AUSTIN COMMUNITY LANDFILL
A WASTE MANAGEMENT COMPANY

P.O. Box 141968
Austin, TX 78714-1968
(512) 272-6200
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October 20, 2003

RECEIVED
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MSW PERMITS SECTION
TEXAS COMMISSION ON
ENVIRONMENTAL QUALITY

Mr. Richard Carmichael, Manager
MC-124
MSW Permits Section
Waste Permits Division
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Subject: Municipal Solid Waste – Travis County
Austin Community Landfill – Permit No. MSW 249C
Permit Modification Request – Final Cover and Drainage Improvements

Dear Mr. Carmichael:

On behalf of Waste Management of Texas, Inc. (WMTX) and in association with RJR Engineering, Ltd., L.L.P. (RJR), the enclosed revisions to the final cover system and surface water drainage facilities in Attachments 1, 8 and 9 of the Site Development Plan (SDP) for the subject facility is being submitted to the Texas Commission on Environmental Quality (TCEQ) for consideration as a Class I permit modification.

By this request, WMTX is seeking approval to: modify the final grades on the eastern most hill included in Attachment 1 of the SDP; modify some of the site drainage facilities included in Attachment 8 of the SDP including the revision of the control structure of a sedimentation pond in the central channel, the relocation of the site drainage rundown channels and terraces on the eastern most hill to adjust for the revisions in the final grades, the addition of two culverts, and minor revisions to other east hill culverts, ditches and rundown channels; and modify the final grades included in Attachment 9 of the SDP.

This request for a permit modification includes the submittal of revisions and additions to the SWMP for the facility. The following information is being submitted in support of this request for a permit modification.

Description of Proposed Changes

This permit modification proposes improvements to the site's final grades and surface water drainage system. These improvements include the following:

1) The revision of final grades on the south face of the easternmost waste hill to change the direction and location of an access way onto the top slopes of the hill.

WWC 10355601
04-3568

ED 0010332

This revision resulted in a net loss of landfill capacity of 1,550 cubic yards of permitted airspace.

2) The revision of the system of drainage rundown channels and terraces on the eastern waste hill to conform to the final grades as revised on the south face of the easternmost hill with this submittal and as revised elsewhere on the easternmost hill in previous TCEQ permit modifications that did not already address these features.

3) The revision of the perimeter drainage channels along the southern and eastern perimeters of the eastern waste hill to conform to the physical of the final grades.

4) The revision of Central Channel South Pond Structure to incorporate a 60-inch corrugated metal pipe culvert and wall type weir acting as the primary spillway and a secondary spillways as a roadway weir structure. The structure will allow for storm-water storage behind the wall with dewatering provided from two six-inch pipes located at the base of the wall. A combination of concrete stilling blocks, concrete riprap, and 24 inch thick stone riprap have been included to protect the downstream receiving channel from erosion.

5) The revision of culvert 6 to conform to the revised Central Channel South Pond Structure described in Item No. 4.

6) Added culverts 10A and 12A.

Explanation Supporting Modification

Modifications to the final grades and site drainage facilities are in accordance with provisions of the TCEQ rules. There are several operational benefits to the design modification including the following:

- Consistent with long-term development of the landfill

  The proposed modifications to the final grades will provide access to the top slopes of the final cover. The proposed modifications to the drainage facilities will bring the design into conformance with the revised configuration of the eastern waste hill.

- Improves the landfill's capability to protect the environment and human health

  The revision of the final grades relocates the access way to the top slope of the east hill and has no impact on the landfill's capability to protect the environment and human health. The revision of the drainage rundown channels and terraces reduces erosion on the eastern hill. The revision of the perimeter drainage channels improve the performance of the eastern hill drainage system. The revision of the Central Channel South Pond Structure and Culver 6 will allow for additional site access in all but the more extreme rainfall events. These items will improve the landfill's capability to protect the environment and human health.

- Consistent with Site Operations

Changes to the final grades on the east hill conform to current facility filling operations. Changes to the drainage rundown channels, terraces, perimeter ditches and Central Channel South Pond Structure and Culvers 6, 10A, and 12A are being made in conjunction with the preparation of final cover and drainage facility construction plans.

Sections of Site Development Plan Being Revised

Section	Title	Description
Revision of Appendix 2.3 (text and calculations)	Post-Development Drainage Calculations	Revision of the text. Revision of the calculations for drainage terraces, perimeter ditches, rundown channels, and culverts.
Revision of Attachment 1-B (figure)	East Landfill Final Contour	Revision of final contours, perimeter ditches, interceptor berms, and rundown channels.
Revision of Attachment 8-1B (figure)	East Landfill Drainage Plan	Revision of final contours, perimeter ditches, interceptor berms, rundown channels, and sub-drainage areas.
Revision of Attachment 8-3 (figure)	Surface Water Management Details	Addition of culverts 10A and 12A, revision of culvert and ditch schedule, and revision of Drainage Terrace Detail.
Revision of Attachment 8-3A (figure)	Central Channel South Pond Structure Plan	Revision of a Central Channel South Pond Structure Plan and Culvert 6.
Revision of Attachment 8-3B (figure)	Central Channel South Pond Structure Profile	Revision of a Central Channel South Pond Structure Profile.
Revision of Attachment 9-2 (figure)	East Landfill Final Contour	Revision of final contours, perimeter ditches, interceptor berms, and rundown channels.
Revision of Sheet 1 of 3 (figure)	Current Permit Final Grades	Revision of final contours.
Revision of Sheet 2 of 3 (figure)	Cross Sections "A" & "B"	Revision of cross sections and volume calculation.
Revision of Sheet 3 of 3 (figure)	Cross Sections "C" & "D"	Revision of cross sections and volume calculation.

Specific Provision Under Which Modification Requested

The proposed changes to Attachments 1, 8, and 9 are minor in nature and do not substantially alter the permit conditions or reduce the capability of the facility to protect human health and the environment. Additionally, these changes will improve offsite drainage by reducing the peak flows and improving the quality of the storm water run-off without increasing landfill disposal capacity. Therefore, approval of this modification is requested under the provisions of Title 30 Texas Administrative Code Section 305.70(j)(11) (30 TAC §305.70(j)(11)), changes in the drainage control plan that significantly alter internal stormwater run-on/run-off control without impacting offsite drainage or increasing landfill disposal capacity, or of 30 TAC §305.70(l).

Certification

The certification statement required by 30 TAC §305.44 is enclosed as a part of this request.

As required by 30 TAC §330.113(c) of TCEQ rules, please be advised that this letter with enclosures is being placed in the operating record for the subject facility in accordance with requirements of 30 TAC §330.113(a) and /or (b). Also as required, an original and one copy of this letter with enclosures are being submitted to the TCEQ central office while another copy is being submitted directly to the appropriate TCEQ regional office.

I trust that this submittal is complete and will lead to approval of this permit modification request. If you have any questions or comments concerning this submittal, please contact me at telephone number (512) 272-6221 or Mr. J.Roy Murray, P.E., of RJR at telephone number (281) 397-6747 in Houston.

Very truly yours,
Waste Management of Texas, Inc.

James Smith
Landfill Manager

JS:jm
Enclosures

cc w/enclosures: Barry Kalda, TCEQ Region 11 Austin

cc w/o enclosures: Steve Jacobs, WMTX
Tim Champagne, WMTX
J. Roy Murray, RJR

Certification Statement to
Texas Commission on Environmental Quality
Pertaining to Permit Modification

Facility Permittee:	Waste Management of Texas, Inc.
Facility Name:	Austin Community Landfill
Facility Permit No.:	MSW Permit No. 249C
Subject:	Class I Modification – Final Cover and Drainage Improvements
Modification Date:	October 20, 2003

Description: WMTX is seeking approval to modify the eastern hill final grades and site drainage facilities to modify the final grades on the eastern most hill included in Attachment 1 of the SDP; modify some of the site drainage facilities included in Attachment 8 of the SDP including the revision of the control structure of a sedimentation pond in the central channel, the relocation of the site drainage rundown channels and terraces on the eastern most hill to adjust for the revisions in the final grades, the addition of two culverts, and minor revisions to other east hill culverts, ditches and rundown channels; and modify the final grades included in Attachment 9 of the SDP.

Certification: In accordance with Title 30 Texas Administrative Code Section 305.70(b) and on behalf of the facility permittee, I make the following certification pertaining to the above described permit modification:

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 information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: [signature] Date: 10-20-03

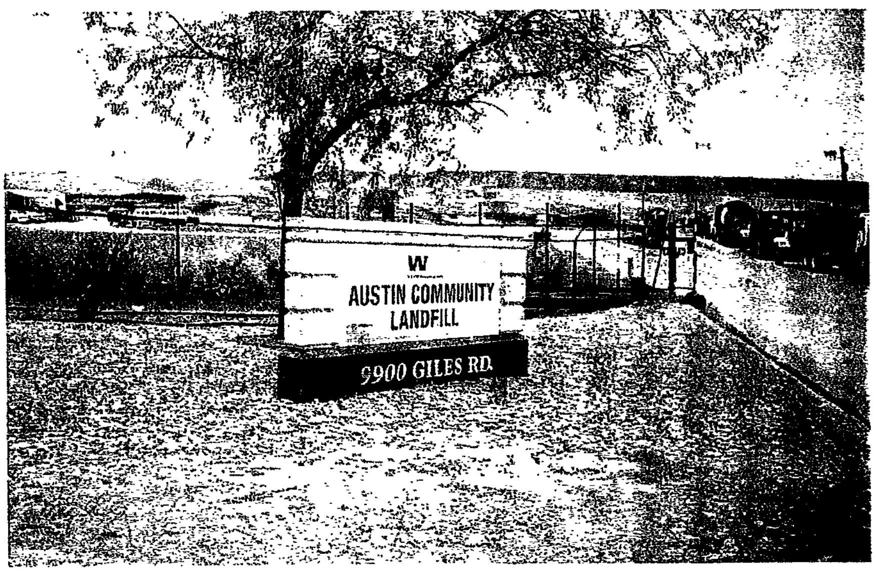
Printed Name: James O. Smith Title: District Manager

WASTE MANAGEMENT

PERMIT MODIFICATION REQUEST
Permit No. MSW- 249C

Final Cover and Drainage Improvements

Austin Community Landfill
Austin, Travis County, Texas



September 2003

RJR ENGINEERING

ED 0010347

For Permit Purposes Only

APPENDIX 2.3

AUSTIN COMMUNITY RECYCLING AND DISPOSAL FACILITY

POST-DEVELOPMENT DRAINAGE CALCULATIONS

Prepared For:

Waste Management of Texas, Inc.
9900 Giles Road
Austin, Texas 78754

Prepared By:

RJR Engineering, Ltd., L.L.P.
12651 Briar Forest, Suite 205
Houston, Texas 77077

STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER

9/22/03
Cover Page and
Pages 2 through 5

March 19, 1996
Revised September 22, 2003

INTRODUCTION

To control runoff and reduce the potential for erosion of final cover, a system of interceptor berms and drainage rundown channels has been designed for the landfill surface, and a perimeter ditch network has been designed to convey runoff to natural drainage ways.

The Austin Community Landfill facility consists of an east and west landfill separated by a natural drainageway oriented north-south across the site. Each landfill has been divided into several small drainage subareas as shown in Attachments 8-1A and 8-1B. The boundaries of these subareas consist of landfill ridge line high points, interceptor berms, rundown channels, or perimeter ditches. Runoff will sheet flow across the top surface of the landfill and a short distance down the 3:1 and 4:1 landfill side slopes. Interceptor berms will be constructed at 30 foot vertical intervals on the 3:1 side slopes and 40 foot vertical intervals down the 4:1 side slopes to intercept runoff and convey it laterally to rundown channels. These rundowns are lined, flat-bottom channels which route runoff down the side slope to the landfill toe. Once the runoff is conveyed to the base of the landfill, it is conveyed to natural drainage ways via perimeter drainage ditches.

INTERCEPTOR BERMS

The interceptor berms will be constructed above the final cover system at a 3% longitudinal slope along the sideslopes of the landfill. Uniform Soil Loss Equation calculations contained in this appendix demonstrate that a vertical spacing of 30 foot vertical intervals on the 3:1 side slopes and 40 feet on the 4:1 side slopes is an acceptable interval for placing the berms to control erosion. At these intervals, soil loss due to sheet flow runoff is expected to be 2.98 ton/ac/yr on the 3:1 side slopes and 2.36 ton/ac/yr on the 4:1 side slopes, less than the recommended maximum of 3 ton/ac/yr. The berms form a 2.5 foot deep drainage swale with one side being the 3:1 or 4:1 side slope of the landfill and the other consisting of the 2.5:1 face of the intercept berm (see Attachment 8-3). Maximum calculated depth of flow is 1.62 feet with a velocity of 5.45 feet per second. For flow velocities greater than 5.0 feet per second, erosion control mats will be used.

RUNDOWN CHANNELS

Rundown channels have been designed to convey the runoff flows from the interceptor berms to perimeter ditches or natural drainageways located at the base of the landfill. Runoff from several subareas will drain into the rundown channels which are aligned down the landfill sideslopes. To reduce the erosion potential, rundown channels will be provided with reno mattresses, grouted riprap, or HDPE geomembrane as shown on Attachment 8-3. The channels will flow directly into the perimeter ditches at the base of the landfill, or into catch basins and culverts to convey the runoff underneath the perimeter road. The channels will be constructed with nine foot wide flat bottoms and 2:1 sideslopes. Maximum depth of flow is calculated at 0.9 feet at 13.5 ft/sec. Design depth of the channels is 2.25 feet as shown on Attachment 8-3.

PERIMETER DITCHES

The perimeter ditches are located at the base of the landfill and have slopes varying from 0.86% to 11.0%. The ditch flowlines typically match the perimeter slope of the landfill toe and convey the runoff to natural drainageways. A minimum of one foot of free board will be provided above the 25-year storm depths of flow. For flow velocities less than 5 ft/sec, the ditches will have a vegetated surface. For higher velocities, rock riprap or erosion control mats will be used. Ditch designs are summarized in the Ditch Schedules on Attachment 8-3.

RUNOFF CALCULATION METHODS

Rainfall runoff has been calculated using the Rational Method as follows:

Q = CIA, (Rational Formula), where,

A - is the drainage area, in acres, associated with the particular area being analyzed.

C - is the runoff coefficient; as in previous drainage analyses for this site, a value was obtained using the City of Austin Drainage Criteria Manual Table 2-2 dated June 1, 1988. Landfill input characteristics include a developed area with slopes greater than 7% considered to be in "fair condition" (grass cover on 50 to 75 percent of the area). For this particular condition, the runoff coefficient is 0.46.

I - is the rainfall intensity of the 25 yr storm calculated from the Texas Department of Transportation Hydraulic Manual intensity equation:

$$(I=b/(T_c + d)^e)$$

Using Travis County constants from Table 6:

b=87

d=8.6

e=0.766

T_c=time of concentration

The time of concentration (T_c) is the time in minutes required for the runoff to flow from the most hydraulically remote point in the drainage area to the analysis point and is estimated from the drainage area characteristics of slope, surface conditions and degree of concentrated flow. The TxDOT Rational Method sheet flow velocities in Figure 5 of the Manual is used to estimate T_c for overland flow. Mannings equation is used to estimate channel velocities and T_c for flow along the intercept berm swales, rundown channels or in perimeter ditches. The computer program HYDROCALC by Dodson & Associates incorporates Mannings equation and is used in the calculation of the flow and velocity in each channel.

