OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: March 2019

DFI No. D00965

Figure 1: DFI No. D00965, looking north

Identification

Drainage Facility ID (DFI):	D00965
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 49V-028
Location:	District: 4
	Highway No.: 33
	Mile Post: 17.80 to 17.82, left

1. Manual Purpose

The purpose of this manual is to outline inspection needs and summarize maintenance actions.

2. Facility Location

The location map below details the facility location. The highway, mile posts, side streets, access location, and stormwater flow directions are noted on the map.

Facility location type: Roadway shoulder

Flow direction: South to North

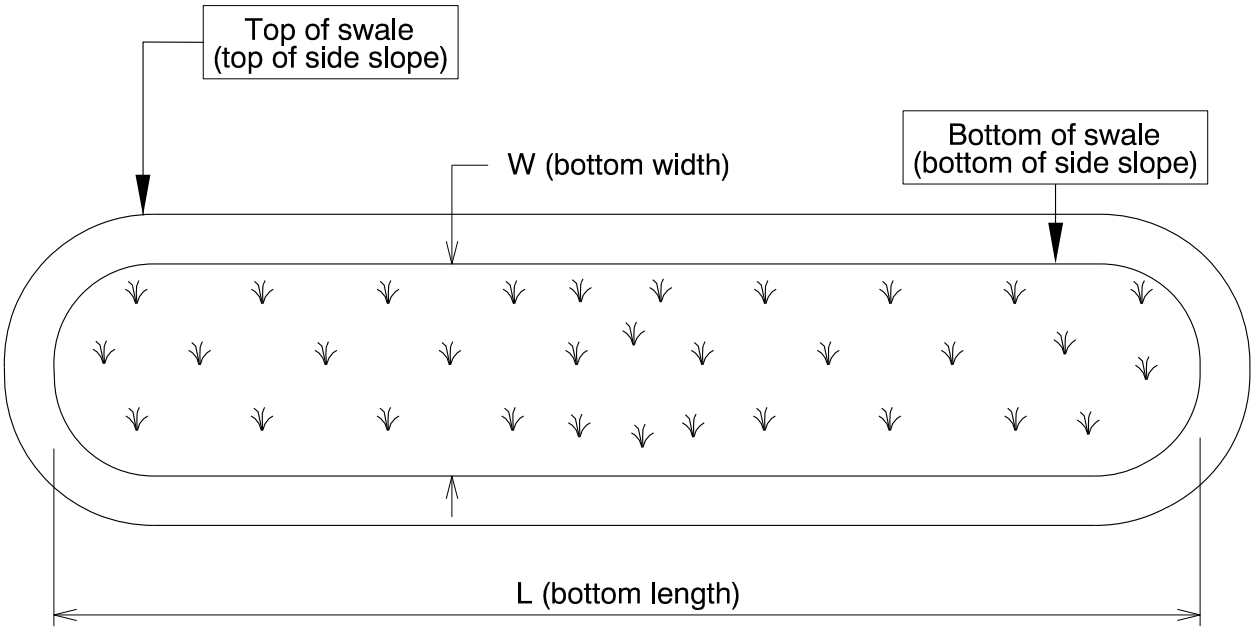
Figure 2: Facility location map

3. Facility Summary

The length and width of a swale is based on the bottom dimensions.

The bottom length and bottom width of the swale is:

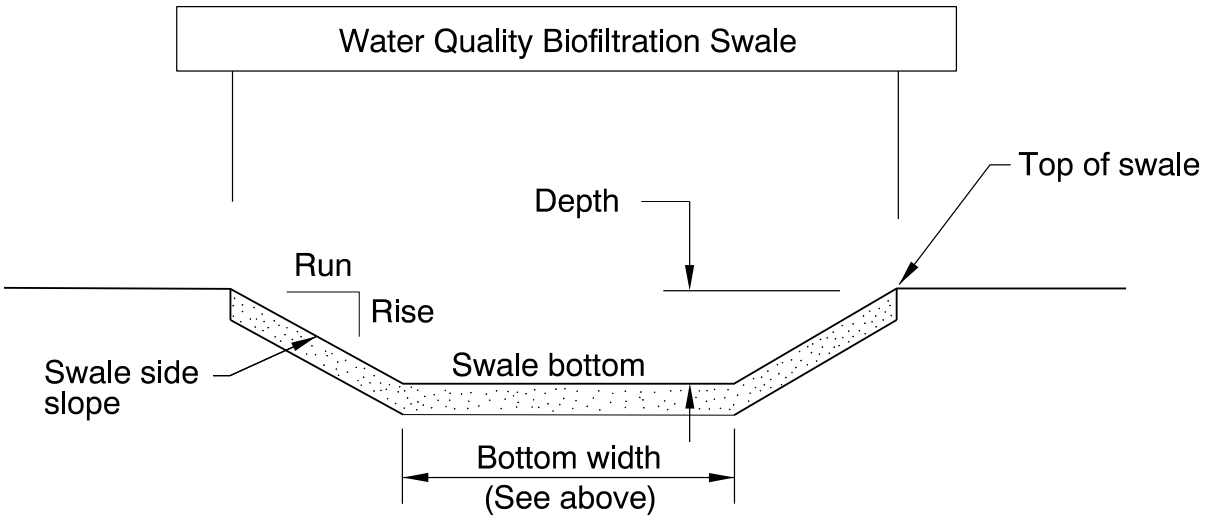
Bottom Length (feet)	Bottom Width (feet)
109	6


Top of swale
(top of side slope)
W (bottom width)
Bottom of swale
(bottom of side slope)
L (bottom length)

The depth of the swale is the vertical distance measured from the bottom of the swale to the top. The slope of the swale sides is presented by a vertical distance (rise) followed by the horizontal distance (run).

Depth and side slopes:

Depth (feet)	Rise (feet)	Run (feet)
1.5 minimum	1	4



Site Specific Information: Water enters the facility from the south in a ditch. Stormwater exits the swale in a ditch on the north end of the swale.

4. Facility Access

Maintenance access to the facility:

☐Roadside pad	☒Roadside shoulder
☐Access road with Gate	☐Access road without Gate

Figure 3: Highway No.: 33, looking north

5. Operational Components / Maintenance Items

Classification

This facility is classified as an:

☒ On-line Swale	☐ Off-line Swale
A swale that does not include a high flow bypass component; flow drains into and through the facility	**A swale that treats low/small flows and diverts high flows using a bypass component**

Bypass Component

This facility includes a high flow bypass component:

☒ No	☐ Yes

There is no bypass component. High flows drains into and through the facility	**There is a bypass component. Only low/small flows drain into the swale. High flows are diverted around the swale using a bypass component**

Operational Components

A swale has many components that assist with treatment, conveyance, and reducing flow velocity to minimize erosion. The components in use can vary depending if the facility was designed to operate on-line or off-line. The facility components table (**Table 1**) has been provided to highlight the applicable components for this facility. The component is in use when the box contains an "x" (e.g. ☒).

