

**Project Location**  
 SW ¼ SE ¼ S7 T33N R23 E  
 Lat 48° 21' 1.97" N  
 Long 120°0'15.40"W

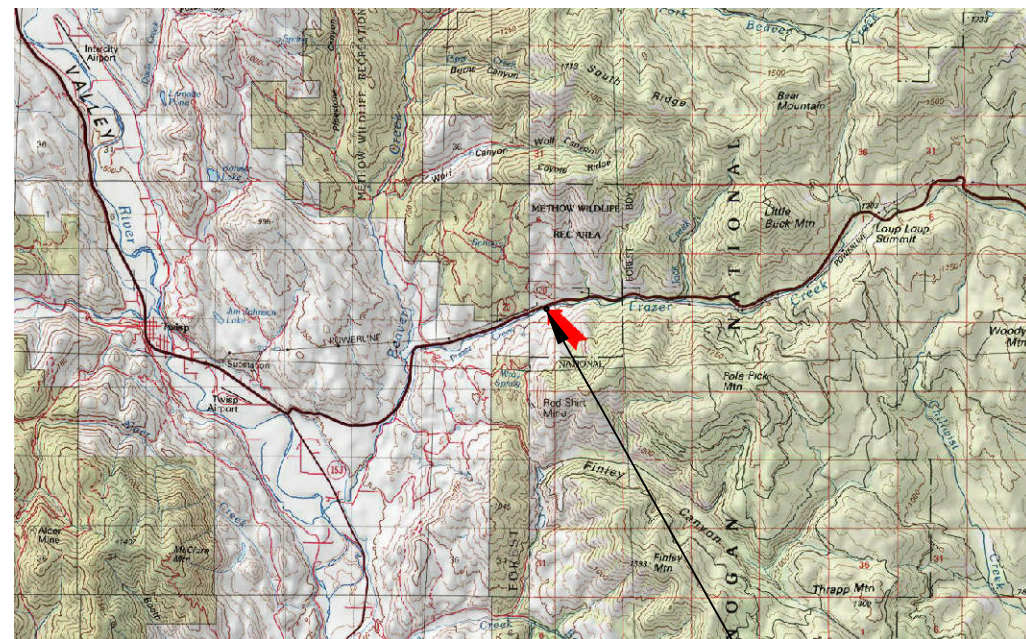
Family Forest Fish Passage Program  
 Okanogan County Conservation District  
**Traylor Crossing Frazer Creek  
 Culvert Replacement  
 Project 06-1712**



PREPARED  
 BY:



860 Windrose Drive  
 Coupeville, Washington 98239  
 (360) 678-4747  
**Professional Consulting Engineers**



VICINITY MAP

**Project Location**  
 SW ¼ SE ¼ S7 T33N R23 E  
 Lat 48° 21' 1.97" N  
 Long 120°0'15.40"W

**INDEX OF DRAWINGS**

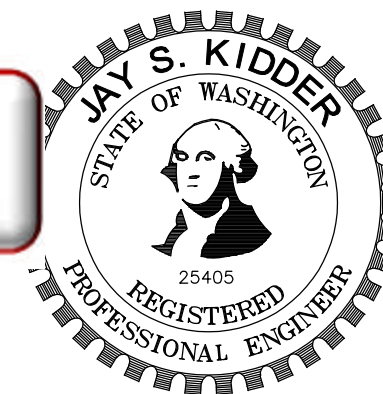
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**CONTACT INFORMATION:**

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 1251 S. 2nd Ave, Room 101  
 Okanogan, WA 98840  
 (509) 422-0855 ext 127  
 FAX (509) 422-0532

**Approved for Bidding**  
 4-13-2012

APPROVED AT CHINOOK ENGINEERING: \_\_\_\_\_ DATE \_\_\_\_\_



1" Bar at Original Scale

EXPIRES: 5-1-2014

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1	7/20/2011	Issued for permits	JSK	JSK	JSK
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Family Forest Fish Passage Program  
 Traylor Crossing Frazer Creek 06-1712  
**Cover**

DRAWING NO.  
**CVR**  
 1 OF 11

# SPECIFICATIONS

All work performed under these contract documents shall be in accordance with the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, most recent version. In the event of a conflict between the following attached specifications and the State of Washington Standard Specifications for Road, Bridge, and Municipal Construction, M41-10, the attached specifications for this contract shall prevail.

The following most current provisions, codes and specific material and workmanship specifications are attached to this contract and shall be adhered to;

AAWA	Architectural Aluminum Manufactures' Association
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Plywood Association
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society For Testing of Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
WSDOT	Washington Standard Specifications for Road, Bridge, and Municipal Construction, M41-10

## Items in Specifications

Certain items described in the specification may not be utilized in this project but are listed as general items and may or may not apply specifically to this project.

## Alternates

Alternative materials and construction methods are acceptable. The overall size and concept of the project shall be unchanged. Alternate methods of construction and any dimensional alternates shall be provided in writing for approval by the engineer, prior to installation. Changes in cost associated with alternates shall be at the risk of the contractor. Any alternates installed without prior written approval may be removed and replaced at the discretion of the engineer at no cost to the owner.

## Submittals

Submittals for appurtenances installed under this contract shall be provided to the engineer prior to installation for approval. The following notes apply unless indicated otherwise:

Special inspection, as noted shall be provided by the engineer of record..

## Code:

International Building Code, 2009 edition.

## Design soil pressure:

2000 psf max dead + live load

Cast footings and slab on grade over 12" thick compacted granular fill over compacted subgrade 90% min. compaction. Special inspection required.

## Design loads:

Snow = 25 psf  
 Snow drift = ANSI 58.1  
 Seismic Design Category D  
 Site Classification D

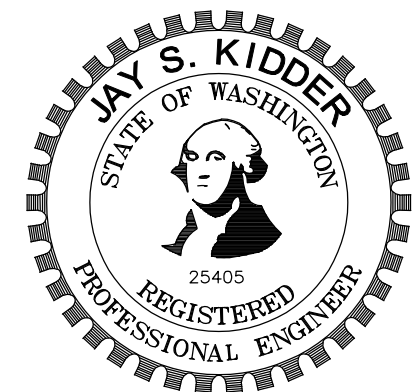
Fa= 1.33  
 Fv= 2.01  
 Sms= 0.782  
 Sm1= 0.397  
 Sds= 0.521  
 Sd1= 0.264

## Equivalent lateral Fluid pressure

Cantilevered walls 35 pcf  
 Restrained 50 pcf  
 Wind 50 psf on exposure

## Location Verification of Underground Utilities

The contractor is responsible to locate all underground utilities. Call before you dig services shall be utilized. It is assumed that electrical power and telephone are located inside the road embankment to the SFR driveway. Additionally a Century Link main communication cable is located along the road embankment of Highway 20. Any underground utilities that are located to interfere with the replacement of the project culvert shall be temporarily relocated and reconstructed to their original location and condition.



