

# HAYDEN CREEK RESTORATION CONCEPTS

## CONCEPT

### PROJECT PARTNERS



### PROJECT DESCRIPTION

DIVERSION KR-222 ON THE KLAMATH RIVER ROUTES WATER TO A DITCH THAT CROSSES EAST AND WEST HAYDEN CREEK. THE PRIMARY CONTROL STRUCTURE WAS DAMAGED DURING A WILDFIRE, AND CONTROL STRUCTURES AT THE CROSSINGS WITH HAYDEN CREEK ARE FAILING AND THE DITCH DIVERTS MOST OF THE FLOW IN HAYDEN CREEK. THIS DESIGN CONCEPT PRESENTS THE PREFERRED ALTERNATIVE FOR RESTORING THE DIVERSION AND HAYDEN CREEK TO IMPROVE HABITAT QUALITY AND FISH PASSAGE IN HAYDEN CREEK.

### SPATIAL REFERENCE

SURVEY CONTROL USED FOR THE PROJECT IS PROVIDED ON DRAWING 2.0 AND COORDINATES CORRESPOND TO THE TOP CENTER OF CONTROL MARKERS.

#### LIDAR, GPS RTK, AND TOTAL STATION:

HORIZONTAL PROJECTION: OREGON STATE PLANE SOUTH  
 HORIZ DATUM: NAD83  
 VERT DATUM: NAVD88

UNITS: INT FT  
 UNITS: INT FT

SURVEY DATE: 10/13/2021  
 LIDAR COLLECTED: 2010  
 LIDAR COLLECTED BY: WOOLPERT, INC.

### STANDARD OF PRACTICE

RDG WORKS EXCLUSIVELY IN THE RIVER ENVIRONMENT AND EMPLOYS THE MOST CURRENT AND ACCEPTED PRACTICES AVAILABLE FOR PLANNING AND DESIGN OF FISH PASSAGE, RESTORATION, AND CHANNEL ENHANCEMENT PROJECTS. THE ANALYSIS FOR THE DESIGN RELIES ON CURRENT FISH PASSAGE CRITERIA FROM ODFW AND NMFS/NOAA. ALL WORK WAS PERFORMED OR DIRECTED BY A REGISTERED PROFESSIONAL CIVIL ENGINEER WITH PAST EXPERIENCE IN FISH PASSAGE DESIGN.

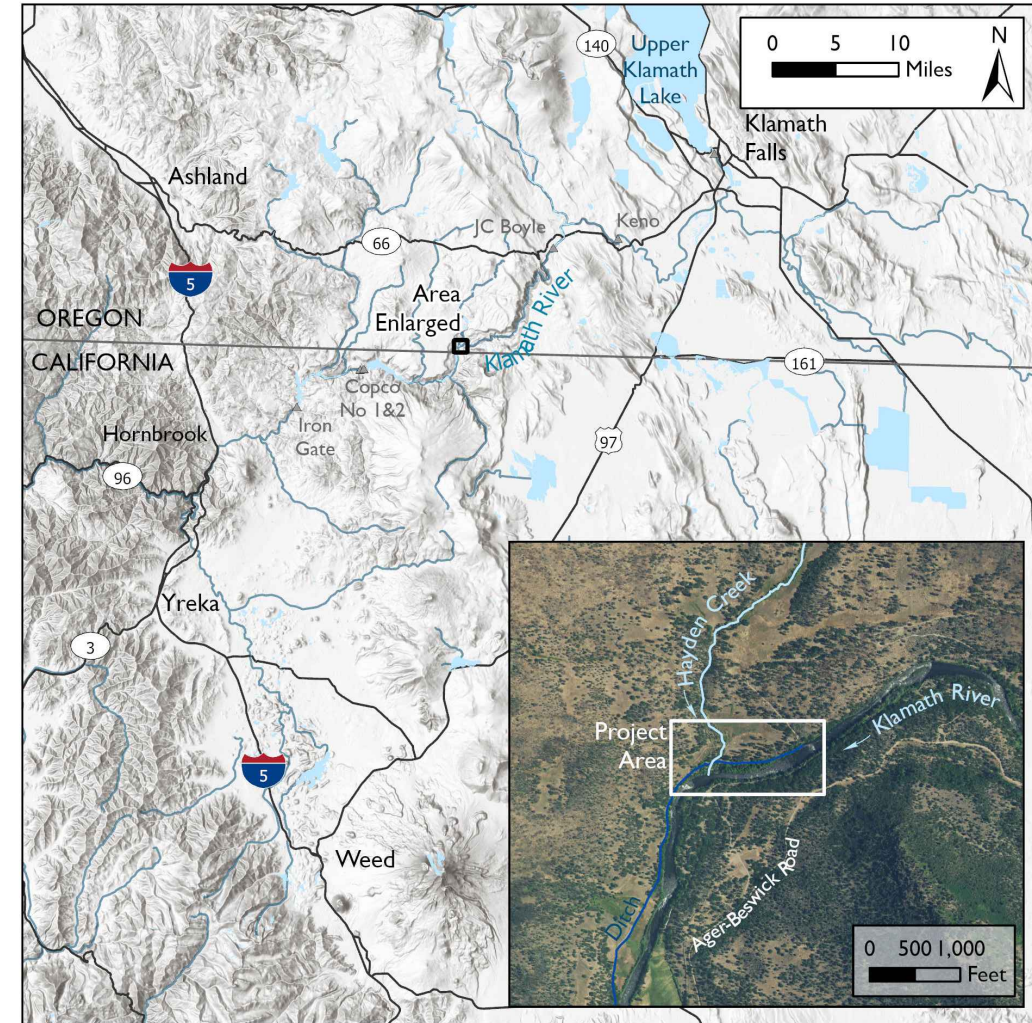
### REUSE OF DRAWINGS

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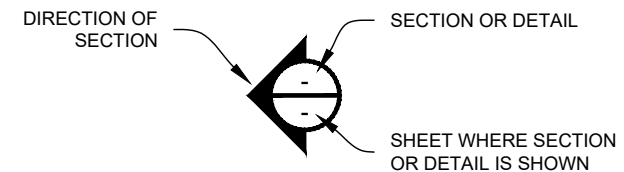
### DRAWING INDEX

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1.1	SITE OVERVIEW, ACCESS, AND STAGING
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4.1	SINGLE LOG STRUCTURE DETAILS
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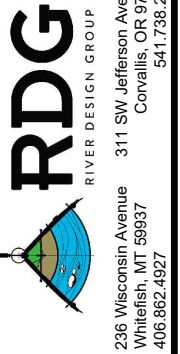
### PROJECT VICINITY MAP



**LOT 3 OF SECTION 13, T.41S., R.5E., WILLAMETTE MERIDIAN  
 KLAMATH COUNTY, OREGON  
 USGS QUADRANGLE: MULE HILL, OR/CA**



### CROSS-SECTION SHEET REFERENCE



## COVER SHEET AND NOTES

HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ

PROJECT NUMBER  
RDG-21-132

DRAWING NUMBER

**1.0**

Drawing 1 of 12





**1 SITE OVERVIEW, ACCESS, AND STAGING**

1" = 300'

**CONTROL NETWORK**

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
14	127541.22	4462668.58	2866.54	WCP-103

NOTE:  
EXISTING CONDITION INFORMATION IS NOT A LAND SURVEY AND IS PRIMARILY A TOPOGRAPHIC ANALYSIS FOR RESTORATION DESIGN PURPOSES.

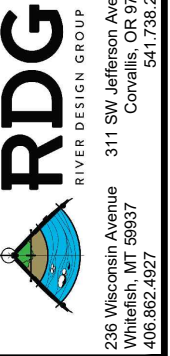
COORDINATE SYSTEM: OREGON STATE PLANE SOUTH  
HORIZ DATUM: NAD83  
VERT DATUM: NAVD88  
UNITS: INTERNATIONAL FEET

**HAYDEN CREEK CHARACTERISTICS**

DRAINAGE AREA	28.2 SQ. MILES
AVERAGE REACH SLOPE	0.0500 FT/FT
WEST HAYDEN ACTIVE CHANNEL WIDTH	3 FT
EAST HAYDEN ACTIVE CHANNEL WIDTH	10 FT
2-YEAR FLOW	92 cfs
10-YEAR FLOW	189 cfs
25-YEAR FLOW	243 cfs
50-YEAR FLOW	284 cfs
100-YEAR FLOW	328 cfs
IN WATER WORK PERIOD	JULY 1 - SEPT 30

**ABBREVIATIONS**

KR-222-US	EXISTING UPSTREAM CONTROL POINT DAMAGED BY WILDFIRE
KR-222-DS	DOWNSTREAM TARP CONTROL POINT
CMP	CORRUGATED METAL PIPE
WSE	WATER SURFACE ELEVATION
TOB	TOP OF BANK



**SITE OVERVIEW, ACCESS, AND STAGING**  
HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ

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**1.1**

Drawing 2 of 12





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**1 EXISTING CONDITIONS LAYOUT**  
 1" = 100'

**EXISTING LAYOUT**  
 HAYDEN CREEK RESTORATION CONCEPTS

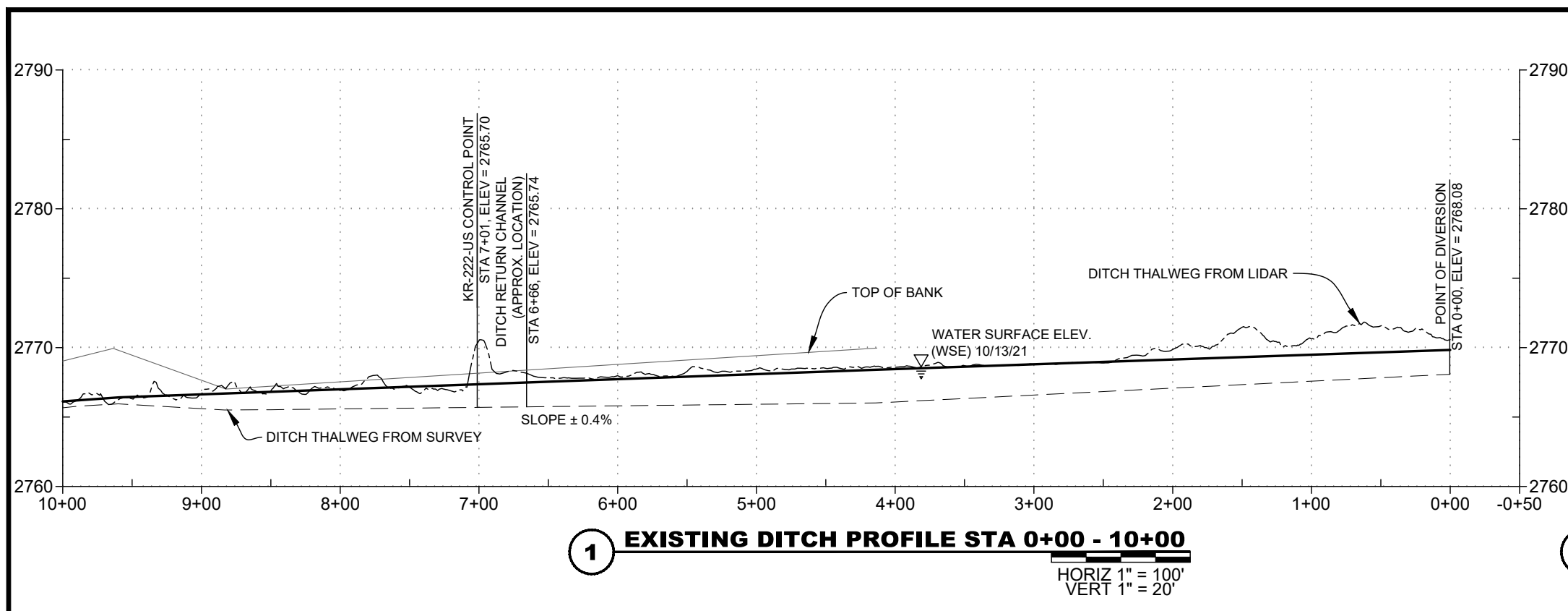
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*	01/12/22	JW	CONCEPT	JZ