CALCULATION OF FLOW IN THE INTERCEPTOR SWALES

Runoff from each drainage subarea sheetflows across the landfill surface and is generally collected in an intercept berm swale and conveyed to the rundown channel. In a few locations, runoff will sheetflow directly to a perimeter ditch or natural drainageway. Runoff volumes from each subarea and flow conditions in intercept swales are shown in the Tables at the end of this appendix. For all subareas, the time of concentration was less than 10 minutes so T_c = 10 min. was used to calculate Q as recommended by §330.55. The typical swale is designed with a 3% flowline grade and a depth of 2.5 feet. This provides at least 0.75 foot of freeboard for the 25 year storm flow.

CALCULATION OF FLOW IN RUNDOWN CHANNELS

For most landfill areas, several interceptor swales drain into rundown channels to convey runoff down the side of the landfill. The channels exhibit high velocities and will be constructed using reno mattresses, grouted riprap, or HDPE geomembrane to prevent excessive erosion. A 9 foot bottom width is selected because it is a standard mattress width.

In order to determine the required channel depths, the total flow from all subareas that flow into a channel is calculated by adding the respective flows from the swales. As show in the Rundown Channel Schedule on Attachment 8-3, the maximum 25 year depth of flow is 0.9 feet, and the channel depth will typically be

2.25 feet to provide a minimum of 1.35 feet of freeboard to contain turbulent flow or accommodate alignment variation during landfill settlement.

CALCULATION OF FLOW IN THE PERIMETER DITCHES

The perimeter ditches are divided into segments for design purposes. Segments are delineated by locations where the ditch slope changes and/or where significant flow enters the ditch such as at the intersection with a rundown channel. Runoff volumes in each segment are determined by the rational method along with continuity considerations so that design flows within perimeter ditches will not decrease in downstream segments. Segments are designed in segments beginning from the upper end of each ditch. The rational method flow volume is input into the HYDROCALC program, and flow depth, velocity and segment travel time is calculated. For each segment, a new time of concentration is developed for determination of the design runoff volume. The results of these calculations are presented in tabular form at the end of this appendix.

CULVERT DESIGN

A perimeter access road will be aligned along the toe of the landfill, and as a result, it is necessary to convey ditch flows under the road in culverts. Corrugated metal pipe culverts are proposed to range in size from 18 inches to 36 inches in diameter. Culvert sizing is accomplished by using the computer program, CULVERT ANALYSIS PROGRAM version 1.10, by Josef Valenta in San Antonio, Texas or HYDROCALC Hydraulics for Windows, Version 1.2a by Dodson & Associate in Houston, Texas. The principles of the program are those found in Section 4 of the TxDOT Hydraulic Manual. In all cases, it is assumed that the tailwater is at the top of the pipe and a roughness coefficient of 0.024 is used. Culvert slope may be from 1 to 10 percent. Ditch depths will be transitioned within about 100 feet of the pipe invert to provide adequate headwater depth. Invert elevations and headwater requirements are shown on Attachment 8-3. Pipe outfalls have been set to provide non-erosive flow to natural drainage ways, or riprap splashpads will be provided to connect to the drainage ways. Culvert calculations are provided at the end of this appendix.

Appendix 2.3, cont.

SOIL LOSS CALCULATIONS

Universal Soil Loss Calculation

	By	Date	Initial
Calculated:	JRM	9/19/2003	[initials]
Checked:	JKR	9/19/2003	

Project: Austin Community Landfill
Project Number: 10210

Purpose: Determine the rate of soil loss of final cover for the closure/post closure periods.

Given/Assumptions:

Final Cover Slopes:	25	Percent	
Maximum Length of Slope:	165	Feet	
Vegetated Cover Canopy:			
Type:	0	Percent	
Percent Coverage	90	Percent	
Cover Organic Content:	< 0.5	Percent	
Cover Soil Type:	Clay		
Rainfall Erosion Index (R):	280		See Note 1
Texture Factor K:	0.25		See Note 2
Cover Factor C:	0.005		See Note 3
Contouring Factor P:	0.9		See Note 4
Topographic Factor LS:	7.5		See Note 5

Equation:

A = R*K*LS*C*P

Solve:

A =	**2.36** tons/acre/year	< 3.0 tons/acre/year

Therefore, OK based on guidance from TNRCC USLE Procedural Handbook

Notes:

1. From Figure 1 - Average Annual Values of the Rainfall Erosion Index
2. From Table 1 of the USDA, Agricultural Handbook Number 537
3. From Table 2 of the USDA, Agricultural Handbook Number 537
4. From page 187 of the US Department of Commerce Handbook, Predicting Soil Erosion by Water
5. From Figure 2 of the USDA, Agricultural Handbook Number 537

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STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER

Sheets 1 to 3 of 3
9/26/03

Sheet 1 of 3

ED 0010679

Universal Soil Loss Calculation

	By	Date	Initial
Calculated:	JRM	9/19/2003	[signature]
Checked:	JKR	9/19/2003	

Project: Austin Community Landfill
Project Number: 10210

Purpose: Determine the rate of soil loss of final cover for the closure/post closure periods.

Given/Assumptions:

Final Cover Slopes:	33	Percent	
Maximum Length of Slope:	90	Feet	
Vegetated Cover Canopy:			
Type:	0	Percent	
Percent Coverage	90	Percent	
Cover Organic Content:	< 0.5	Percent	
Cover Soil Type:	Clay		
Rainfall Erosion Index (R):	280		See Note 1
Texture Factor K:	0.25		See Note 2
Cover Factor C:	0.005		See Note 3
Contouring Factor P:	1		See Note 4
Topographic Factor LS:	8.5		See Note 5

Equation:

A = R*K*LS*C*P

Solve:

A =	**2.98** tons/acre/year	< 3.0 tons/acre/year

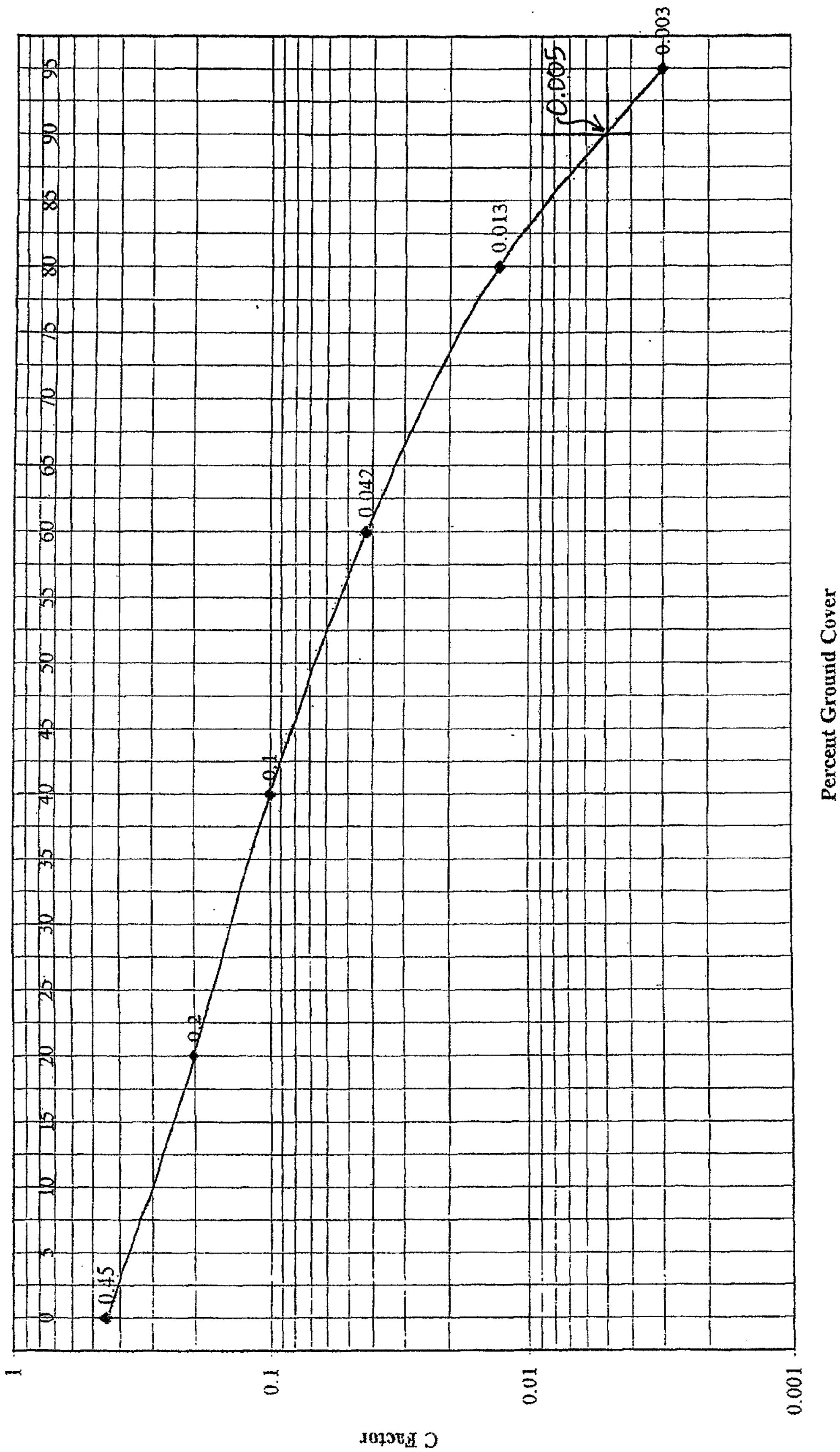
Therefore, OK based on guidance from TNRCC USLE Procedural Handbook

Notes:

1 From Figure 1 - Average Annual Values of the Rainfall Erosion Index
2 From Table 1 of the USDA, Agricultural Handbook Number 537
3 From Table 2 of the USDA, Agricultural Handbook Number 537
4 From page 187 of the US Department of Commerce Handbook, Predicting Soil Erosion by Water
5 From Figure 2 of the USDA, Agricultural Handbook Number 537

Sheet 2 of 3

C Factor - No Appreciable Canopy



Sheet 3 of 3

ED 0010681

DRAINAGE AREA RUNOFF AND INTERCEPT SWALE FLOW

DRAINAGE AREA RUNOFF AND INTERCEPT SWALE FLOW
AUSTIN COMMUNITY LANDFILL
WEST LANDFILL AREA

DRAINAGE AREA	AREA (ACRES)	TOTAL Tc (MIN)	25-YR. INTENSITY (IN/HR)	25-YR. RUNOFF COEFF. C	25-YR. RUNOFF (CFS)	INTERCEPT SWALE FLOW DEPTH (FT)	INTERCEPT SWALE FLOW VELOCITY (FPS)
WA1	3.53	10.00	9.27	0.46	15.05	1.06	4.10
WA2	1.20	10.00	9.27	0.46	5.12	0.71	3.13
WA3	4.97	10.00	9.27	0.46	21.19	1.21	4.45
WA4	2.22	10.00	9.27	0.46	9.47	0.89	3.64
WA5	5.47	10.00	9.27	0.46	23.32	1.25	4.56
WA6	4.12	10.00	9.27	0.46	17.57	1.13	4.26
WAA1	1.70	10.00	9.27	0.46	7.25	N/A	N/A
WAA2	2.69	10.00	9.27	0.46	11.47	N/A	N/A
WB1	7.72	10.00	9.27	0.46	32.92	1.43	4.97
WB2	0.80	10.00	9.27	0.46	3.41	0.61	2.83
WB3	6.58	10.00	9.27	0.46	28.06	1.34	4.78
WB4	2.62	10.00	9.27	0.46	11.17	0.95	3.81
WBB1	2.92	10.00	9.27	0.46	12.45	N/A	N/A
WBB2	0.53	10.00	9.27	0.46	2.26	N/A	N/A
WBB3	2.90	10.00	9.27	0.46	12.37	N/A	N/A
WBB4	0.87	10.00	9.27	0.46	3.71	N/A	N/A
WBB5	2.61	10.00	9.27	0.46	11.13	N/A	N/A
WBB6	1.28	10.00	9.27	0.46	5.46	N/A	N/A
WBB7	1.35	10.00	9.27	0.46	5.76	N/A	N/A
WBB8	1.07	10.00	9.27	0.46	4.56	N/A	N/A
WC1	3.47	10.00	9.27	0.46	14.80	N/A	N/A
WC2	1.74	10.00	9.27	0.46	7.42	0.82	3.42
WCC1	1.01	10.00	9.27	0.46	4.31	N/A	N/A
WD1	1.19	10.00	9.27	0.46	5.07	0.71	3.12
WD2	5.83	10.00	9.27	0.46	24.86	1.28	4.63
WD3	3.83	10.00	9.27	0.46	16.33	1.10	4.18
WDD1	1.39	10.00	9.27	0.46	5.93	N/A	N/A
WDD2	3.33	10.00	9.27	0.46	14.20	N/A	N/A
WDD3	1.94	10.00	9.27	0.46	8.27	N/A	N/A
WE1	3.66	10.00	9.27	0.46	15.61	1.08	4.13
WE2	5.16	10.00	9.27	0.46	22.00	1.23	4.50
WE3	3.22	10.00	9.27	0.46	13.73	1.03	4.00
WE4	3.37	10.00	9.27	0.46	14.37	1.05	4.04
WE5	4.28	10.00	9.27	0.46	18.25	1.14	4.30
WE6	4.60	10.00	9.27	0.46	19.61	1.17	4.37
WEE2	4.04	10.00	9.27	0.46	17.23	N/A	N/A
WF1	1.80	10.00	9.27	0.46	7.68	0.83	3.45
WF2	3.90	10.00	9.27	0.46	16.63	1.10	4.20
WF3	2.14	10.00	9.27	0.46	9.13	0.88	3.61
WFF1	2.54	10.00	9.27	0.46	10.83	N/A	N/A
WFF2	0.19	10.00	9.27	0.46	0.81	N/A	N/A

Runoff Q = CiA
Intensity "i" = b/(Tc+d)^e
b = : 87
d = : 8.6
e = : 0.766

Depth and velocity calculated by Mannings equation with n=.04, s=3%, ss=2.5:1 and 4:1.

