OPERATION & MAINTENANCE MANUAL

Water Quality Biofiltration Swale

Manual prepared: July 2017

DFI No. D00299

Figure 1: DFI No. D00299, looking South

1. Identification

Drainage Facility ID (DFI):	D00299
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Numbers) 40V-022
Location:	District: 2C
	Highway No.: 100
	Mile Post: 51.26 to 51.27, Right

2. Manual Purpose

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

3. 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.

Flow direction: North and west

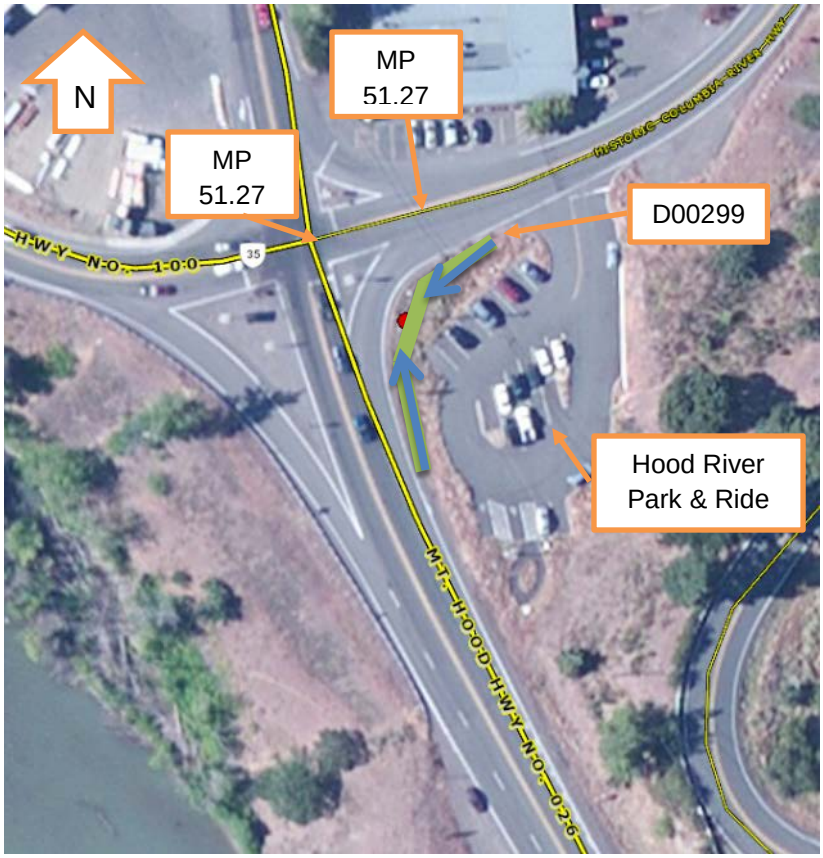


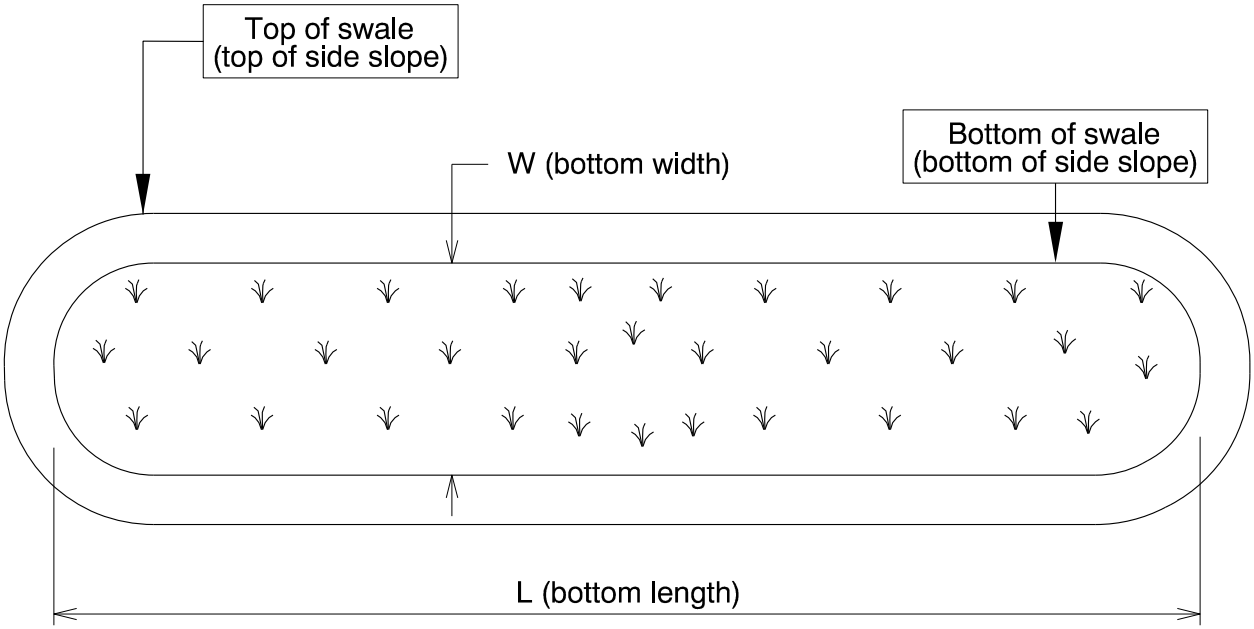
Figure 2: Facility location map

4. 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:

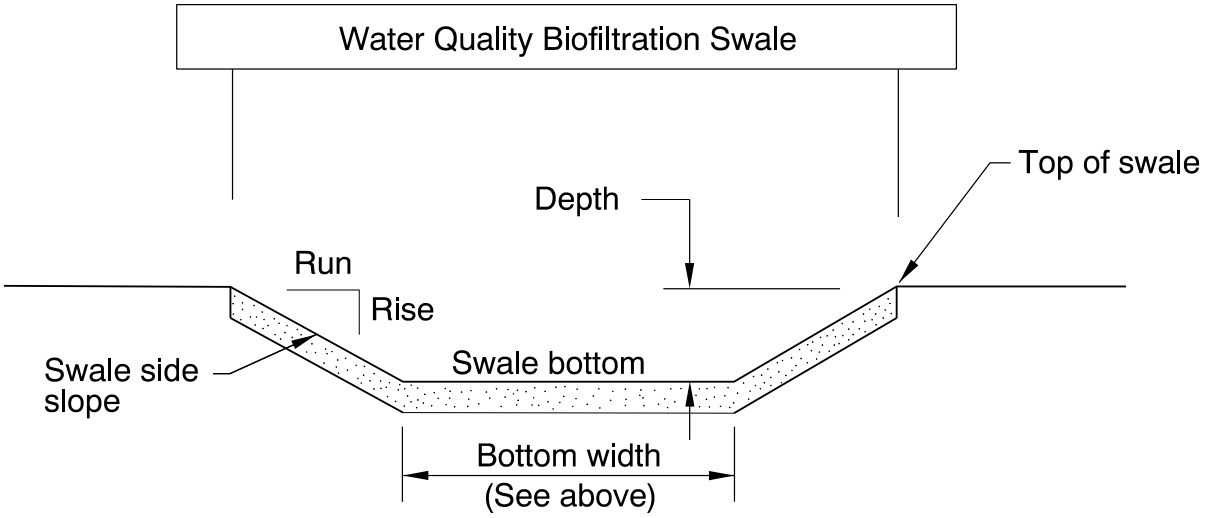
Bottom Length (feet)	Bottom Width (feet)
140	1



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)
Varies	**1**	**Varies**



Site Specific Information: This swale uses a combination of water quality mix and granular drain rock. It can be identified by the exposed granular drain rock.

5. Facility Access

Maintenance access to the facility:

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

Figure 3: Facility access via roadside shoulder, looking South

6. 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
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:	☐	**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**

7. 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

8. Limitations

Access grid installed:

☒ No	☐ Yes
There are (Choose applicable weight: no, light, med., heavy) 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.

9. 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

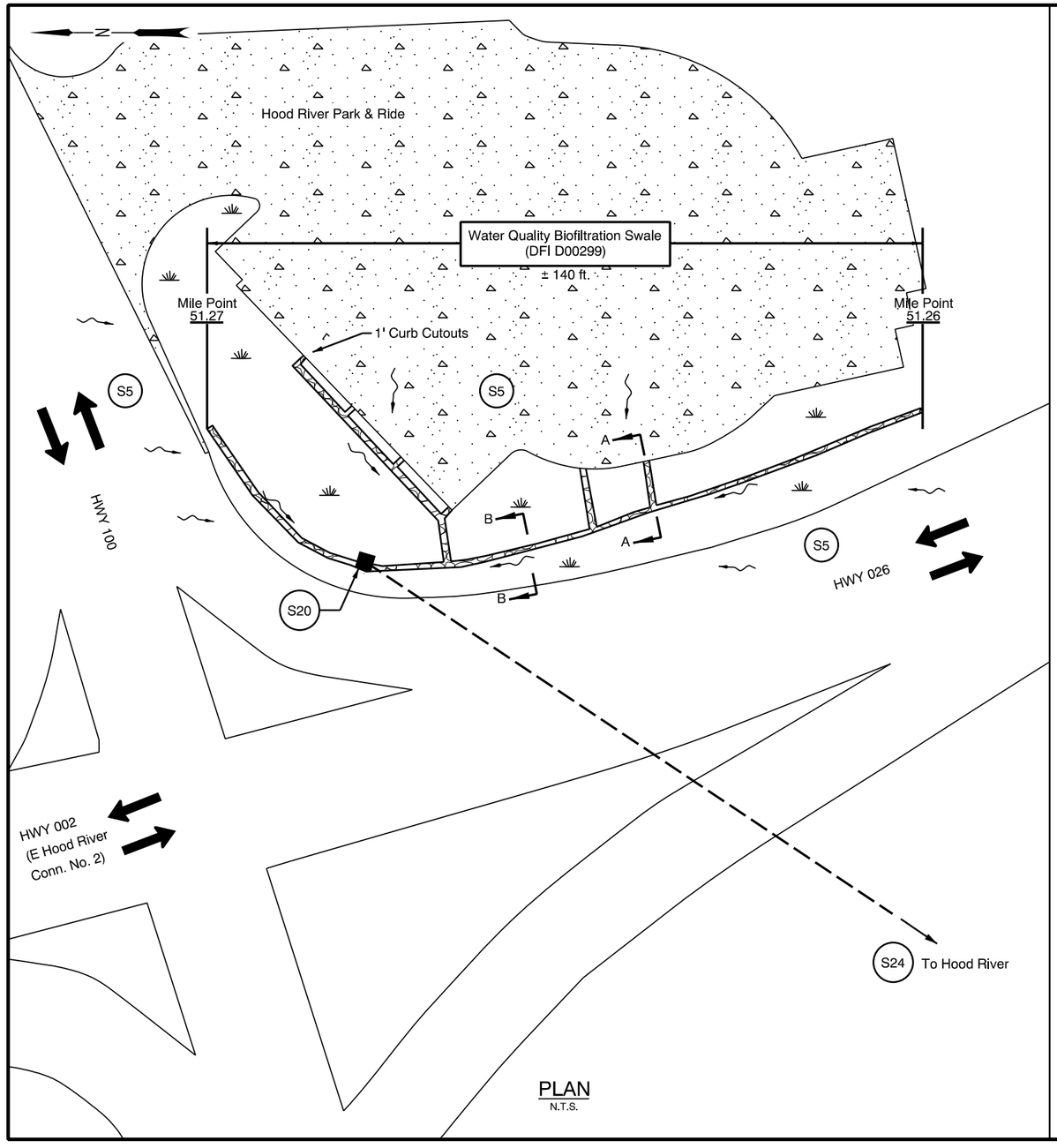
Contact any of the following for more detailed information about management of waste materials found on site:

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

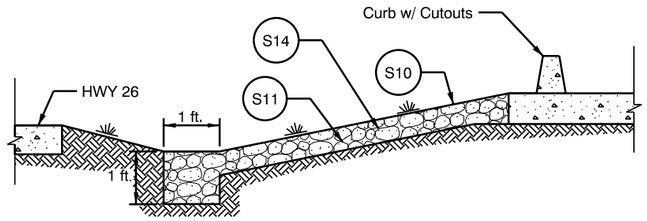
A Appendix A – Site Specific Operational Plan

Contents:

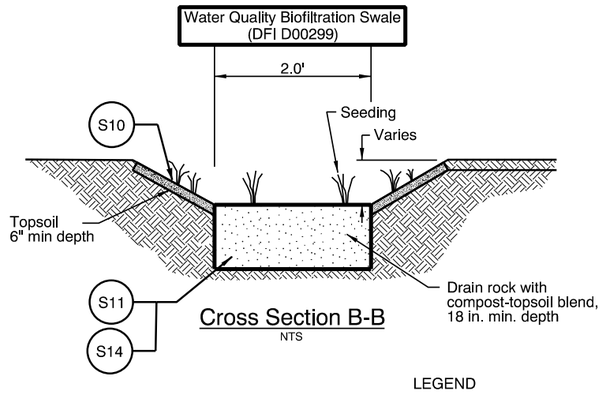
Operational Plan: DFI D00299



PLAN
N.T.S.



SECTION A-A
N.T.S.



Cross Section B-B
NTS

LEGEND

- Stormwater Flow Path
- Catch Basin
- Traffic Flow Direction
- S5 Table 1: Facility Components

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Brooklyn Scholz

Drafted By: Brooklyn Scholz

DFI D00299
MAINTENANCE DISTRICT 2C HWY 100
WATER QUALITY BIOFILTRATION SWALE
HIGHWAY MP 64.42
HOOD RIVER

DFI_D00299.dgn

B Appendix B – Project Contract Plans

Contents:

Site Specific Subset of Project Contract Plan 40V-022

40V-22

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
2B Thru 2B-6 Incl.	Details
2B-7 Thru 2B-24 Incl.	Interpretive Sign Panel Details
2B-25	Color Palette Exhibit For Signs
3	Cascade Locks General Construction
3A	Cascade Locks General Construction Plan And Profile
4	Cascade Locks Grading, Drainage, & Utilities Plan
5	Cascade Locks Roadside Development Plan
6	Hood River General Construction
7	Hood River Grading, Drainage, & Utilities Plan
8	Hood River Roadside Development Plan
9	Mosier General Construction
10	Non-Urban Interpretive Panel Locations
11	Non-Urban Interpretive Panel Locations

Standard Drg. Nos. ⚠1

BR720	- Gravity Retaining Wall
RD105	- Disabled Person Parking
RD300, RD350, RD370	- Drainage
RD700, RD715, RD720, RD725	- Curbs, Islands, Sidewalks, And Dwys.
RD820	- Fence Gates
RD900, RD905, RD910, RD911	- Traffic Control
RD1010, RD1040	- Erosion Control
TM100, TM105	- Temporary Signing
TM239	- Permanent Signing
TM500, TM501	- Pavement Marking

