Rowdy and Dominie Creek Fish Passage Improvement Project

Initial Study/Proposed Mitigated Negative Declaration

GHD | 718 Third Street, Eureka, CA 95501

Project Reference Number : 11209093 | June 2021

This page is intentionally left blank

Initial Study/Proposed Mitigated Negative Declaration

Del Norte County

Rowdy and Dominie Creek Fish Passage Improvement Project

Prepared for Lead Agency:

Del Norte County
981 H Street, Suite 110
Crescent City, CA 95531

Prepared by:

GHD
718 Third Street
Eureka, California 95501

Applicant:

Tolowa Dee-ni' Nation
140 Rowdy Creek Road
Smith River, CA 95567

June 2021

This page is intentionally left blank

Table of Contents

1. Project Information 1-1

1.1 CEQA Requirements 1-1

1.2 Project Setting 1-2

1.3 Project Purpose 1-3

1.3.1 Project Goals 1-4
1.3.2 Project Objectives 1-4

1.4 Project Background 1-4

1.5 Existing Conditions 1-5

1.5.1 Water Rights 1-5
1.5.2 Rowdy Creek Existing Infrastructure 1-5
1.5.3 Dominie Creek Existing Infrastructure 1-9
1.5.4 Existing Geotechnical Conditions 1-12
1.5.5 Existing Operations 1-12

2. Project Description 2-1

2.1 Demolition and Removal 2-1

2.2 Replacement Infrastructure 2-2

2.3 Instream Enhancements 2-4

2.4 Project Schedule and Equipment 2-5

2.5 Operation and Maintenance 2-7

2.6 Cumulative Impact Projects 2-8

2.7 Environmental Protection Actions Incorporated into the Project 2-8

2.7.1 Environmental Protection Action 1 – Stormwater Pollution Prevention Plan (SWPPP) 2-8
2.7.2 Environmental Protection Action 2 – Construction BMPs 2-8

2.8 Required Permits and Approvals 2-9

2.9 California Tribal Consultation 2-9

3. Environmental Factors Potentially Affected 3-1

4. Environmental Analysis 4-1

4.1 Aesthetics 4-1

4.2 Agriculture and Forest Resources 4-4

4.3 Air Quality 4-7

4.4 Biological Resources 4-14

4.5 Cultural Resources 4-44

4.6 Energy 4-48

4.7 Geology and Soils 4-50

4.8 Greenhouse Gas Emissions 4-55

4.9 Hazards and Hazardous Materials 4-57

4.10 Hydrology and Water Quality 4-62

4.11 Land Use and Planning 4-71
4.12 Mineral Resources 4-73
4.13 Noise 4-74
4.14 Population and Housing 4-77
4.15 Public Services 4-78
4.16 Recreation 4-80
4.17 Transportation 4-81
4.18 Tribal Cultural Resources 4-84
4.19 Utilities and Service Systems 4-86
4.20 Wildfire 4-89
4.21 Mandatory Findings of Significance 4-92
5. References 5-1
6. Report Preparers 6-1
6.1 Del Norte County 6-1
6.2 Tolowa Dee-ni' Nation 6-1
6.3 GHD 6-1
6.4 Sub-consultants 6-1

Table index

Table 1.2-1. Parcels Located within the Project Area 1-3
Table 4.3-1. Construction Regional Pollutant Emissions 4-12
Table 4.4-1. Potential for Special-status Species to Occur within Study Area 4-17
Table 4.10-1 – Predicted Flows at Project Site 4-63
Table 4.11-1. Land Use and Zoning Designations within the Project Area 4-72
Table 4.13-1 Maximum Noise Exposure for Noise Sensitive and Other Uses Due to Stationary Noise Sources (Hourly Leq in dB[1,2]) (Table 2-2) 4-75
Table 4.21-1. Projects Considered for Cumulative Impact Analysis 4-94

Image index

Image 1-1. Rowdy Creek Diversion Weir at confluence with Dominie Creek (looking upstream) 1-7
Image 1-2. Fish Trap (looking downstream from river right) and picket fence in upright position 1-8
Image 1-3. Rowdy Creek Diversion Infrastructure (facing river right bank) 1-9
Image 1-4. Dominie Creek at confluence (looking upstream) 1-10
Image 1-5. Dominie Creek diversion structure and upstream infrastructure (facing downstream) 1-11

Image 1-6. Dominie Creek diversion structure (facing upstream) 1-11

Appendix Index

Appendix A Figures

Appendix B Final Design Plans

Appendix C Basis of Design Report

Appendix D CalEE Mod Emissions Report

Appendix E Biological Resources Report

Appendix F Aquatic Resources Delineation Report

Appendix G Geotechnical Report

Appendix H Asbestos and Naturally Occurring Asbestos Technical Memo

This page is intentionally left blank

1. Project Information

Project Title	Rowdy and Dominie Creek Fish Passage Improvement Project
Lead Agency Name & Address	Del Norte County 981 H Street, Suite 110 Crescent City, CA 95531
Contact Person & Phone Number	Heidi Kunstal, (707) 464-7254
Project Location	Rowdy Creek Fish Hatchery 255 N. Fred Haight Drive Smith River, CA 95567
Project Applicant's Name & Address	Tolowa Dee-ni' Nation 140 Rowdy Creek Road Smith River, CA 95567
General Plan Land Use Designation	Light Industrial, General Commercial, General Industrial
Zoning	General Commercial (C-4), General Commercial (C-3), Manufacturing (M), Central Business (C-2)

1.1 CEQA Requirements

The Rowdy and Dominie Creek Fish Passage Improvement Project (Project) is subject to the requirements of the California Environmental Quality Act (CEQA). The lead agency is the County of Del Norte, and the Project applicant is the Tolowa Dee-ni' Nation (TDN). The purpose of this Initial Study is to provide a basis for deciding whether to prepare an Environmental Impact Report, a Mitigated Negative Declaration or a Negative Declaration. This Initial Study is intended to satisfy the requirements of the California Environmental Quality Act, CEQA, (Public Resources Code, Div 13, Sec 21000-21177), and the CEQA Guidelines (California Code of Regulations, Title 14, Sec 15000-15387). CEQA encourages lead agencies and applicants to modify their projects to avoid significant adverse impacts.

Section 15063(d) of the State CEQA Guidelines states the content requirements of an Initial Study as follows:

1. A description of the project including the location of the project;
2. An identification of the environmental setting;
3. An identification of environmental effects by use of a checklist, matrix, or other method, provided that entries on a checklist or other form are briefly explained to indicate that there is some evidence to support the entries;
4. A discussion of the ways to mitigate the significant effects identified, if any;
5. An examination of whether the project would be consistent with existing zoning, plans, and other applicable land use controls;
6. The name of the person or persons who prepared or participated in the Initial Study.

1.2 Project Setting

The Rowdy and Dominie Creek Fish Passage Improvement Project (Project) is located in the Smith River watershed, located in the northern extent of California, in the town of Smith River, Del Norte County in the ancestral territory of the Tolowa Dee-ni' Nation (see Figure 1 – Project Vicinity in Appendix A). The Smith River has the unique status of being the last major free flowing coastal river in California that drains to the Pacific Ocean and is considered the "crown jewel" of California by the North American Salmon Stronghold Partnership (WSC 2013). The Smith River watershed encompasses 719 square miles of unique habitat within northwestern California and southern Oregon and is recognized for world-class salmon and Steelhead fishing. The Smith River supports several populations of salmonids including the Southern Oregon/Northern California Coast (SONCC) Evolutionarily Significant Unit (ESU) of Chinook and Coho Salmon (*Oncorhynchus tshawytscha,* and *Oncorhynchus kisutch*), Klamath Mountains Province Designated Population Segment (DPS) of Steelhead (*Oncorhynchus mykiss*) and Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*). Within the Smith River watershed, Coho Salmon are listed under the Federal and California Endangered Species Acts. The Smith River watershed is also important for Pacific Lamprey (*Entosphenus tridentatus*) as well as other aquatic and terrestrial species. Although the Smith River contains areas of high quality habitat, land modifications and uses have resulted in a loss of wetlands, particularly in the lower watershed, which are thought to be contributors to the relatively low Chinook and Coho Salmon and Steelhead numbers as compared to historical records.

The Project is located at the Rowdy Creek Fish Hatchery (Hatchery), located at the confluence of Dominie Creek and Rowdy Creek within the lower Smith River watershed, and in upper Dominie Creek underneath the Hatchery Access Road bridge (see Figure 2 – Project Area in Appendix A). The Project Area is 3.6 acres, and represents the potential limit of disturbance associated with the Project. The Rowdy Creek watershed area above the Dominie Creek confluence is 29.4 square miles and the Dominie Creek watershed area is 3.7 square miles totaling a combined watershed area is 33.1 square miles.

The Hatchery was formed in 1968 by the 15-member Kiwanis Club of Smith River, to increase and perpetuate the native runs of Steelhead and Chinook Salmon in the Smith River. Both creeks contain instream Hatchery infrastructure that are barriers to fish passage including the diversion weir on Rowdy Creek, and the concrete apron on Dominie Creek. The Tolowa Dee-ni' Nation (TDN) own the facility and operate the Hatchery in partnership with the nonprofit Rowdy Creek Fish Hatchery Board of Directors, and the property that the Hatchery operates on, and promotes continuation of the Hatchery Chinook Salmon and Steelhead programs. The TDN is an advocate for improving conditions in the Rowdy Creek watershed for all wildlife, particularly Tribal Trust species that include salmonids and lamprey, and is implementing this Project.

Highway 101 runs north/south and is located to the east and north of the Project, and a residential neighborhood exists in the southern vicinity of the Project Area. A riparian corridor exists along both Rowdy and Dominie Creeks throughout the entire Project Area, except for the western bank of Rowdy Creek just south of the bridge (river right) at the Hatchery. Referencing creek banks is done from the downstream position; therefore river right is the western bank, and river left is the eastern bank, for this Project. See Table 1.2-1 for the assessor parcel numbers (APNs) that comprise the Project, and each APNs purpose within the Project.

Table 1.2-1. Parcels Located within the Project Area

APN	Purpose	Ownership
103-080-043	Access to Rowdy and Dominie Creek channels	TDN
103-080-026	Staging area	TDN
103-080-028	Construction within upper portion of Dominie Creek	Municipal (Smith River Fire Protection District)
103-080-063	Construction within upper portion of Rowdy Creek	Private ownership (Green Diamond Resource Company)
103-080-056	Construction within upper portion of Rowdy Creek, and potential staging area	Private ownership (Green Diamond Resource Company)
103-080-044 (within easement)	Within easement: access to and construction within Rowdy Creek	Easement held by “Smith River Fish Hatchery” (now known as the Rowdy Creek Fish Hatchery owned by TDN) on private property (Lelo)
103-080-044 (outside of easement)*	Potential staging area and access to Rowdy Creek	Private ownership (Lelo)
103-720-002	Access to and construction Rowdy/Dominie Creek confluence and lower Rowdy Creek	Private ownership (Frosini)
103-080-014*	Potential access to staging area and Rowdy Creek	Private ownership (Jenkins)

*: APNs denoted with an asterisk (*) are considered as potentially being utilized in the Project and thus may not be included in the constructed Project. These areas are considered in this ISMND for the purpose of conservative environmental review.

1.3 Project Purpose

The Hatchery was constructed in phases. This infrastructure is dated and inappropriate by today’s standards due to the migrational barrier it creates for anadromous species such as Coho Salmon, Coastal Cutthroat Trout, Steelhead, and Chinook Salmon (collectively termed “salmonids”) and Pacific Lamprey.

The diversion weir on Rowdy Creek is considered a partial barrier to adult fish passage and is comprised of the Hatchery fish exclusion fencing (known as the picket fence) which is connected to a large concrete slab (see Image 1-1 below, and note deep pool downstream of the diversion weir). On Dominie Creek, the concrete entrance apron (at the confluence), water diversion screening facility and associated diversion dam and fish ladder (in the upper portion of Dominie Creek) have been identified as partial barriers to adult fish passage. Regarding juvenile salmonids, the hydraulic conditions created by the concrete apron at Dominie Creek and the diversion weir on Rowdy creek are complete barriers. The diversion weir across Rowdy Creek is one of the most substantial

anadromous fish barriers remaining in coastal California outside of major dams (Parish and Garwood 2016).

One of the access barriers is caused by the picket fence and the deep tailwater pool that has formed immediately downstream of the diversion weir due to blockage of upstream sediment that would have somewhat filled into the pool. Currently the weir on Rowdy Creek is perched approximately three feet above the pool. Even when the picket fence is out of operation, the jump that salmonids would need to make from the pool over the diversion weir is a major obstacle to volitional passage. The diversion weir is a complete barrier for juvenile salmonids, and a mostly complete barrier for adult salmonids. Only at the highest flows can fish pass over the picket fence exclusion fencing. Due to these barriers, approximately 11.5 miles of habitat on Rowdy Creek (Garwood and Larson 2014) and 1.6 miles of habitat on Dominie Creek (Lang 2005) are either fully or partially inaccessible to salmonids and lamprey (depending on life stage and flow).

1.3.1 Project Goals

The goal of the Project is to improve fish passage conditions for all age classes of salmonids on Rowdy Creek at the Hatchery, and to improve fish passage conditions on Dominie Creek at the Rowdy Creek confluence and at the Hatchery Access Road bridge.

1.3.2 Project Objectives

The Project objectives include the following:

- Remove the existing Hatchery diversion weir on Rowdy Creek to provide volitional fish passage, when the Hatchery is not collecting fish, over the range of fish passage design flows while meeting regulatory criteria.
- Improve the Hatchery fish trapping facility on Rowdy Creek to minimize delay and handling of fish not to be collected by the Hatchery.
- Construct a new Hatchery water diversion structure on Rowdy Creek that meets regulatory criteria, and allows the maximum water right diversion of 6 cfs.
- Improve Dominie Creek at the Rowdy Creek confluence to provide volitional fish passage over the range of fish passage design flows while meeting regulatory criteria.
- Remove the existing Hatchery infrastructure on Dominie Creek below the Hatchery Access Road bridge to improve fish passage conditions while protecting the bridge structure.

