PLAN

LEGEND

3924	EXISTING TOPOGRAPHIC CONTOUR
	APPROXIMATE EXISTING LANDFILL CELL LIMITS
	EXISTING LANDFILL PERMIT BOUNDARY
	PROPOSED LANDFILL PERMIT BOUNDARY
3930	PROPOSED 5' PERMIT FINAL COVER GRADES
3924	PROPOSED 1' PERMIT FINAL COVER GRADES
	PROPOSED GRAVEL ROAD
—X—X—X—	PROPOSED CHAIN LINK FENCE

[redacted]

STATE OF TEXAS [redacted] LICENSED PROFESSIONAL ENGINEER

07/29/14

"Sealed for Permitting Purposes Only"

NOTES:

1. GAS MONITORING PROBES AND VENT WELLS RELOCATED TO ALLOW ACCESS TO GAS MONITORING UPON FINAL CLOSURE.
2. EXISTING GAS MONITORING PROBE TO BE EXTENDED AS REQUIRED BY PROPOSED FINAL COVER GRADES.
3. RELOCATION, REMOVAL, OR FILLING AROUND EXISTING UTILITY POLES AND WIRES FOR CLOSURE GRADES SHALL BE COORDINATED WITH UTILITY OWNER AS PER OWNER'S RECOMMENDATIONS.
4. EXISTING LEACHATE CLEAN-OUT PIPES TO BE PROTECTED AND EXTENDED AS REQUIRED TO 2-FT MINIMUM ABOVE FINAL GRADES.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
B	REVISED FOR TCEQ SUBMISSION	07/29/14
A	PRELIMINARY REVIEW	07/11/14

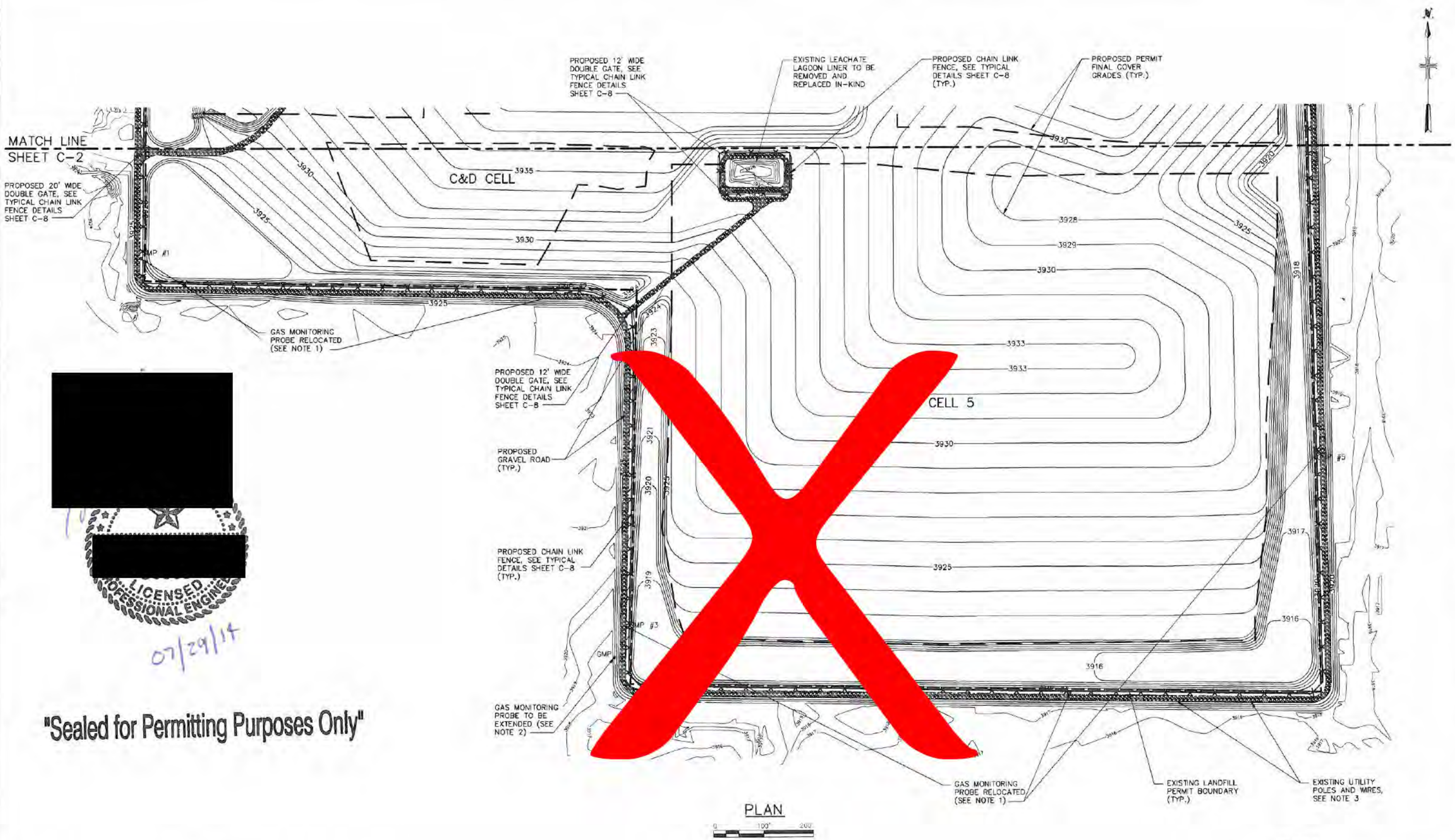
U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

[redacted]

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

FINAL COVER
GRADING PLAN I

SHEET IDENTIFICATION
C-2



PLAN

LEGEND

- 3924 EXISTING TOPOGRAPHIC CONTOUR
- APPROXIMATE EXISTING LANDFILL CELL LIMITS
- LANDFILL PERMIT BOUNDARY
- 3930 PROPOSED 5' PERMIT FINAL COVER GRADES
- 3924 PROPOSED 1' PERMIT FINAL COVER GRADES
- PROPOSED GRAVEL ROAD
- PROPOSED CHAIN LINK FENCE

NOTES:

1. GAS MONITORING PROBES RELOCATED TO ALLOW ACCESS TO GAS MONITORING UPON FINAL CLOSURE.
2. EXISTING GAS MONITORING PROBE TO BE EXTENDED AS REQUIRED BY PROPOSED FINAL COVER GRADES.
3. RELOCATION, REMOVAL, OR FILLING AROUND EXISTING UTILITY POLES AND WIRES FOR CLOSURE GRADES SHALL BE COORDINATED WITH UTILITY OWNER AS PER OWNER'S RECOMMENDATIONS.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
B	REVISED FOR TCEQ SUBMISSION	07/25/14
A	PRELIMINARY REVIEW	07/11/14

U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

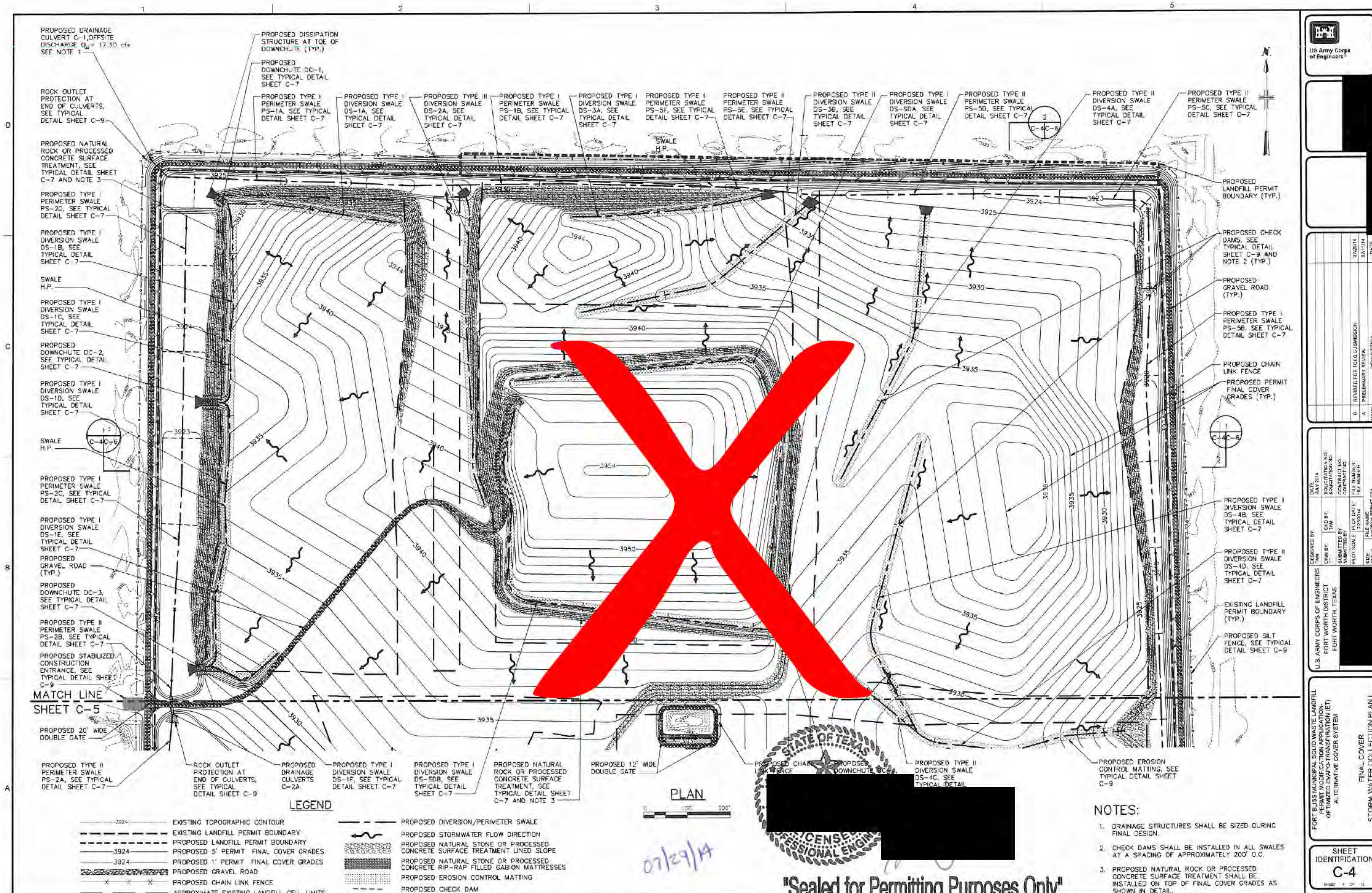
[redacted]

DESIGNED BY: TAM | DATE: JULY 2014
DWN BY: TT | CKD BY: TAM | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
PLOT SCALE: | PLOT DATE: 7/22/2014 | FILE NUMBER:
SIZE: ANSI D | FILE NAME: 04675026-PERMIT-C03

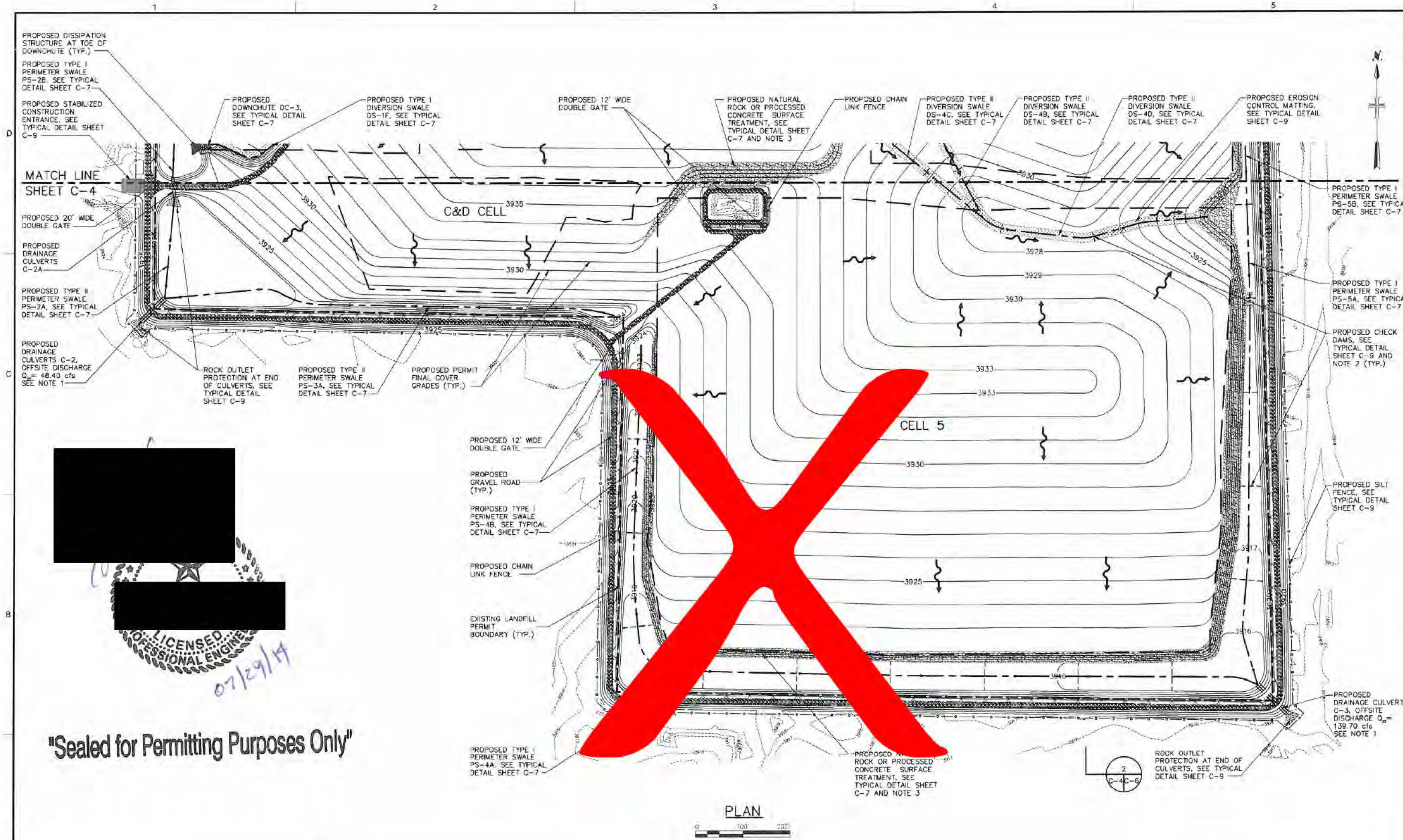
FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