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

PLANS FOR PROPOSED PROJECT

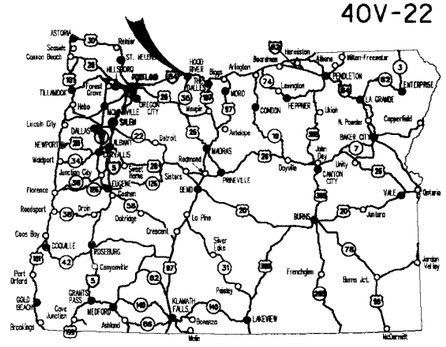
GRADING, DRAINAGE, PAVING, SIGNING, AND ROADSIDE DEVELOPMENT

HCRH INTERPRETIVE SITES AND SIGNS

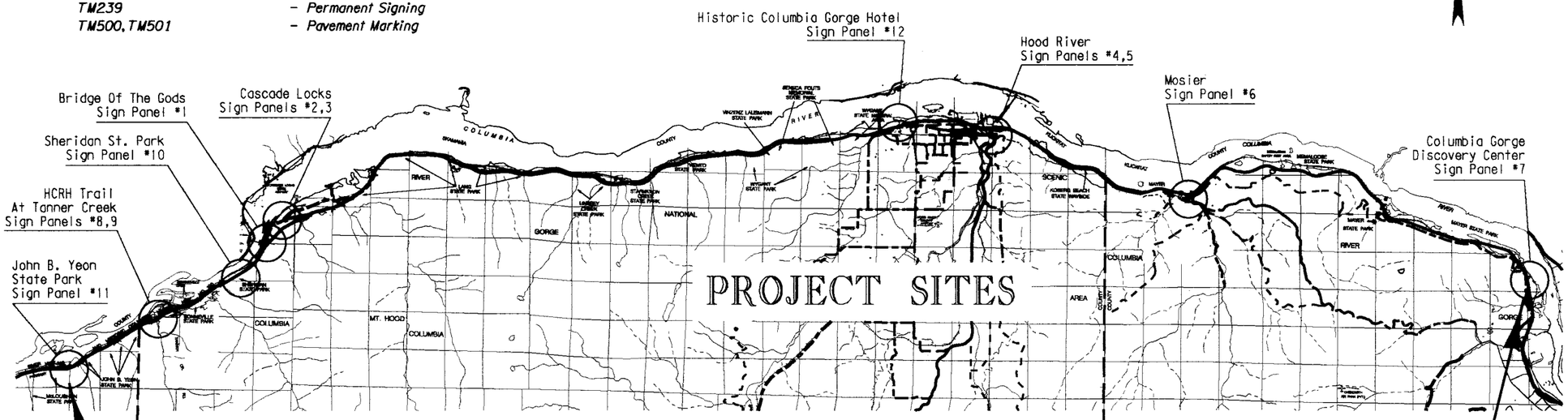
HISTORIC COLUMBIA RIVER HIGHWAY

MULTNOMAH, HOOD RIVER AND WASCO COUNTIES

FEBRUARY 2007



Overall Length Of Project - 93.0 Km (57.8 mi)



BEGINNING OF PROJECT X-FH-S100(043)

M.P. 24.2

END OF PROJECT X-FH-S100(043)

M.P. 82.0

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 From The Center, Or Answers To Questions About The Rules By Calling (503) 232-1987.

⚠1 *01/19/07 - Added Std. Drg. No.*

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE

PLANS PREPARED FOR
OREGON DEPARTMENT OF TRANSPORTATION
BY:

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PLANNERS ENGINEERS SURVEYORS LANDSCAPE ARCHITECTS

OREGON TRANSPORTATION COMMISSION

Stuart Foster	CHAIRMAN
Gail L. Achterman	COMMISSIONER
Michael Nelson	COMMISSIONER
Randall Papé	COMMISSIONER
John Russell	COMMISSIONER
	DIRECTOR OF TRANSPORTATION

