

OPERATION & MAINTENANCE MANUAL

DFI No. D00175

Facility Type: Water Quality Biofiltration
Swale



JUNE, 2011

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1. Identification

Drainage Facility ID (DFI): **D00175**
Facility Type: Water Quality Biofiltration Swale
Construction Drawings: (V-File Number) 37V-041
Location: District: 2B (Old 2A)
Highway No.: 047
Mile Post: 65.68/65.87 (beg./end)
Description: This facility is located on the south side of eastbound US 26 (Hwy 047) between SW Bethany Blvd and SW Cornell Rd. Access to the facility can be obtained from US 26 (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, (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.

The swale is located on the south side of eastbound US 26 (Hwy 047). Access to the swale can be obtained from the highway. The swale is approximately 1,056 feet in length. Stormwater flows towards the center of the swale and is captured by two swale inlets, A and B, and an overflow inlet, C; see Photo 3 and the Operational Plan, Appendix A.

The drainage area for the swale includes the nearby grassy slope to the south of the swale and the southern portion of the westbound lanes of US 26 (Hwy 047). All runoff is directed to the swale and not bypassed. In the event the flows exceed the capacity of the swale inlets (Inlets A and B), the overflow inlet (Inlet C) will be utilized. Inlet C lies between both swale inlets and at the low/sag point of the facility.

Once the water flows through and is treated by the swale it is directed into a nearby 48-inch diameter detention pipe facility (DFI D00176). After being detained, the water is directed into a 24-inch CMP that flows northward underneath the highway.

A. Maintenance equipment access:

The facility can be accessed for maintenance from the eastbound US 26 (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 – Two each 4-inch diameter parallel underdrains placed beneath the entire length of the swale.



Photo 1: Water quality swale looking east. US 26 (Hwy 047) is located to the left.



Photo 2: Water quality swale at the midpoint looking west.



Photo 3: Swale Inlets A and B (Points A and B) looking west. The large manhole adjacent to Inlet B is associated with the detention facility D00176.



Photo 4: Water quality swale looking west. US 26 (Hwy 047) is located to the right.

5. Facility Haz Mat Spill Feature(s)

The water quality biofiltration swale can be used to store a volume of liquid by blocking the three 18 inch-diameter outlet pipes located at the outlet of the of the water quality biofiltration swale and adject to the detention tank (D00176). The pipes are noted as points A, C, and B in Section A-A of the Operational Plan, Appendix A.

6. Auxiliary Outlet (High Flow Bypass)

Auxiliary Outlets are provided if the primary outlet control structure can not safely pass the projected high flows. Broad-crested spillway weirs and over flow 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 – The middle inlet, Point C, serves as an auxiliary outlet. When flows exceed the capacity of the swale outlets, Points A and B, the flow will be directed to the auxiliary outlet located at the low/sag point of the water quality facility.

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>

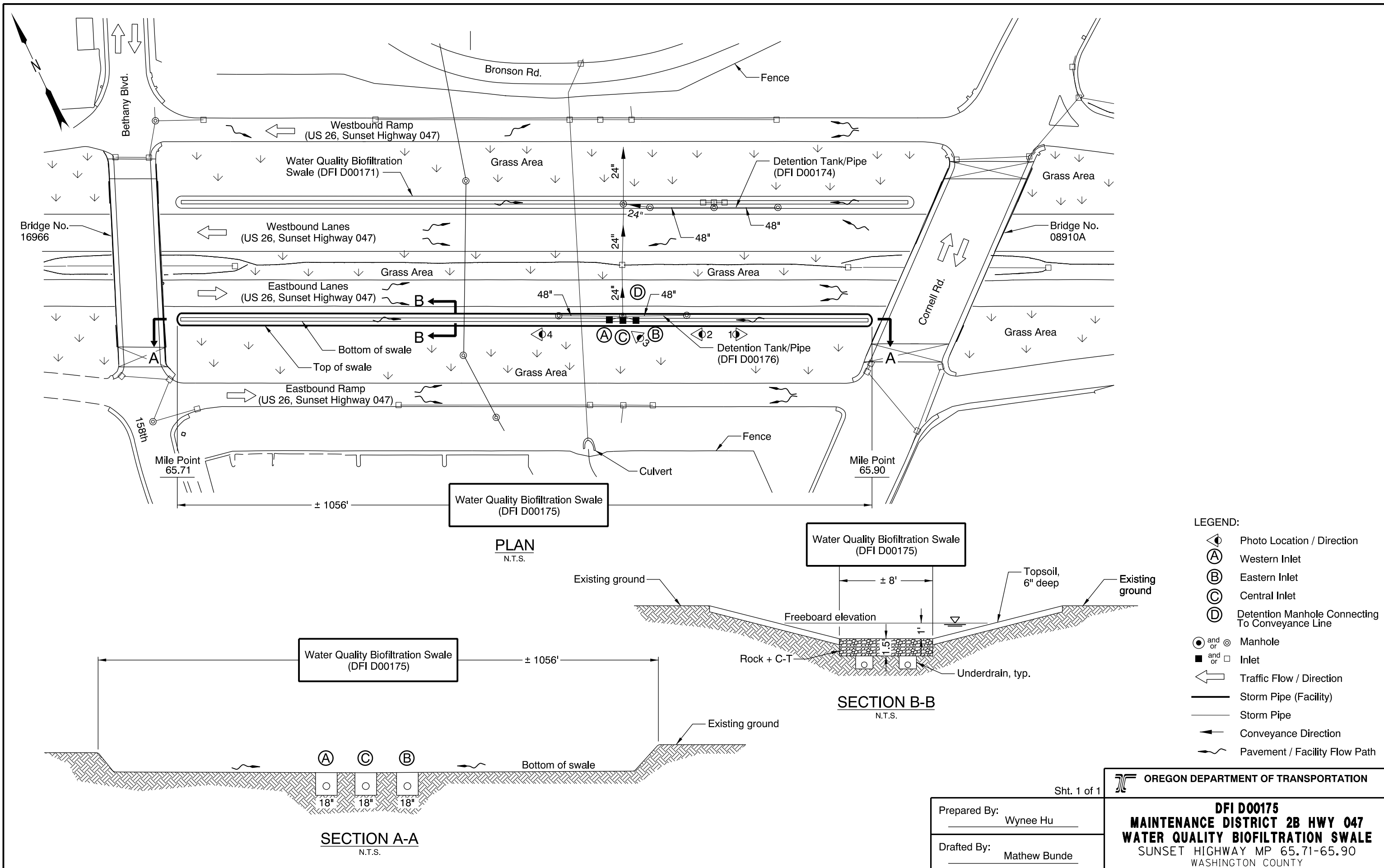
Contact any of the following for more detailed information about management of waste materials found on site:

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
 - Detention Manhole Connecting 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 D00175
MAINTENANCE DISTRICT 2B HWY 047
WATER QUALITY BIOFILTRATION SWALE
 SUNSET HIGHWAY MP 65.71-65.90
 WASHINGTON COUNTY

Appendix B

Content:

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

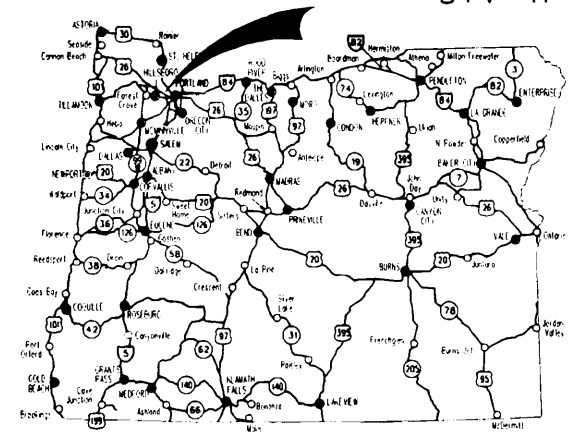
STATE OF OREGON
DEPARTMENT OF TRANSPORTATION

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



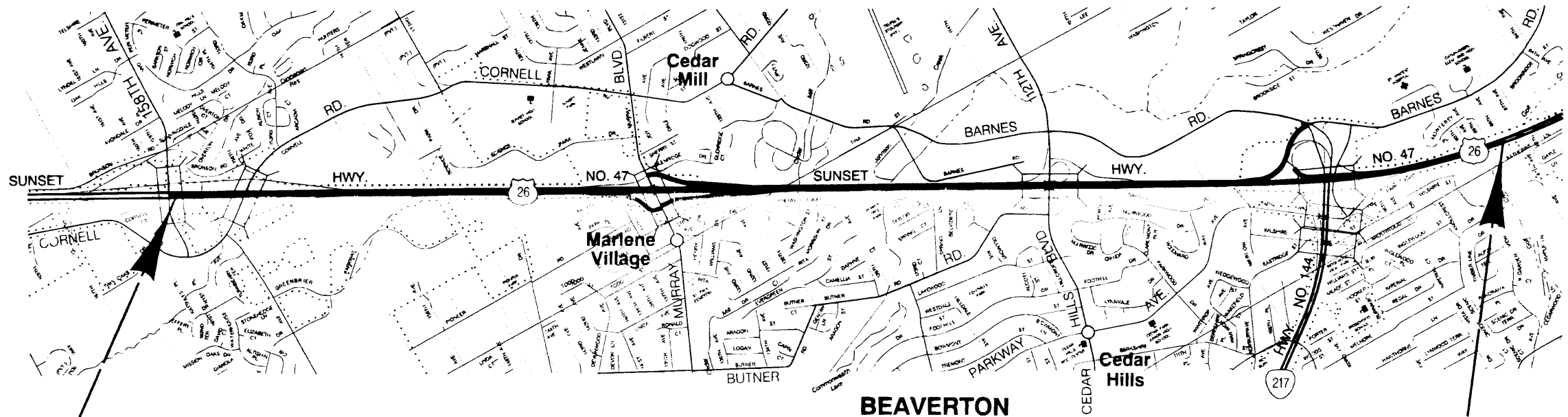
Overall Length Of Project - 6.51 km (4.05 Miles)

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A, 1A-2	Index Of Sheets Cont'd.
1A-3	Std. Drq. 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

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



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)



