TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

PERMIT FOR MUNICIPAL
SOLID WASTE MANAGEMENT FACILITY
issued under provisions of Texas
Health & Safety Code Ann.
Chapter 361 (Vernon)

MSW Permit No. 73A

Name of Permittee and Site Owner:	City of Amarillo P.O. Box 1971 Amarillo, Texas 79186
Facility Name:	City of Amarillo Landfill
Classification of Site:	Type I Municipal Solid Waste Management Facility

The permittee is authorized to store, process, and dispose of wastes in accordance with the limitations, requirements, and other conditions set forth herein. This amended permit is granted subject to the rules and orders of the Commission and laws of the State of Texas and it replaces any previously issued permit. Nothing in this permit exempts the permittee from compliance with other applicable rules and regulations of the Texas Commission on Environmental Quality. This permit will be valid until canceled, amended, or revoked by the Commission.

APPROVED, ISSUED AND EFFECTIVE in accordance with Title 30 Texas Administrative Code Chapter 330, as effective prior to March 27, 2006.

ISSUED DATE: AUG 22 2007

For the Commission

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City of Amarillo Landfill
MSW Permit No. 73A

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PART NO. 1

I. Size and Location of Facility

A. The City of Amarillo Landfill is located in Potter County, Texas at the intersection of S. Hill Road and Bezner Road, 5 miles west of Soncy Road and 2 miles north of I-40, outside the city limits of Amarillo.

B. The legal description is contained in Part I of the application found in Attachment A of this permit.

C. Coordinates and Elevation of Site Permanent Benchmark:

Latitude:	N 35° 13.48'
Longitude:	W 102° 01.03'
Elevation:	3808.65 feet above mean sea level (msl)

II. Facilities and Operations Authorized

A. Days and Hours of Operation

The operating hours for receipt of waste at this municipal solid waste facility shall be: 8:00 am to 7:00 pm Monday through Friday, April through October; 8:00 am to 5:00 pm Monday through Friday, November through March; 8:00 am to 5:00 pm on Saturdays; and 1:00 pm to 5:00 pm on Sundays. For all the other landfill related operations the operating hours will be 24 hours per day, seven days per week.

B. Wastes Authorized at This Facility

The permittee is authorized to dispose municipal solid waste resulting from, or incidental to, municipal, community, commercial, institutional, recreational and industrial activities, including garbage, putrescible wastes, rubbish, ashes, brush, street cleanings, construction-demolition waste, yard waste, Class 2 or 3 non-hazardous industrial solid waste, and certain special wastes that are identified in Part IV found in Attachment A of this permit. The acceptance of the special wastes, indicated in Part IV of Attachment A of this permit, is contingent upon such waste being handled in accordance with Title 30 Texas Administrative Code (30 TAC) Section (§) 330.136, and in accordance with the listed and described procedures in Part IV found in Attachment A of this permit, subject to the limitations and special provisions provided herein.

C. Wastes Prohibited at This Facility

The permittee shall comply with the waste disposal restrictions set forth in 30 TAC §330.5(e). The facility shall not accept any Class 1, non-hazardous industrial solid waste, hazardous or PCB containing wastes, radioactive or liquid waste, regulated asbestos containing materials (RACM), waste oil or oil filters, tires and any other waste not identified in Section II.B of this permit.

D. Waste Acceptance Rate

Authorized solid waste may be accepted at an anticipated initial rate of approximately 780 tons/day, which is expected to increase at approximately 1% per year corresponding to population and economic activity grow. Based on the anticipated growth rate, the estimated life of the expanded landfill is approximately105 years.

E. Waste Volume Available for Disposal

The total waste disposal capacity of the landfill (defined as waste and daily cover) is approximately 93.76 million cubic yards, out of which approximately 89.78 million cubic yards represent the net landfill volume. The information is contained in Part III – Section 2.4 of the application found in Attachment A of this permit.

F. Facilities Authorized

The permittee is authorized to operate a Type I municipal solid waste landfill with a disposal footprint of approximately 526 acres. All waste disposal activities subject to permitting are to be confined to the following facilities, which shall include disposal units, structures, appurtenances, or improvements: a gatehouse/scale house, a white goods and scrap tire collection area, storage and maintenance buildings, access roads, perimeter drainage system including ditches, benches, downchutes, and detention basins, diversion berms and channel, landfill gas monitoring system, contaminated water management system, groundwater monitoring system, final cover, in-situ soils liner with no leachate collection system for cells 1, 2, and 3, and a Subtitle D flexible membrane liner over two-feet of compacted clay or geosynthetic clay line, with a leachate collection systemr for cells 4A, 4B and the remaining cells, and other improvements.

G. Changes, Additions, or Expansions

Any proposed facility changes must be authorized in accordance with the Texas Commission on Environmental Quality (TCEQ) permit amendment or modification rules, 30 TAC Chapters 305 and 330.

III. Facility Design, Construction, and Operation

A. Facility design, construction, and operation and/or maintenance must comply with the provisions of this permit; Commission Rules, including 30 TAC §§330.51 through 330.58, 330.62 through 330.64, 330.111 through 330.139, 330.200 through 330.206, 330.230 through 330.242, 330.250 through 330.256, 330.280 through 330.284, and 330.300 through 330.305; and Parts I through IV of the application found in Attachment A of this permit, and shall be managed in a manner to protect human health and the environment.

B. The entire waste management facility shall be designed, constructed, operated, and maintained to prevent the release and migration of any waste, contaminant, or pollutant beyond the point of compliance as defined in 30 TAC §330.2 and to prevent inundation or discharge from the areas surrounding the facility components. Each receiving, storage, processing, and disposal area shall have a containment system that will collect spills and incidental precipitation in such a manner as to:

1. Preclude the release of any contaminated runoff, spills, or precipitation;

2. Prevent washout of any waste by a 100-year storm; and

3. Prevent run-on into the disposal areas from off-site areas.

C. The site shall be designed and operated so as not to cause a violation of:

1. The requirements of §26.121 of the Texas Water Code;

2. Any requirements of the Federal Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements of §402, as amended, and/or the Texas Pollutant Discharge Elimination System (TPDES), as amended;

3. The requirements under §404 of the Federal Clean Water Act, as amended; and

4. Any requirement of an area wide or statewide water quality management plan that has been approved under §208 or §319 of the Federal Clean Water Act, as amended.

D. Contaminated water shall be handled, stored, treated, disposed of, and managed in accordance with 30 TAC §330.55(b)(6), 30 TAC §330.56(o), and Part III, Attachment 15 found in Attachment A of this permit. Other methods may be considered for approval as a modification to this permit.

E. Best management practices for temporary erosion and sedimentation control shall remain in place until sufficient vegetative cover has been established to control and mitigate erosion on areas having final cover. Vegetative cover will be monitored and maintained throughout the post-closure care period in accordance with Part III Attachment 13 found in Attachment A of this permit.

F. Storm water runoff from the active portion of the landfill shall be managed in accordance with 30 TAC §§330.55(b)(3) and 330.133(b), and as described in Part III found in Attachment A of this permit.

G. All facility employees and other persons involved in facility operations shall be qualified, trained, educated, and experienced to perform their duties so as to achieve compliance with this permit. The permittee shall comply with 30 TAC §330.52(b)(9) and as described in Part I found in Attachment A of this permit. The permittee shall further ensure that personnel are familiar with safety procedures, contingency plans, the requirements of the Commission's rules and this permit, commensurate with their levels and positions of responsibility, in accordance with Part III and Part IV found in Attachment A of this permit. All facility employees and other persons involved in facility operations shall obtain the appropriate level of operator certification as required by recent changes in the statute and applicable regulations.

H. The facility shall be properly supervised to assure that bird populations will not increase and that appropriate control procedures will be followed. Any increase in bird activity that might be hazardous to safe aircraft operations will require prompt mitigation actions.

IV. Financial Assurance

A. Authorization to operate the facility is contingent upon compliance with provisions contained within the permit and maintenance of financial assurance in accordance with 30 TAC Chapter 330, Subchapter K and 30 TAC Chapter 37.

B. Within 60 days after the date of issuance of this permit, the permittee shall provide financial assurance instrument(s) for demonstration of closure of the landfill in accordance with 30 TAC §§330.253(d)(6) and 330.281. The closure cost estimate of $8,145,871 (2005 dollars) is based on estimates as described in Part III Attachments

8 and 12 of the application found in Attachment A of this permit. The financial assurance instrument shall be in an amount that includes the inflation factors for each calendar year following 2005 until the year the permit is issued.

C. Within 60 days after the date of issuance of this permit, the permittee shall provide financial assurance instrument(s) for demonstration of post-closure care of the landfill in an amount for the entire landfill facility. The post-closure care cost estimate of $1,780,200 (2005 dollars) is based on estimates as described in Part III Attachments 8 and 13 of the application found in Attachment A of this permit. The financial assurance instrument shall be in an amount that includes the inflation factors for each calendar year following 2005 until the year the permit is issued.

D. The owner and/or operator shall annually adjust closure and/or post-closure care cost estimates for inflation within 60 days prior to the anniversary date of the establishment of the financial assurance instrument pursuant to 30 TAC §§330.281 and 330.283, as applicable.

E. If the facility's closure and/or post-closure care plan is modified in accordance with 30 TAC §305.70, the permittee shall provide new cost estimates in current dollars in accordance with 30 TAC §§330.253(d)(6), 330.254(b)(3)(D), 330.281, and 330.283, as applicable. The amount of the financial assurance mechanism shall be adjusted within 45 days after the modification is approved. Adjustments to the cost estimates and/or the financial assurance instrument to comply with any financial assurance regulation that is adopted by the TCEQ subsequent to the issuance of this permit, shall be initiated as a modification within 30 days after the effective date of the new regulation.

V. Facility Closure

Closure of the facility shall commence:

A. Upon completion of the disposal operations and the site is completely filled or rendered unusable in accordance with Part III Attachment 7 of the application found in Attachment A of this permit;

B. Upon direction by the Executive Director of the TCEQ for failure to comply with the terms and conditions of this permit or violation of State or Federal regulations. The Executive Director is authorized to issue emergency orders to the permittee in accordance with §§ 5.501 and 5.512 of the Water Code regarding this matter after considering whether an emergency requiring immediate action to protect the public health and safety exists;

C. Upon abandonment of the site;

D. For failure to secure and maintain an adequate bond or other financial assurance as required; or

E. Upon the permittee's notification to the TCEQ that the landfill will cease to accept waste and no longer operate at any time prior to the site being completely filled to capacity.

VI. Site Completion and Closure

The landfill shall be completed and closed in accordance with 30 TAC §330.250 and the applicable portions of 30 TAC §§330.253 through 330.256. Upon closure, the permittee shall submit to the Executive Director documentation of closure as set out in 30 TAC §330.253. Post-closure care and maintenance shall be conducted in accordance with Part III Attachment 13 of the application found in Attachment A of this permit, for a period of 30 years or as otherwise determined by the Executive Director pursuant to 30 TAC §330.254(b).

VII. Standard Permit Conditions

A. Parts I through IV, as described in 30 TAC §330.51(a), which comprise the Permit Application for MSW Permit No.73A are hereby made a part of this permit as Part No. 2: Attachment A. The permittee shall maintain Parts I through IV and Part V, as described in 30 TAC §330.51(a), at the facility and make them available for inspection by TCEQ personnel. The contents of Part III of Attachment A of this permit shall be known as the "Approved Site Development Plan," in accordance with 30 TAC §§330.54 and 330.55. The contents of Part IV of Attachment A of this permit shall be known as the "Approved Site Operating Plan," in accordance with 30 TAC §§330.57 and 330.114.

B. Part No. 3: Attachment B, consisting of minor amendments, modifications, and corrections to this permit, is hereby made a part of this permit.

C. The permittee shall comply with all conditions of this permit. Failure to comply with any permit condition may constitute a violation of the permit, the rules of the Commission, and the Texas Solid Waste Disposal Act, and is grounds for an enforcement action, revocation, or suspension.

D. A pre-construction conference shall be held pursuant to 30 TAC §330.64(c) prior to beginning any construction related to this expansion, within the permit boundary to

ensure that all aspects of this permit, construction activities, and inspections are met. Additional pre-construction conferences may be held prior to the opening of the facility.

E. A pre-opening inspection shall be held pursuant to 30 TAC §330.64(d).

F. The permittee shall monitor sediment accumulations in ditches and culverts on a quarterly basis, and remove sedimentation to re-establish the design flow grades on an annual basis or more frequently if necessary to maintain the design flow.

G. The tracking of mud off-site onto any public right-of-way shall be minimized.

H. In accordance with 30 TAC §330.7(a), the permittee shall record in the deed records of Potter County, a metes and bounds description of all portions within the permit boundary on which disposal of solid waste has and/or will take place. A certified copy of the recorded document(s) shall be provided to the Executive Director in accordance with 30 TAC §330.7(b).

I. Daily cover of the waste fill areas shall be performed with clean soil that has not been in contact with waste or with an alternate daily cover which has been approved in accordance with 30 TAC §§330.133(c) and 305.70. Intermediate cover, run-on, and run-off controls shall not be constructed from soil that has been scraped up from prior daily cover or which contains waste.

J. During construction and operation of the facility, measures shall be taken to control runoff, erosion, and sedimentation from disturbed areas. Erosion and sedimentation control measures shall be inspected and maintained at least monthly and after each storm event that meets or exceeds the design storm event. Erosion and sedimentation controls shall remain functional until disturbed areas are stabilized with established permanent re-vegetation. The permittee shall maintain the on-site access road and speed bumps/mud control devices in such a manner as to minimize the buildup of mud on the access road and to maintain a safe road surface.

K. In complying with the requirements of 30 TAC §330.123, the permittee shall consult with the local District Office of the Texas Department of Transportation or other authority responsible for road maintenance, as applicable, to determine standards and frequencies for litter and mud cleanup on state, county, or city maintained roads serving the site. Documentation of this consultation shall be submitted within 30 days after the permit has been issued.

L. The permittee shall retain the right of entry onto the site until the end of the post-closure care period as required by 30 TAC §330.62(b).

M. Inspection and entry onto the site by authorized personnel shall be allowed during the site operating life and until the end of the post-closure care period as required by §361.032 of the Texas Health and Safety Code.

N. The provisions of this permit are severable. If any permit provision or the application of any permit provision to any circumstance is held invalid, the remainder of this permit shall not be affected.

O. Regardless of the specific design contained in Attachments A and B of this permit, the permittee shall be required to meet all performance standards required by the permit, the regulations, and as required by local, state, and federal laws or ordinances.

P. If differences arise between these permit provisions (including the incorporated Parts I through IV of Attachment A of this permit) and the rules under 30 TAC Chapter 330, the rules provisions shall hold precedence.

Q. The permittee shall comply with the requirements of the air permit exemption in 30 TAC §106.534, if applicable, and the applicable requirements of 30 TAC Chapters 106 and 116.

R. All discharge of storm water will be in accordance with the U.S. Environmental Protection Agency NPDES requirements and/or the State of Texas TPDES requirements, as applicable.

VIII. Incorporated Regulatory Requirements

A. To the extent applicable, the requirements of 30 TAC Chapters 37, 281, 305, and 330 are adopted by reference and are hereby made provisions and conditions of this permit.

B. The permittee shall comply with all applicable federal, state, and local regulations and shall obtain any and all other required permits prior to the beginning of any on-site improvements or construction approved by this permit.

IX. Special Provisions

None.

PART NO. 2

Attachment A

Parts I through IV of the permit application effective with the date on the permit.

PART NO. 3

Attachment B

Minor amendments, corrections, and modifications may be issued for MSW Permit No. 73A.

The minor amendment, modification, or correction document prepared and executed with an approval date shall be attached to this attachment. There is no limitation on the number of these documents that may be included in Attachment B of this permit.

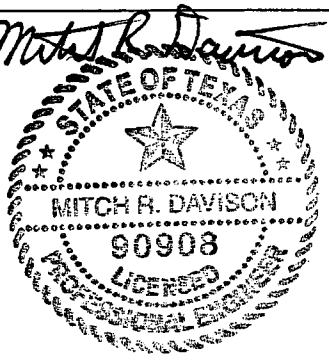
Executive Summary

City of Amarillo Landfill

Permit Amendment – MSW Permit No. 73A

City of Amarillo,
Potter County, Texas

December 2005



12/15/2005

This document is released for the purpose of review only under the authority of Mitch R. Davison, P.E. # 90908. It is not to be used for bidding or construction.

For pages 1 thru 1

EXECUTIVE SUMMARY

The City of Amarillo, Texas is located in the center of the panhandle of Texas. The City is responsible for solid waste disposal services for its residents and businesses. Collection is currently being provided by the City. Disposal at the site began in the 1970's. A permit was issued for the site by the predecessors of the Texas Commission on Environmental Quality (TCEQ) in 1975. The site permit was updated in 1994 to meet the requirements of Subtitle D.

The City's landfill is located five miles west of Soncy Road and two miles north of Interstate 40 partially within the extraterritorial jurisdiction of the City of Amarillo, Potter County, Texas. The legal description of the facility is: All of Section 126, Block 9, B.S&F. Survey, Potter County, Texas. The facility has the following coordinates: N 35° 13.48' W 102° 01.03' with an elevation of 3808.65.

The site has been permitted for 662 acres and is divided into twelve cell areas with only eight remaining to be constructed. Cell 1 has been officially closed and has received an affidavit of closure; Cells 2 and 3 have final cover on them, but have not been officially closed; and the remaining Cells 4-12 are either developed, as in the case of Cell 4, or proposed for future development. A minimum of a 100 foot buffer zone will be maintained between the limit of waste and the permit boundary. Cells 4A and 4B are currently receiving waste.

The purpose of this permit amendment is to expand the capacity of the landfill by increasing the permitted height, thereby allowing the City to provide long-range refuse disposal for the City's residents and businesses. No change is made to the permit boundary in this application.

City of Amarillo Landfill
Potter County, Texas
MSW Permit No. 73A

Permit Amendment

Prepared for:
City of Amarillo, Texas
May 2006

Prepared by:
HDR Engineering, Inc.
17111 Preston Road, Suite 200
Dallas, Texas 75248
972-960-4000

APPLICATION FOR A PERMIT OR REGISTRATION TO OPERATE A MUNICIPAL SOLID WASTE FACILITY
PART A APPLICATION FORM

PERMIT/REGISTRATION APPLICATION NO. MSW 73A (for TCEQ use).

Applicant Information

Applicant Name:	City of Amarillo
Customer Reference Number - if known* (9 digits)	600130942 **CN**

* If you do not have this number, complete the customer information section of the Core Data Form (TCEQ-10400) and submit it with this application.

Facility Information

Facility Name:	City of Amarillo Landfill
Regulated Entity Reference Number - if known* (9 digits)	100237551 **RN**

* If you do not have this number, complete the regulated entity information section of the Core Data Form (TCEQ-10400) and submit it with this application.

Applicant's Agent Information

Authorized Agent's Name	Michael G. Rice, P.E.			
Authorized Agent's Title	Director of Public Works			
Street or P.O. Box	509 S.E. Seventh Ave., PO Box 1971			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79105-1971
(Area Code)(Phone #)	806	378-9337		
(Area Code)(FAX #)	806	378-9363		

Section 361.0666, Health and Safety Code, as added by HB2912 (effective September 1, 2001) requires an applicant for a permit for a <u>new</u> facility which accepts municipal solid waste to hold a public meeting in the county in which the proposed facility is to be located <u>before the 45th day after the date the application is filed</u>. Section 361.0666 also requires the applicant to publish notice of this public meeting at least once each week for the three weeks preceding the meeting. An affidavit certifying that notice was published in accordance with Section 361.0666 must be provided to the Commission.

If you have any questions about this meeting requirement, please contact the MSW Permits Section in the TCEQ Waste Permits Division at (512) 239-2334 or see our website at:

http://www.tnrcc.state.tx.us/permitting/wasteperm/mswperm/notice.html.

Public Place Where Administratively Complete Permit Application Will Be Located

Identify the public place in the county (e.g., public library, county court house, city hall, etc.) including the address, where the application will be made available for review and copying by the public. (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.)

City of Amarillo / Public Works Division

509 S.E. Seventh Ave., Room 209

Amarillo, Potter County, Texas 79105

Application and Facility Type

Check Appropriate Boxes	**Application Type** (select one):	Registration	
		Permit X	
	New Facility:		
	Existing Facility Amendment (select one): X	Registration Number: 100237551	
		Permit Number: 73	
Facility Type:			
Type I	X	Type VI	
Type I-AE		Type VIII	
Type IV		Type IX	
Type IV-AE			
Type V (describe type of process):			

Geographic Coordinates of Permanent Site Benchmark:

Latitude	**N** 35° 13.48'
Longitude	**W** 102° 01.03'
Elevation (above msl)	3808.65

Property Owners Information:

Name:	City of Amarillo
Customer Reference Number - if known* (9 digits)	600130942 **CN**

* If you do not have this number, complete the customer information section of the Core Data Form (TCEQ-10400) and submit it with this application.

Deed Information:

County	Potter County
Book	None
Volume	1257 (Evelyn & William Hill); 1443 (Caroline Bush)
Page	554 – 555; 376 - 383

Easement Holders of On-Site Easements are:

Name	Address	Contact Person	Area Code/Telephone & FAX
Valero Logistics Operations, L.P.	One Valero Way San Antonio, TX 78249	Brad R. Ramsey VP - Engineering	Phone: 210-345-2000 1-800-531-7911 Fax: 210-345-2646

Local Government Jurisdiction

Within City Limits of: N/A		
Within Extraterritorial Jurisdiction of City of: City of Amarillo		
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___X___

Total acreage of Permit Boundary, Waste Acceptance Rate, Site Life, and Population Served:

The total acreage of permit boundary is 662 acres. The facility will serve a population equivalent of 248,000 people, within a service area that includes the following cities and counties, The City of Amarillo and counties of Potter and Randall. It is estimated that the site will receive an average of approximately 1000 (capacity) tons of municipal solid waste per day, and have an estimated life of 105 years.

List the nature, type and estimated quantity of waste.

Municipal Solid Waste	780 tons per day (tpd) – includes appliances (white goods), and oil/oil filter recycling
Class 1 Industrial	None
Class 2 Industrial	Inert material (725 tons/year – NHIW classes 2 & 3)
Class 3 Industrial	Inert material
Special Waste (specify)	Sludge, dead animals, petroleum contaminated soils, healthcare related facility waste
Other Waste (specify)	None
Excluded wastes (specify)	Industrial and regulated hazardous waste, RACM, PCB wastes, radioactive wastes, Class I industrial wastes, commercial chemicals, bulk liquids, certain special wastes from healthcare-related facilities, paints, oils, vehicle batteries, and friable asbestos

Traffic Impact:

The primary access route to the site is Hill Road. Initial traffic impact is estimated to be 120 vehicles/day with an estimated ultimate traffic impact of 465 vehicles/day.

The site is located in Texas Department of Transportation District

TxDOT District Name & #	Amarillo District 4			
District Engineer's Name	Mark E. Tomlinson, P.E.			
Street or P.O. Box	P.O. Box 7368			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79114-7368
(Area Code)(Phone #)	806	356-3200		
(Area Code)(FAX #)	806	356-3206		

The local governmental authority or agency responsible for road maintenance

Contact Person's Name	Roger Cumpston, Potter Co. Road Superintendent			
Street or P.O. Box	2419 Willow Creek			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79107
(Area Code)(Phone #)	806	383-2273		
(Area Code)(FAX #)	806	383-2273		

Consulting Engineer

Responsible Engineer's Name	Michael W. Oden, P.E.			
Name of Engineering Firm	HDR Engineering, Inc.			
Street or P.O. Box	17111 Preston Road, Suite 200			
(City)(County) (State)(Zip)	Dallas	Dallas	TX	75248
(Area Code)(Phone #)	972	960-4400		
(Area Code)(FAX #)	972	960-4471		
E-mail Address (if available)	Michael.Oden@hdrinc.com			

Provide the following information for the State Senators and Representatives who represent the area in which the Municipal solid waste facility is located.

State Representative

District Number	House District 87			
State Representative's Name	David A. Swinford			
District Office Address	724 South Polk, Suite 760			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79101
(Area Code)(Phone #)	806	374-8787		
(Area Code)(FAX #)	806	374-0868		

State Senator

District Number	Senate District 31			
State Senator's Name	Kel Seliger			
District Office Address	PO Box 9155			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79105
(Area Code) (Phone #)	806	374-8994		
(Area Code) (FAX #)	806	374-4607		

Provide the following information for the appropriate regional Council of Governments (COG), River Basin Information, and U.S. Army Corps of Engineers District which represents the area that the Municipal Solid Waste facility is to be located.

Council of Government Information

COG Name	Panhandle Texas Council of Governments			
COG Representative's Name	Gary Pitner			
COG Representative's Title	Executive Director			
Street or P.O. Box	P.O. Box 9257			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79105-9257
(Area Code)(Phone #)	806	372-3381		
(Area Code)(FAX #)	806	373-3268		

River Basin Information:

River Authority	N/A			
Contact Person's Name				
Watershed Sub-Basin Name				
Street or P.O. Box				
(City)(County) (State)(Zip)				
(Area Code)(Phone #)				
(Area Code)(FAX #)				

This site is located in the following District of the U.S. Army Corps of Engineers

	Albuquerque, NM		**Ft. Worth, TX**		**Galveston, TX**	X	**Tulsa, OK**

List all other permits or construction approvals, required, received or applied for to this or any government agency, whether local, state, or federal which pertain to this facility. Be specific, include permit numbers and other identifiers.

RQD = Required APP = Applied For REC = Received N/A = Not Applicable

N/A	Hazardous Waste Management program under the Texas Solid Waste Disposal Act
N/A	Underground Injection Control (UIC) program under the Texas Injection Well Act
REC TXR050000	National Pollutant Discharge Elimination System (NPDES) program under the Federal Clean Water Act (CWA) and Waste Discharge program under the Texas Water Code, Chapter 26
N/A	Prevention of Significant Deterioration (PSD) Program under the Federal Clean Air Act
N/A	Nonattainment Program under the Federal Clean Air Act;
N/A	National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under the Clear Air Act
N/A	Ocean dumping permits under the Marine Protection Research and Sanctuaries Act
N/A	Dredge or fill permits under of the Federal Clean Water Act
N/A	NPDES Stormwater Pollution Control §402 Permit
N/A	U. S. Army Corps of Engineers Dredge and Fill Permit §404
REC PG0196K	TCEQ Air Quality Permit or Registration (Permit by Rule) 30 TAC §106.534 (Standard Exemption 110)
Other environmental permits (provide list)	
RQD	TPDES General Permit for Construction Activities (TXR 150 000)
REC 5165	Petroleum storage tank registration

*

Name of Applicant: City of Amarillo

Applicant's Statement

I, Alan M. Taylor, state that I have knowledge of the facts here in set forth and that these facts are true and correct, to the best of my knowledge and belief. Furthermore, I am familiar with all pertinent requirements contained in the Municipal Solid Waste Rules, and The City of Amarillo agrees to develop and operate the municipal solid waste facility in accordance with the plan, the rules and any permit provisions. I further state that, to the best of my knowledge and belief, the project for which the application is made will not violate any law, rule, ordinance, decree of any duly authorized governmental entity having jurisdiction. I further state that I am the applicant or am authorized to act for the applicant." [30 TAC 330.56(i)]

Signature of Applicant	Alan M Taylor			
Type or Print Name and Title	Alan M. Taylor City Manager			
Street or P.O. Box	509 S.E. Seventh Avenue, PO Box 1971			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79105-1971
(Area Code)(Phone #)	806	378-3000		
(Area Code)(FAX #)	806	378-9394		
Date	12/16/05			

Notary Public's Certificate

Subscribed and sworn to before me, by the said

Alan M. Taylor, City Manager,

this 16th day of December, 20 05, to certify which witness my hand and seal of office.

Frances Hibbs

Notary Public in and for Potter County, Texas

My Commission Expires 8/19/2007

FRANCES HIBBS
NOTARY PUBLIC,
STATE OF TEXAS
My Commission Expires 08-19-2007

Name of Applicant: City of Amarillo

Applicant's Certification

"I 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." [30 TAC §305.44(b)]				
Signature of Applicant	Alan M Taylor			
Type or Print Name and Title	Alan M. Taylor City Manager			
Street or P.O. Box	509 S.E. Seventh Avenue, PO Box 1971			
(City)(County) (State)(Zip)	Amarillo	Potter	TX	79105-1971
(Area Code)(Phone #)	806	378-3000		
(Area Code)(FAX #)	806	378-9394		
Date	12/16/05			

Notary Public's Certificate

Subscribed and sworn to before me, by the said

Alan M. Taylor, City Manager.

this 16th day of December, 20 05, to certify which witness my hand and seal of office.

Frances Hibbs

Notary Public in and for Potter County, Texas

My Commission Expires 8/19/2007

FRANCES HIBBS
NOTARY PUBLIC,
STATE OF TEXAS
My Commission Expires 08-19-2007

Please submit completed Application and a TCEQ Core Data Form(s) (TCEQ-10400) to:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Waste Permits Division
MC 124/Municipal Solid Waste Permits Section
P.O. Box 13087
Austin, Texas 78711-3087

Part I

Attachment 1 - Property Owner Affidavit

for

City of Amarillo Landfill

Potter County, Texas

STATE OF TEXAS §
§
COUNTY OF POTTER §

AFFIDAVIT OF ALAN M. TAYLOR

BEFORE ME, the undersigned authority, personally appeared Alan M. Taylor, who upon being administered oath deposed and stated as follows:

1. My name is Alan M. Taylor. I am over 18 years of age, of sound mind, and am otherwise competent to execute this affidavit. All facts contained in this affidavit are based upon my personal knowledge, and are true and correct.

2. I am employed by the City of Amarillo ("the City") as City Manager. In this capacity, I am authorized to make this affidavit. I am making this affidavit in connection with the City's application to amend its municipal solid waste permit for the City of Amarillo Landfill.

3. The City owns the City of Amarillo Landfill (including the property on which the landfill is located). A legal description for the property on which the City of Amarillo Landfill is located is attached as Exhibit "A" to this affidavit (and is also included in Part I, Attachment 3 of the permit amendment application), and is incorporated for all purposes herein.

4. The City hereby acknowledges that:

   a. the State of Texas may hold the City either jointly or severally responsible for the operation, maintenance, and closure and post-closure care of the site;

   b. the City has a filed with the county deed records an affidavit to the public advising that the land has been used for a solid waste facility, and

   c. the City and the State of Texas shall have access to the property during the active life of the facility and for a period of not less than 30 years after closure for the purpose and maintenance.

Further affiant sayeth not.

Alan M. Taylor
City Manager
City of Amarillo

SWORN TO AND SUBSCRIBED before me by Alan M. Taylor, on

December 13 2005.

Donna DeRight
Notary Public in and for
the State of Texas

DONNA DeRIGHT
NOTARY PUBLIC,
STATE OF TEXAS
My Commission Expires 04-19-2006

03 04 75 jta

PURCHASE OPTION

THE STATE OF TEXAS
COUNTY OF POTTER

KNOW ALL MEN BY THESE PRESENTS:

That this purchase option agreement is made by and between the City of Amarillo, a municipal corporation situated in Potter and Randall Counties, Texas, (PURCHASER) and W. J. Hill and wife, Evelyn D. Hill, (SELLERS) upon the following terms performable in Potter County, Texas:

For and in consideration of the mutual benefits to be derived from the covenants herein mutually made, SELLERS hereby give and grant unto PURCHASER, its successors and assigns, the exclusive right and privilege of purchasing the following described property owned by SELLERS (if SELLERS are the owners of less than the full fee simple title, they represent and warrant that they are duly authorized to act in behalf of all owners) and situated in Potter County, Texas, to-wit:

Being all of Section 126, BS&F Survey, Potter County, Texas containing 662+/- acres;

upon the following terms and conditions:

1. The term of this option is one hundred twenty (120) days from the date of execution of this agreement.

2. The purchase price for said property is Three Hundred Fifty and No/100 Dollars ($350.00) per acre based on a survey to be paid for by PURCHASER prior to closing which purchase price shall be paid all in cash upon closing.

3. SELLERS reserve the right to occupy their present home on the property for a period of sixteen (16) months and to farm the 120+/- acres of irrigated land during this period which period of sixteen (16) months includes the 120 day option recited above plus twelve (12) months.

4. PURCHASER agrees to allow SELLERS irrigation privileges and operation of the well during this period and SELLERS agree to leave the well in as good or better condition at the end of sixteen (16) months than at the time the transaction was closed.

5. PURCHASER agrees to allow SELLERS use the feedlot, elevator, and to share use of the barn with PURCHASER during this same sixteen (16) month period. If at the end of said sixteen (16) months, SELLERS have been unable to feed out the ensilage which is presently stored on the premises, PURCHASER agrees to extend the privilege to use feedlot, elevator, and said barn for eight (8) additional months upon request made in writing by SELLERS. PURCHASER agrees that SELLERS will retain fifty percent (50%) of all mineral rights.

6. All permanent improvements are to remain intact on the property but SELLERS reserve the right to dispose of all farm equipment and machinery.

7. SELLERS agree that they will not enter into any new lease or leases during the term of this option without the written consent of PURCHASER and SELLERS hereby authorize PURCHASER to negotiate with any lessee with respect to modification or any other matter pertaining to any existing lease.

8. Notice of election to purchase hereunder by PURCHASER, its successors or assigns, shall be in writing and shall be delivered in person or by Registered or Certified Mail to SELLERS at SELLERS' address, as set forth below. If notice of election is given by mail, such notice shall be effective at the time of mailing.

9. Upon notice of election, the parties further agree as follows:

(a) PURCHASER will be prepared to pay purchase price in all cash after completion of the survey to be paid for by PURCHASER upon delivery of a General Warranty Deed as hereinafter provided.

(b) SELLERS agree to supply either an abstract of title to said property which shall be conveyed free and clear of any and all encumbrances, or an owners' title policy issued by a title insurance company designated by PURCHASER which property shall be conveyed free and clear of any and all encumbrances.

(c) If any title objections are made, SELLERS shall have a reasonable time, not to exceed thirty (30) days unless extended in writing by PURCHASER, to cure said objections and show good and marketable title. In the event of failure to furnish good and marketable title, PURCHASER its successors or assigns, may at its option, cancel this contract or PURCHASER may enforce specific performance.

(d) SELLERS agree, when title objections have been cured, to deliver a good and sufficient General Warranty Deed properly conveying said property to PURCHASER, its successors or assigns, and PURCHASER agrees, when said Deed is presented, to pay the balance of the purchase price as above set forth.

(e) Taxes for the current year, current rents and insurance, if any, are to be prorated to date of closing.

10. Save for occupation of the home and use of the 120+/- acres of land, SELLERS will give possession of the balance of the section to the PURCHASER at the time of closing.

11. This agreement shall be binding upon and inure to the benefits of the parties hereto, their successors and assigns or heirs and representatives.

EXECUTED in duplicate this 4 day of January, 1975.

W. J. Hill (SELLER)

Box 53
Bushland, Texas
(SELLERS' address)

Evelyn D. Hill (SELLER)

ATTEST:

CITY OF AMARILLO, (PURCHASER)

By

INEZ HUTCHINS, City Secretary

JOHN S. STIFF, City Manager

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared W. J. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of J., 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared Evelyn D. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of J., 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared John S. Stiff, City Manager of the City of Amarillo, known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said City of Amarillo, a municipal corporation, and that he executed the same as the act of such corporation for the purposes and consideration therein expressed, and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

EXTENSION OF OPTION AGREEMENT

THE STATE OF TEXAS :
COUNTIES OF POTTER
AND RANDALL :
CITY OF AMARILLO :

BY MUTUAL AGREEMENT of the Seller and the Purchaser of an OPTION AGREEMENT dated February 4, 1975, an extension of 120 days is hereby agreed to by both parties with no changes in any conditions or covenants.

Dated this 21st day of July, 1975.

W. J. Hill, SELLER

City of Amarillo, PURCHASER

ATTEST:

City Secretary

420613

2.50 WARRANTY DEED Gty. Asst. C. Box 1803 79105

THE STATE OF TEXAS
COUNTY OF POTTER

KNOW ALL MEN BY THESE PRESENTS

VOL. 1257 PAGE 554

That we, WILLIAM JESSE HILL, JR., being one and the same person as W. J. Hill, Jr., and wife, EVELYN D. HILL of the County of Potter and State of Texas for and in consideration of the sum of TWO HUNDRED THIRTY-ONE THOUSAND NINETY-SIX AND 60/100 DOLLARS ($231,096.60) the receipt of which is hereby acknowledged have GRANTED, SOLD AND CONVEYED, and by these presents so GRANT, SELL AND CONVEY unto the CITY OF AMARILLO, a municipal corporation situated in Potter and Randall Counties, Texas, all of the following described real property in Potter County, Texas, to-wit:

All of Section 126, Block 9 , B.S.&F. Survey, Potter County, Texas, containing 658.576 acres and a tract of land containing 1.70 acres out of the Southeast 1/4 of Section 147, Block 9. B.S.&F. Survey, Potter County, Texas and being described by metes and bounds as follows:

BEGINNING at a 3/8 inch iron rod, the Southeast corner of this tract, from whence the Southeast corner of Section 147 bears South 00° 08' 34" West, 2040.92 feet;

THENCE North 00° 08' 34" East, with the East line of Section 147, 240.89 feet to a 3/8 inch iron rod;

THENCE North 54° 54' 26" West, 338.36 feet to a 3/8 inch iron rod;

THENCE South 16° 11' 14" West, 208.71 feet to a 3/8 inch iron rod;

THENCE South 54° 54' 26" East, 408.72 feet to the BEGINNING CORNER OF THIS TRACT.

SAVE AND EXCEPT, and there is hereby reserved unto Grantors, their heirs and assigns, an undivided one-half (1/2) of all of the oil, gas and other minerals in and under and that may be produced from the above described property, together with the right of ingress and egress at all times for the purpose of mining, drilling, exploring, operating and developing said land for oil, gas and other minerals and removing the same therefrom which rights will never be exercised so as to conflict with the use of the above described property by the City of Amarillo for sanitary landfill purposes nor any other municipal purpose.

This conveyance is made and accepted subject to any and all conditions and restrictions, if any, relating to the hereinabove described property to the extent, and only to the extent, that the same may still be in force and effect shown of record in the office of the County Clerk of Potter County, Texas.

TO HAVE AND TO HOLD the above described premises, together with all and singular the rights and appurtenances thereto in anywise belonging, unto the said grantee, its successors and assigns forever; and we do hereby bind ourselves, our heirs and executors and administrators to WARRANT AND FOREVER DEFEND all and singular the said premises unto the said grantee, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof.

EXECUTED this 14th day of October, A.D. 1975.

William Jesse Hill

William Jesse Hill, Jr.

Evelyn D. Hill

Evelyn D. Hill

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority, on this day personally appeared WILLIAM JESSE HILL, JR. and EVELYN D. HILL known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE on this the 14 day of October, A.D. 1975.

Notary Public in and for Potter County, Texas

VOL 1257 PAGE 555

VOL 1257 PAGE 556

STATE OF TEXAS
COUNTY OF POTTER

I hereby certify that this instrument was FILED on the date and at the time stamped hereon by me and was duly RECORDED in the Volume and Page of the Deed RECORDS of POTTER COUNTY, Texas as stamped hereon by me.

PAWNEE GAITHER
County Clerk
Potter County, Texas

Warranty Deed
William Jesse Hill, Jr
et ux
to
City of Amarillo
10-14-75

PAWNEE GAITHER, CLERK
POTTER COUNTY, TEXAS
FILED FOR RECORD

'75 OCT 16 PM 4 15

03 04 75 jba

PURCHASE OPTION

THE STATE OF TEXAS
COUNTY OF POTTER

KNOW ALL MEN BY THESE PRESENTS:

That this purchase option agreement is made by and between the City of Amarillo, a municipal corporation situated in Potter and Randall Counties, Texas, (PURCHASER) and W. J. Hill and wife, Evelyn D. Hill, (SELLERS) upon the following terms performable in Potter County, Texas:

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Being all of Section 126, BS&F Survey, Potter County, Texas containing 662+/- acres;

upon the following terms and conditions:

1. The term of this option is one hundred twenty (120) days from the date of execution of this agreement.

2. The purchase price for said property is Three Hundred Fifty and No/100 Dollars ($350.00) per acre based on a survey to be paid for by PURCHASER prior to closing which purchase price shall be paid all in cash upon closing.

3. SELLERS reserve the right to occupy their present home on the property for a period of sixteen (16) months and to farm the 120+/- acres of irrigated land during this period which period of sixteen (16) months includes the 120 day option recited above plus twelve (12) months.

4. PURCHASER agrees to allow SELLERS irrigation privileges and operation of the well during this period and SELLERS agree to leave the well in as good or better condition at the end of sixteen (16) months than at the time the transaction was closed.

5. PURCHASER agrees to allow SELLERS use the feedlot, elevator, and to share use of the barn with PURCHASER during this same sixteen (16) month period. If at the end of said sixteen (16) months, SELLERS have been unable to feed out the ensilage which is presently stored on the premises, PURCHASER agrees to extend the privilege to use feedlot, elevator, and said barn for eight (8) additional months upon request made in writing by SELLERS.

6. All permanent improvements are to remain intact on the property but SELLERS reserve the right to dispose of all farm equipment and machinery.

7. SELLERS agree that they will not enter into any new lease or leases during the term of this option without the written consent of PURCHASER and SELLERS hereby authorize PURCHASER to negotiate with any lessee with respect to modification or any other matter pertaining to any existing lease.

8. Notice of election to purchase hereunder by PURCHASER, its successors or assigns, shall be in writing and shall be delivered in person or by Registered or Certified Mail to SELLERS at SELLERS' address, as set forth below. If notice of election is given by mail, such notice shall be effective at the time of mailing.

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(a) PURCHASER will be prepared to pay purchase price in all cash after completion of the survey to be paid for by PURCHASER upon delivery of a General Warranty Deed as hereinafter provided.

(b) SELLERS agree to supply either an abstract of title to said property which shall be conveyed free and clear of any and all encumbrances, or an owners' title policy issued by a title insurance company designated by PURCHASER which property shall be conveyed free and clear of any and all encumbrances.

(c) If any title objections are made, SELLERS shall have a reasonable time, not to exceed thirty (30) days unless extended in writing by PURCHASER, to cure said objections and show good and marketable title. In the event of failure to furnish good and marketable title, PURCHASER its successors or assigns, may at its option, cancel this contract or PURCHASER may enforce specific performance.

(d) SELLERS agree, when title objections have been cured, to deliver a good and sufficient General Warranty Deed properly conveying said property to PURCHASER, its successors or assigns, and PURCHASER agrees, when said Deed is presented, to pay the balance of the purchase price as above set forth.

(e) Taxes for the current year, current rents and insurance, if any, are to be pro rated to date of closing.

10. Save for occupation of the home and use of the 120+/- acres of land, SELLERS will give possession of the balance of the section to the PURCHASER at the time of closing.

11. This agreement shall be binding upon and inure to the benefits of the parties hereto, their successors and assigns or heirs and representatives.

EXECUTED in duplicate this 1 day of January, 1975.

W. J. Hill
W. J. Hill (SELLER)

Box 53
Bushland, Texas
(SELLERS' address)

Evelyn D. Hill
Evelyn D. Hill (SELLER)

ATTEST:

CITY OF AMARILLO, (PURCHASER)

By

INEZ HUTCHINS, City Secretary

JOHN S. STIFF, City Manager

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared W. J. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared Evelyn D. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

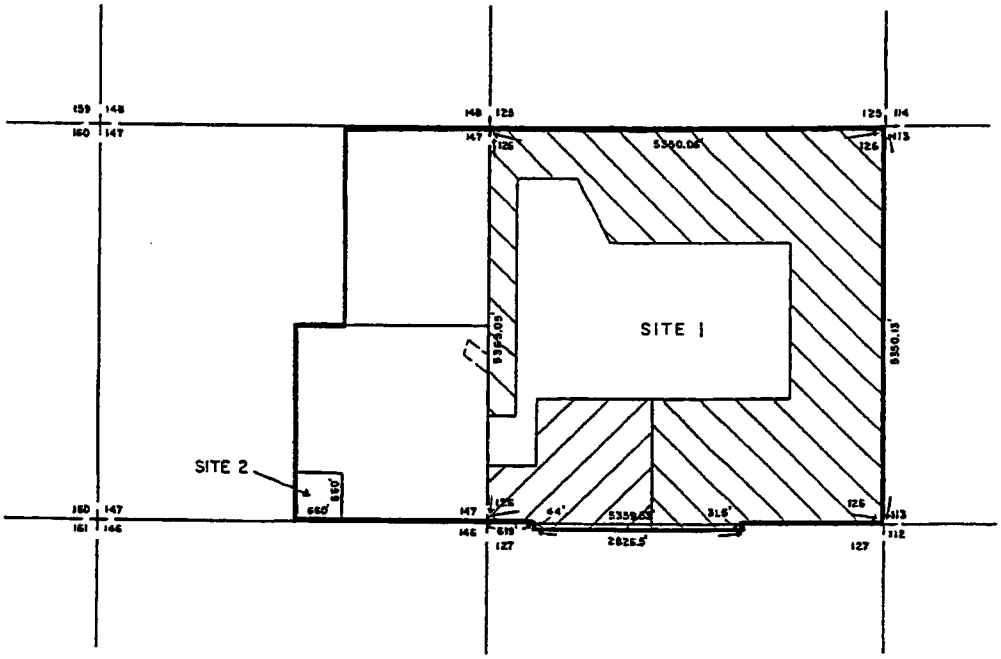
THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared John S. Stiff, City Manager of the City of Amarillo, known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said City of Amarillo, a municipal corporation, and that he executed the same as the act of such corporation for the purposes and consideration therein expressed, and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

1" = 2000'



LEASED TO J.R. CATTLE CO.

AGRICULTURAL LEASE 6-1-90 THRU 5-31-92 (79 ACRES)

GRAZING LEASE 6-1-90 THRU 5-31-92 (371 ACRES)

Site 1

LOCATION:	Four miles west of Soncy and two miles north of I-40
LEGAL:	Sec. 126 and a portion of Sec. 147, Blk. 6, BS&F Survey, Potter Co., Tx.
DEED INFORMATION:	William J. and Evelyn Hill, 10-14-75, Vol. 1257, pp. 554 & 555 Caroline Bush and Frederick L. Emeny, 6-14-82 Vol. 1443, pp. 376-383 Warranty deeds 420613 and 540954 thru 540957
OTHER:	Sanitary landfill

Site 2

Lease 10-acre tract to Northwest Texas Environmental Training Institute, Inc. 10-1-91 till 9-30-94 at $5 per acre/year

AP #'s C-18
D-18

Part I

Attachment 2 - Panhandle Regional Planning Commission Resolution

for

City of Amarillo Landfill

Potter County, Texas

PANHANDLE
REGIONAL
PLANNING
COMMISSION

September 23, 2005

Mr. Jeff Holderread, PE, Team Leader
MSW Permits Section
MSW Division, MC124
TCEQ
P.O. Box 13087
Austin, TX 78711-3987

RECEIVED
SEP 28 2005
PUBLIC WORKS

Re: City of Amarillo MSW Landfill
Permit Amendment Application – MSW Permit No. 73A

Dear Mr. Holderread:

The Panhandle Regional Solid Waste Management Advisory Committee (RSWMAC) met on September 21, 2005 and reviewed the above-referenced application in accordance with TAC §339.566. The purpose of the review was to determine whether or not the facility, as currently proposed, would conform to the goals and objectives of the regional solid waste management plan.

In keeping with the Plan Conformance/Permit Review provisions contained in the current regional solid waste plan amendment, the applicant was asked to self-evaluate the proposed facility against the Plan's Conformance Review Checklist.

The Panhandle Regional Solid Waste Management Plan offers a range of four different comments that the RSWMAC can make in response to a Conformance Review. Those optional responses are listed below. The RSWMAC's comment on this particular application has been highlighted.

Upon reviewing the application, assessing the applicant's responses on the Conformance Review Checklist, and hearing a presentation from the applicant's representative, the RSWMAC voted to make the following comment regarding this application.

☐ The Panhandle RSWMAC finds that additional information will be required before a final recommendation can be rendered. Therefore, the RSWMAC has postponed its decision on this application until such time that the requested information is obtained.

☑ The Panhandle RSWMAC finds that the proposed facility is in conformance with the Panhandle Regional Solid Waste Management Plan and recommends that the TCEQ consider approval of the MSW facility application.

☐ The Panhandle RSWMAC finds that the proposed facility does not adequately conform to the Panhandle Regional Solid Waste Management Plan and recommends that the TCEQ not grant the MSW facility permit until the attached noted deficiencies have been properly addressed.

415 West Eighth Avenue
P.O. Box 9257
Amarillo, Texas 79105
(806) 372-3381
(806) 373-3268 (fax)
www.prpc.cog.tx.us

☐ The Panhandle RSWMAC finds that the proposed facility is inconsistent with existing surrounding land uses and recommends that the TCEQ conduct a Land Use Compatibility hearing on the application before giving the application further consideration.

NOTED DEFICIENCIES:

NONE.

ADDITIONAL COMMENTS:

FAVOR APPROVAL OF THE REGISTRATION APPLICATION.

A copy of this letter has been forwarded to the applicant. If you should have any questions or need any additional information, please contact the Panhandle's Regional Solid Waste Management Program Coordinator at (806) 372-3381.

Thank you.

Sincerely,

Randy Criswell, Chairman
Panhandle RSWMAC

copy: Mr. Michael Rice
Dir. of Public Works, City of Amarillo
Mr. Mitch R. Davison, PE
HDR Engineering

Part I

Attachment 3 - Legal Property Description and Registered Survey of Site

for

City of Amarillo Landfill

Potter County, Texas

The following "Legal Description of Tract of Land for Use by the City of Amarillo as a Waste Disposal Site" is the historic legal description used by the City of Amarillo. The legal description includes two separate tracts of land; one tract is 660 acres and the other tract is 2 acres.

03 04 75 jta

PURCHASE OPTION

THE STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF POTTER §

That this purchase option agreement is made by and between the City of Amarillo, a municipal corporation situated in Potter and Randall Counties, Texas, (PURCHASER) and W. J. Hill and wife, Evelyn D. Hill, (SELLERS) upon the following terms performable in Potter County, Texas:

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(e) Taxes for the current year, current rents and insurance, if any, are to be prorated to date of closing.

10. Save for occupation of the home and use of the 120+/- acres of land, SELLERS will give possession of the balance of the section to the PURCHASER at the time of closing.

11. This agreement shall be binding upon and inure to the benefits of the parties hereto, their successors and assigns or heirs and representatives.

EXECUTED in duplicate this 4 day of January, 1975.

W. J. Hill (SELLER)

Box 53
Buckland Texas
(SELLERS' address)

Evelyn D. Hill (SELLER)

ATTEST:

CITY OF AMARILLO, (PURCHASER)

By

INEZ HUTCHINS, City Secretary

JOHN S. STIFF, City Manager

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared W. J. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of January, 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared Evelyn D. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of January, 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared John S. Stiff, City Manager of the City of Amarillo, known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said City of Amarillo, a municipal corporation, and that he executed the same as the act of such corporation for the purposes and consideration therein expressed, and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

EXTENSION OF OPTION AGREEMENT

THE STATE OF TEXAS :
COUNTIES OF POTTER
AND RANDALL :
CITY OF AMARILLO :

BY MUTUAL AGREEMENT of the Seller and the Purchaser of an OPTION AGREEMENT dated February 4, 1975, an extension of 120 days is hereby agreed to by both parties with no changes in any conditions or covenants.

Dated this 21st day of July, 1975.

W. J. Hill

W. J. Hill, SELLER

City of Amarillo, PURCHASER

ATTEST:

City Secretary

420613

250 WARRANTY DEED Gty. Asst. C. Box 1803 79105

THE STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS
COUNTY OF POTTER §

VOL 1257 PAGE 554

That we, WILLIAM JESSE HILL, JR., being one and the same person as W. J. Hill, Jr., and wife, EVELYN D. HILL of the County of Potter and State of Texas for and in consideration of the sum of TWO HUNDRED THIRTY-ONE THOUSAND NINETY-SIX AND 60/100 DOLLARS ($231,096.60) the receipt of which is hereby acknowledged have GRANTED, SOLD AND CONVEYED, and by these presents so GRANT, SELL AND CONVEY unto the CITY OF AMARILLO, a municipal corporation situated in Potter and Randall Counties, Texas, all of the following described real property in Potter County, Texas, to-wit:

All of Section 126, Block 9 , B.S.&F. Survey, Potter County, Texas, containing 658.576 acres and a tract of land containing 1.70 acres out of the Southeast 1/4 of Section 147, Block 9. B.S.&F. Survey, Potter County, Texas and being described by metes and bounds as follows:

BEGINNING at a 3/8 inch iron rod, the Southeast corner of this tract, from whence the Southeast corner of Section 147 bears South 00° 08' 34" West, 2040.92 feet;

THENCE North 00° 08' 34" East, with the East line of Section 147, 240.89 feet to a 3/8 inch iron rod;

THENCE North 54° 54' 26" West, 338.36 feet to a 3/8 inch iron rod;

THENCE South 16° 11' 14" West, 208.71 feet to a 3/8 inch iron rod;

THENCE South 54° 54' 26" East, 408.72 feet to the BEGINNING CORNER OF THIS TRACT.

SAVE AND EXCEPT, and there is hereby reserved unto Grantors, their heirs and assigns, an undivided one-half (1/2) of all of the oil, gas and other minerals in and under and that may be produced from the above described property, together with the right of ingress and egress at all times for the purpose of mining, drilling, exploring, operating and developing said land for oil, gas and other minerals and removing the same therefrom which rights will never be exercised so as to conflict with the use of the above described property by the City of Amarillo for sanitary landfill purposes nor any other municipal purpose.

This conveyance is made and accepted subject to any and all conditions and restrictions, if any, relating to the hereinabove described property to the extent, and only to the extent, that the same may still be in force and effect shown of record in the office of the County Clerk of Potter County, Texas.

TO HAVE AND TO HOLD the above described premises, together with all and singular the rights and appurtenances thereto in anywise belonging, unto the said grantee, its successors and assigns forever; and we do hereby bind ourselves, our heirs and executors and administrators to WARRANT AND FOREVER DEFEND all and singular the said premises unto the said grantee, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof.

EXECUTED this 14th day of October, A.D. 1975.

William Jesse Hill, Jr.

Evelyn D. Hill

Evelyn D. Hill

THE STATE OF TEXAS |
|
COUNTY OF POTTER |

BEFORE ME, the undersigned authority, on this day personally appeared WILLIAM JESSE HILL, JR. and EVELYN D. HILL known to me to be the persons whose names are subscribed to the foregoing instrument, and acknowledged to me that they executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE on this the 14 day of October, A.D. 1975.

Notary Public in and for Potter County, Texas

VOL 1257 PAGE 555

VOL 1257 PAGE 556

STATE OF TEXAS
COUNTY OF POTTER

I hereby certify that this instrument was FILED on this date and at the time stamped hereon by me and was duly RECORDED in the Volume and Page of the Deed RECORDS of POTTER COUNTY, Texas as stamped hereon by me.

PAWNEE GAITHER
County Clerk
Potter County, Texas

Warranty Deed
William Jesse Hill, Jr
et ux
to
City of Amarillo
10-14-75

PAWNEE GAITHER, CLERK
POTTER COUNTY, TEXAS
FILED FOR RECORD

'75 OCT 16 PM 4 15

03 04 75 jba

PURCHASE OPTION

THE STATE OF TEXAS
COUNTY OF POTTER

KNOW ALL MEN BY THESE PRESENTS:

That this purchase option agreement is made by and between the City of Amarillo, a municipal corporation situated in Potter and Randall Counties, Texas, (PURCHASER) and W. J. Hill and wife, Evelyn D. Hill, (SELLERS) upon the following terms performable in Potter County, Texas:

For and in consideration of the mutual benefits to be derived from the covenants herein mutually made, SELLERS hereby give and grant unto PURCHASER, its successors and assigns, the exclusive right and privilege of purchasing the following described property owned by SELLERS (if SELLERS are the owners of less than the full fee simple title, they represent and warrant that they are duly authorized to act in behalf of all owners) and situated in Potter County, Texas, to-wit:

Being all of Section 126, BS&F Survey, Potter County, Texas containing 662+/- acres;

upon the following terms and conditions:

1. The term of this option is one hundred twenty (120) days from the date of execution of this agreement.

2. The purchase price for said property is Three Hundred Fifty and No/100 Dollars ($350.00) per acre based on a survey to be paid for by PURCHASER prior to closing which purchase price shall be paid all in cash upon closing.

3. SELLERS reserve the right to occupy their present home on the property for a period of sixteen (16) months and to farm the 120+/- acres of irrigated land during this period which period of sixteen (16) months includes the 120 day option recited above plus twelve (12) months.

4. PURCHASER agrees to allow SELLERS irrigation privileges and operation of the well during this period and SELLERS agree to leave the well in as good or better condition at the end of sixteen (16) months than at the time the transaction was closed.

5. PURCHASER agrees to allow SELLERS use the feedlot, elevator, and to share use of the barn with PURCHASER during this same sixteen (16) month period. If at the end of said sixteen (16) months, SELLERS have been unable to feed out the ensilage which is presently stored on the premises, PURCHASER agrees to extend the privilege to use feedlot, elevator, and said barn for eight (8) additional months upon request made in writing by SELLERS.

6. All permanent improvements are to remain intact on the property but SELLERS reserve the right to dispose of all farm equipment and machinery.

7. SELLERS agree that they will not enter into any new lease or leases during the term of this option without the written consent of PURCHASER and SELLERS hereby authorize PURCHASER to negotiate with any lessee with respect to modification or any other matter pertaining to any existing lease.

8. Notice of election to purchase hereunder by PURCHASER, its successors or assigns, shall be in writing and shall be delivered in person or by Registered or Certified Mail to SELLERS at SELLERS' address, as set forth below. If notice of election is given by mail, such notice shall be effective at the time of mailing.

9. Upon notice of election, the parties further agree as follows:

(a) PURCHASER will be prepared to pay purchase price in all cash after completion of the survey to be paid for by PURCHASER upon delivery of a General Warranty Deed as hereinafter provided.

(b) SELLERS agree to supply either an abstract of title to said property which shall be conveyed free and clear of any and all encumbrances, or an owners' title policy issued by a title insurance company designated by PURCHASER which property shall be conveyed free and clear of any and all encumbrances.

(c) If any title objections are made, SELLERS shall have a reasonable time, not to exceed thirty (30) days unless extended in writing by PURCHASER, to cure said objections and show good and marketable title. In the event of failure to furnish good and marketable title, PURCHASER its successors or assigns, may at its option, cancel this contract or PURCHASER may enforce specific performance.

(d) SELLERS agree, when title objections have been cured, to deliver a good and sufficient General Warranty Deed properly conveying said property to PURCHASER, its successors or assigns, and PURCHASER agrees, when said Deed is presented, to pay the balance of the purchase price as above set forth.

(e) Taxes for the current year, current rents and insurance, if any, are to be pro rated to date of closing.

10. Save for occupation of the home and use of the 120+/- acres of land, SELLERS will give possession of the balance of the section to the PURCHASER at the time of closing.

11. This agreement shall be binding upon and inure to the benefits of the parties hereto, their successors and assigns or heirs and representatives.

EXECUTED in duplicate this 1 day of January, 1975.

W. J. Hill (SELLER)

Box 53
Earth, Texas
(SELLERS' address)

Evelyn D. Hill (SELLER)

ATTEST:

INEZ HUTCHINS, City Secretary

CITY OF AMARILLO, (PURCHASER)

By

JOHN S. STIFF, City Manager

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared W. J. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned authority in and for said County, Texas, on this day personally appeared Evelyn D. Hill, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that she executed the same for the purposes and consideration therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

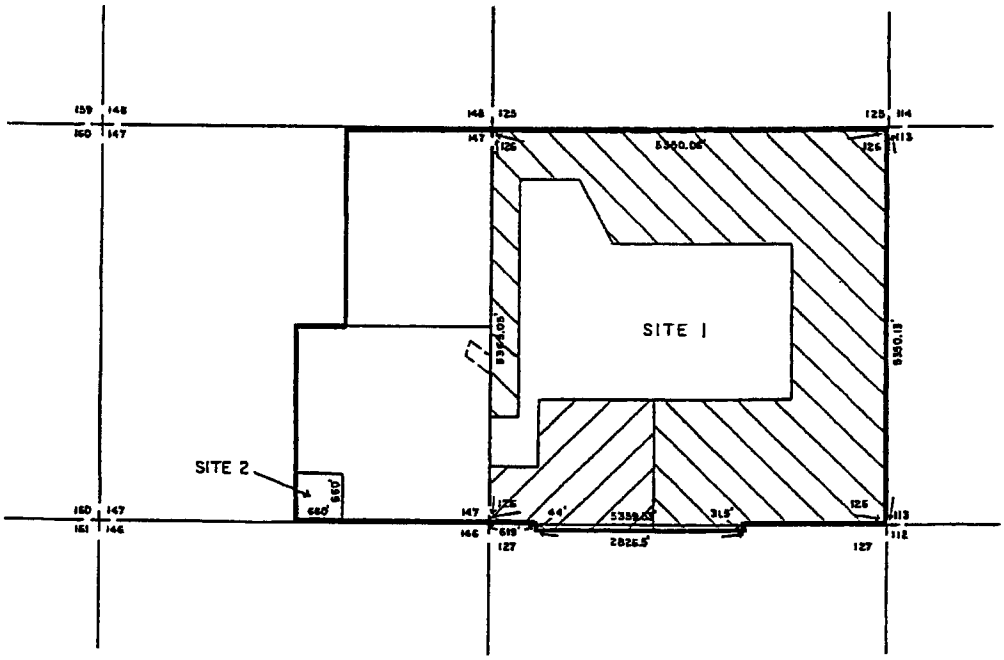
THE STATE OF TEXAS §
§
COUNTY OF POTTER §

BEFORE ME, the undersigned, a Notary Public in and for said County and State, on this day personally appeared John S. Stiff, City Manager of the City of Amarillo, known to me to be the person and officer whose name is subscribed to the foregoing instrument and acknowledged to me that the same was the act of the said City of Amarillo, a municipal corporation, and that he executed the same as the act of such corporation for the purposes and consideration therein expressed, and in the capacity therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this 4 day of February, 1975.

Notary Public, Potter County, Texas

1" = 2000'



LEASED TO J.R. CATTLE CO.

AGRICULTURAL LEASE 6-1-90 THRU 5-31-92 (79 ACRES)

GRAZING LEASE 6-1-90 THRU 5-31-92 (371 ACRES)

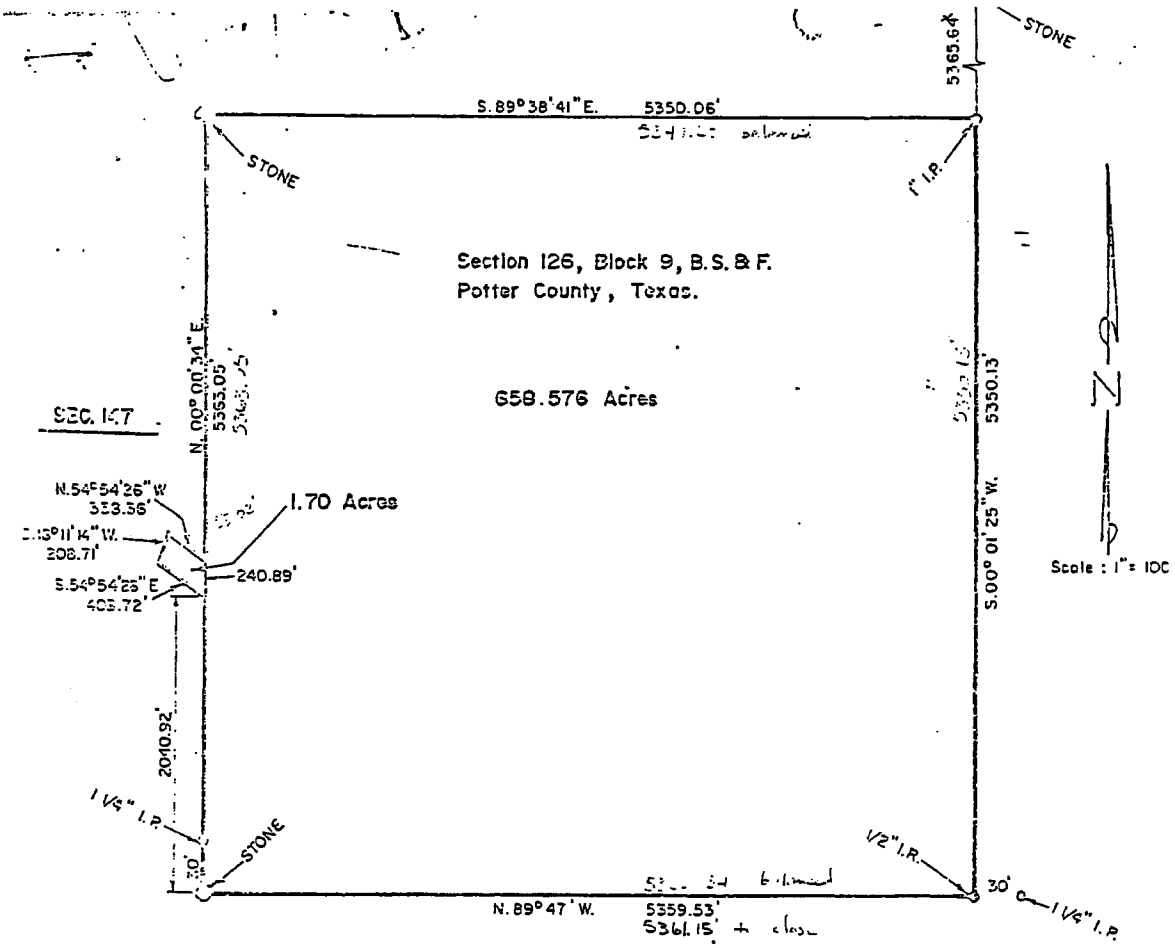
Site 1

LOCATION:	Four miles west of Soncy and two miles north of I-40
LEGAL:	Sec. 126 and a portion of Sec. 147, Blk. 6, BS&F Survey, Potter Co., Tx.
DEED INFORMATION:	William J. and Evelyn Hill, 10-14-75, Vol. 1257, pp. 554 & 555 Caroline Bush and Frederick L. Emeny, 6-14-82 Vol. 1443, pp. 376-383 Warranty deeds 420613 and 540954 thru 540957
OTHER:	Sanitary landfill

Site 2

Lease 10-acre tract to Northwest Texas Environmental Training Institute, Inc. 10-1-91 till 9-30-94 at $5 per acre/year

AP #'s 6-18



D E S C R I P T I O N

All of Section 126, Block 9, B.S.&F. Survey, Potter County, Texas, containing 658.576 acres and a tract of land containing 1.70 acres out of the Southeast 1/4 of Section 147, Block 9, B.S.&F. Survey, Potter County, Texas and being described by metes and bounds as follows:

BEGINNING at a 3/8 inch iron rod, the Southeast corner of this tract, from whence the Southeast corner of Section 147, bears South 00° 08' 34" West, 2040.92 feet;

THENCE N. 00° 08' 34" E., with the East line of Section 147, 240.89 feet to a 3/8 inch iron rod;

THENCE N. 54° 54' 26" W., 338.36 feet to a 3/8 inch iron rod;

THENCE S. 16° 11' 14" W., 208.71 feet to a 3/8 inch iron rod;

THENCE S. 54° 54' 26" E., 408.72 feet to the BEGINNING CORNER OF THIS TRACT.

C E R T I F I C A T E

I, Jimmie Nail, a Registered Public Surveyor, do hereby certify that the above Plat and Description are true and correct, as surveyed on the ground.

Jimmie Nail

REGISTERED PUBLIC SURVEYOR
Amarillo, Texas
October 8, 1975

STATE OF TEXAS
JIMMIE NAIL
1011
REGISTERED PUBLIC SURVEYOR

540957

VOL 1443 PAGE 382

30/584

WARRANTY DEED

GF 39304

THE STATE OF TEXAS (
(KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF POTTER (

That I, Caroline Bush Emeny, not joined herein by my husband because the property which is the subject of this conveyance is my sole and separate property, of the County of Cuyahoga, and the State of Ohio, for and in consideration of the sum of TEN DOLLARS ($10.00) and other valuable consideration to the undersigned paid by the Grantee herein named, the receipt of which is hereby acknowledged have GRANTED, SOLD, and CONVEYED, and by these presents do GRANT, SELL and CONVEY unto the City of Amarillo, Texas, a municipal corporation situated in Potter and Randall Counties, Texas, subject to the reservation hereinafter made, all of the following described real property in Potter County, Texas, to-wit:

A tract of land out of Section 127, Block 9, B.S.&F. Survey, Potter County, Texas, and being more particularly described as follows:

BEGINNING at a point in the North line of said Section 127 from whence the Northwest corner of said Section 127 bears North 89° 47' West a distance of 619 feet;

THENCE South 89° 47' East along the North line of said Section 127 a distance of 2,826.47 feet to a point;

THENCE South 0° 13' West a distance of 31.5 feet to a point;

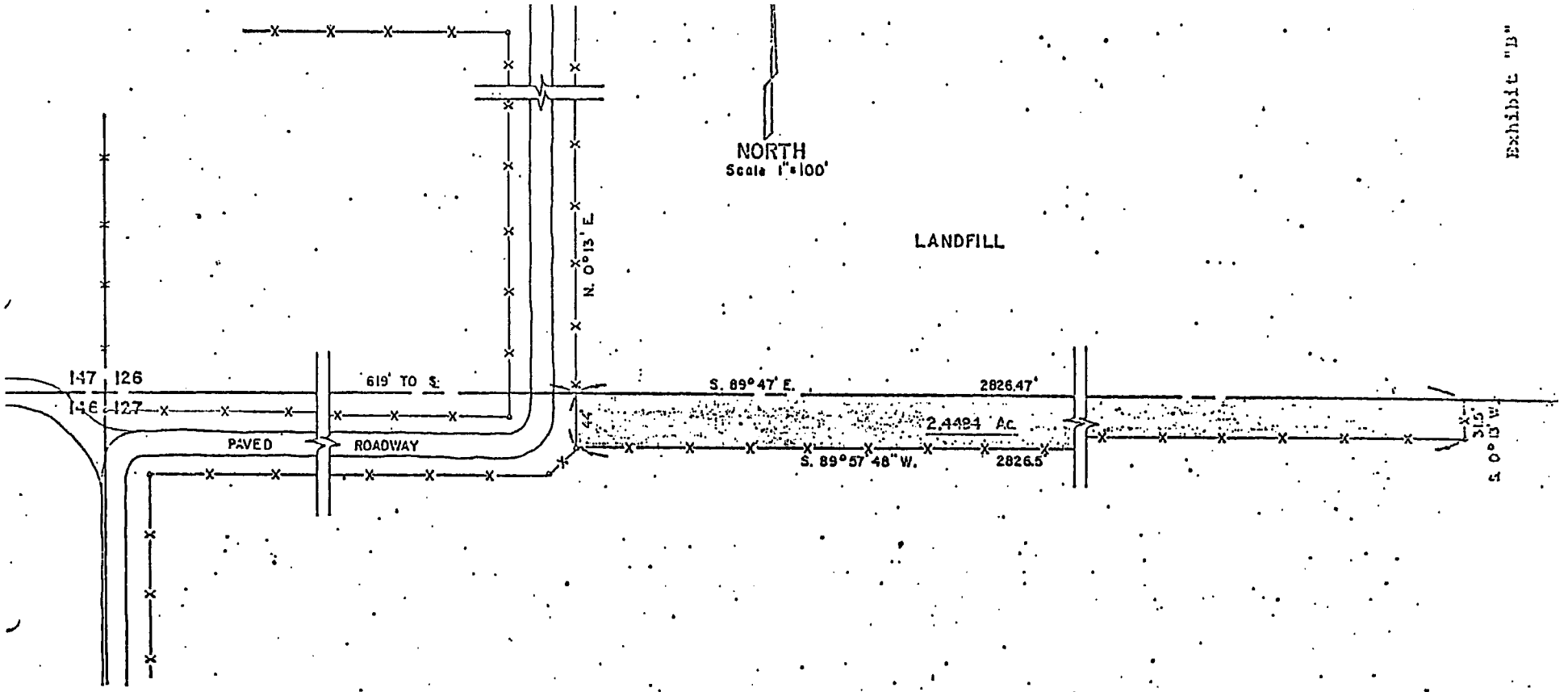
THENCE South 89° 57' 48" West a distance of 2,826.5 feet to a point;

THENCE North 0° 13' East a distance of 44.0 feet to the POINT OF BEGINNING and containing 2.4494 acres of land more or less. SAVE AND EXCEPT there is hereby reserved unto Grantor, her heirs and assigns, all oil, gas, and other minerals in and under and that may be produced from the above described property.

This conveyance is subject to all easements and rights-of-way of record or visible by inspection on the ground.

TO HAVE AND TO HOLD the above described premises, together with all and singular the rights and appurtenances thereto in anywise belonging, unto the said Grantee, its successors and assigns forever, and I do hereby bind myself, my heirs, executors and administrators to WARRANT AND FOREVER DEFEND all and singular the said premises unto the said Grantee, its successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof.

Exhibit "B"



REVISED 4/23/78
CITY OF AMARILLO
DEPT. OF ENGR.

08/28/96 MN MN

Return to:
DONNA DeRIGHT
City Secretary, City of Amarillo
P. O. Box 1971
Amarillo, Texas 79186

841732

RIGHT OF WAY EASEMENT AND AGREEMENT VOL. 2605 PAGE 165

FOR A VALUABLE CONSIDERATION, the receipt of which is hereby acknowledged, the undersigned, herein called Grantor (whether one or more), hereby grants, sells and conveys unto WEST EMERALD PIPE LINE CORPORATION, a Delaware corporation with an address of P. O. Box 631, Amarillo, Texas 79105-0631, hereinafter called EMERALD, its successors and assigns, the RIGHT OF WAY and EASEMENT to lay, construct, inspect, maintain, alter, repair, replace, operate, protect and remove one pipeline and appurtenances, for the transportation of oil, gas or any of their products, or water or other liquid or mineral substances, in, over, through and across the following-described premises situated in Potter County, Texas, to-wit:

> The North sixty feet (60') of Section 126, BS & F Survey, Block 9, more particularly described in a Warranty Deed to the City of Amarillo, dated the 14th of October, 1975, recorded in Book 1257, Page 554 of the Deed Records of Potter County, Texas, AND the North sixty feet (60') of the East 3/4 of the NE/4 of Section 147, BS & F Survey, Block 9, being more particularly described in a Warranty Deed dated 6/15/82 to the City of Amarillo, Texas, recorded in Volume 1443, Page 378 of the Deed Records of Potter County, Texas;

GRANTOR agrees that locations where the pipeline crosses streams, ditches, roadways; or where the terrain should require it, EMERALD's contractor shall have the right to use additional work space as a temporary construction easement, only. Upon completion of the pipeline, EMERALD shall promptly pay to Grantor, or its tenant, damages for the additional work space that was used. EMERALD will maintain a minimum clearance of 25 feet from any of GRANTOR's monitoring wells and will be responsible for immediate repair of damage caused to a monitoring well by construction.

TO HAVE AND TO HOLD until said pipeline is laid and for so long thereafter as it shall be used or maintained, together with all necessary rights of ingress and egress to and from said premises for said purposes.

Grantor is to have the full use and enjoyment of said premises, except for the rights herein granted to EMERALD. EMERALD shall bury its pipeline with at least 48 inches of cover relative to existing natural grade or any proposed grade.

The consideration heretofore paid covers, and EMERALD is hereby released from liability for, all damages reasonably resulting from or incident to the original laying of said pipeline, provided that claims for damages resulting from negligence of EMERALD or of its contractor are not hereby released. EMERALD, however, will restore and reseed to growth the surface disturbed by construction.

This instrument constitutes the entire agreement between the parties hereto, and no covenant or agreement not herein expressed shall be valid unless in writing and signed by the Grantor and a duly authorized officer or agent of EMERALD. The consideration above recited is in full satisfaction of every right hereby granted. The rights of either party hereunder may be assigned in whole or in part with written notice to the other party, and all covenants and agreements herein contained shall extend to and be binding on the respective heirs, devisees, legal representatives, successors or assigns of the parties hereto.

WITNESS THE EXECUTION HEREOF on this 3rd day of September, 1996.

GRANTOR

THE CITY OF AMARILLO

BY: _____
John Q. Ward, City Manager

TID#_____

STATE OF TEXAS

COUNTY OF POTTER

This instrument was acknowledged before me on this 3rd day of September, by John Q. Ward, City Manager, on behalf of the City of Amarillo.

DONNA DeRIGHT
Notary Public, State of Texas
My Commission Expires 4-19-98

_____
Notary Public

FILED FOR RECORD
at 9:00 A M
SEP 06 1996
Mrs. Sue Daniel, County Clerk, Potter Co.
By GB Deputy

STATE OF TEXAS }
COUNTY OF POTTER }

I hereby certify that this instrument was FILED on this date and at the time stamped hereon by me and was duly RECORDED in the OFFICIAL PUBLIC RECORDS OF POTTER COUNTY TEXAS, in the Volume and Page as shown.

MRS. SUE DANIEL
County Clerk,
Potter County, Texas
by _____ DEPUTY

Any provision herein which restricts the sale, rental, or use of the described real property because of color or race is invalid and unenforceable under federal law.

1100 - 46602

02/06/97 MN

851706

Return to:
DONNA DeRIGHT
City Secretary, City of Amarillo
P. O. Box 1971
Amarillo, Texas 79105

VOL. 2643 PAGE 798

EASEMENT

Date: February 18, 1997

Grantor: The City of Amarillo, Texas, a municipal corporation.

Grantee: West Emerald Pipeline Corporation

Grantee's Mailing Address: P. O. Box 631
Amarillo, Texas 79105-0631

Consideration: One Dollar ($1.00) and other good and valuable consideration.

Property: All that certain tract or parcel of land situated in Section 126, Block 9, B.S.&F. Survey, Potter County, Texas being more particularly described as follows:

Beginning at a point from whence the Northeast corner of said Section 126 Bears S 89°38'41" E a distance of 405.2 feet and N 00°01'25" E a distance of 60.0 feet;
Thence S 45°21'19" W a distance of 113.9 feet;
Thence N 89°38'41" W a distance of 1010.5 feet;
Thence N 44°38'41" W a distance of 113.9 feet;
Thence S 89°38'41" E a distance of 84.9 feet;
Thence S 44°38'41" E a distance of 29.0 feet;
Thence S 89°38'41" E a distance of 960.8 feet;
Thence N 45°21'19" E a distance of 29.0 feet;
Thence S 89°38'41" E a distance of 84.9 feet to the Place of Beginning, and the End of this Survey.

Grantor, for consideration by this instrument grants and conveys an Easement in the Property to Grantee for a liquid products pipeline and to make and maintain improvements to the pipeline to better accommodate such purposes. Grantee will maintain 48 inches of cover from existing or proposed grade. Grantor binds itself, its successors and assigns to warrant and forever defend all and singular the Property to Grantee, its successors and assigns against any person whomsoever lawfully claiming the same or any part thereof.

GRANTOR

By: John D Ward

THE STATE OF TEXAS)
)
COUNTY OF POTTER)

This instrument was acknowledged before me on the 18th day of February, 1997, by John Ward, City Manager of the City of Amarillo on its behalf.

Donna DeRight
Notary Public in and for
The State of Texas

DONNA DeRIGHT
Notary Public, State of Texas
My Commission Expires 4/19/98

My Commission Expires: 4/19/98

FILED FOR RECORD
at 1:55 PM

FEB 21 1997

Mrs. Sue Daniel, County Clerk, Potter Co.
By _____ Deputy
Gov - 53034

STATE OF TEXAS
COUNTY OF POTTER }

I hereby certify that this instrument was FILED on this date and at the time stamped hereon by me and was duly RECORDED in the OFFICIAL PUBLIC RECORDS OF POTTER COUNTY TEXAS, in the Volume and Page as shown.

MRS. SUE DANIEL
County Clerk,
Potter County, Texas

by _____ DEPUTY

Any provision herein which restricts the sale, rental, or use of the described real property because of color or race is invalid and unenforceable under federal law.

Part I

Attachment 4 – Easement Release Documentation

for

City of Amarillo Landfill

Potter County, Texas

Valero LP

Valero Logistics Operations, L.P.

P.O. Box 691470 • San Antonio, Texas 78269-1470
One Valero Way • San Antonio, Texas 78249-1616
Phone: 210/345-2000 • Fax: 210/345-3511

December 7, 2005

Mr. Michael Rice
City of Amarillo
P.O. Box 1971
Amarillo, TX 79105

RE: Release of Pipeline Right of Way, Potter County, Texas

Dear Mr. Rice:

Please find enclosed the *Full Release of Pipeline Right of Way* for two easements secured by West Emerald Pipe Line Corporation for a 6" pipeline located in Sections 126 and SE/4 Section 147 Block 9, Beaty, Seale and Forwood Survey, Potter County, Texas. This release was recorded in Volume 3678, Page 563 of Potter County, Texas on November 22, 2005.

Please contact either James Sanford, Manager of Right of Way, at (210) 345-3398, or me, at (210) 345-4822, if you have any questions or require further assistance.

Best Regards,

Terri Chaney

Terri Chaney
Right of Way Department

01065694

VOL. 3678 PAGE 563

FULL RELEASE OF PIPELINE RIGHT-OF-WAY

STATE OF TEXAS §

COUNTY OF POTTER §

WHEREAS VALERO LOGISTICS OPERATIONS, L.P., successor in interest to West Emerald Pipe Line Corporation, with a mailing address of One Valero Way, San Antonio, Texas 78249 (Valero), is the present owner of certain rights of way and other related rights granted by those certain instruments described below (collectively referred to herein as the "Right of Way Agreements"):

dated April 29, 1958 and recorded in Volume 799, Page 465, of the Deed Records of Potter County, Texas; and

dated May 6, 1958 and recorded in Volume 805, Page 55 of the Deed Records of Potter County, Texas

NOW THERFORE, VALERO does hereby release all interest it has in the Right of Way Agreements and quitclaims unto the present record owner, their heirs, successors and assigns, all of its right, title and interest acquired under the Right of Way Agreements as described to wit:

Section 126 and SE/4 Section 147 of Block 9, Beaty, Seale and Forwood Survey, Potter County, Texas

Valero is willing to release its above described Right of Way Agreements; however, Valero retains all rights, title and interest granted by those certain instruments listed below, that traverse the same sections of land in Potter County, Texas:

dated September 3, 1996, recorded in Volume 2605, Page 16 of the Official Public Records of Potter County, Texas; and

dated February 18, 1997, recorded in Volume 2643, Page 798 of the Official Public Records of Potter County, Texas.

IN WITNESS THEREOF, this Release of Pipeline Right-of Way is executed effective as of this 14th day of November 2005.

Valero Logistics Operations, L.P.
By: Valero GP, Inc. its general partner

By: Brad R. Ramsey, Vice President-Engineering

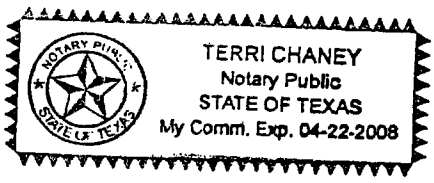
ACKNOWLEDGMENT

VALERO LOGISTICS OPERATIONS, L.P.

STATE OF TEXAS §

COUNTY OF BEXAR §

This instrument was acknowledged before me on this 14th day of ~~August,~~ November 2005 by ***Brad R. Ramsey,*** as Vice President-Engineering of Valero GP, Inc., a Delaware corporation and the general partner of Valero Logistics Operations, L.P., a Delaware limited partnership, on behalf of said legal entity.



Terri Chaney

Terri Chaney, Notary Public
State of Texas

My commission expires: April 22, 2008

When recorded, please return to:
Valero Logistics Operations, L.P.
One Valero Way
San Antonio, TX 78249-1112
ATTN: Terri Chaney, Pipelines and Terminals
File No. ALB10S021016 & ALB10S021016A

COUNTY CLERK'S MEMO

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County Clerk, Potter County., TX

By _____, Deputy

VOL. 3678 PAGE 565

STATE OF TEXAS COUNTY OF POTTER

I hereby certify that this instrument was FILED on this date and at the time stamped hereon by me and was duly RECORDED in the OFFICIAL PUBLIC RECORDS OF POTTER COUNTY TEXAS, in the volume and page as shown.

Mrs Sue Daniel, County Clerk
Potter County.,Texas

By _____, Deputy

Any provision herein which restricts the sale, rental or use of the described real property because of color or race is invalid and unenforceable under federal law.

Part I

Attachment 5 - Legal Authority

for

City of Amarillo Landfill

Potter County, Texas

12/09/2005 _____

RESOLUTION NO. 12-13-05-1

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF AMARILLO, TEXAS, IN SUPPORT OF THE AMARILLO LANDFILL PERMIT AMENDMENT APPLICATION FILED WITH THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY REQUESTING AN INCREASE IN THE STORAGE CAPACITY OF THE CITY OF AMARILLO LANDFILL BY INCREASING THE PERMITTED HEIGHT.

WHEREAS, the City of Amarillo has filed a Landfill Permit Amendment Application requesting authorization from the Texas Commission on Environment Quality (TCEQ) to expand the solid waste storage capacity of the City of Amarillo's existing landfill by increasing the permitted height to provide uninterrupted refuse disposal for the City's residents and businesses; and

WHEREAS, the City Commission has determined that the Landfill Permit Amendment Application is significant to both the City of Amarillo and to the surrounding area; and

WHEREAS, the granting of the Amarillo Landfill Permit Amendment Application by TCEQ will have the effect of providing the City of Amarillo and the surrounding areas with a long-term plan for the efficient and safe disposal of solid waste; and

WHEREAS, the Panhandle Regional Solid Waste Management Advisory Committee has previously confirmed that the Permit Amendment Application to expand the landfill is in conformance with the regional Solid Waste Management Program and has recommended that the Texas Commission on Environmental Quality approve the Amarillo Landfill Permit Amendment Application,

NOW THEREFORE BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF AMARILLO, TEXAS:

That the City of Amarillo, Texas, supports and endorses the Amarillo Landfill Permit Amendment Application to expand the solid waste storage capacity of the existing City of Amarillo landfill and hereby request that the Texas Commission on Environmental Quality approve the Permit Amendment Application.