REGISTERED PROFESSIONAL ENGINEER 8570PE OREGON JAN. 15, 2002 KENNETH S. REHMS

EXPIRES: 12/31/08

OREGON DEPARTMENT OF TRANSPORTATION CONCURRENCE

TECHNICAL SERVICES MANAGING ENGINEER — DATE

ODOT/HCRH
INTERPRETIVE SITES AND SIGNS
HISTORIC COLUMBIA RIVER HIGHWAY
MULTNOMAH, HOOD RIVER & WASCO COUNTIES

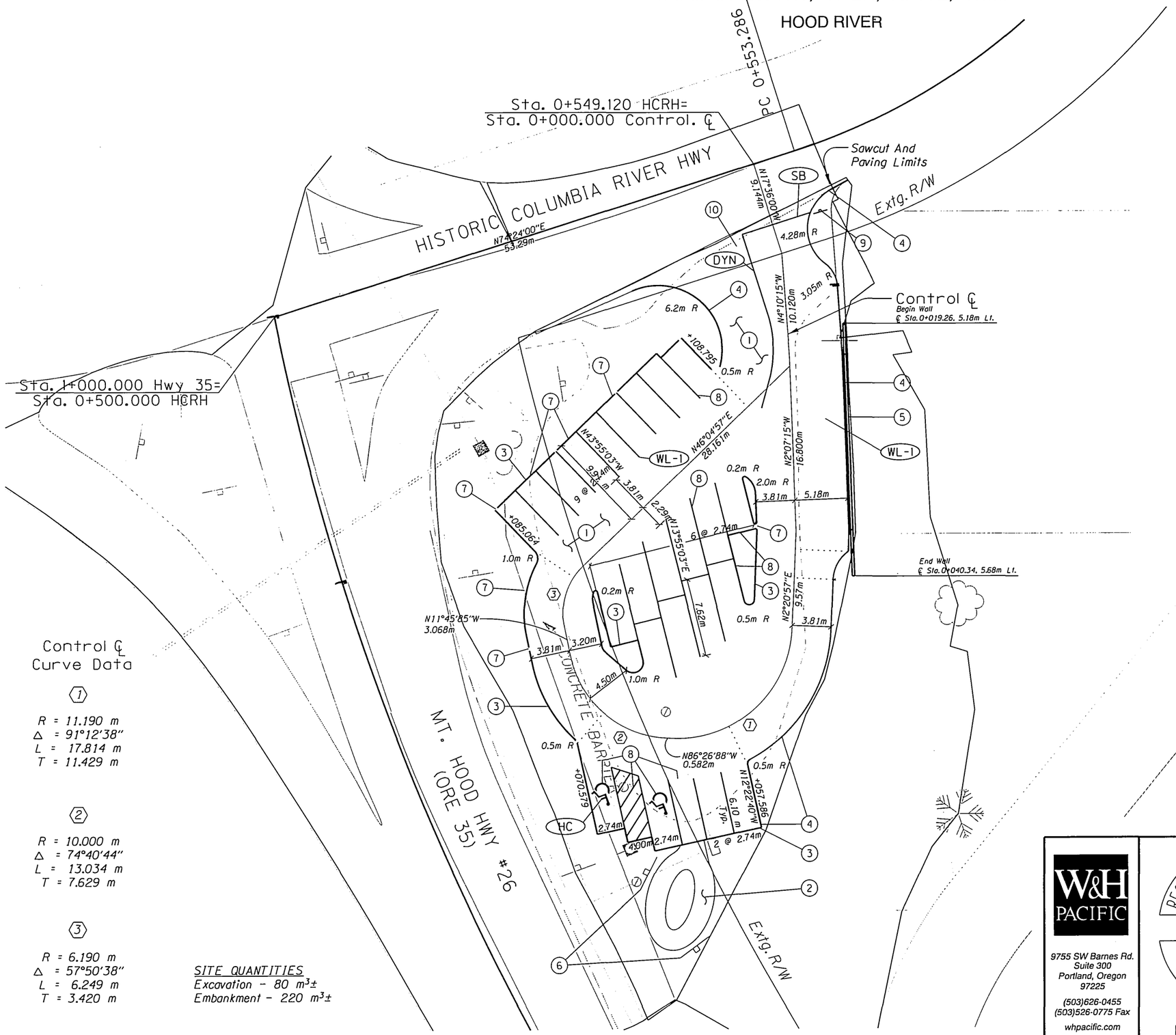
FEDERAL HIGHWAY ADMINISTRATION		PROJECT NUMBER	SHEET NO.
REGION 10	OREGON DIVISION		1

VIEW 3 2142B413-000

VIEW 3

Sec. 31 NW NW, T. 2N, R. 11E, W.M.

10/4/2006



Control ℄
Curve Data

(1)

R = 11.190 m
Δ = 91°12'38"
L = 17.814 m
T = 11.429 m

(2)

R = 10.000 m
Δ = 74°40'44"
L = 13.034 m
T = 7.629 m

(3)

R = 6.190 m
Δ = 57°50'38"
L = 6.249 m
T = 3.420 m

SITE QUANTITIES
Excavation - 80 m^3±
Embankment - 220 m^3±

(1) Const. Asph. Conc. Pavement
HMAC Level 3 - 215 MG
Aggr. Base - 510 MG
(For Details, See Sht. 2B)

(2) Const. Asph. Walk - 41 m^2
(For Details, See Sht. 2B)

(3) Const. P.C. Conc. Drainage Curb - 132 m

(4) Const. Standard Curb (e=0.150 m) - 84 m

(5) Const. Gravity Wall - 23.0 m^2
(See Drg. No. BR720)
(For Details, See Sht. 2B)

(6) Inst. Interpretive Signs - 2
(For Details, See Shts. 2B-7 Through 2B-12)
Work Includes:
Porcelain Enamel Sign Panel - 2
Sign Support Footings- Ls
Precast Concrete Sign Supports - 2

(7) Const. 300 mm Curb Opening - 7
5 m Spacing Or As Directed By Engineer

(8) Inst. Painted Permanent Pavement Striping

(9) Provide And Install Stop Sign

(10) Const. Asph. Appr.

All Dimensions Are In Meters (m)
Unless Otherwise Noted.

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REGISTERED PROFESSIONAL ENGINEER
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JAN. 15, 2002
KENNETH S. REHMS
EXPIRES: 12/31/06

OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

ODOT/HCRH
INTERPRETIVE SITES AND SIGNS
COLUMBIA RIVER HIGHWAY
HOOD RIVER COUNTY

Reviewed By - Ken S. Rehms
Designed By - Elizabeth L. Betts/Christopher J. Largy
Drafted By - Tammy J. Taggart

