OPERATION & MAINTENANCE MANUAL

DFI No. : D00903
Facility Type: Water Quality
Biofiltration Swale

[September, 2016]

INDEX

1. Identification

Drainage Facility ID (DFI):	**D00903**
Facility Type:	Water Quality Biofiltration Swale
Construction Drawings:	(V-File Number) 48V-038
Location:	District: 2C
	Highway No.: 171
	Mile Post: 13.78 / 13.81 (beg./end)
	Description: This facility is located on the south side of OR-224 immediately east of the intersection with SE 232nd Dr. The facility can be accessed via the shoulder of eastbound OR-224.

2. Facility Contact Information

Contact the Engineer of Record (see section 3), Region Technical Center, or Geo-Environmental's Senior Hydraulics Engineer for:

- Operational clarification
- Maintenance clarification
- Repair or restoration assistance

Engineering Contacts:

Region Technical Center Geo-Environmental Unit Manager
(503) 731-8455.

Or

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

3. Construction

Engineer of Record:	ODOT Designer – Region 1 Tech. Center, David McDonald P.E., (503) 731-3160
Facility construction:	2016
Contractor:	Elting Northwest

4. Storm Drain System and Facility Overview

Biofiltration swales are flat-bottomed channels engineered to treat stormwater runoff. They are designed with gentle slopes, shallow flows and lined with grass. Biofiltration facilities are intended to maximize the amount of stormwater that flows through dense vegetation, compost or soil, and to increase the potential for infiltration as compared to standard conveyance systems.

This swale is located on the south side of OR-224. The biofiltration swale begins south/east of the SE 232nd drive turnoff and extends approximately 200 ft from west to east along the south shoulder of OR-224. The facility can be accessed via the road shoulder.

The contributing drainage includes stormwater runoff from the super elevated section of OR-224 adjacent to the facility. There are no outlet or inlet structures associated with this facility. The swale flows outlet into the existing drainage channel to the east. Stormwater flow from this facility eventually discharges into Deep Creek.

A. Maintenance equipment access:

Maintenance crew and equipment can access the bioswale facility by parking on the shoulder of eastbound OR-224 between mile posts 13.78 and 13.81.

B. Heavy equipment access into facility:

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

Heavy equipment access is allowed with limitations. Access is allowed for light to mid weight equipment such as mowers and small excavators.

C. Special Features:

☒ Amended Soils
☐ Porous Pavers
☐ Liners
☐ Underdrains

Photo 1: Bioswale facility ID


Photo 2: Bioswale south of OR-224 from outlet looking west

Photo 3: Looking west at one of the two double culverts, bioswale outlet

5. Facility Haz Mat Spill Feature(s

This facility has no Haz Mat spill features.

The water quality bioswale can be used to temporarily store a small volume of liquid by blocking the flow path and outlet channel. This can be accomplished by constructing a sandbag dam near the outlet. However, hazardous liquid and contaminated materials will need to be removed and the previous condition of the swale restored per the original plan.

6. Auxiliary Outlet (High Flow Bypass)

There is no auxiliary outlet for this 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/GeoEnvironmental/Pages/Stormwater.aspx

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 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:

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

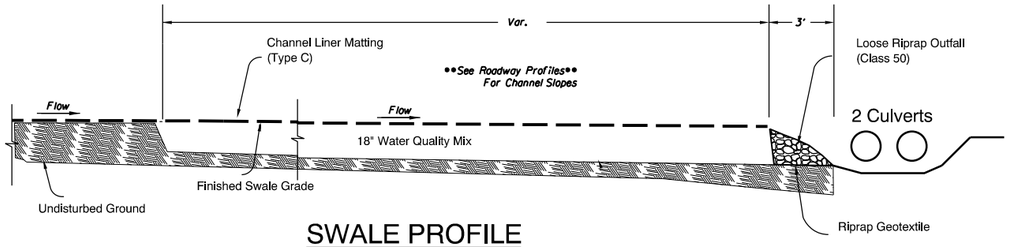
Contact any of the following for more detailed information about management of waste materials found on site:

ODOT Clean Water Unit	(503) 986-3008
ODOT Statewide Hazmat Coordinator	(503) 229-5129
ODOT Region Hazmat Coordinator	(503) 731-8290
ODEQ Northwest Region Office	(503) 229-5263

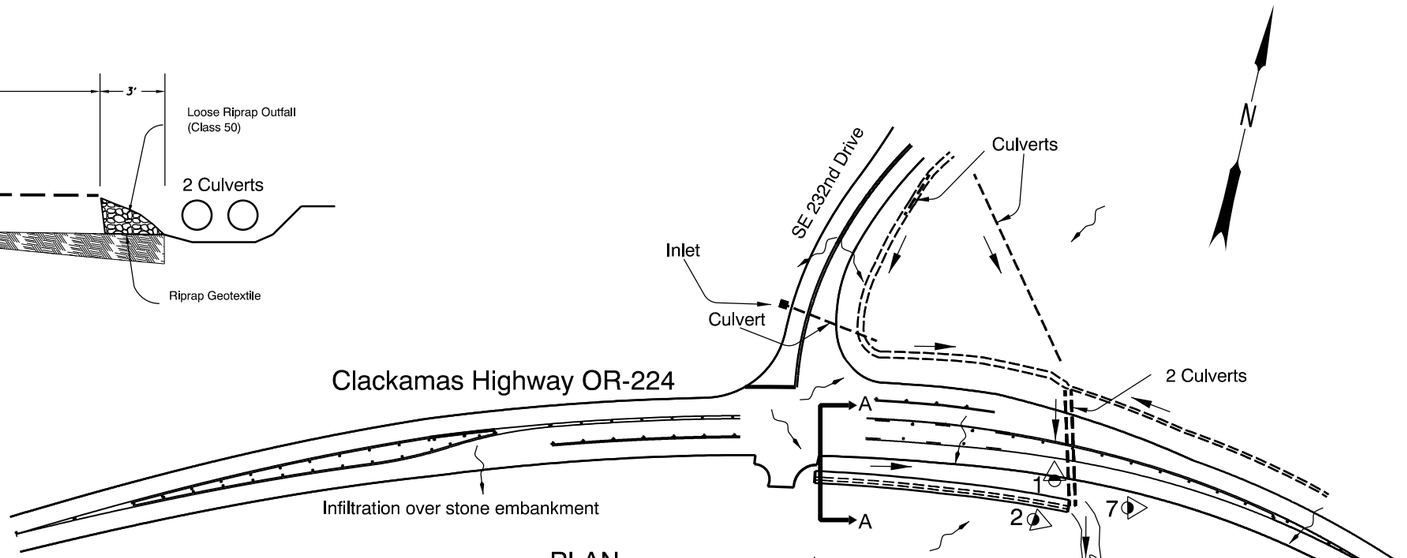
Appendix A

Content:

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



SWALE PROFILE
N.T.S.

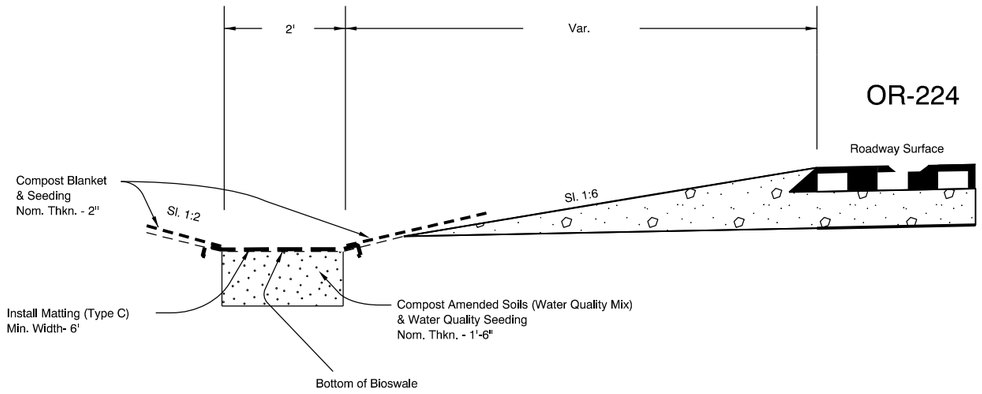


PLAN
N.T.S.

Mile Point 13.78 — Mile Point 13.81

Water Quality Biofiltration Swale (DFI D00903)

+/- 173 ft.



SECTION A-A
N.T.S.

