OPERATION & MAINTENANCE MANUAL

DFI No.: D00171
Facility Type: Water Quality Biofiltration Swale

JULY, 2011

INDEX

1. Identification

Drainage Facility ID (DFI):	**D00171**
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Number) 37V-041
Location:	District: 2B (Old 2A)
	Highway No.: 047
	Mile Post: 65.70/65.90 (beg./end)
	Description: This facility is located north of the westbound lanes of US26 (Hwy 047) between Bethany Boulevard and Cornell Road. Access to the facility can be obtained from the unobstructed shoulder of westbound US26 (Hwy 047).

2. Facility Contact Information

Contact the Engineer of Record, Region Technical Center, or Geo-Environmental's Senior Hydraulics Engineer for:

- Operational clarification
- Maintenance clarification
- Repair or restoration assistance

Engineering Contacts:

Region Technical Center Hydro Unit Manager

Or

Geo-Environmental Senior Hydraulics Engineer (503) 986-3365.

3. Construction

Engineer of Record:	ODOT Designer – Region 1 Tech. Center, Bruce S. Council, P.E., (503) 731-8319
Facility Construction:	2004
Contractor:	Mowat Construction Company.

4. Storm Drain System and Facility Overview

A water quality swale is a flat-bottomed open channel designed to treat stormwater runoff from highway pavement areas. This type of facility is lined with grass. Treatment by trapping sedimentation occurs when stormwater runoff flows through the grass.

This water quality biofiltration swale is located north of the westbound lanes of US26 (Hwy 047) between Cornell Road and Bethany Boulevard. Access to the facility may be obtained from the unobstructed shoulder off these lanes.

The swale is approximately 1,115 feet in length. The swale receives runoff as sheet flow from the grassy slope to its north and from the adjacent westbound lanes of US26 (Hwy 047). After being received, the runoff drains toward the three inlets at the center of the swale (Points A, B, C on the Operational Plan, Appendix A).

From these inlets, the runoff is directed into a 48-inch diameter detention pipe facility (DFI D00174) (Points D, E). After detention, a 24-inch diameter storm pipe conveys the runoff to a manhole (Point F). From there, the water is discharged into a 24-inch diameter storm pipe, which conveys the runoff northwards.

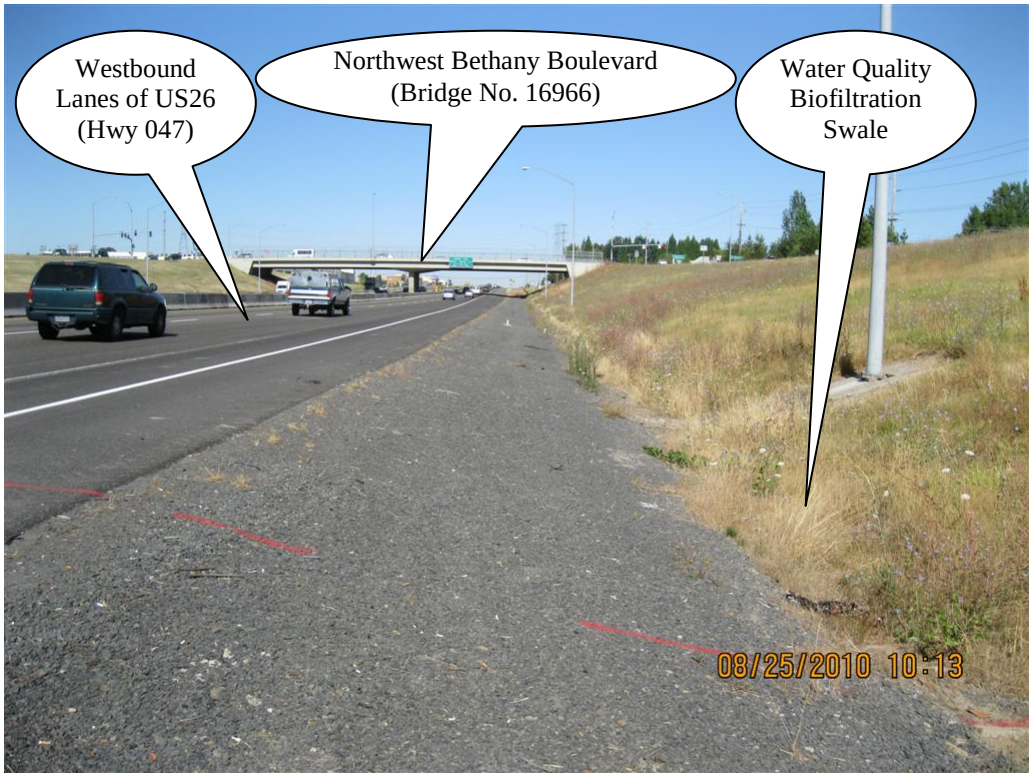


Photo 1: Water quality biofiltration swale. Westbound lanes of US26 (Hwy 047) are on the left. Photo taken facing west.

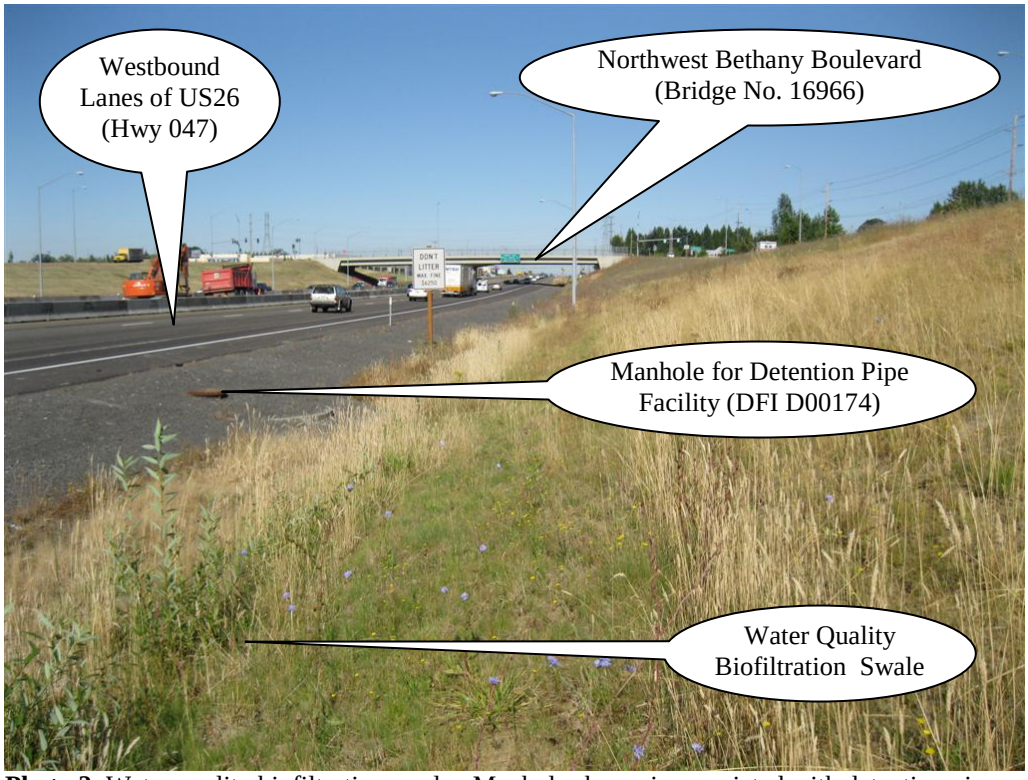


Photo 2: Water quality biofiltration swale. Manhole shown is associated with detention pipe facility (DFI D00174). Photo taken facing west.

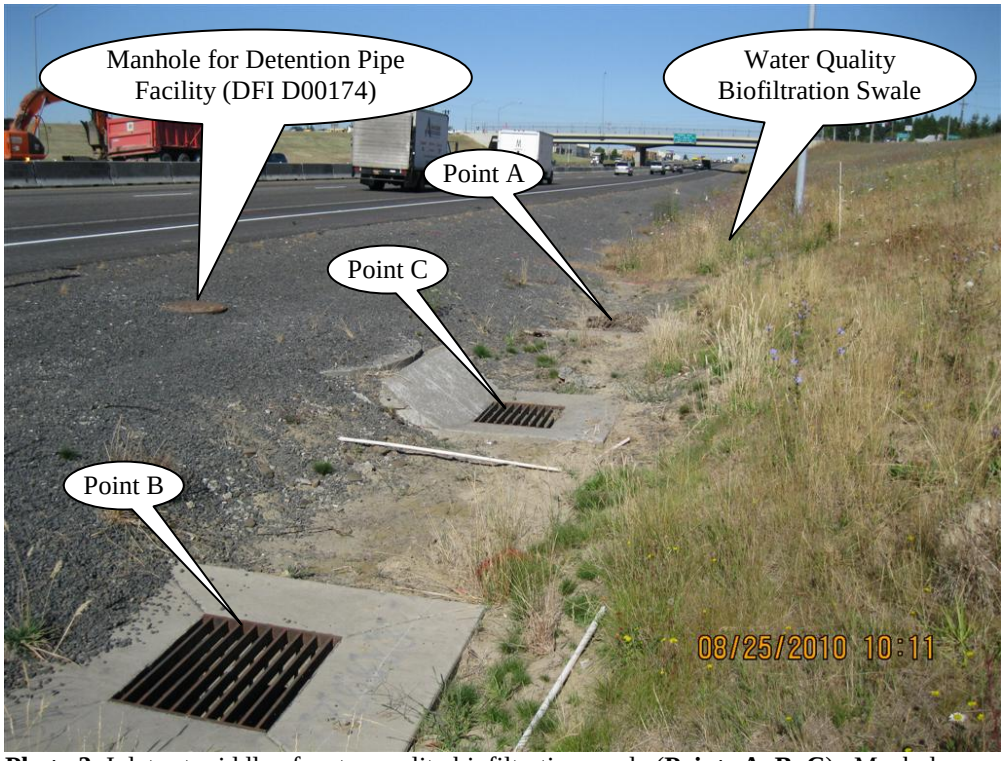


Photo 3: Inlets at middle of water quality biofiltration swale (**Points A, B, C**). Manhole shown is associated with detention pipe facility (DFI D00174) (**Point D**). Photo taken facing west.