INTRODUCED AND PASSED by the City Commission of the City of Amarillo, Texas, on this 13th day of December 2005.

Debra McCartt

Debra McCartt, Mayor

ATTEST:

Donna DeRight

Donna DeRight, City Secretary

THE STATE OF TEXAS }
COUNTIES OF POTTER AND RANDALL }
CITY OF AMARILLO }

The undersigned City Secretary of the City of Amarillo in the State and Counties aforesaid hereby certifies that the attached and forgoing document is a true and correct copy of a part of the records, papers and books in the Office of the City Secretary; and that I am the custodian of such papers, books and records as an officer of the City of Amarillo.

Witness my hand and official seal this 13th day of December 2005

Donna DeRight

City Secretary
City of Amarillo, Texas

MUNICIPAL CODE
City of
AMARILLO, TEXAS

Codified through
Ord. No. 6762, enacted Aug. 31, 2004.
(Supplement No. 35)

Preliminaries

CODE OF ORDINANCES
CITY OF
AMARILLO, TEXAS

GENERAL ORDINANCES OF THE CITY

Adopted September 27, 1988

Published by Order of the City Commission

Published by Municipal Code Corporation
Tallahassee, Florida 1988

OFFICIALS

of the

CITY OF AMARILLO, TEXAS

AT THE TIME OF THIS CODIFICATION

Glen Parkey

Mayor

John Chandler

Don Chrysler
Dave Taylor
Keith Adams
City Commission

Merrill Nunn

City Attorney

Donna DeRight

City Secretary

PREFACE

This Code constitutes a complete recodification of the ordinances of the City of Amarillo, Texas of a general and permanent nature.

Source materials used in the preparation of the Code were the 1960 Code, as amended, and ordinances adopted by the City Commission. The source of each section is included in the history note appearing in parentheses at the end thereof. The absence of such a note indicates that the section is new and was adopted for the first time with the adoption of the Code. By use of the comparative tables appearing in the back of this volume, the reader can locate any section of the 1960 Code, as amended, and any subsequent ordinance included herein.

This Code was prepared after an extensive staff review. The fruit of such review was a series of ordinances amending the Code so as to modernize it. The arrangement and numbering system in this Code has been developed with the cooperation of city officers and employees. The Code has been classified by titles. Each title contains chapters. After Title II, each odd-numbered title has been reserved for future use. The various sections within each chapter have been catchlined to facilitate usage. Footnotes which tie related sections of the Code together and which refer to relevant state laws have been included. A table listing the state law citations and setting forth their location within the Code is included at the back of this volume.

Numbering System

Each section of the Code is identified with its title and chapter number and any additions can be inserted in their proper place by the use of the decimal system. New material consisting of three sections that would logically come between sections 2-4-22 and 2-4-23 would be designated as sections 2-4-22.1, 2-4-22.2 and 2-4-22.3, respectively. When appropriate sections have been reserved at the end of articles and divisions for future expansion. New chapters may be included in the same manner. If the new material is to be included between Chapters 2-4 and 2-5 it will be designated as Chapter 2-4.5. New articles and new divisions may be included in the same way or, in the case of articles, may be placed at the end of the chapter embracing the subject, and, in the cases of divisions, may be placed at the end of the article embracing the subject, the next successive number being assigned to the article or division.

Special Feature

A unique feature of the Code is the capitalization scheme. This scheme was developed by the city. In addition to capitalizing the titles of officials and departments, defined terms are capitalized. As Code section 1-2-1 provides that definitions apply throughout the Code, terms defined in section 4-10-3 are applicable throughout the Code.

Indices

The indices have been prepared with the greatest of care. Each particular item has been placed under several headings, some of the headings being couched in lay phraseology, others in legal terminology, and still others in language generally used by municipal officials and employees. There are numerous cross references within each index which stand as guideposts to direct the user to the particular item in which he is interested.

Looseleaf Supplements

A special feature of this Code to which the attention of the user is especially directed is the looseleaf system of binding and supplemental servicing for the Code. With this system, the Code will be kept up-to-date

periodically. Upon the final passage of amendatory ordinances, they will be properly edited and the appropriate page or pages affected will be reprinted. These new pages will be distributed to holders of copies of the Code, with instructions for the manner of inserting the new pages and deleting the obsolete pages.

Successfully keeping this Code up-to-date at all times will depend largely upon the holder of the volume. As revised sheets are received, it will then become the responsibility of the holder to have the amendments inserted according to the attached instructions. It is strongly recommended by the publisher that all such amendments be inserted immediately upon receipt to avoid misplacing them and, in addition, that all deleted pages be saved and filed for historical reference purposes.

Acknowledgments

The publication of this Code was under the direct supervision of Roger D. Merriam, Supervising Editor, and Laura Johnson, Editor, of the Municipal Code Corporation, Tallahassee, Florida. Credit is gratefully given to the other members of the publisher's staff for their sincere interest and able assistance throughout the project.

The publisher is most grateful to Merril Nunn, City Attorney, and former Assistant City Manager, Mr. Mark F. Sowa, for their cooperation and assistance during the progress of the work on this Code. It is hoped that their efforts and those of the publisher have resulted in a Code of Ordinances which will make the active law of the city readily accessible and which will be a valuable tool in the day-to-day administration of the City's affairs.

MUNICIPAL CODE CORPORATION
Tallahassee, Florida

ADOPTING ORDINANCE

Ordinance No. 5771

An Ordinance Adopting and Enacting a New Code of Ordinances for the City of Amarillo, Providing for the Repeal of Certain Ordinances; Ratifying Penalty Provisions; Providing for the Manner of Amending Such Code; Providing for Severability; and Providing for an Effective Date.

Whereas, the City Commission has recodified ordinances of the City of Amarillo and enacted both substantive and nonsubstantive changes to the Amarillo Municipal Code as have been clearly set out in the amendatory ordinances; and

Whereas, the chapter and section numbers which were enacted by the City Commission have been changed in the recodified code by Municipal Code Corporation; and

Whereas, the City Commission now intends to adopt the Code of Ordinances as published by the Municipal Code Corporation just as if the number system used in such code had been the numbering system adopted by the City Commission in adopting the recodifying ordinances; now, therefore,

Be It Ordained By The City Commission of The City of Amarillo:

Section 1. The Code entitled the "Code of Ordinances, City of Amarillo, Texas," herein referred to as the "Code", published by Municipal Code Corporation, Tallahassee, Florida, 1988, consisting of Titles I through XVIII is adopted. Such Code may also be properly called the Amarillo Municipal Code, and consists of the following Titles used by Municipal Code Corporation to combine and include therein the designated chapters adopted by the City Commission.

(a) Title I, General Provisions, contains Chapter 1 as adopted.

(b) Title II, Administration, includes Chapter 2, Administration, and Chapter 7, Municipal Court.

(c) Title IV, Building Codes Development and Zoning, includes Chapter 5, Buildings; Chapter 8, Electricity; Chapter 17, Plumbing; Chapter 21, Platting and Subdivisions; Chapter 25A, Flood Hazard Areas; Chapter 26, Zoning; and Chapter 26A, Airport Zoning Regulations.

(d) Title VI, Equal Opportunity, contains Chapter 6 as adopted.

(e) Title VIII, Public Health and Sanitation, includes Chapter 4, Animals and Fowl; Chapter 11, Garbage, Trash and Weeds; Chapter 12, Vehicles, Illegal, Junked and Abandoned; and Chapter 10, Public Health.

(f) Title X, Public Safety, includes Chapter 9, Fire Prevention; Chapter 14, Offenses; and

Chapter 18, Police Department.

(g) Title XII, Parks and Recreation; Miscellaneous Nuisances contains Chapter 15, Parks.

(h) Title XIV, Permits, Taxation, Licenses and Business Regulations, includes Chapter 22, Taxation; and Chapter 13, Occupational Regulations, Licenses and Permits.

(i) Title XVI, Transportation, includes Chapter 3A, Airports and Aircraft; Chapter 23, Traffic; and Chapter 24, Vehicles for Hire.

(j) Title XVIII, Utilities, contains Chapter 19, Sewers; and Chapter 25, Water.

Section 2. In the recodification ordinances passed by the City Commission, penalties were enacted, in some ordinances by reference to a general penalty provision which had been adopted, and in some ordinances by enacting a specific penalty for a violation of such ordinance. The specific penalties adopted by such ordinances are hereby ratified and confirmed as they appear in the Code. Where no specific penalty is set out, the general penalty set out in Section 1-1-5 of the code shall apply. The adoption of a penalty shall not preclude the use of any and all other remedies available at law or in equity.

Section 3. The following sections in the Code contain errors which are more than typographical and which change the meaning and intent of those sections. The erroneous portions of such sections should appear as set out herein with the corrections underlined.

Sec. 4-2-2. Definitions.

Surface Display Area: The area made available on either side of the Sign structure, the purpose of which is for the displaying of the advertising message [~~method~~].

Sec. 4-3-1. Adoption of building code, amendments.

Section 33-3(a), Exception 3, to the fifth paragraph, is amended as follows:

"3. Storage rooms, laundry rooms and maintenance offices not exceeding five hundred (500) square feet in floor area may be provided with only one (1) exit."

Sec. 4-5-21. Plumbing code adopted; amendments.

Section 10.3 is amended by adding a second paragraph to read as follows:

"This chapter shall apply to the materials, construction, alterations, and inspection of all plumbing installations within the City of Amarillo and all plumbing installations outside the corporate limits of the City of Amarillo connected to water or sewage systems of the City."

Sec. 4-5-24. Swimming pool, etc., Code.

Section 310 is amended by adding thereto the following:

"A swimming pool being drained by any method other than underground drainage shall be drained to a paved street with curb and gutter or paved alley and shall not be drained to unpaved streets or unpaved alleys. When draining a pool to a street as hereinabove provided, water shall not flow higher than the top of the curb."

Sec. 14-2-56. Penalties.

(a) If any person required by the provisions of this article to collect the tax imposed herein, or make reports required herein, and to pay the Tax Assessor/Collector for the taxes imposed herein, shall fail to collect such taxes, file such report, or remit [~~collect~~] such taxes, or if any such person shall file a false report, or any person shall violate any of the provisions of this article, such person shall be deemed guilty of a misdemeanor and upon conviction be punished by a fine not to exceed five hundred dollars ($500.00).

Sec. 16-3-76(b). Through streets.

On no corner Lot which abuts an intersection of a Through Street and an intersecting Street shall there be erected or maintained any obstruction described in subsection (a) of this section within a triangular area described by the intersection of the adjacent Curblines, or if none exists, the normal Curblines, and a point ten (10) feet from the intersection on the intersecting Street and one hundred (100) feet from the intersection on the Through Street; provided, however, this provision shall not apply at intersections controlled by official traffic control signals.

Sec. 16-3-1002. Schedule B, maximum speed limit.

TABLE INSET:

Location	*From*	*To*	*MPH*
24th Avenue (North)	*Garfield*	*Lake*	*40 ~~[35]~~*

Sec. 16-3-1004. Schedule D, dual left turns.

Schedule of Dual Left Turns

TABLE INSET:

From	*Turning Left Into*
I-40 S. Frontage Rd.	*S. Bell St.*

Section 4. Where this Code contains an undetected error which changes the meaning and intent of the provisions of the Code from the meaning and intent of any provision adopted by the Amarillo City Commission in any recodification ordinance, such error shall not be deemed to have amended any provision of such recodification ordinance to change the meaning and intent thereof but shall be subject to revision and correction when discovered by notifying Municipal Code Corporation of the deviation.

Section 5. All ordinances which had been previously enacted as amendatory ordinances at the Amarillo Municipal Code and which were enacted on or before September 15, 1987, and not included in this Code or recognized and continued in force by reference in such Code are repealed. Such repeal shall not revive any ordinance or part thereof which had been repealed by any ordinance or part thereof that is repealed by this ordinance.

Section 6. Amendments to the Code when passed in a form to indicate the intention of the City Commission to make the same a part of the Code shall be deemed to be incorporated in the Code and reference to the Code shall include such additions and amendments.

Section 7. Ordinances adopted after September 15, 1987, that amend or refer to ordinances that have been codified in the Code shall be construed as if they amend or refer to the provisions of the Code as herein adopted.

Section 8. This ordinance shall become and be effective on and after the date of its adoption.

Section 9. The provisions of this Ordinance and of the Code are deemed to be severable, and the invalidity of any phrase, clause, sentence, paragraph or section of this Ordinance or the Code shall not affect the validity of any remaining provisions. The penalties provided in the recodification ordinances passed by the City Commission have not been changed by the general provisions of this Ordinance, and publication of this ordinance is not required to validate or enact any penalty provision. Should any penalty provision nevertheless be found to be invalid, such penalty provision will be severed and its invalidity will not affect the validity of any other penalty provision in the Code.

Introduced and Passed by the City Commission of the city of Amarillo, Texas, on First Reading the 20th day of September, 1988; and *Passed* on Second and Final Reading the 27th day of September, 1988.

/s/ _____
Glen Parkey, Mayor

ATTEST:

_____
Donna DeRight, City Secretary

CHAPTER 8-3. GARBAGE, TRASH AND WEEDS*

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*Cross references: Health nuisances, § 8-5-51 et seq.; water and sewer systems generally, § 8-5-61 et seq.; utilities, Tit. XVIII.

State law references: Solid Waste Disposal Act, V.A.C.S. art. 4477-7; Comprehensive Municipal Solid Waste Management, Resources and Recovery Act, V.A.C.S. art. 4477-7c; Texas Litter Abatement Act, V.A.C.S. art. 4477-9a; home rule powers, V.T.C.A., Local Government Code§ 51.071 et seq.

ARTICLE I. IN GENERAL

Sec. 8-3-1. Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Commercial Collection: Any refuse collection not defined as Residential Collection.

Family: Any number of individuals living together as a single housekeeping unit, in which not more than four (4) individuals are unrelated by blood, marriage or adoption.

Four-Family Residence: A single Structure containing four (4) connected Housing Units.

Garbage: Putrescible Animal and vegetable waste materials resulting from the storage, handling, preparation, cooking or consumption of food.

One-Family Residence: A Housing Unit designed for Occupancy by only one (1) Family.

Residential Collection: Refuse collection from One-Family Residences, Two-Family Residences, Three-Family Residences or Four-Family Residences.

Superintendent: The person responsible for the direction of the Sanitation Department or his authorized agent.

Three-Family Residence: A single Structure containing three (3) connected Housing Units.

Trash: Nonputrescible waste consisting of both combustible and noncombustible waste materials including, but not limited to, paper, rags, cartons, wood, rubber, plastics, yard or lawn trimmings, tree or shrub trimmings, leaves, glass, crockery, tin cans, aluminum cans, scrap metal, scrap lumber, discarded appliances, furniture, vehicle parts, construction waste, ashes and similar material.

Two-Family Residence: A single Structure containing two (2) connected Housing Units.

(Code 1960, § 11-1; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5649, § 1, 11-11-86)

Sec. 8-3-2. Sanitation department created; supervision.

A Sanitation Department for the City is hereby created which shall be under the direction of the Superintendent of the Sanitation Department, who, in turn shall be under the general supervision of the Director of Public Works.

(Code 1960, § 11-9; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-3. Nonauthorized deposits of garbage, trash; proper use of disposal areas, containers.

(a) The following shall be unlawful and offenses:

(1) To deposit or dispose of any Garbage or Trash at any place within the City or within five thousand (5,000) feet of the City limits, except at an officially designated disposal site;

(2) To deposit any Garbage or Trash within the boundaries of a City disposal site except as directed by the Superintendent;

(3) For any person who does not pay a City refuse collection charge to deposit Garbage or Trash in any City-owned refuse container; or

(4) For the occupant of a Residence for which refuse collection service is not provided by a mechanically-dumped container system to deposit Garbage or Trash in any City-owned refuse container.

(b) Violation of any requirement of Section 8-3-3 is hereby declared an offense punishable in accordance with Section 1-1-5 of this Code.

(Code 1960, § 11-2; Ord. No. 5578, § 2, 3-18-86; Ord. No. 6392, § 1, 1-5-99)

Sec. 8-3-4. City disposal sites--Persons allowed.

Only City employees and persons authorized by the Superintendent or his agent are allowed on City-owned solid waste storage, processing or disposal sites.

(Code 1960, § 11-3; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-5. Same--Deposits become property of city.

All Trash and other material on a City disposal site is the property of the City. No person is allowed to separate, collect, carry off or dispose of Garbage or Trash except under the authority and direction of the Superintendent with the approval of the Director of Public Works.

(Code 1960, § 11-4; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-6. Deposits in streets and alleys.

It shall be unlawful for any person to deposit or place Garbage or Trash upon any Street, Alley or other Public Right-of-way adjacent to any Premises within the corporate limits of the City except as allowed in this chapter.

(Code 1960, § 11-31; Ord. No. 5578, § 2, 3-18-86)

State law references: Littering generally, V.A.C.S. art. 4477-9a, § 2.011.

Sec. 8-3-7. Blocking access to containers prohibited; minimum fine.

(a) It shall be unlawful to stop, stand, or park a vehicle or trailer on public or private property in a manner and in a location that prevents access to a trash container by a trash collection truck which is attempting to empty the trash container.

(b) For the purposes of this section, it shall be presumed that the owner of record of any violating vehicle or trailer is the person who parked the vehicle or trailer in the offending location, and in absence of evidence identifying another person in control of such vehicle, the complaint alleging a violation of this section shall be filed against the owner of record.

(c) The Solid Waste Superintendent is authorized and directed to post warning signs in areas where the greatest number of violations of subsection 8-3-7(a) above, occur giving notice that parked vehicles which block access to trash containers by trash collection trucks will be towed at the vehicle owner's expense. Such signs may simple state *Tow Away Zone* and cite this section number.

(d) A vehicle found parked in violation of section 8-3-7(a), above, where a warning sign has been posted may be towed at the vehicle owner's expense.

(e) A violation of this section shall be punished in accordance with section 1-1-5 of the Amarillo Municipal Code except that the minimum fine upon conviction shall be twenty-five dollars ($25.00).

(Code 1960, § 11-32; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5744, § 1, 5-4-88; Ord. No. 6448, § 1, 11-2-99)

Sec. 8-3-8. Violations; penalty.

Any person violating any of the provisions of this chapter shall, upon conviction, be subject to penalty as provided in section 1-1-5 of this Code.

(Code 1960, § 11-32; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5744, § 1, 5-4-88)

Secs. 8-3-9--8-3-25. Reserved.

ARTICLE II. RECEPTACLES

Sec. 8-3-26. Required.

Each person using or occupying any Building, house or Structure within the corporate limits of the City for a Residence for which service is not provided by a container system which can be mechanically emptied, shall place all Garbage and Trash accumulated by such Residence in plastic bags for collection as provided in this article.

(Code 1960, § 11-5; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-27. Plastic bags; material, capacity.

Plastic Garbage and Trash bags shall be made of a durable grade of plastic at least one and one-half (1.5) mils in thickness. Such bags shall be leakproof and shall have a minimum capacity of twenty (20) gallons each.

(Code 1960, § 11-5(A); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-28. Securing.

The top of such plastic bags when filled and placed out for collection shall be tightly secured by a fastening device to prevent spillage.

(Code 1960, § 11-5(B); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-29. Bags furnished by City.

Where plastic bags are required to be used, the City will furnish three (3) bags per Residence per week. The Superintendent will maintain a supply of bags from which additional bags may be purchased, and the Superintendent will devise a procedure for distribution of the required plastic bags.

(Code 1960, § 11-5(C); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-30. Placement for collection.

(a) *Location.* Bagged Garbage and Trash shall be collected only when it is placed within three (3) feet of the Curbline or of the edge of the roadway in front of the residence. Under special circumstances, the Superintendent may approve an alternate location for a specific Residence.

(b) *Time restriction.* Bagged Garbage and Trash shall be placed at the collection point no more than twelve (12) hours prior to collection nor later than 7:30 a.m. on the designated collection day.

(Code 1960, § 11-6; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-31. Collection specifications for residents.

Collections shall include only Garbage and Trash placed in receptacles with the following provisions and exceptions:

(1) *Maximum weight.* Plastic bags as described in section 8-3-27 shall not be filled to a weight of more than forty (40) pounds.

(2) *Collection frequency.* Residential collection frequency for Garbage and Trash placed in plastic bags as required in this article shall be a maximum and normal of twice a week and a minimum of once a week.

(3) *Heavy accumulations.* Heavy accumulations, such as bricks, broken concrete, lumber, shingles, ashes, clinkers, slag, cinders, dirt, plaster, sand or gravel, automobile frames, furniture, appliances, dead trees and other bulky, heavy material shall not be deposited in or near receptacles or containers for collection, but shall be immediately disposed of at the expense of the person in possession of such material.

(4) *Trimmings.* Tree, hedge, shrub and yard trimmings shall be collected as follows:

a. In areas of the City for which service is not provided by a container system which can be mechanically emptied, trimmings shall be collected at least once every thirty (30) calendar days.

b. In areas of the City for which service is provided by a container system which can be mechanically emptied, trimmings which cannot be placed in receptacles shall be collected once every sixty (60) to ninety (90) calendar days.

(5) *Grass, weeds, leaves.* Trash such as grass, weeds, leaves and similar items must be placed in a container for collection.

(6) *Liquids.* Garbage or Trash that is mixed with water or other liquids shall be drained before being placed in a Garbage or Trash receptacle.

(7) *Dead Animals.* Dead Animals shall not be placed in a Garbage or Trash receptacle. The presence of a dead Animal carcass on any Premises, or in the Street or Alley adjacent thereto, must be promptly reported to the Animal Control Department by the person in control of the Premises.

(8) *Manure.* Manure from cow lots, horse lots, stables, poultry yards, pigeon lofts and other similar areas shall be privately collected regularly so as to prevent accumulations. It shall be the sole responsibility of the person in control of the premises to remove and dispose of such manure periodically.

(9) *Waste oils, grease.* Waste oils, grease or other similar petroleum products from garages, service stations, etc., shall be privately disposed of at the expense of the establishment which accumulates such material.

(Code 1960, § 11-7; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-32. Discontinuance of collection service for cause.

Where violation of this Code regarding collection of Garbage and Trash is not corrected after a seven-day written notice period, in addition to filing a complaint under section 1-1-5 of this Code, the Superintendent is authorized to discontinue Garbage and Trash collection service. Such written notice shall be given by personal service or by certified mail, return receipt requested.

(Code 1960, § 11-8; Ord. No. 5578, § 2, 3-18-86)

Secs. 8-3-33--8-3-45. Reserved.

ARTICLE III. PRIVATE COLLECTORS AND TRANSPORTERS

Division 1. Generally

Sec. 8-3-46. Authorization.

No person shall be prohibited by this chapter from removing the accumulation of Garbage and Trash from the Premises under his control and transporting it to the City refuse disposal area without a permit; provided, however, any person hauling or transporting any kind of Trash or Garbage shall provide for such use a motor-driven vehicle or trailer equipped with a bed or body of sufficient tightness to prevent the Garbage or Trash from escaping therefrom, which shall be covered in such manner so as to prevent such Garbage and Trash from blowing therefrom. It shall be unlawful for any person hauling or transporting any kind of Garbage or Trash to allow, suffer or permit such Garbage or Trash to fall or be scattered upon any Street, Alley or other Public Right-of-way within the City.

(Code 1960, § 11-14; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-47. Specifications for vehicles hauling garbage.

Any person who hauls or offers to haul or transport any kind of Garbage within the City shall provide and use for such hauling a motor-driven vehicle equipped with a waterproof metal tank or body, equipped with a flyproof covering, such as a tarpaulin or heavy duck material. It shall be unlawful for any person hauling or transporting any kind of Garbage to allow, suffer or permit such Garbage to fall or be scattered upon any Street, Alley or other Public Right-of-way within the City.

(Code 1960, § 11-15; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-48. Specifications for vehicles hauling trash.

Any person who hauls or offers to haul or transport any kind of Trash within the City shall provide and use for such hauling a motor-driven vehicle equipped with a bed or body of sufficient tightness to prevent Trash escaping therefrom, and which shall be covered with a screen wire covering or securely tied to the bed of the vehicle to prevent such Trash from blowing therefrom. It shall be unlawful for any person hauling or transporting any kind of Trash to allow, suffer or permit such Trash to fall or be scattered upon any Street, Alley or other Public Right-of-way within the City.

(Code 1960, § 11-16; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-49. Scattering dirt, rocks, brick, etc.

It shall be unlawful for any person hauling any dirt, rocks, brick, broken concrete, ready-mix concrete, lumber, tree trunks, limbs or trimmings, cinders, plaster, sand or gravel or other similar material within the City to allow, suffer or permit such material to fall or be scattered upon any Street, Alley or other Public Right-of-way

within the City.

(Code 1960, § 11-17; Ord. No. 5578, § 2, 3-18-86)

Secs. 8-3-50--8-3-58. Reserved.

Division 2. Collector's Permit

Sec. 8-3-59. Required; investigation of applicant; determination of necessity.

(a) No person except a duly authorized agent and employee of the City shall empty Garbage or Trash receptacles, or convey or transport Garbage or Trash on any Street, Alley or other Public Right-of-way of the City without a written permit granted and issued by the Superintendent.

(b) Any person who desires a permit for the collection, removal and disposal of Garbage and Trash shall make application for such permit to the Superintendent. The Superintendent shall make, or cause to be made, such investigation as he may consider necessary in order to determine whether or not public convenience and necessity require the granting of such permit and whether or not the applicant is fit and proper to conduct such business.

(Code 1960, § 11-10; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-60. Application; required information.

The application for a Garbage and Trash collector's permit shall set forth the following information:

(1) *Name.* The name and address of the applicant.

(2) *Trade name.* The trade name under which the applicant does or proposes to do business.

(3) *Vehicles.* The number of motor vehicles the applicant desires to operate; the class, size, design and license number of each vehicle.

(4) *Convictions.* Whether or not the applicant has been convicted of a violation of any federal, State or municipal law.

(5) *Negligent collision; claim or judgment.* Whether or not the applicant or any person with whom he has been associated or employed has a claim or judgment against him for damages resulting from the negligent operation of a motor vehicle.

(6) *Financial status and responsibility.* The financial status and responsibilities of the applicant; his ability to respond in the event of damages to persons or property by reason of the negligent operation of a motor vehicle on a Street or public Thoroughfare of the City.

(7) *Nature and experience of service.* The nature and character of the service the applicant proposes to render and the experience he has had in rendering such service.

(8) *Patrons.* The patrons for whom he proposes to render the service.

(9) *Disposal site.* The location, type and permit number of the disposal site the applicant proposes to use.

(10) *Other information.* Any other information relevant to the application as may be required by the Superintendent.

(Code 1960, § 11-11; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-61. Bond; term; fee.

(a) *Bond.* No permit shall be issued under this division until the applicant has made and placed in the hands of the Director of Public Works a good and sufficient indemnity bond in the amount of one

thousand dollars ($1,000.00) indemnifying the City against any claims that may arise against it caused by the applicant's operation under the permit.

(b) *Term.* Permits shall be issued to qualified applicants for a period of one (1) year.

(c) *Fee.* Applicants or holders of a permit shall pay to the City an annual fee of one hundred dollars ($100.00).

(Code 1960, § 11-12; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5807, § 1, 5-9-89)

Sec. 8-3-62. Transferability; revocation; posting.

(a) Permits issued under this division shall be nontransferable and may be revoked and rescinded by the Superintendent at any time that, in his judgment, such action is deemed to be in the best interest of the public.

(b) In all cases where a permit has been issued, such permit shall be attached to the vehicles used for such purpose, shall be in possession of the person rendering such service, and shall be subject to inspection at all times.

(Code 1960, § 11-13; Ord. No. 5578, § 2, 3-18-86)

Secs. 8-3-63--8-3-75. Reserved.

ARTICLE IV. MUNICIPAL COLLECTION AND DISPOSAL SERVICE

Division 1. Generally

Sec. 8-3-76. Provision of container service; exceptions.

Under the container system service, the City will furnish and maintain a container or containers of the mechanical pickup type to be used in the collection of Trash and Garbage. Container service only will be provided except as follows:

(1) By request of business, commercial or Apartment complex establishments with approval of the Superintendent;

(2) By decision of the Superintendent when container service is not immediately available to the area concerned or it is not feasible for the City to provide container service.

(Code 1960, § 11-19(A); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-77. Damage to property surface.

If a container is located on private property, any damage caused by the container pickup equipment to the surfaces of the private property adjacent to the container will not be the responsibility of the Sanitation Department.

(Code 1960, § 11-19(b); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-78. Number of containers furnished.

(a) For Residential collection, the Superintendent shall determine the required number and location of containers in the Residential areas.

(b) For commercial collection, the Superintendent, through consultation with the owner or occupant of a

business or commercial establishment, shall determine the number and size required, location and pickup frequency of containers.

(Code 1960, § 11-19(C); Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-79. Removal of tree, shrub trimmings.

Any person engaged in the business of cutting or trimming Trees or shrubs shall be responsible for the disposal of Trees, Tree and shrub cuttings and trimmings at the expense of such person. It shall be unlawful for such person to deposit any Trees, Tree or Shrub cuttings or trimmings at any location for pickup by the City. Failure to properly dispose of such cuttings or trimmings shall constitute littering and is punishable in accordance with section 1-1-5 of this Code.

(Code 1960, § 11-24; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-80. Reserved.

Sec. 8-3-81. Disposal of special wastes from health care related facilities.

It shall be unlawful for any person to set out for collection, place within any City owned refuse container, transport to the City sanitary landfill for disposal, dispose of in the City sanitary landfill, or otherwise dispose of any special waste from a health care related facility as that term is defined by the Texas Natural Resource Conservation Commission, unless such waste has first been treated in accordance with applicable State and Federal regulations.

(Ord. No. 5848, § 1, 3-13-90; Ord. No. 6028, § 1(A), 9-7-93)

Sec. 8-3-82. Disposal of tires.

(a) It shall be unlawful for any person to set out for collection or to place within any City owned refuse container a whole tire or split, quartered or shredded tire pieces.

(b) It shall be unlawful for any person to dispose of a whole tire or a portion of a tire except by delivery to a registered used and scrap tire transporter, processor or disposal facility.

(c) It shall be unlawful to deliver to the City landfill any tire except a whole tire or shredded tire pieces no larger than four (4) inches square. An off-the-road tire intended for use on heavy equipment may not be delivered to the landfill.

(Ord. No. 5878, § 1, 9-11-90; Ord. No. 6028, § 1(B), 9-7-93; Ord. No. 6333, § 1, 12-30-97)

Sec. 8-3-83. Lead-acid storage batteries.

It shall be unlawful for any person to set out for collection, place within any City owned refuse container, transport to the city sanitary landfill for disposal, dispose of in the City sanitary landfill, or otherwise dispose of a lead-acid storage battery except by delivery to:

(1) A battery retailer or wholesaler;

(2) A secondary lead smelter; or

(3) A collection or recycling facility authorized under the laws of this state or by the Unitec States Environmental protection Agency.

(Ord. No. 6015, § 1, 7-20-93)

Sec. 83-84. Waste oil.

(a) It shall be unlawful for any person to set out for collection, place within any city owned refuse container, transport to the City sanitary landfill for disposal, dispose of in the City sanitary landfill or otherwise dispose of any bulk or liquid waste oil or any used internal combustion engine oil or any used internal combustion oil filters except by delivery to a collection or recycling facility authorized to accept waste oil or used internal combustion engine filters.

(b) It shall be unlawful for any person to:

(1) Intentionally discharge waste oil into a sewer, drainage system, septic tank, surface water or groundwater, watercourse, or marine water;

(2) Directly dispose of waste oil on land;

(3) Apply waste oil to roads or land for dust suppression, weed abatement, or other similar uses that introduce waste oil into the environment; or

(4) Dispose of a commercially generated used internal combustion engine oil filter in a City owned used oil filter collection container.

(Ord. No. 6015, § 1, 7-20-93)

Sec. 8-3-85. Liquid waste.

(a) It shall be unlawful for any person to discard or otherwise dispose of any bulk or noncontainerized liquid waste except by delivery to a disposal facility authorized to accept bulk liquid waste unless the liquid waste is household waste other than septic waste.

(b) It shall be unlawful for any person to discard or otherwise dispose of any container holding liquid waste unless:

(1) The container is a small container similar in size to containers normally found discarded in household waste;

(2) The Container is designed to hold liquids for a use other than storage; or

(3) The waste is household waste.

(Ord. No. 6028, § 1,(C), 9-7-93)

Sec. 8-3-86. Items containing chlorinated fluorocarbon (CFC).

It shall be unlawful for any person to discard or otherwise dispose of a refrigerator, freezer, air conditioner or any other item containing chlorinated fluorocarbon (CFC) unless all the CFC contained in such item shall have been captured and sent to an approved CFC disposal site or recycling facility.

(Ord. No. 6028, § 1(D), 9-7-93)

Sec. 8-3-87. Polychlorinated biphenyls (PCB) waste.

It shall be unlawful for any person to discard or otherwise dispose of any polychlorinated biphenyls (PCB) waste as that term is defined by the Texas Natural Resource Conservation Commission, except by delivery to an authorized PCB disposal facility.

(Ord. No. 2028, § 1(E), 9-7-93)

Sec. 8-3-88. Regulated hazardous waste.

It shall be unlawful for any person to discard or otherwise dispose of any regulated hazardous waste as that term is defined by the Texas Natural Resource Conservation Commission except by delivery to an

authorized hazardous waste disposal facility.

(Ord. No. 6028, § 1(F), 9-7-93)

Secs. 8-3-89, 8-3-90. Reserved.

DIVISION 2. RATES AND CHARGES

Sec. 8-3-91. Authorized; variations.

(a) The Superintendent of the Sanitation Department shall establish charges as provided in this division for the collection of Trash and Garbage by the Sanitation Department from any location.

(b) If in the opinion of the Superintendent the charges set out in this division are unreasonable or cannot be applied to a particular house, Building or Premises because of its location, type or quantity or refuse involved, or for other reasons, the Superintendent is hereby authorized to establish a reasonable rate for waste disposal service. All such charges shall be subject to approval of the Director of Public Works.

(Code 1960, § 11-18; Ord. No. 5578, § 2, 3-18-86)

Sec. 8-3-92. Residential collection and disposal.

(a) Residential collection and disposal charges shall be set out as follows:

TABLE NUMBER ONE

Monthly

Type Description Charge

(1) One-Family Residence . . . $11.68

(2) Two-Family Residence with 1 water meter . . . 23.36

(3) Three-Family Residence with 1 water meter . . . 35.04

(4) Four-Family Residence with 1 water meter . . . 46.72

(5) Two-Family Residence, each unit on separate water meter, each unit . . . 11.68

(6) One-Family Residence and single apartment on 1 water meter . . . 23.36

(7) One-Family Residence and single apartment on 1 water meter, each unit . . . 11.68

(b) In areas of the City for which service is provided by a container system which can be mechanically emptied, the Residential collection and disposal charge shall be mandatory of all owners or occupants in such areas.

(Code 1960, § 11-20; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5649, § 2, 11-11-86; Ord. No. 5772, § 1, 9-27-88; Ord. No. 5885, § 1, 10-2-90; Ord. No. 5947, § 1, 1-28-92; Ord. 6361, § 1(Exh.A), 9-15-98; Ord. No. 6436, § 3 (Exh.A), 9-7-99; Ord. No. 6553, § 5, 9-11-2001; Ord. No. 6762, § 3, 8-31-2004)

Sec. 8-3-93. Commercial collection and disposal.

(a) *Table of charges.* Commercial collection and disposal charges shall be based on the size, type and number of containers and frequency of service established for such commercial collection. The monthly charges per container for commercial collection are as set out below:

TABLE NUMBER TWO

Monthly Charge Per Container

TABLE INSET:

		Container Pickups Per Week Not More Than				
	Container Volume (In Cu. Yds.)	2	3	4	5	6
(1)	Single container charge:					
	3	$46.72	62.20	82.10	102.00	121.89
	4		105.73			208.49
	8	84.10	124.39	164.69	204.99	245.29

(b) *Shared containers.* If a container is used by more than one (1) business or commercial user, the charge as established by subsection (a), less any charges for Residential use, shall be prorated to each business or commercial user of the container in a manner established by agreement of such users so that the total charge per container is maintained. If the various users of a container cannot agree to a cost distribution method, the Superintendent shall determine the charge to each user based upon an estimate of the relative volumes of Garbage and Trash generated by each user. However, the charge to a business or commercial user determined by any such distribution method shall not be less than the charge established for a One-Family Residence in the preceding section.

(c) *Container revenue maintained.* If at any time the use of a container changes so that the revenue from such container does not equal the charge as established by subsection (a), then the charges to all current users of such container shall be reestablished so that the total charge per container is maintained.

(d) *Home occupations.* Businesses operated out of a Residence shall be considered separate and apart from the Residence and the charge to such business shall be determined as in subsection (b) above.

(Code 1960, § 11-21; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5772, § 1, 9-27-88; Ord. No. 5885, § 2, 10-2-90; Ord. No. 5947, § 2, 1-28-92; Ord. No. 6279, § 1, 4-15-97; Ord. No. 6361, § 1(Exh.A), 9-15-98; Ord. No. 6436, § 3 (Exh.A), 9-7-99; Ord. No. 6553, § 5, 9-11-2001; Ord. No. 6762, § 3, 8-31-2004)

Sec. 8-3-94. Landfill use fees.

(a) *Table of charges.* Except as hereinafter provided in subsections (b), (c) and (d) below, the fees charged for the use of the City sanitary landfill facility shall be computed at the rate of twenty-three dollars ($23.00) per ton of waste with a minimum charge of five dollars ($5.00) per load. If the net weight in tons of any load cannot be determined, the fees charged shall be as set out in Table Number Three.

TABLE NUMBER THREE

Fee

Solid Waste Volume
Per load

(1) Less than 3 cu. yds . . . $ 10.00

(2) 3 cu. yds. or more, but less than 6 cu. yds . . . 20.00

(3) 6 cu. yds. or more, but less than 12 cu. yds . . . 40.00

(4) 12 cu. yds. or more, but less than 25 cu. yds . . . 80.00

(5) 25 cu. yds. or more . . . 110.00

(6) Automobile bodies, tanks, concrete beams and similar large, heavy or bulky items . . . 70.00

(b) *Other landfill fees.*

(1) Any Waste that requires special handling such as, but not limited to, treated special Wastes from health care related facilities, as defined by the Texas Natural Resource Conservation Commission, dead animals, slaughterhouse Wastes, or empty pesticide or herbicide containers shall be charged at a rate of forty dollars ($40.00) per ton of waste with a minimum charge of thirty-five dollars ($35.00) per load.

(2) Any person transporting Garbage or Trash or liquid Waste in violation of sections 8-3-46, 8-3-47, 8-3-48, or 8-3-49 shall be charged a rate two (2) times the regular rate as established by subsections (a) and (b) above.

(3) 1. Tires that are shredded to pieces no larger than four (4) inches square shall be charged at the regular rate as established by subsection (a) above.

2. Whole tires shall be charged a disposal fee as set out below:

TABLE INSET:

Tire size (nominal diameter in inches)	Fee per tire
12–17.5	$1.50
18–24.5	4.50
25 or larger	9.50

(c) *Fee exemptions.* Householders disposing of Garbage or Trash from their own residence on which there is a sanitation charge currently being paid shall be exempted from the foregoing landfill use fees. This exemption applies to only household wastes and does not exempt waste or scrap materials resulting from construction or demolition.

(d) *Waiving of fees.* The Director of Public Works shall be authorized to issue permits waiving the fees set forth in subsections (a) and (b) above under the following conditions:

(1) For the disposal of excess trash during a one-time cleanup operation for which the Trash was originally generated from a location meeting one of the following conditions:

a. A residential location on which a sanitation charge if currently being paid.

b. A residential location on which a sanitation charge was paid during the time the excess trash was accumulated.

c. Any location where Trash has been deposited upon the property without the owner's consent.

(2) For the disposal of wastes generated from the performance of a demolition or construction

contract issued and administered by any City department.

(3) For the disposal of wastes under special circumstances such as, but not limited to, roadside litter collected by another governmental agency, waste generated by a one-time neighborhood cleanup campaign, etc.

(Code 1960, § 11-22; Ord. No. 5578, § 2, 3-18-86; Ord. No. 5772, § 2, 9-27-88; Ord. No. 5848, § 2, 3-13-90; Ord. No. 5878, § 1, 9-11-90; Ord. No. 5885, § 3, 10-2-90; Ord. No. 5903, § 1, 2-14-91; Ord. No. 5910, § 1, 4-16-91; Ord. No. 5947, § 3, 1-28-92; Ord. No. 6023, § 1, 8-31-93; Ord. No. 6028, § 2, 9-7-93; Ord. No. 6244, § 3(Exh. A), 9-17-96; Ord. No. 6316, § 1, 10-14-97; Ord. No. 6333, § 1, 12-30-97; Ord. No. 6361, § 1(Exh. A), 9-15-98; Ord. No. 6553, § 5, 9-11-2001; Ord. No. 6762, § 3, 8-31-2004)

Sec. 8-3-95. Billing; collection; special charges.

(a) *Mailing bill; date due.* The Auditor of the City shall include on monthly bills mailed to persons who receive the services specified in this chapter the charge designated in this division for the Trash and Garbage collection and disposal services rendered to the Premises of that person.

The charges shall be payable to the City within ten (10) days after such charge is rendered.

State law references: Discount for early payment, § 18-2-59.

(b) *Partial month.* The charges for less than one (1) month's service shall be prorated on a daily basis.

(c) *Service charges.* If any charge for Garbage and Trash collection and disposal services is not paid within ten (10) days after such charge is rendered, the City shall charge and collect an additional service charge in the amount of ten (10) percent of the net amount of such charge.

(d) *Delinquency, service suspended.* Any person who shall fail or refuse to pay the charge herein specified within fifteen (15) days from the date it shall become due and payable shall have his City utility service suspended.

(e) *Extra service.* The charge for any extra collection service rendered by the Sanitation Department will be billed separately from the regular monthly bill. The charge for extra service will be determined by the Superintendent and based on labor and equipment costs of the service rendered.

(f) *Persons not desiring service; procedures, exceptions.* Except in those areas where the sanitation charge is mandatory, any person who does not desire the service herein provided shall not receive the services and shall not be charged therefor upon his notifying the utilities office of the City in writing that he:

(1) Does not want the services rendered to his Premises;

(2) Intends to and will remove the accumulated Garbage and Trash from his Premises;

(3) Will keep his Premises in such condition that he will not violate the provisions of applicable ordinances;

(4) Will not dispose of Garbage and Trash in a City-owned receptacle.

(Code 1960, § 11-23; Ord. No. 5578, § 2, 3-18-86)

Secs. 8-3-96--8-3-115. Reserved.

Part I

Attachment 6 - Applicant's Statement and Notice of Appointment

for

City of Amarillo Landfill

Potter County, Texas

CITY OF AMARILLO

OFFICE OF THE
CITY MANAGER

December 13, 2005

Texas Commission on Environmental Quality
Mr. Glenn Shankle, MC-109
P.O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Shankle:

This is to advise you that the City of Amarillo has duly appointed HDR Engineering, Inc., Dallas, Texas as consulting and design engineers for the purpose of submitting engineering reports, planning material and Parts I, II, III and IV of this permit amendment application.

Mr. Michael Oden, P.E., HDR Engineering, Inc., Engineer for this project is a registered professional engineer in good standing in accordance with the state statutes. HDR Engineering, Inc. has had experience in the design and/or construction of similar landfill projects at the following locations:

Lubbock, Texas
Arlington, Texas
Ferris, Texas
McKinney, Texas
Farmers Branch, Texas
Midland, Texas

We authorize you to review and comment on such reports, planning material, data and a Site Development Plan on this proposed project as HDR Engineering, Inc. may submit to you.

Attest:

Alan M. Taylor
City Manager
City of Amarillo

509 S.E. SEVENTH AVE. • P.O. BOX 1971 • AMARILLO, TEXAS 79105-1971 • 806/378-3000 • FAX 806/378-9394 • TDD 806/378-4229

Part I

Attachment 7 - Financial Assurance and Financial Information

for

City of Amarillo Landfill

Potter County, Texas

CITY OF AMARILLO

OFFICE OF THE
CITY MANAGER

December 13, 2005

Texas Commission on Environmental Quality
Mr. Glenn Shankle, MC-109
P.O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Shankle:

This letter attests that the City of Amarillo will provide financial assurance pursuant to 30 TAC §37.281 adequate for closure and post-closure of the facility. These certifications include the following:

- That the City of Amarillo, Texas accepts responsibility for the construction, operation, maintenance, proper closure and post-closure of the City of Amarillo Landfill.
- That the City of Amarillo, Texas guarantees full financial responsibility for the construction, operation, maintenance, proper closure and post-closure care of the Landfill.
- That the City of Amarillo, Texas will provide adequate funding for the construction, operation, maintenance, closure and post-closure of the above referenced facility in its annual budgets and will acquire additional funds from the Capital Reserve Funds or other sources of funding available to the City as may become necessary to properly construct, operate, maintain and close the Landfill.
- That the City will annually provide evidence that they meet the local government financial test. Should the City be unable to meet the test, it will secure an alternative financial assurance mechanism as allowed by the TCEQ.

Attest:

Alan M. Taylor
City Manager
City of Amarillo

509 S.E. SEVENTH AVE. • P.O. BOX 1971 • AMARILLO, TEXAS 79105-1971 • 806/378-3000 • FAX 806/378-9394 • TDD 806/378-4229

Part I

City of Amarillo Landfill

Permit Amendment – MSW Permit No. 73A

City of Amarillo,
Potter County, Texas

December 2005

This document is released for the purpose of review only under the authority of Mitch R. Davison, P.E. # 90908. It is not to be used for bidding or construction.

For pages 1 thru 21

City of Amarillo
Landfill Permit Amendment – Part I

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City of Amarillo
Landfill Permit Amendment – Part I

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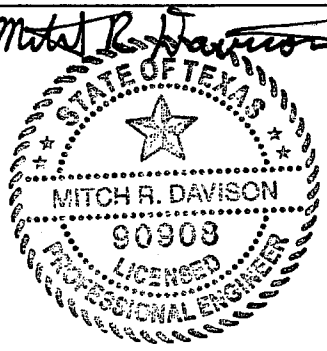

12/15/2005

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For pages i thru ii

1.0 CONTENTS OF THE PERMIT AMENDMENT 30 TAC §330.51(a)

This application is for a permit amendment for the City of Amarillo Landfill, owned and operated by the City of Amarillo. This site is currently permitted as Municipal Solid Waste Permit No. 73. Contents of the amendment application are submitted in four parts in accordance with the requirements of 30 TAC §305.45 and 30 TAC §330.51 through §330.57.

Part I of the application consists of the information required in 30 TAC §305.45, 30 TAC §305.52, and 30 TAC §330.62, including the name of the facility, ownership, site location, nature of business of the facility, volume and rate of disposal, type of waste received, maps of the area, surrounding land owners list, property owner's affidavit, legal authority, evidence of competency, appointments, and evidence of financial assurance.

Part II of the application describes the existing conditions and character of the landfill, as well as the surrounding area. It includes a discussion of the area's land use, the transportation infrastructure available, and a general discussion of site soils and geology. In addition, there is a discussion of floodplains, wetlands, and endangered species, as required under 30 TAC §330.53.

Part III of the application contains the Site Development Plan (SDP) and the necessary attachments to the SDP in accordance with the requirements of 30 TAC §330.54. The SDP contains information related to the proposed landfill method, access control, all-weather operations, solid waste disposal, site life, drinking water protection, run-on and run-off control, drainage structures, contaminated water management, flood protection, final cover design, endangered species protection, and landfill markers. Attachments to the SDP include the following:

Attachment 1	Site Layout Plan
Attachment 2	Fill Cross-Section
Attachment 3	Existing Contour Map
Attachment 4	Geology Report
Attachment 5	Groundwater Characterization Report
Attachment 6	Groundwater and Surface Water Protection Plan and Drainage Plan
Attachment 7	Final Contour Map

Attachment 8	Cost-Estimate for Closure/Post-Closure Care
Attachment 9	Applicant's Statement
Attachment 10	Soil and Liner Quality Control Plan (SLQCP)
Attachment 11	Groundwater Sampling and Analysis Plan (GWSAP)
Attachment 12	Final Closure Plan
Attachment 13	Post-Closure Care Plan
Attachment 14	Landfill Gas Management Plan (LGMP)
Attachment 15	Leachate and Contaminated Water Plan (LCWP)

Part IV of the application is the Site Operating Plan (SOP) and conforms to the requirements of 30 TAC §330.57, 30 TAC §330.113 through 30 TAC §330.139. The SOP includes information identifying personnel and responsibilities, equipment, operating procedures, detection and prevention of disposal of regulated hazardous waste, the fire prevention plan, and the sequence of development.

1.1 Facility Name, Address and Location of the Facility 30 TAC §305.45(a)(1)

Name: City of Amarillo Landfill

MSW Permit No: 73A

Mailing Address: The City of Amarillo
Alan M. Taylor
City Manager
509 S.E. Seventh Ave.
P.O. Box 1971
Amarillo, TX 79105-1971

Location: The landfill is located at the intersection of S. Hill Road and Bezner Road, 5 miles west of Soncy Road and 2 miles north of I-40. The address for the landfill is 16250 Bezner Road, in an unincorporated area of Potter County.

1.2 Ownership 30 TAC §305.45(a)(2)

The landfill is publicly owned and operated by the City of Amarillo, an incorporated municipality. Proof of ownership of the property is included in Part I, Attachment 1.

1.3 Applicant's Name, Address and Telephone 30 TAC §305.45(a)(3)

City of Amarillo
Alan M. Taylor
City Manager
509 S.E. Seventh Ave.
P.O. Box 1971
Amarillo, Texas 79105-1971
(806) 378-3012
(806) 378-9394 (fax)

1.4 Nature of Business 30 TAC §305.45(a)(4) & §330.24

The facility is a Type I Municipal Solid Waste Landfill. A white goods storage area is also located at the site. A citizen's convenience center is planned for the site for some future date. The citizen convenience center will be provided with a sufficient number of appropriate type of roll-off containers to manage the amount and type of waste received. Recycling activities may also be undertaken at the citizen convenience center.

1.5 Activities Conducted Requiring a Permit 30 TAC §305.45(a)(5)

The Type I Amarillo Landfill (current MSW Permit No. 73) serves the City of Amarillo and surrounding area. Municipal refuse is currently accepted at an average rate of 243,000 tons per year, typically consisting of residential and commercial waste, construction/demolition debris, non-friable asbestos, inert materials and Class II and III industrial waste, some special waste from healthcare related facilities as permitted by the Texas Commission on Environmental Quality (TCEQ) regulations, and special waste as authorized by TCEQ. Refer to Part IV of this Permit Amendment Application for a description of the types of special waste accepted at this facility.

Wastes not accepted at the Landfill include hazardous wastes, PCB wastes, radioactive wastes, Class I industrial wastes, bulk liquids, certain special wastes from healthcare-related facilities, liquid paints which have not passed the paint filter test, oils, vehicle batteries, and friable asbestos. Additional information regarding waste acceptance and procedures are discussed in Part IV.

The purpose of this permit amendment is to expand the capacity of the landfill by increasing the permitted height, thereby allowing the City to provide uninterrupted refuse disposal for the City's residents and businesses. No change is made to the permit boundary or landfill footprint in this application.

1.6 Maps 30 TAC §305.45(a)(6)

Items required by this section will be addressed in Section 3 of this Part I under the guidelines of 30 TAC §330.52(b)(4).

1.7 Permits/Approvals Obtained 30 TAC §305.45(a)(7)

The TCEQ Application Form (Part A) located at the front of this application, contains the required information relating to additional permits or approvals. The following permits/approvals were not necessary to obtain: Hazardous Waste Management under the Texas Solid Waste Act; Underground Injection Control under the Texas Injection Well Act; Federal Clean Air Act—Prevention of Significant Deterioration, Non-attainment and National Emission Standards for Hazardous Pollutants under the Federal Clean Air Act; Ocean Dumping under the Marine Protection Research; Dredge of fill under the Federal Clean Water Act; and U.S. Army Corps of Engineers Dredge and Fill Permit §404.

A TCEQ Air Quality Permit or Registration (Permit by Rule) 30 TAC §106.534 is on file at the City's landfill (additional information on air quality issues is presented in Attachment 14 of Part III and the SOP). A FEMA Letter of Map Revision (LOMR) is not required for the proposed expansion because it will not create any adverse impacts on FEMA-regulated floodplains. In fact, no FEMA-regulated floodplains exist at the landfill.

A TCEQ coordination letter acknowledging that the landfill expansion, if constructed and operated in accordance with applicable rules and guidelines, will conform to the requirements in Section 208 of the Federal Clean Water Act is included as Part II, Attachment 1

The Amarillo Landfill is subject to storm water permit requirements established by the EPA and TCEQ. The City has secured a Texas Pollution Discharge Elimination System (TPDES) General Permit for the landfill (TXR00D898), and in conjunction with this permit has developed a Storm Water Pollution Prevention Plan (SWP3).

2.0 SUPPLEMENTARY TECHNICAL REPORT 30 TAC §305.45(A)(8)

Items required by this section will be addressed in Section 2 of this Part I under the guidelines of 30 TAC §330.52(b)(3).

SUPPLEMENTARY TECHNICAL REPORT 30 TAC §330.52(b)(3)

2.1 Introduction

The City of Amarillo provides solid waste management services to its residents and businesses through the operation of a residential and commercial collection program, the operation of a transfer station, and the operation of a Type I municipal solid waste landfill. The City's landfill is located outside the western city limits of the City of Amarillo. The site is located in Potter County. A portion of the landfill boundary is intersected by the City's extraterritorial jurisdiction (ETJ). The purpose of this permit amendment application is to expand the landfill vertically to an elevation of 3,970 feet National Geodatic Vertical Datum (NGVD). The landfill's ultimate height under amended conditions will be approximately 130 feet above currently permitted elevations.

2.2 The City of Amarillo

A municipal charter, granted in 1913 established the City of Amarillo. The charter grants the City certain powers related to protection of health and the environment. As such, the operation of the landfill is within the scope of the City's authority. The City's Code of Ordinances applying to municipal solid waste is included in Attachment 4. The Code identifies City responsibilities for solid waste collection, unacceptable wastes and certain landfill provisions.

2.3 Description of Facilities

The landfill was initially permitted on July 1, 1975, by the Texas Department of Health. The Landfill is located 5 miles west of Soncy Road and 2 miles north of I-40 on Hill Road, outside the city limits of Amarillo, in Potter County, Texas.

The site has been permitted for 662 acres of which approximately 526 acres are designated as fill area. Approximately 43.5 acres (cell 1) have been officially closed and have received an affidavit of closure; approximately 70 additional acres (cells 2 and 3) have final cover on them, but have not been officially closed; and the remaining approximate 412 acres (cells 4-12) are either developed as in the case of Cell 4 or proposed for future development. A minimum of a 100 foot buffer zone will be maintained between the limit of waste and the permit boundary. The site is divided into twelve cell areas with only eight remaining to be constructed. Cells 4A and 4B are currently receiving waste. The sequence of development will continue in a clockwise direction from cell 4 around the southern portions of the landfill until all cells are filled. While a cell is being filled with waste, the next cell in sequence will be excavated and lined. Berms will be constructed to control surface water runoff both within the excavation as well as to prevent surface runoff from entering the excavation. A working face berm will be constructed to control water that comes into contact with waste or daily cover. As major portions of cells reach their ultimate waste placement grades, final cover will be placed, tested, and revegetated as soon as practicable. Figure I.2.1 presents a site layout plan by cell for the landfill.

2.4 Solid Waste Data

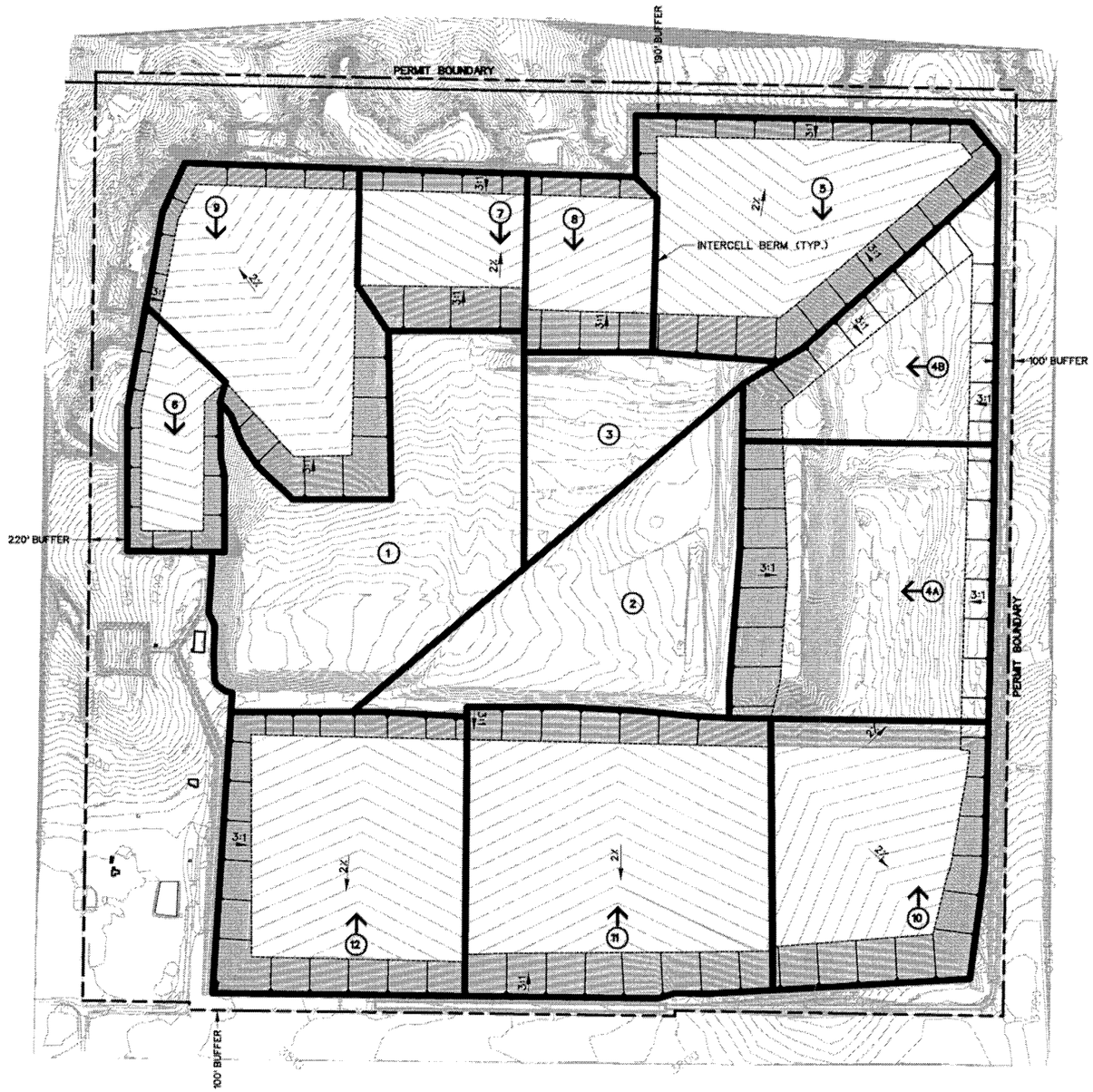
Waste accepted at the landfill includes residential and commercial municipal solid waste, construction/demolition waste, various non-hazardous industrial wastes, non-friable asbestos, permitted special waste from healthcare-related facilities and other special wastes as permitted by the TCEQ. Approximately 780 tons per day of solid waste are disposed at the landfill six (6) days per week. Wastes such as hazardous wastes, PCB wastes, radioactive wastes from healthcare-related facilities, Class I industrial wastes, bulk liquids, certain special wastes, paints, oils, vehicle batteries, and friable asbestos are not accepted for disposal at the facility.

Based on the 2005 disposal rates, approximately forty-six (46) years of refuse capacity remain at the Amarillo Landfill as it is currently permitted.

2.5 Permit Amendment for Expansion

The purpose of this permit amendment is to increase capacity by vertically increasing the final permitted height to three thousand nine hundred and seventy (3,970) feet NGVD from a currently permitted height of 3,840 feet NGVD. The permitted boundary will not change from the currently permitted 662 acres. The expansion is expected to provide an additional 63 million cubic yards of capacity from the initial design capacity. With anticipated increases in population, this will provide the City with approximately 105 years of remaining life.

The Panhandle Regional Planning Commission has adopted a resolution confirming that this permit amendment application to expand the Amarillo Landfill is in conformance with the Regional Solid Waste Management Plan. The resolution is included in Part I, Attachment 2.



N

0 400 800

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- SEQUENCE OF DEVELOPMENT/ DIRECTION OF FILL - SEE TABLE
- CELL BOUNDARY
- EASEMENT

SEQUENCE OF CELL DEVELOPMENT
1
2
3
4A
4B
10
11
12
9
6
7
8
5

NOTES

1. SEQUENCING PER PREVIOUS TCEQ APPROVAL. CELL NUMBERS REMAIN THE SAME FOR OPERATOR CONTINUITY.

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF TCEQ REVIEW UNDER THE AUTHORITY OF MITCH R. DAVISON, P.E. 90908. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

12/15/2005

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SITE SEQUENCE DEVELOPMENT PLAN AND BUFFER

0 1" 2"

FILENAME ...\Site Sequence.dgn

SCALE

SHEET I.2.1

DATE: 12/16/2005
TIME: 1:58:57 PM

V:\USERS\mdavison\FASite Sequence.dgn

3.0 SITE PLAN

3.1 Maps 30 TAC §330.52(b)(4)(A)

Figure I.3.1 represents the general location of the facility in relation to the surrounding area. Figure I.3.2 presents the topographic map for the site, geographic coordinates and the location of site easements. Figure I.3.3 illustrates the location of surrounding structures, land use within one mile of the site and major roadways. A windrose is also shown on this figure. A discussion of land use is presented in the following sections. The land use map was compiled based upon visual reconnaissance, aerial photography, land ownership and easement research. The City of Amarillo provided historical land use and zoning.

The following sections provide an overview of various land use conditions surrounding the site.

(i) Wind Direction – The predominant wind direction is from the south, with the wind blowing in this direction approximately fourteen percent (14%) of the time. The windrose data source is from the TCEQ and is shown in Figure I.3.3.

(ii) Wells – A review of files by Atlas Environmental Research (AER) based on research of Texas Water Development Board Records indicated forty-seven (47) water wells located within a one-mile radius of the facility. Two of these wells are known to have been abandoned. The wells are indicated on Figure I.3.4. No oil or gas wells have been identified on or within one mile of the property boundary.

(iii) Existing Structures – Structures located within the permit limits of the facility include a scale house, maintenance facilities, two residential structures used for storage, three wells (one of which is capped) and a construction trailer. Three residences are located within 500 feet of the proposed permit boundary. The nearest residence is located approximately 130 feet east of the eastern permit boundary. There are three residential structures located within 500 feet of the site. A 400 foot tall communications tower is located east of the site.

(iv) Special Use Areas. – A visual reconnaissance and available records search revealed that there are no active disposal facilities. A visual reconnaissance and available records

search revealed that no schools, licensed day care facilities, churches, hospitals, cemeteries, lakes or major commercial developments are located within one mile of the site. There are approximately 100 residents located within one mile of the property boundary.

(v) Roads – Access to the facility is provided by Hill Road from IH 40. Hill Road is presently a two-lane asphalt surface over a crushed-stone flexible road base. Other access roads within the one-mile radius are made of similar materials or concrete.

(vi) Geographic Coordinates – The geographic coordinate for the Amarillo Landfill is N35° 13.80' W102° 01.05'.

(vii) Area Streams – There are no streams located near the landfill site.

(viii) Airports – No airports are located within five miles of the site. According to a correspondence letter obtained from the Federal Aviation Administration (Part II, Attachment 3), the closest airport is the Amarillo International Airport. The distance to the closest runway is greater than 15 miles west of the facility.

(ix) Property Boundary – The property boundary and the permit boundary are shown on Figure I.3.1. The expansion proposed is a vertical expansion for the entire disposal area, and will not affect the property or permit boundaries.

(x) Easements – There are two easements adjacent to, and within the permit boundaries of the facility. The easements are shown on Figure I.3.2 and described in Attachment 3 of Part I. These easements are with West Emerald Pipeline Corporation. A release of a previous easement that intersected the landfill property is included in Attachment 4.

(xi) Historic Sites, etc. – The project site is an active landfill which has been active since 1975 and has been previously reviewed for location restrictions and permitted. A review

of the Texas Historical Commission's database for a one-mile radius and visual observations indicated that no historic sites are present.

3.2 General Location 30 TAC §330.52(b)(4)(B)

Figure I.3.1 presents the general location of the facility, including the permit limits, using a Texas Department of Transportation map as the base.

3.3 Topographic Map 30 TAC §330.52(b)(4)(C)

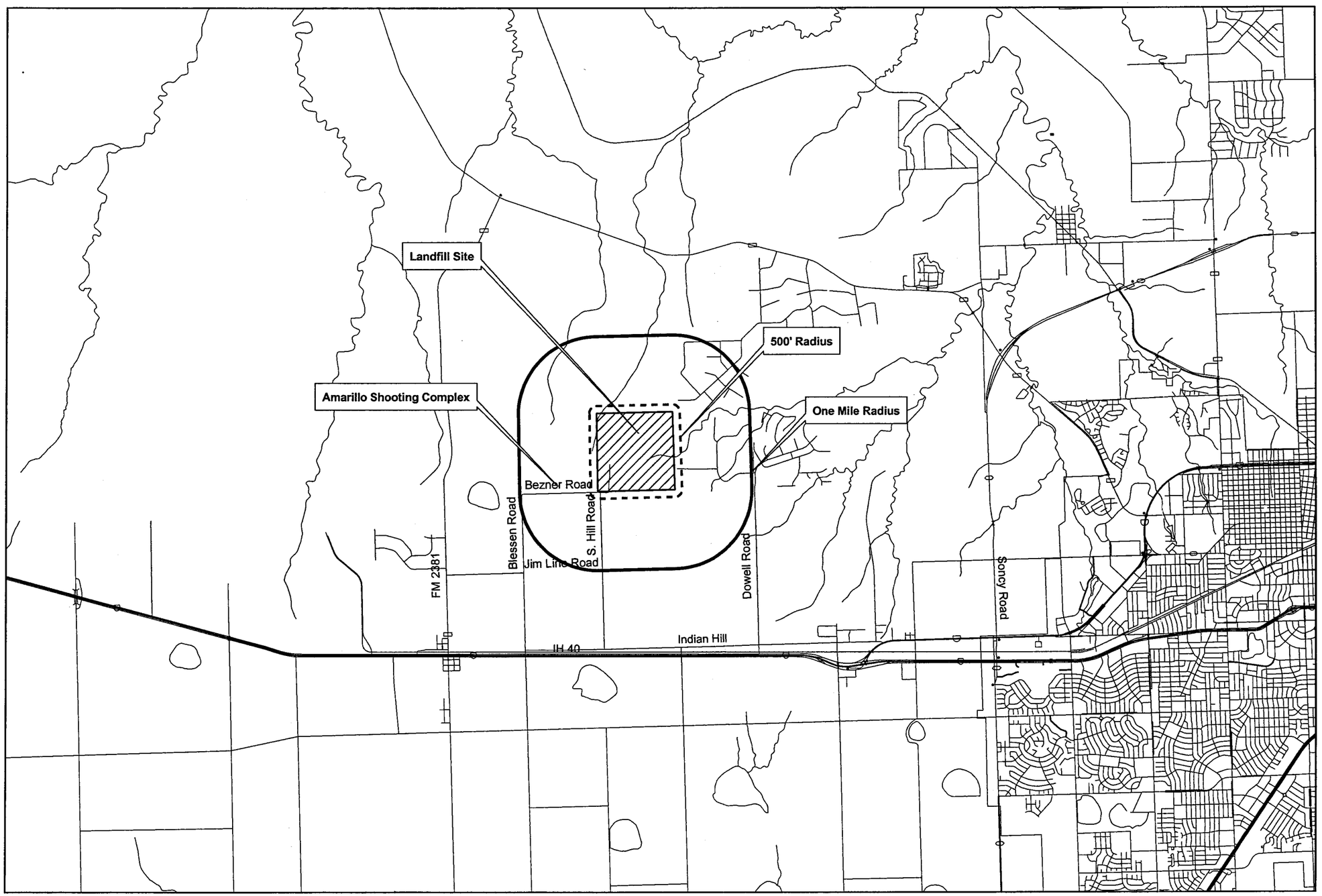
Figure I.3.3 depicts the site as located on portions of the Potter County, TX USGS 7.5 minute topographic quadrangle sheets.

3.4 Land Ownership Map 30 TAC §330.52(b)(4)(D) & 330.52(b)(5)

There are sixteen (16) landowners, including the City of Amarillo, within 500 feet of the permit boundary. Figure I.3.5 identifies the tracts adjacent to the landfill permit boundary. Table I.3.1 lists the property owners corresponding to the tract numbers shown on the Figure I.3.5.

3.5 Legal Description 30 TAC §330.52(b)(6)

A copy of the legal property description and the registered survey of the site, including a metes and bounds map, are included in Part I, Attachment 3. A metes and bounds description of the permit area, encompassing 662 acres, is also included in Part 1, Attachment 3.



Legend

- 1 Mile Radius
- 500' radius
- Landfill Boundary
- Roads

Notes:
1. All access roads consist of concrete or two-course asphalt over crushed stone base.
2. No airports are located within five miles of the airport.

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER
12/15/2005

Data Source:
TXDOT, obtained in May 2005.
Map images are TxDOT raw data provided bt TNRIS. Date: Approximately 1995-1996.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

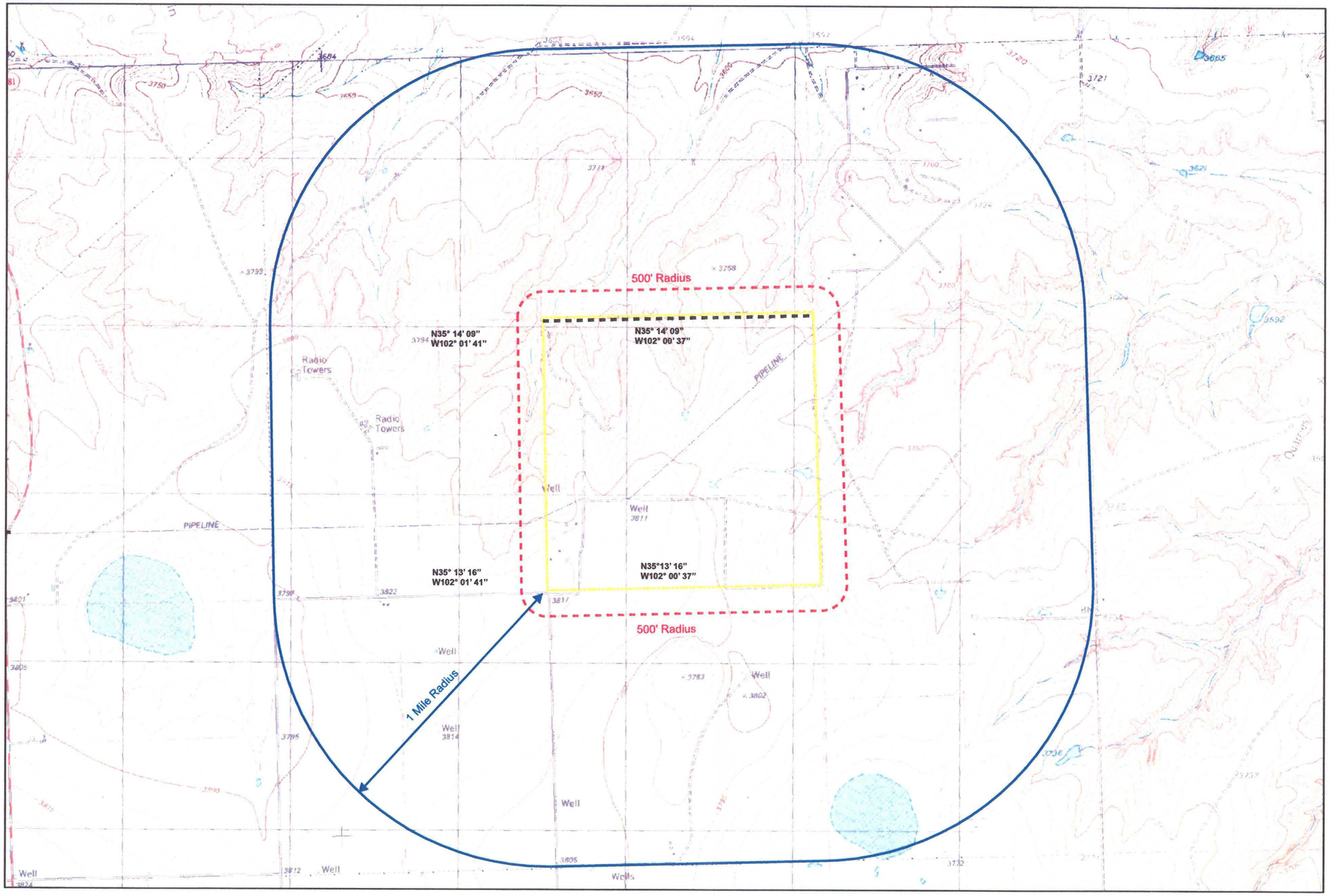
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

GENERAL LOCATION MAP

0 0.75 1.5 Miles

File Name

Sheet I.3.1



Legend

- 1 mile Radius
- 500' Radius
- Property Boundry
- Easement

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

1/03/2006

Data Source:
USGS Topo quad provided by TNRIS converted from standard USGS DOQ format
Date: Approximately 1995-1996.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

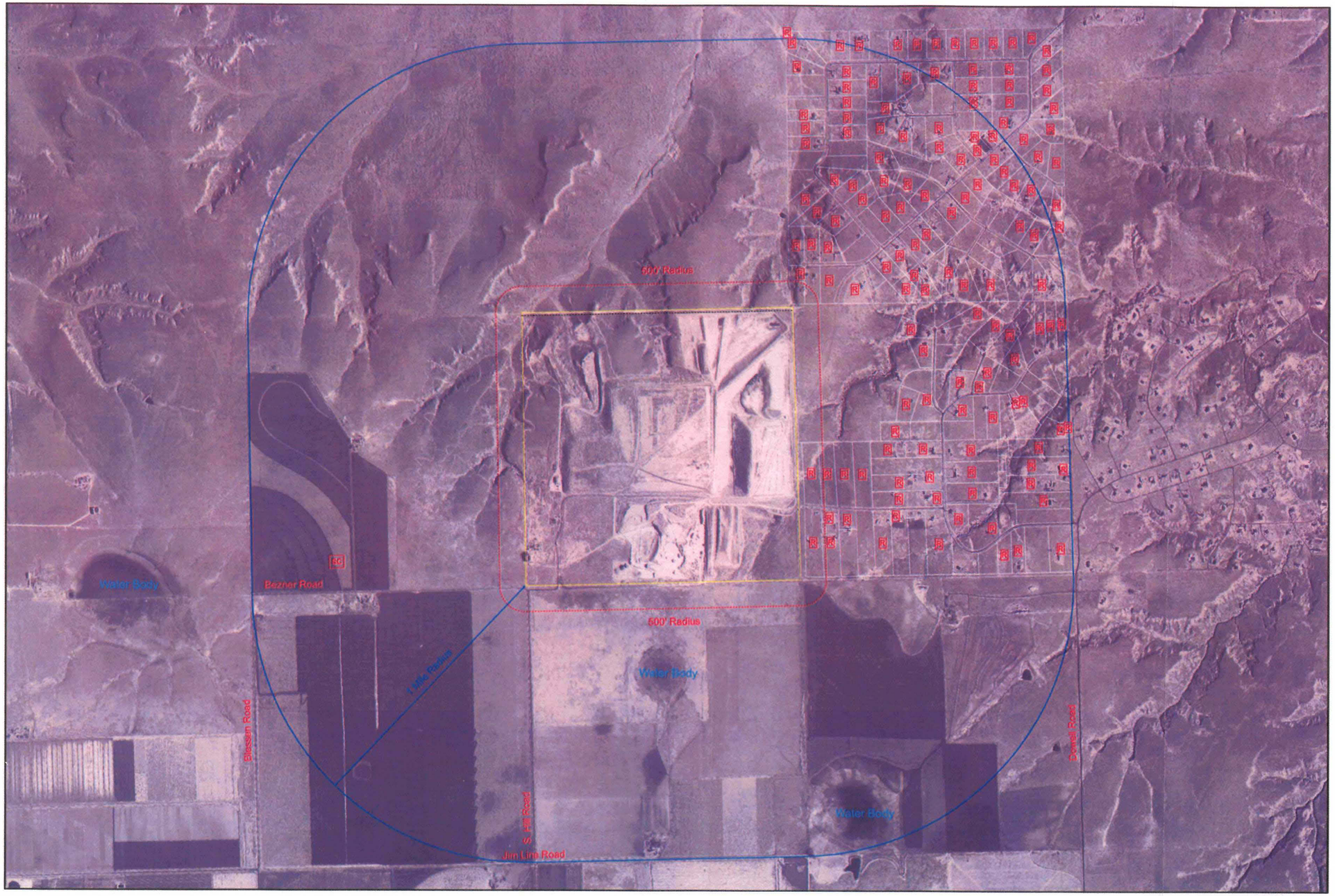
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

TOPOGRAPHIC MAP

0 500 1,000 2,000 Feet

File Name

Sheet I.3.2



Legend

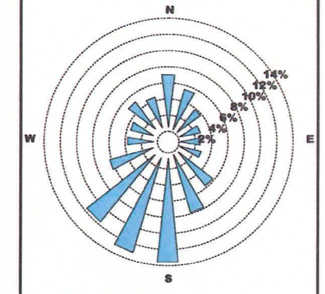
- 500' Radius
- Landfill Boundary
- 1 Mile Radius
- Residential Land Boundries
- Easement
- R — Residences
- SC — Shooting Complex

Mitch R. Davison

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

12/15/2005

AMA January 1-December 1, 1984-1992
Midnight-11 P.M.



Note: Frequencies indicate direction from which the wind is blowing.

Source: Recreated from TCEQ website.

Data Source:
City of Amarillo residential data obtained in May 2005.
Aerial provided by the USDA-FSA
Aerial Photography Field Office 2004.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

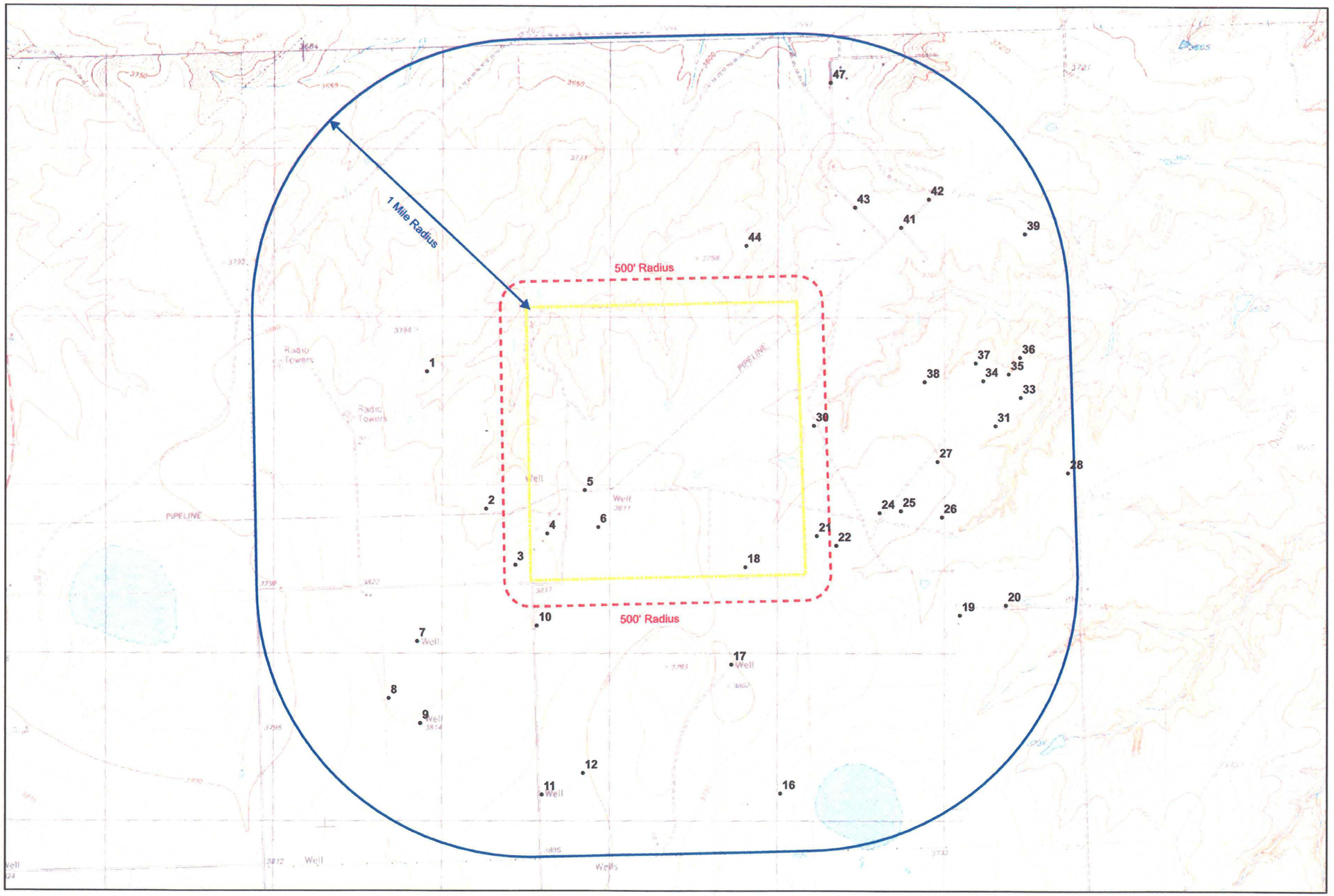
N

0 500 1,000 2,000
Feet

ONE MILE LAND USE MAP

File Name

Sheet
I.3.3



Legend

- 500' Radius
- Landfill Boundary
- 1 Mile Radius

Located Water Wells-8

19 06-49-101
4 07-56-341
17 07-56-302
11 07-56-303
7 07-56-304
8 07-56-305
9 07-56-306
10 07-56-307

Plotted Water Wells-14

6 07-56-2A (Abandoned)
1 07-56-2B
16 07-56-3A
12 07-56-3B
24 07-56-3C
42 07-56-3D (4Wells)
5 07-56-3E (Abandoned)
44 07-56-3F
30 07-56-3H
18 07-56-3J (2 Wells)

Partially Numbered Water Wells-24

38 07-56-3(16)
21 07-56-3(17)
25 07-56-3(20)
39 06-49-1(1)
37 06-49-1(2)
20 06-49-1(3)
47 07-56-3(6)
36 06-49-1(8)
27 07-56-2(1)
3 07-56-3(1)
2 07-56-3(2)
41 07-56-3(3)
26 07-56-3(4) (4 Wells)
31 06-49-1(6) (2Wells)
43 07-56-3(5)
33 07-56-3(8)
34 07-56-3(9)
35 07-56-3(10)
22 07-56-3(12)
28 07-56-3(15)

Unnumbered Water Wells-1

27 UN(1)

Mitch R. Davison

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

12/15/2005

Data Source:
USGS Topo quad provided by TNRIS converted from standard USGS DOQ format
Date: Approximately 1995-1996.
Well data provided by Atlas E.R. Well Search.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

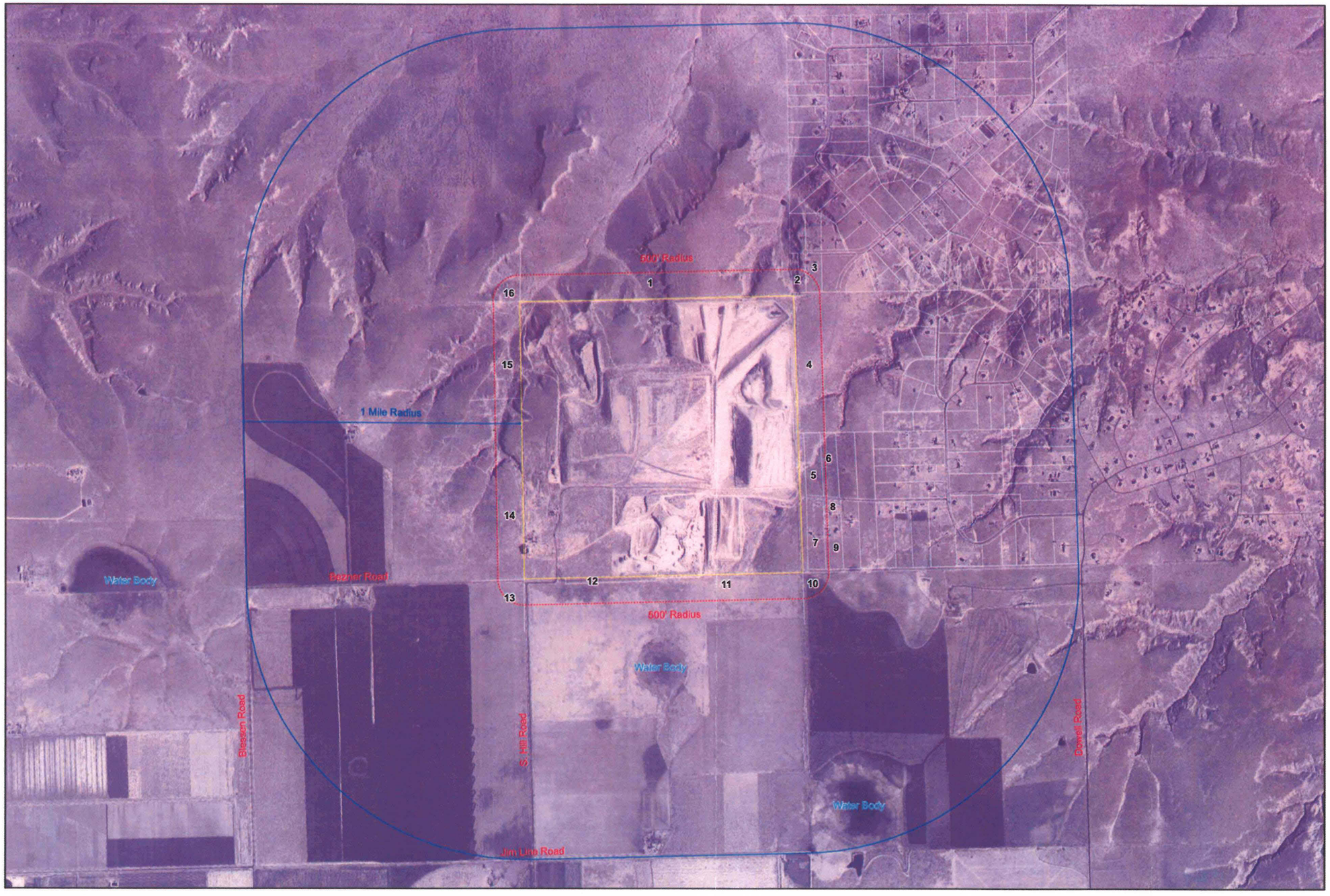
N

WATER WELL MAP

0 990 1,980
Feet

File Name

Sheet
I.3.4



Legend

- 500' Radius
- Landfill Boundary
- 1 Mile Radius
- Residential Land Boundries

Note: See Table I.3.1 for reference to corresponding property owners.