LEGEND:

- Photo Location / Direction
- Manhole (and or)
- Inlet (and or)
- Storm Pipe (Facility)
- Ditch Bottom
- Conveyance Direction
- Pavement / Facility Flow Path

DRAFT

OREGON DEPARTMENT OF TRANSPORTATION

Prepared By: David McDonald

Drafted By: Zoe Keve

DFI D00903
MAINTENANCE DISTRICT 2C HWY 224
WATER QUALITY BIOSWALE
HIGHWAY MP 13.78-13.81
CLACKAMAS COUNTY

D00903_0P.dgn :: Default 5/2/2018 4:05:31 PM Hwyr33e

Appendix B

Content:

- **ODOT Project Plan Sheets**
  - ***Cover/Title Sheet***
  - ***Drainage and Utility Sheets (3A, 4A)***
  - ***Pipe Data Sheet (2D)***
  - ***Drainage Profile Sheets (4C, 4C-2)***
  - ***Drainage Detail Sheets (GJ, GJ-2)***

48V-096

INDEX OF SHEETS	
SHEET NO.	DESCRIPTION
1	Title Sheet
1A	Index Of Sheets Cont. & Std. Drg. Nos.
1B & 1B-2	Survey Control Data

STATE OF OREGON

DEPARTMENT OF TRANSPORTATION

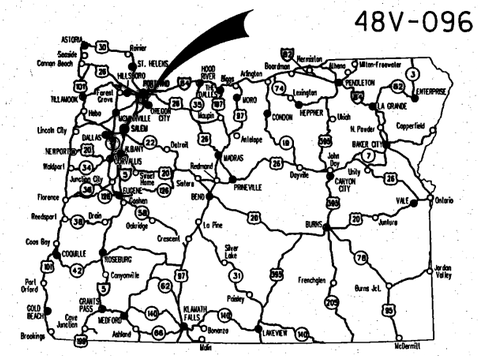
PLANS FOR PROPOSED PROJECT

GRADING, DRAINAGE, PAVING & ROADSIDE DEVELOPMENT

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.

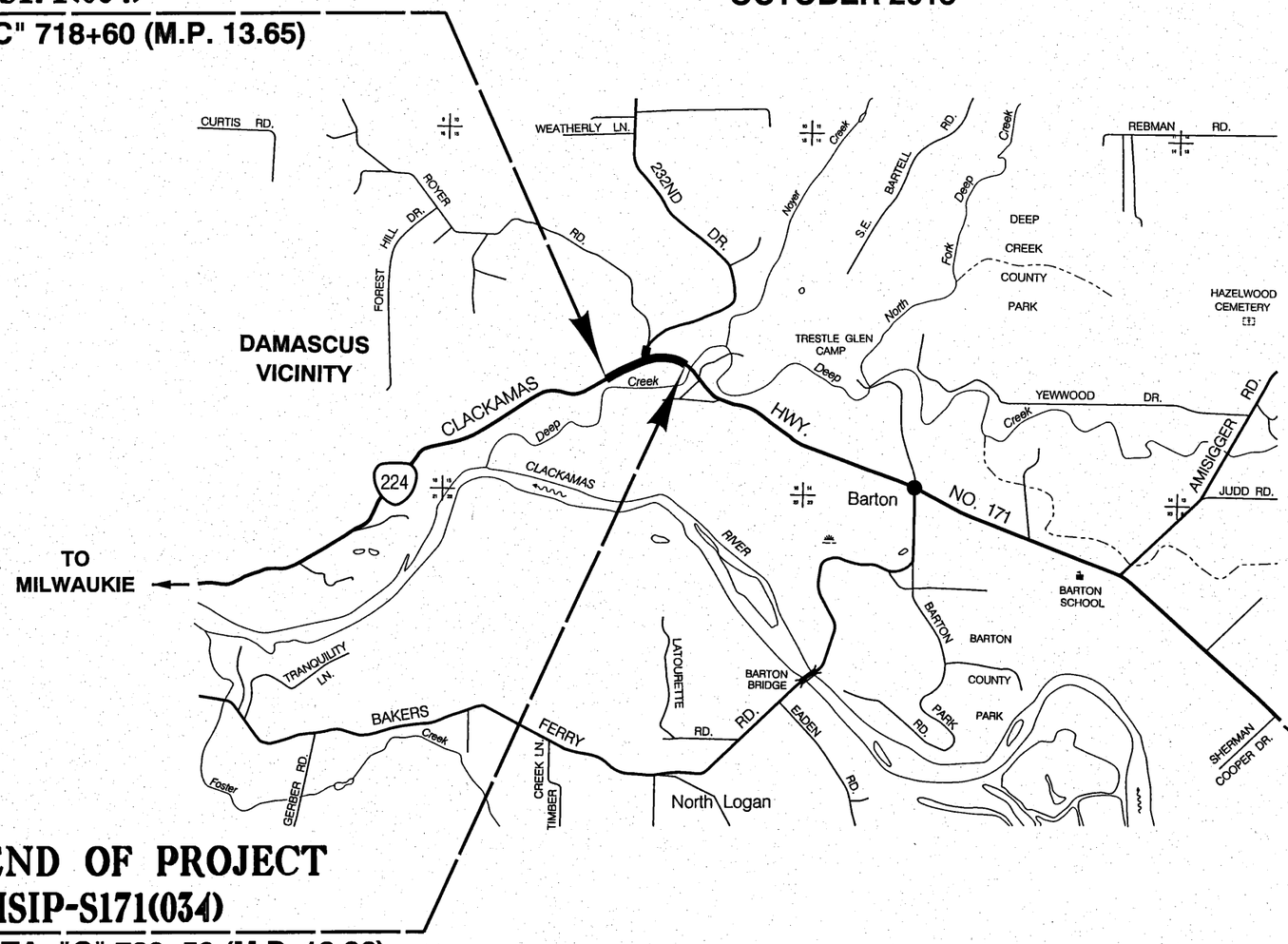
CLACKAMAS HIGHWAY

CLACKAMAS COUNTY
OCTOBER 2015



Overall Length Of Project - 0.21 Miles

BEGINNING OF PROJECT
HSIP-S171(034)
STA. "C" 718+60 (M.P. 13.65)



END OF PROJECT
HSIP-S171(034)
STA. "C" 729+50 (M.P. 13.86)

T. 2 S., R. 3 E., W.M.

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

Tammy Baney	CHAIR
David Lohman	COMMISSIONER
Susan Morgan	COMMISSIONER
Alando Simpson	COMMISSIONER
Sean O'Hollaren	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 J. Clark
Technical Center Manager, Region 1

_____
Concurrence by ODOT Chief Engineer

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	SHEET NO.
OREGON DIVISION	HSIP-S171(034)	1

PE002131-000

G:\17716_OR224_Clackamas_Hwy-@SE_232nd_Dr\Final\17716F.TS1 :: Default 8/19/2015 11:46:42 AM hwye19g

INDEX OF SHEETS, CONT.

SHEET NO.	DESCRIPTION
2, 2A thru 2A-3	Typical Sections
2B thru 2B-6	Details
2C	Detour Plan
2C-2 & 2C-3	Traffic Control Plans
2D	Pipe Data Sheet
3	Alignment & General Construction
3A	Drainage & Utilities
3B	Profile
4	Alignment & General Construction
4A	Drainage & Utilities
4B	Profile
4C & 4C-2	Drainage Profile
GEO-ENVIRONMENTAL	
GA thru GA-2	Erosion Control Plan
GA-3	Erosion Control Details
GB thru GB-6	Geotechnical Data
GG thru GG-3	Temporary Water Management
GJ & GJ-2	Drainage Details
GM	Mandatory Disposal Site
PERMANENT PAVEMENT MARKINGS	
ST	Striping Plan
ST-2	Rumble Strip
PERMANENT SIGNING	
S-15462 thru S-15466	Signing Plan

Standard Drg. Nos.