PROJECT NUMBER  
 RDG-21-132  
 DRAWING NUMBER  
**2.0**  
 Drawing 3 of 12

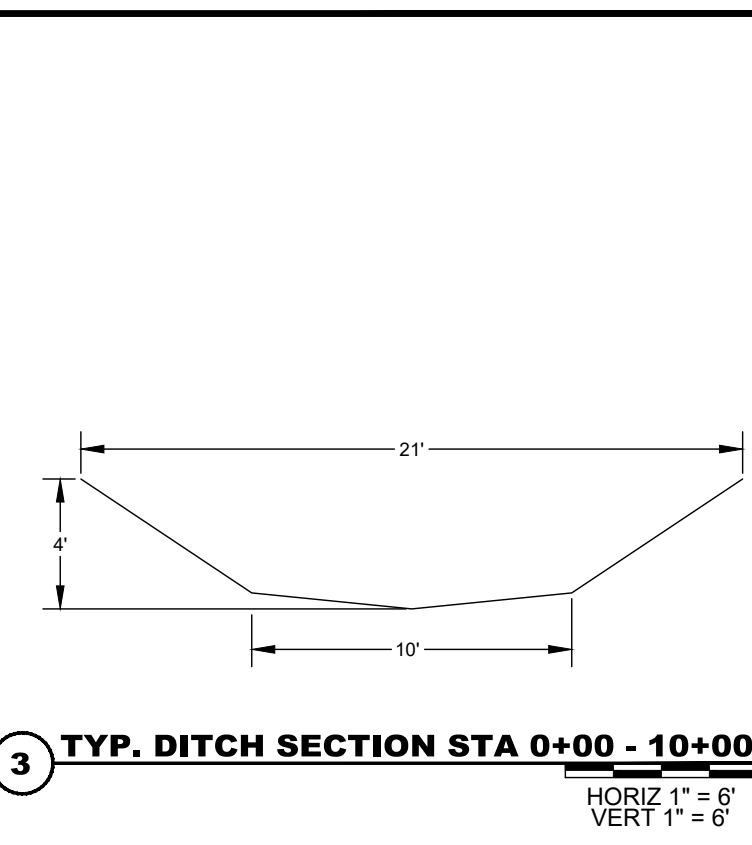




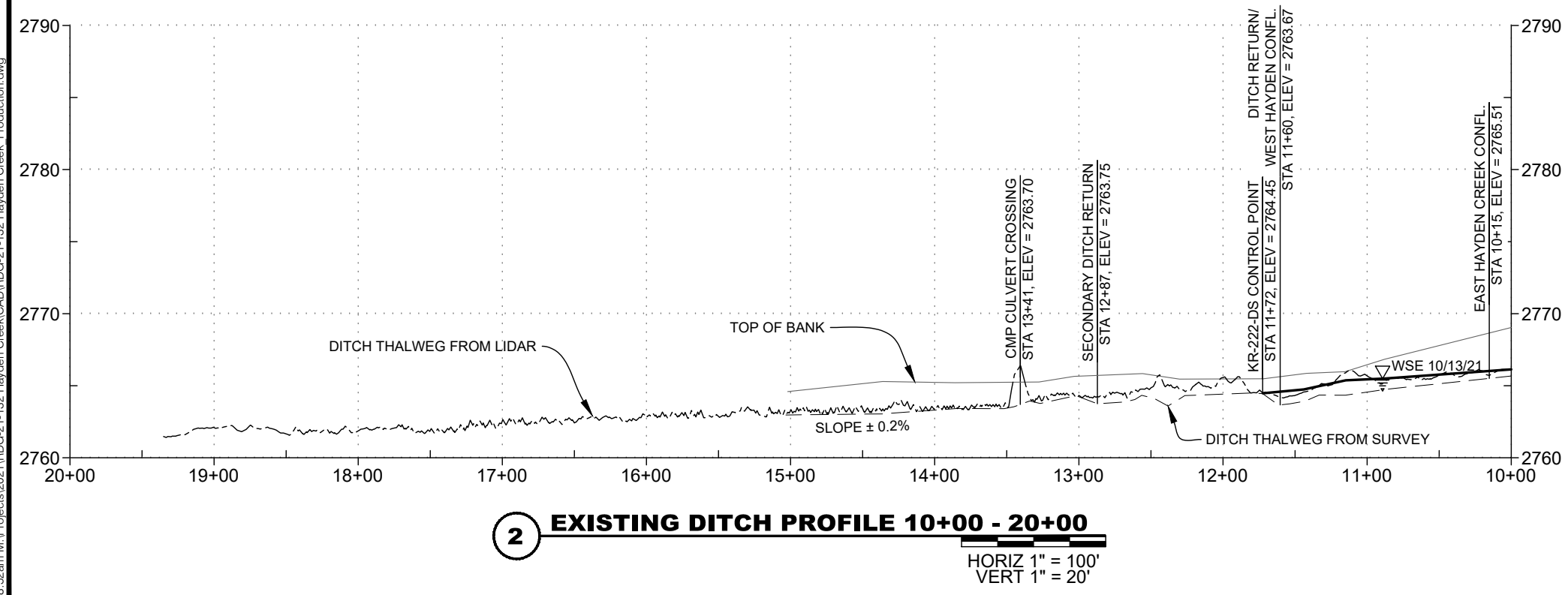
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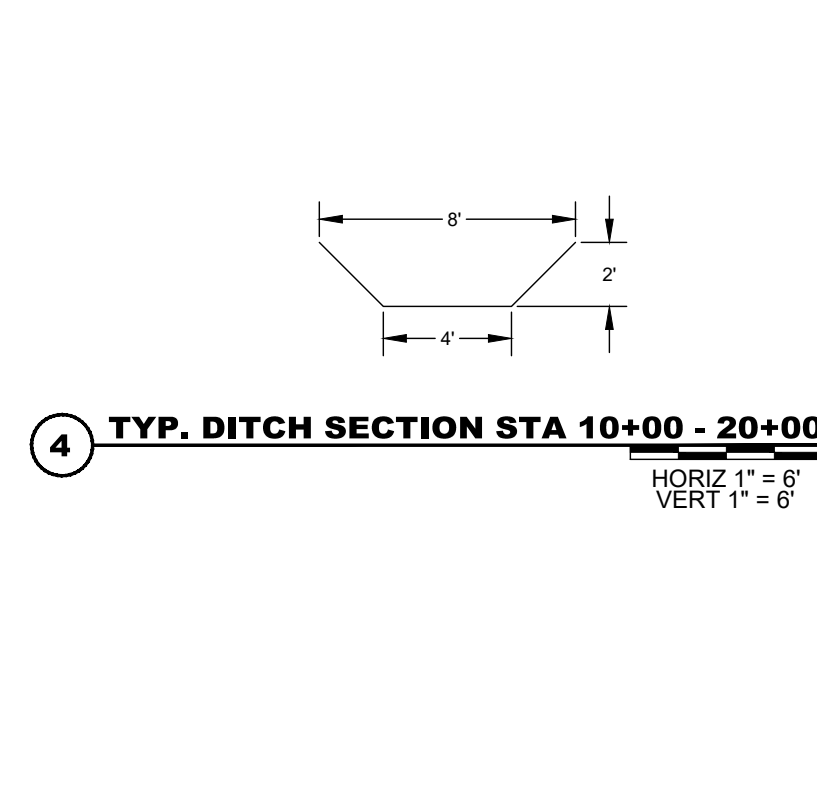
**1 EXISTING DITCH PROFILE STA 0+00 - 10+00**  
 HORIZ 1" = 100'  
 VERT 1" = 20'



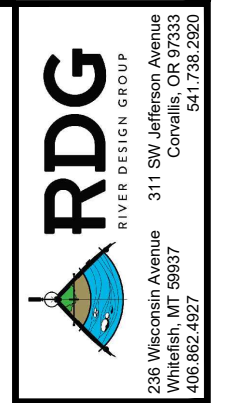
**3 TYP. DITCH SECTION STA 0+00 - 10+00**  
 HORIZ 1" = 6'  
 VERT 1" = 6'



**2 EXISTING DITCH PROFILE 10+00 - 20+00**  
 HORIZ 1" = 100'  
 VERT 1" = 20'



**4 TYP. DITCH SECTION STA 10+00 - 20+00**  
 HORIZ 1" = 6'  
 VERT 1" = 6'



**EXISTING DITCH PROFILE AND SECTIONS**  
 HAYDEN CREEK RESTORATION CONCEPTS

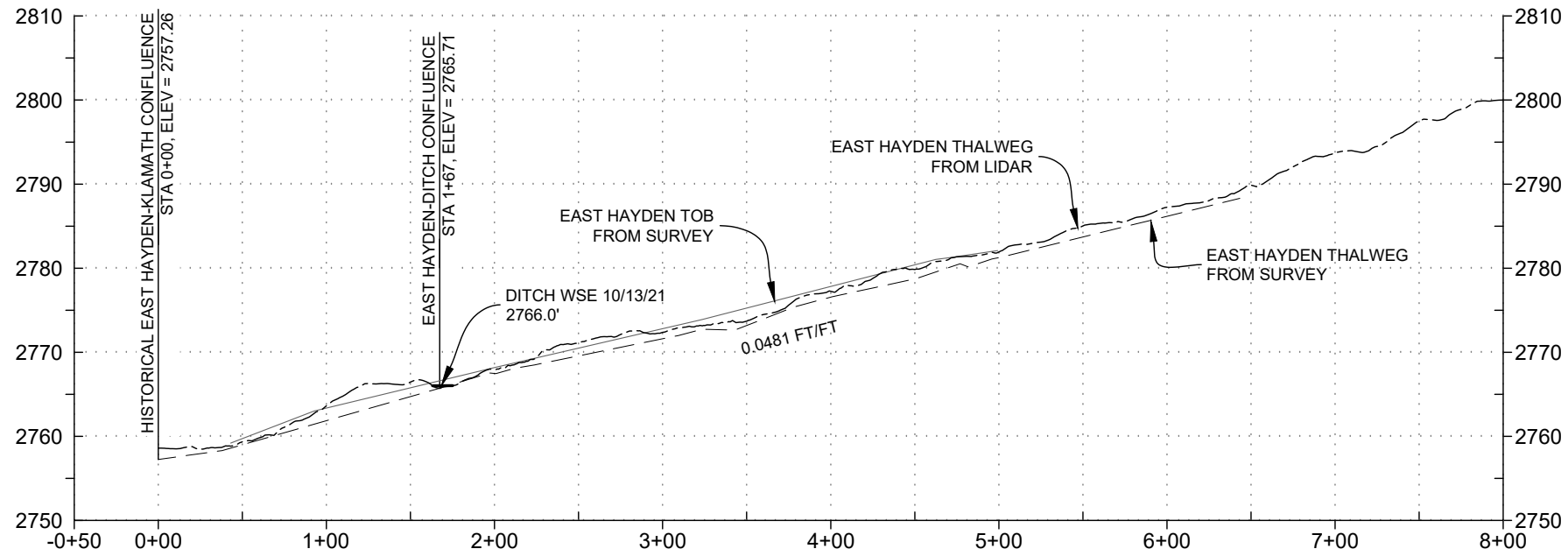
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*	01/12/22	JW	CONCEPT	JZ

