



CHELAN COUNTY
DEPARTMENT OF COMMUNITY DEVELOPMENT
 316 WASHINGTON STREET, SUITE 301, WENATCHEE, WA 98801
 TELEPHONE: (509) 667-6225 FAX: (509) 667-6475

SHORELINE PERMIT APPLICATION

This packet is designed to assist you in preparing your application for a shoreline permit. The following information is required at the time of submittal. Additional information may be required.

Please select all that apply:

- Shoreline Substantial Development Permit
 Shoreline Conditional Use Permit
 Shoreline Variance Permit

The following information is required at the time of submittal.

- JARPA (Joint Aquatic Resource Permit Application)
 SEPA Checklist (State Environmental Policy Act) (if applicable)
 Shoreline Review Criteria – these are requirements of the Shoreline Master Program may be addressed in a narrative format with support documentation
 Site Plan
 Additional plans, as applicable: Landscape Plan, Parking Plan, Wetland Delineation, Habitat Management Plan, Geotechnical Report, Traffic Impact Study
 Complete the following Cannabis Disclosure Section, Site Plan Checklist Section and Acknowledgement Section
- The applicant is required to review and submit documentation showing compliance with all Chelan County Code, including but not limited to Title 4, Title 11, Title 12, Title 14, and Title 15

Within twenty-eight (28) days of receiving a complete application, the applicant will receive a written Determination of Completeness or a notice of Incomplete, identifying required additional information. After issuing the Determination of Completeness, a Notice of Application will be issued within fourteen (14) days. The application is then routed to all agencies with jurisdiction and surrounding properties for a thirty (30) day review and comment period. An open record hearing date will be set before the Chelan County Hearing Examiner and the applicant and all parties of record will be notified of the date, time, and place of the hearing. Testimony related to the proposal will be taken and the applicant will be able to provide a rebuttal to all testimony presented. Upon closing the public hearing, the Hearing Examiner will then have ten (10) working days to approve, approve with conditions, or deny the application. The Hearing Examiner decision can be appealed (CCC Chapter 14.12). Shoreline Conditional Use Permits and Variances require approval from the Department of Ecology, after the County decision; therefore, no work may be authorized until finalization of the Department of Ecology permit.

Parcel Number (APN): 241727311250 Lot Size: 241 (Acres)
 Parcel Address: ICICLE CANYON RD City/Zip Code: Leavenworth/98826
 Property Owner(s): Icicle-Peshastin Irrigation District Zoning: FC; RR20.

SHORELINE PERMIT APPROVAL CRITERIA

NOTE: The following criteria from the Shoreline Master Program (SMP) must be addressed in this application. Additional development standards will apply based on the project. The applicant is required to show consistency with all SMP standards.

- Substantial Development Permits: Chapter 29.1
- Variance Permits: Chapter 29.2
- Conditional Use Permits: Chapter 29.3
- Shorelines of Statewide Significance: Chapter 29.4

AQUIFER RECHARGE AREA DISCLOSURE SECTION

Exempt from this section only are Single Family Residences and their associated development per CCC 11.82.060. An applicant seeking to develop property which requires a development permit, shall submit with the permit application this certified statement, which lists each of the evaluation criteria and shall indicate whether the criteria "applies" or "does not apply" to the site or development. "Unknown" or similar responses will not be accepted.

If the development meets criteria A, B, C, or D or if the site or development meets any two of the remaining criteria, the Department will direct the applicant to determine the vulnerability rating for the development pursuant to Section 11.82.050 Aquifer Recharge Areas. If the development has a high or medium vulnerability rating, the development shall be subject to the performance standards of Section 11.82.060.

If an applicant's statement asserts that the criteria do not apply to the development, the Department will accept the statement and proceed with the permitting process. If any statement is incorrect, the applicant will be advised in writing to either; (a) provide an amended statement adding the evaluation criteria as being applicable and determine the vulnerability rating of the development pursuant to Section 11.82.050, or (b) present sufficient countering information clearly establishing that the basis for the Department's concern is incorrect. If the applicant selects to proceed under (b), upon receipt of the applicant's information, the Department shall review the information and obtain whatever additional assistance may be required to resolve the issue. The final determination as to whether a determination of vulnerability is required shall be made by the Administrator.

EVALUATION CRITERIA

The applicant is required to determine the vulnerability rating for **any development permit**, not otherwise exempted, if the site or development meets criteria A, B, C, or D or meets two or more of the remaining criteria below:

Please write the word(s) "**Applies**" or "**Does Not Apply**" on the lines before each of the following statements:

- Does not apply A. Within a wellhead protection area designated under WAC 246-290; Wellhead Protection Area: The surface and subsurface area surrounding a well or well field for a distance of 100 feet, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field.
- Does not apply B. Within an aquifer recharge area mapped and identified by a qualified ground water scientist;
- Does not apply C. The site will be utilized for hazardous substance, (as now or hereafter defined in RCW 70.105D.020(7)), processing storage or handling in applications or quantities larger than is typical of household use;
- Does not apply D. The site will be utilized for hazardous waste treatment and storage as set forth in RCW 70.105 Hazardous Waste Management, as now or hereafter amended;
- Does not apply E. The site contains highly permeable soils, which include soil types 1a, 1b and 2a under WAC 246-272-11001, Table II; Highly Permeable Soils: Include soil types 1A, 1B and 2A from Table II, Soil Textural Classification, WAC 246-272-11001. 1A: Very gravely coarse sands or coarser, all extremely gravely soils. 1B: Very gravely medium sand, very gravely fine sand, very gravely very fine sand, very gravely loamy sands. 2A: Coarse sands (also includes ASTM C-33 sand).
- Does not Apply F. Within a sole source aquifer recharge area designated pursuant to the Federal Safe Drinking Water Act (**None currently designated in Chelan County**);
- Does not Apply G. Within an area established for special protection pursuant to a groundwater management program, chapters 90.44, 90.48 and 90.54 RCW, and Chapters 173-100 and 173-200 WAC

(None currently designated in Chelan County);

Does not apply

H. The development involves a proposed major or short subdivision and includes present or future plans to construct three or more dwelling units where the dwelling units will not be connected to a public sewer system and any of the lots are less than 1 net acre in size;

Does not apply

I. The proposed commercial and industrial site is not on a public sewer system and the main structure exceeds 4,000 square feet;

Does not apply

J. The proposed use is as a commercial feedlot;

Applies

K. The development is within 200 feet of the ordinary high water mark of a perennial river, stream, lake or pond.

Depending upon soil depths from the surface, the following soil series within Chelan County are considered to be highly permeable soils:

- Ardenvoir: ArF, 27-43 inches (depth from surface), very gravelly sandy loam
- Anatone: AkD, 5-14 inches (depth from surface), very gravelly silt loam
- Beverly: Be, 17-24 inches (depth from surface), very gravelly sandy loam; Bf, 17-24 inches (depth from surface), very gravelly sandy loam; Bg, 0-10 inches (depth from surface), very gravelly loamy fine sand; Bg, 17-24 inches (depth from surface), very gravelly sandy loam
- Brief: BrA, BrB, BrC, Brd, 26-60 inches (depth from surface), very gravelly sandy loam
- BsD, 26-60 inches (depth from surface), very gravelly sandy loam
- Chelan: CgB, CgC, CgD, CgE, 35-60 inches (depth from surface), very gravelly sandy loam; ChC, ChE, 35-60 inches (depth from surface), very gravelly sandy loam; CkD, CkE, 35-60 inches (depth from surface), very gravelly sandy loam; CIA, CIB, CIC, CID, CIE, 35-60 inches (depth from surface), very gravelly sandy loam
- Jumpe: JmD, 10-60 inches (depth from surface), very stony silt loam; JnF, 0-60 inches (depth from surface), very stony silt loam
- Loneridge: LoD, LoF, 0-10 inches (depth from surface), very stony loam; 10-16 inches (depth from surface), very gravelly clay loam
- Malaga: MaA, MaC, 15-19 inches (depth from surface), very gravelly sandy loam
- Peshastin: PhB, PhC, 18-60 inches (depth from surface), very cobbly sandy loam; PID, PIE, 18-60 inches (depth from surface), very cobbly loam
- Pogue: PsE, 0-17 inches (depth from surface), very stony fine sandy loam
- Stemilt: StD, StE, 17-60 inches (depth from surface), very cobbly silty clay loam
- Supplee: SuA, SuB, SuC, SuD, SuE, 0-6 inches (depth from surface), Very fine sandy loam; 18-31 inches (depth from surface), very gravelly sandy loam
- Thow: TgD, 10-60 inches (depth from surface), very gravelly sandy loam; ThE 10-60 inches (depth from surface), very gravelly sandy loam
- Tronsen: TrD, TrE, 8-60 inches (depth from surface), very gravelly clay loam

CANNABIS DISCLOSURE SECTION

SUB-SECTION I: Circle

I AFFIRM there IS NOT or **IS** (circle one) an existing or pending Liquor and Cannabis Board (LCB) license or approval for cannabis production, processing, or retail located on the property that is the subject of the requested development permit or approval.

If you circled "IS NOT" above, proceed to Sub-Section III of this form.

If you circled "IS" above, proceed to Sub-Section II of this form.

SUB-SECTION II: You must read the below statements, initial on the space provided, and then proceed to Sub-Section III.

_____ I ACKNOWLEDGE AND UNDERSTAND that all cannabis-related activities, development, uses and construction must comply with Chelan County regulations, including but not limited to Chelan County Code Section 11.100.

_____ I ACKNOWLEDGE AND UNDERSTAND that only those cannabis-related uses authorized pursuant to Chelan County Code Section 11.100 are permitted within Chelan County. All other commercial and

noncommercial licensed or registered cannabis uses, including but not limited to cannabis research facilities and medical cannabis cooperatives, are prohibited within all zones of Chelan County.

_____ I ACKNOWLEDGE AND UNDERSTAND that pursuant to Chelan County Code Section 11.100 a conditional use permit is required to engage in the production or processing of cannabis within Chelan County, and that all cannabis producers and processors must register annually with Chelan County and pay the appropriate registration fee.

_____ I ACKNOWLEDGE AND UNDERSTAND that it is the responsibility of the property owner to submit for and obtain all necessary development permits and approvals prior to engaging in cannabis-related activities, development, uses or construction, including but not limited to conditional use permits for the production or processing of cannabis, building permits, change of use/occupancy permits, shoreline permits, variances, and mechanical permits.

SUB-SECTION III: Please select one of the following:

- I certify with the signature below that the building or land use permit requested **IS NOT** related to or in any way supportive of existing or planned cannabis-related activities, development, uses or construction on the property. I further certify that any authorized activities, development, uses or construction **WILL NOT** be utilized to support or expand cannabis-related activities, development, uses or construction.
- I certify with the signature below that the building or land use permit requested **IS** related to or in support of existing or planned cannabis-related activities, development, uses or construction on the property. I certify that any authorized activities, development, uses or construction will be in strict compliance with LCB licensure requirements and all applicable laws and regulations including but not limited to Chelan County Code, Chapter 69.50 RCW (Uniform Controlled Substances Act), Chapter 69.51A (Medical Cannabis), Chapter 19.27 RCW and WAC Title 51 (State Building Code), Chapter 58.17 RCW (Plats-Subdivisions-Dedications), Chapter 90.58 RCW (Shoreline Management Act), Chapter 314.55 WAC, and the Chelan County Shoreline Master Program.

SITE PLAN CHECKLIST SECTION

- Two copies of site plan are required. Must be drawn to standard engineering/architect's scale, such as 1"=100'. Indicate the scale used. Must include North arrow, and be drawn on grid paper or engineering plan format. For large parcels, applicant may submit a two-page site plan, the first page depicting the entire lot at a convenient scale and the second page depicting an enlargement of the developed area at a larger scale.
- Label all property lines/boundaries, dimensions, and area of lot/parcel (square feet or acreage).
- Label the location, size, and use of all existing building(s). Identify the distance between property lines and buildings. Label structures with previous building permit number(s) issued if applicable.
- Label the location, size, and use of all proposed structure(s) (temporary or permanent) to include dimensions of all decks, porches, cantilevers, bay windows, roof overhangs, retaining walls, patios, chimneys, landings and stairs.
- Identify the location, dimensions and volume of all existing and proposed propane tanks, fuel tanks, etc., both above ground and underground, as well as setback from property lines.
- Identify land features such as top and bottom of slopes, direction of slope and any areas of erosion.
- Identify and label all water features to include, ponds, springs, ravines, streams, creeks, lakes, rivers, irrigation laterals, canals, ditches, wetlands, bogs, areas of saturated ground, flood plain, floodway. Identify the closest distance between the ordinary high water mark and proposed/existing structures.
- Label the name and width of roads bordering the property and indicate whether they are public or private.
- Locate the width of existing and proposed driveways/accesses serving each structure. Include stormwater control facilities such as drains, detention ponds, connection lines, catch basins, etc.
- Label all existing and proposed parking spaces/areas. Parking in residential districts is typically not allowed in the

front yard setback area. All parking shall have durable and dustless surfaces suited to all weather use, unless required otherwise. If applicable, show handicapped parking and accessible routes to the structure and within the site to other structures and features.

- Identify and label all easements and widths, deed restrictions, other encumbrances, and/or issues restricting or affecting the use or condition of the property, including but not limited to access, utilities, railroads, irrigation and overhead power. Include the Auditor's file number(s). *Before Any Development Occurs, Please Call 1-509-661-8400 To Locate Any PUD Easements!*
- Show the location of all existing and proposed overhead and underground utilities including, but not limited to water, sewer, gas, and electrical.
- Identify location of water lines, well and sanitary control radius. Note: A sanitary control radius around an off-site well may impact your project if it overlaps onto your parcel.
- Identify location of all well(s), septic/pump tank, drain field, reserve area and tight line involving the proposed structure(s). Show the distance from proposed structure(s) to septic tank, drain field, drinking water well source(s), and any water body, wetland area and/or flood plain to ensure they meet the required horizontal setbacks from each other and property lines. See Chelan Douglas Health District Horizontal Setback Table for details. If applicable, the approved Health District and County site plan must be identical.
- If drinking water wells, septic tank/drain field is off site, show the location of these systems on the adjacent property or properties and provide a copy of the easement agreement(s).
- If applicable, identify existing and proposed landscaping, screening and/or fencing. (Show type of landscaping, size, spacing, and provisions for irrigation).
- If applicable, include outdoor lighting and signage. Label each as existing or proposed.

ACKNOWLEDGEMENT SECTION

If the Applicant is not the owner of the property, this application and acknowledgment shall also be executed (signed) by each property owner.

By submitting this application, I acknowledge and certify the following:

Initials

(Owner and, if applicable, Applicant) Agent

- MWT 1. All applications will be reviewed for completeness and processed according to Chelan County Code Title 14. Each application may be denied if not consistent with all Chelan County Codes, adopted regulations, Comprehensive Plan and related plans or studies.
- MWT 2. This application does not constitute approval of the proposed development and Chelan County does not make any guarantee, either express or implied, that this application will be approved.
- MWT 3. False statements, errors and/or omissions in this application or information provided with or in regard to this application may be sufficient cause for denial of the request.
- MWT 4. Additional permit applications and approvals may be necessary to conduct specific activities.
- MWT 5. Application fees are non-refundable, except when approve by the Board.
- MWT 6. In the event of any legal proceeding to challenge this application, any environmental determination or any other aspect of the proposed development, the applicant/owner(s) shall be solely responsible to defend such challenge and pay all court costs and attorney's fees necessary for such defense.
- MWT 7. Chelan County is hereby given consent to enter the property(ies) listed above.
- MWT 8. I certify that I am the property owner, or authorized agent of the property owner, and I have familiarized myself with the rules and regulations of Chelan County with respect to making this application.
- MWT 9. I certify that I possess full legal authority and rights necessary to exercise control over the subject property.

For Tony Jantzer, IPID

- MWT 10. I certify that this application has been made with the consent of the lawful property owner(s).
- MWT 11. I certify that all Easements, Deed Restrictions, other encumbrances, and/or issues restricting or affecting the use or condition of the property have been accurately disclosed and are shown on the site plan submitted with this application.
- MWT 12. This application shall be subject to all additions to and changes in the laws, regulations and ordinances applicable to the proposed development until a determination of completeness has been made pursuant to Section 14.08.030.

I certify (or declare) under penalty of perjury and under the laws of the State of Washington that the foregoing and all information submitted with this application is true, correct and complete to the best of my knowledge.

Owner Signature: See JARPA signatures Place: _____ Date: _____

Print Name: Tony Jautzer, TPID

Owner/Applicant/Agent Signature: See JARPA Place: _____ Date: _____

Print Name: Aaron Penrose

Owner/Applicant/Agent Signature: Marnie Tyler Place: Olympia, WA Date: 9/11/18

Print Name: Marnie W. Tyler

Icicle Creek Fish Passage Improvement, Screening Compliance and City of Leavenworth Water Line Project Biological Assessment



Prepared for: **Trout Unlimited**
Attention: Aaron Penvose
103 Palouse Street #14
Wenatchee WA 98801

Prepared by: **ECOLUTION, LLC**
1910 East 4th Avenue, PMB 193
Olympia, WA 98506

February 4, 2019

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Acronyms, Abbreviations, and References

BA	Biological Assessment
BO	Biological Opinion
Cfs	Cubic feet per second
DPS	Distinct Population Segment
ESU	Evolutionarily Significant Unit
IPID	Icicle and Peshastin Irrigation District's
Left Bank	Refers to the left bank as one is moving downstream
LNFH	Leavenworth National Fish Hatchery
MPG	Major Population Group
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OHW	Ordinary High Water Mark
Right Bank	Refers to the right bank as one is moving downstream
RM	River Mile, beginning at the mouth of the creek and moving upstream.
UCSRB	Upper Columbia Salmon Recovery Board
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WDFW	Washington Department of Fish and Wildlife

BIOLOGICAL ASSESSMENT

For Trout Unlimited's Icicle Creek Fish Passage, Screening Compliance and
City of Leavenworth Water Line Project

Date: February 4, 2019

Applicant:

Trout Unlimited
103 Palouse Street #14
Wenatchee WA 98801
Tel.: 509.888.0970
Fax: 509.888.4352
Contact: Aaron Penvose

Authorized Agent:

Ecolution, LLC
1910 East 4th Avenue, PMB 193
Olympia, WA 98506
Tel: 360.480.5518
Fax: 360.786.0174
Contact: Marnie Tyler

1.0 Introduction

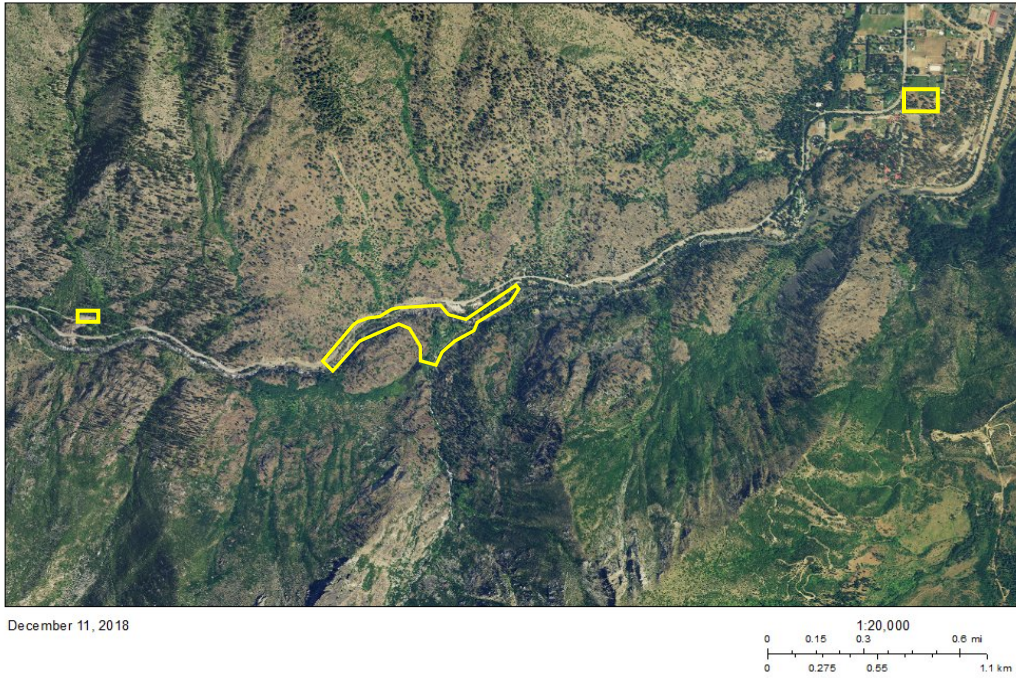
The purpose of this Biological Assessment (BA) is to describe the specific actions of the proposed Icicle Creek Fish Passage, Screening Compliance, and City of Leavenworth Water Line Project and to evaluate the potential impacts on federally protected resources. This BA identifies the potential effects of the project on federally listed, proposed, and candidate species and designated critical habitat. The intent of the BA is to ensure that proposed activities will not likely jeopardize the continued existence of federally protected resources nor adversely modify critical habitat.

1.1 Proposed Actions

The Icicle Creek Fish Passage, Screening Compliance and City of Leavenworth Water Line Project is proposed by Trout Unlimited in support of its Washington Water Project. The project includes three separate elements which are evaluated in this BA (Figure 1):

1. Fish passage improvement at river mile (RM) 5.6, also known as the boulder field.
2. Relocate and replace the City of Leavenworth (COL) water supply pipeline and fish screen.
3. Replace and relocate the Icicle and Peshastin Irrigation District's (IPID) fish screens.

Icicle Creek Action Area--Work Site and Additional Staging Areas



Icicle Creek Action Area--Work Site and Primary Staging Areas

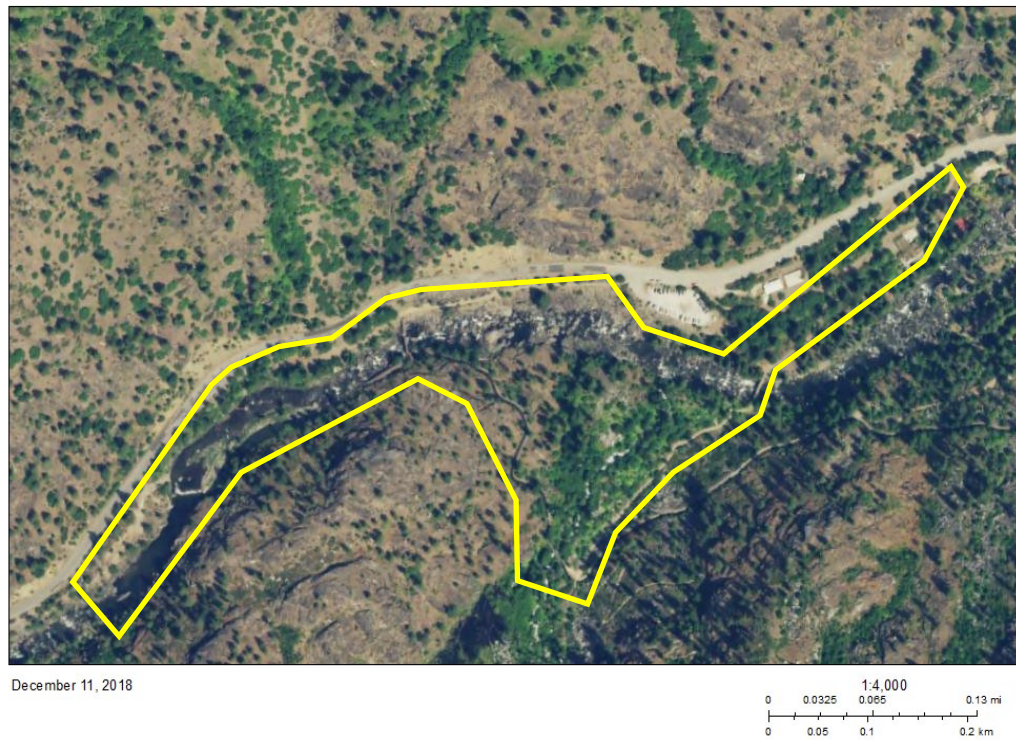


Figure 1. Action area. Work site and potential additional staging areas (above) and work site and primary staging areas (below).

The federal nexus for this project is in federal funding for construction and federal permits anticipated to complete the work. Federal permits anticipated include the Section 404 issued by the U.S. Army Corps of Engineers. A construction access agreement will be sought with the U.S. Forest Service for use of the Icicle Creek Road and modifications to the road shoulder within their easement. A related action, reinforcing the decking over the Icicle Creek bridge just downstream, is undergoing a separate consultation process initiated by the U.S. Forest Service.

2.0 Project Need, Purpose, and Description

Icicle Creek is the major fish-bearing tributary to the Wenatchee River in Water Resources Inventory Area 45 (Figure 2) and is designated as critical habitat for bull trout and steelhead. Fish passage in Icicle Creek is impeded by channel constriction at RM 5.6 due to the presence of large boulders which create high velocity, turbulence, and gradient for migrating fish (Dominguez *et al* 2013).

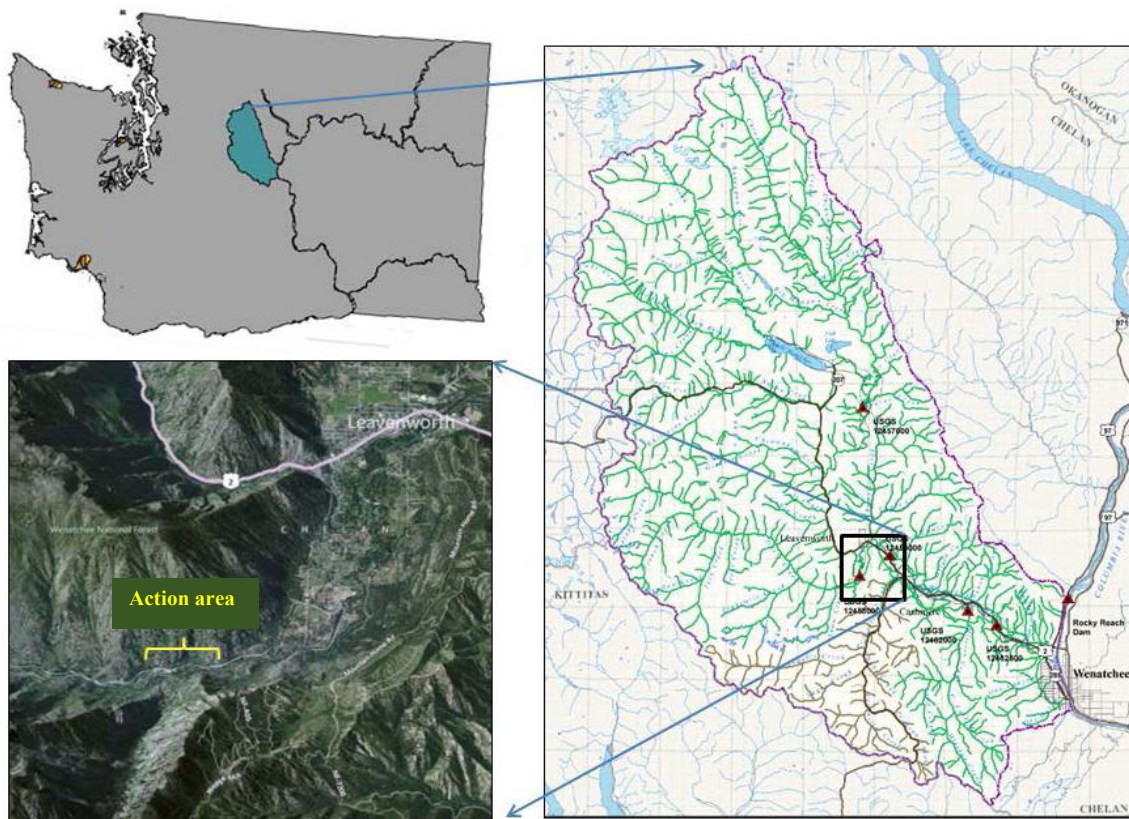


Figure 2. Action location (from Dominguez et al, 2013)

There is some evidence that upstream passage may be occurring but it is extremely limited to a narrow range of flows. Washington Department of Fish and Wildlife (WDFW) document a redd in the IPID diversion canal and a juvenile chinook salmon was noted upstream. The passive integrated transponder (PIT) tag array upstream of the boulder falls has not detected upstream passage. The primary passage impediment occurs at a large boulder referred to here as the anchor rock, which creates a cascade with high turbulence. This location features a 25-foot vertical drop and 30% gradient.

The primary goal of this action is to improve passage for bull trout and steelhead at the Icicle Creek boulder field. This will enhance access for these species to up to 50 miles of mainstem and tributary habitat anadromous fishes and connect Upper Icicle Creek with the Wenatchee River Watershed. To achieve this, it is necessary to complete two other project elements. All three projects are interrelated and interconnected from a biological sense; furthermore, they are connected from a socio-political standpoint. The other project elements will replace and relocate the City of Leavenworth water supply pipeline and fish screen, and replace and relocate the IPID irrigation withdrawal fish screen. These additional elements also serve an important function to bring fish screens up to current state and federal standards and reduce fish mortality in Icicle Creek resulting from water diversions for drinking water and agriculture. Fish passage at the boulder field is identified as a priority by the 5-year status review (NOAA 2016), Upper Columbia Regional Technical Team (RTT 2013), and in the Wenatchee Subbasin Plan (2004). Fish passage at the boulder field has also been included in the Icicle Creek Working Group Master Scope of Work as contributing to the working group's objectives of enhancing fish passage and supporting tribal fisheries.

The step-pool channel at RM 5.6 is intended to improve fish passage without any impact to the water diversion for the Icicle and Peshastin Irrigation District's and City of Leavenworth. Implementation of the fish passage improvement project at RM 5.6 will not affect the flows at the water diversion upstream at RM 5.7. Passage at the step-pool channel as designed will optimally function at a flow of between approximately 80 to 800 cfs in Icicle Creek. It is understood that based on historic flows in the reach below the current irrigation and municipal withdrawals, the step-pool channel may not fully function in the months of late July and August and September. Given the timing of fish migration in lower Icicle Creek, the step-pool channel is expected to most benefit steelhead and bull trout. Discussion with agency representatives indicates that adult steelhead migration peaks in March and April and bull trout migration peaks

in July¹. A detailed description of the proposed action at the boulder field and each of the related project elements and their sequencing follows.

2.1 Improve Fish Passage: Boulder Field

At the boulder field, five different options to address fish passage were considered. The selection of the preferred option was a collaborative process with input from stakeholders as described by Waterfall Engineering *et al* (2016). The 90% designs were developed by Waterfall Engineering, LLC and are included in Appendix A; the only modifications anticipated to the designs are fine details for the rock slope and steps between the pools. The design process included detailed analyses of flow and velocity in the reach and the timing of bull trout and steelhead migration, as described in Waterfall Engineering *et al* (2016) and Dominguez *et al* (2013), and follow-up discussion with federal and state agencies to refine run timing for bull trout, steelhead, and spring Chinook in Icicle Creek¹. A summary of the passage alternatives considered is included in Table 1. These passage parameters were based on calculations described in Powers *et al* (2016). Hydraulic modeling output of the selected option under existing and proposed conditions is shown in Figure 3.

Option	Slope (%)	Length (ft)	Drops (ft)	Icicle Creek Flow at Max Design Flow ¹ (cfs)	Minimum Fish Size Passable (inches)
1	22	85	5 to 7	350	18
2	11	270	2.2 to 3.3	900	12
4b	14	160	3.5 to 4.5	800	13
5	20	130	4.0 to 5.0	700 to 800	14

Table 1. Summary of design variables for fish passage options (reproduced from Waterfall Engineering et al 2016, Table 1). Values are based on the existing flow distribution (stage vs discharge measurement) and calibrated HEC RAS Model.

¹ Per a March 1, 2018 teleconference with WDFW and USFWS.

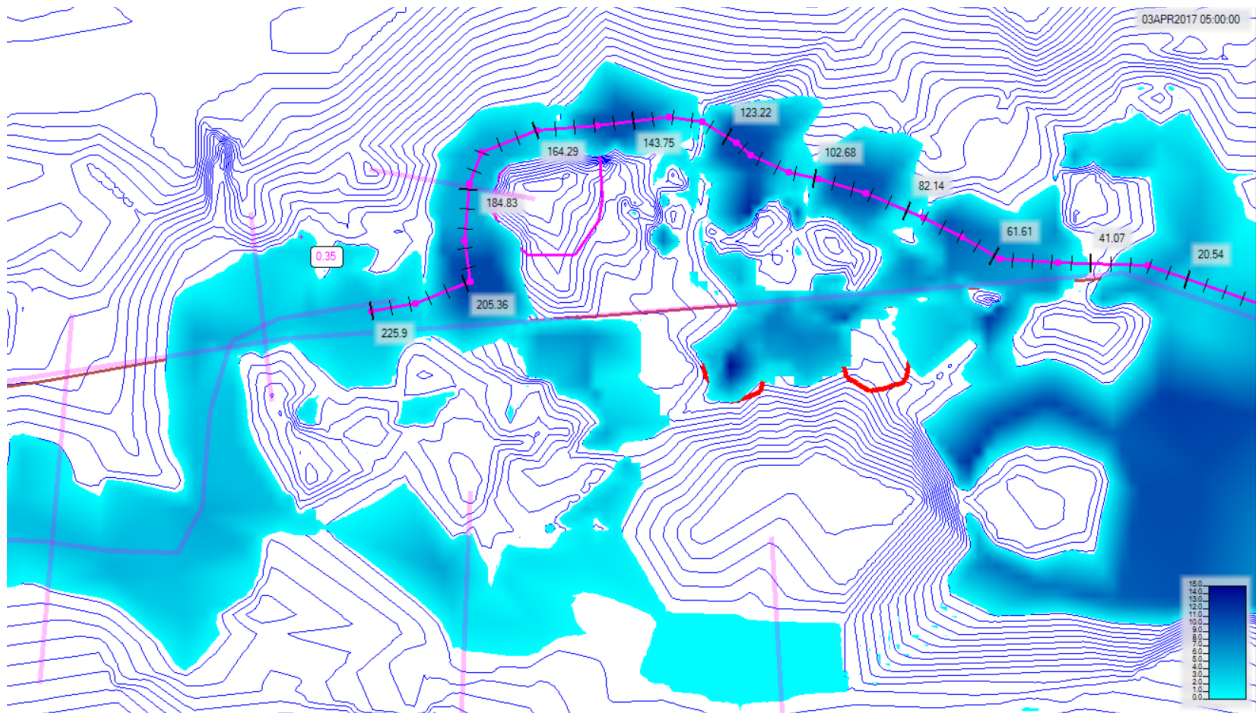
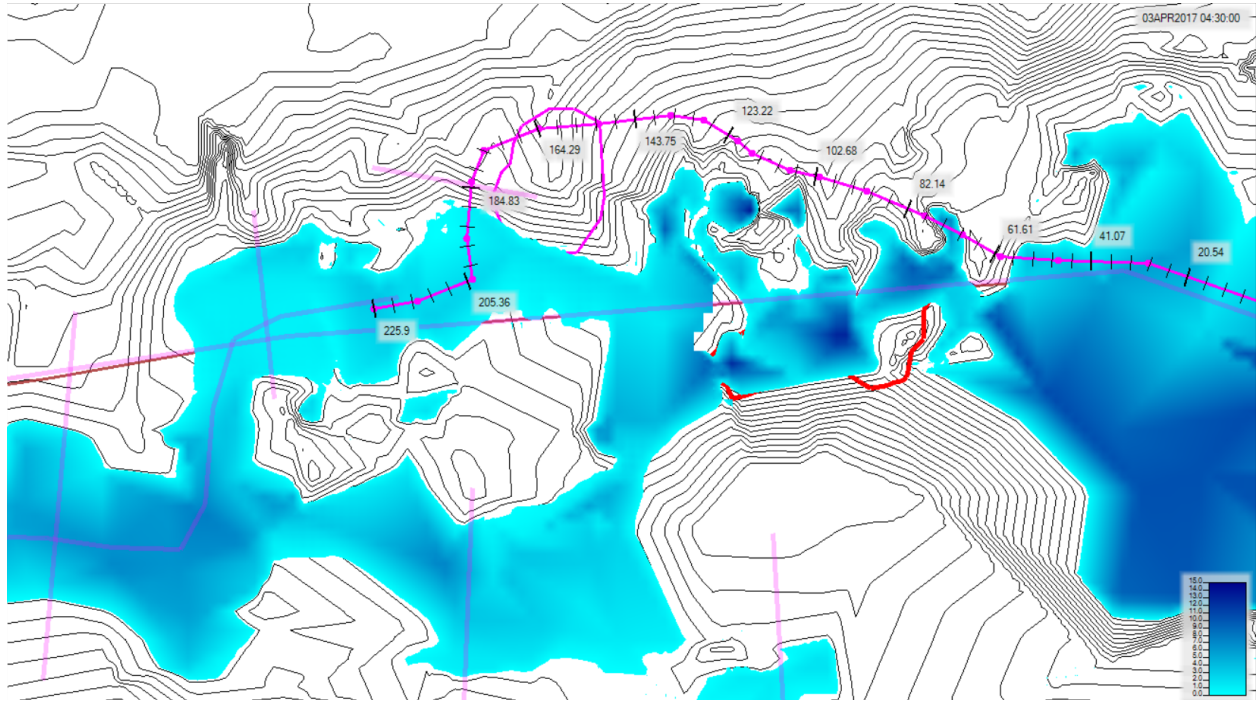


Figure 3. Existing (above) and proposed (below) terrain at 200 cfs

Fish passage at the boulder field will be enhanced through construction of a step-pool channel located along 200 lineal feet adjacent to the left bank of Icicle Creek and some of the existing channel. As noted in Table 1, the design parameters to facilitate passage for a minimum fish size of 14 inches will include drops in the step pool channel of 4 to 5 feet. The maximum and minimum design flows to provide passage are 80 to 800 cfs. Pools on average will be a minimum of 8-foot deep at low flow. In addition to the left bank construction, boulders will be removed in three areas to improve flow to the step-pool channel and reduce turbulence at the downstream end of the proposed channel at high flow. Boulders will also be placed in the gaps of existing boulders in order to raise the tailwater in the deep plunge pool below the falls. Additionally, at least 20 to 30 large boulders greater than 500 cubic feet in volume will need to be shaped with rock breaking techniques described below in Section 2.1.2. Typical step-pool geometry is detailed in Appendix A, Sheet 15. The resulting passability that can be expected from this design is summarized in Table 2. For example, for the month of March, passage will be good 92% of the time. Steelhead is the predominant species present in March. Based on steelhead run timing in Peshastin Creek, March only represents 1% of the total steelhead run.

Month	Species	Passage Window	Percent of Run	Fish Passability Rating
March	Steelhead	92%	1%	Good
April	Steelhead	75%	55%	Good, Limited by High Flows
May 1-15	Steelhead	40%	85%	Fair, Limited by High Flows
July	Bull Trout	72%	?	Good, Limited by High Flows
August	Bull Trout	60%	?	Limited by Diversion Flows

Table 2. Summary of fish passability, Design Flow Range 800 to 80 cfs. Reproduced from Waterfall Engineering *et al* (2016, Table 3).

Implementation of this design will include the following modifications to Icicle Creek, beginning at the upstream end of the boulder field (see also Appendix A, Sheet 4 and photos at the end of this appendix):

- Increase flow into left side of split channel. To achieve this, Boulder 77 will be lowered two feet by removing approximately 5 cubic yards of rocks, which will be spoiled in the channel.
- Remove rock from left floodplain/road and create a 120-foot long step-pool channel. Approximately 3,800 cubic yards of rock will be excavated and hauled off site. The step-pool channel will have drops ranging from 3 to 5 feet with pools a minimum of 8 feet deep. The design flow range for the channel to provide fish passage is 80 to 800 cfs.

- Improve backwater and reduce turbulence to step-pool channel at the downstream end. To achieve this, Boulders 59, 50, 51, and 28 will be removed (approximately 300 cubic yards). The notch at Boulder 29 will be plugged to create a drop and backwater.

A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation to lower elevation to maximize slope stability. Typical excavation of the slope above the boulder field will occur using excavators and buckets to scoop rock and load into trucks, and possibly cranes with clam shells and dump trucks to transport rock off site. All rocks that are small enough (4 to 5-foot diameter) and can be reached by the excavator will simply be removed. When this is not possible, one of three methods will be used to break rocks into smaller pieces (described below in Section 2.1.2).

The channel will be constructed in the first year; an additional construction season the following year will allow for adaptive management to adjust flow and pool turbulence. In the first year of construction, two to three months will be required to complete the excavating, rock breaking, loading, and hauling. The second year of construction, if needed, will last up to two months.

Before any work is done below ordinary high water mark (OHWM), coffer dams constructed of clean fill and silt curtains will be used to isolate the work area from flowing water so that 90% of the boulder field excavation can be done in the dry (See Appendix A, Sheet 4). The coffer dams are expected to block flow and successfully dewater the left bank; areas that are above OHWM or can be successfully dewatered are shown in white on Sheet 4. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. Any fish in danger of being stranded during dewatering will be netted and returned to the main channel. Pumps may be used in areas with seepage to lower the water. Pumped water if contaminated with sediment will be pumped to an upper portion of the bank, or flat areas in the vicinity of the proposed new City of Leavenworth fish screenhouse, where infiltration can be successful. Clean pumped water will be pumped downstream past the work area.

2.1.1 Work Below Icicle Creek Ordinary High Water

The instream work will include areas that cannot be dewatered at the downstream end of the boulder field because of caves, overhanging ledges and very deep pools. These areas are shown in blue on Sheet 4. Even though water is expected to seep in between boulders in this part of the channel, the tops of the rocks will be dry during the time when this work will be completed (see photos at the end of Appendix A). The area that cannot be dewatered accounts for about 10% of

the boulder field step-pool channel work area. In these areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance (see Section 2.1.2). There are four boulders that will be broken in areas that cannot be dewatered: boulders 59, 50, 51, and 28 (Appendix A, between survey stations 1+75 and 2+50, shown in blue). Boulder 30 (shown in white), adjacent to boulder 28, is 8 feet above the water and hangs over a ten-foot-deep pool. Breaking of these five rocks is expected to occur over a two-week period, on weekdays, during daylight hours. Rock grouting may be required at the base of some rocks to maintain the desired pool depths. All work below OHWM will occur between July 1 and October 15 per group discussion with federal and state regulatory agencies² on a November 1 teleconference.

During multiple meetings with a project stakeholder group, the prospect of removing fish from these deep pools was discussed. The point was raised that trying to remove the fish from these deep pools may result in more harm than not handling the fish at all. Thus the approach being followed in this action is to remove fish only from those pools where flows could get low and temperatures could rise creating conditions which could be detrimental for fish. Fish in areas of deep pools and areas of subsurface flows that could sustain fish during the two weeks necessary to break these five rocks will be left where they are. A silt curtain will be installed at the downstream end of the boulder field to block fine sediments from entering the creek downstream.

The second year of construction will also include rock breaking, excavating, loading, and hauling that is potentially below OHWM, but for a shorter duration. This will occur between August 1 and September 30 to make relatively minor modifications based on how the channel has responded to the work completed in the first year of construction. Work in the second construction phase will also be on weekdays only, during daylight hours.

Access and staging will largely occur from the IPID gravel access road upslope from the boulder field (Figure 4). Additional staging may occur at two locations off-site (Figure 1, boxes east and west of the main work area). The first location is owned by the City of Leavenworth and lies east of the project site near the town cemetery (T24N, R17E, S23, SE1/4). City officials have conditionally approved this site. The second site is a gravel parking lot on USFS property, 1.4 miles west of the Snow Lakes Trailhead parking lot on Icicle Creek Road (T24N, R17E, S29, NE1/4). The USFS is still considering the request to use this area for staging. Staging activities

² Including USFWS, NMFS, USFS, WDFW, and WDOE.

will include temporary storage of equipment, material deliveries (pipe, fittings, pipe bedding sand, etc.). A temporary fence may be installed for security purposes. Staging of materials and equipment may be needed from April 1 through October 15, 2019 and August 1 to September 30, 2020.



Figure 4. Primary staging areas.

2.1.2 Rock-Breaking Methods

Two assessments were conducted in prior phases of work to evaluate rock breaking methods, as summarized in Toth and Swanson (2016). The three tools that were identified through these assessments for use in this action are 1) hydraulic rock breaking hammers mounted on the end of an excavator arm; 2) deflagrating low-velocity explosives; and 3) expansive demolition grout. In order to apply these tools, boulders may need to be excavated partially to have room for expansion. The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed.

1. Hydraulic Rock Hammer (Hoe Rammer) mounted on a Large Excavator

A hydraulic hammer, or hoe rammer will be used wherever it is feasible to access the rocks. As work advances downslope, the compressor will remain on the bank above and hand labor may be used to operate the hydraulic drill.

2. Low-velocity Deflagrating Explosives

There are two types of deflagrating explosives that may be used. Both use a nitrocellulose propellant (smokeless powder, also known as ball powder, or gun powder) and an ignition primer. These products break rock via a pressure impulse generated in the tool by a cartridge filled with propellant. The pressure impulse is directed via a barrel into a pre-drilled hole in the rock filled with water. The rapidly developing pressure wave transmitted by the fluid column creates fractures in the rock. The static pressure causes further mechanical stress and tensile fracturing of the rock. The propellant is low concussion with little flying rock and scatter. Blasting mats can be used to prevent even small amounts of flying rock.

The first type of deflagrating explosive uses a nitrocellulose propellant (i.e., smokeless powder) and a primer for ignition. The ignition product is the same cartridge that is used to fire nail guns. The product combusts completely when used under standard operating procedures. This is the only type of deflagrating explosive that will be allowed over the water and up to the elevation of ordinary high water. There are five rocks to be broken over or immediately adjacent to water. While the base of the rock may be in water, the area to be drilled and where rock-breaking agents will be placed will be above the water and dry. Photos of the five rocks to be broken are found at the end of Appendix A. One example of this type of deflagrating explosive is a product called Magnum Buster (formerly Boulder Buster) manufactured by RocBurst LLC. The material safety data sheets for this product and for its constituent components of smokeless powder and the ignition primer are attached in Appendix F. The complete combustion is attractive for use adjacent to aquatic environments. USFS has used Boulder Buster in many projects as has WDFW. The USFS describes this product as "...safe, cost-effective substitute for explosives when rocks need to be broken. This tool can be used safely relatively close to equipment and personnel. It can be used during periods of high fire danger without the risk of starting secondary fires"³. The US Bureau of Alcohol, Tobacco, Firearms and Explosives has designated Magnum Buster as a special explosive device that is exempt from the requirements of [27 CFR 555](#), which regulates commerce in explosives (see Appendix F).

The second type of deflagrating explosive combines smokeless powder with ammonium nitrate. One example, NxBurst, is a mixture comprised of 50% ammonium nitrate and 50% smokeless powder (in contrast to ANFO, which is comprised of 94% ammonium nitrate and 6% fuel oil). This product also combusts completely. However, because it does contain ammonium nitrate, this type of deflagrating explosive will not be used below OHWM; it will

³ See <https://www.fs.fed.us/eng/pubs/htmlpubs/htm98672840/intro.htm>

be used between OHWM and the 100-year flood elevation as a contingency method, when the other methods have not been effective. Based on Toth and Swanson's 2016 test of these tools on Icicle Creek boulders, we have high confidence that a product containing only smokeless powder and an ignition primer (and no ammonium nitrate) is capable of breaking the rocks in the project area; we expect use of a product similar in composition to NxBurst to be limited. A material safety data sheet for this product is also included in Appendix F.

3. Expanding Demolition Grout

Demolition grout (Dexpan or similar) has been used successfully by WDFW and others in a number of fish passage projects⁴ and is desirable because of its ability to sculpt rocks more precisely than can be achieved through a hydraulic hammer or deflagrating explosives. The grout may require 12 to 36 hours to crack the rock. A material safety data sheet for this product is also included in Appendix F.

Table 3 shows the estimated relative use of each method in each work area. Only five rocks totalling 116 cubic yards will be broken in the channel or below ordinary high water. All of these techniques crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. Toth and Swanson (2016) describe these methods in greater detail and include photographs of each tools' application to boulders taken from the shoreline of Icicle Creek. Maple Leaf Powder Company conducted additional testing and analysis of rock-breaking methods for use in the proposed action (see Toth and Swanson 2016, page 30). This included a vibration analysis (p. 34) that concluded that ground vibration associated with rock breaking in the channel would generate equal or less ground vibration than heavy equipment operated on the IPID access road. This conclusion is based on a worst-case scenario of high-velocity explosives in bedrock. Project conditions will be very low compared to the analyzed conditions because high-velocity explosives will not be used in this project and vibration travels through boulders much less efficiently than through bedrock. Use of high-velocity explosives in bedrock would generate a peak particle velocity (PPV) vibration of 7 meters per second at a distance of 50 feet from the blast site (see Toth and Swanson, p. 36). Maple Leaf Powder Company indicated that a PPV of 7 m/s is "close to being an undetectable amount of ground vibration". Heavy equipment operation on the IPID access road would generate a PPV of more than 7 m/s. The hydraulic hammer and low-impact explosives would generate even less vibration.

⁴ For example, see <http://georgianbaystewardship.ca/wp-content/uploads/2018/01/Photos-from-spring-field-work-restoration-work-for-website.pdf> and <http://www.crsalmonfoundation.ca/wp-content/uploads/2016/12/Quinsam-Fish-Passage-Construction-Report-Final.pdf>

Location	Rocks to be broken (no.)	Volume of Rock to be Broken by Method				Volume of rock dust generated (cy)	Weight of Smokeless Powder to be used (Magnum Buster) ⁽¹⁾ (lbs)	Weight of expansive grout to be used (Dexpan) ⁽²⁾ (lbs)	Weight of NxBurst to be used (lbs)
		Hoe Ram (hydraulic rock breaker) (cy)	Magnum Buster (or similar deflagrating low-velocity explosive) (cy)	Dexpan (expansive demolition grout) (cy)	NxBurst (or comparable) (deflagrating low-velocity explosive) (cy)				
		(no.)	(cy)	(cy)	(cy)				
Upper Excavation	⁽³⁾	1,384	123	31	0	0.40	8.1	698	0
Trench Excavation	⁽³⁾	278	25	6	0	0.08	1.6	140	0
Slope > 1,380 Elevation	⁽³⁾	259	23	6	0	0.07	1.5	130	0
Slope < 1,380' and > OHWM	21	1,533	639	383	213	0.35	42.6	337	118
Slope < OHWM and in Channel	5	0	58	58	0	0.24	3.8	267	0

Table 3. Rock breaking: estimated quantities of rocks to be broken, rock dust, and rock-breaking agents.

⁽¹⁾ Magnum Buster - Hole Spacing: 1 per/CY; diameter: 1.5"; depth 30" per/CY; Weight: 30 grams per/CY of rock

⁽²⁾ Dexpan - Hole Spacing: 4 per/CY; diameter: 2"; depth 30" per/CY; Weight: 23 lbs per/CY of rock (>1,380'); 4.6 lbs/CY (<1,380' and > OHWM); 0.9 lbs/CY (< OHWM)

⁽³⁾ Boulders were not counted

⁽⁴⁾ NxBurst hole spacing 2.5'; diameter: 1.5"; depth ½ way through rock; Weight 250g/CY of rock

The drilling necessary to employ deflagrating explosives and demolition grout, has the potential to generate rock dust. Dust control will be addressed through best management practices included in the technical specifications that will be part of the contract bid documents. Dust vacuuming systems are standard equipment when drilling rocks near water. Contractors will be required to meet turbidity standards by following WDOE's Stormwater Management Manual for eastern Washington (WDOE 2004). Contractors will be required to stop work if turbidity standards are not met.

2.2 Relocate and Replace City of Leavenworth Water Supply Pipeline and Fish Screen

Constructing the Icicle Creek boulder field Fish Passage Project will impact a portion of the City of Leavenworth's 16-inch steel water supply pipeline located on the left bank of Icicle Creek. In support of the fish passage project, the City of Leavenworth proposes to replace approximately 1,400 lineal feet of its water supply pipeline between its screen house (RM 5.7) and the western edge of the entrance to the Snow Lakes Trailhead parking lot.

Replacement of the water main will entail the following work:

- Breaking of existing boulders within the pipe excavation boundary to a size manageable by tracked excavators and dump trucks. Breaking of the boulders would be by hydraulic rock breaking hammer mounted on a tracked excavator, deflagrating low-velocity explosives, or demolition grout as described in Section 2.1.2 above.
- Removal from the pipe excavation area of the broken boulders and native material to a stockpile location on-site near the screen structure, estimated total of approximately 1,800 cubic yards of material, and cutting side slopes to approximate 1:1 slopes to allow excavation for pipe installation using tracked excavation equipment and dump trucks.
- Excavating pipe trench to install 16-inch ductile iron pipe, valves, fittings and appurtenances. Excavation to be approximately 7-foot depth, installing pipe and imported pipe bedding to 8 inches below and above pipe, and backfilling and compacting pipe trench with native material to result in installed pipe with generally 5 feet of earth cover using tracked excavation equipment and wheeled front loaders.
- Grading 12-foot wide access road generally centered over installed pipe along the length of the installed pipe between the screen structure and Snow Lakes Trailhead parking area and surfacing with imported crushed rock surfacing using tracked excavation equipment, wheeled loaders, dump trucks and drum rollers.

- Transfer broken boulders from temporary stockpile and machine place the broken angular boulders along the 1:1 cut slope areas along the access road and pipe alignment to provide permanent slope stabilization and restoration using tracked excavation equipment, dump trucks and wheeled loaders.
- The work will include construction of an access entrance to the construction site from the USFS road at the west end of the construction area near the existing screen structure. Access entrance to be constructed from native materials and rocks excavated from the site for the pipeline installation work. Excavation, placing and compaction of the material by tracked excavation equipment, dump trucks, wheeled loaders and drum rollers. Surfacing using imported crushed surfacing.
- Excavation area, slopes and other disturbed areas to be restored using either imported crushed surfacing, hydro seeded with native grasses and/or plantings and trees.

2.2.1 City of Leavenworth Fish Screen

The City of Leavenworth will install a compliant fish screen for their municipal water supply intake when they relocate the water supply pipeline. The existing screen no longer meets state or federal criteria (WDFW 2009; NMFS 2011) for velocity, opening area, screen area, and lack of active cleaning. The current fish screen is located upstream at the diversion dam (RM 5.7). The City of Leavenworth has a year-round water withdrawal of >2.0 cfs and a water right of 6.2 cfs at this point of diversion.

The City proposes to construct a new 16x34x20-foot screen structure in the vicinity of an existing debris screen house and connect to the existing water supply line. A new screen house will be constructed because the existing screen house is failing structurally and it will be demolished during construction. A concrete saw will cut or a boom mounted hydraulic hammer will break the existing concrete screenhouse into manageable sized pieces. Refuse will be loaded into trucks excavator and hauled to a disposal facility. The new screen location was selected due to increased operational safety for the City, reduction of icing issues at the screen, and lower cost for construction and maintenance. Excavation for the new structure will be to a depth of 16 feet to meet grade with the existing water supply pipe and forms will be set to pour concrete for the housing structure. The area where concrete will be poured is separated from flowing water by a horizontal distance of more than 40 feet and at a vertical depth of 16 feet. The contractor will be required to use BMPs that conform to WDOE's Stormwater Pollution Prevention Manual (2004). The existing collection chamber will remain in place so that it could be brought back into service at a future time if needed (see site layout, Figure 5).

An Intake Screens, Inc. (ISI) cone screen with a rotating brush cleaning mechanism will be installed in the screen housing. A 90% design of the fish screen and associated structures is included in Appendix C.

Construction will occur between April 1 and October 31. The existing IPID gravel access road will be used for construction access. A small spur up to Icicle Creek Road will be added on the upstream end of this road to provide a secondary access point for trucks and equipment due to the confined space of the work area. Creating the spur will require the removal of one 16-inch diameter ponderosa pine (*Pinus ponderosa*), one 12-inch black cottonwood (*Populus balsamifera* ssp *trichocarpa*) and three lodgepole pines (*Pinus contorta*) less than 6 inches in diameter. Additionally, a few deciduous small trees and shrubs will be cleared, including a few willow (*Salix* spp.) and red alder (*Alnus rubra*) in the area where the structure is proposed. The vegetation to be removed will be taken from the site. The trees are too small to provide fish habitat benefits as large wood in the channel. They would likely be washed out in the first high-flow event if they were placed in the channel or left in the riparian zone. They are too large however to successfully salvage and transplant. Disturbed areas will be replanted with native species following construction. Equipment will include excavators, dump trucks, concrete mixers, a boom truck, rollers, a bulldozer or grader, and small power tools.

2.2.2 Work Below OHWM

Fish bypass, sediment evacuation, and overflow pipes will be placed below Icicle Creek Ordinary High Water Mark (OHWM) on the left bank. A connection to the existing water line will be made near the collection chamber structure and new pipe will be installed upland from that point. The existing line will be abandoned in place to minimize disturbance to the riparian and stream corridor. Work below ordinary high water to connect to the water intake will occur between July 1 and October 15, per agreement with federal and state regulators on November 1, 2018.

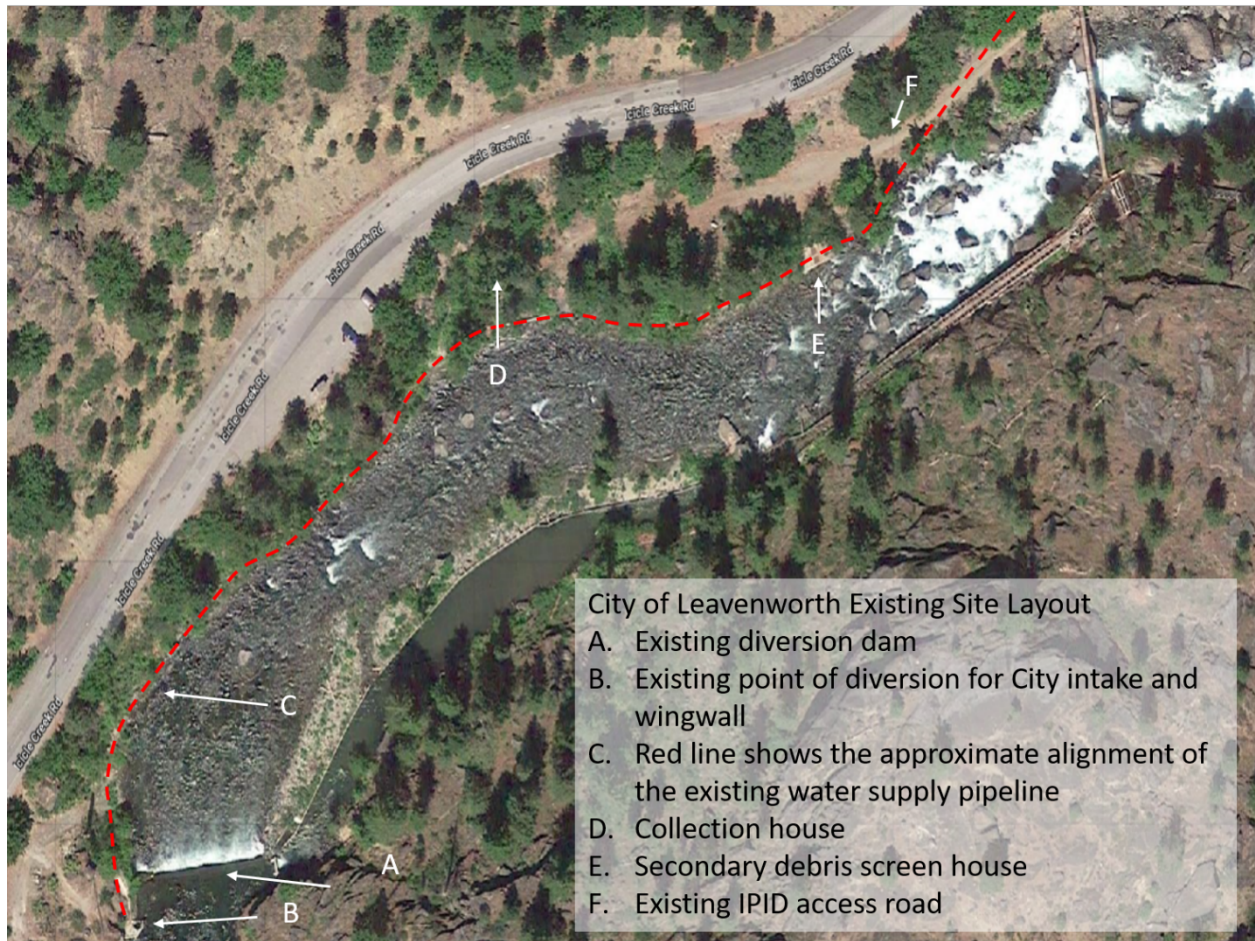


Figure 5. City of Leavenworth water supply pipeline layout.

2.3 Relocate and Replace the IPID Fish Screens

The IPID plans to replace the fish screens for their water diversion, to bring the screens up to current state and federal criteria. Fish are believed to be at high risk of impingement if entrained. The fish bypass releases fish via a 15-foot drop onto a boulder that is not submerged for most of the irrigation season, likely resulting in injury or death (USFWS 2011a). The IPID intake is presently on the right bank at the diversion dam (RM 5.7); water is directed via a canal that runs parallel to Icicle Creek for 800 feet down to the existing fish screens, where the canal turns southeast before crossing Snow Creek (Figure 6). IPID proposes to relocate the fish screen 1,000 feet downstream within their existing canal footprint at the Snow Creek diversion site. The new location was selected because it provides an adequate fish bypass back to Icicle Creek and because of IPID’s existing access road from Icicle Creek Road. WDFW completed topographic surveys, preliminary hydraulic modeling, and 90% designs with input from IPID. The drawings

are included in Appendix D. The new screen will be a vertical plate screen. The Snow Creek channel will be modified to create a low-flow fish bypass channel to ensure adequate fish return. This will involve reducing a few boulder drops and creating adequate pool depth below drops and will be accomplished with hand tools in the dry, when no water is being released from the Lakes/reservoirs (after October 15th). The existing drum screens will be decommissioned after the new screen construction is complete. The drum screen will be cut into pieces using a torch. Fire hazards will be low at this time. A water tanker truck will be used to spray the surrounding area (they will run the water hose from the truck to the site using the existing foot bridge). A person will also be on fire watch. Other equipment includes excavators, dump trucks, a boom truck, rollers, a bulldozer or grader, and small power tools.

- A. Existing Diversion Dam for Icicle-Peshastin Irrig Dist (IPID) & City of Leavenworth Intakes
- B. Existing Point of Diversion for IPID
- C. Existing Screens
- D. Existing Ditch
- E. Existing Access Road/Trail
- F. Existing Snow Lakes Trail Bridge



Figure 6. IPID Snow Creek site layout.

In order to use IPID's access road and the existing bridge over Icicle Creek for construction and ongoing maintenance, the 7-foot-wide footbridge across Icicle Creek will need to be modified. Use of this existing crossing over Icicle Creek will minimize disturbance. A separate biological assessment was written for that action (Ecolution and WDFW 2018) and consultation for this action is occurring separately.

2.3.1 Work Below Icicle Creek OHWM

To keep as much water in Icicle Creek as possible and reduce the amount of water and sediment that are currently diverted, a headgate will be installed at the head of the IPID ditch. A coffer dam will be installed comprised of bulk bags and visqueen to isolate the work area. Those will be placed with an excavator from dry ground near the point of diversion. Upon completion of the work the bulk bags will be removed and hauled offsite. Fish will be chased out of the work area with a seine net prior to completing the coffer dam. The pool will then be shocked and fish will be removed. Water within the work area will be evacuated by a pump while the installation takes place. There is no earthmoving work anticipated in conjunction with the installation of the headgate. The headgate will be affixed to an existing cast-in-place concrete frame. The gate is attached to the concrete frame by steel anchors and sealed with a ribbon of dry packed grout. The area must be dewatered during the placement and curing of the grout to maintain the quality of the seal. Keeping the area dewatered will also prevent contamination of any surface waters by grout.

Project Sequencing

Work on the City of Leavenworth water line, City of Leavenworth fish screen, and boulder field project elements will begin on April 1, 2019 or as soon thereafter that permits are in hand (Table 4); if permits are not acquired in time for 2019 construction, these dates will be shifted by one year. Excavation will initiate on upper slopes of the left bank and proceed downslope as described above. Work below OHWM will occur between July 1 and October 15, as determined during a November 1, 2018 conference call with USFWS, NMFS, USFS, WDFW, and WDOE. Rock-breaking over water will be completed over a two-week period most likely in August or September. Work on replacing the IPID fish screen will occur between October 1 and April 1, when irrigation withdrawals are not occurring in Icicle Creek and water is not being released from Snow Lakes into Snow Creek; the work will most likely be completed in November or December.

Stage	Start Date	End Date	Activity Description
1	4/1/19	10/31/19	<ul style="list-style-type: none"> a. City of Leavenworth (COL) Water Supply Pipeline Excavation on slope above OHWM. b. COL Screenhouse and Fish Screen: Excavation above OHWM. c. Finish grading, permanent surfacing, and landscape restoration above OHWM for water line, COL fish screen, and boulder field elements.
2	7/1/19	10/15/19	<ul style="list-style-type: none"> a. Water intake connection (below OHWM), will supply the COL fish screen and water supply pipeline. b. Boulder Field Fish Passage: step pool channel construction.
3	10/1/19	4/1/20	<ul style="list-style-type: none"> a. Install new IPID fish screen at the Snow Creek diversion site. b. Modify Snow Creek channel to ensure adequate fish bypass. c. Decommission old IPID fish screen.
4	4/1/20	10/31/20	<p>If not completed in prior year:</p> <ul style="list-style-type: none"> a. City of Leavenworth (COL) Water Supply Pipeline Excavation on slope above OHWM. b. COL Screenhouse and Fish Screen: Excavation above OHWM. a. Finish grading, permanent surfacing, and landscape restoration above OHWM for water line, COL fish screen and boulder field elements.
5	7/1/20	10/15/20	<p>If not completed in prior year:</p> <ul style="list-style-type: none"> d. Water intake connection (below OHWM), will supply the COL fish screen and water supply pipeline. <p>Boulder Field Fish Passage: step pool channel construction.</p>
6	7/15/21	10/15/21	Boulder Field Fish Passage: modifications to step-pool channel, if needed and not completed in prior year.

Table 4. Project sequencing

3.0 Action Area

The action area is in Township 24N, Range 17E, Sections 23, 27, 28, and 29 of the Willamette Meridian, Washington. The action area includes Icicle Creek between RM 5.5 and RM 5.7, the lower 800 feet of Snow Creek, and the riparian area on both sides of these creeks (Figure 1). The elevation of the project area ranges from 1,000-1,400 feet. The bulk of the action area falls within Chelan County parcel number 241727311250 owned by IPID. The City of Leavenworth owns adjacent property, as do the U.S. Fish and Wildlife Service, U.S. Forest Service, and private land holders.

The action area has limited development and lies within large swaths of federally protected national forest and wilderness area, but the watershed has a long history of human activity and disturbance. Sheep herding and mining were locally prevalent in the late 1800s (USFWS 2011d). More recently, timber harvest, road building, construction of in-water diversions and water withdrawals, hatchery operations, fires, fire suppression, development of campgrounds, private residences, and resort properties have occurred. The only structures within the action area are the irrigation and water line infrastructure which is the subject of this action. The Icicle Creek Road and Snow Lakes Trailhead parking lot frame the action area. The Snow Lakes Trail and associated Alpine Lakes Wilderness have heavy human recreational use and the action area is less than ten miles from resort areas. Outside of the Alpine Lakes Wilderness, 5% of Icicle Creek's watershed has been logged (USFS 1994). Private property owners have removed over 11% of the riparian vegetation along lower Icicle Creek (USFWS 2011d).

Geology and Soils

Given the importance in understanding geomorphic conditions for the successful implementation of the project, geology and soils have been extensively studied in prior phases of work (Aspect Consulting 2018; Toth and Swanson 2016; Waterfall Engineering et al 2016; Toth 2013).

Icicle Creek lies within a U-shaped valley carved by alpine glaciations. Icicle Creek is confined by bedrock outcrops, talus, and colluvium, leaving little to no floodplain along the project reach. Exposed bedrock is a dominant feature of the steep valley walls. The IPID irrigation canal and infrastructure are carved into this bedrock. The left bank has been further constrained by road construction for Icicle Creek Road (also called Forest Road 7600) and the lower IPID gravel access road. During road construction rocky material appears to have been deposited on top of large boulders on the margin of the Icicle Creek channel, to create a stable road prism and adjust grade. Areas where rocks were manually stacked during road construction are clearly evident along the fill slope (Toth and Swanson 2016).

General Habitat Conditions

The action area has suitable habitat for several fish, mammals, birds, and amphibians, which is summarized in general terms in this section. Detailed discussion of species and habitats protected under the federal Endangered Species Act is included in the effects analysis in Section 5 of this document.

Aquatic Habitat

Icicle Creek is a fourth order fish bearing tributary to the Wenatchee River. Icicle Creek has been designated as critical habitat for bull trout (*Salvelinus confluentus*) and steelhead trout (*Oncorhynchus mykiss*) and supports many other salmonids, including hatchery spring Chinook salmon (*Oncorhynchus tshawytscha*), hatchery coho salmon (*O. kisutch*), sockeye salmon (*O. nerka*), non-native brook trout (*Salvelinus fontinalis*), westslope cutthroat trout (*O. clarki lewisi*), redband trout (*O. mykiss gairdneri*), and mountain whitefish (*Prosopium williamsoni*). Icicle creek watershed also supports native non-salmonids including dace (*Rhinichthys* spp.), lamprey (*Lampetra* spp.), sculpin (*Cottus* spp.), and suckers (*Catostomus* spp.), among others (USFWS 2011d).

Icicle Creek is predominately fed by snowmelt. Measured flows range from 44 cubic feet per second (cfs) to 14,100 cfs, according to readings taken from U.S. Geological Survey (USGS) gage [12458000](#) at RM 5.8. Flows in Icicle Creek are altered by withdrawals for drinking water and agriculture and can be very low during summer and early fall. Mullan *et al* (1992) reported that the irrigation diversion can withdraw 48% and 79% of the average August and September flows, respectively. Without release of up to 50 cfs from the Snow Lakes reservoir, the downstream reaches of Icicle Creek could go dry in some years (USFWS 2004).

Snow Creek is designated as fish bearing by Washington Department of Natural Resources (WDNR 2017), however listed salmonids are not present (WDFW 2017; USFWS 2017). Access from Icicle Creek is limited due to a high gradient boulder field at the mouth of Snow Creek (D. Youkey, USFS, personal communication, January 30, 2018).

Forested Habitat

Forested habitats in the project area are dominated by ponderosa pine (*Pinus ponderosa*), western larch (*Larix occidentalis*), and Douglas-fir (*Pseudotsuga menziesii*). The understory of shrubs, berries, and grasses is generally sparse. A range of mammal species are found in the Alpine Lakes Wilderness including “mountain beaver (*Aplodontia rufa*), bobcat (*Lynx rufus*), hoary marmot (*Marmota caligata*), Douglas squirrel (*Tamiasciurus douglasii*), voles (*Microtus*

spp.), pika (*Ochotona princeps*), and striped skunk (*Mephitis mephitis*). The associated alpine forest habitat is known to support larger, wide-ranging mammals, including elk (*Cervus elaphus*), black-tailed deer (*Odocoileus hemionus*), black bear (*Ursus americanus*), cougar (*Felis concolor*), and coyote (*Canis latrans*) (USDI 2017).

Just upstream along Snow Creek near the proposed IPID screen replacement, forested riverine wetlands are present. Wetland habitats and riparian habitats associated with lake-fed streams support bats (*Myotis* spp.), shrews (*Sorex* spp.), and raccoon (*Procyon lotor*) (USDI 2017).

4.0 Species and Critical Habitats Considered

The species protected under the federal Endangered Species Act which may be present in the action area are summarized in Table 5. This list was developed using the USFWS online Information for Planning and Consultation tool (IPaC; see Appendix F) and was supplemented with information from the NOAA Fisheries web page (NOAA 2018). Final critical habitat has been designated for bull trout and steelhead and overlaps with the project action area.

Fish		
Bull Trout	<i>Salvelinus confluentus</i>	Threatened
Upper Columbia River Steelhead	<i>Oncorhynchus mykiss</i>	Threatened
Upper Columbia River Spring-run Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Endangered
Mammals		
Canada Lynx	<i>Lynx canadensis</i>	Threatened
Gray Wolf	<i>Canis lupus</i>	Endangered
Grizzly Bear	<i>Ursus arctos horribilis</i>	Threatened
American Wolverine	<i>Gulo luscus</i>	Proposed Threatened
Birds		
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Threatened
Northern Spotted Owl	<i>Strix occidentalis caurina</i>	Threatened
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Threatened
Plants		

Showy Stickseed	<i>Hackelia venusta</i>	Endangered
Wenatchee Mountains Checkermallow	<i>Sidalcea oregana</i> var. <i>Calva</i>	Endangered
Whitebark Pine	<i>Pinus albicaulis</i>	Candidate
Critical Habitat		
Bull trout	<i>Salvelinus confluentus</i>	Final
Upper Columbia River steelhead	<i>Oncorhynchus mykiss</i>	Final
Northern spotted owl	<i>Strix occidentalis caurina</i>	Final

Table 5. Species and habitats considered.

4.1 Species and Critical Habitats Excluded from Further Analysis

The project is expected to have **no effect** on several of the species and critical habitats identified in the initial list generated by the USFWS IPaC tool, including: the Canada lynx (*Lynx canadensis*), American wolverine (*Gulo luteus*), yellow-billed cuckoo (*Coccyzus americanus*), showy stickseed (*Hackelia venusta*), Wenatchee Mountains checkermallow (*Sidalcea oregano* var. *calva*), whitebark pine (*Pinus albicaulis*), and critical habitat for the northern spotted owl (*Strix occidentalis caurina*). The rationale for this conclusion for each species and critical habitat is discussed below; these species and habitats are not subsequently addressed within this document.

4.1.1 Canada Lynx (*Lynx canadensis*)

Washington’s Canada lynx population is largely restricted to western Okanogan and northern Chelan counties and the eastern edges of Whatcom and Skagit counties (Lewis 2016). WDFW believes that the only resident population of Canada lynx in Washington is found in western Okanogan County and is estimated at 54 individuals (Lewis 2016). There is no record of a Canada lynx sighting in the Icicle Creek Basin (USFWS 2011d); the lynx prefers subalpine and boreal forested environments over 4,600 feet in elevation (Lewis 2016), much higher than the action area. Recent sightings include a confirmed Canada lynx sighting in 2016 north of Lake Chelan in designated critical habitat, and an unverified observation on Entiat Ridge, roughly 30 miles north of Upper Snow Lakes (USDI 2017). Given the absence of Canada lynx observations in the Icicle Creek Basin, the project location not meeting habitat requirements, and the high human recreational use along the Snow Lakes Trail, Canada lynx will not be in the project area and thus project activities will have “**no effect**” on the Canada lynx.

4.1.2 North American Wolverine (*Gulo luscus*)

The Alpine Lakes Wilderness provides suitable habitat for the North American Wolverine. Wolverine tracks were recorded along the Snow Lakes Trail in the winter approximately five years ago and many observations have been recorded further west in the Icicle Creek drainage over the past ten years (USDI 2017). However, project activities will occur at an elevation of 1,400 feet and the wolverine is found in high mountain habitats at treeline where snow may be found well into May (USFWS 2018). Furthermore, the wolverine is likely to avoid areas of high human use, such as the lower portions of the Snow Lakes Trail where the proposed IPID screen will be replaced, particularly since there is suitable habitat with less disruption nearby. Any exposure the wolverine would have to the project would be in the form of temporary noise disturbance during construction. The majority of this noise will be generated between April 1 and October 31, however a reduced level of noise will be created by replacing the IPID screen between October 2019 and April 2020 and modifications to the step-pool channel in Icicle Creek August and September 2020. The project will have “**no effect**” on the North American wolverine.

4.1.3 Yellow-billed Cuckoo (*Coccyzus americanus*)

Described as “abundant” along the Columbia River along the 1830s, there are no recorded observations of yellow-billed cuckoo in Chelan County, save for two unconfirmed observations in Chelan or Okanagan county in 1895-1896 (Wiles and Kalasz 2017). The most recent records were near Winthrop (70 miles from the action area) in 2015 (Wiles and Kalasz 2017), Omak (80 miles away) in 1990, two individuals in Tonasket (100 miles away) in 1991 and 1992, and downtown Seattle in 1997 (D. Youkey, personal communication, January 30, 2018). Because the action area does not contain suitable nesting habitat and there are no documented observations in the vicinity, the proposed actions will have “**no effect**” on yellow-billed cuckoos.

4.1.4 Marbled Murrelet (*Brachyramphus marmoratus*)

At 80 miles to coastal waters, the project action area is outside the 55-mile marine foraging zone and outside the critical habitat designated for marbled murrelet. Suitable habitat is not found within 25 miles of the action area (D. Youkey, personal communication, October 22, 2018). The project will therefore have “**no effect**” on marbled murrelets.

3.1.5. Showy Stickseed (*Hackelia venusta*)

Showy Stickseed is a local endemic with distribution limited to the Wenatchee Mountains at elevations between 1,500 and 7,400 feet. It is restricted to loose granitic sand and crevices in granite or talus (WDNR 2018). It’s very limited range is higher in elevation and outside the

project area (L. Malmquist, USFS, personal communication, January 30, 2018) and thus project activities would have “**no effect**” on showy stickseed.

4.1.6 Wenatchee Mountains Checkermallow (*Sidalcea oregana* var. *calva*)

This species is endemic to Washington and has historically been found in an area roughly 3 by 11 miles extending south-southeast of Leavenworth, Washington (WDNR 2018). Wenatchee Mountains checkermallow often grows in association with Wenatchee larkspur (*Delphinium viridescens*) and is found in moist meadows having surface water or saturated soils present into early summer. It may also occur in open stands of Douglas-fir (*Pseudotsuga menziesii*) and Ponderosa pine (*Pinus ponderosa*) and along edges of hardwood and shrub thickets (WDNR 2018). The species typically occurs between 1,900 and 3,200 feet in elevation, which is higher than the action area. The USFS Wenatchee River Ranger District has confirmed that the checkermallow is not believed to be in the project area (L. Malmquist, personal communication, January 30, 2018). Another recent environmental assessment concluded that this species was not in the vicinity of Upper Snow Lake (USDI 2017). The species is not present and therefore the project poses “**no effect**” to the Wenatchee Mountains checkermallow.

4.1.6 Whitebark Pine (*Pinus albicaulis*)

Whitebark Pine is typically found at elevations higher than 5,300 feet (USFWS 2017a). Project activities will occur at elevations between 1,000 and 1,400 feet. For this reason, project activities will have “**no effect**” on whitebark pine.

4.1.7 Northern Spotted Owl (*Strix occidentalis caurina*) Critical Habitat

The project is within the boundary of Unit 7, subunit ECN-3, of designated critical habitat for the northern spotted owl, but the specific location does not support biological or physical features required by the owl. Tree size is too small, and canopy cover too low. Removal of a 16-inch dbh ponderosa pine, a 12-inch cottonwood, and a few alder bushes will not alter any primary constituent elements identified for the owl, therefore the actions will have “**no effect**” on northern spotted owl critical habitat.

4.2 Species and Critical Habitats Analyzed

Several species and critical habitats may be present and affected by the proposed actions, including steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), Chinook (*O. tshawytscha*), gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos horribilis*), and northern spotted owl (*Strix occidentalis caurina*). These species are the focus of this BA. The status, range,

and habitat requirements are described below; potential project effects to these species and their critical habitats are addressed in Section 5.

4.2.1 Bull Trout (*Salvelinus confluentus*)

Extensive documentation of bull trout population status and environmental baseline is compiled in the 2011 LNFH Biological Assessment and 2011 LNFH Biological Opinion (USFWS 2011a and 2011b); these documents are incorporated here by reference. This information is supported by extensive analysis of fish presence, passage, and migration in Icicle Creek (Nelson 2010 and 2012; Nelson *et al.* 2009 and 2011; Ringel 1997 and 1998). Additionally, the USFWS Mid-Columbia Fish and Wildlife Conservation Office has enumerated adult spring-run Chinook and bull trout via snorkel surveys every year since 2003, with a consistent methodology since 2006 (USFWS 2017b). Bull trout numbers are low, even below the boulder field (Figure 7), which contributes to the subpopulation characteristics (Table 6). Currently, upstream habitat is accessible infrequently; fish passage is limited at the boulder field at most flow conditions (Dominguez *et al.* 2013), however some passage may occur. Migratory-sized bull trout have been observed upstream of the boulder falls in 2002, 2004, 2006, 2007, and 2009 (USFWS 2011d).

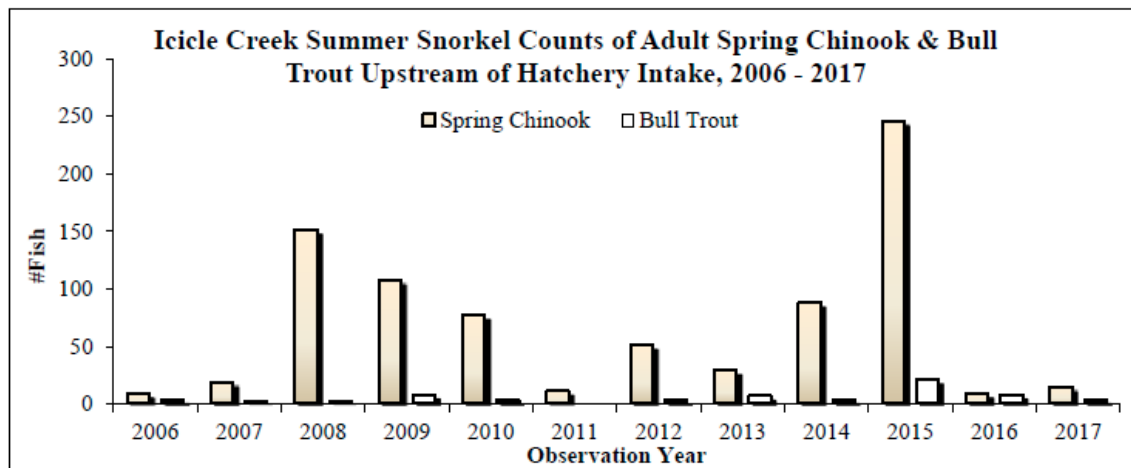


Figure 7. Snorkel surveys above the LNFH water intake (just downstream of the boulder field) by year (reproduced from USFWS 2017b).

Subpopulation Size	Functioning at Risk
Growth and Survival	Functioning at Risk
Life History Diversity and Isolation	Functioning at Risk
Persistence and Genetic Integrity	Functioning at Risk

Table 6. Icicle Creek bull trout subpopulation characteristics, based on the USFWS’s Draft Matrix of Diagnostic/Pathways. Reproduced from USFWS (2011a) and updated by USFS (2017).

The 2011 Biological Opinion (USFWS 2011a) provided a detailed description of the current condition of habitat throughout Icicle Creek and this document is incorporated here by reference. Several fires have occurred in the Icicle Creek watershed and adjacent watersheds since 2011, which have the potential to affect bull trout and steelhead critical habitat. The extent of these fires and suppression methods deployed has been documented by the USFS (2017) and are briefly summarized here. The Wenatchee Complex and Jack Creek fires burned 2.3 and 3 percent of the Icicle Creek watershed respectively, when considered at the scale of the 5th field Hydrologic Unit Code (HUC). The Wenatchee Complex fire occurred in 2012 and of the 2.3% of the Icicle Creek watershed burned, 24% experienced a high-severity burn. Fire severity is descriptive of the degree of watershed impairment and does not reflect the amount of canopy loss. High severity burn in the watershed was found on steep slopes above tributaries to Icicle Creek. The Jack Creek fire burned 3% of the Icicle Creek watershed (HUC5) in 2017. The area in the watershed that was burned at moderate-high severity was less than 2% (USFS 2017). Hand lines were the only fire suppression treatment applied in the Wenatchee Complex fire; no fire retardants were dropped (USFS 2017). A total of 1.4 miles in the Icicle Creek watershed were treated with hand lines in fighting the fire, whereby all fuels are removed to expose mineral soil. Following the fire, the hand lines were rehabilitated by pulling materials back over the line, including soil, duff, logs, and rocks. No suppression actions were taken in the Jack Creek fire.

Intense forest fires can affect surface water quality through increased runoff, sedimentation and erosion, loss of vegetation in the riparian zone which can lead to increased water temperatures and loss of nutrient inputs, change in water quality chemistry, and introduction of fire-fighting chemical control agents when used. The following discussion of impacts resulting from the Wenatchee Complex and Jack Creek fires is drawn from the USFS (2017) evaluation. The Eightmile Creek subwatershed has high potential for impacts due to 14% of the riparian reserves burned, of which 50% burned with moderate-high severity. Short-term impacts expected include increased levels of sediment and turbidity, nutrients, substrate, diminished pool frequency and quality, width to depth ratios, and streambank condition. Long-term impacts could be expected in Eightmile Creek due to the riparian reserve losses and may include locally elevated temperatures and reduced large woody debris recruitment. However, the high-severity burn areas were not extensive enough in the Icicle Creek watershed to affect the environmental baseline. The USFS assessed the subpopulation characteristics and baseline habitat indicators in the context of the Matrix of Pathway Indicators, both before and after the fires (see USFS 2017, page 57). In all cases, USFS determined that the fires resulted in no change to the 2010 environmental baseline used as a point of reference. Other than the forest fires described above,

we did not identify any events which would affect the environmental baseline in a positive or negative way.

The 2011 Biological Opinion applied the *Matrix of Diagnostics/Pathways and Indicators* (USFWS 2011b) to summarize baseline environmental conditions (Table 7). The matrix is designed for use with indicators aggregated at the scale of the 5th or 6th field HUC and thus the area included in the analysis of habitat indicators include Icicle Creek from its mouth to RM 26 (above Leland Creek), Snow and Nada Lakes Basin, and Snow Creek between Snow Lakes and Icicle Creek.

Habitat Indicator	Condition (USFWS 2011; updated by USFS 2017)
Water Quality	
Temperature	Functioning at Unacceptable Risk
Sediment/Turbidity	Functioning at Risk
Chemical Contamination/Nutrients	Functioning at Unacceptable Risk
Habitat Access	
Physical Barriers	Functioning at Unacceptable Risk
Habitat Elements	
Substrate Embeddedness	Functioning at Unacceptable Risk
Large Woody Debris	Functioning at Risk
Pool Frequency and Quality	Functioning at Unacceptable Risk
Large Pools	Functioning at Risk
Off-channel Habitat	Functioning at Risk
Refugia	Functioning at Risk
Channel Condition and Dynamics	
Width/Depth Ratio	Functioning at Risk
Stream Bank Condition	Functioning at Risk
Floodplain Connectivity	Functioning at Risk
Flow/Hydrology	
Change in Peak/Base Flows	Functioning at Unacceptable Risk
Increase in Drainage Network	Functioning at Risk
Watershed Conditions	
Road Density and Location	Functioning at Risk
Riparian Conservation Areas	Functioning at Risk
Disturbance Regime	Functioning at Risk
Integration of Species and Habitat Conditions	Functioning at Risk

Table 7. The habitat criteria and associated status per the USFWS Matrix of Diagnostics/Pathways and Indicators

Bull trout critical habitat (75 FR 63898) is comprised of nine Primary Constituent Elements (PCEs) summarized by USFWS (2011a). The USFWS has determined that these PCEs are essential for the conservation of bull trout and may require special management considerations or protection:

1. Springs, seeps, groundwater sources, and subsurface water connectivity (hyporheic flows) to contribute to water quality and quantity and provide thermal refugia.
2. Migration habitats with minimal physical, biological, or water quality impediments between spawning, rearing, overwintering, and freshwater and marine foraging habitats, including but not limited to permanent, partial, intermittent, or seasonal barriers.
3. An abundant food base, including terrestrial organisms of riparian origin, aquatic macro invertebrates, and forage fish.
4. Complex river, stream, lake, reservoir, and marine shoreline aquatic environments, and processes that establish and maintain these aquatic environments with features such as large wood, side channels, pools, undercut banks and unembedded substrates to provide a variety of depths, gradients, velocities, and structure.
5. Water temperatures ranging from 2 to 15 °C (36 to 59 °F), with adequate thermal refugia available for temperatures that exceed the upper end of this range. Specific temperatures within this range will depend on bull trout life-history stage and form; geography; elevation; diurnal and seasonal variation; shading, such as that provided by riparian habitat; stream flow; and local groundwater influence.
6. In spawning and rearing areas, substrate of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine sediment, generally ranging in size from silt to coarse sand, embedded in larger substrates is characteristic of these conditions. The size and amount of fine sediment suitable to bull trout will likely vary from system to system.
7. A natural hydrograph, including peak, high, low, and base flows within historic and seasonal ranges or, if flows are controlled, minimal flow departure from a natural hydrograph.
8. Sufficient water quality and quantity such that normal reproduction, growth, and survival are not inhibited.
9. Sufficiently low levels of occurrence of nonnative predatory (i.e. lake trout, walleye, northern pike, smallmouth bass); interbreeding (i.e. brook trout); or competing (i.e. brown trout) species that, if present, are adequately temporally and spatially isolated from bull trout.

How the project affects these habitat elements is assessed and summarized in section 6.

4.2.2 Steelhead Trout (*Oncorhynchus mykiss*)

Status

The Upper Columbia River steelhead Distinct Population Segment (DPS) was listed as Endangered under the ESA in 1997 and was reclassified as Threatened in 2006 and 2009 (74 FR 42605). The DPS includes naturally spawned anadromous *O. mykiss* (steelhead) originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.-Canada border. The DPS also includes *O. mykiss* from six artificial propagation programs: Wenatchee River Program, Wells Hatchery Program (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery Program, Omak Creek Program, and Ringold Hatchery Program; *O. mykiss* originating from the LNFH are not part of the listing.

The Wenatchee/Methow major population group has four extant populations: Wenatchee River, Entiat River, Methow River, and Okanogan River. The Crab Creek population is functionally extirpated. To meet recovery goals, three populations must meet viability criteria, two of which must meet high viability criteria; all steelhead populations, except the Crab Creek population, must meet abundance and productivity criteria that are consistent with a 5 percent extinction risk over a 100-year period (UCSRB 2007). Natural origin abundance and productivity are below viability thresholds for three of the four Upper Columbia River *O. mykiss* populations, though numbers have increased since the 1990s (NOAA 2016). Genetic diversity is also of concern; the proportion of hatchery-origin spawners on the spawning grounds is high across the DPS (NOAA 2016).

Range

O. mykiss is found from the Bering Sea, Bristol Bay and coastal streams of Alaska south to central California. Many tributaries to the Columbia and Snake Rivers have *O. mykiss* present, as do most streams in the Puget Sound. Winter steelhead populations have been documented in the Soleduck, Bogachiel, Hoh, Humptulips, Chehalis, Willapa, Cowlitz, Toutle, Kalama, Lewis, Washougal, Nisqually, Puyallup, Green, Snoqualmie, Skykomish, and Skagit rivers. Summer steelhead populations have been documented in Elwha, Queets, Wynoochee, Cowlitz, Toutle, Kalama, Lewis, Washougal, Wind, White Salmon, Klickitat, Walla Walla, Snake, Yakima, Columbia, Wenatchee, Methow, Green, Skykomish, Stillaguamish, and Skagit rivers (USFWS 2004b).

Habitat Requirements

Upper Columbia River *O. mykiss* have a complex life history. Adults enter the Columbia River in late summer and early fall. Some remain in the mainstem reservoirs to overwinter, passing

above the mainstem dams in April and May of the following year. Spawning in the tributaries does not occur until late spring of the year following entry into the Columbia river. For the last two decades, most steelhead spawning naturally are of hatchery origin (UCSRB 2007). Non-anadromous and anadromous forms of *O. mykiss* often co-occur, particularly in inland populations or where a migration barrier is present. The inland non-anadromous form is generally referred to as the Columbia River redband trout (USFWS 2004b).

Icicle Creek O. mykiss

Much remains unknown about adult *O. mykiss* use of Icicle Creek. Spawning occurs in the spring when the river is discharge high and surveys are difficult to implement (Hall *et al* 2014). Icicle Creek historically is thought to have produced wild steelhead (USFWS 2004b). Hatchery-origin steelhead have been planted across the Wenatchee Basin for decades, with a first release of LNFH steelhead into Icicle Creek occurring in 1941; the last release occurred in 1997 (Hall *et al* 2014). The Rock Island Dam brood stock was used at LNFH, with additional eggs from the Wells State Fish Hatchery in low return years (USFWS 2004b). However, LNFH-origin *O. mykiss* have not been present in icicle Creek since around 2000. Thus, *O. mykiss* currently found in Icicle Creek are either of natural origin or originate from other hatcheries within the Basin. Based on Passive Integrated Transponders (PIT) detections in 2012 and 2013, both wild fish and hatchery strays are using Icicle Creek for spawning and holding (Hall *et al* 2014). Both juvenile steelhead and resident rainbow trout are present in Icicle Creek. Snorkel survey data collected from below the boulder field to Trapper Creek (Ringel 1997) indicate that 99% of the juvenile fish are *O. mykiss*. The presence of anadromous *O. mykiss* is presumed, given the presence of anadromous adults spawning in Icicle Creek. Upper Columbia River *O. mykiss* do not occur in Snow Creek; access to Snow Creek is blocked by a high-gradient boulder field near its mouth (D. Youkey, personal communication, January 30, 2018).

O. mykiss migration and spawning typically occurs between March and April and may extend to mid-May. Some biologists conjecture that spawning may also occur in October and November⁵. The area immediately below the boulder field is generally poor spawning habitat. An expert panel estimated in 2005 that less than 300 square feet of habitat was present that was suitable for *O. mykiss* spawning (Hall *et al* 2014). In the Historic Channel of the LNFH immediately downstream however the group identified nearly 20,000 square feet of suitable *O. mykiss* spawning habitat. This area also holds some of the best juvenile rearing habitat in Icicle Creek below the boulder field (Hall *et al* 2014).

⁵ Per March 1, 2018 teleconference with Jeremy Cram (WDFW), Amanda Barg (WDFW), Judy Neibauer (USFWS), and Sierra Franks (USFWS).

4.2.3 Chinook Salmon (*Oncorhynchus tshawytscha*)

Status

The Upper Columbia River spring-run Chinook ESU was listed as Endangered in 1999 (50 CFR 224.101). The listing includes naturally spawned individuals that originate from Columbia River tributaries between Rock Island Dam and Chief Joseph Dam (excluding the Okanagan subbasin). Chinook salmon from six hatchery programs are included in the listing, however the Leavenworth National Fish Hatchery is not among them, thus Chinook originating from the LNFH are not listed (NOAA 2016). Abundance and productivity for the ESU are well below the targets for viability identified in the Upper Columbia Recovery Plan for all three populations (Wenatchee, Entiat, and Methow; UCSRB 2007); all three populations are at high risk (NOAA 2016). All three populations have a low risk rating for spatial structure and a high risk rating for diversity. All three populations remain at high risk for extinction overall, though the status of the ESU has improved in some regards since the listing (NOAA 2016). In addition to the Upper Columbia River ESU, the Lower Columbia River Chinook is listed as Threatened, the Snake River fall and spring runs are listed as Threatened, and the Puget Sound Chinook is listed as Threatened.

Range

The historical range of Chinook salmon in North America extends from the Ventura River in California to Point Hope, Alaska. The historical range in northeastern Asia extends from Hokkaido, Japan to the Anadyr River in Russia (USFWS 2004b).

Habitat Requirements

Chinook require freshwater, estuarine, coastal, and open ocean environments. Chinook can be characterized generally as having two overarching life history strategies: “stream type”, and “ocean type”. Upper Columbia River Spring Chinook follow a stream-type life history strategy, with variations within this general strategy (USFWS 2004b). Spring Chinook enter the Columbia River in early spring with the run hitting its peak in mid-May (UCSRB 2007). These fish enter the Upper Columbia tributaries between April and July, holding until conditions are favorable for spawning, which occurs in late summer, reaching a peak in mid to late August. Juvenile spring Chinook remain in freshwater for one year before migrating to salt water in the spring of their second year. Most Upper Columbia spring Chinook reside in the ocean for two to three years before returning as adults. Some fish will return early (precocious males and males that mature in freshwater without migrating to the ocean). The primary life history pathway

observed however is one of adults returning from the ocean as four- and five-year-old fish that have spent two and three years at sea, respectively (UCSRB 2007).

Stream-type juvenile Chinook disperse downstream and feed on drift insects and zooplankton. As they mature, they move to littoral habitats and the prey base shifts to shallow epibenthic organisms and larger pelagic species (USFWS 2004b). Chinook require cool, clear water and diverse habitats including pools, riffles, off-channel habitat, undercut banks, and complex structure including large woody debris or boulders for cover and shelter. Riparian vegetation is important for keeping temperatures cool, nutrient inputs, and streambank stabilization (USFWS 2004b).

Icicle Creek Chinook

Spring Chinook enter Icicle Creek from early May through mid-July. These fish begin trying to spawn in August and will remain in the system attempting to spawn until the second or third week of September (T. Maitland, WDFW, personal communication, March 1, 2018). Spring-run Chinook adults found in Icicle Creek are generally hatchery stock returning to LNFH, though wild strays do occur. Chinook spawning naturally below the hatchery are thought to have originated from LNFH (USFWS 2002). Spring Chinook returning to Icicle Creek not only provide broodstock for the hatchery operations, but in most years, sufficient numbers are present to allow a subsistence tribal fishery and a non-tribal sport fishery which both occur downstream of the project area. WDFW identifies Icicle Creek above the boulder field as potential habitat for Chinook, if accessible (WDFW 2018).

4.2.4 Gray Wolf (*Canis lupus*)

Status

The gray wolf was listed as endangered under the ESA in 1978 (USFWS 2018). Wolves in the eastern third of Washington were removed from federal ESA protection in 2011. Wolves in the western two-thirds of Washington continue to be listed as Endangered under the ESA and are protected.

Range

Wolves are native to Washington and originally occupied much of the continental United States; their current range is a small portion of its former extent (USFWS 2011). The Wolf was nearly extirpated from Washington in the early 1900s (WDFW 2018; USFWS 2011). Wolves are returning to Washington however and are dispersing from other states and provinces (WDFW 2018). WDFW enumerates wolves in each of the known packs in eastern and northeastern

Washington through tracking surveys and telemetry studies. Current population size is estimated to be at least 115 individuals in 20 known packs, including 10 breeding pairs, which is a 28% increase from 2015 estimates (WDFW *et al* 2017). Packs range in size from 2 to 13 individuals. Packs have been identified and are tracked in Kittitas, Okanagan, Ferry, Stevens, and Pend Oreille counties; WDFW also surveys new areas for signs of wolves (WDFW 2018). There are three recovery areas in Washington: Eastern Washington; the Northern Cascades; and the Southern Cascades and Northwest Coast (WDFW *et al* 2017).

Habitat Requirements

Gray wolves are native to Washington and occupy diverse habitats including temperate forests, tundra, taiga, and grasslands (USFWS 2018). Wolf territories are typically 70-800 square miles (USFWS 2011d). Wolves prefer areas without human disturbance and harassment, have low road densities, and which have large numbers of prey species (deer, elk, goat, moose, and beaver). Deer comprise the bulk of their diet (USFWS 2011d). Wolves follow ungulate herds (deer, elk, and moose) through forest and open meadows. Predominant forest species include white pine, lodge pole pine, Douglas fir, larch, subalpine fir, and grand fir (USFWS 2011d). Denning occurs between April and June; den sites are typically in close proximity to forest cover and far from human disturbance. Pups remain near the den for six to eight weeks and then relocate to a rendezvous site until they can hunt; the pack then travels throughout its territory (USFWS 2011d).

Icicle Creek Gray Wolf

The project area contains habitat that would be suitable for wolves. However, there are no known rendezvous or denning sites near the proposed project. A wolf pack has denned roughly 10 miles south of Snow Lakes in the Teanaway Valley over the past five years, however observations have not been made closer to Icicle Creek (USDI 2017; USFWS 2011d). In 1992, a Class I sighting was confirmed through a solicited howling response of an individual in the Alpine Lakes Wilderness Area (USFWS 2011d), within 20 miles of the project area. Deer and elk and other prey for wolves can be found in the study area and in abundance in the Alpine Lakes Wilderness.

4.2.5 Grizzly Bear (*Ursus arctos horribilis*)

Status

The grizzly bear is one of the subspecies of brown bears. The grizzly bear was listed as a threatened species in the coterminous United States in 1975. Factors leading to the decline of this species include livestock depredation control, habitat deterioration, commercial trapping,

unregulated hunting, and protection of human life (USFWS 1993). In the 2011 five-year status review, current threats to the North Cascades recovery zone include very small population size, disturbance by motorized vehicles, and genetic isolation due to population fragmentation. Washington has two of the six ecosystems identified in the grizzly bear recovery plan: the Northern Cascades and the Selkirk Mountains (WDFW 2012a). The North Cascades and Selkirk Mountains distinct population segments “warranted but were precluded” from an Endangered listing at that time (WDFW 2012a). As of 2012, the grizzly bear population size was estimated at 6 individuals within the North Cascades Ecosystem, and 80 individuals within the Selkirk Mountains Ecosystem (WDFW 2012a).

Range

Grizzly bears occupy diverse habitats in North America, Europe and Asia. Prior to European settlement in North America, the grizzly bear occupied most of Alaska and much of the contiguous western United States, central Mexico, and Canada. By the 1930s, the grizzly had been reduced to 2% of its historic range in the coterminous United States (WDFW 2012a). Grizzly bears were present in most of Washington historically, except for the Olympic Peninsula and lowlands west of the Cascades. Presently in Washington, the grizzly’s range is limited to the Northern Cascades and the Selkirk Mountains.

Habitat Requirements

Brown bears live in a wider range of habitats than other bears, including boreal forests, arctic tundra, coniferous forests, deciduous forests, coastal rainforests, alpine areas, and desert (USFWS 2016). Grizzly bears basic needs are met with food, habitat for seasonal foraging and denning, and a sufficient area to meet these needs. Grizzly bears select habitat based on isolation from human disturbance, food availability and distribution, and denning security. Grizzly bears generally move seasonally, accessing low elevation meadows and riparian areas in the spring, using higher elevations during the summer and fall, and denning in high isolated areas in winter (USFWS 2011d). Grizzly bear home ranges may overlap and change densities based on environmental conditions; they are not considered territorial (WDFW 2012a).

Little is known about the North Cascades grizzly bear distinct population segment. Biologists believe that North Cascades bears select habitat similar to bears from other areas concentrating their use in mixed shrub fields, meadows, old burns, cleared forest, and snow chutes, but telemetry studies are lacking. Information from studies in the Selkirk Mountains and other areas indicate that denning is associated with north facing slopes over 6,000 feet in elevation where snow drifts and remains through warming temperatures (USFWS 2011d). Prior to denning,

bears increase fat reserves with a dramatic increase in consumption of foods rich in protein and carbohydrate. Grizzlies are omnivorous and opportunistic; they will eat whatever is available, including living or dead animals, fish, berries, insects, and garbage (WDFW 2012a). Bears enter dens in October or November. After the cubs are born in February, bears leave the den site and move to low elevation areas to feed on new plant growth and ungulates. Emerging grasses, forbs, and budding shrubs provide food in spring and bears will follow emerging vegetation as it advances upslope, foraging over 3,000 feet in elevation in summer. Breeding occurs between May and July. Grizzly bears forage on berries such as huckleberry, serviceberry, rose, and strawberry in late summer and fall. Bears return to high elevation and denning areas in September or October. Increasing road density is associated with increasing human disturbance in grizzly habitat, which is known to affect bear use of seasonal habitat and may lead to habitat avoidance. (USFWS 2011d).

Icicle Creek Grizzly Bear

Grizzly bears were historically present throughout the Wenatchee National Forest. The project is within the Icicle Bear Management Unit of the North Cascades Grizzly Bear Recovery Zone. The Alpine Lakes Wilderness and the project area itself have suitable habitat for the grizzly bear. However, given the high recreational use along Snow Creek Trail, residences along Icicle Creek, and associated road density, the action area does not include quality habitat, refugia, or core area. The most recent confirmed track was in the North Cascades near the Canadian border. A track was found within five miles southeast of the project area in 1991. Given the high human disturbance in the vicinity, the presence of grizzly bears in the action area and the opportunity for a direct impact is unlikely, particularly since suitable habitat is located relatively close with much less human presence (D. Youkey, personal communication, January 30, 2018).

4.2.7 Northern Spotted Owl (*Strix occidentalis caurina*)

Status

The northern spotted owl was listed as federally threatened in June 1990. In 1994, there were 5,431 documented locations of owl pairs or resident singles, with 16% (851 sites) of those in Washington State (USFWS 2011e). These numbers reflect the cumulative number of sites identified across Washington, Oregon and California, and not a population estimate. Because it is impossible to survey all possible habitat on a regular basis, and because known sites may become abandoned over time, the current number of owl locations is unknown (USFWS 2011e). The owl has become rare in British Columbia, southwestern Washington, and the coastal ranges of Oregon. Past and present loss and fragmentation of suitable habitat and competition from barred owls are the most significant threats facing spotted owls. Other possible threats include

loss of genetic variation associated with small population size and isolation of populations; disease; and inadequacy of regulatory mechanisms (USFWS 2011e).

Range

The northern spotted owl occurs in late successional forest habitats from British Columbia to northern California. It is one of three subspecies of spotted owls: northern, California, and Mexican. The current range of the northern spotted owl is similar to its historic range (USFWS 2011d).

Habitat requirements

The northern spotted owl is strongly associated with mature and old growth forest habitats (USFWS 2011e). The owl also occurs in some younger forest types where the structural attributes of old growth forests are present (WDNR 1997). Nesting, roosting, and feeding may occur in a range of habitat types, however owls show preference for forest canopies with structural diversity and a multi-layered canopy (USDI 1992). Owls select cavities, broken-top trees, or platforms for nesting and roosting. Foraging habitat is more diverse than nesting or roosting habitat but is also most often closed canopy forest with high structural complexity. Small mammals, birds and insects comprise the owl's diet (USFWS 2011e). Breeding begins in February or March, with juvenile owls dispersing in early fall (USDI 1992). Owls can disperse across fragmented habitats, however dispersal habitat across the range of the northern spotted owl is critical for the linkage to other habitat blocks and maintenance of genetic diversity and persistence of the species (USFWS 2011e).

Icicle Creek Northern Spotted Owl

The project action area lies within the range of the northern spotted owl, however suitable habitat for the spotted owl is not present within one mile of the action area (D. Youkey, personal communication, October 22, 2018). While there are no recent surveys of the area, past surveys within the action area did not detect the presence of nesting northern spotted owls. The closest recorded nest site is roughly 3 miles east of the project area, along a creek on the far side of a high ridge (D. Youkey, personal communication, October 22, 2018). The Boundary Butte Late Successional Reserve (LSR) is located approximately half mile to the south in national forest lands. While largely burned in a stand-replacing fire in 1994, this area is still managed as a LSR (USFWS 2011d). Three spotted owl activity centers were located within two miles of the project area before the 1994 fire occurred. Presently, SO-717 (Lower Mill Creek) is the only one activity center within two miles of the project area. This activity center was last known to be active in 1995 (USFWS 2011d).

5.0 Analysis of Effects to Listed Species and Critical Habitat

The effects analysis evaluates impacts expected from construction of the boulder field step-pool channel, replacement and relocation of the City of Leavenworth water supply pipeline, and replacement and relocation of the City of Leavenworth fish screen. The effects analysis does not include operation and maintenance of the water line or fish screens. The purpose of this action is to affect permanent, positive changes in habitat access for *O. mykiss* and bull trout; Chinook salmon could also benefit. Construction work windows will be followed to avoid and minimize negative impacts to fish and aquatic and terrestrial wildlife. The least impactful construction equipment that can be used to achieve the construction objectives will be required of all contractors. For in-water work, this will mean using the selected rock or concrete breaking techniques identified in Section 2.1.2 of this document. These methods (hydraulic hammer, low-velocity deflagrating explosives, and demolition grout) minimize ground vibration, noise, and material deposition in water. Removal of trees and undergrowth will be restricted to the absolute minimum necessary, particularly within a 100-foot buffer of Icicle Creek and Snow Creek. Because of these mitigating measures, adverse effects will be minimized and will not persist following completion of construction. Negative direct or indirect impacts to federal threatened, endangered, or candidate species or designated critical habitat are not anticipated long-term. Adverse effects are described below by species and project element.

5.1 Bull Trout (*Salvelinus confluentus*) and Bull Trout Critical Habitat

Bull trout may experience both positive and negative effects as a result of the proposed action. The project is expected to benefit bull trout by facilitating passage to upstream designated critical habitat. The proposed step-pool channel would provide enhanced access to 50 miles of mainstem and tributary habitat, increasing total available designated critical habitat in the watershed. Several natural obstacles exist upstream from the boulder field, however none are believed to be year-round fish passage barriers (USFWS 2004a). Intrinsic potential fish habitat modeling indicates that overall populations could benefit if bull trout can regularly access this additional habitat upstream (Dominguez *et al* 2013).

5.1.1 Action in and Adjacent to Icicle Creek

Work below Icicle Creek OHWM will present the greatest chance of bull trout experiencing these adverse effects. Work below Icicle Creek OHWM will be necessary to dewater and construct the fish passage element at the boulder field (RM 5.6) and to install the fish bypass pipe for the City of Leavenworth fish screen structure on the left bank. The boulder field project element will have the most work below OHWM and therefore the greatest potential for adverse

effects to bull trout. In-water work in Icicle Creek will occur when flows allow between July 1 and October 15. In most years, flows will only be amenable to in-water work in August and September.

Prior to beginning in-water work, fish will be excluded from the work area to the extent possible so that 90% of the work can be done in the dry. Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill (Appendix A, Sheet 4). Minimization measures also call for fish exclusion screens, and proper screening of pumps used to address water seepage through the boulders. The slopes above the boulder field on the left bank and flatter areas in the vicinity of the proposed City of Leavenworth screen house offer locations where pumped water will infiltrate rather than run directly back to the creek. Areas being dewatered will be monitored to ensure that fish do not become stranded; a dip net will be used to move fish in danger of being stranded to the main channel. The design team and stakeholder group believe that dewatering is not possible in the downstream portion of the work area and that attempts to remove fish from this area would likely cause more harm than benefit, given the deep pools, caves, and overhanging rock ledges. In this area, a silt curtain will be installed to block any fine sediments from entering the water. Where fish cannot feasibly be excluded, work will be limited to rock breaking and placement. As a result of the dewatering, the in-water work will only consist of rock removal and rock breaking for a very small portion of the project (less than 10% of the area affected for the step-pool channel).

Noise and Vibration Impacts

Five boulders will be broken that are in the channel or directly adjacent to water (boulders 59, 51, 50, and 28 shown in blue on Appendix A, Sheet 4; boulder 30 is overhanging a ten-foot pool). The channel is expected to occur over a two-week period, on weekdays, during daylight hours. Table 3 estimates the relative amount of rock-breaking to be completed with each method. For the work below OHWM, just two rock-breaking methods are expected to be used: demolition grout and deflagrating explosives (which do not contain ammonium nitrate). Both methods are low impact; they crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. The demolition grout will crack the rocks by gradual expansion over 12 to 36 hours and the resulting crack will generate an insignificant amount of noise and vibration. Toth and Swanson (2016) tested deflagrating explosives on Icicle Creek rocks in 2016. Based on their results, it is likely that each rock can be broken with 1-2 charges. As a worst-case noise scenario (reflected in Table 3), ten holes will be drilled and ten deflagrating explosions will be used to break these rocks. Each charge has an impulse duration of 3-5 milliseconds. Feist *et al* (1996) evaluated the vibratory sound effects of driving concrete

piles on juvenile pink (*Onchorynchus gorbuscha*) and chum salmon (*O. keta*) in Everett Harbor, Washington. Changes in general behavior and school size were noted. Fish appeared to favor the acoustically isolated area of the site during pile driving, however schools were often observed near the barge-mounted pile driving rigs. No significant changes to feeding or school abundance were noted. The rock breaking methods that will be employed in this project as described in Section 2.1.2 will result in substantially lower peak pressures and accumulated sound exposure levels than are expected from pile driving. Additional testing and analysis of rock breaking techniques for this project were also conducted by Maple Leaf Powder Company (Toth and Swanson 2016, page 30). This included a vibration analysis (Toth and Swanson, p. 34) that concluded that ground vibration associated with rock breaking in the channel would generate equal or less ground vibration than heavy equipment operated on the IPID access road. This conclusion is based on a worst-case scenario of high-velocity explosives in bedrock. Project conditions will be very low compared to the analyzed conditions because high-velocity explosives will not be used in this project and vibration travels through boulders much less efficiently than through bedrock. Use of high-velocity explosives in bedrock would generate a peak particle velocity (PPV) vibration of 7 meters per second at a distance of 50 feet from the blast site (see Toth and Swanson, p 36). Maple Leaf Powder Company indicated that a PPV of 7 m/s is “close to being an undetectable amount of ground vibration”. Heavy equipment operation on the IPID access road would generate a PPV of more than 7 m/s. The hydraulic hammer and low-impact explosives would generate even less vibration. All other rock-breaking activities are above OHWM and completely isolated from flowing water. Rock-breaking occurring above OHWM will generate even less noise and vibration in the water than the work conducted below OHWM.

Water Quality Impacts

In addition to in-channel work, sediment inputs to Icicle Creek could result from rock drilling and breaking on the slope above the boulder field and realignment and use of the access road necessary to construct the City of Leavenworth new screen house and fish screen. A vacuum system will be used for rock drilling for work below OHWM and on the slope above OHWM. Silt curtains are expected to be effective in capturing fine sediments released by work on the terrace on which the IPID gravel access road lies, and on the spur road that will be constructed. Contractors will be required to follow BMPs that conform to the Stormwater Management Manual for Eastern Washington, Department of Ecology Publication #04-10-076, Chapter 7 – “Construction Stormwater Pollution Prevention.

Bull trout response to sediment exposure can range from behavioral to lethal (USFWS 2010). High sediment and turbidity levels could result in gill trauma and direct mortality to adults and

rearing juveniles. This is unlikely unless avoidance and minimization measures fail; if minimization measures function as expected based on past construction experience, sediment impacts will be relatively minor and will not be transported more than 0.25 mile downstream. Other direct impacts could include effects to spawning, redds, eggs, and alevins (USFWS 2010). This high velocity reach is an unlikely location for bull trout spawning and risk to redds, eggs, and alevins is minimal. Indirect effects may include behavioral changes (e.g., habitat avoidance), physiological stress (which may affect available energy and susceptibility to disease), and impacts to macroinvertebrates and feeding efficiency (USFWS 2010). Contractors follow BMPs that conform to the Stormwater Management Manual for Eastern Washington, Department of Ecology Publication #04-10-076, Chapter 7 – “Construction Stormwater Pollution Prevention. They will furthermore be required to stop work if turbidity thresholds are exceeded. Given the fish exclusion and proposed methods to minimize sediments and rock dust described above, the anticipated low level of suspended sediments and the short-term nature of the work, indirect effects are also expected to be minimal.

During the Icicle Creek in-water work window, adult bull trout could be present downstream of the boulder field. A snorkel survey on August 9, 2017 enumerated four bull trout below the boulder field and above the LNFH surface water intake. These four fish were between 190 and 510 mm in length, indicating that they were a combination of adult and sub-adult/juvenile fish (USFWS 2017b). Of the 29 bull trout counted during snorkel surveys from the boulder field to the mouth of Icicle Creek, more than 80% were identified as juvenile/sub-adults (less than 450 mm in length), which is consistent with estimates from prior years (USFWS 2017b). It is possible that bull trout could be present in deep pools in the lower part of the reach where it is not possible to dewater. These fish may move downstream to avoid noise, vibration, or turbidity if present. Fish salvage was discussed at project stakeholder group meetings. Given the complexity of this area in terms of caves, overhanging rocks, and deep pools, fish salvage was considered unlikely to be successful and could potentially result in more harm than benefit. If bull trout remain in the pool, they may experience adverse effects due to sediment and vibratory sound and potentially, crushing, if they are unable to evade a piece of rock falling into the water from one of the five rocks being broken over the water.

Spawning is unlikely to be affected. The boulder field itself does not provide spawning habitat. There is some evidence that upstream passage may be occurring but is extremely limited to a narrow range of flows. The array upstream of the boulder falls has not detected upstream passage. Peak bull trout upstream migration generally occurs in July in response to a dropping hydrograph (Jeremy Cram, WDFW, personal communication, March 1, 2018). Therefore, adults

wanting to spawn upstream will have presumably already passed through the boulder field, if they were able to, prior to commencing rock-breaking activities. If flows are typical in 2019, rock breaking activities are most likely to occur in August and September. If flows are low enough in July for rock-breaking to occur, it will be indicative of an earlier peak runoff, which would also result in an earlier upstream bull trout migration through the boulder field. The greatest action impacts are therefore likely to be felt by adult bull trout that are holding in the deep pool below the boulder field, unable to pass upstream to spawn and do not move downstream to avoid construction impacts. Upstream passage will not be possible during construction; flow attracting fish to left bank of the channel will be diverted by the coffer dam upstream.

Bull trout attempting to move downstream post spawning, will be excluded from the step-pool channel area while it is being constructed, as described in Section 2.1. Downstream passage to the right of the anchor rock will be possible and will be no worse than existing conditions. Flow drops 20 feet into a gap upstream of boulder 50, into a pool under the anchor rock.

5.1.2 Actions in and Adjacent to Snow Creek

The IPID fish screen relocation and replacement will be near Snow Creek, approximately 0.5 miles upstream from its confluence with Icicle Creek. As part of this work, the fish bypass for the IPID fish screen will need to be installed on Snow Creek below OHWM. The Snow Creek channel will be modified by lowering a few boulder drops to create a low-flow fish bypass channel to ensure adequate fish return. Bull trout are not present in Snow Creek and thus will not be directly affected by this work; access to Snow Creek is blocked by a high-gradient boulder field near its mouth (D. Youkey, personal communication, January 30, 2018).

Work below Snow Creek OHWM will be conducted after October 15, when water is not being discharged from Snow/Nada Lake Basin supplementation water supply reservoirs, to minimize the possibility that fine sediment could be transported downstream to Icicle Creek and negatively impact bull trout directly or bull trout critical habitat. The work in Snow Creek will be done with hand tools and silt curtains will be used as an added precaution to minimize any introduction of fine sediments to Icicle Creek via Snow Creek.

5.1.1 USFWS Bull Trout Matrix of Pathway Indicators Assessment: Subpopulation Characteristics within Subpopulation Watersheds

The *Matrix of Diagnostics/Pathways and Indicators* (USFWS 1999) is used to evaluate these project impacts and develop a determination of effect for bull trout and bull trout critical habitat.

Results of this evaluation are summarized below in Table 8. Section 6 evaluates the proposed project actions on the impacts to habitat indicators and critical habitat PCEs

(1) Subpopulation Size

Information remains limited on the bull trout subpopulation size in Icicle Creek and on factors that may affect bull trout abundance and size class distribution. Upon completion, the boulder field fish passage project may have a positive (“Restore”) effect on subpopulation size by increasing the opportunity for bull trout to migrate further upstream and access up to 50 miles of mainstem and tributary habitat.

The project’s fish screening elements will potentially reduce mortality due to entrainment in the existing noncompliant screens and the inadequate fish return in the IPID canal. The fish screens for the IPID diversion on Icicle Creek are not in compliance, the screens are undersized, the mesh openings are too big, there is no sweeping flow, and the approach velocity is too high. Fish are believed to be at high risk of impingement if entrained. There is no fish bypass to safely return fish that enter the ditch back to Icicle creek. Currently, the fish are returned to Icicle Creek via a 15-foot drop onto a boulder that is not submerged for most of the irrigation season, likely resulting in injury or death (USFWS 2011a). The ditch is generally operating from April 1 to September 30. The IPID intake is presently on the right bank at the diversion dam (47.543764, -120.713616; RM 5.7); water is directed via a canal that runs parallel to Icicle Creek for 800 feet down to the existing fish screens, where the canal turns southeast before crossing Snow Creek (Figure 6). IPID, in partnership with WDFW, is proposing to replace and relocate the IPID fish screens downstream to their Snow Creek diversion site near where the Snow Lakes trail crosses IPID’s irrigation ditch (47.541895, -120.711406) to bring them into compliance with current state and federal criteria. This location protects the screen from debris and high water during high flow events in the canyon and provides an adequate fish bypass back to Icicle Creek via Snow Creek. Snow Creek provides adequate habitat for fish return during the irrigation season. Minor modifications will be made to the Snow Creek channel to reduce boulder drops or create a deeper plunge pool to ensure an adequate fish return. Rocks will be moved or placed by hand; there will be no other excavation or fill placed and thus sediment contributions to Icicle Creek via Snow Creek and noise disturbance will be insignificant.

Enhanced passage and the reduction in mortality will have a “Restore” effect long term. Negative effects (“Degrade”) of noise, introduction of fine sediment, rock dust, and chemical contaminants to Icicle Creek could be potentially anticipated from construction of the boulder field step-pool channel primarily, but also from the City of Leavenworth water line, and City of Leavenworth fish screen. Negative project effects will be localized and temporary and will affect very few fish (only four adult bull trout were observed in the area in 2017 snorkel surveys). Prevention efforts identified in Section 2, including a requirement that contactors follow BMPs that conform to the Stormwater

Management Manual for Eastern Washington, Department of Ecology Publication #04-10-076, Chapter 7 – “Construction Stormwater Pollution Prevention”, will limit opportunities for sediment and contaminants to enter the water. The contractor will be required to use a vacuum for rock breaking activities over water. If there is a flume of silty water this will be blocked by a silt curtain and can also be pumped to an infiltration site. Contractors will be required to stop work if turbidity standards are exceeded. Furthermore, the rock-breaking methods provide little opportunity for contaminants to enter the water. If deflagrating explosives are used, these products combust completely, leaving no more residue than would be expected in the barrel of a gun. Only those products which do not contain ammonium nitrate will be allowed for work below ordinary high water. This criterion will therefore be “Maintained” in the Wenatchee Core Area.

(2) Growth and Survival

Information is too limited to identify a trend in subpopulation growth and survival. However, the project’s fish passage elements will have a positive (“Restore”) effect on subpopulation size by increasing the opportunity for bull trout to access up to 50 miles of mainstem and tributary habitat of superior quality. The project’s fish screening elements will reduce mortality due to entrainment in the existing noncompliant screens and correction of the inadequate IPID fish return described above (“Restore” effect). While short-term and localized, negative effects may be felt by bull trout near construction activities, and thus this criterion has a status of “Degrade” in the Icicle Creek subpopulation. This criterion will be “Maintained” in the Wenatchee Core Area.

(3) Life History Diversity and Isolation

The project’s fish passage elements will expand available habitat which creates possibilities for increased life history variability and future development of alternative life history pathways (“Restore” effect). The project’s fish screening elements will enhance emigration from the bull trout subpopulation in Icicle Creek to other subpopulations in the Wenatchee Core Area and Upper Columbia Recovery Unit by reducing mortality due to entrainment in the existing sub-standard screens (“Restore” effect). The adverse effects of construction are offset by the opportunities to enhance life history diversity and emigration. Thus, this criterion is “Maintained in Icicle Creek and will be “Maintained” in the Wenatchee Core Area.

(4) Persistence and Genetic Integrity

Expansion of available habitat will increase the opportunity for genetic exchange and thus may enhance persistence of the species (“Restore effect”). Emigration from the bull trout subpopulation in Icicle Creek to other subpopulations in the Wenatchee Core Area and Upper Columbia Recovery Unit will be enhanced by the improvements to sub-standard screens and relocation of the IPID screen, which will reduce injury and mortality during emigration (“Restore” effect). The “Degrade”

effect of construction impacts will be offset by the “Restore” impacts of the project once completed. The criterion will be “Maintained” at the scale of Icicle Creek and the Wenatchee Core Area.

Indicator	Effect of the Action (Icicle Creek/Wenatchee Core Area)
Subpopulation Size	Degrade/Maintain
Growth and Survival	Degrade/Maintain
Life History Diversity and Isolation	Maintain/Maintain
Persistence and Genetic Integrity	Maintain/Maintain

Table 8. Effects of the Proposed Action.

The overall project is expected to result in a positive benefit to bull trout due to the substantial increase in the amount of available habitat and the opportunity for increased life history diversity and genetic exchange. However, because there will be limited, temporary negative impacts resulting from construction activities, the proposed work “**may affect and is likely to adversely affect**” the bull trout subpopulation and bull trout critical habitat in Icicle Creek during the project’s construction. The proposed action is “**not likely to jeopardize the continued existence of**” the bull trout subpopulation in Icicle Creek. In fact, the increase in accessible habitat may aid in persistence of the species.

5.2 Steelhead Trout (*Oncorhynchus mykiss*) and Steelhead Critical Habitat

O. mykiss may experience both positive and negative effects as a result of the proposed action. The project is expected to benefit steelhead by facilitating passage to upstream designated critical habitat in mainstem Icicle Creek that is currently accessible infrequently. *O. mykiss* passage is limited at the boulder field at most flow conditions (Dominguez *et al* 2013). Intrinsic potential fish habitat modeling shows a very large increase in capacity for *O. mykiss* with regular access to the upper reaches of Icicle Creek (Dominguez *et al* 2013). Rectifying this impediment to passage is identified as a “specific area of concern” and a “recommended future action” to benefit steelhead in NOAA’s 5-year review (NOAA 2016). Enhancing access through the boulder field will open up to 50 miles of mainstem and tributary habitat. Several natural impediments exist upstream from the boulder field, however none are believed to be year-round fish passage barriers (USFWS 2004).

5.2.1 Project Actions in and Adjacent to Icicle Creek

Direct negative impacts to *O. mykiss* and *O. mykiss* critical habitat may occur as a result of ground vibration and noise, increased turbidity, and potential introduction of rock dust, fine sediments, and rock -breaking chemical residues into Icicle Creek. Work below Icicle Creek

OHWL will present the greatest chance of *O. mykiss* experiencing these adverse effects. Work below Icicle Creek OHWL will be necessary to dewater and construct the fish passage element at the boulder field (RM 5.6) and to install the fish bypass pipe for the City of Leavenworth fish screen structure on the left bank. The boulder field project element will have the most work below OHWL and therefore the greatest potential for adverse effects to *O. mykiss*. In-water work in Icicle Creek will occur when flows allow between July 1 and October 15. In most years, flows will only be amenable to in-water work in August and September.

Prior to beginning in-water work, fish will be excluded from the work area to the extent possible. Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill (Appendix A, Sheet 4). Areas being dewatered will be monitored to ensure that fish do not become stranded; a dip net will be used to move fish in danger of being stranded to the main channel. The design team and stakeholder group believes that dewatering is not possible adjacent to the anchor rock and that attempts to remove fish from this area would likely cause more harm than benefit, given the deep pools, caves, and overhanging rock ledges. In this area a silt curtain will be installed to block any fine sediments from entering the water and work will be limited to rock breaking and placement. As a result of the dewatering, the in-water work will only consist of rock removal and rock breaking for a very small portion of the project (less than 10% of the area affected for the step-pool channel).

Noise and Vibration Impacts

Five boulders will be broken that are over or directly adjacent to water (boulders 59, 51, 50, and 28 shown in blue on Appendix A, Sheet 4; boulder 30 is overhanging a ten-foot pool). The rock breaking is expected to occur over a two-week period, on weekdays, during daylight hours. Table 3 estimates the relative amount of rock-breaking to be completed with each method. For the work below OHWL, just two rock-breaking methods are expected to be used: demolition grout and deflagrating explosives (which do not contain ammonium nitrate). Both methods are low impact; they crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. The demolition grout will crack the rocks by gradual expansion over 12 to 36 hours and the resulting crack will generate an insignificant amount of noise and vibration. Toth and Swanson (2016) tested deflagrating explosives on Icicle Creek rocks in 2016. Based on their results, it is likely that each rock can be broken with 1-2 charges. As a worst-case noise scenario (reflected in Table 3), ten holes will be drilled, and ten deflagrating explosions will be used to break these rocks. Each charge has an impulse duration of 3-5 milliseconds. Feist *et al* (1996) evaluated the vibratory sound effects of driving concrete piles on juvenile pink (*Onchorhynchus gorbuscha*) and chum salmon (*O. keta*) in Everett Harbor,

Washington. Changes in general behavior and school size were noted. Fish appeared to favor the acoustically isolated area of the site during pile driving, however schools were often observed near the barge-mounted pile driving rigs. No significant changes to feeding or school abundance were noted. The rock breaking methods that will be employed in this project as described in Section 2.1.2 will result in substantially lower peak pressures and accumulated sound exposure levels than are expected from pile driving. Additional testing and analysis of rock breaking techniques for this project were as conducted by Maple Leaf Powder Company (Toth and Swanson 2016, page 30). This included a vibration analysis (Toth and Swanson, p. 34) that concluded that ground vibration associated with rock breaking in the channel would generate equal or less ground vibration than heavy equipment operated on the IPID access road. This conclusion is based on a worst-case scenario of high-velocity explosives in bedrock. Project conditions will be very low compared to the analyzed conditions because high-velocity explosives will not be used in this project and vibration travels through boulders much less efficiently than through bedrock. Use of high-velocity explosives in bedrock would generate a peak particle velocity (PPV) vibration of 7 meters per second at a distance of 50 feet from the blast site (see Toth and Swanson, p 36). Maple Leaf Powder Company indicated that a PPV of 7 m/s is “close to being an undetectable amount of ground vibration”. Heavy equipment operation on the IPID access road would generate a PPV of more than 7 m/s. The hydraulic hammer and low-impact explosives would generate even less vibration. All other rock-breaking activities are above OHWM and completely isolated from flowing water. Rock-breaking occurring above OHWM will generate even less noise and vibration in the water than the work conducted below OHWM.

Water Quality Impacts

In addition to in-channel work, sediment inputs to Icicle Creek could result from rock drilling and breaking on the slope above the boulder field and realignment and use of the access road necessary to construct the City of Leavenworth new screen house and fish screen. A vacuum system will be used for rock drilling for work below OHWM and on the slope above OHWM. Silt curtains are expected to be effective in capturing fine sediments released by work on the terrace on which the IPID gravel access road lies, and on the spur road that will be constructed. Contractors will be required to follow BMPs that conform to the Stormwater Management Manual for Eastern Washington, Department of Ecology Publication #04-10-076, Chapter 7 – “Construction Stormwater Pollution Prevention.

O. mykiss response to sediment exposure can be expected to be similar to that described above for bull trout, which ranges from behavioral to lethal (USFWS 2010). High sediment and turbidity levels could result in gill trauma and direct mortality to adults and rearing juveniles.

During the timing of in-water work, adult *O. mykiss* are not likely to be present in Icicle Creek. If flows are typical in 2019, most spawning will conclude in the Icicle in early May and rock-breaking activities are most likely to occur in August and September. Furthermore, if sediment minimization measures function as expected based on past construction experience, sediment impacts will be relatively minor and will not be transported more than approximately 0.25 mile downstream. Other direct impacts could include effects to spawning, redds, eggs, and alevins (USFWS 2010). As noted above, there is very little suitable *O. mykiss* spawning habitat in this reach and risk to redds, eggs, and alevins is therefore minimal. Juveniles which may be present would be protected by the described avoidance and minimization measures and construction stormwater best management practices (WDOE 2004) that will be required of all contractors. Other direct effects from sediment may include behavioral changes (e.g., habitat avoidance), physiological stress (which may affect available energy and susceptibility to disease), and impacts to macroinvertebrates and feeding efficiency (USFWS 2010). Given the anticipated low level of suspended sediments (because of the proposed minimization measures), the short-term nature of the work, and the requirement that contractors stop work if turbidity standards are exceeded, indirect effects are also expected to be minimal.

5.2.2 Project Actions in and Adjacent to Snow Creek

The IPID fish screen relocation and replacement will be near Snow Creek, approximately 0.5 miles upstream from its confluence with Icicle Creek. As part of this work, the fish bypass for the IPID fish screen will need to be installed on Snow Creek below the OHWM. The Snow Creek channel will be modified by lowering a few boulder drops to create a low flow channel to ensure adequate fish return. Work along Snow Creek is not expected to impact *O. mykiss* or *O. mykiss* critical habitat in Icicle Creek. *O. mykiss* are not present in Snow Creek and thus will not be directly affected by this work; access to Snow Creek is blocked by a high-gradient boulder field near its mouth (D. Youkey, personal communication, January 30, 2018).

Work below Snow Creek OHWM will be conducted when water is not being discharged from Snow/Nada Lake Basin supplementation water supply reservoirs (after October 15), to minimize the possibility that fine sediment could be transported downstream to Icicle Creek and negatively impact *O. mykiss* directly or *O. mykiss* critical habitat in Icicle Creek. Silt curtains will be used as an added precaution.

While the action is expected to result in a positive benefit in terms of a substantial increase in amount of available habitat, there will be also be short-term effects to both steelhead and their

critical habitat resulting from construction activities. Thus, the proposed action “**may affect and is likely to adversely affect**” *O. mykiss* and their critical habitat during construction.

5.3 Chinook (*Oncorhynchus tshawytscha*)

Chinook may experience both positive and negative effects as a result of the proposed work. The project is expected to benefit bull trout and *O. mykiss* more so than Chinook, however Chinook have been documented above the boulder field (WDFW 2014). WDFW online mapping tools identify Icicle Creek above the boulder field as potential habitat for Chinook, if accessible (WDFW 2018). Several natural passage impediments exist upstream from the boulder field, however none are believed to be year-round fish passage barriers (USFWS 2004).

Direct negative impacts to Chinook may occur if fish are present within the vicinity of in-water construction activities in Icicle Creek. Work OHWM may result in ground vibration and noise, increased turbidity, and introduction of fine sediments. Work below Icicle Creek OHWM will be required to dewater and construct the fish passage elements at the boulder field (RM 5.6) and to install the fish bypass pipe for the City of Leavenworth fish screen structure on the left bank. The boulder field project element will have the most work below OHWM and therefore the greatest potential for adverse effects to Chinook. The dewatering methods described in Section 2.1 include a water bypass to isolate the work area from flowing water so that the majority of work can be done in the dry. Minimization measures also call for fish exclusion screens, sand bag cofferdams, and proper screening of pumps used to address water seepage. Areas being dewatered will be monitored to ensure that fish do not become stranded; a dip net will be used to move fish in danger of being stranded to the main channel. In the lower part of the channel where the pools are deep and it will not be possible to dewater, a silt curtain will be installed to block any fine sediments from entering the water. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance. Rock breaking techniques at the boulder field will begin with those resulting in the least amount of vibration and noise and only advance to more impactful methods as necessary. As noted in Section 2.1, the three methods that the contractor will be allowed to utilize are all low impact; they crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. In addition to in-channel work, sediment inputs to Icicle Creek could result from realignment and use of the access road necessary to construct the City of Leavenworth new screen house and fish screen. Silt curtains will be used to capture fine sediments released by this work.

The IPID fish screen relocation and replacement will be near Snow Creek, approximately 0.5 miles upstream from Icicle Creek. As part of this work, the fish bypass for the IPID fish screen

will need to be installed on Snow Creek below the OHWM. The Snow Creek channel will be modified by lowering a few boulder drops to create a low flow channel to ensure adequate fish return. Chinook are not present in Snow Creek and thus will not be directly affected by this work; access to Snow Creek is blocked by a high-gradient boulder field near its mouth (D. Youkey, personal communication, January 30, 2018).

All work below Icicle Creek OHWM will occur between July 1 and October 15, as determined by a November 1, 2018 teleconference with WDFW, NMFS, USFWS, and WDOE. Work below Snow Creek OHWM will be conducted after October 15 when water is not being discharged from Snow/Nada Lake Basin supplementation water supply reservoirs, to minimize the possibility that fine sediment could be transported downstream to Icicle Creek and negatively impact Chinook. This will occur between October 15 and April 1, but most likely in November or December and silt curtains will be used as an added precaution.

During the work window, adult Chinook could be present downstream of the boulder field. Spring Chinook enter the Icicle around May 1 and remain in the system until the second or third week of September (T. Maitland, WDFW, personal communication, March 1, 2018). Snorkel surveys in 2017 enumerated 15 Chinook below the boulder field and above the LNFH surface water intake (USFWS 2017b). However, most Chinook in Icicle Creek are thought to be of LNFH origin, a non-listed stock (USFWS 2002). Some strays do occur however, which would be listed. The habitat above the hatchery is generally considered poor for spawning; Chinook have shown a preference for spawning in the historic channel rather than lower Icicle Creek or the reach above the hatchery. However, Chinook redds in the reach above the hatchery have been documented (Nelson *et al* 2012) and may be affected by sediment and turbidity. Chinook response to sediment exposure can be expected to be similar to that described above for bull trout, which ranges from behavioral to lethal (USFWS 2010). High sediment and turbidity levels could result in gill trauma and direct mortality to adults and rearing juveniles. This is unlikely unless avoidance and minimization measures fail; if minimization measures function as expected based on past construction experience, sediment impacts will be relatively minor and will not be transported great distances downstream. Other direct impacts could include effects to spawning, redds, eggs, and alevins (USFWS 2010). Indirect effects may include behavioral changes (e.g., habitat avoidance), physiological stress (which may affect available energy and susceptibility to disease), and impacts to macroinvertebrates and feeding efficiency (USFWS 2010). Given the anticipated low level of suspended sediments and turbidity (because of the proposed minimization measures) and the short-term nature of the work, indirect effects are also expected to be minimal.

Feist *et al* (1996) evaluated the vibratory sound effects of driving concrete piles on juvenile pink (*Onchorynchus gorbuscha*) and chum salmon (*O. keta*) in Everett Harbor, Washington. Changes in general behavior and school size were noted. Fish appeared to favor the acoustically isolated area of the site during pile driving, however schools were often observed near the barge-mounted pile driving rigs. No significant changes to feeding or school abundance were noted. The rock breaking methods that will be employed in this project will result in substantially lower peak pressures and accumulated sound exposure levels than are expected from pile driving. Furthermore, rock breaking activities will largely be done with rocks in the dry or only partially in water. Sound propagation is generally poor in shallow conditions. While avoidance of the area during construction is likely (and would be beneficial in terms of minimizing exposure to other construction effects), more serious direct impact is not expected given the short-term nature of the rock breaking activities.

While the project is expected to result in a positive benefit in terms of a substantial increase in amount of available habitat, there will be limited, temporary negative impacts resulting from construction activities that could affect any listed individuals that are present. Thus, the proposed work “**may affect and is likely to adversely affect**” Chinook during construction.

5.4 Gray Wolf (*Canis lupus*)

The Alpine Lakes Wilderness and the project area itself does have suitable habitat for the gray wolf. However, given the high recreational use along Snow Creek Trail, residences along Icicle Creek, and associated road density, the project area does not include core habitat or refugia. The Teanaway wolf pack has dened roughly 10 miles south of Snow Lakes over the past five years, however observations have not been made in the more immediate vicinity of Snow Lakes or closer to Icicle Creek (USDI 2017; USFWS 2011). Given the high human disturbance in the vicinity, the presence of wolves in the project area is unlikely, particularly since suitable habitat is located relatively close with much less human presence (D. Youkey, personal communication, January 30, 2018). Construction noise could disturb wolves and could disrupt ungulate behaviors which serve as a primary food sources for wolves. The project would not alter suitable habitat for wolf prey, such as elk, deer, and smaller mammals. The construction which will generate significant construction noise will occur between April 1 and October 31 in 2019 and between August 1 and September 30 in 2020. Replacing the IPID fish screen on Snow Creek will occur between October 15, 2019 and April 1, 2020, but this work will be completed with hand tools. Contractors will be required to avoid all activities within one mile of a den or rendezvous site between April 15 and June 30. At this time, there are no known rendezvous or

denning sites near the proposed action. Prey are likely to avoid noise disturbance occurring in the action area and move to adjacent habitat. Because of the temporary impact that could result from construction noise, the project “**may affect, but is not likely to adversely affect**” the gray wolf.

5.5 Grizzly Bear (Ursus arctos horribilis)

Given the high human disturbance in the vicinity, the presence of grizzly bears in the project area is unlikely, particularly since suitable habitat is located relatively close with much less human presence (D. Youkey, personal communication, January 30, 2018). Sensitive time periods to evaluate for a direct impact include den selection in late fall through December, emergence in the spring, and foraging in spring and fall. The grizzly selects very remote den sites, usually well away from human activity; the prospect for a grizzly bear selecting a den anywhere near the project area is extremely slim. Exposure to the project would be most likely during foraging, particularly when salmon are present, but this would be a rare exception (USFWS 2002).

Construction noise could disturb bears and could disrupt ungulates which serve as a primary food source for grizzly bears and a temporary impact to grizzly bears could result. The project would not alter suitable habitat for bear prey, such as elk, deer, salmon, and smaller mammals. The construction which will generate significant construction noise will occur between April 1 and October 31 in 2019 and between August 1 and September 30 in 2020. Replacing the IPID fish screen on Snow Creek will occur between October 15, 2019 and April 1 2020, but this work will be completed with hand tools. Ungulate fawning and calving occur between May 15 and July 15, which falls during construction of the City of Leavenworth fish screen and excavation of the slope above the boulder field. However, the project area is not likely to be used for fawning or calving due to existing disturbance from adjacent private residences, recreational activities, and the adjacent Icicle Road. Contractors will be required to follow all timing restrictions established by biologists from federal and state agencies. Because of the temporary impact that could result from construction noise, the project “**may affect, but is not likely to adversely affect**” the grizzly bear.

5.6 Northern Spotted Owl (Strix occidentalis caurina)

While there are no recent surveys of the area, past surveys within the action area did not show the presence of northern spotted owls. The closest recorded nest site is roughly 3 miles east of the project area, along a creek on the far side of a high ridge (D. Youkey, personal communication, January 30, 2018). The most likely potential exposure to the project could come from construction noise. The construction which will generate significant construction noise will

occur between April 1 and October 31 in 2019 and between August 1 and September 30 in 2020. Replacing the IPID fish screen on Snow Creek will occur between October 15, 2019 and April 1 2020, but this work will be completed with hand tools. While there is no suitable habitat for the northern spotted owl within one mile of the action area, owls may use nearby dispersal habitat outside of the nesting season and thus could be disturbed by construction noise (D. Youkey, personal communication, October 22, 2018). The project therefore “**may affect, but is not likely to adversely affect**” the northern spotted owl.

6.0 Effects of the Proposed Action: Impacts to Habitat Indicators and Critical Habitat PCEs

The *Matrix of Diagnostics/Pathways and Indicators* (USFWS 1999) was used to describe the project impacts to habitat indicators and to characterize the status of critical habitat. The matrix is designed for use with indicators aggregated at the scale of the 5th or 6th field HUC and thus the area included in the analysis of habitat indicators includes Icicle Creek from its mouth to RM 26 (above Leland Creek), Snow and Nada Lakes Basin, and Snow Creek between Snow Lakes and Icicle Creek.

6.1 Water Quality

6.1.1. Temperature

None of the project elements will affect water temperature within or below the project reach therefore the project will “Maintain” the current habitat condition.

6.1.2 Sediment/Turbidity

While avoidance and minimization measures will be followed to prevent introduction of fine sediments into Icicle Creek, some sediment input is likely to occur. Sediment effects will result from:

- In-water work in dewatering, constructing, and rewatering the step-pool channel at the boulder field (RM 5.6). Most significantly, this includes rock dust that may be generated in order to employ low-velocity deflagrating explosives and demolition grout. Other potential inputs include demolition of relic concrete structures associated with the City of Leavenworth water supply pipeline and fish screen;
- Modifications to the IPID Snow Creek point of diversion and fish bypass pipe; and
- Realignment and use of the access road necessary to construct the City of Leavenworth new screen house and fish screen. The road realignment will include a second connection to Icicle Creek Road at the west end of the project which will increase the road footprint by 1,200 square feet.

To avoid and minimize sediment inputs, in-water work will occur during low flow periods within the allowed work window prescribed by WDFW, federal Services, and USACE, most likely August and September. Cofferdams and silt curtains will be placed to capture sediments released during construction activities. Rock breaking methods selected will be those creating the least sediment possible that are still effective. As noted in Section 2.1, the three methods that the contractor will be allowed to utilize are all low impact; they crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. Contractor will be required to use a vacuum when drilling rocks adjacent to or over water and to ensure that water turbidity standards are met. Sediment impacts will be distributed temporally. The majority of construction activities at the boulder field will occur in 2019, however some modifications to the step-pool channel may occur in 2020 if needed for optimal function of the step-pool channel. The potential for sediment delivery and turbidity at the boulder field element is thus greatest during the first year of construction as most of the excavation will occur during this phase of work. Modifications to the IPID Snow Creek point of diversion and fish bypass pipe will occur after October 15 (most likely in November or December) when water is not being discharged from Snow Lake⁶, thus removing the potential for fine sediments to be transported down to Icicle Creek where bull trout may be present and critical habitat is designated. The City of Leavenworth screen house and new fish screen will be constructed in one season, between April 1 and October 31.

Given the proposed avoidance and minimization measures described in Section 2.1, including the contractor's obligation to follow the BMPs in the Stormwater Management Manual for Eastern Washington (WDOE 2004), sediment impacts will be relatively minor and are not expected to be transported more than 0.25 miles downstream. This high velocity reach has limited spawning habitat available and thus the proposed actions are unlikely to increase or decrease sediment and turbidity in areas of spawning and incubation in Icicle Creek. The project will slightly "Degrade" habitat conditions temporarily during construction and will "Maintain" the current habitat condition following completion of the project.

6.1.3 Chemical Contamination/Nutrients

If expanding grout or deflagrating explosives are used to break rocks, contaminants could be introduced to the creek. WDOE indicates that demolition grout could result in residual calcium hydroxide crystals. The deflagrating explosives comprised solely of smokeless powder and an

⁶ The Bureau of Reclamation releases up to 50 cfs from Snow Lake between July 1 and October 15.

ignition primer (products such as Magnum Buster) combust completely. These are the only deflagrating explosives that will be used for the five boulders found over or immediately adjacent to water (Appendix A, Sheet 4, boulders 59, 51, 50, 28, and 30). These five boulders total 116 cubic yards in size. Based on manufacturer recommendations on drill pattern, approximately 0.24 cubic yards of rock dust may be generated; approximately 3.8 pounds of smokeless powder and 267 pounds of demolition grout will be needed to break these rocks (see Table 3). All other rock-breaking activities are above OHWM and completely isolated from flowing water.

There is limited opportunity for mixing and pouring concrete for the City of Leavenworth fish screenhouse to result in the introduction of chemical contaminants into Icicle Creek or the surrounding riparian areas. All pouring of concrete will be separated horizontally from flowing water by a minimum of 40 feet. This work will occur during July-September which are low flow months in Icicle Creek resulting in an even greater distance between the structures and flowing water. The plans in Appendix C (Sheets 4 and 7) show the distance from building to the edge of ordinary high water. In all uses, concrete will be poured into forms which will contain it and not allow it to run off. Ninety percent of the concrete by volume will be poured into forms in a hole in the ground that will be 8-18 feet deep. The initial pour of the floor in the vault and lower wall will be 18 feet deep. That lower portion will then be backfilled and the upper portion of the wall will likely be poured in the hole that is now eight feet deep. The remaining 10% of the concrete will be poured on grade level with the building. Concrete with as low water content as possible will be used to maximize strength. This will also minimize any possibility of runoff. The concrete will be poured when it is hot and dry, which will further minimize any chance of runoff as the ground would soak up any water that doesn't first evaporate. Truck washout will occur in an upland area in a location that will pool. Water containing cement will not be allowed to runoff to flowing water. Aggregate and solids will be used in backfill material at an upland location. To protect flowing water from site runoff, silt fences, coffer dams, and other erosion control materials will be in place as a redundant backstop to contain cement materials.

To mitigate for this and other potential chemical contamination, contractors will be required to check all equipment for leaks or signs of external petroleum products, hydraulic fluid, machinery coolants, dirt, weeds, and other deleterious substances prior to entering the site. Contractors will be required to follow construction stormwater pollution prevention BMPs identified in Chapter 7 of the Stormwater Management Manual for Eastern Washington (WDOE 2004). The project will temporarily "Degrade" the current habitat condition.

6.2 Habitat Access

6.2.1 Physical Barriers

There is some evidence that upstream passage may be occurring but is extremely limited to a narrow range of flows. WDFW document a redd in the IPID diversion canal and a juvenile chinook salmon was noted upstream. The array upstream of the boulder falls has not detected upstream passage. The intent of this project is to enhance any passage that is occurring at the boulder field by creating a new channel through the left bank, with drops and pools similar to existing background conditions at five different falls on Icicle Creek. This window of passability is expected to provide an opportunity for passage on an annual basis. Providing annual opportunities for passage at the boulder field will enhance access to the upper watershed (up to 50 miles of mainstem and tributary habitat), which will make a substantial contribution to accessibility of designated critical habitat in the watershed overall. During construction, the left bank will be unavailable for upstream and downstream passage. In a typical water year, adult bull trout migration peaks in Icicle Creek in July.^[1] Presumably, any bull trout present in Icicle Creek will have already arrived at their intended spawning location prior to August; there is little suitable spawning habitat for bull trout in this reach of icicle Creek. In a typical water year, the flows in Icicle Creek will not be low enough for rock breaking until August or September. Given the very small number of bull trout believed to be attempting passage presently (four were observed below the boulder field during 2017 snorkel surveys), impact on bull trout spawning is expected to be insignificant⁷. For post-spawn bull trout (originating either above or below the falls), downstream passage is presently most favorable on the right bank of Icicle Creek at boulder falls during low flows when the IPID is diverting. The right bank will not be affected during construction. Following construction, it is possible that large wood will rack at the upstream end of the step-pool channel in high flow events; maintaining passage via the step-pool channel may require removal and relocation of wood that accumulates if passage is impeded at this location. Overall, the project will “Restore” the current level of habitat access within the watershed.

6.3 Habitat Elements

6.3.1 Substrate

The project actions will not measurably affect substrate embeddedness or sediment load within or below the reach. The step-pool channel to be created at the boulder field will have substrate

^[1] Per March 1, 2018 teleconference with Jeremy Cram (WDFW), Amanda Barg (WDFW), Judy Neibauer (USFWS), and Sierra Franks (USFWS).

⁷ However in late summer, adult spring Chinook stack up in the resting pool below the anchor rock. A carcass of one of these fish was observed last year in August (stranded) after attempting to pass.

conditions similar to other step-pool habitat occurring naturally within the system. Change in flow and velocity at these locations as a result of the project will not appreciably affect sediment movement patterns or the degree of substrate embeddedness. This criterion is assigned a status of “Maintain”.

6.3.2 Large Woody Debris (LWD)

This project will not place or remove large wood from Icicle Creek. Removal of trees in the riparian zone will affect future wood recruitment; a 16-inch ponderosa pine and 12-inch cottonwood will be removed on the left bank, along with smaller deciduous shrubs. As noted above, wood may accumulate at the upstream end of the step-pool channel during high flow events. To maintain passage through the boulder field, it may be necessary to remove individual pieces of wood and relocate this wood elsewhere in the system. This criterion is assigned a status of “Maintain.”

6.3.3 Pool Frequency and Quality

The design of this passage restoration project will add pools to the boulder field reach (see Figure 3). The primary function of the pools is to dissipate energy to facilitate fish passage. The pools are not designed nor expected to function as juvenile rearing or adult holding habitat. Per the matrix criteria however, the project actions will “Restore” the current habitat condition of the reach.

6.3.4 Large Pools

The project will create four pools greater than 1 meter in depth. As noted above, the pools are designed specifically to dissipate energy to promote fish passage. The pools are not designed nor expected to function as juvenile rearing or adult holding habitat. Per matrix criteria however the project will “Restore” the current habitat condition within the reach.

6.3.5 Off-channel Habitat

The boulder field lies within a narrow canyon which functions as a transport reach. There is no off-channel habitat within the area of project activities. The project will “Maintain” current habitat conditions.

6.3.6 Refugia

Refugia at the scale defined in the bull trout matrix (USFWS 1998) will not be affected by the proposed actions and thus the project will “Maintain” the current habitat condition at the scale of the watershed. At a local scale, the project will provide velocity refugia that will improve fish passage and thus have a positive effect on current habitat conditions within the reach. The

project will not affect water temperatures or temperature refugia within or downstream of the project reach.

6.4 Channel Condition and Dynamics

6.4.1 Width/Depth Ratio

The proposed action will increase channel width by six meters at the boulder field and will concurrently create four pools greater than one meter in depth. Given the gradient, channel confinement, and high velocity in this portion of Icicle Creek, the project will not result in a significant change in the ratio of wetted width to depth in scour pools within the reach. The project will “Maintain” the current habitat condition.

6.4.2 Stream Bank Condition

The design of the stream banks within the step-pool channel will be similar to the reference reach upstream and downstream of the proposed activities (a slope of 1.4:1). The banks are comprised of boulders and bedrock and generally sparse riparian vegetation; the channel configuration is expected to remain relatively stable. The project will “Maintain” the current habitat condition within the reach.

6.4.3 Floodplain Connectivity

The boulder field lies within a narrow canyon which is disconnected from the floodplain. Neither the step-pool channel at the boulder field will affect the degree of floodplain connectivity. The project will “Maintain” the current habitat condition.

6.5 Flow/Hydrology

6.5.1 Change in Peak/Base Flows

The project will not affect peak or base flows at the scale of the watershed; this criterion is assigned a status of “Maintain”. The step-pool channel at the boulder field will modify the channel and distribution of flows. At high flows there will be no change in flow distribution. At moderate flows, the flow will be split between the right and left sides of the creek; at low flows, the majority of the flow will be in the step-pool channel on the left side of the creek.

6.5.2 Increase in Drainage Network

The proposed actions will have an insignificant effect on the active channel length correlated with human disturbance. The criterion is assigned a status of “Maintain”.

6.6 Watershed Conditions

6.6.1 Road Density and Location

The existing IPID access road will be realigned as part of the project. The contractor will be allowed to construct a second access to the construction area off of Icicle Creek Road (Appendix B, Sheet 2). This will result in a very minor increase in road density by adding approximately 1,200 square feet of impervious (gravel) surface as a result of the project. The project will therefore have a discountable impact and will “Maintain” the current road density and location.

6.6.2 Disturbance History

The proposed actions will have no impact on the degree of disturbance within the watershed. The project will “Maintain” current conditions.

6.6.3 Riparian Conservation Areas

Some vegetation removal will be required to complete the project. One 16-inch diameter ponderosa pine (*Pinus ponderosa*), one 12-inch black cottonwood (*Populus balsamifera* ssp *trichocarpa*) and three lodgepole pines (*Pinus contorta*) less than 6 inches in diameter will be removed. Additionally, a few deciduous small trees and shrubs will be cleared, including a few willow (*Salix* spp.) and red alder (*Alnus rubra*). Thus, the project will have an insignificant impact on riparian conservation areas in the Icicle Creek watershed. This criterion is assigned a status of “Maintain”.

6.6.4 Disturbance Regime

The proposed actions will have no significant effect on the disturbance regime in the Icicle Creek watershed. The project will “Maintain” current conditions.

6.7 Integration of Species and Habitat Conditions

Providing access at the boulder field will improve access to the upper watershed (up to 50 miles of mainstem and tributary habitat) on an annual basis, which will make a substantial contribution to accessibility of designated critical habitat in the watershed overall. Some passage is currently occurring at the boulder field, however passage has not been documented and numbers are quite low. Improved passage will enhance genetic exchange and life history diversity. Habitat conditions generally improve as you move further up the watershed. Thus, not only is the extent of accessible habitat increased, but the quality of that habitat is also increased, which improves resiliency to natural catastrophes and human disturbance, particularly in light of climate change. In sum, the project actions will have a positive, or “Restore” effect on the integration of species and habitat conditions in Icicle Creek and may also have a positive, or “Restore” effect for the Wenatchee Core Area.

6.8 Climate Change and Potential Effects

Climate change predictions suggest that the duration and magnitude of summer/fall low flow conditions would increase, as would stream temperatures in Icicle Creek, which would have a negative effect on Icicle Creek’s bull trout subpopulation. The project has the potential to ameliorate this impact by enhancing access to up to 50 miles of mainstem and tributary cold water habitat high in the drainage and presents the opportunity for alternative life history pathways to develop.

6.9 Summary of Effects to Bull Trout Critical Habitat: Crosswalk Between Matrix Indicators and PCEs

The previous discussion of project impacts to habitat indicators informs the analysis of effects of the action on critical habitat primary constituent elements. The *Crosswalk Between the Bull Trout Matrix and Bull Trout Critical Habitat Primary Constituent Elements* (USFWS 2011c) was used to summarize impacts to bull trout critical habitat PCEs (Table 9).

Pathways (bold) and Habitat Indicator	PCE 1	PCE 2	PCE 3	PCE 4	PCE 5	PCE 6	PCE 7	PCE 8
Water Quality								
Temperature								
Sediment/Turbidity	--	--	--	--		--		
Chemical Contamination/Nutrients	-	-	-					-
Habitat Access								
Physical Barriers		-/+++						
Habitat Elements								
Substrate Embeddedness								
Large Woody Debris								
Pool Frequency and Quality								
Large Pools								
Off-channel Habitat								
Refugia								
Channel Condition and Dynamics								
Width/Depth Ratio								
Stream Bank Condition								
Floodplain Connectivity								
Flow/Hydrology								
Change in Peak/Base Flows								
Increase in Drainage Network								
Watershed Conditions								

Road Density/Location	-			-	-	-	-	-
Riparian Conservation Areas	-		-	-	-	-	-	
Disturbance Regime								

Table 9. Summary of adverse project impacts to the primary constituent elements of bull trout critical habitat. Negative impacts are identified with a minus sign and positive effects are indicated with a plus sign. Amplitude of the effect is depicted by the number of signs used. A blank indicates that a habitat indicator is unlikely to be impacted in either a positive or a negative way and that the existing habitat condition will be maintained. A single sign indicates that the effect will be insignificant or discountable. Two minus signs indicate an adverse effect that can reliably be avoided with the proper implementation of the proposed avoidance and mitigation measures, three plus signs indicates a high likelihood of a lasting positive effect.

As seen in Table 9, sediment inputs to Icicle Creek are the most noteworthy adverse impact to critical habitat, affecting PCEs 1, 2, 3, 4, and 6. These impacts will be minor and temporary. Low levels of sediment inputs should be expected for in-water construction and rewatering even with avoidance and mitigation measures in place, but with the strategies proposed, these impacts should be minor. Effects will not persist following conclusion of construction activities. Effects of the project are not expected to destroy or adversely modify the critical habitat to the extent that it no longer no longer serves the intended conservation role for the species nor retains the function of those PCEs currently present in the project reach. Based on the analysis above, the project will be beneficial to bull trout critical habitat once completed. The project **“may affect, and is likely to adversely affect”** bull trout critical habitat in Icicle Creek during construction.

6.10 Summary of Effects to *O. mykiss* Critical Habitat

The National Marine Fisheries Service has designated essential physical and biological features for salmon and steelhead critical habitat (70 FR 52630). For the Upper Columbia steelhead, the essential features include substrate, water quality and quantity, water temperature, water velocity, cover, and safe passage conditions. The prior analysis of habitat conditions for bull trout is relevant here and forms the basis for the project impacts to steelhead critical habitat PCEs summarized in Table 10.

Habitat	PCE	Effect from Proposed Action
Freshwater Spawning, Rearing, and Migration	Water Quality	Temperature conditions will be “Maintained”. Sediment conditions will “Degrade” during construction due to minor, temporary increase in sediment and turbidity.
	Water Quantity	The project will not affect change in water quantity.

	Substrate	Current condition will be “Maintained”.
	Floodplain Connectivity	Current condition will be “Maintained”.
	Natural Cover	A very limited number of trees will be removed to construct the project. The largest of these is a 16-inch dbh ponderosa pine. Additionally, a 12-inch black cottonwood will be removed and several deciduous shrubs that are on the left bank of icicle Creek. The vegetation to be removed is not of sufficient size to presently contribute large wood to Icicle Creek, however removing these trees will reduce future contributions that could be expected from them. Because the trees are not large enough to remain in the system when high flows return following construction, they will be removed from the site. Disturbed areas will be replanted with natural vegetation. The project will not remove or add large woody debris to Icicle Creek itself. The project will not significantly affect cover conditions in the riparian zone or within the aquatic environment. Current condition will be “Maintained”.
	Forage	Current condition will be “Maintained”.

Table 10. Project impacts to steelhead critical habitat PCEs .

Based on the analysis above, the project will be beneficial to *O. mykiss* critical habitat in Icicle Creek once completed. The project “**may affect, and is likely to adversely affect**” *O. mykiss* critical habitat in Icicle Creek during construction.

7.0 Cumulative Effects

Future Tribal, state, and private actions that are reasonably likely to occur within the Icicle Creek watershed include water diversions upstream, human activities (recreational activities, private development, including road development), operation of the Leavenworth National Fish Hatchery (LNFH) and freshwater fisheries downstream. Future federal actions are not included here because they will require a separate consultation under Section 7 of the ESA.

Water Diversions

Water withdrawals for the IPID and City of Leavenworth at RM 5.7 are expected to continue in the future. Per its water right, the irrigation district may withdraw up to 118 cfs between mid-March and mid-October. The City of Leavenworth has a water right of 6.2 cfs at this diversion, but typically withdraws more than 2 cfs year-round. IPID supplements Icicle Creek in-stream flow with water from Snow and Nada Lakes. However, the amount of water stored is much less than the amount diverted; the amount diverted often exceeds the total flow of Icicle Creek, which can be as little as 60 cfs (per USGS gage [12458000](#) at RM 5.8). The diversion dam at RM 5.7 is a barrier to fish passage at very low flows. The fish screens for the City of Leavenworth and the IPID at this diversion do not meet current federal or state guidelines. Per the 2011 LNFH Biological Opinion (USFWS 2011a), it is likely that bull trout are at high risk of mortality if they are entrained. Furthermore, the fish return chute for this diversion has a 15-foot drop to a boulder that is not submerged for most of the irrigation season. Fish that pass through this return when flows are low are likely to be injured or killed (USFWS 2011a). The current project elements to relocate and replace the IPID fish screen and fish bypass chute and relocate and replace the City of Leavenworth fish screen will reduce mortality of any fish entering these diversions.

Human activities

The lower Icicle Creek watershed continues to see increasing human presence in terms of increased residential development and associated roads and increased recreational use of the Wenatchee National Forest and Alpine Lakes Wilderness. As population in Washington State increases, this trend is likely to continue in the future. Increased human presence is generally associated with habitat fragmentation and degradation. Despite local ordinances, encroachment on riparian areas and floodplain habitat is often associated with human settlement and increased recreational use. This in turn often leads to reduced opportunities for large wood recruitment, shade, increased stream temperatures, and disconnected groundwater-surface water interactions. Substantial investments in habitat restoration are ongoing at the federal, tribal, state, regional and local level, however restoration efforts across the state are not keeping pace with the habitat degradation associated with expanding human population, development, and activity.

Operation and Maintenance of the LNFH

The LNFH was authorized by the Grand Coulee Fish Maintenance Project in 1937 and has been in operation since 1940. The hatchery operations and maintenance activities have affected Chinook, *O. mykiss*, *O. mykiss* critical habitat, bull trout and bull trout critical habitat in various ways and to varying degrees since that time. The 2011 LNFH Biological Opinion analyzes these

impacts in detail and that analysis is incorporated here by reference. Future operation and maintenance of the LNFH are expected to continue in perpetuity, unless a change in conditions triggers reinitiation of ESA consultation. Thus, the hatchery will continue to have effects on Icicle Creek that must be taken into account in any project within the watershed.

Freshwater Fisheries Management

Bull trout harvest is prohibited for all core area stocks. However, targeted fisheries for many other species have occurred over the years in areas that may overlap with bull trout and other protected resources (USFWS 2011a). Fisheries may result in injury and mortality of protected resources due to incidental catch and trampling of redds.

Columbia River mainstem run predictions and harvest strategies are made by parties to the Columbia River Fish Management Plan (Washington, Oregon, Yakama Nation, Confederated Tribes of Warm Springs, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce Tribe). The harvest strategies are jointly proposed to the Columbia River Compact, created by Congress, which has the authority to approve or reject the proposed harvest strategies. The Compact establishes fisheries in the mainstem Columbia River. In years where a harvestable surplus of spring Chinook is predicted for Icicle Creek, a tribal subsistence fishery and/or non-tribal sport fishery is held. Regulations for the Icicle Creek fishery are developed through collaborative process between the State of Washington and the tribes. The regulations must comply with ESA and provide adequate escapement for hatchery production, based on input from the USFWS. The tribal fishery occurs at the spillway pool at RM 2.8; the non-tribal fishery occurs between the mouth and RM 2.7 (USFWS 2011a).

8.0 Determination of Effects and Federal Response Requested

Table 11 summarizes the determination of effects for each listed resource in the project's vicinity. Rationale for these determinations are provided in Section 5 of this report.

Common Name	Latin Name	Determination of Effects	Federal Response Requested
Bull trout	<i>Salvelinus confluentus</i>	Likely to adversely affect.	Formal Consultation
Steelhead trout	<i>Oncorhynchus mykiss</i>	Likely to adversely affect.	Formal Consultation
Spring Chinook	<i>Oncorhynchus tshawytscha</i>	Likely to adversely affect.	Formal Consultation
Gray wolf	<i>Canis lupus</i>	May affect, but not likely to adversely affect.	Concurrence
Grizzly bear	<i>Ursus arctos</i>	May affect, but not likely to adversely affect.	Concurrence
Northern spotted owl	<i>Strix occidentalis caurina</i>	May affect, but not likely to adversely affect.	Concurrence
Bull trout critical habitat	<i>Salvelinus confluentus</i>	Likely to adversely affect.	Formal Consultation
Steelhead trout critical habitat	<i>Oncorhynchus mykiss</i>	Likely to adversely affect.	Formal Consultation

Table 5. Summary of determination of effects and response requested, by listed resource.

9.0 Essential Fish Habitat

Pursuant to the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) and the 1996 Sustainable Fisheries Act (SFA), it is necessary to evaluate project impacts to Essential Fish Habitat (EFH). The MSFCMA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (50 CFR 600.905-930). The Upper Columbia River and its tributaries are designated as EFH for Pacific salmon, which includes Chinook and coho populations (PFMC 1999). Coho salmon are considered extinct within the mid-Columbia River. However, the Yakama Nation has initiated a coho reintroduction program in the Wenatchee River and Methow River subbasin. The project action area includes habitats that have been designated as EFH for various life-history stages of Pacific salmon.

The assessment of potential effects to Pacific salmon EFH from the proposed action is included within Sections 5 and 6 of this biological assessment. Specific elements that could affect EFH for Pacific salmon are temporary noise and vibration; inputs of fine sediments and rock dust from excavation, rock-breaking, and concrete demolition; introduction of chemical contaminants associated with rock breaking; and habitat alteration due to removal of a few trees in the riparian zone. Negative project effects will be localized and temporary and will affect very few fish. Prevention efforts identified in Section 2, including a requirement that contactors follow BMPs that conform to the Stormwater Management Manual for Eastern Washington, Department of Ecology Publication #04-10-076, Chapter 7 – “Construction Stormwater Pollution Prevention” will minimize project impacts. Based on the minimization measures implemented during construction and the justifications provided in Sections 5 and 6 above, the project will have “no adverse effect” on Pacific salmon EFH.

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Appendix A. Boulder Field Drawings

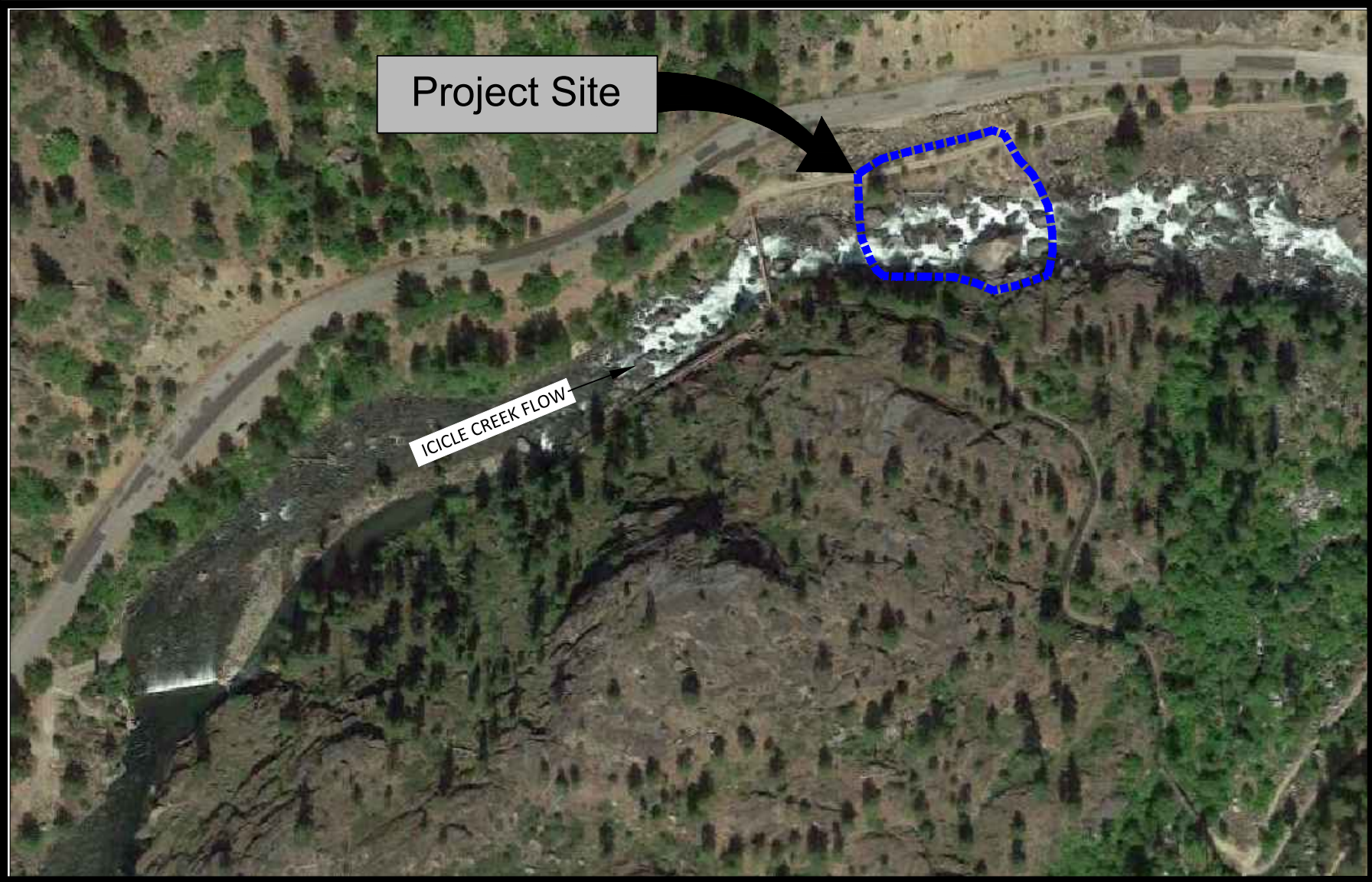
Construction Documents

Icicle Boulder Field Passage - Step Pool Channel

Project Number 15-1219

DRAWING INDEX:

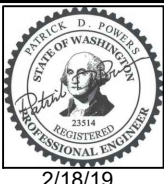
1. Cover Sheet
2. Legend/Survey Control
3. Existing Site Plan and Notes
4. Boulder ID
5. Proposed Site Plan/Construction Plan
6. Upper Site Plan
7. Lower Site Plan
8. Profile
9. Sections D and E
10. Sections F and G
11. Sections H and I
12. Sections J and K
13. Sections L and M
14. Sections N and O
15. Step Pool Channel Details
16. Rock Slope Details
17. Details



VICINITY MAP
Scale 1" = 200'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

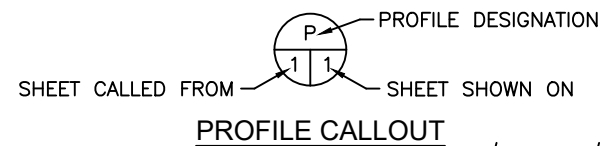
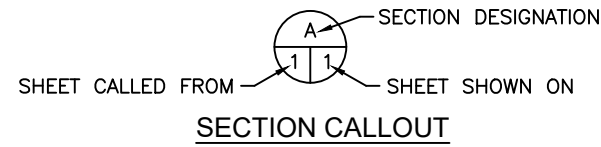
DRAWN BY:
RiverSide Drafting and Design

DATE:
2/18/19

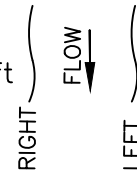
Cover Sheet

1 OF 17 SHEETS

SHEET SYMBOLS



References to Right and Left as viewed downstream



Datum: Horizontal – State Plane Coordinates
North Zone NAD 83 (2011)
Vertical NAVD 88 Based on GPS Static Observation.

Survey Control Points

Control Pt	NORTHING	EASTING	ELEVATION
WFE PT 4	198610.82	1670408.87	1382.43
WFE PT 3	198571.40	1670238.51	1390.02
WFE PT # 2	198531.01	1670021.64	1394.74
WFE PT #1	198411.10	1669795.83	1408.23
M2C PT # 105	198584.84	1669990.61	1417.34
M2C PT # 111	198623.00	1670224.93	1405.49
WFE PT # 5	198466.66	1670272.90	1373.14
WFE PT # 6	198452.98	1670244.93	1373.17
WFE PT # 7	198557.81	1670276.74	1388.87
WFE PT # 8	198559.58	1670197.42	1391.47

Step Pool Channel Layout Control Points to be Provided by Engineer Before Construction

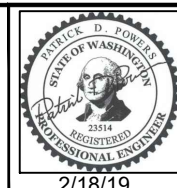
Control Pt	NORTHING	EASTING	ELEVATION
Step 1			
Left			
Right			
Pool 1			
Left			
Center			
Right			
Step 2			
Left			
Right			
Pool 2			
Left			
Center			
Right			
Step 3			
Left			
Right			
Pool 3			
Left			
Center			
Right			
Step 4			
Left			
Right			
Pool 4			
Pool			
Left			
Center			
Right			

LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- CENTERLINE
- EXISTING FENCE
- BUILDING LINE
- INDEX CONTOUR LINE
- UNDERGROUND POWER
- EXISTING WATER LINE
- SURVEY POINT
- EXISTING TREES TO REMAIN
- PROJECT BENCH MARK
- BORING LOCATIONS
- SANDBAGS
- NOTE CALLOUT
- STATION CALLOUT
- PHOTO CALLOUT
- FOUND SURVEY MONUMENT
- SET CONTROL POINT
- POWER POLE
- MANHOLE
- UTILITY CABINET
- LIGHT POST
- TREE
- WATER VALVE
- Existing Boulders to Remain
- Boulders to be Removed
- Boulders to be Placed
- UNDISTURBED GRADE
- WETLAND DELINEATION
- DEMO
- ELEVATION MARKER
- TREE TO BE REMOVED
- TREE TO REMAIN



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1'

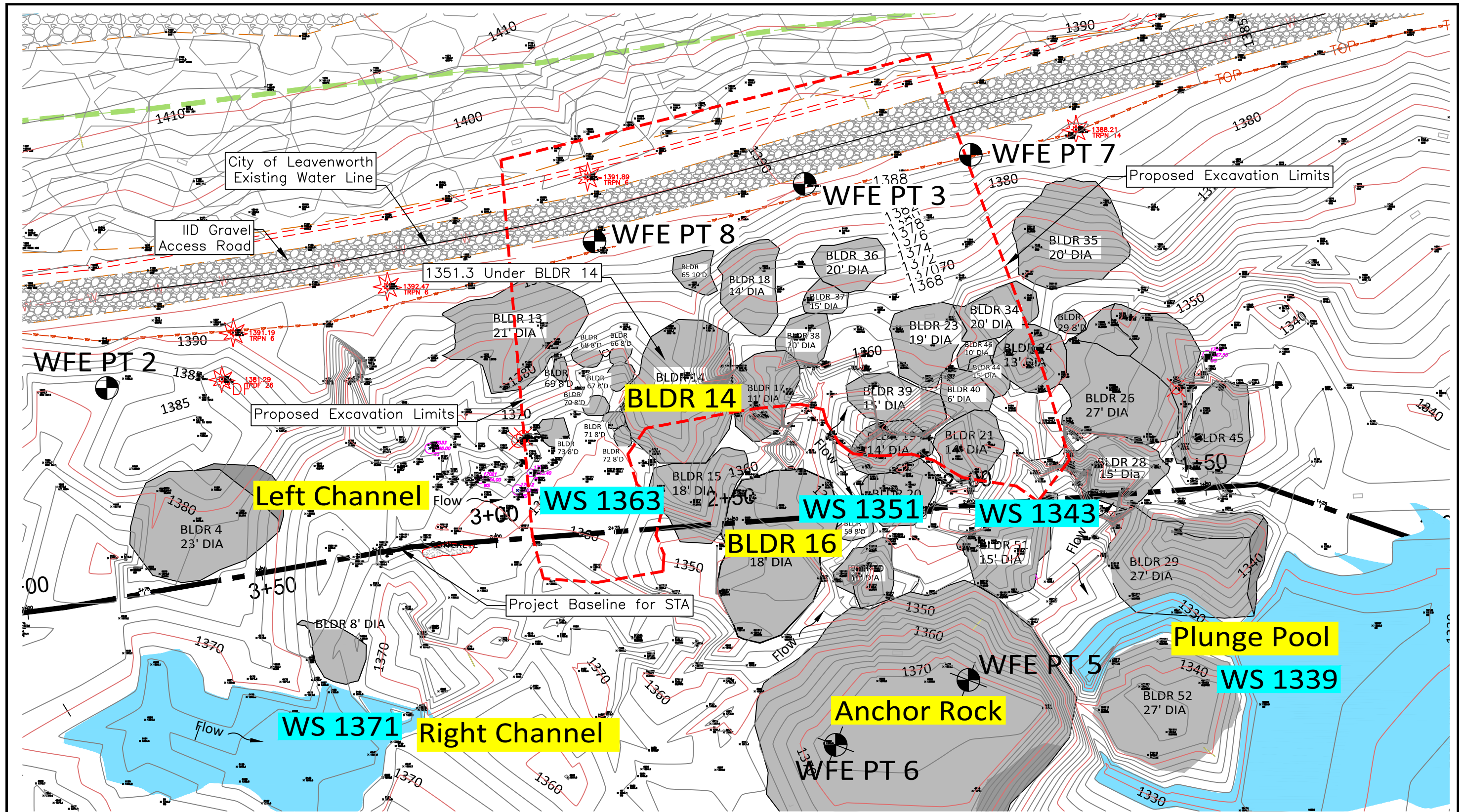
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DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting and Design

DATE:
2/18/19

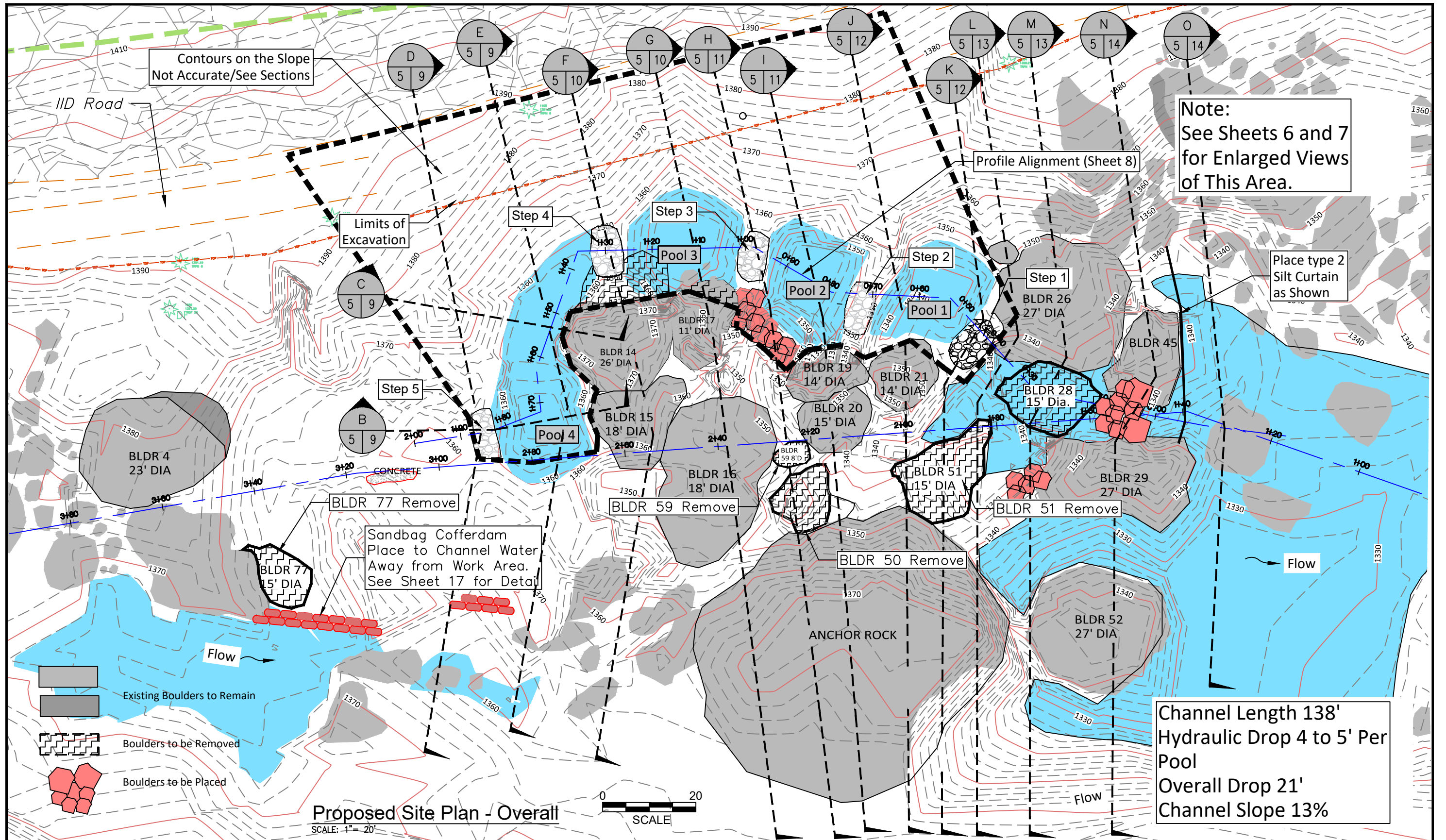
Legend and Notes



Site Plan - Existing (650 cfs Aerial)
 SCALE: 1" = 20'



	<h1>Icicle Boulder Field Passage</h1>		<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>BY</th> <th>APPD</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REV	DATE	BY	APPD	DESCRIPTION											DESIGN BY: Waterfall Engineering DRAWN BY: RiverSide Drafting DATE: 2/18/19	Site Plan - Existing	3 17 SHEET OF
			REV	DATE	BY	APPD	DESCRIPTION														
SCALE VERIFICATION BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"	IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.																				

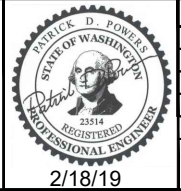


Proposed Site Plan - Overall

SCALE: 1" = 20'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: 1" = 20'

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

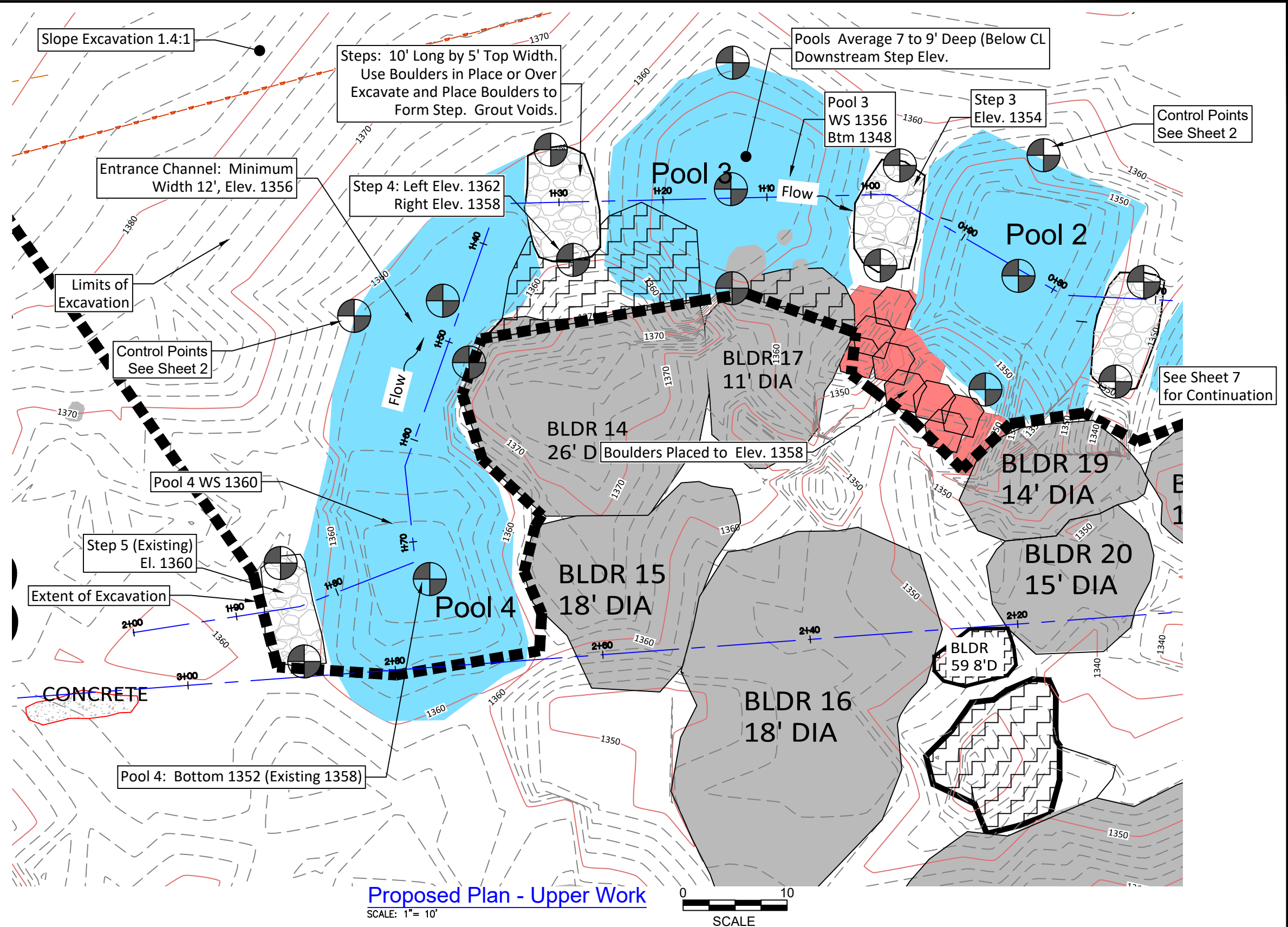
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

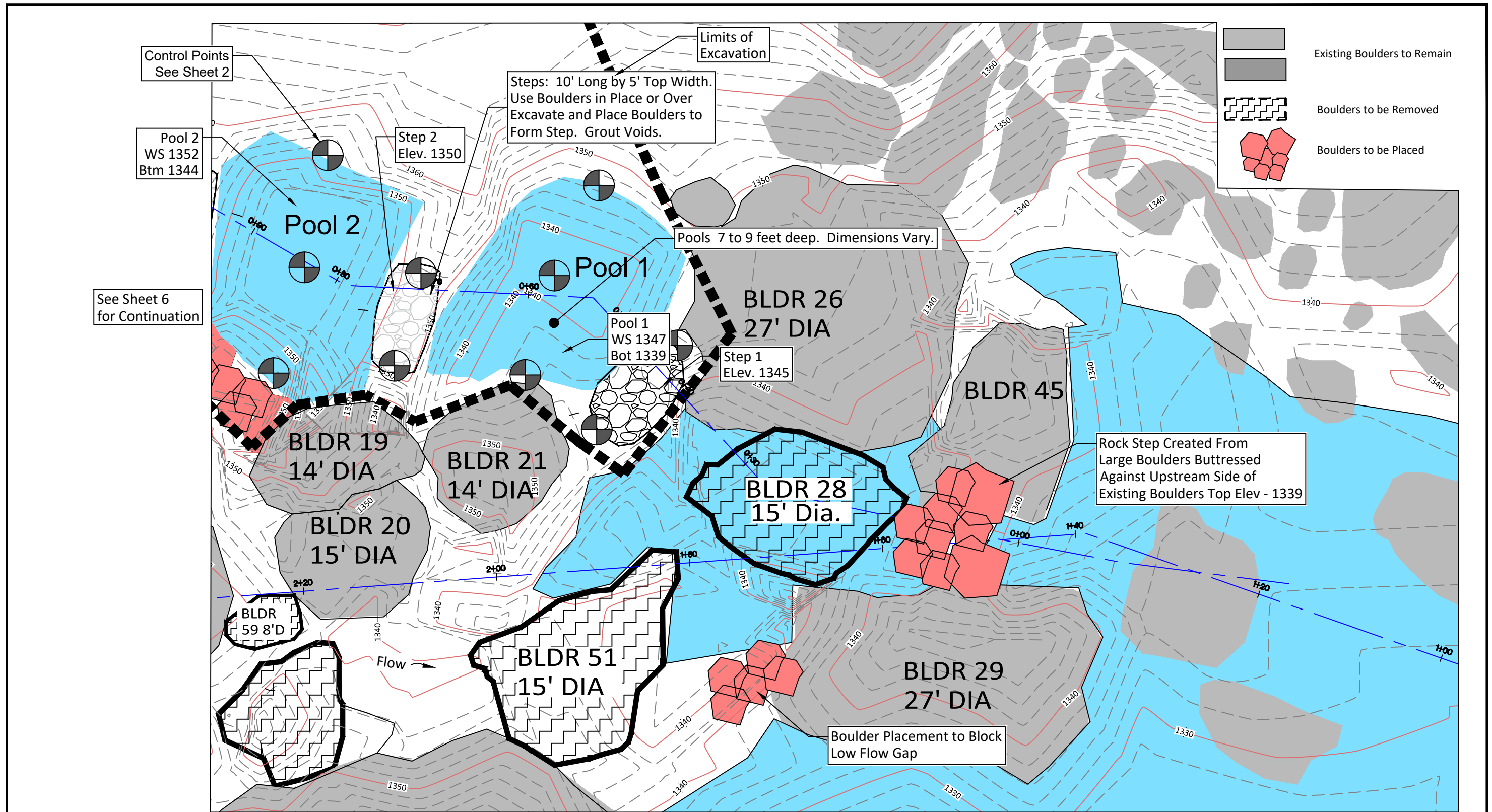
DATE:
03/03/2018

Proposed Site Plan Overall

5 OF 17 SHEETS



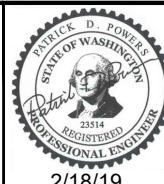
	<h1>Icicle Boulder Field Passage</h1>		<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>BY</th> <th>APPD</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REV	DATE	BY	APPD	DESCRIPTION						DESIGN BY: Waterfall Engineering DRAWN BY: RiverSide Drafting DATE: 03/03/2018	<h2>Proposed Plan Upper Work</h2>	6 17 SHEET OF
			REV	DATE	BY	APPD	DESCRIPTION									
2/18/19 <small>BAR IS ONE INCH ON ORIGINAL DRAWING.</small>	<small>IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.</small>															



Proposed Plan - Lower Work
SCALE: 1" = 10'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

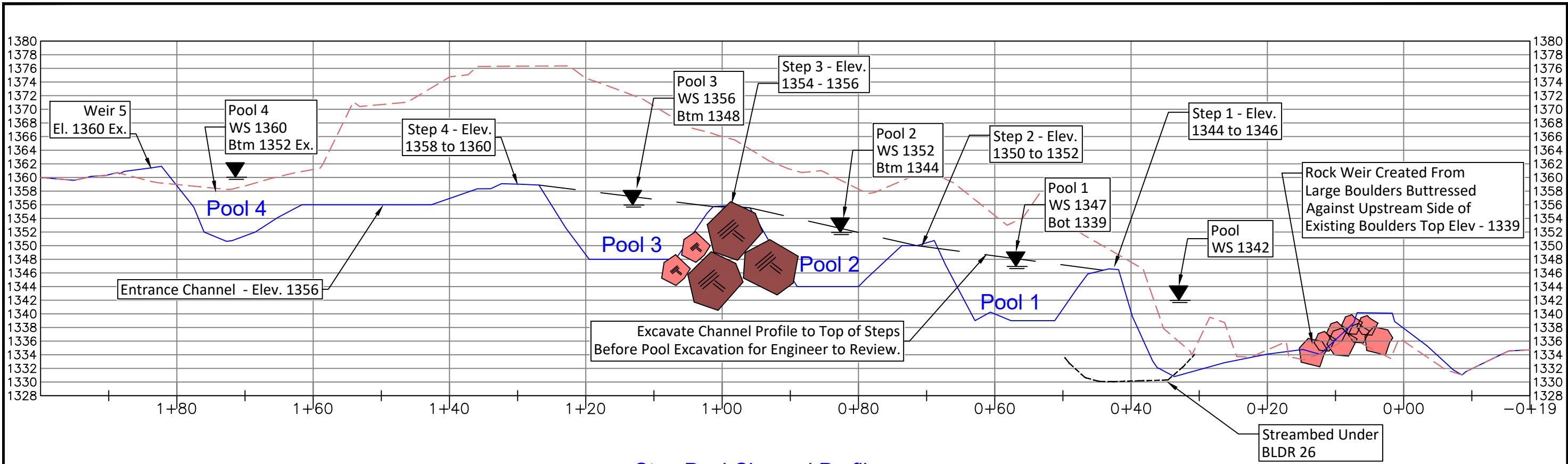
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DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
2/15/19

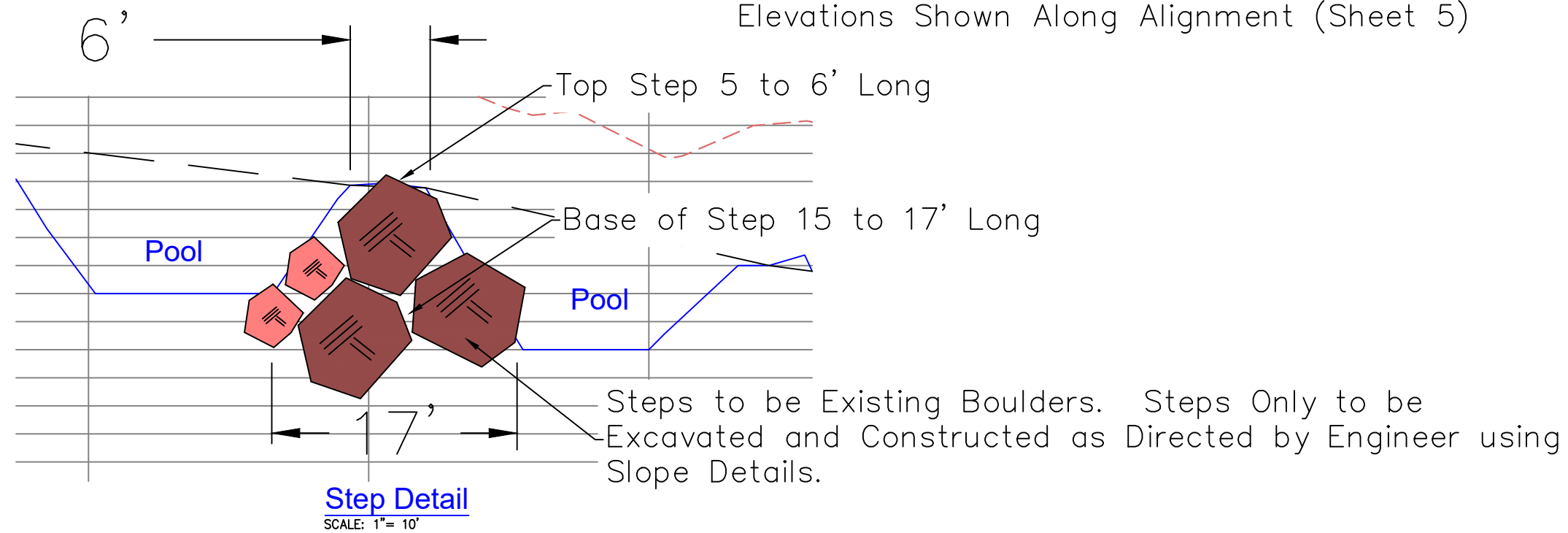
Proposed Plan Lower Work



Step Pool Channel Profile

SCALE: 1" = 15'

Elevations Shown Along Alignment (Sheet 5)

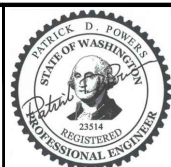


Step Detail

SCALE: 1" = 10'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

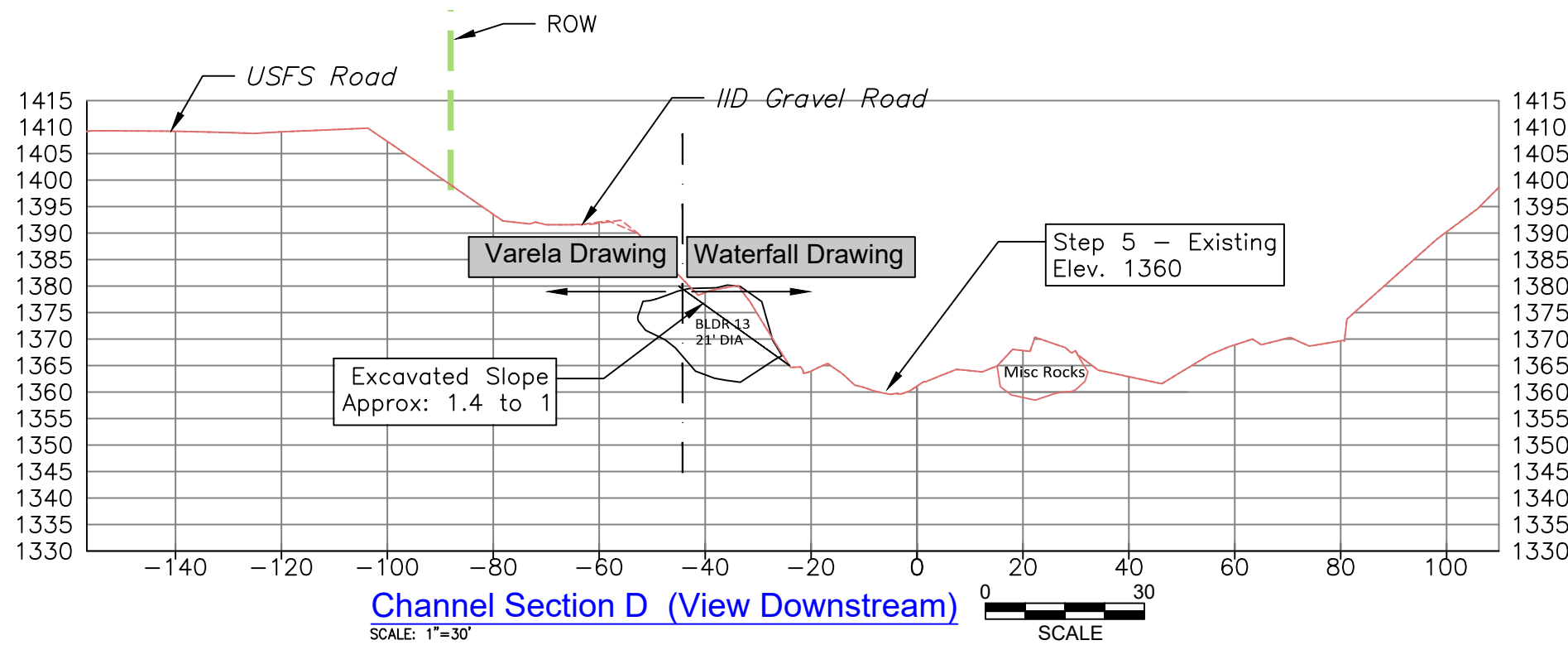
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

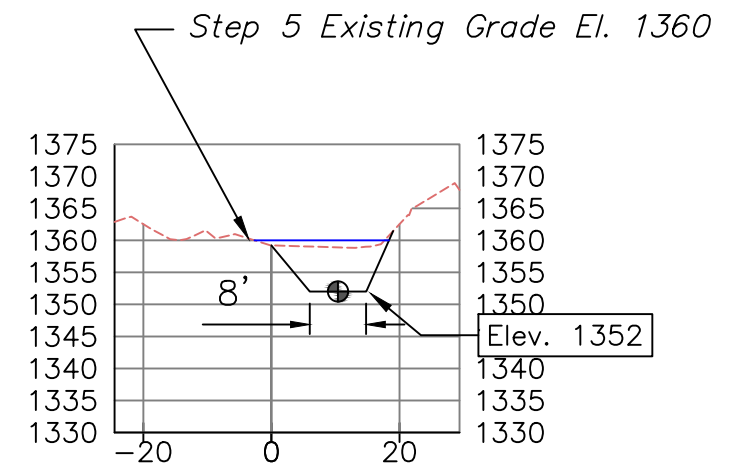
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2/15/19

Step Pool Channel Profile

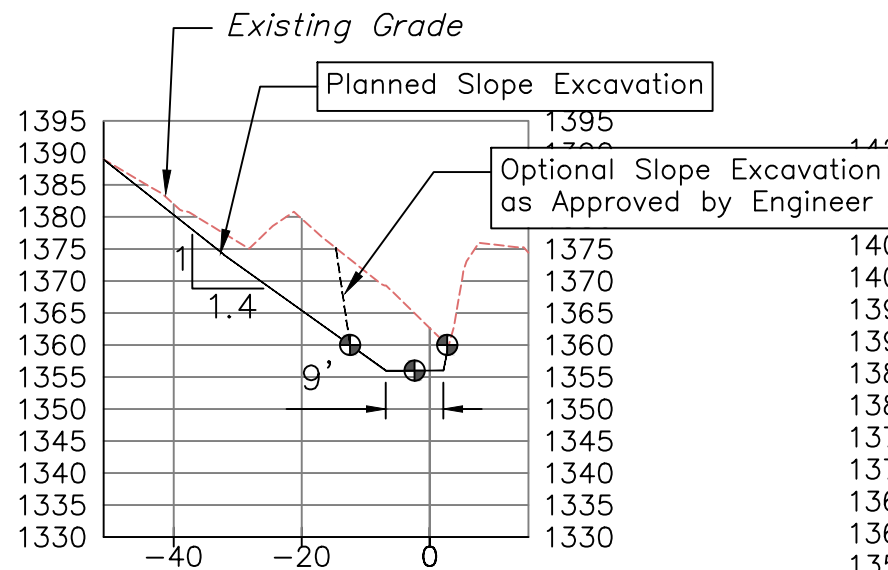
8 **17**
SHEET OF



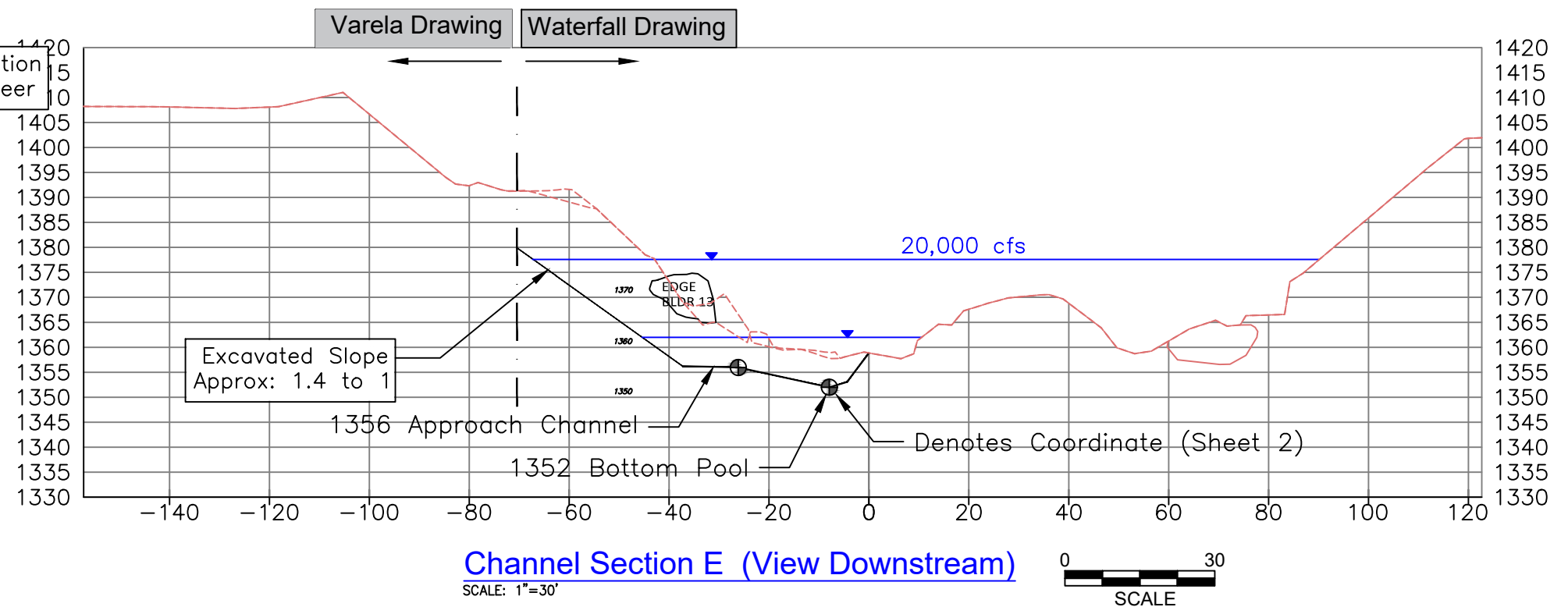
Notes:
 1. All Water Surface Elevations Shown are 500 cfs unless noted otherwise.
 2. Boulders with Numbers Shown in Cross Sections are Surface Boulders. Potential Boulders Buried are not Shown.



