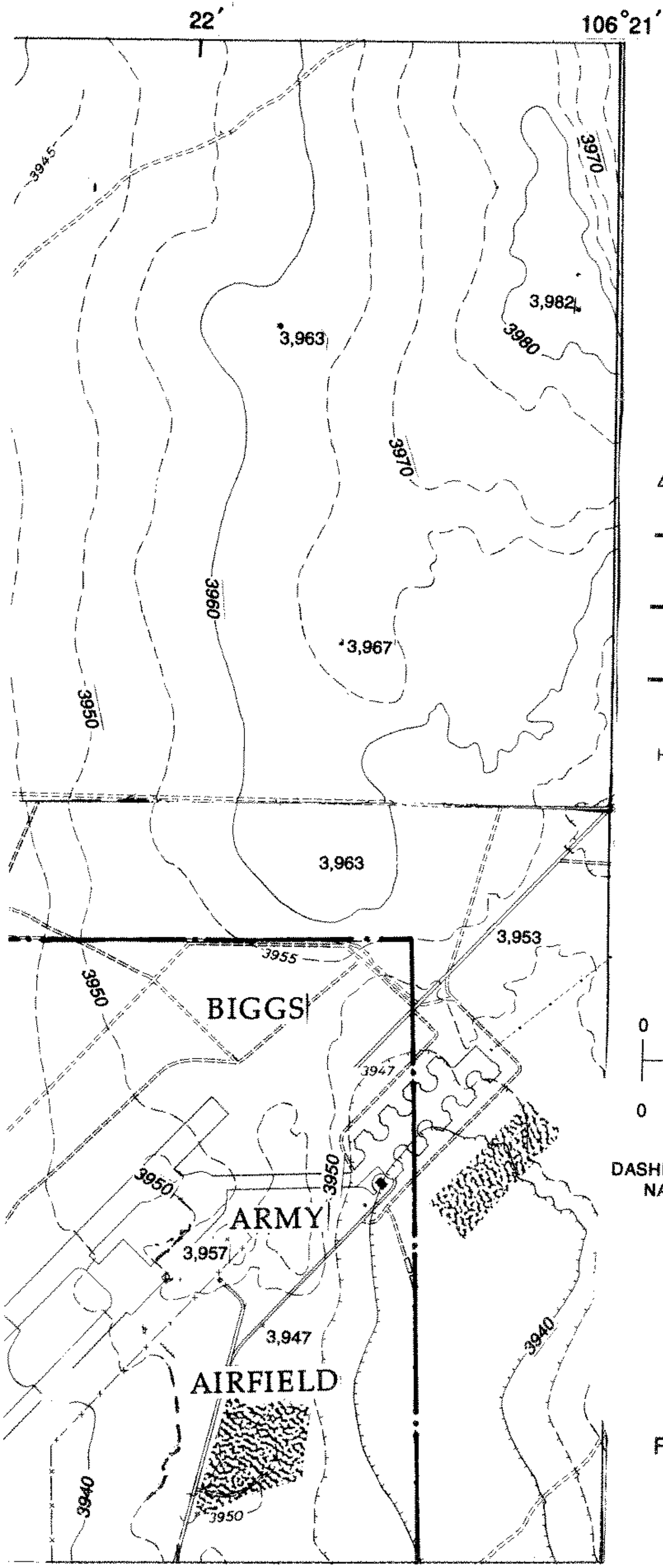
Previous IRP investigations at the USAADACENFB, in compliance with the above mandates, began with a USAADACENFB Headquarters installation assessment (Environmental Science and Engineering, Inc., 1983). The initial assessment was followed by an evaluation of solid waste management units (U.S. Army Environmental Hygiene Agency, 1987) and an RCRA Facility Assessment (RFA) (A.T. Kearney, Inc., 1989; U.S. Army Environmental Hygiene Agency, 1989; and Environmental Science and Engineering, Inc., 1991). Initial assessments included a literature search of published and unpublished reports, discussions with key installation personnel, examination of topographic maps and aerial photographs, identification of potentially hazardous sites, and initial assessments of those sites.

On January 17, 1991, a permit for industrial solid waste management for Class I hazardous waste storage, processing, and Post-closure care at the USAADACENFB military reservation was issued by the Texas Water Commission (TWC, now called the TNRCC) under provisions of the Texas Health and Safety Code Announcement, Chapter 361 (Vernon). The permit is referred to as Texas permit number HW-50296/Environmental Protection Agency permit number TX4213720101. Provisions in the permit stem from State and Federal authority and are subject to TNRCC rules and orders and Texas laws.

A requirement of the permit was that an RCRA Facility Investigation (RFI) be conducted at specified units identified in the permit. The MSWLF, identified as RFI Unit No. 1 in the permit and the previous RFA, was identified as one of the units to be included in the RFI. On the basis of findings in the RFA studies, a field phase of the RFI was conducted during May through June 1990. Work performed at the MSWLF included collection and analysis of soil cuttings at various locations within the MSWLF. Soil samples were analyzed for total petroleum hydrocarbons, total metals, volatile organic carbons, semivolatile organic carbons (by base-neutral-acid extraction), and polychlorinated biphenyls. Volume I of the RFI report of the USAADACENFB sites was completed in December 1991 (Environmental Science and Engineering, Inc., 1991). Findings of the RFI pertaining to the MSWLF indicated that "all of the constituents analyzed for were below action levels" (Environmental Science and Engineering, Inc., 1991, p. 5-1). The RFI reports were submitted to the TWC in February 1992. On the basis of the results of the RFI reports, the TWC, in a March 4, 1992, correspondence, prescribed "no additional efforts at this time" for RFI Unit No. 1 (MSWLF).



Base from U.S. Geological Survey, 1:24,000 quadrangles: El Paso, Texas; Fort Bliss SE, Texas; Fort Bliss NE, Texas; North Franklin Mountains, Texas



EXPLANATION

APPROXIMATE BOUNDARY OF LANDFILL

950-FOOT PERIMETER BOUNDARY AROUND LANDFILL

3,000-FOOT PERIMETER BOUNDARY AROUND LANDFILL

1-MILE PERIMETER BOUNDARY AROUND LANDFILL

RAILROAD

W8 • EXISTING WELL AND IDENTIFICATION NUMBER

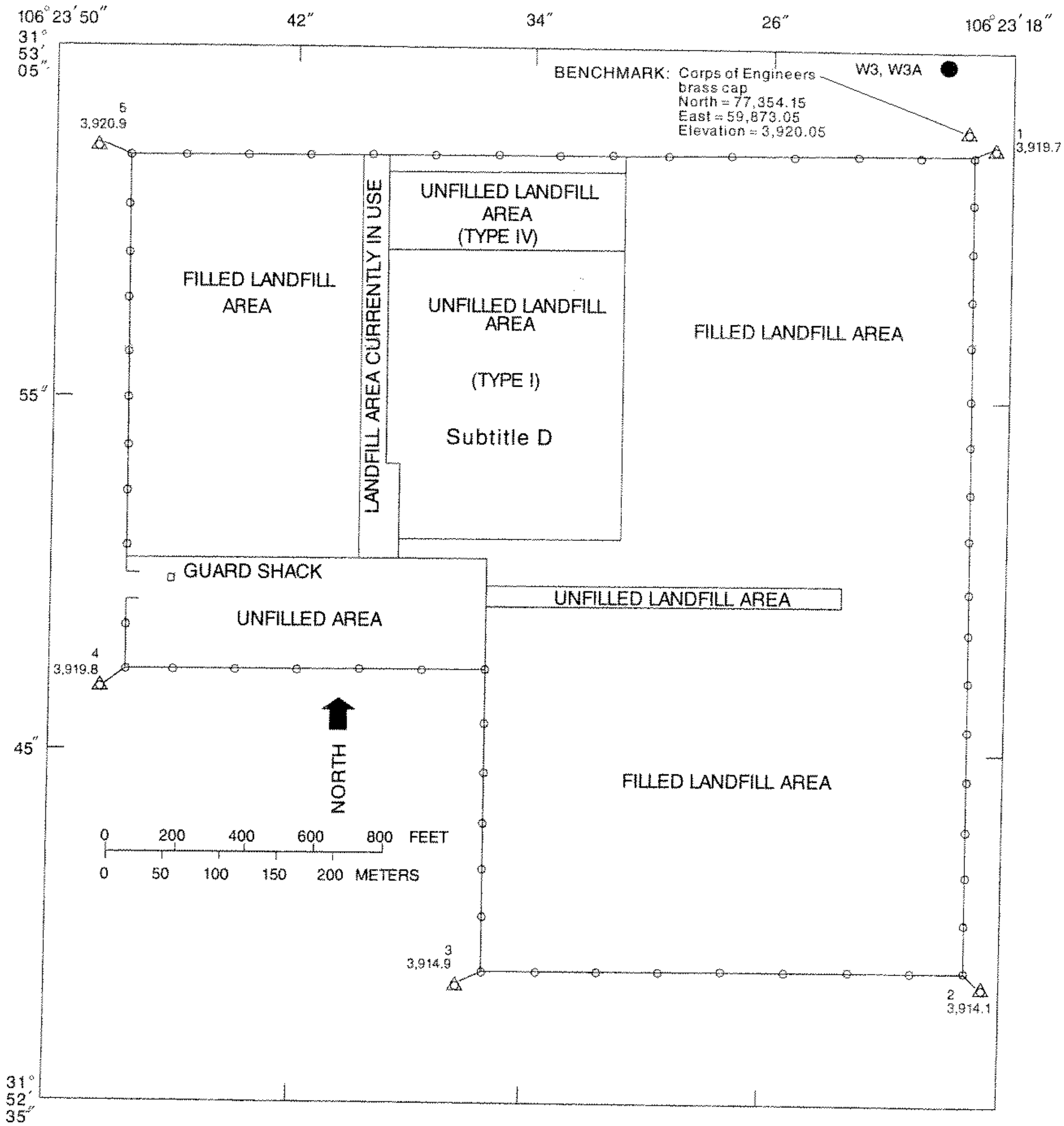
SCALE 1:24,000

0 0.5 1 MILE

0 0.5 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 5- TO 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Figure 2.--Location of U.S. Army Air Defense Artillery Center and Fort Bliss Municipal Soilid Waste Landfill Facility, Texas.



EXPLANATION

	FENCE/LANDFILL BOUNDARY
3,919.8 (4)	CONTROL POINT -- Identification number and elevation, in feet above sea level
W3, W3A	GROUND-WATER PRODUCTION WELL AND IDENTIFICATION NUMBER
TYPE I	STANDARD LANDFILL FACILITY FOR DISPOSAL OF MUNICIPAL SOLID WASTE
TYPE IV	FACILITY AUTHORIZED FOR DISPOSAL OF BRUSH, CONSTRUCTION-DEMOLITION WASTE, AND RUBBISH THAT ARE FREE OF PUTRESCIBLE AND HOUSEHOLD WASTES

Figure 3.--Existing Municipal Solid Waste Landfill Facility boundary conditions.

Resource Conservation and Recovery Act Subtitle D and State of Texas Programs

On October 9, 1991, the RCRA of 1976 was officially expanded to include revisions to the Criteria for Classification of Solid Waste Disposal Facilities and Practices set forth in 40 CFR Part 257, and to add RCRA Subtitle D (40 CFR Part 258). These revisions that implement minimum Federal criteria for municipal solid waste landfill facilities are referred to as Subtitle D of the RCRA. On October 9, 1993, Chapter 330 Municipal Solid Waste of the 30 TAC became effective in the State of Texas. The 30 TAC includes the Subtitle D requirements and covers all aspects of municipal solid waste management under the authority of the TNRCC. Although Texas State permit HW-50296 remains in force, the USAADACENFB is initiating studies to comply with the requirements in 30 TAC Chapter 330 (30 TAC 330).

This study of the MSWLF was conducted to compile existing geohydrologic information to characterize the site, which is under the regulatory jurisdiction of the TNRCC. The study was conducted in accordance with recommendations presented in the TNRCC's Municipal Solid Waste Regulations, 30 TAC 330, which implement requirements of Subtitle D of the RCRA.

Well-Numbering System

The well-numbering system in Texas was developed by the Texas Water Development Board for use throughout the State (fig. 4). The well number is divided into five segments; in this report the first four segments are divided by hyphens. The first segment is a two-letter prefix that identifies the county. The second segment indicates a 1-degree quadrangle that is given a number consisting of two digits ranging from 01 to 89. Each 1-degree quadrangle is divided into 7.5-minute quadrangles that are given a two-digit number from 01 to 64; this two-digit number is the third segment of the well number. Each 7.5-minute quadrangle is divided into 2.5-minute quadrangles that are given a single-digit number from 1 to 9; this one digit number is the fourth segment of the well number. Finally, each well within a 2.5-minute quadrangle is given a two-digit number in the order in which it was inventoried, starting with 01; this two-digit number is the fifth segment of the well number.

ENVIRONMENTAL SETTING

The Fort Bliss Post Headquarters and MSWLF are located in Texas, within the extraterritorial jurisdiction of the City of El Paso (fig. 5). The population of the El Paso metropolitan area is greater than 600,000. Ciudad Juarez, Mexico, lies directly south of El Paso across the Rio Grande and has a population greater than 1,000,000.

Physiography

Fort Bliss military reservation lies in the Hueco Bolson intermontane valley (fig. 5). The Hueco Bolson intermontane valley was produced by numerous diverse faults and folds and is divided into two distinct parts. The northern extension of the Hueco Bolson is referred to as the Tularosa Basin; the southern extension is referred to as the Hueco Bolson proper (Knowles and Kennedy, 1958, p. 8), hereafter referred to as the Hueco Bolson. The Tularosa Basin and Hueco Bolson are divided indefinitely a few miles north of the New Mexico-Texas border. The Tularosa Basin has no external drainage; the Hueco Bolson is partly drained by the Rio Grande. Elevations of the Fort Bliss military reservation range from 3,800 feet to more than 8,000 feet above sea level.

The MSWLF is 4 miles east of the rugged Franklin Mountains. The Franklin Mountains have peaks from 4,600 feet to greater than 7,000 feet above sea level. Geographic coordinates of the MSWLF are 31°52′54.51″ north latitude, 106°25′33.09″ west longitude. Elevations at the MSWLF range from 3,907 to 3,937 feet above sea level.

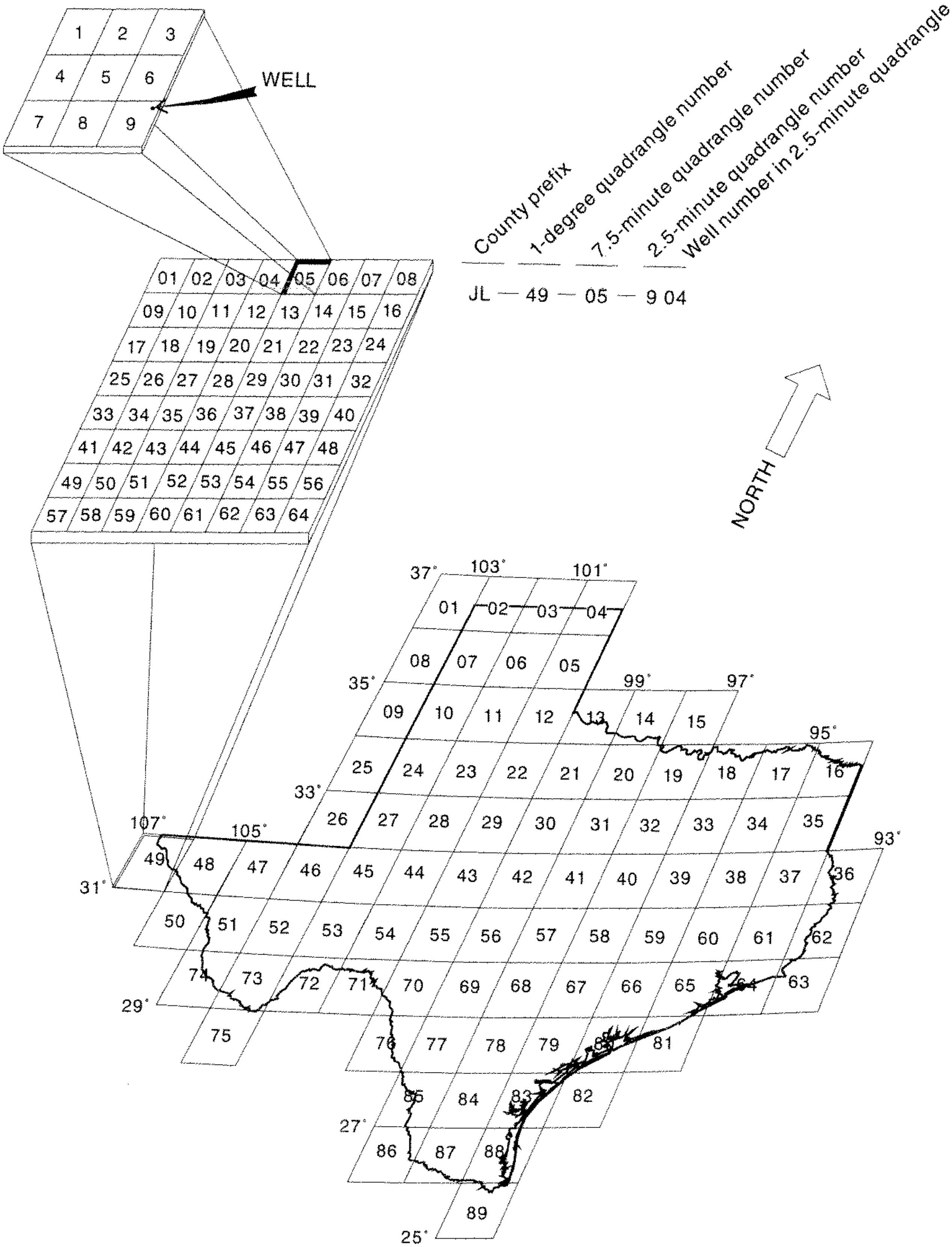


Figure 4.--Texas well-numbering system.

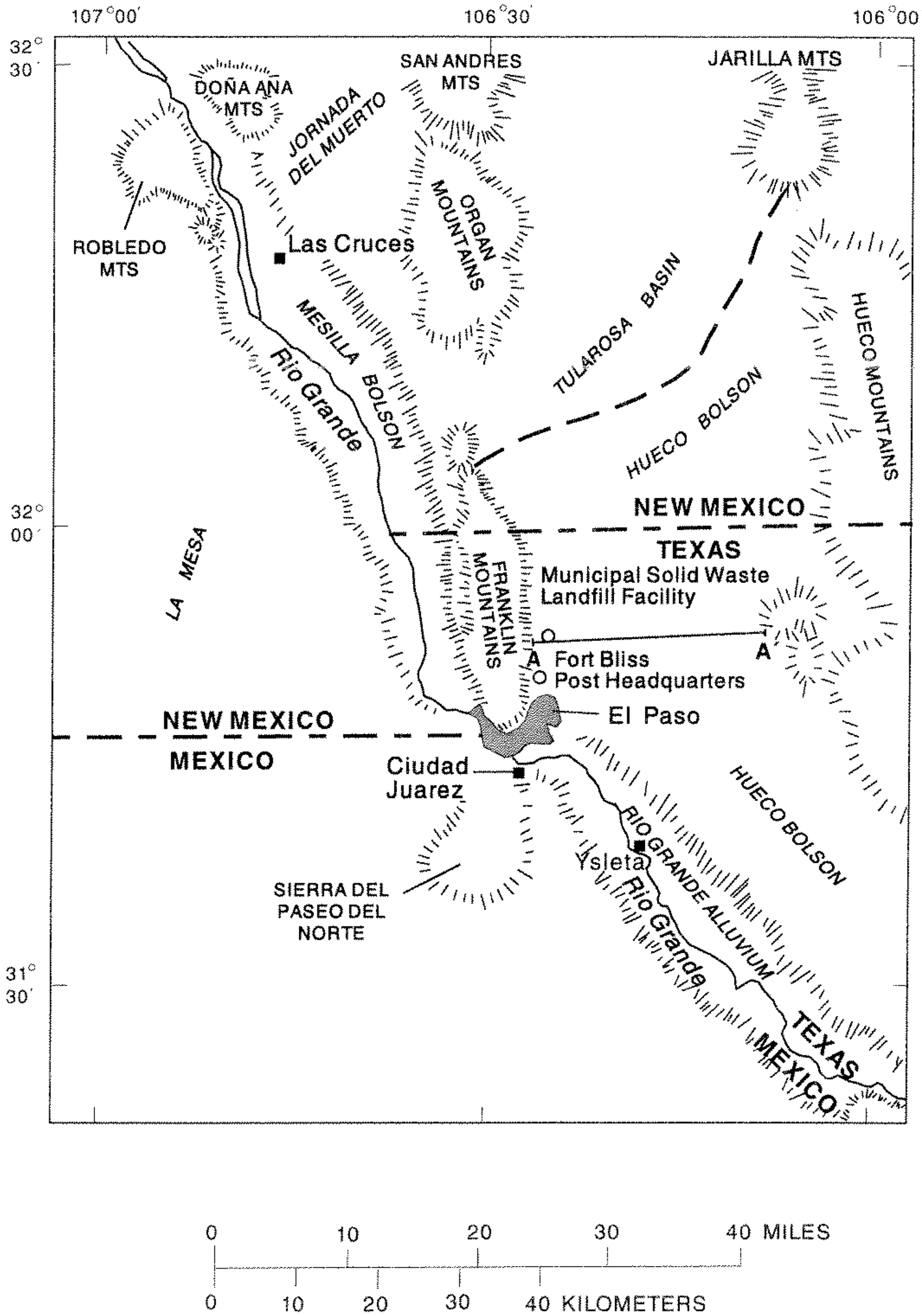


Figure 5.--Physiographic structures of the Tularosa Basin and Hueco Bolson (modified from Sayre and Livingston, 1945). See figures 9 and 11 for explanation of A - A'.

Climate

The climate of the MSWLF and vicinity, classified as arid continental, is characterized by an abundance of sunny days, high summer temperatures, relatively cool winters typical of arid areas, scanty rainfall, and very low humidity throughout the year. Temperature and precipitation data are recorded at El Paso International Airport by the National Weather Service and reported in monthly and annual reports by the National Oceanic and Atmospheric Administration. El Paso International Airport is approximately 4.5 miles southeast of the MSWLF.

Average annual precipitation in the El Paso area is 7.8 inches (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1992). Average monthly precipitation ranges from less than 1 inch during October through June to more than 1.2 inches in July, August, and September. Winter months are typically dry, and monthly snowfalls seldom exceed 3 inches (approximately 0.25 inch of water). Snow rarely lasts longer than 24 hours in the nonmountainous areas. Typically rainy months receive almost half of the annual precipitation in the form of brief but locally heavy thunderstorms. Prolonged periods of continuous precipitation are rare.

Average annual temperature at El Paso International Airport is 63.3 °F, ranging from a mean monthly low of 44.2 °F in January to a mean monthly high of 82.5 °F in July (U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1992). Summer daytime temperatures are frequently above 90 °F and occasionally rise above 100 °F. Summer night minimum temperatures are usually 60 to 65 °F. Winter days are cool and mild with temperatures rising to 55 to 60 °F. Night temperatures drop to below freezing during several nights in December and January.

The prevailing wind direction in the winter months is from the north and in the summer months is from the south. Dust and wind storms are frequent in March and April and wind speeds occasionally exceed 35 miles per hour.

Evaporation records from a class A evaporation pan at Ysleta, Texas, for 1985-92 are given in table 1. Ysleta, Texas, is located in El Paso County southeast of El Paso and 16 miles southeast of the MSWLF. Average annual pan evaporation for 1985-92 was about 93 inches. Sixty-one percent of evaporation occurred during April through August. Potential evaporation is calculated using the pan evaporation figure and the conservative factor of 0.70, resulting in an estimate of 65 inches per year. Relative humidity in the Fort Bliss/El Paso area is generally low. No studies have been identified that discuss pollution characteristics of ambient air quality at the MSWLF.

Soils and Soil Gas

Soils of El Paso County, described by Jaco (1971), constitute generally the first 5 feet of unconsolidated material below land surface. The following is a description of soils at and adjacent to the MSWLF as described by Jaco. The soil descriptions are not applicable to the deeper part of the vadose zone (Hueco Bolson) through which potential contaminants would migrate toward the water table. Because soils do provide much of the material readily available for engineering purposes, however, estimated engineering properties (Jaco, 1971) are shown in table 2 for each soil series.

Soils on the MSWLF and vicinity are mapped in figure 6. Although soils are described by association, soils are highly variable in the field and mapping units generally include areas that have more than one soil series. Soils on the MSWLF are nearly level to gently sloping, have a fine sandy loam subsoil, and are moderately deep over caliche. Loam denotes a mixture of clay (7 to 27 percent), silt (28 to 50 percent), and sand (less than 52 percent). West and north of the MSWLF soils are also nearly level and gently sloping. These soils have a clay loam subsoil and are moderately deep over soft caliche. The following is a brief description of each mapping unit, including the percentages of each series (Jaco, 1971).

Table 1.--Evaporation, in inches, from class A evaporation pan at Ysleta, Texas, 1985-92

[Records of U.S. Weather Bureau. --, no record; B, estimated total]

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1985	--	--	B 7.55	10.37	12.72	13.52	B 12.50	11.03	7.69	5.47	3.09	B 2.58	--
1986	3.51	4.72	7.27	9.48	11.15	9.61	9.94	9.77	8.34	5.45	--	--	--
1987	--	--	B 6.65	8.95	12.34	13.49	13.77	B 9.94	7.31	5.98	--	--	--
1988	--	B 4.56	8.77	10.40	13.24	--	11.24	B 8.16	7.56	6.37	4.64	--	--
1989	--	4.54	7.60	10.96	12.53	13.76	12.43	9.87	8.28	6.02	B 4.25	--	--
1990	--	--	B 6.62	B 10.01	12.75	15.10	11.19	9.01	7.22	6.21	B 3.61	--	--
1991	5.07	B 3.94	B 7.07	11.38	B 13.76	13.07	9.97	9.71	B 6.45	6.57	3.53	B 3.32	B 93.84
1992	B 2.33	B 3.38	6.41	9.67	B 8.92	13.50	B 13.00	10.22	9.32	5.69	B 3.80	--	--
Average	B 3.64	B 4.23	B 7.24	B 10.15	B 12.18	13.15	B 11.76	B 9.71	B 7.77	5.97	B 3.82	B 2.95	B 92.57

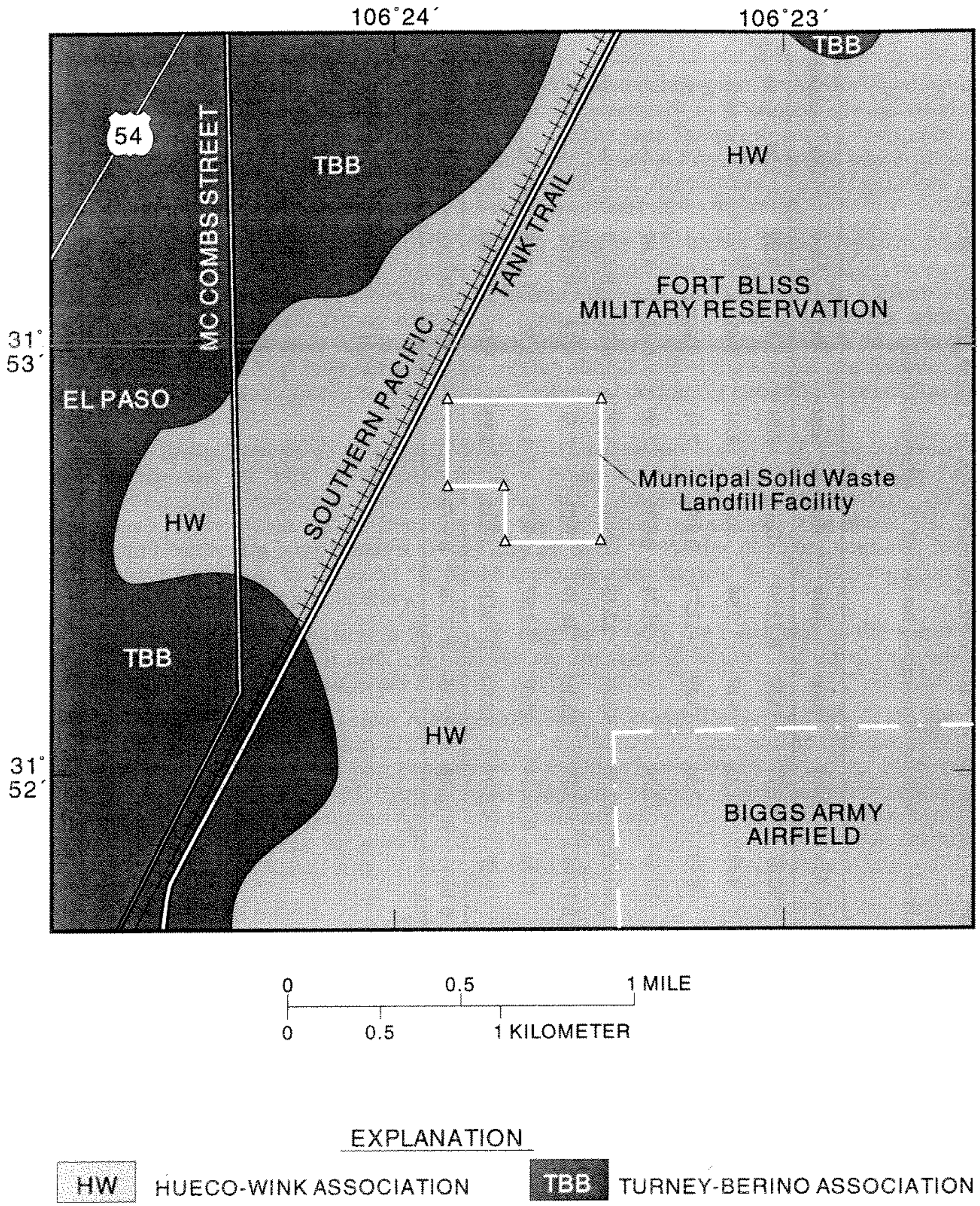


Figure 6.--Soils of the Municipal Solid Waste Landfill Facility and vicinity (modified from Jaco, 1971).

Table 2.--Engineering classification and estimated engineering properties of soil at the Municipal Solid Waste Landfill Facility and vicinity

[Engineering properties from Jaco (1971). TBB, Turney-Berino; HW, Hueco-Wink. The unified system of soil classification is used by Soil Conservation Service engineers. SM, SP, and SC are coarse-grained soils; CL is fine-grained soils. USDA, U.S. Department of Agriculture; AASHO, American Association of State Highway Officials; mm, millimeter; no., number; --, no data]

Soils and map symbols (fig. 6)	Depth below land surface (inches)	Classification			Percentage passing sieve				Permeability (inches per hour)	Available water capacity (inches per inch of soil)	Shrink-swell potential
		USDA texture	Unified	AASHO	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			
Berino, TBB	0-8	Fine sandy loam	SM or SM-SC	A-2 or A-4	100	100	90-100	25-45	0.63-2.00	0.10	Low.
	8-13	Loam	CL	A-6	100	100	85-95	60-75	0.63-2.00	0.15	Moderate.
	13-37	Clay loam	CL	A-6	100	95-100	65-80	55-70	0.20-0.63	0.16	Moderate.
	37-82	Loam	SC or CL	A-6	90-100	85-95	60-70	45-65	0.63-2.00	0.15	Low to moderate.
	82-100	Fine sandy loam	SM or SM-SC	A-2 or A-4	100	100	90-100	25-45	0.63-2.00	0.10	Low.
Hueco, HW	0-4	Loamy fine sand	SP or SP-SM	A-3	100	100	70-85	0-10	2.00-6.30	0.08	Low.
	4-26	Fine sandy loam	SM or SM-SC	A-2-4	100	100	80-95	15-30	2.00-6.30	0.10	Low.
	26-60	Indurated caliche									
Turney, TBB	0-3	Fine sandy loam	SM or SM-SC	A-2 or A-4	100	100	90-100	25-45	0.63-2.00	0.10	Low.
	3-10	Loam	CL	A-6	100	95-100	85-95	50-65	0.63-2.00	0.15	Moderate.
	10-34	Clay loam	CL	A-6	100	95-100	75-90	55-70	0.20-0.63	0.16	Moderate.
	34-60	Caliche (about clay loam texture)	CL	A-6	95-100	95-100	75-90	55-70	0.20-0.63	0.15	Moderate.
	60-80	Fine sandy loam	SM or SM-SC	A-2 or A-4	100	100	90-100	25-45	0.63-2.00	0.10	Low.
Wink, HW	0-24	Fine sandy loam	SM-SC	A-2-4	100	95-100	95-100	20-35	0.63-2.00	0.10	Low.
	24-73	Cemented caliche	--	--	--	--	--	--	--	--	--
	73-100	Gravelly loam	SM or SM-SC	A-2 or A-4	90-95	70-85	65-80	25-45	2.00-6.30	0.08	Low.