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**Specifications 1**

DRAWING NO.  
**SPC1**  
 2 OF 11



Culverts shall be as specified on the drawing and shall be supplied by Pacific Corrugated Pipe Co., Contech or equal. Culvert shall be fabricated with 10 gage, 0.138" steel thickness and shall be Aluminized Steel Type 2 coated as per AASHTO M274 and ASTM A 929. Culvert backfill soil compaction shall be constructed in multiple 8" loose soil thickness layers subsequently compacted to 95% maximum density at optimum moisture content. Care shall be taken to compact the haunches of the culvert to the same 95% maximum soil density. Wrap gasketed bands with geotextile. Special inspection required.

**Crushed gravel surfacing**

Crushed gravel surfacing shall meet WSDOT spec. 9-03.9(3) for crushed surfacing rock and shall meet WSDOT spec. 9-03.9(3) for base course or top coarse as indicated on the drawings.

**Culvert Demolition**

Culverts shall be removed and disposed of in a location as approved by the landowner or engineer.

**Structural fill**

Structural fill material shall be composed of crushed gravel, or quarry spalls as specified herein or approved by the project engineer and shall be compacted to 95% maximum density at optimum moisture content and shall be placed in 8" maximum loose lifts prior to compaction and in accordance with WSDOT 2-03.3(14)C compacting earth embankment Method C.

**Riprap**

WSDOT spec. 9-13.1(2) light loose rip rap. Riprap may exist on site and shall be salvaged and reused as shown in the drawings.

**Quarry spalls**

Quarry spalls shall be WSDOT 9-13.6

**Fish mix**

Fish mix gravel shall follow WSDOT 9-03.11 (1) and (2) and be washed round river rock consisting of 60% 1/2" to 2" rock and 20% 2" to 4" rock, 10% 6" and 10% 12" cobbles. Fish mix shall be supplemented as necessary with native bed material and/or imported pit run in order to match existing bed material gradation and prevent subsurface flow. Written approval shall be made by the engineer prior to construction.

**Stream Dewatering**

If stream dewatering is anticipated to be necessary during construction, a pump and diversion or gravity system will be required. The pump intake shall be screened and water discharged downstream of the project site. Discharge pipeline shall be placed and/or protected so as to prevent erosion in the channel. Upon completion of diversion, contractor and/or project biologist will remove stranded fish, if present. Dewatering plan shall be prepared and approved in writing by the Engineer prior to construction of system.

Pump intakes shall be affixed with a fish screen with mesh openings of 1/16" and shall be maintained clean. Through screen velocities shall not exceed 0.33 feet per second. A dewatering plan shall be submitted and approved in writing by the engineer prior to construction.

**Grout**

Grout shall be 4000 psi minimum 7-day cube strength per ASTM C109. Grout to be premixed, non-shrink "Masterflow" by master builders or "Concresive" by adhesive engineering or approved equal. ICBO certification required. use specific grout mix recommended by manufacturer for each grout application and follow manufacturer's instructions.

**Anchor Bolts**

Anchor bolts shall be ASTM A307. Special inspection required. Set all anchor bolts by template.

**Drill In Expansion Bolts**

"Kwik-Bolts" by Hilti fastening systems, "Parabolts" by USM Corp, "Red Head Wedge Anchor" by ITT Phillips or approved equal ICBO certification required. Special inspection required.

**Adhesive Anchors**

"Hy-150" by Hilti Inc., use A36 or A307 threaded rod. ICBO certification required. Special inspection required.

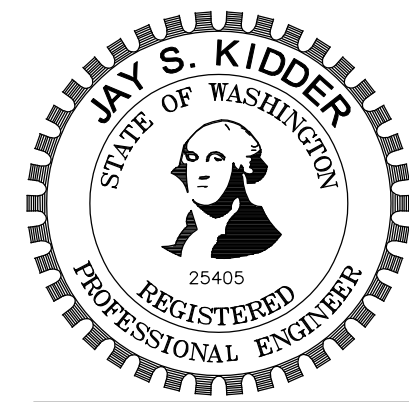
**Revegetation**

Revegetate all disturbed areas of construction. Replant riparian areas as follows: red osier dogwood and willow (salix spp.) shall be live staked along the waters edge at 2'-0" on center for 4 rows back from anticipated Ordinary High Water (OHW) edge. Disturbed areas 10' from OHW edge shall be replanted as follows: quaking aspen black cottonwood and Ponderosa pine shall be interspersed and planted as pull ups with roots in soil throughout disturbed upland areas @ 25' O.C.. Erosion control seed mixture shall be hand broadcast or hydroseeded in all upland disturbed areas. Okanogan



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**Specifications 2**



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DRAWING NO.  
**SPC2**  
3 OF 11

CD shall be responsible for completion of all planting aspects of this project. An alternative planting plan may be provided prior to planting season and shall be approved by engineer in writing prior to construction.

**Geotextile fabric**

Geotextile fabric shall be woven material in conformance with WSDOT spec. 9-33.1 and 9-33.2. Geotextile shall be woven Mirafi HP500 or equal.

**Erosion control seed mixture**

Erosion control seed mixture shall consist of approximate quantities of 20% white clover, 20% annual rye, 60% creeping red fescue. "Or equal" mixes shall be as approved by the engineer. All seed mixes shall be certified weed free and shall be based on the region for which they are being applied.