OREGON TRANSPORTATION COMMISSION

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

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

Catherine M. Nelson
TECHNICAL SERVICES MANAGING ENGINEER

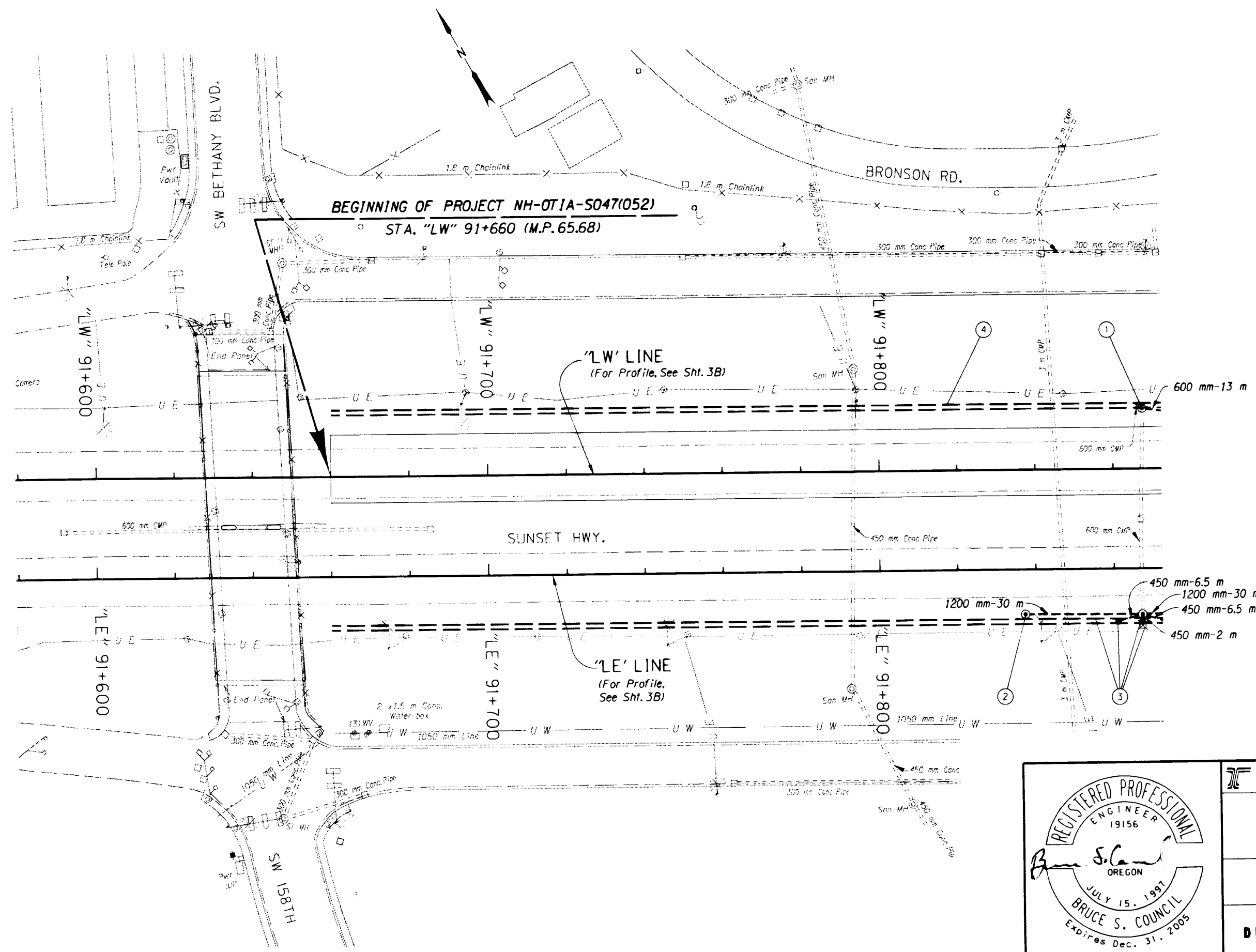
**US26: CORNELL RD. -
OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY**