B
5 | 9
Channel Section B (View Downstream)
SCALE: 1"=30'



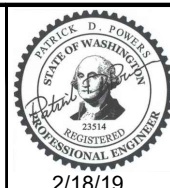
C
5 | 9
Channel Section C (View Downstream)
SCALE: 1"=30'



Channel Section E (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

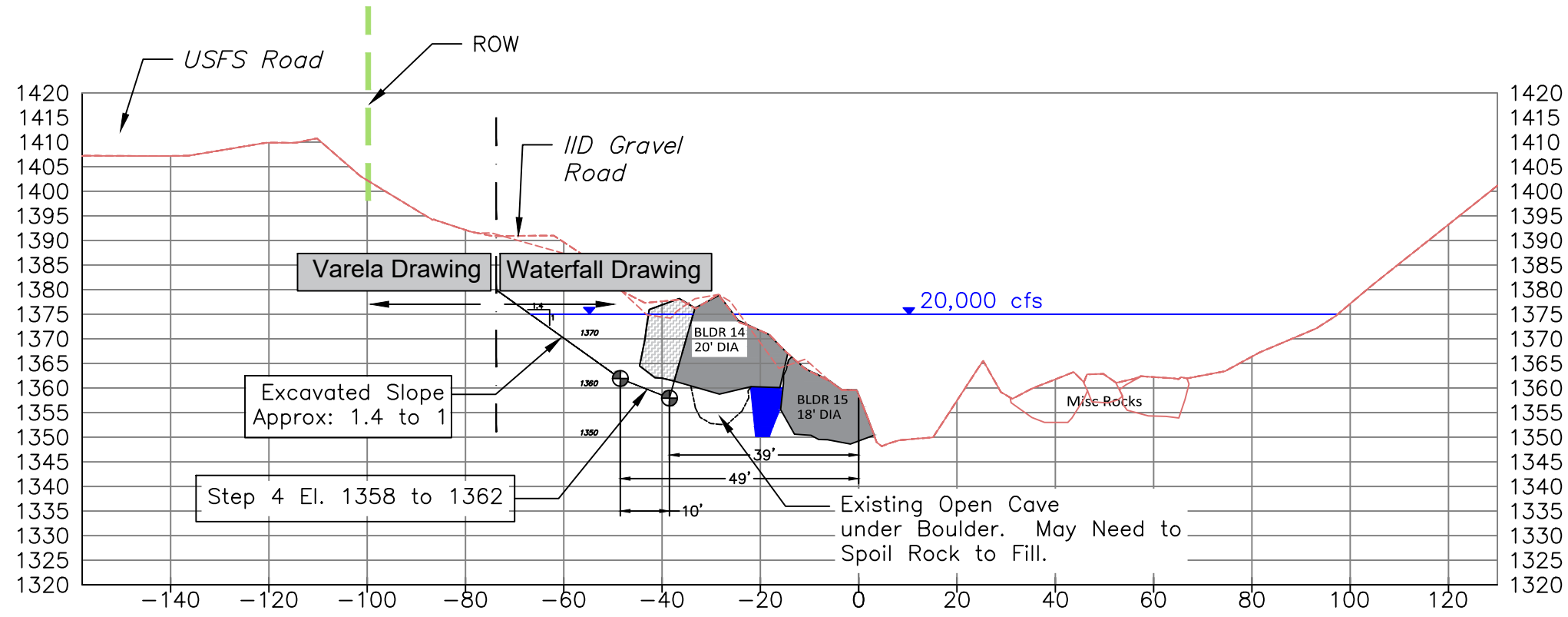
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

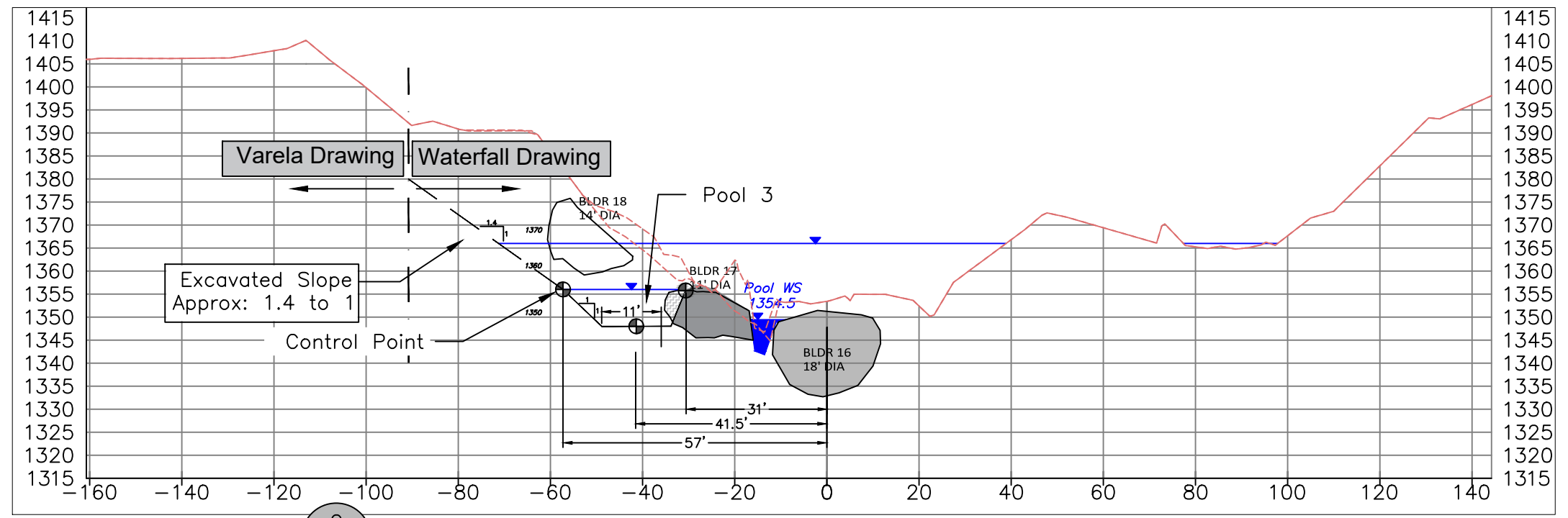
DATE:
2/18/19

Sections

9 **17**
SHEET OF



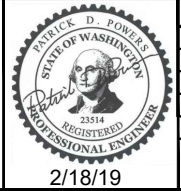
F
5 10
Channel Section F - Step 4 (View Downstream)
SCALE: 1"=30'



G
5 10
Channel Section G - Pool 3 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

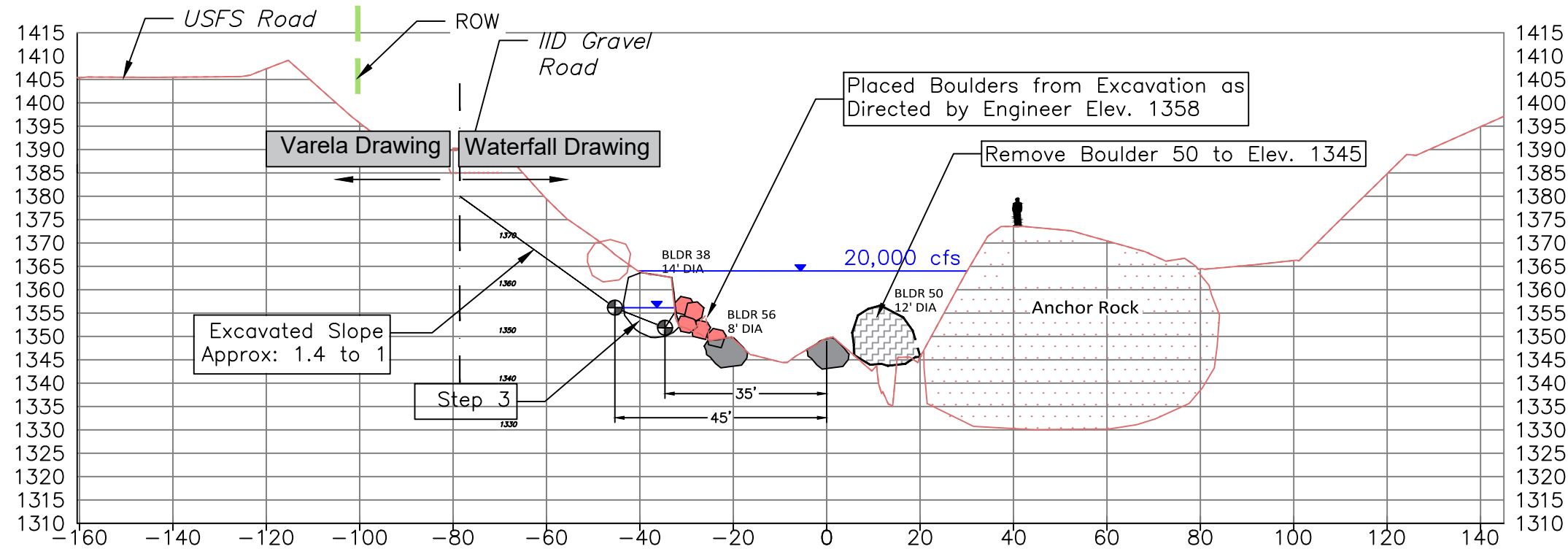
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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

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Waterfall Engineering

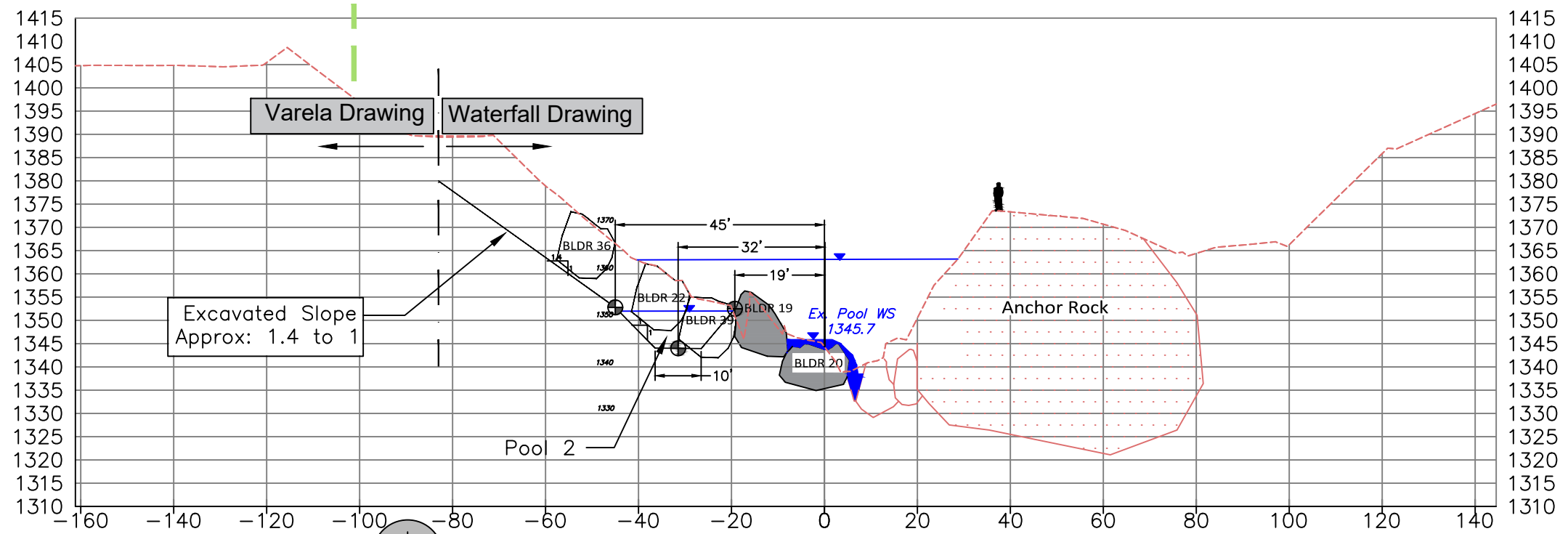
DRAWN BY:
RiverSide Drafting

DATE:
2/18/19

Sections



H
5 | 11
Channel Section H - Step 3 (View Downstream)
SCALE: 1"=30'



I
5 | 11
Channel Section I - Pool 2 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

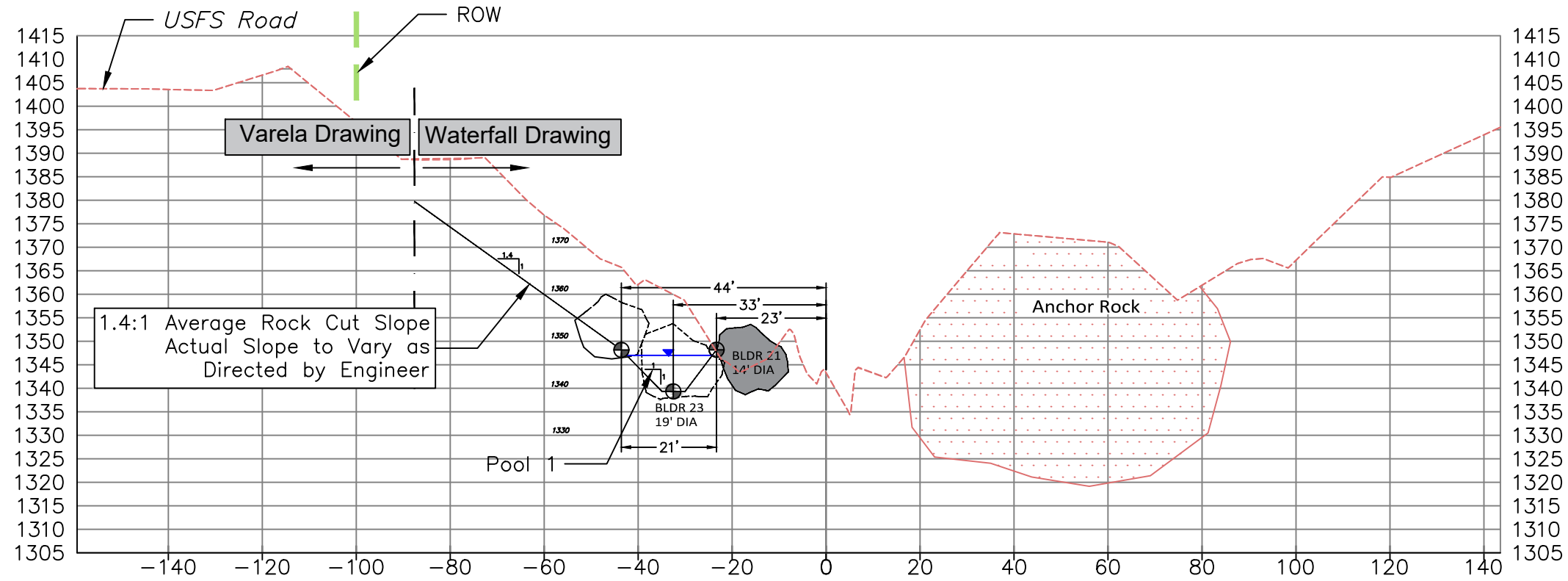
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Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
2/18/19

Sections

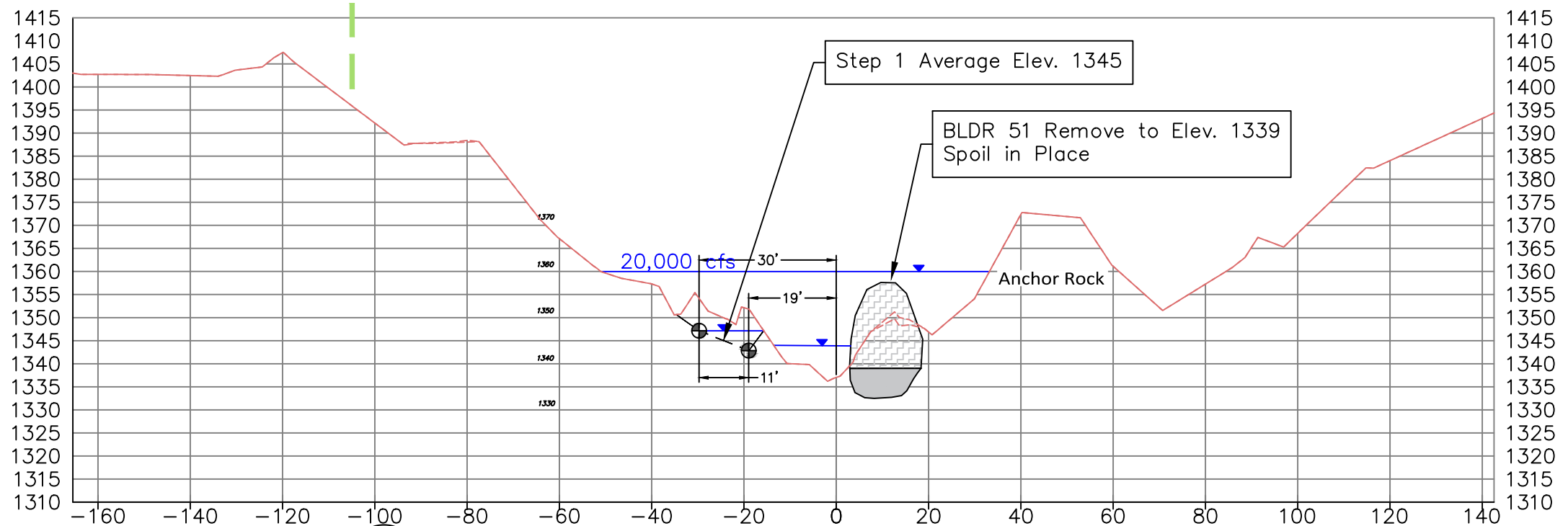
11 **17**
SHEET OF



J
5 | 12

Channel Section J - Pool 1 (View Downstream)

SCALE: 1"=30'



K
5 | 12

Channel Section K - Step 1 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

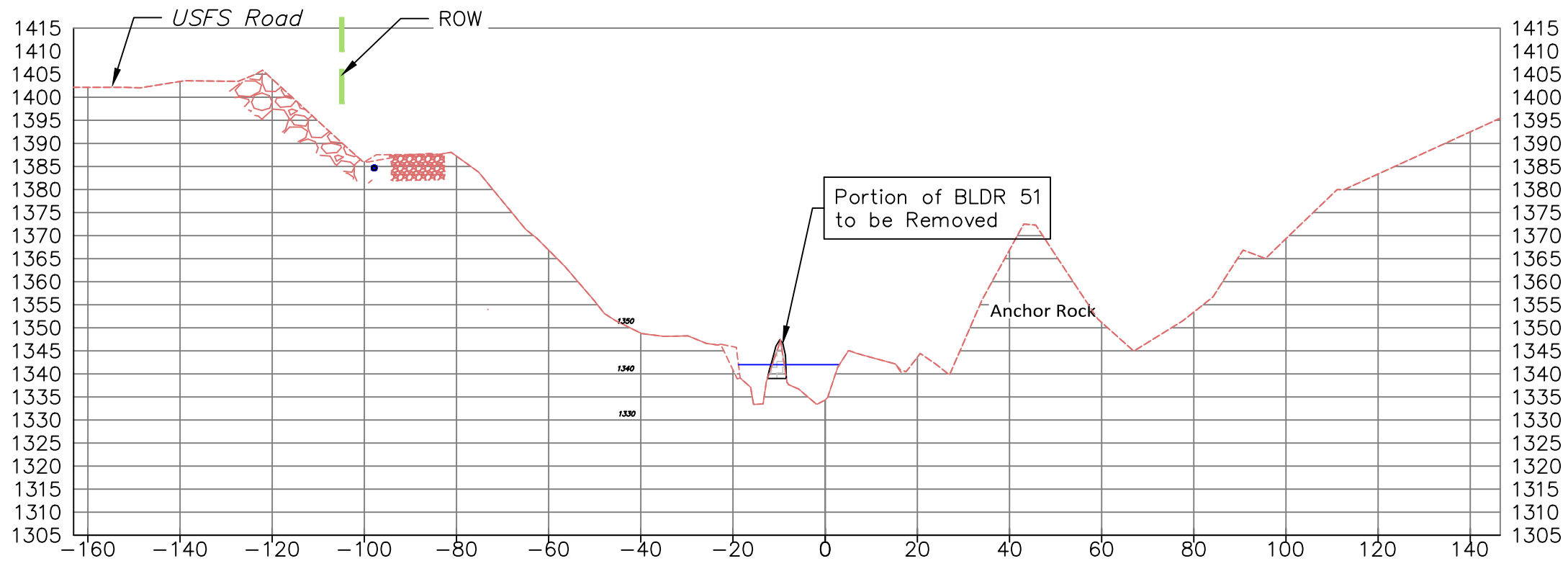
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Waterfall Engineering

DRAWN BY:
RiverSide Drafting

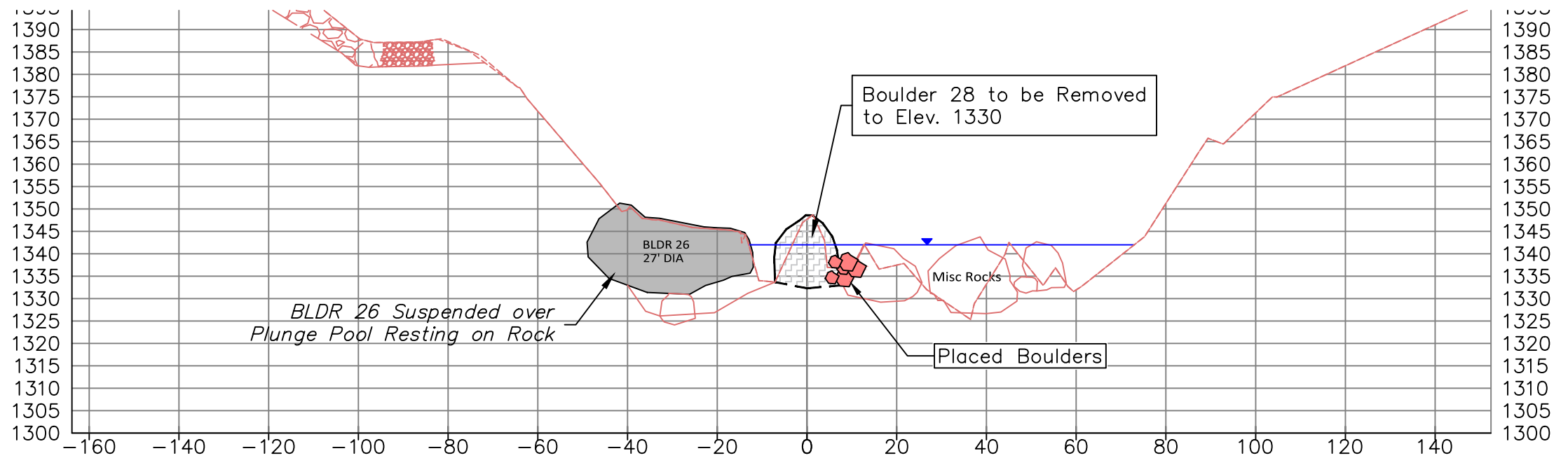
DATE:
2/18/19

Sections

12 17
SHEET OF



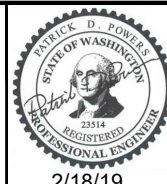
L
5 | 13
Channel Section L - (View Downstream)
SCALE: 1"=30'



M
5 | 13
Channel Section M (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
 BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

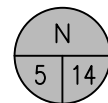
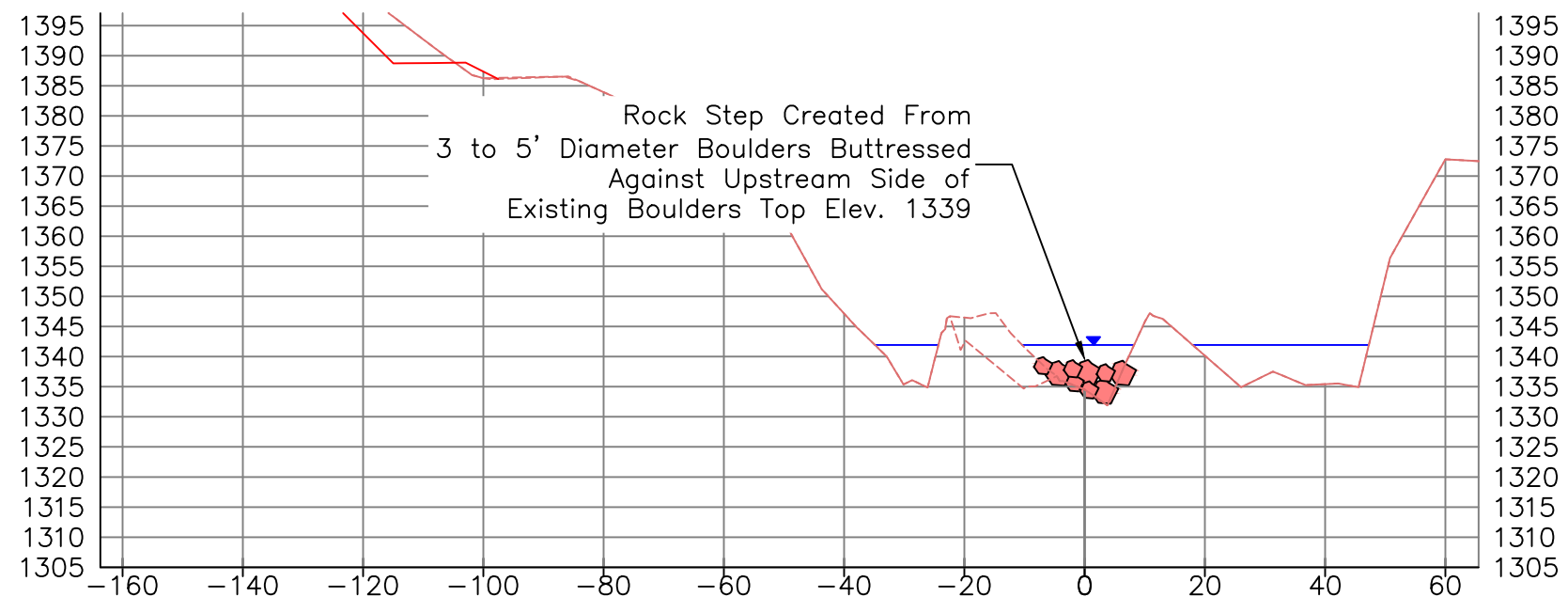
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Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
2/18/19

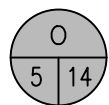
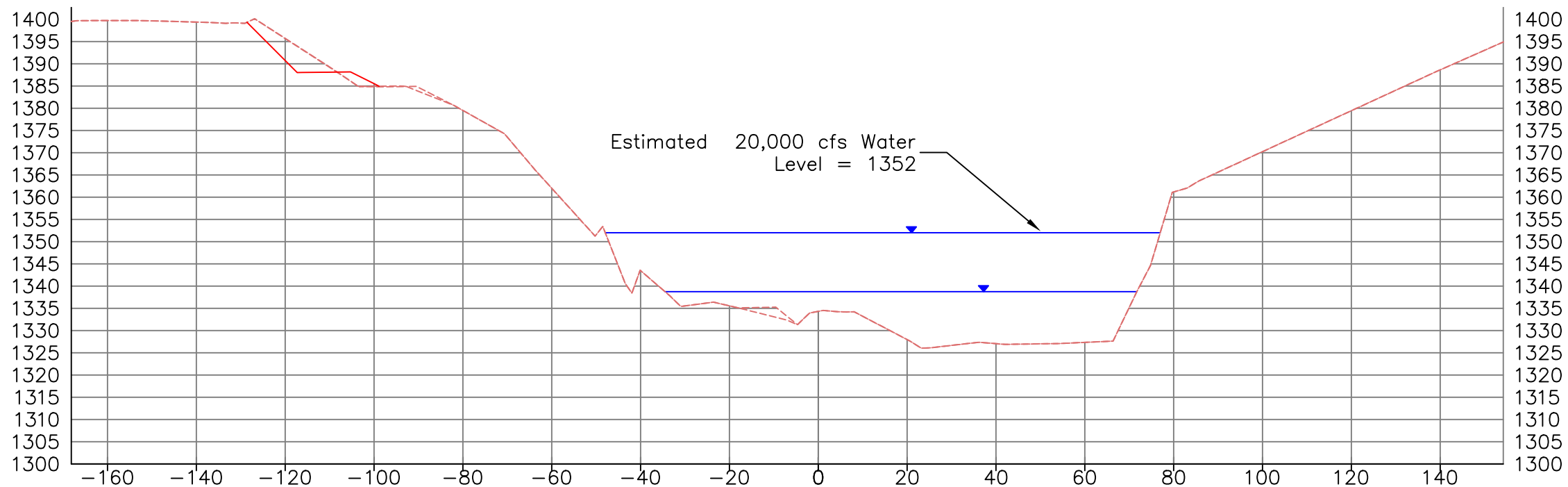
Sections

13 **17**
SHEET OF



Channel Section N (View Downstream)

SCALE: 1"=30'



Channel Section O (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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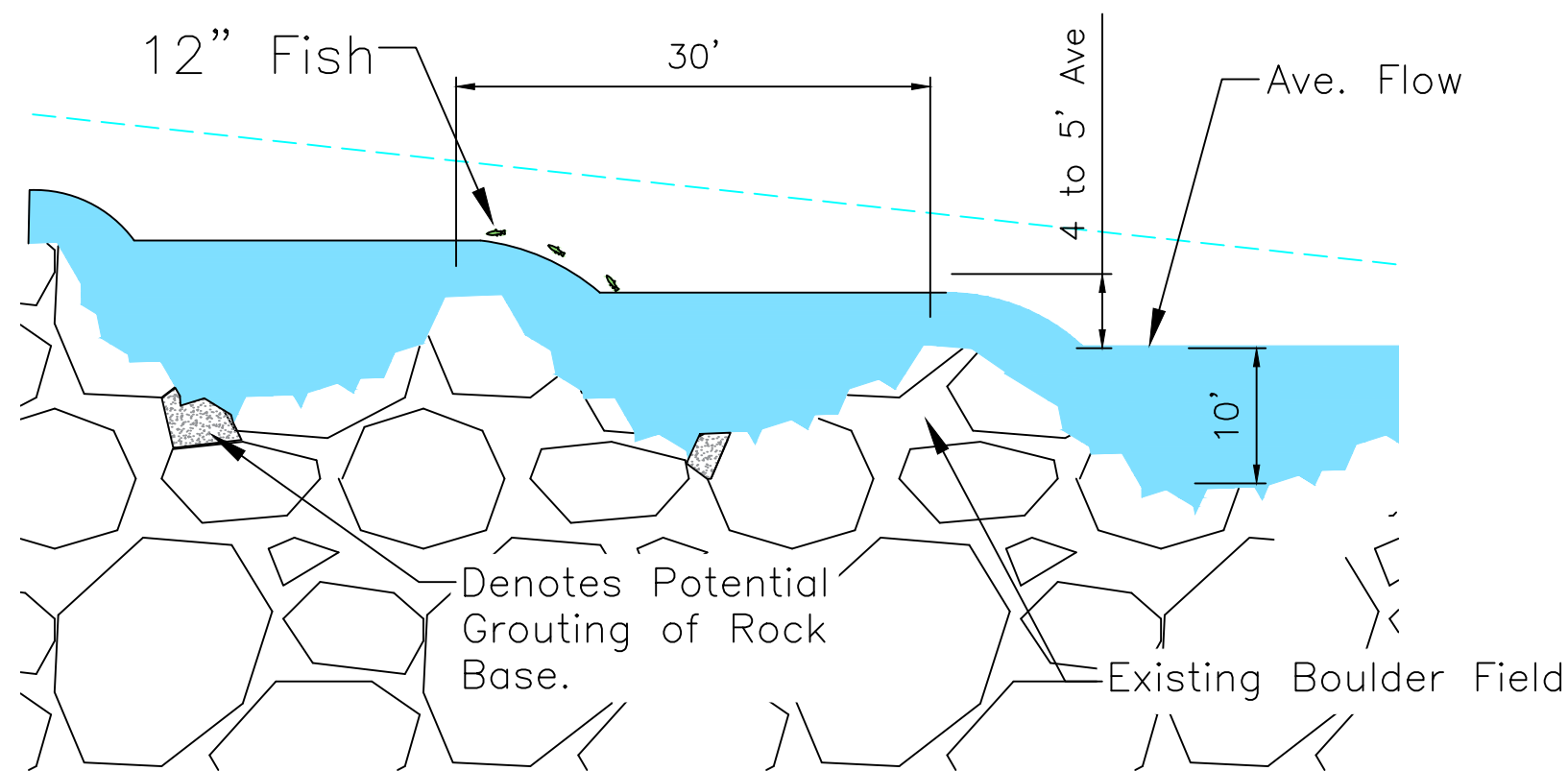
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DRAWN BY:
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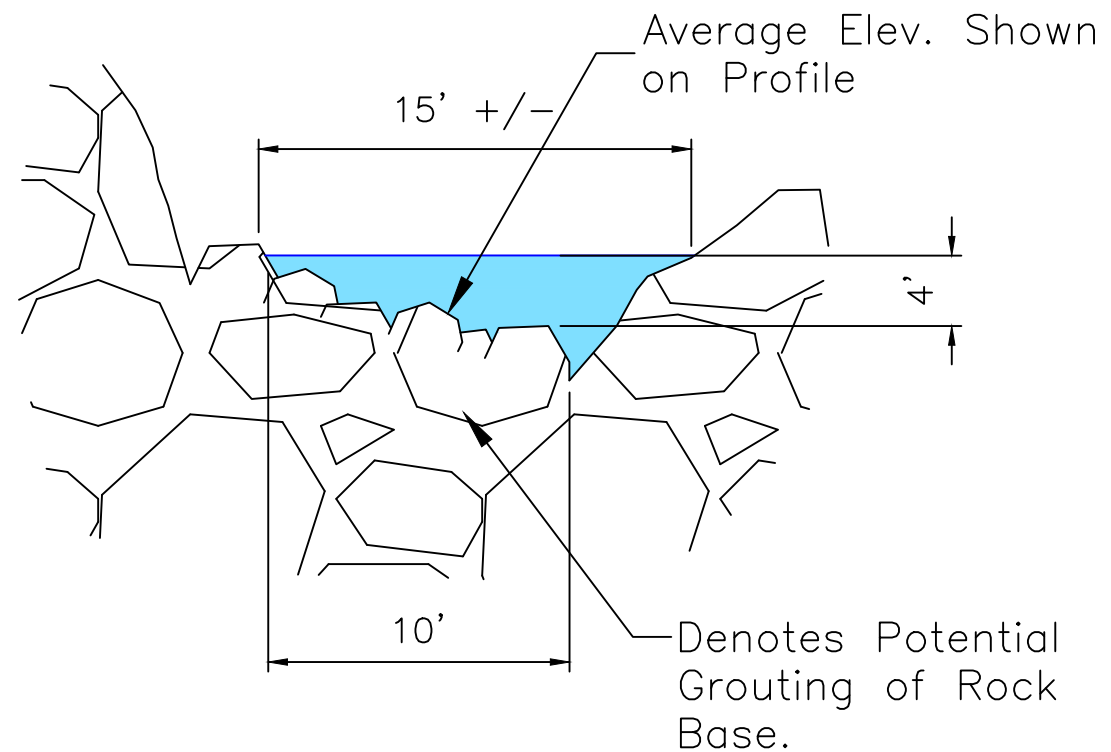
DATE:
2/18/19

Sections

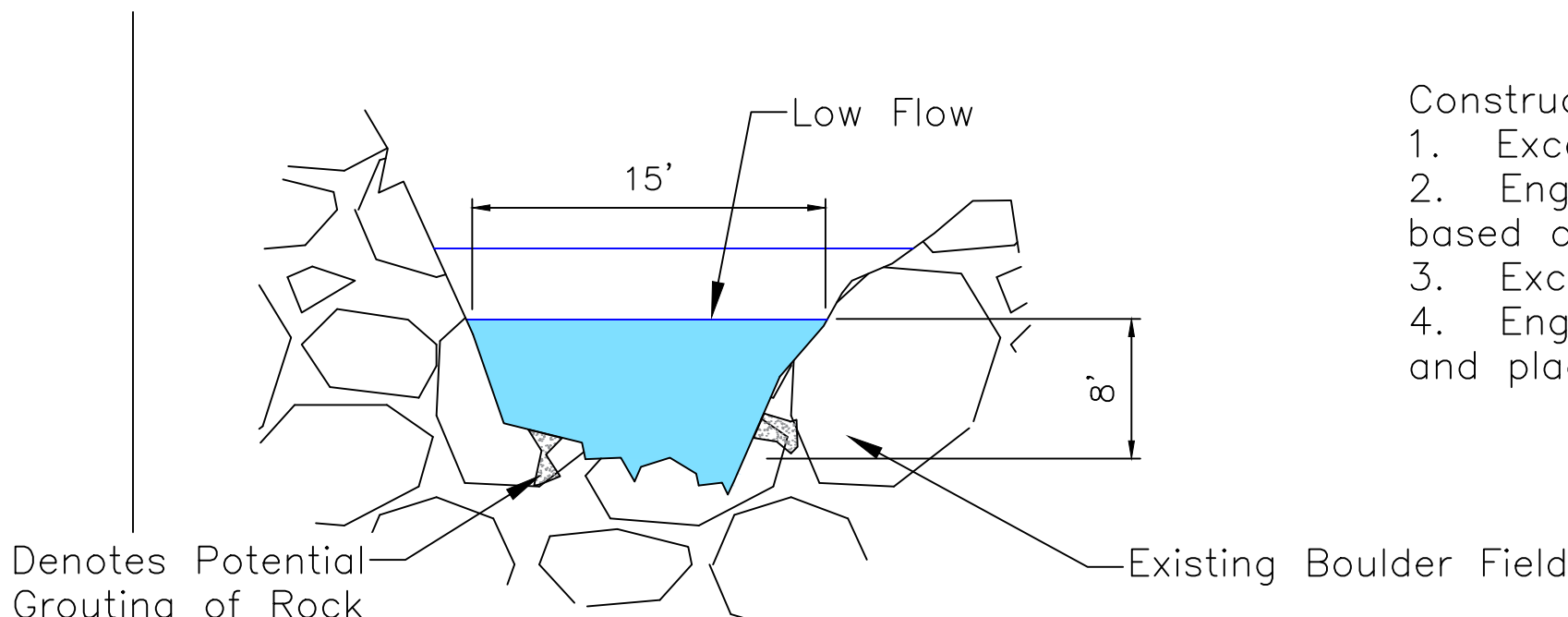
14 **17**
SHEET OF



15% Slope Channel Profile
SCALE: 1" = 10'



Typical Step/Weir
SCALE: 1" = 10'



Typical Pool Detail
SCALE: 1" = 10'

Construction Notes:

1. Excavate to top of proposed Steps.
2. Engineer will inspect to locate final Step Locations based on Boulder Locations.
3. Excavate Pools, Based on New Step Locations.
4. Engineer will Review Steps for potential rock removal and placement.



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

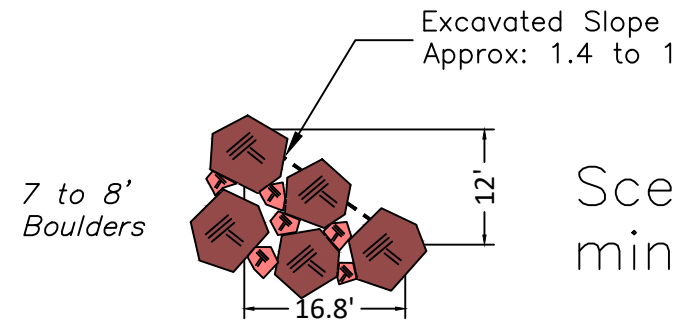
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Waterfall Engineering

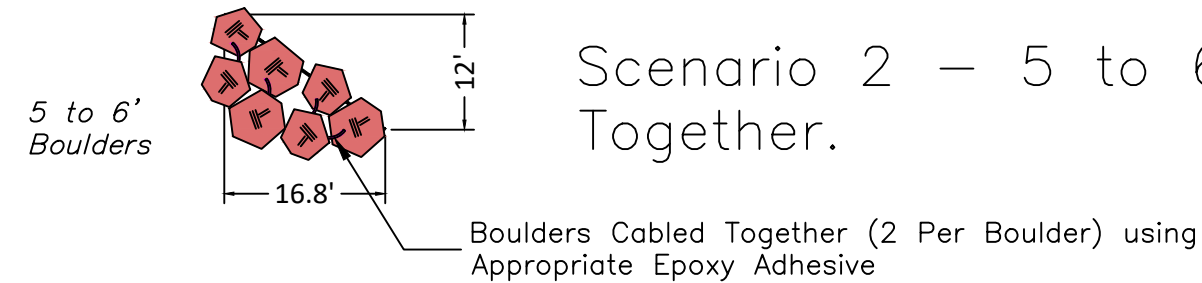
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RiverSide Drafting

DATE:
2/18/19

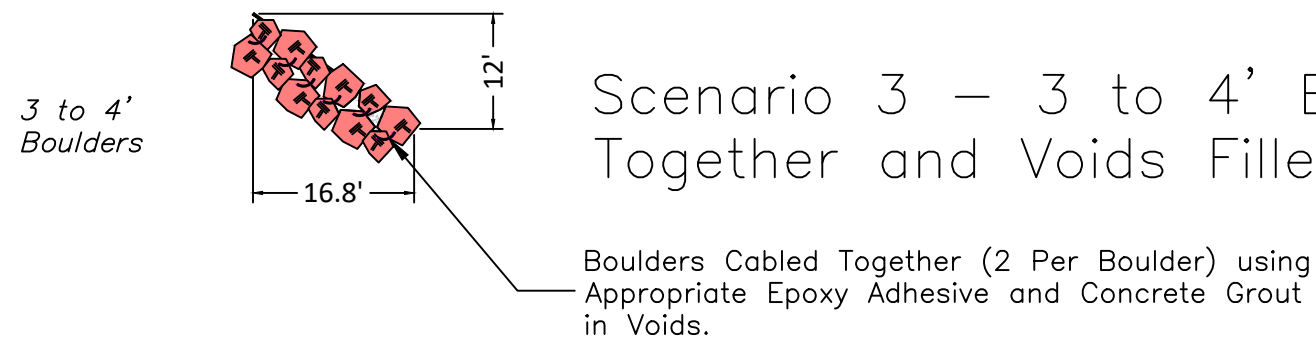
Step/Pool Channel Details



Scenario 1 – Existing Boulders are 7 to 8' minimum diameter and will resist scour



Scenario 2 – 5 to 6' Boulders Cabled Together.



Scenario 3 – 3 to 4' Boulders Cabled Together and Voids Filled with Concrete

[Construction Options for Rock Slope Below 20,000 cfs](#)
SCALE: 1"= 20'

Note: Scenario 2 and 3 Must be Approved on Site by Engineer and Geomorphologist



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

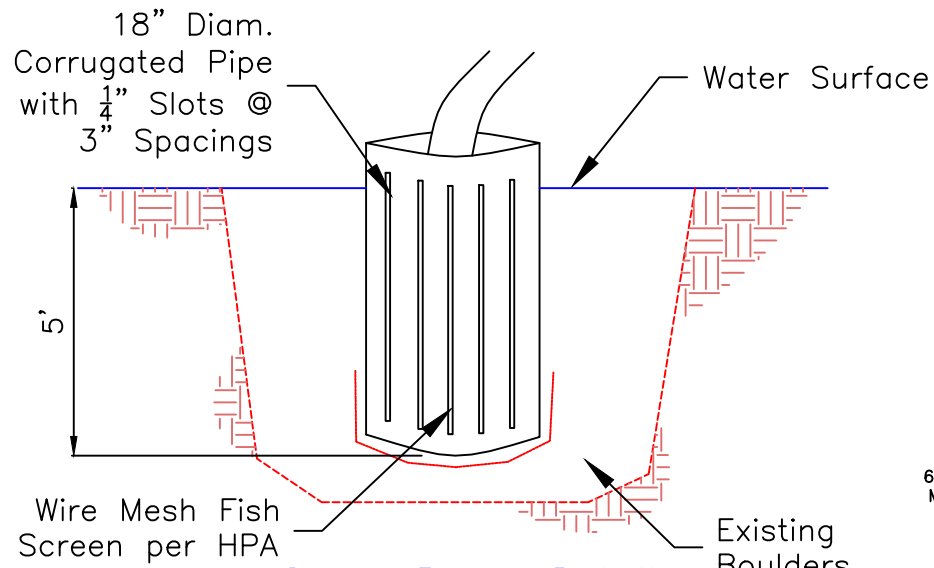
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DESIGN BY:
Waterfall Engineering

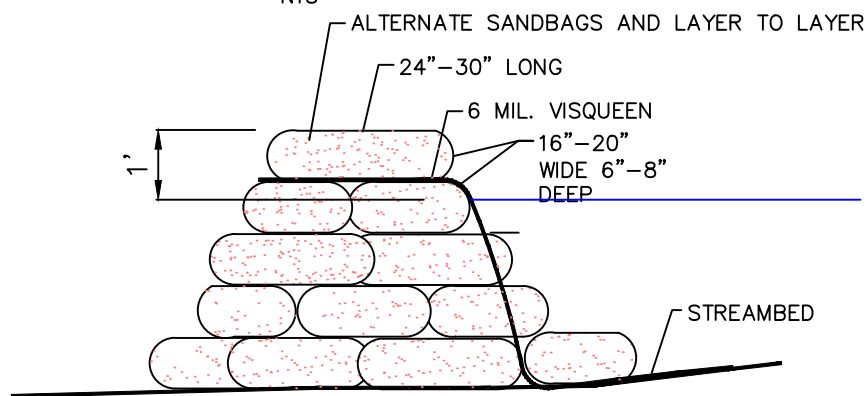
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RiverSide Drafting

DATE:
2/18/19

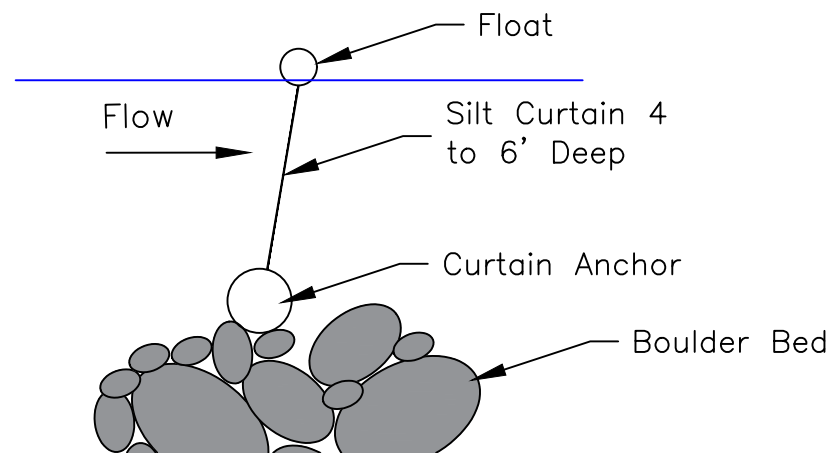
Rock Slope Detail



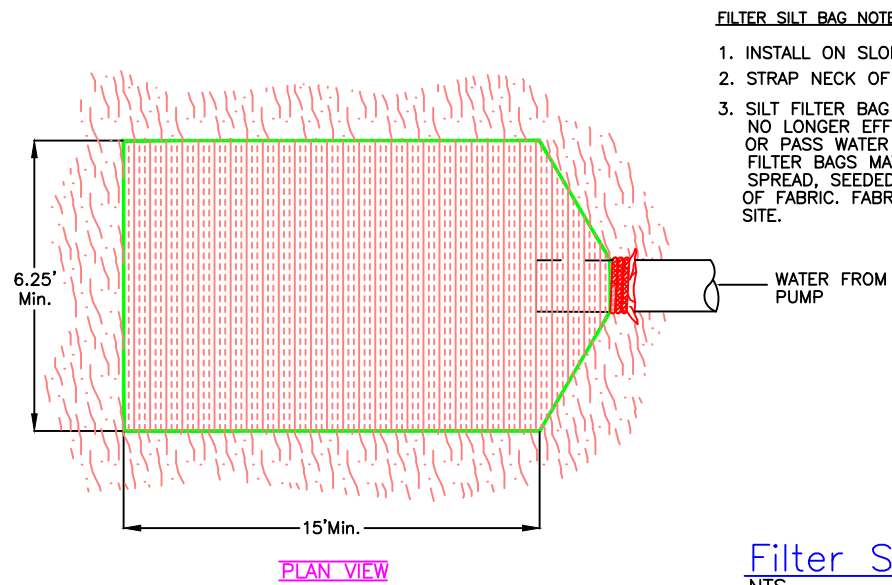
Sump Pump Detail
NTS



SANDBAG COFFER DAM
NTS

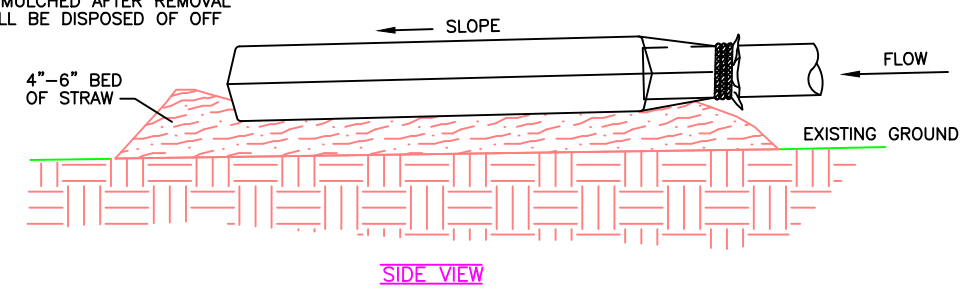


Type 2 Silt Curtain
NTS

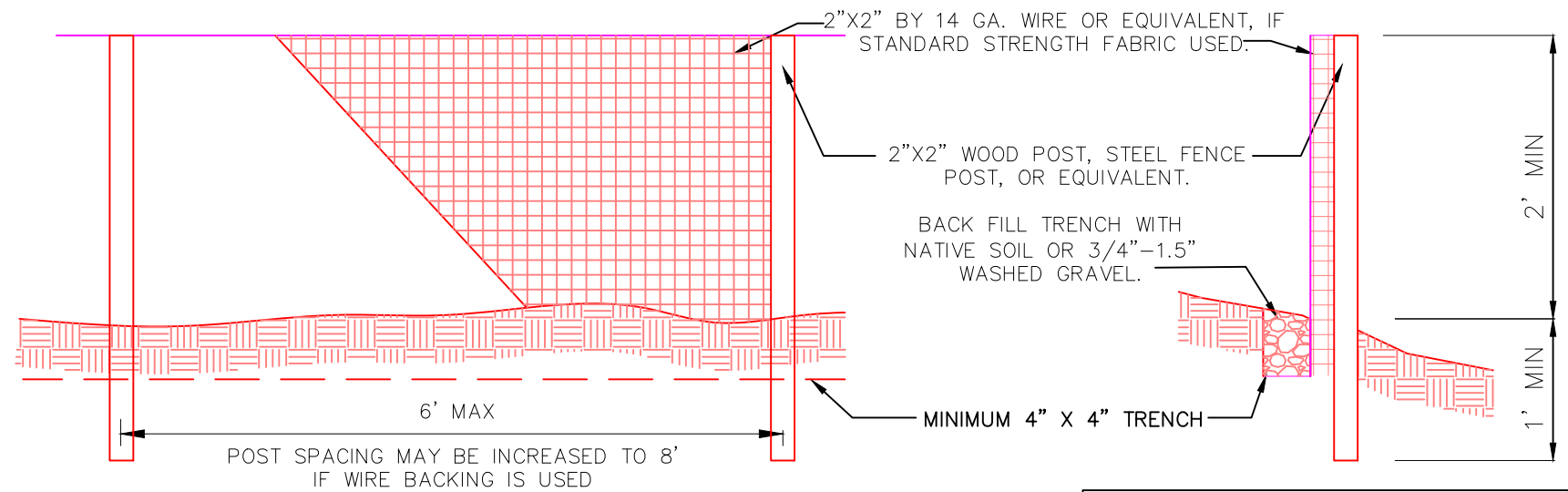


FILTER SILT BAG NOTES

1. INSTALL ON SLOPE SO INCOMING WATER FLOWS DOWNHILL THROUGH THE BAG.
2. STRAP NECK OF SILT FILTER BAG TIGHTLY TO DISCHARGE HOSE.
3. SILT FILTER BAG IS FULL WHEN IT CAN NO LONGER EFFICIENTLY FILTER SEDIMENT OR PASS WATER AT A REASONABLE RATE. USED FILTER BAGS MAY BE CUT OPEN AND CONTENTS SPREAD, SEEDED, AND MULCHED AFTER REMOVAL OF FABRIC. FABRIC SHALL BE DISPOSED OF OFF SITE.



Filter Silt Bag Detail
NTS



Filter Fabric Fence
NTS

JOINTS IN FILTER FABRIC SHALL BE SPLICED AT POSTS. USE STAPLES, WIRE RINGS OR EQUIVALENT TO ATTACH FABRIC TO POST.



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1'

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:

DATE:
2/18/19

Construction BMPs

Appendix B. City of Leavenworth Water Supply Pipeline Drawings

ICICLE CREEK FISH PASSAGE

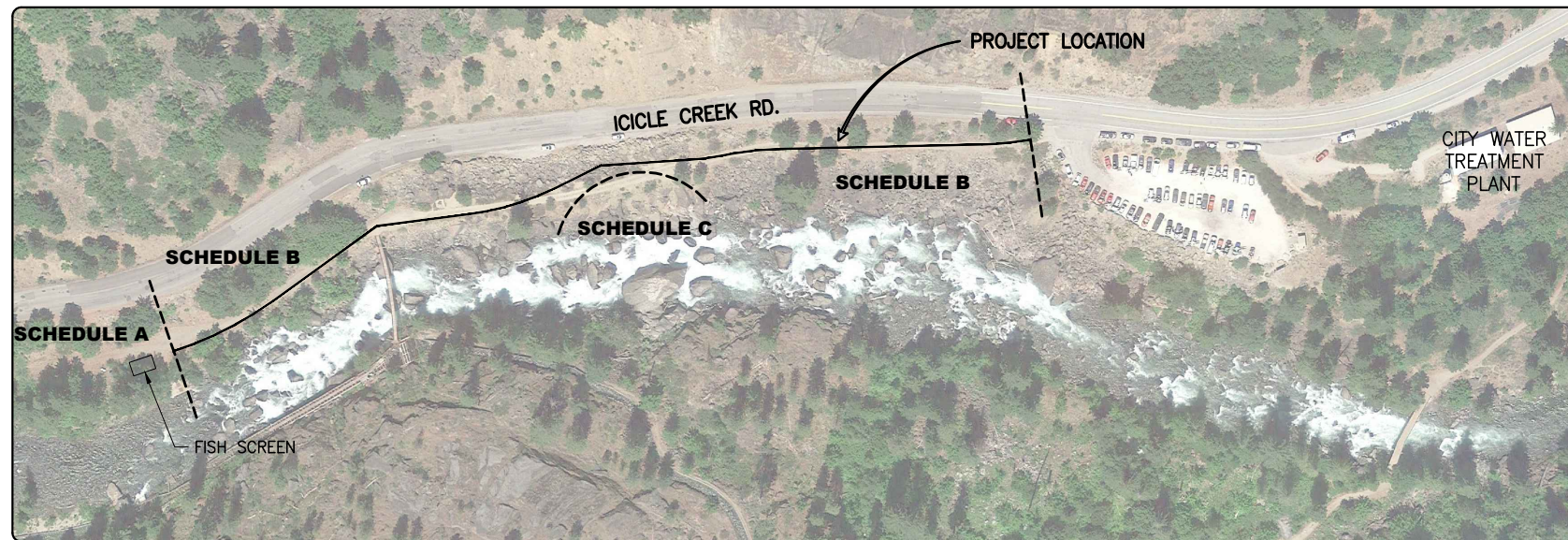
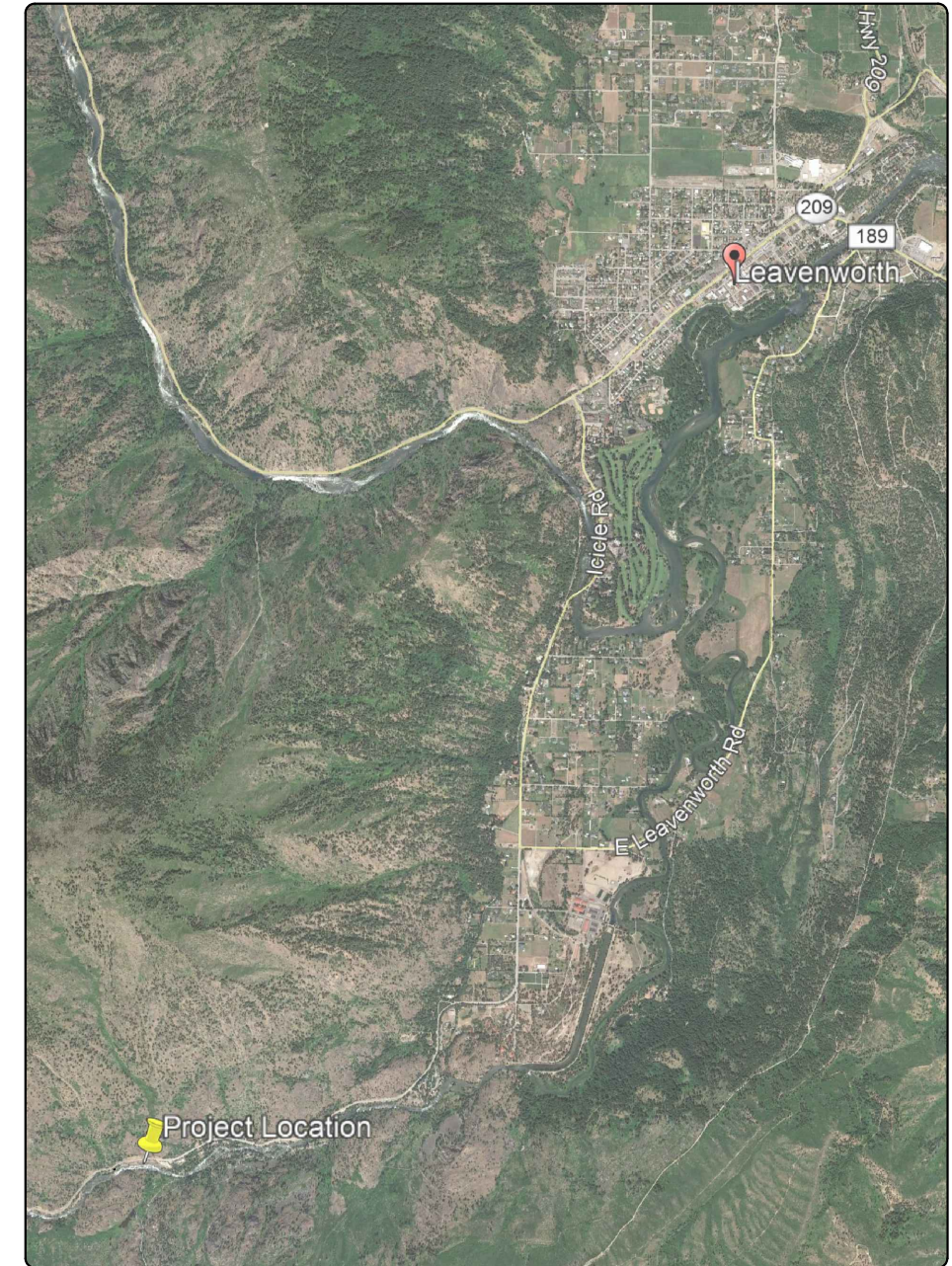
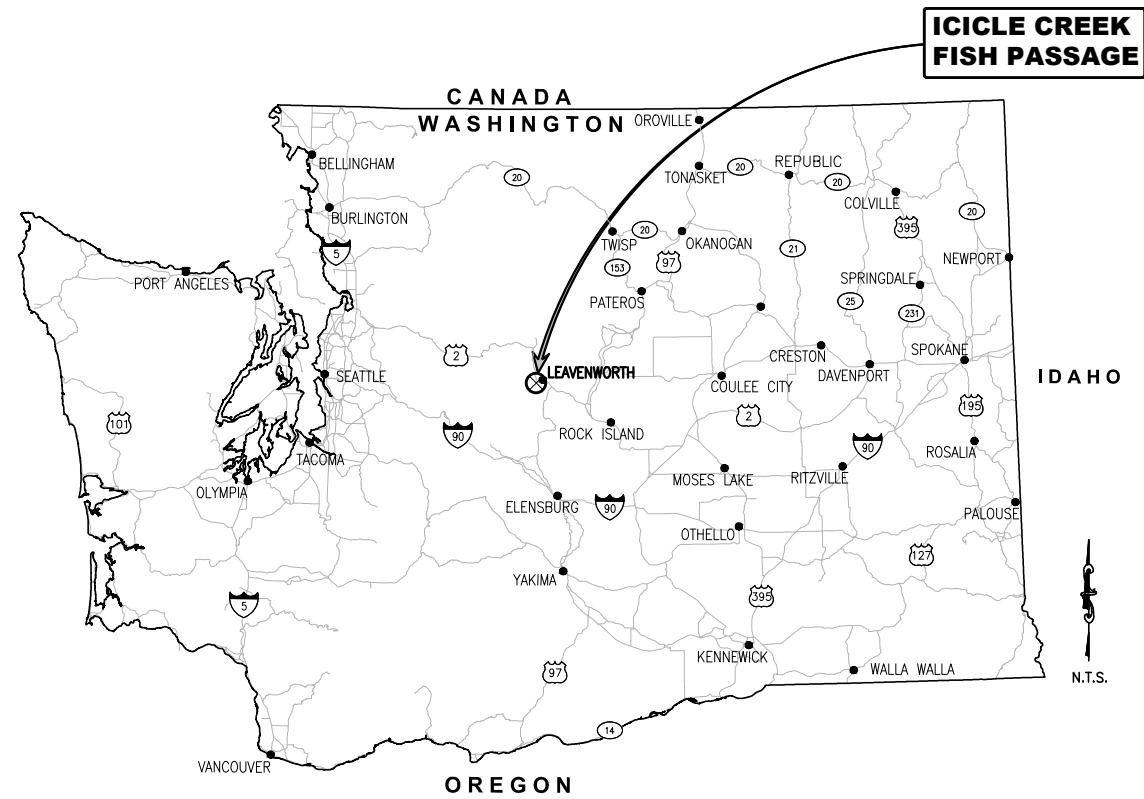
SCHEDULE B

CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

FOR TROUT UNLIMITED

FEBRUARY 2019

(draft)



PROJECT LOCATION

VICINITY MAP



Know what's below. Call before you dig.

ABBREVIATIONS

PIPE	AC CONC CMP CI DI FM GS PVC RCP STL	ASBESTOS CONCRETE CONCRETE CORRUGATED METAL PIPE CAST IRON DUCTILE IRON FORCE MAIN GALVANIZED STEEL POLYVINYL CHLORIDE PIPE REINFORCED CONCRETE PIPE STEEL PIPE	MISC	A.C. B BLM B.O.W. CB C.F.S. CL C.O. CONC. CSBC CSTC C.Y. D DEC. DET. DIA. DIM. DR DW DWG E EG ELEV. EP EXIST. FF FG FH FT. GR HP HWY I.E. IN. LF	ASPHALT CONCRETE BASEMENT BUREAU OF LAND MANAGEMENT BACK OF WALL CATCH BASIN CUBIC FEET PER SECOND CENTERLINE CLEAN OUT CONCRETE CRUSHED SURFACING BASE COURSE CRUSHED SURFACING TOP COURSE CUBIC YARD DIRT DECIDUOUS DETAIL DIAMETER DIMENSION DRAIN PIPE DRYWELL DRAWING EAST EXISTING GRADE ELEVATION EDGE OF PAVEMENT EXISTING FINISH FLOOR FINISH GRADE FIRE HYDRANT FOOT OR FEET GRADE HIGH PRESSURE HIGHWAY INVERT ELEVATION INCHES LINEAL FEET	MAX. MH MIN. N N.I.C. NO. NTS O.C. PP P.S.I. Q.C. Q.D. REV. REQ'D RD. R.R. R/W S SD SHT. SL SS ST. STA STD. SW SWMMEW SY T.B.M. T.O.P. T.O.W. TYP. W	MAXIMUM MANHOLE MINIMUM NORTH NOT IN CONTRACT NUMBER NOT TO SCALE ON CENTER POWER POLE POUNDS PER SQUARE INCH FULL PIPE CAPACITY DESIGN FLOW REVISED REQUIRED ROAD RAILROAD RIGHT-OF-WAY SOUTH SLOPE STORM DRAIN SHEET SURVEY LINE SANITARY SEWER STREET STATION STANDARD SIDEWALK STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON SQUARE YARD TEMPORARY BENCH MARK TOP OF PIPE TOP OF WALL TYPICAL WEST
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GENERAL NOTES

- THESE PLANS SHOW THE DESIGN FOR CONSTRUCTION OF THE ACCESS ROAD, WATER MAIN AND RETAINING WALLS FOR THE ICICLE CREEK FISH PASSAGE PROJECT (PROJECT). OTHER WORK ASSOCIATED WITH THE PROJECT INCLUDE CONSTRUCTION OF A FISH FILTER AND A FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE WORK AND CONSTRUCTION OF THE ENTIRE PROJECT.
- ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
- THE SNOW LAKE TRAILHEAD IS TO REMAIN OPEN TO THE PUBLIC AT ALL TIMES WITH THE FOLLOWING EXCEPTIONS THAT SHALL OCCUR PRIOR TO MAY 15, 2019. THE TRAILHEAD AND ROAD WILL BE OPEN TO THE PUBLIC AND HAVE NO TRAVEL RESTRICTIONS OR CONTRACTOR WORK AFTER MAY 15, 2019:
 - ONE DAY DURING INSTALLATION OF THE WATER MAIN
 - ONE DAY FOR PAVEMENT PATCHING OF THE DRIVEWAY ENTRANCE.
- WHERE KNOWN, EXISTING UTILITIES ARE SHOWN ON THE PLANS FOR THE CONVENIENCE OF THE CONTRACTOR. LOCATIONS SHOWN ARE APPROXIMATE AND DEPTHS ARE GENERALLY NOT KNOWN. OTHER UTILITIES MAY EXIST IN THE WORK AREAS THAT ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL VERIFY THE EXISTENCE, LOCATION, NATURE AND DEPTH OF THE EXISTING UTILITIES IN THE WORK AREA PRIOR TO CONSTRUCTION BY CONTACTING ALL UTILITY OWNERS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT AND REPAIR ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION. OVERHEAD UTILITIES ARE GENERALLY NOT SHOWN.
- WHERE THE POTENTIAL FOR CONFLICT WITH AN EXISTING UTILITY CROSSING EXISTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO EXPOSE, AS NECESSARY, THE EXISTING UTILITY ADEQUATELY IN ADVANCE OF HIS TRENCHING AND PIPE LAYING ACTIVITIES SO THAT IF NECESSARY, AN ADJUSTMENT TO GRADE FOR THE NEW PIPELINE CAN BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER

ACCESS ROAD NOTES

- 12 FOOT WIDE ACCESS ROAD IS TO BE CONSTRUCTED OF 8 INCH THICK COMPACTED CRUSHED SURFACING BASE COURSE (CSBC).
- ACCESS ROAD IS TO BE SLOPED TOWARDS BANK, AWAY FROM RIVER WITH DRAINAGE DIPS INSTALLED APPROXIMATELY EVERY 200 FEET AND AT LOW SPOTS IN THE ROAD.

RETAINING WALL NOTES

- THE UPPER GABION RETAINING WALL MUST BE INSTALLED BEFORE MAY 15, 2019 TO CONFORM TO THE CONSTRUCTION WINDOW OF APRIL 1, 2019 THROUGH MAY 15, 2019 WHEN ICICLE ROAD CAN BE USED BY THE CONTRACTOR FOR CONSTRUCTION.
- THE LOWER GABION RETAINING WALL LAYOUT IS BASED ON THE DESIGN FOR THE FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE TO VERIFY AND COORDINATE THE CONSTRUCTION OF THE FISH PASSAGE AND LOWER WALL WORK.
- BASKET FILL MAY CONSIST OF ON-SITE GRAVELS AND COBBLES THAT ARE ANGULAR OR CRUSHED TO PARTICLE SIZES BETWEEN 4 AND 8 INCHES IN DIAMETER. IMPORTED BASKET FILL, IF REQUIRED, SHALL MEET THE WSDOT STANDARD SPECIFICATION 9-27.3(6) FOR STONE. THE BASKET FILL SHALL BE PLACED IN A MANNER THAT MINIMIZES VOID SPACE IN THE BASKETS.

WATER MAIN NOTES

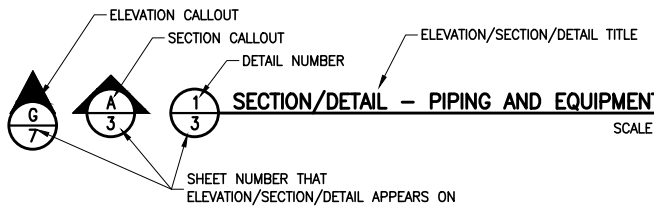
- ALL NEW WATER MAIN PIPE SHALL BE DUCTILE IRON PER SECTION 9.30.1(1), PUSH ON JOINT PIPE SHALL BE SPECIAL THICKNESS CLASS 52. A MINIMUM OF 2 BRASS CONTINUITY WEDGES SHALL BE INSTALLED AT EACH PIPE JOINT.
- PIPE JOINT RESTRAINT SHALL BE FIELD LOK 350 GASKETS BY US PIPE OR APPROVED EQUAL.
- FITTING JOINT RESTRAINT SHALL BE MEGALUG SERIES 1100 BE EBAA IRON OR APPROVED EQUAL.
- CONCRETE THRUST BLOCKS SHALL BE USED ONLY WHERE SHOWN ON THE DRAWINGS.
- TEST PRESSURE FOR WATER MAINS SHALL BE 80 PSI. MINIMUM DURATION SHALL BE 2 HOURS.
- FIRE HYDRANTS SHALL CONFORM TO AWWA C502 WITH TWO 2-1/2" HOSE CONNECTIONS, ONE 4-1/2" PUMPER PORT AND 5-1/2" VALVE OPENING. OPERATING NUT SHALL CONFORM TO THE OWNER'S STANDARD.
- DETECTABLE MARKING TAPE SHALL BE 5.0 MIL OVERALL THICKNESS, WITH A 50 GAUGE ALUMINUM FOIL CORE COVERED BY POLYETHYLENE. TAPE SHALL BE COLOR CODED, IMPREGNATED WITH PERMANENT MESSAGE PRINTING UNDER A MYLAR LAYER. COLOR AND MESSAGE SHALL BE APPROPRIATE FOR SPECIFIC UTILITY. TAPE SHALL BE THORTEXT, OR EQUAL.
- RIGID INSULATION SHALL BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM WITH MINIMUM COMPRESSIVE STRENGTH OF 25 PSI (ASTM D1621-73) AND MAXIMUM WATER ABSORPTION OF 0.3% (ASTM C272-73). MINIMUM INSULATION BOARD THICKNESS SHALL BE 2", WIDTH 48". INSULATION SHALL BE USED ONLY WHEN APPROVED BY THE OWNER WHEN A MINIMUM 5 FEET OF COVER CANNOT BE ACHIEVED.
- ALL NEW PIPE SHALL BE LAID TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS. ALL NEW PIPE SHALL HAVE A MINIMUM BURY DEPTH OF 5 FEET TO THE TOP OF PIPE. IF NECESSITATED BY FIELD CONDITIONS, AND WITH OWNER APPROVAL, THE CONTRACTOR MAY INSTALL THE PIPE WITH A MINIMUM OF 4 FEET COVER WITH INSULATION BOARD. SEE WATER MAIN DETAIL SHEET.
- PIPE ALIGNMENTS INCLUDE BOTH VERTICAL AND HORIZONTAL CURVES. CONTRACTOR SHALL INSTALL THE PIPE ALONG THE CURVE RADIUS SHOWN ON THE DRAWINGS BY DEFLECTING THE PIPE AT THE JOINTS/FITTING PER SECTION 7-09.3(15)A. IN NO CASE SHALL A SINGLE PIPE/FITTING JOINT BE DEFLECTED AT GREATER THAN 80% OF THE MANUFACTURER'S RECOMMENDED MAXIMUM JOINT DEFLECTION.
- ALL WATER MAINS SHALL BE INSTALLED IN SUCH A MANNER AS TO AVOID INTERMEDIATE HIGH POINTS.
- CONTRACTOR SHALL DISPOSE OF ALL EXISTING VALVES, PIPES, FITTINGS, ETC. REMOVED AS PART OF THE WORK, OR IF REQUESTED BY THE OWNER THE CONTRACTOR SHALL DELIVER REMOVED ITEMS SELECTED BY THE OWNER TO THE CITY SHOP.
- WHENEVER MULTIPLE ELBOWS ARE USED TO ACHIEVE A SINGLE BEND THEY SHALL BE FLANGED TOGETHER.
- DISINFECTION OF PIPELINE IS NOT REQUIRED. CONTRACTOR SHALL FLUSH PIPE OF ALL DEBRIS PRIOR TO ALLOWING FLOW TO THE WATER TREATMENT PLANT.
- WHEN SECTIONS OF THE EXISTING PIPE TO BE ABANDONED ARE REMOVED AND ENDS EXPOSED THEY SHALL BE PLUGGED PER SECTION 7-08.3(4).

SURFACE REPLACEMENT NOTES

- SURFACE REPLACEMENT FOR PAVED SURFACING REMOVED FOR CONSTRUCTION SHALL BE 2" COMMERCIAL HMA CLASS 1/2" PG 64-28 OVER 6" CSBC GRAVEL BASE. HMA SHALL BE FURNISHED AND INSTALLED PER SECTION 5-04. GRAVEL BASE SHALL BE FURNISHED AND INSTALLED PER SECTION 4-02.
- WHERE PAVEMENT TO BE REPLACED ABUTS EXISTING PAVEMENT IT SHALL BE SAWCUT OR WHEEL CUT PRIOR TO REPLACEMENT. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO THE ROADWAY.
- THE CONTRACTOR SHALL RE-ESTABLISH THE PUBLIC ROADWAYS DISTURBED BY HIS OPERATIONS TO THEIR ORIGINAL GRADES, LOCATION AND WIDTH. THE COMPLETED SURFACE OF ALL COURSES SHALL BE OF UNIFORM TEXTURE, SMOOTH UNIFORM CROWN AND GRADE IN ACCORDANCE WITH SECTION 5-04.3 (13) OF THE WSDOT STANDARD SPECIFICATIONS.
- SURFACE REPLACEMENT FOR GRAVELED AREAS SHALL BE 6" DEPTH CRUSHED SURFACING BASE COURSE. GRAVEL SURFACE REPLACEMENT SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH SECTION 4-04.

LEGEND

DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED
SURVEY					
ALUMINUM CAP	⊙		SURFACE		
CONCRETE MONUMENT	⊗		ASPHALT-EDGE		
HUB AND TACK	⊗		GRAVEL/DIRT-EDGE		
MONUMENT IN CASE	⊕		CONCRETE-EDGE (EX)		
PK NAIL	⊕		TREE/SHRUB		
SCRIBE	+SC		CREEK/DITCH		
STORM SEWER					
CULVERT	⋈	⋈	SURVEY		
WATER					
VALVE	⊗	⊗	SURVEY CENTERLINE		
FIRE HYDRANT	⊗	⊗	CONTOUR		
UTILITIES					
UTILITY POLE	⊙		CONTOUR (INDEX)		
UTILITY POLE ANCHOR	⊙		RIGHT-OF-WAY		
TELEPHONE RISER	⊗		UTILITIES		
TRAFFIC SIGN					
SIGN	⊗		WATER		



EARTHWORK NOTES

- "ROADWAY EXCAVATION INCLUDING HAUL" SHALL INCLUDE EXCAVATING ALL CUTS IN THE WORK AREA INCLUDING EARTH AND BOULDERS.
- "EMBANKMENT COMPACTION" SHALL INCLUDE CONSTRUCTING THE AREAS OF FILL USING EITHER NATIVE MATERIALS EXCAVATED FROM CUT AREAS OR IMPORTED "COMMON BORROW" MATERIALS.
- "COMMON BORROW INCLUDING HAUL" SHALL BE IMPORTING MATERIALS TO BE USED TO CONSTRUCT AREAS OF FILL IF NATIVE MATERIALS ARE DETERMINED UNSUITABLE.

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02	LEGEND, ABBREVIATIONS, NOTES, INDEX
03	CONTRACTOR STAGING & COORDINATION
04	EROSION CONTROL PLAN
05	TRAFFIC CONTROL PLAN
06	ACCESS ROAD ALIGNMENT
07	ACCESS ROAD - PLAN & PROFILE STA 10+00 TO STA 14+25
08	ACCESS ROAD - PLAN & PROFILE STA 14+25 TO STA 20+22
09	WATER MAIN ALIGNMENT
10	WATER MAIN - PLAN & PROFILE STA 10+00 TO STA 14+50
11	WATER MAIN - PLAN & PROFILE STA 14+50 TO STA 20+00
12	ACCESS ROAD SECTIONS
13	RETAINING WALL PROFILES
14	RETAINING WALL SECTIONS
15	WATER MAIN - DETAIL

ASPECT CONSULTING

- UPPER WALL AT USFS ROAD
- LOWER WALL AT IPID ACCESS ROAD

BOULDER REMOVAL NOTES

- SEE SPECIAL PROVISIONS FOR BOULDER REMOVAL DESCRIPTION, METHODS AND PAYMENT.
- IT IS THE INTENT OF THIS PROJECT TO REDUCE EXPORT OF BOULDERS FROM THIS SITE AS MUCH AS FEASIBLE. BOULDERS EXCAVATED FROM THE PROJECT AREA MAY BE RE-USED ONSITE, WITH ENGINEER APPROVAL, UNDER THE FOLLOWING CONDITIONS:
 - BOULDERS REDUCED TO APPROPRIATE SIZE AND GRADING MAY BE USED AS BACKFILL FOR THE WATER MAIN OR AS FILL UNDER THE ACCESS ROAD. SEE SHEET 16.
 - BOULDERS AND OTHER EXCAVATED MATERIAL MAY BE USED TO CONSTRUCT THE SECONDARY ACCESS ROAD TO THE WEST. SEE SCHEDULE A.
 - BOULDERS REDUCED TO APPROPRIATE SIZE MAY BE PLACED ON 1.5 : 1 SLOPE ABOVE ACCESS ROAD WITH ENGINEER APPROVAL. BOULDERS MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND SHALL NOT ENCRoACH INTO THE 12 FOOT CLEAR LOWER ACCESS ROADWAY.
 - BOULDERS MAY BE WASTED AGAINST EXISTING SLOPE BETWEEN ACCESS ROAD AND USFS ROADWAY FROM THE SECONDARY ACCESS ROAD TO ACCESS ROAD STA 13+00. MATERIAL MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND PROTECTED FROM EROSION.
 - BOULDERS MEASURING LESS THAN 3 FT IN WIDTH MAY BE PLACED ALONG THE SHOULDER PARALLEL TO THE UPPER RETAINING WALL. BOULDERS MUST NOT ENCRoACH WITHIN 3 FT OF THE EDGE OF ASPHALT.
 - BOULDERS 24" OR LESS IN DIAMETER MAY BE PLACED ON SLOPE BETWEEN SNOWLAKES TRAILHEAD PARKING AREA AND USFS ROADWAY.

EMERGENCY BYPASS PUMPING SYSTEM

- THE CITY OF LEAVENWORTH (CITY) WATER SUPPLY IS PROVIDED BY SURFACE WATER, VIA THE WATER TREATMENT PLANT (WTP), AND GROUNDWATER VIA CITY WELLS. THE 16-INCH WATER MAIN TO BE REPLACED PROVIDES SURFACE WATER SUPPLY TO THE CITY WTP. THE GROUNDWATER WELLS HAVE SUFFICIENT SUPPLY CAPACITY TO MEET NORMAL DEMANDS DURING CONSTRUCTION. THE CONTRACTOR MAY SHUT OFF AND DRAIN THE 16-INCH WATER MAIN TO THE CITY WTP DURING CONSTRUCTION FROM THE FIRST DAY OF ONSITE WORK UNTIL SUBSTANTIAL COMPLETION. THIS EXISTING WATER MAIN MAY BE ABANDONED IN PLACE OR REMOVED AS NEEDED FOR CONSTRUCTION.
- IN THE EVENT ONE OR MORE CITY WELLS FAIL DURING CONSTRUCTION AND ARE UNABLE TO PROVIDE SUFFICIENT SUPPLY TO THE CITY THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE SURFACE WATER SUPPLY TO THE WTP AND SHALL BE ABLE TO SETUP AND PROVIDE THIS SUPPLY WITHIN 24 HOURS OF NOTIFICATION.
- DURING THE PERIOD THE 16-INCH WATER MAIN TO THE WTP IS REMOVED FROM SERVICE, THE CONTRACTOR SHALL HAVE ONSITE OR READILY AVAILABLE A BYPASS PUMPING SYSTEM CAPABLE OF DELIVERING A CONSTANT 800 GPM TO THE WTP. THIS SYSTEM INCLUDES PUMPS, PIPING, FITTING AND APPURTENANCES AS NEEDED TO CONNECT THE WTP TO THE EXISTING MAIN UPSTREAM OF THE WORK AREA. THIS SYSTEM WILL BE CAPABLE OF 24 HOUR OPERATION UNTIL THE CITY WELLS ARE RETURNED TO SERVICE. TEMPORARY BYPASS PUMP PIPING MAY BE LAID ALONG THE SHOULDER OF THE USFS ROAD. ACCESS TO THE SNOWLAKES TRAILHEAD PARKING AREA SHALL BE MAINTAINED.
- SEE THE SPECIAL PROVISIONS FOR BID ITEMS, MEASUREMENT AND PAYMENT.

ICICLE CREEK FISH PASSAGE
CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

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 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19

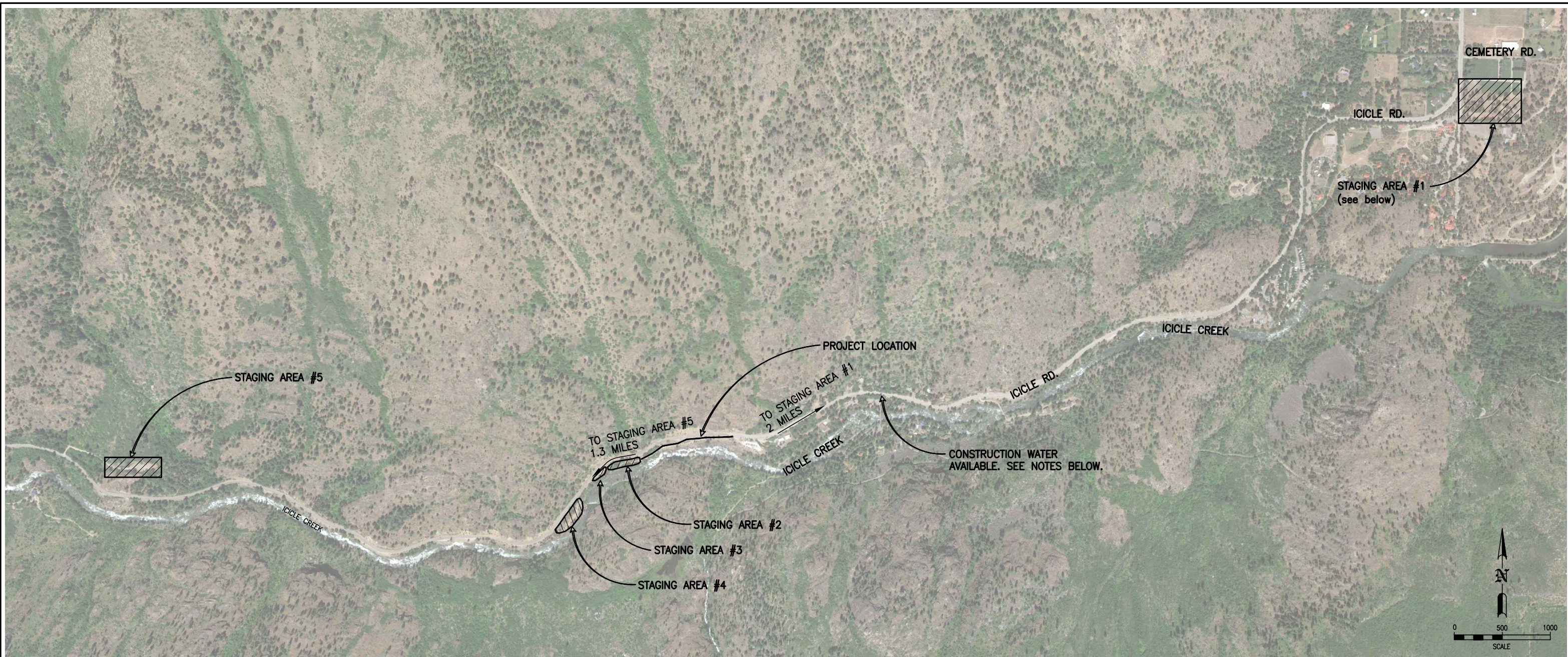


LEGEND, ABBREVIATIONS, NOTES, INDEX

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NOTES

1. PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD TRAFFIC RESTRICTIONS ARE ALLOWED PRIOR TO MAY 15, 2016. SEE TRAFFIC CONTROL PLAN. ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019 WITH THE EXCEPTION OF STAGING AREA #3. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
2. POTENTIAL STAGING AREAS HAVE BEEN IDENTIFIED FOR CONTRACTOR USE BY THE AGENCIES ASSOCIATED WITH THE PROJECT. THE CONTRACTOR SHALL COORDINATE ACCESS, USE, SECURITY, CLEANUP AND RESTORATION WITH THE AGENCY THAT OWNS THE SITE. APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL ARE TO BE INSTALLED AND MAINTAINED FOR DURATION OF USE. THE FOLLOWING STAGING AREAS ARE AVAILABLE FOR USE BY THE CONTRACTOR.
 - a. STAGING AREA #1 – SOUTH OF CITY CEMETERY, OWNED BY CITY OF LEAVENWORTH. AVAILABLE FOR DURATION OF PROJECT. CONTRACTOR MAY USE AREA FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL. STOCKPILED MATERIAL SHALL NOT BE LEFT PERMANENTLY. HOWEVER, A SMALL QUANTITY (~100 CY) OF ANGULAR ROCK/BOULDERS MAY BE LEFT WITH CITY APPROVAL. THE CITY REQUIRES THE AREA BE DELINEATED AND APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL BE INSTALLED FOR DURATION OF USE.
 - b. STAGING AREA #2 –ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - c. STAGING AREA #3 – TURNOUT PARKING AREA ADJACENT TO ICICLE ROAD, OWNED BY USFS. AVAILABLE FOR DURATION OF PROJECT.

- d. STAGING AREA #4 – ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - e. STAGING AREA #5 – PARKING AREA NORTH OF ICICLE ROAD, OWNED BY BLM SPOKANE OFFICE. NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND. AVAILABLE FOR DURATION OF PROJECT.
 - f. SNOW LAKE TRAILHEAD – NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND INCLUDING THE SNOW LAKE TRAILHEAD. THE TRAILHEAD IS AVAILABLE FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL FROM APRIL 1, 2019 THROUGH MAY 15, 2019, THE CONTRACTOR WILL REMOVE ALL MATERIAL AND HAVE THE AREA RESTORED FOR PUBLIC USE BY MAY 16, 2019. EXCEPT FOR ACCESS TO THE CONSTRUCTION AREA NO CONTRACTOR USE WILL BE ALLOWED AFTER MAY 16, 2019.
3. OTHER STAGING AREAS MAY BE IDENTIFIED AND USED BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE OWNER IF OTHER STAGING AREAS WILL BE USED. A PROPERTY USE AND A PROPERTY RELEASE FORM WILL BE PROVIDED TO THE OWNER IF OTHER STAGING AREAS ARE USED.
 4. THE SNOW LAKE TRAILHEAD WILL OPEN TO THE PUBLIC ON MAY 16, 2019. THE CONTRACTOR WILL INSTALL THE WATER MAIN, PRESSURE TEST IT, AND RESTORE THE AREA FROM STA. 20+00 TO STA. 23+00 BY MAY 15, 2019 TO ALLOW PUBLIC USE OF THE TRAILHEAD PARKING AREA.

CONSTRUCTION WATER

1. WATER FOR CONSTRUCTION IS AVAILABLE FROM THE CITY OF LEAVENWORTH FIRE HYDRANT LOCATED IN THIS AREA.
2. CONTRACTOR SHALL METER THE WATER AND PROVIDE USAGE DATA INCLUDING VOLUME, DATE AND TIME OF WITHDRAWAL.
3. CONTRACTOR SHALL FOLLOW ALL BACKFLOW PREVENTION REQUIREMENTS TO PREVENT CROSS CONTAMINATION AND/OR OTHER CITY OF LEAVENWORTH REQUIREMENTS.
4. ALL PERMITS TO WITHDRAW WATER FROM CITY OF LEAVENWORTH FACILITIES ARE THE RESPONSIBILITY OF THE CONTRACTOR.
5. FEES FOR PERMITS AND PAYMENT FOR WATER SHALL BE PAID BY THE OWNER.
6. ARRANGEMENTS TO WITHDRAW WATER FOR CONSTRUCTION FROM OTHER FIRE HYDRANTS SHALL BE AS PERMITTED BY AND COORDINATED WITH THE CITY OF LEAVENWORTH.



STAGING AREA #1

CONTRACTOR TO CONTACT CITY OF LEAVENWORTH TO DETERMINE EXACT EXTENTS OF AREA AVAILABLE FOR USE BY THE CONTRACTOR.

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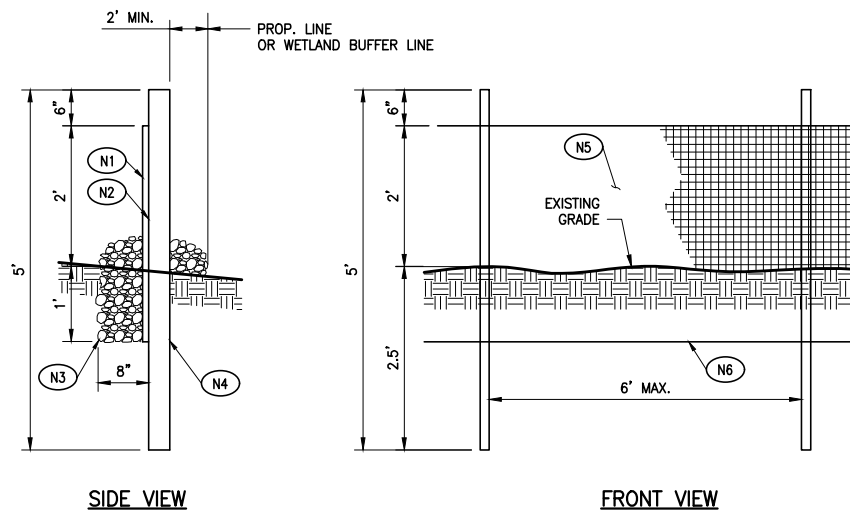
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ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

CONTRACTOR STAGING & COORDINATION

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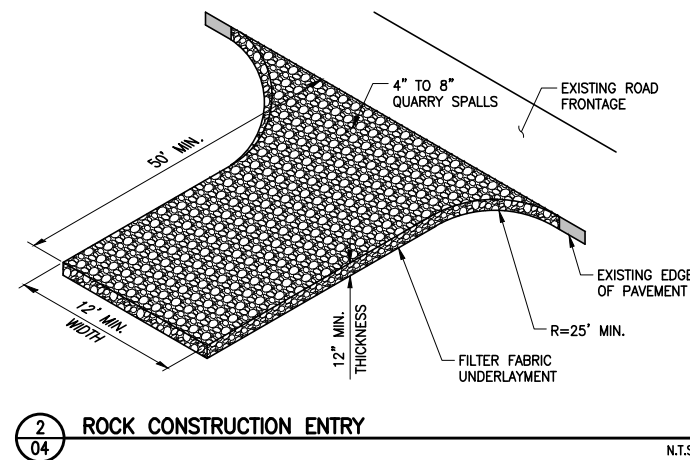
NOTES

- (N1) FILTER FABRIC MATERIAL MIRAFI 100 NS OR EQUIVALENT
- (N2) 2"x2" BY 14 GA. WIRE FABRIC OR EQUIVALENT, AFFIX TO POST (LOCATED ON DOWNHILL SIDE OF FILTER FABRIC)
- (N3) PROVIDE NATIVE BACKFILL
- (N4) 2"x4" WOOD POST OR STEEL FENCE POST
- (N5) FILTER FABRIC MATERIAL 60" WIDE, CONTINUOUS, ROLLS. USE RINGS TO ATTACH TO WIRE FABRIC
- (N6) BURY BOTTOM OF FILTER MATERIAL IN 8"x12" TRENCH

**1
04** SILT FENCE

NOTES

1. FILTER FABRIC FENCE SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6" OVERLAP, AND SECURELY FASTENED AT BOTH ENDS TO POST.
2. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AND DRIVEN SECURELY INTO THE GROUND (MAXIMUM OF 30").
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8" WIDE AND 12" DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4" AND SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO FENCE, AND 20" OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATE. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POST WITH ALL OTHER PROVISIONS OF ABOVE NOTES APPLYING.
7. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
8. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



**2
04** ROCK CONSTRUCTION ENTRY

EROSION CONTROL NOTES

1. THE IMPLEMENT OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND VEGETATION IS ESTABLISHED.
2. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED BY THE CONTRACTOR FOR UNEXPECTED STORM EVENTS AND TO ENSURE THE SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. THE CONTRACTOR SHALL IMPLEMENT BMPs C101-C162 OF THE SWMMW AS NEEDED TO MEET THESE REQUIREMENTS.
3. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
4. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 8 HOURS FOLLOWING A MAJOR STORM EVENT.
5. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

EROSION CONTROL NOTES

1. CONTRACTOR SHALL COMPLETE, SUBMIT AND HAVE AN APPROVED SWPPP PRIOR TO BEGINNING ANY WORK ONSITE. THE FOLLOWING REQUIREMENTS SHALL BE INCLUDED IN OR BE IN ADDITION TO THE SWPPP.
2. ALL STORMWATER MANAGEMENT ELEMENTS SHALL BE CONSISTENT WITH THE STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON (SWMMW).
3. THE FOLLOWING CONSTRUCTION SEQUENCE SHALL BE FOLLOWED IN ORDER TO BEST MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENTATION CONTROL PROBLEMS:
 - (A) CLEAR AND GRUB SUFFICIENTLY FOR INSTALLATION OF TEMPORARY ESC BMPs;
 - (B) INSTALL TEMPORARY ESC BMPs, CONSTRUCTING SEDIMENT TRAPPING BMPs AS ONE OF THE FIRST STEPS PRIOR TO GRADING;
 - (C) CLEAR, GRUB AND ROUGH GRADE FOR ROADS, TEMPORARY ACCESS POINTS AND UTILITY LOCATIONS;
 - (D) STABILIZE ROADWAY APPROACHES AND TEMPORARY ACCESS POINTS WITH THE APPROPRIATE CONSTRUCTION ENTRY BMP;
 - (E) REMOVE TEMPORARY ESC CONTROLS WHEN PROJECT COMPLETE.
4. INSPECT ALL ROADWAYS, AT THE END OF EACH DAY, ADJACENT TO THE CONSTRUCTION ACCESS ROUTE. IF IT IS EVIDENT THAT SEDIMENT HAS BEEN TRACKED OFF SITE AND/OR BEYOND THE ROADWAY APPROACH, CLEANING IS REQUIRED.
5. IF SEDIMENT REMOVAL IS NECESSARY PRIOR TO STREET WASHING, IT SHALL BE REMOVED BY SHOVELING OR PICKUP SWEEPING AND TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA.
6. IF STREET WASHING IS REQUIRED TO CLEAN SEDIMENT TRACKED OFF SITE, ONCE SEDIMENT HAS BEEN REMOVED, STREET WASH WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ON-SITE OR OTHERWISE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO WATERS OF THE STATE.
7. RESTORE CONSTRUCTION ACCESS ROUTE EQUAL TO OR BETTER THAN THE PRE-CONSTRUCTION CONDITION.
8. INSPECT SEDIMENT CONTROL BMPs WEEKLY AT A MINIMUM, DAILY DURING A STORM EVENT, AND AFTER ANY DISCHARGE FROM THE SITE (STORMWATER OR NON-STORMWATER). THE INSPECTION FREQUENCY MAY BE REDUCED TO ONCE A MONTH IF THE SITE IS STABILIZED AND INACTIVE.
9. CONTROL FUGITIVE DUST FROM CONSTRUCTION ACTIVITY IN ACCORDANCE WITH THE STATE AND/OR LOCAL AIR QUALITY CONTROL AUTHORITIES WITH JURISDICTION OVER THE PROJECT AREA.
10. STABILIZE EXPOSED UNWORKED SOILS (INCLUDING STOCKPILES), WHETHER AT FINAL GRADE OR NOT, WITHIN 10 DAYS DURING THE REGIONAL DRY SEASON (JULY 1 THROUGH SEPTEMBER 30) AND WITHIN 5 DAYS DURING THE REGIONAL WET SEASON (OCTOBER 1 THROUGH JUNE 30). SOILS MUST BE STABILIZED AT THE END OF A SHIFT BEFORE A HOLIDAY WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. THIS TIME LIMIT MAY ONLY BE ADJUSTED BY A LOCAL JURISDICTION WITH A "QUALIFIED LOCAL PROGRAM," IF IT CAN BE DEMONSTRATED THAT THE RECENT PRECIPITATION JUSTIFIES A DIFFERENT STANDARD AND MEETS THE REQUIREMENTS SET FORTH IN THE CONSTRUCTION STORMWATER GENERAL PERMIT.
11. PROTECT INLETS, DRYWELLS, CATCH BASINS AND OTHER STORMWATER MANAGEMENT FACILITIES FROM SEDIMENT, WHETHER OR NOT FACILITIES ARE OPERABLE.
12. STOCKPILE MATERIALS (SUCH AS TOPSOIL) ON SITE, KEEPING OFF OF ROADWAY AND SIDEWALKS.
13. COVER, CONTAIN AND PROTECT ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCT, AND NON-INERT WASTES PRESENT ON SITE FROM VANDALISM (SEE CHAPTER 173-304 WAC FOR THE DEFINITION OF INERT WASTE), USE SECONDARY CONTAINMENT FOR ON-SITE FUELING TANKS.
14. CONDUCT MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM REPAIRS, SOLVENT AND DE-GREASING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES THAT MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CLEAN ALL CONTAMINATED SURFACES IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. IF RAINING OVER EQUIPMENT OR VEHICLE, PERFORM EMERGENCY REPAIRS ON SITE USING TEMPORARY PLASTIC BENEATH THE VEHICLE.
15. CONDUCT APPLICATION OF AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, IN SUCH A MANNER, AND AT APPLICATION RATES, THAT INHIBITS THE LOSS OF CHEMICALS INTO STORMWATER RUNOFF FACILITIES. AMEND MANUFACTURER'S RECOMMENDED APPLICATION RATES AND PROCEDURES TO MEET THIS REQUIREMENT, IF NECESSARY.
16. REMOVE TEMPORARY ESC BMPs WITHIN 30 DAYS AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. PERMANENTLY STABILIZE AREAS THAT ARE DISTURBED DURING THE REMOVAL PROCESS.

1760102-Sht 04 (Esc).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

EROSION CONTROL PLAN

SHEET
04
 OF 15

NOTES

- PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD IS TO REMAIN OPEN TO TRAFFIC DURING CONSTRUCTION AT ALL TIMES. FOR WORK THAT NEEDS TO BE ACCESSED FROM ICICLE ROAD, DURING WORK HOURS, THE CONTRACTOR MAY USE THE EASTBOUND LANE (SOUTH LANE ADJACENT TO PROJECT AREA). WHEN WORK IS COMPLETE FOR THE DAY THE CONTRACTOR WILL ALLOW FOR TWO-WAY TRAFFIC.
- THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL. FLAGGERS ARE ANTICIPATED AS IS DAILY CONVERSION OF THE WORK AREA FROM SINGLE LANE DURING WORKING HOURS TO TWO LANE DURING NON-WORKING HOURS.
- TRAFFIC CONTROL PLANS SHALL CONFORM WITH THE STANDARDS OF THE 2009 MUTCD AND THE WSDOT 2014 WORK ZONE TRAFFIC CONTROL GUIDELINES FOR MAINTENANCE OPERATIONS. ALL SIGN SIZES SHALL CONFORM TO MUTCD REQUIREMENTS FOR A CONVENTIONAL ROAD.
- THE CONTRACTOR MAY ACCEPT THE TRAFFIC CONTROL MEASURES SHOWN ON THESE PLANS OR SUBMIT AN ALTERNATIVE PLAN FOR APPROVAL.
- TRAFFIC CONTROL MEASURES SHALL BE INSTALLED BY THE CONTRACTOR PRIOR TO COMMENCING WORK.
- TRAFFIC CONTROL MEASURES NEEDED TO RESTRICT ICICLE ROAD TO ONE LANE SHALL BE INSTALLED BY THE CONTRACTOR WHEN NEEDED TO ACCESS THE WORK AREA. CONTRACTOR TO LIMIT ROAD RESTRICTIONS TO THE IMMEDIATE AREA BEING WORKED ON TO THE MAXIMUM EXTENT PRACTICABLE.
- TEMPORARY TRAFFIC LANES SHALL BE CLEARLY DELINEATED AND MAY CONSIST OF CHANNELIZING DEVICES OR TEMPORARY PAVEMENT MARKINGS.
- CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND UPKEEP OF THE TRAFFIC CONTROL DEVICES FOR THE DURATION OF THE PROJECT.
- UNLESS OTHERWISE NOTED, ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.



WORK HOURS: ONE-LANE TRAFFIC



NON-WORK HOURS: TWO-LANE TRAFFIC

KEY NOTES

① MINIMIZE USE OF SHOULDER FOR MATERIAL STORAGE. AT NIGHT REMOVE MATERIALS AND EQUIPMENT FROM THE ROAD AND PROVIDE SUFFICIENT ROOM BETWEEN TRAFFIC AND THE WORK AREA TO MINIMIZE EROSION AND DAMAGE TO THE WORK AREA.

NO.	DATE	BY	CKD.	APP.	REVISIONS

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SCALE: AS SHOWN
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 CHECKED: -
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 DATE: 02/05/19

VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

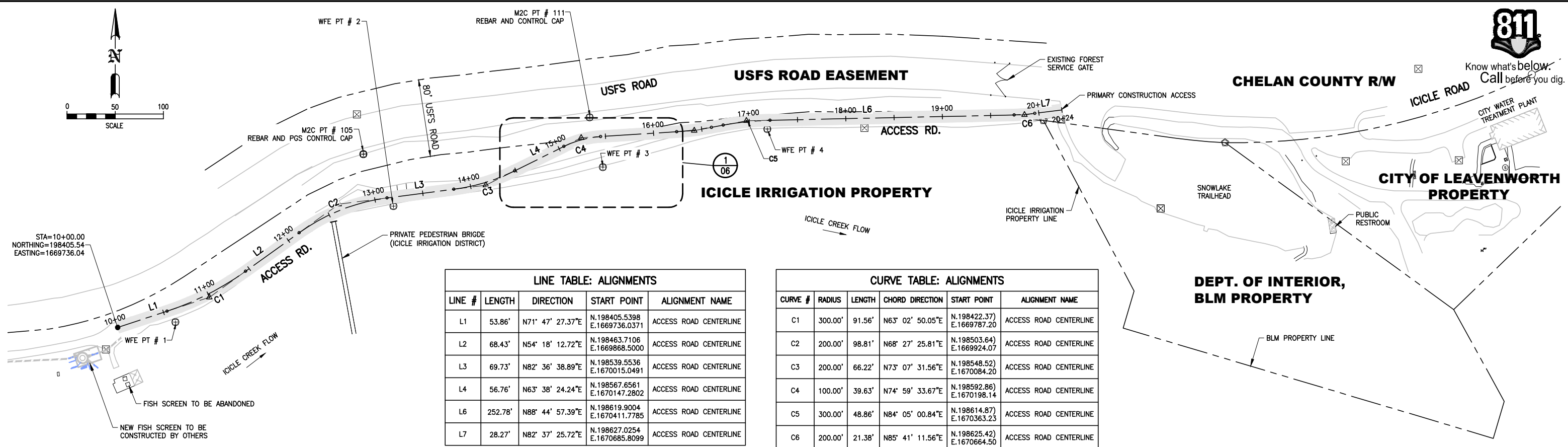
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

TRAFFIC CONTROL PLAN

SHEET
05
 OF 15



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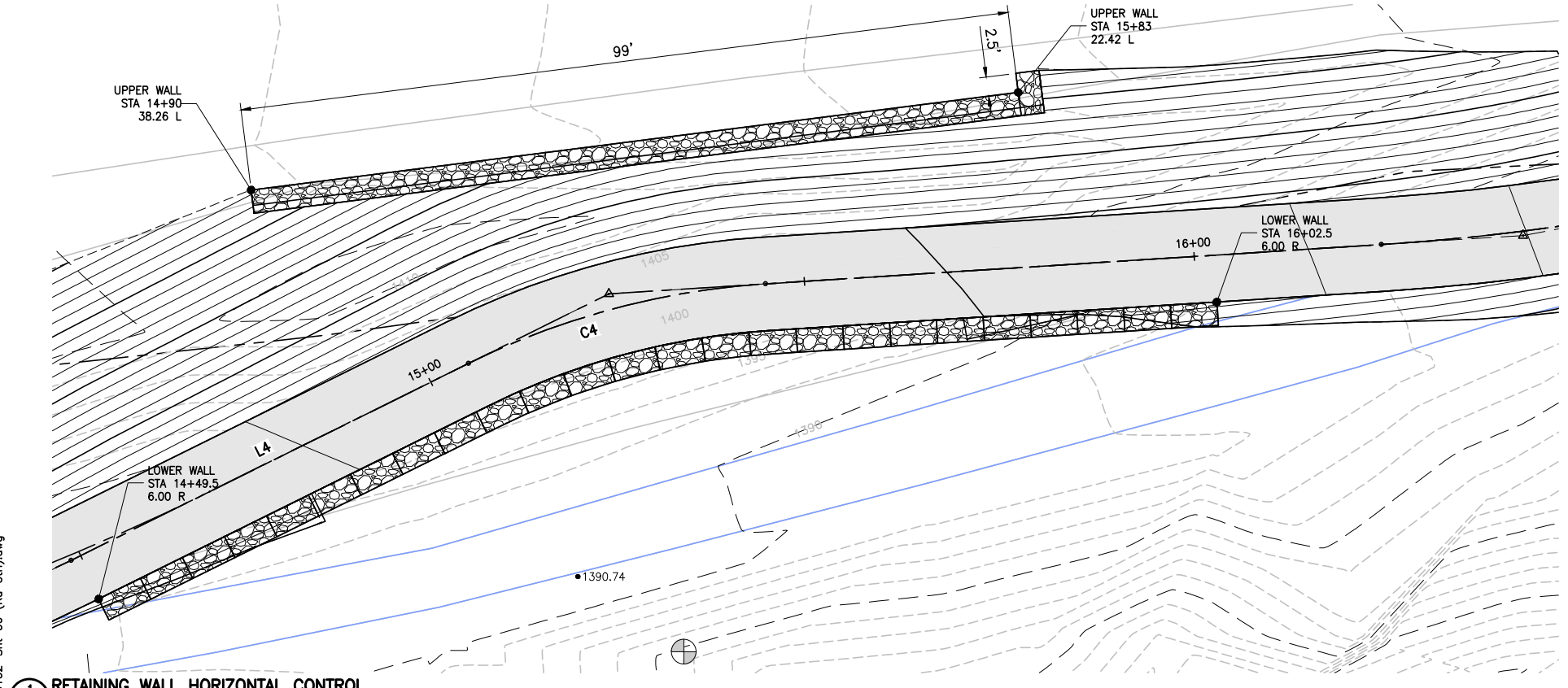


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NORTHING=198405.54
EASTING=1669736.04

LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	53.86'	N71° 47' 27.37"E	N.198405.5398 E.1669736.0371	ACCESS ROAD CENTERLINE
L2	68.43'	N54° 18' 12.72"E	N.198463.7106 E.1669868.5000	ACCESS ROAD CENTERLINE
L3	69.73'	N82° 36' 38.89"E	N.198539.5536 E.1670015.0491	ACCESS ROAD CENTERLINE
L4	56.76'	N63° 38' 24.24"E	N.198567.6561 E.1670147.2802	ACCESS ROAD CENTERLINE
L6	252.78'	N88° 44' 57.39"E	N.198619.9004 E.1670411.7785	ACCESS ROAD CENTERLINE
L7	28.27'	N82° 37' 25.72"E	N.198627.0254 E.1670685.8099	ACCESS ROAD CENTERLINE

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	300.00'	91.56'	N63° 02' 50.05"E	N.198422.37) E.1669787.20	ACCESS ROAD CENTERLINE
C2	200.00'	98.81'	N68° 27' 25.81"E	N.198503.64) E.1669924.07	ACCESS ROAD CENTERLINE
C3	200.00'	66.22'	N73° 07' 31.56"E	N.198548.52) E.1670084.20	ACCESS ROAD CENTERLINE
C4	100.00'	39.63'	N74° 59' 33.67"E	N.198592.86) E.1670198.14	ACCESS ROAD CENTERLINE
C5	300.00'	48.86'	N84° 05' 00.84"E	N.198614.87) E.1670363.23	ACCESS ROAD CENTERLINE
C6	200.00'	21.38'	N85° 41' 11.56"E	N.198625.42) E.1670664.50	ACCESS ROAD CENTERLINE

ACCESS ROAD HORIZONTAL CONTROL



RETAINING WALL HORIZONTAL CONTROL

- NOTES**
- ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT.
 - EXISTING WATERMAIN TO BE ABANDONED IN PLACE OR REMOVED AS NEEDED TO INSTALL NEW MAIN. EXPOSED ENDS OF EXISTING PIPE SHALL BE PLUGGED PER SECTION 7-08.3(4).
 - CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF ACCESS ROAD AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION.

SURVEY NOTES

NOTES

- ORIGINAL SURVEYING COMPLETED JUNE 2014. ADDITIONAL SURVEY COMPLETED NOVEMBER 2017.
- INSTRUMENT USED: SOKKIA SRX3 TOTAL STATION AND TOPCON GR5 GPS.
- ONLY VISIBLE SURFACE UTILITY APPURTENANCES WHERE LOCATED. NO UNDERGROUND UTILITIES WERE LOCATED OR SHOWN ON THIS MAP. A UTILITY LOCATOR SERVICE WAS NOT USED. THIS MAP DOES NOT PURPORT TO SHOW ALL UTILITIES.
- CONTOURS SHOWN IN RIVER AREA ARE A COMPILATION OF WATERFALL ENGINEERING AND MTN2COAST MAPPING.

DATUM
HORIZONTAL - STATE PLANE COORDINATES WASHINGTON NORTH ZONE NAD 83 (2011). SCALE FACTOR = 0.99992931, CONVERGENCE ANGLE = 0°05'30"
VERTICAL - NAVD 88 BASED ON GPS STATIC OBSERVATION.

PROJECT SURVEYOR
COMPANY: MTN 2 COAST LLC.
2320 MOTTMAN RD. SW, STE 106
TUMWATER, WA 98512
CONTACT: BLAIR E. PRIGGE, PLS
PHONE: (360) 512-9198

CONTROL POINTS

POINT NAME	NORTHING	EASTING	ELEVATION
WFE PT # 4	198610.82	1670408.87	1382.43
WFE PT # 3	198571.40	1670238.51	1390.02
WFE PT # 2	198531.01	1670021.64	1394.74
WFE PT # 1	198411.10	1669795.83	1408.23
M2C PT # 105	198584.84	1669990.61	1417.34
WFE PT # 111	198623.00	1670224.93	1405.49

1780102-Sht 06 (Rd Ctrl).dwg

1 06

NO.	DATE	BY	CKD.	APP.	REVISIONS

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SCALE: AS SHOWN
 DESIGNED: JCP/JSM
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 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19

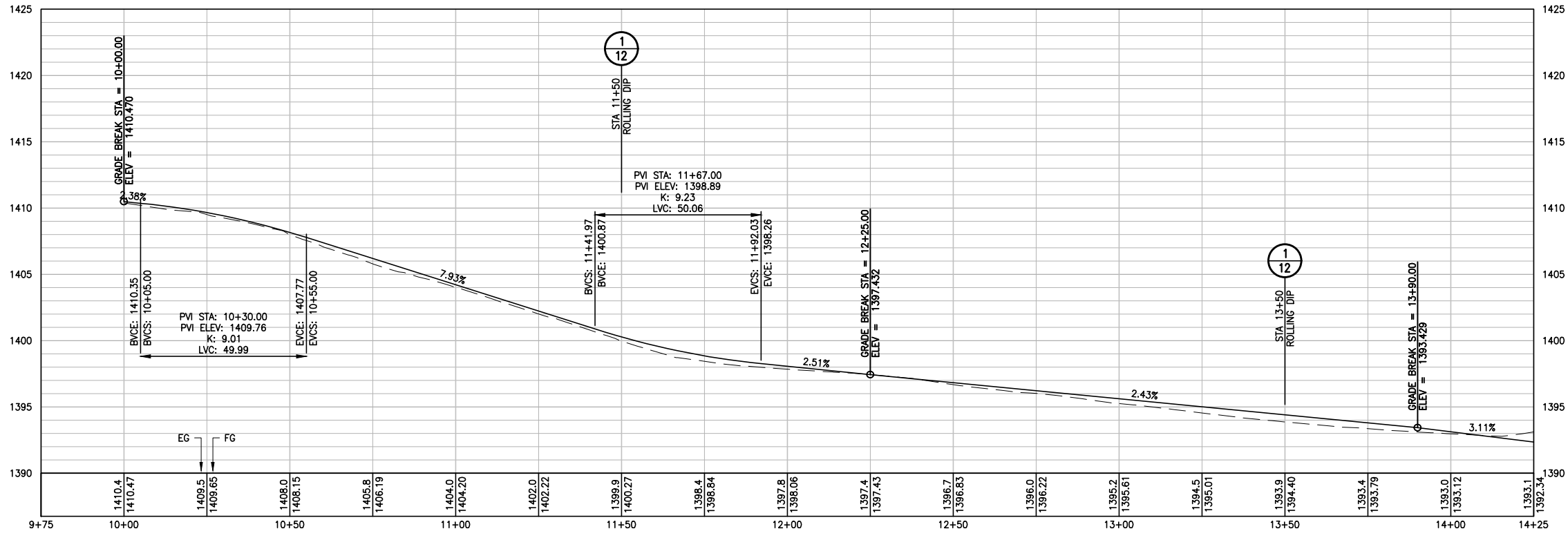
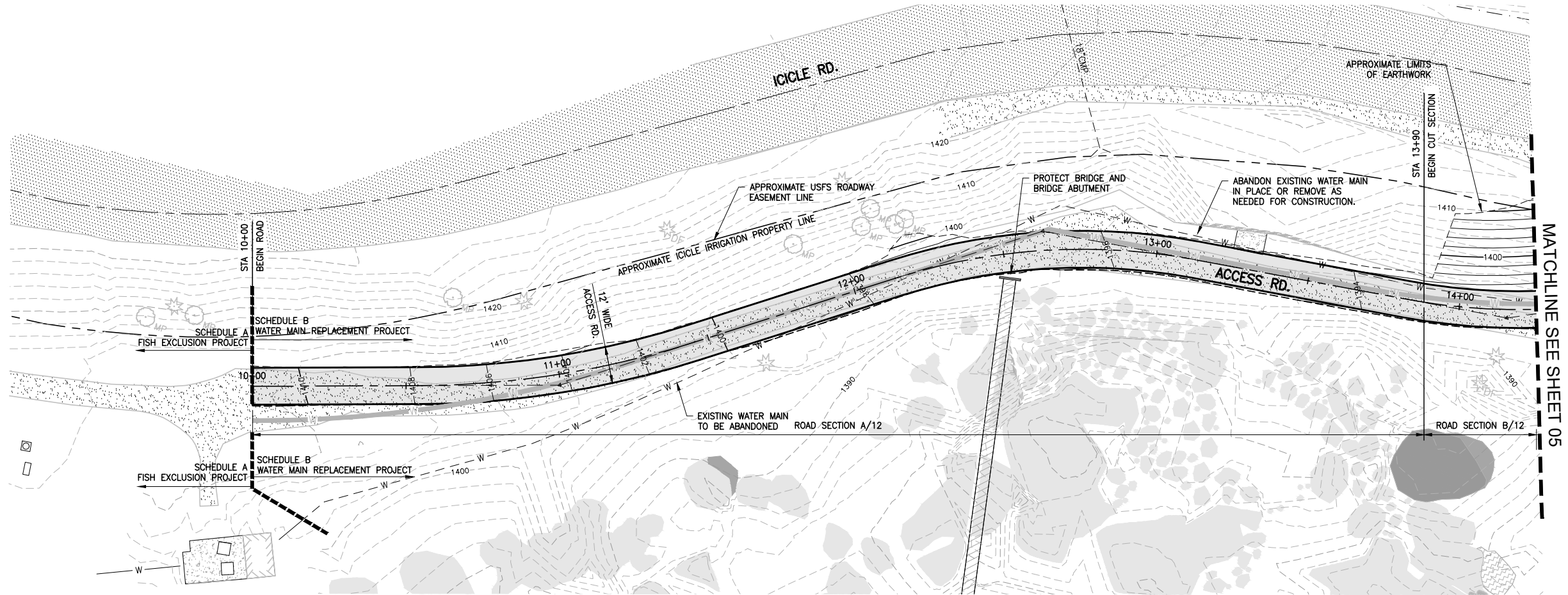
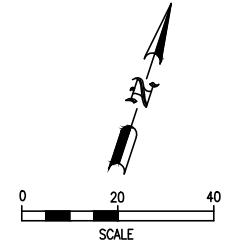


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD ALIGNMENT

SHEET
06
 OF 15



Know what's below.
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PROJ. NO.: 178-01-02
DATE: 02/05/19

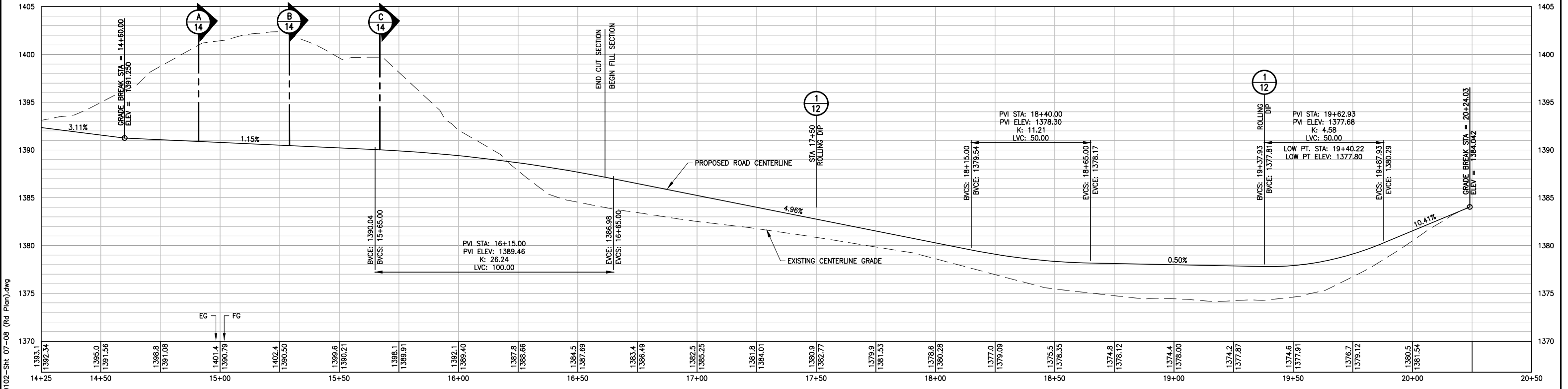
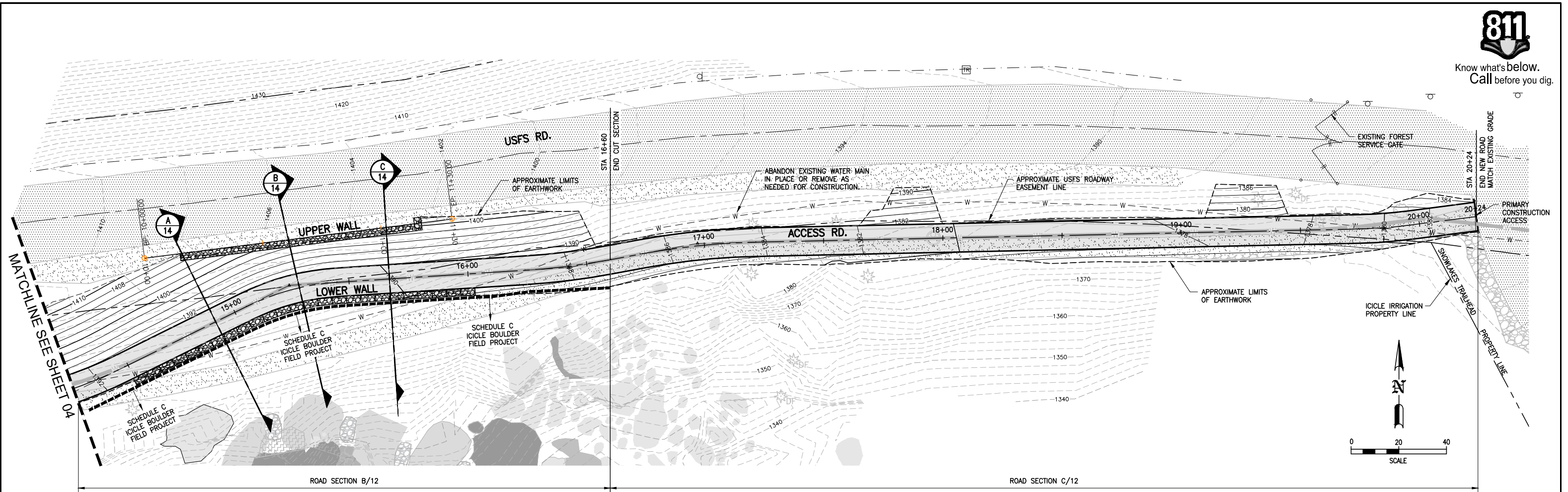


ICICLE CREEK FISH PASSAGE
CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
ACCESS ROAD - PLAN & PROFILE STA 10+00 TO STA 14+25

SHEET
07
OF 15



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NO.	DATE	BY	CKD.	APP.	REVISIONS

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 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19

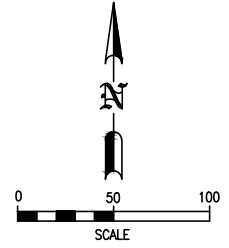
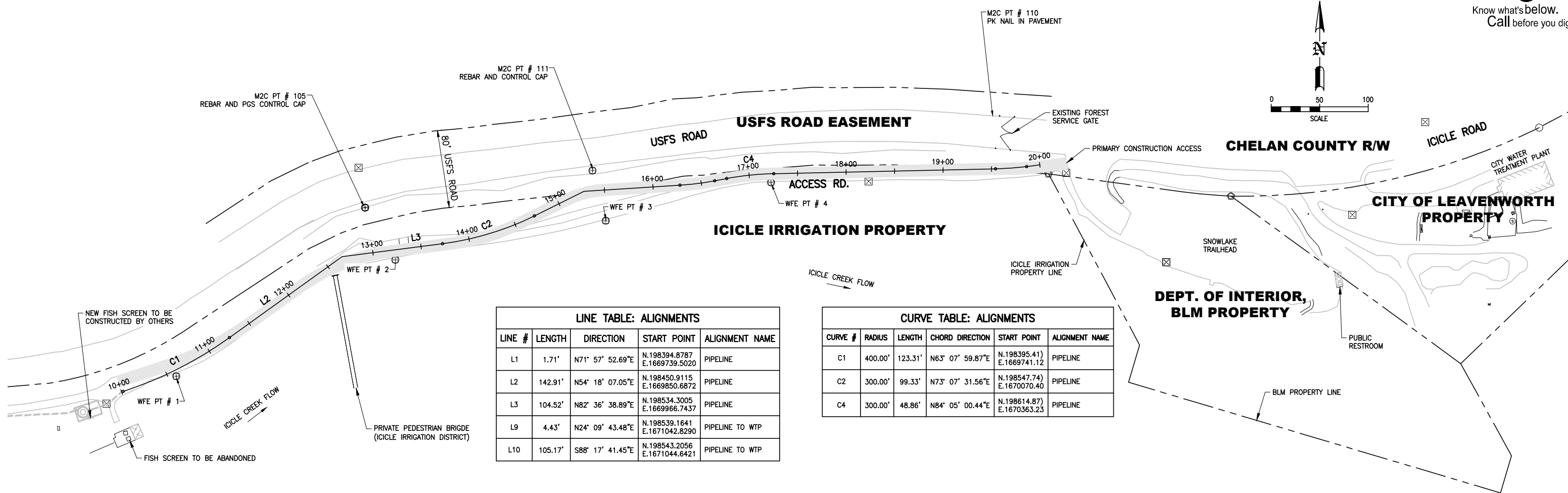


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD - PLAN & PROFILE STA 14+25 TO STA 20+22

SHEET
08
 OF 15



Know what's below.
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LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	1.71'	N71° 57' 52.69"E	N.198394.8787 E.1669739.5020	PIPELINE
L2	142.91'	N54° 18' 07.05"E	N.198450.9115 E.1669850.6872	PIPELINE
L3	104.52'	N82° 36' 38.89"E	N.198534.3005 E.1669966.7437	PIPELINE
L9	4.43'	N24° 09' 43.48"E	N.198539.1641 E.1671042.8290	PIPELINE TO WTP
L10	105.17'	S88° 17' 41.45"E	N.198543.2056 E.1671044.6421	PIPELINE TO WTP

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	400.00'	123.31'	N63° 07' 59.87"E	N.198395.41) E.1669741.12	PIPELINE
C2	300.00'	99.33'	N73° 07' 31.56"E	N.198547.74) E.1670070.40	PIPELINE
C4	300.00'	48.86'	N84° 05' 00.44"E	N.198614.87) E.1670363.23	PIPELINE

WATER MAIN HORIZONTAL CONTROL

- NOTES**
- ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT
 - EXISTING WATERMAIN TO BE ABANDONED IN PLACE OR REMOVED AS REQUIRED TO INSTALL THE NEW MAIN. EXISTING MAIN, WHERE EXPOSED, SHALL BE PLUGGED PER SECTION 7-08.3(4).
 - CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF WATER MAIN AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION

SURVEY NOTES

- NOTES**
- ORIGINAL SURVEYING COMPLETED JUNE 2014 ADDITIONAL SURVEY COMPLETED NOVEMBER 2017.
 - INSTRUMENT USED; SOKKIA SRX3 TOTAL STATION AND TOPCON GR5 GPS.
 - ONLY VISIBLE SURFACE UTILITY APPURTENANCES WHERE LOCATED. NO UNDERGROUND UTILITIES WERE LOCATED OR SHOWN ON THIS MAP. A UTILITY LOCATOR SERVICE WAS NOT USED. THIS MAP DOES NOT PURPORT TO SHOW ALL UTILITIES.
 - CONTOURS SHOWN IN RIVER AREA ARE A COMPILATION OF WATERFALL ENGINEERING AND MTN2COAST MAPPING.

DATUM
 HORIZONTAL - STATE PLANE COORDINATES WASHINGTON NORTH ZONE NAD 83 (2011).
 SCALE FACTOR = 0.99992931,
 CONVERGENCE ANGLE = 0°05'30"
 BASED ON GPS STATIC OBSERVATION PROCESSED THROUGH NOAA OPUS
 VERTICAL - NAVD 88 BASED ON GPS STATIC OBSERVATION.

PROJECT SURVEYOR
 COMPANY: MTN 2 COAST LLC.
 2320 MOTTMAN RD. SW, STE 106
 TUMWATER, WA 98512
 CONTACT: BLAIR E. PRIGGE, PLS
 PHONE: (360) 512-9198

CONTROL POINTS

POINT NAME	NORTHING	EASTING	ELEVATION
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WFE PT # 3	198571.40	1670238.51	1390.02
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M2C PT # 105	198584.84	1669990.61	1417.34
WFE PT # 111	198623.00	1670224.93	1405.49

1780102-Sht 09 (Wrt Ctr).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

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SCALE: AS SHOWN
 DESIGNED: JCP/JSM
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 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19

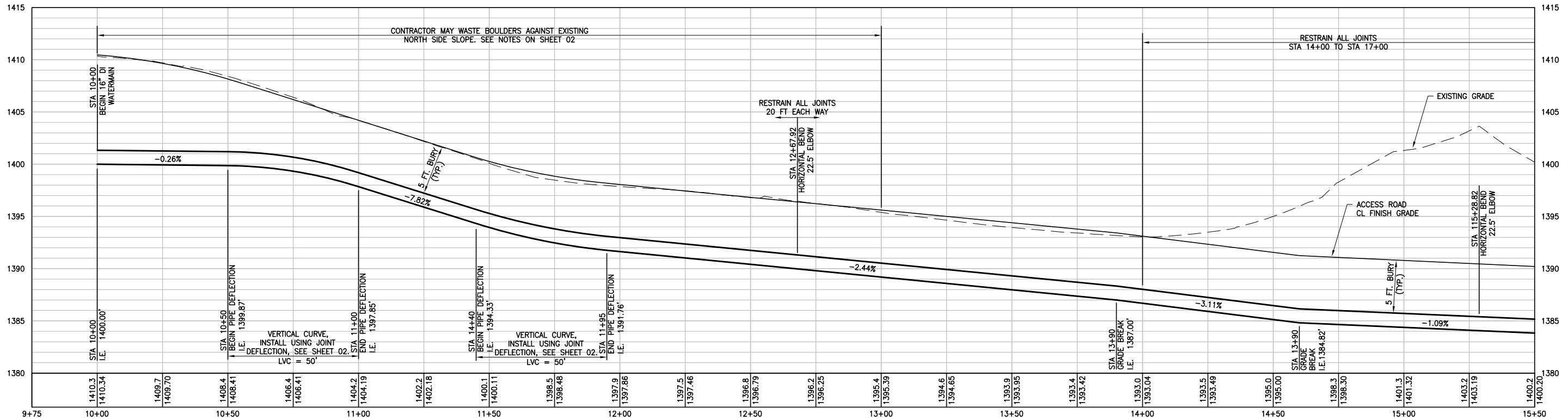
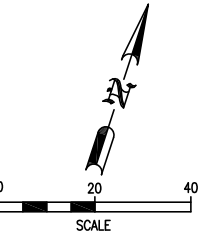
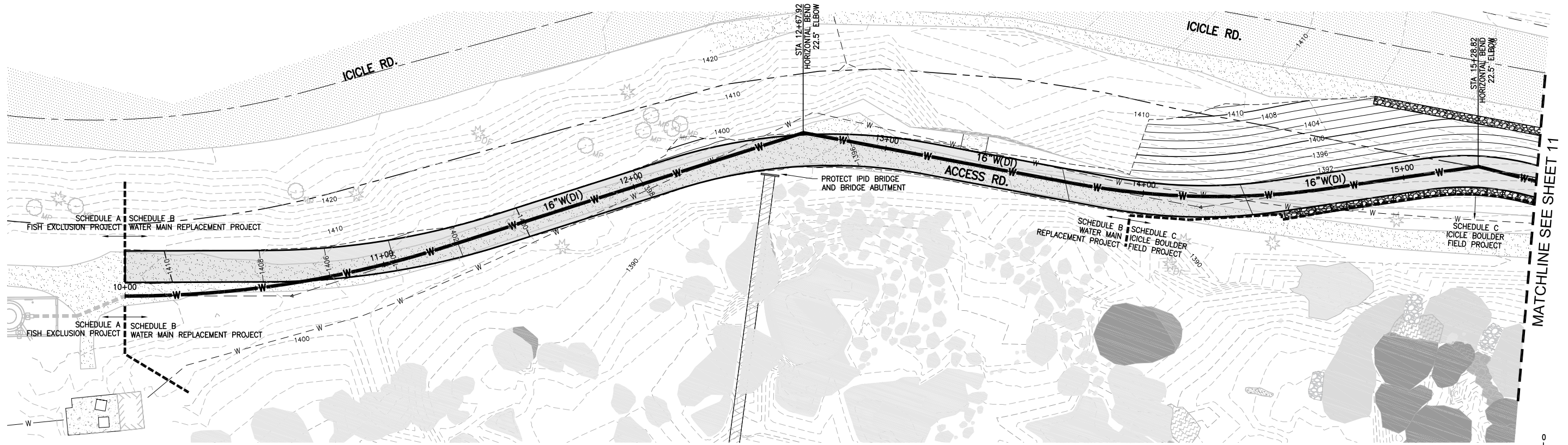


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN ALIGNMENT

SHEET
09
 OF 15



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 PROJ. NO.: 178-01-02
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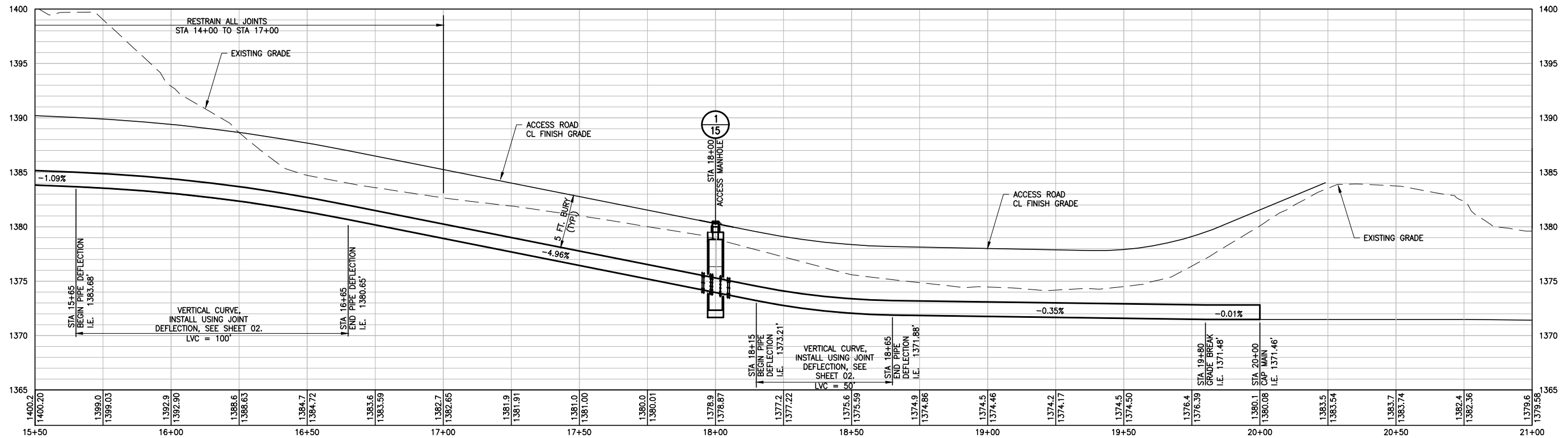
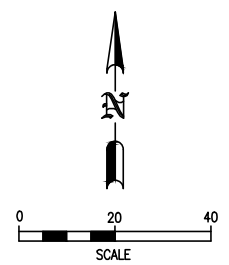
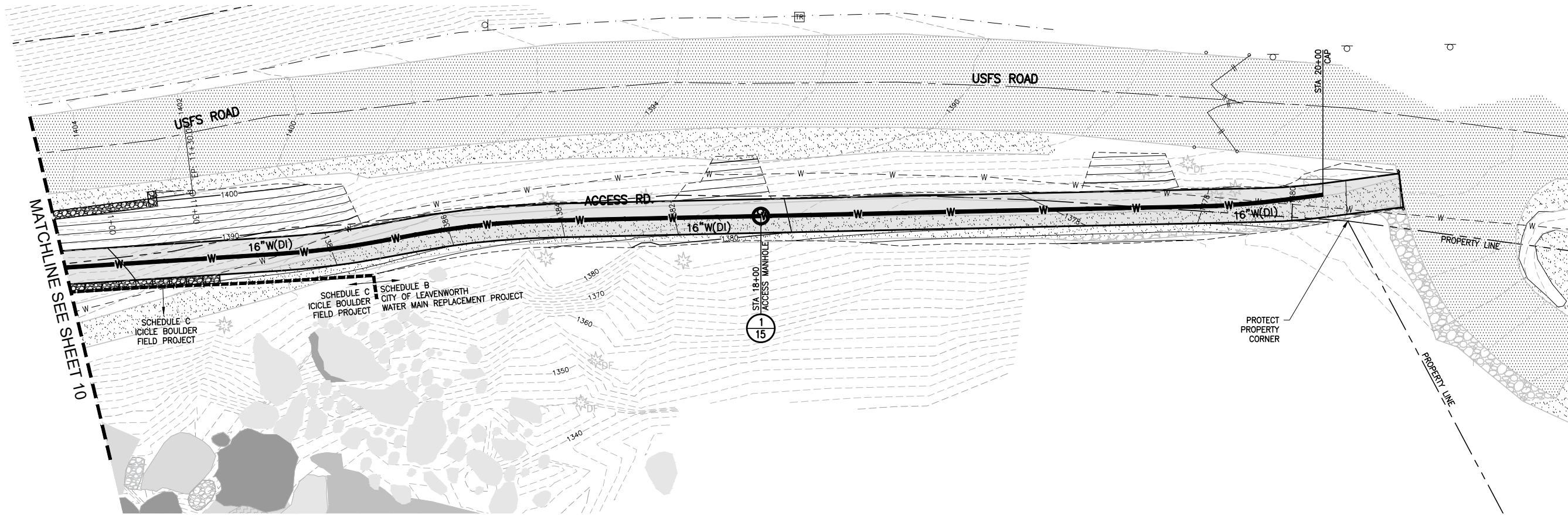


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN - PLAN & PROFILE STA 10+00 TO STA 14+50

SHEET
10
 OF 15



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1760102-Sht 10-11-12 (Wrt Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

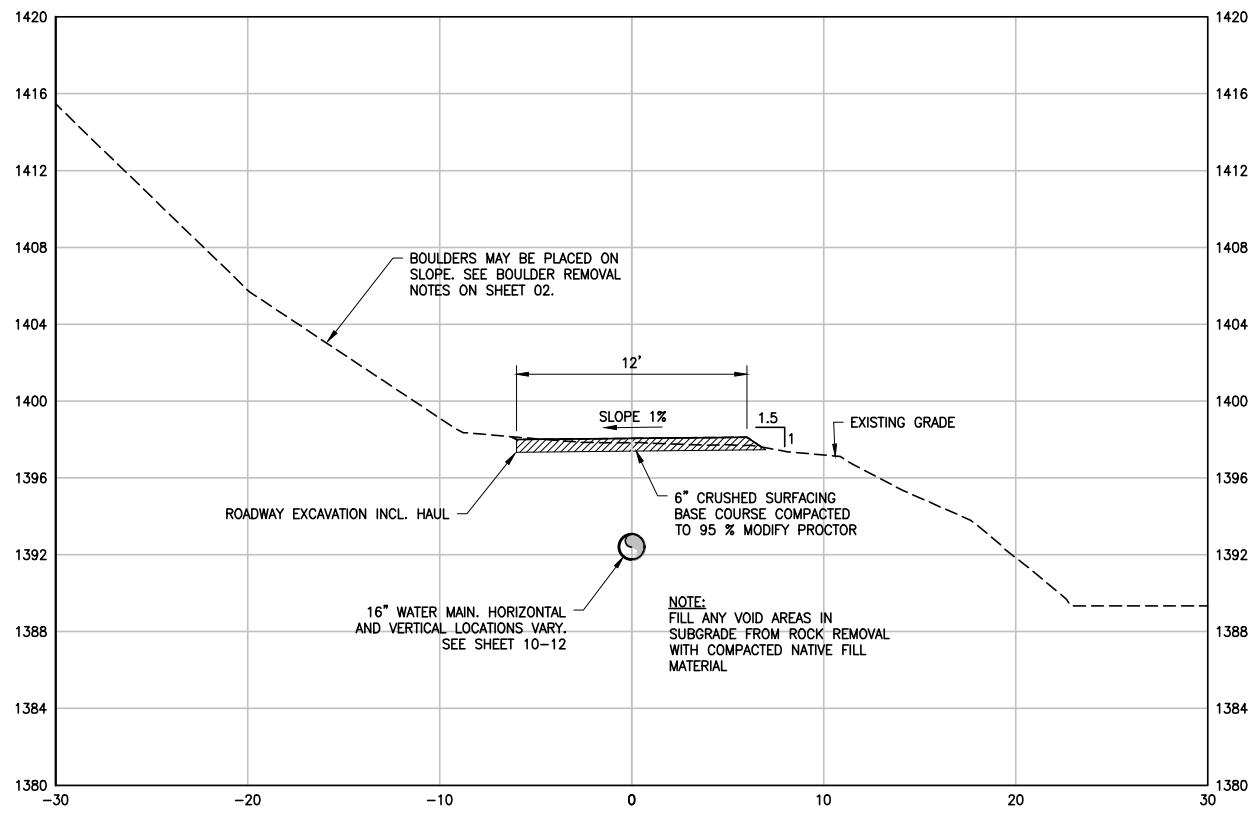
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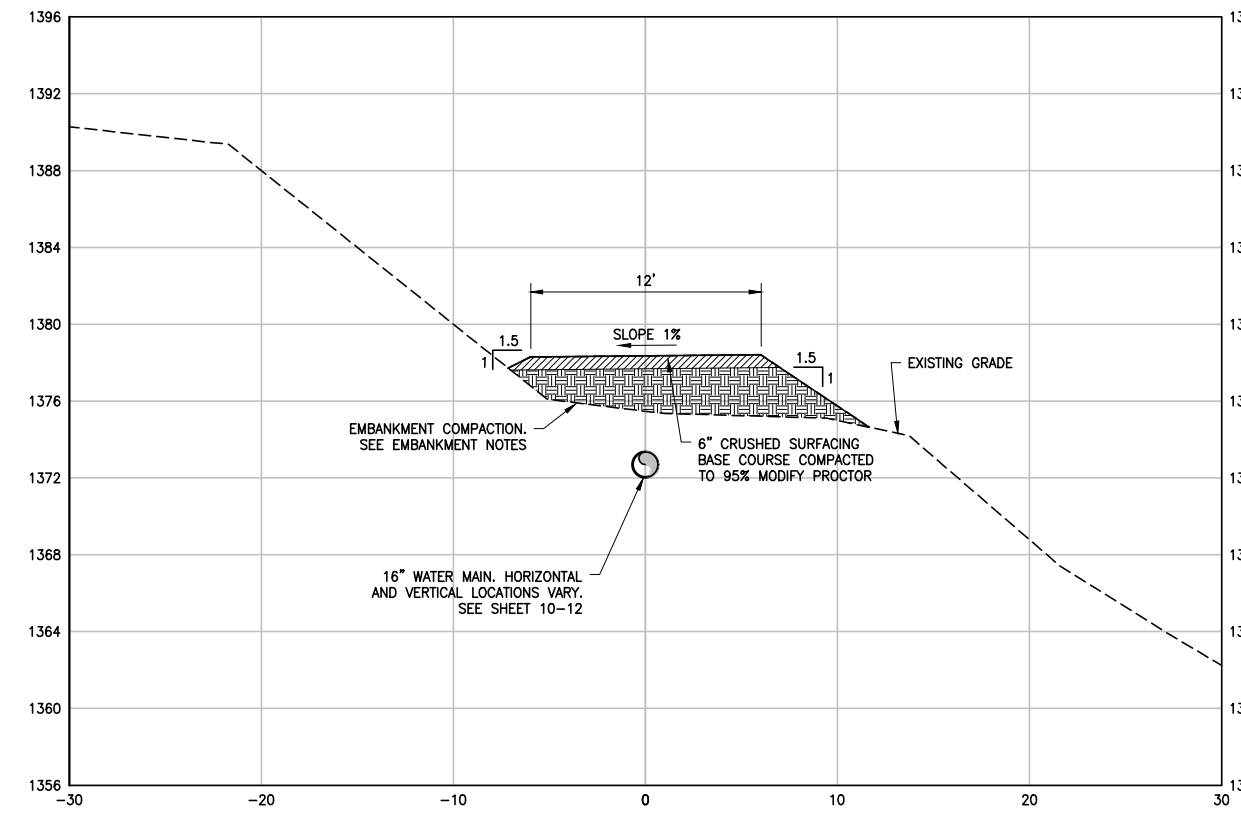


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN - PLAN & PROFILE STA 14+50 TO STA 20+00

SHEET
11
 OF 15



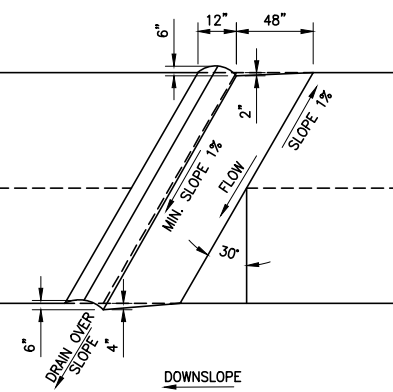
A SECTION - ACCESS ROAD STA 10+00 TO STA 13+90



C SECTION - ACCESS ROAD STA 16+60 TO STA 20+24

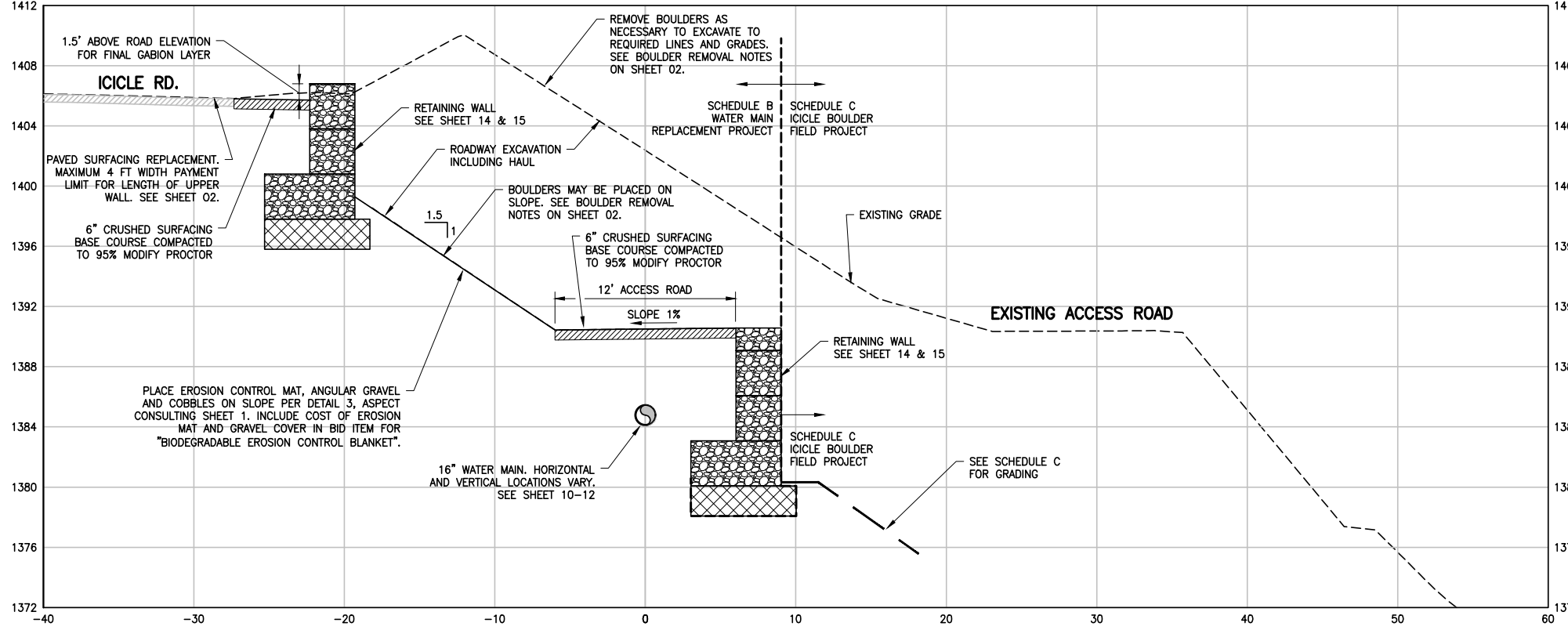
EMBANKMENT NOTES

1. COMPACTED NATIVE FILL MATERIAL OR IMPORTED COMMON BORROW.
2. IF USING NATIVE FILL MATERIAL IT SHALL MEET THE FOLLOWING GRADING REQUIREMENTS: 100% PASSING 12-INCH SIEVE, NO MORE THAN 25% BY MASS RETAINED ON 6-INCH SIEVE. COMPACT EMBANKMENT PER METHOD B.
3. USE OF IMPORTED COMMON BORROW SHALL BE PRE-APPROVED BY THE ENGINEER.
4. SEE ALSO EARTHWORK NOTES ON SHEET 02.

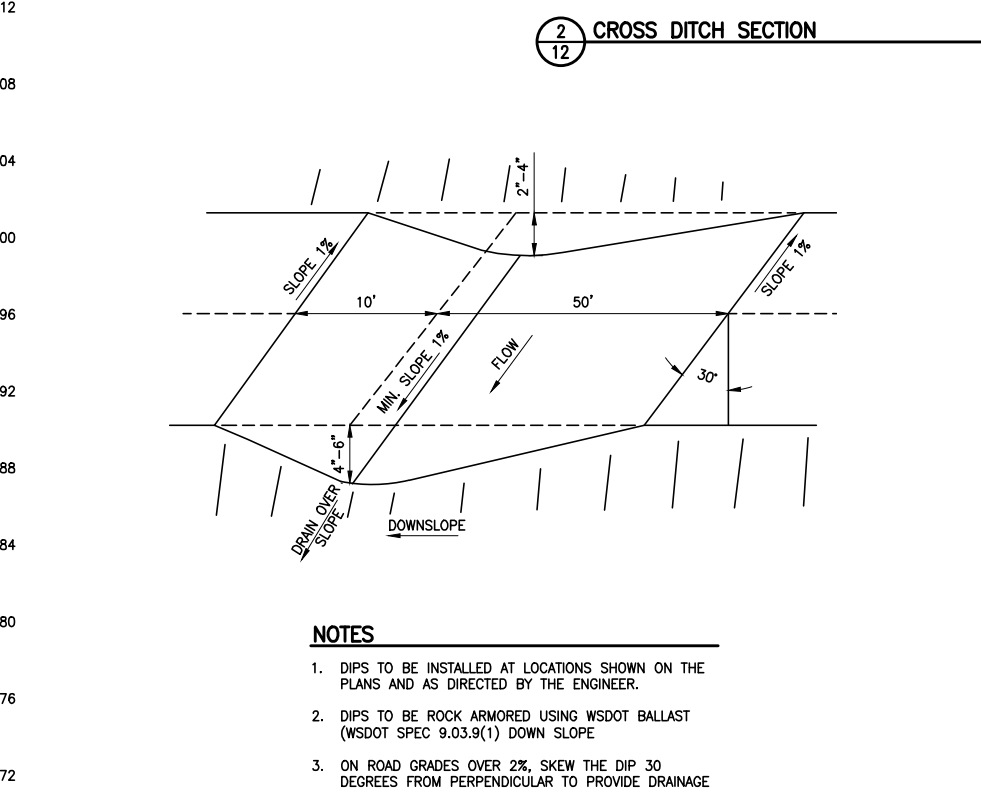


NOTES

1. CROSS DITCH TO BE INSTALLED AT 200 FT INTERVALS AND AS DIRECTED BY THE ENGINEER.
2. DIPS TO BE ROCK ARMORED USING WSDOT BALLAST (WSDOT SPEC 9.03.9(1)) DOWN SLOPE
3. ON ROAD GRADES OVER 2%, SKEW THE DIP 30 DEGREES FROM PERPENDICULAR TO PROVIDE DRAINAGE



B SECTION - ACCESS ROAD STA 13+90 TO STA 16+60



2 CROSS DITCH SECTION

NOTES

1. DIPS TO BE INSTALLED AT LOCATIONS SHOWN ON THE PLANS AND AS DIRECTED BY THE ENGINEER.
2. DIPS TO BE ROCK ARMORED USING WSDOT BALLAST (WSDOT SPEC 9.03.9(1)) DOWN SLOPE
3. ON ROAD GRADES OVER 2%, SKEW THE DIP 30 DEGREES FROM PERPENDICULAR TO PROVIDE DRAINAGE

1780102-Sht. 13 (Rd Dts).dwg

NO.	DATE	BY	CHKD.	APP.	REVISIONS

DRAFT

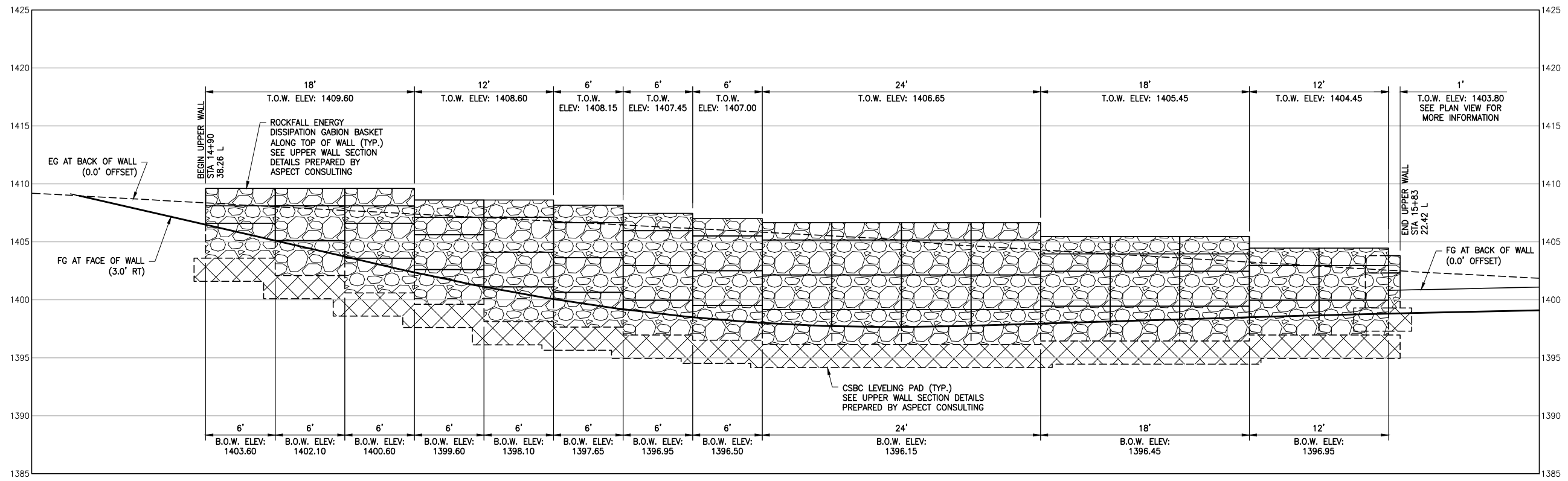
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 PROJ. NO.: 178-01-02
 DATE: 01/28/18



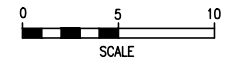
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

ACCESS ROAD SECTIONS

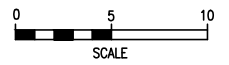
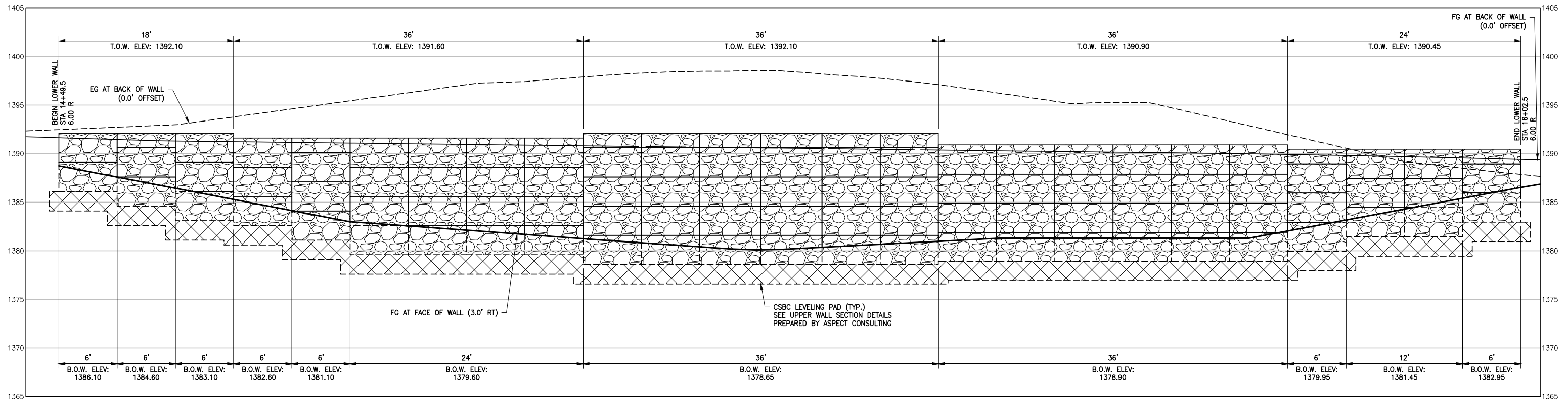
SHEET
12
 OF 15



GENERAL NOTES
 WALL PROFILES ARE BASED ON GRADING FOR THE FISH PASSAGE PREPARED BY WATERFALL ENGINEERING, AND THE RETAINING WALL DESIGN PREPARED BY ASPECT CONSULTING.



1 UPPER RETAINING WALL PROFILE - BACK OF TOP WALL ALIGNMENT



2 LOWER RETAINING WALL PROFILE - BACK OF BOTTOM WALL ALIGNMENT

1760102-Sht 14-15 (Retaining Wall).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

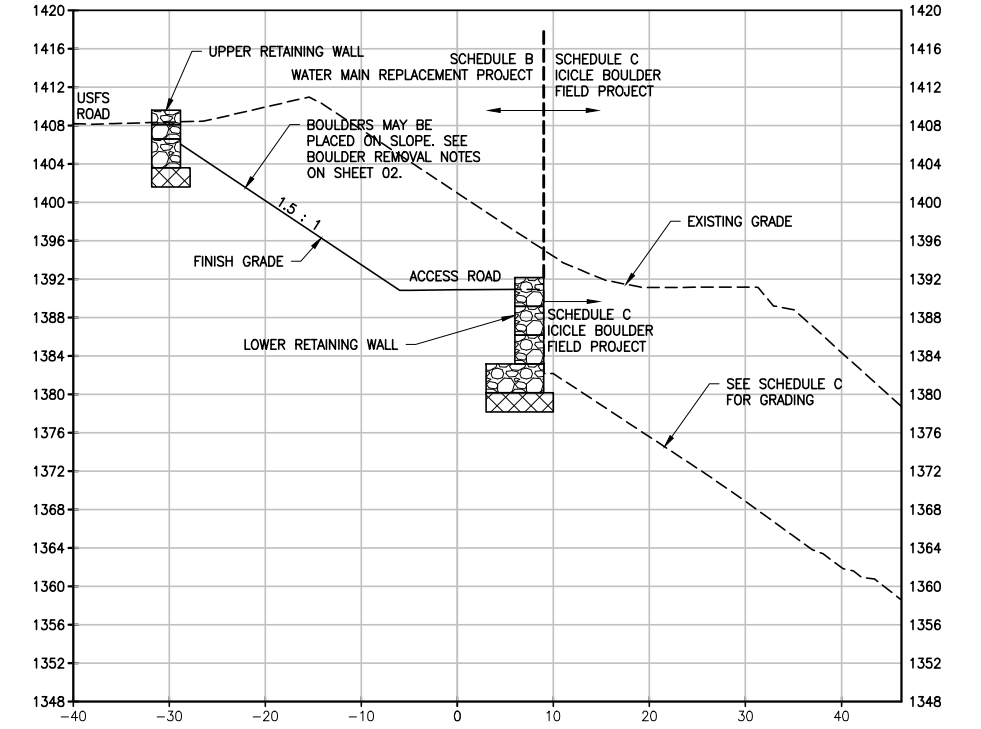
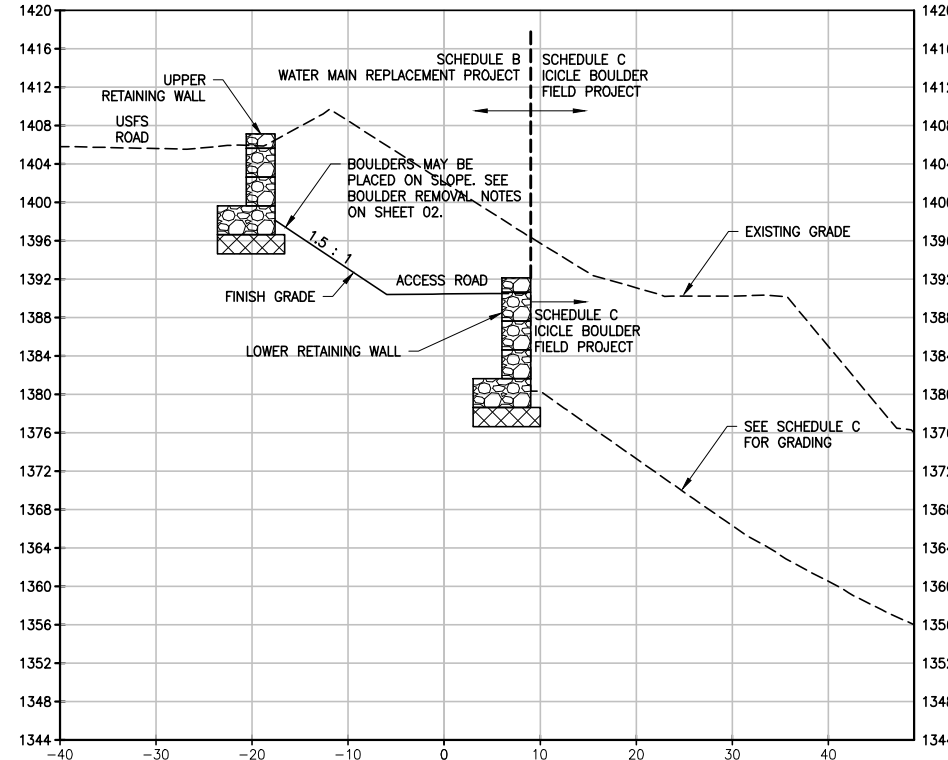
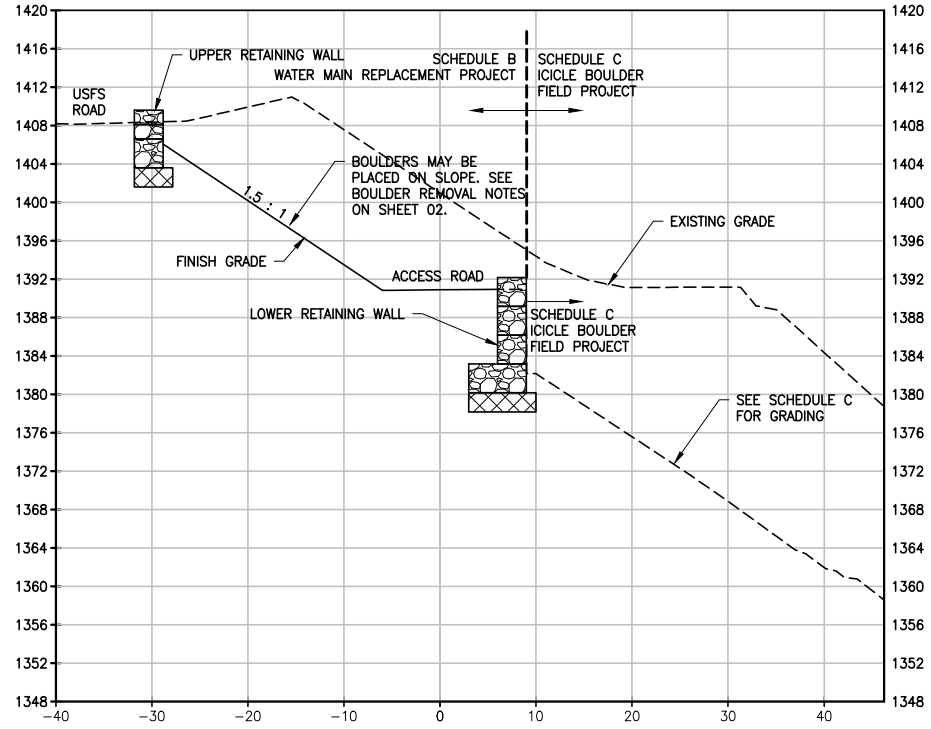
DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 RETAINING WALL PROFILES

SHEET
13
 OF 15



A
14
SECTION A - RETAINING WALLS

B
14
SECTION B - RETAINING WALLS

C
14
SECTION C - RETAINING WALLS

1780102-Sht 14-15 (Retaining Wall).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

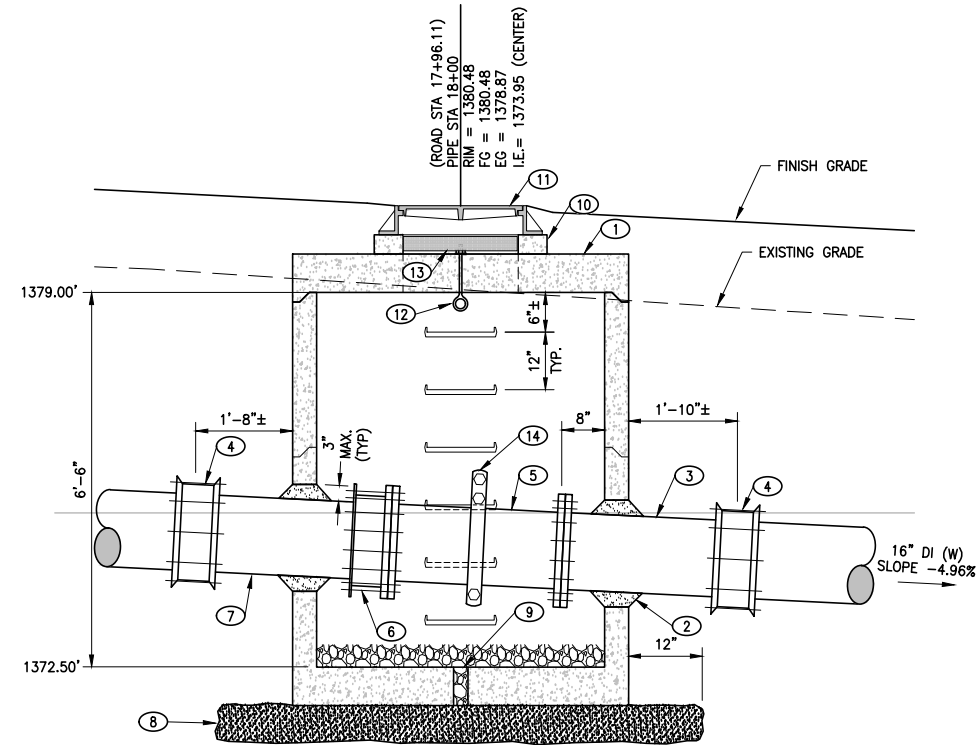
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SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

RETAINING WALL SECTIONS



NOTES

- ① WSDOT CATCH BASIN TYPE 2; 60" DIA. STANDARD PLAN B-10.20-01 WITH H20 RATED TOP SLAB
- ② NON-SHRINK GROUT
- ③ 16" FLXPE SPOOL, 3' LENGTH
- ④ 16" ROMAC 501 COUPLING
- ⑤ 16" FLXFL SPOOL, 3' LENGTH
- ⑥ 16" ROMAC FCA 501
- ⑦ 16" PEXPE SPOOL
- ⑧ 6" COMPACTED CSTC BASE
- ⑨ 3" DIA. DRAIN HOLE, PLACE 4-INCH THICK LAYER OF 2" MINUS DRAIN ROCK IN BOTTOM OF MANHOLE
- ⑩ CONCRETE GRADE RING(S) AS REQUIRED
- ⑪ CIRCULAR FRAME AND COVER, "WATER", TYPE 2 BOLT DOWN WATERTIGHT. WSDOT STANDARD PLAN B-30.70-03
- ⑫ 3/4" FORGED SHOULDER EYEBOLT, GALVANIZED w/NUT, LOCKNUT AND WASHER
- ⑬ 4" THICK SM STYROFOAM INSULATION PAD, FIT SNUG
- ⑭ GRINNEL DOUBLE BOLT PIPE CLAMP, FIG. 295

NOTES:

- 1) WRAP PIPE INSIDE STRUCTURE WITH 3" OWEN'S CORNING FIBERGLAS "FLEXWRAP" ASJ OR APPROVED EQUAL (NOT SHOWN)
- 2) PAYMENT FOR FURNISHING AND INSTALLING PIPE AND FITTINGS TO BE INCLUDED IN BID ITEM FOR PIPE. PIPE SHALL BE MEASURED THROUGH THE STRUCTURE FOR PAYMENT.
- 3) PAYMENT FOR FURNISHING AND INSTALLING ALL OTHER MATERIALS SHALL BE PAID UNDER BID ITEM FOR "CATCH BASIN TYPE 2 60 In. Dia."

① 15 **DETAIL - MANHOLE**

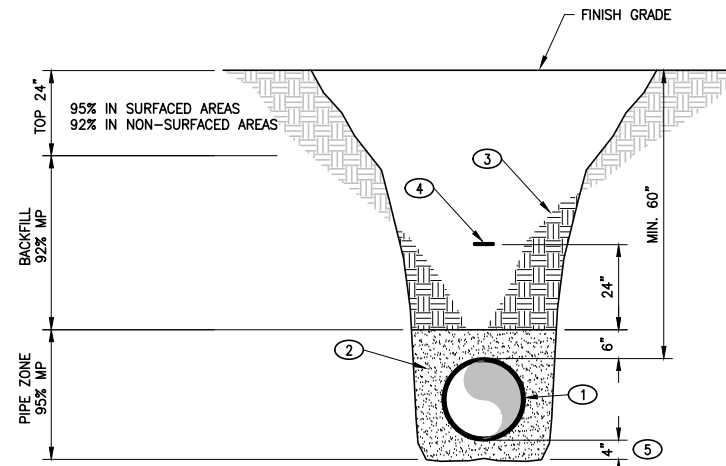
N.T.S.

BACKFILL NOTES

1. BACKFILL SHALL BE NATIVE MATERIAL EXCAVATED FROM SITE OR IMPORTED COMMON BORROW. IMPORTED COMMON BORROW SHALL ONLY BE USED WITH PRIOR APPROVAL BY ENGINEER.
2. IF NATIVE MATERIAL IS USED FOR BACKFILL IT SHALL MEET THE FOLLOWING CRITERIA:
 - BACKFILL SHALL MEET THE FOLLOWING GRADING REQUIREMENTS: 100% PASSING 12-INCH SIEVE, NO MORE THAN 25% BY MASS RETAINED ON 6-INCH SIEVE
 - ROCKS LARGER THAN 6" DIAMETER SHALL NOT BE PLACED CLOSER THAN 12" TO WATER MAIN.
 - BACKFILL SHALL BE COMPACTED TO DENSITY AS NOTED. BACKFILL SHALL BE COMPACTED IN LIFTS. DEPTH OF LIFT SHALL NOT EXCEED 12" UNLESS APPROVED BY THE ENGINEER.

② 15 **DETAIL - TRENCH EXCAVATION**

N.T.S.

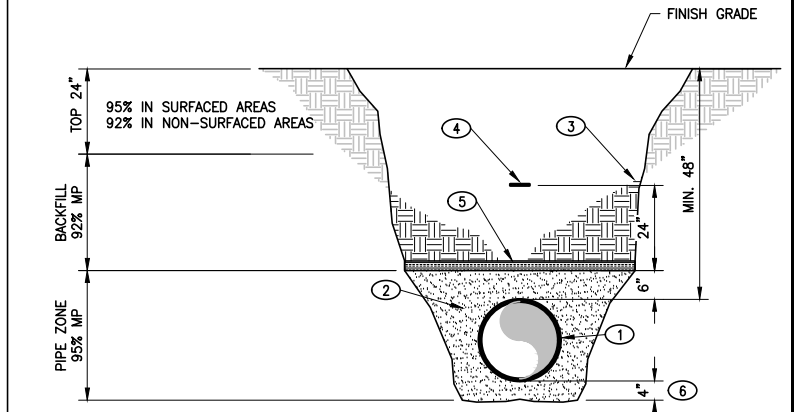


NOTES

- ① 16" DI PIPE
- ② GRAVEL BACKFILL FOR PIPE ZONE BEDDING
- ③ BACKFILL. SEE BACKFILL NOTES.
- ④ DETECTIBLE UTILITY MARKING TAPE. SEE SHEET 02.
- ⑤ INCREASE BEDDING DEPTH UNDER PIPE TO 6" IN AREAS WHERE ROCK REMOVAL IS REQUIRED.

③ 15 **DETAIL - TRENCH EXCAVATION (SHALLOW CONDITION)**

N.T.S.



NOTES

- ① 16" DI PIPE
- ② GRAVEL BACKFILL FOR PIPE ZONE BEDDING
- ③ BACKFILL SEE BACKFILL NOTES
- ④ DETECTIBLE UTILITY MARKING TAPE. SEE SHEET 02.
- ⑤ 48" WIDE RIGID INSULATION. SEE SHEET 02.
- ⑥ INCREASE BEDDING DEPTH UNDER PIPE TO 6" IN AREAS WHERE ROCK REMOVAL IS REQUIRED.

NOTES:

- 1) IF ENCOUNTERING EXCESSIVE ROCK REQUIRING EXCAVATION UNDERNEATH THE WATER MAIN THE CONTRACTOR MAY REQUEST INSTALLING PORTIONS OF THE WATER MAIN PER THIS SHALLOW CONDITION DETAIL WITH ENGINEER APPROVAL.
- 2) UNIT PRICE FOR WATER MAIN SHALL BE FULL COMPENSATION FOR EITHER TRENCH EXCAVATION CONDITION.

1780102-Sht 16-17(Wr. Dits).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 02/05/19

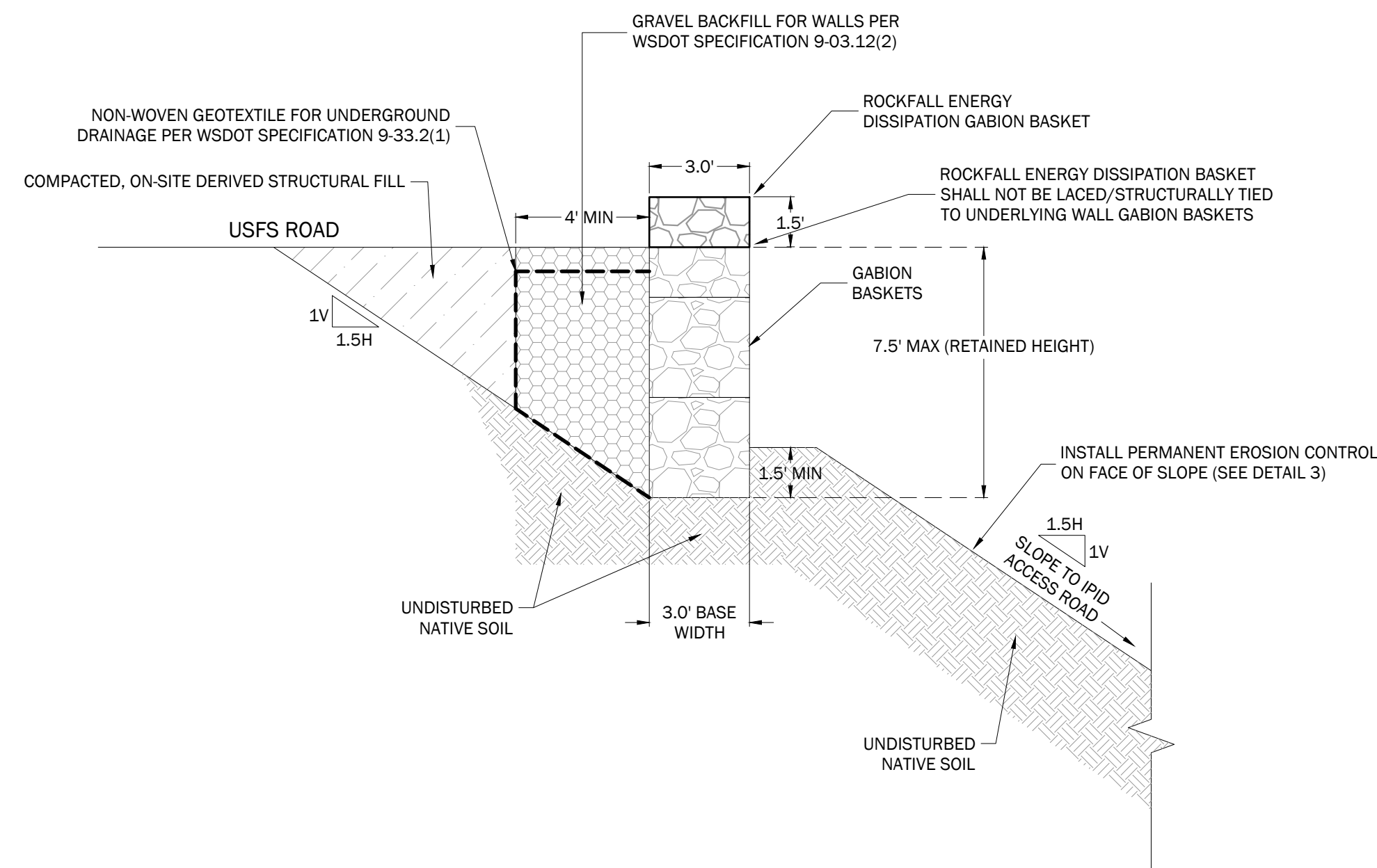
VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

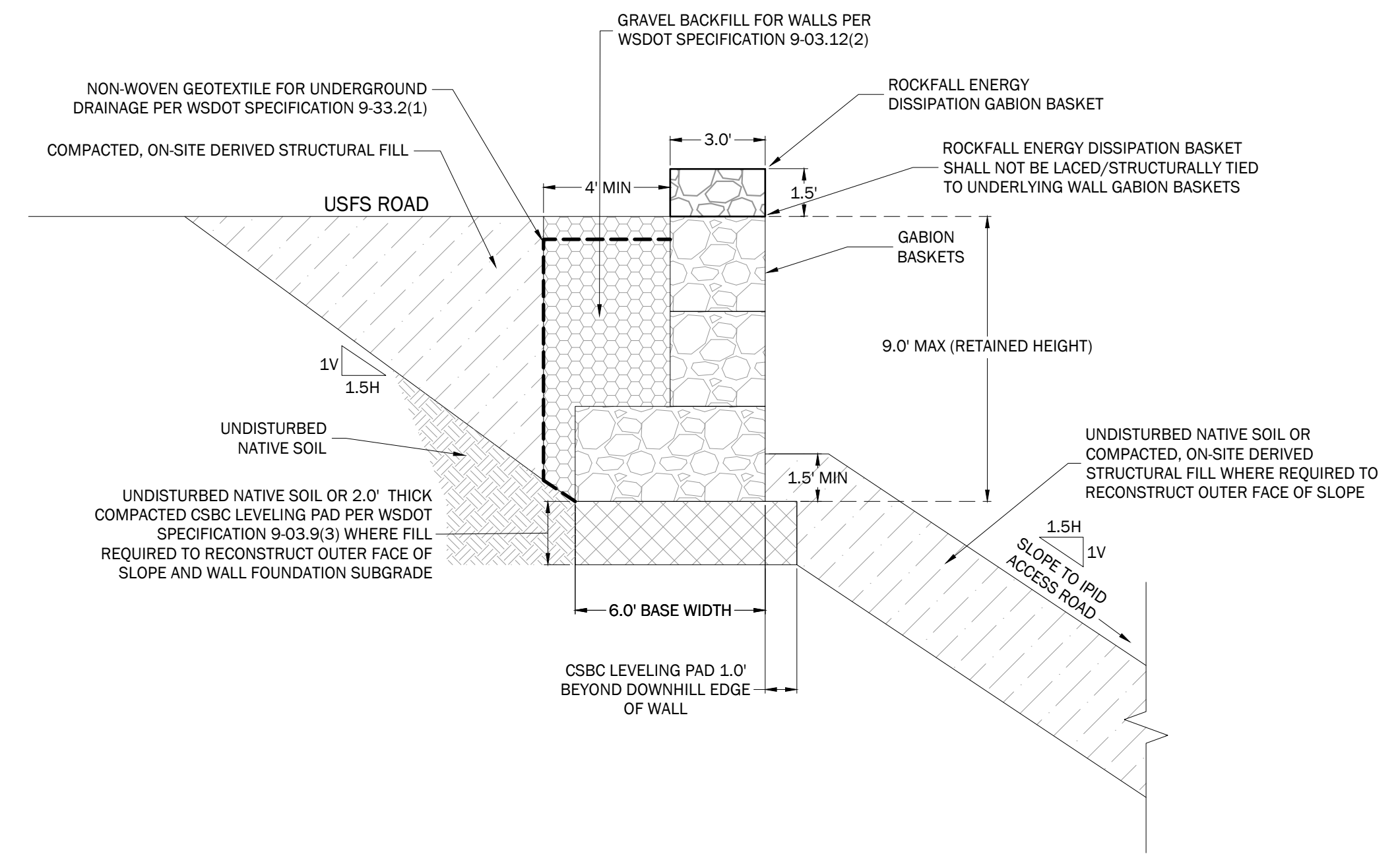
WATER MAIN - DETAIL

SHEET
15
 OF 15

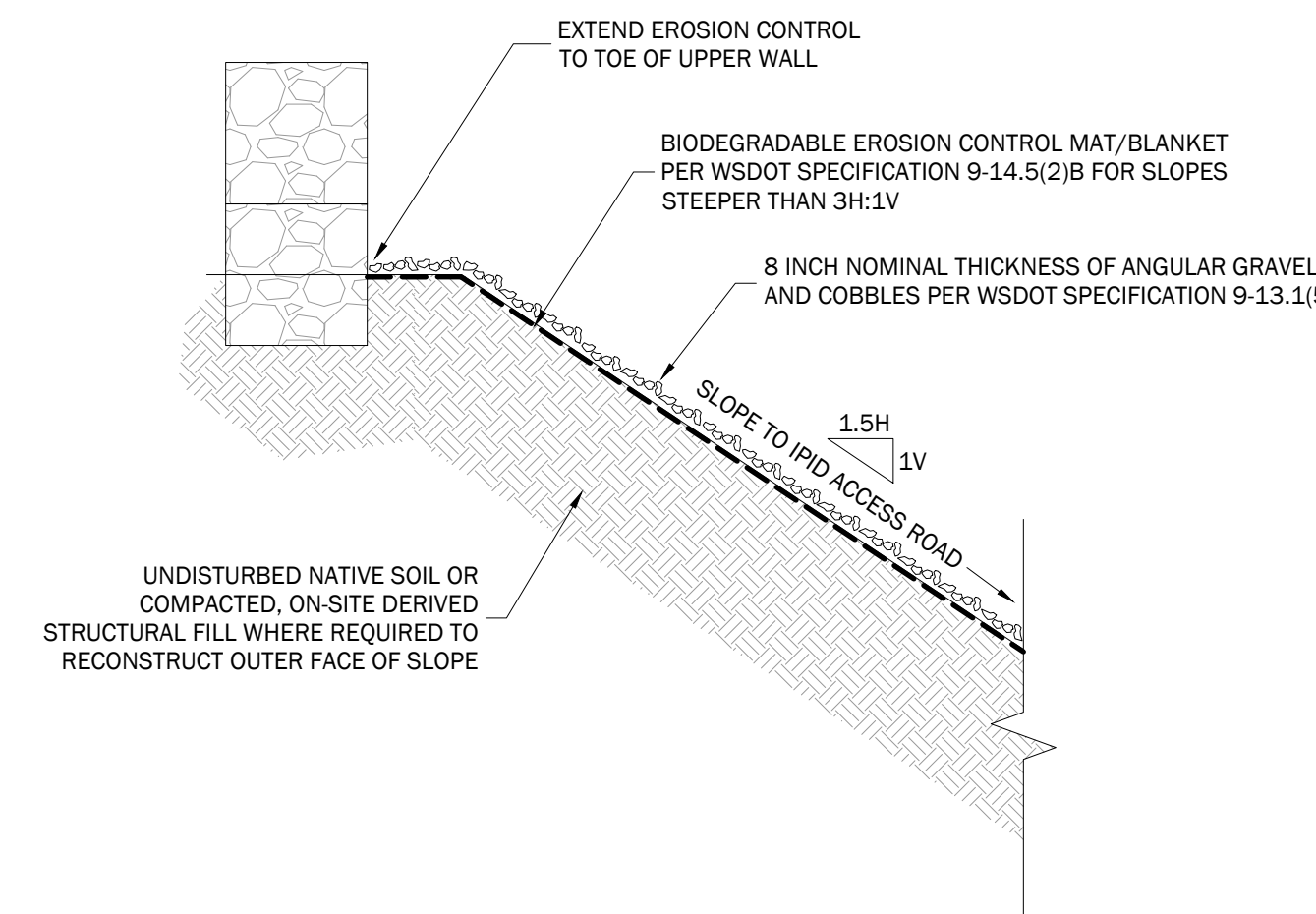
PRELIMINARY



WALL SECTION - RETAINED HEIGHT UP TO 7.5 FEET 1
SCALE: 1" = 4"



WALL SECTION - RETAINED BETWEEN HEIGHT 7.5 FEET AND 9 FEET 2
SCALE: 1" = 4"



DETAIL 3 - PERMANENT EROSION CONTROL 3
SCALE: 1" = 4"

Horizontal Scale: 1" = 4'
Vertical Scale: 1" = 4'
Vertical Exaggeration 1x



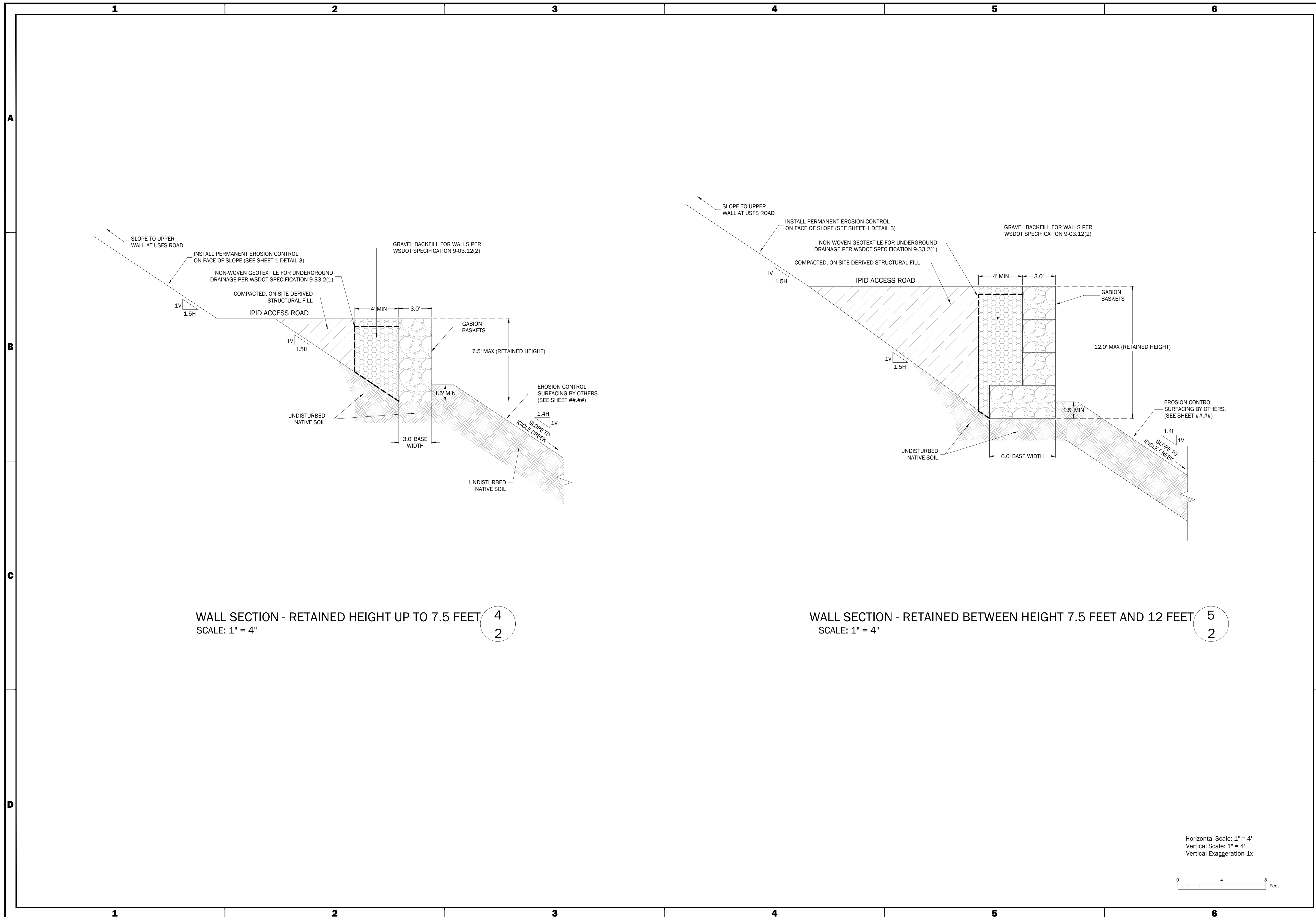
REV.	DESCRIPTION	DATE	APPR.

DESIGNED BY:	ECS
DRAWN BY:	CMV
REVISED BY:	SOC

DATE:	Dec-2018
REVISION:	-
PROJECT NUMBER:	170060

UPPER WALL AT USFS ROAD
CITY OF LEAVENWORTH WATERLINE REPLACEMENT
AND ICICLE CREEK FISH PASSAGE PROJECT
LEAVENWORTH, WASHINGTON

SHEET REFERENCE NUMBER:
1
SHEET 1 OF 2



WALL SECTION - RETAINED HEIGHT UP TO 7.5 FEET
 SCALE: 1" = 4"

4
2

WALL SECTION - RETAINED BETWEEN HEIGHT 7.5 FEET AND 12 FEET
 SCALE: 1" = 4"

5
2

Horizontal Scale: 1" = 4'
 Vertical Scale: 1" = 4'
 Vertical Exaggeration 1x

PRELIMINARY

REV.	DESCRIPTION	DATE	APPR.

DESIGNED BY:	ECS
DRAWN BY:	CMV
REVISION:	SCC

DATE: Dec-2018
 REVISION: -
 PROJECT NUMBER: 170060

**LOWER WALL AT
 IPID ACCESS ROAD**
 CITY OF LEAVENWORTH WATERLINE REPLACEMENT
 AND ICICLE CREEK FISH PASSAGE PROJECT
 LEAVENWORTH, WASHINGTON

SHEET REFERENCE NUMBER:
2
 SHEET 2 OF 2

Appendix C. City of Leavenworth Fish Screen Drawings



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

CITY OF LEAVENWORTH FISH EXCLUSION PROJECT
ICICLE CREEK, TRIBUTARY TO WENATCHEE RIVER
CHELAN COUNTY, WA. WRIA: 45.0474, SITE: 960986

INDEX

SHEET NO.

1. COVER SHEET
2. EXISTING CONDITIONS PLAN VIEW
3. ACCESS ROAD PLAN & PROFILE
4. WATERLINE PLAN & PROFILE
5. DEWATERING PLAN & DETAILS
6. PROJECT NOTES & DETAILS
7. PROJECT NOTES & DETAILS II
8. PROJECT NOTES & DETAILS III
9. 66" STAINLESS SCREEN ASSEMBLY



VICINITY MAP

LAT. 47.54370 N, LONG. -120.71462 W
CHELAN COUNTY
SECTION 28, TOWNSHIP 24 NORTH, RANGE 17 EAST W.M.

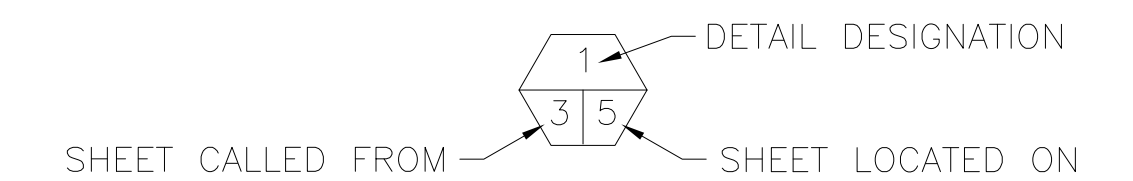
DIRECTIONS TO SITE

FROM LEAVENWORTH, WA. GO WEST ON STATE ROUTE 2 AT THE EDGE OF TOWN TURN LEFT (SOUTHERLY) ON ICICLE ROAD. CONTINUE ON ICICLE ROAD 4.2 MILES TO THE PARKING LOT ON THE LEFT. THE SITE IS DOWN THE DIRT ROAD PAST THE FOOT BRIDGE OVER ICICLE CREEK TO THE END OF THE ROAD.

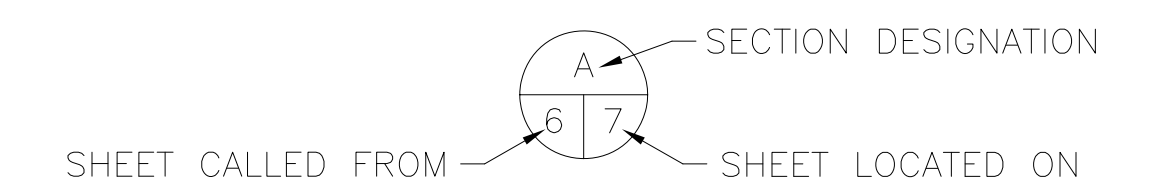
ABBREVIATIONS

APPROX.	APPROXIMATE
BM	BENCH MARK
BLDG	BUILDING
CONC.	CONCRETE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
DIA.	DIAMETER
ELEV.	ELEVATION
EXIST.	EXISTING
FT.	FEET
HORIZ.	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
I.E.	INVERT ELEVATION
LAT.	LATITUDE
LF	LINEAL FOOT
LONG.	LONGITUDE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MP	MILE POST
PAV'T	PAVEMENT
REQ'D	REQUIRED
S	SLOPE IN PERCENT
SEC.	SECTION
SHT.	SHEET
SPEC'S.	SPECIFICATIONS
TBM	TEMPORARY BENCH MARK
TYP.	TYPICAL
VERT.	VERTICAL
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
W.S.	WATER SURFACE

SHEET SYMBOLS



DETAIL

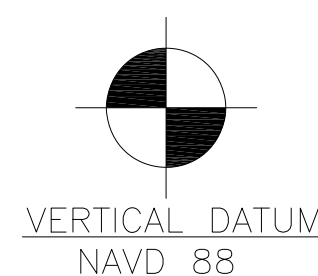


SECTION

PROJECT CONTROL POINTS

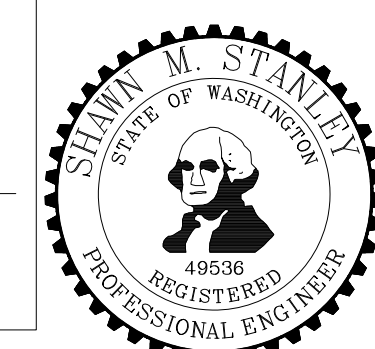
SURVEY CONTROL POINTS TABLE

Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
3. R&C 1	1669795.83'	198411.10'	1408.23'
4. R&C 2	1670021.64'	198531.01'	1394.74'

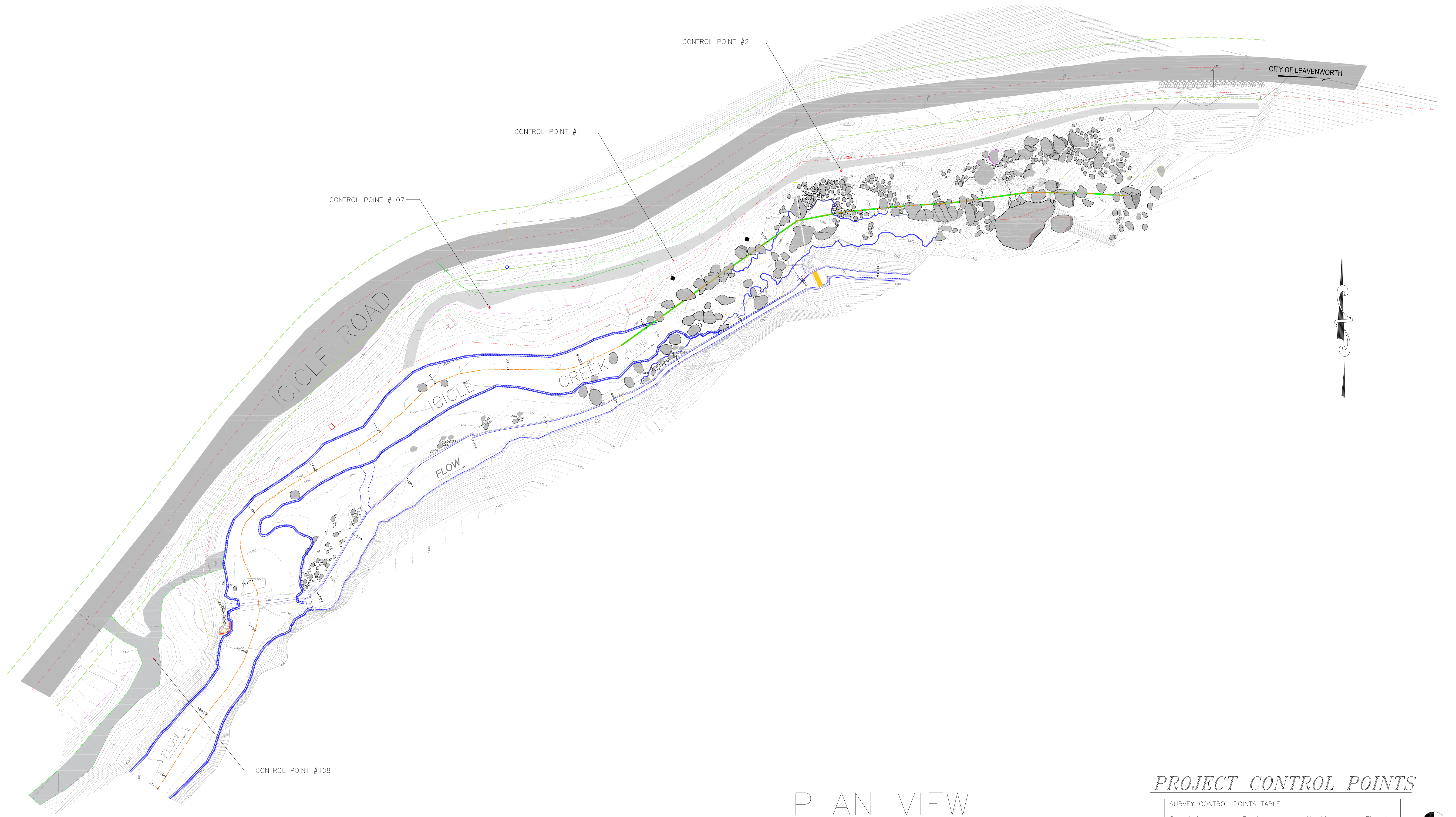


APPROVED FOR CONSTRUCTION

Donald C. Ponder, PE
Environmental Engineering Section Manager
Fish Passage Division, Habitat Program, WDFW



PROJECT NO. 960986-18	
SHEET	OF
1	8

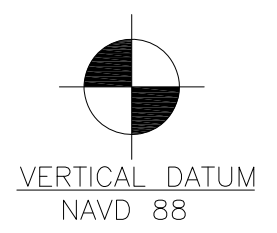


PLAN VIEW

Scale: 1"=60'

PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE			
Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
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WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



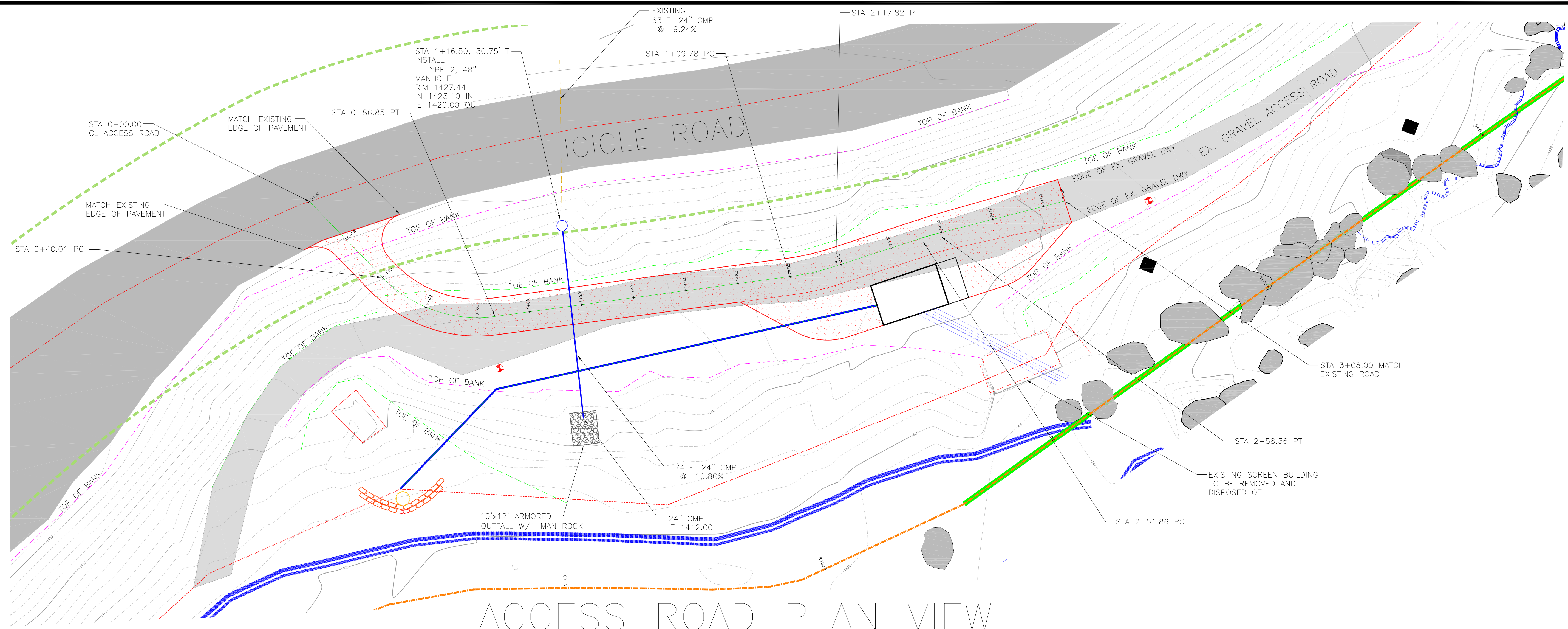
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APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:	DESIGNED BY S. STANLEY	CHECKED BY
PROGRAM	DATE:	DRAWN BY T.G.	DATE 07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
EXISTING PLAN VIEW

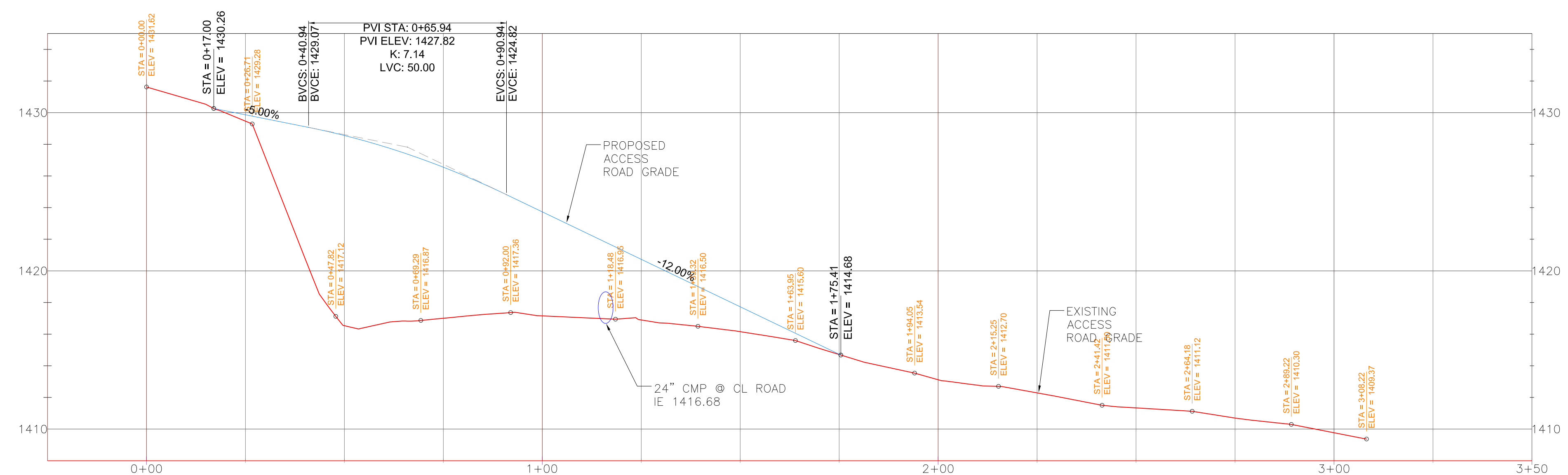
PROJECT NO. 960986-18
SHEET 2 OF 8

NOT FOR CONSTRUCTION



ACCESS ROAD PLAN VIEW

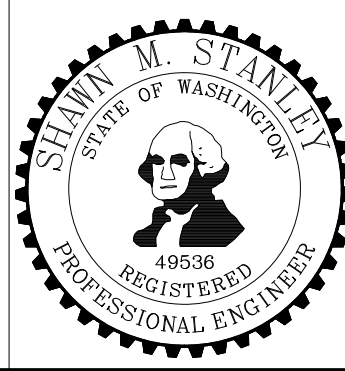
SCALE: HORZ. 1"=20'



ACCESS ROAD PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

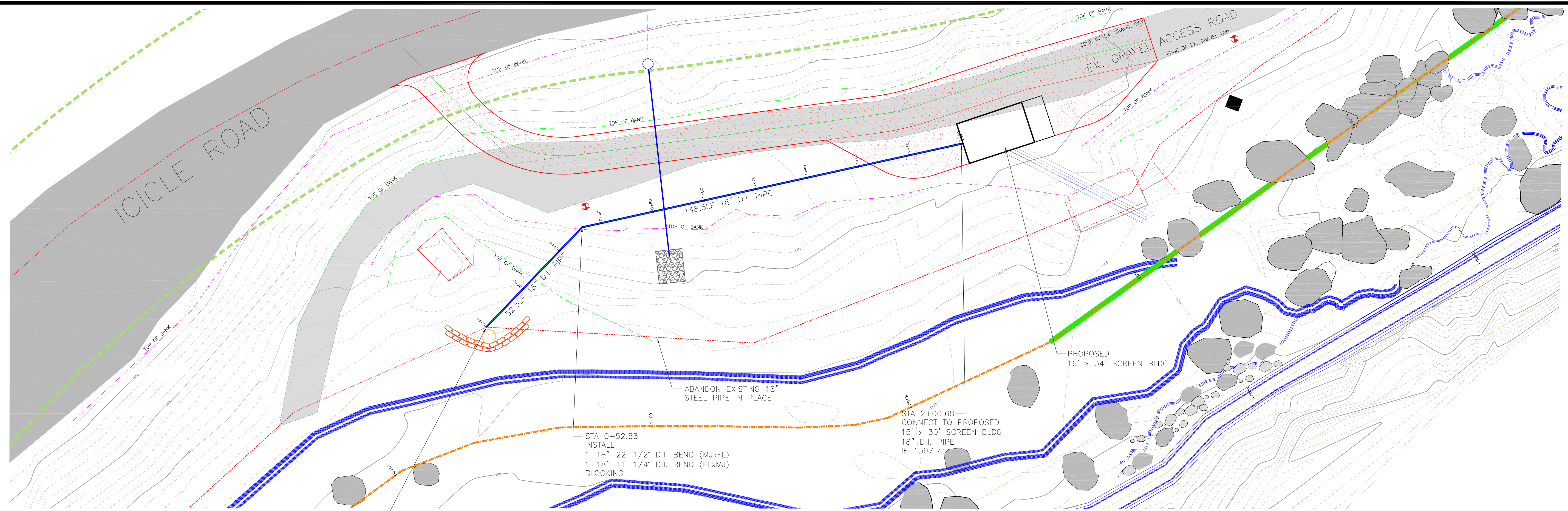


SYMBOL	DATE	BY	DESIGNED BY	S. STANLEY
APPROVED AND READY FOR CONSTRUCTION			CHECKED BY	T.C.
CHIEF ENGINEER			DRAWN BY	T.C.
PROGRAM			DATE	07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

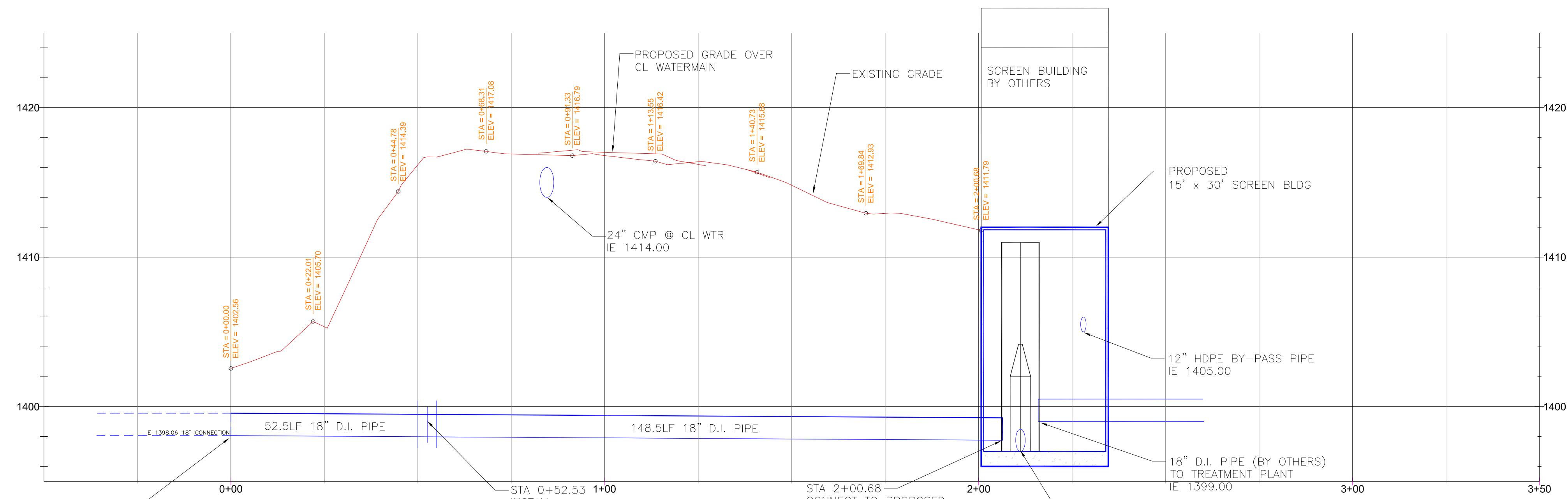
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
ACCESS ROAD PLAN AND PROFILE VIEW

PROJECT NO.
960986-18
SHEET 3 OF 8



WATERLINE PLAN VIEW

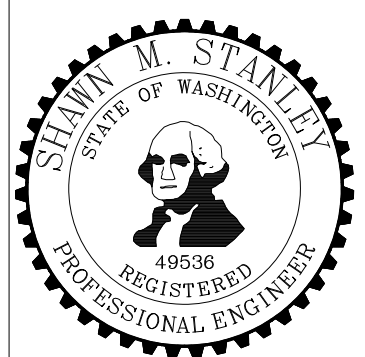
SCALE: HORZ. 1"=20'



WATERLINE PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



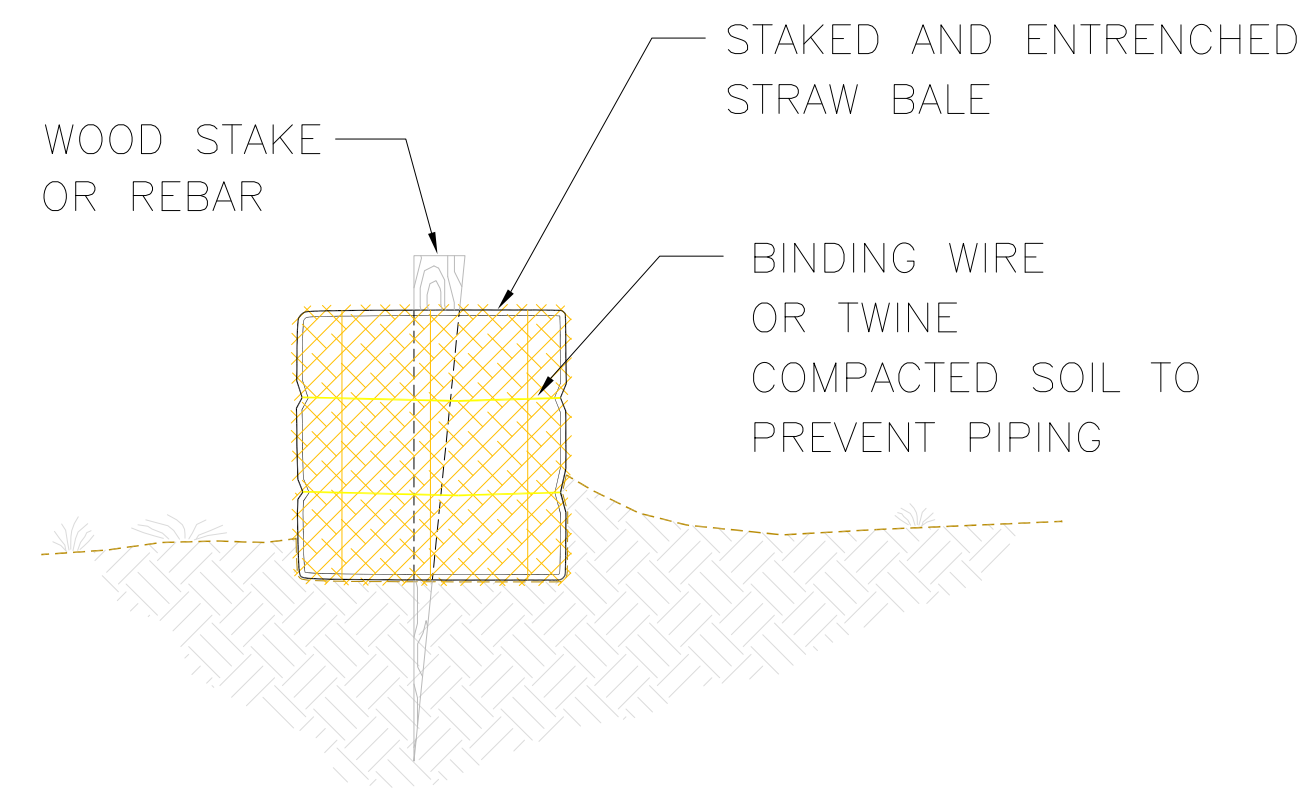
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APPROVED AND READY FOR CONSTRUCTION		DESIGNED BY S. STANLEY	
CHIEF ENGINEER		CHECKED BY	
PROGRAM		DRAWN BY T.C.	
		DATE 07-25-2018	

ICICLE CREEK		PROJECT NO.
FISH PASSAGE AND HABITAT RESTORATION PROJECT		960986-18
FISH EXCLUSION SCREEN	WATERMAIN PLAN AND PROFILE VIEW	SHEET OF
		4 8

BALES SHALL BE PLACED IN A SINGLE ROW, LENGTHWISE ON THE CONTOUR, WITH ENDS OF ADJACENT BALES TIGHTLY ABUTTING ONE ANOTHER.

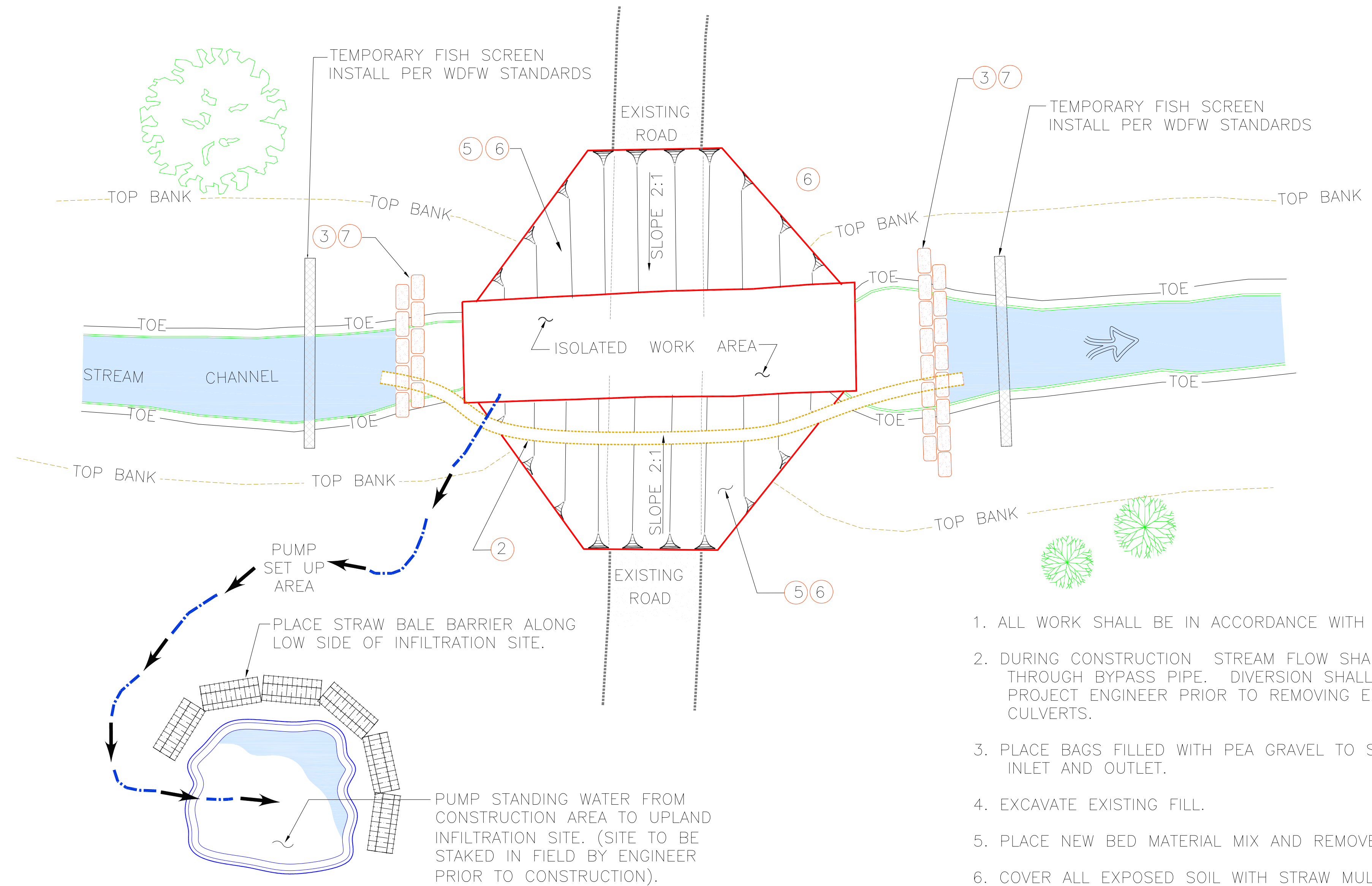
THE BARRIER SHALL BE ENTRENCHED AND BACKFILLED. A TRENCH SHALL BE A MINIMUM OF 4 INCHES. BACKFILL SOIL SHALL CONFORM TO THE GROUND LEVEL ON THE DOWNHILL SIDE AND SHALL BE BUILT UP 4 INCHES AGAINST THE UPHILL SIDE OF THE BARRIER. EACH BALE SHALL BE SECURELY ANCHORED BY AT LEAST 2 STAKES OR REBAR DRIVEN THROUGH THE BALE.

THE GAP BETWEEN THE BALES SHALL BE FILLED BY WEDGING WITH STRAW TO PREVENT WATER FROM ESCAPING BETWEEN THE BALES.



STRAW BALE BARRIER

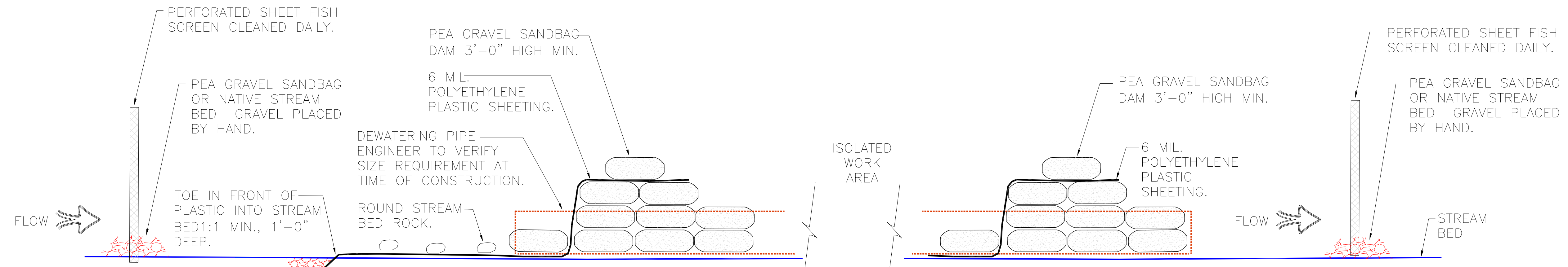
SCALE: N.T.S.



1. ALL WORK SHALL BE IN ACCORDANCE WITH HPA.
2. DURING CONSTRUCTION STREAM FLOW SHALL BE DIVERTED THROUGH BYPASS PIPE. DIVERSION SHALL BE APPROVED BY PROJECT ENGINEER PRIOR TO REMOVING EXISTING CULVERTS.
3. PLACE BAGS FILLED WITH PEA GRAVEL TO SEAL BYPASS INLET AND OUTLET.
4. EXCAVATE EXISTING FILL.
5. PLACE NEW BED MATERIAL MIX AND REMOVE BYPASS PIPE.
6. COVER ALL EXPOSED SOIL WITH STRAW MULCH AND GRASS SEED. (SEE SITE RESTORATION PLAN)
7. REMOVE DIVERSION BAGS AND FISH SCREENS BY HAND.

TYPICAL DEWATERING SCHEMATIC

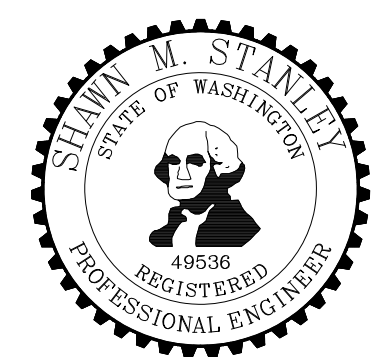
SCALE: N.T.S.



TYPICAL DEWATERING SECTION

Scale: N.T.S.