**Rootwads and Large Organic Debris (LOD)**

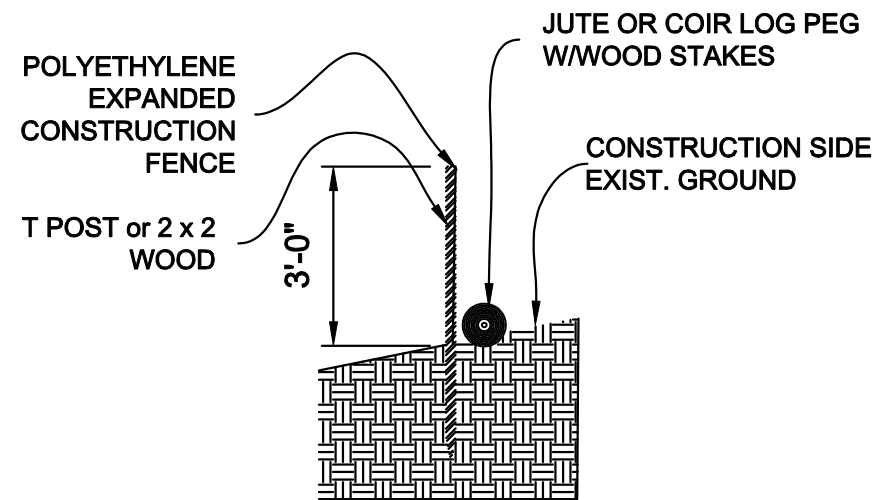
Rootwads and large organic debris shall be utilized from live trees and shall have a minimum of 15 feet of tree stem integral with the roots UNO. LOD shall be from live or recently live wood. All LOD shall have a minimum diameter of 18" at the small tapered end UNO. LOD shall be Douglas fir, Ponderosa pine, spruce, or hemlock unless otherwise approved by project engineer. Exact locations of all in stream habitat structures are to be approved on site by project engineer prior to installation.

**Road Closure**

Road closure of the SFR driveway shall include a closure plan with dates and timing so that the landowner is aware of the closures for access to the residence during construction. This plan shall be discussed with the engineer and the landowner prior to initiation of construction.

**T.E.S.C. PLAN:**

Appropriate erosion control BMP's shall be installed and remain throughout the duration of the project where there is a risk of sediment runoff. This may include but is not limited to the use of plastic sheeting, straw mulch, hay bales and silt fence. Fences shall be installed as shown in the detail on this sheet. Upon completion of the project or during construction periods of inclement weather all disturbed areas shall be seeded or covered with plastic to prevent erosion.



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 Traylor Crossing Frazer Creek 06-1712  
**Specifications 3**

DRAWING NO.  
**SPC3**  
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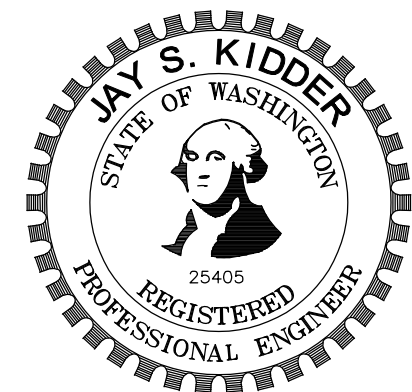
## MATERIALS LIST ESTIMATE

MATERIAL	UNIT	QUANTITY
Mobilization	LS	1
Clearing and Grubbing	AC	0.5
Dewatering system and gravel bags	LS	1.0
Excavation - Common to subgrade, no haul	CY	233
Culvert Disposal	LS	1
New Culvert 10 Ga 3x1 c or 150" x 96" x 70' long, mitered in and out	LBS	21000
Subgrade Construction crushed gravel	CY	56
Culvert Bedding and compaction crushed gravel	CY	89
Culvert Road Prism Exist fill or common barrow and compaction	CY	337
Culvert Fishmix gravel	CY	65
3 Man rock	Ton	40
3-9" quarry spall	Ton	60
1.5 to 1 shaping of road prism	CY	120
Old Channel fill	CY	178
New Channel excavate	CY	111
New Channel fishmix and trim	CY	30
New Channel LOD	EA	4
Crushed gravel surfacing road finish grade	CY	67
Cleanup and final pickup	LS	1
Plantings live stakes	EA	600
Plantings 1 gallon woody trees	EA	200
Restoration seed mix	LBS	200

### Design Criteria

1. Culvert designed by stream simulation methodology.
2. Bank full width measurements were conducted in the field, and by topographic map analysis.
3. Streambed particle size collected by pebble count methodology.

<b>Bank Full Width Calculation</b>			
	<i>Upstream measurement feet</i>		<i>Downstream measurement feet</i>
	4.65		5.38
	2.85		4.05
	4.81		5.8
	4.67		5.1
Average bank full width (BFW)	4.2		5.1
Stream simulation method culvert span			
BFW*1.2+2	7.1		8.1
Use a minimum culvert span of 8.1 feet			



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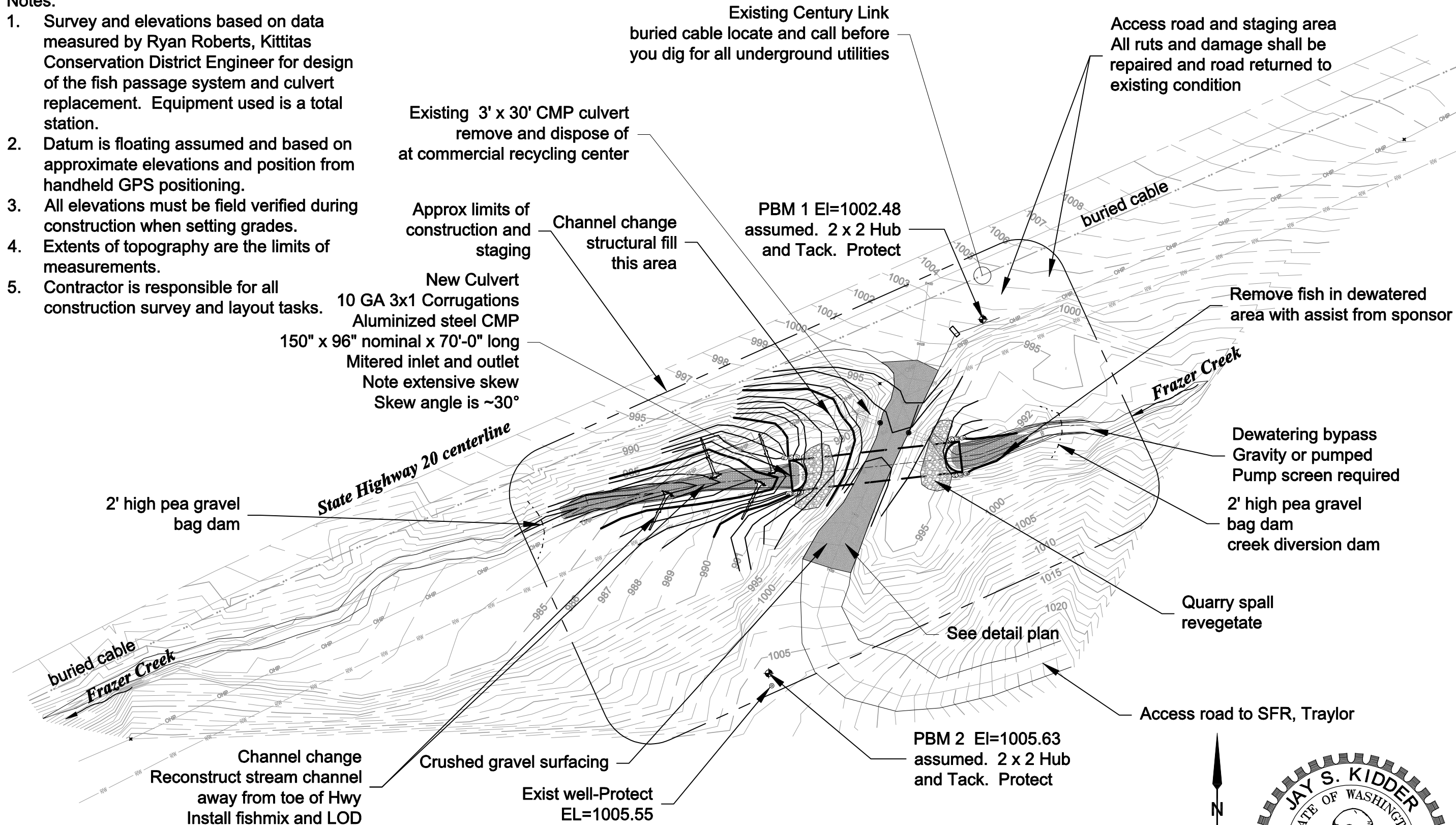
### Specifications 4