PROJECT NUMBER  
RDG-21-132

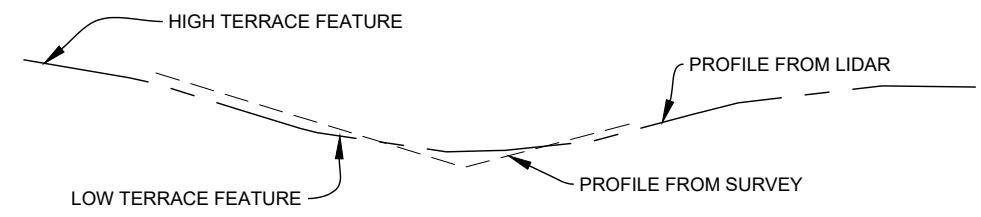
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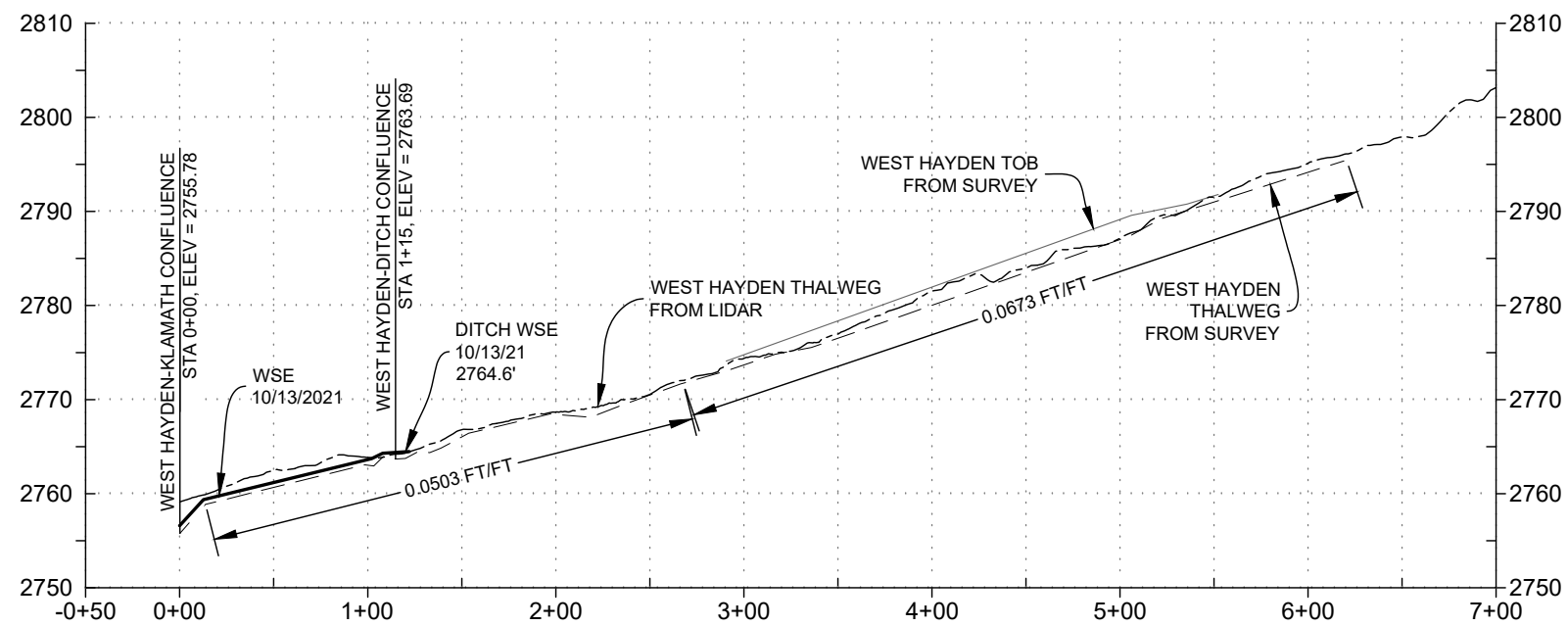




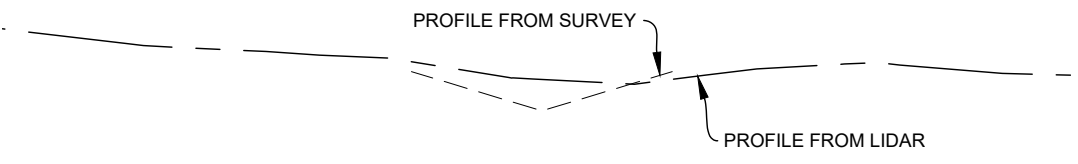
**1 EAST HAYDEN CREEK EXISTING PROFILE**  
 HORIZ 1" = 100'  
 VERT 1" = 20'



**3 EAST HAYDEN CREEK TYP. SECTION**  
 HORIZ 1" = 5'  
 VERT 1" = 5'



**2 WEST HAYDEN CREEK EXISTING PROFILE**  
 HORIZ 1" = 100'  
 VERT 1" = 20'



**4 WEST HAYDEN CREEK TYP. SECTION**  
 HORIZ 1" = 5'  
 VERT 1" = 5'

**EXISTING HAYDEN CREEK PROFILES AND SECTIONS**  
 HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ

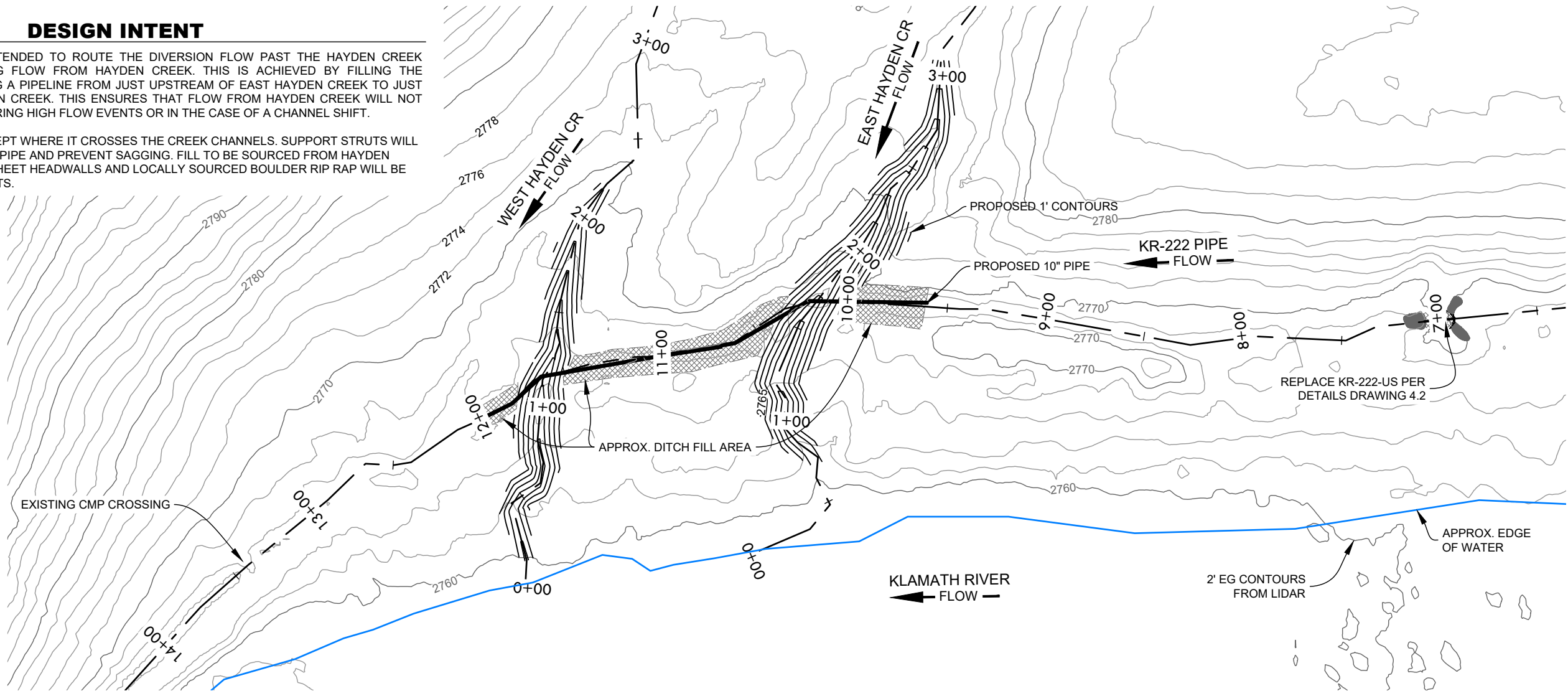


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### DESIGN INTENT

THE DIVERSION PIPELINE IS INTENDED TO ROUTE THE DIVERSION FLOW PAST THE HAYDEN CREEK CHANNELS WITHOUT DIVERTING FLOW FROM HAYDEN CREEK. THIS IS ACHIEVED BY FILLING THE EXISTING DITCH AND INSTALLING A PIPELINE FROM JUST UPSTREAM OF EAST HAYDEN CREEK TO JUST DOWNSTREAM OF WEST HAYDEN CREEK. THIS ENSURES THAT FLOW FROM HAYDEN CREEK WILL NOT ENTER THE DITCH NETWORK DURING HIGH FLOW EVENTS OR IN THE CASE OF A CHANNEL SHIFT.

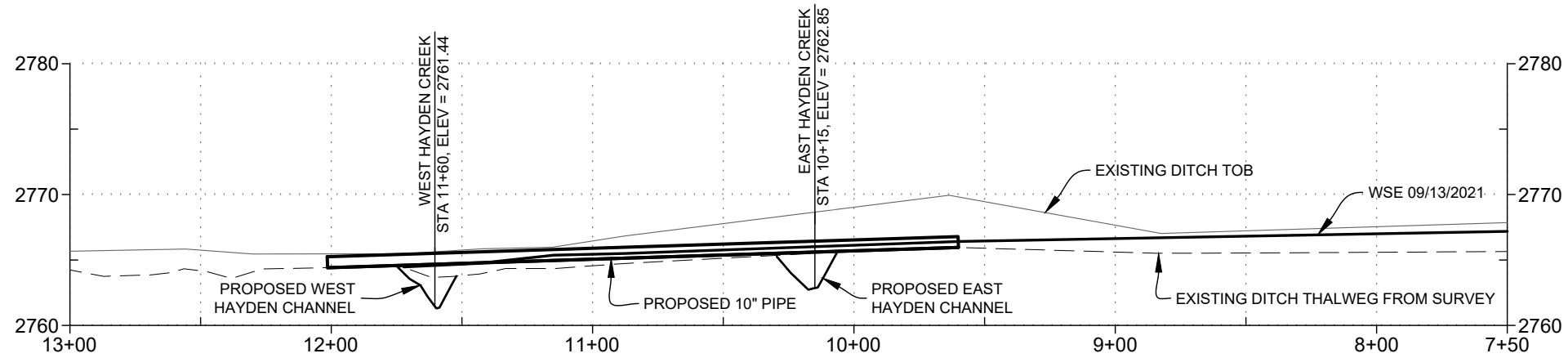
THE PIPELINE IS TO BE BURIED EXCEPT WHERE IT CROSSES THE CREEK CHANNELS. SUPPORT STRUTS WILL BE INSTALLED TO STABILIZE THE PIPE AND PREVENT SAGGING. FILL TO BE SOURCED FROM HAYDEN CREEK CHANNEL EXCAVATION. STEEL SHEET HEADWALLS AND LOCALLY SOURCED BOULDER RIP RAP WILL BE PLACED AT THE PIPE TIE-IN POINTS.