HW--Hueco-Wink Association, hummocky. The Hueco-Wink Association includes Hueco and Wink soils. In El Paso County, the Hueco-Wink Association constitutes 41 percent of the soils. Hueco soils constitute 42 percent of the association; Wink soils constitute 38 percent, and minor soils constitute 20 percent.

Hueco soils--typically have a brown, loamy, fine sand surface layer, about 4 inches thick, that is mildly alkaline and noncalcareous. The subsoil is brown and yellowish-brown, calcareous, fine sandy loam about 22 inches thick. A layer of indurated caliche is about 32 inches thick at a depth of 26 inches.

Wink soils--typically have a pale-brown surface layer about 6 inches thick and a light yellowish-brown subsoil about 18 inches thick. Both layers are calcareous, fine sandy loam. Cemented caliche begins at a depth of about 24 inches.

TBB--Turney-Berino Association, undulating. The Turney-Berino Association includes Turney and Berino soils. In El Paso County, the Turney-Berino Association constitutes 5 percent of the soils. Turney soils constitute 68 percent of the association, Berino soils constitute 18 percent, and minor soils constitute 14 percent.

Turney soils--typically have a moderately alkaline, calcareous surface layer about 10 inches thick. They are light-reddish-brown, fine sandy loam to a depth of about 3 inches and are light-brown loam below. The subsoil is light-brown, calcareous clay loam. Depth to soft caliche is about 34 inches.

Berino soils--are similar to Turney soils but their surface layer is noncalcareous and mildly alkaline, and their clay loam subsoil contains clay films on the soil particles.

To determine the location and concentration of vapor-phase gases generated by the MSWLF that may have migrated upward to the surface, laterally toward the MSWLF perimeter, or to the MSWLF guard shack, a soil-gas survey was conducted June 15-16, 1994, by the USAADACENFB. At 30 points around the perimeter of the MSWLF and 4 points adjacent to the four walls of the guard shack (fig. 7), a 1/4-inch-diameter rod was driven to 4 feet below land surface and then extracted. A probe was inserted into the resultant hole. Dirt was used to seal the annular space of the hole at the land surface. A portable gas meter (Gastech GT201) calibrated to methane was used to measure the concentration of methane and hydrocarbons at each probe site. Methane and hydrocarbon concentrations in the ambient air in the guard shack also were measured using the portable gas meter. Results of data collected during the soil-gas survey are presented in table 3. In all cases methane was less than 1 percent by volume. Hydrocarbon concentrations ranged from 80 to 1,160 parts per million.

A methane-gas monitoring network was installed at the MSWLF in November 1994. The monitoring network was designed to collect representative samples of explosive gases (specifically methane) generated by the facility and to monitor whether these gases exceed maximum allowable levels as defined in RCRA Subtitle D (40 CFR 258.23 (d)) and 30 TAC §330.56(n)(2). The methane-monitoring probes are screened from 5 to 30 feet below land surface. Locations of methane-monitoring probes and ambient-air methane-monitoring sites are shown in figure 8. These sites are monitored quarterly.

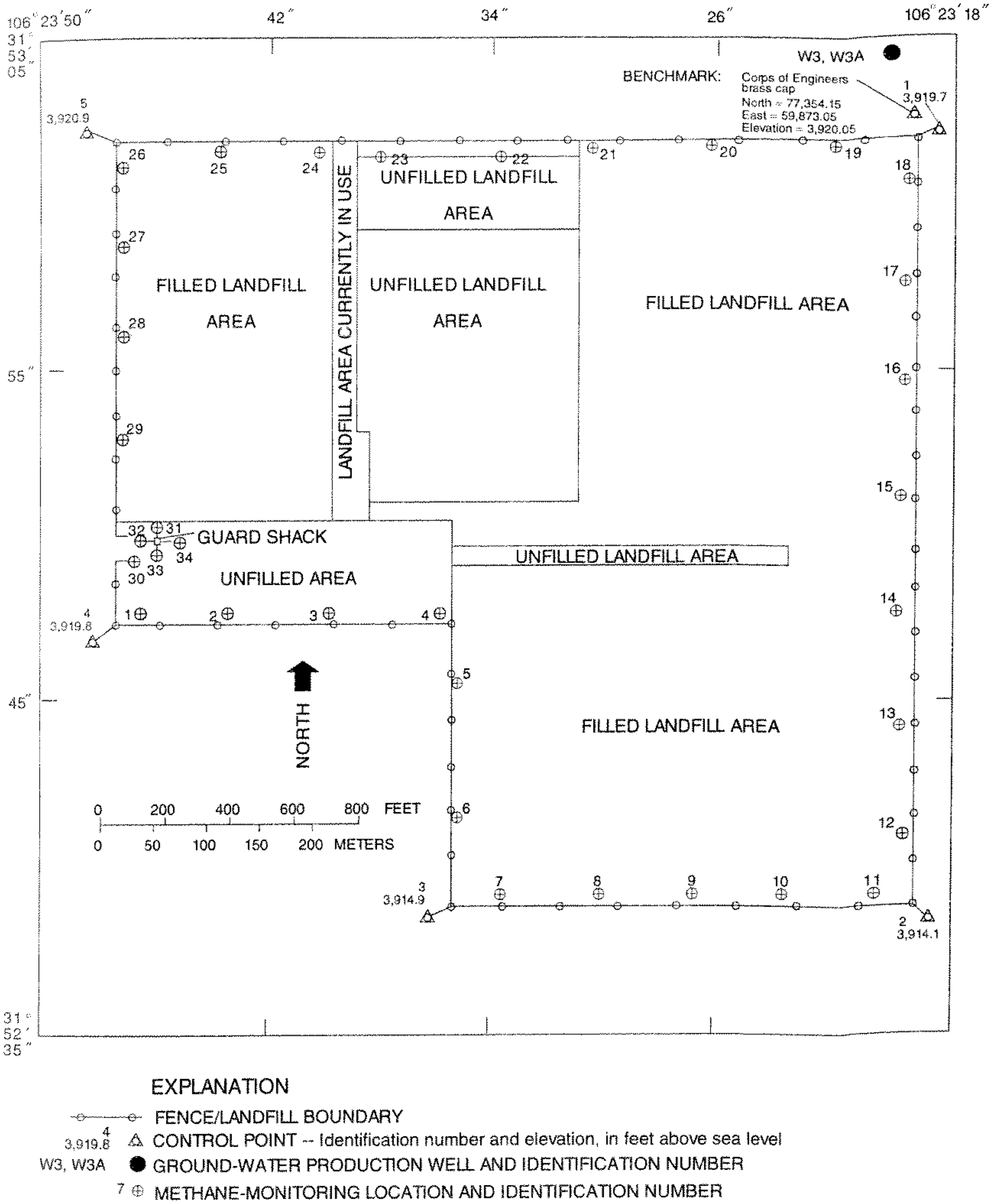


Figure 7.--Methane-monitoring locations of soil-gas survey conducted June 15-16, 1994, by the U.S. Army Air Defense Artillery Center and Fort Bliss.

Table 3.--Results of soil-gas survey conducted June 15-16, 1994, by U.S. Army Air Defense Artillery Center and Fort Bliss[1]

[<, less than]

Map number (fig. 7)	Date	Time	Percent by volume methane[2]	Hydrocarbon concentration (parts per million)
1	6-15-94	0818	<1	320
2	6-15-94	0837	<1	380
3	6-15-94	0850	<1	360
4	6-15-94	0906	<1	360
5	6-15-94	0917	<1	340
6	6-15-94	0936	<1	240
7	6-15-94	0950	<1	280
8	6-15-94	1002	<1	260
9	6-15-94	1012	<1	300
10	6-15-94	1027	<1	280
11	6-15-94	1040	<1	260
12	6-15-94	1113	<1	260
13	6-15-94	1134	<1	240
14	6-15-94	1148	<1	80
15	6-15-94	1405	<1	260
16	6-15-94	1417	<1	200
17	6-15-94	1429	<1	200
18	6-15-94	1440	<1	280
19	6-15-94	1452	<1	320
20	6-15-94	1501	<1	380
21	6-15-94	1511	<1	380
22	6-15-94	1523	<1	400
23	6-15-94	1535	<1	380
24	6-15-94	1543	<1	480
25	6-15-94	1557	<1	460
26	6-16-94	0820	<1	260
27	6-16-94	0835	<1	1,160
28	6-16-94	0855	<1	480
29	6-16-94	0908	<1	600
30	6-16-94	0925	<1	440
[3]31	6-16-94	0939	<1	500
[3]32	6-16-94	0946	<1	580
[3]33	6-16-94	0956	<1	580
[3]34	6-16-94	1005	<1	600

[1]Samples collected from a depth of 4 feet. Measurements made with a Gastech GT201 gas monitor calibrated to methane.
[2]1 percent by volume equals 10,000 parts per million methane.
[3]Measured within 5 feet of each of the four walls of the guard shack. All measurements of methane in the ambient air in the guard shack were zero.

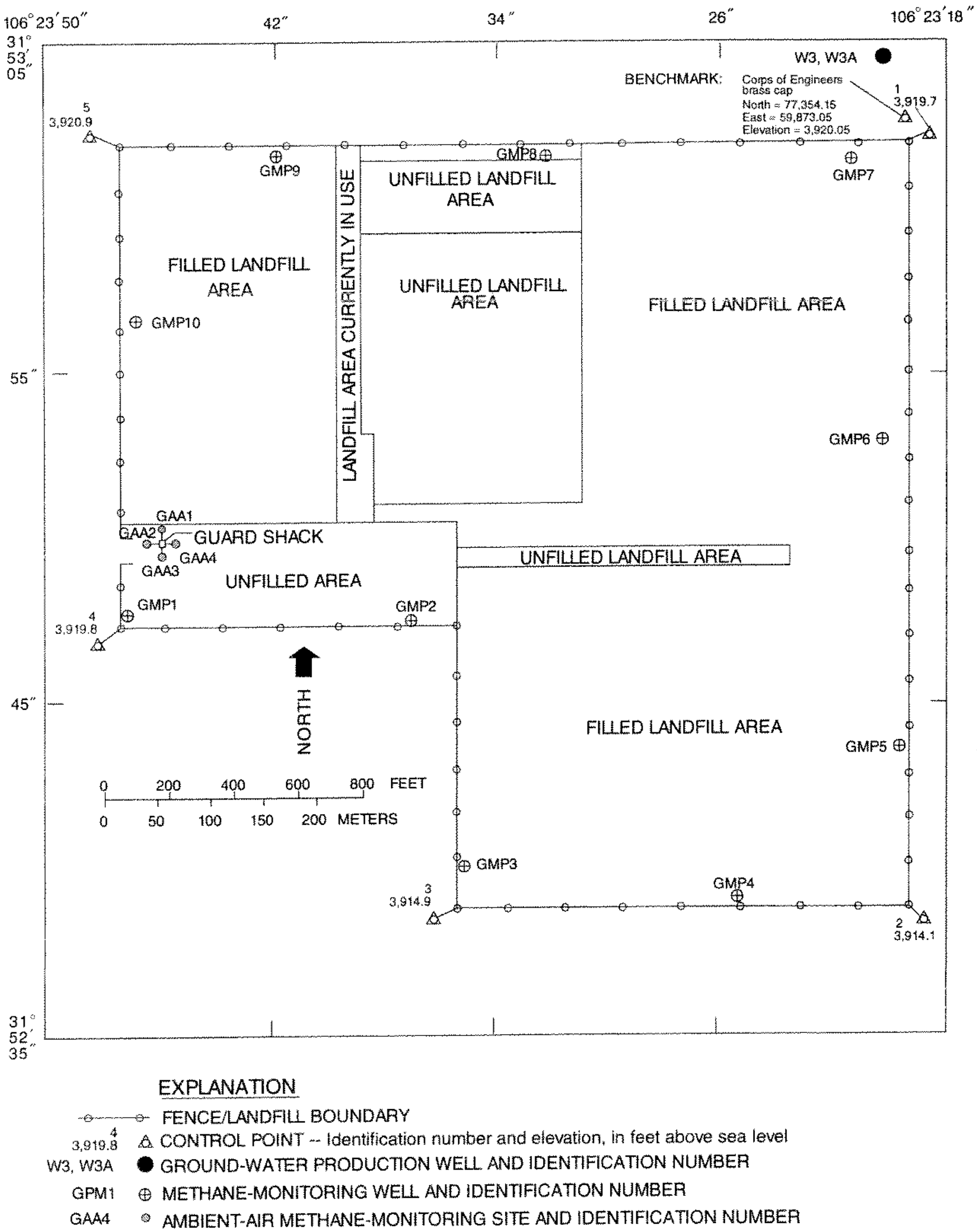


Figure 8.--Location of methane-monitoring sites at the Municipal Solid Waste Landfill Facility.

GEOHYDROLOGY

Data describing the geohydrologic characteristics of the deposits in the MSWLF area were compiled from existing sources and during installation of the MSWLF methane-monitoring system. A summary of the information available on the geohydrology of the MSWLF and vicinity is presented in the following sections.

Geology

The MSWLF is underlain by Hueco Bolson deposits of locally derived materials. The Hueco Bolson is a clastic-filled graben extending from a few miles north of the New Mexico-Texas border to several miles south into Mexico (fig. 5). Hueco Bolson deposits are of Tertiary age and primarily include fluvial and lacustrine deposits, but alluvial-fan material and aeolian sediments also are present (Cliett, 1969). Hueco Bolson deposits are reported to have a maximum thickness of about 9,000 feet within a deep structural trough (fig. 9) paralleling the east base of the Franklin Mountains (Mattick, 1967, p. 85-91).

Hueco Bolson deposits typically are composed of fine- to medium-grained sand with interbedded lenses of clay, silt, gravel, and caliche. These deposits range from unconsolidated to slightly consolidated. Sand fragments are composed primarily of chert, granite, and porphyry. Individual beds are not well defined and range in thickness from a fraction of an inch to about 100 feet.

Consolidated igneous and sedimentary rocks ranging in age from Precambrian to Tertiary are exposed in the Franklin and Hueco Mountains (fig. 5). Igneous rocks are predominately granitic and are composed of coarse grains of quartz and feldspar. These granitic rocks are easily weathered and are a primary source material of the bolson deposits.

Hydrology

A summary of information available on the hydrology of the MSWLF and vicinity is presented in the following sections. Tabulated data were compiled from El Paso Water Utilities and U.S. Geological Survey data bases.

Ground Water

The three primary sources of ground water in the El Paso area are Hueco Bolson deposits, Mesilla Bolson deposits, and Rio Grande alluvium (Alvarez and Buckner, 1980, p. 4). The primary source of ground water in the MSWLF area is the unconsolidated and semiconsolidated sedimentary deposits of the Hueco Bolson. Wells completed in the Hueco Bolson supply water for the City of El Paso, Ciudad Juarez, Fort Bliss military reservation, private industries, and agricultural areas. Wells discharging large amounts of water usually are drilled at least 200 feet into water-yielding material. City of El Paso and Fort Bliss municipal water-supply wells completed in the Hueco Bolson range in depth from about 600 feet to greater than 1,200 feet.

A relatively thick unsaturated zone of approximately 300 feet overlies the aquifer of the Hueco Bolson deposits in the vicinity of the MSWLF. A deep water table prevails for all of the study area. Whether any perched water zones exist below the MSWLF is unknown. Under current conditions, extensive ground-water development by the City of El Paso encompasses the MSWLF (fig. 10).

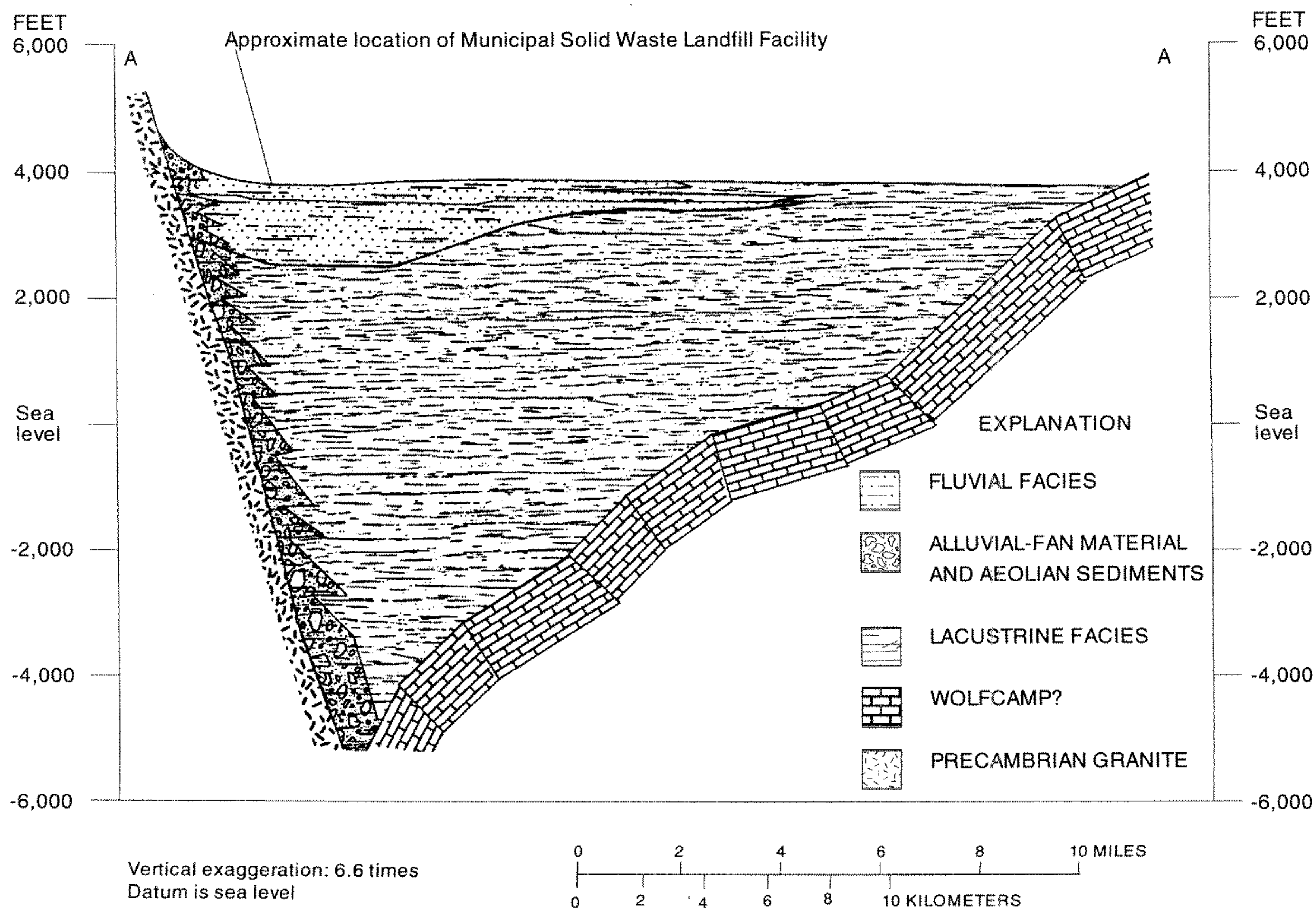
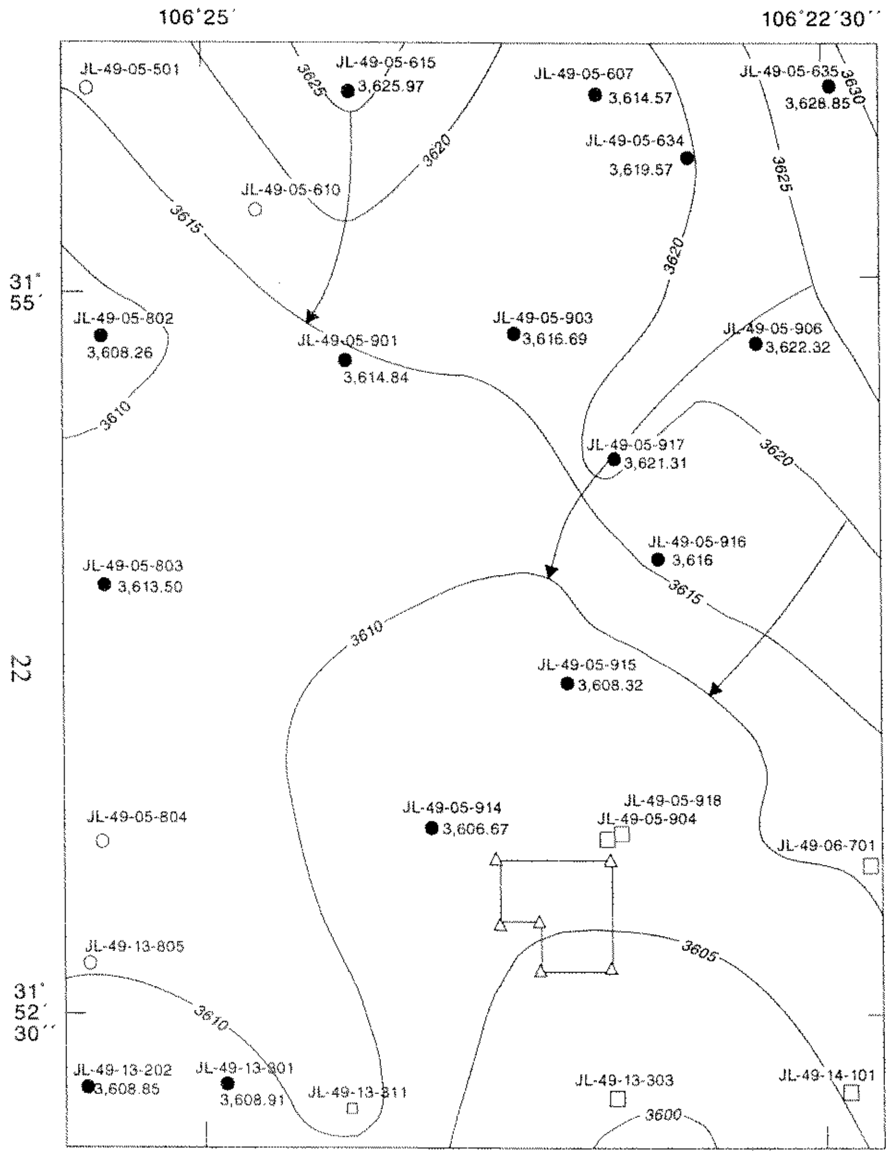


Figure 9.--Geologic section of the Hueco Bolson (trace shown in fig. 5; modified from Cliett, 1969, fig. 2, and published with permission).



EXPLANATION

3,625 WATER-LEVEL CONTOUR--Shows altitude at which water level would have stood in tightly cased wells, December 1993 to February 1994. Contour interval: 5 feet. Datum is sea level

APPROXIMATE DIRECTION OF GROUND-WATER FLOW

APPROXIMATE BOUNDARY OF U.S. ARMY AIR DEFENSE ARTILLERY CENTER AND FORT BLISS MUNICIPAL SOLID WASTE LANDFILL FACILITY

JL-49-05-906 3,622.32 CITY OF EL PASO WELL--Upper number is well number; lower number is elevation of water level, in feet above sea level

JL-49-05-804 CITY OF EL PASO WELL--Well number; water-level data not available for period December 1993 to February 1994

JL-49-06-701 U.S. ARMY WELL--Well number; water-level data not available for period December 1993 to February 1994

Figure 10.--Approximate water-level altitude and directions of ground-water flow from December 1993 to February 1994 (water-level contours from Roger Sperka, El Paso Water Utilities, written commun., 1994).

Hydraulic characteristics of the Hueco Bolson vary significantly because of the nonuniform nature of the individual beds (Alvarez and Buckner, 1980). On a regional scale the Hueco Bolson can be considered a single aquifer, but on a local scale the rate and volume of water flowing through individual beds probably vary considerably. Transmissivities of Hueco Bolson deposits under water-table conditions in the El Paso area are estimated to be 1,340 to 37,500 feet squared per day (10,000 to 280,000 gallons per day per foot) (Alvarez and Buckner, 1980, p. 6).

The Hueco Bolson aquifer underlying the MSWLF is recharged primarily by inflow from the mountainous areas to the north, west, and east. Recharge resulting from direct infiltration of precipitation may be minor due to the high evaporation and low precipitation rates discussed earlier in this report. The regional direction of ground-water flow in the Hueco Bolson deposits is generally south and southwest, toward the Rio Grande. Hydraulic gradients have been altered locally due to extensive pumping of ground water in the El Paso area. Ground-water flow direction at a given location may change from time to time due to pumpage of City of El Paso and U.S. Army production wells. The direction of flow in various strata of the aquifer at a given location generally is somewhat difficult to determine due to the three-dimensional nature of the aquifer. An inventory of wells located within a 1-mile radius of the MSWLF is given in table 4.

Water levels have been declining in the El Paso area. Water pumped from wells in the vicinity of the MSWLF is mostly for municipal use. Ground-water monitoring data in the vicinity of the MSWLF show a water-level decline of 55.65 feet from November 1958 to December 1987 (well JL-49-05-904, table 4). Depth to water in the MSWLF area is currently 325.8 feet below land surface (newly completed U.S. Army well JL-49-05-918 located adjacent to U.S. Army well JL-49-05-904, July 26, 1994). The hydraulic gradient in the MSWLF area is variable due to pumpage of well JL-49-05-918, located near the northeast corner of the perimeter boundary (well W3A in fig. 2). A water-level map (fig. 10) of ground water underlying the MSWLF and vicinity indicates that flow is generally to the south.

The city-operated Shearman Well Field is a primary source of ground water for the City of El Paso. The Shearman Well Field is located north of the MSWLF and includes wells JL-49-05-914, JL-49-05-915, JL-49-05-916, JL-49-05-917, JL-49-05-906, JL-49-05-634, and JL-49-05-635 (fig. 10). Well JL-49-05-906 has been in operation for several years; ground-water monitoring data at this well indicate a water-level decline of 48.34 feet from March 1966 to December 1993 (El Paso Water Utilities, El Paso, Texas, written commun., 1995). Shearman Well Field wells JL-49-05-914, JL-49-05-915, JL-49-05-916, JL-49-05-917, JL-49-05-634, and JL-49-05-635 were installed from 1990 to 1992 and are planned to begin operation from mid-October 1994 through December 1995.

Test-pumping rates at wells in the Shearman Well Field range from 1,800 to 2,400 gallons per minute; drawdowns in the wells ranged from 39.83 feet (well JL-49-05-917 after 24 hours of pumping at 1,930 gallons per minute, August 18-19, 1992) to 73.40 feet (well JL-49-05-916 after 20 hours of pumping at 1,994 gallons per minute, June 30, 1992). Transmissivities of the seven Shearman Well Field wells range from 16,200 to 25,600 feet squared per day (121,000 to 191,000 gallons per day per foot) (El Paso Water Utilities, written commun., 1995). The test-pumping rate of well JL-49-05-914, the well nearest to the MSWLF having test pumping data (fig. 10), was 1,972 gallons per minute on July 20, 1992; the static water level prior to pumping was 317.54 feet below land surface; the pumping level after 8 hours of pumping was 367.80 feet below land surface, resulting in a drawdown rate of 50.26 feet, transmissivity of 22,200 feet squared per day (166,000 gallons per day per foot), and specific capacity of 39.2 gallons per minute per foot of drawdown. After the well was shut off, the well recovered to a static water level of 317.46 feet below land surface on July 21, 1992.

Table 4.--Records of wells in the vicinity of the Municipal Solid Waste Landfill Facility

[Data from El Paso Water Utilities and U.S. Geological Survey files. N, north; W, west; --, no data]

Well identification number (fig. 2)	Well number (fig. 10)	Latitude-longitude	Use	Owner	Well depth (feet)	Elevation of well (feet above sea level)	Date water level measured	Depth to water (feet below land surface)	Elevation of water level (feet above sea level)
W1	JL-49-05-915	31°53'37"N-106°23'31"W	Public supply	City of El Paso	1,202.0	3,925.0	08-Aug-92	322.05	3,602.95
							22-Jan-93	317.69	3,607.31
							22-Dec-93	316.68	3,608.32
W2	JL-49-05-914	31°53'09"N-106°24'03"W	Public supply	City of El Paso	935.0	3,917.0	20-July-92	317.54	3,599.46
							21-July-92	317.46	3,599.54
							22-Jan-93	311.12	3,605.88
							22-Dec-93	310.33	3,606.67
W3	JL-49-05-904	31°53'03"N-106°23'22"W	Public supply	U.S. Army	826.0	3,920.0	18-Nov-58	249.00	3,671.00
							18-Jan-80	291.50	3,628.50
							28-Dec-81	293.34	3,626.66
							23-Jan-83	295.65	3,624.35
							23-Dec-83	294.72	3,625.28
							09-Feb-85	297.71	3,622.29
							31-Dec-85	299.63	3,620.37
							30-Dec-86	303.22	3,616.78
							23-Dec-87	304.65	3,615.35
W3A	JL-49-05-918	31°53'05"N-106°23'20"W	Public supply	U.S. Army	940.0	3,920.0	26-July-94	325.8	3,594.2
W4	JL-49-06-701	31°53'05"N-106°22'20"W	Public supply	U.S. Army	819.0	3,944.0	02-Dec-59	274.00	3,670.00
							18-Jan-79	305.75	3,638.25
							26-Dec-79	308.40	3,635.60
							29-Dec-80	309.15	3,634.85
							24-Dec-81	312.16	3,631.84
							21-Jan-83	315.46	3,628.54
							23-Dec-83	314.72	3,629.28
							29-Jan-85	315.27	3,628.73
							31-Dec-85	320.19	3,623.81
							02-Jan-86	318.64	3,625.36
							29-Dec-86	321.16	3,622.84
							23-Dec-87	323.24	3,620.76
							12-Dec-88	326.19	3,617.81
							08-Dec-89	327.69	3,616.31
							12-Dec-90	326.87	3,616.31
							14-Jan-92	327.74	3,616.26
							22-Dec-92	330.07	3,613.93

Table 4.--Records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Continued

Well identi-fication number (fig. 2)	Well number (fig. 10)	Latitude-longitude	Use	Owner	Well depth (feet)	Elevation of well (feet above sea level)	Date water level measured	Depth to water (feet below land surface)	Elevation of water level (feet above sea level)
W5	JL-49-13-301	31°52'12"N-106°24'51"W	Observation	City of El Paso	612.0	3,882.0	15-Feb-64	228.48	3,653.52
							31-Dec-64	228.89	3,653.11
							31-Dec-66	233.55	3,648.45
							31-Dec-67	234.08	3,647.92
							31-Dec-68	235.55	3,646.45
							31-Dec-69	235.02	3,646.98
							31-Dec-70	237.83	3,644.17
							31-Dec-71	241.11	3,640.89
							31-Dec-72	238.80	3,643.20
							31-Dec-73	247.28	3,634.72
							31-Dec-74	246.75	3,635.25
							19-Dec-75	248.42	3,633.58
							20-Dec-76	251.55	3,630.45
							19-Dec-77	250.53	3,631.47
							20-Dec-78	253.11	3,628.89
							20-Dec-79	255.03	3,626.97
							19-Dec-80	258.58	3,623.42
							21-Dec-81	257.56	3,624.44
							21-Dec-82	259.69	3,622.31
							13-Dec-83	260.73	3,621.27
							20-Dec-84	262.45	3,619.55
							17-Dec-85	265.06	3,616.94
							24-Dec-86	266.32	3,615.68
							21-Dec-87	266.89	3,615.11
							19-Dec-88	268.55	3,613.45
							14-Dec-89	269.96	3,612.04
							18-Dec-90	270.90	3,611.10
							15-Dec-91	271.89	3,610.11
							17-Dec-92	271.85	3,610.15
							21-Dec-93	273.09	3,608.91
W6	JL-49-13-311	31°52'11"N-106°24'19"W	Observation	U.S. Army	812.0	3,900.0	18-Jan-79	267.04	3,632.96
							15-Jan-80	269.98	3,630.02
							24-Dec-80	270.62	3,629.38
							24-Dec-81	272.12	3,627.88
							21-Jan-83	274.09	3,625.91
							23-Dec-83	274.93	3,625.07
							28-Jan-85	277.96	3,622.04
							31-Dec-85	277.99	3,622.01

Table 4.--Records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Concluded

Well identification number (fig. 2)	Well number (fig. 10)	Latitude-longitude	Use	Owner	Well depth (feet)	Elevation of well (feet above sea level)	Date water level measured	Depth to water (feet below land surface)	Elevation of water level (feet above sea level)
W6 (Continued)							29-Dec-86	281.75	3,618.25
							29-Dec-87	284.01	3,615.99
							12-Dec-88	285.32	3,614.68
							10-Dec-89	286.30	3,613.70
							12-Dec-90	287.12	3,612.88
							14-Jan-92	287.17	3,612.83
							22-Dec-92	290.07	3,609.93
W7	JL-49-13-303	31°52'11"N-106°23'22"W	Public supply	U.S. Army	813.0	3,908.0	23-Dec-87	297.06	3,610.94
W8	JL-49-14-101	31°52'14"N-106°22'21"W	Public supply	U.S. Army	819.0	3,940.0	21-Aug-59	274.00	3,666.00
							18-Jan-80	321.31	3,618.69
							24-Jan-81	308.60	3,631.40
							23-Dec-83	314.52	3,625.48
							02-Jan-86	318.95	3,621.05
							19-Dec-86	322.82	3,617.18

Ground water in the El Paso area is chemically suitable for most uses. Concentrations of dissolved solids in water from the Hueco Bolson fluvial deposits (fig. 11) range from 300 parts per million to more than 1,500 parts per million; concentrations of dissolved solids in water from underlying lake deposits are as much as 50,000 parts per million (Cliett, 1969, p. 210). El Paso Water Utilities reports that dissolved-solids concentration in the MSWLF vicinity generally ranges from 297 to 625 milligrams per liter (wells JL-49-05-904 and JL-49-05-915, respectively) but concentrations have been measured as high as 1,312 milligrams per liter (well JL-49-05-914, April 7, 1992) (table 5).