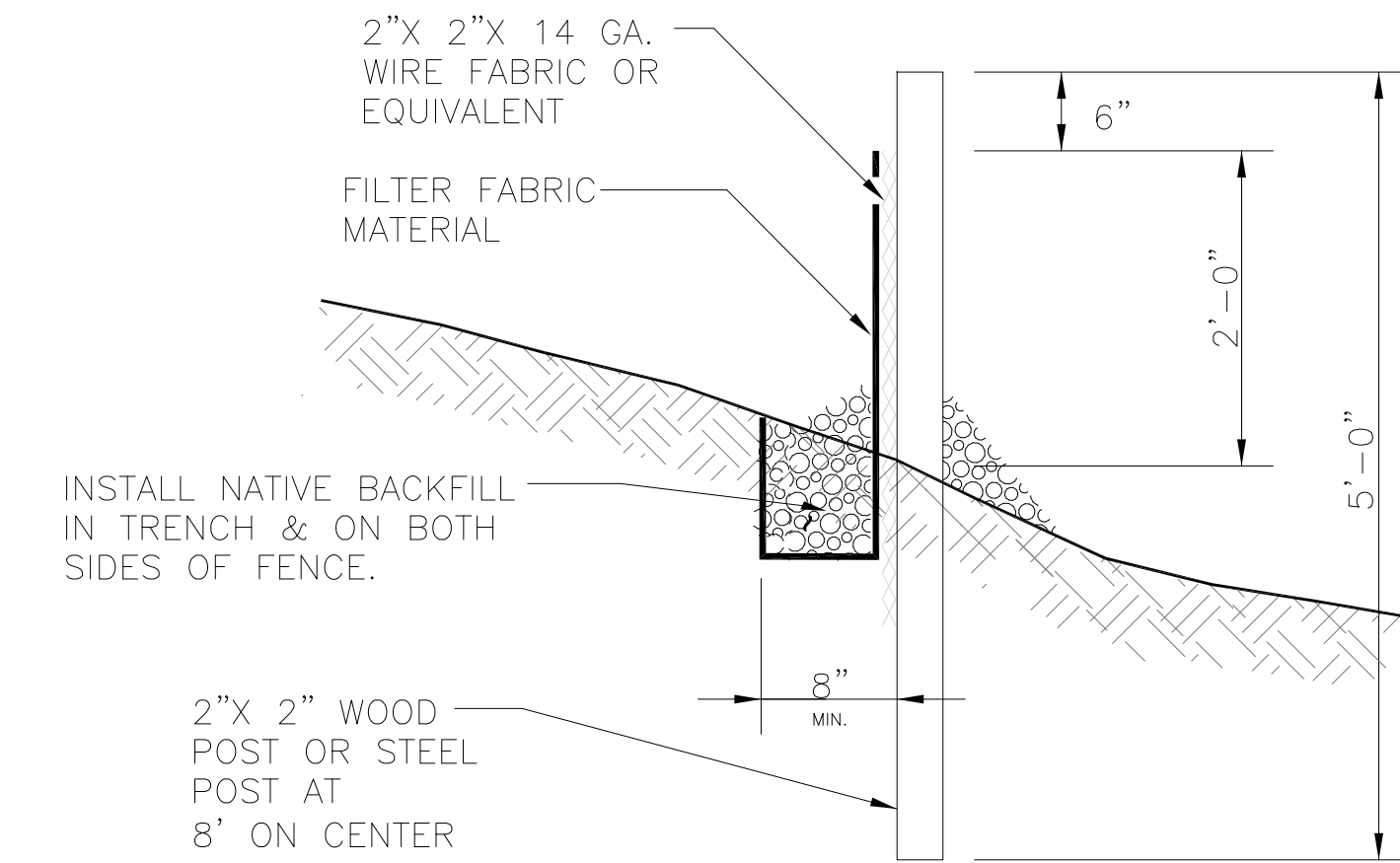
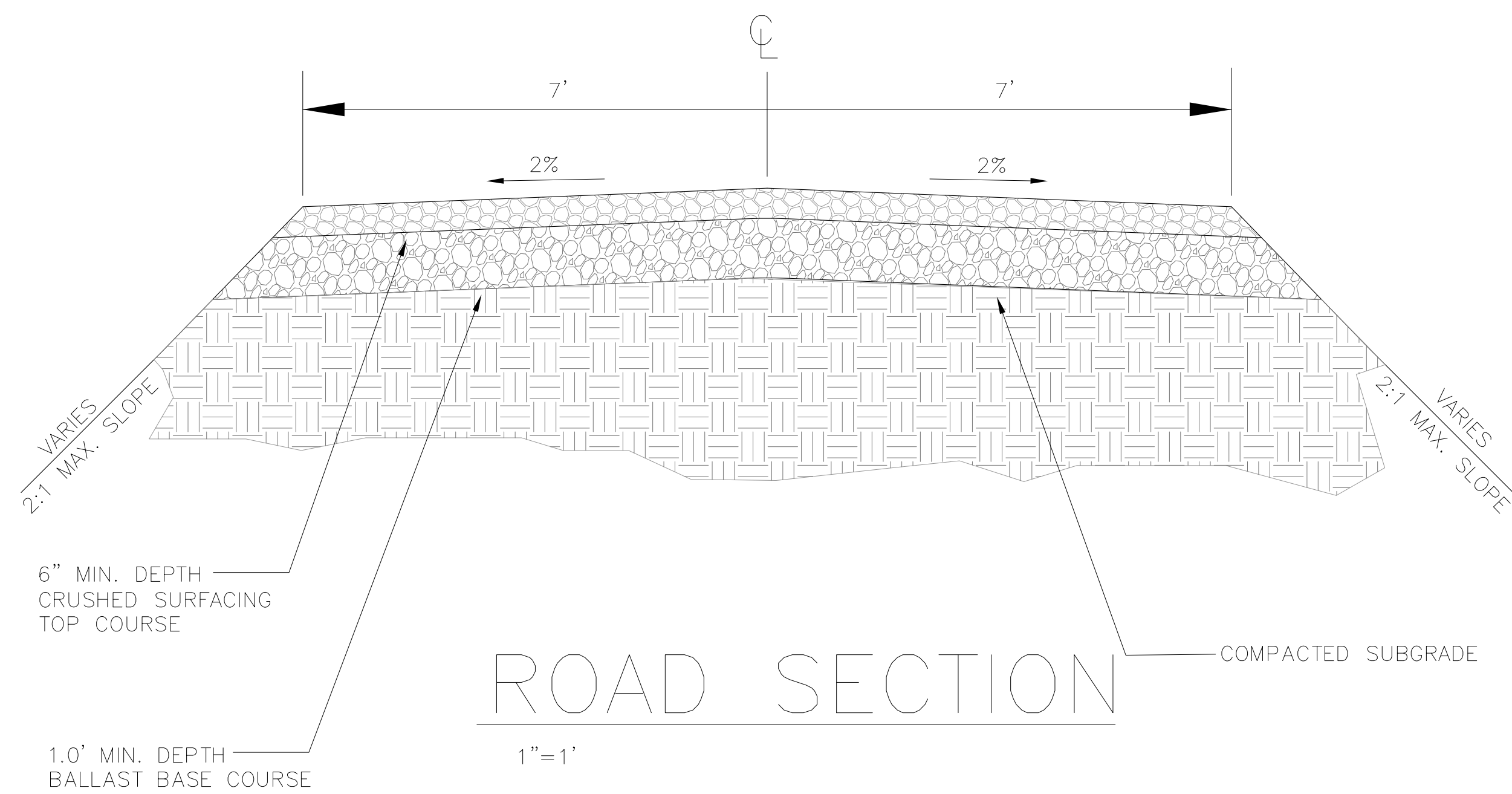
WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:	DESIGNED BY S. STANLEY	CHECKED BY
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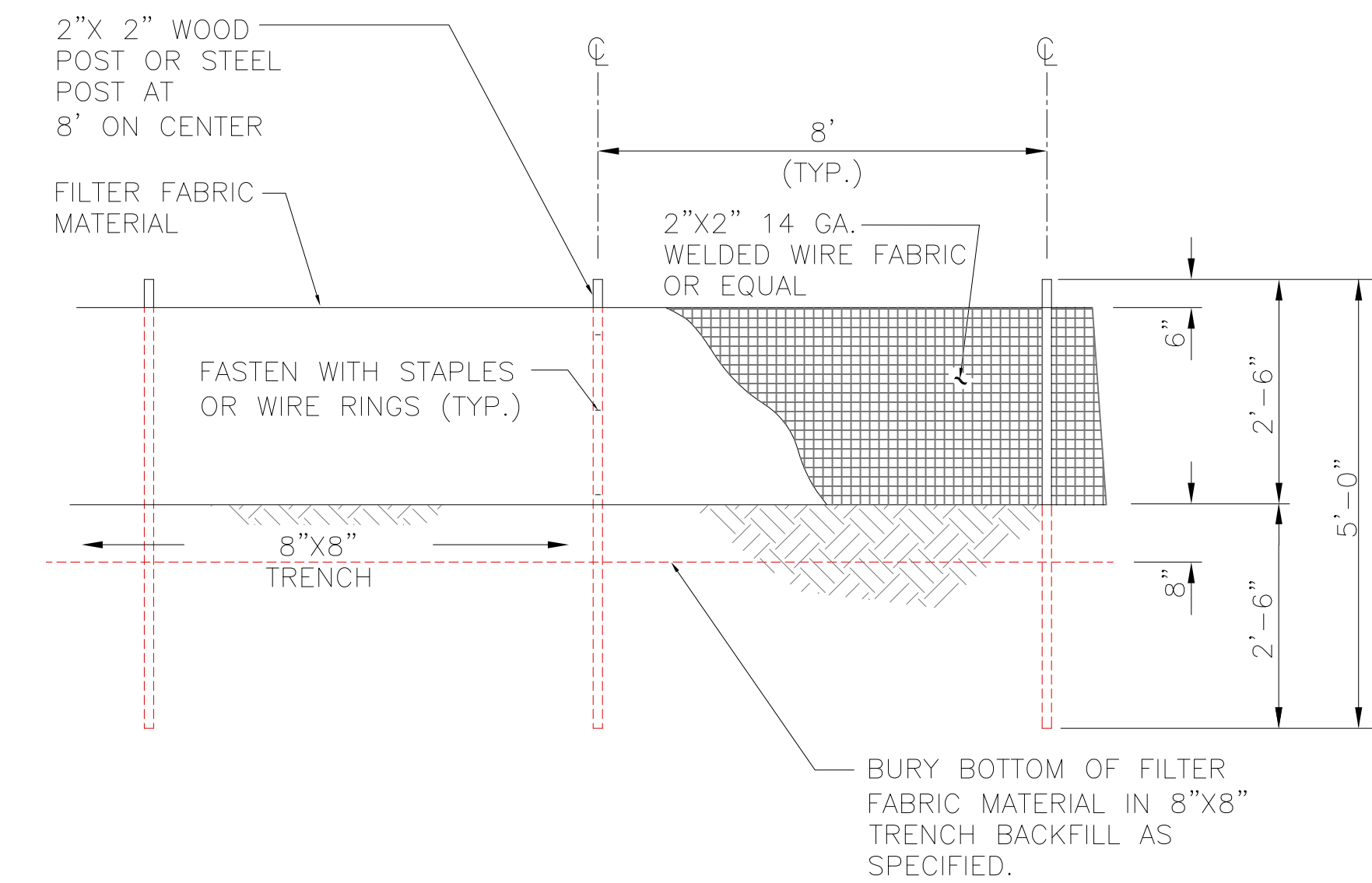
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
DEWATERING PLAN

PROJECT NO.
960986-18
SHEET 5 OF 8



TYPICAL SILT FENCE SECTION VIEW

SCALE: N.T.S.



TYPICAL SILT FENCE DETAIL

SCALE: N.T.S.

SILT FENCE NOTES

- SITE ISOLATION (SILT FENCE, STRAW BALE BARRIER) IS ONLY REQUIRED IF LIVE WATER IS PRESENT. IF THE CHANNEL IS DRY, NO FENCING IS REQUIRED.
- FILTER FABRIC SHALL BE PURCHASED CONTINUOUS ROLL CUT TO LENGTH AS NEEDED. IF JOINTS ARE NECESSARY FABRIC SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS WITH A MINIMUM OF (6) INCH OVERLAP. BOTH ENDS SHALL BE SECURED AS REQUIRED.
- SILT FENCING SHALL BE INSTALLED TO FOLLOW CONTOURS. FENCE POSTS SHALL BE SPACED A MAXIMUM OF EIGHT (8) FEET APART UNLESS OTHERWISE SHOWN HEREIN. ALL POSTS SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 30 INCHES.
- A TRENCH SHALL BE EXCAVATED, ROUGHLY EIGHT (8) INCHES WIDE BY EIGHT (8) INCHES DEEP UPSLOPE AND ADJACENT TO THE POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
- WHEN STANDARD STRENGTH FILTER FABRIC IS UTILIZED, A WIRE SINGLE SPACE MESH SUPPORT FENCE SHALL BE FASTENED TO THE UPSLOPE SIDE OF THE POSTS USING ONE (1) INCH MINIMUM LENGTH WIRE STAPLES TIE WIRE OR APPROVED HOG RINGS. ALL WIRE SUPPORT SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR (4) INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE ORIGINAL GRADE.
- ALL FILTER FABRIC SHALL BE STAPLED OR WIRED TO SUPPORT FENCING AND A MINIMUM OF 20 INCHES OF FABRIC SHALL BE EXTENDED INTO THE TRENCH. FILTER FABRIC SHALL NOT BE STAPLED OR FASTENED TO EXISTING TREES OR STRUCTURES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
- IF HIGH STRENGTH FILTER FABRIC AND CLOSER SPACING ARE USED, THE WIRE SUPPORT FENCING MAY BE ELIMINATED. HIGH STRENGTH FABRIC SHALL BE STAPLED OR WIRED DIRECTLY TO POSTS AS REQUIRED BY THE ENGINEER.
- TRENCH SHALL BE BACKFILLED WITH 3/4 INCH MINIMUM DIAMETER WASHED GRAVEL OR OTHER SIMILAR SOURCE AS APPROVED BY THE ENGINEER.
- SILT FENCING SHALL BE INSTALLED WHERE SHOWN ON THE PLAN, OR AS MARKED IN THE FIELD BY THE ENGINEER, PRIOR TO COMMENCEMENT OF WORK. ALL FENCING SHALL BE INSPECTED DAILY DURING CONSTRUCTION AND AFTER EACH SIGNIFICANT RAINFALL EVENT UNTIL SITE HAS BEEN PERMANENTLY STABILIZED. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
- REMOVAL OF TRAPPED SEDIMENT SHALL BE PERFORMED WHEN AMOUNTS REACH APPROXIMATELY 1/3 HEIGHT OF THE FENCE ABOVE GROUND.
- SILT FENCING SHALL REMAIN IN-PLACE UNTIL SITE HAS BEEN REVEGETATED TO ORIGINAL CONDITION OR DIRECTED BY THE ENGINEER.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:	DESIGNED BY S. STANLEY	CHECKED BY
PROGRAM	DATE:	DRAWN BY T.G.	DATE 07-25-2018

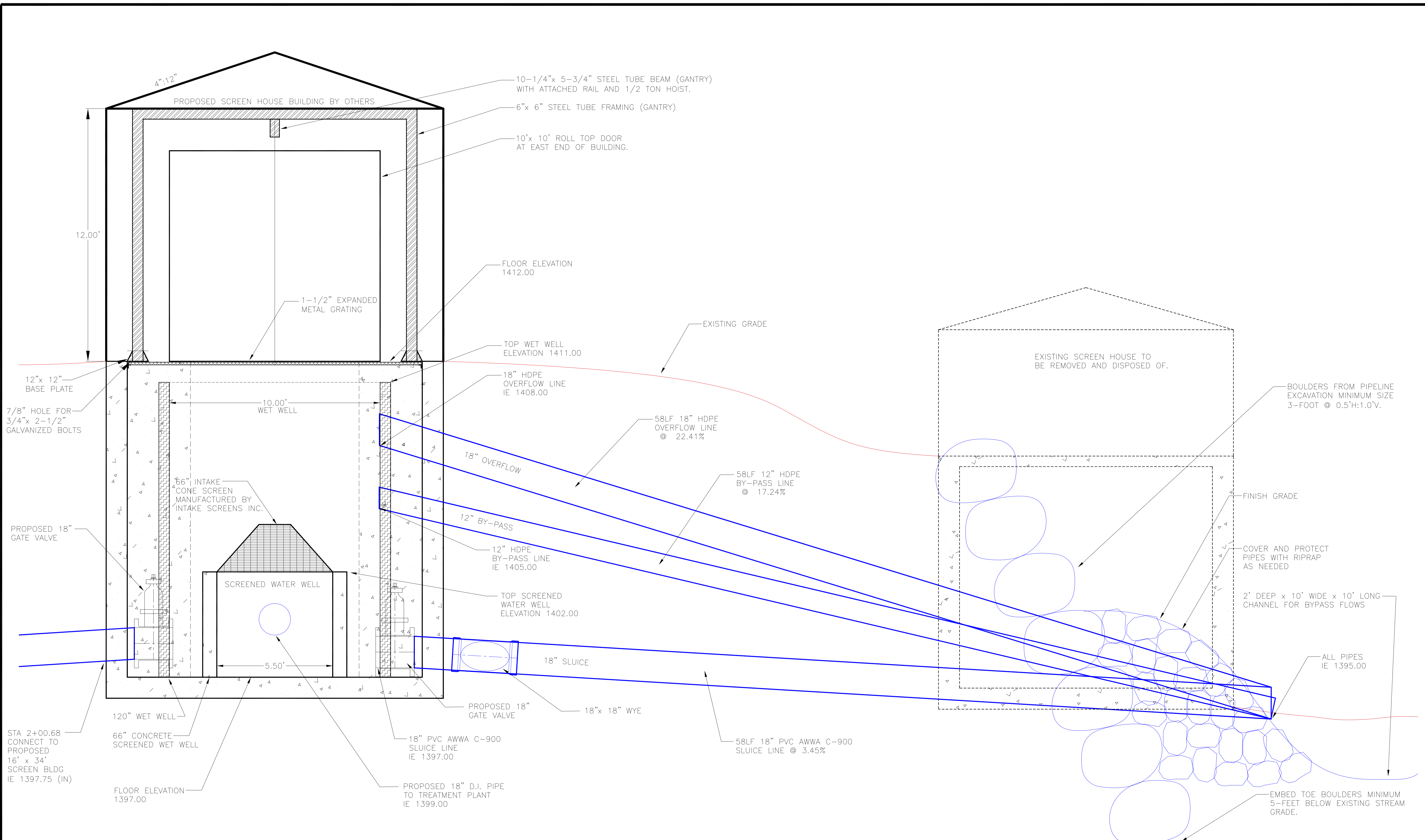
0 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT

FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS

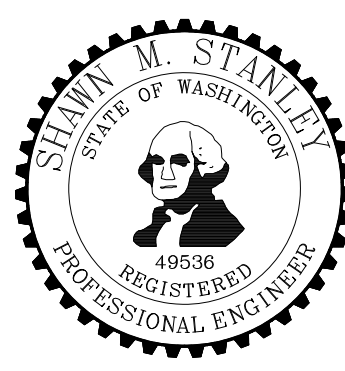
PROJECT NO.
960986-18

SHEET 6 OF 8



SCREEN BUILDING DETAILS

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:		
PROGRAM	DATE:		

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

DESIGNED BY S. STANLEY

CHECKED BY

DRAWN BY T.G.

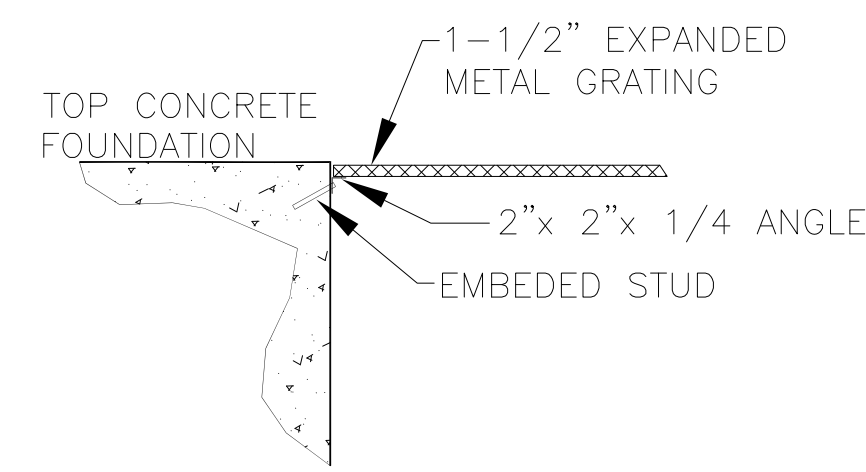
DATE 07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT

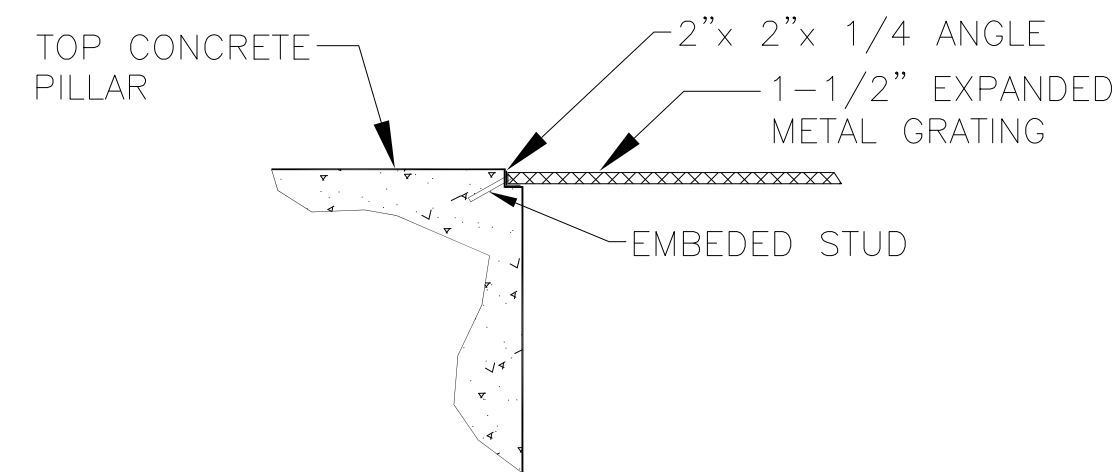
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS II

PROJECT NO. 960986-18

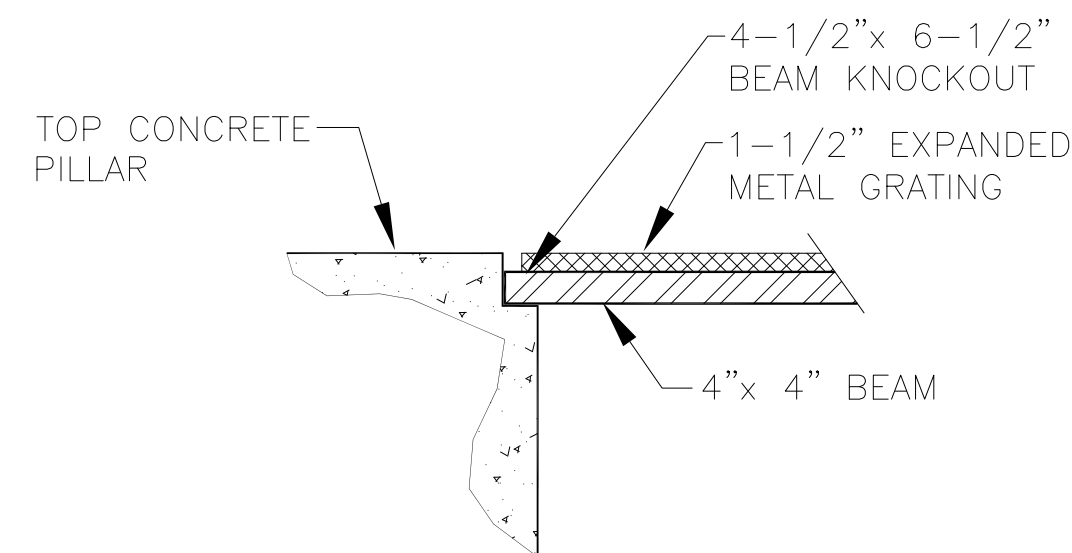
SHEET 7 OF 8



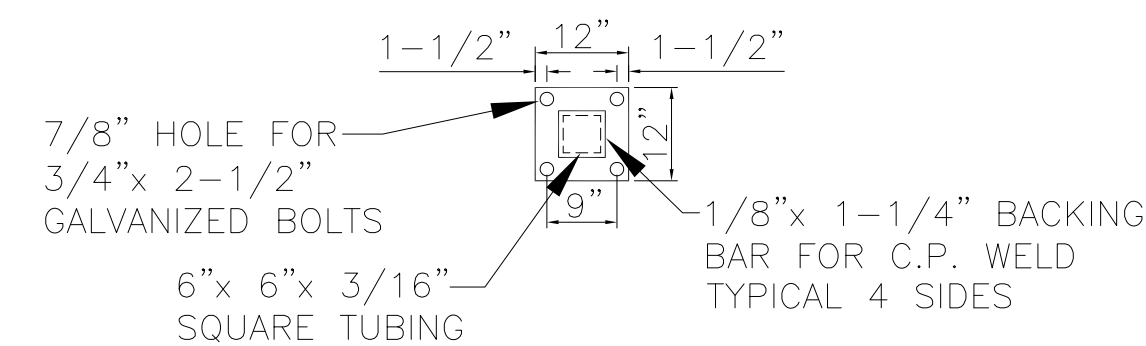
LEDGER DETAIL



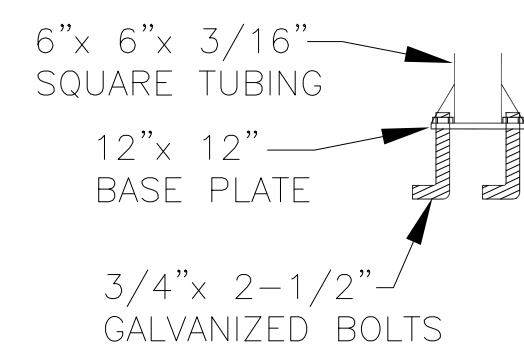
KNOCKOUT DETAIL



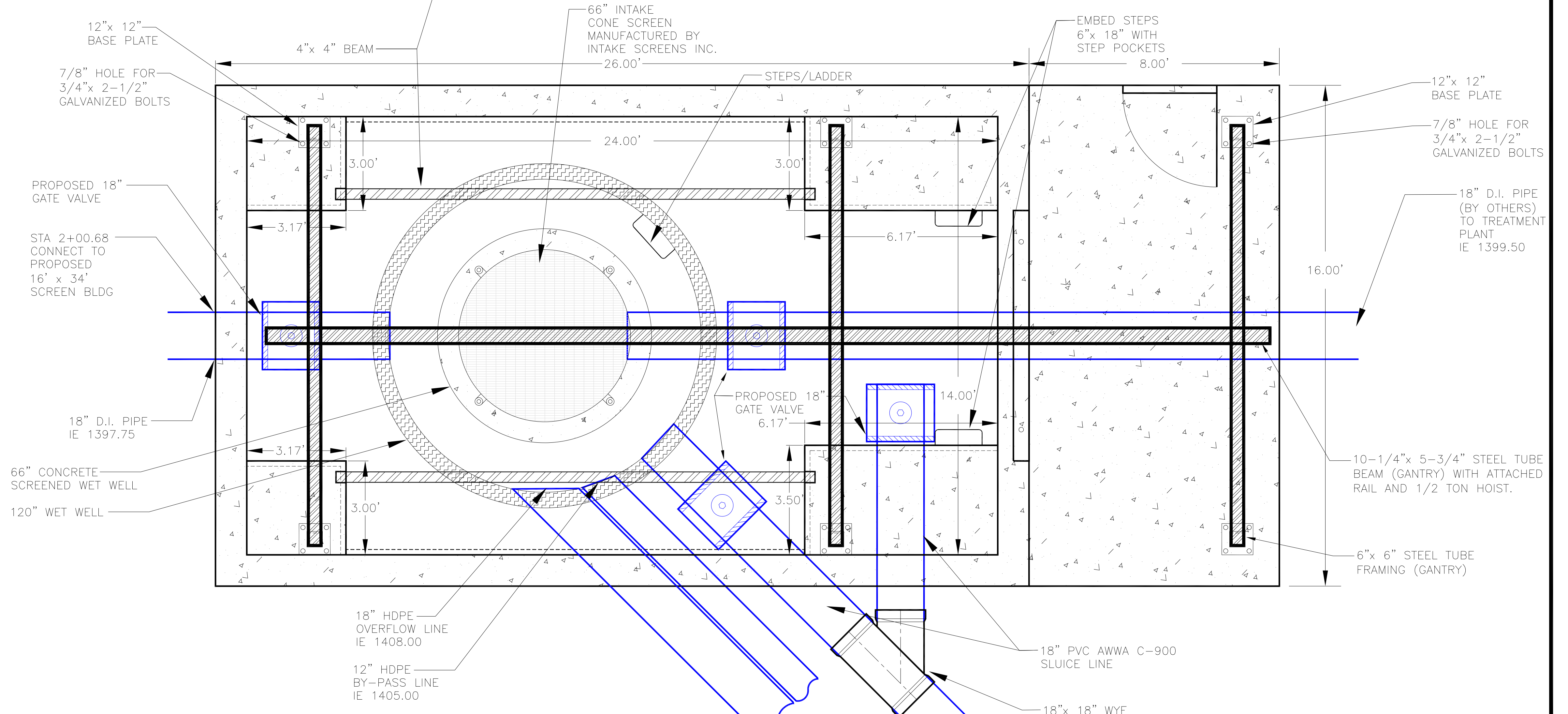
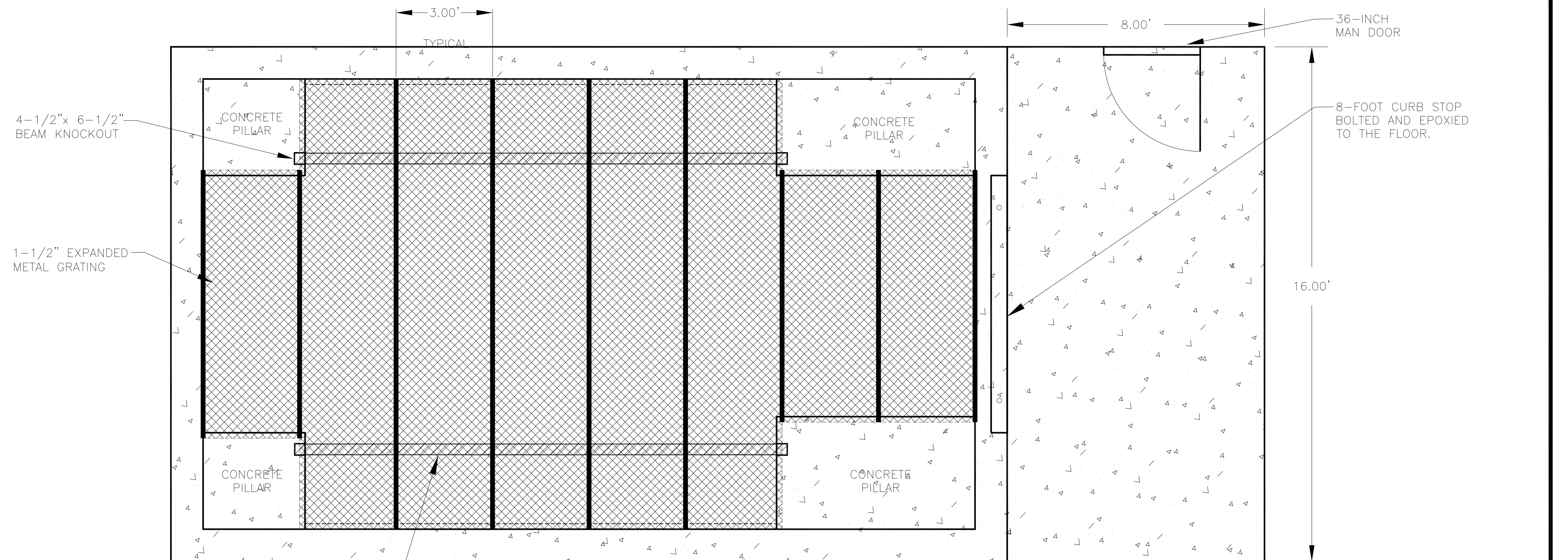
BEAM KNOCKOUT DETAIL



BASE PLATE DETAIL



BASE PLATE BOLT DETAIL



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

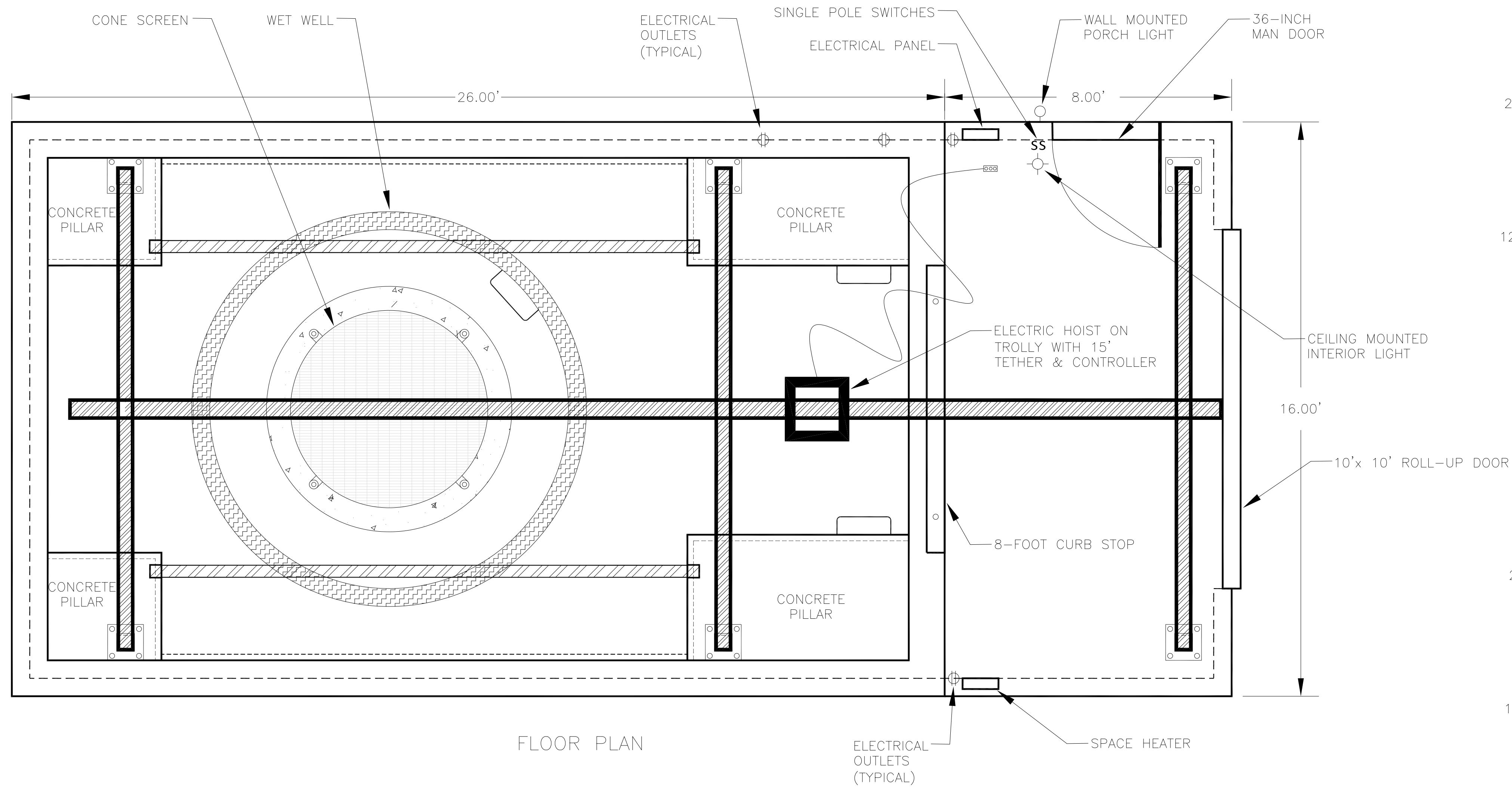


SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

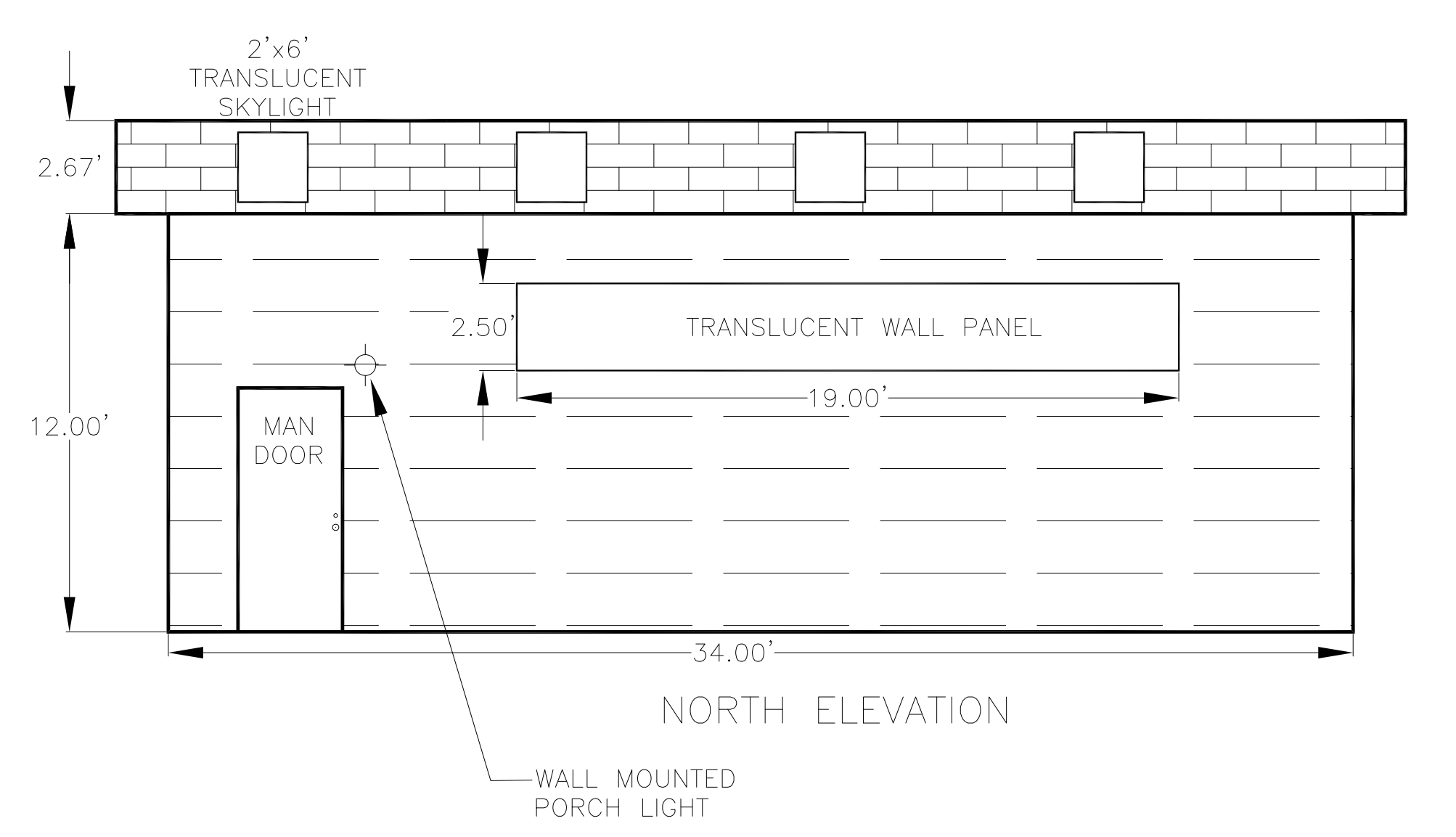
0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS
DESIGNED BY S. STANLEY
CHECKED BY
DRAWN BY T.G.
DATE 07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS II

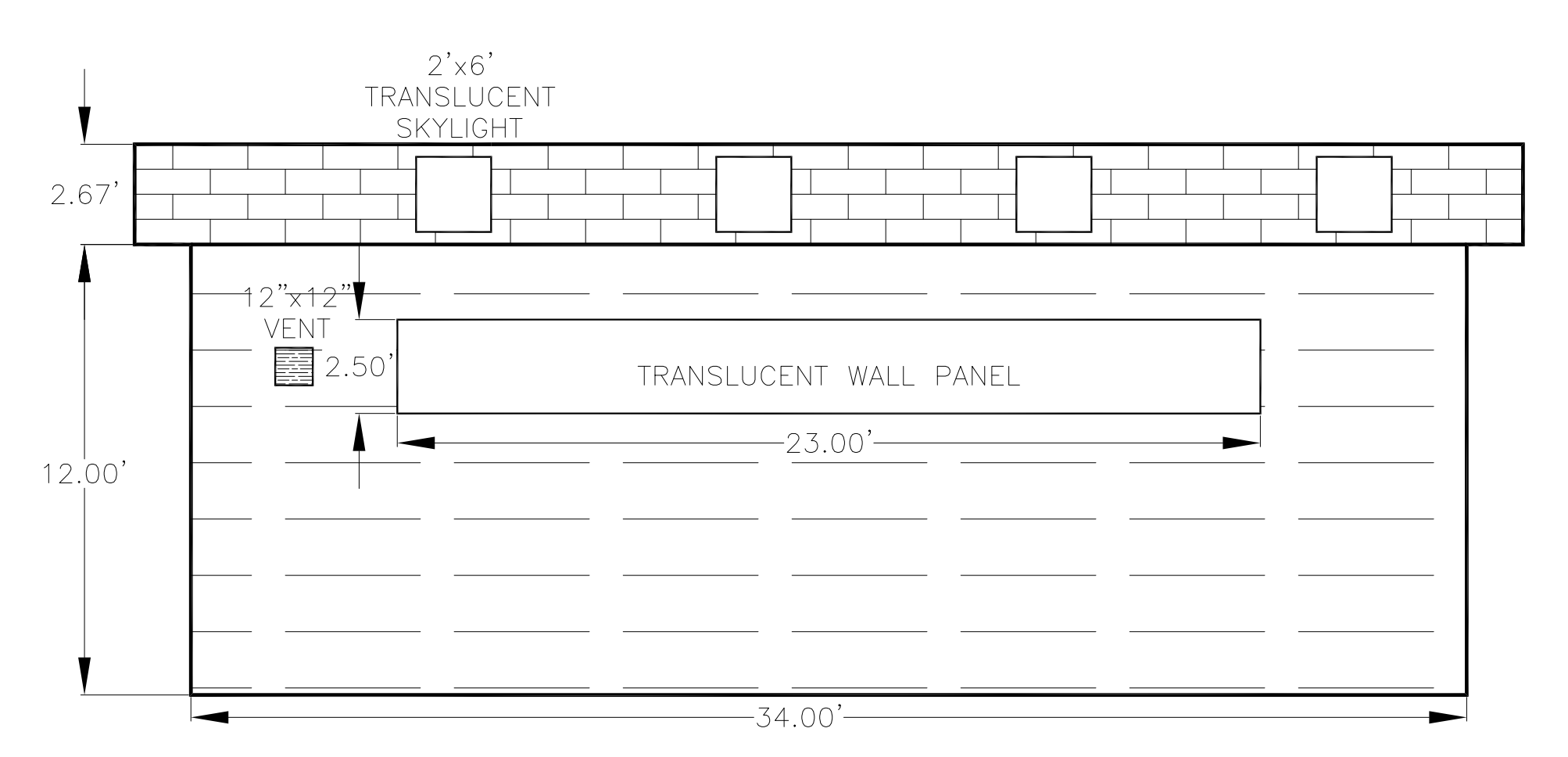
PROJECT NO. 960986-18
SHEET 8 OF 8



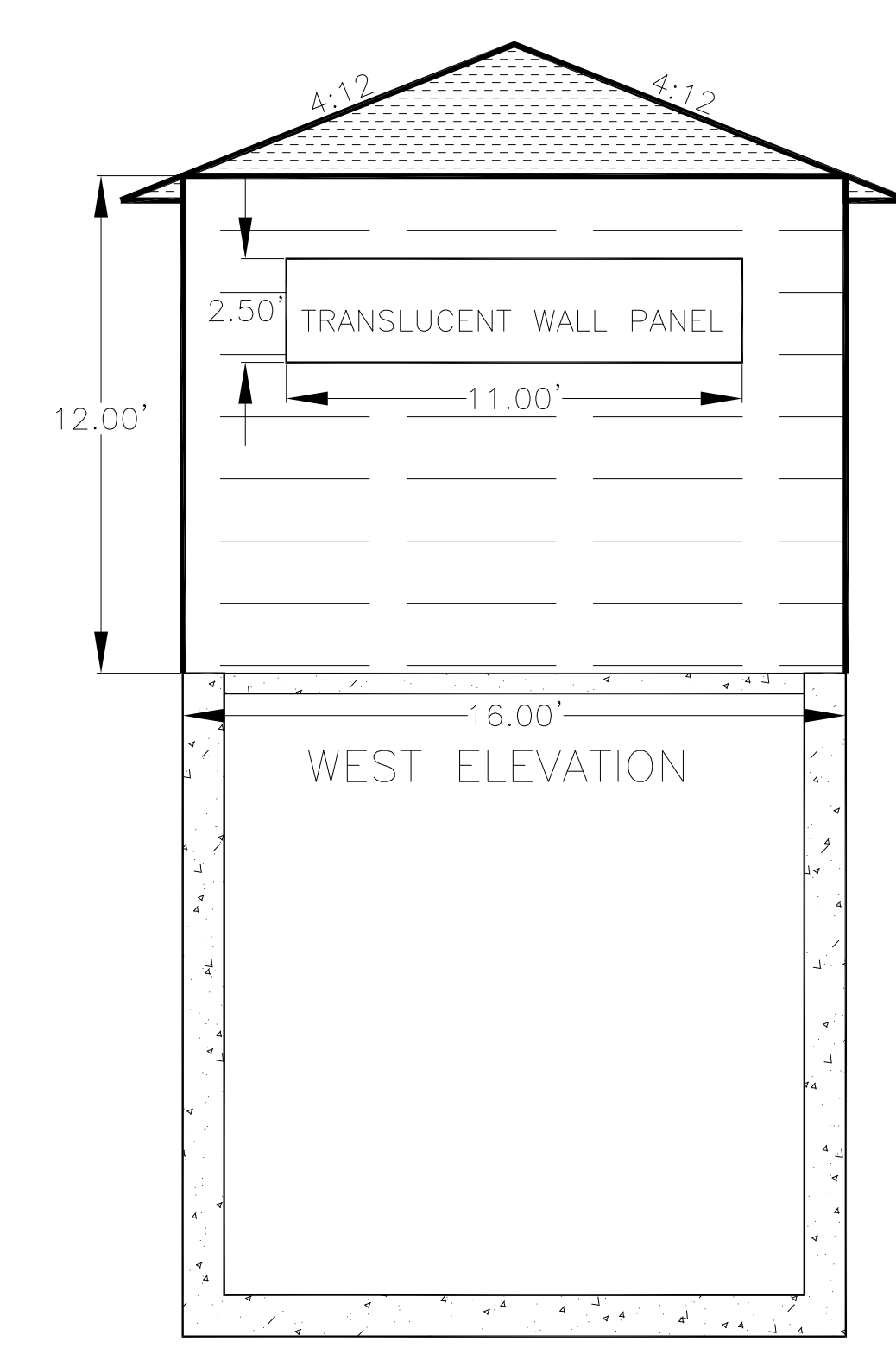
FLOOR PLAN



NORTH ELEVATION

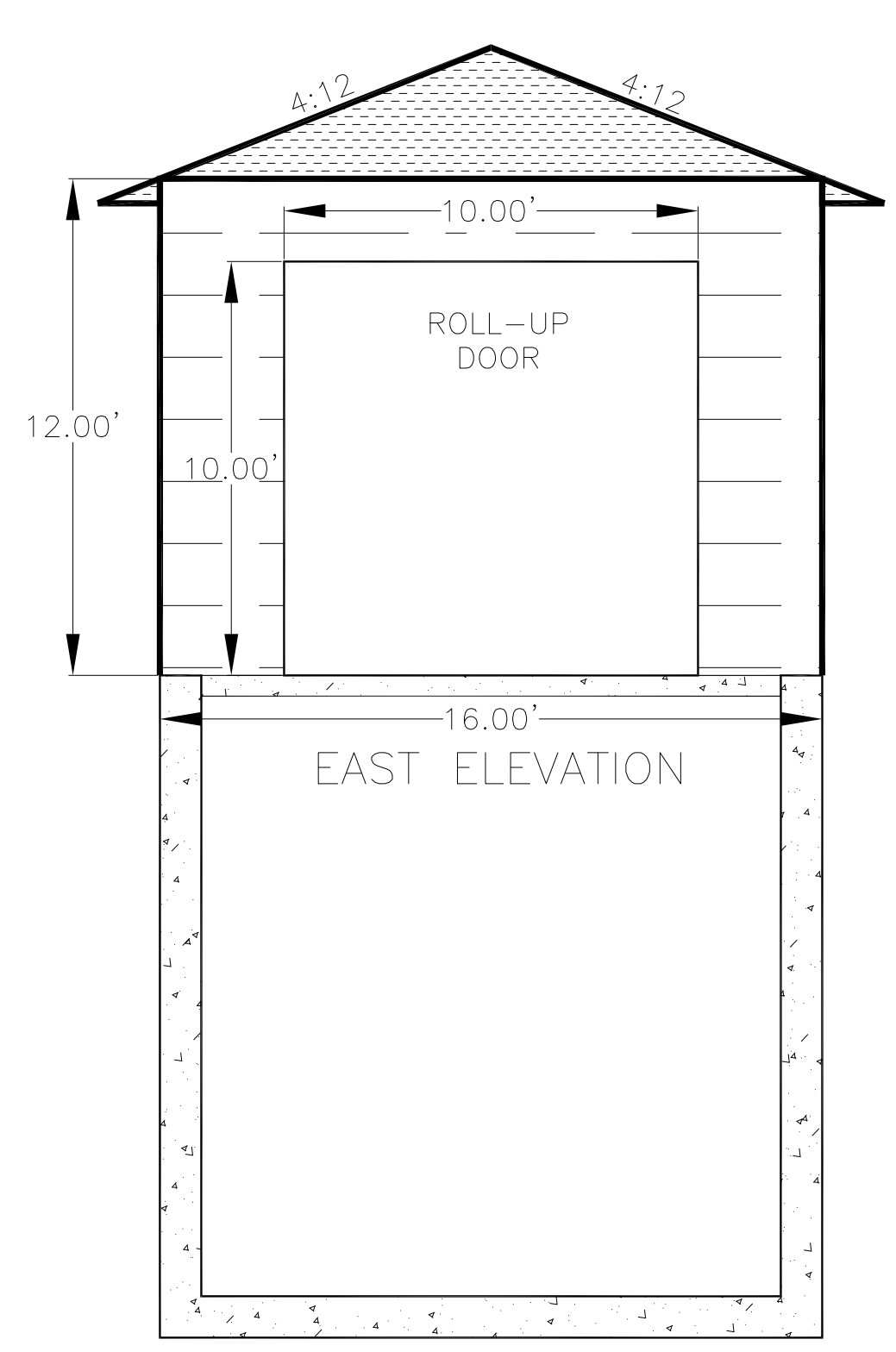


SOUTH ELEVATION

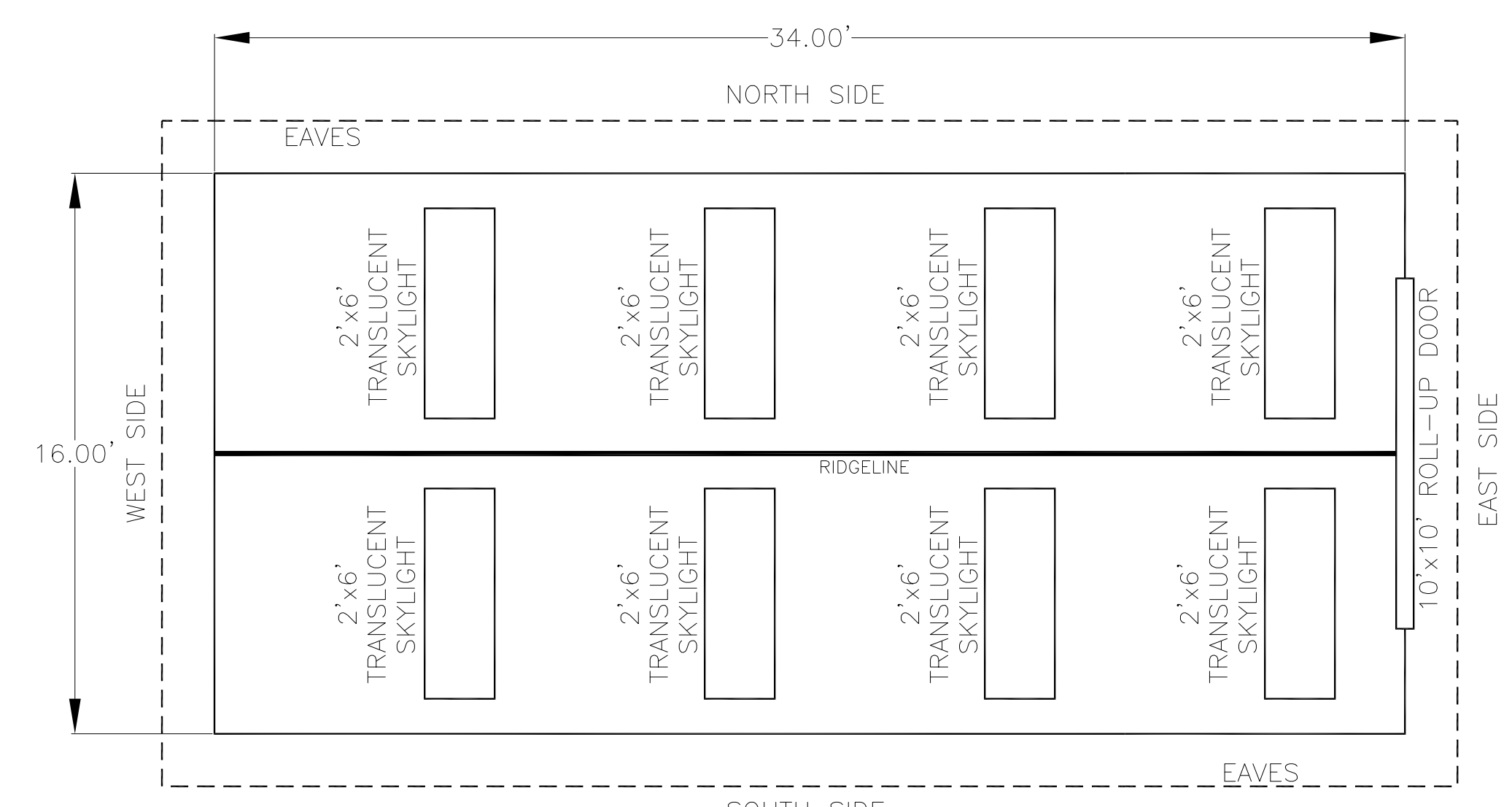


WEST ELEVATION

NOTE:
BUILDING TO BE INSULATED WITH
4"-6" ROOF INSULATION AND
4" WALL INSULATION

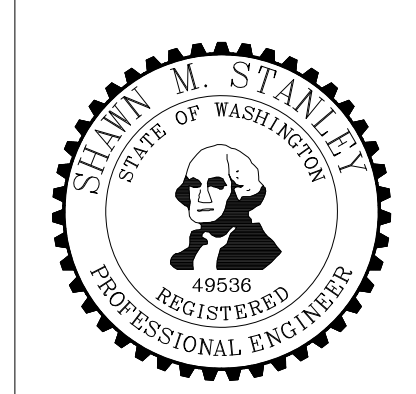


EAST ELEVATION



TOP VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

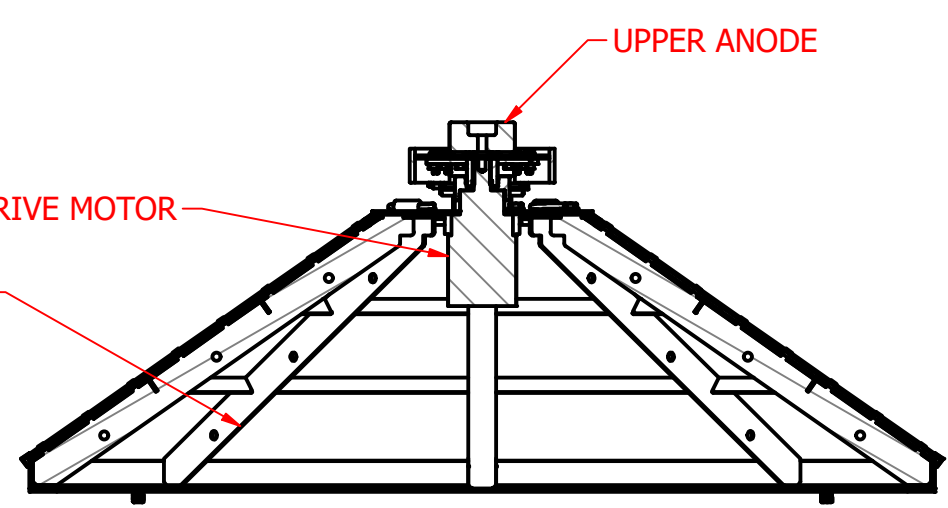
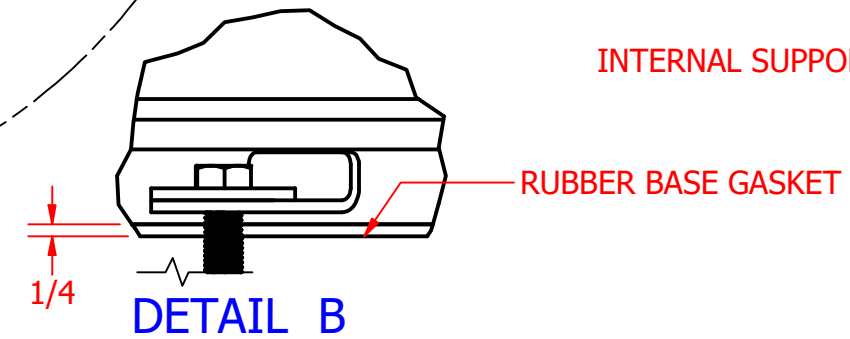
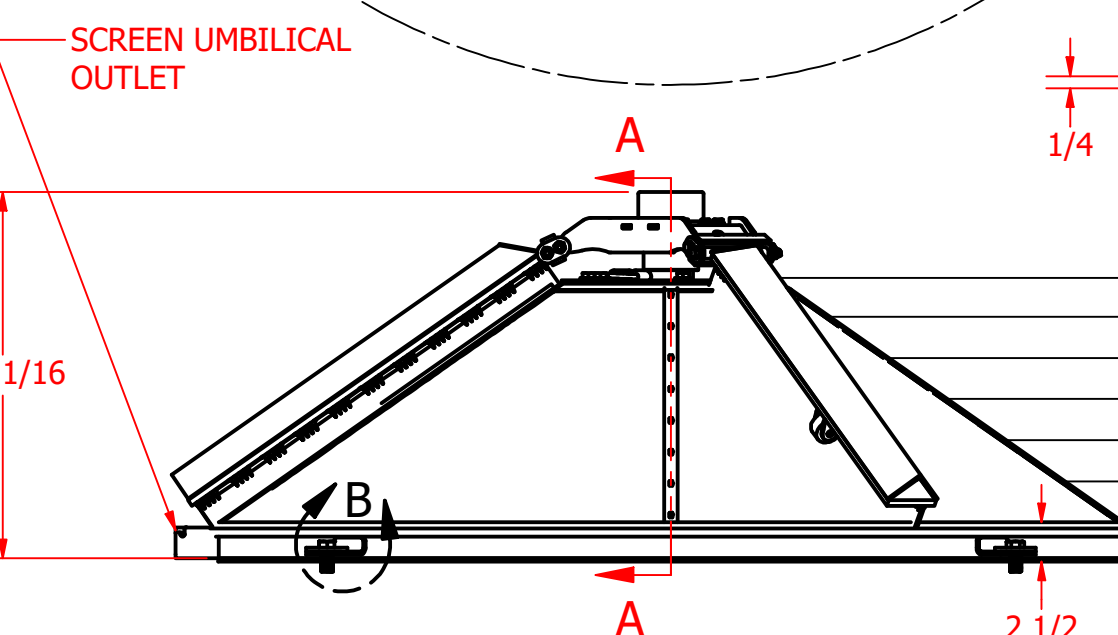
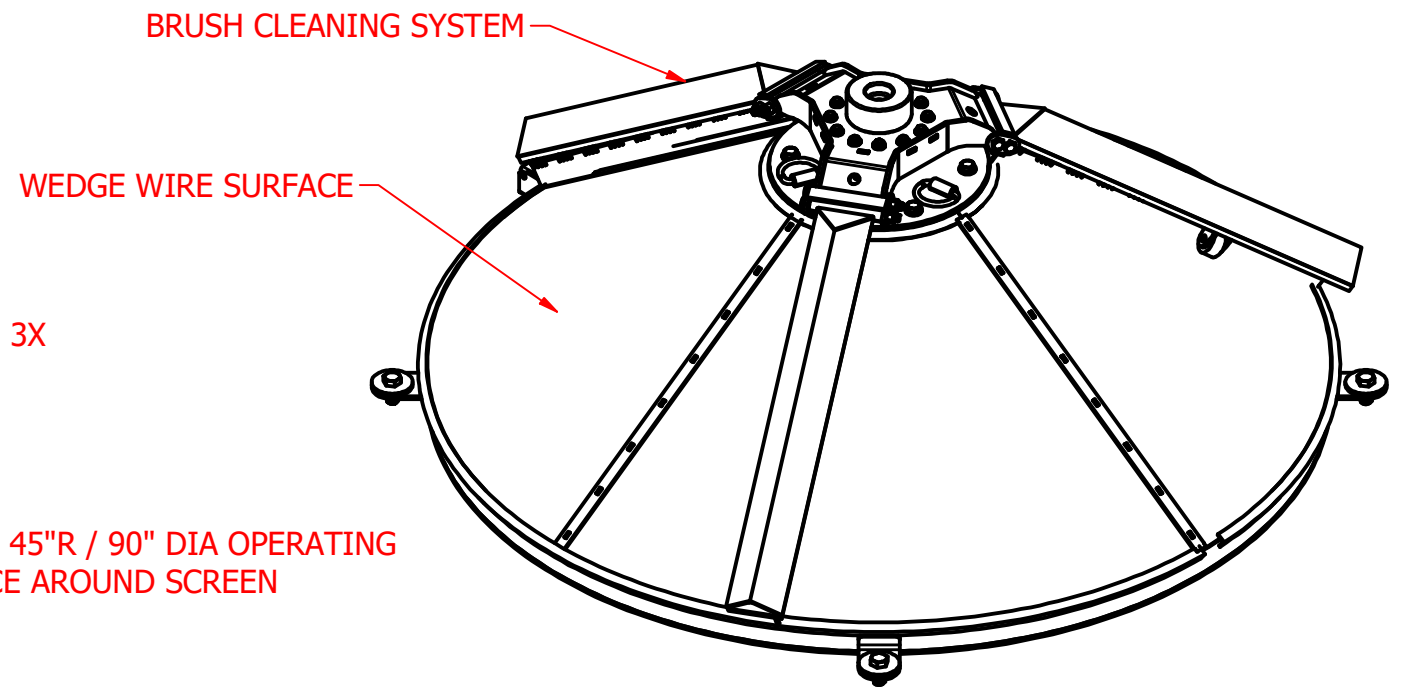
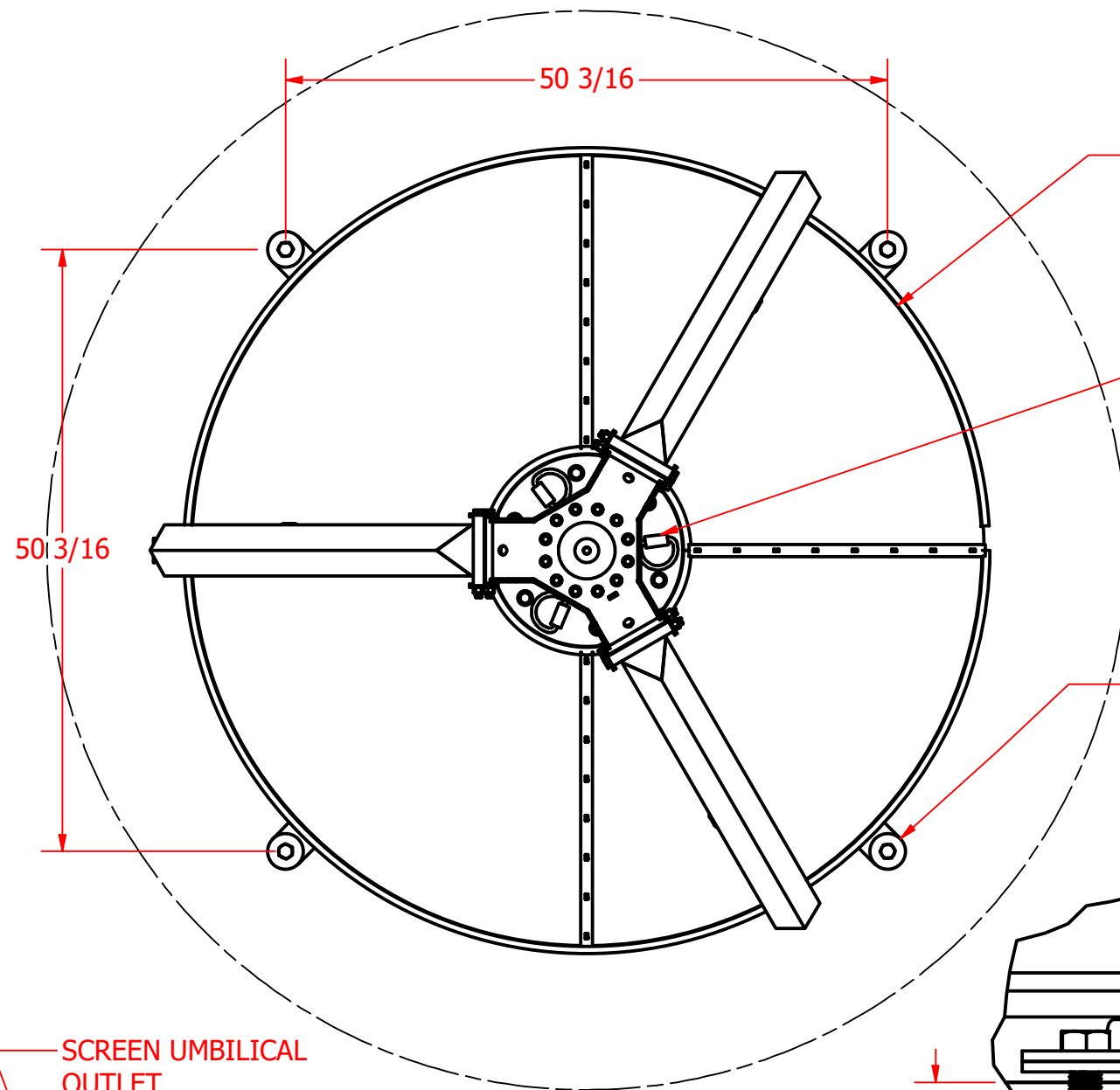


SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
		CHIEF ENGINEER	DATE:
		PROGRAM	DATE:

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS IV

PROJECT NO.	960986-18
SHEET	9
OF	9



17.81" / 26.80
15" / 24.86
12" / 21.85
9" / 17.85
6" / 12.88
3" / 6.93
0" / 0
WATER DEPTH (in) / SUBMERGED SCREEN AREA (sq ft)

ISI C66-18 BRUSHED CONE SELF CLEANING INTAKE SCREEN
 FRAME MATERIAL: ASTM A276, TYPE 304
 MOTOR FRAME / DRIVE PLATE MATERIAL: EPOXY COATED ASTM A36 CARBON STEEL
 69 V WEDGEWIRE: 1.75mm WIDTH, 1.75 SLOT SIZE, 50% OPEN AREA

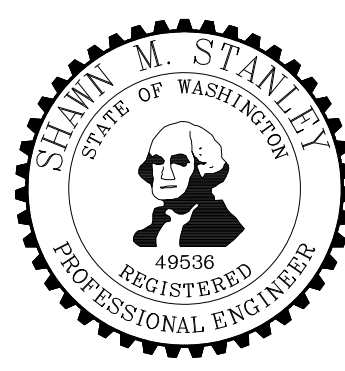
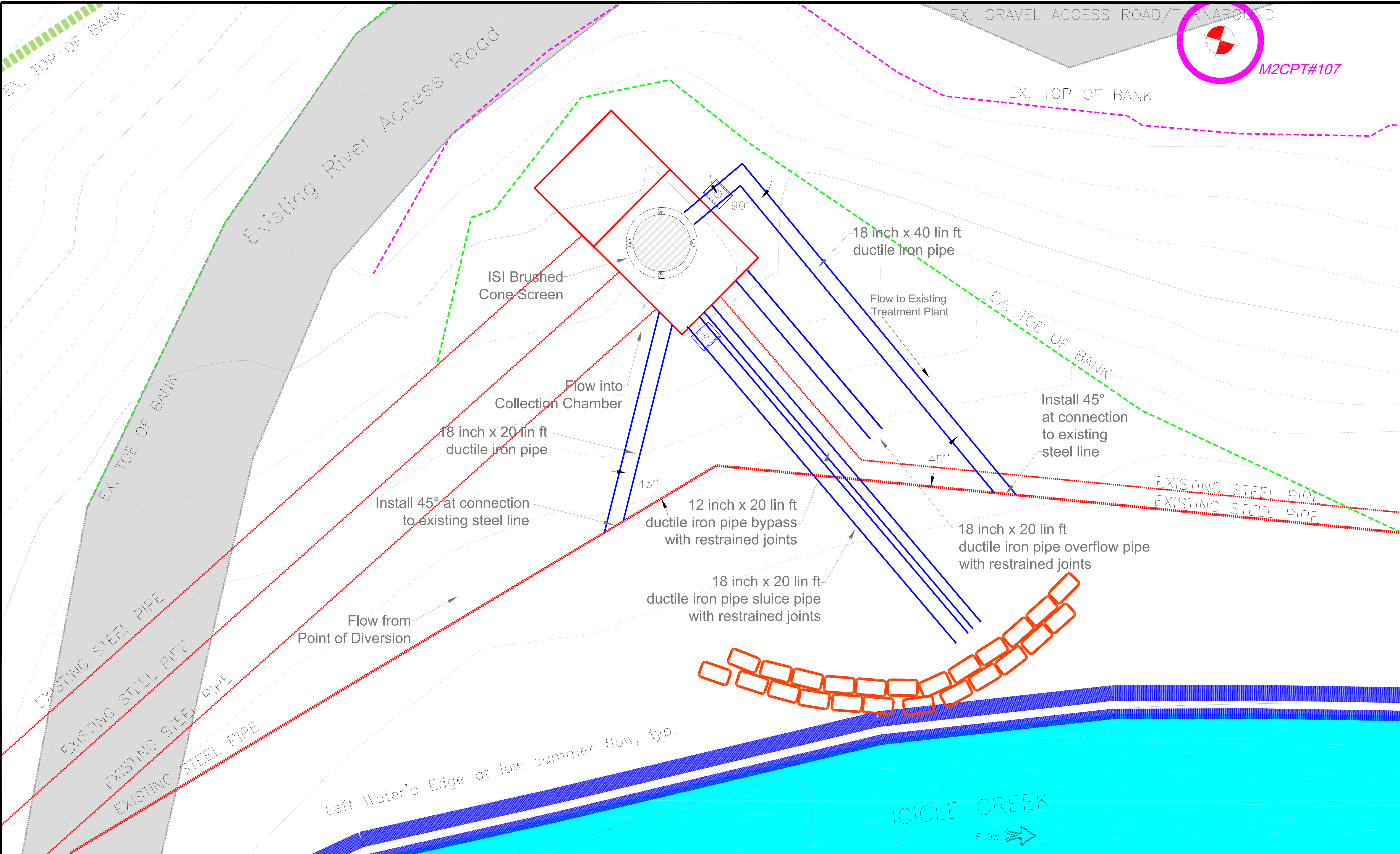
ALL DIMENSIONS IN INCHES UNLESS NOTED			
REV	DESCRIPTION	DATE	APPROVED
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.		STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005	

www.intakescreensinc.com
 CA CL. 796197
ISI Intake Screens, Inc.
 8417 River Road - Sacramento, California 95832
 (916) 665-2727 (916) 665-2729 FAX

DATE 5/9/2018	PROJECT Yellow Jacket
APP'D BY RUSSELL BERRY	DESCRIPTION 66" CONE SCREEN
DRAWN BY MAR	MATERIAL 304 STAINLESS ASSEMBLY
"B" SHEET SCALE	

DESCRIPTION 66" CONE SCREEN	DRAWING NUMBER 66 CONE SCREEN-12
MATERIAL 304 STAINLESS ASSEMBLY	MASS N/A

DRAWING NUMBER 66 CONE SCREEN-12	SHEET NUMBER 1 of 1
MASS N/A	



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	09-10-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
Re-Use Collection Chamber Option

PROJECT NO. 960986-18	
SHEET	OF
X	X

NOT FOR CONSTRUCTION

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

Appendix D. IPID Fish Screen Drawings



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

SNOW CREEK TRIBUTARY TO ICICLE CREEK SCREEN REMOVAL AND RELOCATION PROJECT CHELAN COUNTY, WA. WRIA: 45.0488, SITE: 603097

INDEX

SHEET NO.

1. COVER SHEET
2. SITE ACCESS PLAN & PROFILE
3. ICICLE CREEK BRIDGE CROSSING PLAN VIEW
4. ICICLE CREEK BRIDGE CROSSING PROFILE & SECTIONS
5. BY-PASS PIPE PLAN & PROFILE
6. PROPOSED SCREEN PLAN VIEW
7. PROPOSED SCREEN CROSS-SECTIONS
8. EROSION SILTATION CONTROL NOTES & DETAILS
9. SCREEN DETAILS
10. SCREEN DETAILS
11. SCREEN DETAILS
12. SCREEN DETAILS
13. SCREEN DETAILS
14. SCREEN DETAILS
15. SCREEN DETAILS
16. SCREEN DETAILS
17. SCREEN DETAILS



VICINITY MAP

LAT: 47.54201 N / LONG: -120.71171 W
WRIA: 45.0488, SITE ID: 603097
SECTION 27 & 28, TOWNSHIP 24N, RANGE 17E

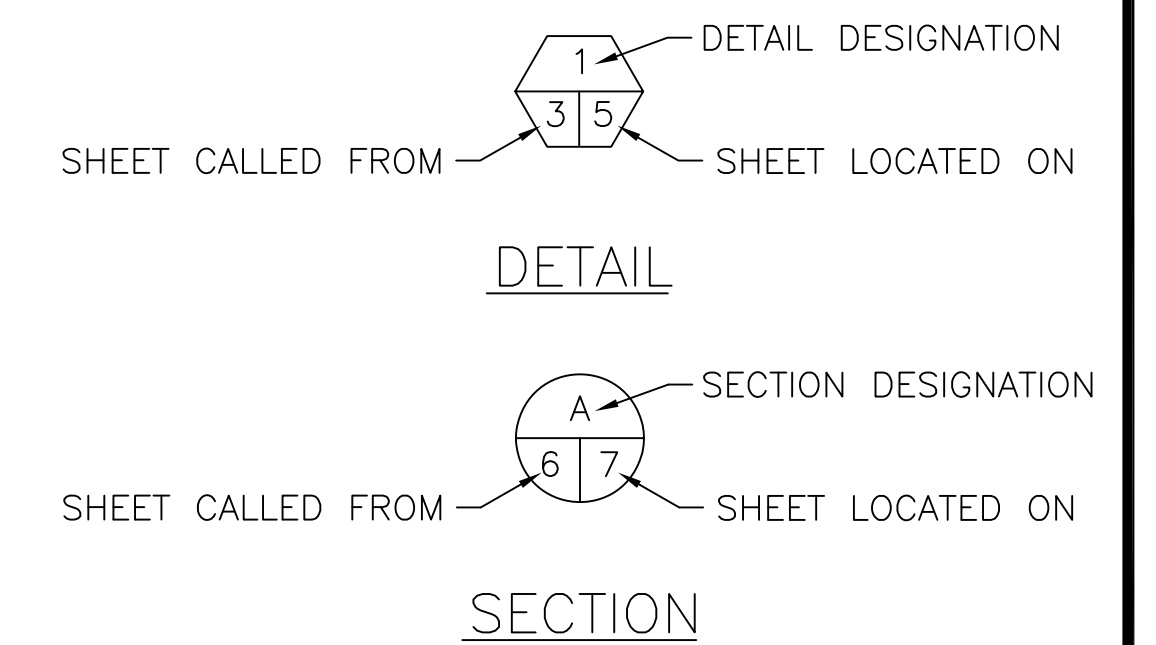
DIRECTIONS TO SITE

FROM LEAVENWORTH, WA. GO WEST ON STATE ROUTE 2
AT THE EDGE OF TOWN TURN LEFT (SOUTHERLY) ON ICICLE
ROAD. CONTINUE ON ICICLE ROAD 4.2 MILES TO THE PARKING
LOT ON THE LEFT. THE SITE IS DOWN THE HILL ACROSS THE
FOOT BRIDGE UP THE TRAIL TO THE IRRIGATION BY-PASS
OVER SNOW CREEK.

ABBREVIATIONS

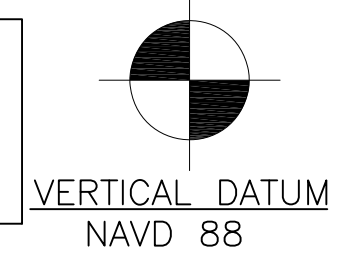
APPROX.	APPROXIMATE
BM	BENCH MARK
CONC.	CONCRETE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CP	CONTROL POINT
DIA.	DIAMETER
ELEV.	ELEVATION
EXIST.	EXISTING
FT.	FEET
GA.	GAUGE
HORIZ.	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
IE.	INVERT ELEVATION
ID.	IDENTIFICATION
LAT.	LATITUDE
LF.	LINEAL FOOT
LONG.	LONGITUDE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MP.	MILE POST
NRCS	NATURAL RESOURCES CONSERVATION SERVICE
NTS	NOT TO SCALE
PAV'T	PAVEMENT
REQ'D	REQUIRED
SEC.	SECTION
SHT.	SHEET
SPEC'S.	SPECIFICATIONS
STA.	STATION
TP.	TAX PARCEL NUMBER
TBM	TEMPORARY BENCH MARK
TYP.	TYPICAL
VERT.	VERTICAL
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WRIA	WATER RESOURCE INVENTORY AREA
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
W.S.	WATER SURFACE

SHEET SYMBOLS



PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE			
Description	Easting	Northing	Elevation
1. WDFW REBAR #2	1670577.170'	197616.595'	1434.41'
2. WDFW REBAR #1	1670524.666'	197694.655'	1405.34'



REVIEW AND ACCEPTANCE

The Drawings, Construction and material Specifications, and Operation and Maintenance Plans for this project have been reviewed with me and are accepted for this installation. I also acknowledge that any modifications prior to review by the WDFW before implementation may result in WDFW disapproval of this installation. I hereby acknowledge receipt of a copy(ies) of this plan.

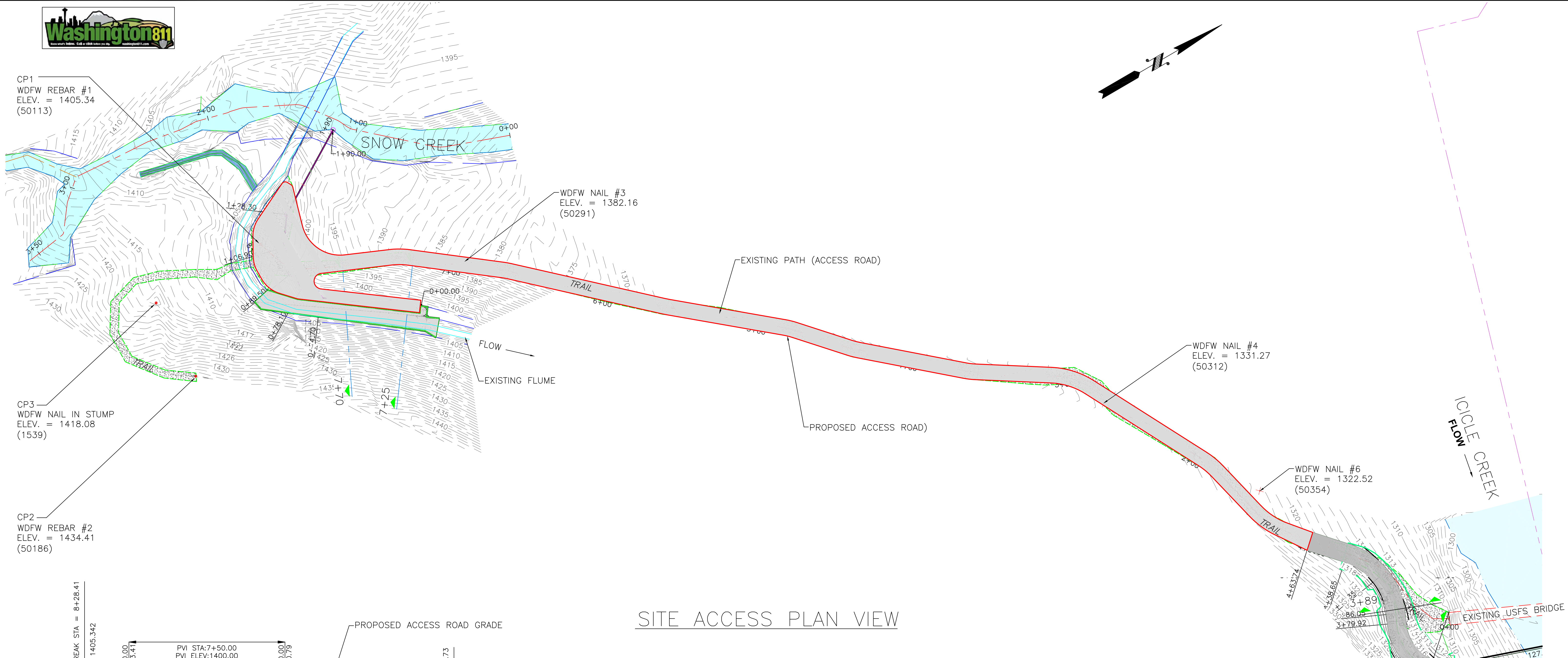
Owner/Operator _____

Date _____

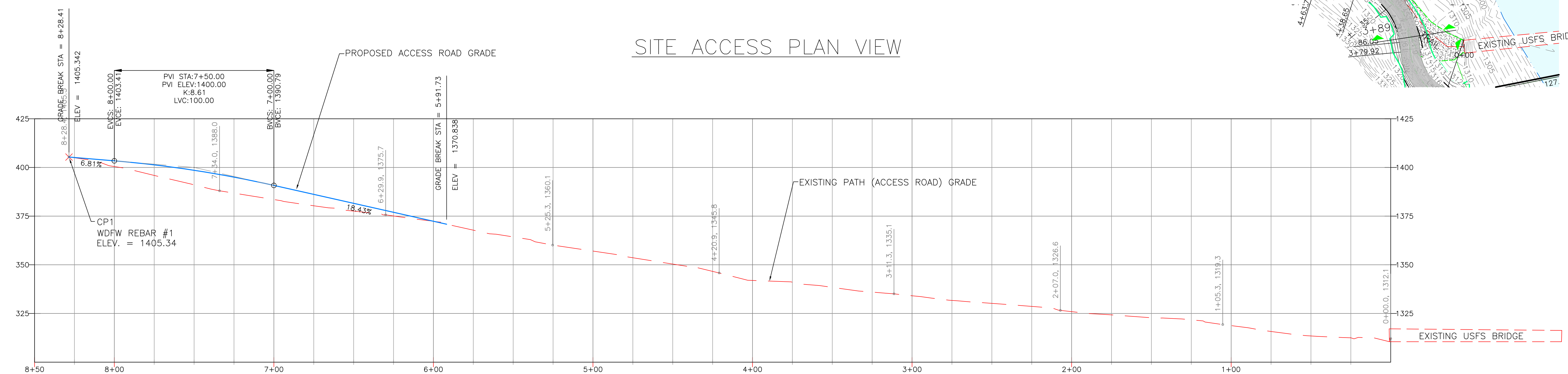
APPROVED FOR CONSTRUCTION

Donald C. Ponder, PE _____ Date _____
Environmental Engineering Section Manager
Restoration Division, Habitat Program, WDFW

PROJECT NO. 603097-18-2	
SHEET	OF
1	17



SITE ACCESS PLAN VIEW



SITE ACCESS PROFILE VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

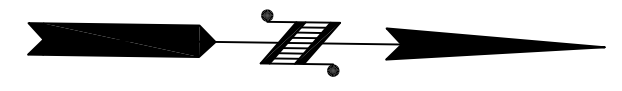
DESIGNED BY: S. STANLEY
CHECKED BY: D. PONDER
DRAWN BY: I. GODAT/K. CORWIN
DATE: 9-26-2018

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
SITE ACCESS PLAN & PROFILE

PROJECT NO.
603097-18-2

SHEET 2 OF 17



MATCH EXISTING GRADE

WDFW NAIL #7
ELEV. = 1312.52
(1542)

EXCAVATION LIMITS

EXISTING PATH

ICICLE CREEK
FLOW

EXISTING USFS BRIDGE

TO PARKING LOT

TRAIL

WDFW NAIL #8
ELEV. = 1314.94
(1580)

EXISTING CONTOUR
TYP.

EXCAVATION LIMITS

PROPOSED
12' WIDE GRAVEL
ACCESS ROAD

PROPERTY LINE

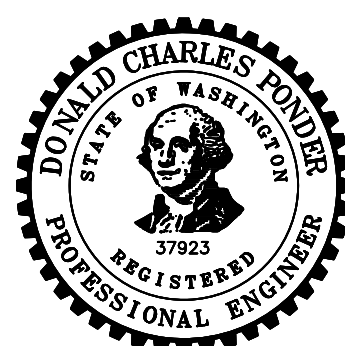
130.0' LONG BRIDGE

EXISTING BOULDER
TOP ~ 1315.0

EXISTING PATH
(ACCESS ROAD)

ICICLE CREEK BRIDGE CROSSING PLAN VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



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PROGRAM		DATE:	

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

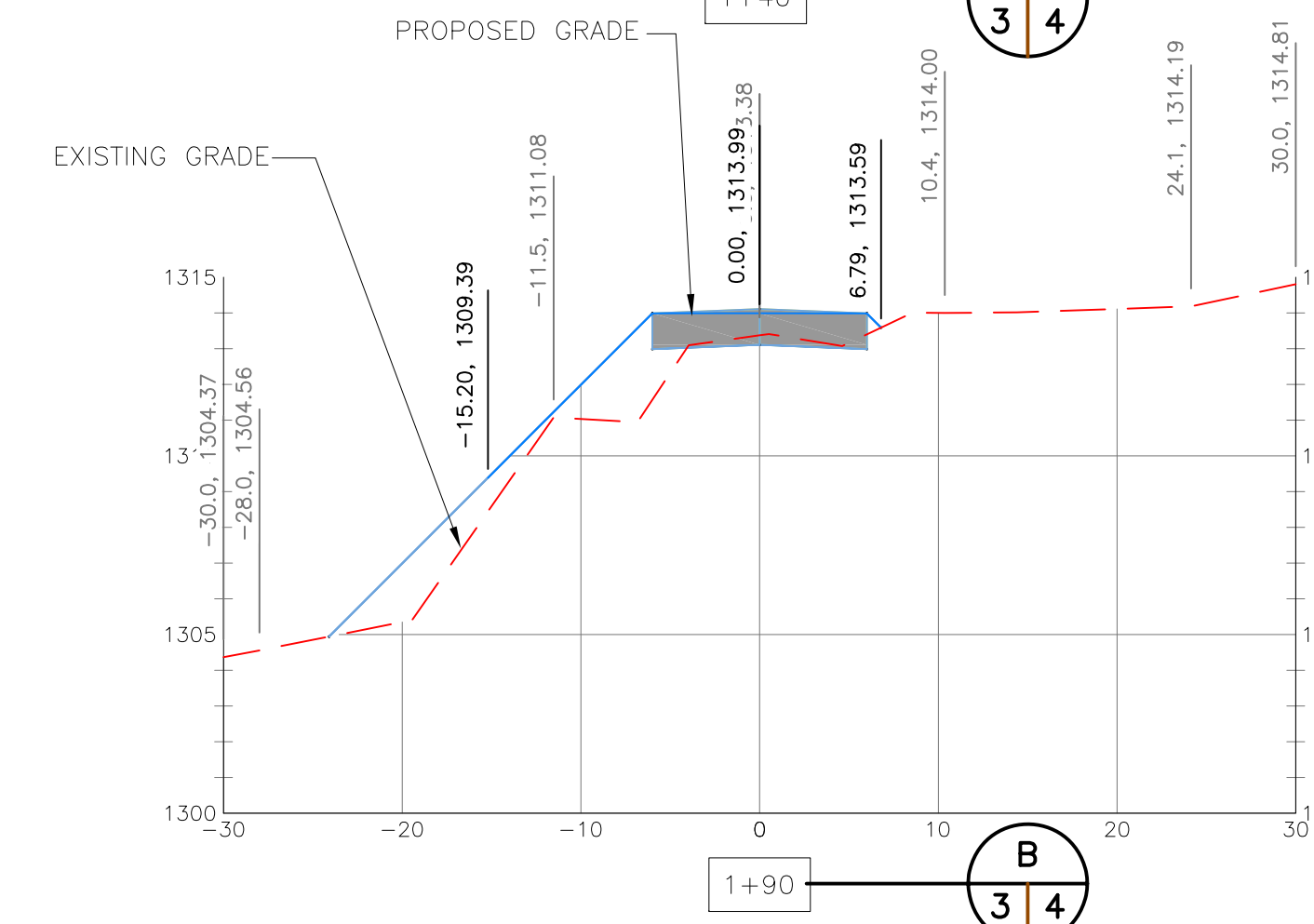
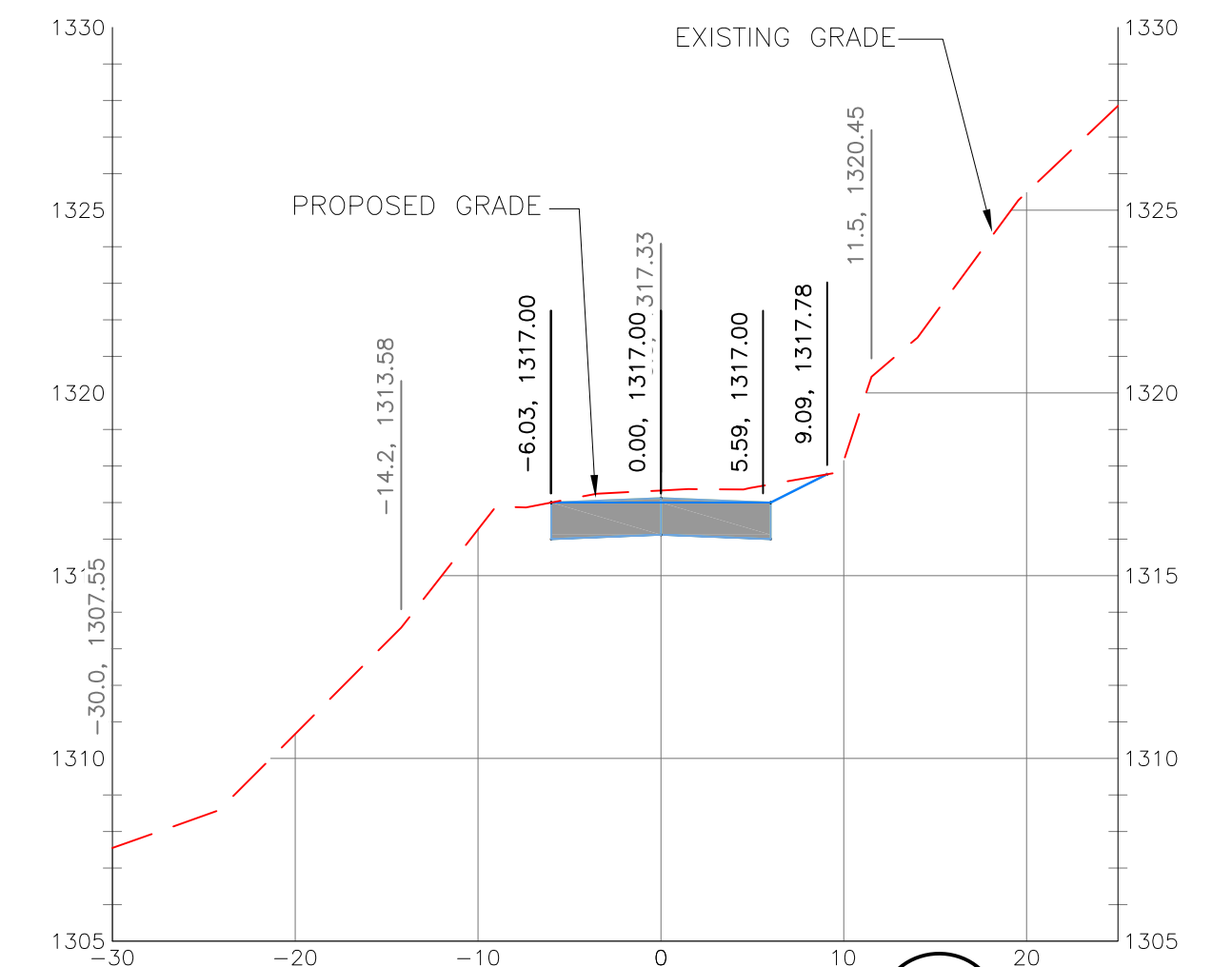
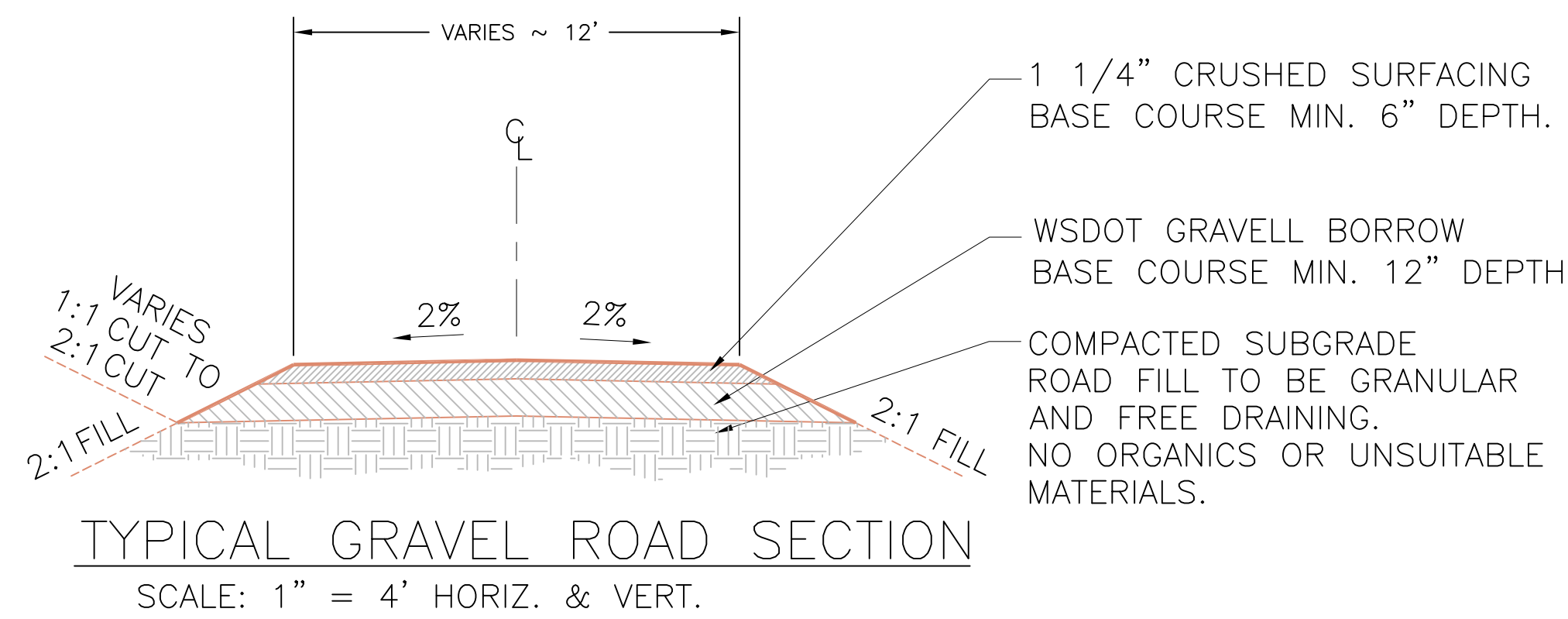
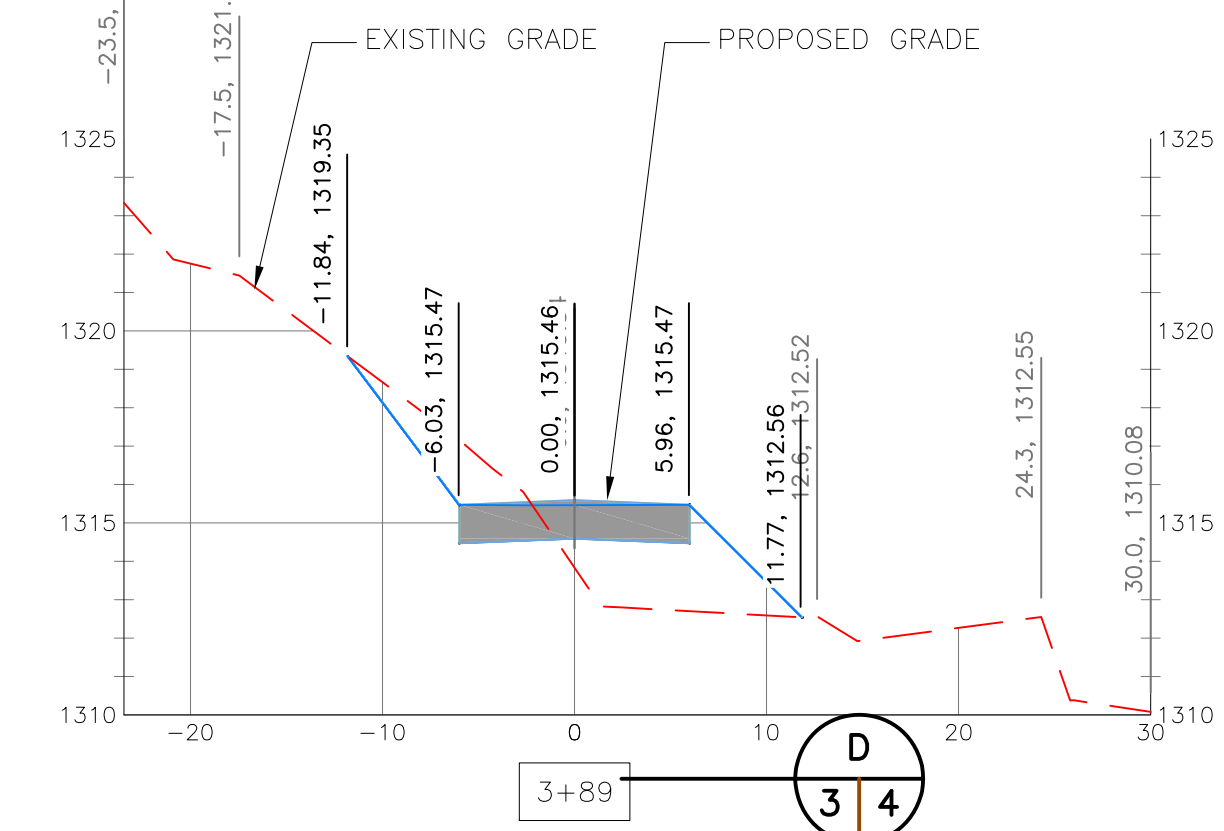
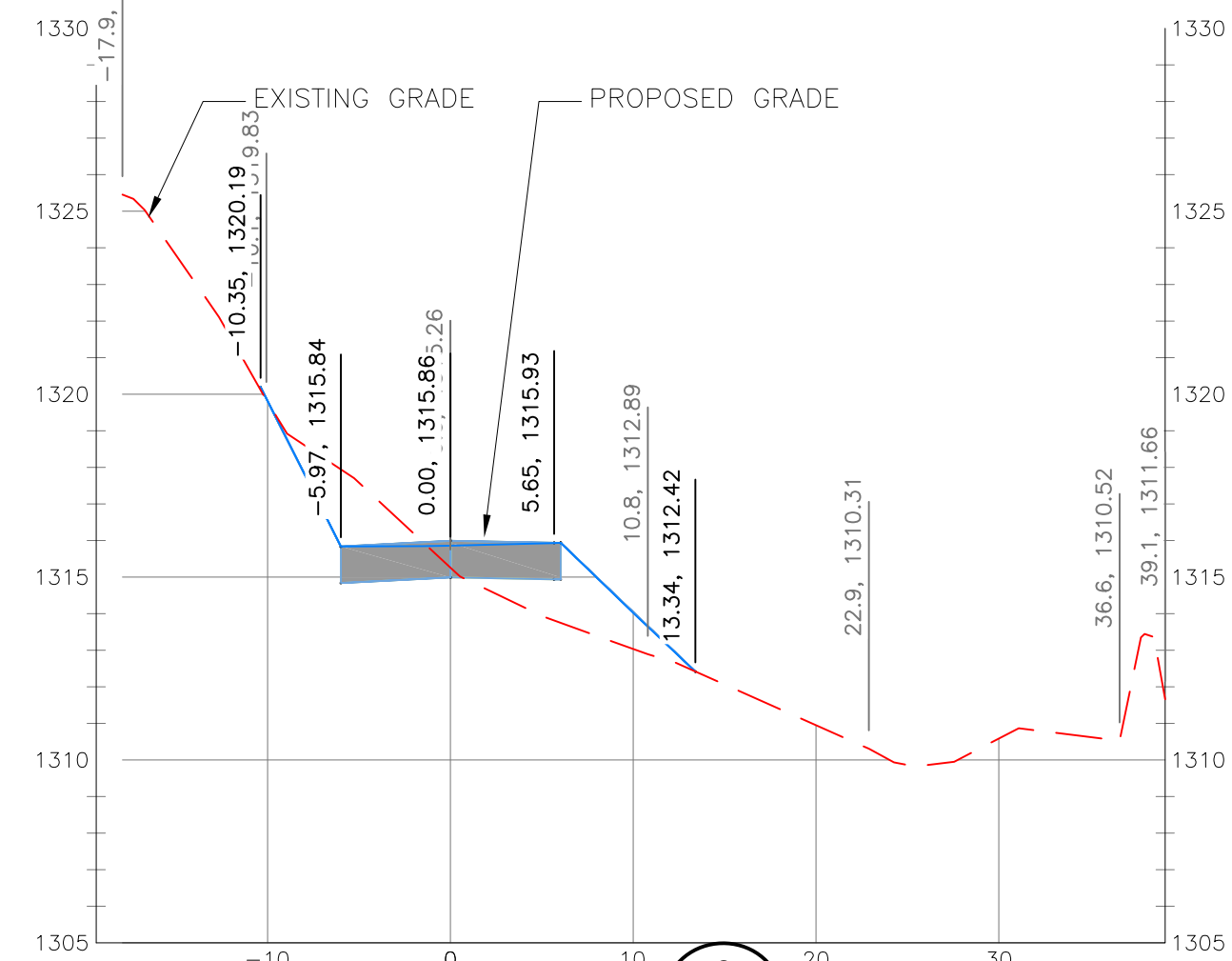
DESIGNED BY S. STANLEY
CHECKED BY D. PONDER
DRAWN BY T. GODAT/K. CORWIN
DATE 9-26-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
ICICLE CREEK BRIDGE CROSSING

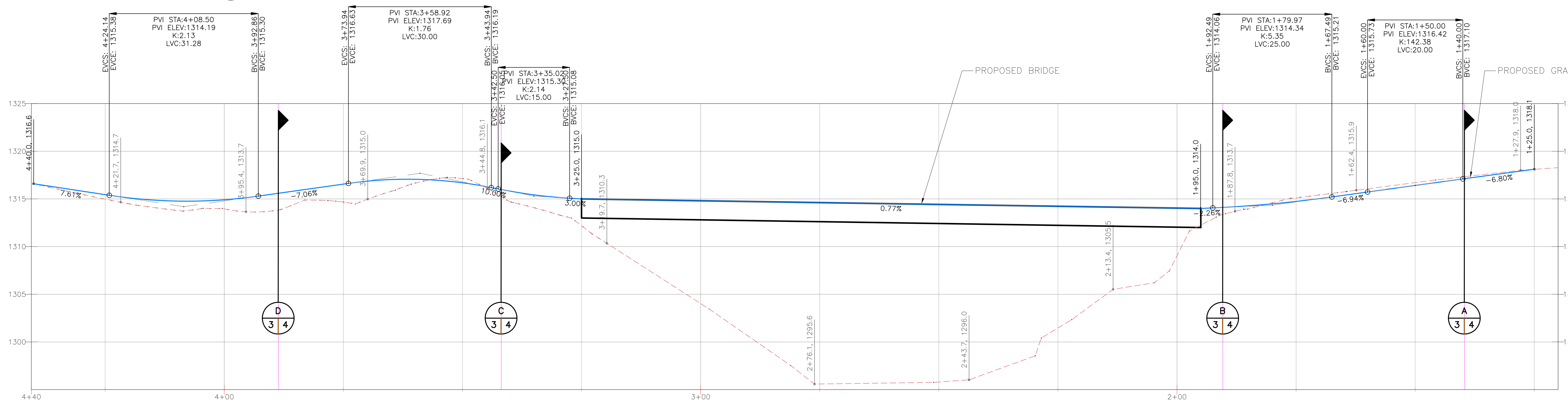
PROJECT NO.
603097-18-2

SHEET 3 OF 17

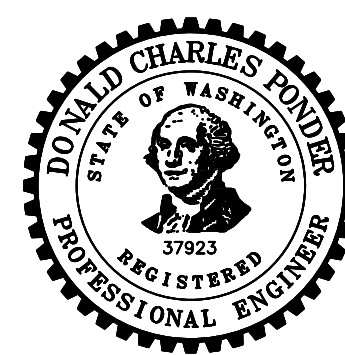
FILE NAME: S:\M\RESTORATION\ICICLE CREEK\ICICLE CREEK SCREEN\NEW 9/20/17\TEMP_SNOW_CREEK2.DWG
LAYOUT TAB: 3 ICICLE CREEK CROSSING
PLOT TIME: 9/25/2018 11:00:01 AM
USER NAME: DONAT, ANTHONY N (DPW)
PLOT PAGES: 17



ICICLE CREEK BRIDGE CROSSING PROFILE & SECTIONS



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

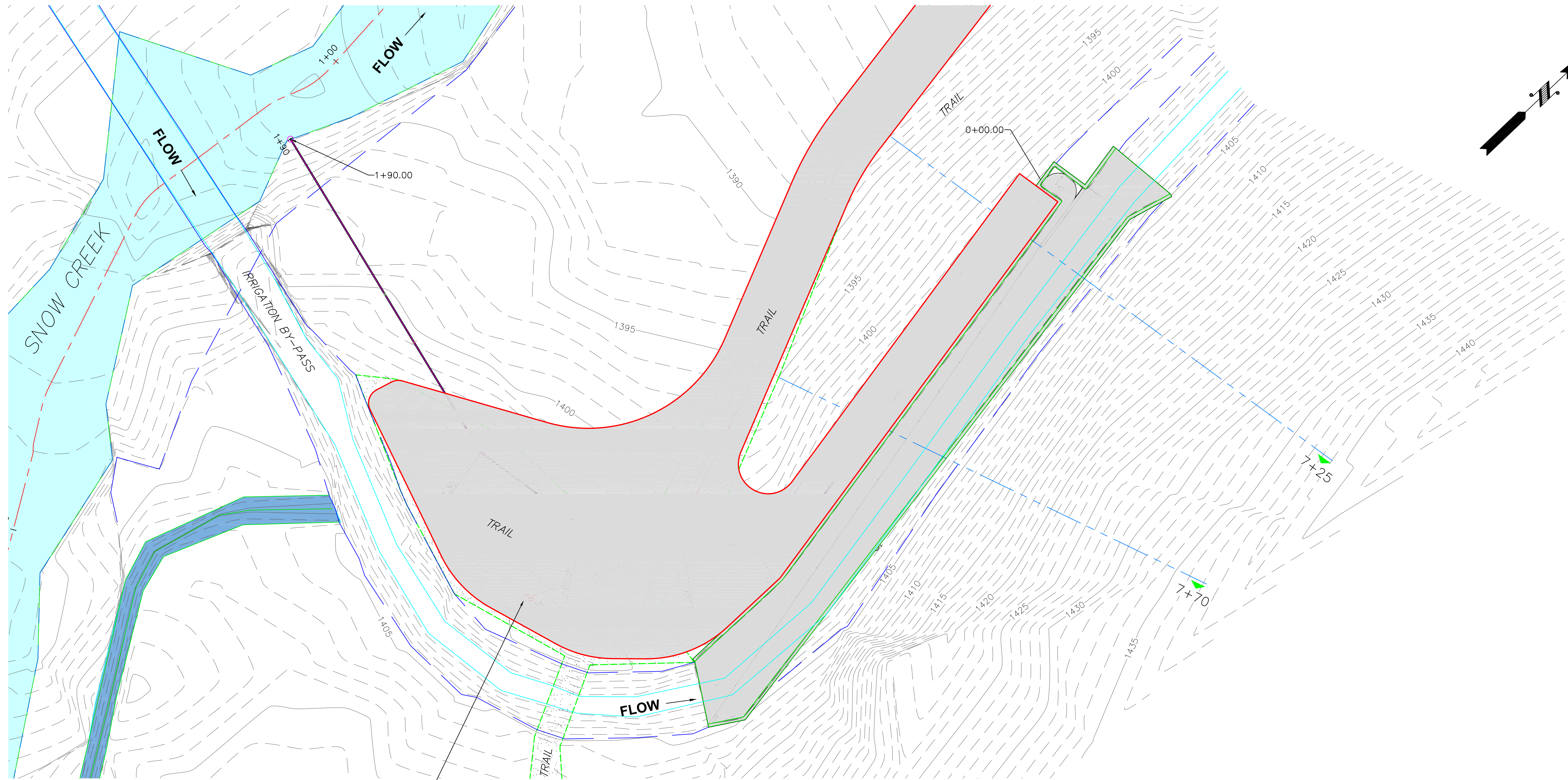


SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
DESIGNED BY	S. STANLEY	DATE:	
CHECKED BY	D. PONDER	DATE:	
DRAWN BY	T. GODAT/K. CORWIN	DATE:	9-26-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
ICICLE CREEK BRIDGE CROSSING PROFILE & SECTIONS

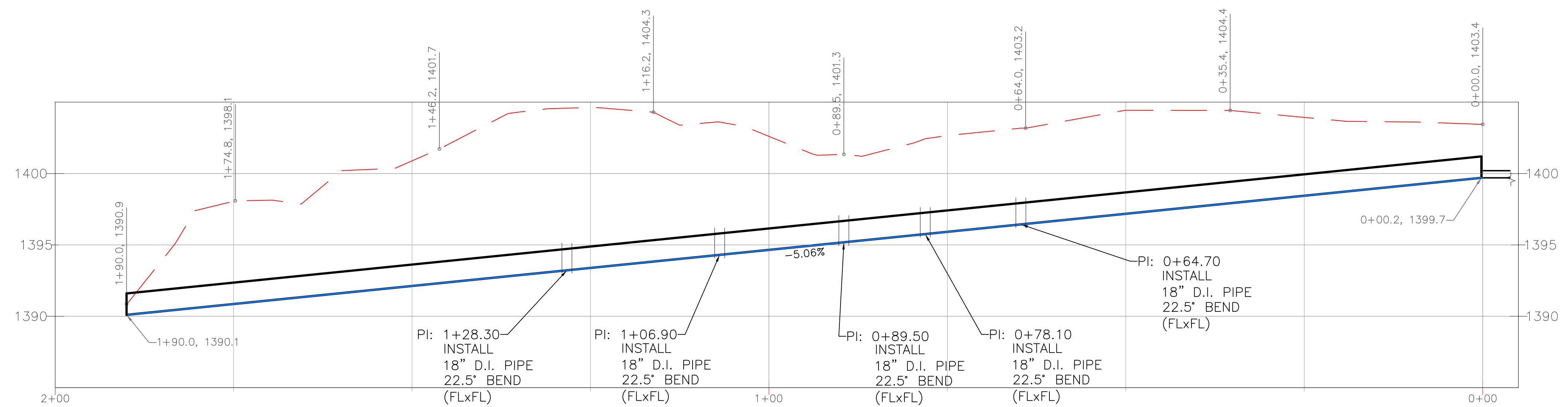
PROJECT NO.
603097-18-2
SHEET 4 OF 17

FILE NAME: S:\PROJECTS\2018\ICICLE CREEK BRIDGE\ICICLE CREEK BRIDGE\NEW 9192017\TEMP_SNOW_CREEK2.DWG
LAYOUT TAB: 4 PROFILE ICICLE CR CROSSING
PLOT TIME: 9/25/2018 11:00:01 AM
USER NAME: DONALD CHARLES PONDER
PLOT FILE: ICICLE_CREEK_BRIDGE.dwg



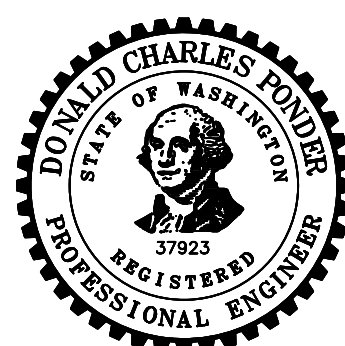
CP1
WDFW REBAR #1
ELEV. = 1405.34

BY-PASS PIPE PLAN VIEW



BY-PASS PIPE PROFILE VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
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CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

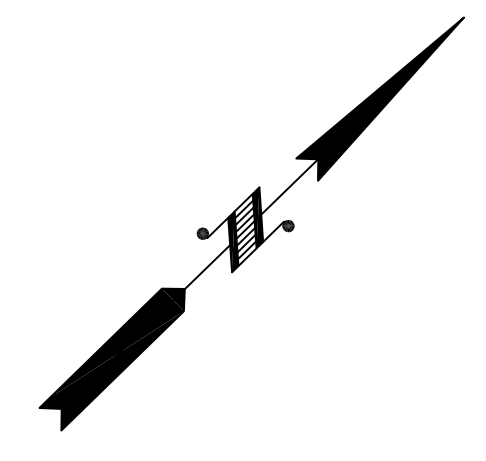
0 = 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY: S. STANLEY
CHECKED BY: D. PONDER
DRAWN BY: T. GODAT/K. CORWIN
DATE: 9-26-2018

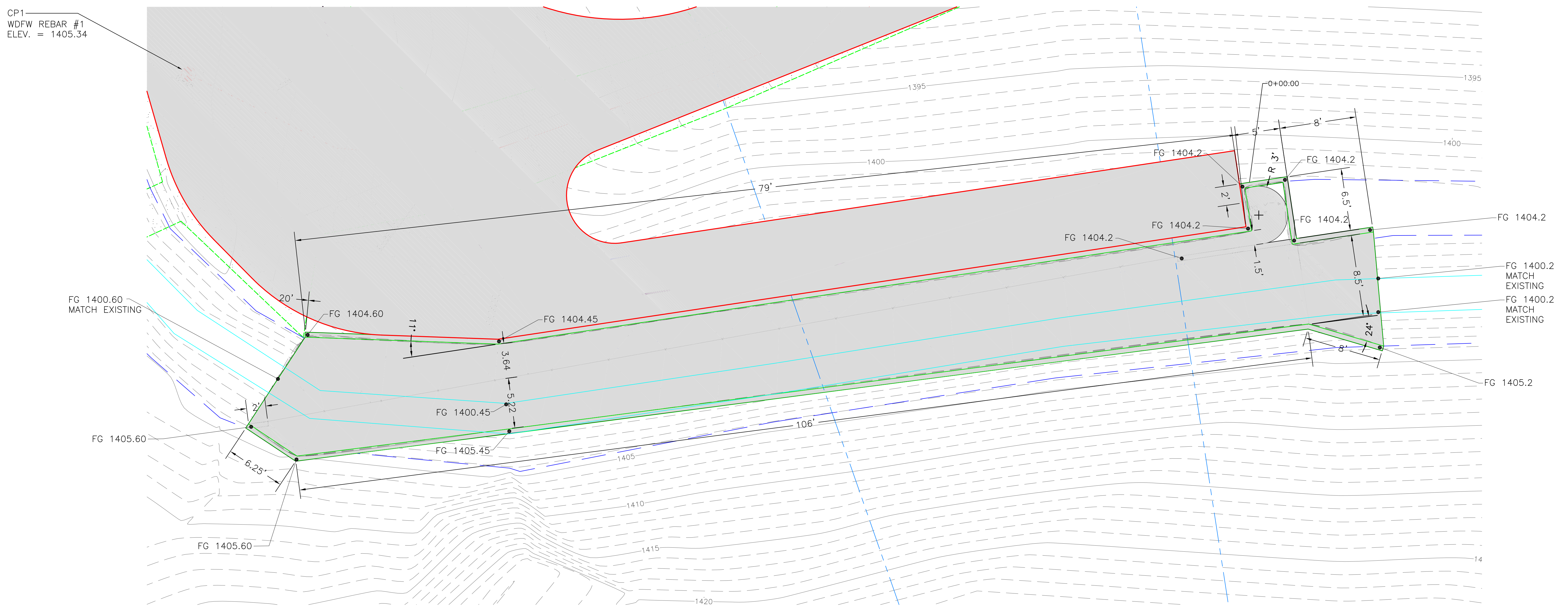
SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
BY-PASS PIPE PLAN & PROFILE

PROJECT NO.
603097-18-2

SHEET 5 OF 17



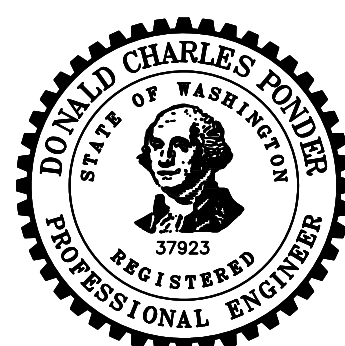
Scale: 1" = 5'



SCREEN PLAN VIEW



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
		CHIEF ENGINEER	DATE:
		PROGRAM	DATE:

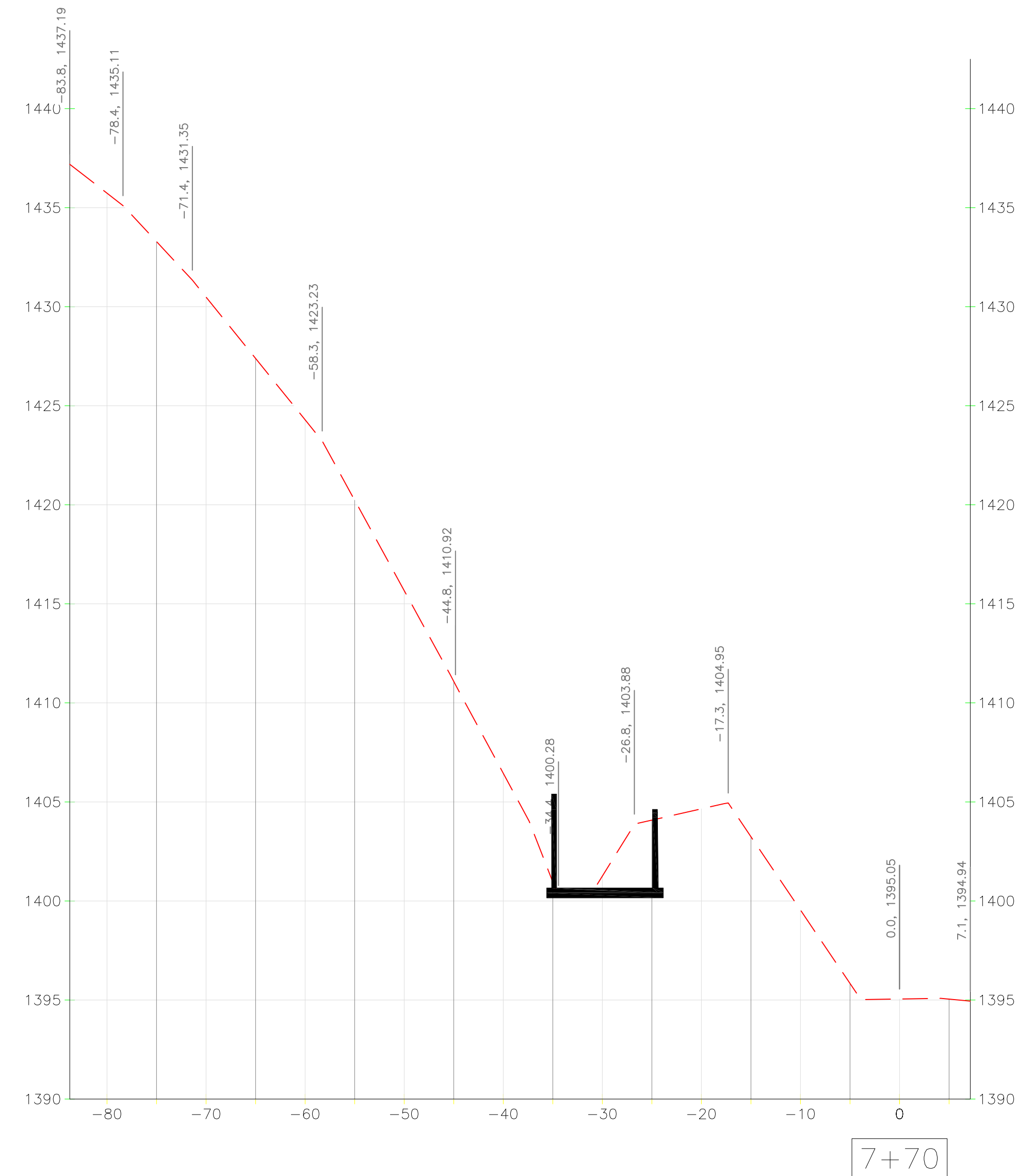
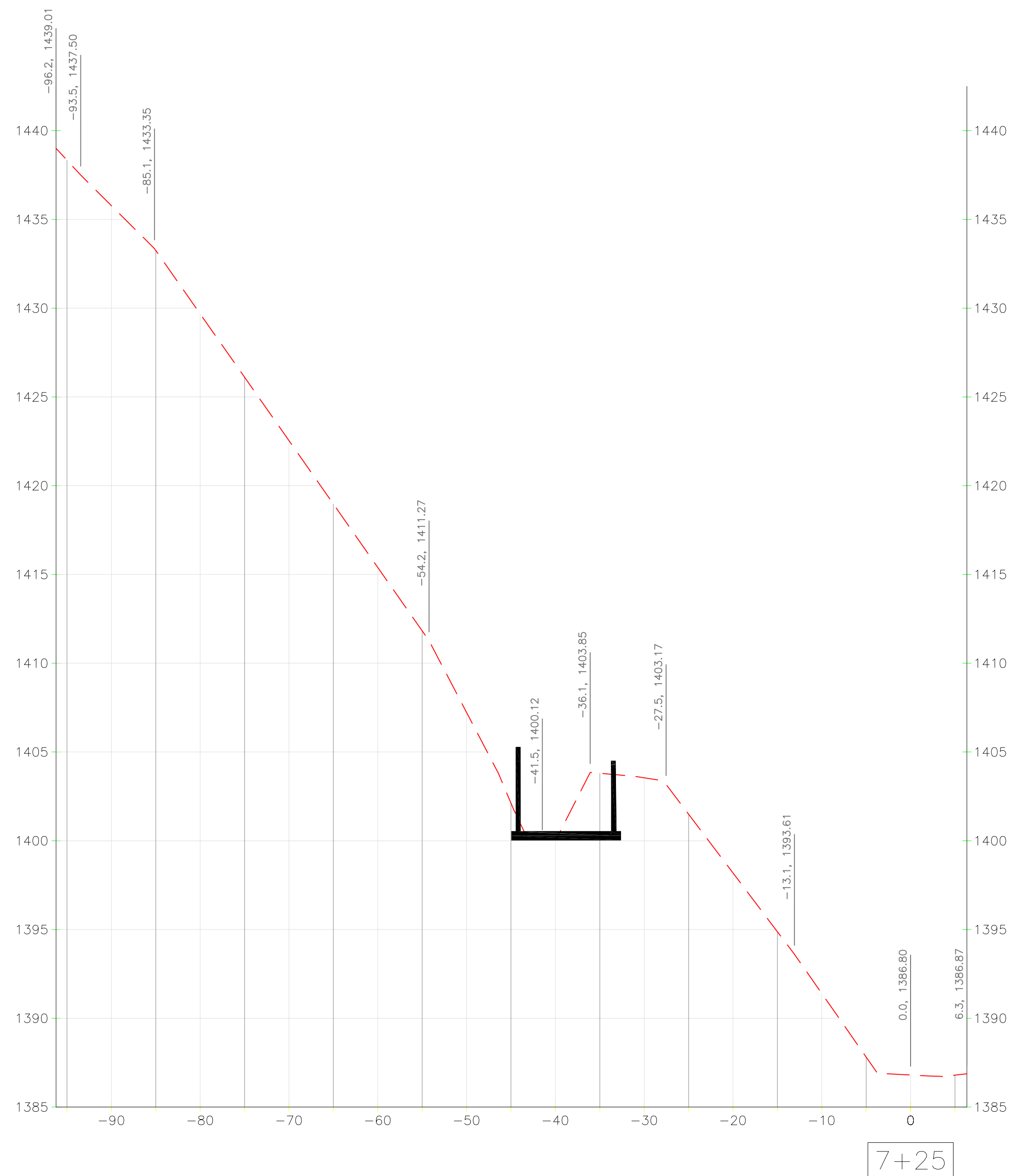
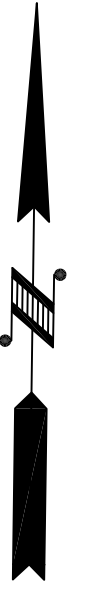
0 ——— 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY S. STANLEY
CHECKED BY D. PONDER
DRAWN BY T. GODAT/K. CORWIN
DATE 9-26-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
PROPOSED SCREEN PLAN VIEW

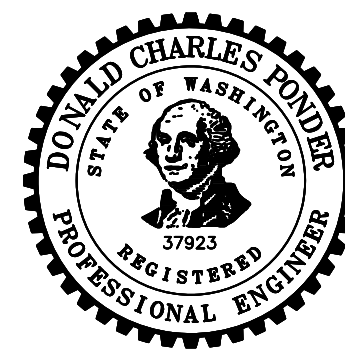
PROJECT NO.
603097-18-2

SHEET 6 OF 17



SCREEN CROSS-SECTIONS

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

0 — 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY S. STANLEY
CHECKED BY D. PONDER
DRAWN BY T. GODAT/K.CORWIN
DATE 9-26-2018

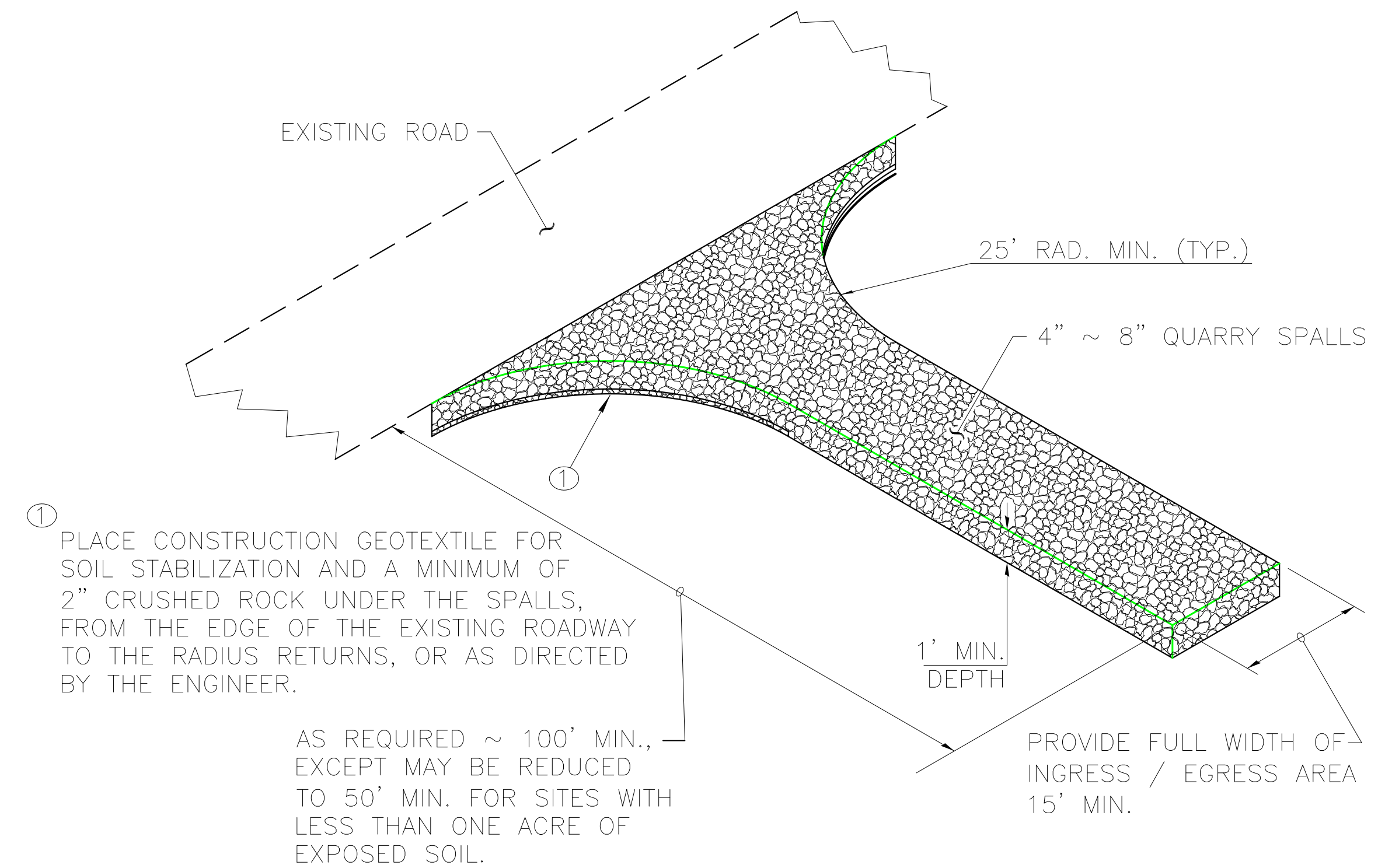
SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
PROPOSED SCREEN CROSS-SECTIONS

PROJECT NO.
603097-18-2

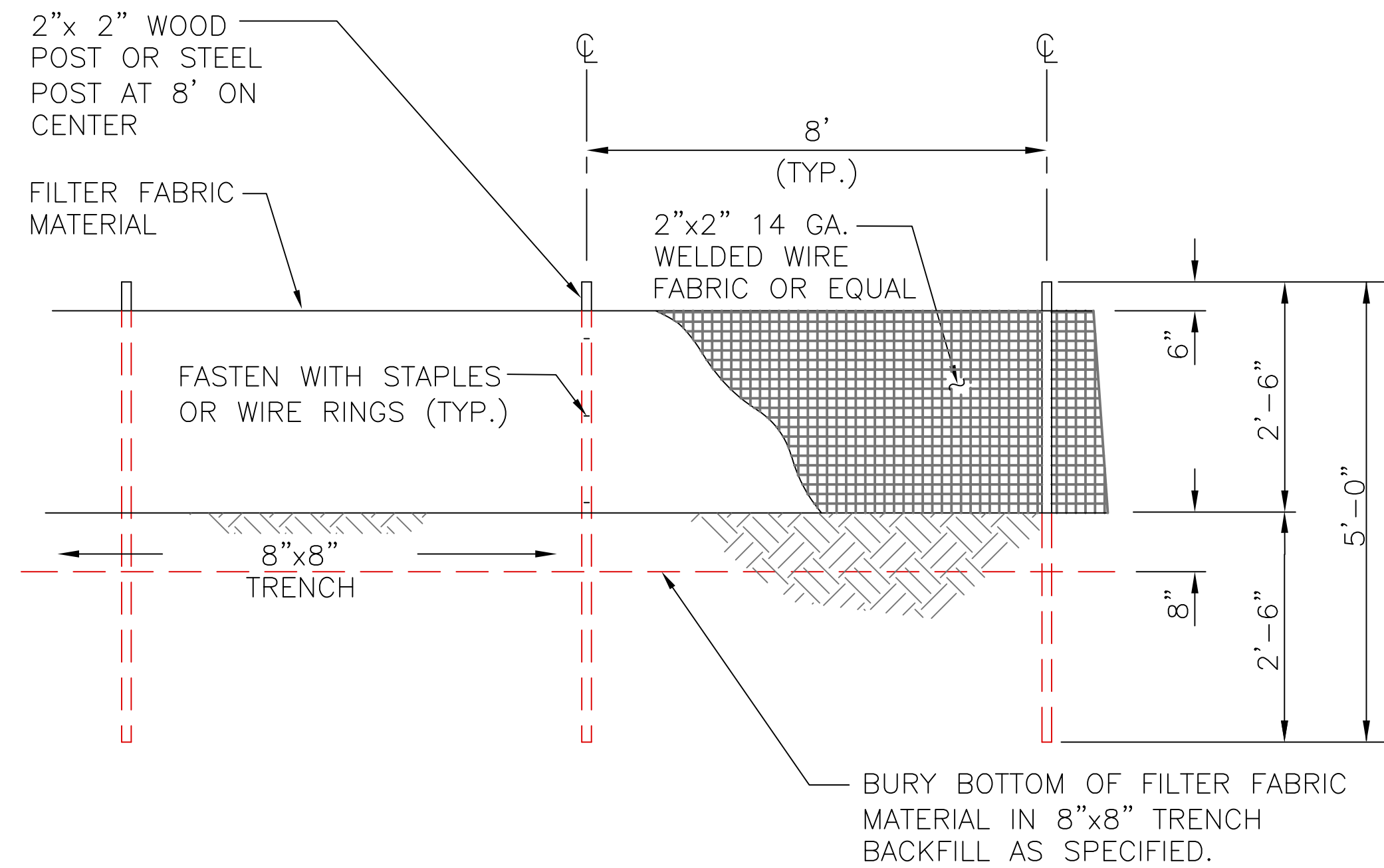
SHEET OF
7 17

SILT FENCE NOTES:

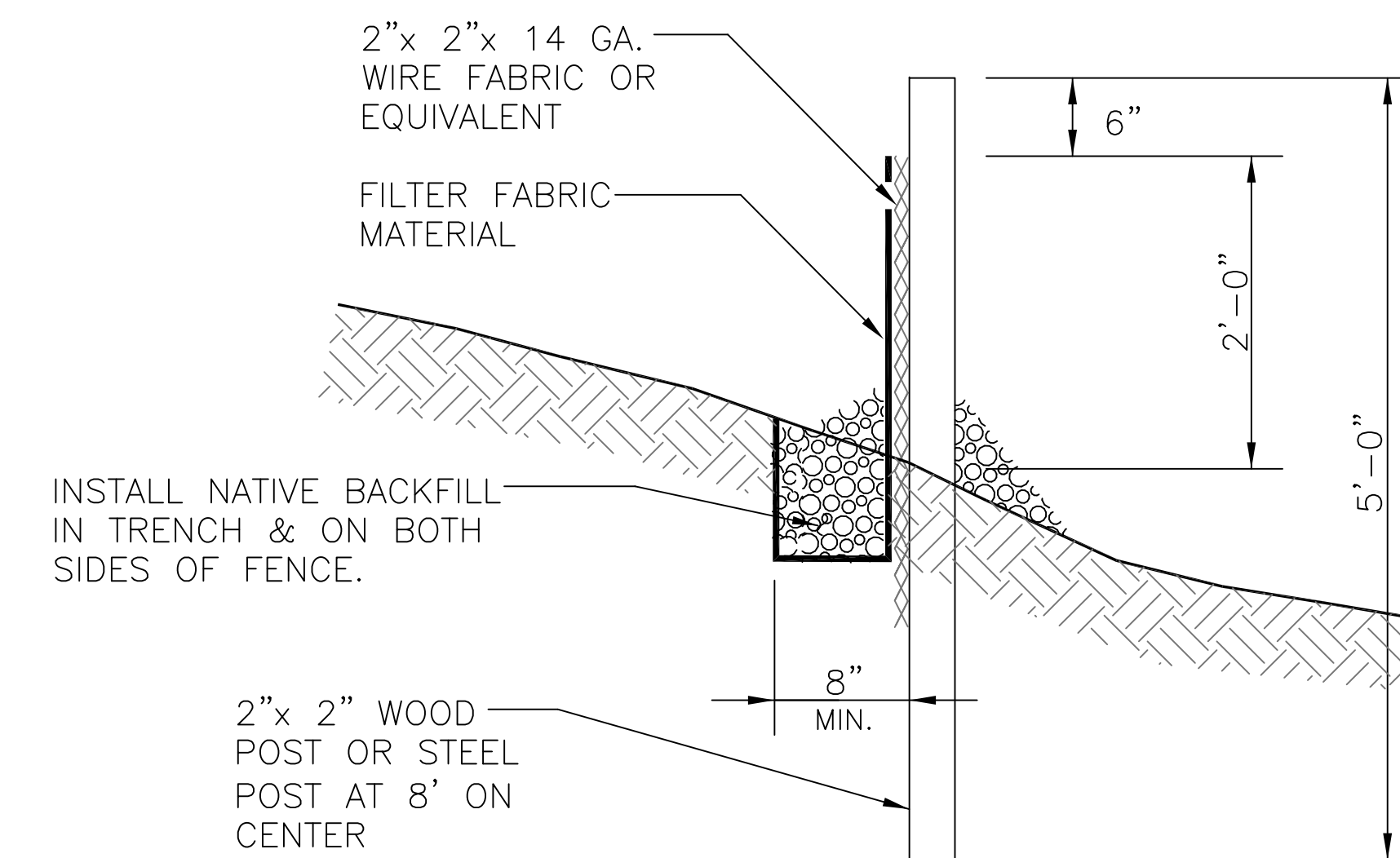
1. SITE ISOLATION (SILT FENCE, STRAW BALE BARRIER) IS ONLY REQUIRED IF LIVE WATER IS PRESENT. IF THE CHANNEL IS DRY, NO FENCING IS REQUIRED.
2. FILTER FABRIC SHALL BE PURCHASED CONTINUOUS ROLL CUT TO LENGTH AS NEEDED. IF JOINTS ARE NECESSARY FABRIC SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS WITH A MINIMUM OF (6) INCH OVERLAP. BOTH ENDS SHALL BE SECURED AS REQUIRED.
3. SILT FENCING SHALL BE INSTALLED TO FOLLOW CONTOURS. FENCE POSTS SHALL BE SPACED A MAXIMUM OF EIGHT (8) FEET APART UNLESS OTHERWISE SHOWN HEREIN. ALL POSTS SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 30 INCHES.
4. A TRENCH SHALL BE EXCAVATED, ROUGHLY EIGHT (8) INCHES WIDE BY EIGHT (8) INCHES DEEP UPSLOPE AND ADJACENT TO THE POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS UTILIZED, A WIRE SINGLE SPACE MESH SUPPORT FENCE SHALL BE FASTENED TO THE UPSLOPE SIDE OF THE POSTS USING ONE (1) INCH MINIMUM LENGTH WIRE STAPLES TIE WIRE OR APPROVED HOG RINGS. ALL WIRE SUPPORT SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR (4) INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE ORIGINAL GRADE.
6. ALL FILTER FABRIC SHALL BE STAPLED OR WIRED TO SUPPORT FENCING AND A MINIMUM OF 20 INCHES OF FABRIC SHALL BE EXTENDED INTO THE TRENCH. FILTER FABRIC SHALL NOT BE STAPLED OR FASTENED TO EXISTING TREES OF STRUCTURES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
7. IF HIGH STRENGTH FILTER FABRIC AND CLOSER SPACING ARE USED, THE WIRE SUPPORT FENCING MAY BE ELIMINATED. HIGH STRENGTH FABRIC SHALL BE STAPLED OR WIRED DIRECTLY TO POSTS AS REQUIRED BY THE ENGINEER.
8. TRENCH SHALL BE BACKFILLED WITH 3/4 INCH MINIMUM DIAMETER WASHED GRAVEL OR OTHER SIMILAR SOURCE AS APPROVED BY THE ENGINEER.
9. SILT FENCING SHALL BE INSTALLED WHERE SHOWN ON THE PLAN, OR AS MARKED IN THE FIELD BY THE ENGINEER, PRIOR TO COMMENCEMENT OF WORK. ALL FENCING SHALL BE INSPECTED DAILY DURING CONSTRUCTION AND AFTER EACH SIGNIFICANT RAINFALL EVENT UNTIL SITE HAS BEEN PERMANENTLY STABILIZED. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
10. REMOVAL OF TRAPPED SEDIMENT SHALL BE PERFORMED WHEN AMOUNTS REACH APPROXIMATELY 1/3 HEIGHT OF THE FENCE ABOVE GROUND.
11. SILT FENCING SHALL REMAIN IN-PLACE UNTIL SITE HAS BEEN REVEGETATED TO ORIGINAL CONDITION OR DIRECTED BY THE ENGINEER.



STABILIZED CONSTRUCTION ENTRANCE
SCALE: N.T.S.



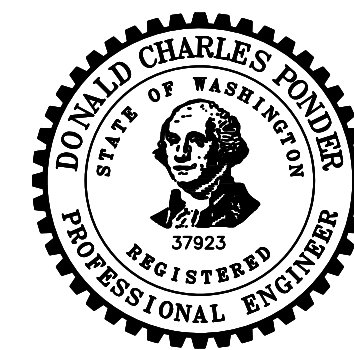
TYPICAL SILT FENCE DETAIL
SCALE: N.T.S.



TYPICAL SILT FENCE SECTION VIEW
SCALE: N.T.S.



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

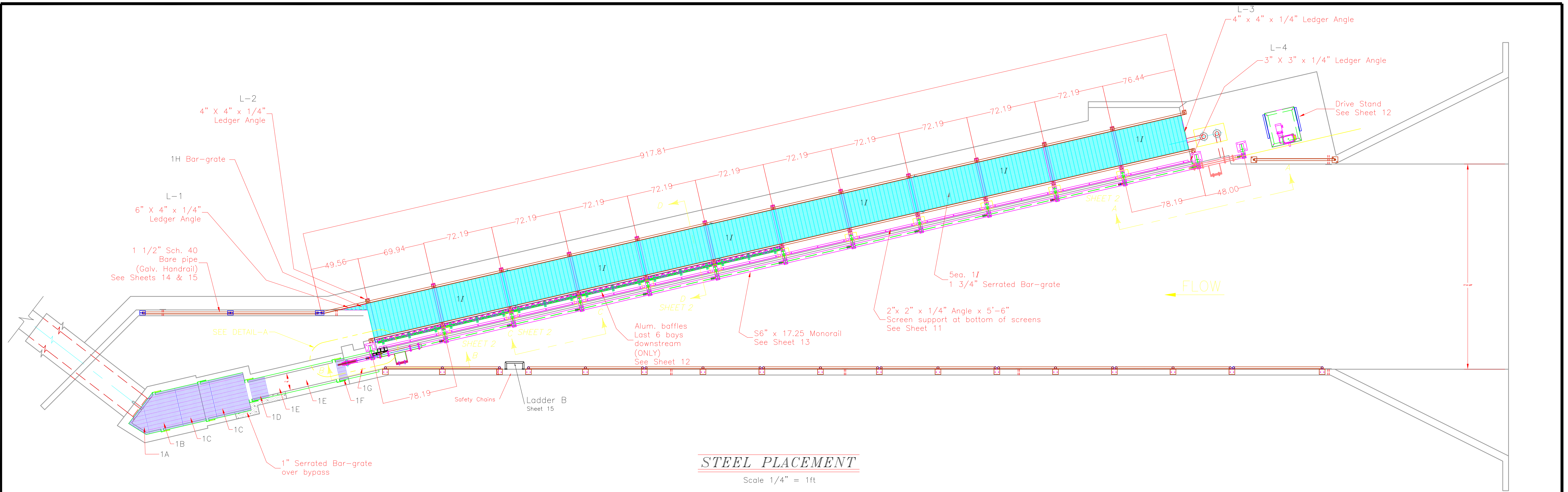


SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

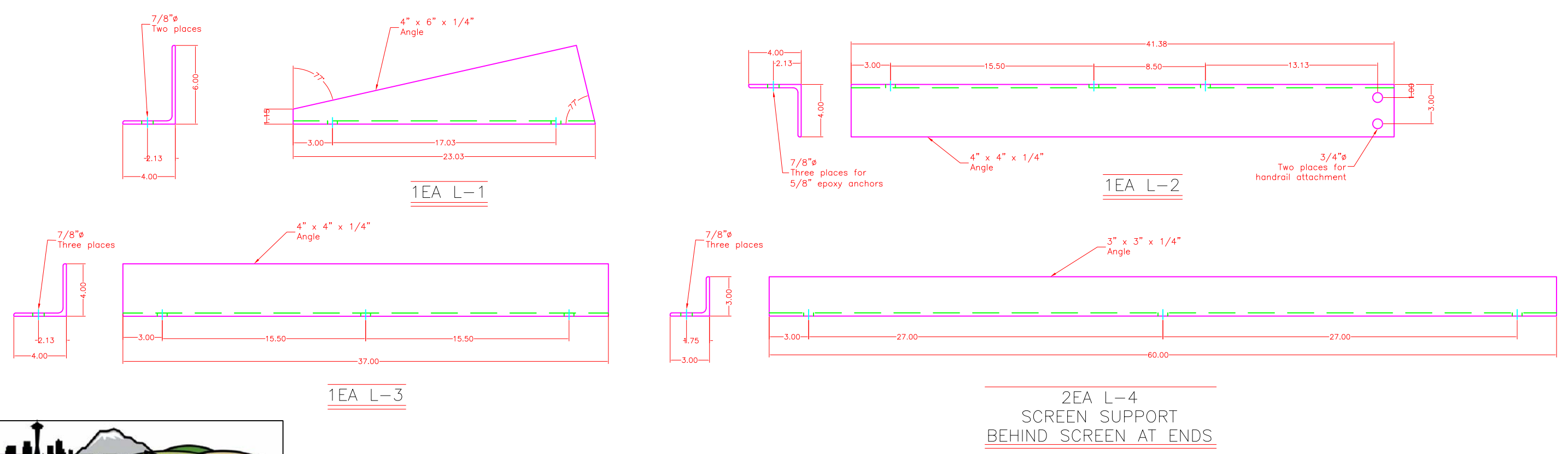
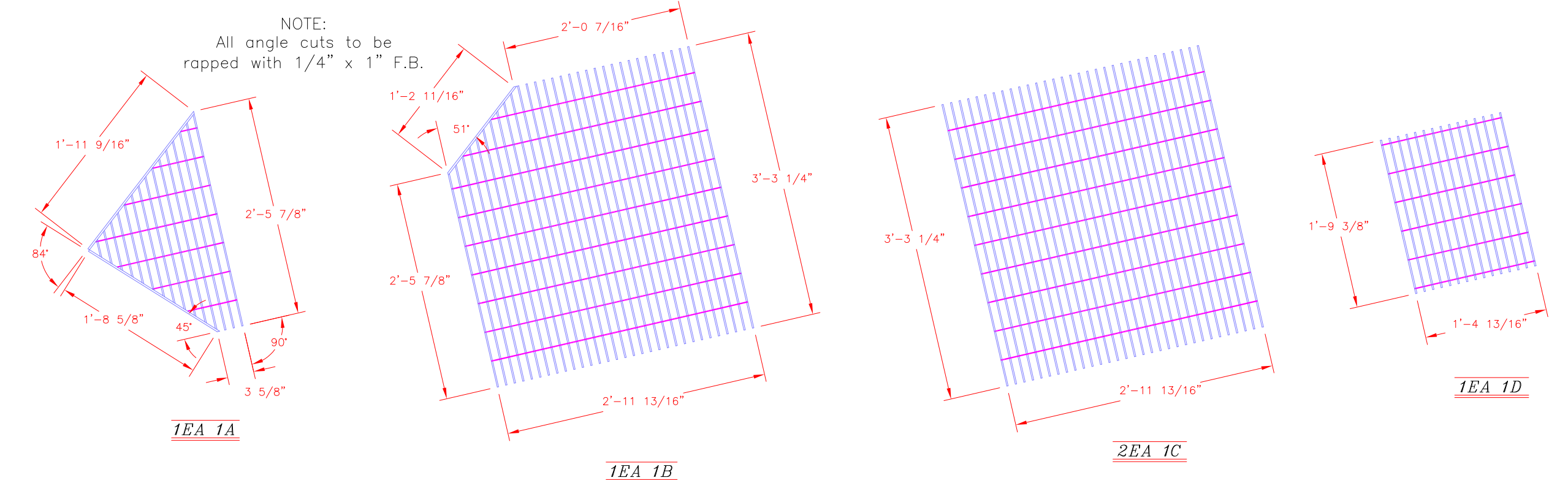
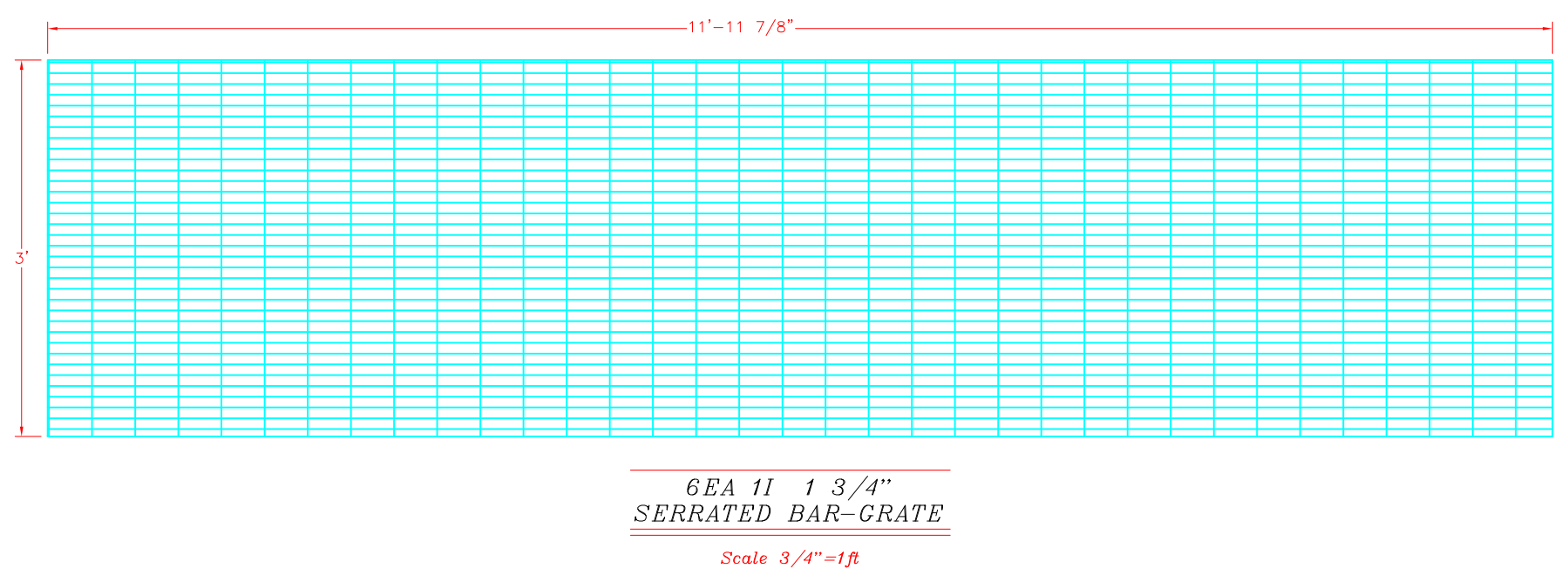
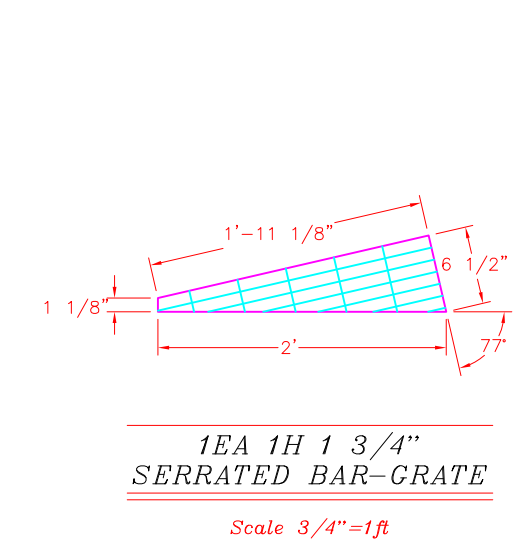
DESIGNED BY	S. STANLEY
CHECKED BY	D. PONDER
DRAWN BY	T. GODAT/K. CORWIN
DATE	9-26-2018

SNOW CREEK	
SCREEN REMOVAL AND RELOCATION PROJECT	
EROSION SILTATION CONTROL NOTES & DETAILS	

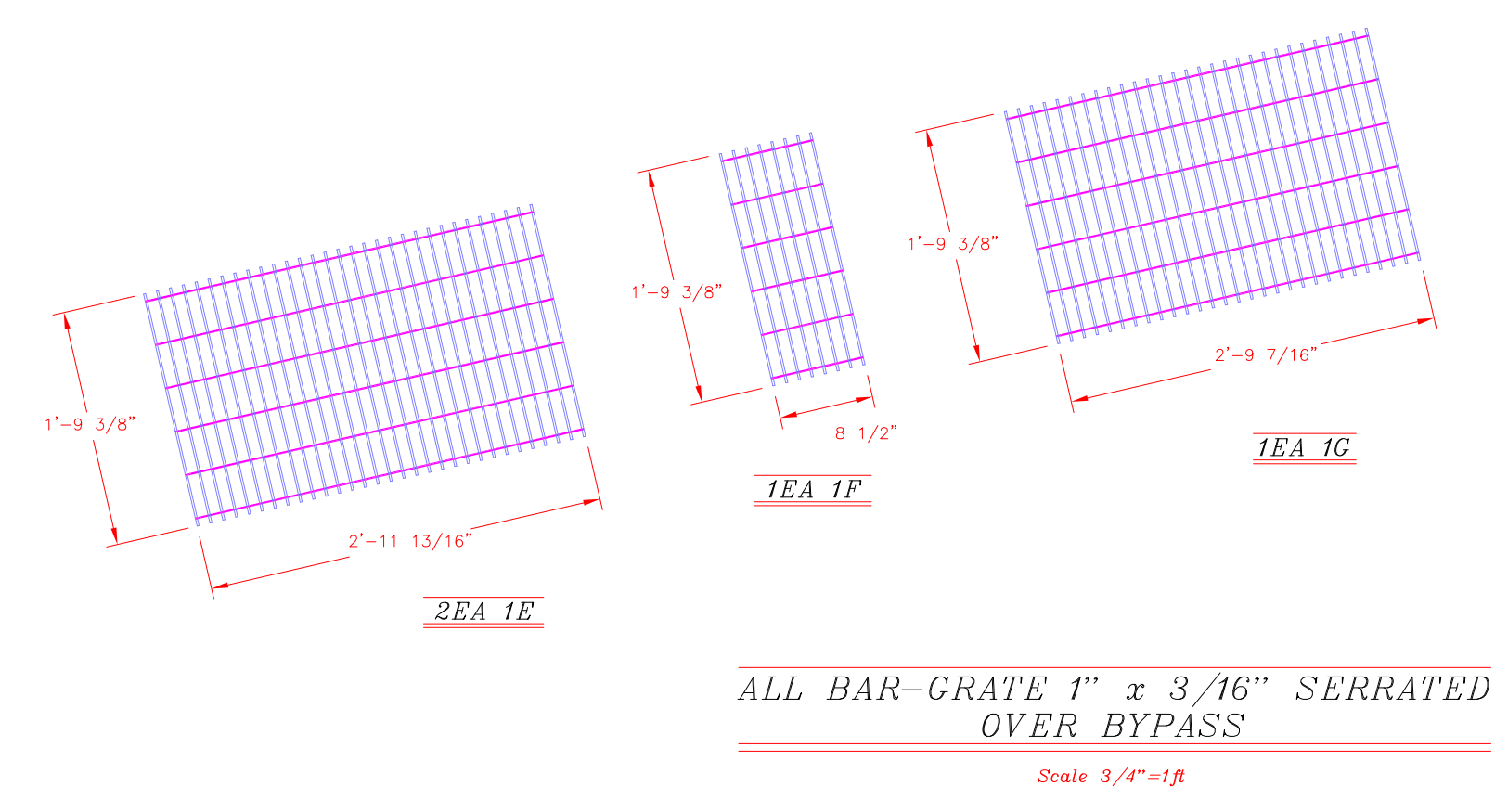
PROJECT NO. 603097-18-2	
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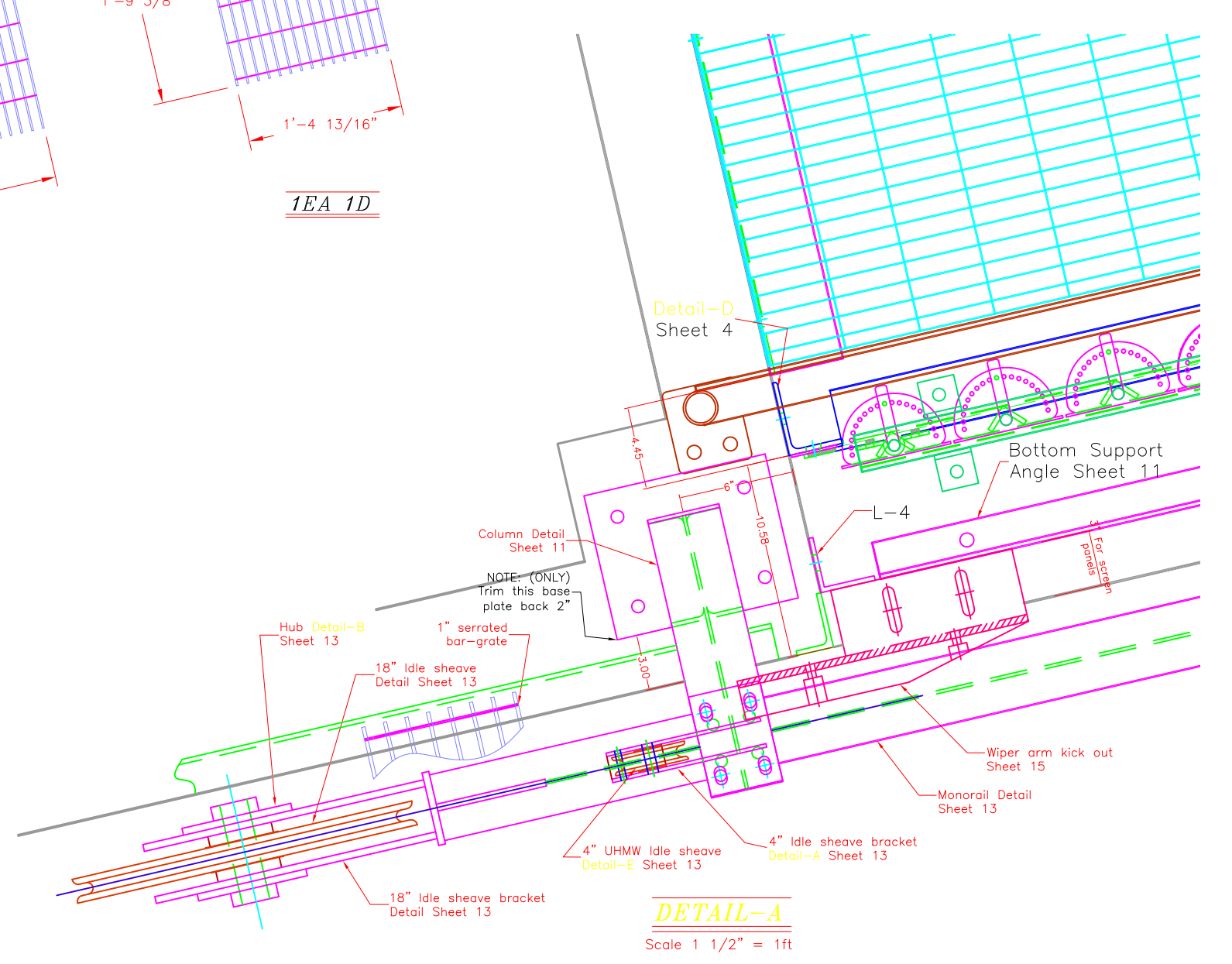
STEEL PLACEMENT
Scale 1/4" = 1ft



LEDGER ANGLE DETAIL
Scale 1 1/2" = 1ft



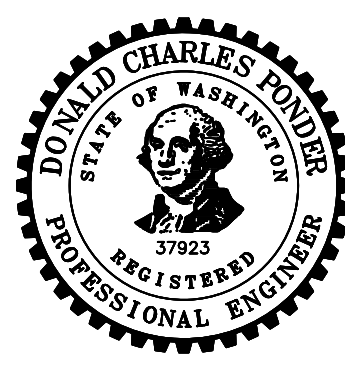
ALL BAR-GRATE 1\"/>



DETAIL-A
Scale 1 1/2" = 1ft



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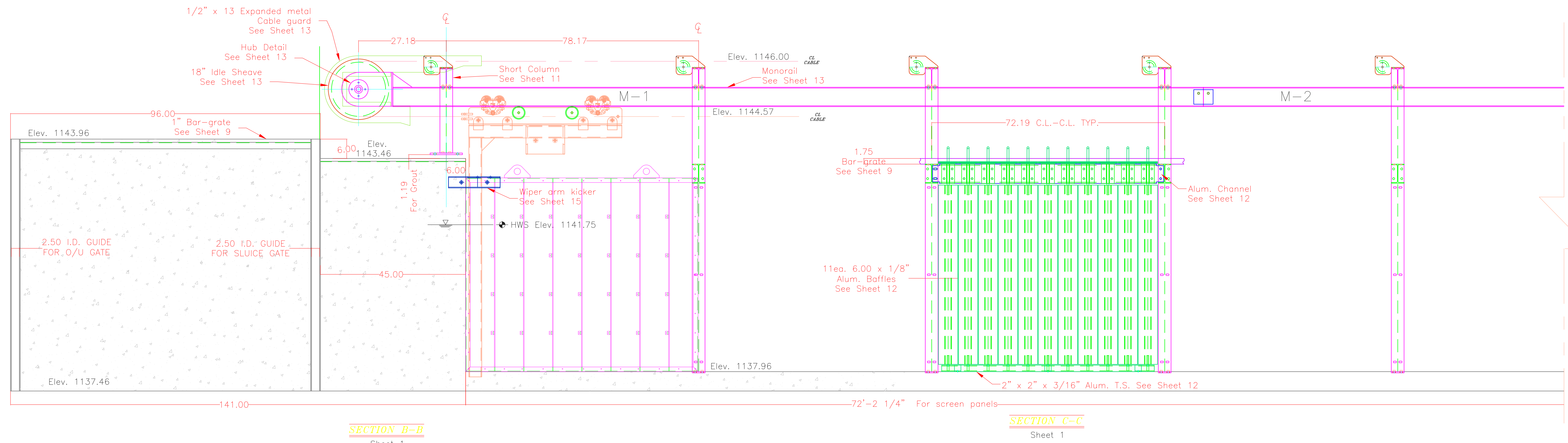


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CHECKED BY	D. PONDER
DRAWN BY	T. GODAT/K. CORWIN
DATE	9-26-2018

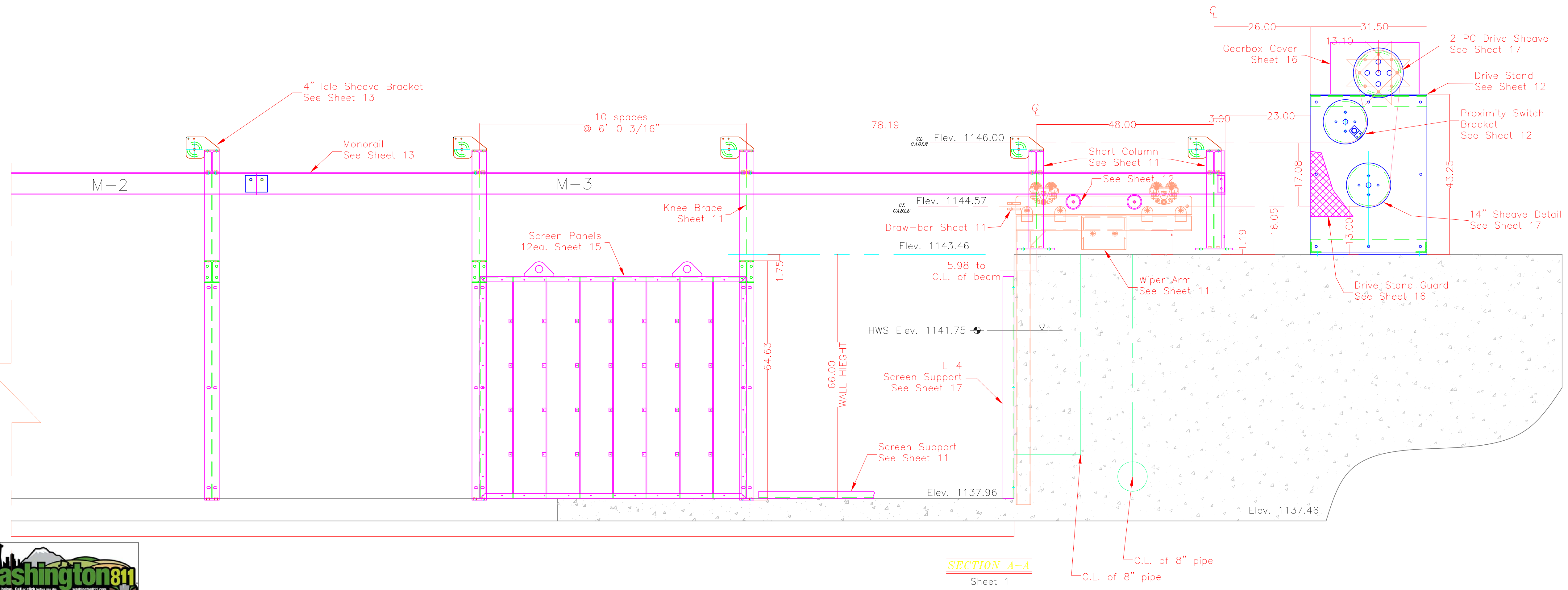
SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
SCREEN NOTES & DETAILS

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OF	17



SECTION B-B
Sheet 1

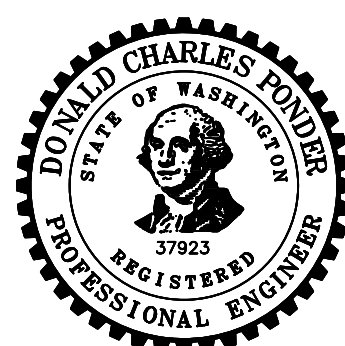
SECTION C-C
Sheet 1



SECTION A-A
Sheet 1



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SYM	DATE	REVISION DESCRIPTION	BY
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CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

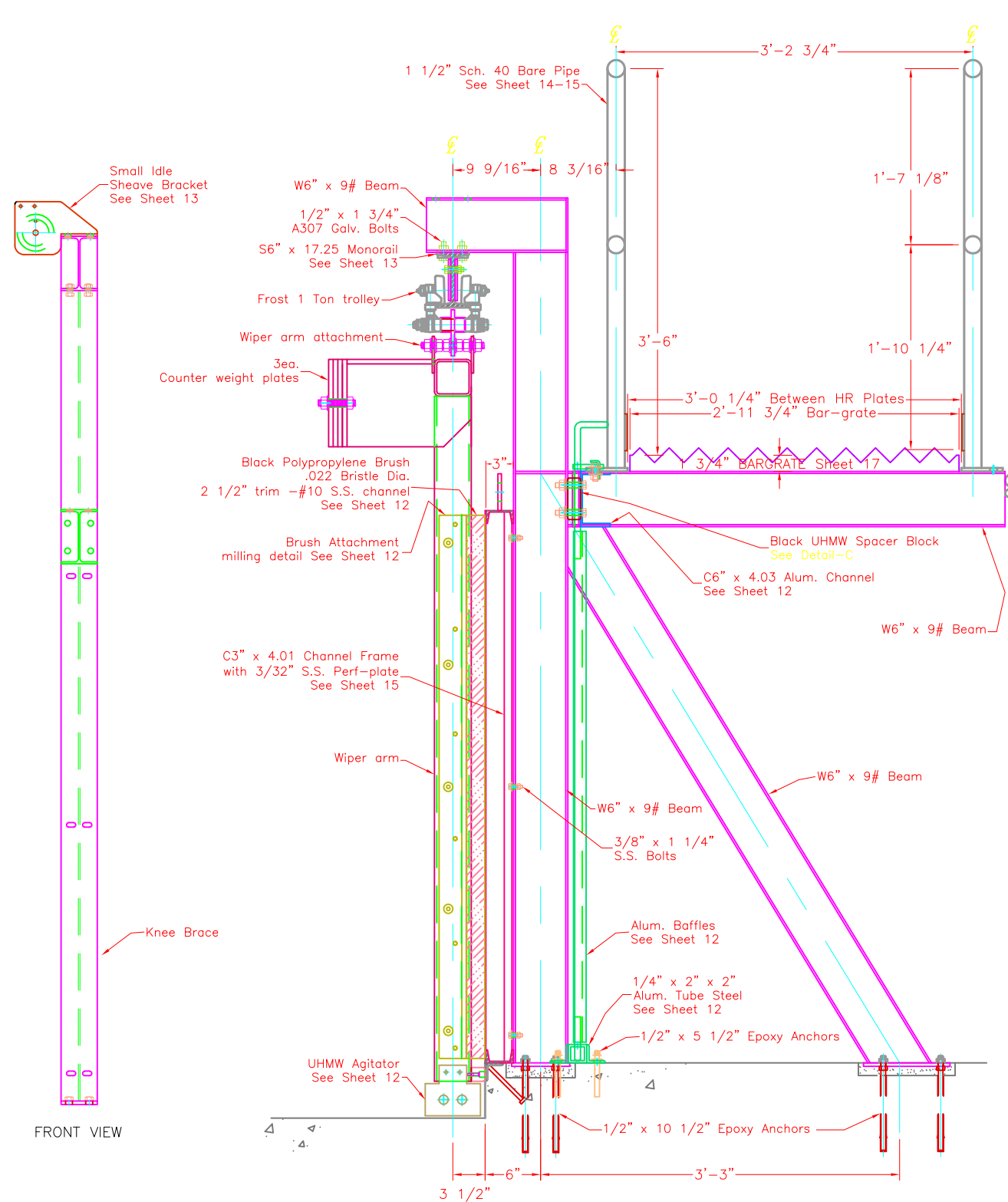
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BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY: S. STANLEY
CHECKED BY: D. PONDER
DRAWN BY: T. GODAT/K. CORWIN
DATE: 9-26-2018

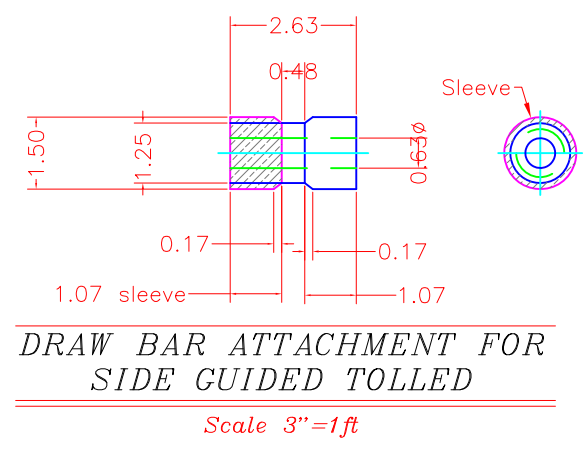
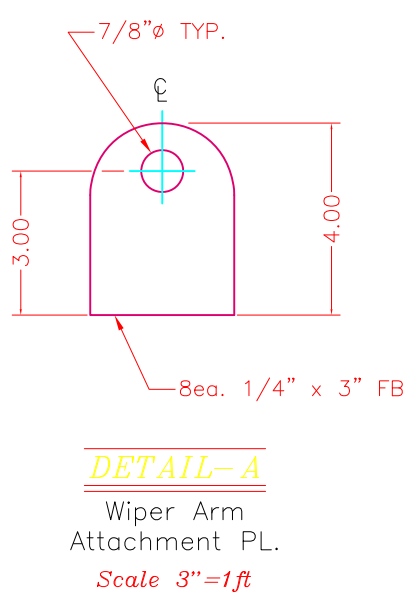
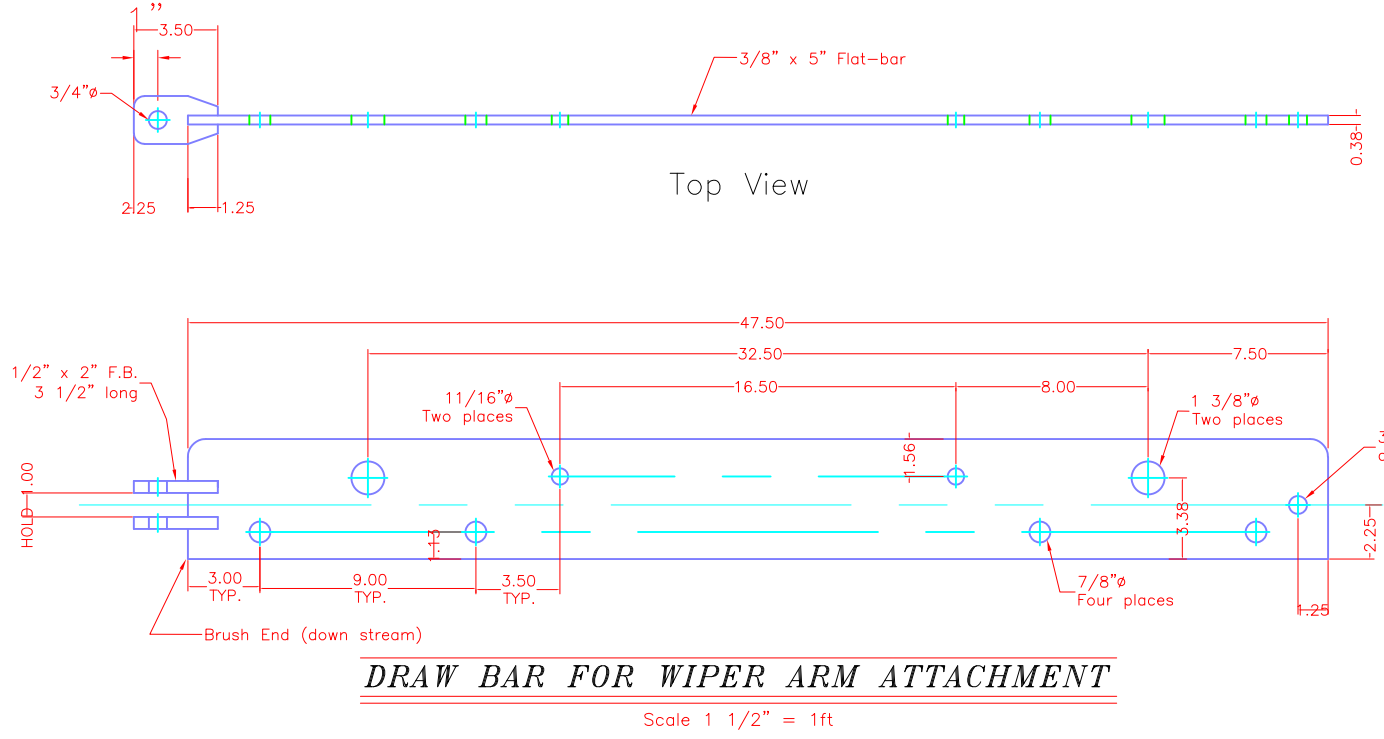
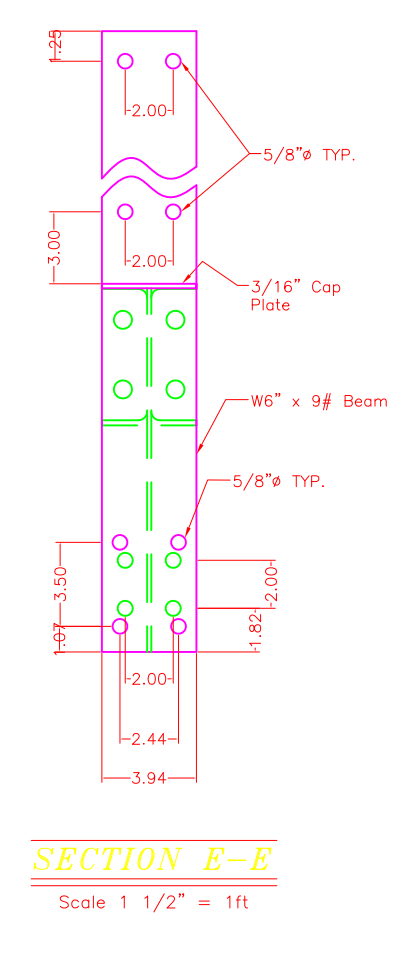
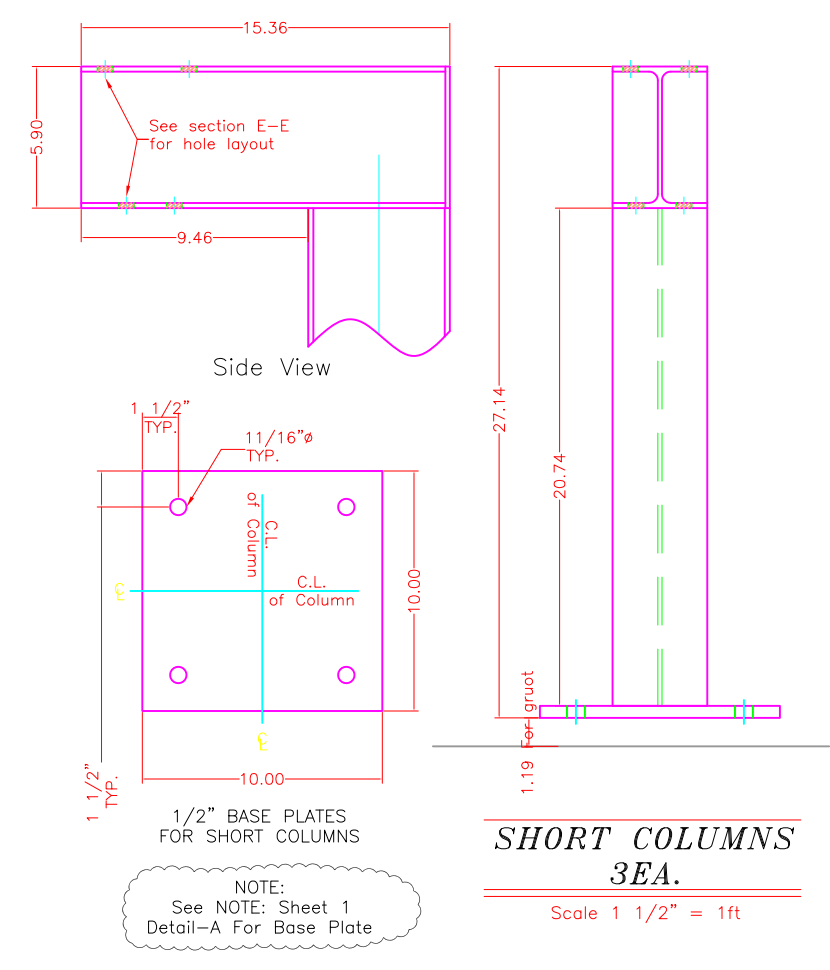
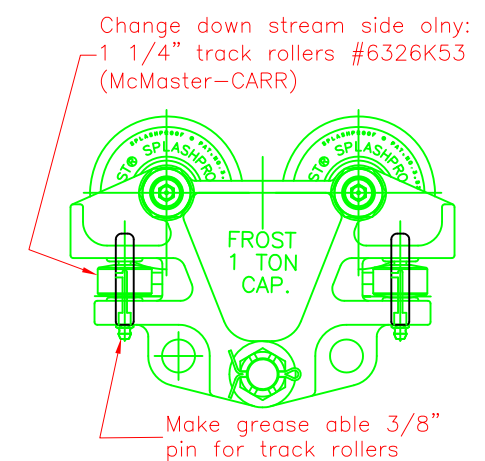
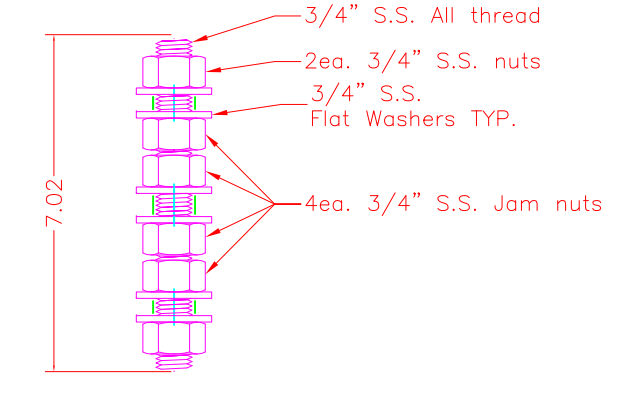
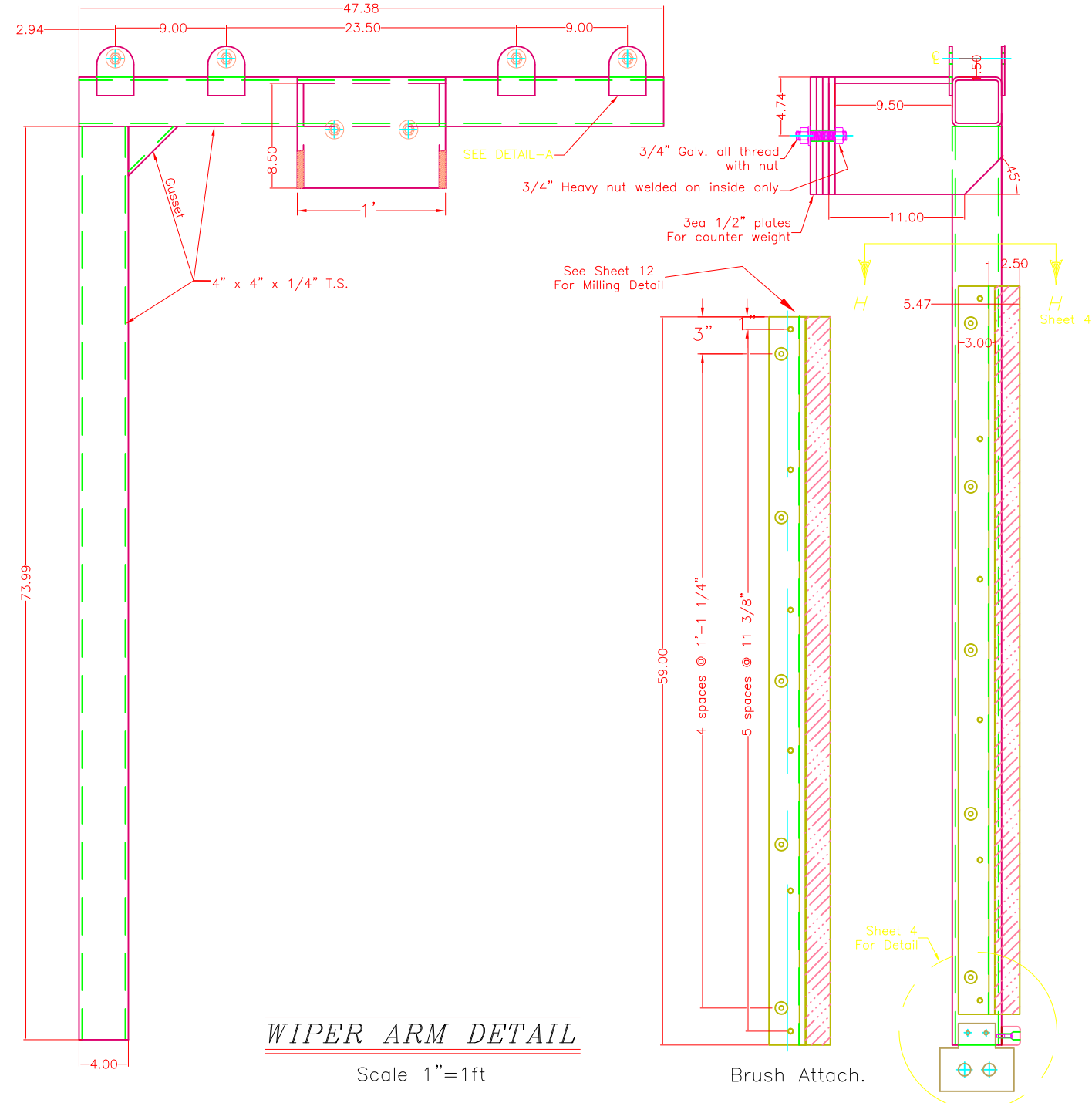
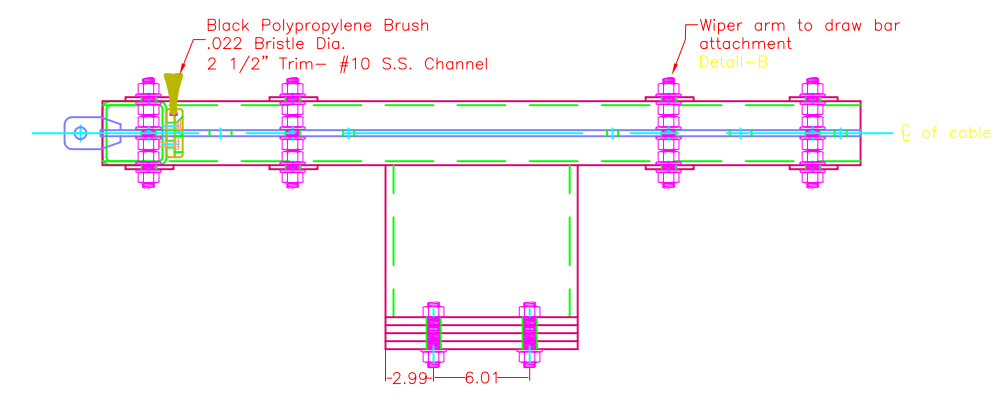
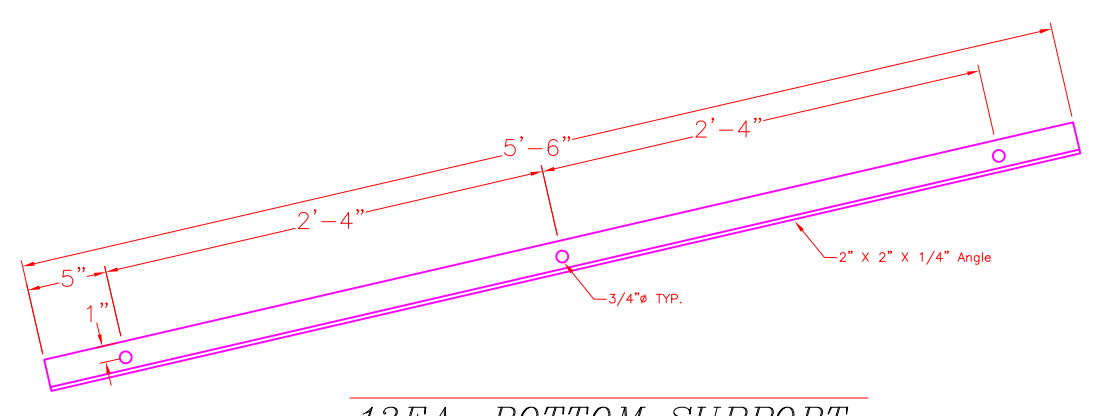
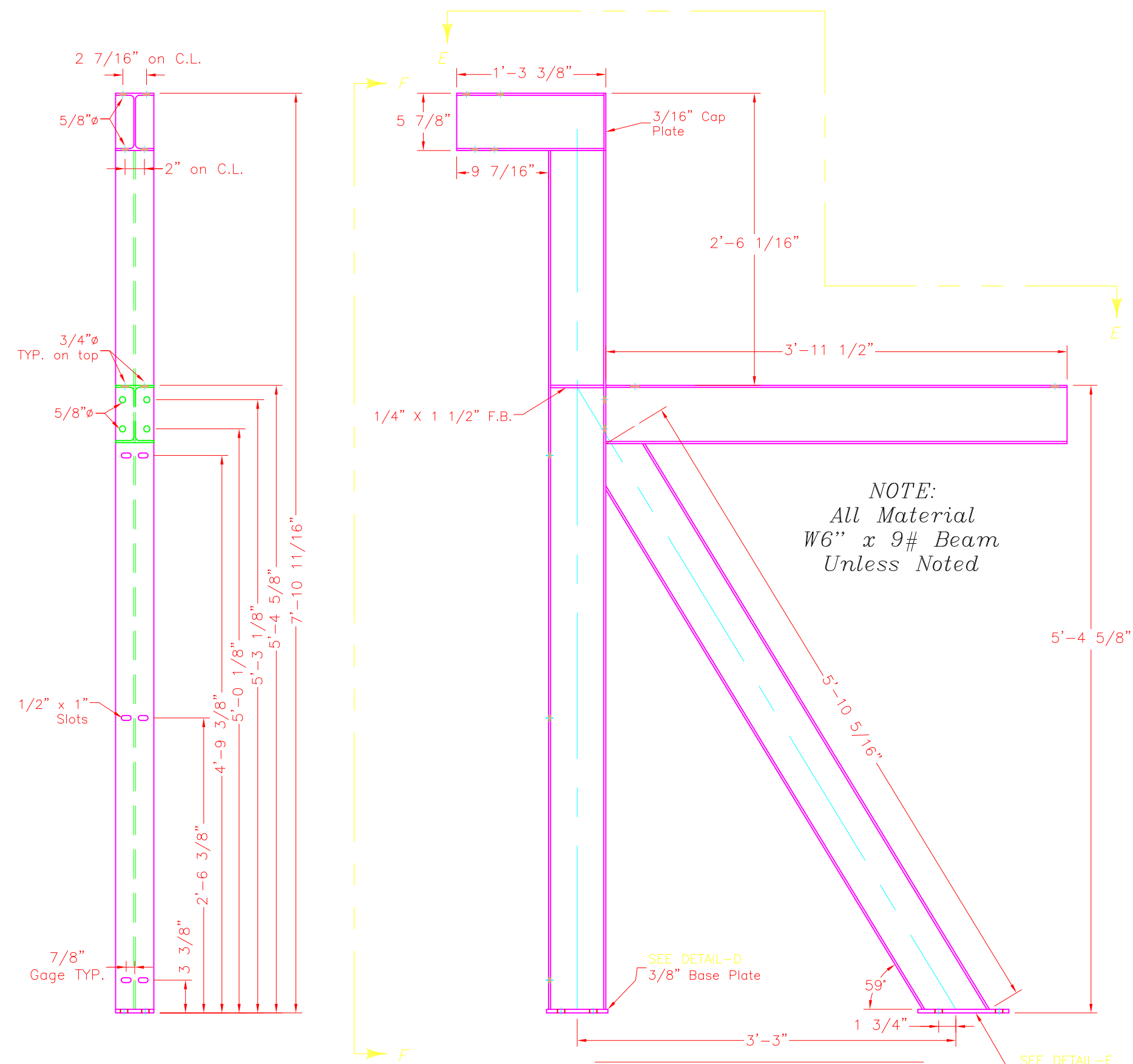
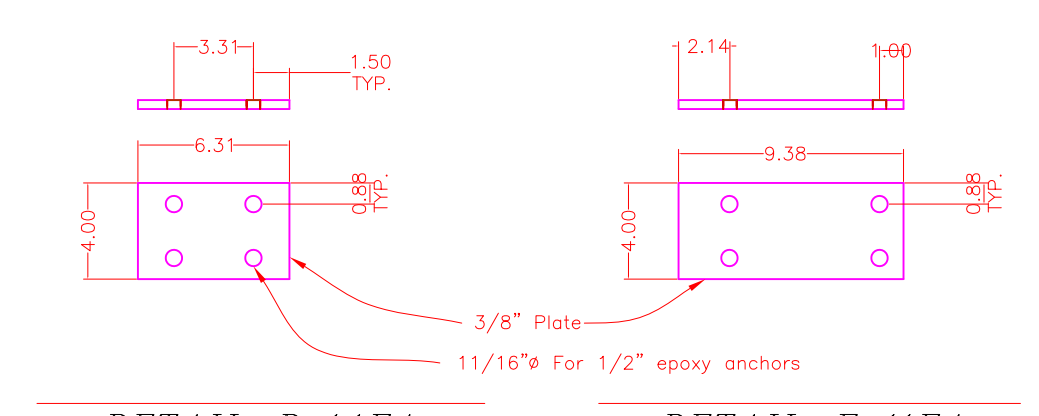
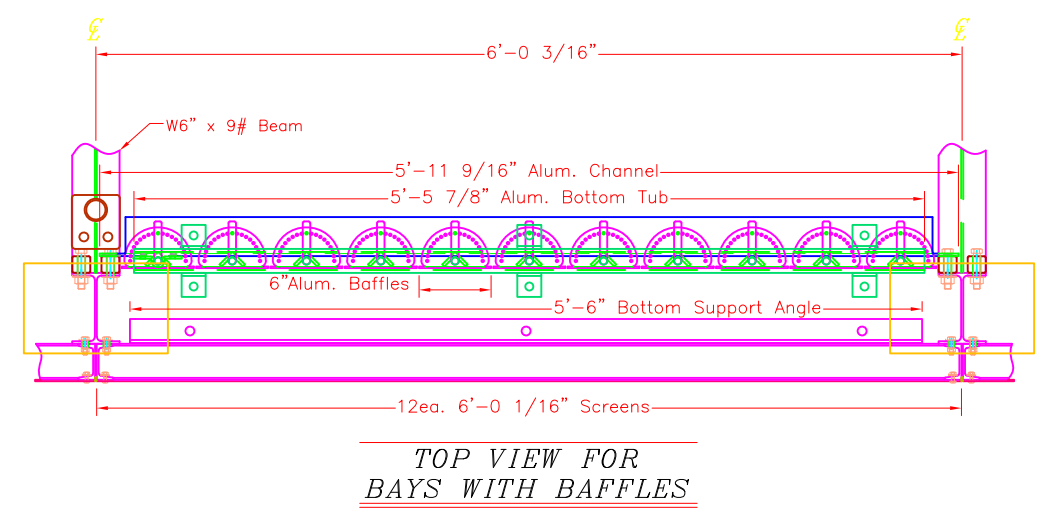
SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
SCREEN NOTES & DETAILS

PROJECT NO.
603097-18-2

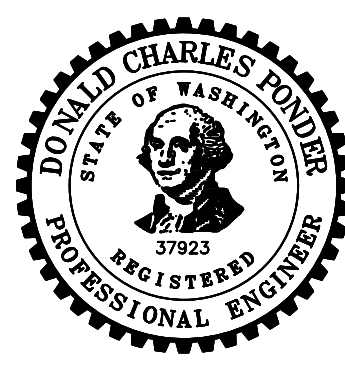
SHEET 10 OF 17



SECTION D-D
SHEET 1
Scale 3/4"=1ft



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



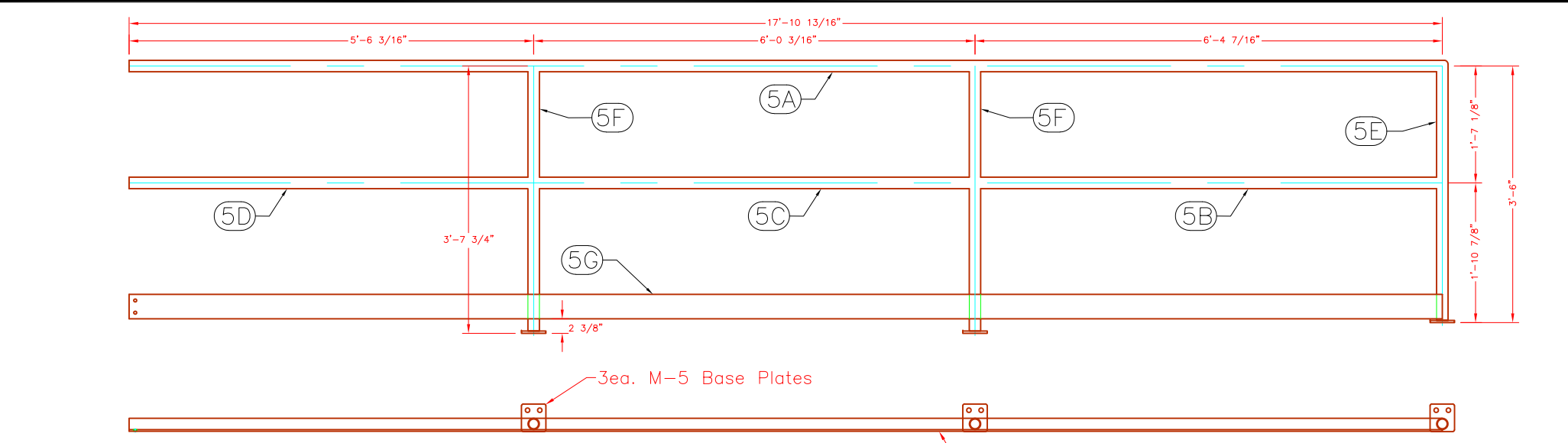
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CHIEF ENGINEER		DATE:	
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DESIGNED BY: S. STANLEY
CHECKED BY: D. PONDER
DRAWN BY: T. GODAT/K. CORWIN
DATE: 9-26-2018

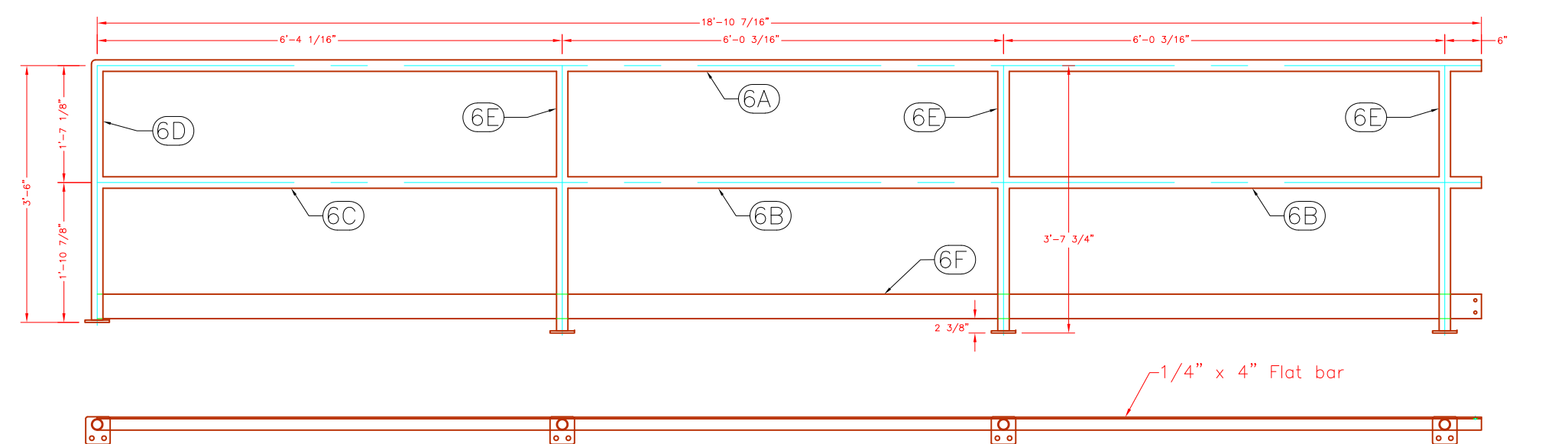
0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
SCREEN NOTES & DETAILS

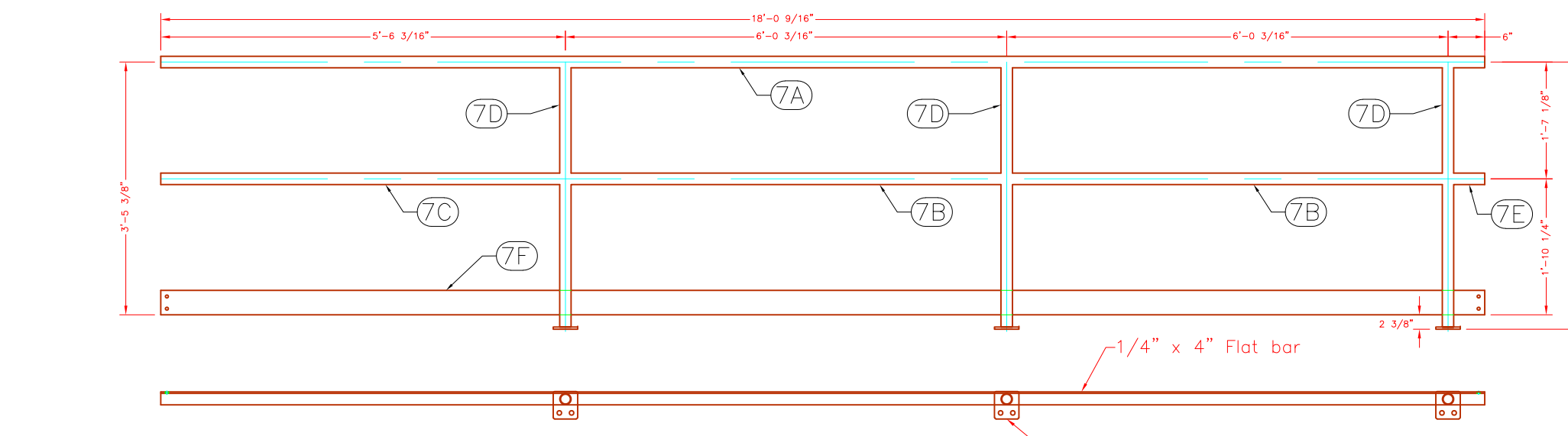
PROJECT NO. 603097-18-2
SHEET 11 OF 17



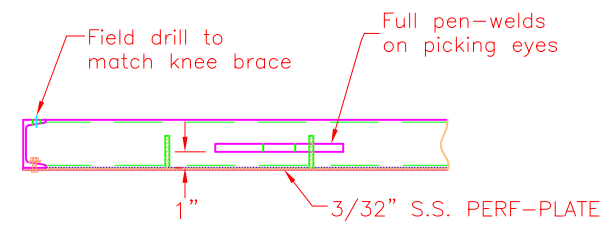
1ea. HR-5
Scale 3/8" = 1ft



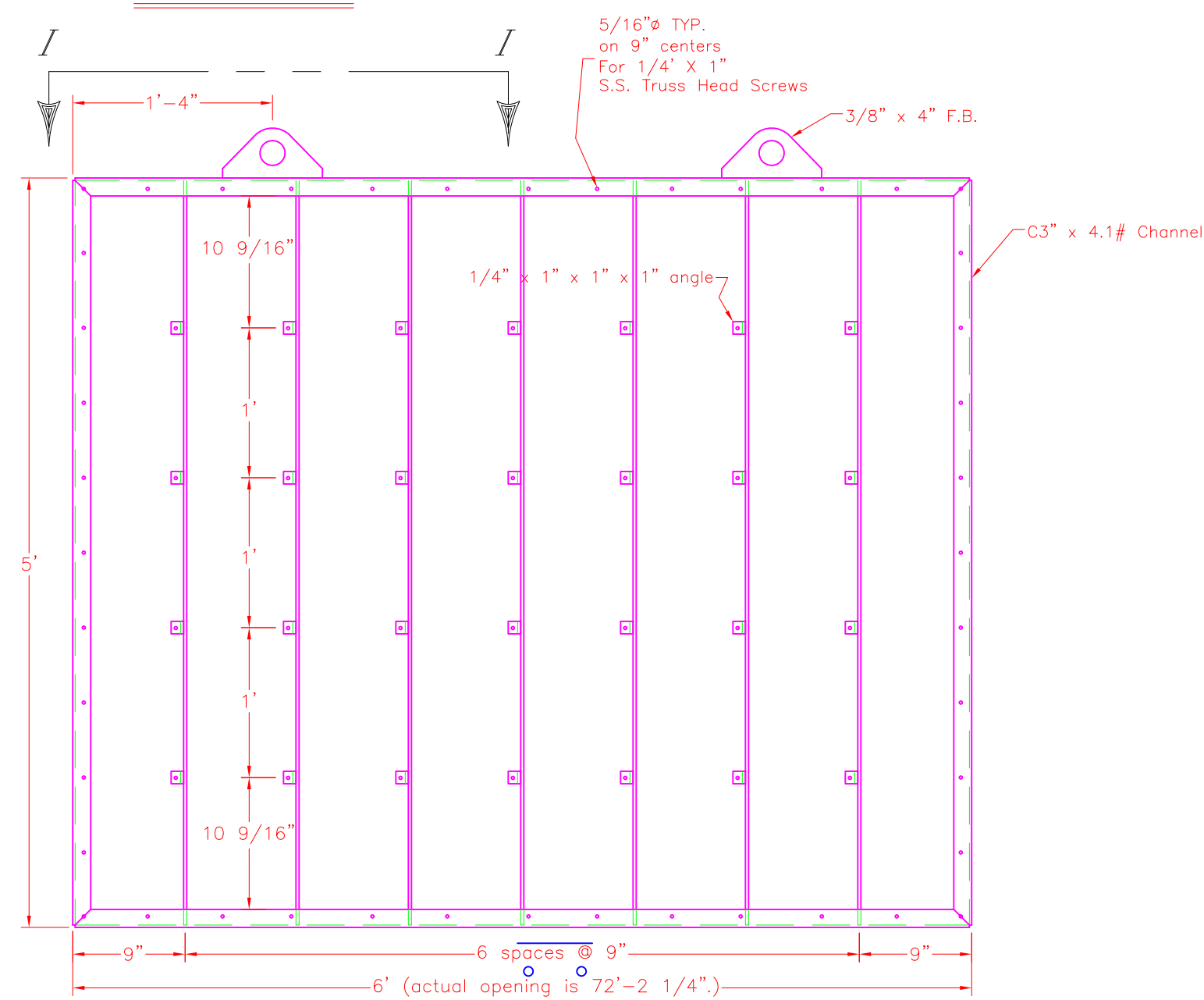
1ea. HR-6
Scale 3/8" = 1ft



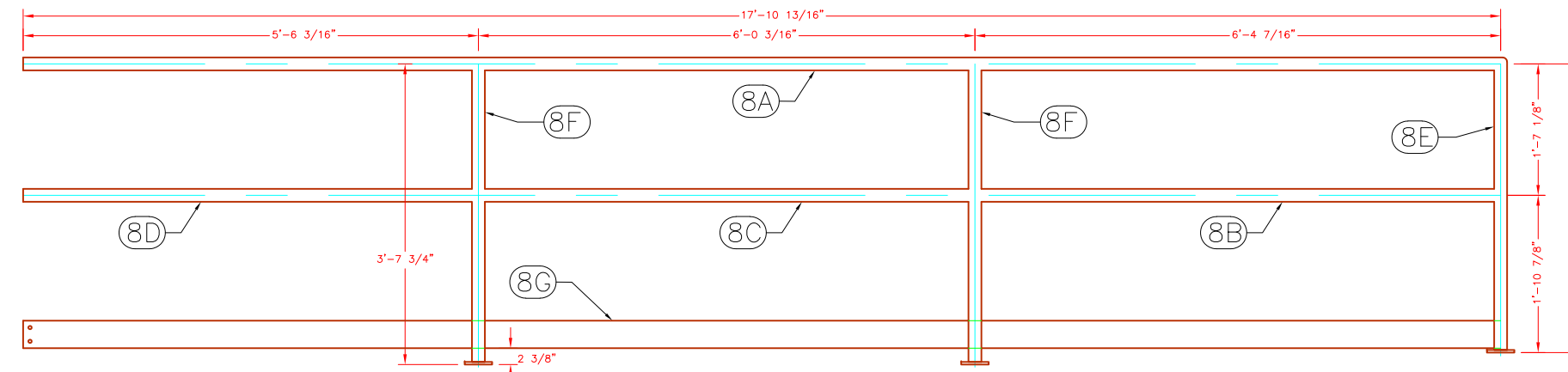
2ea. HR-7
Scale 3/8" = 1ft



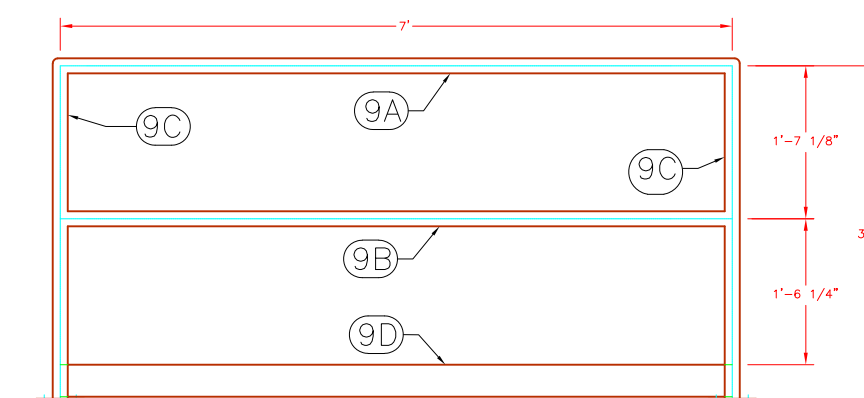
SECTION I-I



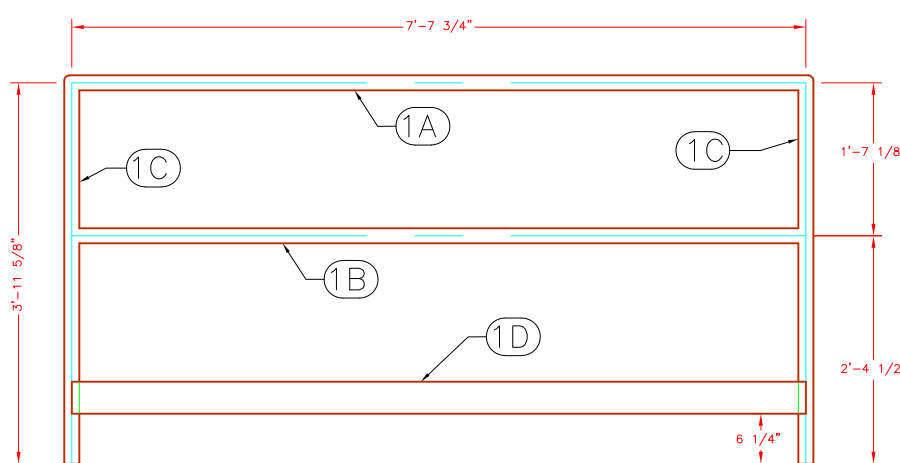
12EA. SCREEN PANELS
Scale 1" = 1ft



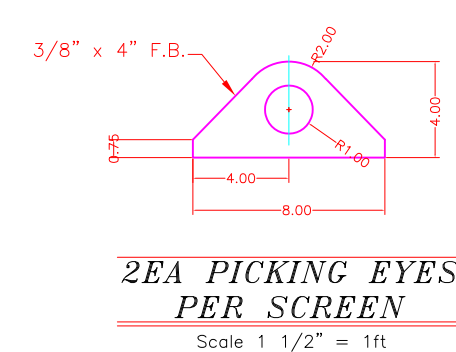
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Scale 3/8" = 1ft



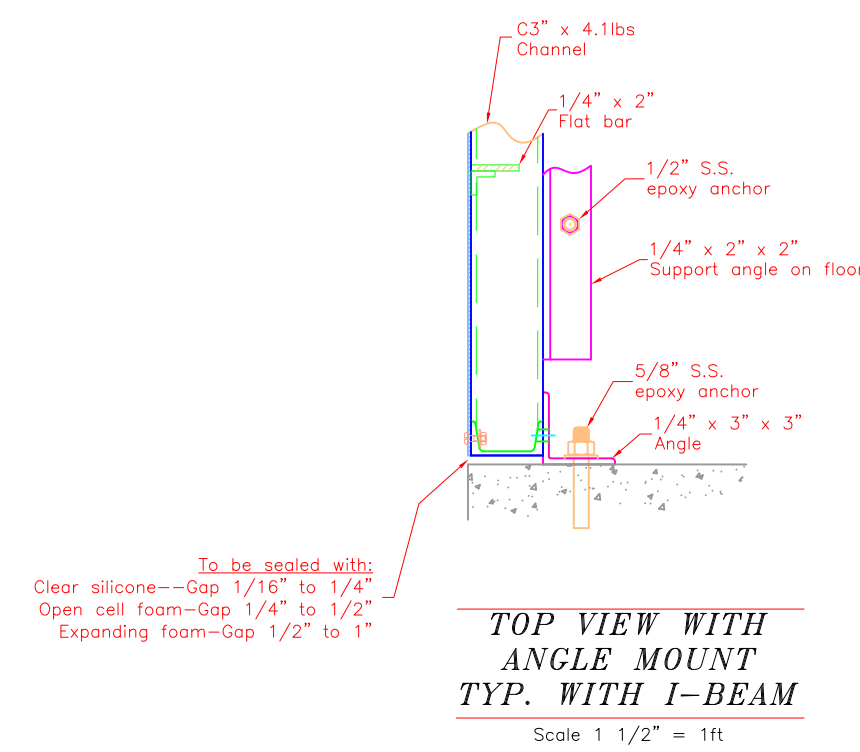
1ea. HR-9
Scale 3/8" = 1ft



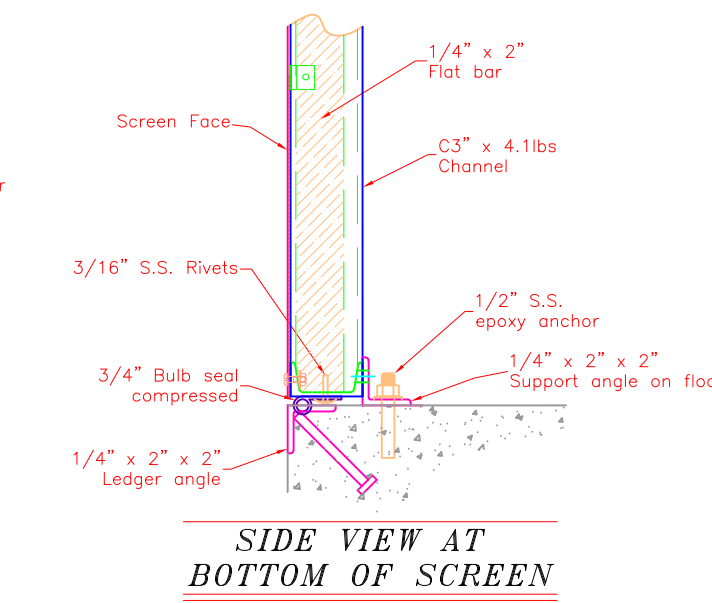
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Scale 3/8" = 1ft



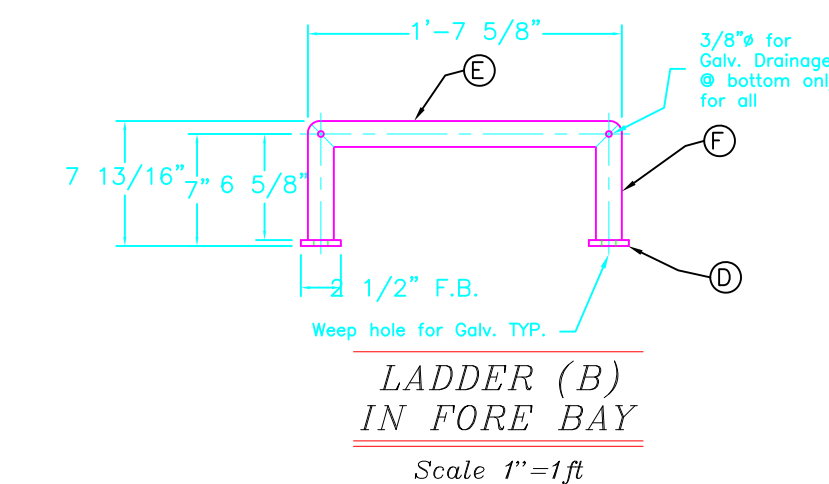
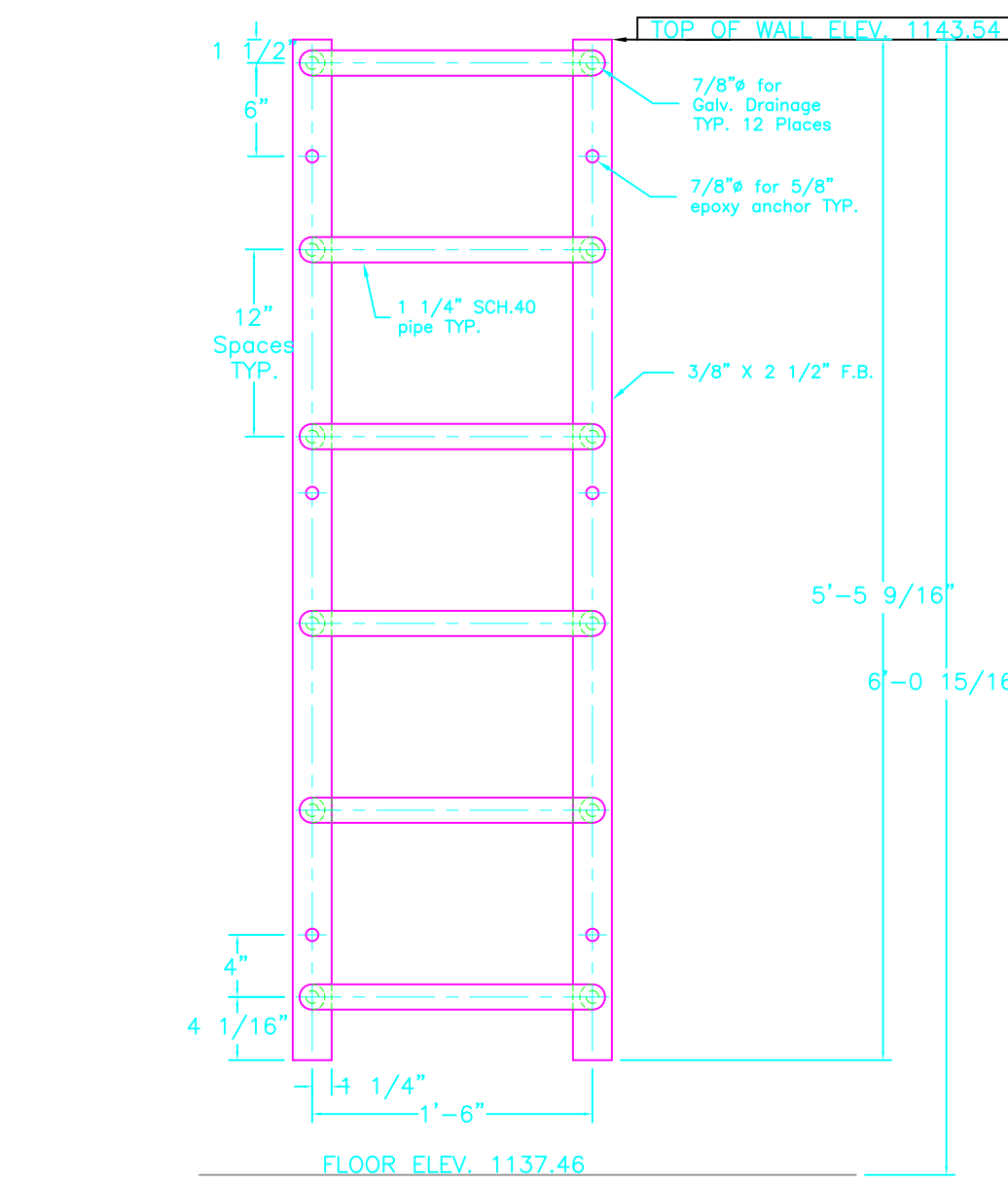
2EA PICKING EYES PER SCREEN
Scale 1 1/2" = 1ft



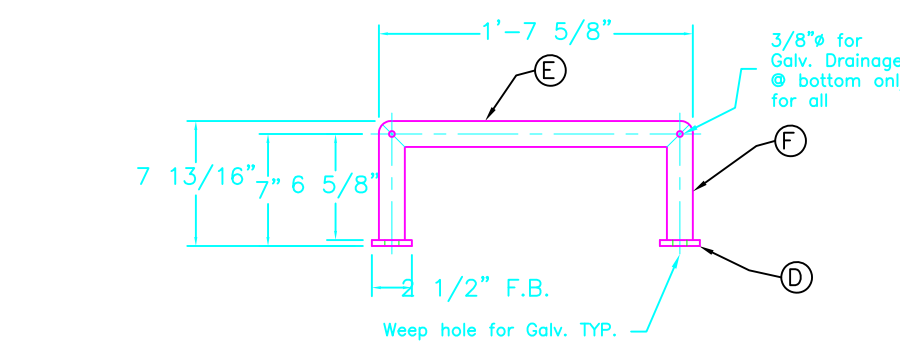
TOP VIEW WITH ANGLE MOUNT TYP. WITH I-BEAM
Scale 1 1/2" = 1ft



SIDE VIEW AT BOTTOM OF SCREEN
Scale 1 1/2" = 1ft



LADDER (B) IN FORE BAY
Scale 1" = 1ft



WIPER ARM KICK OUT
Scale 1 1/2" = 1ft

HR-5	QTY	MATERIAL	LENGTH
HR-5	1	1 1/2" Sch. 40 Bare Pipe	17'-11 3/4"
5A	1	Top rail 45° one end	6'-3 5/16"
5B	1	Mid rail cope both ends	5'-11 1/16"
5C	1	Mid rail cope both ends	5'-11 1/16"
5D	1	Mid rail cope one end	5'-5 5/8"
5E	1	End post 45° one end	3'-6 9/16"
5F	2	Mid post cope one end	3'-6 13/16"
5G	1	1/4" x 4" F.B. Toe kick	17'-10 13/16"
M-5	3	Base plates	

HR-6	QTY	MATERIAL	LENGTH
HR-6	1	1 1/2" Sch. 40 Bare Pipe	18'-11 3/8"
6A	1	Top rail 45° one end	5'-11 1/16"
6B	2	Mid rail cope both ends	6'-2 15/16"
6C	1	Mid rail cope both ends	3'-6 9/16"
6D	1	End post 45° one end	3'-6 9/16"
6E	2	Mid post cope one end	3'-6 13/16"
6F	1	1/4" x 4" F.B. Toe kick	18'-10 7/16"
M-5	4	Base plates	

HR-7	QTY	MATERIAL	LENGTH
HR-7	1	1 1/2" Sch. 40 Bare Pipe	18'-0 9/16"
7A	2	Top rail	5'-11 1/16"
7B	4	Mid rail cope both ends	5'-5 5/8"
7C	2	Mid rail cope one end	3'-6 9/16"
7D	6	Mid post cope one end	5 7/16"
7E	2	Mid rail cope one end	18'-0 9/16"
7F	2	1/4" x 4" F.B. Toe kick	
M-5	6	Base plates	

HR-8	QTY	MATERIAL	LENGTH
HR-8	1	1 1/2" Sch. 40 Bare Pipe	17'-11 3/4"
8A	1	Top rail	6'-3 5/16"
8B	1	Mid rail cope both ends	5'-11 1/16"
8C	1	Mid rail cope both ends	5'-11 1/16"
8D	1	Mid rail cope one end	5'-5 5/8"
8E	1	End post 45° one end	3'-6 9/16"
8F	2	Mid post cope one end	3'-6 13/16"
8G	1	1/4" x 4" F.B. Toe kick	17'-10 13/16"
M-5	3	Base plates	

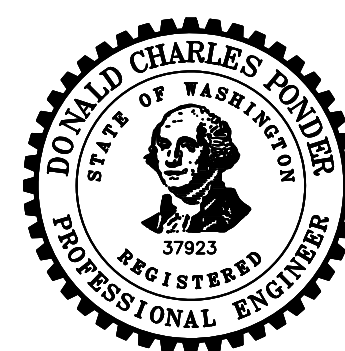
HR-9	QTY	MATERIAL	LENGTH
HR-9	1	1 1/2" Sch. 40 Bare Pipe	7'-1 7/8"
9A	1	Top rail	6'-10 7/8"
9B	1	Mid rail cope both ends	3'-6 9/16"
9C	2	End post 45° one end	7'
9D	1	1/4" x 4" F.B. Toe kick	
V1	2	Base plates	

HR-1A	QTY	MATERIAL	LENGTH
HR-1A	1	1 1/2" Sch. 40 Bare Pipe	7'-9 5/8"
1AA	1	Top rail	7'-6 5/8"
1AB	1	Mid rail cope both ends	4'-0 9/16"
1AC	2	End post 45° one end	7'-7 3/4"
1AD	1	1/4" x 4" F.B. Toe kick	

Ladder (B)			
D	2	3/8" X 2 1/2" F.B.	5'-5 9/16"
E	6	1 1/4" Sch. 40 Pipe	1'-7 5/8"
F	12	1 1/4" Sch. 40 Pipe	7 7/16"



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



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DRAWN BY	T. GODAT/K. CORWIN
DATE	9-26-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
SCREEN NOTES & DETAILS

PROJECT NO.
603097-18-2

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15 17

Appendix E: USFWS IPaC Report

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Chelan County, Washington



Local office

Washington Fish And Wildlife Office

☎ (360) 753-9440

📠 (360) 753-9405

510 Desmond Drive Se, Suite 102
Lacey, WA 98503-1263

<http://www.fws.gov/wafwo/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species

¹ are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service.