RD101 - Mailbox Installation
RD140 - Roadway Cross Slopes Superelevated Sections
RD150 - Slope Rounding

RD300 - Trench Backfill, Bedding, Pipe Zone And Mult. Installations
RD302 - Street Cut
RD316 - Sloped Ends For Metal Pipe
RD317 - Culvert Embankment Protection
RD318 - Sloped Ends For Concrete Pipe
RD319 - Miscellaneous Culvert Details
RD334 - Locator Post
RD336 - Standard Manhole Detail
RD364 - Concrete Inlets Type G-1, G-2, G-2M & G-2MA
RD365 - Frames & Grates For Concrete Inlets
RD370 - Ditch Inlet Type D
RD386 - Fill Height Tables For Circular Concrete Pipe
RD398 - Culvert ID Marker
RD399 - Stormwater Treatment And Storage Facility Field Markers

RD400 - Guardrail And Metal Median Barrier
RD405 - Guardrail And Metal Median Barrier Parts
RD415 - Guardrail And Metal Median Barrier Parts
RD420 - Energy Absorbing Terminal
RD450 - Guardrail Anchors (Steel)

RD500 - Precast Concrete Barrier Pin And Loop Assembly
RD505 - Concrete Barrier Cast-In-Place
RD510 - Concrete Barrier Terminal
RD515 - Median Barrier Anchoring Details
RD516 - Securing Concrete Barrier To Roadway
RD545 - Precast Tall (42") Concrete Barrier

RD610 - Asphalt Concrete Pavement (ACP) Details

RD715 - Approaches And Non-Sidewalk Driveways

RD1000 - Construction Entrances
RD1005 - Check Dams Type 1, 3, and 4
RD1006 - Check Dams Type 2 and 6
RD1010 - Inlet Protection Type 2, 3, 6 and 7
RD1030 - Sediment Barrier Type 2, 3, and 4
RD1040 - Sediment Fence
RD1055 - Slope and Channel Matting

TM200 - Sign Installation Details
TM201 - Miscellaneous Sign Placement Details
TM204 - Flag Board Mounting Details
TM212 - Signing Details Oregon Route Signs
TM223 - Conventional Roads Directional Sign Layout Street Name Signs
TM230 - Mounting Details For Removable Legend 4" Through 8" Letters & Numbers

TM500 - Pavement Marking Standard Detail Blocks
TM501 - Pavement Marking Standard Detail Blocks
TM502 - Pavement Marking Standard Detail Blocks
TM503 - Pavement Marking Standard Detail Blocks
TM515 - Pavement Markers
TM517 - Recessed Pavement Markers
TM521 - Durable Pavement Markings Method "A" & Method "B" Surface & Groove Installed Non-Profiled
TM530 - Intersection Pavement Markings (Crosswalk, Stop Bar & Bike Lane Stencil)
TM531 - Turn Arrow Marking Details
TM539 - Median and Left Turn Channelization Details
TM560 - Alignment Layout: General
TM561 - Alignment Layout: Left Turn Lane, Centerline & Medians
TM570 - Traffic Delineators
TM571 - Traffic Delineators Steel Post Details
TM576 - Traffic Delineator Installation For Non-Freeways

TM670 - Wood Post Sign Supports
TM671 - 3 Second Gust Wind Speed Map
TM677 - Sign Mounts
TM681 - Perforated Steel Square Tube (PSST) Sign Support Installation
TM687 - Perforated Steel Square Tube (PSST) Anchor Foundation
TM688 - Perforated Steel Square Tube (PSST) Slip Base Foundation

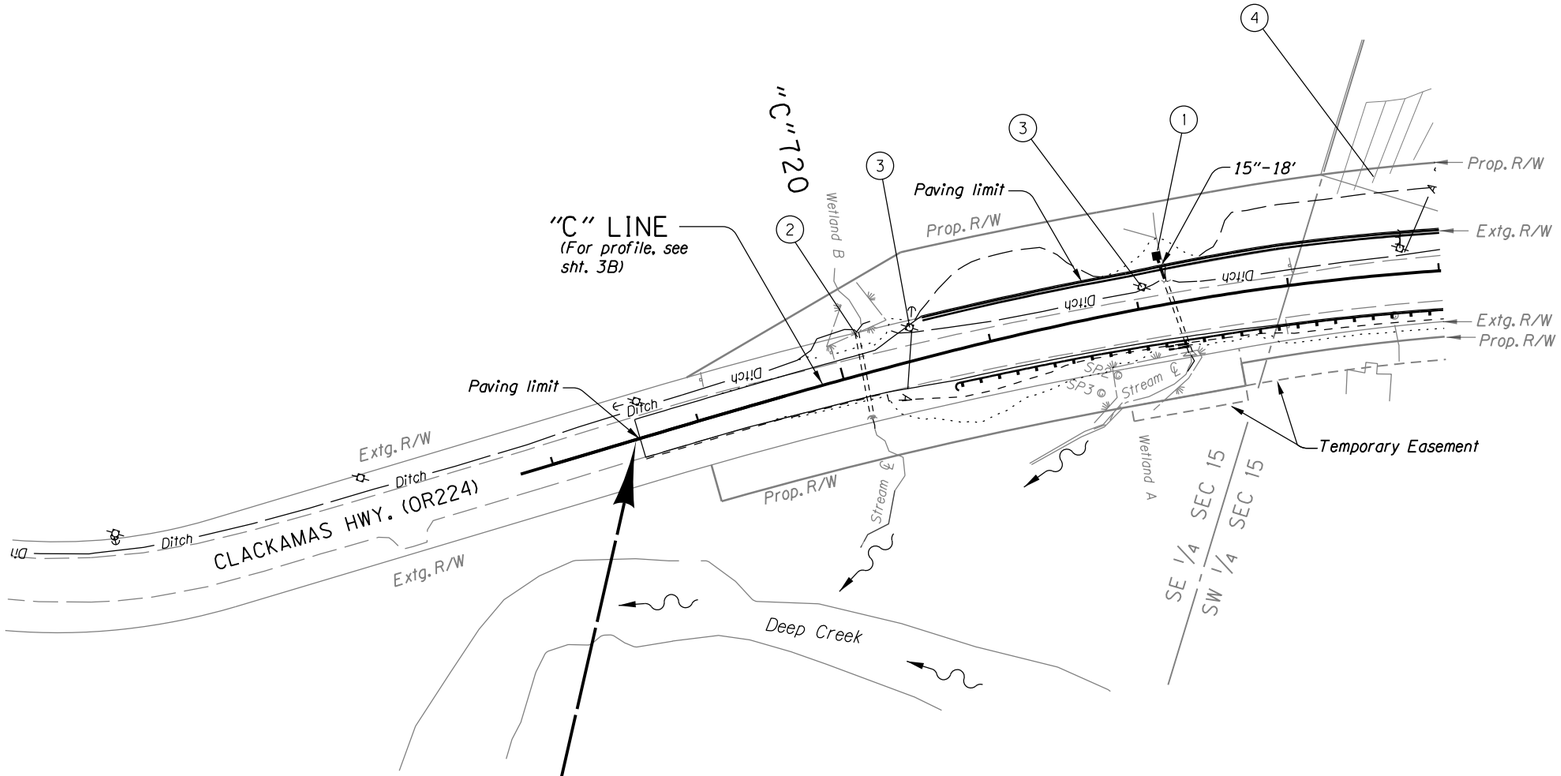
TM800 - Tables, Abrupt Edge And PCMS Details
TM810 - Temporary Pavement Markings
TM820 - Temporary Barricades
TM821 - Temporary Sign Supports
TM840 - Closure Details
TM841 - Intersection Work Zone Details
TM842 - Signalized Intersection Details
TM850 - 2-Lane, 2-Way Roadways

R/W Map No. 11B-7-33

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

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

FEDERAL HIGHWAY ADMINISTRATION	PROJECT NUMBER	
OREGON DIVISION	HSIP-S171(034)	1A



(1) *Sta. "C" 722+17.8, Lt.*
Extend Extg. 15" Culvert Pipe - 18'
(Field Verify Material Size, Type & Slope)
Inst. Type "D" Inlet W/ 1.5' Sump
Estimated Invert Rim Elev. = 454.5'
Estimated F.L. Out = 451.16' (S)
Const. Class 50 Riprap Apron - 3 Tons
Inst. Culvert Drainage Marker, Type 1
(See Drg. Nos. RD300, RD316, RD317, RD334, RD365, RD370, RD386, & RD398)
(For Details See Sht. 4C)

(1) (2) *Sta. "C" 720+15.0, Lt.*
Inst. Culvert Drainage Marker, Type 1

(3) *Relocate Utility Pole (By others)*

(4) *Relocate Septic Field (By Others)*

No.	DATE	REVISIONS	BY
1	9/1/2015	Station change from "722+15.0" to "720+15.0, Lt."	DLM

LEGEND

(Items in legend may not appear on plans)

Remove manhole:
Adjust manhole:
Const. manhole:
Remove inlet:
Adjust inlet:
Const. inlet:
Infiltration ditch:
Const. pipe
Plug and abandon pipe:

REGISTERED PROFESSIONAL ENGINEER
88,701
OREGON
MAY 21, 2014
DAVID L. MCDONALD
RENEWS: 12-31-2016

OREGON DEPARTMENT OF TRANSPORTATION

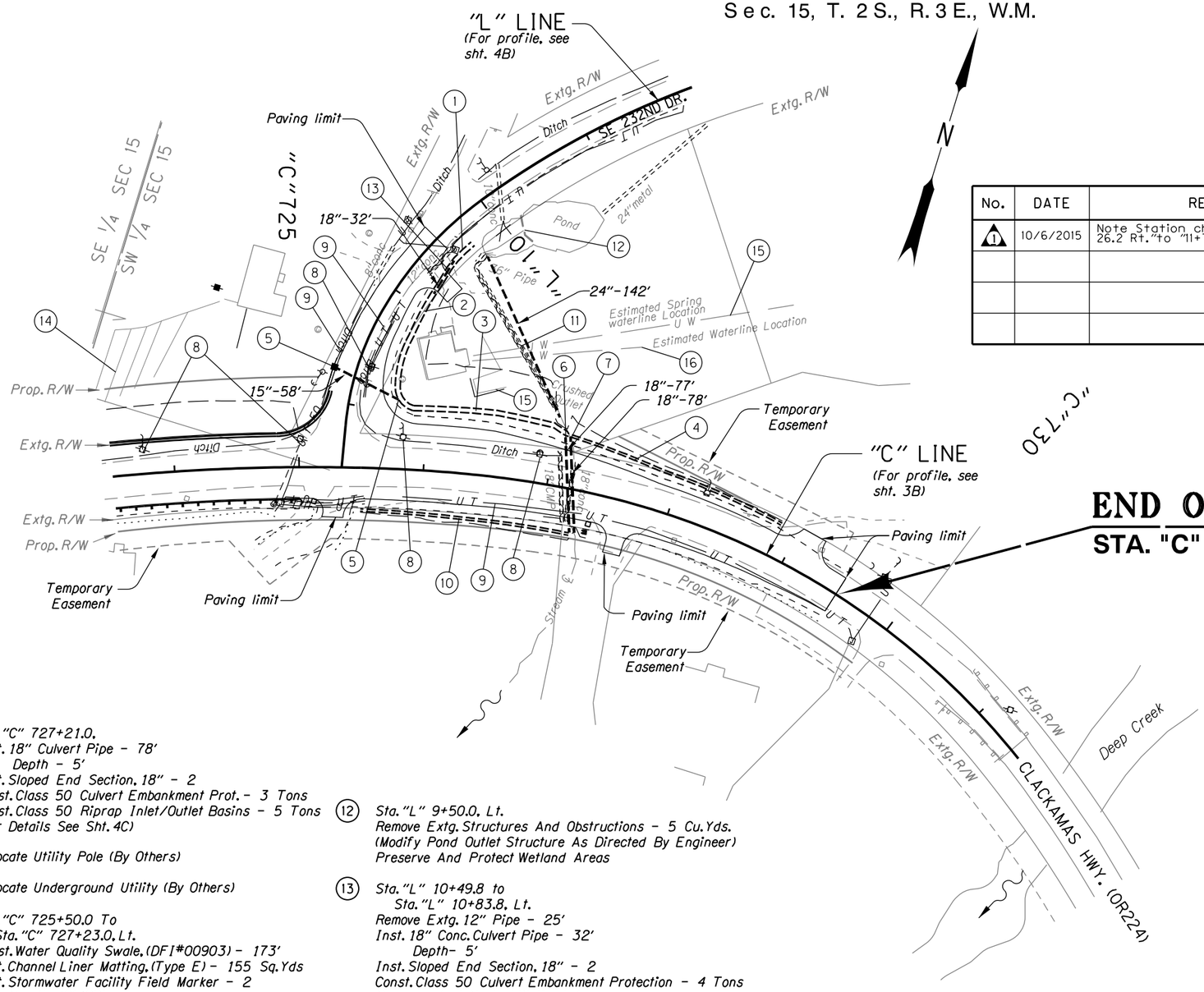
REGION 1 - GEO-ENVIRONMENTAL UNIT

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed by - Bruce Council
Designed by - David McDonald
Drafted by - David McDonald

DRAINAGE & UTILITIES

SHEET NO. 3A



No.	DATE	REVISIONS	BY
1	10/6/2015	Note Station change from "12+38.2, 26.2 Rt." to "11+74.37, 17.6 Rt."	DLM

END OF PROJECT
STA. "C" 729+50 (M.P. 13.86)

(1) *Sta. "L" 10+40.0 To*
Sta. "L" 10+49.8, Lt.
Const. 4' Flat Bottom Ditch - 10'
(Fine Grade To Match Extg. Surface)
Inst. Channel Liner Matting, (Type E) - 10 Sq.Yds.
(See Drg. No. RD1055)
(For Details See Sht. GJ)

(2) *Sta. "L" 10+79.9 To*
Sta. "C" 726+00.0, Lt.
Const. 4' Flat Bottom Ditch - 125'
Inst. Class 50 Riprap Reinforcement - 75 Tons
Inst. Riprap Geotextile, Type 1 - 170 Sq.Yds.
(For Details See Shts. GJ, GA, & GA-2)

(3) *Sta. "C" 726+00.0 To*
Sta. "C" 727+09.0, Lt.
Const. 4' Flat Bottom Ditch - 125'
Inst. Channel Liner Matting, (Type E) - 170 Sq.Yds.
(For Details See Sht. GJ)

(4) *Sta. "C" 727+21.0 To*
Sta. "C" 728+86.0, Lt.
Const. 2' Flat Bottom Ditch - 125'
(For Details See Sht. GJ)

1 (5) *Sta. "L" 11+74.37, 17.6' Rt.*
Inst. Modified Type "D" Inlet W/ 1.5' Sump
Invert Rim Elev.= 465.5'
Const. Class 50 Riprap Apron - 2.5 Tons
Inst. 15" Culvert Pipe - 58'
Depth - 5'
Inst. Sloped End Section, 15"
Inst. Culvert Drainage Marker, Type 1
Trench Resurfacing - 15 Sq.Yd.
(For Details See Shts. 4C & GJ-2)
(See Drg. Nos. RD302, RD318, & RD319)

(6) *Sta. "C" 727+16.9,*
Remove Extg. 18" Conc Pipe - 48'
Remove Extg. 18" CMP - 48'
Const. Temporary Water Management
Inst. 18" Culvert Pipe - 77'
Depth - 5'
Inst. Sloped End Section, 18" - 2
Inst. Culvert Drainage Marker, Type 1
Const. Class 50 Culvert Embankment Prot. - 3 Tons
Const. Class 50 Riprap Inlet/Outlet Basins - 5 Tons
Trench Resurfacing - 30 Sq.Yd.
(For Details See Sht. 4C)
(For Temp. Water Mgmt. See Shts. GG & GG-2)

(7) *Sta. "C" 727+21.0,*
Inst. 18" Culvert Pipe - 78'
Depth - 5'
Inst. Sloped End Section, 18" - 2
Const. Class 50 Culvert Embankment Prot. - 3 Tons
Const. Class 50 Riprap Inlet/Outlet Basins - 5 Tons
(For Details See Sht. 4C)

(8) *Relocate Utility Pole (By Others)*

(9) *Relocate Underground Utility (By Others)*

(10) *Sta. "C" 725+50.0 To*
Sta. "C" 727+23.0, Lt.
Const. Water Quality Swale, (DF1#00903) - 173'
Inst. Channel Liner Matting, (Type E) - 155 Sq.Yds
Inst. Stormwater Facility Field Marker - 2
(See Drg. No. RD399)
(For Details See Sht. GJ)

(11) *Sta. "L" 10+25.6, Rt. To*
Sta. "C" 727+01.1, Lt.
Remove 36" Culvert Pipe - 140'
(Preserve And Protect Extg. Water Line)
Const. Temporary Water Management
Inst. 24" Culvert Pipe - 142'
Depth - 20'
Const. Embankment Protection - 3.0 Tons
Const. Class 50 Riprap Inlet/Outlet Basins - 5 Tons
(For Details See Sht. 4C-2)
(For Temp. Water Mgmt. See Shts. GG-2 & GG-3)

(12) *Sta. "L" 9+50.0, Lt.*
Remove Extg. Structures And Obstructions - 5 Cu.Yds.
(Modify Pond Outlet Structure As Directed By Engineer)
Preserve And Protect Wetland Areas

(13) *Sta. "L" 10+49.8 to*
Sta. "L" 10+83.8, Lt.
Remove Extg. 12" Pipe - 25'
Inst. 18" Conc. Culvert Pipe - 32'
Depth- 5'
Inst. Sloped End Section, 18" - 2
Const. Class 50 Culvert Embankment Protection - 4 Tons
Preserve And Protect Wetland Areas
(Ditch Installation Should Stop Short Of Wetland Limits)
(For Details See Sht. 4C)