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STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER

Sheets 1 and 2 of 2

J. Murray
9/26/03

DRNGAPP2.WK4

3/19/96

Sheet 1 of 2

ED 0010683

DRAINAGE AREA RUNOFF AND INTERCEPT SWALE FLOW
AUSTIN COMMUNITY LANDFILL
EAST LANDFILL AREA

Drainage Area	Area (Acres)	Total Tc (Minutes)	25-Yr Intensity (in/hr)	25-Yr Runoff Coefficient	25-Yr Runoff (cfs)	Intercept Swale Flow Depth (Ft)	Intercept Swale Flow Velocity (fps)	
EA1	1.42	10.00	9.27	0.46	6.06	0.79	3.37	*
EA2	2.61	10.00	9.27	0.46	11.13	1.00	3.93	*
EA3	1.38	10.00	9.27	0.46	5.88	0.78	3.34	*
EA4	1.16	10.00	9.27	0.46	4.95	0.73	3.20	*
EA5	3.76	10.00	9.27	0.46	16.03	1.14	4.31	*
EA6	2.59	10.00	9.27	0.46	11.04	0.99	3.93	*
EA7	2.01	10.00	9.27	0.46	8.57	0.90	3.68	*
EA8	1.97	10.00	9.27	0.46	8.40	0.90	3.66	*
EA9	1.59	10.00	9.27	0.46	6.78	0.83	3.47	*
EAA1	0.88	10.00	9.27	0.46	3.75	N/A	N/A	
EAA2	1.74	10.00	9.27	0.46	7.42	N/A	N/A	
EAA3	1.14	10.00	9.27	0.46	4.86	N/A	N/A	
EAA4	1.03	10.00	9.27	0.46	4.39	N/A	N/A	
EAA5	1.01	10.00	9.27	0.46	4.31	0.69	3.09	*
EB1	0.48	10.00	9.27	0.46	2.05	0.52	2.56	*
EB2	1.57	10.00	9.27	0.46	6.69	0.82	3.45	*
EB3	0.50	10.00	9.27	0.46	2.13	0.53	2.59	*
EB4	0.89	10.00	9.27	0.46	3.80	0.66	2.99	*
EB5	0.77	10.00	9.27	0.46	3.28	0.62	2.89	*
EB6	2.63	10.00	9.27	0.46	11.21	1.00	3.94	*
EBB1	1.74	10.00	9.27	0.46	7.42	N/A	N/A	
EBB2	1.59	10.00	9.27	0.46	6.78	N/A	N/A	
EBB3	0.23	10.00	9.27	0.46	0.98	N/A	N/A	
EBB4	0.15	10.00	9.27	0.46	0.64	N/A	N/A	
EC1	1.46	10.00	9.27	0.46	6.23	0.75	3.28	
EC2	4.68	10.00	9.27	0.46	19.96	1.17	4.40	
EC3	11.09	10.00	9.27	0.46	47.29	1.62	5.45	
ECC1	1.07	10.00	9.27	0.46	4.56	N/A	N/A	
ECC2	2.33	10.00	9.27	0.46	9.94	0.90	3.69	
ECC3	3.29	10.00	9.27	0.46	14.03	N/A	N/A	
ECC4	2.84	10.00	9.27	0.46	12.11	N/A	N/A	
ECC5	2.91	10.00	9.27	0.46	12.41	0.97	3.90	
ECC6	1.20	10.00	9.27	0.46	5.12	N/A	N/A	

Runoff Q = CIA
Intensity "I" = b/(Tc+d)^e
b = 87
d = 8.6
e = 0.766

Depth and velocity calculated by Mannings equatino with n=0.04, s=3%, and ss=2.5:1 and 4:1 or 3:1 (conservative). Drainage areas with a * were analyzed for 3:1, others for 4:1.

Sheet 2 of 2

PERIMETER DITCH DESIGN

Austin Community Landfill
Perimeter Ditch Design

Ditch Segment	Segment Slope (%)	Drainage Areas	Area (Acres)	Ditch Length (Ft.)	Channel Velocity (Fps)	Tc (Min.)	i25 (In/Hr)	Segment Q25 (by Manning's) (Cfs)	Design Q25 (by continuity) (Cfs)
Ditch One :									
1A	2.43	WBB1	2.92	270	4.06	10.00	9.27	12.45	12.45
1B	2.43	WBB1	2.92	320	4.06	10.00	9.27	12.45	12.45
1C	6.25	WBB1,2	3.45	950	5.77	10.00	9.27	14.71	14.71
1D	1.61	WBB1,2	3.45	330	3.63	11.52	8.73	13.85	14.71
1E	1.00	WBB1,2	3.45	200	2.98	12.63	8.38	13.29	14.71
1F	2.44	WBB1,2,3,4,5 + WB 1,2,3,4	27.55	530	4.12	14.78	7.78	98.60	98.60
1G	3.33	Above + WBB 6,7,8	31.25	760	7.67	16.43	7.38	106.15	106.15
Ditch Two :									
2A	7.00	WC1,2	5.21	400	6.96	10.00	9.27	22.22	22.22
2B	7.00	WC 1,2 + WCC1	6.22	520	6.96	11.25	8.82	25.24	25.24
2C	1.00	Above + WDD1 +WD 1,2,3	18.46	500	3.97	13.34	8.17	69.35	69.35
Ditch Three:									
3A	2.94	WDD 2	3.33	270	4.5	10.00	9.27	14.20	14.20
3B	6.25	WDD2	3.33	130	5.96	10.36	9.13	13.99	14.20
3C	2.43	WDD2	3.33	220	4.17	11.24	8.82	13.51	14.20
3D	1.33	WDD 2,3	5.27	220	3.31	12.35	8.46	20.51	20.51
3E	2.03	WDD 2,3	5.27	210	4.29	13.17	8.22	19.92	20.51
3F	3.70	WDD 2,3	5.27	200	5.35	13.79	8.04	19.50	20.51
3G	1.25	WDD 2,3	5.27	280	3.53	15.11	7.70	18.66	20.51
3H	2.08	WDD 2,3 + WEE 2 (part)	7.11	430	4.23	16.81	7.30	23.88	23.88
3I	1.56	WDD 2,3 + WE	9.31	350	4.04	18.25	7.00	29.97	29.97
Ditch Four :									
4A	1.51	part of WEE 2	0.75	350	2.42	10.00	9.27	3.20	3.20
Ditch Five :									
5A	1.00	part of WEE 2	0.4	200	1.77	10.00	9.27	1.71	1.71
Ditch Six :									
6A	9.09	WFF 1	2.54	490	6.43	10.00	9.27	10.83	10.83
6B	4.76	WFF 1	2.54	140	5.03	10.46	9.10	10.63	10.83
6C	1.00	WFF 1	2.54	830	2.8	15.40	7.62	8.91	10.83

For Permit Purposes Only

STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER

[signature]
9/26/03
For Sheets 1 through 31 of 31

ACLDRNG.WK4

3/19/96

Sheet 1 of 31

ED 0010686

Ditch Seven :									
7A	9.00	WF 1,2	5.7	300	7.46	10.00	9.27	24.30	24.30
7B	9.00	WF 1,2	5.7	370	7.46	10.83	8.97	23.51	24.30
7C	1.00	WF 1,2,3	7.84	120	3.41	11.41	8.76	31.61	31.61
7D	7.69	WF 1,2,3 +WFF	8.03	350	7.9	12.15	8.52	31.49	31.61
'E	6.25	WAA 1	9.73	260	7.28	12.75	8.34	37.34	37.34
7F	2.27	WAA 1	9.73	480	5.21	14.28	7.91	35.40	37.34
7G	6.66	WAA 1	9.73	700	7.68	15.80	7.53	33.70	37.34
7H*	1.72	WF 1,2,3 +WFF 2	31.2	350	4.28	17.16	7.22	103.66	103.66
(* 6 ft. Flat Bottom)		+WAA1+WA 1to6							
7I*	1.00	WF 1,2,3 +WFF 2	31.2	400	4.83	18.54	6.94	99.59	103.66
(* 6 ft. Flat Bottom)		+WAA1+WA 1to6							
Ditch Eight :									
8A	0.86	ECC2 (part)	0.75	680	1.96	10.00	9.27	3.20	3.20
Ditch Nine :									
9A	3.70	EBB 1	0.83	500	3.48	10.00	9.27	3.54	3.54
9B	0.90	EBB 1	0.83	650	2.04	10.00	9.27	3.54	3.54
9C	0.90	EBB 1,2,3	6.01	520	2.04	14.25	7.82	21.89	21.89
9D	0.90	EB 1,2+ECC 1	18.84	1000	3.22	19.42	[illegible]	58.69	58.69
		+EBB 1,2,3							
9E	1.56	EB 1,2+ECC 1	18.84	400	5.07	[illegible]	[illegible]	56.66	58.69
		+EBB 1,2,3							
9F	1.33	EB 1,2+ECC 1	18.84	400	[illegible]	[illegible]	6.31	54.66	58.69
		+EBB 1,2,3							
Ditch Ten :									
10A	3.20	EAA 3 (part)	1.7	230	[illegible]	10.00	9.27	7.25	7.25
10B	5.90	EAA 3 (part)	1.7	490	4.95	10.00	9.27	7.25	7.25
Ditch Eleven :									
11A	3.12	EAA [illegible]	[illegible]	240	3.94	10.00	9.27	7.68	7.68
11B	1.00	EAA 1,2	3.38	180	2.58	10.00	9.27	14.41	14.41
Ditch Twelve :									
12A	0.90	ECC 2 (part)	0.75	220	1.99	10.00	9.27	3.20	3.20
12B	[illegible]	ECC 2 (part)	0.75	240	3.49	10.00	9.27	3.20	3.20
12C	11.00	ECC 2 (part)	0.75	60	5.11	10.00	9.27	3.20	3.20
12D	8.33	ECC 2 (part)	0.75	80	4.6	10.00	9.27	3.20	3.20
12 E	1.51	ECC 2 (part)	1.9	400	2.42	10.00	9.27	8.10	[illegible]

Replaced dated
See new calculations 9/25/03

Note:
Manning's roughness coefficient (channel), n = 0.035
Runoff coeff., C = 0.46
Minimum Tc = 10 minutes

ACLDRNG.WK4

3/19/96

Sheet 2 of 31

ED 0010687

PERIMETER DITCH, RUNDOWN CHANNELS, AND CULVERT FLOW CALCULATION
AUSTIN COMMUNITY LANDFILL
EAST LANDFILL AREA

Ditch Segment	Segment Slope (percent)	Drainage Area	Area (acres)	Ditch Length (feet)	Channel Velocity (fps)	Time of Concentration (minutes)	25-Yr Intensity (in/hr)	25-Yr Runoff (cfs)	Design 25-Yr Runoff (cfs)
PERIMETER DITCHES									
Ditch 8									
8A	0.86	EBB2	1.59	680	1.96	10.00	9.27	6.78	6.78
Ditch 9									
9A	4.00	ECC1	1.07	450	3.79	10.00	9.27	4.56	4.56
9B	4.00	ECC1, 2	3.40	70	5.09	10.00	9.27	14.50	14.50
9C	1.27	ECC1, 2, 3	6.69	200	3.91	10.00	9.27	28.53	28.53
9D	0.90	ECC1, 2, 3	6.69	440	3.44	10.00	9.27	28.53	28.53
9E	0.90	ECC1, 2, 3, 4	9.53	1290	3.72	10.97	8.92	39.08	39.08
9F	1.56	ECC1, 2, 3, 4, 5, 6	13.64	370	4.95	12.22	8.50	53.35	53.35
9G	1.33	ECC1, 2, 3, 4, 5, 6	13.64	400	4.66	13.65	8.08	50.71	53.35
Ditch 10									
10A	3.20	EAA1	0.88	220	3.32	10.00	9.27	3.75	3.75
10B	5.90	EAA1	0.88	130	4.17	10.00	9.27	3.75	3.75
10C	5.90	EAA1, 2	2.62	350	5.50	10.00	9.27	11.17	11.17
Ditch 11									
11A	3.12	EAA4, 5	2.04	230	4.07	10.00	9.27	8.70	8.70
11B	0.50	EAA4, 5	2.04	200	2.05	10.00	9.27	8.70	8.70
Ditch 12									
12A	0.90	EBB1	1.74	210	2.45	10.00	9.27	7.42	7.42
12B	4.00	EBB1	1.74	240	4.29	10.00	9.27	7.42	7.42
12C	11.00	EBB1	1.74	60	6.26	10.00	9.27	7.42	7.42
12D	8.33	EBB1	1.74	80	5.64	10.00	9.27	7.42	7.42
12E	1.51	EBB1	1.74	350	2.98	10.00	9.27	7.42	7.42
12F	2.08	EBB4	0.15	190	1.81	10.00	9.27	0.64	0.64
12AA	2.08	EBB3	0.23	200	2.02	10.00	9.27	0.98	0.98
RUNDOWN CHANNELS									
Rundown Channel EA	N/A	EA1, 2, 3, 4, 5, 6, 7, 8, 9	18.49	N/A	N/A	10.00	9.27	78.84	78.84
Rundown Channel EB	N/A	EB1, 2, 3, 4, 5, 6	6.84	N/A	N/A	10.00	9.27	29.17	29.17
Rundown Channel EC	N/A	EC1, 2, 3,	17.23	N/A	N/A	10.00	9.27	73.47	73.47
CULVERTS									
Culvert 8	N/A	EBB2	1.59	N/A	N/A	10.00	9.27	6.78	6.78
Culvert 9	N/A	ECC1, 2, 3, 4, 5, 6 and EC1, 2, 3,	30.87	N/A	N/A	13.65	8.08	114.76	114.76
Culvert 10	N/A	EAA1, 2	2.62	N/A	N/A	10.00	9.27	11.17	11.17
Culvert 10A	N/A	EAA1	0.88	N/A	N/A	10.00	9.27	3.75	3.75
Culvert 11	N/A	EAA4, 5 and EA1, 2, 3, 4, 5, 6, 7, 8, 9	20.53	N/A	N/A	10.00	9.27	87.54	87.54
Culvert 12	N/A	EBB1, 4	1.89	N/A	N/A	10.00	9.27	8.06	8.06
Culvert 12A	N/A	EBB3 and EB1, 2, 3, 4, 5, 6	7.07	N/A	N/A	10.00	9.27	30.15	30.15

Sheet 3 of 31

Austin Community Landfill
West Landfill Ditch Schedule

Ditch	Channel Slope (Ft./Ft.)	Q25 (Design) (Cfs)	Side Slope H:V	Side Slope H:V	Bottom Width (Ft.)	Depth of Flow (Ft.)	Velocity (Fps)	Erosion Control Required
1	2.43	12.45	3	3	0	1.01	4.06	Grass
1	2.43	12.45	3	3	0	1.01	4.06	Grass
1	6.25	14.71	3	3	0	0.9	6.02	3 in. Rock
1	1.61	14.71	3	3	0	1.16	3.63	Grass
1	1.00	14.71	3	3	0	1.27	3.03	Grass
1	2.44	98.60	3	3	0	2.2	6.81	6 in. Rock
1	3.33	106.15	3	3	0	2.13	7.81	6 in. Rock
2	7.00	22.22	3	3	0	1.03	6.96	6 in. Rock
2	7.00	25.24	3	3	0	1.08	7.2	6 in. Rock
2	1.00	69.35	3	3	0	2.28	4.46	Grass
3	2.94	14.20	3	3	0	1.03	4.5	Grass
3	6.25	14.20	3	3	0	0.89	5.96	3 in. Rock
3	2.43	14.20	3	3	0	1.06	4.2	Grass
3	1.33	20.51	3	3	0	1.37	3.66	Grass
3	2.03	20.51	3	3	0	1.26	4.29	Grass
3	3.70	20.51	3	3	0	1.13	5.39	3 in. Rock
3	1.25	20.51	3	3	0	1.38	3.58	Grass
3	2.08	23.88	3	3	0	1.33	4.5	Grass
3	1.56	29.97	3	3	0	1.53	4.28	Grass
4	1.51	3.20	3	3	0	0.66	2.42	Grass
5	1.00	1.71	3	3	0	0.57	1.77	Grass
6	9.09	10.83	3	3	0	0.75	6.43	3 in. Rock
6	4.76	10.83	3	3	0	0.85	5.03	3 in. Rock
6	1.00	10.83	3	3	0	1.13	2.81	Grass
7	9.00	24.30	3	3	0	1.02	7.85	6 in. Rock
7	9.00	24.30	3	3	0	1.02	7.85	6 in. Rock
7	1.00	31.61	3	3	0	1.69	3.67	Grass
7	7.69	31.61	3	3	0	1.15	7.9	6 in. Rock
7	6.25	37.34	3	3	0	1.28	7.6	6 in. Rock
7	2.27	37.34	3	3	0	1.55	5.21	3 in. Rock
7	6.66	37.34	3	3	0	1.26	7.78	6 in. Rock
7	1.72	103.66	3	3	6	1.62	5.88	3 in. Rock
7	1.00	103.66	3	3	6	1.86	4.83	Grass

