OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: January, 2019

DFI No. D00825

Figure 1: DFI No. D00825, looking west

Identification

Drainage Facility ID (DFI):	D00825
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(46V-126)
Location:	District: 2C
	Highway No.: 26
	Mile Post: 51.87-51.92

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: west

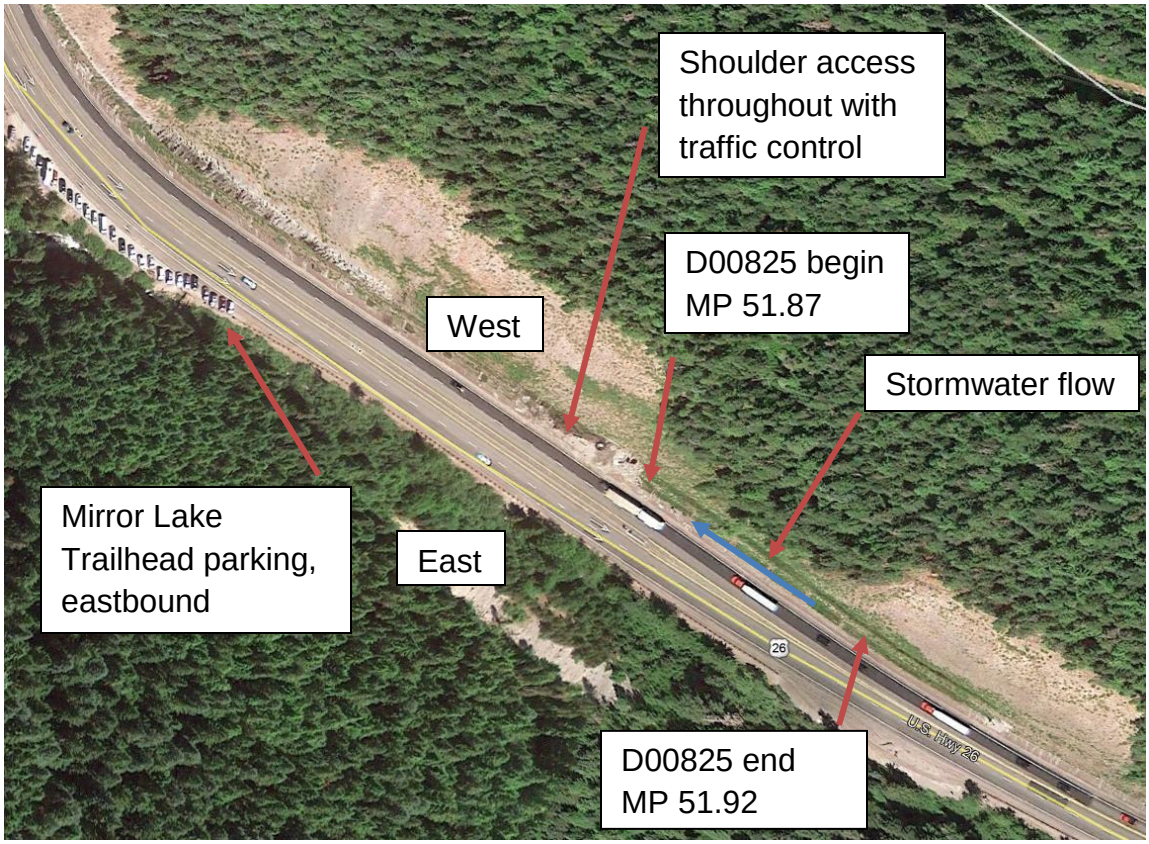


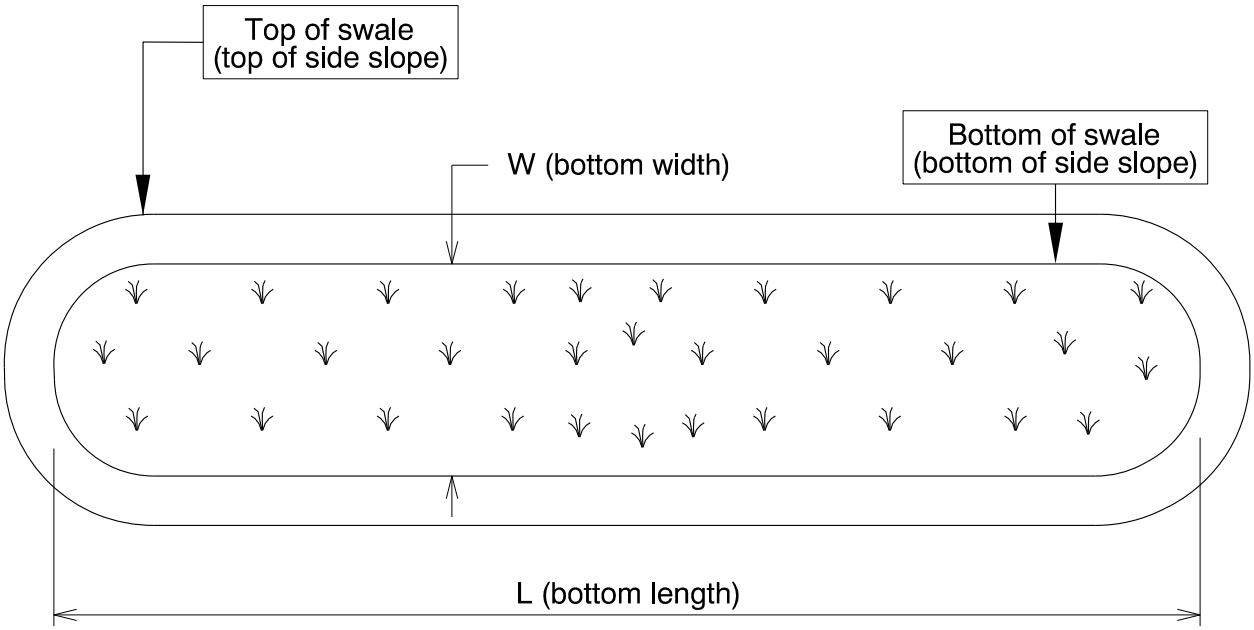
Figure 2: Facility location map

3. Facility Summary

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

The bottom length and bottom width of the swale is:

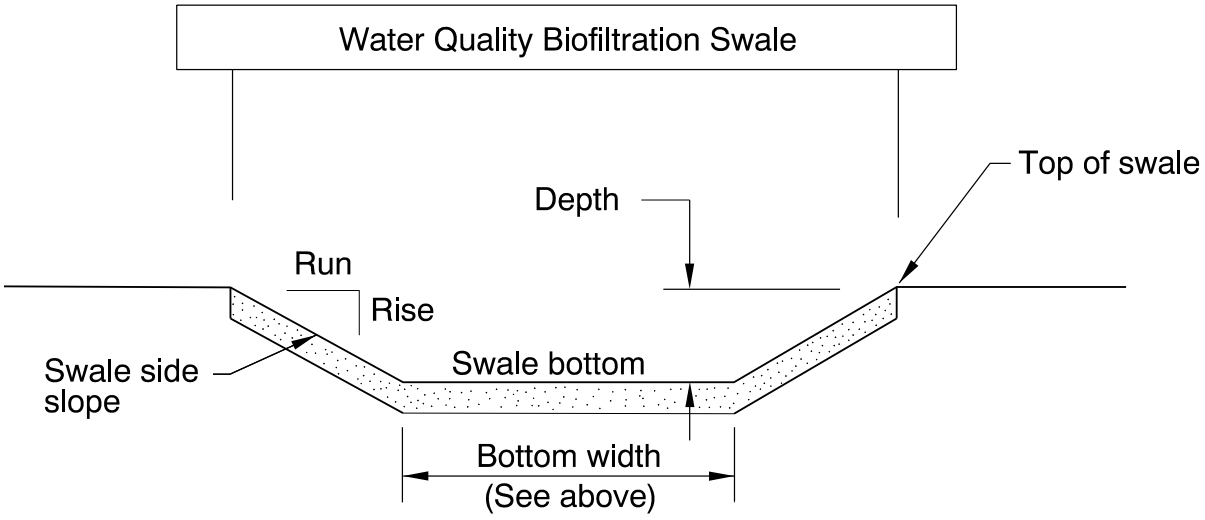
Bottom Length (feet)	Bottom Width (feet)
270	6



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)
0.5	0.5	2



Site Specific Information: Access to the facility may require traffic control including shoulder closure.