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

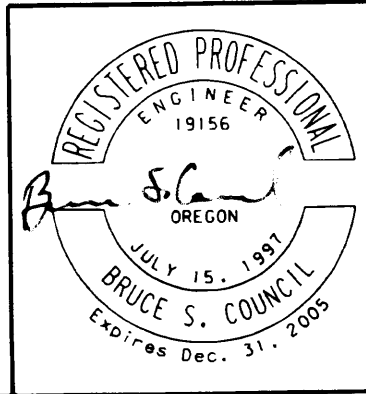


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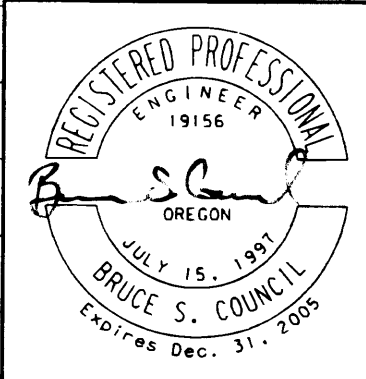
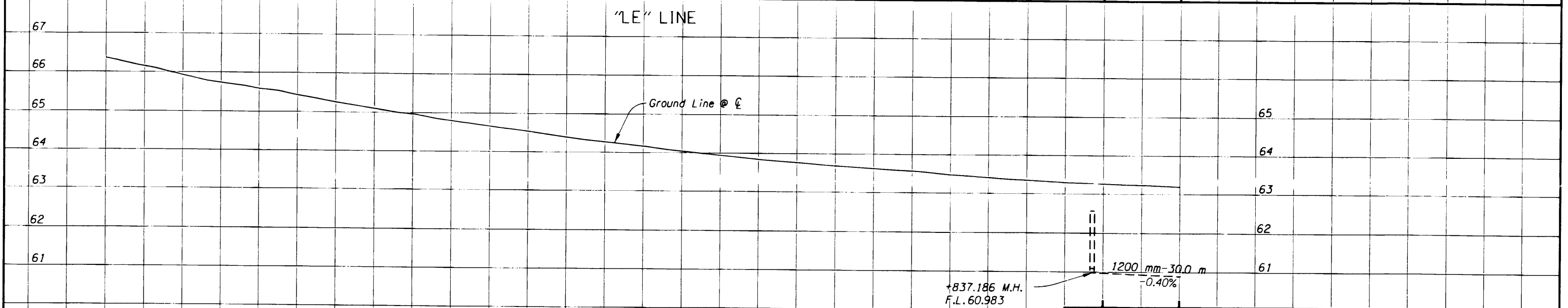
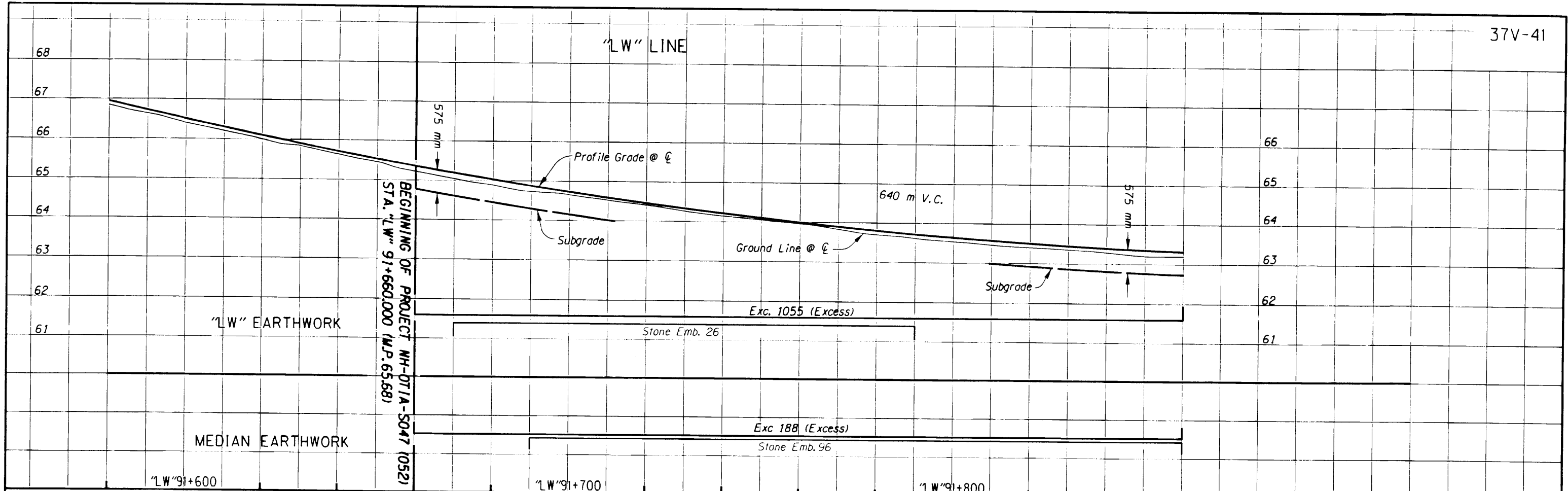
Sec. 32, T. 1N, R. 1W, W.M.