Austin Community Landfill
East Landfill Ditch Schedule

Ditch	Channel Slope (Ft./Ft.)	Q25 (Design) (Cfs)	Side Slope H:V	Side Slope H:V	Bottom Width (Ft.)	Depth of Flow (Ft.)	Velocity (Fps)	Erosion Control Required
8	0.86	3.20	3	3	0	0.74	[illegible]	Grass
9	3.70	3.54	3	3	0	[illegible]	3.48	Grass
9	0.90	3.54	3	3	0	[illegible]	2.04	Grass
9	0.90	[illegible]	3	3	[illegible]	1.11	[illegible]	Grass
9	0.90	58.69	[illegible]	3	[illegible]	[illegible]	4.12	Grass
9	1.56	58.69	3	3	0	1.96	5.07	3 in. Rock
9	1.33	58.69	3	[illegible]	0	2.02	4.77	Grass
10	3.20	7.25	3	3	0	0.78	3.93	Grass
10	5.90	7.25	[illegible]	3	[illegible]	0.7	4.95	Grass
11	3.12	7.68	3	3	0	0.81	3.94	Grass
11	1.00	[illegible]	3	3	0	[illegible]	3.01	Grass
12	0.90	[illegible]	3	3	0	0.73	1.99	Grass
12	4.00	3.20	3	3	0	0.55	[illegible]	Grass
12	[illegible]	3.20	3	3	0	0.46	5.11	3 in. Rock
12	8.33	3.20	3	3	0	0.48	4.6	Grass
12	1.51	8.10	3	3	0	0.94	3.06	Grass

Replaced
dated
See New Calcs
9/25/03

Note:

For Erosion Control, if Velocity < 5 fps, use Grass
if Velocity > 5 fps but < 6.5 fps, then use 3" rock
if Velocity > 6.5 fps, use 6" rock

Ditch 8

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	6.78
Channel Bottom Slope (ft/ft)	0.0086
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.96	
Flow Velocity (fps)	2.36	∠ 5 fps ✓
Froude Number	0.596	
Velocity Head (ft)	0.09	Grass
Energy Head (ft)	1.05	
Cross-Sectional Area of Flow (sq ft)	2.87	
Top Width of Flow (ft)	5.87	

Sheet 6 of 3[illegible]

Ditch 9A

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	4.56
Channel Bottom Slope (ft/ft)	0.04
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.62	
Flow Velocity (fps)	3.79	< 5 ✓
Froude Number	1.188	Grass
Velocity Head (ft)	0.22	
Energy Head (ft)	0.84	
Cross-Sectional Area of Flow (sq ft)	1.2	
Top Width of Flow (ft)	3.8	

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Sheet 7 of 31

Ditch 9B

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	14.5
Channel Bottom Slope (ft/ft)	0.04
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.96	
Flow Velocity (fps)	5.09	> 5
Froude Number	1.285	Use 3" Stone
Velocity Head (ft)	0.4	
Energy Head (ft)	1.36	
Cross-Sectional Area of Flow (sq ft)	2.85	
Top Width of Flow (ft)	5.85	

Sheet 8 of 31

Ditch 9C

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	28.53
Channel Bottom Slope (ft/ft)	0.0127
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	1.54	
Flow Velocity (fps)	3.91	< 5 ✓
Froude Number	0.78	
Velocity Head (ft)	0.24	grass
Energy Head (ft)	1.78	
Cross-Sectional Area of Flow (sq ft)	7.3	
Top Width of Flow (ft)	9.36	

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Ditch 9D

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	28.53
Channel Bottom Slope (ft/ft)	0.009
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	1.65	
Flow Velocity (fps)	3.44	<5 ✓
Froude Number	0.665	
Velocity Head (ft)	0.18	Grass
Energy Head (ft)	1.83	
Cross-Sectional Area of Flow (sq ft)	8.29	
Top Width of Flow (ft)	9.97	

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Sheet 10 of 31

Ditch 9E

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	39.08
Channel Bottom Slope (ft/ft)	0.009
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	1.85	
Flow Velocity (fps)	3.72	< 5 ✓
Froude Number	0.679	
Velocity Head (ft)	0.22	grass
Energy Head (ft)	2.07	
Cross-Sectional Area of Flow (sq ft)	10.5	
Top Width of Flow (ft)	11.22	

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Ditch 9 F

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	53.35
Channel Bottom Slope (ft/ft)	0.0156
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	1.88	
Flow Velocity (fps)	4.95	< 5 ✓
Froude Number	0.896	
Velocity Head (ft)	0.38	grass
Energy Head (ft)	2.26	
Cross-Sectional Area of Flow (sq ft)	10.78	
Top Width of Flow (ft)	11.38	

Sheet 12 of 31

Ditch 9G

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	53.35
Channel Bottom Slope (ft/ft)	0.0133
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	1.94
Flow Velocity (fps)	4.66 <5 ✓
Froude Number	0.831
Velocity Head (ft)	0.34 grass
Energy Head (ft)	2.27
Cross-Sectional Area of Flow (sq ft)	11.45
Top Width of Flow (ft)	11.72

Sheet 13 of 31

Ditch 10A

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	3.75
Channel Bottom Slope (ft/ft)	0.032
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.6	
Flow Velocity (fps)	3.32	<5 ✓
Froude Number	1.057	
Velocity Head (ft)	0.17	Grass
Energy Head (ft)	0.77	
Cross-Sectional Area of Flow (sq ft)	1.13	
Top Width of Flow (ft)	3.68	

Sheet 14 of 31

Ditch 10 B

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	3.75
Channel Bottom Slope (ft/ft)	0.059
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.53	
Flow Velocity (fps)	4.17	< 5 ✓
Froude Number	1.407	
Velocity Head (ft)	0.27	grass
Energy Head (ft)	0.8	
Cross-Sectional Area of Flow (sq ft)	0.9	
Top Width of Flow (ft)	3.28	

Sheet 15 of 31

Ditch 10C

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	11.17
Channel Bottom Slope (ft/ft)	0.059
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.81	
Flow Velocity (fps)	5.5	> 5
Froude Number	1.511	
Velocity Head (ft)	0.47	3" stone
Energy Head (ft)	1.28	
Cross-Sectional Area of Flow (sq ft)	2.03	
Top Width of Flow (ft)	4.94	

Ditch 11A

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	8.7
Channel Bottom Slope (ft/ft)	0.0312
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.83
Flow Velocity (fps)	4.07 < 5 ✓
Froude Number	1.104
Velocity Head (ft)	0.26 grass
Energy Head (ft)	1.08
Cross-Sectional Area of Flow (sq ft)	2.14
Top Width of Flow (ft)	5.07

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Ditch 11 B

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	8.7
Channel Bottom Slope (ft/ft)	0.005
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	1.17	
Flow Velocity (fps)	2.05	< 5 ✓
Froude Number	0.47	
Velocity Head (ft)	0.07	grass
Energy Head (ft)	1.24	
Cross-Sectional Area of Flow (sq ft)	4.24	
Top Width of Flow (ft)	7.13	

Sheet 18 of 31

Ditch 12A

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	7.42
Channel Bottom Slope (ft/ft)	0.009
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.99
Flow Velocity (fps)	2.45 <5 ✓
Froude Number	0.61
Velocity Head (ft)	0.09 grass
Energy Head (ft)	1.08
Cross-Sectional Area of Flow (sq ft)	3.02
Top Width of Flow (ft)	6.03

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ED 0010704

Ditch 12 B

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	7.42
Channel Bottom Slope (ft/ft)	0.04
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.74	
Flow Velocity (fps)	4.29	< 5 ✓
Froude Number	1.227	grass
Velocity Head (ft)	0.29	
Energy Head (ft)	1.03	
Cross-Sectional Area of Flow (sq ft)	1.73	
Top Width of Flow (ft)	4.56	

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Ditch 12C

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	7.42
Channel Bottom Slope (ft/ft)	0.11
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.61	
Flow Velocity (fps)	6.26	< 6
Froude Number	1.968	
Velocity Head (ft)	0.61	6" Stone
Energy Head (ft)	1.22	
Cross-Sectional Area of Flow (sq ft)	1.19	
Top Width of Flow (ft)	3.77	

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Ditch 12D

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	7.42
Channel Bottom Slope (ft/ft)	0.0833
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.65	
Flow Velocity (fps)	5.64	> 5
Froude Number	1.728	
Velocity Head (ft)	0.49	3" stone
Energy Head (ft)	1.14	
Cross-Sectional Area of Flow (sq ft)	1.32	
Top Width of Flow (ft)	3.97	

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Sheet 22 of 31

Ditch 12E

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	7.42
Channel Bottom Slope (ft/ft)	0.0151
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.89	
Flow Velocity (fps)	2.98	< 5 ✓
Froude Number	0.778	
Velocity Head (ft)	0.14	grass
Energy Head (ft)	1.03	
Cross-Sectional Area of Flow (sq ft)	2.49	
Top Width of Flow (ft)	5.47	

Sheet 23 of 31

Ditch 12E

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	0.64
Channel Bottom Slope (ft/ft)	0.0208
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.33	
Flow Velocity (fps)	1.81	< 5 ✓
Froude Number	0.773	
Velocity Head (ft)	0.05	grass
Energy Head (ft)	0.38	
Cross-Sectional Area of Flow (sq ft)	0.35	
Top Width of Flow (ft)	2.06	

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Ditch 12AA

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 25, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	0.98
Channel Bottom Slope (ft/ft)	0.0208
Manning's Roughness Coefficient (n-value)	0.035
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	0.1

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	0.39	
Flow Velocity (fps)	2.02	<5 ✓
Froude Number	0.793	
Velocity Head (ft)	0.06	grass
Energy Head (ft)	0.45	
Cross-Sectional Area of Flow (sq ft)	0.49	
Top Width of Flow (ft)	2.42	

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Sheet 25 of 31

RJR

JOB NAME Austin Comm. L/F
JOB NO. 10210.003
CALCULATED BY JRoy DATE 11/26/02
CHECKED BY ________ DATE ________
SHEET 1 OF 1

Purpose: Calculate depth of flow over weir on the central channel northern pond structure.

Given: Q_{100} = 585.38 cfs (Developed Surface Water Plan Attachment 8, Sheet 9 of 10, MSW-249A) CH2

L = 84 feet

Equation:

$$H = \left(\frac{Q}{\frac{2}{3}(C_1) b \sqrt{2g}} \right)^{2/3}$$

where: C_1 = 0.54 for a broad crested weir (range 0.50 to 0.57)

g = 32.2 fps²

Solve:

$$H = \frac{585.38 \text{ cfs}}{\frac{2}{3}(0.54)\ 84 \text{ ft} \sqrt{2(32.2 \text{ fps}^2)}} = 2.41'$$

∴ The 100 year storm of 585.38 cfs will overflow the weir @ a depth of 2.41 ft. The weir will be designed to provide erosion protection to a minimum depth of 3.0 ft.

The elevation of the spillway	=	604.00
Depth of 100-Year Flow over spillway	=	2.41
Elevation of 100-Year Event	=	606.41

Sheet 26 of 31
ED 0010711

CH 2 - Alternate Channel Configuration

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

November 20, 2002

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	585.43 - See Note 1
Channel Bottom Slope (ft/ft)	0.007
Manning's Roughness Coefficient (n-value)	0.035 - See Note 2
Channel Left Side Slope (horizontal/vertical)	3.0
Channel Right Side Slope (horizontal/vertical)	3.0
Channel Bottom Width (ft)	40.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	2.26
Flow Velocity (fps)	5.54 < 6.0 fps ✓
Froude Number	0.695
Velocity Head (ft)	0.48
Energy Head (ft)	2.74
Cross-Sectional Area of Flow (sq ft)	105.73
Top Width of Flow (ft)	53.56

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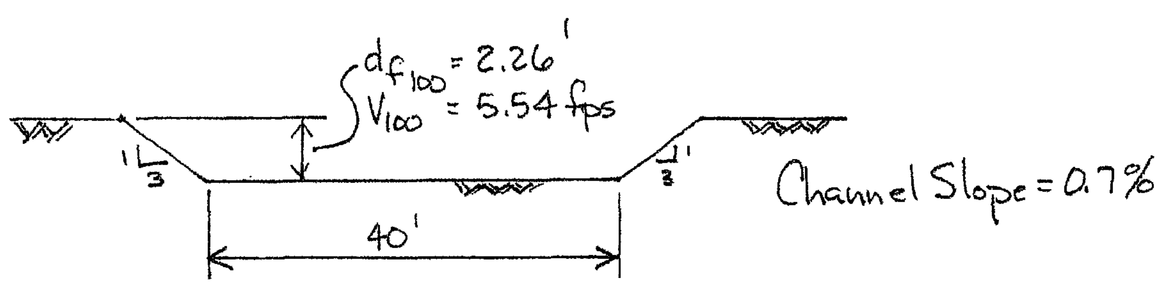
Notes:

1. Q_{100} Year from Developed Surface Water Plan Attachment 8, Sheet 9 of 10, MSW-249A, for CH2.
2. Mannings "N" Value for a grass lined channel.



CH2 Alternate Channel Section

RJR

JOB NAME	Austin Community L/F
JOB NO.	10210.003
CALCULATED BY	JRoy
DATE	9/26/03
CHECKED BY	
DATE	
SHEET	1
OF	1

Purpose: Calculate depth of flow over weir on the Central Channel Southern Pond Structure.

Given: Q_{100} = 977.48 cfs (Developed Surface Water Plan Attachment 8, Sheet 9 of 10, MSW-249A) CH 1

L = 158 feet

For Permit Purposes Only

STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER

JR Murray 9/26/03

Equation:

$$Q = \frac{2}{3}(C_1) b \sqrt{2g}\,(H)^{3/2}$$

$$H^{3/2} = \frac{Q}{\frac{2}{3}(C_1) b \sqrt{2g}}$$

$$H = \left(\frac{Q}{\frac{2}{3}(C_1) b \sqrt{2g}}\right)^{2/3}$$

Where: C_1 = 0.5 for a broad crested weir (range 0.50 to 0.57)

g = 32.2 fps

Solve:

$$H = \left(\frac{977.48 \text{ cfs}}{\frac{2}{3}(0.5)158 \text{ ft} \sqrt{2(32.2 \text{ fps})}}\right)^{2/3} = 1.75 \text{ ft}$$

∴ The 100 year storm of 977.48 cfs will overflow the weir @ a depth of 1.75 feet. The weir will be designed to provide erosion protection to a minimum depth of 2.0 feet

The elevation of the spillway	= 582.40 feet m.s.l.
Depth of 100-Year flow over spillway	= 1.75 feet
Elevation of 100-Year Event	= 584.15 feet m.s.l.