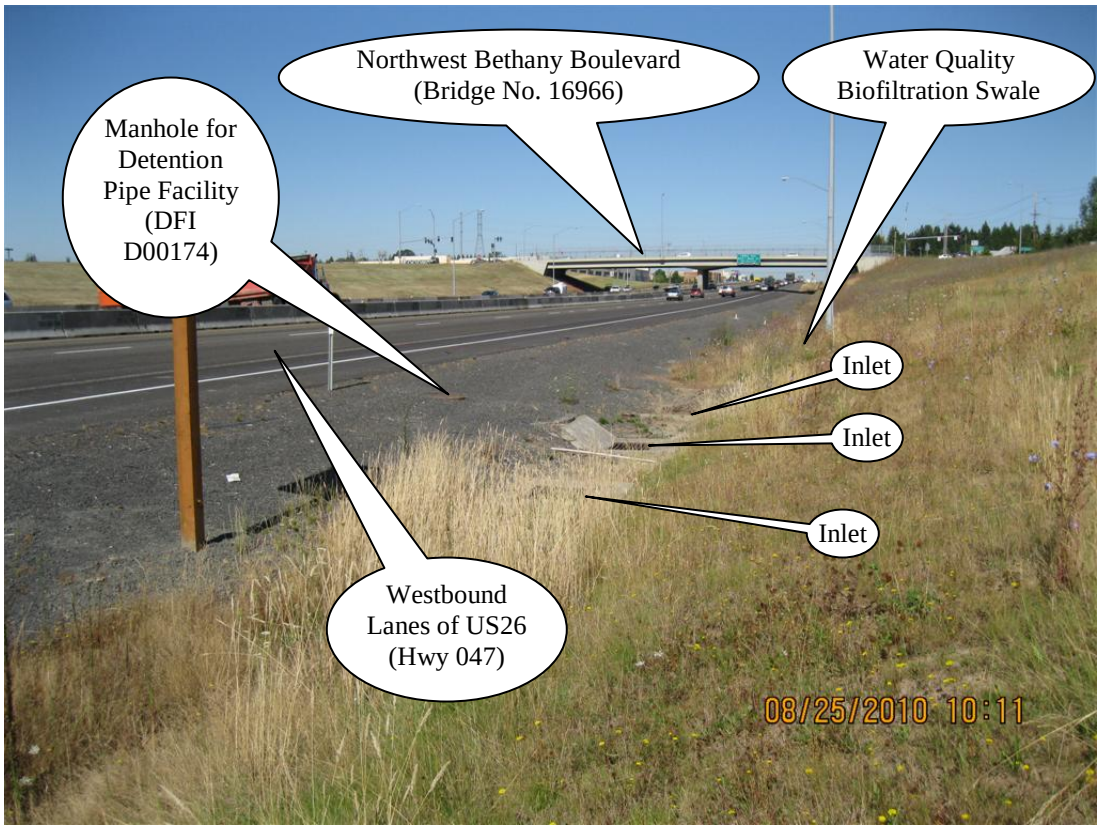


Photo 4: Inlets at middle of swale (**Points A, B, C**). Manhole shown is associated with detention pipe facility (DFI D00174) (**Point D**). Photo taken facing west.

Photo 5: Two of three inlets (**Points B, C**). Photo taken facing east.

For further information and details regarding the system refer to Appendix A for the Operational Plan and Appendix B for the Construction Project Plan sheets.

A. Maintenance equipment access:
The facility can be accessed for maintenance from the unobstructed shoulder off the westbound lanes of US26 (Hwy 047).

B. Heavy equipment access into facility:

☒ Allowed (no limitations)
☐ Allowed (with limitations)
☐ Not allowed

C. Special Features:

☒ Amended Soils – Drain rock with compost blend.
☐ Porous Pavers
☐ Liners
☒ Underdrains – 2 parallel, 4-inch diameter underdrains lengthwise under swale.

5. Facility Haz Mat Spill Feature(s)

The water quality biofiltration swale can be used to store a volume of liquid by using metal plates or sandbags to block the inlets at the middle of the swale (Points A, B, C; Photo 3).

6. Auxiliary Outlet (High Flow Bypass)

Auxiliary Outlets are provided if the primary outlet control structure cannot safely pass the projected high flows. Broad-crested spillway weirs and overflow risers are the two most common auxiliary outlets used in stormwater treatment facility design. The auxiliary outlet feature is either a part of the facility or an additional storm drain feature/structure.

The auxiliary outlet feature for this facility is:

☐ Designed into facility

☒Other, as noted – This facility has no auxiliary outlet features.

7. Maintenance Requirements

Routine maintenance table for non-proprietary stormwater treatment and storage/detention facilities have been incorporated into ODOT's Maintenance Guide. These tables summarize the maintenance requirements for ponds, swales, filter strips, bioslopes, and detention tanks and vaults. Special maintenance requirements in addition to the routine requirements are noted below when applicable.

The ODOT Maintenance Guide can be viewed at the following website:

http://www.oregon.gov/ODOT/HWY/OOM/MGuide.shtml

Maintenance requirements for proprietary structures, such as underground water quality manholes and/or vaults with filter media are noted in Appendix C when applicable.

The following stormwater facility maintenance table (See ODOT Maintenance Guide) should be used to maintain the facility outlined in this Operation and Maintenance Manual or follow the Maintenance requirements outlined in Appendix C when proprietary structure is selected below:

- ☒ Table 1 (general maintenance)
- ☐ Table 2 (stormwater ponds)
- ☒ Table 3 (water quality or biofiltration swales)
- ☐ Table 4 (water quality filter strips)
- ☐ Table 5 (water quality bioslopes)
- ☐ Table 6 (detention tank)
- ☐ Table 7 (detention vault)
- ☐ Appendix C (proprietary structure)
- ☐ Special Maintenance requirements:

Note: Special maintenance Requirements Require Concurrence from ODOT SR Hydraulics Engineer.

8. Waste Material Handling

Material removed from the facility is defined as waste by DEQ. Refer to the roadwaste section of the ODOT Maintenance Yard Environmental Management System (EMS) Policy and Procedures Manual for disposal options: http://egov.oregon.gov/ODOT/HWY/OOM/EMS.shtml

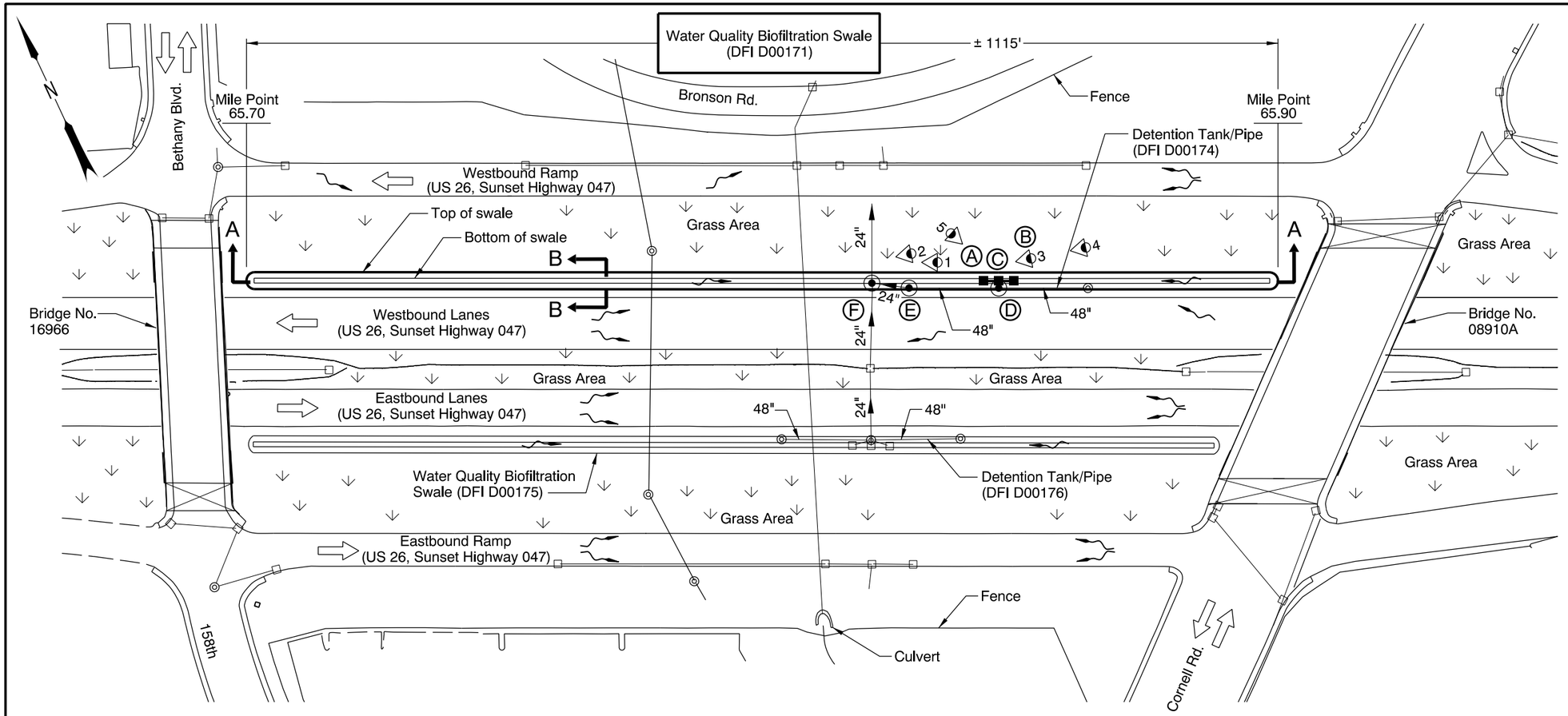
Contact any of the following for more detailed information about management of waste materials found on site:

ODOT Clean Water Unit	(503) 986-3008
ODOT Statewide Hazmat Coordinator	(503) 229-5129
ODOT Region Hazmat Coordinator	(503) 731-8304
ODEQ Northwest Region Office	(503) 229-5263

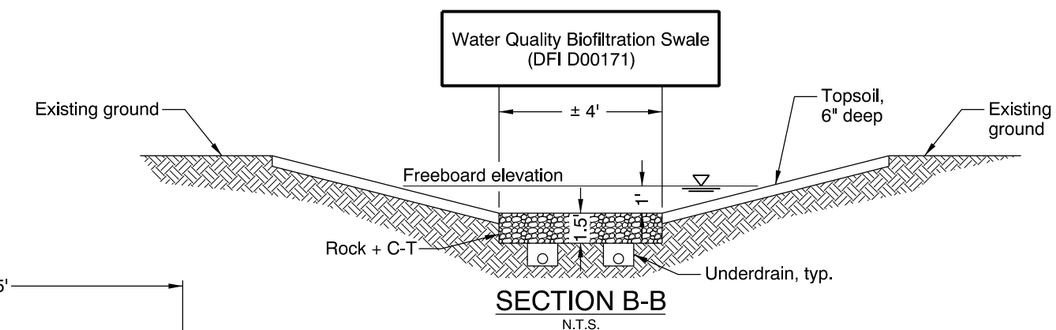
Appendix A

Content:

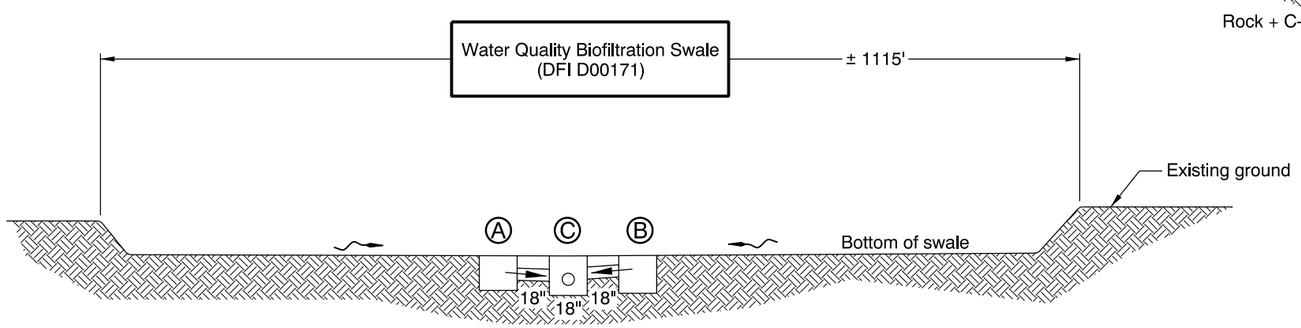
- **Operational Plan and Profile Drawing(s)**



PLAN
N.T.S.



SECTION B-B
N.T.S.



SECTION A-A
N.T.S.

LEGEND:

- Photo Location / Direction
- Western Inlet
- Eastern Inlet
- Central Inlet
- Manhole Connected to Central Inlet by Pipe
- Detention Manhole
- Manhole Connecting Detention Tank / Pipe to Conveyance Line
- Manhole
- Inlet
- Traffic Flow / Direction
- Storm Pipe (Facility)
- Storm Pipe
- Conveyance Direction
- Pavement / Facility Flow Path

Sht. 1 of 1

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: Wynee Hu

Drafted By: Mathew Bunde

DFI D00171
MAINTENANCE DISTRICT 2B HWY 047
WATER QUALITY BIOFILTRATION SWALE
SUNSET HIGHWAY MP 65.70-65.90
WASHINGTON COUNTY

Z:\Hydraulics\Hydraulics OM\Completed_Facility_Files_READY to QAQC\Dist_2B\Hwy_047\2B_047_D00171\Operational Plan\DFI_D00171.dgn :: Sheet 2/20/2014 9:35:51 AM hwyr33e

DFI_D00171.dgn

Appendix B

Content:

- **ODOT Project Plan Sheets**
  - ***Cover/Title Sheet***
  - ***Water Quality/Detention Plan Sheets***
  - ***Other Details***

37V-41

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A, 1A-2	Index Of Sheets Cont'd.
1A-3	Std. Drg. Nos.
1B	Sheet Layout
2, 2A, 2A-2 Thru 2A-65 Incl.	Typical Sections
2B, 2B-2 Thru 2B-18 Incl.	Details
2C, 2C-2	Traffic Control Details
2CA, 2CA-2, 2CA-2A, 2CA-3 Thru 2CA-57 Incl.	Traffic Control Plans - Murray Work Area
2CB, 2CB-2 Thru 2CB-12 Incl.	Traffic Control Plans - Cornell Work Area
2D, 2D-2, Thru 2D-12, Incl.	Pipe Data Sheet

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

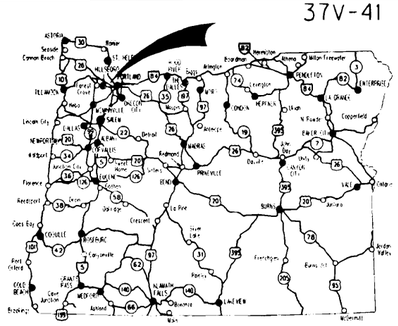
PLANS FOR PROPOSED PROJECT

GRADING, DRAINAGE, STRUCTURES, PAVING, SIGNING, ILLUMINATION, SIGNALS, & ROADSIDE DEVELOPMENT

US26: CORNELL RD. - OR217 (BEAVERTON) SEC.

SUNSET HIGHWAY

WASHINGTON COUNTY
MARCH 2004

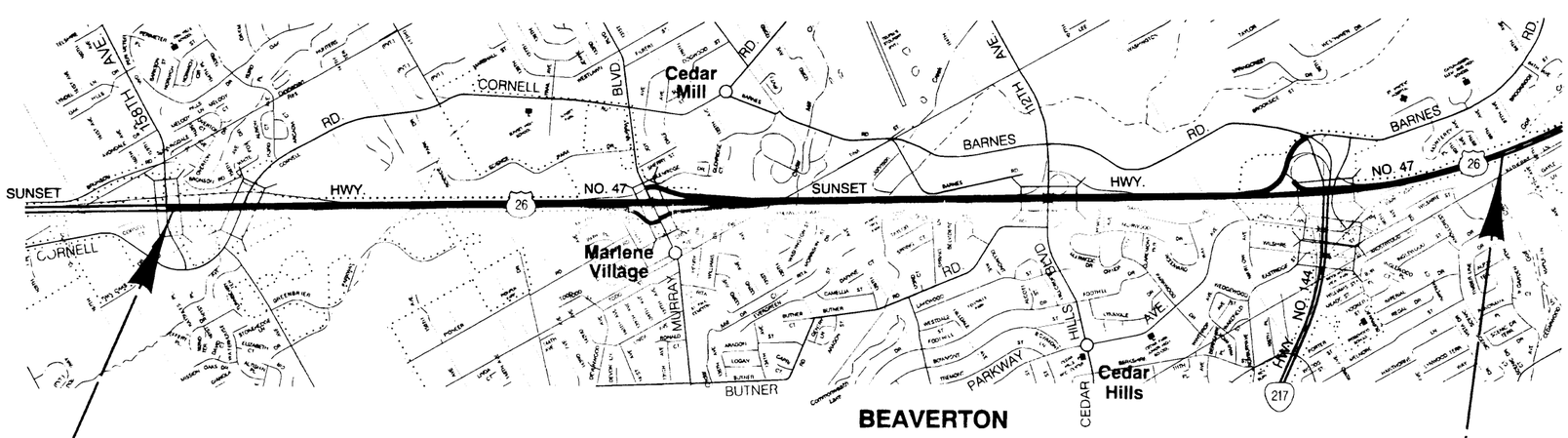


Overall Length Of Project - 6.51 km (4.05 Miles)

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.)