FINAL COVER
GRADING PLAN II

SHEET IDENTIFICATION
C-3



PROPOSED DRAINAGE CULVERT C-1, OFFSITE DISCHARGE Q = 17.30 cfs SEE NOTE 1
PROPOSED DISSIPATION STRUCTURE AT TOE OF DOWNCHUTE (TYP.)
PROPOSED DOWNCHUTE DC-1, SEE TYPICAL DETAIL SHEET C-7
ROCK OUTLET PROTECTION AT END OF CULVERTS, SEE TYPICAL DETAIL SHEET C-9
PROPOSED TYPE I PERIMETER SWALE PS-1A, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-1A, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II DIVERSION SWALE DS-2A, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I PERIMETER SWALE PS-1B, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-3A, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I PERIMETER SWALE PS-5F, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II PERIMETER SWALE PS-5E, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II DIVERSION SWALE DS-3B, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-5DA, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II PERIMETER SWALE PS-5D, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II DIVERSION SWALE DS-4A, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II PERIMETER SWALE PS-5C, SEE TYPICAL DETAIL SHEET C-7
PROPOSED NATURAL ROCK OR PROCESSED CONCRETE SURFACE TREATMENT, SEE TYPICAL DETAIL SHEET C-7 AND NOTE 3
PROPOSED TYPE I PERIMETER SWALE PS-2D, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-1B, SEE TYPICAL DETAIL SHEET C-7
SWALE H.P.
PROPOSED TYPE I DIVERSION SWALE DS-1C, SEE TYPICAL DETAIL SHEET C-7
PROPOSED DOWNCHUTE DC-2, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-1D, SEE TYPICAL DETAIL SHEET C-7
SWALE H.P.
PROPOSED TYPE I PERIMETER SWALE PS-2C, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-1E, SEE TYPICAL DETAIL SHEET C-7
PROPOSED GRAVEL ROAD (TYP.)
PROPOSED DOWNCHUTE DC-3, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II PERIMETER SWALE PS-2B, SEE TYPICAL DETAIL SHEET C-7
PROPOSED STABILIZED CONSTRUCTION ENTRANCE, SEE TYPICAL DETAIL SHEET C-9
MATCH LINE SHEET C-5
PROPOSED 20' WIDE DOUBLE GATE
PROPOSED LANDFILL PERMIT BOUNDARY (TYP.)
PROPOSED CHECK DAMS, SEE TYPICAL DETAIL SHEET C-9 AND NOTE 2 (TYP.)
PROPOSED GRAVEL ROAD (TYP.)
PROPOSED TYPE I PERIMETER SWALE PS-5B, SEE TYPICAL DETAIL SHEET C-7
PROPOSED CHAIN LINK FENCE
PROPOSED PERMIT FINAL COVER GRADES (TYP.)
PROPOSED TYPE II DIVERSION SWALE DS-4B, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE II DIVERSION SWALE DS-4D, SEE TYPICAL DETAIL SHEET C-7
EXISTING LANDFILL PERMIT BOUNDARY (TYP.)
PROPOSED SILT FENCE, SEE TYPICAL DETAIL SHEET C-9
PROPOSED TYPE II PERIMETER SWALE PS-2A, SEE TYPICAL DETAIL SHEET C-7
ROCK OUTLET PROTECTION AT END OF CULVERTS, SEE TYPICAL DETAIL SHEET C-9
PROPOSED DRAINAGE CULVERTS C-2A
PROPOSED TYPE I DIVERSION SWALE DS-1F, SEE TYPICAL DETAIL SHEET C-7
PROPOSED TYPE I DIVERSION SWALE DS-5DB, SEE TYPICAL DETAIL SHEET C-7
PROPOSED NATURAL ROCK OR PROCESSED CONCRETE SURFACE TREATMENT, SEE TYPICAL DETAIL SHEET C-7 AND NOTE 3
PROPOSED 12' WIDE DOUBLE GATE
PROPOSED CHAIN LINK FENCE
PROPOSED DOWNCHUTE DC-4
PROPOSED TYPE II DIVERSION SWALE DS-4C, SEE TYPICAL DETAIL
PROPOSED EROSION CONTROL MATTING, SEE TYPICAL DETAIL SHEET C-9
PLAN
LEGEND
EXISTING TOPOGRAPHIC CONTOUR
EXISTING LANDFILL PERMIT BOUNDARY
PROPOSED LANDFILL PERMIT BOUNDARY
PROPOSED 5' PERMIT FINAL COVER GRADES
PROPOSED 1' PERMIT FINAL COVER GRADES
PROPOSED GRAVEL ROAD
PROPOSED CHAIN LINK FENCE
APPROXIMATE EXISTING LANDFILL CELL LIMITS
PROPOSED DIVERSION/PERIMETER SWALE
PROPOSED STORMWATER FLOW DIRECTION
PROPOSED NATURAL STONE OR PROCESSED CONCRETE SURFACE TREATMENT LINED SLOPE
PROPOSED NATURAL STONE OR PROCESSED CONCRETE RIP-RAP FILLED GABION MATTRESSES
PROPOSED EROSION CONTROL MATTING
PROPOSED CHECK DAM
NOTES:
1. DRAINAGE STRUCTURES SHALL BE SIZED DURING FINAL DESIGN.
2. CHECK DAMS SHALL BE INSTALLED IN ALL SWALES AT A SPACING OF APPROXIMATELY 200' O.C.
3. PROPOSED NATURAL ROCK OR PROCESSED CONCRETE SURFACE TREATMENT SHALL BE INSTALLED ON TOP OF FINAL COVER GRADES AS SHOWN IN DETAIL.
STATE OF TEXAS
[redacted]
LICENSED PROFESSIONAL ENGINEER
07/29/14
"Sealed for Permitting Purposes Only"
US Army Corps of Engineers
[redacted]
B REVISED FOR TCEQ SUBMISSION 07/29/14
A PRELIMINARY REVIEW 07/11/14
MARK DESCRIPTION DATE
U.S. ARMY CORPS OF ENGINEERS FORT WORTH DISTRICT FORT WORTH, TEXAS
[redacted]
FORT BLISS MUNICIPAL SOLID WASTE LANDFILL PERMIT MODIFICATION APPLICATION OPTIMIZED EVAPO-TRANSPIRATION (ET) ALTERNATIVE COVER SYSTEM
FINAL COVER STORM WATER COLLECTION PLAN I
SHEET IDENTIFICATION
C-4



[redacted]

[redacted]

LICENSED PROFESSIONAL ENGINEER

07/29/14

"Sealed for Permitting Purposes Only"

LEGEND

- EXISTING TOPOGRAPHIC CONTOUR
- EXISTING LANDFILL PERMIT BOUNDARY
- PROPOSED 5' PERMIT FINAL COVER GRADES
- PROPOSED 1' PERMIT FINAL COVER GRADES
- PROPOSED GRAVEL ROAD
- PROPOSED CHAIN LINK FENCE
- APPROXIMATE EXISTING LANDFILL CELL LIMITS
- PROPOSED DIVERSION/PERIMETER SWALE
- PROPOSED STORMWATER FLOW DIRECTION
- PROPOSED NATURAL STONE OR PROCESSED CONCRETE SURFACE TREATMENT LINED SLOPE
- PROPOSED NATURAL STONE OR PROCESSED CONCRETE RIP-RAP FILLED GABION MATTRESSES
- PROPOSED EROSION CONTROL MATTING
- PROPOSED CHECK DAM

NOTES:

1. DRAINAGE STRUCTURES SHALL BE SIZED DURING FINAL DESIGN.
2. CHECK DAMS SHALL BE INSTALLED IN ALL SWALES AT A SPACING OF APPROXIMATELY 200' O.C.
3. PROPOSED NATURAL ROCK OR PROCESSED CONCRETE SURFACE TREATMENT SHALL BE INSTALLED ON TOP OF FINAL COVER GRADES AS SHOWN IN DETAIL.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
B	REVISED FOR TCEQ SUBMISSION	07/29/14
A	PRELIMINARY REVIEW	07/11/14

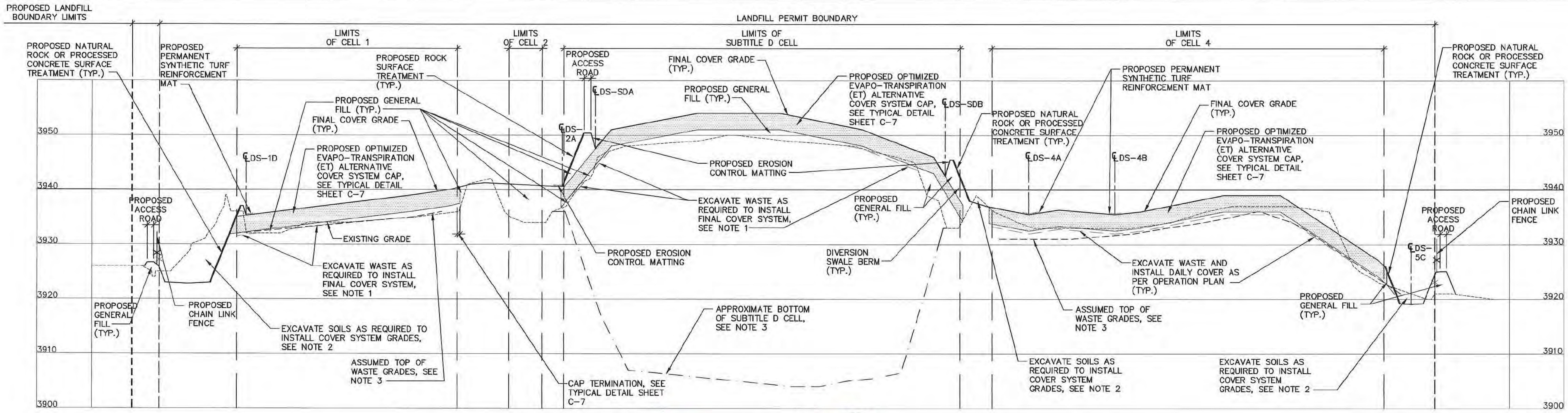
U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

[redacted]

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

FINAL COVER
STORM WATER COLLECTION PLAN II

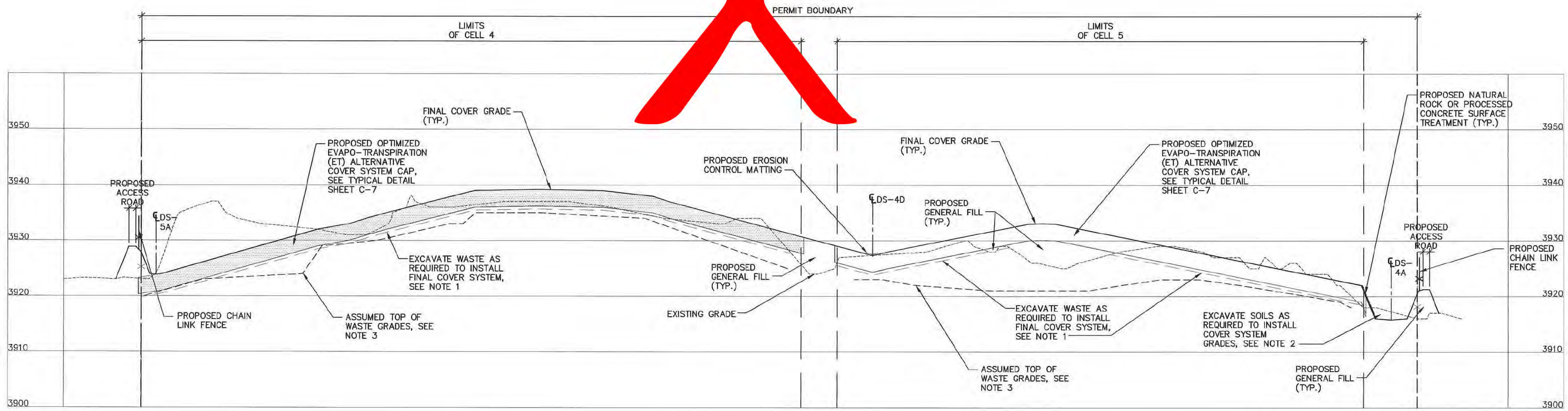
SHEET IDENTIFICATION
C-5



SECTION 1 / C-4 C-6

0 100' 200' HORIZONTAL SCALE

0 10' 20' VERTICAL SCALE



SECTION 2 / C-4 C-6

0 100' 200' HORIZONTAL SCALE

0 10' 20' VERTICAL SCALE

"Sealed for Permitting Purposes Only"

10-24-2014

STATE OF TEXAS

[redacted]

NOTES:

1. WASTE EXCAVATED TO INSTALL FINAL COVER SYSTEM SHALL BE RELOCATED WITHIN LANDFILL LIMITS AND COVERED WITH COVER SOILS IN ACCORDANCE WITH OPERATING PERMIT PRIOR TO PLACEMENT OF FINAL COVER SYSTEM SOILS.
2. SOILS EXCAVATED OUTSIDE LANDFILL CELLS NOT CONTAINING WASTE MAY BE USED FOR GENERAL FILL IF APPROVED BY CONTRACTING OFFICER'S REPRESENTATIVE OR DISPOSED OF WITHIN LANDFILL LIMITS AND COVERED WITH COVER SOILS IN ACCORDANCE WITH OPERATING PERMIT PRIOR TO PLACEMENT OF FINAL COVER SYSTEM SOILS.
3. BOTTOM OF SUBTITLE D CELL SHOWN IS APPROXIMATE. IN OTHER AREAS WITHIN LANDFILL CELL LIMITS SHOWN THE WASTE WAS DEPOSITED BY TRENCH AND COVER METHODS. ASSUMED TOP OF WASTE WAS DETERMINED BY TEST PIT INVESTIGATION.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
C	REVISED FOR RTC	10/01/14
B	REVISED FOR TCEQ SUBMISSION	07/25/14
A	PRELIMINARY REVIEW	07/11/14

DESIGNED BY: TAM | DATE: JULY 2014 | DWN BY: TT | CKD BY: TAM | SOLICITATION NO.: | SUBMITTED BY: | CONTRACT NO.: | PLOT SCALE: | PLOT DATE: 9/29/2014 | FILE NUMBER: | SIZE: ANSI D | FILE NAME: 04675026-PERMIT-C06

U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

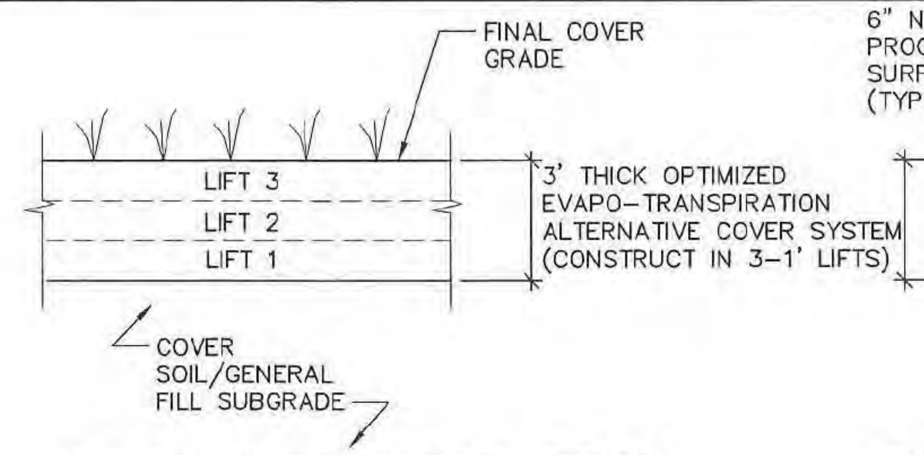
[redacted]