1.4 Project Background

In 2013, the California Department of Fish and Wildlife (CDFW) through its Fisheries Restoration Grant Program (FRGP) in partnership with the State Coastal Conservancy (SCC) awarded funds to TDN to conduct a feasibility study to assess infrastructure alternatives, and operational improvements that would improve fish passage conditions at the Hatchery. As part of the Feasibility Study (GHD and Michael Love & Associates 2015), a Technical Advisory Group (TAG) was formed to develop and screen alternatives. The Feasibility Study considered the following alternatives:

a. Downstream roughened channel, repair existing concrete apron, replace picket fence, new trap, new diversion facility;

b. Downstream roughened channel, new diversion weir, new trap, new diversion facility;

c. River right fish ladder with river left roughened channel, new diversion weir, new trap, new diversion facility;

d. Roughened channel, new diversion weir, new trap, new diversion facility;

e. Full removal, roughened channel, new diversion structure, new fish ladder/trap on Dominie Creek at existing diversion structure;

f. Roughened channel, modified operational approach, new diversion facility;

g. Roughened channel, new diversion structure, new fish ladder/trap on Dominie at existing ladder;

h. No change;

i. Full removal, roughened channel, new diversion structure, modify existing fish ladder; and

j. Full removal, roughened channel, electric barrier, new trap, new diversion structure.

The Feasibility Study documented the pros and cons of each alternative and the outcome of the TAG meeting which assigned scores to each alternative. Alternative D was decided upon as the best apparent alternative because it would provide unimpeded passage for all life stages of salmonids, achieving the Project's primary goal, in addition to providing continued Hatchery operational opportunities that could contribute to advancing the science of watershed and fisheries management practices into the future (GHD and Michael Love & Associates 2015).

In 2015, TDN was awarded funding from CDFW's Wildlife Conservation Board to complete design plans and supporting Basis of Design Report for Alternative D referred hereafter as the Project. The Project designs were developed in accordance with the National Oceanic and Atmospheric Administration's (NOAA) Fisheries and CDFW fish passage guidelines, while maintaining the function of the Hatchery. The design plans completed by GHD and Michael Love and Associates have been reviewed by NOAA Fisheries and CDFW in 2018, and are attached to this document as Appendix B. The Basis of Design Report (GHD and Michael Love & Associates 2018b) is attached to this document as Appendix D.

1.5 Existing Conditions

1.5.1 Water Rights

TDN contains two water rights at the property. One of the water rights allows the diversion of up to 2.2 cubic feet per second (cfs) from Dominie Creek. The other water right allows for the diversion of up to 6 cfs from Rowdy Creek. The diversion infrastructure on Dominie Creek at the Hatchery Access Road bridge includes the sluice gate, is to be removed (see Section 1.4.1), and therefore the 2.2 cfs of water from Dominie Creek would remain within the stream channel at this time. TDN does not intend to give up this water right on Dominie Creek. Upgrades are proposed at the diversion intake on Rowdy Creek (see Section 1.4.2) to meet NOAA/CDFW guidelines. There are no changes proposed to the water diversion rate on Rowdy Creek.

1.5.2 Rowdy Creek Existing Infrastructure

The primary feature within Rowdy Creek within the Project area is the existing diversion weir, which is located immediately upstream of the Dominie Creek confluence. The diversion weir includes a concrete apron, a picket fence, and adjacent concrete walls as well as the entrance to the fish trap

(Image 1-1). The picket fence, which directs fish to the trap (Image 1-2), is 69 feet long and is skewed relative to the channel flow direction; the river right end is more upstream than the river left end..

Image 1-1. Rowdy Creek Diversion Weir at confluence with Dominie Creek (looking upstream)

The concrete apron spans Rowdy Creek and ranges from 60 to 68 feet wide (perpendicular to flow). The apron is approximately 30 feet wide (parallel to flow). The apron is built on the channel bed. The thickness of the concrete is variable and ranges between 2 and 4 feet. The concrete apron is perched approximately 3 feet above the tailwater pool which formed from scour. The tailwater pool control is a series of large boulders and bedrock that span the channel approximately 40 feet downstream.

The entrance to the fish trap is a box-shaped concrete channel that is approximately 2 feet wide (Image 1-2). The fish trap is a steel bar structure that is approximately 5 feet tall, 9 feet long, and 5 feet wide. The trap opens via a hinged top. The fish trap and channel are separated by a concrete wall and a series of steel baffles.

Image 1-2. Fish Trap (looking downstream from river right) and picket fence in upright position

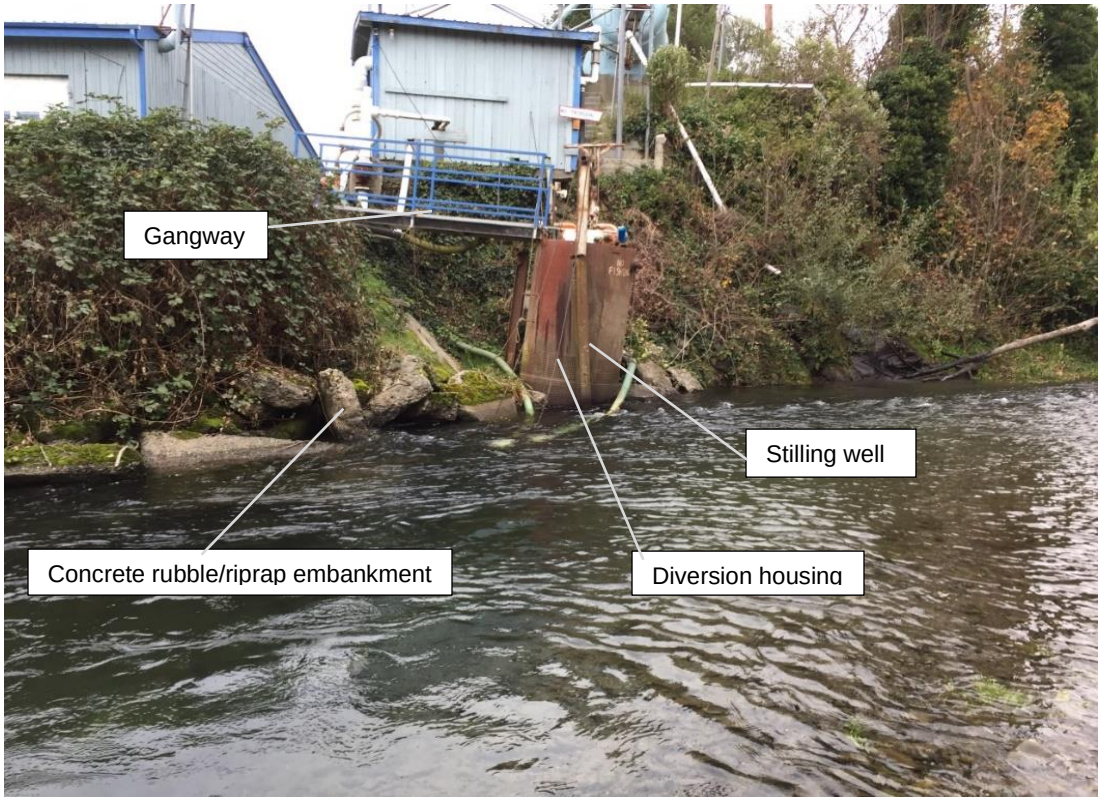


Image 1-3. Rowdy Creek Diversion Infrastructure (facing river right bank)

The Hatchery's Rowdy Creek diversion pump intake is located approximately 80 feet upstream of the fish trap (Image 1-3) on river right. The river right bank between the diversion and fish trap is heavily armored with stacked concrete rubble and is near vertical. The Hatchery diversion consists of gangway and previously were located within slotted steel stilling well (vertical pipe), however currently the pumps are located in the creek and screened. The Highway 101 bridge crossing over Rowdy Creek, maintained by Caltrans, is located approximately 200 feet upstream of the concrete weir and spans over the Project Area. The Highway 101 bridge over Rowdy Creek was constructed in the early 1950's, and the bridge deck was widened in the early 1990's. There is a single pier located near the center of the Rowdy Creek channel. Based on visual observations and review of record drawings, the bridge's pier footing is currently not exposed and extends well below the current channel bed. A mid-channel gravel bar has formed downstream of the pier, nearly extending to the diversion weir. A visible portion of bedrock (approximately 25 feet long and 8 feet wide) was noted to be visible within the pool immediately upstream of the weir (and downstream of the gravel bar)

1.5.3 Dominie Creek Existing Infrastructure

A perched concrete apron spans the Dominie Creek channel at the confluence with Rowdy Creek (see Image 1-4). There is a single pier in the center of the channel (located at the upstream end of the apron) that supports a foot bridge and a pipe crossing. Also visible in Image 1-4 is the entrance (sluice gate) to the Hatchery fish ladder. The fish ladder is intended to provide upstream access for fish, however it is not used because of the labor it requires, limited Hatchery staff, and the increase in fish handling it requires. The fish ladder's outside wall extends approximately 145 feet upstream on Dominie Creek and confines the channel.

Approximately 380 feet upstream of the confluence is the Dominie Creek diversion structure (see

Image 1-5 and 1-6). The diversion structure includes a diversion dam (sluice gate), additional fish ladder, and diversion screens. The diversion dam and ladder is located under the Hatchery Access Road bridge. The diversion dam, and ladder infrastructure rest on visible bedrock and are separated by a wall running the width of the road crossing. The diversion dam is comprised of a sluice gate that rests on two flash boards. The ladder consists of three pools separated by flashboards. The ladder spans approximately 5 feet of elevation. Immediately upstream of the diversion dam are the diversion intake screens. The screens cover an opening in the wall where the pump intakes are located.

Regarding bridge ownership, based on initial discussion with Del Norte County, the County does not have a right-of-way across Hatchery Access Road bridge. Therefore ownership of the bridge is divided down the centerline of the bridge, with Smith River Fire Protection District owning the north western portion, the TDN owning the southwest and southeast portions, and the northeastern portion of the bridge lies within an area assumed to be Caltrans right-of-way.

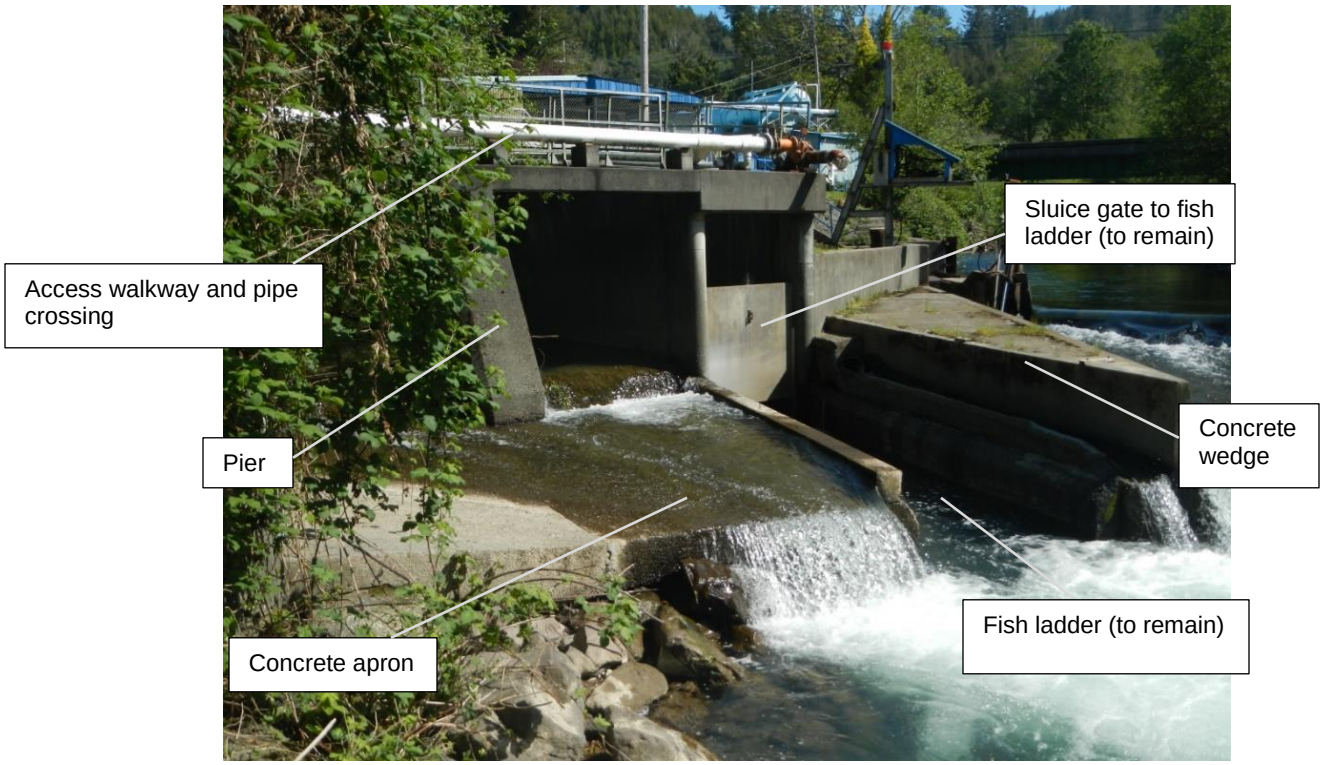


Image 1-4. Dominie Creek at confluence (looking upstream)