The Standard Operation Manual for Water Quality Biofiltration Swales (implemented March 2017) outlines facility operation, typical footprint configuration, and component definitions and details. A link to the manual is attached to the feature marker in TransGIS.
https://gis.odot.state.or.us/TransGIS/

Operational Plan

The applicable standard operational plan for this facility is:

☒ **Operational Plan A**	☐ **Operational Plan B**	☐ **Operational Plan C**
An on-line swale with roadside ditches	**An on-line swale with piped inlets and outlets**	**An off-line swale with a piped high flow bypass**
A standard operational plan illustrates the general facility footprint configuration and explains the purpose of each facility component. Operational plans (A, B, C) are provided in the Standard Operation Manual.		

See Appendix A for the site specific operational plan.

Maintenance Items

Operational components marked in **Table 1** should be inspected and maintained according to Section 7. Each facility component is defined and detailed in the Standard Operation Manual using the associated ID number indicated below.

Table 1: Swale Components		**ID #**
Manholes/Structures		
Pre-treatment manhole	☐	**S1**
Weir type flow splitter/flow splitter manhole	☐	**S2**

Orifice type flow splitter/flow splitter manhole	☐	**S3**
Standard manhole	☐	**S4**
Swale Inlet		
Pavement sheet flow	☒	**S5**
Inlet Pipe (s)	☐	**S6**
Open channel inlet	☒	**S7**
Riprap pad	☒	**S8**
Ground Cover		
Grass bottom	☒	**S9**
Grass side slopes	☒	**S10**
Granular drain rock	☐	**S11**
Plantings	☐	**S12**
Underground Components		
Geotextile fabric	☒	**S13**
Water quality mix	☒	**S14**
Perforated pipe	☐	**S15**
Porous pavers (access grid)	☐	**S16**
Flow Spreader		
Rock basin (used at swale inlet)	☒	**S17**
Anchored board (midpoint of swale or every 50 feet along swale bottom)	☒	**S18**
Other:	☐	**S19**
Swale Outlet		
Catch basin with grate	☐	**S20**
Outlet Pipe (s)	☐	**S21**
Open channel outlet	☒	**S22**
Auxiliary Outlet:	☐	**S23**
Outfall Type		
Waterbody (**C**reek/**L**ake/**O**cean)	☐ **C** ☐ **L** ☐**O**	**S24**
Ditch	☒	**S25**
Storm drain system	☐	**S26**
Outfall Components		
Riprap pad	☐	**S27**
Riprap bank protection	☐	**S28**

6. Maintenance

Maintenance Frequency/Maintain Records

a. Inspect annually. Preferably prior to the rainy season.

b. Clean and maintain as necessary. Refer to Activity 125 for conditions when maintenance is needed.
c. Keep a record of inspections, maintenance, and repairs.

Maintenance Guide/Maintenance Actions

The ODOT Routine Road Maintenance Water Quality and Habitat Guide (the *Blue Book*) outlines the standard maintenance actions for water quality facilities under Activity 125.

There are standard maintenance tables for standard ODOT designs. The maintenance tables describe the maintenance component, the defect or problem, the condition when maintenance is needed, and the recommended maintenance to correct the problem. Use the following tables to maintain ODOT swales:

- Table 1 (General Maintenance): Contains general maintenance and inspection guidelines that are applicable to all ODOT water quality facilities
- Table 3 (Maintenance of Water Quality or Biofiltration Swales): Contains maintenance information for swales

The *Blue Book* can be viewed at the following website:
http://www.oregon.gov/ODOT/Maintenance/Documents/blue_book.pdf

7. Limitations

Access grid installed:

☒ No	☐ Yes

Swales are designed to allow equipment access along the bottom. If an access grid is **NOT** installed, vehicles entering the swale can create depressions (tire ruts), damage vegetation, and damage structural components (e.g. flow spreaders). These conditions may result in poor treatment and drainage performance.

Equipment wheels should be kept on the tops and side slopes. Mower arms may be run along the swale bottom.

8. Waste Material Handling

Material removed from the facility is defined as waste by the Department of Environmental Quality (DEQ). Refer to the roadwaste section of the ODOT

Maintenance Yard Environmental Management System (EMS) Policy and Procedures Manual for disposal options:

http://www.oregon.gov/ODOT/Maintenance/Documents/ems_manual.pdf

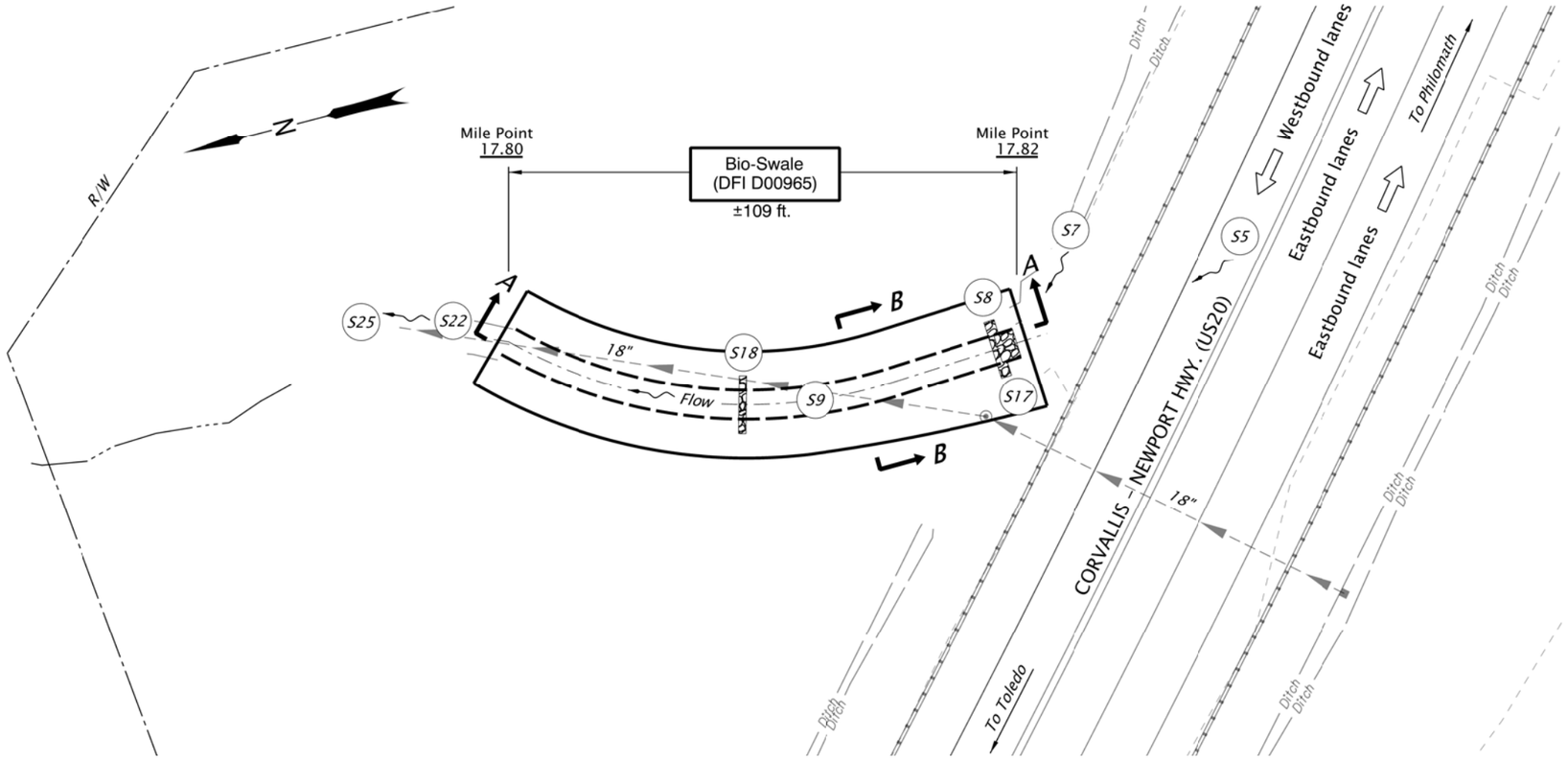
Contact any of the following for more detailed information about management of waste materials found on site:

ODOT Clean Water Unit	(503) 986-3008
ODOT Statewide Hazmat Coordinator	(503) 667-7442
ODOT Region 1 Hazmat Coordinator	(503) 731-8290
ODOT Region 2 Hazmat Coordinator	(503) 986-2647
ODOT Region 3 Hazmat Coordinator	(541) 957-3594
ODOT Region 4 Hazmat Coordinator	(541) 388-6186
ODOT Region 5 Hazmat Coordinator	(541) 963-1590
ODEQ Northwest Region Office	(503) 229-5263

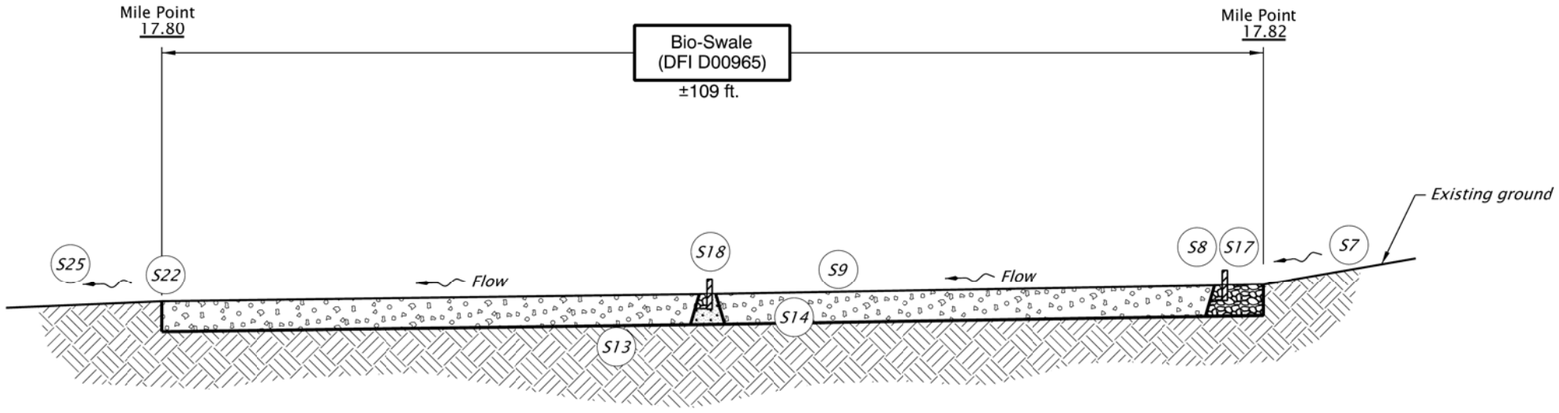
A Appendix A – Site Specific Operational Plan

Contents:

Operational Plan: DFI D00965



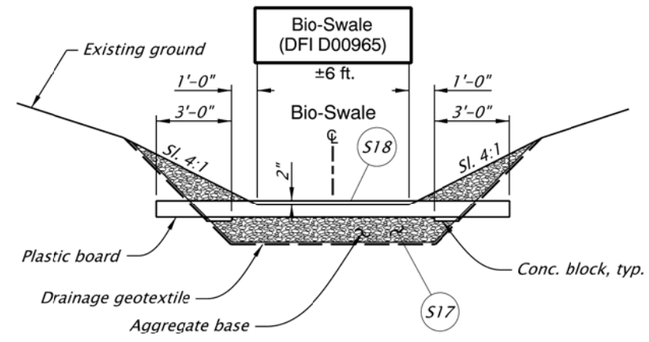
PLAN
N.T.S.



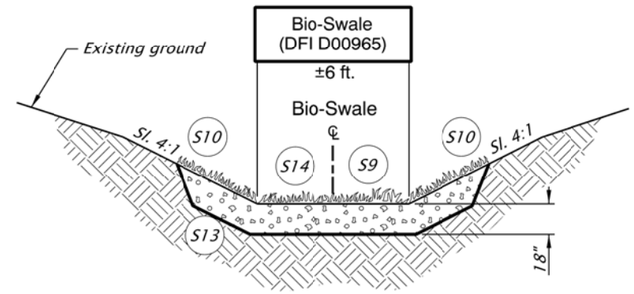
SECTION A–A
N.T.S.

LEGEND:

- *X#* — *Facility Component (see table 1 in O&M Manual)*
- *and / or* — *Manhole*
- *and / or* — *Inlet*
- *Storm Pipe (Facility)*
- *Storm Pipe*
- *Ditch Line*
- *Swale Boundary*
- *Conveyance Direction*
- *Pavement / Facility Flow Path*
- *Traffic Flow Direction*



FLOW SPREADER DETAIL
N.T.S.



SECTION B–B
N.T.S.

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Bruce Carmichael

Drafted By: Jeff Coon

DFI D00965
MAINTENANCE DISTRICT 4 HWY 33
WATER QUALITY BIOFILTRATION SWALE
CORVALLIS-NEWPORT HIGHWAY MP 17.80
LINCOLN COUNTY