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

FINAL COVER
LANDFILL CROSS SECTIONS

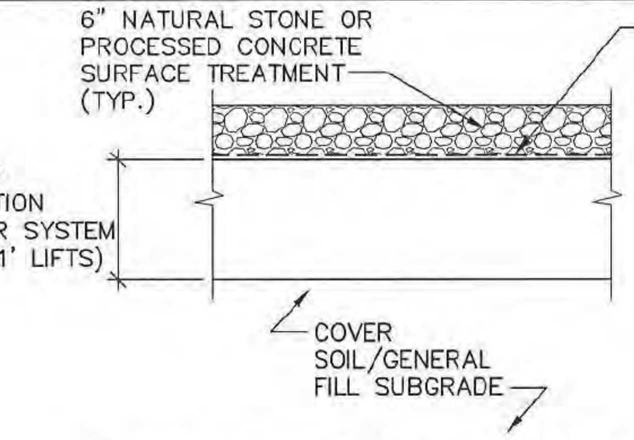
SHEET IDENTIFICATION
C-6

SHEET 9 OF 12



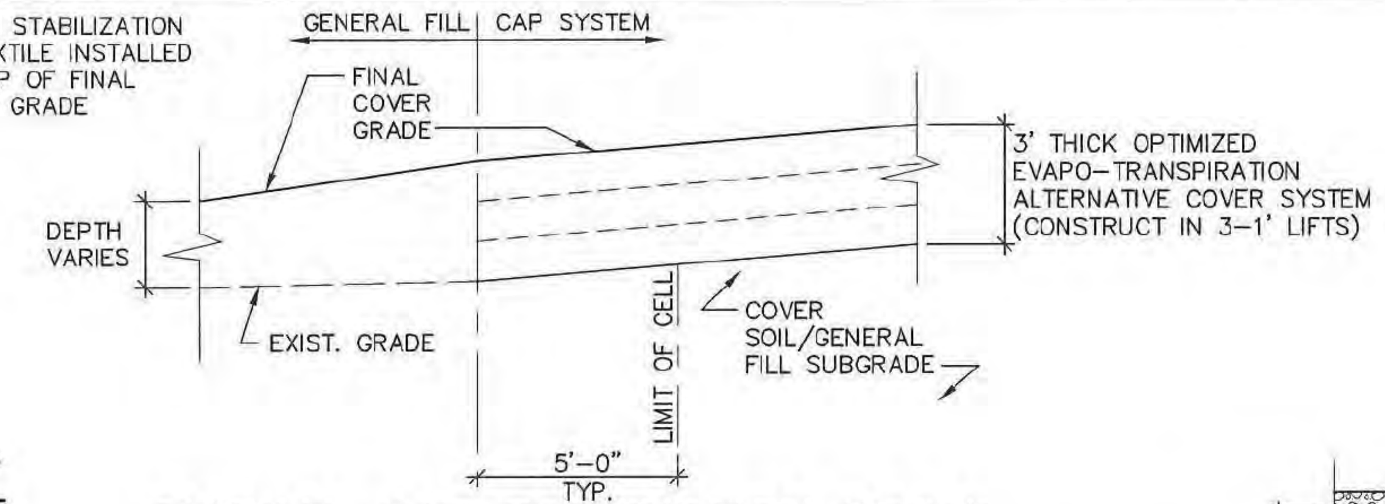
FINAL COVER CAP DETAIL

NOT TO SCALE



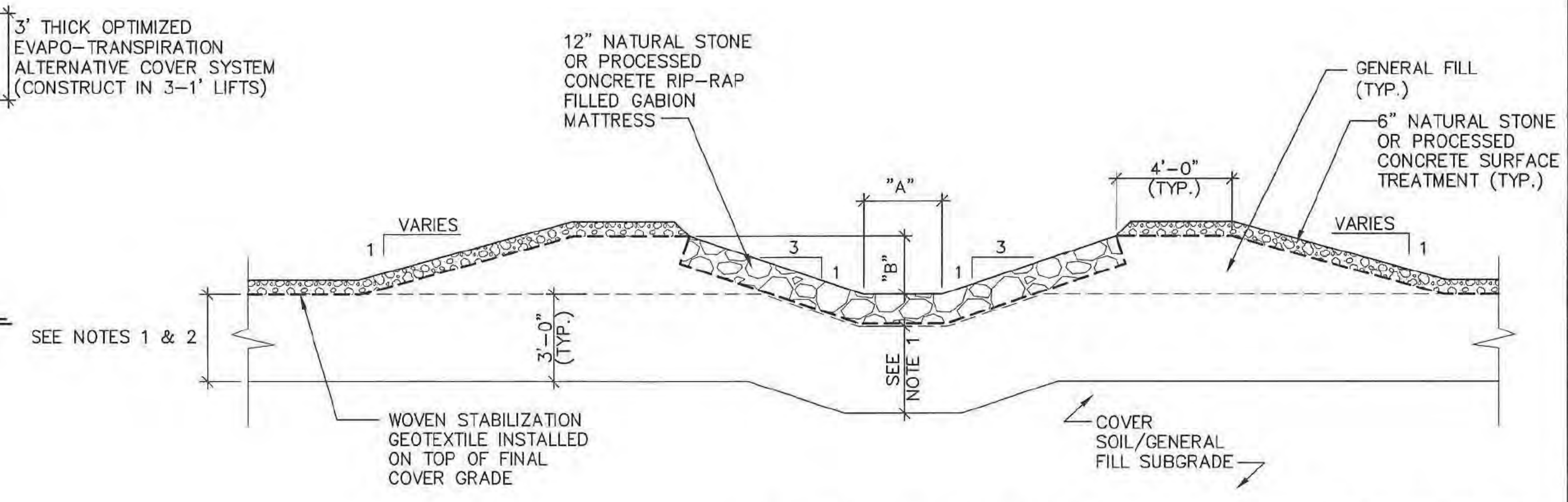
ROCK SURFACE TREATMENT

NOT TO SCALE



TYPICAL CAP TERMINATION DETAIL

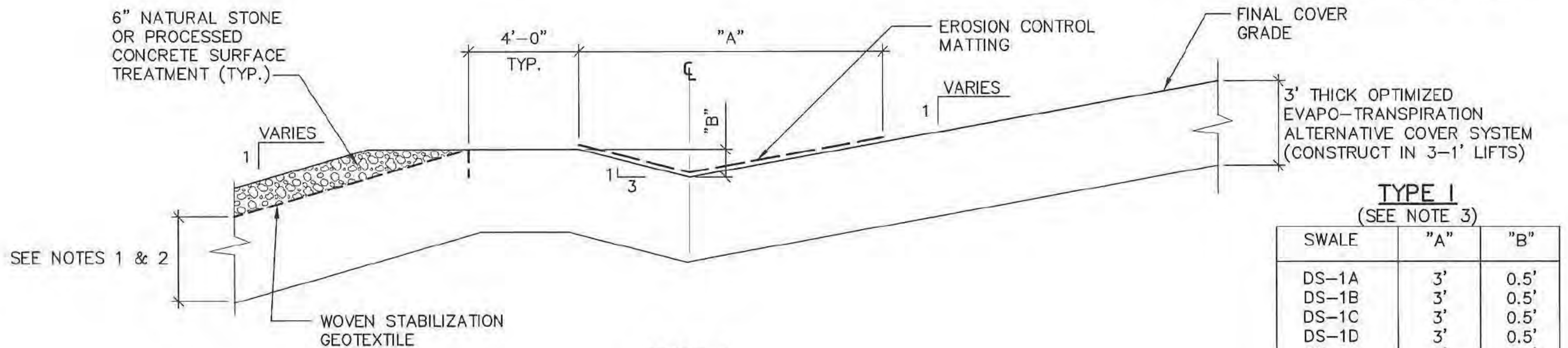
NOT TO SCALE



DOWNCHUTE DETAIL

NOT TO SCALE

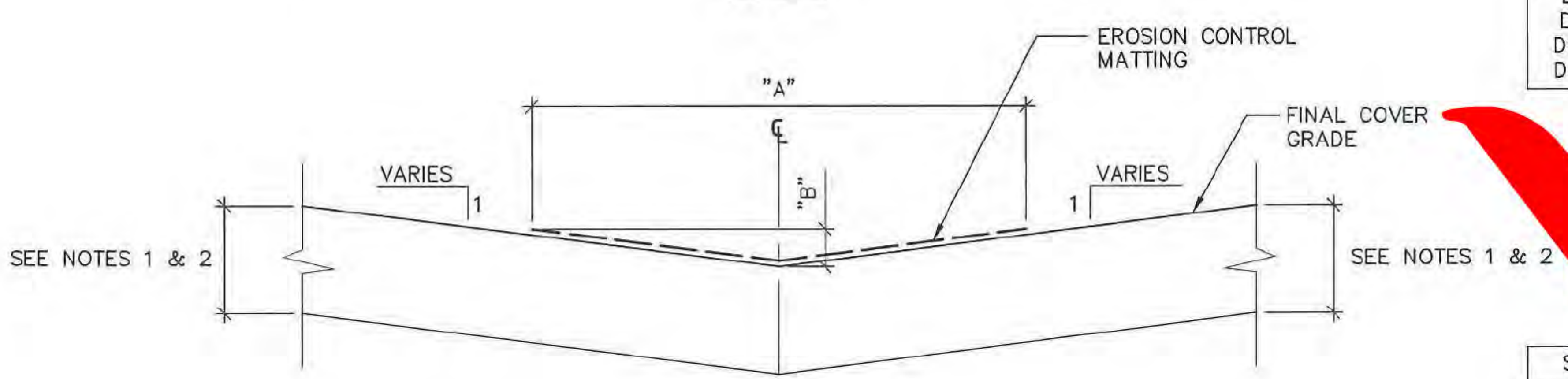
DOWNCHUTE	"A"	"B"
DC-1	2'	1'
DC-2	2'	1'
DC-3	2'	1'
DC-4	2'	1'



TYPE I

TYPE I
(SEE NOTE 3)

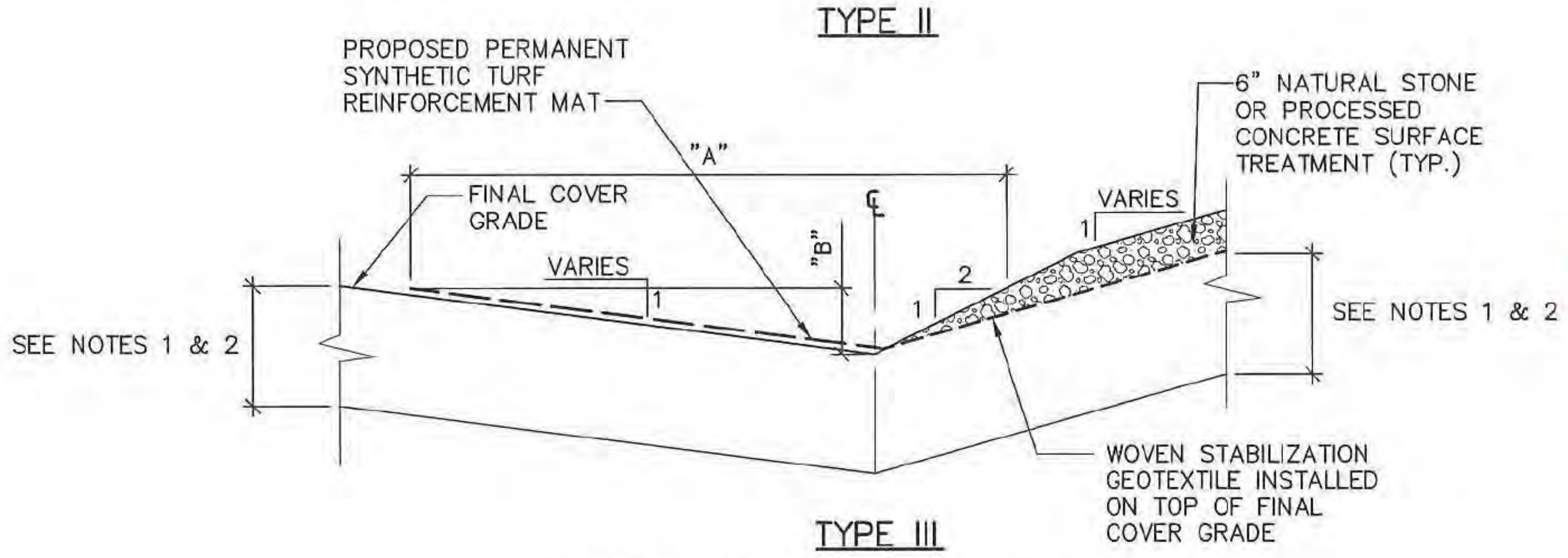
SWALE	"A"	"B"
DS-1A	3'	0.5'
DS-1B	3'	0.5'
DS-1C	3'	0.5'
DS-1D	3'	0.5'
DS-1E	3'	0.5'
DS-1F	3'	0.5'
DS-3A	6'	1'
DS-SDA	6'	1'
DS-SDB	6'	1'



TYPE II

TYPE II
(SEE NOTE 3)

SWALE	"A"	"B"
DS-3		2'
DS		2'
DS		2'
		2'
	20	2'



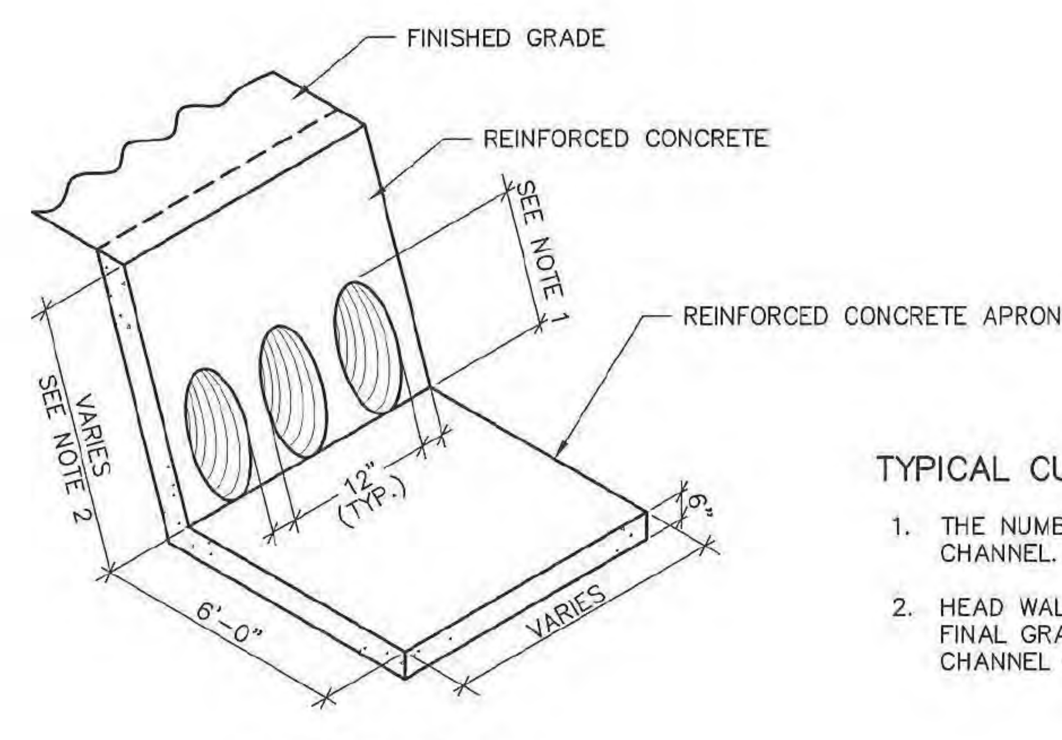
TYPE III

TYPE III
(SEE NOTE 3)

SWALE	"A"	"B"
DS-2A	10'	1'

DIVERSION SWALE DETAILS

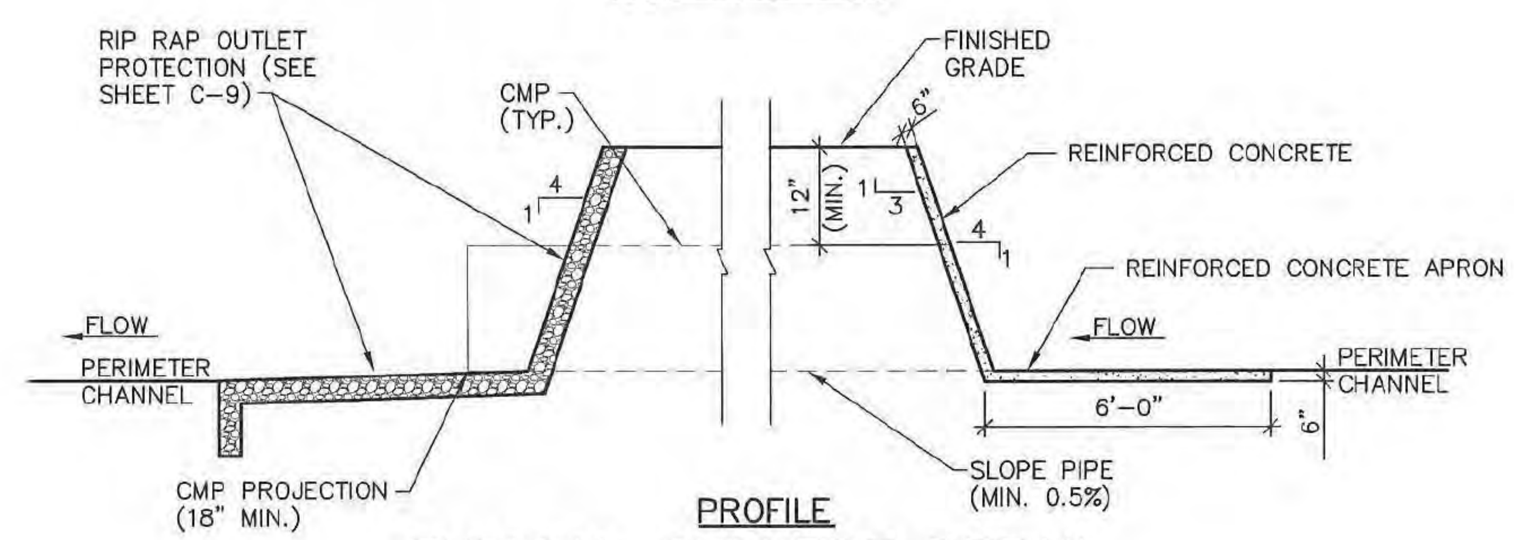
NOT TO SCALE



ISOMETRIC VIEW

TYPICAL CULVERT NOTES:

1. THE NUMBER OF CMP AND SIZE VARIES BY CHANNEL.
2. HEAD WALL SHALL EXTEND TO TOP OF FINAL GRADE AND SLOPED TO MATCH CHANNEL CROSS SECTION.