(14) *Relocate Septic Field (By Others)*

(15) *Remove And Cap Spring Waterline (By Others)*
Inst. Locator Post (By Others)

(16) *Remove And Cap Waterline (By Others)*
Inst. Locator Post (By Others)

LEGEND

(Items in legend may not appear on plans)

Remove manhole:
Adjust manhole:
Const. manhole:
Remove inlet:
Adjust inlet:
Const. inlet:
Infiltration ditch:
Const. pipe
Remove or abandon pipe:

REGISTERED PROFESSIONAL ENGINEER
88,701
OREGON
MAY 21, 2014
DAVID L. MCDONALD
RENEWS: 12-31-2016

OREGON DEPARTMENT OF TRANSPORTATION

REGION 1 - GEO-ENVIRONMENTAL UNIT

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed by - Bruce Council
Designed by - David McDonald
Drafted by - David McDonald

DRAINAGE & UTILITIES

SHEET NO. 4A

SHEET NUMBER	NOTE No. ON PLANS	DESIGN HEIGHT OF COVER ① (FEET)	PIPE: CIRCULAR OR ELLIPTICAL — SIZE IN (Inches)	PIPE: LENGTH IN FEET	PIPE - ARCH: HELICAL Riveted Welded or Lock Seam	PIPE - ARCH: LENGTH (Feet)	PIPE - ARCH: CROSS-SECTIONAL DIMENSIONS ② SPAN (Feet-Inches)	PIPE - ARCH: CROSS-SECTIONAL DIMENSIONS ② RISE (Feet-Inches)	PIPE - ARCH: CROSS-SECTIONAL DIMENSIONS ② CORNER RADII (Inches)	USE / INSTALLATION CRITERIA: DRAIN (PERFORATED)	CULVERT (ROAD APPROACH)	CULVERT (CONDUIT)	CULVERT	IRRIGATION	SIPHON	STORM SEWER	SANITARY SEWER	OTHERS (SEE REMARKS)	WATERTIGHT JOINTS	SLOPE ANCHORS	IMPERFECT TRENCH	PH	RESISTIVITY (HUNDREDS)	TERMINAL TREATMENT: LT./RT. SLOPED ENDS	TERMINAL TREATMENT: SKEW NUMBER	TERMINAL TREATMENT: PAVED END SLOPES Not For Conc. Pipe Over 60" Dia. No.
3A	1	2.0																				6.2	20			
4A	5												✓									6.2	20	45	16	
	5	1.0		58'									✓									6.2	20	45	16	
	6	1.0		77'									✓									6.2	20	45	15	
	7	1.0		78'									✓									6.2	20	45	15	
	11	2.0		142'									✓									6.2	20			
	13	1.0		32'									✓									6.2	20	45		

ALTERNATE MATERIALS — HELICAL CORRUGATED METAL

ALUMINUM — SIZE OF CORRUGATIONS

SHEET NUMBER	NOTE No. ON PLANS	RIVETED, WELDED OR LOCK SEAM: 1½" x ¼" 2⅔" x ½" PLATE THKN. (Inches)	RIVETED, WELDED OR LOCK SEAM: 1½" x ¼" 2⅔" x ½" ③ CROSS SECTION (Inches)	RIVETED, WELDED OR LOCK SEAM: 3" x 1" PLATE THKN. (Inches)	RIVETED, WELDED OR LOCK SEAM: 3" x 1" ③ CROSS SECTION (Inches)	LOCK SEAM: SMOOTH WALL SPIRAL RIB ¾" x ¾" @ 7½" O.C. Or ¾" x 1" @ 11½" O.C.	LOCK SEAM: SMOOTH WALL SPIRAL RIB ⅝" x ¾" @ 12" O.C. PLATE THKN. (Inches)	LOCK SEAM: ③ CROSS SECTION	LOCK SEAM: ⑤ COATING
3A	1								
4A	5								
	5								
	6								
	7								
	11								
	13								

ALUMINIZED OR GALVANIZED IRON AND STEEL — SIZE OF CORRUGATIONS

SHEET NUMBER	NOTE No. ON PLANS	RIVETED, WELDED OR LOCK SEAM: 1½" x ¼" 2⅔" x ½" PLATE THKN. (Inches)	RIVETED, WELDED OR LOCK SEAM: 1½" x ¼" 2⅔" x ½" ③ CROSS SECTION (Inches)	RIVETED, WELDED OR LOCK SEAM: 3" x 1" PLATE THKN. (Inches)	RIVETED, WELDED OR LOCK SEAM: 3" x 1" ③ CROSS SECTION (Inches)	RIVETED, WELDED OR LOCK SEAM: COATING ⑤ GALVANIZED	RIVETED, WELDED OR LOCK SEAM: COATING ⑤ ALUMINIZED	LOCK SEAM: SMOOTH WALL SPIRAL RIB ¾" x ¾" @ 7½" O.C. Or ¾" x 1" @ 11½" O.C. ⅝" x ¾" @ 12" O.C. PLATE THKN. (Inches)	LOCK SEAM: ③ CROSS SECTION	LOCK SEAM: COATING ⑤ GALVANIZED	LOCK SEAM: COATING ⑤ ALUMINIZED
3A	1										
4A	5										
	5										
	6										
	7										
	11										
	13										

RIGID — PRE-CAST CONCRETE ④

SHEET NUMBER	NOTE No. ON PLANS	PLAIN 1	PLAIN 2	PLAIN 3	REINF. III	REINF. IV	REINF. V
3A	1						
4A	5						
	5					✓	
	6					✓	
	7					✓	
	11				✓		
	13					✓	

PLASTIC & IRON

SHEET NUMBER	NOTE No. ON PLANS	CORRUGATED HDPE	SOLID WALL HDPE	REINFORCED HDPE	PVC	POLYPROPYLENE	DUCTILE IRON
3A	1						
4A	5						
	5						
	6						
	7						
	11						
	13						

APPURTENANCES — MANHOLES

SHEET NUMBER	NOTE No. ON PLANS	DEPTH, TOP OF COVER TO INVERT (Feet)	DIAMETER OF LARGEST PIPE IN BASE (In.)	CONC. PRECAST	CONC. CAST-IN-PLACE	Adjust Manhole	SPECIAL (SHALLOW)
3A	1						
4A	5						
	5						
	6						
	7						
	11						
	13						

APPURTENANCES — INLETS

SHEET NUMBER	NOTE No. ON PLANS	TYPE D	TYPE G-2	TYPE CG-1	TYPE CG-3	Number Required
3A	1	✓				
4A	5	✓				
	5					
	6					
	7					
	11					
	13					

EXTENSION

SHEET NUMBER	NOTE No. ON PLANS	LEFT (Feet)	RIGHT (Feet)	⑥ EXTG. PIPE MATERIAL	REMARKS
3A	1	18'		CO	Extend 15" Conc. Culvert
4A	5				Const. class 50 riprap apron
	5				Const. class 50 rirap basin
	6				Const. class 50 rirap basin
	7				Const. class 50 rirap basin
	11				Const. class 50 rirap basin
	13				Const. class 50 rirap basin

48V-096

GENERAL NOTES:

1. A check (✓) indicates column heading applies.
2. A new pipe culvert installation shall be of like material throughout.
3. Extension of existing metal culverts may be of unlike metal or corrugations. For connecting details, see Std Drg. No. RD326.
4. Dimensions shown are nominal.
5. All pipes shall conform to the AASHTO specification applicable for the type of material and the diameter of the pipe involved.

FOOTNOTES:

① Design height of cover is the critical design height used to select pipe materials. The height of cover for any given run of pipe may vary. Design height of cover shall be measured to subgrade.

② Cross-sectional dimensions may vary with different materials. When galvanized iron or steel and aluminum are acceptable alternates use a separate line for each type of material.

③ Cross-sectional shape of pipe normal to longitudinal axis, prior to loading
A = Pipe - Arch
R = Round
E = Elliptical (5% nominal elongation)

④ Minimum allowable diameter for Class 1 nonreinforced concrete pipe is 15".