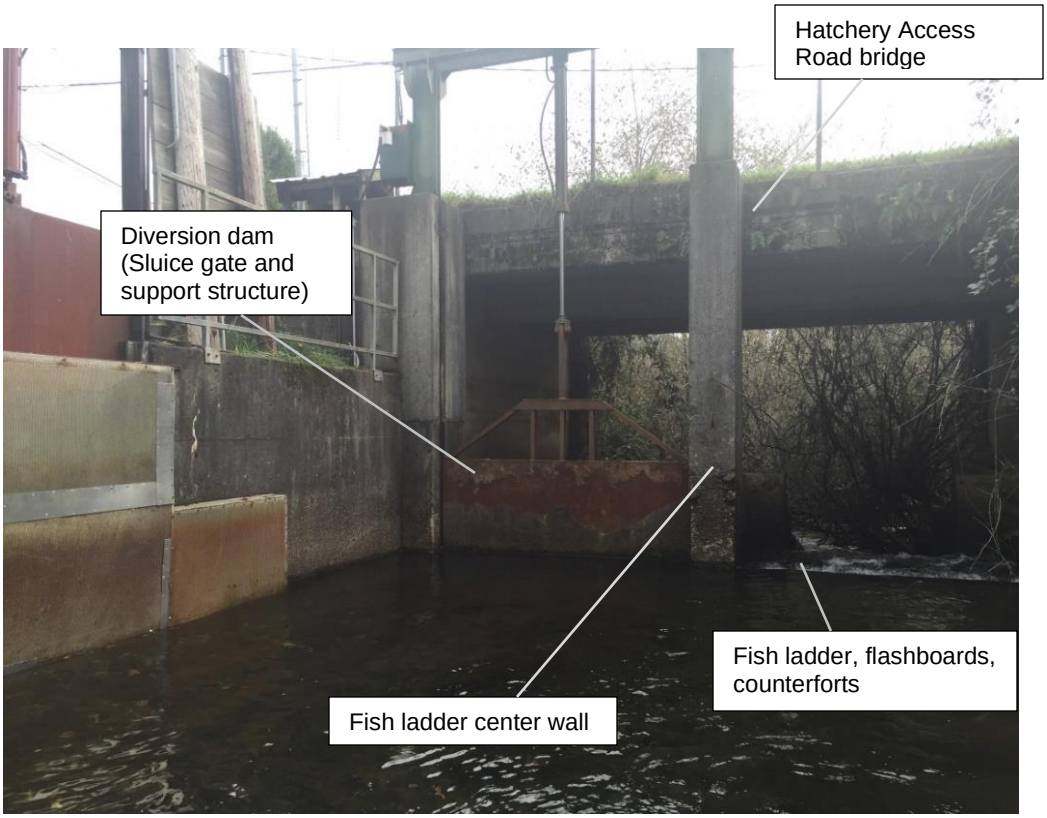


Image 1-5. Dominie Creek diversion structure and upstream infrastructure (facing downstream)

Image 1-6. Dominie Creek diversion structure (facing upstream)

1.5.4 Existing Geotechnical Conditions

A Geotechnical Investigation was conducted during July 2017 to support the final Project design. The results of the investigation concluded that the subsurface materials in the Project Area generally consist of gravels and clayey sands overlying weathered to fresh bedrock. The improvements proposed as part of the final design plans have been designed based on the available sub-surface geologic information and recognize the limitations of boring depths and extents.

1.5.5 Existing Operations

Since 1973, the Hatchery has been rearing Chinook Salmon for release into the Smith River drainage. The number of Chinook Salmon produced have fluctuated from year to year, due to Hatchery production potential, funding, water control, and management objectives. The Steelhead Program began in 1982 in response to an increase in the popularity of drift boat fishing for Steelhead. An annual Steelhead Derby was started in 1983 to assist in support of the program. The Project does not propose to modify Hatchery operations. However, implementation of the Project would improve water supply via the updated water diversion equipment on Rowdy Creek, which is critical for operations. Therefore, because the Project would not modify Hatchery operation, information in this section is for informational purposes only.

The Hatchery is a significant center for environmental education. It supplies Chinook Salmon and Steelhead eggs to local schools for classroom education programs, which was originally started by California Sea Grant program and is now sponsored by Rural Human Services and coordinated with and supported by CDFW. The Hatchery also provides tours for local students and visitors as well as classes from Brookings, Grants Pass, and surrounding areas. The majority of these tours occur during the spawning seasons so that students are able to witness, first hand, spawning techniques and learn the life cycles of anadromous fish.

The Hatchery operates two fish programs: Chinook Salmon (Program 1), and Steelhead (Program 2). The programs have two purposes: provide fish for harvest (particularly to improve subsistence opportunities), and provide educational opportunities to the local community. Some program goals presented in the Rowdy Creek Fish Hatchery 5-Year Management Plan 2016/2017-2020/2021 (RCFH 2016) include the following:

- Enhancement of Chinook Salmon and Steelhead in the Smith River, using Hatchery production to increase the number of catchable fish and improve subsistence, sport and commercial angling opportunities while also promoting the economic development of Del Norte County;
- Evaluate Steelhead fisheries in the Smith River resulting from the previous change of release site, from the U.S. Forest Service boat ramp at the forks to the County Boat Launch on Fred Haight Drive;
- Minimize the potential for impacts to natural stock in the Smith River;
- Provide monitoring of marked Hatchery production to obtain data essential to the integrated Hatchery program in the Smith River Basin. Marked hatchery production would be used to calculate Proportional Natural Influence;
- Supply eggs for classroom incubation projects, and provide educational support to local classrooms, and information to the public through tours and presentations; and

- Supply a portion of healthy, marked adult Chinook Salmon and Steelhead to the TDN for subsistence;

Current production goals identified in the 2018 Hatchery and Genetic Management Plan (RCFH 2018), which supercedes the 5-Year Management Plan, include the following by program:

- **Chinook Salmon Program**

  The primary purpose of the Chinook program is to provide fish for tribal harvest. The program will release between 50,000 and 150,000 subyearling Chinook each year. Release number will be dependent on the number of natural origin fish returning to the Rowdy Creek Hatchery weir. The program will collect between 53 and 79 natural origin recruit adults each year for incorporation into broodstock (RCFH 2018).

- **Steelhead Program**

  The primary purpose of the Steelhead program is to provide fish for sport and tribal harvest. The program will release between 50,000 and 80,000 yearling Steelhead each year depending on the run-size of natural origin Steelhead returning to the Rowdy Creek Hatchery Weir. This range of juvenile releases is expected to produce up to 1,000 adult fish for harvest. The program proposes to meet a proporation of natural origin broodstock (pNOB) of 100% when natural origin recruit Steelhead run-size allows. Based on a release range of 50,000 to 80,000 yearling Steelhead, the program will collect between 54 and 83 natural origin recruit adults each year for incorporation into broodstock (RCFH 2018).

Components of the Hatchery infrastructure appear to be at or near the end of its design life. The overall site layout, age and nature of improvements and additions over a number of years have resulted in a hatchery that functions, yet is challenging to operate and to maintain. The condition of the water supply and distribution system is the primary constraint of the Hatchery (DJWA and Meridian Environmental 2018). The water supply quantity and layout creates major challenges for staff to maintain both the quality and quantity of the water needed for the two programs (DJWA and Meridian Environmental 2018). The proposed Project would allow the Hatchery diversion and fish trapping/handling to meet NOAA/CDFW guidelines, and would allow the Hatchery to meet its production goals.

2. Project Description

The three major components of this Project are: demolition and removal, infrastructure replacement, and instream enhancement, which can collectively be considered "construction." The Project does not include operational changes to the Hatchery. Not all Hatchery facility/concrete components proposed for demolition would be replaced, rather instream and bank infrastructure would be removed from Rowdy and Dominie Creeks at their confluence and from within Dominie Creek below Hatchery Access Road, and replacement infrastructure would be installed in and along the banks of Rowdy Creek. The three components of the Project are further discussed below.

2.1 Demolition and Removal

A major component of this Project includes demolition and removal of instream infrastructure to accommodate the proposed improvements. Specific pieces of infrastructure to be demolished and removed are shown on Figure 3 – Proposed Demolition in Appendix A, and pages C-102 through C-104 in Appendix B (Design Plans). The following infrastructure at the Rowdy and Dominie Creek confluence is planned for removal (see Images 1-1 through 1-4):

- Concrete apron in Dominie Creek;
- Concrete wedge located between lower Dominie and Rowdy Creeks;
- Access walkway, pipe crossing and pier above Dominie Creek;
- Rowdy Creek diversion weir (comprised of the concrete apron, slab and picket fence);
- Concrete stairs along Rowdy Creek;
- Fish trap along Rowdy Creek, including box channel, concrete wall and steel baffles;
- Concrete rubble/riprap embankment along Rowdy Creek river right bank; and
- Diversion housing along Rowdy Creek, including stilling well and the gangway.

Along upper Dominie Creek the following infrastructure located beneath or around the Hatchery Access Road bridge would be demolished and removed (see Images 1-5 and 1-6):

- Fish ladder weirs (3), flashboards, counterforts;
- Diversion dam (sluice gate and support structure);
- Sluice channel concrete slab (subsurface); and
- Fish ladder center wall.

The infrastructure to be removed are large concrete structures, i.e. the concrete slab and apron on Rowdy Creek ranges from 60 to 68 feet wide and 30 feet long, and appears to be approximately 2 to 4 feet thick. After field inspection, it appears evident that most of the infrastructure proposed to be demolished were "add on" items. As an example, the fish ladder and sluice gate on Dominie Creek beneath the Hatchery Access Road bridge appear to have been constructed much later than the bridge itself, based on the visual appearance of concrete weathering and joints. This would indicate that the bridge would have been constructed to be stable under conditions that did not rely on the fish ladder or sluice gate components themselves, and that their removal would have minimal impact.

The Design Plans (Appendix B) incorporates protections to elements proposed to remain, but which are located near features to be removed, such as concrete walls, buried footings, soil nails, and

shotcrete facing. These protections are intended to provide the same level of structural protection, or better, than the previous features.

2.2 Replacement Infrastructure

This component of the Project includes the construction and installation of replacement infrastructure and equipment. The purpose of the replacement infrastructure is to maintain functionality of the Hatchery, allow for fish passage and to divert flow for Hatchery operational use that meets NOAA guidelines. See Figure 4 - Proposed Infrastructure in Appendix A (Figures) and pages C-105 through C-109, C-301, and C-501 in the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B for depictions of the proposed infrastructure which consists of the following:

- Diversion Weir: A new hydraulic picket fence would be installed in the same approximate footprint as the existing one. It would be set a skew to the flow to help direct fish towards the fish trap and would span across the entire channel. The proposed picket fence would have multiple sections and therefore the operator may only need to raise the section closest to the trap while leaving the remaining sections down. The picket fence would be actuated with automated compressed air to raise or lower during fish trapping periods. The picket fence would remain lowered during all non-trapping periods. It is anticipated that the pickets would be approximately 9.25 feet long. A proposed passive integrated transponder (PIT) antenna array may be installed in conjunction with the picket fence, which would be able to detect fish that pass over or through it that are tagged with a PIT tag. Each PIT tag contains a unique identification number, and data sourced from PIT antennas contributes to the ongoing study of regional fish distribution.
- The picket fence would be supported on a thickened concrete slab foundation 10 feet wide (which is approximately 20 feet less in width than the existing slab), continuous across Rowdy creek. The proposed concrete slab foundation would be at the same elevation as the new roughened channel pool, and thus a residual depth of 3 feet water would remain at lower flows. A concrete cutoff wall below the foundation would extend to bedrock to minimize undermining of the slab.
- Engineered streambed material would be installed in conjunction with the concrete foundation and retaining wall, in order to raise the channel bed elevation and avoid channel disconnection and improve fish passage (further described in Section 3.1). A concrete retaining wall would be installed at the eastern terminus of the picket fence, along the Rowdy Creek bank opposite to the Hatchery (river left).
- Access Stairway: A concrete stairway would be located in approximately the same footprint as the former concrete stairway, located along Rowdy Creek just upstream of the proposed picket fence. The stairway would allow access to the proposed fish trap.
- Fish Trap: The fish trap would be constructed adjacent to the proposed stairway. The fish trap would be concrete and would contain interconnected chambers including a holding pool, fish crowder, flume and gate, and return channel. At the downstream end of the fish trap is the trap entrance, and at the upstream end of the fish trap is both a gate and flume for fish access to upper Rowdy Creek. Both the gate and flume connect to the return channel. A small submersible pump and nozzle system that pulls water from the holding pool would be installed to keep the flume wetted. An exterior electrical outlet is incorporated into the design located on the top of the wall near the holding pool chamber to accommodate the submersible pump. The return flume is approximately 8 feet long, and it's cross sectional geometry has been sized to

meet minimum NOAA criteria, which is 15 inches wide and 24 inches high. The flume would be smooth to minimize fish injury potential. Metal grates would be located on the top of the fish trap to keep fish contained. The fish trap would contain an OSHA-compliant fixed access ladder, which would be mounted to concrete. A concrete landing with handrail would be located at the edge of the fish ladder, allowing access to view the fish trap from above.