HOOD RIVER
GENERAL CONSTRUCTION

SHEET NO. 6

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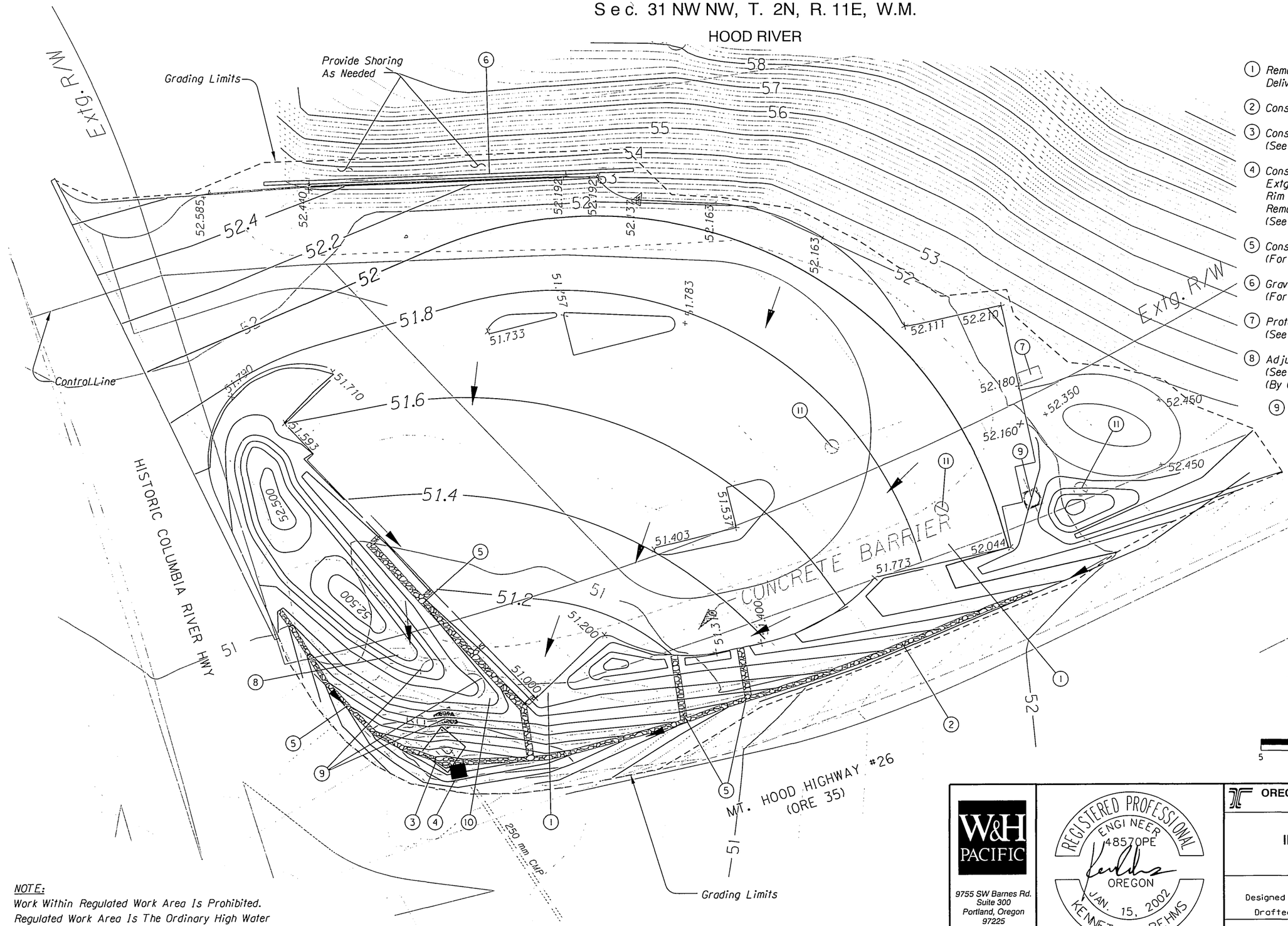
VIEW 2

VIEW 2

Sec. 31 NW NW, T. 2N, R. 11E, W.M.

HOOD RIVER

11/8/2006



1. Remove Conc. Barrier - 51 m
   Deliver To ODOT's Parkdale Yard
2. Const. Unsupported Sediment Fence - 38 m
3. Const. Type 1 Inlet Protection
   (See Drg. No RD1010)
4. Const. Ditch Inlet (Type D) Over Extg. Culvert
   Extg. I.E. 48.856
   Rim I.E. 50.20
   Remove 1.5 m Extg. Culvert
   (See Drg. No RD370)
5. Const. Drainage Swale
   (For Details, See Sht. 2B-2)
6. Gravity Wall
   (For Details, See Shts. 2B & 6)
7. Protect Gas Facilities
   (See Specials For Utility Contact)
8. Adjust Or Relocate Telephone Riser
   (See Specials For Utility Contact)
   (By Others)
9. Protect Power Pole
   Adjust Or Relocate Guy Anchors (By Others)
   (See Specials For Utility Contact)
10. Relocate Power Riser
    (See Specials For Utility Contact)
    (By Others)
11. Adjust Gas Valve Box - 3
    (By Others)

NOTE:
Work Within Regulated Work Area Is Prohibited. Regulated Work Area Is The Ordinary High Water Elevation For Hood River, Located West Of Project, Across Mt. Hood Hwy. #26 (ORE 35).

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OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

ODOT/HCRH
INTERPRETIVE SITES AND SIGNS
COLUMBIA RIVER HIGHWAY
HOOD RIVER COUNTY

Reviewed By - Ken S. Rehms
Designed By - Elizabeth L. Betts/Christopher J. Largy
Drafted By - Elizabeth L. Betts/Tammy J. Taggart