4. Facility Access

Maintenance access to the facility:

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

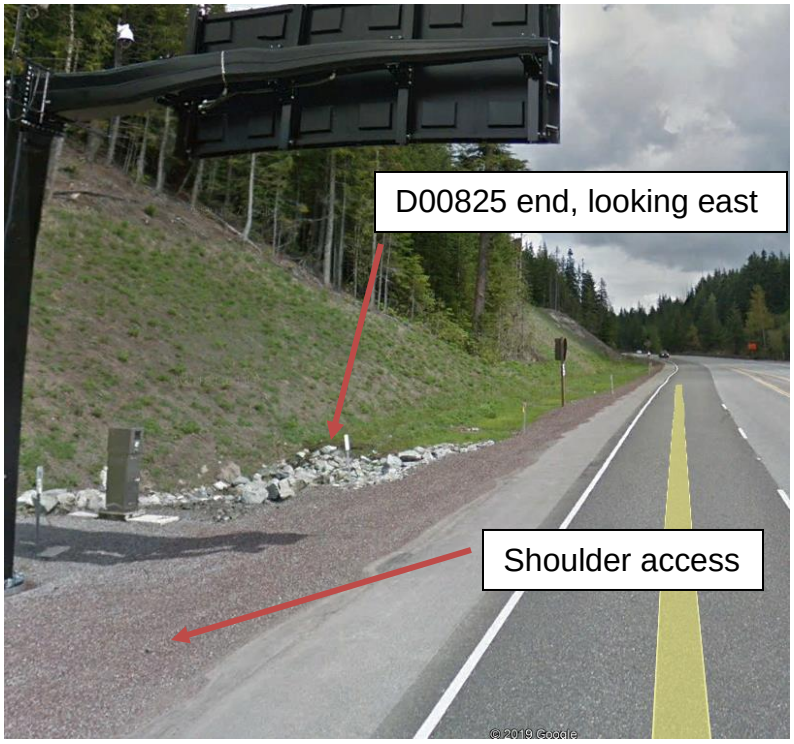


Figure 3: Eight foot shoulder access, facing east

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 inlet)	☐	**S17**
Anchored board (midpoint of swale or every 50 feet along swale bottom)	☒	**S18**
Other: describe type	☐	**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 slope 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
There are no duty porous pavers installed in this swale	

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

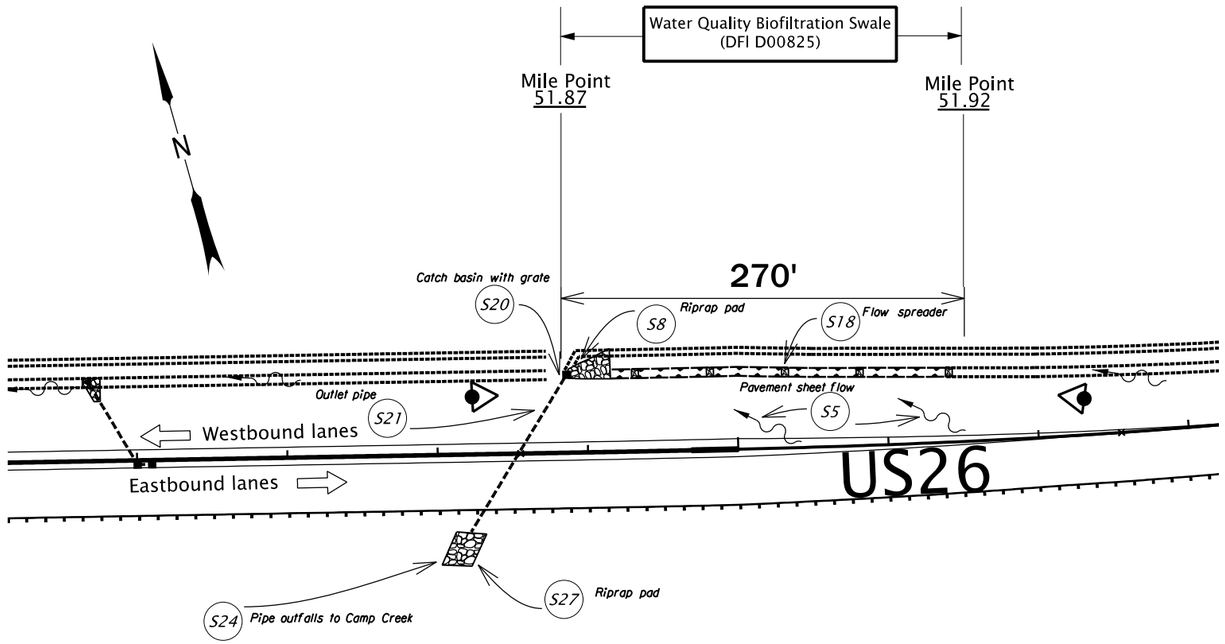
Contact any of the following for more detailed information about management of waste materials found on site:

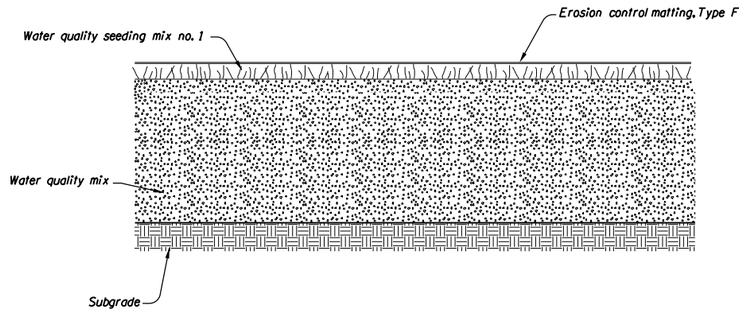
ODOT Clean Water Unit	(503) 986-3008
ODOT Statewide Hazmat Coordinator	(503) 667-7442
ODOT Region 1 Hazmat Coordinator	(503) 731-8290
ODOT Region 2 Hazmat Coordinator	(503) 986-2647
ODOT Region 3 Hazmat Coordinator	(541) 957-3594
ODOT Region 4 Hazmat Coordinator	(541) 388-6186
ODOT Region 5 Hazmat Coordinator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

A Appendix A – Site Specific Operational Plan

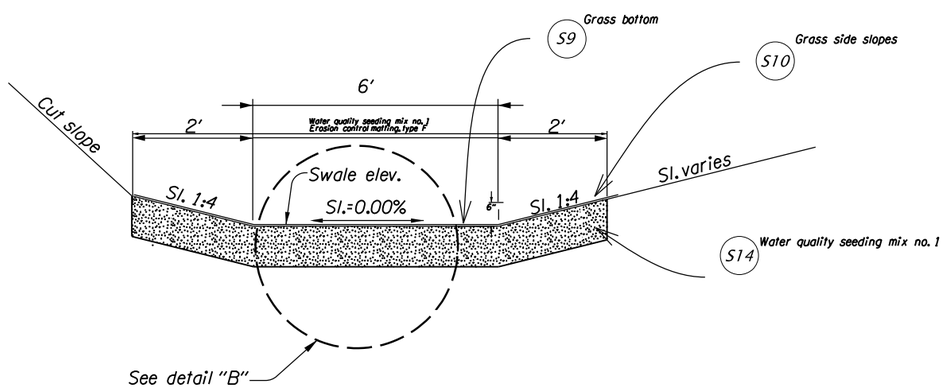
Contents:

Operational Plan: DFI D00825





DETAIL B



SECTION A-A
N.T.S.