Surface Water

The Rio Grande is the only perennial stream in the El Paso area. Streamflow in the Rio Grande at El Paso is regulated by upstream reservoirs and diversions. Flow in the Rio Grande at El Paso averaged 543 cubic feet per second from 1938 to 1988 (International Boundary and Water Commission, 1988, p. 9). Runoff from the western and southern slopes of the Franklin Mountains drains into the Rio Grande. Runoff from the eastern slopes of the Franklin Mountains drains into the Hueco Bolson where it infiltrates and/or evaporates (Alvarez and Buckner, 1980, p. 6).

No perennial or ephemeral streams are on or in the vicinity of the MSWLF. Moderately defined arroyos extend from the Franklin Mountains and drain into the Hueco Bolson 2 or more miles west of the MSWLF. The arroyos flow only in response to intense precipitation during thunderstorms. Surface outflow at the MSWLF is assumed to be negligible due to the absence of surface-water flow in the vicinity of the facility.

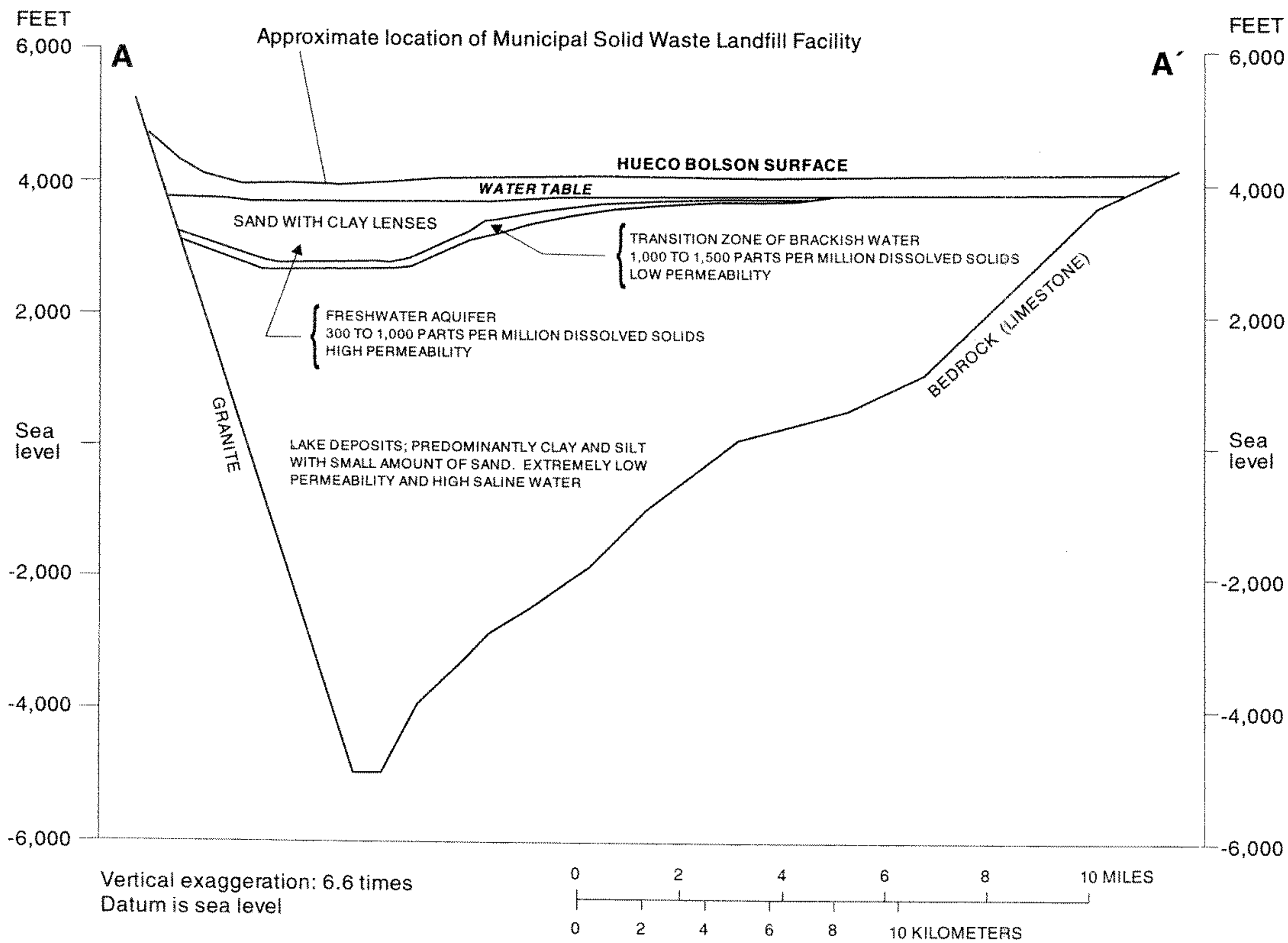


Figure 11.- -Ground-water occurrence in the Hueco Bolson (trace shown in fig. 5; modified from Cliett, 1969, fig. 3, and published with permission).

Table 5.--Water-quality records of wells in the vicinity of the Municipal Solid Waste Landfill Facility

[µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; DS, dissolved solids; EPWU, El Paso Water Utilities; USGS, U.S. Geological Survey; --, no data; <, less than; µg/L, micrograms per liter]

Well identification number (fig. 2)	Well number (fig. 10)	Analyst	Depth (feet below land surface)	Date	Specific conductance (µS/cm)	pH	Hardness (mg/L)	Reported DS (mg/L)	Calculated DS (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
							Field properties and inorganic constituents														
W1	JL-49-05-915	EPWU[1]	1,005-1,015	04-May-92	674	8.69	58	395	481	16	4.4	123	8.7	168	7.2	58	88	1.3	18	6.2	<0.09
		EPWU[1]	1,175-1,185	04-May-92	1,180	8.46	86	625	678	26	5.3	203	8.4	105	7.2	41	280	0.8	20	<0.1	1.3
		EPWU[1]	443-1,202	09-Aug-92	582	8.20	79	338	414	24	4.8	93	8.9	150	0	52	72	1.0	36	7.9	<0.09
W2	JL-49-05-914	EPWU[1]	960-970	08-Apr-92	772	8.43	80	425	495	22	5.8	126	9.6	139	7.2	55	125	1.0	30	4.6	<0.09
		EPWU[1]	1,008-1,018	08-Apr-92	787	8.49	66	436	498	20	3.8	134	10	124	9.6	62	130	1.0	32	3.6	<0.09
		EPWU[1]	1,094-1,104	07-Apr-92	834	8.50	80	492	567	30	1.5	151	8.5	146	7.2	73	143	1.0	35	5.2	0.1
		EPWU[1]	1,194-1,204	07-Apr-92	2,420	8.05	319	1,312	1,354	111	10	366	13	83	4.8	101	660	0.8	32	4.3	<0.09
		EPWU[1]	371-935	23-July-92	664	8.08	95	384	477	26	7.3	100	9.9	184	0	72	68	1.1	35	8.8	<0.09
W3	JL-49-05-904	USGS	260-815	24-Feb-59	595	7.6	88	358	413	23	7.5	92	--	165	0	61	61	0.9	32	3.0	--
		USGS	260-815	14-June-61	554	7.5	81	338	379	21	6.9	84	--	154	0	52	54	0.9	34	5.8	--
		USGS	260-815	22-June-81	470	8.2	69	314	353	18	5.8	73	8.9	146	0	47	43	0.8	35	10	--
		USGS	260-815	08-Aug-85	530	7.7	73	316	357	19	6.2	75	9.2	142	0	45	52	0.9	31	8.0	--
		USGS	260-815	18-Aug-87	545	8.30	70	310	362	18	6.1	73	9.6	149	--	48	49	0.90	29	8.0	--
		EPWU	260-815	18-Aug-87	520	8.09	86	363	364	23	6.9	72	9.5	149	0	44	50	0.83	38	8.4	<0.09
		USGS	260-815	13-Sept-89	506	8.20	72	304	357	19	6.0	73	9.0	152	0	45	45	0.90	31	7.5	--
		USGS	260-815	14-May-91	515	7.9	72	307	359	19	6.0	72	10	144	0	44	55	0.90	29	8.4	--
		USGS	260-815	16-Jan-92	476	7.9	71	297	350	19	5.7	70	9.4	148	0	44	45	0.9	30	8.4	--
W4	JL-49-06-701	USGS	293-810	16-May-61	505	6.9	70	306	342	18	6.1	78	--	136	0	40	56	1.1	31	6.3	--
		USGS	293-810	11-Apr-66	627	7.3	97	362	403	24	9.0	91	--	142	0	39	92	0.9	31	5.3	--

Table 5.--Water-quality records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Continued

Well identi-fication number (fig. 2)	Well number (fig. 10)	Analyst	Depth (feet below land surface)	Date	Specific conduct-ance (µS/cm)	pH	Hard-ness (mg/L)	Re-ported DS (mg/L)	Calcu-lated DS (mg/L)	Cal-cium (mg/L)	Mag-nesium (mg/L)	So-dium (mg/L)	Potas-sium (mg/L)	Bicar-bonate (mg/L)	Car-bonate (mg/L)	Sul-fate (mg/L)	Chlo-ride (mg/L)	Fluo-ride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phos-phate (mg/L)
Field properties and inorganic constituents--Continued																					
W4	JL-49-06-701	USGS	293-810	22-June-81	615	8.0	93	371	407	25	7.4	87	7.0	134	0	37	100	0.8	32	8.4	--
		USGS	293-810	06-June-83	625	8.1	93	363	401	25	7.4	87	6.4	134	0	33	99	0.9	30	8.0	--
		EPWU	293-810	06-June-83	600	8.05	92	397	397	28	5.0	90	6.6	127	0	30	100	0.84	30	9.1	<0.03
		USGS	293-810	01-Sept-84	670	7.8	99	387	421	27	7.7	93	7.2	126	0	31	120	0.9	30	8.0	--
		USGS	293-810	22-May-85	632	8.1	93	363	393	25	7.4	87	6.3	118	0	30	110	0.8	30	8.0	--
		USGS	293-810	18-Aug-87	695	8.2	93	370	415	25	7.5	89	8.3	126	0	30	120	0.90	29	8.0	--
		EPWU	293-810	18-Aug-87	640	8.23	98	405	404	28	6.8	89	6.6	124	0	28	112	0.80	24	9.1	<0.09
		USGS	293-810	23-May-88	641	8.10	94	365	408	25	7.6	83	7.5	127	0	39	110	0.80	30	8.0	0.06
		USGS	293-810	07-June-90	751	8.00	100	396	433	28	8.5	100	6.6	122	0	30	130	0.60	30	7.5	--
		USGS	293-810	16-June-93	658	7.9	96	381	415	26	7.5	89	7.3	124	0	33	120	0.8	29	7.5	--
W6	JL-49-13-311	USGS	324-807	05-June-81	745	8.1	96	463	529	25	8.1	120	10	195	0	84	76	1.2	33	9.7	--
		USGS	324-807	06-June-83	720	8.0	100	447	511	26	8.5	110	9.0	195	0	84	68	1.3	35	9.3	--
		EPWU	324-807	06-June-83	715	7.96	100	516	516	28	7.0	115	9.2	190	0	82	73	1.2	33	11	<0.03
		USGS	324-807	01-Sept-84	745	7.8	100	456	518	27	8.6	110	10	190	0	87	75	1.3	34	9.3	--
		USGS	324-807	06-May-86	770	8.0	97	450	519	25	8.5	110	9.8	192	0	86	77	1.3	34	9.3	--
		USGS	324-807	23-May-88	736	8.10	100	412	515	27	8.9	110	10	192	0	79	78	1.5	3.5	8.9	0.06
		USGS	324-807	29-May-91	741	7.9	100	439	512	27	8.4	110	9.4	192	0	78	77	1.2	34	9.3	--
W7	JL-49-13-303	USGS	260-690	20-Apr-53	599	7.7	90	356	416	22	8.5	92	--	169	0	63	55	0.9	36	5.9	--
		USGS	260-690	24-July-56	511	7.9	68	328	364	18	5.6	83	--	161	0	48	42	1.0	38	5.5	--
		USGS	260-690	05-June-57	569	7.5	76	358	402	20	6.6	92	--	166	0	58	51	0.9	38	7.1	--
		USGS	260-690	16-May-61	533	7.4	74	340	375	19	6.4	84	--	160	0	54	44	1.0	37	7.0	--
		USGS	260-690	05-June-81	490	8.1	68	336	385	18	5.7	83	9.8	159	0	52	47	0.9	32	9.7	--
		USGS	260-690	06-June-83	505	8.1	69	318	365	18	5.8	75	8.8	159	0	49	39	1.0	33	9.7	--
		EPWU	260-690	06-June-83	490	8.08	70	356	356	19	5.5	74	8.4	159	0	38	40	0.95	35	11	<0.03
		USGS	260-690	22-May-85	508	8.1	68	303	347	18	5.7	75	7.8	150	0	40	40	1.0	32	9.3	--

Table 5.--Water-quality records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Continued

Well identification number (fig. 2)	Well number (fig. 10)	Analyst	Depth (feet below land surface)	Date	Specific conductance (µS/cm)	pH	Hardness (mg/L)	Reported DS (mg/L)	Calculated DS (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Bicarbonate (mg/L)	Carbonate (mg/L)	Sulfate (mg/L)	Chloride (mg/L)	Fluoride (mg/L)	Silica (mg/L)	Nitrate (mg/L)	Phosphate (mg/L)
							Field properties and inorganic constituents--Concluded														
W7	JL-49-13-303	USGS	260-690	18-Aug-87	525	8.30	66	300	361	17	5.7	75	9.4	161	--	46	37	1.0	30	8.9	--
		EPWU	260-690	18-Aug-87	495	8.14	72	366	366	19	6.0	74	9.5	162	0	46	40	0.96	33	8.8	<0.09
		USGS	260-690	19-Sept-88	534	8.20	73	317	378	19	6.1	76	9.9	165	0	52	40	0.90	32	8.9	--
		USGS	260-690	04-June-90	503	8.10	68	308	365	18	5.7	75	8.4	160	0	48	40	0.80	32	8.9	--
		USGS	260-690	09-June-92	499	7.8	68	305	364	18	5.5	73	9.6	163	0	48	37	1.0	32	9.3	--
W8	JL-49-14-101	USGS	289-810	24-Aug-59	473	7.5	67	297	341	18	5.4	77	--	146	0	43	45	0.8	30	5.8	--
		USGS	289-810	16-May-61	487	7.2	65	298	339	17	5.6	78	--	141	0	44	46	1.0	31	6.5	--
		USGS	289-810	19-May-67	530	7.4	70	324	372	19	5.4	86	--	160	0	48	49	1.4	28	3.5	--
		USGS	289-810	05-June-81	520	8.2	77	336	380	20	6.5	78	7.9	146	0	43	69	0.8	30	8.4	--
		USGS	289-810	06-June-83	560	8.1	84	345	388	22	7.0	82	7.9	146	0	40	74	0.8	31	8.0	--
		EPWU	289-810	06-June-83	553	8.05	86	368	368	22	7.5	78	7.8	138	0	30	75	0.80	30	9.3	<0.03
		USGS	289-810	22-May-85	562	8.1	83	329	363	22	6.7	78	7.2	129	0	38	75	0.8	30	6.6	--
		USGS	289-810	18-Aug-87	680	8.20	89	370	415	23	7.6	90	8.7	140	0	38	99	0.90	29	8.0	--
		EPWU	289-810	18-Aug-87	630	8.20	92	423	424	27	6.0	91	8.5	142	0	36	104	0.80	25	8.4	<0.09
		USGS	289-810	13-Sept-89	580	8.10	84	332	379	22	7.1	79	7.9	138	0	38	79	0.80	30	7.1	--
		USGS	289-810	14-May-91	575	7.9	86	338	387	23	6.9	80	9.2	137	0	37	85	0.80	29	8.0	--
		USGS	289-810	16-June-93	574	8.0	86	341	379	23	6.9	79	9.0	134	0	40	79	0.8	30	7.5	--

Table 5.--Water-quality records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Continued

Well identi-fication number (fig. 2)	Well number (fig. 10)	Analyst	Depth (feet below land surface)	Date	Ar-senic (µg/L)	Bar-ium (µg/L)	Boron (µg/L)	Cad-mium (µg/L)	Chro-mium (µg/L)	Cop-per (µg/L)	Iron (µg/L)	Lead (µg/L)	Lith-ium (µg/L)	Man-ganese (µg/L)	Mer-cury (µg/L)	Nick-el (µg/L)	Sele-nium (µg/L)	Sil-ver (µg/L)	Zinc (µg/L)
									Metals										
W1	JL-49-05-915	EPWU[1]	1,005-1,015	04-May-92	<10	109	128	<0.5	<10	<10	4,110	16	73	158	<1	--	<10	<1	423
		EPWU[1]	1,175-1,185	04-May-92	<10	198	84	<5	20	<10	2,330	12	89	115	<1	--	<10	<1	266
		EPWU[1]	443-1,202	09-Aug-92	<10	69	117	<0.5	<10	<10	68	<5	51	3	<1	--	<10	<1	37
W2	JL-49-05-914	EPWU[1]	960-970	08-Apr-92	<10	325	112	<0.5	<10	<10	816	<5	64	34	<1	--	<10	<1	201
		EPWU[1]	1,008-1,018	08-Apr-92	<10	61	99	<0.5	<10	<10	425	44	68	30	<1	--	<10	<1	168
		EPWU[1]	1,094-1,104	07-Apr-92	<10	104	280	<0.5	<10	<10	174	<5	438	70	<1	--	<10	<1	138
		EPWU[1]	1,194-1,204	07-Apr-92	<10	133	542	<0.5	<10	<10	813	8	173	40	<1	--	<10	<1	334
		EPWU[1]	371-935	23-July-92	<10	55	145	<0.5	<10	<10	835	<5	62	140	<1	--	<10	<1	47
W3	JL-49-05-904	USGS	260-815	14-May-91	--	--	120	--	--	--	--	--	--	--	--	--	--	--	--
		EPWU	260-815	16-June-92	<10	67	114	<0.5	<10	<10	<10	<5	48	<2	<1	--	<10	<1	19
		USGS	260-815	16-June-92	--	--	120	--	--	1	--	<1	--	--	--	--	--	--	--
W4	JL-49-06-701	EPWU	293-810	06-June-83	--	--	--	<10	<10	<10	<10	<10	--	<10	--	<10	--	<10	<10
		USGS	293-810	22-May-85	--	--	--	--	10	--	--	<1	--	--	--	--	--	--	--
		USGS	293-810	23-May-88	--	--	90	--	--	--	--	--	--	--	--	--	--	--	--
		USGS	293-810	16-June-93	--	--	100	--	--	<1	--	1	--	--	--	--	--	--	--
		EPWU	293-810	16-June-93	5.7	107	87	<0.5	6.8	<5	<20	<5	36	<10	<1	--	<5	<0.5	<10
W6	JL-49-13-311	EPWU	324-807	06-June-83	--	--	--	<10	<10	<10	<10	<10	--	<10	--	<10	--	<10	<10
		USGS	324-807	23-May-88	--	--	150	--	--	--	--	--	--	--	--	--	--	--	--
		USGS	324-807	29-May-91	--	--	150	--	--	--	--	--	--	--	--	--	--	--	--
W7	JL-49-13-303	EPWU	260-690	06-June-83	--	--	--	<10	<10	<10	<10	<10	--	<10	--	<10	--	<10	<10
		USGS	260-690	22-May-85	--	--	--	--	10	--	--	2	--	--	--	--	--	--	--

Table 5.--Water-quality records of wells in the vicinity of the Municipal Solid Waste Landfill Facility--Concluded

Well identification number (fig. 2)	Well number (fig. 10)	Analyst	Depth (feet below land surface)	Date	Arsenic (µg/L)	Barium (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)	Lithium (µg/L)	Manganese (µg/L)	Mercury (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Zinc (µg/L)
									Metals--Concluded										
W7	JL-49-13-303	USGS	260-690	19-Sept-88	--	--	130	--	--	--	--	--	--	--	--	--	--	--	--
		USGS	260-690	04-June-90	--	--	130	--	--	--	--	--	--	--	--	--	--	--	--
		EPWU	260-690	09-June-92	<10	52	129	<0.5	<10	<10	12	<5	56	<2	<1	--	<10	<1	7
		USGS	260-690	09-June-92	--	--	210	--	--	2	--	<1	--	--	--	--	--	--	--
W8	JL-49-14-101	EPWU	289-810	06-June-83	--	--	--	<10	<10	<10	<10	<10	--	<10	--	<10	--	<10	<10
		USGS	289-810	22-May-85	--	--	--	--	<10	--	--	2	--	--	--	--	--	--	--
		USGS	289-810	14-May-91	--	--	100	--	--	--	--	--	--	--	--	--	--	--	--
		USGS	289-810	16-June-93	--	--	110	--	--	<1	--	<1	--	--	--	--	--	--	--
		EPWU	289-810	16-June-93	<5	86	98	<0.5	6.7	<5	<20	<5	45	<10	<1	--	<5	<0.5	<10

[1]Sample was air lifted during interval sampling; sampling method was probably not an appropriate method for detailed chemical analyses because of screen corrosion or incrustation effects on the water sample (high metal concentrations). These analyses should be considered not representative of natural water conditions (Roger Sperka, El Paso Water Utilities, oral commun., 1995).

SUMMARY

Geohydrologic conditions of the MSWLF on the USAADACENFB were evaluated by the U.S. Geological Survey in cooperation with the U.S. Army. The report includes: (1) information on the boundaries, areas, and contents of the MSWLF; (2) information on the environmental setting of the MSWLF and vicinity including a description of the physiography, climate, and soils; (3) description of geologic and hydrologic characteristics of the unsaturated zone and the shallow part of the aquifer; and (4) description of the ground-water quality in the vicinity of the MSWLF.

The 106.03-acre MSWLF has been in operation since January 1974 and is located about 1,200 feet east of the nearest occupied structure. The MSWLF is estimated to receive an average of approximately 56 tons of municipal solid waste per day. The landfill fill rate is about 1-4 acres per year and at this fill rate is expected to reach its capacity by the year 2004.

Types of solid wastes disposed of at the MSWLF include household refuse, Post solid wastes, bulky items, grass and tree trimmings from family housing, refuse from litter cans, construction debris, classified waste (dry), dead animals, asbestos, and empty oil cans. Operation, refuse collection, and disposal services are provided by a private contractor. The method of landfilling is progressive trench where excavation and filling occur simultaneously in trenches 40 feet wide by 30 feet deep. Refuse is dumped at the end of the trench, then spread and covered by use of a crawler tractor. Daily cover of a minimum of 6 inches of compacted earth and a final cover of 2 to 3 feet are provided.

The MSWLF is located in the Hueco Bolson proper 4 miles east of the Franklin Mountains. The Franklin Mountains have peaks ranging from 4,600 to greater than 7,000 feet above sea level. Elevations at the MSWLF range from 3,907 to 3,937 feet above sea level. The climate of the MSWLF, classified as arid continental, is characterized by an abundance of sunny days, high summer temperatures, relatively cool winters typical of arid areas, scanty rainfall, and very low humidity throughout the year. Average annual temperature is 63.3 °F in the El Paso area; mean annual precipitation is 7.8 inches. Typically rainy months receive almost half of the annual precipitation in the form of brief but locally heavy thunderstorms. Prolonged periods of continuous precipitation are rare. The prevailing wind direction in the winter months is from the north and in the summer months is from the south. Potential evaporation in the El Paso area is estimated to be 65 inches per year. Soils at and adjacent to the MSWLF are nearly level to gently sloping, have a fine sandy loam subsoil, and are moderately deep over caliche.

The MSWLF is underlain by Hueco Bolson deposits of Tertiary age and typically are composed of fine- to medium-grained sand with interbedded lenses of clay, silt, gravel, and caliche. The deposits range from unconsolidated to slightly consolidated. Individual beds are not well defined and range in thickness from a fraction of an inch to about 100 feet. Hueco Bolson deposits are reported to have a maximum thickness of 9,000 feet within a deep structural trough paralleling the east base of the Franklin Mountains.

The primary source of ground water in the MSWLF area is the unconsolidated and semiconsolidated sedimentary deposits of the Hueco Bolson. A relatively thick vadose zone of approximately 300 feet overlies the aquifer of the Hueco Bolson deposits in the vicinity of the MSWLF. A deep water table prevails for all of the study area. Whether any perched water zones exist below the MSWLF is unknown. Under current conditions, extensive ground-water development by the City of El Paso encompasses the MSWLF. An inventory of nine wells located within a 1-mile radius of the MSWLF was compiled. These wells are owned and operated by the City of El Paso or the U.S. Army. Wells discharging large amounts of water usually are drilled at least 200 feet into water-yielding material. The municipal water system of the City of El Paso and Fort Bliss is supplied by wells ranging in depth from about 600 feet to greater than 1,200 feet.

Hydraulic characteristics of the Hueco Bolson vary significantly as a result of the nonuniform nature of the individual beds. On a regional scale the Hueco Bolson can be considered a single aquifer, but on a local scale the rate and volume of water flowing through individual beds probably vary considerably. Recharge resulting from direct infiltration of precipitation may be minor due to the high evaporation and low precipitation rates. Hydraulic gradients have been altered locally due to extensive pumping of ground water in the El Paso area. The hydraulic gradient in the MSWLF vicinity is generally to the south but may vary due to pumpage of a well on the northeast corner of the perimeter boundary. Ground-water flow direction at a given location may change from time to time due to pumpage of City of El Paso and U.S. Army production wells. Ground-water monitoring data in the MSWLF vicinity showed a water-level decline of 55.65 feet from November 1958 to December 1987. Depth to water at the northeast corner of the MSWLF as of July 26, 1994, was 325.8 feet below land surface.

The city-operated Shearman Well Field, located north of the MSWLF, is a primary source of ground water for the City of El Paso. Currently, one well in the Shearman Well Field is in operation; the rest of the well field is planned to be in full operation by December 1995. Records from El Paso Water Utilities report that the test-pumping rate of well JL-49-05-914 (the well nearest to the MSWLF having test-pumping data) was 1,972 gallons per minute on July 20, 1992; the static water level prior to pumping was 317.54 feet below land surface. The pumping level after 8 hours of pumping was 367.80 feet below land surface, resulting in a drawdown rate of 50.26 feet, transmissivity of 22,200 feet squared per day (166,000 gallons per day per foot), and specific capacity of 39.2 gallons per minute per foot of drawdown. After the well was shut off, the well recovered to a static water level of 317.46 feet below land surface on July 21, 1992.

Ground water in the El Paso area is chemically suitable for most uses. Records from El Paso Water Utilities report concentrations of dissolved solids in the MSWLF vicinity ranging from 297 to 625 milligrams per liter (wells JL-49-05-904 and JL-49-05-915, respectively), but concentrations have been measured as high as 1,312 milligrams per liter (well JL-49-05-914, April 7, 1992). No perennial or ephemeral streams are on or in the vicinity of the MSWLF.

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APPENDIX D-4

Appendix O – Closure Plan

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
TCEQ PERMIT NO. 1422
PERMIT MODIFICATION APPLICATION
ALTERNATIVE ET COVER CLOSURE DESIGN

APPENDIX O
CLOSURE PLAN – REPLACEMENT COPY

U.S. Army Corps of Engineers, Fort Worth District

819 Taylor Street, Forth Worth, TX 76102

Final Closure Plan

Fort Bliss
Municipal Solid Waste Landfill Facility
(Permit #1422)

Revised September 2011

Prepared By:

Malcolm Pirnie, Inc.

44 South Broadway
15th Floor
White Plains, NY 10601

6400003

MALCOLM PIRNIE

Engineering Certification

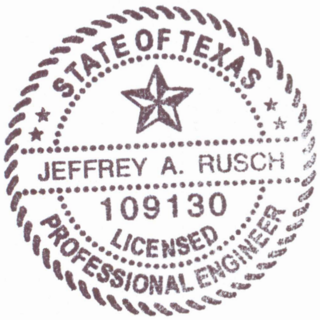
I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 of the Texas Administrative Code (Title 30 TAC) Rule §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer:	Jeffrey Rusch, P.E.
State:	Texas
Registration Number:	109130

Signature: ____________________

Certification Date: 10/5/11

Engineering Seal:



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Certifying Engineer:	Jeffrey Rusch, P.E.
State:	Texas
Registration Number:	109130

Signature: ______________________________

Certification Date: ______________________________

Engineering Seal:

Contents

List of Tables

Attachments

1. Introduction

The final closure plan has been prepared to provide a general guidance for the Fort Bliss Municipal Solid Waste Landfill (MSWLF) in meeting the Texas Commission on Environmental Quality (TCEQ) rules listed in Title 30 of the Texas Administrative Code Chapter Rule 330.457 (Title 30 TAC §330.457) in reference to the closure requirements for MSWLF units.