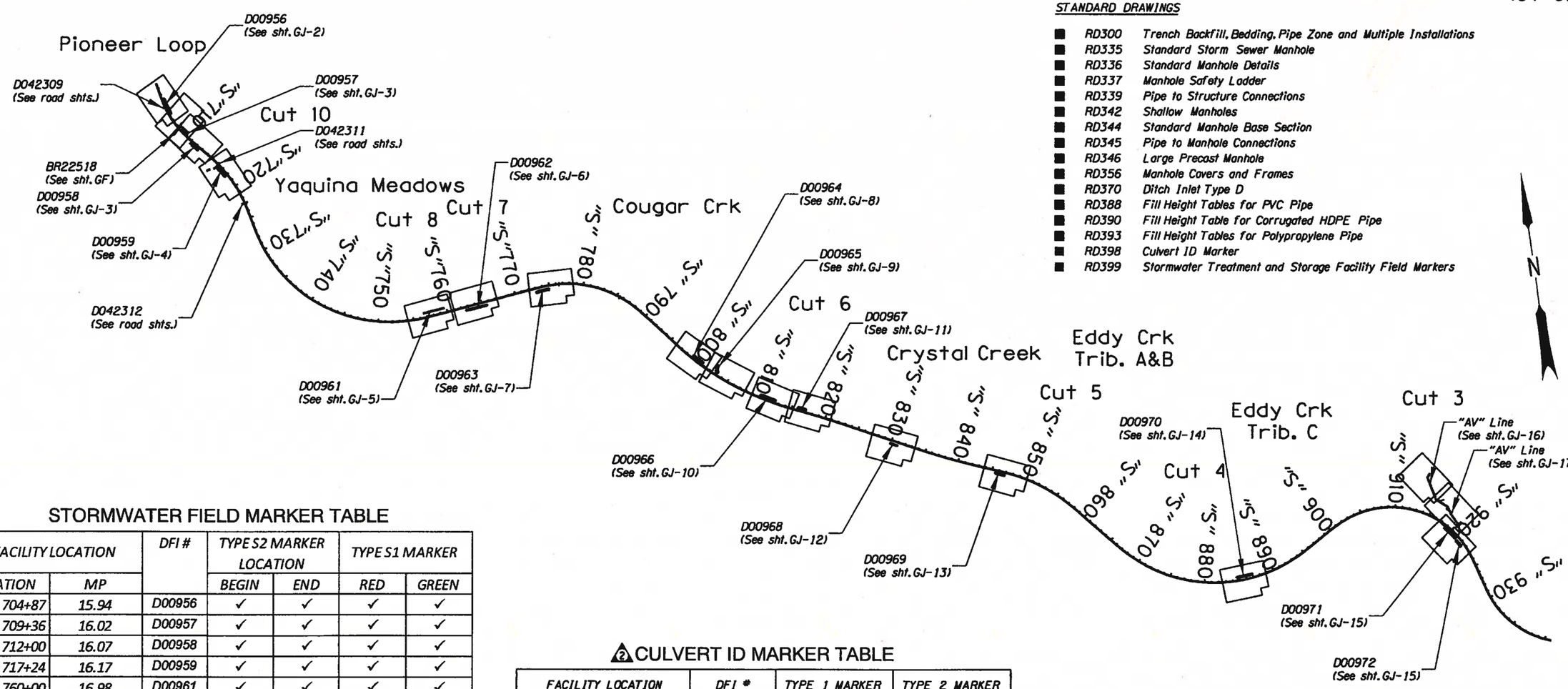
B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 49V-028

HYDRAULIC FEATURE LOCATION INDEX

49V-028



STANDARD DRAWINGS

- RD300 Trench Backfill, Bedding, Pipe Zone and Multiple Installations
- RD335 Standard Storm Sewer Manhole
- RD336 Standard Manhole Details
- RD337 Manhole Safety Ladder
- RD339 Pipe to Structure Connections
- RD342 Shallow Manholes
- RD344 Standard Manhole Base Section
- RD345 Pipe to Manhole Connections
- RD346 Large Precast Manhole
- RD356 Manhole Covers and Frames
- RD370 Ditch Inlet Type D
- RD388 Fill Height Tables for PVC Pipe
- RD390 Fill Height Table for Corrugated HDPE Pipe
- RD393 Fill Height Tables for Polypropylene Pipe
- RD398 Culvert ID Marker
- RD399 Stormwater Treatment and Storage Facility Field Markers

STORMWATER FIELD MARKER TABLE

FACILITY LOCATION		DFI #	TYPE S2 MARKER LOCATION		TYPE S1 MARKER	
STATION	MP		BEGIN	END	RED	GREEN
"S" 704+87	15.94	D00956	✓	✓	✓	✓
"S" 709+36	16.02	D00957	✓	✓	✓	✓
"S" 712+00	16.07	D00958	✓	✓	✓	✓
"S" 717+24	16.17	D00959	✓	✓	✓	✓
"S" 760+00	16.98	D00961	✓	✓	✓	✓
"S" 764+19	17.06	D00962	✓	✓	✓	✓
"S" 773+99	17.25	D00963	✓	✓	✓	✓
"S" 799+80	17.74	D00964	✓	✓	✓	✓
"S" 802+93	17.80	D00965	✓	✓	✓	✓
"S" 811+32	17.96	D00966	✓	✓	✓	✓
"S" 816+41	18.05	D00967	✓	✓	✓	✓
"S" 830+46	18.32	D00968	✓	✓	✓	✓
"S" 846+20	18.62	D00969	✓	✓	✓	✓
"S" 885+81	19.37	D00970	✓	✓	✓	✓
"S" 918+99	19.99	D00971	✓	✓	✓	✓
"S" 920+98	20.03	D00972	✓	✓	✓	✓

See Drg. No. RD399 for facility marker details.

②CULVERT ID MARKER TABLE

FACILITY LOCATION		DFI #	TYPE 1 MARKER		TYPE 2 MARKER	
STATION	MP		INLET	INLET & OUTLET	INLET	INLET & OUTLET
"S" 704+86	15.94	D042309	✓		✓	
"S" 708+40	16.01	BR22518	✓		✓	
"S" 716+20	16.15	D042311	✓		✓	
"S" 722+85	16.28	D042312	✓		✓	

See Drg. No. RD398 for culvert marker details.

No.	DATE	REVISIONS	BY
②	04-04-16	Revised Culvert ID marker table	M.C.M.