- Crushed gravel would be spread near the proposed stairway and fish trap. A drainage pipe would be installed below the crushed gravel to collect and transport stormwater around the proposed infrastructure. As a component of the roughened channel, large rocks are proposed to be strategically placed to protect the proposed fish trap and diversion infrastructure from scouring.
- Diversion Infrastructure: New diversion infrastructure and housing would be installed along Rowdy Creek, upstream of the proposed fish trap. The diversion infrastructure and housing would replace the existing stilling well and pumps. Proposed diversion infrastructure would consist of two 15 horsepower submersible pumps and housing for a third submersible pump, fish screens, valves, pressure reducers, piping, a hydraulic brush screen cleaner, and metal grates on top. Each pump will have the capacity to pump approximately 2 cfs, for a total of 4 cfs, which is the approximate maximum the existing Hatchery piping system can accommodate. If the full water right of 6 cfs is desired at a later date, an additional pump can be added. The proposed fish screen design meets NOAA Fisheries criteria (see page S-504 in Appendix B for details of proposed fish screen). As a component of the roughened channel, large rocks and engineered streambed material would be placed in Rowdy Creek to protect the diversion infrastructure from scouring. A concrete wingwall would be installed upstream of the diversion for protection and bank stabilization. A cantilevered walkway is proposed along the top of the diversion structure. A handrail is proposed along the edge of the walkway, diversion housing, fish trap and access stairway.
- Access Walkway over Lower Dominie Creek: A new access walkway would be located over lower Dominie Creek, at the confluence, to provide continued access across the channel for Hatchery management and operational purposes. This walkway would consist of metal grating, and handrails on both side. A new 8 inch diameter PVC water line would be installed along the outer base of the walkway, to replace the existing water line. During construction, either the water line would be temporarily disconnected, or a temporary PVC water line would be installed. A concrete retaining wall with soil anchors would be installed at the western terminus of the walkway located along Dominie Creek (river right) to reduce future erosion potential. The existing fish ladder and retaining wall, both located on lower Dominie Creek would remain in its current location and be protected, and would not be used following Project construction.
- Hatchery Access Road Bridge Structural Supports: Following the removal of infrastructure in upper Dominie Creek (diversion dam, subsurface concrete slab, fish ladder center wall and fish ladder weirs, flashboard and counterforts), protections would be installed to mitigate against future potential undermining of the bridge. Proposed improvements include a new concrete facing wall to be anchored into the existing abutment concrete, which would extend from the bridge soffit to the bedrock in the channel. Steel struts would be added on each concrete beam underneath the bridge. This system would work to prevent movement of the abutments while also guarding against scour at their base. Designed improvements to the bridge abutments would ensure that the finished Project leaves the bridge in equal or better structural condition compared to pre-Project conditions.

- Electrical Control Building: Several of the proposed components would require electrical connections, and an area to house operating equipment such as controllers, motors, and compressors. The current facility does not have adequate space to accommodate these features, therefore, a new electrical control building is proposed as part of the Project. The proposed electrical control building would be constructed north of the proposed stairway. The approximate 6 foot by 12 foot prefabricated electrical control building would house all of the new pumping, picket fence, fish screen brush and all miscellaneous electrical components. The electrical control building would have a concrete slab foundation, approximately 8 inches thick. Power for the building would come from the service panel located within the existing trough building (outside of the Project Area).

This infrastructure (in conjunction with the instream enhancements discussed below) would improve passage for juvenile and adult salmonids on lower and upper Dominie Creek and Rowdy Creek when the picket fence is not in use at a greater variety of flows.

2.3 Instream Enhancements

An approximately 675-foot long roughened channel would be installed throughout Rowdy Creek, with approximately 50 feet of roughened channel in lower Dominie Creek, and limited, strategic rock placement in upper Dominie Creek. The purpose of the roughened channel is to overcome the existing vertical drop caused by the existing Rowdy Creek diversion weir while maintaining the existing grade upstream within Rowdy and Dominie Creek. The roughened channel would provide interconnected transitional habitat and prevent channel degradation upstream of the Highway 101 bridge pier. It is necessary to lower and increase the channel bed elevation in certain areas to allow for this transition. The proposed roughened channel would create conditions supportive of a gradient of continuous flow, as opposed to areas of disconnected pools which are more noticeable during low flow conditions and can lead to fish stranding. See pages C-105, C-106, C-109, C-301, C-502 and C-503 of Appendix B (Final Design Plans) for details on the proposed roughened channel.

The roughened channel is comprised of five chutes and five pools. The chutes and pools that comprise the “lower reach” (pools 1 through 4 and chutes 1 through 3) are channel spanning. The proposed diversion weir would be located in pool 4. The “upper reach” (pool 5 and chutes 4 and 5) have two flow paths separated by a long boulder structure referred to as the “channel spine”, which mimics and provides a continuation of the existing gravel bar downstream of the Highway 101 bridge pier. The existing gravel bar would be integrated into the roughened “channel spine” grading. Bankline rock will be placed along the edge of the channel, to protect the bank and keep flow within the roughened channel. Bankline rock will be 0.5 ton class rock, and will leave large voids which will be filled using rock G through J which ranges from a maximum diameter of 13 inches to less than #10 sieve. Willow stakes will also be planted in the voids along channel banks. The proposed roughened channel would extend across the entire channel, between the existing rock slope protection (rsp) on river right to the proposed bankline rock on river left (see page V-101 in Appendix B). Much of lower Rowdy Creek reach is perched, meaning that the new channel bed elevation is greater than the existing bed elevation. Constructing a channel under these conditions can be challenging because there is a high potential for flow to go subsurface. During construction, it will be critical that the channel is correctly sealed through adequate compaction and jetting methods prior to completion. Engineered Streambed Material (ESM) would be comprised of a gradation of rock ranging from gravel to boulders up to 6 feet in diameter (GHD and Michael Love & Associates 2018b). See Figure 4 – Proposed Project Components for a depiction of the roughened channel, and page

G-004 in the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B for notes on rock sizes and types to be utilized.

Rock bands define the upper and lower portion of a chute, provide the structure of the roughened channel and maintain the chute's grade. They are constructed using the largest of the ESM mixture. Rock bands have an arched shape where the most upstream rock is located near the center of the chute. This allows the rocks to work together, creating a robust structure. The material placed between the rock bands (including within the pools) is a mixture of smaller diameter rocks. This mixture of smaller diameter rock is placed in lifts and each lift is sealed to prevent water from flowing subsurface. Some larger rock protrudes through the lifts to provide habitat structure. The objective is to place the final lift so the channel bed is rough and has large rock protruding a third of its diameter above the channel bed. This roughness decreases the flow velocity, increases the flow depth, and creates varied flow paths. See detail 1 and 2 on page C-503 in the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B for depictions of the roughened channel pool and chute detail, and roughened channel profile and ESM placement including lifts.

In the lower extent of the Project Area, rock would be placed to prevent erosion along the western toe slope bank of Rowdy Creek (river right). In the upper extent of the Project Area along Dominie Creek, large boulders would be placed in the channel, similar to the boulders placed at the confluence, to help control the degree to which the channel adjusts following the removal of infrastructure from beneath the bridge. The boulders would create roughness, which would decrease the water velocity and likely cause bed material to settle.

California native plant species would be planted along the channel banks; shrub and tree species to be planted include: Pacific willow, red alder, black cottonwood, twin berry, and salmon berry. Grass seed to be sown would include seed from the following species: California brome, blue wild rye, red fescue, and meadow barley. Fast growing regreen hybrid wheatgrass would be used to provide quick vegetative cover while other grass species developed. See pages V-101 and V-501 in the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B for proposed planting locations and methods.

2.4 Project Schedule and Equipment

Construction of the Project would involve a variety of equipment (see list below). All construction would occur from within the channel and/or from channel banks. No construction, including placement or adjustment of the roughened channel, would occur in a wetted channel, and equipment would not be within the channel unless it was dewatered.

Construction Duration and Hours

Demolition and construction activities would occur in a single construction season (June 15 through October 15) in 2022 or 2023.

Anticipated work hours would be 7:00 to 6:00 Monday through Friday, and intermittently on weekends.

Construction Equipment

A variety of construction equipment would be used to implement the Project. This would include, but not necessarily be limited to, excavators, backhoes, front end loaders, concrete saws, jackhammers, horizontal directional drills, winches, pumps, chainsaws, fork lifts, compactors, air compressors, generator sets, and pneumatic tools. A variety of trucks including concrete mixers, haul trucks, and

water trucks would also be required. Site preparation, including demolition, clearing and grading of the Project site as necessary would require the removal and off-haul of materials. This would include, but not necessarily be limited to, vegetation, concrete, asphalt and fill, and certain existing utilities that would be removed and replaced.

Construction Staging Areas

All work including stockpiling and staging would occur within the Project Area limits as shown on Figure 2 – Project Area. Construction staging could occur in either all or a combination of the three staging areas shown in Figure 2. All potential staging areas are uplands and contain grasses or graveled roadways or paved lots; one of the potential staging areas (Staging Area 1) contains limited shrubs. All shrubs would be avoided as feasible. Access to Staging Area 1 would be from Highway 101, and access to Staging Area 2 would be from North Fred Haight Drive onto Hatchery Access Road, access to Staging Area 3 would be from Highway 101.

Construction Site Access

Access into the Rowdy Creek channel is likely to be feasible from two primary routes along the Rowdy Creek eastern (river left) bank, and from one location along the Rowdy Creek western (river right) bank. However, each of the proposed access routes have some limitations further described below. It is anticipated that the Project will utilize Access Scenario 1 and 3, or Access Scenario 2 and 3.

Access Scenario 1

The first access to the Rowdy Creek channel occurs from the existing Highway 101 bridge (that spans over Rowdy Creek) via the Caltrans right-of-way, and via an easement granted to the Hatchery for “fish rearing purposes” located on APN 103-080-044. Up to approximately 0.40 acres of riparian vegetation would be adversely affected under this access scenario, however would be replanted following construction. This access point would require securing an encroachment permit from Caltrans.

Access Scenario 2

The second potential access is near the existing concrete weir on the river left bank, which is connected to Staging Area 1 located on APN 103-080-044. There are two potential access locations to Staging Area 1, including securing a temporary construction easement through APN 103-080-014, which owns the ingress/egress rights to Highway 101, or via Timber Blvd through an easement held by the APN 103-080-044 (see page G-005 of the Final Design Plans [GHD and Michael Love & Associates 2018a] in Appendix B). Access, likely through a temporary construction easement, would need to be granted by the landowners of APNs 103-080-044 and 103-080-014 prior to use of this access.

Access Scenario 3

Access to the Rowdy Creek river right and Dominie Creek would be possible utilizing the western Staging Area 2 and via APNs 103-080-043 and 103-080-026 (both owned by TDN) and Hatchery Access Road.

Construction Water Management

Channel dewatering, streamflow diversion and water management during construction would be necessary for this Project. Summer base flows in Rowdy Creek and Dominie Creek would be diverted through a typical clear water coffer dam and bypass system and discharged downstream of the Project reach to maintain continuous streamflow downstream. Given the grade, it is anticipated a

gravity bypass pipe and coffer dam with fish screens would be used, however, pumping may be necessary during times when there is limited space within the channel to complete the work while maintaining necessary gravity pipe slopes. It is expected that the entirety of Rowdy Creek within the Project Area would be dewatered (approximately 675 feet), and the entirety of Dominie Creek (including the area between upstream Hatchery Access Road bridge and downstream potions) would be dewatered (approximately 550 feet total). The two creeks would be dewatered concurrently, and the bypass systems on each creek would release water downstream of the work area in Rowdy Creek.

The primary water management consideration for this Project is timing. The instream portion of the Project should be completed prior to a major rainfall event. Typically this window is between June 15th and October 15th, however, the Rowdy Creek and Dominie Creek watersheds have shown to exhibit rapid runoff response time, and therefore any rainfall event occurring during construction could increase streamflow so the diversion system would have to accommodate this potential increase in streamflow. To minimize this risk, completing the instream work as early in the season as possible, and having a robust water diversion system would be necessary. Due to the nature of the work, the Project would be constructed during a single instream work season.

All construction components (demolition, infrastructure replacement, and instream enhancements), would require dewatering of the stream channels and native aquatic species relocation. Native species relocation would occur concurrently with dewatering, utilizing best management practices to reduce potential impacts to aquatic species. Native aquatic species relocation and measures to reduce potential impacts to species during relocation is further discussed in regulatory reports. Water pumped out of the construction work area would be discharged to permeable areas downstream of the construction work area within the Project Area. Nuisance water (the subsurface water that re-enters the work area following initial dewatering) is anticipated to be encountered. Therefore dewatering of nuisance water in the instream portions of Rowdy and Dominie Creeks may be necessary, and would be discharged to permeable uplands areas within the Project Area. Dewatering is further discussed in Section 4.4 – Biological Resources.

2.5 Operation and Maintenance

Operation and maintenance of the Project would be completed by TDN and Hatchery staff, under the direction of TDN, and would not deviate from existing maintenance actions. Operation and maintenance is expected to include routine testing and maintenance of all equipment, including the picket fence to ensure it is in working condition (i.e. it can be taken out and put back into operation), water diversion, and cleaning of amenities. Removal of debris and sediment deposition in and around the picket fence, fish trap, and return channel is expected. The diversion facility may require maintenance to remove fine sediments that pass through the screen and into the stilling well during high flow events. Additionally, Hatchery staff will likely have to remove leaves or other large debris material from the screen face of the diversion, as these items will not be removed by a brush system. It is possible that large debris moving downstream could contact and damage the screen, in this case the screen would require maintenance or replacement to restore to working condition. This operational maintenance is already completed as a regular component of Hatchery operation and the Project would not modify maintenance. Instream maintenance of the roughened channel is not expected to be necessary.

2.6 Cumulative Impact Projects

Cumulative impacts are defined as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts” (CEQA Guidelines Section 15355). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. A list of regional projects and the cumulative impact analysis for each environmental resource category is described in Section 4.21 – Mandatory Findings of Significance.

2.7 Environmental Protection Actions Incorporated into the Project

The following actions are included as part of the Project to reduce or avoid potential adverse effects that could result from construction or operation of the Project. Additional mitigation measures are presented in the following analysis sections in Chapter 4 – Environmental Analysis. Environmental protection actions and mitigation measures, together, will be included in a Mitigation Monitoring and Reporting Program at the time that the Project is considered for approval.

2.7.1 Environmental Protection Action 1 – Stormwater Pollution Prevention Plan (SWPPP)

The Project will seek coverage under State Water Resources Control Board (Water Board) Order No. 2009-0009-DWQ, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities. The TDN will submit permit registration documents (notice of intent, risk assessment, site maps, SWPPP, annual fee, and certifications) to the Water Board. The SWPPP will address pollutant sources, best management practices, and other requirements specified in the Order. The SWPPP will include erosion and sediment control measures, and dust control practices to prevent wind erosion, sediment tracking, and dust generation by construction equipment. A Qualified SWPPP Practitioner will oversee implementation of the Project SWPPP, including visual inspections, sampling and analysis, and ensuring overall compliance.