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**SPC4**  
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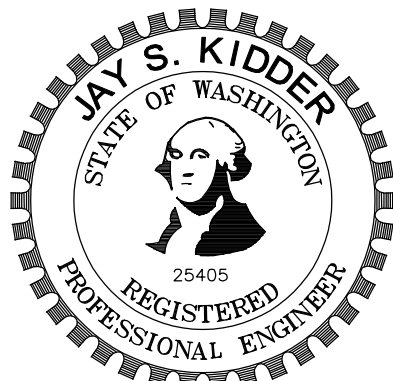
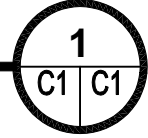
**Notes:**

1. Survey and elevations based on data measured by Ryan Roberts, Kittitas Conservation District Engineer for design of the fish passage system and culvert replacement. Equipment used is a total station.
2. Datum is floating assumed and based on approximate elevations and position from handheld GPS positioning.
3. All elevations must be field verified during construction when setting grades.
4. Extents of topography are the limits of measurements.
5. Contractor is responsible for all construction survey and layout tasks.



**Site Plan**

1" = 40'-0"



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1" Bar at Original Scale



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**Site Plan**

DRAWING NO.  
**C-1**  
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LOD (4) plcs 18" DBH x 12' long  
embed into bank min 9' and engage  
roots into low flow channel  
do not impede stream cross section  
do not excavate into toe of highway  
embankment Special inspection  
required

State hwy ROW  
60' offset from ctrl  
approx

Extent of crushed gravel surfacing  
top course 5/8" clean gravel  
Ovrhd power pole  
match grade with fill  
Fill old channel  
Reconstruct new channel

Staging and parking  
area for owners during closure

Exist mail box  
Protect

Overhead power

State hwy ROW  
50' offset from ctrl  
approx

State Highway 20 centerline

MP 20840 HES 89+00

Gate, remove and  
replace

Fishmix  
3 man rock  
countersunk ea  
quadrant typ

OHWL approximate

# Detailed Site Plan

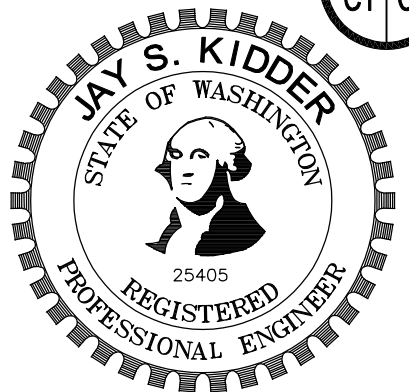
1" = 20'-0"

1  
C1 C2

New culvert see call out  
on C1

Fishmix gravel  
3"-9" quarry spalls  
crushed gravel surfacing  
top course 5/8" clean