Sheet 28 of 31

ED 0010713

Rundown Channel EA

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	78.84
Channel Bottom Slope (ft/ft)	0.286
Manning's Roughness Coefficient (n-value)	0.045
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	9.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.64
Flow Velocity (fps)	11.95
Froude Number	2.791
Velocity Head (ft)	2.22
Energy Head (ft)	2.86
Cross-Sectional Area of Flow (sq ft)	6.6
Top Width of Flow (ft)	11.57

Sheet 29 of 31

Rundown Channel EB

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	29.17
Channel Bottom Slope (ft/ft)	0.33
Manning's Roughness Coefficient (n-value)	0.045
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	9.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.34
Flow Velocity (fps)	8.79
Froude Number	2.739
Velocity Head (ft)	1.2
Energy Head (ft)	1.54
Cross-Sectional Area of Flow (sq ft)	3.32
Top Width of Flow (ft)	10.37

Rundown Channel EC

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Flow Rate (cfs)	73.47
Channel Bottom Slope (ft/ft)	0.25
Manning's Roughness Coefficient (n-value)	0.045
Channel Left Side Slope (horizontal/vertical)	2.0
Channel Right Side Slope (horizontal/vertical)	2.0
Channel Bottom Width (ft)	9.0

COMPUTATION RESULTS

DESCRIPTION	VALUE
Normal Depth (ft)	0.64
Flow Velocity (fps)	11.16
Froude Number	2.609
Velocity Head (ft)	1.94
Energy Head (ft)	2.58
Cross-Sectional Area of Flow (sq ft)	6.58
Top Width of Flow (ft)	11.56

Sheet 31 of 31

CULVERT DESIGN

CULVERT DESIGN

AUSTIN COMMUNITY LANDFILL

CORRUGATED METAL PIPE CULVERT 1

```
NUMBER OF BARRELS = 2
DIAMETER =     3.00 FT
LENGTH OF CULVERT =     50.00 FT
ROUGHNESS COEFFICIENT = 0.024
PROPOSED CULVERT SLOPE = 0.0300 FT/FT
TAILWATER DEPTH =    3.00 FT
ENTRANCE LOSS COEFFICIENT = 0.50
TOTAL DISCHARGE =     106.20 C.F.S.
DISCHARGE PER BARREL =      53.10 C.F.S.

CULVERT HAS TYPE III B CONDITIONS.
OUTLET VELOCITY IS BASED ON FULL FLOW AT THE OUTLET.
THE ENTRANCE IS SUBMERGED.

HEADWATER DEPTH =    4.47 FT
OUTLET VELOCITY =    7.51 FT/S

CRITICAL SLOPE =  0.0232 FT/FT
CRITICAL DEPTH =    2.37 FT
CRITICAL VELOCITY =    8.87 FT/SEC
```

Calculation Software by Josef Valenta, San Antonio, Texas. Based on Section 4 of TxDOT Hydraulic Manual

STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER

9/26/03
Sheets 1 to 15 of 15

Sheet 1 of 15

WM-019614

CORRUGATED METAL PIPE CULVERT 2

NUMBER OF BARRELS = 2
D ETER = 3.00 FT
 H OF CULVERT = 50.00 FT
 GHNESS COEFFICIENT = 0.024
PROPOSED CULVERT SLOPE = 0.0300 FT/FT
TAILWATER DEPTH = 3.00 FT
ENTRANCE LOSS COEFFICIENT = 0.50
TOTAL DISCHARGE = 69.40 C.F.S.
DISCHARGE PER BARREL = 34.70 C.F.S.

THE CULVERT HAS TYPE III B CONDITIONS.
OUTLET VELOCITY IS BASED ON FULL FLOW AT THE OUTLET.
THE ENTRANCE IS UNSUBMERGED.

HEADWATER DEPTH = 3.09 FT
OUTLET VELOCITY = 4.91 FT/S

CRITICAL SLOPE = 0.0170 FT/FT
CRITICAL DEPTH = 1.91 FT
CRITICAL VELOCITY = 7.29 FT/SEC

~~CORRUGATED METAL PIPE CULVERT 3/4~~

NUMBER OF BARRELS = 1
DIAMETER = 3.00 FT
LENGTH OF CULVERT = 50.00 FT
 GHNESS COEFFICIENT = 0.024
 OSED CULVERT SLOPE = 0.0200 FT/FT
 ILWATER DEPTH = 3.00 FT
ENTRANCE LOSS COEFFICIENT = 0.5
TOTAL DISCHARGE = 33.2 C.F.S.
DISCHARGE PER BARREL = 3 .20 C.F.S.

THE CULVERT HAS TYPE III B CONDITIONS.
OUTLET VELOCITY IS BASED ON FULL FLOW AT THE OUTLET.
THE ENTRANCE IS UNSUBMERGED.

HEADWATER DEPTH = .01 FT
OUTLET VELOCITY = 4.70 FT/S

CRITICAL SLOPE = 0.0167 FT/FT
CRITICAL DEPTH = 1.87 FT
CRITICAL VELOCITY = 7.16 FT/SEC

Replaced See Calcs dated 12/5/02

Sheet 2 of 15

WM-019615

Culvert 3-4

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2002

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	67.0
Invert Elevation at Downstream end of Culvert (ft)	587.22
Invert Elevation at Upstream end of Culvert (ft)	594.0
Culvert Slope (ft/ft)	0.1012
Starting Flow Rate (cfs)	33.2
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	33.2
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
33.2	0.0	2.69	0.0	1.1	1.87	1.1	14.07

For tailwater depth see next sheet.

Headwater Elev. = 594.0 + 2.69 = 596.69

Inlet Elev. = = 600.00

∴ A single 36" C.M.P. is adequate to convey the 25 year flowrate with a headwater that is 3.31' below the inlet elevation.

Tailwater Calculation
Culvert 3-4

TRAPEZOIDAL CHANNEL ANALYSIS
NORMAL DEPTH COMPUTATION

December 5, 2002

PROGRAM INPUT DATA

DESCRIPTION	VALUE	
Flow Rate (cfs)	585.43	← See Note 1
Channel Bottom Slope (ft/ft)	0.003	
Manning's Roughness Coefficient (n-value)	0.013	← Concrete
Channel Left Side Slope (horizontal/vertical)	3.0	
Channel Right Side Slope (horizontal/vertical)	3.0	
Channel Bottom Width (ft)	19.0	

COMPUTATION RESULTS

DESCRIPTION	VALUE	
Normal Depth (ft)	2.39	←
Flow Velocity (fps)	9.37	
Froude Number	1.207	
Velocity Head (ft)	1.36	
Energy Head (ft)	3.75	
Cross-Sectional Area of Flow (sq ft)	62.47	
Top Width of Flow (ft)	33.33	

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The receiving channel elevation @ Culvert 3-4 = 582.97
Normal Depth in receiving channel @ Culvert 3-4: 2.39 (see above)
Water surface elevation in channel @ Culvert 3-4 = 585.36

Elevation of outlet of Culvert 3-4 = 587.22

The tailwater elevation (585.36) is below the outlet elevation (587.22).

Note:
1. $Q_{100 Year}$ from Developed Surface Water Plan, Attachment 8, Sheet 9 of 10, MSW-249A, for CHZ.

Sheet 4 of 15

WM-019617

CORRUGATED METAL PIPE CULVERT 5/6

NUMBER OF BARRELS = 2
DIAMETER = 3.00 FT
LENGTH OF CULVERT = 50.00 FT
ROUGHNESS COEFFICIENT = 0.024
PROPOSED CULVERT SLOPE = 0.0200 FT/FT
TAILWATER DEPTH = 3.00 FT
ENTRANCE LOSS COEFFICIENT = 0.50
TOTAL DISCHARGE = 95.50 C.F.S.
DISCHARGE PER BARREL = 47.75 C.F.S.

THE CULVERT HAS TYPE IV B CONDITIONS. THE FLOW IS CONTROLED BY OUTLET.
OUTLET VELOCITY IS BASED ON TAILWATER AT THE OUTLET.
THE ENTRANCE IS SUBMERGED.

HEADWATER DEPTH = 3.94 FT
OUTLET VELOCITY = [illegible] FT/S

CRITICAL SLOPE = 0.0210 FT/FT
CRITICAL DEPTH = 2.25 FT
CRITICAL VELOCITY = 8.40 FT/SEC

See Calculations
12/5/02

Replaced
dated

CORRUGATED METAL PIPE CULVERT 7

NUMBER OF BARRELS = 2
DIAMETER = 3.00 FT
LENGTH OF CULVERT = 50.00 FT
ROUGHNESS COEFFICIENT = 0.024
PROPOSED CULVERT SLOPE = 0.0200 FT/FT
TAILWATER DEPTH = 3.00 FT
ENTRANCE LOSS COEFFICIENT = 0.50
TOTAL DISCHARGE = 103.70 C.F.S.
DISCHARGE PER BARREL = 51.85 C.F.S.

THE CULVERT HAS TYPE IV B CONDITIONS. THE FLOW IS CONTROLED BY OUTLET.
OUTLET VELOCITY IS BASED ON TAILWATER AT THE OUTLET.
THE ENTRANCE IS SUBMERGED.

HEADWATER DEPTH = 4.28 FT
OUTLET VELOCITY = 7.34 FT/S

CRITICAL SLOPE = 0.0227 FT/FT
CRITICAL DEPTH = 2.34 FT
CRITICAL VELOCITY = 8.76 FT/SEC

Culvert 5-6

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

December 5, 2002

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	589.0
Invert Elevation at Upstream end of Culvert (ft)	590.0
Culvert Slope (ft/ft)	0.02
Starting Flow Rate (cfs)	47.75
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	47.75
Starting Tailwater Depth (ft)	0.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	0.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
47.75	0.0	3.81	3.87 ✓	2.3	2.25	2.25	8.39

Q_{25} = 95.5 cfs (See Surface Water Management System Details Attachment 8.3)

with 2 - 36" C.M.P.

Q_{25}/pipe = 47.75 cfs.

100-Yr from CH1, Attachment 8

Water Surface @ Outfall = 581.0 + 2.71 = 583.78 Pipe Outfall = 589.0 ∴ Tailwater = 0'

Headwater Elev = 590.00 + 3.87' = 593.87

Inlet Elev. = = 597.00

∴ Two 36" C.M.P. are adequate to convey the 25 year flowrate with a headwater that is 3.13' below the inlet elevation.

Sheet 6 of 15

WM-019619

Culvert 6

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 30, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	66.0
Invert Elevation at Downstream end of Culvert (ft)	583.39
Invert Elevation at Upstream end of Culvert (ft)	584.0
Culvert Slope (ft/ft)	0.0092
Starting Flow Rate (cfs)	10.83 ← Design Q_{25} from Perimeter Ditch Six
Incremental Flow Rate (cfs)	1.0
Ending Flow Rate (cfs)	10.83
Starting Tailwater Depth (ft)	0.76
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	0.76

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
10.83	0.76	1.43	1.59	1.15	1.04	1.04	4.96

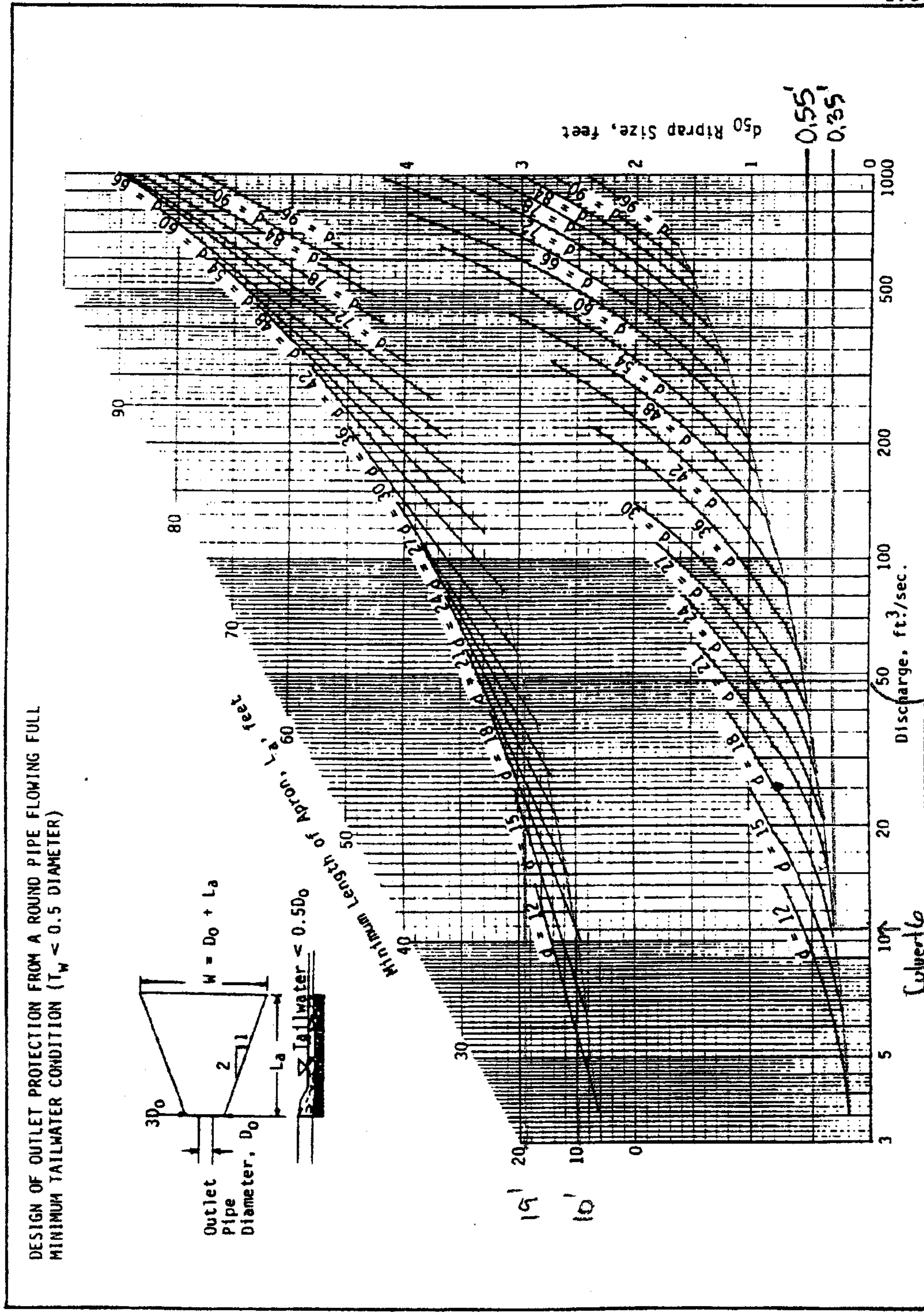
Tailwater Depth = 584.15 - 583.39 = 0.76'

↑ From South Pond Structure 100-Year

Headwater Elev. = 584.0 + 1.59 = 585.59

Inlet Elev. = = 590.00

∴ A single 36" C.M.P. is adequate to convey the 25 year flowrate with a headwater that is 4.41' below the inlet elevation.