2.7.2 Environmental Protection Action 2 – Construction BMPs

The Contractor will implement Best Management Practices (BMPs) during construction including the following BMPs from the current California Stormwater BMP Handbook for Construction: EC-1: Scheduling; EC-2: Preservation of Existing Vegetation; NS-2: Dewatering Operations; NS-9: Vehicle Equipment and Fueling; NS-10: Vehicle & Equipment Maintenance; WM-2: Material Use; WM-4: Spill Prevention and Control. Additionally, the following conditions will be required during construction:

- Contractors will be responsible for minimizing erosion and preventing the transport of sediment to sensitive areas;
- Sufficient erosion control supplies will be maintained on site at all times, available for prompt use in areas susceptible to erosion during rain events;
- Disturbance of existing vegetation will be minimized to only that necessary to complete the work;
- The contractor will make adequate preparations, including training and providing equipment, to contain oil and/or other hazardous materials spills;

- Dewatering operations will be conducted where needed from the work location and stored or disposed of appropriately;
- Vehicle and equipment maintenance should be performed off-site whenever practical;
- Contractor shall ensure that the site is prepared with BMPs prior to the onset of any storm predicted to receive 0.5 inches or more of rain over 24 hours;
- All erosion and sediment control measures shall be maintained in accordance to their respective BMP fact sheet until disturbed areas are stabilized;
- Grassy areas that would be utilized by construction equipment within the Project Area shall be mowed prior to construction, and shall be mowed again if grasses grow to an unsafe length (approximately 8 inches);
- This plan may not cover all the situations that arise during construction due to unanticipated field conditions. Variations may be made to the plan in the field subject to the approval of or at the direction of the League's Project Manager or Construction Manager

2.8 Required Permits and Approvals

The following permits are anticipated to be required for Project Implementation:

- Del Norte County – Demolition/Building Permit for demolition and replacement of Hatchery infrastructure
- Del Norte County – Grading Permit
- North Coast Regional Water Quality Control Board (NCRWQCB) – 401 Water Quality Certification on private property
- Environmental Protection Agency (EPA) – 401 Water Quality Certification on Tribal trust or owned property
- California Department of Transportation (Caltrans) - Encroachment permit for access along Highway 101
- California Department of Fish and Wildlife (CDFW) – Lake and Streambed Alteration Agreement
- CDFW – 2081(a) permit for take of California Endangered Species Act (CESA) listed species
- U.S. Army Corps of Engineers (USACE) – Individual 404 Permit and 404(B)1 Alternatives Analysis or Nationwide Permit, and National Historic Preservation Act Section 106 consultation
- National Marine Fisheries Service (NMFS) – Endangered Species Act (ESA) Section 7 Consultation and Incidental Take Permit

2.9 California Tribal Consultation

On April 19, 2021, the County sent notification of the Project to three tribal representatives with traditional lands or cultural places located within Del Norte County, as provided by the Native American Heritage Commission, including the Tolowa Dee-ni' Nation, Elk Valley Rancheria and Karuk Tribe. The County contacted the tribes pursuant to Section 21080.3.1(d). No responses have been received from the tribes, and therefore there is no request for formal consultation. In late Spring 2020, cultural resources specialist Roscoe and Associates contacted Tribal Historic Preservation

Officers (THPO) for the TDN and Elk River Rancheria tribes in preparation of the cultural resources investigation report prepared for the Project. TDN THPO joined Roscoe and Associates in the field investigation, and THPO from the Elk Valley Rancheria shared no concerns or information regarding the proposed Project (Roscoe and Associates 2020).

3. Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages. Where checked below, the topic with a potentially significant impact will be addressed in an environmental impact report:

☐ Aesthetics	☐ Greenhouse Gas Emissions	☐ Public Services
☐ Agricultural & Forestry Resources	☐ Hazards & Hazardous Materials	☐ Recreation
☐ Air Quality	☐ Hydrology/Water Quality	☐ Transportation
☐ Energy	☐ Land Use/Planning	☐ Tribal Cultural Resources
☐ Biological Resources	☐ Mineral Resources	☐ Utilities/Service Systems
☐ Cultural Resources	☐ Noise	☐ Wildfire
☐ Geology/Soils	☐ Population/Housing	☐ Mandatory Findings of Significance

DETERMINATION (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION would be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there would not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION would be prepared.

☐ I find that the proposed MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect: (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect: (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Heidi Kunstal — 6-18-2021

LEAD AGENCY Signature — Date

This page is intentionally left blank

4. Environmental Analysis

4.1 Aesthetics

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
a) Have a substantial adverse effect on a scenic vista?			✓	
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				✓
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public view of the site and its surroundings? (Public Views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?			✓	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?				✓

Environmental Setting

For the purpose of this Section, the study area includes the Project Area and surrounding areas including the Hatchery and segments of Highway 101, Rowdy Creek Mobile Park and the U.S. Post Office (USPS) adjacent to the Project Area. More specifically, the study area includes the instream portions of Rowdy and Dominie Creeks, riparian corridor along Rowdy Creek, a vacant field surrounded by development, a meadow surrounded by shrubs and trees, and a potential staging area in a former industrial area east of Highway 101. The Project Area is visible from the USPS parking area, Hatchery facility, and Rowdy Creek Mobile Home Park and from portions of Highway 101 where there is a break in the vegetation.

a) Have a substantial adverse effect on a scenic vista? (Less than Significant Impact)

A scenic vista can commonly be defined as a view that has remarkable scenery or a broad or outstanding view of the natural landscape. Within the study area, views of the Project Area are visible from the Hatchery and from the Rowdy Creek Mobile Home Park when viewed between vegetation. There are no views of the instream portions of the Project Area from Highway 101 due to dense vegetation. Although these views are aesthetically pleasing, the scenery is not considered

remarkable, broad or outstanding, nor easily viewed and therefore does not meet the definition of a scenic vista.

During Project construction, views of the site will be altered due to the presence of construction equipment, earth and infrastructure moving, and bare soils. Up to 0.40 acres of riparian vegetation may be removed during construction, which would incidentally improve views of Rowdy Creek. Riparian vegetation will be replanted where disturbed, and is expected to mature to existing conditions in approximately four years. Due to the short-term nature of site modifications and presence of construction equipment, this impact is not considered substantially adverse. Operation of the Project will not have an adverse effect on views, rather there would be improved views of the Project Area (where visible) due to the reduction of infrastructure within the creek channels. The Project's impact on scenic vistas will be **less than significant.**

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? (No Impact)

The section of Highway 101 adjacent to the Project is located north of the intersection of Highway 199 in Crescent City and is therefore not considered a state scenic highway (Caltrans 2017). There are views of the Project Area from the Hatchery and Rowdy Creek Mobile Home Park, and very limited views from Highway 101 due to dense vegetation. There are no historic buildings, rock outcroppings or exceptional trees, visible from the Hatchery, Mobile Park or Highway 101. A historic-era feature was identified upstream of the Highway 101 bridge over Rowdy Creek comprised of two dilapidated bridge abutments. However, the Project does not proposed alterations or removal of these historic-era features, and they are generally not visible from commonly used areas (Hatchery, Highway 101, Rowdy Creek Mobile Home Park). Therefore, there will be **no impact** to scenic resources.

c) In non-urbanized areas, substantially degrade the existing visual character or quality of public view of the site and its surroundings? (Public Views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality? (Less than Significant Impact)

There are limited public views of the Project Area due to dense vegetation along the creek channels. When the Hatchery is open to the public, which is daily, public views are available. The Hatchery is zoned General Commercial C-4, which allows for light commercial uses which are not detrimental or obnoxious to the neighborhood in which they are located (Del Norte County 2020). The Hatchery will be closed to the public during Project construction, and therefore public views of the Project Area will not be visible or accessible from the Hatchery. Limited public views would be available from Highway 101, which would be temporarily impacted by construction. According to the Del Norte County General Plan there are no scenic resources in the study area or Project vicinity (Mintier & Associates et al. 2003). The closest scenic resource is the Smith River Public Fishing Access location, which is approximately three miles south of the Project Area (Mintier & Associates et al. 2003). Operation of the Project will result in improved public views from the Hatchery because of the demolition and removal of outdated infrastructure and the installation of updated equipment and instream habitat enhancements (roughened channel). Due to the lack of public views available during construction, lack of scenic resources within the study area, conformance with Project Area zoning, and the temporary nature of construction, there would be a **less than significant impact** to public views.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area? (No Impact)

Construction of the Project includes the demolition and removal of infrastructure, replacement of some infrastructure with modern equipment and the installation of a roughened channel to improve hydrology, fish passage and instream habitat conditions. Construction of the Project is not anticipated to result in any temporary or permanent sources of light, or substantial light or glare which will adversely affect day or nighttime views within the study area, as no night time work is proposed. Operation of the Project would not result in the use of exterior lighting above and beyond existing conditions. Due to the absence of nighttime work and additional light sources to be used during operation, **no impact** would occur.

4.2 Agriculture and Forest Resources

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				✓
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				✓
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?				✓
d) Result in the loss of forest land or conversion of forest land to non-forest use?			✓	
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?				✓

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. The majority of the Project includes the instream portions of Rowdy and Dominie Creeks, riparian corridor along Rowdy Creek, a vacant field surrounded by development, a meadow surrounded by shrubs and trees, and vacant former industrial site east of Highway 101.

According to the California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP), no farmland classification data is available for Del Norte County. However, according to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the study area contains 1.6 acres of farmland of statewide importance (including Bigtree-Mystery complex and Tillas 2-9% soils), and 2.0 acre of prime farmland if irrigated (including Tillas 0-2% soils) (NRCS 2021). Soils designated farmland of statewide importance are located in the Rowdy and Dominie Creek channels and corridor, and west of Dominie Creek, and the soil type considered prime farmland if irrigated is located east and west of the Rowdy Creek corridor (see Figure 4.7-1 – NRCS Soil Units for the location of soil types). The NRCS Web Soil Survey data is used in this analysis because there is no data available for Del Norte County through the FMMP.

The Del Norte County General Plan contains definitions of prime agricultural lands and general agricultural land as the following:

> *Policy 1.G.1 – The County defines prime agricultural lands as those which meet both of the following criteria:*
>
> *a) Land of high agricultural value:*
>
> *1. Lands "actively used" (lands may be considered "actively used" even though they lie idle for up to ten years) for agricultural production such as nursery crops, pasture crops, dairy products, and/or livestock, or;*
>
> *2. Lands which qualify for rating 80 through 100 in the Storie Index.*
>
> *b) A minimum of 20 acres in contiguous ownership.*
>
> *Policy 1.G.2 – The County defines general agricultural land as lands that meet all of the following criteria:*
>
> *a) A minimum of 5 acres of contiguous ownership;*
>
> *b) Lands in agricultural use or adjacent to agricultural use; and*
>
> *c) Lands where small-scale agriculture provides or can provide food, fiber, or animal management for the enjoyment or economic benefit of the property owner or renter.*

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland)? (No Impact)

The study area comprises instream channels, riparian corridor, fallow fields, and a vacant former industrial lot (see Figure 2). The Project would demolish and remove infrastructure within the instream portions of Rowdy and Dominie Creeks, and replace infrastructure within Rowdy Creek and along the banks where existing infrastructure occurs with the exception of the proposed electronic control building which would be a new structure adjacent to existing Hatchery buildings, and complete instream habitat improvements through the installation of a roughened channel. Although all land within the study area is considered farmland of statewide importance or prime farmland if irrigated by the NRCS (2021), no portions of the study area have been used for agricultural production in at least 30 years according to Google Earth satellite imagery. Most of the Project Area consists of the instream portions of Rowdy and Dominie Creeks or vegetated riparian areas. The potential staging areas and access routes occur within either fallow areas, vacant former industrial areas, Highway 101, or the Caltrans right-of-way and are considered to be prime farmland if irrigated. Staging would occur for up to one construction season (June 15 through October 15), and would therefore not convert these areas out of their current designation: prime farmland if irrigated, or limit their potential to be used for agriculture in the future.

According to the Del Norte County General Plan, the lands within the study area do not meet the definitions of prime agricultural land or general agricultural land as defined above because lands have not been "actively used" in at least 30 years for agricultural production including nursery crops, pasture crops, dairy products and/or livestock, or are adjacent to agricultural use (Mintier & Associates et. al. 2003).