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx <i>Lynx canadensis</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened

Gray Wolf *Canis lupus* Endangered
There is **final** critical habitat for this species. The location of the critical habitat is not available.
<https://ecos.fws.gov/ecp/species/4488>

Grizzly Bear *Ursus arctos horribilis* Threatened
There is **proposed** critical habitat for this species. The location of the critical habitat is not available.
<https://ecos.fws.gov/ecp/species/7642>

North American Wolverine *Gulo gulo luscus* Proposed Threatened
No critical habitat has been designated for this species.
<https://ecos.fws.gov/ecp/species/5123>

Birds

NAME	STATUS
Marbled Murrelet <i>Brachyramphus marmoratus</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/4467	Threatened
Northern Spotted Owl <i>Strix occidentalis caurina</i> There is final critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/1123	Threatened
Yellow-billed Cuckoo <i>Coccyzus americanus</i> There is proposed critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Fishes

NAME	STATUS
Bull Trout <i>Salvelinus confluentus</i> There is final critical habitat for this species. Your location overlaps the critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Flowering Plants

NAME	STATUS
Showy Stickseed <i>Hackelia venusta</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5210	Endangered

Wenatchee Mountains Checkermallow *Sidalcea oregana* var. **Endangered**
calva

There is **final** critical habitat for this species. Your location is outside the critical habitat.

<https://ecos.fws.gov/ecp/species/7222>

Conifers and Cycads

NAME	STATUS
Whitebark Pine <i>Pinus albicaulis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1748	Candidate

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Bull Trout <i>Salvelinus confluentus</i> https://ecos.fws.gov/ecp/species/8212#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act

¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the [FAQ below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see maps of where birders and the general public have sighted birds in and around your project area, visit E-bird tools such as the [E-bird data mapping tool](#) (search for the name of a bird on your list to see specific locations where that bird has been reported to occur within your project area over a certain timeframe) and the [E-bird Explore Data Tool](#) (perform a query to see a list of all birds sighted in your county or region and within a certain timeframe). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

Breeds Dec 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

Black Swift *Cypseloides niger*

Breeds Jun 15 to Sep 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8878>

Brewer's Sparrow *Spizella breweri*

Breeds May 15 to Aug 10

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

<https://ecos.fws.gov/ecp/species/9291>

Clark's Grebe <i>Aechmophorus clarkii</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Dec 31
Golden Eagle <i>Aquila chrysaetos</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/1680	Breeds Dec 1 to Aug 31
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Lewis's Woodpecker <i>Melanerpes lewis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9408	Breeds Apr 20 to Sep 30
Olive-sided Flycatcher <i>Contopus cooperi</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Sage Thrasher <i>Oreoscoptes montanus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9433	Breeds Apr 15 to Aug 10
White Headed Woodpecker <i>Picoides albolarvatus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9411	Breeds May 1 to Aug 15
Williamson's Sapsucker <i>Sphyrapicus thyroideus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8832	Breeds May 1 to Jul 31
Willow Flycatcher <i>Empidonax traillii</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/3482	Breeds May 20 to Aug 31

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) and/or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the counties which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [E-bird Explore Data Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird entry on your migratory bird species list indicates a breeding season, it is probable that the bird breeds in your project's counties at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the BGEPA should such impacts occur.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location overlaps the following wetlands:

RIVERINE

R3UBH

A full description for each wetland code can be found at the National Wetlands Inventory website:

<https://ecos.fws.gov/ipac/wetlands/decoder>

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix F. Rock-Breaking Compound Material Safety Data Sheets

[Magnum Buster](#) is a cartridge containing ball powder and an ignition primer. Because the Magnum Buster MSDS contains limited information on chemical specifications, MSDS sheets are also included for ball powder and a typical ignition primer used with ball powder (Hilti DX Cartridge). The Hilti DX Cartridge is the same type of ignition primer as that used in nail guns.

T S F T T S T



P T
U BUST



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Washington, DC 20226

www.atf.gov

SPECIAL EXPLOSIVE DEVICE DETERMINATION

Pursuant to a request by BDS, Inc., the Bureau of Alcohol, Tobacco, Firearms and Explosives has determined the following explosive device, when possessed and used for its intended purpose in breaking rock and similar materials, meets the special explosive device requirements in accordance with 27 CFR § 555.32.

ATF Tracking Number

17-809683

U.N. Proper Shipping Name and Number:

ORM-D, Cartridges, Power Device

U.S. Department of Transportation Approval Number:

N/A

Product Designation/Part Number:

Number 10, Number 20 and Number 30 Magnum Buster Booster Cartridges

NOTES:

Any alterations to the device will render this exemption void.

DATED:

November 2, 2017

William E. Frye, Jr.
Chief, Explosives Industry
Programs Branch

Material Safety Data Sheet

This product should be stored and used in accordance with good industrial and personal hygiene practices and in conformity with any applicable regulation. The information contained herein is based on the present state of knowledge and is intended to describe the product from the point of view of Safety. The user should therefore not be construed as guaranteeing specific product performance properties.

UF TU

Name: McCarthy Industries
 Address: 500 Haggin View Rd
 Ramsay, MT 59748

Tel No: (713) 575 5002
 Email: info@mccarthyindustries.com

Contact: Don McCarthy

F SUBST	Cartridges	Power Device
F U	Not Applicable	Final Product
o estic S ipping	Exemption	ORM-D
port S ipping: U escription	Cartridges, Power Device	U u ber SS 0323 1.4S

P S P P T S (Nominal for Power Cartridge)		T T ST S
Auto-ignition Temperature: Net Explosive Mass: <i>Small D x L</i> <i>Medium D x L</i> <i>Large D x L</i> Gross Mass w/Cartridge Body: <i>Small D x L</i> <i>Medium D x L</i> <i>Large D x L</i> Approximate Dimensions: <i>Small D x L</i> <i>Medium D x L</i> <i>Large D x L</i>	150 deg C 10 g (maximum) 15 g (maximum) 30 g (maximum) 31 g 39 g 58 g 25 mm x 75 mm 25 mm x 90 mm 25 mm x 120mm	A plastic cartridge containing a primer for ignition and a nitrocellulose propellant (ball powder) for gas production. The configuration is unique and cannot be fitted or used in a standard weapon. The cartridge is used to produce a rapid evolution of gas, which provides the energy necessary to break rock in the mining industry. The energy is converted into a hydrostatic pulse by directing the gas into a water filled hole within the rock.

S S PT S	P T	F T US TS F ST
<p>Fire</p> <p>Will not explode en masse. Exposure to flame will destroy packaging and may result in the ignition of cartridges.</p> <p>Explosion</p> <p>An explosion risk exists only when cartridges are tightly confined in a closed vessel or similar. A pressure build-up may cause an explosion and a scattering of the confined material.</p> <p>Inhalation</p> <p>Periodic inhalation of normal combustion products presents no hazard to the user. Typical mass decomposition products include Pb, CO, CO₂, H₂O, H₂, NO_x, and N₂.</p> <p>Hearing</p> <p>Permanent damage to hearing may result from frequent exposure to impact noise without wearing suitable hearing protection.</p>	<p>Store and transport away from radiant heat and open flames. Maintain a distance of at least 8m should any packaging catch alight.</p> <p>Use cartridges only as specified by the manufacturer. Limit quantity stored to a minimum. Ensure that cartridges are not subject to impact, friction, electrostatic or electric sources, heat.</p> <p>Do not use in confined spaces. Ensure good ventilation during use. NO_x and other gases are present in hazardous quantities when cartridges are burnt in mass.</p> <p>Hearing protection which provides at least 50dB(A) attenuation should be worn, or use should be made of the percussion valve type ear muff.</p>	<p>Douse fire with water, dry powder, carbon dioxide, or foam. Wear SCBA when large quantities of cartridges are burning.</p> <p>Douse fire with water, dry powder, carbon dioxide, or foam. Punctures and lacerations caused by flying projectiles may be treated in the normal manner.</p> <p>If a headache develops as a result of inhalation of combustion products, remove to fresh air. Ensure that work area has been sufficiently ventilated before resuming work.</p> <p>Persons exposed to percussion on a frequent and regular basis should be subjected to an annual audiometric examination. Chronic hearing loss may be untreatable.</p>

SP and SP S P UT S	ST U TS
<p>Design of the product makes spillage of large amounts of propellant unlikely. Propellant powder which has been spilled must be soaked in water for a minimum of one hour and then thrown directly onto a fire. Observe the following precautions when carrying out this action;</p> <ol style="list-style-type: none"> 1. Move at least 5m away from the fire immediately after the wet propellant has been thrown onto the flames. 2. Never throw dry propellant powder onto a fire, as this may result in injury. <p>Empty Magnum Cartridges may be disposed of one at a time by throwing them into an enclosed fire which protects the operator from flying debris. A sharp report will signal the successful disposal of the initiator.</p>	<p>Store in a dry place with temperature and humidity preferably between 41-95 F (5-35 C) (ideally 68 F/20°C) and less than 50% Relative Humidity.</p>

P B
<p><u>Cartridges Po er e ice</u></p> <p>o estic: ORM-D, One hundred cartridges are packed in a cardboard box. Cardboard box is marked ORM-D Cartridges, Power Device</p> <p>nternationa : U. N. 0323, Group 1.4S. Maximum, One hundred cartridges are packed in a cardboard box. Cardboard box is marked Power Cartridge, Magnum Buster. Also included will be actual Size Class, Gross Weight and Net Explosive Weight.</p>

T T T	F S T T F T
<p>Injury arising from accidental discharge of the Magnum Buster cartridge should be treated according to nature and severity. Treat all persons who have inhaled large quantities of ignition products as stretcher cases. Ensure that patients who have inhaled large quantities of ignition gases are observed for 24 hours (effect of Nitrous oxides).</p>	<p>Occupational Health & Safety Act No 85 of 1993 General Administrative Regulations of Act 85 of 1993</p> <p>UN Publication Recommendations on the Transport of Dangerous Goods .</p>

P T P U T S

CONSULT USER MANUAL FOR DETAILED OPERATING INSTRUCTIONS.

S F T P U T S

1. KEEP ALL CARTRIDGES AWAY FROM CHILDREN.
2. DO NOT USE CARTRIDGES IN AN ENVIRONMENT CONTAINING FLAMABLE GASES.
3. DO NOT INITIATE A CARTRIDGE IN IMMEDIATE CONTACT WITH COMBUSTABLE MATERIALS.
4. DO NOT ATTEMPT TO PUNCTURE, DISSASSEMBLE OR MODIFY ANY CARTRIDGE.
5. DO NOT HEAT CARTRIDGE OR DISPOSE OF IN OPEN FIRE.
6. APPLY SAFETY PRACTICES APPLICABLE TO THE HANDLING POWER CARTRIDGES.
7. DO NOT ALLOW UNTRAINED PERSONS TO HANDLE THIS PRODUCT.

o e- ase n owder
Western Powders, nc.
ss e ate 1 01 015

Safety ata S eet according to S a o Standard re uire ents

Section 1 - Identification of the Mixture and of the Company

Product Names:

Nitro 100 NF, Ramshot Zip, Accurate #2, Accurate #5, Ramshot Silhouette, Ramshot True Blue, Accurate TCM, Accurate 4100, Ramshot Enforcer, Accurate 11FS, Ramshot X-Terminator, Accurate 2230, Ramshot TAC, Ramshot Hunter, Ramshot Big Game, Ramshot Magnum, Accurate 2520, Ramshot Competition, Accurate #7, Accurate #9, Accurate 1680, Accurate 5744, Accurate 2200, Accurate 2460, Accurate 2700, Accurate Magpro

Trade Names and Synonyms:

herica g n owder, a owder, o e- ase g n owder.

Relevant Identified Uses:

Prod ct is intended or se in s o e ess ro e ant a ications on .

Distributed By:

WESTERN POWDERS, INC.

P. . o 158

Mi es it , Montana 59301

e e hone (406) 34-04

a (406) 34-0430

We site www.western owders.co

ai c sto erser ice ra shot.co

Emergencies – Chemtrec – 1-800-424-9300

Section 2 - HAZARD IDENTIFICATION

Classification of the Mixture:

Explosives Division 1.3

GHS Classification:



Signal Word:

Danger

Hazard Statements:

H203 Explosive; fire, blast or projection hazard.

H302 ar i swa owed.

H319 a ses serio se e irritation.

H317 Ma ca se an a ergic s in reaction.

H371 Ma ca se da age to organs

(circ ator s ste , ood, idne s, i er) thro gh ro onged or re eated e os re.

Precautionary Statements

Prevention

P210 ee awa ro heat.

P240 ro nd or ond container and recei ing e i ent

P250 o not s ect to choc or riction.

P260 o not reathe d st.

P 80 Wash thoro gh a ter hand ing.

P 0 o not eat, drin or s o e when sing this rod ct.

P 81 Wear protective goggles, protective clothing and eye protection.

Response

- P370** Avoid contact with skin and eyes. Rinse immediately with plenty of water. Get medical attention if you feel unwell.
- P312** Wash with plenty of water. Get medical attention if you feel unwell.
- P330** Wash with plenty of water.
- P305** If in contact with eyes, rinse continuously with water or water solution.
- P338** If in contact with skin, wash immediately with plenty of water.
- P303** If on skin, wash with plenty of water.
- P337** If irritation persists, get medical attention.
- P333** If rash persists, get medical attention.
- P363** Wash contaminated clothing before reuse.

Storage

- P410+412** Store in a well-ventilated place away from direct sunlight.
- P404** Keep container tightly closed.
- P420** Store away from ignition sources.

Disposal

- P501** Dispose of container, waste and residues in accordance with applicable regulations and requirements.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Substances:

Product is a mixture.

CAS Number	%[Weight]	Name
9004-0-0	50-100	Nitrocellulose
55-63-0	0-4	Nitrocellulose
84-4-	0-10	Diethyl Phthalate
Not Available	0-10	Polyester Adipate
85-98-3	0-10	Diethylene Glycol (diethylene glycol)
8050-09-0	0-5	Diethylamine
13114--	0-3	Ammonium
5-9-1	0-3	Potassium Nitrate
8-80-5	0-3	Potassium Acetate
141-8-6	0-	Diethyl Acetate
141-8-6	0-1.5	Diethylene Glycol
86-30-6	0-1.5	N-Nitrosodiethylene Glycol
188-10-5	0-1.5	Diethylene Glycol
131-65-3	0-1	Diethylene Glycol
8-4-5	0-1	Diethylene Glycol

Section 4 - FIRST AID MEASURES

Inhalation

- Move to fresh air.
- Remove clothing, institute rescue breathing.
- Breathing is difficult, ensure airway is clear, give oxygen and continue to monitor.
- If heart has stopped, institute emergency cardiac resuscitation (CPR).
- See affected person warmed and at rest. Get immediate medical attention.

Eye Contact

- Do not rub eyes.
- Flush immediately with plenty of water or water solution for 15 minutes.
- If eye contact occurs and opens wide apart. Eye irritation develops, call a physician.

Skin Contact

- Flush immediately with plenty of water and soap and water while removing contaminated clothing and shoes.
- Make a sorbed through the skin in harness.
- Call a physician if necessary.

- Wash clothing before reuse.
- Clothing is to be altered, in or out the person performing the operation of the contaminants have appropriate properties.

Ingestion

- Ingested through with water and give large amounts water to avoid unconsciousness.
- Notify medical attention.
- Do not give anything to the person if unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed.

Eye irritation. Skin symptoms include itching, stinging, redness and tearing. In contact with cause redness and pain. Ingestion causes gastrointestinal irritation, nausea, vomiting and diarrhea. High concentrations of dust irritate throat and respiratory system and cause coughing. A drop in blood pressure, headache, cyanosis and mental confusion are symptoms of nitrogen in the product.

Indications of any immediate medical attention and special treatment needed.

Provide general first aid and treatment to attend. See medical attention.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Large amounts of water should be applied as it is a flammable liquid.

Unsuitable extinguishing media

Do not use water as an extinguisher, as this is flammable.

Special Hazards arising from the substrate or mixture.

Flammable gases are formed during a fire. Combustion products are dependent on fire conditions and other combustibles present. The dominant products will be carbon dioxide and oxides of nitrogen, under some conditions, ethane, carbon monoxide, irritating aldehydes and carbonic acids, and hydrogen cyanide are formed.

Special protective equipment and precautions for firefighters

Self-contained breathing apparatus (SCBA) and protective clothing should be worn in case of fire. In addition, it is not advised to, in serious cases, gloves, hard hat and chemical protective suit.

Fire-fighting equipment/instructions

Fires involving these materials should not be fought unless extinguishing media can be applied from a well-protected (e.g. behind a fire barricade) and distant location from the fire.

Specific methods

Accompany personnel to a safe area according to predetermined evacuation plan. Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards

Flammable, flammable liquid.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures.

Evacuate unnecessary personnel away. Minimize ignition sources. Use non-sparking tools. Wear appropriate protective equipment and non-flammable or flame retardant clothing during clean-up. Avoid inhalation of dust. See MSDS. Major respiratory irritant if there is a risk of exposure to dusts at the site exceeding the exposure limits. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing. Always read the label. Local authorities should be advised if significant quantities cannot be contained. For personal protection, see section 8 of this MSDS.

Methods and materials for containment and cleaning up

Avoid dispersal of dust in the air (e.g. clearing dust surfaces with compressed air). Clean surfaces immediately using non-spraying techniques. Wet down settled materials prior to initiating clean-up and clean materials wetted or dissolved. Avoid contamination of water bodies during clean-up and disposal. This material is heavier than water. Create an overflow dam with filtration capabilities to retain material. Collect dust using a vacuum cleaner equipped with HEPA filter. Large spills sweep, shoveling or vacuuming and collect in suitable container or disposal. Pour spillage into water where possible, remove intact containers from the water. Clean contaminated surfaces thoroughly to remove residual contamination. Never return settled material to original containers or reuse. For waste disposal, see section 13 of this MSDS.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Do not handle until a safety precaution has been read and understood. Do not subject to mechanical shock. Avoid exposure to sunlight or artificial ultraviolet light. Minimize dust generation and accumulation. Provide adequate ventilation. Avoid breathing dust. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wear appropriate personal protective equipment. Use good industrial hygiene practices. The powder contains stabilizers and deteriorates over long-term storage conditions. Discoloration of powder should be checked for deterioration regularly. Deteriorating smokeless powder produces an acidic odor and a reddish-brown residue. Avoid deteriorating smokeless powder through, for example, controlled burning in small quantities (rod cuts should be submerged in water immediately). The powder should not be exposed to excessive heat, as this can accelerate deterioration. Deterioration produces an acid that accelerates further reaction and has been known, because of heat generated in the reaction, to cause spontaneous combustion.

Conditions for safe storage, including any incompatibilities

Store at 1 (0), 50 relative humidity (decomposition decreases as relative humidity (1)). Store in original container. Keep container tightly closed. Store in a cool, well-ventilated place away from sources of ignition. Store away from incompatible materials (see section 10 of this MSDS). For additional information regarding handling and storage guidelines, see "Properties and Storage of Smokeless Powder" published by the SPORTING ARMS AND AMMUNITION MANUFACTURERS NATIONAL ASSOCIATION (SAA), 11 Middle Road, Newtown, 06405 (www.saa.org).

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Control Parameters


Occupation Exposure Limits (OEL)

Chemical Name	CAS Number	ACGIH TLV	OSHA PEL	Other Information
Nitrocellulose	9004-0-0	None established	None established	
Nitroglycerin	55-63-0	0.05 mg/m ³ in designation	0.1 mg/m ³ Airtight spaces	Air sampling is insufficient to accurately determine. Measures to prevent significant exposure are required.
Diethyl Phthalate	84-64-2	5 mg/m ³	5 mg/m ³	
Polyester Adipate	Not Available	Not Available	Not Available	
Diethylhexyl Sebacate (diethylhexyl sebacate)	85-98-3	None established	None established	
Diethyl Sebacate	8050-09-2	None established	None established	
Acetate	13114-13-3	None established	None established	
Potassium Nitrate	78-05-2	None established	None established	
Potassium Sulfate	78-05-2	None established	None established	
Diethyl Acetate	141-85-6	400	400 1400 mg/m ³	
Diethylamine	109-89-4	10 mg/m ³	None established	
N-Nitrosodiethylamine	86-30-6	None established	None established	
Diethylamine	188-10-5	5 mg/m ³	5 mg/m ³	Diethylamine and inorganic compounds
Sodium Azide	131-06-3	None established	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)	
Sodium Azide	804-5-5	5 mg/m ³ (respirable fraction)	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)	

Biological limit values

- No toxicological effects noted for the ingredient(s).

Exposure Controls

Appropriate engineering Controls	<p>Engineering controls are used to reduce the hazard or create a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and with technical independent worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <ul style="list-style-type: none"> Process controls which involve changing the way a task or process is done to reduce the risk. Enclosures and isolation of emission sources which enclose selected hazardous activities away from the worker and ventilation that strategically adds and removes air in the work environment. Ventilation can remove or dilute an air contaminant in a designed manner. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> Wear safety glasses with side shields.
Skin protection	<ul style="list-style-type: none"> Wear appropriate chemical resistant, flame retardant clothing (e.g. coveralls or a coat).
Hands/feet protection	<ul style="list-style-type: none"> Wear impermeable gloves.
Respiratory protection	<ul style="list-style-type: none"> Use a NIOSH-approved respirator with organic vapor cartridge and particulate filter if there is a risk of exposure to dusts or gases exceeding the exposure limits.
General hygiene Considerations	<p>Always observe good personal hygiene practices, such as washing after handling the material and before eating, drinking and/or smoking. routinely wash work clothing and protect equipment to reduce contaminants.</p>

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:

translucent to opaque solid

Physical state	solid	Relative density (Water = 1)	density 0.5 - 1 (g/cc)
Odor	odorless	Partition coefficient n-octanol / water	Not available
Odor threshold	Not available	Auto-ignition temperature (°C)	190-200 (34-39)
pH (as supplied)	Not available	Decomposition temperature	decomposition occurs at approximately 50 (100 °F).
Melting point / freezing point (°C)	Not available	Viscosity (cSt)	Not available
Initial boiling point and boiling range (°C)	Not available	Flammability	Flammable and other information
Flash point (°C)	Not available		Product can be ignited and contained
Evaporation rate	Not available		
Flammability	flammable solid		
Upper Explosive Limit (%)	Not available		
Lower Explosive Limit (%)	Not available		
Vapor pressure (kPa)	1 g		
Solubility in water (g/L)	insoluble		
Vapor density	Not available		

Section 10 - STABILITY AND REACTIVITY

Reactivity	<p>It is not ignited by mechanical shock and or impact. It is not ignited by static discharge (minimum ignition energy 0.00 J).</p> <p>Product can be ignited and contained.</p>
Chemical stability	<p>Stable when exposed to sources of heat, sunlight or artificial radiation.</p>
Possibility of hazardous Reactions	<p>Hazardous oxidation does not occur.</p>
Conditions to avoid	<p>Avoid contact with incompatible materials. Direct sunlight, artificial radiation, flame, and heat.</p>
Incompatible materials	<p>Strong acids, alkalis, oxidizers, and amines.</p>
Hazardous decomposition Products	<p>Carbon monoxide, carbon dioxide, oxides of nitrogen.</p> <p>decomposition occurs at approximately 50 (100 °F)</p>

Section 11 - TOXICOLOGICAL INFORMATION

Inhaled	<ul style="list-style-type: none"> • st a irritate res irator s ste . • nha ation o a ors a ca se drowsiness and di iness. his a e acco anied s ee iness, red ced a ertness, oss o re e es, ac o co- ordination and ertigo. • entra ner o s s ste (N) de resion a inc de genera disco ort, s to s o giddiness, headache, di iness, na sea, anaesthetic e ects, s owed reaction ti e, s rred s eech and a rogress to nconsciousness. • erio s oisonings a res t in res irator de resion and a e ata .
Ingestion	<ul style="list-style-type: none"> • ar i swa owed. • ngestion a ca se gastrointestina irritation.
Skin Contact	<ul style="list-style-type: none"> • Ma e har in contact with s in. • Ma ca se s in irritation. • Ma ca se an a ergic s in reaction.
Eye	<ul style="list-style-type: none"> • a ses e e irritation.
Chronic	<ul style="list-style-type: none"> • his rod ct contains i hen a ine, which has een shown to ind ce idne da age. he ow concentration o this ateria in, and the nat re o the rod ct, wo d rec de de e o ent o s ch an e ect.

Information on toxicological effects

Acute toxicity	Nitrog cerine wi rod ce di ation o ood esse s and a dro in ood ress re which a a ect the heart. t has a so een shown to ca se ethe og o ine ia (c anosis).
Skin corrosion/irritation	Ma ca se s in irritation.
Serious eye damage/eye irritation	a ses serio s e e irritation
Respiratory sensitization	Ma ca se res irator irritation.
Skin sensitization	Ma ca se s in sensiti ation.
Germ cell mutagenicity	his rod ct or an o its ingredients are not nown or re ortd to e tagenic
Carcinogenicity	his rod ct contains N-Nitrosodi hen a ine, which is re ortd as a ossi e h an carcinogen A .
Reproductive toxicity	Ma da age erti it or the n om chi d.
Specific target organ toxicity - single exposure	Not assi id
Specific target organ toxicity - repeated exposure	Ma ca se da age to the circ ator s ste , ood, idne s, and i er thro gh ro onged or re eated e os re.
Aspiration hazard	e to the h sica or o the rod ct it is not an as iration ha ard.

Section 12 - ECOLOGICAL INFORMATION

AQUATIC TOXICITY: **Do not discharge into sewers or waterways.**

Ecotoxicity	o ic to a atic i e with ong asting e ects.
Persistence and degradability	No data a ai a e on rod ct i t re
Bioaccumulative potential	No data a ai a e on rod ct i t re
Mobility in soil	No data a ai a e on rod ct i t re
Other adverse effects	No other ad erse en iron enta e ects nown.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal instructions:

ateria eco es a waste, it a e treated contro ed rning in s a antities i er issi e re e ant reg ator agencies (s ch as in a A er itted o en r m nit or incinerator). Materia sho d e s read into thin a ers and ignited ro a sa e distance. is ose o in accordance with a ica e edera , state, and oca reg ations. o not discharge into drains, water co rses or onto the gro nd.

Local disposal regulations

is ose o in accordance with oca reg ations.

Waste from residues/unused products

are st eta en to re enten iron enta conta ination ro the se o this ateria . he ser has the res onsi i it to dis ose o n sed ateria , resid es, and containers in co iance with a re e ant aws and reg ations.

Section 14 - TRANSPORT INFORMATION

DOT / IMDG:

UN Number	N0161
UN Proper Shipping Name	Powder, toxic
Transport Hazard Class(es)	1.3
Packing Group	Not applicable
Special precautions for user	This material is a dangerous good for transport. A in o ed sta st e a ro riate trained.
Other information	A o e c assi cation re ates to the s eci ic ac aging in which this ateria is s ied the an act rer. the ateria is re ac aged, this c assi cation wi no nger e re e ant.

IATA:

UN Number	or idden
UN Proper Shipping Name	or idden
Transport Hazard Class(es)	or idden
Packing Group	or idden

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Section 15 - REGULATORY INFORMATION

US Federal Regulations

This product is a hazardous material as defined in the A a ard o nication tandard, 9 1910.1 00.

CERCLA Hazardous Substance List (40 CFR 302.4)

Nitrocerine (10 s) i t htha ate (10 s) N-Nitrosodi hen a ine (100 s) th acetate (5000 s)

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories:

mediate a ard	es
e a ed a ard	es
ire a ard	es
Press re a ard	No
eacti it a ard	es

SARA 302 Extremely hazardous substance

Not listed.

SARA 313 (TRI reporting)

Nitrocerin (55-63-0) i t Phtha ate (84- 4-) i hen a ine (1 -39-4)

US State Regulations

US. Massachusetts RTK - Substance List

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. New Jersey Worker and Community Right-to-Know Act

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) in dio ide (18 8 -10-5) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. Pennsylvania Worker and Community Right-to-Know Law

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. Rhode Island RTK

Nitrocerin (55-63-0) i t Phtha ate (84- 4-) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6).

US. California Proposition 65

California Air Resources Board Water and Toxic Substance Control Act of 1986 (Proposition 65) This material contains a chemical currently listed as a carcinogen and or developmental and reproductive toxin.

Toxic Substance Control Act

Components of this product are listed on the United States Periodic Tables of Elements Act
(A) n entor

Section 16 - OTHER INFORMATION

Revision Date: 11/05/2015

The (M) is a standard communication tool and should be used to assist in the Risk Assessment. Manufacturers determine whether the reported hazards are risks in the workplace or other settings. Risks are determined in reference to various scenarios, cause, release, exposure and current or available engineering controls that are considered.

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DX-Cartridge

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 01/28/2016

Revision date: 01/28/2016

Supersedes: 05/18/2015

Version: 2.3

SECTION 1: Identification

1.1. Identification

Product form	Article
Name	DX-Cartridge
Product code	BU Direct Fastening

1.2. Relevant identified uses of the substance or mixture and uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Supplier	Department issuing data specification sheet
Hilti, Inc.	Hilti Entwicklungsgesellschaft mbH
Legacy Tower, Suite 1000	Hiltistrasse 6
75024 Plano - USA	86916 Kaufering - Deutschland
T +1 9724035800	T +49 8191 906310 - F +49 8191 90176310
1-800-879-8000 toll free - F +1 918 254 0522	df-hse@hilti.com

1.4. Emergency telephone number

Emergency number	Chem-Trec
	Tel.: 1 800 424 9300 (USA, PR, Virgin Islands, Canada)
	Tel.: 703 527 3887 (Other countries)
	+1 918 8723000
	1-800-879-8000 toll free

SECTION 2: Hazards identification

The dismantling of the article is prohibited!, This article contains hazardous substances or preparations not intended to be released under normal or reasonably foreseeable conditions of use.

2.1. Classification of the substance or mixture

GHS-US classification

Expl. 1.4 H204 - Fire or projection hazard

Full text of H-statements: see section 16

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US)



GHS01

Signal word (GHS-US)

Warning

Hazard statements (GHS-US)

H204 - Fire or projection hazard

Precautionary statements (GHS-US)

P210 - Keep away from heat. - No smoking

P250 - Do not subject to shock

P280 - Wear eye protection

2.3. Other hazards

No additional information available

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2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	GHS-US classification
glycerol trinitrate	(CAS No) 55-63-0	3 - 10	Unst. Expl, H200 Acute Tox. 2 (Oral), H300 Acute Tox. 1 (Dermal), H310 Acute Tox. 2 (Inhalation:dust,mist), H330 STOT RE 2, H373 Aquatic Chronic 2, H411
lead styphnate	(CAS No) 15245-44-0	0.1 - 5	Unst. Expl, H200 Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation:dust,mist), H332 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Barium nitrate	(CAS No) 10022-31-8	0 - 5	Acute Tox. 4 (Oral), H302
diphenylamine	(CAS No) 122-39-4	0 - 1	Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation:dust,mist), H331 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Tetrazen	(CAS No) 109-27-3	0 - 0.2	Unst. Expl, H200 Eye Irrit. 2A, H319

Full text of H-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation	Allow breathing of fresh air. Allow the victim to rest.
First-aid measures after skin contact	Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.
First-aid measures after eye contact	Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persist.
First-aid measures after ingestion	Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Foam. Dry powder. Carbon dioxide. Water spray. Sand.
Unsuitable extinguishing media	Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

No additional information available

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5.3. Advice for firefighters

Firefighting instructions	Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.
Protection during firefighting	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	Remove ignition sources. Use special care to avoid static electric charges. No open flames. No smoking.
6.1.1. For non-emergency personnel	
Emergency procedures	Evacuate unnecessary personnel.
6.1.2. For emergency responders	
Protective equipment	Equip cleanup crew with proper protection.
Emergency procedures	Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	Pick up loose cartridges only by hand. Exposed ingredients must be swept up carefully and phlegmatized in a water container, labelled according the regulations, wipe down with water the contaminated area. Store away from other materials.
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6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed	Hazardous waste due to potential risk of explosion.
Precautions for safe handling	Do not subject to grinding, shock, friction. Take precautionary measures against static discharge. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.
Hygiene measures	Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Keep only in the original container in a cool, well ventilated place away from : Direct sunlight, Heat sources. Store in a dry place.
Incompatible products	Strong bases. Strong acids.
Incompatible materials	Sources of ignition. Direct sunlight.
Storage temperature	5 - 25 °C
Prohibitions on mixed storage	KEEP SUBSTANCE AWAY FROM: highly flammable materials. ignition sources.
Storage area	Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

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glycerol trinitrate (55-63-0)		
ACGIH	ACGIH TWA (ppm)	0.05 ppm
ACGIH	ACGIH STEL (ppm)	0.05 ppm
ACGIH	Remark (ACGIH)	Vasodilation
OSHA	OSHA PEL (Ceiling) (mg/m ³)	2 mg/m ³
OSHA	OSHA PEL (Ceiling) (ppm)	0.2 ppm

Barium nitrate (10022-31-8)		
ACGIH	ACGIH TWA (mg/m ³)	0.5 mg/m ³

diphenylamine (122-39-4)		
ACGIH	ACGIH TWA (mg/m ³)	10 mg/m ³
ACGIH	Remark (ACGIH)	Liver & kidney dam; hematologic eff

8.2. Exposure controls

Personal protective equipment

Avoid all unnecessary exposure. Safety glasses. Protective clothing.



Eye protection

Safety glasses.

Skin and body protection

When using setting tools, sufficient ear protection must be worn.

Other information

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Colour	According to product specification
Odour	There may be no odour warning properties, odour is subjective and inadequate to warn of overexposure. Mixture contains one or more component(s) which have the following odour(s): No data available on odour Pleasant odour Floral odour Odourless
Odour threshold	No data available
pH	No data available
Melting point	No data available
Freezing point	No data available
Boiling point	No data available
Flash point	No data available
Relative evaporation rate (butylacetate=1)	No data available
Flammability (solid, gas)	No data available
Explosive limits	No data available
Explosive properties	Fire or projection hazard.
Oxidising properties	No data available
Vapour pressure	No data available
Relative density	No data available
Relative vapour density at 20 °C	No data available
Solubility	No data available
Log Pow	No data available
Auto-ignition temperature	No data available

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Decomposition temperature	No data available
Viscosity	No data available
Viscosity, kinematic	No data available
Viscosity, dynamic	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures. Heat. Sparks. Open flame. Overheating.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide. Nitrogen oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity Not classified

glycerol trinitrate (55-63-0)	
ATE US (oral)	5.000 mg/kg bodyweight
ATE US (dermal)	5.000 mg/kg bodyweight
ATE US (dust,mist)	0.050 mg/l/4h
Barium nitrate (10022-31-8)	
LD50 oral rat	355 mg/kg (Rat)
ATE US (oral)	355.000 mg/kg bodyweight
lead styphnate (15245-44-0)	
ATE US (oral)	500.000 mg/kg bodyweight
ATE US (dust,mist)	1.500 mg/l/4h
diphenylamine (122-39-4)	
ATE US (oral)	100.000 mg/kg bodyweight
ATE US (dermal)	300.000 mg/kg bodyweight
ATE US (dust,mist)	0.500 mg/l/4h

Skin corrosion/irritation	Not classified
Serious eye damage/irritation	Not classified
Respiratory or skin sensitisation	Not classified

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Germ cell mutagenicity	Not classified
	Based on available data, the classification criteria are not met
Carcinogenicity	Not classified
Reproductive toxicity	Not classified
	Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not classified
Potential adverse human health effects and symptoms	Based on available data, the classification criteria are not met. No harmful effects are to be expected if used properly. The contained ingredients can be harmful, but they are hermetically enclosed in the article and can not be released. The dismantling of the article is prohibited.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	No harmful effects are to be expected if used properly. The contained ingredients can be harmful, but they are hermetically enclosed in the article and can not be released. The dismantling of the article is prohibited.
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glycerol trinitrate (55-63-0)	
LC50 fish 1	2.1 mg/l (96 h; Pimephales promelas)
EC50 Daphnia 1	25 mg/l (168 h; Daphnia magna)
LC50 fish 2	1.3 mg/l (96 h; Lepomis macrochirus)
ErC50 (algae)	0.4 mg/l
NOEC chronic fish	0.03 mg/l
Threshold limit algae 1	> 6.5 mg/l (Scenedesmus quadricauda)
Barium nitrate (10022-31-8)	
LC50 fish 1	1900 mg/l
LC50 other aquatic organisms 1	> 1000 mg/l (96 h)
Threshold limit other aquatic organisms 1	> 1000 mg/l (96 h)
lead styphnate (15245-44-0)	
EC50 Daphnia 1	7 mg/l
TLM fish 1	7.48 mg/l (96 h; Pimephales promelas; Lead ion)
Threshold limit algae 1	0.14 mg/l (Selenastrum capricornutum; Lead ion)
diphenylamine (122-39-4)	
LC50 fish 1	> 20 mg/l (48 h; Leuciscus idus)
EC50 Daphnia 1	2.3 mg/l (24 h; Daphnia magna)
LC50 fish 2	2.2 - 5.1 mg/l (48 h; Oryzias latipes)
ErC50 (algae)	0.36 mg/l
Threshold limit other aquatic organisms 1	1000 mg/l (24 h; Pseudomonas fluorescens)
Threshold limit algae 1	0.048 mg/l (72 h; Scenedesmus subspicatus; Inhibitory)
Tetrazen (109-27-3)	
EC50 Daphnia 1	0.14 mg/l

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12.2. Persistence and degradability

DX-Cartridge	
Persistence and degradability	Not established.
glycerol trinitrate (55-63-0)	
Persistence and degradability	Biodegradable in water.
Biochemical oxygen demand (BOD)	53.6 g O ₂ /g substance
Barium nitrate (10022-31-8)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable
diphenylamine (122-39-4)	
Persistence and degradability	Not readily biodegradable in water.
ThOD	2.39 g O ₂ /g substance

12.3. Bioaccumulative potential

DX-Cartridge	
Bioaccumulative potential	Not established.
glycerol trinitrate (55-63-0)	
Log Pow	1.62
Bioaccumulative potential	Low potential for bioaccumulation (Log Kow < 4).
Barium nitrate (10022-31-8)	
Bioaccumulative potential	Not bioaccumulative.
diphenylamine (122-39-4)	
BCF fish 1	51 - 253 (Cyprinus carpio; Test duration: 8 weeks)
Log Pow	3.22 - 3.50
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil

diphenylamine (122-39-4)	
Surface tension	0.03 N/m (60 °C)
Ecology - soil	May be harmful to plant growth, blooming and fruit formation.

12.5. Other adverse effects

Effect on the global warming	No known ecological damage caused by this product.
Other information	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	Dispose in a safe manner in accordance with local/national regulations. Refer to manufacturer/supplier for information on recovery/recycling.
Additional information	Hazardous waste due to potential risk of explosion.
Ecology - waste materials	Avoid release to the environment.





DX-Cartridge

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	RID
14.1. UN number			
0323	0323	0323	0323
14.2. UN proper shipping name			
CARTRIDGES, POWER DEVICE	CARTRIDGES, POWER DEVICE	Cartridges, power device	CARTRIDGES, POWER DEVICE
Transport document description			
UN 0323 CARTRIDGES, POWER DEVICE (1.4S), (E)	UN 0323 CARTRIDGES, POWER DEVICE, 1.4S		
14.3. Transport hazard class(es)			
1.4S	1.4S	1.4S	1.4S
			
14.4. Packing group			
Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards			
Dangerous for the environment : No	Dangerous for the environment : No Marine pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No
No supplementary information available			

14.6. Special precautions for user

- Overland transport

Special provisions (ADR)	347
Limited quantities (ADR)	0
Packing instructions (ADR)	P134, LP102
Mixed packing provisions (ADR)	MP23
Tunnel restriction code (ADR)	E

- Transport by sea

Special provisions (IMDG)	347
Limited quantities (IMDG)	0
Packing instructions (IMDG)	P134, LP102
EmS-No. (Fire)	F-B
EmS-No. (Spillage)	S-X
Stowage category (IMDG)	01
Stowage and segregation (IMDG)	Protected from sources of heat
MFAG-No	114

- Air transport

PCA packing instructions (IATA)	134
PCA max net quantity (IATA)	25kg
Special provisions (IATA)	A165

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- Rail transport

Special provisions (RID)	347
Limited quantities (RID)	0
Packing instructions (RID)	P134, LP102
Carriage prohibited (RID)	No

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

glycerol trinitrate	CAS No 55-63-0	3 - 10%
diphenylamine	CAS No 122-39-4	0 - 1%

glycerol trinitrate (55-63-0)

Subject to reporting requirements of United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb
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diphenylamine (122-39-4)

Subject to reporting requirements of United States SARA Section 313

EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.
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15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Expl. 1.4 H204

Full text of hazard classes and H-statements : see section 16

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date 01/28/2016

DX-Cartridge

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Full text of H-statements:

Acute Tox. 1 (Dermal)	Acute toxicity (dermal), Category 1
Acute Tox. 2 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 2
Acute Tox. 2 (Oral)	Acute toxicity (oral), Category 2
Acute Tox. 3 (Dermal)	Acute toxicity (dermal), Category 3
Acute Tox. 3 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 3
Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Acute Tox. 4 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment — Chronic Hazard, Category 2
Expl. 1.4	Explosives, Division 1.4
Eye Irrit. 2A	Serious eye damage/eye irritation, Category 2A
Repr. 1A	Reproductive toxicity, Category 1A
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
Unst. Expl	Explosives, Unstable explosives
H200	Unstable explosives
H204	Fire or projection hazard
H300	Fatal if swallowed
H301	Toxic if swallowed
H302	Harmful if swallowed
H310	Fatal in contact with skin
H311	Toxic in contact with skin
H319	Causes serious eye irritation
H330	Fatal if inhaled
H331	Toxic if inhaled
H332	Harmful if inhaled
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H411	Toxic to aquatic life with long lasting effects

SDS_US_Hilti

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

MSDS INFORMATION

Document No.: MSDSNXBURST01SB60



NXCO MINING TECHNOLOGIES (PTY) LTD

1. IDENTIFICATION

SUPPLIER (Manufacturer)

Company: NXCO Mining Technologies (Pty) Ltd
Address: P.O. Box 529
Broederstroom 0240
South Africa
Telephone +27 12 305 5237
Emergency Telephone +27 83 279 8695

DISTRIBUTOR IN CANADA

Company: Coogar Sales & Services
Address: 70 Sandford Fleming Drive, Unit #2
Collingwood, Ontario
Canada, L9Y 4V7
Telephone (705) 444-8892
Emergency Telephone (613) 996-6666 (CANUTEC)

PRODUCT DESIGNATION

Product Name: NXburst Safety Cartridge
UN. Number. 0432 Cartridge Power Device
Cartridge Sizes: All cartridges
Dangerous Goods Class: 1.4S
Subsidiary Risk: None
Poisons Schedule Number: None

MSDS INFORMATION

Document No.: MSDSNXBURST01SB60

USE

Rock / Concrete breaking and excavation

PERSONAL PROTECTIVE EQUIPMENT REQUIRED

None

PHYSICAL DESCRIPTION / PROPERTIES

APPEARANCE

Cylinder of various lengths 70mm to 460 mm and external diameter 12, 13, 28, 34 and 60 mm.

Each Cartridge contains between 2 to 500 grams of a 50/50 nitrocellulose propellant and ammonium nitrate mixture. (10034 = 100 gram mixture and 34 mm diameter)

PHYSICAL PROPERTIES

Boiling Point (°C):	Not Applicable
Melting Point (°C):	Not Applicable
Vapor Pressure (kPa):	Negligible
Freezing Point (°C):	Not Applicable
Specific Gravity of Propellant:	Approx-0.9
Flash Point:	Not Applicable
Lower Explosive Limit:	Not Applicable
Upper Explosive Limit:	Not Applicable
Solubility in Water ('Propellant,):	Immiscible

2. CHEMICAL SPECIFICATIONS

Table 1. Chemical Specification of Ammonium Nitrate.

Item		Quantity
Ammonium Nitrate	NHNO ₃	99,5%
pH	-	4.5 – 6.0
Moisture	H ₂ O	0,1% max
Chloride	Cl	50 ppm max
Copper	Cu	10 ppm max
Iron	Fe	50 ppm max
Loose bulk density	-	0.7 – 0.76 kg/l
C Absorption	-	7.5% min
Particle size	> 2.8 mm	3 % max
Distribution	< 1.0 mm	1 % max
Total organic material	C	0.2 %
UN Hazard classification	United Nations 1942 Oxidising Substance Class 5.1	

ppm = parts per million

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Table 2. Chemical Specification of Nitrocellulose Propellant.

	Characteristics	Specification Limits	Method	Classification of defects
1	Chemical properties		SLM 210	Minor
1.1	Nitrocellulose (Spec No. 06-7600-2020-075)	Remainder %		Minor
1.4	Dibutylphthalate (Spec No. 06-7600-2010-027)	3 to 6 %	**	Major
1.5	Diphenylamine (Spec No. 06-7600-2010-023)	0.8 % min, 1.4 % max	**	Minor
1.6	Calcium Carbonate (Spec No. 06-7600-2010-004)	0.5 % max	**	Minor
1.7	Potassium Nitrate (Spec No. 06-7600-2010-022)	0.4 to 1.0 %		Minor
1.8	Sodium Sulphate (Spec No. 06-7600-2010-075)	0.5 % max		Minor
1.9	Stannic Oxide (Addition optional) (Spec No. 06-7600-2010-077)	0.2 % max		Minor
1.10	Graphite (Spec No. 06-7600-2010-084)	0.1 to 0.4 %		Major
1.11	Water and volatile matter (2h at 100 °C)	0.75 to 1.25 %		Major
1.12	Dust and foreign matter	0.10 % max		Major
2	Methyl Violet stability at 120 °C			Major
2.1	Complete discolouration to salmon pink	Not within 45 min		
2.2	Emission of brown fumes	Not within 60 min		
2.3	Explosion	Not within 5 h		
3	Dimension of granules	Rolled	Unrolled	Minor
3.1	Smaller than 850 µm	97 % min	97 % min	
3.2	Between 850 and 400 µm	90 % min		
3.3	Smaller than 400 µm	7 % max		
3.4	Smaller than 355 µm	3 % max		
3.5	Between 850 and 355 µm		90 % max	
3.6	Smaller than 355 µm		7 % max	
3.7	Smaller than 212 µm		3 % max	
3.8	Voids and fissures	5 % max		Information only
4	Bulk Density	Reference to approximately 3 %		Minor
4.1	Approximate range	800 to 1000 g/dm ³	SPM 5.1	Minor

MSDS INFORMATION

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3. HEALTH HAZARD INFORMATION

3.1 HEALTH EFFECTS - CARTRIDGE STRUCTURE UNCOMPROMISED

ACUTE

SWALLOWED

No Risk - Humans unable to swallow cartridge.

EYE

No Risk - All irritating material is contained within the cartridge.

SKIN

No Risk - All irritating material is contained within the cartridge.

INHALED

No Risk - All irritating material is contained within the cartridge.

CHRONIC

No Risk apart from the explosive nature of the product

FIRST AID

All potentially hazardous substances are sealed within the cartridge and as such do not pose a risk to users.

3.2 HEALTH EFFECTS - CARTRIDGE STRUCTURE COMPROMISED

ACUTE

SWALLOWED

Propellant is toxic if swallowed.
Considered an unlikely route of entry in commercial / industrial environments.

EYE

Propellant may be irritating to the eyes.

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SKIN

Propellant may be irritating to the skin.
Repeated contact may lead to dermatitis.

INHALED

Dusty material may be irritating to the upper respiratory tract and lungs.
The decomposition vapors are extremely harmful to the upper respiratory tract and lungs.

CHRONIC

Principal routes of exposure are usually by skin contact and inhalation of dust.

The principal hazard is related to the potential of fire / explosion and associated physical injury.

As with any chemical, ingestion, inhalation and prolonged or repeated skin contact should be avoided by good occupational work practice.

Short-term exposure by all routes is considered to be practically non-harmful, apart from the explosive nature of the propellant.

FIRST AID

SWALLOWED

- DO NOT induce vomiting.
- Give water (or milk to rinse out mouth), then provide liquid slowly and as much as the casualty can comfortably drink. DO NOT give liquid to a person showing the signs of being sleepy or becoming unconscious.
- Transport to hospital or doctor without delay.

EYE

If the propellant comes into contact with the eyes:

- Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under the eyelids by occasionally lifting the upper and lower lids.
- Transport to hospital or doctor without delay.
- Skilled personnel should only undertake removal of contact lenses after an eye injury.

SKIN

If propellant comes into contact with the skin:

- Immediately remove all contaminated clothing, including footwear (after rinsing with water)
- Wash affected area thoroughly with water (and soap if available).

MSDS INFORMATION

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- Seek medical attention in the event of irritation.

INHALED

If fumes or combustion products are inhaled:

- Remove to fresh air.
- Lay patient down. Keep warm and rested.
- If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
- Transport to hospital or doctor.

ADVICE TO DOCTORS

Treat symptomatically and as for exposure to nitro compounds.

Delayed Pulmonary Edema may result following exposure to nitrous oxides formed on thermal decompositions.

4. SAFE HANDLING AND STORAGE

STORAGE REQUIREMENTS

- Store NXburst cartridge in original containers.
- Keep containers securely sealed until ready for use.
- No smoking, naked flames, heat or ignition source within 10 meters of storage location.
- Store NXburst cartridge in a well ventilated, secure store.
- Store in a cool dry place, do not store at temperatures above 65.5 °C (150 °F).
- Store in an area away from other materials.
- Protect NXburst cartridge Packaging against physical damage.
- Regularly check storage container and packaging.

STORAGE INCOMPATIBILITY

- Avoid storage with acids, alkalis and oxidizing / reducing agents.

FIRE / EXPLOSION HAZARD

In the event of a fire, clear area of personnel and move upwind. Propellants contained within the NXburst cartridge are extremely sensitive to heat and will burn with rapidly increasing intensity of fire.

Heating of cartridges may cause expansion or decomposition of the propellant leading to violent rupture of the cartridge housing. Heat affected cartridges remain hazardous.

Use only water to fight a nitrocellulose fire.

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Combustion / Decomposition produces toxic fumes of oxides and nitrogen (NO_x), carbon monoxide (CO) and carbon dioxide (CO₂) if burned unconfined.

MINOR SPILLS

In the event that propellant or black powder from a PCF cartridge should be spilt the following action should be taken:

- Clear up all spills immediately.
- Avoid breathing the powder / vapor and contact with the skin and eyes.
- Wear impervious gloves and safety glasses.
- Remove all ignition sources.
- Use spark free tools when handling propellant.
- Sweep into non-sparking containers or barrels and place under water.
- Place spilled material in a clean container for disposal. Mark the container properly.
- Flush the area with large amounts of water.

5. CONTACT POINTS

EMERGENCY CONTACTS – CANADA

COOGAR SALES & SERVICES

Telephone No.: (705) 444-8892
Emergency No: (705) 443-0962

EMERGENCY CONTACTS – SOUTH AFRICA

Police/Fire Brigade Dial 10111
Notify Police and Fire Brigade as to location, material, quantity, UN Number and Company contact.

NXCO Mining Technologies

Factory Telephone No.: +27 12 305 5237
Emergency Telephone No.: +27 83 279 8695

SAFETY DATA SHEET

DEXPAN (Non-Explosive Demolition Agent)



Section 1. Identification

GHS product identifier : DEXPAN (Non-Explosive Demolition Agent)
Product code : Not available.
Other means of identification : Expanding Cement.
Product type : Powder.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : For controlled demolition, reinforced concrete cutting, rock breaking, quarrying, stone dimension, mining, excavating...

Manufacturer : Archer Company USA, Inc.
2031 Appaloosa Dr.
Sunland Park, NM 88063
Tel: 575-528-5454
Fax: 575-528-5458
Toll Free: 866-272-4378

Distributor/Canada :

Emergency telephone number (with hours of operation) : +1-575-528-5454
(24/7)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

Hazard statements	: H318 - Causes serious eye damage. H315 - Causes skin irritation. H335 - May cause respiratory irritation.
Precautionary statements	
Prevention	: P280 - Wear protective gloves. Wear eye or face protection. P271 - Use only outdoors or in a well-ventilated area. P261 - Avoid breathing dust. P264 - Wash hands thoroughly after handling.
Response	: P304 + P340 + P312 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. P302 + P352 + P362+P364 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. P332 + P313 - If skin irritation occurs: Get medical attention. P305 + P351 + P338 + P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	: P405 - Store locked up.
Disposal	: P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
Hazards not otherwise classified	: Not applicable.

Section 3. Composition/information on ingredients

Substance/mixture	: Mixture
Other means of identification	: Expanding Cement.

Ingredient name	%	CAS number
Calcium dihydroxide	≥75 - ≤90	1305-62-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
Inhalation	: Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 4. First aid measures

- Skin contact** : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Eye contact** : Causes serious eye damage.
- Inhalation** : May cause respiratory irritation.
- Skin contact** : Causes skin irritation.
- Ingestion** : No known significant effects or critical hazards.

Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : Adverse symptoms may include the following:
respiratory tract irritation
coughing
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe dust. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Section 7. Handling and storage

- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Calcium dihydroxide	ACGIH TLV (United States, 3/2017). TWA: 5 mg/m ³ 8 hours. NIOSH REL (United States, 10/2016). TWA: 5 mg/m ³ 10 hours. OSHA PEL (United States, 6/2016). TWA: 5 mg/m ³ 8 hours. Form: Respirable fraction TWA: 15 mg/m ³ 8 hours. Form: Total dust

Canada

Occupational exposure limits

Ingredient name	Exposure limits
Calcium dihydroxide	CA Alberta Provincial (Canada, 4/2009). 8 hrs OEL: 5 mg/m ³ 8 hours. CA British Columbia Provincial (Canada, 7/2016). TWA: 5 mg/m ³ 8 hours. CA Ontario Provincial (Canada, 7/2015). TWA: 5 mg/m ³ 8 hours. CA Quebec Provincial (Canada, 1/2014). TWA _{AEV} : 5 mg/m ³ 8 hours. CA Saskatchewan Provincial (Canada, 7/2013). STEL: 10 mg/m ³ 15 minutes. TWA: 5 mg/m ³ 8 hours.

- Appropriate engineering controls** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

- Environmental exposure controls** : In some cases, dust collection, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

- Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Solid. [Powder.]
- Color** : Gray.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : 1000°C (1832°F)
- Boiling point** : Not available.
- Flash point** : Not available.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** : Not available.
- Relative density** : 3.2
- Solubility** : Very slightly soluble in the following materials: cold water.
- Partition coefficient: n-octanol/water** : Not available.
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : Not available.
- Viscosity** : Not available.
- Flow time (ISO 2431)** : Not available.

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : No specific data.
- Incompatible materials** : Reactive or incompatible with the following materials: moisture.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium dihydroxide	LD50 Oral	Rat	7340 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Calcium dihydroxide	Eyes - Severe irritant	Rabbit	-	10 mg	-

Sensitization

There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

There is no data available.

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Specific target organ toxicity (single exposure)

Name	Category	Target organs
Calcium dihydroxide	Category 3	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Section 11. Toxicological information

- Eye contact** : Causes serious eye damage.
Inhalation : May cause respiratory irritation.
Skin contact : Causes skin irritation.
Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : Adverse symptoms may include the following:
respiratory tract irritation
coughing
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

- General** : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.



Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Calcium dihydroxide	Acute LC50 33884.4 µg/L Fresh water	Fish - Clarias gariepinus - Fingerling	96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{oc}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.

AERG : Not applicable.



Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

Composition/information on ingredients

Name	Classification
Calcium dihydroxide	SKIN CORROSION/IRRITATION - Category 2 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

SARA 313

There is no data available.

State regulations

Massachusetts : The following components are listed: Calcium dihydroxide; Silica, vitreous; Diiron trioxide; Aluminium oxide

New York : None of the components are listed.

New Jersey : The following components are listed: Calcium dihydroxide; Silica, vitreous; Diiron trioxide; Aluminium oxide

Pennsylvania : The following components are listed: Calcium dihydroxide; Diiron trioxide; Aluminium oxide

California Prop. 65

No products were found.

Section 15. Regulatory information

Canada

Canadian lists

- Canadian NPRI** : None of the components are listed.
CEPA Toxic substances : None of the components are listed.
Canada inventory (DSL NDSL) : All components are listed or exempted.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method

History

- Date of issue mm/dd/yyyy** : 01/15/2018
Date of previous issue : 04/15/2015
Version : 6
Prepared by : KMK Regulatory Services Inc.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



WASHINGTON STATE
Joint Aquatic Resources Permit
Application (JARPA) [\[help\]](#)



AGENCY USE ONLY

Date received: _____

Agency reference #: _____

Tax Parcel #(s): _____

TO BE COMPLETED BY APPLICANT [\[help\]](#)

Project Name: _____

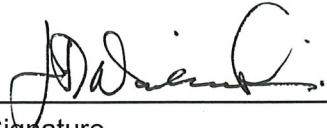
Location Name (if applicable): _____

Attachment A:
For additional property owner(s) [\[help\]](#)

Use this attachment only if you have more than one property owner. Complete one attachment for each additional property owner impacted by the project.

Signatures of property owners are not needed for repair or maintenance activities on existing rights-of-way or easements.

Use black or blue ink to enter answers in white spaces below.

1. Name (Last, First, Middle) and Organization (if applicable)			
Joel Walinski, City Administrator, City of Leavenworth, WA			
2. Mailing Address (Street or PO Box)			
Post Office Box 287			
3. City, State, Zip			
Leavenworth, WA 98826			
4. Phone (1)	5. Phone (2)	6. Fax	7. E-mail
(509) 548-5275		(509) 548-6429	jwalinski@cityofleavenworth.com
Address or tax parcel number of property you own:			
241 727 3200 50			
Signature of Property Owner			
I consent to the permitting agencies entering the property where the project is located to inspect the project site or any work. These inspections shall occur at reasonable times and, if practical, with prior notice to the landowner.			
Joel Walinski			
_____ Printed Name		_____ Signature	

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341. ORIA publication number: ORIA-16-012 rev. 10/2016



City of Leavenworth

700 Highway 2 / Post Office Box 287
Leavenworth, Washington 98826
(509) 548-5275 / Fax: (509) 548-6429
Web: www.cityofleavenworth.com

City Council
Cheryl K. Farivar - *Mayor*
Elmer Larsen
Carolyn Wilson - *Mayor Pro Tem*
Mia Bretz
Margaret Neighbors
Sharon Waters
Clint Strand
Jason Lundgren
Joel Walinski - *City Administrator*

October 22, 2018

Ms. Maggie Boles
Department of Community Development
316 Washington Street, Suite 301
Wenatchee, WA. 98801

Re: Icicle Creek Boulder Field Fish Habitat Improvement – Step-Pool Channel Construction and City of Leavenworth Water Line and Fish Screen Replacement

Ms. Boles:

The City of Leavenworth authorizes the relocation and replacement of the City's water line, fish screen, and pump house. Trout Unlimited is leading this effort and securing all permits and funding for this project. Washington Department of Fish and Wildlife is assisting with design services of the fish screen and screen house. The City fully appreciates the efforts of the entities working together on this project. Full approval of the project by the City will be after a review of final plans.

Please contact me directly if you have any questions regarding the City of Leavenworth's involvement in this effort. For other questions about the project, please contact the project sponsor, Aaron Penvose, at (509) 881-7689 or the project's authorized agent, Marnie Tyler at (360) 480-5518.

Sincerely,

Joel Walinski

Cc: Aaron Penvose, Trout Unlimited
Marnie Tyler, Ecolution, LLC



WASHINGTON STATE

Joint Aquatic Resources Permit Application (JARPA) Form^{1,2}

USE BLACK OR BLUE INK TO ENTER ANSWERS IN THE WHITE SPACES BELOW.



US Army Corps
of Engineers®
Seattle District

AGENCY USE ONLY

Date received: _____

Agency reference #: _____

Tax Parcel #(s): _____

Part 1–Project Identification

1. Project Name (A name for your project that you create. Examples: Smith’s Dock or Seabrook Lane Development) [\[help\]](#)

Icicle Creek Boulder Field Fish Habitat Improvement – Step-Pool Channel Construction and City of Leavenworth Water Line and Fish Screen Replacement

Part 2–Applicant

The person and/or organization responsible for the project. [\[help\]](#)

2a. Name (Last, First, Middle)

Aaron Penvose

2b. Organization (If applicable)

Trout Unlimited

2c. Mailing Address (Street or PO Box)

103 Palouse Street, Suite 13

2d. City, State, Zip

Wenatchee, WA 98801

2e. Phone (1)

509.881.7689

2f. Phone (2)

2g. Fax

2h. email

apenvose@tu.org

¹ Additional forms may be required for the following permits:

- If your project may qualify for Department of the Army authorization through a Regional General Permit (RGP), contact the U.S. Army Corps of Engineers for application information (206) 764-3495.
- If your project might affect species listed under the Endangered Species Act, you will need to fill out a Specific Project Information Form (SPIF) or prepare a Biological Evaluation. Forms can be found at <http://www.nws.usace.army.mil/Missions/CivilWorks/Regulatory/PermitGuidebook/EndangeredSpecies.aspx>.
- Not all cities and counties accept the JARPA for their local Shoreline permits. If you need a Shoreline permit, contact the appropriate city or county government to make sure they accept the JARPA.

²To access an online JARPA form with [\[help\]](#) screens, go to http://www.epermitting.wa.gov/site/alias__resourcecenter/jarpa_jarpa_form/9984/jarpa_form.aspx.

For other help, contact the Governor’s Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@ora.wa.gov.

Part 3—Authorized Agent or Contact

Person authorized to represent the applicant about the project. (Note: Authorized agent(s) must sign 11b of this application.) [\[help\]](#)

3a. Name (Last, First, Middle)			
Tyler, Marnie W.			
3b. Organization (If applicable)			
Ecolution, LLC			
3c. Mailing Address (Street or PO Box)			
1910 East 4 th Avenue, PMB 193			
3d. City, State, Zip			
Olympia, WA 98506			
3e. Phone (1)	3f. Phone (2)	3g. Fax	3h. E-mail
(360) 786-0174	(360) 480-5518	(360) 786-0174	marnie.tyler@ecolution.us.com

Part 4—Property Owner(s)

Contact information for people or organizations owning the property(ies) where the project will occur. Consider both **upland and aquatic** ownership because the upland owners may not own the adjacent aquatic land. [\[help\]](#)

- Same as applicant. (Skip to Part 5.)
- Repair or maintenance activities on existing rights-of-way or easements. (Skip to Part 5.)
- There are multiple upland property owners. Complete the section below and fill out [JARPA Attachment A](#) for each additional property owner.
- Your project is on Department of Natural Resources (DNR)-managed aquatic lands. If you don't know, contact the DNR at (360) 902-1100 to determine aquatic land ownership. If yes, complete [JARPA Attachment E](#) to apply for the Aquatic Use Authorization.

4a. Name (Last, First, Middle)			
Tony Jantzer			
4b. Organization (If applicable)			
Icicle-Peshastin Irrigation District			
4c. Mailing Address (Street or PO Box)			
PO BOX 371			
4d. City, State, Zip			
CASHMERE, WA 98815-0371			
4e. Phone (1)	4f. Phone (2)	4g. Fax	4h. E-mail
(509) 782.2651	()	(509) 433.4064	tony.iid.pid@nwi.net

Part 5–Project Location(s)

Identifying information about the property or properties where the project will occur. [\[help\]](#)

- There are multiple project locations (e.g. linear projects). Complete the section below and use [JARPA Attachment B](#) for each additional project location.

5a. Indicate the type of ownership of the property. (Check all that apply.) [help]			
<input checked="" type="checkbox"/> Private <input checked="" type="checkbox"/> Federal <input checked="" type="checkbox"/> Publicly owned (state, county, city, special districts like schools, ports, etc.) <input type="checkbox"/> Tribal <input type="checkbox"/> Department of Natural Resources (DNR) – managed aquatic lands (Complete JARPA Attachment E)			
5b. Street Address (Cannot be a PO Box. If there is no address, provide other location information in 5p.) [help]			
ICICLE CANYON RD; Icicle Creek river mile 5.5 above the confluence with the Wenatchee River			
5c. City, State, Zip (If the project is not in a city or town, provide the name of the nearest city or town.) [help]			
LEAVENWORTH, WA. 98826			
5d. County [help]			
CHELAN COUNTY			
5e. Provide the section, township, and range for the project location. [help]			
¼ Section	Section	Township	Range
	27, 28	24N	17E, WM
5f. Provide the latitude and longitude of the project location. [help]			
<ul style="list-style-type: none"> Example: 47.03922 N lat. / -122.89142 W long. (Use decimal degrees - NAD 83) 			
47.54436 N lat. / -120.71209 W long.			
5g. List the tax parcel number(s) for the project location. [help]			
<ul style="list-style-type: none"> The local county assessor’s office can provide this information. 			
Parcel # 241727311250	Property ID 29981 (Icicle-Peshastin Irrigation District)		
Parcel # 241727320050	Property ID 29985 (City of Leavenworth)		
Parcel # 241727320100	Property ID 29986 (US Forest Service)		
5h. Contact information for all adjoining property owners. (If you need more space, use JARPA Attachment C.) [help]			
Name	Mailing Address	Tax Parcel # (if known)	
United States of America	ICICLE RD, LEAVENWORTH, WA 98826	241728000000	
U S FOREST SERVICE	ICICLE RD, LEAVENWORTH, WA 98826	241733000050	
U S GOVERNMENT	ICICLE RD, LEAVENWORTH, WA 98826	241733000000	
United States of America	ICICLE RD, LEAVENWORTH, WA 98826	241734000000	
USDA FOREST SERVICE WNF	ICICLE RD, LEAVENWORTH, WA 98826	241727340050	
United States of America	ICICLE RD, LEAVENWORTH, WA 98826	241727000150	

5i. List all wetlands on or adjacent to the project location. [help]
None.
5j. List all waterbodies (other than wetlands) on or adjacent to the project location. [help]
Icicle Creek, LLID: 1206661475803
5k. Is any part of the project area within a 100-year floodplain? [help]
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
5l. Briefly describe the vegetation and habitat conditions on the property. [help]
The project area is Icicle Creek RM 5.6 to RM 6.0 and the left bank up to USFS Road 7600. The surrounding land is vegetated with dry forest supporting ponderosa pine, western larch, and Douglas-fir. Underbrush is thin. A gravel access road owned by the Icicle-Peshastin Irrigation District lies on a terrace directly below USFS Road 7600 (see site layout attached). Below this terrace, the rock slope down to Icicle Creek is quite steep. Slope fill material from the existing road encroaches into the Icicle Creek channel.
5m. Describe how the property is currently used. [help]
The gravel road below USFS Road 7600 is used by the Icicle-Peshastin Irrigation District to access and maintain irrigation equipment. The City of Leavenworth water supply pipeline is buried beneath the Icicle-Peshastin gravel access road. The surrounding forest lands and federal wilderness area are used for passive recreation.
5n. Describe how the adjacent properties are currently used. [help]
The project area is largely surrounded by the Okanogan-Wenatchee National Forest. Adjacent properties are used for outdoor recreation, primarily hiking and wilderness adventure. Some residential properties abut the eastern portions of the project area.
5o. Describe the structures (above and below ground) on the property, including their purpose(s) and current condition. [help]
A 16-inch steel waterline owned by the City of Leavenworth is located approximately 5 feet below the surface. One element of this project is to replace and relocate this waterline further away from Icicle Creek. A channel spanning weir and diversion access bridge owned by the Icicle-Peshastin Irrigation District is just upstream of the project area. A concrete valve house operated by the City of Leavenworth is adjacent to the access road. There are no other structures in the project area.
5p. Provide driving directions from the closest highway to the project location, and attach a map. [help]
From the town center of Leavenworth, WA, follow US Route 2 west towards 9 th Street, 0.8 mile, to the junction with Icicle Road. Proceed south on Icicle Road 4.3 miles (Note: Icicle Road becomes Icicle Creek Road before it becomes USFS 7600 Road). The gravel access road is on the south side of Icicle Creek Road and begins at the west end of the Snow Lakes Trailhead parking lot above the confluence of Snow Creek and Icicle Creek.

Part 6–Project Description

6a. Briefly summarize the overall project. You can provide more detail in 6b. [\[help\]](#)

This is a multi-phase fish passage and fish habitat improvement project. Several preliminary studies have been completed in earlier phases of work:

- 2013 Icicle Creek Fish Passage Assessment
- 2013 Geologic Assessment of the Icicle Creek Boulder Field Study Reach
- 2015 Leavenworth Waterline Assessment
- 2016 Fish Passage Alternatives Analysis and Design
- 2016 Geotech Assessment (Toth and Swanson)
- 2018 Geotech Assessment (Aspect Engineering)

Analysis, reports and drawings resulting from these studies can be found at the following link:

<https://1drv.ms/f/s!AvU38uOxQjXNgb81eL-ULgmeQo6LIQ>

In the current phase, the sponsor proposes to construct a step-pool channel to enhance fish passage to more than 50 miles of mainstem and tributary habitat in the upper reaches of Icicle Creek. In order to construct the step-pool channel, the City of Leavenworth water supply pipeline will need to be replaced and relocated. The City's new water line will incorporate a new fish screen and screen house as part of this project.

6b. Describe the purpose of the project and why you want or need to perform it. [\[help\]](#)

The overarching goal of the project is to improve fish passage for bull trout and steelhead at Icicle Creek river mile 5.6, locally known as the boulder falls, to enhance fish access to the wilderness headwaters. This will connect the lower reaches with over 50 miles of mainstem and tributary habitat for anadromous fishes and connect Upper Icicle Creek with the Wenatchee River Watershed. Icicle Creek is the major fish-bearing tributary to the Wenatchee River in WRIA 45. The project was originally identified by a 2013 Fish Passage Assessment. Fish passage at the boulder falls is identified as a priority by the 5-year status review (NOAA 2016), Upper Columbia Regional Technical Team (RTT 2013), and in the Draft Wenatchee Subbasin Plan (2004). Fish passage improvement at the boulder field has also been included in the Icicle Creek Working Group Master Scope of Work as contributing to the working group's objectives of improving fish passage and supporting tribal fisheries. The project has been reviewed and funded by the Salmon Recovery Funding Board, which implements a formal grant program established by the legislature for fish habitat enhancement and restoration.

Substantial work has been done in prior phases of work to scope and design alternative fish passage solutions. The preferred fish passage alternative, a step-pool channel, was selected by a group of local stakeholders and technical experts. At the boulder field, many different options to address fish passage were considered. The selection of the preferred alternative was a collaborative process described by Waterfall Engineering et al (2016). Waterfall Engineering, LLC drafted a final design, which is attached. The design process included detailed analyses of flow volume and velocity in the reach and the timing of bull trout and steelhead migration. A summary of the design parameters evaluated is included in Waterfall Engineering et al (2016).

In order to complete the boulder field fish habitat improvement element, it is essential to relocate a portion of the City of Leavenworth's water supply pipeline to make room for the step-pool channel. The City has agreed to the relocation in support of the fish passage improvement project. Rather than relocating the existing 16" steel pipeline, the City has opted to replace the pipeline located on the left bank of Icicle Creek between its water intake structure (RM 5.8) and the Snow Lakes Trailhead parking lot (RM 5.6). The City will take advantage of this opportunity to also replace the fish screen, as the existing screen will not meet current state and federal standards on completion of the fish passage improvement project. Replacing the screen will reduce fish mortality in Icicle Creek resulting from water diversions for the City's drinking water.

The step-pool channel at RM 5.6 is intended to improve fish passage without any impact to the water diversion for the Icicle-Peshastin Irrigation District and City of Leavenworth. Implementing the fish passage improvement project at RM 5.6 will not affect the flows at the water diversion upstream at RM 5.8. Passage at the step-pool channel optimally functions at a flow of approximately 80 cfs in Icicle Creek. It is understood that based on historic flows in the reach below the current irrigation and municipal withdrawals, the step-pool channel may not fully function in late July and August and September. Given the timing of fish migration in Icicle Creek, the step-pool channel is expected to most benefit steelhead and bull trout. Discussion with agency representatives indicates that adult steelhead migration peaks in March and April and bull trout migration peaks in July.

6c. Indicate the project category. (Check all that apply) [\[help\]](#)

- Commercial
 Residential
 Institutional
 Transportation
 Recreational
 Maintenance
 Environmental Improvement

6d. Indicate the major elements of your project. (Check all that apply) [\[help\]](#)

- | | | | |
|--|---|--|---|
| <input type="checkbox"/> Aquaculture | <input type="checkbox"/> Culvert | <input type="checkbox"/> Float | <input checked="" type="checkbox"/> Retaining Wall (upland) |
| <input type="checkbox"/> Bank Stabilization | <input type="checkbox"/> Dam / Weir | <input type="checkbox"/> Floating Home | <input checked="" type="checkbox"/> Road |
| <input type="checkbox"/> Boat House | <input type="checkbox"/> Dike / Levee / Jetty | <input type="checkbox"/> Geotechnical Survey | <input type="checkbox"/> Scientific Measurement Device |
| <input type="checkbox"/> Boat Launch | <input type="checkbox"/> Ditch | <input type="checkbox"/> Land Clearing | <input type="checkbox"/> Stairs |
| <input type="checkbox"/> Boat Lift | <input type="checkbox"/> Dock / Pier | <input type="checkbox"/> Marina / Moorage | <input type="checkbox"/> Stormwater facility |
| <input type="checkbox"/> Bridge | <input type="checkbox"/> Dredging | <input type="checkbox"/> Mining | <input type="checkbox"/> Swimming Pool |
| <input type="checkbox"/> Bulkhead | <input type="checkbox"/> Fence | <input type="checkbox"/> Outfall Structure | <input type="checkbox"/> Utility Line |
| <input type="checkbox"/> Buoy | <input type="checkbox"/> Ferry Terminal | <input type="checkbox"/> Piling/Dolphin | |
| <input checked="" type="checkbox"/> Channel Modification | <input type="checkbox"/> Fishway | <input type="checkbox"/> Raft | |

Other:

6e. Describe how you plan to construct each project element checked in 6d. Include specific construction methods and equipment to be used. [\[help\]](#)

- Identify where each element will occur in relation to the nearest waterbody.
- Indicate which activities are within the 100-year floodplain.

There are three construction components to this project: 1) Construct Boulder Field Fish Passage Improvement; 2) Replace and Relocate City of Leavenworth Water Supply Pipeline, and 3) Replace City of Leavenworth Fish Screen and Screen House.

1) Construct Boulder Field Fish Passage Improvement

Fish passage at the boulder field will be enhanced through a step-pool channel occupying 150 lineal feet of the left bank of the reach and some of the existing channel. The design parameters to facilitate passage for a minimum fish size of 14 inches will include drops in the step-pool channel of 4 to 5 feet. The minimum and maximum design flows to provide passage are 80 and 1,000 cfs. Pools on average will be a minimum of 8 feet deep at low flow. In addition to the left bank construction, boulders will be removed in three areas to improve flow to the step-pool channel and reduce turbulence at the downstream end of the step-pool at high flow. Boulders will also be placed in the gaps of existing boulders in order to raise the tailwater in the deep plunge pool below the falls. Additionally, at least 20 to 30 large boulders greater than 500 cubic feet in volume will need to be shaped with rock breaking techniques (Toth and Swanson 2016); 5 of these are located within or immediately adjacent to Icicle Creek. Typical step-pool geometry is detailed in the attached drawings, Sheet 15. Implementation of this design will include the following channel modifications, beginning at the upstream end of the project (see drawings, sheet 4):

- Increase flow into left side of split channel. To achieve this, Boulder 77 will be lowered two feet by removing approximately 5 cubic yards of rocks, which will be spoiled in the channel.
- Remove rock from left floodplain/road and create a 120-foot long step-pool channel. Approximately 3,800 cubic yards of rock will be excavated and hauled off site. The step-pool channel will have drops ranging from 3 to 5 feet with pools a minimum of 8 feet deep. The design flow range for the channel to provide fish passage is 80 to 800 cfs.
- Improve backwater and reduce turbulence to step-pool channel at the downstream end. To achieve this, Boulders 50, 51, and 28 will be removed (approximately 300 cubic yards). The notch at Boulder 29 will be plugged to create a drop and backwater.

A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation areas to lower elevation areas to maximize slope stability. Within the channel pools, the proposed slope of the excavation is 1:1; this is extended to 1.4:1 along the slope between the ordinary high water mark (OHWM) and the 20-year peak flood level. Above the 20-year peak flood level, the designs specify construction of a 1:4 rock wall to reduce the cut and to match a stable grade below Icicle Creek Road. The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed. Two assessments were conducted in prior phases of work to evaluate the most effective and least impactful approaches for breaking rocks that will be encountered in constructing the step-pool channel. Toth and Swanson (2016) identified three tools through these assessments for use in project construction: 1) hydraulic rock breaking hammers mounted on the end of an excavator arm (i.e. hoe rammer), 2) deflagrating low-velocity explosives (e.g., the Magnum Buster™, NxBurst, or similar non-detonating rock-breaking tool that utilizes propellant technology), and 3) expansive demolition grout. Magnum Buster is the only low-velocity explosive that will be allowed below OHWM, because this tool does not contain ammonium nitrate. In order to apply these tools, boulders may need to be excavated partially to have room for expansion. These techniques crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. Toth and Swanson (2016) describe these methods in detail and include photographs of the tools' application to boulders taken from the shoreline of Icicle Creek. Safety sheets for the compounds that may be used are attached. All instream work will occur between July 1 and October 15, as agreed upon during a November 1, 2018 teleconference call including NMFS, USFWS, USFS, WDFW, and WDOE. Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill.

Typical removal will occur using excavators with hydraulic breakers and buckets to scoop rock and load into trucks, and possibly cranes with clam shells and dump trucks to transport rock off site. Rock grouting may be required at the base of some rocks to maintain the desired pool depths. A coffer dam and silt curtain will be included as part of the dewatering and temporary sediment control measures (drawings, Sheets 4 and 17). Access and staging will largely occur from the IPID gravel access road upslope from the boulder field. The project team is working with the USFS to minimize impacts to forest visitors. USFS is aware that a portion of the USFS Road 7600 shoulder will be unavailable for parking during construction and a temporary closure of the Snow Lakes Trailhead parking lot will be necessary.

Construction of the boulder field step-pool channel will be done over two summers to allow for an adaptive management approach to flow control and pool turbulence. In the first year of construction, two to three months will be required to complete the rock breaking, excavating, loading, and hauling. Sand bag cofferdams will be placed in the channel to block flow and pumps will also be used in areas with seepage to lower the water. Pumped water if contaminated with sediment will be pumped to an upland site and allowed to infiltrate. Clean pumped water will be pumped downstream past the work area. In the lower part of the channel where the pools are deep and it will not be possible to dewater, a silt curtain will be installed to block any fine sediments from the construction. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance. The second year of construction will also include rock breaking, excavating, loading, and hauling, but for a duration of

two to three weeks to make relatively minor modifications based on how the channel has responded to the work completed in the first year of construction.

2) Replace City of Leavenworth Water Supply Pipeline

Constructing the Icicle Creek boulder field fish passage improvement will impact a portion of the City of Leavenworth's 16-inch steel water supply pipeline located on the left bank of Icicle Creek. In support of the fish passage project, the City of Leavenworth proposes to replace its water supply pipeline between its screen house (RM 5.7) and the western edge of the driveway to the Snow Lakes Trailhead parking lot. This will entail approximately 1,500 lineal feet. The 90% drawings are attached.

Full or partial replacement of the water main will entail the following work:

- Breaking of existing boulders within the pipe excavation boundary to a size manageable by tracked excavators and dump trucks. Breaking of the boulders would be by hydraulic rock breaking hammer mounted on a tracked excavator, or Magnum Buster™ method noted previously.
- Removal from the pipe excavation area of the broken boulders and native material to a stockpile location on-site near the screen structure, estimated total of approximately 1,800 CY of material, and cutting side slopes to approximate 1:1 slopes to allow excavation for pipe installation using tracked excavation equipment and dump trucks.
- Excavating pipe trench to install 16-inch ductile iron pipe, valves, fittings and appurtenances. Excavation to be approximately 7-foot depth, installing pipe and imported pipe bedding to 8-inches below and above pipe, and backfilling/compacting pipe trench with native material to result in installed pipe with generally 5-feet of earth cover using tracked excavation equipment and wheeled front loaders.
- Grading 12-foot wide access road generally centered over installed pipe along the length of the installed pipe between the screen structure and Snow Lakes Trailhead parking area and surfacing with imported crushed rock surfacing using tracked excavation equipment, wheeled loaders, dump trucks and drum rollers.
- Transfer broken boulders from temporary stockpile and machine place the broken angular boulders along the 1:1 cut slopes along the access road and pipe alignment to provide permanent slope stabilization and restoration using tracked excavation equipment, dump trucks and wheeled loaders.
- The work will include construction of a secondary access entrance to the construction site from the USFS road at the west end of the construction area near the existing screen structure. Secondary access entrance to be constructed from native materials and rocks excavated from the site for the pipeline installation work and imported crushed surfacing. Excavation, placing and compaction of the material by tracked excavation equipment, dump trucks, wheeled loaders and drum rollers.
- Excavation area, slopes and other disturbed areas to be restored using either imported crushed surfacing, hydro seeded with native grasses and/or plantings and trees.

3) Replace City of Leavenworth Fish Screen and Construct New Screen House

The City of Leavenworth intends to install a compliant fish screen for their municipal water supply intake when they relocate the water supply pipeline. The current screen will no longer meet state or federal criteria (WDFW 2009; NMFS 2011) for velocity, opening area, screen area, and lack of active cleaning on completion of the fish passage project. The City of Leavenworth seeks to reduce cost long-term by installing the screen at the same time they are upgrading their water supply pipeline. The current fish screen is located upstream at the diversion dam (RM 5.7). To facilitate all construction and future maintenance of City of Leavenworth infrastructure, a secondary access point to the site will be constructed. USFS has requested that this access point come off of Forest Road 7600 from the existing kiosk just upstream of the boulder falls.

6f. What are the anticipated start and end dates for project construction? (Month/Year) [help] <ul style="list-style-type: none"> If the project will be constructed in phases or stages, use JARPA Attachment D to list the start and end dates of each phase or stage.
Start date: <u>June 1, 2019</u> End date: <u>12/31/2023</u> <input checked="" type="checkbox"/> See JARPA Attachment D
6g. Fair market value of the project, including materials, labor, machine rentals, etc. [help]
\$2,000,000
6h. Will any portion of the project receive federal funding? [help] <ul style="list-style-type: none"> If yes, list each agency providing funds.
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know Salmon Recovery Funding Board

Part 7–Wetlands: Impacts and Mitigation

Check here if there are wetlands or wetland buffers on or adjacent to the project area.
(If there are none, skip to Part 8.) [\[help\]](#)

7a. Describe how the project has been designed to avoid and minimize adverse impacts to wetlands. [help]
<input checked="" type="checkbox"/> Not applicable
A field survey by a wetland biologist has confirmed that wetlands or buffers are not present on or adjacent to the project area.
7b. Will the project impact wetlands? [help]
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
7c. Will the project impact wetland buffers? [help]
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
7d. Has a wetland delineation report been prepared? [help] <ul style="list-style-type: none"> If Yes, submit the report, including data sheets, with the JARPA package.
<input type="checkbox"/> Yes <input type="checkbox"/> No
7e. Have the wetlands been rated using the Western Washington or Eastern Washington Wetland Rating System? [help] <ul style="list-style-type: none"> If Yes, submit the wetland rating forms and figures with the JARPA package.
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't know
7f. Have you prepared a mitigation plan to compensate for any adverse impacts to wetlands? [help] <ul style="list-style-type: none"> If Yes, submit the plan with the JARPA package and answer 7g. If No, or Not applicable, explain below why a mitigation plan should not be required.
<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable
7g. Summarize what the mitigation plan is meant to accomplish, and describe how a watershed approach was used to design the plan. [help]

7h. Use the table below to list the type and rating of each wetland impacted, the extent and duration of the impact, and the type and amount of mitigation proposed. Or if you are submitting a mitigation plan with a similar table, you can state (below) where we can find this information in the plan. [\[help\]](#)

Activity (fill, drain, excavate, flood, etc.)	Wetland Name ¹	Wetland type and rating category ²	Impact area (sq. ft. or Acres)	Duration of impact ³	Proposed mitigation type ⁴	Wetland mitigation area (sq. ft. or acres)

¹ If no official name for the wetland exists, create a unique name (such as "Wetland 1"). The name should be consistent with other project documents, such as a wetland delineation report.

² Ecology wetland category based on current Western Washington or Eastern Washington Wetland Rating System. Provide the wetland rating forms with the JARPA package.

³ Indicate the days, months or years the wetland will be measurably impacted by the activity. Enter "permanent" if applicable.

⁴ Creation (C), Re-establishment/Rehabilitation (R), Enhancement (E), Preservation (P), Mitigation Bank/In-lieu fee (B)

Page number(s) for similar information in the mitigation plan, if available.

7i. For all filling activities identified in 7h, describe the source and nature of the fill material, the amount in cubic yards that will be used, and how and where it will be placed into the wetland. [\[help\]](#)

7j. For all excavating activities identified in 7h, describe the excavation method, type and amount of material in cubic yards you will remove, and where the material will be disposed. [\[help\]](#)

Part 8–Waterbodies (other than wetlands): Impacts and Mitigation

In Part 8, "waterbodies" refers to non-wetland waterbodies. (See Part 7 for information related to wetlands.) [\[help\]](#)

Check here if there are waterbodies on or adjacent to the project area. (If there are none, skip to Part 9.)

8a. Describe how the project is designed to avoid and minimize adverse impacts to the aquatic environment. [\[help\]](#)

Not applicable

- Existing paved and gravel roads provide access to the site.
- A temporary erosion and sediment control plan including coffer dams and silt curtains will be in place to minimize turbid water inputs to Icicle Creek. Construction activities will be isolated from any flowing water and will be done during low flows, following the in-water work window agreed to by federal and state agencies. When pumps are used to lower the water, pumped water contaminated with sediment will be pumped to an upland site and allowed to infiltrate. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance.
- The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed.
- Disturbed soils will be seeded and mulched.
- Any spoils temporarily piled on site will be covered with plastic. The excavated areas will be backfilled and stabilized to pre-project conditions.

8b. Will your project impact a waterbody or the area around a waterbody? [\[help\]](#)

Yes No

8c. Have you prepared a mitigation plan to compensate for the project's adverse impacts to non-wetland waterbodies? [\[help\]](#)

- If **Yes**, submit the plan with the JARPA package and answer 8d.
- If **No, or Not applicable**, explain below why a mitigation plan should not be required.

Yes No Not applicable

The proposed work will result in a functional lift in habitat for steelhead and bull trout. Some of the excavated material to be removed is fill generated by the construction of Forest Road 7600. Negative impacts to water quality will be small in magnitude and short in duration.

8d. Summarize what the mitigation plan is meant to accomplish. Describe how a watershed approach was used to design the plan.

- If you already completed 7g you do not need to restate your answer here. [\[help\]](#)

8e. Summarize impact(s) to each waterbody in the table below. [\[help\]](#)

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name ¹	Impact location ²	Duration of impact ³	Amount of material (cubic yards) to be placed in or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Step-pool channel construction: Fill	Icicle Creek	In	Permanent	500 CY	150 LF ³
Step-pool channel grout: Fill	Icicle Creek	In	Permanent	20 CY	150 LF
Water main installation and access road: Fill	Icicle Creek	Adjacent	Permanent	1,800 CY	1,500 LF
Water main installation rock retaining wall: Fill	Icicle Creek	Adjacent	Permanent	180 CY	130 LF
Fish screen bypass: Fill	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.
Fish screen bypass: Fill	Icicle Creek	Adjacent	Permanent	235 CY	1,500 sq. ft.
Screen house: Fill	Icicle Creek	Adjacent	Permanent	1,950 CY	4,000 sq. ft.
2 nd Construction Access: Fill	Icicle Creek	Adjacent	Permanent	1,240 CY	3,200 sq. ft.
Step-pool channel construction: Excavation	Icicle Creek	Adjacent	Permanent	3,400 CY	150 LF

³ Note that the same area directly affected is often included for more than one entry, e.g., the 150 LF affected by fill from the step-pool channel is the same 150LF of stream affected by grout.

Step-pool channel construction: Excavation	Icicle Creek	In	Permanent	500 CY	150 LF
Water main installation: Excavation	Icicle Creek	Adjacent	Permanent	700 CY	1,500 LF
Fish screen bypass: Excavation	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.
Fish screen bypass: Excavation	Icicle Creek	Adjacent	Permanent	240 CY	1,500 sq. ft.
Screen house: Excavation	Icicle Creek	Adjacent	Permanent	2,200 CY	4,000 sq. ft.
TOTAL Fill	Icicle Creek	In		580 CY	
TOTAL Fill	Icicle Creek	Adjacent		5,405 CY	
TOTAL Excavation	Icicle Creek	In		560 CY	
TOTAL Excavation	Icicle Creek	Adjacent		6,540 CY	

¹ If no official name for the waterbody exists, create a unique name (such as "Stream 1") The name should be consistent with other documents provided.

² Indicate whether the impact will occur in or adjacent to the waterbody. If adjacent, provide the distance between the impact and the waterbody and indicate whether the impact will occur within the 100-year flood plain.

³ Indicate the days, months or years the waterbody will be measurably impacted by the work. Enter "permanent" if applicable.

8f. For all activities identified in 8e, describe the source and nature of the fill material, amount (in cubic yards) you will use, and how and where it will be placed into the waterbody. [\[help\]](#)

1) Boulder Field Fish Passage

The fill placed within the channel in this task will be native rock that has been excavated from the channel to modify flows. Implementation of this design will include the following channel modifications, beginning at the upstream end of the project (see drawings, sheet 4):

- Spoil approximately 5 cubic yards of native rocks in the channel, which will be excavated to lower Boulder 77 by two feet.
- Up to 20 CY of rock grouting may be required to fill voids at the base of some rocks in order to maintain the desired pool depths.
- Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill.

2) Replace City of Leavenworth Water Supply Pipeline

This work will occur adjacent to the waterbody, above the 100-year flood elevation. The length of disturbance will be up to 1,500 linear feet and will occur at a horizontal distance of approximately 50 feet from the waterbody. Activities involving fill include:

- Grading 12-foot wide access road generally centered over installed pipe along the length of the installed pipe between the screen structure and Snow Lakes Trailhead parking area and surfacing with imported crushed rock surfacing using tracked excavation equipment, wheeled loaders, dump trucks and drum rollers.
- A rock retaining wall will be constructed below the new access road to provide stability. The retaining wall will be constructed of approximately 180 CY of native rock materials which will be excavated in order to place the new water main.

3) Relocate and Replace the Fish Screen and Construct Screen House

All work is located on the river-left bank. Fill placed below OHWM to backfill the fish bypass chute for the fish screen will be sourced from native material excavated from the creek for the installation of the pipeline or roughened channel. The armor material on the bank will be oversize boulders from the excavation of the screen house, pipelines, or roughened channel.

Fill placed adjacent to the waterbody and above OHWM will be used as base material for the re-aligned IPID access road and the secondary access road entering the site from the west. The source for this road base material will be native materials and rocks excavated from the site for the pipeline installation work. A layer of crushed rock 4 inches deep (approximately 40 CY) from a commercial source will be placed and compacted on the road.

Concrete and debris associated with the demolition of the existing screen house will result in removal of approximately 200 CY, of which approximately 60 CY will be concrete.

8g. For all excavating or dredging activities identified in 8e, describe the method for excavating or dredging, type and amount of material you will remove, and where the material will be disposed. [\[help\]](#)

1) Boulder Field Fish Passage

A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation areas to lower elevation areas to maximize slope stability. The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed. Two assessments were conducted in prior phases of work to evaluate the most effective and least impactful approaches for breaking rocks that will be encountered in constructing the step-pool channel. Toth and Swanson (2016) identified three tools through these assessments for use in project construction: 1) hydraulic rock breaking hammers mounted on the end of an

extractor arm (i.e. hoe rammer), 2) deflagrating low-velocity explosives (e.g., the Magnum Buster™, NxBurst, or similar non-detonating rock-breaking tool that utilizes propellant technology), and 3) expansive demolition grout. Magnum Buster is the only low-velocity explosive that will be allowed below OHWM, because this tool does not contain ammonium nitrate. In order to apply these tools, boulders may need to be excavated partially to have room for expansion. These techniques crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. Toth and Swanson (2016) describe these methods in detail and include photographs of the tools' application to boulders taken from the shoreline of Icicle Creek. Typical removal will occur using excavators with hydraulic breakers and buckets to scoop rock and load into trucks, and possibly cranes with clam shells and dump trucks to transport rock off site unless spoiled onsite as noted below; much of the native rock material will be spoiled in the channel. Rock grouting may be required at the base of some rocks to maintain the desired pool depths. Material excavated for removal per the designs will be taken off-site to an approved location. Specific excavation volumes are as follows:

- Approximately 3,400 CY of material will be excavated from the slope above the boulder field between OHWM and the approximate elevation of the 100-year flood (elevation 1,370') to make room for the 120-foot step-pool channel. The excavated material will be hauled off site.
- In the channel, Boulder 77 will be lowered two feet by removing approximately 5 cubic yards of rocks, which will be spoiled in the channel.
- Boulders 50, 51, and 28 will be removed (approximately 300 cubic yards). The notch at Boulder 29 will be plugged to create a drop and backwater.

2) Replace City of Leavenworth Water Supply Pipeline

Replacement of the water main will entail the following work involving excavation:

- Breaking of existing boulders within the pipe excavation boundary to a size manageable by tracked excavators and dump trucks. Breaking of the boulders would be by hydraulic rock breaking hammer mounted on a tracked excavator, or Magnum Buster™ method noted previously.
- Removal from the pipe excavation area of the broken boulders and native material to a stockpile location on-site near the screen structure. Estimated total of approximately 1,800 CY of material removed above the 100-year flood elevation (elevation 1,370'), and cutting side slopes to approximate 1:1 slopes to allow excavation for pipe installation using tracked excavation equipment and dump trucks.
- Excavating pipe trench to install 16-inch ductile iron pipe, valves, fittings and appurtenances. Excavation to be approximately 7-foot depth, installing pipe and imported pipe bedding to 8-inches below and above pipe, and backfilling/compacting pipe trench with native material to result in installed pipe with generally 5-feet of earth cover using tracked excavation equipment and wheeled front loaders.
- Transfer broken boulders from temporary stockpile and machine place the broken angular boulders along the 1:1 cut slopes areas along the access road and pipe alignment to provide permanent slope stabilization and restoration using tracked excavation equipment, dump trucks and wheeled loaders.
- The work will include construction of a second entrance to the construction site from the USFS road at the west end of the construction area near the existing screen structure. Second entrance to be constructed from native materials and rocks excavated from the site for the pipeline installation work. Excavation, placing and compaction of the material by tracked excavation equipment, dump trucks, wheeled loaders and drum rollers. Surfacing using imported crushed surfacing.
- Excavation area, slopes and other disturbed areas to be restored using either imported crushed surfacing, hydro seeded with native grasses and/or plantings and trees.

3) Relocate and Replace the Fish Screen and Construct New Screen House

Material will be excavated by hydraulic excavator whenever possible. When rock breaking is required, it will be done at the contractor's discretion by mechanical breaking with a hydraulic impactor, chemical expansion, or Magnum Buster™ as described above. The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed. Earth and rock will be moved via dump truck. It is probable that the majority of the material will be staged and re-used on site. If there is a surplus of material following the installation of the second access road, the material will be spoiled off site.

- a. Work tying into the existing water line will likely commence at the junction of the existing and proposed lines and work landward up out of OHWM. A hydraulic excavator and dump trucks are the anticipated heavy equipment to accomplish this work. 3,300 CY of native soil and rock will be removed and replaced. Imported crushed will be used to bed and surround the pipe. The proposed line is an 18-inch ductile iron pipe. Temporary spoils will be staged adjacent to the trench and/or near the proposed screen house location. Those spoils will then be used to backfill the excavation. 1H:1V side slopes and the use of trench boxes for safety and to reduce the amount of excavation are anticipated. The depth of excavation ranges from 4 to 17 feet in depth with an average of 13 feet. Disturbed material within OHWM will be topped with native streambed material from the excavation of the line and/or the roughened channel. Streambank material will be hydroseeded/seeded and mulched and planted. The majority of the upland disturbance will be within the footprint of the second access road and will be covered by fill and/or road surfacing (see drawings, sheet 3).
- b. Work for the bypass and sluice lines will occur in the direction of the contractor's discretion. A hydraulic excavator and dump trucks are the anticipated heavy equipment to accomplish this work. 300 CY native soil and rock will be removed and replaced in conjunction with the installation of these lines. The bypass and sluice lines are 12 and 18-inch PVC or HDPE respectively. Depth of installation ranges from 16 feet at the screen house to 5 feet burial depth at the stream bank. The pipes will be enveloped and bedded with crushed and after being backfilled with native material. 1H:1V side slopes and the use of trench boxes for safety and to reduce the amount of excavation are anticipated. Spoils will be staged in the vicinity of the proposed screen house. A portion of the upland disturbance will be within the footprint of the secondary access road and will be covered by road surfacing. A portion of the backfill at the bank will be armored to protect against erosion in conjunction with the existing screen house removal. The disturbed portion will be hydroseeded/seeded and mulched and planted.
- c. Removing the existing screen house concrete will occur from equipment operating with tracks on land. At the contractor's discretion, a hydraulic impactor or concrete saw may be used to reduce the building into manageable sized pieces. A hydraulic excavator and dump trucks are the anticipated heavy equipment to accomplish the majority of this work. 200 CY volume of building will be removed comprised of 60 CY of concrete rubble once broken down. Concrete will be disposed with a licensed facility or transfer station off-site. 140 CY boulders will be used to protect the bank from scour. The bank protection boulders will be native boulders sourced from the excavation of the pipelines and roughened channel. Constructed fill slopes will be 1.5-2H:1V and contoured to match existing native side slopes.
- d. The screen house will be excavated with excavators with assistance from rock breaking equipment as needed. 2,200 CY will be excavated and 1,950 CY of native backfill will be replaced. Concrete will be formed and poured on-site or precast elements will be used at the Contractor's discretion. Spoils will be incorporated in the access road fill construction and staged in that vicinity or along the route of the proposed pipeline. A crushed envelope will be placed and compacted around the concrete and then native material used for the remainder of the backfill. 1H:1V side slopes and the use of trench boxes for safety and to reduce the amount of excavation are anticipated. The depth of excavation is 16 feet. Disturbed soils outside the access road and building footprint will be hydroseeded/seeded and mulched and planted.
- e. The second access route will be constructed with 1,200 CY suitable native spoils from the pipeline, screen house, and roughened channel. It will be topped with a course of crushed rock sourced from a commercial operation. The work will be accomplished with hydraulic excavators, dump trucks, drum roller compactors, and other equipment the contractor selects. The outside of the fill may be treated with boulders or hydroseeded/seeded and mulched depending on the material surplus nearing the conclusion of the work. Constructed fill slopes will be 1.5H:1V. Fill heights range from a match at grade of 0 ft up to 20 ft where it meets the paved edge of Forest Road 7600.

Part 9—Additional Information

Any additional information you can provide helps the reviewer(s) understand your project. Complete as much of this section as you can. It is ok if you cannot answer a question.

9a. If you have already worked with any government agencies on this project, list them below. [help]			
Agency Name	Contact Name	Phone	Most Recent Date of Contact
Chelan County	Lilith Yanagimachi	509.667.6586	4/26/17
Chelan County	Maggie Boles	509.667.6586	1/30/19
Chelan County	Kirsten Larsen	509.667.6246	2/19/19
City of Leavenworth	Josh Walinski	509.548.5275	10/22/18
City of Leavenworth	Arnica Briody	509.548.5275	4/20/16
City of Leavenworth	Cheryl K. Farivar	509.548.5275	9/9/14
WDFW	Gary Bell	360.902.2412	1/22/15
WDFW	Carmen Andonaegui	509.754.4624	4/26/17
WDFW	Jeremy Cram	509.664.3148 x 16	1/22/15
WDFW	Amanda Barg	509.429.9285	11/1/18
WDNR	Cindy Preston	509.925.0969	5/3/18
WDOE	Andrea Jedel	509.454.4260	2/19/18
WDOE	Wendy Neet	509.575.2490	5/24/18
USFS	Kevin Smith	509.548.2585	2/1/19
USFWS	Robes Parish	509.548.2983	3/15/18
USFWS	Cynthia Raekes	509.665.3508 x2009	2/8/19
NOAA/NMFS	Justin Yeager	509.962.8911	2/8/19
USACE	Jess Jordan	206.316.3967	2/19/19
<p>9b. Are any of the wetlands or waterbodies identified in Part 7 or Part 8 of this JARPA on the Washington Department of Ecology's 303(d) List? [help]</p> <ul style="list-style-type: none"> • If Yes, list the parameter(s) below. • If you don't know, use Washington Department of Ecology's Water Quality Assessment tools at: http://www.ecy.wa.gov/programs/wq/303d/ <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p>			
This portion of Icicle Creek is on the 303d list for temperature (Listing #42827; a Category 4A stream reach).			

9c. What U.S. Geological Survey Hydrological Unit Code (HUC) is the project in? [help]

- Go to <http://cfpub.epa.gov/surf/locate/index.cfm> to help identify the HUC.

Wenatchee Watershed – 17020011

9d. What Water Resource Inventory Area Number (WRIA #) is the project in? [help]

- Go to <http://www.ecy.wa.gov/services/gis/maps/wria/wria.htm> to find the WRIA #.

WRIA #45 – Chelan

9e. Will the in-water construction work comply with the State of Washington water quality standards for turbidity? [help]

- Go to <http://www.ecy.wa.gov/programs/wq/swqs/criteria.html> for the standards.

Yes No Not applicable

9f. If the project is within the jurisdiction of the Shoreline Management Act, what is the local shoreline environment designation? [help]

- If you don't know, contact the local planning department.
- For more information, go to: http://www.ecy.wa.gov/programs/sea/sma/laws_rules/173-26/211_designations.html.

Rural Urban Natural Aquatic Conservancy Other

9g. What is the Washington Department of Natural Resources Water Type? [help]

- Go to http://www.dnr.wa.gov/BusinessPermits/Topics/ForestPracticesApplications/Pages/fp_watertyping.aspx for the Forest Practices Water Typing System.

Shoreline Fish Non-Fish Perennial Non-Fish Seasonal

9h. Will this project be designed to meet the Washington Department of Ecology's most current stormwater manual? [help]

- If No, provide the name of the manual your project is designed to meet.

Yes No

Name of manual: 2012 Stormwater Management Manual for Western Washington (SWMMWW)

9i. Does the project site have known contaminated sediment? [help]

- If Yes, please describe below.

Yes No

9j. If you know what the property was used for in the past, describe below. [help]

Historical use of the project site was explored in a 2013 study. A brief summary of prior use is described below; the full report can be found online: [Dominguez, L., P. Powers, E. S. Toth, and S. Blanton. 2013, Icicle Creek Boulder Field Fish Passage Assessment. Prepared for Trout Unlimited – Washington Water Project. Wenatchee, WA.](#)

The original Icicle Creek road was built in 1934. The surrounding Okanogan-Wenatchee National Forest was established in 1908. The earliest historical records include 1905 General Land Office surveys of township and section boundaries. The 1905 map shows a trail on the south side of Icicle Creek, but no other signs of human disturbance. In 1914 topographic profiles were surveyed along Icicle Creek just prior to construction of the irrigation infrastructure. Again, no sign of human disturbance is noted in the study area.

The road currently used to access the irrigation diversion is a portion of the original Icicle Creek Road. The current Forest Road 7600 was constructed during 1964 to 1966 along the same route as the old Icicle Creek Road, except in the study area where the new road was built just upslope from the old road. Portions of Icicle Creek were filled with blasted rock boulders during the 1960s construction.

9k. Has a cultural resource (archaeological) survey been performed on the project area? [\[help\]](#)

- **If Yes**, attach it to your JARPA package.

Yes No

Yes, a report is attached.

9l. Name each species listed under the federal Endangered Species Act that occurs in the vicinity of the project area or might be affected by the proposed work. [\[help\]](#)

The following salmonids are listed as threatened or endangered by NOAA National Marine Fisheries Service:

Upper Columbia River steelhead (*Oncorhynchus mykiss*); **Threatened**

Upper Columbia River spring-run Chinook (*Oncorhynchus tshawytscha*); **Endangered**

The US Fish and Wildlife Service identifies the following listed species in Chelan County:

Bull trout (*Salvelinus confluentus*) – Columbia River DPS; **Threatened**

Dolly Varden (*Salvelinus malma*); **Proposed-Threatened**

Canada lynx (*Lynx canadensis*); **Threatened**

Gray wolf (*Canis lupus*); **Endangered**

Grizzly bear (*Ursus arctos horribilis*); **Threatened**

Greater sage-grouse (*Centrocercus urophasianus*); **Candidate**

Marbled murrelet (*Brachyramphus marmoratus*); **Threatened**

Northern spotted owl (*Strix occidentalis caurina*); **Threatened**

Western Yellow-Billed Cuckoo (*Coccyzus americanus*); **Threatened**

Hackelia venusta (*showy stickseed*); **Endangered**

Wenatchee Mountains checkermallow (*Sidalcea oregana* var. *calva*); **Endangered**

Ute ladies' tresses (*Spiranthes diluvialis*); **Threatened**

Showy stickseed (*Hackelia venusta*); **Endangered**

Whitebark pine (*Pinus albicaulis*); **Candidate**

9m. Name each species or habitat on the Washington Department of Fish and Wildlife's Priority Habitats and Species List that might be affected by the proposed work. [help]

The following species and habitats are listed in WDFW's PHS database as potentially occurring within ½ mile of the project area. The species listing status, if listed, is included in bold. A conversation with WDFW's Gary Bell revealed that the agency has reviewed existing location data on the listed species identified below and does not expect project activities to impact any of the listed species. Except for in-water work windows, no restrictions are expected for the work from WDFW.

Species:

- Rainbow Trout (*Oncorhynchus mykiss*)
- Bull Trout (*Salvelinus malma*); **Federal: Threatened**
- Westslope Cutthroat (*Oncorhynchus clarki lewesi*)
- Mountain Goat (*Oreamnos americanus*)
- Golden eagle (*Aquila chrysaetos*); **State Candidate species**
- Grizzly bear (*Ursus arctos*); **Federal: Threatened; State: Endangered**
- Little brown myotis (*Myotis lucifugus*)
- Yuma myotis (*Myotis yumanensis*)
- Northern spotted owl (*Strix occidentalis*); **Federal: Threatened; State Endangered**

Habitats:

- Cave-rich areas

Part 10—SEPA Compliance and Permits

Use the resources and checklist below to identify the permits you are applying for.

- Online Project Questionnaire at [HTTP://apps.ecy.wa.gov/opas/](http://apps.ecy.wa.gov/opas/).
- Governor's Office for Regulatory Innovation and Assistance at (800) 917-0043 or help@ora.wa.gov.
- For a list of addresses to send your JARPA to, click on [agency addresses for completed JARPA](#).

10a. Compliance with the State Environmental Policy Act (SEPA). (Check all that apply.) [help]

- For more information about SEPA, go to www.ecy.wa.gov/programs/sea/sepa/e-review.html.

A copy of the SEPA determination or letter of exemption is included with this application.

A SEPA determination is pending with: Chelan County

I am applying for a Fish Habitat Enhancement Exemption. (Check the box below in 10b.) [help]

This project is exempt (choose type of exemption below).

Categorical Exemption. Under what section of the SEPA administrative code (WAC) is it exempt?

Other: _____

SEPA is pre-empted by federal law.

10b. Indicate the permits you are applying for. (Check all that apply.) [\[help\]](#)

LOCAL GOVERNMENT

Local Government Shoreline permits:

- Substantial Development Conditional Use Variance
 Shoreline Exemption Type (explain): _____

Other City/County permits:

- Floodplain Development Permit Critical Areas Ordinance

STATE GOVERNMENT

Washington Department of Fish and Wildlife:

- Hydraulic Project Approval (HPA) Fish Habitat Enhancement Exemption – [Attach Exemption Form](#)

Effective July 10, 2012, you must submit a check for \$150 to Washington Department of Fish and Wildlife, unless your project qualifies for an exemption or alternative payment method below. **Do not send cash.**

Check the appropriate boxes:

- \$150 check enclosed. Check # _____
Attach check made payable to Washington Department of Fish and Wildlife.
- Charge to billing account under agreement with WDFW. Agreement # _____
- My project is exempt from the application fee. (Check appropriate exemption)
- HPA processing is conducted by applicant-funded WDFW staff.
Agreement # _____
 - Mineral prospecting and mining.
 - Project occurs on farm and agricultural land.
(Attach a copy of current land use classification recorded with the county auditor, or other proof of current land use.)
 - Project is a modification of an existing HPA originally applied for, prior to July 10, 2012.
HPA # _____

Washington Department of Natural Resources:

- Aquatic Use Authorization
Complete [JARPA Attachment E](#) and submit a check for \$25 payable to the Washington Department of Natural Resources.
Do not send cash.

Washington Department of Ecology:

- Section 401 Water Quality Certification

FEDERAL GOVERNMENT

United States Department of the Army permits (U.S. Army Corps of Engineers):

- Section 404 (discharges into waters of the U.S.) Section 10 (work in navigable waters)

United States Coast Guard permits:

- Private Aids to Navigation (for non-bridge projects)

Part 11—Authorizing Signatures

Signatures are required before submitting the JARPA package. The JARPA package includes the JARPA form, project plans, photos, etc. [\[help\]](#)

11a. Applicant Signature (required) [\[help\]](#)

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities, and I agree to start work only after I have received all necessary permits.

I hereby authorize the agent named in Part 3 of this application to act on my behalf in matters related to this application. AP (initial)

By initialing here, I state that I have the authority to grant access to the property. I also give my consent to the permitting agencies entering the property where the project is located to inspect the project site or any work related to the project. AP (initial)

Aaron Penvose

Applicant Printed Name



Applicant Signature

8/23/18

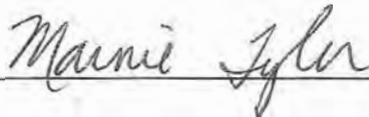
Date

11b. Authorized Agent Signature [\[help\]](#)

I certify that to the best of my knowledge and belief, the information provided in this application is true, complete, and accurate. I also certify that I have the authority to carry out the proposed activities and I agree to start work only after all necessary permits have been issued.

Marnie Tyler

Authorized Agent Printed Name



Authorized Agent Signature

8/28/18

Date

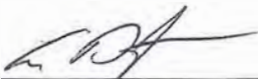
11c. Property Owner Signature (if not applicant) [\[help\]](#)

Not required if project is on existing rights-of-way or easements.

I consent to the permitting agencies entering the property where the project is located to inspect the project site or any work. These inspections shall occur at reasonable times and, if practical, with prior notice to the landowner.

Tony Jantzer- IPID Manager

Property Owner Printed Name



Property Owner Signature

Aug 23 2018

Date

18 U.S.C §1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious, or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than 5 years or both.

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341. ORIA publication number: ENV-019-09 rev. 08/2013



WASHINGTON STATE Joint Aquatic Resources Permit Application (JARPA) [\[help\]](#)



US Army Corps
of Engineers®
Seattle District

AGENCY USE ONLY

Date received: _____

Agency reference #: _____

Tax Parcel #(s): _____

TO BE COMPLETED BY APPLICANT [\[help\]](#)

Project Name: _____

Location Name (if applicable): _____

Attachment D: Construction sequence [\[help\]](#)

Use this attachment only if your project will be constructed in phases or stages. Complete the outline showing the construction sequence and timing of activities, including the start and end dates of each phase or stage.

Use black or blue ink to enter answers in white spaces below.

Phase or Stage	Start Date	End Date	Activity Description
1	4/1/19	7/15/19	<ul style="list-style-type: none"> a. City of Leavenworth (COL) Water Supply Pipeline Excavation on slope above OHWM. b. COL Screenhouse and Fish Screen: Excavation above OHWM. c. Finish grading, permanent surfacing, and landscape restoration above OHWM for water line, COL fish screen and boulder field elements
2	7/1/19	10/15/19	<ul style="list-style-type: none"> a. Water intake connection (below OHWM), will supply the COL fish screen and water supply pipeline. b. Boulder Field Fish Passage: step pool channel construction.
3	7/1/20	10/15/20	<ul style="list-style-type: none"> a. Boulder Field Fish Passage: modifications to step-pool channel, if needed.

NOTE: If permits are not in hand for 2019 construction, these dates will shift.

If you require this document in another format, contact the Governor's Office for Regulatory Innovation and Assistance (ORIA) at (800) 917-0043. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call (877) 833-6341. ORIA publication number: ORIA-16-015 rev. 10/2016

References

- Aspect Consulting. 2018. Geotechnical Conceptual Design Report. City of Leavenworth Water Line Replacement and Icicle Creek Fish Passage Project. Prepared for: Trout Unlimited. Project No. 170060. January 8, 2018. Final.
- Dominguez, L., P. Powers, E. S. Toth, and S. Blanton. 2013. Icicle Creek Boulder Field Fish Passage. Assessment. Prepared for Trout Unlimited-Washington Water Project. Wenatchee, WA.
- IntegriTech. 2015. Icicle Creek Boulder Field Fish Passage Design 13-1342. Task 4 - Waterline Assessment. City of Leavenworth's Gravity-Feed Intake Piping to the Water Treatment Plant. September 2015. Prepared for Waterfall Engineering/Trout Unlimited. 61 pp.
- Toth, E. S. 2013. Geologic Assessment of the Icicle Creek Boulder Field Study Reach. Technical Report to Trout Unlimited Washington Water Project, May 24, 2013.
- Toth, E.S. and T. Swanson. 2016. Geotechnical Assessment of the Icicle Creek Boulder Field Study Reach. Technical, SRFB Project #13-1342, October 14, 2016. Version 2.0. Prepared for the Trout Unlimited Washington Water Project. 46 pp.
- Waterfall Engineering, Toth Consulting, and IntegriTech. 2016. Icicle Creek Boulder Field Fish Passage Design, Basis of Design Report. SRFB Project #13-1342. October 15, 2016. Prepared for Trout Unlimited Washington Water Project. 50 pp.

State Vicinity Map



Overall Site Layout

- A. Existing diversion dam for Icicle-Peshastin Irrigation District/City of Leavenworth intakes
- B. General position of existing City of Leavenworth water supply pipeline (dashed blue line)
- C. Boulder Falls
- D. General position of existing IPID gravel access road (yellow line)
- E. Snow Lakes Trailhead Parking Lot
- F. Existing City of Leavenworth water treatment plant



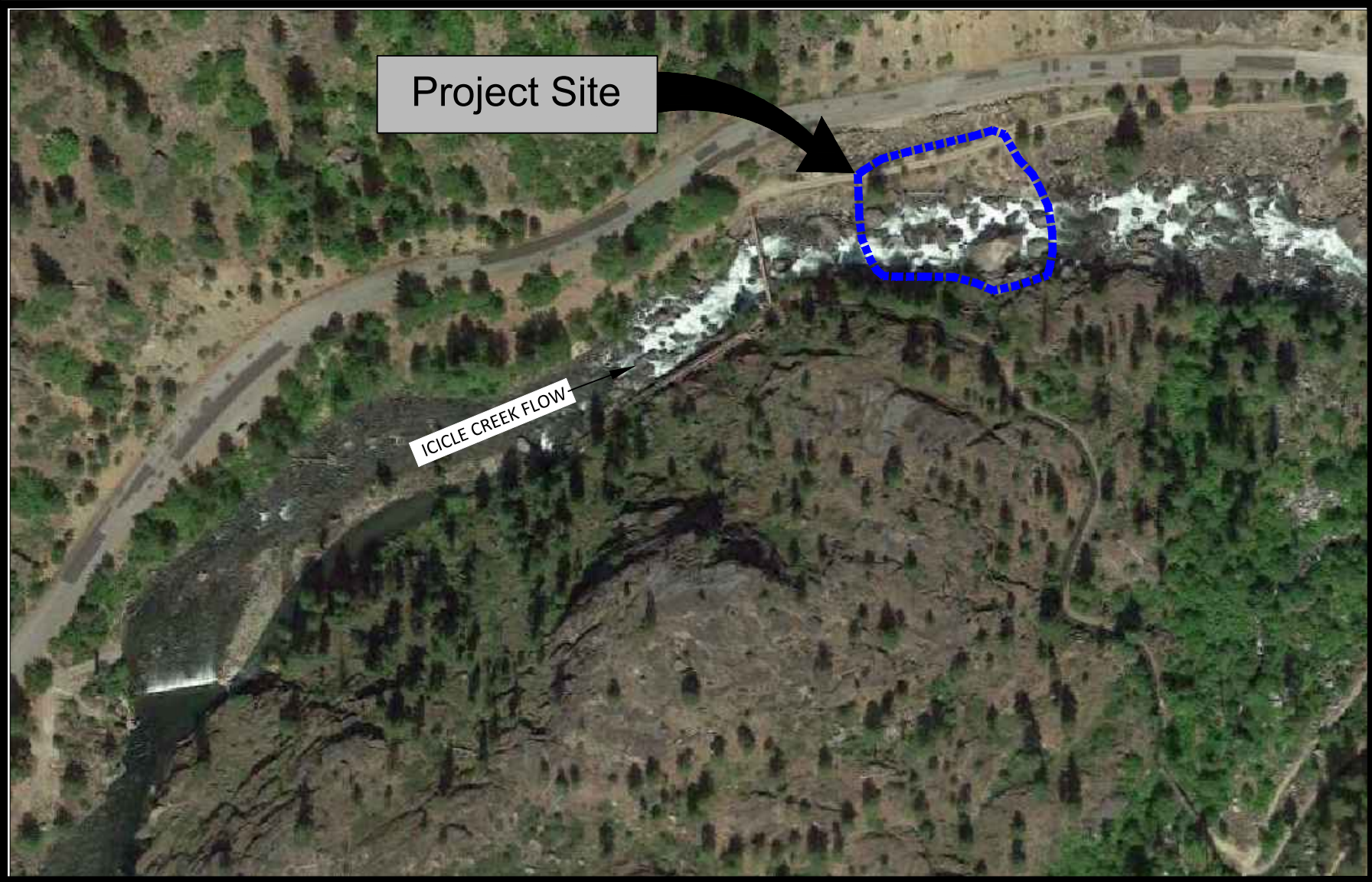
Construction Documents

Icicle Boulder Field Passage - Step Pool Channel

Project Number 15-1219

DRAWING INDEX:

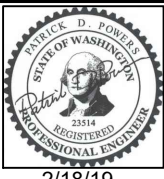
1. Cover Sheet
2. Legend/Survey Control
3. Existing Site Plan and Notes
4. Boulder ID
5. Proposed Site Plan/Construction Plan
6. Upper Site Plan
7. Lower Site Plan
8. Profile
9. Sections D and E
10. Sections F and G
11. Sections H and I
12. Sections J and K
13. Sections L and M
14. Sections N and O
15. Step Pool Channel Details
16. Rock Slope Details
17. Details



VICINITY MAP
Scale 1" = 200'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

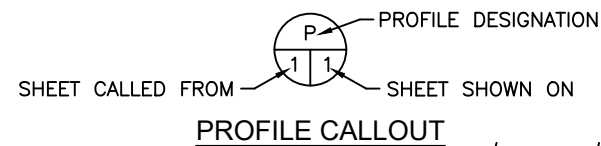
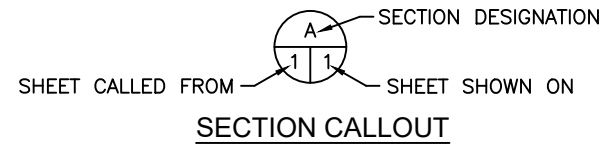
DRAWN BY:
RiverSide Drafting and Design

DATE:
2/18/19

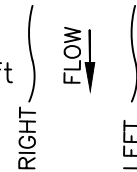
Cover Sheet

1 OF 17 SHEETS

SHEET SYMBOLS



References to Right and Left as viewed downstream



Datum: Horizontal – State Plane Coordinates
North Zone NAD 83 (2011)
Vertical NAVD 88 Based on GPS Static Observation.

Survey Control Points

Control Pt	NORTHING	EASTING	ELEVATION
WFE PT 4	198610.82	1670408.87	1382.43
WFE PT 3	198571.40	1670238.51	1390.02
WFE PT # 2	198531.01	1670021.64	1394.74
WFE PT #1	198411.10	1669795.83	1408.23
M2C PT # 105	198584.84	1669990.61	1417.34
M2C PT # 111	198623.00	1670224.93	1405.49
WFE PT # 5	198466.66	1670272.90	1373.14
WFE PT # 6	198452.98	1670244.93	1373.17
WFE PT # 7	198557.81	1670276.74	1388.87
WFE PT # 8	198559.58	1670197.42	1391.47

Step Pool Channel Layout Control Points to be Provided by Engineer Before Construction

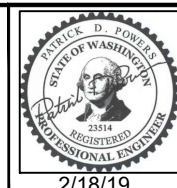
Control Pt	NORTHING	EASTING	ELEVATION
Step 1			
Left			
Right			
Pool 1			
Left			
Center			
Right			
Step 2			
Left			
Right			
Pool 2			
Left			
Center			
Right			
Step 3			
Left			
Right			
Pool 3			
Left			
Center			
Right			
Step 4			
Left			
Right			
Pool 4			
Pool			
Left			
Center			
Right			

LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- CENTERLINE
- EXISTING FENCE
- BUILDING LINE
- INDEX CONTOUR LINE
- UNDERGROUND POWER
- EXISTING WATER LINE
- SURVEY POINT
-
- PROJECT BENCH MARK
- BORING LOCATIONS
- SANDBAGS
- NOTE CALLOUT
- STATION CALLOUT
- PHOTO CALLOUT
- FOUND SURVEY MONUMENT
- SET CONTROL POINT
- POWER POLE
- MANHOLE
- UTILITY CABINET
- LIGHT POST
- TREE
- WATER VALVE
- Existing Boulders to Remain
- Boulders to be Removed
- Boulders to be Placed
- UNDISTURBED GRADE
- WETLAND DELINEATION
- DEMO
- ELEVATION MARKER
- TREE TO BE REMOVED
- TREE TO REMAIN



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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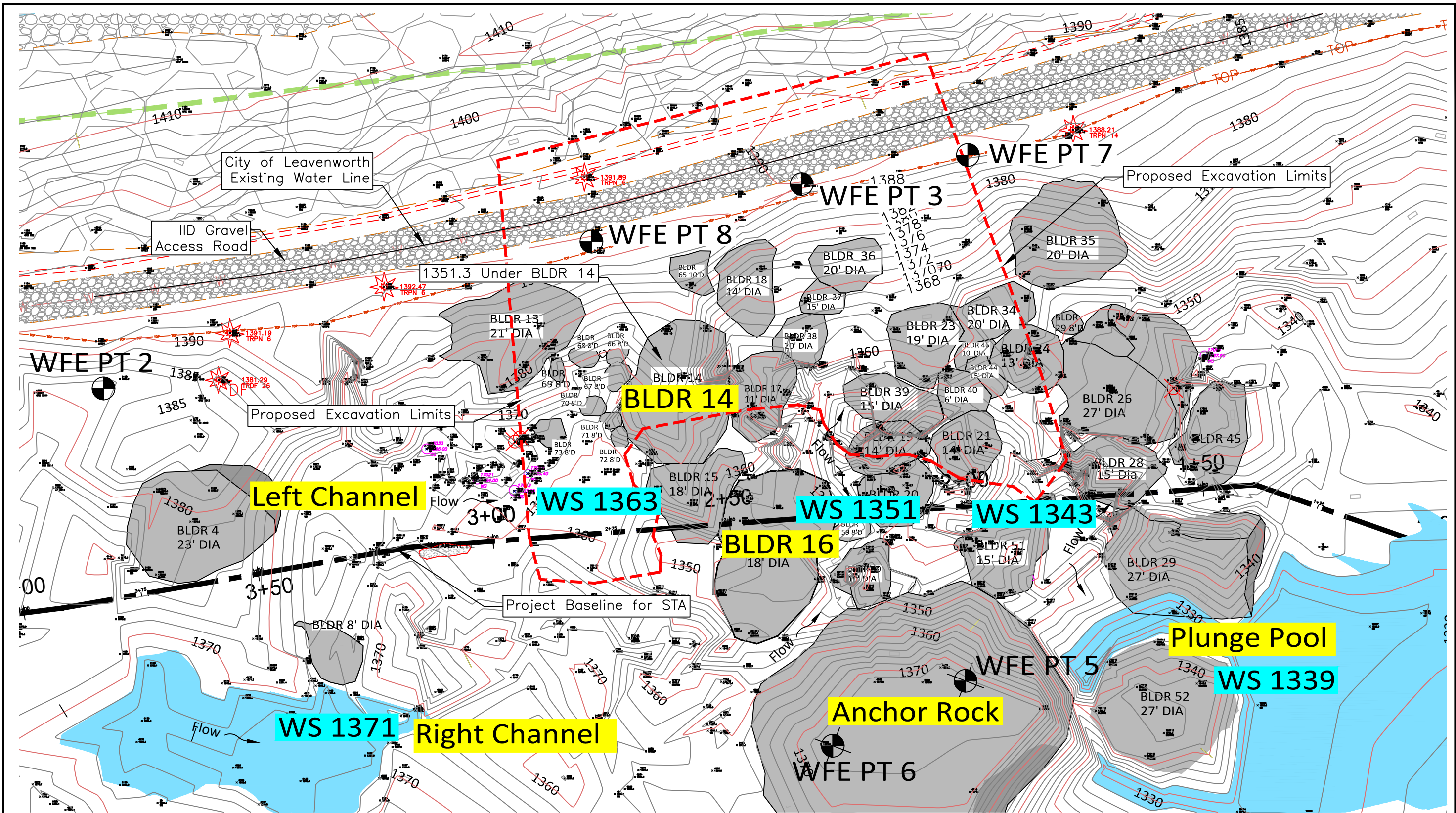
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DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting and Design

DATE:
2/18/19

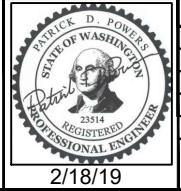
Legend and Notes



Site Plan - Existing (650 cfs Aerial)
 SCALE: 1" = 20'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

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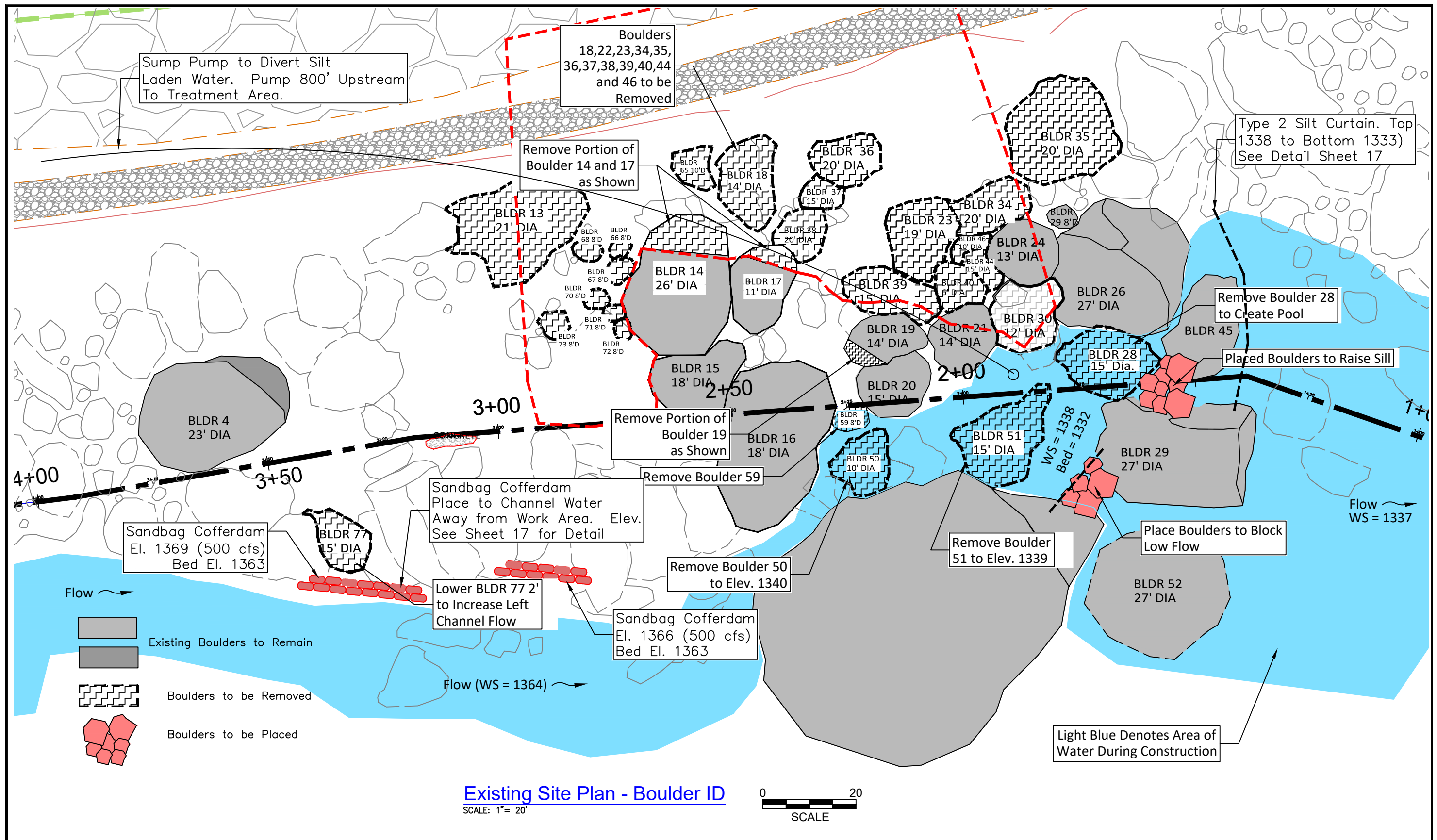
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
2/18/19

Site Plan - Existing



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

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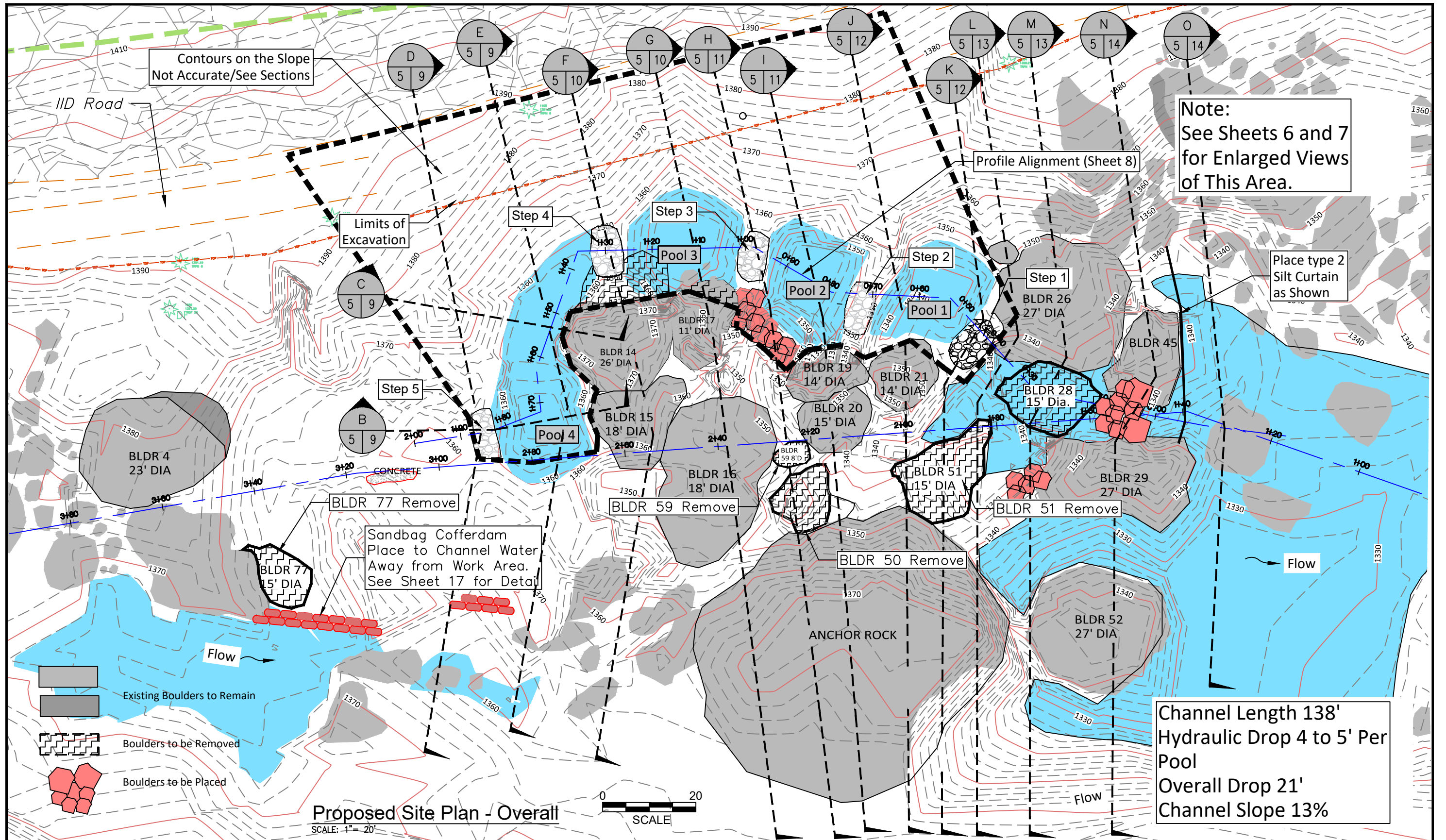
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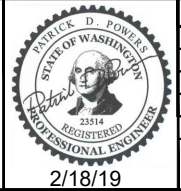
DRAWN BY:
RiverSide Drafting

DATE:
2/18/19

Boulder ID Sheet Water Management Plan



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: 1" = 20'

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

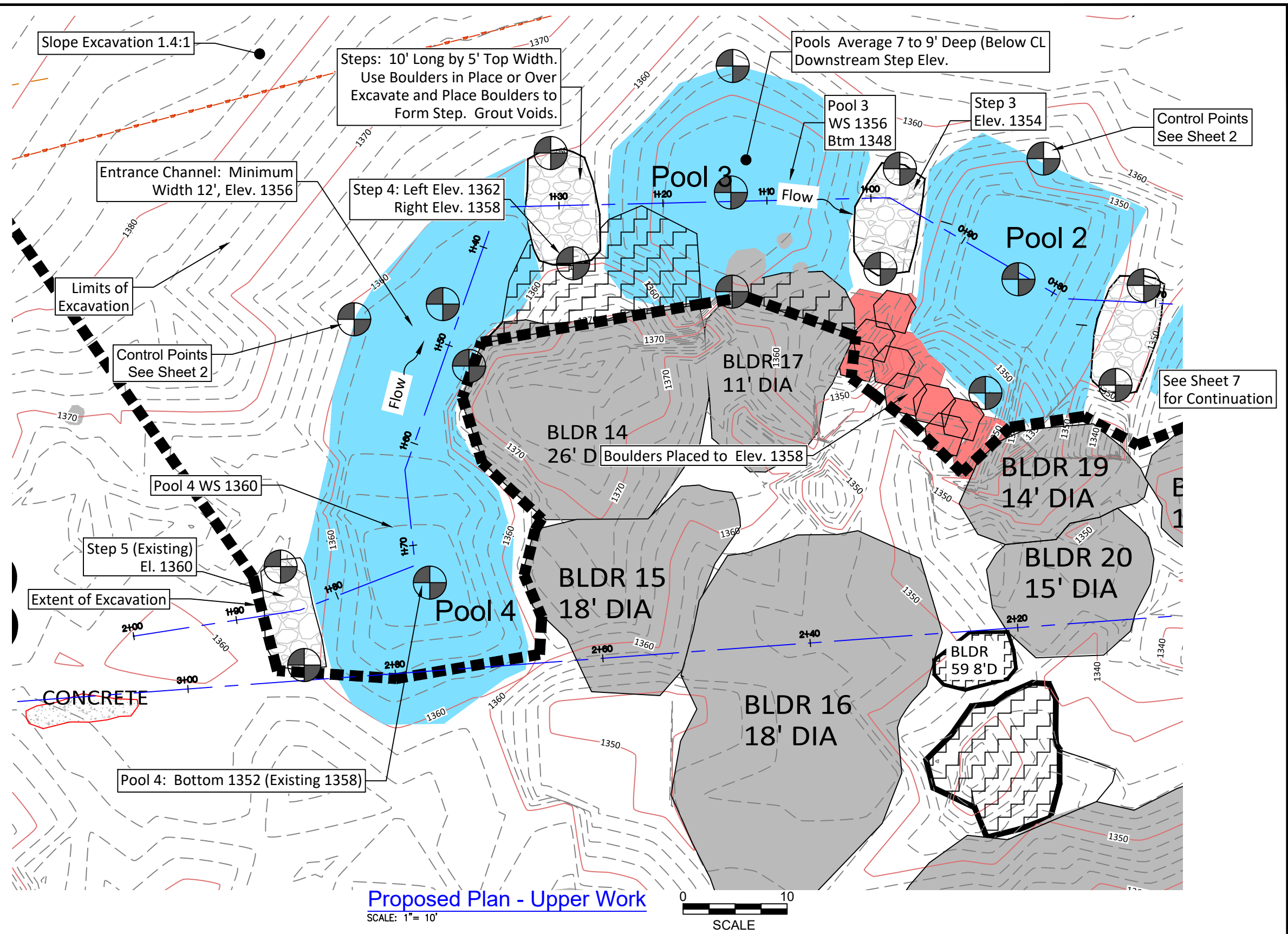
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DRAWN BY:
RiverSide Drafting

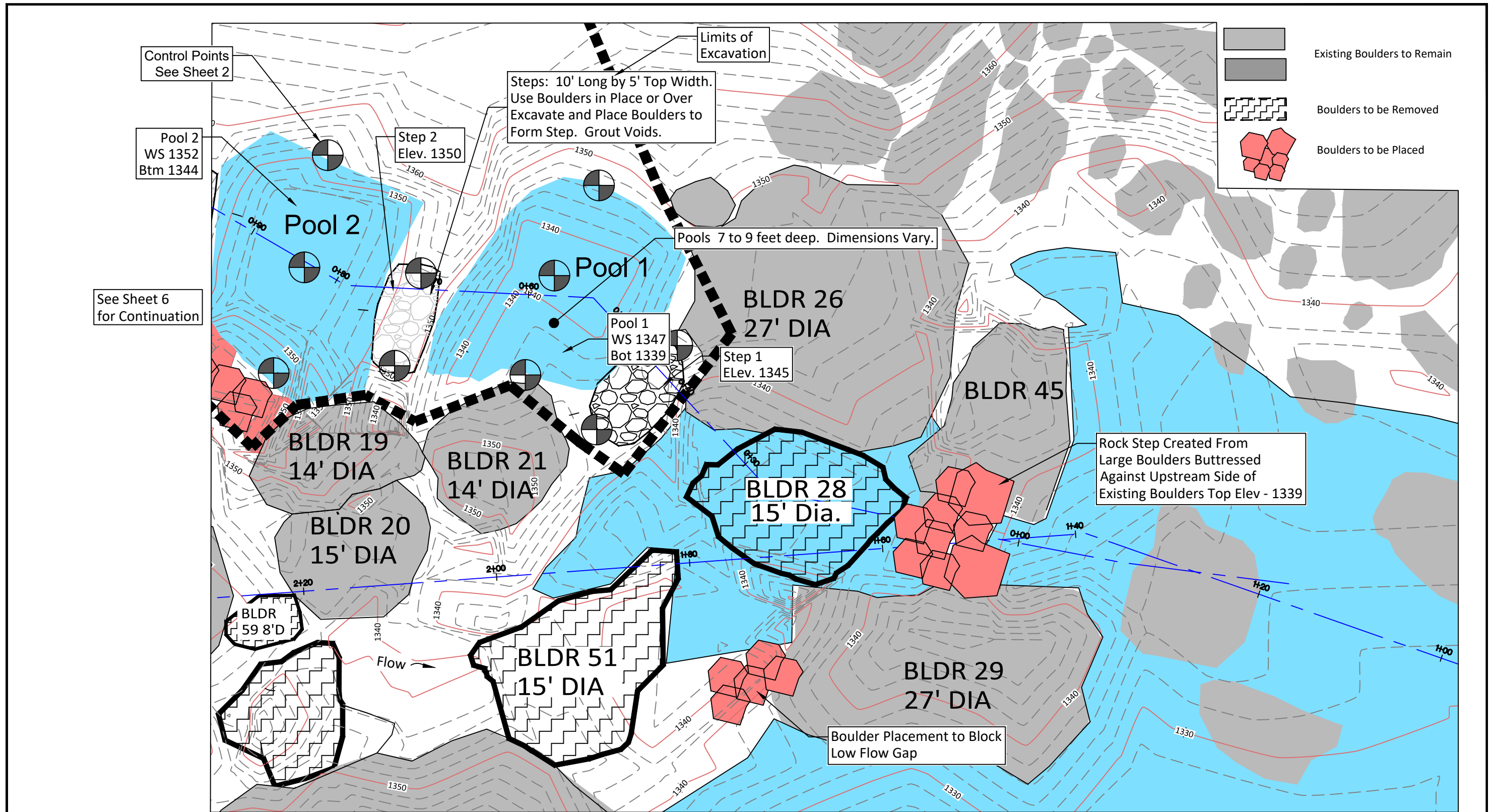
DATE:
03/03/2018

Proposed Site Plan
Overall

5 **17**
SHEET OF



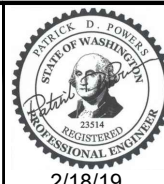
	<h1>Icicle Boulder Field Passage</h1>		<table border="1"> <thead> <tr> <th>REV</th> <th>DATE</th> <th>BY</th> <th>APPD</th> <th>DESCRIPTION</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	REV	DATE	BY	APPD	DESCRIPTION						DESIGN BY: Waterfall Engineering DRAWN BY: RiverSide Drafting DATE: 03/03/2018	<h2>Proposed Plan Upper Work</h2>	6 17 SHEET OF
			REV	DATE	BY	APPD	DESCRIPTION									
2/18/19 <small>BAR IS ONE INCH ON ORIGINAL DRAWING.</small>	<small>IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.</small>															



Proposed Plan - Lower Work
SCALE: 1" = 10'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

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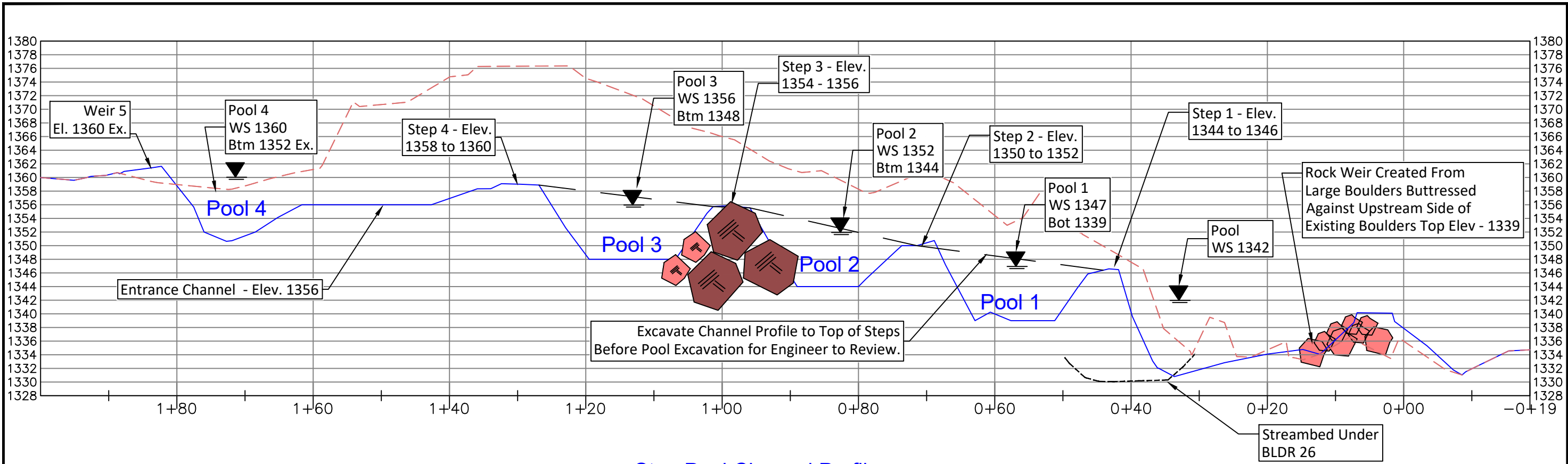
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
2/15/19

Proposed Plan Lower Work

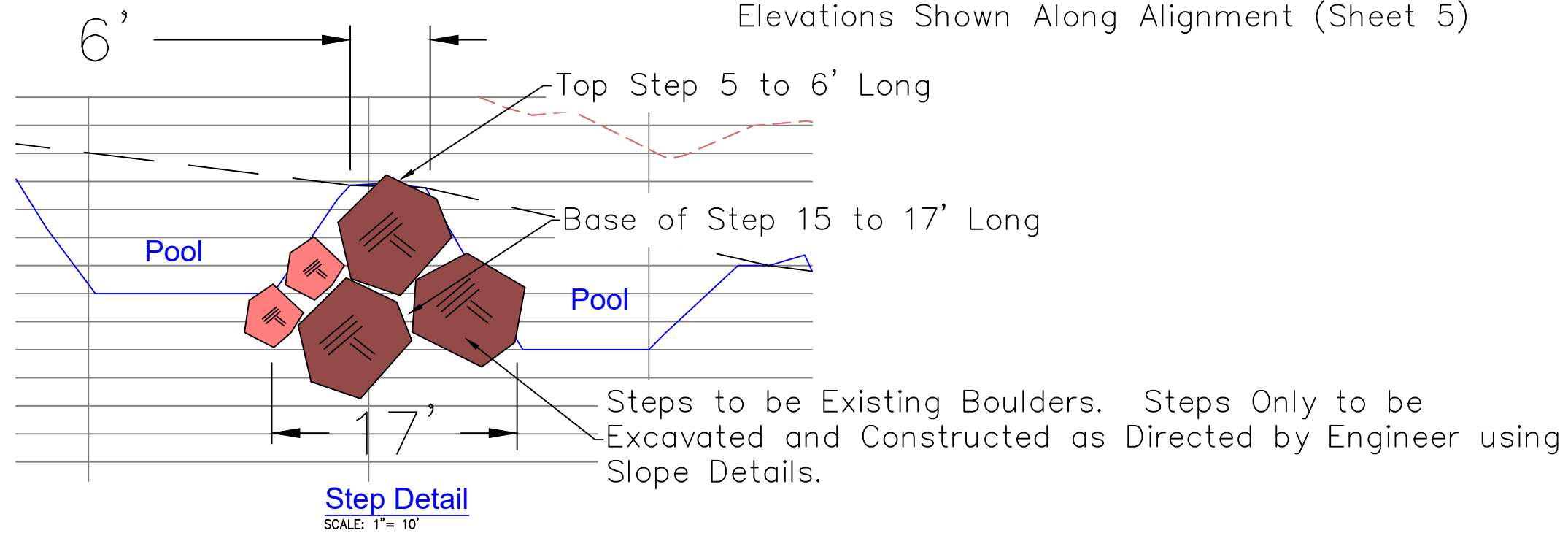
7 **17**
SHEET OF



Step Pool Channel Profile

SCALE: 1" = 15'

Elevations Shown Along Alignment (Sheet 5)

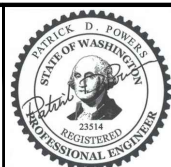


Step Detail

SCALE: 1" = 10'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

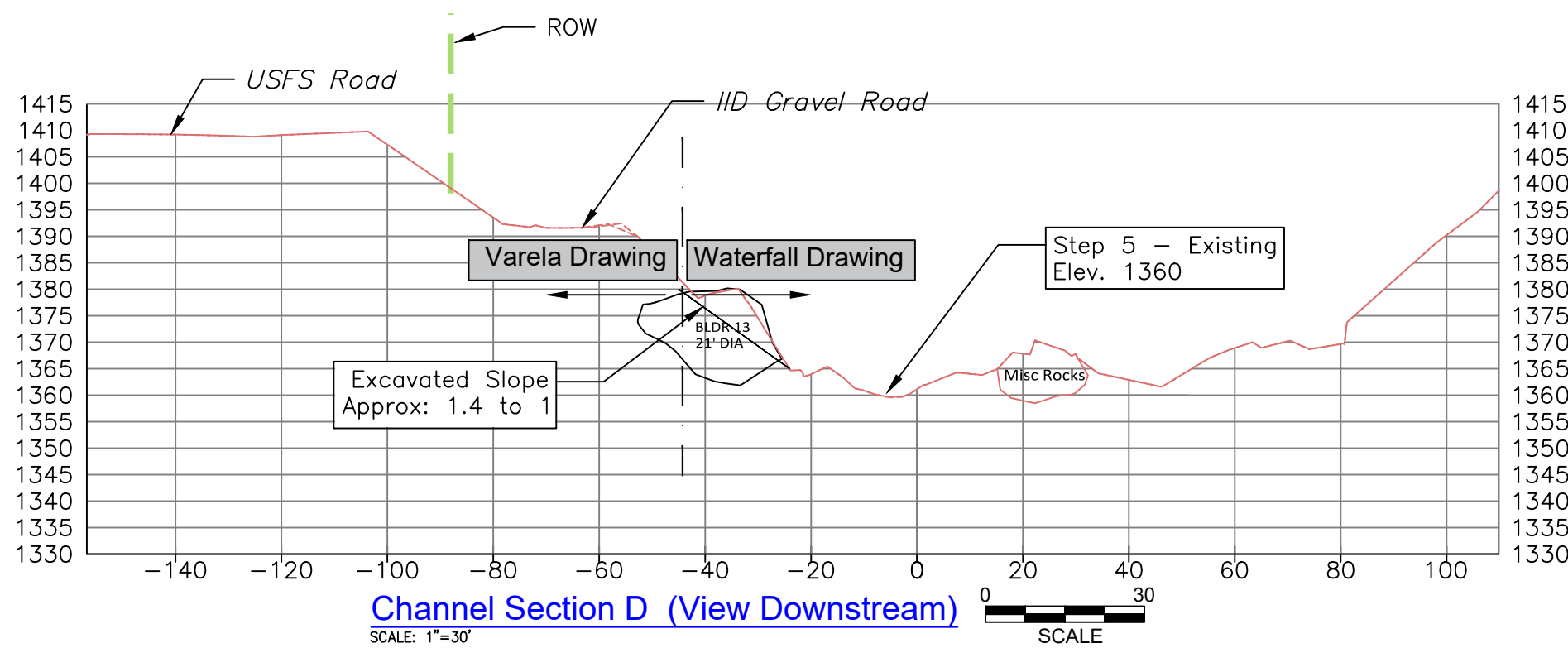
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

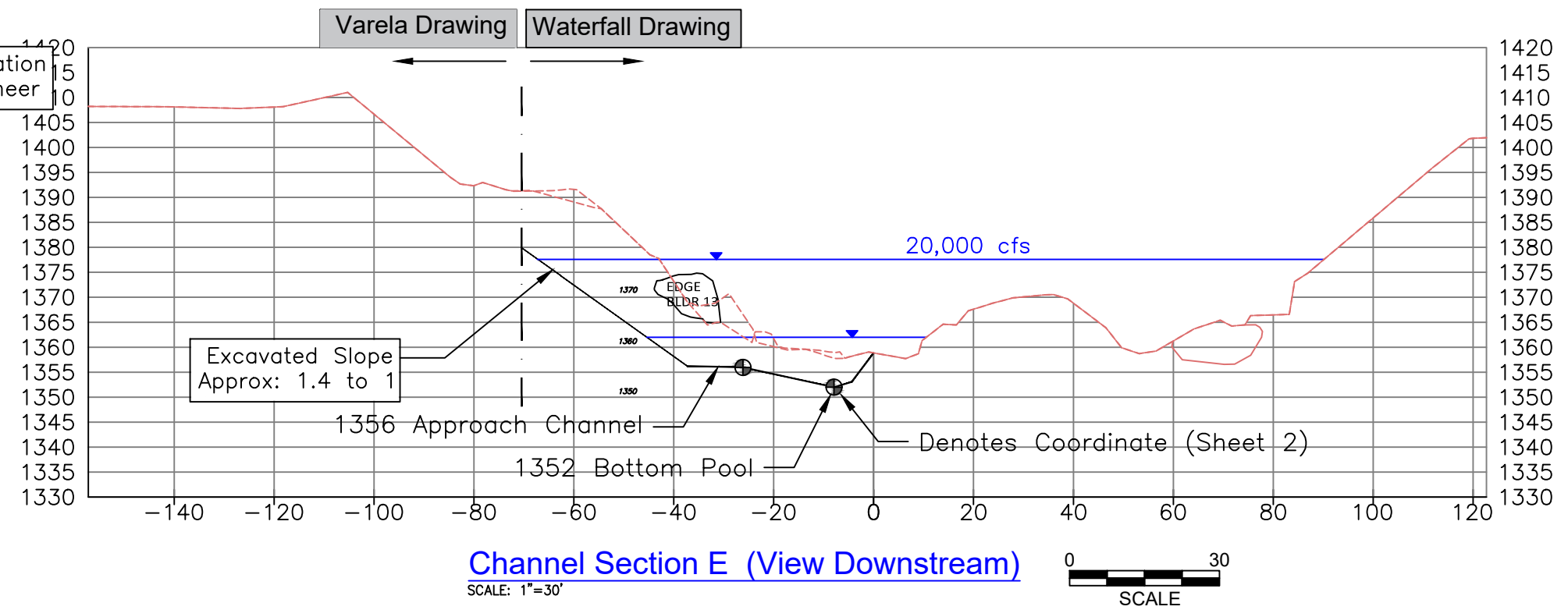
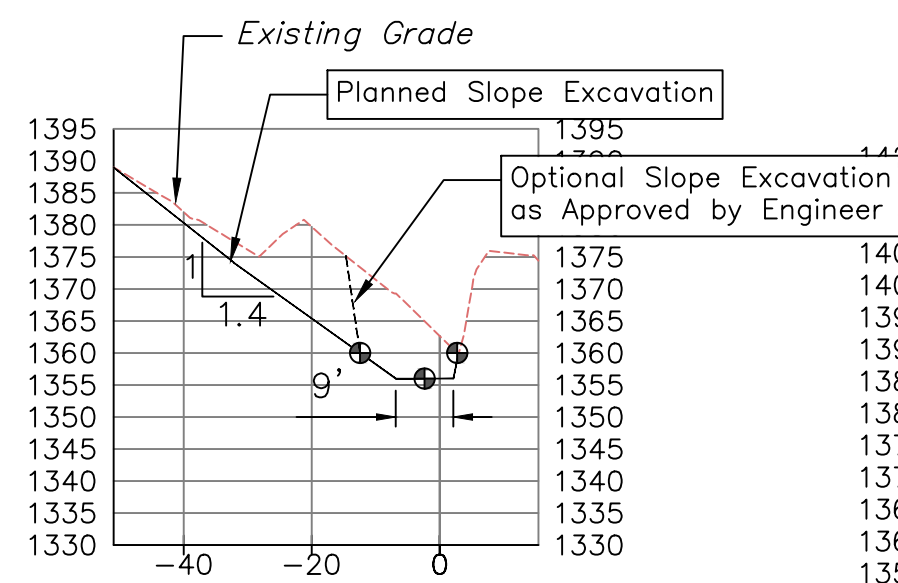
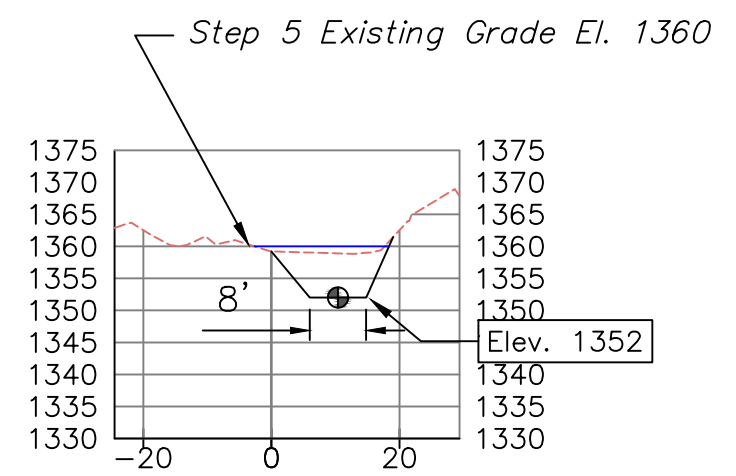
DATE:
2/15/19

Step Pool Channel Profile

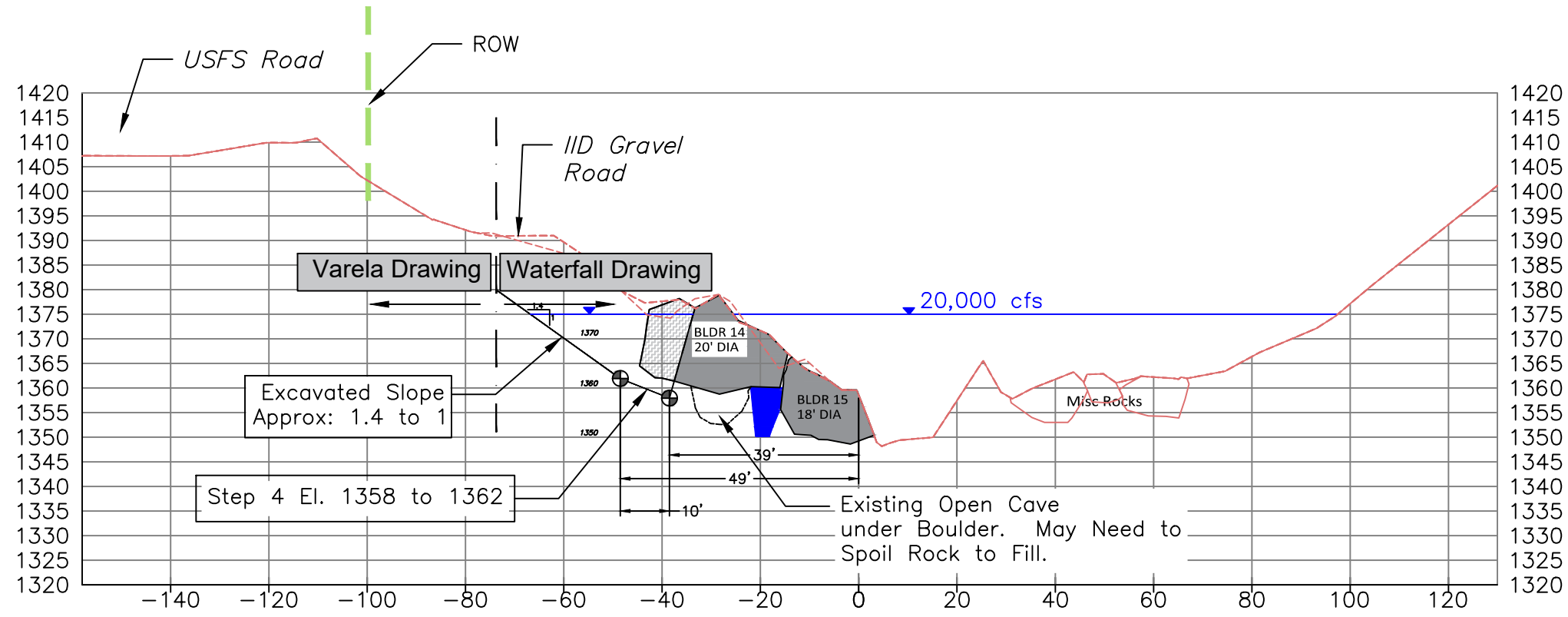
8 **17**
SHEET OF



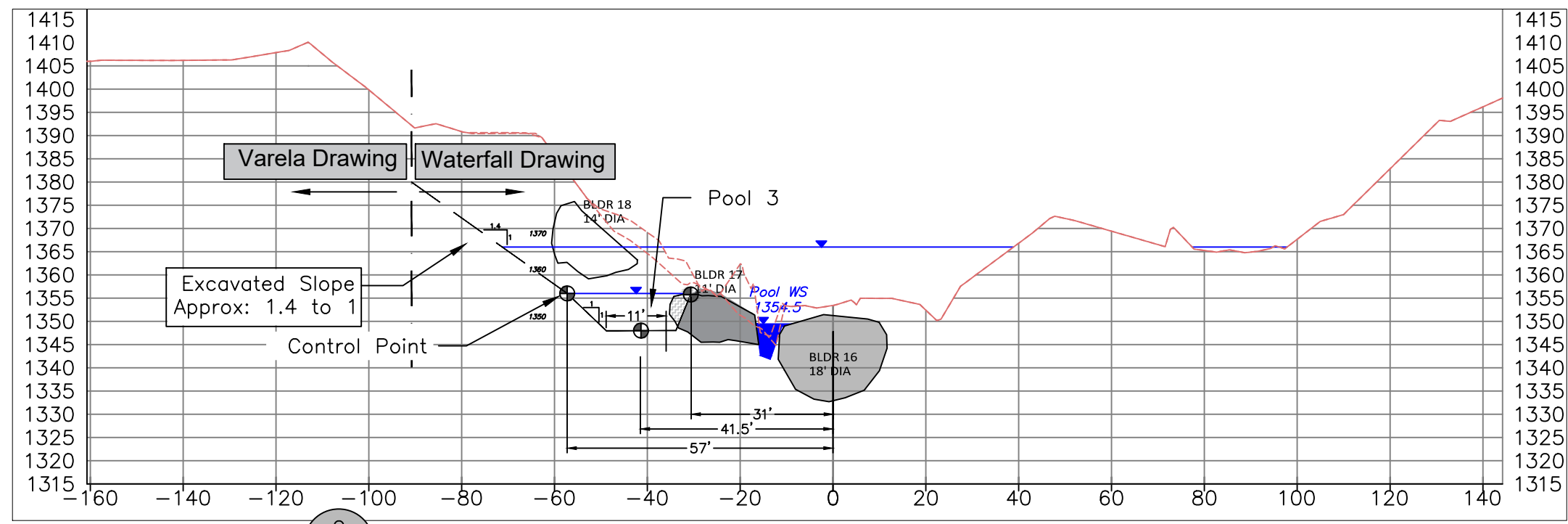
Notes:
 1. All Water Surface Elevations Shown are 500 cfs unless noted otherwise.
 2. Boulders with Numbers Shown in Cross Sections are Surface Boulders. Potential Boulders Buried are not Shown.



Channel Section C (View Downstream)
SCALE: 1"=30'



F
5 10
Channel Section F - Step 4 (View Downstream)
SCALE: 1"=30'



G
5 10
Channel Section G - Pool 3 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

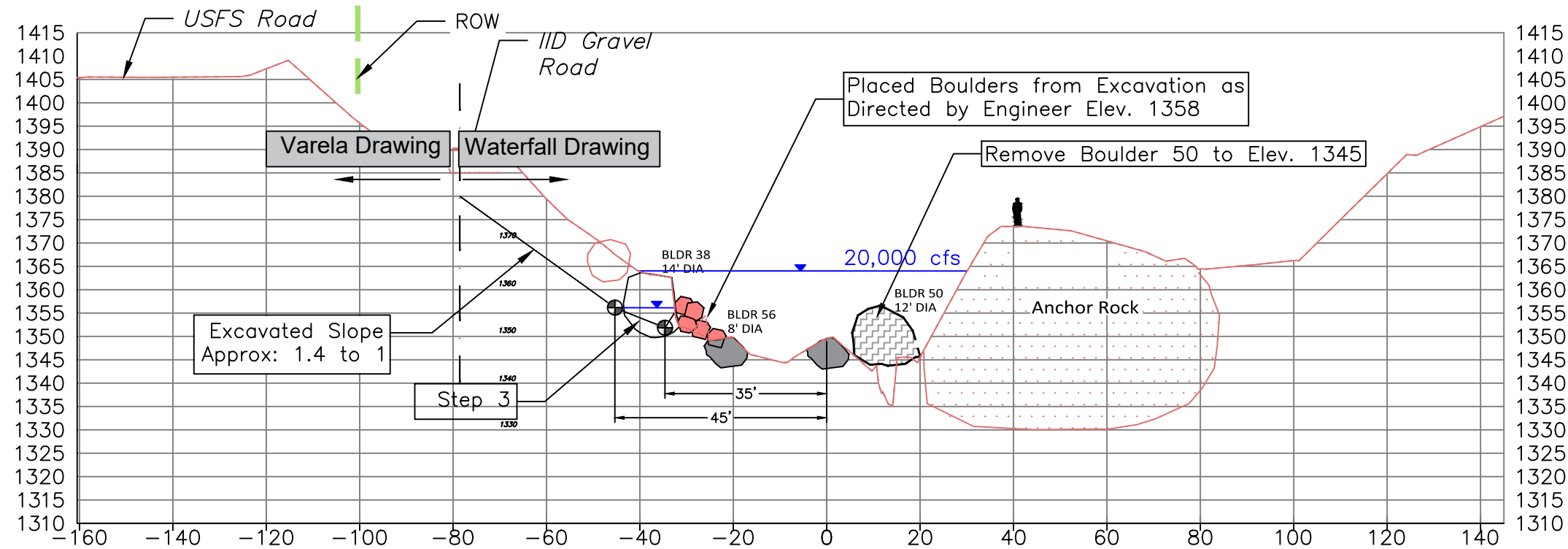
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Waterfall Engineering

DRAWN BY:
RiverSide Drafting

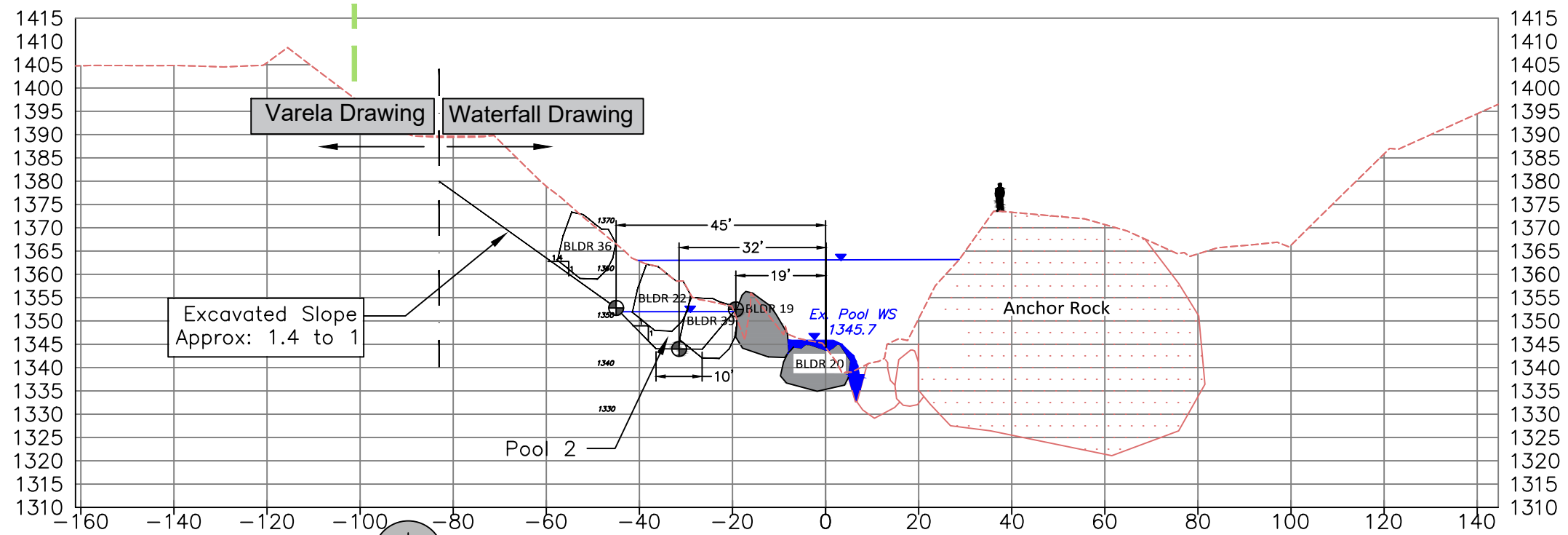
DATE:
2/18/19

Sections

10 **17**
SHEET OF



H
5 | 11
Channel Section H - Step 3 (View Downstream)
SCALE: 1"=30'



I
5 | 11
Channel Section I - Pool 2 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

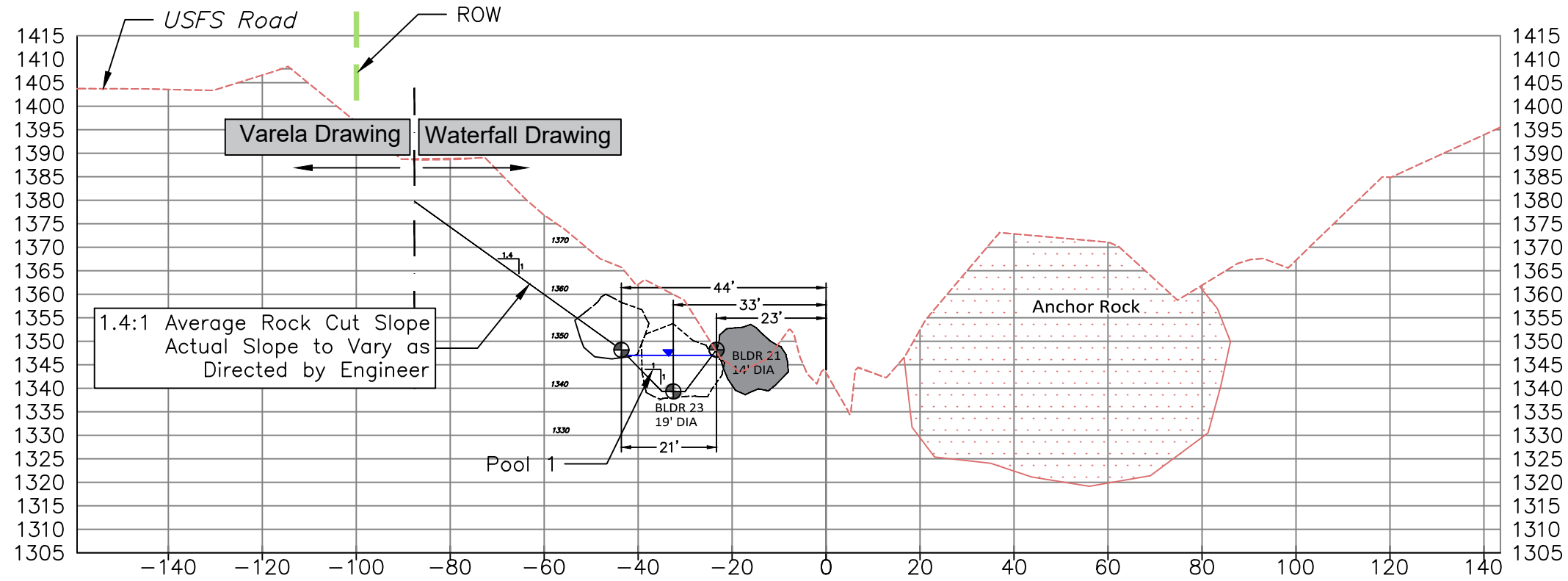
DESIGN BY:
Waterfall Engineering

DRAWN BY:
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DATE:
2/18/19

Sections

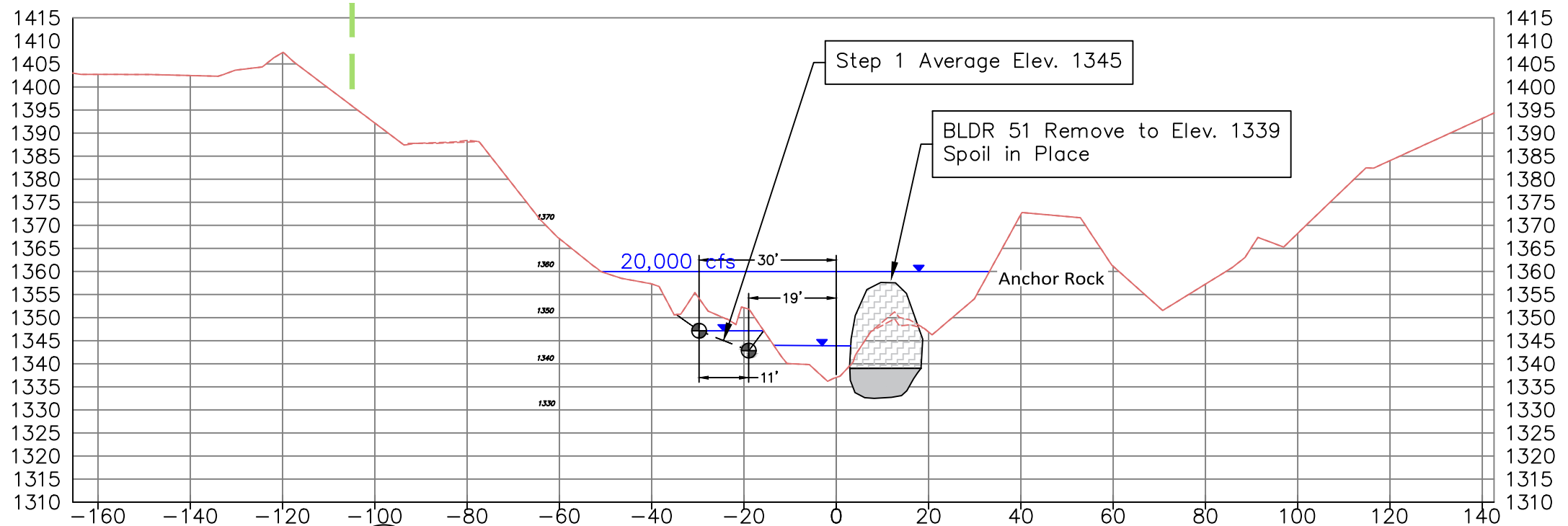
11 **17**
SHEET OF



J
5 | 12

Channel Section J - Pool 1 (View Downstream)

SCALE: 1"=30'



K
5 | 12

Channel Section K - Step 1 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

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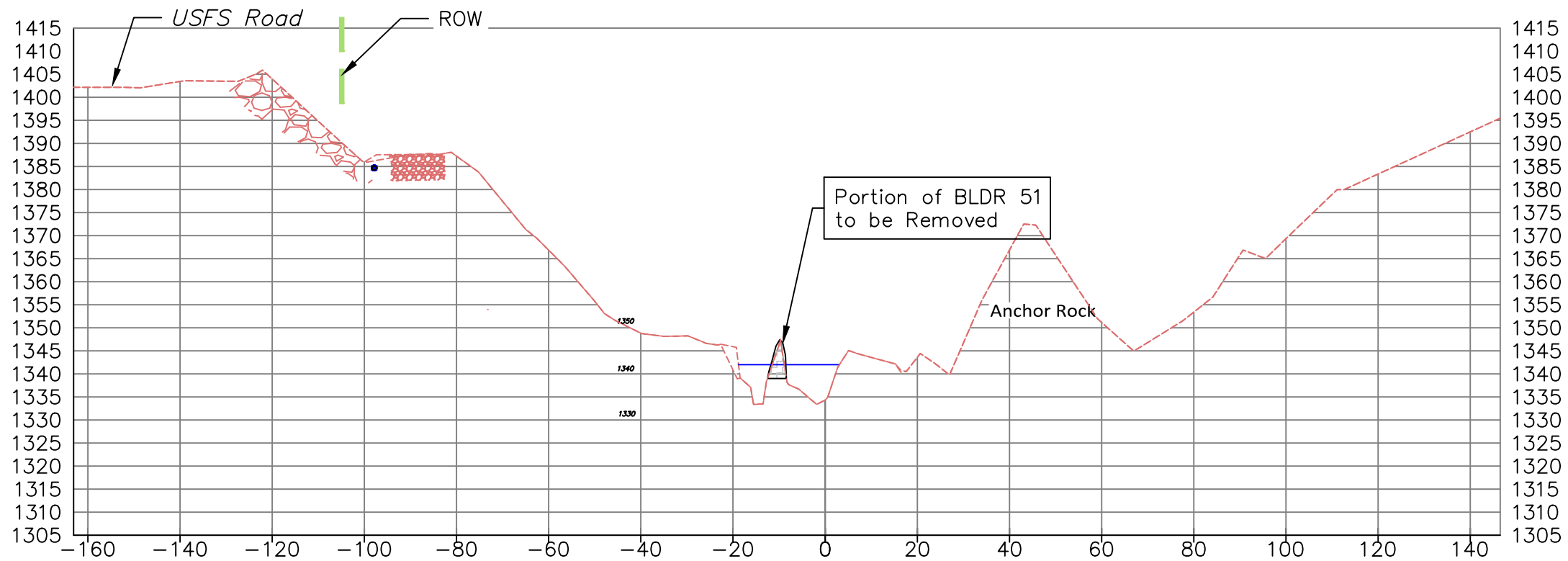
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Waterfall Engineering

DRAWN BY:
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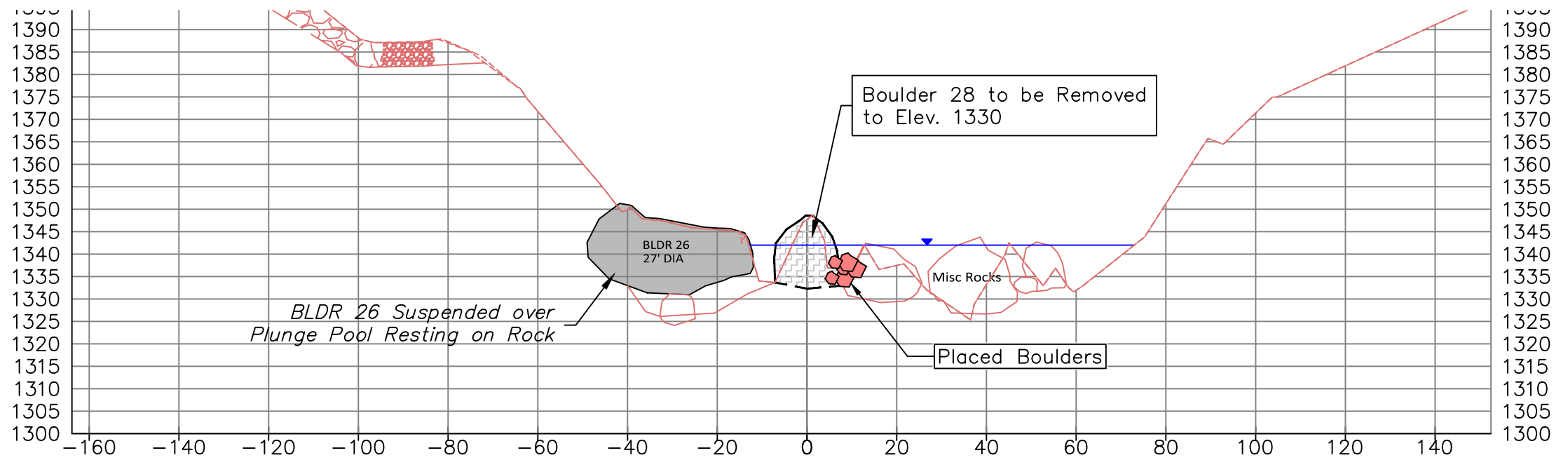
DATE:
2/18/19

Sections

12 17
SHEET OF



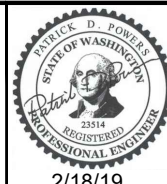
L
5 | 13
Channel Section L - (View Downstream)
SCALE: 1"=30'



M
5 | 13
Channel Section M (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION

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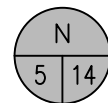
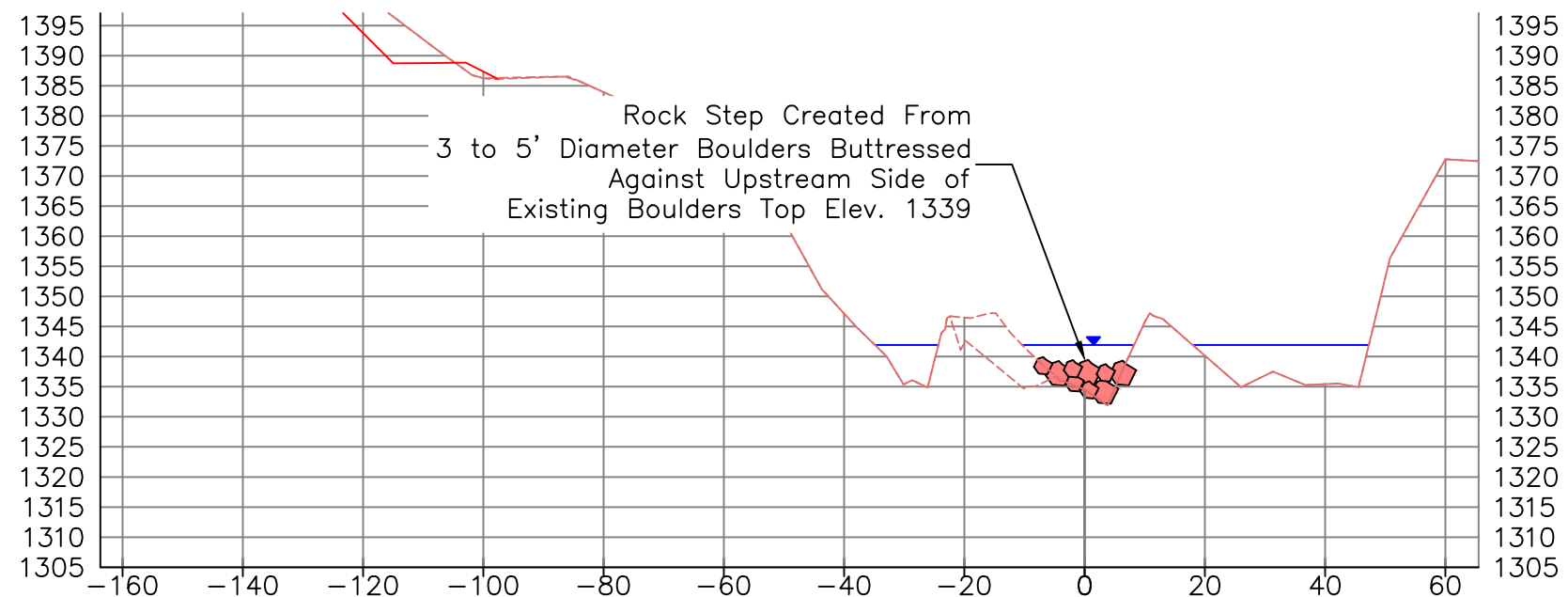
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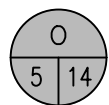
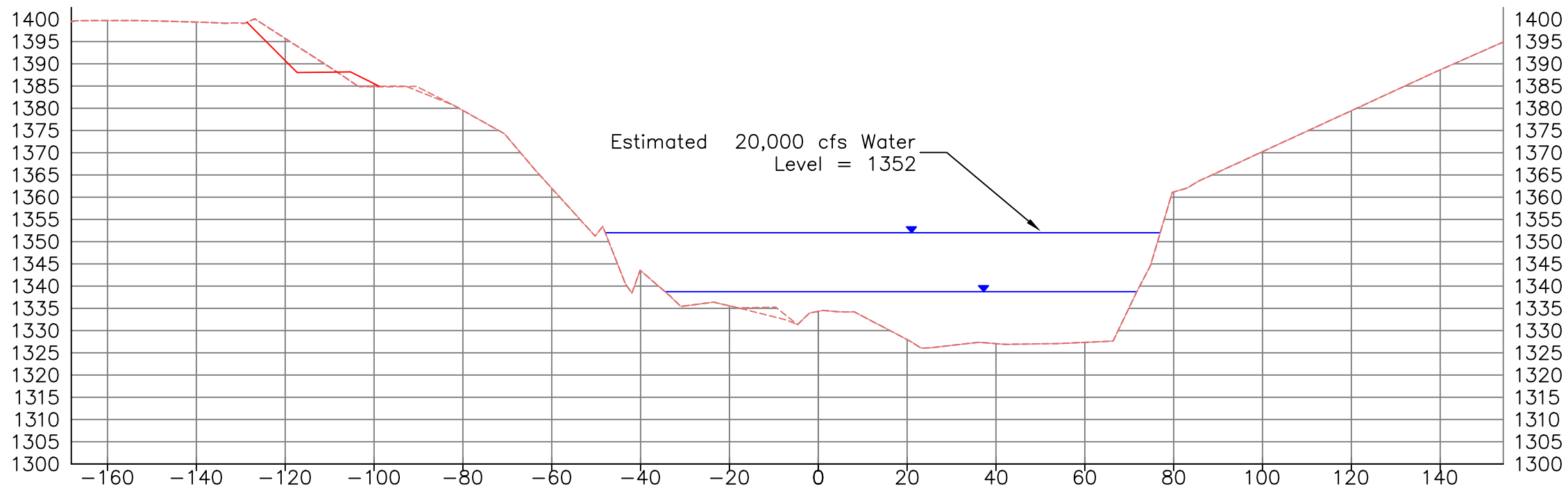
Sections

13 17
SHEET OF



Channel Section N (View Downstream)

SCALE: 1"=30'



Channel Section O (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

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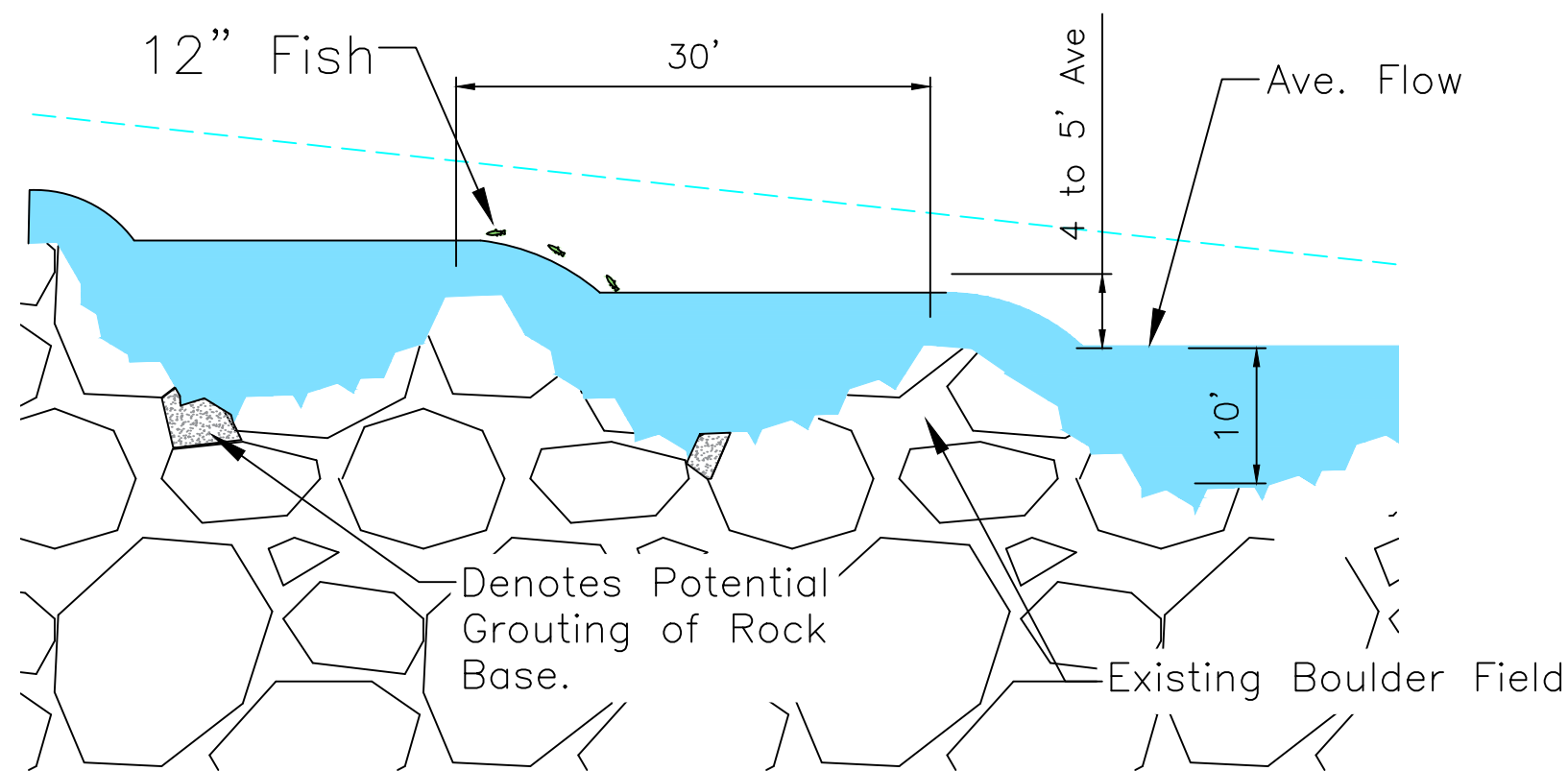
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DRAWN BY:
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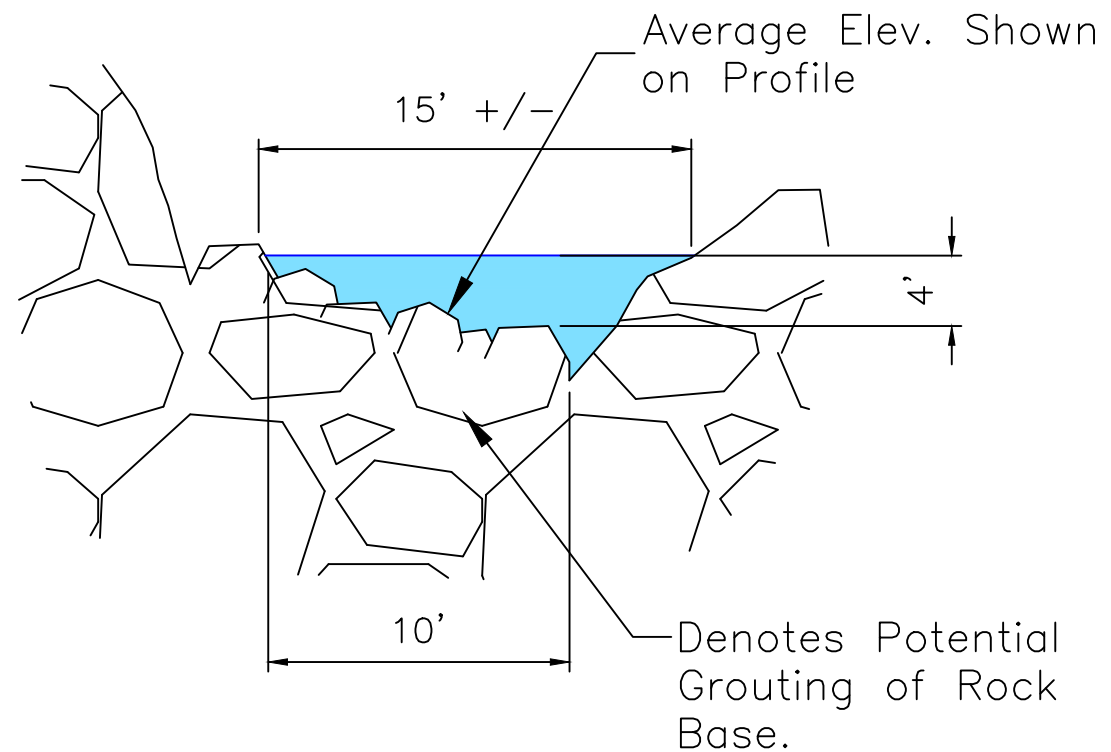
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2/18/19

Sections

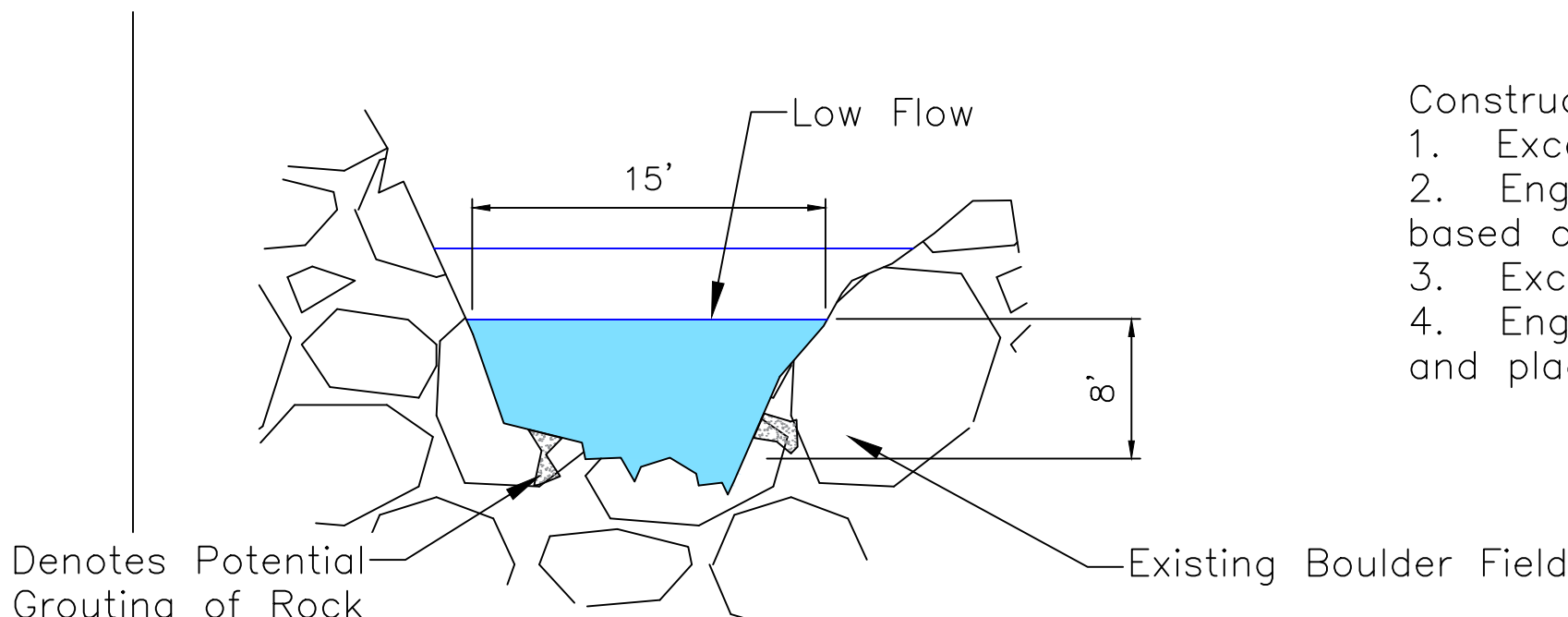
14 **17**
SHEET OF



15% Slope Channel Profile
SCALE: 1" = 10'



Typical Step/Weir
SCALE: 1" = 10'



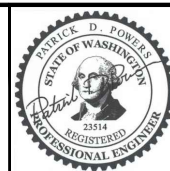
Typical Pool Detail
SCALE: 1" = 10'

Construction Notes:

1. Excavate to top of proposed Steps.
2. Engineer will inspect to locate final Step Locations based on Boulder Locations.
3. Excavate Pools, Based on New Step Locations.
4. Engineer will Review Steps for potential rock removal and placement.



Icicle Boulder Field Passage



2/18/19

REV	DATE	BY	APPD	DESCRIPTION

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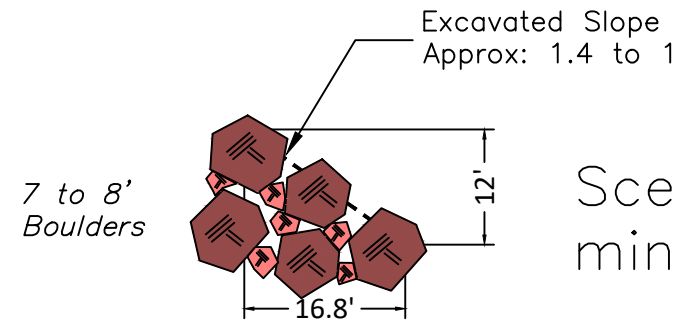
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

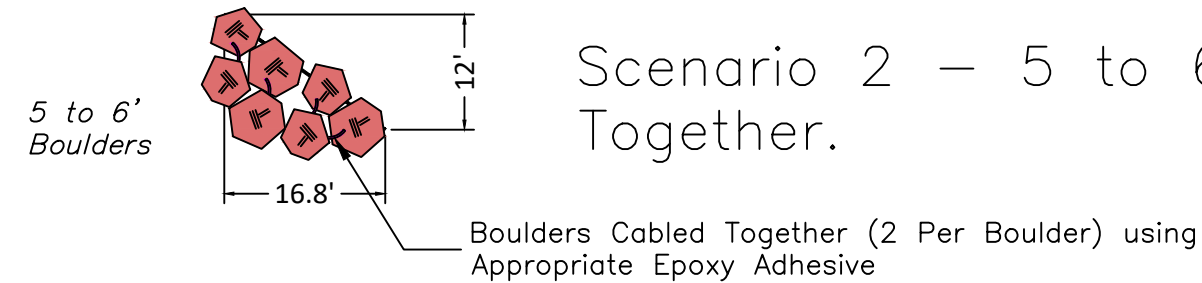
DATE:
2/18/19

Step/Pool Channel Details

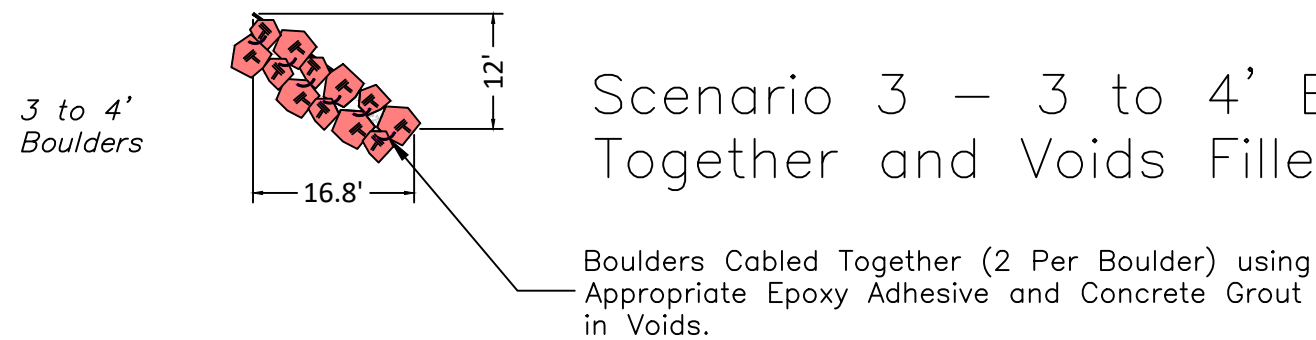
15 **17**
SHEET OF



Scenario 1 – Existing Boulders are 7 to 8’ minimum diameter and will resist scour



Scenario 2 – 5 to 6’ Boulders Cabled Together.