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

1/03/2006

Data Source:
City of Amarillo obtained in May 2005.
Aerial provided by the USDA-FSA
Aerial Photography Field Office 2004.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

N

0 500 1,000 2,000 Feet

500' LAND OWNERSHIP MAP

File Name

Sheet I.3.5

Table I.3.1: Amarillo Permit Boundary Adjacent Property Owners

Land Owner Name	Mailing Address	ID No.	Legal Description	Map ID No.
Frying Pan Ventures	P.O. Box 1230 Amarillo, TX 79105-1230	370-1250-0001	Sect. 125 BS&F Block 0009	1
Jones, Roger L.	14601 W. Estates Dr. Amarillo, TX 79124-4637	005-0050-1100	Bishop Estates #1 Block 0001 Portion of Tr. 46	2
Jones, Roger L.	14602 W. Estates Dr. Amarillo, TX 79124-4637	005-0050-1080	Bishop Estates #1 Block 0001 Tract 45	3
Sell, Glenda D.	1951 Blue Quail Dr. Amarillo, TX 79124-3634	370-1130-0001	Sect. 113 BS&F Block 0009 N/2 of Sect. Less East Platted Portion	4
American Tower Management, Inc. Site 30381	P.O. Box 990421 Boston, MA 02199-0421	078-2380-0300	Two Deer Creek #2 Block 0002 Lot 008	5
American Tower Management, Inc. Site 30382	P.O. Box 990421 Boston, MA 02199-0422	078-2380-0290	Two Deer Creek #2 Block 0002 Lot 007	6
Reed, Glen D.	P.O. Box 3546 Amarillo, TX 79116-3546	078-2380-0120	Two Deer Creek #2 Block 0002 Lot 013	7
Papay, Gary	P.O. Box 7413 Amarillo, TX 79114-7413	078-2380-0110	Two Deer Creek #2 Block 0001 155.4 ft. N x 280.65 ft. W Beg. 30 ft. W and 1044.92 ft. N of SE Cor of Lot 12	8
Lawrence, Bill G.	14511 White Tail Ave. Amarillo, TX 79124-3615	078-2380-0115	Two Deer Creek #2 Block 0001 Lot 12 Less 1.0012 ac. In N Portion	9
Coury, A. Sam	17917 N. Portland Ave. Edmund, OK 73003-8960	370-1120-1000	Sect. 112 BS&F Block 0009 Entire Sect. Less 3 ac. Homesite in N/2 and Less Platted Area	10

Land Owner Name	Mailing Address	ID No.	Legal Description	Map ID No.
Emeny, Carolina B. (Trust 86)	P.O. Box 1230 Amarillo, TX 79105-1230	370-1270-0002	Sect. 127 BS&F Block 0009 Entire Sect. Less 2.45 ac. Tract and Less 1 ac. Homesite and Less Row	11
City of Amarillo	P.O. Box 1971 Amarillo, TX 79105-1971	370-1270-2000	Sect. 127 BS&F Block 0009 2.4494 acs. Beg. 619 ft. E of NW Corner of Sect.	12
Durrett, Allen Teel	1700 S. Washington St. Amarillo, TX 79102-2664	370-1460-1000	Sect. 146 BS&F Block 0009 Entire Sect. Less 2 ac. In NW/4	13
City of Amarillo	P.O. Box 1971 Amarillo, TX 79105-1972	370-1470-2500	Sect. 147 BS&F Block 0009 SE/4 of Sect.	14
City of Amarillo	P.O. Box 1971 Amarillo, TX 79105-1973	370-1470-0001	Sect. 147 BS&F Block 0009 E 3/4ths of NE/4 of Sect.	15
Piehl Family Partners, Ltd.	3505 S. Georgia St. Amarillo, TX 79109-4845	370-1480-0001	Sect. 148 BS&F Block 0009 S 1/4 of Sect.	16

4.0 PROPERTY OWNER AFFIDAVIT 30 TAC §330.52(b)(7)

Part I, Attachment 1 provides a copy of the property owner affidavit, including the legal description of the facility.

5.0 LEGAL AUTHORITY 30 TAC §330.52(b)(8)

Legal authority for the City of Amarillo to provide its own solid waste management service is provided through the City Charter located in Part I, Attachment 5.

6.0 EVIDENCE OF COMPETENCY 30 TAC §330.52(b)(9)

The existing site is the only solid waste landfill owned or operated by the City of Amarillo. The City's landfill was originally permitted in 1975. The City does not have a financial interest in any other landfills. The Landfill operation is under the direction of the Public Works Director. The City is also responsible for the collection of both residential waste and a majority of the commercial waste generated by the City. The City also owns and operates a municipal solid waste transfer station which is located inside the City limits. Approximately 700 to 1000 tons of MSW are processed at this facility. The Solid Waste Supervisor will have at least a Class A certification and previous solid waste management experience. The City of Amarillo maintains an active training program for landfill personnel to improve facility operations and safety. Details of the City's training program are provided in the Site Operating Plan.

Current City employees responsible for the landfill include Michael G. Rice, P.E. (Public Works Director), Rick Cognasi (Solid Waste Supervisor) and William Lay (Landfill Supervisor). Mr. Rice has been with the City of Amarillo for 22 years and is a Professional Engineer. Rick Cognasi has a Class (A) TCEQ certification and William Lay has a Class A certification.

7.0 APPOINTMENTS 30 TAC §330.52(B)(10)

Part I, Attachment 6 includes a copy of the Applicant's Statement and a Notice of Appointment. The City of Amarillo has appointed HDR Engineering Inc., Dallas, Texas, as the consulting engineers responsible for developing this permit amendment. Mr. Michael W. Oden, P.E., is the Principal Engineer for the project. Mr. Alan Taylor, City Manager, has the authority to sign this application and the Notice of Appointment.

8.0 EVIDENCE OF FINANCIAL ASSURANCE 30 TAC §330.52(b)(11)

The City of Amarillo is a municipality created by charter. It has power through its charter to issue bonds and maintain funds for meeting financial needs for closure and post-closure care activities. The City will continue to meet its obligations for financial assurance through use of the local government financial test. Calculations for financial assurance can be found in Attachment 8 of Part III. The City will satisfy the requirements of the annual financial test.

Part II

Attachment 1: TCEQ Coordination Letter Regarding the Clean Water Act and Texas Historic Commission

for

City of Amarillo Landfill

Potter County, Texas

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 9, 2005

Mr. Michael E. Carleton, Vice President
HDR Engineering
17111 Preston Road
Dallas, TX 75248-1232

Re: Water Quality Management Plan Conformance Review
Amarillo, Type I Municipal Solid Waste Landfill
Potter County

Dear Mr. Carleton:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the information you provided related to the proposed expansion of Amarillo's Type I municipal solid waste landfill, located in Potter County, for conformance with Section 208 of the federal Clean Water Act. If the facility is constructed and operated in accordance with TCEQ rules and guidelines, it will comply with the requirements in Section 208 of the federal Clean Water Act.

If you need additional information, please contact Mark Palmie of my staff at (512) 239-0849.

Sincerely,

Laurie Curra

Laurie Curra, Team Leader
Watershed Management Team
Monitoring Operations Division
MC-165

LC/bj

October 7, 2005

23358-037

Mr. Mark Denton
Division of Archeology
Texas Historical Commission
P.O. Box 12276
Austin, Texas 78711-2276

Re: Amarillo Landfill Re-Permitting Project, TCEQ Solid Waste Permit Application

Dear Mark:

The City of Amarillo is proposing to re-permit an existing landfill facility located in Potter County, Texas (Figure 1). The northern and eastern 1/3rd of the landfill tract is characterized by canyonlands, which were cut by ephemeral tributaries of the Canadian River. The southern and western 2/3rds of the landfill is comprised of relatively flat tablelands of the Llano Estacado. The existing facility has been in operation for over 15 years, and as much as 75 percent of the landfill tract has been impacted by grading, excavation, and fill placement (Figure 2).

In an effort to assess impacts to historic properties in accordance with Section 106 of the National Historic Preservation Act, and to State Archeological Landmarks in accordance with the Antiquities Code of Texas, we conducted a review of available records. Records examined included site records available at the Texas Archeological Research Laboratory, and on the Texas Historic Sites Atlas website. We also examined historic highway maps available on the State Archives website, and reviewed the county soil survey and the Geologic Atlas to evaluate depositional contexts of the proposed landfill tract.

Although the records review indicated that no recorded historic properties or archeological sites occur within the landfill tract, there were a number of sites recorded outside of the landfill boundaries. These included sites 41PT184, 41PT185, and 41PT245, which were all recorded during a survey conducted for the Department of Energy in 1998. All of these sites were reported as being prehistoric open campsites with unknown time periods of occupation and were located within a canyonland setting. No sites were recorded nearby that occur within a tableland setting. Examination of the 1936 State Highway map indicates no standing structures with the landfill tract. The Texas Historic Sites Atlas indicates that there are no National Register listed properties within the landfill tract.

The local surface geology within the canyonlands is Tertiary in age, while it is Quaternary in age in the tablelands. In both settings this information indicates that any archeological deposits would most likely exist as surface manifestations. In addition, soils within the canyonlands of the landfill tract include Pullman clay loam 1-3 percent slope, Estacado clay loam, 3 to 5 percent slope, and Posey clay loam, 5 to 8 percent

slope. Given the relatively steep gradient of the slopes on which these soils form, the Soil Conservation Service reports them to be highly susceptible to erosion.

Although there were a few previously recorded sites located outside of the landfill tract, it would appear unlikely that any intact archeological deposits occur within the area of the existing landfill. The fact that the known archeological sites are situated within canyonlands – a depositional environment that is highly susceptible to erosion – that approximately 75% of the landfill tract has already been disturbed by previous landfill activities, and the age of the local surface geology, all support an assessment that there is a low potential for the occurrence of intact archeological deposits within the tract. Under these circumstances we request your concurrence that this activity will have no effect to historic properties that are either listed or eligible for listing on the National Register of Historic Places, and no effect on State Archeological Landmarks.

If you have any questions regarding this matter, please call me.

Sincerely,

Eric Schroeder, RPA
Senior Archeologist

CONCUR

by _____
for F. Lawerence Oaks
State Historic Preservation Officer
Date 11/2/05

cc: Mike Carleton, HDR Engineering, Inc.

References

BEG
1981 *Geologic Atlas of Texas: Amarillo Sheet.* Bureau of Economic Geology, the University of Texas at Austin.

Pringle, F. B.
1980 *Soil Survey of Potter County, Texas.* U.S.D.A. Soil Conservations Service in cooperation with the Texas Agricultural Experiment Station.

NO HISTORIC
PROPERTIES AFFECTED
PROJECT MAY PROCEED

By _____
for F. Lawerence Oaks
State Historic Preservation Officer
Date 11/2/05

Part II

Attachment 2: Documentation of Compliance with Army Corps of Engineers Regulations

for

City of Amarillo Landfill

Potter County, Texas

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, TULSA DISTRICT
1645 SOUTH 101ST EAST AVENUE
TULSA, OKLAHOMA 74128-4609

April 19, 2006

Regulatory Office

Mr. James A. Thomas
HDR Engineering, Inc.
17111 Preston Road, Suite 300
Dallas, TX 75248-1232

Dear Mr. Thomas:

Please reference your letter dated April 13, 2006, regarding the proposed expansion of an existing landfill. The proposed project is situated approximately 5 miles west and 2 miles north of Amarillo, in Potter County, Texas.

The provided information does not indicate that a placement of dredged or fill material will be required, permanently or temporarily, into any "waters of the United States," including jurisdictional wetlands. Therefore, your proposal is not subject to regulation pursuant to Section 404 of the Clean Water Act, and a Department of the Army (DA) permit will not be required. Should your method of construction necessitate such a discharge, we suggest that you resubmit that portion of your project so that we may determine whether an individual DA permit will be required.

Although DA authorization is not required, this does not preclude the possibility that other Federal, State, or local permits may be required.

Your project has been assigned Identification Number 15297. Please refer to this number during future correspondence. If further assistance is required, contact Mr. Allen Ryan at 918-669-7618.

Sincerely,

for David A. Manning
Chief, Regulatory Office

PRELIMINARY JURISDICTIONAL DETERMINATION (JD)
INFORMATION SHEET

Preliminary JDs are not subject to appeal under the Administrative Appeal Process (AAP) of the U.S. Army Corps of Engineers (Corps). If you wish to challenge Corps regulatory jurisdiction for this project site, you may request an approved JD, which is subject to appeal under the AAP. If you desire to provide new information regarding this project site to the Corps for further consideration in reevaluation of the JD, it is recommended that any information be submitted prior to or accompanying your request for a final approved JD. Once the appeal process is underway for an approved JD, the AAP rules do not allow for submission of new information. You are not required to respond to the Corps regarding a preliminary JD if you concur with the determination.

For obtaining an approved JD, there are two options. The first option is to obtain the services of a consultant trained in the identification and delineation of wetlands and waters of the United States. A list of consultants in the area may be obtained from the Corps office. Any wetland delineation performed by a consultant must be completed in accordance with the 1987 Corps of Engineers Wetland Delineation Manual and supplemental guidance. The submitted wetland delineation should be accompanied by appropriate documentation and will be subject to review and validation by the Corps. A properly prepared and supported wetland delineation report provided by a consultant will expedite project review under the authority of Section 404 of the Clean Water Act. The second option is to request an approved wetland delineation from the Corps office. However, due to resource limitations and the size of the proposed development, the Corps cannot conduct the delineation of wetlands on these lands without a substantial delay for the permit applicant. If you desire the Corps to delineate the wetlands, expect a delay of at least 3 months for us to begin this service. To accomplish this task, you will need to provide notice to the Corps that you elect not to complete the delineation process through a private consultant. You should also provide written right-of-entry for the Corps to access the properties related to this project for wetland delineation purposes.

In addition to the above information, we also request site-specific construction plans that describe, at least in concept, any proposed excavation or filling activity on the subject site. Upon receipt of this information, an on-site investigation of the property may be conducted. The Corps will then provide a formal wetland delineation describing the extent or absence of wetlands on the property likely to be affected by the proposed project. In accordance with Federal mitigation policy, we may also recommend ways the proposal can be altered to avoid impacting aquatic environments and wetlands. The final wetland determination will be the official position of the Corps used to ascertain the subsequent need for a Section 404 permit for the proposed work, and as an approved JD will be subject to the AAP.

Contact:
Regulatory Office
U.S. Army Corps of Engineers
1645 South 101st East Avenue
Tulsa, OK 74128-4609

April 13, 2006

Mr. David Manning,
Regulatory Branch Chief
U. S. Army Engineer District, Tulsa
CESWT-PE-R
1645 South 101st East Ave.
Tulsa, OK 74128

Re: Request for Verification of Proposed Jurisdictional Determination of Waters of the U.S., including Wetlands, on the Amarillo Landfill Expansion Site

Dear Mr. Manning,

HDR, Inc., acting on behalf of the City of Amarillo (Owner), is requesting a verification of a proposed jurisdictional determination for waters of the U.S. on the existing Amarillo Landfill, as discussed with Allen Ryan in your office. The site is located at the intersection of Bezner and Hill Road, five miles west of Soncy Road and two miles north of Interstate 40 on Bezner Road. The site is the location of the existing landfill within the current Texas Commission on Environmental Quality permitted area. To summarize the findings of the proposed jurisdictional determination, no waters of the U.S. were identified on the site.

Background

The City of Amarillo owns and operates the Landfill, which is a Type I municipal facility operating under TCEQ Permit No. 73. Based on current refuse inflow rates and available capacity, the remaining site life is estimated at forty-six (46) years from September 2005. The Landfill is situated within a portion of the City of Amarillo's Extraterritorial Jurisdiction (ETJ). The landfill is located at the intersection of Bezner and Hill Road, five miles west of Soncy Road and two miles north of Interstate 40 on Bezner Road. Attached is a general location map (Attachment 1) that shows the site on a 2003 color infra-red (CIR) aerial photography, a USGS topographic map, and a 2005 true color aerial photography.

Survey Results

The field visit for the determination and delineation survey was conducted on 11 August 2005, using the approved Corps of Engineers 1987 Wetland Delineation Manual methodology. The delineation was conducted by Tom Trimble, HDR Environmental Scientist, a trained delineator with extensive experience conducting delineations and proposed jurisdictional determinations.

HDR Engineering, Inc.
17111 Preston Road
Suite 300
Dallas, TX 75248-1232
Phone: (972) 960-4400
Fax: (972) 960-4471
www.hdrinc.com

Prior to the site visit, HDR conducted research using aerial photography, USGS topographical maps, soil surveys, and floodplain maps. Site survey results indicate no waters of the U.S. are located within the project site. Two upland vegetated swales are located on the area of future development. The swales carry runoff from surrounding areas through overland sheet flow. No evidence of naturally occurring channels exists, and no definable channels were delineated within the swales. Included in Attachment 1 are site photos of these vegetated swales.

The habitat associated with the upland swales consisted of Japanese brome (*Bromus japonicus*), western ragweed (*Ambrosia psilostachya*), yucca (*Yucca constricta*), maximilian sunflower (*Helianthus maximiliani*), and goldenrod (*Solidago* sp.). The remainder of the area consisted of uplands dominated by these species along with sideoats grama (*Bouteloua curtipendula*), Mexican hat (*Ratibida columnifera*), and mesquite (*Prosopis glandulosa*).

Key Issues

The Texas Commission on Environmental Quality (TCEQ) is requesting a letter verifying the jurisdictional determination of the project site from the USACE prior to issuance of the landfill permit amendment.

If you have any questions or comments on the survey that was performed by HDR, please contact Tom Trimble at 972.960.4483 or me at 972.960.4431.

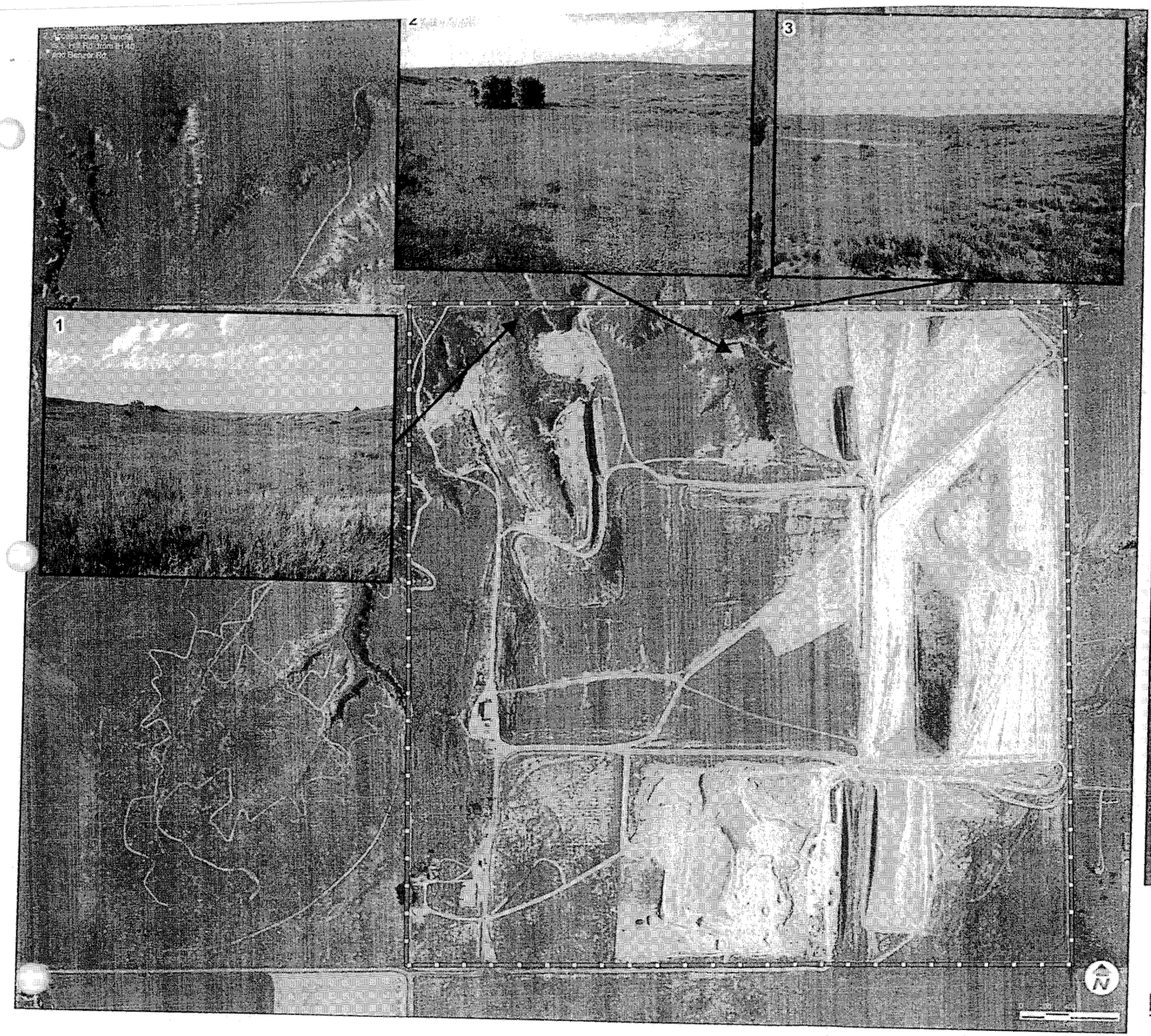
Respectfully submitted,

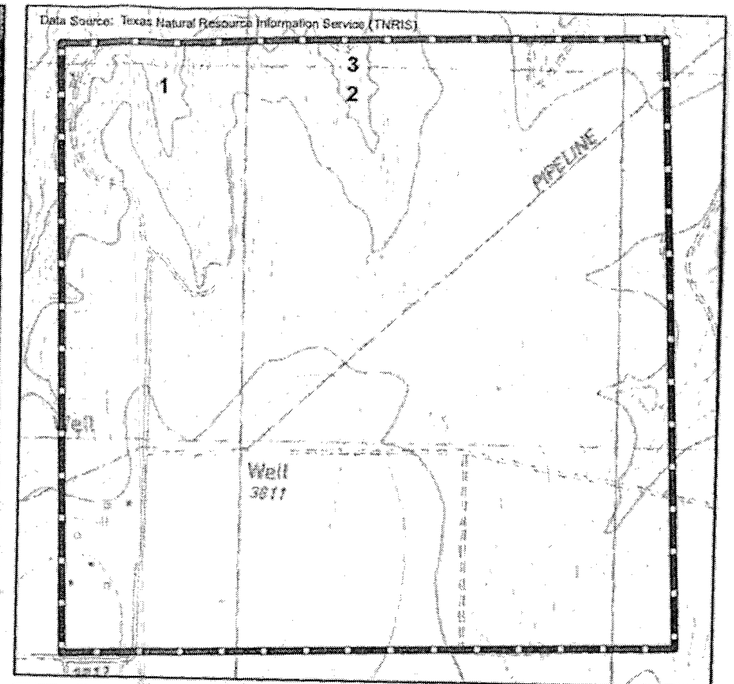
HDR Engineering, Inc.

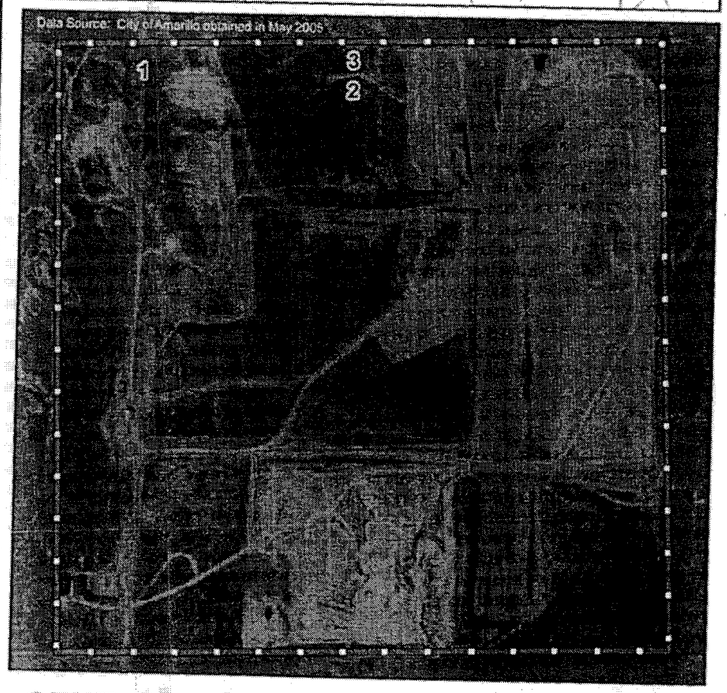
James A. Thomas, PWS

Cc: Michael G. Rice, P.E., Public Work Director, City of Amarillo
Mitch Davison, P.E., Project Manager, HDR

Attachments: Attachment 1: General Site Maps: 2003 Color Infra-Red Aerial Photograph of the project site, Site Photography, USGS Topographic Map, and 2005 True Color Aerial Photography







GENERAL SITE MAPS

CITY OF AMARILLO LANDFILL
POTTER COUNTY, TEXAS

Legend

Property Boundry

HDR

HDR Engineering, Inc.

1 September 2005

Michael G. Rice, P.E.
Public Works Director
City of Amarillo
509 S.E. Seventh Avenue
Amarillo, TX 79105-1971

RE: City of Amarillo Landfill Construction Area, Amarillo, Potter County, Texas

Dear Mr. Rice,

Per your request, HDR, Inc. has completed an on-site delineation survey for jurisdictional waters of the U.S., including wetlands, on a parcel of land on the existing City of Amarillo Landfill in Amarillo, Potter County, Texas. The survey was conducted on 11 August 2005, using the approved Corps of Engineers 1987 Manual methodology. The project site is the location of the existing landfill within the existing Texas Commission on Environmental Quality permitted area.

HDR conducted research using aerial photography, USGS topographical maps, soil surveys, and floodplain maps prior to the site visit. Site survey results indicate no jurisdictional waters of the U.S. within the project site. Two upland vegetated swales are located on the area of future development. The swales carry runoff from surrounding areas through overland sheet flow. No evidence of naturally occurring channels exist, and no definable channels were delineated within the swales.

The habitat associated with the upland swales consisted of Japanese brome (*Bromus japonicus*), western ragweed (*Ambrosia psilostachya*), yucca (*Yucca constricta*), maximilian sunflower (*Helianthus maximiliani*), and goldenrod (*Solidago* sp.). The remainder of the area consisted of uplands dominated by these species along with sideoats grama (*Bouteloua curtipendula*), Mexican hat (*Ratibida columnifera*), and mesquite (*Prosopis glandulosa*).

It appears from the site plans provided to HDR that the project would not impact any Waters of the U.S.; therefore, would not require consultation with the U.S. Army Corps of Engineers, Tulsa District.

If you have any questions or comments on the survey that was performed by HDR, please contact Tom Trimble at 972.960.4483 or me at 972.960.4431.

Sincerely,

James Thomas, PWS, CWB
Senior Environmental Scientist
HDR, Inc.

HDR Engineering, Inc.
17111 Preston Road
Suite 200
Dallas, TX 75248-1232
Phone: (972) 960-4400
Fax: (972) 960-4471
www.hdrinc.com

Part II

Attachment 3: Federal Aviation Administration Coordination Letters

for

City of Amarillo Landfill

Potter County, Texas

U.S. Department
of Transportation
**Federal Aviation
Administration**

Airports Division
Southwest Region
Arkansas, Louisiana,
New Mexico, Oklahoma,
Texas

Fort Worth, Texas 76193-0600

April 24, 2006

Mr. Michael E. Carleton
17111 Preston Rd
Suite 300
Dallas, TX 75248-1232

Dear Mr. Carleton:

This is in response to your letters of December 6, 2005, and July 6, 2005, regarding the proposed Class I Landfill Permit Amendment for the City of Amarillo in Potter County, Texas. The site is located beyond the five-mile criteria requiring Federal Aviation Administration review from the standpoint of potential wildlife hazards to aircraft operations. The closest public-use airports, Tradewind and Palo Duro, are located more than 11 miles from the proposed site.

This site has been assigned our file No. 26-011TX. Please use this number in any future correspondence concerning this facility. Please contact me at 817-222-5656 if you have any questions. Thank you for coordinating this proposal with us.

Sincerely,

Faye Nedderman
Executive Technical Assistant
Airports Division

cc:

Texas Commission on Environmental Quality
P.O. Box 13087
Austin, TX 78711-3087

Texas Department of Transportation
Division of Aviation
125 East 11th Street
Austin, TX 78701-2483

HDR ONE COMPANY | *Many Solutions* SM

July 6, 2005

Mr. William Mitchell
Department of Transportation
Federal Aviation Administration
Airports Division, ASW-620
2601 Meacham Boulevard
Fort Worth, TX 76193

RE: City of Amarillo, Potter County, Texas
Type I Landfill Permit Amendment

Dear Mr. Mitchell,

HDR Engineering, Inc. is preparing a Class I Landfill Permit Amendment for the City of Amarillo, in Potter County, Texas. Texas Commission on Environmental Quality (TCEQ) rule 30 TAC §330.51(b)(6)(C) requires that we contact your agency regarding airport location restrictions within, or near the landfill site. Enclosed is a map that shows the location of the landfill in relation to surrounding municipalities. The closest public airfield that we have identified is the Amarillo International Airport, located north of the City of Amarillo, which is approximately 15.5 miles east of the existing landfill.

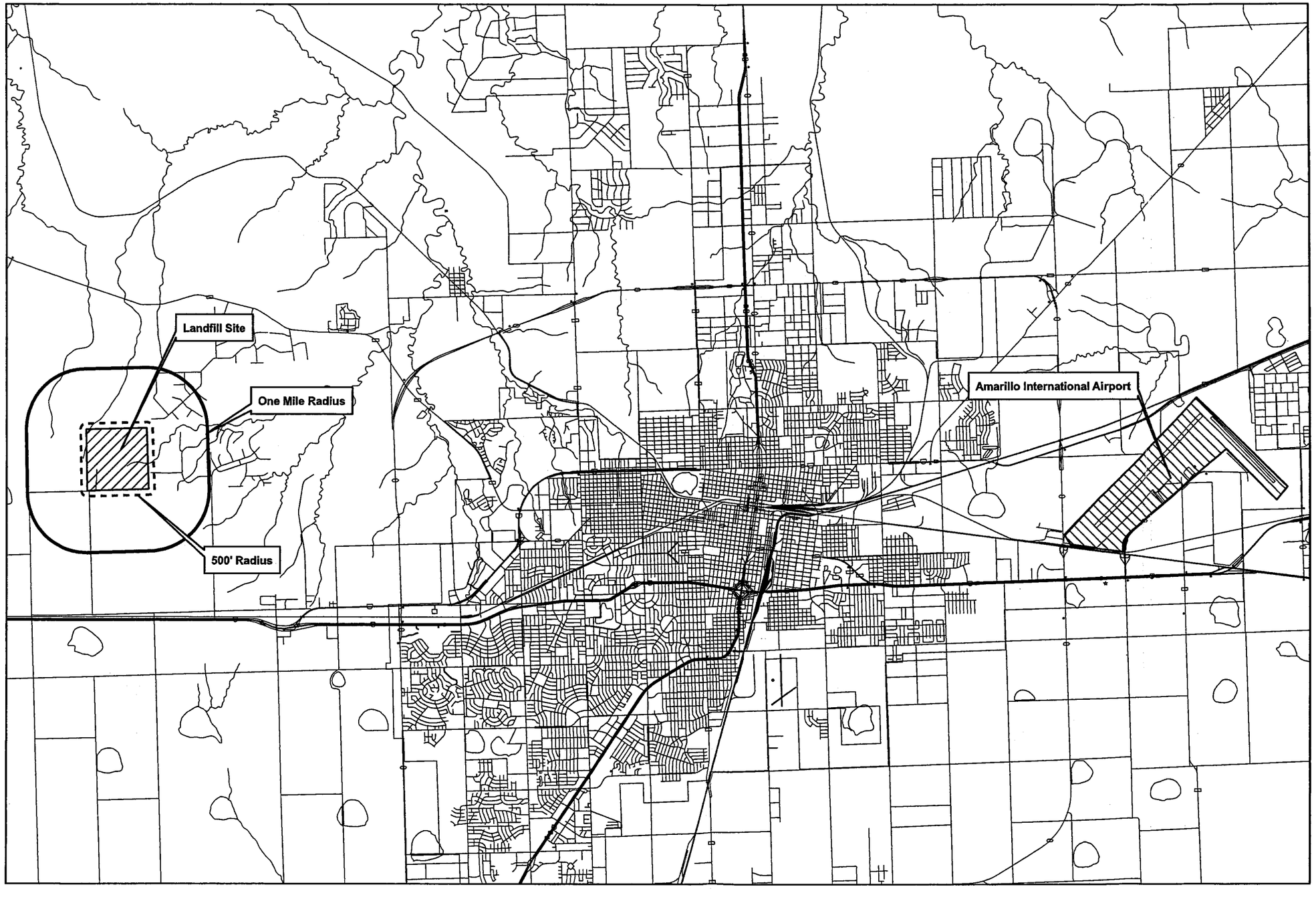
Since we have not identified any new public airports within the regulatory boundary limits, we would like to request that your office send us a letter documenting our coordination with the FAA and certifying that the site is still in compliance with both TCEQ and FAA location restrictions.

We appreciate your assistance in helping us fulfill this TCEQ requirement. If you have any questions or require any additional information, you may reach me at (972) 960-4475. Thank you for your time and effort.

Sincerely,
HDR Engineering, Inc.

Michael E. Carleton
Vice President

Enclosure



Legend

- 1 Mile Radius
- 500' radius
- Landfill Boundary
- Airport
- Roads

Notes:
1. Maping Images are TxDOT raw data provided bt TNRIS. Date: Approximately 1995-1996.
2. All access roads consist of concrete or two-course asphalt over crushed stone base.

Data Source:
TXDOT, obtained in May 2005

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL/ AIRPORT GENERAL LOCATION MAP POTTER COUNTY, TEXAS

Coordinate System: UTM Zone 13 N

0 500 1,000 2,000 Feet

File Name		Sheet

Part II

Attachment 4: Endangered Species Correspondence

for

City of Amarillo Landfill

Potter County, Texas

1 September 2005

Tom Cloud
Field Supervisor
United States Fish and Wildlife Service
711 Stadium Drive East, Suite 252
Arlington, TX 76011

RE: City of Amarillo Landfill Expansion, Amarillo, Potter County, Texas

Dear Mr. Cloud,

HDR, Inc. has completed an on-site survey for threatened and endangered species on a parcel of land within the existing City of Amarillo Landfill in Amarillo, Potter County, Texas. The survey was conducted on 11 August 2005. The project site is the proposed location for the development of the existing landfill within the existing Texas Commission on Environmental Quality permitted construction area.

Site survey results indicate a 50-acre black tailed prairie dog (*Cynomys ludovicianus*) town within the project site. However, based on survey guidance for the black-footed ferret (*Mustela nigripes*) provided by USFWS (1989), no further surveys for the black-footed ferret were conducted, as the size of the town (50 acres) falls beneath the town size threshold (80 acres) to require surveys. Three burrowing owls (*Athene cunicularia hypugaea*) were identified on the site within the prairie dog town. The habitat associated with the prairie dog town consisted of short grasses including buffalo grass (*Buchloe dactyloides*) and Japanese brome (*Bromus japonicus*).

Based on the site plans, it appears that the project would impact the prairie dog town; however, prior to ground disturbance, silt fencing would be advanced approximately 50 feet at a time into the future construction area, which would force the prairie dogs to migrate to an area that allows them to monitor their surroundings for up to 100 yards. Only after the prairie dogs have migrated will construction commence in the area of the prairie dog town.

If you have any questions or comments on the survey that was performed by HDR, please contact Tom Trimble at 972.960.4483 or me at 972.960.4431.

Sincerely,

James Thomas, PWS, CWB
Senior Environmental Scientist
HDR, Inc.

NO ACTION
Date: 4-13-06
Consultation #: 2-12-05-I-428
Approved by Tom Cloud
Thomas J. Cloud, Jr., Field Supervisor
U.S. FISH & WILDLIFE SERVICE, ARLINGTON, TEXAS

HDR Engineering, Inc.
17111 Preston Road
Suite 200
Dallas, TX 75248-1232
Phone: (972) 960-4400
Fax: (972) 960-4471
www.hdrinc.com

Part II

Attachment 5: Texas Department of Transportation Correspondence

for

City of Amarillo Landfill

Potter County, Texas

Texas Department of Transportation

P.O. Box 7368 • AMARILLO, TEXAS 79114-7368 • (806) 356-3200

July 13, 2005

HDR Engineering, Inc.
Attn: Michael E. Carleton
Vice President
512 Main Street, Suite 600
Ft. Worth, TX 76102

RE: City of Amarillo, Potter County, Texas
Type I Landfill Permit Amendment

Mr. Carleton:

In your letter dated July 6, 2005 you indicated that the Texas Commission on Environmental Quality (TCEQ) requires a response from the Texas Department of Transportation (TxDOT) in acquiring a Type I Landfill Permit Amendment for the City of Amarillo, Potter County, Texas. In reviewing the attached map, showing the location of the landfill, we feel the roads that access the landfill that we are responsible for are adequate.

Sincerely,

Kenneth R. Petr, P.E.
Director of Transportation Planning
and Development

bgk

cc: District File
Mark E. Tomlinson, P.E.

Part II

Attachment 6: Location Restriction Information

Fault Areas
Seismic Impact Zones
Unstable Areas
Floodplain
Airport
Wetlands

for

City of Amarillo Landfill

Potter County, Texas

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

JAN 14 1994

Michael D. Kennedy, P.E.
Director of Public Works
City of Amarillo
509 E. 7th
P. O. Box 1971
Amarillo, Texas 79186-0001

Re: City of Amarillo
Municipal Solid Waste Landfill
MSW Permit No. 73
Location Restrictions

Dear Mr. Kennedy:

On January 11, 1994, the Texas Natural Resource Conservation Commission (TNRCC) received the certifications by the responsible professional engineer for the demonstration of the location restrictions pursuant to 30 Texas Administrative Code (TAC) Subchapter L.

Please enter these certifications along with the supporting documentation into the Site Operating Record pursuant to 30 TAC Section 330.113.

If you have any questions concerning this letter, please contact Susan Janek, P.E. at (512) 239-6674.

Sincerely,

Mary B. Adrian, P.E.
Manager
Permits Section
Municipal Solid Waste Division

cc: TNRCC Regional Office - Amarillo
Troy Hotchkiss
HDR Engineering, Inc.
Suite 125
12700 Hillcrest Road
Dallas, Texas 75230-2096

JAN 17 1994

If you have any questions on this letter, please contact Susan Janek, P.E. at (512) 908-6674.

Sincerely,

Mary B. Adrian

Mary B. Adrian, P.E.
Manager
Permits Section
Municipal Solid Waste Division

cc: TNRCC Regional Office - Amarillo
Troy Hotchkiss
HDR Engineering, Inc.
Suite 125
12700 Hillcrest Road
Dallas, Texas 75230-2096

PSC

August 17, 1993

The City of Amarillo
c/o HDR Engineering, Inc.
12700 Hillcrest, Suite #125
Dallas, Texas 75230-2096

Attn: Troy Hotchkiss

Re: City of Amarillo
Municipal Solid Waste Landfill

Gentlemen:

We are enclosing a map of the referenced landfill showing boundaries at 1/2-mile and 200 feet outside the landfill boundary.

This is to certify that, using available current information, we have not identified any active faults or differential subsidence areas within 1/2-mile of the landfill boundary. In addition, no Holocene faults were identified within 200 feet of the landfill boundary.

Sincerely,
PARKHILL, SMITH & COOPER, INC.

By Royce L. Gooch
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

STATEMENT OF COMPLIANCE

LOCATION RESTRICTION: FAULTING

A. General Information

1. **Site Name:** City of Amarillo Municipal Solid Waste Landfill
2. **Site Location:** Amarillo, Texas
3. **Date Issued:** September 10, 1993

B. Statement of Compliance

I, Royce L. Gooch, P.E., certify that the City of Amarillo Municipal Solid Waste Landfill is, on the basis of the supporting information provided in (D) below, in compliance with the FAULTING location restriction. The studies performed indicate that compliance has been achieved by satisfying the requirements set forth in applicable regulations.

C. Certification

1. **Prepared By:** Royce L. Gooch, P.E.
2. **Title:** Vice-President
3. **Firm:** Parkhill, Smith & Cooper, Inc.
4. **Signature (Consultant):** Royce L. Gooch 9/10/93
5. **Signature (Owner/Operator):** Michael D. Kennedy

STATE OF TEXAS
ROYCE L. GOOCH
54595
REGISTERED
PROFESSIONAL ENGINEER

D. Supporting Information

1. **Title of Document(s) Supporting Statement:**
   Geologic Atlas of Texas, Tucumcari sheet, 1983, Bureau of Economic Geology
   USGS 7-1/2 Minute Quad maps
2. **Location of Document(s):**
   Attached

E. Comments

PSC

August 17, 1993

Mr. Troy Hotchkiss
HDR Engineering, Inc.
12700 Hillcrest, Suit #125
Dallas, Texas 75230-2096

Re: City of Amarillo
Municipal Solid Waste Landfill

Dear Troy:

Attached is a copy of the most recent seismic impact zone map with the Amarillo Municipal Solid Waste Landfill shown. As you can see, the landfill is located outside the seismic impact zone. A seismic impact zone is defined as "... an area with a 10% or greater probability that the maximum horizontal acceleration in rock, expressed as a percentage of the earth's gravitational pull will exceed 0.10g in 250 years."

The attached map shows "contour" lines of maximum acceleration in rock in percent of the earth's gravitational pull. Based on this map, the maximum expected horizontal acceleration is 0.08 to 0.09 g.

Sincerely,
PARKHILL, SMITH, & COOPER, INC.

By _____
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

200' BOUNDARY

CITY OF AMARILLO
MUNICIPAL LANDFILL

1/2 MILE BOUNDARY

NOTE
FROM GEOLOGICAL ATLAS OF TEXAS
NO KNOWN ACTIVE FAULTS WITHIN
1/2 MILE OF LANDFILL. NO KNOWN
HOLOCENE FAULTS WITHIN 200' OF
LANDFILL.

Bushland

POTTER CO

HDR Engineering, Inc.

PSC
PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drawn	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager
Architect
Civil RLG
Electrical
M/C/Process
Mechanical
Structural
Drawn By KGG

FAULT AREAS

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date JULY 1993
Scale 1" 2000'
Project No.
Drawing No.

KLEINFELDER

FAULT AREAS

SUBTITLE D LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
Fault Areas

General Site Information

Site: City of Amarillo Landfill

Site Location: Potter County, Texas

TWC Permit No.: 73

Date Permit Issued: July 2, 1975

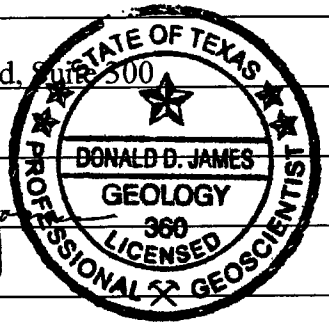
Statement of Compliance

I, Donald D. James, C.P.G., Senior Geologist, certify that the site indicated above is in compliance with the Subtitle D – Fault Areas Location Restriction, as stated in 30 TAC 330.303 Fault Areas.

Firm/Address: Kleinfelder

6850 Manhattan Boulevard, Suite 300

Fort Worth, Texas 76120



Signature: Donald D. James

Date: 12-15-05

Supporting documentation attached.

Owner/Operator of Site

Owner/Operator of Site: City of Amarillo

Official Mailing Address: P.O. Box 1971

Amarillo, Texas 79186-0001

Official's Name and Title: _____

Signature: _____

Date: _____

Note: This certification has been prepared consistent with 30 TAC 330.250(b).

CITY OF AMARILLO LANDFILL

Fault Areas

Introduction

The Amarillo Landfill was examined for the presence of faulting. A review was made of the references listed for the location restriction Statement of Compliance for "Faulting," September 10, 1993, for this permit. This information remains valid in support of the original compliance statement.

Geomorphology

The site occurs within the southern high plains physiographical province of North America. The site is founded in a peneplain of fluvial outwash and eolian sediments deposited at the end of the tectonic uplift of the Rocky Mountains (Laramide Orogony) during late Cretaceous to early Cenozoic time (40 to 65 mya). These sediments range from 100 to 500 feet thick and are located over incised Triassic and Permian age bedrock. The fluvial source for the sediments were cut off at the inception of the Pecos River process. Eolian deposition of the southern high plains continues through present.

In time arid cycles have cemented upper portions of these sediments with formation of caliche recognized as erosionally resistant "caprock." The land surface is generally flat with little topographic relief except for playa lakes dotting the land surface. The Canadian River process, immediately north of the landfill, has incised the landscape down through the Permian bedrock resulting in precipitous exposures.

Tectonic Setting

The site is founded in structurally stable Pliocene age sediments ranging from 100 to 500 feet thick depending on the location over the underlying incised Triassic age bedrock.

The "Tectonic Map of Texas, BEG, U.T. Austin, 1990" indicates the site is located between the Palo Duro Basin geological structural feature to the south and the Amarillo Uplift to the north. According to this reference the Palo Duro Basin is recognized in the Precambrian age basement rock approximately 1,200 meters (3,900 feet) below sea level. The Amarillo Uplift is recognized in the Precambrian age basement rock approximately at sea level (3,500 feet below the land surface).

Hinging between these two tectonic structures is the Whittenburg Trough, Bush Dome, and Carson Basin. The Whittenburg trough is indicated approximately 20 miles north of the landfill site in northern Potter County approximately 2,000 to 2,800 meters (6,600 to 9,300 feet) below sea level. This trough trends generally west to east. The Bush Dome is a subordinate upwelling of the Whittenburg Trough bounded by deep seated faulting and occurs approximately nine miles northeast of the landfill in central Potter County approximately 1,000 meters (3,300 feet) below sea level. The Carson Basin is recognized approximately 20 miles northeast of the landfill from 1,000 to 1,400 meters (3,300 to 4,500 feet) below sea level.

Faulting

There are no known active (within the last 10,000 years) faults within 195 miles of the site. There are no faults mapped within five miles of the landfill site. A group of normal intersecting faults within the basement structure are mapped as close as 5 miles northwest of the site. These faults strike northwest to southeast with associated strikes of northeast to southwest. The reference shows this cluster of faults to occur in a southeastern extension of the Bravo Dome in northeastern New Mexico and just south of the southern end of the mapped Whittenburg trough.

The reference indicates faulting of undetermined nature to occur within the Palo Duro Basin as close as five miles west to northwest of the landfill and trend approximately northwest to southeast. This fault is mapped over 12.5 miles in the basement structure and strikes approximately 60^0 west of north. If extended this fault would not intersect the landfill site.

The nearest surface displacements are mapped as Quaternary faults located in the Meers Fault Zone approximately 195 miles east of the site in Oklahoma, and approximately 195 miles northwest of the site in the Sangre de Cristo mountains of New Mexico.

Based on a review of the available literature in corroboration with site reconnaissance by a professional geologist, no active faults are interpreted to occur within 200 feet of the site. The site therefore complies with Subtitle D regulation TCEQ 30 TAC §330.303.

References:

University of Texas website, www.if.utexas.edu.htm

USGS Earthquake Hazards Program, eqint.cr.usgs.gov/eq/cgi-bin/zipcode.cgi

Map of Mean Horizontal Acceleration, Percent in Rock, Algermissen, 1993

International Building Code 2000

USGS Seismic Hazard Maps, http://gldims.cr.usgs.gov

C.M. Woodruff, Jr., Geothermal Resources of Texas, 1982, Bureau of Economic Geology, University of Texas Austin.

Tectonic Map of Texas, Bureau of Economic Geology, 1990, University of Texas at Austin.

STATEMENT OF COMPLIANCE

LOCATION RESTRICTION: SEISMIC

A. General Information

1. **Site Name:** City of Amarillo Municipal Solid Waste Landfill
2. **Site Location:** Amarillo, Texas
3. **Date Issued:** September 10, 1993

B. Statement of Compliance

I, Royce L. Gooch, P.E., certify that the City of Amarillo Municipal Solid Waste Landfill is, on the basis of the supporting information provided in (D) below, in compliance with the SEISMIC location restriction. The studies performed indicate that compliance has been achieved by satisfying the requirements set forth in applicable regulations.

C. Certification

1. **Prepared By:** Royce L. Gooch, P.E.
2. **Title:** Vice-President
3. **Firm:** Parkhill, Smith & Cooper, Inc.
4. **Signature (Consultant):** Royce L. Gooch
5. **Signature (Owner/Operator):** Michael D. Kennedy

STATE OF TEXAS
ROYCE L. GOOCH
54595
REGISTERED
PROFESSIONAL ENGINEER

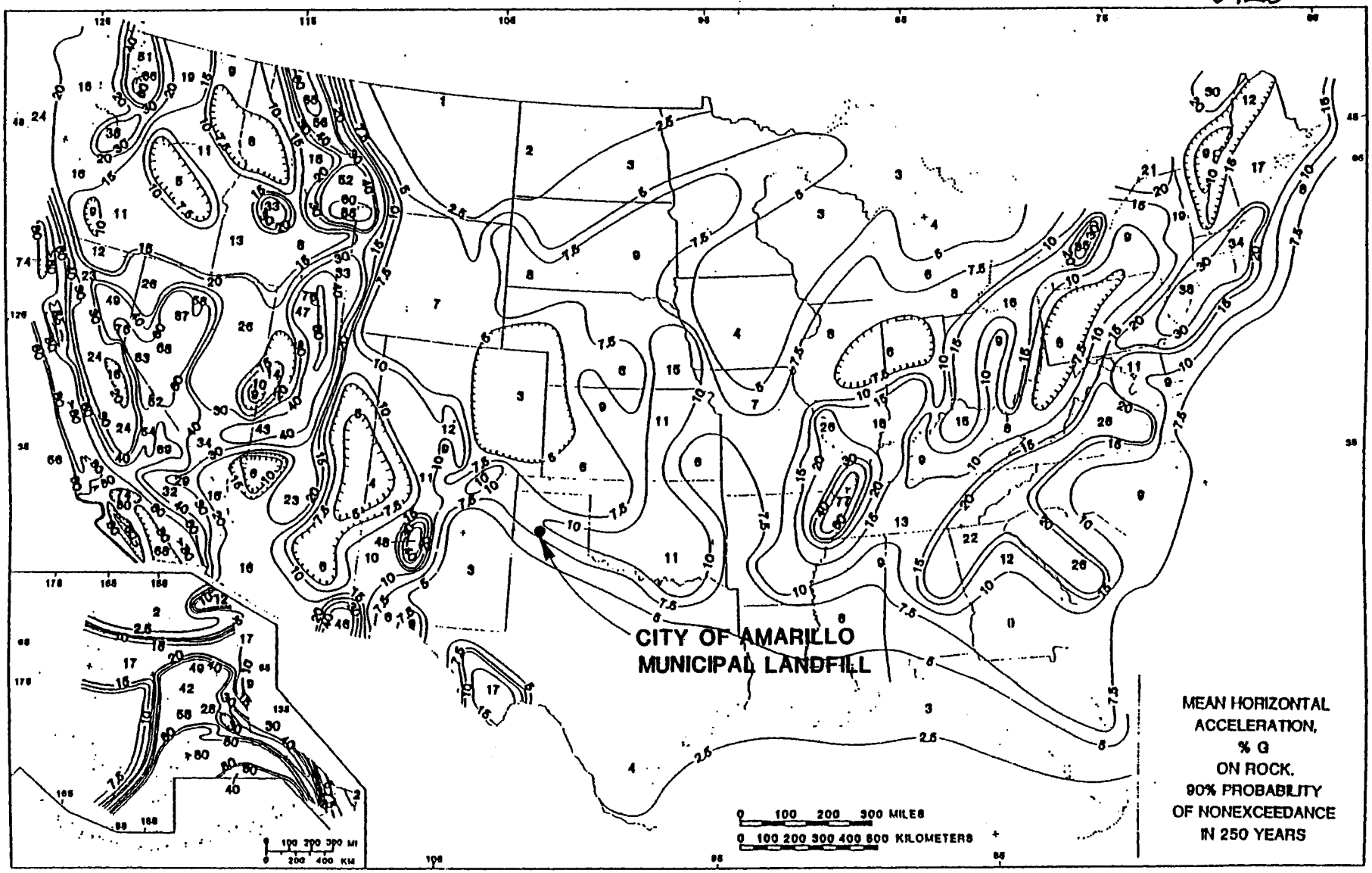
9/10/93

D. Supporting Information

1. **Title of Document(s) Supporting Statement:**
   Map of Mean Horizontal Acceleration, % G in Rock - Algermissen, 1990
   Seismicity Map of North America - Davis, 1985
   Uniform Building Code - 1991 Seismic Zone Map
   ASCE - 1988 - Seismic Zone Map
2. **Location of Document(s):**
   Attached

E. Comments

FROM MF-2120


CITY OF AMARILLO
MUNICIPAL LANDFILL
0 100 200 300 MILES
0 100 200 300 400 500 KILOMETERS
MEAN HORIZONTAL
ACCELERATION,
% G
ON ROCK,
90% PROBABILITY
OF NONEXCEEDANCE
IN 250 YEARS

KLEINFELDER

SEISMIC IMPACT ZONES

SUBTITLE D LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
Seismic Impact Zone

General Site Information

Site: City of Amarillo Landfill

Site Location: Potter County, Texas

TWC Permit No.: 73

Date Permit Issued: July 2, 1975

Statement of Compliance

I, Donald D. James, C.P.G., Senior Geologist, certify that the site indicated above is in compliance with the Subtitle D, as stated in 30 TAC 330.304 Seismic Impact Zones.

Firm/Address: Kleinfelder

6850 Manhattan Boulevard, Suite 300

Fort Worth, Texas 76120

Signature: Donald D. James

Date: 5-8-06

STATE OF TEXAS
DONALD D. JAMES
GEOLOGY
360
LICENSED
PROFESSIONAL GEOSCIENTIST

Supporting documentation attached.

Owner/Operator of Site

Owner/Operator of Site: City of Amarillo

Official Mailing Address: P.O. Box 1971

Amarillo, Texas 79186-0001

Official's Name and Title: _____

Signature: _____

Date: _____

Note: This certification has been prepared consistent with 30 TAC 330.250(b).

CITY OF AMARILLO LANDFILL

Seismic Impact Zones

U.S.G.S. literature (http://eqint.cr.usgs.gov) indicates ten (10) earthquakes, listed in the following table, of magnitude 3 or greater have occurred in the Amarillo area since 1993 (Subtitle D compliance). Magnitudes range from 3.0 to 3.9 (Modified Mercalli scale range from III to V respectively). It was uncertain as to the cause or nature of any of these events. No damage was reported from any of these events. The U.S.G.S. 2002 P.S.H.A. model indicates the landfill site occurs within a delineated zone with a 0.025 (2.5%) probability that a magnitude 5.0 earthquake will occur within 50 years and within 50 kilometers (31 miles) from the site.

Texas Panhandle Earthquakes of Magnitude 3 or Greater

Date	Location	County	Magnitude
March 25, 1996	near Channing	Huntley	3.5
November 23, 1996	near McLean	Gray	3.0
February 12, 1997	near McLean	Gray	3.0
February 15, 1997	near McLean	Gray	3.2
August 7, 2000	Amarillo	Potter	3.3
August 7, 2000	Amarillo	Potter	3.0
August 10, 2000	Amarillo	Potter	3.0
August 10, 2000	Amarillo	Potter	3.0
August 17, 2000	Amarillo	Potter	3.9
December 16, 2000	Amarillo	Potter	3.9

The University of Texas website (www.if.utexas.edu.htm) for earthquake engineering indicates the landfill is included within an area which experienced Modified Mercali Intensities of V (Borger) or VI (Borger) during the earthquakes of 1925 and 1936 respectively.

The International Building Code indicates the site to be categorized as seismic Design Category - Class C. The 0.2 second and 1.0 second spectral response acceleration (% of gravity) is 0.02g and 0.069g respectively. U.S.G.S. Earthquake Hazards Program (http://eqint.cr.usgs.gov/eq/cgi-bin/zipcode.cgi) data for probabilistic ground motions for the same zip code for the landfill indicate a peak ground acceleration of 0.0213g for a 10% probable exceedance in 50 years.

A seismic impact zone is defined by TCEQ 30 TAC §330.304 as an area with a 10 percent or greater probability that the maximum horizontal acceleration in rock, expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 250 years. Due to the site not being located within a seismic impact zone, the seismic impact zone location restriction does not apply.

References:

1. University of Texas Website, www.if.utexas.edu.htm
2. Earthquake Hazards Program, eqint.cr.usgs.gov/eq/cgi-bin/zipcode.cgi
3. http://www.ig.utexas.edu.research/project/eq/compendium/DEN__panhandle.htm
4. International Building Code 2000
5. USGS Seismic Hazards Maps, http://gldims.cr.usgs.gov

USGS
Earthquake Hazards Program

The input zip-code is 79124.

ZIP CODE	79124	
LOCATION	35.2500 Lat.	-101.9091 Lo
DISTANCE TO NEAREST GRID POINT	5.6074 kms	
NEAREST GRID POINT	35.3 Lat.	-101.9 Long.

Probabilistic ground motion values, in %g, at the Nearest

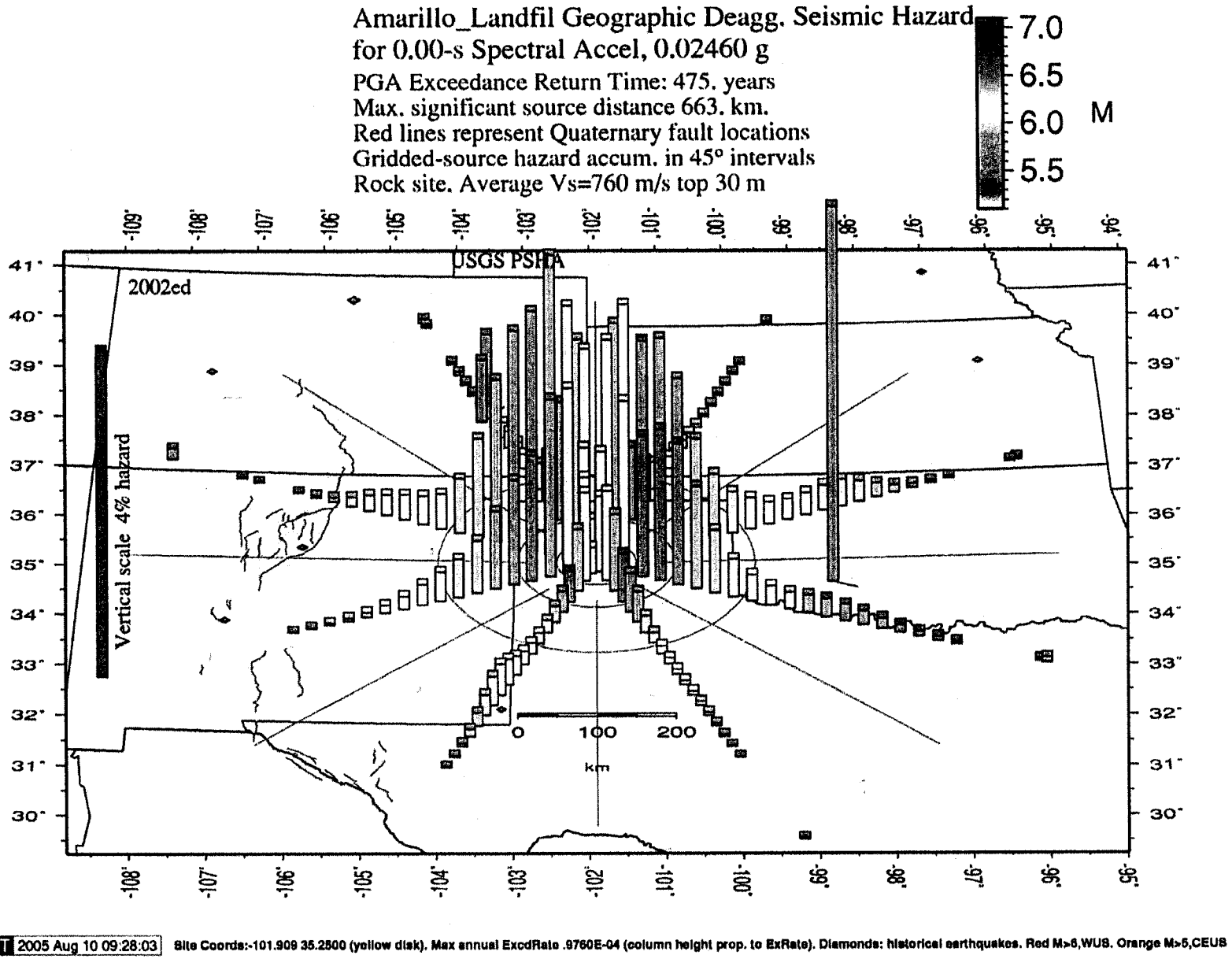
	10%PE in 50 yr	5%PE in 50 yr	2%PE in 50 y
PGA	2.130822	3.845670	7.858997
0.2 sec SA	5.052442	8.505360	16.743441
0.3 sec SA	3.884339	6.889711	12.383300
1.0 sec SA	1.296723	2.386207	4.297119

- -

The input zip-code is .
Zip code is zero and we go to the end and stop.

PROJECT INFO: Home Page

SEISMIC HAZARD: Hazard by Zip Code


Amarillo_Landfil Geographic Deagg. Seismic Hazard
for 0.00-s Spectral Accel, 0.02460 g
PGA Exceedance Return Time: 475. years
Max. significant source distance 663. km.
Red lines represent Quaternary fault locations
Gridded-source hazard accum. in 45° intervals
Rock site. Average Vs=760 m/s top 30 m
7.0
6.5
6.0
5.5
M
USGS PSHA
2002ed
Vertical scale 4% hazard
0
100
200
km
GMT 2005 Aug 10 09:28:03
Site Coords:-101.909 35.2500 (yellow disk). Max annual ExcdRate .9760E-04 (column height prop. to ExRate). Diamonds: historical earthquakes. Red M>6,WUS. Orange M>5,CEUS

EARTHQUAKE SEISMOLOGY

COMPENDIUM OF TEXAS EARTHQUAKES

Texas Panhandle Earthquakes of Magnitude 3 or Greater

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*I_{max} = Maximum Modified Mercalli intensity reported in Texas.
**Cause: T=probably tectonic in origin. M=probably man-made (induced). ?=poorly constrained event, insufficient or conflicting evidence.

Date	Origin time (UTC)	Lat.°N	Long. °W	Magnitude	I_{max} *	Felt area (km^2)	Cause**	Location	County
Apr. 1907	-	35.2		3.6	V	-	?	Amarillo	Potter
Comments: Newspapers report a window broken from the shock.									
28 Mar. 1917	19:56	35.4	101.3	3.9	VI	7,600	?	Panhandle	Carson
Comments: Reports of cracked plaster.									
29 July 1925	11:30	34.5	101.2	3.3	IV	-	?	Silverton	Briscoe
30 July 1925	12:17	35.4	101.3	5.4	VI	520,000	?	Panhandle	Carson
Comments: A large cistern cracked, and a coal bin broke. A railroad track needed repairs after the shock. Other reports of damage include cracked plaster and a fallen chimney.									
31 July 1925	18	35.5	101.1	3.0	III	-	?	White Deer	Carson
19 June 1936	21	35.2	100.7	3.0	III	-	?	Clarendon	Gray

20 June 1936	03:13:37	35.7	101.4	3.9	III	-	?	Borger	Hutchinson
20 June 1936	03:18:27	35.7	101.4	3.9	III-IV	21,000	?	Borger	Hutchinson
20 June 1936	03:24:06	35.7	101.4	5.0	VI	110,000	?	Borger	Hutchinson

Comments: At Pampa, dishes were broken and small cracks in buildings were noted. Buildings were also reported as cracked in Kenton, OK, and Elkhart, KS.

12 Mar. 1948	04:29	36.0	102.5	5.2	VI	240,000	T	Dalhart	Dallam

Comments: Slight cracks in plaster reported in several citites.

20 June 1951	18:37:10	35.0	102.0	4.2	V	74,000	?	Amarillo	Potter

Comments: Damage to plaster reported in Amarillo and Hereford.

09 Apr. 1952	16:29:34	35.4	97.8	5.5	V	640,000	T	El Reno, OK	

Comments: Intensities III-V noted in much of north Texas. Felt as far south as Austin, TX.

20 July 1966	09:04:58	35.7	101.2	4.1	V	36,000	?	Borger	Hutchinson
15 Feb. 1974	13:33:50	36.39	100.52	4.5	V	110,000	T	Perryton	Ochiltree

Comments: Glasses broke and walls cracked at Perryton. Cracks in walls or plaster were also reported in six other cities in Texas, Oklahoma, and Kansas

09 June 1980	22:37:10	35.50	101.05	4.3	V	35,000	?	Pampa	Gray

Comments: Reports of cracked plaster at Pampa.

14 Oct. 1982	12:52:46	36.05	102.53	3.9	III	8,200	T	Dalhart	Dallam

Comments: A crack in a parking lot was reported at Dalhart.

07 Nov. 1982	00:04:19	35.2	100.2	3.1	-	-	?		Wheeler Co.
03 Apr. 1984	04:55:24	35.32	102.4	3.4	-	-	?		Oldham Co.
21 May 1984	13:30:14	35.4	102.4	3.1	-	-	?		Oldham Co.
03 Mar. 1986	11:45:17	35.31	102.52	3.1	-	-	?		Oldham Co.
25 Mar. 1996	06:43:47	35.61	102.60	3.5	-	-	?	near Channing	Huntley
23 Nov. 1996	10:54:18	35.04	100.50	3.0	possibly felt	-	?	near McLean	Gray
12 Feb. 1997	23:53:11	35.11	100.60	3.0	IV	110	?	near McLean	Gray
15 Feb. 1997	09:08:55	35.11	100.60	3.2	V	110	?	near McLean	Gray
7 Aug. 2000	17:19:07	35.2	101.9	3.3	III	-	?	Amarillo	Potter

7 Aug. 2000	18:34:08	35.37	101.87	3.0	III	-	?	Amarillo	Potter
7 Aug. 2000	17:21:36	35.36	101.91	3.0	III	-	?	Amarillo	Potter
10 Aug. 2000	13:59:50	35.2	101.9	3.0	III	-	?	Amarillo	Potter
17 Aug. 2000	01:08:05	35.24	101.84	3.9	V	5,000	?	Amarillo	Potter
16 Dec. 2000	22:08:39	35.20	101.81	3.9	IV	-	?	Amarillo	Potter

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To TOP
To COMPENDIUM OF TEXAS EARTHQUAKES
To EARTHQUAKE SEISMOLOGY

University of Texas - Institute for Geophysics
4412 Spicewood Springs Rd. #600 Austin, TX 78759-8500 USA | Phone: 512-471-6156 Fax: 512-471-8844
webmaster@ig.utexas.edu | Site Map | Directions to UTIG
Last modified: 07 Aug 2001 17:26 -- Hits: -- Visitors:

August 17, 1993

The City of Amarillo
c/o HDR Engineering, Inc.
12700 Hillcrest, Suite #125
Dallas, Texas 75230-2096

Attn: Troy Hotchkiss

Re: City of Amarillo
Municipal Solid Waste Landfill

Gentlemen:

Enclosed is a map showing the referenced landfill along with boundary line located 1-mile outside the landfill boundary.

This is to certify that, based on available current information, no unstable areas as defined in 31 TAC 330.305 have been identified within one mile of the landfill boundary.

Sincerely,
PARKHILL, SMITH & COOPER, INC.

By Royce L. Gooch
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

STATEMENT OF COMPLIANCE

LOCATION RESTRICTION: UNSTABLE AREAS

A. General Information

1. **Site Name:** City of Amarillo Municipal Solid Waste Landfill
2. **Site Location:** Amarillo, Texas
3. **Date Issued:** September 10, 1993

B. Statement of Compliance

I, Royce L. Gooch, P.E., certify that the City of Amarillo Municipal Solid Waste Landfill is, on the basis of the supporting information provided in (D) below, in compliance with the UNSTABLE AREAS location restriction. The studies performed indicate that compliance has been achieved by satisfying the requirements set forth in applicable regulations.

C. Certification

1. **Prepared By:** Royce L. Gooch, P.E.
2. **Title:** Vice-President
3. **Firm:** Parkhill, Smith & Cooper, Inc.
4. **Signature (Consultant):** Royce L. Gooch 9/10/93
5. **Signature (Owner/Operator):** Michael D. Kennedy

STATE OF TEXAS
ROYCE L. GOOCH
54595
REGISTERED
PROFESSIONAL ENGINEER

D. Supporting Information

1. **Title of Document(s) Supporting Statement:**
   USGS 7-1/2 minute Quad map
   USGS-SCS Soil Survey - Potter Co., Texas, Soils Map
   Bureau of Economic Geology Publications GC81-8, RI162, RI121, RI115
2. **Location of Document(s):**
   Attached

E. Comments

Some of the reports from the Bureau of Economic Geology indcates some potential for salt dissolution; however, site visits, aerial photographs and other geologic reports from the Bureau of Economic Geology do not indicate active areas of instability in the area of the landfill. No apparent unstable areas have been located in the area of the landfill.

CITY OF AMARILLO
MUNICIPAL LANDFILL

1 - MILE BOUNDARY

NOTE:
NO UNSTABLE AREAS HAVE BEEN IDENTIFIED WITHIN 1 - MILE OF THE LANDFILL.

Bushland

TYLER CO

POTTER CO

HDR Engineering, Inc.

PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager

Architect | M/C/Process

Civil RLG | Mechanical

Electrical | Structural

Drawn by KGG

UNSTABLE AREAS

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date JULY 1993 | Project No. | Drawing No.

Scale 1" = 2,000'

KLEINFELDER

UNSTABLE AREAS

SUBTITLE D LOCATION RESTRICTION
CERTIFICATION OF COMPLIANCE
Unstable Areas

General Site Information

Site: City of Amarillo Landfill

Site Location: Potter County, Texas

TWC Permit No.: 73

Date Permit Issued: July 2, 1975

Statement of Compliance

I, Michael M. Shiflett, P.E., Senior Engineer, certify that the active disposal areas of the site indicated above are in compliance with the Subtitle D – Unstable Areas Location Restriction, as stated in 30 TAC 330.305 Unstable Areas.

Firm/Address: Kleinfelder

6850 Manhattan Boulevard, Suite 300

Fort Worth, Texas 76120

Signature: Michael M. Shiflett

STATE OF TEXAS
M. M. SHIFLETT
43763
LICENSED
PROFESSIONAL ENGINEER

Date: 12-15-05

Supporting documentation attached.

Owner/Operator of Site

Owner/Operator of Site: City of Amarillo

Official Mailing Address: P.O. Box 1971

Amarillo, Texas 79186-0001

Official's Name and Title: _____

Signature: _____

Date: _____

Note: This certification has been prepared consistent with 30 TAC 330.250(b).

CITY OF AMARILLO LANDFILL
Unstable Areas

Unstable areas as defined in 30 TAC §330.305 are locations that are susceptible to natural or human-induced events or forces capable of impairing the integrity of structural components of the landfill such that one or more of the components could no longer prevent a release from the landfill.

The potential existence of unstable areas for the City of Amarillo Landfill was evaluated by site observations, a review of available geotechnical and geologic information, and experience from construction projects within the landfill.

Based on the existing geologic/geotechnical site data, site reconnaissance by a professional geologist, the site is not located within karst terrain, nor is the site underlain by unstable sediments or soil layers or susceptible to mass movement. Settlement analysis using laboratory test results from on-site material indicate that expected settlements would not negatively influence the landfill.

Side slopes have been constructed prior to this permit amendment in 2005. The constructed slopes as observed have not experienced slope failures nor do they show signs of instability. Stability calculations indicate the slopes will have adequate factors of safety and this is further evidenced by acceptable slope performance of the existing slope.

To summarize, as stated above, the following factors have been addressed when determining whether an area is unstable:

1. On-site or local soil conditions that may result in significant differential settling. The foundation subsurface strata, when loaded, will not be susceptible to differential settlements that would negatively influence the landfill.
2. On-site or local geologic or geomorphologic features. The site does not contain geologic or geomorphologic features that would result in unstable foundation conditions at the site.
3. On-site or local human-made features or events (both surface and subsurface). There are no on-site or local human-made features at the site that are negatively impacting the construction or operation of the landfill.

Based upon the above stated conclusions, site observations, and on-going landfill construction, monitoring, and subsequent site surveys, the City of Amarillo Landfill is in compliance with the Subtitle D – Unstable Areas Location Restrictions, as stated in 30 TAC §330.305, in my professional opinion.

September 2, 1993

Mr. Troy Hotchkiss
HDR Engineering, Inc.
12700 Hillcrest, #125
Dallas, Texas 75230-2096

Re: City of Amarillo
Municipal Solid Waste Landfill

Dear Troy:

Enclosed is a copy of the flood plain map prepared for the permit modifications for the referenced landfill.

This is to certify that, based on available data, no 100-year flood plains were located within 500 feet of the landfill boundary.

Attached is a letter of concurrence from the local flood plain administrator, Mr. J. D. Smith.

Sincerely,
Parkhill, Smith & Cooper, Inc.

By _____
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

City of Amarillo

PLANNING DEPARTMENT

August 20, 1993

Mr. Royce L. Gooch, PE
Parkhill, Smith, & Cooper, Inc.
6300 Canyon Drive
Amarillo, Texas 79109

RE: City of Amarillo
Municipal Solid Waste Landfill

Dear Mr. Gooch:

I have reviewed the map you have prepared and our flood hazard boundary maps and I concur with your findings that there are no 100-year flood plains within 500 feet of the landfill boundary.

Sincerely,

J D Smith, Jr.
Floodplain Administrator
City of Amarillo

JDS/kk

cc: Mike Kennedy, Dir. Public Works
Mike Smith, City Engineer

STATEMENT OF COMPLIANCE

LOCATION RESTRICTION: FLOODPLAINS

A. General Information

1. **Site Name:** City of Amarillo Municipal Solid Waste Landfill
2. **Site Location:** Amarillo, Texas
3. **Date Issued:** September 10, 1993

B. Statement of Compliance

I, Royce L. Gooch, P.E., certify that the City of Amarillo Municipal Solid Waste Landfill is, on the basis of the supporting information provided in (D) below, in compliance with the FLOODPLAIN location restriction. The studies performed indicate that compliance has been achieved by satisfying the requirements set forth in applicable regulations.

C. Certification

1. **Prepared By:** Royce L. Gooch, P.E.
2. **Title:** Vice-President
3. **Firm:** Parkhill, Smith & Cooper, Inc.
4. **Signature (Consultant):** Royce L. Gooch 9/10/93
5. **Signature (Owner/Operator):** Michael D. Kennedy

STATE OF TEXAS
ROYCE L. GOOCH
54595
REGISTERED
PROFESSIONAL ENGINEER

D. Supporting Information

1. **Title of Document(s) Supporting Statement:**
   Potter Co. FEMA map, Panel #481241-0010A
   USGS 7-1/2 Minute Quad map
2. **Location of Document(s):**
   Attached

E. Comments

500 FOOT BOUNDARY

CITY OF AMARILLO
MUNICIPAL LANDFILL

NOTE:
NO 100 - YEAR FLOOD PLAINS ARE IDENTIFIED WITHIN 500 FEET OF THE MSWLF BOUNDARY

Bushland

POTTER CO

POTTER CO

HDR Engineering, Inc.

PSC
PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager

Architect — M&C/Process

Civil: RLG — Mechanical

Electrical — Structural

Drawn By: KGG

FLOOD PLAINS

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date: JULY 1993

Scale: 1" 2,000'

Project No.

Drawing No.

August 17, 1993

The City of Amarillo, Texas
c/o HDR Engineering
12700 Hillcrest, Suite 125
Dallas, Texas 75230-2096

Attn: Troy Hotchkiss

Gentlemen:

Attached are two maps showing the City of Amarillo, Municipal Landfill. One maps also shows a boundary line 5-miles outside the landfill boundary. The other shows boundaries at 5,000 feet and 10,000 outside the landfill boundary.

This is to certify that we have reviewed the available data, including USGS maps and FAA sectional maps, and have located no airports within 5-miles of the landfill boundary.

Sincerely,
PARKHILL, SMITH, & COOPER, INC.

By Royce L. Gooch
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

STATEMENT OF COMPLIANCE

LOCATION RESTRICTION: AIRPORTS

A. General Information

1. **Site Name:** City of Amarillo Municipal Solid Waste Landfill
2. **Site Location:** Amarillo, Texas
3. **Date Issued:** September 10, 1993

B. Statement of Compliance

I, Royce L. Gooch, P.E., certify that the City of Amarillo Municipal Solid Waste Landfill is, on the basis of the supporting information provided in (D) below, in compliance with the AIRPORTS location restriction. The studies performed indicate that compliance has been achieved by satisfying the requirements set forth in applicable regulations.

C. Certification

1. **Prepared By:** Royce L. Gooch, P.E.
2. **Title:** Vice-President
3. **Firm:** Parkhill, Smith & Cooper, Inc.
4. **Signature (Consultant):** Royce L. Gooch
5. **Signature (Owner/Operator):** Michael D Kennedy

STATE OF TEXAS
ROYCE L. GOOCH
54595
REGISTERED
PROFESSIONAL ENGINEER
9/10/93

D. Supporting Information

1. **Title of Document(s) Supporting Statement:**
   USGS 7-1/2 minute Quad maps (2 maps)
   NOAA Albuquerque Sectional Aeronautical Chart (May 27, 1993)
   TelCom Memo from Ronnie Moore of TxDOT Division of Aviation
2. **Location of Document(s):**
   Attached

E. Comments

NOTE:
NO AIRPORTS HAVE BEEN IDENTIFIED
WITHIN 5 MILES OF THE LANDFILL

HDR Engineering, Inc.

PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager

Architect | MEC/Process

Civil: RLG | Mechanical

Electrical | Structural

Drawn By: KGG

AIRPORT SAFETY
5 MILE RADIUS

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date: JULY 1993 | Project No. | Drawing No. | Sheet

Scale: 1" = 4000'

CITY OF AMARILLO
MUNICIPAL LANDFILL

5,000 FT. BOUNDARY

10,000 FT. BOUNDARY

NOTE:
NO AIRPORTS HAVE BEEN IDENTIFIED WITHIN EITHER 5,000 OR 10,000 FEET OF THE LANDFILL.

HDR Engineering, Inc.

PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager	
Architect	MC/Process
Civil RLG	Mechanical
Electrical	Structural
	Drawn By KGG

AIRPORT SAFETY
5,000 AND 10,000 FOOT RADII

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date	Project No.	Drawing No.
JULY 1993		
Scale 1"=2000'		

August 18, 1993

Mr. Troy Hotchkiss
HDR Engineering, Inc.
12700 Hillcrest, Suite #125
Dallas, Texas 75230-2096

Re: City of Amarillo, Texas
Municipal Solid Waste Landfill

Dear Troy:

Enclosed is a copy of the map showing potential wetlands inside or near the landfill. As you can see, there are a few small areas of potential wetlands within the landfill boundary.

I have requested the appropriate determinations from the Corp of Engineers in Tulsa regarding these sites. I have enclosed a copy of my letter to COE - Tulsa.

I have also requested a determination from the U.S. Fish & Wildlife Service as to whether or not we are in the range of an endangered species. I have attached a copy of this request also.

Sincerely,
PARKHILL, SMITH & COOPER, INC.

By _____
Royce L. Gooch, P. E.

enc.

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

August 18, 1993

U.S. Fish & Wildlife Service
7111 Stadium Dr. East, Suite 252
Arlington, Texas 76011

Attn: Mr. Robert Short

Re: City of Amarillo, Texas
Municipal Solid Waste Landfill

Dear Mr. Short:

The City of Amarillo, Texas is attempting to modify its permit for its existing landfill in order to come into compliance with the latest solid waste regulations. One issue we need to address is the issue of endangered species.

I have enclosed a copy of a USGS map showing the landfill site. Please review this drawing and let us know whether or not this site is in the range of an endangered or threatened species.

If you require additional data, please let us know.

Sincerely,
PARKHILL, SMITH, & COOPER, INC.

By Royce L. Gooch
Royce L. Gooch, P. E.

mc: Mr. Troy Hotchkiss

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

PSC

August 18, 1993

Tulsa District
Corp of Engineers
P. O. Box 61
Tulsa, Oklahoma 74121-0061

Attn: Mr. David Manning
Chief, Regulatory Section

Re: City of Amarillo, Texas
Municipal Solid Waste Landfill

Dear Mr. Manning:

The City of Amarillo, Texas requests your review of the enclosed map showing potential wetlands within 1-mile of the City's landfill. Please provide us a determination of the presence or absence of wetlands within 1-mile of the landfill boundary. In addition, please provide a determination of the presence or absence of justiciable wetlands within the landfill boundary and what requirements if any, the City is obligated to related to any wetlands which may be present within the landfill boundary.

Your prompt review and response will be greatly appreciated as the City is currently attempting to modify its landfill permit to bring it into compliance with the latest solid waste regulations.

If you require additional data, please let us know.

Sincerely,
PARKHILL, SMITH & COOPER, INC.

By Royce L. Gooch
Royce L. Gooch, P. E.

mc: Mr. Troy Hotchkiss - HDR Engineering

Parkhill, Smith & Cooper, Inc.
Engineers • Architects • Planners
6300 Canyon Drive, Amarillo, Texas 79109-6799 (806) 352-2796
FAX (806) 356-0289

Lubbock El Paso Midland Amarillo

POW

POW

POW

POW

POW

CITY OF AMARILLO
MUNICIPAL LANDFILL

Pf

PEMA

PEMA

PEMC

1 MILE BOUNDARY

Bushland

POTTER CO

POTTER CO

HDR Engineering, Inc.

PARKHILL, SMITH & COOPER, INC.
Lubbock, Texas

Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager	
Architect	M&C/Process
Civil RLG	Mechanical
Electrical	Structural
	Drawn By KGG

WETLANDS

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
PERMIT MODIFICATIONS

Date	Project No.	Drawing No.
JULY 1998		
Scale 1" = 2000'		

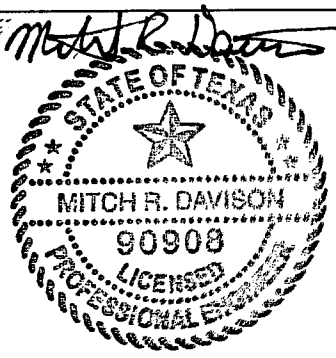
Part II

City of Amarillo Landfill

Permit Amendment – MSW Permit No. 73A

City of Amarillo,
Potter County, Texas

December 2005



12/15/2005

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For pages 1 thru 22

City of Amarillo
Landfill Permit Amendment – Part II

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City of Amarillo
Landfill Permit Amendment – Part II

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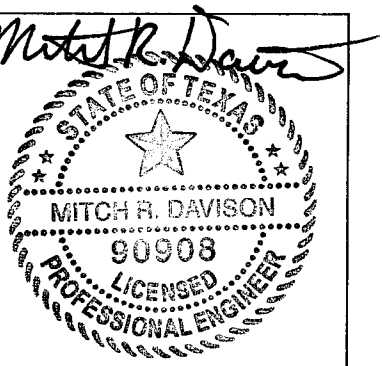
Attachment 3: Federal Aviation Administration Coordination Letters
Attachment 4: Endangered Species Correspondence
Attachment 5: Texas Department of Transportation Correspondence
Attachment 6: Location Restriction Information



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For pages i thru ii

1.0 INTRODUCTION – SUPPLEMENTARY TECHNICAL REPORT 30 TAC §330.53(b)(3)

Part II of this permit amendment application presents information related to existing conditions at the City of Amarillo Landfill, including: (i) general location maps, (ii) aerial photographs, (iii) a discussion of land use, (iv) transportation and access, (v) general geology and soils, (vi) groundwater and surface water, (vii) floodplain and wetlands, and (viii) protection of endangered species. The purpose of amendment application is to create additional landfill capacity through a vertical expansion of the landfill. The permit boundary for this landfill will not change as a result of this amendment. The Supplementary Technical Report is included in Part I, Section 2 and is incorporated by reference to Part II.

2.0 EXISTING CONDITIONS SUMMARY 30 TAC §330.53(b)(4)

The City of Amarillo owns and operates the Landfill, which is a Type I municipal facility operating under TCEQ Permit No. 73. Based on current refuse inflow rates and available capacity, the remaining site life is estimated at forty-six (46) years from September 2005.

2.1 Landfill Description

The City's landfill is located five miles west of Soncy Road and two miles north of Interstate 40 on Bezner Road. The site has been permitted for 662 acres of which approximately 526 acres are designated as fill area. Approximately 43.5 acres (cell 1) have been excavated, lined and officially closed. Approximately 70 additional acres (cells 2 and 3) have received final cover, and the remaining approximate 412 acres (cells 4-12) are either developed as in the case of Cell 4, or proposed for future development. A minimum of a 100 foot buffer zone will be maintained between the limit of waste and the permit boundary. The site is divided into twelve cell areas with only eight cells remaining to be constructed. Cells 4A and 4B are currently receiving waste. The sequence of development will continue in a clockwise direction from cell 4 around the southern portions of the landfill until all cells are filled. While a cell is being filled with waste, the next cell in sequence will be excavated and lined. The City may construct partial cells as part of this sequencing. Berms will be constructed to control surface water runoff both within the excavation as well as to prevent surface runoff from entering the excavation. A working face berm will be constructed to control water that comes into contact with waste or daily cover. As major portions of cells reach their ultimate waste placement grades, final cover will be placed, tested, and revegetated as soon as practicable.