- 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



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



OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

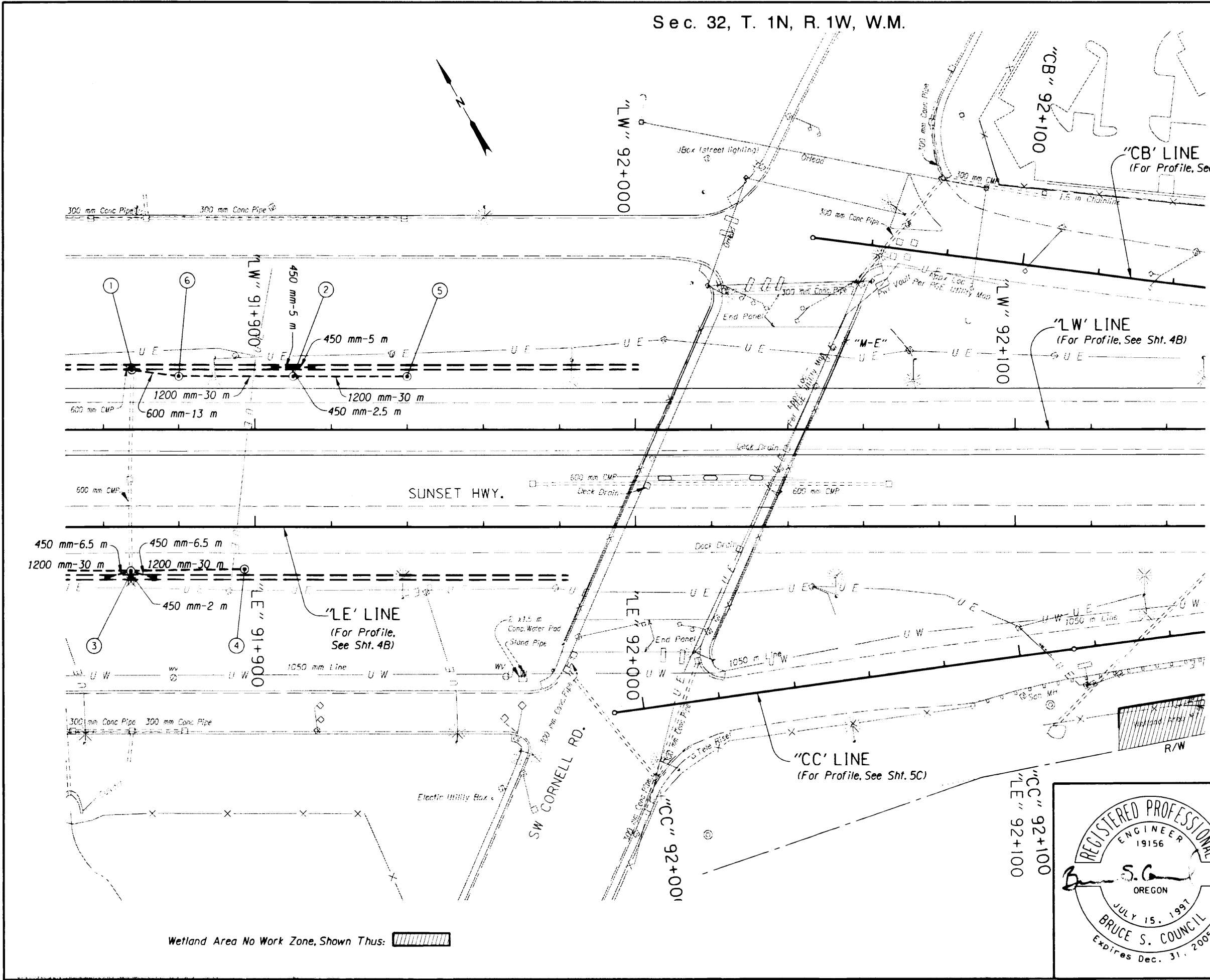
US26: CORNELL RD. -
OR217 (BEAVERTON) SEC.
SUNSET HIGHWAY
WASHINGTON COUNTY

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

PROFILE

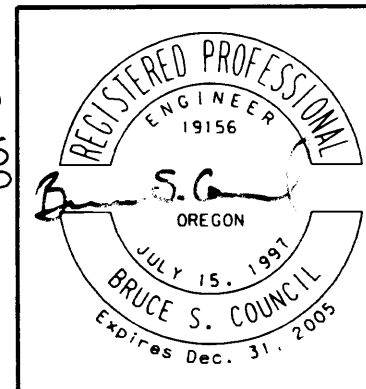
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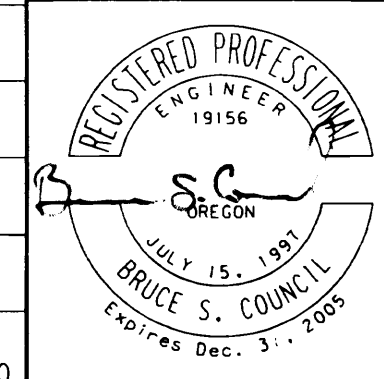