Scenario 3 – 3 to 4’ Boulders Cabled Together and Voids Filled with Concrete

[Construction Options for Rock Slope Below 20,000 cfs](#)
SCALE: 1"= 20'

Note: Scenario 2 and 3 Must be Approved on Site by Engineer and Geomorphologist



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

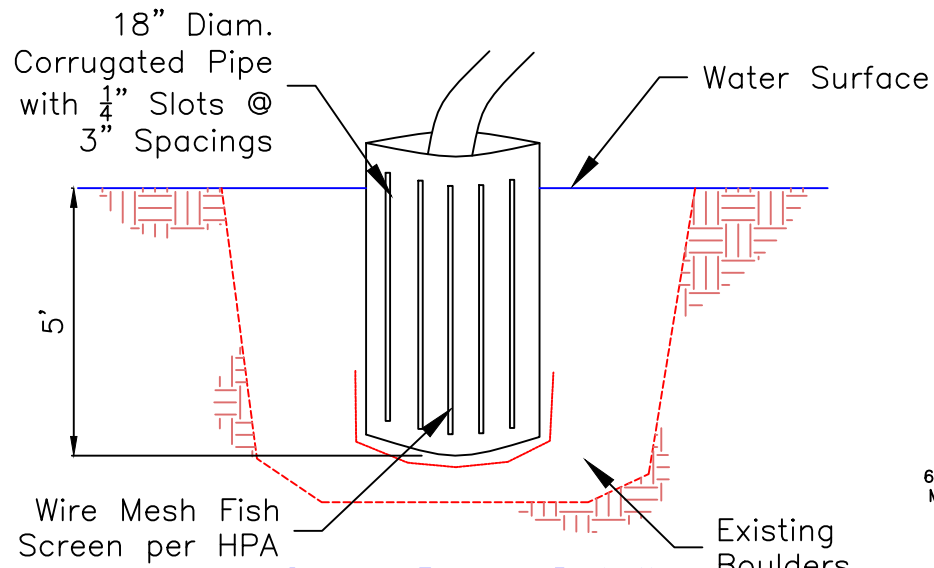
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

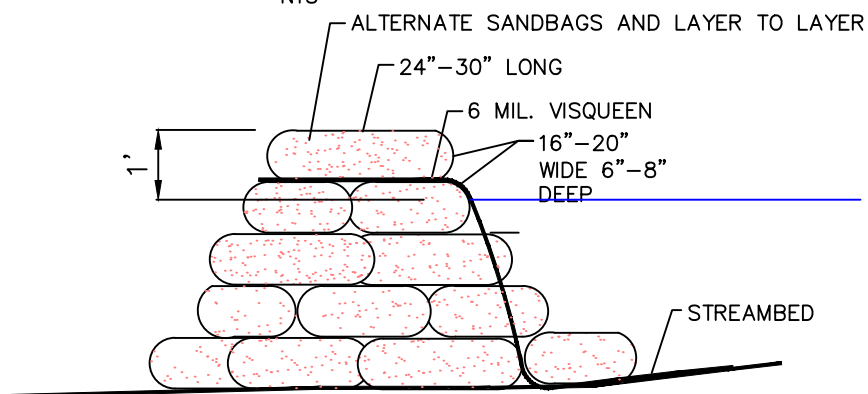
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RiverSide Drafting

DATE:
2/18/19

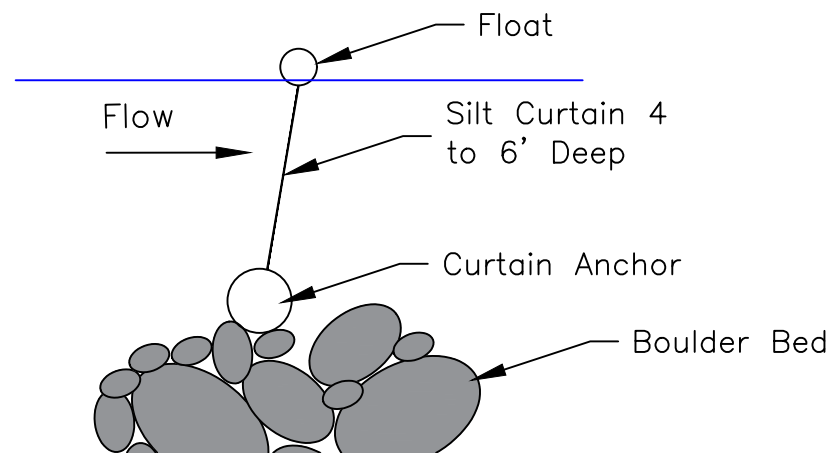
Rock Slope Detail



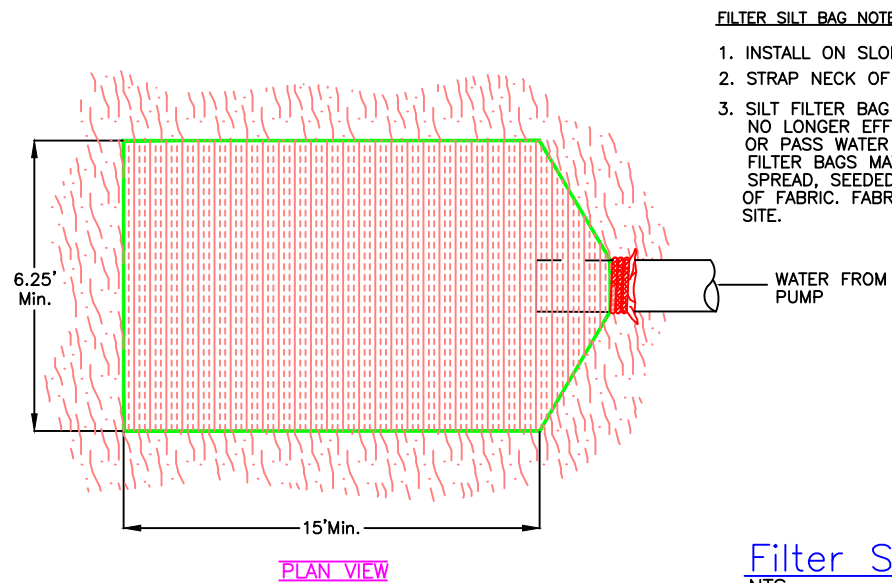
Sump Pump Detail
NTS



SANDBAG COFFER DAM
NTS



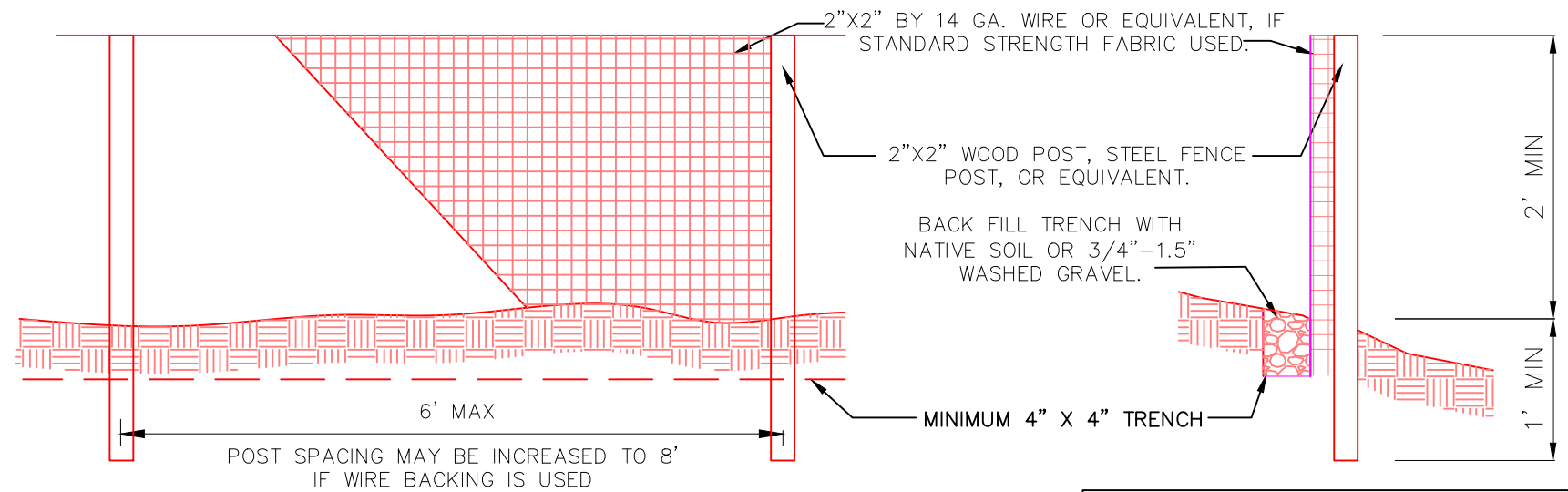
Type 2 Silt Curtain
NTS



FILTER SILT BAG NOTES

1. INSTALL ON SLOPE SO INCOMING WATER FLOWS DOWNHILL THROUGH THE BAG.
2. STRAP NECK OF SILT FILTER BAG TIGHTLY TO DISCHARGE HOSE.
3. SILT FILTER BAG IS FULL WHEN IT CAN NO LONGER EFFICIENTLY FILTER SEDIMENT OR PASS WATER AT A REASONABLE RATE. USED FILTER BAGS MAY BE CUT OPEN AND CONTENTS SPREAD, SEEDED, AND MULCHED AFTER REMOVAL OF FABRIC. FABRIC SHALL BE DISPOSED OF OFF SITE.

Filter Silt Bag Detail
NTS

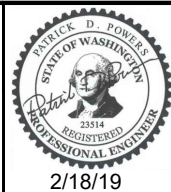


Filter Fabric Fence
NTS

JOINTS IN FILTER FABRIC SHALL BE SPLICED AT POSTS. USE STAPLES, WIRE RINGS OR EQUIVALENT TO ATTACH FABRIC TO POST.



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION

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DESIGN BY:
Waterfall Engineering

DRAWN BY:

DATE:
2/18/19

Construction BMPs

ICICLE CREEK FISH PASSAGE

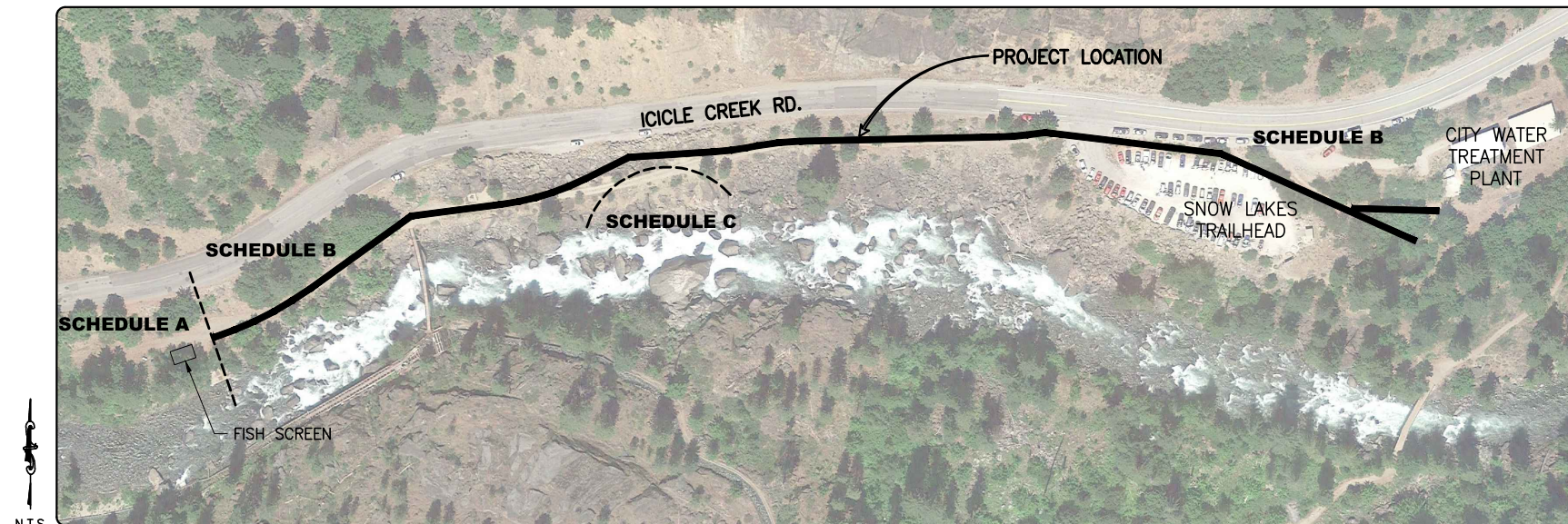
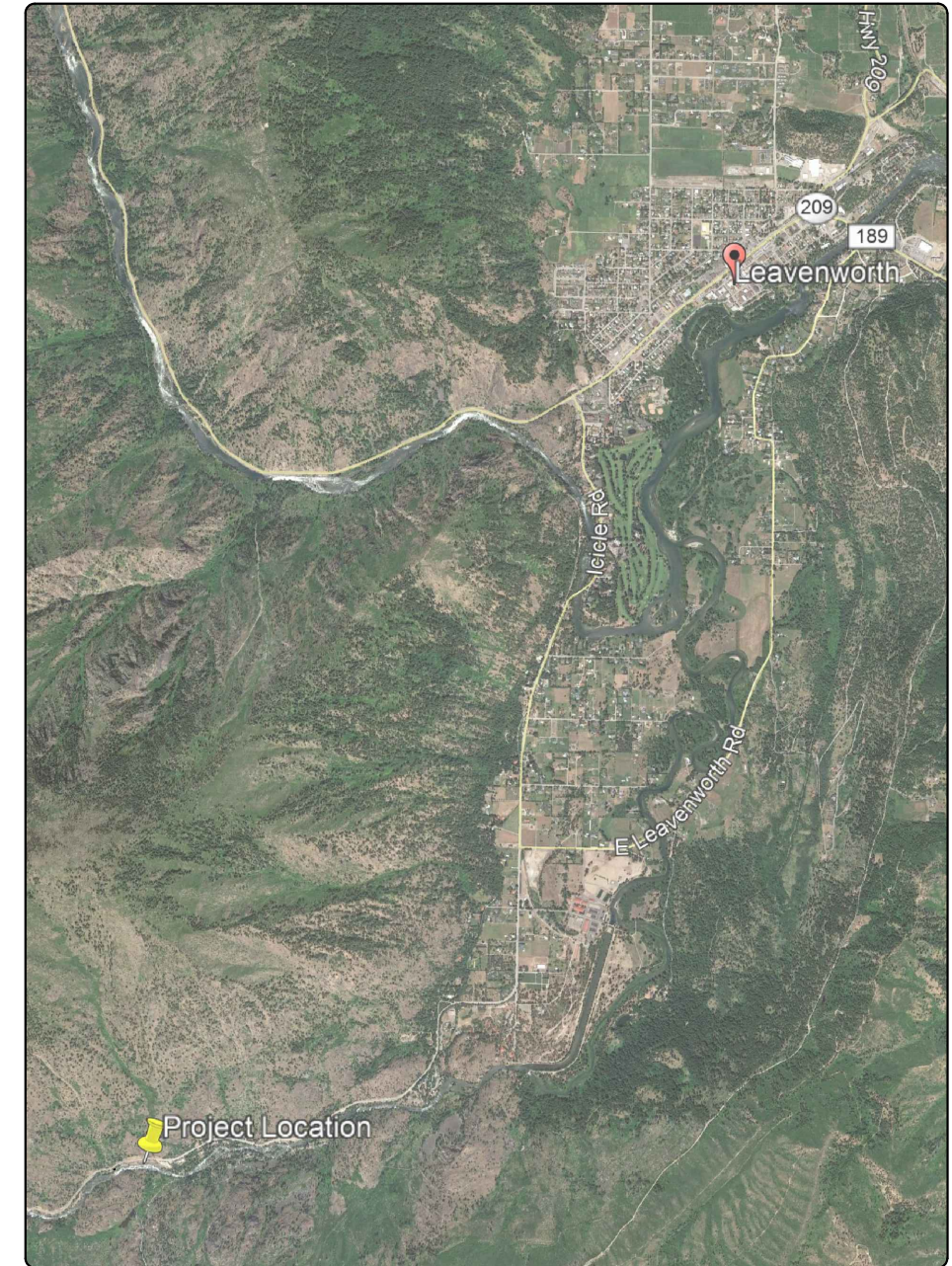
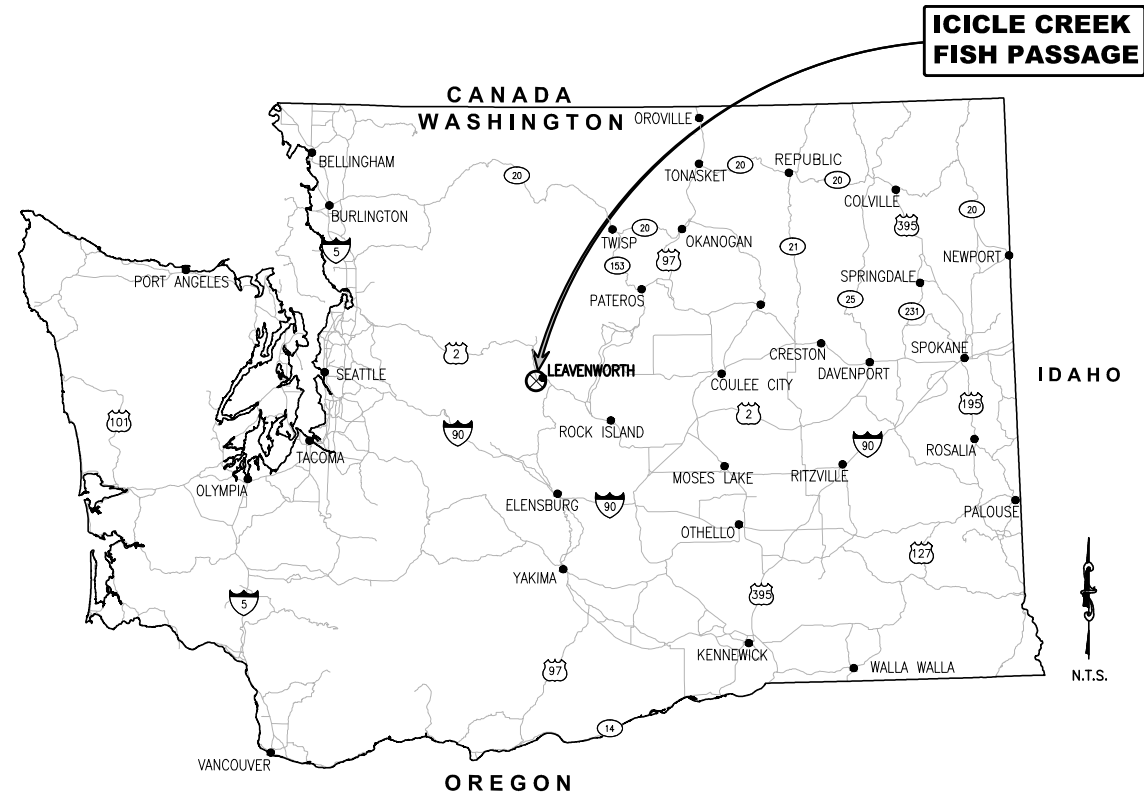
SCHEDULE B

CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

FOR TROUT UNLIMITED

JANUARY 2019

(DRAFT)



PROJECT LOCATION

VICINITY MAP

1780102-Sht 01 (Cover)

ABBREVIATIONS

	PIPE	AC CONC CMP CI DI FM GS PVC RCP STL	ASBESTOS CONCRETE CONCRETE CORRUGATED METAL PIPE CAST IRON DUCTILE IRON FORCE MAIN GALVANIZED STEEL POLYVINYL CHLORIDE PIPE REINFORCED CONCRETE PIPE STEEL PIPE	MISC	A.C. B BLM B.O.W. CB C.F.S. CL C.O. CONC. CSBC CSTC C.Y. D DEC. DET. DIA. DIM. DR DW DWG E EG ELEV. EP EXIST. FF FG FH FT. GR HP HWY I.E. IN. LF	ASPHALT CONCRETE BASEMENT BUREAU OF LAND MANAGEMENT BACK OF WALL CATCH BASIN CUBIC FEET PER SECOND CENTERLINE CLEAN OUT CONCRETE CRUSHED SURFACING BASE COURSE CRUSHED SURFACING TOP COURSE CUBIC YARD DIRT DECIDUOUS DETAIL DIAMETER DIMENSION DRAIN PIPE DRYWELL DRAWING EAST EXISTING GRADE ELEVATION EDGE OF PAVEMENT EXISTING FINISH FLOOR FINISH GRADE FIRE HYDRANT FOOT OR FEET GRADE HIGH PRESSURE HIGHWAY INVERT ELEVATION INCHES LINEAL FEET	MAX. MH MIN. N N.I.C. NO. NTS O.C. PP P.S.I. Q.C. Q.D. REV. REQ'D RD. R.R. R/W S S= SD SHT. SL SS ST. STA STD. SW SWMMEW SY T.B.M. T.O.P. T.O.W. TYP. W	MAXIMUM MANHOLE MINIMUM NORTH NOT IN CONTRACT NUMBER NOT TO SCALE ON CENTER POWER POLE POUNDS PER SQUARE INCH FULL PIPE CAPACITY DESIGN FLOW REVISED REQUIRED ROAD RAILROAD RIGHT-OF-WAY SOUTH SLOPE STORM DRAIN SHEET SURVEY LINE SANITARY SEWER STREET STATION STANDARD SIDEWALK STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON SQUARE YARD TEMPORARY BENCH MARK TOP OF PIPE TOP OF WALL TYPICAL WEST
--	------	--	--	------	--	--	--	--

LEGEND

DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED
SURVEY					
ALUMINUM CAP	⊙		SURFACE		
CONCRETE MONUMENT	⊗		ASPHALT-EDGE		
HUB AND TACK	⊗		GRAVEL/DIRT-EDGE		
MONUMENT IN CASE	⊕		CONCRETE-EDGE (EX)		
PK NAIL	⊕		TREE/SHRUB		
SCRIBE	+SC		CREEK/DITCH	---	---
STORM SEWER					
CULVERT	>--<		SURVEY		
WATER					
VALVE	⊗	⊗	SURVEY CENTERLINE	---	---
FIRE HYDRANT	⊗	⊗	CONTOUR	---	---
UTILITIES					
UTILITY POLE	⊙		CONTOUR (INDEX)	---2010---	---2010---
UTILITY POLE ANCHOR	↑		RIGHT-OF-WAY	---	---
TELEPHONE RISER	⊗		UTILITIES		
TRAFFIC SIGN					
SIGN	⊗		WATER	--- 8"W(PVC) ---	--- W ---

ELEVATION CALLOUT
SECTION CALLOUT
DETAIL NUMBER
ELEVATION/SECTION/DETAIL TITLE
SECTION/DETAIL -- PIPING AND EQUIPMENT
SCALE
SHEET NUMBER THAT ELEVATION/SECTION/DETAIL APPEARS ON

SURVEY NOTES

NOTES	DATUM	PROJECT SURVEYOR																												
1. ORIGINAL SURVEYING COMPLETED JUNE 2014 ADDITIONAL SURVEY COMPLETED NOVEMBER 2017.	HORIZONTAL - STATE PLANE COORDINATES WASHINGTON NORTH ZONE NAD 83 (2011). SCALE FACTOR = 0.99992931, CONVERGENCE ANGLE = 0°05'30"	COMPANY: MTN 2 COAST LLC. 2320 MOTTMAN RD. SW, STE 106 TUMWATER, WA 98512																												
2. INSTRUMENT USED; SOKKIA SRX3 TOTAL STATION AND TOPCON GR5 GPS.	BASED ON GPS STATIC OBSERVATION PROCESSED THROUGH NOAA OPUS	CONTACT: BLAIR E. PRIGGE, PLS PHONE: (360) 512-9198																												
3. ONLY VISIBLE SURFACE UTILITY APPURTENANCES WHERE LOCATED. NO UNDERGROUND UTILITIES WERE LOCATED OR SHOWN ON THIS MAP. A UTILITY LOCATOR SERVICE WAS NOT USED. THIS MAP DOES NOT PURPORT TO SHOW ALL UTILITIES.	VERTICAL - NAVD 88 BASED ON GPS STATIC OBSERVATION.	CONTROL POINTS																												
4. CONTOURS SHOWN IN RIVER AREA ARE A COMPILED OF WATERFALL ENGINEERING AND MTN2COAST MAPPING.		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>POINT NAME</th> <th>NORTHING</th> <th>EASTING</th> <th>ELEVATION</th> </tr> </thead> <tbody> <tr> <td>WFE PT # 4</td> <td>198610.82</td> <td>1670408.87</td> <td>1382.43</td> </tr> <tr> <td>WFE PT # 3</td> <td>198571.40</td> <td>1670238.51</td> <td>1390.02</td> </tr> <tr> <td>WFE PT # 2</td> <td>198531.01</td> <td>1670021.64</td> <td>1394.74</td> </tr> <tr> <td>WFE PT #1</td> <td>198411.10</td> <td>1669795.83</td> <td>1408.23</td> </tr> <tr> <td>M2C PT # 105</td> <td>198584.84</td> <td>1669990.61</td> <td>1417.34</td> </tr> <tr> <td>WFE PT # 111</td> <td>198623.00</td> <td>1670224.93</td> <td>1405.49</td> </tr> </tbody> </table>	POINT NAME	NORTHING	EASTING	ELEVATION	WFE PT # 4	198610.82	1670408.87	1382.43	WFE PT # 3	198571.40	1670238.51	1390.02	WFE PT # 2	198531.01	1670021.64	1394.74	WFE PT #1	198411.10	1669795.83	1408.23	M2C PT # 105	198584.84	1669990.61	1417.34	WFE PT # 111	198623.00	1670224.93	1405.49
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WFE PT # 111	198623.00	1670224.93	1405.49																											

GENERAL NOTES

- THESE PLANS SHOW THE DESIGN FOR CONSTRUCTION OF THE ACCESS ROAD, WATER MAIN AND RETAINING WALLS FOR THE ICICLE CREEK FISH PASSAGE PROJECT (PROJECT). OTHER WORK ASSOCIATED WITH THE PROJECT INCLUDE CONSTRUCTION OF A FISH FILTER AND A FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE WORK AND CONSTRUCTION OF THE ENTIRE PROJECT.
- ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
- THE SNOW LAKE TRAILHEAD IS TO REMAIN OPEN TO THE PUBLIC AT ALL TIMES WITH THE FOLLOWING EXCEPTIONS THAT SHALL OCCUR PRIOR TO MAY 15, 2019. THE TRAILHEAD AND ROAD WILL BE OPEN TO THE PUBLIC AND HAVE NO TRAVEL RESTRICTIONS OR CONTRACTOR WORK AFTER MAY 15, 2019:
 - ONE DAY DURING INSTALLATION OF THE WATER MAIN
 - ONE DAY FOR PAVEMENT PATCHING OF THE DRIVEWAY ENTRANCE.
- WHERE KNOWN, EXISTING UTILITIES ARE SHOWN ON THE PLANS FOR THE CONVENIENCE OF THE CONTRACTOR. LOCATIONS SHOWN ARE APPROXIMATE AND DEPTHS ARE GENERALLY NOT KNOWN. OTHER UTILITIES MAY EXIST IN THE WORK AREAS THAT ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL VERIFY THE EXISTENCE, LOCATION, NATURE AND DEPTH OF THE EXISTING UTILITIES IN THE WORK AREA PRIOR TO CONSTRUCTION BY CONTACTING ALL UTILITY OWNERS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT AND REPAIR ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION. OVERHEAD UTILITIES ARE GENERALLY NOT SHOWN.
- WHERE THE POTENTIAL FOR CONFLICT WITH AN EXISTING UTILITY CROSSING EXISTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO EXPOSE, AS NECESSARY, THE EXISTING UTILITY ADEQUATELY IN ADVANCE OF HIS TRENCHING AND PIPE LAYING ACTIVITIES SO THAT IF NECESSARY, AN ADJUSTMENT TO GRADE FOR THE NEW PIPELINE CAN BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER

ACCESS ROAD NOTES

- 12 FOOT WIDE ACCESS ROAD IS TO BE CONSTRUCTED OF 8 INCH THICK COMPACTED CRUSHED SURFACING BASE COURSE (CSBC).
- ACCESS ROAD IS TO BE SLOPED TOWARDS BANK, AWAY FROM RIVER WITH DRAINAGE DIPS INSTALLED APPROXIMATELY EVERY 200 FEET AND AT LOW SPOTS IN THE ROAD.

RETAINING WALL NOTES

- THE UPPER GABION RETAINING WALL MUST BE INSTALLED BEFORE MAY 15, 2019 TO CONFORM TO THE CONSTRUCTION WINDOW OF APRIL 1, 2019 THROUGH MAY 15, 2019 WHEN ICICLE ROAD CAN BE USED BY THE CONTRACTOR FOR CONSTRUCTION.
- THE LOWER GABION RETAINING WALL LAYOUT IS BASED ON THE DESIGN FOR THE FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE TO VERIFY AND COORDINATE THE CONSTRUCTION OF THE FISH PASSAGE AND LOWER WALL WORK.
- BASKET FILL MAY CONSIST OF ON-SITE GRAVELS AND COBBLES THAT ARE ANGULAR OR CRUSHED TO PARTICLE SIZES BETWEEN 4 AND 8 INCHES IN DIAMETER. IMPORTED BASKET FILL, IF REQUIRED, SHALL MEET THE WSDOT STANDARD SPECIFICATION 9-27.3(6) FOR STONE. THE BASKET FILL SHALL BE PLACED IN A MANNER THAT MINIMIZES VOID SPACE IN THE BASKETS.

WATER MAIN NOTES

- ALL NEW WATER MAIN PIPE SHALL BE DUCTILE IRON PER SECTION 9.30.1(1).
- PIPE JOINT RESTRAINT SHALL BE FIELD LOK 350 GASKETS BY US PIPE OR APPROVED EQUAL.
- FITTING JOINT RESTRAINT SHALL BE MEGALUG SERIES 1100 BE EBAA IRON OR APPROVED EQUAL.
- CONCRETE THRUST BLOCKS SHALL BE USED ONLY WHERE SHOWN ON THE DRAWINGS.
- TEST PRESSURE FOR WATER MAINS SHALL BE 80 PSI. MINIMUM DURATION SHALL BE 2 HOURS.
- FIRE HYDRANTS SHALL CONFORM TO AWWA C502 WITH TWO 2-1/2" HOSE CONNECTIONS, ONE 4-1/2" PUMPER PORT AND 5-1/2" VALVE OPENING. OPERATING NUT SHALL CONFORM TO THE OWNER'S STANDARD.
- DETECTABLE MARKING TAPE SHALL BE 5.0 MIL OVERALL THICKNESS, WITH A 50 GAUGE ALUMINUM FOIL CORE COVERED BY POLYETHYLENE. TAPE SHALL BE COLOR CODED, IMPREGNATED WITH PERMANENT MESSAGE PRINTING UNDER A MYLAR LAYER. COLOR AND MESSAGE SHALL BE APPROPRIATE FOR SPECIFIC UTILITY. TAPE SHALL BE THORTEC, OR EQUAL.
- RIGID INSULATION SHALL BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM WITH MINIMUM COMPRESSIVE STRENGTH OF 25 PSI (ASTM D1621-73) AND MAXIMUM WATER ABSORPTION OF 0.3% (ASTM C272-73). MINIMUM INSULATION BOARD THICKNESS SHALL BE 2", WIDTH 48". INSULATION SHALL BE USED ONLY WHEN APPROVED BY THE OWNER WHEN A MINIMUM 5 FEET OF COVER CANNOT BE ACHIEVED.
- ALL NEW PIPE SHALL BE LAID TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS. ALL NEW PIPE SHALL HAVE A MINIMUM BURY DEPTH OF 5 FEET TO THE TOP OF PIPE. IF NECESSITATED BY FIELD CONDITIONS, AND WITH OWNER APPROVAL, THE CONTRACTOR MAY INSTALL THE PIPE WITH A MINIMUM OF 4 FEET COVER WITH INSULATION BOARD. SEE WATER MAIN DETAIL SHEET.
- PIPE ALIGNMENTS INCLUDE BOTH VERTICAL AND HORIZONTAL CURVES. CONTRACTOR SHALL INSTALL THE PIPE ALONG THE CURVE RADIUS SHOWN ON THE DRAWINGS BY DEFLECTING THE PIPE AT THE JOINTS/FITTING PER SECTION 7-09.3(15)A. IN NO CASE SHALL A SINGLE PIPE/FITTING JOINT BE DEFLECTED AT GREATER THAN 80% OF THE MANUFACTURER'S RECOMMENDED MAXIMUM JOINT DEFLECTION.
- ALL WATER MAINS SHALL BE INSTALLED IN SUCH A MANNER AS TO AVOID INTERMEDIATE HIGH POINTS.
- CONTRACTOR SHALL DISPOSE OF ALL EXISTING VALVES, PIPES, FITTINGS, ETC. REMOVED AS PART OF THE WORK, OR IF REQUESTED BY THE OWNER THE CONTRACTOR SHALL DELIVER REMOVED ITEMS SELECTED BY THE OWNER TO THE CITY SHOP.
- WHENEVER MULTIPLE ELBOWS ARE USED TO ACHIEVE A SINGLE BEND THEY SHALL BE FLANGED TOGETHER.

SURFACE REPLACEMENT NOTES

- SURFACE REPLACEMENT FOR PAVED SURFACING REMOVED FOR CONSTRUCTION SHALL BE 2" COMMERCIAL HMA CLASS 1/2" PG 64-28 OVER 6" CSBC GRAVEL BASE. HMA SHALL BE FURNISHED AND INSTALLED PER SECTION 5-04. GRAVEL BASE SHALL BE FURNISHED AND INSTALLED PER SECTION 4-02.
- WHERE PAVEMENT TO BE REPLACED ABUTS EXISTING PAVEMENT IT SHALL BE SAWCUT OR WHEEL CUT PRIOR TO REPLACEMENT. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO THE ROADWAY.
- THE CONTRACTOR SHALL RE-ESTABLISH THE PUBLIC ROADWAYS DISTURBED BY HIS OPERATIONS TO THEIR ORIGINAL GRADES, LOCATION AND WIDTH. THE COMPLETED SURFACE OF ALL COURSES SHALL BE OF UNIFORM TEXTURE, SMOOTH UNIFORM CROWN AND GRADE IN ACCORDANCE WITH SECTION 5-04.3 (13) OF THE WSDOT STANDARD SPECIFICATIONS.
- SURFACE REPLACEMENT FOR GRAVELED AREAS SHALL BE 6" CSBC GRAVEL SURFACE REPLACEMENT OF EXISTING GRAVEL SURFACES SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH SECTION 4-04.

SHEET INDEX

Sheet Number	Sheet Title
01	COVER SHEET, PROJECT LOCATION
02	LEGEND, ABBREVIATIONS, NOTES, INDEX
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ASPECT CONSULTING	
1.	UPPER WALL AT USFS ROAD
2.	LOWER WALL AT IPID ACCESS ROAD

ROCK EXCAVATION NOTES

- ROCK EXCAVATED FROM THIS SITE MAY BE USED ONSITE UNDER THE FOLLOWING CONDITIONS WITH ENGINEER APPROVAL:
 - ROCK OF APPROPRIATE SIZE AND GRADING MAY BE USED AS BACKFILL FOR THE WATER MAIN OR AS FILL UNDER THE ACCESS ROAD. SEE SHEET 16.
 - ROCK AND OTHER EXCAVATED MATERIAL MAY BE USED TO CONSTRUCT THE SECONDARY ACCESS ROAD TO THE WEST. SEE SCHEDULE A.
 - ROCK MAY BE PLACED ON 1.5 : 1 SLOPE ABOVE ACCESS ROAD WITH ENGINEER APPROVAL. ROCK MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND SHALL NOT ENCRUCH INTO THE 12 FOOT CLEAR LOWER ACCESS ROADWAY.
 - ROCK AND OTHER EXCAVATED MATERIAL MAY BE WASTED AGAINST EXISTING SLOPE BETWEEN ACCESS ROAD AND USFS ROADWAY FROM THE SECONDARY ACCESS ROAD TO ACCESS ROAD STA 13+00. MATERIAL MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND PROTECTED FROM EROSION.

SNOWLAKES TRAILHEAD NOTES

- CONTRACTOR SHALL NOT EXCAVATE OR ALLOW EXCAVATION TO OCCUR ON BLM PROPERTY.
- CONTRACTOR CAN USE PROPERTY AND PARKING AREA FOR OTHER CONSTRUCTION ACTIVITIES INCLUDING DRIVING, SPOIL PILES, MATERIAL STORAGE (ONLY FOR MATERIALS TO BE INCORPORATED IN THAT DAYS WORK, NO EXCESS MATERIALS WITHOUT PROJECT OWNER APPROVAL).
- CONTRACTOR SHALL ALLOW ACCESS TO THE PARKING AREA, AND PARKING ALONG THE SOUTHERN PORTION OF THE PARKING AREA, TO THE PUBLIC AT ALL TIMES, EXCEPT FOR WHEN INSTALLING PIPE THROUGH THE ENTRANCE.
- CONTRACTOR SHALL RESTORE THE ENTRANCE AND PARKING LOT SURFACING TO EQUAL OR BETTER CONDITION BY MAY 15TH. THIS INCLUDES FINISH GRADING, PAVING, AND GRAVEL SURFACE RESTORATION.
- CLOSING OF THE PARKING AREA AND ACCESS TO THE PARKING AREA DURING CONSTRUCTION SHALL BE COORDINATED WITH THE USFS.

EMERGENCY BYPASS PUMPING SYSTEM

- THE CITY OF LEAVENWORTH (CITY) WATER SUPPLY IS PROVIDED BY SURFACE WATER, VIA THE WATER TREATMENT PLANT (WTP), AND GROUNDWATER VIA CITY WELLS. THE 16-INCH WATER MAIN TO BE REPLACED PROVIDES SURFACE WATER SUPPLY TO THE CITY WTP. THE GROUNDWATER WELLS HAVE SUFFICIENT SUPPLY CAPACITY TO MEET NORMAL DEMANDS DURING CONSTRUCTION. THE CONTRACTOR MAY SHUT OFF AND DRAIN THE 16-INCH WATER MAIN TO THE CITY WTP DURING CONSTRUCTION FROM THE FIRST DAY OF ONSITE WORK UNTIL SUBSTANTIAL COMPLETION. THIS EXISTING WATER MAIN MAY BE ABANDONED IN PLACE OR REMOVED AS NEEDED FOR CONSTRUCTION.
- IN THE EVENT ONE OR MORE CITY WELLS FAIL DURING CONSTRUCTION AND ARE UNABLE TO PROVIDE SUFFICIENT SUPPLY TO THE CITY THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE SURFACE WATER SUPPLY TO THE WTP AND SHALL BE ABLE TO SETUP AND PROVIDE THIS SUPPLY WITHIN 24 HOURS OF NOTIFICATION.
- DURING THE PERIOD THE 16-INCH WATER MAIN TO THE WTP IS REMOVED FROM SERVICE, THE CONTRACTOR SHALL HAVE ONSITE OR READILY AVAILABLE A BYPASS PUMPING SYSTEM CAPABLE OF DELIVERING A CONSTANT RATE OF 700 GPM TO THE WTP. THIS SYSTEM INCLUDES PUMPS, PIPING, FITTING AND APPURTENANCES AS NEEDED TO CONNECT THE WTP TO THE EXISTING MAIN UPSTREAM OF THE WORK AREA. THIS SYSTEM WILL BE CAPABLE OF 24 HOUR OPERATION UNTIL THE CITY WELLS ARE RETURNED TO SERVICE. TEMPORARY BYPASS PUMP PIPING MAY BE LAID ALONG THE SHOULDER OF THE USFS ROAD. ACCESS TO THE SNOWLAKES TRAILHEAD PARKING AREA SHALL BE MAINTAINED.
- A BID ITEM IS PROVIDED FOR THE FOLLOWING ITEMS:
 - STANDBY EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE LUMP SUM PAYMENT FOR PROVIDING THE EMERGENCY PUMPING SYSTEM ON STANDBY AND SHALL BE PAID UPON APPROVAL OF THE STANDBY EMERGENCY BYPASS PUMPING SYSTEM SUBMITTAL AND CONFIRMATION OF EQUIPMENT AND MATERIALS ONSITE.
 - SETUP / REMOVAL OF EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE LUMP SUM PAYMENT PER EACH FOR SETUP AND REMOVAL OF THE EMERGENCY BYPASS PUMPING SYSTEM. SETUP SHALL INCLUDE MAKING OPERATIONAL WITHIN 24 HOURS OF NOTIFICATION. REMOVAL OF EMERGENCY BYPASS PUMPING SYSTEM SHALL BE AFTER NOTIFICATION BY OWNER TO REMOVE SYSTEM.
 - OPERATION OF EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE PAYMENT PER DAY FOR OPERATION OF EMERGENCY BYPASS PUMPING SYSTEM FOR EACH 24 HOURS OF OPERATION IN WHICH THE SYSTEM SUPPLIES THE WTP AT THE NOTED CAPACITY. DAYS IN WHICH OPERATION IS LESS THAN 24 HOURS THE PAY ITEM WILL BE PRORATED FOR THE PERIOD OF OPERATION.

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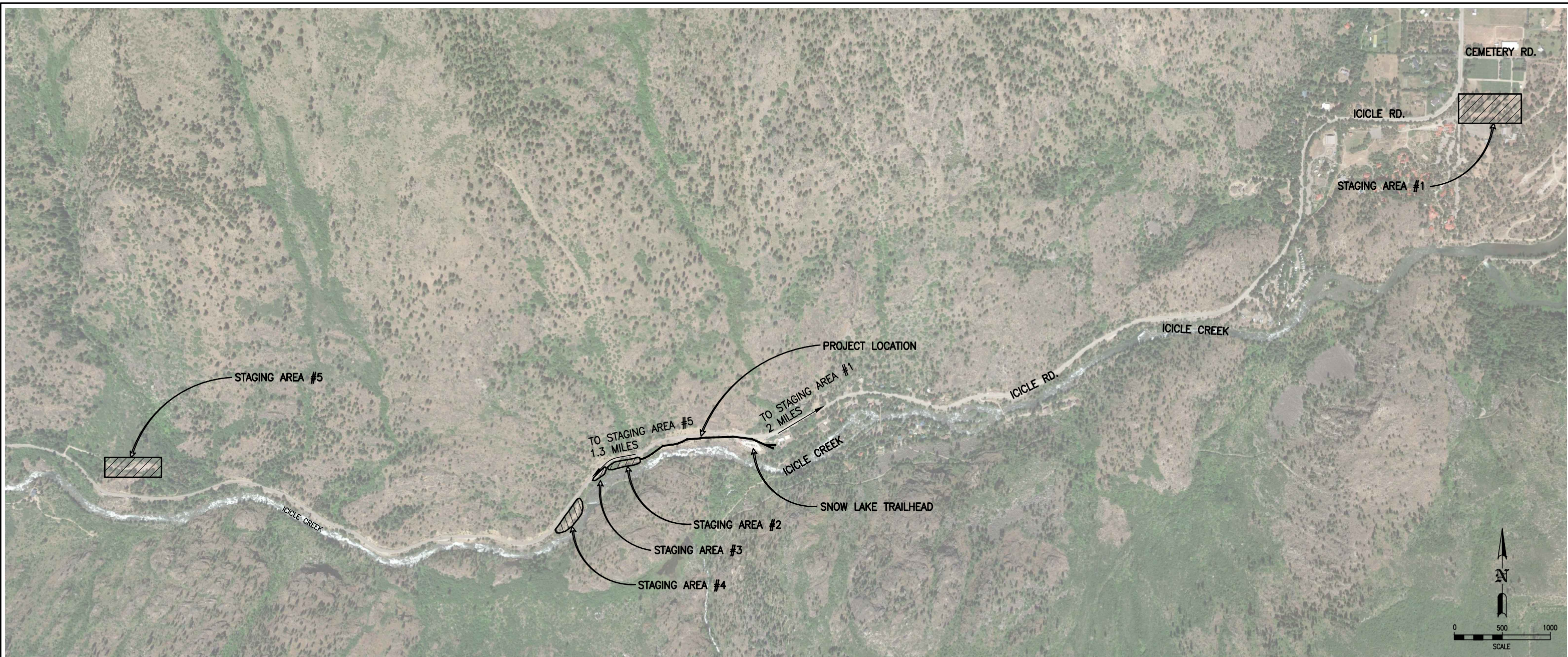
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VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

LEGEND, ABBREVIATIONS, NOTES, INDEX



NOTES

1. PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD TRAFFIC RESTRICTIONS ARE ALLOWED PRIOR TO MAY 15, 2016. SEE TRAFFIC CONTROL PLAN. ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019 WITH THE EXCEPTION OF STAGING AREA #3. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
2. POTENTIAL STAGING AREAS HAVE BEEN IDENTIFIED FOR CONTRACTOR USE BY THE AGENCIES ASSOCIATED WITH THE PROJECT. THE CONTRACTOR SHALL COORDINATE ACCESS, USE, SECURITY, CLEANUP AND RESTORATION WITH THE AGENCY THAT OWNS THE SITE. APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL ARE TO BE INSTALLED AND MAINTAINED FOR DURATION OF USE. THE FOLLOWING STAGING AREAS ARE AVAILABLE FOR USE BY THE CONTRACTOR.
 - a. STAGING AREA #1 – SOUTH OF CITY CEMETERY, OWNED BY CITY OF LEAVENWORTH. AVAILABLE FOR DURATION OF PROJECT. CONTRACTOR MAY USE AREA FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL. STOCKPILED MATERIAL SHALL NOT BE LEFT PERMANENTLY. HOWEVER, A SMALL QUANTITY (~100 CY) OF ANGULAR ROCK/BOULDERS MAY BE LEFT WITH CITY APPROVAL. THE CITY REQUIRES THE AREA BE DELINEATED AND APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL BE INSTALLED FOR DURATION OF USE.
 - b. STAGING AREA #2 –ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - c. STAGING AREA #3 – TURNOUT PARKING AREA ADJACENT TO ICICLE ROAD, OWNED BY USFS. AVAILABLE FOR DURATION OF PROJECT.
 - d. STAGING AREA #4 – ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - e. STAGING AREA #5 – PARKING AREA NORTH OF ICICLE ROAD, OWNED BY BLM SPOKANE OFFICE. NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND. AVAILABLE FOR DURATION OF PROJECT.
 - f. SNOW LAKE TRAILHEAD – NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND INCLUDING THE SNOW LAKE TRAILHEAD. THE TRAILHEAD IS AVAILABLE FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL FROM APRIL 1, 2019 THROUGH MAY 15, 2019, THE CONTRACTOR WILL REMOVE ALL MATERIAL AND HAVE THE AREA RESTORED FOR PUBLIC USE BY MAY 16, 2019. EXCEPT FOR ACCESS TO THE CONSTRUCTION AREA NO CONTRACTOR USE WILL BE ALLOWED AFTER MAY 16, 2019.
3. OTHER STAGING AREAS MAY BE IDENTIFIED AND USED BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE OWNER IF OTHER STAGING AREAS WILL BE USED. A PROPERTY USE AND A PROPERTY RELEASE FORM WILL BE PROVIDED TO THE OWNER IF OTHER STAGING AREAS ARE USED.
4. THE SNOW LAKE TRAILHEAD WILL OPEN TO THE PUBLIC ON MAY 16, 2019. THE CONTRACTOR WILL INSTALL THE WATER MAIN, PRESSURE TEST IT, AND RESTORE THE AREA FROM STA. 20+00 TO STA. 23+00 BY MAY 15, 2019 TO ALLOW PUBLIC USE OF THE TRAILHEAD PARKING AREA.

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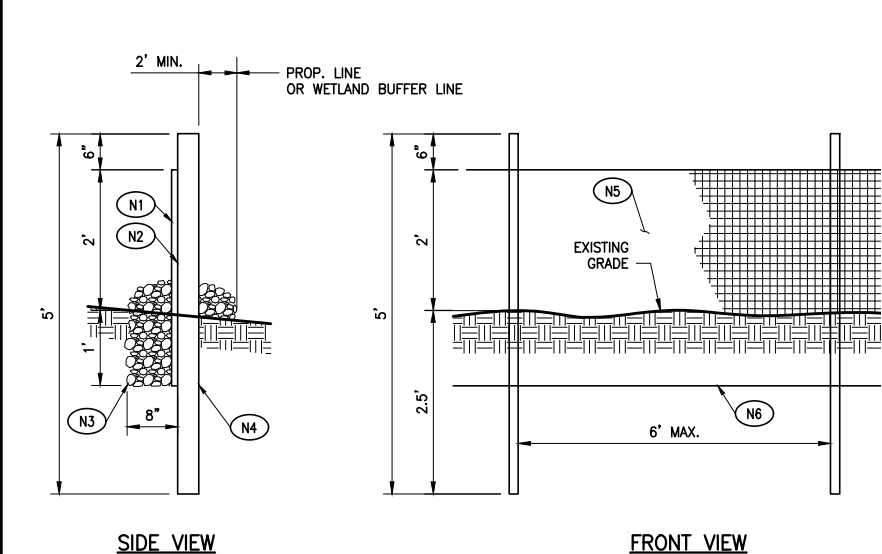
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ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

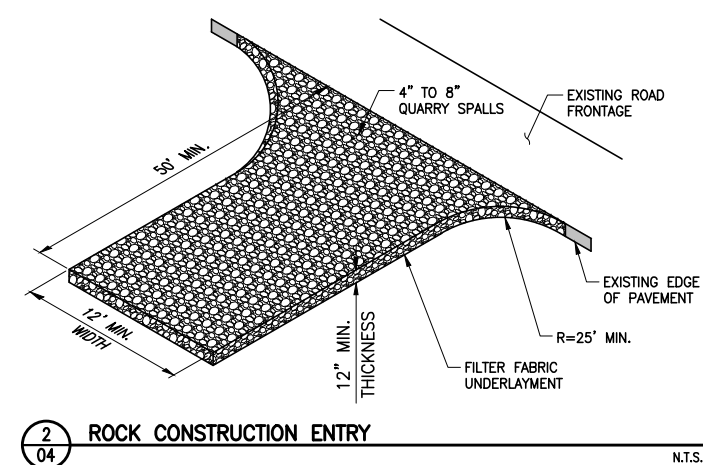
CONTRACTOR STAGING & COORDINATION

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- NOTES**
- (N1) FILTER FABRIC MATERIAL MIRAFI 100 NS OR EQUIVALENT
 - (N2) 2"x2" BY 14 GA. WIRE FABRIC OR EQUIVALENT, AFFIX TO POST (LOCATED ON DOWNHILL SIDE OF FILTER FABRIC)
 - (N3) PROVIDE NATIVE BACKFILL
 - (N4) 2"x4" WOOD POST OR STEEL FENCE POST
 - (N5) FILTER FABRIC MATERIAL 60" WIDE, CONTINUOUS, ROLLS. USE RINGS TO ATTACH TO WIRE FABRIC
 - (N6) BURY BOTTOM OF FILTER MATERIAL IN 8"x12" TRENCH
- 1/04 SILT FENCE**

- NOTES**
1. FILTER FABRIC FENCE SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6" OVERLAP, AND SECURELY FASTENED AT BOTH ENDS TO POST.
 2. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AND DRIVEN SECURELY INTO THE GROUND (MAXIMUM OF 30").
 3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8" WIDE AND 12" DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
 4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4" AND SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE.
 5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO FENCE, AND 20" OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
 6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POST WITH ALL OTHER PROVISIONS OF ABOVE NOTES APPLYING.
 7. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
 8. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



- 2/04 ROCK CONSTRUCTION ENTRY**
- EROSION CONTROL NOTES**
1. THE IMPLEMENT OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND VEGETATION IS ESTABLISHED.
 2. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED BY THE CONTRACTOR FOR UNEXPECTED STORM EVENTS AND TO ENSURE THE SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. THE CONTRACTOR SHALL IMPLEMENT BMPs C101-C162 OF THE SWMMW AS NEEDED TO MEET THESE REQUIREMENTS.
 3. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
 4. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 8 HOURS FOLLOWING A MAJOR STORM EVENT.
 5. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

- EROSION CONTROL NOTES**
1. CONTRACTOR SHALL COMPLETE, SUBMIT AND HAVE AN APPROVED SWPPP PRIOR TO BEGINNING ANY WORK ONSITE. THE FOLLOWING REQUIREMENTS SHALL BE INCLUDED IN OR BE IN ADDITION TO THE SWPPP.
 2. ALL STORMWATER MANAGEMENT ELEMENTS SHALL BE CONSISTENT WITH THE STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON (SWMMW).
 3. THE FOLLOWING CONSTRUCTION SEQUENCE SHALL BE FOLLOWED IN ORDER TO BEST MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENTATION CONTROL PROBLEMS:
 - (A) CLEAR AND GRUB SUFFICIENTLY FOR INSTALLATION OF TEMPORARY ESC BMPs;
 - (B) INSTALL TEMPORARY ESC BMPs, CONSTRUCTING SEDIMENT TRAPPING BMPs AS ONE OF THE FIRST STEPS PRIOR TO GRADING;
 - (C) CLEAR, GRUB AND ROUGH GRADE FOR ROADS, TEMPORARY ACCESS POINTS AND UTILITY LOCATIONS;
 - (D) STABILIZE ROADWAY APPROACHES AND TEMPORARY ACCESS POINTS WITH THE APPROPRIATE CONSTRUCTION ENTRY BMP;
 - (E) REMOVE TEMPORARY ESC CONTROLS WHEN PROJECT COMPLETE.
 4. INSPECT ALL ROADWAYS, AT THE END OF EACH DAY, ADJACENT TO THE CONSTRUCTION ACCESS ROUTE. IF IT IS EVIDENT THAT SEDIMENT HAS BEEN TRACKED OFF SITE AND/OR BEYOND THE ROADWAY APPROACH, CLEANING IS REQUIRED.
 5. IF SEDIMENT REMOVAL IS NECESSARY PRIOR TO STREET WASHING, IT SHALL BE REMOVED BY SHOVELING OR PICKUP SWEEPING AND TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA.
 6. IF STREET WASHING IS REQUIRED TO CLEAN SEDIMENT TRACKED OFF SITE, ONCE SEDIMENT HAS BEEN REMOVED, STREET WASH WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ON-SITE OR OTHERWISE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO WATERS OF THE STATE.
 7. RESTORE CONSTRUCTION ACCESS ROUTE EQUAL TO OR BETTER THAN THE PRE-CONSTRUCTION CONDITION.
 8. INSPECT SEDIMENT CONTROL BMPs WEEKLY AT A MINIMUM, DAILY DURING A STORM EVENT, AND AFTER ANY DISCHARGE FROM THE SITE (STORMWATER OR NON-STORMWATER). THE INSPECTION FREQUENCY MAY BE REDUCED TO ONCE A MONTH IF THE SITE IS STABILIZED AND INACTIVE.
 9. CONTROL FUGITIVE DUST FROM CONSTRUCTION ACTIVITY IN ACCORDANCE WITH THE STATE AND/OR LOCAL AIR QUALITY CONTROL AUTHORITIES WITH JURISDICTION OVER THE PROJECT AREA.
 10. STABILIZE EXPOSED UNWORKED SOILS (INCLUDING STOCKPILES), WHETHER AT FINAL GRADE OR NOT, WITHIN 10 DAYS DURING THE REGIONAL DRY SEASON (JULY 1 THROUGH SEPTEMBER 30) AND WITHIN 5 DAYS DURING THE REGIONAL WET SEASON (OCTOBER 1 THROUGH JUNE 30). SOILS MUST BE STABILIZED AT THE END OF A SHIFT BEFORE A HOLIDAY WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. THIS TIME LIMIT MAY ONLY BE ADJUSTED BY A LOCAL JURISDICTION WITH A "QUALIFIED LOCAL PROGRAM," IF IT CAN BE DEMONSTRATED THAT THE RECENT PRECIPITATION JUSTIFIES A DIFFERENT STANDARD AND MEETS THE REQUIREMENTS SET FORTH IN THE CONSTRUCTION STORMWATER GENERAL PERMIT.
 11. PROTECT INLETS, DRYWELLS, CATCH BASINS AND OTHER STORMWATER MANAGEMENT FACILITIES FROM SEDIMENT, WHETHER OR NOT FACILITIES ARE OPERABLE.
 12. STOCKPILE MATERIALS (SUCH AS TOPSOIL) ON SITE, KEEPING OFF OF ROADWAY AND SIDEWALKS.
 13. COVER, CONTAIN AND PROTECT ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCT, AND NON-INERT WASTES PRESENT ON SITE FROM VANDALISM (SEE CHAPTER 173-304 WAC FOR THE DEFINITION OF INERT WASTE), USE SECONDARY CONTAINMENT FOR ON-SITE FUELING TANKS.
 14. CONDUCT MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM REPAIRS, SOLVENT AND DE-GREASING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES THAT MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CLEAN ALL CONTAMINATED SURFACES IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. IF RAINING OVER EQUIPMENT OR VEHICLE, PERFORM EMERGENCY REPAIRS ON SITE USING TEMPORARY PLASTIC BENEATH THE VEHICLE.
 15. CONDUCT APPLICATION OF AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, IN SUCH A MANNER, AND AT APPLICATION RATES, THAT INHIBITS THE LOSS OF CHEMICALS INTO STORMWATER RUNOFF FACILITIES. AMEND MANUFACTURER'S RECOMMENDED APPLICATION RATES AND PROCEDURES TO MEET THIS REQUIREMENT, IF NECESSARY.
 16. REMOVE TEMPORARY ESC BMPs WITHIN 30 DAYS AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. PERMANENTLY STABILIZE AREAS THAT ARE DISTURBED DURING THE REMOVAL PROCESS.

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VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

EROSION CONTROL PLAN

NOTES

- PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD IS TO REMAIN OPEN TO TRAFFIC DURING CONSTRUCTION AT ALL TIMES. FOR WORK THAT NEEDS TO BE ACCESSED FROM ICICLE ROAD, DURING WORK HOURS, THE CONTRACTOR MAY USE THE EASTBOUND LANE (SOUTH LANE ADJACENT TO PROJECT AREA). WHEN WORK IS COMPLETE FOR THE DAY THE CONTRACTOR WILL ALLOW FOR TWO-WAY TRAFFIC.
- THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL. FLAGGERS ARE ANTICIPATED AS IS DAILY CONVERSION OF THE WORK AREA FROM SINGLE LANE DURING WORKING HOURS TO TWO LANE DURING NON-WORKING HOURS.
- TRAFFIC CONTROL PLANS SHALL CONFORM WITH THE STANDARDS OF THE 2009 MUTCD AND THE WSDOT 2014 WORK ZONE TRAFFIC CONTROL GUIDELINES FOR MAINTENANCE OPERATIONS. ALL SIGN SIZES SHALL CONFORM TO MUTCD REQUIREMENTS FOR A CONVENTIONAL ROAD.
- THE CONTRACTOR MAY ACCEPT THE TRAFFIC CONTROL MEASURES SHOWN ON THESE PLANS OR SUBMIT AN ALTERNATIVE PLAN FOR APPROVAL.
- TRAFFIC CONTROL MEASURES SHALL BE INSTALLED BY THE CONTRACTOR PRIOR TO COMMENCING WORK.
- TRAFFIC CONTROL MEASURES NEEDED TO RESTRICT ICICLE ROAD TO ONE LANE SHALL BE INSTALLED BY THE CONTRACTOR WHEN NEEDED TO ACCESS THE WORK AREA. CONTRACTOR TO LIMIT ROAD RESTRICTIONS TO THE IMMEDIATE AREA BEING WORKED ON TO THE MAXIMUM EXTENT PRACTICABLE.
- TEMPORARY TRAFFIC LANES SHALL BE CLEARLY DELINEATED AND MAY CONSIST OF CHANNELIZING DEVICES OR TEMPORARY PAVEMENT MARKINGS.
- CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND UPKEEP OF THE TRAFFIC CONTROL DEVICES FOR THE DURATION OF THE PROJECT.
- UNLESS OTHERWISE NOTED, ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.



WORK HOURS: ONE-LANE TRAFFIC



NON-WORK HOURS: TWO-LANE TRAFFIC

KEY NOTES

① MINIMIZE USE OF SHOULDER FOR MATERIAL STORAGE. AT NIGHT REMOVE MATERIALS AND EQUIPMENT FROM THE ROAD AND PROVIDE SUFFICIENT ROOM BETWEEN TRAFFIC AND THE WORK AREA TO MINIMIZE EROSION AND DAMAGE TO THE WORK AREA.

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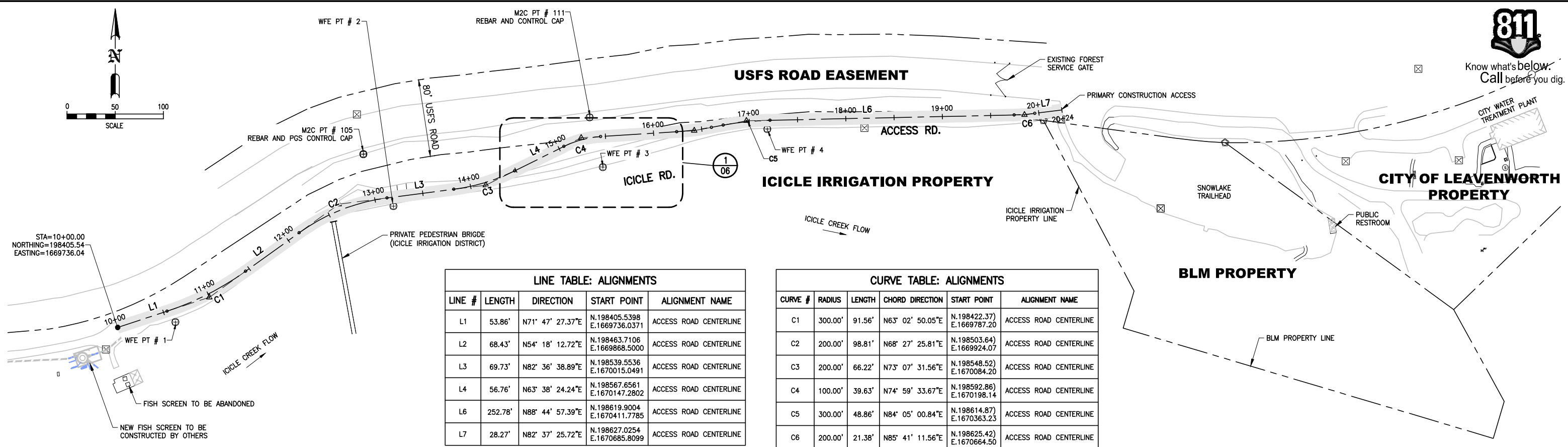
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

TRAFFIC CONTROL PLAN

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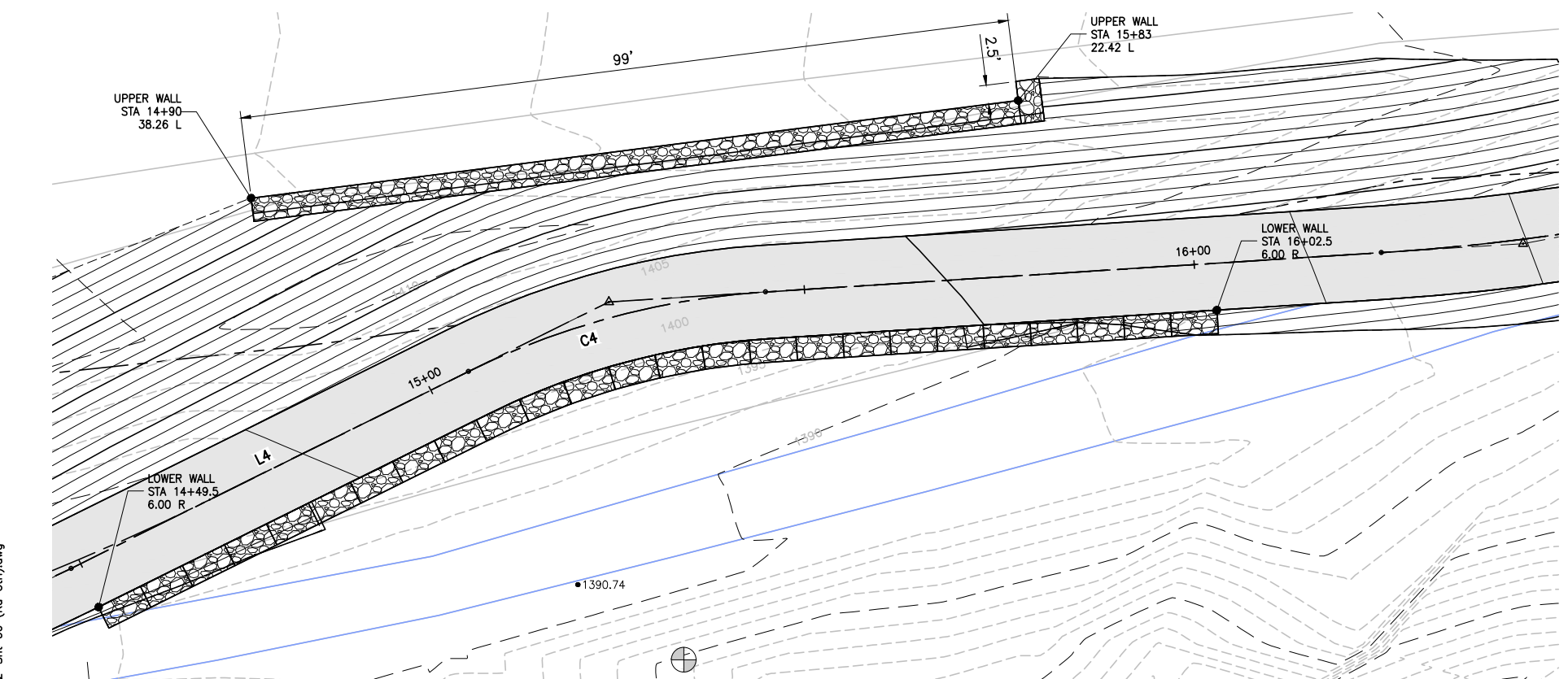
Know what's below. Call before you dig.



LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	53.86'	N71° 47' 27.37"E	N.198405.5398 E.1669736.0371	ACCESS ROAD CENTERLINE
L2	68.43'	N54° 18' 12.72"E	N.198463.7106 E.1669868.5000	ACCESS ROAD CENTERLINE
L3	69.73'	N82° 36' 38.89"E	N.198539.5536 E.1670015.0491	ACCESS ROAD CENTERLINE
L4	56.76'	N63° 38' 24.24"E	N.198567.6561 E.1670147.2802	ACCESS ROAD CENTERLINE
L6	252.78'	N88° 44' 57.39"E	N.198619.9004 E.1670411.7785	ACCESS ROAD CENTERLINE
L7	28.27'	N82° 37' 25.72"E	N.198627.0254 E.1670685.8099	ACCESS ROAD CENTERLINE

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	300.00'	91.56'	N63° 02' 50.05"E	N.198422.37) E.1669787.20	ACCESS ROAD CENTERLINE
C2	200.00'	98.81'	N68° 27' 25.81"E	N.198503.64) E.1669924.07	ACCESS ROAD CENTERLINE
C3	200.00'	66.22'	N73° 07' 31.56"E	N.198548.52) E.1670084.20	ACCESS ROAD CENTERLINE
C4	100.00'	39.63'	N74° 59' 33.67"E	N.198592.86) E.1670198.14	ACCESS ROAD CENTERLINE
C5	300.00'	48.86'	N84° 05' 00.84"E	N.198614.87) E.1670363.23	ACCESS ROAD CENTERLINE
C6	200.00'	21.38'	N85° 41' 11.56"E	N.198625.42) E.1670664.50	ACCESS ROAD CENTERLINE

ACCESS ROAD HORIZONTAL CONTROL



RETAINING WALL HORIZONTAL CONTROL

- NOTES**
- ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT.
 - EXISTING WATERMAIN TO BE ABANDONED.
 - CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF ACCESS ROAD AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION.

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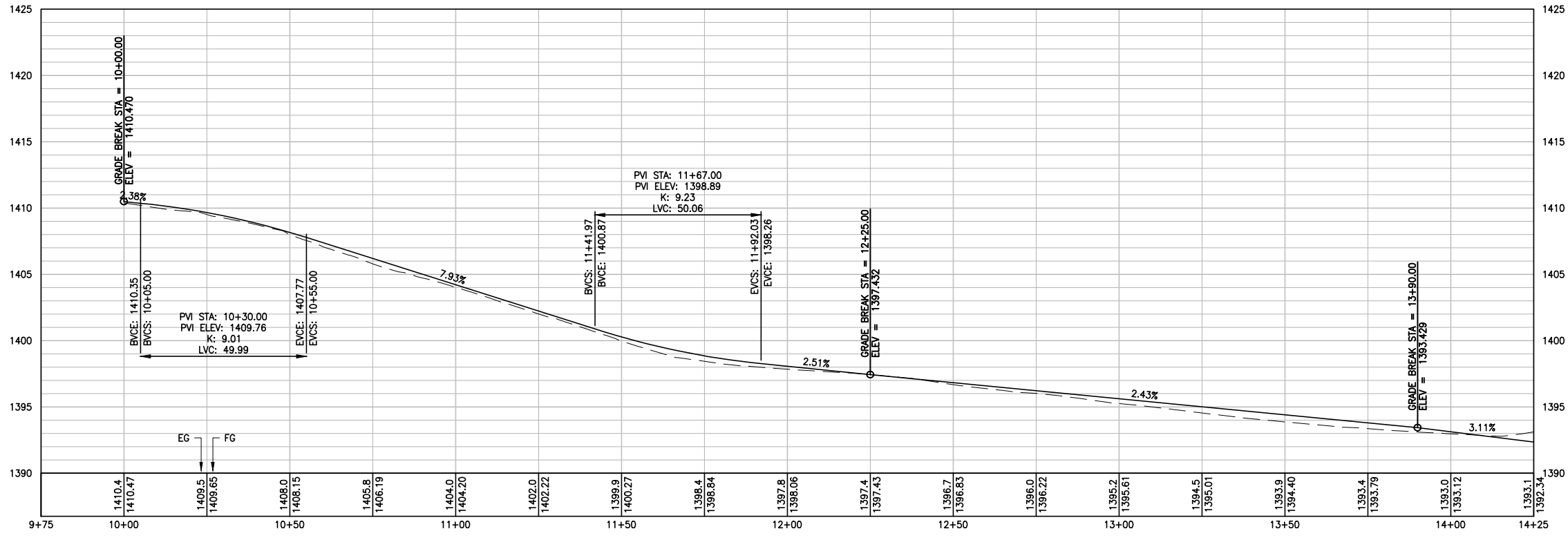
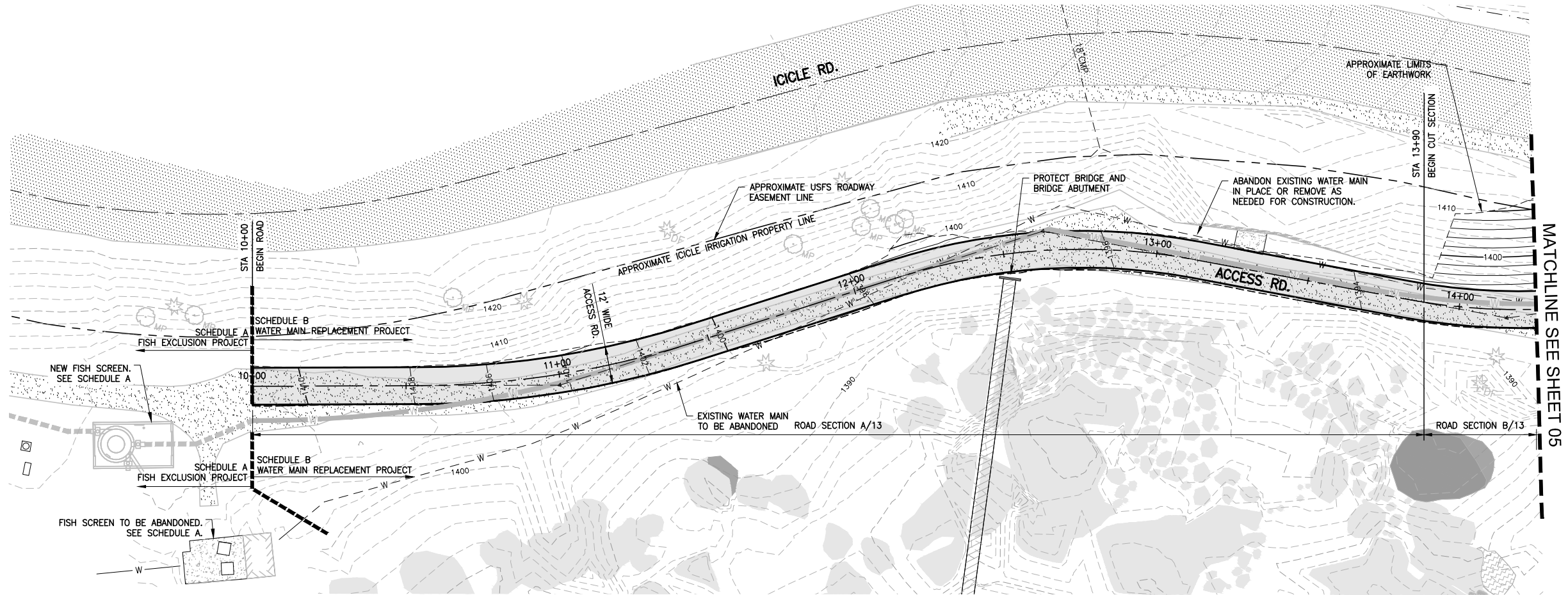
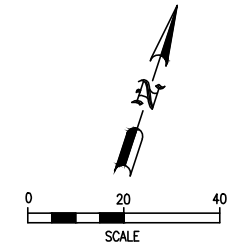


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD ALIGNMENT

SHEET
06
 OF 16



Know what's below.
Call before you dig.



1780102-Sht 07-08 (Rd Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

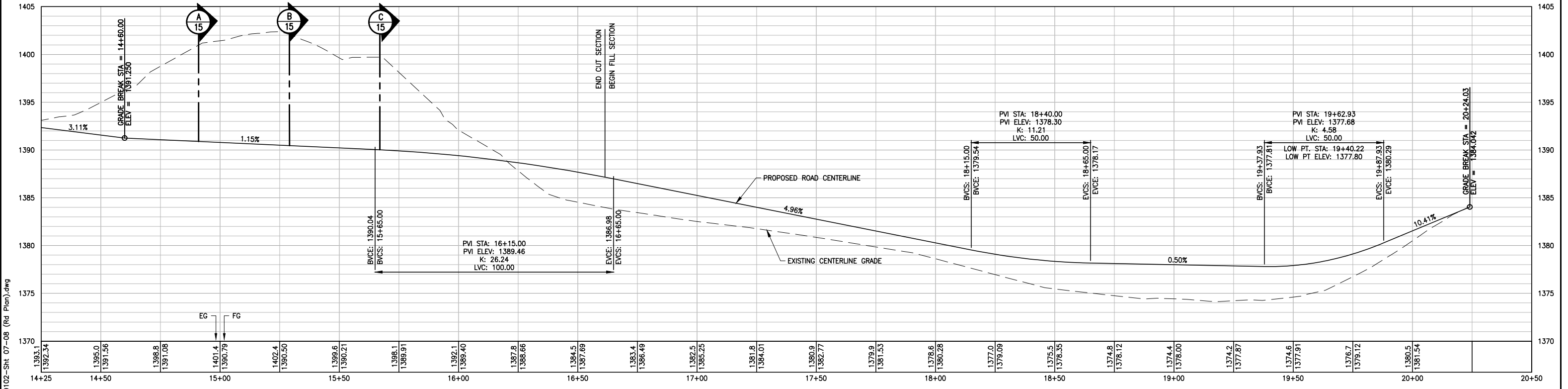
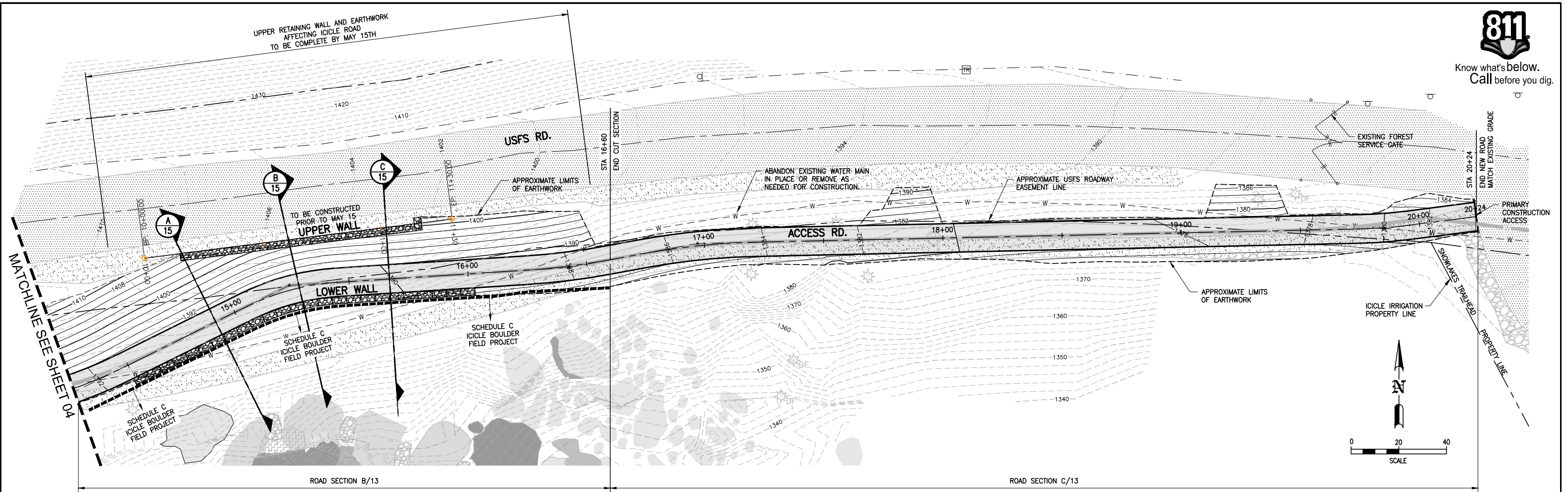


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD - PLAN & PROFILE STA 10+00 TO STA 14+25

SHEET
07
 OF 16



Know what's below.
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1780102-Sht 07-08 (Rd Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

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 DRAWN: -
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 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

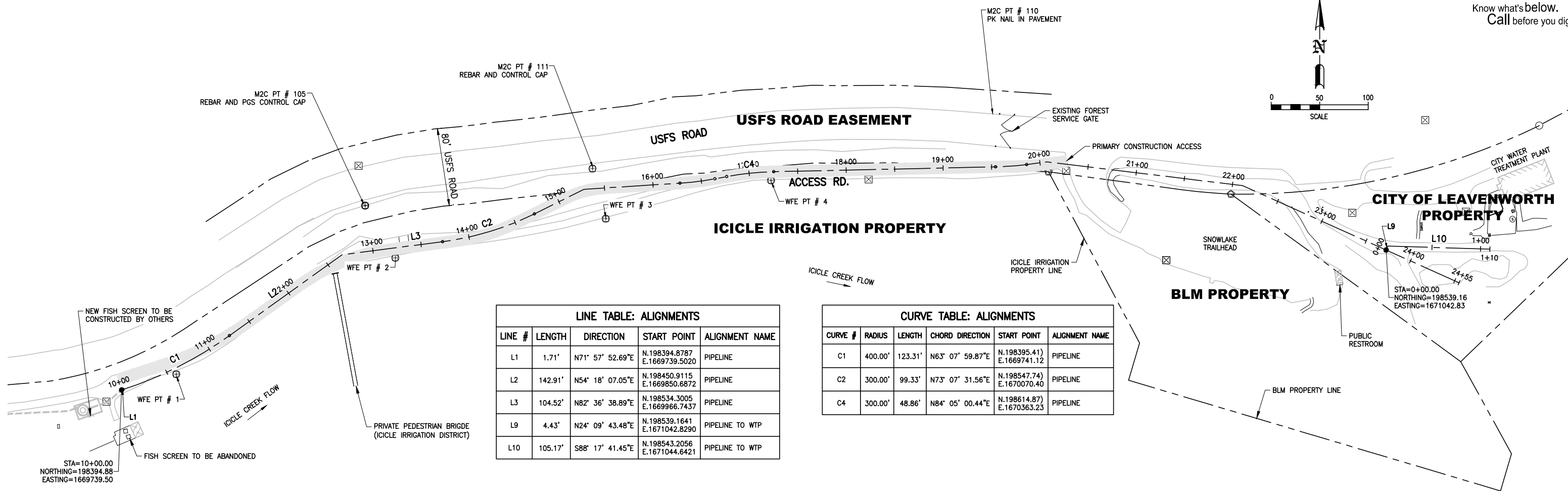
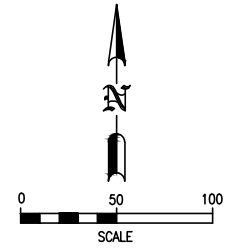


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD - PLAN & PROFILE STA 14+25 TO STA 20+22

SHEET
08
 OF 16



Know what's below.
Call before you dig.



LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	1.71'	N71° 57' 52.69"E	N.198394.8787 E.1669739.5020	PIPELINE
L2	142.91'	N54° 18' 07.05"E	N.198450.9115 E.1669850.6872	PIPELINE
L3	104.52'	N82° 36' 38.89"E	N.198534.3005 E.1669966.7437	PIPELINE
L9	4.43'	N24° 09' 43.48"E	N.198539.1641 E.1671042.8290	PIPELINE TO WTP
L10	105.17'	S88° 17' 41.45"E	N.198543.2056 E.1671044.6421	PIPELINE TO WTP

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	400.00'	123.31'	N63° 07' 59.87"E	N.198395.41) E.1669741.12	PIPELINE
C2	300.00'	99.33'	N73° 07' 31.56"E	N.198547.74) E.1670070.40	PIPELINE
C4	300.00'	48.86'	N84° 05' 00.44"E	N.198614.87) E.1670363.23	PIPELINE

WATER MAIN HORIZONTAL CONTROL

NOTES

1. ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT
2. EXISTING WATERMAIN TO BE ABANDONED
3. CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF WATER MAIN AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION

1780102-Sht 09 (Wrt Ctr).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
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 DRAWN: -
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 PROJ. NO.: 178-01-02
 DATE: 12/11/18

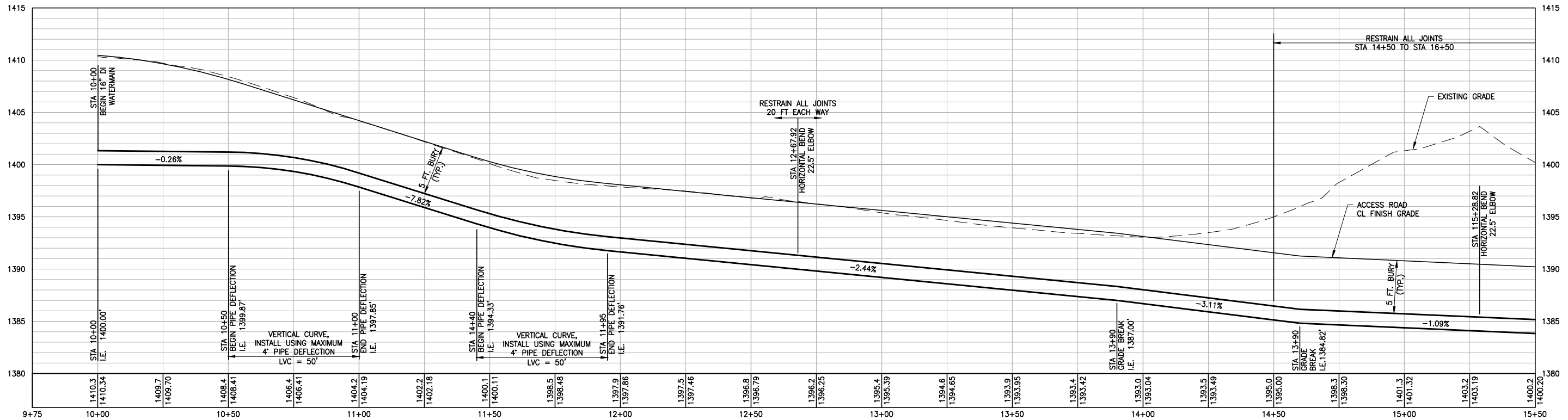
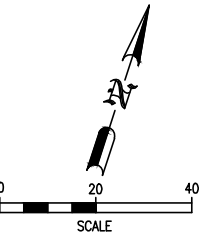
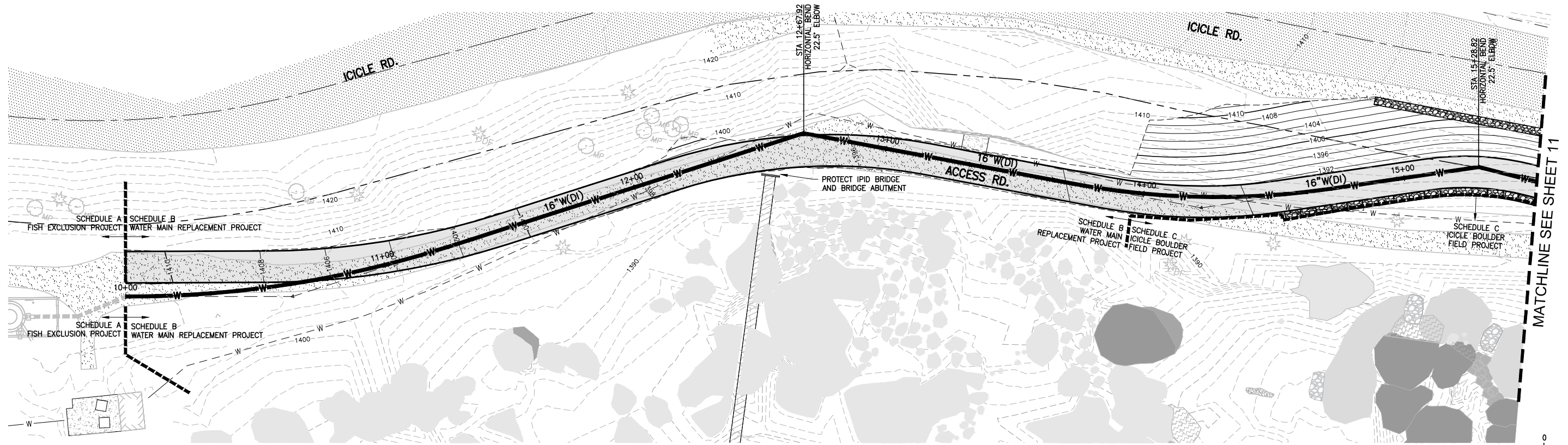


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN ALIGNMENT

SHEET
09
 OF 16



Know what's below.
Call before you dig.



1780102-Sht 10-11-12 (Wrt Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

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 DATE: 12/11/18



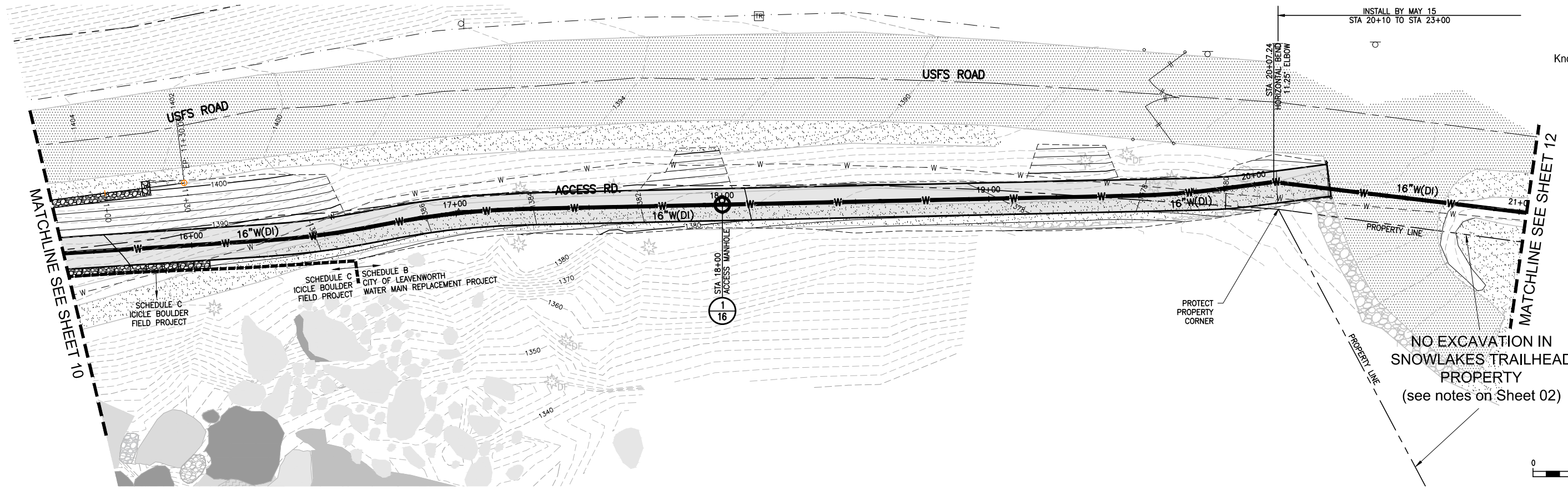
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

WATER MAIN - PLAN & PROFILE STA 10+00 TO STA 14+50

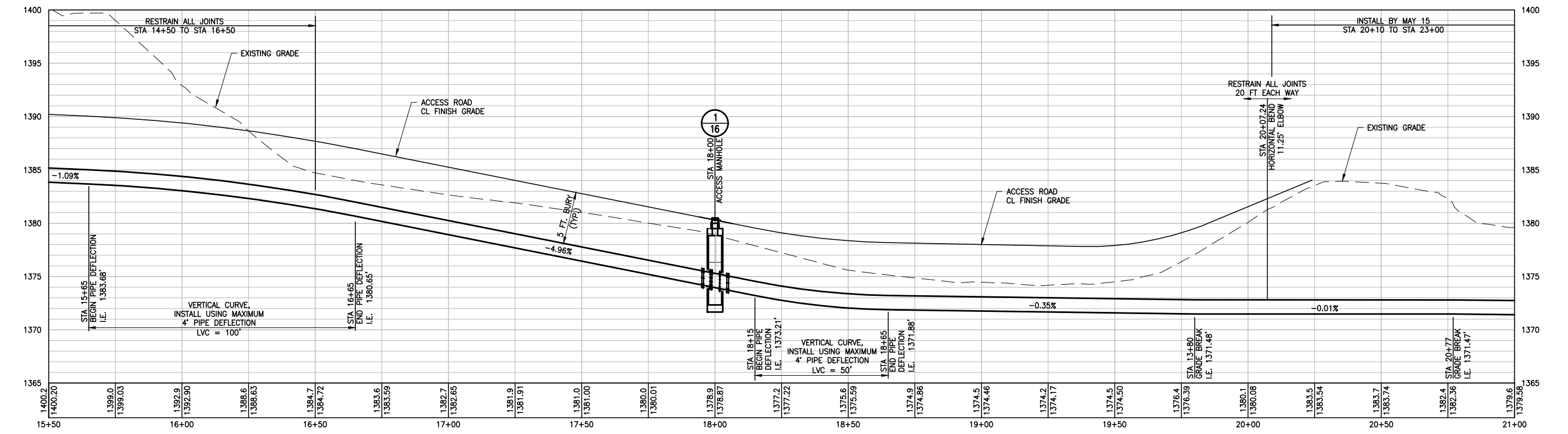
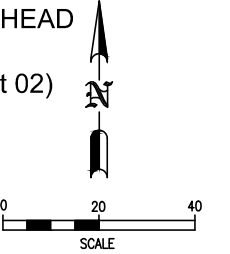
SHEET
10
 OF 16



Know what's below.
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NO EXCAVATION IN
SNOWLAKES TRAILHEAD
PROPERTY
(see notes on Sheet 02)



1760102-Sht 10-11-12 (Wrt Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

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 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

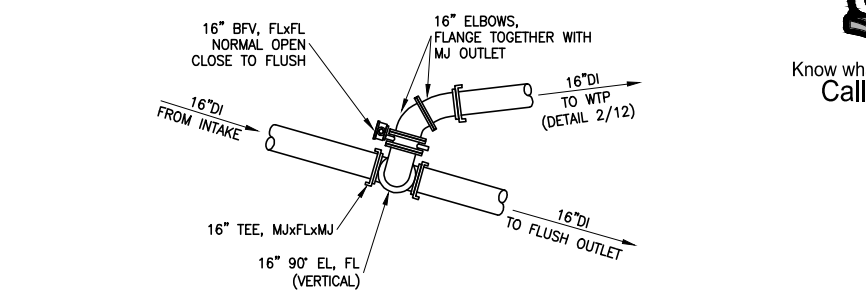
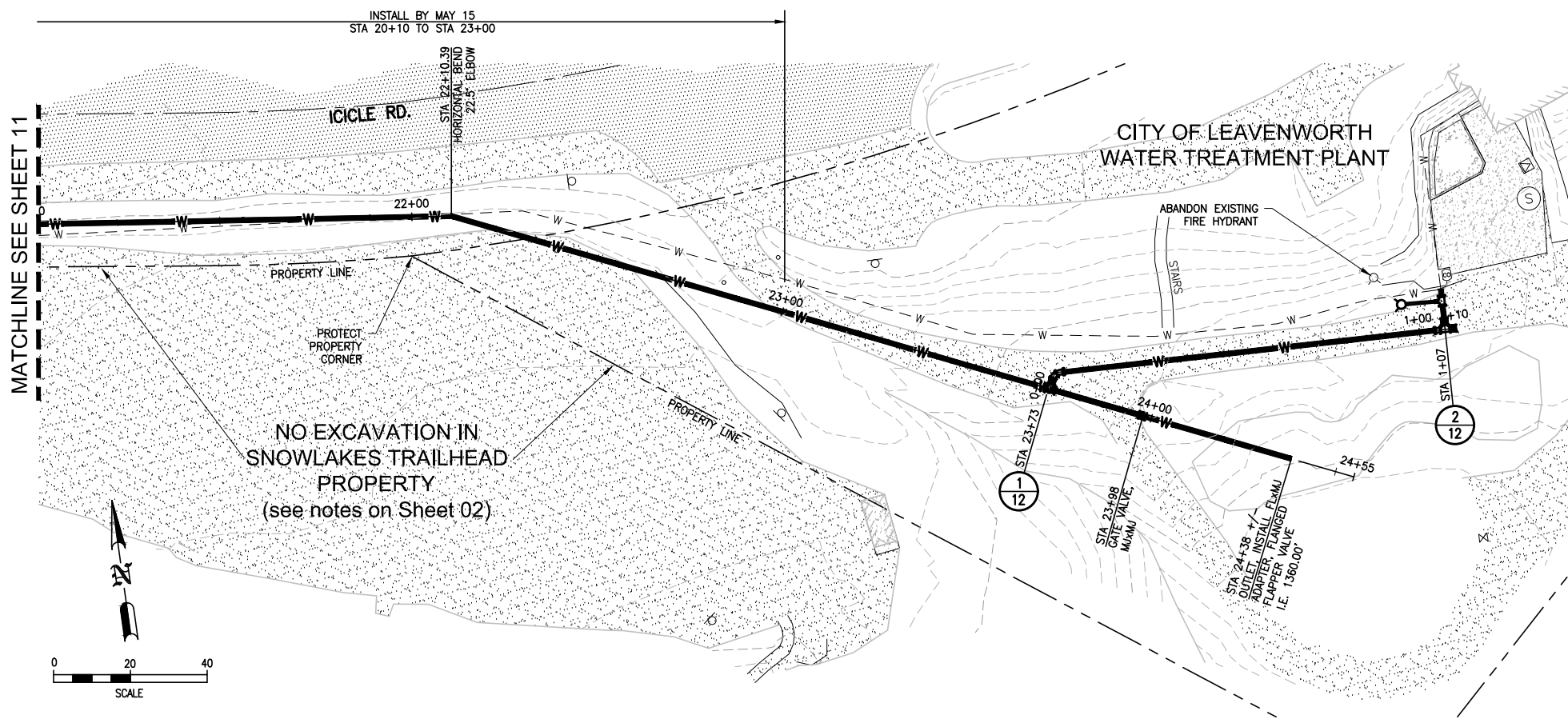


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN - PLAN & PROFILE STA 14+50 TO STA 21+00

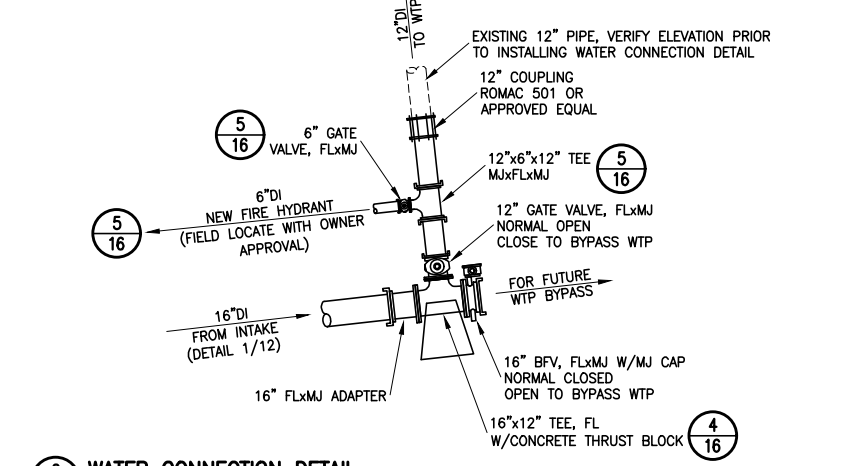
SHEET
11
 OF 16



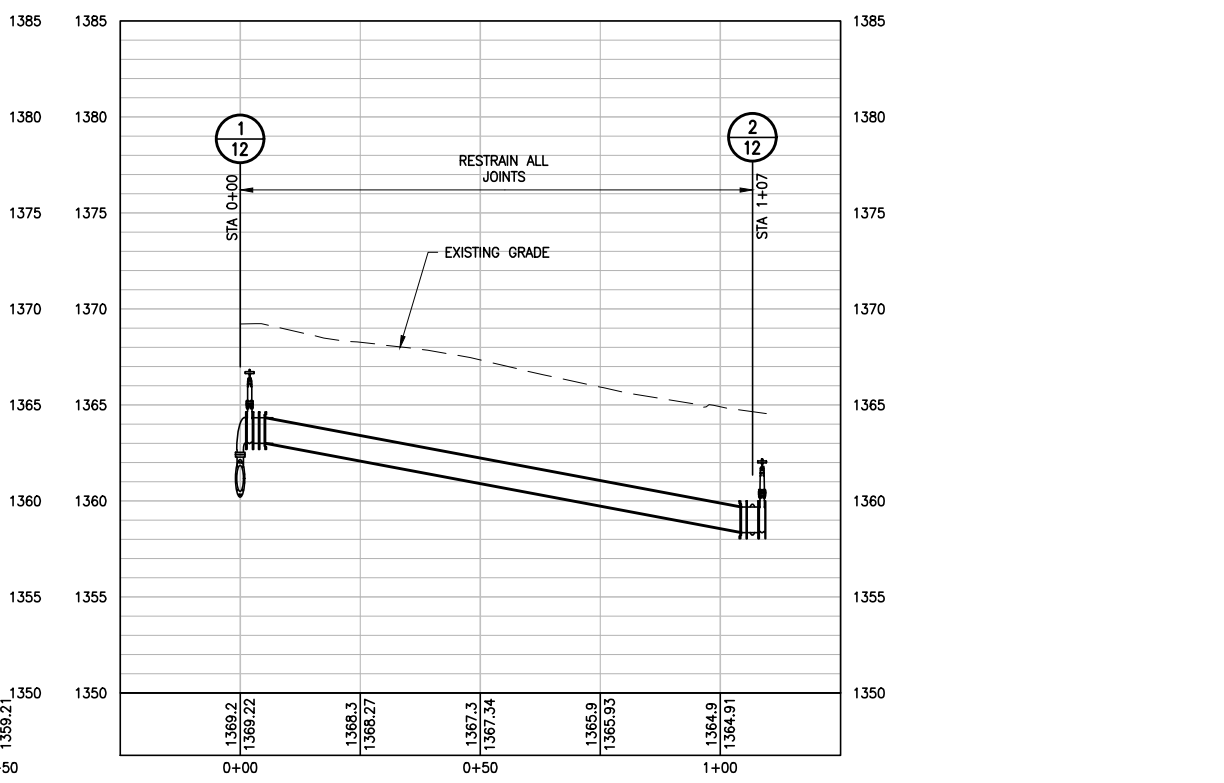
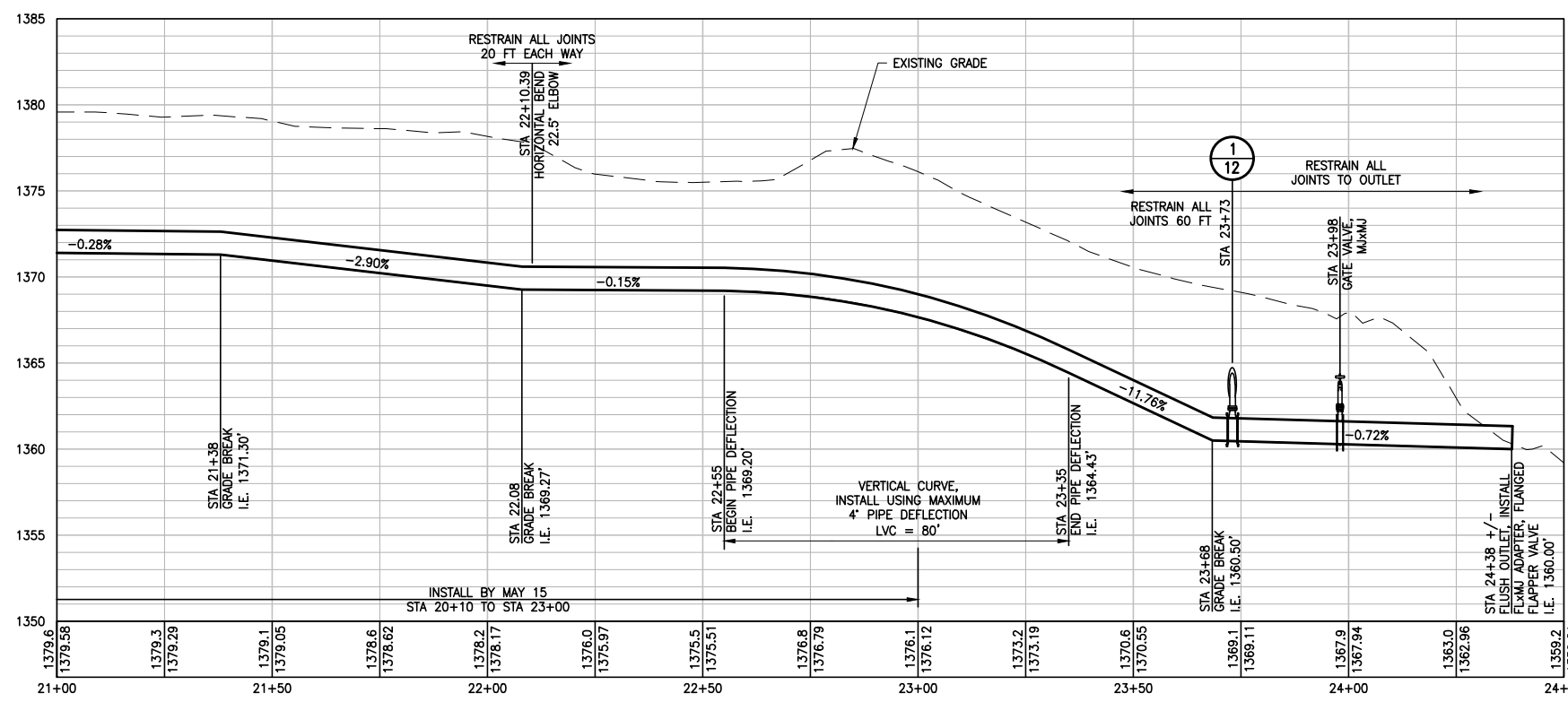
Know what's below.
Call before you dig.



1 WATER CONNECTION DETAIL N.T.S.



2 WATER CONNECTION DETAIL N.T.S.



1760102-Sht 10-11-12 (Wrt Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

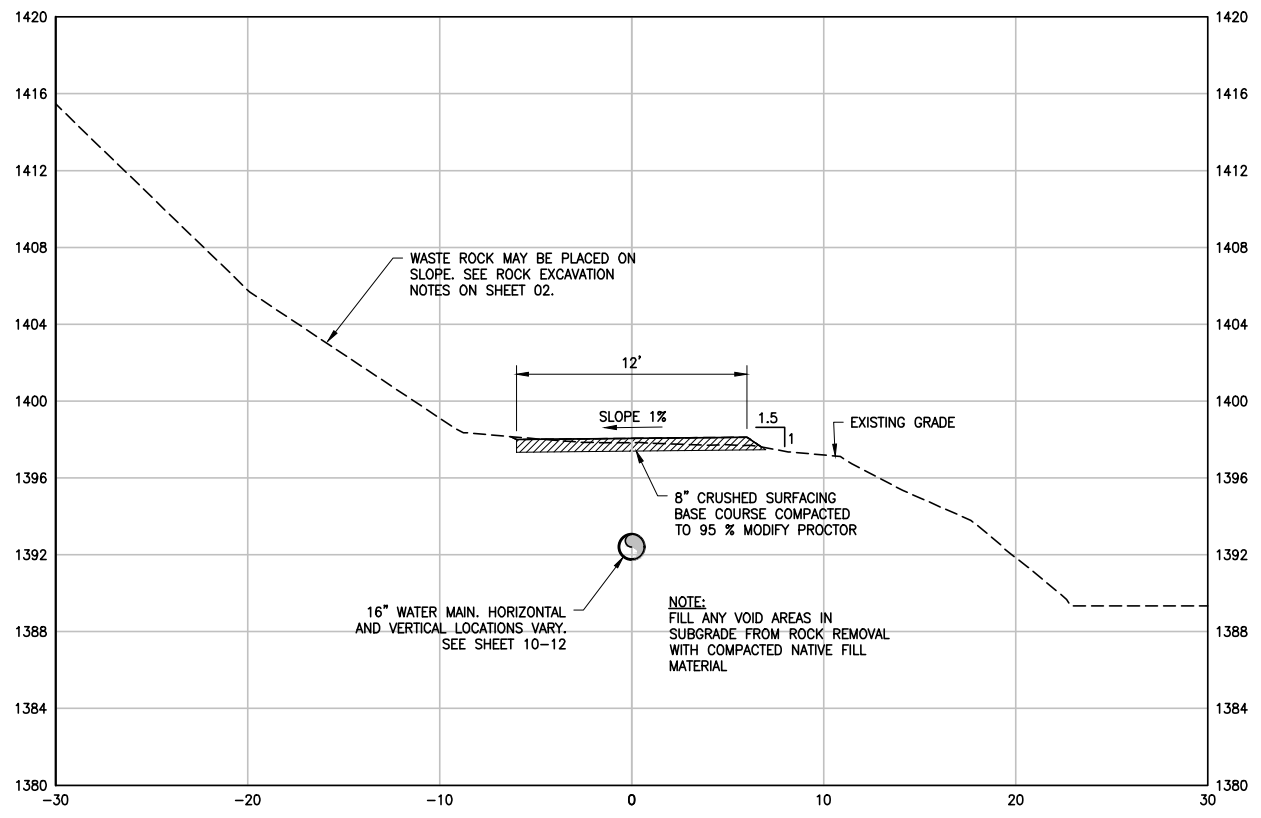
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 PROJ. NO.: 178-01-02
 DATE: 12/11/18

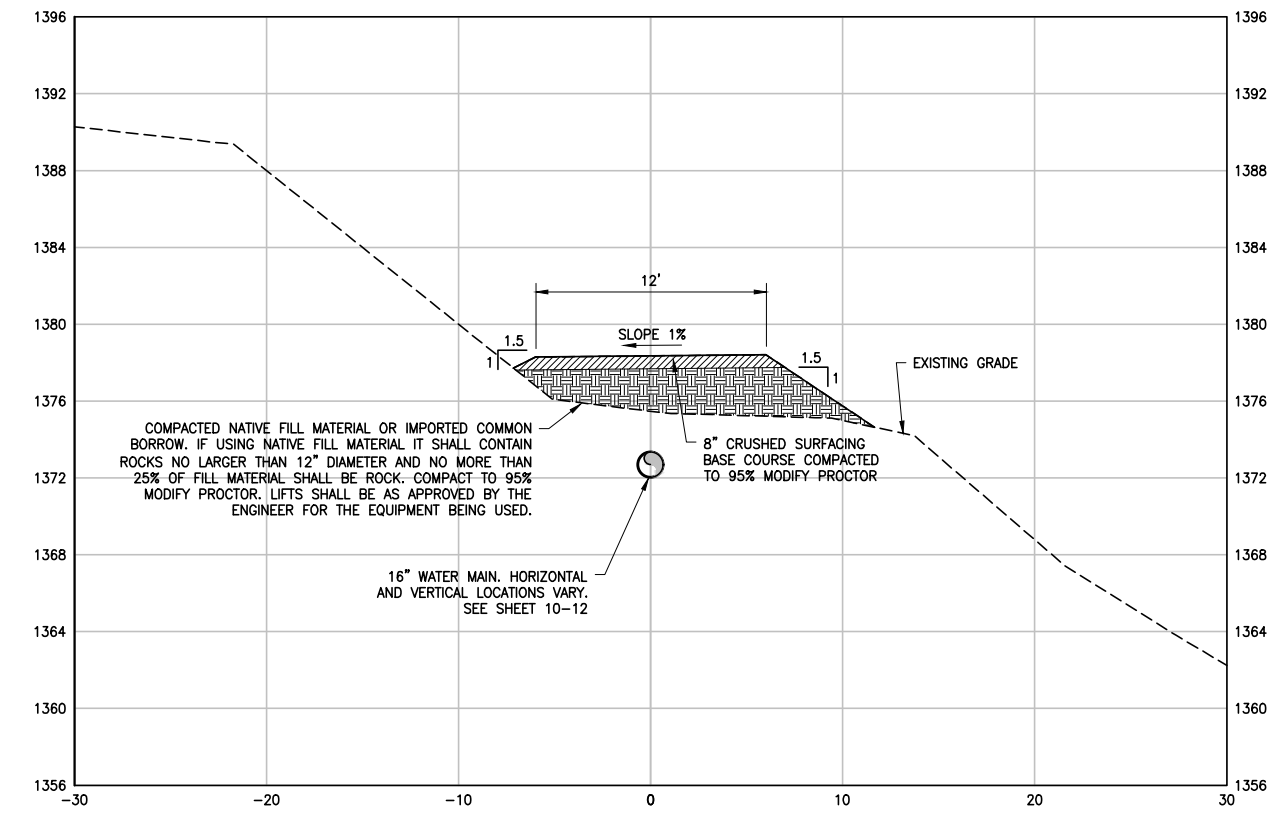
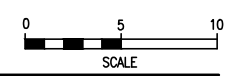


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN - PLAN & PROFILE STA 21+00 TO STA 24+55

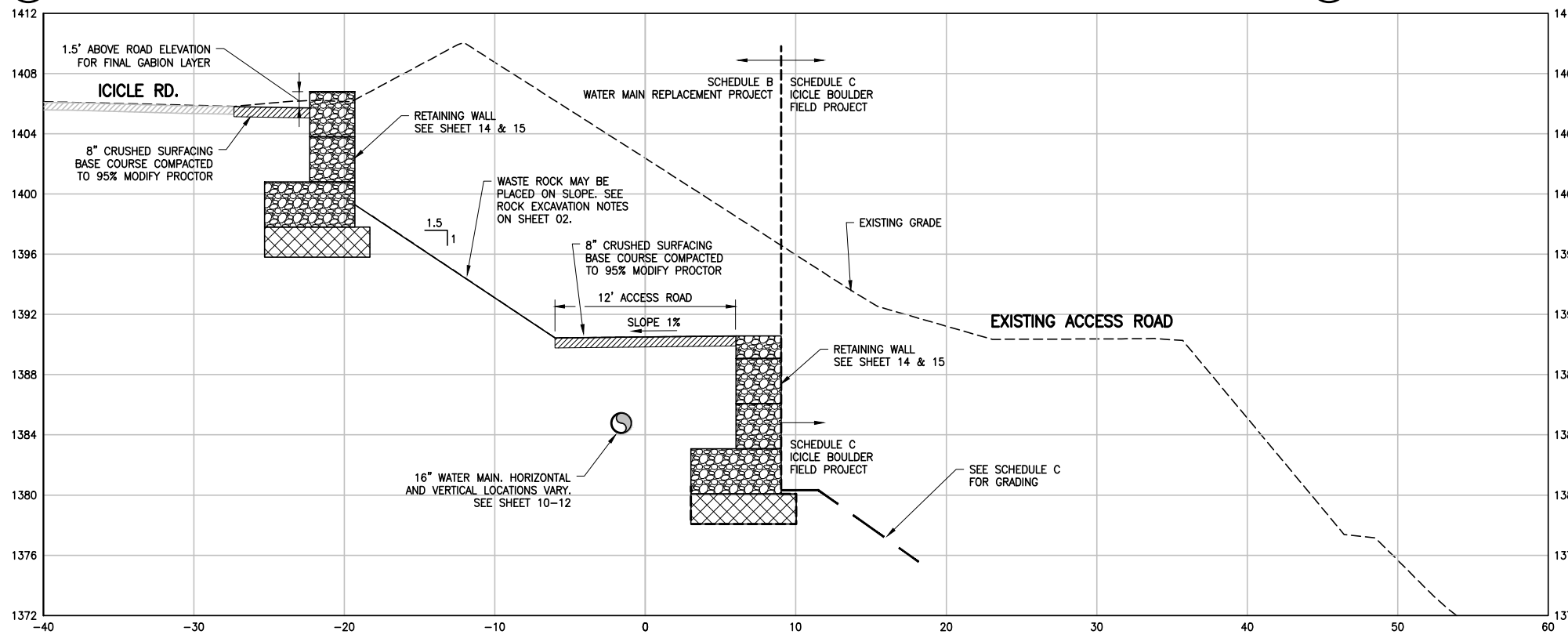
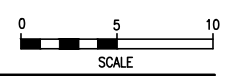
SHEET
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 OF 16



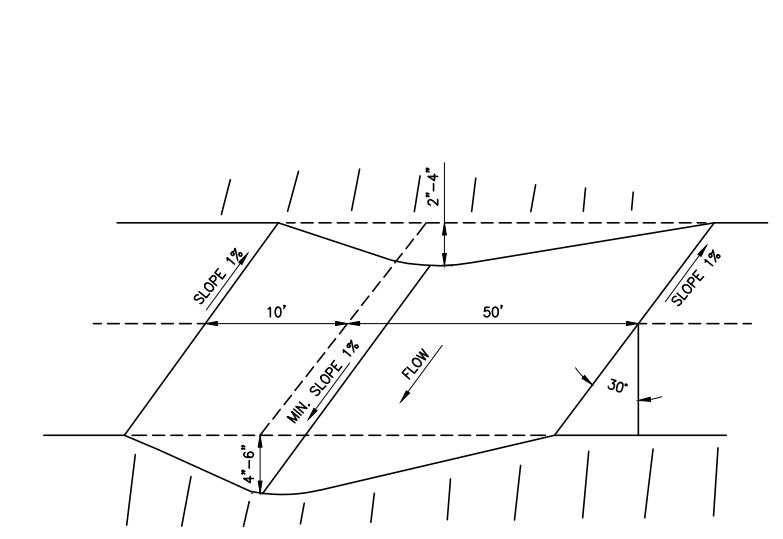
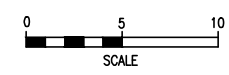
A SECTION - ACCESS ROAD STA 10+00 TO STA 13+90



C SECTION - ACCESS ROAD STA 16+60 TO STA 20+24



B SECTION - ACCESS ROAD STA 13+90 TO STA 16+60



- NOTES**
1. DIPS TO BE INSTALLED AT 200 FT INTERVALS AND AT LOW SPOTS IN THE ROADWAY
 2. DIPS TO BE ROCK ARMORED USING WSDOT BALLAST (WSDOT SPEC 9.03.9(1) DOWN SLOPE
 3. ON STEEP ROAD GRADES, SKEW THE DIP 30 DEGREES FROM PERPENDICULAR TO PROVIDE DRAINAGE

1 ROLLING DIP SECTION

N.T.S.

1780102-Sht. 13 (Rd Dis).dwg

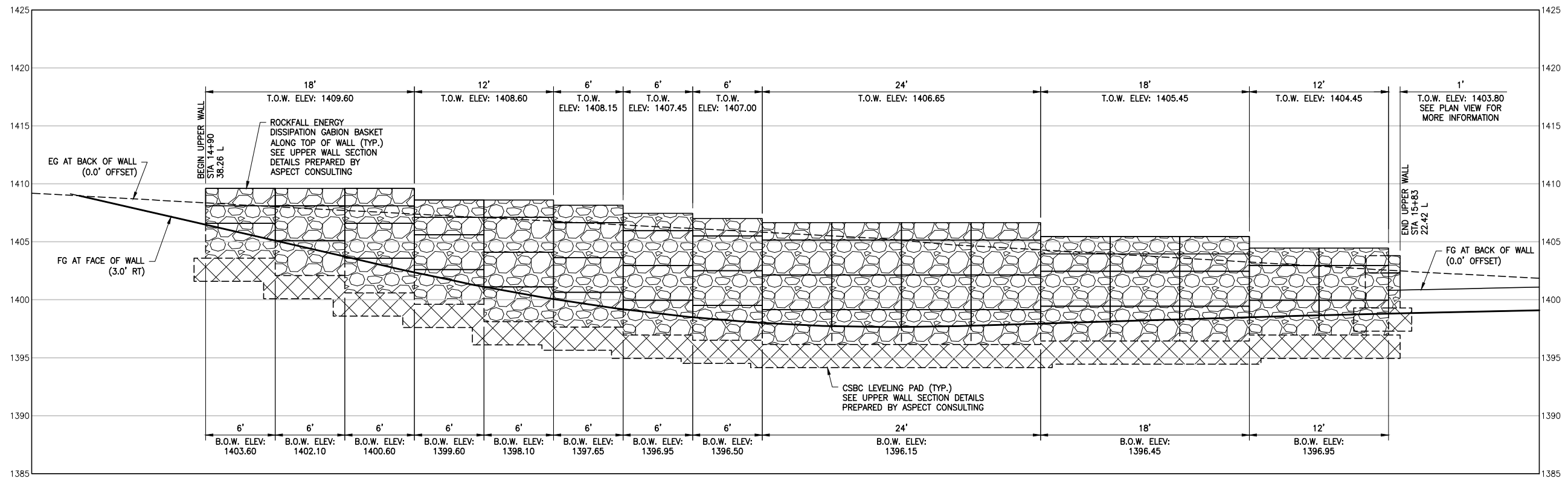
NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

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 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

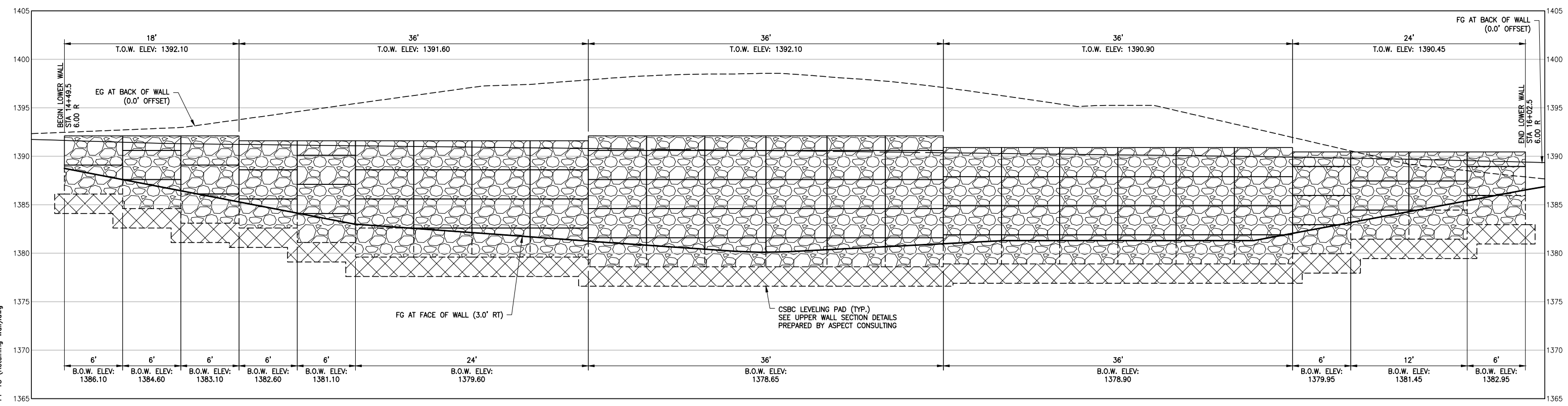


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD SECTIONS



GENERAL NOTES
 WALL PROFILES ARE BASED ON GRADING FOR THE FISH PASSAGE PREPARED BY WATERFALL ENGINEERING, AND THE RETAINING WALL DESIGN PREPARED BY ASPECT CONSULTING.

1 UPPER RETAINING WALL PROFILE - BACK OF TOP WALL ALIGNMENT



2 LOWER RETAINING WALL PROFILE - BACK OF BOTTOM WALL ALIGNMENT

1760102-Sht 14-15 (Retaining Wall).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

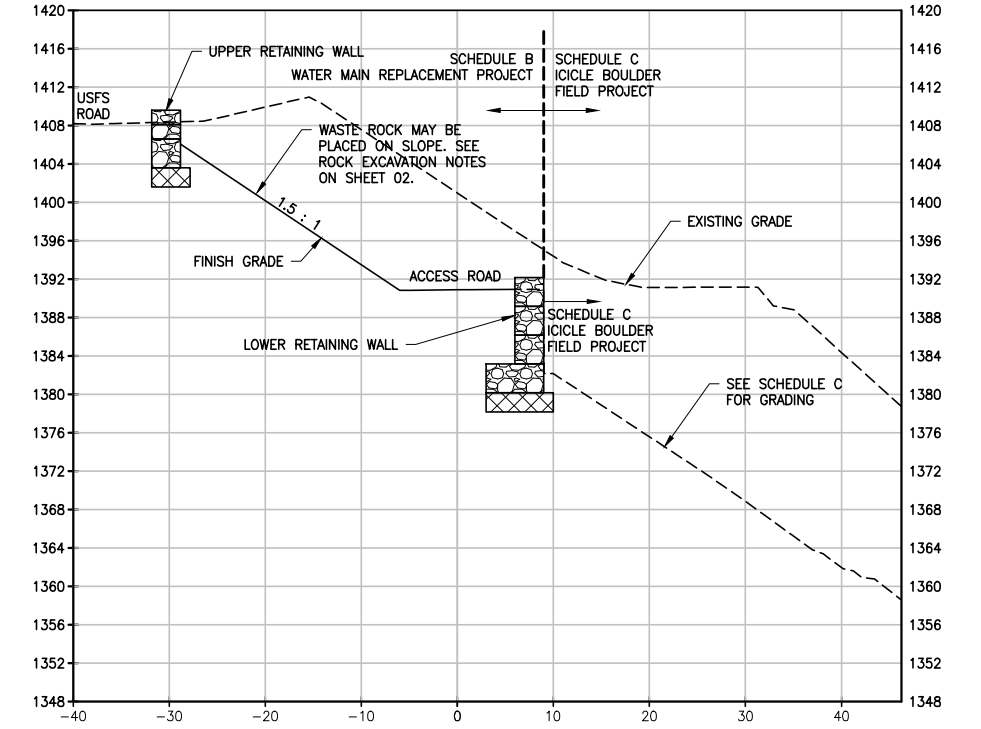
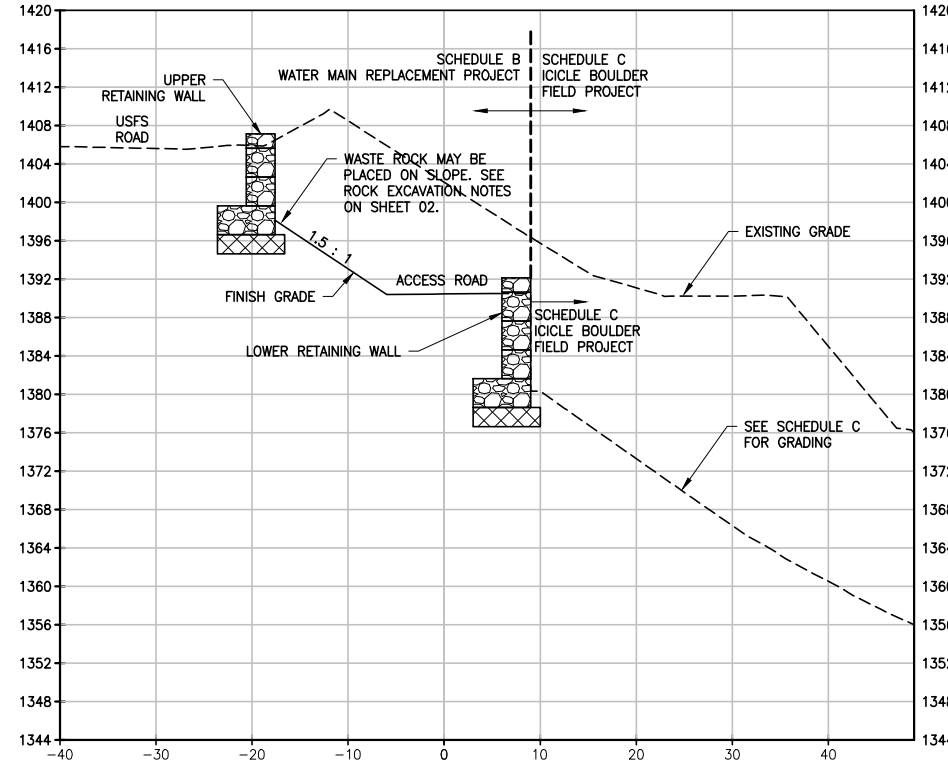
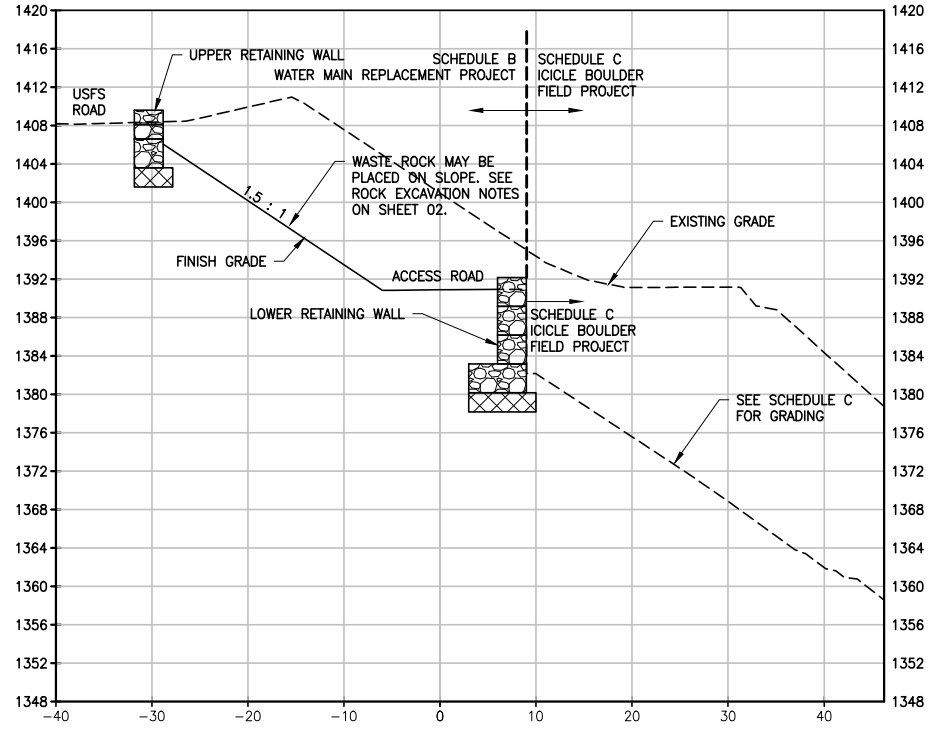
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 APPROVED: -
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 DATE: 12/11/18



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 RETAINING WALL PROFILES

SHEET
14
 OF 16



A
15 SECTION A - RETAINING WALLS

B
15 SECTION B - RETAINING WALLS

C
15 SECTION C - RETAINING WALLS

1780102-Sht 14-15 (Retaining Wall).dwg

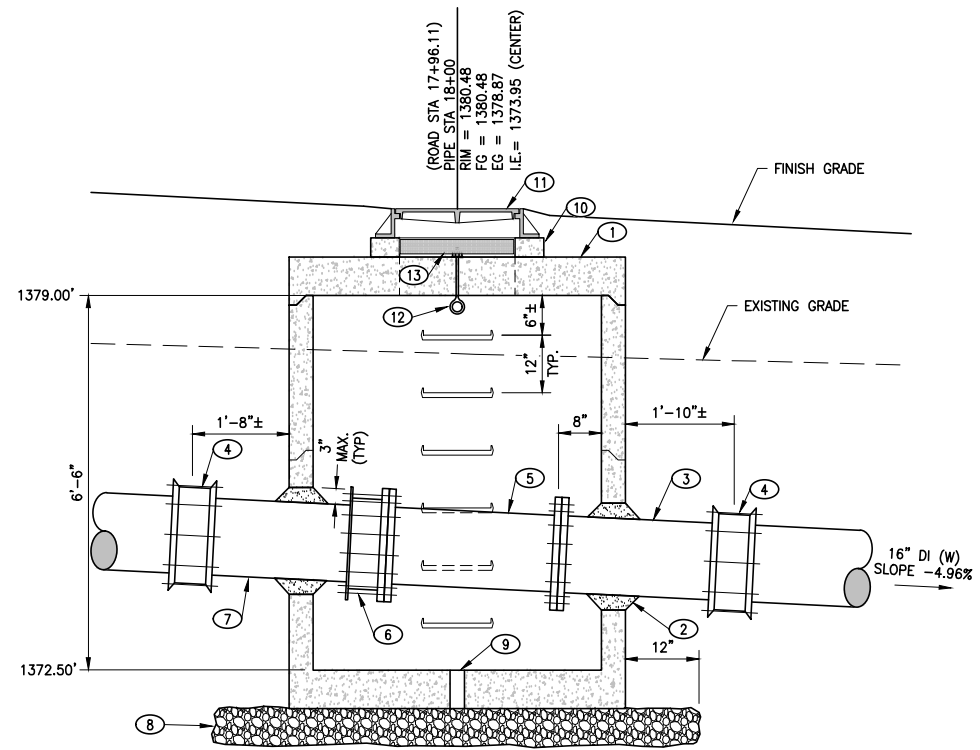
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DRAFT

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 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 RETAINING WALL SECTIONS



NOTES

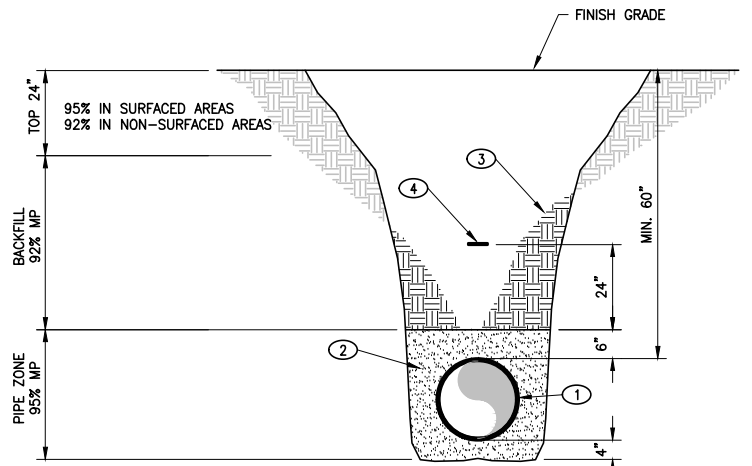
- ① WSDOT CATCH BASIN TYPE 2; 60" DIA. STANDARD PLAN B-10.20-01 WITH H2O RATED TOP SLAB
- ② NON-SHRINK GROUT
- ③ 16" FLXPE SPOOL, 3' LENGTH
- ④ 16" ROMAC 501 COUPLING
- ⑤ 16" FLXFL SPOOL, 3' LENGTH
- ⑥ 16" ROMAC FCA 501
- ⑦ 16" PEXPE SPOOL
- ⑧ 6" COMPACTED CSTC BASE
- ⑨ 3" DIA. DRAIN HOLE
- ⑩ CONCRETE GRADE RING(S) AS REQUIRED
- ⑪ CIRCULAR FRAME AND COVER, "WATER", TYPE 2 BOLT DOWN WATERTIGHT. WSDOT STANDARD PLAN B-30.70-03
- ⑫ 3/4" FORGED SHOULDER EYEBOLT, GALVANIZED w/NUT, LOCKNUT AND WASHER
- ⑬ 4" THICK 5M STYROFOAM INSULATION PAD, FIT SNUG

NOTE: WRAP PIPE INSIDE STRUCTURE WITH 3" OWENS CORNING FIBERGLAS "FLEXWRAP" ASJ OR APPROVED EQUAL

① 16 DETAIL - MANHOLE N.T.S.

BACKFILL NOTES

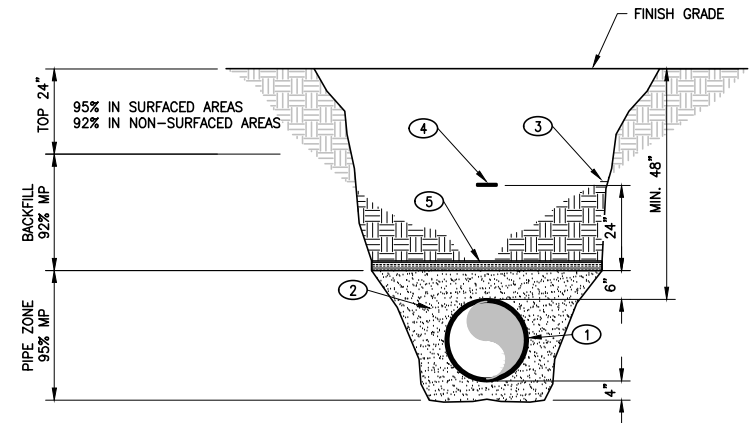
1. BACKFILL SHALL BE NATIVE MATERIAL EXCAVATED FROM SITE OR IMPORTED COMMON BORROW. IF NATIVE MATERIAL IS USED FOR BACKFILL IT SHALL MEET THE FOLLOWING CRITERIA:
 - BACKFILL SHALL CONTAIN NO ROCKS LARGER THAN 12" DIAMETER AND NO MORE THAN 25% OF FILL MATERIAL SHALL BE ROCK.
 - ROCKS LARGER THAN 6" DIAMETER SHALL NOT BE PLACED CLOSER THAN 12" TO WATER MAIN.
 - BACKFILL SHALL BE COMPACTED TO DENSITY AS NOTED. BACKFILL SHALL BE COMPACTED IN LIFTS. DEPTH OF LIFT SHALL NOT EXCEED 12" UNLESS APPROVED BY THE ENGINEER.



NOTES

- ① 16" DI PIPE
- ② GRAVEL BACKFILL FOR PIPE ZONE BEDDING
- ③ BACKFILL. SEE BACKFILL NOTES.
- ④ DETECTIBLE UTILITY MARKING TAPE. SEE SHEET 02.

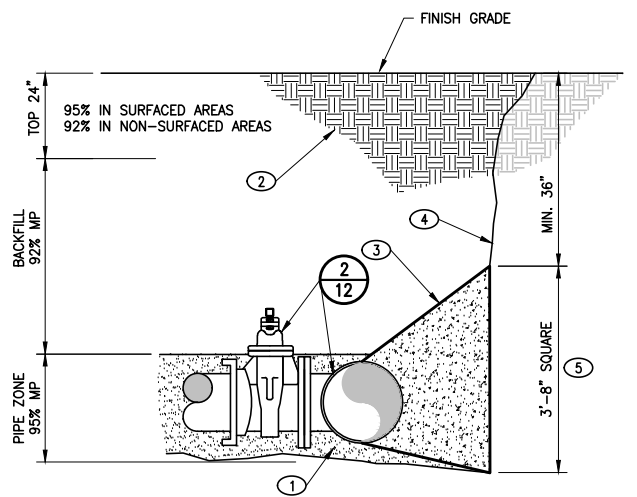
② 16 DETAIL - TRENCH EXCAVATION N.T.S.



NOTES

- ① 16" DI PIPE
- ② GRAVEL BACKFILL FOR PIPE ZONE BEDDING
- ③ BACKFILL SEE BACKFILL NOTES
- ④ DETECTIBLE UTILITY MARKING TAPE. SEE SHEET 02.
- ⑤ 48" WIDE RIGID INSULATION. SEE SHEET 02.

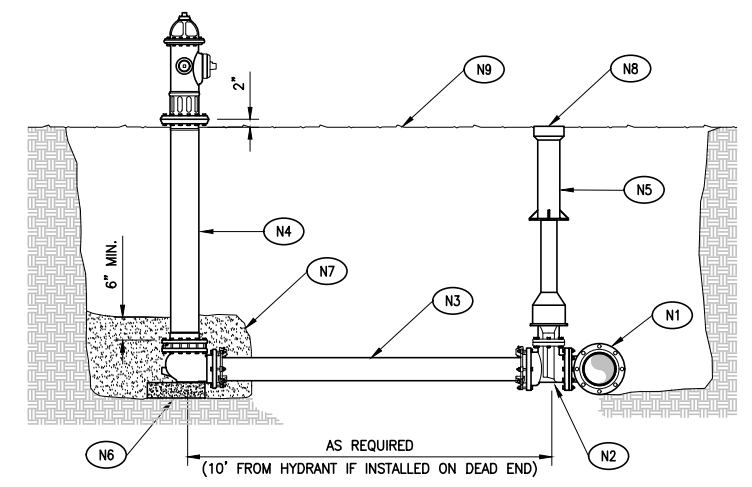
③ 16 DETAIL - TRENCH EXCAVATION (SHALLOW CONDITION) ONLY WITH ENGINEER APPROVAL N.T.S.



NOTES

- ① GRAVEL BACKFILL FOR PIPE ZONE BEDDING
- ② BACKFILL. SEE BACKFILL NOTES
- ③ CONCRETE THRUST BLOCK. SEE SECTION 7-09.3(21).
- ④ UNDISTURBED EARTH
- ⑤ MINIMUM 13 SQ.FT. BEARING AREA

④ 16 DETAIL - CONCRETE THRUST BLOCK N.T.S.



NOTES:

- ① DUCTILE IRON TEE, MAIN SIZE x MAIN SIZE x 6" (FL OUTLET, ON RUN JOINT TYPE MAY VARY) NOT APPLICABLE IF INSTALLED ON DEAD END.
- ② 6" RSGV, FL x MJ (RESTRAINED JOINT)
- ③ 6" DI PIPE, PE x PE, LENGTH AS REQUIRED (USED RESTRAINED JOINT IF MORE THAN 1 PIECE REQUIRED)
- ④ FIRE HYDRANT, MJ OUTLET (RESTRAINED JOINT)
- ⑤ C.I. VALVE BOX
- ⑥ 15" x 4" CONCRETE BLOCK SET ON COMPACTED FOUNDATION
- ⑦ 1/2 C.Y. 3" TO 3/8" CLEAN GRAVEL AROUND BASE
- ⑧ SET TOP FLUSH IN ROADWAYS, 2" ABOVE GRADE IN OTHER AREAS
- ⑨ FINISH GRADE

NOTE: ALL JOINTS SHALL BE RESTRAINED

⑤ 16 DETAIL - FIRE HYDRANT ASSEMBLY N.T.S.

1780102-Sht 16-17(Wr. Dits).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

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SCALE: AS SHOWN
 DESIGNED: JCP/JSM
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 APPROVED: -
 PROJ. NO.: 178-01-02
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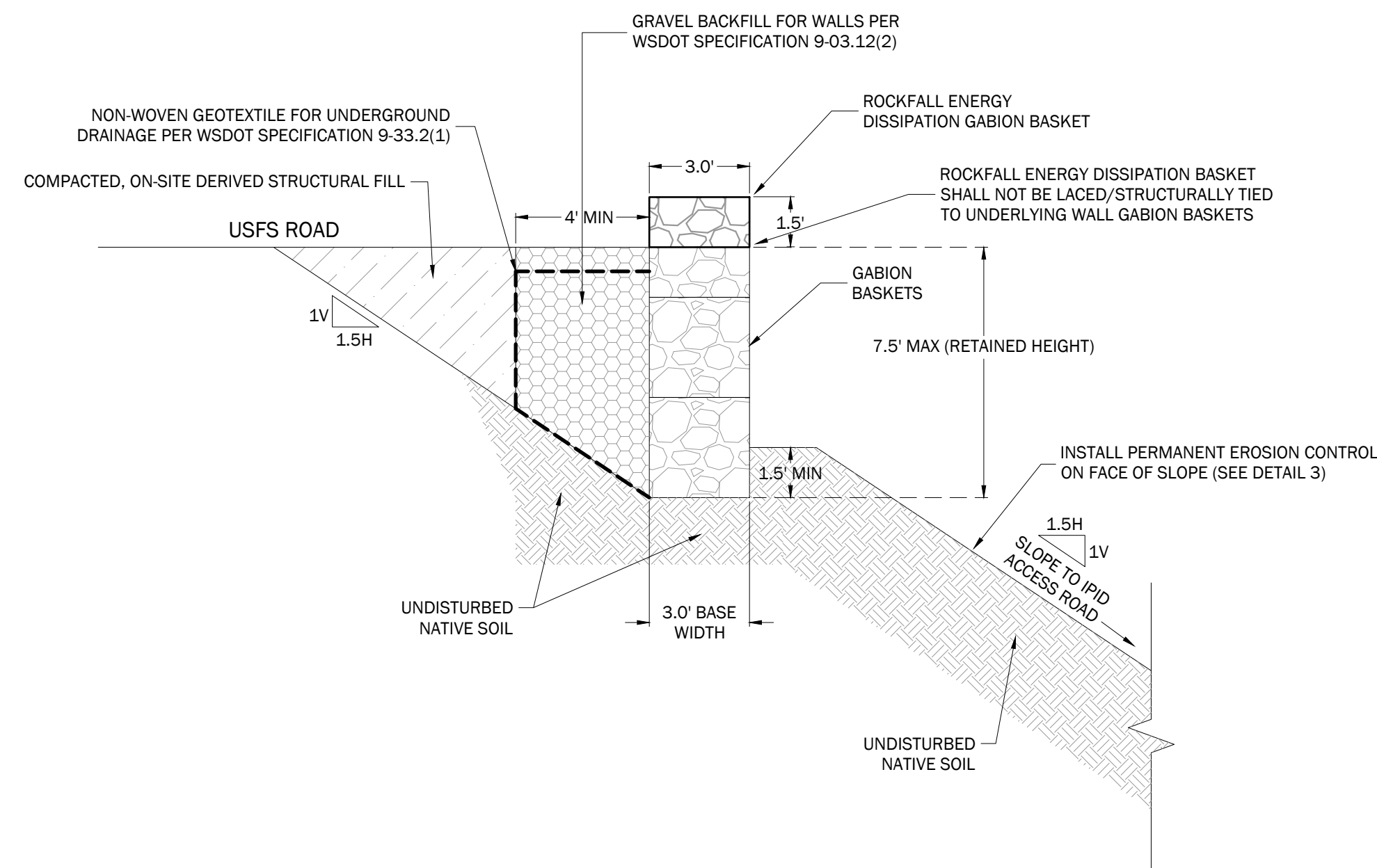
VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

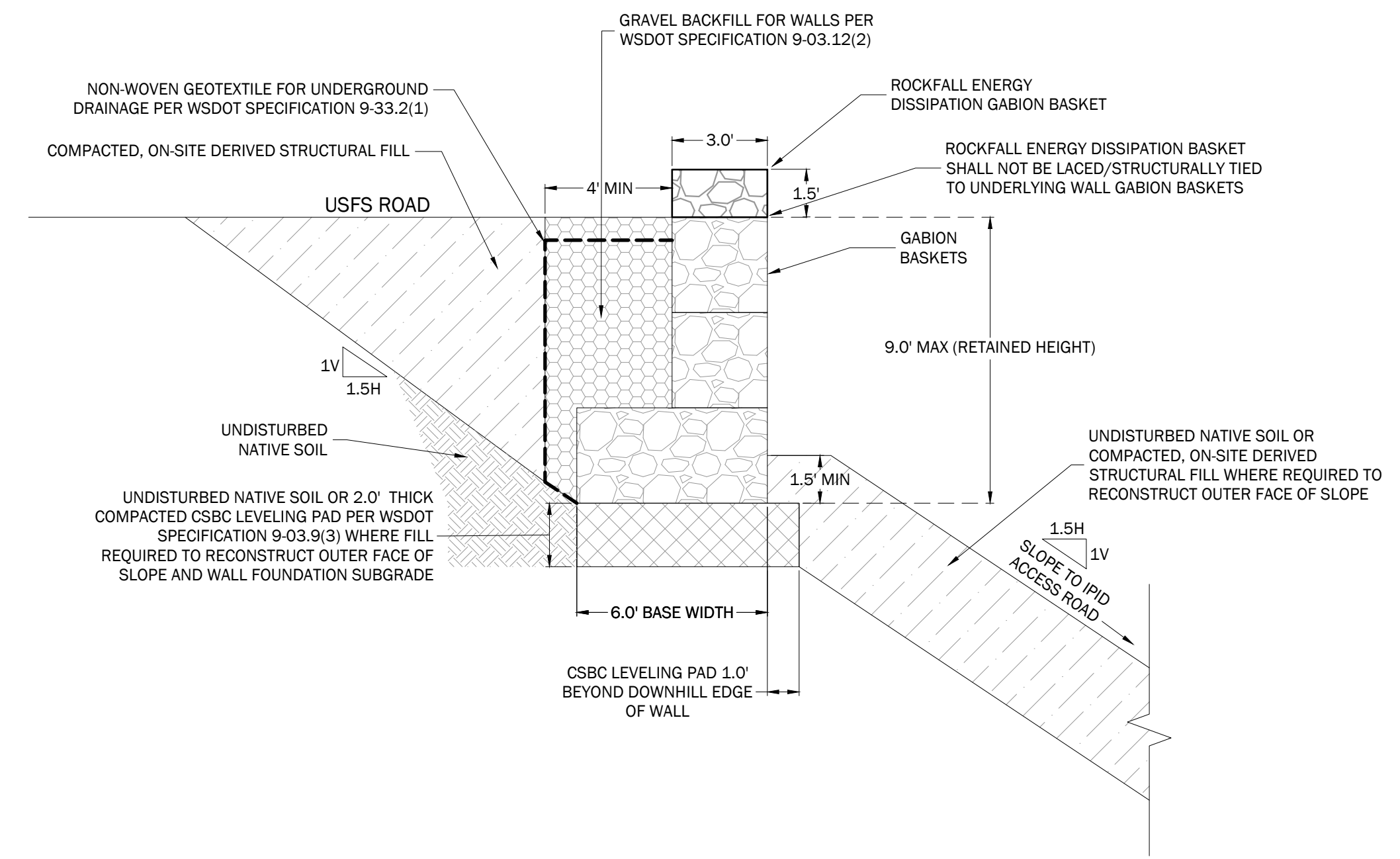
WATER MAIN - DETAIL

SHEET
16
 OF 16

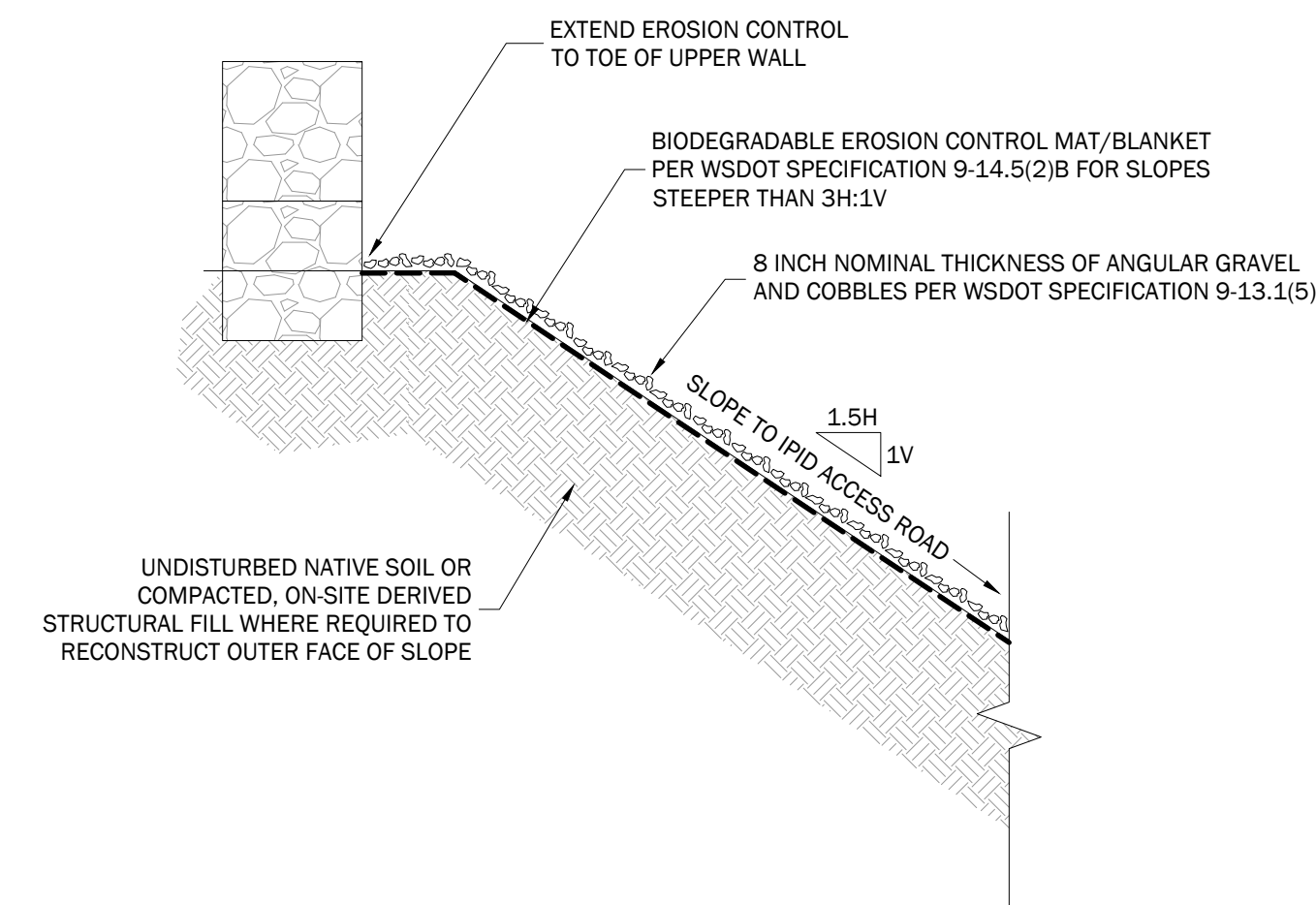
PRELIMINARY



WALL SECTION - RETAINED HEIGHT UP TO 7.5 FEET 1
SCALE: 1" = 4"



WALL SECTION - RETAINED BETWEEN HEIGHT 7.5 FEET AND 9 FEET 2
SCALE: 1" = 4"



DETAIL 3 - PERMANENT EROSION CONTROL 3
SCALE: 1" = 4"

Horizontal Scale: 1" = 4'
Vertical Scale: 1" = 4'
Vertical Exaggeration 1x



REV.	DESCRIPTION	DATE	APPR.

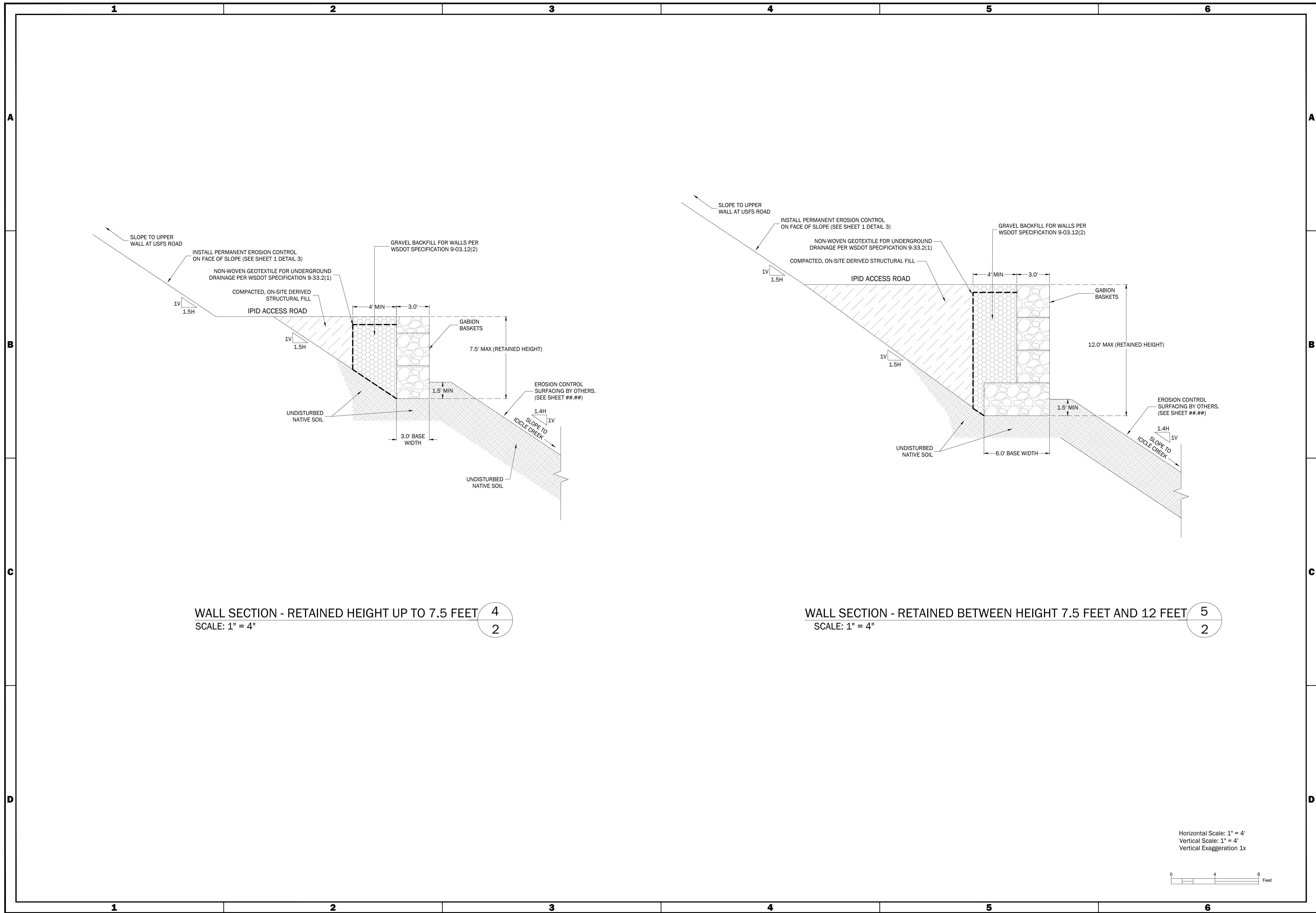
DESIGNED BY:	ECS
DRAWN BY:	CMV
REVISED BY:	SOC

Aspect
CONSULTING

PROJECT NUMBER: 170060
REVISION: -
DATE: Dec-2018

UPPER WALL AT USFS ROAD
CITY OF LEAVENWORTH WATERLINE REPLACEMENT
AND ICICLE CREEK FISH PASSAGE PROJECT
LEAVENWORTH, WASHINGTON

SHEET REFERENCE NUMBER:
1
SHEET 1 OF 2



Horizontal Scale: 1" = 4'
 Vertical Scale: 1" = 4'
 Vertical Exaggeration 1x

PRELIMINARY

REV.	DESCRIPTION	DATE	APPR.

Aspect
CONSULTING

DATE: Dec-2018
 REVISION: -
 PROJECT NUMBER: 170060
 DESIGNED BY: ECS
 DRAWN BY: CMV
 REVISED BY: SCC

**LOWER WALL AT
 IPID ACCESS ROAD**
 CITY OF LEAVENWORTH WATERLINE REPLACEMENT
 AND ICICLE CREEK FISH PASSAGE PROJECT
 LEAVENWORTH, WASHINGTON

SHEET
 REFERENCE
 NUMBER:
2

SHEET **2** OF **2**

CAD Path: Q:\Trout Unlimited\170060 Icicle Creek Fish Passage Project\2018-12 City of Leavenworth Water Line Replacement\170060-Plan Set\dwg SHEET 2 | Date Saved: Dec 14, 2018 9:32am | User: scud



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

CITY OF LEAVENWORTH FISH EXCLUSION PROJECT
ICICLE CREEK, TRIBUTARY TO WENATCHEE RIVER
CHELAN COUNTY, WA. WRIA: 45.0474, SITE: 960986

INDEX

SHEET NO.

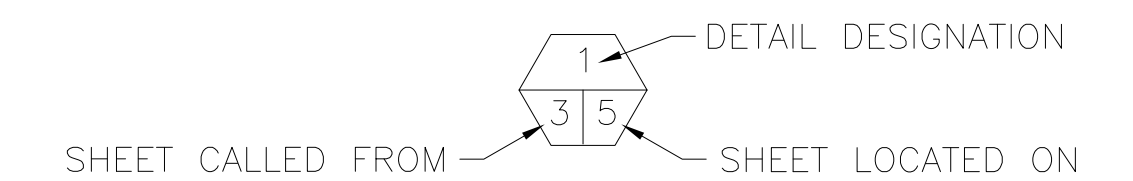
1. COVER SHEET
2. EXISTING CONDITIONS PLAN VIEW
3. ACCESS ROAD PLAN & PROFILE
4. WATERLINE PLAN & PROFILE
5. DEWATERING PLAN & DETAILS
6. PROJECT NOTES & DETAILS
7. PROJECT NOTES & DETAILS II
8. PROJECT NOTES & DETAILS III
9. 66" STAINLESS SCREEN ASSEMBLY



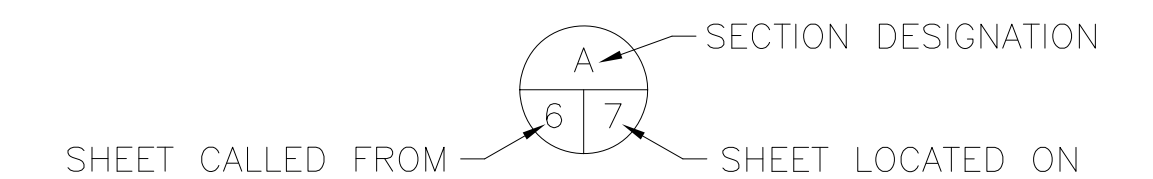
ABBREVIATIONS

APPROX.	APPROXIMATE
BM	BENCH MARK
BLDG	BUILDING
CONC.	CONCRETE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
DIA.	DIAMETER
ELEV.	ELEVATION
EXIST.	EXISTING
FT.	FEET
HORIZ.	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
I.E.	INVERT ELEVATION
LAT.	LATITUDE
LF	LINEAL FOOT
LONG.	LONGITUDE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MP	MILE POST
PAV'T	PAVEMENT
REQ'D	REQUIRED
S	SLOPE IN PERCENT
SEC.	SECTION
SHT.	SHEET
SPEC'S.	SPECIFICATIONS
TBM	TEMPORARY BENCH MARK
TYP.	TYPICAL
VERT.	VERTICAL
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
W.S.	WATER SURFACE

SHEET SYMBOLS



DETAIL



SECTION

VICINITY MAP

LAT. 47.54370 N, LONG. -120.71462 W
CHELAN COUNTY
SECTION 28, TOWNSHIP 24 NORTH, RANGE 17 EAST W.M.

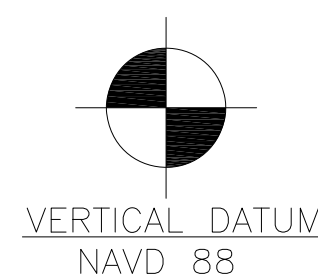
DIRECTIONS TO SITE

FROM LEAVENWORTH, WA. GO WEST ON STATE ROUTE 2 AT THE EDGE OF TOWN TURN LEFT (SOUTHERLY) ON ICICLE ROAD. CONTINUE ON ICICLE ROAD 4.2 MILES TO THE PARKING LOT ON THE LEFT. THE SITE IS DOWN THE DIRT ROAD PAST THE FOOT BRIDGE OVER ICICLE CREEK TO THE END OF THE ROAD.

PROJECT CONTROL POINTS

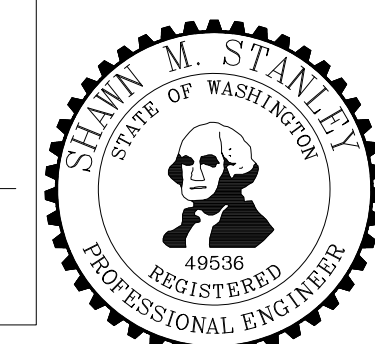
SURVEY CONTROL POINTS TABLE

Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
3. R&C 1	1669795.83'	198411.10'	1408.23'
4. R&C 2	1670021.64'	198531.01'	1394.74'

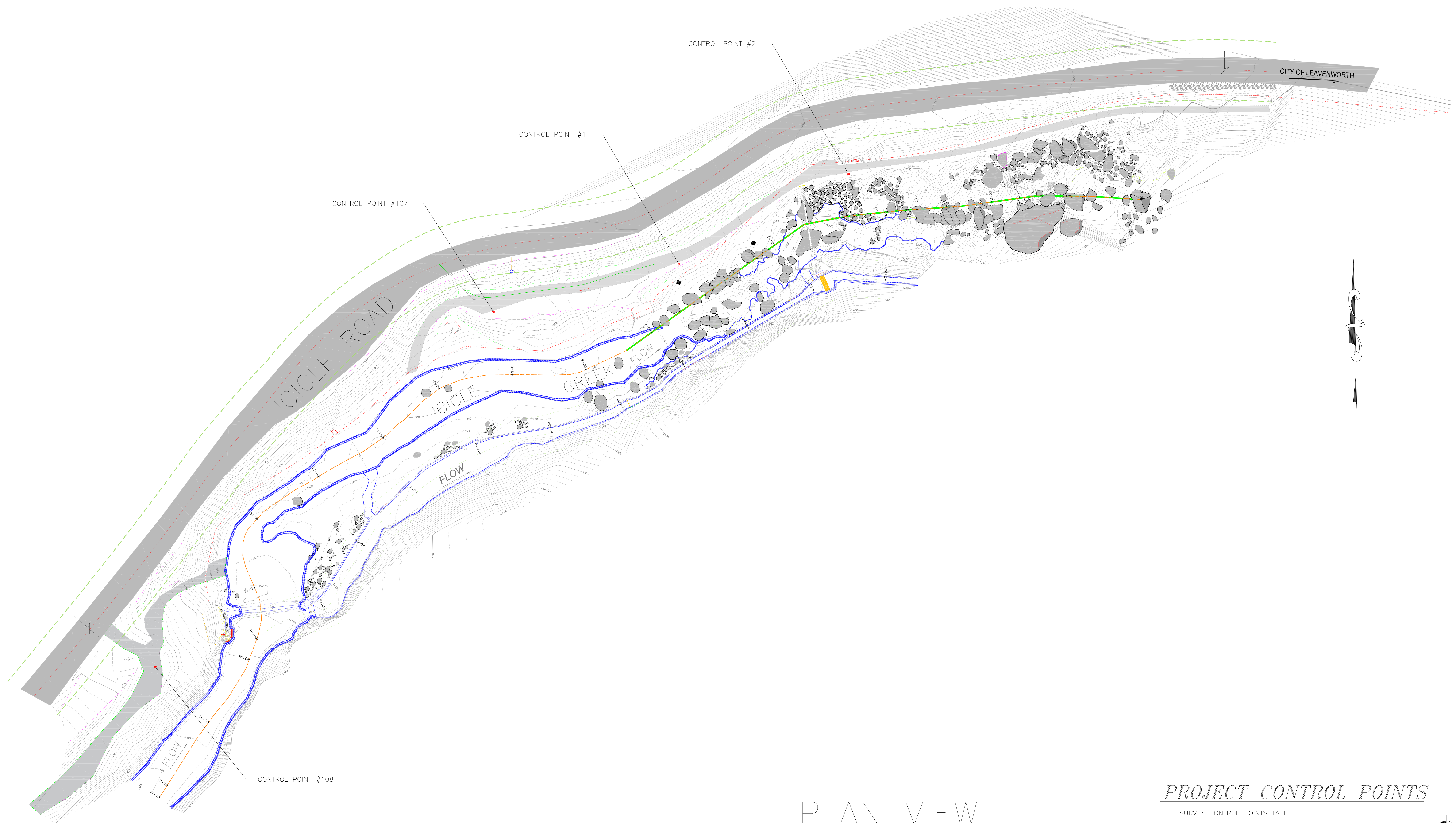


APPROVED FOR CONSTRUCTION

Donald C. Ponder, PE
Environmental Engineering Section Manager
Fish Passage Division, Habitat Program, WDFW



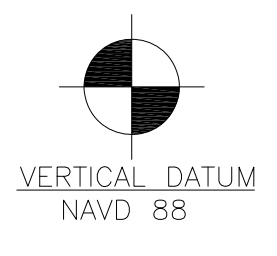
PROJECT NO. 960986-18	
SHEET	OF
1	8



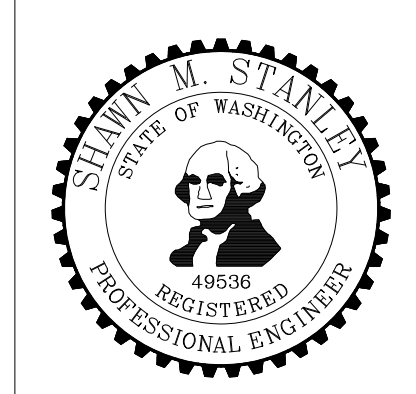
PLAN VIEW
Scale: 1"=60'

PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE			
Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
3. R&C 1	1669795.83'	198411.10'	1408.23'
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WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



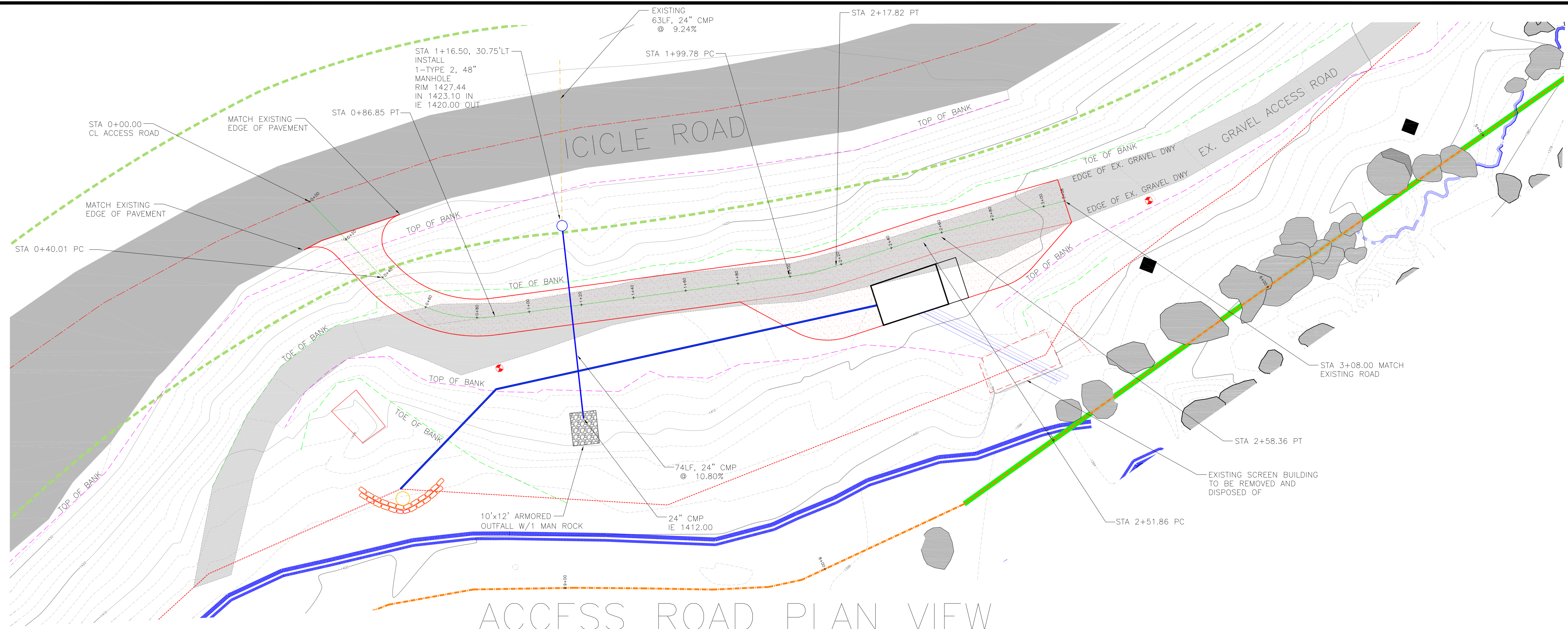
SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER	DATE:	DESIGNED BY S. STANLEY	CHECKED BY
PROGRAM	DATE:	DRAWN BY T.G.	DATE 07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
EXISTING PLAN VIEW

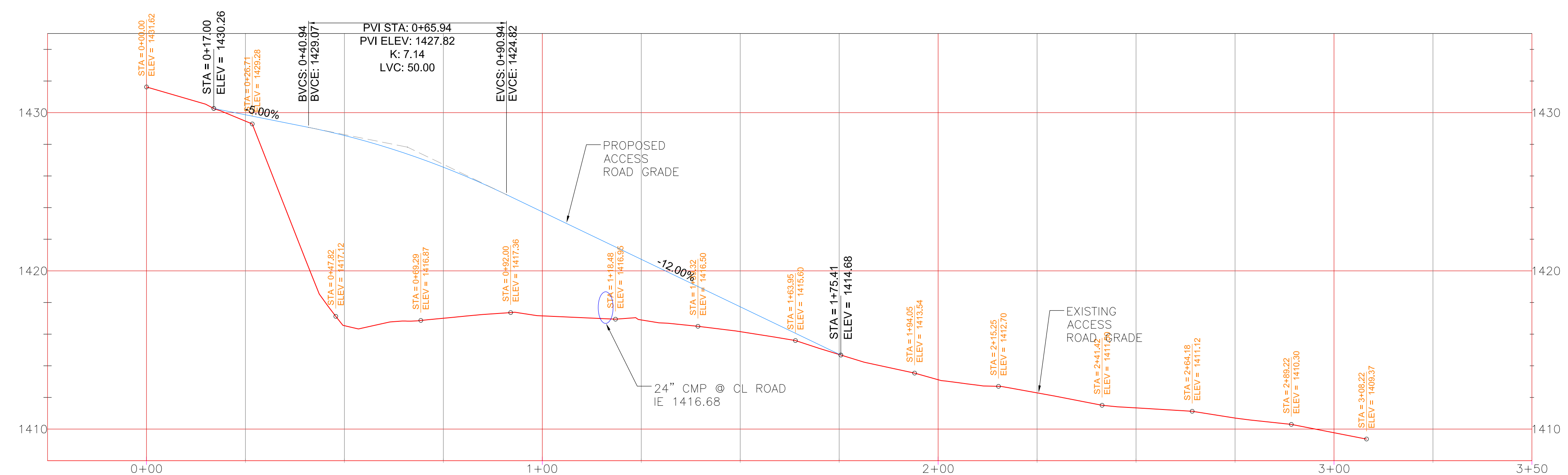
PROJECT NO. 960986-18
SHEET 2 OF 8

NOT FOR CONSTRUCTION



ACCESS ROAD PLAN VIEW

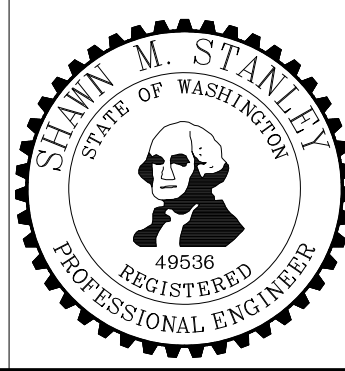
SCALE: HORZ. 1"=20'



ACCESS ROAD PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

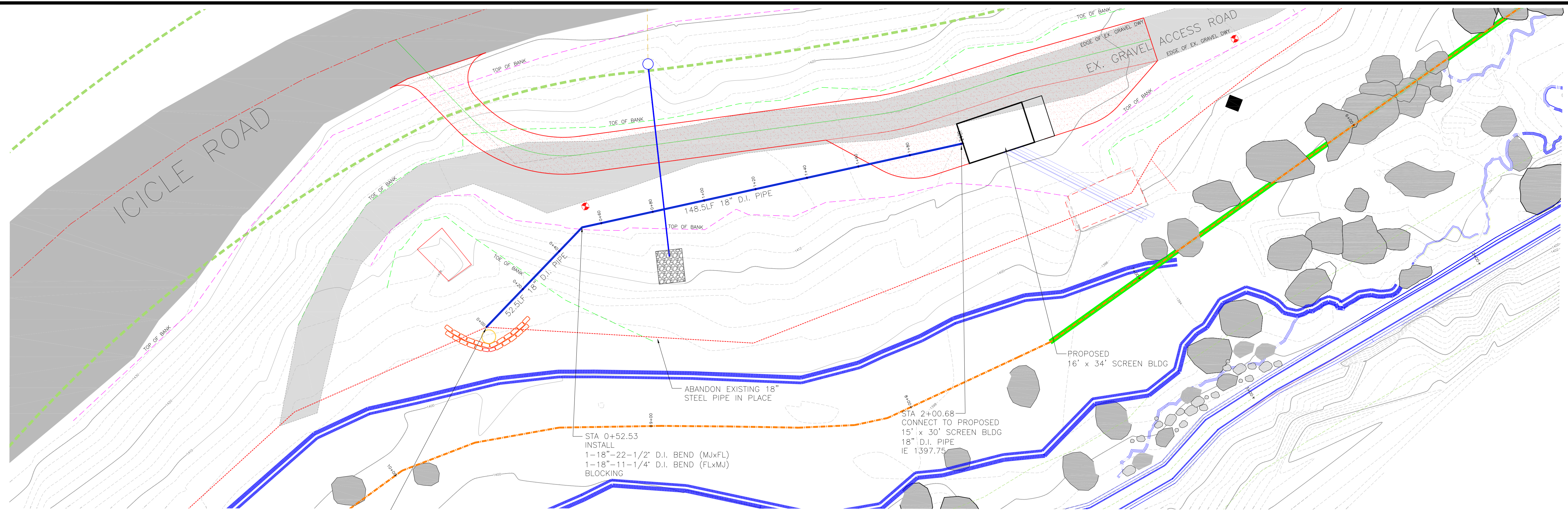


SYMBOL	DATE	BY	DESIGNED BY	S. STANLEY
APPROVED AND READY FOR CONSTRUCTION			CHECKED BY	T.C.
CHIEF ENGINEER			DRAWN BY	T.C.
PROGRAM			DATE	07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

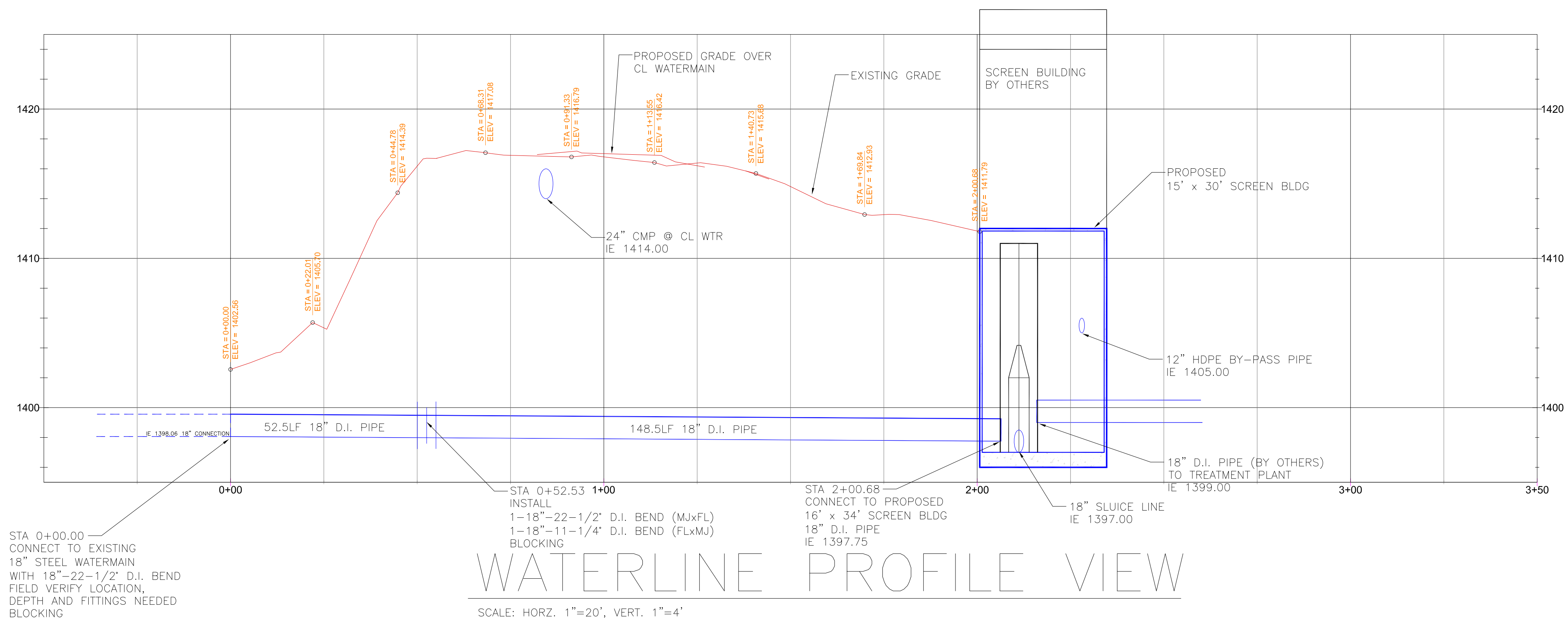
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
ACCESS ROAD PLAN AND PROFILE VIEW

PROJECT NO.
960986-18
SHEET 3 OF 8



WATERLINE PLAN VIEW

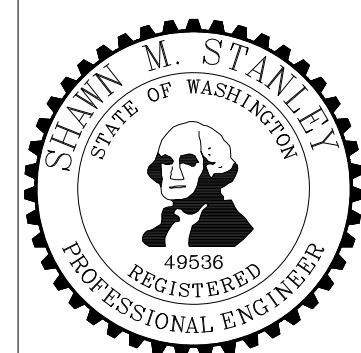
SCALE: HORZ. 1"=20'



WATERLINE PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



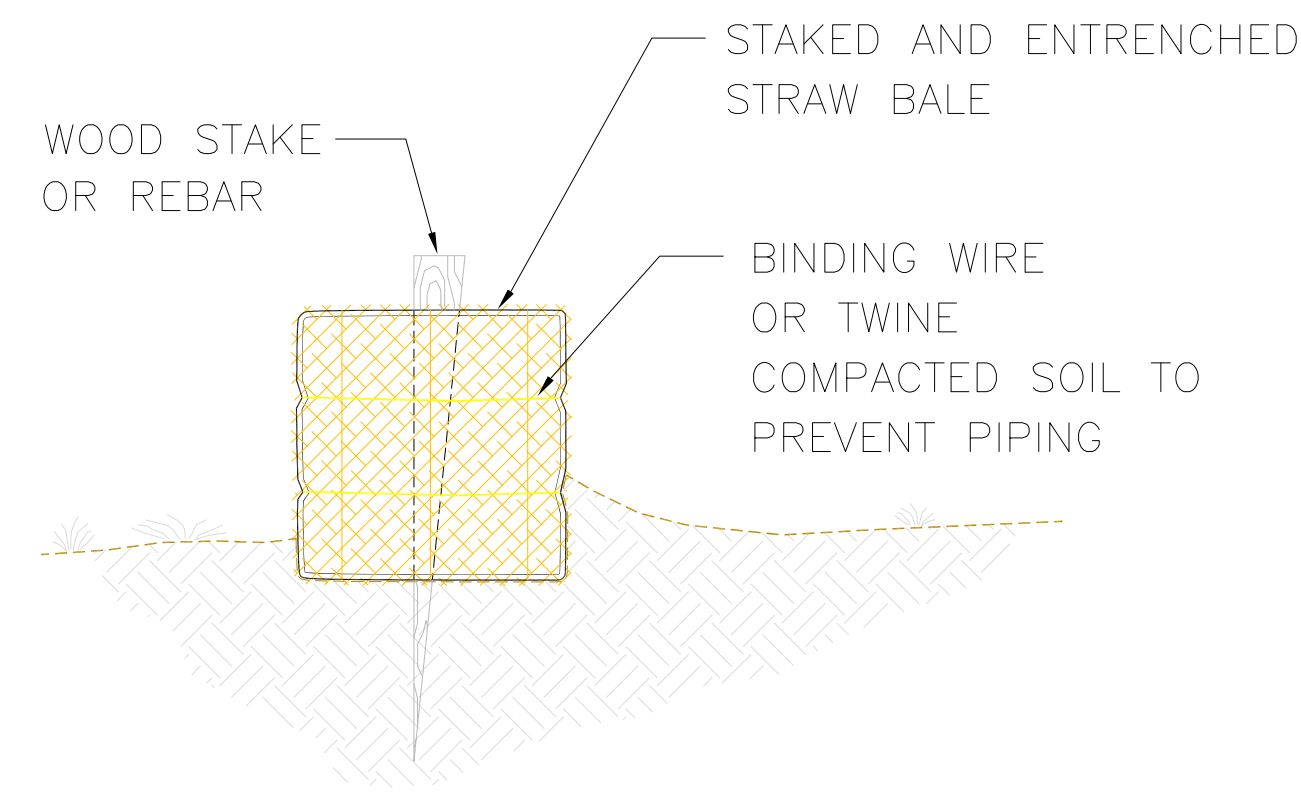
SYMBOL	DATE	REVISION	BY
APPROVED AND READY FOR CONSTRUCTION		DESIGNED BY S. STANLEY	
CHIEF ENGINEER		CHECKED BY	
PROGRAM		DRAWN BY T.C.	
		DATE 07-25-2018	

ICICLE CREEK		PROJECT NO.
FISH PASSAGE AND HABITAT RESTORATION PROJECT		960986-18
FISH EXCLUSION SCREEN		SHEET
WATERMAIN PLAN AND PROFILE VIEW		OF
		4
		8

BALES SHALL BE PLACED IN A SINGLE ROW, LENGTHWISE ON THE CONTOUR, WITH ENDS OF ADJACENT BALES TIGHTLY ABUTTING ONE ANOTHER.

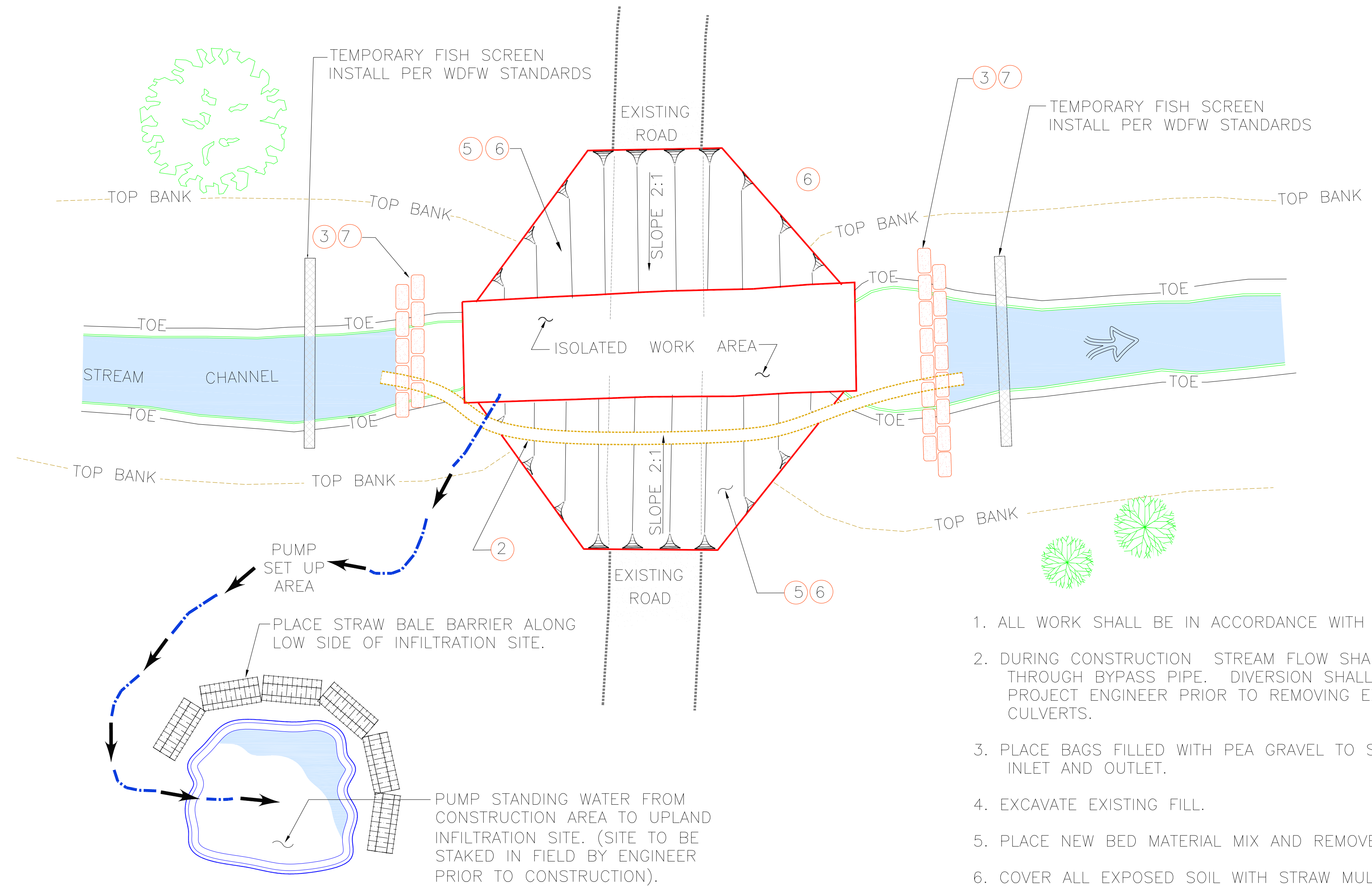
THE BARRIER SHALL BE ENTRENCHED AND BACKFILLED. A TRENCH SHALL BE A MINIMUM OF 4 INCHES. BACKFILL SOIL SHALL CONFORM TO THE GROUND LEVEL ON THE DOWNHILL SIDE AND SHALL BE BUILT UP 4 INCHES AGAINST THE UPHILL SIDE OF THE BARRIER. EACH BALE SHALL BE SECURELY ANCHORED BY AT LEAST 2 STAKES OR REBAR DRIVEN THROUGH THE BALE.

THE GAP BETWEEN THE BALES SHALL BE FILLED BY WEDGING WITH STRAW TO PREVENT WATER FROM ESCAPING BETWEEN THE BALES.



STRAW BALE BARRIER

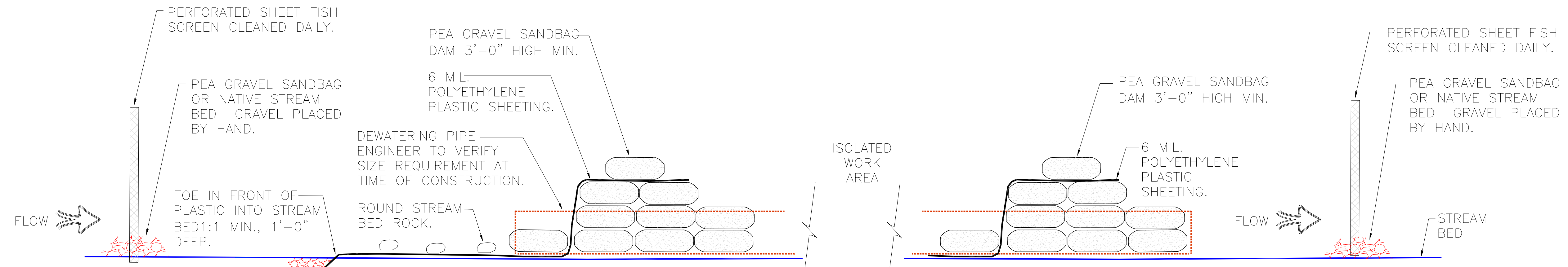
SCALE: N.T.S.



1. ALL WORK SHALL BE IN ACCORDANCE WITH HPA.
2. DURING CONSTRUCTION STREAM FLOW SHALL BE DIVERTED THROUGH BYPASS PIPE. DIVERSION SHALL BE APPROVED BY PROJECT ENGINEER PRIOR TO REMOVING EXISTING CULVERTS.
3. PLACE BAGS FILLED WITH PEA GRAVEL TO SEAL BYPASS INLET AND OUTLET.
4. EXCAVATE EXISTING FILL.
5. PLACE NEW BED MATERIAL MIX AND REMOVE BYPASS PIPE.
6. COVER ALL EXPOSED SOIL WITH STRAW MULCH AND GRASS SEED. (SEE SITE RESTORATION PLAN)
7. REMOVE DIVERSION BAGS AND FISH SCREENS BY HAND.

TYPICAL DEWATERING SCHEMATIC

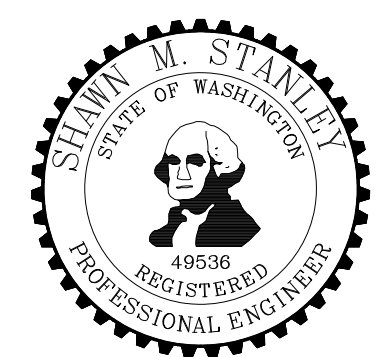
SCALE: N.T.S.



TYPICAL DEWATERING SECTION

Scale: N.T.S.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

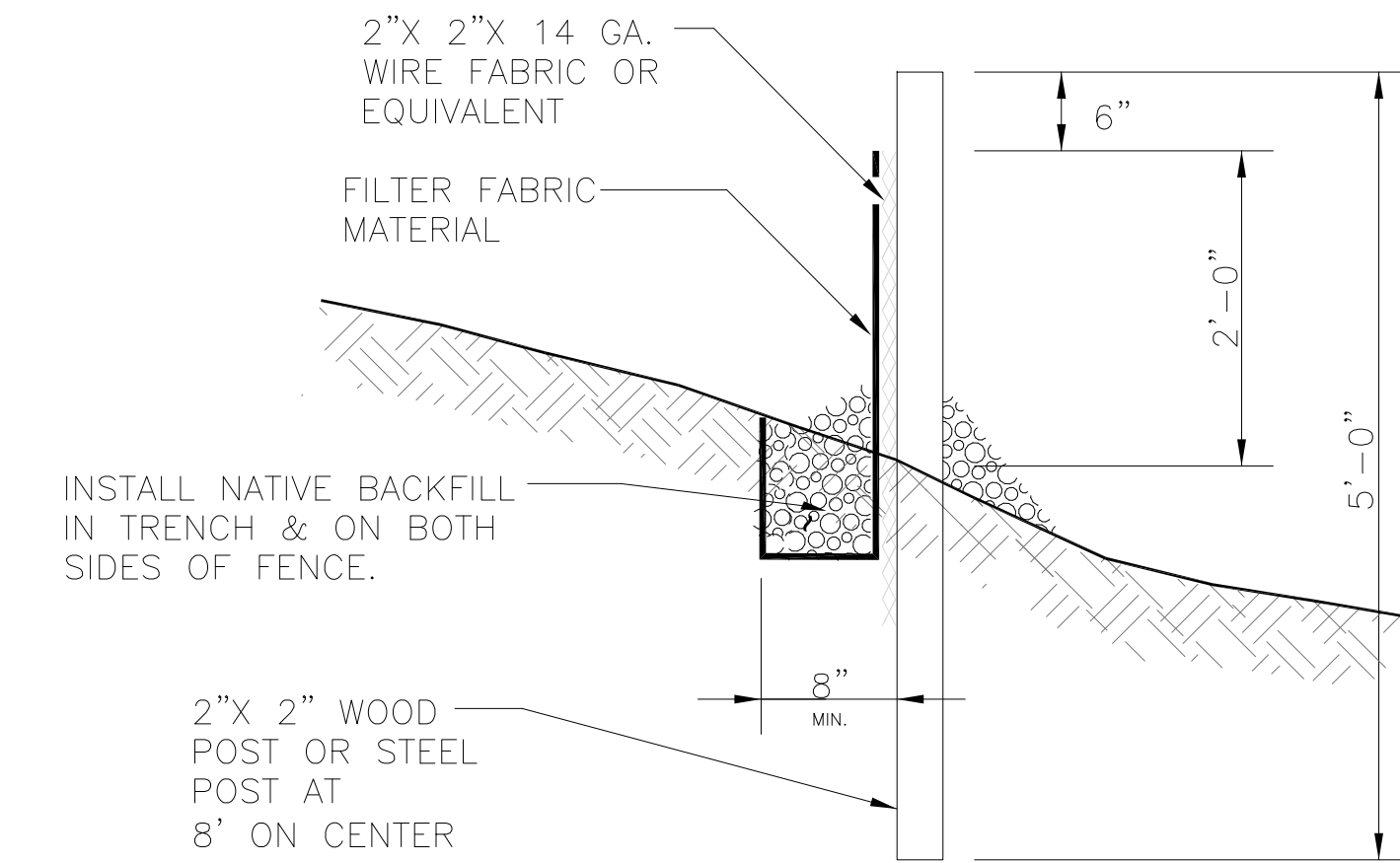
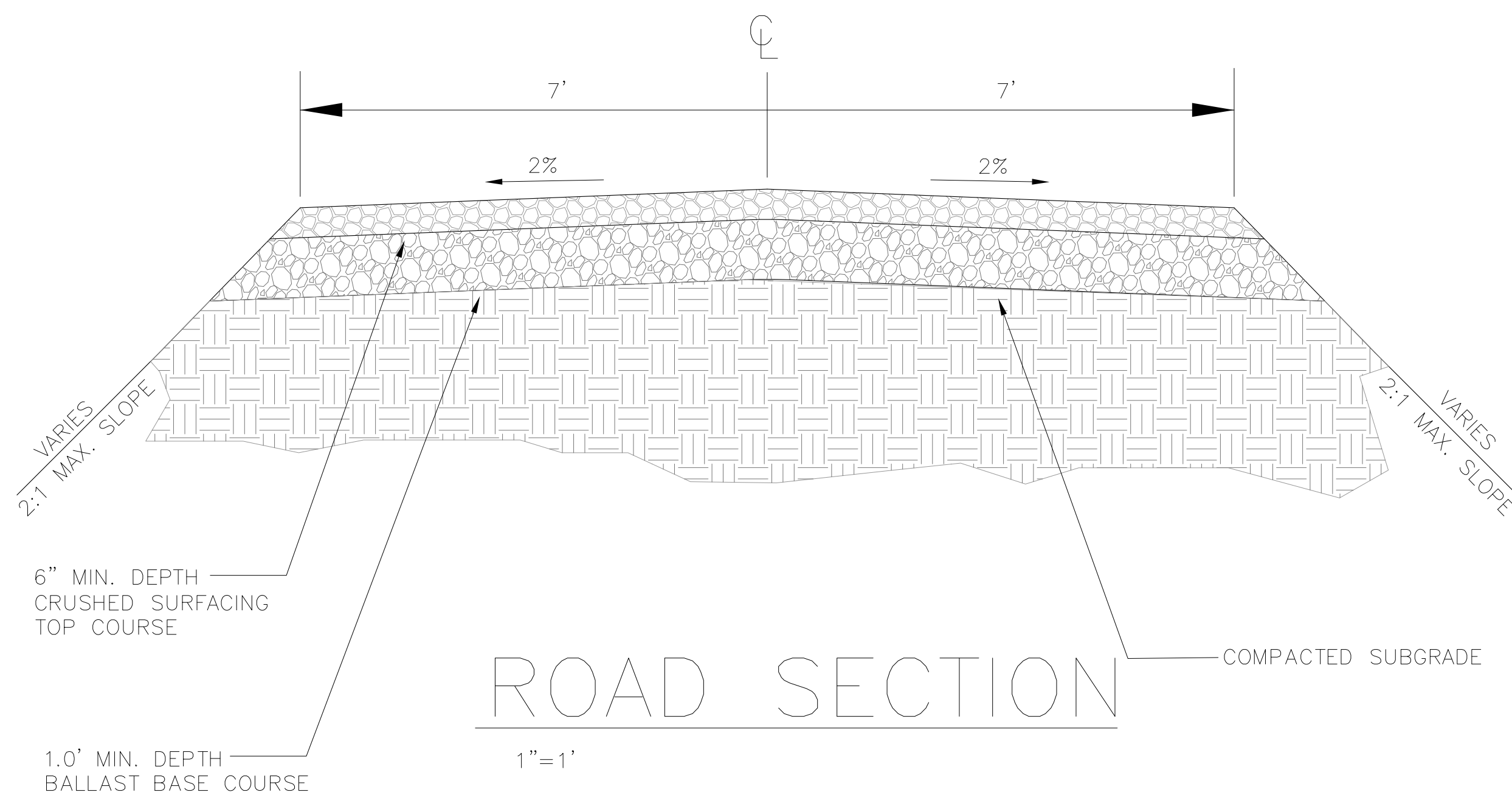


SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	DATE:
PROGRAM		DATE:	DATE:

DESIGNED BY: S. STANLEY
CHECKED BY:
DRAWN BY: T.G.
DATE: 07-25-2018

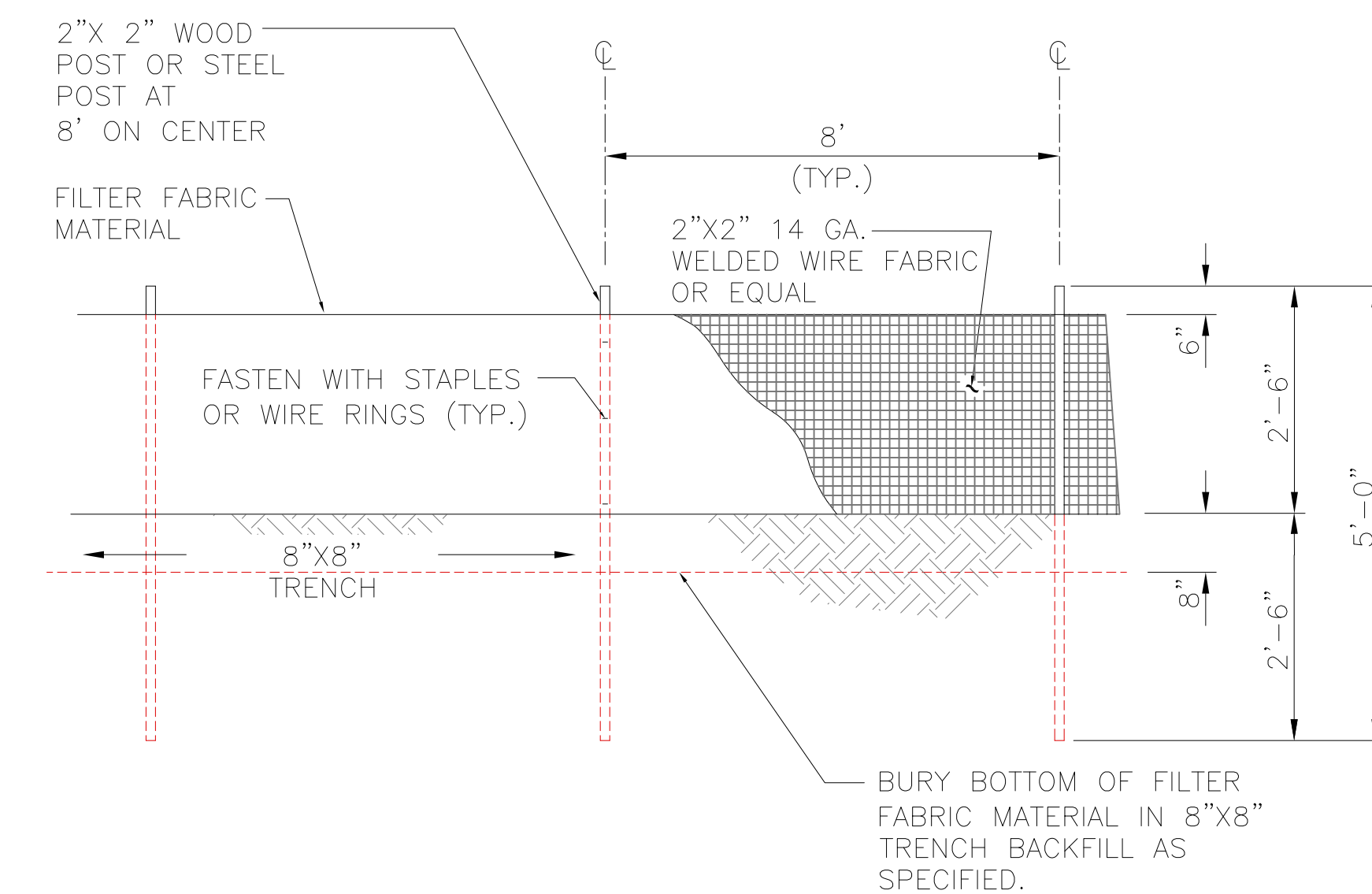
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
DEWATERING PLAN

PROJECT NO.
960986-18
SHEET 5 OF 8



TYPICAL SILT FENCE SECTION VIEW

SCALE: N.T.S.



TYPICAL SILT FENCE DETAIL

SCALE: N.T.S.