The proposed Project activities predominantly occur within the instream portion of the study area, which would not be utilized for agricultural productivity, and land-based Project activities (including

staging and access routes) would not result in the conversion of these areas out of its current NRCS designation. Therefore, **no impact** would occur.

b) Conflict with Agricultural Zoning or Williamson Act Contract? (No Impact)

Agricultural zoning in Del Norte County includes Agriculture Exclusive (AE, A), and Agriculture Industrial (AI) zoning ordinances. Zoning within the study area includes: General Commercial (C-3, and C-4), Central Business (C-2), and Manufacturing (M). Therefore, there are no agricultural zoning designations within the study area. See Section 4.11 (Land Use & Planning) for a discussion of zoning and land use designations in conjunction with proposed land uses under the Project. No Williamson Act contracts exist within the study area. Therefore, **no impact** would occur.

c,d) Conflict with Forest Land Zoning or Convert Forest Land? (Less than Significant Impact)

Forest-related zoning in Del Norte County includes Timberland Preserve Zone (TPZ), Forest-Recreation (FR-1, FR-2) and Agriculture Forestry (AF) zoning. Zoning in the study area includes commercial, central business and manufacturing (see above), therefore the Project would not conflict with forest land zoning because there is no forest land zoning within the study area. Forest land is defined as native tree cover greater than ten percent that allows for management of timber, aesthetics, fish and wildlife, recreation, and other public benefits (Public Resources Code Section 12220(g)). The riparian corridor along Rowdy Creek can be considered forest land because there is greater than ten percent cover by native trees. Should Access Scenario 1 be utilized, up to 0.40 acres of riparian forest habitat may be removed to allow access of construction equipment. Implementation of Access Scenario 2 would likely result in up to 4,000 square feet (0.09 acres) of riparian habitat removal. Implementation of Access Scenario 3 would not result in loss of riparian habitat. All removal of riparian trees would be replanted in the same location, and therefore potential loss of trees would be temporary in nature. Riparian vegetation has been documented to grow back to nearly pre-project conditions in approximately four years (Ward et al. 2017). Therefore, due to the potential temporary loss of riparian trees, the Project would not convert forest land. A **less than significant impact** would occur.

e) Convert Farmland or Forest? (No Impact)

As discussed in question (a), there is no farmland in the study area because land within the study area has not been “actively used” in at least 30 years for agricultural production. Available staging areas and access routes are predominantly located in upland areas, with the exception of Access Scenario 1 which would result in the temporary loss of riparian vegetation. However, as stated above, riparian vegetation would be replanted and has been documented to grow back to nearly pre-project conditions in approximately four years (Ward et al. 2017), and therefore the Project would not convert forest land. Construction and operation of the Project would not result in the permanent conversion of farmland or forest land. Therefore, **no impact** would occur.

4.3 Air Quality

	Potentially Significant Impact	Less-Than-Significant With Mitigation Incorporation	Less-Than-Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?		✓		
b) Result in a cumulatively considerable net increase in any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?			✓	
c) Expose sensitive receptors to substantial pollutant concentrations?			✓	
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?			✓	

Environmental Setting

For the purpose of this Section, the study area includes the Project Area and the entire North Coast Unified Air Quality Management District's air basin. The Project Area is located in a rural part of northern California absent major emissions sources, approximately 3.25 miles from the Pacific Ocean. The largest existing source of emissions within the study area is traffic on Highway 101, unpaved road dust, smoke from wood stoves, construction dust, open burning of vegetation, and airborne salts and other particulate matter naturally generated by ocean surf. The study area is located near the coast and is influenced by coastal fog throughout the year.

Regulatory Setting

Federal

Clean Air Act

Under the Federal Clean Air Act, the U.S. Environmental Protection Agency (EPA) is responsible for establishing the National Ambient Air Quality Standards (NAAQS) for the following six 'criteria' air pollutants: ozone, particulate matter (PM10 and PM2.5), nitrogen dioxide, carbon monoxide, lead, and sulfur dioxide.

State

California Clean Air Act

In addition to being subject to federal requirements, air quality in California is also governed by more stringent regulations under the California Clean Air Act. The California Clean Air Act is administered by the California Air Resources Board (CARB), which is part of the California Environmental Protection Agency, and by the Air Quality Management Districts at the regional and local levels. The CARB is responsible for meeting the state requirements of the federal CAA, administering the California Clean Air Act, and establishing the California Ambient Air Quality Standards (CAAQS) which include the six NAAQS criteria pollutants listed above as well as visibility-reducing particulates, hydrogen sulfide, sulfates, and vinyl chloride. The CARB regulates mobile air pollution sources, such as motor vehicles. It is responsible for setting emission standards for vehicles sold in California and for other emission sources, such as consumer products and certain off-road equipment.

Local

North Coast Unified Air Quality Management District

The North Coast Unified Air Quality Management District (NCUAQMD) has jurisdiction over Humboldt, Del Norte, and Trinity counties. The NCUAQMD's primary responsibility is for controlling air pollution from stationary sources. Additionally, the NCUAQMD has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits, impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The NCUAQMD monitors air quality, enforces local, state, and federal air quality regulations for counties within its jurisdiction, inventories and assesses the health risks of toxic air contaminants (TACs), and adopts rules that limit pollution. The NCUAQMD is listed as in "attainment" or "unclassified" for all the federal standards, also known as the National Ambient Air Quality Standards. The NCUAQMD is listed as "attainment" or "unclassified" for all the state standards, also known as the California Ambient Air Quality Standards, except for the state 24-hour particulate (PM10) standard, in Humboldt County only. Del Norte County is designated 'attainment' for all federal and state standards.

To address non-attainment for the state PM10 standard, the NCUAQMD adopted a Particulate Matter Attainment Plan in 1995. This plan presents available information about the nature and causes of PM10 standard exceedances and identifies cost-effective control measures to reduce PM10 emissions to levels necessary to meet the CAAQS. The Particulate Matter Attainment Plan addresses PM10 emissions in Humboldt, Del Norte, and Trinity Counties.

Compliance with applicable NCUAQMD PM10 rules is applied as the threshold of significance for the purposes of this analysis, which includes NCUAQMD Rule 104 Section D, Fugitive Dust Emissions. Pursuant to Rule 104 Section D, the handling, transporting, or open storage of materials in such a manner, which allows or may allow unnecessary amounts of particulate matter to become airborne, shall not be permitted. Reasonable precautions shall be taken to prevent particulate matter from becoming airborne, including, but not limited to, covering open bodied trucks when used for transporting materials likely to give rise to airborne dust and the use of water during the grading of roads or the clearing of land.

Additionally, the NCUAQMD requires notification for all construction within their geographic jurisdiction, and submission of an application, dust control plan, and filing fee, consistent with Naturally Occurring Asbestos (NOA) regulations. Dust control plans must, at a minimum, require that:

- Visible emissions from equipment and operations shall not cross the property line;
- Crushers shall not discharge emissions for a 3-minute period in any hour that are greater than 15% opacity;
- Grinding mills, screens, and transfer points on conveyors shall not discharge emissions for a 3-minute period in any one hour that are equal to or greater than 10% opacity.
- Use the NCUAQMD's "NOA Dust Mitigation Form" to file the Dust Control Plan

For projects that are exempt from the NOA regulations, the NCUAQMD's Dust Mitigation Form may be used informally as Best Management Practices (BMPs).

Existing Air Quality – Criteria Air Pollutants

California and the federal government (i.e., the EPA) have established ambient air quality standards for several different pollutants. Of pollutants that may be generated by the proposed Project, those of greatest concern are emitted by motor vehicles. These pollutants include fine particulate matter less than 2.5 microns in diameter (PM2.5) and particulate matter less than 10 microns in diameter (PM10). Other pollutants that are less problematic to the region include ozone precursors (nitrogen oxides [NOX] and reactive organic gases [ROG]) and carbon monoxide.

Del Norte County General Plan

The goals and policies within the Humboldt County General Plan that regulate air quality include the following:

Del Norte General Plan Policies for Air Resources:

1.F.6. The County shall encourage development to be located and designed to minimize direct and indirect air pollutants

a) Conflict with or obstruct implementation of the applicable air quality plan? (Less than Significant Impact with Mitigation)

This impact relates to consistency with an adopted attainment plan. Within the Project vicinity, the NCUAQMD is responsible for monitoring and enforcing local, state, and federal air quality standards.

As noted above, Del Norte County is designated 'attainment' for all National Ambient Air Quality Standards and California Ambient Air Quality Standards. Within the NCUAQMD, only Humboldt County is designated as "non-attainment" for the state's PM10 standard.

PM10 refers to inhalable particulate matter with an aerodynamic diameter of less than 10 microns. PM10 includes emission of small particles that consist of dry solid fragments, droplets of water, or solid cores with liquid coatings. The particles vary in shape, size, and composition. PM10 emissions include unpaved road dust, smoke from wood stoves, construction dust, open burning of vegetation, and airborne salts and other particulate matter naturally generated by ocean surf. Therefore, any use or activity that generates airborne particulate matter may be of concern to the NCUAQMD. The proposed Project will create PM10 emissions in part through vehicles and machinery coming and going to the Project Area to conduct the construction activities associated with the Project.

As noted above, Rule 104, Section D – Fugitive Dust Emissions is used by the NCUAQMD to address non-attainment for PM10. Pursuant to Rule 104 Section D, the handling, transporting, or open storage of materials in such a manner, which allows or may allow unnecessary amounts of particulate matter to become airborne, shall not be permitted. Reasonable precautions shall be taken to prevent particulate matter from becoming airborne, including, but not limited to covering open bodied trucks

when used for transporting materials likely to give rise to airborne dust and the use of water during the grading of roads or the clearing of land. During earth moving activities, fugitive dust (PM10) will be generated. The amount of dust generated at any given time will be highly variable and is dependent on the size of the area disturbed at any given time, amount of activity, soil conditions, and meteorological conditions. Unless controlled, fugitive dust emissions during construction of the proposed Project could be a significant impact, therefore, Mitigation Measure AIR-1 will be incorporated to comply with NCUAQMD's Rule 104 Section D.

Operation of the Project will typically not include the handling, transporting or open storage of materials in which particulate matter may become airborne with the exception of removal of debris in and around the proposed picket fence, fish trap, and return channel. However, debris removal would not be significant in size, as it will only be utilized for facility maintenance when appropriate. Due to the limited handling, transport or open storage of materials in which particulate matter may become airborne, operation of the Project is not expected to conflict with NCUAQMD's Rule 104 Section D. A less than significant impact from operation of the Project will occur.

Mitigation

Implementation of Mitigation Measure AIR-1 would reduce the potential impact related to PM10 fugitive dust by requiring BMPs.

Mitigation Measure AIR-1: Best Management Practices to Reduce Air Pollution

The contractor shall implement the following BMPs during construction:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, active graded areas, excavations, and unpaved access roads) shall be watered at least two times per day in areas of active construction, or at whatever frequency is necessary to prevent dust (which may increase due to change in winds or temperature).
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 mph, unless the unpaved road surface has been treated for dust suppression with water, rock, wood chip mulch, or other dust prevention measures.
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes. Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with the manufacturer's specifications.
- Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take

corrective action within 48 hours. The NCUAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

With implementation of Mitigation Measure AIR-1, the Project will not conflict with applicable air plans. This impact will be reduced to a **less than significant level with mitigation**.

b) Result in a cumulatively considerable net increase in any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard? (Less than Significant Impact)

The Project's potential to generate criteria pollutants of concern during construction and operation is assessed in this section. Potential impacts of concern will be exceedances of state or federal standards for PM10. Localized PM10 is of concern during construction because of the potential to emit fugitive dust during earth-disturbing activities.

Construction

Localized PM10

The Project will include demolition, site preparation, grading, and facility construction. Generally, the most substantial air pollutant emissions will be dust generated from site clearing and grubbing, and grading. If uncontrolled, these emissions could lead to both health and nuisance impacts. Construction activities would also temporarily generate emissions of equipment exhaust and other air contaminants. The Project's potential impacts from equipment exhaust are assessed separately below.

The NCUAQMD does not have formally adopted thresholds of significance for fugitive, dust-related particulate matter emissions above and beyond Rule 104, Section D, which does not provide quantitative standards. For the purposes of analysis, this document uses the Bay Area Air Quality Management District (BAAQMD) approach to determining significance for fugitive dust emissions from Project construction. The BAAQMD bases the determination of significance for fugitive dust on a consideration of the control measures to be implemented. If all appropriate emissions control measures recommended by BAAQMD are implemented for a project, then fugitive dust emissions during construction are not considered significant. BAAQMD recommends a specific set of "Basic Construction Measures" to reduce emissions of construction-generated PM10 to less than significant. Without incorporation of these Basic Construction Measures, the Project's construction-generated fugitive PM10 (dust) would result in a potentially significant impact.

The Basic Construction Measure controls recommended by the BAAQMD are incorporated into Mitigation Measure AIR-1. These controls are consistent with NCUAQMD Rule 104 (D), Fugitive Dust Emission, and provide supplemental, additional control of fugitive dust emissions beyond that which would occur with Rule 104 (D) compliance alone. Therefore, with incorporation of Mitigation Measure AIR-1, the Project would result in a less than significant impact for construction-period PM10 generation and would not violate or substantially contribute to an existing or projected air quality violation.

Construction Criteria Pollutants

The NCUAQMD does not have established CEQA significance criteria to determine the significance of impacts that may result from a project; however, the NCUAQMD does have criteria pollutant significance thresholds for new or modified stationary source projects proposed within the NCUAQMD's jurisdiction. NCUAQMD has indicated that it is appropriate for lead agencies to compare proposed construction emissions that last more than one year to its stationary source significance thresholds (Davis 2019), which are:

- Nitrogen oxides – 40 tons per year,
- Reactive organic gases – 40 tons per year,
- PM10 – 15 tons per year, and
- Carbon monoxide – 100 tons per year.

If an individual project's emission of a particular criteria pollutant is within the thresholds outlined above, the project's effects concerning that pollutant are considered to be less than significant.

The California Emissions Estimator Model (CalEEMod) version 2016.3.2 was used to estimate air pollutant emissions from Project construction (GHD 2021a, Appendix D of this ISMND). Construction of the Project is expected to begin in 2022 or 2023 and be complete within approximately four months. The Project will include demolition, site preparation, grading, facility construction and installation of a roughened channel. The detailed equipment activity and materials hauling assumptions are provided in Appendix D.

Table 4.3-1 Construction Regional Pollutant Emissions summarizes construction-related emissions. As shown in the table, the Project's construction emissions would not exceed the NCUAQMD's stationary sources emission thresholds in any year of construction. Therefore, the Project's construction emissions are considered to have a **less-than-significant impact**.