HOOD RIVER
GRADING, DRAINAGE & UTILITIES PLAN

SHEET NO. 7

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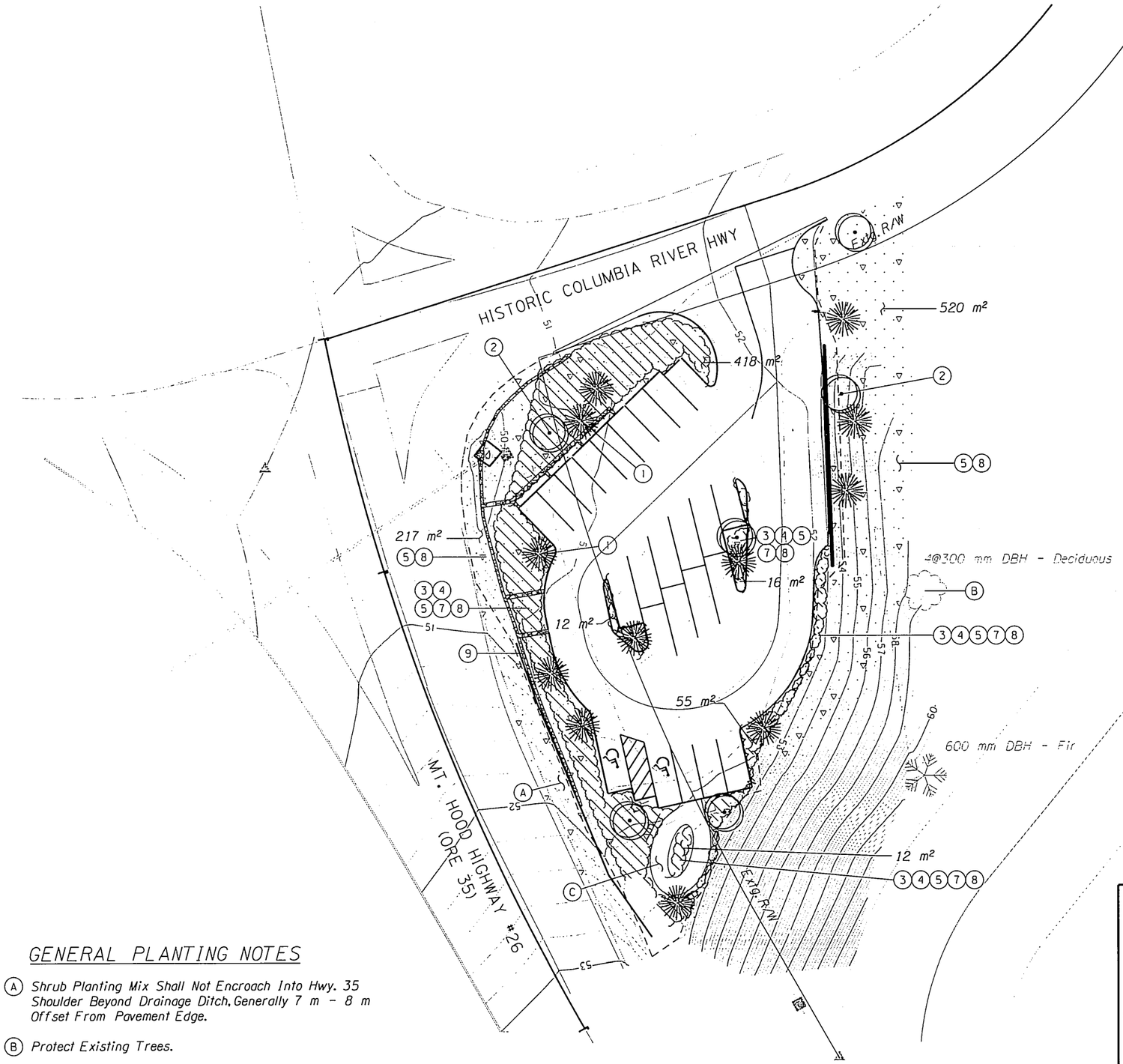
VIEW 2

VIEW 2

Sec. 31 NW NW, T. 2N, R. 11E, W.M.

HOOD RIVER

11/15/2006



(1) *Plant 900 mm Evergreen Trees:*
Pinus ponderosa - 7
Psuedotsuga menziesii - 5
Conifer Trees - 12

(2) *Plant No. 5 Cont. Deciduous Trees:*
Quercus garryana - 6
Deciduous Trees - 6

(3) *Plant Mixed Shrub (Size As Noted) In Random Fashion (Clump And Scatter), Average 750 mm O.C. Spacing: (Approx. 513m²)*
Amelanchier alnifolia - 86
Holodiscus discolor - 138
Philadelphus lewisii - 138
Pursia tridentata - 292
Ribes sanguineum - 86
Rosa nutkana - 86
Symphoricarpos albus - 86
Tubeling Shrubs, 525 cm³ - 912

(4) *Plant Shrubs And Groundcover (Size As Noted) In Random Fashion (Clump And Scatter)*
Average 0.5 m O.C. Spacing: (Approx. 538 m²)
Agropyron spicatum - 266
Arctostaphylos columbiana - 554 (100 mm Pot)
Ceanothus sanguineus - 266
Cryptogramma crispa - 268
Festuca idahoensis - 266
Festuca occidentalis -266
Penstemon richardonii -266
Shrubs, 165 cm³ Tubeling - 1598
Groundcover, 100 mm Pot - 554

(5) *Seed And Mulch Permanent Seeding In All Disturbed Areas: (Approx. 1275 m²)*
Permanent Seeding, Mix 1 - 1275 m²

(6) *Provide And Place Boulders (Avg. 1 m Diameter) Within Shrub Beds (Note #3):*
Boulders - 50

(7) *Spread Topsoil, Spread And Till Soil Conditioner, Before Planting:*
Topsoil (150 mm Depth) - 81 m³
Soil Conditioner (50 mm Depth) - 27 m³

(8) *Prior To The Start Of Landscape Work, Germinate Resident Weeds, Then Kill All Weeds And Grasses Where Designated. Cut Grasses To 50 mm Height. Repeat Weed Germination And Kill, Then Clear All Dead Weeds And Grass From Site.*
Clearing And Grubbing - 0.13± ha.