SILT FENCE NOTES

- SITE ISOLATION (SILT FENCE, STRAW BALE BARRIER) IS ONLY REQUIRED IF LIVE WATER IS PRESENT. IF THE CHANNEL IS DRY, NO FENCING IS REQUIRED.
- FILTER FABRIC SHALL BE PURCHASED CONTINUOUS. ROLL CUT TO LENGTH AS NEEDED. IF JOINTS ARE NECESSARY FABRIC SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS WITH A MINIMUM OF (6) INCH OVERLAP. BOTH ENDS SHALL BE SECURED AS REQUIRED.
- SILT FENCING SHALL BE INSTALLED TO FOLLOW CONTOURS. FENCE POSTS SHALL BE SPACED A MAXIMUM OF EIGHT (8) FEET APART UNLESS OTHERWISE SHOWN HEREIN. ALL POSTS SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 30 INCHES.
- A TRENCH SHALL BE EXCAVATED, ROUGHLY EIGHT (8) INCHES WIDE BY EIGHT (8) INCHES DEEP UPSLOPE AND ADJACENT TO THE POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
- WHEN STANDARD STRENGTH FILTER FABRIC IS UTILIZED, A WIRE SINGLE SPACE MESH SUPPORT FENCE SHALL BE FASTENED TO THE UPSLOPE SIDE OF THE POSTS USING ONE (1) INCH MINIMUM LENGTH WIRE STAPLES TIE WIRE OR APPROVED HOG RINGS. ALL WIRE SUPPORT SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR (4) INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE ORIGINAL GRADE.
- ALL FILTER FABRIC SHALL BE STAPLED OR WIRED TO SUPPORT FENCING AND A MINIMUM OF 20 INCHES OF FABRIC SHALL BE EXTENDED INTO THE TRENCH. FILTER FABRIC SHALL NOT BE STAPLED OR FASTENED TO EXISTING TREES OR STRUCTURES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
- IF HIGH STRENGTH FILTER FABRIC AND CLOSER SPACING ARE USED, THE WIRE SUPPORT FENCING MAY BE ELIMINATED. HIGH STRENGTH FABRIC SHALL BE STAPLED OR WIRED DIRECTLY TO POSTS AS REQUIRED BY THE ENGINEER.
- TRENCH SHALL BE BACKFILLED WITH 3/4 INCH MINIMUM DIAMETER WASHED GRAVEL OR OTHER SIMILAR SOURCE AS APPROVED BY THE ENGINEER.
- SILT FENCING SHALL BE INSTALLED WHERE SHOWN ON THE PLAN, OR AS MARKED IN THE FIELD BY THE ENGINEER, PRIOR TO COMMENCEMENT OF WORK. ALL FENCING SHALL BE INSPECTED DAILY DURING CONSTRUCTION AND AFTER EACH SIGNIFICANT RAINFALL EVENT UNTIL SITE HAS BEEN PERMANENTLY STABILIZED. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
- REMOVAL OF TRAPPED SEDIMENT SHALL BE PERFORMED WHEN AMOUNTS REACH APPROXIMATELY 1/3 HEIGHT OF THE FENCE ABOVE GROUND.
- SILT FENCING SHALL REMAIN IN-PLACE UNTIL SITE HAS BEEN REVEGETATED TO ORIGINAL CONDITION OR DIRECTED BY THE ENGINEER.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY

APPROVED AND RELEASED FOR CONSTRUCTION

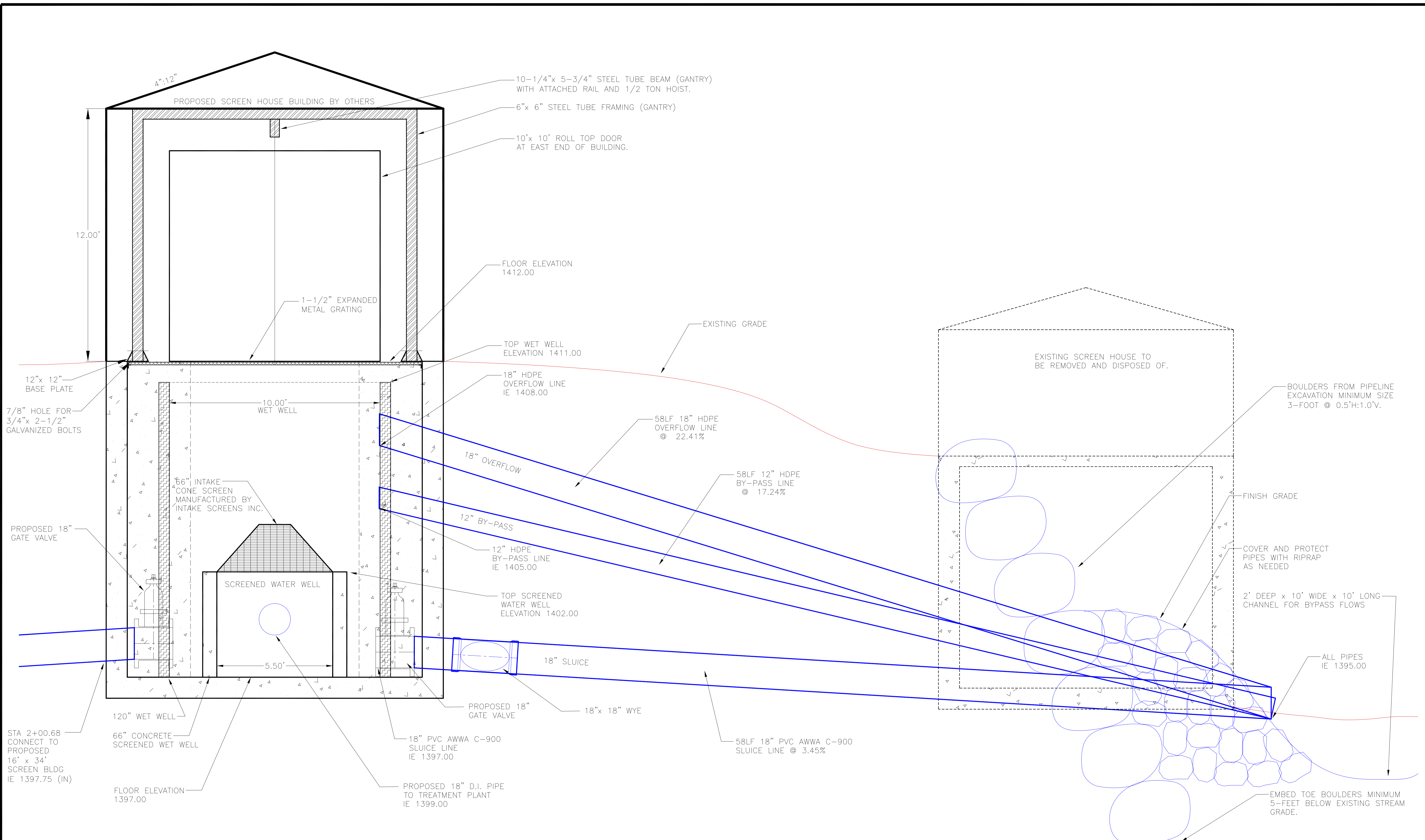
CHIEF ENGINEER DATE: _____

PROGRAM DATE: _____

DESIGNED BY	CHECKED BY	DRAWN BY	DATE
S. STANLEY		T.G.	07-25-2018

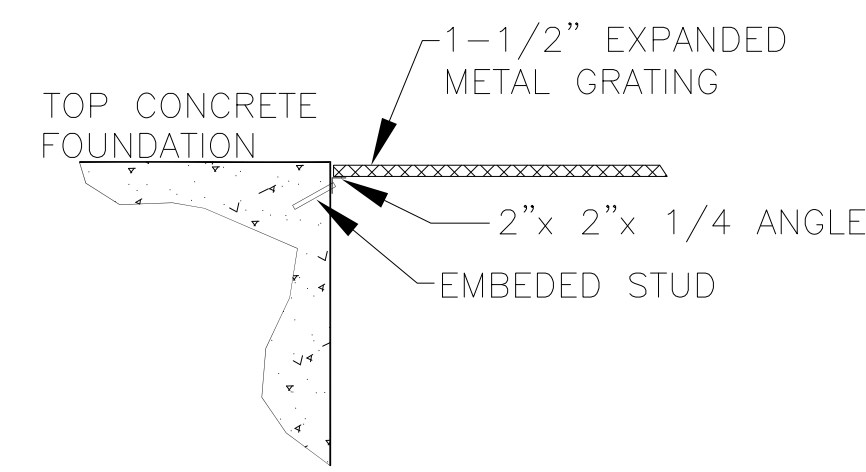
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS

PROJECT NO.	
960986-18	
SHEET	OF
6	8

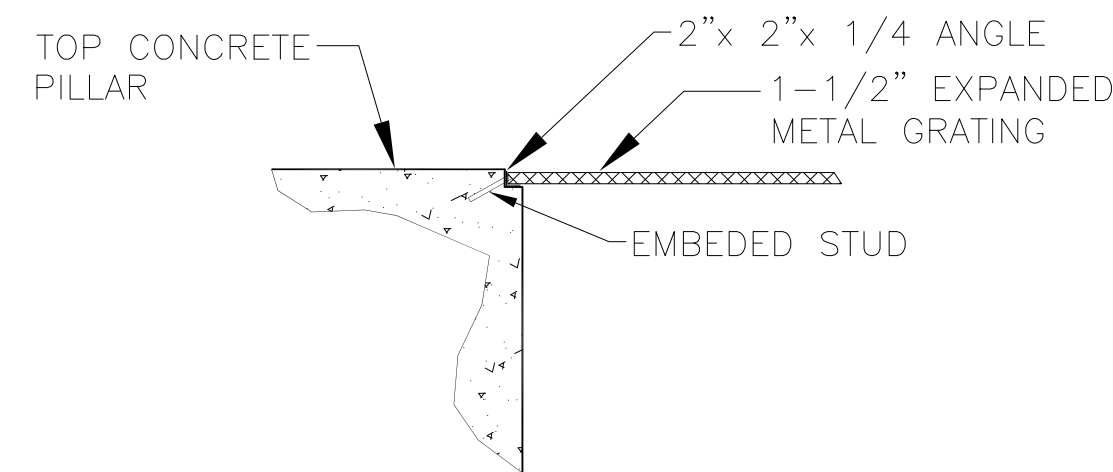


SCREEN BUILDING DETAILS

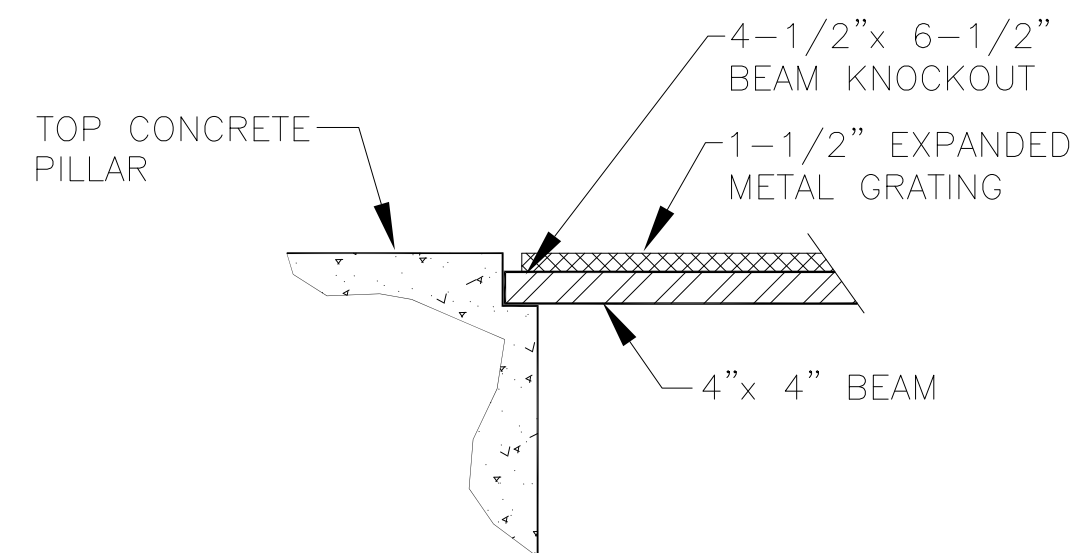
<p>WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE</p>			<p>NOT FOR CONSTRUCTION</p>	<p>0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS</p>	<p>ICICLE CREEK FISH PASSAGE AND HABITAT RESTORATION PROJECT</p>	<p>PROJECT NO. 960986-18</p>
<p>DESIGNED BY S. STANLEY</p>	<p>CHECKED BY</p>	<p>DATE</p>	<p>DATE</p>	<p>DATE</p>	<p>FISH EXCLUSION SCREEN PROJECT NOTES AND DETAILS II</p>	<p>SHEET 7 OF 8</p>



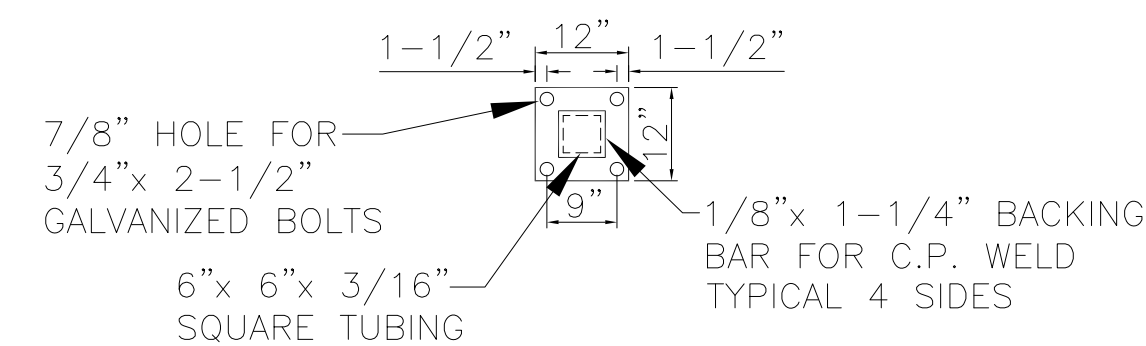
LEDGER DETAIL



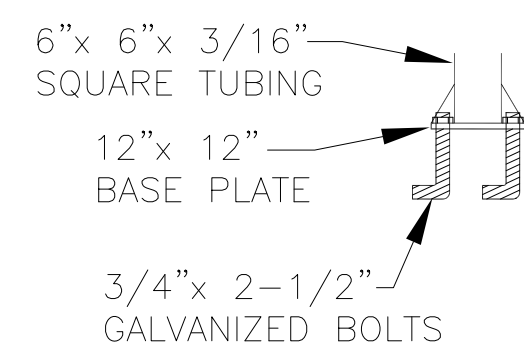
KNOCKOUT DETAIL



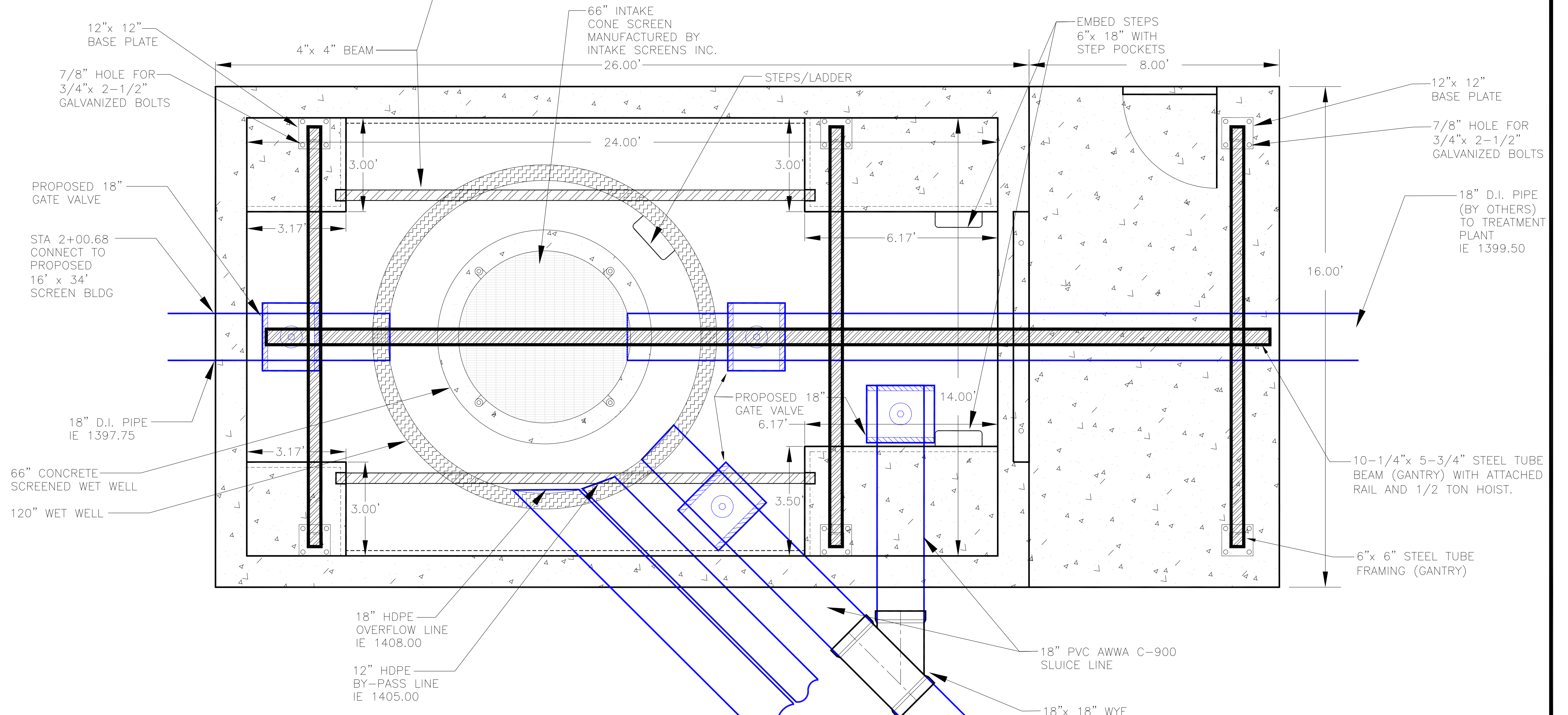
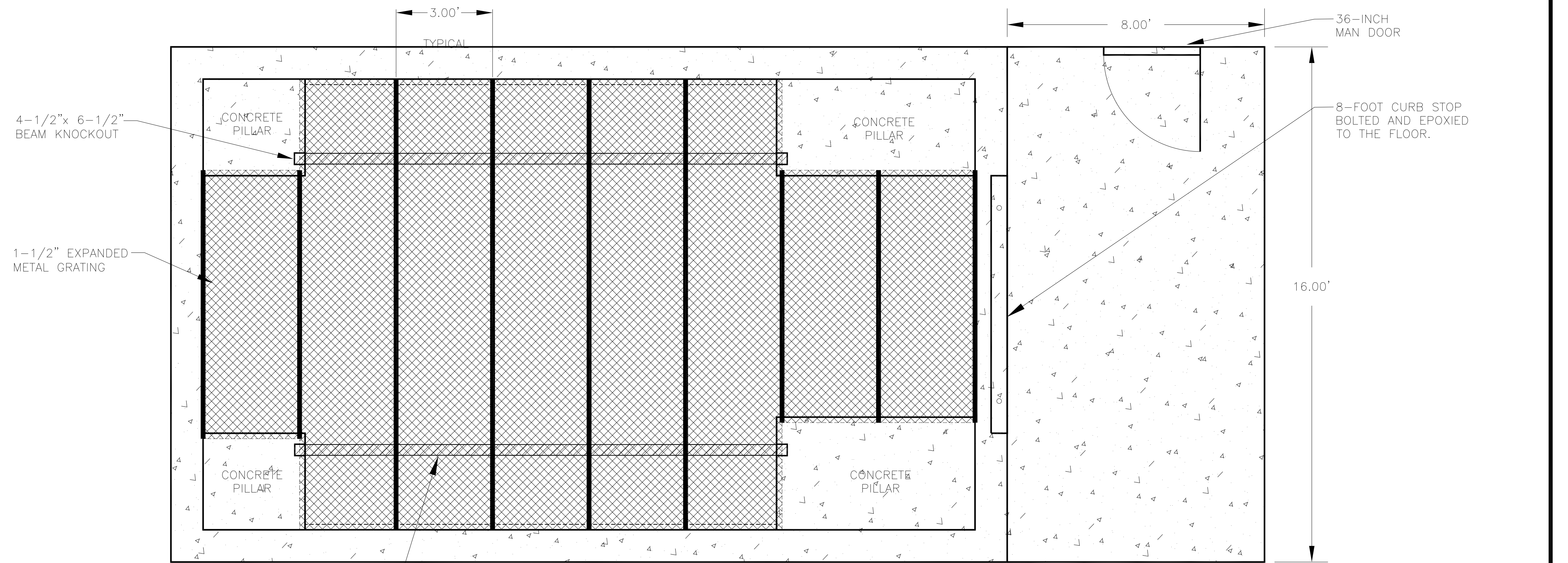
BEAM KNOCKOUT DETAIL



BASE PLATE DETAIL



BASE PLATE BOLT DETAIL



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

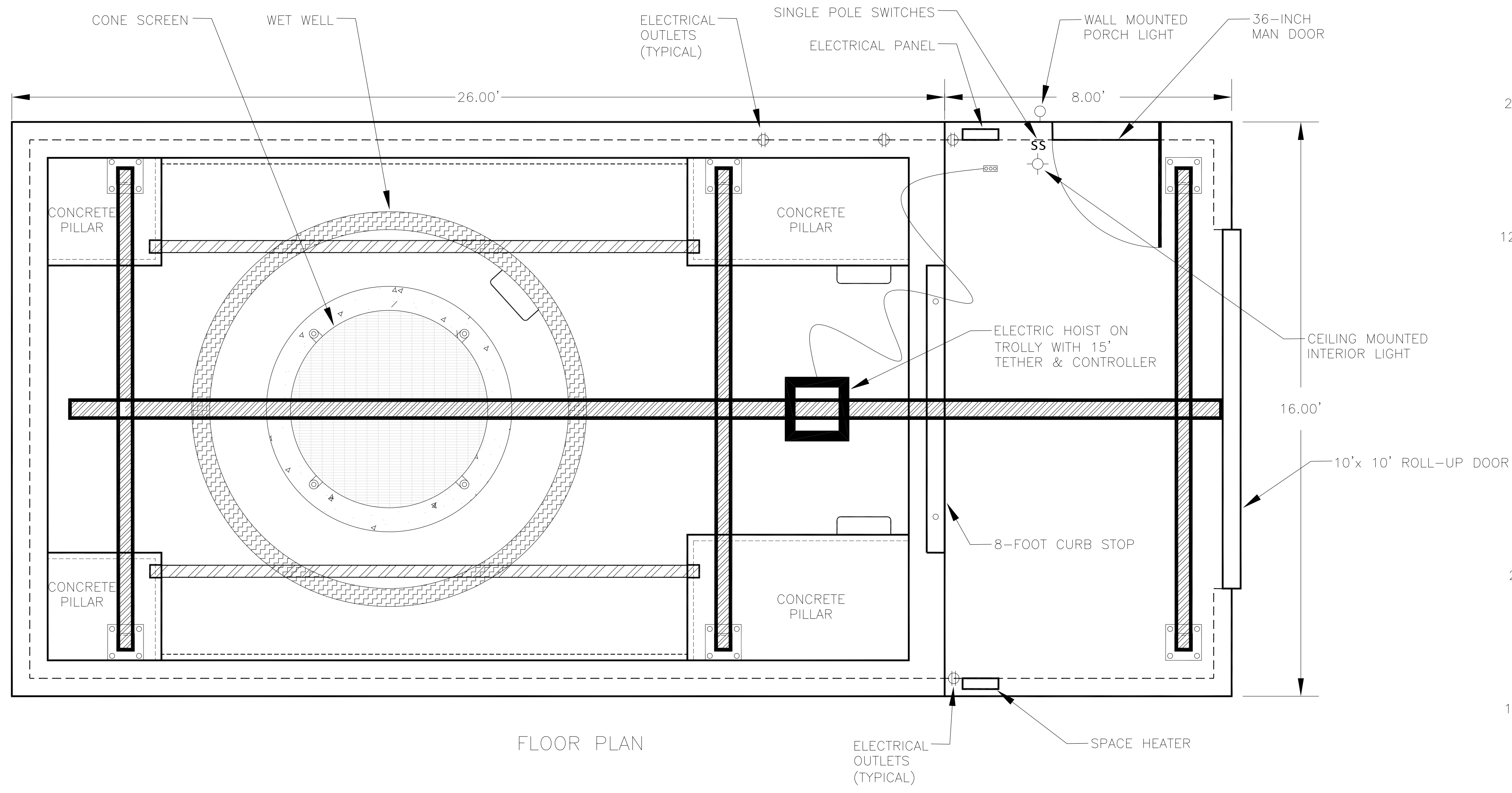


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		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

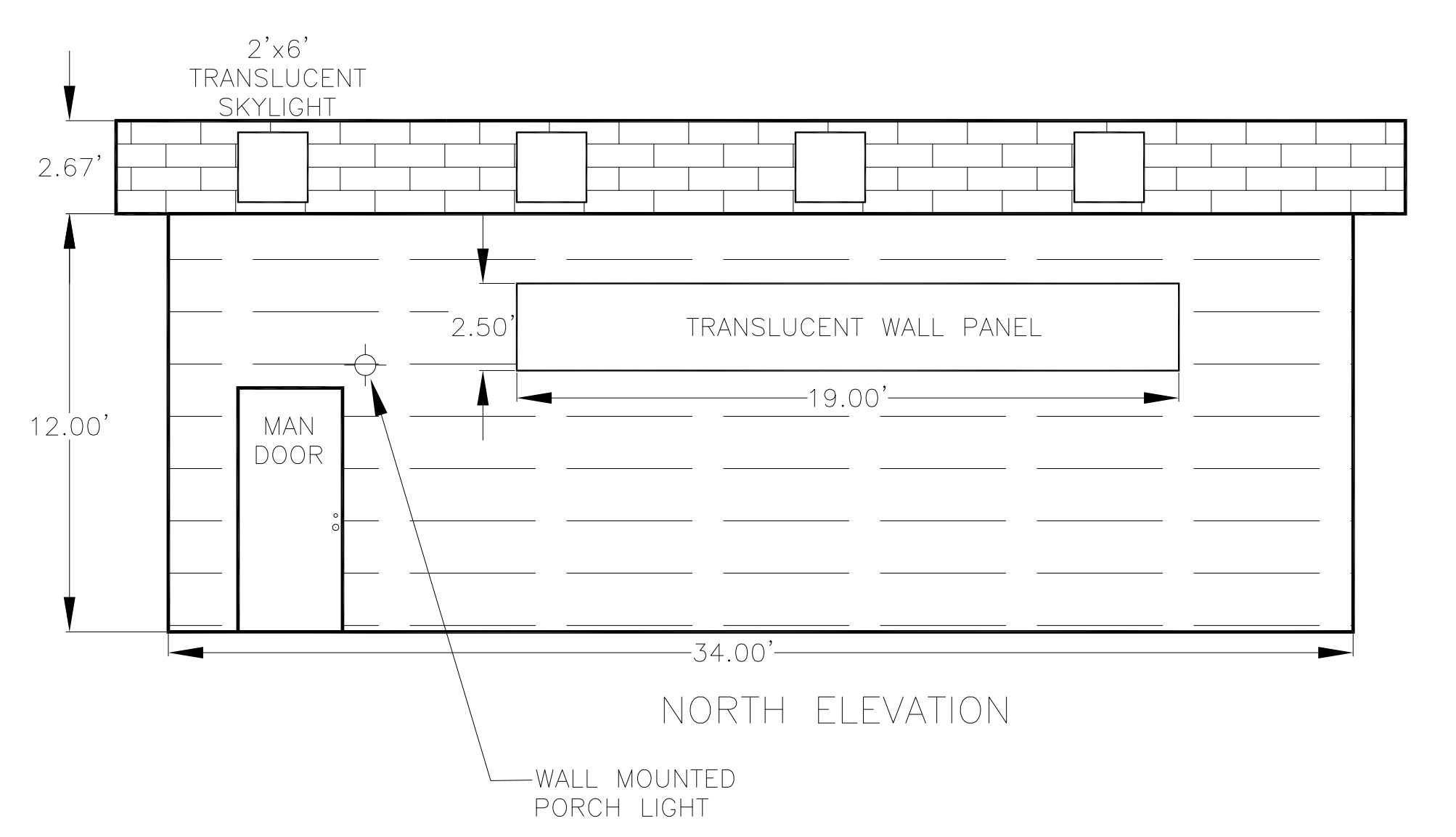
0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS
DESIGNED BY S. STANLEY
CHECKED BY
DRAWN BY T.G.
DATE 07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS II

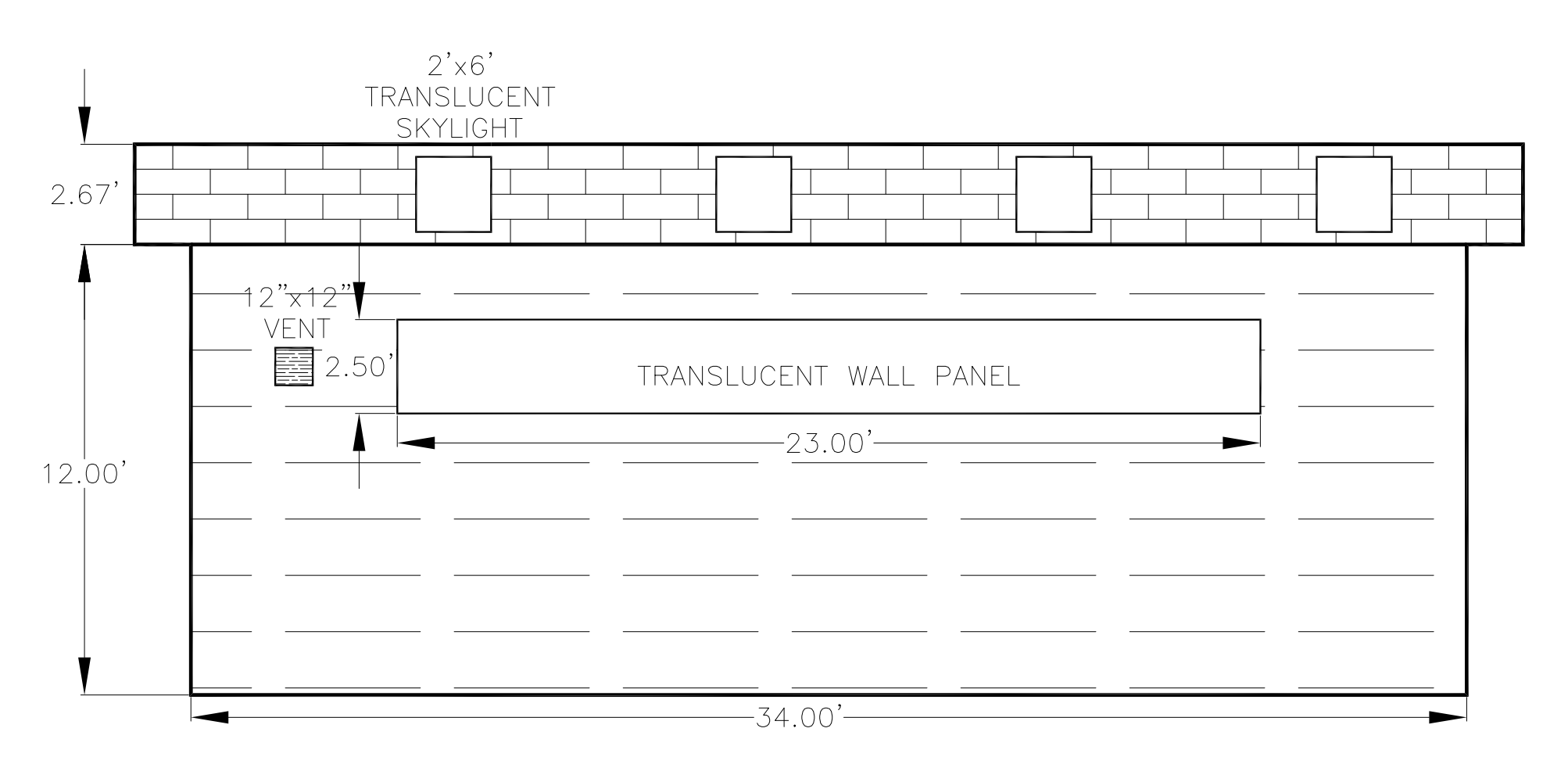
PROJECT NO. 960986-18
SHEET 8 OF 8



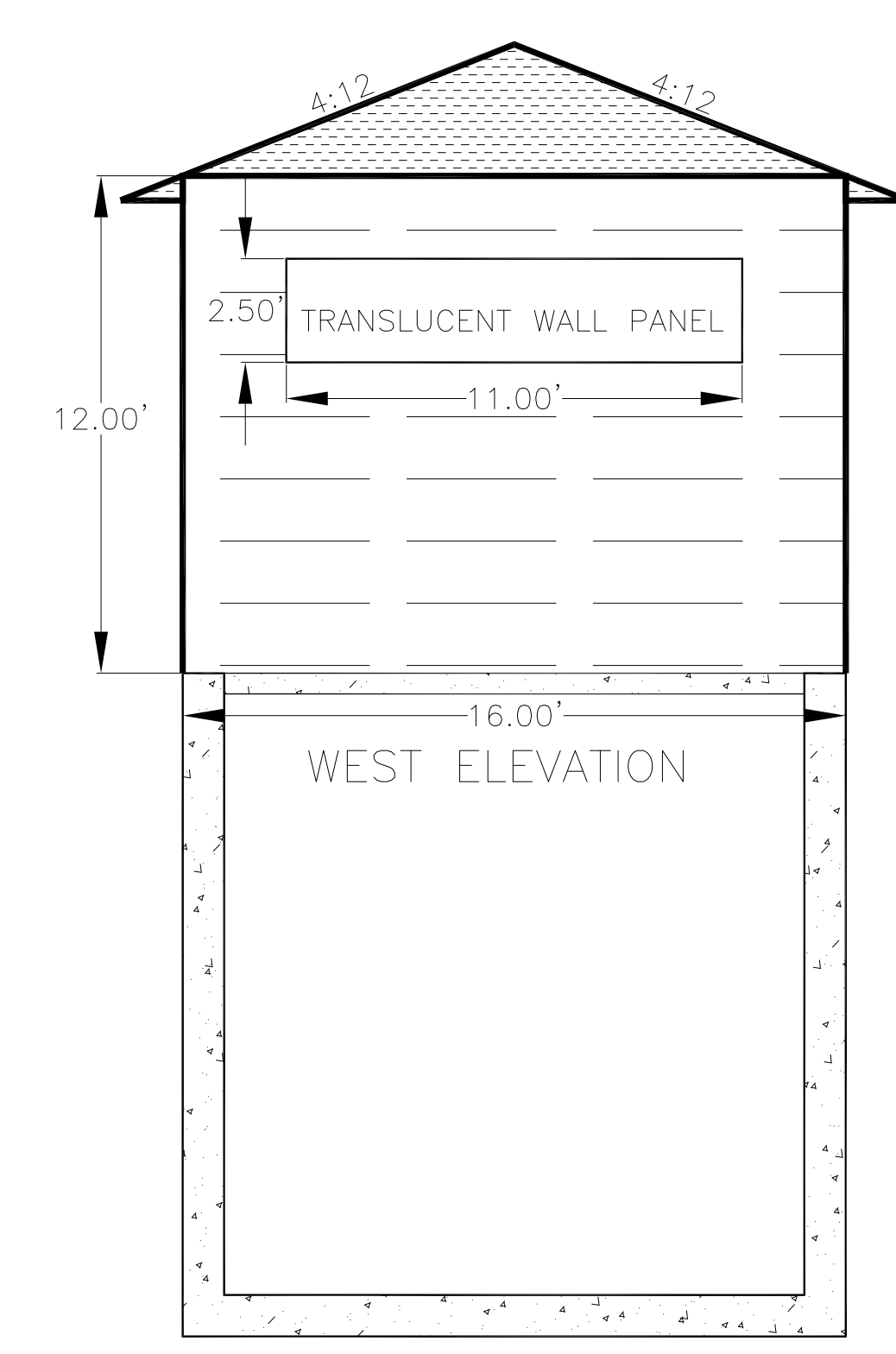
FLOOR PLAN



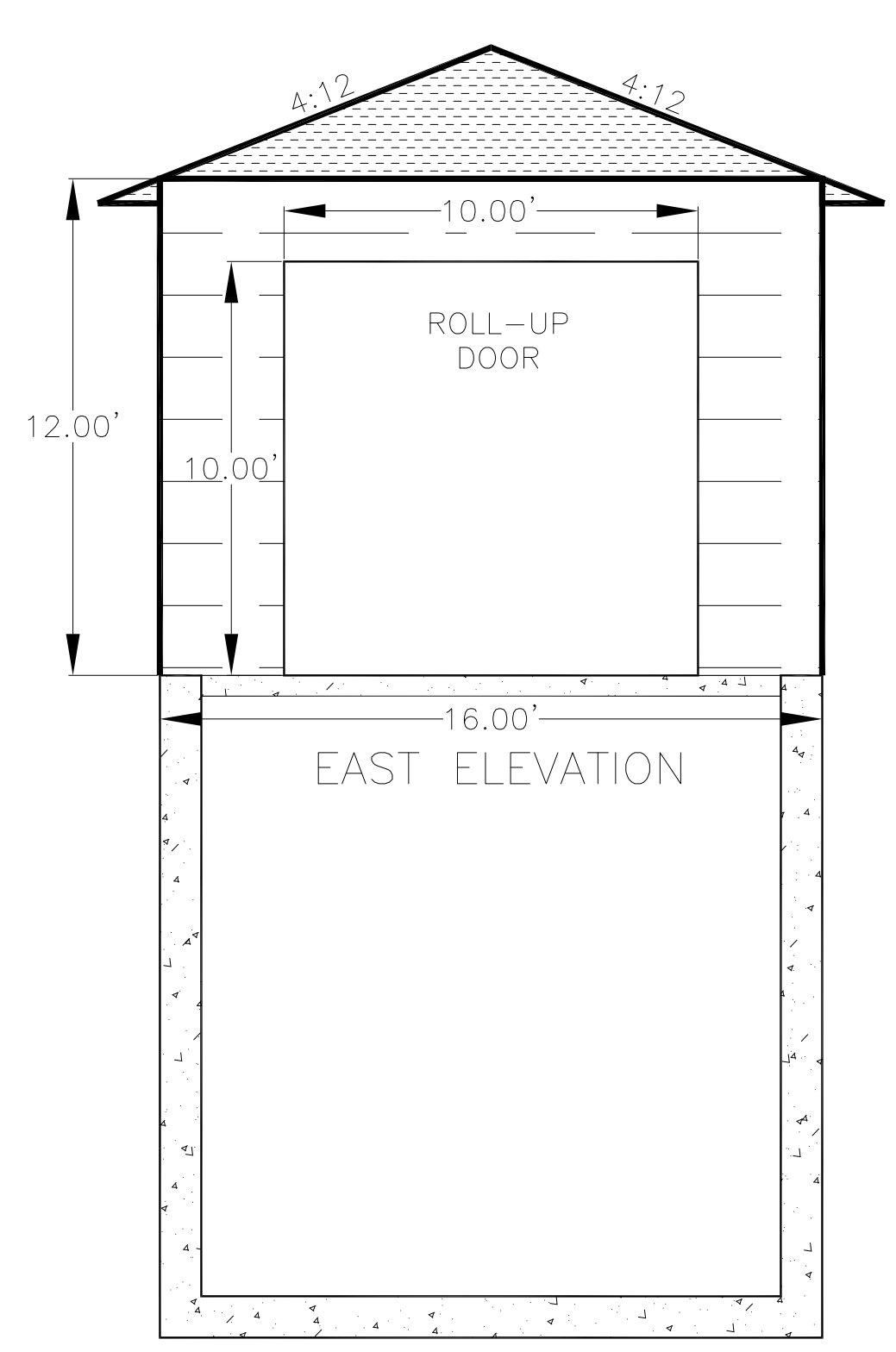
NORTH ELEVATION



SOUTH ELEVATION

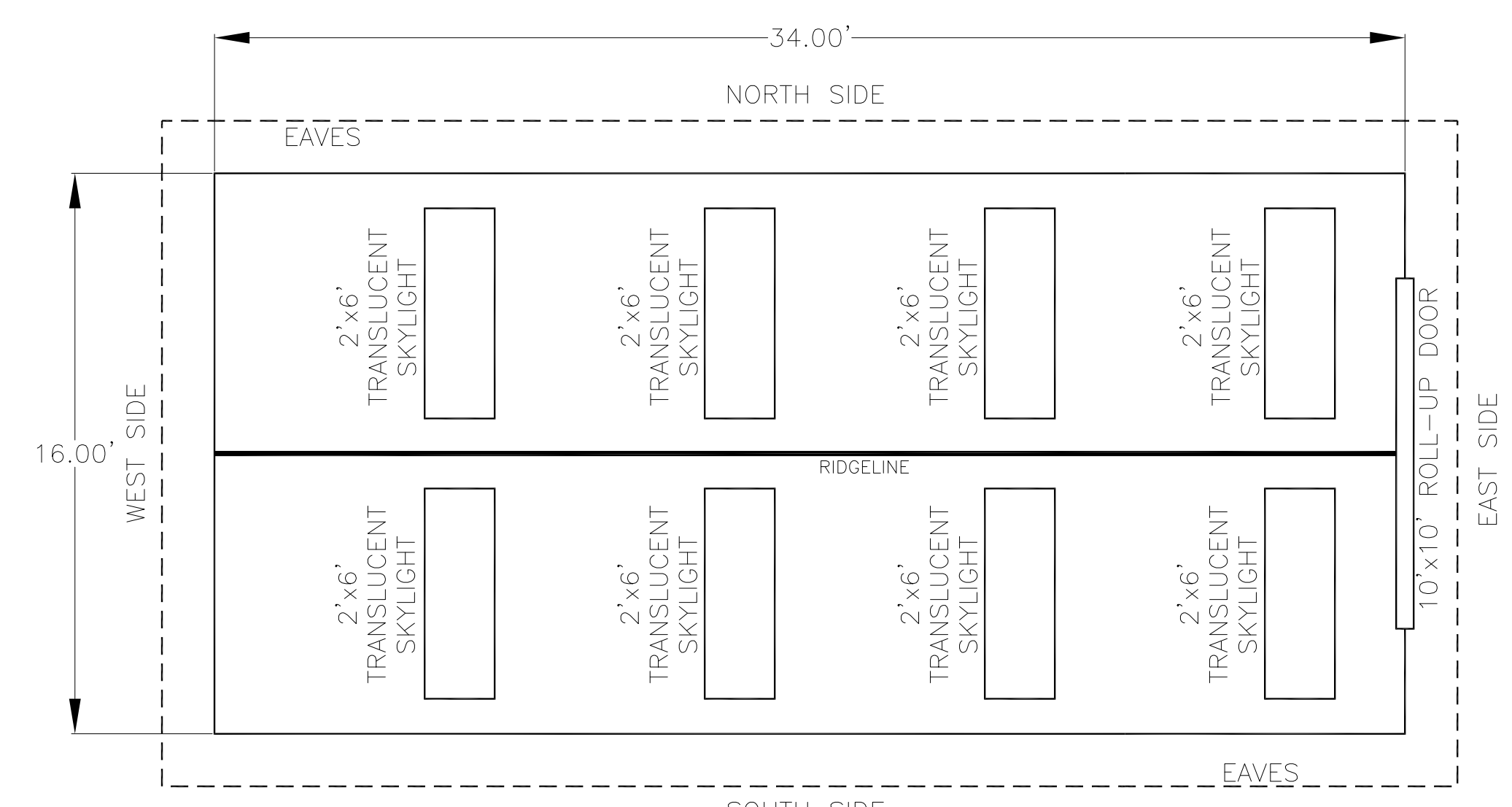


WEST ELEVATION



EAST ELEVATION

NOTE:
BUILDING TO BE INSULATED WITH
4"-6" ROOF INSULATION AND
4" WALL INSULATION



TOP VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION / DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

0 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

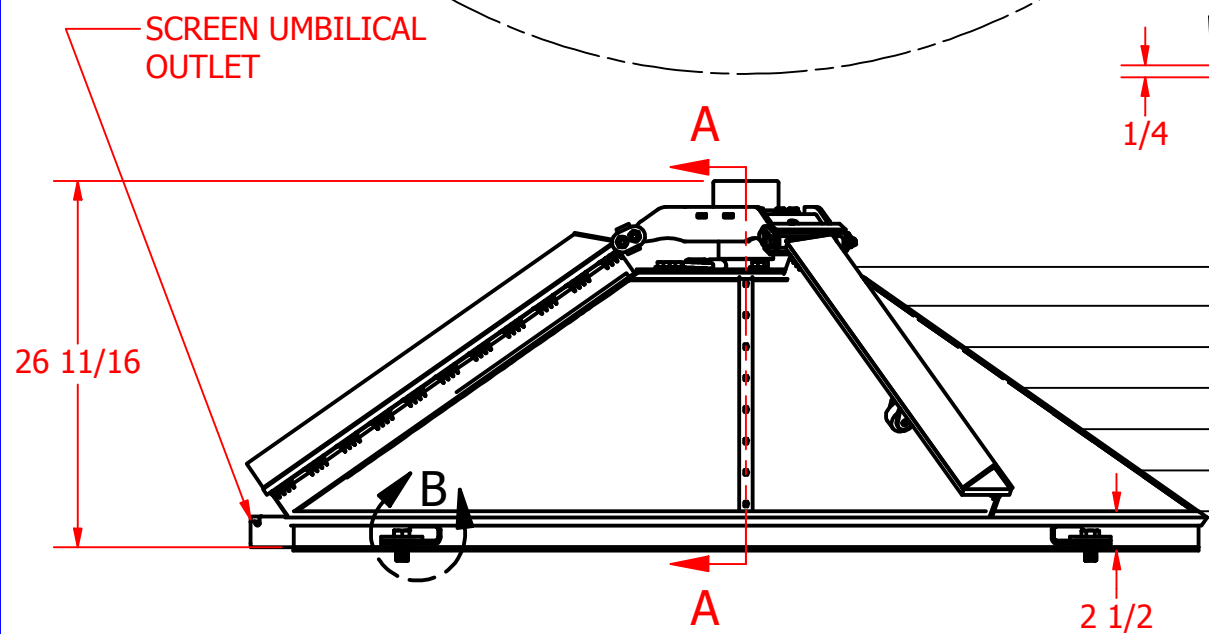
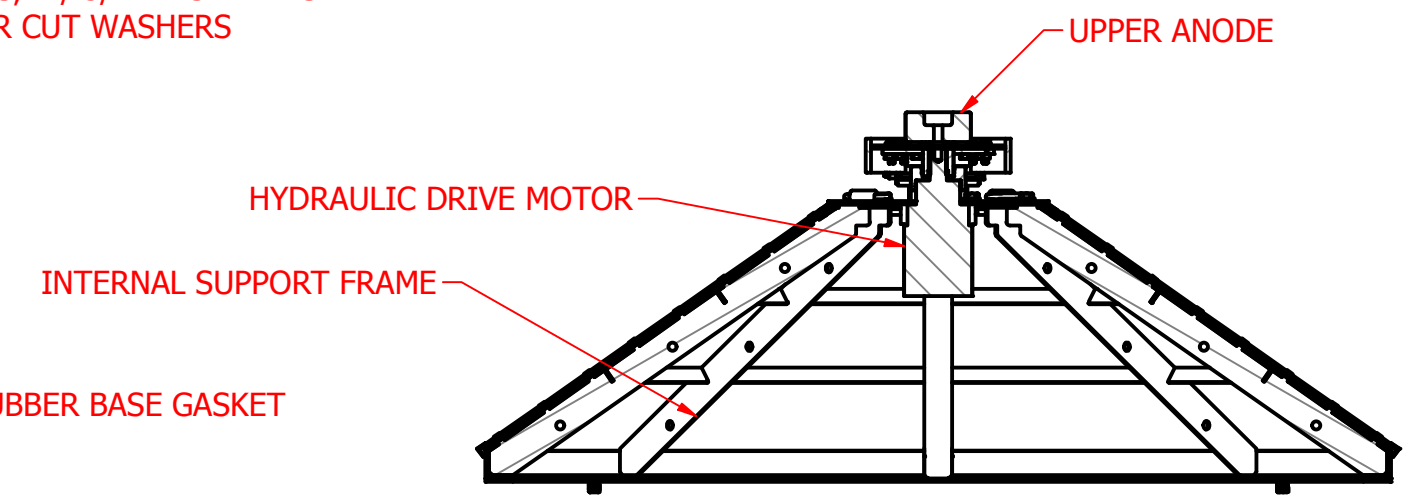
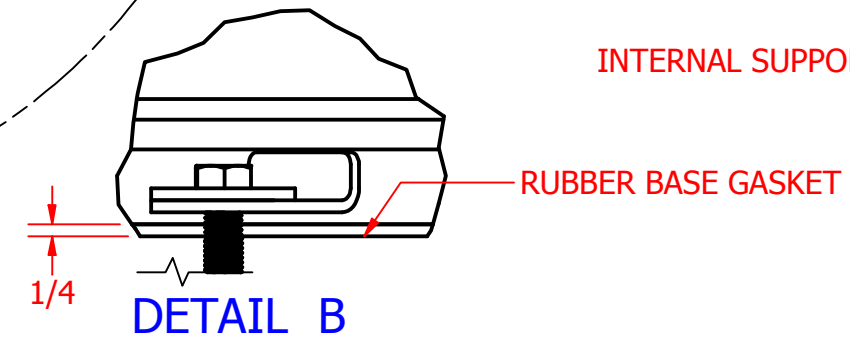
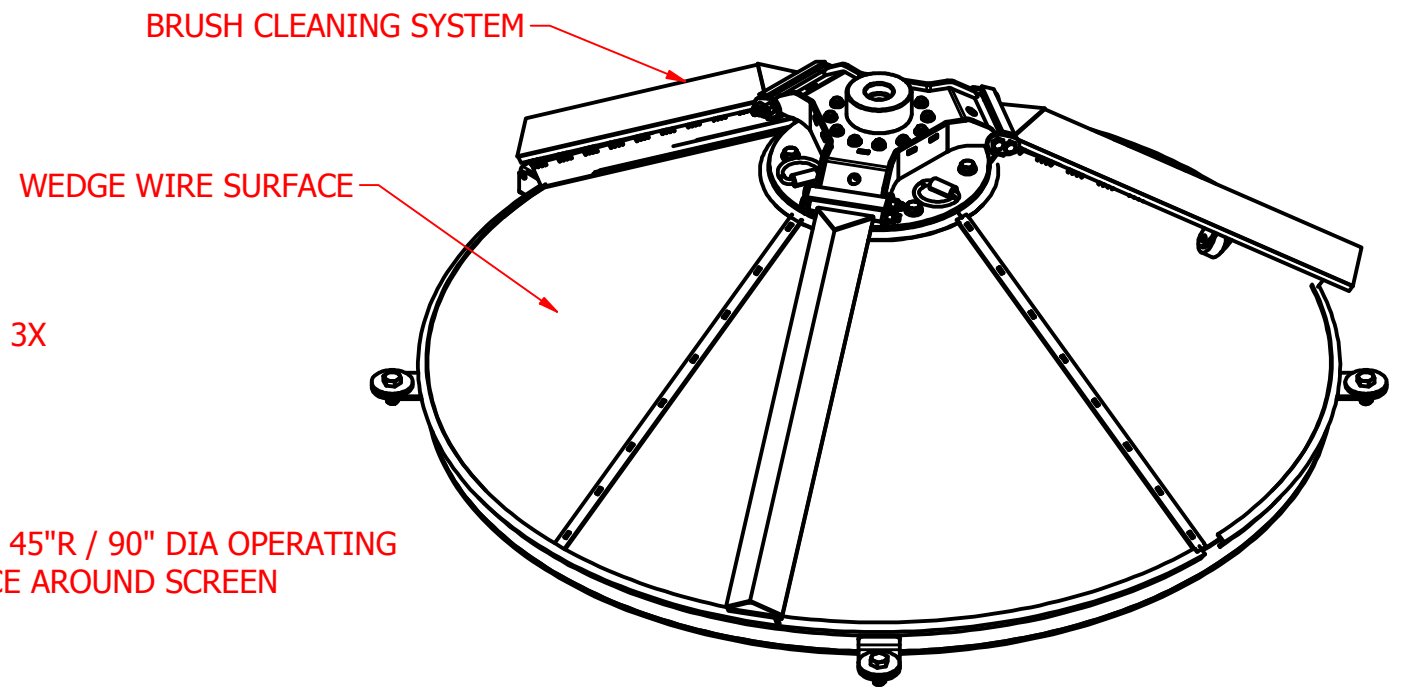
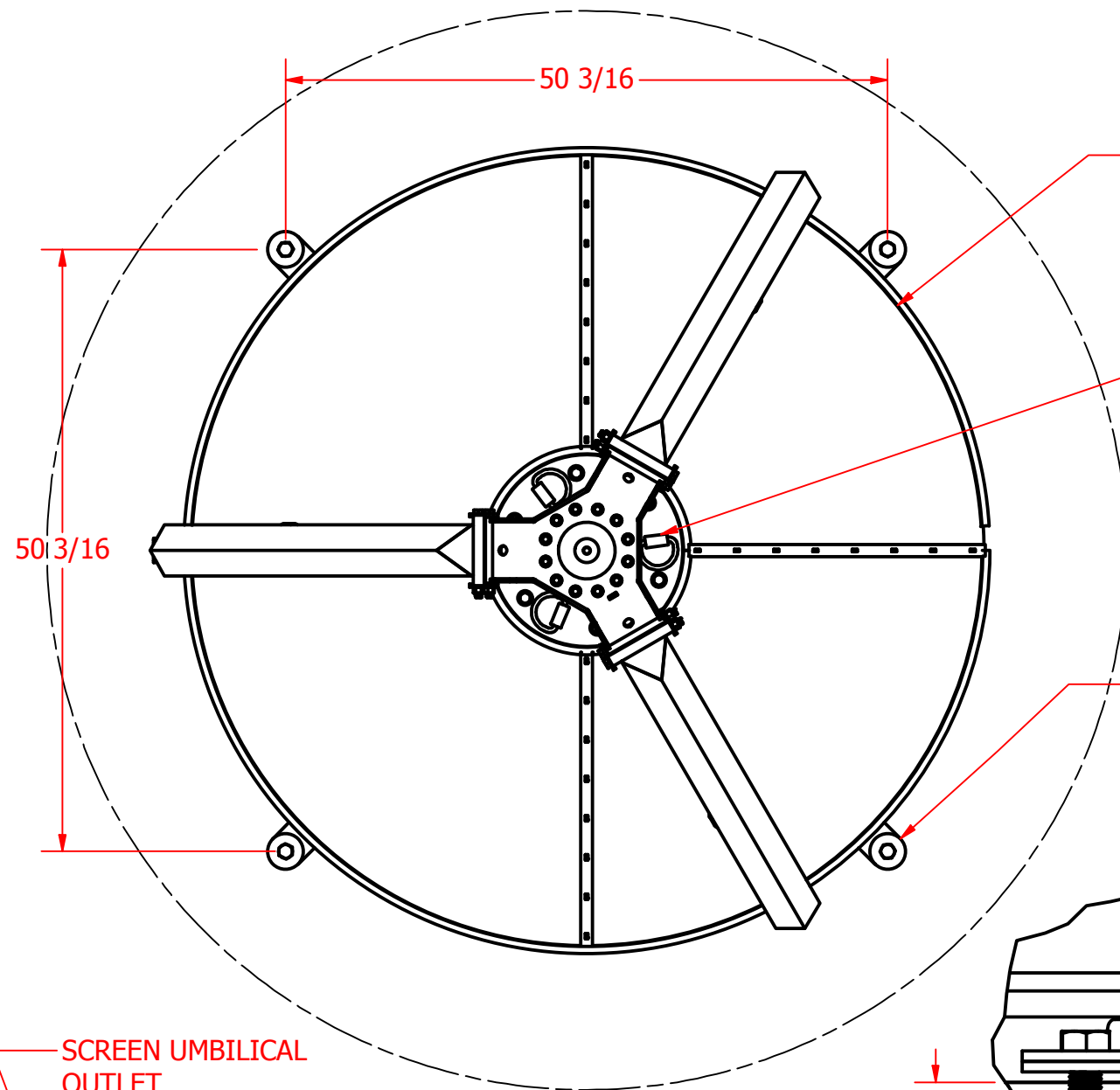
DESIGNED BY S. STANLEY
CHECKED BY
DRAWN BY T.G.
DATE 07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT

FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS IV

PROJECT NO.
960986-18

SHEET 9 OF 9



17.81" / 26.80
15" / 24.86
12" / 21.85
9" / 17.85
6" / 12.88
3" / 6.93
0" / 0

WATER DEPTH (in) / SUBMERGED SCREEN AREA (sq ft)

ISI C66-18 BRUSHED CONE SELF CLEANING INTAKE SCREEN
 FRAME MATERIAL: ASTM A276, TYPE 304
 MOTOR FRAME / DRIVE PLATE MATERIAL: EPOXY COATED ASTM A36 CARBON STEEL
 69 V WEDGEWIRE: 1.75mm WIDTH, 1.75 SLOT SIZE, 50% OPEN AREA

ALL DIMENSIONS IN INCHES UNLESS NOTED			
REV	DESCRIPTION	DATE	APPROVED
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.		STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005	

www.intakescreensinc.com
 CA CL. 796197

ISI Intake Screens, Inc.

8417 River Road - Sacramento, California 95832
 (916) 665-2727 (916) 665-2729 FAX

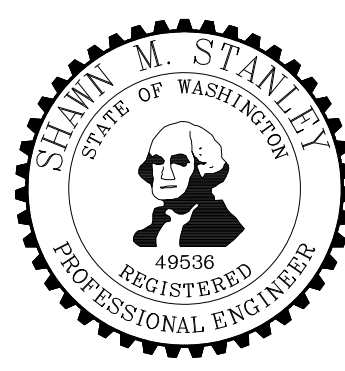
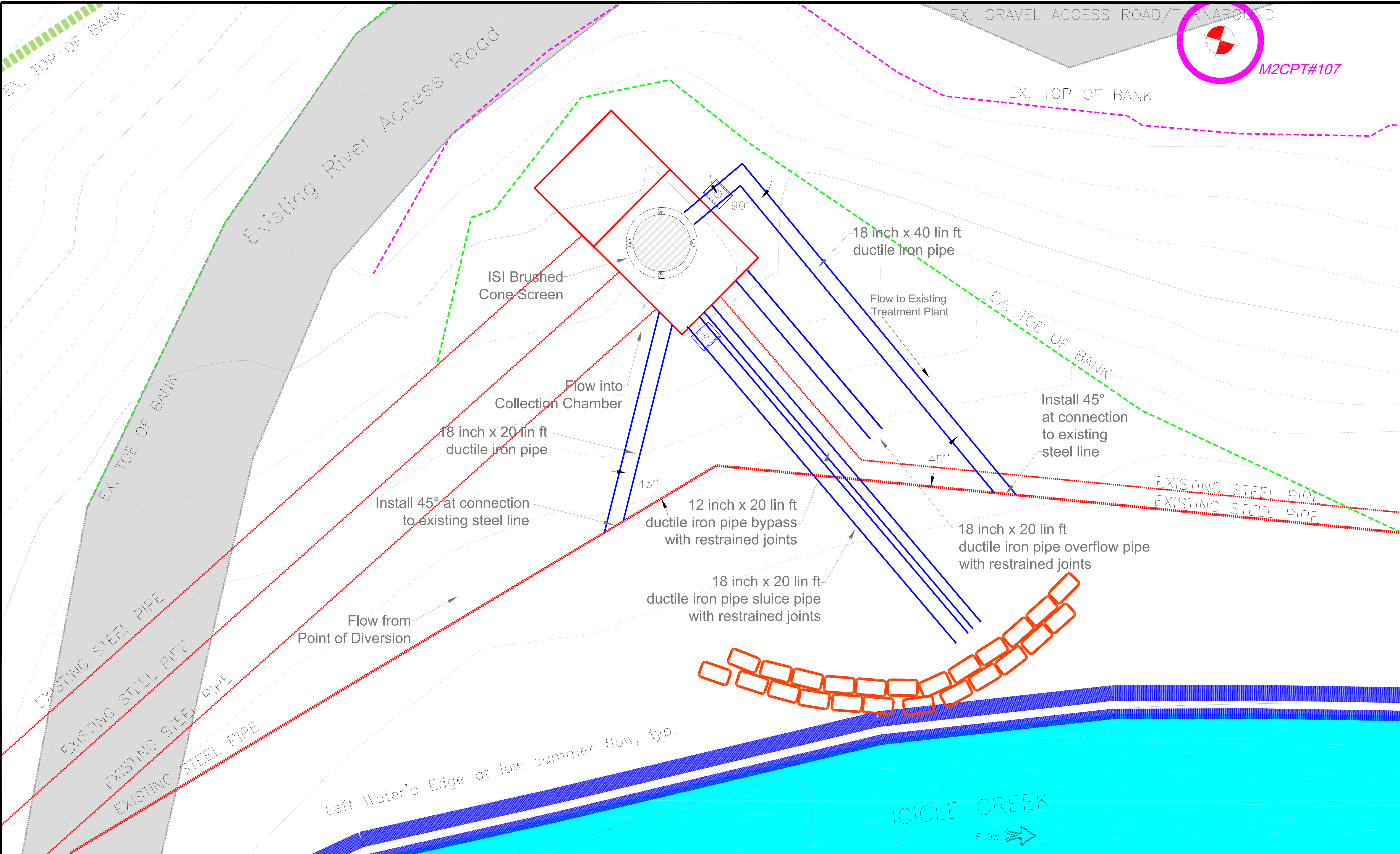
DATE	5/9/2018
APP'D BY	RUSSELL BERRY
DRAWN BY	MAR
"B" SHEET SCALE	

PROJECT: Yellow Jacket

DESCRIPTION	66" CONE SCREEN
MATERIAL	304 STAINLESS ASSEMBLY

DRAWING NUMBER	66 CONE SCREEN-12
MASS	N/A

SHEET NUMBER	1 of 1
--------------	--------



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	09-10-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
Re-Use Collection Chamber Option

PROJECT NO. 960986-18	
SHEET	OF
X	X

NOT FOR CONSTRUCTION

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

T S F T T S T



P T
U BUST



U.S. Department of Justice

Bureau of Alcohol, Tobacco,
Firearms and Explosives

Washington, DC 20226

www.atf.gov

SPECIAL EXPLOSIVE DEVICE DETERMINATION

Pursuant to a request by BDS, Inc., the Bureau of Alcohol, Tobacco, Firearms and Explosives has determined the following explosive device, when possessed and used for its intended purpose in breaking rock and similar materials, meets the special explosive device requirements in accordance with 27 CFR § 555.32.

ATF Tracking Number

17-809683

U.N. Proper Shipping Name and Number:

ORM-D, Cartridges, Power Device

U.S. Department of Transportation Approval Number:

N/A

Product Designation/Part Number:

Number 10, Number 20 and Number 30 Magnum Buster Booster Cartridges

NOTES:

Any alterations to the device will render this exemption void.

DATED:

November 2, 2017

William E. Frye, Jr.
Chief, Explosives Industry
Programs Branch

Material Safety Data Sheet

This product should be stored and used in accordance with good industrial and personal hygiene practices and in conformity with any applicable regulation. The information contained herein is based on the present state of knowledge and is intended to describe the product from the point of view of Safety. The user should therefore not be construed as guaranteeing specific product performance properties.

UF TU

Name: McCarthy Industries
 Address: 500 Haggin View Rd
 Ramsay, MT 59748

Tel No: (713) 575 5002
 Email: info@mccarthyindustries.com

Contact: Don McCarthy

FUNCTION	Cartridges	Power Device
FUNCTION	Not Applicable	Final Product
Domestic Shipping	Exemption	ORM-D
Export Shipping: UN Description	Cartridges, Power Device	UN Number 1.4S

PHYSICAL PROPERTIES (Nominal for Power Cartridge)		TECHNICAL DATA
Auto-ignition Temperature:	150 deg C	A plastic cartridge containing a primer for ignition and a nitrocellulose propellant (ball powder) for gas production. The configuration is unique and cannot be fitted or used in a standard weapon.
Net Explosive Mass:	10 g (maximum)	
<i>Small D x L</i>	15 g (maximum)	
<i>Medium D x L</i>	30 g (maximum)	
Gross Mass w/Cartridge Body:	31 g	The cartridge is used to produce a rapid evolution of gas, which provides the energy necessary to break rock in the mining industry. The energy is converted into a hydrostatic pulse by directing the gas into a water filled hole within the rock.
<i>Small D x L</i>	39 g	
<i>Medium D x L</i>	58 g	
Approximate Dimensions:	25 mm x 75 mm	
<i>Small D x L</i>	25 mm x 90 mm	
<i>Medium D x L</i>	25 mm x 120mm	

S S PT S	P T	F T US TS F ST
<p>Fire</p> <p>Will not explode en masse. Exposure to flame will destroy packaging and may result in the ignition of cartridges.</p> <p>Explosion</p> <p>An explosion risk exists only when cartridges are tightly confined in a closed vessel or similar. A pressure build-up may cause an explosion and a scattering of the confined material.</p> <p>Inhalation</p> <p>Periodic inhalation of normal combustion products presents no hazard to the user. Typical mass decomposition products include Pb, CO, CO₂, H₂O, H₂, NO_x, and N₂.</p> <p>Hearing</p> <p>Permanent damage to hearing may result from frequent exposure to impact noise without wearing suitable hearing protection.</p>	<p>Store and transport away from radiant heat and open flames. Maintain a distance of at least 8m should any packaging catch alight.</p> <p>Use cartridges only as specified by the manufacturer. Limit quantity stored to a minimum. Ensure that cartridges are not subject to impact, friction, electrostatic or electric sources, heat.</p> <p>Do not use in confined spaces. Ensure good ventilation during use. NO_x, and other gases are present in hazardous quantities when cartridges are burnt in mass.</p> <p>Hearing protection which provides at least 50dB(A) attenuation should be worn, or use should be made of the percussion valve type ear muff.</p>	<p>Douse fire with water, dry powder, carbon dioxide, or foam. Wear SCBA when large quantities of cartridges are burning.</p> <p>Douse fire with water, dry powder, carbon dioxide, or foam. Punctures and lacerations caused by flying projectiles may be treated in the normal manner.</p> <p>If a headache develops as a result of inhalation of combustion products, remove to fresh air. Ensure that work area has been sufficiently ventilated before resuming work.</p> <p>Persons exposed to percussion on a frequent and regular basis should be subjected to an annual audiometric examination. Chronic hearing loss may be untreatable.</p>

SP and SP S P UT S	ST U TS
<p>Design of the product makes spillage of large amounts of propellant unlikely. Propellant powder which has been spilled must be soaked in water for a minimum of one hour and then thrown directly onto a fire. Observe the following precautions when carrying out this action;</p> <ol style="list-style-type: none"> 1. Move at least 5m away from the fire immediately after the wet propellant has been thrown onto the flames. 2. Never throw dry propellant powder onto a fire, as this may result in injury. <p>Empty Magnum Cartridges may be disposed of one at a time by throwing them into an enclosed fire which protects the operator from flying debris. A sharp report will signal the successful disposal of the initiator.</p>	<p>Store in a dry place with temperature and humidity preferably between 41-95 F (5-35 C) (ideally 68 F/20°C) and less than 50% Relative Humidity.</p>

P B
<p><u>Cartridges Power Device</u></p> <p>Product: ORM-D, One hundred cartridges are packed in a cardboard box. Cardboard box is marked ORM-D Cartridges, Power Device</p> <p>Classification: U. N. 0323, Group 1.4S. Maximum, One hundred cartridges are packed in a cardboard box. Cardboard box is marked Power Cartridge, Magnum Buster. Also included will be actual Size Class, Gross Weight and Net Explosive Weight.</p>

T T T	F S T T F T
<p>Injury arising from accidental discharge of the Magnum Buster cartridge should be treated according to nature and severity. Treat all persons who have inhaled large quantities of ignition products as stretcher cases. Ensure that patients who have inhaled large quantities of ignition gases are observed for 24 hours (effect of Nitrous oxides).</p>	<p>Occupational Health & Safety Act No 85 of 1993 General Administrative Regulations of Act 85 of 1993</p> <p>UN Publication Recommendations on the Transport of Dangerous Goods .</p>

P T P U T S

CONSULT USER MANUAL FOR DETAILED OPERATING INSTRUCTIONS.

S F T P U T S

1. KEEP ALL CARTRIDGES AWAY FROM CHILDREN.
2. DO NOT USE CARTRIDGES IN AN ENVIRONMENT CONTAINING FLAMABLE GASES.
3. DO NOT INITIATE A CARTRIDGE IN IMMEDIATE CONTACT WITH COMBUSTABLE MATERIALS.
4. DO NOT ATTEMPT TO PUNCTURE, DISSASSEMBLE OR MODIFY ANY CARTRIDGE.
5. DO NOT HEAT CARTRIDGE OR DISPOSE OF IN OPEN FIRE.
6. APPLY SAFETY PRACTICES APPLICABLE TO THE HANDLING POWER CARTRIDGES.
7. DO NOT ALLOW UNTRAINED PERSONS TO HANDLE THIS PRODUCT.

Magnum Buster is a cartridge containing ball powder and an ignition primer. Because the Magnum Buster MSDS contains limited information on chemical specifications, MSDS sheets are also included for ball powder and a typical ignition primer used with ball powder.

o e- ase n owder
Western Powders, nc.
ss e ate 1 01 015

Safety ata S eet according to S a o Standard re uire ents

Section 1 - Identification of the Mixture and of the Company

Product Names:

Nitro 100 NF, Ramshot Zip, Accurate #2, Accurate #5, Ramshot Silhouette, Ramshot True Blue, Accurate TCM, Accurate 4100, Ramshot Enforcer, Accurate 11FS, Ramshot X-Terminator, Accurate 2230, Ramshot TAC, Ramshot Hunter, Ramshot Big Game, Ramshot Magnum, Accurate 2520, Ramshot Competition, Accurate #7, Accurate #9, Accurate 1680, Accurate 5744, Accurate 2200, Accurate 2460, Accurate 2700, Accurate Magpro

Trade Names and Synonyms:

herica g n owder, a owder, o e- ase g n owder.

Relevant Identified Uses:

Prod ct is intended or se in s o e ess ro e ant a ications on .

Distributed By:

WESTERN POWDERS, INC.

P. . o 158

Mi es it , Montana 59301

e e hone (406) 34-04

a (406) 34-0430

We site www.western owders.co

ai c sto erser ice ra shot.co

Emergencies – Chemtrec – 1-800-424-9300

Section 2 - HAZARD IDENTIFICATION

Classification of the Mixture:

Explosives Division 1.3

GHS Classification:



Signal Word:

Danger

Hazard Statements:

H203 Explosive; fire, blast or projection hazard.

H302 ar i swa owed.

H319 a ses serio se e irritation.

H317 Ma ca se an a ergic s in reaction.

H371 Ma ca se da age to organs

(circ ator s ste , ood, idne s, i er) thro gh ro onged or re eated e os re.

Precautionary Statements

Prevention

P210 ee awa ro heat.

P240 ro nd or ond container and recei ing e i ent

P250 o not s ect to choc or riction.

P260 o not reathe d st.

P 80 Wash thoro gh a ter hand ing.

P 0 o not eat, drin or s o e when sing this rod ct.

P 81 Wear protective goggles, protective clothing and eye protection.

Response

- P370** Avoid contact with skin and eyes. Rinse immediately with plenty of water. Get medical attention if necessary.
- P312** Wash thoroughly with plenty of water. Get medical attention if necessary.
- P330** Wash with plenty of water.
- P305** If in contact with eyes, rinse immediately with plenty of water. Get medical attention if necessary.
- P338** In case of contact with skin, wash immediately with plenty of water. Get medical attention if necessary.
- P303** If on clothing, remove contaminated clothing and shoes. Wash thoroughly with plenty of water.
- P337** If irritation persists, get medical attention.
- P333** If rash persists, get medical attention.
- P363** Wash contaminated clothing before reuse.

Storage

- P410+412** Store in a well-ventilated place. Avoid direct sunlight.
- P404** Store in a closed container.
- P420** Store away from ignition sources.

Disposal

- P501** Dispose of contents and container in accordance with applicable regulations.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Substances:

Product is a mixture.

CAS Number	%[Weight]	Name
9004-0-0	50-100	Nitrocellulose
55-63-0	0-4	Nitrocellulose
84-4-	0-10	Diethyl Phthalate
Not Available	0-10	Polyester Adipate
85-98-3	0-10	Diethylene Glycol (diethylene glycol)
8050-09-0	0-5	Diethylamine
13114--	0-3	Ammonium
5-9-1	0-3	Potassium Nitrate
8-80-5	0-3	Potassium Acetate
141-8-6	0-	Diethyl Acetate
141-8-6	0-1.5	Diethylene Glycol
86-30-6	0-1.5	N-Nitrosodiethylene Glycol
188-10-5	0-1.5	Diethylene Glycol
131-65-3	0-1	Diethylene Glycol
8-4-5	0-1	Diethylene Glycol

Section 4 - FIRST AID MEASURES

Inhalation

- Move to fresh air.
- Remove contaminated clothing and shoes.
- Breathing is difficult, ensure respiratory protection, give oxygen and continue to monitor.
- If heart has stopped, initiate cardiopulmonary resuscitation (CPR).
- See affected person warmed and at rest. Get immediate medical attention.

Eye Contact

- Remove contact lenses.
- Flush immediately with plenty of water for 15 minutes.
- If eye contact occurs and opens wide apart. Eye irritation develops, consult a physician.

Skin Contact

- Immediately wash exposed skin with plenty of soap and water while removing contaminated clothing and shoes.
- Make a sorbed through the skin in hands and soles.
- Consult a physician if necessary.

- Wash clothing before re-use.
- Clothing is to be altered, in or out the person performing the operation of the contaminants have appropriate properties.

Ingestion

- Ingested through with water and give large amounts water to avoid unconsciousness.
- Notify medical attention.
- Do not give anything to the person if unconscious or having convulsions.

Most important symptoms and effects, both acute and delayed.

Eye irritation. Skin symptoms include itching, stinging, redness and tearing. In contact with cause redness and pain. Ingestion causes gastrointestinal irritation, nausea, vomiting and diarrhea. High concentrations of dust irritate throat and respiratory system and cause coughing. A drop in blood pressure, headache, cyanosis and mental confusion are symptoms of nitrogen in the product.

Indications of any immediate medical attention and special treatment needed.

Provide general first aid and treatment to attend. See medical attention.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Large amounts of water should be applied as it is a flammable liquid.

Unsuitable extinguishing media

Do not use water as an extinguisher, as this is flammable.

Special Hazards arising from the substrate or mixture.

Flammable gases are formed during a fire. Combustion products are dependent on fire conditions and other combustibles present. The dominant products will be carbon dioxide and oxides of nitrogen, under some conditions, ethane, carbon monoxide, irritating aldehydes and carbonic acids, and hydrogen cyanide are formed.

Special protective equipment and precautions for firefighters

Self-contained breathing apparatus (SCBA) and protective clothing should be worn in case of fire. In addition, it is not advised to, in any circumstances, gloves, hard hat and chemical protective suit.

Fire-fighting equipment/instructions

Fires involving these materials should not be fought unless extinguishing media can be applied from a well-protected (e.g. behind a fire barricade) and distant location from the point of fire.

Specific methods

Accompany personnel to a safe area according to predetermined evacuation plan. Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards

Flammable, flammable liquid.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures.

Evacuate unnecessary personnel away. Minimize ignition sources. Use non-sparking tools. Wear appropriate protective equipment and non-flammable or flame retardant clothing during clean-up. Avoid inhalation of dust. See MSDS. Major respiratory irritant if there is a risk of exposure to dusts at the site exceeding the exposure limits. Do not touch damaged containers or spilled materials unless wearing appropriate protective clothing. Always read and understand the label. Local authorities should be advised if significant quantities cannot be contained. For personal protection, see section 8 of this MSDS.

Methods and materials for containment and cleaning up

Avoid dispersal of dust in the air (e.g. clearing dust surfaces with compressed air). Clean surfaces immediately using non-spraying techniques. Wet down settled materials prior to initiating clean-up and clean materials wetted or dissolved. Avoid contamination of water bodies during clean-up and disposal. This material is heavier than water. Create an overflow dam with filtration capabilities to retain material. Collect dust using a vacuum cleaner equipped with HEPA filter. Large spills sweep, shoveling or vacuuming and collect in suitable container or disposal. Pour spillage into water where possible, release intact containers from the water. Clean contaminated surfaces thoroughly to remove residual contamination. Never return settled material to original containers or release or waste disposal, see section 13 of this MSDS.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Do not handle until a safety precaution has been read and understood. Do not subject to mechanical shock. Avoid exposure to sunlight or artificial ultraviolet light. Minimize dust generation and accumulation. Provide adequate ventilation. Avoid breathing dust. Avoid contact with eyes, skin and clothing. Do not taste or swallow. Wear appropriate personal protective equipment. Use good industrial hygiene practices. The powder contains stabilizers and deteriorates over long-term storage conditions. Discoloration of powder should be checked for deterioration regularly. Deteriorating smokeless powder produces an acidic odor and a reddish-brown residue. Use of deteriorating smokeless powder through, for example, controlled burning in safety devices (rockets should be submerged in water immediately). The powder should not be exposed to excessive heat, as this can accelerate deterioration. Deterioration produces an acid that accelerates further reaction and has been known, because of heat generated in the reaction, to cause spontaneous combustion.

Conditions for safe storage, including any incompatibilities

Store at 1 (0), 50 relative humidity (decomposition decreases as relative humidity (1)). Store in original container. Keep container tightly closed. Store in a cool, well-ventilated place away from sources of ignition. Store away from incompatible materials (see section 10 of this MSDS). For additional information regarding handling and storage guidelines, see "Properties and Storage of Smokeless Powder" published by the SPORTING ARMS AND AMMUNITION MANUFACTURERS NATIONAL ASSOCIATION (SAA), 11 Middle Road, Newtown, 06405 (www.saa.org).

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Control Parameters


Occupation Exposure Limits (OEL)

Chemical Name	CAS Number	ACGIH TLV	OSHA PEL	Other Information
Nitrocellulose	9004-0-0	None established	None established	
Nitroglycerin	55-63-0	0.05 mg/m ³ in designation	0.1 mg/m ³ Airtight spaces	Air sampling is insufficient to accurately assess release. Measures to prevent significant release are required.
Diethyl Phthalate	84-64-4	5 mg/m ³	5 mg/m ³	
Polyester Adipate	Not Available	Not Available	Not Available	
Diethylene Glycol (diethylene glycol)	85-98-3	None established	None established	
Diethylene Glycol	8050-09-9	None established	None established	
Acetate	13114-13-3	None established	None established	
Potassium Nitrate	78-05-9	None established	None established	
Potassium Sulfate	78-05-9	None established	None established	
Diethyl Acetate	141-85-6	400	400 1400 mg/m ³	
Diethylene Glycol	110-80-4	10 mg/m ³	None established	
N-Nitrosodiethylene Glycol	86-30-6	None established	None established	
Diethylene Glycol	110-80-4	10 mg/m ³	10 mg/m ³	Diethylene Glycol and inorganic compounds
Sodium Azide	131-06-3	None established	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)	
Sodium Azide	78-05-9	10 mg/m ³ (respirable fraction)	15 mg/m ³ (total dust) 5 mg/m ³ (respirable fraction)	

Biological limit values

- No toxicological effects noted for the ingredient(s).

Exposure Controls

Appropriate engineering Controls	<p>Engineering controls are used to reduce the hazard or create a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and with technical independent worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <ul style="list-style-type: none"> Process controls which involve changing the way a task or process is done to reduce the risk. Enclosures and isolation of emission sources which enclose selected hazardous activities away from the worker and ventilation that strategically adds and removes air in the work environment. Ventilation can remove or dilute an air contaminant in a designed manner. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> Wear safety glasses with side shields.
Skin protection	<ul style="list-style-type: none"> Wear appropriate chemical resistant, flame retardant clothing (e.g. coveralls or a coat).
Hands/feet protection	<ul style="list-style-type: none"> Wear appropriate gloves.
Respiratory protection	<ul style="list-style-type: none"> Use a NIOSH-approved respirator with organic vapor cartridge and particulate filter if there is a risk of exposure to dusts or gases exceeding the exposure limits.
General hygiene Considerations	<p>Always observe good personal hygiene practices, such as washing after handling the material and before eating, drinking and/or smoking. routinely wash work clothing and protect equipment to reduce contaminants.</p>

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:

translucent to opaque solid

Physical state	solid	Relative density (Water = 1)	density 0.5 - 1 (g/cc)
Odor	odorless	Partition coefficient n-octanol / water	Not available
Odor threshold	Not available	Auto-ignition temperature (°C)	190-200 (34-39)
pH (as supplied)	Not available	Decomposition temperature	decomposition occurs at approximately 50 (100 °F).
Melting point / freezing point (°C)	Not available	Viscosity (cSt)	Not available
Initial boiling point and boiling range (°C)	Not available	Flammability	Flammable and other information
Flash point (°C)	Not available		Product can be ignited and contained
Evaporation rate	Not available		
Flammability	flammable solid		
Upper Explosive Limit (%)	Not available		
Lower Explosive Limit (%)	Not available		
Vapor pressure (kPa)	1 g		
Solubility in water (g/L)	insoluble		
Vapor density	Not available		

Section 10 - STABILITY AND REACTIVITY

Reactivity	<p>It is not ignited by mechanical shock and or impact. It is not ignited by static discharge (minimum ignition energy 0.00).</p> <p>Product can be ignited and contained.</p>
Chemical stability	<p>Stable when exposed to sources of heat, sunlight or artificial radiation.</p>
Possibility of hazardous Reactions	<p>Hazardous oxidation does not occur.</p>
Conditions to avoid	<p>Avoid contact with incompatible materials. Direct sunlight, artificial radiation, flame, and heat.</p>
Incompatible materials	<p>Strong acids, alcohols, aldehydes, and amines.</p>
Hazardous decomposition Products	<p>Carbon monoxide, carbon dioxide, oxides of nitrogen.</p> <p>decomposition occurs at approximately 50 (100 °F)</p>

Section 11 - TOXICOLOGICAL INFORMATION

Inhaled	<ul style="list-style-type: none"> • Immediate respiratory irritation. • Inhalation of vapors causes drowsiness and dizziness. This is accompanied by sleepiness, reduced alertness, loss of reflexes, and coordination and vertigo. • Concentrations of 500 ppm (N) depresses the central nervous system, resulting in dizziness, headache, drowsiness, nausea, anaesthetic effects, slowed reaction time, increased heart rate and a progression to unconsciousness. • Chronic poisonings are reported in respiratory depression and asphyxia.
Ingestion	<ul style="list-style-type: none"> • Acutely swallowed. • Ingestion causes gastrointestinal irritation.
Skin Contact	<ul style="list-style-type: none"> • May be harmful in contact with skin. • May cause skin irritation. • May cause an allergic reaction.
Eye	<ul style="list-style-type: none"> • Causes eye irritation.
Chronic	<ul style="list-style-type: none"> • This rodenticide contains diethionamine, which has been shown to induce kidney damage. The low concentration of this material in, and the nature of the rodenticide, would reduce the potential of such an effect.

Information on toxicological effects

Acute toxicity	Nitrocinerone with rodenticide action is a rodenticide and a dropper which affects the heart. It has also been shown to cause ethyloproline (cyanosis).
Skin corrosion/irritation	May cause skin irritation.
Serious eye damage/eye irritation	Causes serious eye irritation.
Respiratory sensitization	May cause respiratory irritation.
Skin sensitization	May cause skin sensitization.
Germ cell mutagenicity	This rodenticide or any of its ingredients are not known or reported to be mutagenic.
Carcinogenicity	This rodenticide contains N-Nitrosodiethionamine, which is reported as a possible human carcinogen (A).
Reproductive toxicity	May damage fertility or the normal child.
Specific target organ toxicity - single exposure	Not assessed.
Specific target organ toxicity - repeated exposure	May cause damage to the circulatory system, kidney, and liver through prolonged or repeated exposure.
Aspiration hazard	Due to the high volatility of the rodenticide it is not an aspiration hazard.

Section 12 - ECOLOGICAL INFORMATION

AQUATIC TOXICITY: **Do not discharge into sewers or waterways.**

Ecotoxicity	Acute aquatic toxicity with long-lasting effects.
Persistence and degradability	No data available on rodenticide.
Bioaccumulative potential	No data available on rodenticide.
Mobility in soil	No data available on rodenticide.
Other adverse effects	No other adverse environmental effects known.

Section 13 - DISPOSAL CONSIDERATIONS

Disposal instructions:

Material is a waste, it is to be treated and controlled in accordance with applicable local, state, and federal regulations (such as in a certified incinerator). Material should be spread into thin layers and ignited from a safe distance. This is done in accordance with applicable local, state, and federal regulations. Do not discharge into drains, water courses or onto the ground.

Local disposal regulations

This is done in accordance with local regulations.

Waste from residues/unused products

are retained to prevent environmental contamination from the use of this material. The user has the responsibility to dispose of unused material, residues, and containers in accordance with applicable laws and regulations.

Section 14 - TRANSPORT INFORMATION

DOT / IMDG:

UN Number	N0161
UN Proper Shipping Name	Powder, o e ss
Transport Hazard Class(es)	1.3
Packing Group	Not a ica e
Special precautions for user	his ateria is a dangero s good or trans ort. A in o ed sta st e a ro riate trained.
Other information	A o e c assi ication re ates to the s eci ic ac aging in which this ateria is s ied the an act rer. the ateria is re ac aged, this c assi ication wi no nger e re e ant.

IATA:

UN Number	or idden
UN Proper Shipping Name	or idden
Transport Hazard Class(es)	or idden
Packing Group	or idden

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not a ica e

Section 15 - REGULATORY INFORMATION
--

US Federal Regulations

his rod ct is a a ardo s he ica as de ined the A a ardo o nication tandard, 9 1910.1 00.

CERCLA Hazardous Substance List (40 CFR 302.4)

Nitrog cerine (10 s) i t htha ate (10 s) N-Nitrosodi hen a ine (100 s) th acetate (5000 s)

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories:

ediate a ard	es
e a ed a ard	es
ire a ard	es
Press re a ard	No
eacti it a ard	es

SARA 302 Extremely hazardous substance

Not isted.

SARA 313 (TRI reporting)

Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) i hen a ine (1 -39-4)

US State Regulations

US. Massachusetts RTK - Substance List

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. New Jersey Worker and Community Right-to-Know Act

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) in dio ide (18 8 -10-5) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. Pennsylvania Worker and Community Right-to-Know Law

Nitroce ose (9004- 0-0) Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) Potassi Nitrate (5 - 9-1) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6) a ci ar onate (131 -65-3) ra hite (8 -4 -5).

US. Rhode Island RTK

Nitrog cerin (55-63-0) i t Phtha ate (84- 4-) th Acetate (141- 8-6) i hen a ine (1 -39-4) N-Nitrosodi hen a ine (86-30-6).

US. California Proposition 65

a i ornia a e rin ing Water and o ic n orce ent Act o 1986 (Pro osition 65) his ateria contains a che ica c rrent isted as a carcinogen and or de e o enta and re rod cti e to in.

Toxic Substance Control Act

Components of this product are listed on the United States Periodic Tables of Elements Act
(A) n entor

Section 16 - OTHER INFORMATION

Revision Date: 11/05/2015

The (M) is a standard communication tool and should be used to assist in the Risk Assessment. Manufacturers determine whether the reported hazards are risks in the workplace or other settings. Risks are determined in reference to various scenarios, cause, release, exposure and current or available engineering controls that are considered.

The information contained herein is believed to be accurate and represents the best information currently available to Western Powders, Inc. No warranty or guarantee, express or implied, with regard to the safety or suitability of these products, or to the results obtained from their use, is offered by Western Powders, Inc. Buyer and user assume any and all risk, responsibility and liability for any injury (including death), loss or damage arising from usage of these products.

DX-Cartridge

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 01/28/2016

Revision date: 01/28/2016

Supersedes: 05/18/2015

Version: 2.3

SECTION 1: Identification

1.1. Identification

Product form	Article
Name	DX-Cartridge
Product code	BU Direct Fastening

1.2. Relevant identified uses of the substance or mixture and uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

Supplier	Department issuing data specification sheet
Hilti, Inc.	Hilti Entwicklungsgesellschaft mbH
Legacy Tower, Suite 1000	Hiltistrasse 6
75024 Plano - USA	86916 Kaufering - Deutschland
T +1 9724035800	T +49 8191 906310 - F +49 8191 90176310
1-800-879-8000 toll free - F +1 918 254 0522	df-hse@hilti.com

1.4. Emergency telephone number

Emergency number	Chem-Trec
	Tel.: 1 800 424 9300 (USA, PR, Virgin Islands, Canada)
	Tel.: 703 527 3887 (Other countries)
	+1 918 8723000
	1-800-879-8000 toll free

SECTION 2: Hazards identification

The dismantling of the article is prohibited!, This article contains hazardous substances or preparations not intended to be released under normal or reasonably foreseeable conditions of use.

2.1. Classification of the substance or mixture

GHS-US classification

Expl. 1.4 H204 - Fire or projection hazard

Full text of H-statements: see section 16

2.2. Label elements

GHS-US labelling

Hazard pictograms (GHS-US)



GHS01

Signal word (GHS-US)

Warning

Hazard statements (GHS-US)

H204 - Fire or projection hazard

Precautionary statements (GHS-US)

P210 - Keep away from heat. - No smoking

P250 - Do not subject to shock

P280 - Wear eye protection

2.3. Other hazards

No additional information available

DX-Cartridge

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	GHS-US classification
glycerol trinitrate	(CAS No) 55-63-0	3 - 10	Unst. Expl, H200 Acute Tox. 2 (Oral), H300 Acute Tox. 1 (Dermal), H310 Acute Tox. 2 (Inhalation:dust,mist), H330 STOT RE 2, H373 Aquatic Chronic 2, H411
lead styphnate	(CAS No) 15245-44-0	0.1 - 5	Unst. Expl, H200 Acute Tox. 4 (Oral), H302 Acute Tox. 4 (Inhalation:dust,mist), H332 Repr. 1A, H360 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Barium nitrate	(CAS No) 10022-31-8	0 - 5	Acute Tox. 4 (Oral), H302
diphenylamine	(CAS No) 122-39-4	0 - 1	Acute Tox. 3 (Oral), H301 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation:dust,mist), H331 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Tetrazen	(CAS No) 109-27-3	0 - 0.2	Unst. Expl, H200 Eye Irrit. 2A, H319

Full text of H-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation	Allow breathing of fresh air. Allow the victim to rest.
First-aid measures after skin contact	Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.
First-aid measures after eye contact	Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persist.
First-aid measures after ingestion	Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Foam. Dry powder. Carbon dioxide. Water spray. Sand.
Unsuitable extinguishing media	Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

No additional information available

DX-Cartridge

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according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

5.3. Advice for firefighters

Firefighting instructions	Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.
Protection during firefighting	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	Remove ignition sources. Use special care to avoid static electric charges. No open flames. No smoking.
6.1.1. For non-emergency personnel	
Emergency procedures	Evacuate unnecessary personnel.
6.1.2. For emergency responders	
Protective equipment	Equip cleanup crew with proper protection.
Emergency procedures	Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	Pick up loose cartridges only by hand. Exposed ingredients must be swept up carefully and phlegmatized in a water container, labelled according the regulations, wipe down with water the contaminated area. Store away from other materials.
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6.4. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection". For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed	Hazardous waste due to potential risk of explosion.
Precautions for safe handling	Do not subject to grinding, shock, friction. Take precautionary measures against static discharge. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.
Hygiene measures	Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	Keep only in the original container in a cool, well ventilated place away from : Direct sunlight, Heat sources. Store in a dry place.
Incompatible products	Strong bases. Strong acids.
Incompatible materials	Sources of ignition. Direct sunlight.
Storage temperature	5 - 25 °C
Prohibitions on mixed storage	KEEP SUBSTANCE AWAY FROM: highly flammable materials. ignition sources.
Storage area	Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

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glycerol trinitrate (55-63-0)		
ACGIH	ACGIH TWA (ppm)	0.05 ppm
ACGIH	ACGIH STEL (ppm)	0.05 ppm
ACGIH	Remark (ACGIH)	Vasodilation
OSHA	OSHA PEL (Ceiling) (mg/m ³)	2 mg/m ³
OSHA	OSHA PEL (Ceiling) (ppm)	0.2 ppm

Barium nitrate (10022-31-8)		
ACGIH	ACGIH TWA (mg/m ³)	0.5 mg/m ³

diphenylamine (122-39-4)		
ACGIH	ACGIH TWA (mg/m ³)	10 mg/m ³
ACGIH	Remark (ACGIH)	Liver & kidney dam; hematologic eff

8.2. Exposure controls

Personal protective equipment

Avoid all unnecessary exposure. Safety glasses. Protective clothing.



Eye protection

Safety glasses.

Skin and body protection

When using setting tools, sufficient ear protection must be worn.

Other information

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Colour	According to product specification
Odour	There may be no odour warning properties, odour is subjective and inadequate to warn of overexposure. Mixture contains one or more component(s) which have the following odour(s): No data available on odour Pleasant odour Floral odour Odourless
Odour threshold	No data available
pH	No data available
Melting point	No data available
Freezing point	No data available
Boiling point	No data available
Flash point	No data available
Relative evaporation rate (butylacetate=1)	No data available
Flammability (solid, gas)	No data available
Explosive limits	No data available
Explosive properties	Fire or projection hazard.
Oxidising properties	No data available
Vapour pressure	No data available
Relative density	No data available
Relative vapour density at 20 °C	No data available
Solubility	No data available
Log Pow	No data available
Auto-ignition temperature	No data available

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Decomposition temperature	No data available
Viscosity	No data available
Viscosity, kinematic	No data available
Viscosity, dynamic	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures. Heat. Sparks. Open flame. Overheating.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide. Nitrogen oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity Not classified

glycerol trinitrate (55-63-0)	
ATE US (oral)	5.000 mg/kg bodyweight
ATE US (dermal)	5.000 mg/kg bodyweight
ATE US (dust,mist)	0.050 mg/l/4h
Barium nitrate (10022-31-8)	
LD50 oral rat	355 mg/kg (Rat)
ATE US (oral)	355.000 mg/kg bodyweight
lead styphnate (15245-44-0)	
ATE US (oral)	500.000 mg/kg bodyweight
ATE US (dust,mist)	1.500 mg/l/4h
diphenylamine (122-39-4)	
ATE US (oral)	100.000 mg/kg bodyweight
ATE US (dermal)	300.000 mg/kg bodyweight
ATE US (dust,mist)	0.500 mg/l/4h

Skin corrosion/irritation	Not classified
Serious eye damage/irritation	Not classified
Respiratory or skin sensitisation	Not classified

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Germ cell mutagenicity	Not classified
	Based on available data, the classification criteria are not met
Carcinogenicity	Not classified
Reproductive toxicity	Not classified
	Based on available data, the classification criteria are not met
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not classified
Potential adverse human health effects and symptoms	Based on available data, the classification criteria are not met. No harmful effects are to be expected if used properly. The contained ingredients can be harmful, but they are hermetically enclosed in the article and can not be released. The dismantling of the article is prohibited.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	No harmful effects are to be expected if used properly. The contained ingredients can be harmful, but they are hermetically enclosed in the article and can not be released. The dismantling of the article is prohibited.
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glycerol trinitrate (55-63-0)	
LC50 fish 1	2.1 mg/l (96 h; Pimephales promelas)
EC50 Daphnia 1	25 mg/l (168 h; Daphnia magna)
LC50 fish 2	1.3 mg/l (96 h; Lepomis macrochirus)
ErC50 (algae)	0.4 mg/l
NOEC chronic fish	0.03 mg/l
Threshold limit algae 1	> 6.5 mg/l (Scenedesmus quadricauda)
Barium nitrate (10022-31-8)	
LC50 fish 1	1900 mg/l
LC50 other aquatic organisms 1	> 1000 mg/l (96 h)
Threshold limit other aquatic organisms 1	> 1000 mg/l (96 h)
lead styphnate (15245-44-0)	
EC50 Daphnia 1	7 mg/l
TLM fish 1	7.48 mg/l (96 h; Pimephales promelas; Lead ion)
Threshold limit algae 1	0.14 mg/l (Selenastrum capricornutum; Lead ion)
diphenylamine (122-39-4)	
LC50 fish 1	> 20 mg/l (48 h; Leuciscus idus)
EC50 Daphnia 1	2.3 mg/l (24 h; Daphnia magna)
LC50 fish 2	2.2 - 5.1 mg/l (48 h; Oryzias latipes)
ErC50 (algae)	0.36 mg/l
Threshold limit other aquatic organisms 1	1000 mg/l (24 h; Pseudomonas fluorescens)
Threshold limit algae 1	0.048 mg/l (72 h; Scenedesmus subspicatus; Inhibitory)
Tetrazen (109-27-3)	
EC50 Daphnia 1	0.14 mg/l

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12.2. Persistence and degradability

DX-Cartridge	
Persistence and degradability	Not established.
glycerol trinitrate (55-63-0)	
Persistence and degradability	Biodegradable in water.
Biochemical oxygen demand (BOD)	53.6 g O ₂ /g substance
Barium nitrate (10022-31-8)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable
diphenylamine (122-39-4)	
Persistence and degradability	Not readily biodegradable in water.
ThOD	2.39 g O ₂ /g substance

12.3. Bioaccumulative potential

DX-Cartridge	
Bioaccumulative potential	Not established.
glycerol trinitrate (55-63-0)	
Log Pow	1.62
Bioaccumulative potential	Low potential for bioaccumulation (Log Kow < 4).
Barium nitrate (10022-31-8)	
Bioaccumulative potential	Not bioaccumulative.
diphenylamine (122-39-4)	
BCF fish 1	51 - 253 (Cyprinus carpio; Test duration: 8 weeks)
Log Pow	3.22 - 3.50
Bioaccumulative potential	Low potential for bioaccumulation (BCF < 500).

12.4. Mobility in soil

diphenylamine (122-39-4)	
Surface tension	0.03 N/m (60 °C)
Ecology - soil	May be harmful to plant growth, blooming and fruit formation.

12.5. Other adverse effects

Effect on the global warming	No known ecological damage caused by this product.
Other information	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	Dispose in a safe manner in accordance with local/national regulations. Refer to manufacturer/supplier for information on recovery/recycling.
Additional information	Hazardous waste due to potential risk of explosion.
Ecology - waste materials	Avoid release to the environment.





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SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	RID
14.1. UN number			
0323	0323	0323	0323
14.2. UN proper shipping name			
CARTRIDGES, POWER DEVICE	CARTRIDGES, POWER DEVICE	Cartridges, power device	CARTRIDGES, POWER DEVICE
Transport document description			
UN 0323 CARTRIDGES, POWER DEVICE (1.4S), (E)	UN 0323 CARTRIDGES, POWER DEVICE, 1.4S		
14.3. Transport hazard class(es)			
1.4S	1.4S	1.4S	1.4S
			
14.4. Packing group			
Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards			
Dangerous for the environment : No	Dangerous for the environment : No Marine pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No
No supplementary information available			

14.6. Special precautions for user

- Overland transport

Special provisions (ADR)	347
Limited quantities (ADR)	0
Packing instructions (ADR)	P134, LP102
Mixed packing provisions (ADR)	MP23
Tunnel restriction code (ADR)	E

- Transport by sea

Special provisions (IMDG)	347
Limited quantities (IMDG)	0
Packing instructions (IMDG)	P134, LP102
EmS-No. (Fire)	F-B
EmS-No. (Spillage)	S-X
Stowage category (IMDG)	01
Stowage and segregation (IMDG)	Protected from sources of heat
MFAG-No	114

- Air transport

PCA packing instructions (IATA)	134
PCA max net quantity (IATA)	25kg
Special provisions (IATA)	A165

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- Rail transport

Special provisions (RID)	347
Limited quantities (RID)	0
Packing instructions (RID)	P134, LP102
Carriage prohibited (RID)	No

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

SECTION 15: Regulatory information

15.1. US Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

glycerol trinitrate	CAS No 55-63-0	3 - 10%
diphenylamine	CAS No 122-39-4	0 - 1%

glycerol trinitrate (55-63-0)

Subject to reporting requirements of United States SARA Section 313

RQ (Reportable quantity, section 304 of EPA's List of Lists)	10 lb
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diphenylamine (122-39-4)

Subject to reporting requirements of United States SARA Section 313

EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.
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15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Expl. 1.4 H204

Full text of hazard classes and H-statements : see section 16

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date 01/28/2016

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Full text of H-statements:

Acute Tox. 1 (Dermal)	Acute toxicity (dermal), Category 1
Acute Tox. 2 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 2
Acute Tox. 2 (Oral)	Acute toxicity (oral), Category 2
Acute Tox. 3 (Dermal)	Acute toxicity (dermal), Category 3
Acute Tox. 3 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 3
Acute Tox. 3 (Oral)	Acute toxicity (oral), Category 3
Acute Tox. 4 (Inhalation:dust,mist)	Acute toxicity (inhalation:dust,mist) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Aquatic Chronic 2	Hazardous to the aquatic environment — Chronic Hazard, Category 2
Expl. 1.4	Explosives, Division 1.4
Eye Irrit. 2A	Serious eye damage/eye irritation, Category 2A
Repr. 1A	Reproductive toxicity, Category 1A
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
Unst. Expl	Explosives, Unstable explosives
H200	Unstable explosives
H204	Fire or projection hazard
H300	Fatal if swallowed
H301	Toxic if swallowed
H302	Harmful if swallowed
H310	Fatal in contact with skin
H311	Toxic in contact with skin
H319	Causes serious eye irritation
H330	Fatal if inhaled
H331	Toxic if inhaled
H332	Harmful if inhaled
H360	May damage fertility or the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H411	Toxic to aquatic life with long lasting effects

SDS_US_Hilti

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

MSDS INFORMATION

Document No.: MSDSNXBURST01SB60



NXCO MINING TECHNOLOGIES (PTY) LTD

1. IDENTIFICATION

SUPPLIER (Manufacturer)

Company: NXCO Mining Technologies (Pty) Ltd
Address: P.O. Box 529
Broederstroom 0240
South Africa
Telephone +27 12 305 5237
Emergency Telephone +27 83 279 8695

DISTRIBUTOR IN CANADA

Company: Coogar Sales & Services
Address: 70 Sandford Fleming Drive, Unit #2
Collingwood, Ontario
Canada, L9Y 4V7
Telephone (705) 444-8892
Emergency Telephone (613) 996-6666 (CANUTEC)

PRODUCT DESIGNATION

Product Name: NXburst Safety Cartridge
UN. Number. 0432 Cartridge Power Device
Cartridge Sizes: All cartridges
Dangerous Goods Class: 1.4S
Subsidiary Risk: None
Poisons Schedule Number: None

MSDS INFORMATION

Document No.: MSDSNXBURST01SB60

USE

Rock / Concrete breaking and excavation

PERSONAL PROTECTIVE EQUIPMENT REQUIRED

None

PHYSICAL DESCRIPTION / PROPERTIES

APPEARANCE

Cylinder of various lengths 70mm to 460 mm and external diameter 12, 13, 28, 34 and 60 mm.

Each Cartridge contains between 2 to 500 grams of a 50/50 nitrocellulose propellant and ammonium nitrate mixture. (10034 = 100 gram mixture and 34 mm diameter)

PHYSICAL PROPERTIES

Boiling Point (°C):	Not Applicable
Melting Point (°C):	Not Applicable
Vapor Pressure (kPa):	Negligible
Freezing Point (°C):	Not Applicable
Specific Gravity of Propellant:	Approx-0.9
Flash Point:	Not Applicable
Lower Explosive Limit:	Not Applicable
Upper Explosive Limit:	Not Applicable
Solubility in Water ('Propellant,):	Immiscible

2. CHEMICAL SPECIFICATIONS

Table 1. Chemical Specification of Ammonium Nitrate.

Item		Quantity
Ammonium Nitrate	NHNO ₃	99,5%
pH	-	4.5 – 6.0
Moisture	H ₂ O	0,1% max
Chloride	Cl	50 ppm max
Copper	Cu	10 ppm max
Iron	Fe	50 ppm max
Loose bulk density	-	0.7 – 0.76 kg/l
C Absorption	-	7.5% min
Particle size	> 2.8 mm	3 % max
Distribution	< 1.0 mm	1 % max
Total organic material	C	0.2 %
UN Hazard classification	United Nations 1942 Oxidising Substance Class 5.1	

ppm = parts per million

MSDS INFORMATION

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Table 2. Chemical Specification of Nitrocellulose Propellant.

	Characteristics	Specification Limits	Method	Classification of defects
1	Chemical properties		SLM 210	Minor
1.1	Nitrocellulose (Spec No. 06-7600-2020-075)	Remainder %		Minor
1.4	Dibutylphthalate (Spec No. 06-7600-2010-027)	3 to 6 %	**	Major
1.5	Diphenylamine (Spec No. 06-7600-2010-023)	0.8 % min, 1.4 % max	**	Minor
1.6	Calcium Carbonate (Spec No. 06-7600-2010-004)	0.5 % max	**	Minor
1.7	Potassium Nitrate (Spec No. 06-7600-2010-022)	0.4 to 1.0 %		Minor
1.8	Sodium Sulphate (Spec No. 06-7600-2010-075)	0.5 % max		Minor
1.9	Stannic Oxide (Addition optional) (Spec No. 06-7600-2010-077)	0.2 % max		Minor
1.10	Graphite (Spec No. 06-7600-2010-084)	0.1 to 0.4 %		Major
1.11	Water and volatile matter (2h at 100 °C)	0.75 to 1.25 %		Major
1.12	Dust and foreign matter	0.10 % max		Major
2	Methyl Violet stability at 120 °C			Major
2.1	Complete discolouration to salmon pink	Not within 45 min		
2.2	Emission of brown fumes	Not within 60 min		
2.3	Explosion	Not within 5 h		
3	Dimension of granules	Rolled	Unrolled	Minor
3.1	Smaller than 850 µm	97 % min	97 % min	
3.2	Between 850 and 400 µm	90 % min		
3.3	Smaller than 400 µm	7 % max		
3.4	Smaller than 355 µm	3 % max		
3.5	Between 850 and 355 µm		90 % max	
3.6	Smaller than 355 µm		7 % max	
3.7	Smaller than 212 µm		3 % max	
3.8	Voids and fissures	5 % max		Information only
4	Bulk Density	Reference to approximately 3 %		Minor
4.1	Approximate range	800 to 1000 g/dm ³	SPM 5.1	Minor

MSDS INFORMATION

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3. HEALTH HAZARD INFORMATION

3.1 HEALTH EFFECTS - CARTRIDGE STRUCTURE UNCOMPROMISED

ACUTE

SWALLOWED

No Risk - Humans unable to swallow cartridge.

EYE

No Risk - All irritating material is contained within the cartridge.

SKIN

No Risk - All irritating material is contained within the cartridge.

INHALED

No Risk - All irritating material is contained within the cartridge.

CHRONIC

No Risk apart from the explosive nature of the product

FIRST AID

All potentially hazardous substances are sealed within the cartridge and as such do not pose a risk to users.

3.2 HEALTH EFFECTS - CARTRIDGE STRUCTURE COMPROMISED

ACUTE

SWALLOWED

Propellant is toxic if swallowed.
Considered an unlikely route of entry in commercial / industrial environments.

EYE

Propellant may be irritating to the eyes.

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SKIN

Propellant may be irritating to the skin.
Repeated contact may lead to dermatitis.

INHALED

Dusty material may be irritating to the upper respiratory tract and lungs.
The decomposition vapors are extremely harmful to the upper respiratory tract and lungs.

CHRONIC

Principal routes of exposure are usually by skin contact and inhalation of dust.

The principal hazard is related to the potential of fire / explosion and associated physical injury.

As with any chemical, ingestion, inhalation and prolonged or repeated skin contact should be avoided by good occupational work practice.

Short-term exposure by all routes is considered to be practically non-harmful, apart from the explosive nature of the propellant.

FIRST AID

SWALLOWED

- DO NOT induce vomiting.
- Give water (or milk to rinse out mouth), then provide liquid slowly and as much as the casualty can comfortably drink. DO NOT give liquid to a person showing the signs of being sleepy or becoming unconscious.
- Transport to hospital or doctor without delay.

EYE

If the propellant comes into contact with the eyes:

- Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under the eyelids by occasionally lifting the upper and lower lids.
- Transport to hospital or doctor without delay.
- Skilled personnel should only undertake removal of contact lenses after an eye injury.

SKIN

If propellant comes into contact with the skin:

- Immediately remove all contaminated clothing, including footwear (after rinsing with water)
- Wash affected area thoroughly with water (and soap if available).

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- Seek medical attention in the event of irritation.

INHALED

If fumes or combustion products are inhaled:

- Remove to fresh air.
- Lay patient down. Keep warm and rested.
- If breathing is shallow or has stopped, ensure clear airway and apply resuscitation.
- Transport to hospital or doctor.

ADVICE TO DOCTORS

Treat symptomatically and as for exposure to nitro compounds.

Delayed Pulmonary Edema may result following exposure to nitrous oxides formed on thermal decompositions.

4. SAFE HANDLING AND STORAGE

STORAGE REQUIREMENTS

- Store NXburst cartridge in original containers.
- Keep containers securely sealed until ready for use.
- No smoking, naked flames, heat or ignition source within 10 meters of storage location.
- Store NXburst cartridge in a well ventilated, secure store.
- Store in a cool dry place, do not store at temperatures above 65.5 °C (150 °F).
- Store in an area away from other materials.
- Protect NXburst cartridge Packaging against physical damage.
- Regularly check storage container and packaging.

STORAGE INCOMPATIBILITY

- Avoid storage with acids, alkalis and oxidizing / reducing agents.

FIRE / EXPLOSION HAZARD

In the event of a fire, clear area of personnel and move upwind. Propellants contained within the NXburst cartridge are extremely sensitive to heat and will burn with rapidly increasing intensity of fire.

Heating of cartridges may cause expansion or decomposition of the propellant leading to violent rupture of the cartridge housing. Heat affected cartridges remain hazardous.

Use only water to fight a nitrocellulose fire.

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Combustion / Decomposition produces toxic fumes of oxides and nitrogen (NO_x), carbon monoxide (CO) and carbon dioxide (CO₂) if burned unconfined.

MINOR SPILLS

In the event that propellant or black powder from a PCF cartridge should be spilt the following action should be taken:

- Clear up all spills immediately.
- Avoid breathing the powder / vapor and contact with the skin and eyes.
- Wear impervious gloves and safety glasses.
- Remove all ignition sources.
- Use spark free tools when handling propellant.
- Sweep into non-sparking containers or barrels and place under water.
- Place spilled material in a clean container for disposal. Mark the container properly.
- Flush the area with large amounts of water.

5. CONTACT POINTS

EMERGENCY CONTACTS – CANADA

COOGAR SALES & SERVICES

Telephone No.: (705) 444-8892
Emergency No: (705) 443-0962

EMERGENCY CONTACTS – SOUTH AFRICA

Police/Fire Brigade Dial 10111
Notify Police and Fire Brigade as to location, material, quantity, UN Number and Company contact.

NXCO Mining Technologies

Factory Telephone No.: +27 12 305 5237
Emergency Telephone No.: +27 83 279 8695

SAFETY DATA SHEET

DEXPAN (Non-Explosive Demolition Agent)



Section 1. Identification

GHS product identifier : DEXPAN (Non-Explosive Demolition Agent)
Product code : Not available.
Other means of identification : Expanding Cement.
Product type : Powder.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : For controlled demolition, reinforced concrete cutting, rock breaking, quarrying, stone dimension, mining, excavating...

Manufacturer : Archer Company USA, Inc.
2031 Appaloosa Dr.
Sunland Park, NM 88063
Tel: 575-528-5454
Fax: 575-528-5458
Toll Free: 866-272-4378

Distributor/Canada :

Emergency telephone number (with hours of operation) : +1-575-528-5454
(24/7)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :



Signal word : Danger

Section 2. Hazards identification

Hazard statements	: H318 - Causes serious eye damage. H315 - Causes skin irritation. H335 - May cause respiratory irritation.
Precautionary statements	
Prevention	: P280 - Wear protective gloves. Wear eye or face protection. P271 - Use only outdoors or in a well-ventilated area. P261 - Avoid breathing dust. P264 - Wash hands thoroughly after handling.
Response	: P304 + P340 + P312 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. P302 + P352 + P362+P364 - IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. P332 + P313 - If skin irritation occurs: Get medical attention. P305 + P351 + P338 + P310 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	: P405 - Store locked up.
Disposal	: P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.
Hazards not otherwise classified	: Not applicable.

Section 3. Composition/information on ingredients

Substance/mixture	: Mixture
Other means of identification	: Expanding Cement.

Ingredient name	%	CAS number
Calcium dihydroxide	≥75 - ≤90	1305-62-0

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	: Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician.
Inhalation	: Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 4. First aid measures

- Skin contact** : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 20 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Eye contact** : Causes serious eye damage.
- Inhalation** : May cause respiratory irritation.
- Skin contact** : Causes skin irritation.
- Ingestion** : No known significant effects or critical hazards.

Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : Adverse symptoms may include the following:
respiratory tract irritation
coughing
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use an extinguishing agent suitable for the surrounding fire.
- Unsuitable extinguishing media** : None known.

Specific hazards arising from the chemical : No specific fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
metal oxide/oxides

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not get in eyes or on skin or clothing. Do not breathe dust. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Section 7. Handling and storage

- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

United States

Occupational exposure limits

Ingredient name	Exposure limits
Calcium dihydroxide	ACGIH TLV (United States, 3/2017). TWA: 5 mg/m ³ 8 hours. NIOSH REL (United States, 10/2016). TWA: 5 mg/m ³ 10 hours. OSHA PEL (United States, 6/2016). TWA: 5 mg/m ³ 8 hours. Form: Respirable fraction TWA: 15 mg/m ³ 8 hours. Form: Total dust

Canada

Occupational exposure limits

Ingredient name	Exposure limits
Calcium dihydroxide	CA Alberta Provincial (Canada, 4/2009). 8 hrs OEL: 5 mg/m ³ 8 hours. CA British Columbia Provincial (Canada, 7/2016). TWA: 5 mg/m ³ 8 hours. CA Ontario Provincial (Canada, 7/2015). TWA: 5 mg/m ³ 8 hours. CA Quebec Provincial (Canada, 1/2014). TWA _{AEV} : 5 mg/m ³ 8 hours. CA Saskatchewan Provincial (Canada, 7/2013). STEL: 10 mg/m ³ 15 minutes. TWA: 5 mg/m ³ 8 hours.

- Appropriate engineering controls** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

- Environmental exposure controls** : In some cases, dust collection, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

- Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Section 8. Exposure controls/personal protection

- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Solid. [Powder.]
- Color** : Gray.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : 1000°C (1832°F)
- Boiling point** : Not available.
- Flash point** : Not available.
- Evaporation rate** : Not available.
- Flammability (solid, gas)** : Not available.
- Lower and upper explosive (flammable) limits** : Not available.
- Vapor pressure** : Not available.
- Vapor density** : Not available.
- Relative density** : 3.2
- Solubility** : Very slightly soluble in the following materials: cold water.
- Partition coefficient: n-octanol/water** : Not available.
- Auto-ignition temperature** : Not available.
- Decomposition temperature** : Not available.
- Viscosity** : Not available.
- Flow time (ISO 2431)** : Not available.

Section 10. Stability and reactivity

- Reactivity** : No specific test data related to reactivity available for this product or its ingredients.
- Chemical stability** : The product is stable.
- Possibility of hazardous reactions** : Under normal conditions of storage and use, hazardous reactions will not occur.
- Conditions to avoid** : No specific data.
- Incompatible materials** : Reactive or incompatible with the following materials: moisture.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium dihydroxide	LD50 Oral	Rat	7340 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Calcium dihydroxide	Eyes - Severe irritant	Rabbit	-	10 mg	-

Sensitization

There is no data available.

Mutagenicity

There is no data available.

Carcinogenicity

There is no data available.

Reproductive toxicity

There is no data available.

Teratogenicity

There is no data available.

Specific target organ toxicity (single exposure)

Name	Category	Target organs
Calcium dihydroxide	Category 3	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

There is no data available.

Aspiration hazard

There is no data available.

Information on the likely routes of exposure : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Section 11. Toxicological information

- Eye contact** : Causes serious eye damage.
Inhalation : May cause respiratory irritation.
Skin contact : Causes skin irritation.
Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
pain
watering
redness
- Inhalation** : Adverse symptoms may include the following:
respiratory tract irritation
coughing
- Skin contact** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
- Ingestion** : Adverse symptoms may include the following:
stomach pains

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Long term exposure

- Potential immediate effects** : No known significant effects or critical hazards.
Potential delayed effects : No known significant effects or critical hazards.

Potential chronic health effects

- General** : Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

There is no data available.



Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Calcium dihydroxide	Acute LC50 33884.4 µg/L Fresh water	Fish - Clarias gariepinus - Fingerling	96 hours

Persistence and degradability

There is no data available.

Bioaccumulative potential

There is no data available.

Mobility in soil

Soil/water partition coefficient (K_{oc}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling empty containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-	-
Transport hazard class(es)	-	-	-	-
Packing group	-	-	-	-
Environmental hazards	No.	No.	No.	No.

AERG : Not applicable.



Section 14. Transport information

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption:** Not determined
United States inventory (TSCA 8b): All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

Composition/information on ingredients

Name	Classification
Calcium dihydroxide	SKIN CORROSION/IRRITATION - Category 2 SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1 SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

SARA 313

There is no data available.

State regulations

Massachusetts : The following components are listed: Calcium dihydroxide; Silica, vitreous; Diiron trioxide; Aluminium oxide

New York : None of the components are listed.

New Jersey : The following components are listed: Calcium dihydroxide; Silica, vitreous; Diiron trioxide; Aluminium oxide

Pennsylvania : The following components are listed: Calcium dihydroxide; Diiron trioxide; Aluminium oxide

California Prop. 65

No products were found.

Section 15. Regulatory information

Canada

Canadian lists

- Canadian NPRI** : None of the components are listed.
CEPA Toxic substances : None of the components are listed.
Canada inventory (DSL NDSL) : All components are listed or exempted.

Section 16. Other information

Procedure used to derive the classification

Classification	Justification
SKIN CORROSION/IRRITATION - Category 2	Calculation method
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1	Calculation method
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method

History

- Date of issue mm/dd/yyyy** : 01/15/2018
Date of previous issue : 04/15/2015
Version : 6
Prepared by : KMK Regulatory Services Inc.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Please adjust the format of this template as needed. Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals: [\[help\]](#)

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the [SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS \(part D\)](#). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. Background [\[help\]](#)

1. Name of proposed project, if applicable: [\[help\]](#)

Icicle Creek Boulder Field Fish Habitat Improvement Project

2. Name of applicant: [\[help\]](#)

Trout Unlimited

3. Address and phone number of applicant and contact person: [\[help\]](#)

Aaron Penvose
103 Palouse Street, Suite 13
Wenatchee, WA 98801

4. Date checklist prepared: [\[help\]](#)

September 10, 2018

5. Agency requesting checklist: [\[help\]](#)

Chelan County

6. Proposed timing or schedule (including phasing, if applicable): [\[help\]](#)

The ability to work at this site is constrained by the timing of snowmelt, flows in Icicle Creek, and USFS restrictions on impacting the Snow Lakes Trailhead parking lot. We would like to allow contractors to begin work as soon after snowmelt as is possible to reduce conflicts with USFS visitors. In-channel work will commence as soon as flows are low enough, within the in-water work window designated in the HPA and allowed by USFWS and NOAA. Work will fall within the schedule below; the precise dates will be driven by the factors listed above.

Overall: 3/1/19-11/15/22

City of Leavenworth water line and fish screen: 3/1/19-11/15/19

Boulder Field fish passage: 7/1/19-11/15/19 and 7/15/20-9/15/20

IPID fish screen and screen house: 3/1/19-11/15/19

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. [\[help\]](#)

Nothing beyond what is scoped here, which includes a phased approach to completing the work.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal. [\[help\]](#)

A great deal of work has been completed in prior phases of work. Analysis, reports and drawings resulting from these studies can be found at the following link:

<https://1drv.ms/f/s!AvU38uOxQjXNgb81eL-ULgmeQo6LIQ>

Aspect Consulting. 2018. Geotechnical Conceptual Design Report. City of Leavenworth Water Line Replacement and icicle Creek Fish Passage Project. Prepared for: Trout Unlimited. Project No. 170060. January 8, 2018. Final.

Dominguez, L., P. Powers, E. S. Toth, and S. Blanton. 2013. Icicle Creek Boulder Field Fish Passage. Assessment. Prepared for Trout Unlimited-Washington Water Project. Wenatchee, WA.

Ecolution. 2018. Icicle Creek Fish Passage, Screening Compliance and City of Leavenworth Waterline Project Biological Assessment

Toth, E. S. 2013. Geologic assessment of the Icicle Creek boulder field study reach. Technical Report to Trout Unlimited Washington Water Project, May 24, 2013.

Toth, E.S. and T. Swanson. 2016. Geotechnical Assessment of the Icicle Creek Boulder Field Study Reach. Technical, SRFB Project #13-1342, October 14, 2016. Version 2.0. Prepared for the Trout Unlimited Washington Water Project. 46 pp.

Waterfall Engineering, Toth Consulting, and IntegriTech. 2016. Icicle Creek Boulder Field Fish Passage Design, Basis of Design Report. SRFB Project #13-1342. October 15, 2016. Prepared for Trout Unlimited Washington Water Project. 50 pp.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. [\[help\]](#)

Permit applications for two elements of the proposed work described in item 11 below have been submitted to USACE and WDOE (Boulder Field fish passage and City of Leavenworth water line and fish screen). Permit applications for the remaining project elements (IPID fish screen and screen house, and COL/IPID diversion dam) will be submitted in the future. All project elements are not being submitted in a single permit application because they are at different levels of design completion and some elements may require longer review periods.

10. List any government approvals or permits that will be needed for your proposal, if known. [\[help\]](#)

In addition to this SEPA Checklist, the following permits and approvals will be required and permit applications are being submitted concurrently to this application:

Chelan County—Shorelines, Substantial Development Permit

State—Hydraulic Project Approval (WDFW), Section 401 (WDOE)

Federal—Section 404 (USACE), Endangered Species Act review (USFWS, NOAA Fisheries); NEPA (USFS)

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.) [\[help\]](#)

The project includes four separate elements:

1. Fish passage improvement at RM 5.6, also known as the boulder field.
2. Relocate and replace the City of Leavenworth (COL) water supply pipeline and fish screen.
3. Replace and relocate the Icicle and Peshastin Irrigation District's (IPID) fish screens.
4. Improve fish passage at the IPID and COL Diversion Dam.

The overarching goal of the project is to improve fish passage for bull trout and steelhead at Icicle Creek river mile 5.6, locally known as the boulder falls, to enhance fish access to the wilderness headwaters. This will connect the lower reaches with over 23 miles of mainstem Icicle Creek. Additionally, the project will provide access to dozens of miles of tributary habitat for anadromous fishes and connect Upper Icicle Creek with the Wenatchee River Watershed. Icicle Creek is the major fish-bearing tributary to the Wenatchee River in WRIA 45. The project was originally identified by a 2013 Fish Passage Assessment. Fish passage

at the boulder falls is identified as a priority by the 5-year status review (NOAA 2016), Upper Columbia Regional Technical Team (RTT 2013), and in the Draft Wenatchee Subbasin Plan (2004). Fish passage improvement at the boulder field has also been included in the Icicle Creek Working Group Master Scope of Work as contributing to the working group's objectives of improving fish passage and supporting tribal fisheries. The project has been reviewed and funded by the Salmon Recovery Funding Board, which implements a formal grant program established by the legislature for fish habitat enhancement and restoration.

Enhancing fish passage at the boulder falls has triggered several other project elements. In order to complete the boulder field fish habitat improvement element, it is essential to relocate a portion of the City of Leavenworth's water supply pipeline to make room for the step-pool channel. The City has agreed to the relocation in support of the fish passage improvement project. Rather than relocating the existing 16" steel pipeline, the City has opted to partially or completely replace the pipeline located on the left bank of Icicle Creek between its water intake structure (RM 5.8) and the Snow Lakes Trailhead parking lot (RM 5.6). The City will take advantage of this opportunity to also replace the fish screen, as the existing screen will not meet current state and federal standards on completion of the fish passage improvement project. Replacing the screen will reduce fish mortality in Icicle Creek resulting from water diversions for the City's drinking water.

The step-pool channel at RM 5.6 is intended to improve fish passage without any impact to the water diversion for the Icicle-Peshastin Irrigation District and City of Leavenworth. Implementing the fish passage improvement project at RM 5.6 will not affect the flows at the water diversion upstream at RM 5.8. Passage at the step-pool channel optimally functions at a flow of approximately 80 cfs in Icicle Creek. It is understood that based on historic flows in the reach below the current irrigation and municipal withdrawals, the step-pool channel may not fully function in late July and August and September. Given the timing of fish migration in Icicle Creek, the step-pool channel is expected to most benefit steelhead and bull trout. Consultation with agency representatives indicates that adult steelhead migration peaks in March and April and bull trout migration peaks in July.

Additionally, Icicle-Peshastin Irrigation District is working with WDFW to relocate and replace their fish screen and screen house to the banks of Snow Creek. Access of heavy machinery to this site will require modification to the existing bridge over Icicle Creek at RM 5.5, or construction of a new bridge. The existing bridge is part of the Snow Lakes Trail and is owned by the USFS. The USFS has not yet made a final determination on whether IPID may modify the existing bridge or must construct a new bridge.

Finally, fish passage improvements are proposed at the diversion dam that diverts water for withdrawal from Icicle Creek by the IPID and City of Leavenworth (at approximately RM 6.0).

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist. [\[help\]](#)

The action area is in Township 24N, Range 17E, Sections 27 and 28 of the Willamette Meridian, Washington. The action area includes Icicle Creek between RM 5.6 and RM 6.0, the lower 800 feet of Snow Creek, and the riparian area on both sides of these creeks (Figures 1-3, attached). The elevation of the project area ranges from 1,000-1,400 feet. The bulk of the action area falls within Chelan County parcel number 241727311250 owned by IPID (Figures 4-5). The City of Leavenworth owns adjacent property, as do the U.S. Fish and Wildlife Service, U.S. Forest Service, and private land holders. The boulder field fish passage element occurs at 47.54436 N lat. / -120.71209 W long.

B. ENVIRONMENTAL ELEMENTS [\[help\]](#)

1. Earth [\[help\]](#)

a. General description of the site: [\[help\]](#)

(circle one): Flat, rolling, hilly, steep slopes, mountainous, other _____

b. What is the steepest slope on the site (approximate percent slope)? [\[help\]](#)

On the left bank of Icicle Creek, there is a stretch that is nearly vertical, at 400% slope (see Boulder Field Passage Design drawings, Sheet 8, Station +45). This area is slated for removal to make room for the proposed step-pool channel. More typical slopes are approximately 1:1, or 100% along the slope above the channel (see Sheet 13).

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. [\[help\]](#)

The project area is largely comprised of rock. Geologic assessments and geotechnical studies have been previously completed as noted above. Soil types have been mapped as Icicle very bouldery sandy loam, Icicle-Chumstick_Rock outcrop complex, and very boulder loamy sand (see attached soil report).

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. [\[help\]](#)

There is evidence of rocks falling from adjacent slopes into Icicle Creek and its shoreline, which is expected in areas that are steep.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. [\[help\]](#)

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name ¹	Impact location ²	Duration of impact ³	Amount of material (cubic yards) placed or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Step-pool channel construction: Fill	Icicle Creek	In	Permanent	500 CY	150 LF ¹
Step-pool channel grout: Fill	Icicle Creek	In	Permanent	20 CY	150 LF
Water main installation and access road: Fill	Icicle Creek	Adjacent	Permanent	1,800 CY	1,500 LF
Water main installation rock retaining wall: Fill	Icicle Creek	Adjacent	Permanent	180 CY	130 LF
Fish screen bypass: Fill	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.
Fish screen bypass: Fill	Icicle Creek	Adjacent	Permanent	235 CY	1,500 sq. ft.
Screen house: Fill	Icicle Creek	Adjacent	Permanent	1,950 CY	4,000 sq. ft.
2 nd Construction Access: Fill	Icicle Creek	Adjacent	Permanent	1,240 CY	3,200 sq. ft.
Step-pool channel construction: Excavation	Icicle Creek	Adjacent	Permanent	3,400 CY	150 LF
Step-pool channel construction: Excavation	Icicle Creek	In	Permanent	500 CY	150 LF
Water main installation: Excavation	Icicle Creek	Adjacent	Permanent	700 CY	1,500 LF
Fish screen bypass: Excavation	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.

¹ Note that the same area directly affected is often included for more than one entry, e.g., the 150 LF affected by fill from the step-pool channel is the same 150LF of stream affected by grout.

Fish screen bypass: Excavation	Icicle Creek	Adjacent	Permanent	240 CY	1,500 sq. ft.
Screen house: Excavation	Icicle Creek	Adjacent	Permanent	2,200 CY	4,000 sq. ft.
TOTAL Fill	Icicle Creek	In		580 CY	
TOTAL Fill	Icicle Creek	Adjacent		5,405 CY	
TOTAL Excavation	Icicle Creek	In		560 CY	
TOTAL Excavation	Icicle Creek	Adjacent		6,540 CY	

Boulder Field Fish Passage

The fill placed within the channel in this task will be native rock that has been excavated from the channel to modify flows. Implementation of this design will include the following channel modifications, beginning at the upstream end of the project (see drawings, sheet 4):

- Spoil approximately 5 cubic yards of native rocks in the channel, which will be excavated to lower Boulder 77 by two feet.
- Spoil approximately 120 cubic yards of native rock in the channel, which will be excavated from the right of the Anchor Rock to lower elevation in this area.
- Up to 20 CY of rock grouting may be required to fill voids at the base of some rocks in order to maintain the desired pool depths.
- Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill.

Replace City of Leavenworth Water Supply Pipeline

This work will occur adjacent to the waterbody, above the 100-year flood elevation. The length of disturbance will be up to 1,500 linear feet and will occur at a horizontal distance of approximately 50 feet from the waterbody. Activities involving fill include:

- Grading 12-foot wide access road generally centered over installed pipe along the length of the installed pipe between the screen structure and Snow Lakes Trailhead parking area and surfacing with imported crushed rock surfacing using tracked excavation equipment, wheeled loaders, dump trucks and drum rollers.
- A rock retaining wall will be constructed below the new access road to provide stability. The retaining wall will be constructed of approximately 180 CY of native rock materials which will be excavated in order to place the new water main.

Relocate and Replace the Fish Screen and Construct Screen House

All work is located on the river-left bank. Fill placed below OHWM to backfill the fish bypass chute for the fish screen will be sourced from native material excavated from the creek for the installation of the pipeline or roughened channel. The armor material on the bank will be oversize boulders from the excavation of the screen house, pipelines, or roughened channel.

Fill placed adjacent to the waterbody and above OHWM will be used as base material for the re-aligned IPID access road and the secondary access road entering the site from the west. The source for this road base material will be native materials and rocks excavated from the site for the pipeline installation work. A layer of crushed rock 4 inches deep (approximately 40 CY) from a commercial source will be placed and compacted on the road.

Concrete and debris associated with the demolition of the existing screen house will result in removal of approximately 200 CY, of which approximately 60 CY will be concrete.

Project elements to replace and relocate the IPID screen and screen house and improve passage at the diversion dam are at a preliminary stage and quantities are not yet available.

- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

[\[help\]](#)

Given the steep slopes, it is possible that erosion could occur along the slopes. Most of the material to be excavated will be rock and boulder. Some fine sediment is inevitable however with the proposed excavation. To ameliorate for this, sediment control measures will be in place as described below.

- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? [\[help\]](#)

The project will result in an additional 3,200 square feet of impervious surface due to the creation of the secondary access road on the north side of Icicle Creek Road (USFS Forest Road 7600). A small additional amount of impervious surface may be expected at either end of the bridge over Icicle Creek, however an amount is not yet calculated given the uncertainties still surrounding the bridge design described above.

- h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: [\[help\]](#)

- A temporary erosion and sediment control plan is developed and is incorporated into the attached designs. Existing paved and gravel roads provide access to the site.
- A temporary erosion and sediment control plan including coffer dams and silt curtains will be in place to minimize turbid water inputs to Icicle Creek. Construction activities will be isolated from any flowing water and will be done during low flows, following prescribed WDFW work windows. When pumps are used to lower the water, pumped water contaminated with sediment will be pumped to an upland site and allowed to infiltrate. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The

- rock breaking and placement will create minimal sediment disturbance.
- The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed.
- Disturbed slopes will be seeded and mulched.
- Any spoils temporarily piled on site will be covered with plastic. The excavated areas will be backfilled and stabilized to pre-project conditions.
- In-water sediment control measures are also shown on the Fish Passage Design drawings, Sheet 5).

2. Air [\[help\]](#)

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. [\[help\]](#)

The only emissions that can be expected from the project will be during construction itself. The heavy equipment needed to construct the project will increase emissions in the area incrementally, between the hours of 7 a.m. and 7 p.m. Construction will commence on the upper slopes after April 1, and will extend into October potentially, however in-water work will not begin until 7/1.

- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. [\[help\]](#)

No. The project occurs on national forest land adjacent to the Snow Lakes Wilderness.

- c. Proposed measures to reduce or control emissions or other impacts to air, if any: [\[help\]](#)
None are proposed.

3. Water [\[help\]](#)

- a. Surface Water:

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. [\[help\]](#)

Yes. The project occurs on Icicle Creek (LLID: 1206661475803), a tributary to the Wenatchee River and on Snow Creek (LLID 1207094475438), a tributary to Icicle Creek.

- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. [\[help\]](#)

The project includes four separate elements which are all within 200' of OHWM:

- Fish passage improvement at Icicle Creek RM 5.6, also known as the boulder field.
- Relocate and replace the City of Leavenworth (COL) water supply pipeline and fish screen.
- Replace and relocate the Icicle and Peshastin Irrigation District's (IPID) fish screens.
- Improve fish passage at the IPID and COL Diversion Dam.

A. Construct Boulder Field Fish Passage Improvement

Fish passage at the boulder field will be enhanced through a step-pool channel occupying 150 lineal feet of the left bank of the reach and some of the existing channel. The design parameters to facilitate passage for a minimum fish size of 14 inches will include drops in the step-pool channel of 4 to 5 feet. The minimum and maximum design flows to provide passage are 80 and 1,000 cfs. Pools on average will be a minimum of 8 feet deep at low flow. In addition to the left bank construction, boulders will be removed in three areas to improve flow to the step-pool channel and reduce turbulence at the downstream end of the step-pool at high flow. Boulders will also be placed in the gaps of existing boulders in order to raise the tailwater in the deep plunge pool below the falls. Additionally, at least 20 to 30 large boulders greater than 500 cubic feet in volume will need to be shaped with rock breaking techniques (Toth and Swanson 2016). Typical step-pool geometry is detailed in the attached drawings, Sheet 15. Implementation of this design will include the following channel modifications, beginning at the upstream end of the project (see drawings, sheet 4):

- Increase flow into left side of split channel. To achieve this, Boulder 77 will be lowered two feet by removing approximately 5 cubic yards of rocks, which will be spoiled in the channel.
- Distribute more flood flows to the right bank away from the step-pool channel. Approximately 120 cubic yards will be removed to the right of the Anchor Rock to lower elevation in this area; rock will be spoiled in the channel.
- Remove rock from left floodplain/road and create a 120-foot long step-pool channel. Approximately 3,800 cubic yards of rock will be excavated and hauled off site. The step-pool channel will have drops ranging from 3 to 5 feet with pools a minimum of 8 feet deep. The design flow range for the channel to provide fish passage is 80 to 900 cfs.
- Improve backwater and reduce turbulence to step-pool channel at the downstream end. To achieve this, Boulders 50, 51, and 28 will be removed (approximately 300 cubic yards). The notch at Boulder 29 will be plugged to create a drop and backwater.

A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation areas to lower elevation areas to maximize slope stability. Within the channel pools, the proposed slope of the excavation is 1:1; this is extended to 1.4:1 along the slope between the ordinary high water mark (OHWM) and the 20-year peak flood level (see drawings, Sheet 16). Above the 20-year peak flood level, the designs specify construction of a 1:4 rock wall to reduce the cut and to match a stable grade below Icicle Creek Road. The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed. Two assessments were conducted in prior phases of work to evaluate the most effective and least impactful approaches for breaking rocks that will be encountered in constructing the step-pool channel. The four tools that were identified through these assessments for use in project construction are 1) hydraulic rock breaking hammers mounted on the end of an extractor arm, 2) the Boulder Buster™, a non-detonating rock-breaking tool that utilizes propellant

technology, 3) expansive demolition grout (Toth and Swanson 2016), and 4) deflagrating low-velocity explosives may be applied if other methods have not been successful. In order to apply these tools, boulders may need to be excavated partially to have room for expansion. These techniques crack the rock and generate very little ground vibration, unlike high velocity explosives which create rock fly. Toth and Swanson (2016) describe these methods in detail and include photographs of the tools' application to boulders taken from the shoreline of Icicle Creek. Safety sheets for the compounds that may be used are attached. All instream work will occur during the work windows prescribed by WDFW, which typically begins on July 15. Cofferdams and silt curtains will be used to isolate the work area from flowing water and will be constructed of clean fill.

Typical removal will occur using excavators with hydraulic breakers and buckets to scoop rock and load into trucks, and possibly cranes with clam shells and dump trucks to transport rock off site. Rock grouting may be required at the base of some rocks to maintain the desired pool depths. A coffer dam and silt curtain will be included as part of the dewatering and temporary sediment control measures (drawings, sheet 5). Access and staging will largely occur from the IPID gravel access road upslope from the boulder field. The project team is working with the USFS to minimize impacts to forest visitors. USFS is aware that a portion of the USFS Road 7600 shoulder will be unavailable for parking during construction and a temporary closure of the Snow Lakes Trailhead parking lot will be necessary.

Construction of the boulder field step-pool channel will be done over two summers to allow for an adaptive management approach to flow control and pool turbulence. In the first year of construction, two to three months will be required to complete the rock breaking, excavating, loading, and hauling. The first phase of construction before any in water work occurs will be to break rock and create a water bypass along the right of the anchor rock. For this work the area will be isolated from any flowing water and will be done in the dry. After the water bypass route is complete, sand bag cofferdams will be placed in the channel to block flow and raise the water so it will flow down the new bypass to the right of the anchor rock. Pumps will also be used in areas with seepage to lower the water. Pumped water if contaminated with sediment will be pumped to an upland site and allowed to infiltrate. Clean pumped water will be pumped downstream past the work area. In the lower part of the channel where the pools are deep and it will not be possible to dewater, a silt curtain will be installed to block any fine sediments from the construction. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance. The second year of construction will also include rock breaking, excavating, loading, and hauling, but for a duration of two to three weeks to make relatively minor modifications based on how the channel has responded to the work completed in the first year of construction.

B. Replace City of Leavenworth Water Supply Pipeline

Constructing the Icicle Creek boulder field fish passage improvement will impact a portion of the City of Leavenworth's 16-inch steel water supply pipeline located on the left bank of Icicle Creek. In support of the fish passage project, the City of Leavenworth proposes to partially or completely replace its water supply pipeline between its screen house (RM 5.7) and the Water Treatment Plant (RM 5.5). Partial replacement could involve as little as 150 lineal feet, the length of the proposed step-pool channel. Complete replacement would entail approximately 1,500 lineal feet. The current drawings (attached) depict complete replacement.

Full or partial replacement of the water main will entail the following work:

- Breaking of existing boulders within the pipe excavation boundary to a size manageable by tracked excavators and dump trucks. Breaking of the boulders would be by hydraulic rock breaking hammer mounted on a tracked excavator, or Boulder Buster TM method noted previously, or by use of deflagrating low-velocity explosives.
- Removal from the pipe excavation area of the broken boulders and native material to a stockpile location on-site near the screen structure, estimated total of approximately 1,800 CY of material, and cutting side slopes to approximate 1:1 slopes to allow excavation for pipe installation using tracked excavation equipment and dump trucks.
- Excavating pipe trench to install 16-inch ductile iron pipe, valves, fittings and appurtenances. Excavation to be approximately 7-foot depth, installing pipe and imported pipe bedding to 8-inches below and above pipe, and backfilling/compacting pipe trench with native material to result in installed pipe with generally 5-feet of earth cover using tracked excavation equipment and wheeled front loaders.
- Grading 12-foot wide access road generally centered over installed pipe along the length of the installed pipe between the screen structure and Snow Lakes Trailhead parking area and surfacing with imported crushed rock surfacing using tracked excavation equipment, wheeled loaders, dump trucks and drum rollers.
- Transfer broken boulders from temporary stockpile and machine place the broken angular boulders along the 1:1 cut slopes along the access road and pipe alignment to provide permanent slope stabilization and restoration using tracked excavation equipment, dump trucks and wheeled loaders.
- The work will include construction of a secondary access entrance to the construction site from the USFS road at the west end of the construction area near the existing screen structure. Secondary access entrance to be constructed from native materials and rocks excavated from the site for the pipeline installation work. Excavation, placing and compaction of the material by tracked excavation equipment, dump trucks, wheeled loaders and drum rollers. Temporary surfacing using imported crushed surfacing.
- Excavation area, slopes and other disturbed areas to be restored using either imported crushed surfacing, hydro seeded with native grasses and/or plantings and trees.

Replace City of Leavenworth Fish Screen and Construct New Screen House

The City of Leavenworth intends to install a compliant fish screen for their municipal water supply intake when they relocate the water supply pipeline. The current screen will no longer meet state or federal criteria (WDFW 2009; NMFS 2011) for velocity, opening area, screen area, and lack of active cleaning on completion of the fish passage project. The City of Leavenworth seeks to reduce cost long-term by installing the screen at the same time they are upgrading their water supply pipeline. The current fish screen is located upstream at RM 5.7.

To facilitate all construction and future maintenance of City of Leavenworth infrastructure, a secondary access point to the site will be constructed. USFS has requested that this access point come off of Forest Road 7600 from the existing kiosk just upstream of the boulder falls.

C. Replace and relocate IPID fish screen and screen house.

The IPID plans to replace the fish screens for their water diversion, to bring the screens up to current state and federal criteria. Fish are believed to be at high risk of impingement if entrained. The fish bypass releases fish via a 15-foot drop onto a boulder that is not submerged for most of the irrigation season. The IPID intake is presently on the right bank at the diversion dam (RM 6.0); water is directed via a canal that runs parallel to Icicle Creek for 800 feet down to the existing fish screens, where the canal turns southeast before crossing Snow Creek. IPID proposes to relocate a vertical or incline plate fish screen 1,000 feet downstream in their existing canal footprint at the Snow Creek diversion site. A fish bypass will be installed below the Snow Creek OHWM and the Snow Creek channel will be modified to create a low flow channel to ensure adequate fish return. This will involve reducing a few boulder drops and will be accomplished with hand tools. The IPID fish screen and screen house designs are still at a conceptual design level and quantities are not yet available.

Accessing the Snow Creek site will require modifications to the bridge over Icicle Creek at RM 5.5 (that is part of the Snow Creek Trail), or construction of a new bridge. WDFW has been in discussion with USFS to select a bridge option that will work for all parties. An evaluation of the current bridge and a list of alternatives being considered is attached.

D. Improve fish passage at the IPID and COL Diversion Dam.

Fish passage improvements are proposed at the diversion dam that diverts water for withdrawal from Icicle Creek by the IPID and City of Leavenworth (at approximately RM 6.0). Stakeholders initially identified a pool and chute fishway as the preferred approach (typical drawing attached), however a roughened channel has also been discussed and is now considered preferable. This action is proposed as a subsequent phase of work, which will be informed by the boulder field fish passage element and subsequent monitoring of fish migration upstream. Passive Integrated Transponder (PIT) tag arrays at the upstream end of the boulder field will document number and timing of fish that pass through the boulder field, which will provide critical information for advancing the design of fish passage improvements at the diversion dam.

- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. [\[help\]](#)

Activity (clear, dredge, fill, pile drive, etc.)	Waterbody name ¹	Impact location ²	Duration of impact ³	Amount of material placed or removed from waterbody	Area (sq. ft. or linear ft.) of waterbody directly affected
Step-pool channel construction: Fill	Icicle Creek	In	Permanent	500 CY	150 LF ²
Step-pool channel grout: Fill	Icicle Creek	In	Permanent	20 CY	150 LF
Water main installation and access road: Fill	Icicle Creek	Adjacent	Permanent	1,800 CY	1,500 LF
Water main installation rock retaining wall: Fill	Icicle Creek	Adjacent	Permanent	180 CY	130 LF
Fish screen bypass: Fill	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.
Fish screen bypass: Fill	Icicle Creek	Adjacent	Permanent	235 CY	1,500 sq. ft.
Screen house: Fill	Icicle Creek	Adjacent	Permanent	1,950 CY	4,000 sq. ft.
2 nd Construction Access: Fill	Icicle Creek	Adjacent	Permanent	1,240 CY	3,200 sq. ft.
Step-pool channel construction: Excavation	Icicle Creek	Adjacent	Permanent	3,400 CY	150 LF
Step-pool channel construction: Excavation	Icicle Creek	In	Permanent	500 CY	150 LF
Water main installation: Excavation	Icicle Creek	Adjacent	Permanent	700 CY	1,500 LF
Fish screen bypass: Excavation	Icicle Creek	In	Permanent	60 CY	1,500 sq. ft.

² Note that the same area directly affected is often included for more than one entry, e.g., the 150 LF affected by fill from the step-pool channel is the same 150LF of stream affected by grout.

Fish screen bypass: Excavation	Icicle Creek	Adjacent	Permanent	240 CY	1,500 sq. ft.
Screen house: Excavation	Icicle Creek	Adjacent	Permanent	2,200 CY	4,000 sq. ft.
TOTAL Fill	Icicle Creek	In		580 CY	
TOTAL Fill	Icicle Creek	Adjacent		5,405 CY	
TOTAL Excavation	Icicle Creek	In		560 CY	
TOTAL Excavation	Icicle Creek	Adjacent		6,540 CY	

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. [\[help\]](#)

No new withdrawal or diversion is proposed. The City of Leavenworth currently diverts between 3-6.2 cubic feet per second year round. The water supply pipeline will be relocated temporarily or permanently in order to construct the boulder field step-pool channel. The IPID may divert up to 118 cfs between mid-March and mid-October, however total flow in Icicle can be below 60 cfs just above the point of diversion (RM 5.7) in late summer and early fall.

The step-pool channel at RM 5.6 is intended to improve fish passage without any impact to the water diversion for the Icicle-Peshastin Irrigation District and City of Leavenworth. Implementing the fish passage improvement project at RM 5.6 will not affect the flows at the water diversion upstream at RM 5.8.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. [\[help\]](#)

Yes. All of the fish passage work is below the 100-year flood elevation (approximately 1,370'). All of the City of Leavenworth water line work is above the 100-year floodplain. The City of Leavenworth fish screen is largely above 100-year floodplain elevation, but the work tying in the new line to the existing line will be below 100-year floodplain elevation (and below OHWM).

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. [\[help\]](#)

No.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities

withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. [\[help\]](#)

No.

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. [\[help\]](#)

None.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. [\[help\]](#)

In constructing the project more than one acre of land will be disturbed, so a construction stormwater general permit will be secured. If storm events occur during construction, it is possible that water could run off of the site and enter surface waters. The project is immediately adjacent to Icicle Creek and Snow Creek. The contractor will be required to follow a sediment and erosion control plan to minimize this risk (see section d below). Once construction is complete, the site will be restored to pre-project conditions. The project site will not generate additional runoff following project completion.

- 2) Could waste materials enter ground or surface waters? If so, generally describe. [\[help\]](#)
Fine sediments could be released during construction activities.

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. [\[help\]](#)

Yes. The objective of the project is to enhance fish passage through this part of Icicle Creek so flow velocities and Icicle Creek alignment will be affected. Drainage patterns for adjacent land will not be affected.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: [\[help\]](#)

A temporary erosion and sediment control plan including coffer dams and silt curtains will be in place to minimize turbid water inputs to Icicle Creek (see Fish Passage Design drawings, Sheet 5). The following measure will also be followed to reduce fine sediments from washing into surface waters from construction activities on the slopes above the waterbodies:

- Existing paved and gravel roads provide access to the site.
- Construction activities will be isolated from any flowing water and will be done during low flows, following prescribed WDFW work windows. When pumps are used to lower the water, pumped water contaminated with sediment will be pumped to an upland site and allowed to infiltrate. Fish exclusion screens will be used where they are feasible to place and maintain given the flows at the time of construction. In areas where fish cannot feasibly be excluded from the area, work will be limited to rock breaking and placement. The rock breaking and placement will create minimal sediment disturbance.

- The least impactful method will be attempted for rock breaking and will advance to more forceful approaches only if needed.
- Disturbed slopes will be seeded and mulched.
- Any spoils temporarily piled on site will be covered with plastic. The excavated areas will be backfilled and stabilized to pre-project conditions.

4. Plants [\[help\]](#)

a. Check the types of vegetation found on the site: [\[help\]](#)

- deciduous tree: alder, maple, aspen, other
 evergreen tree: fir, cedar, pine, other
 shrubs
 grass
 pasture
 crop or grain
 Orchards, vineyards or other permanent crops.
 wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
 water plants: water lily, eelgrass, milfoil, other
 other types of vegetation

b. What kind and amount of vegetation will be removed or altered? [\[help\]](#)

Primarily shrubs and grasses will be cleared for construction of the secondary access road and screen houses. Several trees will also need to be removed, these will largely be deciduous willows, cottonwoods, and alders. The total project footprint will require disturbance over approximately 2.25 acres. However much of the disturbed area is not vegetated (the IPID gravel access road, and the access road and trail to the Snow Creek site). Some vegetation will be cleared as needed from roughly 1.25 acres across all project elements.

c. List threatened and endangered species known to be on or near the site. [\[help\]](#)

The USFWS online Information for Planning and Consultation tool (IPaC) system identifies the following listed plant species as possibly present in the project vicinity. However, the habitat requirements of these plants are not met in the project area and the USFS botanist has confirmed that there are no known observations of any of these species in the vicinity of the project.

Plants		
Showy Stickseed	<i>Hackelia venusta</i>	Endangered
Wenatchee Mountains Checkermallow	<i>Sidalcea oregana</i> var. <i>calva</i>	Endangered
Whitebark Pine	<i>Pinus albicaulis</i>	Candidate

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: [\[help\]](#)
 All disturbed areas will be seeded and mulched. Native shrubs and trees that can be salvaged will be replanted.

e. List all noxious weeds and invasive species known to be on or near the site. [\[help\]](#)
 While several invasive plant species have been observed in the Okanogan-Wenatchee National Forest and knapweed in particular has been noted in the watershed, the forest condition in the vicinity of the project is generally good. There are no substantial infestations of invasive plant species.

5. **Animals** [\[help\]](#)

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. [\[help\]](#)

Examples include:

- birds: hawk, heron, eagle, songbirds, other:
- mammals: deer, bear, elk, beaver, other:
- fish: bass, salmon, trout, herring, shellfish, other _____

Bull trout, steelhead, Chinook, hawks and eagles have been directly observed in the project vicinity. Signs of deer are common. The project site is within the Okanogan-Wenatchee National Forest, which is home to a wide array of mammals, herpetiles, birds and fish, including peregrine falcon, river otter, beaver, cougar, and black bear. Most wildlife shy away from the high-use human recreation areas found around the project site.

b. List any threatened and endangered species known to be on or near the site. [\[help\]](#)
 The USFWS online Information for Planning and Consultation tool (IPaC) system identifies the following listed species as possibly present in the project vicinity.

Fish		
Bull Trout	<i>Salvelinus confluentus</i>	Threatened
Upper Columbia River Steelhead	<i>Oncorhynchus mykiss</i>	Threatened
Upper Columbia River Spring-run Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Endangered
Mammals		
Canada Lynx	<i>Lynx canadensis</i>	Threatened
Gray Wolf	<i>Canis lupus</i>	Endangered
Grizzly Bear	<i>Ursus arctos horribilis</i>	Threatened
American Wolverine	<i>Gulo luscus</i>	Proposed Threatened
Birds		
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Threatened

Northern Spotted Owl	<i>Strix occidentalis caurina</i>	Threatened
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Threatened
Critical Habitat		
Bull trout	<i>Salvelinus confluentus</i>	Final
Upper Columbia River Steelhead	<i>Oncorhynchus mykiss</i>	Final

A biological assessment has been completed for the project but not yet reviewed by USFWS and NOAA Fisheries. The BA considered potential impacts to the list of species above and determined that several were likely to experience no effect as a result of the project and these species were excluded from further analysis, including the Canada lynx (*Lynx canadensis*), American wolverine (*Gulo luteus*), yellow-billed cuckoo (*Coccyzus americanus*), showy stickseed (*Hackelia venusta*), Wenatchee Mountains checkermallow (*Sidalcea oregano var. calva*), and whitebark pine (*Pinus albicaulis*). The rationale for this conclusion for each species is discussed in the BA. Species analyzed in the BA include Bull trout (*Salvelinus confluentus*), steelhead trout (*Oncorhynchus mykiss*), Chinook (*Oncorhynchus tshawytscha*), Gray Wolf (*Canis lupus*), Grizzly Bear (*Ursus arctos horribilis*), Northern Spotted Owl (*Strix occidentalis caurina*), and Marbled Murrelet (*Brachyramphus marmoratus*). The 2018 biological assessment concluded the following expected degree of impact on these resources:

Common Name	Latin Name	Determination of Effects	Federal Response Requested
Bull trout	<i>Salvelinus confluentus</i>	Likely to adversely affect.	Formal Consultation
Steelhead trout	<i>Oncorhynchus mykiss</i>	Likely to adversely affect.	Formal Consultation
Spring Chinook	<i>Oncorhynchus tshawytscha</i>	Likely to adversely affect.	Formal Consultation
Gray wolf	<i>Canis lupus</i>	May affect, but not likely to adversely affect.	Concurrence
Grizzly bear	<i>Ursus arctos</i>	May affect, but not likely to adversely affect.	Concurrence
Northern spotted owl	<i>Strix occidentalis caurina</i>	May affect, but not likely to adversely affect.	Concurrence
Marbled murrelet	<i>Brachyramphus marmoratus</i>	May affect, but not likely to adversely affect.	Concurrence
Bull trout critical habitat	<i>Salvelinus confluentus</i>	Likely to adversely affect.	Formal Consultation
Steelhead trout critical habitat	<i>Oncorhynchus mykiss</i>	Likely to adversely affect.	Formal Consultation

c. Is the site part of a migration route? If so, explain. [\[help\]](#)

As noted in the IPaC report (attached), the project site is part of a migratory bird route. The IPaC report list several birds which potentially could migrate through the project vicinity.

d. Proposed measures to preserve or enhance wildlife, if any: [\[help\]](#)

The entire premise of the project is to enhance habitat and access to habitat for steelhead and bull trout, and to reduce mortality at existing fish screens. Enhancing habitat and access to additional habitat for these fish will also benefit wildlife species that feed upon fish or benefit from the nutrients that fish contribute to the ecosystem.

e. List any invasive animal species known to be on or near the site. [\[help\]](#)

The Icicle Creek drainage has been stocked with non-native eastern brook trout and lake trout (*Salvelinus fontinalis* and *Salvelinus namaycush*) in the past. These fish can still be found in the system and some hybridization with bull trout has been observed.

6. Energy and Natural Resources [\[help\]](#)

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. [\[help\]](#)

Operation of the new IPID screen on Snow Creek will require a power source. The type of power is not yet finalized; solar and an on-site generator have been considered. More likely however is the option of running power up the road via a 2" conduit in the road or trail bed, covered by concrete encasement (if concrete encasement is not used, a depth of two to three feet is required). WDFW is still discussing this with USFS.

b. Would your project affect the potential use of solar energy by adjacent properties?

If so, generally describe. [\[help\]](#)

No.

c. What kinds of energy conservation features are included in the plans of this proposal?

List other proposed measures to reduce or control energy impacts, if any: [\[help\]](#)

Solar power will be included in the fish screen operations if feasible.

7. Environmental Health [\[help\]](#)

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal?

If so, describe. [\[help\]](#)

No.

1) Describe any known or possible contamination at the site from present or past uses.

[\[help\]](#)

None.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity. [\[help\]](#)

None.

- 3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project. [\[help\]](#)

None.

- 4) Describe special emergency services that might be required. [\[help\]](#)

None.

- 5) **Proposed measures to reduce or control environmental health hazards, if any:** [\[help\]](#)

Not applicable.

b. Noise [\[help\]](#)

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? [\[help\]](#)

Existing traffic noise will not affect implementation of the project.

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. [\[help\]](#)

The project will result in an increase in noise due to the operation of heavy equipment (excavators, bull dozers, hydraulic hammer, graders) and increased traffic volumes given construction vehicles entering and leaving the site.

- 3) Proposed measures to reduce or control noise impacts, if any: [\[help\]](#)

Work hours will be restricted to the hours of 7 a.m. and 7 p.m.

8. **Land and Shoreline Use** [\[help\]](#)

- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. [\[help\]](#)

The project site is owned by the Icicle Peshastin Irrigation District and the City of Leavenworth. The site is used to withdraw water from Icicle Creek for irrigation to serve agriculture and drinking water for the City of Leavenworth. The adjacent lands are comprised of national forest and federally protected wilderness area. The proposal will temporarily affect adjacent lands used for recreation by creating noise disturbance and contributing to congestion on the Icicle Creek Road and the Snow Lakes Trailhead parking lot.

- b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? [\[help\]](#)

The project site has not been used as working farm or forest land.

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how: [\[help\]](#)

The proposal will not affect nor be affected by working farm or forest land.

c. Describe any structures on the site. [\[help\]](#)

Existing structures include:

- Icicle Creek Road
- IPID gravel access road
- COL water supply pipeline
- COL Collection house
- COL Secondary Debris Screen House
- Existing IPID/COL Diversion dam
- COL water intake
- Footbridge to access IPID infrastructure
- IPID intake, fish screens, and canal.

These structures are all described in the attached cultural resources report.

d. Will any structures be demolished? If so, what? [\[help\]](#)

Yes. The City of Leavenworth water line secondary debris screen house.

e. What is the current zoning classification of the site? [\[help\]](#)

Commercial Forest Lands (FC); Rural Residential/Resource 20: one dwelling unit per 20 acres (RR20).

f. What is the current comprehensive plan designation of the site? [\[help\]](#)

The Primary Use codes over the project site include Undeveloped/Vacant (Code 91) and Governmental Services (Code 67).

g. If applicable, what is the current shoreline master program designation of the site? [\[help\]](#)

Conservancy.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify. [\[help\]](#)

The entire project area falls within the shoreline buffers of Icicle Creek and Snow Creek. The in-channel portions of the project are frequently flooded; most of the project site is a fish and wildlife conservation area.

i. Approximately how many people would reside or work in the completed project? [\[help\]](#)

None.

j. Approximately how many people would the completed project displace? [\[help\]](#)

None.

k. Proposed measures to avoid or reduce displacement impacts, if any: [\[help\]](#)

Not applicable; no displacement will occur.

L. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: [\[help\]](#)
Not applicable. The completed project will not affect current or projected land uses. Project construction will temporarily cause significant disruption to recreational users of the Snow Lakes Trail. The project team has been working with the USFS to minimize this disruption.

m. Proposed measures to reduce or control impacts to agricultural and forest lands of long-term commercial significance, if any: [\[help\]](#)
The related project element to replace and relocate the IPID fish screen provides a direct benefit to agriculture. The enhanced fish habitat will also benefit recreational users of the Okanogan-Wenatchee National Forest through increased opportunities for viewing fish and wildlife.

9. Housing [\[help\]](#)

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. [\[help\]](#)
None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. [\[help\]](#)
None.

c. Proposed measures to reduce or control housing impacts, if any: [\[help\]](#)
Not applicable; there will be no impacts to housing.

10. Aesthetics [\[help\]](#)

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? [\[help\]](#)
The screen house for the new City of Leavenworth fish screen will be approximately 15' tall (see Sheet 7 of the COL Fish Screen Drawings). It will be placed landward of the existing screen house and will extend roughly 6' taller than the existing structure, which will be demolished. The new screen house exterior will be made of concrete.

b. What views in the immediate vicinity would be altered or obstructed? [\[help\]](#)
Views will be minimally affected by this project as a result of the new City of Leavenworth screen house standing slightly taller (6') than the existing structure. A small number of trees will be removed to construct the project, which will result in greater visibility of Icicle Creek from Icicle Creek Road.

b. Proposed measures to reduce or control aesthetic impacts, if any: [\[help\]](#)
Disturbed areas would be seeded and mulched and restored to pre-project conditions.

11. Light and Glare [\[help\]](#)

a. What type of light or glare will the proposal produce? What time of day would it mainly occur? [\[help\]](#)
The project will not generate additional light.

b. Could light or glare from the finished project be a safety hazard or interfere with views? [\[help\]](#)
No. The project will not result in glare upon completion.

- c. What existing off-site sources of light or glare may affect your proposal? [\[help\]](#)

None.

- d. Proposed measures to reduce or control light and glare impacts, if any: [\[help\]](#)

Not applicable.

12. Recreation [\[help\]](#)

- a. What designated and informal recreational opportunities are in the immediate vicinity? [\[help\]](#)

The project vicinity is used extensively for recreation. The surrounding Okanogan-Wenatchee National Forest was established in 1908. The adjacent Snow Lakes Trailhead is a popular access point for the Snow Lakes Wilderness.

- b. Would the proposed project displace any existing recreational uses? If so, describe. [\[help\]](#)

The construction and presence of construction vehicles will add to the vehicle traffic on Icicle Creek Road and will generate noise that will detract from the sense of wilderness associated with the area. The impacts will most likely be felt at the busy Snow Lakes Trailhead parking lot, and at the USFS campgrounds upstream along Icicle Creek Road. While these impacts will not be welcome to recreational users, they are temporary and will be offset by the increased biological and recreational benefit long term. Providing regular fish access to the upper reaches of Icicle Creek will increase fishing opportunities and fish and wildlife viewing opportunities for recreational users.

- c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: [\[help\]](#)

The project sponsor is coordinating with the USFS to identify measures to minimize impacts to recreational users. USFS has requested a firm construction schedule by January or February, 2019, before permits for the wilderness area are released. They have also requested that work directly impacting the trailhead parking lot concludes before May 15 and that the project sponsor identify a point of public contact to field public questions and comments about the project.

13. Historic and cultural preservation [\[help\]](#)

- a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers? If so, specifically describe. [\[help\]](#)

There are two historic properties located on the site, the City of Leavenworth water system intake and screen house. Per the attached cultural resources report, the historic structures were recommended not eligible to the National Register of Historic Places (NRHP). The report concludes that the project will result in no adverse effect to historic properties.

- b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources. [\[help\]](#)

The attached cultural resources report (Lancaster 2018) describes previous archaeology investigations by Lancaster (2017), Fink (1995), and Christenden (1995). Lancaster (2018, page 11) suggests that “the area was likely utilized by Native American groups traveling up and down canyon during hunting, fishing, and gathering activities. The most likely precontact sites may include isolated finds, lithic scatters, and/or features associated with resource extraction or temporary camps”. Additionally, “the 1907 General Land Office cadastral plat for Township 24 North, Range 17 East shows a historic trail on the south side of Icicle Creek”.

Lancaster (2018, page 12) further indicates that “historic era cultural resources present within the APE would likely be associated with transportation and irrigation activities. The APE are within an area that has been heavily impacted by ground disturbing activities over the past century”. The work area itself is largely boulder, bedrock, or previously disturbed road prism.

- c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.

[\[help\]](#)

An archaeologist conducted a literature review, a field inspection, walking survey of the site, and monitored the excavation of four test pits and several drill holes on site. This was followed by consultation with DAHP and the Confederated Tribes of the Colville Reservation. The attached cultural resources report describes the methods used to evaluate the potential impacts to cultural resources, the findings, and provides evidence of consultation.

- d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required. [\[help\]](#)

The majority of the excavation will be in rock, or previously disturbed road prism, so discovery of artifacts is not expected. The contractor will be required to follow conditions for addressing inadvertent discoveries as outlined in the August 15, 2014 letter from the Confederated Tribes of the Colville Reservation to Kim Lancaster (attached).

14. **Transportation** [\[help\]](#)

- a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any. [\[help\]](#)

The project is accessed from Icicle Creek Road (US Forest Road 7600), which connects to U.S Route 2.

- b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop? [\[help\]](#)

No.

- c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate? [\[help\]](#)

None.

- d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private). [\[help\]](#)
 The existing IPID gravel access road that runs parallel and just downslope from Icicle Creek Road will be realigned.
- e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.
 No, water, air, and rail facilities are not located nearby. However the project is located immediately adjacent to Icicle Creek Road (U.S. Forest Road 7600). The road is heavily used for recreation.
- f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates? [\[help\]](#)
 The completed project will not result in an increase in vehicular traffic.
- g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe. [\[help\]](#)
 No. Construction and staging will occur on lands owned by the Icicle Peshastin Irrigation District, the City of Leavenworth, and possibly the U.S. Forest Service, however this is still under discussion.
- h. Proposed measures to reduce or control transportation impacts, if any: [\[help\]](#)
 The sponsor has initiated discussions with the USFS to identify means to reduce recreational transportation impacts on of the Okanogan-Wenatchee National Forest.

15. **Public Services** [\[help\]](#)

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. [\[help\]](#)
 No.
- b. Proposed measures to reduce or control direct impacts on public services, if any. [\[help\]](#)
 Not applicable.

16. **Utilities** [\[help\]](#)

- a. Circle utilities currently available at the site: [\[help\]](#)
 electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other _____
 Electricity is available only at the City of Leavenworth water treatment plant. The Icicle-Peshastin Irrigation District fish screen is currently powered by paddlewheel.
- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. [\[help\]](#)
 The project will upgrade the water supply pipeline for the City of Leavenworth. Electricity will be extended from the water treatment plant to both the City of Leavenworth and Icicle-Peshastin Irrigation District fish screens. The Chelan County PUD is the utility providing the electricity. zNo other new facilities are proposed to be available at the site.

C. Signature [\[help\]](#)

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 

Name of signee Marnie Tyler, Authorized Agent for Trout Unlimited and IPID

Position and Agency/Organization Principal/Ecolution, LLC

Date Submitted: 9/11/18

State Vicinity Map



Overall Site Layout

- A. Existing diversion dam for Icicle-Peshastin Irrigation District/City of Leavenworth intakes
- B. General position of existing City of Leavenworth water supply pipeline (dashed blue line)
- C. Boulder Falls
- D. General position of existing IPID gravel access road (yellow line)
- E. Snow Lakes Trailhead Parking Lot
- F. Existing City of Leavenworth water treatment plant



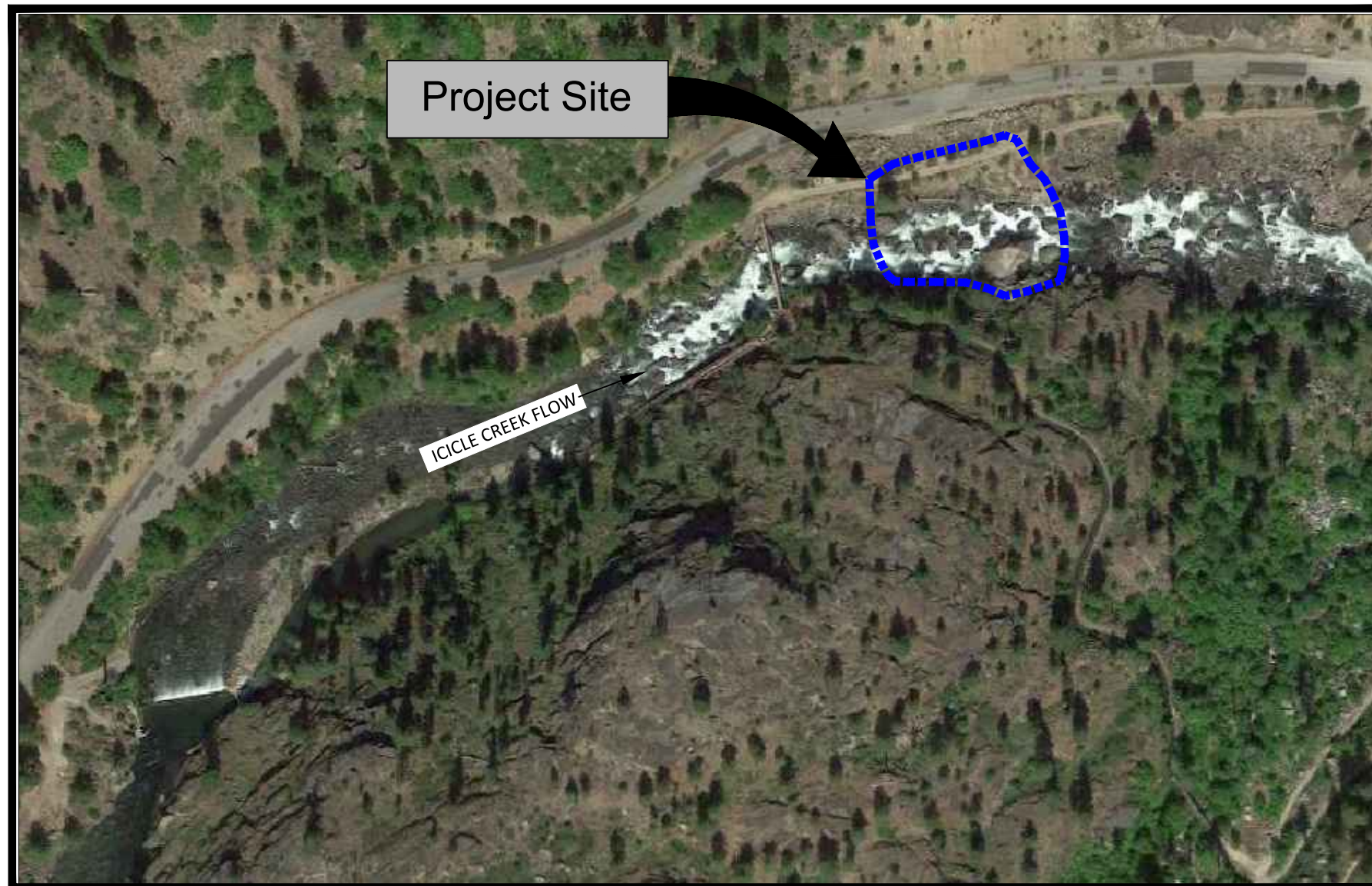
90% Design

Icicle Boulder Field Passage - Step Pool Channel

Project Number 15-1219

DRAWING INDEX:

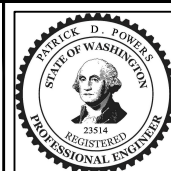
1. Cover Sheet
2. Legend/Survey Control
3. Existing Site Plan and Notes
4. Boulder ID
5. Proposed Site Plan/Construction Plan
6. Upper Site Plan
7. Lower Site Plan
8. Profile
9. Sections D and E
10. Sections F and G
11. Sections H and I
12. Sections J and K
13. Sections L and M
14. Sections N and O
15. Step Pool Channel Details
16. Rock Slope Details
17. Details



VICINITY MAP
Scale 1" = 200'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

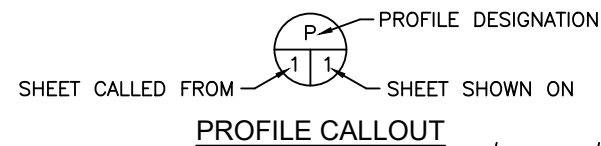
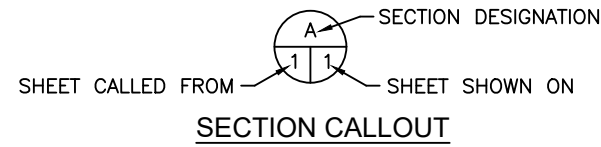
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering
DRAWN BY:
RiverSide Drafting and Design
DATE:
10/28/18

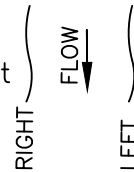
Cover Sheet

1 17
SHEET OF

SHEET SYMBOLS



References to Right and Left as viewed downstream



Datum: Horizontal – State Plane Coordinates
North Zone NAD 83 (2011)
Vertical NAVD 88 Based on GPS Static Observation.

Survey Control Points

Control Pt	NORTHING	EASTING	ELEVATION
WFE PT 4	198610.82	1670408.87	1382.43
WFE PT 3	198571.40	1670238.51	1390.02
WFE PT # 2	198531.01	1670021.64	1394.74
WFE PT #1	198411.10	1669795.83	1408.23
M2C PT # 105	198584.84	1669990.61	1417.34
M2C PT # 111	198623.00	1670224.93	1405.49
WFE PT # 5	198466.66	1670272.90	1373.14
WFE PT # 6	198452.98	1670244.93	1373.17
WFE PT # 7	198557.81	1670276.74	1388.87
WFE PT # 8	198559.58	1670197.42	1391.47

Step Pool Channel Layout Control Points

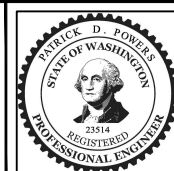
Control Pt	NORTHING	EASTING	ELEVATION
Step 1			
Left	198507.84	1670182.26	1345.0
Right	198498.37	1670184.53	1345.0
Pool 1			
Left	198546.33	1670283.75	1350.0
Center	198534.61	1670279.04	1340.0
Right	198526.24	1670276.18	1340.0
Step 2			
Left	198534.88	1670265.26	1354.0
Right	198525.29	1670262.54	1350.0
Pool 2			
Left	198558.21	1670224.11	1354.0
Center	198542.31	1670227.85	1344.0
Right	198532.44	1670230.34	1354.0
Step 3			
Left	198546.08	1670241.80	1354.0
Right	198536.46	1670239.93	1354.0
Pool 3			
Left	198558.21	1670224.12	1357.3
Center	198542.32	1670227.86	1348.0
Right	198530.74	1670230.74	1360.8
Step 4			
Left	198534.87	1670265.25	1362.0
Right	198525.29	1670262.53	1358.0
Pool 4			
Pool	198506.30	1670196.60	1352.0
Left	198531.61	1670189.33	1360.0
Center	198528.38	1670197.47	1357.0
Right	198527.12	1670200.37	1358.0

LEGEND

- PROPERTY LINE
- RIGHT OF WAY LINE
- CENTERLINE
- EXISTING FENCE
- BUILDING LINE
- INDEX CONTOUR LINE
- UNDERGROUND POWER
- EXISTING WATER LINE
- EXISTING CALLOUT
- NEW CALLOUT
- SURVEY POINT
- EXISTING TREES TO REMAIN
- PROJECT BENCH MARK
- BORING LOCATIONS
- SANDBAGS
- NOTE CALLOUT
- STATION CALLOUT
- PHOTO CALLOUT
- FOUND SURVEY MONUMENT
- SET CONTROL POINT
- POWER POLE
- MANHOLE
- UTILITY CABINET
- LIGHT POST
- TREE
- WATER VALVE
- Existing Boulders to Remain
- Boulders to be Removed
- Boulders to be Placed
- UNDISTURBED GRADE
- WETLAND DELINEATION
- DEMO
- ELEVATION MARKER
- TREE TO BE REMOVED
- TREE TO REMAIN



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

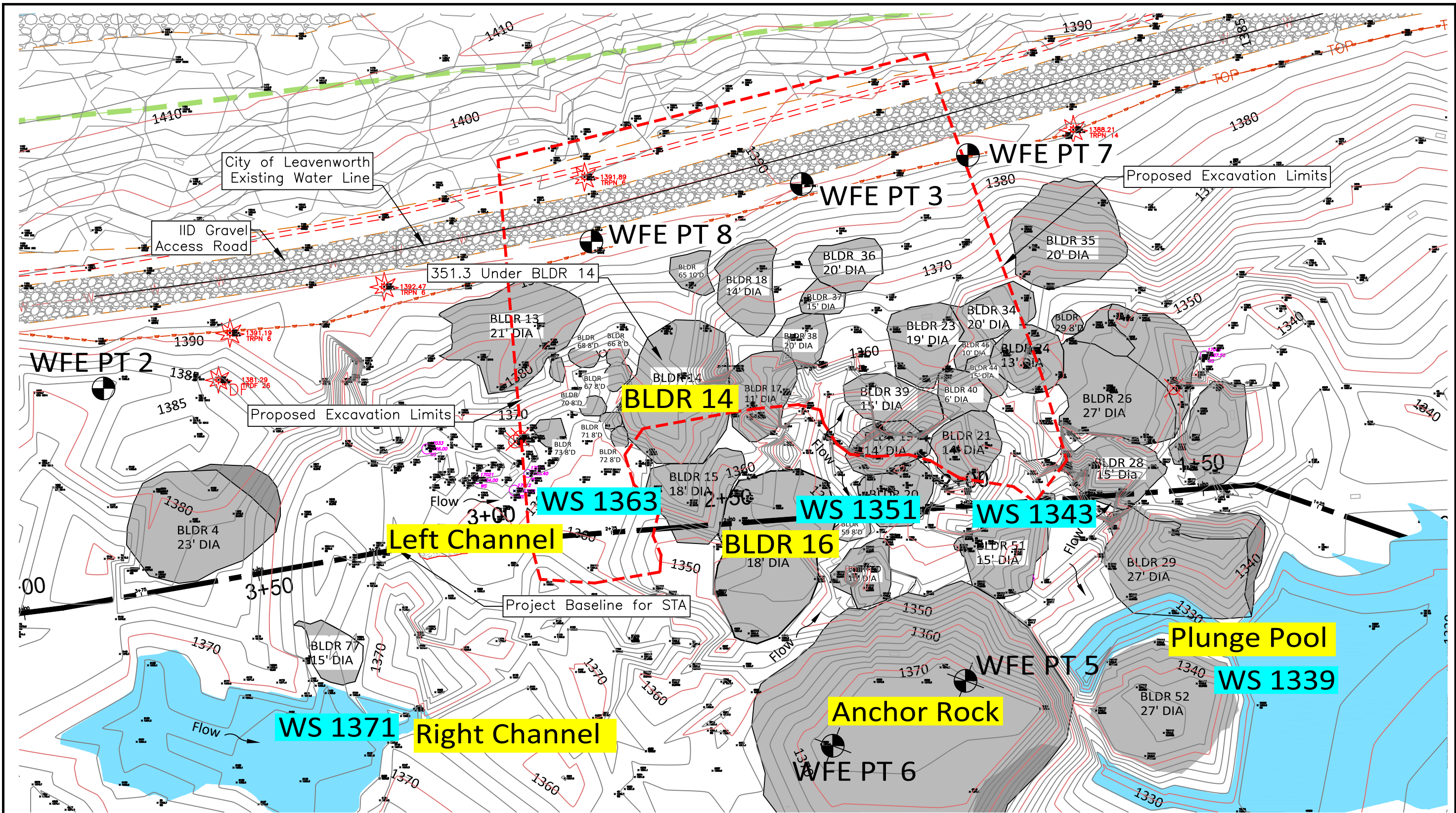
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting and Design

DATE:
10/28/18

Legend and Notes



Site Plan - Existing (650 cfs Aerial) 0 20
 SCALE: 1" = 20' SCALE



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: 0 1" 20'

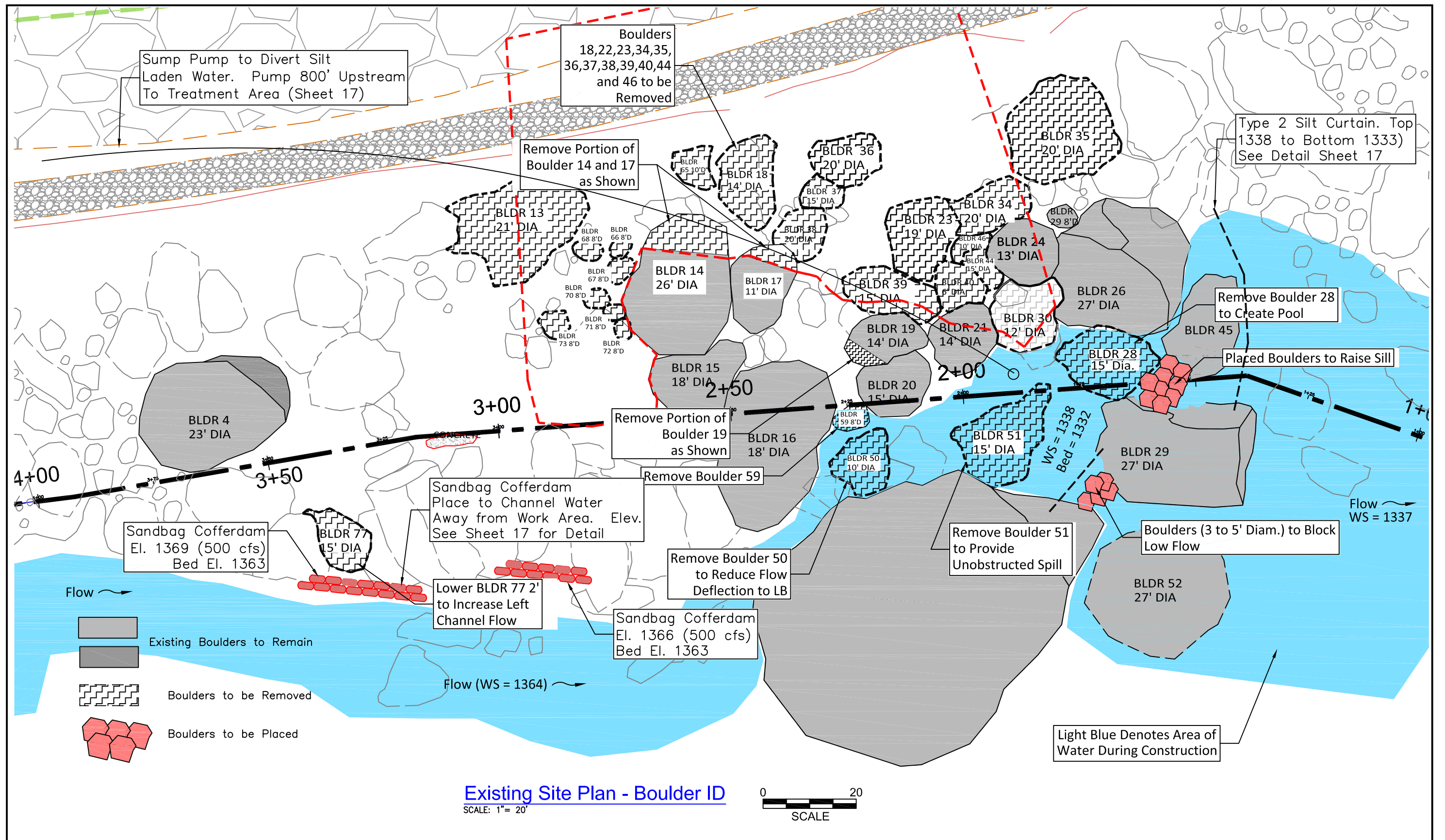
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
10/28/18

Site Plan - Existing



Existing Site Plan - Boulder ID
SCALE: 1"= 20'



Icicle Boulder Field Passage

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: 0 1" 20'

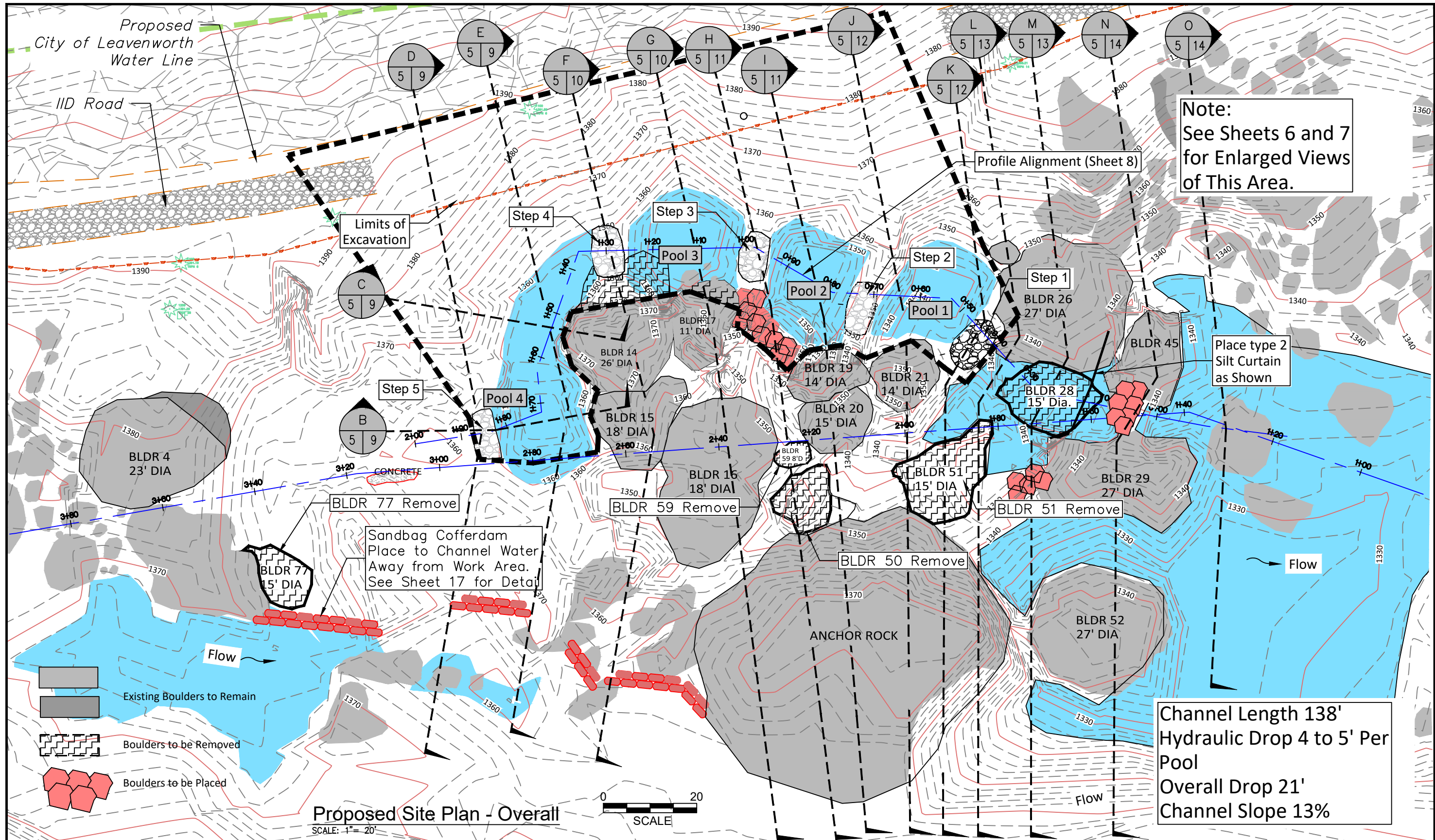
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
11/15/18

Boulder ID Sheet Water Management Plan



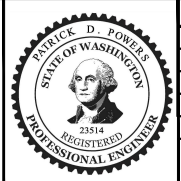
Note:
See Sheets 6 and 7
for Enlarged Views
of This Area.

Channel Length 138'
Hydraulic Drop 4 to 5' Per
Pool
Overall Drop 21'
Channel Slope 13%

Proposed Site Plan - Overall
SCALE: 1" = 20'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

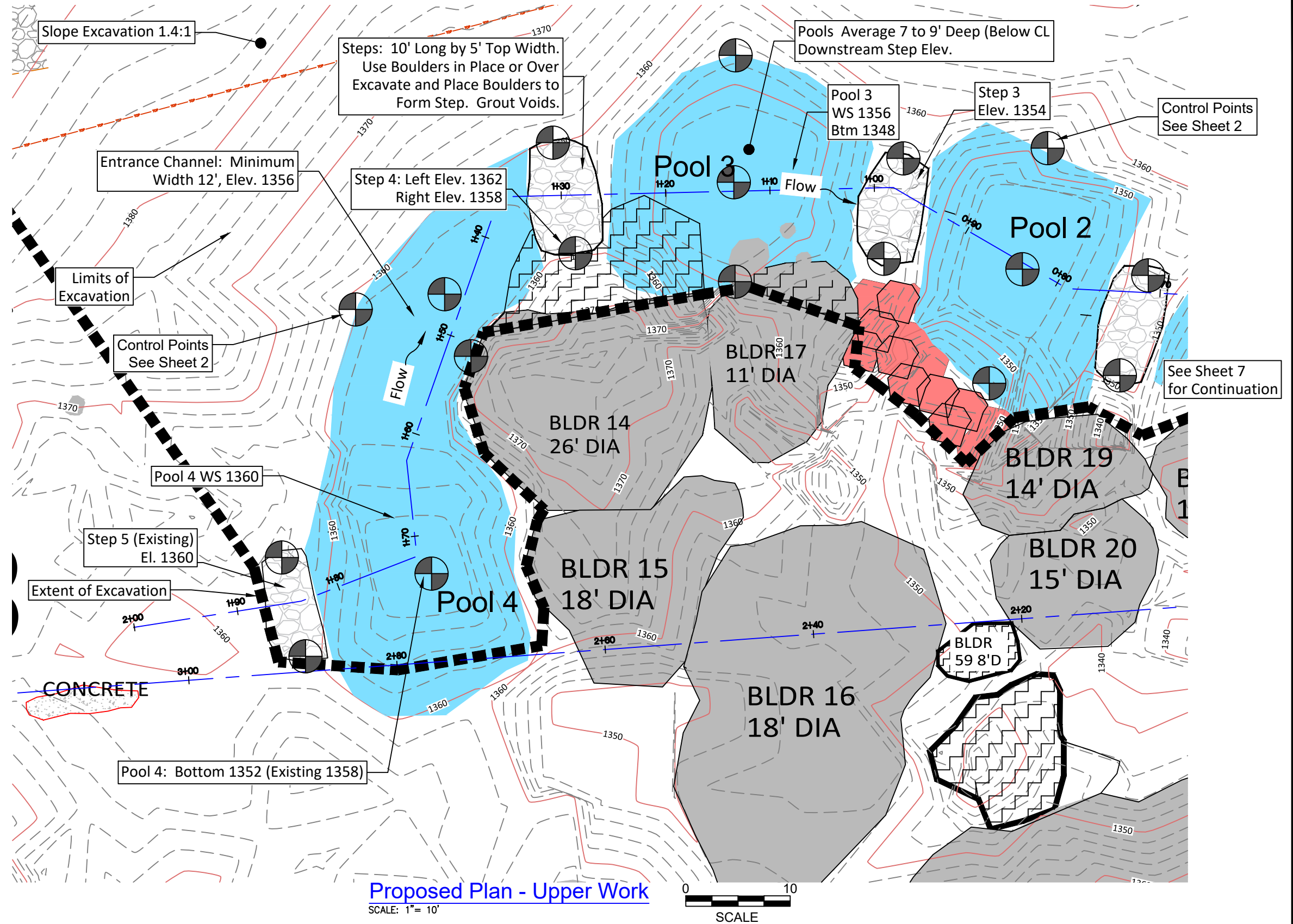
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

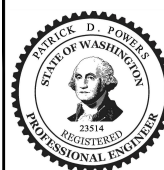
DATE:
03/03/2018

Proposed Site Plan
Overall

5 **17**
SHEET OF



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION: 0 1"

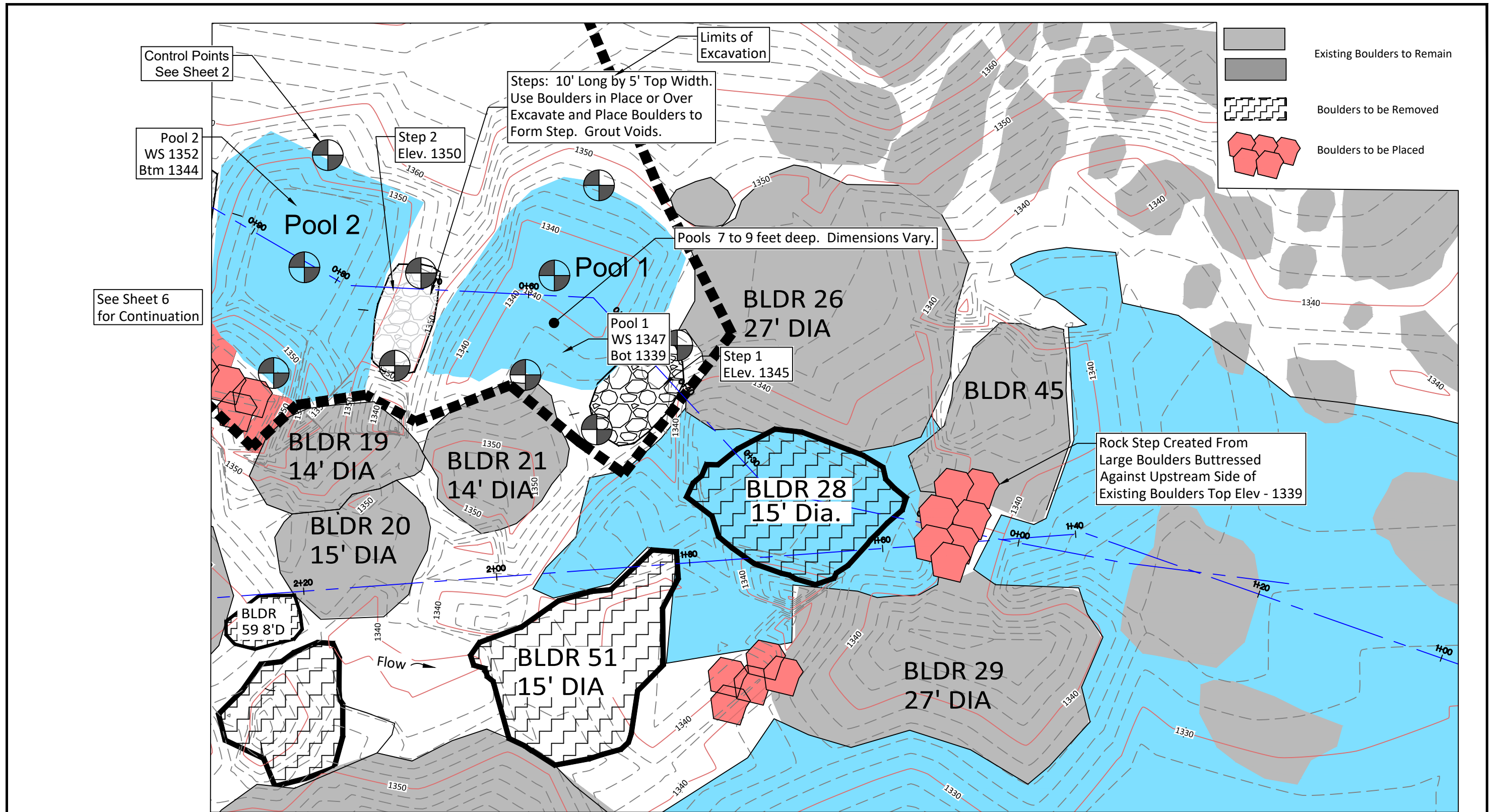
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

Proposed Plan Upper Work



Proposed Plan - Lower Work
SCALE: 1" = 10'



Icicle Boulder Field Passage

REV	DATE	BY	APPD	DESCRIPTION

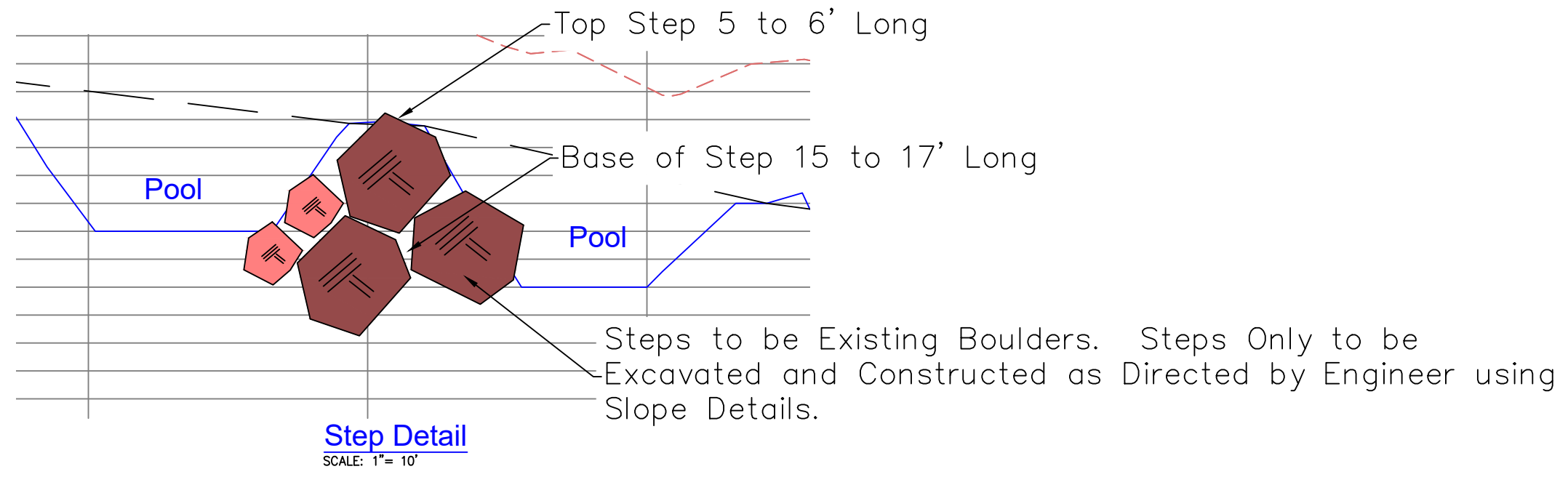
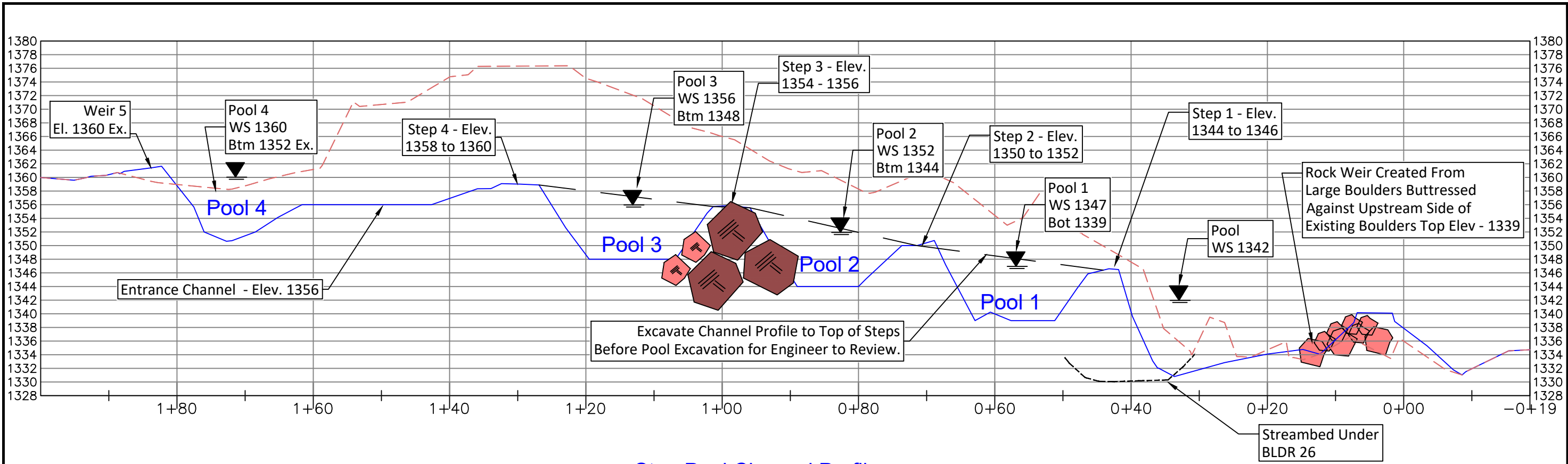
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING.
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

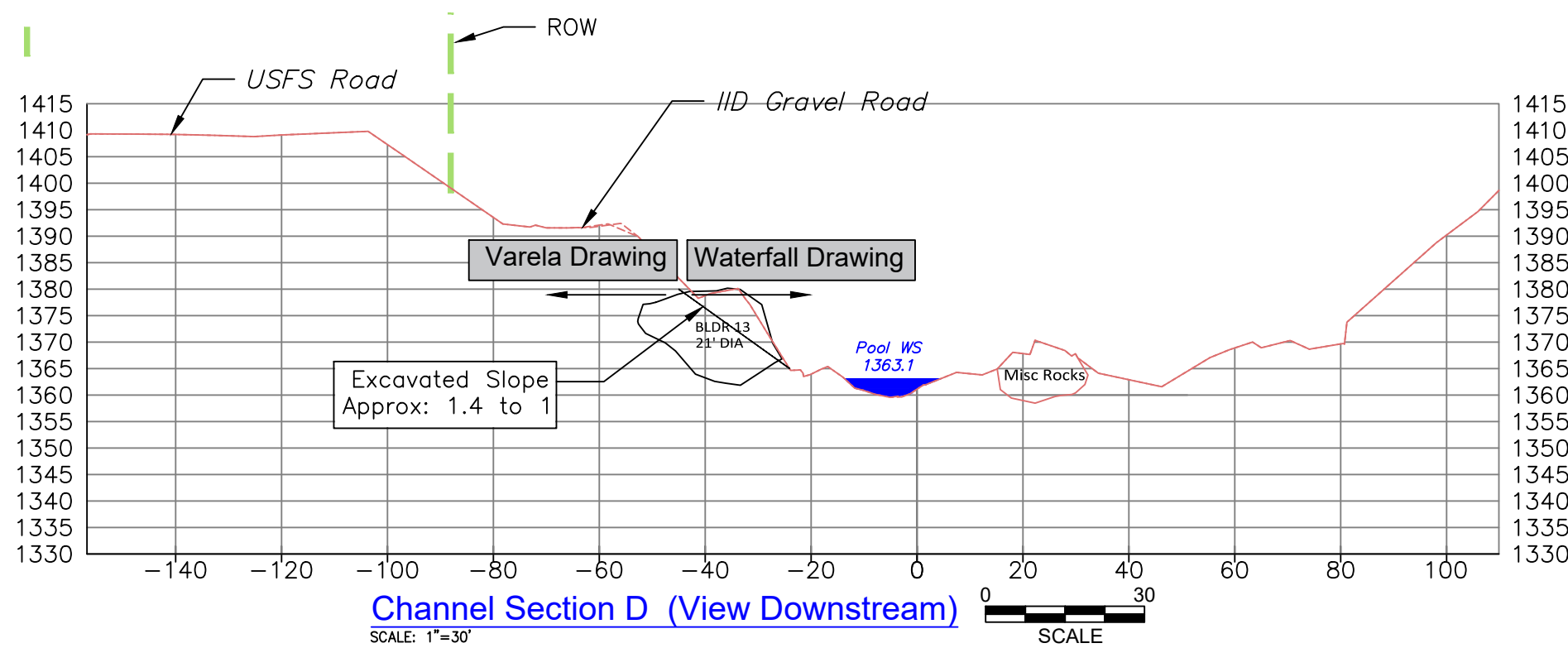
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

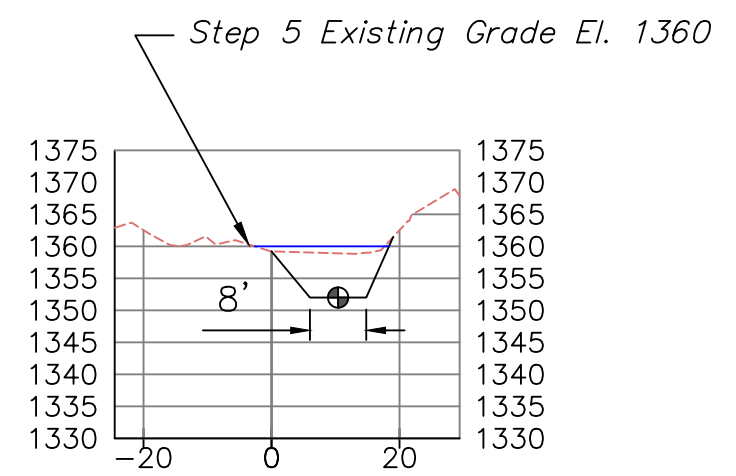
DATE:
03/03/2018

Proposed Plan Lower Work

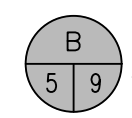




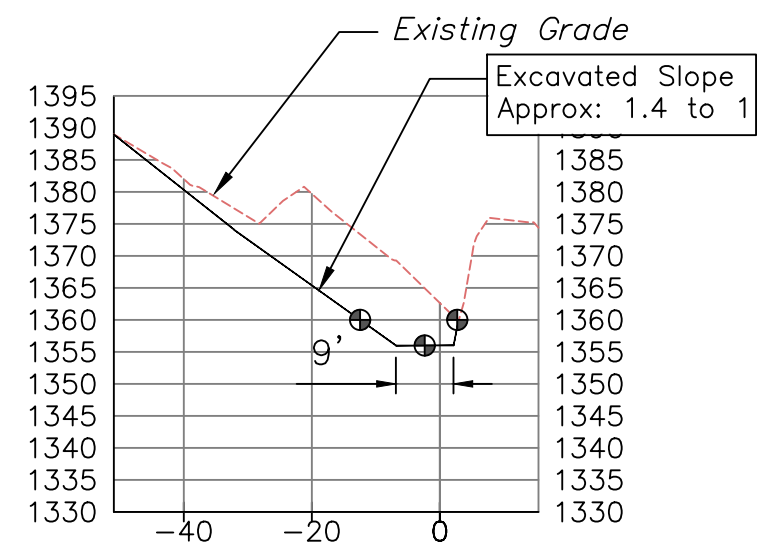
Notes:
 1. All Water Surface Elevations Shown are 500 cfs unless noted otherwise.
 2. Boulders with Numbers Shown in Cross Sections are Surface Boulders. Potential Boulders Buried are not Shown.



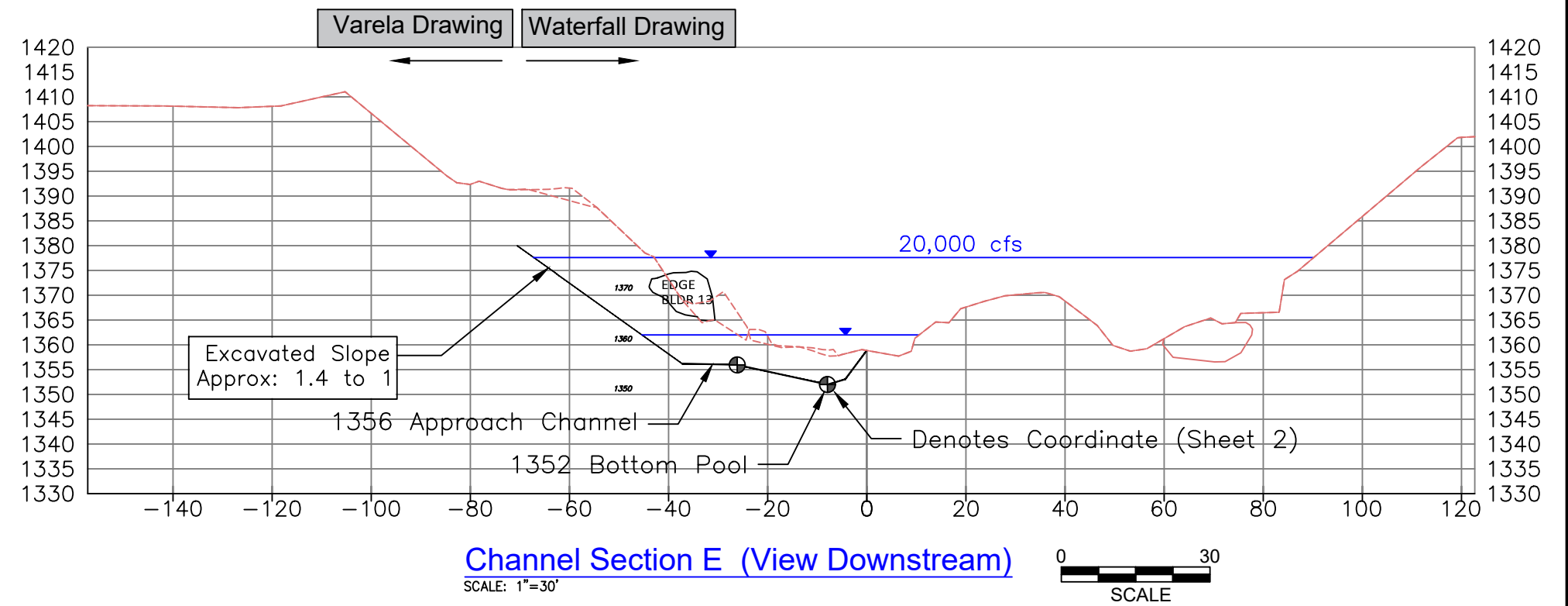
Channel Section D (View Downstream)
 SCALE: 1"=30'



Channel Section B (View Downstream)
 SCALE: 1"=30'



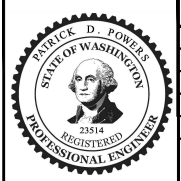
Channel Section C (View Downstream)
 SCALE: 1"=30'



Channel Section E (View Downstream)
 SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
 BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

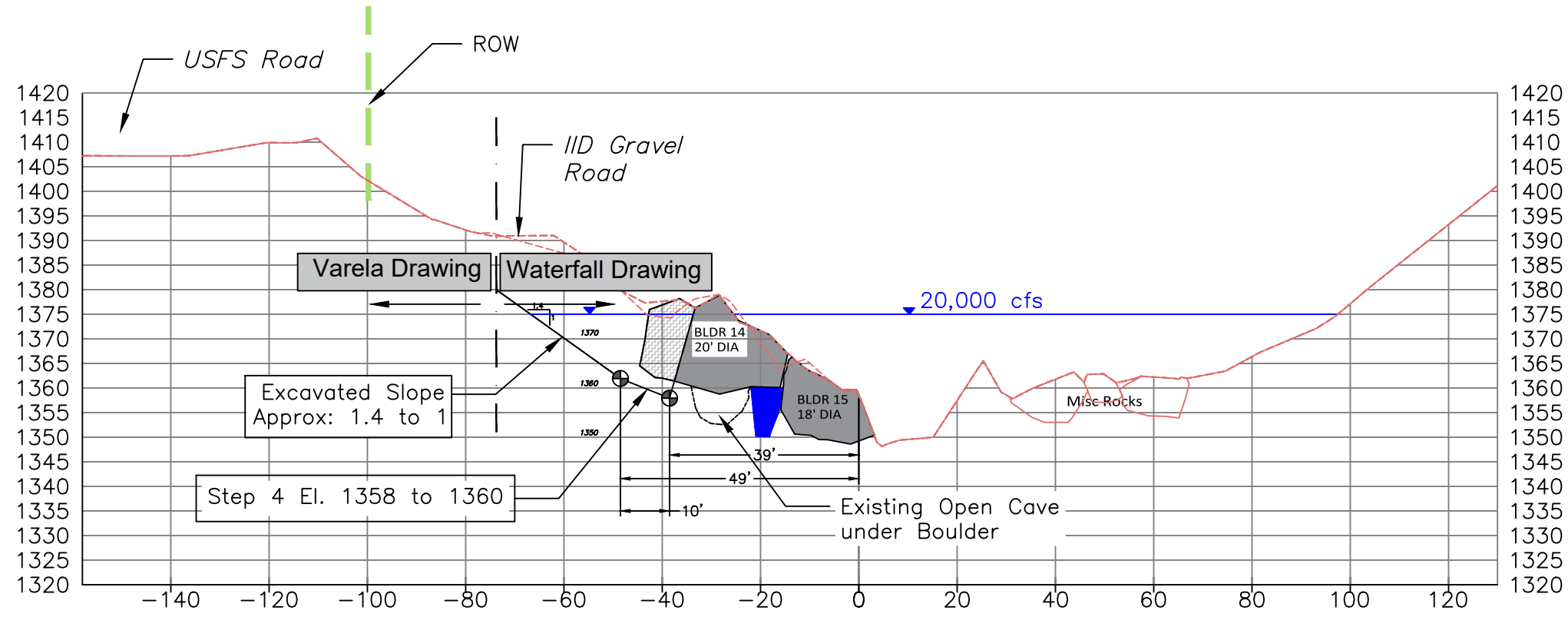
DESIGN BY:
 Waterfall Engineering

DRAWN BY:
 RiverSide Drafting

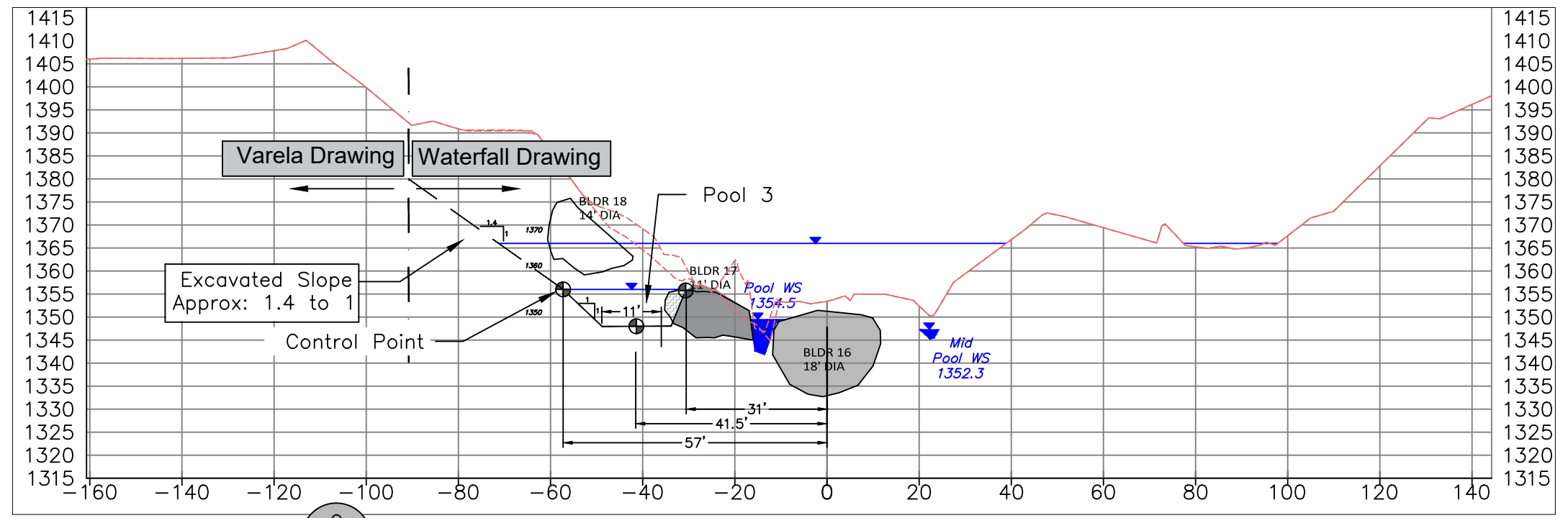
DATE:
 10/26/18

Sections

9 **17**
 SHEET OF



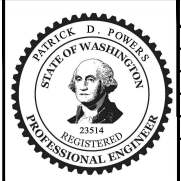
F
5 | 10
Channel Section F - Step 4 (View Downstream)
SCALE: 1"=30'



G
5 | 10
Channel Section G - Pool 3 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

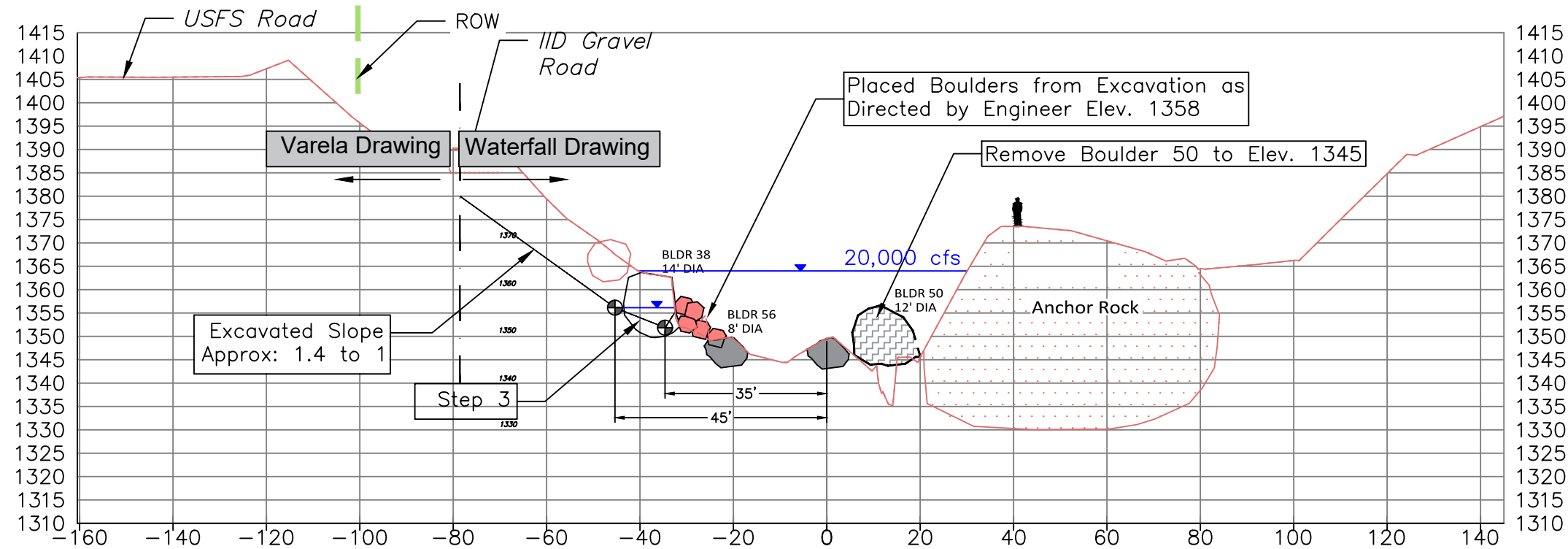
SCALE VERIFICATION
 BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

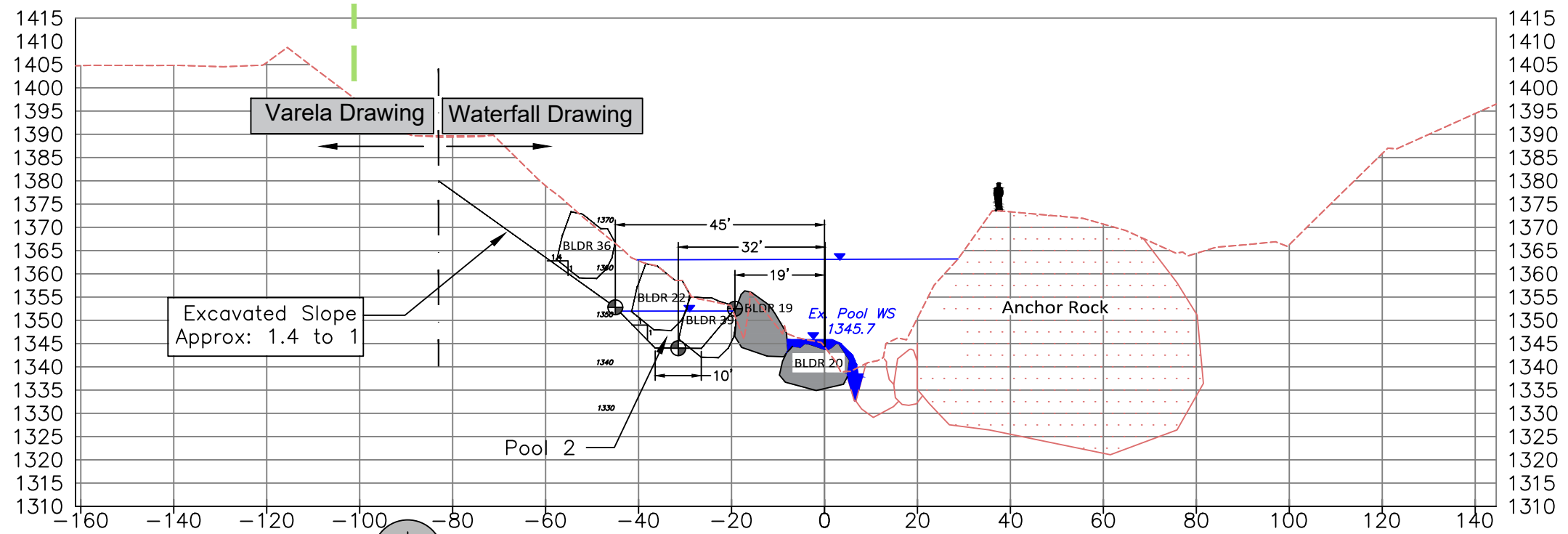
DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

Sections



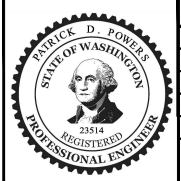
H
5 | 11
Channel Section H - Step 3 (View Downstream)
SCALE: 1"=30'



I
5 | 11
Channel Section I - Pool 2 (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

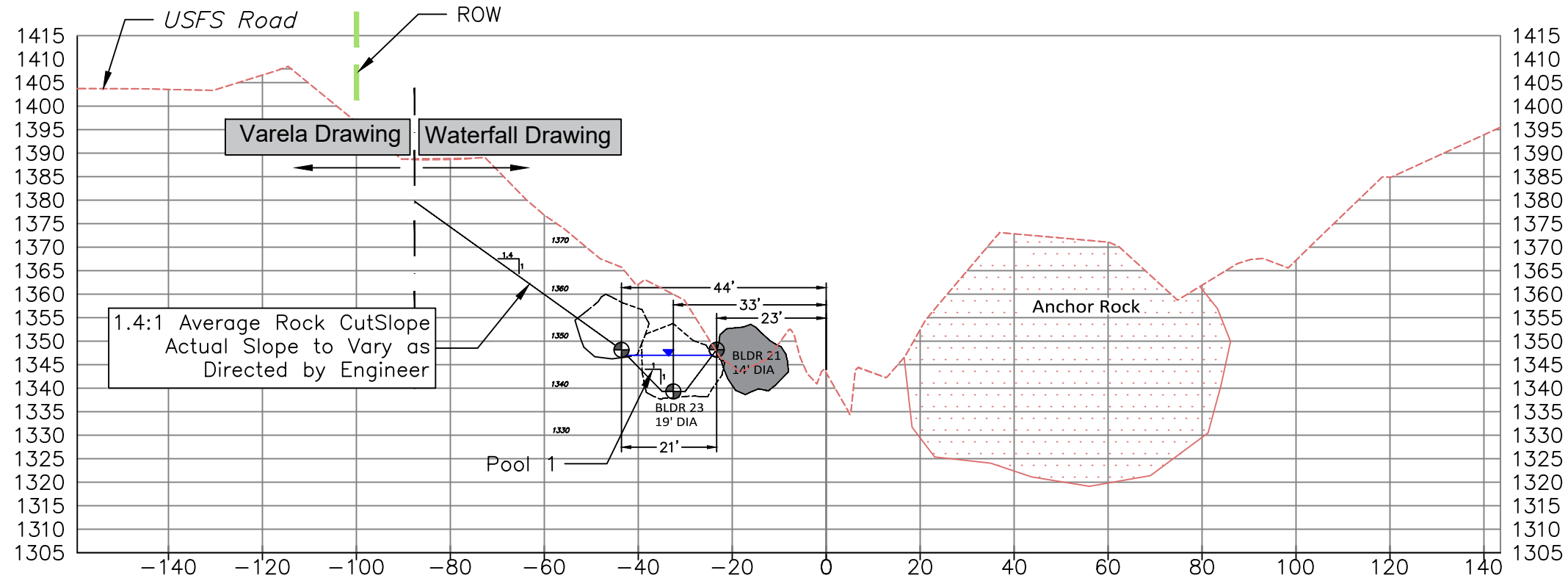
SCALE VERIFICATION
 BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
10/26/18

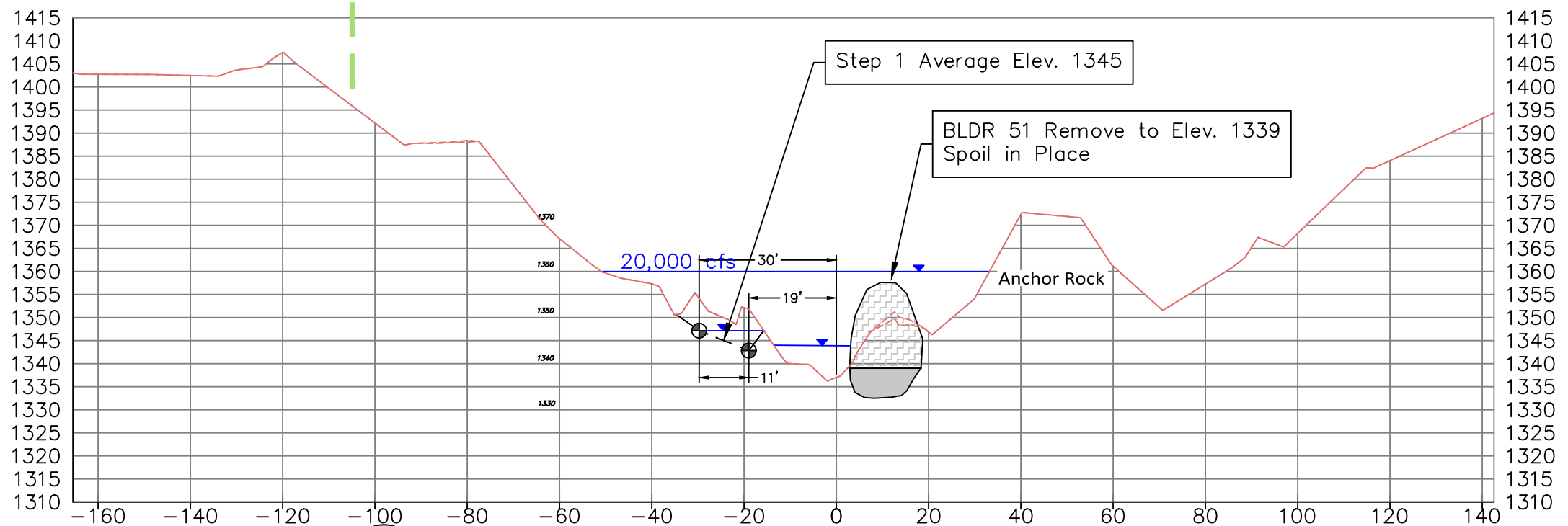
Sections



J
5 | 12

Channel Section J - Pool 1 (View Downstream)

SCALE: 1"=30'



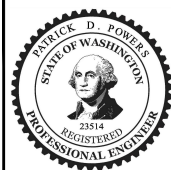
K
5 | 12

Channel Section K - Step 1 (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APP'D	DESCRIPTION

SCALE VERIFICATION
 BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
 IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

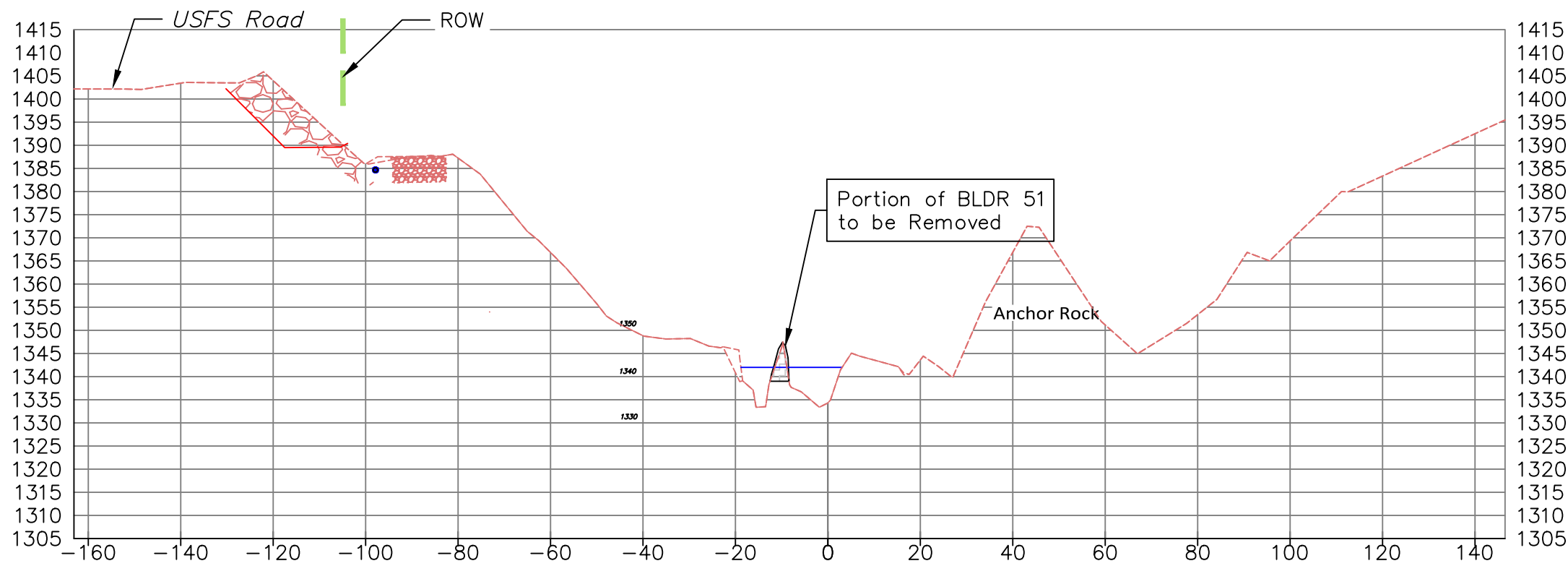
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

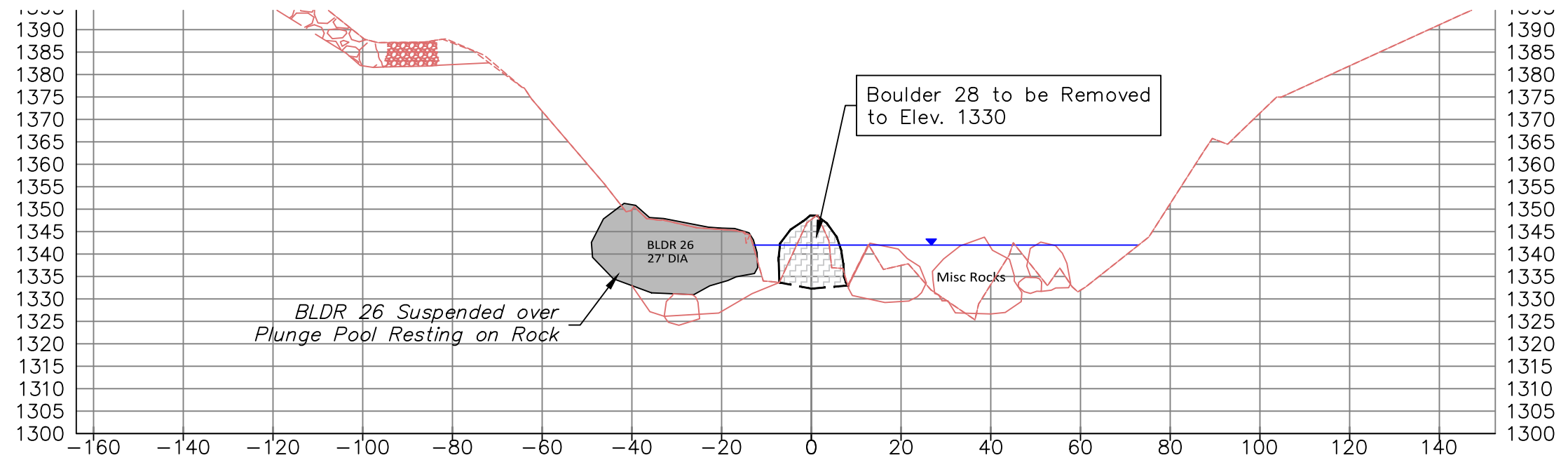
Sections

12 17
SHEET OF



L
5 | 13

Channel Section L - Step 1 (View Downstream)
SCALE: 1"=30'

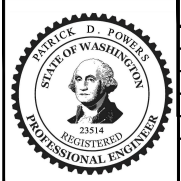


M
5 | 13

Channel Section M (View Downstream)
SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING.
 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

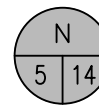
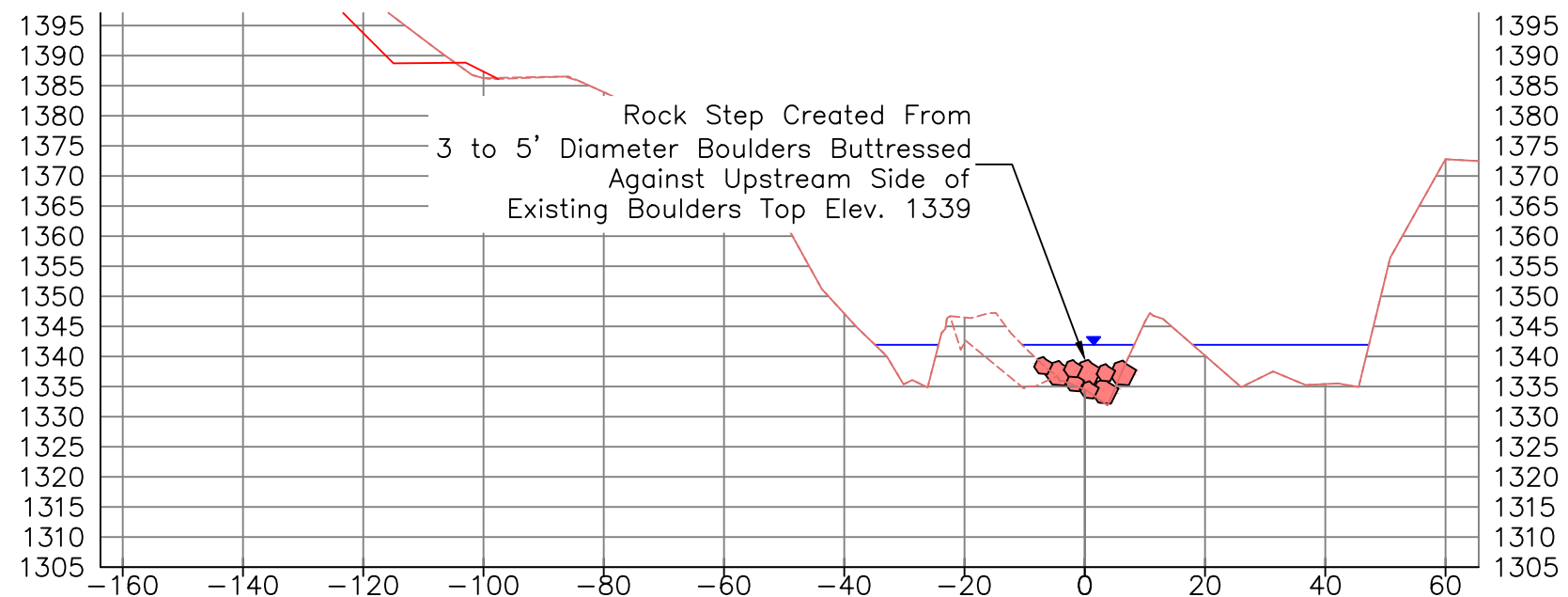
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

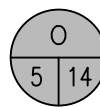
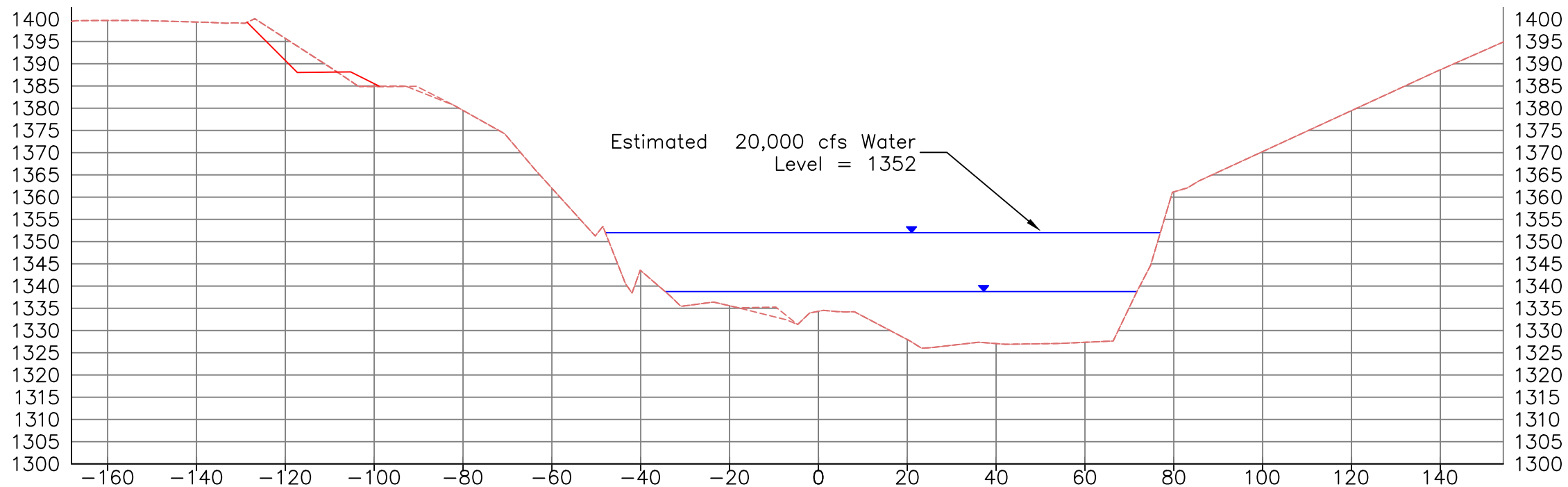
Sections

13 **17**
SHEET OF



Channel Section N (View Downstream)

SCALE: 1"=30'

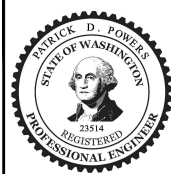


Channel Section O (View Downstream)

SCALE: 1"=30'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

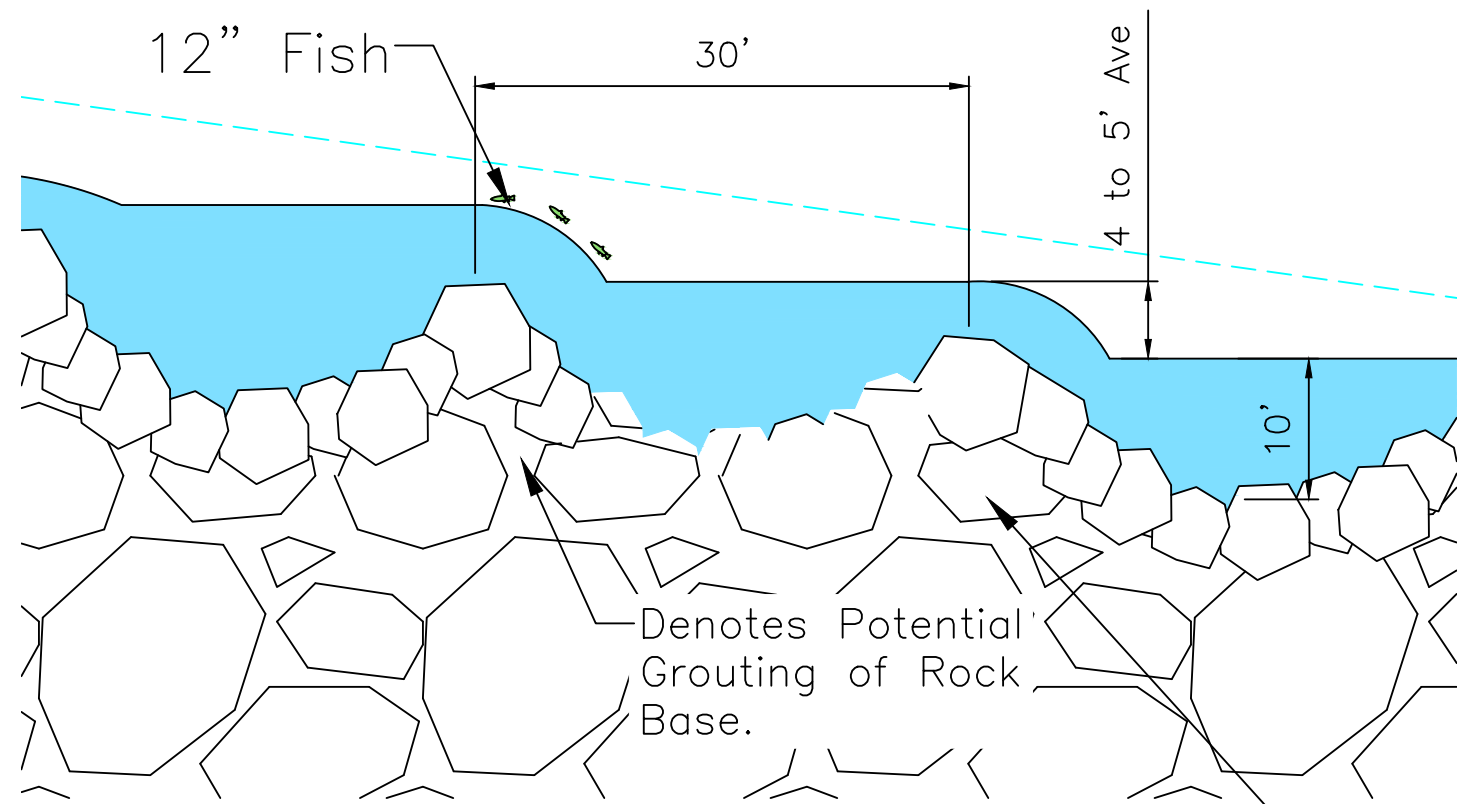
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

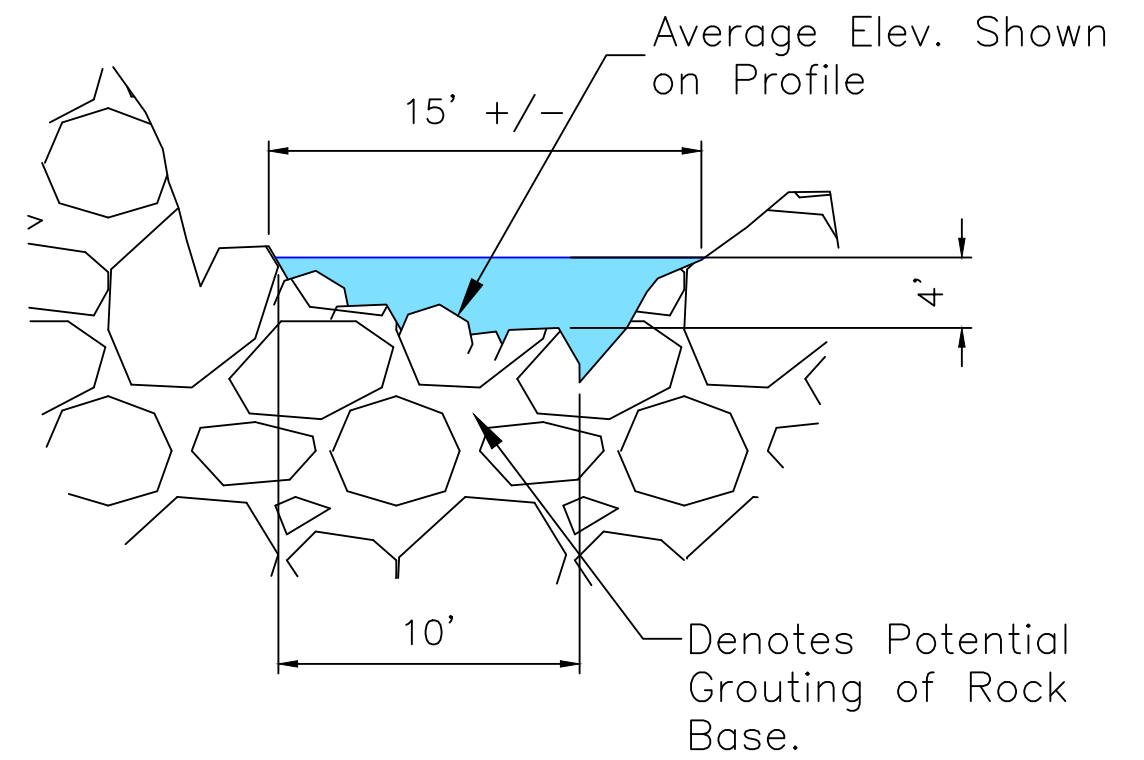
DATE:
4/13/18

Sections

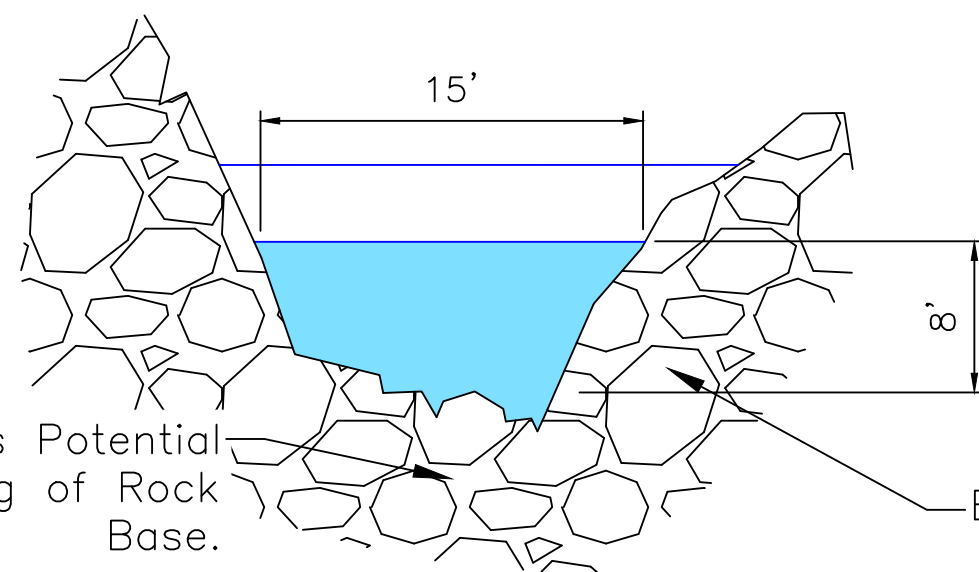
14 **17**
SHEET OF



11% Slope Channel Profile
SCALE: 1" = 10'



Typical Step/Weir
SCALE: 1" = 10'



Typical Pool Detail
SCALE: 1" = 10'

Existing Boulder Field



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

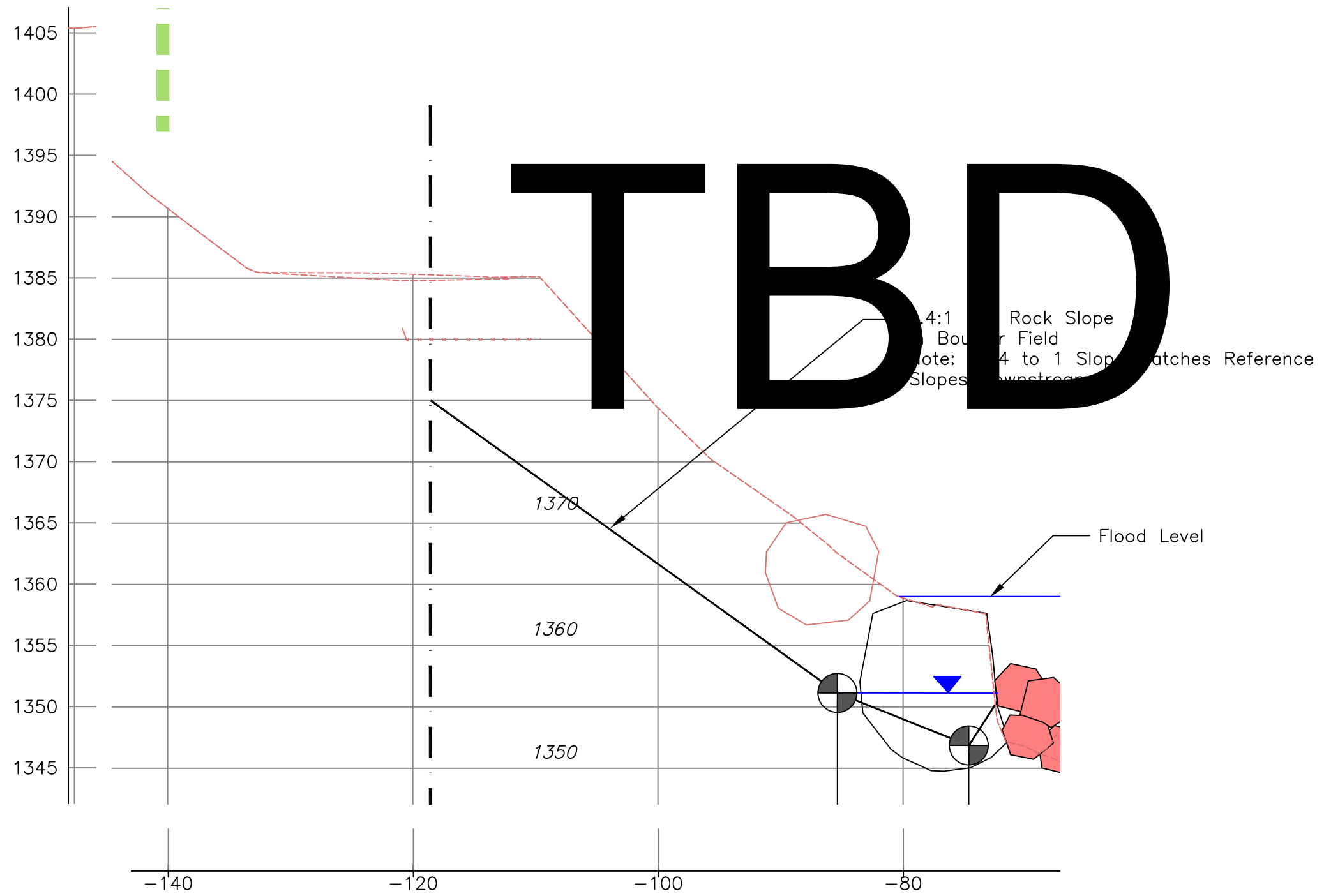
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

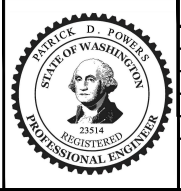
Step/Pool Channel Details



Typical Slope Section
SCALE: 1" = 10'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

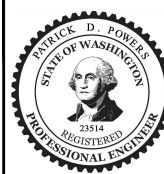
DATE:
03/03/2018

Rock Slope Detail

Extra Sheet for Details




Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION

BAR IS ONE INCH ON ORIGINAL DRAWING. 0  1"

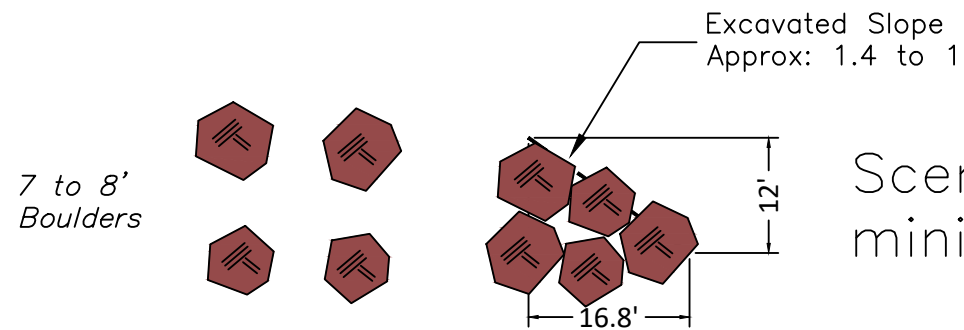
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

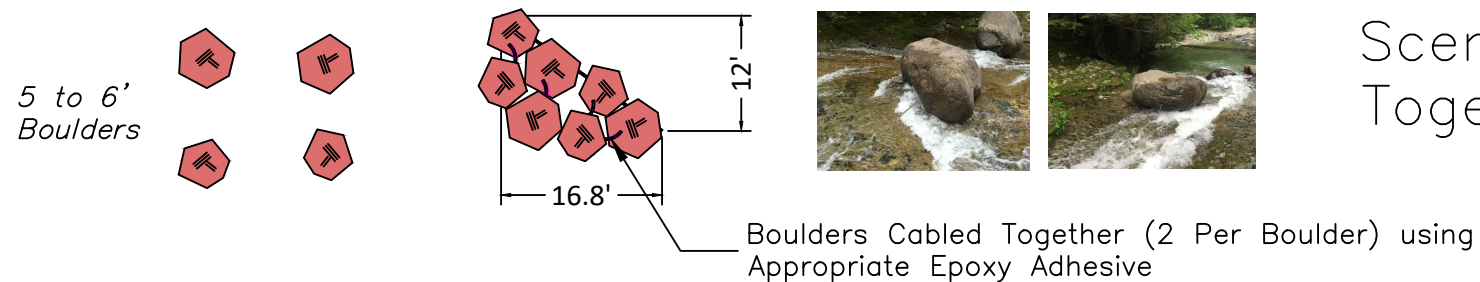
DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

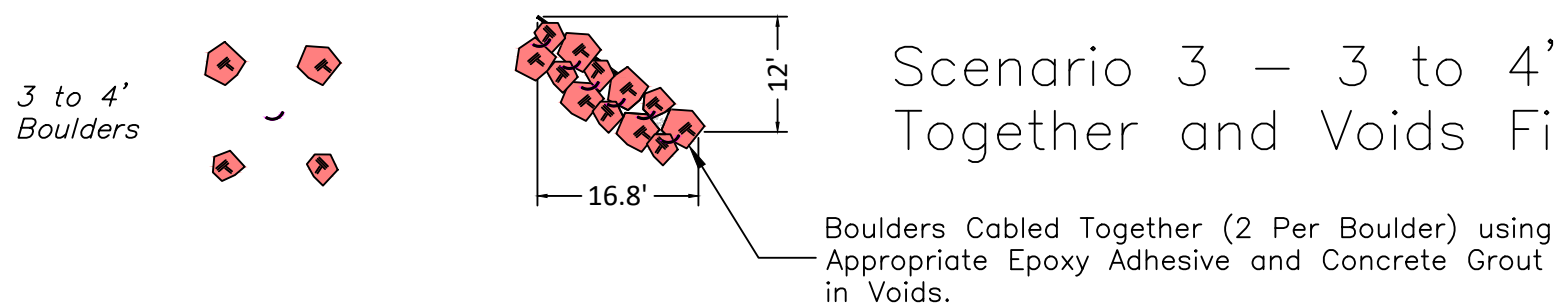
17 17
SHEET OF



Scenario 1 – Existing Boulders are 7 to 8' minimum diameter and will resist scour



Scenario 2 – 5 to 6' Boulders Cabled Together.