If any questions arise regarding the Fort Bliss MSWLF final closure methods or requirements, he or she should consult with: (1) the Department of Public Works – Environmental (DPW-ENV) of Fort Bliss or (2) the TCEQ.

The DOE may be contacted at the following address:

Directorate of Public Works – Environmental (DPW-ENV)
Fort Bliss
IMWE-BLS-PW
Fort Bliss, TX 79916
Tel. (915) 568-5724

The TCEQ Municipal Solid Waste Division is located at the following address:

Texas Commission on Environmental Quality
Municipal Solid Waste Division
MC 124
P.O. Box 13087
Austin, Texas 78711-3087
Tel. (512) 239-6784

Additionally, the Region 6 TCEQ staff at El Paso can be reached at the following address:

Texas Commission on Environmental Quality
Region 6
401 E. Franklin Ave., Ste. 560
El Paso, Texas 79901-1212
Tel. (915) 834-4949

2. Final Cover Requirements

2.1. Final Cover Design

Title 30 TAC §330.457(a)

The Fort Bliss MSWLF was permitted on November 1, 1982 for a total area of 106.03 acres. Currently, approximately 80% of the MSWLF has been operationally closed or is inactive. Three acres of the MSWLF have been closed as a Type I landfill unit. Ten and a half acres of the remaining portion of the landfill are designed to meet both USEPA Subtitle D and the Texas Municipal Solid Waste regulations. The remaining landfill area is classified as a Type IV construction and demolition debris cell.

The currently permitted final cover requirements for the MSWLF are summarized as follows:

Table 2-1
Fort Bliss MSWLF Final Cover Requirements (Title 30 TAC §330.457(e)(2))

Area*	Cover Requirements	Current Status
83 Acres	24" Clean Soil	Operationally Closed/Inactive
10.6 Acres (Type I)	Subtitle D Cover	Active
3 Acres (Type I)	Non-Subtitle D Cover	Closed 1999
5 Acres (Type IV)	24" Clean Soil	Active
7 Acres **	N/A	N/A

* Acreage is approximate and for estimation purposes only.
** Designed landfill access area.

Pursuant to Title 30 TAC §330.70(k)(10), an alternative final cover design may be approved as long as the alternative design achieves an equivalent reduction in infiltration as the clay-rich soil specified in 30 TAC §330.457(a)(2) and provides equivalent protection from wind and water erosion as the erosion layer specified in Title 30 TAC §330.457(a)(3). As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell was closed in 1999 with a final cover that complied with the closure plan for that cell and for which TCEQ closure approval was obtained on February 24, 1999. However, the remainder of the facility will be closed with an alternative evapotranspiration (ET) final cover designed to be equivalent with the currently permitted final cover system.

The ET Final Cover System will consist of a 3.5-foot layered soil cap comprised of (from top to bottom) the following:

- 12-inch thick Vegetative Surface Layer that serves as a medium for seed germination and plant growth, and provides protection against erosion and desiccation;
- 12-inch thick Storage Layer providing storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials;
- 6-inch thick Capillary Break Layer which will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break layer. The additional water stored within the Storage Layer will help promote the establishment and development of surface vegetation, contribute to greater evapotranspiration, and reduce surface erosion; and,
- 12-inch thick Intermediate Cover Layer to provide additional water retention storage volume.

2.2. Final Cover Area

As summarized in Table 2-1, the 3-acre Non-Subtitle D Type I cell was closed in 1999. However, the remainder of the facility will be closed with an alternative evapotranspiration (ET) landfill cover. The total area to be capped and closed with the ET landfill cover includes the 1970's era inactive cells, the 10.6-acre Type I cell, and the 5-acre Type IV C&D cell, and encompasses approximately 98.6 acres.

3. Maximum Inventory of Waste

Title 30 TAC §330.457(e)(3)

Based on the approved 1995 final landfill contours, the total permitted waste capacity of the Fort Bliss MSWLF is 5.9 million cubic yards. The 2008 permit modification for the 10-foot height increase in the Subtitle-D cell added an additional 180,000 cubic yards of landfill capacity. The alternative ET landfill cover final grading plan doesn't significantly alter the final grades presented in the 2008 permit modification; however, the ET landfill cover final grading plan generally conforms to the grades developed during filling operations (based on the 2010 topographic survey) to provide more easily constructible ridges, swales, and slopes. As of 2008, the current volume of in-place waste was about 5.1 million cubic yards. The Annual Solid Waste Reports from FY 2009 and FY 2010 and the most recent Daily Landfill Log from FY 2011 document an additional 85,000 cubic yards of in-place waste. Based on the existing landfill grades and the ET landfill cover final grading plan, the remaining capacity in the active Type I and Type IV cells is 100,200 cubic yards. Therefore, at the time of closure the maximum in-place waste volume is expected to be 5,285,200 cubic yards.

4. Final Cover Design

Title 30 TAC §330.457(e)(1)

The final cover systems of the MSWLF will be designed and constructed to meet the requirements listed in Title 30 TAC §330.457. The Fort Bliss MSWLF is comprised of five distinct areas:

1. 1970's era inactive cells that consist of 30-foot deep trenches with two feet of clean soil cover. These cells cover an 83 acre area and are unlined and without leachate collection. The permit does not allow further placement of MSW on these cells. According to the March 1995 Final Closure Plan and Cost Estimate these 80 acres are closed; however, formal TCEQ approval documentation has not been located in the DOE or TCEQ files.
2. A three-acre Type 1 cell with final cover in place (non-Subtitle D) that complies with the closure plan and TCEQ closure requirements. TCEQ approval was received February 24, 1999 (see Attachment 1).
3. A 10.6-acre Type I active cell meeting Subtitle D requirements. This cell is lined and has a leachate collection system. This cell is nearing permitted capacity and is anticipated to be full by January 2012.
4. A 5-acre active Type IV construction debris cell. This cell is unlined and without leachate collection. This cell is also anticipated to reach capacity by July 2012.
5. Seven acres designated for landfill roads, access areas, gatehouse, etc.

4.1. 1970's Inactive Cells

The 1970's era inactive areas are covered with 24-inch thick clean soil, as indicated in the March 1995 Final Closure Plan and Cost Estimate sealed by Mr. John Karlsruher of Cardenas-Salcedo and Associates, Inc. These landfill areas are also indicated as closed in the May 1999 Final Cover Quality Control Plan for the 3-acre Type 1 cell. However, this area is described as in interim closure by Fort Bliss DPW-ENV and no TCEQ approval or Texas P.E. certification of closure has been found in TCEQ or Fort Bliss DPW-ENV records. Accordingly, an ET Final Cover System as described in Section 4.3 will be installed.

Side slopes of the final cover for the 1970's era cells vary between 2% and 25% based on site constraints and drainage features. All cells will be crowned at the top to promote positive drainage off the landfill and preclude ponding of surface water when total fill height and expected subsidence are taken into consideration.

4.2. Non-Subtitle D Area (Type I)

The TCEQ approval letter dated February 24, 1999 of the final cover for this 3-acre unit is provided as Attachment 1.

4.3. Subtitle D Area (Type I)

Fort Bliss will install a final cover system for the Subtitle D cell that will be designed and constructed to minimize infiltration and erosion. Fort Bliss shall place a copy of the Final Cover System Evaluation Report in the operating record.

Fort Bliss will install an ET Final Cover System that consists of a 3.5-foot layered soil cap comprised of (from top to bottom) the following:

- 12-inch thick Vegetative Surface Layer consisting of stockpiled Silty Sand (United Soil Classification System (USCS) SM) material compacted to 75% of the Modified Proctor maximum dry density and seeded. The Vegetative Surface Layer serves as a medium for seed germination and plant growth, and provides protection against erosion and desiccation;
- 12-inch thick Storage Layer consisting of stockpiled Silty Sand (SM) material compacted to 75% of the Modified Proctor maximum dry density . The Storage Layer will provide storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials;
- 6-inch thick Capillary Break Layer consisting of well-graded, fine to coarse grained sand. The Capillary Break Layer will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break layer. The additional water stored within the Storage Layer will help promote the establishment and development of surface vegetation, contribute to greater evapotranspiration, and reduce surface erosion; and,
- 12-inch thick Intermediate Cover Layer consisting of existing cover material and/or additional stockpiled Silty Sand (SM) material compacted to 75% of the Modified Proctor maximum dry density to provide additional water retention storage volume.

The final grading of the Subtitle-D cell will consist of a landfill crown set at a 2% slope transitioning to 25% side slopes.

4.4. Non-Subtitle D Area (Type IV)

The final cover for the Type IV Non-Subtitle D area at the MSWLF will be the ET Final Cover System as described in Section 4.3 above. The final grading of the Non-Subtitle D cell consists of a landfill crown with 2% sideslopes.

5. Construction Quality Assurance

5.1. Introduction

Title 30 TAC §330.457(e)(1)

Construction of the Subtitle D cell final cover system will be performed by using equipment that is suitable for completing the construction in accordance with current standards imposed by TCEQ.

The TCEQ Municipal Solid Waste (MSW) Permitting Program uses a 25-inch average annual precipitation line as defined by Title 30 TAC §330.5(b)(1)(D) to delineate areas of the State defined as arid. El Paso lies to the west of the 25-inch average annual precipitation line and therefore has been deemed arid for the purposes of considering an alternative landfill design and modeling and constructing without model calibration.

5.2. Construction Quality Control Plan (CQCP)

This section addresses the construction of the soil components of the alternative ET final cover system and outlines the Construction Quality Control Plan (CQCP) to be implemented with regard to material selection and evaluation, laboratory test requirements, and field test requirements.

5.2.1. Source Material Evaluation

Material evaluations shall be performed on stockpiled or delivered material to ascertain its acceptability for the intended purpose. All material shall be sampled and tested by the Contractor in accordance with the requirements summarized in the following subsections. Stockpile materials shall not be altered in any manner, including adding or taking material, until the results from the material testing laboratory have been received and reviewed. Copies of the laboratory inspection testing results will be submitted to the Engineer of Record and will also be included in the Final Cover System Evaluation Report (FCSER).

Standards referenced in this Section are:

- ASTM D422, Test Method for Particle Size Analysis of Soils
- ASTM D1557, Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3)
- ASTM D2216, Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

- ASTM D5084 – Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
- ASTM D6836 - Standard Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using a Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, and/or Centrifuge
- ASTM D6938, Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

5.2.2. Intermediate Cover Layer

The Intermediate Cover Layer will consist of twelve-inches of existing placed cover material or stock-piled cover material (SM) placed over the waste and compacted to approximately 75% of the Modified Proctor maximum dry density. In most instances, this material will consist of the existing intermediate cover soil placed in accordance with the Site Operating Plan. The Contractor will re-work the existing cover soil to provide a smooth uniformly graded surface. The cover soil will be free of rock and debris greater than 2-inches in diameter. Existing intermediate cover material shall be probed to verify that a minimum of 12-inches of cover soil is in place.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed on a sample collected from each soil type of the existing and/or stockpiled and installed intermediate cover material. The intermediate cover layer will be re-worked, where required, to provide the specified density. The minimum frequency of field density testing (ASTM D6938) for the existing and/or re-worked intermediate cover material shall be 2 tests per acre.

5.2.3. Capillary Break Layer

The Capillary Break Layer will be installed over the Intermediate Cover Layer as approved by the Engineer of Record and will consist of 6-inches of well-graded, fine to coarse grained sand (SW). Sand shall be a fine granular material produced by the crushing of rock, gravel, or naturally produced by disintegration of rock and shall be free of organic material, mica, loam, clay and other deleterious substances.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed on a sample collected from each source of capillary break material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every source of capillary break material to verify the van Genuchten parameters and saturated hydraulic properties of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the capillary break layer.

5.2.4. Storage Layer

The Storage Layer will be installed over the capillary break layer as approved by the Engineer of Record and will consist of a minimum of 12-inches of stockpiled SM material compacted to 75% of the Modified Proctor maximum dry density. The soil will be inspected as placed to be free of debris and rocks greater than 2-inches in diameter. The Storage Layer will be placed as a single lift and compacted to the specified density.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed for every 10,000 cubic yards of stockpiled and installed storage layer material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every 20,000 cubic yards of stockpiled and installed storage layer material to verify the saturated hydraulic properties and van Genuchten parameters of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the storage layer.

5.2.5. Vegetative Surface Layer

The vegetative Surface layer will be installed over the storage layer as approved by the Engineer of Record and will consist of a minimum of 12-inches of stockpiled SM material compacted to 75% of the Modified Proctor maximum dry density. The soil will be inspected as placed to be free of debris and rocks greater than 2-inches in diameter. The Storage Layer will be placed as a single lift and compacted to the specified density.

A minimum of one moisture/density compaction test (ASTM D1557) and one sieve analysis (ASTM D422) will be performed for every 10,000 cubic yards of stockpiled and installed storage layer material. Additionally, a minimum of one soil water characteristic curve (ASTM D6836) and saturated hydraulic permeameter test (ASTMD5084) will be performed for every 20,000 cubic yards of stockpiled and installed storage layer material to verify the saturated hydraulic properties and van Genuchten parameters of the material. The minimum frequency of field density testing for the existing and/or re-worked intermediate cover material shall be 2 tests per acre. Over-compacted material will be ripped or tilled and recompacted. Material installed as part of the storage layer will be maintained to avoid overdrying of the material below 2% of the optimum water content. Placement of storage layer material will not occur during rainfall events to prevent saturation and overcompaction. Surveying will be performed to verify the thickness and final grades of the surface layer. The surface of the vegetative surface layer will be tilled parallel to the final grades in preparation for seeding in accordance with Section 5.3.

5.3. Vegetation Planting Plan

The purpose of this plan is to detail the procedures to be used for soil preparation and initial planting on the ET Cover. This plan sets forth use a specified native seed mix for permanent cover which includes the two target grass species from the genus *Sporobolus* for permanent establishment, but also allows for use of non-native and cultivated seed mixes per TxDOT specifications which are designed for temporary cover to achieve soil stabilization in the event final grading is completed outside of the germination period for target species (May 15 – November).

5.3.1. Soil Preparation and Seeding

All seeds must conform to the requirements of the USDA rules and regulations set forth in the Federal Seed Act and Texas seed law. Utilization of local soils stockpiled on-site will constitute the 12-inch thick Vegetative Surface Layer. These soils consist of silty sand (SM) and will be compacted to 75% of the Modified Proctor maximum dry density prior to seedbed preparation as discussed in Section 5.2.5.

Seedbed preparation will start as soon as possible after completion of the Vegetative Surface Layer to the lines and grades specified in the construction plans. The vegetated area will be cultivated to a typical depth of 4-inches before placement of seed or seed mix. If temporary seeding is utilized, the area covered with temporary grass will be cultivated to a typical depth of 4 inches before application of permanent seeds.

Table 5-1 includes the schedule and species for seeding as well as the seed application rate of pure live seed (PLS) per acre. The schedule is subject to potentially change depending on the availability of grass species specified as well as due to unexpected climatic conditions during and immediately after final cover construction are encountered.

Table 5-1
Fort Bliss MSWLF ET Cover Seeding Schedule

Dates	Seed Type to Use	Seed Species to Use (Common Name)	Seed Species to Use (Latin Name)	Rates (lb Pure Live Seed/ac)
February 1 – May 15	Perennial (Native Species Seed Mix)	Green Sprangletop	*Leptochloa dubia*	0.3
		Sand Dropseed	***Sporobolus cryptandrus***	0.4
		Alkali Sacaton	***S. airoides***	0.9
		Blue Grama	*Bouteloua gracilis*	1.0
		Indian Ricegrass	*Oryzopsis hymenoides*	1.6
		Purple Prairieclover	*Dalea purpurea*	0.5
May 16 – August 31	Temporary Warm (Summer) Season (A Native Species and A Cultivated Species)	Buffalo Grass	*Buchloe dactyloides*	50
September 1 – November 30	Temporary Cool (Winter) Season (Introduced Species)	Plains Bristlegrass	*Setaria vulpiseta*	4.0

Plant seeding may utilize one or a combination of the following methods, as suggested by the Texas Department of Transportation *Specifications Book*.

1. Broadcast Seeding. Distribute seed/mixture uniformly over the areas shown on the plans using hand or mechanical distribution or hydro-seeding on top of the soil. When seed and water are to be distributed as a slurry during hydroseeding, apply the mixture to the area to be seeded within 30 minutes of placement of components in the equipment. Roll the planted area with a light roller or other suitable equipment. Roll sloped areas along the contour of the slope.

2. Straw or Hay Mulch Seeding. Use Broadcast Seeding method to plant seed. Immediately after planting the seed/mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw mulch at 2 to 2.5 tons per acre. Apply hay mulch at 1.5 to 2 tons per acre. Use a tacking method over the mulched area.

3. Cellulose Fiber Mulch Seeding. Plant seed using broadcast seeding. Immediately after planting seed/mixture, apply cellulose fiber mulch uniformly over the seeded area at the following rates:
   - Clay soils with slopes of 3:1 or less – 2,000 lbs per acre
   - Clay soils with slopes greater than 3:1 – 2,300 lbs per acre
   - Sandy soils with slopes of 3:1 or less – 2,500 lbs per acre
   - Sandy soils with slopes greater than 3:1 – 3,000 lbs per acre
4. Drill Seeding. Using a pasture or rangeland type drill, plant seed/mixture uniformly over the area at a depth of 1/4 inch to 1/3 inch. Plant seed along the contour of the slopes.
5. Straw or Hay Mulching. Apply straw or hay mulch uniformly over the area as indicated on the plans. Apply hay mulch at 1.5 to 2 tons per acre. Apply straw at 2 to 2.5 tons per acre. Use a tacking method over the mulched area.

5.3.2. Fertilizer Recommendations

The installed vegetation layer will be tested for fertilizer need prior to seeding. Except for broadcast seeding, initial fertilization will occur prior to seeding. Fertilizer needs for the installed vegetation layer will be determined by collecting one soil sample per every 10 acres of installed vegetation layer, (for the purpose of this plan only one vegetation layer is proposed). Soil nutrient needs will be tested by a qualified agronomic testing laboratory (e.g. Texas A&M University Soil, Water and Forage Testing Laboratory). The laboratory testing report will determine macro and micro nutrient needs and may also contain suggestions for soil inoculants, organic matter, etc. for the installed vegetation layer. The nitrogen, phosphoric acid and potash ratio is 2:1:1, and will be applied at a rate of 100 pounds of nitrogen, 50 pounds of phosphoric acid and 50 pounds of potash per acre, unless laboratory testing results mandate higher rates. At a minimum, micronutrients will be applied at a minimum rate of 1 pound per acre of boron, calcium and magnesium.

Seed and fertilizer may be distributed simultaneously during Broadcast Seeding operations, provided each component is applied at the specified rate. When temporary and permanent seeding are both specified for the same area, apply half of the amount of fertilizer during temporary seeding operation and the other half during the permanent seeding operation. Fertilization will occur at intervals of no more than six week after initial seeding and until vegetation is established. To prevent damage to established vegetation, turf type line equipment will be used to apply fertilizer.

Unless otherwise specified on the plans, use a fertilizer containing nitrogen, phosphoric acid and potash nutrients. Similar to urea-based and plastic resin-coated fertilizers, at least 50 percent of the nitrogen component must be of a slow release formulation unless otherwise dictated by the soils laboratory. The vegetation establishment contractor will ensure that fertilizer is in an acceptable condition for distribution in containers labeled with the analysis. Fertilizer is subject to testing by the Texas A&M Feed and Fertilizer Control Service in accordance with the Texas Fertilizer Law.

5.4. Vegetation Establishment Verification Plan

5.4.1. Introduction

The Vegetation Establishment Verification Plan will ensure that the vegetation is established consistent with the parameters used in the ET Alternative Final Cover Demonstration and includes the following subsections:

- Vegetation Establishment Period
- Maintenance Activities to be Completed During the Vegetation Establishment Period
- Vegetation Performance Specification

5.4.2. Vegetation Establishment Period

The maintenance period will start immediately after seeding is conducted and will continue until TCEQ approves the vegetation establishment verification. The specified vegetative cover will be established allowing for 50% of bare areas during the maintenance period as it is assumed that re-use of local stockpiled soils containing native plant seed stock will significantly aide in facilitating vegetative growth. A bare area is defined as zero plants within a square meter quadrant (~10.76 square feet). In addition, establishment of vegetative cover will also require that at least 10% of the matured vegetative species belong to the *Sporobolus* genus.

The vegetation establishment period begins after the Final Cover System Evaluation Report is approved by TCEQ and ends when the Vegetation Establishment Report is approved by TCEQ. The standard timeframe is 2 to 3 years. The facility will establish the vegetation consistent with the parameters specified in the Vegetation Planting Plan.

5.4.3. Maintenance Activities to be Completed during the Vegetation Establishment Period

The following maintenance activities ensure that the planted vegetation will meet the vegetation performance specification:

- Following application of perennial seed mix, if greater than 50% of bare areas are determined to exist, re-seeding of the percentage of areas that will amount to achieving 50% coverage will need to be completed prior to May 15.

- Following application of a temporary seed mix, if greater than 50% of bare areas are determined to exist, re-seeding of the percentage of areas that will amount to achieving 50% coverage will need to be completed prior to November 30 to avoid over-winter exposure of said bare areas.
- Additional landfill gas extraction wells will be installed in any specific vegetative area where landfill gas poses a detrimental threat.
- Areas of significant differential settlement will be re-graded and re-seeded.
- Depending on the season, vegetation will be maintained and mowed as appropriate. No mowing will be allowed until grasses establish mature seeds.
- The facility will irrigate and fertilize the ET final cover area to stimulate and promote vegetative.
- Erosion and sediment controls will be added to areas that experience erosion.

5.4.4. Vegetation Performance Specification

The vegetation layer will be evaluated at the end of the vegetation establishment period by a Texas Licensed Professional Engineer to determine if the vegetation is established in accordance with the Evapotranspiration Cover Design Report. The performance specification for the vegetation layer is summarized herein:

- Root Penetration – The minimum root depth required of 12" is based on achieving 10% vegetative cover entirely comprised of two *Sporobolus* species as an input parameter for completing the UNSAT-H model demonstration. This root depth will ensure that these two grass species are established and will survive drought conditions.
- Percent Vegetation Cover – An 50% vegetative cover will be based on experience of a satisfactory population of mature plants, defined as 50% ground cover with at least 10% of the matured vegetative species belong to the *Sporobolus* genus, and no bare areas larger than one square meter of the established species.

5.5. Documentation

5.5.1. Final Cover System Evaluation Report (FCSER)

Following the installation of the ET cover system, a Final Cover System Evaluation Report will be submitted certifying that the ET soils were constructed in accordance with the construction methods and test procedures in the Final Cover Quality Control Program. The FCSER will be signed and sealed by a Professional Engineer in the State of Texas and include, at a minimum:

- Completed report forms required by TCEQ
- Summary of construction activities

- Summary of the initial installation of vegetation
- Summary of all laboratory and field test results
- Drawings showing sample and test locations
- Field and laboratory test results
- As-built drawings
- A description of significant construction problems and the resolution of these problems
- A statement of compliance with the Final Cover Quality Control Program

The Final Cover Evaluation Report will be signed and sealed by the Resident Engineer, signed by the site operator, and submitted to the MSW Permits Section of Waste Permits Division of the TCEQ for acceptance. Upon acceptance of the Final Cover Evaluation Report, the vegetation establishment period will begin as noted in the Vegetation Establishment Verification Plan. After the acceptance of the Final Cover Evaluation Report and during the vegetation establishment period, the applicant will request closure of the site in accordance with this Report. Since the vegetation establishment period timeframe is 2 to 3 years, closure of the site will occur prior to the completion of the vegetation establishment period.

5.5.2. *Vegetation Establishment Verification Report*

At the end of the vegetation establishment period, a Vegetation Establishment Verification Report will be completed as described in the Vegetation Establishment Verification Plan. A quarterly report will be submitted to TCEQ during the vegetation establishment period. The quarterly report will include the status of vegetation establishment activities (fertilizer application, watering, reseeding, etc.) and any other activities that are related to installed final cover or vegetation

The Vegetation Establishment Verification Report will be prepared and submitted to TCEQ for approval at the end of the vegetation establishment period. The report will be prepared by a Texas Licensed Professional Engineer and include the following:

- Documentation of the root penetration performance. A hand auger or drive cylinder will be driven at a frequency of every acre within vegetative cover areas consisting of either *Sporobolus* species to a depth of 12 inches to determine and verify the rooting depth. In addition, each core obtained will be examined by the certifying engineer to observe that the *Sporobolus* roots are denser in the upper portion of the soul profile and extend to 12 inches in depth. Each sample location will be shown on design drawings.
- Documentation that the percent vegetative cover is in accordance with the ground cover determination procedures included in this plan. This documentation will

include the engineers' assessment of the vegetation cover and photographs that document compliance with the performance specification.

- The certifying engineer will also provide a statement indicating that the vegetation layer of the ET final cover system has been maintained consistent with the parameters used in the UNSAT-H analysis.

6. Schedule for Closure Activities

6.1. Closure Schedule

Title 30 TAC §330.457(e)(4)

An overall timetable for the closure of the Fort Bliss MSWLF is presented following this section. This schedule is based on the current BRAC realignment process at Fort Bliss and the regulatory closure requirements described in subsequent sections.

6.2. Final Contour Map

Title 30 TAC §330.457(e)(5)

A final contour map depicting the proposed final contours, top slopes, and side slopes, and proposed surface drainage features is provided as Sheet 3 in Appendix B of the permit modification application. The MSWLF is not within a 100-year flood plain.

6.3. Location of Plan

Title 30 TAC §330.457(f)(1)

Fort Bliss DPW-ENV shall maintain a copy of the closure plan in the operating record.

6.4. Written Notification

Title 30 TAC §330.457(f)(2)

No later than 45 days prior to the initiation of closure activities for any area or final closure of the facility, Fort Bliss shall provide written notification to the Executive Director of the intent to close the unit or facility and place this notice of intent in the operating record.

No later than 90 days prior to the initiation of a final facility closure, Fort Bliss shall, through a public notice in the newspaper(s) of largest circulation in the vicinity of the facility, provide public notice for final facility closure. This notice shall provide the following information:

- Facility Name
- Facility Address
- Physical Location of the Facility
- The Permit Number

- Last Date of Intended Receipt of Waste.

6.5. Start of Final Closure Activities

Title 30 TAC §330.457(f)(3)

Fort Bliss shall begin final closure activities for each unit or facility no later than 30 days after the date on which the unit or facility receives the known final receipt of wastes or, if the unit or facility has remaining capacity and there is a reasonable likelihood that the unit or facility will receive additional wastes, no later than one year after the most recent receipt of wastes. A request for an extension beyond the one-year deadline for the initiation of closure may be submitted to the executive director for review and approval and shall include all applicable documentation necessary to demonstrate that the unit has the capacity to receive additional waste and that Fort Bliss has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the MSWLF.

6.6. Completion of Final Closure Activities

Title 30 TAC §330.457(f)(4)

Fort Bliss shall complete final closure activities for the unit or facility in accordance with the approved final closure plan within 180 days following the initiation or final closure activities. A request for an extension for the completion of final closure activities may be submitted to the Executive Director for review and approval and shall include all applicable documentation necessary to demonstrate that closure will, of necessity, take longer than 180 days and all steps have been taken and will continue to be taken to prevent threats to human health and the environment from the unclosed MSWLF unit.

6.7. Certification

Title 30 TAC §330.457(f)(5)

Following final closure of the MSWLF unit or facility, the owner or operator shall submit to the Executive Director for review and approval a Final Cover System Evaluation Report (FCSER), a Vegetation Establishment Report, signed by an independent licensed professional engineer, verifying that final closure has been completed in accordance with the approved final closure plan. The submittal to the Executive Director shall include all applicable documentation necessary for certification of closure. Once approved, this certification shall be placed in the operating record.

6.8. Inspection Report

Title 30 TAC §330.457(f)(6)

Following receipt of the required final closure documents, as applicable, and an inspection report from the commission's district office verifying proper closure of the MSWLF unit or facility according to the approved final closure plan, the executive director may acknowledge the termination of operation and closure of the unit or facility and deem it properly closed.

6.9. Affidavit to the Public

Title 30 TAC §330.457(g)

Upon notification to the executive director, Fort Bliss shall post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons who may utilize the facility of the date on closing for specific unit(s) or the entire facility and the prohibition against further receipt of waste materials after the stated date.

Within 10 days after completion of final closure of the MSWLF unit or facility, Fort Bliss shall submit to the executive director a certified copy of an "Affidavit to the Public" in accordance with the requirements of Title 30 TAC §330.19 and place a copy of the affidavit in the operating record. In addition, a certified notation of the deed to the facility property, or on some other instrument that is normally examined during title search, needs to be recorded. This is intended so that in perpetuity any potential purchaser of the property is notified that the land has been used as a landfill facility and use of the land is restricted.

Post-closure care maintenance specified in Title 30 TAC §330.463(b) (relating to Post-Closure Care Requirements) shall begin immediately upon the date of final closure as approved by the executive director.

6.10. Post-Closure Care

Following the professional engineer certification of the completion of closure as accepted by the Executive Director of the TCEQ Waste Permits Division, Fort Bliss DPW-ENV shall commence the 30-year post-closure care period. A Vegetation Establishment Report shall be submitted semi-annually during the cover vegetation start-up period indicating the type and quantity of vegetation established, the percent vegetative cover, and the vegetative root structure. If the type or quantity of vegetation or root structure does not meet specifications, then corrective action shall be taken to improve the vegetation consistent with the ET final cover design. Post-closure care requirements are discussed in the *Post Closure Plan.*

7. Closure Cost Estimate

Title 30 TAC §330.63(j)

As an agency of the Federal Government, Fort Bliss is not required to complete financial assurance mechanism requirements. Therefore, a closure cost estimate is not required per Title 30 TAC § 330.5.

APPENDIX D-5

Appendix P – Post-Closure Plan

APPENDIX P
POST-CLOSURE PLAN – REPLACEMENT COPY

U.S. Army Corps of Engineers, Fort Worth District
819 Taylor Street, Fort Worth, TX 76102

Post-Closure Care Plan

Fort Bliss
Municipal Solid Waste Landfill Facility
(Permit #1422)

Revised September 2011

Report Prepared By:

Malcolm Pirnie, Inc.

44 South Broadway
15th Floor
White Plains, NY 10601

6400003

Engineering Certification

I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 of the Texas Administrative Code (Title 30 TAC) Chapter §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer: Jeffrey Rusch, P.E.

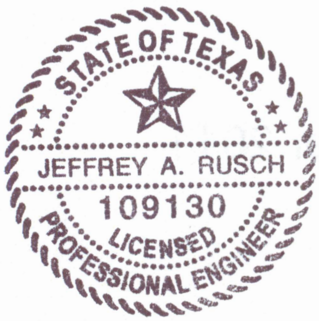
State: Texas

Registration Number: 109130

Signature: ______________________

Certification Date: 10/5/11

Engineering Seal:



Engineering Certification

I attest that this Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards, and with the requirements of Title 30 of the Texas Administrative Code (Title 30 TAC) Chapter §330. This certification in no way relieves Fort Bliss of its duty to prepare and fully implement this Plan.

Certifying Engineer: Jeffrey Rusch, P.E.

State: Texas

Registration Number: 109130

Signature: ______________________________

Certification Date: ______________________________

Engineering Seal:

List of Tables

1. Introduction

This Post–Closure Care Plan has been prepared to provide general guidance for Fort Bliss in meeting the Texas Commission on Environmental Quality (TCEQ) rules listed in Title 30 of the Texas Administrative Code Chapter 330.463 (Title 30 TAC §330.463) in reference to the post-closure care maintenance requirements for MSWLF units. A copy of this Post-Closure Care Plan will be maintained in the operating record.