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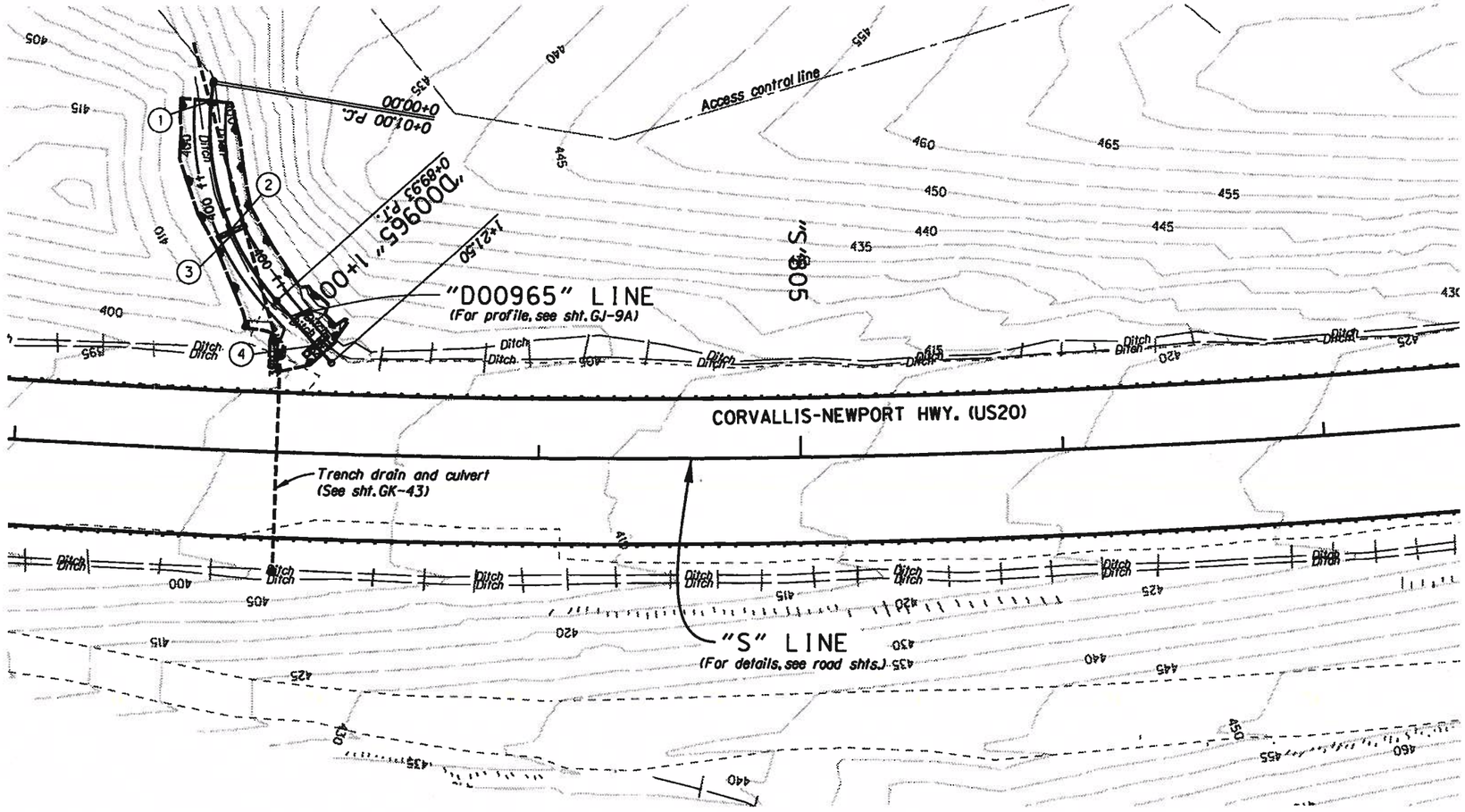
Designed By - Jeremy Tamargo
Drafted By - Sadie Reiter

WATER QUALITY PLAN LAYOUT SHEET

SHEET NO. GJ

D00965

49V-028



GENERAL NOTES:

1. Sta. "S" 802+69.88, 139.86' Lt.
   Begin Sta. "D00965" 0+00
2. Sta. "D00965" 0+07.6 to Sta. "D00965" 1+16.6
   Const. water quality swale, see table this sht.

"D00965" Line Construction Table			
#	"D00965" Line Sta. begin	"D00965" Line Sta. end	Const. (For details, see shts. GJ-20 thru GJ-22)
①	0+07.6	0+57.6	Water quality section
②	0+57.6	0+59.1	Flow spreader
③	0+59.1	1+12.6	Water quality section
④	1+12.6	1+16.6	Energy dissipator

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Designed By - Jeremy Tamargo
Drafted By - Sadie Reiter

WATER QUALITY SWALE PLAN

SHEET NO. GJ-9

D00965

49V-028

420
415
410
405
400
395
390
385

Profile grade @ ℄

399.07

399.59

0.50%

0.00%

Ground line @ ℄

+07.63

+16.63

0+00
1+00
2+00
3+00

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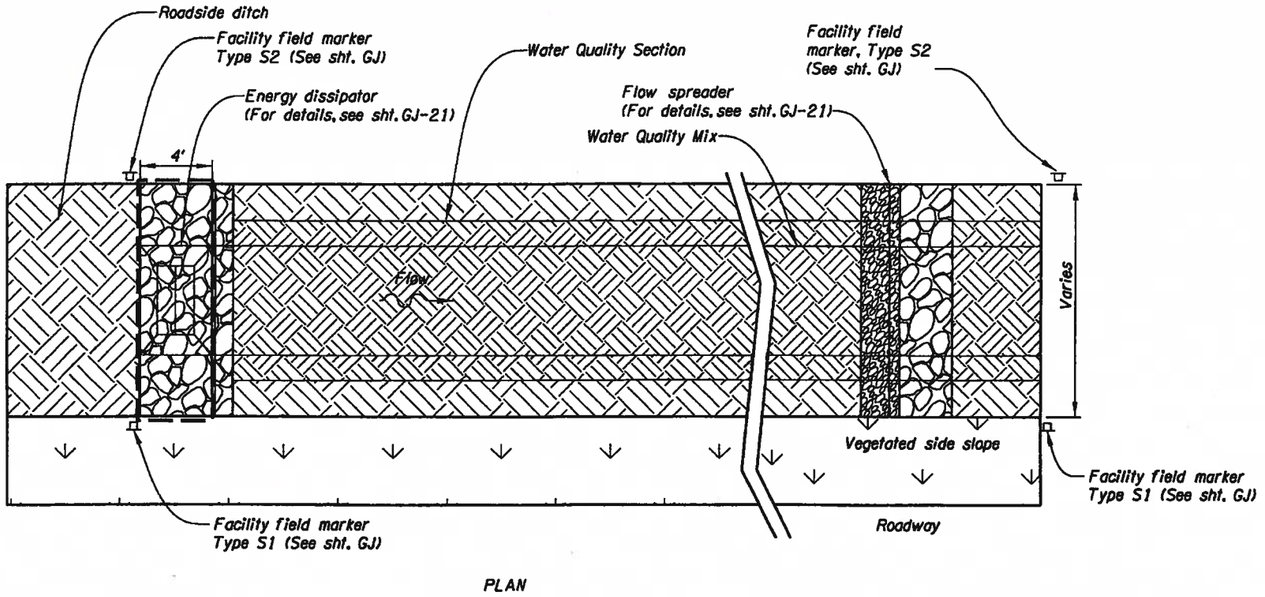
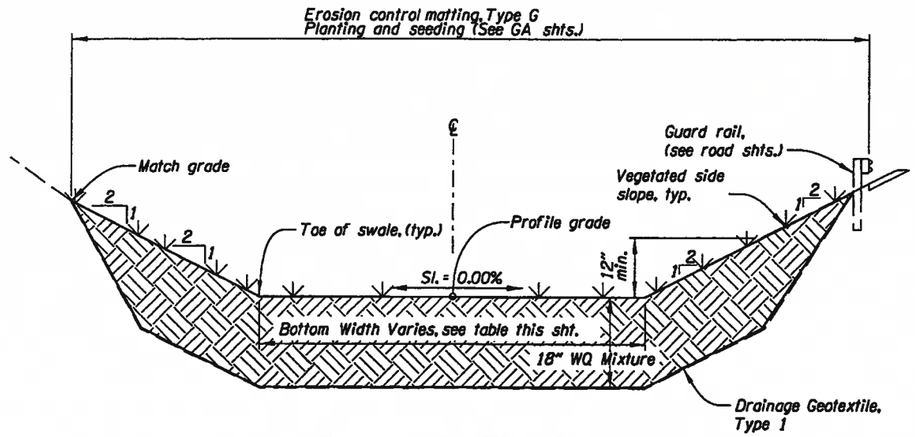
WATER QUALITY SWALE PROFILE