**1 DIVERSION PIPE CONCEPT LAYOUT**  
1" = 60'

### ESTIMATED GRADING QUANTITIES (NEAT LINE VOLUMES)

PROJECT AREA	CUT (CY)	FILL** (CY)
KR-222 DITCH	0	105
EAST HAYDEN CREEK	335	0
WEST HAYDEN CREEK	180	0
<b>NET EXCAVATION</b>	<b>410</b>	



**2 DIVERSION PIPE CONCEPT PROFILE**  
HORIZ 1" = 60'  
VERT 1" = 12'

## DIVERSION PIPE OVERVIEW

### HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
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PROJECT NUMBER  
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DRAWING NUMBER

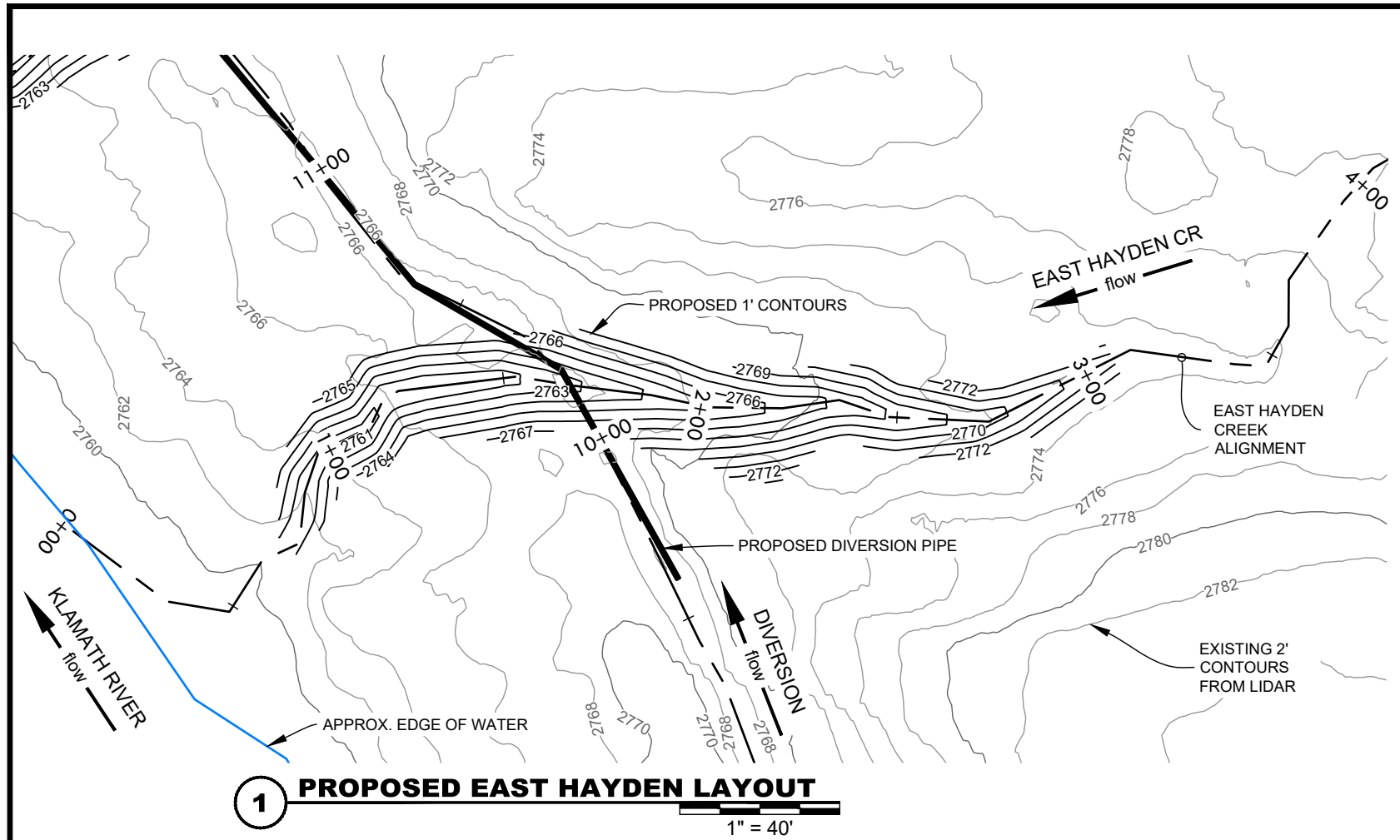
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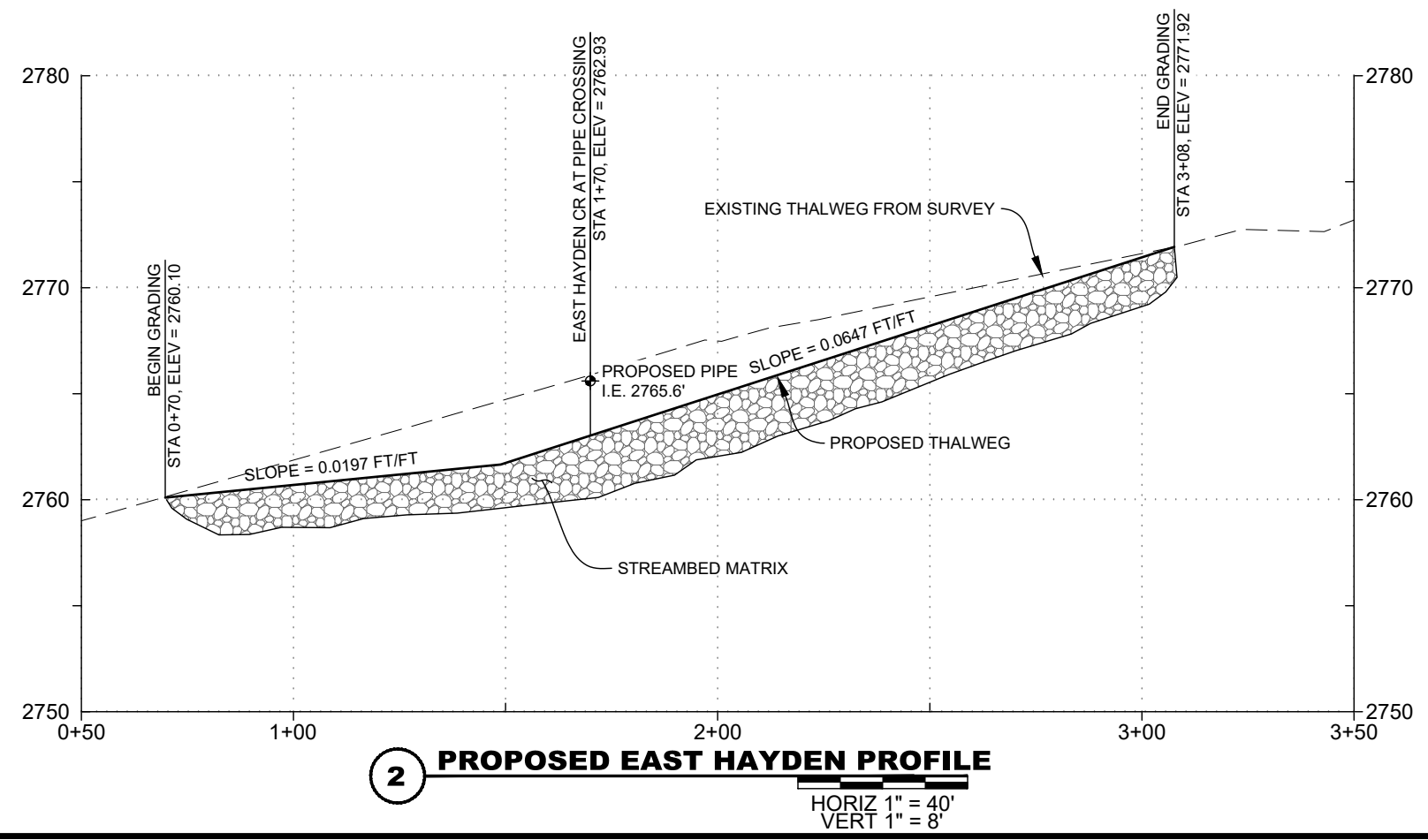




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**1 PROPOSED EAST HAYDEN LAYOUT**  
1" = 40'

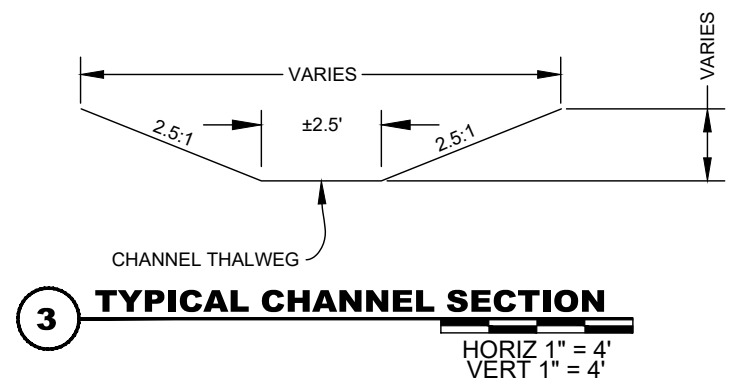


**2 PROPOSED EAST HAYDEN PROFILE**  
HORIZ 1" = 40'  
VERT 1" = 8'

**DESIGN INTENT**

THE DESIGN INTENT IS TO LOWER THE EAST HAYDEN CREEK CHANNEL AT THE DIVERSION CROSSING TO ALLOW ADEQUATE FREEBOARD TO PASS THE 100 YEAR FLOOD BELOW THE PROPOSED DIVERSION PIPE WHILE MAINTAINING FISH PASSAGE AND CHANNEL STABILITY. THIS WILL BE ACHIEVED BY REGRADING THE CHANNEL, PLACING SPECIFIED ROCK AND SEDIMENT AND SHAPING THE STREAMBED TO MATCH NATURAL CONDITIONS. IN STEEPENED SEGMENTS ADDITIONAL GRADE STABILIZATION IS PROVIDED BY BOULDER RIBS.

WHERE APPROPRIATE, POOL HABITAT WILL BE CONSTRUCTED, ESPECIALLY IN DOWNSTREAM REACH NEAR THE KLAMATH RIVER.