If any questions arise regarding the Fort Bliss MSWLF post-closure care maintenance methods or requirements, he or she should consult with: (1) the Department of Public Works – Environmental (DPW-ENV) of Fort Bliss or (2) the TCEQ.

The DPW-ENV may be contacted at the following address:

Directorate of Public Works – Environmental (DPW-ENV)
Fort Bliss
IMWE-BLS-PW
Fort Bliss, TX 79916
Tel. (915) 568-5724

The TCEQ Municipal Solid Waste Division is located at the following address:

Texas Commission on Environmental Quality
Municipal Solid Waste Division
MC 124
P.O. Box 13087
Austin, Texas 78711-3087
Tel. (512) 239-6784

Additionally, the Region 6 TCEQ staff at El Paso can be reached at the following address:

Texas Commission on Environmental Quality
Region 6
401 E. Franklin Ave., Ste. 560
El Paso, Texas 79901-1212
Tel. (915) 834-4949

2. Maintenance and Monitoring

2.1. Maintenance and Requirements

2.1.1. Rights of Entry

Title 30 TAC §330.463(a)(1)

Fort Bliss shall retain the right of entry to and maintain all rights-of-way of the closed municipal solid waste management unit in order to conduct periodic inspections of the closed unit. Fort Bliss shall correct, as needed, the erosion of cover material, lack of vegetative growth, leachate or methane migration, and subsidence or ponding of water on the unit. If any of these problems occur after the end of the five year post-closure period or persist for longer than the first five years of post-closure care, Fort Bliss shall be responsible for their correction until the executive director determines that all problems have been adequately resolved. The executive director may reduce the post-closure period for the unit if all wastes and waste residues have been removed during closure.

2.1.2. Monitoring Programs

Title 30 TAC §330.463(a)(2)

Any monitoring programs (groundwater monitoring, resistivity surveys, methane monitoring, etc.) in effect during the life of the unit shall be continued during the post-closure care period.

2.1.3. Evidence of Release

Title 30 TAC §330.463(a)(3)

If there is any evidence of release from a municipal solid waste unit, the executive director may require an investigation into the nature and extent of the release and an assessment of the measures necessary to correct an impact to groundwater.

2.2. Post-Closure Care

Title 30 TAC §330.463(b)(1)

After professional engineer certification of the completion of closure requirements for the MSWLF is accepted by the executive director, Fort Bliss shall begin conducting post-closure care maintenance for 30 years unless the executive director specifies otherwise.

2.2.1. General Maintenance

§330.463(b)(1)(A)

Title 30 TAC Fort Bliss (the owner) or operator shall retain the right of entry to the closed unit or facility and shall maintain all rights-of-way and conduct maintenance and/or remediation activities as needed, in order to maintain the integrity and effectiveness of all final cover and drainage control system(s); to correct any effects of settlement, subsidence, ponded water, erosion, or other events or failures detrimental to the integrity of the closed unit or facility; and to prevent surface run-on and run-off from eroding or otherwise damaging the final cover system.

2.2.2. Leachate Collection System Monitoring

Title 30 TAC §330.463(b)(1)(B)

Fort Bliss shall maintain and operate the leachate collection system (LCS) in accordance with the requirements listed in Title 30 TAC §330.331 and §330.333 (relating to Design Criteria and Leachate Collection System, respectively).

Leachate shall be measured at least once a year by a scaled dip stick into the on-site vertical leachate monitoring pipe. The watermark on the stick measures the depth of leachate that collected on the liner. If the leachate is more than 12 inches (30 centimeters) deep in the landfill, it will be pumped out through the leachate transfer pipe and spread on the Subtitle D cell for evaporation.

The leachate measurement shall be kept in the site operating record. These measurements shall also be reported to the TCEQ. The executive director may allow Fort Bliss to stop managing leachate if Fort Bliss demonstrates to the approval of the executive director that leachate no longer poses a threat to human health and the environment.

2.2.3. Groundwater Monitoring

Title 30 TAC §330.463(b)(1)(C)

Ground-water monitoring requirements under Title 30 TAC §330.403 (relating to Ground-Water Monitoring Systems), §330.405 (relating to Groundwater Sampling and Analysis Requirements), §330.407 (relating to Detection Monitoring Program for Type I Landfills), and §330.409 (relating to Assessment Monitoring Program) were suspended by the executive director on May 22, 1996, since Fort Bliss demonstrated that there is no potential for migration of hazardous constituents from the MSWLF unit to the uppermost aquifer as defined in Title 30 TAC §330.3 (relating to Definitions) during the active life and the closure and post-closure care period of the unit. A copy of the May 22, 1996 letter is provided in Appendix F of the permit modification application.

2.2.4. Gas Monitoring

Title 30 TAC §330.463(b)(1)(D)

Fort Bliss shall maintain and operate the gas monitoring system in accordance with the requirements listed in 30 TAC §330 Subchapter I and the current approved Landfill Gas Management Plan.

2.2.5. Electrical Resistivity Surveys

Title 30 TAC §330.463(b)(1)(E)

Fort Bliss is not subject to electrical resistivity surveys.

2.2.6. Vegetation Establishment Monitoring

A Vegetation Establishment Report shall be submitted semi-annually during the cover vegetation start-up period indicating the type and quantity of vegetation established, the percent vegetative cover, and the vegetative root structure. If the type or quantity of vegetation or root structure does not meet specifications, then corrective action shall be taken to improve the vegetation consistent with the ET final cover design in accordance with the Fort Bliss MSWLF Closure Plan.

2.2.7. Schedule

Title 30 TAC §330.463(b)(3)(A)

Post-closure activities required for the MSWLF are described below:

Table 2-1.
Post-Closure Monitoring and Inspection Activities

Items	Inspection period	Action	Remark
Erosion	Quarterly and after any major storm	Correct	-----
Methane	Quarterly	Report to TCEQ	Monitoring
Leachate	Annually	Report to TCEQ	Measuring
Vegetation Establishment	Quarterly during establishment period	Report to TCEQ	Monitoring/Measuring

2.2.8. Post Closure Care Period

Title 30 TAC §330.463(b)(2)

Following the professional engineer certification of the completion of closure as accepted by the executive director of the TCEQ Waste Permits Division, Fort Bliss DPW-ENV shall commence the 30-year post-closure care period. The length of the Post-Closure Care maintenance period of the MSWLF may be decreased by the executive director if

Fort Bliss submits to the executive director for review and approval a documented certification, signed by an independent registered professional engineer and including all applicable documentation necessary to support the certification that demonstrates that the reduced period is sufficient to protect human health and the environment. The post-closure maintenance period may be increased by the executive director if it is determined that the lengthened period is necessary to protect human health and the environment. If there is evidence of a release from the MSWLF, the executive director may require an investigation into the nature and extent to the release and an assessment of measures necessary to correct an impact to groundwater.

3. Post - Closure Cost Estimate

Title 30 TAC §330.463(b)(3)(D)

As an agency of the Federal Government, Fort Bliss is not required to complete financial assurance mechanism requirements. Therefore, a post-closure cost estimate is not required per Title 30 TAC §330.5.

4. Completion of Post - Closure Care

Title 30 TAC §330.465

Following completion of the post-closure care maintenance period for the MSWLF, Fort Bliss will submit to the executive director for review and approval a documented certification, signed by an independent registered professional engineer verifying that post-closure care maintenance has been completed in accordance with the approved post-closure care plan. The submittal to the executive director shall include all applicable and supporting documentation necessary for the certification of completion of post-closure care maintenance.

Upon completion of the post-closure care period for the MSWLF Fort Bliss shall also submit to the executive director a request for voluntary revocation of the facility permit.

Title 30 TAC §330.463(b)(3)(C)

Fort Bliss has no foreseeable future land use plan for the landfill property at this time. However, if such a land use plan is needed, it will be made in accordance with Title 30 TAC§330.463

APPENDIX D-6

Appendix Q – Evapotranspiration Cover Design Report

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
TCEQ PERMIT NO. 1422
PERMIT MODIFICATION APPLICATION
ALTERNATIVE ET COVER CLOSURE DESIGN

APPENDIX Q
EVAPOTRANSPIRATION (ET) COVER DESIGN REPORT

This document is released for the purpose of review under the authority of Francisco Xavier Urueta P.E. #99473 on 5-6-2011. It is not to be used for construction or bidding purposes

EVAPOTRANSPIRATION COVER DESIGN REPORT

FORT BLISS DESIGN AND PERMIT MODIFICATION APPLICATION BLISS-A10-001

May, 2011

zia engineering & environmental consultants, llc

755 South Telshor Blvd, Suite F-201 ● Las Cruces, New Mexico 88011 ● phone (575) 532-1526 ● fax (575) 532-1587
Texas Board of Professional Engineers Certificate of Registration #F-11907

TABLE OF CONTENTS

INTRODUCTION

The purpose of report is to present the approach and methodologies used during the design of the proposed evapotranspiration (ET) final cover system for the Fort Bliss Municipal Solid Waste Landfill (MSWLF). The MSWLF consists of the following distinct areas:

- An active 10.6-acre Type Subtitle D Cell
- A closed 3-acre Type 1 Non-Subtitle D cell (TCEQ closure approval received February 24, 1999)
- An active 5-acre Type IV C&D cell
- Approximately 83 acres of previously filled and closed areas
- Approximately 7 acres designated for landfill roads, access areas, and guard shack / scale house, etc.

Based on capacity estimations performed by Zia Engineering and Environmental Consultants (Zia) and current disposal rates provided by the Fort Bliss Environmental Division, the Subtitle D cell is expected to reach its capacity in the second quarter of FY 2012. At that time, the Subtitle D cell will be closed, followed shortly thereafter by the Type IV C&D cell. The permitted closure design for the Subtitle D Cell, the C&D Cell, and the previously filled and closed areas includes an 18 inch thick prescriptive layer with low permeability soil (i.e. clay) that is not readily available in the area and would need to be imported at a considerable expense.

The purpose of the proposed ET final cover system is to create a more cost-effective and sustainable landfill cover alternative that is equally protective of human health and the environment as the prescriptive closure design. The proposed ET cover system will utilize readily available fill material located on-site to create a layered soil cover designed to optimize water storage and evapotranspiration. This report discusses the feasibility and preliminary design requirements of an ET cover system at Fort Bliss and presents a demonstration of its performance.

The proposed ET cover system was designed in accordance with the draft Texas Commission on Environmental Quality (TCEQ) document Guidance for Requesting a Water Balance Alternative Final Cover for a Municipal Solid Waste Landfill (guidance document), revised November 17, 2010.

FEASIBILITY

According to the United States Environmental Protection Agency Fact Sheet on Evapotranspiration Cover Systems for Waste Containment, evapotranspiration cover systems are increasingly being considered for use at waste disposal sites in arid regions when equivalent performance to conventional final cover systems can be demonstrated. The TCEQ Municipal Solid Waste (MSW) Permitting Program uses a 25-inch average annual precipitation line as defined by 30 TAC §330.5(b)(1)(D) to delineate areas of the State defined as arid. El Paso lies to the west of the 25-inch average annual precipitation line and therefore has been deemed arid for considering alternative landfill designs. Additionally, over 60% of the precipitation in the El Paso region is received during the growing season, between March and August.

Numerous species of indigenous herbaceous and vascular vegetation inhabit the native soils at Fort Bliss. As such, the utilization of local soils stockpiled on-site and native plant species bodes well for the successful performance of an ET cap. Additionally, a balanced seed design of both herbaceous and vascular native plants has been chosen in an effort to promote and sustain evapotranspiration throughout the year.

During preliminary research, Malcolm Pirnie (MP) found that the Interstate Technology and Regulatory Council (ITRC) document titled Technical and Regulatory Guidance for Design, Installation, and Monitoring of Alternative Final Landfill Covers (December 2003) states that a range of 75%-85% compaction is best for ET cover systems. Hydraulic laboratory testing of the native material stockpiled on-site at 75% and 80% compaction was performed in December of 2008 by AMEC and indicates adequate water retention and saturated hydraulic conductivity parameters for use in an ET cover system, with a plant-available water content (difference between water content at field capacity and at wilting point) of 0.3. Additionally, a substantial portion of the landfill area currently contains in excess of 1.5-feet of interim cover material that will be incorporated into the ET cover system as supplemental intermediate cover material.

DESCRIPTION OF PROPOSED DESIGN

The proposed ET cover system, shown in **Figure 2**, will consist of a 3.5-foot layered soil cap and include the following components (from top of cover to top of waste):

- 12-inch thick Vegetative Surface Layer, consisting of stock-piled Silty Sand (SM) material compacted to 75% of the Modified Proctor maximum dry density and seeded. The Vegetative Surface Layer will serve as a medium for seed germination and plant growth as well as provide protection against erosion and desiccation.
- 12-inch thick Storage Layer, consisting of stock-piled SM material also compacted to 75% of the Modified Proctor maximum dry density (ASTM D 1557). The Storage Layer will provide approximately 11.3 cm of storage volume during wet weather periods to promote deep root growth while limiting infiltration to the underlying Capillary Break and Intermediate Cover materials.
- 6-inch thick Capillary Break Layer, consisting of well-graded, fine to coarse grained sand. Installation of the Capillary Break Layer will allow the fine-textured soil of the Storage Layer to store more water than a comparable layer without the capillary break due to the difference in the hydraulic conductivities of the two layers. The additional water stored within the Storage Layer will help promote the establishment and development of the surface vegetation. The increased vegetative cover will contribute to greater ET and reduce surface erosion from both wind and rain.
- 12-inch thick Intermediate Cover Layer, consisting of existing cover material and/or additional stock-piled SM material compacted to approximately 75% of the Modified Proctor maximum dry density (ASTM D 1557). The Intermediate Cover Layer will provide approximately 11.3 cm of additional water retention storage volume.

COMPUTER MODELING

The performance of the proposed ET cover system was predicatively modeled using UNSAT-H version 3.01 software, which is managed by the Hydrology Group at the Pacific Northwest National Laboratory. UNSAT-H is a one-dimensional model that simulates soil water infiltration, redistribution, evaporation, plant transpiration, and deep drainage. UNSAT-H is commonly used to evaluate and optimize performance of barrier designs. The following sections summarize input parameters, the source of those parameters, and major assumptions made in modeling the proposed ET cover system.

Options, Constants, and Limits

The input parameters noted below define the modeling period, the components of groundwater flow to be modeled, and the solution methods.

- IPLANT: The plant option was selected to include plants, as transpiration will be a critical component of the performance of the proposed ET cap system.
- NGRAV: The model was given a vertical orientation to model vertical infiltration through the proposed ET cap system
- IFDEND, IDTBEG, and IDTEND: The ending day of the simulation and the number of days that weather data was provided annually was set at 365.
- IYS and NYEARS: The model was set to run for a 30-year period. The first year of the simulation was set as 1981.
- ISTEAD: The model was set to solve in transient mode, utilizing variable historical weather data.
- NPRINT: The level of output was set for end of day and end of simulation summaries.
- ISMETH: The Crank-Nicholson solution method was specified based on guidance from the Pacific Northwest National Laboratory.
- KOPT: Soil hydraulic properties were defined by the van Genuchten parameters.
- KEST: The arithmetic mean was selected to calculate liquid conductivity at the midpoint between nodes.
- ITOPBC and LOWER: A flux surface boundary and unit gradient lower boundary condition was specified.
- IEVOPT and NFHOUR: The evaporation option was selected as evaporation will be a critical component of the performance of the proposed ET cap system. The option to generate hourly factors from a sine wave function for distribution of daily potential evapotranspiration was selected to calculate the surface boundary condition.
- HIRRI and HDRY: Minimum and maximum heads to which the soil can wet up and dry out were defined as 1 and 1 x 10^6 cm, respectively.
- RHA, IETOPT, ICLOUD, and IRAIN: Daily meteorological data from the National Oceanic and Atmospheric Administration (NOAA) was provided for the model.

Daily solar radiation values were synthetically generated using the Hydrologic Evaluation of Landfill Performance (HELP) model. Average relative humidity was also obtained from the HELP model for the El Paso, Texas region.

- IHYS and IHEAT: Hysteresis and heat flow were not simulated.
- IVAPOR: The option to model vapor flow was selected. Fayer and Gee (2004) have documented that vapor flow is a necessary process to be included in simulations of drainage in sandy soil in arid and semiarid climates.
- MATN: Four soil layers were modeled, as previously described in the Description of Proposed Design section.

Soil Property Information

Composite soil samples were collected in December of 2008 by AMEC from the stockpiled material on-site for hydraulic laboratory testing by TRI Environmental Inc. in order to evaluate its water retention and saturated hydraulic conductivity parameters. The ITRC states that a range of 75%-85% compaction is best for ET cover systems. As such, the soil was prepared at 75% of the Modified Proctor (MP) maximum dry density (ASTM D 1557) for laboratory testing. The 75% compaction material was specified for the surficial Vegetative Surface Layer to promote vegetative growth, for the Storage Layer to increase water retention capacity, and the Intermediate Cover Layer to conservatively estimate the existing conditions of the interim cover material. Compaction requirements were based on the Modified Proctor maximum dry density to more accurately simulate compaction of the landfill area by modern construction equipment and methods. It should be noted that, due to the low fines content of the available fill on-site, minimal variance (i.e. 5%) between the Standard and Modified Proctor maximum dry densities is expected. As such, estimated equivalent compaction requirements based on the Standard Proctor maximum dry density (i.e. 80%) can be specified as well. Hydraulic properties of the Capillary Break Layer were estimated using typical parameter values of van Genuchten models for sand from Leij, Alves, and van Genuchten (1996).

The Mualem-van Genuchten conductivity model was used with an exponent of the pore interaction term of 2, as recommended in the UNSAT-H User's Manual. The hydraulic properties of the proposed ET cover system materials are summarized below. Laboratory data is included in Appendix A.

Layers 1 and 2 – Stockpiled SM Material at 75% MP Compaction Density

- THET - Saturated water content: 0.372
- THTR – Residual water content: 0.1025
- VGA – Van Genuchten α coefficient: 0.020
- VGN - Van Genuchten n coefficient: 1.560
- SK – Saturated hydraulic conductivity: 0.504 cm/hr (1.4 x 10^{-4} cm/sec)

Layer 3 – Capillary Break Layer of Well-Graded Clean Sand

- THET - Saturated water content: 0.43
- THTR – Residual water content: 0.045
- VGA – Van Genuchten α coefficient: 0.145

- VGN - Van Genuchten n coefficient: 2.68
- SK – Saturated hydraulic conductivity: 29.7 cm/hr (8.25 x 10^{-3} cm/sec)

Layer 4 – Stockpiled SM Material at 75% MP Compaction Density

- THET - Saturated water content: 0.372
- THTR – Residual water content: 0.1025
- VGA – Van Genuchten α coefficient: 0.020
- VGN - Van Genuchten n coefficient: 1.560
- SK – Saturated hydraulic conductivity: 0.504 cm/hr (1.4 x 10^{-4} cm/sec)

Initial Conditions

Initial suction head values were estimated using the soil water characteristic curves generated during hydraulic laboratory testing. The suction head values, summarized below, assume that the soil will be placed with ±2% of the optimum water content for the given compaction requirements.

- Layer 1 and 2: 1.0 x 10^4 cm
- Layer 3: 1.0 x 10^2 cm
- Layers 4: 1.0 x 10^4 cm

Plant Information

Transpiration will be a contributing component of the performance of the proposed ET cover system. Vegetative growth of the final design of the proposed ET cover system will consist of a balanced mixture of native herbaceous and vascular plants. Dr. Rafael Corral of the Fort Bliss Environmental Division and Leah Markiewitz with Zia provided an optimum vegetative design to utilize indigenous species of the area such as alkali sacaton and sand dropseed. For the purposes of this preliminary ET model, a conservative 10% coverage of vegetative growth over the area was assumed. Due to the difficulty in finding root data, the rooting depth of the indigenous species in our vegetative design was estimated using seasonal cheatgrass data published by Harris (1967). The rooting depth of cheatgrass is very similar to the native species of grass found at Fort Bliss as shown in **Figure 1**.

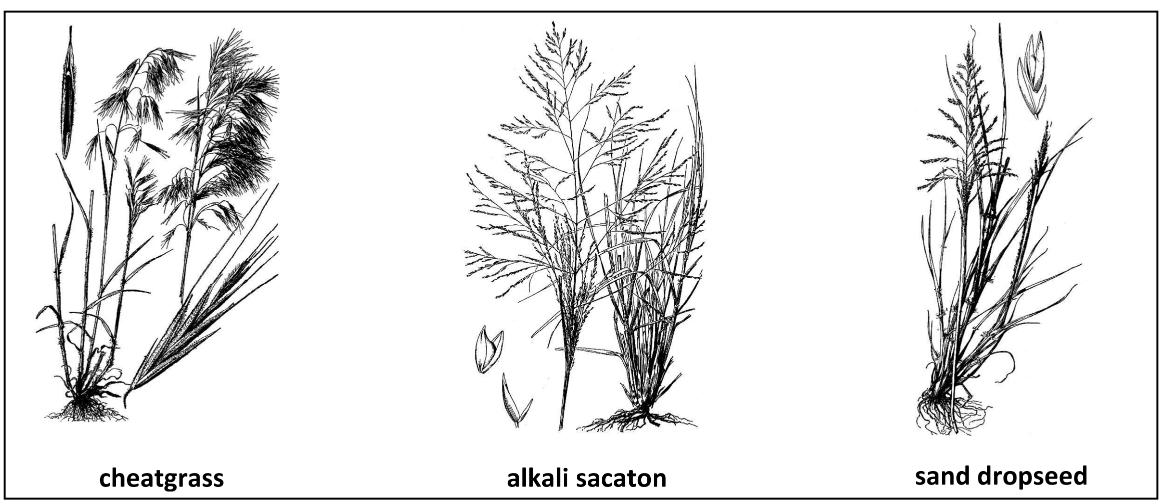


Figure 1: Rooting Depth Comparison

Potential transpiration and evaporation were generated from empirical cheatgrass data published by Hinds (1975). The HELP model was consulted to define the growing season of the El Paso region, between March and August. The HELP model was also consulted to define the plant water uptake parameters. The influence of landfill gas on vegetative growth was modeled by limiting maximum root growth to within the top 12-inches of the Vegetative Support Layer only.

Boundary Conditions

The boundary conditions required for the model include general site-specific data and daily meteorological data. Daily meteorological input data includes maximum and minimum temperature, dew point, solar radiation, average wind speed, cloud cover, and daily precipitation. Data was obtained for the El Paso International Airport weather station from the National Oceanic and Atmospheric Administration (NOAA). The El Paso International Airport weather station is located approximately 4.4 nautical miles south of the landfill.

DEMONSTRATION OF PERFORMANCE

The TCEQ set two performance criteria for the demonstration of performance of an ET cover system, as summarized below:

- Less than 4 millimeters per year of drainage from the base of the ET cover system
- Modeled runoff less than 10% of the annual water applied.

Table 1 summarizes annual results of the 30-year simulation of the proposed ET cover system. It should be noted that the model is conservative in that transpiration was modeled based on 10% coverage of vegetative growth and incorporates influences of landfill gas. The data presented in **Table 1** demonstrates that the proposed ET cover system meets the TCEQ drainage performance criteria over the 30-year modeling period. Furthermore, the model's performance over years 24 through 28, which on average received 40% more precipitation than the annual average, demonstrate the ability of the proposed cover system to perform under variable weather conditions. The runoff ratio exceeds the TCEQ Performance Criteria of 10% by 1% during the floods of 2006, but it should be noted that 2006 was the wettest year on record in the El Paso region.

Figure 3 shows the annual storage requirement of the proposed ET cover system compared to the available storage capacity of the cover system design. It can be seen that the annual storage requirement never exceeds 53% of the overall storage capacity.

The sensitivity of the model was evaluated by varying various input parameters, including time-stop factors; initial suction head conditions, and solution types. Layer thicknesses were also varied in order to develop the proposed cover system design. The performance of the cover system design presented in this Preliminary Design Report was determined to be stable with respect to variable non-boundary condition and/or initial condition input parameters. The design-specific input parameters were conservatively developed to accurately portray the anticipated conditions during the construction and performance of the cover system.

ATTACHMENTS

Table 1 – Proposed ET Cover System Performance Demonstration Summary

Figure 2 – Schematic of Proposed ET Cover System
Figure 3 - Storage Requirement / Capacity Comparison

Appendix A - UNSAT-H Input File
Appendix B - UNSAT-H Output Data
Appendix C - Hydraulic Parameter Lab Testing Data
Appendix D - Meteorological Data

Table 1 - Proposed ET Cover System Performance Demonstration Summary

Year	Precipitation (cm)	PET (cm)	P/PET	Evaporation (cm)	Transpiration (cm)	Runoff (cm)	R/P[2]	Capacity (cm)	Storage (cm)	%	Drainage (cm)	TimeStp	MasBalErr (cm)	Drainage + Error (cm) [1]
0	Initial storage =							38.39	13.62					
1	32.08	239.94	0.13	27.34	2.16	0.80	0.02	38.39	15.36	40%	0.00	19846.00	0.05	0.05
2	27.86	236.06	0.12	21.79	1.53	1.69	0.06	38.39	18.19	47%	0.00	18506.00	0.03	0.03
3	20.30	230.27	0.09	21.55	1.98	0.00	0.00	38.39	14.93	39%	0.00	18549.00	0.02	0.02
4	41.07	218.38	0.19	34.92	1.73	1.56	0.04	38.39	17.75	46%	0.00	18898.00	0.03	0.03
5	20.73	189.15	0.11	21.45	1.59	0.00	0.00	38.39	15.43	40%	0.00	18520.00	0.01	0.01
6	30.91	196.27	0.16	27.33	1.52	0.29	0.01	38.39	17.19	45%	0.00	19594.00	0.02	0.02
7	27.79	207.25	0.13	23.57	2.07	0.35	0.01	38.39	18.96	49%	0.00	19035.00	0.03	0.03
8	28.09	211.76	0.13	29.72	1.74	0.00	0.00	38.39	15.57	41%	0.00	19033.00	0.02	0.02
9	18.44	224.97	0.08	17.47	1.86	0.07	0.00	38.39	14.59	38%	0.00	18256.00	0.03	0.03
10	32.64	226.79	0.14	29.02	1.30	0.14	0.00	38.39	16.74	44%	0.00	18876.00	0.03	0.03
11	31.45	224.82	0.14	26.77	1.75	0.54	0.02	38.39	19.10	50%	0.00	19668.00	0.03	0.03
12	28.96	225.83	0.13	28.60	2.07	0.84	0.03	38.39	16.54	43%	0.00	19736.00	0.00	0.00
13	24.46	239.48	0.10	23.36	1.94	0.00	0.00	38.39	15.68	41%	0.00	18990.00	0.02	0.02
14	13.92	251.76	0.06	12.19	2.13	0.00	0.00	38.39	15.24	40%	0.00	17218.00	0.04	0.04
15	15.39	248.49	0.06	14.60	1.22	0.01	0.00	38.39	14.78	38%	0.00	17676.00	0.02	0.02
16	21.31	260.54	0.08	19.60	1.51	0.06	0.00	38.39	14.90	39%	0.00	17986.00	0.02	0.02
17	24.46	226.38	0.11	21.28	2.22	0.00	0.00	38.39	15.82	41%	0.00	19257.00	0.05	0.05
18	17.20	236.93	0.07	16.02	1.60	0.01	0.00	38.39	15.35	40%	0.00	17984.00	0.03	0.03
19	20.73	238.02	0.09	18.66	1.45	0.00	0.00	38.39	15.94	42%	0.00	17395.00	0.03	0.03
20	18.82	240.07	0.08	17.55	1.84	0.15	0.01	38.39	15.20	40%	0.00	17900.00	0.03	0.03
21	10.90	240.84	0.05	10.79	1.43	0.00	0.00	38.39	13.85	36%	0.00	17090.00	0.03	0.03
22	17.50	241.24	0.07	15.00	1.38	0.00	0.00	38.39	14.93	39%	0.00	17989.00	0.04	0.04
23	10.69	251.67	0.04	10.47	1.65	0.00	0.00	38.39	13.48	35%	0.00	16736.00	0.02	0.02
24	30.99	236.19	0.13	24.93	2.17	0.16	0.01	38.39	17.15	45%	0.00	17776.00	0.07	0.07
25	32.69	238.22	0.14	29.67	2.27	1.83	0.06	38.39	16.05	42%	0.00	18639.00	0.03	0.03
26	44.48	260.38	0.17	35.82	1.92	5.08	0.11[3]	38.39	17.62	46%	0.05	18698.00	0.03	0.09
27	25.71	241.12	0.11	23.59	2.33	0.08	0.00	38.39	17.12	45%	0.16	18651.00	0.04	0.20
28	25.02	255.25	0.10	23.36	1.32	0.53	0.02	38.39	16.81	44%	0.11	18361.00	0.01	0.12
29	22.05	244.94	0.09	18.77	1.76	0.14	0.01	38.39	18.09	47%	0.08	17683.00	0.03	0.11
30	16.94	240.72	0.07	17.16	1.94	0.00	0.00	38.39	15.86	41%	0.06	18245.00	0.02	0.08
SUM=	733.55	7023.70		662.31	53.35	14.33					0.45		0.88	

Notes:
1. TCEQ Performance Criteria   Annual drainage less than or equal to 4 mm/yr
2. TCEQ Performance Criteria   Runoff less than or equal to 10% total water applied
3. This value excceeds the TCEQ Performance Criteria of 10%, but it should be noted that 2006 was the wettest year on record in the El Paso region.