1" Bar at Original Scale



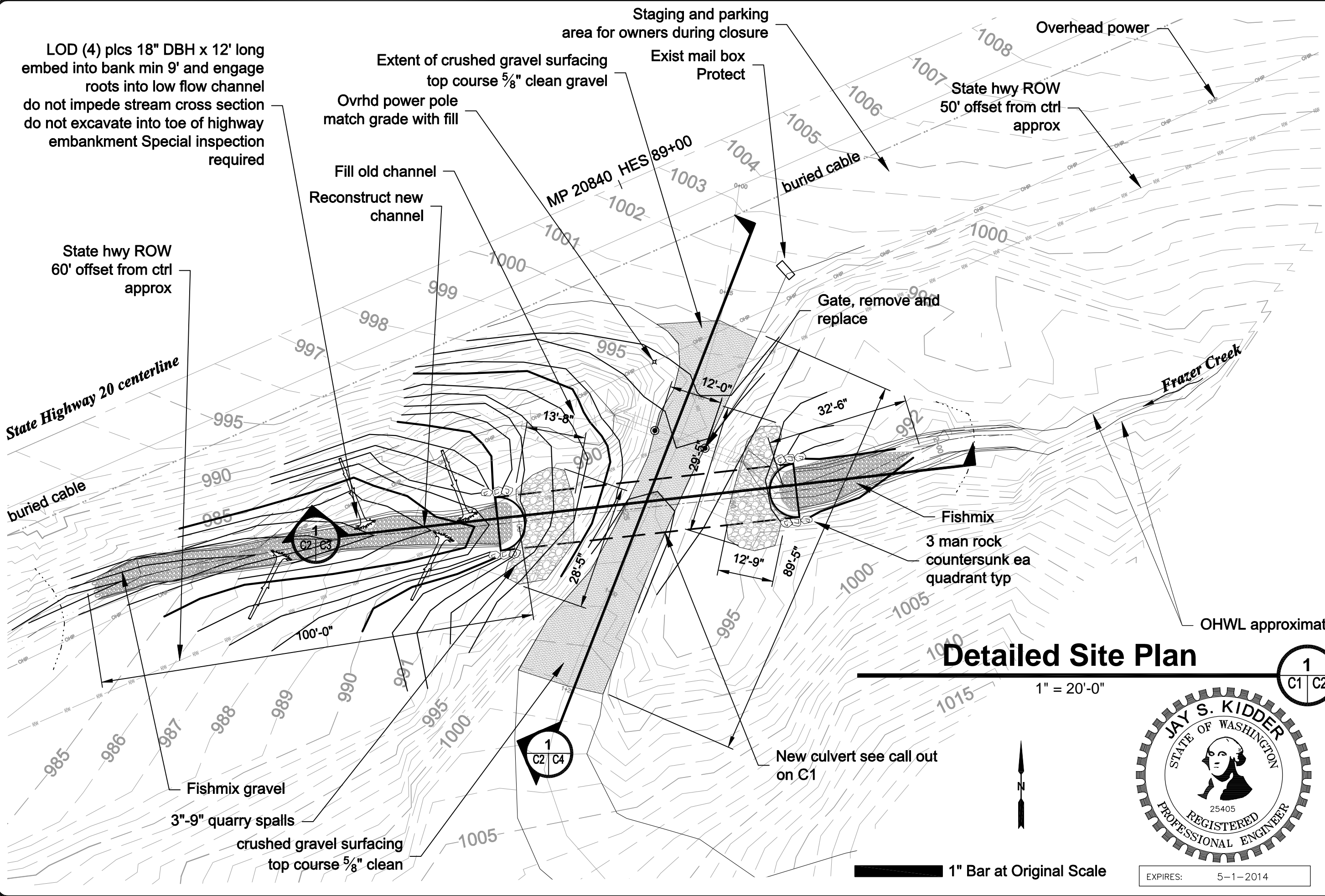
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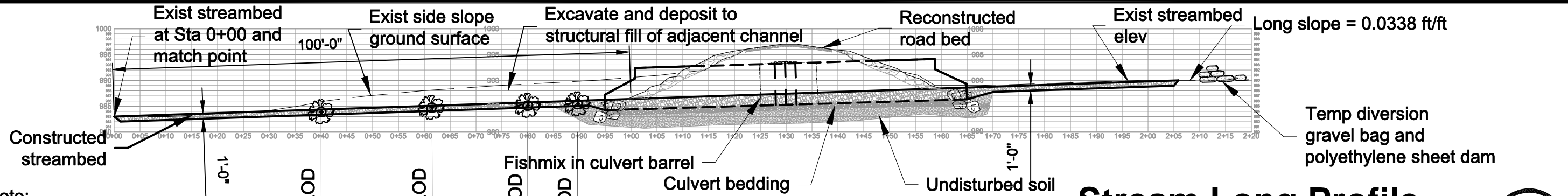
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**Detailed Site Plan**

DRAWING NO.  
**C-2**  
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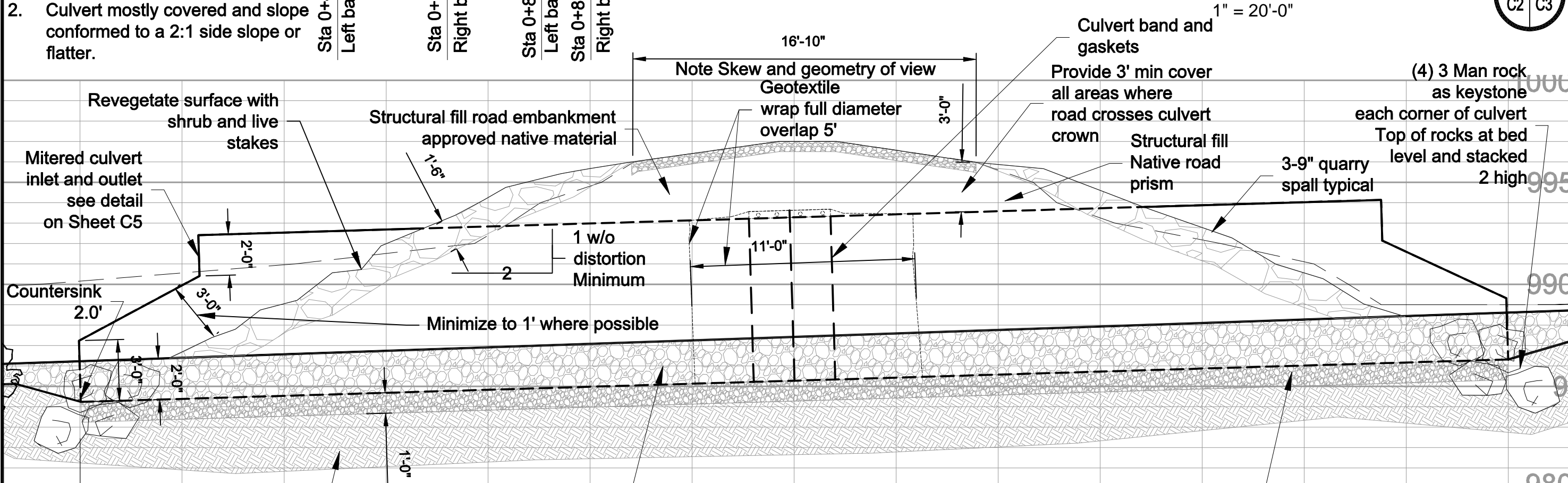


Note:

1. Extreme skew to culvert barrel.
2. Culvert mostly covered and slope conformed to a 2:1 side slope or flatter.

# Stream Long Profile

1  
C2 | C3

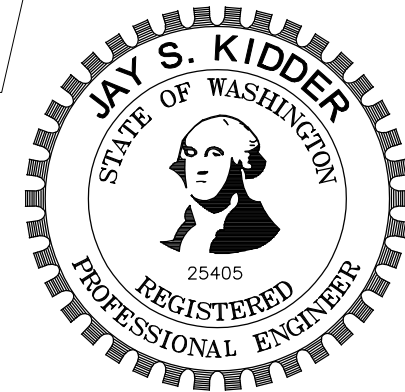


# Detailed Stream Profile

2  
C3 | C3

1" = 5'-0"