In 1994, the City modified its landfill permit to bring the site into compliance with federal Subtitle D regulations. These regulations define the requirements for landfill liners, leachate collection systems, gas management systems, final covers, post-closure care, and overall operations. Subtitle D regulations are administered by the TCEQ, and landfill requirements are defined in Chapter 330 of the Texas Administrative Code (TAC).

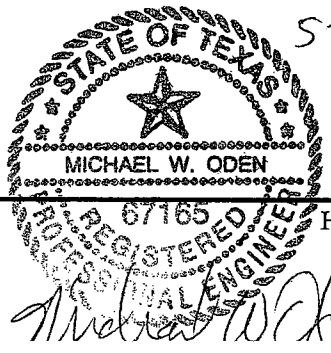
The liner for Cells 1, 2, and 3 were designed and constructed prior to Subtitle D liner standards and relied on in-situ soils with no system for leachate collection. The existing final cover over these cells consists of a compacted soil cover and vegetative layer. Prior to placement of additional waste over these cells for the expansion, the vegetative layer will be removed without disturbing the clay barrier layer. Some areas may require re-grading with additional soil to facilitate drainage flow. The remaining impermeable clay barrier layer is to be used as the liner for the vertical expansion of the landfill. This existing cap was field tested and verified to have an average hydraulic conductivity of 1.17×10^{-7} cm/s for Cell 1 and 9.63×10^{-8} cm/s for Cells 2 and 3, for an overall permeability of 8.73×10^{-8} cm/s. Future final cover for these cells will be the same as for the Subtitle D areas.

The remaining cells are designed in compliance with Subtitle D requirements. This includes a flexible membrane liner over two-feet of compacted clay (or a geosynthetic clay liner) with a maximum permeability of 1.0×10^{-7} cm/sec. and a leachate collection system. An alternate liner and an alternative final cover have been previously approved by the TCEQ for the landfill. The design of the liner and final cover systems are presented in Part III.

Cells 5-12 will be lined with a geosynthetic clay liner, a HDPE flexible membrane liner, and drainage net (Cells 4A and 4B have already been constructed with this system). The final cover system for the landfill will be composed of 12 inches of compacted clay material with a hydraulic conductivity of 1×10^{-5} cm/sec or less for the infiltration layer, and 24 inches of earthen material for the erosion/vegetative layer, with the upper 6 inches capable of sustaining vegetation.

The drainage layer for Cells 5-12 (Cells 4A and 4B have already been constructed with this system) will be composed with a minimum 2% cross slope to promote flow to perforated leachate collector pipes and ultimately to the sumps. For the closed Cells 1-3, the current clay cap/barrier will be graded to promote leachate flow into the collection system installed in the surrounding cells. See Part III, Attachment 15 for a more detailed description of the liner and leachate collection system.

Two easements are present at the site. These easements are for a gas pipeline which runs along the northern portion of the site as shown in Figure I.3.3. Surrounding land use is predominantly agricultural and open space, with some residential and commercial.



5-18-2007

Pg 3

2.2 Other Authorizations Needed

A review of the proposed project for other permit requirements and any adverse potential impacts to environmental and cultural resources was conducted as part of the original permit, the 1994 Subtitle D Modification submitted to the TCEQ and this amendment application. No federal rulings or permits regarding wetlands are necessary for this amendment. Based upon this review, no impacts to historic sites or to endangered and/or threatened species will occur. Correspondence to this effect is presented in Attachments 1, 2 and 4 of Part II.

Other permits required include a notice-of-intent to operate under a general TPDES permit for construction activities and a Tile V air permit has been applied for by the City to TCEQ.

3.0 GENERAL LOCATION 30 TAC §330.53(b)(5)

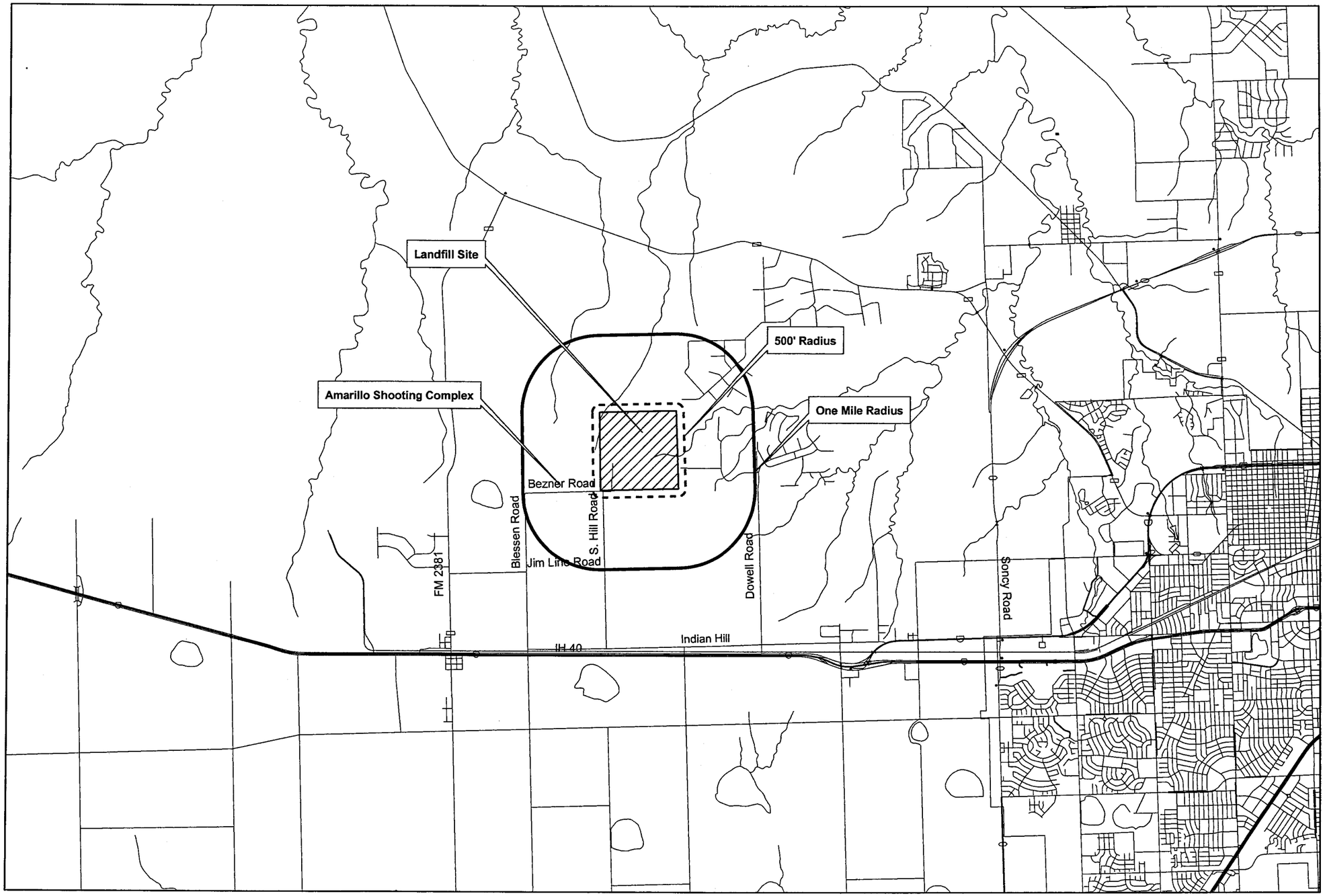
The Landfill is situated within a portion of the City of Amarillo's Extraterritorial Jurisdiction (ETJ). The landfill is located at the intersection of Bezner and Hill Road, five miles west of Soncy Road and two miles north of Interstate 40 on Bezner Road. Figure II.3.1 is a general location map that shows the proximity of the facility to surrounding features. It is constructed from a Texas Department of Transportation quarter-scale county roadway map.

4.0 AERIAL PHOTOGRAPH 30 TAC §330.53(b)(6)

An aerial photograph of the landfill and surrounding area, dated 2003, is shown on Figure II.4.1. The one-mile and 500-foot radii are indicated along with the site boundary and proposed landfill footprint of the expansion.

5.0 LAND USE MAP 30 TAC §330.53(b)(7)

Information on land use for the landfill and surrounding areas is discussed in Section 6.0. Current land use maps were provided by the City of Amarillo. The Land Use Map shows the boundary of the permit area and actual land uses within one mile. Access roads serving the site are also shown. Figure II.5.1 shows existing physical features (structures, utilities, etc.) surrounding the landfill. Figure II.5.2 shows drainage, pipeline, and utility easements within the site.



Legend

- 1 Mile Radius
- 500' radius
- Landfill Boundary
- Roads

Notes:
1. Maping Images are TxDOT raw data provided bt TNRIS. Date: Approximately 1995-1996.
2. All access roads consist of concrete or two-course asphalt over crushed stone base.
3. No airports are located within five miles of the airport.

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

12/15/2005

Data Source:
TXDOT, obtained in May 2005
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

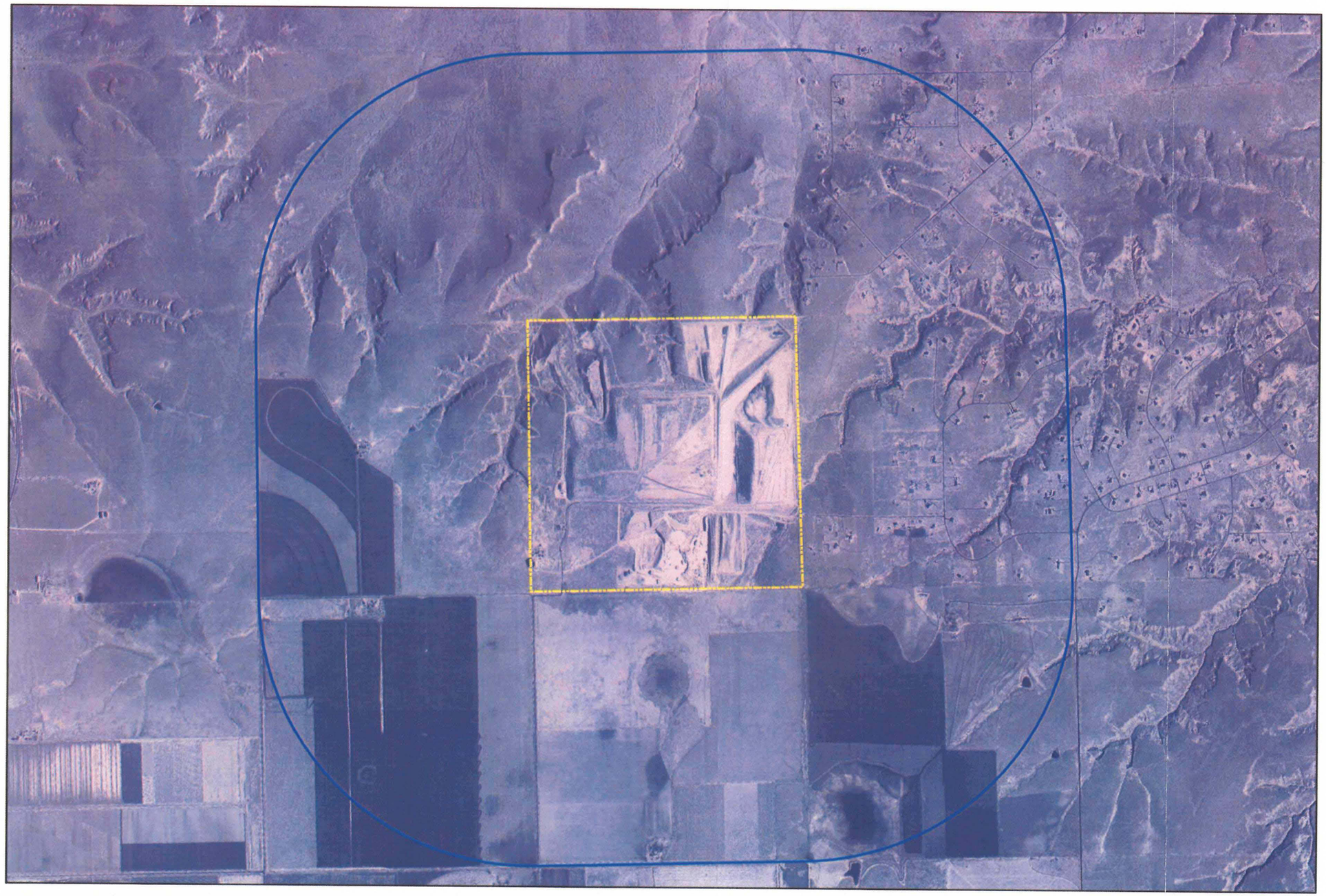
N

0 0.25 0.5 1 1.5
Miles

GENERAL LOCATION MAP

File Name

Sheet
II.3.1



Legend

Property Boundary

MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

12/15/2005

Data Source:
Aerial provided by the USDA-FSA
Aerial Photography Field Office 2004.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

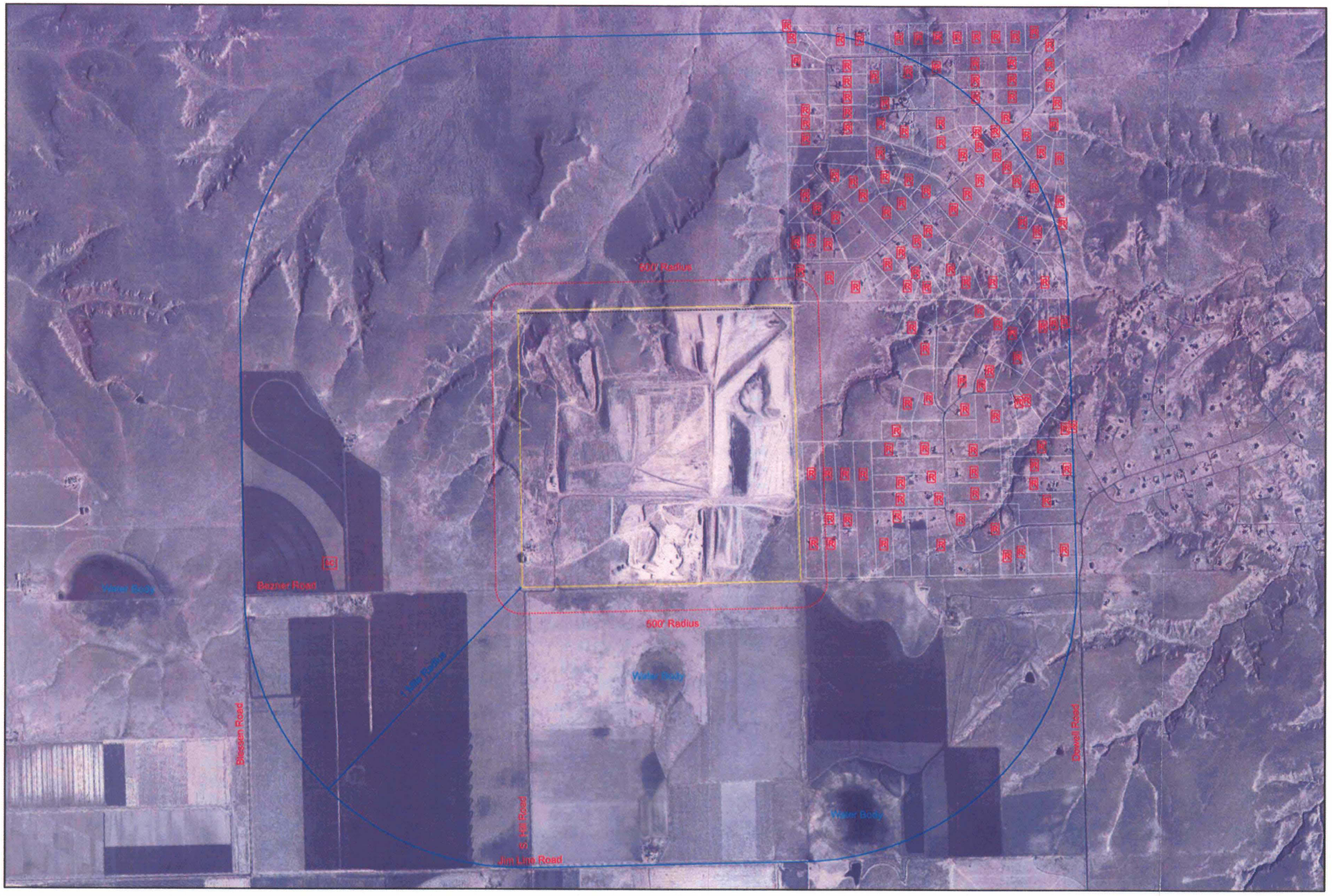
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

AERIAL PHOTOGRAPH

0 500 1,000 2,000
Feet

File Name

Sheet
II.4.1



Legend

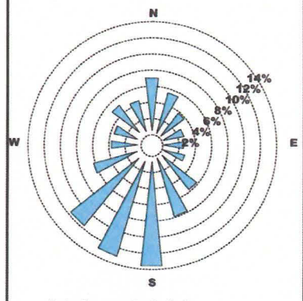
- 500' Radius
- Landfill Boundary
- 1 Mile Radius
- Residential Land Boundries
- Easement
- R — Residents
- SC — Shooting Complex

Mitch R. Davison

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

12/15/2005

AMA January 1-December 1, 1984-1992
Midnight-11 P.M.



Note: Frequencies indicate direction from which the wind is blowing.

Source: Recreated from TCEQ website.

Data Source:
City of Amarillo obtained in May 2005.
Aerial provided by the USDA-FSA
Aerial Photography Field Office 2004.
Coordinate System: UTM Zone 13 N

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

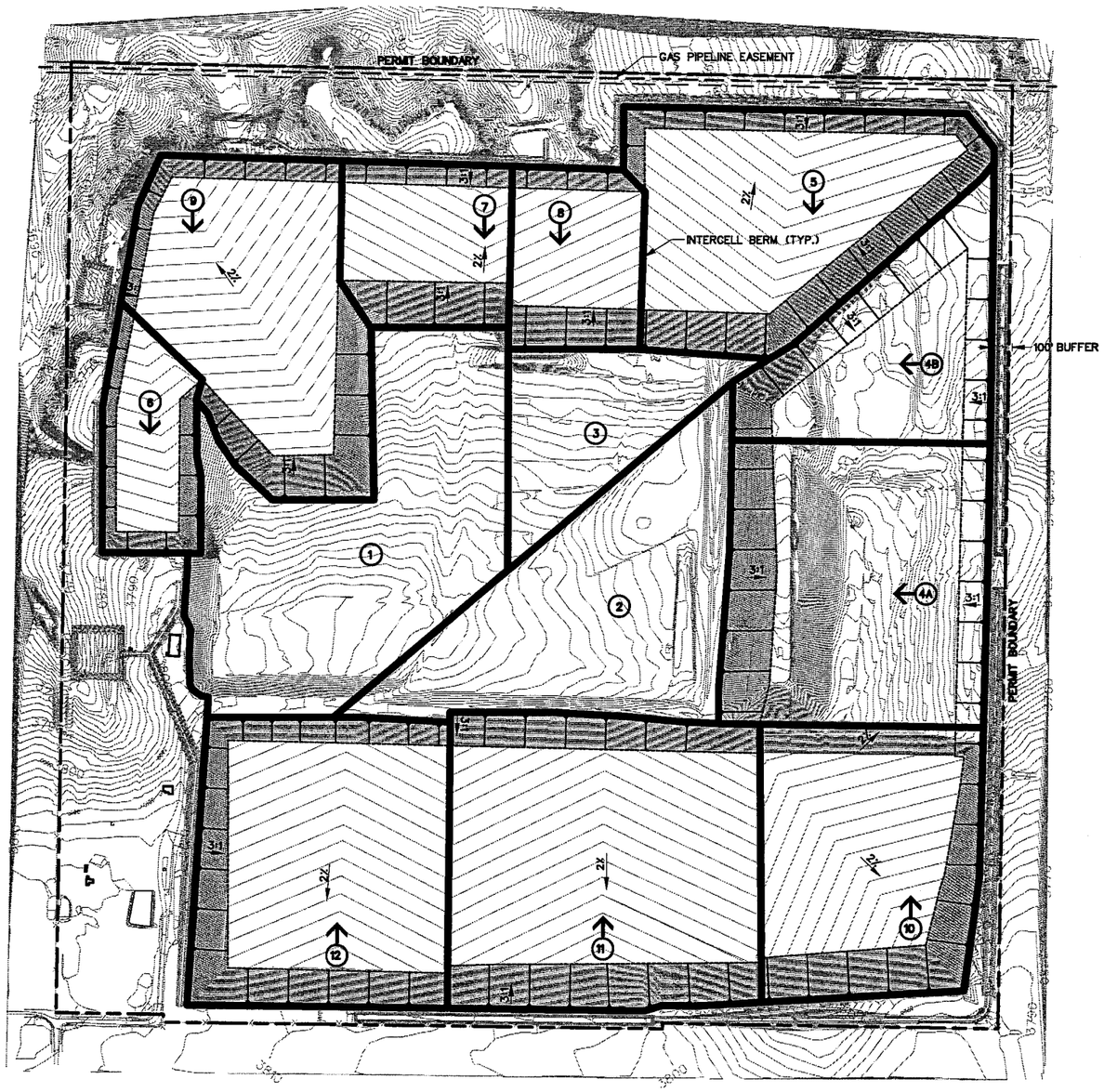
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

ONE MILE LAND USE MAP

0 500 1,000 2,000 Feet

File Name

Sheet II.5.1



N

0 400 800

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- SEQUENCE OF DEVELOPMENT/ DIRECTION OF FILL - SEE TABLE
- CELL BOUNDARY
- EASEMENT
- EXISTING CONTOURS (3750)
- PROPOSED EXCAVATION CONTOURS

SEQUENCE OF CELL DEVELOPMENT
1
2
3
4A
4B
10
11
12
9
6
7
8
5

NOTES

1. THE PROPOSED GRADES REPRESENT THE BOTTOM OF EXCAVATION

DATE:12/14/2005
TIME: 2:24:48 PM

...\vdrg8er\brgreen\
FILE:...\AMII05.02.DGN

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF TCEQ REVIEW UNDER THE AUTHORITY OF MITCH R. DAVISON, P.E. 90908. IT IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

12/15/2005

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SITE PLAN

0 1" 2"

FILENAME	...\AMII05.02.DGN
SCALE	

SHEET II.5.2

6.0 LAND USE 30 TAC §330.53(b)(8)

6.1 Site Land Use

Currently, the site is being utilized as a Type I Municipal Landfill operating under TCEQ Permit No. 73.

6.2 Zoning 30 TAC §330.53(b)(8)(A)

The landfill site, as well as the property adjacent to the site, have been classified as unincorporated area that is not zoned.

6.3 Surrounding Land Use 30 TAC §330.53(b)(8)(B)

The area within one mile of the site consists of a variety of land uses, including a significant amount of open space as well as agricultural, residential, commercial and municipal land. Land use to the north of the site is primarily open space. The land to the west is undeveloped land with some residential and commercial areas. To the west and south is vacant with some agricultural and municipal land uses. A gun range operated by the City of Amarillo is located to the west of the property. Floodplain development restrictions are addressed in Section 9.1 - Floodplains.

6.4 Growth Trends 30 TAC §330.53(b)(8)(C)

Growth for the area surrounding the landfill is anticipated to be equal to the rate of growth for Amarillo and Potter County. Both the city and the county have projected population increases. Data collected by HDR from the City, the Panhandle Regional Planning Commission and the Texas Water Development Board all indicate an anticipated population increase in the one percent range. Table II.6.1 illustrates population projections from these sources for future years.

Table II.6.1: Amarillo Population Projections

	2000	2010	2020	2030
City of Amarillo*	173,627	186,000		
Potter County**	113,546	158,953		
Potter County***	114,042	121,538	131,631	140,012

*City of Amarillo Planning Department 2005
**Panhandle Regional Planning Commission – August 2005 (Amarillo is in both Potter and Randall Counties.
***Panhandle Water Planning Area - 2005

An analysis of the City's anticipated growth was performed by the Real Estate Center. The Real Estate Center is part of Texas A&M University. The Center is the nation's largest publicly funded organization devoted to real estate research. Most of the Center's $2 million funding comes from real estate license fees. A nine-member advisory committee is appointed by the governor to provide research guidance and to approve budgets. The following is an excerpt of their analysis of the Amarillo MSA. "Residential development has been occurring mostly in southwest Amarillo, with growth occurring to a smaller degree in the northwest and southeast. Canyon (City of Canyon) has been experiencing some residential growth. Retail development has been strong in southwest Amarillo, while office redevelopment has been occurring downtown. Northeast Amarillo has seen expansion of industrial facilities such as the new Bell Helicopter plant, which is near the Amarillo International Airport. Residential growth in the northwest section of the city will be limited because of the natural terrain in the area. Growth in single family homes has occurred primarily in the southwester area of the city, whit some subdivision development occurring throughout the City." (Source: Real Estate Center at Texas A&M University, 2002).

The landfill was originally permitted in 1975. At the time of the original permit, there were only 11 landowners adjacent to the site. Aerial photographs taken in 1996 show some residential housing beginning to be established to the east and northeast of the site. A current review of the area shows that the number of residences near the site has increased from between 30 to 50 in 1996 to approximately 100 in 2005. The potential number of houses that could be constructed to the east and northeast of the site is anticipated to be 75 to 100 based on a review of available

tracts of land in the area. A reconnaissance visit of the area indicates that some residential construction is occurring around the site and there are still a number of vacant lots still in the area.

Land to the north of the site will be difficult to develop due to topographic constraints. The land has severe terrain that would make it undesirable land for development. Directly to the west of the site is a municipally-owned gun range which began operations in 2004. Further to the west and to the south of the site is agricultural land. No known plans exist at this time that indicate it will be developed for residential or commercial uses.

6.5 Proximity to Other Uses 30 TAC §330.53(b)(8)(D)

Surrounding land uses within one mile of the landfill are shown on Figure II.5.1. There are approximately 100 residences, all of which are single family, within one mile of the site. The closest residence is located approximately 130 feet east of the eastern permit boundary. A majority of the existing residential areas within the one mile radius are located to the east and northeast of the site.

The only structures within 500 feet of the site are a mobile home and two residences which are located east of the permit boundary. A communication tower is located approximately 500 feet east of the site. The nearest shopping centers (commercial centers) are located approximately 2.25 miles west of the property boundary in Bushland. There are approximately 4 known business establishments within one mile of the site; which are primarily small business operations located adjacent to a household.

A visual reconnaissance and available records search revealed that there are no day care, church, or cemetery facilities located within a mile of the site. There are no other landfills or transfer stations located within the 1-mile perimeter. Also, there no are educational or recreational facilities located within a mile of the landfill boundary. A municipally-owned gun range is located within one mile west of the site.

There are no known airports within five miles of the site. The Amarillo International Airport is located 15.5 miles away.

6.6 Water Wells 30 TAC §330.53(b)(8)(E)

A survey of records, completed by Atlas Environmental Research, indicated forty-seven (47) water wells are within a one-mile radius of the site (February 2002). There are 2 active wells located on site, as well as two abandoned wells. Based on visual observation, it has been determined that the abandoned wells have been plugged. There is no documentation available on the abandoned wells located within the permit boundary. Approximate locations of these wells are shown on Figure I.3.4.

The closest well located off site is approximately 200 feet to the east. In addition to the on site wells, three wells are located within 500 feet of the permit boundary.

FOR PAGES AND 12

7.0 TRANSPORTATION 30 TAC §330.53(b)(9)

7.1 Selected Route

Vehicles entering the landfill include semi-trailers, dump trucks and waste hauling trailers, light-duty trucks and cars. Access to the site is limited to the entrance off Hill Road. To reduce potential traffic impacts, the City of Amarillo has established a policy that all collection vehicles using the Landfill are to use this route exclusively. Figure II.7.1 shows the route followed by refuse collection vehicles between IH 40 and the landfill entrance. Traffic primarily travels to the landfill on Hill Road from the south. Traffic leaving the site generally exits to the south onto Hill Road before entering IH 40.

7.2 Adequacy of Roads 30 TAC §330.53(b)(9)(A)

The County has the responsibility to maintain Hill Road which leads to the landfill entrance. Hill Road has no posted weight limits. Periodic maintenance of the asphalt paved roadway is routinely undertaken to maintain availability of this route to the landfill and to ensure that residents and businesses along the route have continued access. Part of the periodic maintenance includes daily collection of windblown litter. This program will continue after the permit amendment has been issued for the expansion. Hill road is the primary entrance to the site. An alternative entrance is via Bezner Road.

The Texas Department of Transportation (TxDOT) is responsible for maintaining IH 40. The construction of IH 40 consists of a 9-inch thick reinforced concrete section in the vicinity of the Hill Road. Trucks exit IH 40 at the 74A Exit. Correspondence with TxDOT can be found in Attachment 5 of Part II.

7.3 Existing Traffic Volumes 30 TAC §330.53(b)(9)(B)

The estimated vehicle count on IH 40 at the location of Hill Road, in both directions, is approximately 18,400 per day based upon Texas Department of Transportation records. Based on

the City's scale records, approximately 120 waste-hauling vehicles per day currently enter the landfill, including transfer vehicles, solid waste collection trucks and small commercial haulers.

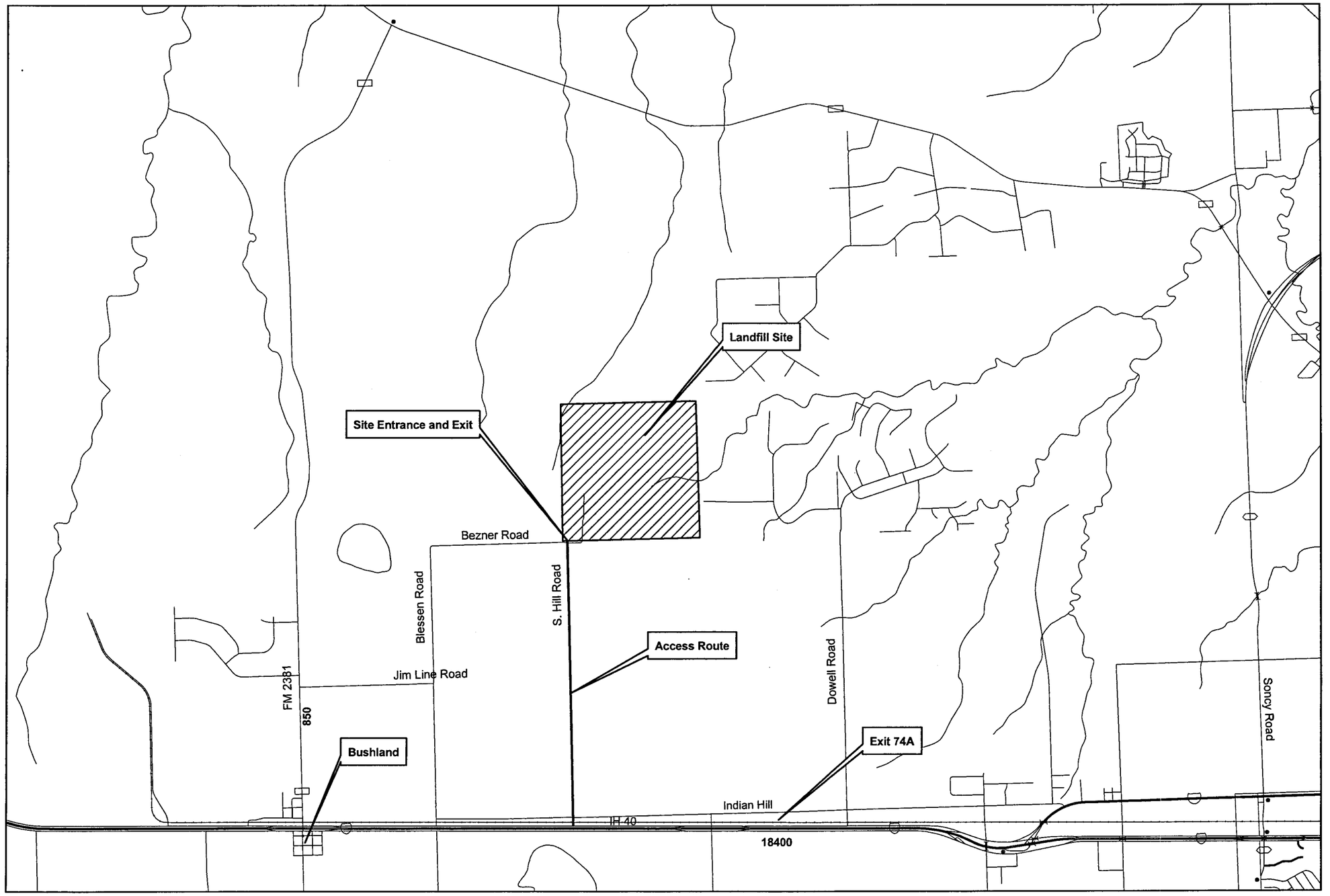
7.4 Additional Volume of Vehicular Traffic 30 TAC §330.53(b)(9)(C)

This request for an expansion is designed to provide 110 years of waste capacity from the year 2005. Truck traffic and vehicle traffic to the landfill are anticipated to increase as the population of the City increases, since the landfill only accepts waste generated within the City. The Amarillo Population Technical Committee has estimated a population growth of 5.1% for the City from the year 2005 to 2010. This equates to about 1.03% annually. Applying this increase to the traffic accessing the site, the volume of vehicular traffic using the landfill will increase from 120 in the year 2005 to 465 in the year 2110.

Traffic counts on IH 40 between Business IH 40 and FM 2381, performed by the TxDOT in 2003 estimated that 18,400 vehicles per day used IH 40. Applying the 1.03% increase, results in a traffic count of 22,600 vehicles per day by 2025.

7.5 Airports 30 TAC §330.53(b)(9)(D) & 30 TAC §330.300

There are no known publicly owned airports located within five miles of the site. The closest airport is the Amarillo International Airport, located over fifteen and one-half (15.5) miles away. This landfill is in full compliance with the Airport Safety Location Restrictions, 30 TAC §330.300. The landfill is not located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used by piston-type aircraft. A coordination letter from the Federal Aviation Administration is included in Part II Attachment 4.



Legend

- Access Route
- Landfill Boundary
- Roads
- **18400** Annual Traffic Counts

Notes:
1. All access roads consist of concrete or two-course asphalt over crushed stone base.
2. Prime access routes include S. Hill Rd.

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

12/15/2005

Source:
Map images are TxDOT raw data provided bt TNRIS. Date: Approximately 1995-1996.
Coordinate System: UTM Zone 13 N

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

Issue	Date	Description

Project Manager	M. Davison
Civil	M. Oden
Project Number	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

N

0 2,000 4,000
Feet

ACCESS ROUTES

File Name

Sheet
II.7.1

8.0 GENERAL GEOLOGY AND SOILS 30 TAC §330.53(B)(10)

8.1 Site Geology and Soils 30 TAC §330.53(b)(10)(A)

The site is located in the Southern High Plains physiographic region of Northwest Texas and lies within the Ogallala Formation of late Miocene and Pliocene age. To the north of the site is the Canadian River Basin. The Ogallala Formation consists primarily of fluvial unconsolidated clastic deposits of sand, silt, clay, and gravel. Caliche forms a layer of material near the top of the Ogallala Formation. In the Amarillo area, the Ogallala Formation overlies rocks of the Triassic age. The Triassic rocks consist of siltstone, claystone, sandstone, and limestone that form the Dockum Group. The Triassic rocks consist of valleys and basins due to erosion. These valleys and basins have since been filled in by sediments of the Ogallala Formation; resulting in the Ogallala Formation to be thick in some areas (hundreds of feet) and thin in others (tens of feet) (City of Amarillo MSWLF Alternate Final Cover Plan, HDR, 1994). The Geology Report in Part III, Attachment 4 contains more detailed information regarding site geology.

8.2 Fault Areas 30 TAC §330.53(b)(10)(B) & 30 TAC §330.303

New units and lateral expansions cannot be located within 200 feet of a fault that has had displacement within Holocene time unless the owner or operator demonstrates to the Executive Director that an alternative setback distance of less than 200 feet will prevent damage to the structural integrity of the MSWLF unit and will be protective of human health and the environment. There are no known active (within the last 10,000 years) or inactive faults interpreted beneath or within a 1/2-mile radius of the site. A review of the Geologic Atlas of Texas, Tucumcari sheet, 1983, Bureau of Economic Geology was used to demonstrate that the site did not indicate the presence of any faulting activity of late Cenozoic or younger (<1.8 million years) age within 200 miles of the site. Therefore, the site will not be subject to differential subsidence or active geologic faulting. This site is in full compliance with the regulatory restrictions regarding Fault Areas. Documentation related to the landfill's compliance with Location Restrictions - Fault Issues is presented in Part II, Attachment 6.

8.3 Seismic Impact Zones 30 TAC §330.53(b)(10)(C) & 30 TAC §330.304

Sources evaluated to establish compliance with Seismic Impact Zone criteria included the following:

- Map of Mean Horizontal Acceleration, % G in Rock – Algermissen, 1990
- Seismicity of Map of North America – Davis, 1985
- Uniform building Code – 1991 Seismic Zone map
- ASCE – 1988 – Seismic Zone Map

The Amarillo landfill is located in an area having a maximum horizontal acceleration of approximately 0.08 to 0.09 g not being exceeded in 250 years. This value does not exceed the Subtitle D criteria (0.10 g in 250 years - 40 CFR §258.14 and 30 TAC §330.304). Therefore, the Landfill is in full compliance with regulatory restrictions associated with Seismic Impact Zones. Documentation related to the landfill's compliance with Location Restrictions - Seismic Impact Zones is presented in Attachment 6.

8.4 Unstable Areas 30 TAC §330.53(b)(10)(D) & 30 TAC §330.305

The site has been previously evaluated for susceptibility to unstable areas as defined by Subtitle D. Some reports by the Texas Bureau of Economic Geology indicate some regional potential for salt dissolution. However, a review of aerial photographs and site visits by a registered professional engineer (conducted in 1993 by PSC Engineers) indicate no apparent unstable areas in the vicinity of the landfill. The demonstration of compliance with the Location Restrictions was accepted by TCEQ, formerly TNRCC. As a result, the site is in full compliance with regulatory requirements regarding Unstable Areas. Documentation related to the landfill's compliance with Location Restrictions – Unstable Areas is presented in Attachment 6.

5/9/2006

FOR PAGES 17-18

9.0 GROUNDWATER AND SURFACE WATER 30 TAC §330.53(b)(11)

The Amarillo Landfill is located in the southern High Plains physiographic region of Northwest Texas and lies within the Ogallala Formation of the late Miocene to Pliocene age. The Ogallala Formation, consisting primarily of fluvial unconsolidated clastic deposits of sand, silt, clay, and gravel, is considered to be the major aquifer of the High Plains area by the TCEQ. To the north of the site is the Canadian River Basin. The Ogallala Formation is considered to be under unconfined (water table) conditions and, in the Amarillo area, has a thickness ranging from 0 to approximately 100 feet.

Piezometer and monitoring well readings obtained on April 4, 2005, indicate that the groundwater elevation ranges from approximately 3,587 feet MSL in the southeast corner of the site to approximately 3,614 feet MSL in the northern sector. Flow direction and gradients from October 2004 data are similar to those interpreted from the 1994 data. The 2004 groundwater data indicates the Ogallala aquifer is 3 to 5 feet lower in elevation than measured in 1994 over the southern half of the site. Underlying the Ogallala is the Dockum Group. The Dockum Group is of continental origin and is believed to have been deposited as river-channel and flood plain deposits (Cronin, 1971). Seni, 1988 indicates the depositional setting involved braided and meandering streams, alluvial fan deltas, lacustrine deltas, lacustrine systems, and mud flats. These deposits were laid down in a basin feature that underwent folding prior to and after deposition. The resultant surface of the Triassic deposits was one of valleys and basins.

Since 1994, six groundwater-monitoring wells have been implemented for this site. As a portion of this 2005 permit document, two additional geotechnical borings were drilled in the northeastern portion of the permitted area to correlate with existing borings and for further analysis regarding landfill foundation settlement as presented in Attachment 4, 2005 permit document. A complete table of groundwater elevations may be found in Part III, Attachments 4 and 5. Site specific analytical groundwater data is provided in Appendix 5B of Attachment 5 of Part III of the permit amendment application.

Two playa lakes are located to the south of the site as shown on Figure II.5.1. Immediately to the north of the site is the Canadian River Basin, which has eroded much of the overlying surficial material and created essentially a large valley or canyon feature. Several tributaries branch off the main system pronounced relief in this are compared to areas further south on the High Plains.

Existing contours promote overland flow in a northerly direction. The existing flow patterns of the land discharge water into tributaries and creeks at the western, northern, and eastern boundaries of the site. See Part III, Attachment 6 for a detailed stormwater management plan regarding drainage design, drainage features and information on the Texas Pollution Discharge Elimination Permit, which addresses discharge into Waters of the State.

10.0 FLOODPLAINS AND WETLANDS

10.1 Floodplains 30 TAC §330.53(b)(12) & 30 TAC §330.301

Based on currently available data, there are no 100-year flood plains located within 500 feet of the landfill boundary. The most current FEMA regulatory floodway and floodplain boundaries as defined by FEMA are shown with respect to the landfill on Figure II.10.1. Attachment 6 of Part III provides additional details concerning the floodplain boundaries. This map is the most current version.

10.2 Section 208 of the Clean Water Act and Wetlands 30 TAC §330.51(b)(5) & 30 TAC §330.53(b)(12), 30 TAC §330.302

TCEQ regulations and Subtitle D require that new MSWLF units and lateral expansions shall not be located in wetlands, unless the owner or operator makes the proper demonstrations as outlined in subsections (1) through (5) of 30 TAC §330.302. This amendment is for an expansion into previously permitted areas only, and therefore no lateral expansion of the Landfill into "waters of the United States" is planned.

The landfill has previously been investigated for the presence of wetlands and "waters of the U.S." for previous permit applications and modifications. From these investigations and current assessment of the site by a certified wetland biologist, it was determined that the municipal solid waste landfill site does not contain any jurisdictional wetlands or other waters of the United States. See Attachment 2 of Part II of this application.

Because of the facility design and operational requirements, no discharge of dredged or fill material will occur into "waters of the United States that is in violation of the Clean Water Act. Further, the landfill will not cause or contribute to violations of any State water quality standard or violate any toxic effluent standard.

STATE OF TEXAS
MITCH R. DAVISON
90903
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PROFESSIONAL ENGINEER
Mitch R. Davison
FOR PAGE 19
1/25/2007

10.0 FLOODPLAINS AND WETLANDS

10.1 Floodplains 30 TAC §330.53(b)(12) & 30 TAC §330.301

Based on available data, there are no 100-year flood plains located within 500 feet of the landfill boundary. The FEMA regulatory floodway and floodplain boundaries as defined by the hydraulic model are shown with respect to the landfill on Figure II.10.1. Attachment 6 of Part III provides additional details concerning the floodplain boundaries.

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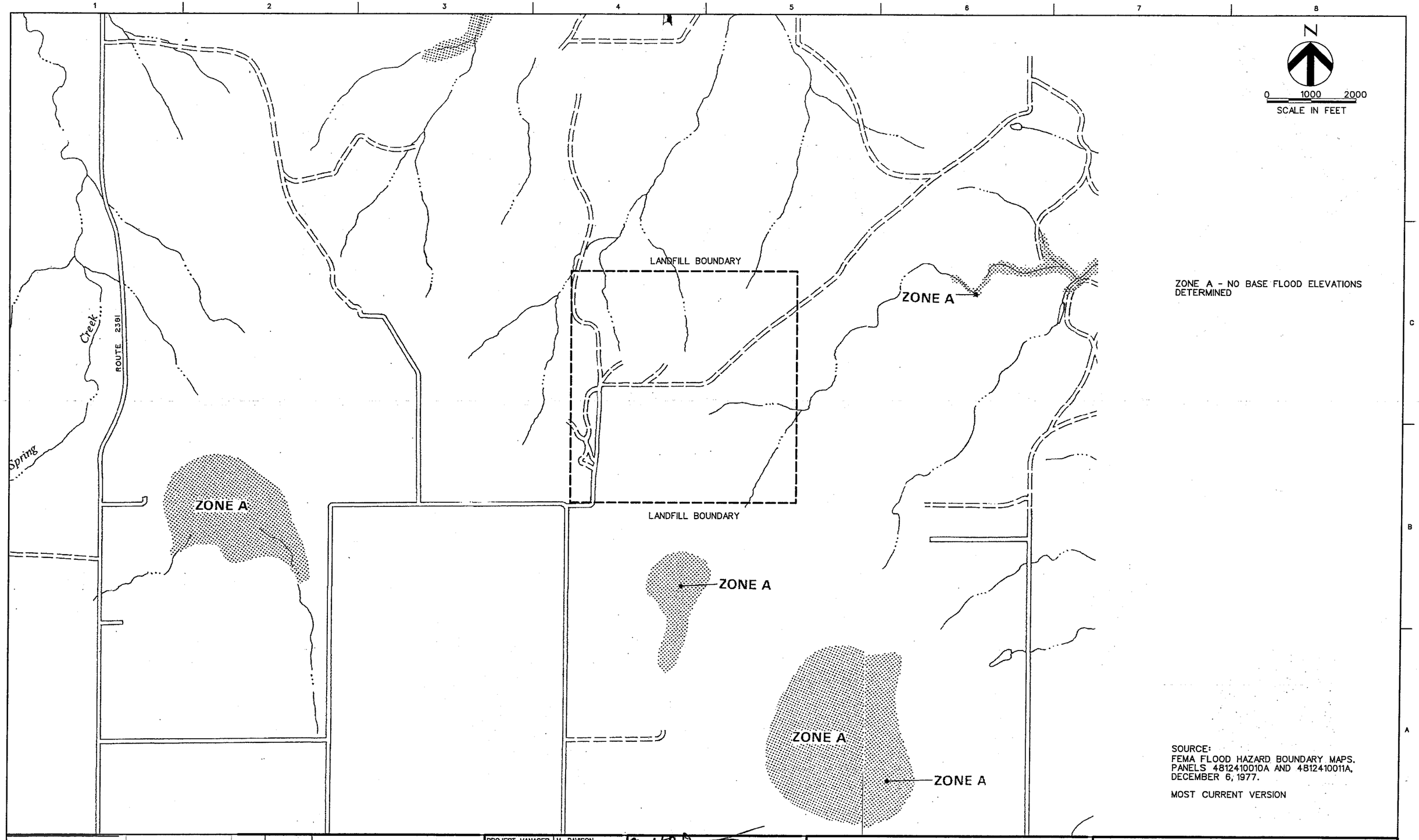
Because of the facility design and operational requirements, no discharge of dredged or fill material will occur into "waters of the United States that is in violation of the Clean Water Act. Further, the landfill will not cause or contribute to violations of any State water quality standard or violate any toxic effluent standard.

No marine sanctuary exists at the site nor do any wetlands, therefore, no degradation of these sites can occur. As discussed in Section 11 of Part II below, the facility and the operation of the

facility will not result in the destruction or adverse modification of critical habitat of endangered or threatened species, or cause or contribute to the taking of any endangered or threatened species.

No additional federal rulings or permits regarding wetlands are necessary for this amendment. Therefore, the site is considered to be in full compliance with regulatory restrictions regarding Wetlands and compliance with the Federal Clean Water Act.



CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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1/25/2007

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

100 YEAR FLOOD PLAIN MAP

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11.0 ENDANGERED SPECIES 30 TAC §330.53(b)(13)

A literature review of endangered and threatened species within Potter County was conducted. The proposed project site consists of an established landfill without significant vegetation or potential habitat. Due to the past and current land uses of the proposed expansion area, this area does not constitute potential habitat for the Black Footed Ferret due to the fact that the existing prairie dog town is less than the 80 acres required by the Corps for consideration as habitat for this species. Based upon these findings, the facility and the operation of the facility will not result in the destruction or adverse modification of critical habitat of endangered or threatened species, or cause or contribute to the taking of any endangered or threatened species. Correspondence with the US Fish and Wildlife Service is in Attachment 4 of Part II.

Part III

City of Amarillo Landfill

Permit Amendment – MSW No. 73

City of Amarillo,
Potter County, Texas

December 2005

12/15/2005

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For pages 1 thru 15

City of Amarillo
Landfill Permit Amendment – Part III
Site Development Plan

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For pages i thru i

1.0 INTRODUCTION

The following Site Development Plan (SDP) has been prepared in accordance with 30 TAC §330.54 through §330.56. The SDP contains a narrative discussion of the proposed vertical expansion of the City of Amarillo Landfill, and presents information regarding the proposed landfill method, all-weather operations, access control, solid waste deposition and site life, groundwater protection design and operation, drainage information, final cover design, endangered species protection and markers. It also contains the following attachments:

Attachments

Attachment 1	Site Layout Plan
Attachment 2	Fill Cross-sections
Attachment 3	Existing Contour Map
Attachment 4	Geology Report
Attachment 5	Groundwater Characterization Report
Attachment 6	Groundwater and Surface Water Protection Plan and Drainage Plan
Attachment 7	Final Contour Map
Attachment 8	Cost Estimates for Closure and Post-Closure Care
Attachment 9	Applicant's Statement
Attachment 10	Soil and Liner Quality Control Plan
Attachment 11	Groundwater Sampling and Analysis Plan
Attachment 12	Final Closure Plan
Attachment 13	Post-Closure Care Plan
Attachment 14	Landfill Gas Management Plan
Attachment 15	Leachate and Contaminated Water Plan

1.1 Solid Waste Data §330.54(3)

The Amarillo Landfill serves residences and businesses within the City of Amarillo, Texas. The site currently receives approximately 780 tons of solid waste per day, six days per week. Using the population equivalent method, the estimated population served by this landfill is approximately 248,000.

The facility continues to receive only residential and some commercial type wastes typical of what is generated by these sources. The facility does not accept any hazardous wastes, friable asbestos material, or polychlorinated biphenyls (PCBs). Other special wastes are handled in

accordance with 30 TAC §330.136. A used tire recycling operation maintains a collection and temporary storage area on-site consisting of an over-the-road tractor trailer box holding less than 1000 tires. Located near the site entrance is a recyclable white-goods collection and temporary storage area, as approved by TCEQ Permit Modification February 25, 1994.

The City of Amarillo currently owns and operates the Amarillo Landfill.

2.0 DESIGN DATA §330.54(4)

Since the Amarillo Landfill is an existing permitted solid waste disposal facility, many of the required site features are already in place. The scale house, entrance road, and fence around the property are currently in place. Both existing and proposed site features are shown in Part III, Attachment 1.

2.1 Landfilling Methods §330.55(a)(1)

The landfill has and will continue to be operated utilizing the area fill method. This method will continue to be used throughout the life of the landfill. To maintain continuity with the original permit application, waste disposal operations will be delineated by individual cells as shown in Part III, Attachment 1. A minimum 100 foot buffer zone will be maintained between the limit of waste and permit boundary. Included in Attachment 1 is the proposed sequence of development.

2.2 Wet-Weather Operations §330.55(a)(2)

The provisions for all weather operation are provided here for clarity and completeness. The access road to the site is paved and is of suitable size to handle two-way traffic. The interior roads are graded and compacted on an as needed basis to provide a smooth, firm surface for all weather operations. The interior roads consist of on-site compacted caliche. Any mud that accumulates on the roads will be removed by graders. An all weather access ramp to the active waste cell will be constructed of on-site material and compacted. This ramp will be maintained with graders during inclement weather to minimize the amount of mud generated. If necessary, rubble and/or crushed rock will be utilized and compacted for vehicles to use. During inclement weather, vehicles will be directed to the base of the ramp for disposal and the waste will be moved by on-site equipment to the working face. This method will preclude vehicles from entering the base of the waste cell and possibly becoming stuck.

2.3 Access Control §330.55(a)(3)

The City of Amarillo utilizes a paved, city and county maintained county road. No roadway limitations exist on the landfill access routes. The existing entrance and site fencing for the Amarillo Landfill will continue to be used for this permit amendment. The site entrance is located at the southwest corner of the site. Access is controlled at the entrance by a steel gate that is kept locked when the site is not in operation. The site exit is at the same location. The perimeter fence is a combination of chain link and barbed wire.

During operating hours, facility personnel will regularly watch for unauthorized persons in the vicinity of the working face, at the site entrance, and any other areas of the site. Entry to the active portion of the site is restricted to designated personnel, approved waste haulers, and properly identified persons whose entrance is authorized by the Landfill Supervisor or his designee.

2.4 Site Life §330.55(a)(4)

The life expectancy of the existing permitted sectors is 52 years. The Amarillo Landfill accepts approximately 780 tons of solid waste per day (6 days per week). The expected rate of solid waste deposition is anticipated to increase at approximately one (1) percent per year (corresponding to the anticipated growth in population) according to information provided by the City. Table III.2.1 shows the solid waste deposition projection used for calculating the expected site life of the expanded facility. Based on the anticipated annual growth rate, the expanded facility will last approximately 105 years. Table III.2.2 shows the supporting site life and soil balance calculations. For calculating volumes, a compaction density of 1,200 pounds per cubic yard and a waste-to daily cover soil ratio of 4:1 were used.

Actual quantities accepted at the site will vary depending on changes in population or economic activity, and changes in waste collection and disposal practices by private haulers using the facility.

Table III.2.1: Solid Waste Deposition Projection

Year	Date	Yearly Tonnage	Yearly Waste Volume Received [CY]	Daily Cover Required [CY]	Yearly Volume Used [CY]	Cumulative Volume Used [CY]	Remaining Airspace [CY]
1	2005	243,000	405,000	101,250	506,250	506,250	93,260,353
2	2006	245,430	409,050	102,263	511,313	1,017,563	92,749,040
3	2007	247,884	413,141	103,285	516,426	1,533,988	92,232,615
4	2008	250,363	417,272	104,318	521,590	2,055,578	91,711,025
5	2009	252,867	421,445	105,361	526,806	2,582,384	91,184,219
6	2010	255,395	425,659	106,415	532,074	3,114,458	90,652,145
7	2011	257,949	429,916	107,479	537,395	3,651,852	90,114,750
8	2012	260,529	434,215	108,554	542,769	4,194,621	89,571,982
9	2013	263,134	438,557	109,639	548,196	4,742,817	89,023,786
10	2014	265,766	442,943	110,736	553,678	5,296,495	88,470,108
11	2015	268,423	447,372	111,843	559,215	5,855,710	87,910,893
12	2016	271,107	451,846	112,961	564,807	6,420,517	87,346,086
13	2017	273,818	456,364	114,091	570,455	6,990,972	86,775,630
14	2018	276,557	460,928	115,232	576,160	7,567,132	86,199,471
15	2019	279,322	465,537	116,384	581,921	8,149,053	85,617,549
16	2020	282,115	470,192	117,548	587,741	8,736,794	85,029,809
17	2021	284,937	474,894	118,724	593,618	9,330,412	84,436,191
18	2022	287,786	479,643	119,911	599,554	9,929,966	83,836,637
19	2023	290,664	484,440	121,110	605,550	10,535,516	83,231,087
20	2024	293,570	489,284	122,321	611,605	11,147,121	82,619,482
21	2025	296,506	494,177	123,544	617,721	11,764,842	82,001,761
22	2026	299,471	499,119	124,780	623,898	12,388,740	81,377,862
23	2027	302,466	504,110	126,027	630,137	13,018,878	80,747,725
24	2028	305,491	509,151	127,288	636,439	13,655,317	80,111,286
25	2029	308,546	514,243	128,561	642,803	14,298,120	79,468,483
26	2030	311,631	519,385	129,846	649,231	14,947,351	78,819,252
27	2031	314,747	524,579	131,145	655,724	15,603,074	78,163,528
28	2032	317,895	529,825	132,456	662,281	16,265,355	77,501,247
29	2033	321,074	535,123	133,781	668,904	16,934,259	76,832,344
30	2034	324,284	540,474	135,119	675,593	17,609,851	76,156,751
31	2035	327,527	545,879	136,470	682,349	18,292,200	75,474,403
32	2036	330,803	551,338	137,834	689,172	18,981,372	74,785,231
33	2037	334,111	556,851	139,213	696,064	19,677,436	74,089,167
34	2038	337,452	562,419	140,605	703,024	20,380,460	73,386,143
35	2039	340,826	568,044	142,011	710,055	21,090,515	72,676,088
36	2040	344,234	573,724	143,431	717,155	21,807,670	71,958,933
37	2041	347,677	579,461	144,865	724,327	22,531,996	71,234,606
38	2042	351,154	585,256	146,314	731,570	23,263,566	70,503,036
39	2043	354,665	591,109	147,777	738,886	24,002,452	69,764,151
40	2044	358,212	597,020	149,255	746,275	24,748,727	69,017,876
41	2045	361,794	602,990	150,747	753,737	25,502,464	68,264,139

Year	Date	Yearly Tonnage	Yearly Waste Volume Received [CY]	Daily Cover Required [CY]	Yearly Volume Used [CY]	Cumulative Volume Used [CY]	Remaining Airspace [CY]
42	2046	365,412	609,020	152,255	761,275	26,263,738	67,502,864
43	2047	369,066	615,110	153,777	768,887	27,032,626	66,733,977
44	2048	372,757	621,261	155,315	776,576	27,809,202	65,957,401
45	2049	376,484	627,474	156,868	784,342	28,593,544	65,173,059
46	2050	380,249	633,748	158,437	792,185	29,385,730	64,380,873
47	2051	384,052	640,086	160,021	800,107	30,185,837	63,580,766
48	2052	387,892	646,487	161,622	808,108	30,993,945	62,772,657
49	2053	391,771	652,952	163,238	816,189	31,810,135	61,956,468
50	2054	395,689	659,481	164,870	824,351	32,634,486	61,132,117
51	2055	399,646	666,076	166,519	832,595	33,467,081	60,299,522
52	2056	403,642	672,737	168,184	840,921	34,308,002	59,458,601
53	2057	407,678	679,464	169,866	849,330	35,157,332	58,609,271
54	2058	411,755	686,259	171,565	857,823	36,015,155	57,751,448
55	2059	415,873	693,121	173,280	866,402	36,881,557	56,885,046
56	2060	420,031	700,052	175,013	875,066	37,756,622	56,009,981
57	2061	424,232	707,053	176,763	883,816	38,640,438	55,126,164
58	2062	428,474	714,124	178,531	892,654	39,533,093	54,233,510
59	2063	432,759	721,265	180,316	901,581	40,434,674	53,331,929
60	2064	437,086	728,477	182,119	910,597	41,345,270	52,421,332
61	2065	441,457	735,762	183,941	919,703	42,264,973	51,501,630
62	2066	445,872	743,120	185,780	928,900	43,193,873	50,572,730
63	2067	450,331	750,551	187,638	938,189	44,132,062	49,634,541
64	2068	454,834	758,056	189,514	947,571	45,079,632	48,686,971
65	2069	459,382	765,637	191,409	957,046	46,036,678	47,729,924
66	2070	463,976	773,293	193,323	966,617	47,003,295	46,763,307
67	2071	468,616	781,026	195,257	976,283	47,979,578	45,787,024
68	2072	473,302	788,837	197,209	986,046	48,965,624	44,800,979
69	2073	478,035	796,725	199,181	995,906	49,961,530	43,805,072
70	2074	482,815	804,692	201,173	1,005,865	50,967,396	42,799,207
71	2075	487,643	812,739	203,185	1,015,924	51,983,319	41,783,283
72	2076	492,520	820,867	205,217	1,026,083	53,009,403	40,757,200
73	2077	497,445	829,075	207,269	1,036,344	54,045,747	39,720,856
74	2078	502,420	837,366	209,341	1,046,707	55,092,454	38,674,148
75	2079	507,444	845,740	211,435	1,057,175	56,149,629	37,616,974
76	2080	512,518	854,197	213,549	1,067,746	57,217,375	36,549,228
77	2081	517,643	862,739	215,685	1,078,424	58,295,799	35,470,804
78	2082	522,820	871,366	217,842	1,089,208	59,385,007	34,381,596
79	2083	528,048	880,080	220,020	1,100,100	60,485,107	33,281,496
80	2084	533,329	888,881	222,220	1,111,101	61,596,208	32,170,395
81	2085	538,662	897,770	224,442	1,122,212	62,718,420	31,048,183
82	2086	544,048	906,747	226,687	1,133,434	63,851,854	29,914,749
83	2087	549,489	915,815	228,954	1,144,769	64,996,623	28,769,980

Year	Date	Yearly Tonnage	Yearly Waste Volume Received [CY]	Daily Cover Required [CY]	Yearly Volume Used [CY]	Cumulative Volume Used [CY]	Remaining Airspace [CY]
84	2088	554,984	924,973	231,243	1,156,216	66,152,839	27,613,764
85	2089	560,534	934,223	233,556	1,167,778	67,320,617	26,445,985
86	2090	566,139	943,565	235,891	1,179,456	68,500,073	25,266,529
87	2091	571,800	953,001	238,250	1,191,251	69,691,324	24,075,278
88	2092	577,518	962,531	240,633	1,203,163	70,894,487	22,872,115
89	2093	583,294	972,156	243,039	1,215,195	72,109,682	21,656,920
90	2094	589,126	981,877	245,469	1,227,347	73,337,029	20,429,574
91	2095	595,018	991,696	247,924	1,239,620	74,576,649	19,189,953
92	2096	600,968	1,001,613	250,403	1,252,016	75,828,666	17,937,937
93	2097	606,978	1,011,629	252,907	1,264,537	77,093,203	16,673,400
94	2098	613,047	1,021,746	255,436	1,277,182	78,370,385	15,396,218
95	2099	619,178	1,031,963	257,991	1,289,954	79,660,338	14,106,264
96	2100	625,370	1,042,283	260,571	1,302,853	80,963,192	12,803,411
97	2101	631,623	1,052,706	263,176	1,315,882	82,279,074	11,487,529
98	2102	637,940	1,063,233	265,808	1,329,041	83,608,115	10,158,488
99	2103	644,319	1,073,865	268,466	1,342,331	84,950,446	8,816,157
100	2104	650,762	1,084,604	271,151	1,355,754	86,306,200	7,460,403
101	2105	657,270	1,095,450	273,862	1,369,312	87,675,512	6,091,091
102	2106	663,842	1,106,404	276,601	1,383,005	89,058,517	4,708,085
103	2107	670,481	1,117,468	279,367	1,396,835	90,455,352	3,311,250
104	2108	677,186	1,128,643	282,161	1,410,804	91,866,156	1,900,447
105	2109	683,958	1,139,929	284,982	1,424,912	93,291,067	475,535
	Totals:	**44,779,712**	**74,632,854**	**18,658,213**	**93,291,067**		

Notes:
1. 1.% annual growth rate
2. 310 days per year
3. 1,200 pounds per cubic yard
4. Refuse (R) to daily cover (C) = 4:1
5. Total Available Volume = 93,766,603 cubic yards

Table III.2.2: Remaining Site Life And Soil Balance

Site Airspace	
Waste Area (acre)[1]	526.0
Waste Area (SF)	22,912,560
Gross Volume (CY)	93,766,603
3.5' Final Cover Material (CY)	2,970,147
2' Bottom Liner Material (CY)[2]	1,008,979
Net Landfill Volume (CY)	89,787,477
Site Life	
Daily Cover @ 20% (CY) (R:C = 4:1)	18,658,213
Net Solid Waste Volume (CY)	71,129,264
Site Life (YR) @ 780 tons/day[4]	184
Site Life (YR) including 1% Annual Growth	105
Soil Balance	
Excavation (CY)[3]	22,366,537
Liner System (CY)[2]	1,008,979
Daily Cover (CY)	18,658,213
Final Cover	2,970,147
Soil Balance (CY)[3]	(270,802)

1 Area within limit of site footprint

2 Liner Material on Cells 5-12 (312.7 acres)

3 Excavation and Soil Balance volumes based on 05/2005 aerial topography. Soil deficit to be imported.

4 No growth assumed for this calculation

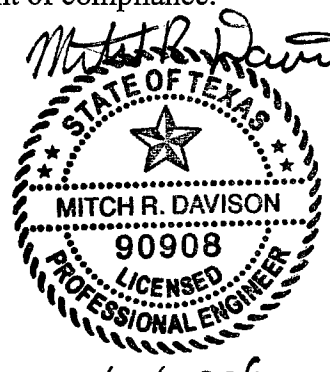
3.0 GROUNDWATER AND SURFACE WATER PROTECTION

This plan was prepared in accordance with Part 330.56(f). The plan discusses the details and control mechanisms to handle run-on and run-off flows expected to occur at the site. The plan is based on the 25 year, 24 hour storm event per 330.56(f). The plan describes drainage control features and includes appropriate calculations and HEC-HMS model analyses to demonstrate expected stormwater runoff peak flows and volumes. The complete details for the plan are presented in Part III, Attachment 6.

A Groundwater Sampling and Analysis Plan (GWSAP) has been prepared in accordance with Subchapter I, Parts 330.233 and 330.234 of the TCEQ regulations. The GWSAP describes the procedures and methodology to monitor and collect ground water samples for the detection of potential leachate constituents. The GWSAP also includes the testing frequency, establishment of background data, and statistical method to evaluate analytical results. The complete details for the GWSAP are presented in Attachment 11 of Part III.

3.1 Discharge of Pollutants §330.55(b)(1)

No discharge of solid wastes or pollutants adjacent to or into the water in the State, including wetlands, that is in violation of the requirements of the Texas Water Code shall be allowed. No discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act shall be allowed. A corrective action workplan provided in Part III, Attachment 14, Appendix 14D is being implemented to address the presence of VOCs internal to the site. VOCs have not been detected at the point of compliance.



FOR PAGES 9-11

5/9/2006

3.2 Run-on Control §330.55(b)(2)

During the development of the landfill, diversion berms will be constructed to prevent stormwater from running onto the active portion of the landfill. These berms will be constructed to contain the peak discharge from a 25-year, 24-hour storm event. This is discussed further in Part III, Attachment 6.

3.3 Run-off Control §330.55(b)(3)

Run-off control will be provided by the construction of diversion berms, channels, and containment areas. These structures will be constructed to contain the peak discharge from the 25-year, 24-hour storm event, and will prevent the discharge of solid wastes or pollutants into adjacent watercourses, wetlands or waters of the state. This is discussed further in Part III, Attachment 6.

3.4 Drainage Structures §330.55(b)(4)

Drainage controls are incorporated into the site to reduce flooding and minimize the amount of sediment carried off the site and discharged into adjacent lands and water bodies. Drainage controls include perimeter ditches, downchutes, benches, and detention basins. Drainage controls are shown in Part III, Attachment 6.

3.5 Drainage Calculations §330.55(b)(5)

Times of concentration, drainage areas, and runoff coefficients were developed from the proposed final grading plans. All drainage calculations are provided in Part III, Attachment 6. Calculations are also provided to verify that existing drainage patterns will not be significantly altered by development of the landfill.

3.6 Erosion Controls §330.55(b)(5)(E)

Temporary and permanent erosion controls for the facility will consist of silt fences, terraces, diversion berms and vegetation. These erosion controls have been designed to lower storm water

runoff velocities, keep soil erosion losses below permissible levels and provide long-term, low maintenance and stability for the final cover. The location of temporary erosion controls will vary depending on the landfilling progress. The Erosion and Sedimentation Control Plan is provided in Part III, Attachment 6.

3.7 Contaminated Water §330.55(b)(6)

A Leachate and Contaminated Water Plan has been prepared to include the procedures for handling any leachate and contaminated water that may be generated as a result of surface water coming into contact with exposed waste or leachate. Appropriately sized berms will be constructed within the waste cell to prevent surface water from coming into contact with the waste. These berms will be relocated as cell development progresses. The plan addresses the leachate collection system, storage facilities, routing system, calculations, and handling procedures. The plan has been prepared in accordance with Subchapter H Part 330.200 of the TCEQ regulations. The plan is presented in Part III, Attachment 15.

3.8 Flood Control §330.55(b)(7)

The Amarillo Landfill is not within the 100-year floodplain as shown in the regulatory Flood Insurance Rate Map (FIRM) published by the Federal Emergency Management Agency (FEMA). This is further discussed in Part II and also in Part III, Attachment 6.

4.0 FINAL COVER DESIGN §330.55(b)(8)

Part III, Attachment 12 (Final Closure Plan) contains the details of the final cover design, which has been developed to comply with §330.253 in order to minimize the infiltration of surface water. This is also discussed in section 4 of Part IV. Part III, Attachment 6 includes stormwater runoff and rainfall run-on controls. Part III Attachment 1 provides final cover cross-section details.

Estimated soil losses due to erosion, as calculated by the Soil Conservation Service of the U.S. Department of Agriculture in its Revised Universal Soil Loss Equation, are within the permissible limits for comparable slope lengths and soil cover conditions. Part III, Attachment 6 contains the Erosion Control Plan and the soil loss calculations.

5.0 ENDANGERED SPECIES §330.55(b)(9)

Neither the construction nor the operation of the facility will result in the destruction or adverse modifications of the critical habitat of endangered or threatened species, or cause or contribute to the taking of any endangered or threatened species. Part II of this application includes the findings of the endangered species research conducted for the expansion.

6.0 LANDFILL MARKERS AND BENCHMARK §330.55(b)(10)

Landfill markers have been installed to clearly mark significant features as required by §330.55(b)(10). Markers used will be steel, fiberglass or wooden posts that extend at least six feet above ground level. The markers will not be obscured by vegetation and will be placed in sufficient numbers to clearly show the required boundaries. Markers that are removed or destroyed will be replaced as soon as practicable, not more than 15 days after the removal or destruction. All markers will be repainted as needed to retain visibility. Guidelines for type, placement, and color-coding of markers are provided below:

- ***Black - boundary markers.*** The boundary markers have been placed at each corner of the site and along each boundary line at intervals no greater than 300 feet. Fencing may be placed within these markers as required.

- ***Yellow - buffer zones.*** The buffer zone markers have been placed along each buffer zone boundary, at all corners and between corners at intervals of no more than 300 feet.

- ***Green - easements and rights-of-way.*** Easement and right-of-way markers have been placed along the exterior limits of easements and along the boundary of rights-of-way at each corner within the site and at the intersection of the site boundary.

- ***White - landfill grid.*** The landfill grid system consists of numbered markers on the site perimeter utilizing a site grid system. Markers are spaced no greater than 100 feet apart, measured along perpendicular lines. The grid system will be maintained and updated to encompass at least the area to be filled within the next three years. Intermediate markers will be installed if necessary to allow visibility from opposite boundaries. The grid markers will be maintained during the active life of the site.

- ***Red - approved SLER areas.*** The Soil Liner Evaluation Report (SLER) or Geomembrane Liner Evaluation Report (GLER) markers will be placed so that all areas for which a SLER or GLER has been submitted and approved by the TCEQ are readily determinable.

These markers will be located so that they are not destroyed during operations or until operations extend into the next area, and provide site workers immediate knowledge of the extent of approved disposal areas. The location of the markers will be tied into the landfill grid system and reported on each SLER or GLER submitted. SLER or GLER markers will not be placed inside the evaluated areas.

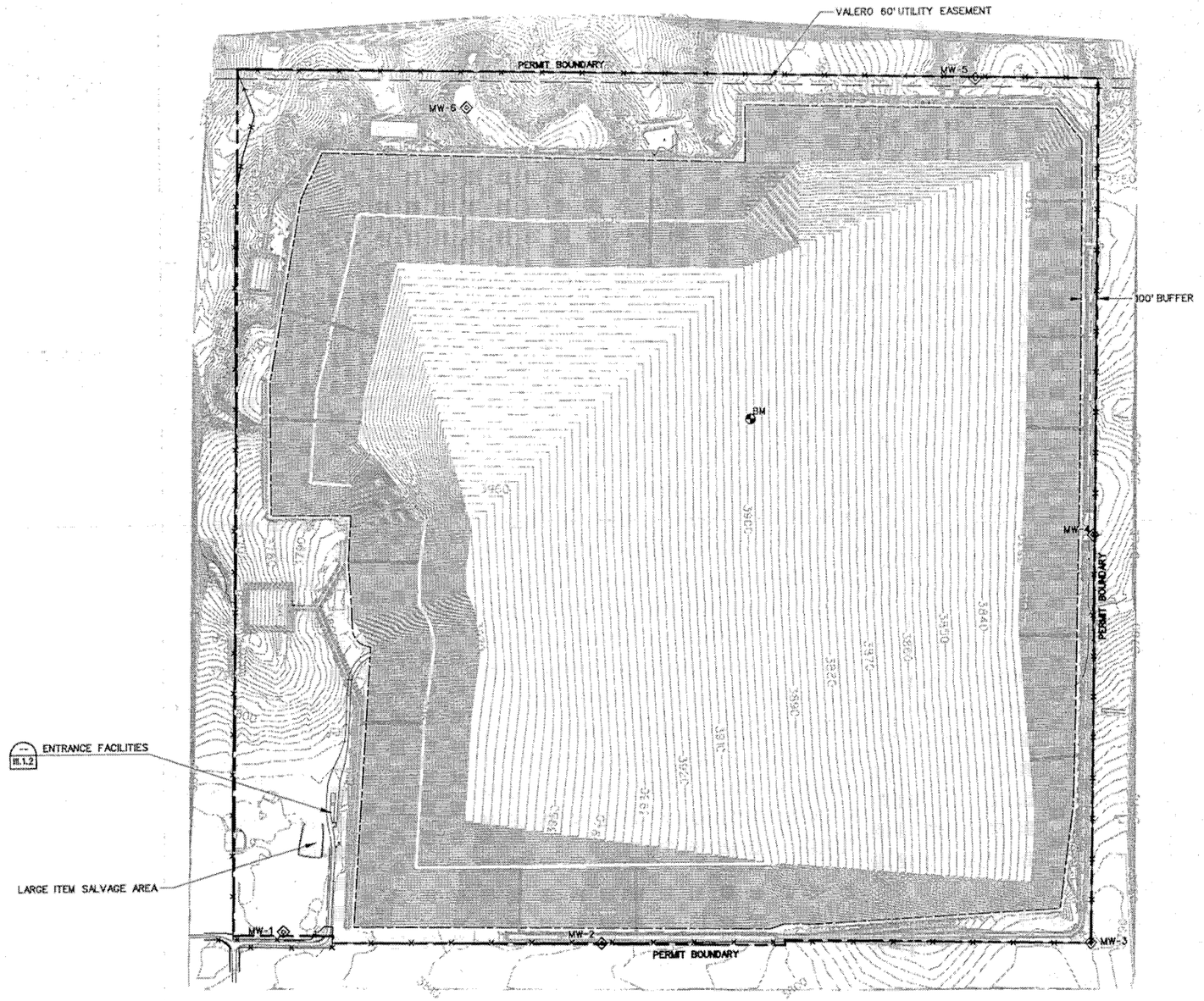
- ***Blue – floodplain limits.*** Floodplain markers will be installed for any area that is subject to flooding from the 100-year storm event. Markers will be permanent posts placed at intervals of 300 feet, or closer if needed for visibility. Since there are no areas on-site that are located within the 100-year flood limits, these markers are not currently required.

A permanent benchmark is installed at the site near the facility entrance. This is an area that is readily accessible and will not be used for disposal. The benchmark is a bronze survey marker set in concrete. The benchmark elevation was surveyed from a known reliable benchmark. The approximate locations and elevations of the benchmarks are identified in Part III, Attachment 1.

City of Amarillo
Landfill Permit Amendment – Part III, Attachment 1

Index

Figure III.1.1	Site Layout Plan
Figure III.1.2	Entrance Facilities
Figure III.1.3	Survey Reference Landfill Grid System
Figure III.1.4	Typical Sector Development
Figure III.1.5	Leachate Collection System Layout
Figure III.1.6	Leachate Collection System Details
Figure III.1.7	Leachate Collection System Details
Figure III.1.8	Miscellaneous Details
Figure III.1.9	Liner Details
Figure III.1.10	Final Cover Details



N

0 400 800

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- LANDFILL FOOTPRINT BOUNDARY
- 5240 CONTOURS
- PERIMETER FENCE
- UTILITY EASEMENT
- BM PERMANENT BENCHMARK
  LANDFILL GRID COORDINATES
  N 13,209.3
  E 7,922.22
  ELEV 3808.65

NOTES

1. THE PROPOSED GRADES REPRESENT THE TOP OF FINAL COVER,
2. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY STEWART GEO TECHNOLOGIES, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED APRIL 7, 2005. VERTICAL DATUM BASED ON NGVD 29. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
3. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.
4. MAXIMUM FINAL COVER ELEVATION = 3970 FT. AND MAXIMUM WASTE ELEVATION = 3966 FT.

CITY OF AMARILLO TEXAS

HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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1/25/2007

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SITE LAYOUT PLAN

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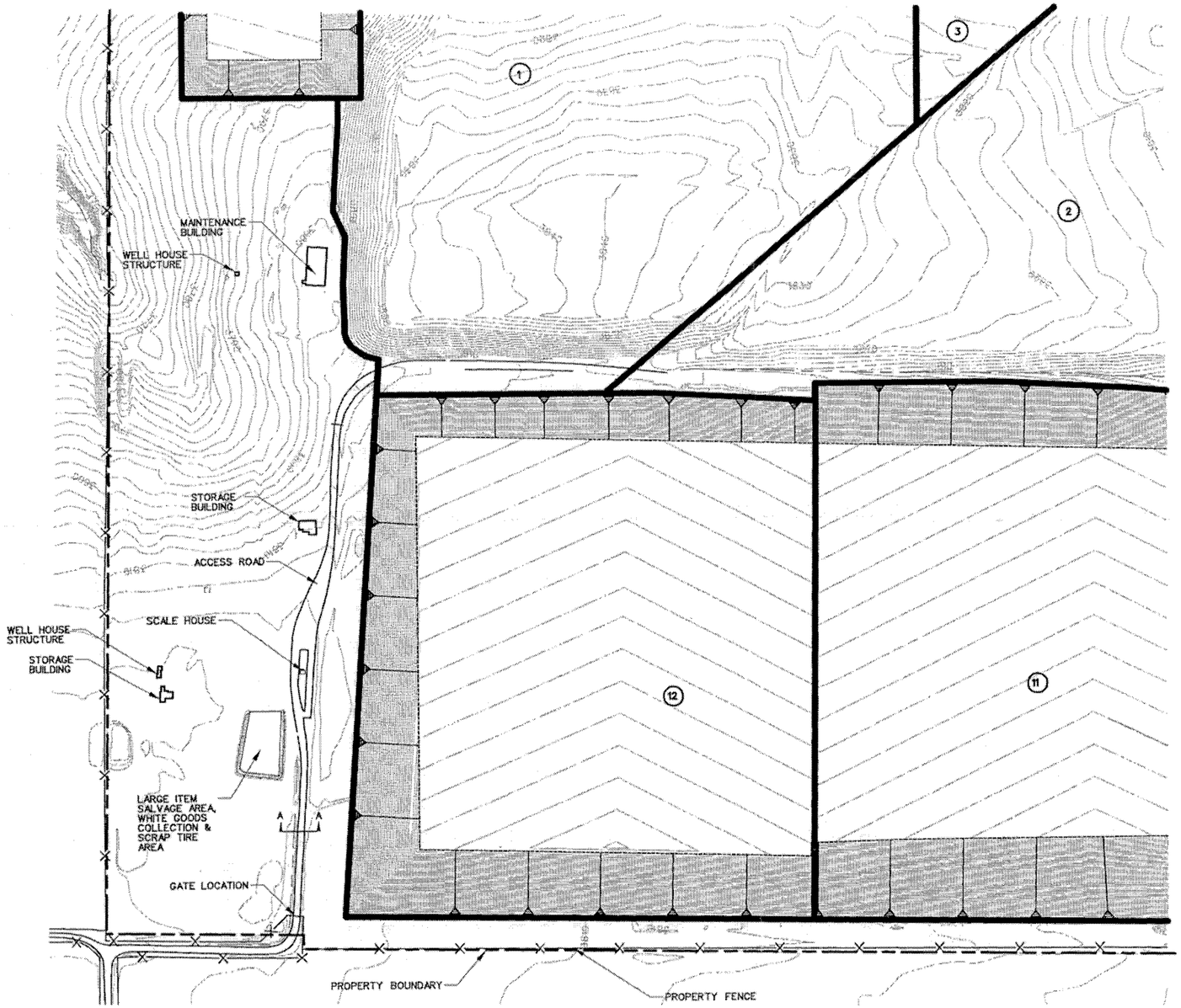

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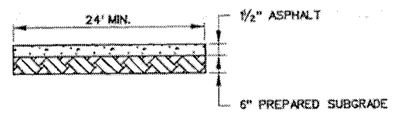
SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- (1) CELL NUMBER
- CELL BOUNDARY
- FENCE LOCATIONS



ACCESS ROAD DETAIL
SECTION A-A

NOTES
1. THE PROPERTY LINE IS A COMBINATION OF CHAINLINK FENCE AND BARBED WIRE FENCE.

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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1/25/2007

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

ENTRANCE FACILITIES

0 1" 2"

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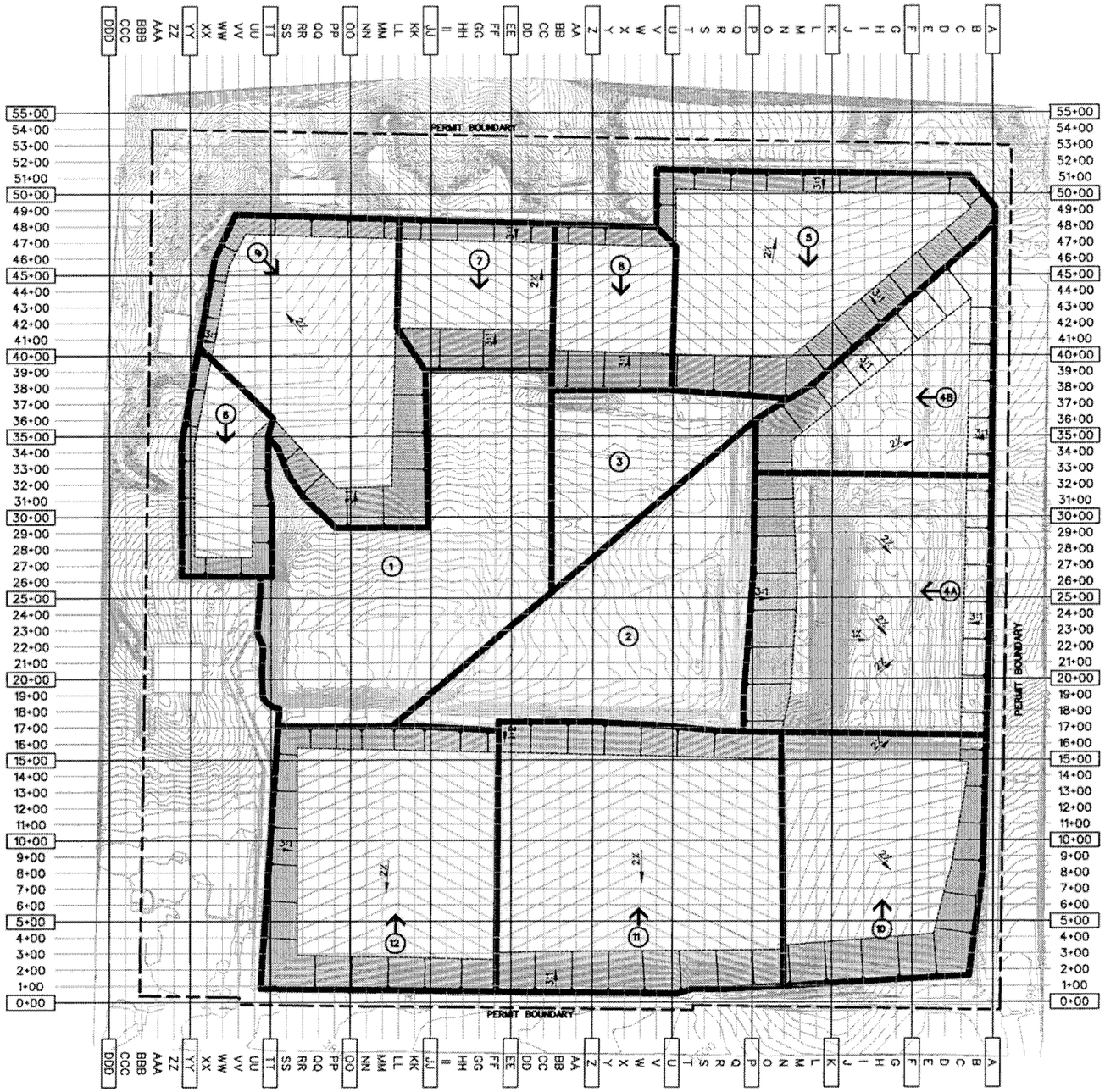

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

HDR Engineering, Inc.