SHEET NO. GJ-9A

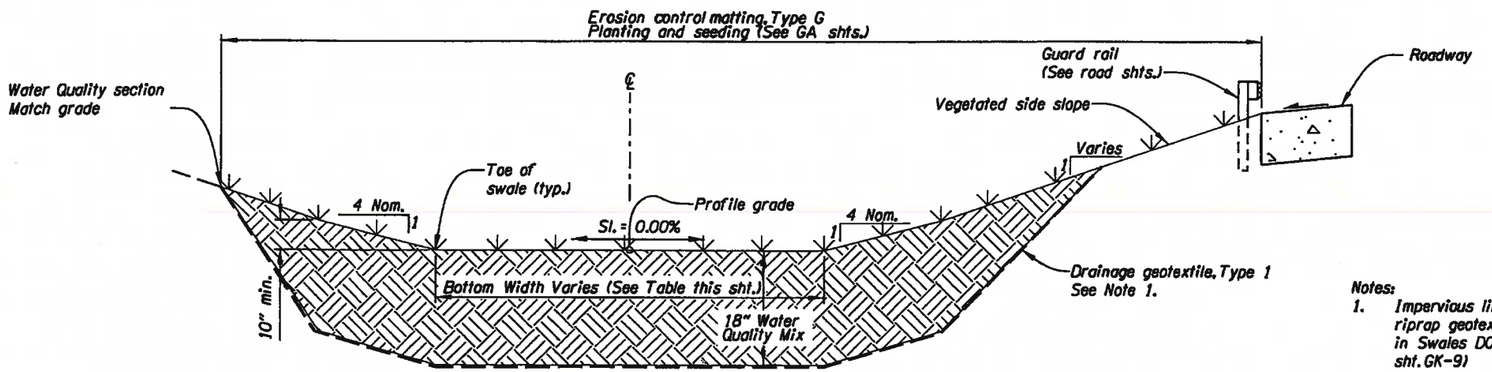


PLAN



WATER QUALITY SECTION - TYPE 1

SWALE DATA TABLE		
SWALE	BOTTOM WIDTH (FT)	TYPE
D00955	6.0	1
D00956	6.0	1
D00957	6.0	1
D00958	6.0	1
D00959	8.0	1
D00962	6.0	2
D00963	6.0	2
D00964	6.0	2
D00965	6.0	2
D00966	8.0	2
D00967	6.0	2
D00968	4.0	2
D00969	6.0	2
D00970	8.0	2
D00971	10.0	2
D00972	6.0	2



WATER QUALITY SECTION - TYPE 2

Notes:
1. Impervious liner shall replace riprap geotextile and drainage geotextile in Swales D00965 and D00970. (For details, see sht. GK-9)

WATER QUALITY SWALE DETAIL

Not to Scale

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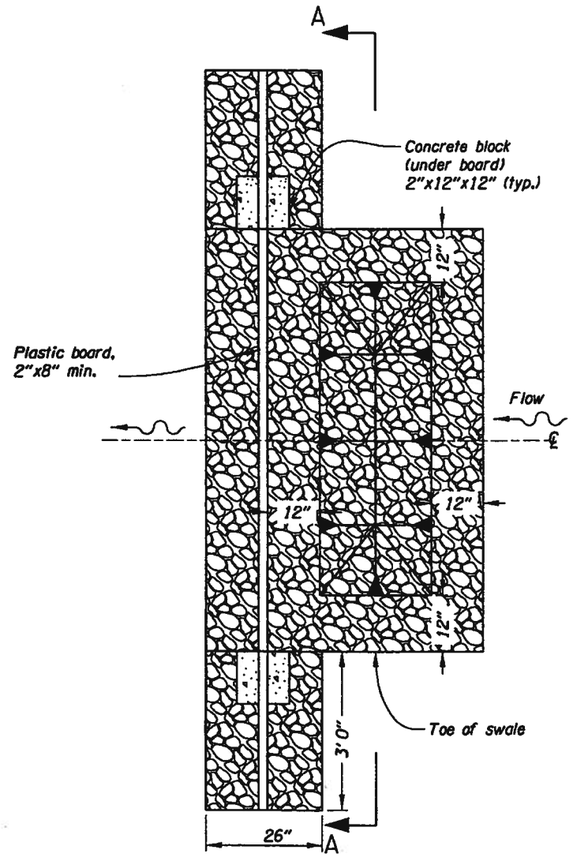
WATER QUALITY SWALE DETAILS

SHEET NO. GJ-20



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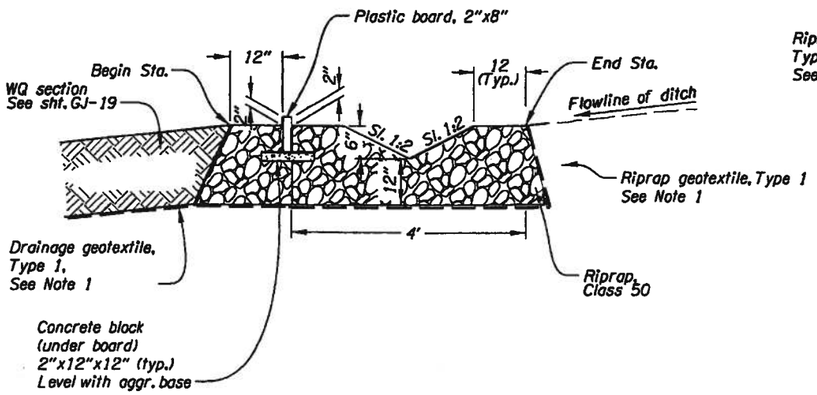
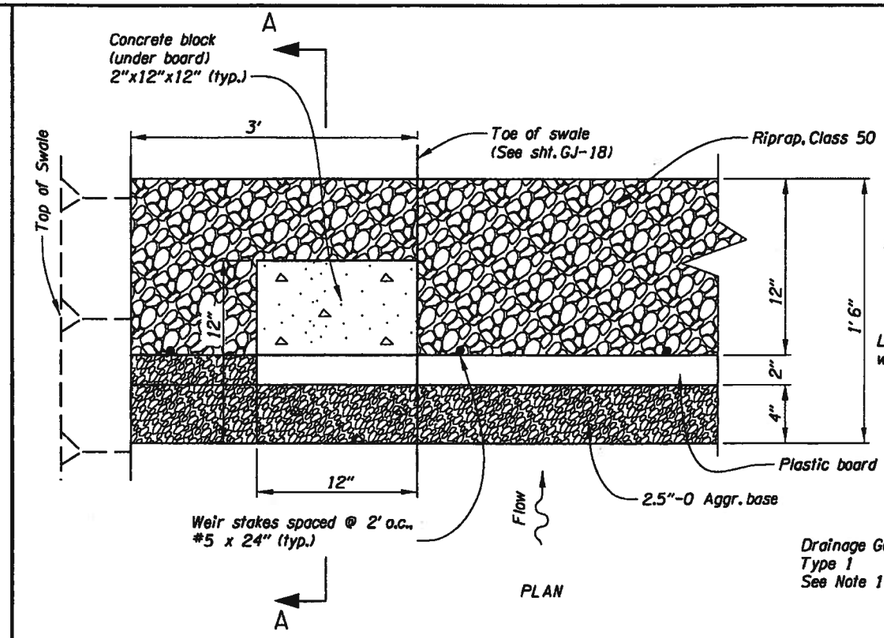
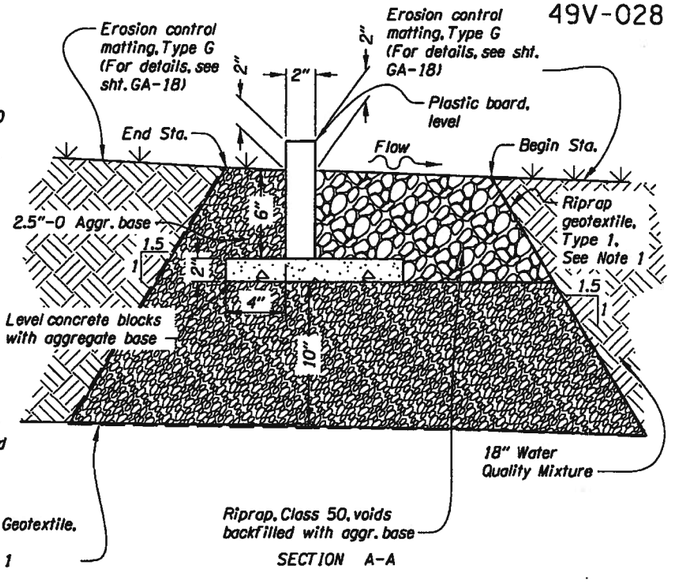