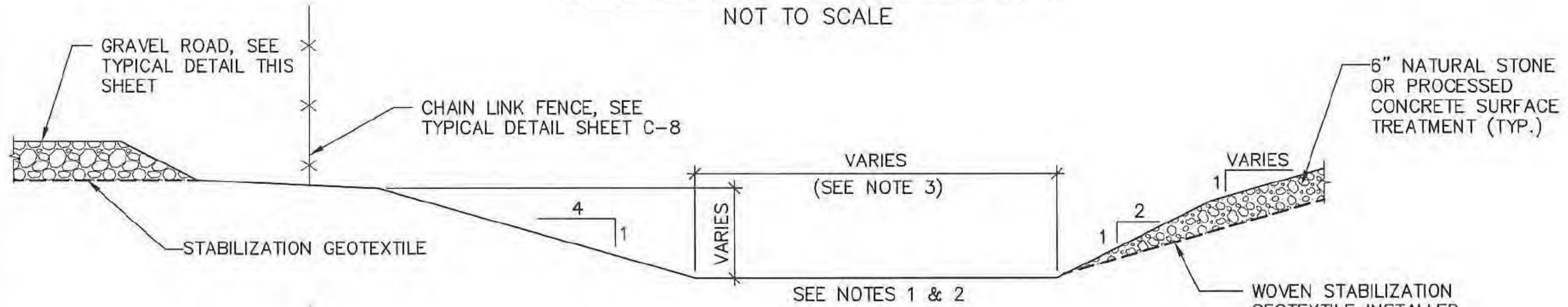


PROFILE

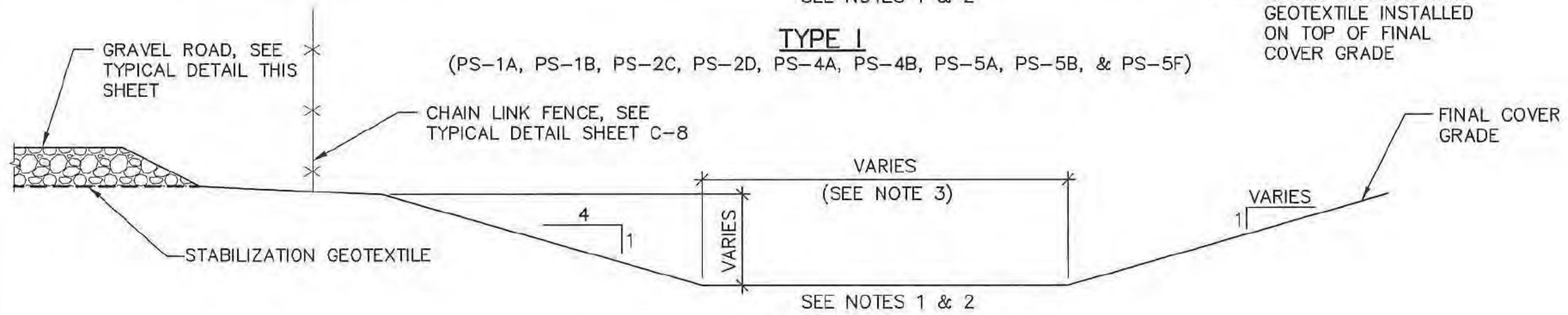
TYPICAL CULVERT DETAIL

CULVERT TABLE
(SEE NOTE 3)

CULVERT. NO.	(#) PIPES & SIZE (CMP)	PEAK DISCHARGE
DC-1	(1) - 24"ø	17.3 CFS
DC-2A	(2) - 24"ø	21.3 CFS
DC-2	(3) - 24"ø	48.4 CFS
DC-3	(3) - 36"ø	139.7 CFS



TYPE I
(PS-1A, PS-1B, PS-2C, PS-2D, PS-4A, PS-4B, PS-5A, PS-5B, & PS-5F)



TYPE II
(PS-2A, PS-2B, PS-3A, PS-5C, PS-5D, & PS-5E)

PERIMETER SWALE DETAILS

NOT TO SCALE

[redacted]

"Sealed for Permitting Purposes Only"

NOTES:

1. WHERE DRAINAGE STRUCTURE FALLS WITHIN CELL LIMITS, STRUCTURE SHALL BE BUILT ON TOP OF THE 3' THICK OPTIMIZED EVAPO-TRANSPIRATION ALTERNATIVE COVER SYSTEM.
2. WHERE DRAINAGE STRUCTURE FALLS OUTSIDE CELL LIMITS, STRUCTURE SHALL BE BUILT ON TOP OF GENERAL FILL MATERIAL.
3. DRAINAGE STRUCTURE "A" AND "B" DIMENSIONS WILL BE DETERMINED AS PART OF THE FINAL CLOSURE DESIGN. DIMENSIONS SHOWN ARE APPROXIMATE AND BASED ON SHEETS C-4 AND C-5.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
C	REVISED FOR RTC	10/01/14
B	REVISED FOR TCEQ SUBMISSION	07/25/14
A	PRELIMINARY REVIEW	07/11/14

U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

[redacted]

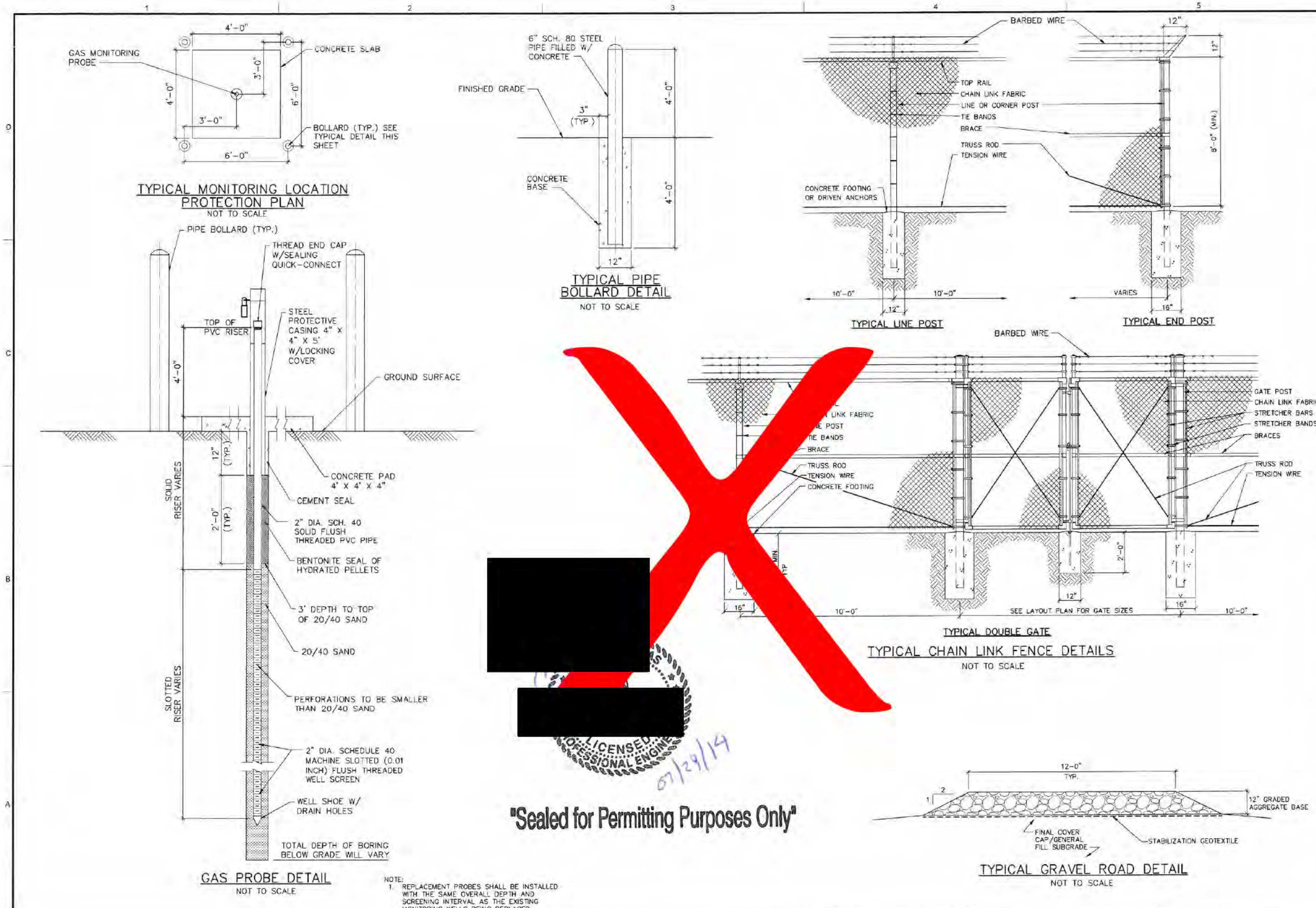
DESIGNED BY: TAM | DATE: JULY 2014
DWN BY: TT | CKD BY: TAM | SOLICITATION NO.:
SUBMITTED BY: | CONTRACT NO.:
PLOT SCALE: | PLOT DATE: 10/28/2014 | FILE NUMBER:
SIZE: ANSI D | FILE NAME: 04675026-PERMIT-C07

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

TYPICAL CAP & DRAINAGE DETAILS

SHEET IDENTIFICATION
C-7
SHEET 10 OF 12

User: TTI Spec: PIRNIE STANDARD File: I:\ENVCAD\WhitePlains-NY\ACT\04675026\Fort Bliss Autocad Files\PERMIT MODIFICATION APPLICATION\DWGS\04675026-PERMIT-C07.DWG Scale: 1:1 Date: 06/17/2014 Time: 11:45 Layout: Layout1



NOTE:
1. REPLACEMENT PROBES SHALL BE INSTALLED WITH THE SAME OVERALL DEPTH AND SCREENING INTERVAL AS THE EXISTING MONITORING WELLS BEING REPLACED.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
B	REVISED FOR TCEQ SUBMISSION	07/29/14
A	PRELIMINARY REVIEW	07/11/14

U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

[redacted]

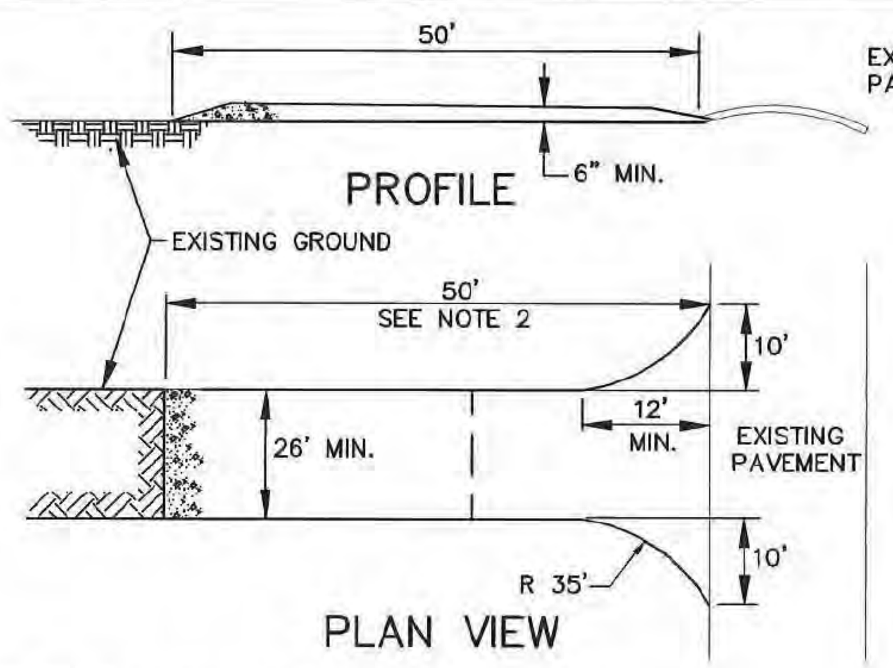
FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

TYPICAL SITE DETAILS

SHEET IDENTIFICATION
C-8

GENERAL EROSION AND SEDIMENT CONTROL NOTES:

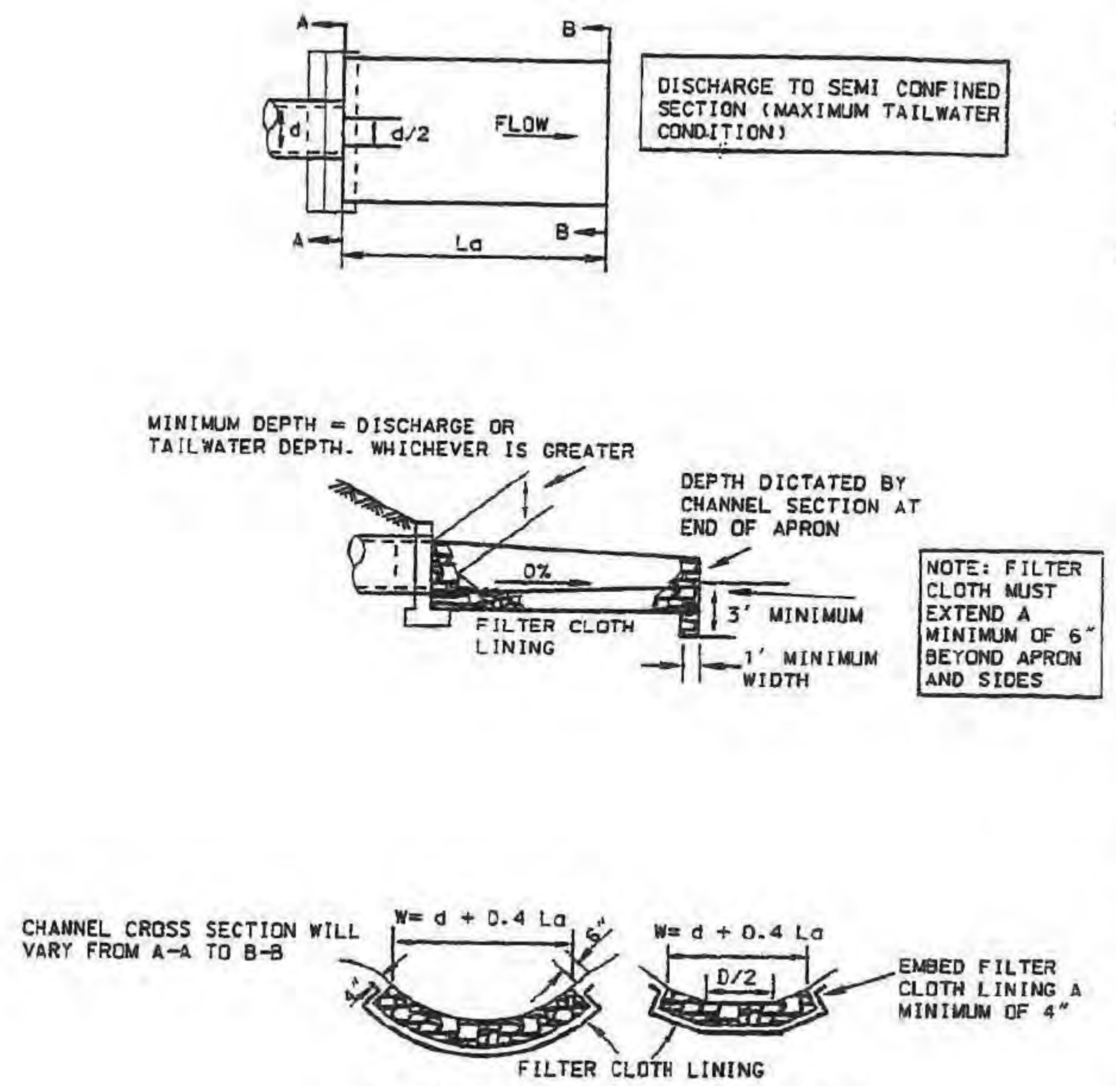
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE TEXAS GUIDELINES FOR URBAN EROSION AND SEDIMENT CONTROL, CURRENT EDITION. CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE STORMWATER PERMITS.
2. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED. CONTRACTOR SHALL INSPECT AND REPAIR SEDIMENT AND EROSION CONTROL MEASURES DAILY.
3. DISTURBED AREAS AND STOCKPILED MATERIALS, WHICH WILL NOT BE RE-DISTURBED WITHIN TEN (10) DAYS, SHALL BE STABILIZED BY USE OF MULCHING, SEEDING, GEOTEXTILE FABRIC, OR OTHER APPROVED METHODS.
4. CLEANING OF ROADWAYS: CONTRACTOR SHALL KEEP THE TRAVELED WAY FREE OF FOREIGN OBJECTS SUCH AS SPILLED EARTH, ROCK, TIMBER, AND OTHER ITEMS THAT MAY FALL FROM TRANSPORTING VEHICLES. MATERIALS SPILLED BY OR DROPPED FROM THE UNDERCARRIAGE OF ANY CARRYING VEHICLE USED IN CONTRACTOR'S HAULING OPERATIONS ALONG OR ACROSS ANY PUBLIC TRAVELED WAY SHALL BE REMOVED IMMEDIATELY.
5. CONDUIT OUTLET PROTECTION MUST BE INSTALLED AT ALL REQUIRED OUTFALLS PRIOR TO THE DRAINAGE SYSTEM BECOMING OPERATIONAL.
6. STORMWATER MANAGEMENT BASINS SHALL ACT AS SEDIMENT TRAPS DURING CONSTRUCTION. CONTRACTOR SHALL CLEAN SEDIMENT TRAPS PER REQUIREMENTS. SEDIMENT TRAPS SHALL BE CLEANED AND FINAL GRADED TO THE ELEVATIONS SHOWN AND TOPSOILED, SEEDED AND MULCHED PRIOR TO PROJECT COMPLETION.