MITCH R. DAVISON 90908 LICENSED PROFESSIONAL ENGINEER STATE OF TEXAS

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12/15/2005

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SURVEY REFERENCE
LANDFILL GRID SYSTEM

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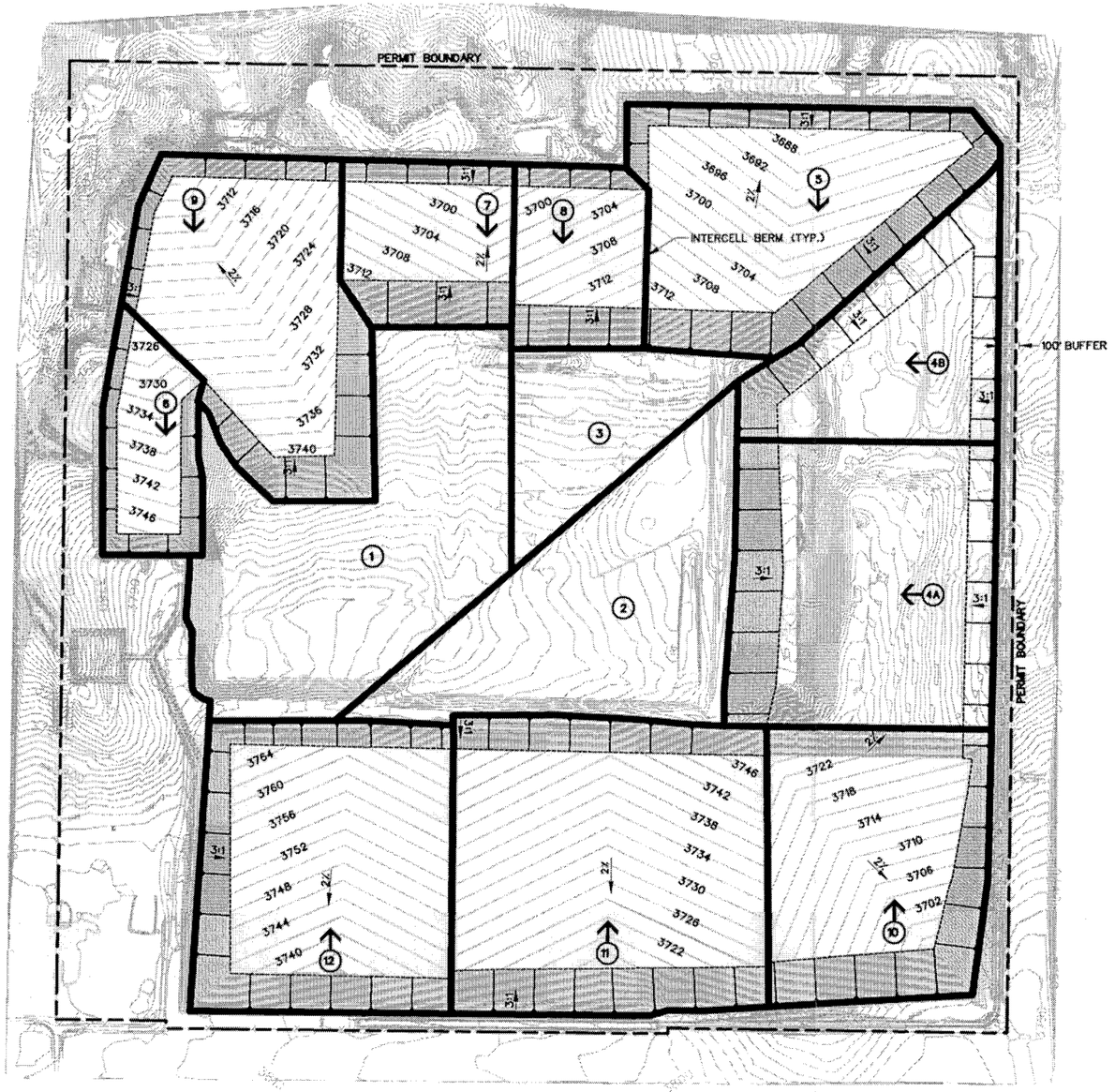

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0 400 800

SCALE IN FEET

LEGEND

PERMIT BOUNDARY

SEQUENCE OF DEVELOPMENT/ DIRECTION OF FILL - SEE TABLE

CELL BOUNDARY

SEQUENCE OF CELL DEVELOPMENT
1
2
3
4A
4B
10
11
12
9
6
7
8
5

NOTES

1. THE PROPOSED GRADES REPRESENT THE BOTTOM OF EXCAVATION.
2. CELLS 1-4 HAVE BEEN CONSTRUCTED.
3. CELLS MAY BE SUB-DIVIDED FOR CONSTRUCTION PURPOSES.
4. WASTE TO BE DISPOSED IN EACH SECTOR WILL BE MSW.
5. WASTE DEPOSITION RATES ARE GIVEN IN TABLE III.V.1 OF THE PERMIT DOCUMENTS.

CITY OF AMARILLO TEXAS

HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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5/9/2006

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

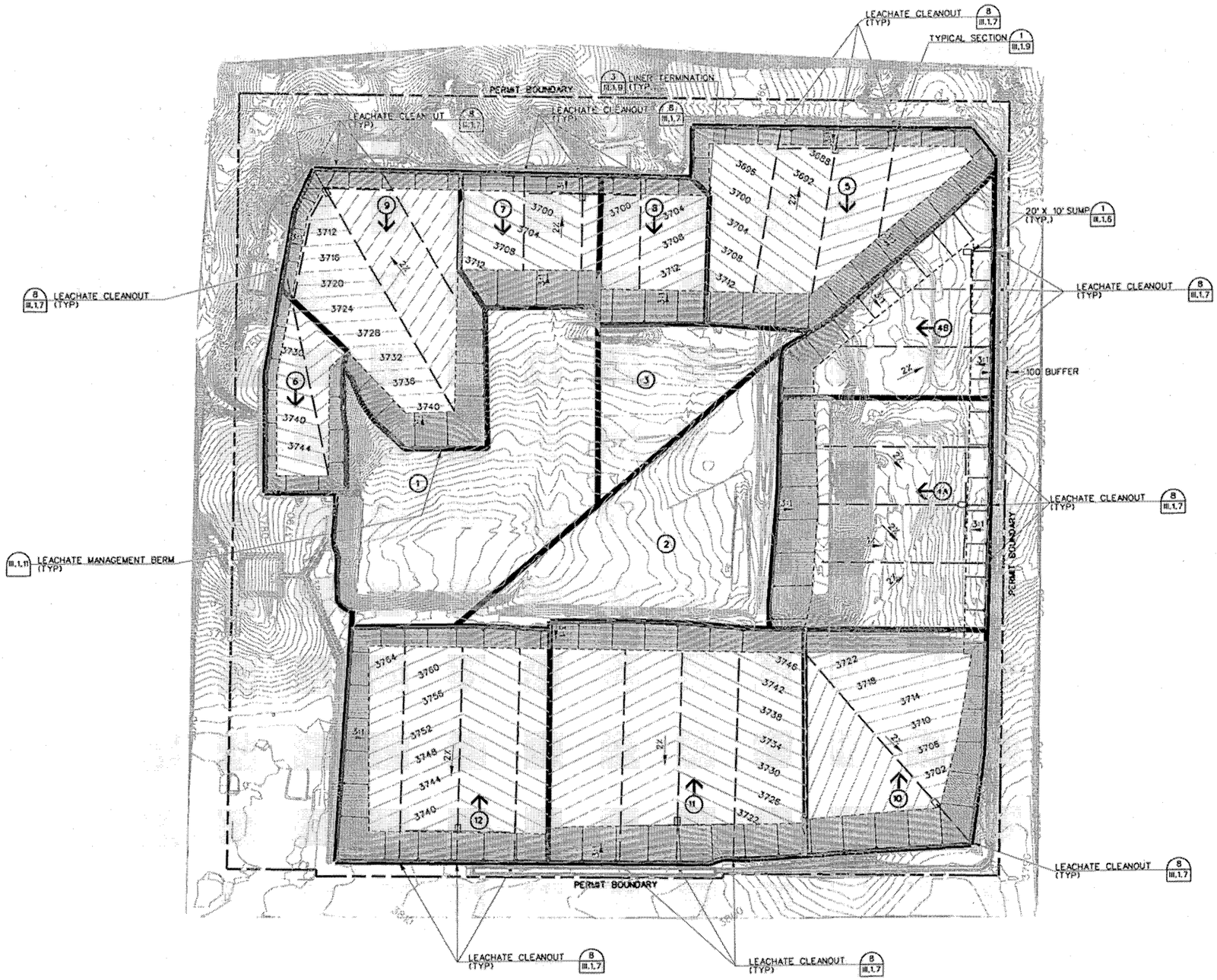
TYPICAL SECTOR DEVELOPMENT

0 1" 2"

FILENAME	...\AMIII01.04.DGN
SCALE	

SHEET III.1.4

USER: mdavison DATE: 5/9/2006
FILE: ...\AMIII01.04.DGN TIME: 12:33:19 PM



N

0 400 800

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- DIRECTION OF FILL
- CELL BOUNDARY
- LEACHATE SUMP
- LEACHATE COLLECTION LINE

NOTES

1. THE PROPOSED GRADES REPRESENT THE BOTTOM OF EXCAVATION

2. CELLS 1, 2, AND 3 WILL HAVE A LEACHATE MANAGEMENT SYSTEM CONSISTING OF THE EXISTING FINAL COVER SYSTEM WHICH HAS BEEN FIELD VERIFIED TO HAVE AN AVERAGE HYDRAULIC CONDUCTIVITY OF 1.17x10-7 CM/SEC FOR CELL 1 AND 9.83x10-8 CM/SEC FOR CELLS 2 AND 3. THESE CELLS WILL BE GRADED TO DRAIN TO THE LEACHATE COLLECTION SYSTEMS OF ADJOINING CELLS.

USER: ssumner
FILE: \AMIII01.05.DGN
DATE: 5/17/2007
TIME: 9:56:50 AM

CITY OF AMARILLO TEXAS

HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. ODEN
CIVIL ENGINEER	M. ODEN
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

5-18-2007

STATE OF TEXAS
MICHAEL W. ODEN
67165
REGISTERED
PROFESSIONAL ENGINEER

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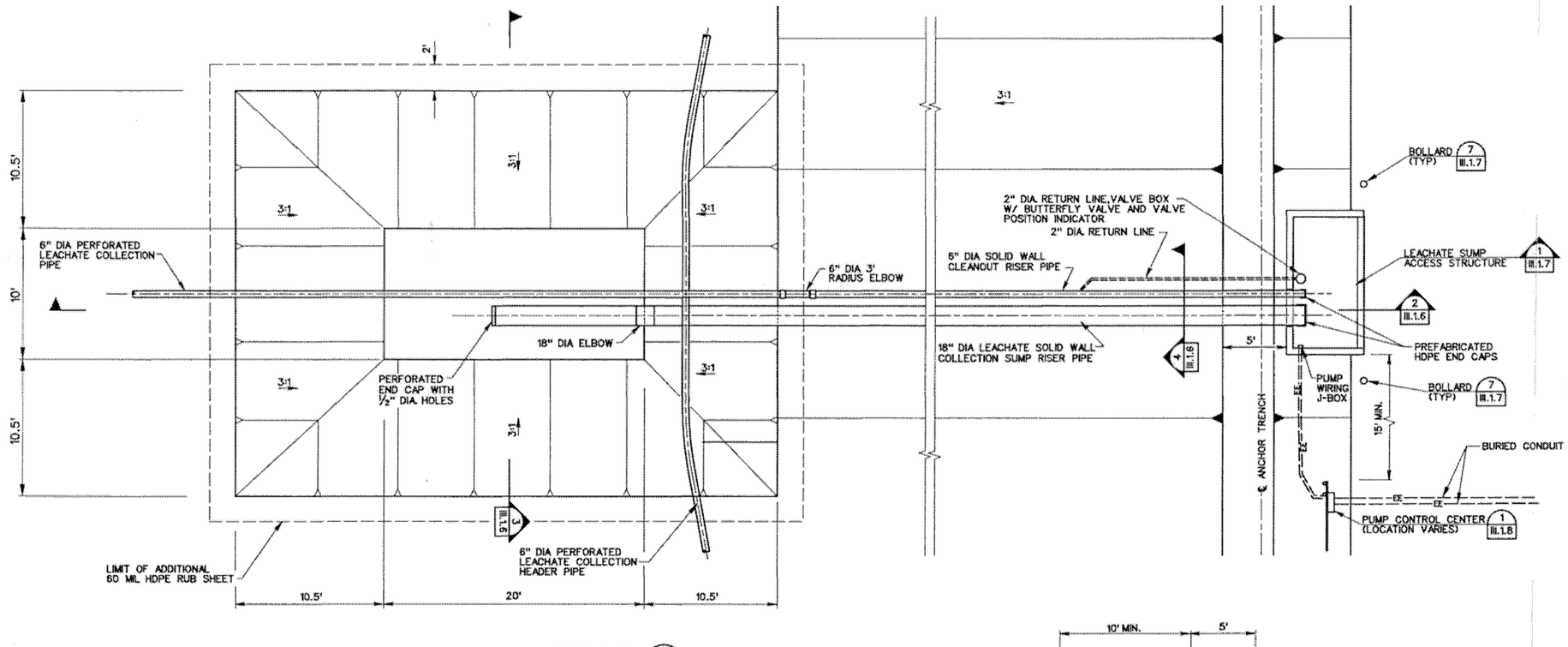
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

LEACHATE COLLECTION SYSTEM LAYOUT

0 1" 2"

FILENAME ...\AMIII01.05.DGN
SCALE

SHEET III.1.5



SUMP PLAN (1 / III.1.6)
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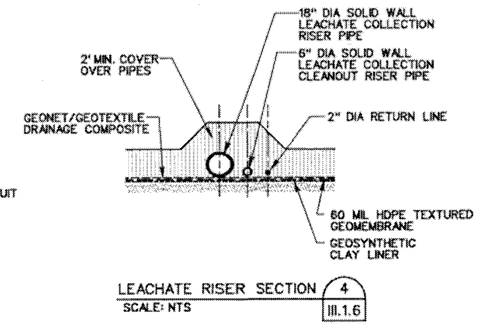

LEACHATE RISER SECTION (4 / III.1.6)
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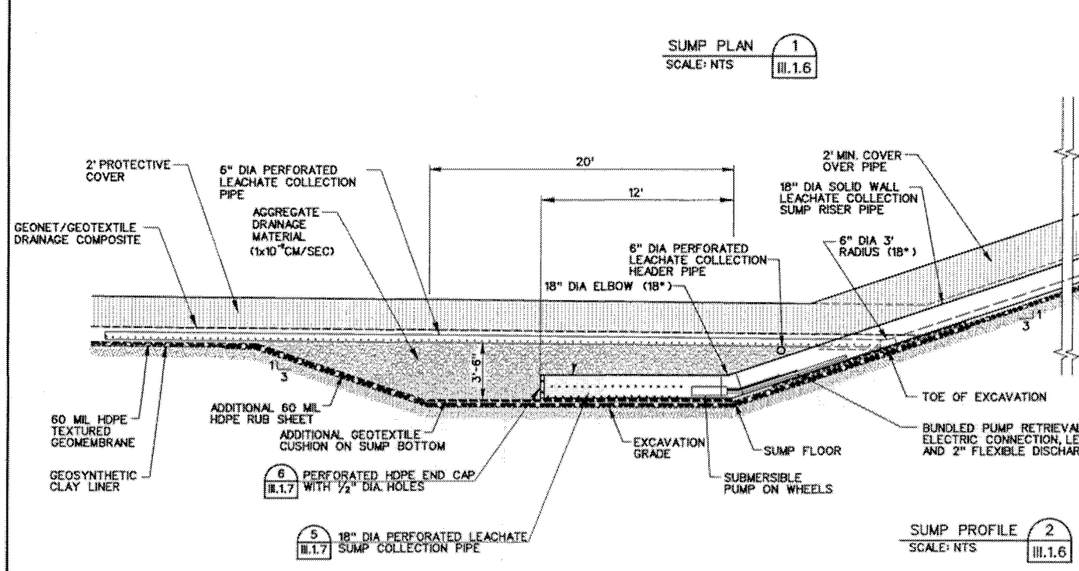

SUMP PROFILE (2 / III.1.6)
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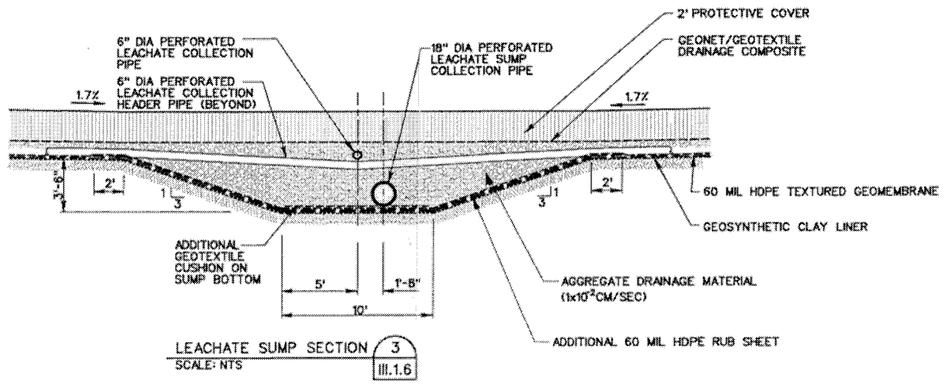

LEACHATE SUMP SECTION (3 / III.1.6)
SCALE: NTS

CITY OF AMARILLO TEXAS

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CML ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

LEACHATE COLLECTION SYSTEM DETAILS

0 1" 2"

FILENAME ...\amiii01.06.dgn
SCALE N.T.S.

SHEET III.1.6

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FILE: ...\amiii01.06.dgn
DATE: 12/7/2005
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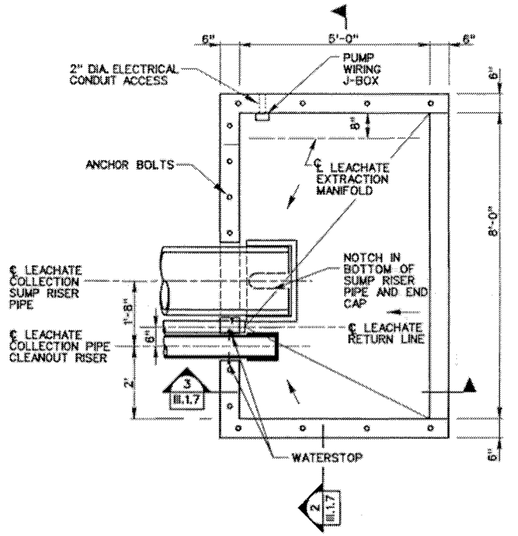

LEACHATE SUMP ACCESS - PLAN 1 III.1.7
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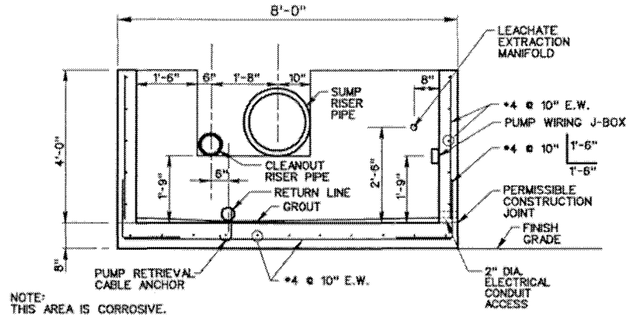

NOTE:
THIS AREA IS CORROSIVE.

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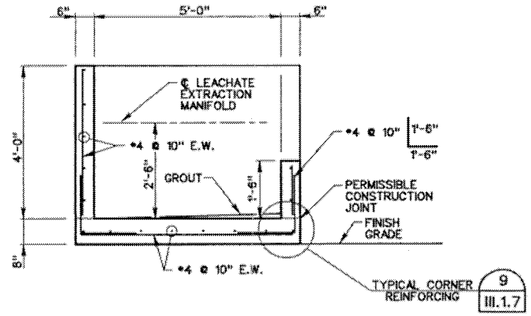
SCALE: NTS



LEACHATE SUMP ACCESS - SECTION
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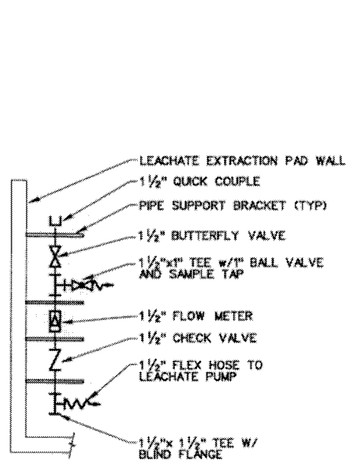

SUMP ACCESS MANIFOLD 4 III.1.7
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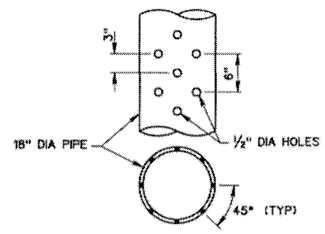

LEACHATE COLLECTION SUMP PERFORATION DETAIL 5 III.1.7
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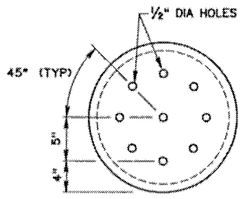

PERFORATED END CAP DETAIL 6 III.1.7
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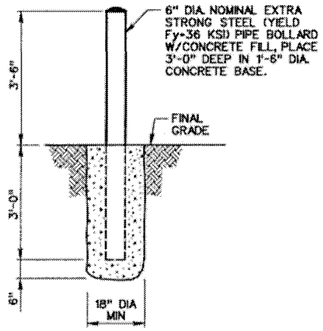

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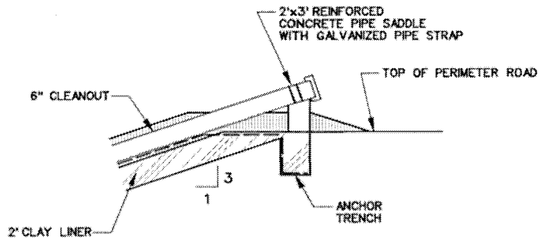

LEACHATE CLEANOUT PIPE TERMINATION 8 III.1.7
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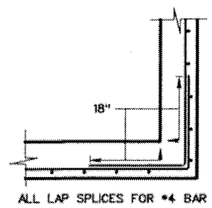

TYPICAL CORNER REINFORCING 9 III.1.7
SCALE: NTS

CITY OF AMARILLO TEXAS

HDR
HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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12/15/2005

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

LEACHATE COLLECTION SYSTEM DETAILS

0 1" 2"

FILENAME	...\amiii01.07.dgn
SCALE	N.T.S.

SHEET III.1.7

USER: brgreen
FILE: ...\amiii01.07.dgn
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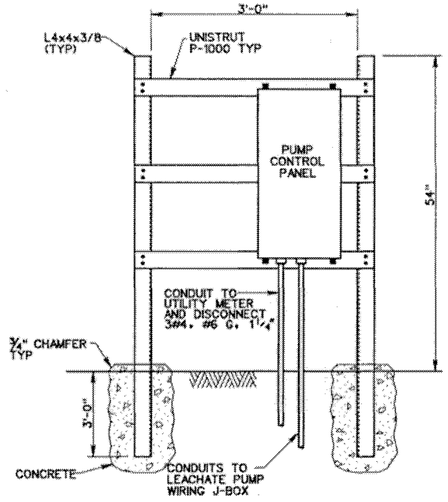

EQUIPMENT RACK ELEVATION 1 III.1.8
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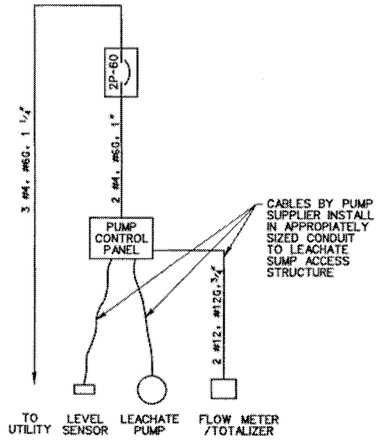

LEACHATE PUMP ONE-LINE DIAGRAM 2 III.1.8
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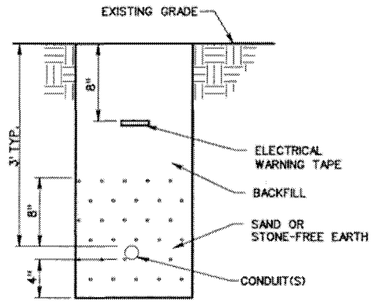

DIRECT BURIED CONDUIT DETAIL 3 III.1.8
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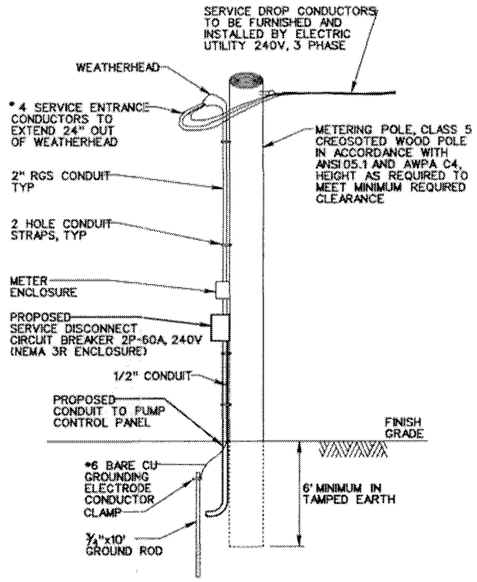

NOTE:
SERVICE POLE AND APPURTENANCES BY OTHERS. CONTRACTOR TO PROVIDE SERVICE DISCONNECT AND CONDUIT TO PUMP CONTROL PANEL.

SERVICE ENTRANCE DETAIL 4 III.1.8
SCALE: NTS

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS · MITCH R. DAVISON · 90908 · LICENSED PROFESSIONAL ENGINEER

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12/15/2005

HDR Engineering, Inc.

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

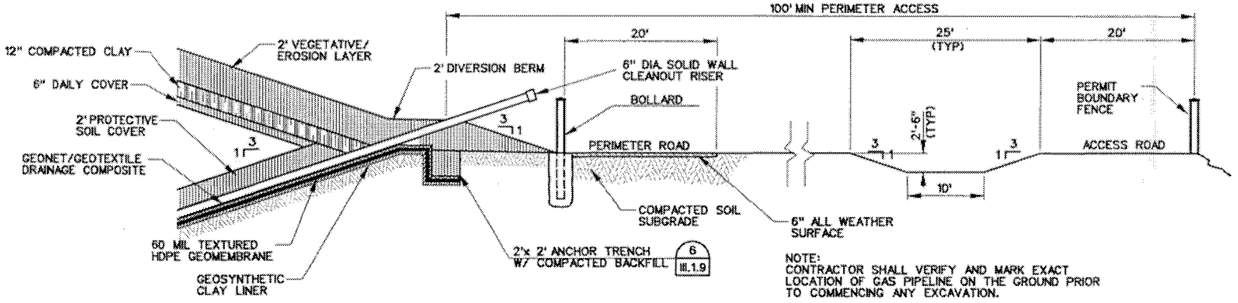
MISCELLANEOUS DETAILS

0 1" 2"

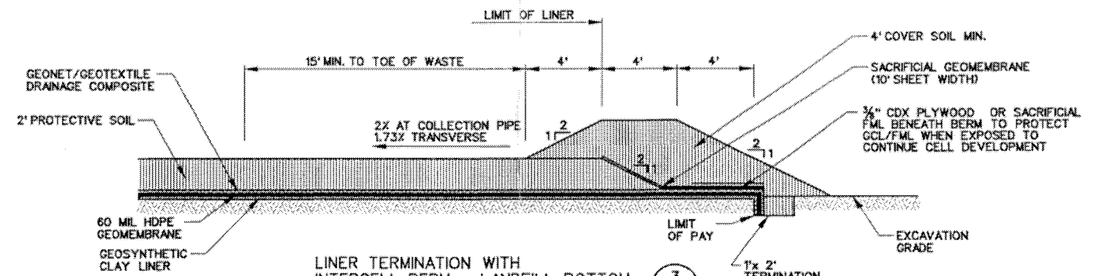
FILENAME ...\amiii01.08.dgn
SCALE N.T.S.

SHEET III.1.8

USER: brgreen DATE: 12/7/2005
FILE: ...\amiii01.08.dgn TIME: 11:43:04 AM



TYPICAL SECTION AT LANDFILL PERIMETER 1
SCALE: NTS
III.1.9



LINER TERMINATION WITH INTERCELL BERM - LANDFILL BOTTOM 3
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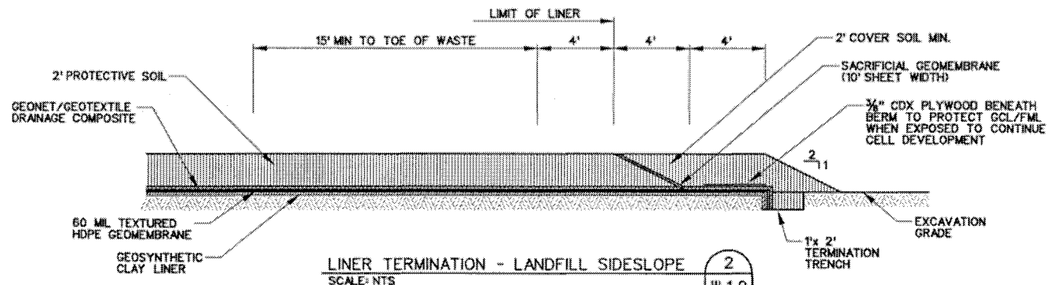
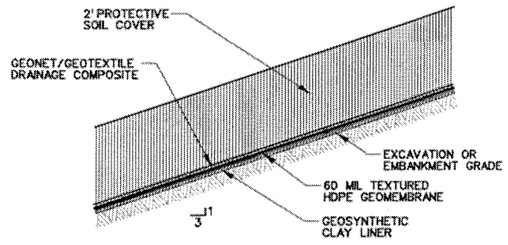
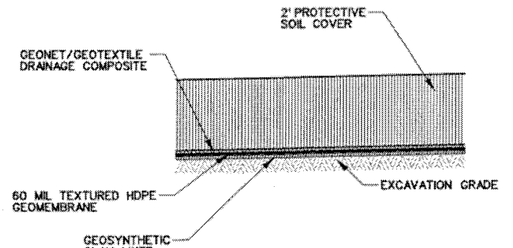
III.1.9



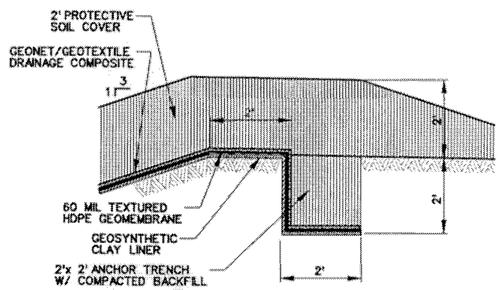
LINER TERMINATION - LANDFILL SIDESLOPE 2
SCALE: NTS
III.1.9



TYPICAL LINER DETAIL - LANDFILL SIDESLOPE 4
SCALE: NTS
III.1.9



TYPICAL LINER DETAIL - LANDFILL BOTTOM 5
SCALE: NTS
III.1.9



ANCHOR TRENCH 6
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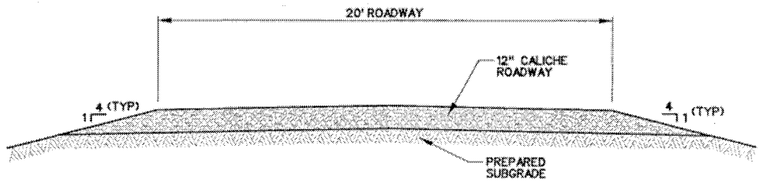
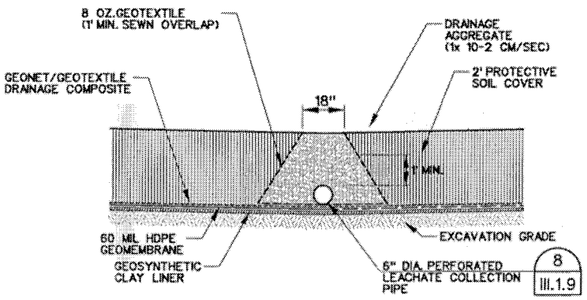


TYPICAL ACCESS ROAD SECTION 9
SCALE: 1" = 5'
III.1.9



LEACHATE COLLECTION PIPE 7
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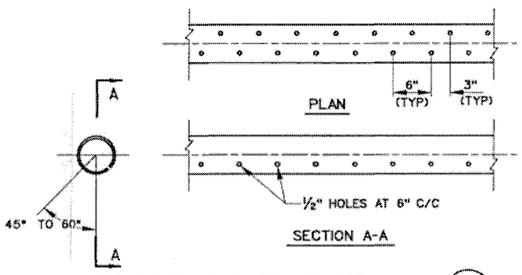
III.1.9



PERFORATED LEACHATE COLLECTION PIPE 8
SCALE: NTS
III.1.9

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
PROFESSIONAL ENGINEER

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

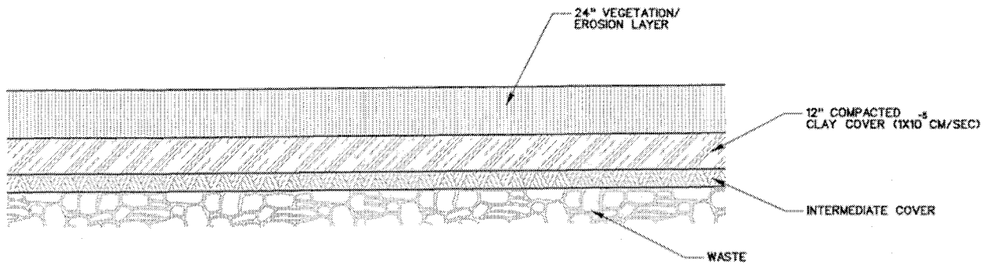
LINER DETAILS

0 1" 2"

FILENAME	...\amiii01.09.dgn
SCALE	N.T.S.

SHEET
III.1.9

USER: brgreen
FILE: \amiii01.09.dgn
DATE: 12/7/2005
TIME: 11:43:05 AM



FINAL COVER DETAIL 1
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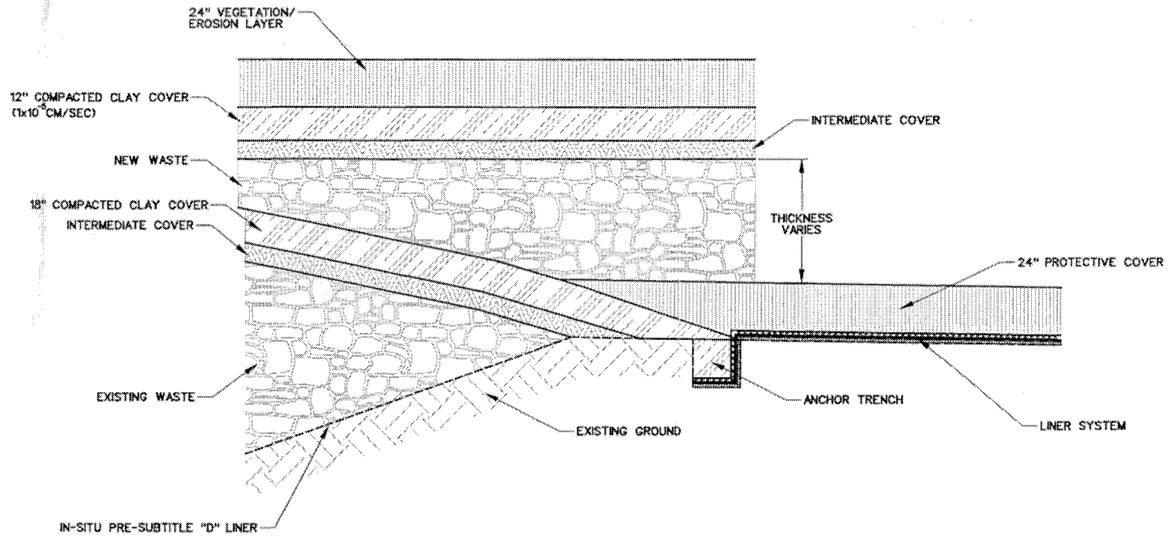

FINAL COVER DETAIL FOR PRE-SUBTITLE "D" AREAS 2
SCALE: NTS III.1.10

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

FINAL COVER CONNECTION DETAILS

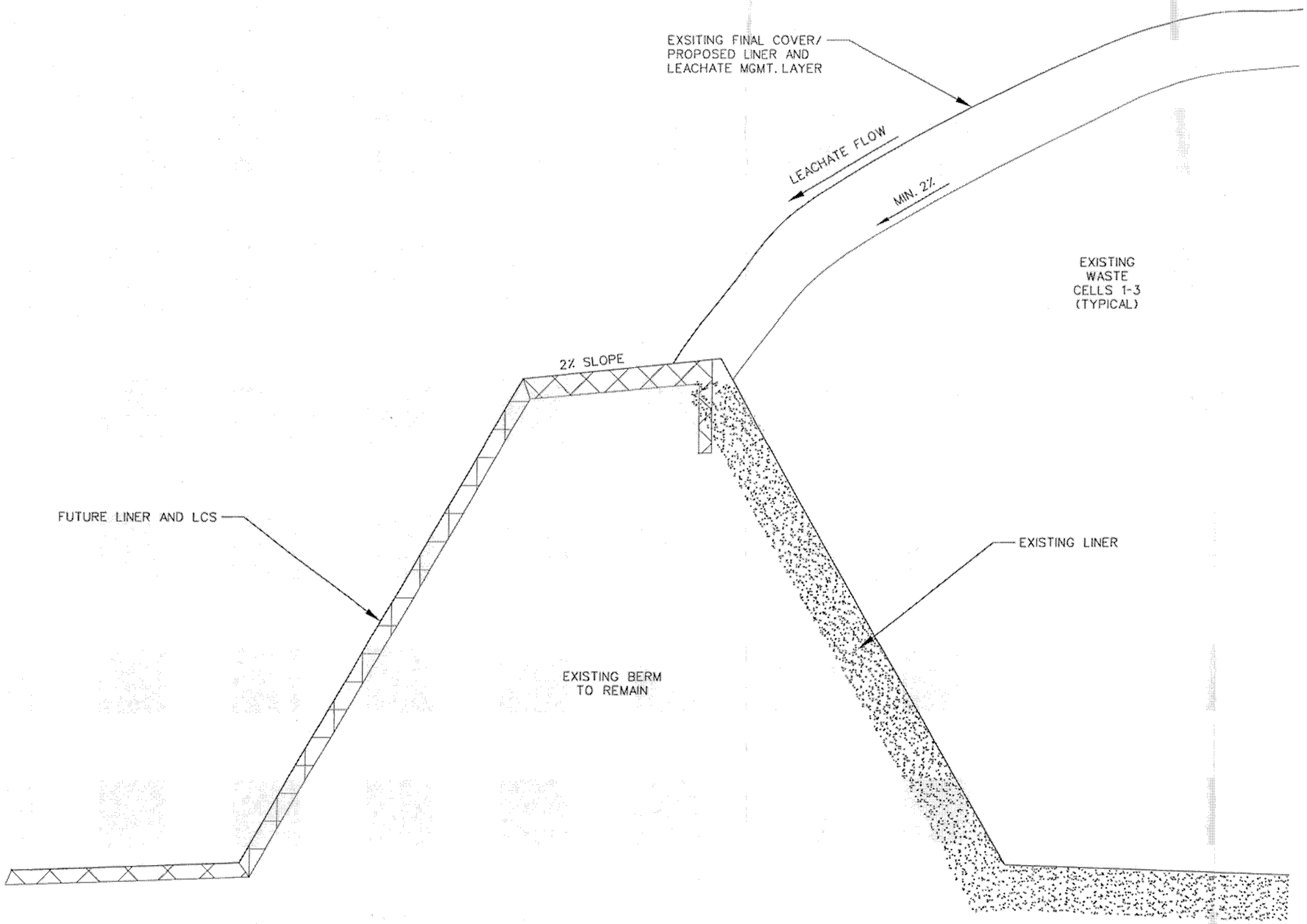
0 1" 2"

FILENAME ...\amiii01.10.dgn
SCALE

SHEET III.1.10

USER: brgreen
FILE: \amiii01.10.dgn
DATE: 12/7/2005
TIME: 11:43:05 AM

NOTE:
THIS DRAWING IS NOT TO SCALE



ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. ODEN
CIVIL ENGINEER	M. ODEN
CHECKED BY	M. ODEN
DESIGNED	S. SUMNER
DRAWN BY	S. SUMNER
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

HDR ENGINEERING, INC.

STATE OF TEXAS
MICHAEL W. ODEN
67165
REGISTERED
PROFESSIONAL ENGINEER

5-18-2007

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

LEACHATE MANAGEMENT PLAN

0 1" 2"

FILENAME
SCALE

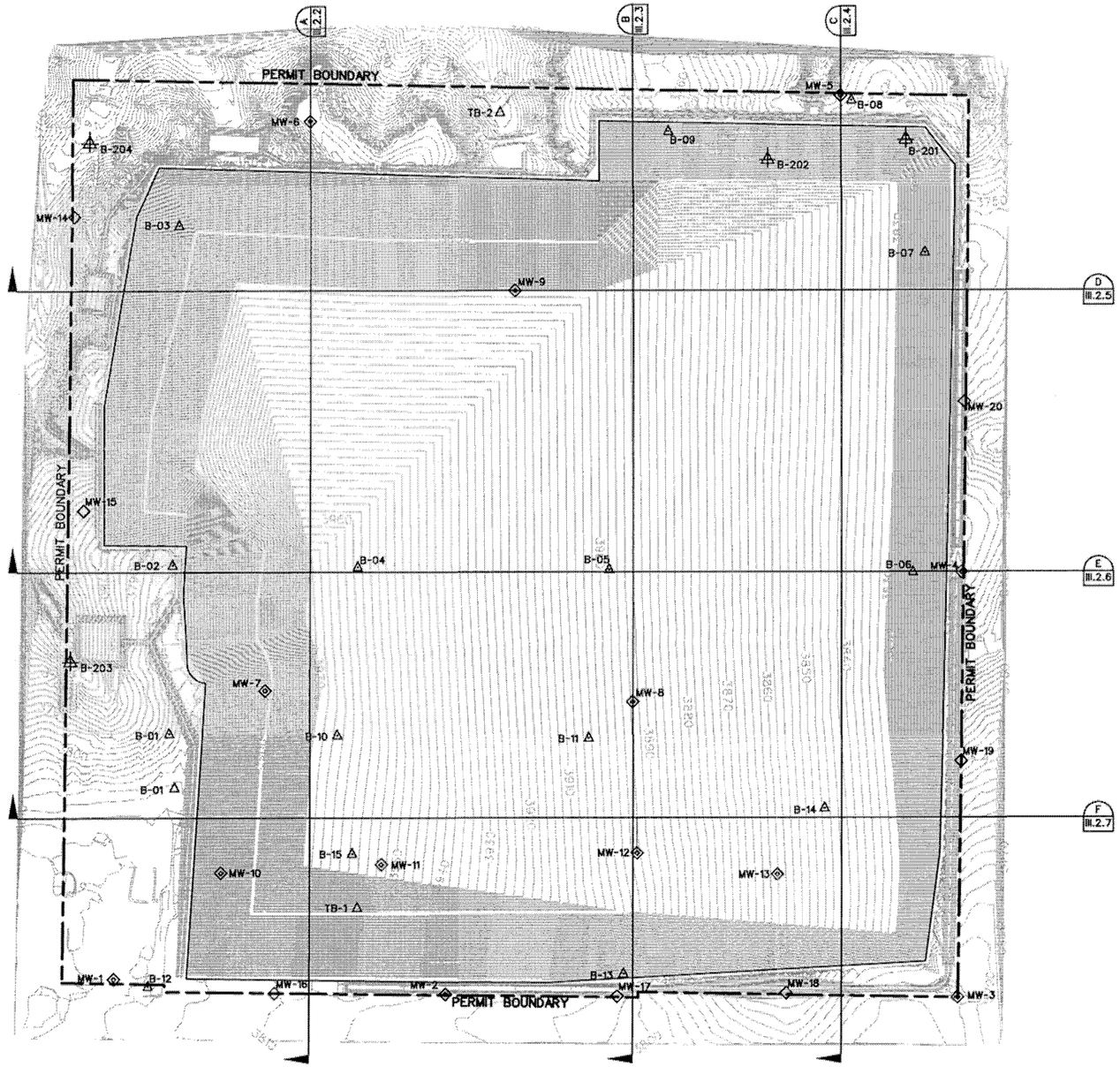
SHEET
III.1.11

USER: SSUMNER
FILE: ...\DAL\0[illegible]03\DM\III01.11.DGN
DATE:6/17/2007
TIME:4:07:01 PM

City of Amarillo
Landfill Permit Amendment – Part III, Attachment 2

Index

Figure III.2.1 Cross-Section Location Map
Figure III.2.2 Typical Cross-Section A-A
Figure III.2.3 Typical Cross-Section B-B
Figure III.2.4 Typical Cross-Section C-C
Figure III.2.5 Typical Cross-Section D-D
Figure III.2.6 Typical Cross-Section E-E
Figure III.2.7 Typical Cross-Section F-F



N

0 400 800

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- MW-1 MONITORING WELL LOCATIONS
- B-07 1975 BORING LOCATIONS
- B-201 2005 BORING LOCATIONS
- TB-2 1994 BORING LOCATIONS

NOTES:

1. THE PROPOSED GRADES REPRESENT THE FINAL CONTOURS (TOP OF FINAL COVER).
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

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STATE OF TEXAS · MITCH R. DAVISON · 90908 · LICENSED PROFESSIONAL ENGINEER

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5/9/2006

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

CROSS-SECTION LOCATION MAP

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FILENAME	...\AMIII02.01.DGN
SCALE	

SHEET III.2.1

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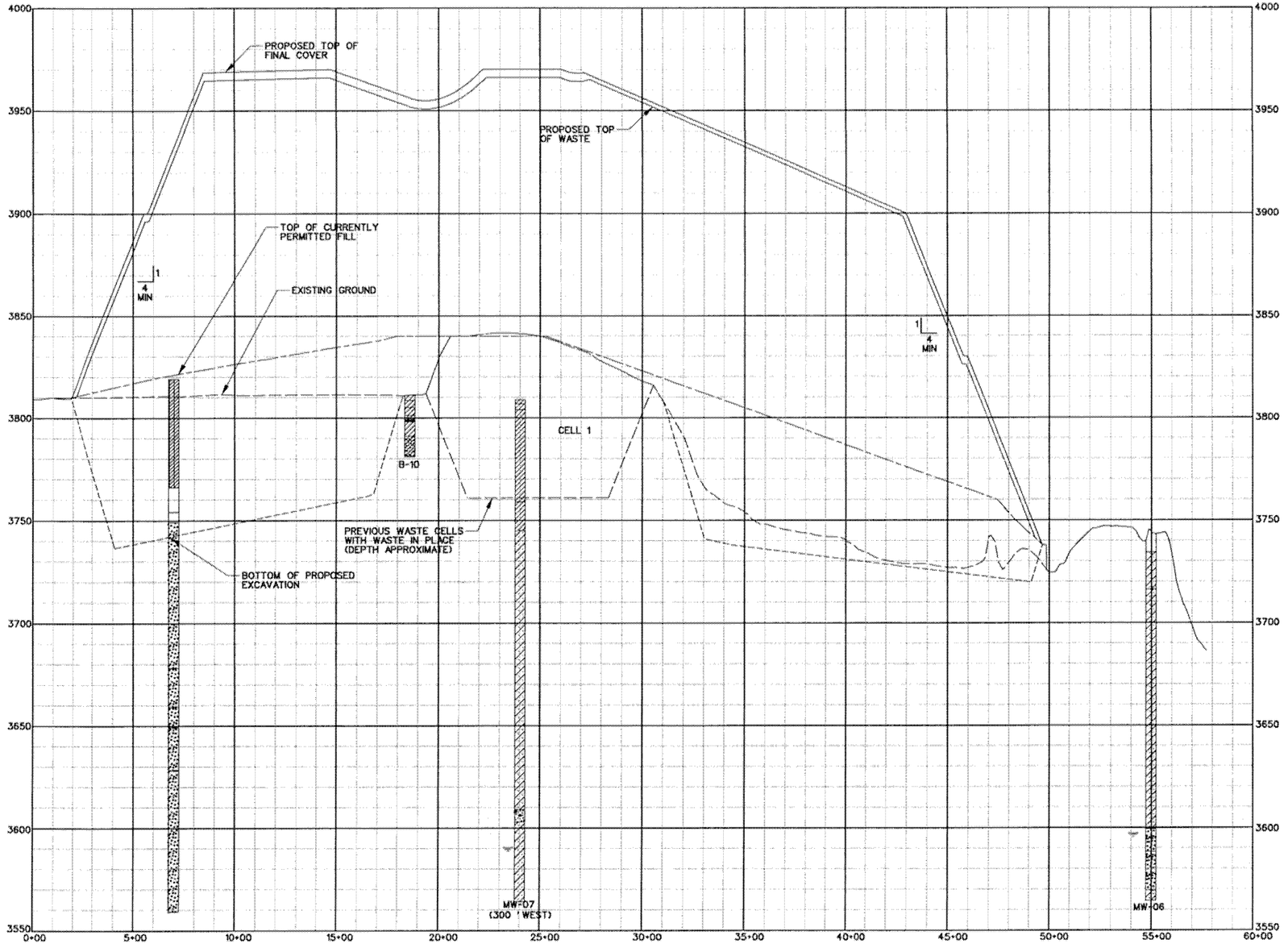


SECTION A III.2.1

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

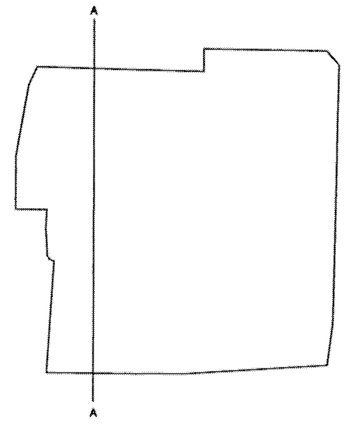
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- SAND
- CALICHE
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS MITCH R. DAVISON 90908 LICENSED PROFESSIONAL ENGINEER 5/9/2006

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION A-A

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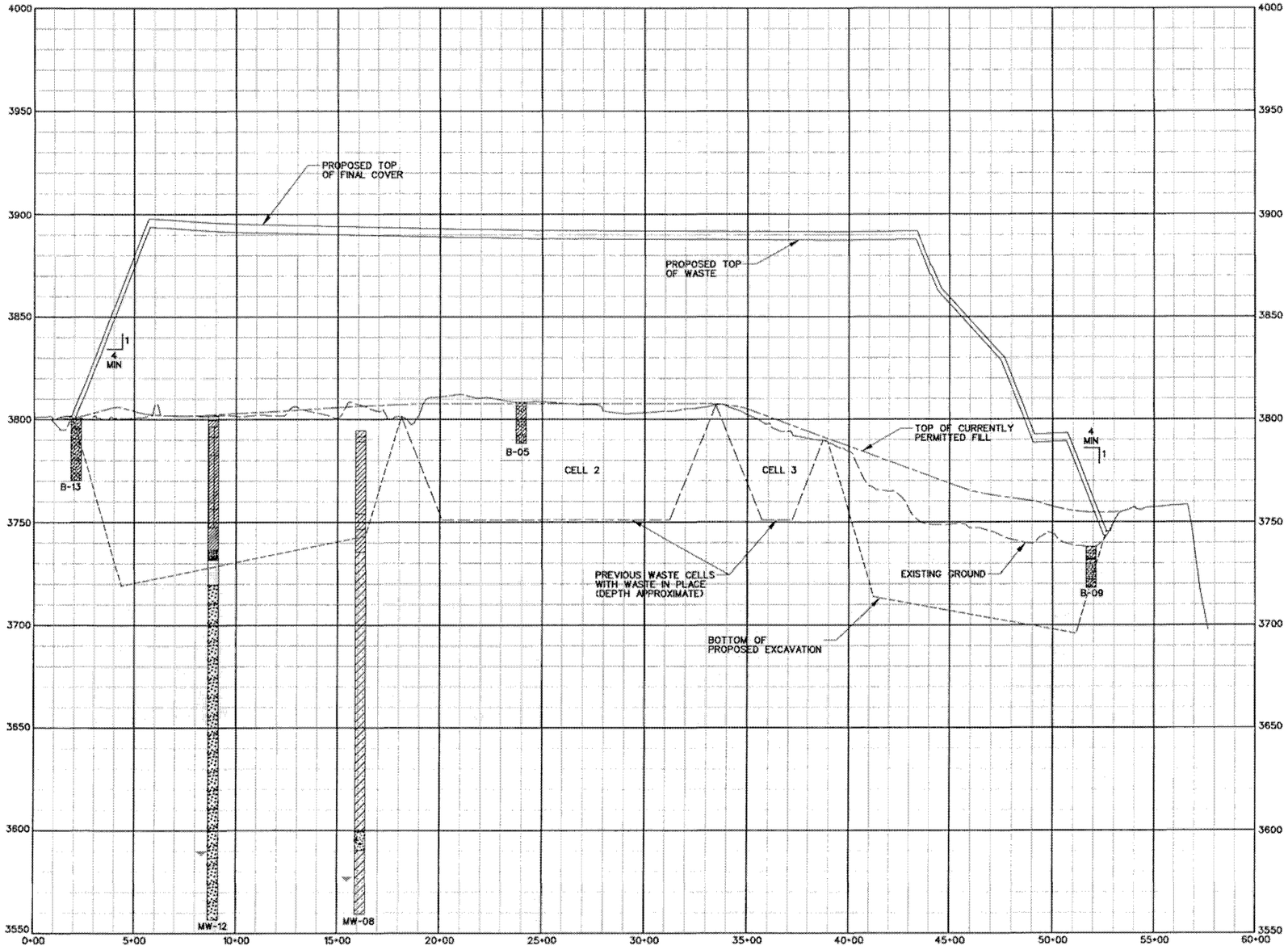


SECTION B / III.2.1

HORIZONTAL 0 300 600
VERTICAL 0 30 60
SCALE IN FEET

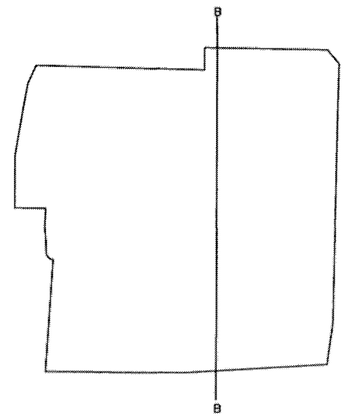
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- CEMENTED CALICHE
- CEMENTED LIMESTONE WITH CALICHE
- SILTY CLAY
- CALICHE
- SAND
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

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CHECKED BY	M. ODEN
DESIGNED	S. MILLER
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QA/QC	M. ODEN
PROJECT NUMBER	23358-037

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5/9/2006

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION B-B

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET III.2.3

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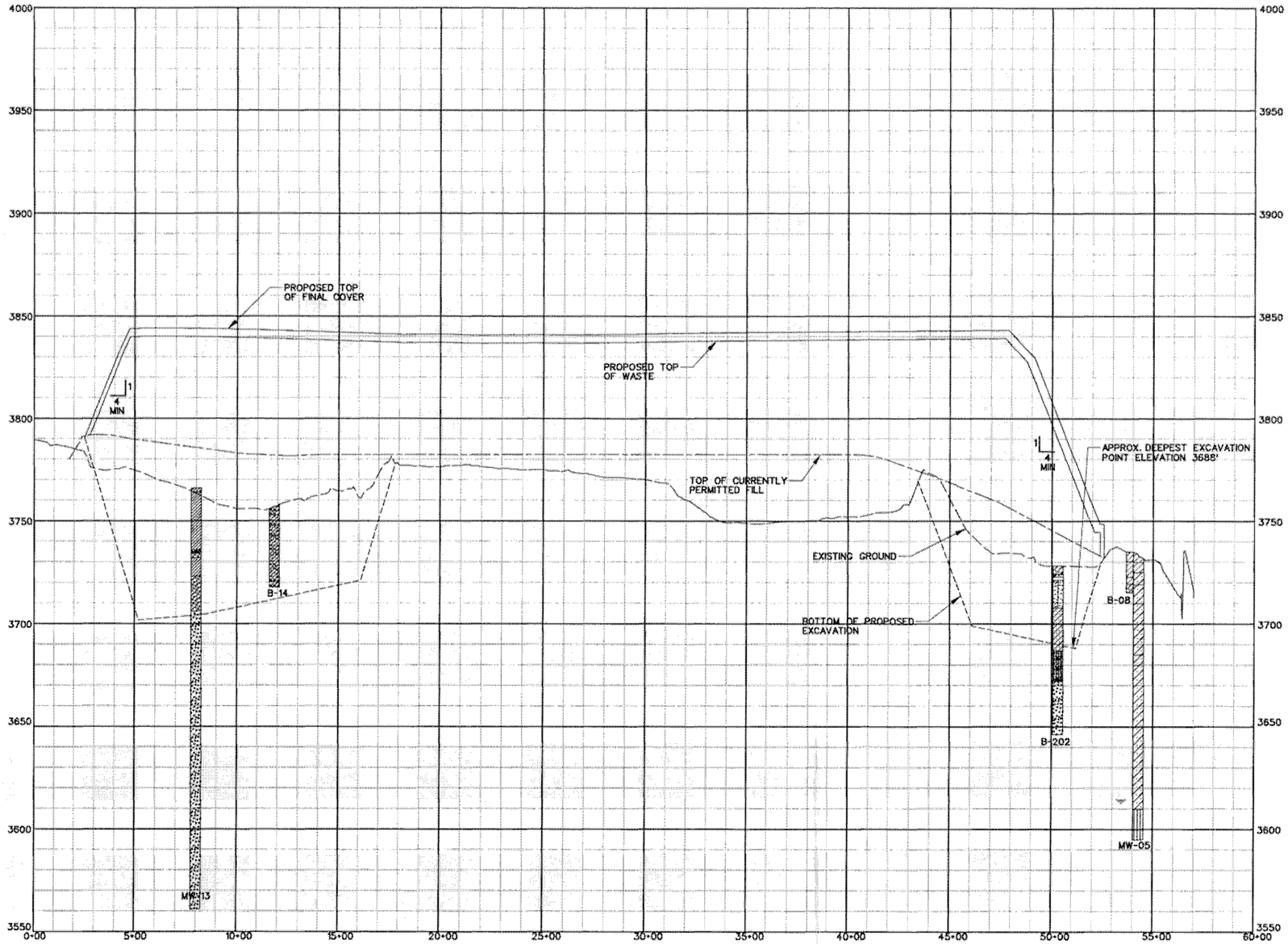


SECTION C / III.2.1

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

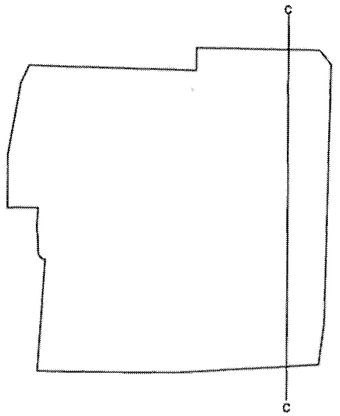
BORING LEGEND

- CLAY
- SANDY CLAY
- SILTY CLAY
- SILTY SANDSTONE
- SAND
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

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CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS · MITCH R. DAVISON · 90908 · LICENSED · PROFESSIONAL ENGINEER

5/9/2006

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION C-C

0 1" 2"

FILENAME	$$FILE$$
SCALE	

SHEET III.2.4

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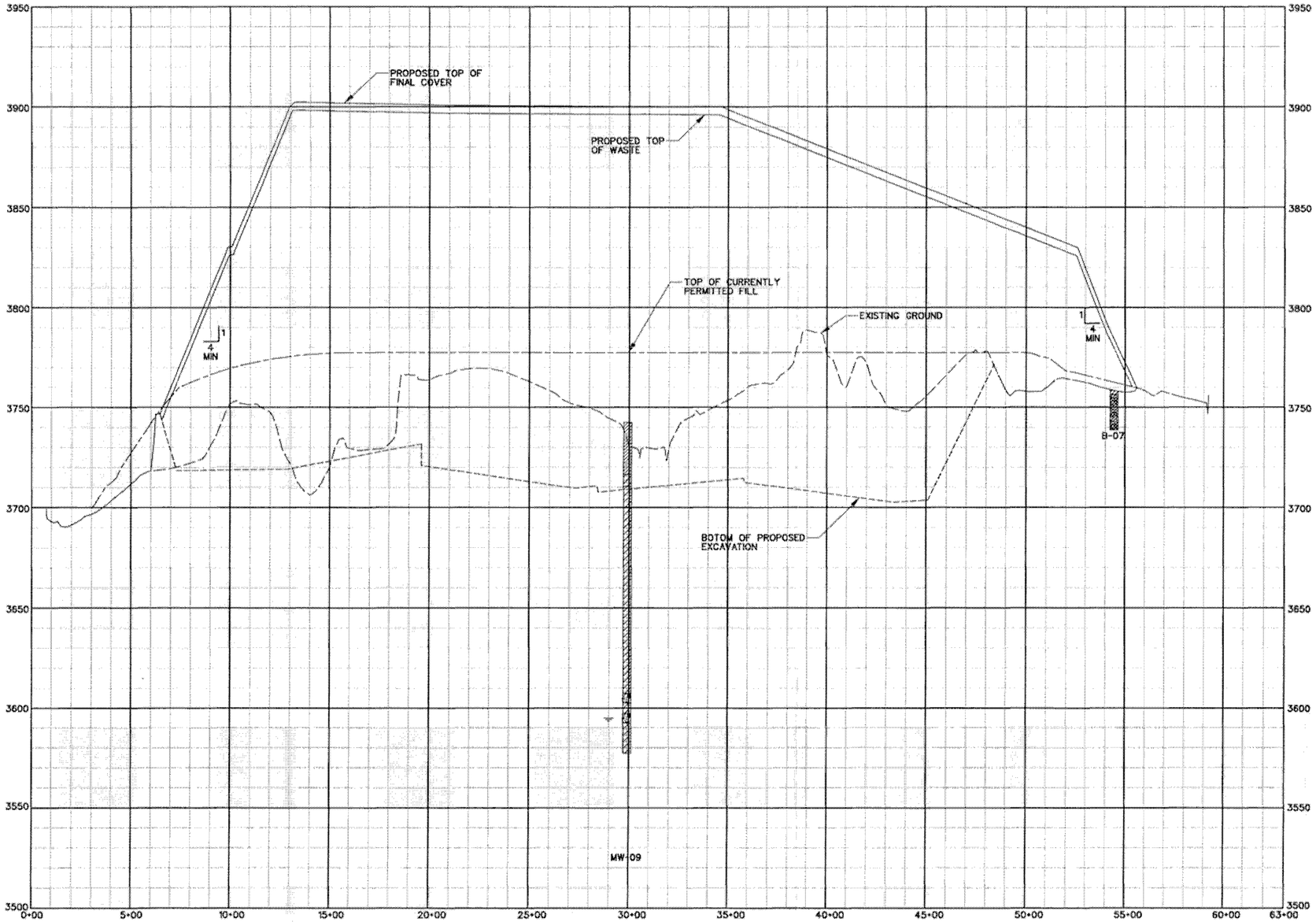


SECTION D
III.2.1

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

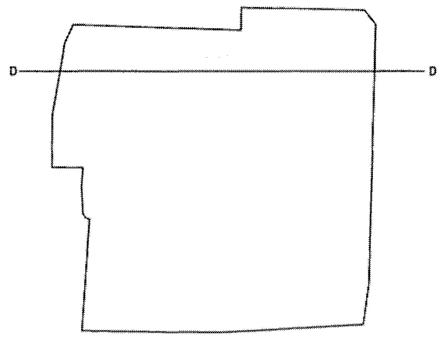
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



CITY OF AMARILLO TEXAS

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CIVIL ENGINEER	M. DAVISON
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DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION D-D

0 1" 2"

FILENAME $$FILE$$

SCALE

SHEET III.2.5

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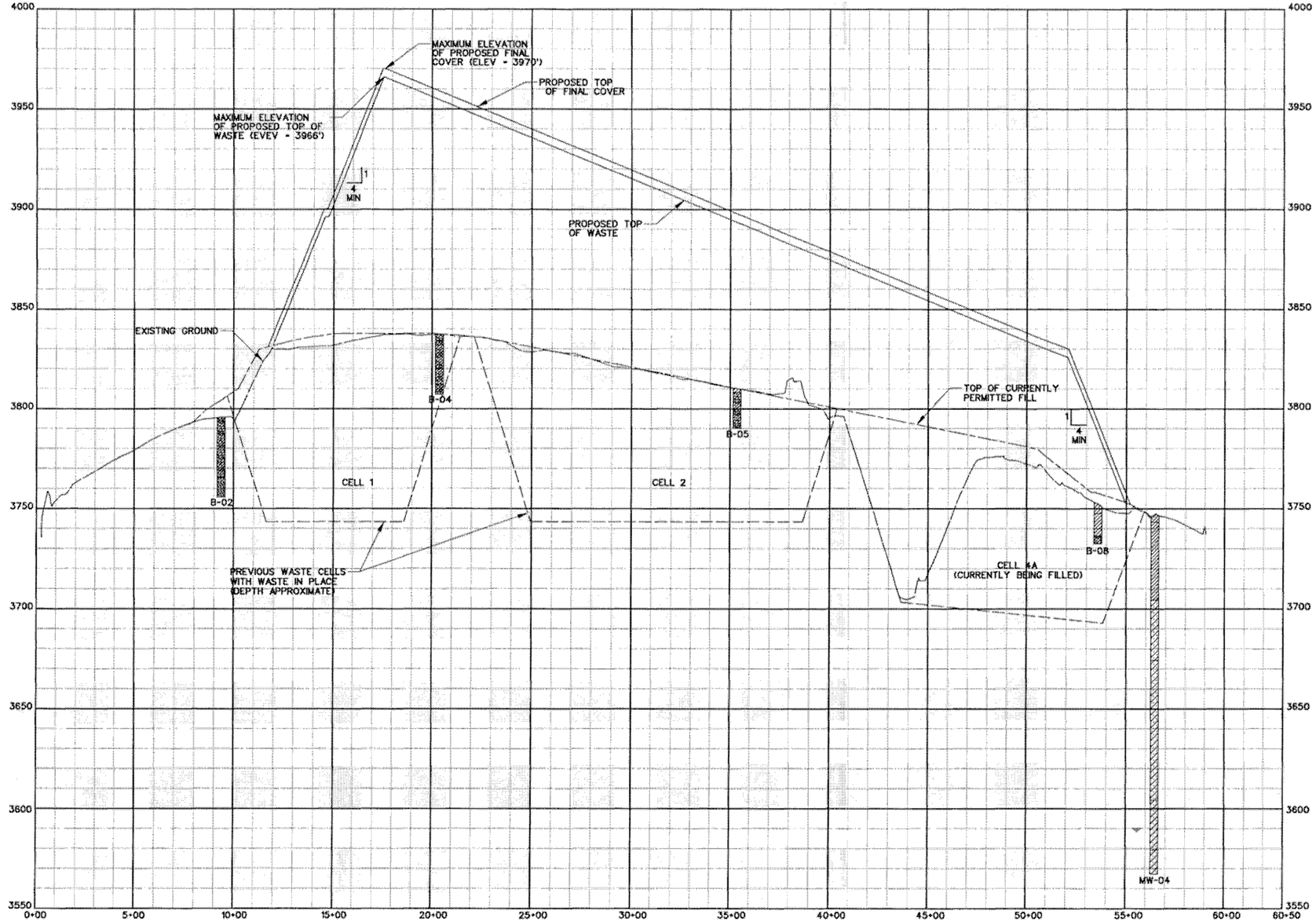


SECTION E
III.2.1

HORIZONTAL 0 300 600
VERTICAL 0 30 60
SCALE IN FEET

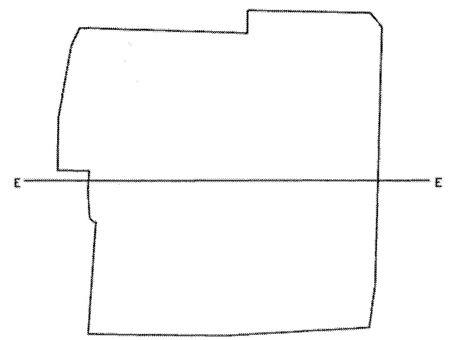
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- CEMENTED LIMESTONE WITH CALICHE
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



HDR Engineering, Inc.

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PROJECT NUMBER	23358-037

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION E-E

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
III.2.6

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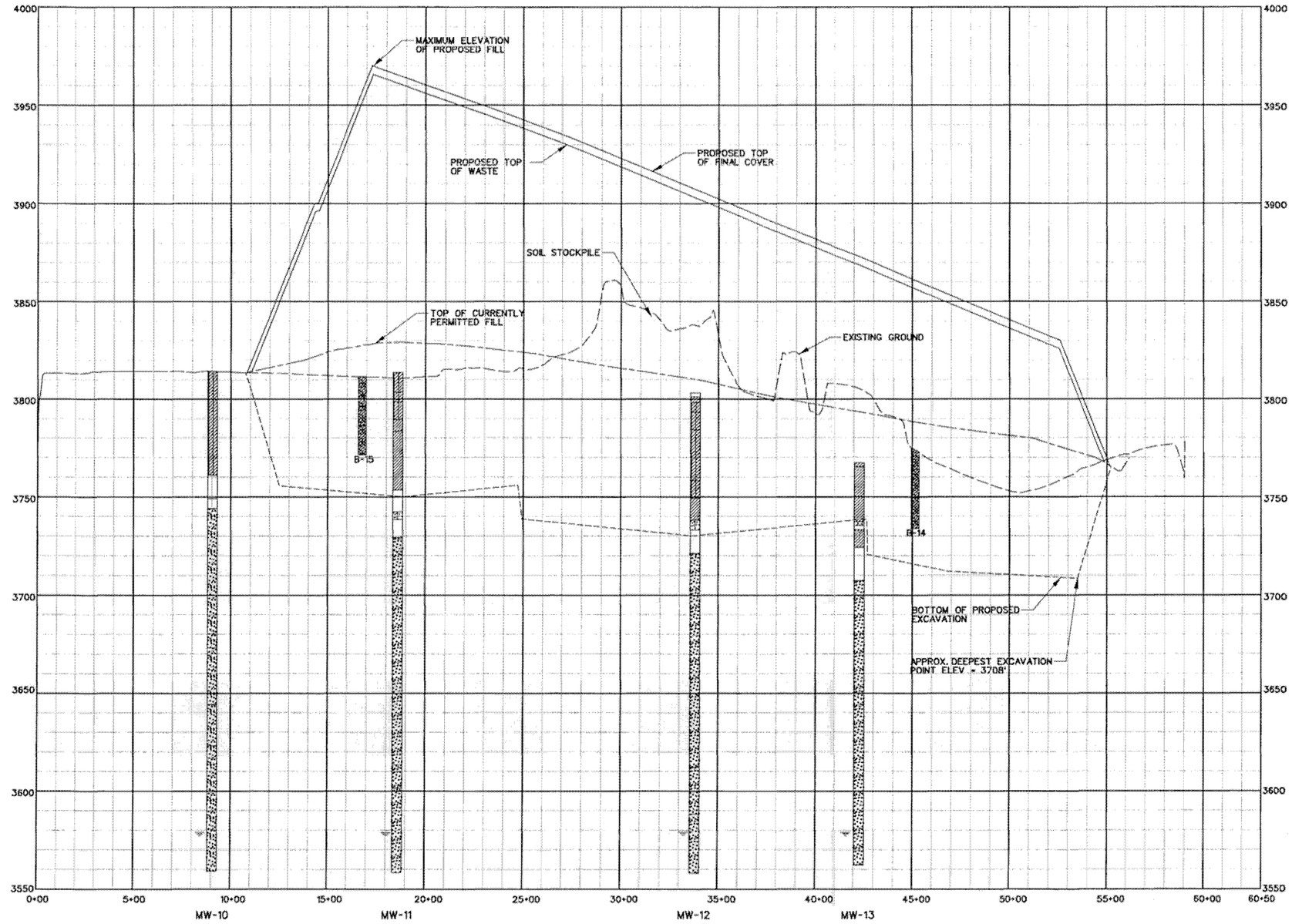


SECTION F — III.2.1

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

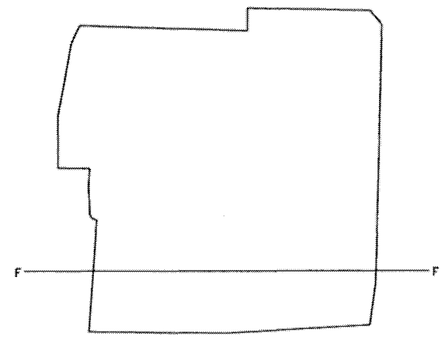
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- SILTY CLAY
- SAND
- CALICHE
- STATIC WATER LEVEL

NOTE:

1. INITIAL WATER LEVELS WERE NOT AVAILABLE FROM HISTORICAL BORING LOGS.

KEY MAP



CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

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DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

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CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION F-F

0 1" 2"

FILENAME $$FILE$$

SCALE

SHEET III.2.7

USER: $$USER$$ DATE: $$DATE$$
FILE: $$FILE$$ TIME: $$TIME$$

City of Amarillo
Landfill Permit Amendment – Part III, Attachment 3

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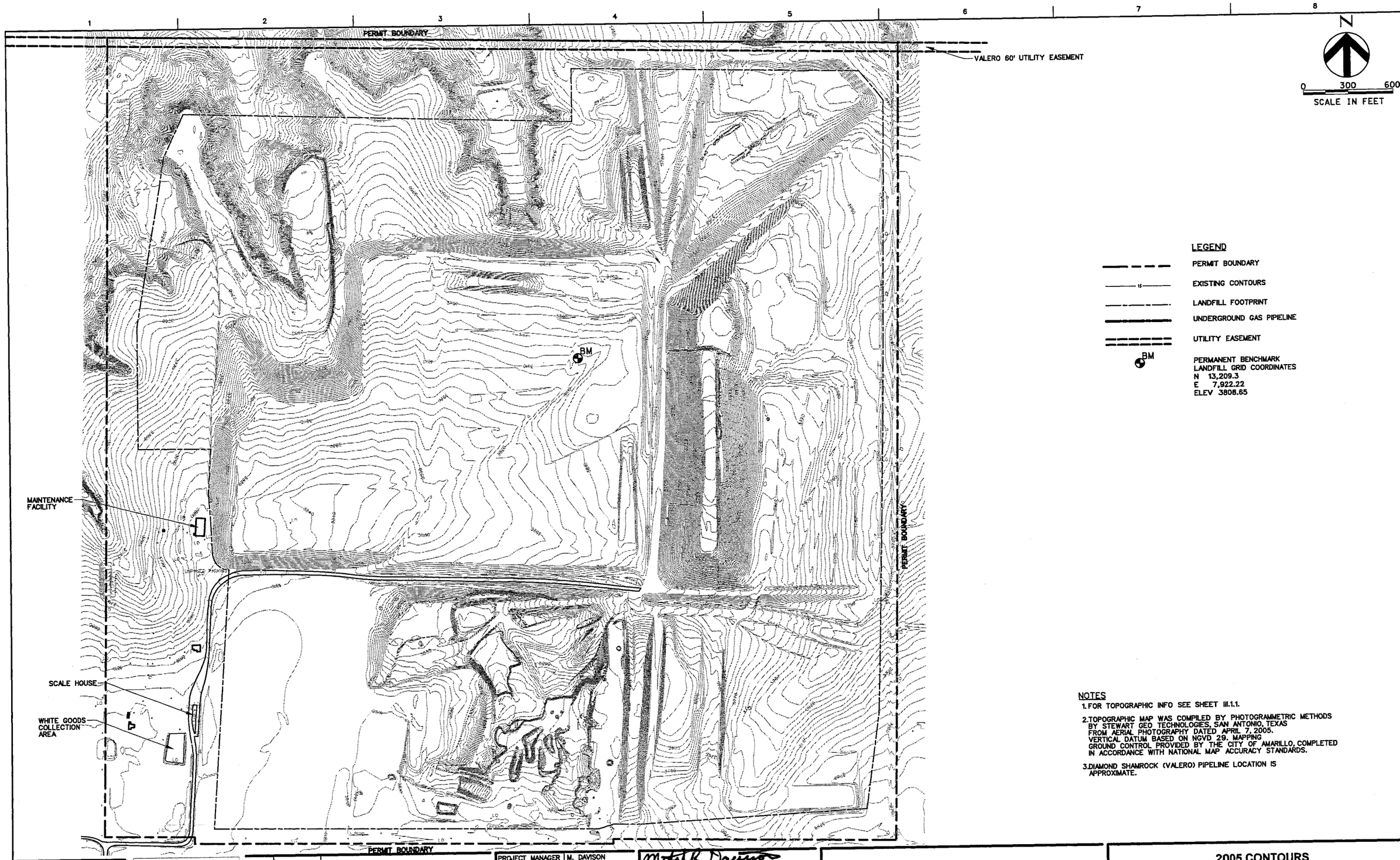
Figure III.3.1 2005 Contours
Figure III.3.2 Existing Conditions Map 1994 Permitted Final Contour Map



N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- EXISTING CONTOURS
- LANDFILL FOOTPRINT
- UNDERGROUND GAS PIPIELINE
- UTILITY EASEMENT
- BM — PERMANENT BENCHMARK
  LANDFILL GRID COORDINATES
  N 13,209.3
  E 7,922.22
  ELEV 3808.65

NOTES

1. FOR TOPOGRAPHIC INFO SEE SHEET III.1.1.
2. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY STEWART GEO TECHNOLOGIES, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED APRIL 7, 2005. VERTICAL DATUM BASED ON NGVD 29. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
3. DIAMOND SHAMROCK (VALERO) PIPELINE LOCATION IS APPROXIMATE.

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

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PROJECT MANAGER	M. DAVISON
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12/15/2005

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

2005 CONTOURS

0 1" 2"

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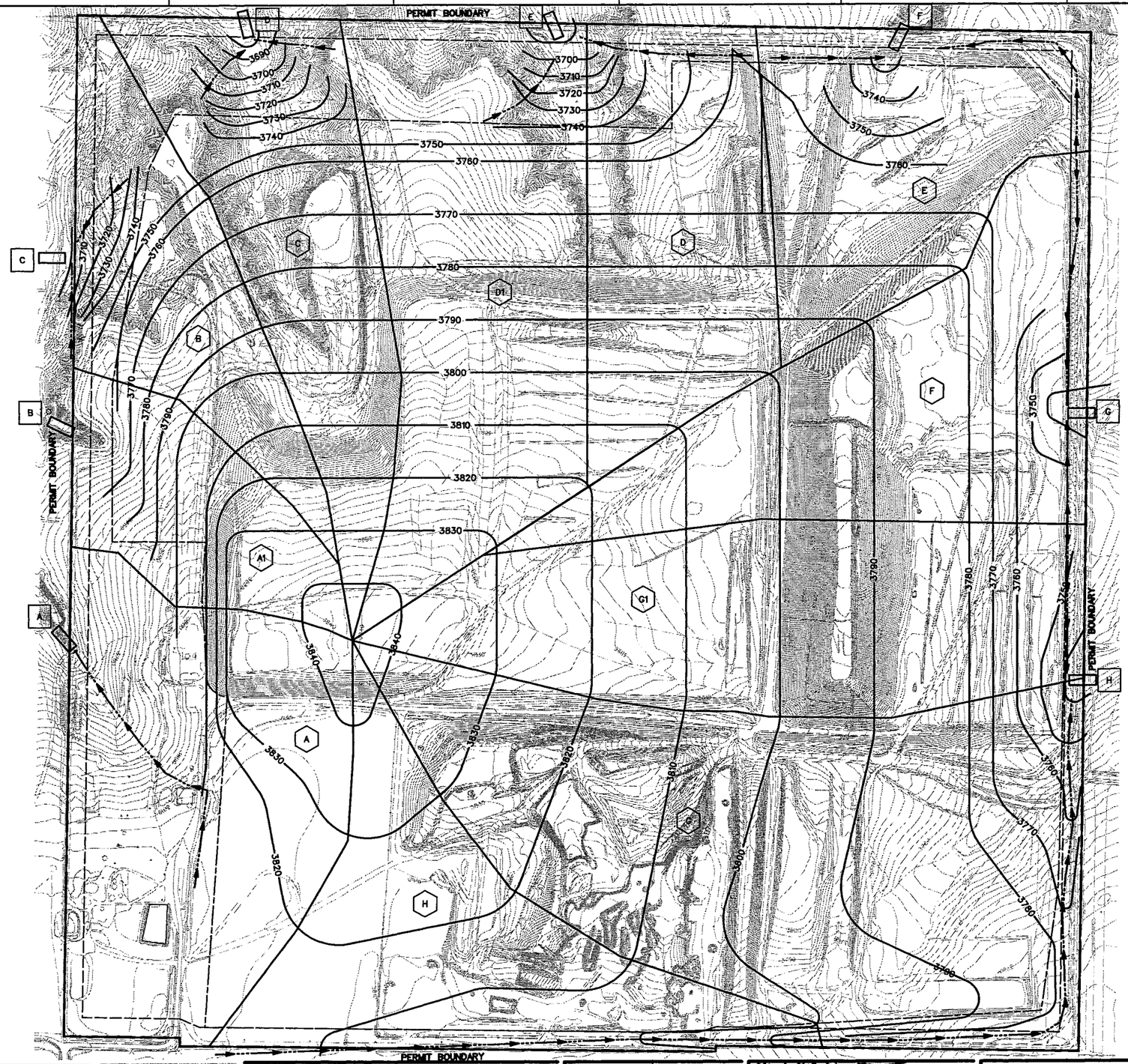

N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- DRAINAGE BOUNDARY LINE
- 32 PROPOSED FINAL CONTOURS
- 15 EXISTING CONTOURS
- OUTLET CULVERTS
- DRAINAGE DITCH
- H DISCHARGE POINT
- A DRAINAGE AREA

SCS Parameters in HEC-HMS
Existing Conditions - 1994 Permit

Discharge*	Subbasin	Area (acres)	Area (sq. mi.)	t_{lag} (min)	CN	Q25 (cfs)	V25 (fps)
	A	71.9	0.1123	21.6	80		
@A						119	12.0
	A1	27.1	0.0423	7.8	80		
@B						68	6.7
	B	36.1	0.0564	17.4	80		
@C						66	4.0
	C	49.2	0.0769	19.8	80		
@D						84	3.2
	D	47.8	0.0747	22.5	80		
	D1	71.1	0.1111	20.3	80		
@E						198	4.1
	E	48.1	0.0752	13.7	80		
@F						97	10.1
	F	65.1	0.1017	19.8	80		
@G						112	5.5
	G	120.3	0.1880	34.8	80		
	G1	71.1	0.1111	22	80		
	H	53.2	0.0831	27.6	80		
@H						340	5.4

*Discharge points changed from model runs to match proposed conditions.

NOTES

1. PROPOSED GRADES REPRESENT 1994 PERMITTED TOP OF FINAL COVER.
2. FOR TOPOGRAPHIC INFO SEE DRAWING III.1.1
3. FOR PERMIT BOUNDARY INFO SEE DRAWING III.1.1.

CITY OF AMARILLO TEXAS

HDR

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

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CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
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DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

STATE OF TEXAS
MITCH R. DAVISON
90908
LICENSED
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5/9/2006

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

EXISTING CONDITIONS MAP 1994 PERMITTED FINAL CONTOUR MAP

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SCALE

SHEET III.3.2

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Part III

Attachment 4

Geology and Geotechnical Report

Permit Amendment – MSW No. 73A

City of Amarillo,
Potter County, Texas

May 2006

Michael M. Shiflett, P.E.

STATE OF TEXAS
M. M. SHIFLETT
43763
LICENSED
PROFESSIONAL ENGINEER

Donald D. James, P.G.

STATE OF TEXAS
DONALD D. JAMES
GEOLOGY
360
LICENSED
PROFESSIONAL GEOSCIENTIST

GROUNDWATER MONITORING SYSTEM CERTIFICATION

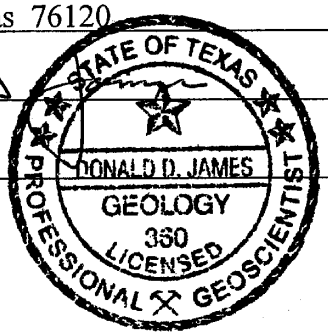
General Site Information

Site:	City of Amarillo Landfill
Site Location:	Amarillo, Potter County, Texas
Permit No:	73
Date Permit Issued:	1974

Qualified Groundwater Scientist Statement

I, Donald D. James, P.G., am a licensed professional geologist in the State of Texas (Texas License No. 360). I have completed the baccalaureate degree at Texas Tech University and have been a consulting engineering geologist since 1980. I am a qualified groundwater scientist as defined by 30 TAC §330.2. I have participated in the preparation of Attachment 4, Geology Report for the City of Amarillo MSW Permit No. 73 Amendment.

Firm/Address:	Kleinfelder
	6850 Manhattan Boulevard, Suite 300
	Fort Worth, Texas 76120
Signature:	Donald D. James
Date:	7-19-06



City of Amarillo
Landfill Permit Amendment – Part III, Attachment 4

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1994 Alternate Liner Design

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Appendix 4B

Updated Slope Stability Analysis and Liner System Design (2005)
- 2005 Slope Stability Analysis
  - Excavation Slope
  - Interior Slope – Interim Waste Slope
  - Final Slope
- 2005 Liner System Design
- 2005 Foundation Settlement Calculations
- 2005 Solid Waste Settlement Calculations
- 2005 Final Cover Differential Settlement Analysis

- Monitoring Well Groundwater Elevation Summary

Appendix 4C

• Site Plan with Boring Locations	HDR Engineering, Inc.
• Key to Logs of Borings	Kleinfelder
• 2005 Logs of Borings B-201 through B-204	Kleinfelder
• Geological Map	Kleinfelder
• Groundwater Contour Map	Kleinfelder
• Groundwater Monitoring Data	Kleinfelder
• 1999 Logs of Borings PP-8 through PP-12	Dyess-Peterson Testing Laboratory, Inc.
• 1999 Monitoring Wells MW-10 through MW-13	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Logs of Borings TB-1 through TB-2	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Monitoring Well MW-1 through MW-6	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Logs of Borings PZ-1 through PZ-3 (MW 7 - 9)	Dyess-Peterson Testing Laboratory, Inc.
• 1979 Logs of Borings No. 1 through No. 4	Dyess-Peterson Testing Laboratory, Inc.
• 1975 Logs of Borings No. 1 through No. 15	Dyess-Peterson Testing Laboratory, Inc.

OVERVIEW OF ATTACHMENT 4 INFORMATION

The City of Amarillo plans to vertically expand its landfill. The waste footprint of the proposed landfill will be identical to the footprint that the TNRCC (now TCEQ) originally approved in 1975 and reviewed again as part of the Alternate Liner Demonstration (ALD) submitted in compliance with the requirements of the RCRA Subtitle D upgrades. The ALD provided for utilizing a flexible membrane liner including a geosynthetic clay liner (FML/GCL).

A Subsurface Investigation and Geotechnical Soils Report was produced by Dyess-Peterson Testing Laboratory, Inc. in 1994 in support of the Alternate Liner Demonstration. Subsurface information contained in the 1994 Alternate Liner Demonstration (see Appendix 4A) has been reviewed in connection with this 2005 permit amendment. The Dyess-Peterson report interprets subsurface borings, laboratory soil classification tests, as well as presenting information on soil characterization and lithology. The information contained in the 1994 report remains applicable to this permit amendment.