Table 4.3-1. Construction Regional Pollutant Emissions

Construction Activity	Emissions (tons)			
	ROX	NOX	CO	PM_{10}
Dewatering	0.14	1.17	1.40	0.07
Demolition	0.02	0.23	0.31	0.01
Site Preparation	0.01	0.14	0.17	0.01
Grading	0.10	1.15	0.65	0.38
Building Construction	0.03	0.32	0.33	0.01
Rock Hauling	0.01	.022	0.14	0.01
Total Construction	**0.32**	**3.23**	**3.01**	**0.50**
NCUAQMD Stationary Source Thresholds	40	40	100	15

Operation

Following construction, operation of the Project will not include any stationary sources of air emissions. Project operation is not expected to increase vehicle trips to the site because the Project would not necessitate increasing the number of staff or visitors. Additionally, periodic repair of infrastructure and removal of debris in and around the proposed picket fence, fish trap, and return channel would be minor in scope and duration. Therefore, the Project's operational emissions are considered to have a **less than significant impact**.

c) Expose sensitive receptors to substantial pollutant concentrations? (Less than Significant Impact)

Activities occurring near sensitive receptors should receive a higher level of preventative planning. Sensitive receptors include school-aged children (schools, daycare, playgrounds), the elderly (retirement community, nursing homes), the infirm (medical facilities/offices), and those who exercise outdoors regularly (public and private exercise facilities, parks). Existing residences are located approximately 90 feet from the Project boundary, and the Smith River Elementary School is located 0.41 miles from the Project. No other sensitive receptors (besides residences) are located within 0.25 miles of the Project boundary.

Construction equipment and heavy-duty truck traffic generate diesel particulate matter (DPM) exhaust, which is a known toxic air contaminant. DPM from equipment exhaust and PM2.5 pose potential health impacts to nearby receptors if those receptors have prolonged exposure to substantial emissions.

As required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]), construction contractors would be required to minimize idling times for trucks and equipment to five minutes, as well as to ensure that construction equipment is maintained in accordance with manufacturer's specifications. Given the limited daily activity for construction and continuous shifting of the construction activities, prolonged exposure of sensitive receptors (residences) to substantial pollutant concentrations would not occur. Therefore, the impact of construction-related emissions on sensitive receptors would be **less than significant**.

Following construction, the Project will not include any stationary sources of air emissions or new emissions that will result in substantial long-term operational emissions of criteria air pollutants that will substantially affect sensitive receptors. Therefore, Project operation will not expose nearby sensitive receptors to substantial levels of pollutants. The operation-related impact will be **less than significant**.

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people? (Less than Significant Impact)

Implementation of the project would not result in major sources of odor. The project type is not one of the common types of facilities known to produce odors (e.g., landfill, coffee roaster, wastewater treatment facility). Minor odors from the use of equipment during construction activities would be intermittent and temporary, and would dissipate rapidly from the source with an increase in distance. The impact would be less than significant.

4.4 Biological Resources

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		✓		
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?			✓	
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?			✓	
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?			✓	
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				✓
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				✓

Environmental Setting

For the purpose of this Section, the study area includes the Project Area and a 0.25 mile buffer around the southern, western and northern boundaries. The eastern portion of the Project Area (Potential Staging Area 3) was added into the Project after the preparation of the Biological Resources Report (GHD 2020a), and encompasses most of the 0.25 mile buffer study area.

The Project includes the instream portions of Rowdy and Dominie Creeks, riparian corridor along Rowdy Creek, a vacant field surrounded by development, a meadow surrounded by shrubs and trees, a small segment of Highway 101, and a former industrial paved area that is now vacant. Vegetation

within the Project Area consists of large coniferous Sequoia trees, smaller deciduous shrubs and trees, and blackberry bushes. The riparian corridor on the eastern and western banks of Rowdy and Dominie Creek has been manipulated in the past few decades due to the installation of Hatchery infrastructure, and is of average quality. The confluence of Rowdy and Dominie Creeks is approximately 1.75 miles upstream from the Smith River. The Smith River supports several populations of salmonids including Chinook and Coho Salmon, Steelhead and Cutthroat Trout. Coho Salmon within the Smith River watershed are a listed species under the Federal and California Endangered Species Acts. The Smith River watershed is also important for Pacific Lamprey as well as other aquatic and terrestrial species.

As described in the Biological Resources Report (BRR) completed for the Project (GHD 2020a), which can be found as Appendix E of this ISMND, database searches were conducted of CDFW's California Natural Diversity Database, USFWS' Information for Planning and Consultation, NOAA Fisheries West Coast Region California Species List Tools, and California Native Plant Society's Rare Plant Inventory. Relevant literature was also reviewed, including recovery plans, status reports, published articles, species lists maintained by CDFW, previous regulatory review documents when available, and citizen science databases such as eBird, Bumble Bee Watch, Bat Acoustic Monitoring Visualization Tool (BAMVT) and iNaturalist. A field reconnaissance survey was conducted to confirm habitat conditions and observe evidence of wildlife within the Project Area. Potential Staging Area 3 was not included in the reconnaissance field survey because this area was added into the Project at a later date. However, the database queries include a standard 9-quad search, and the study area (referred to as "Project Study Boundary" in the BRR) is defined to include a 0.25 mile buffer around the Project Area, therefore Potential Staging Area 3 was included in biological resource scoping and the findings of Table 4-4.1 (Potential for Special-status Species to Occur) below.

Disturbed shrub and ruderal habitat, with many invasive species, was observed in the eastern staging area (Potential Staging Area 1). This potential staging area was dominated by Himalayan blackberry (*Rubus armeniacus*), cotoneaster (*Cotoneaster spp.*), and coyotebrush (*Baccharis pilularis*), with many non-native species in the herbaceous layer including ox-eye daisy (*Leucanthemum vulgare*), klamathweed (*Hypericum perforatum*), slender oats (*Avena barbata*), and orchardgrass (*Dactylis glomerata*). Coast redwood (*Sequoia sempervirens*) Sitka spruce (*Picea sitchensis*), and native riparian trees and shrubs occur in the surrounding area. Disturbed ruderal habitat was observed around the gravel pavement at the western staging area (Potential Staging Area 2), near the Hatchery, and the bridge over Dominie Creek. Red alder (*Alnus rubra*) dominated the riparian canopy, with a diverse mixture of other native riparian trees, such as Sitka willow (*Salix sitchensis*), shining willow (*Salix lasiandra*), bigleaf maple (*Acer macrophylum*), and some conifers such as coast redwood, Sitka spruce, western red cedar (*Thuja plicata*), and grand fir (*Abies grandis*). Invasive Himalayan blackberry (*Rubus armeniacus*), native thimbleberry (*Rubus parviflorus*), common ladyfern (*Athyrium filix-femina*), and western swordfern (*Polystichum munitum*) were common in the riparian understory (GHD 2020a).

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? (Less than Significant Impact with Mitigation)

The Project includes demolition of outdated instream Hatchery infrastructure, installation of modern instream Hatchery infrastructure, and installation of a roughened channel which will serve as an instream enhancement. The proposed infrastructure and roughened channel will improve fish

passage conditions at a greater variety of flows than existing conditions. This impact analysis section addresses special-status wildlife species followed by special-status plant species. If appropriate, mitigation measures are proposed to reduce the impact to a less than significant level.

Per the database queries and field reconnaissance survey summarized in the BRR (GHD 2020a, Appendix E), 39 special-status species have moderate or high potential to occur within the study area. Species with moderate to high potential to occur within the study area, are listed below in Table 4.4-1. Species with low potential or no potential to occur within the study area are not considered further in this ISMND. These species were deemed to have low or no potential to occur in the study area due to lack of suitable habitat. Please see Appendix E (Biological Resources Report [GHD 2020a]) for the excluded species and additional rationale as to why these species are considered to have low or no potential to occur within the study area.

Table 4.4-1. Potential for Special-status Species to Occur within Study Area

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
Mammals									
Erethizon dorsatum	North American Porcupine	None	None	G5	S3		IUCN_LC-Least Concern	Broadleaved upland forest | Cismontane woodland | Closed-cone coniferous forest | Lower montane coniferous forest | North coast coniferous forest | Upper montane coniferous forest. Forested habitats in the Sierra Nevada, Cascade, and Coast ranges, with scattered observations from forested areas in the Transverse Ranges. Wide variety of coniferous and mixed woodland habitat.	**Moderate Potential.** Numerous recent records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 1960 in the vicinity of Smith River, within 0.5 miles of the Project Area (CDFW 2020a). The study area contains suitable (e.g., riparian forest) habitat for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Lasionycteris noctivagans	Silver-haired Bat	None	None	G5	S3S4		IUCN_LC-Least Concern | WBWG_M-Medium Priority	Lower montane coniferous forest | Oldgrowth | Riparian forest. Primarily a coastal and montane forest dweller, feeding over streams, ponds & open brushy areas. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes, and rarely under rocks. Needs drinking water.	**Moderate Potential.** Closest known record is from 2005 in Jedediah Smith Redwoods State Park, ~10 miles south of the Project Area (CDFW 2020a). This species primarily roosts in trees and will also roost in caves, crevices, mines, hollow trees, and buildings (Erickson et al. 2002). The study area contains suitable foraging and roosting habitat (e.g., buildings and trees) for this species. Given the presence of suitable habitat, this species has a moderate potential to occur in the study area.
Myotis yumanensis	Yuma Myotis	None	None	G5	S4		BLM_S-Sensitiv	Lower montane coniferous forest | Riparian forest |	**Moderate Potential.** Closest known record is from 2013 near

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
							e | IUCN_LC-Least Concern | WBWG_LM-Low-Medium Priority	Riparian woodland | Upper montane coniferous forest. Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings or crevices.	Klamath, ~23 miles south of the Project Area (BAMVT 2020). This species roosts in buildings, trees, mines, caves, bridges, and rock crevices (Erickson et al. 2002). The study area contains suitable foraging and roosting (e.g., buildings and trees) habitat for this species. Given the presence of suitable habitat, this species has a moderate potential to occur in the study area.
Birds									
Ardea alba	Great Egret	None	None	G5	S4		CDF_S-Sensitive | IUCN_LC-Least Concern	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp | Riparian forest | Wetland. Colonial nester in large trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Moderate Potential.** Closest known record is from 2018 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Ardea herodias	Great Blue Heron	None	None	G5	S4		CDF_S-Sensitive | IUCN_LC-Least Concern	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp | Riparian forest | Wetland. Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	**Moderate Potential.** Closest known record is from 2019 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
Circus hudsonius	Northern Harrier	None	None	G5	S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Coastal scrub | Great Basin grassland | Marsh & swamp | Riparian scrub | Valley & foothill grassland | Wetland. Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian scrub) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur and nest in the study area.
Cypseloides niger	Black Swift	None	None	G4	S2		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | NABCI_YWL-Yellow Watch List | USFWS_BCC-Birds of Conservation Concern	Coastal belt of Santa Cruz and Monterey counties; central & southern Sierra Nevada; San Bernardino & San Jacinto mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf; forages widely.	**Moderate Potential.** Closest known record is from 2010 along Pala Road, ~3 miles west of the Project Area (eBird 2020). The study area contains suitable seasonal foraging habitat, however, does not contain suitable nesting habitat (e.g., cliffs, waterfalls) for this species. Given the presence of suitable foraging habitat and recent nearby records, this species has a moderate potential to forage (but not nest) in the study area.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
Egretta thula	Snowy Egret	None	None	G5	S4		IUCN_LC-Least Concern	Marsh & swamp | Meadow & seep | Riparian forest | Riparian woodland | Wetland. Colonial nester, with nest sites situated in protected beds of dense tules. Rookery sites situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Elanus leucurus	White-tailed Kite	None	None	G5	S3S4		BLM_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern	Cismontane woodland | Marsh & swamp | Riparian woodland | Valley & foothill grassland | Wetland. Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Empidonax traillii brewsteri	Little Willow Flycatcher	None	SE	G5T3T4	S1S2		USFWS_BCC-Birds of Conservation Concern	Meadow & seep | Riparian woodland. Mountain meadows and riparian habitats in the Sierra Nevada and Cascades. Nests near the edges of vegetation clumps and near streams.	**Moderate Potential.** Closest known record is from 2016 along Rowdy Creek, ~0.6 miles from the Project Area (CDFW 2020a). The study area contains suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this species has a

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
									moderate potential to occur in the study area.
Haliaeetus leucocephalus	Bald Eagle	FD	SE	G5	S3		BLM_S-Sensitive | CDF_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Lower montane coniferous forest | Oldgrowth. Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	**Moderate Potential.** Closest known record is from 2019 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., large trees and fish-bearing waters) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Nycticorax nycticorax	Black-crowned Night-heron	None	None	G5	S4		IUCN_LC-Least Concern	Marsh & swamp | Riparian forest | Riparian woodland | Wetland. Colonial nester, usually in trees, occasionally in tule patches. Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.	**Moderate Potential.** Closest known record is from 2009 in the Smith River Bottoms, within 1 mile of the Project Area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
									species has a moderate potential to occur in the study area.
Pandion haliaetus	Osprey	None	None	G5	S4		CDF_S-Sensitive | CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest. Ocean shore, bays, freshwater lakes, and larger streams. Large nests built in tree-tops within 15 miles of a good fish-producing body of water.	**Moderate Potential.** Closest known record is from 2006 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Phalacrocorax auritus	Double-crested Cormorant	None	None	G5	S4		CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest | Riparian scrub | Riparian woodland. Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the study area (eBird 2020). The study area contains suitable aquatic foraging habitat for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Riparia riparia	Bank Swallow	None	ST	G5	S2		BLM_S-Sensitive | IUCN_LC-Least Concern	Riparian scrub | Riparian woodland. Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**Moderate Potential.** Several records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is of a breeding colony from 2010 at the confluence of Rowdy Creek and the Smith River, ~1.5 miles south of the Project Area (CDFW 2020a). The study area contains suitable foraging and nesting habitat (e.g., riparian woodland with vertical banks) for this