1" Bar at Original Scale



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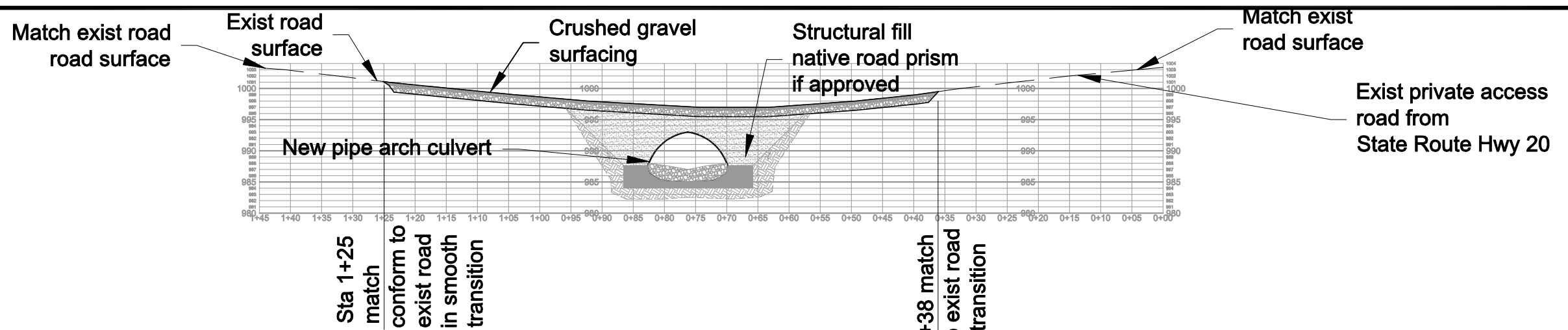


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Taylor Crossing Frazer Creek 06-1712  
Stream Profiles

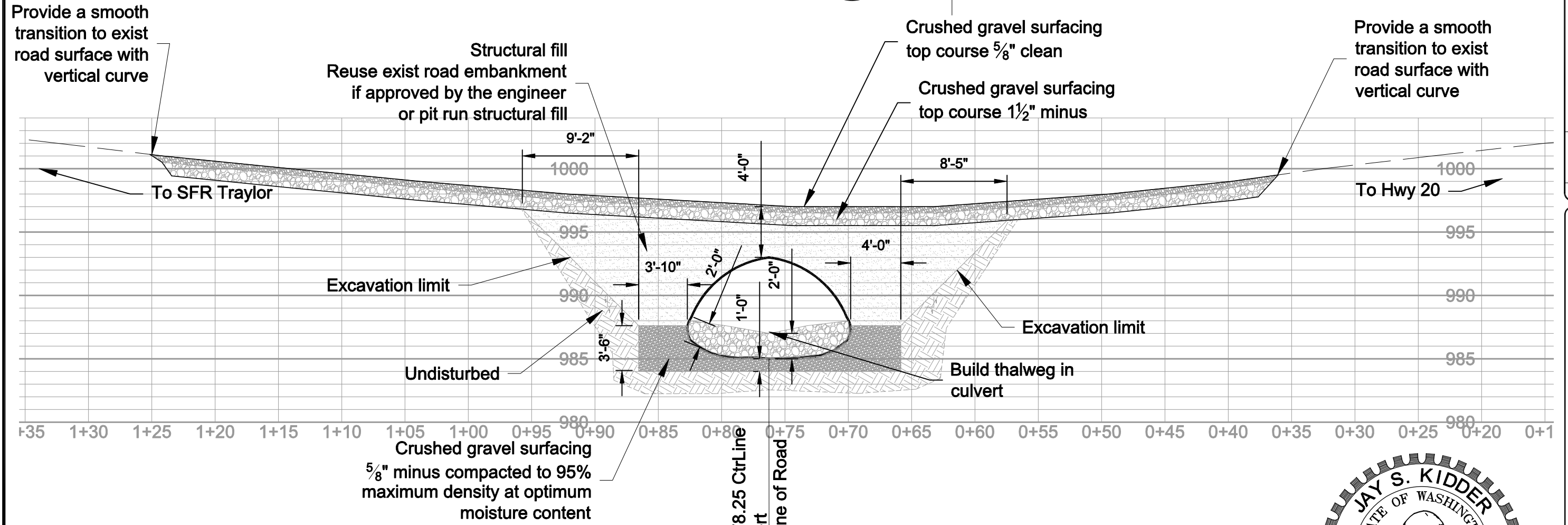
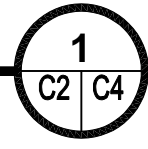
DRAWING NO. C3  
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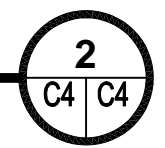
# Road Profile

1" = 20'-0"



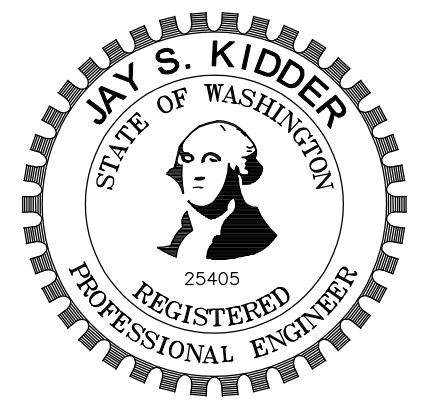
# Detailed Road Profile

1 1/2" = 1'-0"



**Note:**  
Culvert is set on a 30° skew. Road profile is parallel to road and culvert geometry is drawn without distortion as if perpendicular to road. This view looking downstream.