As a portion of this 2005 permit document, four additional geotechnical borings were drilled. Borings 201 and 202 were drilled June 7 and 8, 2005 in the northeastern portion of the permitted area. The purpose of these borings was to retrieve soil samples and to review stratigraphic information with existing subsurface information. Recovered soil samples from Borings 201 and 202 were used for further analysis regarding landfill foundation settlement as presented in Attachment 4, 2005 permit document. Borings 203 and 204 were drilled on September 7 and 8, 2005 in the western portion of the permitted area in order to install piezometers, and to gather additional groundwater information.

The geologic data and much of the geotechnical analysis from the 1994 permit documents have not changed, and consequently, the data from the Alternate Liner Demonstration, including Site Hydrogeologic and Geotechnical Report from the 1994 permit documents is attached and incorporated in it's entirety as an appendix to this updated report. However, several portions of the 1994 geologic and geotechnical data and analysis – primarily portions regarding slope stability analysis, liner system design, and settlement analysis – have been updated for this 2005 application in order to reflect the impact and different loading conditions due to the increase in height of solid waste.

The following information is included in this 2005 Attachment 4 as Appendices.

Attachment 4 Appendices

Appendix 4A – Alternate Liner Demonstration with Appendices (1994 permit document)

- 1994 Alternate Liner Design

Appendix 4B - Updated Slope Stability Calculations and Liner System Design (2005)

- Updated Slope Stability Analysis and Liner System Design (2005)
    - 2005 Slope Stability Analysis
        - Excavation Slope
        - Interior Slope – Interim Waste Slope
        - Final Slope
    - 2005 Liner System Design
    - 2005 Foundation Settlement Analysis

Appendix 4B (continued)

    - 2005 Solid Waste Settlement Analysis
    - 2005 Potential Final Cover Differential Settlement Analysis
- Monitoring Well Groundwater Elevation Analysis

Appendix 4C – Logs of Borings for Subsurface Exploration at Amarillo Landfill

• Site Plan with Boring Location	HDR Engineering, Inc.
• Key to Logs of Borings	Kleinfelder
• 2005 Logs of Borings B-201 through B-204	Kleinfelder
• Geological Map	Kleinfelder
• Groundwater Contour Map	Kleinfelder
• Groundwater Monitoring Data	Kleinfelder
• Typical Monitoring Well Detail	Kleinfelder
• 1999 Logs of Borings PP-8 through PP-12	Dyess-Peterson Testing Laboratory, Inc.
• 1999 Monitoring Wells MW-10 through MW-13	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Logs of Borings TB-1 through TB-2	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Monitoring Well MW-1 through MW-6	Dyess-Peterson Testing Laboratory, Inc.
• 1994 Logs of Borings PZ-1 through PZ-3 (MW 7 - 9)	Dyess-Peterson Testing Laboratory, Inc.
• 1979 Logs of Borings No. 1 through No. 4	Dyess-Peterson Testing Laboratory, Inc.
• 1975 Logs of Borings No. 1 through No. 15	Dyess-Peterson Testing Laboratory, Inc.

1.0 REGIONAL INFORMATION

The regional information contained in the 1994 documents (Appendix 4A of this 2005 document) is incorporated herein as if set out in its entirety in the text of the 2005 application. This information was generated from published geologic references and has been reviewed in connection with this 2005 application. The information when compared to our experience for the area and the landfill, with our site observations, and with four recent geotechnical core borings, is applicable as previously published.

Information on regional geology and hydrogeology was included in the 1994 permit documents by HDR, and is included in this 2005 document as Appendix 4A. A portion of that information is being produced in this current section as an aid to the reader. For the complete and detailed discussion of regional geologic information, please refer to Appendix 4A of this 2005 document.

The following sections Physiography and Topography, Regional Geology and Regional Hydrogeology have been extracted from the 1994 Alternate Liner Demonstration prepared by HDR Engineering, Inc.

Physiography and Topography

The site lies within the Southern High Plains (high Plains) physiographic region in the Texas Panhandle (Figure 3). The High Plains encompasses approximately 22,000 square miles and extends eastward where it is defined by a sharp escarpment several hundred feet high (Cronin, 1971). The Southern High Plains form a relatively flat plateau that slopes toward the southeast at approximately 10 feet per mile. The surficial deposits consist mainly of clays and loams (Nativ, 1988) and also sand and silty loams and fine sandy loams (Knowles, 1984). Figure 4 shows a distribution of soil types within Potter County, Texas.

Immediately to the north of the site is the Canadian River Basin, which has eroded much of the overlying surficial material and created essentially a large valley or canyon feature. Several tributaries branch off the main system creating valley and plateau features which gives rise to a much more pronounced relief in this area compared to areas further south on the High Plains.

The site topography ranges from approximately elevation 3,700 feet on the northern section to approximately 3,800 feet on the southern section (Figure 5). The majority of the site is fairly flat with little relief. However, the northern section of the property is dissected by three main drainage features that divert drainage from the site to the north. These drainage features are most likely associated with the Canadian River Basin. The change in relief on the northern section of the site can be as much as 100 feet.

Regional Geology

The stratigraphy of the High Plains consists of deposits ranging in age from the Permian to Recent. In general, the deposits consist of sandstone, shales, limestones, clays, sands, and windblown deposits of sands and clays near the surface. The primary water-bearing deposits in the High Plains area are usually from the Cretaceous and Tertiary deposits. Of these deposits, the Ogallala (Pliocene Age) and the Washita, Fredericksburg, and Trinity groups (Cretaceous Age) supply the majority of the usable water in the High Plains. The general stratigraphy for the area is summarized in Figure 7.

In the vicinity of the Amarillo area, the Jurassic and Cretaceous deposits are absent. The stratigraphy consists in general of the Ogallala Formation unconformably overlying rocks of Triassic and Permian Ages (Nativ, 1988). In the Amarillo area, the Ogallala Formation specifically overlies rocks of Triassic age (Figure 8). Directly overlying the Ogallala are deposits consisting primarily of silty sands, fine sands, clays, and loams of the Blackwater Draw Formation that have been deposited by either wind or fluvial deposition. Near the top of the Ogallala Formation, caliche is typically encountered which is usually referred to as the "Caprock." The caprock forms an east facing escarpment toward the eastern most extent of the High Plains area. Triassic deposits are exposed north of Amarillo along the Canadian River Basin where the Canadian River has eroded the overlying Ogallala Formation. The thickness of these deposits has been measured up to 150 feet along portions of the Canadian River valley. The Triassic deposits are of continental origin (Cronin, 1971) and have been named the "Dockum Group" and typically consist of varicolored shale to sandy shale, sandstone, and conglomerate. Depending on the location within the High Plains, the Dockum Group can be subdivided into at least three formations consisting of 1) Tecovas Formation (basal member), 2) Santa Rosa Formation (middle member), and 3) Chinle Formation (upper member). The Triassic deposits also are typically referred to as the "redbed" because of their reddish color throughout the section.

According to Seni (1980), the Ogallala Formation was deposited in a deltaic environment as a series of overlapping alluvial fanes derived from deposits from the uplift of the southern Rocky Mountains to the west. Figure 9 show a generalized depositional facies map of the Ogallala. Prior to the deposition of the Ogallala, streams originating from the west eroded the existing Permian, Triassic, Jurassic and Cretaceous strata forming valleys

and basins. The erosion of these strata occurred until at least late Miocene to early Pliocene at the time when the climate was arid.

The Dockum Group is of continental origin and is believed to have been deposited as river-channel and flood plain deposits (Cronin, 1971). Seni, 1988 indicates the depositional setting involved braided and meandering streams, alluvial fan deltas, lacustrine deltas, lacustrine systems, and mud flats. These deposits were laid down in a basin feature that underwent folding prior to and after deposition. The resultant surface of the Triassic deposits was one of valleys and basins.

The site lies within the northern portion of the Palo Duro Basin, which is considered a small subbasin to the Permian Basin of southwest Texas (Gustavson and others, 1981). To the northeast is the Amarillo uplift and to the south is the Matador Arch. The uplifts are thought to have occurred as the result of movement along high-angle reverse faults. Faulting within the region created displacement of small blocks which in turn formed subbasins, such as Palo Duro Basin and others in this area. Figure 10 shows a generalized structure map of the region.

Regional Hydrogeology

The Ogallala Formation (also called the High Plains aquifer) is the major aquifer of the High Plains area. In Texas, the area extent of the Ogallala is approximately 111,000 square kilometers (Figure 11). The Ogallala consists primarily of fluvial unconsolidated clastic deposits of sand, silt, clay and basal gravel...

Throughout much of the High Plains, the Ogallala Formation is unconfined (water table conditions). In the Amarillo area, the depth to groundwater is approximately 200 to 230 feet below the ground surface and the saturated thickness ranges from 0 (near the Canadian Breaks) to approximately 100 feet (McReynolds, 1990). The Canadian River Basin as well as withdrawal of groundwater are controlling factors on the depth and saturated thickness. The regional groundwater flow direction is toward the south-southeast, which is controlled by the structure of the High Plains. The rate of movement is on the order of 60 to 150 feet per year. The rate of movement is controlled by the gradient (approximately 0.008 ft/ft) and permeability of the material in the saturated zone...

Recharge to the Ogallala Formation is usually small. According to data published by Knowles and others, 1984, an average of less than 0.2 inches of water reaches the water table as natural recharge. Areas where natural recharge is the highest are usually associated with where the Ogallala outcrops and caliche layers are absent, through Quaternary deposits that overlie the Ogallala, and potentially along river channels of flowing streams.

Discharge from the Ogallala occurs through natural outlets such as seeps and springs or as leakage to the underlying formations (Nativ, 1988). Similar chemical composition between the Ogallala aquifer and underlying formations that the Ogallala is in contact with suggest that flow between the Ogallala and deeper aquifers does occur. Pumping, however, accounts for the greatest amount of discharge from the Ogallala.

1.1.1 Fault Areas

The Amarillo Landfill was examined for the presence of faulting. A review was made of the references listed for the location restriction Statement of Compliance for "Faulting," September 10, 1993, for this permit. This information remains valid in support of the original compliance statement. Based on a review of the available literature in corroboration with site reconnaissance by a professional geologist, no active faults are interpreted to occur within 200 feet of the site. The site therefore complies with Subtitle D regulation TCEQ 30 TAC §330.303.

1.1.2 Geomorphology

The site occurs within the southern high plains physiographical province of North America. The site is founded in a peneplain of fluvial outwash and eolian sediments deposited at the end of the tectonic uplift of the Rocky Mountains (Laramide Orogony) during late Cretaceous to early Cenozoic time (40 to 65 mya). These sediments range from 100 to 500 feet thick and are located over incised Triassic and Permian age bedrock. The fluvial source for the sediments were cut off at the inception of the Pecos River process. Eolian deposition of the southern high plains continues through present.

In time arid cycles have cemented upper portions of these sediments with formation of caliche recognized as erosionally resistant "caprock." The land surface is generally flat with little topographic relief except for playa lakes dotting the land surface. The Canadian River process, immediately north of the landfill, has incised the landscape down through the Permian bedrock resulting in precipitous exposures.

1.1.3 Tectonic Setting

The site is founded in structurally stable Pliocene age sediments ranging from 100 to 500 feet thick depending on the location over the underlying incised Triassic age bedrock.

The "Tectonic Map of Texas, BEG, U.T. Austin, 1990" indicates the site is located between the Palo Duro Basin geological structural feature to the south and the Amarillo Uplift to the north. According to this reference the Palo Duro Basin is recognized in the Precambrian age basement rock approximately 1,200 meters (3,900 feet) below sea level. The Amarillo Uplift is recognized in the Precambrian age basement rock approximately at sea level (3,500 feet below the land surface).

Hinging between these two tectonic structures is the Whittenburg Trough, Bush Dome, and Carson Basin. The Whittenburg trough is indicated approximately 20 miles north of the landfill site in northern Potter County approximately 2,000 to 2,800 meters (6,600 to 9,300 feet) below sea level. This trough trends generally west to east. The Bush Dome is a subordinate upwelling of the Whittenburg Trough bounded by deep seated faulting and occurs approximately nine miles northeast of the landfill in central Potter County approximately 1,000 meters (3,300 feet) below sea level. The Carson Basin is recognized approximately 20 miles northeast of the landfill from 1,000 to 1,400 meters (3,300 to 4,500 feet) below sea level.

1.1.4 Faulting

There are no known active (within the last 10,000 years) faults within 195 miles of the site. There are no faults mapped within five miles of the landfill site. A group of normal intersecting faults within the basement structure are mapped as close as 5 miles northwest of the site. These faults strike northwest to southeast with associated strikes of northeast to southwest. The reference shows this cluster of faults to occur in a southeastern extension of the Bravo Dome in northeastern New Mexico and just south of the southern end of the mapped Whittenburg trough.

The reference indicates faulting of undetermined nature to occur within the Palo Duro Basin as close as five miles west to northwest of the landfill and trend approximately northwest to southeast. This fault is mapped over 12.5 miles in the basement structure and strikes approximately 60° west of north. If extended this fault would not intersect the landfill site.

The nearest surface displacements are mapped as Quaternary faults located in the Meers Fault Zone approximately 195 miles east of the site in Oklahoma, and approximately 195 miles northwest of the site in the Sangre de Cristo mountains of New Mexico.

Based on a review of the available literature in corroboration with site reconnaissance by a professional geologist, no active faults are interpreted to occur within 200 feet of the site. The site therefore complies with Subtitle D regulation TCEQ 30 TAC §330.303.

1.2 Unstable Areas

Unstable areas as defined in 30 TAC §330.305 are locations that are susceptible to natural or human-induced events or forces capable of impairing the integrity of structural components of the landfill such that one or more of the components could no longer prevent a release from the landfill.

The potential existence of unstable areas for the City of Amarillo Landfill was evaluated by site observations, a review of available geotechnical and geologic information, and experience from construction projects within the landfill.

Based on the existing geologic/geotechnical site data, site reconnaissance by a professional geologist, the site is not located within karst terrain, nor is the site underlain by unstable sediments or soil layers or susceptible to mass movement. Settlement analysis using laboratory test results from on-site material indicate that expected settlements would not negatively influence the landfill.

Side slopes have been constructed prior to this permit amendment in 2005. The constructed slopes as observed have not experienced slope failures nor do they show signs of instability. Stability calculations indicate the slopes will have adequate factors of safety and this is further evidenced by acceptable slope performance of the existing slope.

To summarize, as stated above, the following factors have been addressed when determining whether an area is unstable:

1. On-site or local soil conditions that may result in significant differential settling. The foundation subsurface strata, when loaded, will not be susceptible to differential settlements that would negatively influence the landfill.
2. On-site or local geologic or geomorphologic features. The site does not contain geologic or geomorphologic features that would result in unstable foundation conditions at the site.
3. On-site or local human-made features or events (both surface and subsurface). There are no on-site or local human-made features at the site that are negatively impacting the construction or operation of the landfill.

Based upon the above stated conclusions, site observations, and on-going landfill construction, monitoring, and subsequent site surveys, the City of Amarillo Landfill is in compliance with the Subtitle D – Unstable Areas Location Restrictions, as stated in 30 TAC §330.305, in my professional opinion.

1.3 Erosion

The site is subject to dominant southerly wind patterns. As indicated on the Land Use Map presented in Part 1, about 36 percent of the time the wind is blowing from the south and southwest as per TCEQ website. The current wind, direction, and erosive impact is being controlled in the daily operations and by existing and final cover vegetation. The erosive nature and extent of wind upon the site has not been impacted in a negative sense since exposed soil faces or material that are not covered with vegetation are exposed only as temporary conditions during cell or site development. Soil stockpiled for interim and final cover will be placed as described in the Site Operation Plan. Drainage controls will be placed around the stockpile areas

to divert surface water run-on away from the disturbed areas. Also, please see section 1.1.1 Geomorphology, regarding area eolian deposition.

Overland flow of water is directed toward controlled drainage areas that have been designed not only to direct flow, but also to control soil erosion due to water velocity. As discussed in Attachment 6, Groundwater and Surface Water Protection Plan and Drainage Plan, natural channels along the western edge of the landfill will be left in their natural condition. Channel improvements to the ditch are proposed to control the runoff from the last portions of the landfill to be developed. These improvements will be stabilized by vegetation. Rock riprap protection will be placed at all concentrated discharge points in natural and manmade channels onsite and at site boundaries. The channels were designed so as not to exceed a velocity of 6 feet per second. Ditch cross-sections and channel slopes are to be constructed accordingly.

Sheet flow down side slopes of the landfill is allowed to flow into downchutes, perimeter ditches, and detention basins. This minimizes erosion potential by minimizing sheet flows down the side slope segments, as well as providing sediment trapping between slope segments. Landfill top grades are not more that 4 percent and the sideslope grades are no more than 25 percent.

The final cover over all portions of the landfillable area is proposed to consist of a 12-inch compacted, density and permeability controlled clayey soil overlain by a 24-inch erosion layer, with at least the top six inches being suitable to sustaining native vegetation. This 24-inch erosion layer is essentially the same final cover system approved under the existing permit. This top vegetation/erosion layer is anticipated to achieve a hydrologic condition similar to the native surface soils.

Landfill runoff discharge points are not changed from existing conditions and the geometry of discharge points are maintained to prevent changes in runoff velocities in the proposed permit conditions. With discharge rates not being increased significantly, and often decreased, it can be stated that erosive velocities will not be achieved or that existing velocities will not be adversely impacted by the proposed permit amendment.

2.0 SITE CHARACTERIZATION

Subsurface information was developed in connection with the 1994 permit documents, Appendix 4A. Based upon our knowledge and information at the site, the information developed in connection with the 1994 permit document remains applicable and has been included and used for this 2005 amendment. Four additional core borings have been drilled at the site for three purposes as follows: (1) to obtain soil samples to correlate and confirm our visual observations regarding site soils and soil classification tests with the existing subsurface information, (2) to further investigate and confirm foundation conditions for supporting the proposed increase in weight due to the height increase of solid waste, and, (3) to obtain additional groundwater information. These additional logs of borings and the accompanying laboratory tests on recovered soil samples are included in Appendix 4C in this 2005 amendment.

The four additional core borings drilled on June 7-8, 2005 (Borings 201 and 202) and September 7-8, 2005 (Borings 203 and 204) encountered subsurface materials similar to the stratigraphic conditions encountered and described by the 1994 reports. Soil types and strength characteristics are compatible between the 1994 and the 2005 data. The findings of these four 2005 core borings, as well as the previous subsurface borings at the site confirm materials of the Ogallala overlying the Triassic "red beds" of the Dockum Group, as previously described. The materials of the Ogallala consist of sand, silt, clay, gravel, and caliche. The sand is fine to coarse-grained quartz, silty in part, caliche nodules locally, and cemented locally by calcite and by silica. Minor silt and clay with caliche nodules occurs in the formation, and these fine-grained soils are sandy in places. Gravel, although not present everywhere, is composed of pebbles and cobbles of quartz, quartzite, minor chert, igneous rock, metamorphic rock, limestone, and abraded Grayphaea. Caliche, not everywhere present, is sandy, pisolitic, white, gray, and comprises beds up to several feet thick, and in the upper part, forms ledges and caprock. (Bureau of Economic Geology, University of Texas, Geologic Atlas of Texas, Amarillo Sheet) The site specific subsurface information as well as the published information on the Ogallala is descriptive of site conditions and the subsurface materials.

The Triassic "red beds" that underlie the Ogallala consists of conglomerate, sandstone, siltstone and shale. It is upon the red beds that the water of the Ogallala is perched.

The Site Characterization has referenced the discussion of Regional Geology and Regional Hydrogeology prepared by Mr. Brad McCardell, Geologist and presented in Appendix B of the Alternate Liner Demonstration, 1994 permit documents included in Appendix 4A of this 2005 amendment. Additionally, Appendix A of the 1994 Alternate Liner Demonstration includes a report by Dyess-Peterson Testing Laboratory, Inc. that describes the site stratigraphy as well includes subsurface exploratory borings that have been drilled at the site.

2.1 Wetlands

There are no wetlands within the permit boundary. A copy of the letter from the Department of the Army, Corps of Engineers, Tulsa District dated April 19, 2006 confirming the site review, that there are no wetlands within the permit boundary is included in Part II of this document.

3.0 GEOTECHNICAL REPORT

3.1 Subsurface Information

Laboratory testing of soil samples was conducted in connection with the 1994 permit document. These tests depict the subsurface soils, classifications, and strength characteristics at the site. The previous information has been used for this 2005 amendment, with additional subsurface exploration and testing having been performed.

The four additional exploratory borings drilled during 2005 confirm the previous information generated at the site. The logs of borings for the June 2005 explorations are labeled Log of Boring B-201 and B-202. The logs of borings for the September 2005 explorations are labeled Log of Boring B-203 and B-204. The logs of borings are included at the end of this text in Appendix 4C. The locations of the borings are presented in Appendix 4C, on Plate 1, also following this text. Soil classification tests performed on soil samples recovered in June and September 2005 closely parallel previous testing at the site. In addition to the classification tests, a consolidation test has been performed in order to provide actual data for settlement calculations with the additional load of the solid waste. This test and settlement calculations are discussed in this Attachment 4, Section 3.5 labeled Settlement Analysis.

Additional soil testing at the site has been performed during liner construction activities in accordance with the Soil and Liner Quality Control Plan (SLQCP), Attachment 10. Since the liner is constructed using synthetic liner barrier systems, only minimal soil testing is required. However, liner construction has occurred in large excavated areas where the excavated side slopes have revealed soils and stratigraphy for comparison with the site borings. These types of observations and operation activities have been consistent and have not noted unforeseen subsurface conditions. Subgrade preparation and placement of protective cover will continue to occur in accordance with the approved SLQCP.

3.2 Protective Cover

In accordance with the SLQCP, a protective soil cover will be placed over the constructed liner system and the leachate collection system. The protective cover will be a minimum 2-foot thick soil layer in the floor and sidewall areas. The protective cover will consist of soils with a Unified Soil Classification System designation of GP, GW, SP, SW, or SM. The maximum gravel size shall not exceed two inches. Conformance testing in accordance with the SLQCP will be performed.

3.3 Final Cover

The final soil cover system will be placed in accordance with Attachment 12, FINAL CLOSURE PLAN. The final cover section includes a surface erosion layer consisting of 24 inches of earthen material. At least the top 6 inches of the erosion layer will be capable of sustaining vegetative growth.

Underlying the erosion layer, will be the 12-inch infiltration layer. The Final Closure Plan states (see Attachment 12) as follows:

Infiltration Layer Placement:

The infiltration soil layer will consist of 12 inches of soil. The soil layer will be constructed to meet the following requirements.

- The soil lifts shall not exceed 12 inches in compacted thickness. Each lift shall have a maximum permeability of 1×10^{-5} centimeters per second.
- The soil shall have a clod or rock size of no more than 3 inches.
- The soil shall be compacted to at least 95 percent of Standard Proctor density at or above optimum moisture content.
- The soil shall be free of deleterious material and solid wastes.

The infiltration layer will be tested for permeability in accordance with quality control testing specified in Appendix 12A of Attachment 12 (Final Cover Quality Control Plan).

3.4 Slope Stability Analysis

Slope stability calculations have been updated from the 1994 permit document. It has been necessary to update slope stability calculations since the heights of interim and final slopes have increased due to the proposed increase in fill thickness. Information from the 1994 permit document including subsurface stratification, soil classification, and strength determinations has been incorporated into this permit amendment. Factor of Safety calculations for both the interim and final waste slopes have produced values of 1.5 or greater, indicating acceptable slope configurations. A factor of safety of 1.5 or greater is considered to be a conservative design value for the landfill slopes, and the Amarillo Landfill meets or exceeds these slope values when constructed as presented in the permit documents.

3.4.1 Excavation Slopes

Slope stability calculations for the 70-foot deep excavated slope were made for the 1994 modification. The excavated slope is formed on a 3 horizontal to 1 vertical (3:1) slope through the existing materials in order to expose the permitted landfill bottom. The slope stability calculation was made using cohesion (c) = 0.75 tons per square foot (1,500 psf), angle of internal friction (ϕ) = 0°, and a unit soil weight of 125 pounds per cubic foot. The calculation indicated a slope factor of safety of 1.76. The excavated slopes have performed satisfactorily with no indications of movement prior to waste placement. The 3:1 slope configuration is considered appropriate for the soil types at the site.

As the excavation is open, the soils may change shear strength due to drying, and an additional slope calculation has been made in this 2005 amendment to model a slightly less cohesive condition and an apparent increase in soil friction, which occurs as effective stress conditions develop in soil. This additional calculation has incorporated c = 1000 psf, ϕ = 10°, and soil unit

weight 125 pcf, yielding a factor of safety of 1.5. This calculated value indicating stable slope conditions support the fact that there have been no slope failures at the landfill within the excavated cells, and further confirm observable, onsite slope performance.

3.4.2 Waste Slopes

Slope stability analyses of the waste slopes have been updated from the 1994 permit document. It has been necessary to update slope stability calculations since the heights of interim and final slopes have increased due to the proposed increase in fill thickness. Interim and final waste slopes have been modeled for slope stability to reflect the proposed increase in waste height.

The interim waste slope has been modeled to determine a probable maximum height of slope that should not be exceeded during waste deposition. The interim slope model included a composite liner system where liner components consisting of geosynthetics could provide a shearing plane upon which solid waste could slide. This interim slope analysis utilized a wedge type failure mode. The interim slope was calculated for a 240-foot high waste slope incorporating intermediate benches. The first 3 benches from the landfill bottom will be 50 feet in height above the lower bench and 75 feet in width, with a 3:1 waste slope. The 4th bench will be 75 feet in width, 50 feet high, but will incorporate a 4:1 waste slope between the 3rd and 4th benches, as well as a 4:1 waste slope up to the full height of the landfill. Not all areas of the landfill will achieve this waste thickness, but when the waste thickness approaches an interim slope height in excess of 150 feet, the waste slope above this height will be flattened to 4:1 or flatter. This interim slope configuration and benches are presented in graphical format within Appendix 4B Interim Slope Stability Analysis.

These interim waste slopes and benches are necessary in order to achieve acceptable factors of safety during landfill operation. Implementing this stated bench and slope requirement will allow operations to proceed within the long reaches of the permitted site up to the full permitted height as long as the interim bench and slope geometry is maintained. A change in the landfill liner system from the 1994 permit document is the incorporation of a textured 60 mil HDPE

geomembrane along the landfill bottom. The textured geomembrane adds shear strength at this interface to help protect the interim slope from slipping with the increase in interim slope height. This interim slope configuration with benches and solid waste fill is presented in Appendix 4B along with the slope stability calculations for each of the interim constructed benches and the resulting factor of safety. The calculated factors of safety for each constructed bench height are 1.5 or greater.

The final slope configuration has been determined to be a 4 horizontal to 1 vertical (4:1) from the ground surface up to the top of the side slope, and continue along a 100:4 (4% grade) up to the maximum height of the landfill that varies in elevation across the permitted area. The critical or highest slope will occur along the western slope of the landfill. The waste will be filled to the top of the excavated area, which is about 70 feet, then will be placed on the 4:1 slope up to the crest for a total waste thickness of about 230 to 240 feet on the western side of the landfill. While this waste thickness will not occur across the entire landfill area, the critical final waste slope has been calculated for this location. A factor of safety of about 2 has been calculated for the final slope configuration.

The soil strength and properties used for the analysis of both the interim and final slopes are as follows:

Table III 4.1: Summary of Material Weight and Strength Properties
City of Amarillo Solid Waste Disposal Facility
MSW Permit No. 73A

Material	Unit Weight, pcf	Cohesion, psf	Friction Angle, degrees
Final Cover	120	200	10
Solid Waste, upper	70	400	20
Solid Waste, lower	70	500	30
Liner	125	100	10
Natural Soil	125	1000	30

The strength properties of the solid waste placed above the natural ground surface have been modeled using the values recommended by Sharma (see Section 7.0 REFERENCES). The bottom 70 feet of solid waste will have greater strength values because it will have been in place longer and will have undergone more compaction and compression. The strength of the bottom 70 feet of waste has been modeled using the values documented by Eid and Stark (see Section 7.0 REFERENCES). This slightly higher strength has been considered in the final slope calculations, but the interim slope calculations have not included this slight strength increase, since the interim slope might not be confined at the liner surface and using the slightly lower waste strength provides a more conservative slope analysis for the exposed interim operations.

As previously stated, the liner/waste interface is a surface where slippage can occur as the waste is placed. A textured geomembrane will be used in the landfill bottom. The modeled liner strength value is considered to be conservative, that is, the shear strength at the liner/waste interface should be exceeded in the field, resulting in calculated factors of safety that are conservative.

The factors of safety that were calculated for the interim and final slopes are as follows:

Table III 4.2: Summary of Slope Stability Analysis
City of Amarillo Solid Waste Disposal Facility
MSW Permit No. 73A

Condition Analyzed	Minimum Factor of Safety Calculated	Recommended Minimum Factor of Safety
Interim Fill Slope	1.5	1.5
Final Slope	2.0	1.5

These calculated factors of safety are conservative values and are acceptable.

Slope stability calculations have been made using the slope stability computer program PCSTABL, University of Wisconsin-Madison and Purdue University. The results of the computer modeling, including strength values and slope configurations are included in Appendix 4B.

3.5 Settlement Analysis

Settlement calculations have been made to establish potential magnitudes of settlement within the solid waste and the underlying natural materials. The final height of the landfill will vary across the site, with final grades ranging from elevation 3830 feet to 3970 feet. As previously stated, the maximum thickness of solid waste will be 240 feet, with much of the fill area being less. The settlement calculations discussed in the following sections have been made for the maximum conditions of settlement, that is, for the thickest section of solid waste. The foundation settlement has also been made for this one loading condition of maximum waste thickness. Therefore, across the landfill, most of the permitted area will experience settlement of the solid waste less than the calculated value for the maximum waste thickness.

3.5.1 Foundation Settlement

Foundation settlement calculations have been made for a landfill section of 240 feet of solid waste over natural subgrade. The landfill includes site excavation below natural grade of about 70 feet, which places the landfill bottom which places landfill bottom between elevation 690 and 3755 feet. This places the landfill bottom within very dense clayey sand that contains some discontinuous layers of hard sandy clay with caliche. A layer of hard caliche exists near the landfill bottom excavation, depending upon the location within the landfill area and also depending upon the landfill bottom elevation at a particular location. Therefore, the landfill bottom will be supported upon the hard caliche layer, very dense clayey sand, or hard sandy clay. This description concurs with the ongoing landfill operations and the subsurface conditions exposed by the site operations. The subsurface materials encountered by the borings will not be susceptible to significant long-term settlements based upon the information revealed by the exploratory borings and the indicated shear strength of the materials.

In order to confirm these stated observations deduced from the subsurface information obtained prior to the 1994 permit document, four additional borings have been drilled as a portion of this 2005 permit amendment. Borings 201 and 202 were drilled on June 7 and 8, 2005, and were

drilled within a partially excavated area of the landfill operations. Borings 203 and 204 were drilled on September 7 and 8, 2005, and were drilled in the northwestern portion of the site. The purposes of the borings were to recover stratigraphic information for comparison with existing borings, to confirm the existing data for use within this 2005 permit amendment, and also to attempt to recover suitable soil samples that could be tested for settlement characteristics (consolidation). The four borings have been labeled Borings 201 through 204 and are included in Appendix 4C. Temporary 2-inch standpipe piezometers were installed at Borings 203 and 204 to obtain additional groundwater information.

A laboratory consolidation test was performed on a soil sample recovered from Boring 201, 35 to 36½ feet, or elevation 3689.3 feet to 3687.8 feet. This sample yielded laboratory consolidation test results that are applicable to the site conditions, as observed by the data presented for this test in Appendix 4B. The laboratory consolidation test was performed on an undisturbed soil sample that we were able to sample at the site, carefully preserve, transport, and place into a consolidation loading frame. Although the soil is sand, the consolidation test results have provided a time-settlement relationship whereby settlement calculations and estimates of long term foundation settlement have been made.

Using the results of the consolidation test, and anticipating a potential load of 240 feet of solid waste, which will be the maximum waste thickness, a total settlement within the foundation soils of slightly less than 1 foot has been calculated (See Foundation Settlement Analysis, Appendix 4B, Plates 29 through 33). This minor amount of foundation settlement will occur as the water is placed. This calculation should yield a conservative estimate for the foundation settlement; that is, actual settlement at the site within the natural materials supporting solid waste will probably be less than the theoretical, calculated value.

While the 240-foot waste thickness will occur over only a portion of the landfill, the theoretical foundation settlement will therefore be less over much of the landfilled area. Foundation settlement would transition over a wide area based upon the waste thickness and its variation, and would occur as gradual transitions. Such widely distributed settlement, if occurring, would

not adversely affect the liner or leachate collection systems. The underlying materials supporting the landfill waste are very dense or very hard and sufficient to support the weight of the solid waste.

3.5.2 Solid Waste Settlement

Settlement of the final cover system will depend upon settlement within the solid waste with only negligible amounts of foundation settlement occurring. Final settlement within the waste consists of primary consolidation that occurs relatively quickly after waste placement, and secondary settlement that occurs over several years and is a result of organic degradation. Therefore, settlement of the solid waste will vary depending upon waste thickness, compaction, age of waste in the fill area, and waste deposition sequencing.

Waste settlement calculations are presented in Appendix 4B. Waste lift thicknesses of 20 feet (for a 2-year interval) are used in the calculation, which would approximate a 10-foot lift per year. If actual waste placement intervals take longer than the calculated intervals, then actual settlement within the solid waste has more time to occur during fill operations prior to placement of the final cover. In that case, settlement that occurs after placement of the final cover system will be less than the theoretical, calculated values shown in Appendix 4B. Details of the material properties and settlement that are used in the calculations are presented and discussed in Appendix 4B. Since the landfill footprint covers such a large area, the actual solid waste settlement will vary across the fill area as the waste thickness varies and much of the waste column will be less than the 240 feet of waste thickness used in the calculations.

Waste placement has occurred in Cells 1, 2, and 3, and is ongoing in Cell 4. The waste has been filled to approximate original ground surface, for a waste thickness of about 70 to 80 feet. This waste area will remain in place undergoing primary settlement and progressing into secondary settlement depending upon the duration of time. Table 1 presented in Appendix 4B within the Solid Waste Settlement Analysis section, presents the settlement scenario where the interior cells are filled with waste and allowed to undergo settlement as fill operations progress to the

surrounding cells. Table 2 of the same section presents a fill scenario where waste deposition begins at the landfill bottom and continually progresses to the maximum full height of the landfill, or 240 feet. These two landfill scenarios, when compared, provide a condition where differential settlement of the final cover system could occur in adjacent cell areas due to the difference in age of in place waste. While the assumptions may not be actually replicated in the operation, the settlement calculations as presented should represent settlement conditions over time durations that are likely worst-case occurrences.

Operations will have significant impact upon the actual settlement amounts experienced by the final cover system. Due to the depths of waste planned and for the wide areas of fill, settlement within the solid waste will occur, as shown in the calculations presented in Appendix 4B, Plate 34 through 42, Solid Waster Settlement Analysis. Solid waste settlement is not anticipated to produce excessive strain to the final cover system. Post closure maintenance of the landfill and the final cover system will be important, as in all closed sites, but the depths of waste and large areas provide potentials for non-uniform settlement that if attended as normal post closure maintenance, should pose minimal problems and stress to the final cover system. Calculations for tensile strain within the cover system and assumptions made for worst-case tensile strains are presented in Appendix 4B.

4.0 GROUNDWATER REPORT

The groundwater investigation was performed with information during and prior to the 1994 permit document. Groundwater elevations flow rate calculation, field investigation, and correlations within the Ogallala that underlies the site remain valid and accurate.

Temporary piezometers were installed in Borings 203 and 204 in September 2005. These were installed to provide additional groundwater data in the western portion of the landfill site. The data was used to extend potentiometric contours to the western permit boundary of the landfill site. The piezometer construction for Borings 203 and 204 are presented in Attachment 5, Appendix 5B.

Since 1994, groundwater elevations have been documented as a portion of the required monitoring well sampling plan. These groundwater elevations have supplemented the historic water level measurements and are presented in tabular and graphical form in Attachment 5, Appendix 5B, Plates 3 through 5. These current water-level measurements are also presented in Attachment 4, Appendix 4B, Plates 47 and 48. The resulting potentiometric surface map also presented in Attachment 5, Appendix 5B, Plate 6 has been produced as the current groundwater maps based on these measurements.

Comparing current 2005 groundwater elevations with the 1994 groundwater elevations, a drop in groundwater elevation has occurred across at least a portion of the permitted area. This drop in groundwater elevation occurs toward the southern end of the property. Within the northeastern quadrant of the site, a steeper groundwater gradient exists than within other sectors of the site. This steeper gradient or mounding of the groundwater surface was also reflected in the 1994 permit documents. Although groundwater elevations and gradients have slightly changed since 1994, the direction of groundwater flow remains toward the south.

Groundwater elevations at the site have been compared to published data of the Ogallala as collected and published by the High Plains Underground Water Conservation District No. 1

(www.hpwd.com). The closest water wells to the landfill site that are being monitored by the District lie south of IH 40 in Randall County. These wells indicate a decrease in groundwater elevation between 1995 and 2005. A third well in this northern Randall County area indicated a rise in groundwater surface. Published groundwater elevations from the District indicate a general decrease in elevations between 1995 and 2005, with a slight increase or rise in groundwater elevations from 2004 to 2005.

Within Potter County, seven wells are monitored for groundwater depth, as indicated in "The Cross Section", Volume 51-Number 4, April 2005, a monthly publication of the High Plains Underground Water Conservation District No. 1. Of the seven wells, four (4) do not have data, while the remaining three (3) wells indicated decreases in water levels ranging from 0.15 feet to 2.56 feet from 1995 to 2005.

Consequently, the decrease in groundwater elevations noted beneath the landfill since the 1994 permit documents are associated with the groundwater levels within the Ogallala and are not associated with landfill operations.

4.1 POTENTIAL FLOW PATHWAYS

In the event that the primary composite liner system is compromised and a release occurs, the anticipated primary pathway of contaminant transport would be vertically and to a lesser extent horizontal through the unsaturated materials. The majority of the subsurface materials consist of sand and clayey sand in the unsaturated zone, and then sand in the saturated zone of the Ogallala Formation. Caliche layers are also present in the upper portion of the unsaturated zone that would have some affect on vertical migration. Some horizontal migration would be expected as a result of the caliche and finer grained material in the unsaturated zone. Because of the relative thickness of the unsaturated zone and the finer grained nature of the unsaturated zone materials, any release of contaminants could likely become entrapped in the soil and slowly released over time. Infiltration of surface water is generally minimal in this area, and therefore it is not

expected that percolation of surface water into the subsurface would aid in the leaching of any contaminant that may have been released due to a breach in the liner system.

In the event a contaminant reaches the saturated zone, the primary mechanisms controlling the distribution of chemical transport would be advection and dispersion through the aquifer materials in the direction of groundwater flow as shown on Plate 7, Appendix 5B. The predominant downgradient groundwater-monitoring boundary for the landfill site is the southern boundary. The flow direction and gradient has been consistent at the site since monitoring was initiated during the 1994 permitting process. As previously discussed above, given the consistent nature of the groundwater flow and gradient at the site, the existing groundwater monitoring network with the proposed additional monitoring wells is anticipated to be adequate to monitor groundwater conditions at the site.

5.0 CONCLUSIONS

The subsurface information generated prior to and used within the 1994 permit documents has been reviewed and remains a valid assessment of site conditions. The design calculations for slope stability, waste and foundation settlement, and liner system component stability have been updated for this permit amendment to reflect increased solid waste fill thickness and the resulting higher solid waste interim and final slope. Each of these components has been updated and the calculations in Appendix 4B present the detailed calculations for the various landfill components.

The liner system components, interim fill slope, and final solid waste slope will exist in stable conditions when the landfill is operated within the guidelines of this document. The settlement of the landfill foundation as well as the calculated settlement of the final cover system will be within the acceptable operational limits. Post closure maintenance in accordance with the Post Closure Maintenance Plan will provide for landfill cover maintenance after landfill closure.

6.0 REFERENCES

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Amarillo Landfill
Permit Application MSW No. 73A
Technical Review
Response to 1st Notice of Deficiency

Part III
Attachment 4
Appendix 4C

May 2006

KLEINFELDER

APPENDIX 4C

Site Plan with Boring Locations

Key to Logs of Borings

2005 Logs of Borings B-201 through B-204

Geological Map

Groundwater Contour Map

Groundwater Monitoring Data

Typical Monitoring Well Detail

1999 Logs of Borings PP-8 through PP-12

1999 Monitoring Wells MW-10 through MW-13

1994 Logs of Borings TB-1 through TB-2

1994 Monitoring Well MW-1 through MW-6

1994 Logs of Borings PZ-1 through PZ-3 (MW 7 – MW-9)

1979 Logs of Borings No. 1 through No. 4

1975 Logs of Borings No. 1 through No. 15

KLEINFELDER

2005 – Kleinfelder

Key to Logs of Borings

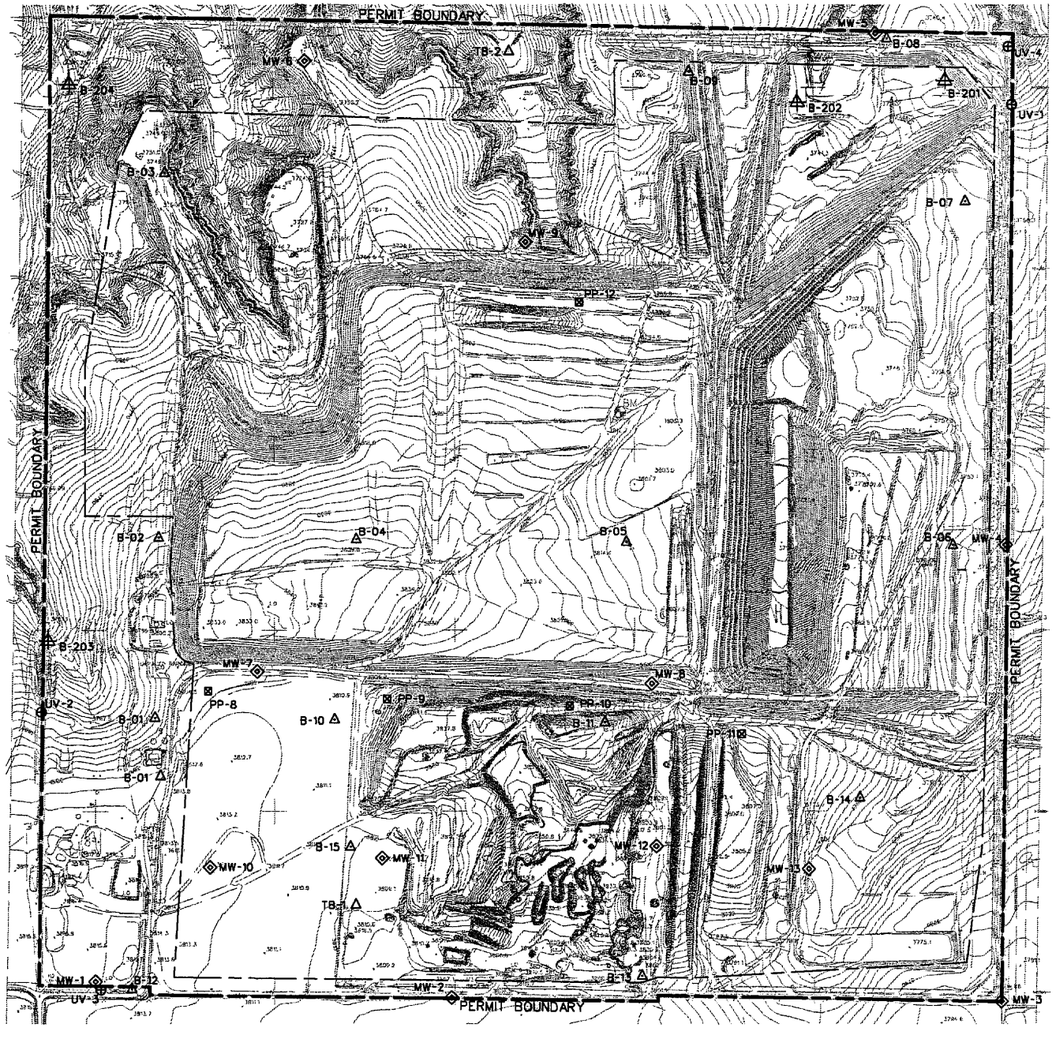
Logs of Borings B-201 through B-204

Geological Map

Groundwater Contour Map

Groundwater Monitoring Data

Typical Monitoring Well Detail



N

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SCALE IN FEET

LEGEND

PERMIT BOUNDARY	
MW-1	MONITORING WELL LOCATIONS
B-07	1975 BORING LOCATIONS
UV-1	UTILITY VENT LOCATIONS
TB-1	1994 BORING LOCATIONS
B-202	2005 BORING LOCATIONS
PP-11	PERIMETER PROBE LOCATIONS

STATE OF TEXAS
M. M. SHIFLETT
43763
5-8-06
LICENSED
PROFESSIONAL ENGINEER

For Borings 201, 202, 203 & 204 only

NOTES:

1. THE PROPOSED GRADES REPRESENT THE FINAL CONTOURS.
2. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY STEWART GEO TECHNOLOGIES, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED APRIL 15, 2004. VERTICAL DATUM BASED ON NGVD 29. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
3. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.
4. LOCATIONS OF 1979 BORINGS UNKNOWN.

USER: $$USER$$
FILE: $$FILE$$
DATE: $$DATE$$
TIME: $$TIME$$

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

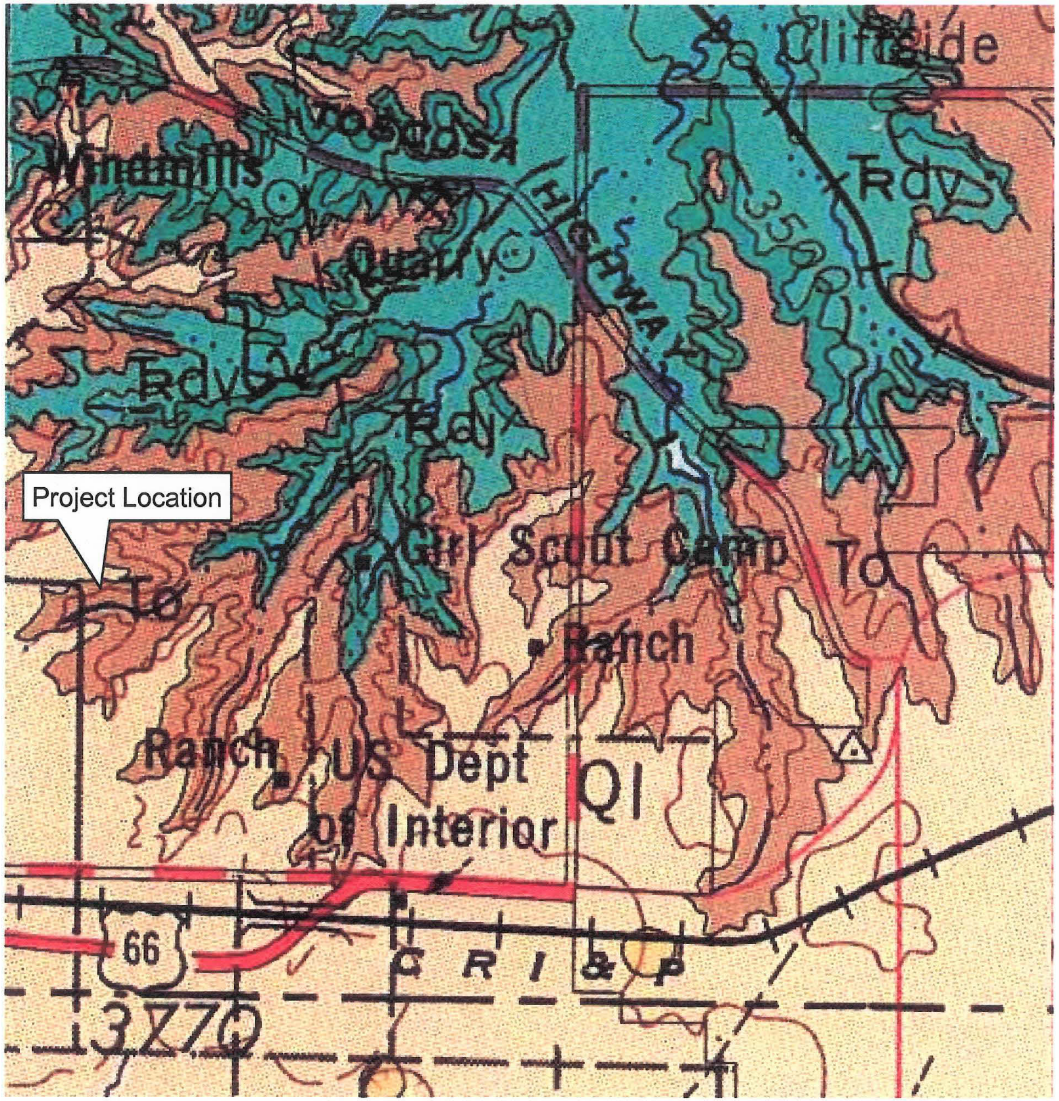
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

BORING LOCATION MAP

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
PLATE 1, APP 4C



Ql

Loess

Windblown silt

To

Ogallala Formation

Sand, silt, clay, gravel, and caliche. Sand, fine to coarse-grained quartz, silty in part, caliche nodules locally, cemented locally by calcite and by silica, locally cross-bedded, various shades of gray, brown, and red. Minor silt and clay with caliche nodules, sandy in places, massive, white, gray, olive-green, brown, red, and maroon. Gravel, not everywhere present, composed of pebbles and cobbles of quartz, quartzite, minor chert, igneous rock, metamorphic rock, limestone, clay balls in lower part, and abraded Gryphaea *in intraformational channel deposits and in basal conglomerate. Caliche, not everywhere present, sandy, pisolitic, white, gray, pink, comprises four or five beds up to 12 feet thick in upper part, forms ledges and caprock. Maximum thickness 550 feet, thins westward. (Locally includes Ogallala sand which has moved downslope covering older formations)*

Trd | Trdj / Trdv

Dockum Group undivided and
Trujillo and Tecovas Formations

Dockum Group undivided, Trd, *in Palo Duro Canyon. Thickness 250 feet. (Elsewhere Dockum is divided into Trujillo and Tecovas Formations.)*

Trujillo Formation, Trdj, *conglomerate, sandstone, and shale. Conglomerate, sandy, composed of granules and pebbles of quartz, limestone, sandstone, siltstone, minor chert, and fragments of petrified wood, massive, gray, brown. Sandstone, conglomeratic, fine to coarse grains of quartz and limestone, micaceous, calcareous locally, cross-bedded to massive, gray, greenish gray, and brown. Shale, micaceous, occurs as thin interbeds, gray and red. Forms scarp. Thickness 30 feet, truncated locally*

Tecovas Formation, Trdv, *shale, clay, siltstone, and sand. Shale, clay, and siltstone, sandy in places, micaceous, calcareous locally, reddish brown, various shades of red, maroon, gray, greenish gray, yellow, and purple. Sand, fine to medium-grained quartz, locally large petrified logs, unconsolidated, massive, lenticular, white, and light gray. Thickness 275 feet, truncated eastward*

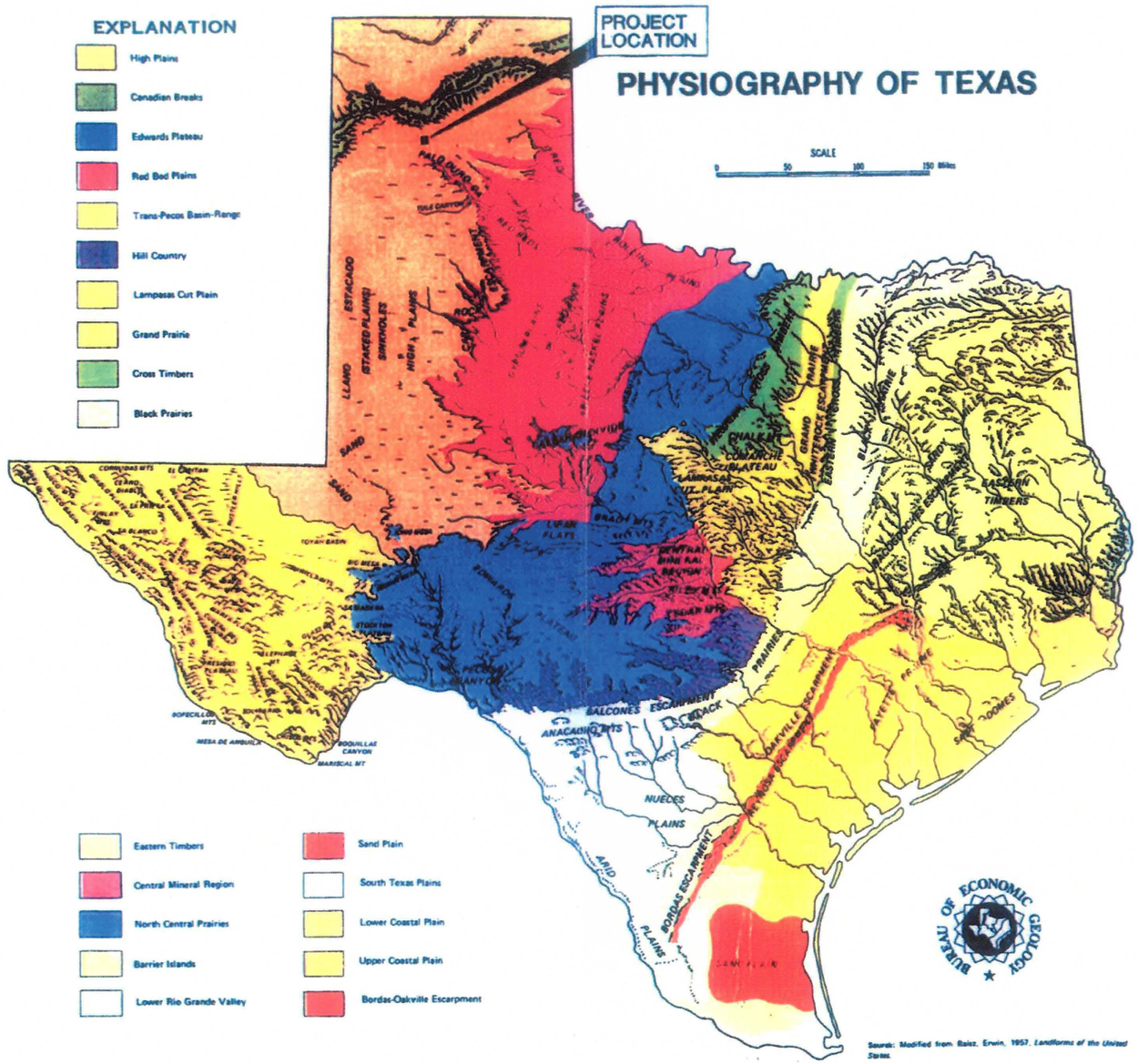
KLEINFELDER

Not to scale

GEOLOGICAL MAP
City of Amarillo Landfill
MSW Permit No. 73
Potter County, Texas

Project 57815 April 2006

Plate 7a, App. 4C



HDR Engineering, Inc.

CITY OF AMARILLO
MUNICIPAL LANDFILL

PHYSIOGRAPHIC MAP

Project Manager	T. HOTCHKISS
Designed	HDR
Drafted	HDR
Checked	
Project Number	06625-015-037
Date	NOVEMBER, 1994
Issue	
Figure Number	3

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HDR

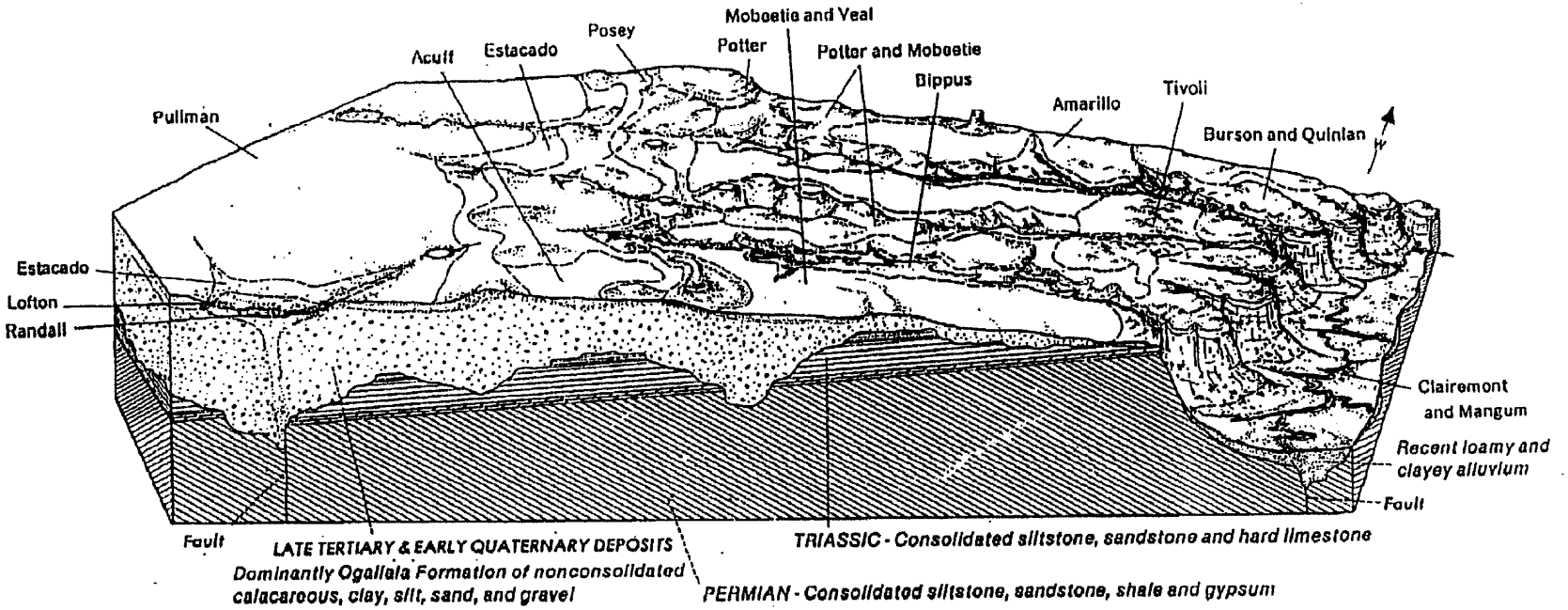
HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

DISTRIBUTION OF SOIL TYPES

Date 11/94

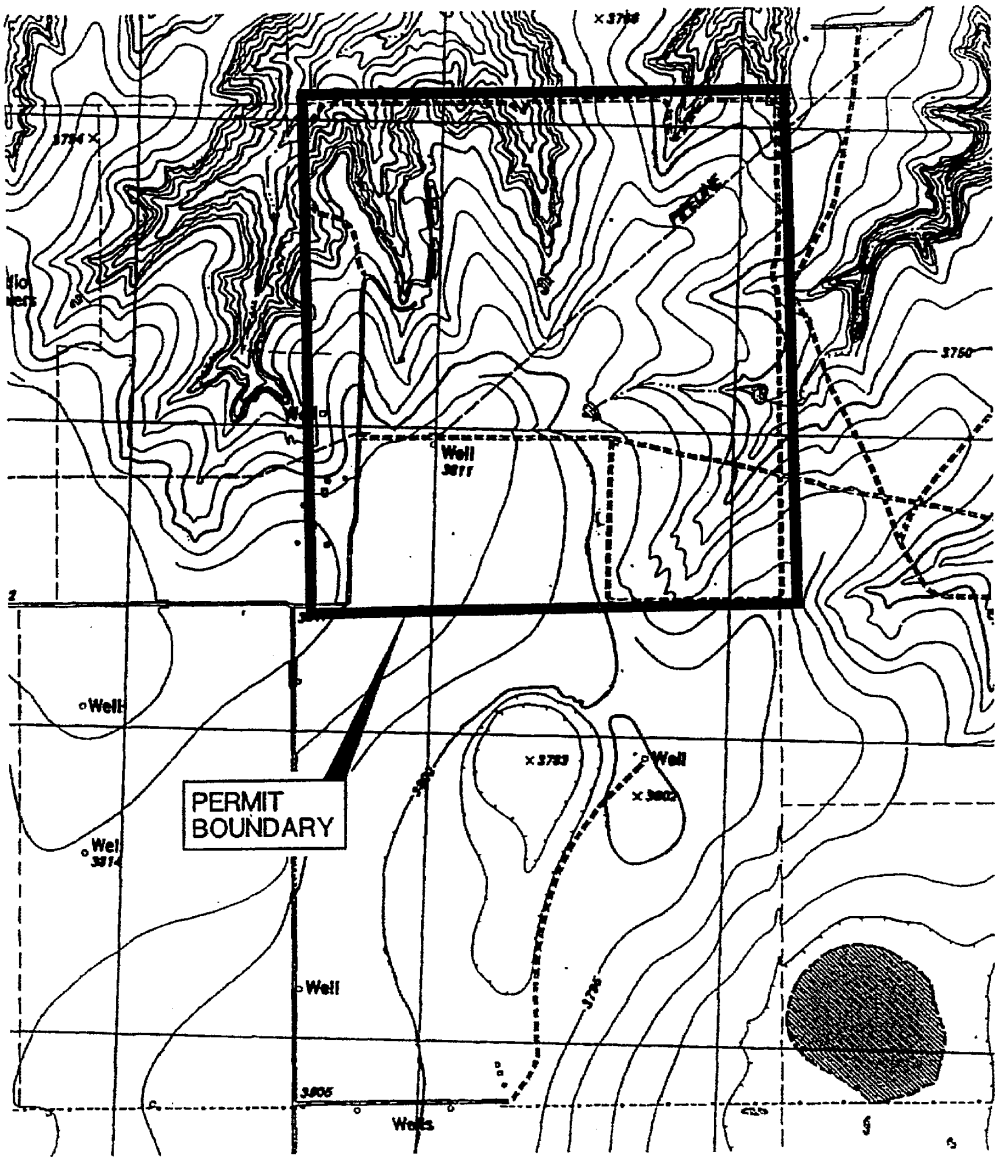
Figure 4



Pattern of soils in Potter County.

MAP SOURCE:
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL SURVEY OF POTTER COUNTY, FEBRUARY, 1980

Plate 7c, App. 4C



MAP SOURCE:
USGS 7.5 MINUTE QUADRANGLE, BUSHLAND, TEXAS, 1984

0 2000 4000

SCALE IN FEET

HDR

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

TOPOGRAPHIC MAP

Date
11/94

Figure
5

FILENAME: E:\AMARILLO\DWG\AMATOPO

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System	Series	Formation or Group	Thickness (feet)	Lithologic Description	Water Supply
Quaternary	Recent		0–15	Chiefly Windblown sand and silt.	Yields no water to wells. Sandy areas form excellent recharge facilities.
	Pleistocene		0–144	Sand, clay, diatomaceous earth, volcanic ash, limestone.	Mostly above water table. Does not yield large supplies.
Tertiary	Pliocene	Ogallala Formation	0–500	Fine to coarse sand and gravel; clay, silt, and caliche.	Yields large supplies of water throughout the Southern High Plains
Cretaceous		Not present in Amarillo area.	Unconformity		
Triassic		Dockum Group Tecovas Formation Santa Rosa sandstone Chinle Formation equivalent	150–1800+	Varicolored shale and sandy shale, gray or brown crossbedded sandstone and conglomerate.	Probably capable of yielding small to moderate supplies of water; most of the water is at least slightly saline.
Permian		Not present in Amarillo area.			

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REPORT NO. 105, 1980

HDR Engineering, Inc.

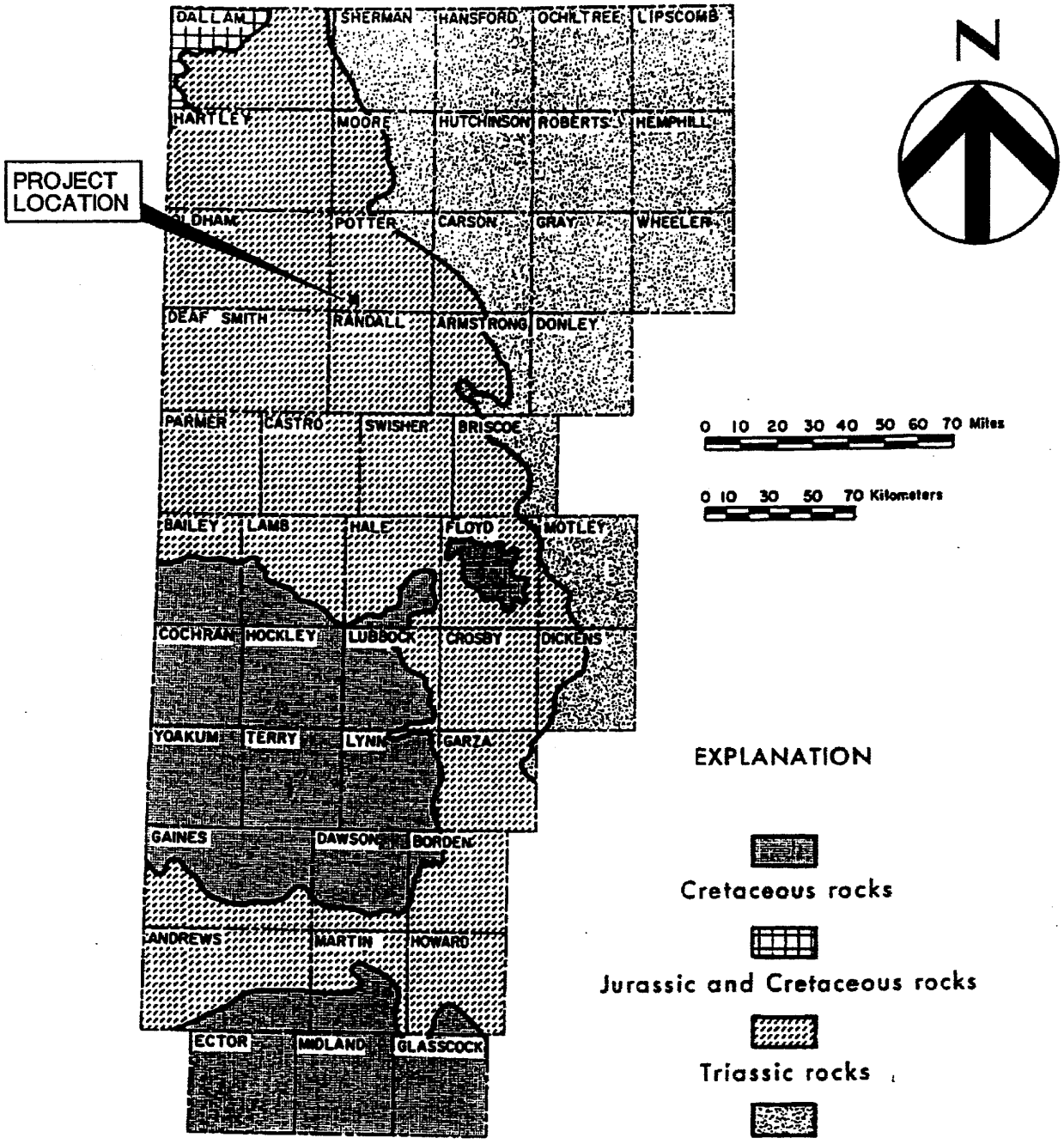
CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

GENERALIZED STRATIGRAPHY

Date 11/94

Figure 7

Plate 7c, App. 4C



MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
REPORT 288, VOL. I, MAY, 1984.
TEXAS DEPARTMENT OF WATER RESOURCES

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL
GEOLOGIC UNITS UNDERLYING THE OGALLALA FORMATION

Date: 11/94

Figure: 8

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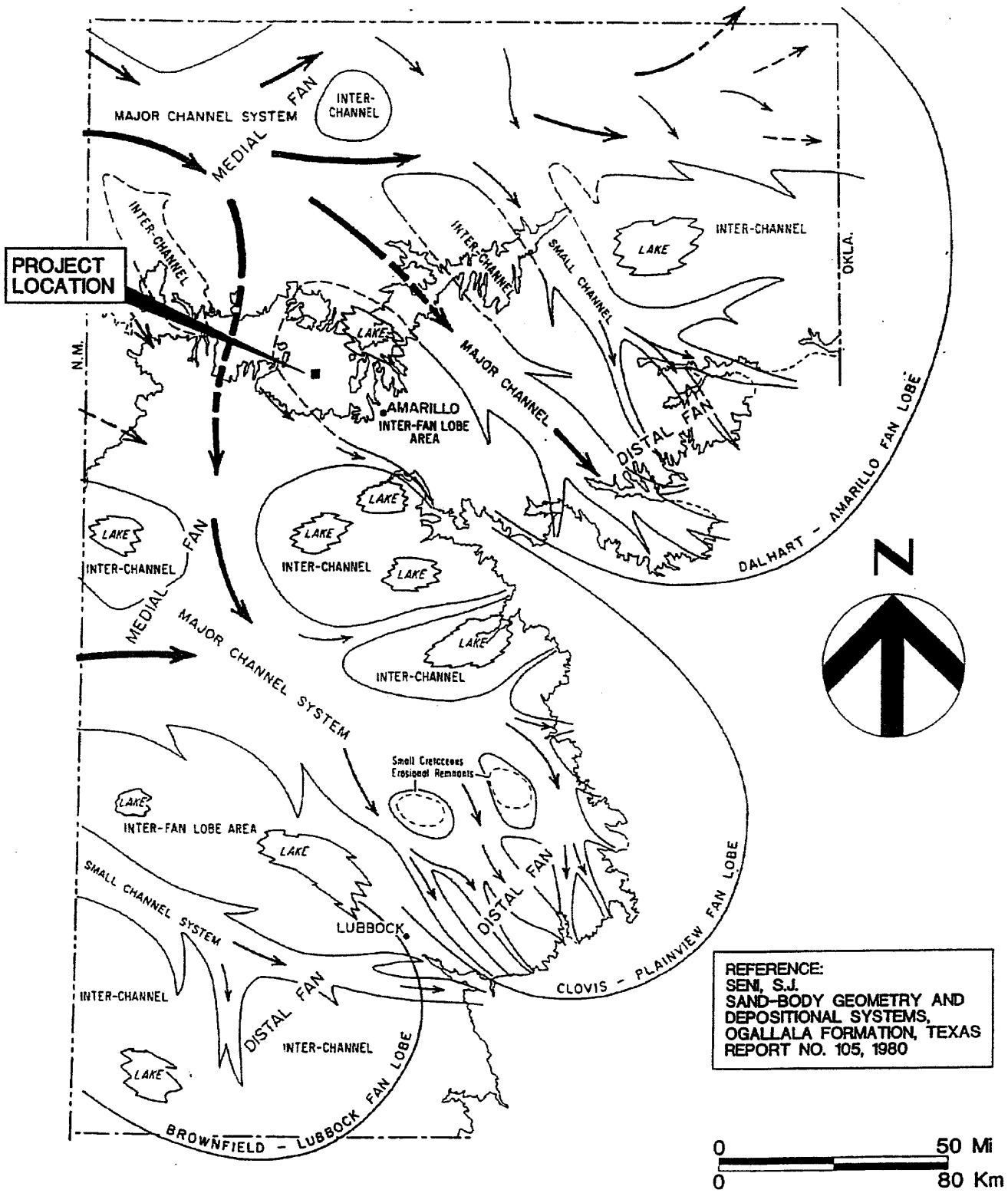

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS MUNICIPAL LANDFILL

DEPOSITIONAL FACIES MAP

Date: 11/94

Figure: 9

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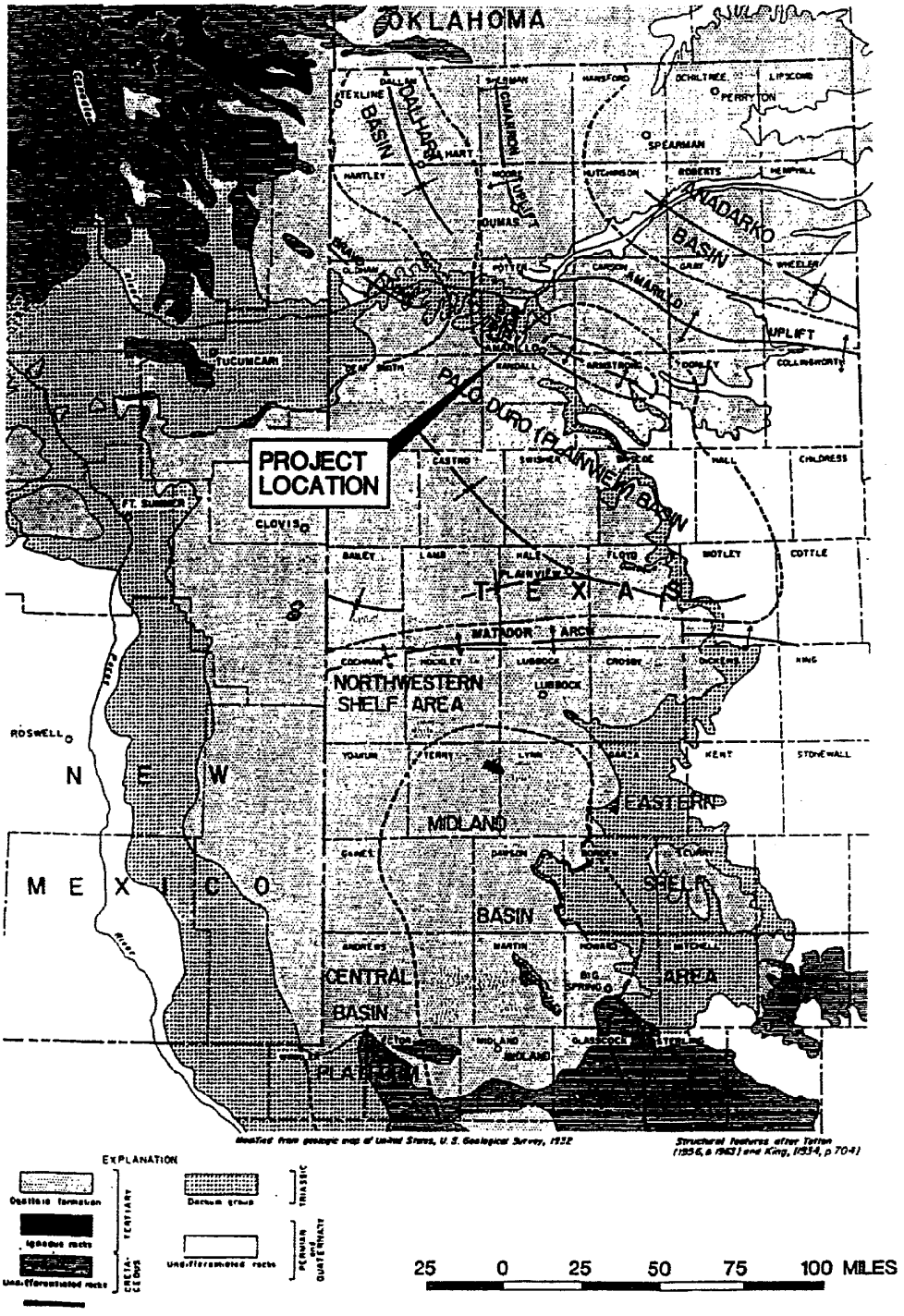

REFERENCE: CRONIN, J.G.
A SUMMARY OF THE OCCURRENCE AND DEVELOPMENT OF GROUNDWATER IN THE SOUTHERN HIGH PLAINS OF TEXAS, TEXAS BOARD OF WATER ENGINEERS, BULLETIN 6107, 1971.

HDR

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS MUNICIPAL LANDFILL

REGIONAL STRUCTURE MAP

Date: 11/94

Figure: 10

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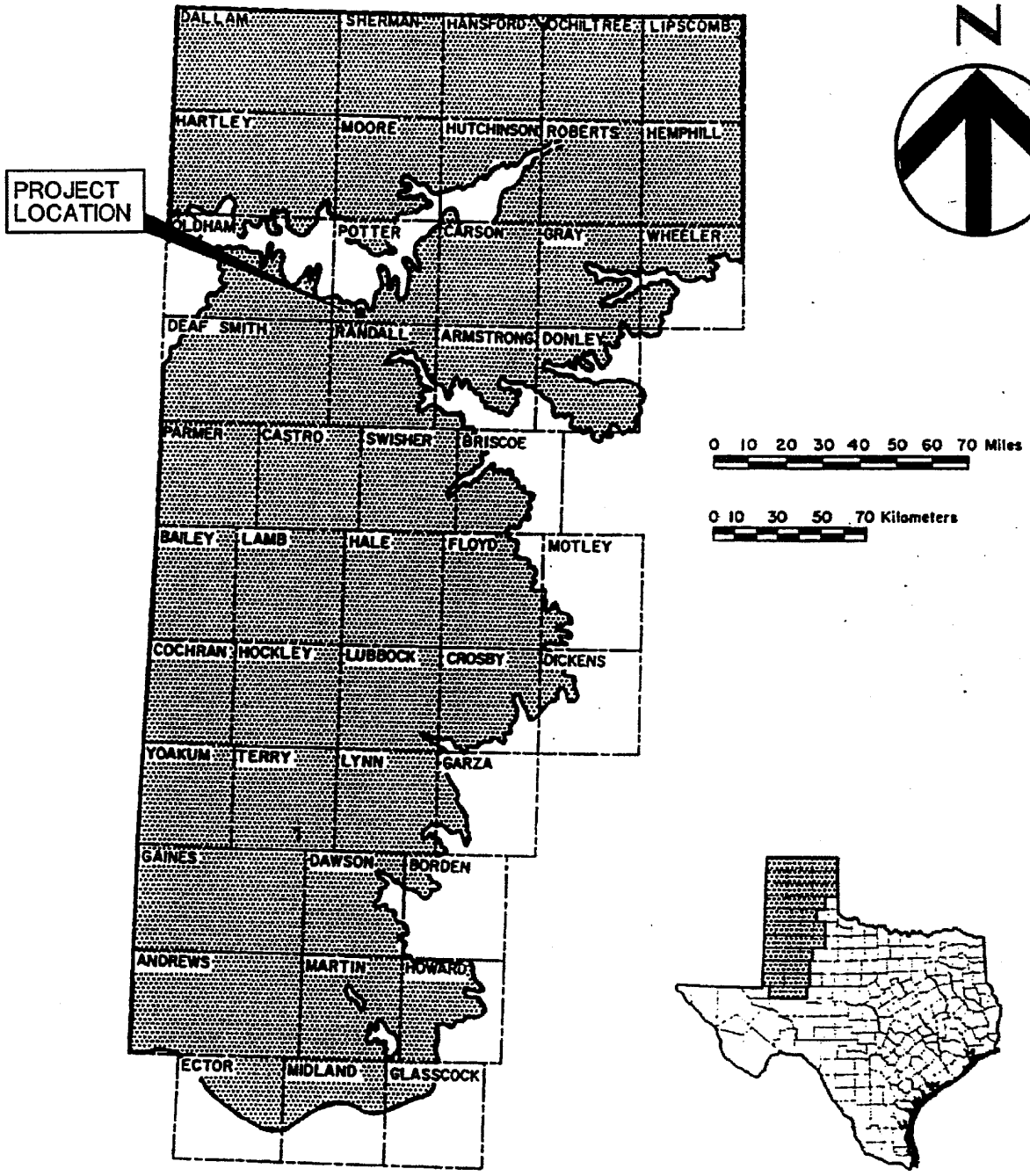

MAP SOURCE:
EVALUATING THE GROUNDWATER RESOURCES OF THE HIGH PLAINS OF TEXAS,
FINAL REPORT, VOL. I, AUGUST, 1982.
TEXAS DEPARTMENT OF WATER RESOURCES

HDR

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

HIGH PLAINS AQUIFER

Date
11/94

Figure
11

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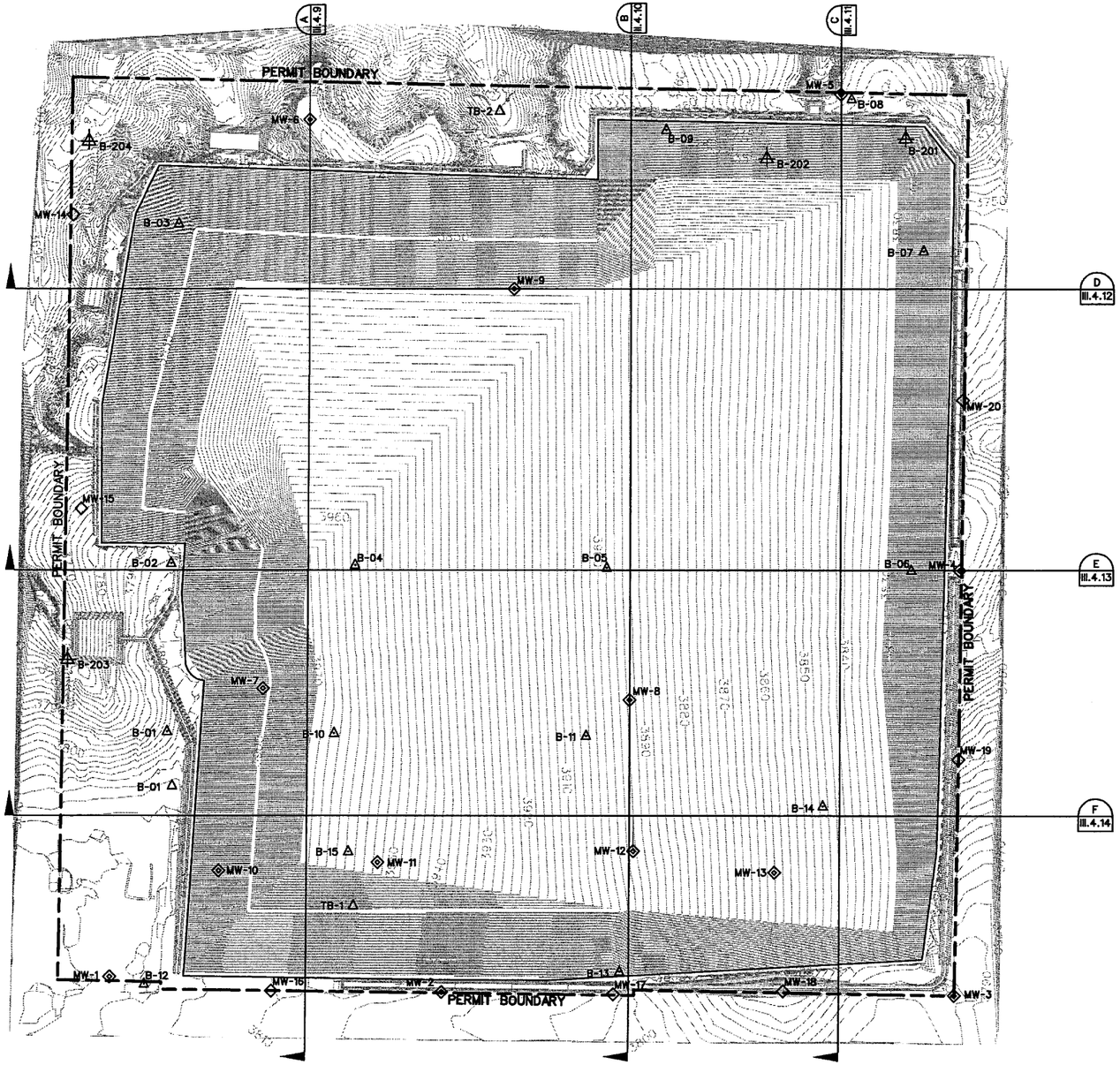

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SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- MW-1 MONITORING WELL LOCATIONS
- B-07 1975 BORING LOCATIONS
- B-201 2005 BORING LOCATIONS
- TB-2 1994 BORING LOCATIONS
- MW-15 PROPOSED MONITORING WELL

NOTES:

1. THE PROPOSED GRADES REPRESENT THE FINAL CONTOURS (TOP OF FINAL COVER).
2. PROPERTY BOUNDARY INFORMATION BASED ON BOUNDARY SURVEY DATA PROVIDED BY THE CITY OF AMARILLO.