Source: USDA-SCS

Plate 1.36c

Sheet 8 of 15

WM-019621

TJFA 506
PAGE 059

Culvert 8

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	60.0
Invert Elevation at Downstream end of Culvert (ft)	603.4
Invert Elevation at Upstream end of Culvert (ft)	604.0
Culvert Slope (ft/ft)	0.01
Starting Flow Rate (cfs)	6.8
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	6.8
Starting Tailwater Depth (ft)	2.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	2.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
6.8	2.0	1.31	1.69	1.06	0.92	2.0	2.16

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Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Sheet 9 of 15

WM-019622

Culvert 9

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	90.0
Invert Elevation at Downstream end of Culvert (ft)	606.7
Invert Elevation at Upstream end of Culvert (ft)	608.0
Culvert Slope (ft/ft)	0.0144
Starting Flow Rate (cfs)	38.3
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	38.3
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
38.3	3.0	3.12	3.4	2.19	2.01	3.0	5.42

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Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com

Q for 3 pipes = 114.8 cfs

∴ Q for 1 pipe = 38.3 cfs

Sheet 10 of 15

WM-019623

Culvert 10

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	625.5
Invert Elevation at Upstream end of Culvert (ft)	626.0
Culvert Slope (ft/ft)	0.01
Starting Flow Rate (cfs)	11.2
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	11.2
Starting Tailwater Depth (ft)	2.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	2.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
11.2	2.0	1.79	2.21	1.5	1.2	2.0	3.57

Sheet 11 of 15

WM-019624

Culvert 10A

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	80.0
Invert Elevation at Downstream end of Culvert (ft)	642.28
Invert Elevation at Upstream end of Culvert (ft)	647.0
Culvert Slope (ft/ft)	0.059
Starting Flow Rate (cfs)	3.8
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	3.8
Starting Tailwater Depth (ft)	2.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	2.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
3.8	2.0	0.89	-2.61	0.48	0.68	0.48	6.5

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Sheet 12 of 15

WM-019625

Culvert 11

PIPE CULVERT ANALYSIS

COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	3.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	621.5
Invert Elevation at Upstream end of Culvert (ft)	622.0
Culvert Slope (ft/ft)	0.01
Starting Flow Rate (cfs)	43.8
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	43.8
Starting Tailwater Depth (ft)	3.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	3.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
43.8	3.0	3.5	4.13	3.0	2.16	3.0	6.2

Q for 2 pipes = 87.6 cfs

∴ Q for 1 pipe = 43.8 cfs

Sheet 13 of 15

WM-019626

Culvert 12

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	601.5
Invert Elevation at Upstream end of Culvert (ft)	602.0
Culvert Slope (ft/ft)	0.01
Starting Flow Rate (cfs)	8.1
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	8.1
Starting Tailwater Depth (ft)	2.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	2.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
8.1	2.0	1.45	1.87	1.19	1.01	2.0	2.58

Culvert 12A

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

September 26, 2003

PROGRAM INPUT DATA

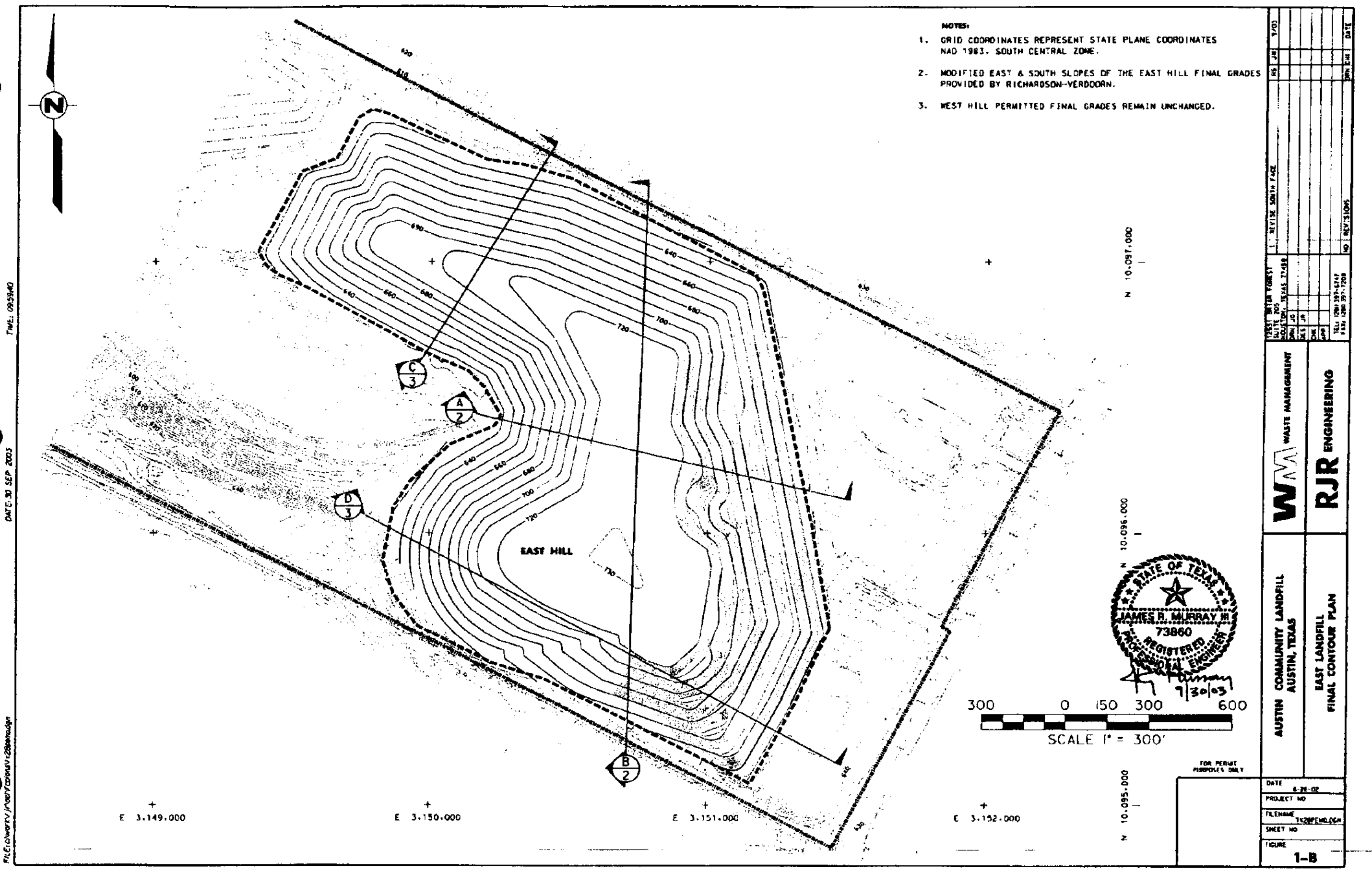
DESCRIPTION	VALUE
Culvert Diameter (ft)	2.0
FHWA Chart Number	2
FHWA Scale Number (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.024
Entrance Loss Coefficient of Culvert Opening	0.5
Culvert Length (ft)	50.0
Invert Elevation at Downstream end of Culvert (ft)	604.5
Invert Elevation at Upstream end of Culvert (ft)	605.0
Culvert Slope (ft/ft)	0.01
Starting Flow Rate (cfs)	15.1
Incremental Flow Rate (cfs)	0.0
Ending Flow Rate (cfs)	15.1
Starting Tailwater Depth (ft)	2.0
Incremental Tailwater Depth (ft)	1.0
Ending Tailwater Depth (ft)	2.0

COMPUTATION RESULTS

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
15.1	2.0	2.21	2.8	2.0	1.4	2.0	4.81

Sheet 15 of 15

WM-019628


NOTES:
1. GRID COORDINATES REPRESENT STATE PLANE COORDINATES NAD 1983, SOUTH CENTRAL ZONE.
2. MODIFIED EAST & SOUTH SLOPES OF THE EAST HILL FINAL GRADES PROVIDED BY RICHARDSON-VERDOORN.
3. WEST HILL PERMITTED FINAL GRADES REMAIN UNCHANGED.
EAST HILL
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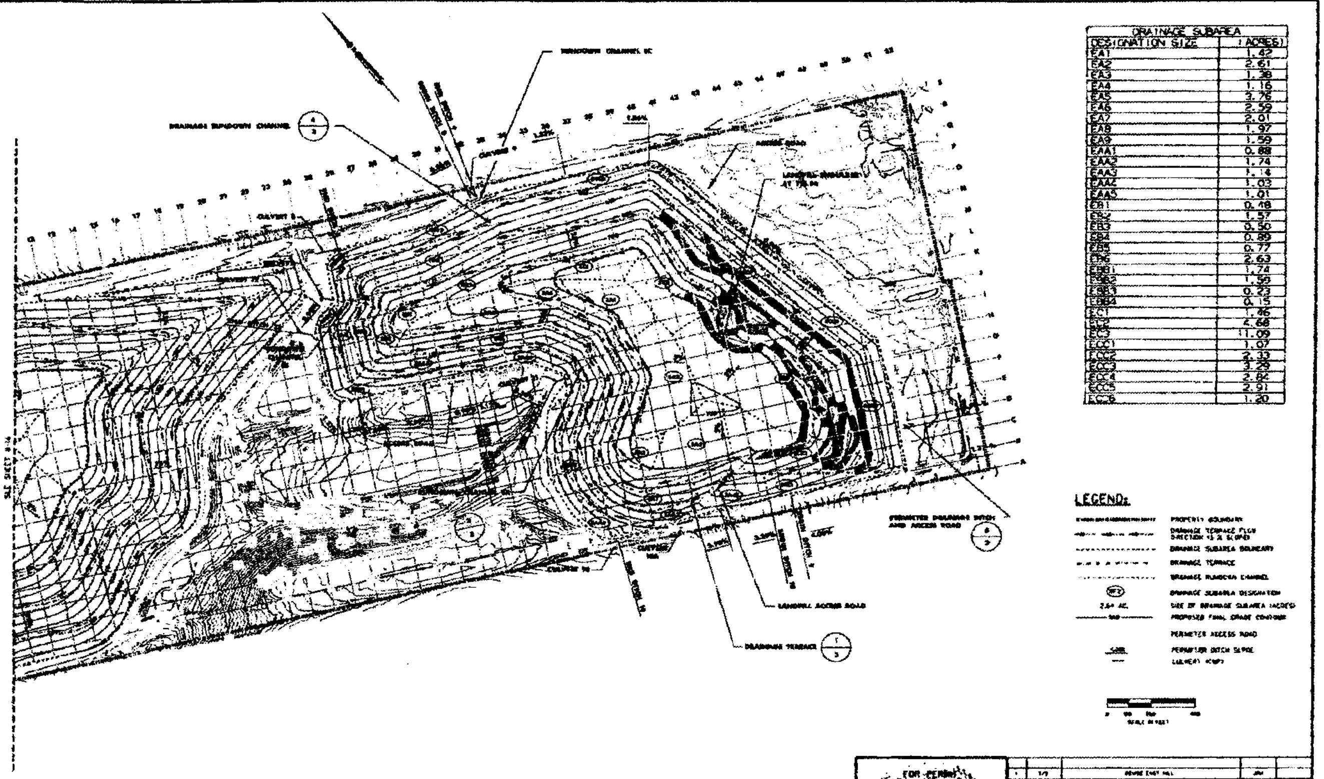
N 10,096,000
N 10,095,000
E 3,149,000
E 3,150,000
E 3,151,000
E 3,152,000
300 0 150 300 600
SCALE 1" = 300'
FOR PERMIT PURPOSES ONLY
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER
9/30/03
DATE: 30 SEP 2003
1 REVISE SOUTH FACE
NO REVISIONS
DATE
WASTE MANAGEMENT
RJR ENGINEERING
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
EAST LANDFILL
FINAL CONTOUR PLAN
DATE 6-26-02
PROJECT NO
FILENAME
SHEET NO
FIGURE 1-B



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DESIGNATION SIZE	(ACRES)
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EA2	2.61
EA3	1.38
EA4	1.16
EA5	3.76
EA6	2.59
EA7	2.01
EA8	1.97
EA9	1.59
EAA1	0.88
EAA2	1.74
EAA3	1.14
EAA4	1.03
EAA5	1.01
EB1	0.48
EB2	1.57
EB3	0.50
EB4	0.89
EB5	0.77
EB6	2.63
EBB1	1.74
EBB2	1.59
EBB3	0.23
EBB4	0.15
EC1	1.46
EC2	4.68
EC3	11.09
ECC1	1.07
ECC2	2.33
ECC3	3.29
ECC4	2.84
ECC5	2.91
ECC6	1.20

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JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER
9/30/03

RJR ENGINEERING

AUSTIN COMMUNITY RECYCLING AND DISPOSAL FACILITY
FINAL CONTOUR MODIFICATION
AUSTIN, TEXAS

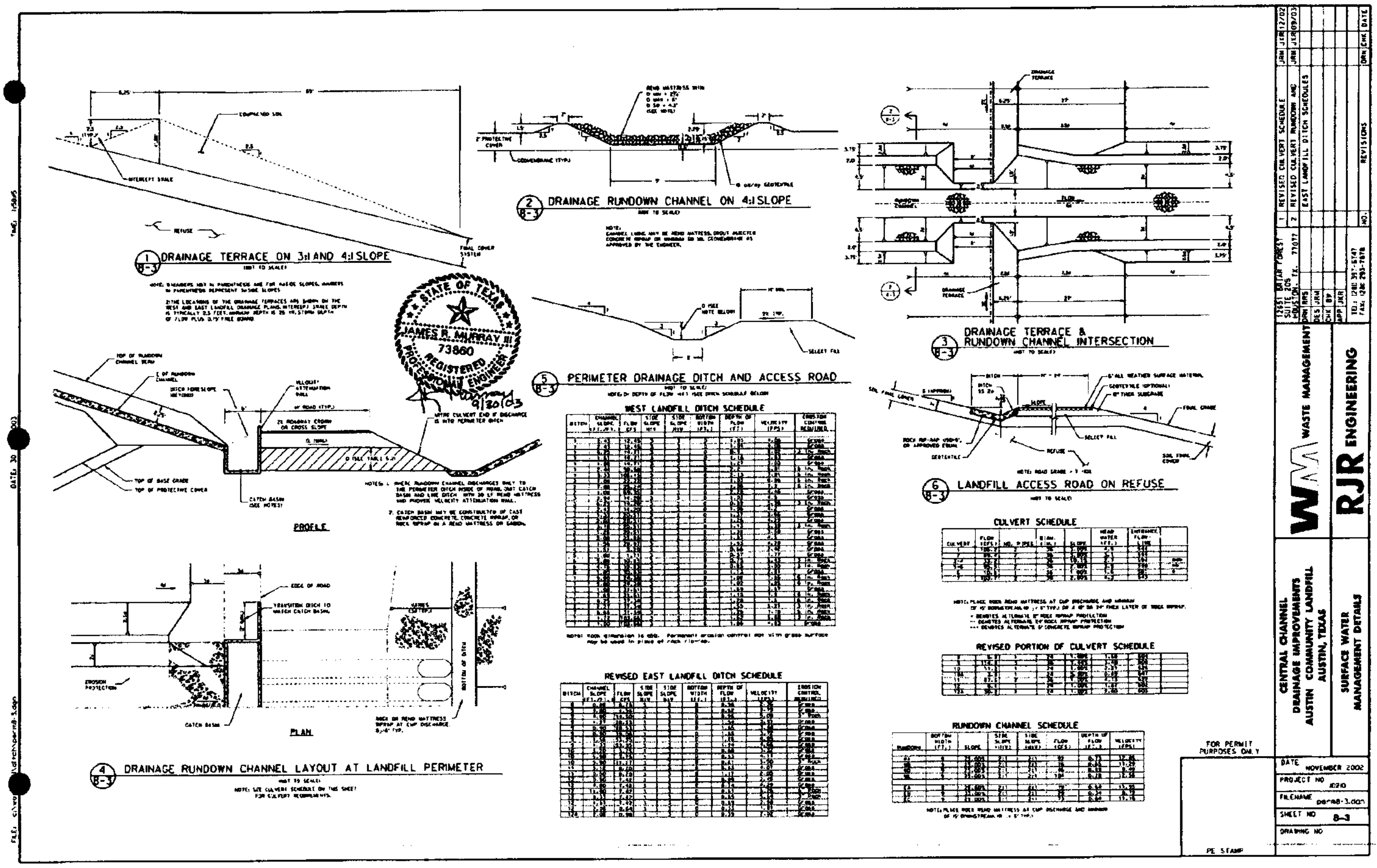
EAST LANDFILL
DRAINAGE PLAN

Waste Management of Texas, Inc.