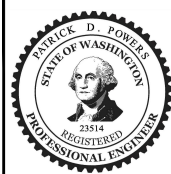
Scenario 3 – 3 to 4' Boulders Cabled Together and Voids Filled with Concrete

Construction Options for Rock Slope Below 20,000 cfs

SCALE: 1" = 20'



Icicle Boulder Field Passage



REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION

BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1"

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting

DATE:
03/03/2018

Slope Construction Details

17 OF 17 SHEET

ICICLE CREEK FISH PASSAGE

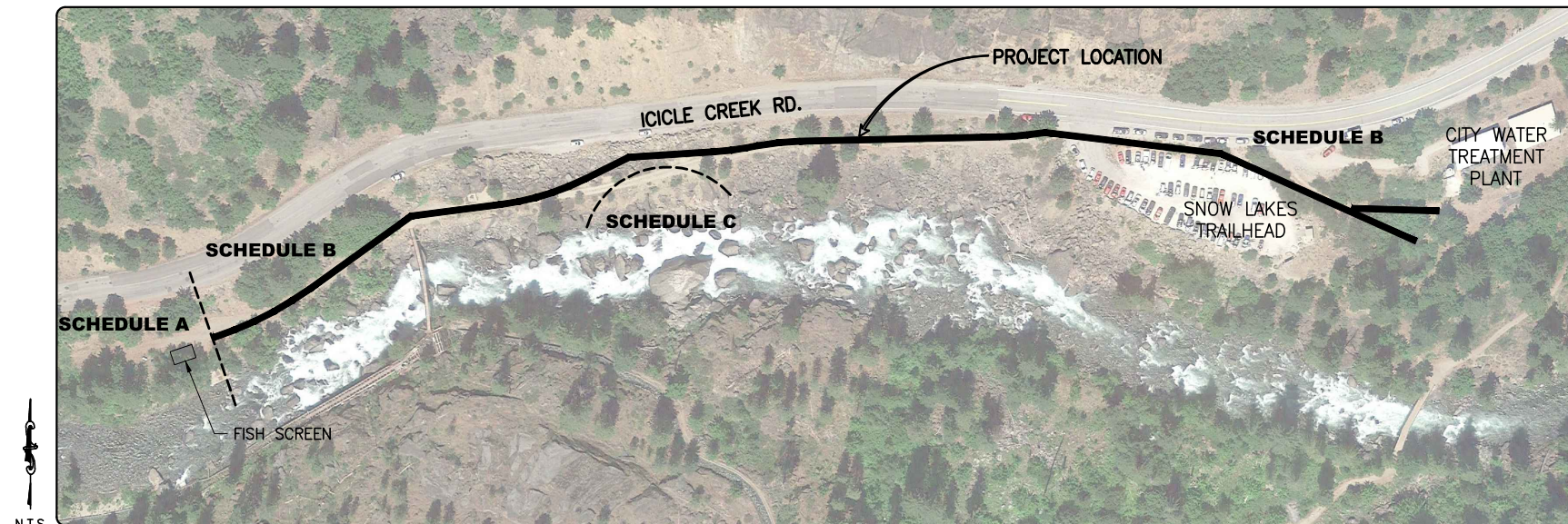
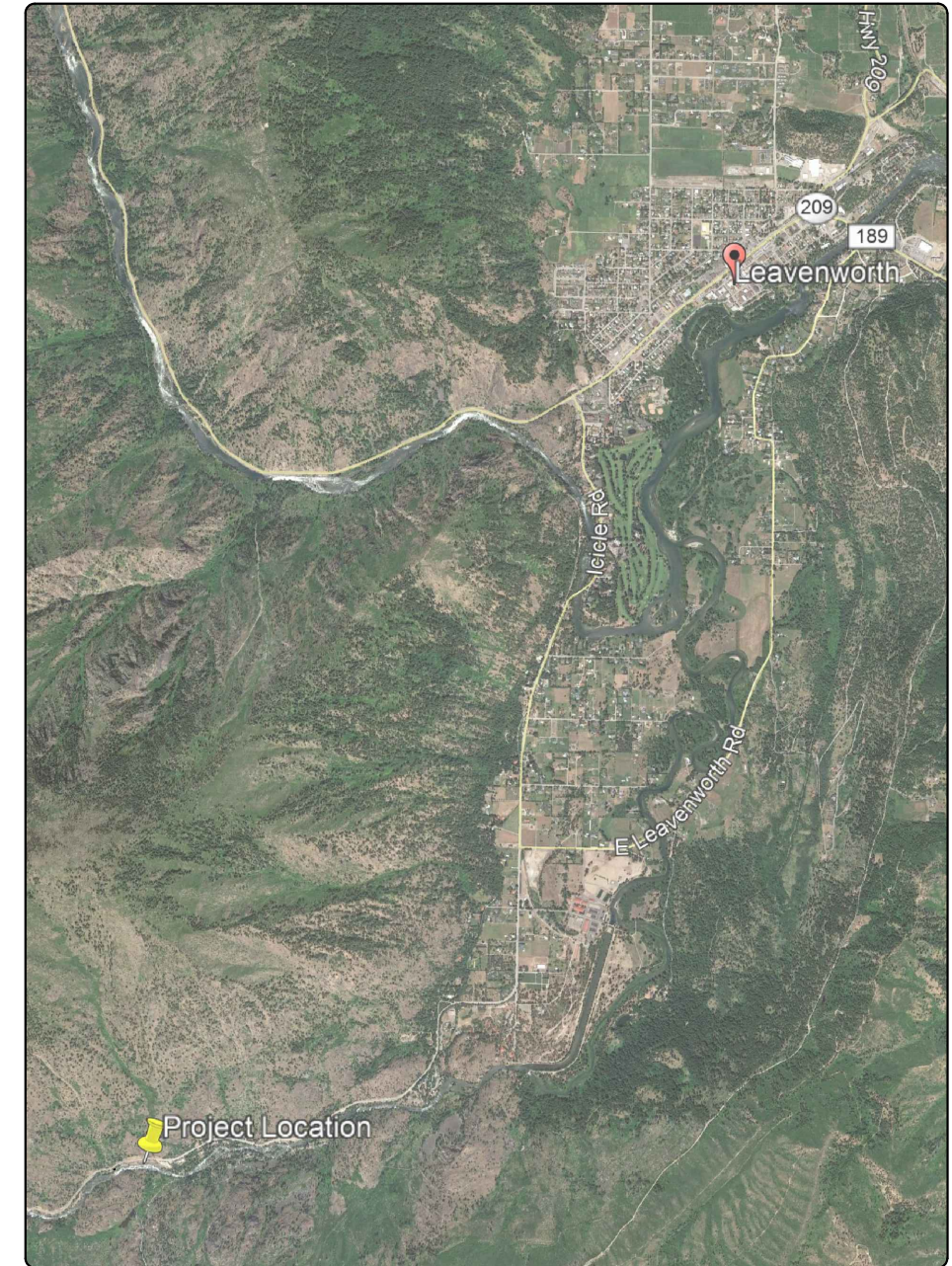
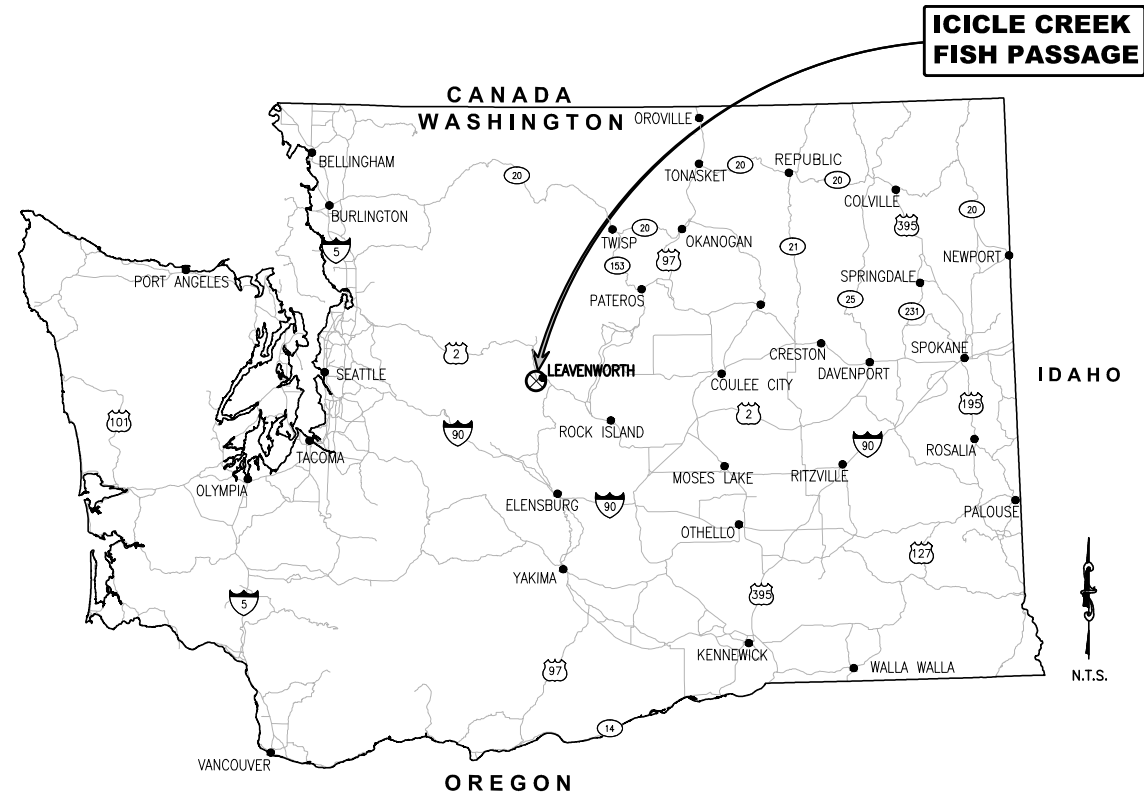
SCHEDULE B

CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

FOR TROUT UNLIMITED

JANUARY 2019

(DRAFT)



PROJECT LOCATION

VICINITY MAP

1780102-Sht 01 (Cover)

ABBREVIATIONS

	PIPE	AC CONC CMP CI DI FM GS PVC RCP STL	ASBESTOS CONCRETE CONCRETE CORRUGATED METAL PIPE CAST IRON DUCTILE IRON FORCE MAIN GALVANIZED STEEL POLYVINYL CHLORIDE PIPE REINFORCED CONCRETE PIPE STEEL PIPE	MISC	A.C. B BLM B.O.W. CB C.F.S. CL C.O. CONC. CSBC CSTC C.Y. D DEC. DET. DIA. DIM. DR DW DWG E EG ELEV. EP EXIST. FF FG FH FT. GR HP HWY I.E. IN. LF	ASPHALT CONCRETE BASEMENT BUREAU OF LAND MANAGEMENT BACK OF WALL CATCH BASIN CUBIC FEET PER SECOND CENTERLINE CLEAN OUT CONCRETE CRUSHED SURFACING BASE COURSE CRUSHED SURFACING TOP COURSE CUBIC YARD DIRT DECIDUOUS DETAIL DIAMETER DIMENSION DRAIN PIPE DRYWELL DRAWING EAST EXISTING GRADE ELEVATION EDGE OF PAVEMENT EXISTING FINISH FLOOR FINISH GRADE FIRE HYDRANT FOOT OR FEET GRADE HIGH PRESSURE HIGHWAY INVERT ELEVATION INCHES LINEAL FEET	MAX. MH MIN. N N.I.C. NO. NTS O.C. PP P.S.I. Q.C. Q.D. REV. REQ'D RD. R.R. R/W S S= SD SHT. SL SS ST. STA STD. SW SWMMEW SY T.B.M. T.O.P. T.O.W. TYP. W	MAXIMUM MANHOLE MINIMUM NORTH NOT IN CONTRACT NUMBER NOT TO SCALE ON CENTER POWER POLE POUNDS PER SQUARE INCH FULL PIPE CAPACITY DESIGN FLOW REVISED REQUIRED ROAD RAILROAD RIGHT-OF-WAY SOUTH SLOPE STORM DRAIN SHEET SURVEY LINE SANITARY SEWER STREET STATION STANDARD SIDEWALK STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON SQUARE YARD TEMPORARY BENCH MARK TOP OF PIPE TOP OF WALL TYPICAL WEST
--	------	--	--	------	--	--	--	--

LEGEND

DESCRIPTION	EXISTING	PROPOSED	DESCRIPTION	EXISTING	PROPOSED
SURVEY					
ALUMINUM CAP	⊙		SURFACE		
CONCRETE MONUMENT	⊗		ASPHALT-EDGE		
HUB AND TACK	⊗		GRAVEL/DIRT-EDGE		
MONUMENT IN CASE	⊕		CONCRETE-EDGE (EX)		
PK NAIL	⊕		TREE/SHRUB		
SCRIBE	+SC		CREEK/DITCH	---	---
STORM SEWER					
CULVERT	>--<		SURVEY		
WATER					
VALVE	⊗	⊗	SURVEY CENTERLINE	---	---
FIRE HYDRANT	⊗	⊗	CONTOUR	---	---
UTILITIES					
UTILITY POLE	⊙		CONTOUR (INDEX)	---2010---	---2010---
UTILITY POLE ANCHOR	↑		RIGHT-OF-WAY	---	---
TELEPHONE RISER	⊗		UTILITIES		
WATER --- 8"W(PVC) ---					
TRAFFIC SIGN					
SIGN	⊗				

SURVEY NOTES

NOTES	DATUM	PROJECT SURVEYOR																												
1. ORIGINAL SURVEYING COMPLETED JUNE 2014 ADDITIONAL SURVEY COMPLETED NOVEMBER 2017.	HORIZONTAL - STATE PLANE COORDINATES WASHINGTON NORTH ZONE NAD 83 (2011). SCALE FACTOR = 0.99992931, CONVERGENCE ANGLE = 0°05'30"	COMPANY: MTN 2 COAST LLC. 2320 MOTTMAN RD. SW, STE 106 TUMWATER, WA 98512																												
2. INSTRUMENT USED; SOKKIA SRX3 TOTAL STATION AND TOPCON GR5 GPS.	BASED ON GPS STATIC OBSERVATION PROCESSED THROUGH NOAA OPUS	CONTACT: BLAIR E. PRIGGE, PLS PHONE: (360) 512-9198																												
3. ONLY VISIBLE SURFACE UTILITY APPURTENANCES WHERE LOCATED. NO UNDERGROUND UTILITIES WERE LOCATED OR SHOWN ON THIS MAP. A UTILITY LOCATOR SERVICE WAS NOT USED. THIS MAP DOES NOT PURPORT TO SHOW ALL UTILITIES.	VERTICAL - NAVD 88 BASED ON GPS STATIC OBSERVATION.	CONTROL POINTS																												
4. CONTOURS SHOWN IN RIVER AREA ARE A COMPILED OF WATERFALL ENGINEERING AND MTN2COAST MAPPING.		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>POINT NAME</th> <th>NORTHING</th> <th>EASTING</th> <th>ELEVATION</th> </tr> </thead> <tbody> <tr> <td>WFE PT # 4</td> <td>198610.82</td> <td>1670408.87</td> <td>1382.43</td> </tr> <tr> <td>WFE PT # 3</td> <td>198571.40</td> <td>1670238.51</td> <td>1390.02</td> </tr> <tr> <td>WFE PT # 2</td> <td>198531.01</td> <td>1670021.64</td> <td>1394.74</td> </tr> <tr> <td>WFE PT #1</td> <td>198411.10</td> <td>1669795.83</td> <td>1408.23</td> </tr> <tr> <td>M2C PT # 105</td> <td>198584.84</td> <td>1669990.61</td> <td>1417.34</td> </tr> <tr> <td>WFE PT # 111</td> <td>198623.00</td> <td>1670224.93</td> <td>1405.49</td> </tr> </tbody> </table>	POINT NAME	NORTHING	EASTING	ELEVATION	WFE PT # 4	198610.82	1670408.87	1382.43	WFE PT # 3	198571.40	1670238.51	1390.02	WFE PT # 2	198531.01	1670021.64	1394.74	WFE PT #1	198411.10	1669795.83	1408.23	M2C PT # 105	198584.84	1669990.61	1417.34	WFE PT # 111	198623.00	1670224.93	1405.49
POINT NAME	NORTHING	EASTING	ELEVATION																											
WFE PT # 4	198610.82	1670408.87	1382.43																											
WFE PT # 3	198571.40	1670238.51	1390.02																											
WFE PT # 2	198531.01	1670021.64	1394.74																											
WFE PT #1	198411.10	1669795.83	1408.23																											
M2C PT # 105	198584.84	1669990.61	1417.34																											
WFE PT # 111	198623.00	1670224.93	1405.49																											

GENERAL NOTES

- THESE PLANS SHOW THE DESIGN FOR CONSTRUCTION OF THE ACCESS ROAD, WATER MAIN AND RETAINING WALLS FOR THE ICICLE CREEK FISH PASSAGE PROJECT (PROJECT). OTHER WORK ASSOCIATED WITH THE PROJECT INCLUDE CONSTRUCTION OF A FISH FILTER AND A FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING THE WORK AND CONSTRUCTION OF THE ENTIRE PROJECT.
- ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
- THE SNOW LAKE TRAILHEAD IS TO REMAIN OPEN TO THE PUBLIC AT ALL TIMES WITH THE FOLLOWING EXCEPTIONS THAT SHALL OCCUR PRIOR TO MAY 15, 2019. THE TRAILHEAD AND ROAD WILL BE OPEN TO THE PUBLIC AND HAVE NO TRAVEL RESTRICTIONS OR CONTRACTOR WORK AFTER MAY 15, 2019:
 - ONE DAY DURING INSTALLATION OF THE WATER MAIN
 - ONE DAY FOR PAVEMENT PATCHING OF THE DRIVEWAY ENTRANCE.
- WHERE KNOWN, EXISTING UTILITIES ARE SHOWN ON THE PLANS FOR THE CONVENIENCE OF THE CONTRACTOR. LOCATIONS SHOWN ARE APPROXIMATE AND DEPTHS ARE GENERALLY NOT KNOWN. OTHER UTILITIES MAY EXIST IN THE WORK AREAS THAT ARE NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL VERIFY THE EXISTENCE, LOCATION, NATURE AND DEPTH OF THE EXISTING UTILITIES IN THE WORK AREA PRIOR TO CONSTRUCTION BY CONTACTING ALL UTILITY OWNERS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT AND REPAIR ALL UTILITIES ENCOUNTERED DURING CONSTRUCTION. OVERHEAD UTILITIES ARE GENERALLY NOT SHOWN.
- WHERE THE POTENTIAL FOR CONFLICT WITH AN EXISTING UTILITY CROSSING EXISTS, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO EXPOSE, AS NECESSARY, THE EXISTING UTILITY ADEQUATELY IN ADVANCE OF HIS TRENCHING AND PIPE LAYING ACTIVITIES SO THAT IF NECESSARY, AN ADJUSTMENT TO GRADE FOR THE NEW PIPELINE CAN BE PROPOSED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER

ACCESS ROAD NOTES

- 12 FOOT WIDE ACCESS ROAD IS TO BE CONSTRUCTED OF 8 INCH THICK COMPACTED CRUSHED SURFACING BASE COURSE (CSBC).
- ACCESS ROAD IS TO BE SLOPED TOWARDS BANK, AWAY FROM RIVER WITH DRAINAGE DIPS INSTALLED APPROXIMATELY EVERY 200 FEET AND AT LOW SPOTS IN THE ROAD.

RETAINING WALL NOTES

- THE UPPER GABION RETAINING WALL MUST BE INSTALLED BEFORE MAY 15, 2019 TO CONFORM TO THE CONSTRUCTION WINDOW OF APRIL 1, 2019 THROUGH MAY 15, 2019 WHEN ICICLE ROAD CAN BE USED BY THE CONTRACTOR FOR CONSTRUCTION.
- THE LOWER GABION RETAINING WALL LAYOUT IS BASED ON THE DESIGN FOR THE FISH PASSAGE. THE CONTRACTOR IS RESPONSIBLE TO VERIFY AND COORDINATE THE CONSTRUCTION OF THE FISH PASSAGE AND LOWER WALL WORK.
- BASKET FILL MAY CONSIST OF ON-SITE GRAVELS AND COBBLES THAT ARE ANGULAR OR CRUSHED TO PARTICLE SIZES BETWEEN 4 AND 8 INCHES IN DIAMETER. IMPORTED BASKET FILL, IF REQUIRED, SHALL MEET THE WSDOT STANDARD SPECIFICATION 9-27.3(6) FOR STONE. THE BASKET FILL SHALL BE PLACED IN A MANNER THAT MINIMIZES VOID SPACE IN THE BASKETS.

WATER MAIN NOTES

- ALL NEW WATER MAIN PIPE SHALL BE DUCTILE IRON PER SECTION 9.30.1(1).
- PIPE JOINT RESTRAINT SHALL BE FIELD LOK 350 GASKETS BY US PIPE OR APPROVED EQUAL.
- FITTING JOINT RESTRAINT SHALL BE MEGALUG SERIES 1100 BE EBAA IRON OR APPROVED EQUAL.
- CONCRETE THRUST BLOCKS SHALL BE USED ONLY WHERE SHOWN ON THE DRAWINGS.
- TEST PRESSURE FOR WATER MAINS SHALL BE 80 PSI. MINIMUM DURATION SHALL BE 2 HOURS.
- FIRE HYDRANTS SHALL CONFORM TO AWWA C502 WITH TWO 2-1/2" HOSE CONNECTIONS, ONE 4-1/2" PUMPER PORT AND 5-1/2" VALVE OPENING. OPERATING NUT SHALL CONFORM TO THE OWNER'S STANDARD.
- DETECTABLE MARKING TAPE SHALL BE 5.0 MIL OVERALL THICKNESS, WITH A 50 GAUGE ALUMINUM FOIL CORE COVERED BY POLYETHYLENE. TAPE SHALL BE COLOR CODED, IMPREGNATED WITH PERMANENT MESSAGE PRINTING UNDER A MYLAR LAYER. COLOR AND MESSAGE SHALL BE APPROPRIATE FOR SPECIFIC UTILITY. TAPE SHALL BE THORTEC, OR EQUAL.
- RIGID INSULATION SHALL BE CLOSED CELL, EXTRUDED POLYSTYRENE FOAM WITH MINIMUM COMPRESSIVE STRENGTH OF 25 PSI (ASTM D1621-73) AND MAXIMUM WATER ABSORPTION OF 0.3% (ASTM C272-73). MINIMUM INSULATION BOARD THICKNESS SHALL BE 2", WIDTH 48". INSULATION SHALL BE USED ONLY WHEN APPROVED BY THE OWNER WHEN A MINIMUM 5 FEET OF COVER CANNOT BE ACHIEVED.
- ALL NEW PIPE SHALL BE LAID TO THE LINES AND GRADES AS SHOWN ON THE DRAWINGS. ALL NEW PIPE SHALL HAVE A MINIMUM BURY DEPTH OF 5 FEET TO THE TOP OF PIPE. IF NECESSITATED BY FIELD CONDITIONS, AND WITH OWNER APPROVAL, THE CONTRACTOR MAY INSTALL THE PIPE WITH A MINIMUM OF 4 FEET COVER WITH INSULATION BOARD. SEE WATER MAIN DETAIL SHEET.
- PIPE ALIGNMENTS INCLUDE BOTH VERTICAL AND HORIZONTAL CURVES. CONTRACTOR SHALL INSTALL THE PIPE ALONG THE CURVE RADIUS SHOWN ON THE DRAWINGS BY DEFLECTING THE PIPE AT THE JOINTS/FITTING PER SECTION 7-09.3(15)A. IN NO CASE SHALL A SINGLE PIPE/FITTING JOINT BE DEFLECTED AT GREATER THAN 80% OF THE MANUFACTURER'S RECOMMENDED MAXIMUM JOINT DEFLECTION.
- ALL WATER MAINS SHALL BE INSTALLED IN SUCH A MANNER AS TO AVOID INTERMEDIATE HIGH POINTS.
- CONTRACTOR SHALL DISPOSE OF ALL EXISTING VALVES, PIPES, FITTINGS, ETC. REMOVED AS PART OF THE WORK, OR IF REQUESTED BY THE OWNER THE CONTRACTOR SHALL DELIVER REMOVED ITEMS SELECTED BY THE OWNER TO THE CITY SHOP.
- WHENEVER MULTIPLE ELBOWS ARE USED TO ACHIEVE A SINGLE BEND THEY SHALL BE FLANGED TOGETHER.

SURFACE REPLACEMENT NOTES

- SURFACE REPLACEMENT FOR PAVED SURFACING REMOVED FOR CONSTRUCTION SHALL BE 2" COMMERCIAL HMA CLASS 1/2" PG 64-28 OVER 6" CSBC GRAVEL BASE. HMA SHALL BE FURNISHED AND INSTALLED PER SECTION 5-04. GRAVEL BASE SHALL BE FURNISHED AND INSTALLED PER SECTION 4-02.
- WHERE PAVEMENT TO BE REPLACED ABUTS EXISTING PAVEMENT IT SHALL BE SAWCUT OR WHEEL CUT PRIOR TO REPLACEMENT. ALL CUTS SHALL BE PARALLEL OR PERPENDICULAR TO THE ROADWAY.
- THE CONTRACTOR SHALL RE-ESTABLISH THE PUBLIC ROADWAYS DISTURBED BY HIS OPERATIONS TO THEIR ORIGINAL GRADES, LOCATION AND WIDTH. THE COMPLETED SURFACE OF ALL COURSES SHALL BE OF UNIFORM TEXTURE, SMOOTH UNIFORM CROWN AND GRADE IN ACCORDANCE WITH SECTION 5-04.3 (13) OF THE WSDOT STANDARD SPECIFICATIONS.
- SURFACE REPLACEMENT FOR GRAVELED AREAS SHALL BE 6" CSBC GRAVEL SURFACE REPLACEMENT OF EXISTING GRAVEL SURFACES SHALL BE FURNISHED AND INSTALLED IN ACCORDANCE WITH SECTION 4-04.

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05	TRAFFIC CONTROL PLAN
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09	WATER MAIN ALIGNMENT
10	WATER MAIN - PLAN & PROFILE STA 10+00 TO STA 14+50
11	WATER MAIN - PLAN & PROFILE STA 14+50 TO STA 21+00
12	WATER MAIN - PLAN & PROFILE STA 21+00 TO STA 24+55
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16	WATER MAIN - DETAIL
ASPECT CONSULTING	
1.	UPPER WALL AT USFS ROAD
2.	LOWER WALL AT IPID ACCESS ROAD

ROCK EXCAVATION NOTES

- ROCK EXCAVATED FROM THIS SITE MAY BE USED ONSITE UNDER THE FOLLOWING CONDITIONS WITH ENGINEER APPROVAL:
 - ROCK OF APPROPRIATE SIZE AND GRADING MAY BE USED AS BACKFILL FOR THE WATER MAIN OR AS FILL UNDER THE ACCESS ROAD. SEE SHEET 16.
 - ROCK AND OTHER EXCAVATED MATERIAL MAY BE USED TO CONSTRUCT THE SECONDARY ACCESS ROAD TO THE WEST. SEE SCHEDULE A.
 - ROCK MAY BE PLACED ON 1.5 : 1 SLOPE ABOVE ACCESS ROAD WITH ENGINEER APPROVAL. ROCK MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND SHALL NOT ENCRUCH INTO THE 12 FOOT CLEAR LOWER ACCESS ROADWAY.
 - ROCK AND OTHER EXCAVATED MATERIAL MAY BE WASTED AGAINST EXISTING SLOPE BETWEEN ACCESS ROAD AND USFS ROADWAY FROM THE SECONDARY ACCESS ROAD TO ACCESS ROAD STA 13+00. MATERIAL MUST BE PLACED IN A PERMANENTLY STABLE MANNER AND PROTECTED FROM EROSION.

SNOWLAKES TRAILHEAD NOTES

- CONTRACTOR SHALL NOT EXCAVATE OR ALLOW EXCAVATION TO OCCUR ON BLM PROPERTY.
- CONTRACTOR CAN USE PROPERTY AND PARKING AREA FOR OTHER CONSTRUCTION ACTIVITIES INCLUDING DRIVING, SPOIL PILES, MATERIAL STORAGE (ONLY FOR MATERIALS TO BE INCORPORATED IN THAT DAYS WORK, NO EXCESS MATERIALS WITHOUT PROJECT OWNER APPROVAL).
- CONTRACTOR SHALL ALLOW ACCESS TO THE PARKING AREA, AND PARKING ALONG THE SOUTHERN PORTION OF THE PARKING AREA, TO THE PUBLIC AT ALL TIMES, EXCEPT FOR WHEN INSTALLING PIPE THROUGH THE ENTRANCE.
- CONTRACTOR SHALL RESTORE THE ENTRANCE AND PARKING LOT SURFACING TO EQUAL OR BETTER CONDITION BY MAY 15TH. THIS INCLUDES FINISH GRADING, PAVING, AND GRAVEL SURFACE RESTORATION.
- CLOSING OF THE PARKING AREA AND ACCESS TO THE PARKING AREA DURING CONSTRUCTION SHALL BE COORDINATED WITH THE USFS.

EMERGENCY BYPASS PUMPING SYSTEM

- THE CITY OF LEAVENWORTH (CITY) WATER SUPPLY IS PROVIDED BY SURFACE WATER, VIA THE WATER TREATMENT PLANT (WTP), AND GROUNDWATER VIA CITY WELLS. THE 16-INCH WATER MAIN TO BE REPLACED PROVIDES SURFACE WATER SUPPLY TO THE CITY WTP. THE GROUNDWATER WELLS HAVE SUFFICIENT SUPPLY CAPACITY TO MEET NORMAL DEMANDS DURING CONSTRUCTION. THE CONTRACTOR MAY SHUT OFF AND DRAIN THE 16-INCH WATER MAIN TO THE CITY WTP DURING CONSTRUCTION FROM THE FIRST DAY OF ONSITE WORK UNTIL SUBSTANTIAL COMPLETION. THIS EXISTING WATER MAIN MAY BE ABANDONED IN PLACE OR REMOVED AS NEEDED FOR CONSTRUCTION.
- IN THE EVENT ONE OR MORE CITY WELLS FAIL DURING CONSTRUCTION AND ARE UNABLE TO PROVIDE SUFFICIENT SUPPLY TO THE CITY THE CONTRACTOR SHALL BE RESPONSIBLE TO PROVIDE SURFACE WATER SUPPLY TO THE WTP AND SHALL BE ABLE TO SETUP AND PROVIDE THIS SUPPLY WITHIN 24 HOURS OF NOTIFICATION.
- DURING THE PERIOD THE 16-INCH WATER MAIN TO THE WTP IS REMOVED FROM SERVICE, THE CONTRACTOR SHALL HAVE ONSITE OR READILY AVAILABLE A BYPASS PUMPING SYSTEM CAPABLE OF DELIVERING A CONSTANT RATE OF 700 GPM TO THE WTP. THIS SYSTEM INCLUDES PUMPS, PIPING, FITTING AND APPURTENANCES AS NEEDED TO CONNECT THE WTP TO THE EXISTING MAIN UPSTREAM OF THE WORK AREA. THIS SYSTEM WILL BE CAPABLE OF 24 HOUR OPERATION UNTIL THE CITY WELLS ARE RETURNED TO SERVICE. TEMPORARY BYPASS PUMP PIPING MAY BE LAID ALONG THE SHOULDER OF THE USFS ROAD. ACCESS TO THE SNOWLAKES TRAILHEAD PARKING AREA SHALL BE MAINTAINED.
- A BID ITEM IS PROVIDED FOR THE FOLLOWING ITEMS:
 - STANDBY EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE LUMP SUM PAYMENT FOR PROVIDING THE EMERGENCY PUMPING SYSTEM ON STANDBY AND SHALL BE PAID UPON APPROVAL OF THE STANDBY EMERGENCY BYPASS PUMPING SYSTEM SUBMITTAL AND CONFIRMATION OF EQUIPMENT AND MATERIALS ONSITE.
 - SETUP / REMOVAL OF EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE LUMP SUM PAYMENT PER EACH FOR SETUP AND REMOVAL OF THE EMERGENCY BYPASS PUMPING SYSTEM. SETUP SHALL INCLUDE MAKING OPERATIONAL WITHIN 24 HOURS OF NOTIFICATION. REMOVAL OF EMERGENCY BYPASS PUMPING SYSTEM SHALL BE AFTER NOTIFICATION BY OWNER TO REMOVE SYSTEM.
 - OPERATION OF EMERGENCY BYPASS PUMPING SYSTEM:** THIS SHALL BE PAYMENT PER DAY FOR OPERATION OF EMERGENCY BYPASS PUMPING SYSTEM FOR EACH 24 HOURS OF OPERATION IN WHICH THE SYSTEM SUPPLIES THE WTP AT THE NOTED CAPACITY. DAYS IN WHICH OPERATION IS LESS THAN 24 HOURS THE PAY ITEM WILL BE PRORATED FOR THE PERIOD OF OPERATION.

ICICLE CREEK FISH PASSAGE

CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

LEGEND, ABBREVIATIONS, NOTES, INDEX

SHEET

02

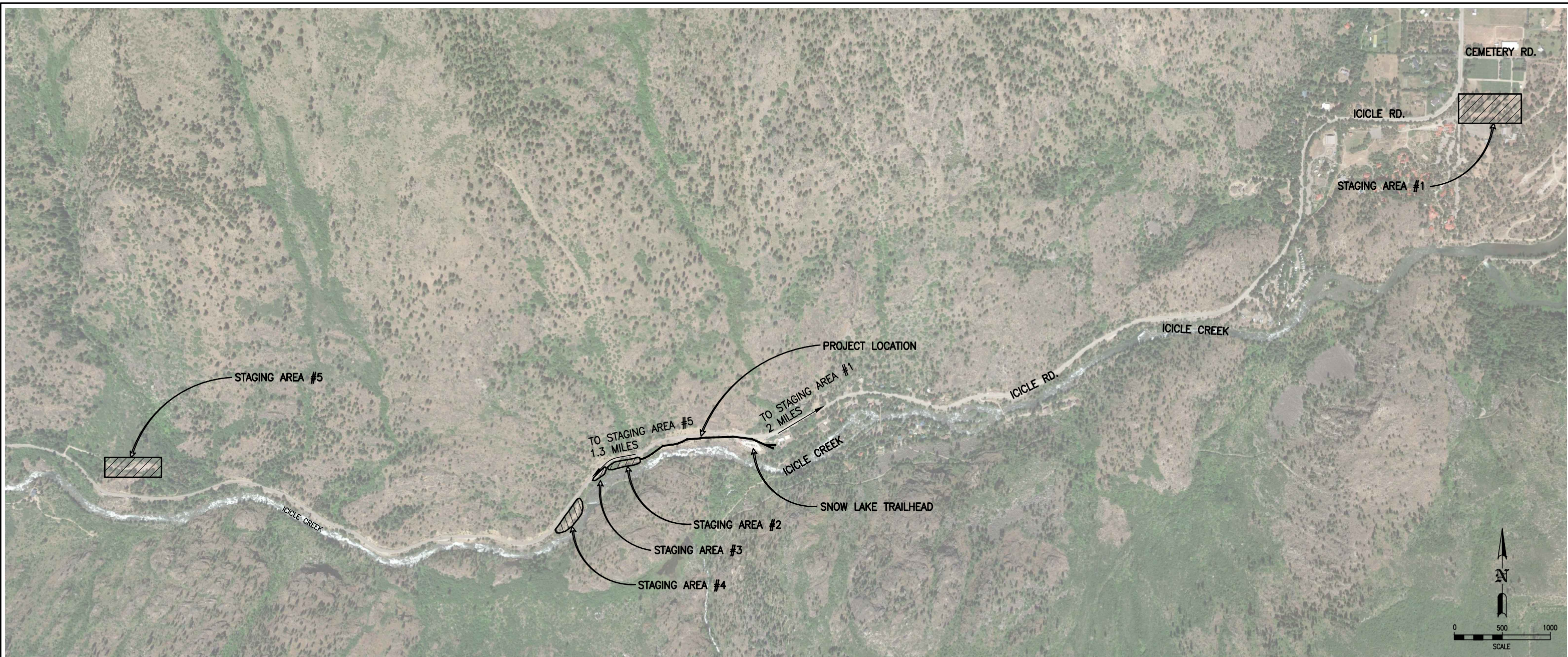
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DATE: 12/11/18



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NOTES

1. PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD TRAFFIC RESTRICTIONS ARE ALLOWED PRIOR TO MAY 15, 2016. SEE TRAFFIC CONTROL PLAN. ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019 WITH THE EXCEPTION OF STAGING AREA #3. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.
2. POTENTIAL STAGING AREAS HAVE BEEN IDENTIFIED FOR CONTRACTOR USE BY THE AGENCIES ASSOCIATED WITH THE PROJECT. THE CONTRACTOR SHALL COORDINATE ACCESS, USE, SECURITY, CLEANUP AND RESTORATION WITH THE AGENCY THAT OWNS THE SITE. APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL ARE TO BE INSTALLED AND MAINTAINED FOR DURATION OF USE. THE FOLLOWING STAGING AREAS ARE AVAILABLE FOR USE BY THE CONTRACTOR.
 - a. STAGING AREA #1 – SOUTH OF CITY CEMETERY, OWNED BY CITY OF LEAVENWORTH. AVAILABLE FOR DURATION OF PROJECT. CONTRACTOR MAY USE AREA FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL. STOCKPILED MATERIAL SHALL NOT BE LEFT PERMANENTLY. HOWEVER, A SMALL QUANTITY (~100 CY) OF ANGULAR ROCK/BOULDERS MAY BE LEFT WITH CITY APPROVAL. THE CITY REQUIRES THE AREA BE DELINEATED AND APPROPRIATE BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENT CONTROL BE INSTALLED FOR DURATION OF USE.
 - b. STAGING AREA #2 –ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - c. STAGING AREA #3 – TURNOUT PARKING AREA ADJACENT TO ICICLE ROAD, OWNED BY USFS. AVAILABLE FOR DURATION OF PROJECT.
 - d. STAGING AREA #4 – ADJACENT TO ICICLE ROAD, OWNED BY ICICLE IRRIGATION DISTRICT. AVAILABLE FOR DURATION OF PROJECT.
 - e. STAGING AREA #5 – PARKING AREA NORTH OF ICICLE ROAD, OWNED BY BLM SPOKANE OFFICE. NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND. AVAILABLE FOR DURATION OF PROJECT.
 - f. SNOW LAKE TRAILHEAD – NO EXCAVATION ALLOWED WITHIN BLM ADMINISTERED LAND INCLUDING THE SNOW LAKE TRAILHEAD. THE TRAILHEAD IS AVAILABLE FOR SORTING AND TEMPORARY STOCKPILING OF MATERIAL FROM APRIL 1, 2019 THROUGH MAY 15, 2019, THE CONTRACTOR WILL REMOVE ALL MATERIAL AND HAVE THE AREA RESTORED FOR PUBLIC USE BY MAY 16, 2019. EXCEPT FOR ACCESS TO THE CONSTRUCTION AREA NO CONTRACTOR USE WILL BE ALLOWED AFTER MAY 16, 2019.
3. OTHER STAGING AREAS MAY BE IDENTIFIED AND USED BY THE CONTRACTOR. THE CONTRACTOR SHALL NOTIFY THE OWNER IF OTHER STAGING AREAS WILL BE USED. A PROPERTY USE AND A PROPERTY RELEASE FORM WILL BE PROVIDED TO THE OWNER IF OTHER STAGING AREAS ARE USED.
4. THE SNOW LAKE TRAILHEAD WILL OPEN TO THE PUBLIC ON MAY 16, 2019. THE CONTRACTOR WILL INSTALL THE WATER MAIN, PRESSURE TEST IT, AND RESTORE THE AREA FROM STA. 20+00 TO STA. 23+00 BY MAY 15, 2019 TO ALLOW PUBLIC USE OF THE TRAILHEAD PARKING AREA.

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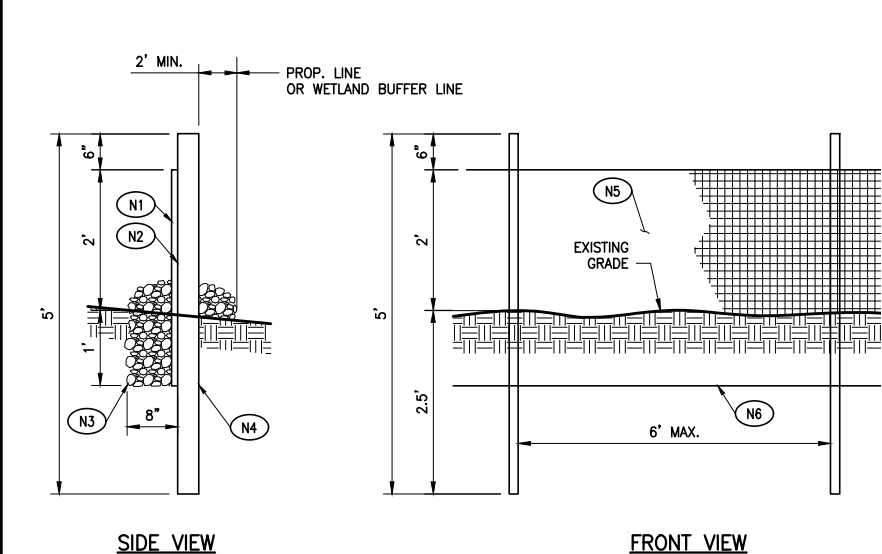
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VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

CONTRACTOR STAGING & COORDINATION

SHEET
03
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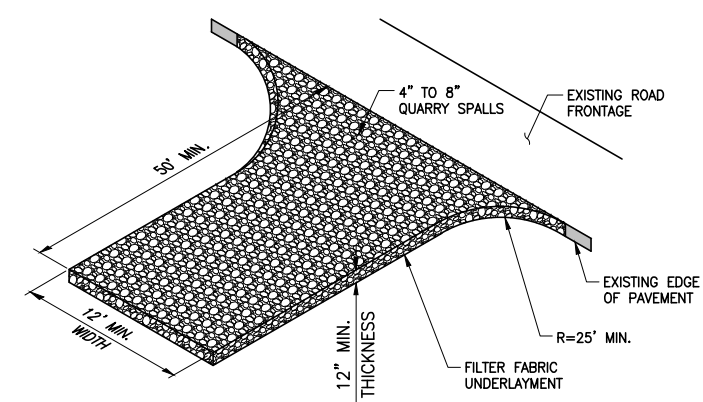


- NOTES**
- (N1) FILTER FABRIC MATERIAL MIRAFI 100 NS OR EQUIVALENT
 - (N2) 2"x2" BY 14 GA. WIRE FABRIC OR EQUIVALENT, AFFIX TO POST (LOCATED ON DOWNHILL SIDE OF FILTER FABRIC)
 - (N3) PROVIDE NATIVE BACKFILL
 - (N4) 2"x4" WOOD POST OR STEEL FENCE POST
 - (N5) FILTER FABRIC MATERIAL 60" WIDE, CONTINUOUS, ROLLS. USE RINGS TO ATTACH TO WIRE FABRIC
 - (N6) BURY BOTTOM OF FILTER MATERIAL IN 8"x12" TRENCH

1/04 SILT FENCE

NOTES

1. FILTER FABRIC FENCE SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6" OVERLAP, AND SECURELY FASTENED AT BOTH ENDS TO POST.
2. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AND DRIVEN SECURELY INTO THE GROUND (MAXIMUM OF 30").
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 8" WIDE AND 12" DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
4. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 1" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 4" AND SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE.
5. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO FENCE, AND 20" OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 24" ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. WHEN EXTRA-STRENGTH FILTER FABRIC AND CLOSER POST SPACING IS USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POST WITH ALL OTHER PROVISIONS OF ABOVE NOTES APPLYING.
7. FILTER FABRIC FENCES SHALL NOT BE REMOVED BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
8. FILTER FABRIC FENCES SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



2/04 ROCK CONSTRUCTION ENTRY

EROSION CONTROL NOTES

1. THE IMPLEMENT OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND VEGETATION IS ESTABLISHED.
2. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED BY THE CONTRACTOR FOR UNEXPECTED STORM EVENTS AND TO ENSURE THE SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE. THE CONTRACTOR SHALL IMPLEMENT BMPs C101-C162 OF THE SWMMW AS NEEDED TO MEET THESE REQUIREMENTS.
3. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
4. THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN 8 HOURS FOLLOWING A MAJOR STORM EVENT.
5. STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AT THE BEGINNING OF CONSTRUCTION AND MAINTAINED FOR THE DURATION OF THE PROJECT. ADDITIONAL MEASURES MAY BE REQUIRED TO INSURE THAT ALL PAVED AREAS ARE KEPT CLEAN FOR THE DURATION OF THE PROJECT.

EROSION CONTROL NOTES

1. CONTRACTOR SHALL COMPLETE, SUBMIT AND HAVE AN APPROVED SWPPP PRIOR TO BEGINNING ANY WORK ONSITE. THE FOLLOWING REQUIREMENTS SHALL BE INCLUDED IN OR BE IN ADDITION TO THE SWPPP.
2. ALL STORMWATER MANAGEMENT ELEMENTS SHALL BE CONSISTENT WITH THE STORMWATER MANAGEMENT MANUAL FOR EASTERN WASHINGTON (SWMMW).
3. THE FOLLOWING CONSTRUCTION SEQUENCE SHALL BE FOLLOWED IN ORDER TO BEST MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENTATION CONTROL PROBLEMS:
 - (A) CLEAR AND GRUB SUFFICIENTLY FOR INSTALLATION OF TEMPORARY ESC BMPs;
 - (B) INSTALL TEMPORARY ESC BMPs, CONSTRUCTING SEDIMENT TRAPPING BMPs AS ONE OF THE FIRST STEPS PRIOR TO GRADING;
 - (C) CLEAR, GRUB AND ROUGH GRADE FOR ROADS, TEMPORARY ACCESS POINTS AND UTILITY LOCATIONS;
 - (D) STABILIZE ROADWAY APPROACHES AND TEMPORARY ACCESS POINTS WITH THE APPROPRIATE CONSTRUCTION ENTRY BMP;
 - (E) REMOVE TEMPORARY ESC CONTROLS WHEN PROJECT COMPLETE.
4. INSPECT ALL ROADWAYS, AT THE END OF EACH DAY, ADJACENT TO THE CONSTRUCTION ACCESS ROUTE. IF IT IS EVIDENT THAT SEDIMENT HAS BEEN TRACKED OFF SITE AND/OR BEYOND THE ROADWAY APPROACH, CLEANING IS REQUIRED.
5. IF SEDIMENT REMOVAL IS NECESSARY PRIOR TO STREET WASHING, IT SHALL BE REMOVED BY SHOVELING OR PICKUP SWEEPING AND TRANSPORTED TO A CONTROLLED SEDIMENT DISPOSAL AREA.
6. IF STREET WASHING IS REQUIRED TO CLEAN SEDIMENT TRACKED OFF SITE, ONCE SEDIMENT HAS BEEN REMOVED, STREET WASH WASTEWATER SHALL BE CONTROLLED BY PUMPING BACK ON-SITE OR OTHERWISE PREVENTED FROM DISCHARGING INTO SYSTEMS TRIBUTARY TO WATERS OF THE STATE.
7. RESTORE CONSTRUCTION ACCESS ROUTE EQUAL TO OR BETTER THAN THE PRE-CONSTRUCTION CONDITION.
8. INSPECT SEDIMENT CONTROL BMPs WEEKLY AT A MINIMUM, DAILY DURING A STORM EVENT, AND AFTER ANY DISCHARGE FROM THE SITE (STORMWATER OR NON-STORMWATER). THE INSPECTION FREQUENCY MAY BE REDUCED TO ONCE A MONTH IF THE SITE IS STABILIZED AND INACTIVE.
9. CONTROL FUGITIVE DUST FROM CONSTRUCTION ACTIVITY IN ACCORDANCE WITH THE STATE AND/OR LOCAL AIR QUALITY CONTROL AUTHORITIES WITH JURISDICTION OVER THE PROJECT AREA.
10. STABILIZE EXPOSED UNWORKED SOILS (INCLUDING STOCKPILES), WHETHER AT FINAL GRADE OR NOT, WITHIN 10 DAYS DURING THE REGIONAL DRY SEASON (JULY 1 THROUGH SEPTEMBER 30) AND WITHIN 5 DAYS DURING THE REGIONAL WET SEASON (OCTOBER 1 THROUGH JUNE 30). SOILS MUST BE STABILIZED AT THE END OF A SHIFT BEFORE A HOLIDAY WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. THIS TIME LIMIT MAY ONLY BE ADJUSTED BY A LOCAL JURISDICTION WITH A "QUALIFIED LOCAL PROGRAM," IF IT CAN BE DEMONSTRATED THAT THE RECENT PRECIPITATION JUSTIFIES A DIFFERENT STANDARD AND MEETS THE REQUIREMENTS SET FORTH IN THE CONSTRUCTION STORMWATER GENERAL PERMIT.
11. PROTECT INLETS, DRYWELLS, CATCH BASINS AND OTHER STORMWATER MANAGEMENT FACILITIES FROM SEDIMENT, WHETHER OR NOT FACILITIES ARE OPERABLE.
12. STOCKPILE MATERIALS (SUCH AS TOPSOIL) ON SITE, KEEPING OFF OF ROADWAY AND SIDEWALKS.
13. COVER, CONTAIN AND PROTECT ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCT, AND NON-INERT WASTES PRESENT ON SITE FROM VANDALISM (SEE CHAPTER 173-304 WAC FOR THE DEFINITION OF INERT WASTE), USE SECONDARY CONTAINMENT FOR ON-SITE FUELING TANKS.
14. CONDUCT MAINTENANCE AND REPAIR OF HEAVY EQUIPMENT AND VEHICLES INVOLVING OIL CHANGES, HYDRAULIC SYSTEM REPAIRS, SOLVENT AND DE-GREASING OPERATIONS, FUEL TANK DRAIN DOWN AND REMOVAL, AND OTHER ACTIVITIES THAT MAY RESULT IN DISCHARGE OR SPILLAGE OF POLLUTANTS TO THE GROUND OR INTO STORMWATER RUNOFF USING SPILL PREVENTION MEASURES, SUCH AS DRIP PANS. CLEAN ALL CONTAMINATED SURFACES IMMEDIATELY FOLLOWING ANY DISCHARGE OR SPILL INCIDENT. IF RAINING OVER EQUIPMENT OR VEHICLE, PERFORM EMERGENCY REPAIRS ON SITE USING TEMPORARY PLASTIC BENEATH THE VEHICLE.
15. CONDUCT APPLICATION OF AGRICULTURAL CHEMICALS, INCLUDING FERTILIZERS AND PESTICIDES, IN SUCH A MANNER, AND AT APPLICATION RATES, THAT INHIBITS THE LOSS OF CHEMICALS INTO STORMWATER RUNOFF FACILITIES. AMEND MANUFACTURER'S RECOMMENDED APPLICATION RATES AND PROCEDURES TO MEET THIS REQUIREMENT, IF NECESSARY.
16. REMOVE TEMPORARY ESC BMPs WITHIN 30 DAYS AFTER THE TEMPORARY BMPs ARE NO LONGER NEEDED. PERMANENTLY STABILIZE AREAS THAT ARE DISTURBED DURING THE REMOVAL PROCESS.

1760102-Sht 04 (Esc).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

EROSION CONTROL PLAN

NOTES

- PROJECT IS LOCATED ADJACENT TO ICICLE ROAD WHICH IS A BUSY FOREST SERVICE ROAD USED TO ACCESS FOREST SERVICE LAND INCLUDING THE ALPINE LAKES WILDERNESS AREA. ICICLE ROAD IS TO REMAIN OPEN TO TRAFFIC DURING CONSTRUCTION AT ALL TIMES. FOR WORK THAT NEEDS TO BE ACCESSED FROM ICICLE ROAD, DURING WORK HOURS, THE CONTRACTOR MAY USE THE EASTBOUND LANE (SOUTH LANE ADJACENT TO PROJECT AREA). WHEN WORK IS COMPLETE FOR THE DAY THE CONTRACTOR WILL ALLOW FOR TWO-WAY TRAFFIC.
- THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL. FLAGGERS ARE ANTICIPATED AS IS DAILY CONVERSION OF THE WORK AREA FROM SINGLE LANE DURING WORKING HOURS TO TWO LANE DURING NON-WORKING HOURS.
- TRAFFIC CONTROL PLANS SHALL CONFORM WITH THE STANDARDS OF THE 2009 MUTCD AND THE WSDOT 2014 WORK ZONE TRAFFIC CONTROL GUIDELINES FOR MAINTENANCE OPERATIONS. ALL SIGN SIZES SHALL CONFORM TO MUTCD REQUIREMENTS FOR A CONVENTIONAL ROAD.
- THE CONTRACTOR MAY ACCEPT THE TRAFFIC CONTROL MEASURES SHOWN ON THESE PLANS OR SUBMIT AN ALTERNATIVE PLAN FOR APPROVAL.
- TRAFFIC CONTROL MEASURES SHALL BE INSTALLED BY THE CONTRACTOR PRIOR TO COMMENCING WORK.
- TRAFFIC CONTROL MEASURES NEEDED TO RESTRICT ICICLE ROAD TO ONE LANE SHALL BE INSTALLED BY THE CONTRACTOR WHEN NEEDED TO ACCESS THE WORK AREA. CONTRACTOR TO LIMIT ROAD RESTRICTIONS TO THE IMMEDIATE AREA BEING WORKED ON TO THE MAXIMUM EXTENT PRACTICABLE.
- TEMPORARY TRAFFIC LANES SHALL BE CLEARLY DELINEATED AND MAY CONSIST OF CHANNELIZING DEVICES OR TEMPORARY PAVEMENT MARKINGS.
- CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE AND UPKEEP OF THE TRAFFIC CONTROL DEVICES FOR THE DURATION OF THE PROJECT.
- UNLESS OTHERWISE NOTED, ICICLE ROAD, SHOULDERS, AND PARKING PULL-OFFS ARE TO BE FULLY OPEN WITH NO TRAVEL RESTRICTIONS AFTER MAY 15, 2019. NO CONTRACTOR WORK ACTIVITIES EXCEPT FOR HAUL WILL BE ALLOWED ALONG ICICLE ROAD AFTER MAY 15, 2019.



WORK HOURS: ONE-LANE TRAFFIC



NON-WORK HOURS: TWO-LANE TRAFFIC

- KEY NOTES**
- ① MINIMIZE USE OF SHOULDER FOR MATERIAL STORAGE. AT NIGHT REMOVE MATERIALS AND EQUIPMENT FROM THE ROAD AND PROVIDE SUFFICIENT ROOM BETWEEN TRAFFIC AND THE WORK AREA TO MINIMIZE EROSION AND DAMAGE TO THE WORK AREA.

1780102-Sht_05 (Traffic).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

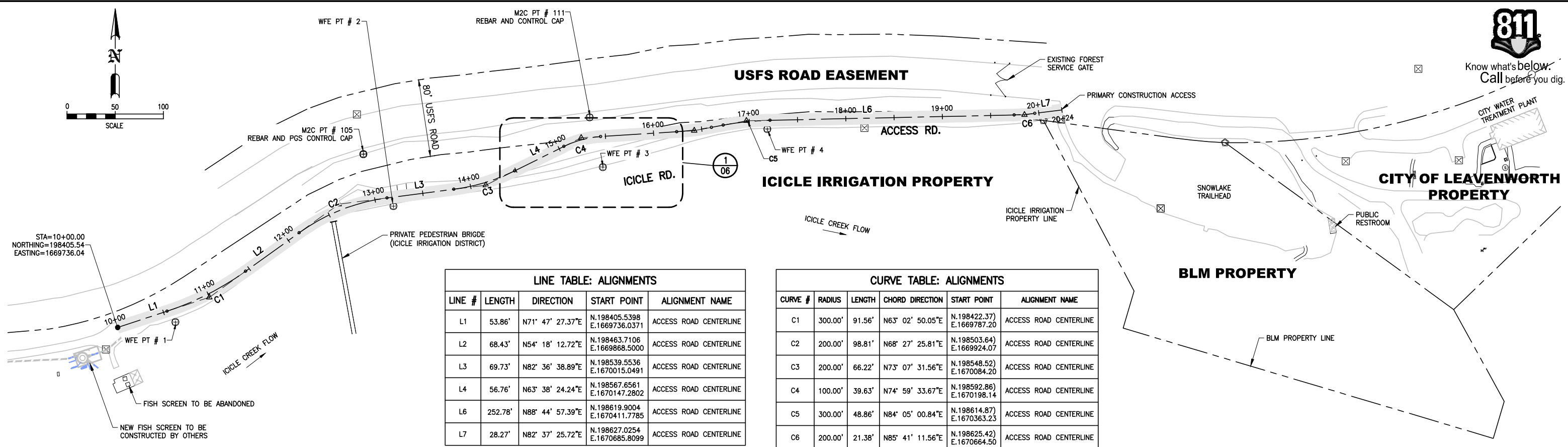
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

TRAFFIC CONTROL PLAN

SHEET
05
 OF 16



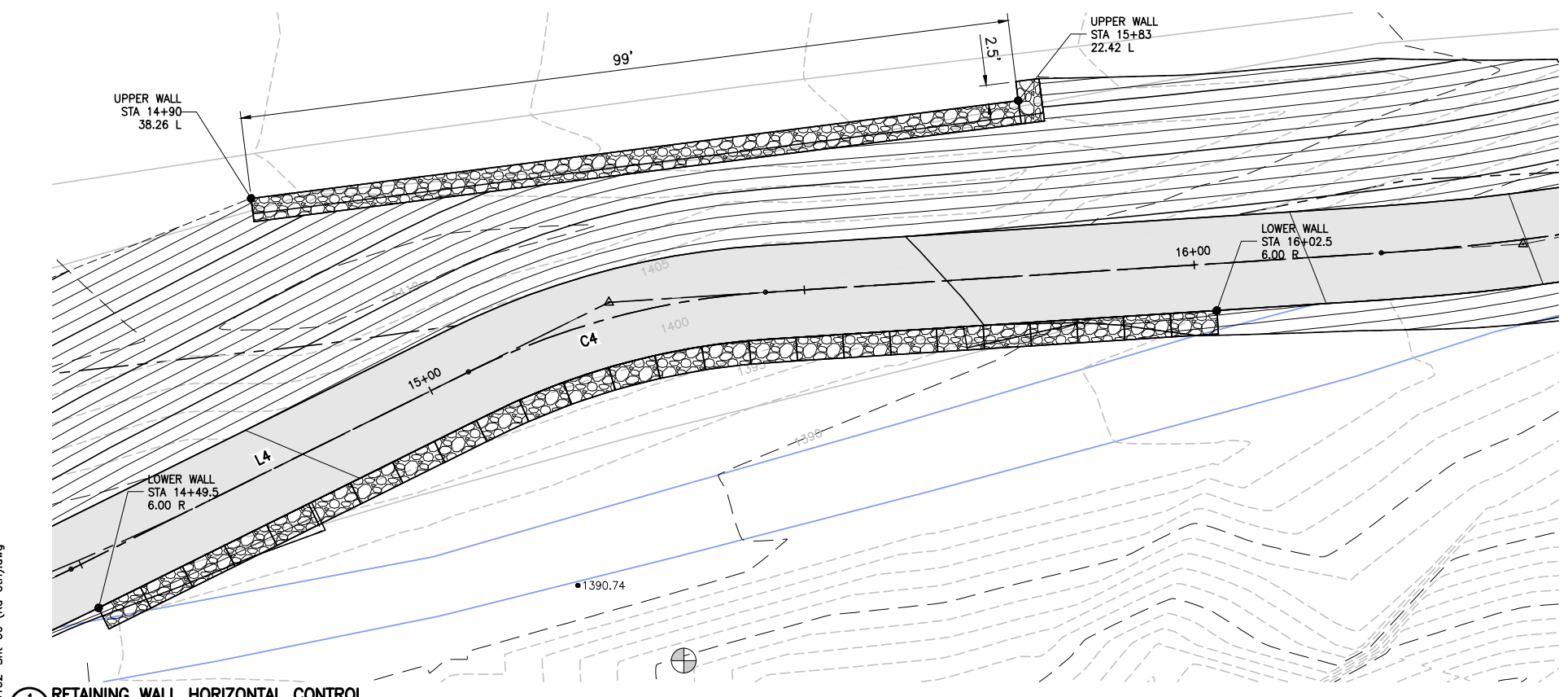
Know what's below.
Call before you dig.



LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	53.86'	N71° 47' 27.37"E	N.198405.5398 E.1669736.0371	ACCESS ROAD CENTERLINE
L2	68.43'	N54° 18' 12.72"E	N.198463.7106 E.1669868.5000	ACCESS ROAD CENTERLINE
L3	69.73'	N82° 36' 38.89"E	N.198539.5536 E.1670015.0491	ACCESS ROAD CENTERLINE
L4	56.76'	N63° 38' 24.24"E	N.198567.6561 E.1670147.2802	ACCESS ROAD CENTERLINE
L6	252.78'	N88° 44' 57.39"E	N.198619.9004 E.1670411.7785	ACCESS ROAD CENTERLINE
L7	28.27'	N82° 37' 25.72"E	N.198627.0254 E.1670685.8099	ACCESS ROAD CENTERLINE

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	300.00'	91.56'	N63° 02' 50.05"E	N.198422.37) E.1669787.20	ACCESS ROAD CENTERLINE
C2	200.00'	98.81'	N68° 27' 25.81"E	N.198503.64) E.1669924.07	ACCESS ROAD CENTERLINE
C3	200.00'	66.22'	N73° 07' 31.56"E	N.198548.52) E.1670084.20	ACCESS ROAD CENTERLINE
C4	100.00'	39.63'	N74° 59' 33.67"E	N.198592.86) E.1670198.14	ACCESS ROAD CENTERLINE
C5	300.00'	48.86'	N84° 05' 00.84"E	N.198614.87) E.1670363.23	ACCESS ROAD CENTERLINE
C6	200.00'	21.38'	N85° 41' 11.56"E	N.198625.42) E.1670664.50	ACCESS ROAD CENTERLINE

ACCESS ROAD HORIZONTAL CONTROL



RETAINING WALL HORIZONTAL CONTROL

- NOTES**
- ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT.
 - EXISTING WATERMAIN TO BE ABANDONED.
 - CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF ACCESS ROAD AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION.

1780102-Sht 06 (Rd Ctr).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

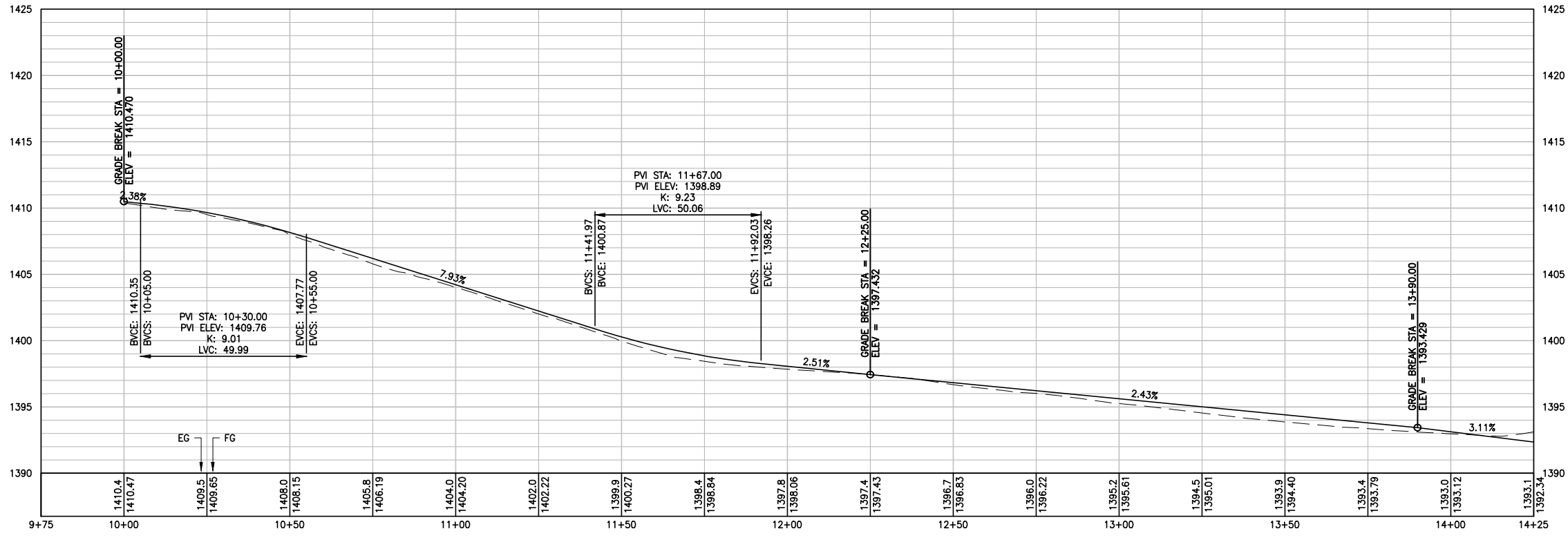
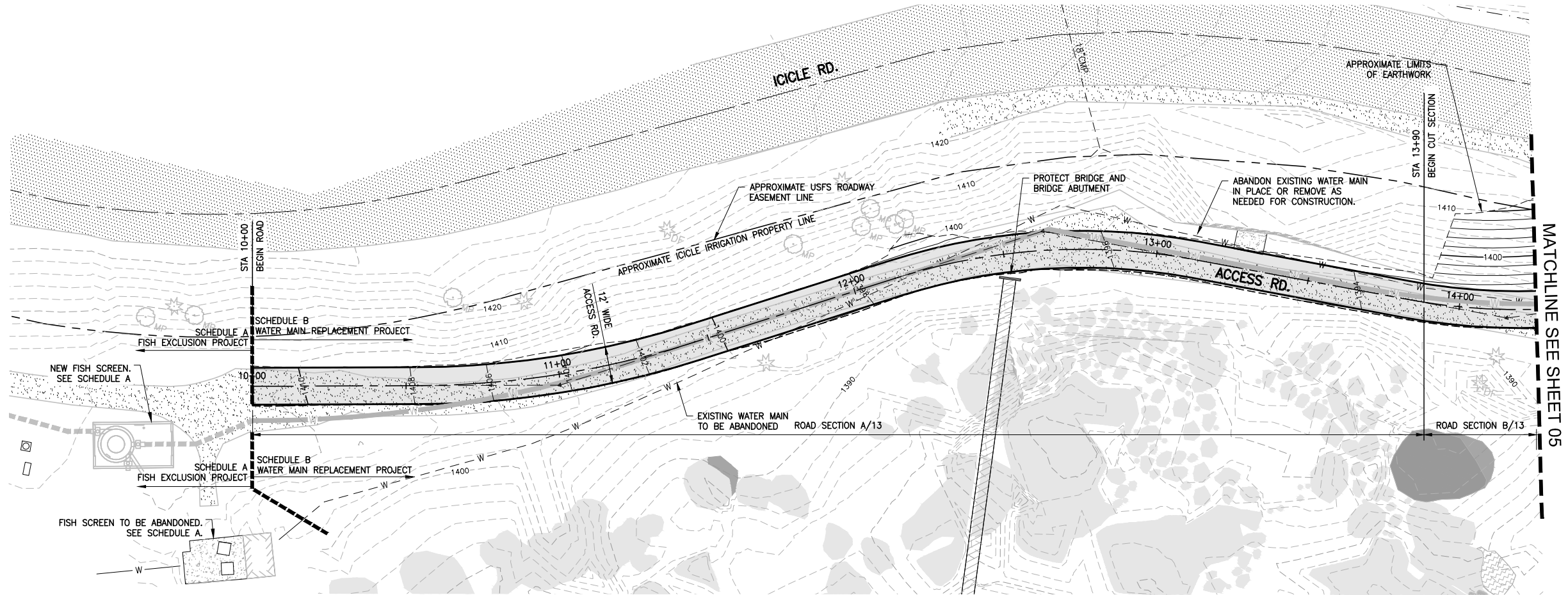
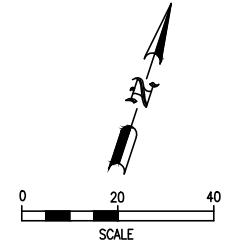


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD ALIGNMENT

SHEET
06
 OF 16



Know what's below.
Call before you dig.



1780102-Sht 07-08 (Rd Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

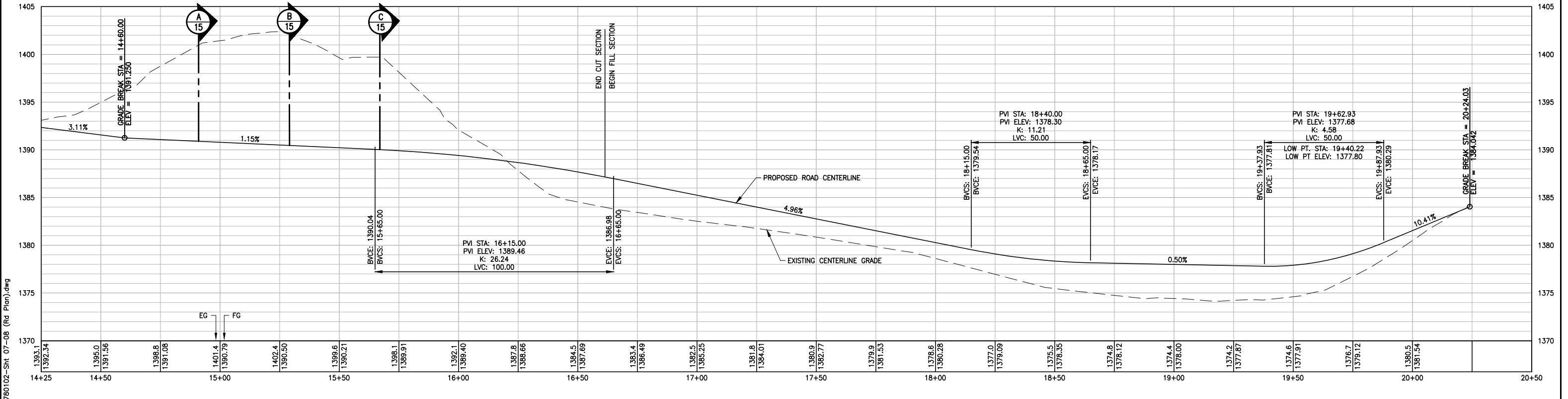
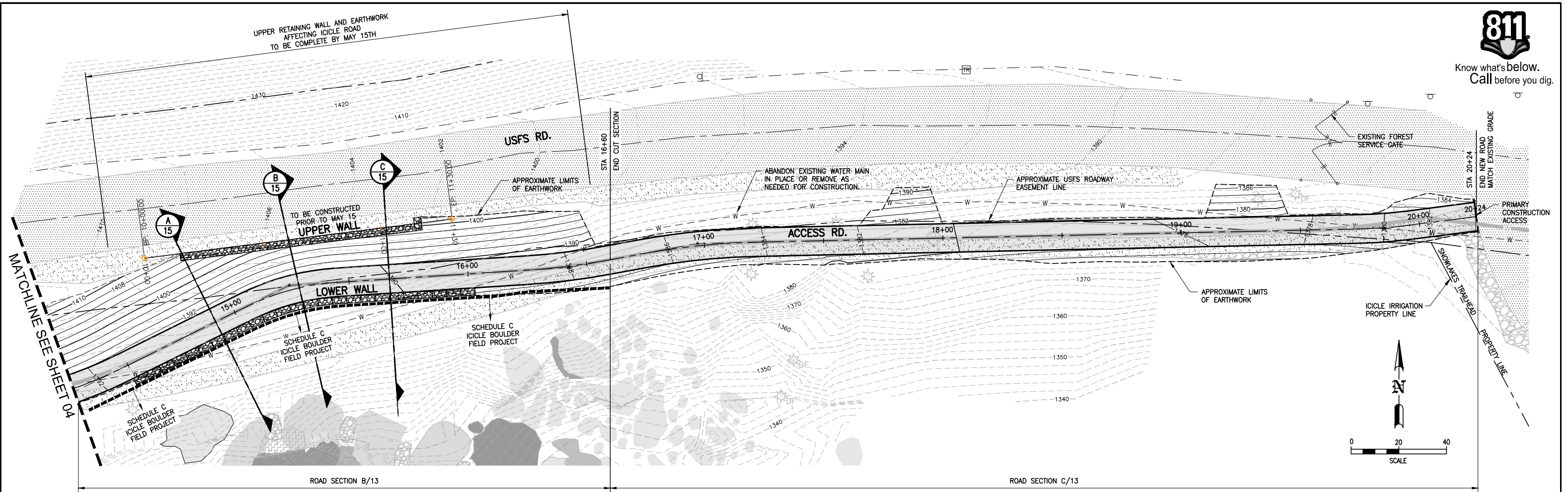


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD - PLAN & PROFILE STA 10+00 TO STA 14+25

SHEET
07
 OF 16



Know what's below.
Call before you dig.



1760102-Sht 07-08 (Rd Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

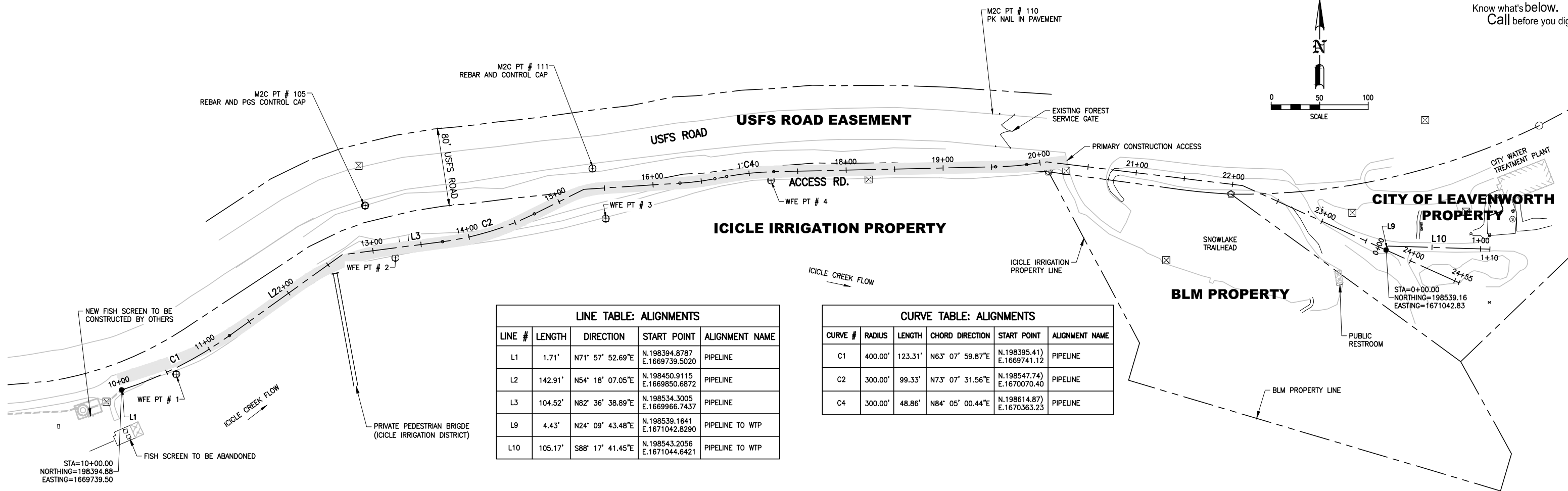
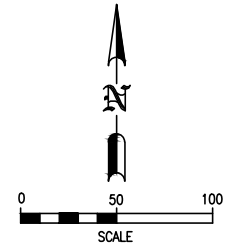


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD - PLAN & PROFILE STA 14+25 TO STA 20+22

SHEET
08
 OF 16



Know what's below.
Call before you dig.



LINE TABLE: ALIGNMENTS				
LINE #	LENGTH	DIRECTION	START POINT	ALIGNMENT NAME
L1	1.71'	N71° 57' 52.69"E	N.198394.8787 E.1669739.5020	PIPELINE
L2	142.91'	N54° 18' 07.05"E	N.198450.9115 E.1669850.6872	PIPELINE
L3	104.52'	N82° 36' 38.89"E	N.198534.3005 E.1669966.7437	PIPELINE
L9	4.43'	N24° 09' 43.48"E	N.198539.1641 E.1671042.8290	PIPELINE TO WTP
L10	105.17'	S88° 17' 41.45"E	N.198543.2056 E.1671044.6421	PIPELINE TO WTP

CURVE TABLE: ALIGNMENTS					
CURVE #	RADIUS	LENGTH	CHORD DIRECTION	START POINT	ALIGNMENT NAME
C1	400.00'	123.31'	N63° 07' 59.87"E	N.198395.41) E.1669741.12	PIPELINE
C2	300.00'	99.33'	N73° 07' 31.56"E	N.198547.74) E.1670070.40	PIPELINE
C4	300.00'	48.86'	N84° 05' 00.44"E	N.198614.87) E.1670363.23	PIPELINE

WATER MAIN HORIZONTAL CONTROL

NOTES

- ROAD AND WATERMAIN ALIGNMENTS AND STATIONING ARE DIFFERENT
- EXISTING WATERMAIN TO BE ABANDONED
- CONTRACTOR TO SURVEY AND MARK ALIGNMENT OF WATER MAIN AND REVIEW WITH OWNER PRIOR TO EXCAVATION AND CONSTRUCTION

1780102-Sht 09 (Wrt Ctr).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

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 PROJ. NO.: 178-01-02
 DATE: 12/11/18

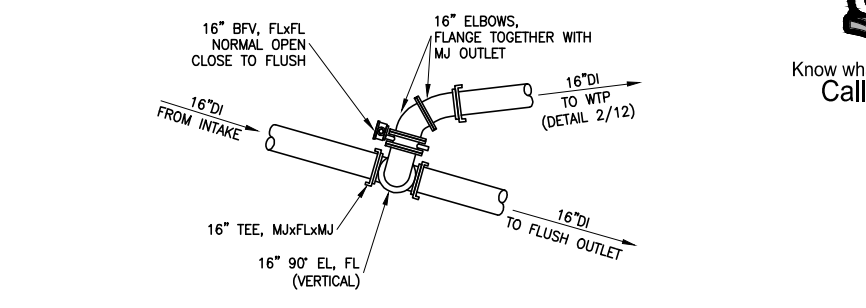
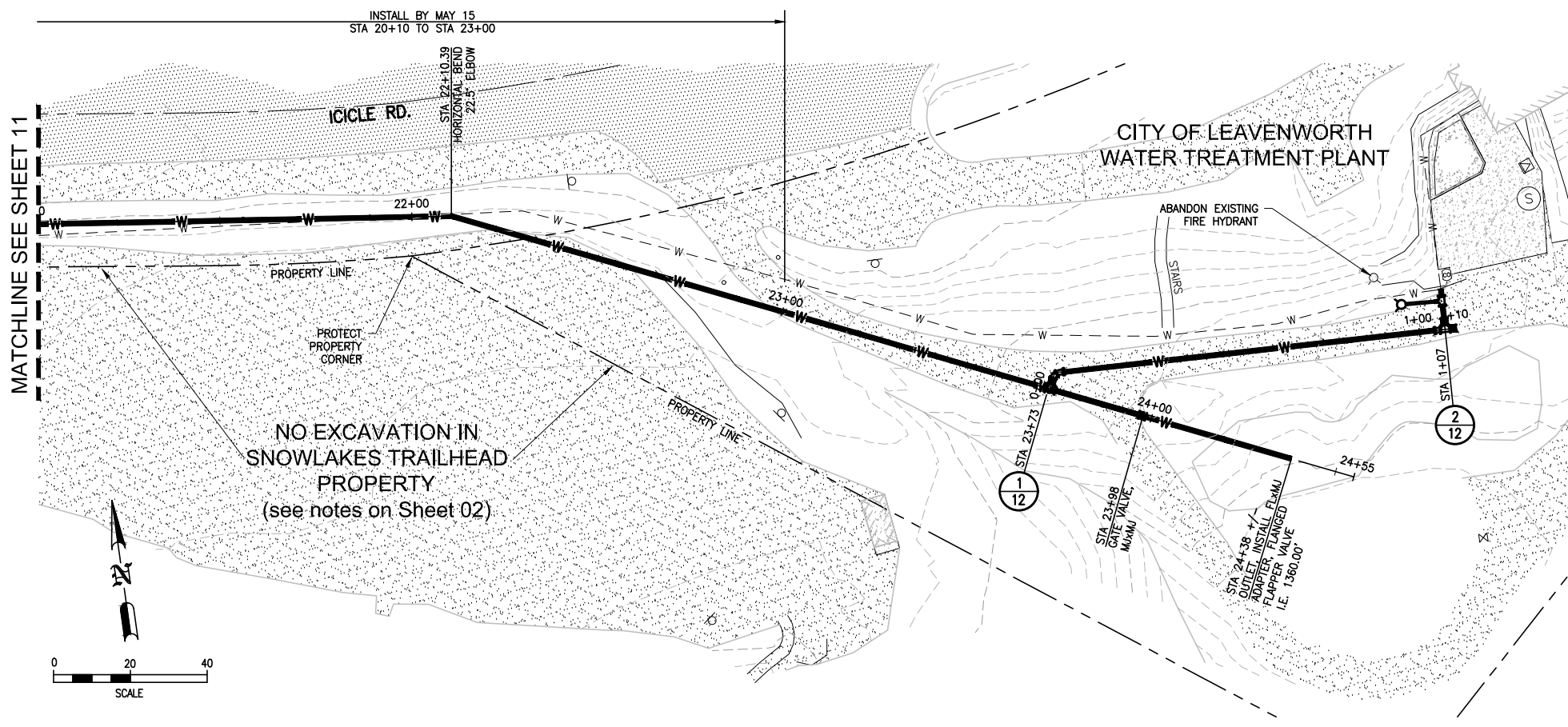


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN ALIGNMENT

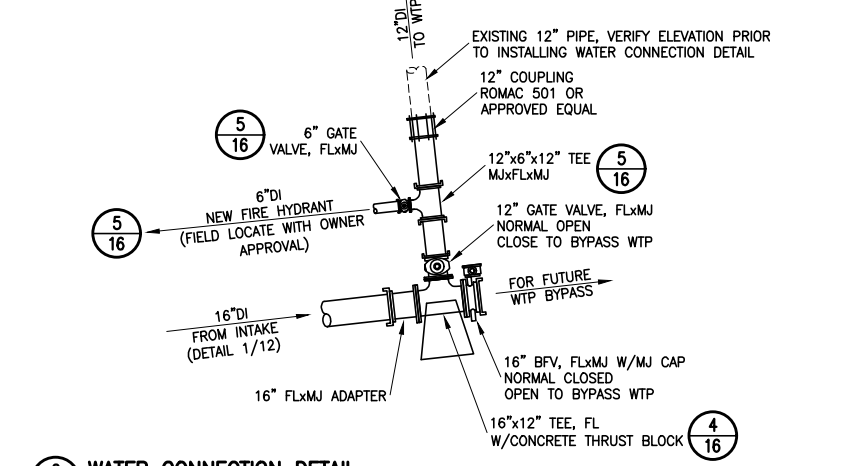
SHEET
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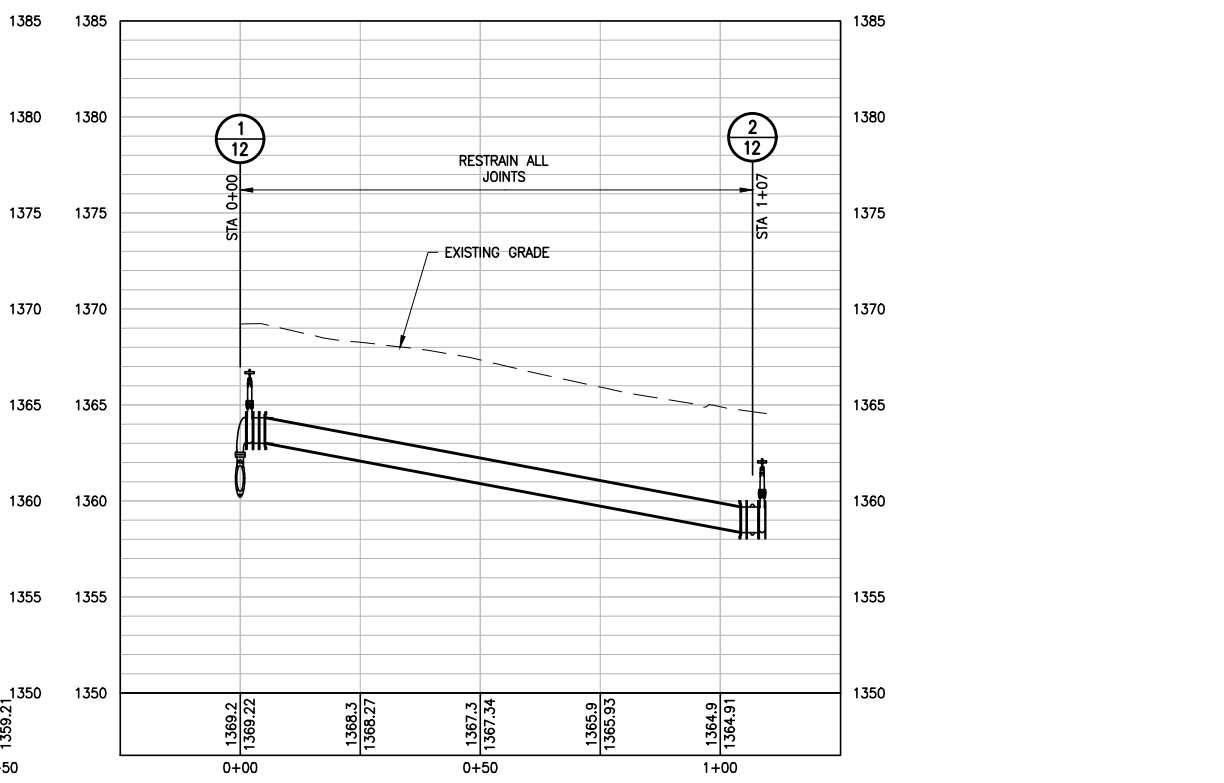
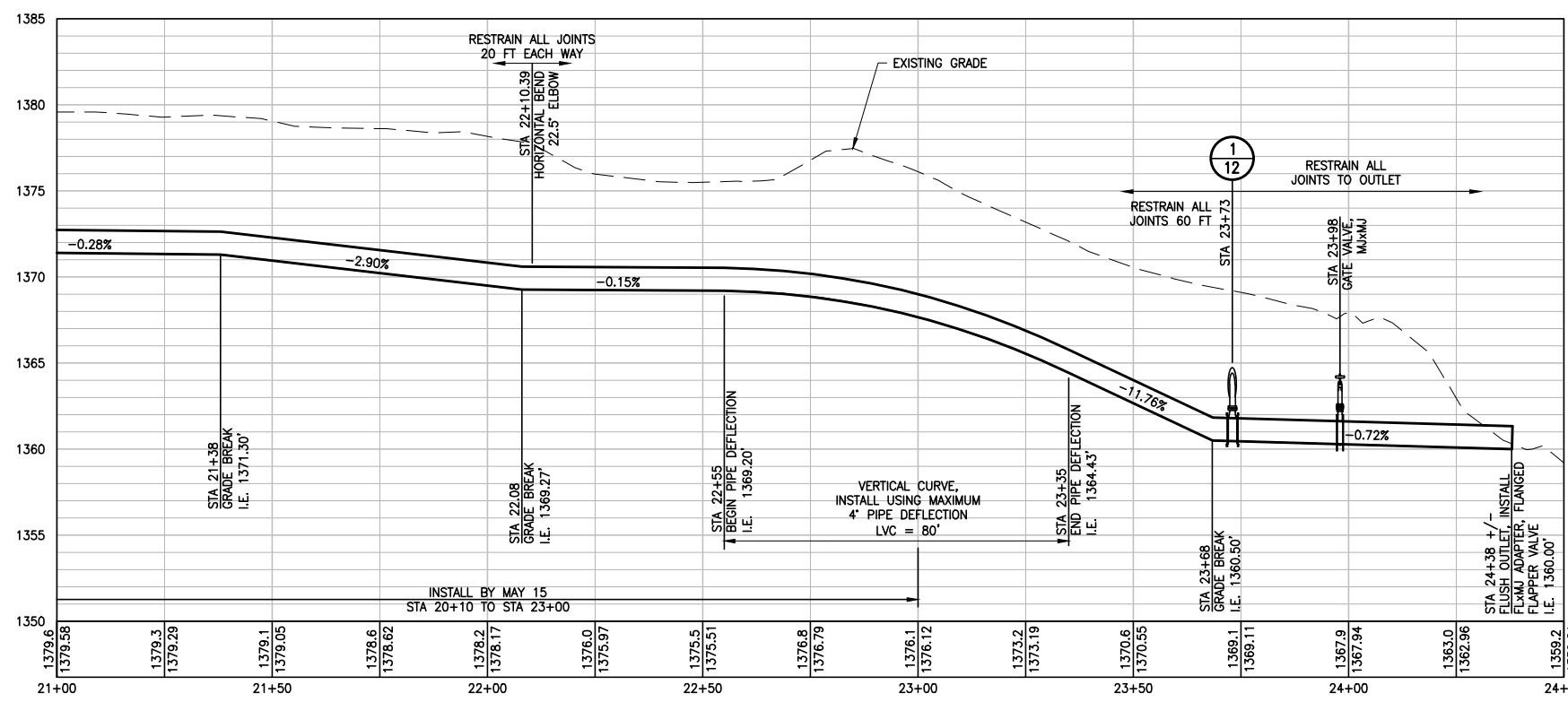
Know what's below.
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1 WATER CONNECTION DETAIL N.T.S.



2 WATER CONNECTION DETAIL N.T.S.



1760102-Sht 10-11-12 (Wrt Plan).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

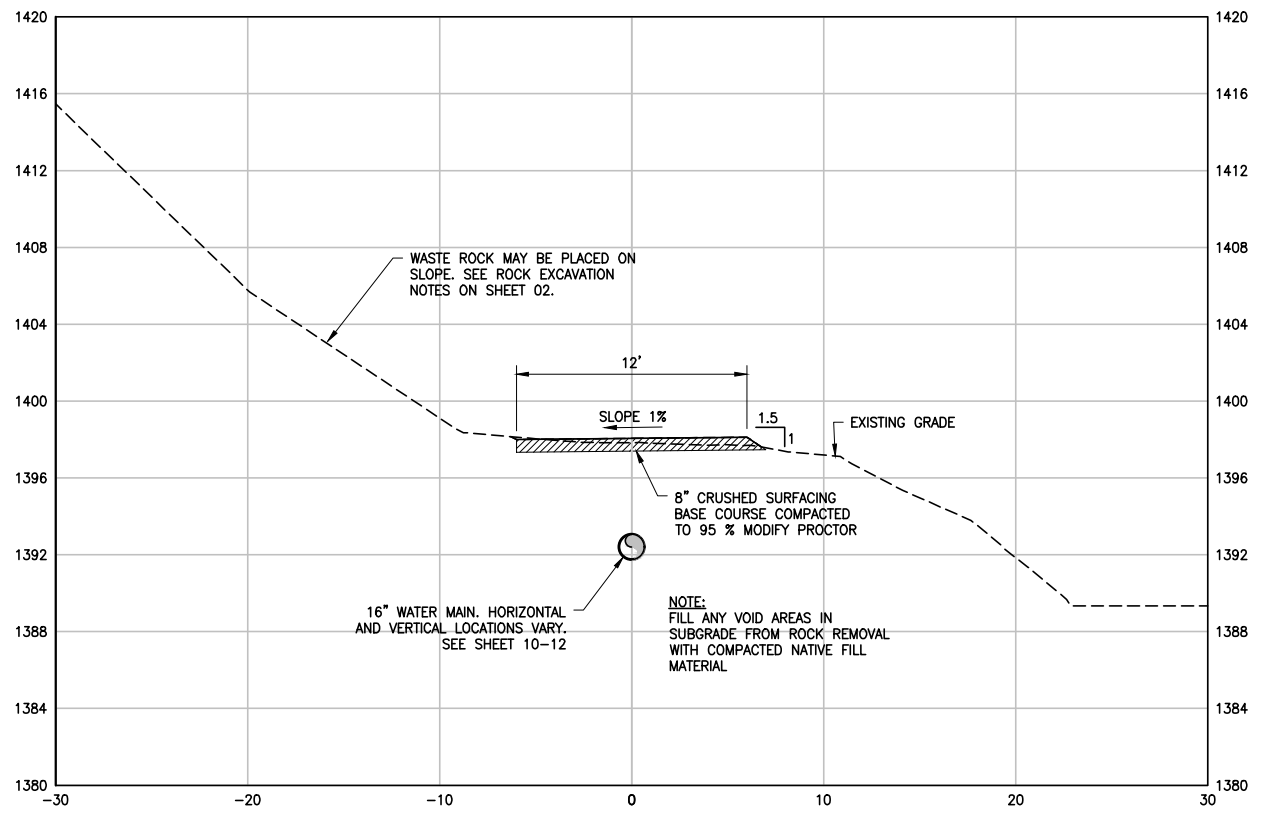
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 PROJ. NO.: 178-01-02
 DATE: 12/11/18

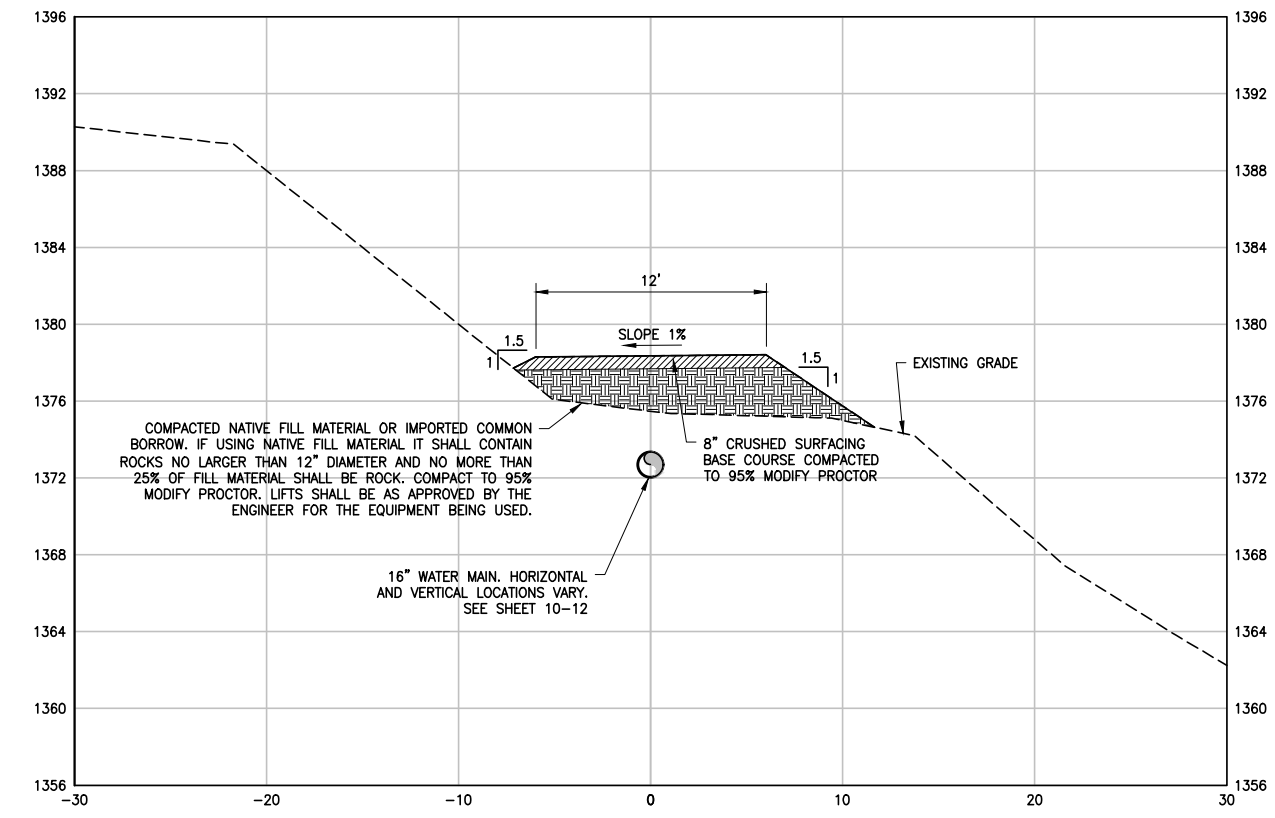
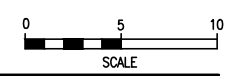


ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 WATER MAIN - PLAN & PROFILE STA 21+00 TO STA 24+55

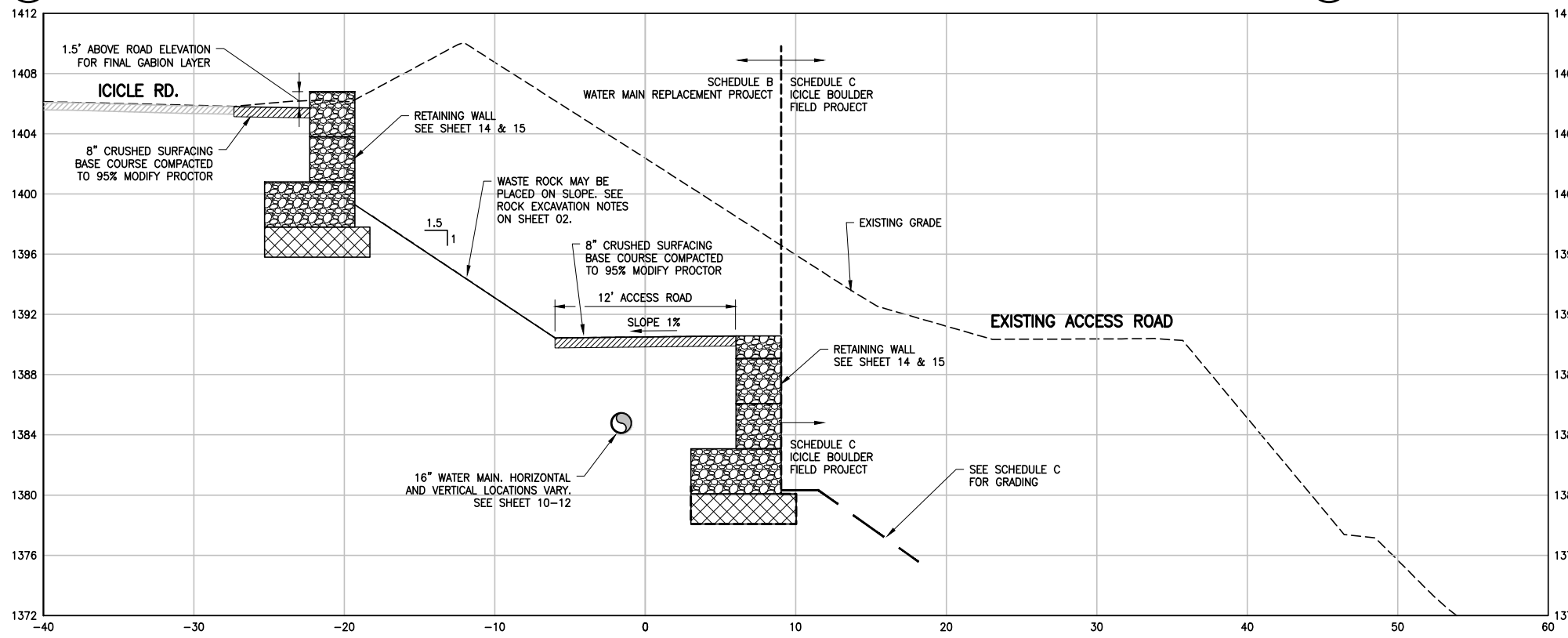
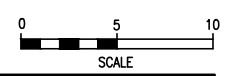
SHEET
12
 OF 16



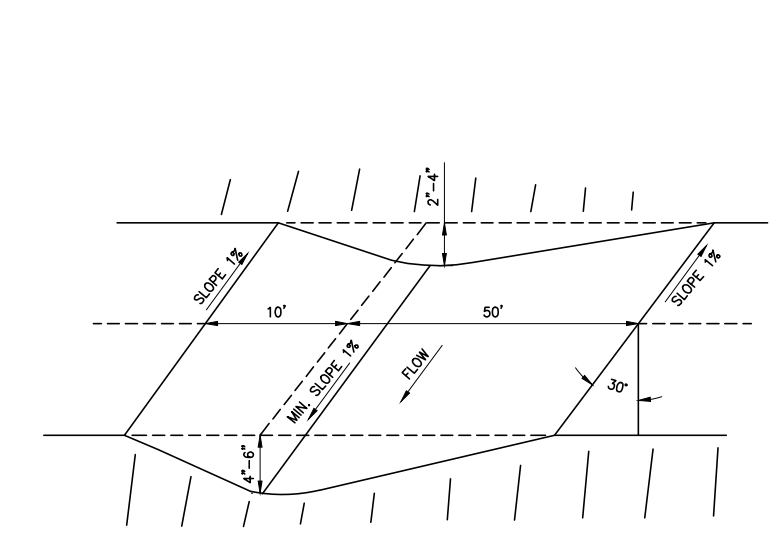
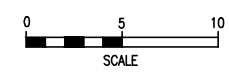
A SECTION - ACCESS ROAD STA 10+00 TO STA 13+90



C SECTION - ACCESS ROAD STA 16+60 TO STA 20+24



B SECTION - ACCESS ROAD STA 13+90 TO STA 16+60



- NOTES**
1. DIPS TO BE INSTALLED AT 200 FT INTERVALS AND AT LOW SPOTS IN THE ROADWAY
 2. DIPS TO BE ROCK ARMORED USING WSDOT BALLAST (WSDOT SPEC 9.03.9(1) DOWN SLOPE
 3. ON STEEP ROAD GRADES, SKEW THE DIP 30 DEGREES FROM PERPENDICULAR TO PROVIDE DRAINAGE

1 ROLLING DIP SECTION

N.T.S.

1780102-Sht. 13 (Rd Dis).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

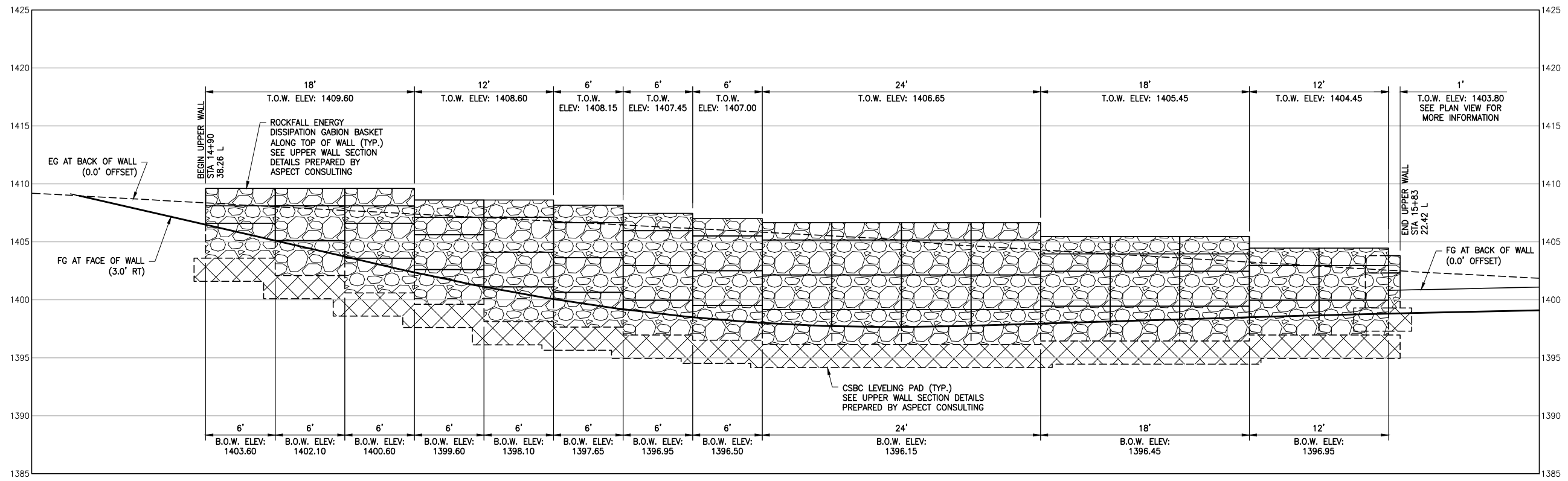
DRAFT

SCALE: AS SHOWN
 DESIGNED: JCP/JSM
 DRAWN: -
 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18

VARELA AND ASSOCIATES, INC.
 ENGINEERING AND MANAGEMENT

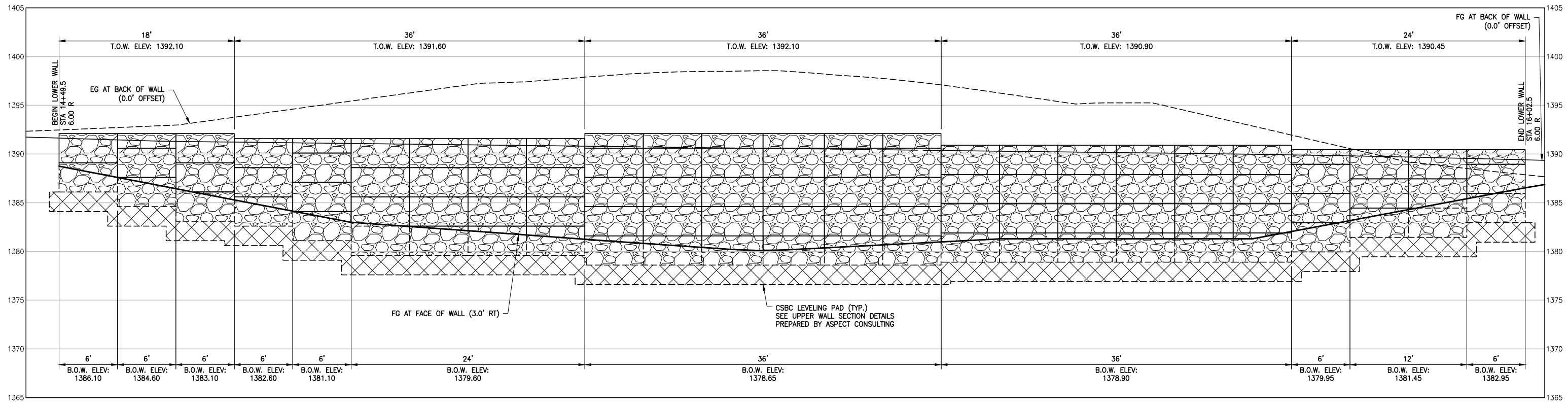
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 ACCESS ROAD SECTIONS

SHEET
13
 OF 16



GENERAL NOTES
 WALL PROFILES ARE BASED ON GRADING FOR THE FISH PASSAGE PREPARED BY WATERFALL ENGINEERING, AND THE RETAINING WALL DESIGN PREPARED BY ASPECT CONSULTING.

1 UPPER RETAINING WALL PROFILE - BACK OF TOP WALL ALIGNMENT



2 LOWER RETAINING WALL PROFILE - BACK OF BOTTOM WALL ALIGNMENT

1780102-Sht 14-15 (Retaining Wall).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

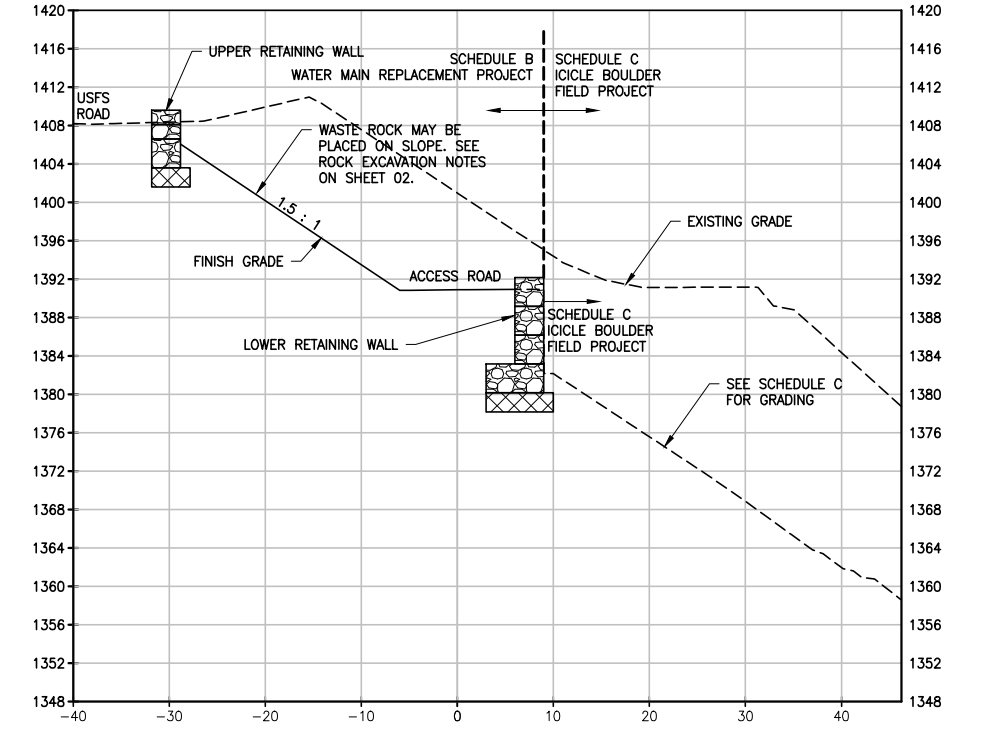
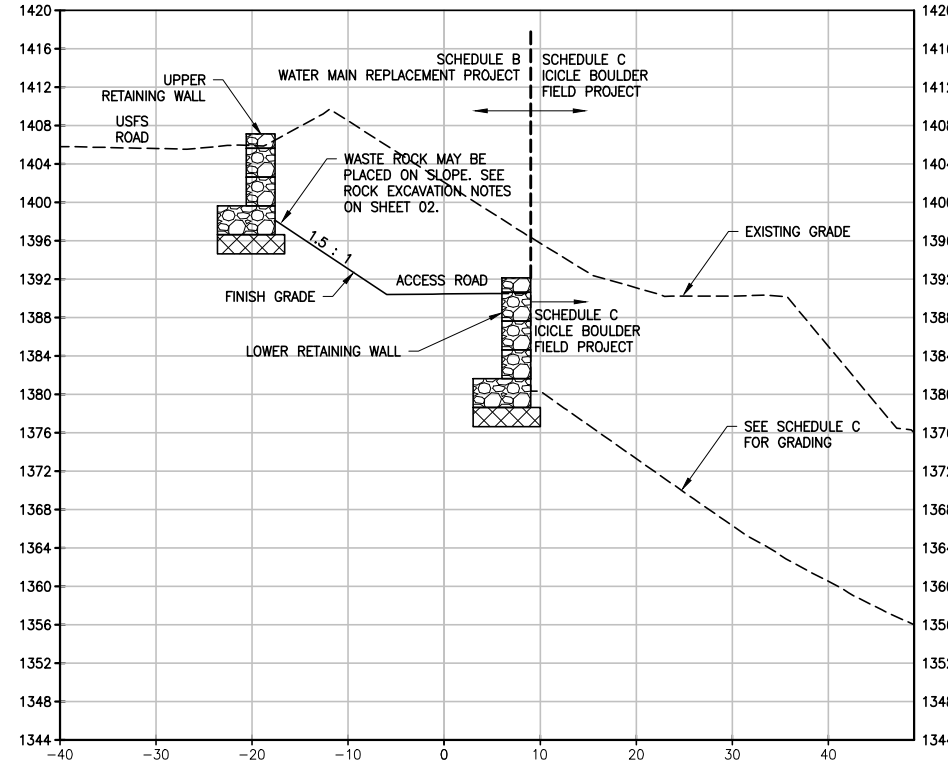
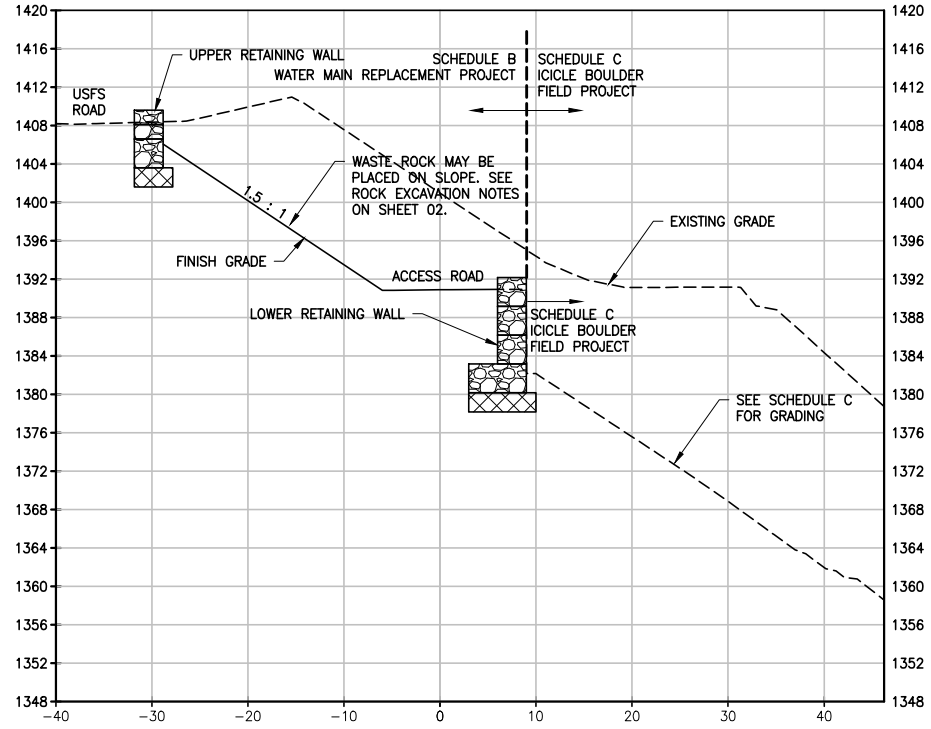
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 CHECKED: -
 APPROVED: -
 PROJ. NO.: 178-01-02
 DATE: 12/11/18



ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT

RETAINING WALL PROFILES

SHEET
14
 OF 16



1780102-Sht 14-15 (Retaining Wall).dwg

NO.	DATE	BY	CKD.	APP.	REVISIONS

DRAFT

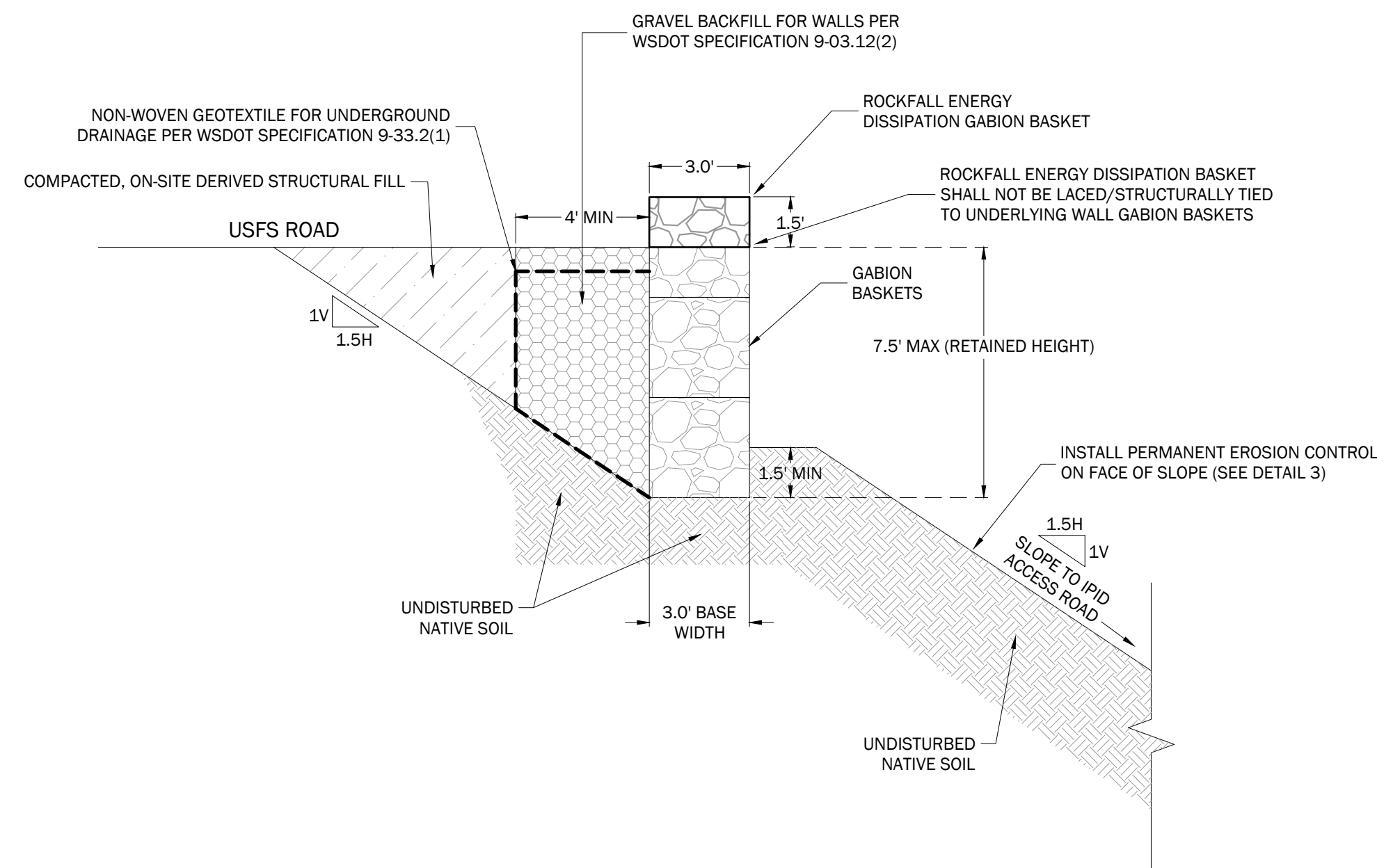
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 PROJ. NO.: 178-01-02
 DATE: 12/11/18



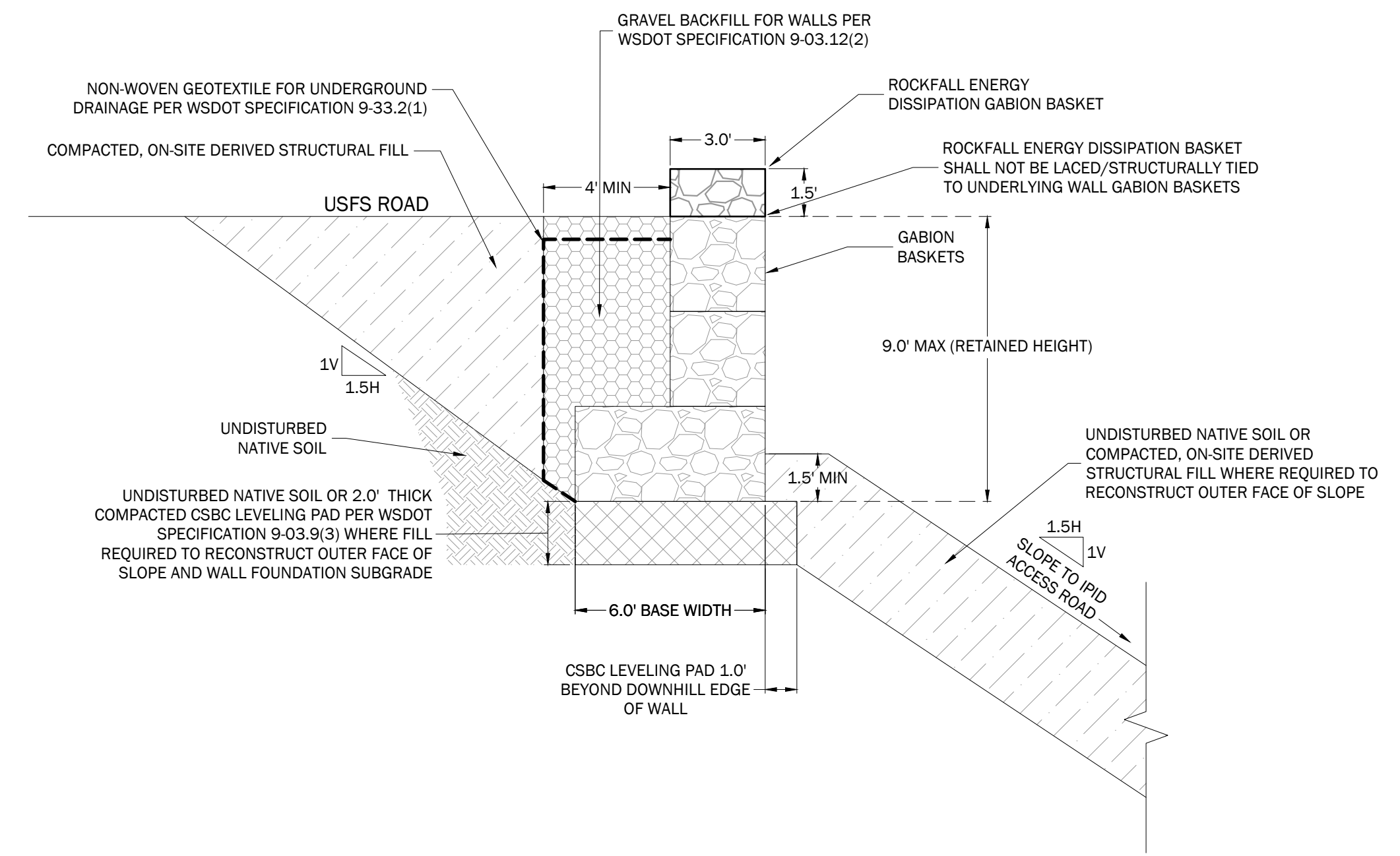
ICICLE CREEK FISH PASSAGE
 CITY OF LEAVENWORTH WATER MAIN REPLACEMENT PROJECT
 RETAINING WALL SECTIONS

SHEET
15
 OF 16

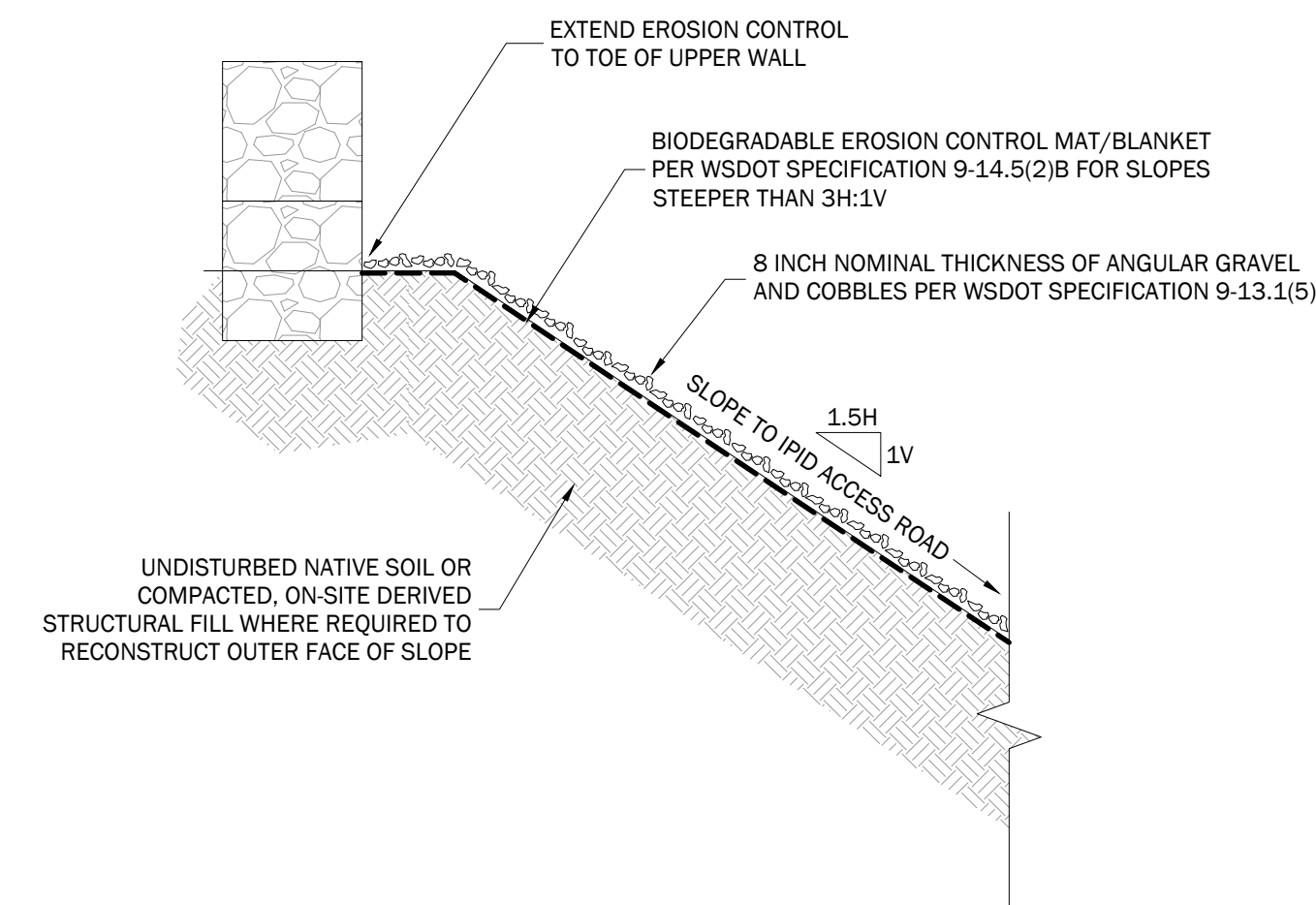
PRELIMINARY



WALL SECTION - RETAINED HEIGHT UP TO 7.5 FEET 1
SCALE: 1" = 4"

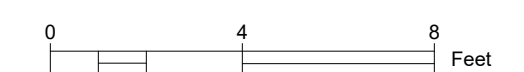


WALL SECTION - RETAINED BETWEEN HEIGHT 7.5 FEET AND 9 FEET 2
SCALE: 1" = 4"



DETAIL 3 - PERMANENT EROSION CONTROL 3
SCALE: 1" = 4"

Horizontal Scale: 1" = 4'
Vertical Scale: 1" = 4'
Vertical Exaggeration 1x



REV.	DESCRIPTION	DATE	APPR.

DESIGNED BY:	DRAWN BY:	REVISION BY:	SOC
ECS	CMV		

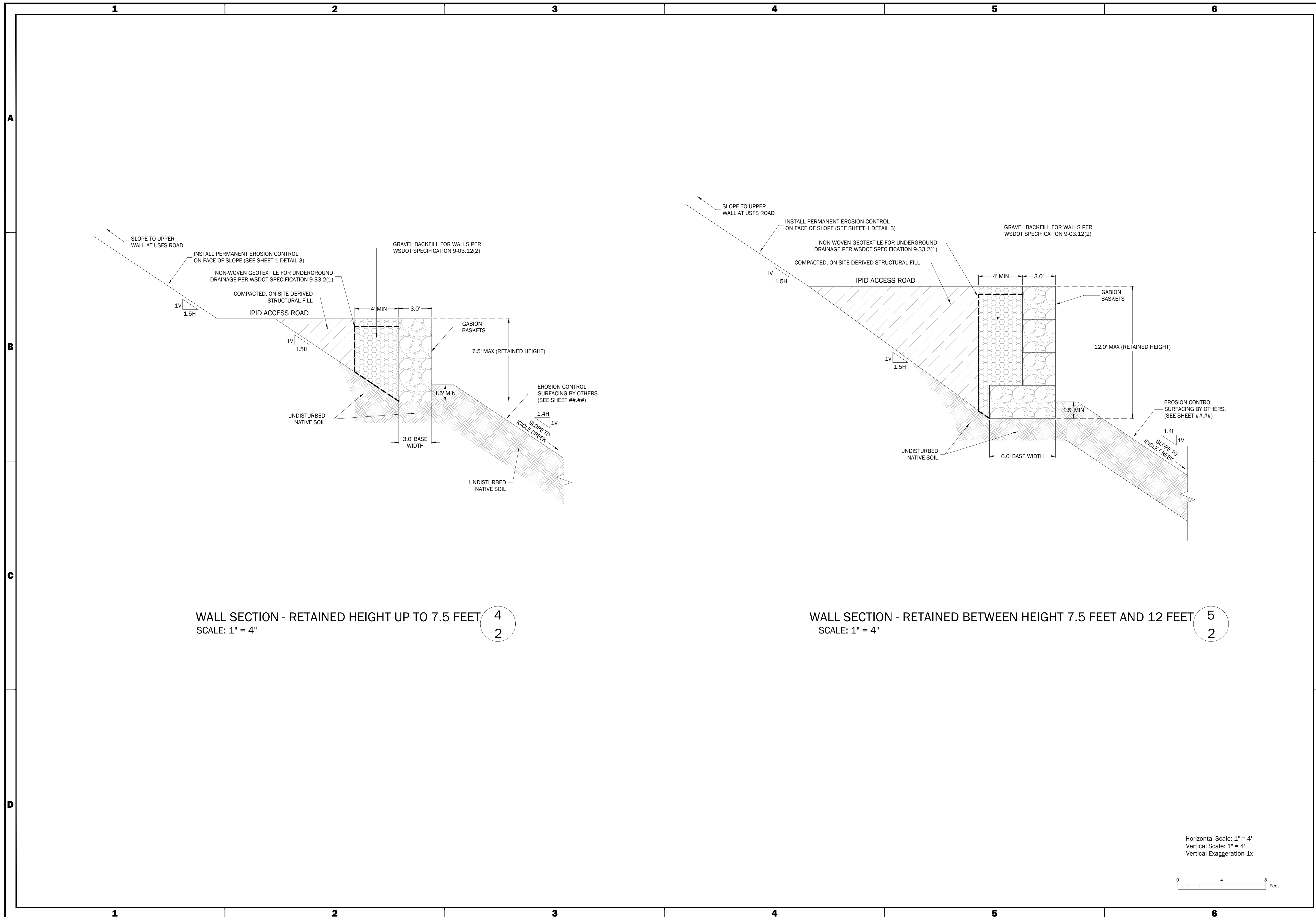
DATE:	REVISION:	PROJECT NUMBER:
Dec-2018		170060

Aspect
CONSULTING

UPPER WALL AT USFS ROAD
CITY OF LEAVENWORTH WATERLINE REPLACEMENT
AND ICICLE CREEK FISH PASSAGE PROJECT
LEAVENWORTH, WASHINGTON

SHEET REFERENCE NUMBER:
1

SHEET 1 OF 2



WALL SECTION - RETAINED HEIGHT UP TO 7.5 FEET 4
 SCALE: 1" = 4" 2

WALL SECTION - RETAINED BETWEEN HEIGHT 7.5 FEET AND 12 FEET 5
 SCALE: 1" = 4" 2

Horizontal Scale: 1" = 4'
 Vertical Scale: 1" = 4'
 Vertical Exaggeration 1x

PRELIMINARY

REV.	DESCRIPTION	DATE	APPR.

DESIGNED BY:	ECS
DRAWN BY:	CMV
REVISION:	SCC

DATE: Dec-2018
 REVISION: -
 PROJECT NUMBER: 170060

**LOWER WALL AT
 IPID ACCESS ROAD**
 CITY OF LEAVENWORTH WATERLINE REPLACEMENT
 AND ICICLE CREEK FISH PASSAGE PROJECT
 LEAVENWORTH, WASHINGTON

SHEET REFERENCE NUMBER:
2
 SHEET 2 OF 2



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

CITY OF LEAVENWORTH FISH EXCLUSION PROJECT
ICICLE CREEK, TRIBUTARY TO WENATCHEE RIVER
CHELAN COUNTY, WA. WRIA: 45.0474, SITE: 960986

INDEX

SHEET NO.

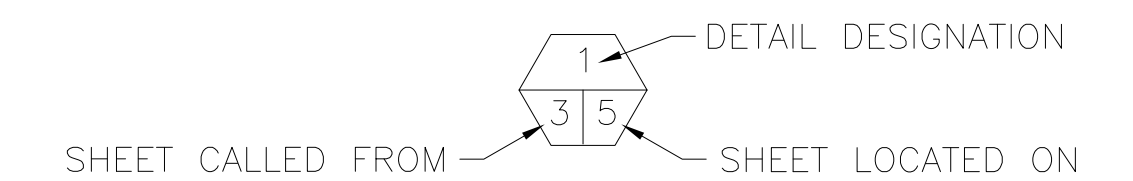
1. COVER SHEET
2. EXISTING CONDITIONS PLAN VIEW
3. ACCESS ROAD PLAN & PROFILE
4. WATERLINE PLAN & PROFILE
5. DEWATERING PLAN & DETAILS
6. PROJECT NOTES & DETAILS
7. PROJECT NOTES & DETAILS II
8. PROJECT NOTES & DETAILS III
9. 66" STAINLESS SCREEN ASSEMBLY



ABBREVIATIONS

APPROX.	APPROXIMATE
BM	BENCH MARK
BLDG	BUILDING
CONC.	CONCRETE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
DIA.	DIAMETER
ELEV.	ELEVATION
EXIST.	EXISTING
FT.	FEET
HORIZ.	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
I.E.	INVERT ELEVATION
LAT.	LATITUDE
LF	LINEAL FOOT
LONG.	LONGITUDE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MP	MILE POST
PAV'T	PAVEMENT
REQ'D	REQUIRED
S	SLOPE IN PERCENT
SEC.	SECTION
SHT.	SHEET
SPEC'S.	SPECIFICATIONS
TBM	TEMPORARY BENCH MARK
TYP.	TYPICAL
VERT.	VERTICAL
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
W.S.	WATER SURFACE

SHEET SYMBOLS



DETAIL

SECTION DESIGNATION

SHEET CALLED FROM SHEET LOCATED ON

SECTION

VICINITY MAP

LAT. 47.54370 N, LONG. -120.71462 W
CHELAN COUNTY
SECTION 28, TOWNSHIP 24 NORTH, RANGE 17 EAST W.M.

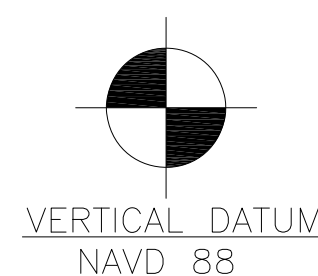
DIRECTIONS TO SITE

FROM LEAVENWORTH, WA. GO WEST ON STATE ROUTE 2 AT THE EDGE OF TOWN TURN LEFT (SOUTHERLY) ON ICICLE ROAD. CONTINUE ON ICICLE ROAD 4.2 MILES TO THE PARKING LOT ON THE LEFT. THE SITE IS DOWN THE DIRT ROAD PAST THE FOOT BRIDGE OVER ICICLE CREEK TO THE END OF THE ROAD.

PROJECT CONTROL POINTS

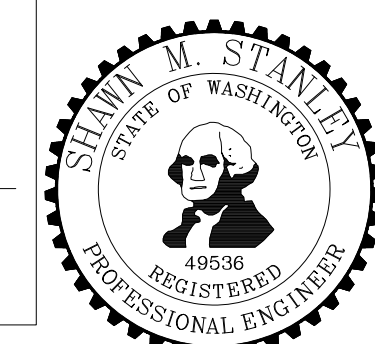
SURVEY CONTROL POINTS TABLE

Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
3. R&C 1	1669795.83'	198411.10'	1408.23'
4. R&C 2	1670021.64'	198531.01'	1394.74'



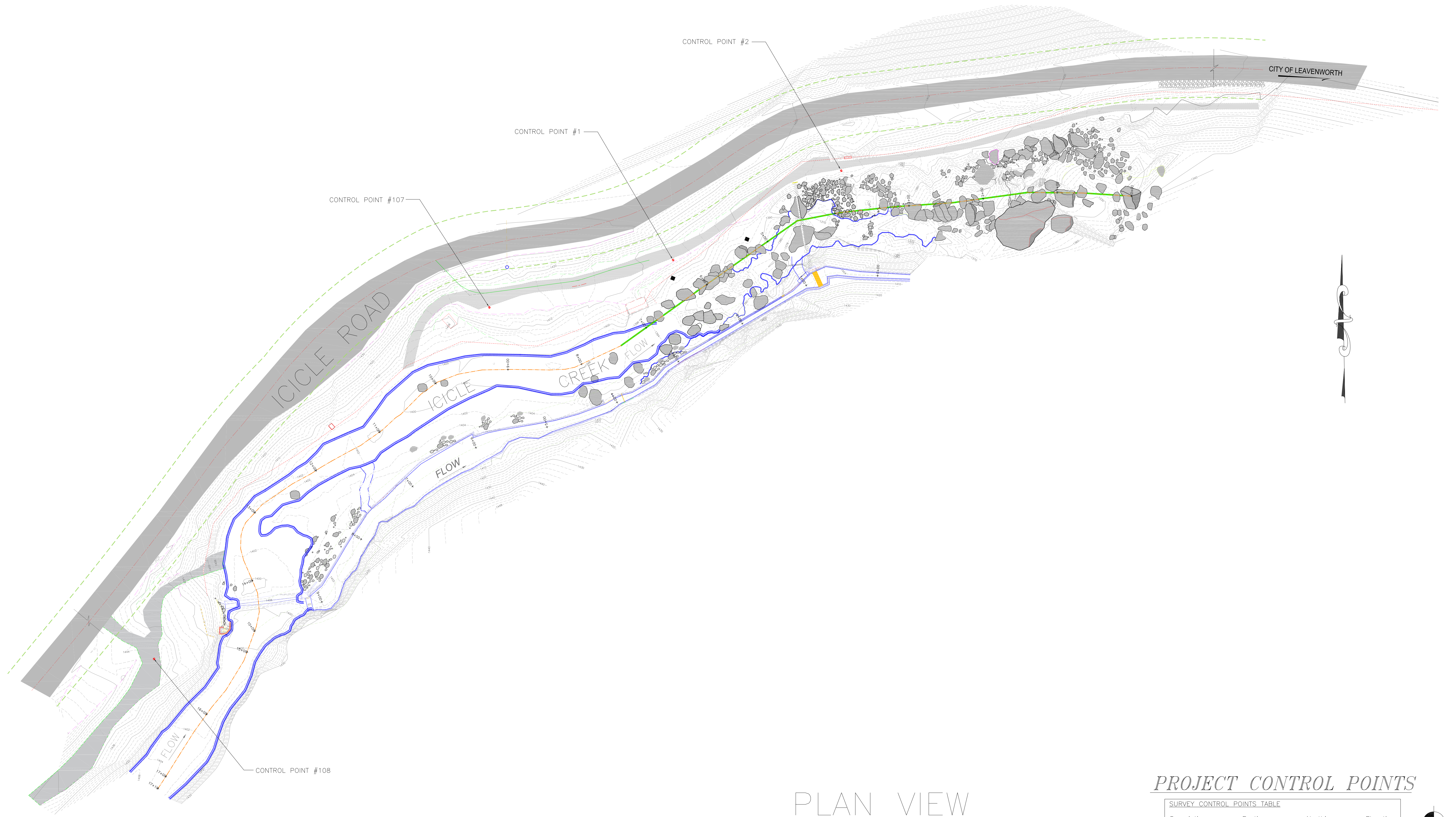
APPROVED FOR CONSTRUCTION

Donald C. Ponder, PE
Environmental Engineering Section Manager
Fish Passage Division, Habitat Program, WDFW



PROJECT NO.
960986-18

SHEET OF
1 8



PLAN VIEW

Scale: 1"=60'

PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE			
Description	Easting	Northing	Elevation
1. MON. 108	1669099.0219'	197875.3407'	1443.392'
2. R&C 107	1669549.1800'	198347.4800'	1417.420'
3. R&C 1	1669795.83'	198411.10'	1408.23'
4. R&C 2	1670021.64'	198531.01'	1394.74'



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:		
PROGRAM	DATE:		

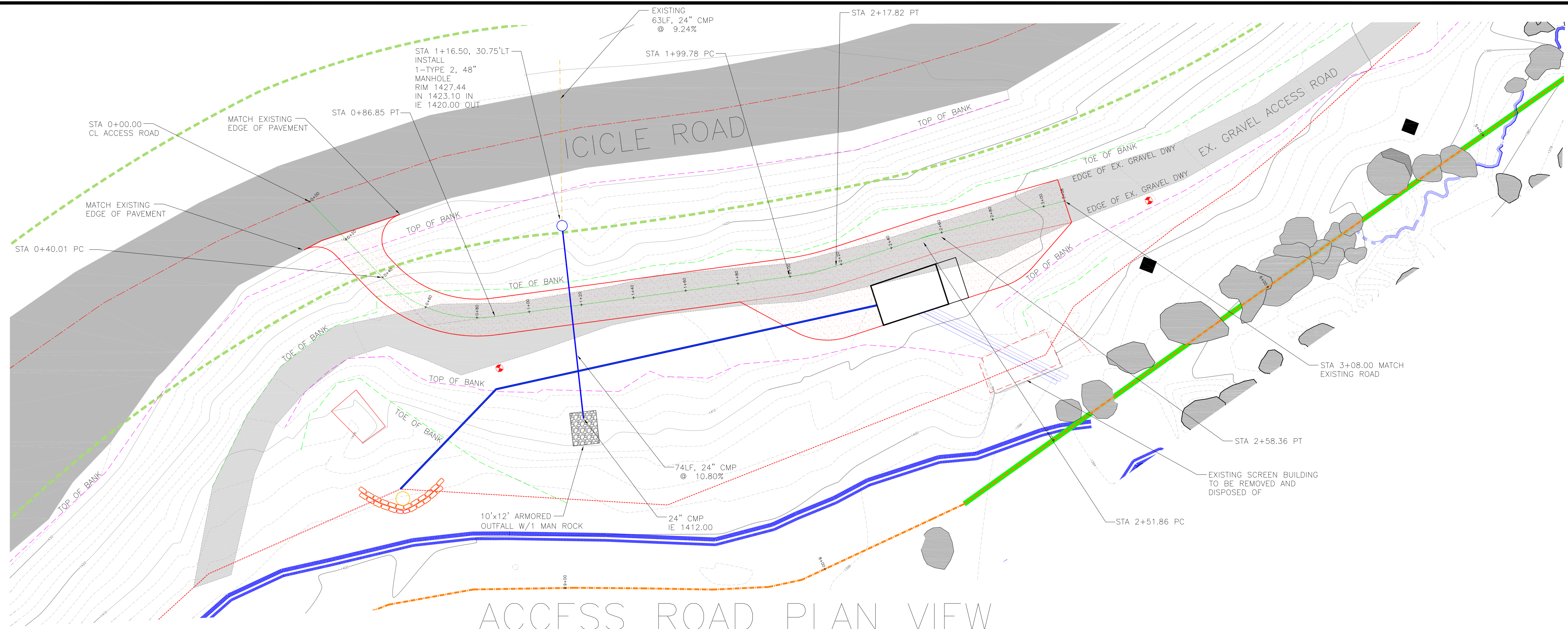
0 ——— 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
EXISTING PLAN VIEW

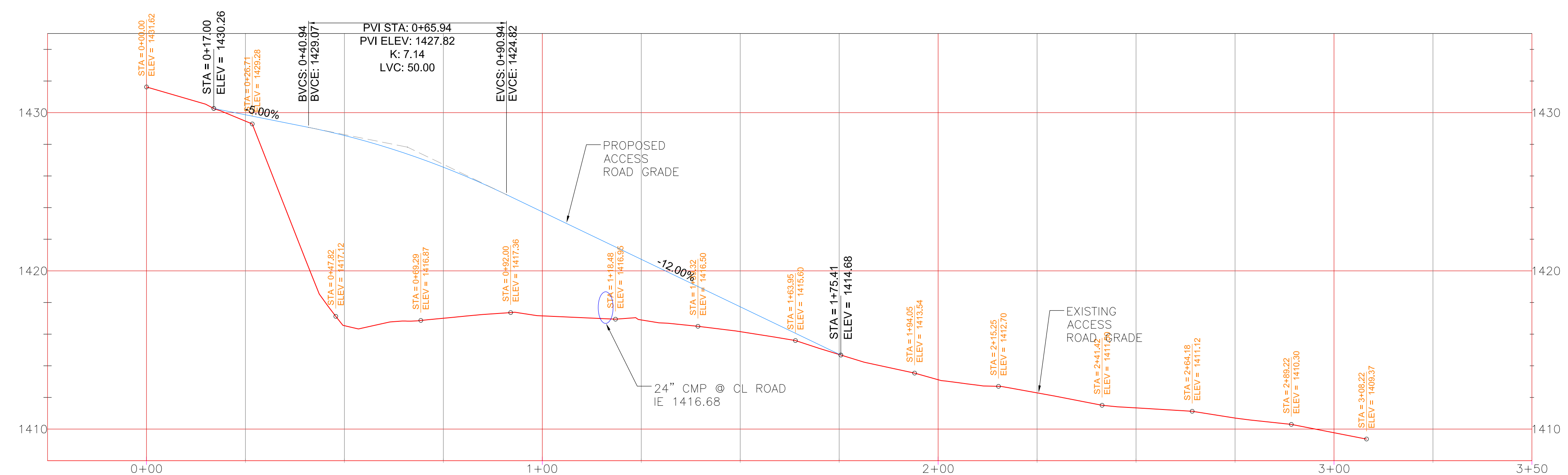
PROJECT NO.
960986-18
SHEET 2 OF 8

NOT FOR CONSTRUCTION



ACCESS ROAD PLAN VIEW

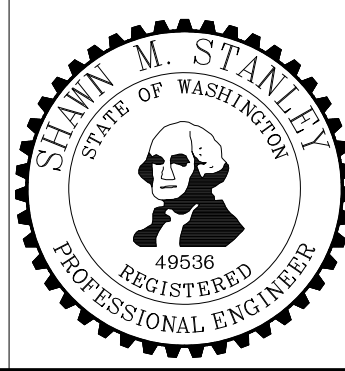
SCALE: HORZ. 1"=20'



ACCESS ROAD PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

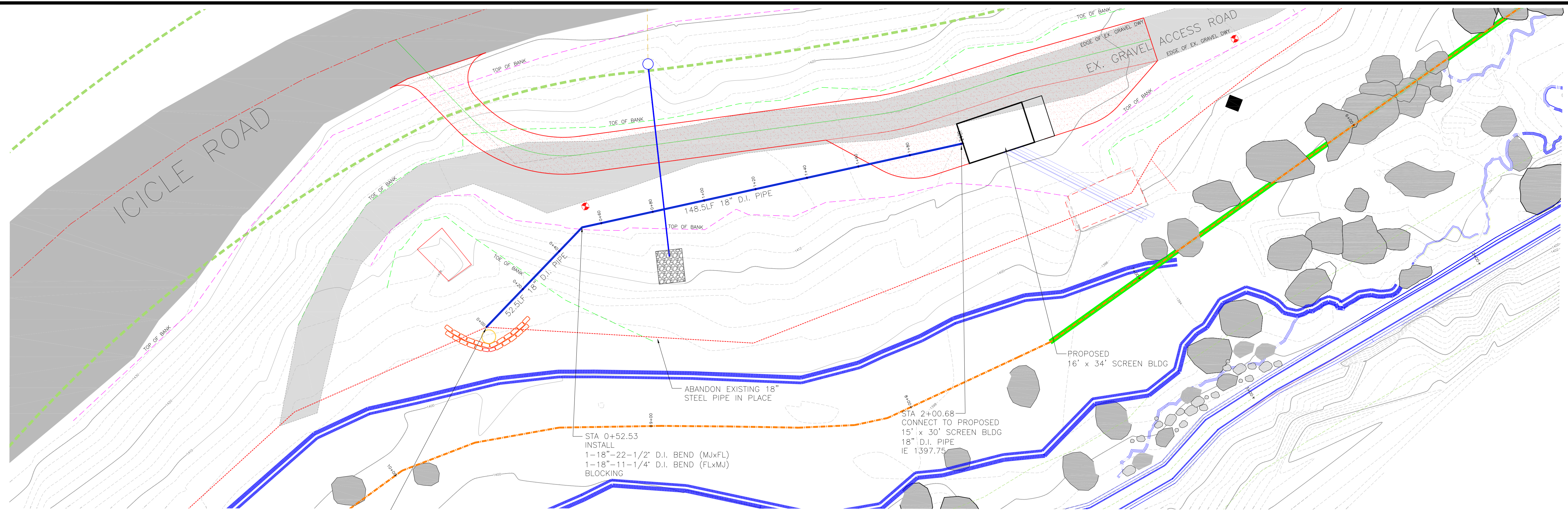


SYMBOL	DATE	BY	DESIGNED BY	S. STANLEY
APPROVED AND RELEASED FOR CONSTRUCTION			CHECKED BY	T.C.
CHIEF ENGINEER			DATE	07-25-2018
PROGRAM			DATE	07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

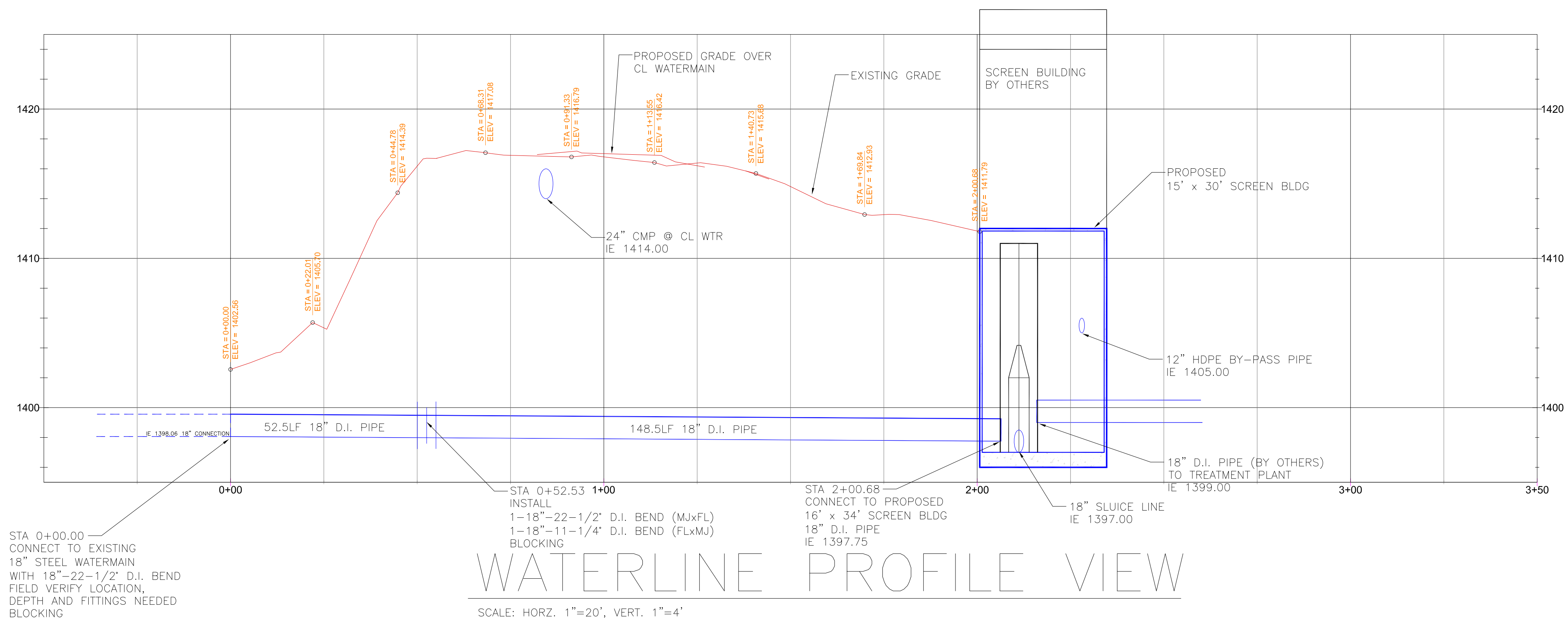
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
ACCESS ROAD PLAN AND PROFILE VIEW

PROJECT NO. 960986-18
SHEET 3 OF 8



WATERLINE PLAN VIEW

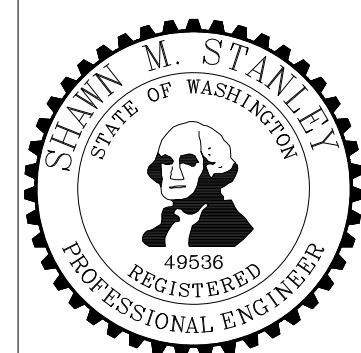
SCALE: HORZ. 1"=20'



WATERLINE PROFILE VIEW

SCALE: HORZ. 1"=20', VERT. 1"=4'

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYMBOL	DATE	REVISION	BY
APPROVED AND READY FOR CONSTRUCTION		DATE:	
CHIEF ENGINEER	DATE:	DESIGNED BY	S. STANLEY
PROGRAM	DATE:	CHECKED BY	T.G.
		DRAWN BY	T.G.
		DATE	07-25-2018

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
WATERMAIN PLAN AND PROFILE VIEW

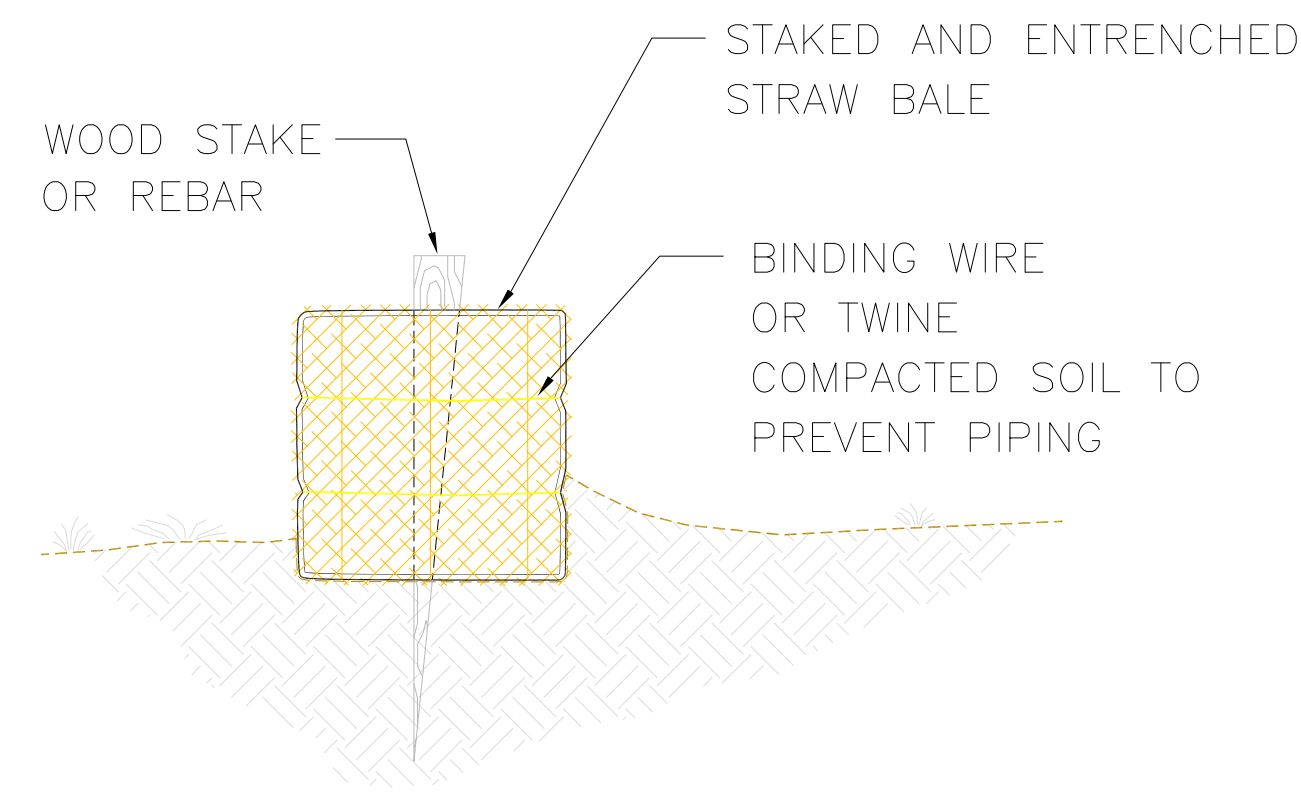
PROJECT NO.
960986-18

SHEET 4 OF 8

BALES SHALL BE PLACED IN A SINGLE ROW, LENGTHWISE ON THE CONTOUR, WITH ENDS OF ADJACENT BALES TIGHTLY ABUTTING ONE ANOTHER.

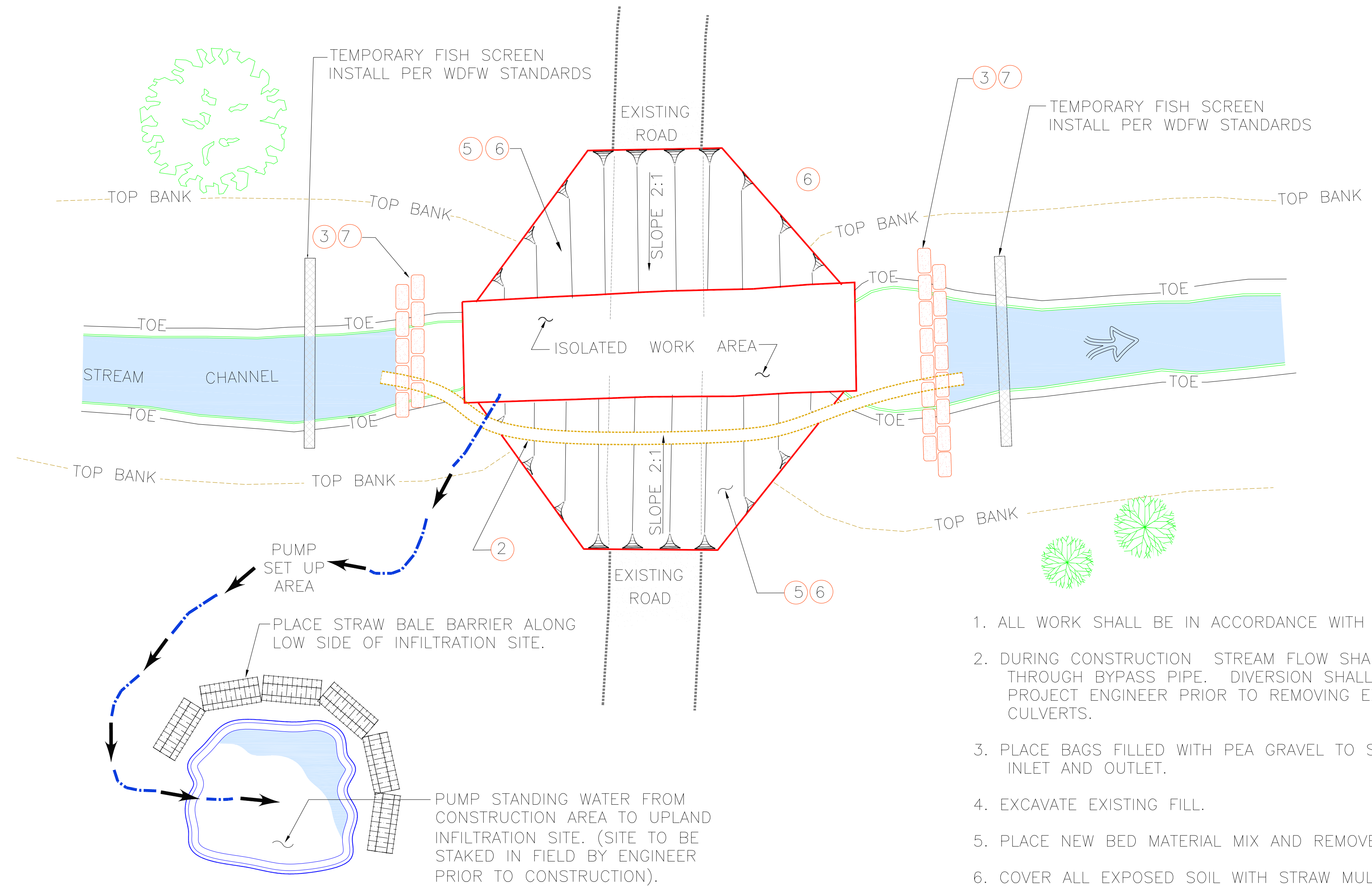
THE BARRIER SHALL BE ENTRENCHED AND BACKFILLED. A TRENCH SHALL BE A MINIMUM OF 4 INCHES. BACKFILL SOIL SHALL CONFORM TO THE GROUND LEVEL ON THE DOWNHILL SIDE AND SHALL BE BUILT UP 4 INCHES AGAINST THE UPHILL SIDE OF THE BARRIER. EACH BALE SHALL BE SECURELY ANCHORED BY AT LEAST 2 STAKES OR REBAR DRIVEN THROUGH THE BALE.

THE GAP BETWEEN THE BALES SHALL BE FILLED BY WEDGING WITH STRAW TO PREVENT WATER FROM ESCAPING BETWEEN THE BALES.



STRAW BALE BARRIER

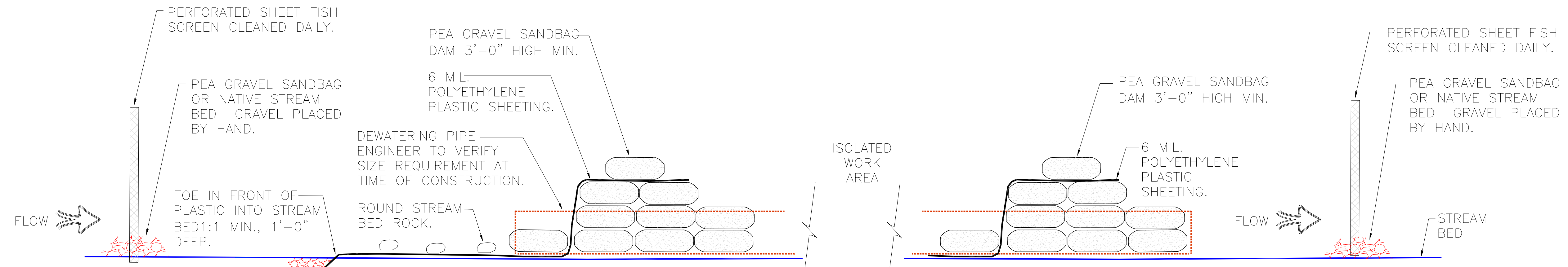
SCALE: N.T.S.



1. ALL WORK SHALL BE IN ACCORDANCE WITH HPA.
2. DURING CONSTRUCTION STREAM FLOW SHALL BE DIVERTED THROUGH BYPASS PIPE. DIVERSION SHALL BE APPROVED BY PROJECT ENGINEER PRIOR TO REMOVING EXISTING CULVERTS.
3. PLACE BAGS FILLED WITH PEA GRAVEL TO SEAL BYPASS INLET AND OUTLET.
4. EXCAVATE EXISTING FILL.
5. PLACE NEW BED MATERIAL MIX AND REMOVE BYPASS PIPE.
6. COVER ALL EXPOSED SOIL WITH STRAW MULCH AND GRASS SEED. (SEE SITE RESTORATION PLAN)
7. REMOVE DIVERSION BAGS AND FISH SCREENS BY HAND.

TYPICAL DEWATERING SCHEMATIC

SCALE: N.T.S.



TYPICAL DEWATERING SECTION

Scale: N.T.S.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

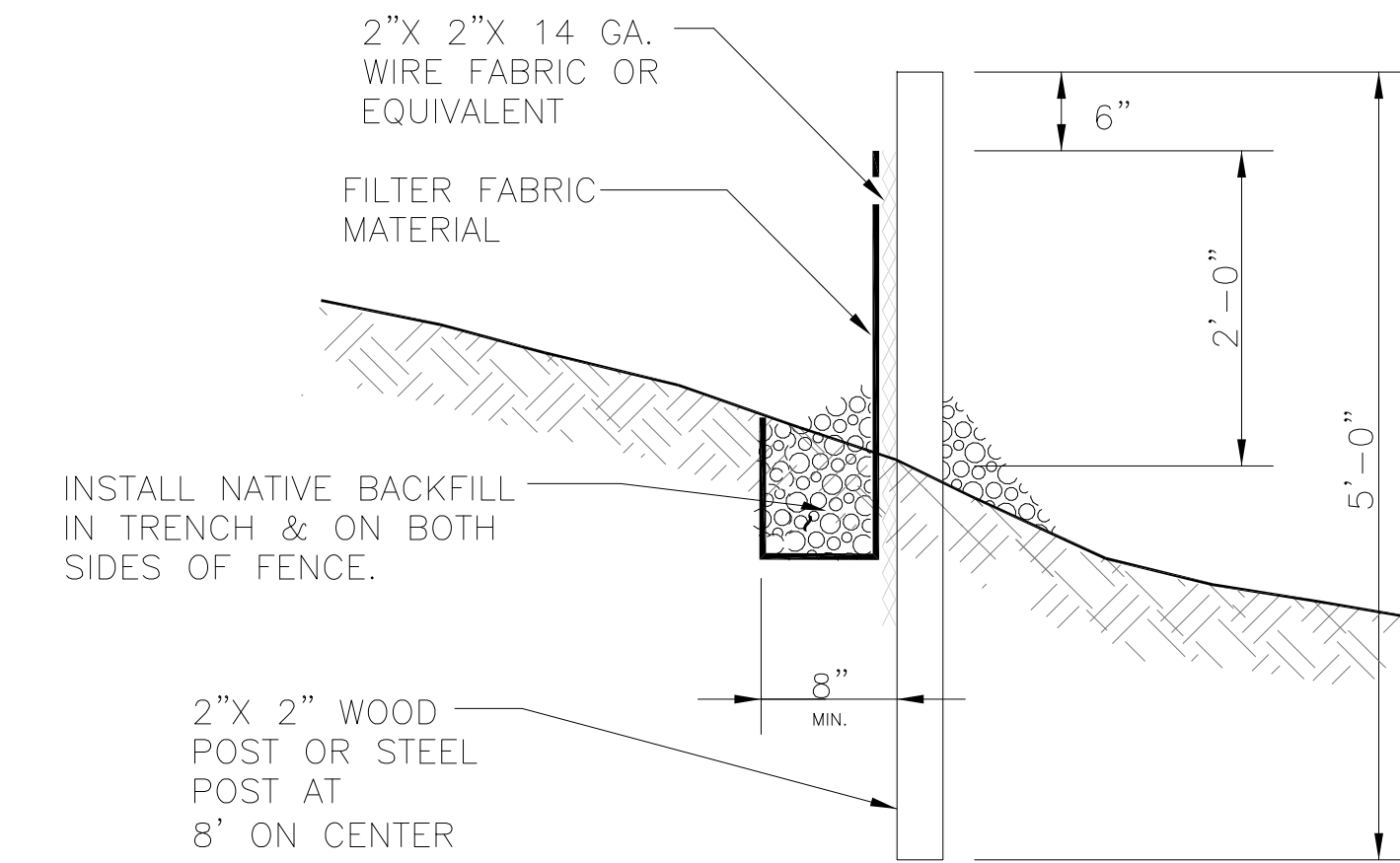
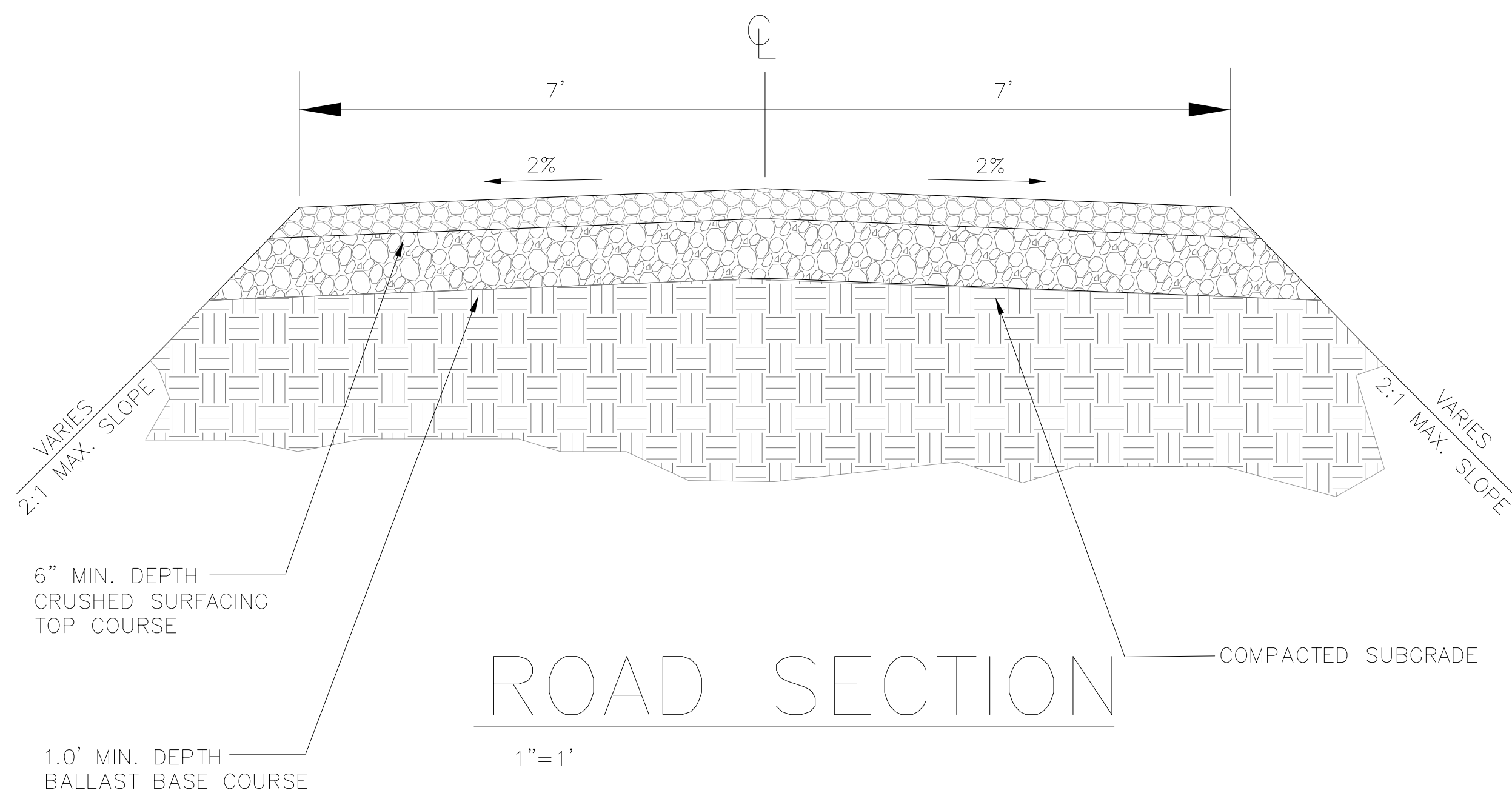


SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	DATE:
PROGRAM		DATE:	DATE:

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	07-25-2018

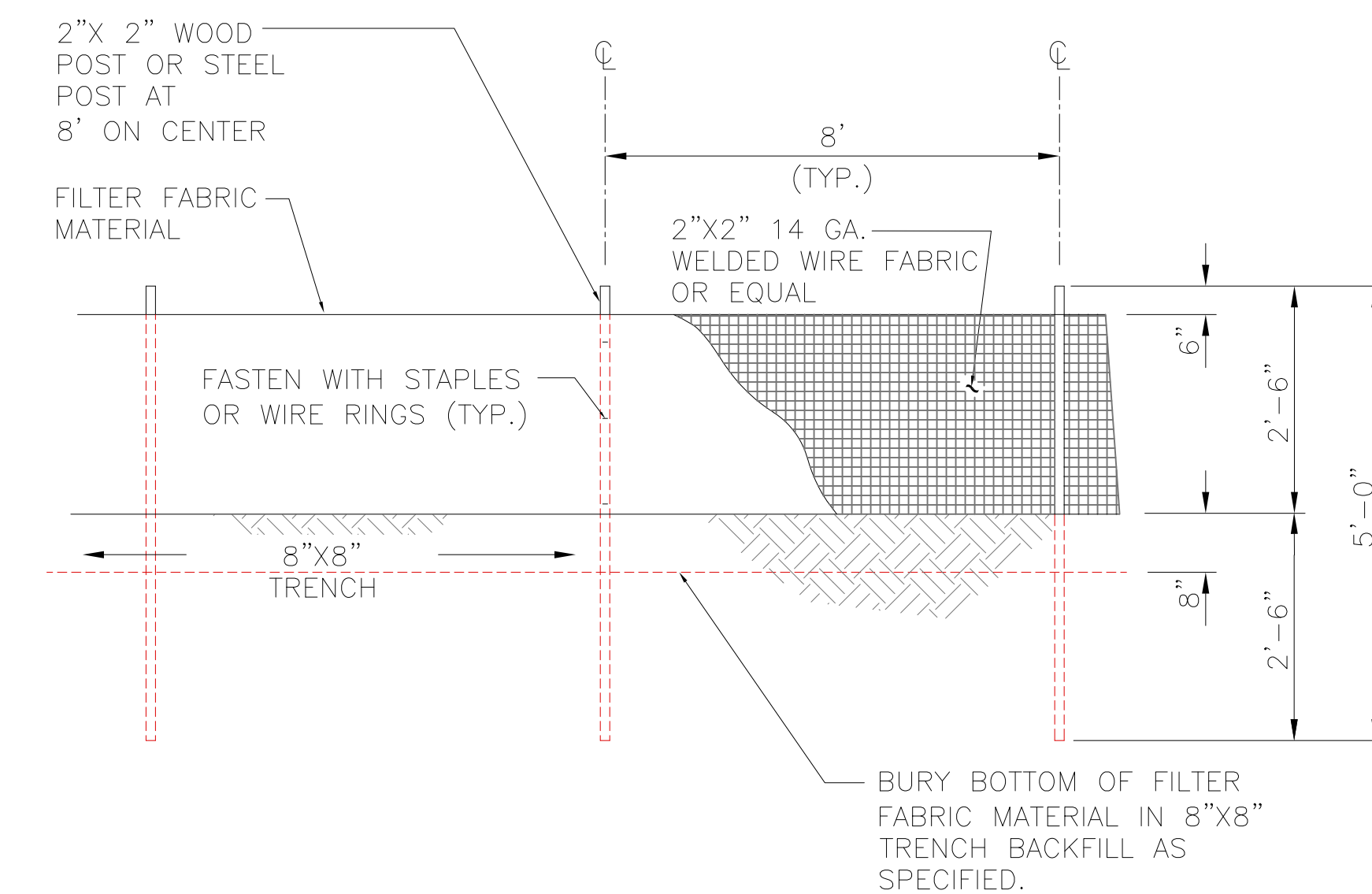
ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
DEWATERING PLAN

PROJECT NO. 960986-18	
SHEET 5	OF 8



TYPICAL SILT FENCE SECTION VIEW

SCALE: N.T.S.



TYPICAL SILT FENCE DETAIL

SCALE: N.T.S.

SILT FENCE NOTES

1. SITE ISOLATION (SILT FENCE, STRAW BALE BARRIER) IS ONLY REQUIRED IF LIVE WATER IS PRESENT. IF THE CHANNEL IS DRY, NO FENCING IS REQUIRED.
2. FILTER FABRIC SHALL BE PURCHASED CONTINUOUS. ROLL CUT TO LENGTH AS NEEDED. IF JOINTS ARE NECESSARY FABRIC SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS WITH A MINIMUM OF (6) INCH OVERLAP. BOTH ENDS SHALL BE SECURED AS REQUIRED.
3. SILT FENCING SHALL BE INSTALLED TO FOLLOW CONTOURS. FENCE POSTS SHALL BE SPACED A MAXIMUM OF EIGHT (8) FEET APART UNLESS OTHERWISE SHOWN HEREIN. ALL POSTS SHALL BE DRIVEN INTO THE GROUND A MINIMUM OF 30 INCHES.
4. A TRENCH SHALL BE EXCAVATED, ROUGHLY EIGHT (8) INCHES WIDE BY EIGHT (8) INCHES DEEP UPSLOPE AND ADJACENT TO THE POST TO ALLOW THE FILTER FABRIC TO BE BURIED.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS UTILIZED, A WIRE SINGLE SPACE MESH SUPPORT FENCE SHALL BE FASTENED TO THE UPSLOPE SIDE OF THE POSTS USING ONE (1) INCH MINIMUM LENGTH WIRE STAPLES TIE WIRE OR APPROVED HOG RINGS. ALL WIRE SUPPORT SHALL EXTEND INTO THE TRENCH A MINIMUM OF FOUR (4) INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE ORIGINAL GRADE.
6. ALL FILTER FABRIC SHALL BE STAPLED OR WIRED TO SUPPORT FENCING AND A MINIMUM OF 20 INCHES OF FABRIC SHALL BE EXTENDED INTO THE TRENCH. FILTER FABRIC SHALL NOT BE STAPLED OR FASTENED TO EXISTING TREES OR STRUCTURES UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
7. IF HIGH STRENGTH FILTER FABRIC AND CLOSER SPACING ARE USED, THE WIRE SUPPORT FENCING MAY BE ELIMINATED. HIGH STRENGTH FABRIC SHALL BE STAPLED OR WIRED DIRECTLY TO POSTS AS REQUIRED BY THE ENGINEER.
8. TRENCH SHALL BE BACKFILLED WITH 3/4 INCH MINIMUM DIAMETER WASHED GRAVEL OR OTHER SIMILAR SOURCE AS APPROVED BY THE ENGINEER.
9. SILT FENCING SHALL BE INSTALLED WHERE SHOWN ON THE PLAN, OR AS MARKED IN THE FIELD BY THE ENGINEER, PRIOR TO COMMENCEMENT OF WORK. ALL FENCING SHALL BE INSPECTED DAILY DURING CONSTRUCTION AND AFTER EACH SIGNIFICANT RAINFALL EVENT UNTIL SITE HAS BEEN PERMANENTLY STABILIZED. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
10. REMOVAL OF TRAPPED SEDIMENT SHALL BE PERFORMED WHEN AMOUNTS REACH APPROXIMATELY 1/3 HEIGHT OF THE FENCE ABOVE GROUND.
11. SILT FENCING SHALL REMAIN IN-PLACE UNTIL SITE HAS BEEN REVEGETATED TO ORIGINAL CONDITION OR DIRECTED BY THE ENGINEER.