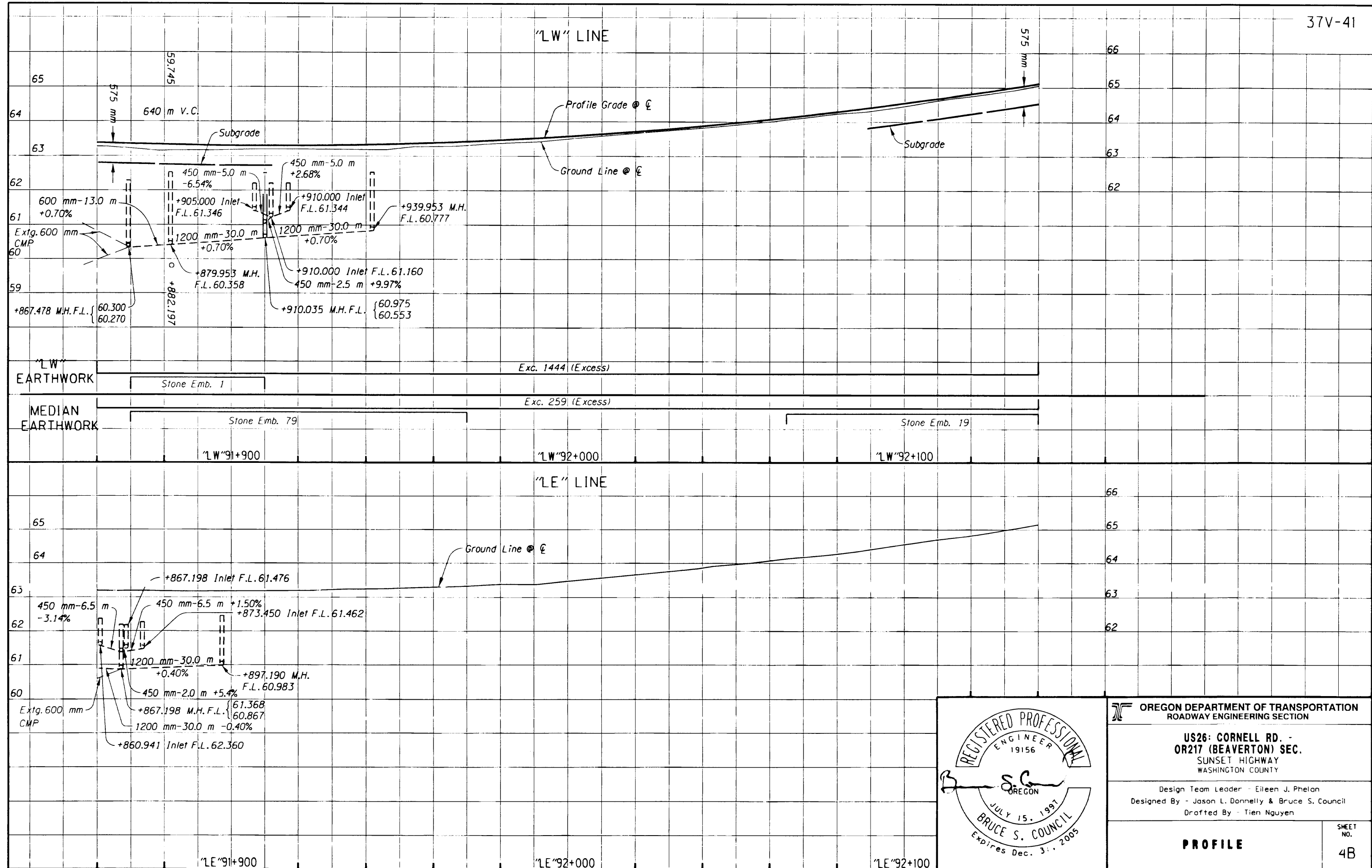


- ① See Sht. 3A, Note 1
- ② Sta. "LW" 91+910.035, 13.984 m Lt.
Const. Water Quality Swale "WCW"
Const. Manhole, Large, 2400 mm Dia.
Const. Type "G-2MA" Inlet - 2
Inst. 450 mm Storm Sew. Pipe - 12.5 m
1.5 m Depth
Inst. 1200 mm Storm Sew. Pipe - 30.0 m
3 m Depth
- ③ See Sht. 3A, Note 3
- ④ Sta. "LE" 91+897.190, 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)

Wetland Area No Work Zone, Shown Thus:



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



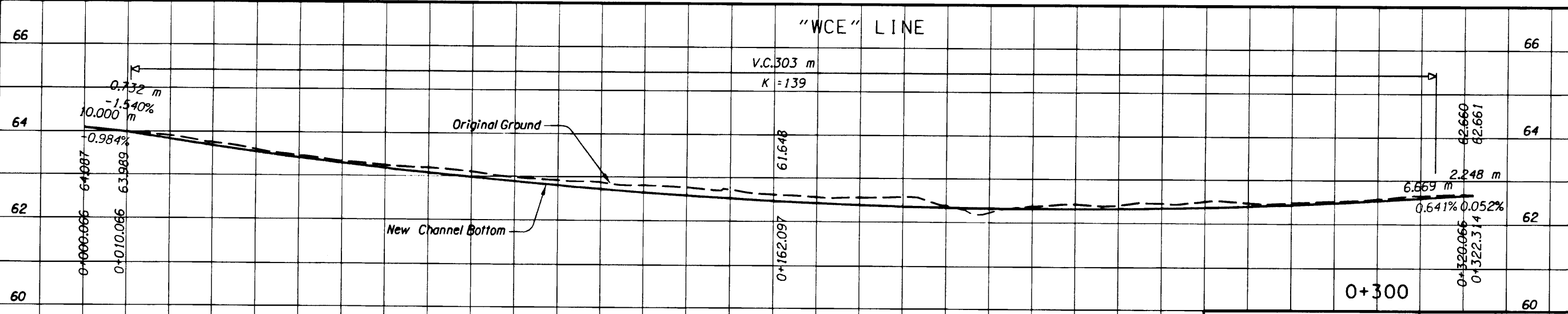
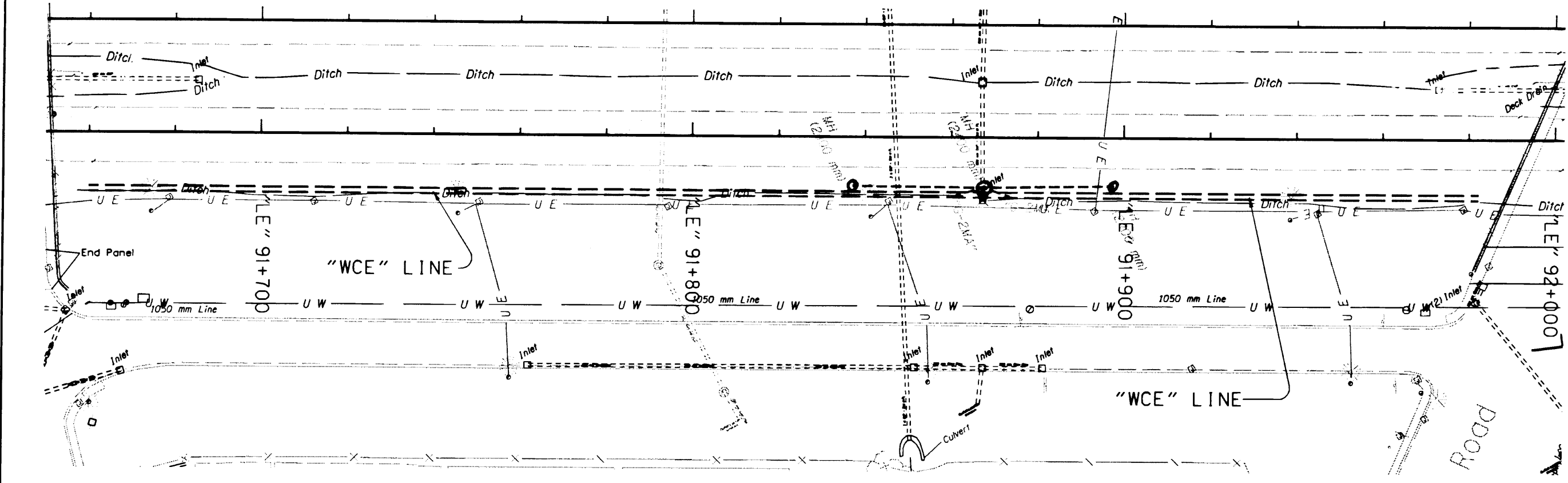
OREGON DEPARTMENT OF TRANSPORTATION
ROADWAY ENGINEERING SECTION

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



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-33**

WATER QUALITY SWALES
SITE SPECIFIC INFORMATION

Notes:

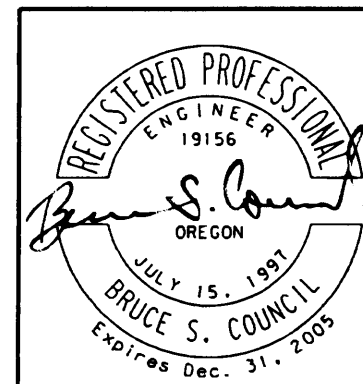
- 1) U-S= Upstream, D-S= Downstream
- 2) See Site Plans For Pipe Inverts At Inlets.
- 3) "C-T Blend" = Compost-Topsoil Blend,
"Rock+C-T" = Drain Rock With Compost-Topsoil Blend.