1" Bar at Original Scale



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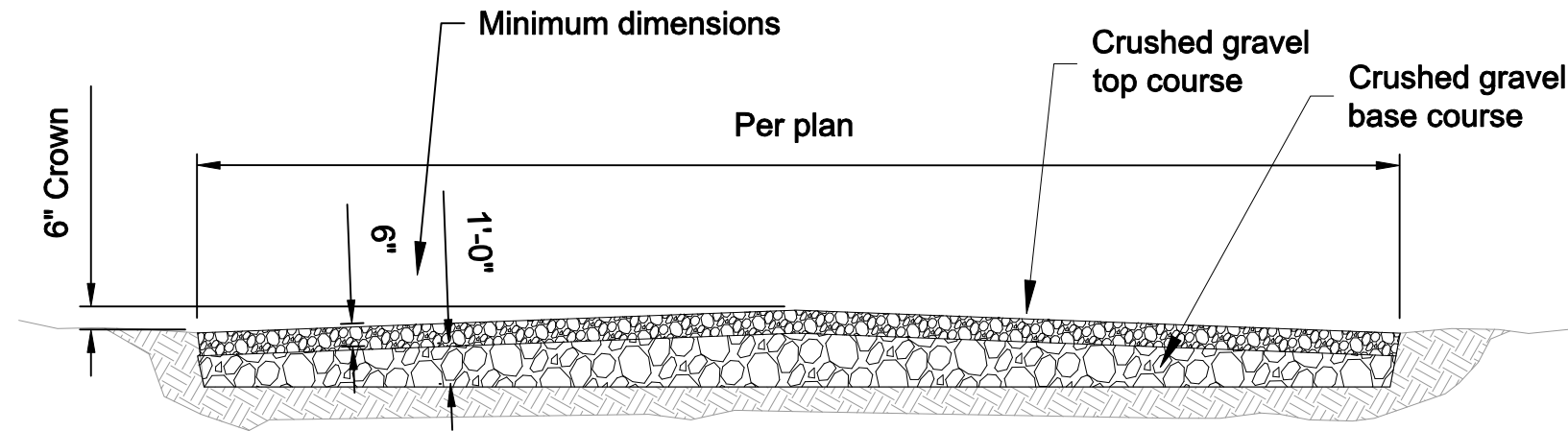
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**Road Profiles**

DRAWING NO. **C4**  
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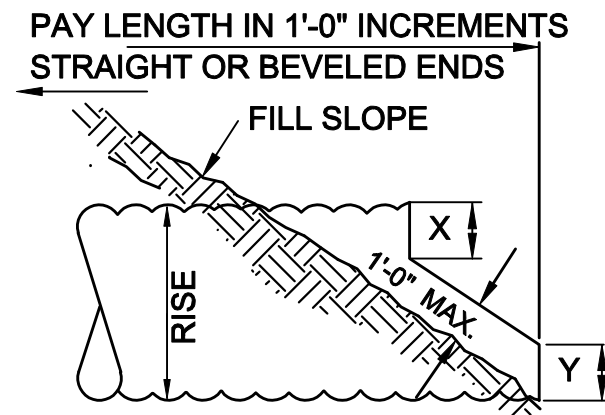
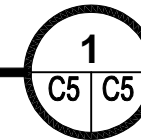
**Note:**

1. Crushed gravel surfacing shall include top course and base course as per WSDOT
2. Top course shall be  $\frac{3}{4}$ " minus unless noted otherwise (UNO)
3. Base course shall be  $\frac{1}{4}$ " minus UNO



## Road Section

1/4" = 1'-0"



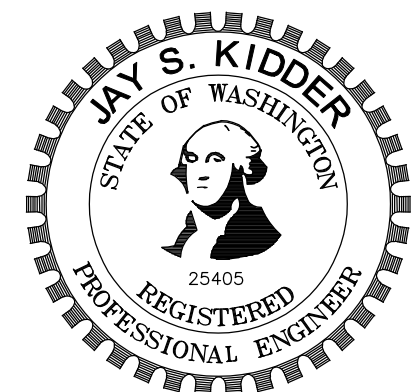
## CULVERT END BEVEL DETAIL

NTS

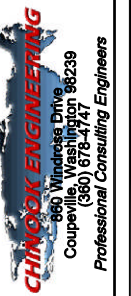
### ROUND PIPE AND ARCHES

1. STEP BEVEL PIPE ARCHES WHEN RISE EQUALS 6'-0" OR LARGER.
2. STEP BEVEL ROUND PIPES WHEN DIAMETER EQUALS 6'-0" OR LARGER.
3. ROUND PIPES AND PIPE ARCHES WITH DIMENSIONS LESS THAN INDICATED ABOVE SHALL BE BEVELED ONLY WHEN SHOWN ON THE DRAWINGS, OR CALLED FOR IN THE SCHEDULE OF ITEMS. BEVEL OF PIPE SHALL BE 1:1.25 SLOPE UNLESS OTHERWISE SHOWN ON THE DRAWINGS OR CALLED FOR IN THE SCHEDULE OF ITEMS.
4. THE ENDS OF CULVERTS SHALL NOT BE CUT ON A SKEW UNLESS SHOWN ON THE DRAWINGS, OR CALLED FOR IN THE SCHEDULE OF ITEMS.
5. X = 1/4 DIAMETER OR MANUFACTURERS STANDARDS. Y = PIPE EMBEDMENT DEPTH OR X, WHICHEVER IS GREATER.

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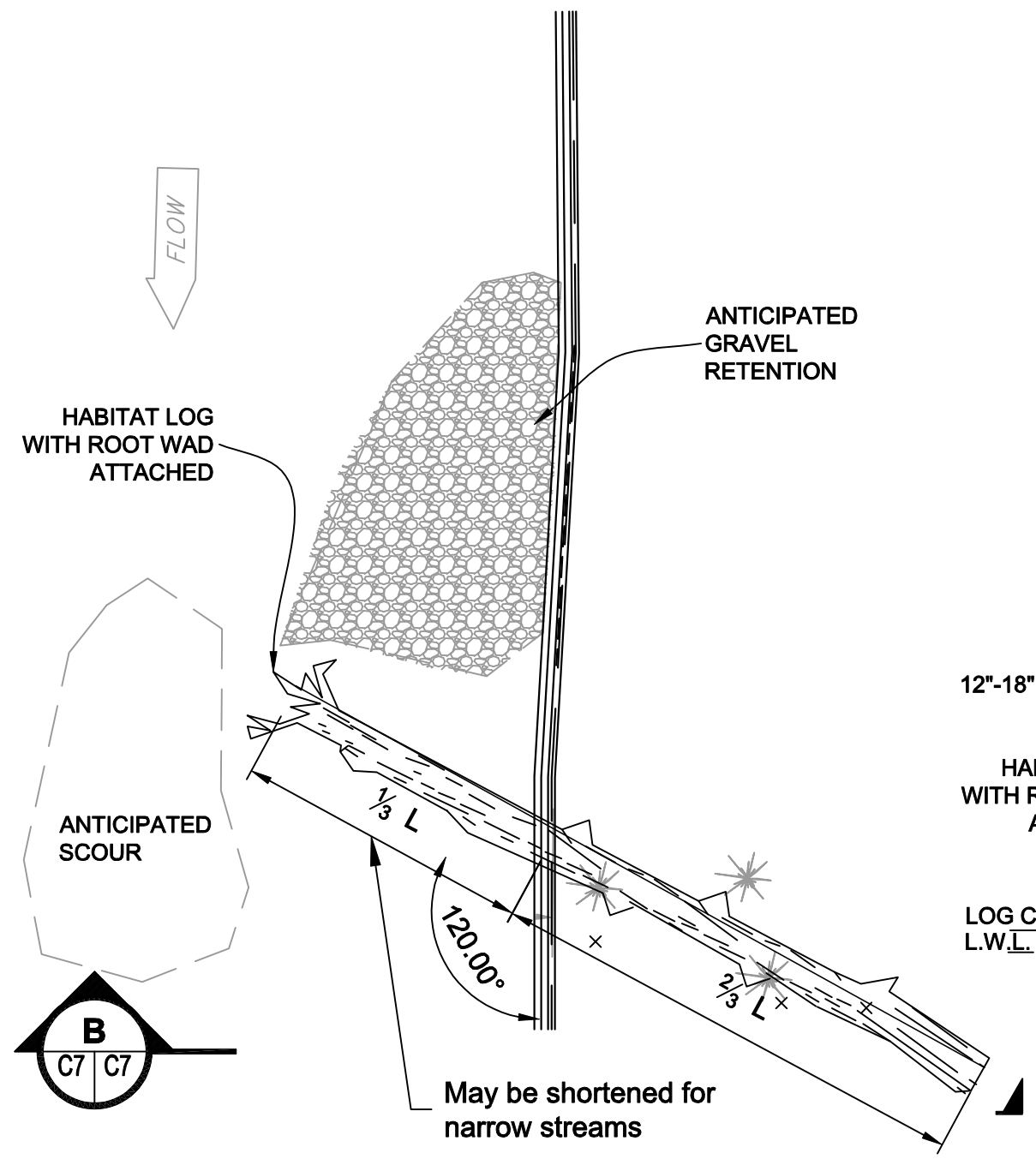
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Miscellaneous Details