Legend:

- Photograph Location/Direction
- Storm Pipe (Facility)
- Type G-2M Inlet
- Manhole
- Traffic Flow Direction
- Water Flow Direction
- Conveyence Direction

OREGON DEPARTMENT OF TRANSPORTATION

Sht. 01 of 02

Prepared By: Laila Bush

Drafted By: Laila Bush

DFI D00825
MAINTENANCE DISTRICT 2C HWY 026
Water Quality Biofiltration Swale
Mt. Hood Highway MP 51.87-51.92
Clackamas County

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DFI_D00825.dgn

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets Cont'd.
1A-2	Std. Drg. Nos.
1B	Material and Construction Staging Sites

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

GRADING, ROCKFALL MITIGATION, DRAINAGE, STRUCTURES, PAVING, SIGNING & ROADSIDE DEVELOPMENT

FFO-US26: MP 49.2 - MP 57.45 SEC.

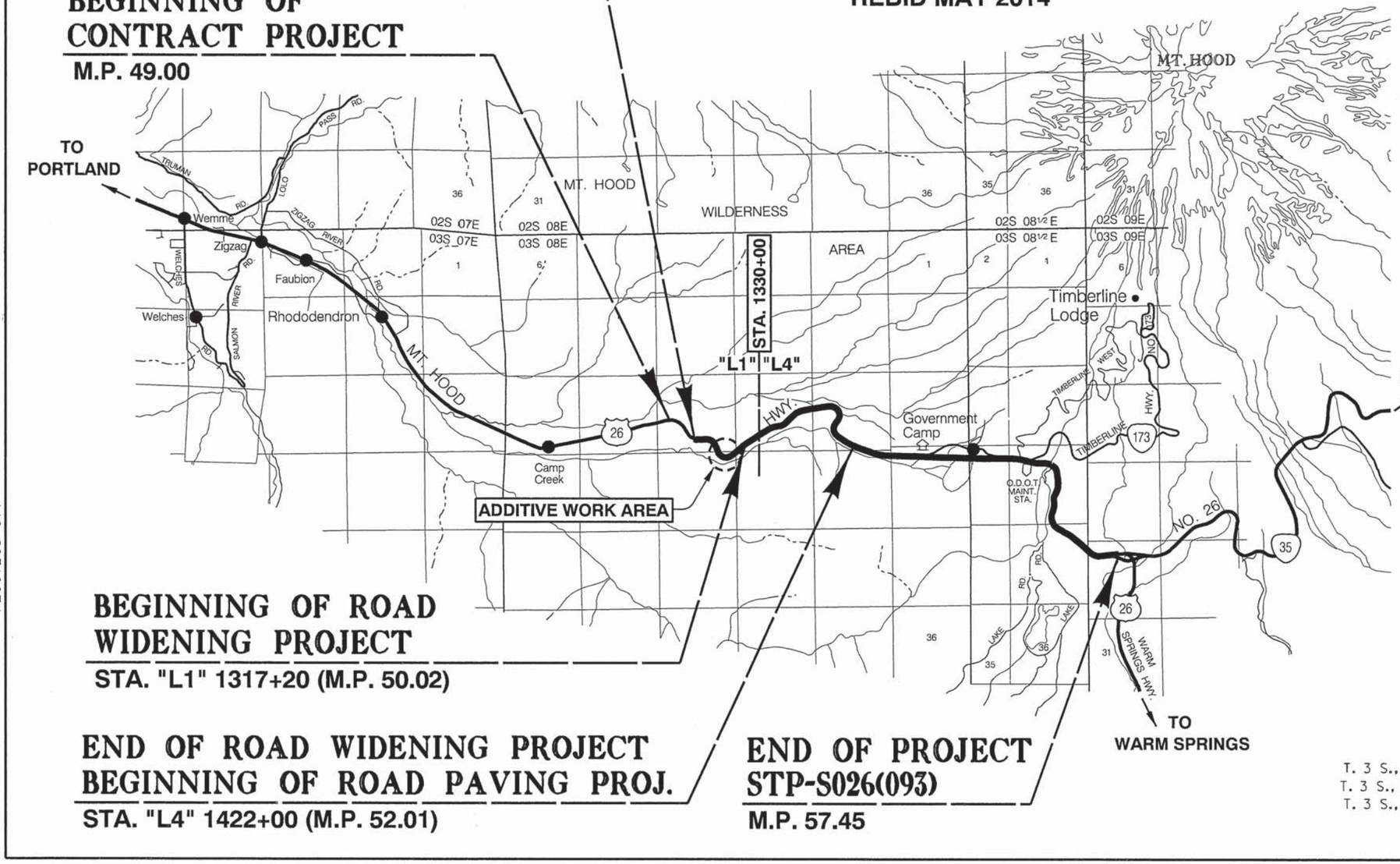
MT. HOOD HIGHWAY

CLACKAMAS COUNTY

REBID MAY 2014

BEGINNING OF PROJECT
STP-S026(093)
STA. "L1" 1273+74 (M.P. 49.20)

BEGINNING OF CONTRACT PROJECT
M.P. 49.00



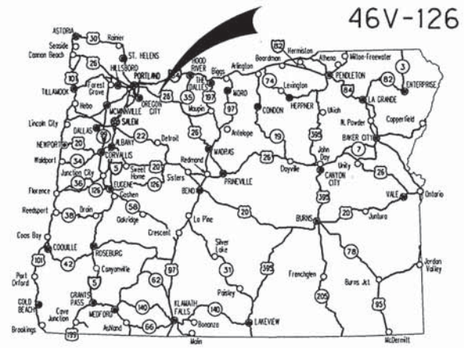
BEGINNING OF ROAD WIDENING PROJECT
STA. "L1" 1317+20 (M.P. 50.02)

END OF ROAD WIDENING PROJECT
BEGINNING OF ROAD PAVING PROJ.
STA. "L4" 1422+00 (M.P. 52.01)

END OF PROJECT
STP-S026(093)
M.P. 57.45

T. 3 S., R. 8 E., W.M.
T. 3 S., R. 8½E., W.M.
T. 3 S., R. 9 E., W.M.

46V-126



Overall Length Of Project - 8.25 Miles

ATTENTION:
Oregon Law Requires You To Follow Rules Adopted By The Oregon Utility Notification Center. Those Rules Are Set Forth In OAR 952-001-0010 Through OAR 952-001-0090. You May Obtain Copies Of The Rules By Calling The Center. (Note: The Telephone Number For The Oregon Utility Center Is (503) 232-1987.)

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

OREGON TRANSPORTATION COMMISSION

Pat Egan	CHAIR
David Lohman	COMMISSIONER
Mark Frohnmayer	COMMISSIONER
Tammy Baney	COMMISSIONER
Matthew L. Garrett	DIRECTOR OF TRANSPORTATION

These plans were developed using ODOT design standards. Exceptions to these standards, if any, have been submitted and approved by the ODOT Chief Engineer or their delegated authority.