OTIA
OREGON TRANSPORTATION INVESTMENT ACT

LET'S ALL WORK TOGETHER TO MAKE THIS JOB SAFE



BEGINNING OF PROJECT
NH-OTIA-S047(052)
STA. "LW" 91+660.00 (M.P. 65.68)

END OF PROJECT
NH-OTIA-S047(052)
STA. "L" 98+160.00 (M.P. 69.73)

T. 1 N., R. 1 W., W.M.

OREGON TRANSPORTATION COMMISSION

Stuart Foster	CHAIRMAN
Gail L. Achterman	COMMISSIONER
Mike Nelson	COMMISSIONER
Randall Papé	COMMISSIONER
John Russell	COMMISSIONER
Bruce A. Warner	DIRECTOR OF TRANSPORTATION

REGISTERED PROFESSIONAL ENGINEER
13,704
OREGON
JULY 16, 1987
CATHERINE M. NELSON
Expires Dec. 31, 2004

Catherine M. Nelson
TECHNICAL SERVICES MANAGING ENGINEER

METRIC

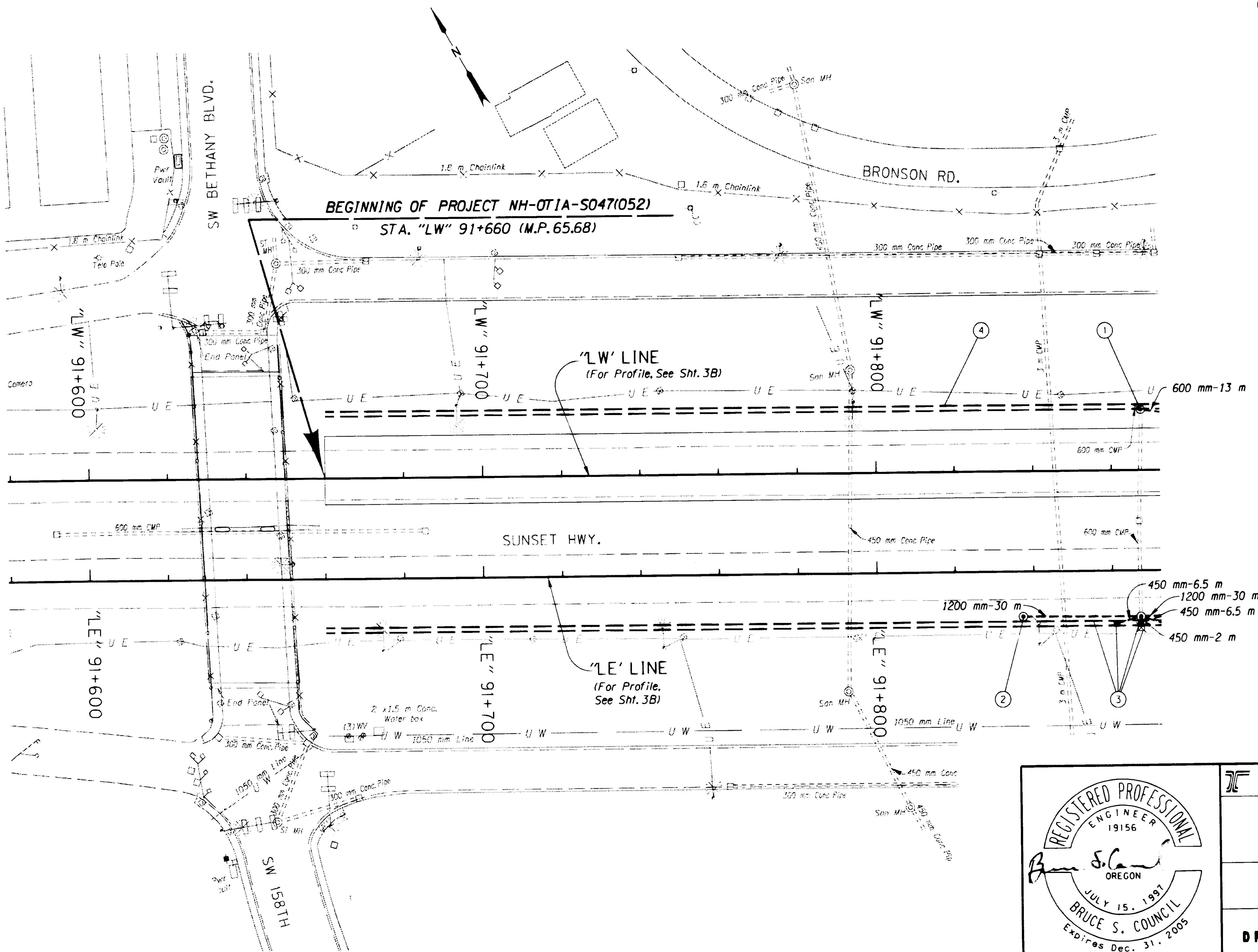
US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	NH-OTIA-S047(052)	1

PE000656/C0341403-011

F:\ODOT DATA\Projects\13459 Cornell 217\13459r1.tsl 1/16/2004 1:19:56 PM bwve07n

Sec. 32, T. 1N, R. 1W, W.M.



1. Sta. "LW" 91+867.478, 15.633 m Lt.
   Const. Manhole
   Connect To Extg. 600 mm CMP
   Inst. 600 mm Storm Sew. Pipe - 13.0 m
   3 m Depth
   (See Drg. Nos. RD300, RD336, RD344, RD356, & RD360)

2. Sta. "LE" 91+837.186, 11.250 m Rt.
   Const. Manhole, Large, 2400 mm Dia.
   (See Drg. No. 346)

3. Sta. "LE" 91+867.185, 11.508 m Rt.
   Remove Inlet
   Const. Water Quality Swale "WCE"
   Const. Detention Manhole 2.4 m
   Const. Type "G-2MA" Inlet - 3
   Inst. 450 mm Storm Sew. Pipe - 15.0 m
   1.5 m Depth
   Inst. 1200 mm Storm Pipe - 60.0 m
   3 m Depth
   (For Details, See Shts. R-28, GHJ-11, & GHJ-33)
   (See Drg. No. RD364)

4. See Sht. 4A, Note 2

REGISTERED PROFESSIONAL ENGINEER 19156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
Expires Dec. 31, 2005

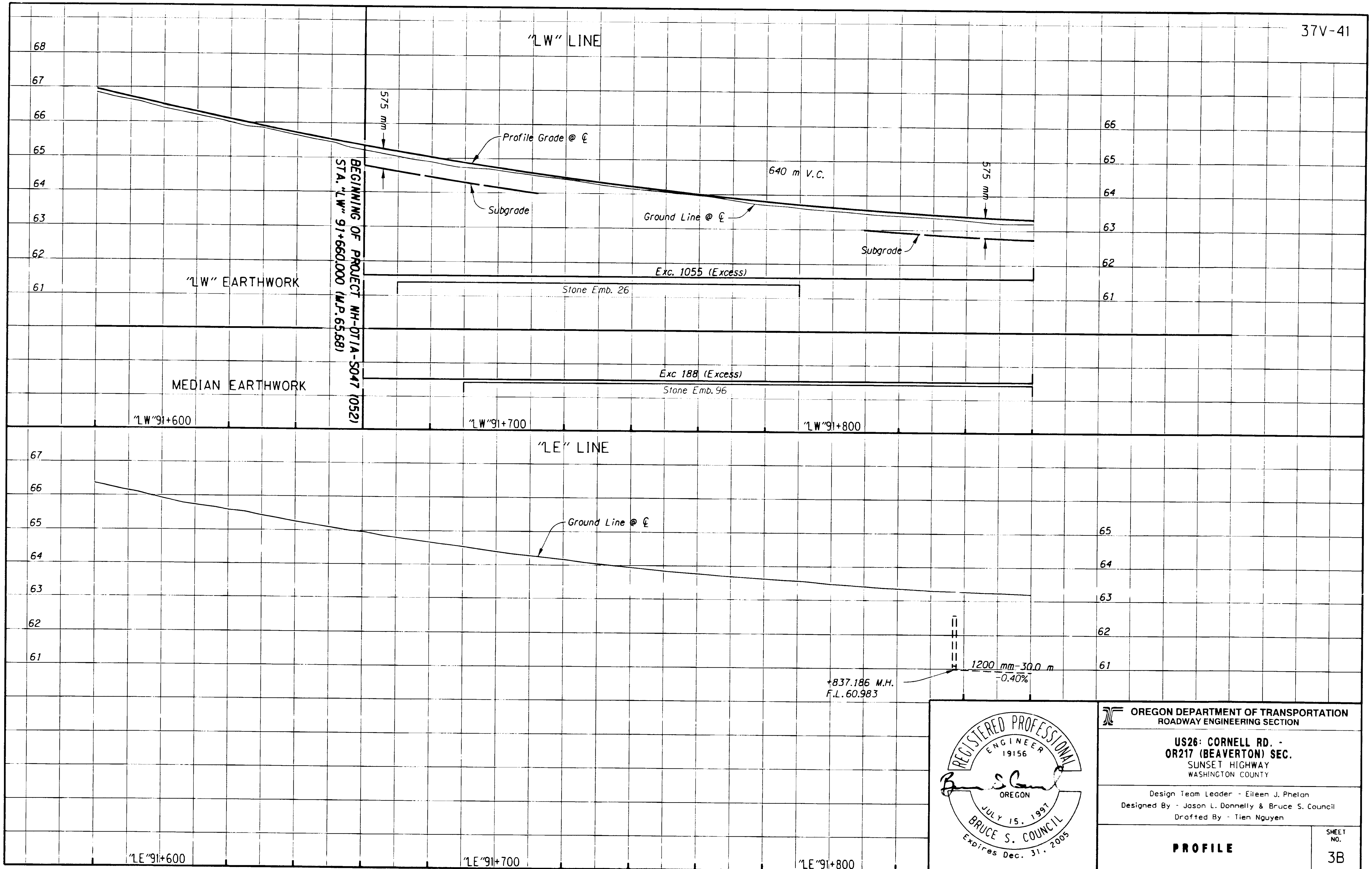
OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Design Team Leader - Eileen J. Phelan
Designed By - Bruce S. Council
Drafted By - Tien Nguyen

DRAINAGE & UTILITIES

SHEET NO. 3A


37V-41
"LW" LINE
575 mm
Profile Grade @ ℄
640 m V.C.
575 mm
Subgrade
Ground Line @ ℄
Subgrade
BEGINNING OF PROJECT NH-OTIA-S047 (052)
STA. "LW" 91+660.000 (M.P. 65.68)
Exc. 1055 (Excess)
Stone Emb. 26
"LW" EARTHWORK
MEDIAN EARTHWORK
Exc 188 (Excess)
Stone Emb. 96
"LW"91+600
"LW"91+700
"LW"91+800
"LE" LINE
Ground Line @ ℄
+837.186 M.H.
F.L. 60.983
1200 mm-30.0 m
-0.40%
"LE"91+600
"LE"91+700
"LE"91+800
68
67
66
65
64
63
62
61
REGISTERED PROFESSIONAL ENGINEER
19156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
Expires Dec. 31, 2005

OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

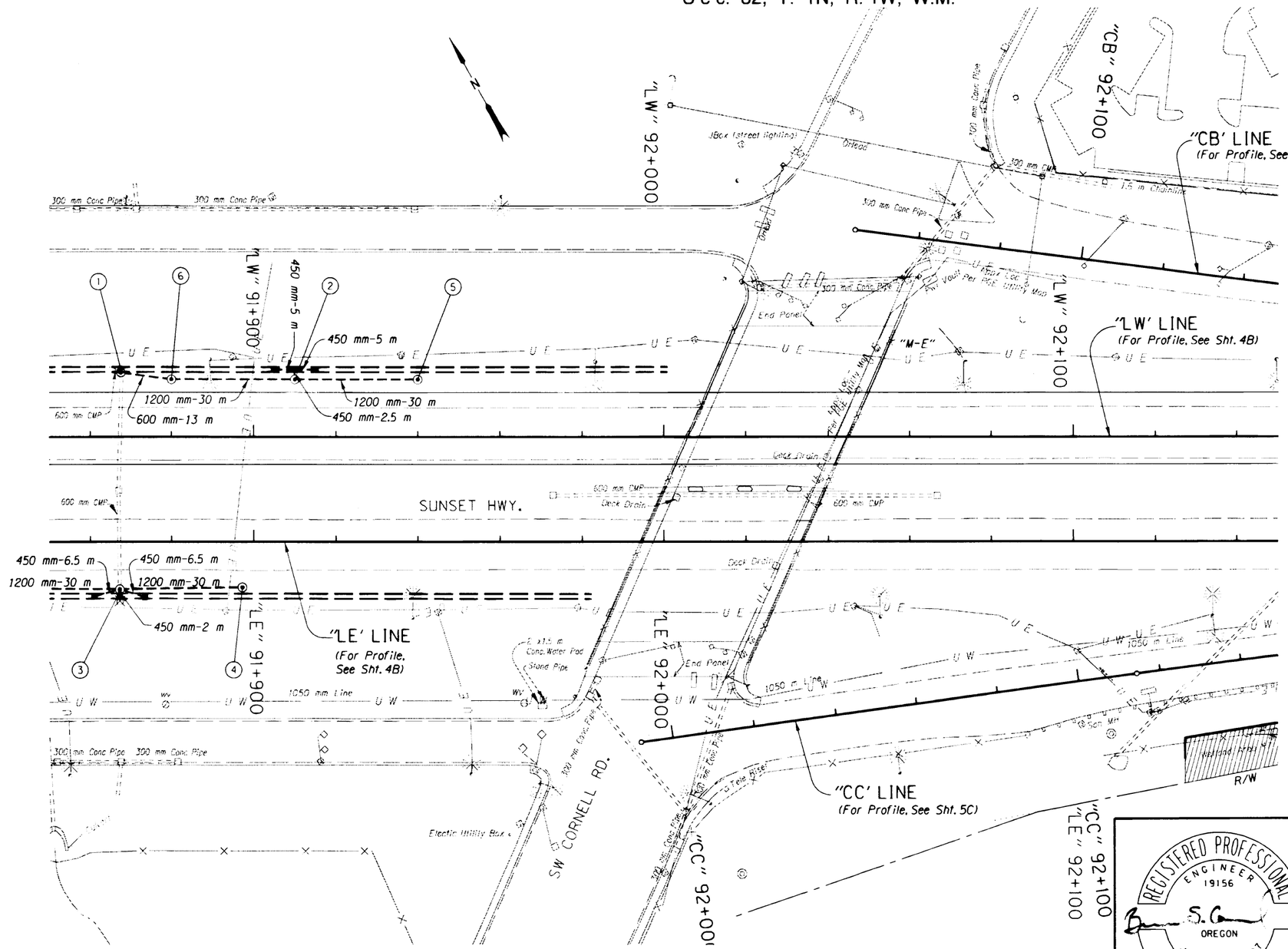
US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Design Team Leader - Eileen J. Phelan
Designed By - Jason L. Donnelly & Bruce S. Council
Drafted By - Tien Nguyen

PROFILE

SHEET NO. 3B

Sec. 32, T. 1N, R. 1W, W.M.



Wetland Area No Work Zone, Shown Thus: ▨

① See Sht. 3A, Note 1

② Sta. "LW" 91+910.035, 13.984 m Lt.
Const. Water Quality Swale "WCW"
Const. Manhole, Large, 2400 mm Dia.
Const. Type "G-2MA" Inlet - 2
Inst. 450 mm Storm Sew. Pipe - 12.5 m
1.5 m Depth
Inst. 1200 mm Storm Sew. Pipe - 30.0 m
3 m Depth

③ See Sht. 3A, Note 3

④ Sta. "LE" 91+897.190, 11.057 m Rt.
Const. Manhole, Large, 2400 mm Dia.

⑤ Sta. "LW" 91+939.953, 13.998 m Lt.
Const. Manhole, Large, 2400 mm Dia.

⑥ Sta. "LW" 91+879.953, 13.998 m Lt.
Const. Detention Manhole, 2400 Dia.
Inst. 1200 mm Storm Sew. Pipe - 30.0 m
3 m Depth
(For Details, See Shts. R-28, GHJ-10, & GHJ-32)

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19156
OREGON
JULY 15, 1997
BRUCE S. COUNCIL
Expires Dec. 31, 2005

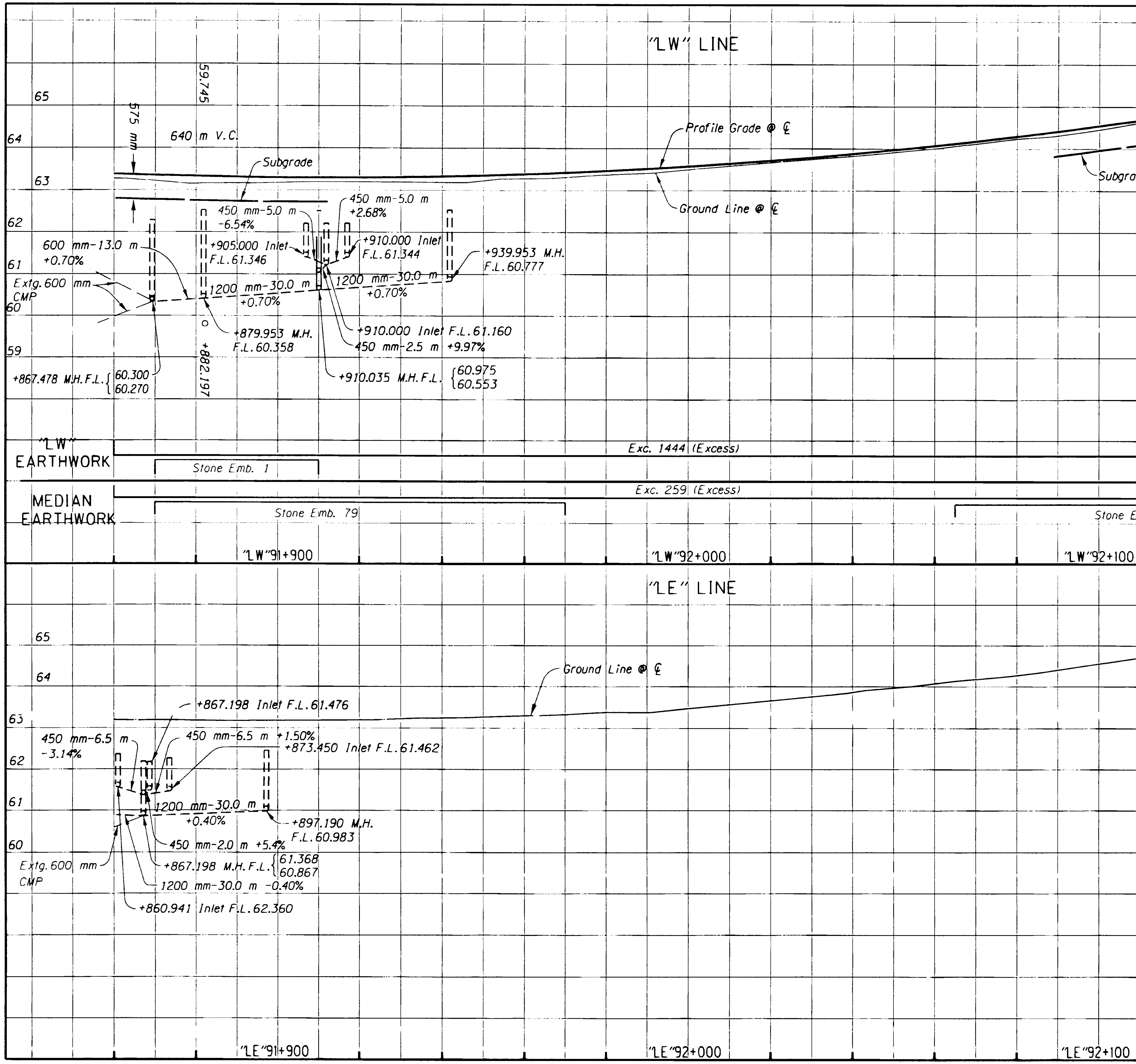
OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

US26: CORNELL RD. -
OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Design Team Leader - Eileen J. Phelan
Designed By - Bruce S. Council
Drafted By - Tien Nguyen