8-IB

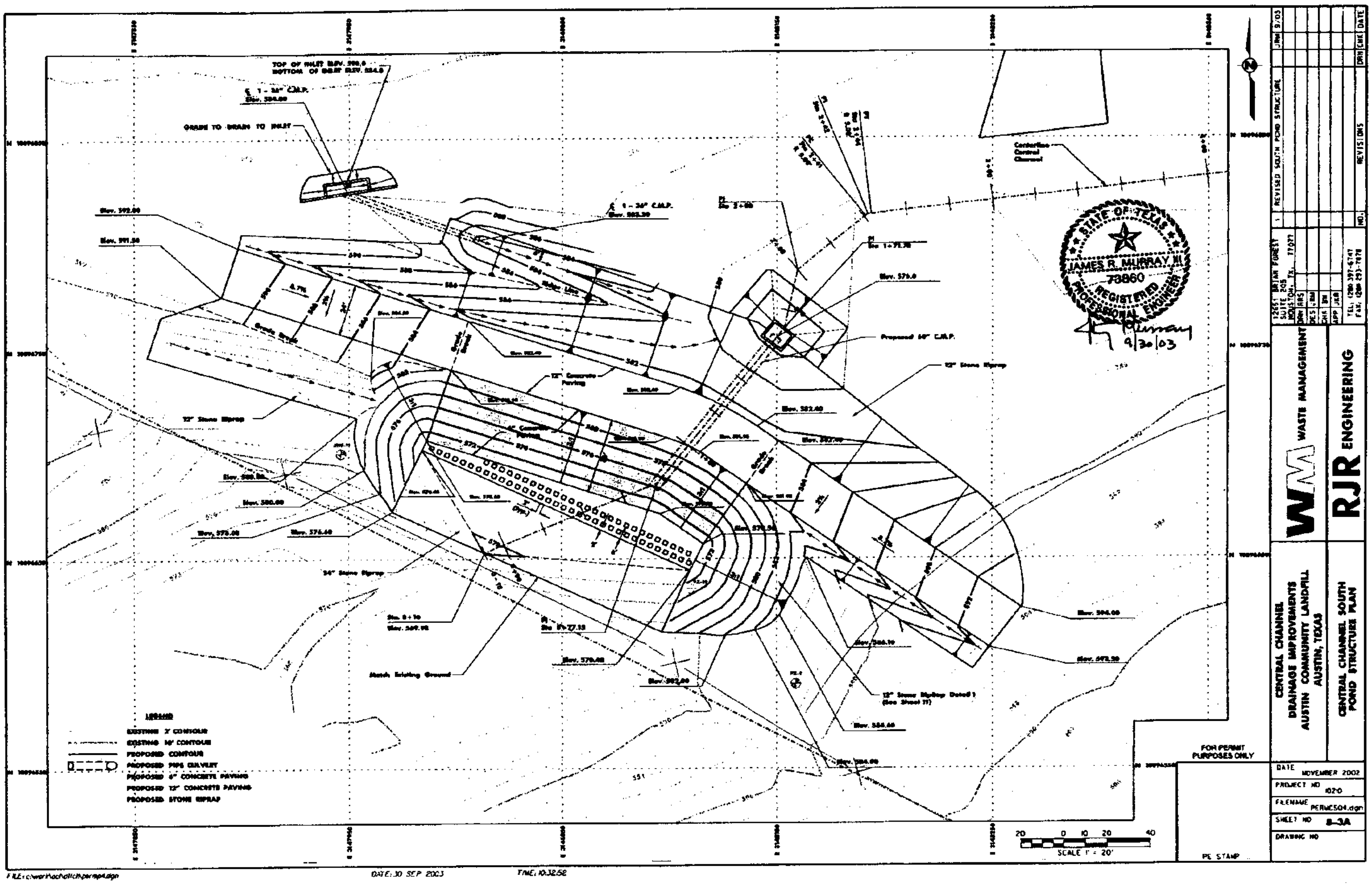
WM-019630

TJFA 506
PAGE 068

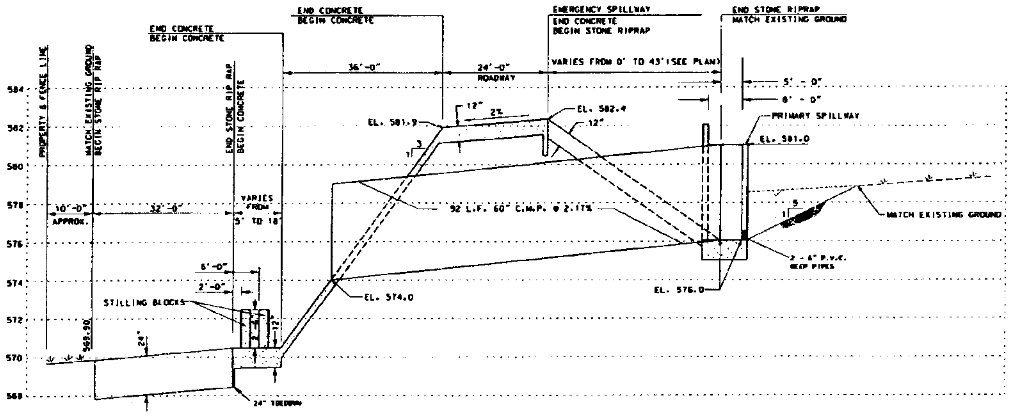


DRAINAGE TERRACE ON 3:1 AND 4:1 SLOPE
(NOT TO SCALE)
DRAINAGE RUNDOWN CHANNEL ON 4:1 SLOPE
DRAINAGE TERRACE & RUNDOWN CHANNEL INTERSECTION
PERIMETER DRAINAGE DITCH AND ACCESS ROAD
WEST LANDFILL DITCH SCHEDULE
LANDFILL ACCESS ROAD ON REFUSE
CULVERT SCHEDULE
REVISED PORTION OF CULVERT SCHEDULE
PROFILE
PLAN
DRAINAGE RUNDOWN CHANNEL LAYOUT AT LANDFILL PERIMETER
REVISED EAST LANDFILL DITCH SCHEDULE
RUNDOWN CHANNEL SCHEDULE
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER
FOR PERMIT PURPOSES ONLY
PE STAMP
REVISED CULVERT SCHEDULE
REVISED CULVERT RUNDOWN AND EAST LANDFILL DITCH SCHEDULES
REVISIONS
WASTE MANAGEMENT
RJR ENGINEERING
CENTRAL CHANNEL
DRAINAGE IMPROVEMENTS
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
SURFACE WATER MANAGEMENT DETAILS
DATE NOVEMBER 2002
SHEET NO 8-3

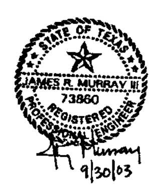
WM-019631


CENTRAL CHANNEL
DRAINAGE IMPROVEMENTS
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
CENTRAL CHANNEL SOUTH
POND STRUCTURE PLAN
WASTE MANAGEMENT
RJR ENGINEERING
REVISED SOUTH POND STRUCTURE
REVISIONS
DATE NOVEMBER 2002
PROJECT NO 1020
FILENAME PERMC504.dgn
SHEET NO 8-3A
DRAWING NO
FOR PERMIT PURPOSES ONLY
PE STAMP
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER
9/30/03
LEGEND
12" Stone Riprap
24" Stone Riprap
Match Existing Ground
Proposed 60" C.M.P.
SCALE 1" = 20'
DATE: 30 SEP 2003

WM-019632



CENTRAL CHANNEL SOUTH POND STRUCTURE PROFILE
(NOT TO SCALE)



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PE STAMP

NO.	REVISIONS	DRN	CHK	DATE
1	REVISE SOUTH POND PROFILE	RS	JRM	9/03

WASTE MANAGEMENT

RJR ENGINEERING

12651 BRIAR FOREST
SUITE 705
HOUSTON, TX. 77077
TEL: (281) 597-6747
FAX: (281) 293-7878

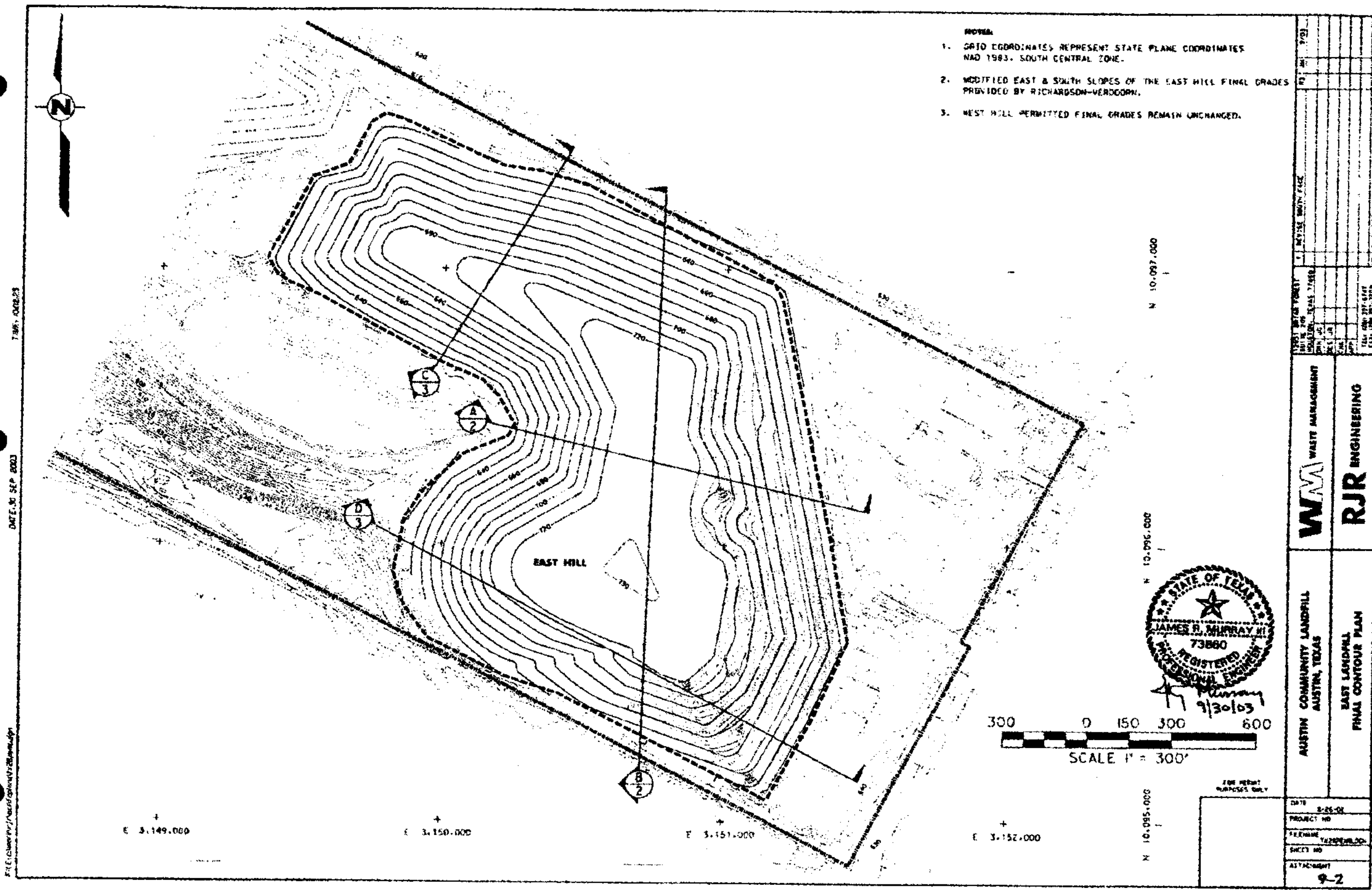
DRN JMC
DES JRM
CHK
APP

CENTRAL CHANNEL
DRAINAGE IMPROVEMENTS
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS