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

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



**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

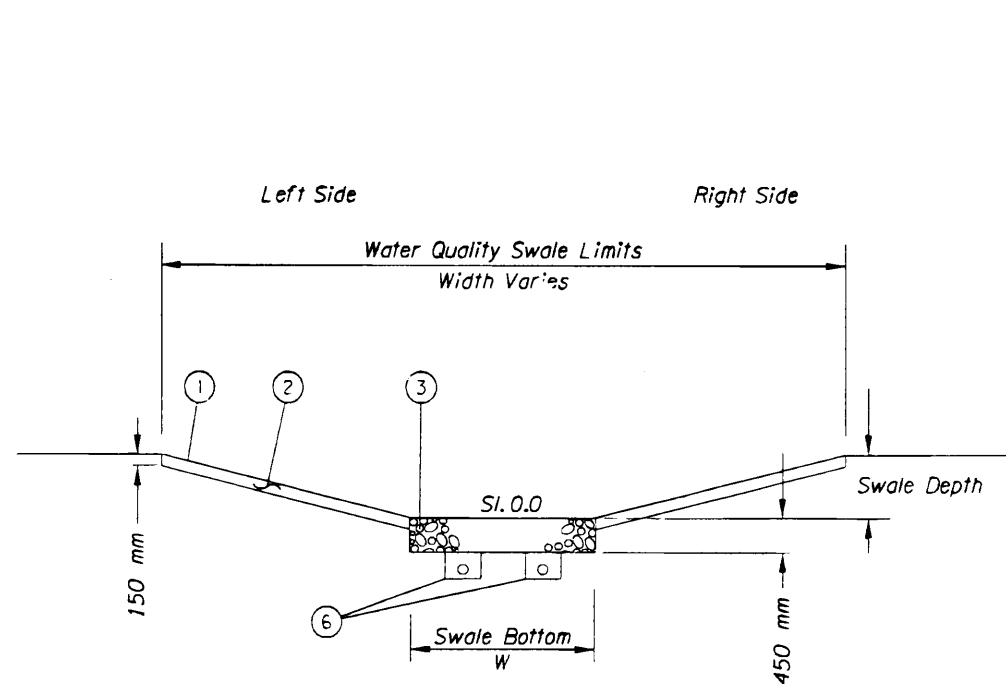
WATER QUALITY DETAILS

SHEET NO. GHJ-49

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

37V-41

CEDAR MILL CREEK ENHANCEMENT AREA

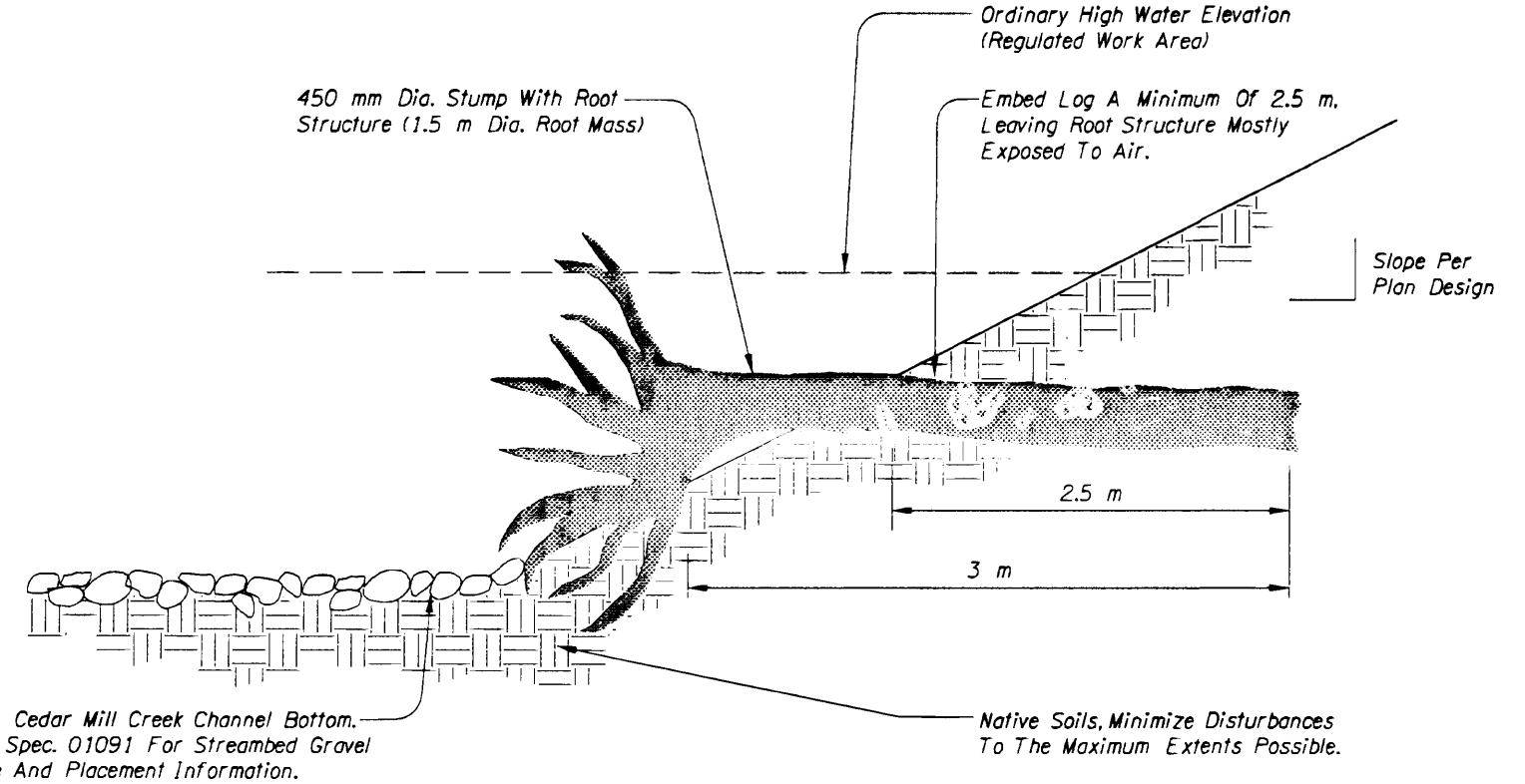


Min. Swale Length - 33 m
 Min. (Max.) Longitudinal Swale Slope - .005 (0.5%)
 Min. Swale Depth - 0.45 m

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.

12/02/03

c:\projects\0001\31017 Murray Blvd\MicroStation\06021cm.dfl

<p>9755 SW Barnes Rd Suite 300 Portland, Oregon 97225 (503)526-0455 (503)526-0775 Fax whpacific.com</p>	<p>REGISTERED 317 MICHAEL D. SMYTH OREGON 4/4/94 LANDSCAPE ARCHITECT</p>	<p>OREGON DEPARTMENT OF TRANSPORTATION ENVIRONMENTAL SECTION</p>	
		<p>US26: CORNELL RD. - OR217 (BEAVERTON) SEC. SUNSET HIGHWAY WASHINGTON COUNTY</p>	
		<p>Reviewed By - Mark A. Hadley Designed By - Mike D. Smyth Drafted By - Tammy J. Taggart</p>	<p>SHEET NO. R28</p>
<p>BIO-STABILIZATION DETAILS</p>			