⑤ Abbreviations for protective coatings for metal pipe
PM = Polymeric, 10 Mil. thkn. coated both sides
PO = Polyethylene inside lining, polymeric outside
U = Uncoated
CIM = Chevron industrial membrane
Ep = Epoxy coated

⑥ Abbreviations for existing pipe materials
AB = Asbestos cement
Al = Corrugated aluminum
Co = Concrete
Pl = Plastic
St = Corrugated steel
X = Other material, see remarks column

■	RD300	Trench Backfill, Bedding, Pipe Zone And Multiple Installations
■	RD302	Street Cut
□	RD304	Arch Pipe Backfill/Compaction
□	RD306	Concrete Encasement, Cradle, and Cap Details
□	RD308	Bore Casing Detail
□	RD310	Shallow/Deep Trench Service Connection, Blocking and Markers
□	RD312	Subsurface Drain
■	RD316	Sloped Ends For Metal Pipe
■	RD317	Culvert Embankment Protection
■	RD318	Sloped Ends For Concrete Pipe
■	RD319	Miscellaneous Culvert Details
□	RD320	Paved End Slope For Culverts 60" Maximum Pipe Size
□	RD321	Paved End Slope With Removable Safety Bar(s)
□	RD322	Safety End Section For Metal Pipe
□	RD324	Safety End Section For Concrete, PVC, HDPE & Polypropylene Pipe
□	RD326	Coupling Bands For Corrugated Metal Pipe Types A, B, D & E
□	RD327	Coupling Bands For Corrugated Metal Pipe Types F, J & K
□	RD328	Slotted C.M.P. Drain Details
□	RD330	Metal Pipe Slope Anchors
□	RD332	Concrete Pipe Anchor Detail
■	RD334	Locator Post
□	RD335	Standard Storm Sewer Manhole
■	RD336	Standard Storm Sewer Manhole
□	RD338	Standard Sanitary Sewer Manhole
□	RD340	Storm Sewer Pollution Control Manhole
□	RD342	Shallow Manholes
□	RD343	24" Manhole
□	RD344	Standard Manhole Base Section
□	RD346	Large Precast Manhole
□	RD348	Manhole With Inlet
□	RD350	Sanitary Sewer Piped Inside Drop Connection for Manholes
□	RD352	Outside Drop Manholes
□	RD354	Carry Through Manhole - Storm
□	RD356	Manhole Covers And Frames
□	RD358	Manhole Slope Protectors
□	RD360	Manhole Frame Adjustment
□	RD362	Sanitary Cleanout
■	RD364	Concrete Inlets Type G-1, G-2, G-2M, & G-2MA
■	RD365	Frames & Grates For Concrete Inlets
□	RD366	Concrete Inlets Type CG-1, CG-2 And Curb Inlet Channel
□	RD368	Concrete Inlets Type M-E, M-O, B And B-SL
■	RD370	Ditch Inlet Type D
□	RD371	Concrete Inlet Base Type CG-3
□	RD372	Concrete Inlet Top, Option 1 Type CG-3
□	RD373	Concrete Inlet Top, Option 2 Type CG-3
□	RD374	Area Drainage Basin Or Field Inlet
□	RD376	Miscellaneous Drainage Structures Siphon Box, Inlet Cap & Inlet Adjustment
□	RD378	Type "3" Catch Basin, Frame and Grate
□	RD380	Fill Height Tables For Aluminum & Steel Corrugated Pipe
□	RD382	Fill Height Tables For Aluminum & Steel Arch Pipe
□	RD384	Fill Height Tables For Aluminum & Steel Spiral Rib Pipe
■	RD386	Fill Height Table For Circular Concrete Pipe
□	RD388	Fill Height Tables For PVC Pipe
□	RD390	Fill Height Table For Corrugated HDPE Pipe
□	RD391	Fill Height Tables For Steel Reinforced HDPE Pipe
□	RD393	Fill Height Tables For Polypropylene Pipe
■	RD398	Culvert ID Marker
■	RD399	Stormwater Treatment and Storage Facility Field Markers

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REGION 1 - GEO-ENVIRONMENTAL UNIT

OR224 (CLACKAMAS HWY.): SE 232ND DR. SEC.
CLACKAMAS HIGHWAY
CLACKAMAS COUNTY

Reviewed by - Bruce Council
Designed by - David McDonald
Drafted by - David McDonald

PIPE DATA SHEET

SHEET NO. 2D

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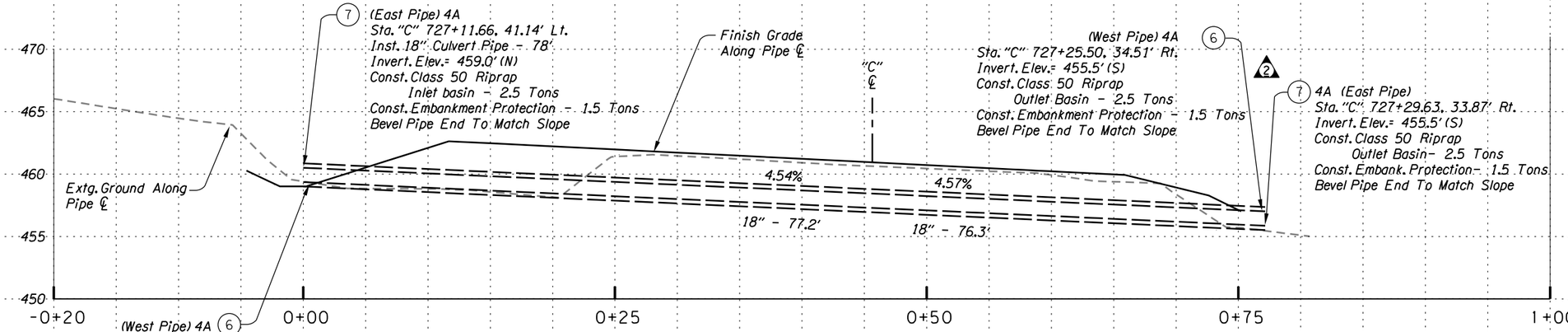
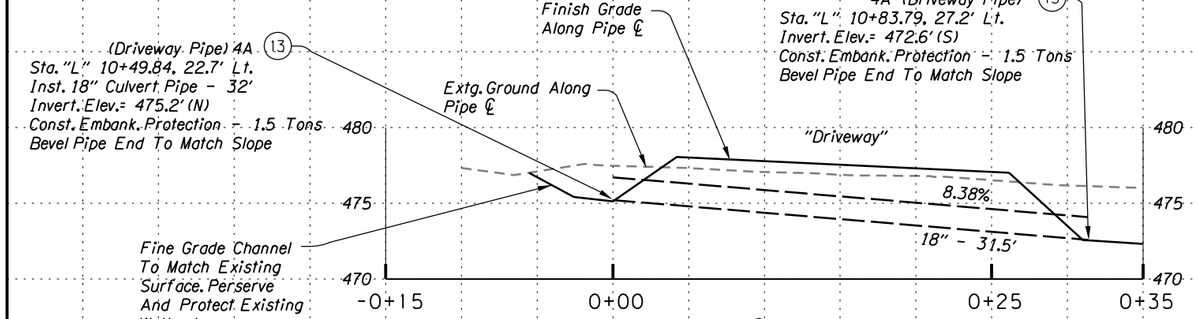


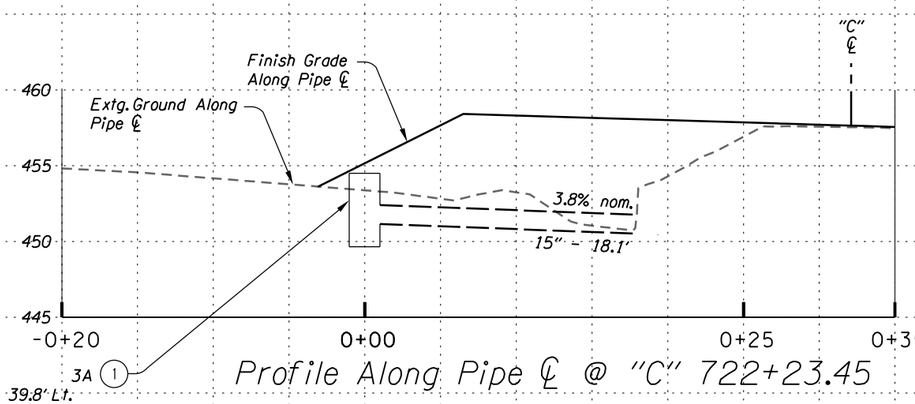
(West Pipe) 4A
Sta. "C" 727+07.97, 39.9' Lt.
Inst. 18" Culvert Pipe - 77'
Invert. Elev.= 459.0' (N)
Const. Class 50 Riprap
Inlet Basin - 2.5 Tons
Const. Embankment Protection - 1.5 Tons
Bevel Pipe End To Match Slope

Profile Along Pipe ℄ @ STA. "C" 727+15.5

No.	DATE	REVISIONS	BY
1	10/6/2015	Changed offset from "64.0' Lt." to "38.7' Lt."	DLM
2	10/6/2015	Changed east and west pipe bubble notes. Thet were reversed	DLM