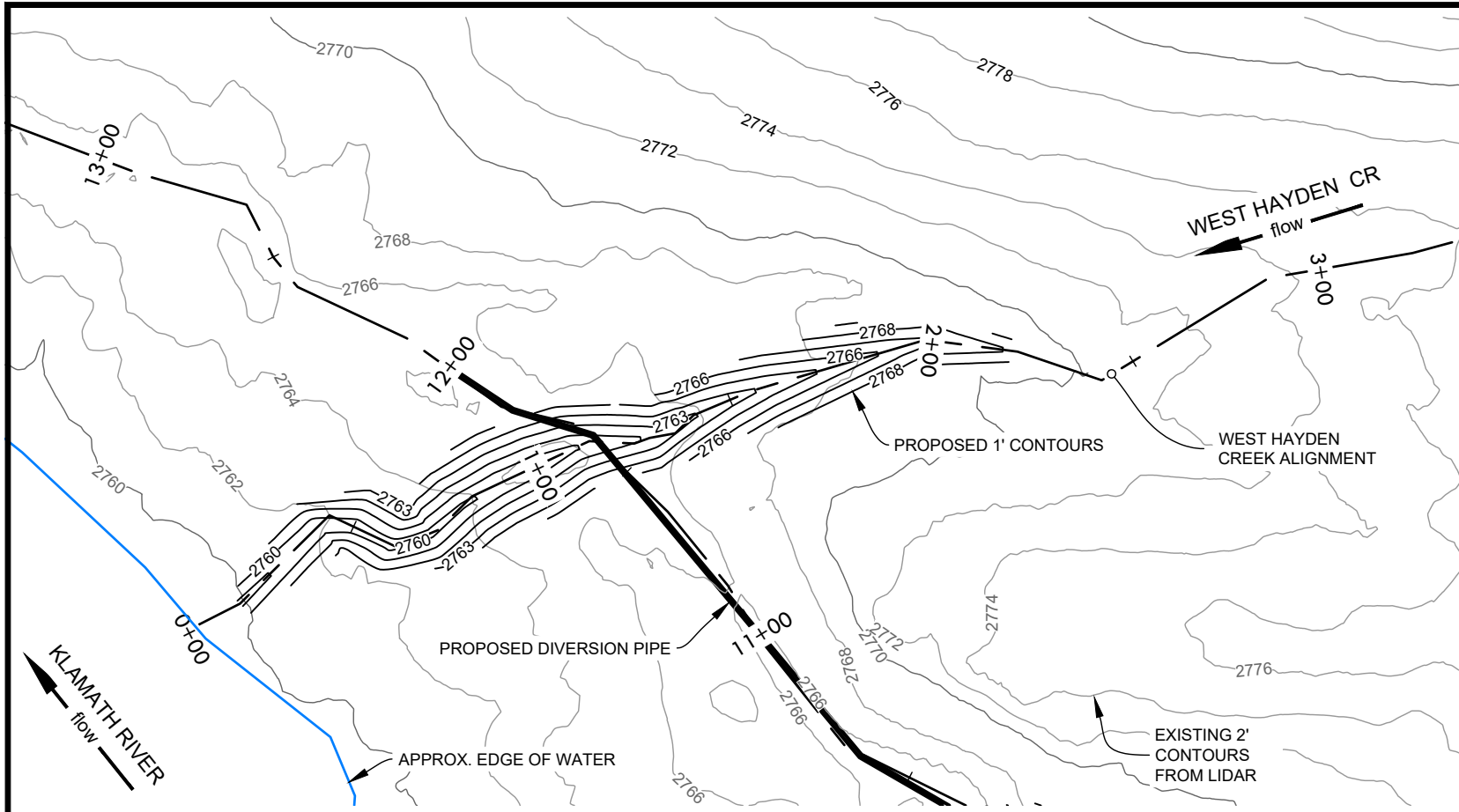


**3 TYPICAL CHANNEL SECTION**  
HORIZ 1" = 4'  
VERT 1" = 4'

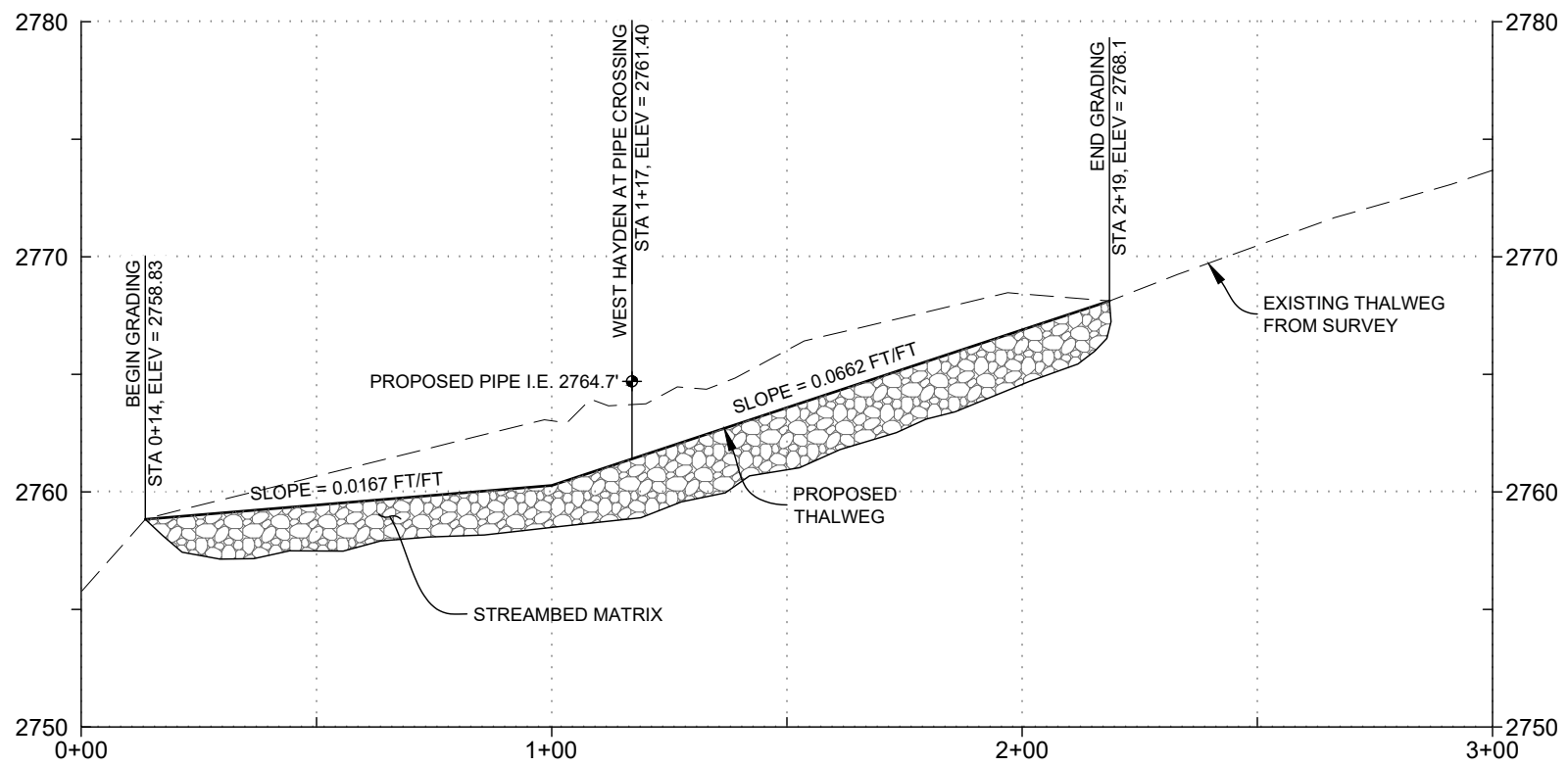
**EAST HAYDEN CREEK  
RESTORATION OVERVIEW**  
HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ
PROJECT NUMBER RDG-21-132				
DRAWING NUMBER <b>3.1</b>				
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**1 PROPOSED WEST HAYDEN LAYOUT**  
1" = 40'

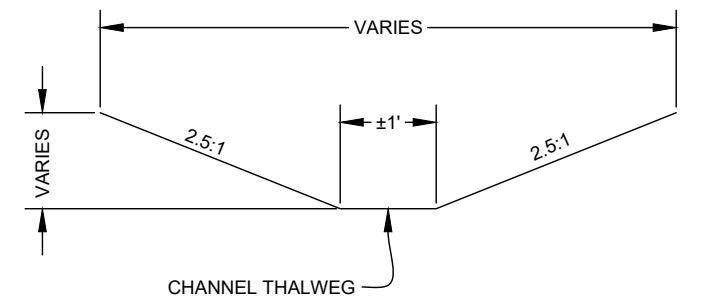


**2 PROPOSED WEST HAYDEN PROFILE**  
HORIZ 1" = 40'  
VERT 1" = 8'

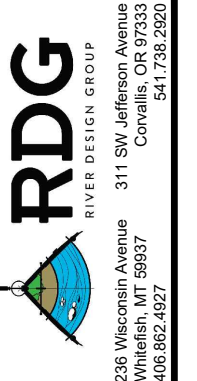
**DESIGN INTENT**

THE DESIGN INTENT IS TO LOWER THE WEST HAYDEN CREEK CHANNEL AT THE DIVERSION CROSSING TO ALLOW ADEQUATE FREEBOARD TO PASS THE 100 YEAR FLOOD BELOW THE PROPOSED DIVERSION PIPE WHILE MAINTAINING FISH PASSAGE AND CHANNEL STABILITY. THIS WILL BE ACHIEVED BY REGRADING THE CHANNEL, PLACING SPECIFIED ROCK AND SEDIMENT AND SHAPING THE STREAMBED TO MATCH NATURAL CONDITIONS. IN STEEPENED SEGMENTS ADDITIONAL GRADE STABILIZATION IS PROVIDED BY BOULDER RIBS.

WHERE APPROPRIATE, POOL HABITAT WILL BE CONSTRUCTED, ESPECIALLY IN DOWNSTREAM REACH NEAR THE KLAMATH RIVER.