Approving Authority: Tamira Clark
Tamira J. Clark
Technical Center Manager, Region 1

Concurrence by ODOT Chief Engineer

FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	STP-S026(093)	1

PE001208-011

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INDEX OF SHEETS, CONT'D.

SHEET NO.	DESCRIPTION
2.2A Thru 2A-12	Typical Sections
2B Thru 2B-15	Details
2C Thru 2C-18	Traffic Control Plan
2C-19	Detour Plan
2D Thru 2D-3	Pipe Data Sheet
3	Alignment & General Construction
3A	Not Used
3B	Not Used
3C	Not Used
4	Alignment & General Construction
4A	Drainage
4B	Not Used
4C	Not Used
5	Alignment & General Construction
5A	Drainage
5B	Not Used
5C	Not Used
6	Alignment & General Construction
6A	Drainage
6B	Not Used
6C	Not Used
7	Alignment & General Construction
7A	Drainage
7B	Profile
7C	Drainage Profile
8	Alignment & General Construction
8A	Drainage
8B	Profile
8C	Drainage Profile
9	Alignment & General Construction
9A	Drainage
9B	Profile
9C	Drainage Profile
10	Alignment & General Construction
10A	Drainage
10B	Profile
10C	Drainage Profile
11	Alignment & General Construction
11A	Drainage
11B	Profile
11C	Drainage Profile
12	Alignment & General Construction
12A	Drainage
12B	Profile
12C	Drainage Profile
13	Alignment & General Construction
13A	Drainage
13B	Profile
13C	Drainage Profile
14	Alignment & General Construction
14A	Drainage
14B	Profile
14C	Drainage Profile
15	Alignment & General Construction
15A	Drainage
15B	Profile
15C	Drainage Profile

GEO/HYDRO	
GA Thru GA-4	Erosion Control Details
GA-5 Thru GA-28	Erosion Control Plan
GB	Geotechnical Data Sheet Layout & Legend
GB-2	Plan
GB-3 Thru GB-8	Geotechnical Data
GB-9	Plan
GB-10 & GB-11	Geotechnical Data
GB-12	Resistivity Profile Location Plan
GB-13	Geotechnical Data Sheet Layout
GB-14 Thru GB-25	Geotechnical Data
GC & GC-2	Wall Plan and Profile
GC-3 & GC-4	Details
GG	Temporary Drainage Plan
GJ & GJ-2	Water Quality Details
GJ-3	Water Quality Plan
GJ-4	Water Quality Profile
GJ-5	Water Quality Plan
GJ-6	Water Quality Profile
GM Thru GM-7	Mandatory Disposal Site
GQ Thru GQ-4	Rockfall Mitigation Plan
GQ-5 Thru GQ-10	Rockfall Mitigation Excavation Typical Sections
GQ-11 Thru GQ-13	Rockfall Mitigation Details
PERMANENT PAVEMENT MARKINGS	
ST Thru ST-15	Striping Plan
PERMANENT SIGNING	
S-14299 Thru S-14310	Permanent Signing
TRAFFIC SIGNALS	
ITS-1553	Legend
ITS-1554 Thru ITS-1558	ITS Plan
ITS-1559 Thru ITS-1561	ITS Details

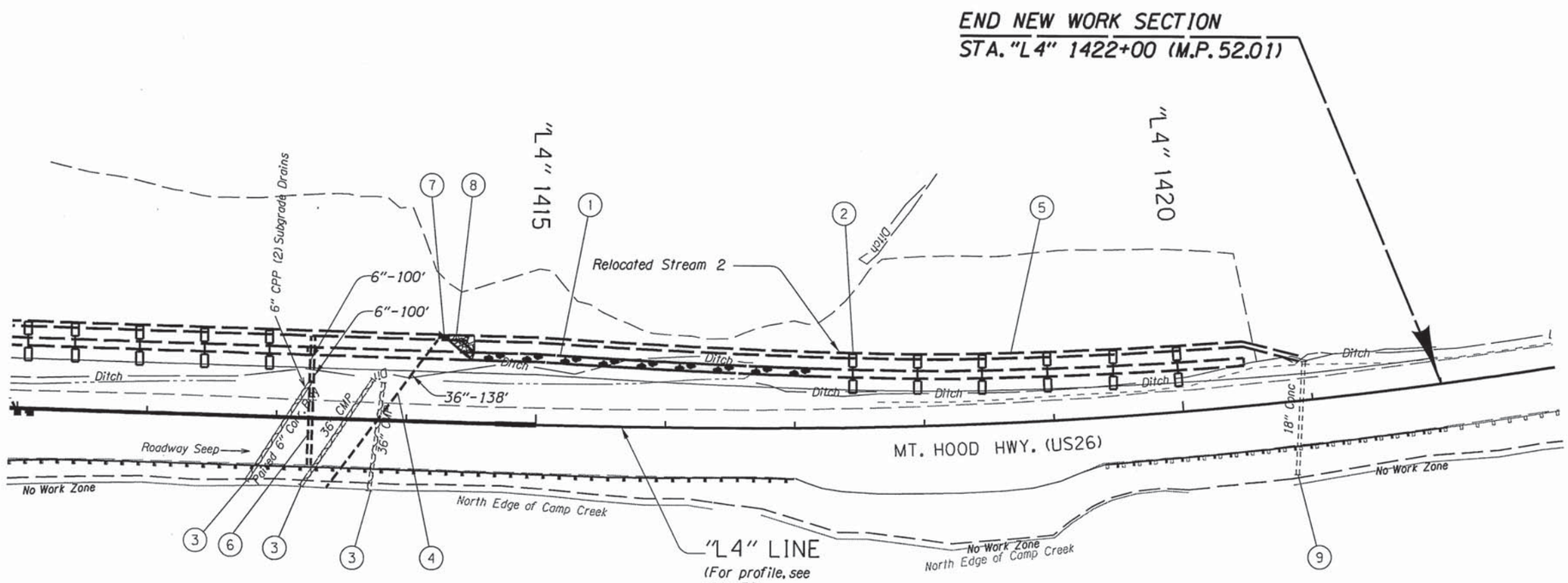
Standard Drawings located on the web at:
http://www.oregon.gov/ODOT/HWY/ENGSERVICES/Pages/standard_drawings_home.aspx

FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	STP-S026(093)	1A

Sec. 14, T. 3 S., R. 8 E., W.M.

46V-126



1. Const. water quality swale "D00825"
   (For details, see sheet GJ-5)
2. Permanent check dam, (typ.)
   (See erosion control sheets)
3. Abandon pipe in place
4. Sta. "L4" 1413+78
   Install 36" culvert pipe - 138'
   5' depth
   Const. 36" sloped end section
   Const. paved end slope
   Const. culvert embankment protection - 2
   Loose riprap, (class 50) - 9.6 cu.yd.
   Trench resurf. - 51.7 sq. yd.
   Culvert ID marker (type 1) - 1
   Culvert ID marker (type 2) - 1
   (For details, see sheets 2B-11)
   See note 1
5. Relocated Stream 2
   (For details, see sheets 2A-14 and 15)
6. Sta. "L4" 1413+28
   Inst. 6" drain pipe - 100'
   Inst. 6" drain pipe - 100'
   Drainage geotextile (Type 2) - 85 sq. yd.
   Subsurface drain outlet - 1
   Daylight drain pipes to relocated stream 2
   Trench resurf. - 29.4 sq. yd.
   (See drg. no. RD312)
7. Sta. "L4" 1414+28, 66' Lt.
   Const. type "G-2M" conc. inlet.
   with 4' sump
8. Sta. "L4" 1414+30 to 1414+49.
   Const. riprap slope protection
   Loose riprap, (class 50) - 9.0 cu. yd.
9. Sta. "L4" 1420+92
   Extg. culvert
   Culvert ID marker (type 1) - 1
   Culvert ID marker (type 2) - 1

Abandon pipe in place shown thus: ~~~~~~~~~~

Notes:
1. See special provisions section 290.30(a)(7) for work restrictions.