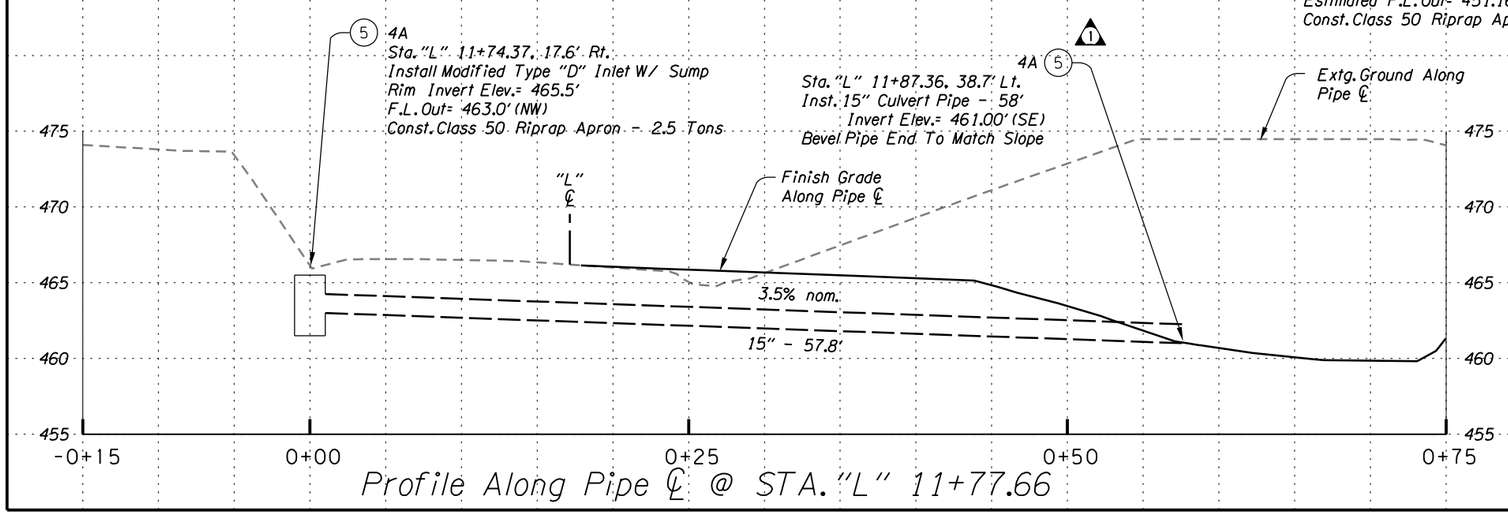
Profile Along Pipe ℄ (Driveway Culvert)



3A (1)

Profile Along Pipe ℄ @ "C" 722+23.45

Sta. "C" 722+16.65, 39.8' Lt.
Extend Extg. 15" Conc. Pipe - 18'
(Field Verify Material Size, Type & Slope)
Install Type "D" Inlet W/ Sump
Estimated Invert Rim Elev.= 454.5'
Estimated F.L. Out= 451.16' (S)
Const. Class 50 Riprap Apron - 3 Tons



Profile Along Pipe ℄ @ STA. "L" 11+77.66

General Notes:

1. Install class 50 riprap reinforcement accounding to standard drawing RD317.
2. Match ditch flow line at type D inlet rim elevation. Fine grade soil to match top elevation on back slope.
3. Install culvert pipe with beveled end sections according to standard drawing RD318.

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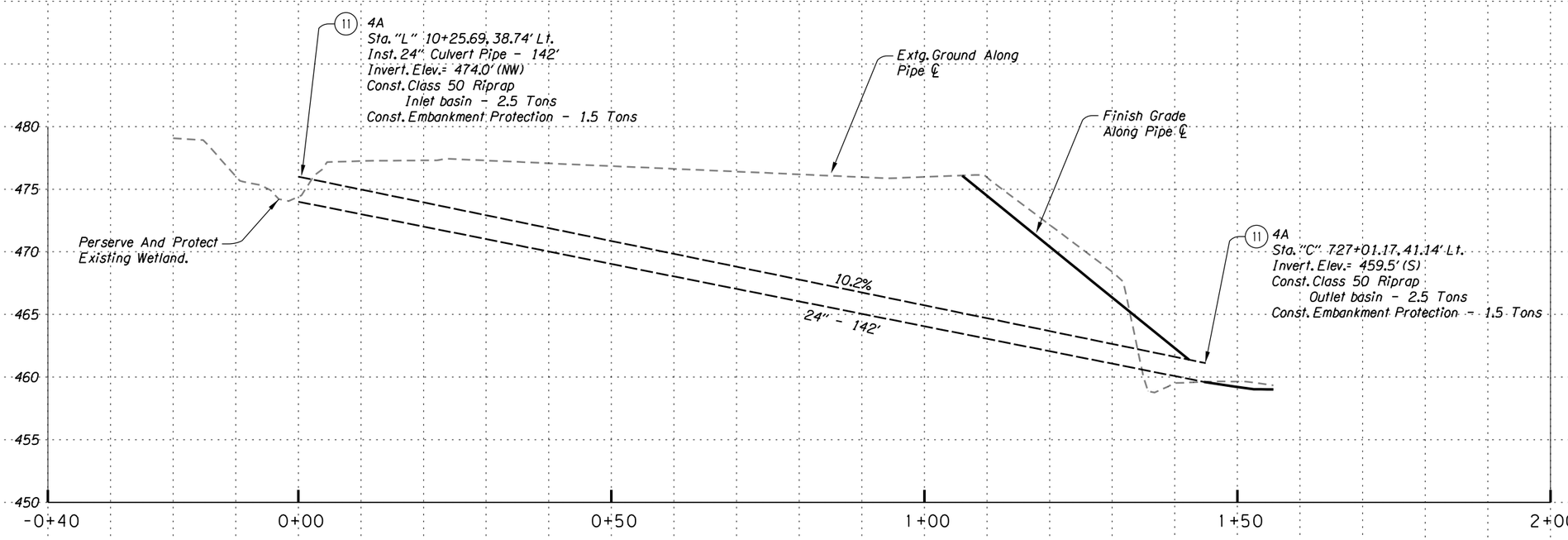
DRAINAGE PROFILE

SHEET NO. 4C



Profile Along Pipe ℄

General Notes:

1. Install class 50 riprap reinforcement accounding to standard drawing RD317.
2. Match ditch flow line at type D inlet rim elevation. Fine grade soil to match top elevation on back side.
3. Install culvert pipe with beveled end sections according to standard drawing RD318.

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DRAINAGE PROFILE

SHEET NO. 4C-2

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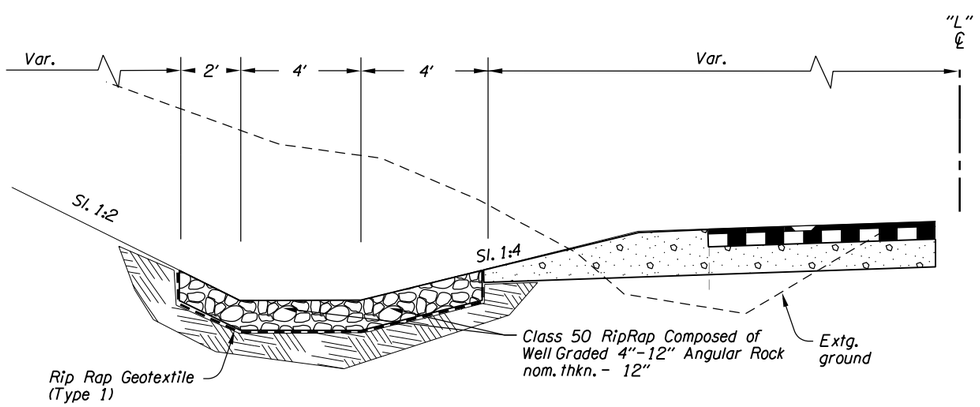


STA."L" 10+80 Lt. To STA. "C" 726+00 Lt.