**3 TYPICAL CHANNEL SECTION**  
HORIZ 1" = 2'  
VERT 1" = 2'



**WEST HAYDEN CREEK RESTORATION OVERVIEW**  
HAYDEN CREEK RESTORATION CONCEPTS

NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ

PROJECT NUMBER  
RDG-21-132

DRAWING NUMBER

**3.2**

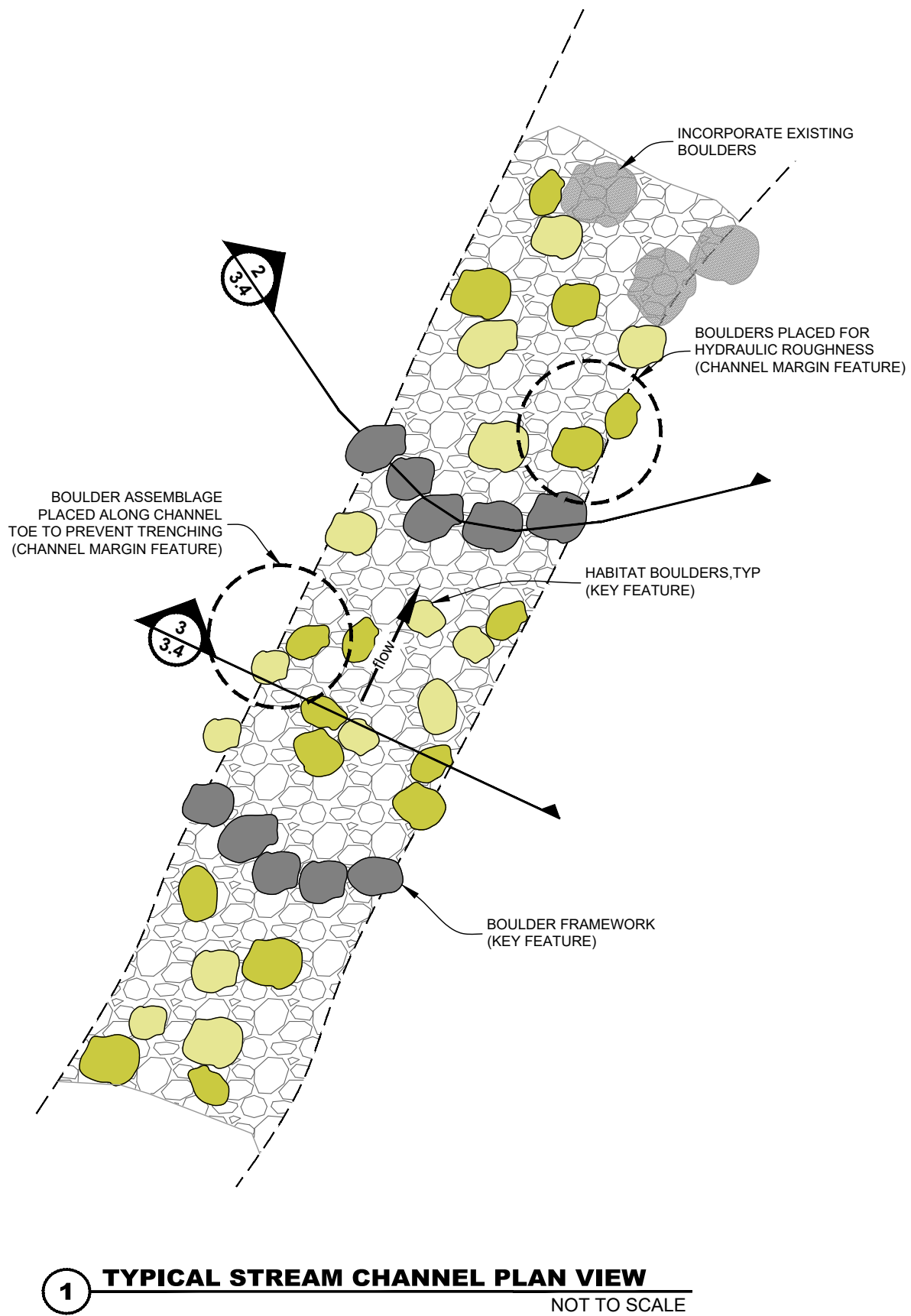
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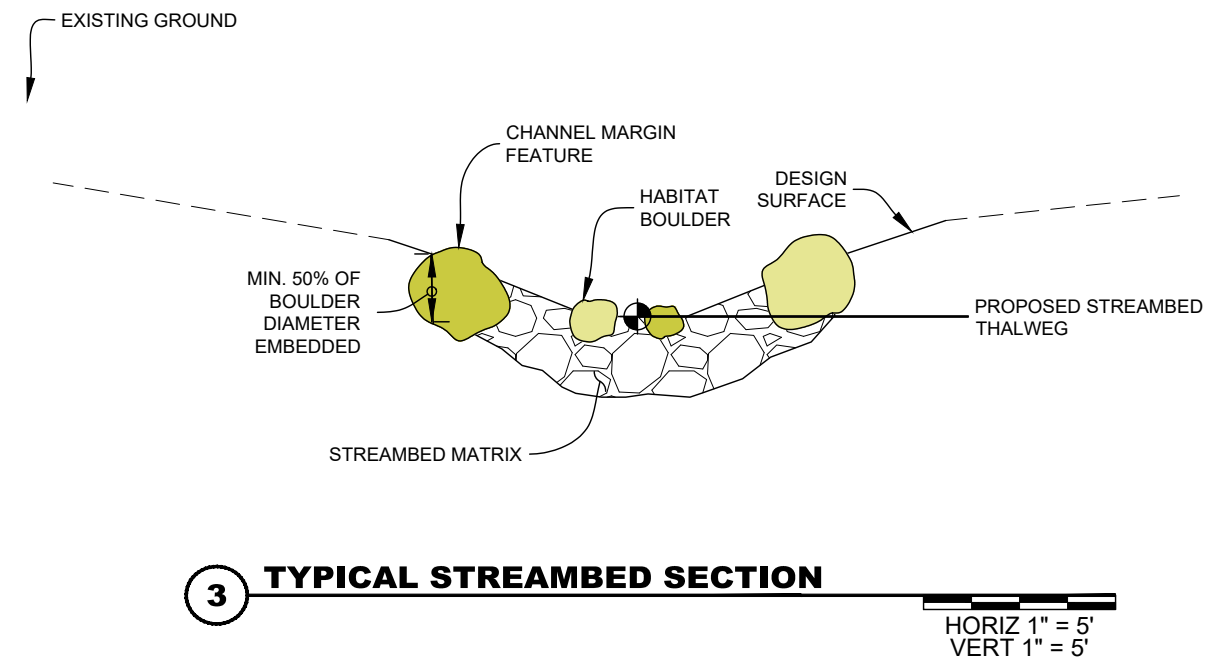
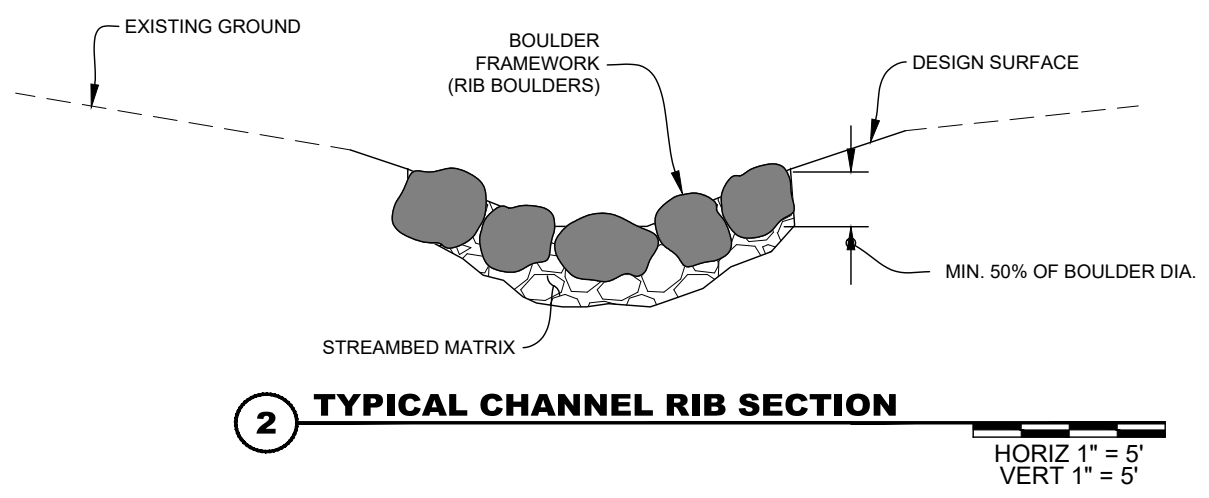


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**DESIGN INTENT**

THE DESIGN INTENT IS TO CONSTRUCT A STABLE, NATURAL STREAMBED IN STEEPENED SEGMENTS OF EAST AND WEST HAYDEN CREEK. THIS IS ACCOMPLISHED BY PLACING THE SPECIFIED ROCK AND SEDIMENT IN THE EXCAVATED CHANNEL AND SHAPING THE STREAMBED TO MATCH NATURAL CONDITIONS. BOULDER RIBS WILL BE CONSTRUCTED TO PROVIDE ADDITIONAL GRADE STABILIZATION AND ADDITIONAL BOULDERS WILL PROVIDE HABITAT COMPLEXITY. WHERE APPROPRIATE, POOL HABITAT WILL BE CONSTRUCTED. ALL STREAMBED MATRIX AND BOULDERS WILL BE SOURCED ON-SITE FROM WITHIN THE EXCAVATION FOOTPRINT AND SURROUNDING AREAS.



**STREAMBED TREATMENT DETAILS**  
HAYDEN CREEK RESTORATION CONCEPTS

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## DESIGN INTENT

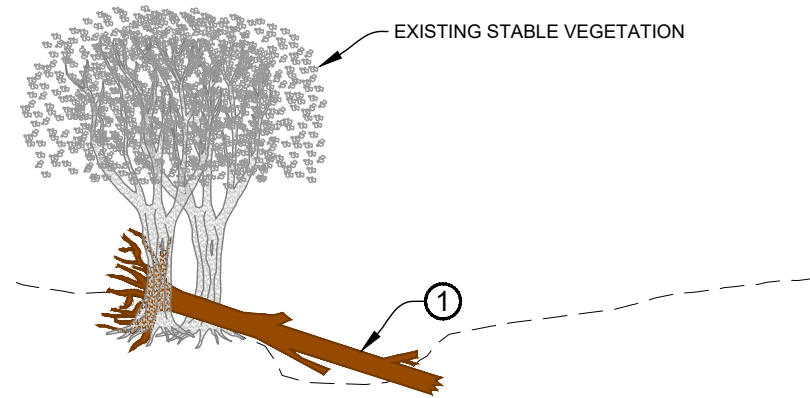
WHERE POSSIBLE, SINGLE LOGS WILL BE INSTALLED IN THE HAYDEN CREEK CHANNELS TO ENHANCE IN-STREAM HABITAT. LOGS WILL BE SOURCED FROM ON-SITE WITHIN THE EXCAVATION FOOTPRINT AND NEARBY AREAS. EXISTING STABLE VEGETATION AND/OR BOULDERS WILL BE USED TO PIN THE LOGS IN PLACE.

## CONSTRUCTION NOTES

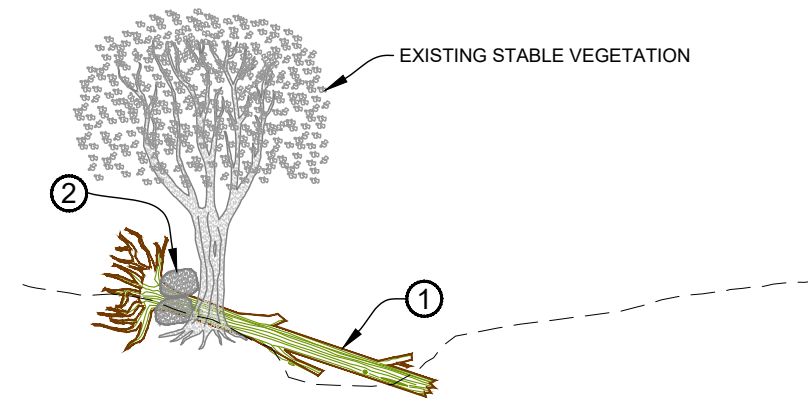
- ① WEAVE LARGE WOOD MEMBER THROUGH SOLID STABLE VEGETATION AND PROJECT INTO CHANNEL.
- ② PLACE BALLAST BOULDERS AT UPPER ENDS OF LARGE WOOD MEMBERS BETWEEN ROOTWADS AND SOLID STABLE TREES. COVER BOULDERS WITH NATIVE MATERIAL AND/OR WOODY DEBRIS TO MINIMIZE VISIBILITY.