PROFILE



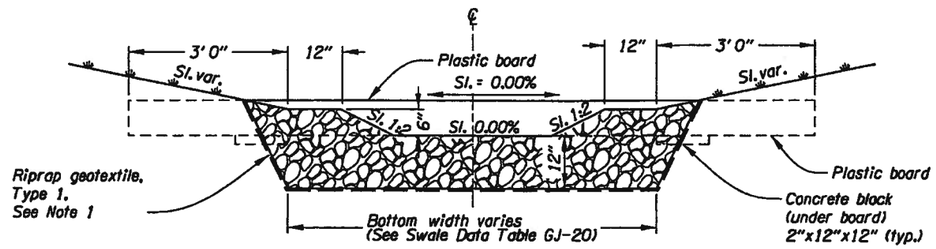
PLAN



SECTION A-A

FLOW SPREADER

Notes:
1. Impervious liner shall replace riprap geotextile and drainage geotextile in Swales D00965 and D00970. See sht. GK-9.



SECTION A-A

Notes:
1. Impervious liner shall replace riprap geotextile and drainage geotextile in Swales D00965 and D00970. See sht. GK-9.

ENERGY DISSIPATOR

Not to Scale

REGISTERED PROFESSIONAL ENGINEER
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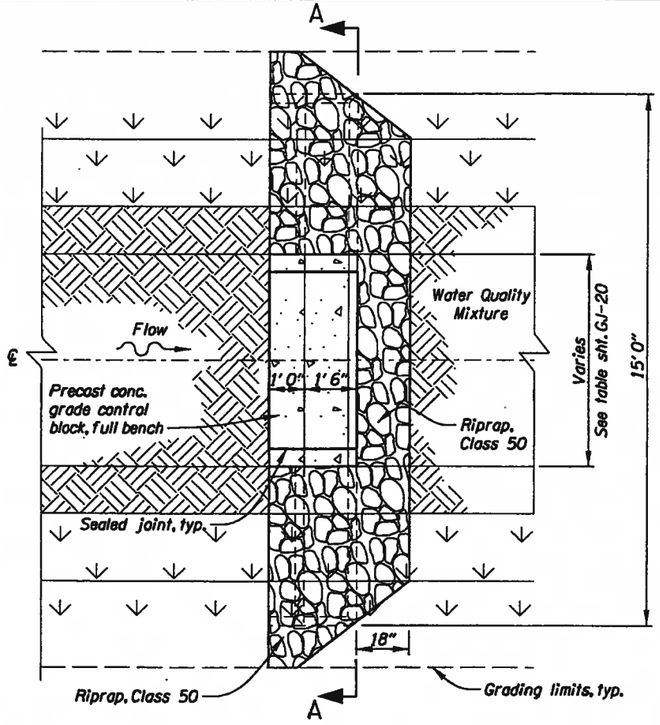
WATER QUALITY SWALE DETAILS

SHEET NO. GJ-21

49V-028



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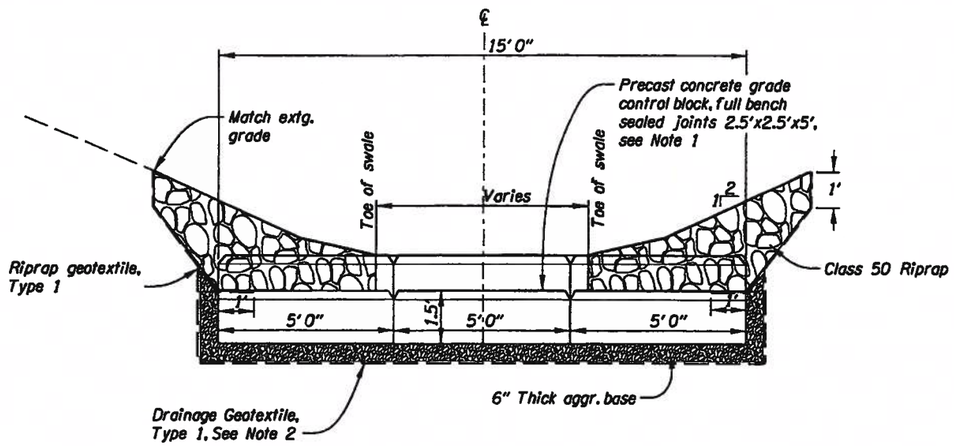
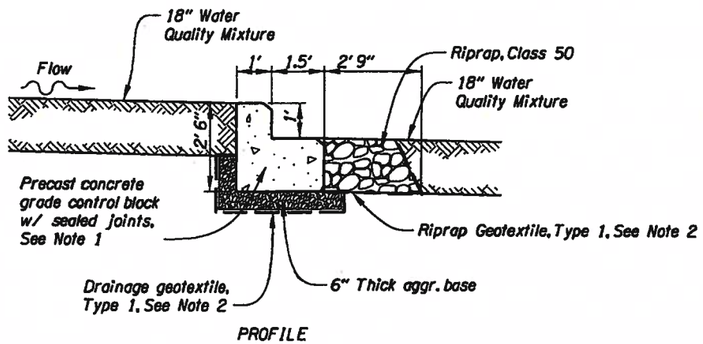