Figure 2 - Optimized Evapotranspiration Cover System Cross-section

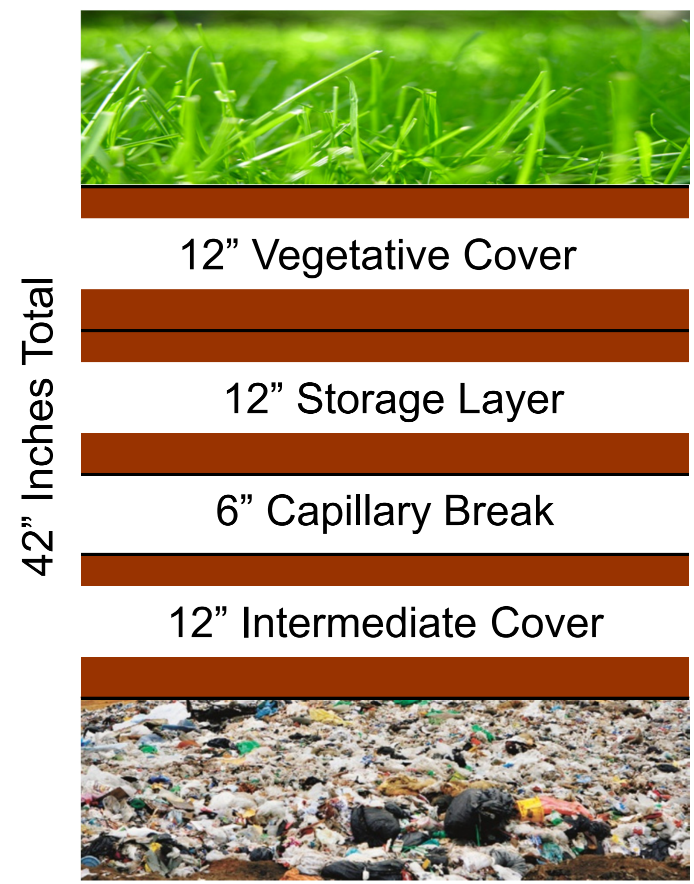
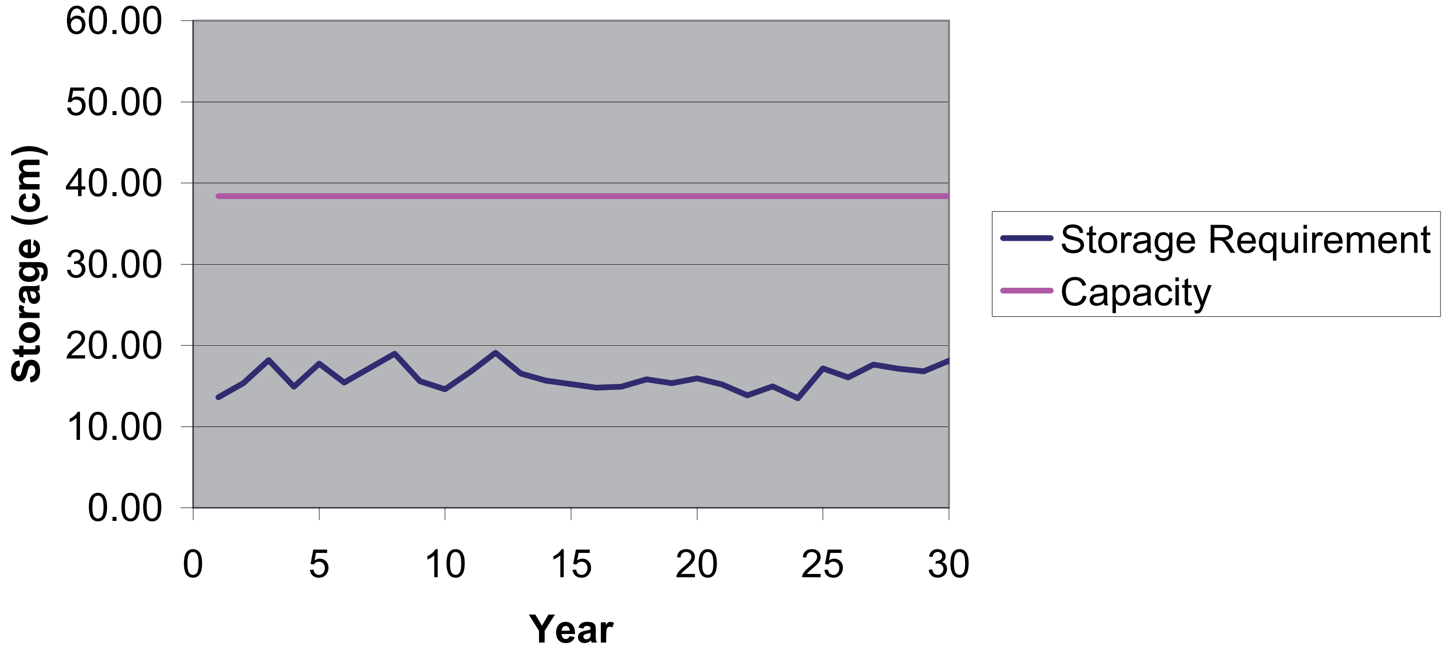


Figure 3
Fort Bliss Proposed ET Cover System
Storage Requirement / Capacity Comparison