CENTRAL CHANNEL PROFILES

DATE NOVEMBER 2002
PROJECT NO 10210
FILENAME PERMCS05.dgn
SHEET NO 8-3B
DRAWING NO

WM-019633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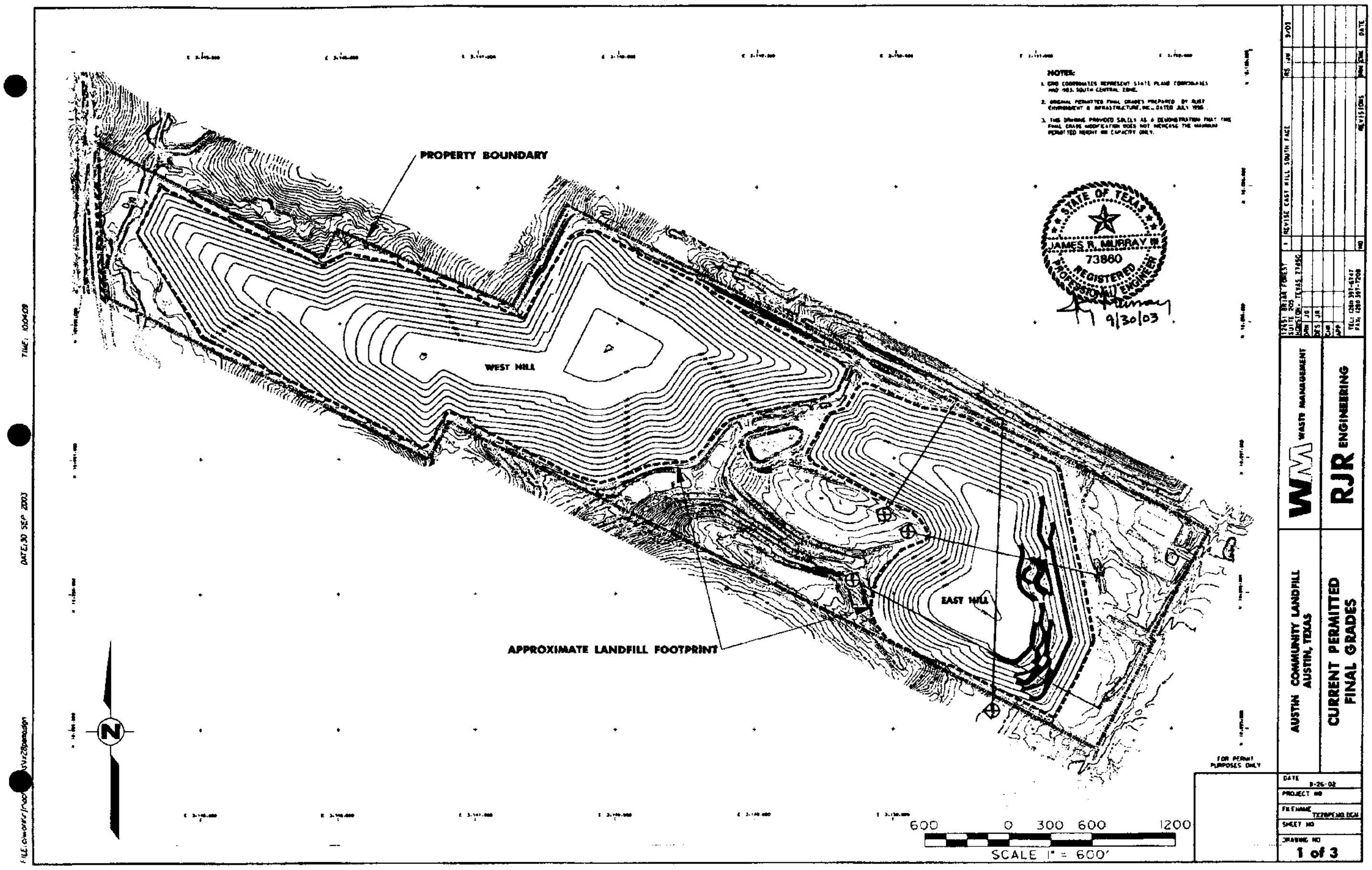
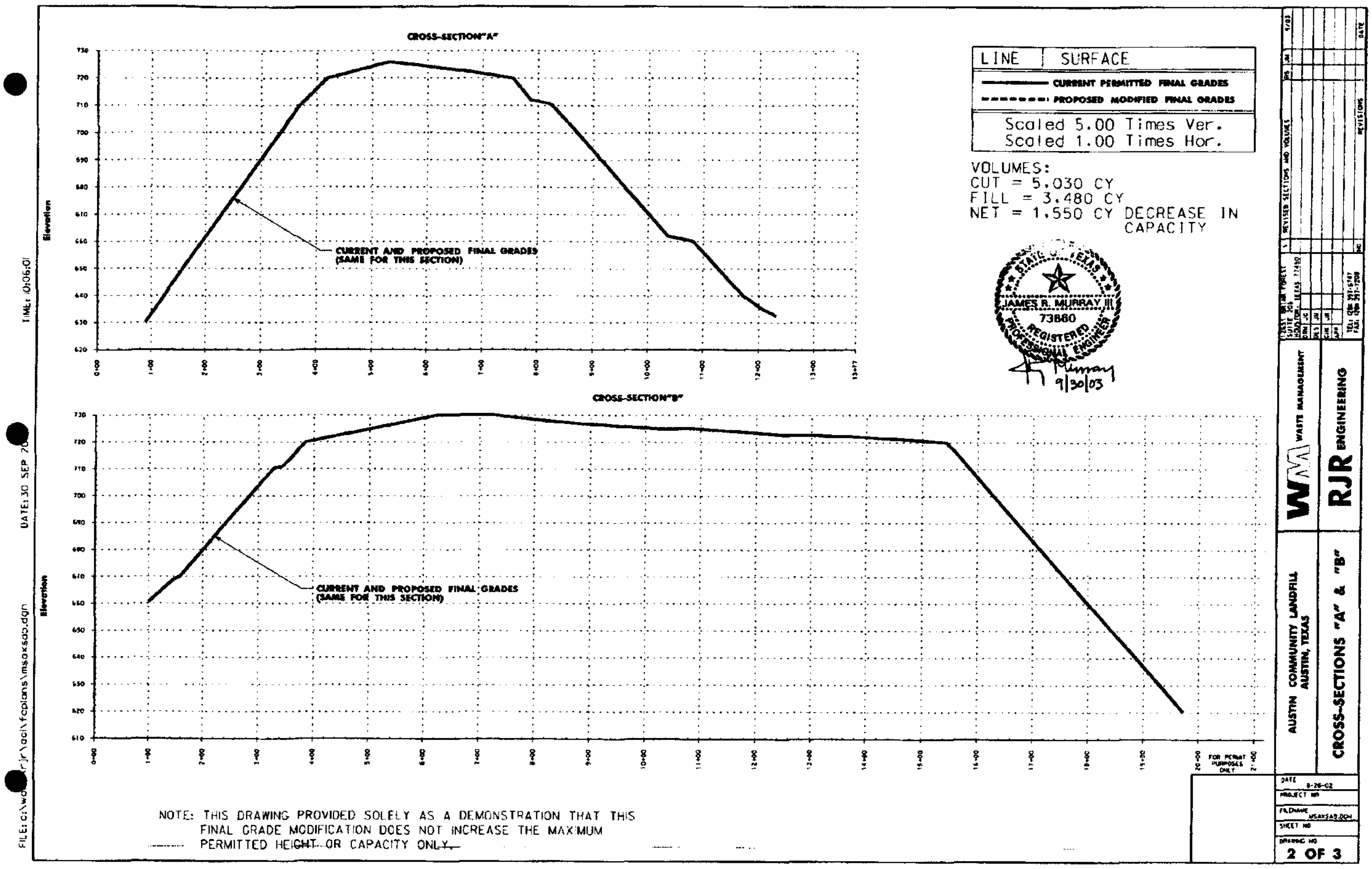
NOTES:
1. GRID COORDINATES REPRESENT STATE PLANE COORDINATES NAD 1983, SOUTH CENTRAL ZONE.
2. MODIFIED EAST & SOUTH SLOPES OF THE EAST HILL FINAL GRADES PROVIDED BY RICHARDSON-VERDOORN.
3. WEST HILL PERMITTED FINAL GRADES REMAIN UNCHANGED.
EAST HILL
C/3
A/2
D/3
B/2
N 10,097,000
N 10,096,000
N 10,095,000
E 3,149,000
E 3,150,000
E 3,151,000
E 3,152,000
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER
9/30/03
300 0 150 300 600
SCALE 1" = 300'
WM WASTE MANAGEMENT
RJR ENGINEERING
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
EAST LANDFILL
FINAL CONTOUR PLAN
DATE
PROJECT NO
SHEET NO
ATTACHMENT
9-2
DATE: 30 SEP 2003

WM-019634


PROPERTY BOUNDARY
WEST HILL
EAST HILL
APPROXIMATE LANDFILL FOOTPRINT
NOTES:
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED
PROFESSIONAL ENGINEER
9/30/03
N
600 0 300 600 1200
SCALE 1" = 600'
FOR PERMIT PURPOSES ONLY
REVISE EAST HILL SOUTH FACE
RS JJW 9/03
REVISIONS
DATE
WM WASTE MANAGEMENT
RJR ENGINEERING
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
CURRENT PERMITTED FINAL GRADES
DATE 8-26-02
PROJECT NO
FILENAME TX2BPEMO.DGN
SHEET NO
DRAWING NO
1 of 3

WM-019635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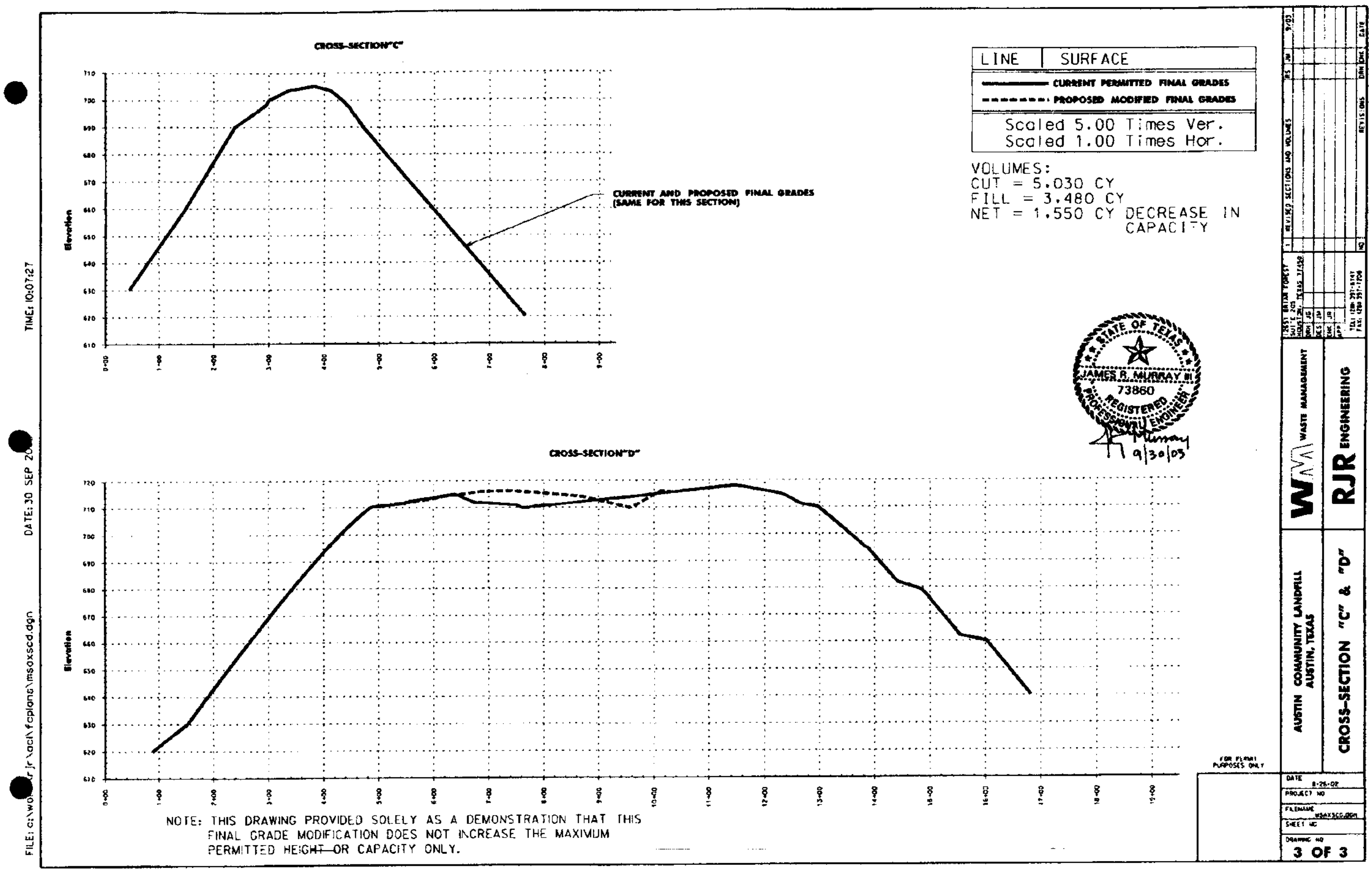
CROSS-SECTION "B"
Elevation
CURRENT AND PROPOSED FINAL GRADES (SAME FOR THIS SECTION)
CURRENT AND PROPOSED FINAL GRADES (SAME FOR THIS SECTION)
LINE | SURFACE
CURRENT PERMITTED FINAL GRADES
PROPOSED MODIFIED FINAL GRADES
Scaled 5.00 Times Ver.
Scaled 1.00 Times Hor.
VOLUMES:
CUT = 5,030 CY
FILL = 3,480 CY
NET = 1,550 CY DECREASE IN CAPACITY
JAMES R. MURRAY III
73880
REGISTERED
PROFESSIONAL ENGINEER
9/30/03
NOTE: THIS DRAWING PROVIDED SOLELY AS A DEMONSTRATION THAT THIS FINAL GRADE MODIFICATION DOES NOT INCREASE THE MAXIMUM PERMITTED HEIGHT OR CAPACITY ONLY.
WASTE MANAGEMENT
RJR ENGINEERING
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
CROSS-SECTIONS "A" & "B"
REVISIONS
2 OF 3


CROSS-SECTION"C"
Elevation
CURRENT AND PROPOSED FINAL GRADES (SAME FOR THIS SECTION)
CROSS-SECTION"D"
LINE SURFACE
CURRENT PERMITTED FINAL GRADES
PROPOSED MODIFIED FINAL GRADES
Scaled 5.00 Times Ver.
Scaled 1.00 Times Hor.
VOLUMES:
CUT = 5,030 CY
FILL = 3,480 CY
NET = 1,550 CY DECREASE IN CAPACITY
STATE OF TEXAS
JAMES R. MURRAY III
73860
REGISTERED PROFESSIONAL ENGINEER
9/30/03
NOTE: THIS DRAWING PROVIDED SOLELY AS A DEMONSTRATION THAT THIS FINAL GRADE MODIFICATION DOES NOT INCREASE THE MAXIMUM PERMITTED HEIGHT OR CAPACITY ONLY.
FOR PERMIT PURPOSES ONLY
TIME: 10:07:27
WASTE MANAGEMENT
RJR ENGINEERING
AUSTIN COMMUNITY LANDFILL
AUSTIN, TEXAS
CROSS-SECTION "C" & "D"
3 OF 3

WM-019637

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 9, 2003

Mr. James Smith
Landfill Manager
Waste Management Austin Community Landfill
9900 Giles Road
Austin, Texas 78754-9747

Re: Waste Management Austin Community Landfill – MSW Permit No. 249C
Permit Modification – Final Contours and Drainage (Site Development Plan Attachments 1, 8, and 9)
WWC Tracking System No. 10355601 (MSW Mail Log No. 04-3568)
RN100215938, CN600127856

Dear Mr. Smith:

We have reviewed your application for a Municipal Solid Waste (MSW) Permit Modification, dated October 20, 2003, and received by the MSW Permits Section on October 20, 2003, requesting authorization to modify final cover contours and drainage features at the referenced facility.

The information presented is technically sufficient for an MSW Permit Modification. Enclosed is a copy of the above referenced modification which is now part of your permit and should be attached thereto. The documentation prepared and submitted to support the modification request shall be considered as requirements of the permit.

If you have any questions regarding this matter, please contact Mr. Arten J. Avakian in the MSW Permits Section by telephone at (512) 239-4419, by e-mail at aavakian@tceq.state.tx.us, or in writing at the address on our letterhead (please specify Mail Code 124 on the first line of our address).

Sincerely,

Richard C. Carmichael, Ph.D., P.E., CIH
Manager, Municipal Solid Waste Permits Section
Waste Permits Division

RCC/aja

cc: Mr. Tim Champagne, P.E., Environmental Compliance Manager, Austin Community Landfill
Mr. Barry Kalda, Waste Section Manager – TCEQ Region 11, Austin

Enclosure

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MODIFICATION TO

MUNICIPAL SOLID WASTE PERMIT No. 249C

AUSTIN COMMUNITY LANDFILL

Municipal Solid Waste Permit No. 249C is hereby modified as follows:

Description of Change

Modifies final contours on the south side of the easternmost waste hill to change direction and location of an access way to the top of the hill, modifies drainage terraces and channels, modifies the Central Channel South Pond Structure and culverts, and adds culverts 10A and 12A. The modification request was presented in a letter from James Smith, Landfill Manager, Waste Management Austin Community Landfill, dated October 20, 2003, received by the MSW Permits Section on October 20, 2003.

Sections of Permit Modified

Site Development Plan, Attachment 8 (Drainage):

- Figure 8-1B, East Landfill Drainage Plan
- Figure 8-3, Surface Water Management Details
- Figure 8-3A, Central Channel South Pond Structure Plan
- Figure 8-3B, Central Channel Profiles

Site Development Plan, Attachment 9 (Final Contours):

- Figure 9-2, East Landfill Final Contour Plan
- Drawing 1, Current Permitted Final Grades
- Drawing 2, Cross-Sections "A" & "B"
- Drawing 3, Cross-Sections "C" & "D"

Site Development Plan, Attachment 12-C (Final Closure Plan):

- Figure 1-B, East Landfill Final Closure Plan

Site Development Plan, Appendix 2.3 (Post-Development Drainage Calculations):

- Title page and text
- Soil loss calculations
- Runoff and flow calculations
- Perimeter ditch design calculations
- Culvert design calculations

The modified pages bear the seal and signature of Mr. James R. Murray III, P.E., Texas Licensed Professional Engineer No. 73860, dated September 22, 2003, and September 26, 2003, September 30, 2003.

This modification is a part of Municipal Solid Waste Permit No. 249C and should be attached thereto.

APPROVED, ISSUED, AND EFFECTIVE in accordance with Title 30 Texas Administrative Code, Chapter 305, Section 305.70(j)(11).

ISSUED DATE:

DEC 0 9 2003

Margaret Hoffman

For the Commission