1. STONE SIZE–USE CRUSHED STONE SUBBASE COURSE.
2. LENGTH–AS REQUIRED, BUT NOT LESS THAN 50'.
3. THICKNESS–NOT LESS THAN 6".
4. GEOTEXTILE FABRIC WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
5. MAINTENANCE–THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
6. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

NOT TO SCALE

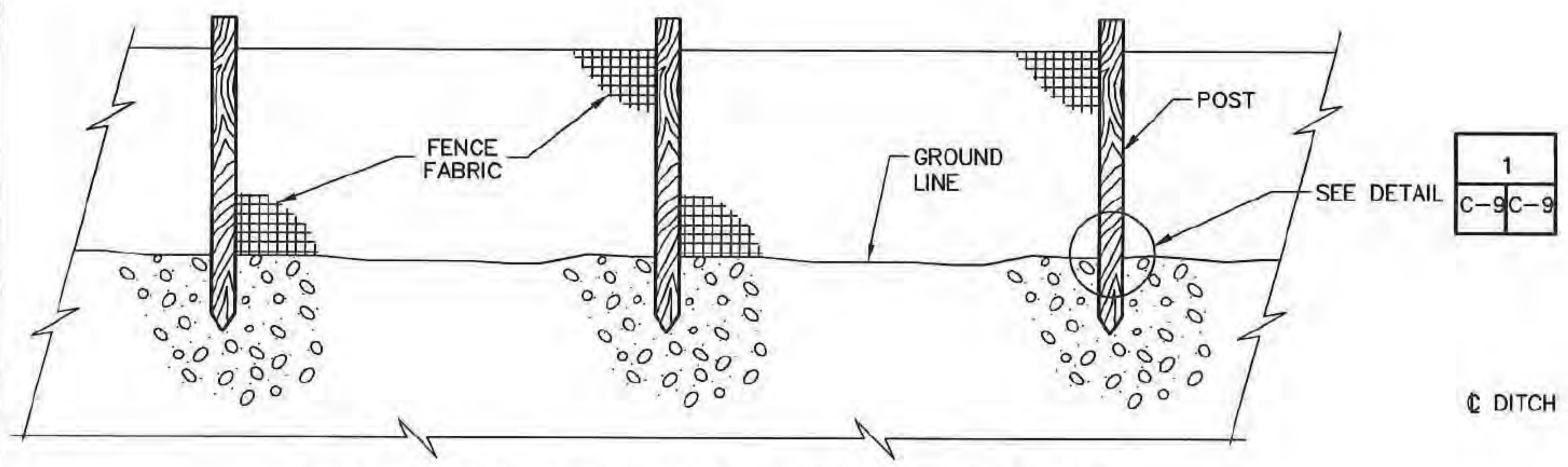


ROCK OUTLET PROTECTION DETAIL

NOT TO SCALE

CONSTRUCTION SPECIFICATIONS:

1. THE SUBGRADE FOR THE FILTER, RIP–RAP, OR GABION SHALL BE PREPARED TO THE REQUIRED LINES AND GRADES. ANY FILL REQUIRED IN THE SUBGRADE SHALL BE COMPACTED TO A DENSITY APPROXIMATED THAT OF THE SURROUNDING UNDISTURBED MATERIAL.
2. THE NATURAL STONE OR PROCESSED CONCRETE SHALL CONFORM TO SPECIFIED GRADING LIMITS WHEN INSTALLED RESPECTIVELY IN THE RIP–RAP OR FILTER.
3. GEOTEXTILE SHALL BE PROTECTED FROM PUNCHING, CUTTING OR TEARING. ANY DAMAGE OTHER THAN AN OCCASIONAL SMALL HOLE SHALL BE REPAIRED BY PLACING ANOTHER PIECE OF GEOTEXTILE OVER THE DAMAGED PART OR BY COMPLETELY REPLACING THE GEOTEXTILE. ALL OVERLAPS WHETHER FOR REPAIRS OR FOR JOINING TWO PIECES OF GEOTEXTILE SHALL BE A MINIMUM OF ONE FOOT.
4. NATURAL STONE OR PROCESSED CONCRETE FOR THE RIP–RAP OR GABION OUTLETS MAY BE PLACED BY EQUIPMENT. THEY SHALL BE CONSTRUCTED TO THE FULL COURSE THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO AVOID DISPLACEMENT OF UNDERLYING MATERIALS. THE NATURAL STONE OR PROCESSED CONCRETE FOR RIP–RAP OR GABION OUTLETS SHALL BE DELIVERED AND PLACED IN A MANNER THAT WILL ENSURE THAT IT IS REASONABLY HOMOGENEOUS WITH THE SMALLER MATERIAL AND SPOILS FILLING THE VOIDS BETWEEN THE LARGER STONES. RIP–RAP SHALL BE PLACED IN A MANNER TO PREVENT DAMAGE TO THE FILTER BLANKET OR GEOTEXTILE. HAND PLACEMENT WILL BE REQUIRED TO THE EXTENT NECESSARY TO PREVENT DAMAGE TO THE PERMANENT WORKS.
5. THE NATURAL STONE OR PROCESSED CONCRETE SHALL BE PLACED SO THAT IT BLENDS IN WITH THE EXISTING GROUND.

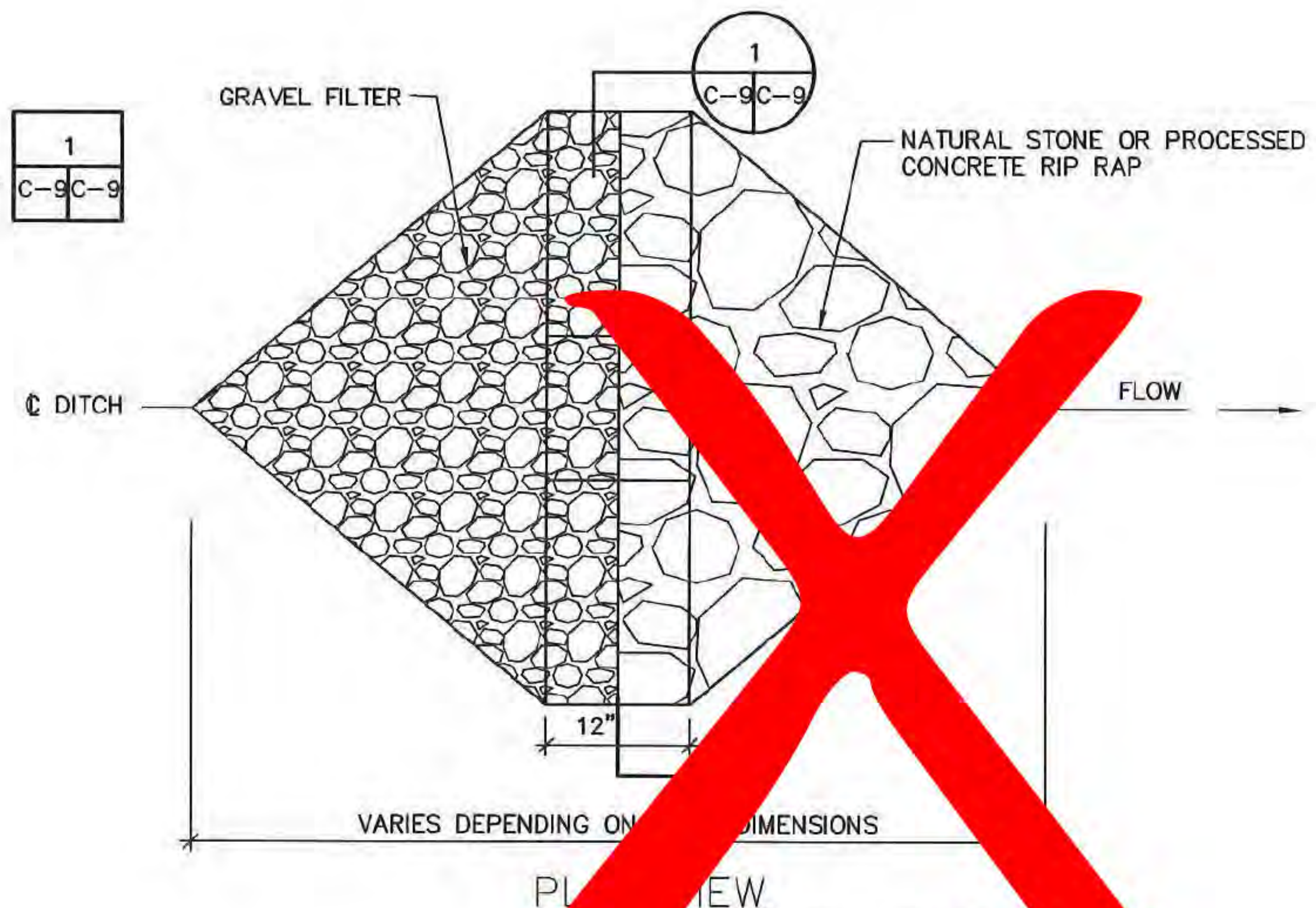


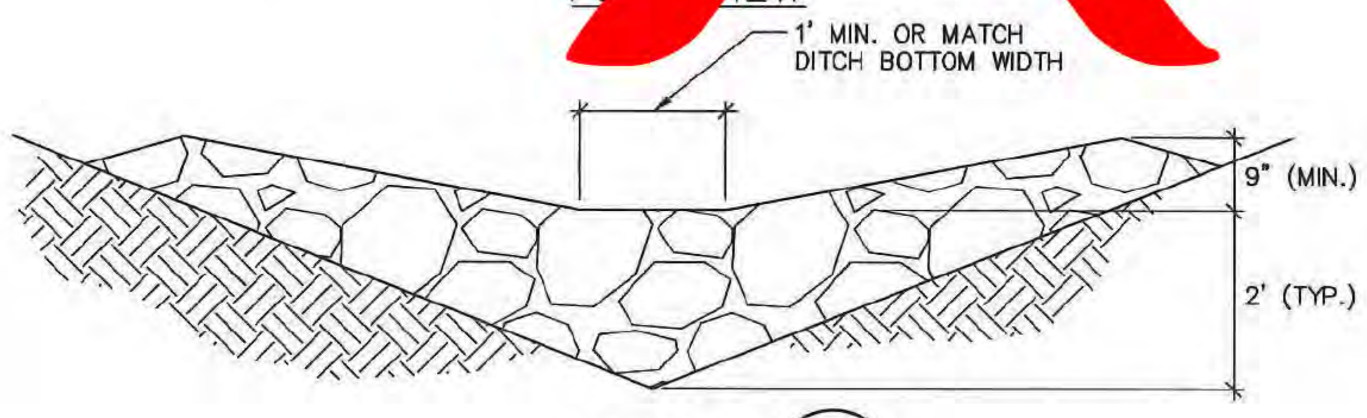
SEDIMENT CONTROL FENCING DETAIL

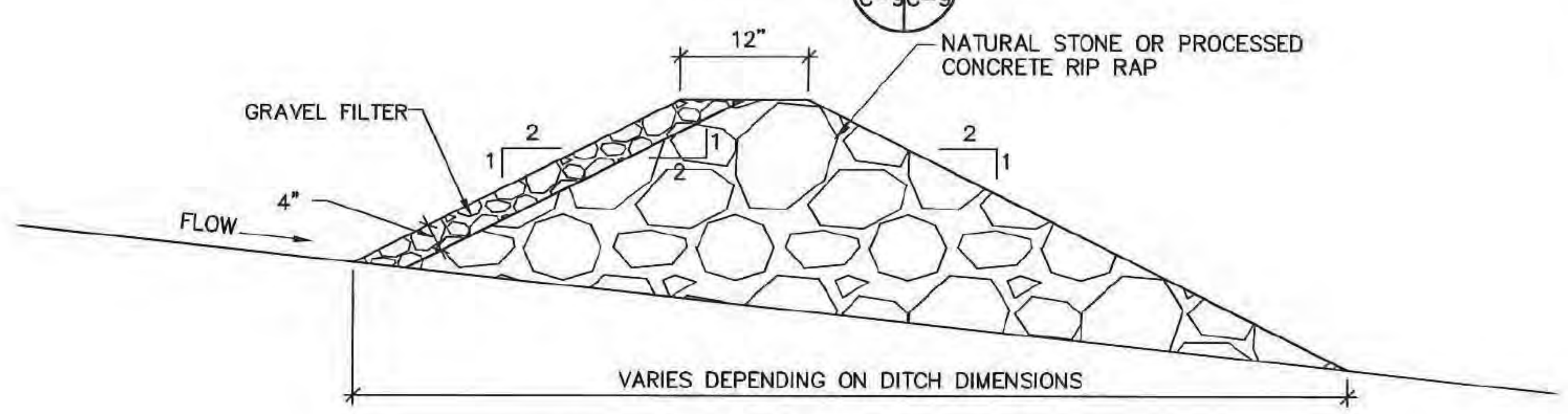
NOT TO SCALE

SEDIMENT CONTROL FENCING NOTES:

1. FENCE FABRIC SHALL BE FASTENED SECURELY TO FENCE POSTS WITH TIES OR STAPLES.
2. WHEN TWO SECTIONS OF FENCE FABRIC ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE FENCE.







CHECK DAM DETAIL

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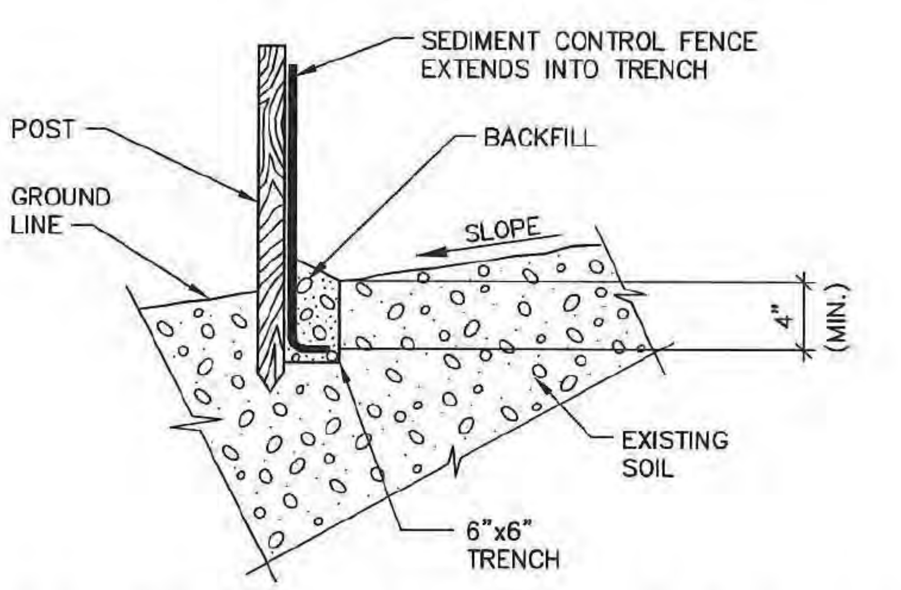