## GENERAL NOTES

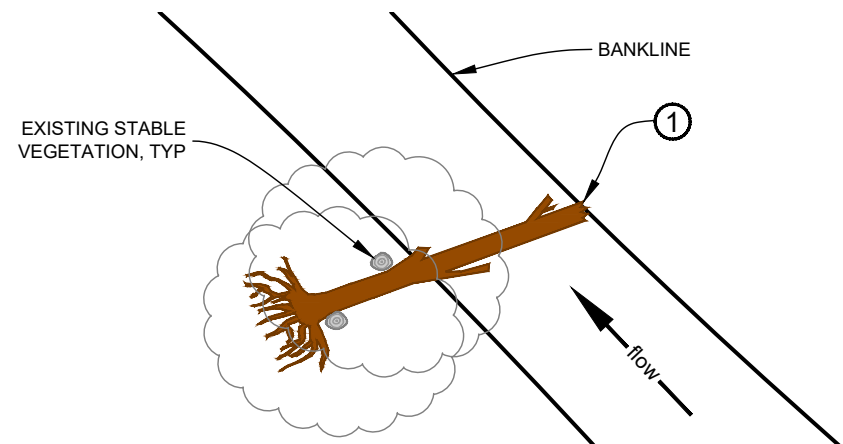
1. REMOVE BLACKBERRY IN BROAD SWATH AROUND ALL LARGE WOOD HABITAT STRUCTURES AND WORK AREAS. BLACKBERRY TO BE REMOVED FROM PROJECT SITE.
2. WOOD MEMBERS MAY BE WITH OR WITHOUT ROOT WAD. ALL WOOD MEMBERS SHALL HAVE BROKEN ENDS PROJECTING INTO CHANNEL. BREAK OR ROUGHEN ENDS OF MEMBERS WITH EXCAVATOR PRIOR TO PLACEMENT.
3. FINAL LOCATION/ORIENTATION OF LOGS AT THE DIRECTION OF PROJECT ENGINEER.



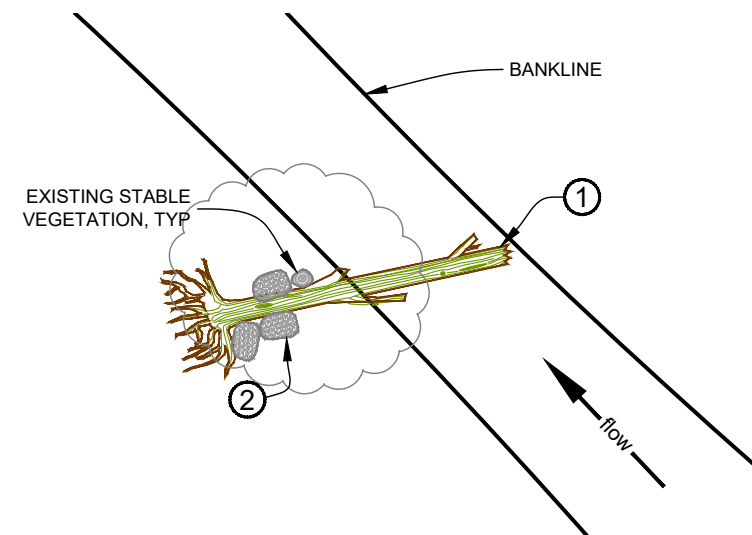
① **LOG ANCHORING SECTION**  
NOT TO SCALE



③ **ROCK ANCHORING SECTION**  
NOT TO SCALE



② **LOG ANCHORING LAYOUT**  
NOT TO SCALE



④ **ROCK ANCHORING LAYOUT**  
NOT TO SCALE

**CONCEPT**

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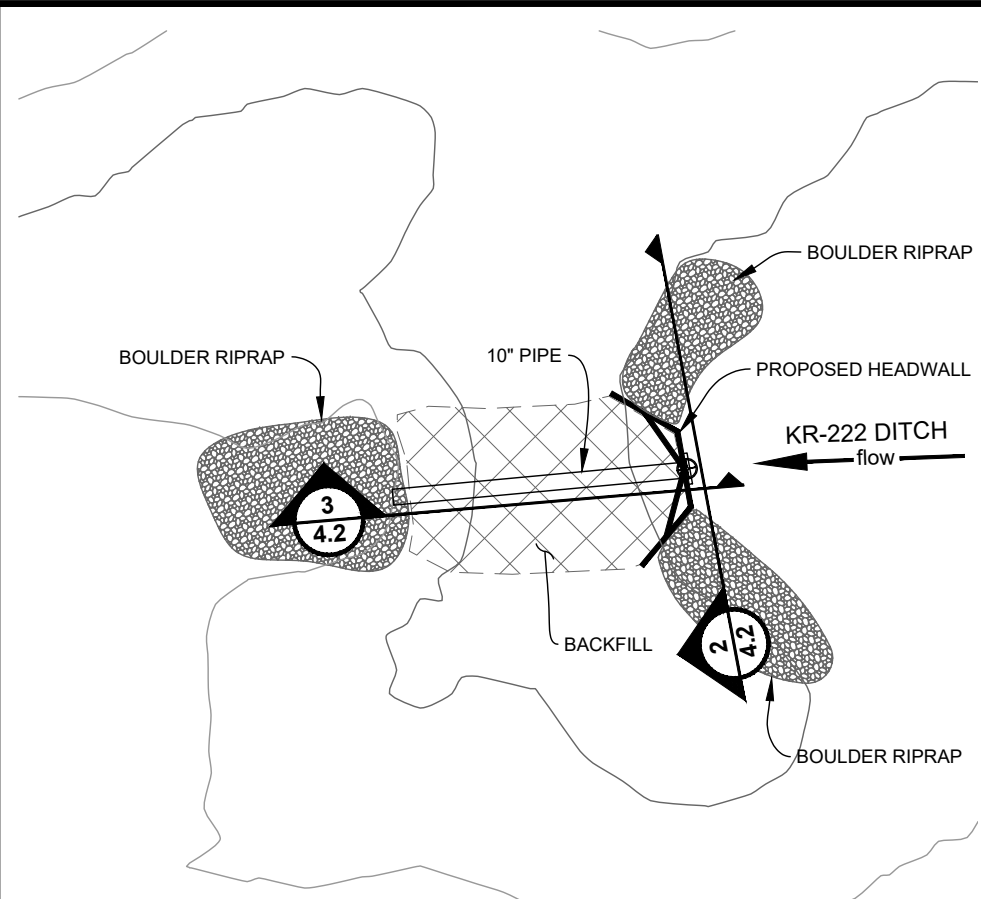
PROJECT NUMBER  
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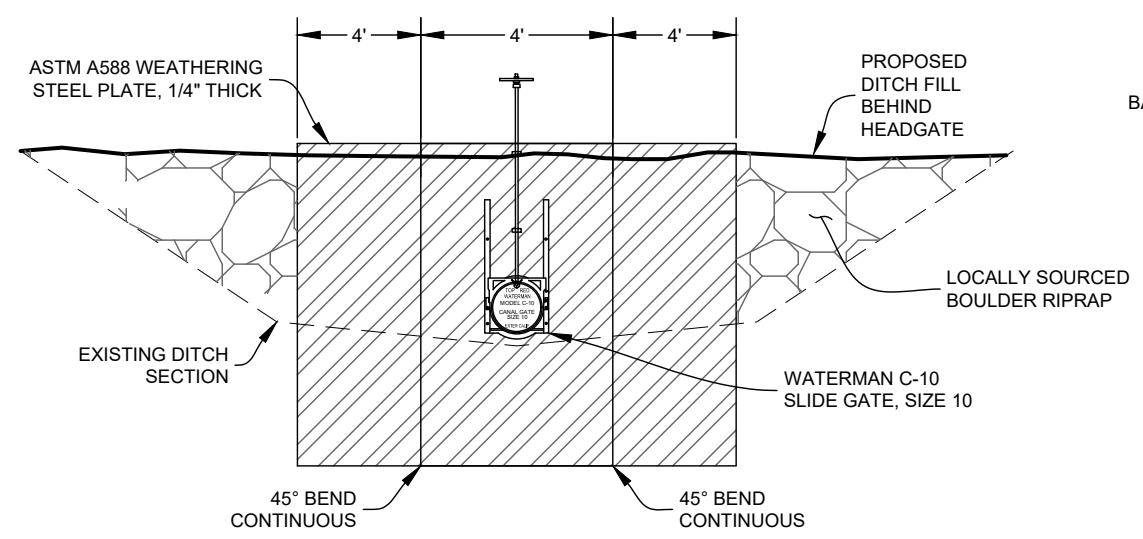
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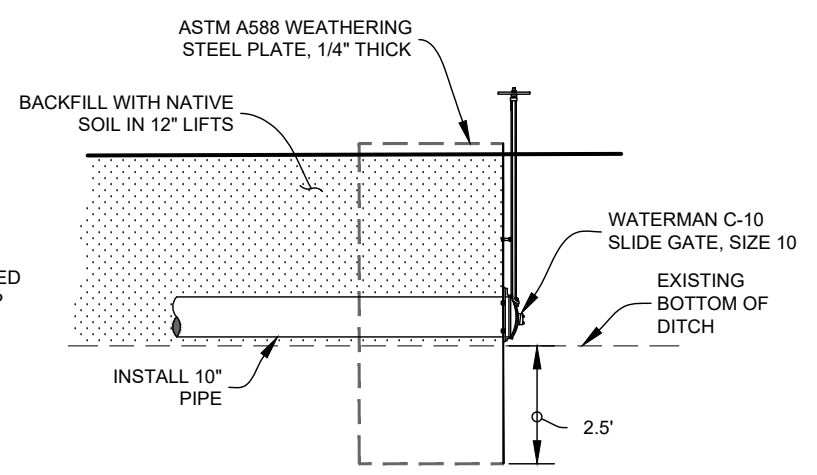
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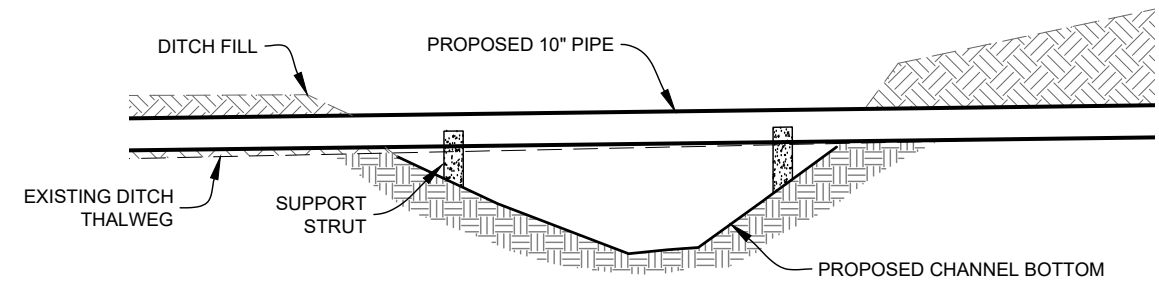
**1 HEADWALL AND HEADGATE DETAIL**  
HORIZ 1" = 10'