DRAINAGE & UTILITIES

SHEET NO.
4A



REGISTERED PROFESSIONAL ENGINEER 19156
OREGON
JULY 15, 1997
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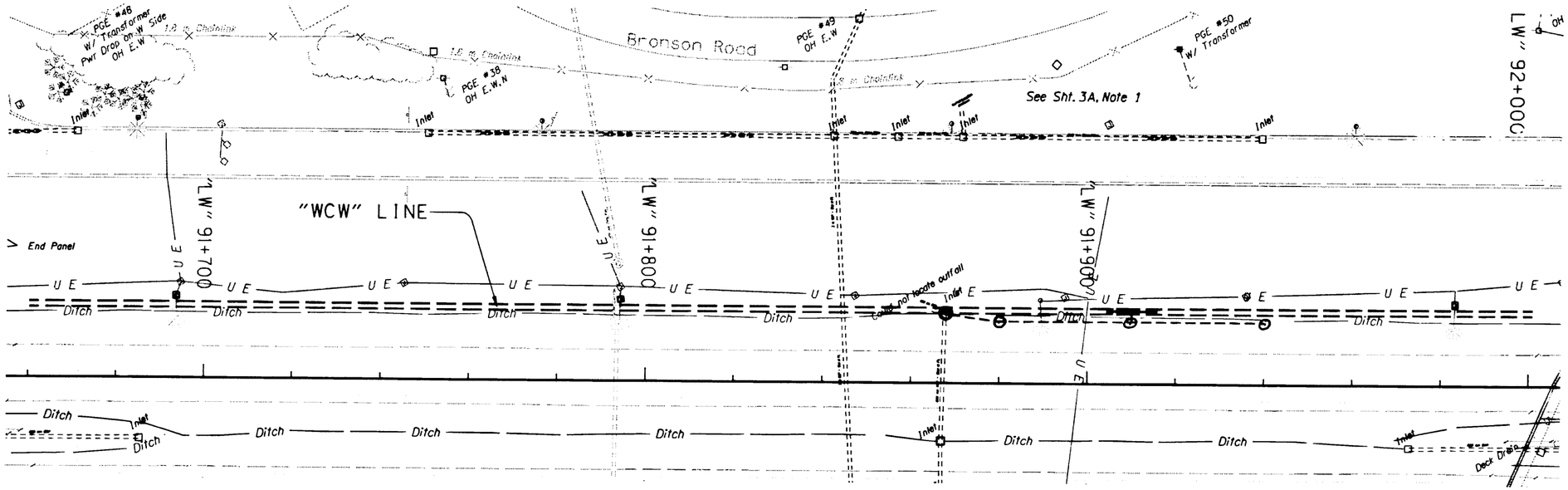
OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

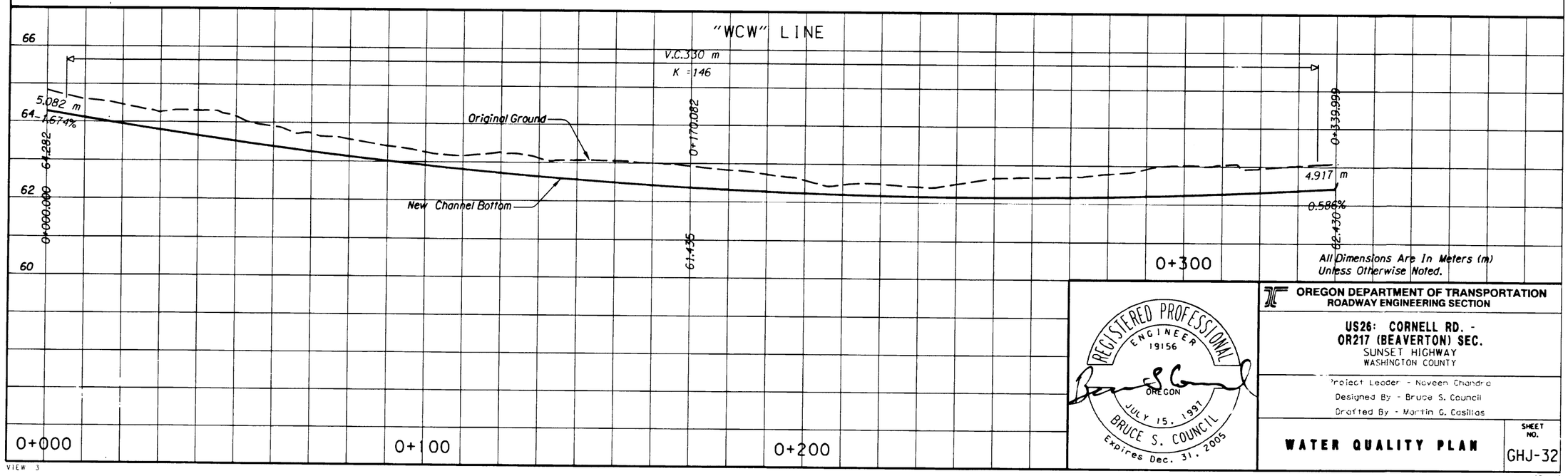
US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Design Team Leader - Eileen J. Phelan
Designed By - Jason L. Donnelly & Bruce S. Council
Drafted By - Tien Nguyen

PROFILE

SHEET NO. 4B





REGISTERED PROFESSIONAL ENGINEER 19156 OREGON JULY 15, 1997 BRUCE S. COUNCIL Expires Dec. 31, 2005

OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Project Leader - Naveen Chandra
Designed By - Bruce S. Council
Drafted By - Martin G. Casillas