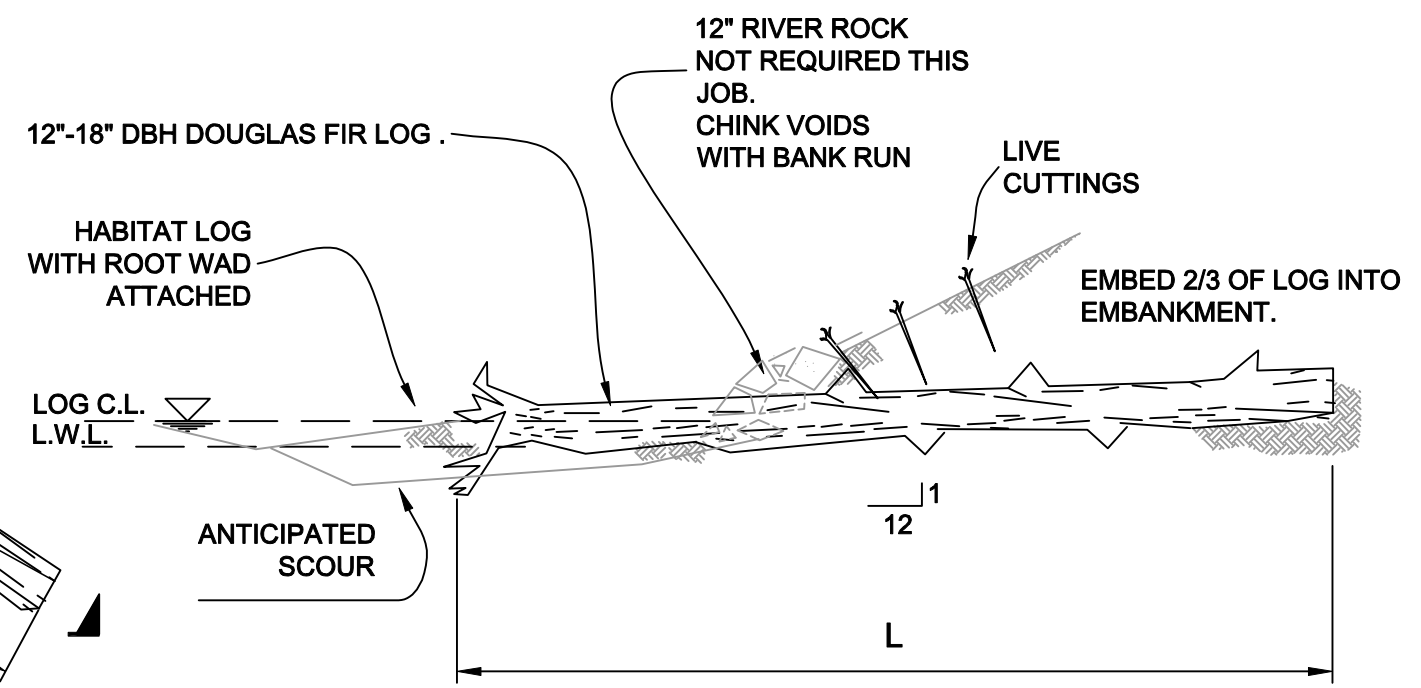
DRAWING NO.  
**C5**  
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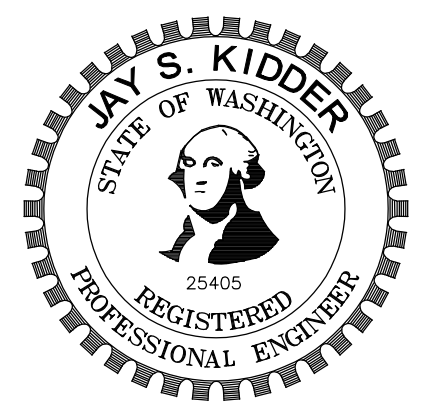
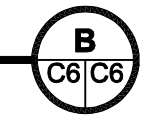
- NOTE:**
1. LOD LOGS SHALL BE 10'-21' LONG (L).  
BURY INTO BANK  $\frac{2}{3}$  L.
  2. REUSE LOGS ON SITE.
  3. ROOT WAD SHALL REMAIN ATTACHED AND IN WATER.
  4. DO NOT EXCAVATE INTO TOE OF HIGHWAY EMBANKMENT.



LOD LOG HABITAT STRUCTURE  
**PLAN VIEW**  
 NTS



LOD LOG HABITAT STRUCTURE  
**ELEVATION VIEW**  
 NTS



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 Taylor Crossing Frazer Creek 06-1712  
**LOD Details**

DRAWING NO.  
**C6**  
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