SEDIMENT CONTROL FENCE ANCHOR DETAIL

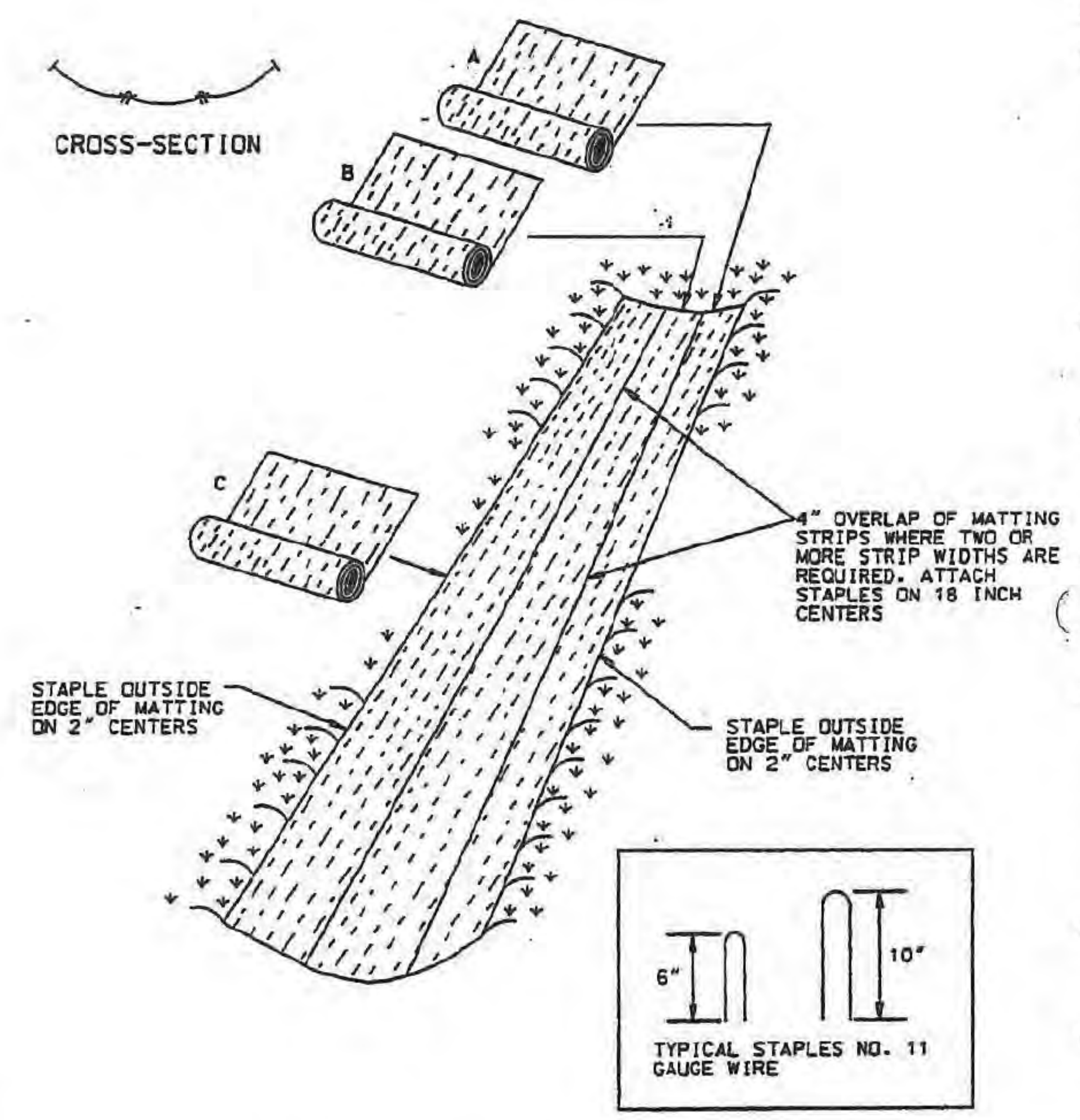
1
C-9C-9

NOT TO SCALE

"Sealed for Permitting Purposes Only"

10-24-2014

[redacted]



EROSION CONTROL MATTING DETAIL

NOT TO SCALE

CONSTRUCTION SPECIFICATIONS:

1. KEY–IN THE MATTING BY PLACING THE TOP ENDS OF THE MATTING IN A NARROW TRENCH, 6" DEEP. BACKFILL THE TRENCH AND TAMP FIRMLY TO CONFORM TO THE CHANNEL CROSS–SECTION. SECURE WITH A ROW OF STAPLES ABOUT 4" DOWN SLOPE FROM THE TRENCH. SPACING BETWEEN THE STAPLES IS 6".
2. STAPLE THE 4" OVERLAP IN THE CHANNEL CENTER USING AN 18" SPACING BETWEEN STAPLES.
3. BEFORE STAPLING THE OUTER EDGES OF MATTING, MAKE SURE THE MATTING IS SMOOTH AND IN FIRM CONTACT WITH THE SOIL.
4. STAPLES SHALL BE PLACED 2' APART WITH 4 ROWS FOR EACH STRIP. 2 OUTER ROWS AND 2 ALTERNATING ROWS DOWN THE CENTER.
5. WHERE ONE ROLL OF MATTING ENDS AND ANOTHER BEGINS, THE END OF THE TOP STRIP SHALL OVERLAP THE UPPER END OF THE LOWER STRIP BY 4", SHIPLAP FASHION. REINFORCE THE OVERLAP WITH A DOUBLE ROW OF STAPLES SPACED 6" APART IN A STAGGERED PATTERN ON EITHER SIDE.
6. THE DISCHARGE END OF THE MATTING LINER SHOULD BE SIMILARLY SECURED WITH 2 DOUBLE ROWS OF STAPLES.

NOTE: OF FLOW WILL ENTER FROM THE EDGE OF THE MATTING THEN THE AREA EFFECTED BY FLOW MUST BE KEYED–IN.

US Army Corps of Engineers

[redacted]

MARK	DESCRIPTION	DATE
C	REVISED FOR RTC	10/01/14
B	REVISED FOR TCEQ SUBMISSION	07/25/14
A	PRELIMINARY REVIEW	07/11/14

U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT
FORT WORTH, TEXAS

[redacted]

DESIGNED BY: TAM		DATE: JULY 2014
DWN BY: TT	CKD BY: TAM	SOLICITATION NO.:
SUBMITTED BY:		CONTRACT NO.:
PLOT SCALE:	PLOT DATE: 9/26/2014	FILE NUMBER:
SIZE: ANSI D	FILE NAME: 04675026-PERMIT-C09	

FORT BLISS MUNICIPAL SOLID WASTE LANDFILL
PERMIT MODIFICATION APPLICATION-
OPTIMIZED EVAPO-TRANSPIRATION (ET)
ALTERNATIVE COVER SYSTEM

EROSION CONTROL DETAILS

SHEET IDENTIFICATION
C-9
SHEET 12 OF 12

User: Tll Spec:PIRNIE STANDARD File:I:\ENVCAD\WhitePlains-NY\ACT\04675026\Fort Bliss Autocad Files\DWGS-OET\04675026-OET-C06.DWG Scale:1:1 Date:05/21/2014 Time:07:11 Layout:Layout1

Appendix L

Facility Surface Water Draining Report

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

Appendix L – Final Facility Surface Water Drainage Report

Fort Bliss Municipal Solid Waste Landfill
Permit 1422

~~Revised~~ July 2014

Revised October 24, 2014 Rev. 1
Revised July 11, 2022 Rev 2

[redacted]

Prepared By [redacted]

[redacted]

~~04675026~~
30056989

[redacted]

Engineering Certification

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

Certifying Engineer:	[redacted], P.E.
State:	Texas
Registration Number:	[redacted]

Signature: ______________________________

Certification Date: ______________________________

Engineering Seal:

Contents

List of Tables

Attachments

Attachment 1: Drainage Basins Map, Peak Discharge Flow and Drainage Swale Design

Attachment 2: Intermediate Erosion and Soil Control Design Calculations (Peak Runoff Velocity, Swale Design, and Soil Loss)

Attachment 3: Final Erosion and Soil Control Design Calculations (Soil Loss)

Attachment 4: Erosion and Soil Control Measures Specifications Information

Attachment 5: 2005 Stormwater Pollution Prevention Plan (For Reference Only. Prepared by U.S. Army Center for Health Promotion and Preventive Medicine.)

Attachment 6: Geohydrologic Site Characterization of the Municipal Solid Waste Landfill Facility, U.S. Army Defense Artillery Center and Fort Bliss, El Paso County, Texas

1. Introduction

The Fort Bliss Municipal Solid Waste Landfill (MSWLF) includes active Subtitle D Type I and Type IV (C&D) landfill cells that are currently in use to serve the United States Army Fort Bliss area. Permitted types of solid wastes disposed of at the Fort Bliss MSWLF are non-hazardous solid waste from military operations, bulky items, grass and tree trimmings, refuse from litter cans, construction debris, classified waste (dry), dead animals, Regulated Asbestos Containing Material (RACM), and empty oil cans (1-quart and 5-gallon sizes). The MSWLF does not receive hazardous waste nor does it recover incoming waste.

The landfill area is comprised of five distinct areas:

- 1970's-era inactive cells that cover approximately 80-acres that are considered closed.
- An approximately 3-acre Type I cell with final cover in place (non-Subtitle D) that complies with the 1995 closure plan and TCEQ requirements.
- An approximately 10.5-acre Type I active cell meeting Subtitle D requirements (Subtitle D Cell).
- An approximately 5-acre Type IV construction and demolition (C&D) debris active cell.
- Approximately 3.2 acres designated for landfill roads, access areas, guard shack/scale house, etc.

This Facility Surface Water Drainage Report has been completed to meet the requirements of Title 30 of the Texas Administrative Code (TAC) Chapter 330.63(c) (30 TAC §330.63(c)) as part of the final closure and permit modification application for an alternative cover design and grading plan. This report illustrates that the proposed modification does not adversely alter the existing (permitted) drainage patterns and that these drainage patterns can be retained for the modification.

This report also serves as the surface water drainage report required by 30 TAC § Subchapter G. The facility design complies with the requirements of 30 TAC § 330.303 relating to management of run-on and runoff. The surface water drainage analysis for the Fort Bliss MSWLF is presented in Section 2. An Erosion and Sediment Control Plan is included in Section 3. Section 4 presents the maintenance and inspection requirements.

1.1. General Geology and Soils

The Fort Bliss MSWLF is underlain by Hueco Bolson deposits of tertiary age and typically are composed of unconsolidated to slightly consolidated interbedded sands, clay, silt, gravel, and caliche. Individual beds are not well defined and range in thickness from a fraction of an inch to about 100 feet. The general geology and soils details for the MSWLF site are provided in Attachment 6 of this report.

1.2. General Climate and Weather

The MSWLF is located in west Texas where desert conditions exist; therefore, surface water flow near the MSWLF is limited. Maximum daytime summer temperatures range between 90 and 105 degrees Fahrenheit (°F) and winter temperatures range from 55 to 60°F. The surrounding area receives less than 10 inches of rain per year and relative humidity is very low. Depending upon the intensity and duration of each precipitation event, the water delivered by the occurrence may infiltrate into the soil or become surface runoff. The infiltrated water may percolate downward to the water table or return to the atmosphere via evapotranspiration.

1.3. Surface Water Bodies

No surface water bodies exist at or near the MSWLF. Given a large rain event, surface water runoff may flow downstream to the storm water retention basin located approximately 2 miles south of the landfill, north of [redacted] Boulevard. Structural control measures to reduce sediment are described in the 2005 Storm Water Pollution Prevention Plan (Attachment 5). Further discussion on the surface water drainage and erosion and sedimentation controls are given in Sections 2 and 3, respectively.

2. Facility Surface Water Drainage Analysis

The final grading/drainage plan for the approximately 110 acre landfill was modified to incorporate an optimized ET cover to further economize the closure effort and costs. This optimized ET cover will reduce the cover thickness and soil characteristics of the cover system to allow for the utilization of soil borrow from sources located within the Fort. The grading was further altered to minimize the excavation and relocation of waste as well as to provide uniform slopes that maximized a southern orientation (to the extent practical) for the future PV development. However, the drainage concept remains consistent with the previously approved site plans and consists of mostly overland and shallow concentrated flows leading off the landfill side slopes. Diversion swales provide flow paths for internal watersheds to the perimeter swales. Surface water runoff collected by these diversion swales discharge either directly or via downchutes into the perimeter swales. In general, surrounding flow patterns drain towards the northwest, southwest and southeast corners of the landfill. Three sets of culverts convey runoff from the perimeter swales to these historic discharge locations as shown on Drawing D-1 in Attachment 1. The surrounding drainage patterns will not be adversely altered as a result of this alternative cover design and grading plan.

A hydrologic and hydraulic analysis was conducted on the final grading plan, shown on Sheets C-2 and C-3 in Appendix B (Design Drawings) of the permit modification. The analysis incorporates the proposed alternative cover design and grading modifications to estimate the peak discharge and run-off volumes associated with the 25-year, 24-hour design storm event as required in 30 TAC §330.305(c). The runoff volumes and peak discharges show that the drainage is not adversely affected and that the designated storm water control features (i.e. diversion swales, downchutes, perimeter swales, and culverts) are adequate.

Drawing D-1 in Attachment 1 of this report provides the drainage areas, cross-sectional areas, and grades used in the analysis.

The TCEQ Guidelines for Preparing a Surface Water Drainage Report for a Municipal Solid Waste Facility (RG-417) and the Rational Method described in Chapter ~~5~~4, Section ~~6~~12 of the Texas Department of Transportation's Hydraulic Design Manual (TxDOT ~~2004~~2019) was used to calculate the peak discharge flows. Use of USDA Natural Resources Conservation Service (NRCC) Technical Release 55 (TR-55) method has been approved by the Texas Commission on Environmental Quality (TCEQ) Executive Director for the calculation of the runoff volumes. The values for runoff volume, peak discharge, and flow velocity calculated in this analysis are used to design the erosion and sediment controls and to confirm that the existing drainage patterns for the landfill will not be adversely affected because of these modifications.

2.1. Runoff Volume

The volume of runoff from the landfill cover is dependent on the anticipated amount of precipitation and potential abstractions (principally infiltration) which depend on the soil type, vegetative cover, and the hydraulic conditions of the soil and proposed cover material.

The runoff volume from the landfill is calculated in accordance with 30 TAC §330.63(c)(1)(C) and §330.305(a) using the Curve Number (CN) Method, also known as the Soil Conservation Service (SCS Runoff Curve Number Method) method TR-55:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)}$$

Where: Q = runoff (inches over the watershed area)

P = precipitation for the 25-year/24-hour storm event (inches)

S = 1000/CN – 10 = potential maximum retention after runoff begins (inches)

CN = SCS curve number (Table 2-2, Chapter 2, TR-55)

The following assumptions were used to obtain the values above:

P = 3.~~5~~3 inches (NOAA National Weather Service, ~~Technical Paper 40, 1961~~NOAA Atlas 14 Volume 11, Version 2 Latitude 31.8811 Longitude -106.3928)

CN = 82 (weighted average: 106.3 acres of CN 81 from Table 2.2d, fair herbaceous cover Hydrologic Soil Type C and 3.2 acres of CN 85 from Table 2.2a, Gravel access roads Hydrologic Soil Type B)

Therefore, the total runoff volume for the landfill during a 25-year, 24-hour storm event is:

S = 1000/82 – 10 = 2.2

Q = (3.~~5~~3 – 0.2*2.2)^2 / (3.5 + 0.8*2.2) = 1.~~78~~62 inches

Runoff Volume = Q*A = 1.~~78~~62 inches (109.5 acres)/12 = ~~16.2~~14.7 acre-feet (ac-ft).

A copy of Worksheet 2 from TR-55 is provided as Attachment 1 of this report.

Table 2-1
Summary of Runoff Volumes

Precipitation (P)	Runoff (Q)	Total Runoff Volume (V)
3.~~5~~3 inches (25-year, 24-hour)	1.~~78~~62 inches	~~16.2~~14.7 ac-ft

The landfill was divided into ~~19~~2 separate drainage (watershed) areas based on the final grading plan as shown on Sheets C-2 and C-3 of Appendix B (Design Drawings) of the permit modification application. The following table summarizes the runoff volume for each watershed.

Table 2-2
Runoff Volumes by Watershed

Watershed No.	Area (acres)	Runoff Volume (ac-ft)
1	4.~~4~~41	0.6
2	12.~~5~~50	1.~~9~~7
3	~~2.0~~1.95	0.3
4	0.~~9~~84	0.1
5	1.~~1~~29	0.2
6	2.~~3~~04	0.3
7	2.~~1~~12	0.3
8	0.~~8~~80	0.1
9	1.~~9~~93	0.3
10	1.~~3~~31	0.2
11	0.~~5~~52	0.1
12	~~14.3~~11.13	~~2.~~1.5
13	~~6.8~~3.36	~~1.~~0.5
14	4.~~4~~35	0.~~7~~6
15	4.~~4~~44	0.~~7~~6
16	7.~~9~~90	1.~~2~~1
17	~~17.8~~19.32	2.6
18	~~19.9~~17.06	2.3.~~0~~
19	4.~~2~~24	0.~~5~~6
20	2.60	0.4
21	4.87	0.7
Total:	109.~~5~~0	~~16.2~~14.7

2.2. Peak Discharges

The peak discharge at any storm water control outlet or overland flow from a watershed area is dependent on the time of concentration of that watershed area or drainage swale outfall. The following paragraphs described the rational method and assumptions used to calculate the peak discharge flows for each of the ~~19~~21 watershed areas shown on Drawing D-1 in Attachment 1 of this report.