APPENDIX A

UNSAT-H INPUT FILE

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FTBLISS
1,1,                           IPLANT,NGRAV
365,1,365,                     IFDEND,IDTBEG,IDTEND
1981,30,0,2,30,                IYS,NYEARS,ISTEAD,IFLIST,NFLIST
0,0,                           NPRINT,STOPHR
0,3,1,1.00E-4,                 ISMETH,INMAX,ISWDIF,DMAXBA
1.0,1.0E-8,0.0,                DELMAX,DELMIN,OUTTIM
1.5,1.00E-05,0,0,0,            RFACT,RAINIF,DHTOL,DHMAX,DHFACT
4,1,0.5,                       KOPT,KEST,WTF
0,1,2,1,                       ITOPBC,IEVOPT,NFHOUR,LOWER
1.0,1.00E6,5.0,0.4025,         HIRRI,HDRY,HTOP,RHA
1,1,1,                         IETOPT,ICLOUD,ISHOPT
1,1.0,                         IRAIN,HPR
0,0,0,0,0,                     IHYS,AIRTO,HYSTOL,HYSMXH,HYFILE
0,0,0,                         IHEAT,CONVH,DMAXHE
0,0,0,0,                       UPPERH,TSMEAN,TSAMP,QHCTOP
0,0,0,                         LOWERH,QHLEAK,TGRAD
1,0.66,291.0,0.239,            IVAPOR,TORT,TSOIL,VAPDIF
4,24,                          MATN,NPT
1,0.00,1,1.00,1,2.00,1,3.00,   MAT,Z
1,4.00,1,5.08,1,10.16,1,20.32,
1,30.48,3,35.56,3,40.64,3,45.72,
3,50.80,3,55.88,3,60.96,4,66.04,
4,71.12,4,76.20,3,81.28,3,83.36,
3,91.44,3,96.52,3,101.6,3,106.68,
Layer 1 75 compaction of silty sand SM water retention parameters
0.372,0.1025,0.020,1.560,                   THET, THTR, vGA, vGN
Layer 1 75 compaction of silty sand SM hydraulic conductivity parameters
2.000,0.504,0.020,1.560,0.500,              RKMOD, SK, VGA, VGN, EPIT
Layer 2 80 compaction of silty sand SM water retention parameters
0.329,0.163,0.010,2.180,                    THET, THTR, vGA, vGN
Layer 2 80 compaction of silty sand SM hydraulic conductivity parameters
2.000,0.036,0.010,2.180,0.500,              RKMOD, SK, VGA, VGN, EPIT
Layer 3 75 compaction of silty sand SM water retention parameters
0.372,0.1025,0.020,1.560,                   THET, THTR, vGA, vGN
Layer 3 75 compaction of silty sand SM hydraulic conductivity parameters
2.000,0.504,0.020,1.560,0.500,              RKMOD, SK, VGA, VGN, EPIT
Layer 4 clean sand water retention parameters
0.430,0.045,0.145,2.68,                     THET, THTR, vGA, vGN
Layer 4 clean sand hydraulic conductivity parameters
2.000,29.7,0.145,2.68,0.500,                RKMOD, SK, VGA, VGN, EPIT
0,    NDAY
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1.00E4,1.00E4,1.00E4,1.00E2,
1.00E2,1.00E2,1.00E4,1.00E4,
1.00E4,1.00E4,1.00E4,1.00E4,
1.00E4,1.00E4,1.00E4,1.00E4,
0,1,1,2,66,243,          LEAF,NFROOT,NUPTAK,NFPET,NSOW,NHRVST
0.90,                    BARE
1.2,0.13,0.02,           A,B1,B2
1,1,2,3,4,6,11,17,23,28,
34,40,45,51,56,85,125,166,365,365,
365,365,365,365,
15000.0,3000.0,300.0,    HW, HD, HN
15000.0,3000.0,300.0,    HW, HD, HN
15000.0,3000.0,300.0,    HW, HD, HN
15000.0,3000.0,300.0,    HW, HD, HN
220.0,                         BIOMAS
2.0E-01,1206.4,10.0,1000.0,    ALBEDO,ALT,ZU,PMB
```

1981.txt
1982.txt
1983.txt
1984.txt
1985.txt
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1988.txt
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2004.txt
2005.txt
2006.txt
2007.txt
2008.txt
2009.txt
2010.txt

APPENDIX B

UNSAT-H OUTPUT FILE

12-12-6-12 10% coverage.out

Created using BSUM Version 3.01; all units are cm

First file in series is Final1981.res

Year	Precip	PET	Transp	Evap	Runoff	Drain	Store	TimeStp	MasBalErr
Initial storage =							13.624		
1	32.080	239.938	2.157	27.340	0.795	0.000	15.364	19846	0.04793
2	27.864	236.062	1.525	21.786	1.694	0.000	18.191	18506	0.03216
3	20.295	230.265	1.981	21.554	0.000	0.000	14.929	18549	0.02176
4	41.072	218.383	1.734	34.921	1.560	0.000	17.751	18898	0.03467
5	20.726	189.147	1.591	21.446	0.000	0.000	15.431	18520	0.00975
6	30.912	196.269	1.516	27.331	0.289	0.000	17.189	19594	0.01780
7	27.788	207.251	2.065	23.565	0.349	0.000	18.962	19035	0.03459
8	28.092	211.756	1.741	29.720	0.001	0.000	15.569	19033	0.02378
9	18.440	224.974	1.857	17.467	0.070	0.000	14.587	18256	0.02723
10	32.639	226.790	1.296	29.019	0.139	0.000	16.740	18876	0.03272
11	31.445	224.820	1.752	26.767	0.537	0.000	19.098	19668	0.03198
12	28.956	225.833	2.069	28.599	0.843	0.000	16.540	19736	0.00341
13	24.460	239.475	1.939	23.360	0.000	0.000	15.679	18990	0.02207
14	13.919	251.763	2.134	12.188	0.000	0.000	15.241	17218	0.03539
15	15.392	248.486	1.224	14.602	0.007	0.000	14.776	17676	0.02473
16	21.311	260.543	1.508	19.603	0.063	0.000	14.895	17986	0.01713
17	24.460	226.377	2.215	21.276	0.000	0.000	15.815	19257	0.05014
18	17.196	236.926	1.596	16.018	0.014	0.000	15.354	17984	0.02850
19	20.726	238.020	1.450	18.662	0.000	0.000	15.940	17395	0.02852
20	18.821	240.065	1.838	17.546	0.146	0.000	15.199	17900	0.03297
21	10.897	240.838	1.434	10.785	0.000	0.000	13.851	17090	0.02550
22	17.501	241.242	1.378	15.001	0.000	0.000	14.932	17989	0.04096
23	10.693	251.668	1.650	10.473	0.000	0.000	13.482	16736	0.01989
24	30.988	236.192	2.165	24.925	0.162	0.000	17.154	17776	0.06504
25	32.690	238.215	2.271	29.666	1.829	0.000	16.047	18639	0.03064
26	44.475	260.375	1.923	35.815	5.081	0.052	17.616	18698	0.03455
27	25.705	241.122	2.333	23.587	0.082	0.162	17.117	18651	0.04005
28	25.019	255.251	1.315	23.362	0.530	0.105	16.809	18361	0.01489
29	22.047	244.936	1.757	18.767	0.136	0.075	18.089	17683	0.03211
30	16.942	240.720	1.935	17.158	0.000	0.058	15.862	18245	0.01789
SUM=	733.552	7023.701	53.346	662.309	14.326	0.454			0.87875

APPENDIX C
HYDRAULIC PARAMETER LABORATORY TESTING DATA

Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-
Attn:	Garrett Ferguson
Project Name:	Geotech Laboratory Testing Ft. Bliss, TX
Project Manager:	David Varela

Report Date:	December 23, 2008
Project #:	8719-000087
Work Order #:	1
Lab #:	TT-1
Sampled By:	Client
Date Sampled:	12/11/2008
Visual Description of Material:	Poorly Graded Sand w/ Silt
Sample Source:	TT-1

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1in.	100%
3/4in.	95%
1/2in.	92%
3/8in.	91%
#4	87%
#10	82%
#40	58%
#100	22%
#200	12%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SP-SM

Liquid Limit: NV

Plastic Limit: NV

Plasticity Index: NP

PI Sample Was Air Dried.

Reviewed By: [signature]
MG

Senior Materials Engineer

Distribution: Client: ☑ File: ☑ Supplier: ☑ Other: Addressee (2)
Email: ☐

AMEC Earth Environmental, Inc.
125 Montoya Rd
El Paso, TX 79932
Tel 9155852472
Fax 9155852626

www.amec.com

amec

Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-2
Project Name:	Geotech Laboratory Testing	**Sampled By:**	Client
		Date Sampled:	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Silty Sand
		Sample Source:	TT-2
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1/2in.	100%
3/8in.	99%
#4	97%
#10	94%
#40	76%
#100	38%
#200	15%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SM

Liquid Limit: NV

Plastic Limit: NV

Plasticity Index: NP

PI Sample Was Air Dried.

Reviewed By: DXA Delph

MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

AMEC Earth Environmental, Inc.
125 Montoya Rd
El Paso, TX 79932
Tel 9155852472
Fax 9155852626

www.amec.com

Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-21A
Project Name:	Geotech Laboratory Testing	**Sampled By:**	Client
		Date Sampled:	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Clayey Sand
		Sample Source:	TT-21A
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1in.	100%
3/4in.	99%
1/2in.	99%
3/8in.	99%
#4	97%
#10	95%
#40	81%
#100	48%
#200	26%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC

Liquid Limit: 32

Plastic Limit: 16

Plasticity Index: 16

PI Sample Was Air Dried.

Reviewed By: TDXA DePh

MG

Senior Materials Engineer

Distribution: Client: ☑ File: ☑ Supplier: ☑ Other: Addressee (2)
Email: ☐

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El Paso, TX 79932
Tel 9155852472
Fax 9155852626

www.amec.com

Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-28
Project Name:	Geotech Laboratory Testing Ft. Bliss, TX	**Sampled By:**	Client
		Date Sampled:	12/11/2008
		Visual Description of Material:	Silty Sand
		Sample Source:	TT-28
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
3/4in.	100%
1/2in.	99%
3/8in.	98%
#4	96%
#10	93%
#40	76%
#100	41%
#200	18%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SM

Liquid Limit: 22

Plastic Limit: 20

Plasticity Index: 2

PI Sample Was Air Dried.

Reviewed By: DJA [signature]

MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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Fax 9155852626

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
		Lab #:	TT-3
Attn:	Garrett Ferguson	**Sampled By:**	Client
Project Name:	Geotech Laboratory Testing	**Date Sampled:**	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Silty Sand w/ Gravel
		Sample Source:	TT-3
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1 1/4in.	100%
1in.	95%
3/4in.	93%
1/2in.	89%
3/8in.	88%
#4	85%
#10	80%
#40	62%
#100	33%
#200	16%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC-SM

Liquid Limit: 20

Plastic Limit: 15

Plasticity Index: 5

PI Sample Was Air Dried.

Reviewed By: DXA Vela
MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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125 Montoya Rd
El Paso, TX 79932
Tel 9155852472
Fax 9155852626

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-16
Project Name:	Geotech Laboratory Testing	**Sampled By:**	Client
		Date Sampled:	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Clayey Sand
		Sample Source:	TT-16
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1/2in.	100%
3/8in.	99%
#4	97%
#10	94%
#40	80%
#100	43%
#200	24%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC

Liquid Limit: 25

Plastic Limit: 14

Plasticity Index: 11

PI Sample Was Air Dried.

Reviewed By: [signature]

MG

Senior Materials Engineer

Distribution: Client: ☑ File: ☑ Supplier: ☑ Other: Addressee (2)
Email: ☐

AMEC Earth Environmental, Inc.
125 Montoya Rd
El Paso, TX 79932
Tel 9155852472
Fax 9155852626

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
		Lab #:	TT-6
Attn:	Garrett Ferguson	**Sampled By:**	Client
Project Name:	Geotech Laboratory Testing	**Date Sampled:**	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Silty Clayey Sand
		Sample Source:	TT-6
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1 1/4in.	100%
1in.	97%
3/4in.	96%
1/2in.	94%
3/8in.	90%
#4	85%
#10	81%
#40	63%
#100	34%
#200	15%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC-SM

Liquid Limit: 23

Plastic Limit: 17

Plasticity Index: 6

PI Sample Was Air Dried.

Reviewed By: [signature]

MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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El Paso, TX 79932
Tel 9155852472
Fax 9155852626

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-8
Project Name:	Geotech Laboratory Testing Ft. Bliss, TX	**Sampled By:**	Client
		Date Sampled:	12/11/2008
		Visual Description of Material:	Clayey Sand
		Sample Source:	TT-8
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1/2in.	100%
3/8in.	98%
#4	96%
#10	93%
#40	75%
#100	38%
#200	20%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC

Liquid Limit: 27

Plastic Limit: 18

Plasticity Index: 9

PI Sample Was Air Dried.

Reviewed By: ____________________

MG

____

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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El Paso, TX 79932
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Fax 9155852626

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-31
Project Name:	Geotech Laboratory Testing Ft. Bliss, TX	**Sampled By:**	Client
		Date Sampled:	12/11/2008
		Visual Description of Material:	Silty Clayey Sand
		Sample Source:	TT-31
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
3/4in.	100%
1/2in.	98%
3/8in.	97%
#4	93%
#10	89%
#40	66%
#100	30%
#200	17%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC-SM

Liquid Limit: 23
Plastic Limit: 16
Plasticity Index: 7

PI Sample Was Air Dried.

Reviewed By: [signature]
MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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Client:	Malcom Pirnie 12400 Coit Road Dallas, TX 75251-	**Report Date:**	December 23, 2008
		Project #:	8719-000087
		Work Order #:	1
Attn:	Garrett Ferguson	**Lab #:**	TT-21B
Project Name:	Geotech Laboratory Testing	**Sampled By:**	Client
		Date Sampled:	12/11/2008
	Ft. Bliss, TX	**Visual Description of Material:**	Clayey Sand
		Sample Source:	TT-21B
Project Manager:	David Varela		

SOILS / AGGREGATES

Sieve Analysis (ASTM C117-04/C136-06)

200 Wash Procedure: A

Sieve Size	Passing
1in.	100%
3/4in.	98%
1/2in.	96%
3/8in.	95%
#4	94%
#10	92%
#40	74%
#100	40%
#200	21%

Plasticity Index (ASTM D4318-05)

Preperation Method: Dry

Liquid Limit Method: A

Soil Classification (ASTM D2487-06) SC

Liquid Limit: 28

Plastic Limit: 17

Plasticity Index: 11

PI Sample Was Air Dried.

Reviewed By: [signature]

MG

Senior Materials Engineer

Distribution: **Client:** ☑ **File:** ☑ **Supplier:** ☑ **Other:** Addressee (2)
Email: ☐

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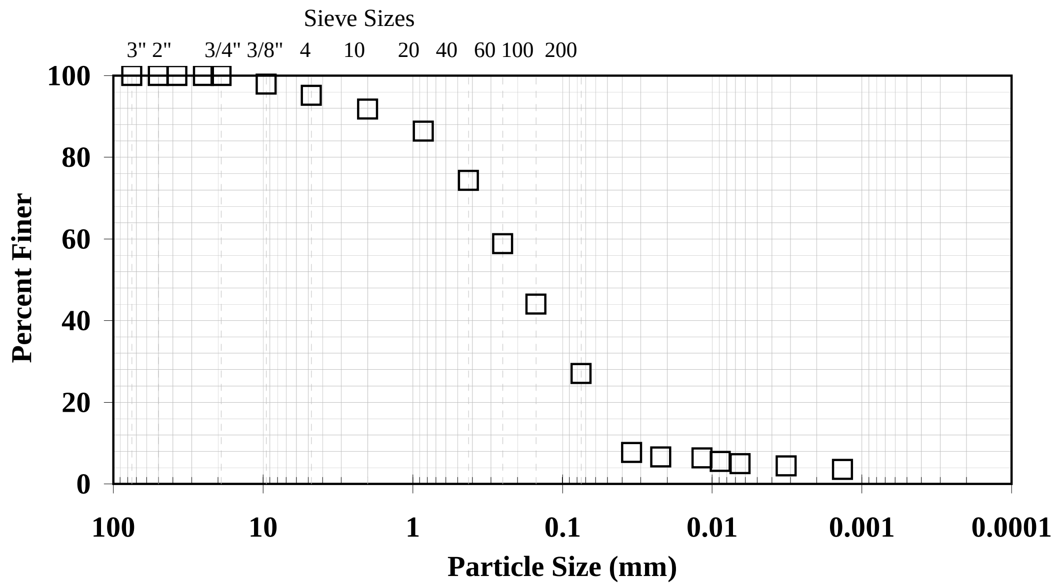
125 Montoya Rd
El Paso, TX 79932
Tel 9155852472
Fax 9155852626

www.amec.com

TRI/ENVIRONMENTAL, INC.
A Texas Research International Company

Particle Size Analysis for Soils

Client: Malcom Pirnie Inc. | TRI Log#: E2325-09-04
Project: Ft. Bliss | Test Method: ASTM D 422
Sample: Composite | Test Date: 03/14/09



Sieve Analysis	
Sieve Size	Percentage Passing (%)
3-in.	100.0
2-in.	100.0
1.5-in.	100.0
1 in.	100.0
3/4 in.	100.0
3/8 in.	97.9
No. 4 (4.75 mm)	95.1
No. 10 (2.00 mm)	91.7
No. 20 (850 mm)	86.4
No. 40 (425 mm)	74.3
No. 60 (250 mm)	58.8
No. 100 (150 mm)	44.0
No. 200 (75 mm)	27.0
Hydrometer Analysis	
Particale Size	Percentage Passing (%)
0.074 mm	25.0
0.005 mm	4.5
0.001 mm	2.0

Notes: Soil classifies as a silty sand (SM) in accordance with ASTM D 2487.

The as received moisture content was 22.57 % as determined by ASTM D 2116.

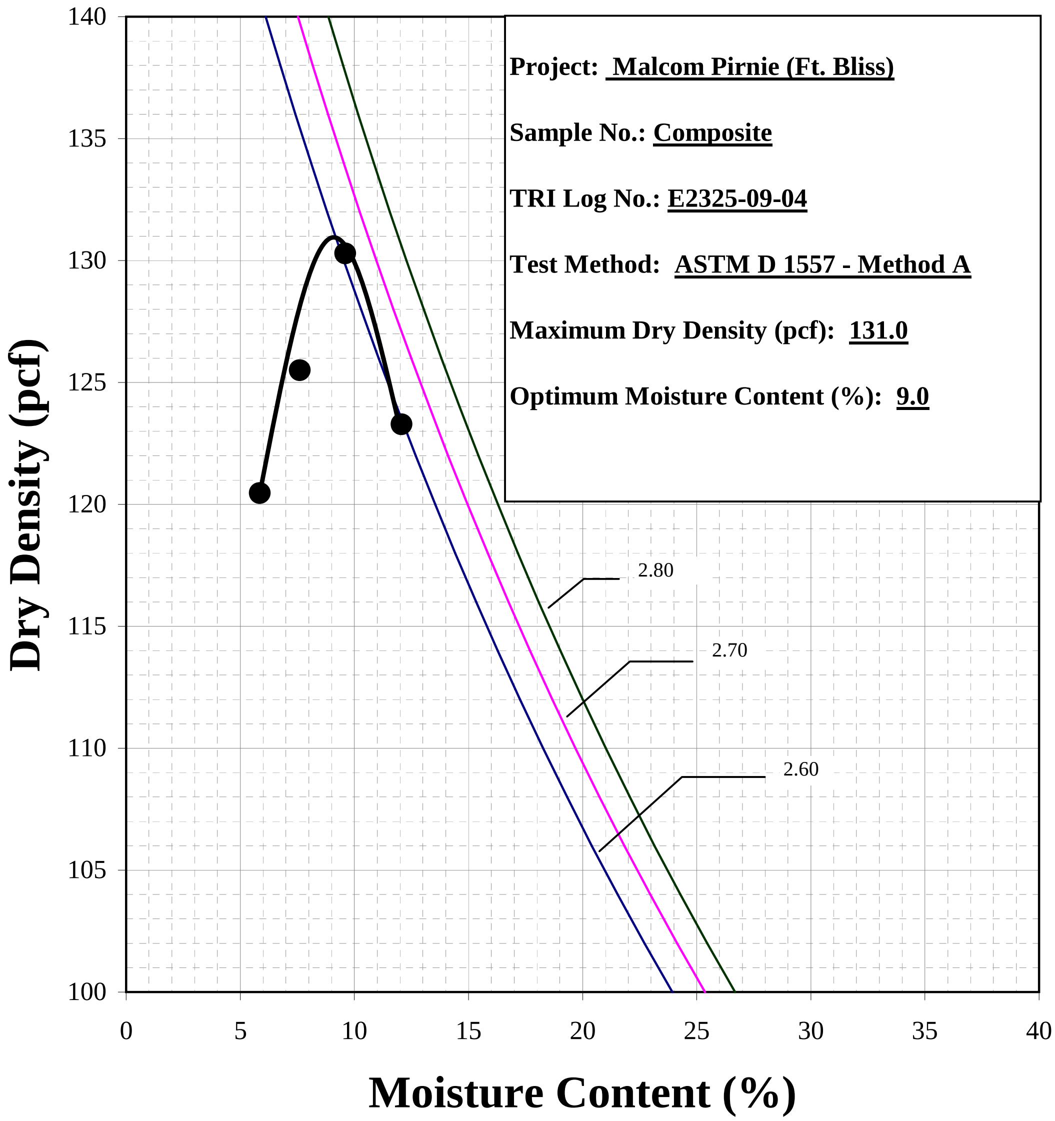
Plastic Index (ASTM D 4318) Results	
Liquid Limit	25
Plastic Limit	NP
Plastic Index	NP
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used.	

John M. Allen, P.E., 03/16/2009
Quality Review/Date
Tested by: Tamika Walker

TRI/ENVIRONMENTAL, INC.

A Texas Research International Company

Proctor Compaction Test



John M. Allen, P.E., 03/16/2009

Quality Review/Date

Tested by: Roderick Thomas

The testing herein is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

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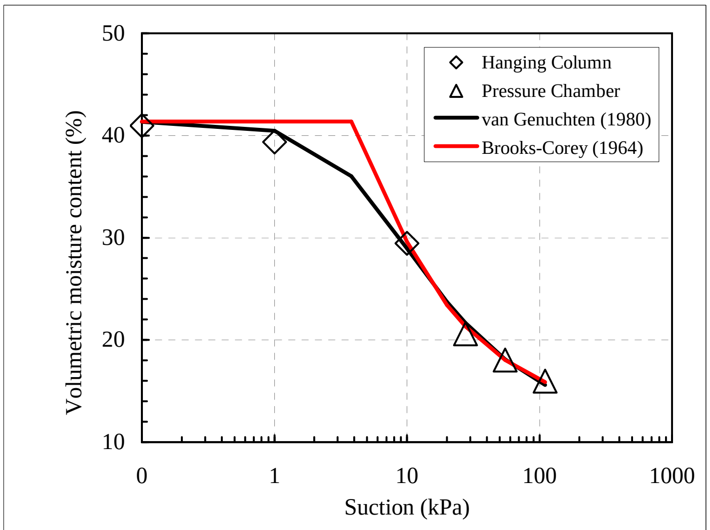
TRI/ENVIRONMENTAL, INC.

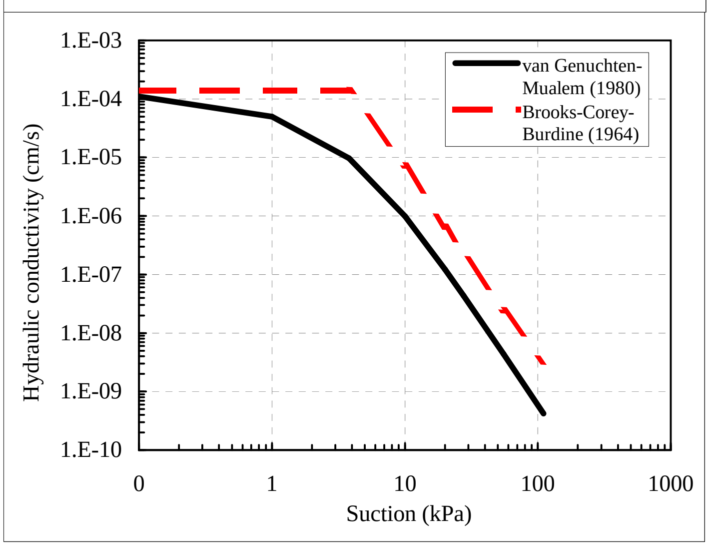
A Texas Research International Company

Soil Water Characteristic Curve

Client: Malcom Pirnie
Project: Ft. Bliss
Sample: Composite

TRI Log#: E2325-09-04
Test Method: ASTM D 6836, Method A & B
Test Date: 04/05/09





TESTING METHOD	Hanging Column	Pressure Chamber
Avg. Sample Height (cm)	2.54	2.54
Avg. Sample Diameter (cm)	6.34	6.34
Wet Weight (g)	135.6	136.2
Initial Water Content (%)	8.74	8.80
Dry Density (g/cm^3)	1.56	1.56
G_s (Mesumed)	2.48	2.48
Void Ratio, e	0.593	0.587
Degree of Saturation, $S_{r,\ initial}$	0.37	0.37
Porosity, n	0.372	0.372
Final Water Content (%)	15.54	10.22

			van Genuchten Model (1980) (Fit to SWRC)		Brooks-Corey Model (1964) (Fit to SWRC)	
	Suction, ψ (kPa)	Volumetric water content, θ (%)	Predicted, θ_{vG} (%)	Predicted, K_{vGM} (cm/s)	Predicted, θ_{BC} (%)	Predicted, K_{BCM} (cm/s)
Hanging Column	0.1	40.96	41.33	1.1E-04	41.36	1.4E-04
	1.0	39.35	40.46	5.0E-05	41.36	1.4E-04
	3.8 [1]	NA	36.02	9.7E-06	41.36	1.4E-04
	10.0	29.47	28.94	9.8E-07	29.59	7.2E-06
Pressure Chamber	20.0	24.18	23.74	1.2E-07	23.41	6.5E-07
	27.6	20.59	21.67	4.4E-08	21.33	2.2E-07
	55.2	18.03	18.10	4.4E-09	18.03	2.4E-08
	110.3	15.97	15.60	4.2E-10	15.87	3.2E-09

Note 1: Ghost point for Brooks-Corey Air Entry Suction

van Genuchten Model Parameters	
θ_r [2]	10.25
α (kPa^{-1})	0.21
n	1.56

Brooks-Corey Model Parameters	
θ_r [2]	11.84
λ	0.62
ψ_{ave} (kPa)	4.39

Note 2: θ_r is residual volumetric water content

Note 2: The soil was air dried and passed through a No. 8 sieve to eliminate any over sized particles. Soil was remolded a target dry density of 75% Modified Proctor at the optimum moisture content or 98.3 lb/ft^3 dry density at a moisture content of 9.0 %. Specimen was prepared using Harvard compaction tamper of 0.5-in lifts with kneading compaction.

Cheng-Wei Chen, 05/04/09

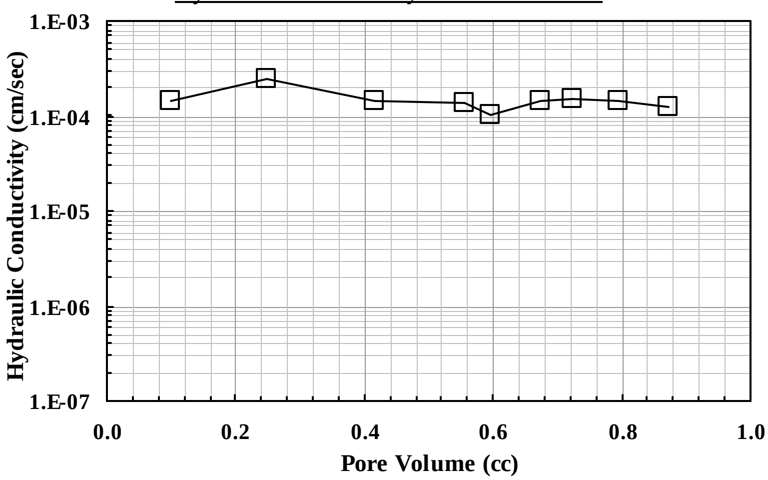
Analysis & Quality Review/Date

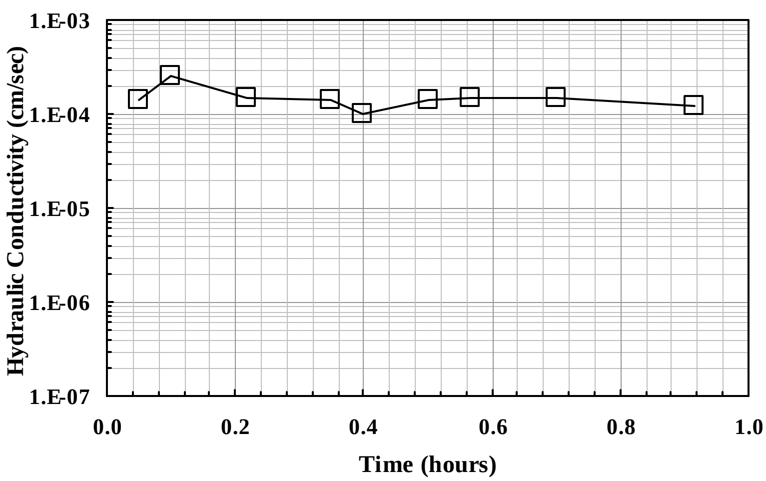
Tested by: Caleb McCord

Hydraulic Conductivity

Client: Malcom Pirnie Inc.
Project: Ft. Bliss
Sample: Composite

TRI Log#: E2325-09-04
Test Method: ASTM D 5084
Test Date: 03/19/09





INITIAL VALUES	
Sample Height (in)	1.50
Sample Diameter (in)	2.80
Wet Weight (g)	258.3
Sample Area (in^2)	6.15
Sample Volume (cc)	150.8
Moisture content (%)	8.64
Wet Density (pcf)	106.9
Dry Density (pcf)	98.4
G_s (measured)	2.48
Degree of Saturation	37.4
Void Ratio	0.57
Porosity	0.36
1 Pore Volume (cc)	54.9
Eff. Confining Stress (psi)	5.0

	Hydraulic Conductivity	
Time (hrs)	k (cm/sec)	k at 20 deg C (cm/sec)
0.05	1.5E-04	1.4E-04
0.10	2.5E-04	2.5E-04
0.22	1.5E-04	1.5E-04
0.35	1.4E-04	1.4E-04
0.40	1.0E-04	1.0E-04
0.50	1.4E-04	1.4E-04
0.57	1.5E-04	1.5E-04
0.70	1.5E-04	1.4E-04
0.92	1.3E-04	1.2E-04
Avg. K[1] at 20 deg C:		**1.4E-04**

1: Average corrected hydraulic conductivity (k_{20}) is obtained from the last 4 average readings.

Note: A B-value of 0.95 was achieved. The soil was air dried and passed through a No. 8 sieve to eliminate any over sized particles. Soil was remolded a target dry density of 75% Modified Proctor at the optimum moisture content or 98.3 lb/ft^3 dry density at a moisture content of 9.0 %. Specimen was prepared using Harvard compaction tamper of 0.5-in lifts with kneading compaction.

Cheng-Wei Chen, 03/22/09
Analysis & Quality Review/Date
Tested by: Caleb McCord

APPENDIX D
METEOROLOGICAL DATA

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236,94,67,43,619.7,9.1,0.5,0.0,
237,85,70,53,464.6,9.7,0.4,0.0,
238,91,63,48,684.5,6.8,0.4,0.0,
239,94,64,44,681.5,8.1,0.4,0.0,
240,96,65,42,526.0,6.3,0.4,0.0,
241,88,67,51,675.5,9.0,0.4,0.0,
242,90,66,57,672.4,6.8,0.4,0.0,
243,89,62,53,564.2,7.5,0.4,0.0,
244,85,62,54,436.5,6.8,0.4,0.0,
245,83,62,55,580.5,7.9,0.5,0.0,
246,85,61,54,525.9,5.0,0.5,0.0,
247,91,63,51,607.6,6.3,0.4,0.0,
248,85,67,56,612.4,8.8,0.5,0.0,
249,86,69,55,642.5,5.9,0.4,0.0,
250,89,66,41,617.0,11.7,0.4,0.0,
251,85,64,42,244.9,1.8,0.4,0.0,
252,85,62,39,516.4,8.1,0.4,0.0,

253,86,55,36,586.9,5.3,0.4,0.0,
254,87,56,37,535.2,4.1,0.4,0.0,
255,93,57,39,558.6,2.7,0.4,0.0,
256,93,61,44,528.1,5.1,0.4,0.0,
257,97,66,49,214.4,5.8,0.5,0.0,
258,94,71,49,618.0,12.9,0.4,0.0,
259,93,70,43,551.1,7.8,0.3,0.0,
260,96,62,40,299.3,3.3,0.3,0.0,
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262,90,69,52,562.2,6.1,0.3,0.0,
263,80,66,65,475.6,8.7,0.3,0.6,
264,82,63,56,595.5,8.1,0.4,0.0,
265,86,63,53,591.7,6.0,0.4,0.0,
266,83,61,45,438.1,6.5,0.4,0.0,
267,85,61,37,344.6,8.3,0.3,0.0,
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269,68,60,56,576.3,7.9,0.3,0.0,
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271,75,59,54,544.9,3.2,0.3,0.0,
272,72,59,54,564.6,6.0,0.3,0.0,
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120,69,46,16,502.9,6.4,0.4,0.00,
121,86,42,12,375.0,9.3,0.3,0.00,
122,91,52,11,509.6,11.4,0.4,0.00,
123,92,64,13,544.6,1.3,0.3,0.00,
124,92,63,17,657.9,12.4,0.3,0.00,
125,93,64,17,513.0,9.4,0.4,0.00,
126,95,53,19,743.4,7.8,0.4,0.00,

127,95,55,17,746.7,7.8,0.3,0.00,
128,96,65,30,655.1,6.0,0.2,0.00,
129,96,58,25,750.2,6.1,0.2,0.00,
130,94,60,32,751.9,9.3,0.3,0.00,
131,92,64,31,598.6,6.4,0.2,0.00,
132,97,61,43,755.2,5.0,0.3,0.00,
133,100,66,45,756.8,5.1,0.2,0.00,
134,102,66,39,485.9,12.6,0.3,0.00,
135,97,79,32,717.8,15.0,0.3,0.00,
136,96,76,26,693.8,12.7,0.3,0.00,
137,97,71,33,644.8,11.4,0.4,0.00,
138,95,69,34,589.8,11.3,0.3,0.00,
139,99,75,35,765.2,13.5,0.4,0.00,
140,97,76,30,627.4,13.3,0.3,0.00,
141,97,77,29,721.3,14.7,0.3,0.00,
142,98,73,28,768.8,1.8,0.4,0.00,
143,97,70,24,769.9,15.9,0.3,0.00,
144,92,72,32,709.6,17.8,0.4,0.00,
145,94,72,38,771.9,13.8,0.3,0.00,
146,86,67,30,579.5,13.5,0.3,0.00,
147,80,62,24,690.3,15.3,0.3,0.00,
148,87,58,26,595.1,13.1,0.3,0.00,
149,88,71,18,680.9,11.5,0.3,0.00,
150,95,58,20,776.3,6.5,0.3,0.00,
151,95,62,22,460.9,8.2,0.3,0.00,
152,93,63,19,777.8,1.3,0.2,0.00,
153,96,56,19,760.3,5.7,0.3,0.00,
154,99,63,31,704.9,5.5,0.4,0.00,
155,99,68,47,623.3,8.4,0.3,0.00,
156,100,67,36,562.5,4.9,0.4,0.00,
157,103,72,28,631.7,9.7,0.4,0.00,
158,105,82,27,454.8,11.3,0.3,0.00,
159,91,69,46,729.1,12.2,0.3,0.00,
160,98,67,48,636.4,7.0,0.3,0.00,
161,101,69,42,508.3,9.4,0.2,0.00,
162,102,68,38,518.5,5.0,0.2,0.00,
163,101,78,39,689.5,8.0,0.2,0.00,
164,98,70,44,783.0,1.9,0.2,0.00,
165,86,70,55,733.6,6.9,0.2,0.05,
166,91,66,58,783.2,6.8,0.3,0.08,
167,93,63,51,670.1,4.8,0.2,0.00,
168,98,65,50,725.4,8.0,0.2,0.00,
169,99,69,51,637.9,6.0,0.3,0.00,
170,103,73,46,653.3,3.8,0.3,0.00,
171,105,67,38,574.5,8.2,0.3,0.00,
172,106,74,35,783.2,6.9,0.3,0.00,
173,107,74,40,783.0,9.8,0.4,0.00,
174,102,76,46,738.6,1.4,0.3,0.00,
175,98,74,45,782.6,9.0,0.3,0.00,
176,99,73,43,782.3,13.8,0.3,0.00,
177,98,72,48,752.6,8.6,0.2,0.00,
178,95,67,60,781.7,12.6,0.3,0.90,
179,80,67,65,781.3,8.5,0.4,0.18,
180,87,68,64,459.7,5.4,0.4,0.00,
181,88,65,62,780.4,9.4,0.4,1.15,
182,90,67,55,779.9,9.4,0.4,0.00,
183,94,69,54,779.4,6.0,0.4,0.00,
184,93,71,56,653.5,6.7,0.4,0.00,
185,89,67,59,717.2,9.1,0.4,0.25,
186,94,73,57,314.9,6.1,0.4,0.00,
187,98,73,55,776.8,6.0,0.4,0.00,
188,99,74,45,597.2,5.3,0.4,0.00,
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192,93,69,63,772.7,9.0,0.5,0.56,
193,92,68,63,771.8,4.7,0.4,0.02,
194,95,73,59,770.8,5.8,0.4,0.00,
195,94,70,61,769.8,7.8,0.4,0.13,
196,85,68,63,663.4,6.2,0.5,0.28,
197,86,67,65,767.6,8.1,0.5,0.35,
198,90,69,64,765.0,5.4,0.5,0.02,
199,92,71,60,493.9,7.4,0.4,0.00,
200,97,70,61,636.3,8.7,0.5,0.23,
201,92,69,61,705.9,5.9,0.5,0.00,
202,97,72,61,553.5,7.8,0.5,0.02,
203,93,69,60,758.7,7.3,0.5,0.01,
204,97,72,58,662.9,7.9,0.5,0.00,
205,97,74,57,688.2,7.0,0.5,0.00,
206,96,72,55,755.7,8.5,0.5,0.01,
207,92,70,55,607.0,9.7,0.5,0.00,
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209,95,73,53,404.9,8.9,0.6,0.00,
210,95,75,56,749.3,7.5,0.5,0.00,
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214,94,72,59,720.5,6.2,0.6,0.05,
215,90,74,57,621.6,8.0,0.5,0.00,
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217,91,72,58,617.6,11.9,0.5,0.00,
218,95,76,50,513.5,9.2,0.4,0.00,
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220,92,67,54,607.3,11.9,0.5,0.00,
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225,96,64,48,500.4,6.2,0.5,0.00,
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227,99,70,45,639.9,6.3,0.5,0.00,
228,98,70,45,526.3,5.0,0.5,0.00,
229,98,73,46,709.2,6.7,0.4,0.00,
230,94,66,55,706.6,8.2,0.5,0.86,
231,88,66,58,584.0,6.7,0.5,0.00,
232,92,73,56,533.0,9.1,0.4,0.01,
233,89,68,61,692.9,6.9,0.4,0.02,
234,91,68,58,610.9,6.5,0.5,0.00,
235,91,72,51,693.1,8.4,0.4,0.00,
236,85,69,56,619.7,1.7,0.5,0.09,
237,85,62,59,464.6,8.3,0.4,0.00,
238,79,69,63,684.5,7.0,0.4,0.00,
239,84,69,63,681.5,5.1,0.4,0.07,
240,85,68,62,526.0,7.3,0.4,0.02,
241,77,68,65,675.5,5.6,0.4,0.61,
242,87,64,54,672.4,8.2,0.4,0.00,
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244,90,68,59,436.5,7.8,0.4,0.00,
245,94,66,56,580.5,8.4,0.5,0.47,
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247,87,67,56,607.6,8.9,0.4,0.00,
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252,90,64,59,516.4,6.9,0.4,0.60,

253,88,65,56,586.9,6.3,0.4,0.00,
254,86,66,56,535.2,6.8,0.4,0.02,
255,83,67,61,558.6,9.2,0.4,0.05,
256,76,63,58,528.1,9.0,0.4,0.00,
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272,80,49,34,564.6,6.1,0.3,0.00,
273,85,49,30,475.3,5.5,0.3,0.00,
274,86,52,37,258.3,5.3,0.3,0.00,
275,90,62,42,389.0,3.3,0.3,0.00,
276,91,56,39,313.4,9.8,0.3,0.00,
277,75,58,50,452.0,11.7,0.3,0.00,
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16,68,37,17,252.8,1.7,0.1,0.00,
17,62,28,14,174.3,6.0,0,0.00,
18,67,26,12,213.1,5.4,0,0.00,
19,68,25,17,265.8,4.9,0,0.00,
20,71,29,15,390.8,7.3,0.3,0.00,
21,61,31,30,368.3,6.9,0.4,0.00,
22,60,29,34,274.6,5.1,0.2,0.00,
23,63,29,35,332.9,4.7,0.9,0.00,
24,71,40,37,246.7,6.9,0.6,0.00,
25,71,42,30,269.0,11.7,0.1,0.00,
26,56,41,20,391.6,12.1,0.6,0.00,
27,56,34,13,409.5,8.4,0.1,0.00,
28,46,32,20,412.4,1.1,1,0.02,
29,44,32,29,415.3,5.5,0.7,0.01,
30,55,30,24,266.4,9.7,0.3,0.00,
31,42,22,17,209.3,8.2,0.7,0.00,
32,46,16,11,318.8,8.7,0.2,0.00,
33,52,15,10,363.9,5.9,0.8,0.00,
34,63,24,13,342.4,7.0,0.8,0.00,
35,61,42,27,273.8,11.0,0.7,0.00,
36,64,32,26,336.6,6.6,0.3,0.00,
37,66,27,21,427.9,6.5,0.1,0.00,
38,74,35,20,444.5,9.7,0.8,0.00,
39,61,45,37,369.0,9.7,0.9,0.23,
40,58,39,32,262.9,9.1,0.3,0.00,
41,60,38,29,251.1,7.5,0.3,0.00,
42,73,42,24,458.7,13.6,0.4,0.00,
43,59,36,17,462.3,1.5,0.1,0.00,
44,56,27,12,383.3,7.8,0.2,0.00,
45,64,37,18,469.7,5.8,0.7,0.00,
46,72,38,23,448.2,6.6,0,0.00,
47,76,34,21,298.6,5.4,0.3,0.00,
48,76,40,27,359.6,6.9,0.7,0.00,
49,76,52,26,246.2,14.5,0.5,0.00,
50,62,45,20,321.7,13.5,0.3,0.00,
51,61,38,21,270.4,6.5,0.7,0.00,
52,64,40,23,496.6,9.9,0.8,0.00,
53,58,45,18,280.6,16.2,0.1,0.00,
54,58,33,10,192.6,6.4,0.1,0.00,
55,66,24,10,101.7,7.0,0.1,0.00,
56,75,32,13,281.6,7.3,0.5,0.00,
57,70,38,21,357.3,5.4,0.4,0.00,
58,74,46,29,444.0,7.8,0.4,0.00,
59,67,51,27,341.4,12.7,0.2,0.00,
60,68,38,31,410.7,6.7,0,0.00,
61,68,37,25,438.7,6.5,0.6,0.00,
62,73,40,22,536.5,5.8,0.8,0.00,
63,78,48,35,340.6,6.9,0.7,0.00,

64,77,50,32,544.7,1.8,0,0.00,
65,79,40,24,272.8,7.7,0,0.00,
66,81,43,25,360.5,1.1,0.1,0.00,
67,64,38,34,556.9,11.6,0.3,0.02,
68,59,35,29,531.3,7.6,0.3,0.00,
69,68,30,21,520.2,7.3,0,0.00,
70,76,37,19,448.7,9.7,0.2,0.00,
71,68,47,25,364.7,11.7,0.4,0.00,
72,59,42,35,202.4,11.3,0.9,0.04,
73,59,46,46,581.0,7.6,1,0.31,
74,75,50,47,511.3,6.2,0.6,0.00,
75,77,48,46,429.0,6.2,0.3,0.00,
76,83,53,39,134.9,9.2,0.3,0.00,
77,82,54,36,356.2,8.7,0.4,0.00,
78,78,62,40,600.8,1.2,0.8,0.00,
79,68,56,42,383.6,14.2,0.8,0.00,
80,74,47,35,250.9,5.1,0,0.00,
81,80,47,31,594.4,1.9,0.4,0.00,
82,76,59,26,616.2,13.8,0.8,0.00,
83,78,58,34,620.0,9.0,0.2,0.00,
84,80,50,30,490.4,11.7,0.7,0.00,
85,67,49,28,535.0,17.8,0.3,0.00,
86,60,36,26,330.3,11.6,0.6,0.00,
87,60,29,15,528.8,6.6,0.1,0.00,
88,72,33,16,638.5,6.6,0.6,0.00,
89,66,41,23,567.9,11.1,0.4,0.00,
90,78,37,28,501.2,5.4,0,0.00,
91,83,50,29,403.7,8.5,0.2,0.00,
92,82,56,24,443.4,1.0,0.2,0.00,
93,79,45,29,518.7,6.9,0.5,0.00,
94,79,56,26,616.0,14.7,0.7,0.00,
95,73,48,17,549.7,16.4,0.1,0.00,
96,74,40,20,353.7,8.0,0.2,0.00,
97,82,46,19,451.8,11.5,0.4,0.00,
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101,72,47,24,678.5,8.0,0.2,0.00,
102,78,42,23,539.9,5.6,0.6,0.00,
103,83,45,24,656.1,8.6,0.6,0.00,
104,86,62,26,436.6,12.6,0.3,0.00,
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106,81,51,29,578.7,1.6,0,0.00,
107,85,45,23,677.2,6.9,0.1,0.00,
108,90,50,24,439.9,5.5,0.8,0.00,
109,95,52,29,583.4,5.9,0.7,0.00,
110,88,59,40,705.2,8.8,0.4,0.00,
111,91,59,43,703.1,6.5,0.5,0.00,
112,87,63,48,609.7,8.9,0.6,0.02,
113,81,60,51,545.1,8.4,0.8,0.63,
114,83,57,39,718.6,12.0,0.1,0.00,
115,77,51,26,543.5,16.0,0.1,0.00,
116,81,58,27,723.5,14.3,0.1,0.00,
117,78,52,29,725.8,13.2,0.2,0.00,
118,79,43,26,726.0,9.1,0,0.00,
119,75,48,24,730.4,1.9,0,0.00,
120,79,44,30,502.9,7.5,0,0.00,
121,85,51,32,375.0,1.8,0.3,0.00,
122,83,57,26,509.6,9.3,0.2,0.00,
123,87,61,28,544.6,9.0,0.1,0.00,
124,93,55,35,657.9,5.8,0,0.00,
125,96,63,47,513.0,8.4,0.4,0.00,
126,92,64,40,743.4,1.4,0.8,0.00,

127,88,68,34,746.7,11.0,1,0.00,
128,80,60,45,655.1,12.5,0.9,0.00,