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

CROSS-SECTION LOCATION MAP

0 1" 2"

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SCALE

SHEET Plate 8 App. 4C

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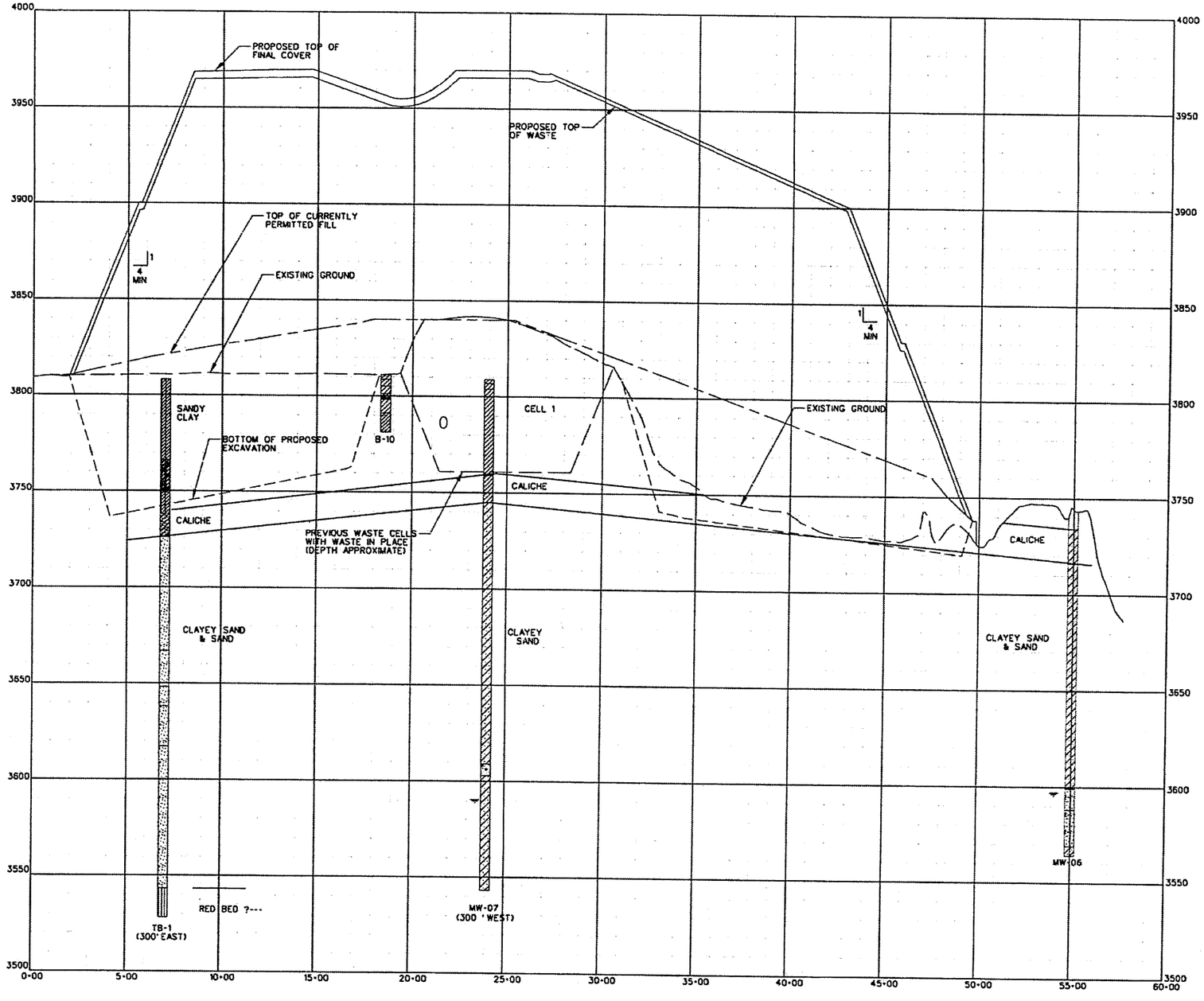


SECTION A
III.4.8

HORIZONTAL 0 300 600
VERTICAL 0 30 60
SCALE IN FEET

STATE OF TEXAS
MICHAEL K. SHIFLETT
43763
LICENSED PROFESSIONAL ENGINEER

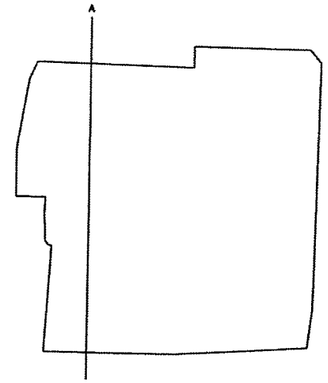
Michael K Shiflett
-for subsurface information only

BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- SAND
- CALICHE

NOTE
THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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DATE: $$DATE$$
TIME: $$TIME$$

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

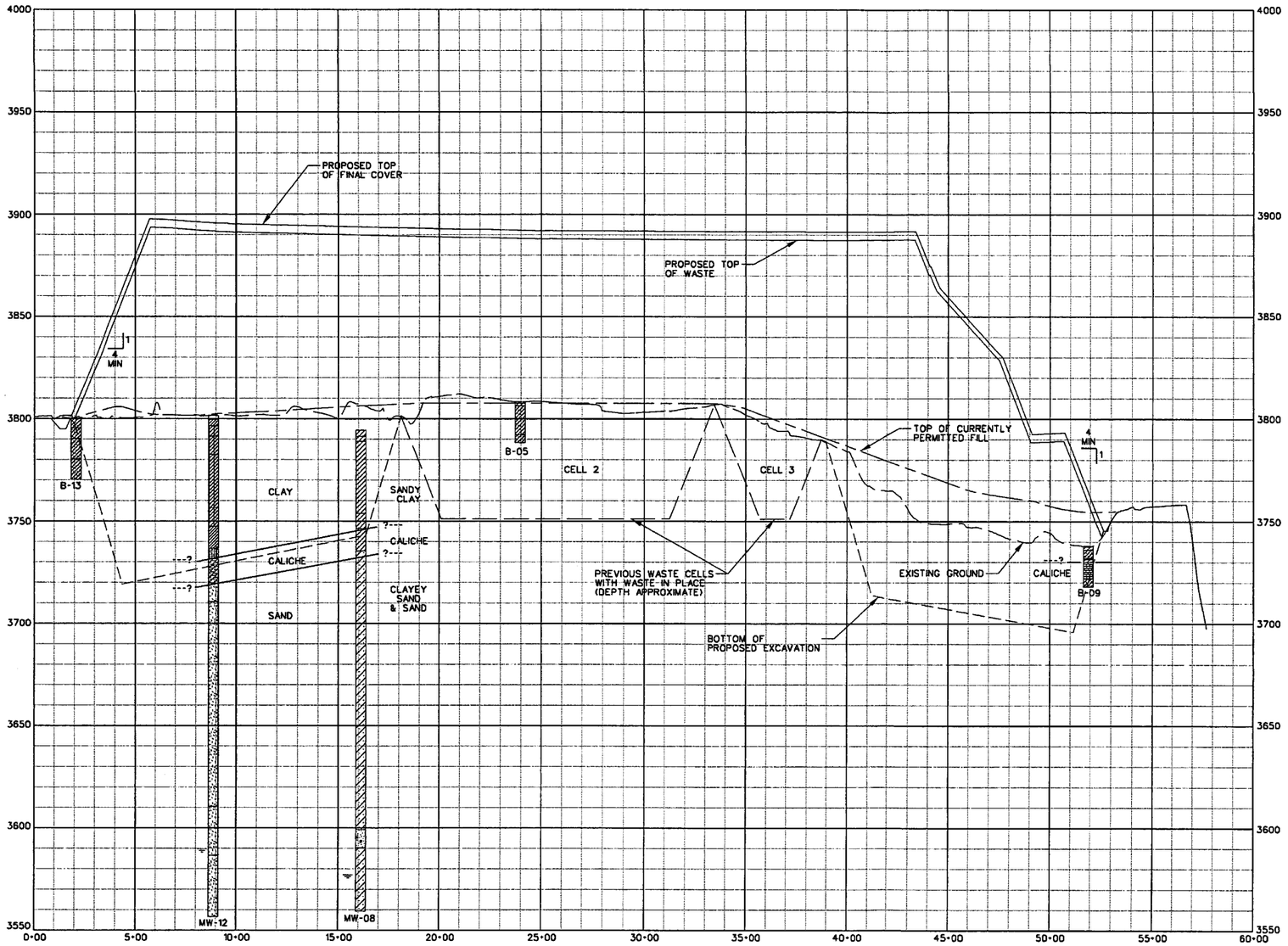
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION A-A

0 1" 2"

FILENAME	$$FILE$$
SCALE	

SHEET
Plate 9
App. 4C



SECTION B / III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

STATE OF TEXAS
M. M. SHIFLETT
49760
LICENSED
PROFESSIONAL ENGINEER

For subsurface information only.

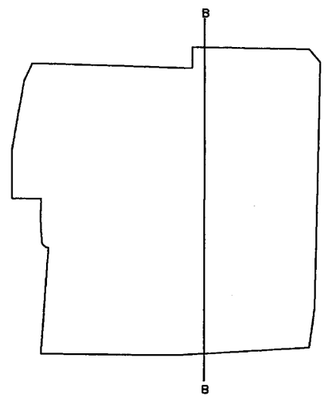
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- CEMENTED CALICHE
- CEMENTED LIMESTONE WITH CALICHE
- SILTY CLAY
- CALICHE
- SAND
- STATIC WATER LEVEL

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

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CIVIL ENGINEER	M. DAVISON
CHECKED BY	M. ODEN
DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

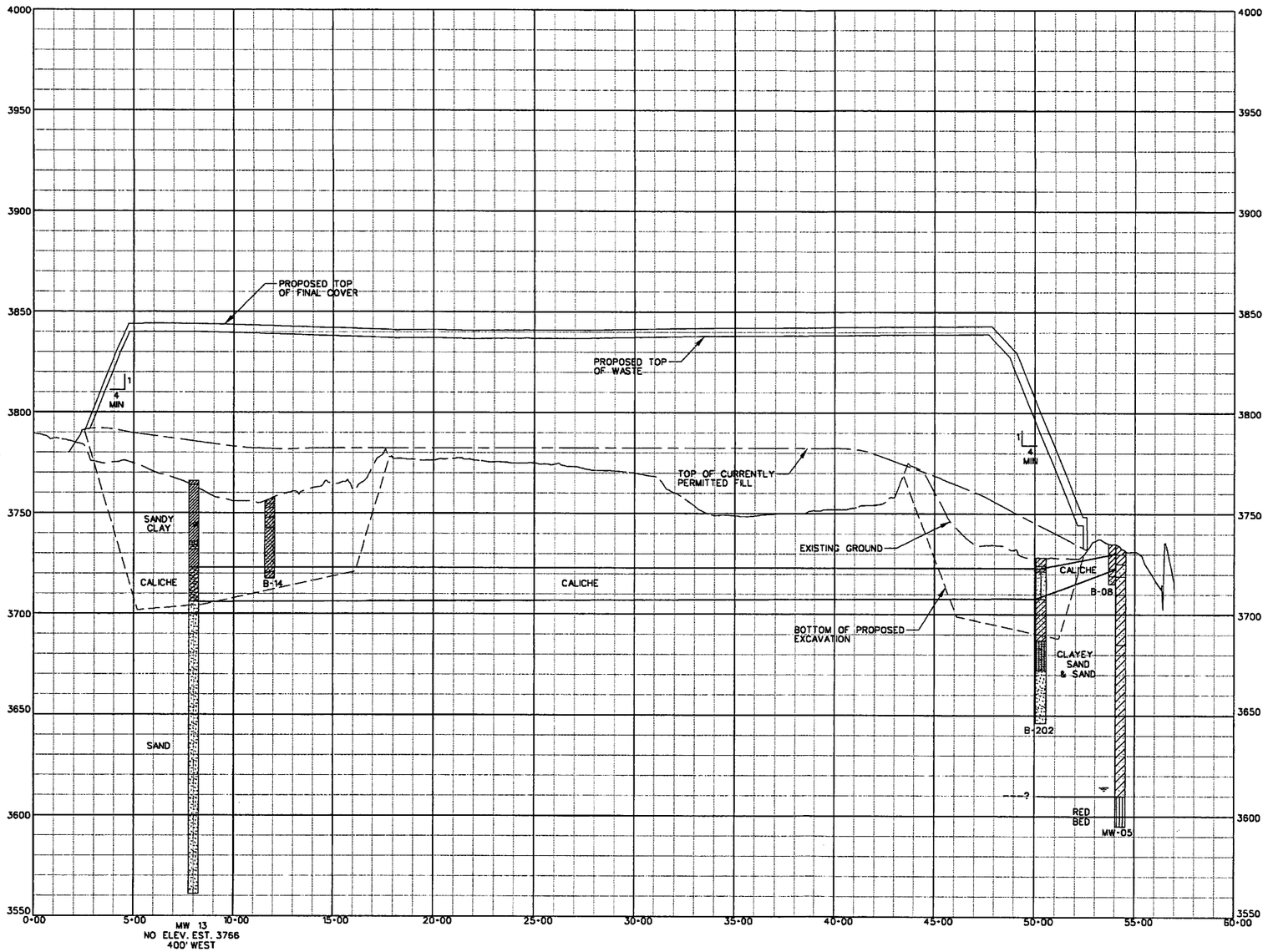
SECTION B-B

0 1" 2"

FILENAME $$FILE$$

SCALE

SHEET Plate 10 App. 4C



SECTION C / III.4.8

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

STATE OF TEXAS
M. M. SHIFLETT
43763
LICENSED
PROFESSIONAL ENGINEER

for subsurface information only

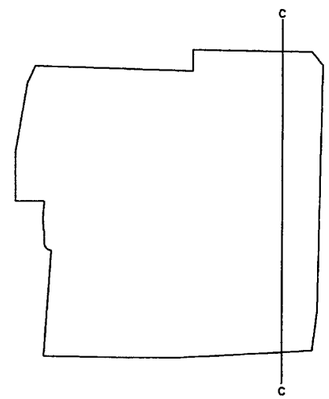
BORING LEGEND

- CLAY
- SANDY CLAY
- SILTY CLAY
- SILTY SANDSTONE
- SAND
- CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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TIME: $$TIME$$

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

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CIVIL ENGINEER	M. DAVISON
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DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

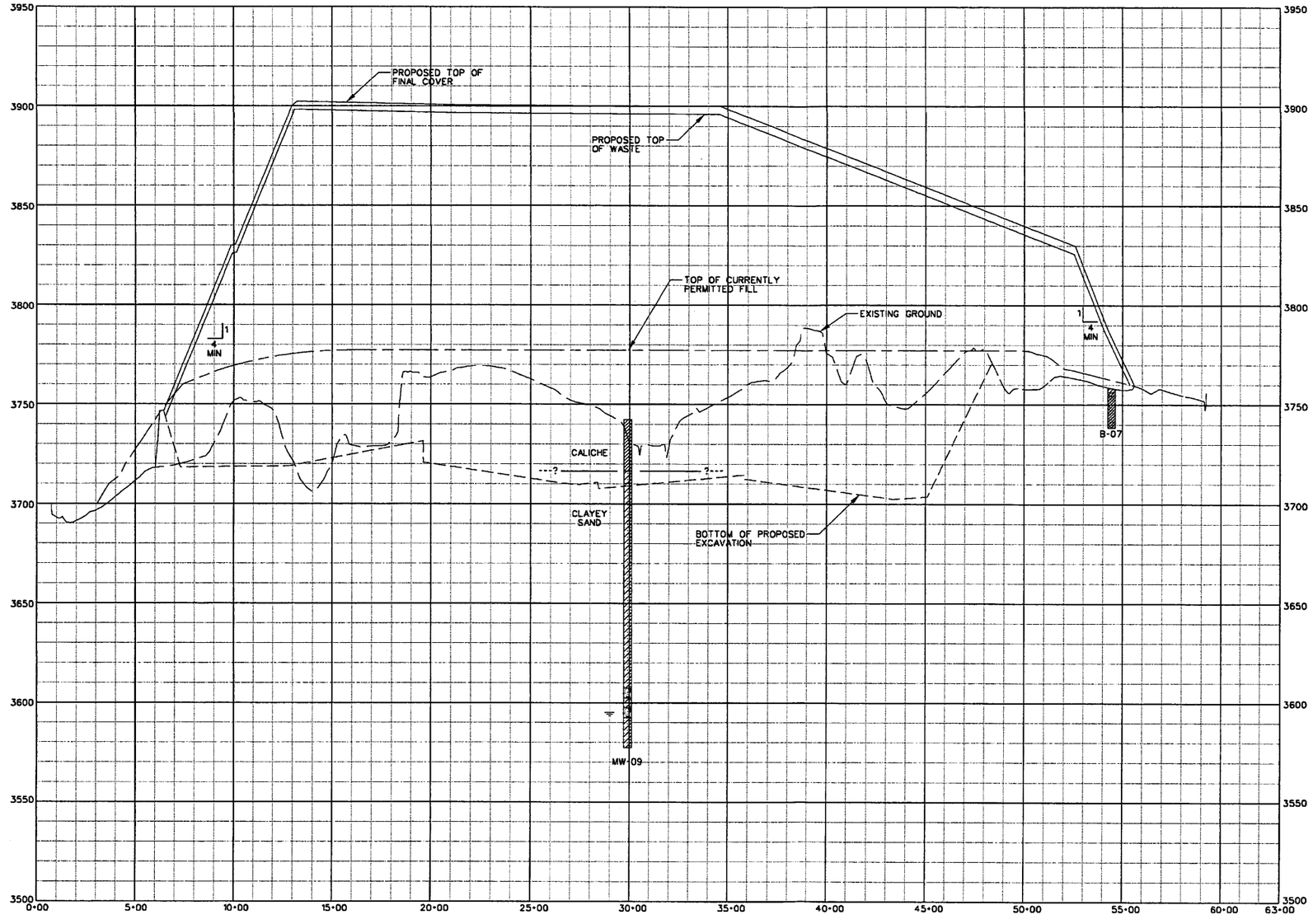
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION C-C

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET Plate 11 App. 4C



SECTION D / III.4.8

HORIZONTAL 0 300 600
VERTICAL 0 30 60
SCALE IN FEET

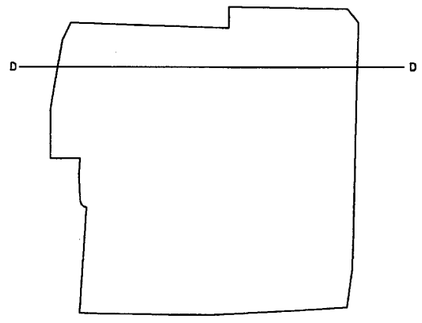
STATE OF TEXAS
M. M. SHIFLETT
43763
LICENSED PROFESSIONAL ENGINEER

For subsurface information only

BORING LEGEND
- CLAY
- SANDY CLAY
- TOP SOIL
- CALICHE

NOTE:
1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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TIME: $$TIME$$

CITY OF AMARILLO TEXAS

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QA/QC	M. ODEN
PROJECT NUMBER	23358-037

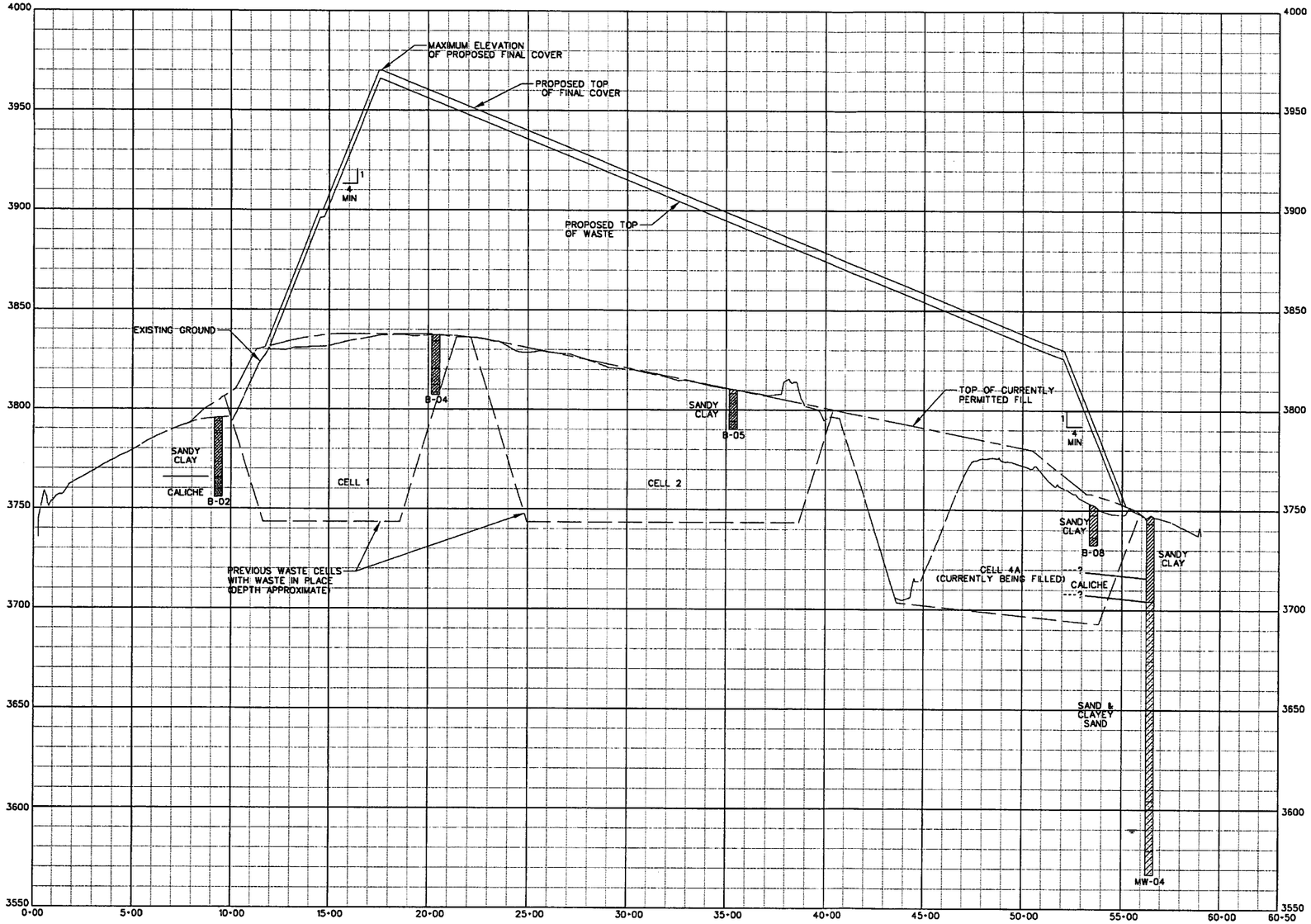
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION D-D

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
Plate 12
App. 4C



SECTION E / III.4.B

HORIZONTAL 0 300 600

VERTICAL 0 30 60

SCALE IN FEET

STATE OF TEXAS
M. M. SHIFLETT
43763
LICENSED
PROFESSIONAL ENGINEER
5-8-06

For Subsurface information only

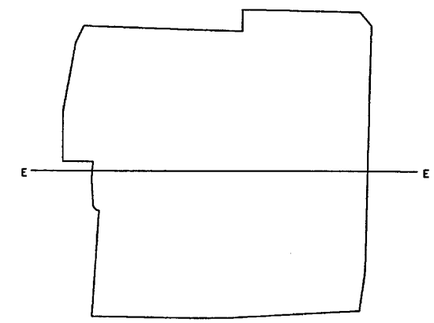
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- CEMENTED LIMESTONE WITH CALICHE
- CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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FILE: $$FILE$$

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PROJECT NUMBER	23358-037

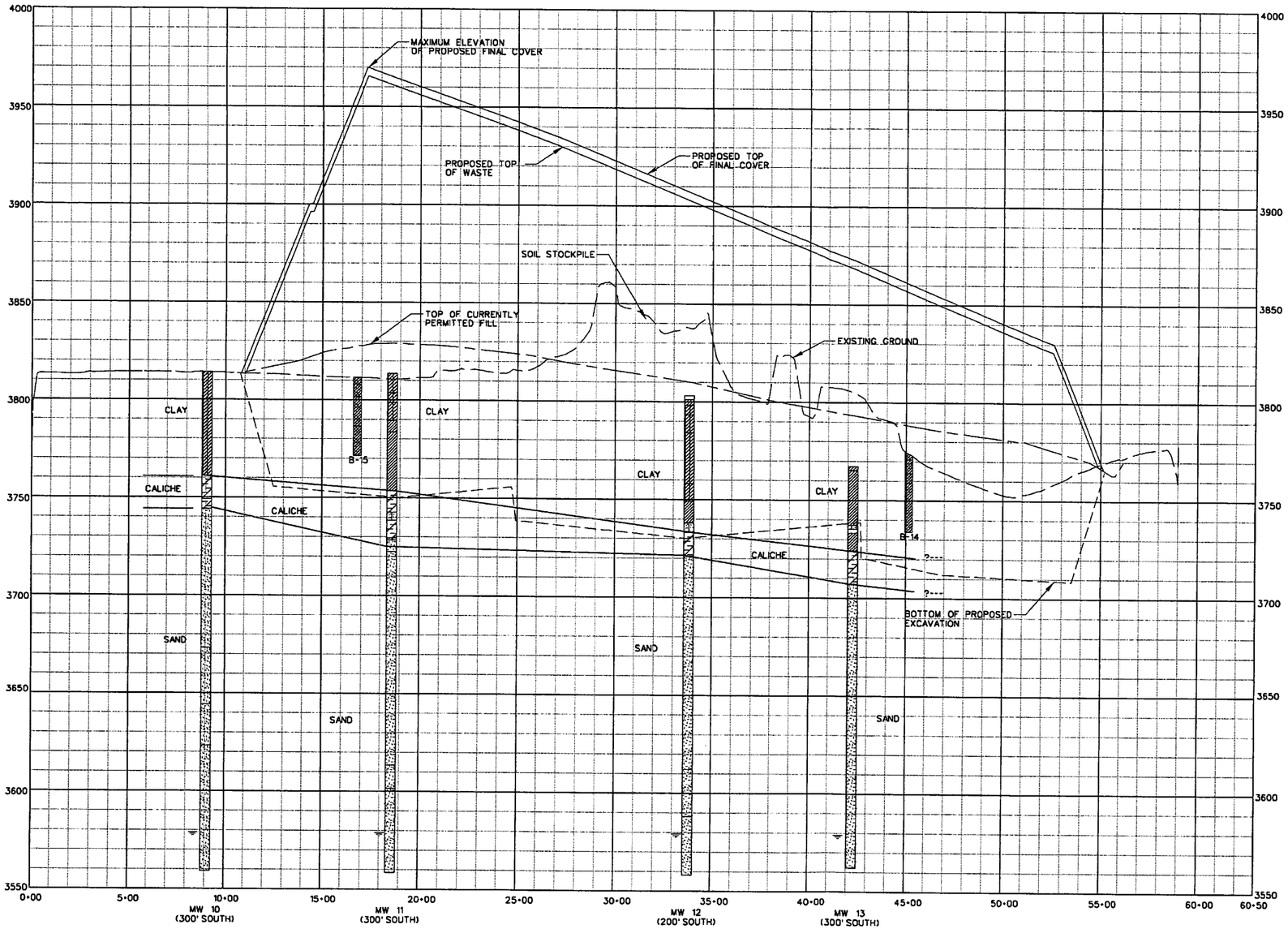
CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION E-E

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
Plate 13
App. 4C



SECTION F
III.4.8

HORIZONTAL 0 300 600
VERTICAL 0 30 60
SCALE IN FEET

STATE OF TEXAS
M. M. SHIFLETT
54376
LICENSED
PROFESSIONAL ENGINEER

For Subsurface information only

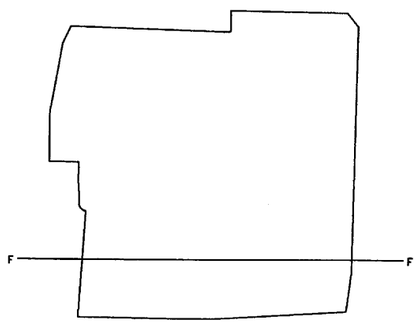
BORING LEGEND

- CLAY
- SANDY CLAY
- TOP SOIL
- SILTY CLAY
- SAND
- CALICHE

NOTE:

1. THE STRATA LINES ARE BASED UPON INTERPOLATION BETWEEN BORINGS, AND MAY NOT REPRESENT ACTUAL SUBSURFACE CONDITIONS.

KEY MAP



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DATE: $$DATE$$
TIME: $$TIME$$

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ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
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PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

SECTION F-F

0 1" 2"

FILENAME $$FILE$$
SCALE

SHEET
Plate 14
App. 4C

N

0 300 600

SCALE IN FEET

LEGEND

- PERMIT BOUNDARY
- EXISTING CONTOURS, IN FEET, MSL
- LANDFILL FOOTPRINT
- 3605 GROUNDWATER CONTOURS
- MW-4 EXISTING MONITORING WELL LOCATIONS
- MW-15 ADDITIONAL MONITORING WELL LOCATIONS
- B-204 2005 BORING LOCATIONS

STATE OF TEXAS
MARK SHEPLEY
43763
LICENSED
PROFESSIONAL ENGINEER
8-06

STATE OF TEXAS
DONALD D. JAMES
GEOLOGY
360
LICENSED
PROFESSIONAL GEOSCIENTIST
8-06

NOTES

1. FOR TOPOGRAPHIC INFO SEE SHEET III.1.1.
2. TOPOGRAPHIC MAP WAS COMPILED BY PHOTOGRAMMETRIC METHODS BY STEWART GEO TECHNOLOGIES, SAN ANTONIO, TEXAS FROM AERIAL PHOTOGRAPHY DATED APRIL 7, 2005. VERTICAL DATUM BASED ON NGVD 29. MAPPING GROUND CONTROL PROVIDED BY THE CITY OF AMARILLO, COMPLETED IN ACCORDANCE WITH NATIONAL MAP ACCURACY STANDARDS.
3. POINT OF COMPLIANCE FOR GROUNDWATER MONITORING IS THE EASTERN AND SOUTHERN PERMIT BOUNDARY.

DATE: $$DATE$$
TIME: $$TIME$$
USER: $$USER$$
FILE: $$FILE$$

CITY OF AMARILLO TEXAS

HDR Engineering, Inc.

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER	M. DAVISON
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DESIGNED	S. MILLER
DRAWN BY	B. GREEN
QA/QC	M. ODEN
PROJECT NUMBER	23358-037

CITY OF AMARILLO LANDFILL
MSW PERMIT NO. 73A
POTTER COUNTY, TEXAS

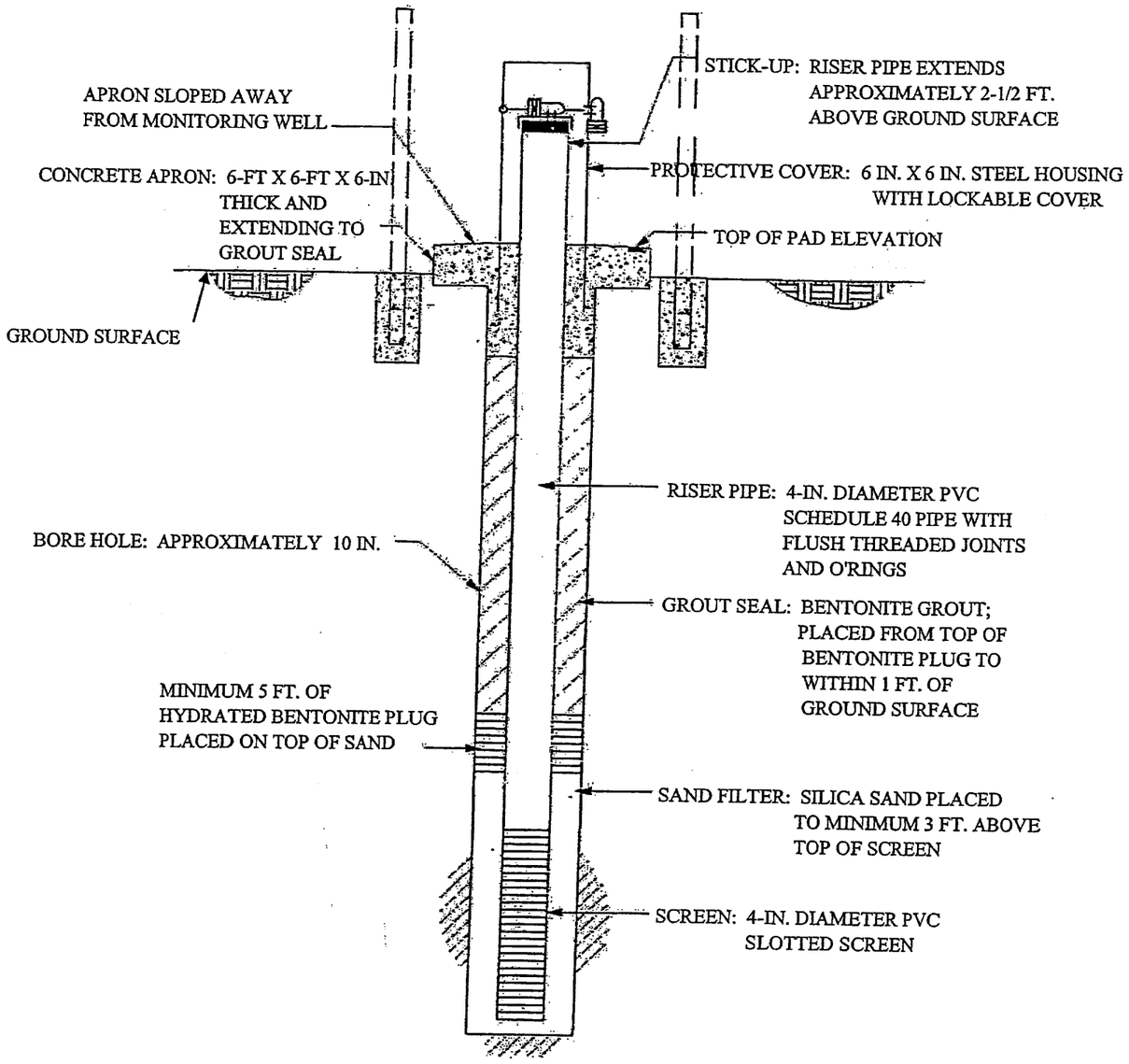
GROUNDWATER CONTOUR MAP
NOVEMBER 18, 2005

0 1" 2"

FILENAME	$$FILE$$
SCALE	

SHEET
Plate 15
App 4C

TYPICAL MONITORING WELL DETAIL



Notes:
1. Typical Monitoring Well Detail as provided in the 1994 document. Table has been updated with current information.
2. Actual monitoring depths to be confimed at time of well installation with pilot borings.

EXISTING MONITORING WELL NETWORK
City of Amarillo Landfill, 2005

Monitoring Well No.	Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-5	3736.64	3596.64	3651.64	3596.64	3656.64	3661.64
MW-6	3746.38	3570.38	3610.38	3570.38	3617.38	3622.38
Downgradient Monitoring Wells						
MW-1	3814.85	3561.65	3601.85	3561.65	3606.85	3611.85
MW-2	3805.39	3560.39	3600.39	3560.39	3605.39	3610.39
MW-3	3789.57	3542.57	3582.57	3542.57	3589.57	3594.57
MW-4	3746.88	3564.88	3604.88	3564.88	3610.88	3615.88

ADDITIONAL MONITORING WELLS
City of Amarillo Landfill, 2005 (See Note 2)

Monitoring Well No.	Estimated Ground Elevation	Bottom Elevation	Screened Interval		Top of Filter Pack Elevation	Top of Bentonite Seal Elevation
			From	To		
Upgradient Monitoring Wells						
MW-14	3705	3550	3588	3552	3591	3596
MW-15	3775	3549	3585	3549	3588	3593
Downgradient Monitoring Wells						
MW-16	3810	3540	3577	3540	3580	3585
MW-17	3800	3540	3577	3540	3580	3585
MW-18	3780	3540	3577	3540	3580	3585
MW-19	3766	3540	3580	3540	3585	3588
MW-20	3752	3540	3589	3550	3592	3597

ALTERNATE LINER DEMONSTRATION

AN EVALUATION OF AN ALTERNATIVE LINER DESIGN USING HELP AND MULTIMED COMPUTER PROGRAMS

FOR THE CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL PERMIT NO. 73
POTTER COUNTY, TEXAS

Prepared by

HDR Engineering, Inc.
12700 Hillcrest Road, Suite 125
Dallas, Texas 75230

ALTERNATE LINER DEMONSTRATION

FOR THE CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL PERMIT NO. 73
POTTER COUNTY, TEXAS

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2.0 Site Hydrogeologic and Climatic Description 2

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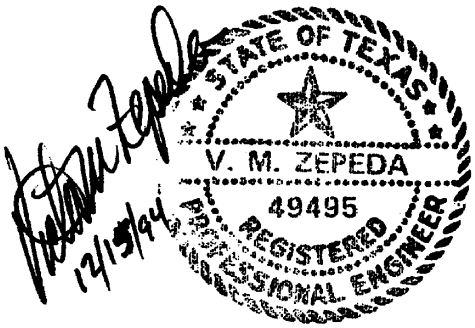
- 4.2 Base MULTIMED Input Data 13
- 4.3 Transient Model 18
- 4.4 Steady-State Modeling Considerations 20

5.0 Conclusions 21

6.0 References 22



ALTERNATE LINER DEMONSTRATION

FOR THE CITY OF AMARILLO
MUNICIPAL SOLID WASTE LANDFILL PERMIT NO. 73
POTTER COUNTY, TEXAS

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APPENDICES

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Appendix B Subsurface Investigation and Geotechnical Report
Appendix C HELP Model Runs
Appendix D MULTIMED Model Runs

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Figure 2 HELP Model AMR2LFTA Summary
Figure 3 HELP Model AMR3LFTA Summary
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Figure 5 HELP Model AMR7FNL Summary
Figure 6 Leachate Generation from HELP Model Simulation

1.0 Introduction

The City of Amarillo presently operates a 660+ acre Municipal Landfill (Permit No. 73). As a result of United States Environmental Protection Agency (EPA) and Texas Natural Resource Conservation Commission (TNRCC) implementation of the Resource Recovery and Conservation Act (RCRA) Subtitle D regulations, the design and operation of the remaining undeveloped areas are being modified to meet new facility design requirements. The rules as implemented by TNRCC allow the City to take advantage of local hydrogeologic and climatologic characteristics to submit for review an Alternate Liner Design (ALD). The proposed liner system varies from the Subtitle D liner, which includes a two foot thick compacted clay liner (CCL) overlain by a flexible membrane liner (FML), in that the CCL is replaced by a geosynthetic clay (bentonite mat) liner (GCL). This type of liner system for municipal solid waste disposal facilities has proven effective throughout the United States, particularly in semi-arid regions.

HDR has implemented the HELP and MULTIMED models as mandated by the TNRCC. These models were executed in the most appropriate and competent manner insofar as the level of technology and the intended use of the models allow. It should be noted that the models implemented in this study have been pushed to their practical limit of usefulness. That is to say, the uncertainty of some parameters result in more than one standard deviation of the result.

These models, as described in their documentation are intended as general use, screening-level comparative tools. Any attempt to use these models beyond the scope of their original intent may be inappropriate without the support of sound scientific reasoning and qualified engineering judgement. The interpretation of model results must be tempered by a thorough comprehension of their meaning. A complete understanding of the conditions being modeled, simplifying assumptions used in the algorithms, and especially the boundary conditions implied by model selection and use are imperative.

HDR has consulted with several noted experts in the modeling of landfill systems. Dr. Paul Schroeder, author of the HELP model and several professional papers regarding landfill leachate generation, flow, and transport systems was conferred with to validate our modeling approach and assumptions. Mr. Peter Kmet, a noted author experienced in landfill lining and modeling, agreed with the assumptions and conclusions reached by HDR, particularly with regard to collection efficiency. The validity of MULTIMED modeling approaches, assumptions, and general model applicability was verified by Mr. Gerard Laniak, the EPA Project Monitor and liason for MULTIMED.

Based upon extensive literature review, verification of modeling procedures and sound engineering judgement, we feel that these semi-numerical models are of some utility and certainly of value as screening level tools. Furthermore, we feel that the modeling

approach and values selected are the most appropriate for the given models and hydrogeologic setting. Presented here is a summary of the HELP and MULTIMED Model application techniques and data used to model the performance of the proposed alternate liner design.

Section 2 of this report contains information regarding the landfill site geologic and hydrogeologic setting. This site-specific data is an integral part of the HELP and MULTIMED models used to simulate leachate production, fate and transport.

Section 3 describes the HELP model input parameters, presents HELP model results and is followed by a discussion of the validity of model results. The HELP model was run and modified using a one year time step simulating site development conditions.

The fate and transport of contaminants (leachate) from the landfill is presented in Section 4. Because fate (defined as chemical and/or biological degradation) is disallowed by State policy, very conservative estimates of final leakage concentrations are calculated by MULTIMED at the point of compliance. A discussion of the field-collected and assumed site-specific input data and modeling procedures is also presented in this section.

Section 5 presents conclusions of the modeling efforts in support of the proposed alternate liner system.

2.0 Site Hydrogeologic and Climatic Description

The landfill's geologic and hydrogeologic setting is described in several subsurface characterizations. All subsurface investigations, characterizations and other geotechnical reports are presented in Appendices A and B. The following are findings, interpretations, and conclusions, presented in these geologic studies, are pertinent to the demonstration of the proposed alternate liner system:

February 12, 1975, Dyess Testing Laboratory, Inc.

Fourteen borings ranging in depth from approximately 20 to 60 feet below natural ground surface were drilled to determine the soil types and characteristics. The soils testing on collected samples included Atterberg Limits, permeability and soil classification. The soils were classified generally as clays, sandy clays and caliche with permeabilities in the range of 2.3×10^{-8} to 1.3×10^{-7} cm/sec.

August 30, 1979, Dyess Testing Laboratory, Inc.

Four shallow borings, that were terminated approximately 26 feet below natural ground surface, were used to classify soils in the proposed disposal area. Like the first investigation, the soils testing also included Atterberg Limits, permeability and soil classification. The soils were classified generally as clays, sandy clays and caliche with permeabilities in the range of $3.1x10^{-7}$ to $7.1x10^{-6}$ cm/sec. These borings yielded samples exhibiting higher permeability and lower plasticity than the soils reported in the first investigation.

July - November, 1994, Dyess-Peterson Testing Laboratory, Inc.

A total of eleven exploratory borings were advanced until saturated (groundwater) conditions were encountered. Two of these borings were advanced until the confining unit below the Ogallala, the Red Beds, was encountered. The remaining nine boreholes were then converted to groundwater monitoring wells as approved by TNRCC (December, 1993).

The subsurface investigation and geotechnical evaluation of the site during this study concluded that there are essentially two major strata overlying the Red Beds;

STRATA I

The uppermost strata, present over the majority of the site where the escarpment has not advanced, are consistent with sandy clays as described by the USCS. This layer may be considered a clayey "topsoil" zone typified by the designation CL (USCS field classification). Strata I is primarily cohesive soils.

Clay: *Brown to reddish tan containing various amounts of silt, sand sized grains, with abundant caliche nodules. The unit, where present on the site, is up to 70 feet thick. However, on the northern portion of the site where the Canadian Breaks intrude, it has been eroded away and is not present. This clay is classified as CL.*

Caliche: *This unit can be found as a hard cap rock with thicknesses up to 20-ft. and as irregular layers occurring mostly at the base of the upper clay. Caliche can also be found as nodules disseminated in the clays and sands throughout the entire section. It is tan colored, and may be sandy in part.*

STRATA II

This strata's classification ranges from SC in the uppermost part, to GW in the lower section. Strata II is mainly cohesive soils with varying consistencies.

Sand: *Underlying the caliche, is tan to reddish tan sand, fine-grained with abundant caliche nodules. The lower part of the unit generally contains medium to coarse gravels, subangular to rounded. At the site, the unit is at least 200 feet thick on the southern portion of the site where there is an overlying clay unit. The thickness of the unit in the northern portion of the site is at least 100 feet. Erosion has removed the overlying clay unit and the upper portion of this sand on the north portion of the site. A caliche cap is present on top of this sand on the northern portion of this site.*

Gravel: *Ranging in size from pea to coarse, these gravels occur in the lower most part of the sand zone and the upper most part of the lower clay. Thickness and occurrence will vary due to local deposition.*

The Subsurface Investigation Report (SIR, Appendix A) and the Limited Groundwater Investigation Report (LGIR, Appendix B) more fully describe the geologic and hydrogeologic conditions underlying the site. The SIR includes a complete discussion of the engineering characteristics of the on-site soils. Similarly, the LGIR describes the geologic and hydrologic properties and dimensions of the site as well as the relative point of compliance - the Ogallala Aquifer at the downgradient permit limit. The information critical to the alternate liner demonstration includes the location of the aquifer relative to the bottom of the landfill (70 feet minimum, 104.4 feet average), the soil characteristics of the unsaturated and saturated zones below the facility, and the estimated travel time for potential leachate to reach the point of compliance.

3.0 Leachate Generation Potential

3.1 HELP Model Scenarios

To conduct an evaluation of the proposed liner system, the rate of moisture percolation to the liner and leachate collection systems must first be estimated. A cursory examination of the water balance for the Amarillo area indicates a significant negative moisture balance. This would seem to indicate that the generation of leachate, particularly given the moisture retention capacity of municipal solid waste, would be non-existent. However, to comply with TNRCC requirements, a worst-case rate of leachate

production (other than zero) was used in the evaluation of liner and leachate collection systems. These quantities were estimated through the use of the Hydrologic Evaluation of Landfill Performance (HELP) Model program. The following scenarios for the proposed alternate liner design were modelled:

1) 6 inches of daily cover on 1 lift of waste (1 year)
   - 6 inch soil layer
   - 10 feet of waste
   - 12 inch protective soil layer
   - 12 inch granular drainage layer with leachate collection system
   - Geosynthetic Clay Liner with 60 mil HDPE

2) 6 inches of daily cover on 20 feet of waste (1 year)
   - 6 inch soil layer
   - 10 feet of waste
   - 10 feet of waste
   - 12 inch protective soil layer
   - 12 inch granular drainage layer with leachate collection system
   - Geosynthetic Clay Liner with 60 mil HDPE

3) 6 inches of daily cover on 30 feet of waste (1 year)
   - 6 inch soil layer
   - 10 feet of waste
   - 10 feet of waste
   - 10 feet of waste
   - 12 inch protective soil layer
   - 12 inch granular drainage layer with leachate collection system
   - Geosynthetic Clay Liner with 60 mil HDPE

4) 6 inches of daily cover on 50 feet of waste (3 year)
   - 6 inch soil layer
   - 20 feet of waste
   - 10 feet of waste
   - 10 feet of waste
   - 10 feet of waste
   - 12 inch protective soil layer
   - 12 inch granular drainage layer with leachate collection system
   - Geosynthetic Clay Liner with 60 mil HDPE

5) 12 inches of intermediate cover on 50 feet of waste (20 year)
   - 12 inch soil layer
   - 50 feet of waste
   - 12 inch protective soil layer

- 12 inch granular drainage layer with leachate collection system
- Geosynthetic Clay Liner with 60 mil HDPE

6) final cover with 12 inch barrier and 24 inch vegetative layer (20 years)
   - 24 inch vegetative layer
   - 12 inch clay barrier layer
   - 70 feet of waste
   - 12 inch protective soil layer
   - 12 inch granular drainage layer with leachate collection system
   - Geosynthetic Clay Liner with 60 mil HDPE

The following assumptions were used as part of the input data for the model.

Climatological data:

The synthetic precipitation option was used to generate 20 years of background rainfall data. The synthetic weather generator (WGEN) developed by the USDA is used by the Hydrologic Evaluation of Landfill Performance (HELP) program to arrive at the temporal distribution of rainfall events. The City of Amarillo was selected from the default climatologic database. To improve the statistical characteristics of the daily precipitation values, the normal mean monthly precipitation and temperature values for Amarillo were entered as part of the input data. The normal rainfall and temperature data was obtained from the National Oceanic and Atmospheric Administration (NOAA), *Climatography of the United States No. 81, for 1961-1990*. The synthetically generated year most closely approximating the 19.5 inches of annual average precipitation for Amarillo, simulation year ten (19.77 inches), was utilized in the single-year HELP model simulations.

As part of the climatological data, additional information is required that describes the soil. One criterion is the evaporative depth. Default values are provided for the area which are based on the vegetative condition of the top layer. A value of 10 inches was provided as the default value for bare ground and was used as input to the program for open conditions. Similarly, 22 inches was provided as the default value for fair grass, and was used as input to the program for closed conditions.

Soil Types and Permeabilities:

The Version 2 HELP Model user's manual (Table 4), provides default values for 18 soil types and textures. Each layer in the landfill must be described by a soil type and texture from this table. The default values including moisture content,

field capacity, wilting point, porosity and hydraulic conductivity were used for each layer with the exception of the waste layer. The moisture content for the waste layer was modified from the default value of 29 percent to a value of 20 percent. This moisture content was based on values reported in various textbooks where the value varies from 12 to 40 percent. The typical value for moisture content as reported is 20 percent.

Drainage layer criteria:

The HELP program also requires information representing the proposed drainage layer design. The following information was used in the model study:

Drainage layer slope	=	2 percent
Maximum drainage distance to the collector	=	840 feet (actually 350')
Permeability of drainage material	=	$1x10^{-2}$ cm/sec

3.2 Results - HELP Models

The scenarios described above were modeled as part of this Alternate Liner Demonstration for the purpose of estimating the maximum probable leachate generation rate (Refer to Appendix C). The resulting lateral drainage and vertical percolation rates reported by the HELP model are provided in Table 1.

TABLE 1
HELP Model Results
(average annual results)

Scenario	Lateral Drainage (in/year)	Vertical Percolation (in/year)	Total Flow (in/year)
AMR1LFTB	0.1755	0.0014	0.1769
AMR2LFTA	0.1478	0.0012	0.1490
AMR3LFTA	0.0868	0.0010	0.0878
AM5LF5YR	0.0390	0.0008	0.0398
AM7FNL	0.0168	0.0007	0.0175

3.3 Leachate Generation Conclusions

Based on sound engineering judgement, consultation with recognized experts in leachate generation modeling and conducting a significant amount of research regarding the HELP Model vadose flow algorithms, it has been determined that the modeling approach and initial conditions modeled here are an acceptable and appropriate engineering solution to the estimation of leachate generation. Therefore, given the observations presented below, the approach used in determining the amount of leachate generation and liner leakage are felt to be reasonable and conservative.

1) Extreme Moisture Balance Deficit

The primary source of water available to produce leachate is generally considered to be rainfall that does not either drain off cover soils or evapotranspirate. It is assumed that this available moisture penetrates these soil covers, beyond the zone of aeration, and percolates into and through variably saturated soil and waste layers below. The resulting moisture balance produced by the HELP model program indicates that as much as 107% of total annual precipitation is lost to evapotranspiration. The first three scenarios, that did not allow moisture loss due to runoff, the evapotranspiration was reported to be 96.5 % of the total precipitation. A review of the Amarillo climatology indicates the annual evaporation exceeded the annual rainfall by nearly three times, which would indicate a significant, negative moisture balance. Therefore, very little moisture should be available to drain into the soil and waste layers below.

The HELP model does not account for added evapotranspiration due to wind effects. This is expected to be substantial due to the fact that Amarillo is generally very windy, particularly during the wettest months of the year.

2) Storage Capacity of the Soil and Waste Layers

The HELP model utilizes algorithms that allow the movement of wetting fronts (flow of moisture) through soil and waste layers that are below field capacity. The model allows the waste layers, initially below field capacity, to pass moisture vertically to lower layers prior to filling the requisite amount or proportion of voids (field capacity). This does not follow currently accepted hydrogeologic principals of unsaturated vertical flow and transport of fluids through porous media. Only after the ambient moisture content of the soils under consideration has exceeded the field capacity of that particular material, will gravity drainage occur.

The typical moisture content of municipal solid waste at the time of placement is about 20 percent (Tchobanoglous, et. al. 1977) by dry weight and between 10 and 20 percent by volume (Oweis, et al., 1990). The moisture content of waste

necessary to allow gravity drainage (i.e., the field capacity of waste) is approximately 29 percent as noted in the HELP model documentation and may range as high as 50 percent (USEPA; Fungaroli, et al., 1979). Given the climatic conditions of Amarillo, the initial moisture content of waste may be substantially lower than those values stated above for wetter, cooler climates, thus allowing for additional moisture storage.

Because the soil and waste layers have the ability to store moisture that may be allowed to move through a layer in the model, a large percentage of moisture should be held in the layers as storage, further decreasing the potential for barrier layer percolation.

The HELP Model v2.05 generates what is commonly called "phantom leachate". Generally, this can be described as water that is reported by the model as leachate that should not, according to currently accepted hydrogeologic principles, be available for vertical percolation between layers. Dr. Schroeder confirmed that this is a flaw in the modeling algorithm. He also pointed out that the apparent flaw added a factor of safety to the model, allowing for the generation of leachate that would not otherwise be possible with a hydrogeologically-correct water balance and routing. He went on to explain that this "technically incorrect" moisture routing helped to account for channeling, or preferential flow of moisture through the waste (and soil) column in HELP v2.05. Dr. Schroeder indicated that the "phantom leachate" generation problem has been remedied in the third version of the model.

3) Leachate Head on the Liner

The HELP Model program calculates the head above the liner system with a Boussinesq method, which results in a peak daily value of 0.4 inches. As a comparison to the value provided in the HELP Model program output, the head was also calculated using Giroud's equation;

$$T_{max} = L \frac{\sqrt{4(\frac{e}{k}) + \tan^2(\beta)} - \tan(\beta)}{2\cos(\beta)}$$

where:
- L = cross gradient drainage length (ft)
- e = impingement rate (peak daily lateral drainage) (in/day)
- k = hydraulic conductivity of the drainage layer (ft/day)
- β = slope angle of the base of the drainage layer (degrees)

TABLE 2 Peak Daily Head on Liner and Lateral Drainage			
Scenario	Peak Daily Lateral Drainage (inches/day)	Head (HELP) (inches)	Head (Giroud equation) (inches)
AMR1LFTB	0.1755	0.4	0.37
AMR2LFTA	0.1478	0.4	0.31
AMR3LFTA	0.0868	0.2	0.18
AM5LF5YR	0.0390	0.1	0.12
AM7FNL	0.0168	0.1	0.06

3.4 Liner Leakage Estimation

As part of the alternate liner design, the leakage through the liner must be estimated and input into the MULTIMED Model. The HELP Model liner leakage values are very conservative. A value of 0.01 was used as the liner leakage fraction input to the program to simulate a geosynthetic liner system that was only 90% efficient. According to experienced professionals in this area, this is not a realistic expectation of a liner installed with even mediocre quality control. Therefore, equations presented by the author of the HELP Model, Dr. Paul Schroeder, P.E., at a HELP Model v3.0 seminar have been utilized for the evaluation of liner leakage. These equations for leakage through geomembranes, given liner system design and installation quality, were utilized to calculate the anticipated leakage through the liner system at the City of Amarillo Landfill as follows;

$$Q = K_s i_{avg} \pi R^2 \left(\frac{No.\ Defects}{acre}\right)$$

Where: Q = infiltration rate of leachate through liner (m/yr)
K_s = saturated hydraulic conductivity of bottom liner (m/sec)

$$i_{avg} = 1 + \frac{H}{2H_s \ln(\frac{R}{R_o})}$$

R_o = radius of geomembrane imperfection (m)

$$R = 0.26a^{0.05}H^{0.45}K_s^{-0.13}(\frac{n_{25}}{n_{15}})$$

H_s = thickness of geosynthetic clay liner (m)
a = area of geomembrane imperfection (m^2)
H = head of leachate over geomembrane liner (m)
n_{25} = viscosity of water at 20° C
n_{15} = viscosity of water at 15° C

Based upon recommendations by Dr. Schroeder, a design imperfection area of 1 cm^2 and imperfection density of one defect per acre was assumed to represent a liner system installation typical of that expected with a good quality assurance and quality control program. It should be noted that, based upon six case studies, a hole size of 3.1 mm^2 is recommended for typical operating conditions, resulting in a factor of safety of approximately 300 for apparent geomembrane imperfection size (3.1 mm^2 / 1 cm^2). The worst case leakage rate was calculated to be 0.00002727 m/yr, representing a five inch static head over a 1 cm^2 imperfection. This leakage rate has been utilized as the infiltration input to the MULTIMED model.

4.0 Potential Leachate Fate and Transport

As part of an alternate liner demonstration, the TNRCC requires that the MULTIMED model be used to evaluate probable fate and transport of leachate resulting from liner leakage. The following sections describe the MULTIMED model in general as well as its application to the City of Amarillo MSW Landfill. Section 4.1 presents an overview of the program. Section 4.2 discusses the baseline data and assumptions used to model the vadose and saturated zones below the Amarillo Landfill. Discussion of the steady-state modeling assumptions and results is given in Section 4.3. The appropriateness of the transient state transport assumption and the corresponding model dilution results are presented in Section 4.4.

4.1 MULTIMED Model Overview

The United States Environmental Protection Agency's (USEPA) Multimedia Exposure Assessment Model (MULTIMED) is a suite of multidimensional fate and transport algorithms that simulate the movement, dispersion, diffusion and degradation of contaminants leaching from waste disposal facilities. Use of this model is mandated by the TNRCC as an evaluation tool for the anticipated performance of landfill liner systems and their suitability to site-specific hydrogeologic conditions. From the model documentation , *"...simplifying assumptions required to obtain the analytical solutions limit the complexity of the systems which can be represented by MULTIMED. The model does not account for site-specific spatial variability, the shape of the land disposal facility, site specific boundary conditions, or multiple aquifers and pumping wells. Nor can MULTIMED simulate processes, such as flow in fractures and chemical reactions between contaminants, which can have a significant affect on the concentration of contaminants at a site."* (Sharp-Hansen, et al., 1990).

The acceptability of an alternate liner design is based upon the dilution attenuation factor, DAF, resulting from site specific fate and transport modeling of the liner design in its unique hydrogeologic setting. Because this method is based on the premise that the model estimation of concentration at the point of compliance (POC) is linear with respect to the input concentration, the DAF is the factor by which the initial concentration can be expected to decrease between the bottom of the land disposal unit and the point of compliance. The design would, according to the USEPA, be acceptable if the DAF is 100 or greater, due to the maximum expected concentration of contaminants. Typical leachate contaminant concentrations found in municipal solid waste landfills are approximately 100 times greater than the Maximum Contaminant Level (MCL) for each constituent (Sharp-Hansen, et al., 1990).

However, according to the Alternate Liner Design Handbook released by the TNRCC (1993), much more conservative input concentrations are required. The TNRCC document requires a minimum DAF of 260, or 2.6 times the USEPA recommended attenuation, for an alternate liner design to be deemed acceptable.

As part of the State mandated alternative liner demonstration, leakage through the liner must be estimated and input into the MULTIMED model. However, the HELP model leachate generation values (as given in the output from the HELP program) are not considered to be realistic for this site (see discussion in previous sections). Equations presented above to calculate liner leakage were used to estimate the maximum anticipated leakage through the liner system at the City of Amarillo Landfill. These worst-case leakage rates (MULTIMED infiltration) were input to the MULTIMED model to estimate leachate concentrations at the landfill's relative point of compliance. This approach used the most applicable options available in the MULTIMED model as well as sensitivity analysis.

4.2 Base MULTIMED Input Data

The following tables do not include the statistical data requested in the TNRCC Handbook. The handbook refers to Monte Carlo simulations which were not used in this exercise. There is little if any material readily available that describe the statistical variance or boundary conditions for the data relating to each of the computer-simulated material properties. The Monte Carlo simulation, although useful in describing parameter uncertainty, assumes that the probability distribution of any given parameter is known. Probability distributions are generally constructed from large sets of site specific data. The cost and timeliness of collecting such data is prohibitive, particularly as these data relate to Subtitle D applications. Assuming a parameter probability distribution when the distribution is unknown does not reduce uncertainty, as the certainty of the output is then a function of the assumed certainty of the input parameter (Salhotra et. al., 1990).

A baseline MULTIMED model with the parameter values for the City of Amarillo Landfill was assembled as outlined in the following tables. These tables represent the same tables found in the TNRCC Alternate Liner Design Handbook, pages 17 through 21. Some values were changed from simulation to simulation to determine the relative model sensitivity to each parameter. The facility was modeled assuming both steady state and transient conditions. For transient state vadose zone models, the average vadose depth of 31.8 meters (104.4 feet) was used. The pulse term for this scenario was varied from 20 to 2000 years. Transient state modeling is the most appropriate approach in view of the conditions existing at the Amarillo Landfill. For most simulations, the mixing zone depth was calculated by the model.

Included as Appendix D are the MULTIMED output files for each of the runs described on Tables 9 and 10.

Table 3
Chemical-Specific Variables

Variable Name	Value	Comments
Solid phase decay coefficient	Derived	Derived by model
Dissolved phase decay coefficient	Derived	Derived by model
Overall decay coefficient	Derived	Derived by model
Acid catalyst hydrolysis constant	0.0	Model default value
Neutral hydrolysis rate constant	0.0	Model default value
Base catalyst hydrolysis constant	0.0	Model default value
Reference temperature	25°C	Model default value
Normalized distribution coefficient	1.0	Model default value
Distribution coefficient	Derived	Derived by model
Biodegredation coefficient	0.0	Not allowed by TNRCC

Note: Chemical-specific variables are all default values from the MULTIMED set-up program, PREMED.

Table 4
Source-Specific Data

Variable Name	Value	Comments
Infiltration rate	0.00002727 m/yr	Calculated GCL leakage
Area of disposal unit	1,971,000 m^2	Landfillable area (487 Ac.)
Spread of contaminant source	Gaussian	σ = W/6 (W = width scale)
Recharge rate	0.0	Conservative value
Initial concentration at landfill	1.0	Per TNRCC Handbook
Length scale of facility	Derived	Derived by model
Width scale of facility	Derived	Derived by model

Table 5
Unsaturated Zone Transport Variables

Variable Name	Value	Comments
Longitudinal dispersivity	Derived	Derived by model
Percent organic matter	1.0	Assumed value
Soil bulk density	1.6	Table 6.8*
Biological decay	0.0	Not allowed by TNRCC

* Sharp-Hansen, 1993

Table 6
Unsaturated Zone Flow Variables

Variable Name	Value	Comments
Saturated hydraulic conductivity	0.036 - 0.36 m/yr	Laboratory values
Unsaturated zone porosity	0.43	Table 6-3*, (fine sand)
Air entry pressure head	0.0	Default value
Depth of unsaturated zone	31.8 m	Mean depth, mode=32.0
Residual water content	0.07	Table 6-4*
Brooks and Corey exponent	0.0	Not used
ALFA Van Genuchten	0.005	Table 6-5*
BETA Van Genuchten	1.09	Table 6-5*

* Sharp-Hansen, 1993

Table 7
Aquifer-Specific Data

Variable Name	Value	Comments
Particle diameter	Not used	Not used by model
Aquifer porosity	0.20	Estimated value
Bulk density	1.50 g/cc	Table 6-11*
Aquifer thickness	12.2 m	Average saturated depth
Mixing zone depth	Derived	Derived by model
Hydraulic conductivity	100 m/yr	Low end of local values
Hydraulic gradient	0.005	Average gradient
Groundwater seepage velocity	Derived	$V_s = KS/\theta$
Retardation coefficient	Derived	$R_s = 1 + \rho_b K_d/\theta$
Longitudinal dispersivity	Derived	$\alpha_L = 0.1\ x_r$
Transversal dispersivity	Derived	$\alpha_T = \alpha_L /3$
Vertical dispersivity	Derived	$\alpha_V = 0.056\ \alpha_L$
Temperature of aquifer	28.0°C	Assumed Value
pH	7.50	Assumed Value
Organic carbon content	0.001	Assumed Value
Receptor distance from well	15 m	Half buffer zone, 100'

* Sharp-Hansen, 1993

TABLE 8
Depth from Bottom Liner to Groundwater Table

Cell	Bottom Elevation*	Groundwater Elevation*	Depth (ft)	Depth (m)
6	3705	3600	105	32.0
9	3705	3600	105	32.0
7	3695	3600	95	29.0
8	3695	3605	90	27.4
5	3685	3615	70	21.3
4	3695	3595	100	30.5
10	3695	3590	105	32.0
11	3715	3590	125	38.1
12	3735	3590	145	44.2

* Cell bottom elevations taken from 1992 Annual Report. Groundwater table elevations are from Limited Groundwater Characterization.

4.3 Transient Model

As stated previously, application of steady-state assumptions to the fate and transport of liner leakage from the City of Amarillo Landfill is inappropriate; therefore, the MULTIMED model was run using a very conservative, worst-case, open-landfill-condition impingement rate with a transient transport case. This impingement rate represents a driving head 12.5 times the calculated daily maximum with a nominal liner defect size approximately 300 times that reported in literature. This cumulative factor of safety is about 3,750. The entire landfill area was assumed to be contributing at this very conservative infiltration rate, forcing the model to calculate the most conservative, transient state DAF.

The model was pre-set to determine the maximum contaminant concentration using the transient mode with a pulse duration of 200 to 2000 years, with a 200 year pulse duration as the base assumption. This pulse duration is conservative considering that it is much longer than any one cell of the landfill will be effectually contributing leachate, particularly at the worst case rate used in the model simulations.

A Gaussian source term was specified for the MULTIMED models. This type of source was chosen in view of the higher concentrations resulting from the Gaussian plume distribution used to calculate the mixing zone depth and concentrations as compared to those resulting from the Patch source as included in the model. The mixing zone depth was also calculated by the program using a Gaussian distribution function.

Vertical, longitudinal and transverse dispersivities were calculated by the model. The model calculates vertical dispersivity as one tenth the distance from the unit boundary to the POC. The transverse dispersivity was calculated as one third of the longitudinal dispersivity, or one thirtieth the distance to the POC. Similarly, the model predicts the vertical dispersivity as 0.056 times the longitudinal dispersivity, or the distance to the POC divided by 17.857. These relationships may be restated as:

$$\textit{Longitudinal Dispersivity } (\alpha_L) = \frac{x_r}{10}$$

$$\textit{Transverse Dispersivity } (\alpha_T) = \frac{\alpha_L}{3}$$

$$\textit{Vertical Dispersivity } (\alpha_V) = \frac{(\alpha_L)}{17.857}$$

where x_r is the radial distance from the edge of the landfill unit to the POC.

The model calculated the groundwater seepage velocity assuming a uniform, saturated porous medium (Darcy's assumptions) as

$$\textit{Seepage Velocity } (V_s) = \frac{KS}{\theta}$$

where K is the apparent hydraulic conductivity of the aquifer, S is the aquifer hydraulic gradient and θ is the aquifer porosity. No biodegradation was assumed to be active in the model, thus the retardation factor, R_s, was assumed to be 1.0 or non-reactive.

The transient state modeling presents the most realistic approach to describing the effects of the extensive vadose zone below the City of Amarillo Landfill. Sensitivity of the transient model to infiltration rate, depth of vadose zone, van Genuchten unsaturated flow parameters, aquifer porosity and hydraulic conductivity, and pulse duration were evaluated.

The results of the baseline transient modeling yielded a DAF of approximately 95,000. The proposed design is, according to the EPA, acceptable because the DAF is greater than 100. The proposed design is also acceptable by the TNRCC-imposed minimum DAF of 260 (Alternate Liner Design Handbook, 1993). The most sensitive parameter, the infiltration rate, yielded a DAF of about 944 when the baseline value was increased by an order of magnitude. It should be noted that when a Patch source term was used in the transient state, the DAF went to infinity.

4.4 Steady-State Modeling Considerations

The MULTIMED model was used in the steady-state mode to simulate the Amarillo Landfill with worst case leakage from the entire landfill area with constant, non-decaying source leakage terms. However, the steady-state transport of leachate from the landfill unit through the vadose zone and the underlying aquifer to the point of compliance requires the contaminant source to be sufficiently large to ensure that the down gradient concentration, once reached, will be maintained. This assumption is not valid for the Amarillo Landfill given the negative water balance, inclusion of a leachate collection system, and the depth from the bottom liner to the groundwater table. Furthermore, the steady-state assumptions require that the source of contamination be continuous and constant, an assumption that is also not applicable to the Amarillo Landfill. The MULTIMED model documentation states that *"...If these assumptions can not be made at a particular site, inaccurate results will be produced... Steady-state models are also inappropriate when the simulation includes chemicals that sorb or transform significantly."* (Sharp-Hansen, pg. 50).

It must be noted that steady-state model runs disregard the effects of the unsaturated zone altogether despite the relative depth and time of transport as compared to the real pulse term of leachate through the landfill system. Running the model assuming steady-state flow and transport boundary conditions forces the immediate appearance of leachate at the water table and neglects the potential attenuation effects due to adsorption, biodegradation and hydrolysis on the source concentration of the leachate load to the groundwater system. The flow field in the unsaturated zone is assumed by the model to be at a steady-state. This does not accurately reflect the unsteady, pulse nature of the system being modeled, especially since the worst case leakage rate is used to establish the flow rate through the system. The model neglects the effects of lateral and transverse advection and dispersion. Molecular diffusion of the modeled

plume, particularly at the boundaries, is not accounted for by the model. Adsorption and decay of the leachate constituents is also not recognized by the MULTIMED model, as applied in accordance with the TNRCC Alternate Liner Design Handbook.

A baseline steady-state model representing a 20 acre cell 30 meters from the point of compliance was prepared with the parameters above. This model indicated a DAF of 332. This value is more than three times the recommended EPA value and almost 130% the TNRCC level. This model was found to be relatively insensitive to changes in aquifer porosity, depth of mixing zone, and changes in groundwater gradient. The steady-state model is sensitive to the size of the facility being modeled, its distance from the relative point of compliance, and changes in aquifer hydraulic conductivity.

5.0 Conclusions

The City of Amarillo presently operates a municipal landfill of approximately 487 fillable acres. The major portion of this facility has not been developed and is being modified to comply with new Subtitle D regulations. The regulations allow for the design of an alternate liner system. Th proposed bottom liner system will include a geosynthetic clay liner overlain by a flexible membrane (60 mil HDPE) liner and a 12 inch granular material leachate collection system. The sidewall is proposed to be constructed similarly but with the granular drainage material being replaced by a geocomposite drainage material. To demonstrate adequate performance of the proposed alternate liner system, the Hydrologic Evaluation of Landfill Performance (HELP) Model and the Multimedia Exposure Assessment Model (MULTIMED) programs were used to simulate the design conditions.

The fate and transport modeling scheme for the Amarillo Landfill included a transient pulse load, Gaussian source boundary condition, and a conservative infiltration rate. The resulting Dilution Attenuation Factor for the most appropriate scenario was in excess of 95,000. This value is approximately 365 times greater than the TNRCC minimum value of 260.

The proposed landfill liner system has been designed and modeled in accordance with §330.202, *Alternate Liners*, and with the highest standards of current professional geoenvironmental engineering practice. The proposed liner system should be protective of the public health and the environment.

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FIGURES

FIGURE 1
HELP MODEL AMR1LFTB SUMMARY FOR YEAR 1

Landfill Cross Section

6" Daily Cover
120" Waste
12" Protective Cover Soil
12" Drainage Layer
Geosynthetic Clay Liner with HDPE

Model AMR1LFTB Parameters
(simulation duration for one year)

Layer	Soil Texture	Thickness (in)	Permeability (cm/sec)	Initial Moisture Content	Final Moisture Content	Field Capacity	Wilting Point	Porosity
1	10	6	1.20 E-4	0.2443	0.1535	0.2443	0.1361	0.3980
2	18	120	2.00 E-4	0.2000	0.2102	0.2942	0.1400	0.5200
3	10	12	1.20 E-4	0.2443	0.2180	0.2443	0.1361	0.3980
4	1	12	1.00 E-2	0.0454	0.0578	0.0454	0.0200	0.4170
5	user specified	0.30	5.00 E-9	0.4000	0.4000	0.3560	0.2899	0.4000

Assumptions

- Synthetic weather generation using normal monthly temperatures and precipitation values for Amarillo, Texas.
- Default city = Amarillo, Texas.
- Leaf area index = 0.0 for bare ground.
- Evaporative zone depth = 10 inches
- Runoff curve number determined by model.
- Leakage fraction through composite liner = 0.01
- Landfill surface area = 1sf
- Slope of drainage layer = 2%
- Maximum length along slope = 840 feet
- User initialized values for moisture content. Soil moisture content set to field capacity to simulate steady state conditions. Moisture content for waste set to 20 percent.

Results

Peak Average Monthly Lateral Drainage	0.0179 inches/month	0.000597 inches/day

FIGURE 2
HELP MODEL AMR2LFTA SUMMARY FOR YEAR 2

Landfill Cross Section

6" Daily Cover

120" Waste

120" Waste

12" Protective Cover Soil

12" Drainage Layer

Geosynthetic Clay Liner with HDPE

Model AMR2LFTA Parameters
(simulation duration for one year)

Layer	Soil Texture	Thickness (in)	Permeability (cm/sec)	Initial Moisture Content	Final Moisture Content	Field Capacity	Wilting Point	Porosity
1	10	6	1.20 E-4	0.2443	0.1535	0.2443	0.1361	0.3980
2	18	120	2.00 E-4	0.2000	0.2102	0.2942	0.1400	0.5200
3	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
4	10	12	1.20 E-4	0.2108	0.2050	0.2443	0.1361	0.3980
5	1	12	1.00 E-2	0.0578	0.0523	0.0454	0.0200	0.4170
6	user specified	0.30	5.00 E-9	0.4000	0.4000	0.3560	0.2899	0.4000

Assumptions

- Synthetic weather generation using normal monthly temperatures and precipitation values for Amarillo, Texas.
- Default city = Amarillo, Texas.
- Leaf area index = 0.0 for bare ground.
- Evaporative zone depth = 10 inches
- Runoff curve number determined by model.
- Leakage fraction through composite liner = 0.01
- Landfill surface area = 1sf
- Slope of drainage layer = 2%
- Maximum length along slope = 840 feet
- User initialized values for moisture content. Soil moisture content set to field capacity to simulate steady state conditions. Moisture content for waste set to 20 percent.

Results

Peak Average Monthly Lateral Drainage	0.0162 inches/month	0.00054 inches/day

FIGURE 3
HELP MODEL AMR3LFTA SUMMARY FOR YEAR 3

Landfill Cross Section

6" Daily Cover

120" Waste

120" Waste

120" Waste

12" Protective Cover Soil

12" Drainage Layer

Geosynthetic Clay Liner with HDPE

Model AMR3LFTA Parameters
(simulation duration for one year)

Layer	Soil Texture	Thickness (in)	Permeability (cm/sec)	Initial Moisture Content	Final Moisture Content	Field Capacity	Wilting Point	Porosity
1	10	6	1.20 E-4	0.2443	0.1535	0.2443	0.1361	0.3980
2	18	120	2.00 E-4	0.2000	0.2102	0.2942	0.1400	0.5200
3	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
4	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
5	10	12	1.20 E-4	0.2050	0.2013	0.2443	0.1361	0.3980
6	1	12	1.00 E-2	0.0523	0.0497	0.0454	0.0200	0.4170
7	user specified	0.30	5.00 E-9	0.4000	0.4000	0.3560	0.2899	0.4000

Assumptions

- Synthetic weather generation using normal monthly temperatures and precipitation values for Amarillo, Texas.
- Default city = Amarillo, Texas.
- Leaf area index = 0.0 for bare ground.
- Evaporative zone depth = 10 inches
- Runoff curve number determined by model.
- Leakage fraction through composite liner = 0.01
- Landfill surface area = 1sf
- Slope of drainage layer = 2%
- Maximum length along slope = 840 feet
- User initialized values for moisture content. Soil moisture content set to field capacity to simulate steady state conditions. Moisture content for waste set to 20 percent.

Results

Peak Average Monthly Lateral Drainage	0.0090 inches/month	0.00030 inches/day

FIGURE 4
HELP MODEL AM5LF5YR SUMMARY FOR YEARS 4-8

Landfill Cross Section

6" Daily Cover

240" Waste

120" Waste

120" Waste

120" Waste

12" Protective Cover Soil

12" Drainage Layer

Geosynthetic Clay Liner with HDPE

Model AM5LF5YR Parameters
(simulation duration for five years)

Layer	Soil Texture	Thickness (in)	Permeability (cm/sec)	Initial Moisture Content	Final Moisture Content	Field Capacity	Wilting Point	Porosity
1	10	6	1.20 E-4	0.2443	0.1892	0.2443	0.1361	0.3980
2	18	240	2.00 E-4	0.2000	0.2014	0.2942	0.1400	0.5200
2	18	120	2.00 E-4	0.2102	0.2100	0.2942	0.1400	0.52(
3	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
4	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
5	10	12	1.20 E-4	0.2013	0.1930	0.2443	0.1361	0.3980
6	1	12	1.00 E-2	0.0497	0.0470	0.0454	0.0200	0.4170
7	user specified	0.30	5.00 E-9	0.4000	0.4000	0.3560	0.2899	0.4000

Assumptions

- Synthetic weather generation using normal monthly temperatures and precipitation values for Amarillo, Texas.
- Default city = Amarillo, Texas.
- Leaf area index = 0.0 for bare ground.
- Evaporative zone depth = 10 inches
- Runoff curve number determined by model.
- Leakage fraction through composite liner = 0.01
- Landfill surface area = 1sf
- Slope of drainage layer = 2%
- Maximum length along slope = 840 feet
- User initialized values for moisture content. Soil moisture content set to field capacity to simulate steady stat conditions. Moisture content for waste set to 20 percent.

Results

Peak Average Monthly Lateral Drainage	0.0057 inches/month	0.00019 inches/day

FIGURE 5
HELP MODEL AMR7FNL SUMMARY FOR YEARS 9-28

Landfill Cross Section

24" Vegetative/Erosion Layer

12" Barrier Layer

240" Waste

240" Waste

120" Waste

120" Waste

120" Waste

12" Protective Cover Soil

12" Drainage Layer

Geosynthetic Clay Liner with HDPE

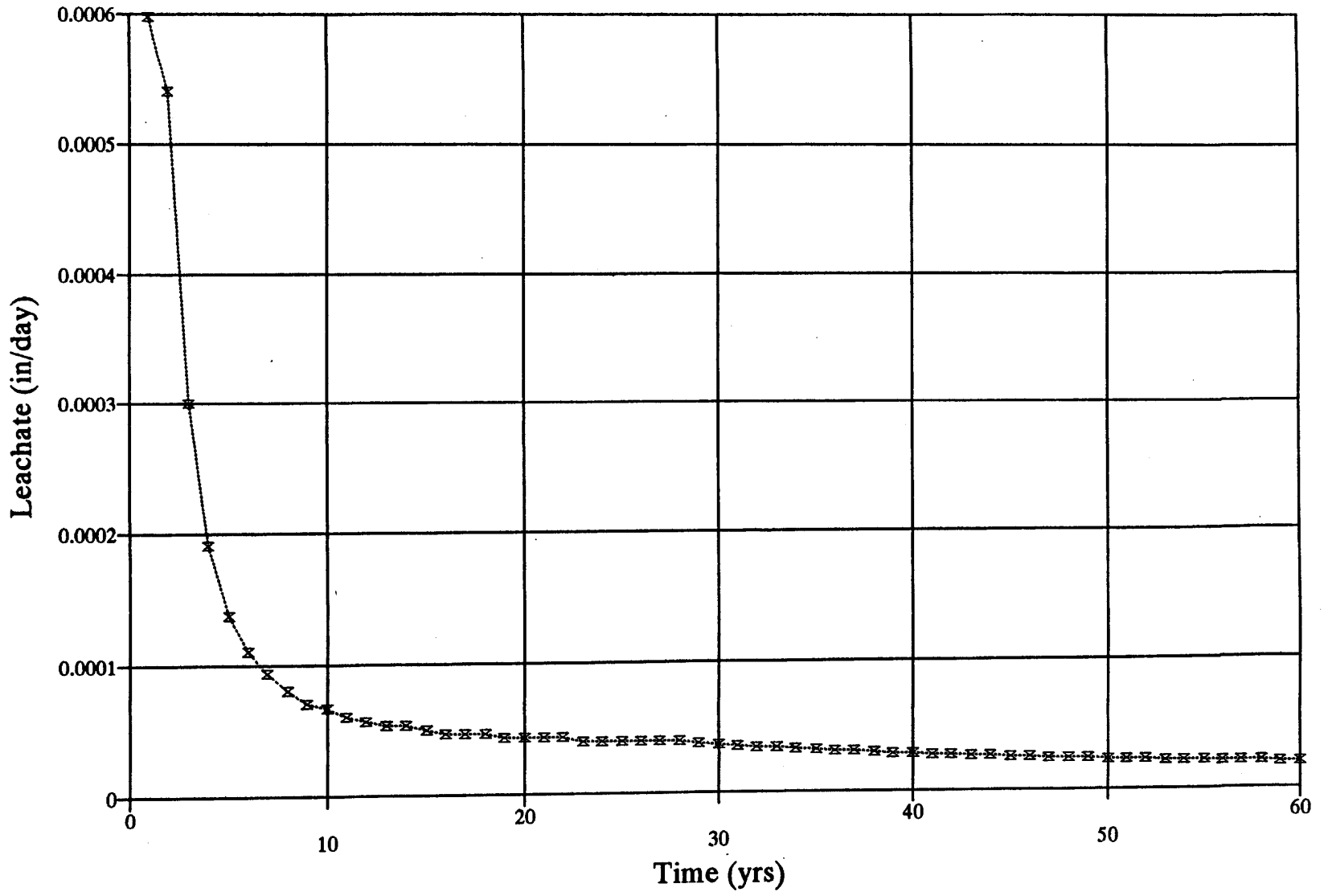
Model AMR7FNL Parameters
(simulation duration for 20 years)

Layer	Soil Texture	Thickness (in)	Permeability (cm/sec)	Initial Moisture Content	Final Moisture Content	Field Capacity	Wilting Point	Porosity
1	11	24	1.00 E-5	0.1892	0.2071	0.3104	0.1875	0.4640
2	11	12	1.00 E-5	0.2648	0.2648	0.3495	0.2648	0.4224
3	18	240	2.00 E-4	0.2000	0.1995	0.2942	0.1400	0.5200
4	18	240	2.00 E-4	0.2014	0.2013	0.2942	0.1400	0.5200
5	18	120	2.00 E-4	0.2100	0.2091	0.2942	0.1400	0.5200
6	18	120	2.00 E-4	0.2102	0.2101	0.2942	0.1400	0.5200
7	18	120	2.00 E-4	0.2102	0.2102	0.2942	0.1400	0.5200
8	10	12	1.20 E-4	0.1930	0.1867	0.2443	0.1361	0.3980
9	1	12	1.00 E-2	0.0470	0.0463	0.0454	0.0200	0.4170
10	user specified	0.30	5.00 E-9	0.4000	0.4000	0.3560	0.2899	0.4000

Assumptions

- Synthetic weather generation using normal monthly temperatures and precipitation values for Amarillo, Texas.
- Default city = Amarillo, Texas.
- Leaf area index = 2.0 for fair grass
- Evaporative zone depth = 22 inches
- Runoff curve number determined by model.
- Leakage fraction through composite liner = 0.01
- Landfill surface area = 1sf
- Slope of drainage layer = 2%
- Maximum length along slope = 840 feet
- User initialized values for moisture content. Soil moisture content set to field capacity to simulate steady state conditions. Moisture content for waste set to 20 percent.

Figure 6 - Leachate Generation from AMR1LFT... HELP Model simulation



APPENDIX A
SUBSURFACE INVESTIGATION REPORT AND GEOTECHNICAL REPORT

Subsurface Investigation

and

Geotechnical Soils Report

for

City of Amarillo Municipal Solid Waste Landfill

in

Amarillo, Texas

December 14, 1994

Requested by:
City of Amarillo
% Michael D. Kennedy, P.E. - Director of Public Works

Dyess-Peterson Testing Laboratory, Inc.
P O Box 30699
Amarillo, Texas 79120
(806) 372-4911

Report No. 6890B

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1.0 INTRODUCTION

1.1 Project Description

On July 5, 1994, Dyess-Peterson Testing Laboratory, Inc. (D-PTL) initiated a geotechnical investigation and installation of ground water monitoring wells for the City of Amarillo Municipal Solid Waste Landfill. The site of this investigation, within the permitted landfill limits, is approximately 4-miles west of the city of Amarillo, approximately 2 miles north of IH-40 on Hill Road, in Potter County, Texas. The location of this project is shown on Figure I.

A Groundwater Monitoring System Plan (GWMSP) was prepared by HDR Engineering, Inc. (HDR) and approved by the Texas Natural Resources Conservation Commission (TNRCC) in December, 1993. The approved GWMSP and Scope of Services called for the installation of six monitor wells, three piezometers and two test borings for a total of 11 borings. The test borings penetrated the entire thickness of the water-bearing formation and terminate in the underlying units. The groundwater monitoring system installation program was expanded by HDR to include a Subsurface Investigation and Geotechnical Laboratory Report in support of an Alternate Liner Demonstration (ALD). The location of the borings for this project, as approved by Mr. Dick Smith, then Manager of the TNRCC MSW Division's Groundwater Protection Section, are shown in Figure 3 "Soil Boring/Monitor Well Location Map".

All monitor wells were completed and developed in general conformance with TNRCC Technical Guides No. 4 and No. 5, Specifications and Guidance for Installation of Groundwater Monitoring Wells at Municipal Solid Waste Landfills and Guidelines for Sampling Monitor Wells at Municipal Solid Waste Landfills, respectively.

1.2 Authorization

Mr. Michael D. Kennedy, P.E., Director of Public Works for the City of Amarillo verbally authorized D-PTL to proceed with this project shortly after the Contract #cityama.01 was presented and accepted at the City Council meeting on May 4, 1994. A site boring plan, from the GWMSP, was provided by Mr. Troy R. Hotchkiss of HDR Engineering, Inc. of Dallas, Texas. City of Amarillo personnel located the borings at this site as indicated on the attached Location of Borings (Figure 3). Prior to field work commencement, representatives of the City, HDR and D-PTL met and resolved that the three proposed piezometers would be completed and registered as monitor wells, for a total of nine monitor wells. During the drilling program, D-PTL, with the consent of the City, moved the location of P-3 approximately 70 feet north-northwest of the location indicated on the site boring plan.

1.3 Purpose

This project was undertaken to 1) install a groundwater monitoring system in accordance with the Scope of Services (TNRCC approved groundwater monitoring system), and 2) to gather knowledge of the subsurface soil conditions, soil properties, and stratigraphy underlying the City of Amarillo Landfill in support of an Alternate Liner Demonstration. Regional geology, hydrology and hydrogeolgy is presented by others. Periodic (weekly) measurement of groundwater elevations in the completed monitor wells is also presented within this report (Table 2).

This Subsurface Investigation and Geotechnical Laboratory Report presents the findings of the field investigation, laboratory studies and generally describes the geotechnical conclusions/interpretations drawn from the work effort. Also included in this report is the installation, development and documentation of the installed groundwater monitoring system.

1.4 Scope of Investigation

The following investigation and engineering studies were performed in connection with the preparation of this report:

1. Subsurface borings were drilled in order to determine the subsurface soils and conditions present at this site and to obtain samples of the subsurface material for laboratory analysis and sampled in accordance with ASTM Designation: D 1586-84.

2. Samples of subsurface material from the borings were analyzed in the Laboratory for classification by the Unified Soil Classification System, Atterberg Limits tests, sieve analysis, moisture content, and unconfined compressive strength.

3. The information obtained by the subsurface borings and the laboratory tests are presented as part of site soils and geotechnical characterization for design of an alternate liner system meeting regulatory criteria set forth by the Texas Natural Resources Conservation Commission for Municipal Solid Waste Landfills, 30 TAC 330.

4. Previous investigations performed by Dyess Testing Laboratory, Inc., in 1975 and 1979, totaling 18 borings, were reviewed for characteristics and classification of subsurface soils. These relatively shallow geotechnical investigations only classified the shallower, surficial soils, but do help characterize the upper stratum.

2.0 REGIONAL GEOLOGICAL/HYDROGEOLOGIC SETTING

2.1 Physiography

The landfill site is located in the High Plains region of Texas. The High Plains is nearly level with a gentle slope toward the southeast. The High Plains does not contain a well defined drainage system. Drainage usually occurs by ephemeral playas and streams across the surface of the High Plains. The dominant drainage feature in the region occurs North of Amarillo which is the Canadian River Basin.