2.2.1. Time of Concentration

The time of concentration (Tc) is the time required for a drop of water to travel from the most hydrological remote point in the watershed to the point of collection.

The time of concentration was calculated according to the procedures specified in TR-55 for each watershed area.

The steps for determining the time of concentration are summarized below:

1. The landfill was divided into ~~19~~21 separate watershed areas based on the final grading plan as shown on Drawing D-1 in Attachment 1.

2. The area of each watershed was determined as summarized in Table 2-2.

3. The sheet flow, shallow concentrated flow, and channel flow lengths and slopes were determined for each watershed area using the grades shown on Drawing D-1 in Attachment 1 of this report.

4. The travel time (Tt) for the separate types of flow in each watershed area were calculated (Worksheet 3, Chapter 3, TR-55) using the following equations and then added together to compute the total Tc for the watershed area:

   Tc = Sheet Flow Tt + Shallow Concentrated Flow Tt + Channel Flow Tt

   a. Sheet flow travel time was calculated with a maximum flow length of 300-feet using Overton and Meadow's equation: Tt = 0.007 (nL)0.8 / (P2)0.5 (S)0.4 (the value for "bare soil", 0.011, was used for the roughness coefficient n).

   b. Shallow concentrated flow travel time was calculated using the equation Tt = L/3600*V where the average flow velocity (V) was obtained from Figure 3.1 in Chapter 3 of TR-55 for unpaved surface at the specified watercourse slope.

c. Channel flow travel time was also calculated using Tt = L/3600*V where the average flow velocity was calculated by the Manning's equation:

V =1.49*(r 2/3) (s ½) / n. (0.022 was used for Manning's roughness coefficient for the grass swale, n). The following iteration was followed to determine the final Tt:

1. Depth of flow, "y", is assumed.
2. Cross-section area, wetted perimeter, and hydraulic radius are calculated.
3. Tt is determined and the peak discharge is computed with TR-55.
4. The peak discharge is used in the Manning's equation to determine the depth of flow, "y".
5. The computed depth of flow is compared with the assumed value. The assumed value is adjusted and the calculation reiterated until the calculated and assumed values are close in value.

2.2.2. Rational Method

The procedure for calculating the Rational Method described in Chapter ~~5~~4, Section ~~6~~12 of the Texas Department of Transportation's Hydraulic Design Manual (TxDOT ~~2004~~2019) was used to calculate the maximum rate of runoff. The Rational Method estimates the peak rate of runoff at any location in a watershed as a function of the drainage area, runoff coefficient, and mean rainfall intensity of duration equal to the time of concentration. The rational formula is expressed as:

Q = ~~CC_fIA~~CIA

Where: Q = Maximum rate of runoff (cfs)

C = Runoff coefficient (0.38 based on poor vegetative cover and relatively flat land)

~~C_f = Runoff Coefficient Adjustments (1.1 for the 25-year storm)~~

I = Average rainfall intensity (in/hr) for the 25-year/24 hr and the time of concentration for each area as described in Section 2.2.1 above.

A = Drainage area (acres)

Because all of the watersheds are small and the fact that they had times of concentration less than 10.25 minutes ~~(~~a minimum time of concentration of 10 minutes ~~recommended by~~

~~2004 TxDOT Hydraulic Manual),~~was applied, the rainfall intensity for the 25-year storm for all watersheds was ~~4.4~~6.1 inches/hour. The runoff coefficient was calculated as a factor of the relief, soil infiltration characteristics, vegetative cover, and surface type in accordance with the Hydraulic Design Manual (TxDOT ~~2004~~2019). A runoff coefficient factor of 1.1 was used to adjust the runoff coefficient since these calculations are for the 25-year storm event. A sample calculation and the results of the peak discharge calculations for the ~~19~~21 watersheds are provided in Attachment 1 and Table 2-3, respectively.

Table 2-3
Peak Discharges

Watershed No.	Area (acres)	Time of Concentration (hours)	Peak Discharge (cfs)
1	4.4	0.14	~~8.1~~10.2
2	12.5	0.11	~~23~~29.0
3	2.0	0.03	~~3.6~~4.5
4	0.~~9~~8	0.03	1.~~6~~9
5	1.~~1~~3	0.01	~~1.9~~3.0
6	2.~~3~~0	0.09	4.~~2~~7
7	2.1	0.11	~~3~~4.9
8	0.8	0.08	1.~~5~~9
9	1.9	0.16	~~3~~4.5
10	1.3	0.04	~~2.4~~3.0
11	0.5	0.03	1.~~0~~2
12	~~14.3~~11.1	0.17	~~26.2~~25.8
13	~~6.8~~3.4	0.04	~~12.5~~7.8
14	4.4	0.07	~~8.0~~10.1
15	4.4	0.07	~~8.2~~10.3
16	7.9	0.~~10~~1	~~14.5~~18.3
17	~~17.8~~19.3	0.~~07~~14	~~32.7~~44.8
18	~~19.9~~17.1	0.14	~~36.6~~39.5
19	4.2	0.06	~~7~~9.8
20	2.6	0.03	6.0
21	4.9	0.07	11.3

2.3. Peak Runoff Velocity Calculations

The general surface hydrology and stormwater runoff for the final cover grades are shown on Drawing D-1 in Attachment 1 of this report. Storm water from watersheds 1, 2, 3, 10, 12, 13, 16, 17, 18, 20 and ~~18~~21 drain straight to the perimeter drainage swales, whereas watersheds 4 through 9, 11, 14, 15, and 19 drain to erosion control lined diversion swales and then out to the existing perimeter drainage swales. Downchutes are used to convey runoff down steep embankments. Culverts collect runoff from the perimeter drainage swales and discharge to the natural surrounding flow patterns that generally flow towards the southeast, southwest, and northwest corners of the landfill.

The flow velocities and the flow depths for the diversion swales, perimeter swales, and downchutes are summarized below in Tables 2-4 through 2-6. The typical diversion swale is V-shaped, 1 to 2 feet deep with approximately 10 (H): 1 (V) side slopes on one side and 2 (H): 1 (V) side slopes on opposite side. The typical perimeter swale is trapezoidal, 1 to 2 feet deep with 4 (H): 1 (V) side slopes and a bottom width that ranges from 13 feet to 30 feet. The typical downchute is trapezoidal in shape, 1 to 2 feet deep with 1 (H): 1 (V) side slopes. Details shown on Sheet C-7 in Appendix B (Design Drawings) of the permit modification were used for the hydraulic analysis of the landfill drainage structures. A sample calculation of the methodology used for determining the velocities and flow depths is provided in Attachment 1. As demonstrated in Tables 2-4 through 2-6, flow depths of each conveyance structure are less than or equal to 1 foot, therefore all drainage structures provide sufficient capacity to convey peak flow from the 25-year, 24-hour storm event. Erosion control measures for velocities greater than the permissible velocity of the soil are discussed in Section 3.0 of this report.

Table 2-4
Velocities and Depths of Flow in Diversion Swales

Diversion Swale	Watershed Associated with Swale	Peak Discharge (cfs)	Flow Depth (ft)	Velocity (ft/s)
DS-1A	4	1.~~6~~9	0.~~3~~29	3.~~7~~82
DS-1B	5	~~1.9~~3.0	0.~~3~~38	3.~~1~~50
DS-1C	6	4.~~2~~7	0.~~4~~47	3.~~5~~62
DS-1D	7	~~3~~4.9	0.~~4~~48	3.~~3~~48
DS-1E	8	1.~~5~~9	0.~~3~~32	~~2.9~~3.06
DS-2A	19	~~7~~9.8	0.~~6~~60	4.~~4~~62
DS-3A	11	1.~~0~~2	0.~~2~~24	3.~~3~~44
DS-3B	21	1.4	0.30	2.54
DS-4A	12	0.9	0.30	1.60

DS-4B	17	13.4	0.79	3.54
DS-4C/4D	14, 15~~,~~ & 17	~~48~~59.9	0.~~9~~99	~~5.8~~6.07
DS-SDA	14	~~8.0~~10.1	0.~~7~~78	2.~~6~~77
DS-SDB	15	~~8.2~~10.3	0.~~7~~76	2.~~8~~98

The potential need and sizing of diversion swales DS-3B, DS-4A, and DS-4B will be evaluated further during final design. Diversion swale DS-1F will convey a minor amount of flow and is intended to funnel any remaining runoff that is not directly captured by downchute DC-3. Therefore, analysis of theses drainage structures is not included in Table 2-4.

Table 2-5
Velocities and Depths of Flow in Perimeter Swales

Perimeter Swale	Watershed Associated with Swale	Peak Discharge (cfs)	Flow Depth (ft)	Velocity (ft/s)
PS-1A	3 thru 5, 10 & 19	~~17~~22.3	0.4	2.~~3~~5
PS-1B	10	~~2.4~~3.0	0.2	1.~~0~~1
PS-2A/2B/2C/2D	1, 6 thru 9	~~21.3~~26.1	0.~~2~~3	1.~~3~~5
PS-3A	2	~~23~~29.0	~~1.~~0.8	~~1~~2.7
PS-4A	16 & 18	~~51.1~~57.8	0.5	1.~~7~~8
PS-4B	16	~~14.5~~18.3	0.~~2~~3	2.~~1~~3
PS-5A	11~~ thru 15 &~~, 12, 13, 17, 20 & 21	~~88.6~~97.5	0.6	~~2.9~~3.0
PS-5B	11~~ thru 13~~, 12, 20 & 21	~~39.7~~44.3	0.~~5~~6	1.8
PS-5C/5D/5E/5F	11~~ & 12~~, 20 & 21	27.2	0.4	2.4

Table 2-6
Velocities and Depths of Flow in Downchutes

Downchute	Watershed Associated with Downchute	Peak Discharge (cfs)	Flow Depth (ft)	Velocity (ft/s)
DC-1	4 & 5	~~3.5~~4.9	0.1	4.~~0~~5
DC-2	6 & 7	~~8.1~~9.6	0.1	5.~~5~~8
DC-3	8 & 9	~~5.0~~6.3	0.1	~~4.~~5.0
DC-4	14 & 15	~~16.2~~20.4	0.2	7.~~2~~9

2.4. Culvert Capacity Calculations

~~Storm water from the perimeter drainage swales drain to four sets of culverts. Three sets of culverts~~There are three locations of discharge to the natural surrounding flow patterns at the southeast, southwest, and northwest corners of the landfill. ~~The fourth culvert conveys flow south across the access point on the west side of the landfill.~~Storm water from the perimeter drainage swales drain to 2 sets of culverts at discharge lo natural surroundings and one internal culvert located at the construction entrance on the west side connecting to a pond. The third discharge point exits at the southwest discharge location across a drivable access swale. All discharge locations are armored to protect against erosion at the discharge locations.

The headwater/depth ratio and outlet velocity are summarized below in Table 2-7. Culverts 1 through 3 will consist of 24-inch CMP barrels and Culvert 4 will have 36-inch barrels. Culverts were sized using nomographs from the Federal Highway Administration HEC-5 manual. These nomographs are provided in Attachment 1. Culverts were sized to provide sufficient capacity to convey peak flow from the 25-year, 24-hour storm event without overtopping. A gabion mattress will be used for erosion control on the outlet side of each culvert. A concrete apron on the inlet side of the culverts will provide erosion control at the culvert entrance. As discussed in Section 3.2.2 below, the permissible velocity for gabions mattresses is 18 ft/sec.

Table 2-7
Velocities and HW/D Ratios of Flow in Culverts

Culvert	Watershed Associated with Culvert	Culvert Size	Peak Discharge (cfs)	HW/D Ratio	Outlet Velocity (ft/s)
~~C~~DC-1	3 thru 5, 10 & 19	~~One~~Two Barrel, 24" CMP	~~17~~22.3	1.5	5.~~5~~8
~~C-2A~~	~~1, 6 thru 9~~	~~Two Barrel, 24" CMPs~~	~~21.3~~	~~1.5~~	~~3.4~~
~~C~~DC-2	1, ~~2,~~ 6 thru 9	~~Three~~Two Barrel, 24" CMPs	~~48.4~~26.2	1.5	~~5~~6.1
~~C~~DC-3	11 thru 18, 20, 21	~~Three~~Four Barrel, 36" CMPs	~~139.7~~175.0	1.3	~~6.6~~8.1

2.5. Summary of Drainage Analysis

Table 2-8 summarizes the results from the pre-developed (permitted facility conditions per the approved 1995 Closure Plan) and post-developed conditions (final closure with optimized ET cover design and grading plan) to demonstrate that the proposed modification does not adversely affect the drainage patterns. The comparison illustrates that the range of peak flow and normal depth of flow decrease compared to pre-developed conditions. This is due to the smaller watersheds created by the modified grading plan. However, the maximum velocities increase over the pre-development condition. This is due to the use of internal downchutes off two of the landfill cells. These ~~downshutes~~downchutes will be protected from scour with the use of gabion mattresses as described in Section 3.2.2 below and will discharge to shallow swales before the stormwater is discharged off-site. The drainage patterns were not altered significantly so as to change the previously permitted drainage conditions of the site.

Table 2-8
Comparison of Peak Discharges, Flow Depths, and Flow Velocities in Swales

Condition and Analysis	Range of Peak Discharge (cfs)	Range of Normal Depth of Flow, y (ft)	Range of Flow Velocities (ft/s)
Pre-Development (2005 Permitted)	10.9 – 73.6	0.7 – 1.1	1.9 – 3.9
Post-Development (Optimized ET Cover and Grading)	1.~~0 – 36.6~~1 – 44.8	0.1 – 1.0~~.7~~	1.1 – 7.~~2~~9

3. Erosion and Sediment Control Plan

This plan describes the design and operation considerations for erosion and sediment control measures specified and best management practices (BMPs) of the landfill facility in order to minimize erosion and provide effective erosional stability to top dome surfaces and external embankment side slopes during all phases of landfill operations in accordance with 30 TAC §330.305(d).

The plan lays out the erosion and sediment control measures for the three conditions of the Fort Bliss MSWLF: the active Subtitle D disposal areas, intermediate cover areas, and final cover areas. The installation of the proposed erosion and sediment control measures will be on-going and include both temporary and permanent controls throughout the remaining duration of the landfill operation until closure is completed when all permanent controls are finally installed.

Landfill cover phases are defined as daily cover, intermediate cover, and final cover. The topography of the landfill changes over time as the landfill is operating and reaching closure grades. In order to comply with 30 TAC §330.305(d), top dome surfaces and external embankment side slopes are defined as areas of above graded slopes that drain to the perimeter swales, areas that have received intermediate or final cover, and areas that have received their permitted elevation and will remain inactive for longer than 180 days. Slopes that drain to cells where waste is being placed are not considered external embankment side slopes.

Based on the above definitions, all areas of the Fort Bliss MSWLF will require erosion and sediment controls per 30 TAC §330.305(d) with the exception of active internal slopes within Subtitle D cell where waste and daily cover are being placed.

3.1. General Erosion and Soil Loss Assessment

Areas of the site most prone to erosion and soil loss are areas of soil disturbance for the landfill operations, areas with steep slopes for intermediate and final covers, and intermediate or permanent drainage swales that control storm water discharges leaving the site. Therefore, the erosion and sediment control plan focuses on these sensitive areas and incorporates structural and non-structural controls to guard against soil loss from the site.

During a rain event, stormwater falls on the top dome and embankment side slopes of the landfill where erosion is more susceptible. In areas of steeper slopes and embankment side slopes, structural BMPs such as temporary soil berms and diversion swales are proposed to control the runoff and minimize erosion. The following sections, accompanied by the Permit Modification Drawings in Appendix B (Design Drawings) describe the design for structural erosion control measures proposed to avoid erosion and off-site discharge of sediments during the phases of landfill operation through final closure. Maintenance and inspections are addressed in Section 3.4 of this report.

3.2. Interim Construction Stages

This sub-section describes temporary and intermediate erosion control measures that will be used during the landfill interim construction stages to minimize erosion of top dome surfaces and external embankment side slopes as required by 30 TAC §330.305(e)(2). The erosion control measures were selected and designed based on velocity and soil erosion analyses. The temporary erosion control measures shall remain in place until the final cover installation is completed and all permanent erosion control measures have been installed.