SECTION A-A



PROFILE

PRECAST CONCRETE GRADE CONTROL

Not to Scale

Notes:

1. *Seal joints between precast concrete grade control blocks with Non-Shrink Grout meeting the requirements of Standard Specification Section 02440.*
2. *Impervious liner shall replace riprap geotextile and drainage geotextile in Swales D00965 and D00970. See sht. GK-9.*

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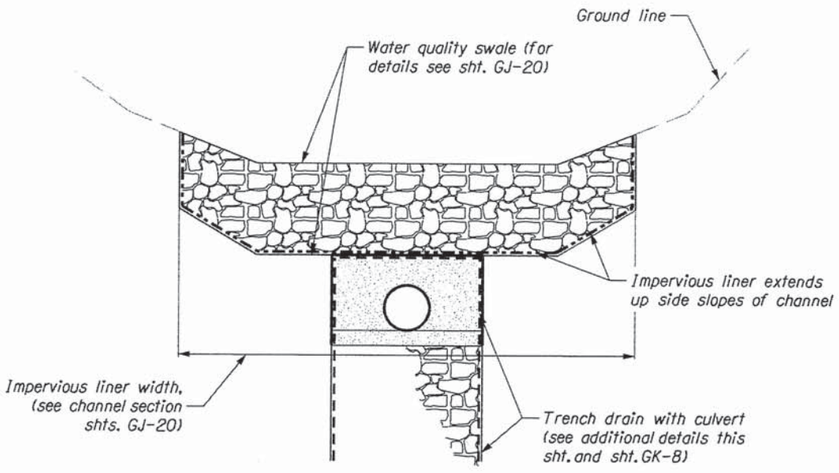
WATER QUALITY SWALE DETAILS

SHEET NO. GJ-22

NOTES:

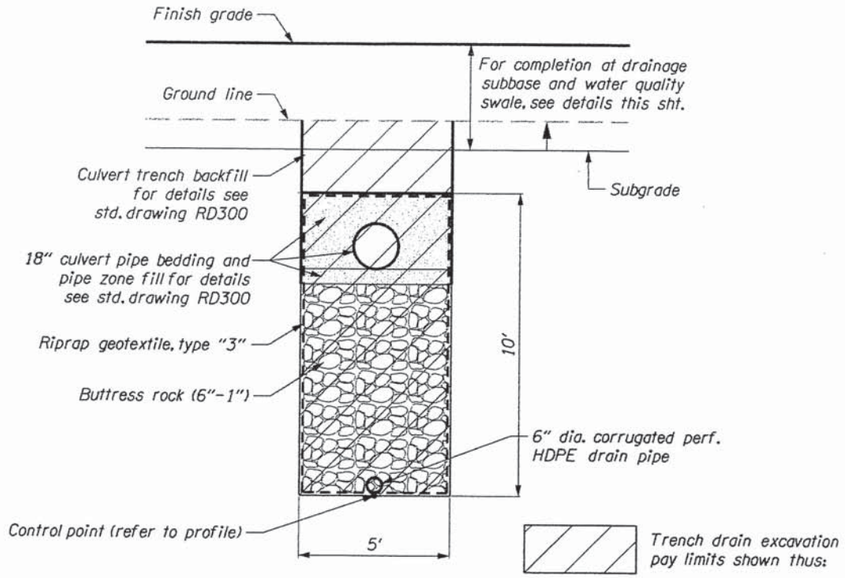
1. Top of trench drain depressed to match bottom of water quality swale.
2. For trench drain details not shown see sht. GK-8

Trench Drain at Water Quality Swale	
Trench Drain	Station Limits
TD-CGT3	"TD-CGT3" 0+82 to 2+06



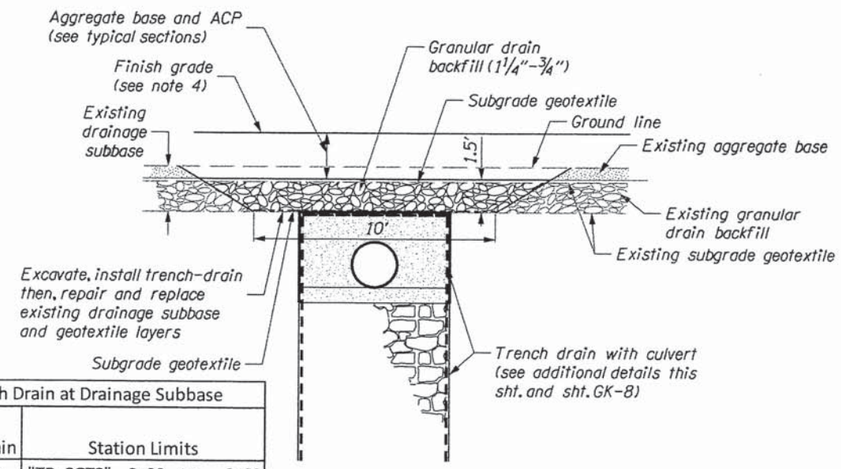
TRENCH DRAIN AT WATER QUALITY SWALE

not to scale
(for locations see shts. GK-29 and GK-43)



TRENCH DRAIN WITH CULVERT

not to scale
(For locations, see shts. 12, GK-29 and GK-43)



Trench Drain at Drainage Subbase	
Trench Drain	Station Limits
TD-CGT3	"TD-CGT3" 0+00 to 0+82

TRENCH DRAIN AT DRAINAGE SUBBASE

not to scale
(for locations see shts. GK-29 and GK-43)

NOTES:

1. For trench drain details not shown see sht. GK-8
2. Excavate existing drainage subbase (aggregate base, granular drain backfill and subgrade geotextile, prior to installing trench drain). Excavatoin Pay limits shown this sheet.
3. Repair and replace drainage subbase disturbed during trench drain construction. Tie-in trench drain and repaired drainage subbase to existing subbase.
4. See roadway profile sheets for finish grade.

CONSTRUCTION REQUIREMENTS

1. Excavate trench, install geotextile and backfill in segments up to 30' max. length. Backfill trench at end of each day. Refer to trench drain excavation and backfill sequence profile, sht. GK-8.
2. Protect work area to prevent contamination or silting of drain rock.
3. Fully encompass buttress rock with geotextile including sides, bottom, top and ends.
4. Top of trench drain depressed to match bottom of culvert bedding.
5. For details not shown and exc. pay limits see sht. GK-8.

REGISTERED PROFESSIONAL ENGINEER
65646PE
OREGON
NOV. 13, 2012
CHRISTOPHER IAN CARPENTER
RENEWS: 12/31/17

OREGON DEPARTMENT OF TRANSPORTATION

CORNFORTH CONSULTANTS

FFO-US20 PME: UPRR-EDDYVILLE (PHASE 4) SECTION
CORVALLIS - NEWPORT HIGHWAY
LINCOLN COUNTY

Reviewed By - George Machan
Designed By - Chris Carpenter
Drafted By - David Sparby

TRENCH DRAIN DETAILS

SHEET NO. GK-9