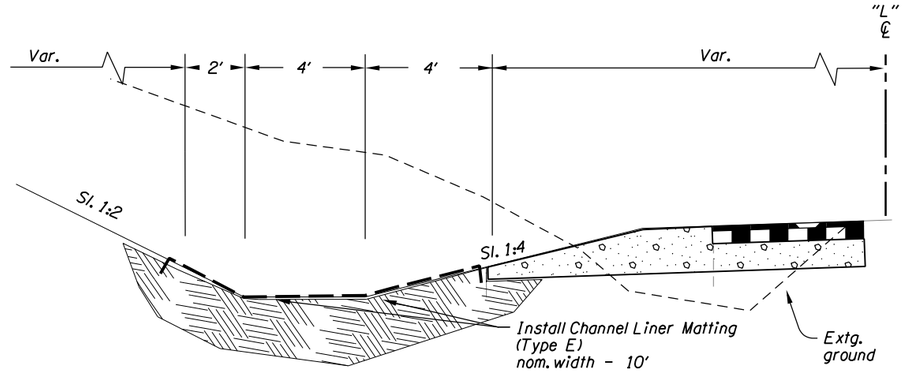
Riprap Reinforced Channel Typical Cross-section

N.T.S

GENERAL NOTES:

1. Ditch excavation is included in the roadway excavation estimate. Additional excavation for the placement of channel reinforcement materials has also been included in the roadway estimate.

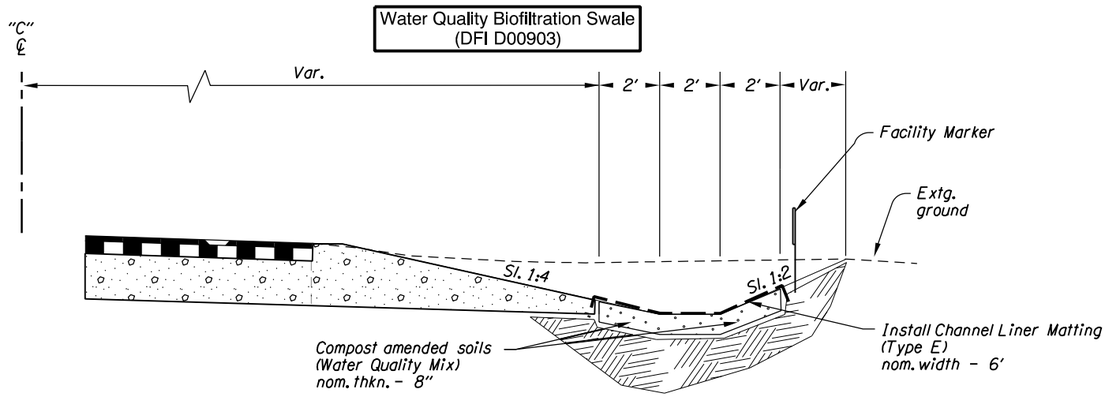
2. See shts. GA & GA-2 for seeding and matting information not shown on this sheet.



STA. "L" 10+40 Lt. To STA. "L" 10+50 Lt.
STA. "C" 726+00 Lt. To STA. "C" 727+09 Lt.

Channel Reinforcement Matting Typical Cross-section

N.T.S



STA. "C" 725+50 Rt. To STA. "C" 727+23 Rt.

Water Quality Swale Typical Cross-section

N.T.S

STORMWATER FIELD FACILITY MARKER TABLE

FACILITY LOCATION		DFI #	TYPE S2 MARKER LOCATION		TYPE S1 MARKER	
STATION "C"	MP		BEGIN	END	RED	GREEN
725+50, Rt.	13.81	D00903	✓			
727+10, Rt.	13.83	D00903		✓		

Check where appropriate
Red = Beginning of facility
Green = End of facility

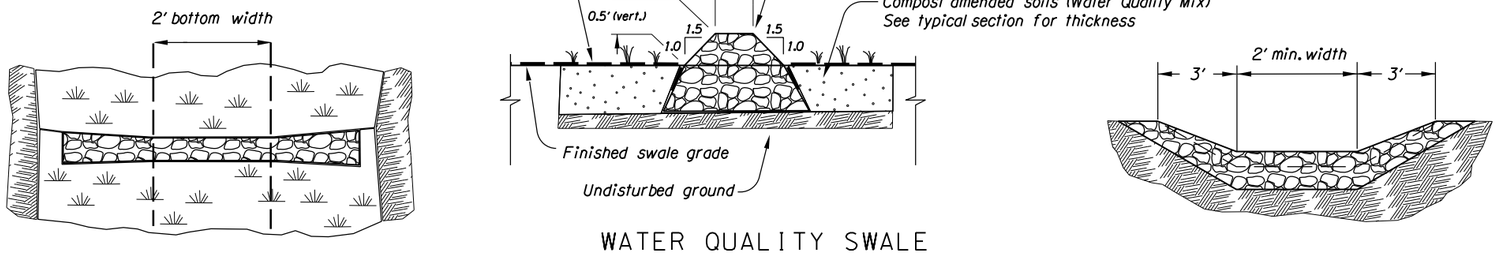
GENERAL NOTES:

1. Create a suitable water quality mix by amending existing soils or installing an engineer approved water quality soil mixture. (See ODOT hydraulics Manual 14-E-1)

2. If chosen, amend existing soil by placing 3" of compost material and mechanically combine into 5" of soil. (total 8" of amended soil).

3. See shts. GA & GA-2 for seeding and matting information not shown on this sheet.

4. Excavation associated with the water quality biofiltration swale is included in the water quality lump sum estimate. Ditch excavation is included in the roadway excavation estimate.



WATER QUALITY SWALE
TYPICAL TYPE 1 CHECK DAM
N.T.S

OREGON DEPARTMENT OF TRANSPORTATION

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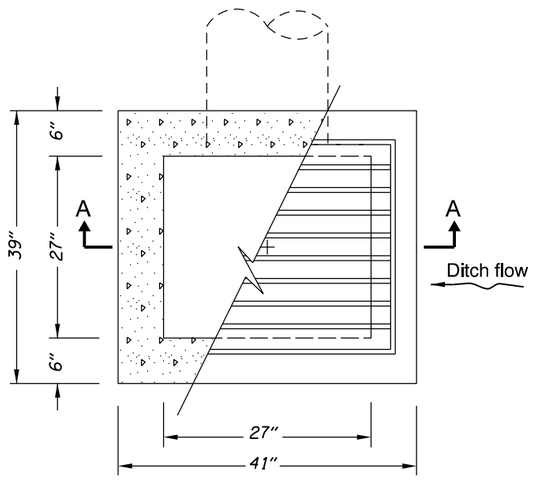
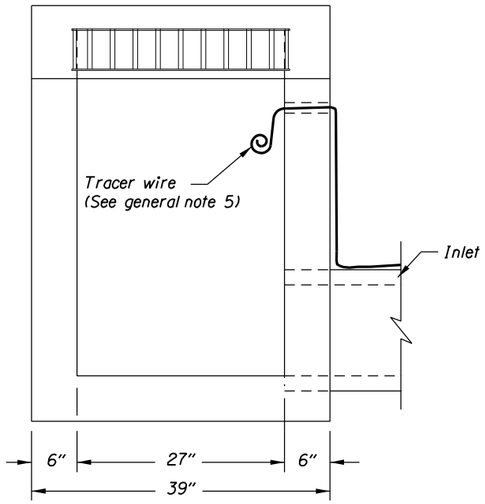
DRAINAGE DETAILS

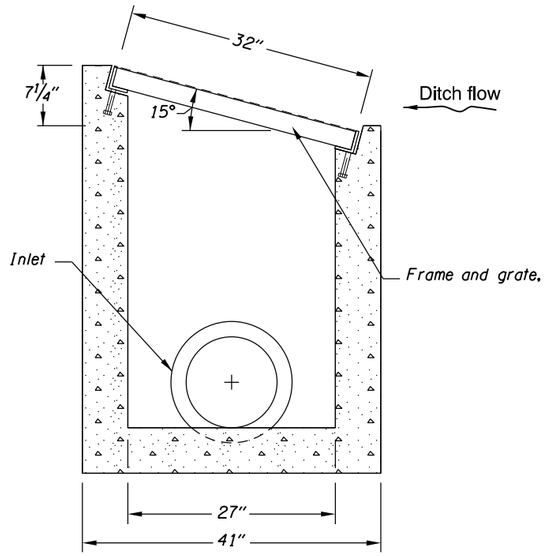
SHEET NO. GJ



PLAN



ELEVATION



SECTION A - A

Modified Type "D" Inlet Detail

GENERAL NOTES FOR ALL DETAILS:

1. *All concrete shall be commercial grade concrete.*
2. *Catch basin, frame, and grates shall meet H20 loading.*
3. *Provide sump only when called by plans, for sump details not shown, see Std. Drg. RD364.*
4. *Cross bars may be fillet welded, resistance welded or electro-forged to bearing bars.*
5. *See Std. Drg. RD336 for tracer wire details.*

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DRAINAGE DETAILS

SHEET NO.
GJ-2