3.2.1. Description of Phase Development

Interim construction phases include filling of waste, daily cover grading, and placement of intermediate soil cover in the Subtitle D. The phased development for landfill cell construction and solid waste placement will be followed as specified in the typical fill operation cross section detail on Sheet C-6 in Appendix B (Design Drawings) of the permit modification. This sequencing will ensure adequate slope stability and limited erosion and soil loss during cell construction and installation of the intermediate and final cover systems.

During filling operations through installation of the final cover, the top dome of the daily and intermediate cover for Subtitle D shall be sloped at 2% to 5% and the external embankment side slopes will be 4(H):1(V). Stormwater shall be controlled with temporary soil berms, and diversion swales to avoid erosion of the embankment side slopes and maintain flow velocities at or below the permissible non-erodible velocity.

The temporary soil berms will be used on-cap to divert runoff to the diversion swales, located around the perimeter of Subtitle D cell, as shown on Drawing D-1 in Attachment 1 of this report. The typical temporary soil berm design will be 2-foot high as measured from the invert of the channel to the top of berm, with the invert sloped at 0.5% minimum and 10% maximum in the direction of flow towards the diversion swales. The slopes of the soil berms will be stabilized with mulch or equal (see Section 3.2.3 below).

Two diversion swales will run around the perimeter of the Subtitle D cell cap to convey runoff from temporary soil berms as shown on Drawing D-1. The recommended minimum dimensions of the discharge swales are V-shaped, 1 to 2 feet deep with 10 (H): 1 (V) side slopes on one side and 2 (H): 1 (V) side slopes on opposite side. Stabilization of the swales shall be established using a Rolled Erosion Control Product (RECP) or recycled concrete rip-rap (free of metal or rebar) to be selected in final design. A specification of the RECPs is included in Attachment 4.

The drainage swales will convey runoff to the on-cap downchute. Runoff from this downchute will eventually be conveyed off-site via perimeter swales and culverts. Hydraulic analysis of the diversion swales, downchutes, perimeter swales, and culverts are included in Attachment 1.

3.2.2. Erosion and Sediment Controls Design

The erosion and sedimentation controls described above were designed based on the following criteria outlined in 30 TAC §330.305(d), to ensure the stability of top dome surface and external embankment side slopes:

The estimated peak runoff velocity should be less than the permissible non-erodible velocities under similar conditions. Typical permissible non-erodible flow velocities assumed for the design are:

- Silty-Sandy Loam is 3 ft/sec
- Recycled Concrete Rip-Rap (D50 > 9”) is 9 ft/sec
- Rolled Erosion Control Product (unvegetated) is 12 ft/sec
- 12” Thick Gabion Mattress is 18 ft/sec

The potential soil erosion loss should not exceed the permissible soil loss for comparable soil slope lengths and soil-cover conditions. The soil erosion loss of 50 tons/acre/year is selected as the permissible soil erosion loss for interim erosion and sediment controls as recommended in the *Guidance for Address Erosional Stability During All Phases of Landfill Operation, 30 TAC §330.63(c), §330.305(c), (d) and (e), 02/14/07*.

Peak Runoff Velocities Calculations

To calculate the flow velocity being conveyed along the temporary soil berm and out the swales and downchute as described above and shown on Drawing D-1 in Attachment 1 of this report, the interim peak discharge from watershed 14 was used. The flow velocity along the temporary soil berm is 2.5 ft/sec on the top dome and the flow velocity through the permanent swale along the top dome is 2.~~6~~9 ft/sec. Thereafter, the velocity through the downchute is 7.~~2~~9 ft/sec and the velocity through the swale off the landfill is 5.8 ft/sec as calculated in Section 3 and presented in Tables 2-4 through 2-6 and Attachment 1.

Drainage and conveyance structures were designed and sized to withstand erosive forces of water and not to exceed the permissible non-erodible velocities presented in Section 3.2.2 and summarized in Table 3-1.

Table 3-1
Comparison of Calculated Flow Velocities and Permissible Non-Erodible Velocities

Type	Velocity	Permissible Non-Erodible Velocity
Temp. Soil Berm – Subtitle D Top Dome	~~2.5~~3.0 ft/sec	3 ft/sec (silty-loam)
Swale – Subtitle D Top Dome	2.~~6~~9 ft/sec	9 to12 ft/sec (RECP or Recycled Rip-Rap)
Downchute – Off Subtitle D Top Dome	7.~~2~~9 ft/sec	18 ft/sec (Gabion Mattress)
Swale – Off Landfill	5.8 ft/sec	9 to12 ft/sec (RECP or Recycled Rip-Rap)

To further reduce flow velocities and allow sediments and other pollutants to settle, rock check dams will be installed along the drainage swales as shown on Sheets C-4 and C-5 in Appendix B (Design Drawings).

The hydraulic calculation supporting this design of the temporary soil berm is included in Attachment 2. The hydraulic calculation supporting the design of the permanent diversion drainage swales are included in Attachment 1.

Soil Loss Calculations

Soil erosion loss was estimated utilizing the Revised Universal Soil Loss Equation Version 2 (RUSLE2). RUSLE2 uses factors that represent the effects of climate (erosivity, precipitation, and temperature), soil erodibility, topography, cover management, and support practices to compute soil loss and erosion.

RUSLE2 is a mathematical model that uses a system of equations implemented in a computer program to estimate erosion rates. The other major component of RUSLE2 is a database containing an extensive array of site/county specific values (precipitation, R, EL, etc.) that are used by the RUSLE2 user to describe a site-specific condition so RUSLE2 can compute erosion values that directly reflect conditions at a particular site. The RUSLE2 computer program and its extensive database information were developed by the USDA-

Agricultural Research Service (ARS), USDA-Natural Resources Conservation Service (NRCS) and the University of Tennessee. The soil loss estimation slope is 1,500 feet long from the crest of the subtitle D cell to the perimeter swale. The RUSLE2 computer program allows for a maximum of 1,000 feet. Therefore, the soil estimation slope was divided into two segments. A 1,000 foot segment with an average slope of 1.8% was calculated using the following flow segments: 270 feet at 0.5%; 280 feet at 1.7%; 20 feet at 25%; and 430 feet at 1.6%. The 500 foot segment has an average slope of 1.8%.

Results show soil losses of 2.9 tons/acre/year. With the rock check dams installed as a best management practice (BMP) for pollution prevention, the soil losses would be reduced to 0.08 tons/acre/year. The soil loss analyses demonstrate that proposed erosion and sedimentation controls can achieve effective erosional stability. Soil loss calculations are included in Attachment 2.

3.2.3. Soil Surface Stabilization – Interim Measures

The selected BMPs to be implemented during landfill operations, for soil stabilization and stormwater control, are ones that are proven and commonly used as described below.

Temporary stabilization of intermediate cover on top dome and external slopes will be completed within 180 days after installation and maintained until the final cover is placed and permanent stabilization controls implemented. The specific cover practices that will be implemented prior to installation of final closure:

- Mulch - Mulching is the application of a layer of organic, biodegradable material which is spread over areas where vegetation is not yet established. Types of mulch include compost, straw, wood chips, or manufactured products. Mulch application can be in dry or hydraulic forms. When applied dry, the thickness of the mulch will vary depending on the type of mulch applied. Primary-grind mulch (e.g. wood shreds that form a mass of intermixed fragments), which will be used primarily for erosion control, will be applied using spreading equipment, such as a bulldozer, at a minimum thickness of 2-inches. Compost material, which will consist of more finely ground mulch, will be applied using mechanical spreaders or sprayers. A tackifier or binder can be used to increase the strength and durability of the mulch. Hydraulic mulch applications consist of the use of hydromulch, bonded fiber matrix, Flexible Growth Medium (FGM), as well as other commercially available products. Hydraulic mulch typically includes a tackifier or binder. Seeds can be applied to the soil first or mixed into the hydraulic mulch.

  The application method and application rate of hydraulic mulch will be based on manufacturers' recommendations to ensure a uniform and complete coverage. Any mulch (dry or hydraulic) that is used shall be evaluated by site personnel to ensure it remains in place on the slopes during rain events or windy conditions.

For erosion control in drainage swales as shown on Drawing D-1 in Attachment 1 of this report, rolled-erosion control Turf Reinforcement Mat (TRM) products can be used and are specified herein. The standard specification for rolled erosion control products published by the Erosion Control Technology Council is provided in Attachment 4.

For pollution prevention, rip-rap rock check dams (rock check dam) are specified. These types of silt control structures are alternatives of traditional silt fences and straw bales. A typical rock check dam consists of rip-rap rock placed in a swale with gravel filter on the upstream face that decreases velocity so that sediment can settle out of the storm water before passing over the dam. Rock check dams are detailed on Sheet C-9 in Appendix B (Design Drawings).

For on-site stockpiles, some combination of silt fences, rock berms and/or soil berms will be required around the stockpiles to prevent the discharge of sediment-laden runoff from the stockpile area(s) unless vegetation is used to stabilize the stockpiles.

3.3. Final Cover Stage

Permanent erosion and sediment control measures will be installed during the final cover phase. These permanent erosion and sedimentation control measures include an erosion control layer (e.g. mulch and rip-rap). Details of the measures are shown on Sheet C-7 and C-9 in Appendix B (Design Drawings).

3.3.1. Erosion and Sedimentation Controls Design

Permanent erosion and sediment control measures were designed based on the peak flow velocities presented in Tables 2-4 through 2-6 and soil loss analysis discussed below for the final cover design.

Peak Runoff Velocities Calculations

The flow velocity through the drainage conveyance structures where calculated in Section 2.3 and presented in Table 2-4 through 2-7. The diversion swales, downchutes, and culverts will have erosion control protection as specified on the drawings. All the velocities presented in Tables 2-4 through 2-7 compared to the permissible erodible velocities presented in Table 3-1 illustrate that the drainage and conveyance structures were designed and sized to withstand erosive forces of water and not to exceed the permissible non-erodible velocities.

Soil Loss Calculations

RUSLE2 was exercised to compute the soil loss analysis for the final cover surfaces. The 1,000 foot segment now has an average slope of 2.6%, which was calculated using the following flow segments: 270 feet at 3.5%; 280 feet at 1.7%; 20 feet at 25%; and 430 feet at 1.6%. The 500 foot segment has an average slope of 1.8%. The input data for management operations have been changed: vegetative cover and rip-rap surface treatment on embankments added, etc. The results show soil losses of 3.1 tons/acre/year without surface erosion measures in place. The soil losses were reduced to 0.08 tons/acre/year with the use of erosion control measures to meet the permissible soil loss rates. The soil loss analysis demonstrates that the landfill surfaces with proposed erosion and sedimentation controls can achieve recommended soil loss rate. (According to *Guidance for Addressing Erosional Stability During all Phases of Landfill Operation,* 30 TAC §330.63(c), §330.305(c), (d) and (e), 02/14/07, the soil erosion loss of 50 tons/acre/year is a permissible soil erosion loss rate and 2 to 3 tons/acre/year is a recommended rate for final cover phase).

Erosion calculations report is included in Attachment 3. Based on velocity and soil erosion analyses, selections of BMPs are identified and general installation guidance is provided in Appendix B (Design Drawings) of the permit modification.

3.3.2. Soil Surface Stabilization – Permanent Measures

The selected BMPs that will be implemented for final cover and post closure landfill operations, to meet the soil stabilization and stormwater control requirements, are ones that are proven and commonly used as described below.

Vegetation - Vegetative cover reduces erosion potential by shielding the soil surface from the direct erosive impact of raindrops, improving the soil's water storage porosity and capacity, so more water can infiltrate, slowing the runoff and allowing the sediment to drop out, and physically holding the soil in place with plant roots. Vegetative cover will consist of a balanced mixture of native herbaceous and vascular plants. Appendix E of the Final Cover Design report prepared by Weaver Boos Consultants, LLC provides a recommended seed mix for vegetation establishment that utilizes indigenous species of the area such as red threeawn and mesa dropseed. This type of vegetation is more suitable for the area and was selected in accordance with rules and regulations published in the Federal Seed Act and Texas Seed Law. The standard seeding specification published by the Texas Department of Transportation (TxDOT) is provided in Attachment 4.

Localized erosion control protection such as rip-rap surface treatment, RECP, and gabion mattresses will be installed as determined by Fort Bliss at the time of closure.

4. Maintenance and Inspections

In addition to the design and operational considerations as previously described in the Erosion and Sedimentation Control Plan, inspection and maintenance of the stormwater management system and erosion control measures are necessary to maintain the required effectiveness of the system components. The inspection, maintenance, and repair guidelines discussed in the following sections will be implemented into the employee training program as outlined in Site Operating Plan and Stormwater Pollution Prevention Plan 2005.

4.1. Stormwater Management System

The facility will be monitored to ensure the integrity and adequate operation of the stormwater collection and conveyance structures. On a weekly basis and following major storm events, all temporary and permanent drainage facilities will be inspected. Major storm events are events with precipitation totals equaling 1.~~6~~9-inches and greater over a one hour period. This rain fall amount corresponds with a 25-year, 1 hour storm event. In the event of a washout or failure, the drainage system will be restored and repaired pursuant to 30 TAC §330.305(e) (1). Plans and actions will be developed to address and remediate the problem, to ensure protection to ground and surface waters.

Erosion of intermediate and final cover will be repaired pursuant to 30 TAC §330.165(g). Sediment and debris will be removed from swales as needed to maintain the effectiveness of the stormwater management system. Minor maintenance requirements, such as the removal of excessive sediment and vegetation, will be undertaken as required.

In accordance with 30 TAC §330.305(g), Stormwater Pollution Prevention Plan 2005, describes inspections, maintenance, and record keeping frequencies and techniques for the phased development of the landfill. The plan discusses how the owner or operator will handle, store, treat, and dispose of surface or groundwater that has become contaminated by contact with the working face of the landfill or with leachate pursuant to §330.207 of this title (relating to Contaminated Water Management); and how storage areas for this contaminated water will be designed with regard to size, locations, and methods.

A Storm Water Pollution Prevention Plan was prepared for the site in 2005 (Attachment 5). The plan satisfies the control of erosion and sedimentation using interim controls for the phased development of the landfill as required by 30 TAC §330.63(c) (1) and §330.305(c), (d), and (e) until the landfill is closed per the regulations.

4.2. Landfill Cover Materials

Landfill cover soils are inspected on a regular basis. Daily cover soils are inspected and applied as part of the Site Operating Plan requirements. In addition, pursuant to the facility's SWPPP, during the active life of the site, daily, intermediate and final cover will be inspected weekly and after a significant rainfall event for areas of erosion, exposed waste, or other damage. During the post-closure maintenance period of the site, the final cover will be inspected quarterly. The inspections will include any temporary or permanent erosion measures that are in place at the time of the inspection.

Reports of these inspections will be documented in the Cover Application Log and will be maintained as part of the site operating record, in accordance with the Site Operating Plan. Damage to the cover system noted during these inspections will be repaired, as set forth below, and documented in the Cover Application Log. Any runoff from damaged or eroded areas that has met waste will be handled as contaminated water in accordance with SWPPP until the repairs are completed.

In accordance with 30 TAC §330.165(g), erosion gullies or washed-out areas deep enough to jeopardize the intermediate or final cover must be repaired within five days of detection. An eroded area is considered deep enough to jeopardize the intermediate or final cover if it exceeds four inches in depth as measured from the vertical plane from the erosion feature and the 90-degree intersection of this plane with the horizontal slope face or surface. Damage to any temporary or permanent erosion measures that are noted during the inspections, will be repaired or replaced within 14 days of detection. The repair schedule as outlined for the cover or the erosion measures may be extended due to inclement weather conditions or the severity of the condition requiring an extended repair schedule.

Attachment 1

Drainage Basins Map, Peak Discharge Flow and Drainage Swale Design

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Location	Checked	Date

Check one: ☐ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☑ acres ☐ mi^2 ☐ %	Product of CN x area
C	HERBACEOUS (FAIR)	81			106.25	8,606.25
B	GRAVEL (ACCESS ROADWAYS)	85			3.18	270.30
					Totals ➡ 109.43	8,876.55

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{8876.55}{109.43} = 81.12$; **Use CN ➡** $\boxed{82}$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	25		
Rainfall, P (24-hour)	in	3.5		
Runoff, Q	in			

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$ where $I_a = 0.2S$

$S = \frac{1000}{CN} - 10$

$= \frac{1000}{82} - 10 = 2.2$

$Q = \frac{\{3.5 - (0.2)(2.2)\}^2}{\{3.5 - 0.2S + S\}} = \frac{\{3.5 - 0.44\}^2}{\{3.5 - 0.8S\}}$

$= 1.79$