REGISTERED PROFESSIONAL ENGINEER
80,521
OREGON
MAY 14, 2013
TYLER S. NORD
RENEWS: 12-31-2014

OREGON DEPARTMENT OF TRANSPORTATION

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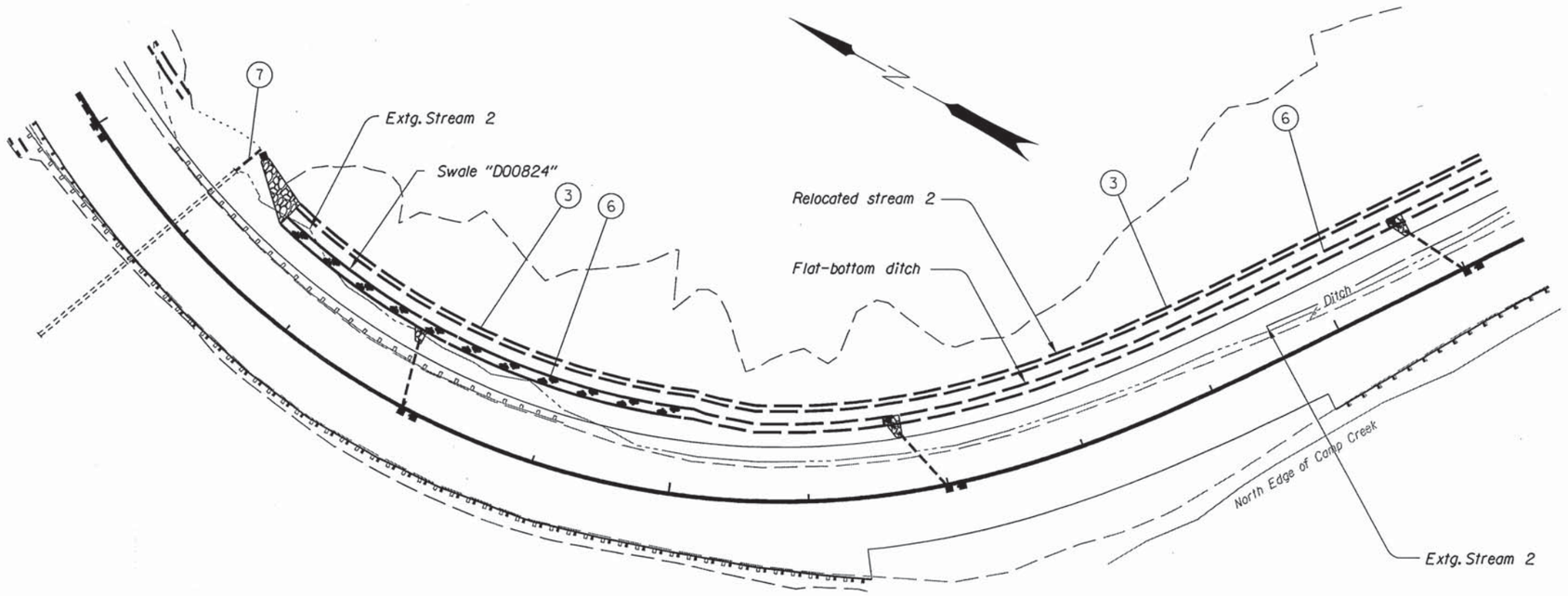
FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Chris S. Link
Designed By - Tyler S. Nord
Drafted By - Rhonda L. Freeman

DRAINAGE

SHEET NO. 15A

46V-126



Stream 2 Temporary Drainage Narrative

Stage 1:

(1) *Install erosion control in existing ditch according to GA-15 and GA-16. Install temporary 24" storm pipe along existing Stream 2. Divert all flow from existing Stream 2 into temporary 24" storm pipe.*

(2) *Construct temporary connection to convey all flow from temporary 24" storm pipe (installed during step 1) and existing Stream 2 into existing culvert at 1413+21.*

(3) *Construct relocated Stream 2. Install erosion control in relocated Stream 2 according to GA-15 and GA-16. Dewater any groundwater entering the new and existing stream during construciton according to 00405.43*

(4) *Install temporary 36" storm pipe from relocated Stream 2 to existing culvert at 1413+21.*

(5) *Construct connection from existing Stream 2 to relocated Stream 2. Remove temporary 24" storm pipe and existing Stream 2.*

Stages 2 & 3:

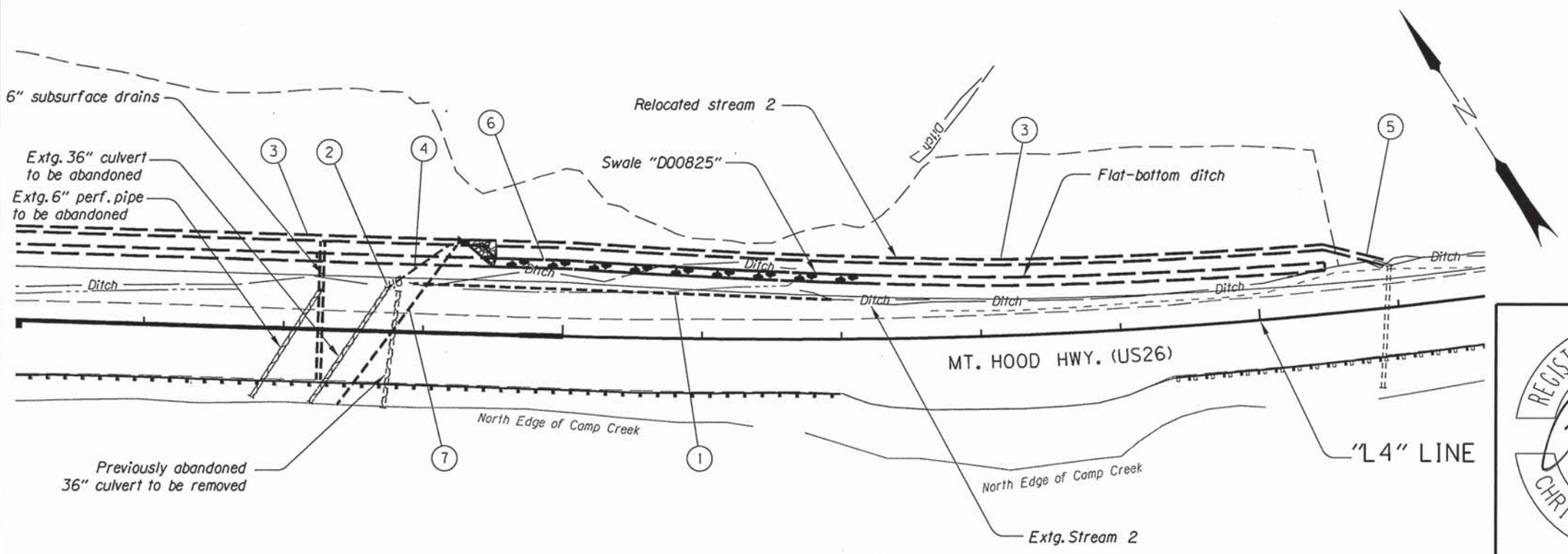
(6) *Install erosion control in existing ditch according to GA-27 and GA-28. Construct flat-bottom ditches and swales "D00824" and "D00825".*

(7) *Install culvert at 1413+78 and culvert extension at 1401+90. Connect culverts to relocated Stream 2 and swales "D00824" and "D00825".*

Notes:

See sheets GA-15, GA-16, GA-27 and GA-28 for erosion control.