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY

APPROVED AND RELEASED FOR CONSTRUCTION

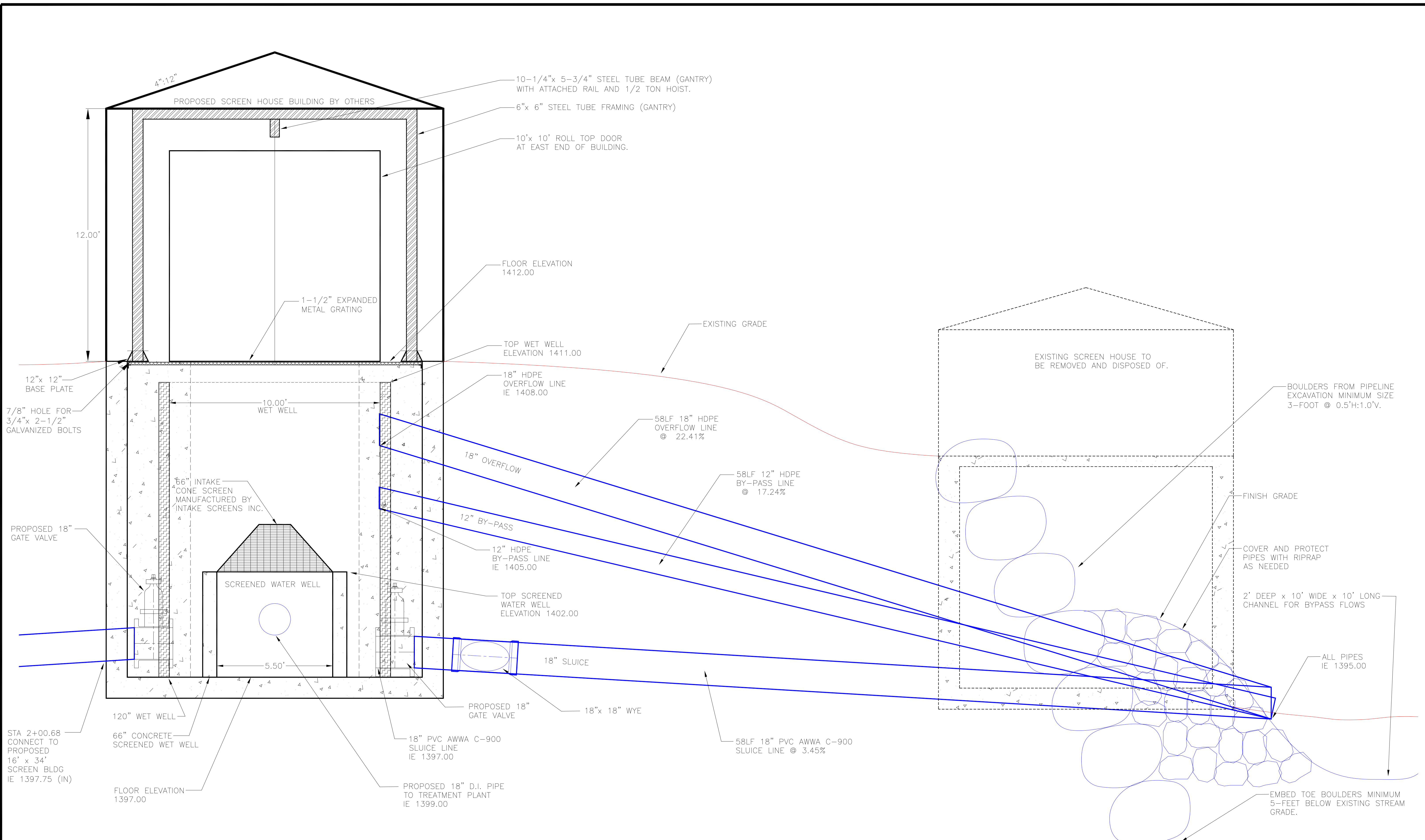
CHIEF ENGINEER DATE: _____

PROGRAM DATE: _____

DESIGNED BY	CHECKED BY	DRAWN BY	DATE
S. STANLEY		T.G.	07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS

PROJECT NO.	
960986-18	
SHEET	OF
6	8



SCREEN BUILDING DETAILS

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER	DATE:		
PROGRAM	DATE:		

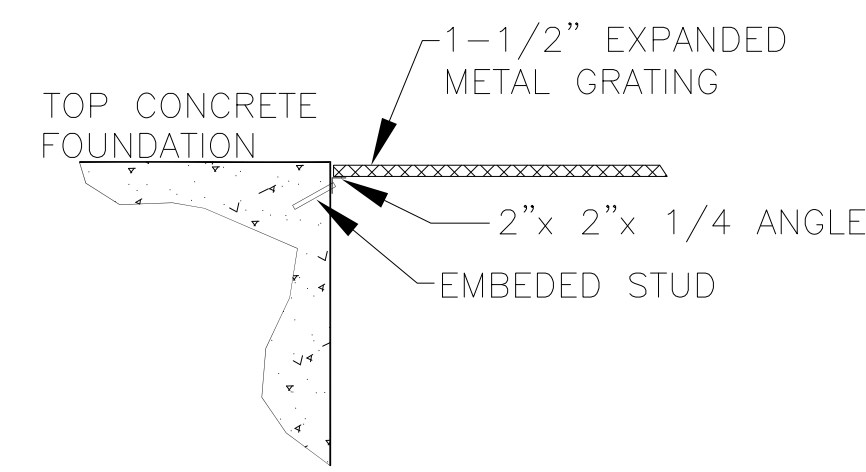
0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT

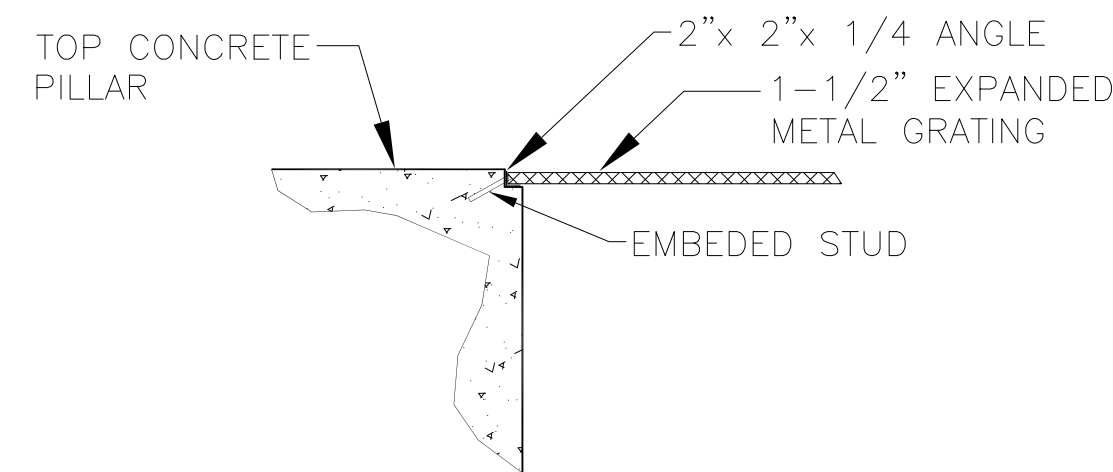
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS II

PROJECT NO.
960986-18

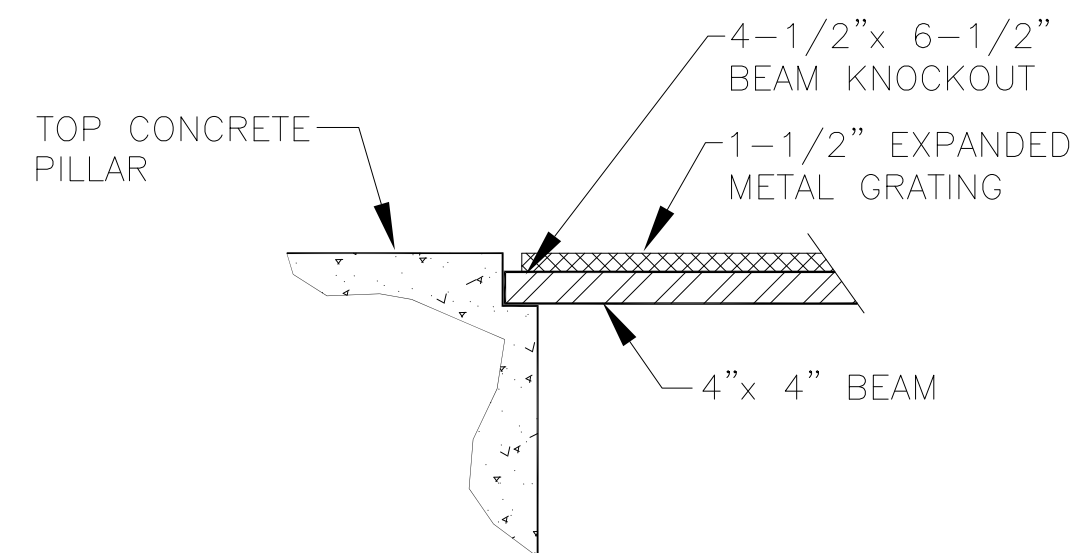
SHEET 7 OF 8



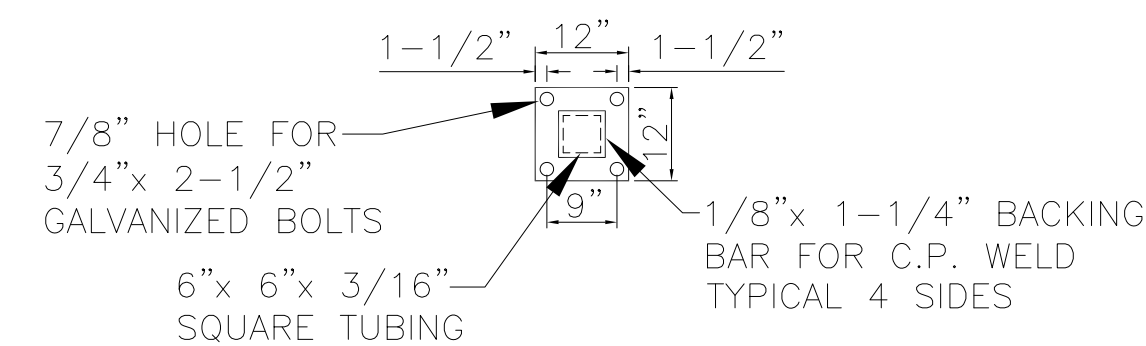
LEDGER DETAIL



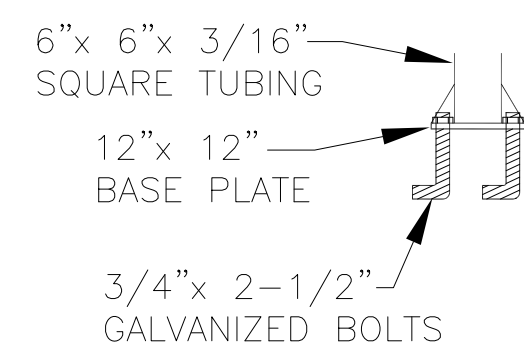
KNOCKOUT DETAIL



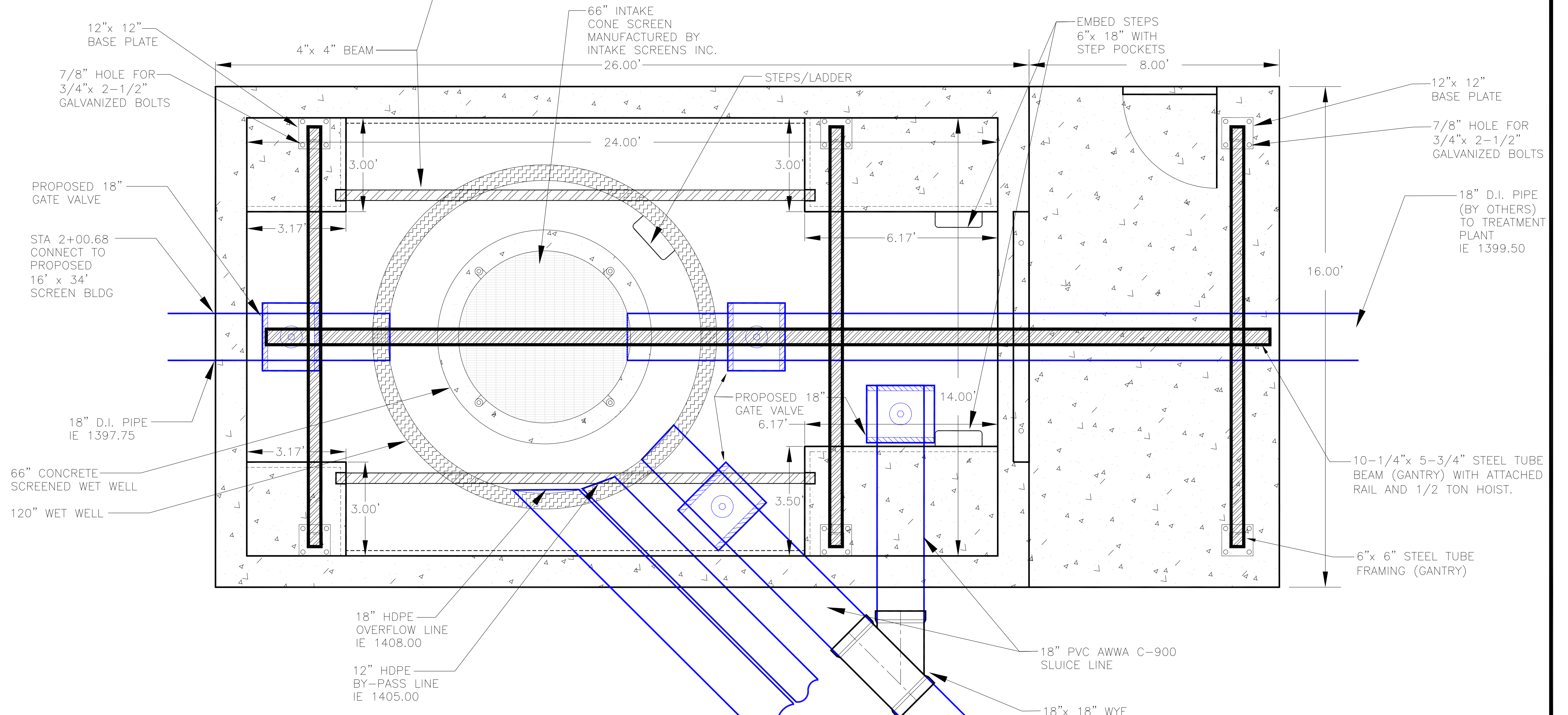
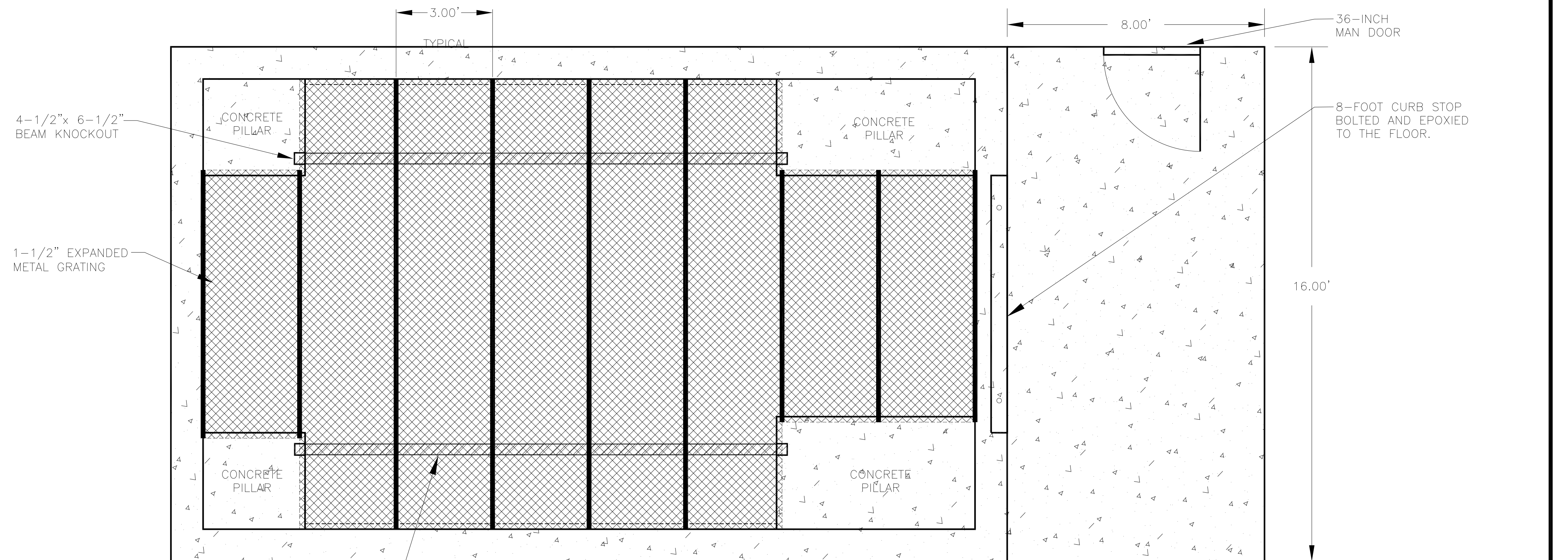
BEAM KNOCKOUT DETAIL



BASE PLATE DETAIL



BASE PLATE BOLT DETAIL



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

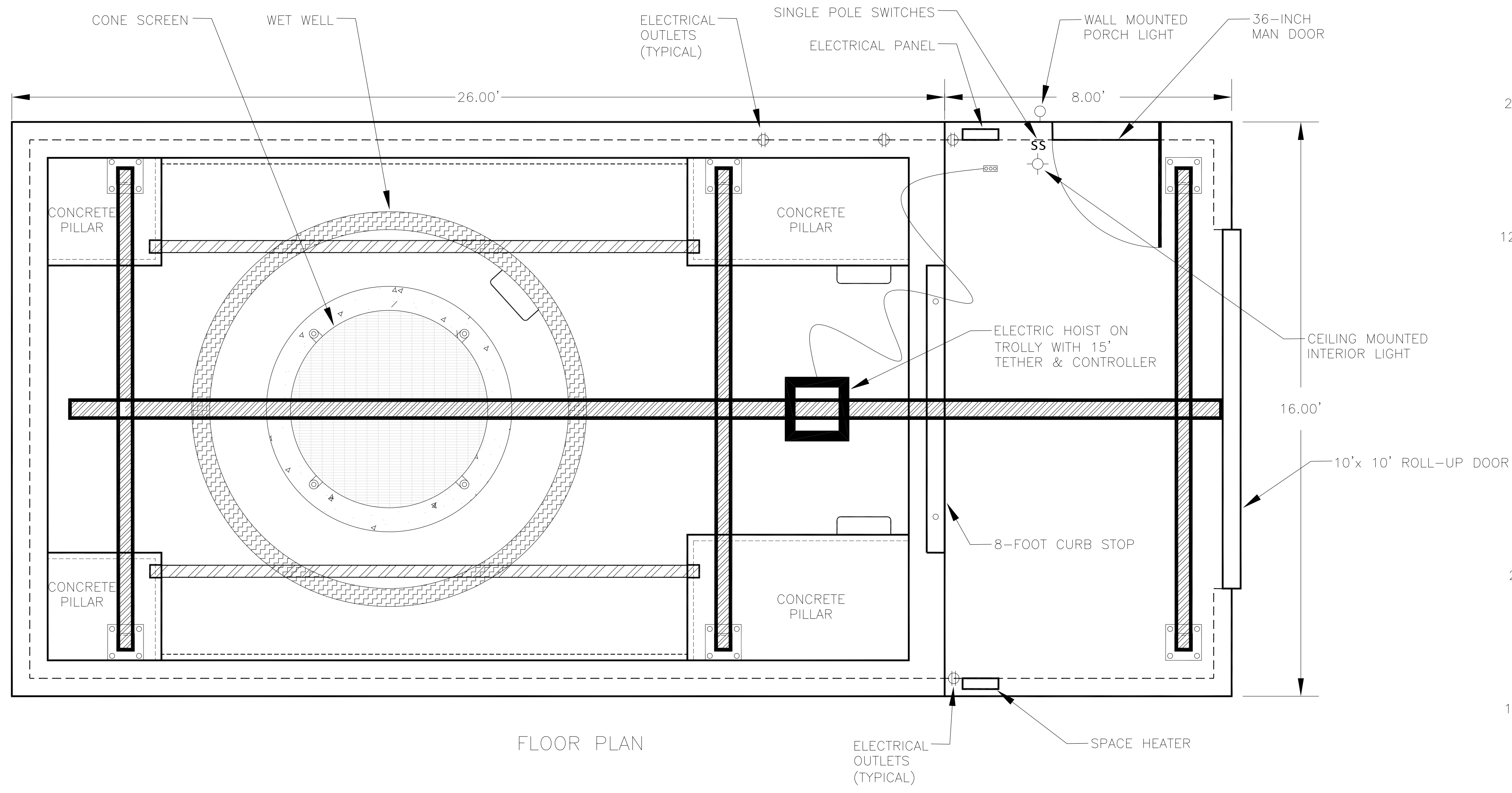


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		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

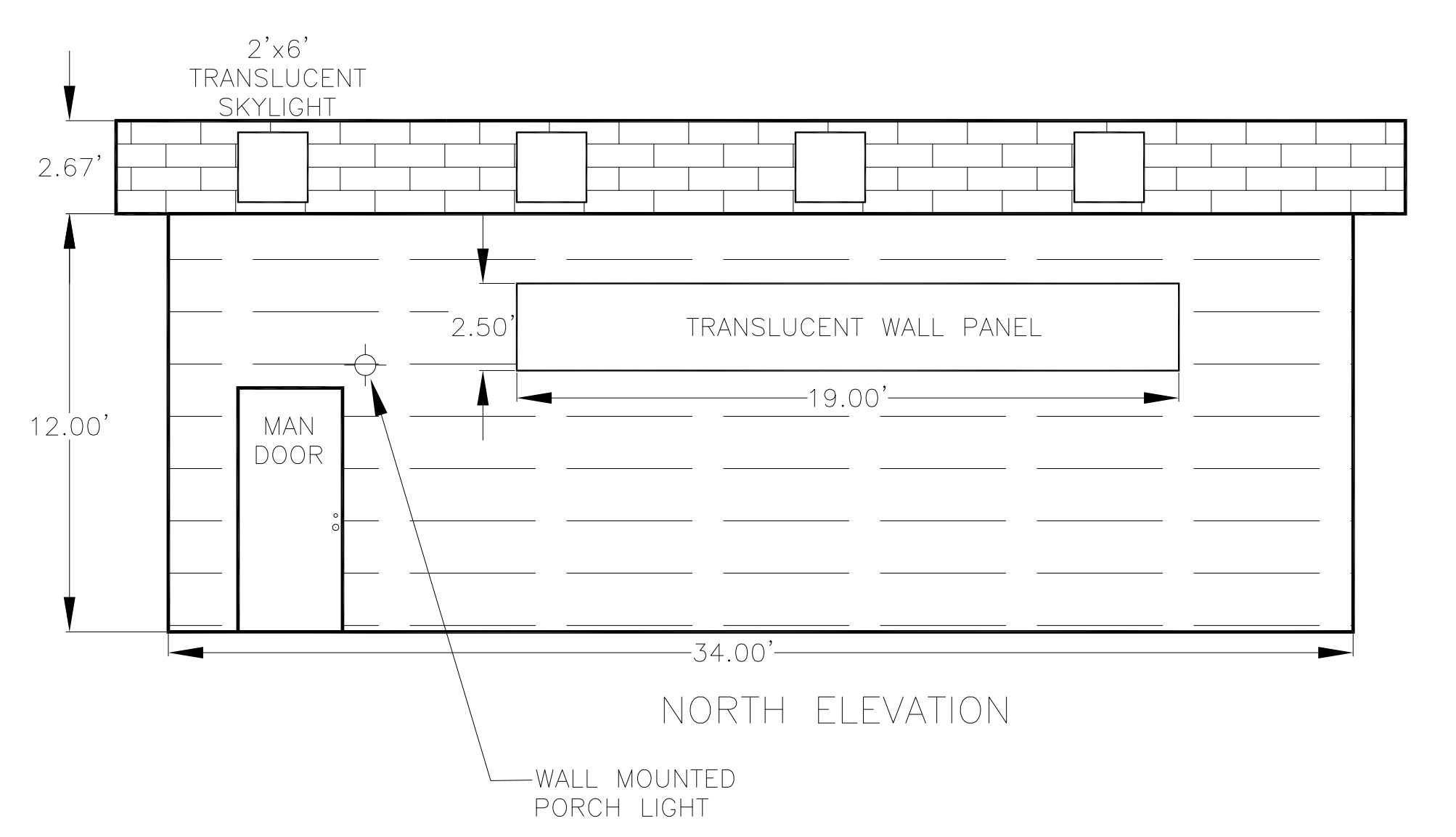
0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS
DESIGNED BY S. STANLEY
CHECKED BY
DRAWN BY T.G.
DATE 07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS II

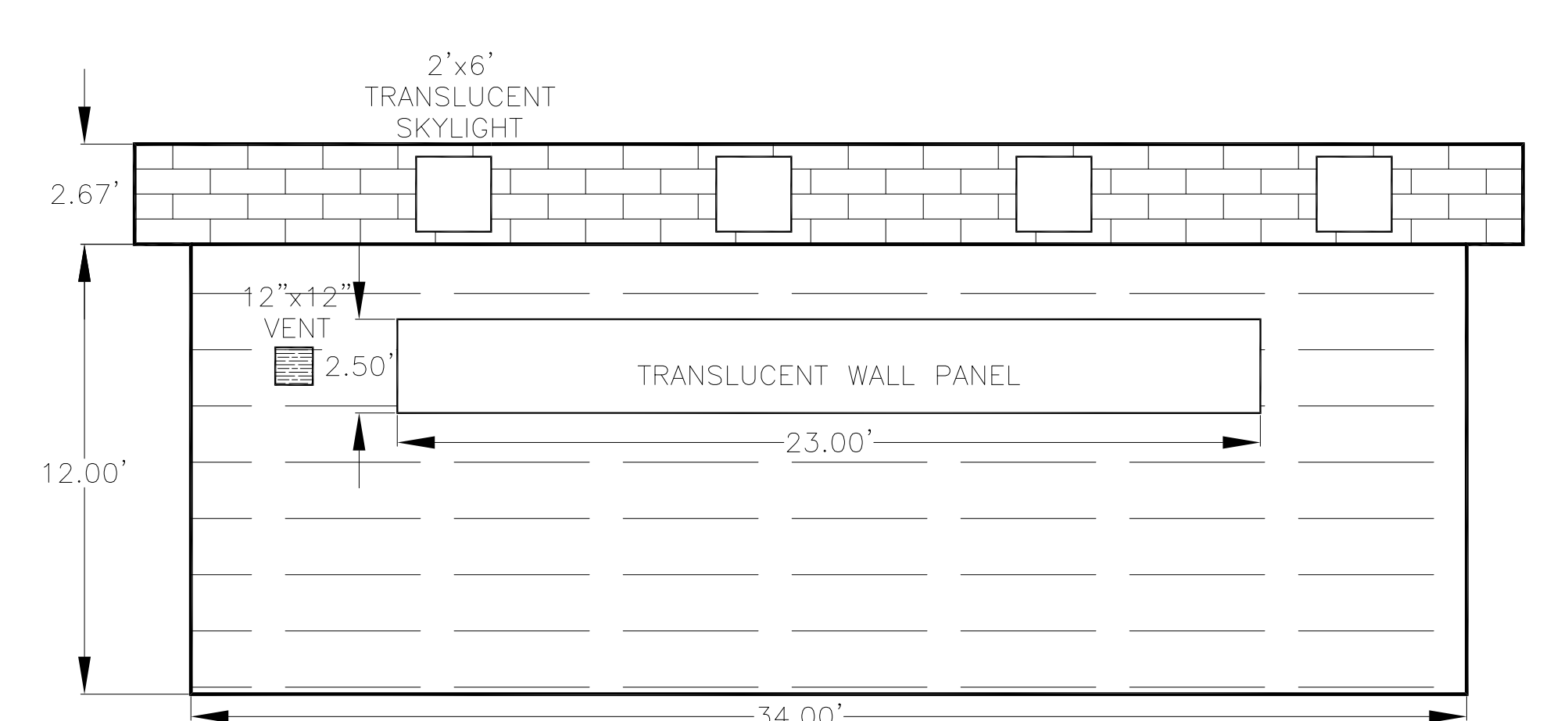
PROJECT NO. 960986-18
SHEET 8 OF 8



FLOOR PLAN

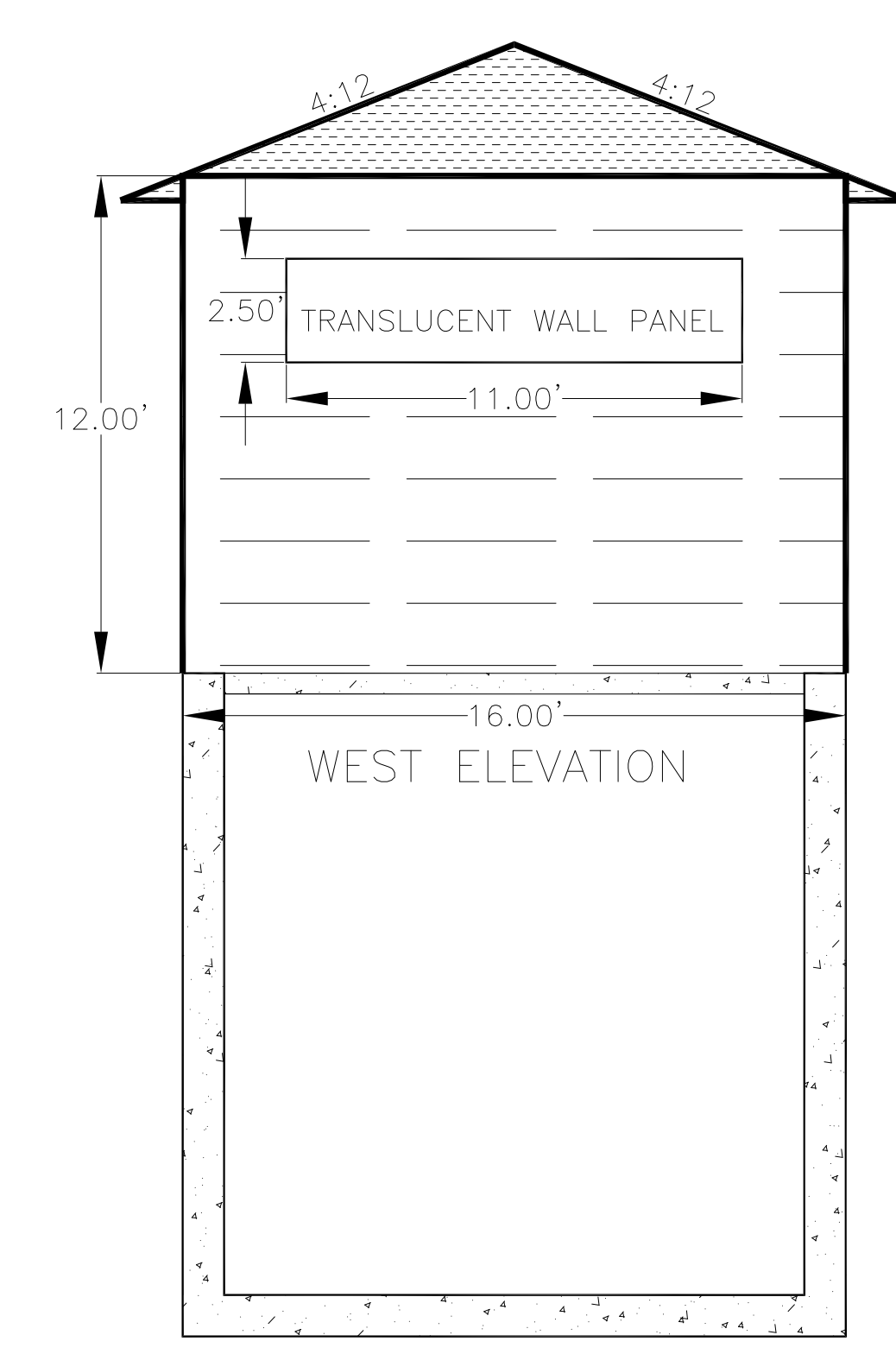


NORTH ELEVATION

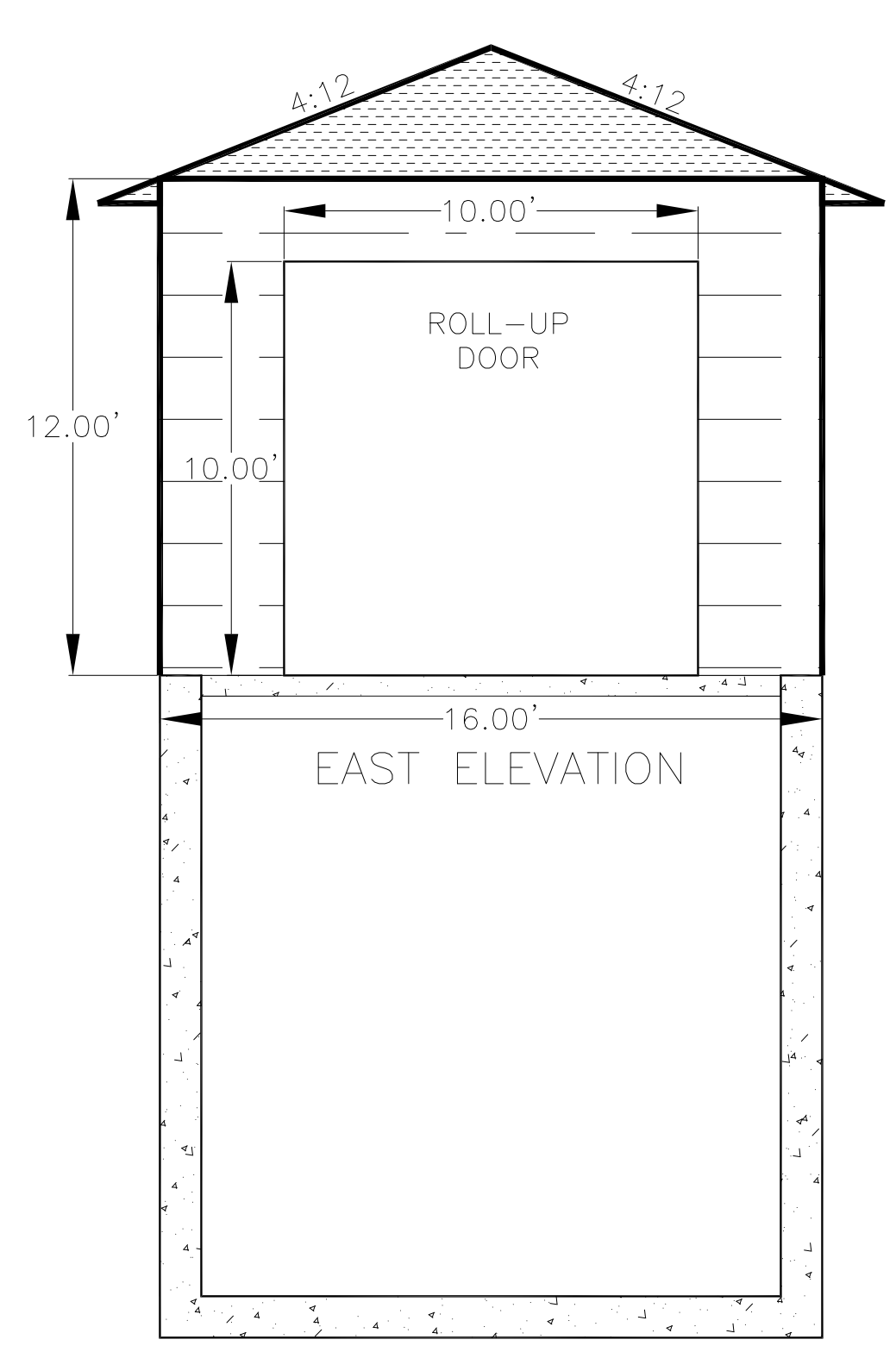


SOUTH ELEVATION

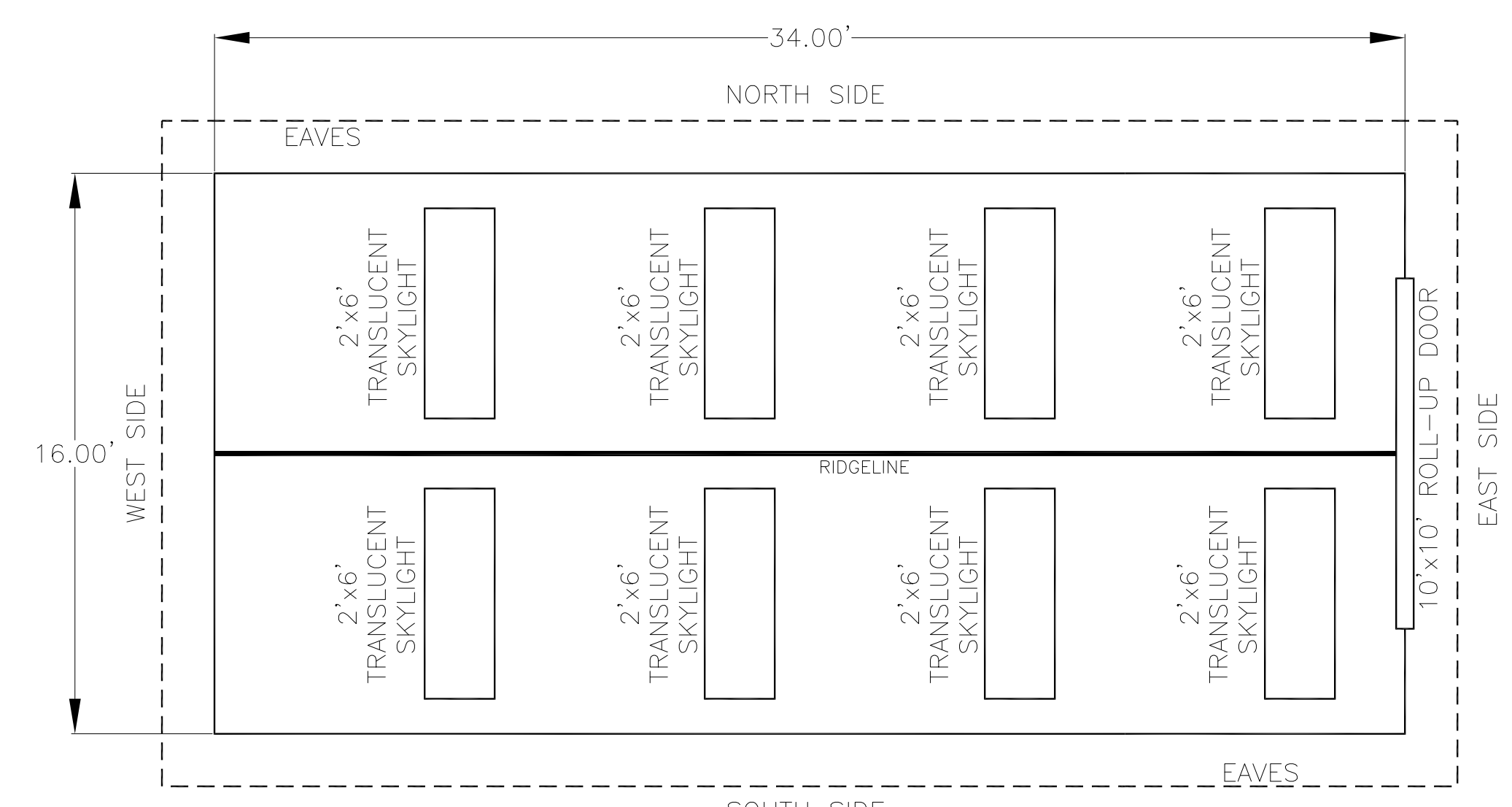
NOTE:
BUILDING TO BE INSULATED WITH
4"-6" ROOF INSULATION AND
4" WALL INSULATION



WEST ELEVATION



EAST ELEVATION



TOP VIEW

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

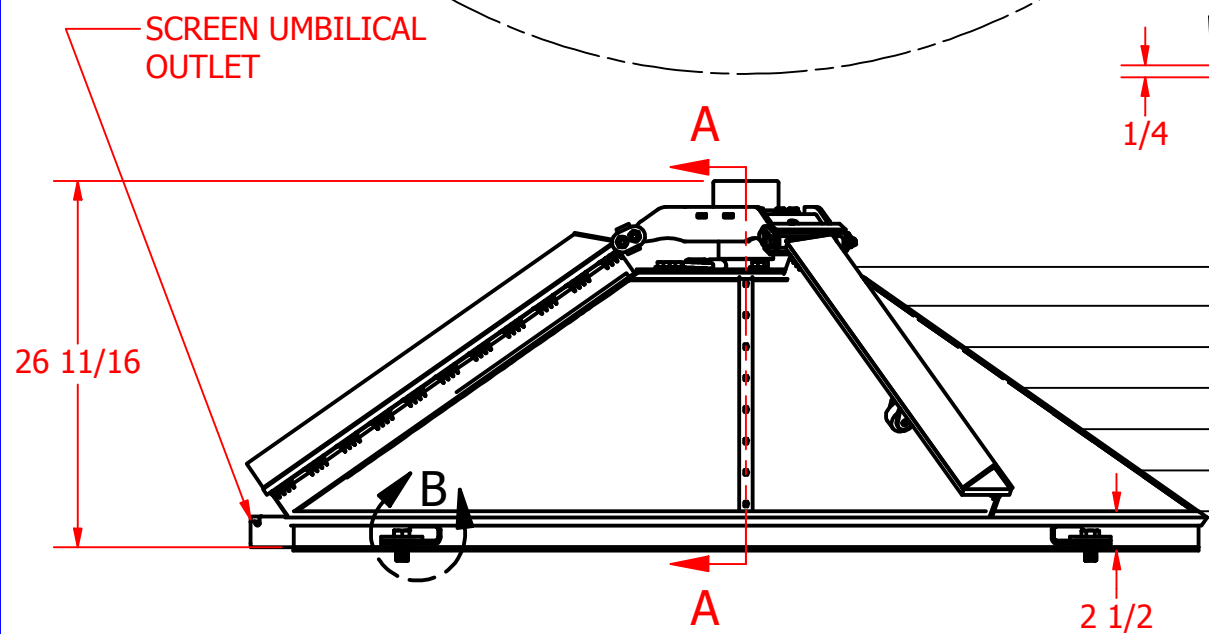
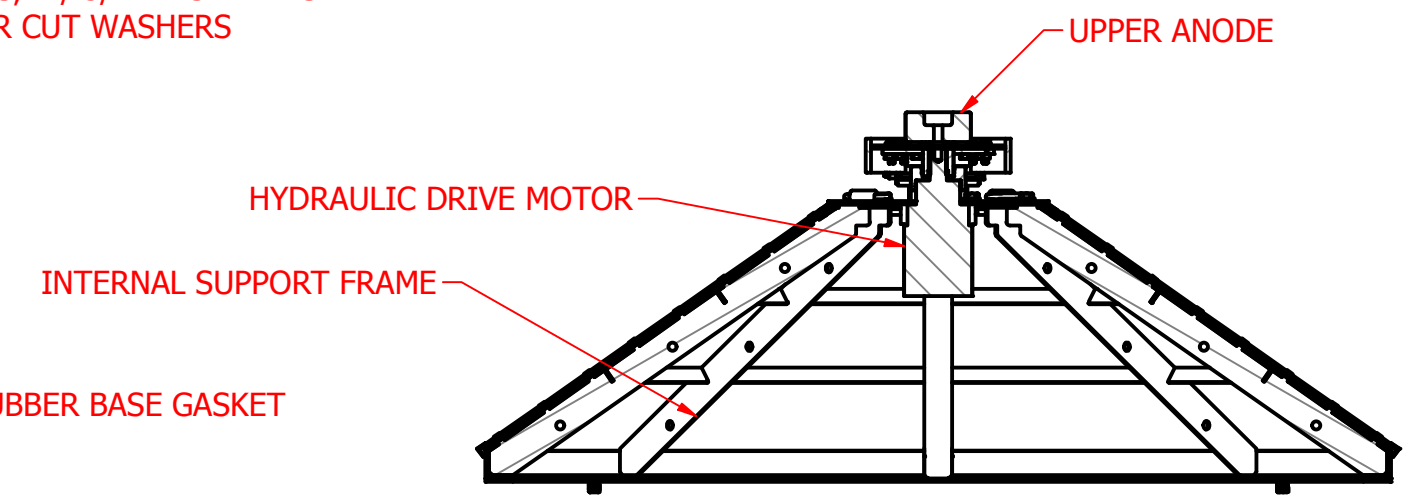
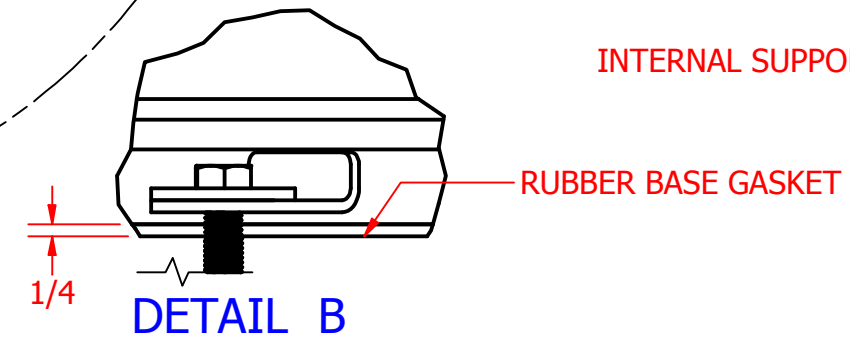
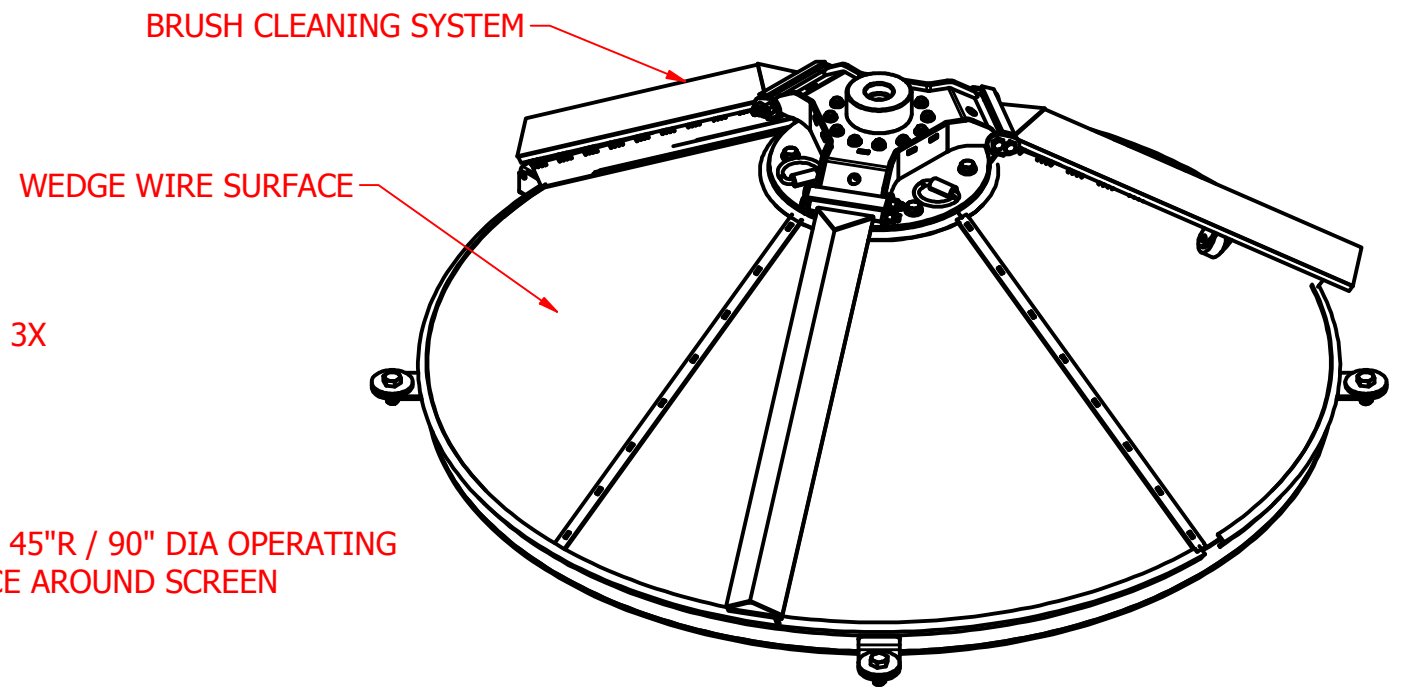
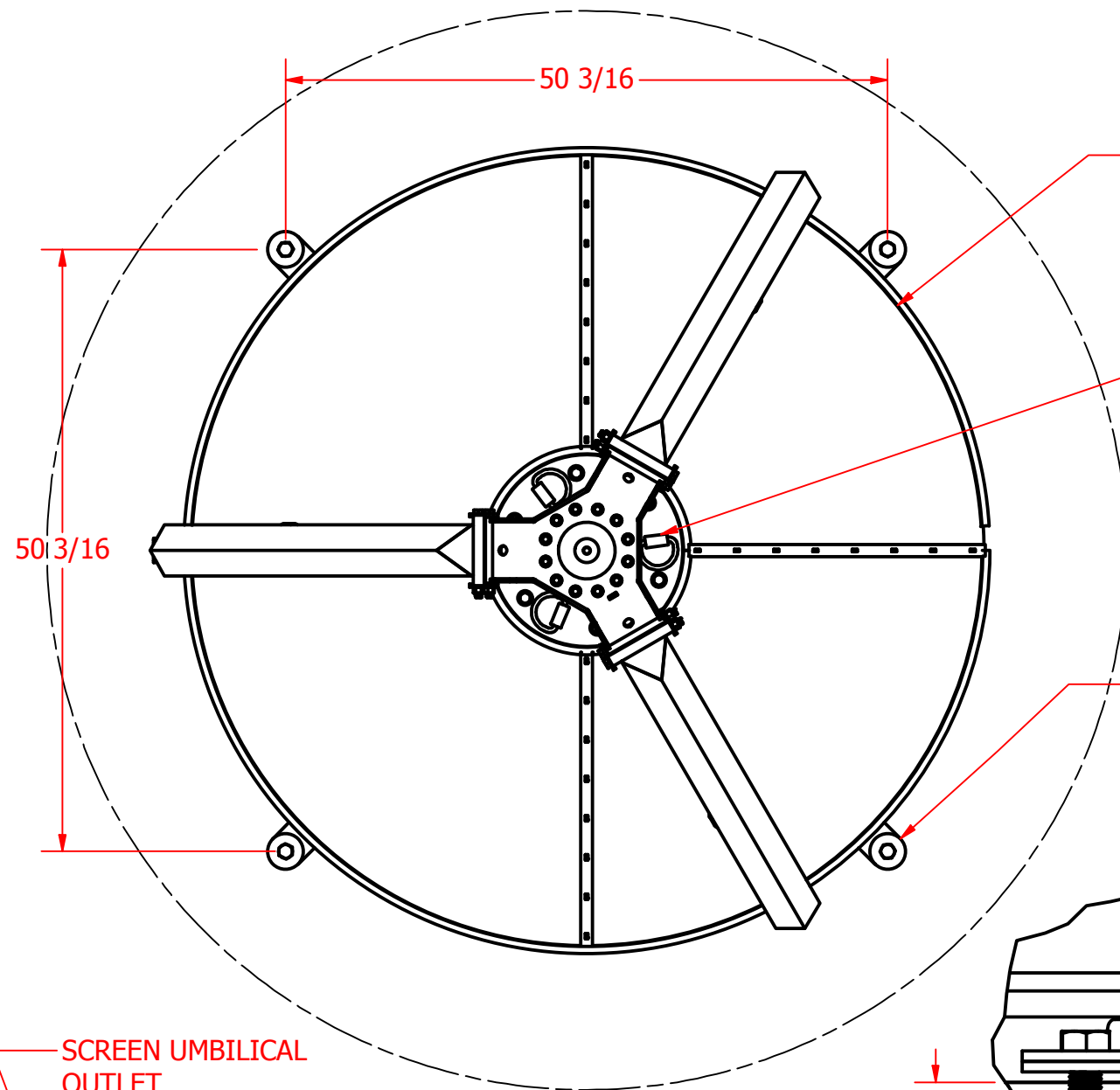


SYM	DATE	REVISION	DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION				
CHIEF ENGINEER		DATE:		
PROGRAM		DATE:		

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	07-25-2018

ICICLE CREEK
FISH PASSAGE AND HABITAT RESTORATION PROJECT
FISH EXCLUSION SCREEN
PROJECT NOTES AND DETAILS IV

PROJECT NO.	960986-18
SHEET	9
OF	9



17.81" / 26.80
15" / 24.86
12" / 21.85
9" / 17.85
6" / 12.88
3" / 6.93
0" / 0

WATER DEPTH (in) / SUBMERGED SCREEN AREA (sq ft)

ISI C66-18 BRUSHED CONE SELF CLEANING INTAKE SCREEN
 FRAME MATERIAL: ASTM A276, TYPE 304
 MOTOR FRAME / DRIVE PLATE MATERIAL: EPOXY COATED ASTM A36 CARBON STEEL
 69 V WEDGEWIRE: 1.75mm WIDTH, 1.75 SLOT SIZE, 50% OPEN AREA

ALL DIMENSIONS IN INCHES UNLESS NOTED

REV	DESCRIPTION	DATE	APPROVED

Designs are property of INTAKE SCREENS INC; and are subject to change without notice.

STANDARD TOLERANCES
 Fractional Dimensions ± 1/32
 Decimal Dimensions ± 0.005

www.intakescreensinc.com
 CA CL. 796197

ISI Intake Screens, Inc.
 8417 River Road - Sacramento, California 95832
 (916) 665-2727 (916) 665-2729 FAX

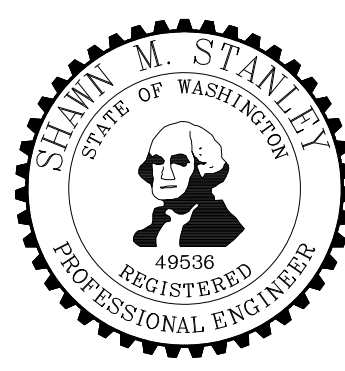
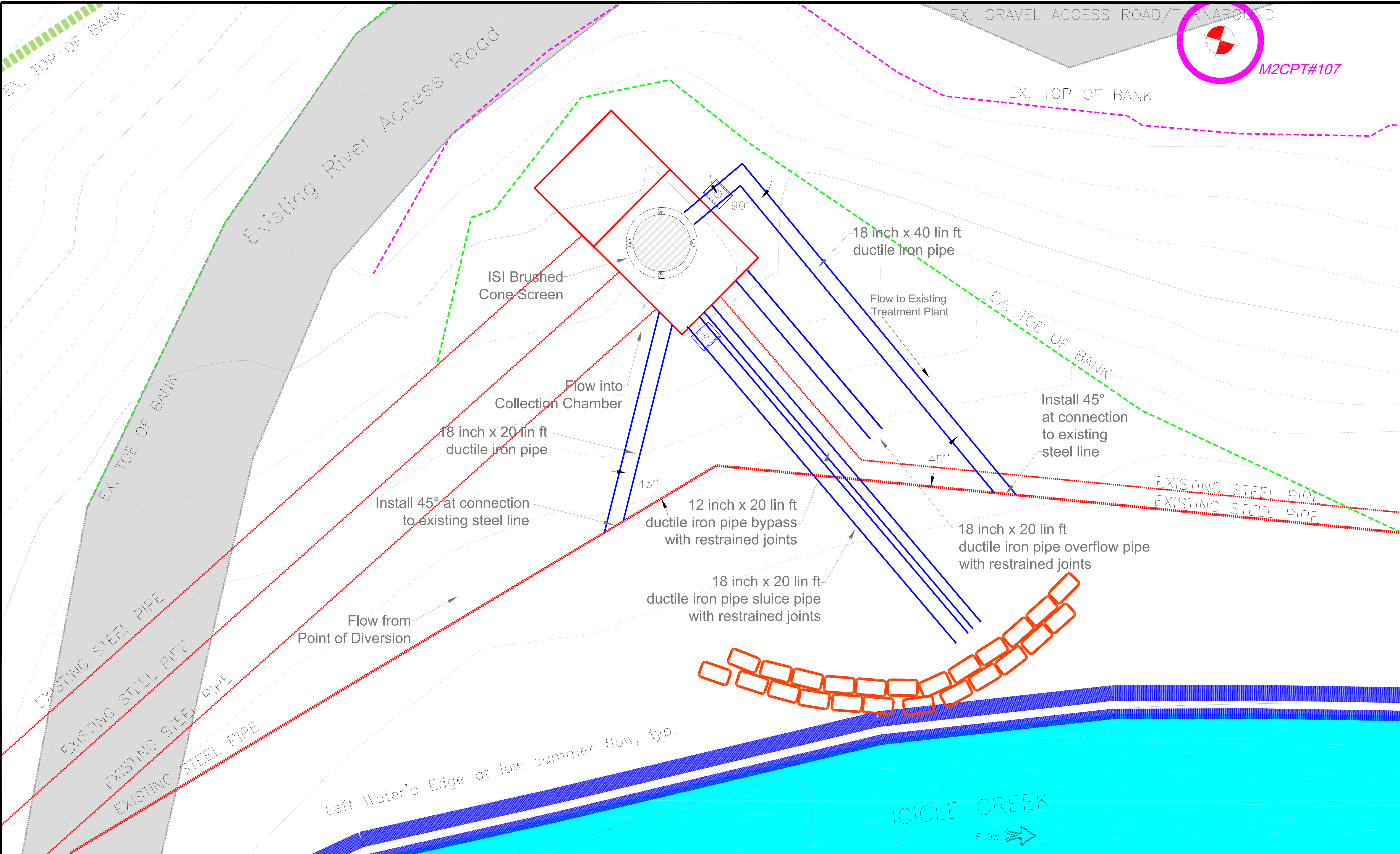
DATE	5/9/2018
APP'D BY	RUSSELL BERRY
DRAWN BY	MAR
"B" SHEET SCALE	

PROJECT: Yellow Jacket

DESCRIPTION	66" CONE SCREEN
MATERIAL	304 STAINLESS ASSEMBLY

DRAWING NUMBER	66 CONE SCREEN-12
MASS	N/A

SHEET NUMBER	1 of 1
--------------	--------



SYM	DATE	REVISION DESCRIPTION	BY
APPROVED AND RELEASED FOR CONSTRUCTION			
CHIEF ENGINEER		DATE:	
PROGRAM		DATE:	

DESIGNED BY	S. STANLEY
CHECKED BY	
DRAWN BY	T.G.
DATE	09-10-2018

NOT FOR CONSTRUCTION

0 1" BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS



WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

SNOW CREEK TRIBUTARY TO ICICLE CREEK SCREEN REMOVAL AND RELOCATION PROJECT CHELAN COUNTY, WA. WRIA: 45.0488, SITE: 603097

INDEX

SHEET NO.

1. COVER SHEET
2. SNOW CREEK EXISTING CONDITIONS PLAN VIEW
3. SNOW CREEK EXISTING CONDITIONS PROFILE VIEW
4. SNOW CREEK CROSS SECTIONS
5. SNOW CREEK CROSS SECTIONS
6. IRRIGATION DITCH PLAN VIEW
7. IRRIGATION DITCH PROFILE & CROSS SECTIONS
8. IRRIGATION DITCH CROSS SECTIONS

DESIGN STANDARDS

STREAM HABITAT IMPROVEMENT
AND MANAGEMENT: PS 395
AQUATIC ORG PASSAGE: PS 396
OPEN CHANNEL: PS 582
ACCESS ROAD: PS 560

PROJECT PARTNERS

XXXXXX

WASHINGTON DEPARTMENT
OF FISH & WILDLIFE

LANDOWNER REPRESENTATIVE

XXXXXX



ABBREVIATIONS

APPROX.	APPROXIMATE
BM	BENCH MARK
CONC.	CONCRETE
CL	CENTERLINE
CMP	CORRUGATED METAL PIPE
CP	CONTROL POINT
DIA.	DIAMETER
ELEV.	ELEVATION
EXIST.	EXISTING
FT.	FEET
GA.	GAUGE
HORIZ.	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
IE.	INVERT ELEVATION
ID.	IDENTIFICATION
LAT.	LATITUDE
LF.	LINEAL FOOT
LONG.	LONGITUDE
MAX.	MAXIMUM
MIN.	MINIMUM
MISC.	MISCELLANEOUS
MP.	MILE POST
NRCS	NATURAL RESOURCES CONSERVATION SERVICE
NTS	NOT TO SCALE
PAV'T	PAVEMENT
REQ'D	REQUIRED
SEC.	SECTION
SHT.	SHEET
SPEC'S.	SPECIFICATIONS
STA.	STATION
TP.	TAX PARCEL NUMBER
TBM	TEMPORARY BENCH MARK
TYP.	TYPICAL
VERT.	VERTICAL
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
WRIA	WATER RESOURCE INVENTORY AREA
WSDOT	WASHINGTON STATE DEPARTMENT OF TRANSPORTATION
W.S.	WATER SURFACE

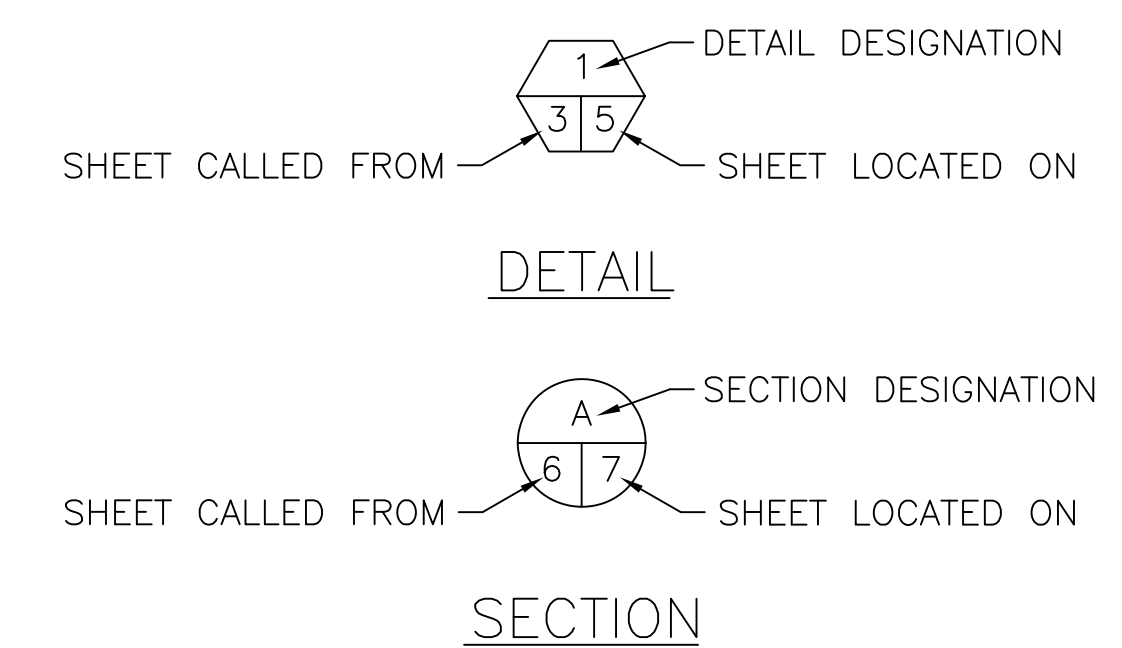
VICINITY MAP

LAT: 47.54201 N / LONG: -120.71171 W
WRIA: 45.0488, SITE ID: 603097
SECTION 27 & 28, TOWNSHIP 24N, RANGE 17E

DIRECTIONS TO SITE

FROM LEAVENWORTH, WA. GO WEST ON STATE ROUTE 2
AT THE EDGE OF TOWN TURN LEFT (SOUTHERLY) ON ICICLE
ROAD. CONTINUE ON ICICLE ROAD 4.2 MILES TO THE PARKING
LOT ON THE LEFT. THE SITE IS DOWN THE HILL ACROSS THE
FOOT BRIDGE UP THE TRAIL TO THE IRRIGATION BY-PASS
OVER SNOW CREEK.

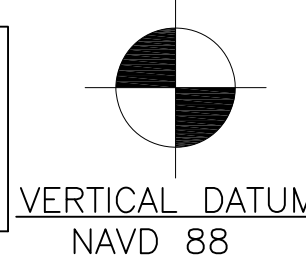
SHEET SYMBOLS



PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE

Description	Easting	Northing	Elevation
1. WDFW REBAR #1	1670577.170'	197616.595'	1434.41'
2. WDFW REBAR #2	1670524.666'	197694.655'	1405.34'



DESIGN STANDARDS

To the best of my professional knowledge, judgement, and belief, these plans meet all applicable NRCS practice standards.

Signature _____ Date: _____

REVIEW AND ACCEPTANCE

The Drawings, Construction and material Specifications, and Operation and Maintenance Plans for this project have been reviewed with me and are accepted for this installation. I also acknowledge that any modifications prior to review by the NRCS before implementation may result in NRCS disapproval of this installation. I hereby acknowledge receipt of a copy(ies) of this plan.

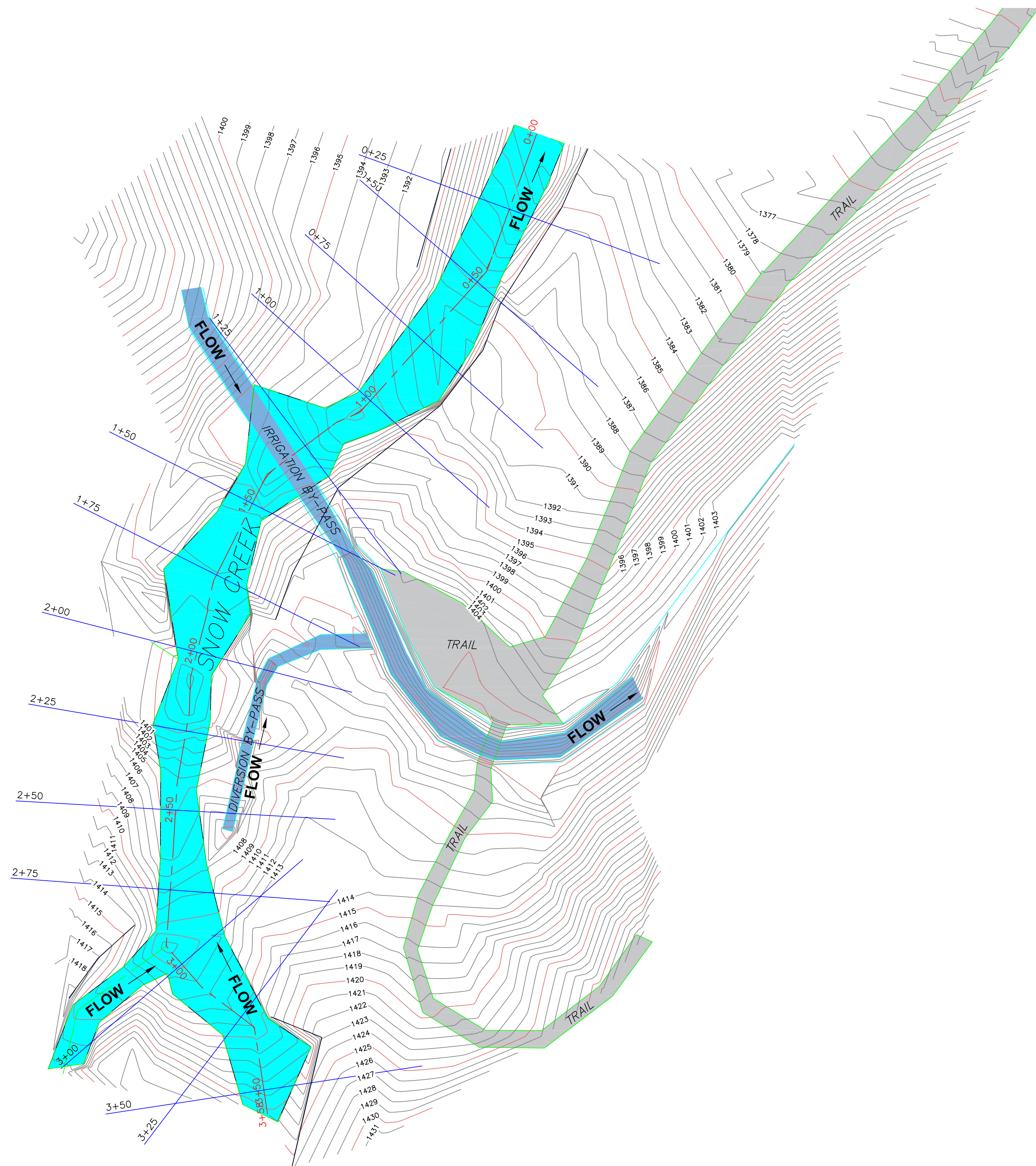
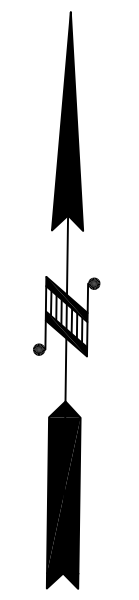
Owner/Operator _____

Date _____

APPROVED FOR CONSTRUCTION

Donald C. Ponder, PE _____ Date _____
Environmental Engineering Section Manager
Restoration Division, Habitat Program, WDFW

PROJECT NO. 603097-18-2	
SHEET	OF
1	8



EXISTING CONDITIONS PLAN VIEW

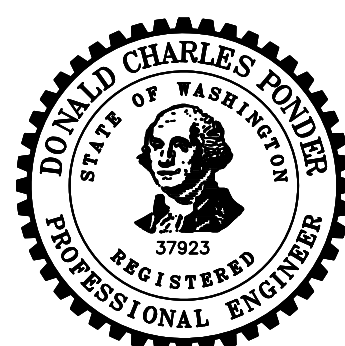
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PROJECT CONTROL POINTS

SURVEY CONTROL POINTS TABLE			
Description	Easting	Northing	Elevation
1. WDFW REBAR #1	1670577.170'	197616.595'	1434.41'
2. WDFW REBAR #2	1670524.666'	197694.655'	1405.34'



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
CHIEF ENGINEER	DATE:		
PROGRAM	DATE:		

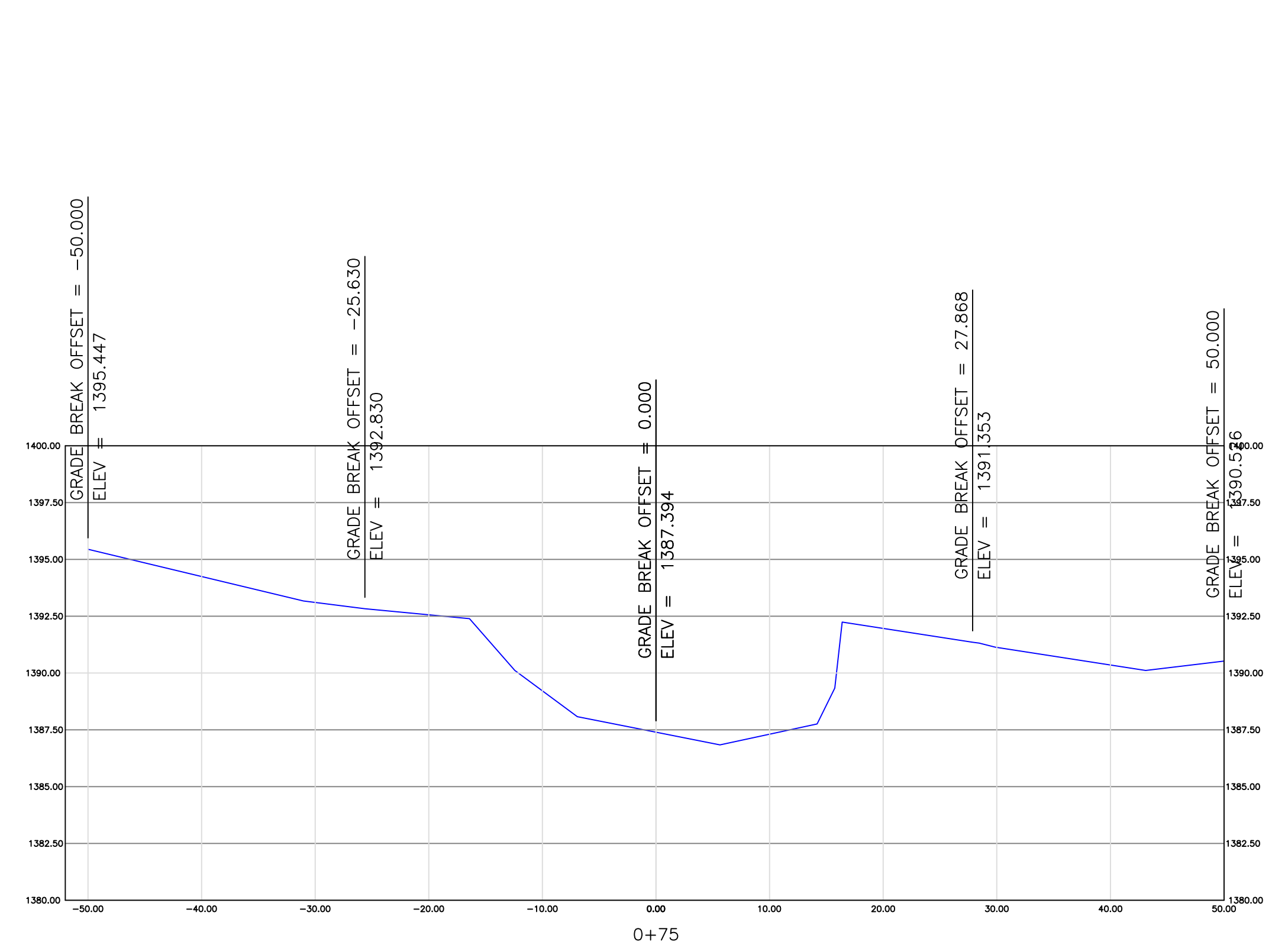
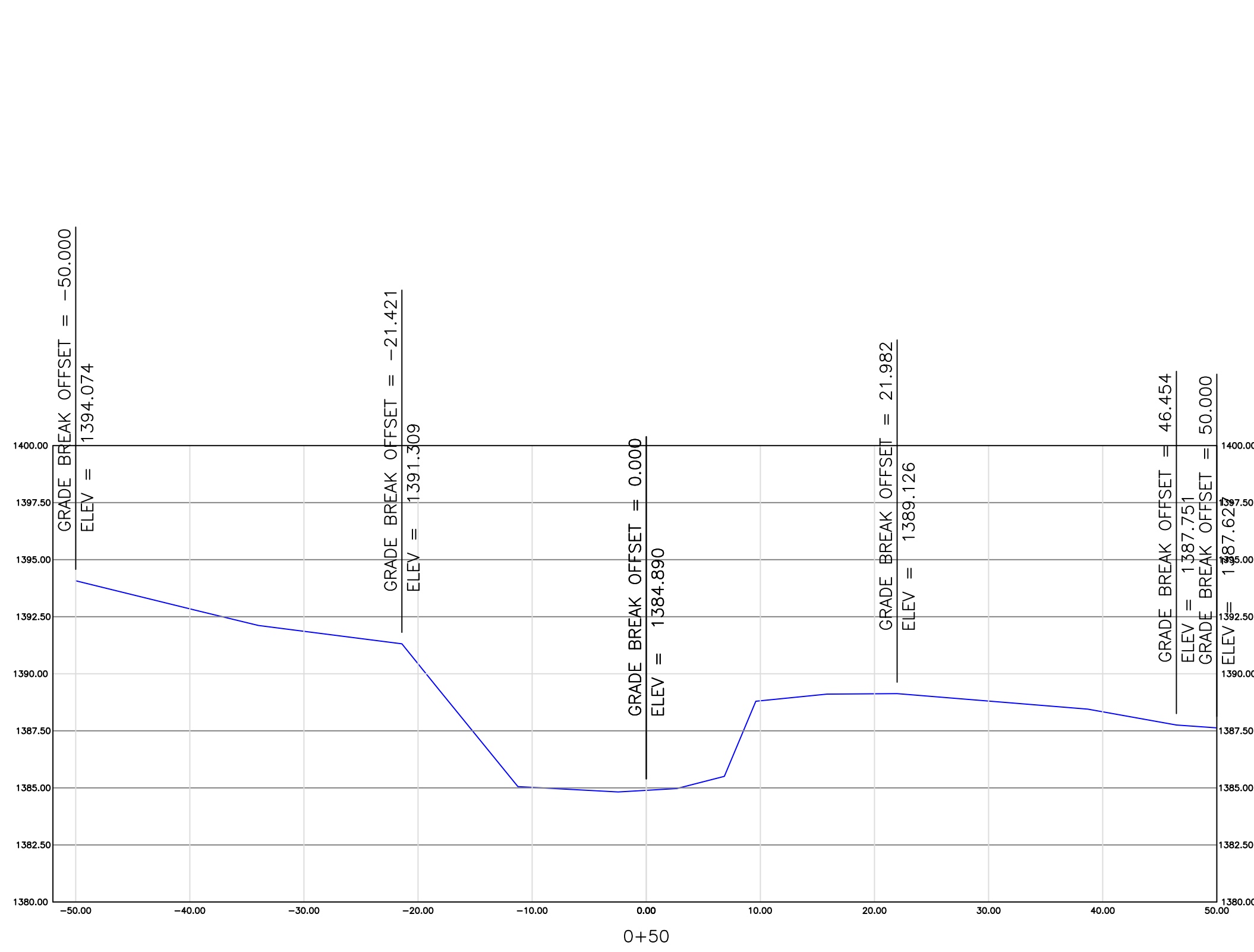
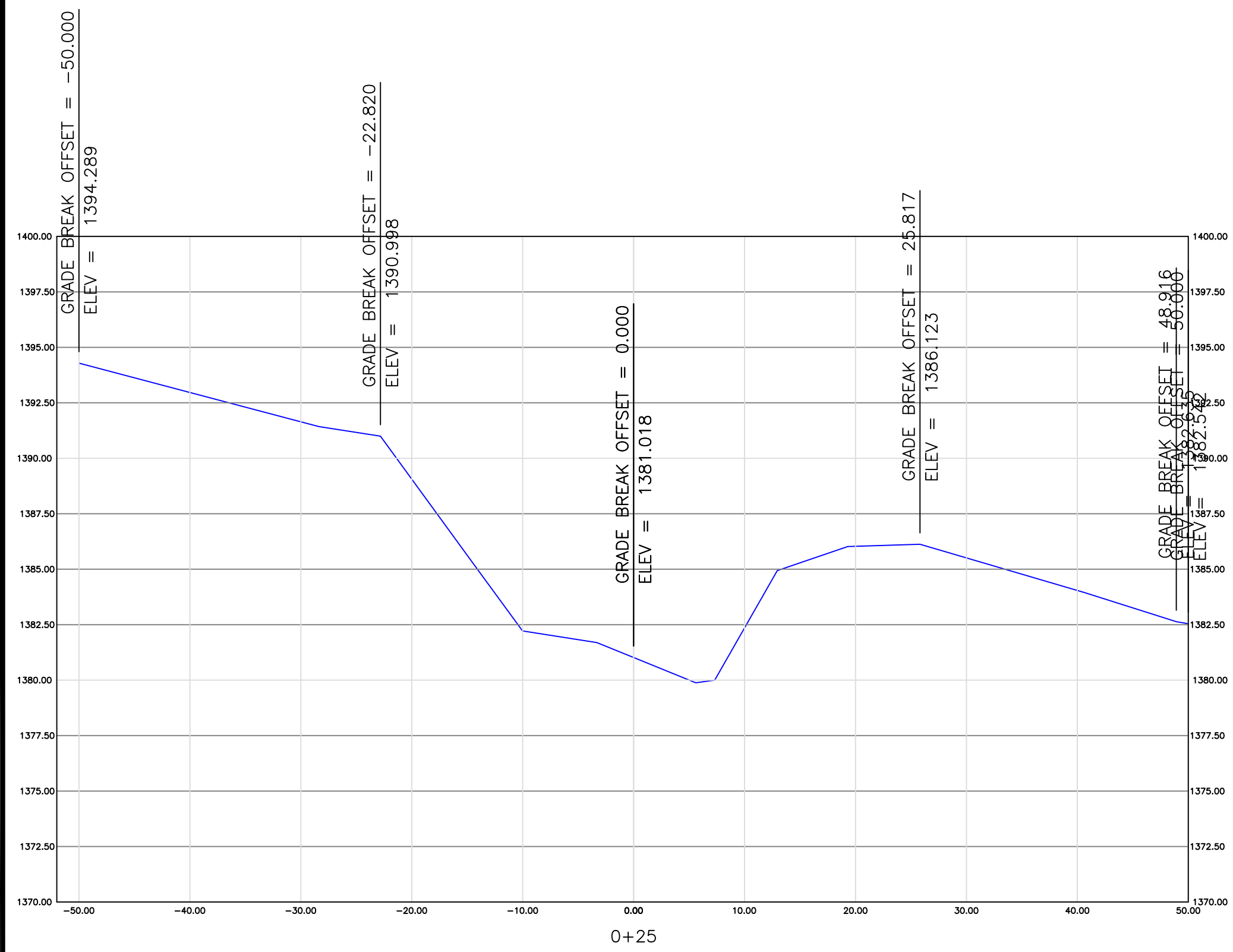
0 ——— 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY S. STANLEY
CHECKED BY D. PONDER
DRAWN BY T. GODAT
DATE 2-15-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
EXISTING CONDITIONS PLAN VIEW

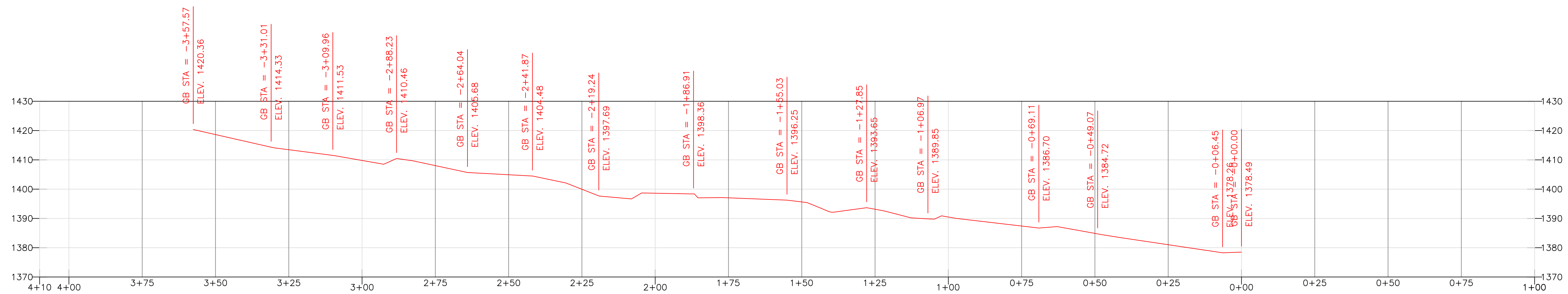
PROJECT NO.
603097-18-2

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2	8



EXISTING SNOW CREEK CROSS SECTIONS

Scale: 1" = 10'

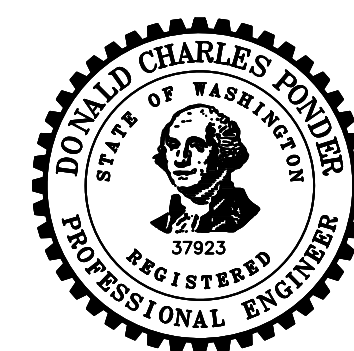


EXISTING SNOW CREEK PROFILE VIEW

Scale: 1" = 20'



WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE



SYM	DATE	REVISION DESCRIPTION	BY
		APPROVED AND RELEASED FOR CONSTRUCTION	
		CHIEF ENGINEER	DATE:
		PROGRAM	DATE:

0 1"
BAR MEASURES
ONE INCH ON
ORIGINAL DRAWINGS

DESIGNED BY S. STANLEY
CHECKED BY D. PONDER
DRAWN BY T. GODAT
DATE 2-15-2018

SNOW CREEK
SCREEN REMOVAL AND
RELOCATION PROJECT
EXISTING CONDITIONS PLAN VIEW

PROJECT NO.
603097-18-2

SHEET	OF
3	8



Washington State Department of Fish and Wildlife

Icicle Creek Bridge Evaluation

KPFF Project No. 10091800042

May 10th, 2018



Submitted To:

Washington State Department of Fish and Wildlife
PO Box 43200
Olympia, WA 98504

Prepared By:

KPFF Consulting Engineers
2407 North 31st Street, Suite 100
Tacoma, WA 98407

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1. Introduction

Washington State Department of Fish and Wildlife (WDFW) retained KPFF Consulting Engineers to provide structural engineering services for an evaluation of the existing timber bridge over Icicle Creek, adjacent to the Snow Lakes Trailhead five miles outside of Leavenworth, WA. The bridge is currently owned and maintained by the U.S. Forest Service and is posted with a 5-ton load limit. In order to provide construction access to a project site adjacent to the existing bridge, WDFW has requested evaluation of multiple options to increase the current load rating to a level acceptable for anticipated construction vehicle loads. KPFF's scope of work included performing a load rating of the existing bridge and support structures (piers and abutments), and developing retrofit options to the existing structure to support various short-and long-term vehicle loading conditions, as well as temporary and permanent replacement options.

The existing bridge is a three-span timber superstructure, supported by two in-stream concrete piers and concrete abutments at each end. The highway (Photo 1) and forest-side (Photo 2) end spans are 30 and 36 feet, respectively, and the center span (Photo 3) is 46 feet. The superstructure consists of glued laminated timber stringers that are 21 inches deep by 6-3/4 inches wide at the highway-side end span, 25.5 inches deep by 6-3/4 inches wide at the forest-side end span, and 33 inches deep by 6-3/4 inches wide at the center span.



Photo 1: Highway-Side End Span



Photo 2: Existing Structure Forest-Side End Span



Photo 3: Existing Structure Center Span

Inspections performed by WDFW and a site visit by KPFF on April 2, 2018 revealed impact damage at the upstream base of the stringers from debris at high stream flow levels, see Photo 4. To provide increased capacity, proposed options include reinforcing the existing girders with steel side plates, replacement of the existing stringers with new glued laminated members, replacement with

steel wide-flange stringers, or replacement with a temporary or permanent pre-engineered bridge system.



Photo 4: Damage to Existing Stringers Due to Flood Debris

The existing bridge deck system is comprised of 3x3 spiked timber decking, overlaid with a 1-inch thick timber driving surface, see Photo 5. The existing clear width of the deck driving surface is 8 feet, and requires widening to support the required clear width for the anticipated construction vehicles. To provide the required clearance, proposed options include replacement of the existing deck/guardrail structure with a system capable of accommodating a 12-foot clear width.



Photo 5: Existing Deck System

2. Load Conditions

KPFF has evaluated five options for increasing bridge capacity for temporary and long-term loading conditions. In each case, short-term construction loading consisted of either a fully loaded, 10 cubic yard or 5 cubic yard concrete/dump truck. Long-term loading consisted of either a 10,000-pound maintenance truck or a 35,000-pound boom truck. See Figures 1 through 4 for axle weights and axle spacing of the four design vehicles.

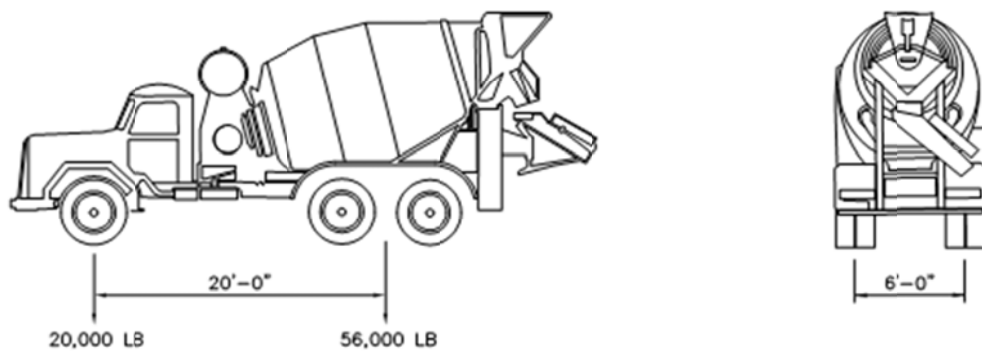


Figure 1 – Design Vehicle 1, 10-CY Concrete/Dump Truck

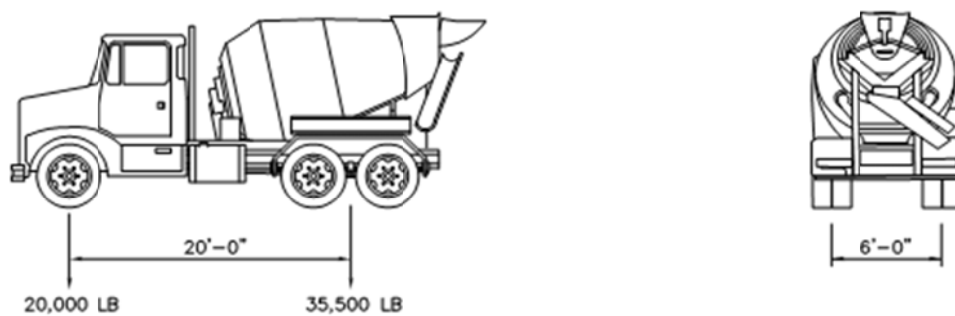


Figure 2 – Design Vehicle 2, 5-CY Concrete/Dump Truck

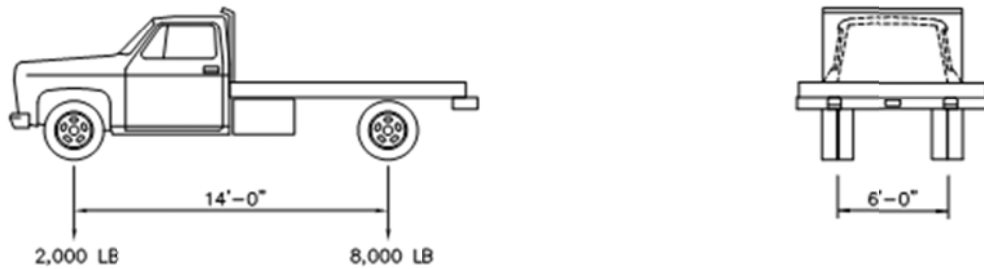


Figure 3 – Design Vehicle 3, 10,000-LB Maintenance Truck

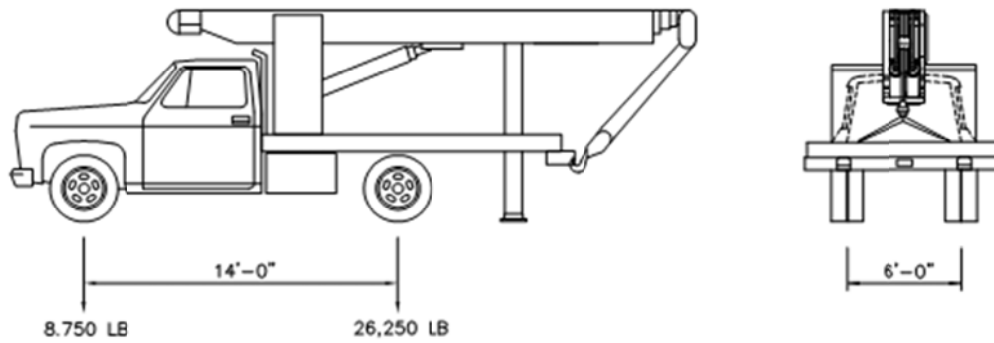


Figure 4 – Design Vehicle 4, 35,000-LB Boom Truck

Multiple bridge configurations were assessed for the various short-term construction and long-term design vehicles. These bridge configurations included rentable, temporary structures to be installed for the duration of the adjacent construction project and removed afterwards with the existing structure to remain; retrofit options to the existing bridge to increase its load capacity to the design vehicle requirements; and complete replacement of the existing structure with a single-span bridge. The following options represent the load conditions and bridge configurations initially explored in KPFF’s evaluations:

Option	Temporary Construction Loading	Long-Term Loading	Bridge Configuration
1	10 CY dump truck and concrete delivery truck	10,000-lb maintenance truck	Temporary bridge superstructure to support construction loading. Temporary bridge removed and existing bridge to remain for long-term loading.
2	5 CY dump truck and concrete delivery truck	10,000-lb maintenance truck	Temporary bridge superstructure to support construction loading. Temporary bridge removed and existing bridge to remain for long-term loading.
3	10 CY dump truck and concrete delivery truck	35,000-lb boom truck	Existing bridge superstructure retrofitted or replaced to support temporary and long-term loading .
4	5 CY dump truck and concrete delivery truck	35,000-lb boom truck	Existing bridge superstructure retrofitted or replaced to support temporary and long-term loading.
5	10 CY dump truck and concrete delivery truck	35,000-lb boom truck	New single-span bridge. Existing in-stream piers removed and new abutments installed at top of creek bank.

Table 1 – Load Condition and Bridge Configuration Options

After initial evaluations, KPFF found that there was minimal cost difference in each Option when designing for the heavier 10-cy concrete/dump truck compared to lighter 5-cy concrete/dump truck. As a result, KPFF simplified the options considered from above and instead explored multiple girder types when evaluating bridge superstructure retrofit or replacement options in order to provide a more representative cost comparison between the different configurations. Table 2 illustrates the options, load criteria, and bridge configurations evaluated by KPFF following our initial evaluations.

Option	Temporary Construction Loading	Long-Term Loading	Bridge Configuration
1	10 CY dump truck and concrete delivery truck	10,000-lb maintenance truck	Temporary clear-span rented bridge to support construction loading. Temporary bridge removed and existing bridge retrofitted to remain for long-term loading.
2	10 CY dump truck and concrete delivery truck	10,000-lb maintenance truck	Existing glulam stringers retrofitted with side plates to support temporary and long-term loading. Replacement of existing deck system to accommodate 12-ft clear roadway width.
3	10 CY dump truck and concrete delivery truck	35,000-lb boom truck	Existing glulam stringers replaced with new glulam stringers to support temporary and long-term loading. Replacement of existing deck system to accommodate 12-ft clear roadway width.
4	10 CY dump truck and concrete delivery truck	35,000-lb boom truck	Existing glulam stringers replaced with steel wide-flange stringers to support temporary and long-term loading. Replacement of existing deck system to accommodate 12-ft clear roadway width.
5	10 CY dump truck and concrete delivery truck	35,000-lb boom truck	New permanent single-span bridge. Existing in-stream piers removed and new abutments installed at top of creek bank.

Table 2 – Revised Load Condition and Bridge Configuration Options

3. Evaluation Methodology

Evaluation of the existing structure and retrofit options were based on the American Association of State and Highway Transportation Officials Standards (AASHTO) for vehicle live loading, the National Design Specification (NDS) for Wood Construction, and American Institute of Steel Construction (AISC) for steel elements. Replacement options for the structure were based on discussions with manufacturers of pre-engineered bridge systems and the performance requirements of the design vehicles.

In the evaluation of the bridge stringers, dead loads to each member were based on their respective tributary areas. Vehicle live loads were distributed to each stringer in accordance with AASHTO live load distribution factors, where a vehicle may be located anywhere transversely along the deck to within 2 feet from either edge. For a pair of unit axle loads, the largest reaction to either stringer for any vehicle position across the deck is taken as the vehicle live load distribution factor, and represents the percentage of the total vehicle weight carried by particular stringer. For the evaluation of the existing 8 foot clear roadway span, the controlling distribution factor was found to be 60%. For a 12-foot clear roadway span proposed in the retrofit options, the controlling distribution factor was found to be 68%. With the distribution factor known, a moving load analysis for a design vehicle can be performed on a single stringer, modeled as a simply supported beam of its respective length. Maximum force demands, deflections, and reactions can then be determined to appropriately size the stringer for a given design vehicle.

The evaluation of the deck was based on the AASHTO “Equivalent Strip” method, which analyzes the deck as a single member with an equivalent width based on the deck system. For the existing 3x3 timber decking system, this is taken as the width of the timber, and the portion of the wheel load carried by a plank is determined as the ratio of the timber width and the tire contact length. For the proposed retrofit options with a prefabricated glulam deck system, the equivalent width is simply the length of the panel. Similar to the determination of stringer distribution factors, the wheels may act transversely along the deck at any position to determine live load demands to the deck, though AASHTO requirements for design of deck overhangs require wheels to be positioned to within 1 foot from either deck edge.

4. Existing Structure Load Rating

The existing structure is currently posted with a load rating of 5-tons. KPFF performed an evaluation to confirm the current load rating and verify that the proposed design vehicles would in fact overload the structure. Because the stringer depths and lengths vary for each span, the three spans were each evaluated individually. Record drawings were not available for the existing structure, so material properties for the glued laminated stringers and timber deck were taken from *the Forest Service Standard Plans for Glued-Laminated Stringer Trail Bridges, Pacific Northwest Region*. The Standard Plans specify the glued-laminated stringers as combination symbol 24F-V4, species DF/DF, wet condition. Deck planks are specified as coastal region douglas fir-larch, rough sawn No. 1 grade.

As noted in Section 3, for the existing 8-foot clear roadway width, the live load distribution factor for the stringers was found to be 60%. For each span, a moving load analysis was performed on a stringer with applicable dead loads and 60% of the axle weights of the 10,000-lb design vehicle. Maximum force demands were determined and compared with allowable design values, which have been modified by appropriate NDS adjustment factors. A duration factor of 1.25 was applied

to applicable design values for the vehicle demands due to the temporary nature of “construction” type loading. The axle loads in the analysis were then iteratively scaled up until the force demands on the structure exceeded an allowable design value.

For the highway-side end span with a length of 30-feet, the maximum vehicle load that could be applied in the analysis before the member was overstressed was approximately 6-tons, with the stringer failing in flexure. For the center span with a length of 46-feet, the maximum vehicle load that could be applied before failure in flexure was approximately 7-tons. For the forest-side end span with a length of 36-feet, the maximum vehicle load that could be applied before overloading the structure in flexure was approximately 5.5-tons. In each case, shear demands and end-bearing stresses were below allowable design values.

The existing in-stream piers and abutments were evaluated for an assumed, lower bound concrete strength of 3000 psi. The highway-side pier’s minimum cross-sectional dimensions are 2-feet by 10-feet, resulting in an allowable reaction to the pier of 8,640 kips. The highway-side abutment has cross-sectional dimensions of 1-foot by 10-feet, for an allowable reaction of 4,320 kips. Similarly, the forest-side pier’s cross-sectional dimensions are 1-foot 4-inches wide by 9-foot 10-inches long, resulting in an allowable reaction to the pier of 5,664 kips. The forest-side abutment has cross-sectional dimensions of 1-foot wide by 10-feet long, for an allowable reaction of 4,320 kips.

Based on KPFF’s evaluation of the existing stringers, piers, and abutments, we agree with the currently posted load rating of 5-tons for the existing system in its *undamaged* condition. Based on the observed damage to the upstream bases of the existing strings, KPFF evaluated an estimated loss in capacity for the bridge. Assuming a loss in section at the base of the existing glulam stringers of approximately 3-inches (two laminations), an overall reduction in capacity for each span of approximately 30% was determined. For options evaluated in Section 5 where the existing structure is to remain for long-term loading, strengthening of the existing glulam stringers will be required to support the requirements of the long-term Design Vehicle.

5. Option 1 – Temporary Clear Span with Rented Bridge

Option 1 includes evaluating the ability to temporarily span over the existing structure with a rented single-span bridge in order to allow construction vehicle access throughout the duration of adjacent WDFW construction work. KPFF reached out to several domestic suppliers of rentable bridges to assess the feasibility of these options and associated costs. Major work items associated with this option includes:

1. Removal of the existing bridge superstructure, including railing system, deck, and girders
2. Rental and installation of single-span, temporary bridge for the duration of WDFW’s adjacent project work

3. Regrading of approach fills to match deck surface elevation of temporary bridge
4. Retrofit of existing stringers to restore to original, undamaged capacity (see following paragraphs)
5. Removal and return of temporary bridge at completion of WDFW's adjacent project work
6. Addition of wide flange bearing supports at existing piers and abutments to increase chord elevation of the bottom of the stringers
7. Reinstallation of existing superstructure with retrofits
8. Regrading of approach fills to match deck surface elevation of retrofitted superstructure

As mentioned in Section 2, through discussions with manufacturers it was found that most typical, off-the-shelf rentable bridges for vehicular use have the capacity to support AASHTO HS-25 vehicle loads, which represent a gross-vehicle-weight (GVR) of 45-tons, which exceeds the short-term construction loading for the fully loaded 10-cy concrete/dump truck with a GVW of 38-tons. A rentable bridge with a capacity limited to the requirements for short-term construction loading of a fully loaded 5-cy concrete/dump truck would have required a customized bridge configuration, with an associated cost equal to or exceeding that of larger 10-cy concrete/dump truck vehicular loading. As a result, KPFF limited their evaluation to temporary rentable bridges with a capacity equal to or greater than that of the 10-cy concrete/dump truck.

After the completion of adjacent WDFW construction work, the existing structure to remain will be required to support a 10,000-lb long-term maintenance vehicle (Design Vehicle 3). Because of the damage to the existing stringers from flood debris, KPFF evaluated strengthening of the stringers with the addition of side plates to bring the structure back to at least its original, undamaged capacity. The stringers with side plates were analyzed as a composite section, and the proportion of the dead and live load demands to both the glulam core and steel side plates were determined. The required side plate thicknesses were then sized such that neither the steel nor the timber demands exceed their allowable stress levels under the design vehicle demands. In addition to reinforcing the existing stringers with side plates, KPFF proposes that steel wide flange members be used as bearing supports between the top of the existing abutments/piers and the superstructure, in order to increase the chord elevation of the bottom of the stringers and minimize the risk of future debris impact at flood levels. See Exhibit 1 for an elevation view and section of the proposed temporary system of Option 1.

To estimate construction costs for Option 1, a crew of six laborers, one equipment operator and one hydraulic 12-ton crane were assumed to remove the existing superstructure, install the temporary bridge, remove the temporary bridge at completion of the adjacent WDFW project work, perform retrofit upgrades to existing stringers, and reinstall the retrofitted superstructure. Regrading of the approach fills before and after use of the temporary bridge was assumed to be performed by a crew with an equipment operator, one laborer, and earthwork equipment. Steel

costs associated with side plate reinforcing to the existing stringers were based on current cost estimates for steel plating from local suppliers. The total cost for this option is shown in Section 8. See Section 8 for a more detailed breakdown of costs associated with each major work item and a total estimated cost for construction.

6. Options 2, 3, 4 – Retrofit or Replacement of Existing Superstructure

For retrofit or replacement options to the existing glulam stringers, several configurations were explored, including reinforcing the existing glulam stringers with steel side plates, replacement of the existing stringers with new, deeper glulam stringers, or replacement with steel stringers. In each stringer retrofit or replacement option, the long-term loading design vehicle is the 35,000-lb boom truck, and the temporary construction loading is the 10-cy concrete/dump truck. Because the retrofit or replacement configurations of Options 2–4 require the system to carry both short-term and long-term loading requirements through the same configuration, the larger demands of the short-term construction vehicle governed the design in each case.

In all configurations, the existing deck system requires widening to support the required clear width for the anticipated construction vehicles. To provide the required clearance, proposed options include replacement of the existing deck structure with a glued laminated, non-interconnected panel system sized for the anticipated design vehicles with a clear span of 12'-0", typical for single-lane vehicular access.

To estimate construction costs for Options 2-4, a crew of six laborers, one equipment operator and one hydraulic 12-ton crane were assumed to remove the existing superstructure, perform retrofit or replacement upgrades to existing stringers, and reinstall the new stringers and deck system. Regrading of the approach fills to match the new deck elevation of the retrofitted or replaced superstructure elements are assumed to be performed by a crew with an equipment operator, one laborer, and earthwork equipment. See Section 8 for total cost comparison between options, and see Section 9b for a more detailed breakdown of costs associated with each required major work item.

6a. Option 2 – Existing Glulam Stringer Retrofit with Side Plates

Steel side plates were sized as a retrofit option to the existing stringers through the same methodology as discussed in Section 5. For the governing Design Vehicle of Option 2, the 10-cy fully loaded dump/concrete truck, the required side plate thicknesses were determined for each individual span, and are shown in Table 3. See Exhibit 2 for elevation and section views for Options 2 with side plate reinforcing. Steel costs for side plating were based on current cost estimates for galvanized steel from local suppliers. Major work items for this option include:

1. Removal of existing bridge superstructure
2. Addition of side plates to existing glued laminated stringers
3. Addition of wide flange bearing supports at existing piers and abutments to increase chord elevation of the bottom of the stringers
4. Reinstallation of strengthened stringers
5. Installation of new deck system
6. Regrading of approach fills to match deck surface elevation

Option	Governing Design Vehicle	Required Side Plate Thicknesses, Highway-Side End Span	Required Side Plate Thicknesses, Center Span	Required Side Plate Thicknesses, Forest-Side End Span
2	10 CY Truck	5/8 in	1/2 in	5/8 in

Table 3 – Required Side Plate Thicknesses, Option 2

6b. Option 3 – New Glulam Stringers

New, glued laminated stringers were also sized for replacement of the existing stringers for Option 3 based on the analysis methodology of Section 3. Required glulam stringer sizes for each span are shown in Table 4, and elevation and section views for Option 3 with new glulam stringers are shown in Exhibit 3. Glulam prices were based on quotes from local suppliers. Major work items for this option include:

1. Demolition of existing bridge superstructure
2. Addition of wide flange bearing supports at existing piers and abutments to increase chord elevation of the bottom of the stringers
3. Installation of new glued laminated stringers
4. Installation of new deck system
5. Regrading of approach fills to match deck surface elevation

Option	Governing Design Vehicle	Required Stringer Width x Depth, Highway-Side End Span	Required Stringer Width/Depth, Center Span	Required Stringer Width/Depth, Forest-Side End Span
3	10 CY Truck	8-3/4" x 42"	(2) 8-3/4" x 42"	8-3/4" x 42"

Table 4 – Required Glulam Stringer Sizes, Options 3 and 4

6c. Option 4 – New Wide-Flange Stringers

In order to evaluate the comparative costs of different superstructure configurations, steel wide flange stringers were also sized for the governing Design Vehicle of Option 4. The required member sizes for steel wide flange stringer configurations are shown in Table 5, see Exhibit 4 for elevation and sections views. Steel costs for wide flange members were based on current cost estimates for galvanized steel from local suppliers. Major work items associated with this option include:

1. Demolition of existing bridge superstructure
2. Addition of wide flange bearing supports at existing piers and abutments to increase chord elevation of the bottom of the stringers
3. Installation of new wide flange steel stringers
4. Installation of new deck system
5. Regrading of approach fills to match deck surface elevation

Option	Governing Design Vehicle	Required Stringer Size, Highway-Side End Span	Required Stringer Size, Center Span	Required Stringer Size, Forest-Side End Span
4	10 CY Truck	W21x50	W21x62	W21x62

Table 5 – Required Steel Wide Flange Sizes, Option 4

7. Option 5 – Permanent Bridge Replacement

Option 5 consists of complete removal of the entire existing bridge structure, including in-stream piers and abutments, and replacement with a new, permanent single-span bridge. The short-term construction loading Design Vehicle is the 10-cy concrete truck, and the long-term Design Vehicle is the 35,000-lb boom truck. As with the temporary bridge options of Option 1, KPFF worked with suppliers of pre-engineered steel truss systems to assess feasibility for the site and estimated costs. See Exhibit 5 for an elevation view and section for the proposed bridge of Option 5. Major work items for this option include:

1. Demolition of existing bridge superstructure
2. Demolition of existing substructure elements – in-stream piers, abutments
3. Installation of new abutments
4. Furnish and installation of new clear-span bridge

To estimate construction costs for Option 5, a crew of six laborers, one equipment operator and one hydraulic 12-ton crane were assumed to remove the existing superstructure. Costs associated with installation of the new bridge include furnishing of the permanent clear-span bridge, labor

associated with demolition of the existing super-and-substructure system, and installation of new abutments. Demolition of the existing in-stream piers are based on bid-tab costs for similar demolition work performed in the area.

8. ROM Construction Cost Comparisons and Recommendations

Rough-order-of-magnitude (ROM) construction cost estimates were developed for each of the five options considered. The intent of the estimates is to illustrate the relative cost differences between each bridge configuration and establish ROM planning-level budgeting estimates. See the Appendix for a breakdown of costs associated with each required work item for each option.

The following table includes the estimated construction cost for each option. Rental prices for the temporary bridge of Option 1 are based on an assumed six-month rental duration. In the event that WDFW proceeds further into the planning and design phases for a particular option, estimates will be refined further. Costs not explicitly identified in the following estimates include contractor mobilization/demobilization, Washington State sales taxes, engineering design, permitting, and temporary environmental protection measures.

Option	ROM Construction Costs
Option 1 – Temporary Clear Span with Rented Bridge	\$198,000
Option 2 – Existing Glulam Stringer Retrofit with Side Plates	\$109,000
Option 3 – New Glulam Stringers	\$131,000
Option 4 – New Wide-Flange Stringers	\$126,000
Option 5 – Permanent Bridge Replacement	\$288,520

Table 6 – ROM Construction Cost Comparisons

Major constructability considerations relevant to this evaluation include site location and accessibility. Most work items will have to be performed from the highway-side approach, as the forest-side is currently inaccessible due to the current load capacity and clear-width of the existing structure. The highway-side approach geometry also limits the size of construction equipment capable of accessing the site. KPFF considered these constraints in our evaluations and the estimated costs for each of the five options considered reflect equipment and methods of construction appropriate for the site.

Based on the relative comparison of the five options considered and on constructability considerations, it appears that Option 2 may be the preferred option, with retrofit of the existing glulam stringers with steel side plates and deck upgrades to accommodate the required clear-width requirements of the short-term construction vehicles. This Option provides WDFW with the most cost effective bridge configuration of the five options considered that is capable of carrying the



vehicular loading requirements of the 10-cy concrete/dump truck, at a marginal cost compared with temporary or complete replacement of the bridge.

If you have any questions or comments regarding this report, please contact us.

Regards,

A handwritten signature in blue ink, appearing to read 'Sean Story'.

Sean Story, EIT
Design Engineer
(253) 396 0150
Sean.Story@kpff.com

A handwritten signature in blue ink, appearing to read 'Scott Kuebler'.

Scott Kuebler, PE, SE
Principal
(253) 396 0150
Scott.Kuebler@kpff.com

7.

APPENDIX

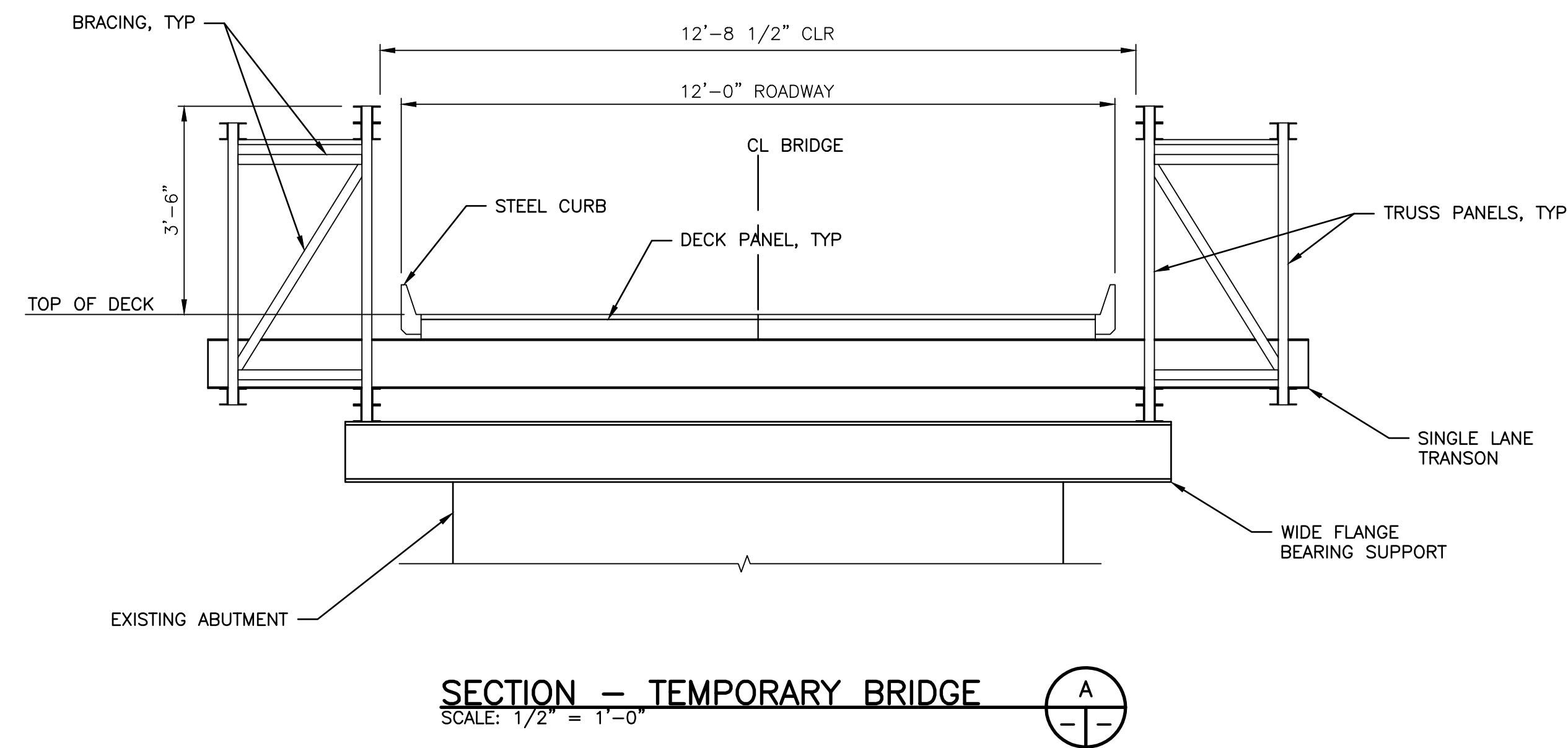
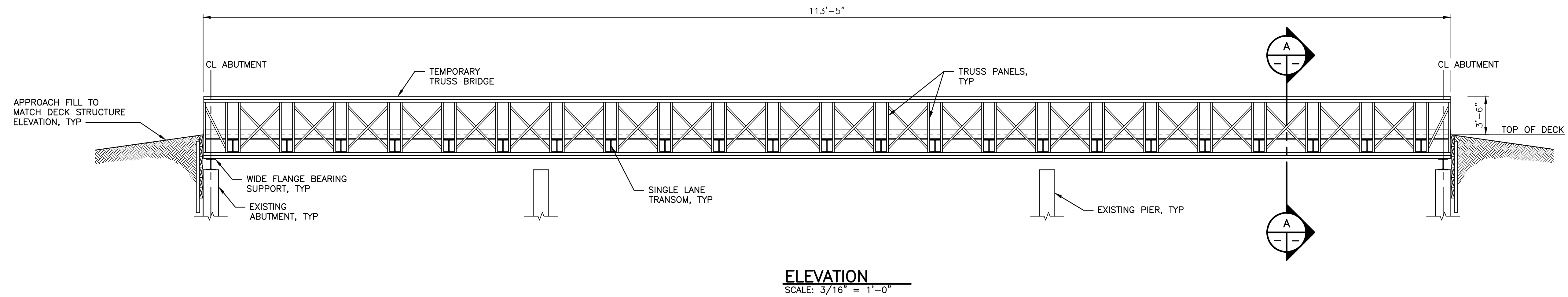


PHOTO OF EXAMPLE INSTALLATION
SCALE: NTS

I:\PROJECTS\2018\1800042\1\Drawings\1800042-1.dwg
 2018-10-10 10:10:10 AM
 User: kprff

kprff
 2407 North 31st Street, Suite 100
 Tacoma, Washington 98407
 (253) 396-0150 Fax (253) 396-0162

WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

SYM	DATE	REVISION DESCRIPTION	BY

APPROVED AND RELEASED FOR CONSTRUCTION

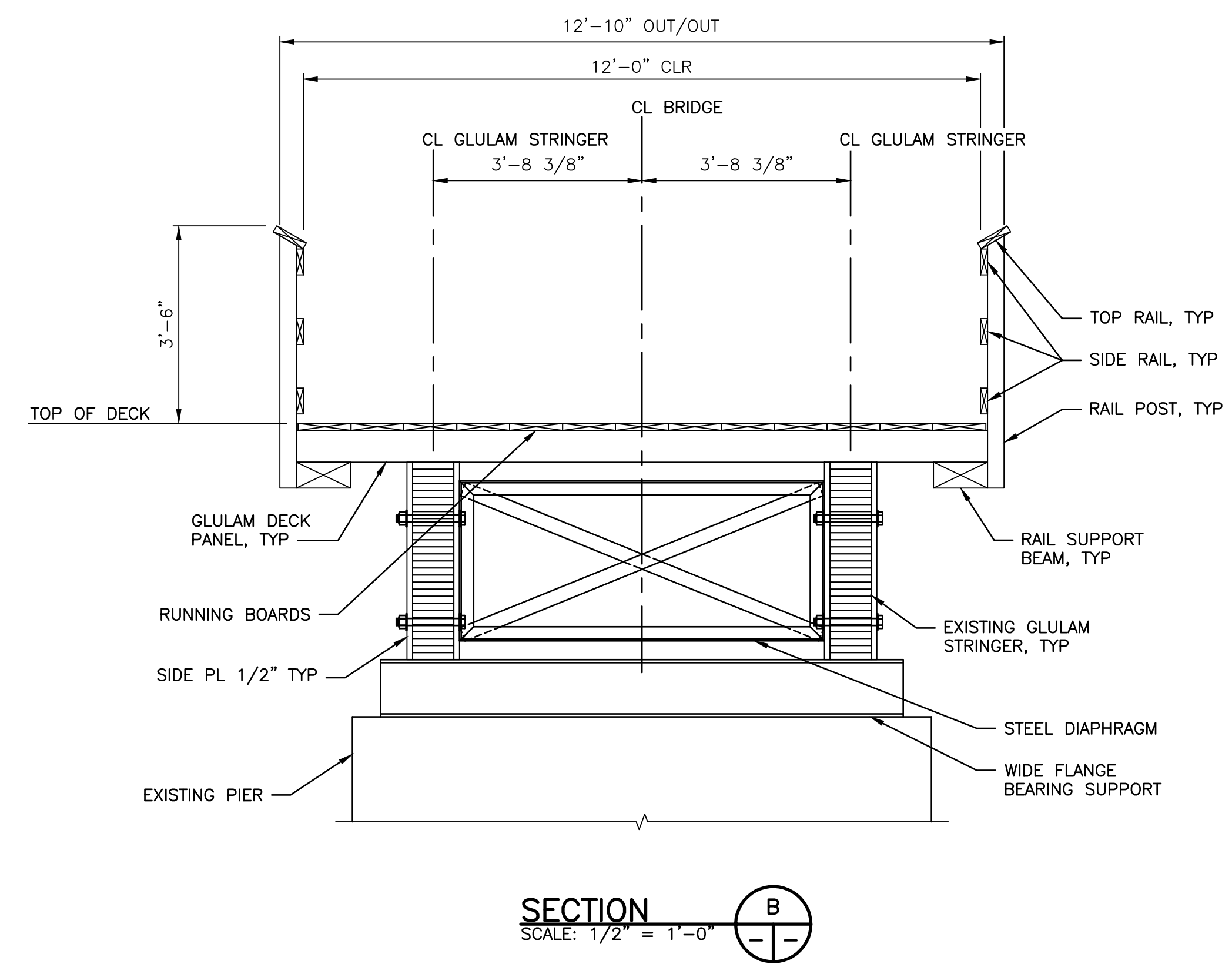
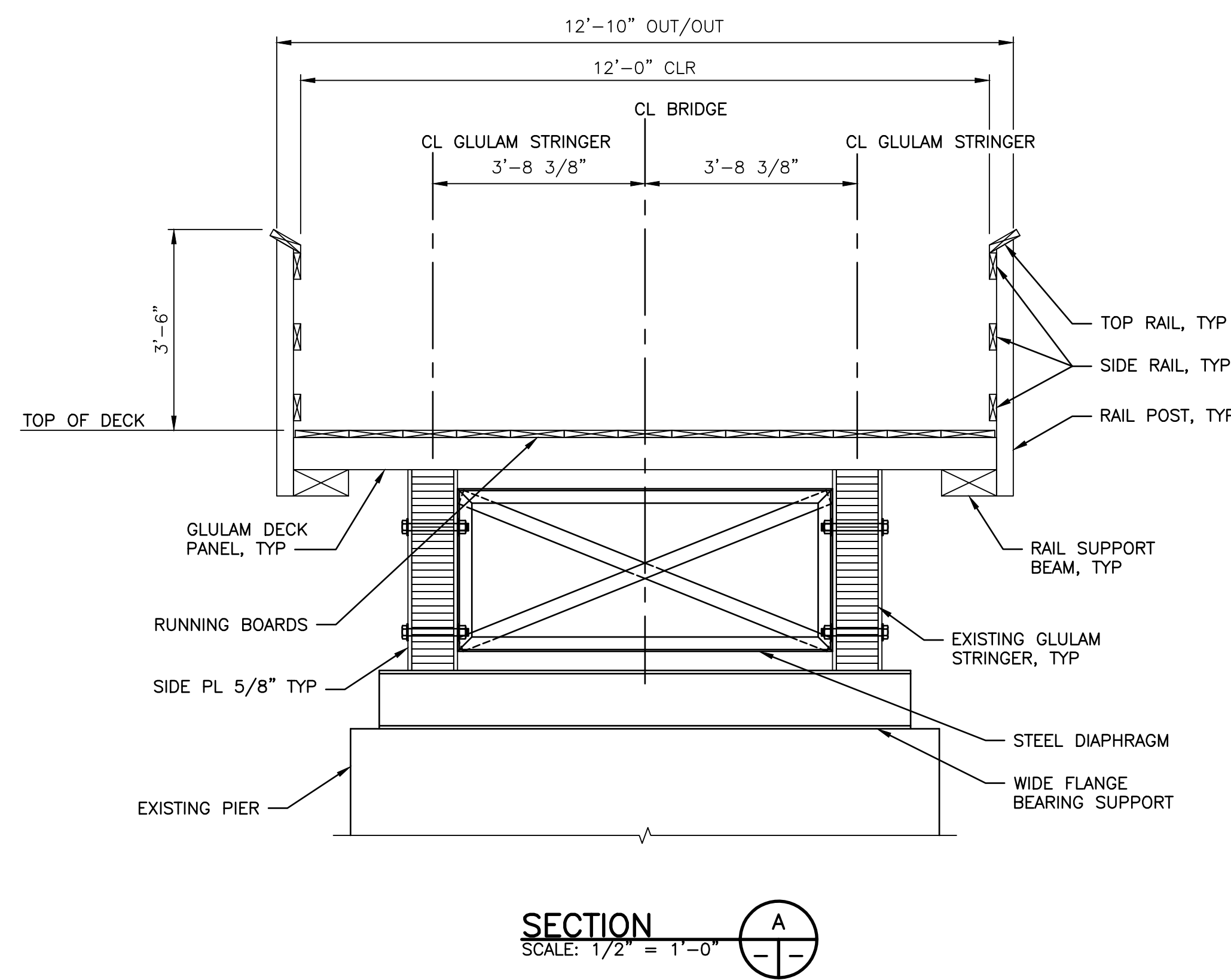
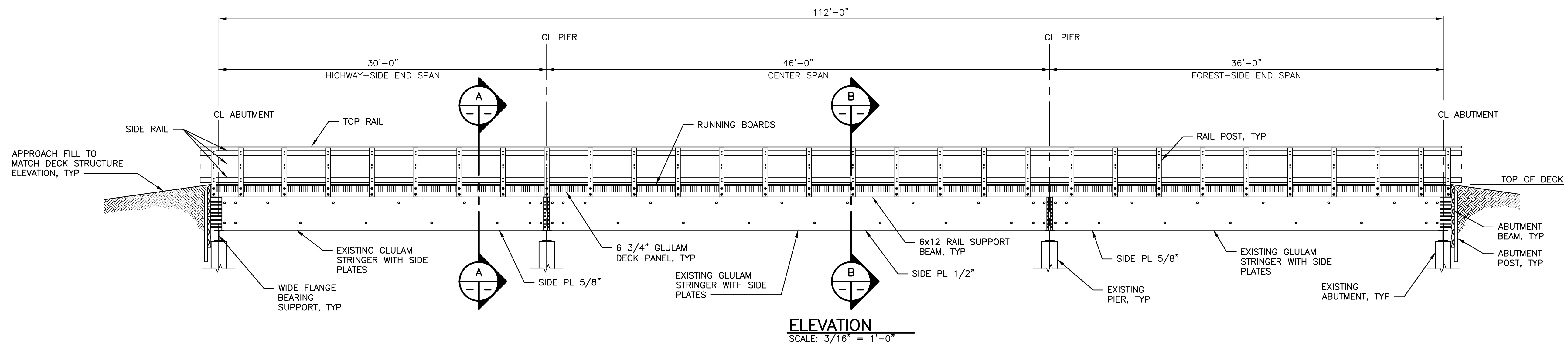
CHIEF ENGINEER _____ DATE: _____
 PROGRAM _____ DATE: _____

0 — 1"
 BAR MEASURES
 ONE INCH ON
 ORIGINAL DRAWINGS

DESIGNED BY SMS
 CHECKED BY SEK
 DRAWN BY TRL
 DATE 5/10/2018

ICICLE CREEK
ICICLE CREEK BRIDGE EVALUATION
 EXHIBIT 1 — OPTION #1
 TEMPORARY BRIDGE RENTAL

PROJECT NO.	
SHEET	OF
1	5



CREEK: 2018-1800042 - D.D. CREEK: 2018-1800042 - D.D. CREEK: 2018-1800042 - D.D. CREEK: 2018-1800042 - D.D. CREEK: 2018-1800042 - D.D.

kpff
 2407 North 31st Street, Suite 100
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WASHINGTON STATE
DEPARTMENT OF FISH AND WILDLIFE

SYM	DATE	REVISION DESCRIPTION	BY

APPROVED AND RELEASED FOR CONSTRUCTION

CHIEF ENGINEER _____ DATE: _____
 PROGRAM _____ DATE: _____

0" = 1"
 BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

DESIGNED BY: SMS
 CHECKED BY: SEK
 DRAWN BY: TRL
 DATE: 5/10/2018

ICICLE CREEK
ICICLE CREEK BRIDGE EVALUATION
EXHIBIT 2 - OPTION #2
SIDE PLATES ON EXISTING GLULAM STRINGERS

PROJECT NO.	
SHEET	OF
2	5



**ROM Construction Cost Estimates
Icicle Creek Bridge Evaluation**

5/10/2018

T	Option Temporary Bridge	U	T	U	T	U	T
1-1	Removal of existing bridge superstructure	1		LS		13,000.00	13,000.00
1-2	Rental and installation of temporary rented bridge (6 months)	1		LS		93,300.00	93,300.00
1-2A	Additional rental cost per month (not included in total)	0		PER/MO		6,000.00	-
1-3	Regrading of approach fills for temporary rented bridge	40		CY		40.00	1,600.00
1-4	Furnish/Installation side plate retrofits to existing glulam stringers	1		LS		14,300.00	14,300.00
1-5	Removal/Return of temporary bridge	1		LS		50,000.00	50,000.00
1-6	Furnish/Installation of wide-flange bearing supports	4		EA		1,400.00	5,600.00
1-7	Reinstallation of retrofitted superstructure	1		LS		18,600.00	18,600.00
1-8	Regrading of approach fills for new driving surface elevation	40		CY		40.00	1,600.00
Total - Option #1							\$198,000

T	Option Existing Glulam Stringers with Side Plates	U	T	U	T	U	T
2-1	Removal of existing bridge superstructure	1		LS		13,000.00	13,000.00
2-2	Retrofit of existing glulam stringers with side plates	1		LS		19,200.00	19,200.00
2-3	Furnish/Installation of wide-flange bearing supports	4		EA		1,400.00	5,600.00
2-4	Furnish & install new deck system	112		LF		460.00	51,520.00
2-5	Reinstallation of strengthened stringers and new deck system	1		LS		18,400.00	18,400.00
2-6	Regrading of approach fills for new driving surface elevation	40		CY		40.00	1,600.00
Total - Option #2							\$109,320

T	Option New Glulam Stringers	U	T	U	T	U	T
3-1	Removal of existing bridge superstructure	1		LS		15,600.00	15,600.00
3-2	Furnish/Installation of wide-flange bearing supports	4		EA		1,400.00	5,600.00
3-3	Furnish new glulam stringers	316		LF		120.00	37,920.00
3-4	Furnish new deck system	112		LF		460.00	51,520.00
3-5	Reinstallation of new bridge superstructure	1		LS		18,400.00	18,400.00
3-6	Regrading of approach fills for new driving surface elevation	40		CY		40.00	1,600.00
Total - Option #3							\$130,640

T	Option New Wide Flange Stringers	U	T	U	T	U	T
4-1	Removal of existing bridge superstructure	1		LS		15,600.00	15,600.00
4-2	Furnish/Installation of wide-flange bearing supports	4		EA		1,400.00	5,600.00
4-3	Furnish new wide-flange stringers	224		LF		150.00	33,600.00
4-4	Furnish new deck system	112		LF		460.00	51,520.00
4-5	Reinstallation of new bridge superstructure	1		LS		18,400.00	18,400.00
4-6	Regrading of approach fills for new driving surface elevation	40		CY		40.00	1,600.00
Total - Option #4							\$126,320

T	Option Permanent Bridge Replacement	U	T	U	T	U	T
5-1	Demo of existing bridge superstructure	1		LS		15,600.00	15,600.00
5-2	Demo of existing bridge substructure	33		CY		300.00	9,900.00
5-3	Installation of new abutments	2		EA		11,000.00	22,000.00
5-4	Furnish new clear-span bridge	1,344		SF		170.00	228,480.00
5-5	Installation of new clear-span bridge	1		LS		12,500.00	12,500.00
Total - Option #5							\$288,480

Preliminary Design Documents

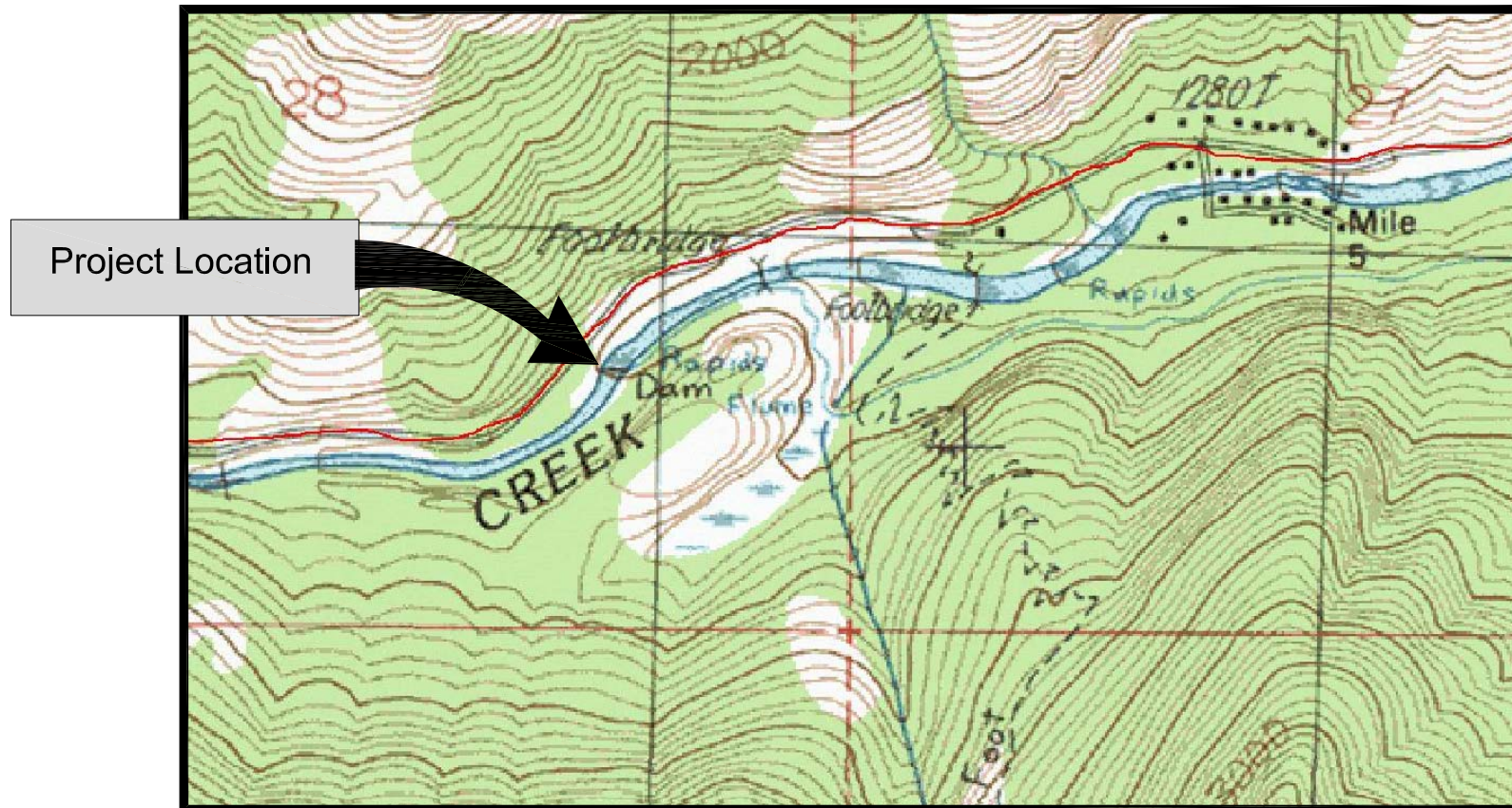
Icicle Creek - Diversion Dam

Pool and Chute Fishway

Project Number 13-1342

DRAWING INDEX:

1. Cover Sheet
2. Site Plan (Aerial Photo)
3. Site Plan (1" = 20')
4. Profile and Sections



VICINITY MAP
NOT TO SCALE



Example of Pool and Chute Fishway on Yakima River



Icicle Creek Diversion Dam
Pool and Chute Fishway

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
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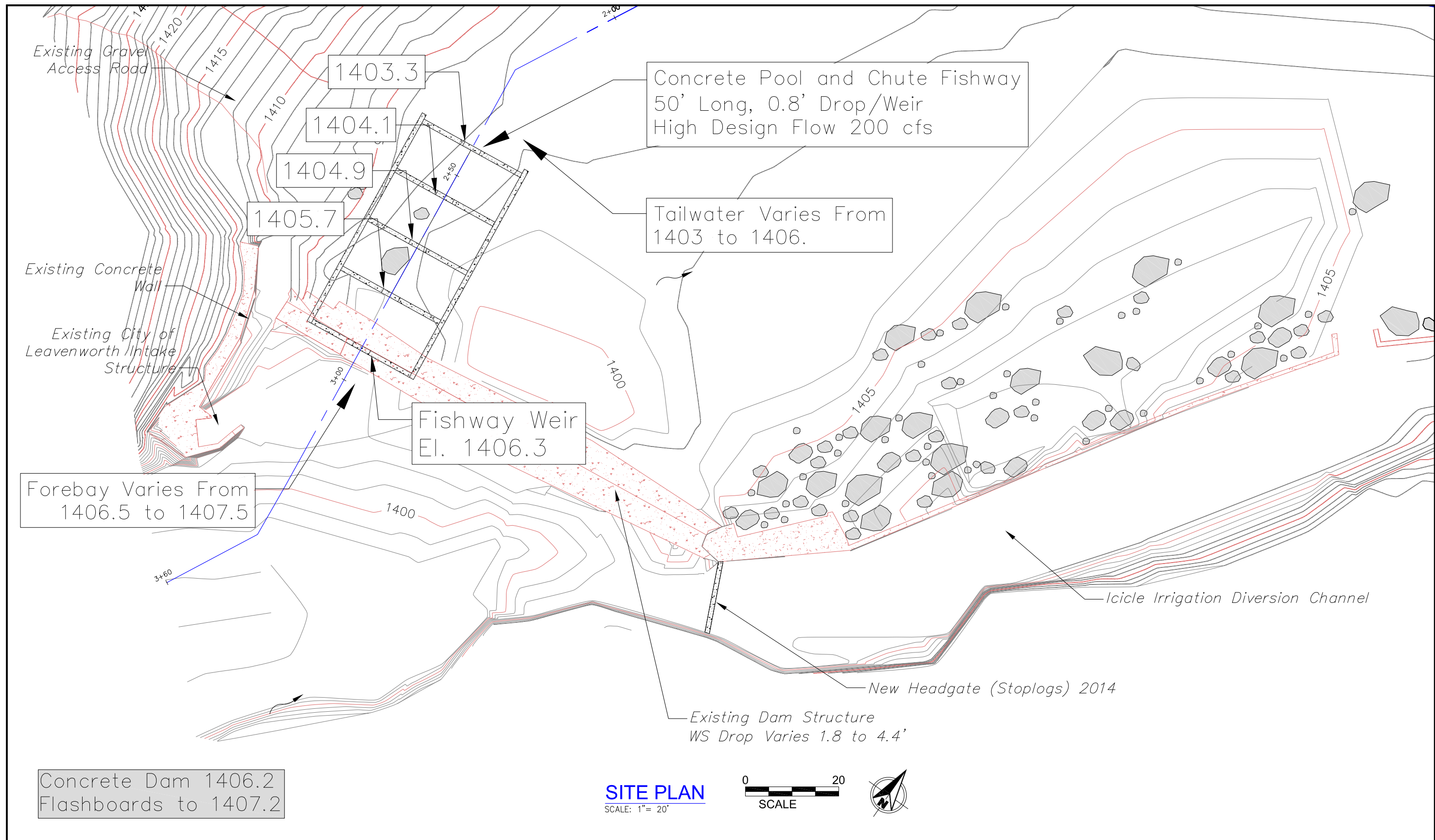
DESIGN BY:
Waterfall Engineering

DRAWN BY:
RiverSide Drafting and Design

DATE:
10/2/15

Cover Sheet

1 **4**
SHEET OF



Icicle Creek Diversion Dam Pool and Chute Fishway

REV	DATE	BY	APPD	DESCRIPTION

DESIGN BY:
Waterfall Engineering

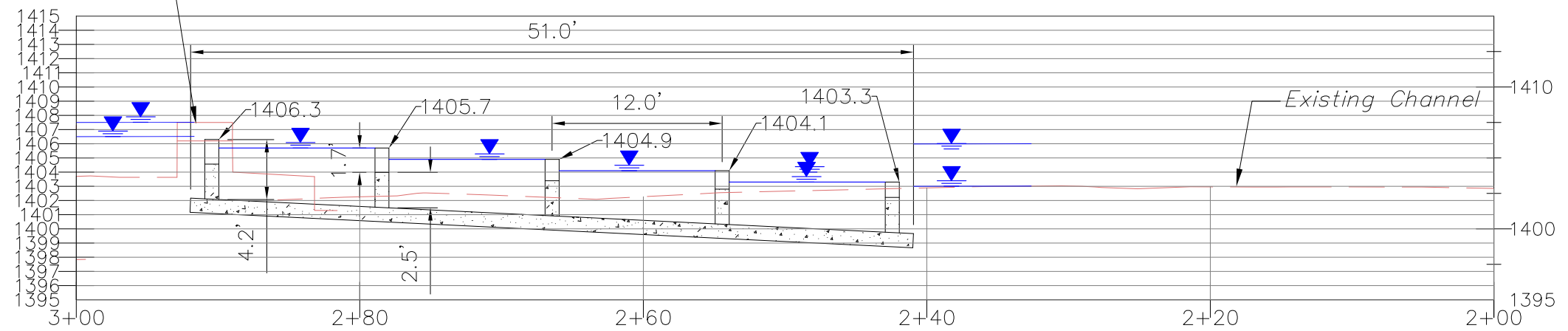
DRAWN BY:
RiverSide Drafting and Design

DATE:
10/2/15

Site Plan

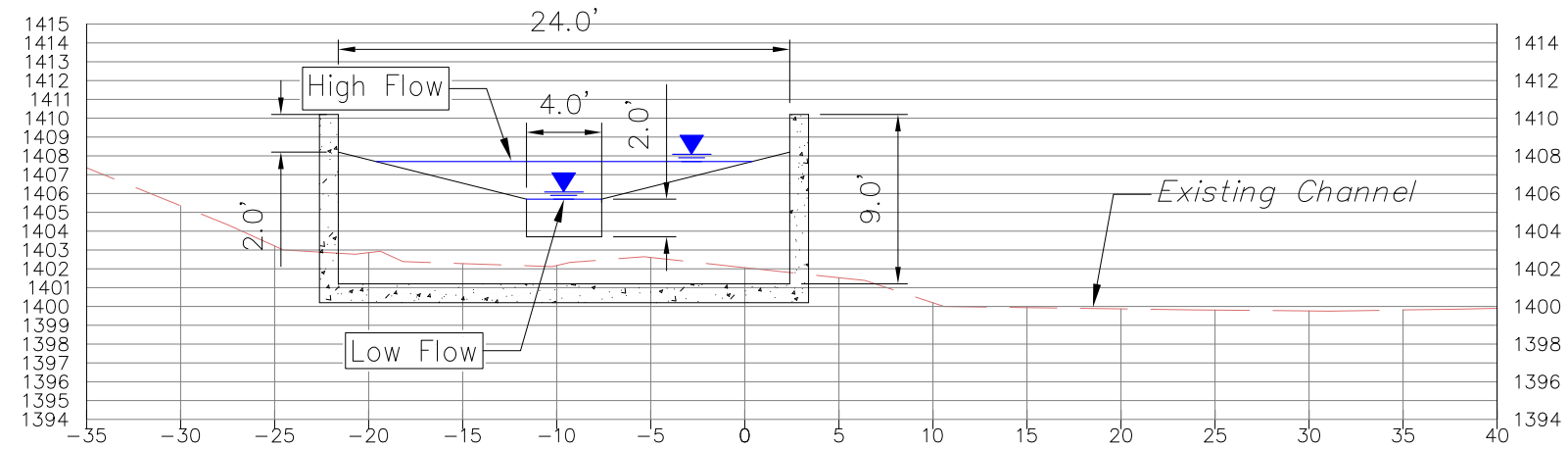
3 **4**
SHEET OF

Existing Dam structure



Channel Profile

SCALE: 1"= 10'



Channel Section A (View Downstream)

SCALE: 1"=30'



Icicle Creek Diversion Dam Pool and Chute Fishway

REV	DATE	BY	APPD	DESCRIPTION

SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

Waterfall Engineering

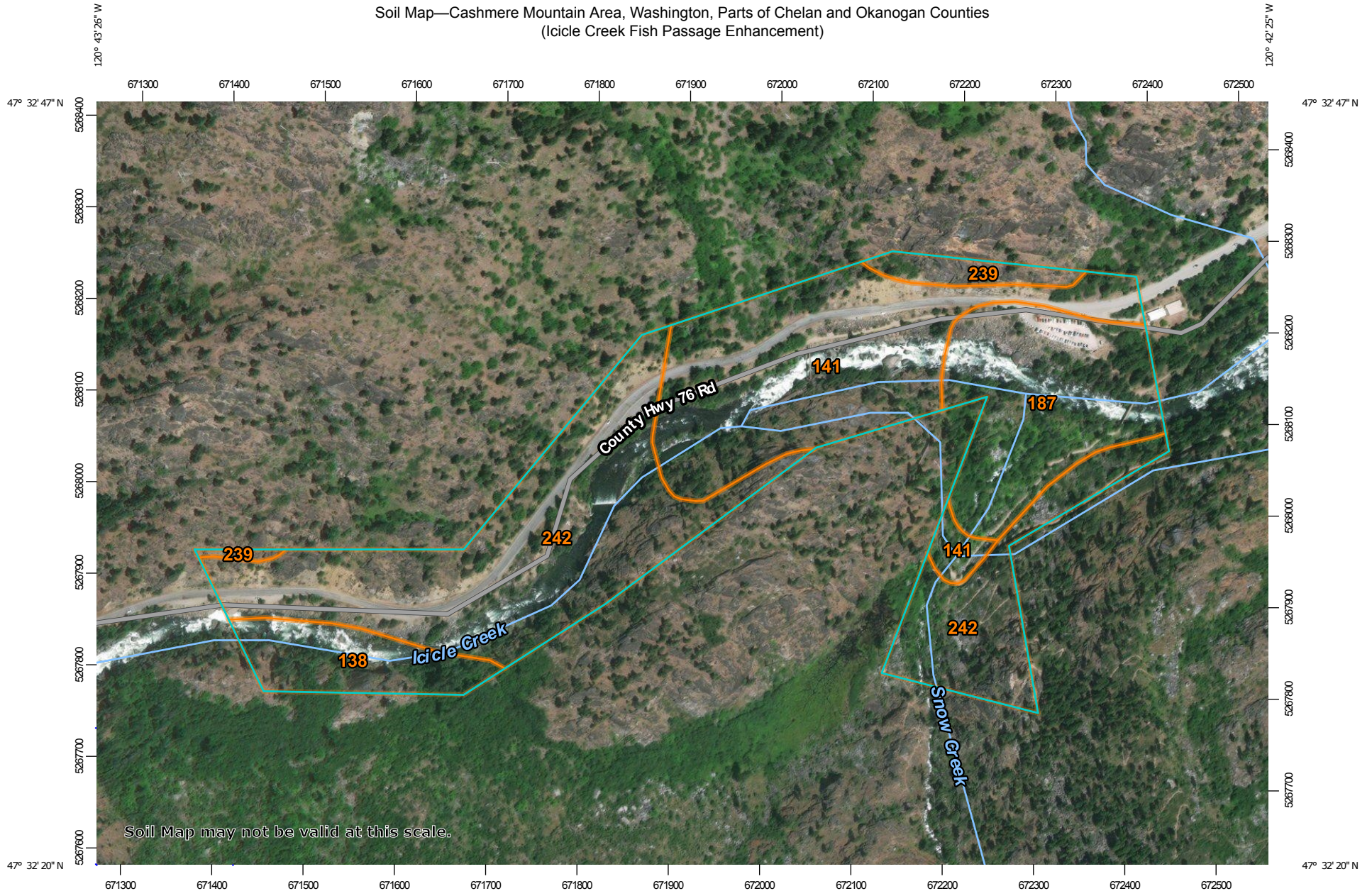
DRAWN BY:
RiverSide Drafting and Design

DATE:
10/2/15

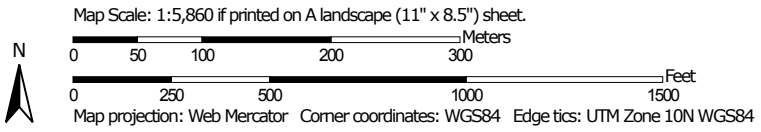
Profile and Section

4 **4**
SHEET OF

Soil Map—Cashmere Mountain Area, Washington, Parts of Chelan and Okanogan Counties
(Icicle Creek Fish Passage Enhancement)




Soil Map may not be valid at this scale.




Soil Map—Cashmere Mountain Area, Washington, Parts of Chelan and Okanogan Counties
(Icicle Creek Fish Passage Enhancement)


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cashmere Mountain Area, Washington, Parts of Chelan and Okanogan Counties

Survey Area Data: Version 16, Sep 5, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 3, 2014—Sep 21, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
138	Icicle very bouldery sandy loam, 30 to 75 percent slopes	4.2	7.3%
141	Icicle-Chumstick-Rock outcrop complex, 45 to 90 percent slopes	16.5	28.7%
187	Mippon very bouldery loamy sand, 0 to 3 percent slopes	10.3	17.9%
239	Rock outcrop	1.7	2.9%
242	Rock outcrop-Chumstick-Icicle complex, 45 to 90 percent slopes	24.8	43.2%
Totals for Area of Interest		57.5	100.0%

IPaC Information for Planning and Consultation U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as trust resources) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Chelan County, Washington



Local office

Washington Fish And Wildlife Office

☎ (360) 753-9440

📠 (360) 753-9405

510 Desmond Drive Se, Suite 102

Lacey, WA 98503-1263

<http://www.fws.gov/wafwo/>

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ are managed by the [Endangered Species Program](#) of the U.S. Fish and Wildlife Service.

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information.

The following species are potentially affected by activities in this location:

Birds

NAME

STATUS

Marbled Murrelet *Brachyramphus marmoratus* Threatened
 There is a **final critical habitat** designated for this species. Your location is outside the designated critical habitat.
<https://ecos.fws.gov/ecp/species/4467>

Northern Spotted Owl *Strix occidentalis caurina* Threatened
 There is a **final critical habitat** designated for this species. Your location is outside the designated critical habitat.
<https://ecos.fws.gov/ecp/species/1123>

Yellow-billed Cuckoo *Coccyzus americanus* Threatened
 There is a **proposed critical habitat** for this species. Your location is outside the proposed critical habitat.
<https://ecos.fws.gov/ecp/species/3911>

Conifers and Cycads

NAME	STATUS
Whitebark Pine <i>Pinus albicaulis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1748	Candidate

Fishes

NAME	STATUS
Bull Trout <i>Salvelinus confluentus</i> There is a final critical habitat designated for this species. Your location overlaps the designated critical habitat. https://ecos.fws.gov/ecp/species/8212	Threatened

Flowering Plants

NAME	STATUS
Showy Stickseed <i>Hackelia venusta</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5210	Endangered
Wenatchee Mountains Checkermallow <i>Sidalcea oregana</i> var. <i>calva</i> There is a final critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/7222	Endangered

Mammals

NAME	STATUS
Canada Lynx <i>Lynx canadensis</i> There is a final critical habitat designated for this species. Your location is outside the designated critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
Gray Wolf <i>Canis lupus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4488	Endangered
Grizzly Bear <i>Ursus arctos horribilis</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7642	Threatened
North American Wolverine <i>Gulo gulo luscus</i> No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Bull Trout <i>Salvelinus confluentus</i> https://ecos.fws.gov/ecp/species/8212#crithab	Final designated
Steelhead <i>Oncorhynchus (=Salmo) mykiss</i> https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead <i>Oncorhynchus (=Salmo) mykiss</i> https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead <i>Oncorhynchus (=Salmo) mykiss</i> https://ecos.fws.gov/ecp/species/1007#crithab	Final designated
Steelhead <i>Oncorhynchus (=Salmo) mykiss</i> https://ecos.fws.gov/ecp/species/1007#crithab	Final designated

Steelhead *Oncorhynchus* (=Salmo) mykiss
<https://ecos.fws.gov/ecp/species/1007#crithab>

Final designated

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any activity that results in the take (to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service³. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Conservation measures for birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Year-round bird occurrence data <http://www.birdscanada.org/birdmon/default/datasummaries.jsp>

The migratory birds species listed below are species of particular conservation concern (e.g. [Birds of Conservation Concern](#)) that may be potentially affected by activities in this location. It is not a list of every bird species you may find in this location, nor a guarantee that all of the bird species on this list will be found on or near this location. Although it is important to try to avoid and minimize impacts to all birds, special attention should be made to avoid and minimize impacts to birds of priority concern. To view available data on other bird species that may occur in your project area, please visit the [AKN Histogram Tools](#) and [Other Bird Data Resources](#). To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

NAME

SEASON(S)

Bald Eagle	<i>Haliaeetus leucocephalus</i> https://ecos.fws.gov/ecp/species/1626	Year-round
Black Swift	<i>Cypseloides niger</i> https://ecos.fws.gov/ecp/species/8878	Breeding
Brewer's Sparrow	<i>Spizella breweri</i> https://ecos.fws.gov/ecp/species/9291	Breeding
Calliope Hummingbird	<i>Stellula calliope</i> https://ecos.fws.gov/ecp/species/9526	Breeding
Cassin's Finch	<i>Carpodacus cassinii</i> https://ecos.fws.gov/ecp/species/9462	Year-round
Eared Grebe	<i>Podiceps nigricollis</i>	Breeding
Flammulated Owl	<i>Otus flammeolus</i> https://ecos.fws.gov/ecp/species/7728	Breeding
Fox Sparrow	<i>Passerella iliaca</i>	Breeding
Greater Sage-grouse	<i>Centrocercus urophasianus</i> https://ecos.fws.gov/ecp/species/8159	Year-round
Lewis's Woodpecker	<i>Melanerpes lewis</i> https://ecos.fws.gov/ecp/species/9408	Breeding
Loggerhead Shrike	<i>Lanius ludovicianus</i> https://ecos.fws.gov/ecp/species/8833	Breeding
Long-billed Curlew	<i>Numenius americanus</i> https://ecos.fws.gov/ecp/species/5511	Breeding
Peregrine Falcon	<i>Falco peregrinus</i> https://ecos.fws.gov/ecp/species/8831	Breeding
Rufous Hummingbird	<i>selasphorus rufus</i> https://ecos.fws.gov/ecp/species/8002	Breeding

Sage Thrasher <i>Oreoscoptes montanus</i> https://ecos.fws.gov/ecp/species/9433	Breeding
Short-eared Owl <i>Asio flammeus</i> https://ecos.fws.gov/ecp/species/9295	Year-round
Swainson's Hawk <i>Buteo swainsoni</i> https://ecos.fws.gov/ecp/species/1098	Breeding
Western Grebe <i>Aechmophorus occidentalis</i> https://ecos.fws.gov/ecp/species/6743	Breeding
White Headed Woodpecker <i>Picoides albolarvatus</i> https://ecos.fws.gov/ecp/species/9411	Year-round
Willow Flycatcher <i>Empidonax traillii</i> https://ecos.fws.gov/ecp/species/3482	Breeding

What does IPaC use to generate the list of migratory bird species potentially occurring in my specified location?

Landbirds:

Migratory birds that are displayed on the IPaC species list are based on ranges in the latest edition of the National Geographic Guide, Birds of North America (6th Edition, 2011 by Jon L. Dunn, and Jonathan Alderfer). Although these ranges are coarse in nature, a number of U.S. Fish and Wildlife Service migratory bird biologists agree that these maps are some of the best range maps to date. These ranges were clipped to a specific Bird Conservation Region (BCR) or USFWS Region/Regions, if it was indicated in the 2008 list of Birds of Conservation Concern (BCC) that a species was a BCC species only in a particular Region/Regions. Additional modifications have been made to some ranges based on more local or refined range information and/or information provided by U.S. Fish and Wildlife Service biologists with species expertise. All migratory birds that show in areas on land in IPaC are those that appear in the 2008 Birds of Conservation Concern report.

Atlantic Seabirds:

Ranges in IPaC for birds off the Atlantic coast are derived from species distribution models developed by the National Oceanic and Atmospheric Association (NOAA) National Centers for Coastal Ocean Science (NCCOS) using the best available seabird survey data for the offshore Atlantic Coastal region to date. NOAA/NCCOS assisted USFWS in developing seasonal species ranges from their models for specific use in IPaC. Some of these birds are not BCC species but were of interest for inclusion because they may occur in high abundance off the coast at different times throughout the year, which potentially makes them more susceptible to certain types of development and activities taking place in that area. For more refined details about the abundance and richness of bird species within your project area off the Atlantic Coast, see the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other types of taxa that may be helpful in your project review.

About the NOAA/NCCOS models: the models were developed as part of the NOAA/NCCOS project: [Integrative](#)

[Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#). The models resulting from this project are being used in a number of decision-support/mapping products in order to help guide decision-making on activities off the Atlantic Coast with the goal of reducing impacts to migratory birds. One such product is the [Northeast Ocean Data Portal](#), which can be used to explore details about the relative occurrence and abundance of bird species in a particular area off the Atlantic Coast.

All migratory bird range maps within IPaC are continuously being updated as new and better information becomes available.

Can I get additional information about the levels of occurrence in my project area of specific birds or groups of birds listed in IPaC?

Landbirds:

The [Avian Knowledge Network \(AKN\)](#) provides a tool currently called the "Histogram Tool", which draws from the data within the AKN (latest, survey, point count, citizen science datasets) to create a view of relative abundance of species within a particular location over the course of the year. The results of the tool depict the frequency of detection of a species in survey events, averaged between multiple datasets within AKN in a particular week of the year. You may access the histogram tools through the [Migratory Bird Programs AKN Histogram Tools](#) webpage.

The tool is currently available for 4 regions (California, Northeast U.S., Southeast U.S. and Midwest), which encompasses the following 32 states: Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, West Virginia, and Wisconsin.

In the near future, there are plans to expand this tool nationwide within the AKN, and allow the graphs produced to appear with the list of trust resources generated by IPaC, providing you with an additional level of detail about the level of occurrence of the species of particular concern potentially occurring in your project area throughout the course of the year.

Atlantic Seabirds:

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS [Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project](#) webpage.

Facilities

Wildlife refuges

Any activity proposed on [National Wildlife Refuge](#) lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any

questions or concerns.

THERE ARE NO REFUGES AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

This location overlaps the following wetlands:

RIVERINE

[R3UBH](#)

A full description for each wetland code can be found at the National Wetlands Inventory website: <https://ecos.fws.gov/ipac/wetlands/decoder>

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of

aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

**Not for
consultation**

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Authors: Kim J. Lancaster

Title of Report: Trout Unlimited Icicle Boulder Field IPID COL Project in Chelan County, Washington (DAHP Log No. 2018-02-01361-WSCC)

Date of Report: August 3, 2018

County (ies): Chelan Sections: 27 & 28 Township: 24N Range: 17E
Quad: Leavenworth, Wa Acres: 2

PDF of report submitted (REQUIRED) Yes No

Historic Property Export Files submitted Yes No

Archaeological Site(s)/Isolate(s) Found or Amended Yes No

TCP(s) found Yes No

Replace a draft Yes No

Satisfy a DAHP Archaeological Excavation Permit requirement Yes # No

DAHP Archaeological Site #:



**Cascadia Conservation District
Short Report for Cultural Resources Monitoring**

STATEMENT

Cascadia Conservation District (CCD) is cooperating with Trout Unlimited Washington Water Project (TU WWP) with an investigation into widening a short section of Icicle Creek with the goal of improved fish passage. Funding for this project is from the Salmon Recovery Funding Board, Rock Island Habitat Conservation Plan Tributary Committee, and United States Fish and Wildlife. Trout Unlimited has contracted with the CCD to conduct a cultural resources review of the project APEs. This cultural resource review is being conducted in compliance with Section 106 of the National Historic Preservation Act of 1966 and other environmental and cultural resource legislation.

The project is located on the USGS 7.5' Leavenworth, Washington topographic quadrangle.

The CCD implemented a cultural resources site identification survey to determine if any historic properties occur at or near the locations of the planned practices in each of the listed project areas. The cultural resources identification consisted of a brief literature review and field inspection for archaeological sites and standing structures, through pedestrian survey. CCD consulted with Tribes to determine whether this project would affect known TCPs.

Two historic properties associated with the City of Leavenworth's Water System were documented within the project APEs and a segment of the Icicle Irrigation Canal, located within the project APEs, was updated as a result of this survey. The two historic properties include the City of Leavenworth Water System Intake and Screen House. The historic structures were recommended not eligible to the NRHP.

Changes to the segment of the Icicle Irrigation Canal would include removal of the existing fish screen and installation of a new fish screen that meets current standards. The new screen would be installed at the point where Snow Creek crosses the canal, some 1000 feet up canal from the existing screens location. These changes will occur in segments of the canal that have already been subjected to significant alterations over the past 100 years including replacement of wood and metal flume with concrete canal, installation of the existing fish screens, addition of the existing diversion dam, and improvements and changes to the existing head gates and other water control features. The replacement of

the existing fish screens with new screens will not affect elements of the canal that would contribute to its eligibility for listing on the NRHP. It is recommended that the project proceed as planned.

Project Title: Trout Unlimited Icicle Boulder Field IPID COL Project in Chelan County, Washington (DAHP Log No. 2018-02-01361-WSCC).

Author: Kim J. Lancaster, M.A.

Report Date: August 3, 2018

State: Washington **County:** Chelan

Project Operator: Trout Unlimited, Cascadia Conservation District

Contract: TU WWP

Legal Description and Location

Identifier	¼ Section	Section	Township	Range
Leavenworth Quad	SW ¼	27	24N	17E
Leavenworth Quad	SE ¼	28	24N	17E

USGS 7.5' Topographic Maps Showing Planned on-site Undertakings: Leavenworth, Washington (Figure 2).

Other Maps or Photos: Project Location Map (Figure 1); Orthographic Image showing survey transects (Figure 3)

Compliance: Conducted in compliance with the National Environmental Policy Act and Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations.

Total Area of Resources: 2 (in APE)

Description of Proposed on-site Undertaking: The project entails modifications to the north bank of Icicle Creek and removal and adjustment of large boulders within the creek channel at RM 5.6 (Icicle Creek Boulder Field); replacement of a portion of an existing City of Leavenworth (COL) pipeline that parallels the north side of Icicle Creek, removal of the COL debris screen structure and replacement and relocation the COL fish screen; improved fish passage at the Icicle Peshastin Irrigation District (IPID) and COL Diversion Dam; and replacement and relocation of the IPID fish screens. Additional potential impacts would include widening of the existing trail/road that extends from the Snow Lakes bridge south of the USFS Snow Lakes Trailhead to the confluence of Icicle Creek and Snow Creek to allow for passage of equipment required to install the fish screen.

Fish passage at the boulder field is identified as a priority by the 5-year status review of the Wenatchee Sub-basin Plan (NOAA 2016) which is the major driver for this suite of Icicle projects. Fish passage at the boulder field will be achieved through a step-pool channel along 150 lineal feet of the left bank of the reach. A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation areas to lower elevation areas to maximize slope stability.

The City of Leavenworth (COL) is concurrently working on the installation of new pipeline for COL which will average 5-foot depth and a maximum of a 10-foot-wide trench to install the new pipe along a 1500 foot transgress, all work will be within previously disturbed road on the IPID right of way and directly adjacent to the existing water line location throughout its length.

COL also intends to replace the fish screen downstream of their Icicle intake when they relocate the water supply pipeline. The current screen no longer meets state or federal standards. The current fish screen is located upstream at the diversion dam and is not in compliance, the new fish screen will be located downstream adjacent to the COL debris screen. Ground disturbance associated with a small spur road and installation of new screens which will include instillation of a new screen structure building and ISI Cone Screen with an estimated foot print of 30 feet by 20 feet on river left.

On river right the IPID plans to replace their fish screens to bring the screens into compliance with the state and federal regulations. The IPID intake is presently on the right bank 500 feet downstream of the IPID/COL channel spanning diversion dam. IPID wants to move their screen an additional 1,000 feet downstream on the canal. IPID disturbance associated with installation of new fish screen at confluence of Snow Creek will include modification to the existing canal to accommodate a screen structure that includes a small vault above snow creek on the IPID right of way and a fish return/bypass back to Snow Creek for fish.

Lastly, ground disturbance associated with trail/road work between foot bridge and fish screen will require widening the approaches on each end of the bridge. The approaches would be widened by at least 5 feet to allow for passage of construction equipment. Where needed boulders will be moved to widen the trail/road up to the IPID location and a staging area next to the canal where the fish screen work will occur. A majority of the work will involve scraping of the ground surface to widen the existing trail/road. Sediments are relatively shallow, and the removal of some rock/boulders may be required which would result in greater disturbance than scraping of the surface sediments. Although in general trail/road work would not extend more than 2 feet below the modern ground surface. Gravel may be brought in and used to level/smooth portions of the trail/road. Gravel would be hauled in from a commercial gravel pit at final completion of the project.

Survey Objective Research Design : The survey research design was utilized to identify any cultural resources (e.g., historic districts, archeological sites, standing structures, traditional cultural properties, and isolated artifacts) within the project's area of potential effect (APE).

Number of Previously Unrecorded Cultural Resources Identified and Recorded: 2

Background Studies : Previous Archaeological Studies : Yes_ No _

Archival Sources Checked: (- indicates a negative finding, indicates positive finding with a short explanation, not consulted)

DAHP GIS Database

A review of the DAHP WISAARD database indicates there are two previously documented sites located within one mile of the project APEs including:

Site FS01582, Sam Beecher's Flume Line, a historic segment of irrigation flume located 870 m (2853 feet/0.54 miles) to the south.

Site FS01584, the 5 Mile Terrace site that consists of a lithic scatter located 1160 m (3804 feet/0.72 miles) to the west.

Additionally, Historic Property #85445, the Icicle Canal Company Irrigation System is located within the project APEs.

USGS Topographic Map

The project APEs are located on land owned by the Icicle Irrigation District located approximately 4 miles southwest of Leavenworth, Washington. The project area is bounded to the north by the Icicle Road and to the south by Icicle Creek.

Soil Survey

A review of the Web Soil Survey database shows that soils within the project APEs consist of Rock outcrop; Rock outcrop-Chumstick-Icicle complex (45 to 90 percent slopes). Soils are described as colluvium and residuum from granite, gneiss, and schist mixed with volcanic

ash and loess. Typical profiles measure 0 to 23 inches to lithic bedrock.

Project Cooperator

TU WWP; Daniel Jaspers TU WWP

GLO

General Land Office (GLO) cadastral plat (1907) for Township 24 North, Range 17 East, shows Icicle Creek, Snow Creek and a trail on the south side of Icicle Creek. No additional constructed features are shown.

Metsker's Map

The 1959 Metsker Map indicates lands contained within the project APEs were owned by the Icicle Irrigation District.

Geologic Map

Holocene-Pleistocene glacial outwash

rc i e or epository isited: (- indicates a negative finding, indicates visit with a short explanation, not consulted)
DAHP

A review of the DAHP WISAARD database indicates there are two previously documented surveys located within one mile of the project APEs, including:

Lancaster (2017) authored the Trout Unlimited Icicle Boulder Field Passage Geotechnical Investigation Monitoring Report associated with an investigation into subsurface rock and soil conditions along a section of Icicle Creek that is located within the current project APEs. One historic structure, a defunct structure associated with historic management of the City of Leavenworth water system, was documented as a result of this monitoring survey.

Fink (1995) authored the 8-Mile Salvage Sale Report associated with survey on the north side of Icicle Road adjacent to the current project area. One site, a lithic scatter (FS1584) was documented within one mile of the project APEs.

Christensen (1995) authored the Boundary Butte Timber Sale Report associated with survey on the south side of Icicle Creek adjacent to the current project area. One site, a historic irrigation

flume (FS1582) was documented within one mile of the project APEs.

ulture istory:

Using Pokotylo and Mitchell's physiographic definitions for Plateau Culture in the *Handbook of North American Indians*, Volume 12 (Sturtevant 1998) the project area is located within the Southern Plateau province. Including the intermountain zone of North-Central Washington, the province extends southward from the Canadian border on the north, westward to the crest of the Cascade Range, east to the Bitterroot Mountains, and southward into central and northeastern Oregon. It is characterized as an area of gently rolling uplands separated by deeply incised river and lake valleys, intermittent highlands and mountain ranges. The southern portion of the area in north-central Washington is drained by the Columbia River.

**Period B
Period Paleoindian circa years ago**

This period is the oldest discovered in north-central Washington and is represented in the archaeological record by the Richey-Roberts Clovis Cache near Wenatchee, Washington (Mehringer 1989) and scattered surface finds of Clovis points. Artifact assemblages at the Richey-Roberts site include unifacial stone and bone tools, large bifaces, bifacial blades and fluted projectile points associated with hunting and gathering subsistence strategies. Surface indications remain rare, but similarities between assemblages suggest a link with areas to the south and east. Evidence of food storage, dwellings or structures of any kind is lacking in the archaeological record.

Period B B

This broad period in prehistory is characterized by a wide variety of projectile point forms (side-notched, shouldered and stemmed, indented-base, lanceolate and laurel-leaf shaped), cobble tools, bifaces, utilized flakes, scrapers, bolas and cores, microblades, hafted bone points, bone needles and awls, the use of ochre, beads, hammer stones, edged or edge-ground cobbles, harpoons and net weights, abraders, and milling stones. The lanceolate projectile point is the hallmark artifact of the period; large side-notched points are poorly represented north of Rock Island Reservoir (Chatters and Pokotylo 1998). Basalt, silicified mudstone and related metamorphic rock are the preferred materials for lithic procurement.

Overall, IB assemblages characterize a "broad-spectrum" seasonally mobile, hunter-gatherer subsistence pattern. Population densities remained low with limited evidence of dwellings from Wells Reservoir. These structures are small (11 square meters) and consist of circles of stones with trampled interiors. Hearths are found outside the features. Other major sites dated to this period through faunal remains include Marmes Rock shelter, sites in the Chief Joseph

Reservoir, Kettle Falls, Lind Coulee, and sites in the Wells Reservoir (Chatters 1984; Chance and Chance 1976; Kirk and Daugherty 2007).

Period B

The disappearance of the Cascade technique used in lithic procurement, changes in material assemblages and the use of pit house dwellings mark the advent of this period. It is well represented in the northern portion of the province, but population increase and subsistence strategies geared toward more efficient exploitation of salmon and root crops are indicated throughout the region. Intensive exploitation of riverine environments led to increased sedentism and seasonal reoccupation of some sites (Campbell 1989; Galm and Masten 1985).

The earliest pit house, reported from Chief Joseph Reservoir (Lohse 1987), dates to around 3,200 B.C. Circular or oval with shallow depressions excavated into soft sediments, the largest dwelling measures nearly 12 meters in diameter. Projectile point styles associated with the period include laurel-leaf shaped or Cascade, Cold Springs side-notched and Mahkin Shouldered. Faunal remains from sites point to increased diversification. Dwelling sites are documented in Wells Reservoir by Chatters (1984) and near Wenatchee at Cox's Pond (Hartmann 1975). Sites without dwellings resemble those associated with the preceding Period IB.

Period B -

This period is marked by widespread occurrence of and in some areas, the reappearance of pit houses, the use of longhouses, heavy reliance on fishing, storage of salmon, and intensive exploitation of the camas root. Canyon bottoms support winter-early spring villages while special use camps located in uplands and mountain zones are utilized in the summer and fall. Subsistence and settlement patterns of this period persist well into the 19th century (Chatters and Pokotylo 1998).

Large pit house villages appear in the record by A.D. 500. House size and shape is quite varied and includes those with and without post-supported superstructures. Large diameter structures are common after A.D. 1,000. Bark and woven reed mat covered longhouses appear after A.D. 500. Pit house villages spring up along the Columbia, its tributaries and on benches/terraces of small streams that feed larger systems. Sites also appear at high elevations and at unexpected locales in the middle of the Columbia Basin.

Across the south-central plateau, population and sedentism increase. Large riverine pit house villages along most salmon-bearing rivers and streams are present. Tool assemblages diversify and expand. Expedient tools fashioned largely from crypto crystalline silica dominate artifact assemblages. Around A.D. 1 small projectile points mark the appearance of bow and arrow technology. Trade in non-local commodities increases in terms of efficiency. Fishing for salmon, hunting of large mammals, root and plant gathering activities and

storage are predominant activities. The period is well represented around the Chief Joseph, Wells, Rock Island, Priest Rapids, and Wanapum reservoirs (Campbell 1989; Chatters 1984; Schalk 1982).

Proto historic Period

The Protohistoric Period witnesses the introduction of the horse, trade and contact with fur traders and missionaries in both the Northern and Southern Plateau regions, as well as widespread disease of epidemic proportions. There is good evidence for small pox epidemics in the Columbia Basin by 1801, although the first epidemics in the Pacific Northwest may have arrived in the 16th century (Campbell 1989). The source may have been ship crews exploring the west coast for furs. If not eliminated, indigenous populations are reduced by half (Boyd 1985).

Circa A.D. 1,800, the southern province supports communities of Sinkaietk or Southern Okanogan, the Northern Okanogan, the Columbia, the Methow, the Chelan, the Nespelam, the Entiat, the Wenatchee, and to the west, the Skagit. Subsistence is based largely on the exploitation of riverine species, primarily salmon, and supplemented by the hunting of ungulates and the gathering of root crops. The settlement pattern is characterized by semi-sedentary winter pit house villages (Campbell 1987).

The project area is located within the traditional homelands and territory of the Wenatchi, whose lands were adjacent to the Kittitas, Columbia (Sinkiuse), and Entiat, many of whom live on the Colville Reservation, and near the northern boundary of lands ceded by the Yakama Nation (Ray 1936; 1974; Teit 1928; Spier 1936). Many other tribes travelled to and fished the Wenatchee River including the Methow, Chelan, Entiat, Columbia and bands of the Yakama. There were known villages at Leavenworth (*tca'ma'us*), Cashmere (*ntua'tckam*), the confluence of Chumstick Creek and the Wenatchee River, and about 10 mile south of Monitor there was a permanent village (*alota's*) situated on the north side of the Wenatchee River opposite an island (Miller 1998; Ray 1936:142-143, Ray 1974:425; Spier 1938).

The Wenatchi were divided into five distinct bands, the *Sinpusq'isho* were headquartered near Leavenworth during the summer and near Cashmere during the winter. The *Sinhahamc'ma* band may have wintered south of Monitor. The *Sinkumchimuh* band had a village on the north bank of the Wenatchee near its mouth, another in the northeast corner of the territory near its border with the Entiat, and another small village on Swakane Creek. The fifth Wenatchi band was situated near the mouth of the Stemilt River (Schuerman 2005:35). The Peshastin Creek valley was used as a prehistoric trail between the Kittitas and Wenatchee valleys (Harberberger 1991).

Historic Period

During the 1850s, representatives of Columbia Plateau tribes signed treaties with the U.S. government ceding the majority of their lands to the U.S. and established a small number of reservations. In 1855, the Yakama and 13 affiliated groups (Yakama Indian Nation) signed a treaty which ceded nearly ten million acres of land that was stretched from “the Cascade ridge on the west to the Chelan-Methow Cascade ridge to the north, to the Palouse and Snake rivers on the southeast, and back to the Columbia” (Ruby and Brown 1965:30-31). In exchange, a reserve was to be set aside in south-central Washington. The treaty provided for the “right to hunt and gather on all lands that were not occupied by whites” and the right to “continue fishing in the usual and accustomed” manner (Hart 2002:14). Although the treaty was signed in June of 1855 it was not signed into law until April of 1889. Less than one month later, Governor Stevens “proclaimed that all ceded lands were open and available for white settlement” (Wilson 1990).

In 1871, Congress authorized the president to establish reservations by Executive Order and in 1872 Ulysses Grant created the Colville Indian Reservation. From 1872 to 1896, the Colville Indian Reservation encompassed lands bounded on the west by the Okanogan River, the south and east by the Columbia River, and the 49th parallel on the north. In 1879, Executive Order established the Columbia or Moses Reservation west of the Okanogan River. In 1880, the boundary of that reservation was expanded to include all territory between Chelan and the Canadian border to the north and territory from the Cascade Mountains eastward to the Okanogan River (Confederated Colville Reservation 2008; Wilson 1990).

When the Columbia or Moses Reservation was created the U.S. Government assumed that Wenatchi Indians not living on the Yakima or Colville Reservation would move to that new reservation. By 1874, most Wenatchi were clustered below the junction of Mission and Yaxon Creeks, near present day Cashmere near a traditional village (Watkins 1996:8). The Wenatchi were steadfast about staying in their traditional homelands even after white settlers began claiming land in the 1880s. Around this time the Wenatchi people began to take advantage of the Indian Homestead laws in order to protect their lands and their identity. “At the turn of the century Wenatchi people had acquired trust title to about 2,858 acres in 23 homesteads and another 2,716 acres in 22 allotments” (Watkins 1996:1).

The Wenatchi acquired these lands through the Indian Homestead Act and the Dawes or General Allotment Act. Most of the 23 Wenatchi homesteads that were filed between 1885 and 1886 were located along the Wenatchee River and its tributary canyons. Others were scattered along the Columbia River near village locations and at the mouths of creeks or in tributaries that emptied into the Columbia (Watkins 1996:6). According to the Treaty of 1885, the Wenatchi were promised and never provided their own reservation at the confluence of Icicle

Creek and the Wenatchee River to coincide with a salmon fishery located there (Hart 2000).

P T

The project area is located approximately 4.5 miles southwest of Leavenworth, Washington. Icicle road bounds the APE to the north and west and the Icicle Irrigation Canal bounds to the project APEs to the south and east. Slopes observed on the north side of Icicle Creek within the APEs measure from 70 to 90 percent, resulting in frequent rock falls within the APEs. Similarly, steep slopes bound the project APEs south and east of the irrigation canal. Icicle Creek flows north through the middle of the APEs. Past disturbances within the APE include construction of an access road on the north and west side of Icicle Creek; construction of Icicle Road; installation of existing mainline pipes, and construction of several structures that house water control equipment on the north and west side of Icicle Creek; construction and maintenance of the Icicle Irrigation Canal on the south and east sides of Icicle Creek; construction and maintenance of the Snow Creek Trailhead parking area, bridge, and trail that are present within and along the north and northeast boundary of the project APEs. .

The Icicle Canal Company Irrigation System, commonly known as the Icicle Canal, is located within the project APEs. The existing fish screen, located approximately 500 feet from the diversion for the canal will be moved an additional 1000 feet down the canal to the junction of Snow Creek and the canal. Soderberg (1983) who completed the original documentation of the canal, explained that construction of the canal, which extends from the diversion on the Icicle River to “lands on both sides of the Wenatchee River, began in 1911 and continued on through 1912. original Icicle Canal, measuring over 39 miles in length was comprised of wood stave pipe, timber flume, open canal and rock tunnels. The Icicle Irrigation District was formed by landowner’s along the canal, in 1917, and by 1918, “the District officially too over the system under a deed and agreement,” (Soderberg 1983). The canal has been in use for over 100 years and during that time wood stave pipe, timber flumes, and open canals have been converted largely to concrete lined canal.

P T T S

The DAHP Predictive Model identifies areas contained within the project APEs as high to very high risk for cultural resources. Additionally, the 1907 General Land Office cadastral plat for Township 24 North, Range 17 East shows a historic trail on the south side of Icicle Creek.

The area was likely utilized by Native American groups traveling up and down canyon during hunting, fishing, and gathering activities. The most likely pre-contact sites may include isolated finds, lithic scatters, and/or features associated with resource extraction or temporary camps.

Historic era cultural resources present within the APEs would likely be associated with transportation and irrigation activities. The APE are within an area that has been heavily impacted by ground disturbing activities over the past century.

F

Total area analyzed and methodology: The cultural resource identification survey consisted of a brief literature review and field inspection for archaeological sites, standing structures, and other cultural resources, through pedestrian survey. CCD consulted with Tribes to determine whether this project would affect known traditional cultural places (TCPs). The entire APEs (100%) were covered during pedestrian survey.

Prior to conducting survey for this project a portion of the project area was monitored by Kim J. Lancaster during Geotechnical Investigations conducted along the proposed pipeline replacement APE associated with the current project. A total of four test pits were excavated within the pipeline APE and several drill holes were conducted along the edge of Icicle Road, directly above the pipeline APE. No cultural materials were observed during monitoring of the Test Pit excavations and/or associated pedestrian survey within the project APEs.

In regards to the current project proposal pedestrian survey of all areas contained within the project APEs was conducted. In general, survey consisted of two transects along the paved Icicle Road, directly north of the project APEs. One transect was walked along the north edge of the road and one transect was walked along the south edge of the road. These transects ended at the east end of the City of Leavenworth Treatment Plant at the east end of the project area and at the City of Leavenworth Water System Intake at the west end of the project area. A third transect was walked from the water City of Leavenworth Water Treatment Plant through the Snow Creek Trailhead Parking Area and along the dirt access road that parallels Icicle Creek between the paved road, to the north, and Icicle Creek to the south. At the west end of the project area a larger area, that may be used as a staging area, was inspected with three additional short transects spaced between the dirt access road and the north bank of the creek. In addition, two areas of steep, boulder river bank were inspected, along the north bank of the creek. The first area extends west for approximately 100 meters from the existing City of Leavenworth screen house. The second extends for approximately 120 m east from a suspension bridge located approximately 70 m northeast of the screen house, again along the north bank of the creek. These two areas are depicted as linear survey transects on the map (see Figure), although due to the extremely steep and boulder terrain they consisted of scrambling and climbing around boulders and accessible areas.

More specifically, survey within the project APEs associated with improving fish passage at the boulder field was accomplished by investigation of the left bank

slope from the edge of the paved Icicle Road to the edge left bank of Icicle Creek. In areas where it was possible to walk along the slope transects were conducted. In many places within the APE the slope was exceedingly steep and rather than walking transects, survey was accomplished by crawling up and down the slope and inspecting all accessible rock surfaces and exposed ground.

Survey of the proposed pipeline replacement APE was accomplished by walking parallel transects within and along either side of the existing Icicle Creek Road, within the City of Leavenworth (COL) access road, and a small amount of additional survey at the west end of the APE, where a staging area may be located. This survey is supplemented by monitoring of four test pits during an earlier project associated with Geotechnical Investigations of subsurface materials within the pipeline APEs (Lancaster 2017).

Survey associated with the proposed COL fish screen replacement APE was conducted through an investigation of accessible terrain upstream from the existing screen house. Three transects discussed above covered the area between the dirt access road and the north side of Icicle Creek Road. Additional inspection associated with this APE consisted of one additional “transect” or rather investigation of the area between the dirt road and the north bank of the creek. Rather than a linear transect this inspection was accomplished by crawling up and down the steep, boulder slope and inspecting all accessible rock surfaces and exposed ground.

Survey of the project APEs located on river right included survey of the segment of the Icicle Canal from the diversion on Icicle Creek (south end of APE) to just north of the bridge over Icicle Creek on Snow Creek Trail (north end of APE). The canal was walked from the diversion to a point on the canal roughly east of the foot bridge on the Snow Creek Trail, at the east end of the project APEs.

From north of the creek crossing, the trail was surveyed, as well as a 20 m wide corridor centered on the trail where ground disturbance associated with trail widening may occur. An enlarged survey area was conducted at the north end of the foot bridge, directly south of the City of Leavenworth Water Treatment Facility, where the bridge approach may require widening and in the area where the screen will be installed at the confluence of Snow Creek and the irrigation canal.

reas ot a ined and easons y: None

Personne onducting or ssisting it Sur ey: Kim J. Lancaster, Archaeologist; Daniel Jaspers, TU WWP assisted with logistics and accompanied the archaeologist during some of the survey

ate s of Sur ey: ctober and and une

Weather and Surface Visibility: Initial survey was conducted during monitoring of geotechnical investigations of subsurface rock and soil present within an area contained within the project APEs. The weather was partly cloudy and cool with temperatures in the low 40s. Survey was completed on June 20, 2018. The weather was warm with temperatures in the low 80s.

Ground visibility ranged from good to excellent. The project APEs are located within a maintained dirt road and trail with excellent ground visibility, steep rocky slopes above the road and trail and steep rocky slopes between the road and trail and Icicle Creek, and on the steep rocky slopes and rock faces on the upslope side of the Icicle Canal and the varying terrain on the downslope side of the Icicle Canal. Vegetation observed within the project APEs includes mixed conifers, aspen, cottonwood, alder, wild rose, Oregon grape, grasses and weeds.

SUBCULTURAL RESOURCES IDENTIFIED AND DESCRIPTION

Cultural Resources Identified and Description: Two historic properties associated with the City of Leavenworth's Water System were documented within the project APEs and a segment of the Icicle Irrigation Canal, located within the project APEs, was updated as a result of this survey.

The two historic properties include the City of Leavenworth Water System Intake (HPI #716426) and the City of Leavenworth Water System Screen House (HPI #715428). The concrete Intake structure extends into Icicle creek and is connected to a short tunnel that is bored into the adjacent bedrock. Water enters into the intake structure and passes through a 180 degree turn, over submerged baffles, and through a flushing gate that provides three stages of screening (Schmidt 2015).

A concrete weir style dam that spans the width of the creek just downstream of the Intake backs up water creating a pool that allows water to flow into the Intake Structure (Schmidt 2015). Alterations to the Intake Structure were conducted circa the early 1950s and during that same time period the weir dam was installed. Since those changes additional improvements including the installation of a concrete roof, expansion, and fencing around the structure have been made (Schmidt 2015).

The screen house, which has settling chambers and additional screening, was originally constructed in 1940. A series of buried pipes enter the screen house from the Intake Structure and exit the screen house conveying water to the City of Leavenworth Treatment Plant.

These structures are still in use and provide an integral part of the City of Leavenworth Water System. With that said, since the initial construction of the water system alterations, additions, and continuous maintenance have been conducted on the various structures that make up the water system. Over the years additional components including an infiltration gallery, wells, pump houses,

reservoirs, and booster pump stations have been added to the system (Schidt 2015). The system has been functional since the early 1900s and has been upgraded and altered over time. The structures documented as a result of this survey do not exhibit exemplary or unique characteristics and are typical of water systems within the region. The Intake Structure and Screen House are not associated with a significant event or person in local or regional history, structurally they represent utilitarian construction elements similar to many Public Works type buildings of this time period. The historic structures have been recommended not eligible to the NRHP.

Proposed changes to the segment of the Icicle Irrigation Canal (HPI #85445) surveyed as part of this project include removal of the existing fish screen and installation of a new fish screen that meets current standards. The new screen would be installed at the point where Snow Creek crosses the canal, some 1000 feet up canal from the existing fish screen. This portion of the canal has been subjected to significant alterations over the past 100 years including replacement of wood and metal flume with concrete canal, installation of the existing fish screens, addition of the existing diversion dam, and improvements and changes to the existing head gates and other water control features. The replacement of the existing fish screens with new screens will not result in changes to the canal that have the potential to impact elements of the canal that would contribute to its eligibility for listing on the NRHP. It is recommended that the project proceed as planned.

Project conclusions Findings and recommendations:

- No historic properties affected
- Historic properties affected
 - No adverse effect to historic properties
 - Adverse effect to historic properties

Timeline of Consultation:

Notification of APE	2/21/2018	Guy Moura, THPO, Colville Confederated Tribes
	2/21/2018	Kate Valdez, THPO, Yakama Nation
	2/21/2018	Dr. Rob Whitlam, State Archaeologist, DAHP
	2/21/2018	Johnson Menninick, Cultural Resources Manager, Yakama Nation
Comments on APE	2/24/2018	Guy Moura, THPO, Colville Confederated Tribes
Response to Comments	3/14/2018	Guy Moura, THPO, Colville Confederated Tribes
Concurrence on APE	2/26/2018	Dr. Rob Whitlam, State Archaeologist, DAHP
	6/6/2018	Guy Moura, THPO, Colville Confederated Tribes
Final Report	8/3/2018	Guy Moura, THPO, Colville Confederated Tribes
	8/3/2018	Kate Valdez, THPO, Yakama Nation
	8/3/2018	Dr. Rob Whitlam, State Archaeologist, DAHP
	8/3/2018	Johnson Menninick, Cultural Resources Manager, Yakama Nation

ocation of u tura esource ocu entation: Cultural resource reports and correspondence is on file at the Department of Archaeology and Historic Preservation, Olympia, Washington and in the CCD cultural resource files.

TT	TS
Figures	Figures 1-4
Photographs	Photographs 1-20
Other	UTM Table 1

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Kim J. Lancaster, M.A.
Author's names

August 3, 2018
Date

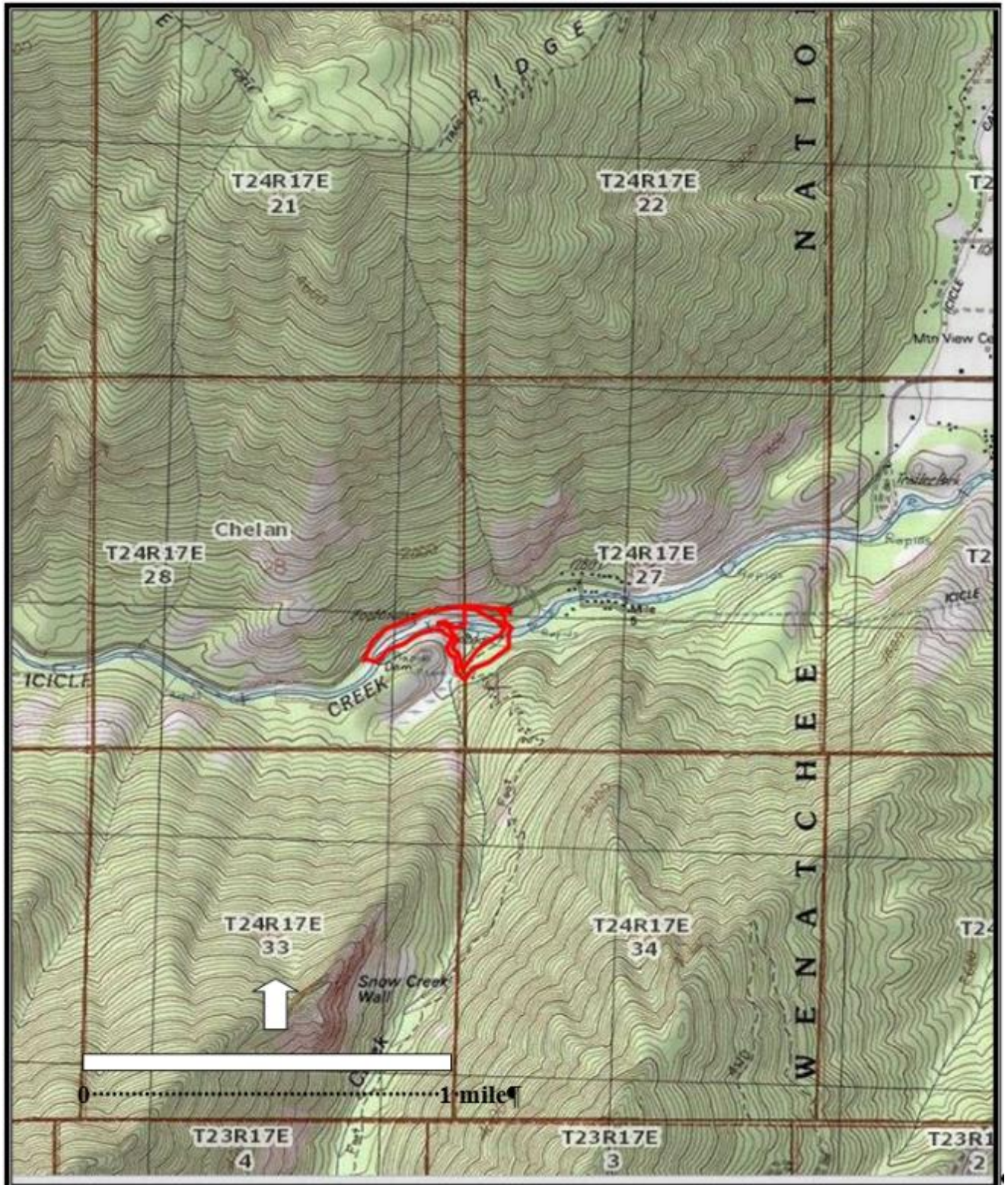


Figure : Topographic map showing project location

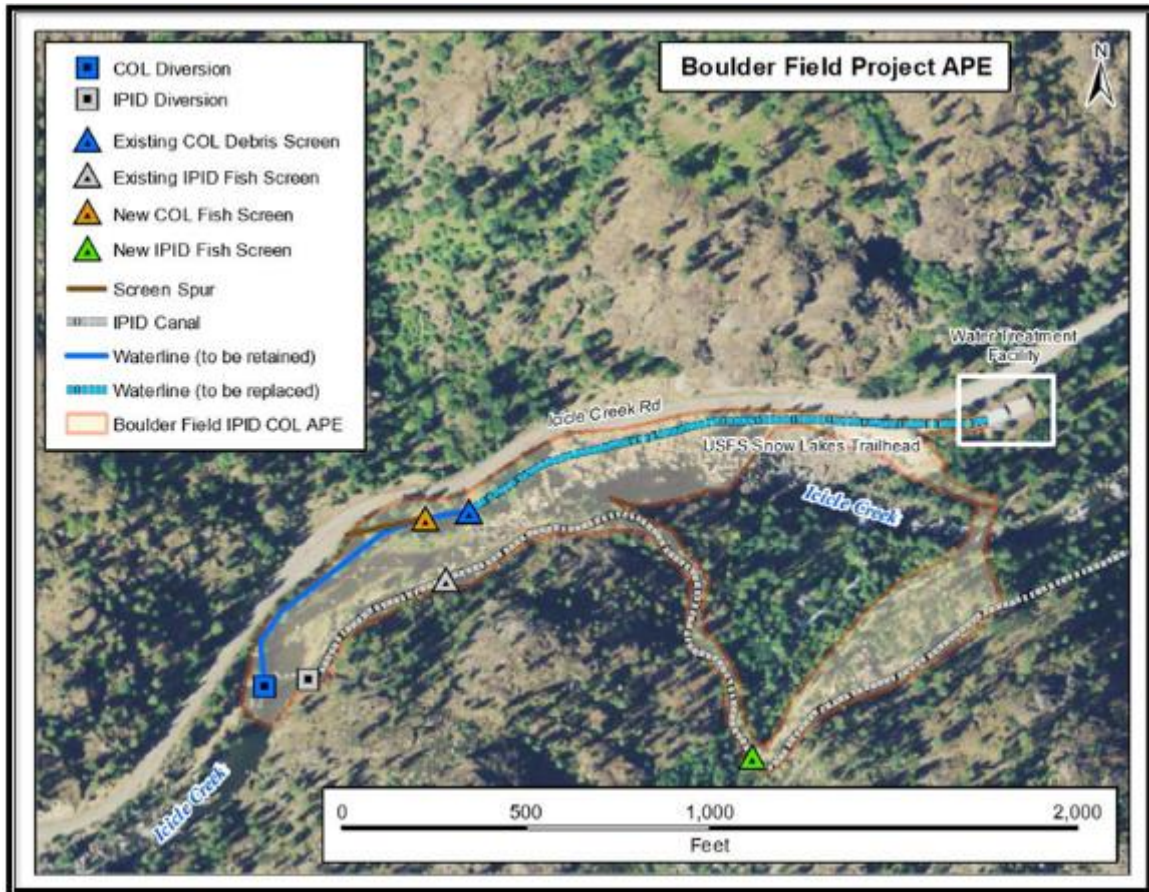


Figure : rt ograp ic i age s o ing project P s

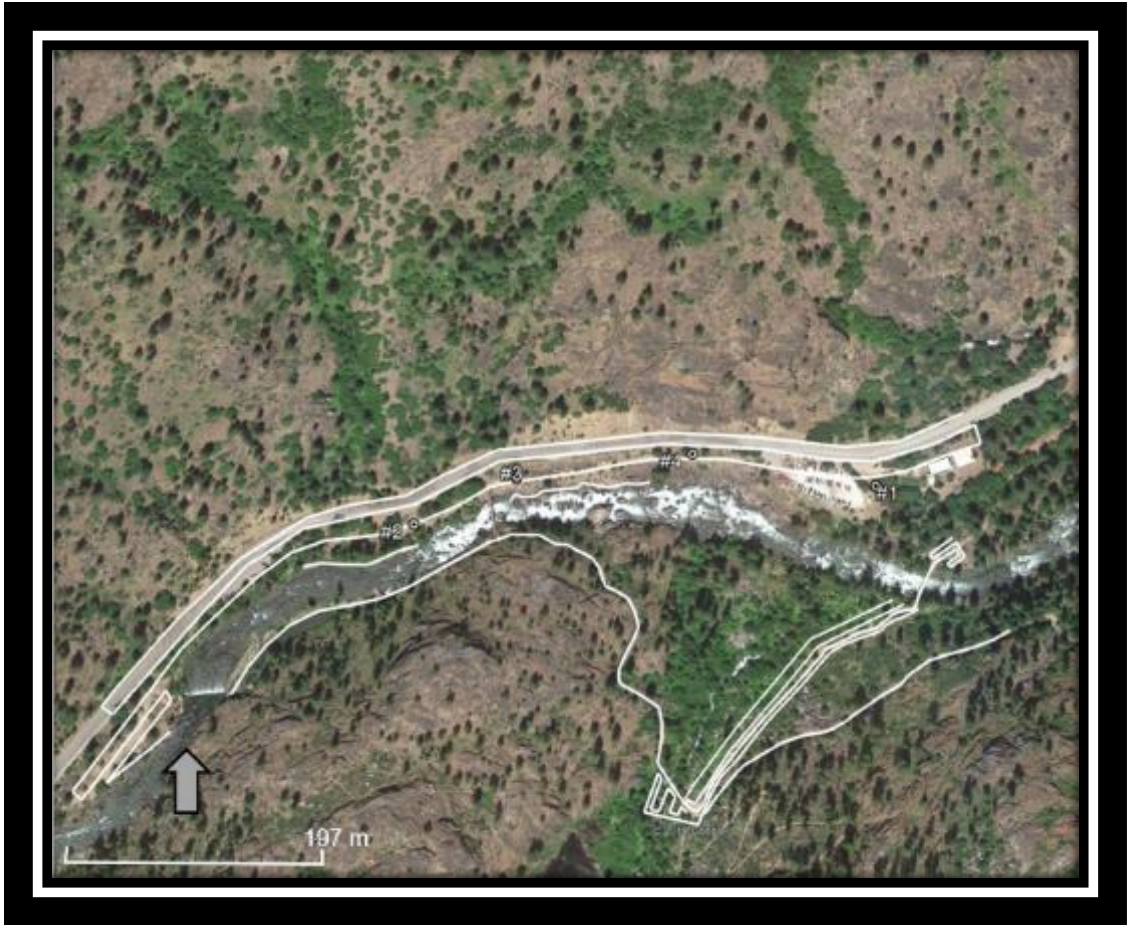


Figure : Aerial photograph showing survey transects and locations of test pits conducted during geotechnical investigations. The locations of test pits are indicated by white circles. A scale bar indicates 197 m. A grey arrow points to a specific location on the left side of the image.

Table : UT ata one

Point	asting	ort ing	o ent
1	672429	5268257	N side of Icicle Road; NE end of APE
2	671745	5267982	N side of Icicle Road; SW end of APE
3	671756	5267974	S side of Icicle Road; SW end of APE
4	672440	5268246	S side of Icicle Road; NE end of APE
5	672446	5268230	N side of water treatment plant; NE end of APE
6	671733	5267911	SW end of APE; SW of end of access road; possible staging area
7	671740	5267909	SW end of APE; SW end of access road; possible staging area
8	671794	5267944	NW end of possible staging area; W of City of Leavenworth Intake
9	671800	5267987	NW end of possible staging area; next to fence around intake
10	671759	5267922	SW end of APE; SW end of access road; possible staging area
11	671803	5267963	End of survey in SW portion of APE; point taken on creeks edge
12	671892	5268098	W end of survey of creek bank below access road W of screen house
13	671984	5268120	E end of survey of creek bank below access road E of screen house
14	672057	5268160	W end of survey of creek bank N of suspension bridge; S of new pipeline
15	672172	5268181	E end of survey of creek bank N of suspension bridge; S of new pipeline
16	671847	5267995	S end of Icicle Canal survey; E side of creek; E of diversion dam
17	672049	5268131	Existing fish screens
18	672199	5267947	Proposed new fish screen location
19	672212	5267932	SE end of canal survey; S end of trail survey
20	672393	5268098	S end of foot bridge over Icicle Creek
21	672405	5268122	N end of foot bridge over Icicle Creek

22	672424	5268139	Turn in survey transect; approach to N end of foot bridge
23	672427	5268136	Turn in survey transect; approach to N end of foot bridge
24	672418	5268129	Turn in survey transect; approach to N end of foot bridge
25	672420	5268125	Turn in survey transect; approach to N end of foot bridge
26	672432	5268134	Turn in survey transect; approach to N end of foot bridge
27	672426	5268145	Turn in survey transect; approach to N end of foot bridge
28	672406	5268131	Turn in survey transect; approach to N end of foot bridge
29	672403	5268134	Turn in survey transect; approach to N end of foot bridge
30	672422	5268149	End point in survey within approach to N end of footbridge
31	672383	5268092	Survey along NW and W side of Snow Creek Trail; NW end
32	672223	5267929	Survey along NW and W side of Snow Creek Trail; S end
33	672214	5267933	S end of return transect along NW and W side of Snow Creek Trail
34	672374	5268096	N end of return transect along NW and W side of Snow Creek Trail
35	672395	5268087	NW end of survey along NE and E side of Snow Creek Trail
36	672225	5267915	S end of transect along NE and E side of Snow Creek Trail
37	672183	5267920	W end of E/W transect S of existing irrigation ditch
38	672192	5267950	N end of N/S transect on W side of Snow Creek; S of irrigation ditch
39	672194	5267947	N end of N/S transect on W side of Snow Creek; S of irrigation ditch
40	672188	5267924	S end of N/S transect on W side of Snow Creek; S of irrigation ditch
41	672193	5267923	S end of N/S transect on E side of Snow Creek; S of irrigation ditch
42	672200	5267939	N end of N/S transect on E side of Snow Creek; S of irrigation ditch
43	672206	5267934	N end of N/S transect on E side of Snow Creek; S of irrigation ditch
44	672203	5267923	S end of N/S transect on E side of Snow Creek; S of irrigation ditch

45	672208	5267920	S end of N/S transect on E side of Snow Creek; S of Snow Creek Trail
46	672212	5267924	N end of N/S transect on E side of Snow Creek; S of Snow Creek Trail
47	672216	5267922	E end of E/W transect on E side of Snow Creek; S of Snow Creek Trail
48	672230	5267922	S end of Icicle Canal survey W of Snow Creek Trail
49	672468	5268077	N end of Icicle Canal survey SE of foot bridge over Icicle Creek



Photograph : view of west bank of creek at diversion dam and vicinity of earthen intake structure. Photograph taken from opposite side of creek looking east.



Photograph : view of creek bank directly downstream of vicinity of earthen intake structure. This is as surveyed. View is north east.



Photograph : Perspective of circle road taken near vicinity of eastern Port Water Treatment Plant on south side of circle road. View is south-east.



Photograph : Perspective of circle road taken near center of Port. Looking east. The slopes north of the road consisted of bedrock rear of photograph and loosely consolidated eroding slopes front of photograph.



Photograph : Series of view of eastern port access road taken near east end of road east of Snoke's Trail head parking area. This is east



Photograph : Series of south end of access road south of view of eastern port. Screen house looking south. This is east



Photograph : Series of cicada creek Boulder Field taken from edge of access road on the north side of the creek looking south east



Photograph : View of sandy sediments and boulders near the creek edge that in the area where proposed fish passage activities would occur



Photograph : Erosion of the bank on north side of creek near east end of proposed fish passage activities. The Snohomish Creek Trail foot bridge is visible in background of photograph. Direction is east.



Photograph : Erosion of steep bank observed along north side of creek in fish passage project.



Photograph : Perspective of south end of concrete irrigation and water control structure is visible in center of photograph. Location of eastern intake structure is visible in right of photograph. This is south east



Photograph : Perspective of water control feature south of fish screens. This is north east concrete irrigation district foot bridge to access fish screens from the access road on the opposite side of the creek. This is visible in rear of photograph



Photograph : Aerial view of location of Screen House and surrounding river bank taken from spiralay on cic e rrigation ana lise is north



Photograph : Aerial view of existing fish screens located approximately 100 feet north east of cic e creek diversion



Photograph : view of Sno Creek Trail looking east towards junction of the cic e rrigation ana and Sno Creek Trail in this location is relatively wide and deep



Photograph : view of cic e rrigation ana north east of the junction of the cana and Sno Creek trail is south east



Photograph : view of Sno Creek Trail taken from the canyon this location the canyon is so close distance above upslope of the trail and creek The slopes immediately south of the trail are extremely steep and boundary



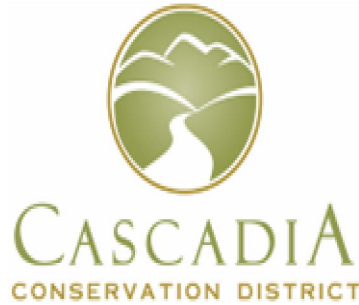
Photograph : view of the existing trail tread showing exposed rock and granular sediments



Photograph : partially exposed boulder in the trail tread that has blasting scars on the exposed surface



Photograph : view of the Snow Creek foot bridge along the east boundary of the project area. The approaches to the bridge may need some widening. Work could take place in the previously disturbed approach areas at either end of the bridge. View is north.



14 N. Mission Wenatchee, WA 98801 Phone (509) 436-1601

www.cascadiacd.org

February 21, 2018

Dr. Rob Whitlam
State Archaeologist
Department of Archaeology and Historic Preservation
1110 Capitol Way, S. #30
PO Box 48343
Olympia, WA 98504-8343

Subject: Trout Unlimited 2018 Icicle Boulder Field- IPID-COL Project in Chelan County, Washington.

Type of Project Being Funded: Cascadia Conservation District (CCD) is cooperating with Trout Unlimited Washington Water Project (TU) with an investigation into widening a short section of Icicle Creek with the goal of improved fish passage. The project APEs are located in the SE $\frac{1}{4}$ of Section 28 and the SW $\frac{1}{4}$ of Section 27, in Township 24 North, Range 17 East, as shown on the Leavenworth, WA. Topographic quadrangle, in Chelan County.

Funding for this project is from the Salmon Recovery Funding Board, Rock Island Habitat Conservation Plan Tributary Committee, and United States Fish and Wildlife. TU has contracted with the CCD to conduct a cultural resource review of the project APEs. This cultural resources review is being conducted in compliance with Section 106 of the National Historic Preservation Act of 1966 and other environmental and cultural resource legislation.

Cultural resources surveys are being designed to review existing history and prehistory of the area and identify potential areas to be impacted by the planned ground disturbing activities. Your assistance is needed to determine if physical evidence of cultural resources or traditional cultural properties are present within the Area of Potential Effects (APE). Goals also include identification and analysis of cultural resources that may qualify as historic properties, resolve any adverse effects, and address Native American concerns. Your input on these issues is requested as part of the consultation process.

Undertakings: The project entails modifications to the north bank of Icicle Creek and removal and adjustment of large boulders within the creek channel at RM 5.6 (Icicle Creek Boulder Field); replacement of a portion of an existing City of Leavenworth (COL) pipeline that parallels the north side of Icicle Creek, removal of the COL debris screen structure and replacement and relocation the COL fish screen; improved fish passage at the Icicle Peshastin Irrigation District (IPID) and COL Diversion Dam; and replacement and relocation of the IPID fish screens. Additional potential impacts would include widening of the existing trail/road that extends from the Snow Lakes bridge south of the USFS Snow Lakes Trailhead to the confluence of Icicle Creek and Snow Creek to allow for passage of equipment required to install the fish screen.

Fish passage at the boulder field is identified as a priority by the 5-year status review of the Wenatchee Sub-basin Plan (NOAA 2016) which is the major driver for this suite of Icicle projects. Fish passage at the boulder field will be achieved through a step-pool channel along 150 lineal feet of the left bank of the reach. A combination of excavation and rock breaking will be necessary during construction. Some of the left bank slope material will be excavated to create space for the step-pool channel. Slope excavation will proceed from higher elevation areas to lower elevation areas to maximize slope stability.

The City of Leavenworth (COL) is concurrently working on the installation of new pipeline for COL which will average 5-foot depth and a maximum of a 10-foot-wide trench to install the new pipe along a 1500 foot transgress, all work will be within previously disturbed road on the IPID right of way and directly adjacent to the existing water line location throughout its length.

COL also intends to replace the fish screen downstream of their Icicle intake when they relocate the water supply pipeline. The current screen no longer meets state or federal standards. The current fish screen is located upstream at the diversion dam and is not in compliance, the new fish screen will be located downstream adjacent to the COL debris screen. Ground disturbance associated with a small spur road and installation of new screens which will include installation of a new screen structure building and ISI Cone Screen with an estimated foot print of 30 feet by 20 feet on river left.

On river right the IPID plans to replace their fish screens for water diversion, to bring the screens into compliance with the state and federal regulations. The IPID intake is presently on the right bank 500 feet downstream of the IPID/COL channel spanning diversion dam. IPID wants to move their screen an additional 1,000 feet downstream on the canal. IPID disturbance associated with installation of new fish screen at confluence of Snow Creek will include modification to the existing canal to accommodate a screen structure that includes a small vault above snow creek on the IPID right of way and a fish return/bypass back to Snow Creek for fish.

Lastly, ground disturbance associated with trail/road work between foot bridge and fish screen will require widening the approaches on each end of the bridge. The approaches would be widened by at least 5 feet to allow for passage of construction

equipment. Where needed boulders will be moved to widen the trail/road up to the IPID location and a staging area next to the canal where the fish screen work will occur. A majority of the work will involve scraping of the ground surface to widen the existing trail/road. Sediments are relatively shallow, and the removal of some rock/boulders may be required which would result in greater disturbance than scraping of the surface sediments. Although in general trail/road work would not extend more than 2 feet below the modern ground surface. Gravel may be brought in and used to level/smooth portions of the trail/road. Gravel would be hauled in from a commercial gravel pit at final completion of the project.

Cascadia Conservation District is recommending 100 % pedestrian survey of the project APEs. The project APEs are situated in areas that have been heavily disturbed by the construction and maintenance of the Icicle Canal and its associated features, installation of the existing COL pipeline that extends from the existing intake to the COL Water Treatment Facility, construction and maintenance of the Icicle Road, which has had many episodes of washout and repair in the project area, construction of the access road that parallels the existing pipeline, and construction and maintenance of the Show Lake Trail. The project APEs are in areas that have shallow soils, large expanses of exposed bedrock, and areas with fill where road failures have been repaired.

Construction is planned for Fall of 2018/2019. Background research, past planning and implementation efforts, monitoring during construction, and degree of previous disturbances will be used to identify and record cultural resources and determine their potential for national registry eligibility.

Comments must be received no later than 30 days from the receipt of this letter.

If you have any questions about this project, please contact me at (509) 436-1601 or email at mikec@cascadiacd.org.

Sincerely,

Mike Cushman
Program Manager
Cascadia Conservation District

Cc: Guy Moura, THPO for the Colville Confederated Tribes
Kate Valdez, THPO for the Yakama Nation
Johnson Meninick, Cultural Resources Manager, Yakama Nation



Figure 1: Location Map

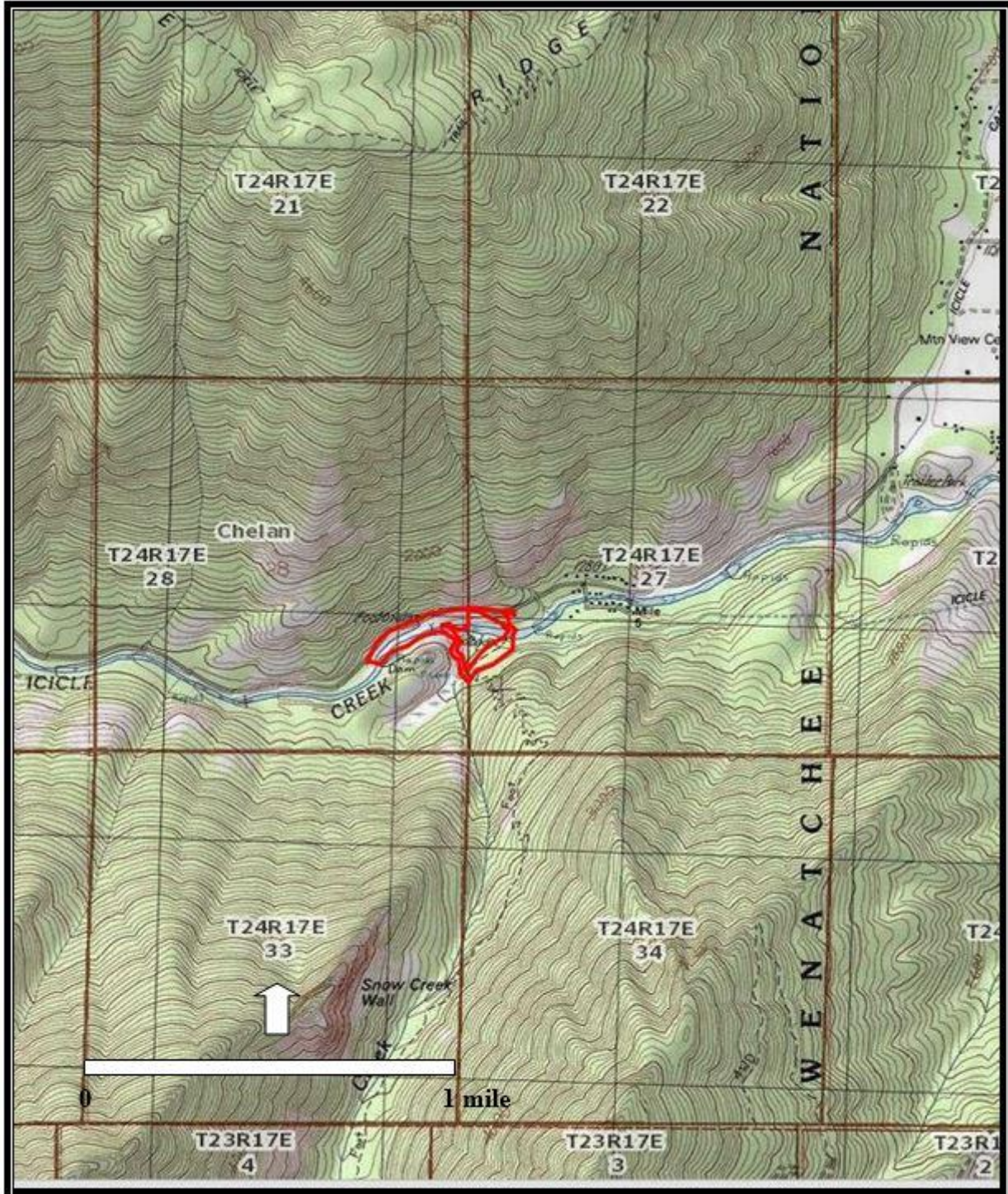


Figure 2: USGS Topographic Map showing project APEs in Township 24 North, Range 17 East, Sections 27 & 28, as shown on the Leavenworth, Washington 7.5" Topographic Quadrangle.

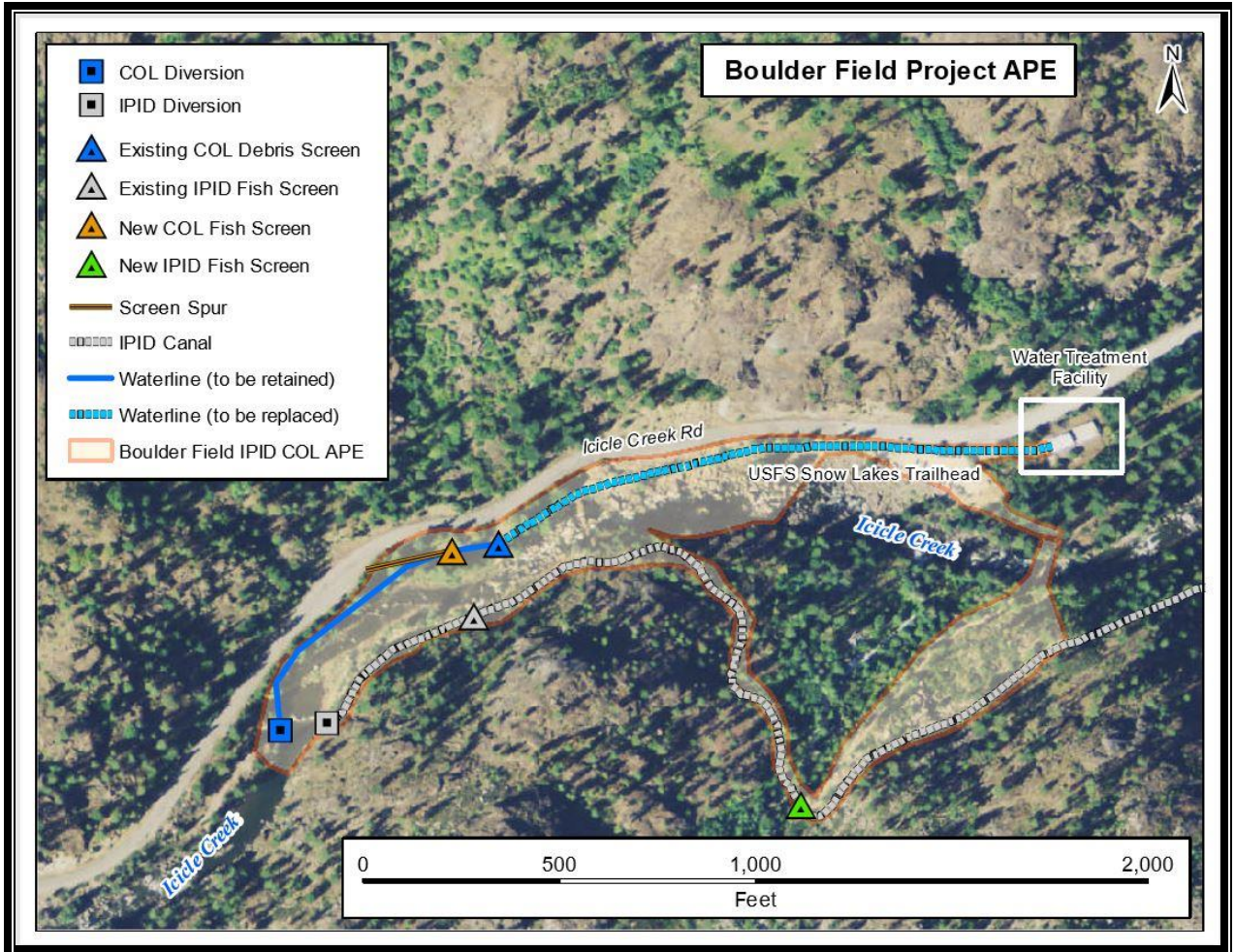


Figure 3: Orthographic map showing project APEs.



Allyson Brooks Ph.D., Director
State Historic Preservation Officer

February 26, 2018

Mr. Mike Cushman
Cascadia Conservation District
215 Melody Lane
Wenatchee, Washington 98801

RE: 2018 Icicle Boulder Field IPID-CO Project
Log No.: 2018-02-01361-WSCC

Dear Mr. Cushman;

Thank you for contacting our department. We have reviewed Area of Potential Effect (APE) you provided for the proposed Trout Unlimited Washington Water Project 2018 Icicle Boulder Field IPID-CO Project, Chelan County, Washington.

We concur with the proposed Area of Potential Effect (APE) detailed in your letter and illustrated in the attached figures.

We look forward to receiving the results of your review, the professional cultural resources report, consultations with the concerned tribes, and the Determination of Effect.

We would also appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on behalf of the State Historic Preservation Officer in compliance with the Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.4.

Should additional information become available, our assessment may be revised, including information regarding historic properties that have not yet been identified. Thank you for the opportunity to comment and we look forward to receiving the report on the results of your investigations.

Sincerely,

A handwritten signature in blue ink, appearing to read 'R. Whitlam', is written over a light blue horizontal line.

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 890-2615
email: rob.whitlam@dahp.wa.gov



RE: Section 106 Initial Consultation Letters for the Icicle Boulder Field IPID COL Project



Guy Moura (HSY) <Guy.Moura@colvilletribes.com>
Wed 6/6/2018, 2:47 PM
You: Mike Cushman; Aaron Penrose; Kaehler, Gretchen (DAHP) ❌



Mike,

Sorry it took you a call to get me to respond. We reviewed all of the pertinent documentation provided. We no longer have concerns about the monitoring because of the previous investigations at the project location. Kim has nothing to apologize for, we continue to be pleased and impressed with her work.

We have no further questions or concerns regarding this undertaking moving forward.

Im leant, qeZcairyeni (thank you)

Guy Moura
Program Manager, History/Archaeology
Tribal Historic Preservation Office
Confederated Tribes of the Colville Reservation
(509) 634-2695

From: Mike Cushman [mailto:MacC@cascadiaad.org]
Sent: Thursday, March 15, 2018 8:55 AM
To: Guy Moura (HSY)
Cc: vikingwoman20@hotmail.com; Aaron Penrose
Subject: RE: Section 106 Initial Consultation Letters for the Icicle Boulder Field IPID COL Project

Good morning,

First, we must apologize for our oversight in not specifically identifying the previous monitoring conducted during the Geo-Technical Investigations within the pipeline. We have attached a copy of Guys response to the CCT Icicle APE letter, the CCT Icicle APE letter, Kim's response to concerns outlining monitoring work conducted during the Icicle Boulder Field Geotechnical Monitoring, and a copy of the monitoring report. By sending all of this information we hope you will have everything in one place for review.

Additionally, Aaron Penrose would be the person to contact regarding further biological questions that may arise.

Please let us know if you have further questions.

Regards,

Mike Cushman

Michael Cushman | Program Director | 408-436-5100 | mcc@cascadiaad.org
Cascadia Conservancy District | 14 North Mission, Wenatchee, WA 98801 | www.cascadiad.org

From: Guy Moura (HSY) [mailto:Guy.Moura@colvilletribes.com]
Sent: Saturday, February 24, 2018 9:11 AM
To: Mike Cushman <MikeC@cascadiaad.org>
Cc: vikingwoman20@hotmail.com; Aaron Penrose <APenrose@tzu.org>; Kaehler, Gretchen (DAHP) <Gretchen.Kaehler@dshp.wa.gov>; Robert Sloma (HSY) <Robert.Sloma@colvilletribes.com>; Frederick Donald (HSY) <Frederick.Donald.HSY@colvilletribes.com>; Charissa Eichman (ORA) <Charissa.Eichman.ORA@colvilletribes.com>; Cody Desautel (LSP ADM) <Cody.Desautel@colvilletribes.com>; Karen Cepuder (HSY) <Karen.Cepuder@colvilletribes.com>; Crystal Miller (HSY) <Crystal.Miller@colvilletribes.com>; Guy Moura (HSY) <Guy.Moura@colvilletribes.com>
Subject: RE: Section 106 Initial Consultation Letters for the Icicle Boulder Field IPID COL Project

Hi Mike:

Thanks for the notification. We reviewed the documentation sent in relation to the subject undertaking, Icicle Boulder Field Project.

- We concur this is an undertaking
 - It is an undertaking that may have implications for the Colville Tribes' Fish and Wildlife Department. Therefore I forwarded the information on to others with concerns beyond the Section 106 scope for Historic Properties.
 - We concur with the APE.
 - We concur with a 100% pedestrian survey.
 - We **do not concur** that survey alone is adequate. There is no discussion of monitoring or shovel probes along the proposed pipelines. While there is ample discussion of previous disturbances, there is no indication the line was previously surveyed, nor evidence previous disturbance went 5 feet deep.
- We are aware of the shallowness of fine sediments atop fluvial redeposited glacial out-wash. We recommend the simplest strategy might be monitoring initial trenching. We see no need to continue monitoring during pipe-laying and back-filling.

Thank you for consulting with the Tribal Historic Preservation Office on the Section 106 process. If others have concerns on the larger biological aspects of the project, should they contact Aaron Penrose?

Guy Moura
Tribal Historic Preservation Officer



The Confederated Tribes of the Colville Reservation

History/Archaeology Program
P.O. Box 150, Nespelem, WA 99155

(509) 634-2693
FAX: (509) 634-2694



August 15, 2014

HA# U14-216
14.0273

Kim Lancaster
Cultural Resource Specialist
PO Box 4408
Omak, WA 98841

RE: Trout Unlimited 2014 Icicle Boulder Field Passage Project in Chelan County, Washington

Dear Ms. Lancaster:

We received your letter initiating consultation of subsurface rock and soil condition investigations in four to six locations in the Icicle Creek Irrigation District.

Please be advised that your proposed undertaking lies within the traditional territory of the Wenatchi tribe, one of the twelve tribes that make up the Confederated Tribes of the Colville Reservation (also known as the Colville Confederated Tribes or CCT), which is governed by the Colville Business Council (CBC). The CBC has delegated to the Tribal Historic Preservation Officer (THPO) the responsibility of representing the CCT with regard to cultural resources management issues throughout the traditional territories of all of the constituent tribes under Resolution 1996-29.

We agree with your recommendation for a cultural resource monitor during excavation activities. As the project moves forward, we recommend the proponent proceeds with caution and ask that the following conditions be observed:

- Condition 1: Inadvertent Discoveries - In the event that human remains, burials, funerary items, sacred objects, or objects of cultural patrimony are found during project implementation, the proponent or his authorized agent shall adhere to all of the requirements of RCW 68.50.645. They shall immediately cease any activity which may cause further disturbance and then take steps to protect the find from further damage or disruption. They shall then contact the county coroner, who will contact the Washington State Department of Archaeology and Historic Preservation (DAHP). They shall then contact the Confederated Tribes of the Colville Reservation Tribal Historic Preservation Officer (THPO) at (509) 634-2695 or the Tribal Archaeologist at (509) 634-2691 as soon as possible to report the find. No further work shall be allowed on the project until there is an approved a plan for managing or preserving the remains or items.
- Condition 2: Post-Review Discoveries - In the event that prehistoric artifacts (i.e., arrowheads, spear points, mortars, pestles, other ground stone tools, knives, scrapers, or flakes from the manufacture of tools, fire pits, peeled trees, etc.) or historic-period artifacts or features (i.e., fragments of old plates or ceramic vessels, weathered glass, dumps of old cans, cabins, root cellars, etc.) are found during project implementation, the proponent or his authorized agent shall cease work immediately within 200 ft. of the find.

Then they shall contact the Washington State DAHP to report the find. Then they shall contact the THPO at (509) 634-2695 or the Tribal Archaeologist at (509) 634-2691. No further work shall be allowed on the project until there is an approved a plan for managing or preserving the artifacts or features.

- Condition 3: Activities that have the potential to disturb cultural resources outside the specified project area should not proceed prior to a cultural resources review of potential adverse effects in the new area.

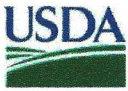
Thank you for consulting with the CCT. Please note that these comments are based on information available to us at the time of the project review. We reserve the right to revise our comments as information becomes available. If you have any questions or concerns, please contact Eric Oosahwee-Voss at (509) 634-2690 or eric.oosahwee-voss@colvilletribes.com. If you wish to speak with me, do so at (509) 634-2695.

Sincerely,

A handwritten signature in purple ink, appearing to read 'GUY MOURA', written in a cursive style.

Guy Moura
Tribal Historic Preservation Officer

cc: Chron; Gretchen Kaehler (DAHP); File (EOV)



United States
Department of
Agriculture

Forest
Service

Okanogan-Wenatchee National
Forest Wenatchee River Ranger
District

600 Sherbourne
Leavenworth WA 98826
509-548-2550

File Code: 2710
Date: January 30, 2019

Ms. Kirsten Larsen
Department of Community development
316 Washington St.
Suite 301
Wenatchee, WA 98801

Dear Ms. Larsen

The USFS is aware of Trout Unlimited's fish habitat improvement project in Icicle Creek near the Snow Lakes Trailhead parking lot. We understand that the City of Leavenworth water line lies within USFS right-of-way along Icicle Creek Road (Forest Road 7600). The USFS authorizes Trout Unlimited and City of Leavenworth to work within the USFS right-of-way in order to replace the water line and construct the fish habitat improvement project. We are working directly with Trout Unlimited to set constraints on the timing of the construction.

Please contact me directly if you have any questions regarding project as it relates to the USFS right-of-way. For other questions about the project, please contact the project sponsor, Aaron Penvose, at (509) 881-7689 or the project's authorized agent, Marnie Tyler at (360) 480-5518.

Sincerely,

JEFFREY A. RIVERA
District Ranger

Aaron Penvose; Marnie Tyler