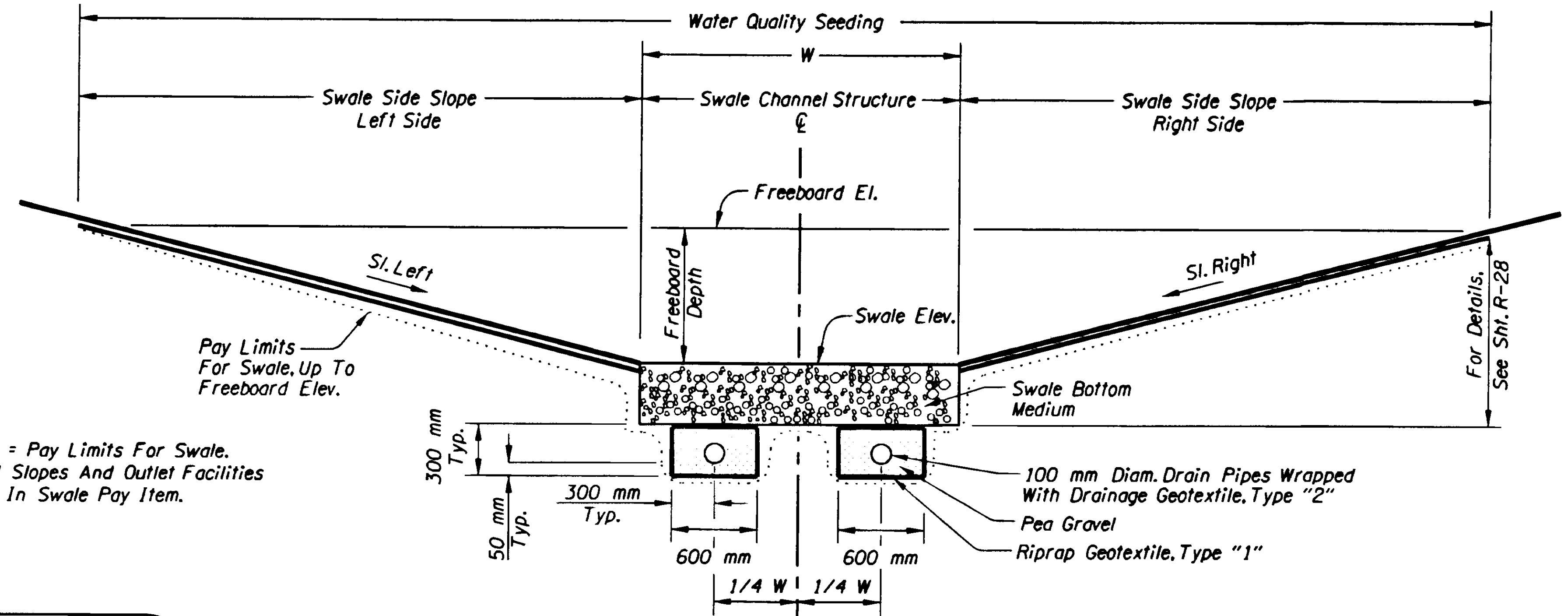
WATER QUALITY PLAN

SHEET NO. GHJ-32

VIEW 3

WATER QUALITY SWALE GENERAL DETAILS

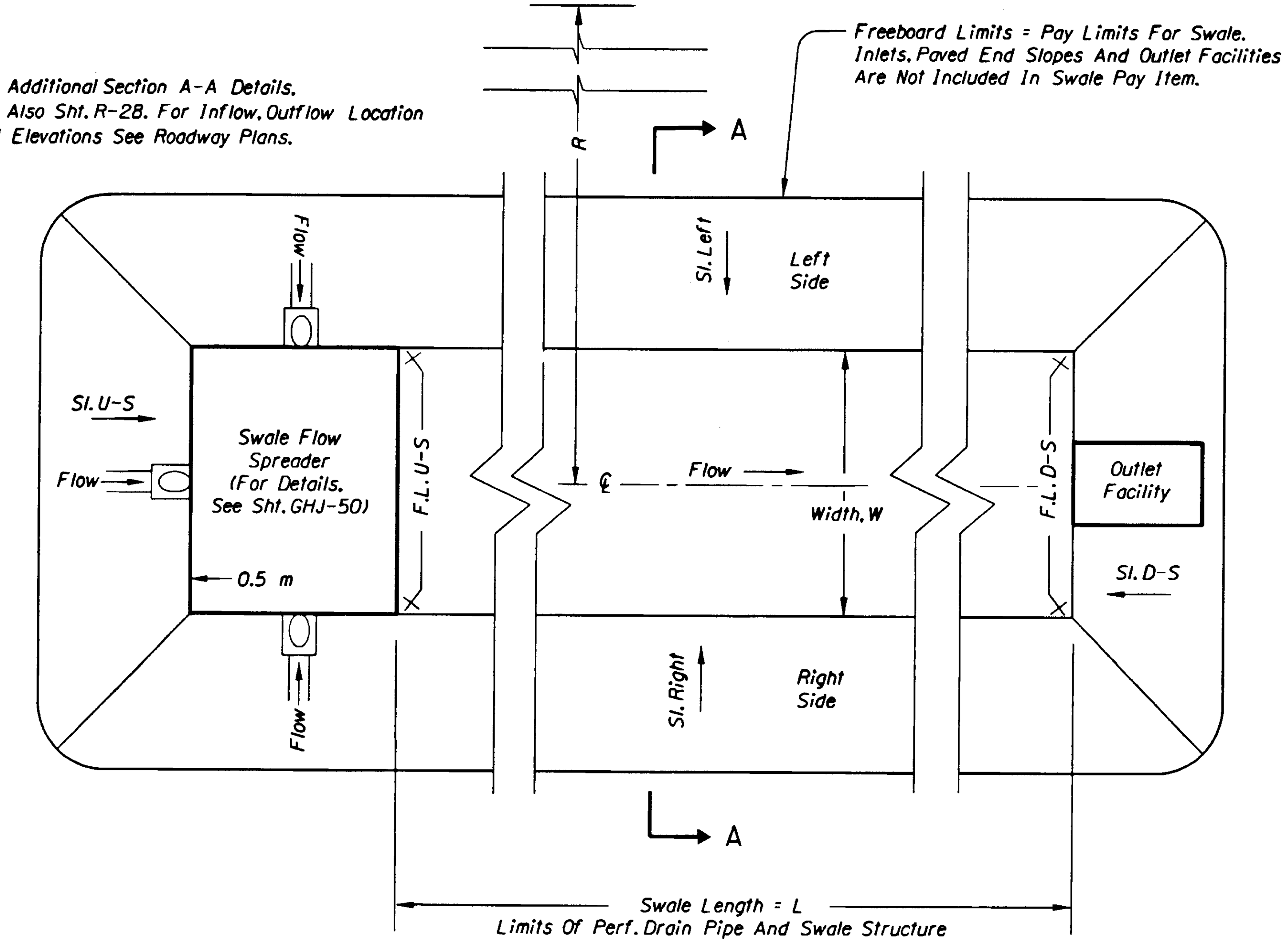
PLAN AND TYPICAL CROSS-SECTION



Note:
See Sht. R-28 For Seeding, Planting, And Swale Bottom Medium Details.

SECTION A-A, AND UNDER DRAIN

For Additional Section A-A Details,
See Also Sht. R-28. For Inflow, Outflow Location
And Elevations See Roadway Plans.



Note:
For Swale Specifics, See Sht. GHJ-49.

PLAN

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

REGISTERED PROFESSIONAL ENGINEER 19156 OREGON JULY 15, 1997 BRUCE S. COUNCIL Expires Dec. 31, 2005

REGISTERED PROFESSIONAL ENGINEER 62,609 OREGON MAY 9, 2000 HENRY MINTON ALLEN Expires Dec. 31, 2005

OREGON DEPARTMENT OF TRANSPORTATION GEO / HYDRO SECTION	
US26: CORNELL RD. - OR217 (BEAVERTON) SEC. SUNSET HIGHWAY WASHINGTON COUNTY	
Project Leader - Naveen Chandra Designed By - Henry M. Allen Drafted By - Martin C. Casillas	
WATER QUALITY DETAILS	SHEET NO. GHJ-48

THIS IS THE FILE NAME LOCATION \\screg\Vwye66c\ODOT_DATA\projects\06021_wq\0602lwqd14 1/15/2004 7:08:20 PM

VIEW 5

WATER QUALITY SWALES
SITE SPECIFIC INFORMATION

Notes:
1) U-S= Upstream, D-S= Downstream
2) See Site Plans For Pipe Inverts At Inlets.
3) "C-T Blend" = Compost-Topsoil Blend,
"Rock+C-T" = Drain Rock With Compost-Topsoil Blend.

Swale ID	L, m	W, m	F.L. U-S, m	F.L. D-S, m	Long. Slope, %	Centerline Curve Radius, m	Swale Sideslopes				Freeboard Depth, m	Swale Bottom Medium	No. Under-Drain Segments	Under Drain Tie-In Location	Swale Outlet Facility
							U-S	Left	Right	D-S					
WCW	340	1.2	See GHJ-32	See GHJ-32	Varies	None	1:3	1:4	1:6	1:4	0.3	Rock+C-T	2	"G-2MA" Mod. Inlet	"G-2MA" Mod. Inlet
WCE	322	2.4	See GHJ-33	See GHJ-33	Varies	None	1:20	1:6	1:4	1:18	0.3	Rock+C-T	2	"G-2MA" Mod. Inlet	"G-2MA" Mod. Inlet
WC1	82	2.4	68.062	66.543	1.85	None	1:4	1:3	1:6	1:4	0.3	C-T Blend	2	"D" Mod. Inlet	"M-E" Mod. Inlet
WC2A	30	0.6	70.673	70.197	1.50	None	1:2	1:2	1:2	1:2	0.3	C-T Blend	1	"D" Mod. Inlet	"D" Mod. Inlet
WC2B	474	0.7	70.815	70.637	0.32	None	1:3	1:3	1:3	1:3	0.3	C-T Blend	1	"D" Mod. Inlet	"D" Mod. Inlet
WC2C	37	0.8	71.042	70.839	0.55	None	1:4	1:4	1:4	1:4	0.45	C-T Blend	1	"D" Mod. Inlet	"D" Mod. Inlet
WC2D	41	0.9	72.556	71.634	Varies	None	1:5	1:5	1:5	1:5	0.3	Rock+C-T	1	"D" Mod. Inlet	"D" Mod. Inlet
WC3A	50	2.4	70.195	69.961	0.5	None	1:4	Var.	Var.	1:4	.8	C-T Blend	2	"D" Mod. Inlet	"V"-Bottom Ditch
WC3B	50	2.4	74.408	74.158	0.5	80	1:4	1:4	1:6	1:4	0.45	C-T Blend	2	"D" Mod. Inlet	"M-E" Mod. Inlet
MA1	31.5	2.4	72.160	72.000	0.51	None	1:3	1:3	Var.	1:6	0.45	C-T Blend	None	N.A.	"M-E" Mod. Inlet
CBR	See GHJ-43	2.4	See GHJ-43	See GHJ-43	Varies	None	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	"D" Inlet
N1a	23	2.4	102.150	102.035	0.5	100	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Riprap Basin
N1b	12.3	2.4	101.812	101.750	0.5	25	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Channel
N2	36	2.4	102.750	102.570	0.5	100	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Pipe
N3	36	2.4	103.350	103.170	0.5	100	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Pipe
N4	36	2.4	103.850	103.670	0.5	100	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Pipe
N5a	12.6	2.4	104.404	104.341	0.5	None	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Channel
N5b	24	2.4	104.150	104.030	0.5	100	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Pipe
S1	36	2.4	93.550	93.370	0.5	20, Each	1:4	1:4	1:4	1:4	0.45	C-T Blend	None	N.A.	Channel

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

REGISTERED PROFESSIONAL ENGINEER 19156 OREGON JULY 15, 1997 BRUCE S. COUNCIL Expires Dec. 31, 2005

REGISTERED PROFESSIONAL ENGINEER 62,609 OREGON MAY 9, 2000 HENRY MINTON ALLEN Expires Dec. 31, 2005

OREGON DEPARTMENT OF TRANSPORTATION
GEO / HYDRO SECTION

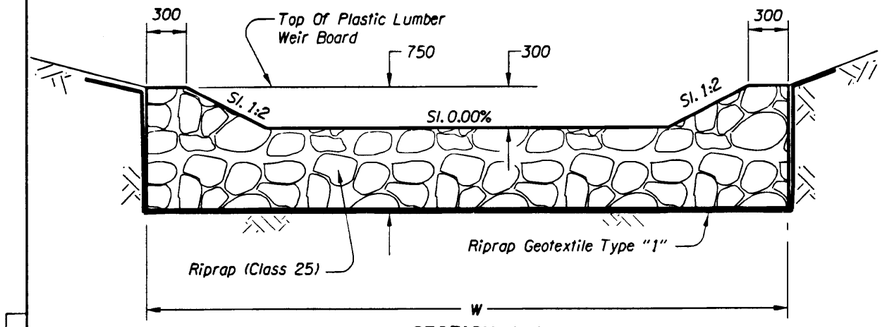
US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Project Leader - Naveen Chandra
Designed By - Henry M. Allen
Drafted By - Martin C. Casillas