129,85,53,36,750.2,8.2,0,0.00,
130,86,49,38,751.9,7.7,0,0.00,
131,86,58,44,598.6,7.0,0.2,0.00,
132,84,61,44,755.2,9.1,0.6,0.00,
133,86,59,39,756.8,11.4,0.3,0.00,
134,91,63,44,485.9,7.6,0.4,0.00,
135,94,63,43,717.8,1.5,0.2,0.00,
136,94,66,36,693.8,1.5,0.4,0.00,
137,94,61,34,644.8,7.0,0.5,0.00,
138,93,64,47,589.8,7.6,0.5,0.00,
139,92,63,48,765.2,8.1,0,0.00,
140,93,62,47,627.4,7.0,0,0.00,
141,91,65,50,721.3,8.3,0.6,0.00,
142,80,61,52,768.8,9.1,0.7,0.16,
143,92,57,51,769.9,7.0,0.8,0.12,
144,91,62,58,709.6,7.5,0.6,0.25,
145,88,63,42,771.9,11.3,0.1,0.00,
146,81,59,43,579.5,8.9,0.2,0.00,
147,89,61,45,690.3,5.9,0.1,0.00,
148,97,63,41,595.1,5.0,0.4,0.00,
149,99,65,38,680.9,6.1,0.6,0.00,
150,103,68,38,776.3,5.5,0.7,0.00,
151,101,73,50,460.9,9.7,0.8,0.27,
152,101,68,52,777.8,1.9,0.5,0.37,
153,98,67,54,760.3,8.4,0.3,0.00,
154,96,65,54,704.9,9.0,0.2,0.30,
155,97,67,53,623.3,6.3,0.2,0.00,
156,100,67,42,562.5,7.7,0.3,0.00,
157,102,72,40,631.7,8.6,0.2,0.00,
158,100,79,46,454.8,11.2,0.3,0.00,
159,100,76,34,729.1,9.7,0,0.00,
160,102,73,38,636.4,7.8,0,0.00,
161,107,68,47,508.3,8.2,0.3,0.00,
162,102,77,45,518.5,12.6,0.8,0.00,
163,103,73,45,689.5,1.2,0.4,0.00,
164,102,76,47,783.0,8.3,0.2,0.00,
165,104,78,43,733.6,9.3,0.1,0.00,
166,100,82,41,783.2,1.5,0,0.00,
167,104,79,41,670.1,8.3,0.1,0.00,
168,106,79,50,725.4,12.1,0.5,0.00,
169,101,74,52,637.9,1.2,0.5,0.00,
170,97,74,49,653.3,1.3,0.5,0.00,
171,99,73,51,574.5,9.6,0.3,0.00,
172,94,76,54,783.2,7.9,0.7,0.00,
173,98,72,52,783.0,7.9,0.5,0.00,
174,104,72,49,738.6,9.3,0,0.00,
175,107,71,45,782.6,6.7,0,0.00,
176,111,79,42,782.3,7.6,0,0.00,
177,112,80,42,752.6,7.7,0,0.00,
178,113,81,43,781.7,9.9,0.3,0.00,
179,113,81,40,781.3,9.2,0.9,0.00,
180,111,82,44,459.7,7.7,0.5,0.00,
181,114,77,43,780.4,7.2,0.7,0.00,
182,111,85,44,779.9,7.5,0.4,0.00,
183,108,83,47,779.4,9.7,0.7,0.00,
184,108,85,47,653.5,1.5,0.8,0.00,
185,103,84,46,717.2,12.7,0.8,0.00,
186,102,78,47,314.9,12.7,0.1,0.00,
187,100,78,34,776.8,11.8,0,0.00,
188,104,78,32,597.2,8.1,0,0.00,
189,102,72,50,377.8,11.5,0.3,0.02,

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191,102,71,50,760.5,7.3,0.1,0.00,
192,103,75,48,772.7,9.2,0.3,0.00,
193,107,79,46,771.8,8.6,0.2,0.00,
194,107,76,44,770.8,8.4,0.4,0.00,
195,102,70,50,769.8,9.5,0.3,0.00,
196,102,75,51,663.4,1.2,0.4,0.00,
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202,101,75,55,553.5,11.0,0.6,0.02,
203,99,72,56,758.7,7.1,0.5,0.00,
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210,97,66,56,749.3,9.0,0.5,0.00,
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215,99,72,54,621.6,8.6,0.5,0.01,
216,97,73,50,551.6,1.3,0.2,0.00,
217,95,72,52,617.6,9.7,0.2,0.00,
218,100,73,52,513.5,6.6,0.3,0.00,
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224,97,73,51,518.5,6.3,0.1,0.00,
225,102,71,48,500.4,6.8,0.1,0.00,
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228,99,74,55,526.3,6.2,0.4,0.00,
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235,103,75,52,693.1,4.9,0.3,0.00,
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242,98,71,56,672.4,8.3,0.7,0.00,
243,93,71,58,564.2,8.0,0.6,0.00,
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245,92,70,58,580.5,1.7,0.3,0.00,
246,91,71,59,525.9,9.0,0.8,0.00,
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237,86,70,59,464.6,1.5,0.6,0.00,
238,91,63,54,684.5,6.3,0.1,0.00,
239,93,64,57,681.5,6.6,0.1,0.00,
240,92,67,56,526.0,8.0,0.2,0.00,
241,96,67,56,675.5,5.9,0.3,0.00,
242,93,73,55,672.4,1.4,0.9,0.00,
243,91,70,52,564.2,7.9,0.4,0.00,
244,94,64,50,436.5,7.2,0.3,0.00,
245,95,65,49,580.5,8.0,0,0.00,
246,95,67,46,525.9,6.5,0.4,0.00,
247,97,64,43,607.6,5.8,0.6,0.00,
248,99,67,44,612.4,8.6,0.6,0.00,
249,98,66,44,642.5,8.1,0.1,0.00,
250,97,69,42,617.0,6.5,0,0.00,
251,100,62,45,244.9,7.0,0.4,0.00,
252,100,74,49,516.4,8.2,0.5,0.00,

253,98,68,38,586.9,7.7,0,0.00,
254,99,61,38,535.2,8.7,0.1,0.00,
255,90,61,53,558.6,8.0,0.1,0.00,
256,91,61,53,528.1,6.9,0,0.00,
257,96,70,53,214.4,7.8,0.2,0.00,
258,89,69,61,618.0,9.0,0.8,0.00,
259,88,67,63,551.1,8.3,0.6,0.01,
260,89,66,63,299.3,7.0,0.4,0.14,
261,95,66,58,546.7,5.4,0.1,0.00,
262,96,69,55,562.2,8.1,0.4,0.00,
263,93,67,57,475.6,6.5,0.7,0.00,
264,88,71,54,595.5,13.4,0.4,0.00,
265,92,66,50,591.7,1.1,0,0.00,
266,87,62,41,438.1,9.2,0,0.00,
267,84,56,45,344.6,8.2,0,0.00,
268,86,57,45,580.2,5.3,0,0.00,
269,91,59,41,576.3,9.2,0,0.00,
270,86,62,37,572.4,8.7,0,0.00,
271,89,57,42,544.9,6.6,0,0.00,
272,86,53,37,564.6,1.8,0,0.00,
273,84,52,37,475.3,8.9,0,0.00,
274,84,52,31,258.3,6.2,0,0.00,
275,84,47,30,389.0,5.4,0,0.00,
276,85,48,28,313.4,5.3,0,0.00,
277,86,50,28,452.0,5.4,0,0.00,
278,89,51,26,428.5,5.0,0,0.00,
279,91,53,28,537.0,5.8,0.3,0.00,
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281,82,52,21,529.1,8.8,0,0.00,
282,75,43,24,494.2,6.0,0,0.00,
283,84,39,23,282.0,6.9,0,0.00,
284,81,43,25,222.5,8.1,0,0.00,
285,86,44,29,367.1,5.6,0,0.00,
286,89,47,28,448.9,7.1,0,0.00,
287,88,47,34,388.6,8.7,0.2,0.00,
288,84,61,41,417.5,1.8,0.1,0.00,
289,82,61,36,312.0,9.4,0,0.00,
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291,85,51,35,316.1,5.1,0,0.00,
292,87,46,37,335.5,6.2,0.3,0.00,
293,87,57,45,482.6,6.9,0.6,0.00,
294,79,60,46,478.9,7.8,0.9,0.00,
295,83,53,50,475.2,7.9,0.6,0.00,
296,73,57,55,405.5,6.9,0.9,0.10,
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301,82,47,37,357.3,6.1,0.4,0.00,
302,65,52,49,214.5,9.3,0.7,0.09,
303,71,52,52,380.1,8.0,0.5,0.02,
304,73,58,42,284.4,11.2,0,0.00,
305,75,55,44,389.5,12.3,0.5,0.00,
306,66,46,22,377.1,9.0,0,0.00,
307,74,36,26,346.2,1.0,0.2,0.00,
308,64,37,30,241.9,11.3,0.7,0.08,
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310,54,35,28,423.6,5.1,0.8,0.00,
311,61,31,23,420.5,6.0,0.1,0.00,
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314,71,50,35,411.6,8.7,0.2,0.00,
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331,50,20,14,137.2,7.3,0,0.00,
332,53,18,14,344.8,5.5,0,0.00,
333,54,17,15,73.6,6.5,0,0.00,
334,57,21,14,200.7,6.2,0.5,0.00,
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338,56,44,38,360.8,7.3,1,0.05,
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351,48,33,24,280.4,9.0,0.4,0.00,
352,52,23,22,277.9,6.3,0.2,0.00,
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355,50,36,25,351.0,7.2,0.9,0.00,
356,59,34,30,320.2,5.6,0.8,0.00,
357,64,35,36,243.5,6.6,0.4,0.00,
358,61,35,18,351.7,1.4,0.6,0.00,
359,55,39,23,352.1,8.3,0.9,0.00,
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4,51,39,37,196.4,4.6,0.9,0.00,
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7,62,37,38,343.4,5.1,0.3,0.00,
8,63,29,34,306.8,4.8,0.5,0.00,
9,57,38,36,365.6,9.2,0.7,0.00,
10,58,38,34,256.6,8.6,0.4,0.02,
11,56,30,26,263.8,5.5,0.2,0.00,
12,56,26,22,281.7,5.5,0.5,0.00,
13,62,22,22,128.6,6.4,0,0.00,
14,60,38,24,356.4,11.4,0.3,0.00,
15,57,25,19,341.5,6.9,0,0.00,
16,55,28,25,252.8,9.5,0.6,0.00,
17,45,37,35,174.3,11.1,1,0.15,
18,52,35,34,213.1,7.6,0.5,0.42,
19,55,35,31,265.8,1.6,0.1,0.00,
20,52,32,30,390.8,9.2,0.9,0.02,
21,34,29,27,368.3,6.9,1,0.04,
22,49,30,31,274.6,4.9,0.8,0.00,
23,48,33,36,332.9,6.3,0.6,0.08,
24,53,29,29,246.7,6.5,0,0.00,
25,60,34,29,269.0,6.3,0.4,0.00,
26,62,30,28,391.6,5.9,0.4,0.00,
27,64,43,17,409.5,8.8,0.3,0.00,
28,62,33,24,412.4,1.7,0.3,0.00,
29,60,39,29,415.3,11.3,0.5,0.00,
30,52,25,26,266.4,5.0,0.2,0.08,
31,59,22,23,209.3,3.3,0,0.00,
32,63,29,23,318.8,7.3,0.5,0.00,
33,68,36,26,363.9,6.4,0.7,0.00,
34,68,35,34,342.4,6.4,0.4,0.00,
35,66,40,21,273.8,7.5,0,0.00,
36,64,31,26,336.6,5.7,0,0.00,
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38,65,34,25,444.5,11.4,0,0.00,
39,72,35,24,369.0,8.7,0.2,0.00,
40,64,35,29,262.9,8.3,0.8,0.00,
41,61,41,31,251.1,7.9,1,0.00,
42,52,46,44,458.7,4.5,1,0.13,
43,67,45,49,462.3,8.3,0.8,0.14,
44,70,50,40,383.3,13.4,0.4,0.00,
45,71,42,30,469.7,5.0,0.2,0.00,
46,64,36,29,448.2,7.1,0.6,0.00,
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49,51,40,37,246.2,11.1,0.9,0.10,
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52,67,28,27,496.6,5.5,0,0.00,
53,71,31,26,280.6,5.8,0.4,0.00,
54,71,42,24,192.6,6.1,1,0.00,
55,72,53,22,101.7,9.6,0.9,0.00,
56,59,37,24,281.6,6.9,0.9,0.00,
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58,67,34,32,444.0,5.6,0.4,0.00,
59,57,46,43,341.4,9.9,0.8,0.20,
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61,58,46,35,438.7,2.4,0.3,0.07,
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67,63,29,11,556.9,5.7,0,0.00,
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69,79,40,31,520.2,7.9,0.8,0.00,
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72,65,37,12,202.4,6.2,0.8,0.00,
73,69,38,17,581.0,13.6,0.2,0.00,
74,65,37,18,511.3,7.6,0.2,0.00,
75,53,37,19,429.0,16.0,0.3,0.00,
76,64,26,16,134.9,5.8,0.3,0.00,
77,76,36,17,356.2,5.5,0.8,0.00,
78,72,52,35,600.8,15.6,0.8,0.00,
79,68,39,30,383.6,8.3,0.6,0.00,
80,65,40,28,250.9,15.8,0.4,0.00,
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86,69,41,26,330.3,1.7,0.2,0.00,
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89,62,39,19,567.9,1.5,0.1,0.00,
90,69,26,19,501.2,5.8,0,0.00,
91,84,35,22,403.7,1.9,0.2,0.00,
92,76,53,19,443.4,13.7,0,0.00,
93,78,41,18,518.7,6.7,0.5,0.00,
94,73,47,34,616.0,1.3,0.4,0.00,
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97,86,62,23,451.8,14.4,0.2,0.00,
98,81,58,19,291.3,11.9,0.4,0.00,
99,78,45,14,459.9,8.9,0,0.00,
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120,84,45,17,502.9,7.3,0.4,0.00,
121,86,47,24,375.0,6.6,0.1,0.00,
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123,81,47,18,544.6,11.9,0,0.00,
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132,89,54,25,755.2,7.3,0.4,0.00,
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164,91,65,44,783.0,11.0,0.6,0.00,
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166,93,55,34,783.2,6.3,0,0.00,
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168,102,61,32,725.4,6.1,0,0.00,
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187,98,68,53,776.8,7.2,0.2,0.00,
188,99,70,55,597.2,7.4,0.3,0.00,
189,100,71,56,377.8,8.3,0.4,0.02,

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145,96,72,34,771.9,12.5,0.3,0.00,
146,93,69,29,579.5,11.9,0.3,0.00,
147,93,58,25,690.3,5.9,0,0.00,
148,96,60,40,595.1,1.1,0.1,0.00,
149,84,67,27,680.9,13.7,0,0.00,
150,88,54,31,776.3,7.1,0.2,0.00,
151,91,63,31,460.9,8.3,0,0.00,
152,95,68,29,777.8,11.7,0,0.00,
153,95,61,29,760.3,6.1,0,0.00,
154,101,55,32,704.9,5.5,0,0.00,
155,103,69,48,623.3,9.7,0.1,0.00,
156,104,77,41,562.5,11.0,0.4,0.00,
157,102,76,40,631.7,9.5,0.8,0.00,
158,100,80,41,454.8,9.3,1,0.00,
159,102,74,44,729.1,8.1,0.5,0.00,
160,97,79,49,636.4,1.1,0.8,0.00,
161,97,75,53,508.3,6.6,0.7,0.00,
162,98,76,56,518.5,7.6,0.8,0.00,
163,98,79,47,689.5,11.0,0.5,0.00,
164,98,74,45,783.0,12.2,0.1,0.00,
165,99,71,45,733.6,9.0,0.2,0.00,
166,95,78,45,783.2,9.5,0.7,0.00,
167,97,72,40,670.1,1.4,0.1,0.00,
168,103,61,43,725.4,6.2,0.2,0.00,
169,104,73,53,637.9,8.1,0.2,0.00,
170,106,78,48,653.3,9.5,0.1,0.00,
171,103,75,44,574.5,8.8,0.1,0.00,
172,106,73,48,783.2,6.4,0.1,0.00,
173,99,70,53,783.0,1.7,0,0.00,
174,105,72,51,738.6,6.2,0.1,0.00,
175,106,76,47,782.6,6.9,0.1,0.00,
176,110,68,42,782.3,7.1,0.5,0.00,
177,110,71,44,752.6,8.3,0.2,0.00,
178,105,76,45,781.7,7.9,0.1,0.00,
179,106,74,47,781.3,7.4,0.1,0.00,
180,103,74,49,459.7,9.6,0.1,0.00,
181,98,72,48,780.4,11.0,0,0.00,
182,96,69,51,779.9,1.1,0.3,0.00,
183,89,67,55,779.4,6.4,0.8,0.00,
184,94,68,60,653.5,8.1,0.5,0.01,
185,96,73,61,717.2,6.7,0.7,0.01,
186,94,73,60,314.9,7.4,0.8,0.00,
187,97,71,52,776.8,7.1,0.3,0.00,
188,98,71,55,597.2,9.3,0.3,0.00,
189,95,70,59,377.8,6.9,0.6,0.00,

190,97,74,61,684.1,7.2,0.7,0.00,
191,97,71,63,760.5,6.6,0.4,0.00,
192,99,70,55,772.7,9.6,0.6,0.00,
193,85,69,62,771.8,1.6,0.7,0.02,
194,93,62,55,770.8,9.1,0.6,0.00,
195,94,67,59,769.8,8.8,0.9,0.15,
196,84,67,63,663.4,6.9,0.9,0.01,
197,92,63,59,767.6,6.5,0.6,0.00,
198,97,67,60,765.0,6.8,0.3,0.02,
199,96,67,58,493.9,7.3,0.3,0.00,
200,97,68,59,636.3,8.2,0.3,0.00,
201,99,71,63,705.9,5.8,0.4,0.23,
202,96,71,63,553.5,9.0,0.8,0.00,
203,86,68,60,758.7,11.1,0.6,0.00,
204,88,65,58,662.9,7.2,0.2,0.00,
205,92,65,59,688.2,8.3,0.6,0.00,
206,95,69,61,755.7,9.6,0.6,0.00,
207,95,65,63,607.0,8.2,0.4,1.28,
208,93,66,61,276.5,8.7,0.4,0.53,
209,89,66,62,404.9,8.7,0.6,0.04,
210,84,63,63,749.3,7.8,0.5,1.07,
211,79,64,64,495.7,7.4,0.7,0.55,
212,79,65,64,745.9,7.4,0.8,0.04,
213,84,64,63,744.1,5.7,0.6,0.00,
214,91,67,59,720.5,9.2,0.4,0.00,
215,92,69,59,621.6,8.1,0.3,0.00,
216,91,66,58,551.6,9.5,0.3,0.00,
217,87,66,57,617.6,11.3,0.8,0.00,
218,71,61,61,513.5,9.0,1,0.35,
219,67,58,61,593.8,5.5,1,0.84,
220,84,62,63,607.3,5.8,0.6,0.00,
221,92,62,61,509.3,6.2,0,0.00,
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223,90,68,57,481.1,6.1,0.8,0.00,
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225,81,64,64,500.4,7.1,0.9,0.15,
226,86,61,61,506.2,6.5,0.5,0.03,
227,86,66,62,639.9,6.2,0.6,0.01,
228,87,66,62,526.3,9.2,0.6,0.00,
229,91,65,54,709.2,9.1,0.5,0.00,
230,92,67,55,706.6,8.1,0.2,0.00,
231,95,65,56,584.0,6.1,0.4,0.00,
232,90,65,61,533.0,11.4,0.8,0.25,
233,78,64,66,692.9,7.4,1,0.29,
234,85,63,62,610.9,6.9,0.8,0.03,
235,88,60,59,693.1,5.0,0.1,0.00,
236,92,66,59,619.7,6.1,0.1,0.00,
237,95,62,56,464.6,5.2,0,0.00,
238,97,69,62,684.5,6.2,0.3,0.00,
239,98,67,59,681.5,5.7,0.2,0.00,
240,97,69,54,526.0,7.4,0.1,0.00,
241,96,66,48,675.5,8.0,0,0.00,
242,96,63,53,672.4,6.0,0.1,0.00,
243,96,67,56,564.2,6.4,0.1,0.00,
244,93,69,63,436.5,5.8,0.6,0.06,
245,93,63,57,580.5,5.9,0.6,0.03,
246,86,64,55,525.9,1.1,0.4,0.00,
247,82,63,62,607.6,9.4,0.7,0.00,
248,83,67,66,612.4,6.3,1,0.02,
249,89,65,64,642.5,6.0,0.4,0.00,
250,95,65,63,617.0,6.5,0.4,0.00,
251,92,68,62,244.9,7.2,0.4,0.00,
252,94,62,57,516.4,5.1,0,0.00,

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255,93,63,51,558.6,6.7,0.2,0.00,
256,91,58,50,528.1,6.0,0.2,0.00,
257,81,61,57,214.4,7.3,0.7,0.01,
258,82,61,59,618.0,6.7,0.5,0.00,
259,87,57,59,551.1,5.0,0.3,0.20,
260,90,60,55,299.3,7.2,0,0.00,
261,91,61,60,546.7,8.7,0.4,0.04,
262,88,64,64,562.2,5.5,0.5,0.05,
263,86,63,62,475.6,6.7,0.5,0.53,
264,88,66,64,595.5,5.9,0.8,0.00,
265,76,62,64,591.7,8.1,1,0.93,
266,62,54,58,438.1,8.7,1,0.55,
267,73,54,57,344.6,4.6,0.8,0.00,
268,85,54,58,580.2,4.6,0,0.00,
269,90,57,55,576.3,4.5,0.1,0.00,
270,88,57,52,572.4,5.9,0,0.00,
271,87,61,55,544.9,4.6,0.7,0.00,
272,84,61,57,564.6,5.4,0.8,0.00,
273,71,60,61,475.3,1.0,1,1.04,
274,69,58,61,258.3,4.6,0.9,0.44,
275,71,57,58,389.0,7.8,0.7,0.14,
276,80,55,52,313.4,6.6,0,0.00,
277,84,52,52,452.0,6.5,0,0.00,
278,84,56,58,428.5,5.9,0.7,0.00,
279,84,59,58,537.0,8.3,0.1,0.00,
280,87,61,54,455.5,8.3,0.1,0.00,
281,84,57,47,529.1,11.3,0.1,0.00,
282,68,47,33,494.2,8.4,0,0.00,
283,72,40,34,282.0,4.6,0,0.00,
284,81,43,34,222.5,8.0,0,0.00,
285,76,47,34,367.1,6.7,0.1,0.00,
286,83,43,32,448.9,9.6,0,0.00,
287,84,50,25,388.6,8.2,0,0.00,
288,83,47,35,417.5,7.8,0.4,0.00,
289,83,47,41,312.0,7.4,0.3,0.00,
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291,78,48,38,316.1,7.0,0.1,0.00,
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293,78,56,36,482.6,13.3,0.1,0.00,
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298,81,41,35,425.2,5.1,0,0.00,
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300,85,41,33,259.7,9.4,0.1,0.00,
301,76,47,41,357.3,7.5,0,0.00,
302,77,41,43,214.5,4.0,0,0.00,
303,81,40,38,380.1,3.7,0,0.00,
304,82,42,37,284.4,7.1,0.2,0.00,
305,75,51,43,389.5,8.3,0.9,0.00,
306,76,53,51,377.1,9.8,0.8,0.30,
307,59,40,41,346.2,7.1,0.5,0.08,
308,56,32,34,241.9,5.6,0,0.00,
309,64,31,34,419.3,7.4,0,0.00,
310,70,41,37,423.6,7.5,0.8,0.00,
311,49,33,32,420.5,13.0,0.9,0.58,
312,53,33,34,417.5,6.2,0.5,0.10,
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314,68,32,36,411.6,4.1,0,0.00,
315,71,36,38,363.5,5.8,0,0.00,

316,72,38,39,406.0,6.5,0.2,0.00,
317,73,38,37,403.2,5.5,0.4,0.00,
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319,76,37,39,381.4,4.5,0,0.00,
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322,75,38,42,390.4,5.1,0,0.00,
323,79,39,38,100.7,6.0,0.3,0.00,
324,60,50,51,358.0,8.5,1,0.19,
325,65,50,47,269.1,5.9,0.8,0.03,
326,66,43,35,381.3,7.1,0.5,0.00,
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328,73,40,39,302.6,6.0,0.5,0.00,
329,75,52,48,156.0,8.5,0.7,0.00,
330,69,47,44,217.4,15.3,0.4,0.06,
331,56,43,20,137.2,13.4,0.2,0.00,
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344,63,23,17,354.7,6.3,0,0.00,
345,69,30,26,354.0,6.6,0,0.00,
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349,56,45,44,252.8,7.2,1,0.01,
350,54,47,49,351.5,7.5,1,0.24,
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11,68,23,13,263.8,9.2,0,0.00,
12,45,34,15,281.7,14.1,0.3,0.00,
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24,67,37,27,246.7,7.8,0.3,0.00,
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72,86,54,26,202.4,1.4,0.4,0.00,
73,81,56,22,581.0,1.0,0,0.00,
74,80,43,21,511.3,6.7,0.4,0.00,
75,79,41,23,429.0,7.5,0.6,0.00,
76,82,57,25,134.9,9.2,0.3,0.00,
77,85,46,23,356.2,5.9,0.6,0.00,
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79,80,33,27,383.6,12.1,0.6,0.23,
80,55,33,30,250.9,6.2,0.3,0.02,
81,73,33,24,594.4,5.3,0.3,0.00,
82,76,41,22,616.2,8.8,0.6,0.00,
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85,72,56,26,535.0,1.9,0.7,0.00,
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87,73,39,35,528.8,8.1,0.1,0.00,
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90,75,43,31,501.2,6.4,0,0.00,
91,85,47,30,403.7,11.5,0.2,0.00,
92,83,62,26,443.4,13.6,0.2,0.00,
93,83,62,30,518.7,13.3,0.3,0.00,
94,82,47,29,616.0,5.9,0,0.00,
95,80,52,24,549.7,6.7,0,0.00,
96,89,43,26,353.7,6.8,0.1,0.00,
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275,79,65,63,389.0,4.9,0.9,0.04,
276,82,59,51,313.4,6.8,0.4,0.00,
277,83,56,45,452.0,7.4,0.5,0.00,
278,78,59,57,428.5,7.0,0.9,0.00,
279,73,56,51,537.0,7.4,0.6,0.00,
280,78,48,49,455.5,2.4,0,0.00,
281,83,49,47,529.1,3.6,0.1,0.00,
282,85,57,49,494.2,7.0,0.6,0.00,
283,78,60,57,282.0,6.5,0.5,0.26,
284,69,50,43,222.5,6.5,0.5,0.01,
285,52,44,42,367.1,3.9,0.9,0.05,
286,66,44,43,448.9,3.7,0.4,0.01,
287,73,40,34,388.6,3.2,0,0.00,
288,76,40,36,417.5,5.9,0.4,0.00,
289,66,48,46,312.0,6.1,0.7,0.02,
290,76,47,47,340.2,4.1,0,0.00,
291,83,50,46,316.1,4.6,0.2,0.00,
292,82,54,52,335.5,5.6,0.3,0.00,
293,80,52,47,482.6,4.5,0.2,0.00,
294,78,53,40,478.9,4.7,0.1,0.00,
295,78,42,30,475.2,4.2,0.3,0.00,
296,77,47,38,405.5,3.5,0.6,0.00,
297,75,43,42,285.6,3.0,0.2,0.00,
298,75,43,36,425.2,4.1,0,0.00,
299,76,41,38,165.4,2.3,0.1,0.00,
300,77,37,30,259.7,2.9,0.4,0.00,
301,79,37,27,357.3,2.0,0,0.00,
302,76,42,35,214.5,3.4,0.7,0.00,
303,78,40,38,380.1,3.9,0.1,0.00,
304,81,43,37,284.4,5.3,0.1,0.00,
305,79,44,40,389.5,4.9,0.4,0.02,
306,61,46,49,377.1,8.3,1,0.47,
307,57,45,47,346.2,6.0,0.8,0.85,
308,60,40,39,241.9,4.1,0.1,0.00,
309,63,34,38,419.3,1.5,0,0.00,
310,67,37,39,423.6,5.2,0,0.00,
311,63,44,39,420.5,7.6,0.2,0.00,
312,65,40,30,417.5,4.1,0,0.00,
313,66,39,26,298.6,6.2,0.1,0.00,
314,69,37,34,411.6,4.8,0.5,0.00,
315,59,37,38,363.5,2.2,0.7,0.00,

316,56,33,32,406.0,8.3,0.8,0.00,
317,34,29,28,403.2,5.5,1,0.02,
318,50,33,34,400.5,2.4,0.8,0.00,
319,53,37,39,381.4,3.9,1,0.00,
320,67,41,43,395.3,3.0,0.9,0.00,
321,75,46,46,268.8,6.0,0.6,0.00,
322,67,53,52,390.4,2.6,0.8,0.04,
323,69,49,47,100.7,7.0,0.3,0.02,
324,65,43,38,358.0,4.9,0,0.00,
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326,69,49,38,381.3,8.1,0.2,0.00,
327,54,31,29,379.2,6.4,0.2,0.00,
328,52,24,20,302.6,2.9,0,0.00,
329,59,25,22,156.0,4.9,0,0.00,
330,54,34,24,217.4,5.5,0.2,0.00,
331,59,24,24,137.2,1.6,0,0.00,
332,61,25,25,344.8,2.8,0.1,0.00,
333,65,24,24,73.6,2.7,0.1,0.00,
334,62,37,16,200.7,6.5,0.2,0.00,
335,60,28,18,298.6,3.4,0,0.00,
336,63,20,16,290.9,1.3,0.1,0.00,
337,64,29,18,203.2,3.2,0.3,0.00,
338,63,23,21,360.8,2.7,0.7,0.00,
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340,60,46,42,253.1,4.0,1,0.00,
341,62,44,49,235.2,3.6,0.9,0.28,
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345,42,24,23,354.0,2.3,0.3,0.00,
346,48,20,25,353.3,2.6,0,0.00,
347,50,28,27,326.9,3.0,0.5,0.00,
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349,59,29,36,252.8,2.4,0.5,0.00,
350,47,41,43,351.5,3.7,1,0.16,
351,50,41,46,280.4,4.1,1,0.50,
352,46,36,38,277.9,0.5,0.9,0.08,
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354,58,29,35,350.9,3.1,0.5,0.00,
355,49,40,39,351.0,5.9,1,0.12,
356,44,38,37,320.2,3.9,1,0.07,
357,53,33,37,243.5,2.2,0.5,0.00,
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365,56,23,24,316.1,2.7,0.5,0.00,

1,55,27,27,326.7,7.6,0.7,0.01,
2,35,21,18,338.9,4.7,0.3,0.00,
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4,53,19,22,196.4,4.6,0,0.00,
5,57,22,25,279.8,3.8,0,0.00,
6,58,22,26,271.0,3.6,0.6,0.00,
7,57,31,26,343.4,4.6,0.9,0.00,
8,64,41,29,306.8,11.1,0.6,0.00,
9,54,33,27,365.6,1.4,0.1,0.01,
10,57,27,28,256.6,4.9,0.6,0.00,
11,56,31,26,263.8,11.4,0.7,0.00,
12,31,21,21,281.7,9.5,1,0.22,
13,34,16,21,128.6,3.8,0.9,0.18,
14,40,13,23,356.4,5.2,0.6,0.00,
15,45,32,29,341.5,5.7,0.8,0.00,
16,43,27,30,252.8,5.6,0.7,0.11,
17,48,22,26,174.3,5.7,0,0.00,
18,63,24,28,213.1,5.4,0,0.00,
19,67,26,27,265.8,8.8,0,0.00,
20,44,22,18,390.8,9.4,0.2,0.00,
21,46,17,17,368.3,4.2,0,0.00,
22,54,23,24,274.6,5.3,0.5,0.00,
23,57,29,30,332.9,4.7,0.9,0.00,
24,64,37,31,246.7,4.6,0.9,0.07,
25,61,43,40,269.0,4.0,0.8,0.01,
26,57,43,44,391.6,7.2,1,0.26,
27,57,44,36,409.5,8.0,0.6,0.01,
28,55,38,31,412.4,5.8,0.6,0.00,
29,62,33,33,415.3,8.0,0.4,0.00,
30,60,40,30,266.4,14.5,0.4,0.00,
31,42,19,24,209.3,7.9,1,0.07,
32,24,13,13,318.8,6.9,0.6,0.05,
33,40,8,17,363.9,3.7,0.2,0.00,
34,50,28,27,342.4,8.1,0.7,0.00,
35,49,31,30,273.8,9.4,0.7,0.00,
36,48,30,29,336.6,7.1,0.6,0.01,
37,53,34,22,427.9,9.3,0.3,0.00,
38,56,23,20,444.5,5.2,0,0.00,
39,63,22,23,369.0,6.4,0,0.00,
40,65,38,27,262.9,8.7,0.2,0.00,
41,62,31,26,251.1,9.1,0.2,0.00,
42,53,22,13,458.7,6.2,0,0.00,
43,63,21,14,462.3,5.4,0,0.00,
44,68,30,21,383.3,7.6,0,0.00,
45,63,26,23,469.7,4.7,0,0.00,
46,66,25,21,448.2,4.6,0,0.00,
47,73,27,22,298.6,4.1,0,0.00,
48,77,35,25,359.6,7.6,0.3,0.00,
49,74,36,27,246.2,5.6,0.7,0.00,
50,69,39,40,321.7,4.9,1,0.00,
51,71,47,40,270.4,7.3,0.9,0.00,
52,73,37,25,496.6,7.4,0.5,0.00,
53,60,41,32,280.6,8.9,0.6,0.00,
54,57,37,36,192.6,1.3,0.9,0.13,
55,53,32,31,101.7,5.3,0.3,0.00,
56,64,29,26,281.6,4.9,0,0.00,
57,67,31,28,357.3,6.0,0.8,0.00,
58,67,34,37,444.0,4.6,0.3,0.00,
59,67,51,41,341.4,5.4,0.5,0.00,
60,70,38,35,410.7,7.0,0.1,0.00,
61,77,36,25,438.7,9.4,0.8,0.00,
62,65,39,20,536.5,19.5,0.3,0.00,
63,56,29,12,340.6,8.3,0,0.00,

64,70,23,16,544.7,5.1,0.1,0.00,
65,76,40,25,272.8,5.6,0.9,0.00,
66,77,40,21,360.5,6.4,0.9,0.00,
67,83,36,29,556.9,5.2,0.7,0.00,
68,82,53,50,531.3,7.4,0.7,0.00,
69,83,43,42,520.2,6.3,0.6,0.00,
70,82,45,38,448.7,9.2,0.7,0.00,
71,78,47,39,364.7,11.4,0.6,0.00,
72,59,46,33,202.4,1.1,1,0.00,
73,55,43,35,581.0,9.5,1,0.03,
74,50,39,39,511.3,8.3,1,0.42,
75,60,34,38,429.0,5.8,0.8,0.00,
76,58,39,37,134.9,5.2,0.9,0.00,
77,68,38,40,356.2,5.4,0.7,0.00,
78,62,41,34,600.8,13.5,0.4,0.13,
79,65,44,32,383.6,13.7,0.4,0.00,
80,70,37,33,250.9,6.0,0.1,0.00,
81,70,52,23,594.4,1.8,0,0.00,
82,70,36,15,616.2,6.0,0,0.00,
83,77,32,22,620.0,3.5,0.4,0.00,
84,80,40,28,490.4,6.4,0.6,0.00,
85,77,59,26,535.0,1.6,0.6,0.00,
86,79,52,23,330.3,12.4,0.3,0.00,
87,78,55,22,528.8,15.2,0.9,0.00,
88,62,40,29,638.5,15.4,0.8,0.01,
89,54,37,19,567.9,13.4,0.5,0.00,
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91,70,32,20,403.7,6.9,0,0.00,
92,79,32,19,443.4,6.2,0,0.00,
93,83,39,20,518.7,7.3,0.4,0.00,
94,80,51,22,616.0,13.5,0.3,0.00,
95,80,57,28,549.7,11.9,0.3,0.00,
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97,75,47,36,451.8,8.5,0.1,0.00,
98,71,48,43,291.3,8.6,0.7,0.00,
99,74,40,44,459.9,5.5,0.3,0.00,
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101,85,46,38,678.5,3.2,0.1,0.00,
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103,82,49,41,656.1,4.7,0.3,0.00,
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106,89,48,30,578.7,5.5,0.6,0.00,
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114,86,42,26,718.6,5.1,0.5,0.00,
115,81,66,34,543.5,9.9,0.5,0.00,
116,76,49,37,723.5,7.8,0.7,0.00,
117,76,46,44,725.8,6.1,1,0.07,
118,65,48,37,726.0,8.3,0.6,0.00,
119,76,45,41,730.4,8.7,0,0.00,
120,88,48,40,502.9,4.3,0,0.00,
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122,83,60,48,509.6,4.7,0.8,0.00,
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124,89,53,44,657.9,3.7,0.3,0.00,
125,85,61,32,513.0,3.6,0.8,0.00,
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127,88,56,35,746.7,4.2,1,0.00,
128,92,57,36,655.1,4.7,0.3,0.00,
129,94,55,38,750.2,6.8,0.7,0.00,
130,84,66,36,751.9,15.8,0.9,0.00,
131,83,54,25,598.6,1.6,0,0.00,
132,82,47,23,755.2,1.4,0,0.00,
133,79,55,27,756.8,11.3,0,0.00,
134,78,42,17,485.9,4.9,0,0.00,
135,89,41,27,717.8,5.5,0.6,0.00,
136,92,59,44,693.8,6.0,0.9,0.00,
137,85,57,50,644.8,5.7,0.6,0.01,
138,86,55,48,589.8,4.6,0.3,0.00,
139,86,49,40,765.2,4.7,0.4,0.00,
140,84,68,31,627.4,8.1,0.3,0.00,
141,86,61,32,721.3,7.3,0,0.00,
142,84,56,39,768.8,7.2,0.3,0.00,
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149,96,65,25,680.9,7.6,0.4,0.00,
150,90,62,35,776.3,5.1,0.8,0.00,
151,89,65,47,460.9,5.3,0.9,0.00,
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161,101,62,47,508.3,4.7,0.2,0.00,
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166,103,64,43,783.2,4.1,0.5,0.00,
167,105,65,45,670.1,4.8,0.4,0.00,
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172,97,70,48,783.2,3.6,0.2,0.00,
173,99,70,54,783.0,6.0,0.4,0.00,
174,96,64,55,738.6,4.2,0.3,0.00,
175,93,71,58,782.6,4.5,0.7,0.00,
176,94,70,60,782.3,5.3,0.7,0.02,
177,96,62,35,752.6,3.9,0,0.00,
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179,92,61,45,781.3,1.6,0.3,0.00,
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193,95,60,51,771.8,2.3,0.2,0.00,
194,98,65,45,770.8,2.0,0.2,0.00,
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200,91,70,58,636.3,3.1,0.8,0.00,
201,88,60,60,705.9,2.4,0.6,0.03,
202,86,59,60,553.5,2.0,0.5,0.00,
203,89,66,63,758.7,3.3,0.6,0.00,
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210,95,69,59,749.3,2.3,0.5,0.00,
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213,94,67,60,744.1,4.7,0.6,0.02,
214,92,65,62,720.5,3.9,0.5,0.34,
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220,91,69,57,607.3,2.8,0.7,0.00,
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222,89,71,61,481.4,4.5,0.7,0.00,
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224,93,70,60,518.5,3.5,0.7,0.00,
225,95,68,56,500.4,3.4,0.5,0.00,
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56,75,40,23,281.6,8.6,0.4,0.00,
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APPENDIX E

Adjacent Landowner Information

Appendix E

Adjacent Landowner Information

LANDOWNERS CROSS-REFERENCED TO APPLICATION MAP

The persons identified below would be considered as affected persons.

1. MALLARD EL PASO LP
   THE BOEING CO
   100 N RIVERSIDE PLZ
   CHICAGO, IL 606061501

   Location Address: 6055 Threadgill

2. KELLER & AZAR JOINT VENTURE
   KELLER, MALES A REALTORS
   TEXAS COMMERCE BANK BLDG
   EL PASO, TX 799010000

   Location Address: 6001 Threadgill

MINERAL INTEREST OWNERSHIP UNDER THE FACILITY

N/A

FACILITY EASEMENT HOLDERS

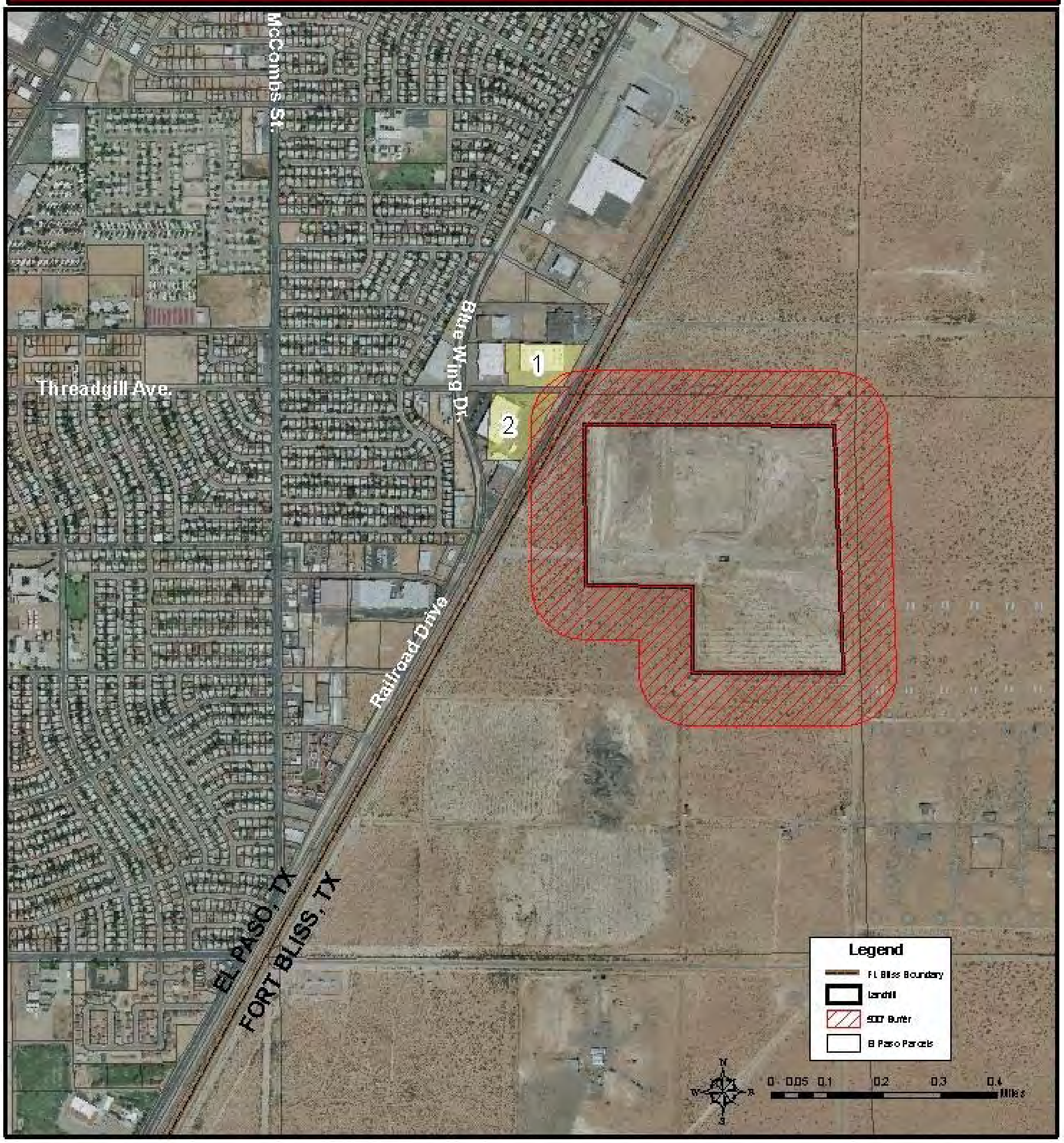
EL PASO ELECTRIC
P.O. Box 982
El Paso, Texas 79960

EL PASO WATER UTILITES
P.O. Box 511
El Paso, TX 79961-0001

TEXAS GAS SERVICE
7117 Florida Blvd.
Baton Rouge, LA 70806

UNION PACIFIC RAILROAD COMPANY
1400 Douglas Street – Stop 1690
Omaha, NE 68179-1690

LANDOWNERS WITHIN 500' OF LANDFILL



Engineer's Seal:

LANDOWNERS WITHIN 500' OF LANDFILL

Engineer's Seal:

10/5/11

STATE OF TEXAS
JEFFREY A. RUSCH
109130
LICENSED
PROFESSIONAL ENGINEER