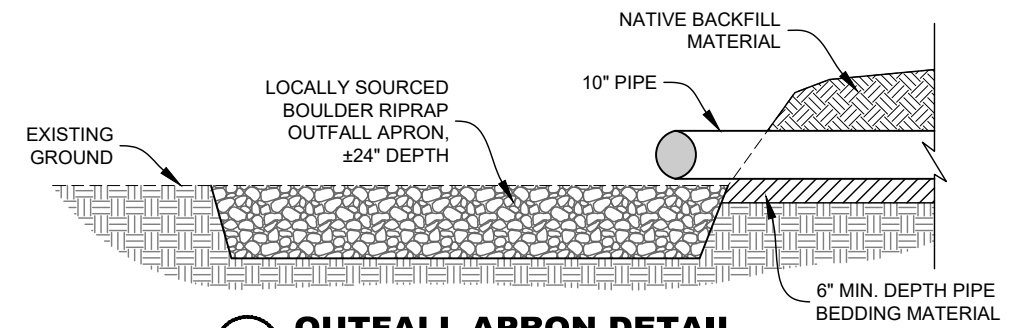
**2 HEADWALL AND HEADGATE - FRONT**  
HORIZ 1" = 4'  
VERT 1" = 4'



**3 HEADWALL AND HEADGATE - SECTION**  
HORIZ 1" = 4'  
VERT 1" = 4'



**4 TYPICAL PIPE BRIDGE DETAIL**  
HORIZ 1" = 10'  
VERT 1" = 5'



**5 OUTFALL APRON DETAIL**  
HORIZ 1" = 4'  
VERT 1" = 4'

**DESIGN INTENT**

THE EXISTING DAMAGED KR-222-US CONTROL STRUCTURE WILL BE REPLACED WITH A SIMPLE STEEL SHEET HEADWALL WITH WATERMAN GATE AND STUB PIPE TO CONTROL FLOW INTO THE DITCH NETWORK.

A PIPELINE WILL BE INSTALLED AND THE EXISTING DITCH WILL BE FILLED FROM JUST UPSTREAM OF THE EAST HAYDEN CREEK CHANNEL TO JUST DOWNSTREAM OF THE WEST HAYDEN CREEK CHANNEL. THE PIPELINE WILL DAYLIGHT OVER THE HAYDEN CREEK CHANNELS, WHERE IT WILL BE SUPPORTED BY A PIPE BRIDGE TO PREVENT SAGGING.

**HEADGATE AND PIPELINE NOTES**

- PIPE SHALL BE 10"-DIAMETER DUAL-WALL BELLED AND GASKETED CORRUGATED PLASTIC PIPE, ADS N-12 OR EQUIVALENT.
- PREPARE SUBGRADE TO ACCOMMODATE PIPE. SUBGRADE SHALL BE FORMED TO CRADLE PIPE WITHOUT DIPS OR VOIDS AND SHALL BE FREE OF ROCK FRAGMENTS GREATER THAN 3 INCHES.
- PLACE PIPE AND JOIN PER MANUFACTURER'S RECOMMENDATION.
- BACKFILL PIPE WITH NATIVE SOIL, MINIMUM 12" COVER. BACKFILL TO BE FREE OF ROCK PARTICLES GREATER THAN 3".
- AT PIPE OUTLETS, CONSTRUCT APRON FROM BOULDERS SOURCED FROM WITHIN THE PROJECT SITE, SET FLUSH WITH GRADE. FORM ROCK APRON ALONG CHANNEL MARGINS.
- PIPELINE TO DAYLIGHT AT HAYDEN CREEK CHANNEL CROSSINGS. PIPELINE SHALL BE SUPPORTED BY A PIPE BRIDGE TO PREVENT SAGGING.

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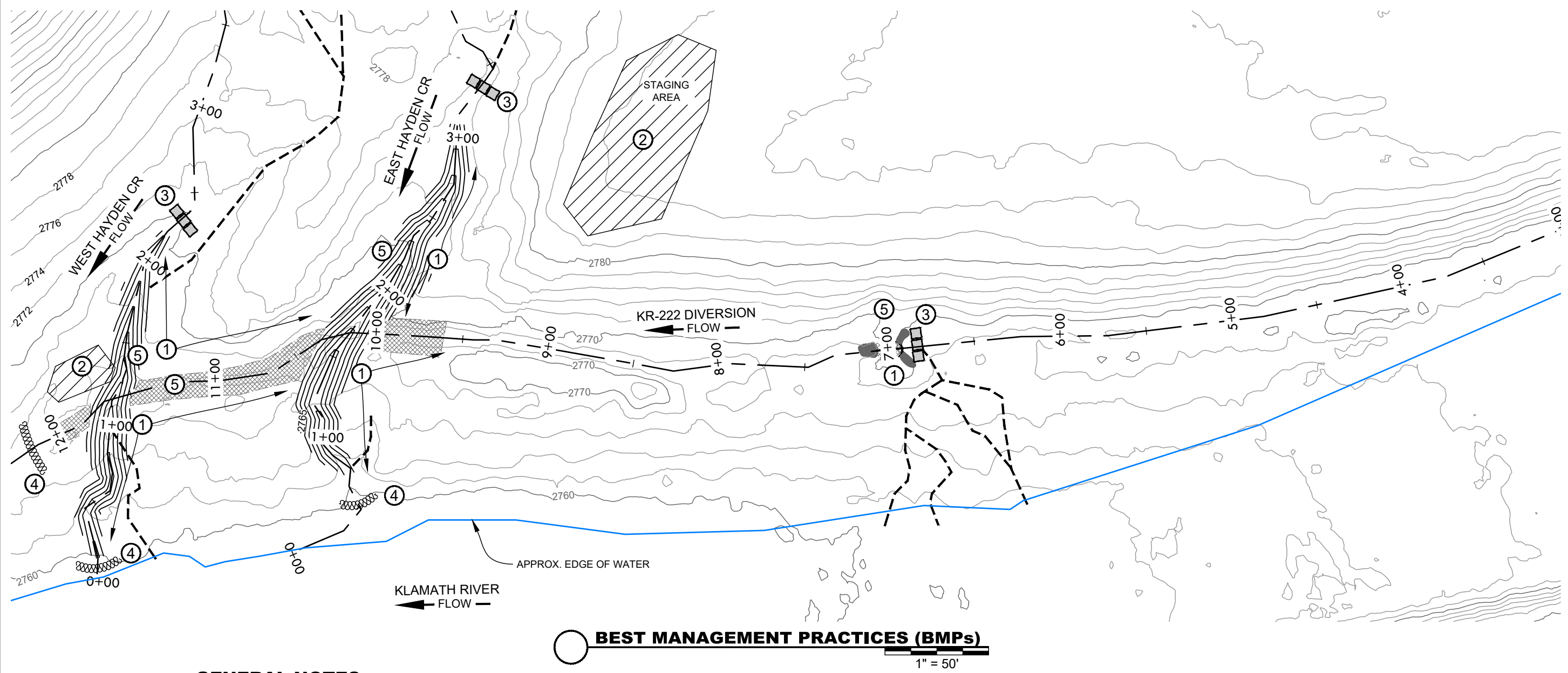
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**4.2**

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**BEST MANAGEMENT PRACTICES (BMPs)**  
1" = 50'

**GENERAL NOTES**

ALL EROSION CONTROL MEASURES ARE TO BE IMPLEMENTED PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.

**CARE AND DIVERSION OF WATER**

FLOW CONDITIONS DURING IN-WATER WORK  
THE PROJECT WILL BE IMPLEMENTED DURING THE IN-STREAM WORK WINDOW (JULY 1ST - SEPT 30TH). HAYDEN CREEK IS LIKELY TO BE DRY DURING CONSTRUCTION.

METHOD OF WORK AREA ISOLATION  
THE PROJECT SITE WILL BE ISOLATED FROM ACTIVE FLOW USING COFFER DAMS, WITH DITCH FLOW ROUTED DOWN THE EXISTING RETURN CHANNEL AT THE KR-222-US CONTROL POINT.

**GENERAL FISH SALVAGE NOTES**

THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT ENGINEER AND/OR OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW) TO REMOVE FISH FROM ISOLATION AREAS.

REDUCING WATER VOLUME WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE DONE USING PUMPS FITTED WITH APPROVED FISH SCREENS THAT PREVENT IMPINGEMENT OR ENTRAPMENT OF FISH. IF ISOLATED POCKETS OR POOLS OCCUR, THEY WILL BE DEFISHED WITH DIP NETS AND PUMPING WILL BE REDUCED ONCE MANAGEABLE WATER LEVELS ARE OBTAINED THAT CAN EASILY BE WADED AND DE-FISHED.

IF NECESSARY, A BACKPACK ELECTROSHOCKER OR SEINE NET (MADE FROM 9.5 MM STRETCHED NYLON MESH) WILL BE USED TO REMOVE FISH FROM THE ISOLATED IN-WATER WORK SITE. A QUALIFIED BIOLOGIST WILL DETERMINE THE METHODS FOR EACH AREA.

**EROSION CONTROL SEEDING**

ALL DISTURBED AREAS SHALL BE BROADCAST SEED WITH NATIVE SEED MIX AND COVERED WITH STERILE STRAW. THIS SHALL BE ACCOMPLISHED WITH A HAND/BROADCAST SEEDING METHOD AND THE SEED SHALL BE RAKED ONE QUARTER INCH INTO THE SOIL AND COMPACTED WITH A 5,000 POUND OR LESS TRACKED VEHICLE AND THEN COVERED WITH STERILE STRAW.

**SITE RECLAMATION NOTES**

ALL DAMAGED OR DISTURBED STREAMBANKS ARE TO BE RESTORED TO A NATURAL SLOPE PATTERN AND PROFILE SUITABLE FOR ESTABLISHMENT OF PERMANENT WOODY VEGETATION.

TEMPORARY ACCESS ROUTES AND OTHER AREAS DISTURBED DURING CONSTRUCTION WILL BE REHABILITATED TO SIMILAR OR BETTER THAN PRE-WORK CONDITIONS. AT A MINIMUM SITE RECLAMATION ACTIVITIES SHALL RESULT IN PLANT DISTRIBUTION AND DENSITY THAT MATCH PRE-PROJECT CONDITIONS.

SHORT-TERM STABILIZATION MEASURES WILL BE IMPLEMENTED UNTIL PERMANENT EROSION CONTROL MEASURES (PLANT RESTORATION) ARE EFFECTIVE.

**BMP NOTES**

- ① PRESERVE AND PROTECT EXISTING VEGETATION TO THE FULLEST EXTENT POSSIBLE. ALL VEGETATION TO BE REMOVED WILL BE DESIGNATED BY PROJECT ENGINEER.
- ② INSTALL SILT FENCE AROUND EQUIPMENT STAGING AND MATERIAL STOCKPILING AREA, AND ANY STOCKPILED FILL.
- ③ PLACE BULK BAGS OR APPROVED ALTERNATIVE COFFER DAM AT DESIGNATED LOCATIONS.
- ④ PLACE BLOCK NETS OR ALTERNATIVE EROSION CONTROL AT DESIGNATED LOCATIONS.
- ⑤ SEED ALL EXPOSED CONSTRUCTION SURFACES WITH NATIVE SEED MIX AND SPREAD STERILE STRAW PER NOTES THIS SHEET.



NO.	DATE	BY	DESCRIPTION	CHK
*	01/12/22	JW	CONCEPT	JZ
PROJECT NUMBER RDG-21-132				
DRAWING NUMBER <b>5.0</b>				
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