(9) *Seed Drainage Swale Bottom (Approx. 30 m²)*
Permanent Seeding, Mix No. 3 - 30 m²

GENERAL PLANTING NOTES

(A) *Shrub Planting Mix Shall Not Encroach Into Hwy. 35 Shoulder Beyond Drainage Ditch, Generally 7 m - 8 m Offset From Pavement Edge.*

(B) *Protect Existing Trees.*

(C) *See Engineering Details For Path Construction, Sheets 2B And 6.*

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REGISTERED
317
MICHAEL D. SMYTH
OREGON
04/04/94
LANDSCAPE ARCHITECT

OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

ODOT/HCRH
INTERPRETIVE SITES AND SIGNS
COLUMBIA RIVER HIGHWAY
HOOD RIVER COUNTY

Reviewed By - Mark A. Hadley
Designed By - Mike D. Smyth
Drafted By - Elizabeth L. Betts / Tammy Taggart

HOOD RIVER
ROADSIDE DEVELOPMENT PLAN

SHEET NO. 8

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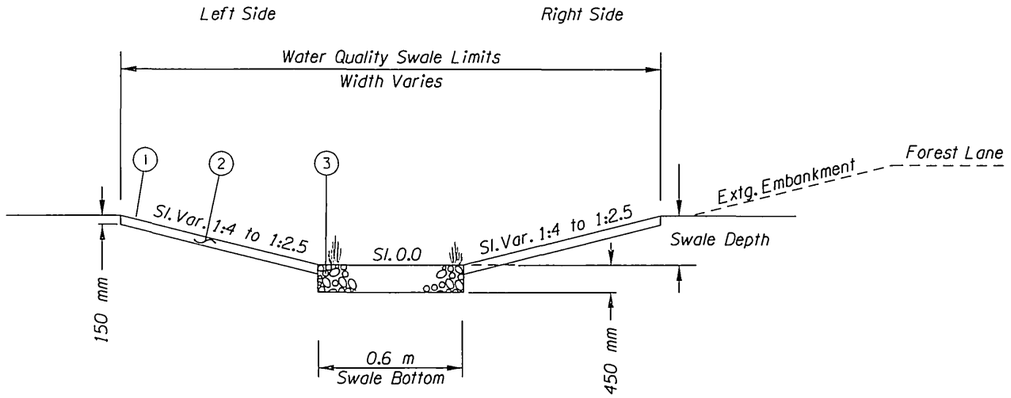
VIEW 2

VIEW 2

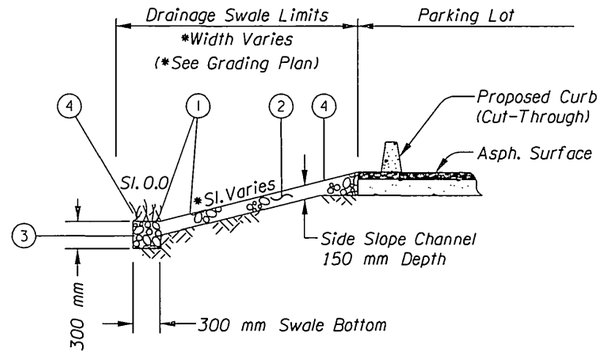
10/4/2006



Swale Length - 43 m
Min. (Max.) Longitudinal Swale Slope - .005 (0.5%)
Min. Swale Depth - 0.45 m

VEGETATED STORM WATER QUALITY SWALE
(CASCADE LOCKS SITE)

1. Provide And Install Biodegradable Matting, Type B, Throughout Swale.
2. Provide And Place 150 mm Deep Topsoil Throughout Swale.
3. Swale Bottom Medium - Provide And Place 450 mm Deep Medium In Bottom Of Swale, Continuous Full Length Of Swale. Medium Composed Of Drain Rock With Compost-Topsoil Blend.
4. Seed Swale Using Mix No. 3. See Specifications, Section 01030.



DRAINAGE SWALE
(HOOD RIVER SITE)

1. Provide And Install Biodegradable Matting, Type B, Along All Swale Bottoms And Side Slope Channels.
2. Side Slope Channel - Provide And Place 150 mm Deep Medium Along Side Slope Channel To Bottom Of Swale. Medium Composed Of Drain Rock With Compost-Topsoil Blend.
3. Swale Bottom Medium - Provide And Place 300 mm Deep Medium In Bottom Of Swale, Continuous Full Length Of Swale. Medium Composed Of Drain Rock With Compost-Topsoil Blend.
4. Seed Swale Using Mix No. 3, See Specifications, Section 01030.

All Dimensions Are In Millimeters (mm)
Unless Otherwise Noted.

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OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

ODOT/HCRH
INTERPRETIVE SITES AND SIGNS
COLUMBIA RIVER HIGHWAY
MULTNOMAH, HOOD RIVER & WASCO COUNTIES

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Designed By - Elizabeth L. Betts
Drafted By - Elizabeth L. Betts

DETAILS

SHEET NO.
2B-2