Perform pumping operations as necessary.



Abandon pipe in place shown thus: ▭▭▭▭▭▭▭▭

REGISTERED PROFESSIONAL ENGINEER
74,338
OREGON
DEC 31, 2007
CHRISTOPHER S. LINK

RENEWS: 12-31-2014

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MSA

FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Chris S. Link
Designed By - Tyler S. Nord
Drafted By - Rhonda L. Freeman

TEMP. DRAINAGE PLAN

SHEET NO. GG

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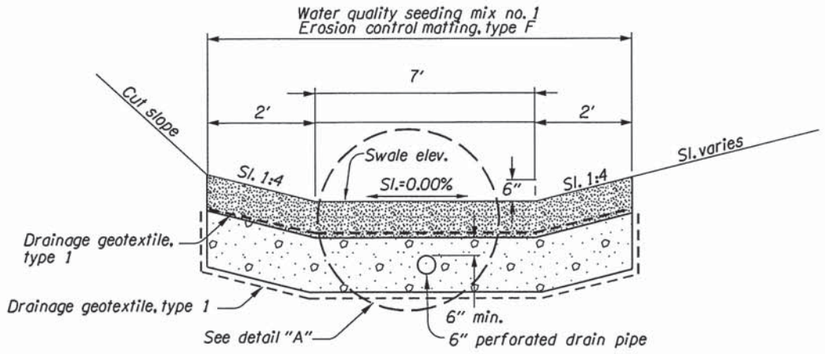
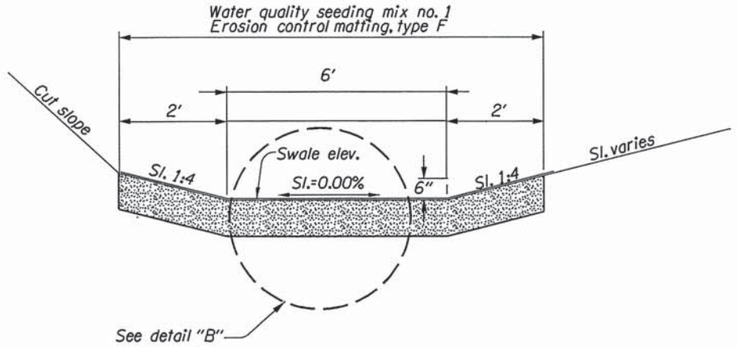
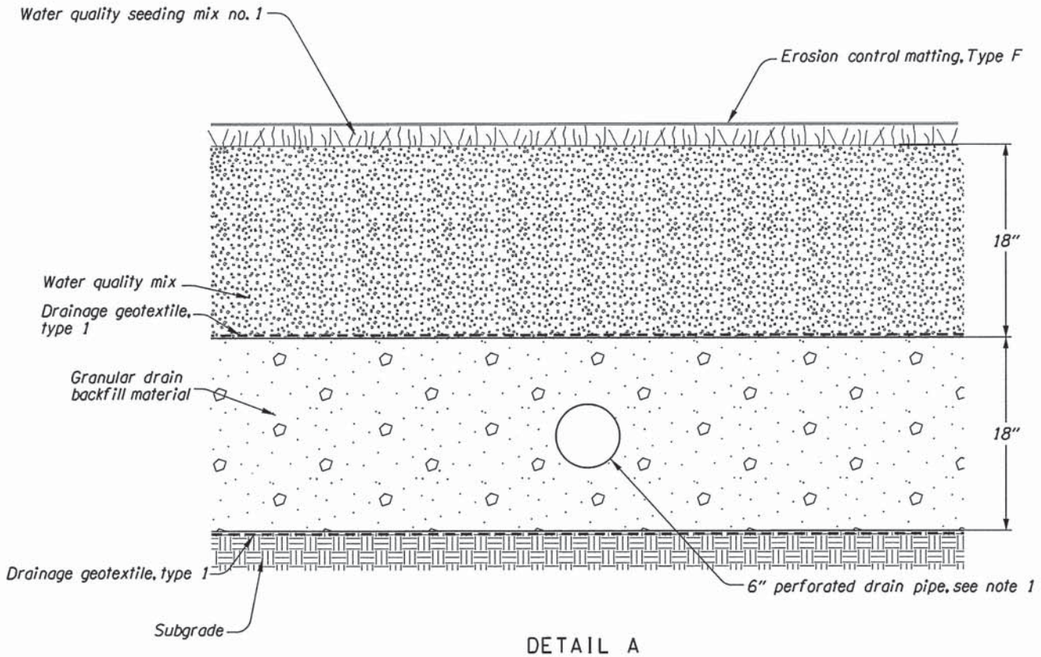
WATER QUALITY SWALE DETAILS



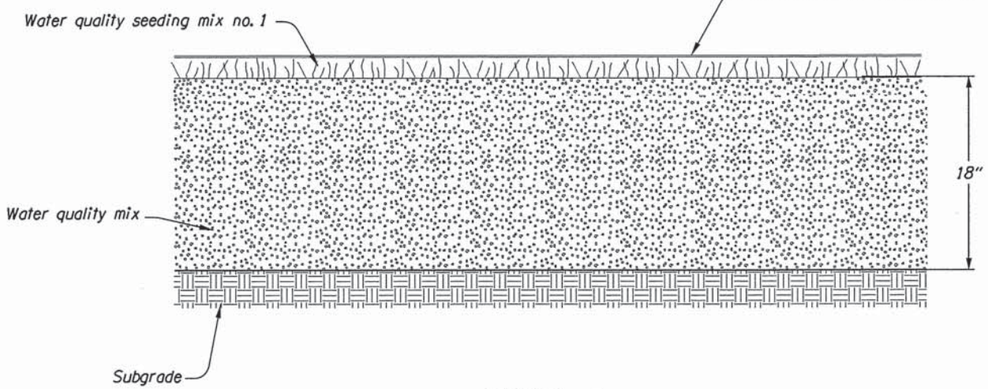
WATER QUALITY SWALE D00824 SECTION
NTS



WATER QUALITY SWALE D00825 SECTION
NTS



DETAIL A



DETAIL B

Notes:

1. Perforations shall only be on the top half of pipe.
2. Side-slopes are shown as vert. to horiz.

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80521
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MSA

FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

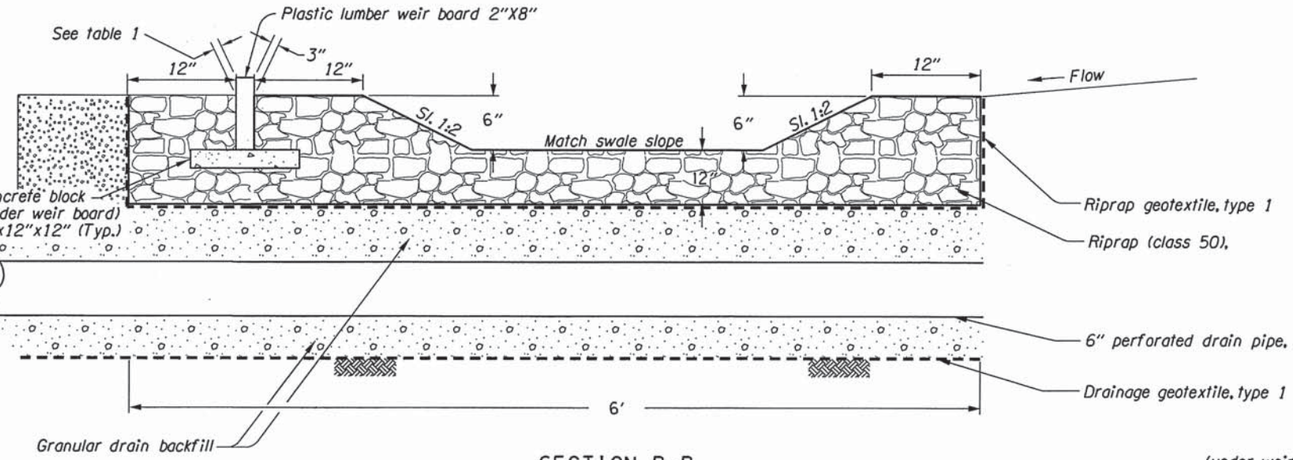
Reviewed By - Chris S. Link
Designed By - Tyler S. Nord
Drafted By - Rhonda L. Freeman

WATER QUALITY DETAILS

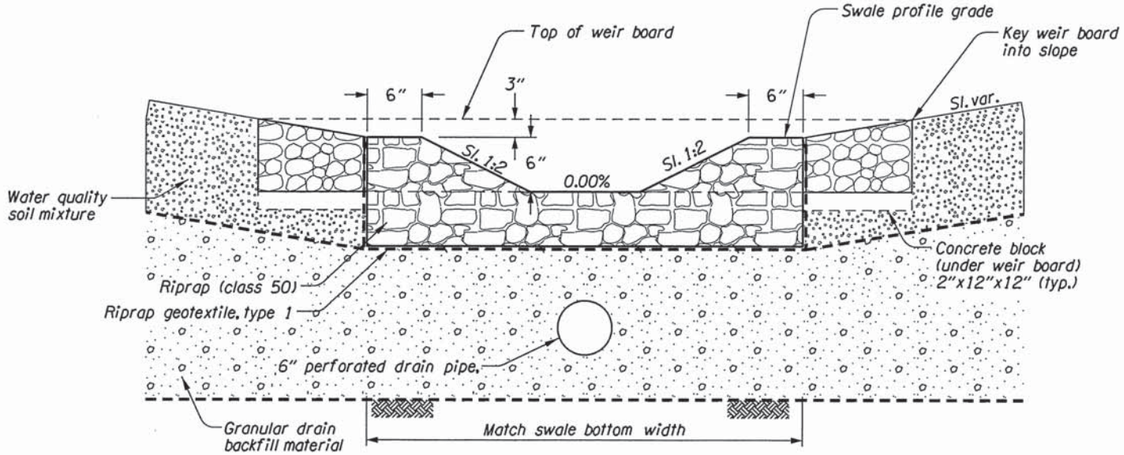
SHEET NO. GJ

FLOW SPREADER

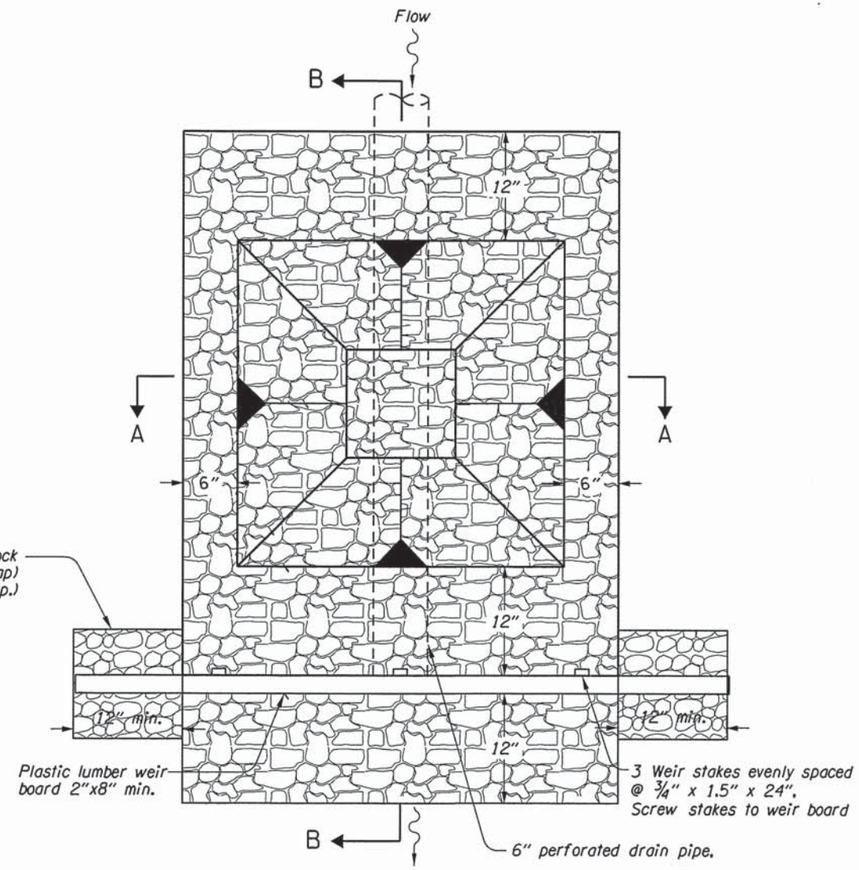
46V-126



SECTION B-B



SECTION A-A



PLAN

Table 1	
Facility	Dimension
Swale D00824	7"
Swale D00825	3"

Notes:

1. Side-slopes are shown as vert. to horiz.

REGISTERED PROFESSIONAL ENGINEER
80,521
OREGON
MAY 14, 2013
TYLER S. NORD
RENEWS: 12-31-2014

OREGON DEPARTMENT OF TRANSPORTATION

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121 S.W. Salmon, Suite 900, Portland, Oregon 97204-2919
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MSA

FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Chris S. Link
Designed By - Tyler S. Nord
Drafted By - Rhonda L. Freeman