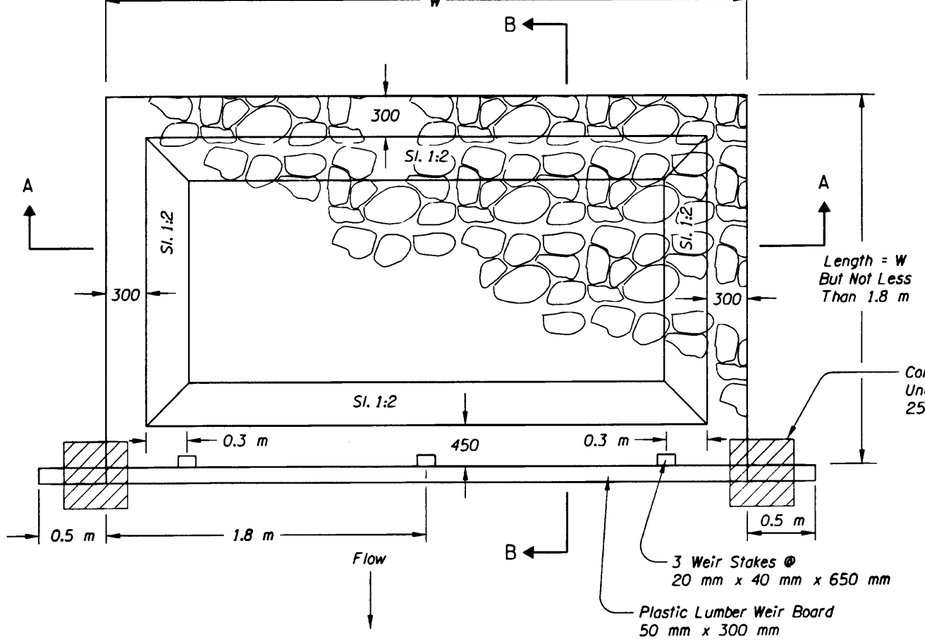
WATER QUALITY DETAILS

SHEET NO. GHJ-49

WATER QUALITY SWALE FLOW SPREADER



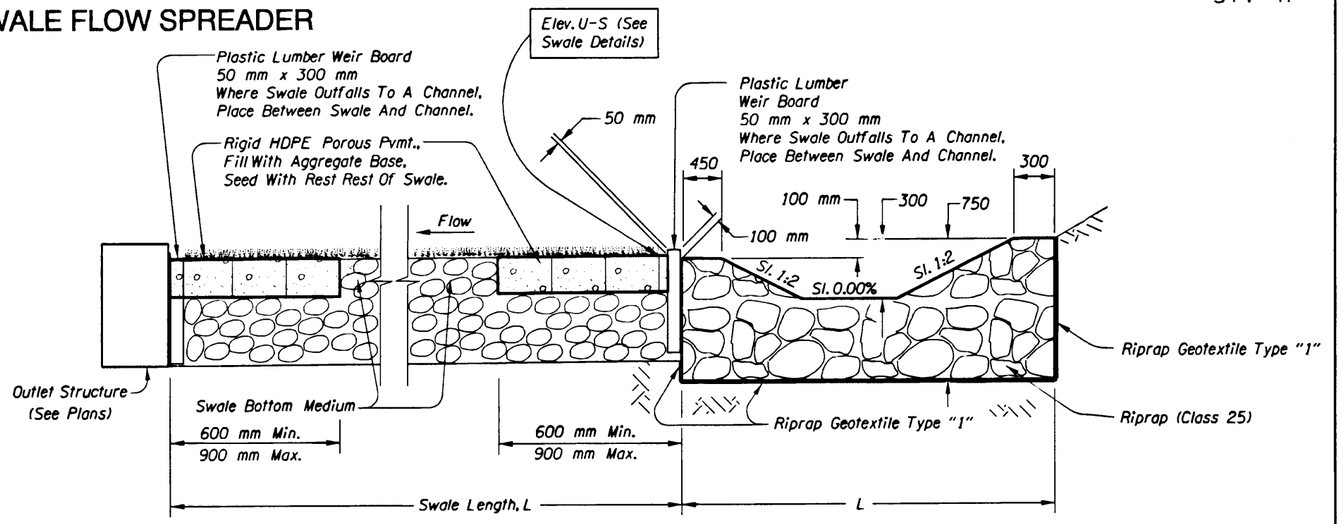
SECTION A-A



Note:
Swale Bottom Medium May Consist Of Compost-Topsoil Blend Or Drain Rock With Compost-Topsdoil Blend.

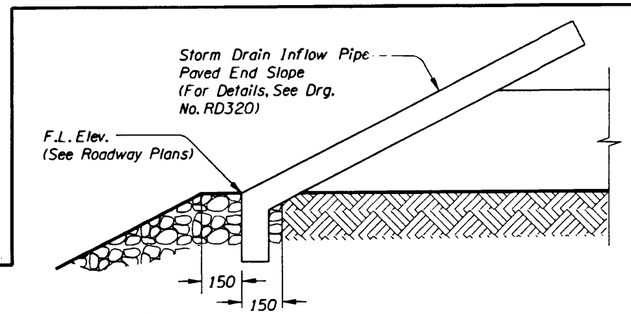
PLAN

SWALE FLOW SPREADER



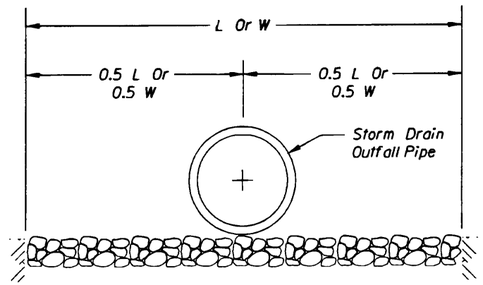
SECTION B-B

Note:
Place A Section Of Rigid HDPE Porous Pavement At The Upstream And Downstream Ends Of Each Swale Or Swale Segment.



Note:
Pipe F.I. Elev. And Top Of Weir Board Elev. Are The Same.

SECTION THROUGH SIDE PIPE OUTLET



LOOKING AT A SIDE

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

REGISTERED PROFESSIONAL ENGINEER 62,609 OREGON MAY 9, 2000 HENRY MINTON ALLEN Expires Dec. 31, 2005

OREGON DEPARTMENT OF TRANSPORTATION
GEO / HYDRO SECTION

US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Project Leader - Naveen Chandra
Designed By - Henry M. Allen
Drafted By - Martin G. Casillas

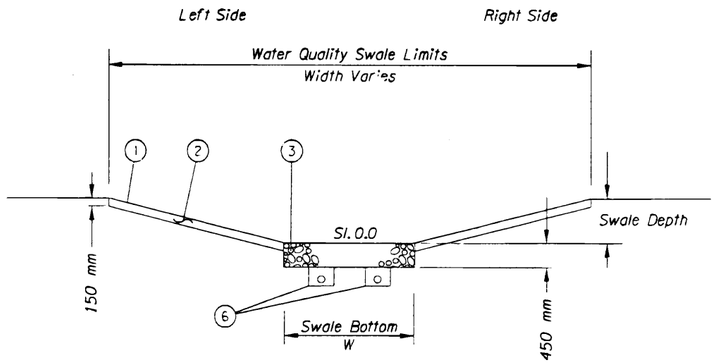
WATER QUALITY DETAILS

SHEET NO. GHJ-50

R O A D S I D E D E V E L O P M E N T

CEDAR MILL CREEK ENHANCEMENT AREA

12/02/03

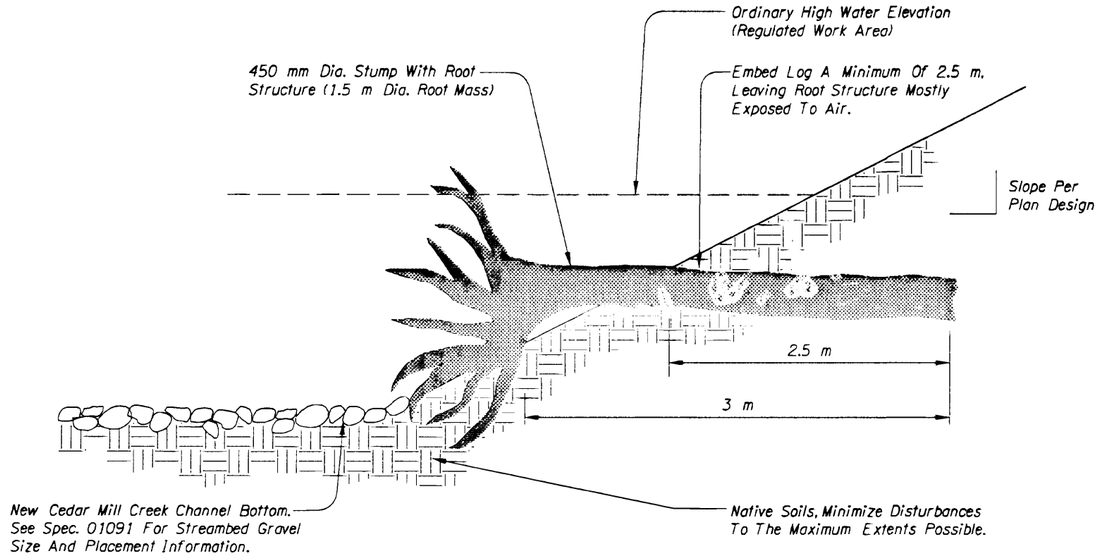


Min. Swale Length - 33 m
Min. (Max.) Longitudinal Swale Slope - .005 (0.5%)
Min. Swale Depth - 0.45 m

VEGETATED STORM WATER QUALITY SWALE

Detail Shown For Reference Only. Design By H. Allen (ODOT).

1. Provide And Install Jute Mat Per Specifications.
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 Compost-Topsoil Blend Or Drain Rock With Compost-Topsoil Blend.
4. Not Used
5. Seed Swale Using Mix No. 4. See Specifications.
6. Under Drains, Where Recommended By The Engineer. Contact Henry Allen 503-731-8299.
7. For Details Not Shown, See Water-Quality Swale Details In GHJ Series Sheets.



STREAM BANK LOG WITH ROOT WAD

NOTE:
Recruit Log With Root Wad From Conifer Material Within Project Clearing Limits. See Specs.

The Log Must Be Anchored And/Or Ballasted To Maintain Design Placement. Details Of The Anchoring And/Or Ballast Will Be Provided By The Engineer At The Time Of Installation.

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REGISTERED
317
MICHAEL D. SMYTH
OREGON
4/4/94
LANDSCAPE ARCHITECT

OREGON DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL SECTION

US26: CORNELL RD. - OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

Reviewed By - Mark A. Hadley
Designed By - Mike D. Smyth
Drafted By - Tammy J. Taggart

BIO-STABILIZATION DETAILS

SHEET NO. R28

c:\projects\0001\3017 Murray Blvd\MicroStation\0602lcm.dtl

VIEW 2

VIEW 2