2.2 Stratigraphy and Hydrogeology

The stratigraphy of the High Plains generally consists of deposits ranging in age from Permian to Recent. The primary units of interest, from oldest to youngest, in the Amarillo area consist of the Triassic Red Beds, Ogallala Formation of Pliocene age, and the Recent age windblown, eolian, and fluvial deposits. The Ogallala unconformably overlies the Triassic Red Beds in the Amarillo area. The Triassic Red Beds consist of sandstone, shales, clays, and conglomerates. The Ogallala Formation consists primarily of sands, silts, clays, and basal gravels. Caliche is also abundant in the Ogallala and usually forms a caprock near the surface. The windblown, eolian, and fluvial deposits consist of silty sands, fine sands, and clays. The thickness of these deposits can be up to 100 feet thick.

The primary source of groundwater in this area is from the Ogallala Formation. The saturated portion of the Ogallala can be as much as 100 feet thick in the Amarillo area and yield from several hundred to 1,000 gallons per minute. Depth to the saturated zone of the Ogallala is approximately 200 feet below ground surface at the site. The regional flow direction is toward the south-southeast at a gradient of approximately 0.008 ft/ft.

3.0 FIELD INVESTIGATION

3.1 Subsurface Exploration and Techniques

All drilling activities at the site were conducted by D-PTL with a Gardner-Denver 1500 equipped with air and wash rotary drilling capability. The rig operator was an employee of D-PTL and a licensed monitor well driller in the State of Texas. Borings were logged by Mr. Ray Hamby, an independent, registered AAPG geologist and groundwater professional. Drilling was conducted by air rotary methods using a 4-inch diameter drill bit to advance the borehole until stability of the borehole could not be maintained by this method. When the formation would not allow utilization of the air rotary method, the rig was switched to the wash rotary method to maintain an open boring to advance the hole. Core samples were taken at five foot and ten foot intervals with a split-barrel sampler and at each strata change, or color change, as directed and logged by Mr. Hamby. Continuous samples were also obtained for the purpose of collecting undisturbed samples for permeability testing.

Sampling equipment was cleaned after each sample and the drilling rig, with sampling equipment, were cleaned after each hole with a high pressure stream cleaner to prevent any intermixing of stratas. Penetration tests were taken using a Split-Spoon Sampler with a 140 lb. hammer with a 30 inch free fall and blow counts were recorded on the logs. Cores were removed from the sampler in the field, logged, and sealed in plastic air-tight bags for transport to the laboratory.

3.2 Subsurface Soils and Site Conditions

The specific type of soil and subsurface soil stratas encountered at all locations are shown on the attached Log of Borings. The laboratory test results are shown on the attached Summary of Tests and Log of Borings (Appendix A).

The boring locations are shown on the attached Location of Borings. About 100 acres of the permitted 660+ acre facility is currently being utilized for the land disposal of municipal solid waste.

3.3 Soil Borings

Eleven borings were drilled at the site to gain principal information on in-place stratas. Two borings were drilled through the entire saturated thickness of the water bearing formation (Ogallala formation) and were terminated several feet into the Red Beds. Samples were collected at 5-ft. intervals to a 100-ft. depth (below ground surface) and every 10-ft. thereafter to total depth drilled. The remaining borings were terminated approximately twenty feet into the saturated zone.

After completion of the two tests borings, a tremie pipe was lowered into the borehole to approximately 10-ft. off the bottom of the boring, and a neatly mixed bentonite/cement slurry was pumped into the boring to seal the annular space and provide an adequate environmental seal to the ground surface. The nine remaining boreholes were converted to groundwater monitor wells as described below.

3.4 Description of Well Installation and Completion

After the proposed boreholes were completed to the desired depth, the drill stem was retrieved from the borehole. The borehole was reamed to accommodate the well casing with a 9-7/8-inch drill bit utilizing the wash rotary method. The boreholes were reamed to at least twenty feet into the saturated zone. The drilling fluids were constantly monitored for viscosity and density. Fresh water was utilized to prevent caking of the borehole in the water bearing zones. Upon completion of the boring, fresh water was utilized

to wash all drilling fluids from the borehole. Drill pipe was then removed from the borehole and a Smeal unit equipped with a hydraulic winch was used to lower the Schedule 40 polyvinyl chloride (PVC), flush-threaded well casing and screen into the borehole. The screen size of each monitor well was 0.020-inch. A threaded, flush-joint PVC point was installed at the bottom of the screened interval of each well. When the casing installation was completed, an #8/#16 gravel pack was placed from the bottom of the boring to approximately 5-ft. above the screened interval. The top of the gravel pack was verified by a weighted tape measure. A bentonite seal was placed on top of the gravel and hydrated with fresh water. The seal consists of 1/4-inch bentonite pellets with a minimum 4-ft. thickness. A tremie pipe was carefully lowered into the annular space between the borehole wall and PVC casing and a neat mixture of bentonite/cement was pumped through the tremie pipe to fill the annular space to the surface. The grout slurry was allowed to stand overnight. After approximately 24 hours, the monitor well was completed to the surface.

The monitor wellhead completions consisted of a 6' x 6' x 6" thick concrete pad, reinforced with wire mesh, four 6-inch guard posts filled with concrete at each corner, and a protective steel locking cover riser installed over the wellhead. The wellheads are approximately three feet above ground level.

Upon completion of the wellheads, initial well development was performed utilizing a high speed bailing unit (Smeal) equipped with a 3" x 10 foot long stainless steel bailer. The bailer was lowered into the casing to the bottom of the well to withdraw any drilling fluids, or silt, that may have accumulated in the bottom of the well casing. The bailing was performed until the water was "clear". Further development involved using a 3/4 horsepower submersible pump that was lowered into the well on 1-inch Schedule 80 PVC pipe with PVC couplers. A generator was utilized as a portable power unit. The development water was removed from the wells until the parameters, pH, conductivity and temperature readings stabilized. These parameters were measured using a HyDAC conductivity, temperature, and pH meter. Small samples of the water were collected in a container from the discharge and analyzed with the HyDAC

instrument.

Following well completion, the water levels in the monitor wells were allowed to stabilize for a minimum of three days. Water levels were monitored and are recorded in Table 2 of this report.

4.0 SITE GEOLOGY

4.1 Stratigraphy

The strata encountered during the boring program is relatively uniform across the site and generally agrees with the regional geology previously described. The following is a description of the various stratigraphic units encountered, starting from near the surface and proceeding downward with depth.

Upper-Clay: Brown to reddish tan containing various amounts of silt and sand sized grains. This unit also contains abundant caliche nodules and is generally 70-ft. thick.

Caliche: This tan colored unit was encountered as a hard surface cap rock with thicknesses up to 20-ft. and as irregular layers occurring mostly at the base of the upper clay. The caliche can also be found as nodules disseminated in the clays and sands throughout the entire section.

Sand: Underlying the caliche is a tan to reddish tan sand, generally fine-grained and poorly sorted (well graded). The unit also contains abundant caliche nodules. The lower part of the unit generally contains medium to coarse gravels.

Gravel: The gravel ranges in size from medium to coarse, occurs in the lower most part of the overlying sand and in the upper most part of the underlying lower clay. Thickness and occurrence varies due to local deposition.

Lower-Clay: Dark red clay represents the uppermost portion of the Triassic Red Beds. It contains some layers of gravels and sand. This unit marks the approximate base of the Ogallala Aquifer.

Profiles illustrating the site soils are presented on Figures 5, 6, and 7. The cross sections indicate a predominant dip toward the southeast. The location of the three cross sections are shown on Figure 4.

4.3 Hydrostratigraphic Units

The uppermost aquifer encountered at the site is the Ogallala Formation of Pliocene age. The groundwater elevations encountered across the site range from a low of 3,589 feet in monitor well MW-3, to a high of 3,612 feet in monitor well MW-5. The saturated thickness ranges from approximately 55 feet on the south side of the side to approximately 10 feet in portions of the north side of the site.

5.0 SITE SOIL PROPERTIES

5.1 Previous Investigations

Two previous geotechnical investigations at the site were used as a guide to the expected nature of the upper strata (surficial clays). The first investigation, February 12, 1975, included 14 borings ranging in depth from approximately 20 to 60 feet below natural ground surface. The soils testing on collected samples included Atterberg Limits, permeability and soil classification. The soils were classified generally as clays, sandy clays and caliche with permeabilities in the range of 2.3×10^{-8} to 1.3×10^{-7} cm/sec.

The second investigation, August 30, 1979, consisted of four shallow borings that were terminated approximately 26 feet below natural ground surface. Like the first investigation, the soils testing also included Atterberg Limits, permeability and soil classification. The soils were classified generally as clays, sandy clays and caliche with permeabilities in the range of 3.1×10^{-7} to 7.1×10^{-6} cm/sec.

These borings yielded samples exhibiting higher permeability and lower plasticity than the soils reported in the first investigation.

Both previous investigations are included as Appendices F and G.

5.2 Subsurface Investigation

Soil samples recovered from the eleven borings drilled during this boring program were placed in air-tight plastic bags to preserve field moisture contents and transported to the geotechnical laboratory for further analysis. The geotechnical characteristics of these samples were then used to classify the materials and derive a general stratigraphic profile of the site based on soil type and representative characteristics.

Based on extensive knowledge of the regional geology and local drilling experience, the site was assumed to consist predominantly of surficial clays and silty sand mixtures, a caliche caprock and layers, underlain by sands and silty sands and gravels of the Ogallala Formation. The two test borings (TB-1 and TB-2) were advanced until the confining unit below the Ogallala, the Red Beds, had been encountered (at least ten feet of penetration). All borings were to be advanced and sampled in such a manner as to adequately describe the soil properties and change of lithology of all significant units below the surface.

Soil samples were recovered at five foot intervals in the upper 100 feet of drilling and at changes in lithology thereafter not to exceed 10 feet. The sampling was conducted more frequently as needed to identify significant changes in stratigraphy, formation consistency or other consequential change in soil character. Undisturbed samples were recovered with a split-barrel sampling device in general conformance with ASTM D 1586-84 at the direction of Mr. Ray Hamby.

Selected samples of each soil horizon encountered during the boring program were placed in air-tight plastic bags and transported to the geotechnical laboratory for analysis.

5.3 Laboratory Test Program

Samples typical of the materials encountered were selected in the field for analysis and classification in the geotechnical laboratory. As described in Section 1.4, Scope of Investigation, the following laboratory tests were performed;

visual classification in the field using the Unified Soil Classification System, and in the Laboratory as per ASTM Designation D 2487-92,

Atterberg Limits as per ASTM Designation D 4318-84,

-200 sieve analysis as per ASTM Designation D 1140 and D 422,

moisture content of the in-place soils as per ASTM Designation D 2216-92.

unconfined compressive strength of cohesive soils as per ASTM Designation: D 2166-85 for cohesive soils,

and unconfined compressive strength of intact rock core per ASTM Designation: D 2938-86.

Selected samples from each drilling location were turned over to the City of Amarillo Environmental Laboratory for analysis of Organic Carbon Content. The results of these analyses are included with this report as Appendix B.

5.4 Soil Characterization and Lithology

The soils encountered at the site can be segregated into three general strata. The principle geologic formation at the site is the Ogallala Formation consisting generally of silty sands and sands with some clay layers and gravels. Near the surface throughout the site, but primarily in the northern portion, a caliche layer is encountered overlying the Ogallala. Overlying the caliche layer typically is fine sand to silty clays. The specific soil stratigraphy can be divided into three generalized soil zones, Strata I to III (shallow to deep), as described above with the upper two horizons absent where highly localized weathering effects (the "Canadian Breaks") have removed the caprock and overlying Clay-sands.

STRATA I

The uppermost strata, present over the majority of the site where the escarpment has not advanced, are consistent with sandy clays as described by the USCS. This layer may be considered a clayey "topsoil" zone typified by the designation CL (USCS field identification). This strata's classification ranges from a CL in the uppermost part, to a chemical precipitate in the Caliche strata. The Plastic Index range from 3 to 22 with Liquid Limits from 19 to 38. With the clayey topsoil and the Caliche Cap, the permeability rates range from 5.70×10^{-8} cm/sec. to 2.35×10^{-5}cm/sec. Strata I is primarily cohesive soils with varying consistencies and unconfined compressive strengths ranging from .25 to 4.00/tsf.

Clay: Brown to reddish tan containing various amounts of silt, sand sized grains, with abundant caliche nodules. The unit, where present on the site, is up to 70 feet thick. However, on the northern portion of the site where the Canadian Breaks intrude, it has been eroded away and is not present. This clay is classified as CL (USCS classification).

Caliche: This unit can be found as a hard cap rock with thicknesses up to 20-ft. and with irregular layers occurring mostly at the base of the upper clay. Caliche can also be found as nodules disseminated in the clays and sands throughout the entire section. It is tan colored, and may be sandy in part. Since caliche occurence is a result of chemical precipitation, it is not found on the USCS Flow Chart.

STRATA II

This strata's classification ranges from SC in the uppermost part, to GW in the lower section. The Plastic Index ranges from 3 to 14 with Liquid Limit from 18 to 27. Due to the sand and gravel in this strata, the permeability rates range from 2.73×10^{-2}cm/sec. to 3.31×10^{-5}cm/sec. Strata II is mainly soils with varying consistencies and unconfined compression strengths from >.25 to 2.50/tsf.

Sand: Underlying the caliche, is tan to reddish tan sand, fine-grained with abundant caliche nodules. The lower part of the unit generally contains medium to coarse gravels, subangular to rounded. At the site, the unit is at least 200 feet thick on the southern portion of the site where there is an overlying clay unit. The thickness of the unit in the northern portion of the site is at least 100 feet. Erosion has removed the overlying clay

unit and the upper portion of this sand on the north portion of the site. A caliche cap is present on top of this and on the northern portion of this site. The sand is classified as SC (USCS).

Gravel: Ranging in size from pea to coarse, these gravels occur in the lower most part of the sand zone and the upper most part of the lower clay. Thickness and occurrence will vary due to local deposition. These gravels are classified as GW (USCS).

STRATA III

This strata is classified as MH and is referred to as the Triassic Red Bed. The Plastic Index ranges from 3 to 12 with Liquid Limits from 13 to 40. This fine grained material has permeability rates ranging from 4.72×10^{-9}cm/sec. to 3.47×10^{-10} cm/sec. Strata III is a cohesive soil, very dense in consistency with unconfined compressive strengths ranging from .50 to 4.00+/tsf.

Clay: This dark red clay is the top of the Triassic. It usually contains gravel and sand. This unit approximately marks the base of the Ogallala Aquifer. This clay is classified as MH (USCS).

Limitations

The enclosed information is based on the assumption that the soil or soil properties in the area between the borings are reasonably uniform and similar to those found in the borings performed.

If any unusual conditions, not described in this report are encountered during future excavation activities, this Laboratory should be notified, and if any additional analyses are necessary Dyess-Peterson Testing Laboratory, Inc. would gladly provide any other services deemed necessary.

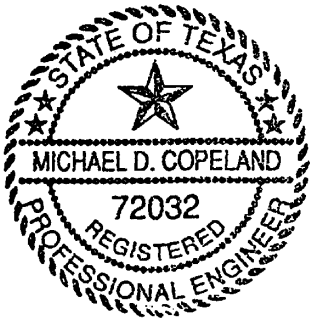
Respectfully submitted,

Michael D. Copeland

Michael D. Copeland, P.E.

Ray Hamby

Ray Hamby, A.A.P.G.



FIGURES

Figure	Title
1	Regional Map
2	Area Map
3	Soil Boring/Monitor Well Location Map
4	Location of Cross Sections
5	Cross Section A-A', Soil Stratigraphy
6	Cross Section B-B', Soil Stratigraphy
7	Cross Section C-C', Soil Stratigraphy
8	Soil Classification Charts

TABLES

Table No.	Title
1	Typical Monitor Well Design
2	Summary of Groundwater Level Measurement
3	Elevation Information

APPENDICES

Appendix A- Logs of Soil Borings/Monitor Wells including Summary of Tests

Appendix B- Organic Carbon Content Test Results

Appendix C- Summary of Permeability Tests

Appendix D- TNRCC Monitor Well Data Sheets

Appendix E- TNRCC Monitor Well Logs

Appendix F- 1975 Site Investigation Report

Appendix G- 1979 Site Investigation Report

FIGURE 1

REGIONAL MAP

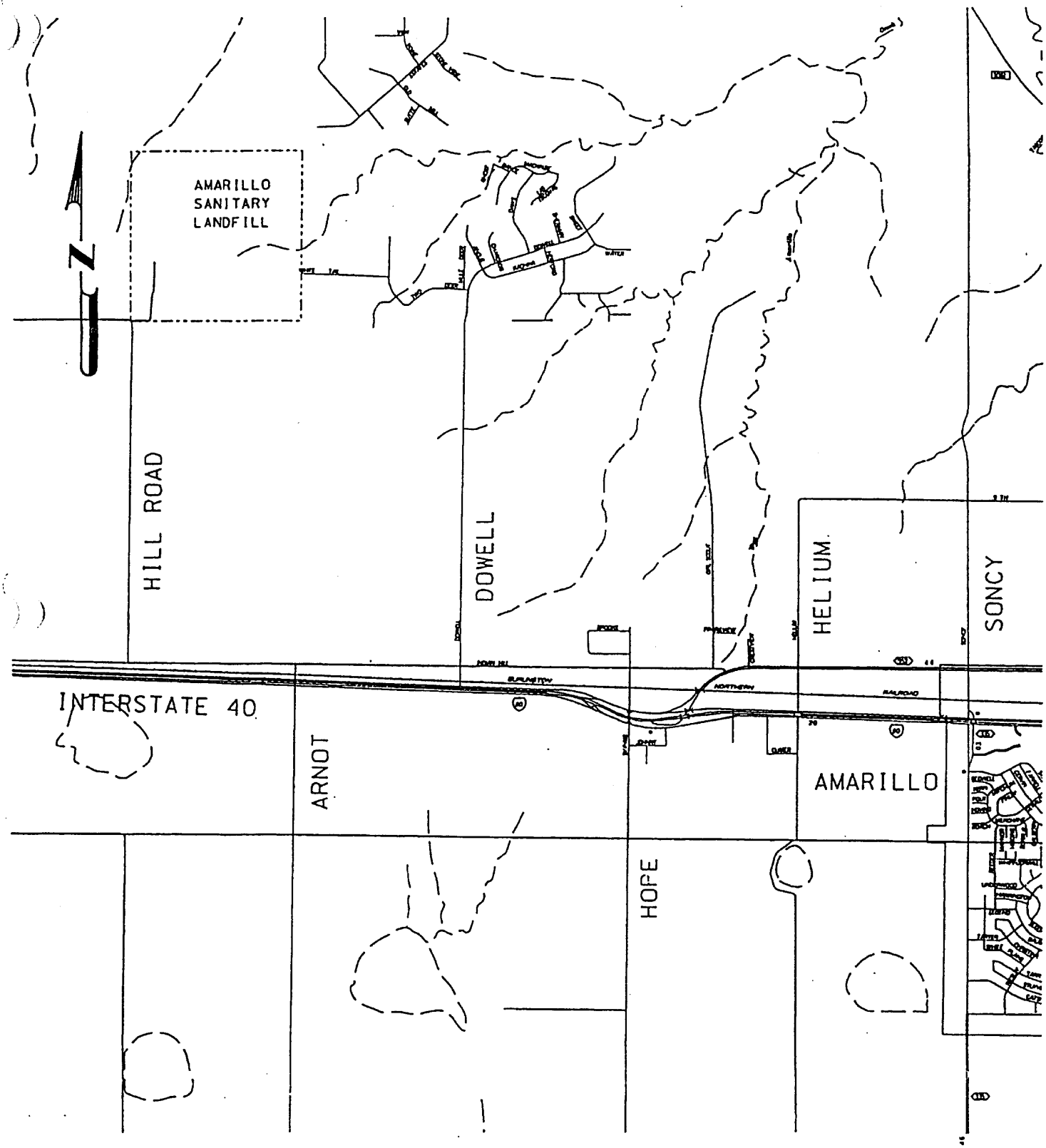
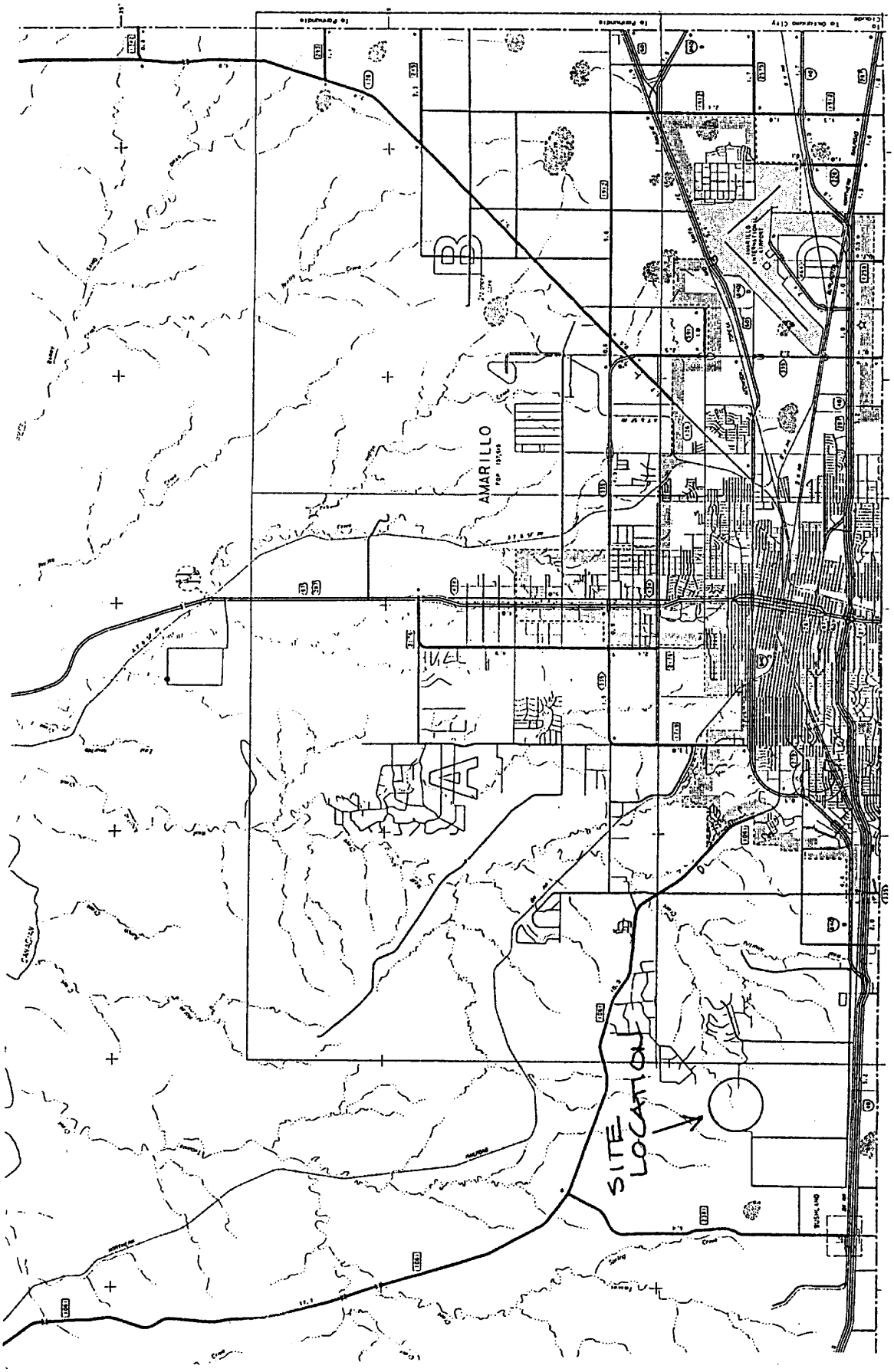

AMARILLO
SANITARY
LANDFILL
HILL ROAD
DOWELL
HELIUM
SONCY
INTERSTATE 40
ARNOT
HOPE
AMARILLO

FIGURE 2

AREA MAP



DYESS-PETERSON TESTING LABORATORY, INC.

FIGURE 3

SOIL BORING/MONITOR WELL LOCATION MAP

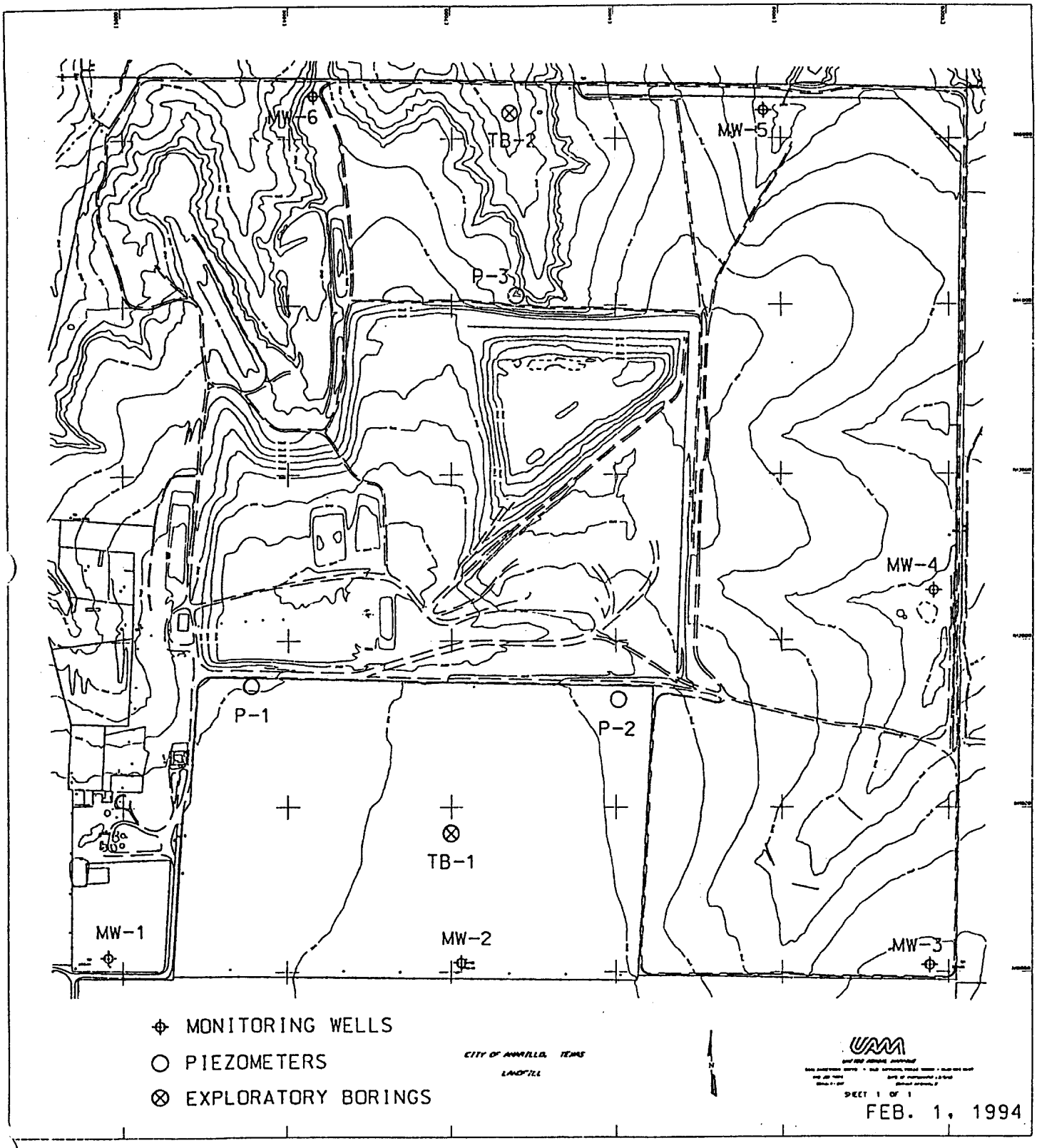
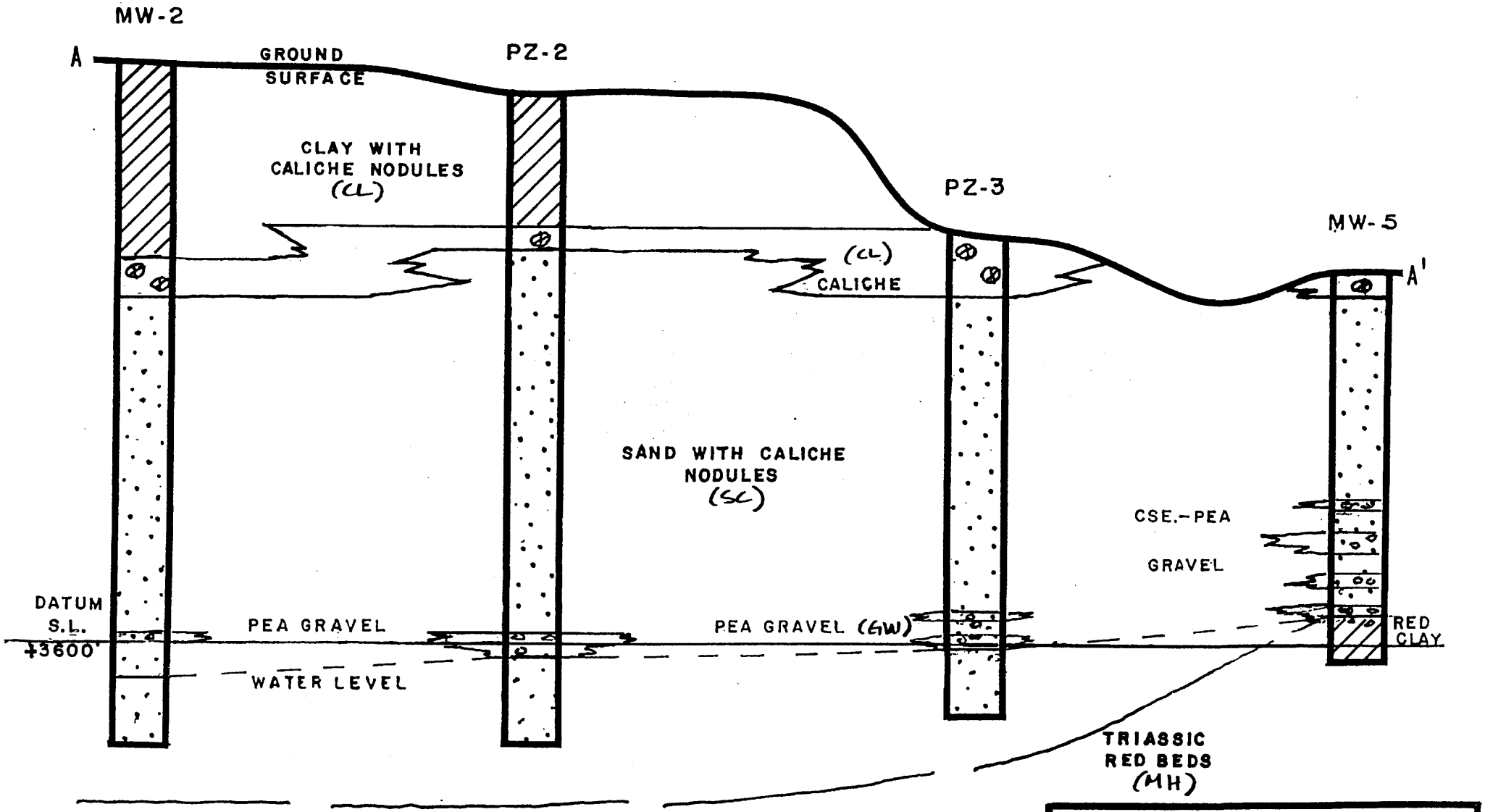

MW-6
TB-2
MW-5
P-3
MW-4
P-1
P-2
TB-1
MW-1
MW-2
MW-3
MONITORING WELLS
PIEZOMETERS
EXPLORATORY BORINGS
CITY OF AMARILLO, TEXAS
LANDFILL
SHEET 1 OF 1
FEB. 1, 1994

FIGURE 4

LOCATION OF CROSS SECTIONS

FIGURE 5

CROSS SECTION A-A'
SOIL STRATIGRAPHY



STRATIGRAPHIC CROSS SECTION A-A'

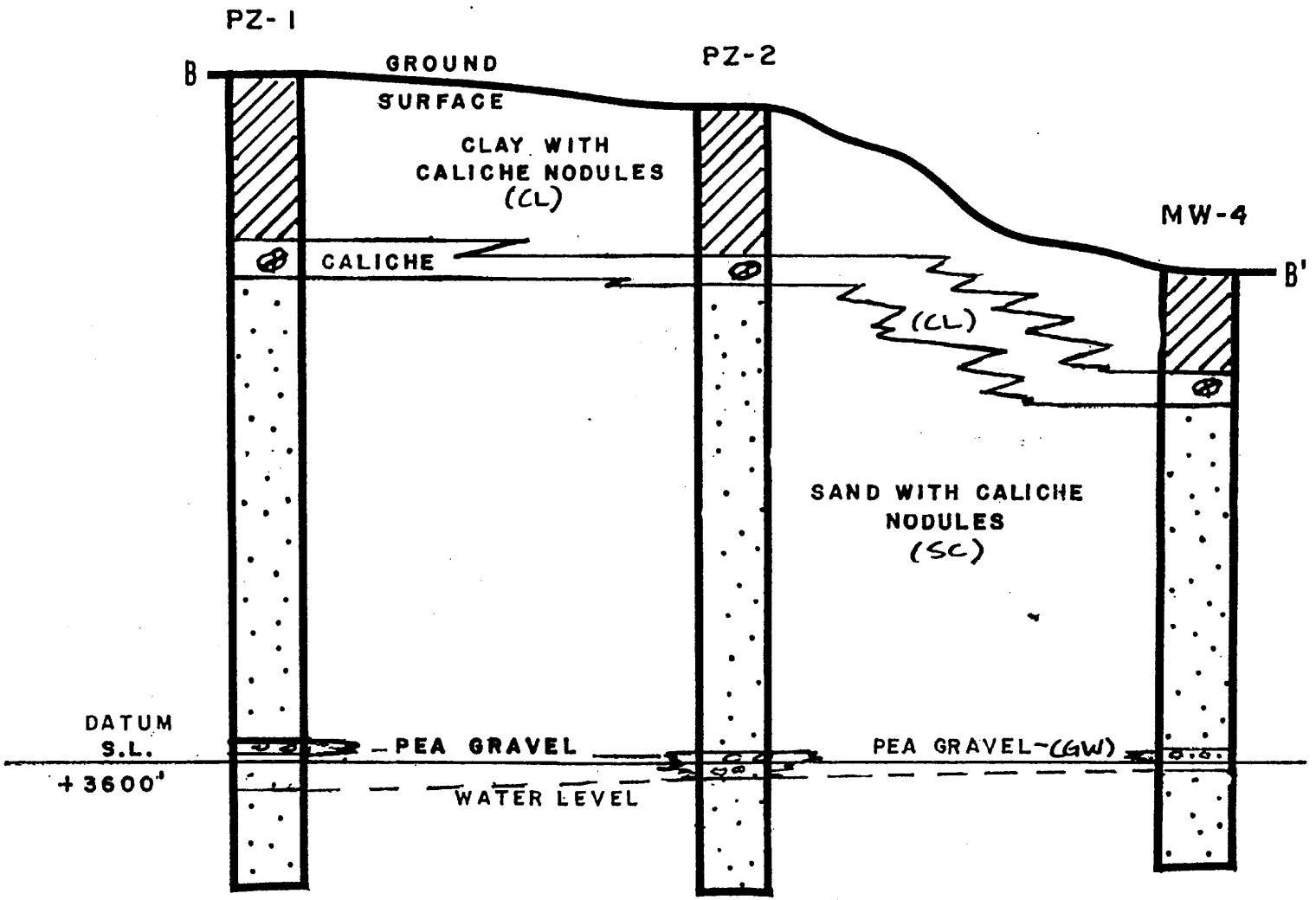
AMARILLO LANDFILL

VERT SCALE 1"=50'
HORZ SCALE 1"=800'

10/31/94
RRH

FIGURE 6

CROSS SECTION B-B'
SOIL STRATIGRAPHY



STRATIGRAPHIC CROSS
SECTION B-B'

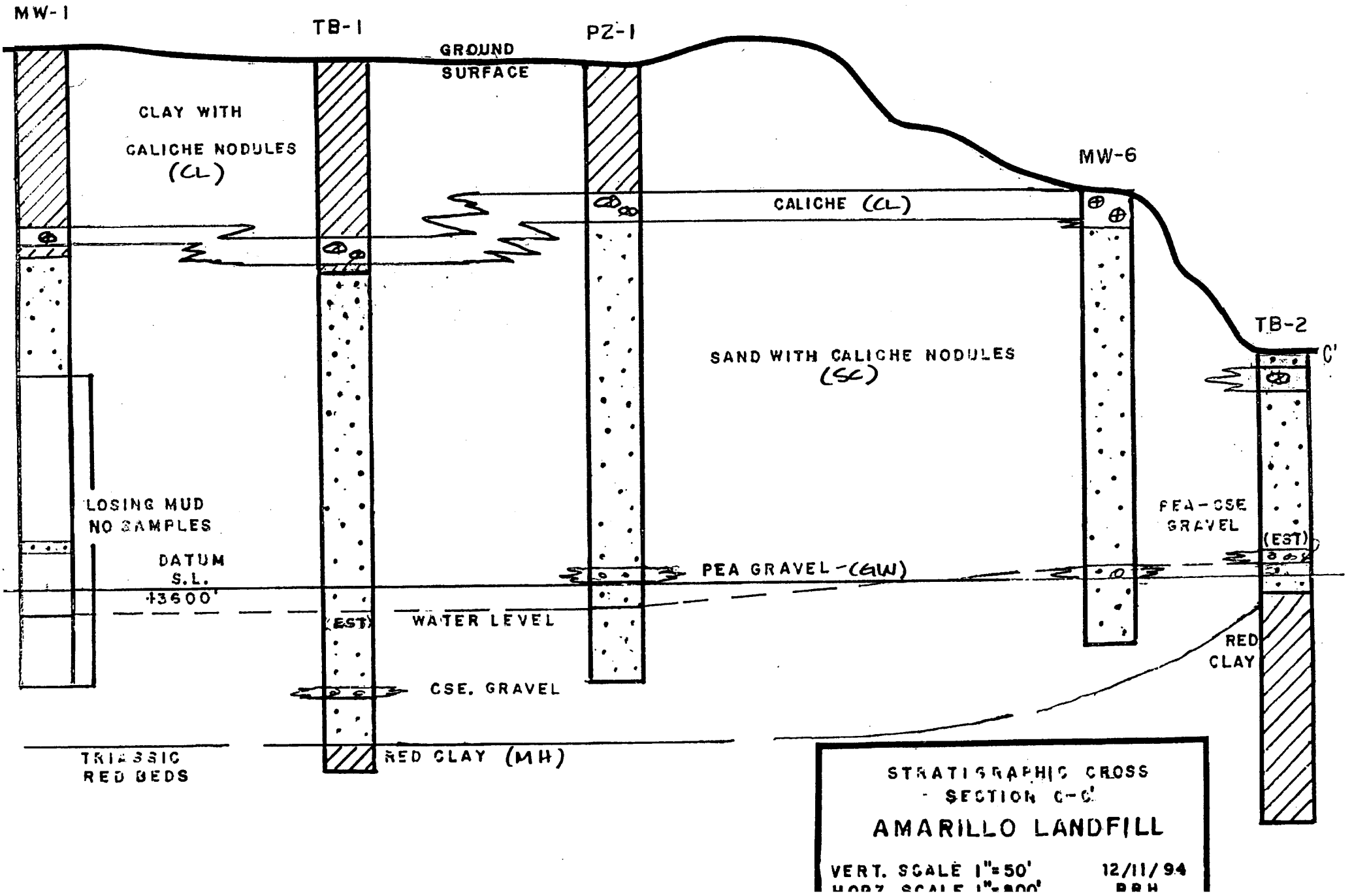
AMARILLO LANDFILL

VERT SCALE 1"=50'
HORZ. SCALE 1"=800'

10/31/94
RRH

FIGURE 7

CROSS SECTION C-C'
SOIL STRATIGRAPHY



STRATIGRAPHIC CROSS - SECTION C-C'

AMARILLO LANDFILL

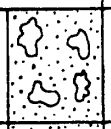
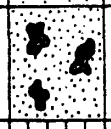
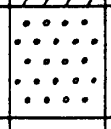
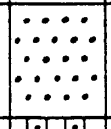
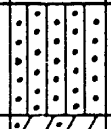
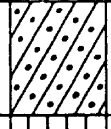
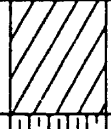
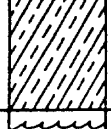
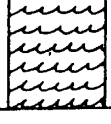
VERT. SCALE 1"=50' 12/11/94

HORZ. SCALE 1"=800' RRH

FIGURE 8

SOIL CLASSIFICATION CHARTS

KEY TO CLASSIFICATION USED ON LOGS

MAJOR DIVISIONS			GROUP SYMBOLS		DESCRIPTIONS
COARSE-GRAINED SOILS — More Than Half of Material is LARGER Than No. 200 Sieve Size.	GRAVELS — More Than Half of Coarse Fraction is LARGER Than No. 4 Sieve Size.	Clean Gravels (Little or no Fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines.
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines.
		Gravels With Fines (Appreciable Amount of Fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS — More Than Half of Coarse Fraction is SMALLER Than No. 4 Sieve Size.	Clean Sands (Little or no Fines)	SW		Well-Graded Sands, Gravelly Sands, Little or no Fines.
			SP		Poorly-Graded Sands, Gravelly Sands, Little or no Fines.
		Sands With Fines (Appreciable Amount of Fines)	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS — More Than Half of Material is SMALLER Than No. 200 Sieve Size.	SILTS and CLAYS — Liquid Limit Less Than 50		ML		Inorganic Silts & Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts with Slight Plasticity.
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
			OL		Organic Silts & Organic Silty Clays of Low Plasticity.
	SILTS and CLAYS — Liquid Limit Greater Than 50		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils, Elastic Silts.
			CH		Inorganic Clays of High Plasticity, Fat Clays.
			OH		Organic Clays of Medium to High Plasticity, Organic Silts.
Highly Organic Soils			Pt		Peat & Other Highly Organic Soils

Ref. (Unified Soil Classification System) Corps of Engineers, U.S. ARMY, T.M. NO. 3-357

KEY TO SOIL SYMBOLS AND CLASSIFICATIONS

THE ABBREVIATIONS COMMONLY EMPLOYED ON EACH "RECORD OF SUBSURFACE EXPLORATION", ON THE FIGURES AND IN THE TEXT OF THE REPORT, ARE AS FOLLOWS:

SOIL OR ROCK TYPES
(SHOWN IN SYMBOLS COLUMN)


CLAY


SILT


SAND


LIMESTONE


GRAVEL


CALICHE

I. SOIL DESCRIPTION

(A) COHESIONLESS SOILS

RELATIVE DENSITY	N, BLOWS/FT
VERY LOOSE	0 TO 4
LOOSE	5 TO 10
COMPACT	11 TO 30
DENSE	31 TO 50
VERY DENSE	OVER 50

(B) COHESIVE SOILS

CONSISTENCY	Qu, TSF
VERY SOFT	LESS THAN .25
SOFT	.25 TO .50
FIRM	.50 TO 1.00
STIFF	1.00 TO 2.00
VERY STIFF	2.00 TO 4.00
HARD	OVER 4.00

II. PLASTICITY

DEGREE OF PLASTICITY	PLASTICITY INDEX
NONE TO SLIGHT	0 - 4
SLIGHT	5 - 10
MEDIUM	11 - 30
HIGH TO VERY HIGH	OVER 30

NOTE: ALL SOILS CLASSIFIED ACCORDING TO THE UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)

III. RELATIVE PROPORTIONS

DESCRIPTIVE TERM	PERCENT
TRACE	1 - 10
LITTLE	11 - 20
SOME	21 - 35
AND	36 - 50

IV. PARTICLE SIZE IDENTIFICATION

BOULDERS:		-8 INCH DIAMETER OR MORE
COBBLES :		-3 TO 8 INCH DIAMETER
GRAVEL	:	-COARSE - 3/4 TO 3 INCH
		-FINE - 5.0 MM TO 3/4 INCH
SAND	:	-COARSE - 2.0 MM TO 5.0 MM
		-MEDIUM - 0.4 MM TO 2.0 MM
		-FINE - 0.07 MM TO 0.4 MM
SILT	:	-0.002 MM TO 0.07 MM
CLAY	:	-0.002 MM

V. DRILLING AND SAMPLING SYMBOLS

AU: AUGER SAMPLE
RC: ROCK CORE
TCP: TEXAS CONE PENETRATION TEST
SS: SPLIT-SPOON 1 3/8" I.D. 2" O.D. EXCEPT WHERE NOTED
ST: SHELBY TUBE = 3" O.D. EXCEPT WHERE NOTED
WS: WASHED SAMPLE
HSA: HOLLOW STEM AUGERS
CFA: CONTINUOUS FLIGHT AUGERS
MD: MUD DRILLING

FLOW CHART
UNIFIED SOIL CLASSIFICATION
FIELD IDENTIFICATION
FIELD IDENTIFICATION PROCEDURES

COARSE GRAINED SOILS: More than half of material (by weight) is of individual grains visible to the naked eye. No. 200 sieve size is about the smallest particle visible to the naked eye.	GRAVEL AND GRAVELLY SOILS: More than half of Coarse Fraction (by weight) is larger than $\frac{1}{4}$ inch size. For visual classification the $\frac{1}{4}$ inch size may be used as equivalent to the No.4 sieve size	CLEAN GRAVELS: Will not leave a dirt stain on a wet palm.	Wide range in grain sizes and substantial amounts of all intermediate partical sizes.								GW
			Predominately one size or a range of sizes with some intermediate sizes missing.								GP
		DIRTY GRAVELS: Will leave a dirt stain on a wet palm.	Nonplastic fines or fines with low plasticity (for identification of fines see characteristics of ML below.)								GM
			Plastic fines (for identification of fines see characteristics of CL or CH below)								GC
	SAND AND SANDY SOILS: More than half of Coarse Fraction (by weight) is smaller than $\frac{1}{4}$ inch size	CLEAN SANDS: Will not leave a dirt stain on a wet palm.	Wide range in grain size and substantial amounts of all intermediate partical sizes.								SW
			Predominantly one size or a range of sizes with some intermediate sizes missing								SP
		DIRTY SANDS: Will leave a dirt stain on a wet palm.	Nonplastic fines or fines with low plasticity (for identification of fines see characteristics of ML below).								SM
			Plastic fines (for identification of fines see characteristics of CL or CH below)								SC
FINE GRAINED SOILS: More than half of material (by weight) is of individual grains not visible to the naked eye. See Identification Procedures	SILTS AND CLAYS (Low Liquid Limit)	ODOR: None	DRY STRENGTH: Slight	DILATANCY (SHAKE) REACTION: Rapid	TOUGHNESS: Low to None	RIBBON (NEAR THE PL): None	SHINE (NEAR THE PL): Dull				ML
			Medium to High	Medium to Slow	Medium	Weak	Slight to Shiny				CL
		Pronounced Organic	Medium	Slow to None	Low (Spongy)	None	Dull to Slight				OL
	SILTS AND CLAYS (High Liquid Limit)		Medium	Very Slow to None	Medium to High	Weak to Strong	Slight				MH
			Very High	None	High	Strong	Shiny				CH
		Pronounced Organic	High	None	Low to Medium (Spongy)	Weak	Dull to Slight				OH
HIGHLY ORGANIC SOILS			Readily identified by color, odor, spongy feel and frequently by fibrous texture								PT

SOIL CONSERVATION SERVICE

SOIL MECHANICS LABORATORY

UNIFIED SOIL CLASSIFICATION SYSTEM
PLASTICITY CHART

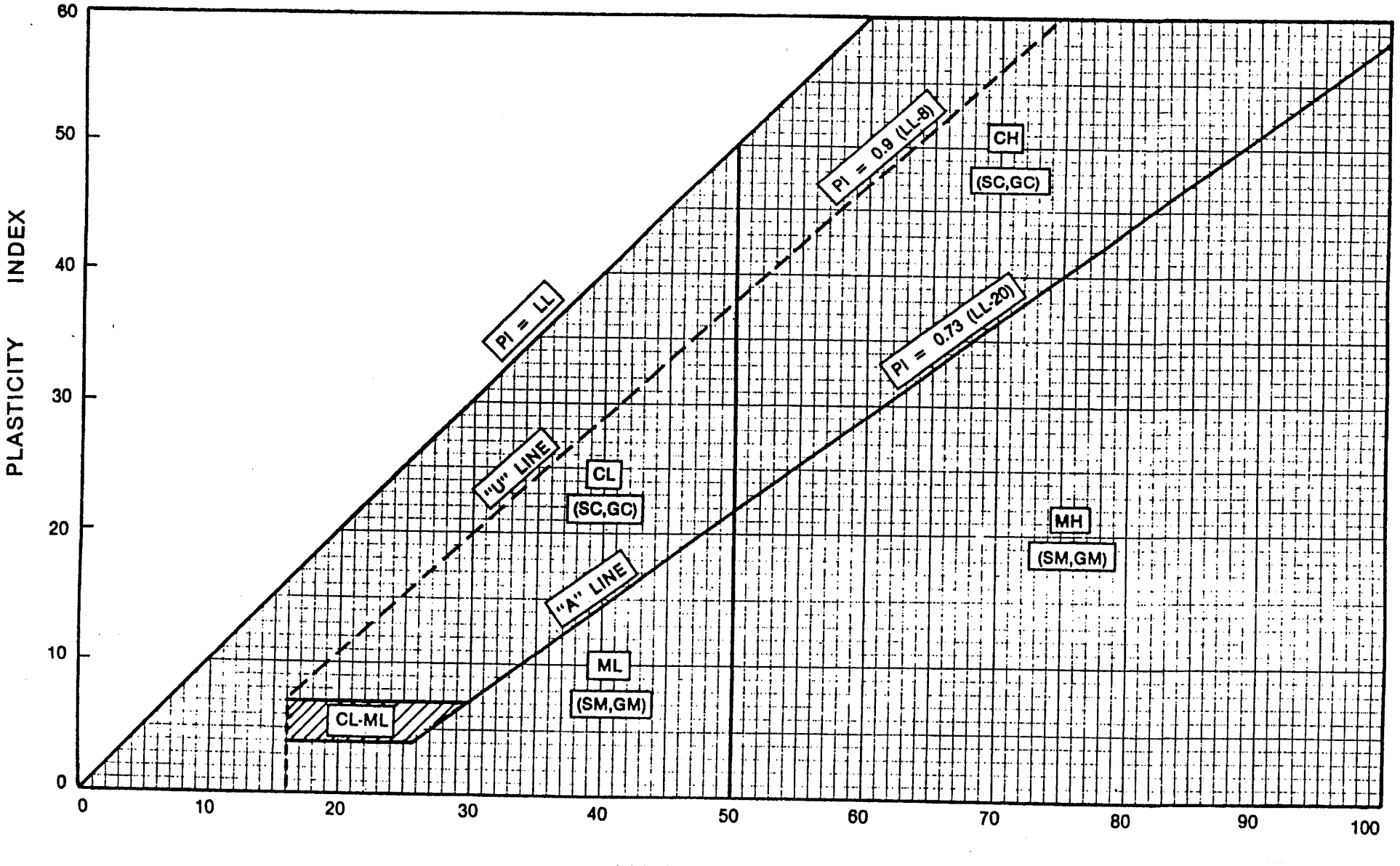
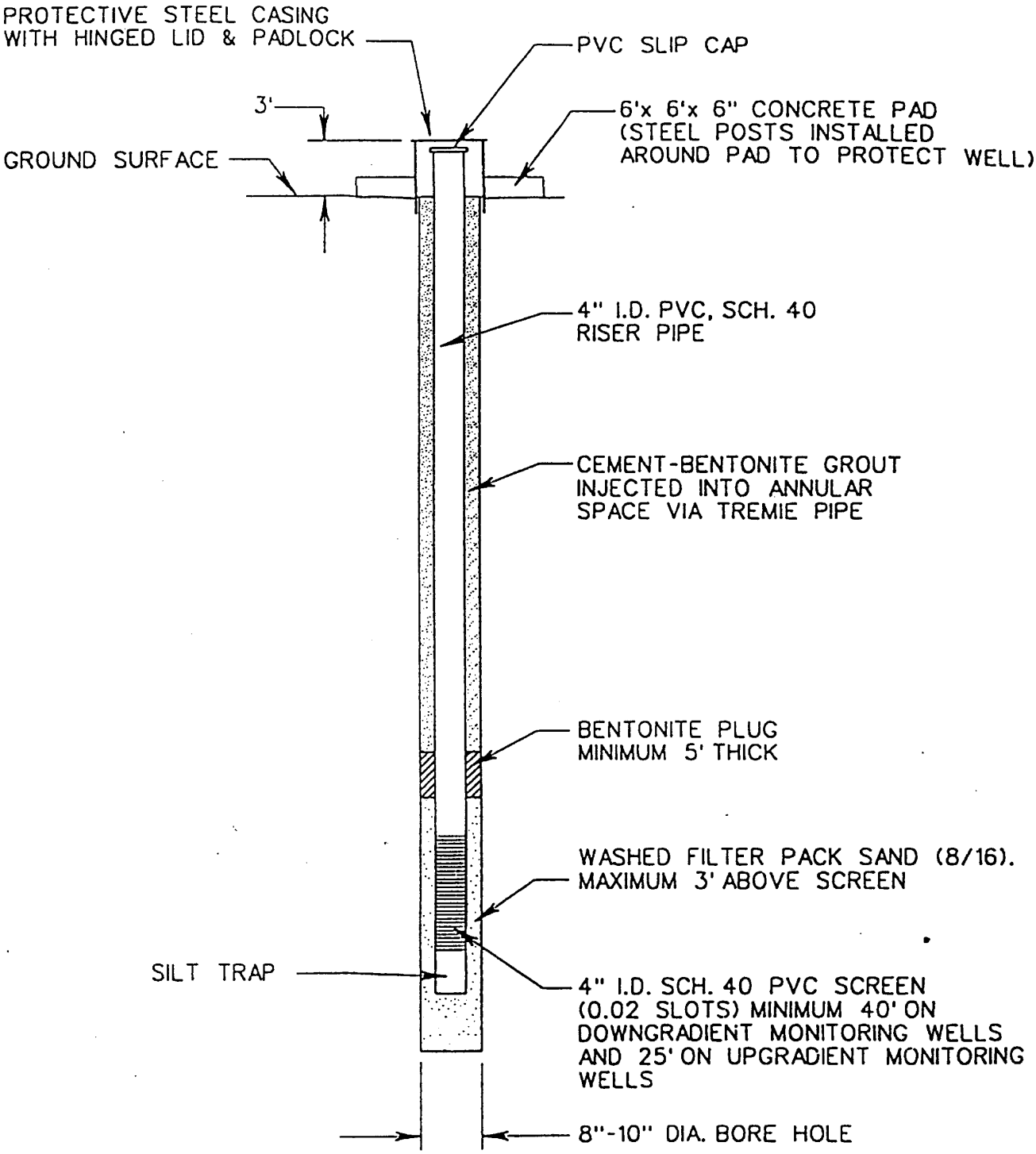


TABLE 1

TYPICAL MONITOR WELL DESIGN



NOTE:
PIEZOMETER CONSTRUCTION WILL BE SIMILAR, EXCEPT FILTER PACK WILL EXTEND A MAXIMUM OF 10 FEET ABOVE THE TOP OF THE SCREEN. PIEZOMETER SCREENS ARE TO EXTEND A MINIMUM OF 20 FEET INTO THE WATER TABLE AND 5 FEET ABOVE THE WATER TABLE.

HDR

HDR Engineering, Inc.

CITY OF AMARILLO, TEXAS
MUNICIPAL LANDFILL

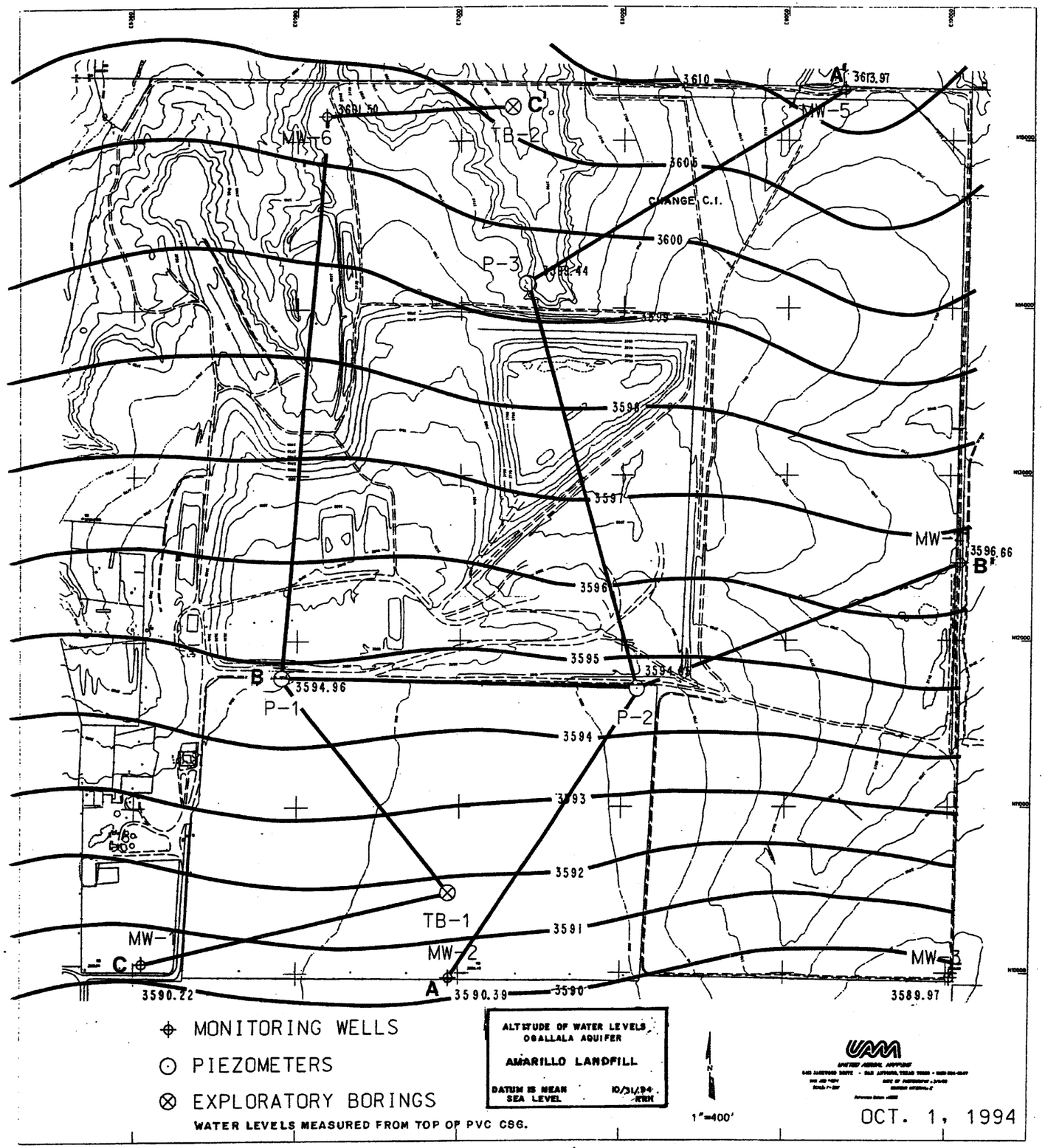
TYPICAL MONITORING WELL DESIGN

Date 8/9

Plate

TABLE 2

SUMMARY OF GROUNDWATER LEVEL MEASUREMENT


3610
3613.97
A'
MW-5
MW-6
3601.50
TB-2
C'
3605
CHANGE C.I.
3600
P-3
3599.44
3595
3596
3597
MW-4
3596.66
B'
3595
3594.96
B
P-1
3594.98
P-2
3594
3593
3592
TB-1
3591
MW-1
MW-2
MW-3
C
A
3590.22
3590.39
3590
3589.97
MONITORING WELLS
PIEZOMETERS
EXPLORATORY BORINGS
WATER LEVELS MEASURED FROM TOP OF PVC CSG.
ALTITUDE OF WATER LEVELS
OGALLALA AQUIFER
AMARILLO LANDFILL
DATUM IS MEAN SEA LEVEL
10/31/94
RTH
N
1"=400'
OCT. 1, 1994

WATER LEVELS ENCOUNTERED DURING PROJECT

JULY 7, 1994

* Hit Water at 210-215' in TB-1

JULY 11, 1994

* Hit Water at 145-150' in MW-6
* Measurement on TB-1 = 214'

JULY 13, 1994

* Measurement on TB-1 = 215'

JULY 15, 1994

* Measurement on TB-1 = 215'
* Measurement on TB-2 = 80.75'

JULY 18, 1994

* Measurement on TB-1 = 215.15'
* Measurement on TB-2 = 80.81'

JULY 19, 1994

* Hit Water at 145' in MW-2

JULY 26, 1994

* Measurement on MW-2 = 216.4'

AUGUST 9, 1994

* Water level on MW-2 = 216.5' (3591.15)
* Water level on MW-3 = 201.6' (3590.71)
* Water level on PZ-2 = 200.46' (3595.73)
* Water level on PZ-1 = 215.35' (3594.39)

AUGUST 10, 1994

* Water level on MW-1 = 217.75' (3597.58)

AUGUST 15, 1994

* Water level on MW-1 = 222.40'

AUGUST 17, 1994

* Water level on MW-2 = 216.60' (3591.05)
* Water level on MW-3 = 200.55' (3591.85)
* Water level on PZ-1 = 215.33' (3594.41)
* Water level on PZ-2 = 200.46' (3595.73)
* Water level on MW-1 = 224.60' (3590.70)
* Water level on MW-4 = 152.39' (3596.46)

AUGUST 19, 1994

* Water level on MW-6 = 146.50'

AUGUST 23, 1994

* Water level on MW-5 = 120-05' (3616)

AUGUST 24, 1994

* Hit Water in PZ-3 at 130-145'
* Water level on MW-5 = 120.30'
* Water level on MW-6 = 146.52'

WATER LEVEL FROM TOP OF STEEL CASING ON NORTH SIDE
BEFORE FINAL PVC ELEVATION WAS CUT

MW-1 = 227.37'
MW-2 = 219.50'
MW-3 = 203.65'
MW-4 = 154.25'
MW-5 = 124.00'
MW-6 = 149.02'
PZ-1 = 217.50'
PZ-2 = 203.52'
PZ-3 = 147.10'

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 3069
AMARILLO, TEXAS 7912

September 28, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.53
MW-2	219.15
MW-3	202.60
MW-4	153.75
MW-5	123.60
MW-6	148.80
PZ-1	217.20
PZ-2	203.15
PZ-3	148.70

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P. O. BOX 30495
AMARILLO, TEX.

October 5, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.50
MW-2	219.10
MW-3	202.60
MW-4	153.75
MW-5	123.55
MW-6	148.85
PZ-1	217.11
PZ-2	203.15
PZ-3	148.75

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 3069
AMARILLO, TEXAS 7912

October 12, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.55
MW-2	219.10
MW-3	202.65
MW-4	153.70
MW-5	123.50
MW-6	148.85
PZ-1	217.30
PZ-2	203.20
PZ-3	148.80

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
F.)06-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 30699
AMARILLO, TEXA

October 31, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

On water level information sent to you on October 5 and October 12, 1994, our office mistakenly switched PZ-1 and PZ-2 information. Please make these changes in your records. The following is a list of water levels taken on three different dates:

	October 19	October 26	October 31
MW-1	226.50'	226.55'	226.60'
MW-2	219.10'	219.10'	219.15'
MW-3	202.60'	202.60'	202.75'
MW-4	153.75'	153.60'	153.60'
MW-5	123.55'	123.45'	123.40'
MW-6	148.85'	148.90'	148.90'
PZ-1	217.20'	217.15'	217.35'
PZ-2	203.20'	203.15'	203.30'
PZ-3	146.75'	146.80'	146.90'

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 3069
AMARILLO, TEXAS 7912

November 9, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.65
MW-2	219.15
MW-3	202.75
MW-4	153.50
MW-5	123.30
MW-6	148.90
PZ-1	217.30
PZ-2	203.30
PZ-3	146.90

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 3069
AMARILLO, TEX

November 16, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.60
MW-2	219.15
MW-3	202.70
MW-4	153.45
MW-5	123.15
MW-6	148.95
PZ-1	217.25
PZ-2	203.20
PZ-3	146.90

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 3069
AMARILLO, TEXAS 7912

November 23, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.60
MW-2	219.20
MW-3	202.70
MW-4	153.35
MW-5	123.05
MW-6	148.95
PZ-1	217.20
PZ-2	203.20
PZ-3	146.85

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 30695
AMARILLO, TEXAS

November 30, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

Re: Water Levels at City Landfill - Amarillo, Texas.

WELL #	WATER LEVEL (FT.)
MW-1	226.90
MW-2	219.20
MW-3	202.70
MW-4	153.20
MW-5	123.00
MW-6	148.95
PZ-1	217.30
PZ-2	203.20
PZ-3	146.90

If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

DYESS-PETERSON TESTING LABORATORY, INC.

BUSINESS PHONE: 806-372-4911
806-372-5552

PROFESSIONAL TESTING & INSPECTION
CHEMICAL & MATERIALS TESTING

P.O. BOX 306
AMARILLO, TEXAS 791

December 7, 1994

HDR Engineering
Attn: Brad McCardell
12700 Hillcrest Rd., Suite 125
Dallas, Texas 75230

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If you have any questions, please feel free to call.

Respectfully submitted,

Lee Peterson
Vice President

FILE COPY

TABLE 3

ELEVATION INFORMATION

LANDFILL GROUNDWATER MONITORING

DESCRIPTION	COORDINATES		ELEVATION	ELEVATION	ELEVATION
	Northing	Easting	Top of Metal Casing	Top of PVC Casing	Top of Concrete Slab
Monitor Well 1	10060.31	5050.75	3817.62	3816.82	3815.03
Monitor Well 2	9970.05	6940.69	3809.89	3809.54	3807.19
Monitor Well 3	9973.50	10019.35	3792.81	3792.72	3791.37
Monitor Well 4	12474.17	10064.76	3750.58	3750.26	3748.68
Monitor Well 5	15299.30	9351.93	3737.75	3737.39	3735.44
Monitor Well 6	15149.06	6179.42	3750.72	3750.40	3748.18
Piezometer 1	11774.29	5906.41	3812.61	3812.31	3809.84
Piezometer 2	11706.38	8097.05	3798.27	3797.95	3795.66
Piezometer 3	14147.56	7397.16	3746.66	3746.34	3743.88
Test Boring 1	10482.79	6935.14			
Test Boring 2	15200.33	7311.97			

APPENDIX A

LOG OF SOIL BORINGS/MONITOR WELLS
INCLUDING
SUMMARY OF TESTS

LOG OF BORING

TB - 1

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo

BORING NO.: TB-1
LOCATION: Amarillo, Texas

Date: 7-5-94 thru 7-9-94

Ground Elevation: 3808.14

DRILLING METHOD: Air/Mud Rotary

GROUNDWATER INFORMATION: Air Drilled to 210' groundwater encountered at 215'

DEPTH, FEET	SYMBOL	SAMPLE	DESCRIPTION OF STRATUM	SPT BLOWS / FT PENETROMETER TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	UNCONFINED COMPRESSIVE STRENGTH, TSF	% PASSING NO. 200 SIEVE
0			Sandy Clay: Dark Brown -Stiff, Dry (CL)								
			Sandy Clay: Reddish Brown, Stiff Dry (CL)								
5		X	Sandy Clay: Reddish Tan w/Scattered Calcareous Nodules (8%),Stiff-Dry (CL)	11-6"	8.7		30	15	15	2.0	94.1
				29-12"							
				50-18"							
10		X		7-6"	8.9		29	13	16		82.6
				25-12"							
				41-18"							
15		X	K = 6.35 X 10^{-6}	17.6"	11.2		35	13	22		86.6
				50-12"							
20		X		18-6"	11.0		34	18	16		83.2
				38-12"							
				50-18"							
25		X		13-6"	8.2		26	15	11	1.0	84.0
				29-12"							
				47-18"							
30		X	Continued on Page 2								

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo

BORING NO.: TB-1
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30		X	Sandy Clay: Reddish Tan, w/Scattered Calcareous Nodules (10%) Stiff-Dry (CL)	17-6"	9.0		30	13	17		77.2
				50-12"							
35		X		28-6"	11.1		35	20	15		84.0
				50-10"							
40		X		12-6"	11.1		32	21	11		82.3
				27-12"							
				44-18"							
45		X		35-6"	8.6		32	22	10	2.75	77.8
				50-8"							
50		X		18-6"	9.9		33	26	7		81.7
				50-12"							
55		X	Becomes Harder	50-6"	8.4		26	19	7	3.0	65.5
60		X	Continued on Page 3								

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo

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60			$K = 3.34 \times 10^{-5}$	50-5"	7.2		21	18	3	2.50	44.9
65				33-6"	6.1		21	16	5		59.2
				50-9"							
70			Caliche: Light Tan Limestone Layers, Fractures, Hard (CL)	50-3"	5.3		23	18	5		66.0
75				50-3"						4.0+	
80				50-4"							
85			Clayey Sand:Reddish Tan to Tan w/Scattered Calcareous Nodules, (10%) Dry (SC)	28-6"	3.8		21	18	3		28.2
				50-9"							
90			Continued on Page 4								

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo

BORING NO.: TB-1
LOCATION: Amarillo, Texas

Date: 7-5-94 thru 7-9-94

Ground Elevation: 3808.14

DRILLING METHOD: Air/Mud Rotary

GROUNDWATER INFORMATION:
Air Drilled to 210' groundwater encountered at 215'

DEPTH, FEET	SYMBOL	SAMPLE	DESCRIPTION OF STRATUM	SPT BLOWS / FT. PENETROMETER TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	UNCONFINED COMPRESSIVE STRENGTH, TSF	% PASSING NO. 200 SIEVE
90		X		50-6"	3.7		21	17	4		21.2
95		X		50-5"	3.2		17	13	4	3.25	21.7
100		X		50-6"	3.6		23	20	3		26.9
105		X	Clayey Sand: Reddish Tan to Tan w/Scattered Calcareous Nodules (10%) Dry (SC)	18-6"	1.9		15	10	5		8.7
				42-12"							
				50-14"							
110		X		15-6"	1.8		14	11	3		7.4
				50-12"							
115		X		30-5"							
				50-8.5"							
120			Continued on Page 5								

LOG OF BORING

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Date: 7-5-94 thru 7-9-94
Ground Elevation: 3808.14

DRILLING METHOD: Air/Mud Rotary
GROUNDWATER INFORMATION: Air Drilled to 210' groundwater encountered at 215'

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120		X		19-6"	1.7		16	13	3		7.8
				50-9"							
125		X	K = 7.15 X 10^{-5}	50-6"	2.6				NP		16.1
130			No Sample								
135		X		40-6"	2.2		15	11	4		21.3
				50-6.5"							
140			No Sample								
145		X		36-6"	3.8				NP	2.0	17.7
				50-8"							
150			Continued on Page 6								

LOG OF BORING

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LOCATION: Amarillo, Texas

Date: 7-5-94 thru 7-9-94

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150											
155		X		21-6"	4.0		21	16	5		15.0
				50-8"							
160											
165		X		38-6"	4.5		19	16	3	2.50	11.6
170											
175		X		50-5"	3.7		18	14	4		11.7
180			Continued on Page 7								

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo
BORING NO.: TB-1
LOCATION: Amarillo, Texas

Date: 7-5-94 thru 7-9-94
Ground Elevation: 3808.14

DRILLING METHOD: Air/Mud Rotary
GROUNDWATER INFORMATION: Air Drilled to 210' groundwater encountered at 215'

DEPTH, FEET	SYMBOL	SAMPLE	DESCRIPTION OF STRATUM	SPT BLOWS/FT PENETROMETER TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	UNCONFINED COMPRESSIVE STRENGTH, TSF	% PASSING NO. 200 SIEVE
180											
185			Sand: Well Sorted Fine Grain(SC)	50-5"	3.7				NP		14.4
190											
195				33-6"	4.0		20	16	4		10.0
				50-8"							
200											
205				50-5"	5.1		20	16	4		19.2
			Sand: Light Tan, Fine Grain, w/Small Pea Gravel(15%) (SC)								
210			Continued on Page 8								

LOG OF BORING

PROJECT: Amarillo MSWLF
CLIENT: City of Amarillo
BORING NO.: TB-1
LOCATION: Amarillo, Texas

Date: 7-5-94 thru 7-9-94
Ground Elevation: 3808.14

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DEPTH, FEET	SYMBOL	SAMPLE	DESCRIPTION OF STRATUM	SPT BLOWS / FT PENETROMETER TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, LL	PLASTIC LIMIT, PL	PLASTICITY INDEX, PI	UNCONFINED COMPRESSIVE STRENGTH, TSF	% PASSING NO. 200 SIEVE
210											
215		X	Organic Carbon Content(*)	39-6"	MD		13	7	6		12.6
			*257.32 MG/KG	50-6.5"							
220											
225		X	*523.32 MG/KG	35-6"	MD				NP		36.5
				50-7.5"							
230											
235		X	*741.97 MG/KG	50-4"	MD						27.1
240			Continued on Page 9								

LOG OF BORING

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240											
245		X	*491.65 MG/KG	50-4"	MD				NP		24.0
250											
255		X	*1155.23 MG/KG	50-3"	MD						
260			Clayey Sand: Light Tan, Hard Calcareous Limestone Cap w/Black Coarse Gravel(SC)								
265											
270			Silty Clay: Red to Deep Red, Red Bed (MH)								

Continued on Page 10

LOG OF BORING

PROJECT: Amarillo MSWLF
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BORING NO.: TB-1
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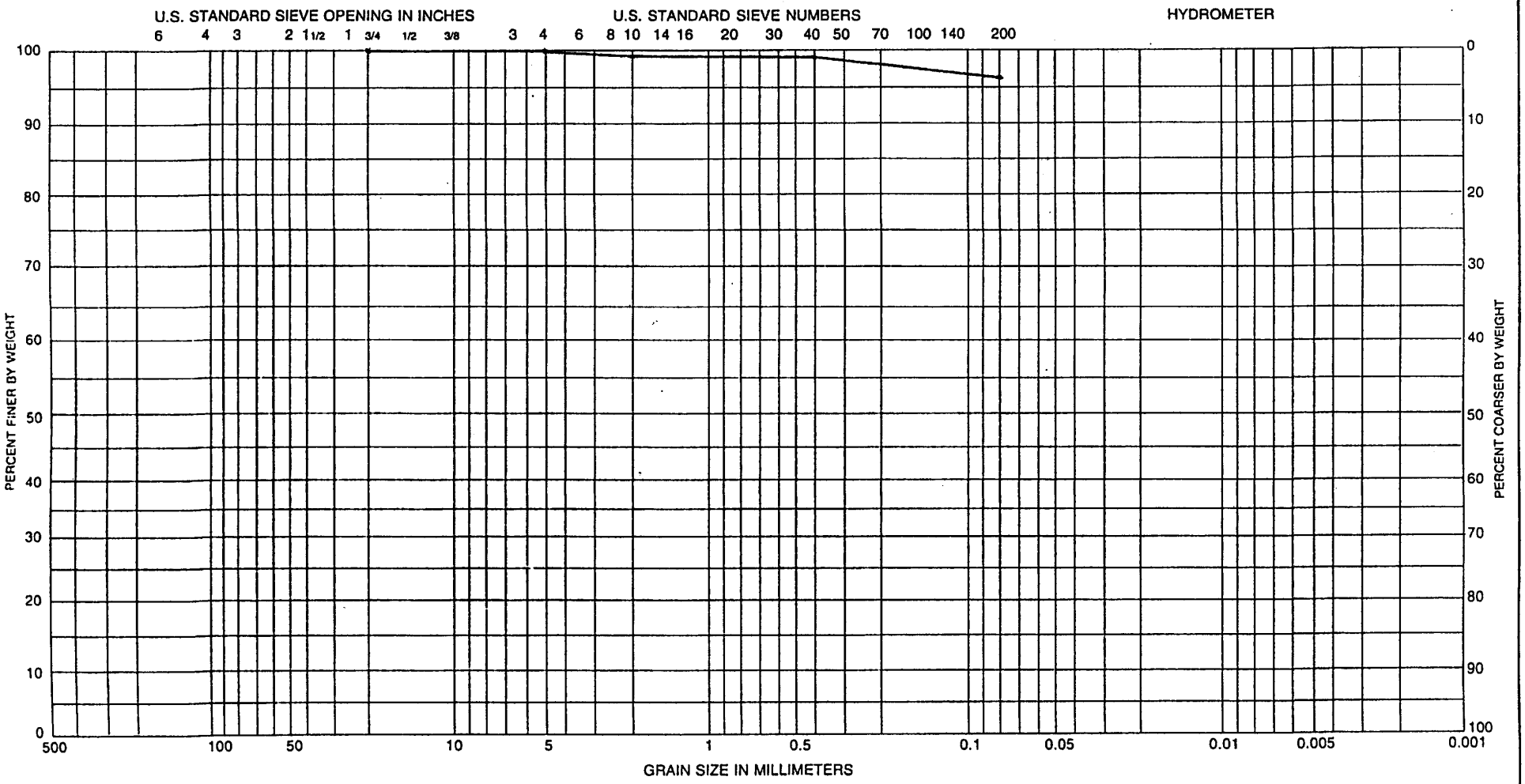
270		X	*225.22 MG/KG	50-4.5"	MD		37	25	12		85.4
275											
280		X	*310.35 MG/KG	50-5"	MD		40	30	10		63.1
			* T.D. - 280' *								



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	NEUTRAL	FINE	

Sample No.	Elev or Depth	Classification	Net w %	LL	PL	PI
TB-1-1	5'	Sandy Clay: Reddish Tan				
		w/Scattered Calcareous Nodules		30	15	15
		(8%), Stiff-Dry (CL)				

GRADATION CURVES

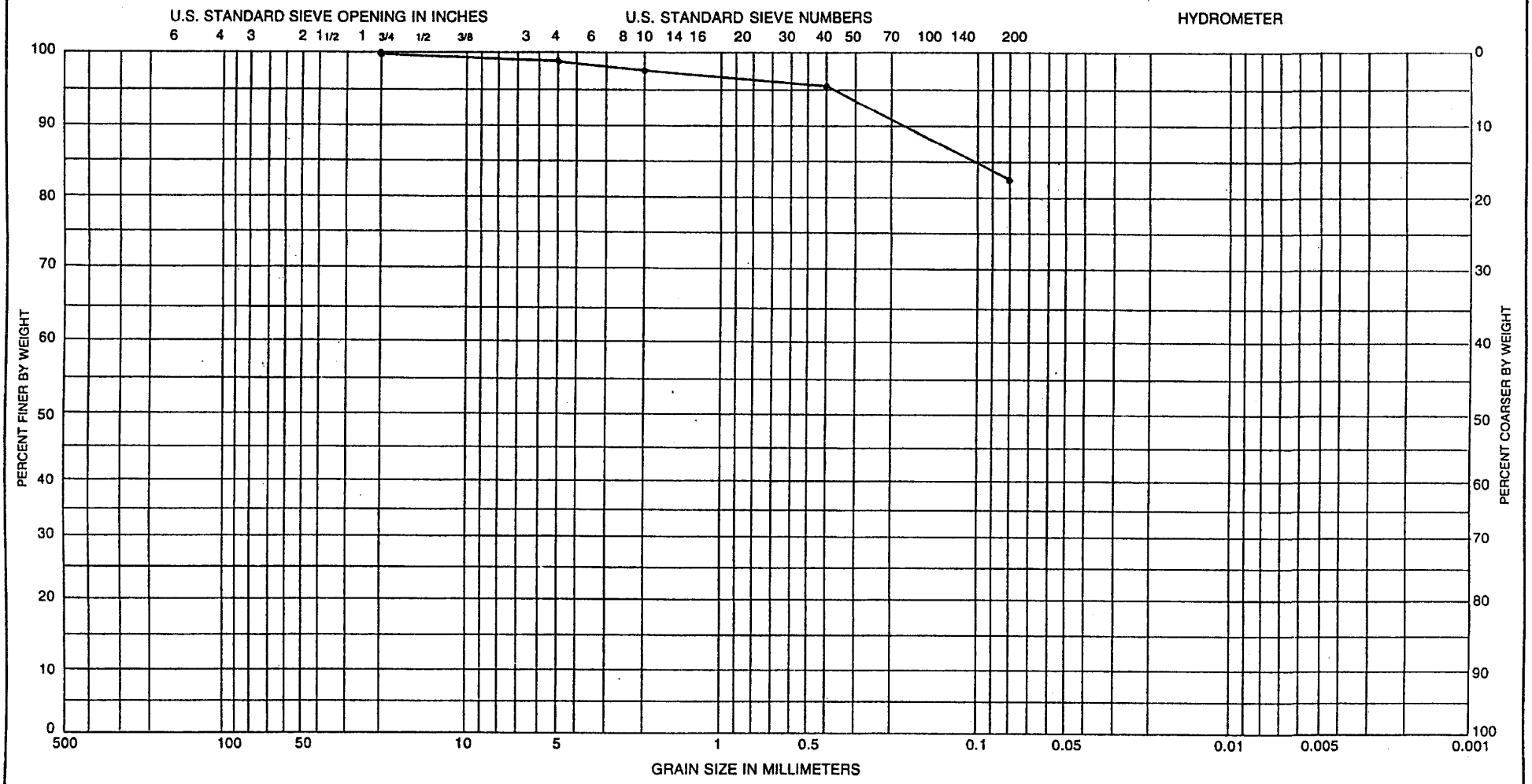
Project Amarillo MSWLF

Area

Boring No. TB-1

Date 7-5-94

DYESS-PETERSON TESTING LABORATORY, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	NEUTRAL	FINE	

Sample No.	Elev or Depth	Classification	Net w %	LL	PL	PI
TB-1-2	10'	Sandy Clay: Reddish Tan		29	13	16
		w/Scattered Calcareous Nodules				
		(8%) Stiff-Dry (CL)				

GRADATION CURVES

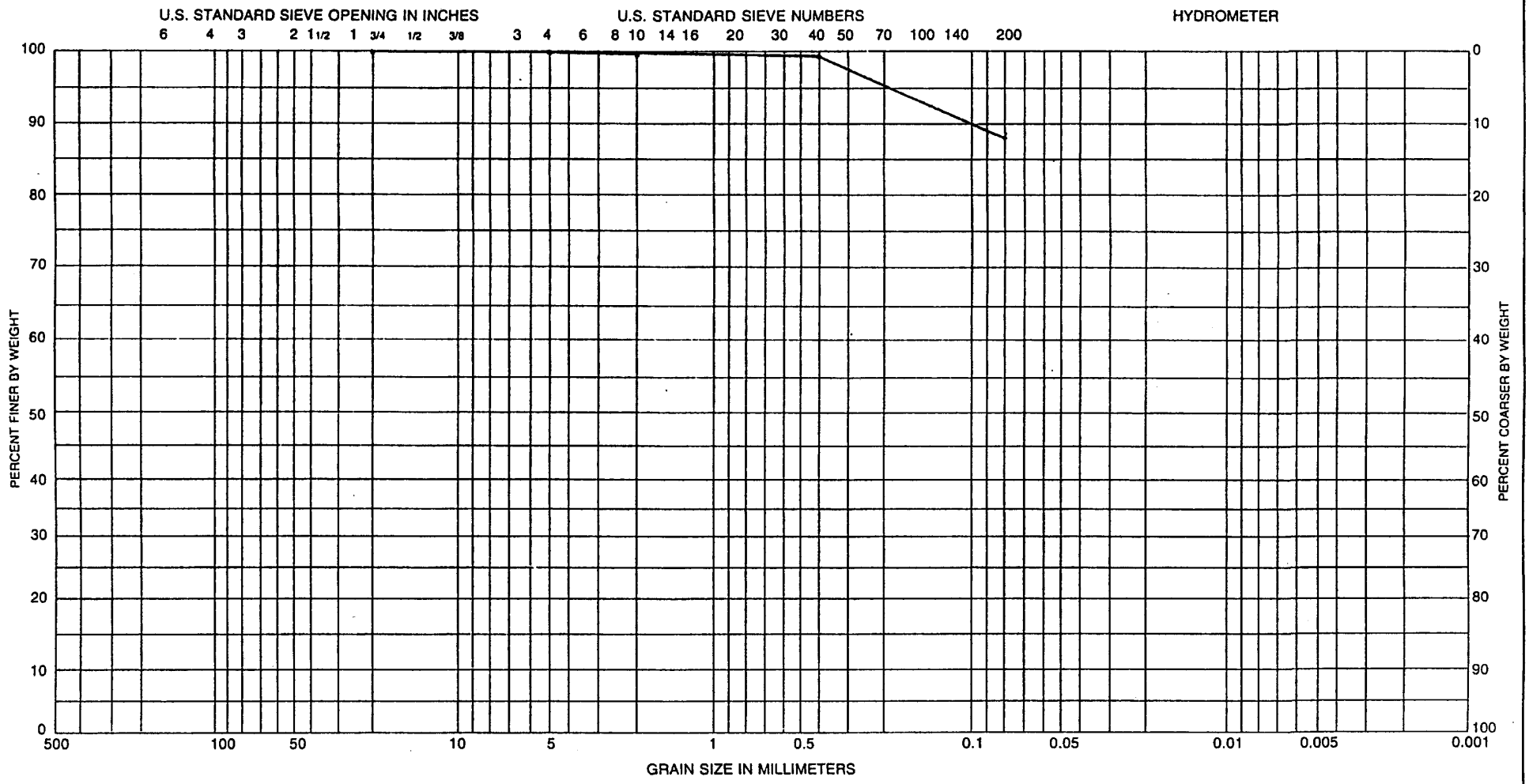
Project Amarillo MSWLF

Area

Boring No. TB-1

Date 7-5-94

DYESS-PETERSON TESTING LABORATORY, INC.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	NEUTRAL	FINE	

Sample No.	Elev or Depth	Classification	Net w %	LL	PL	PI
TB-1-3	15'	Sandy Clay: Reddish Tan		35	13	22
		w/Scattered Calcareous Nodules				
		(8%) Stiff-Dry (CL)				

GRADATION CURVES

Project Amarillo MSWLF

Area

Boring No. TB-1

Date 7-5-94

DUESS-PETERSON TESTING LABORATORY, INC.