WATER QUALITY DETAILS

SHEET NO. GJ-2

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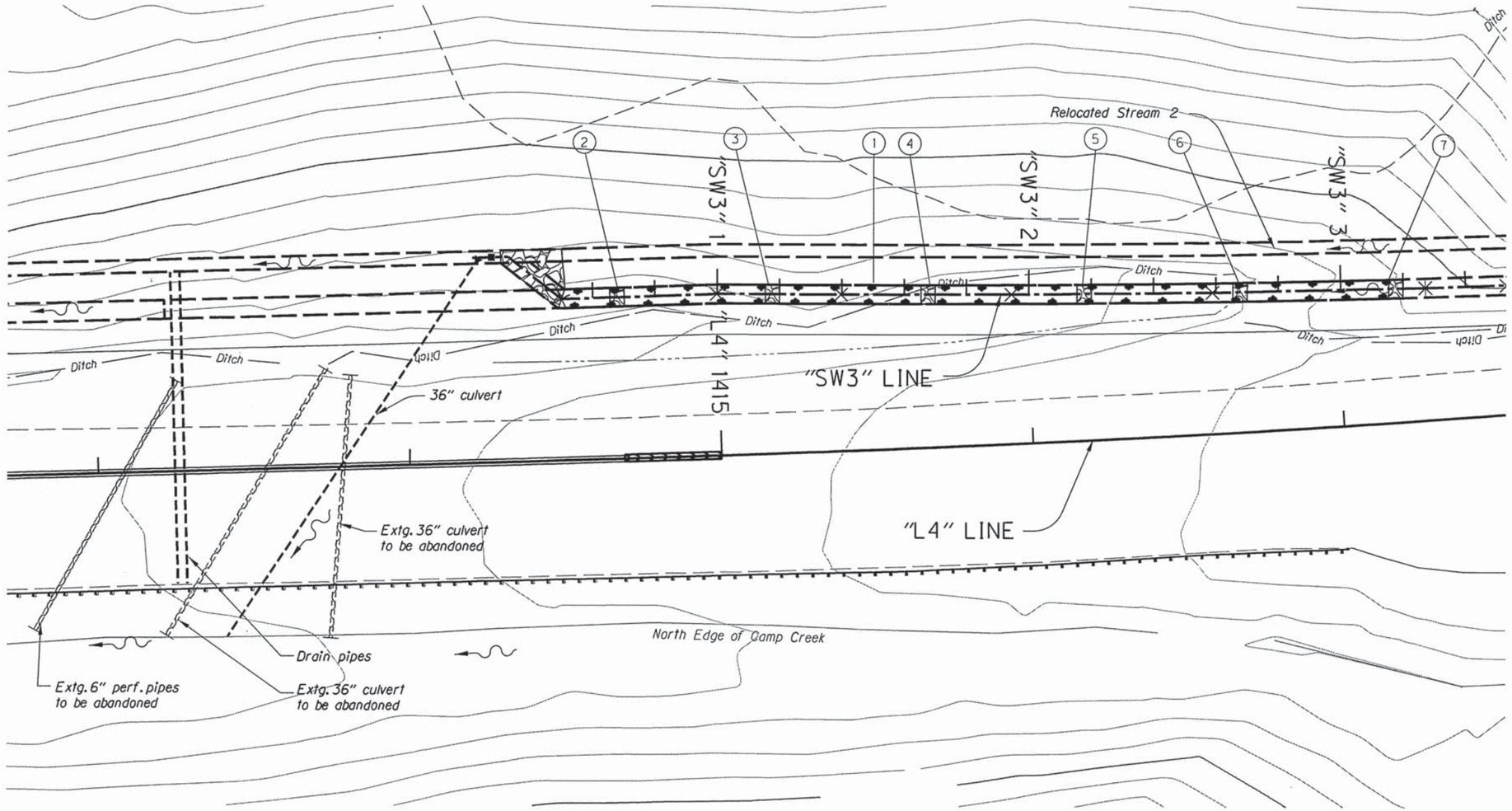
WATER QUALITY SWALE D00825

46V-126



(1) Sta. "SW3" 0+50 to Sta. 3+20
Const. water quality swale "SW3" - 259'
Riprap geotextile - 27 sq. yd.
Water quality mixture - 137 cu. yd.
Exc. - 137 cu. yd.
Field facility marker (Type S1) - 2
Field facility marker (Type S2) - 1
(For details, see sheet GJ)

(2) Sta. "SW3" 0+70
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

(3) Sta. "SW3" 1+20
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

(4) Sta. "SW3" 1+70
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

(5) Sta. "SW3" 2+20
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

(6) Sta. "SW3" 2+70
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

(7) Sta. "SW3" 3+20
Const. flow spreader
Riprap class 50 - 1.8 cu. yd.
Riprap geotextile, class 1 - 7.9 sq. yd.
(For details see sheet GJ-2)

REGISTERED PROFESSIONAL ENGINEER
80,521
OREGON
MAY 14, 2013
TYLER S. NORD
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FFO-US26: MP 49.2 - MP 57.45 SEC.
MT. HOOD HIGHWAY
CLACKAMAS COUNTY

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Drafted By - Rhonda L. Freeman

WATER QUALITY PLAN

SHEET NO. GJ-5

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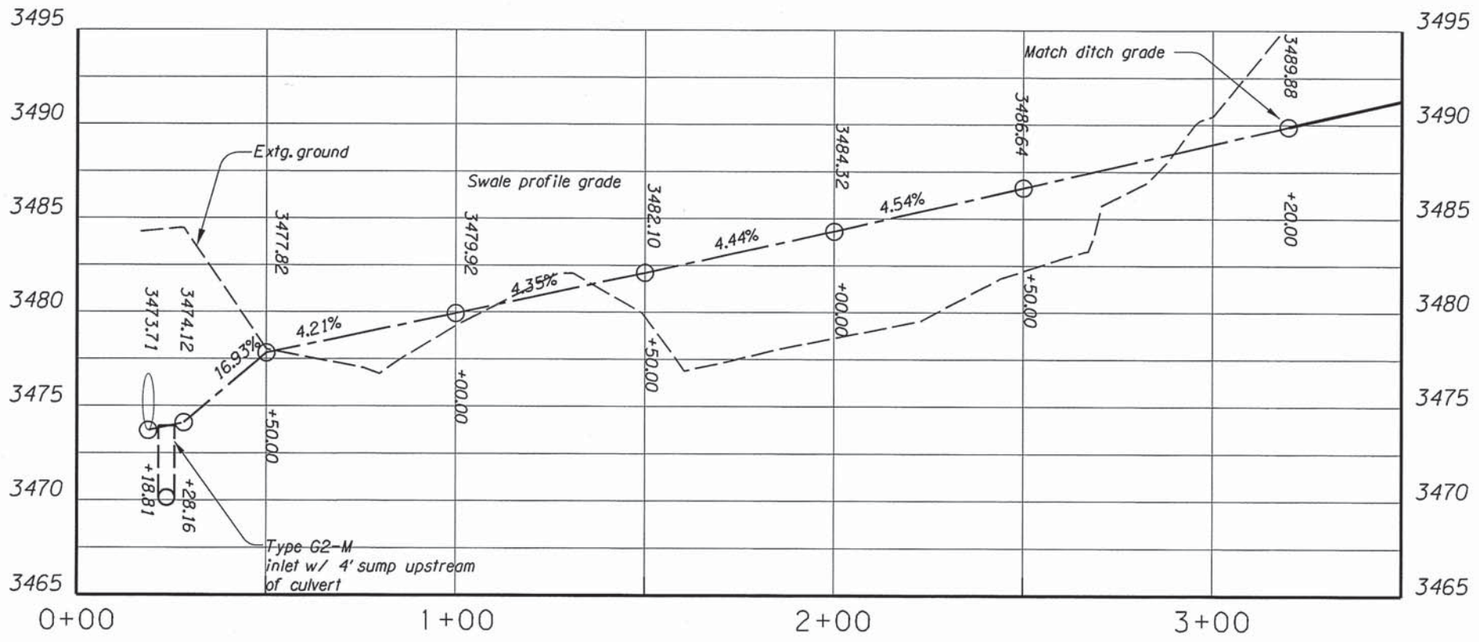
Rotation: 0° Scale: 1"=40'

46V-126

WATER QUALITY FACILITY PROFILES

SCALE: 1"=40" HORIZ. 1"=5' VERT.



"SW3" LINE

REGISTERED PROFESSIONAL ENGINEER
80521
OREGON
MAY 14, 2013
TYLER S. NORD
RENEWS: 12-31-2014

OREGON DEPARTMENT OF TRANSPORTATION

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MT. HOOD HIGHWAY
CLACKAMAS COUNTY

Reviewed By - Chris S. Link
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Drafted By - Rhonda L. Freeman

WATER QUALITY PROFILE

SHEET NO. GJ-6

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Rotation: 0° Scale: 1"=40'