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
									species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Reptiles									
Emys marmorata	Western Pond Turtle	None	None	G3G4	S3		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable | USFS_S-Sensitive	Aquatic | Artificial flowing waters | Klamath/North coast flowing waters | Klamath/North coast standing waters | Marsh & swamp | Sacramento/San Joaquin flowing waters | Sacramento/San Joaquin standing waters | South coast flowing waters | South coast standing waters | Wetland. A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	**Moderate Potential.** Closest known record is from 2008 at Del Norte County Regional Airport, ~10.5 miles southwest of the Project Area (CDFW 2020a). The study area contains suitable foraging and nesting habitat (e.g., Rowdy and Dominie Creeks, and adjacent uplands) for this species. Given the presence of suitable habitat, this species has a moderate potential to occur in the study area.
Amphibians									
Ascaphus truei	Pacific Tailed Frog	None	None	G4	S3S4		CDFW_SSC-Species of Special Concern	Aquatic | Klamath/North coast flowing waters | Lower montane coniferous forest | North coast coniferous forest | Redwood | Riparian forest.	**Moderate Potential.** Numerous recent records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2015 near the confluence of Rowdy Creek and South Fork

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
							| IUCN_LC-Least Concern	Occurs in montane hardwood-conifer, redwood, Douglas-fir & ponderosa pine habitats. Restricted to perennial montane streams. Tadpoles require water below 15 degrees C.	Rowdy Creek, ~1.5 miles east of the Project Area (CDFW 2020a). The study area contains suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Plethodon elongatus	Del Norte Salamander	None	None	G4	S3		CDFW_WL-Watch List | IUCN_NT-Near Threatened	Oldgrowth. Old-growth associated species with optimum conditions in the mixed conifer/hardwood ancient forest ecosystem. Cool, moist, stable microclimate, a deep litter layer, closed multi-storied canopy, dominated by large, old trees.	**Moderate Potential.** Closest known record is from 2008 along Rowdy Creek, ~2.5 miles northeast of the Project Area (CDFW 2020a). The study area contains suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the study area.
Rana aurora	Northern Red-legged Frog	None	None	G4	S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Klamath/North coast flowing waters | Riparian forest | Riparian woodland. Humid forests, woodlands, grasslands, and streamsides in northwestern California, usually near dense riparian cover.Generally near permanent water, but can be found far from water, in damp woods and meadows, during non-breeding season.	**High Potential.** Numerous recent records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2016 along Morrison Creek, ~1 mile south of the Project Area (CDFW 2020a). The study area contains suitable habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the study area.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
Rana boylii	Foothill Yellow-legged Frog	None	Northwest/North Coast clade not listed.	G3	S3		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | USFS_S-Sensitive	Aquatic | Chaparral | Cismontane woodland | Coastal scrub | Klamath/North coast flowing waters | Lower montane coniferous forest | Meadow & seep | Riparian forest | Riparian woodland | Sacramento/San Joaquin flowing waters. Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	**High Potential.** Several records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 1955 in Smith River along Morrison Creek, ~1 mile south of the Project Area (CDFW 2020a). The study area contains suitable habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the study area.
Rhyacotriton variegatus	Southern Torrent Salamander	None	None	G3G4	S2S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Lower montane coniferous forest | Oldgrowth | Redwood | Riparian forest. Coastal redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer habitats. Old growth forest. Cold, well-shaded, permanent streams and seepages, or within splash zone or on moss-covered rocks within trickling water.	**High Potential.** Numerous recent records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2001 along Rowdy Creek, within 0.5 miles of the Project Area (CDFW 2020a). The study area contains suitable habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the study area.
Fish									
Entosphenus tridentatus	Pacific Lamprey	None	None	G4	S4		AFS_VU-Vulnera	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin	**High Potential.** Known to occur in the Smith River watershed. The study area contains suitable

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
							ble | BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	flowing waters | South coast flowing waters. Found in Pacific Coast streams north of San Luis Obispo County, however regular runs in Santa Clara River. Size of runs is declining. Swift-current gravel-bottomed areas for spawning with water temps between 12-18 C. Ammocoetes need soft sand or mud.	spawning and rearing habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the instream portion of the study area.
Lampetra richardsoni	Western Brook Lamprey	None	None	G4G5	S3S4		CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	Aquatic | Freshwater rivers and streams.	**High Potential.** Known to occur in the Smith River watershed. The study area contains suitable spawning and rearing habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the instream portion of the study area.
Oncorhynchus clarkii clarkii	Coastal Cutthroat Trout	None	None	G4T4	S3		AFS_VU-Vulnerable | CDFW_SSC-Species of Special Concern |	Aquatic | Klamath/North coast flowing waters. Small coastal streams from the Eel River to the Oregon border. Small, low gradient coastal streams and estuaries. Needs shaded streams with water temperatures <18C, and small gravel for spawning.	**High Potential.** Known to occur throughout Smith River watershed (Hogan and Zuber 2012). The study area contains suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the instream portion of the study area.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
							USFS_S-Sensitive		
Oncorhynchus kisutch	Coho Salmon - southern Oregon / northern California ESU	FT	ST	G4T2Q	S2?		AFS_TH-Threatened	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. Federal listing refers to populations between Cape Blanco, Oregon and Punta Gorda, Humboldt County, California.State listing refers to populations between the Oregon border and Punta Gorda, California.	**High Potential.** Known to spawn in Rowdy Creek (Walkley and Garwood 2017). The study area contains suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and known occurrences, this species has a high potential to occur in the instream portion of the study area.
Oncorhynchus mykiss irideus	summer-run Steelhead Trout	None	SCE	G5T4Q	S2		CDFW_SSC-Species of Special Concern	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. No. Calif coastal streams south to Middle Fork Eel River. Within range of Klamath Mtns province DPS & No. Calif DPS. Cool, swift, shallow water & clean loose gravel for spawning, & suitably large pools in which to spend the summer.	**High Potential.** Known to occur throughout the Smith River watershed (CDFW 2012). Closest known records are from 1993 in the Smith River and North Fork Smith River, ~7 linear miles east of the Project Area (CDFW 2020a). The study area contains suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and previous occurrences, this species has a high potential to occur in the instream portion of the study area.
Thaleichthys pacificus	Eulachon	FT	None	G5	S3			Aquatic | Klamath/North coast flowing waters. Found in Klamath River, Mad	**Moderate Potential.** Closest known record is from 1975 at the Smith River Mouth, ~2.5 miles

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
								River, Redwood Creek, and in small numbers in Smith River and Humboldt Bay tributaries. Spawn in lower reaches of coastal rivers with moderate water velocities and bottom of pea-sized gravel, sand, and woody debris.	west of the Project Area (CDFW 2020a). Known to occur in small numbers in the Smith River (CDFW 2020a). The study area contains suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a moderate potential to occur in the instream portion of the study area.
Mollusks									
Juga chacei	Chace Juga	None	None	G1	S1		USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters. Small, permanent streams at low to middle elevations in the Smith River drainage. Generally on gravel substrate, always in cold, clear, highly oxygenated, unpolluted, running water.	**Moderate Potential.** Closest known record is from 2017 in a tributary of the Smith River, ~5 miles south of the Project Area (CDFW 2020a). The study area contains suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the instream portion of the study area.
Margaritifera falcata	Western Pearlshell	None	None	G4G5	S1S2			Aquatic. Aquatic. Prefers lower velocity waters.	**Moderate Potential.** Closest known record is from below Dr. Fine Bridge of the Smith River within Jedediah Smith Redwoods State Park, ~3 miles south of the Project Area (CCC 2019). The study area contains seasonally suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of seasonally suitable

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
									habitat and recent nearby records, this species has a moderate potential to occur in the instream portion of the study area.
Insects									
Bombus caliginosus	Obscure Bumble Bee	None	None	G4?	S1S2		IUCN_VU-Vulnerable	Coastal areas from Santa Barabara county to north to Washington state. Food plant genera include *Baccharis, Cirsium, Lupinus, Lotus, Grindelia* and *Phacelia*.	**Moderate Potential.** Closest known record is from 2011 between Lake Earl and Point Saint George, ~8.5 miles south of the Project Area (CDFW 2020a). The study area falls within the species current range (Hatfield et al. 2014). In addition, the study area are within the coastal fog belt and several of the species' food plants were observed on-site. Given the presence of suitable habitat and food source, this species has a moderate potential to occur in the study area.
Plants									
Cardamine angulata	seaside bittercress	None	None	G4G5	S3	2B.1		Lower montane coniferous forest | North coast coniferous forest | Wetland. North coast coniferous forest, lower montane coniferous forest. Wet areas, streambanks. 5-515 m.	**Moderate Potential.** Species can occur on streambanks.
Cascadia nuttallii	Nuttall's saxifrage	None	None	G4?	S1	2B.1		North coast coniferous forest. North coast coniferous forest. Cliff walls, moss-covered rocks along creeks; mesic sites. 35-80 m.	**Moderate Potential.** Species may occur on steep banks and rocks within riparian areas.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
Fissidens pauperculus	minute pocket moss	None	None	G3?	S2	1B.2	USFS_S-Sensitive	North coast coniferous forest | Redwood. North coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 30-1025 m.	**Moderate Potential.** Species may be found on streambanks along the North Coast.
Monotropa uniflora	ghost-pipe	None	None	G5	S2	2B.2		Broadleaved upland forest | North coast coniferous forest. Broadleafed upland forest, north coast coniferous forest. Often under redwoods or western hemlock. 15-855 m.	**Moderate Potential.** Although species typically occurs in coniferous forest, may also occur in low-elevation mixed forest, and numerous occurrences are documented in the Smith River area (CDFW 2020a).
Polemonium carneum	Oregon polemonium	None	None	G3G4	S2	2B.2		Coastal prairie | Coastal scrub | Lower montane coniferous forest. Coastal prairie, coastal scrub, lower montane coniferous forest.15-1525 m.	**Moderate Potential.** Species documented in riparian areas in the vicinity of Smith River. Records date from the 1930s and are generally mapped to the Smith River vicinity (CDFW 2020a).
Potamogeton foliosus ssp. fibrillosus	fibrous pondweed	None	None	G5T2T4	S1S2	2B.3		Marsh & swamp | Wetland. Marshes and swamps. Shallow water, small streams. 5-1300 m.	**Moderate Potential.** Subspecies may occur in small streams.
Sanguisorba officinalis	great burnet	None	None	G5?	S2	2B.2		Bog & fen | Broadleaved upland forest | Marsh & swamp | Meadow & seep | North coast coniferous forest | Riparian forest | Ultramafic | Wetland. Bogs and fens, meadows and seeps, broadleafed upland forest, marshes and swamps, north coast coniferous forest, riparian forest. Rocky serpentine	**Moderate Potential.** Species may occur in riparian areas.

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
								seepage areas and along stream 5-1400 m.	
Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	None	None	G5T2	S2	1B.2	BLM_S-Sensitive	Coastal bluff scrub | Coastal prairie | North coast coniferous forest. Coastal bluff scrub, coastal prairie, north coast coniferous forest. Open coastal forest; roadcuts. 5-1255 m.	**Moderate Potential.** Subspecies may occur in a wide variety of open habitats, including disturbed areas. Previously documented nearby along Hwy 101 (CDFW 2020a).
Sidalcea oregana ssp. eximia	coast checkerbloom	None	None	G5T1	S1	1B.2	BLM_S-Sensitive	Lower montane coniferous forest | Meadow & seep | North coast coniferous forest | Wetland. Meadows and seeps, north coast coniferous forest, lower montane coniferous forest. Near meadows, in gravelly soil. 5-1805 m.	**Moderate Potential.** May occur in disturbed brushy openings and riparian areas.

Footnotes:

[1] General habitat, and microhabitat column information, reprinted from CNDDB (April 2020).

[2] Rankings from CNDDB (April 2020)

Column Header Categories and Abbreviations:

FedList: Listing status under the federal Endangered Species Act (ESA)

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; P = Proposed for Federal Listing; FD = Federally Delisted

CalList: Listing status under the California state Endangered Species Act (CESA)

SE = State Endangered; SD = State Delisted; ST = State Threatened.

GRank: Global Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of global imperilment - G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors; G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure—Common; widespread and abundant. Subspecies/variety level: "Subspecies/varieties receive a T-rank attached to the G-rank. With the subspecies/varieties, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety" (CDFW 2019); ? = " Denotes inexact numeric rank" (NatureServe 2020); Q = " Questionable taxonomy that may reduce conservation priority" (NatureServe 2020)

SRank: State Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of imperilment in the state (California) - S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state; S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state; S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
(often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state; S4 = Apparently Secure—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors; S5 = Secure—Common, widespread, and abundant in the state; SNR = State Not Ranked *RPlantRank*: CNPS rankings for rare plants (CNPS 2020) - 1A = Plants presumed extinct in California; 1B = Plants rare, threatened or endangered in California and elsewhere; 2 = Plants rare, threatened, or endangered in California, but more common elsewhere; 3 = Plants about which more information is needed (a review list); 4 = Plants of limited distribution (a watch list); n/a = not applicable; Threat Code extensions and their meanings:" .1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat); .2 – Moderately threatened in California (20-80% of occurrences threatened / moderate degree and immediacy of threat); .3 – Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)" (CDFW 2020a).									
Other Statuses (other federal or state listings may include)**:** **AFS_TH** (American Fisheries Society Threatened):"a taxon that is in imminent danger of becoming threatened throughout all or a significant portion of its range" (Jelks et al. 2008). **AFS_VU** (American Fisheries Society Vulnerable): "a taxon that is in imminent danger of becoming threatened throughout all or a significant portion of its range" (Jelks et al. 2008). **BLM_S** (Bureau of Land Management Sensitive): "(1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species." (CDFW 2020b); **CDF_S**: (California Department of Forestry and Fire Protection Sensitive): "those species that warrant special protection during timber operations" (CDFW 2020b); **CDFW_FP** (CDFW Fully Protected Animal): "This classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibians and reptiles, birds and mammals. Most of the species on these lists have subsequently been listed under the state and/or federal endangered species acts." (CDFW 2020b); **CDFW_SSC** (CDFW Species of Special Concern): "It is the goal and responsibility of the Department of Fish and Wildlife to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as 'Species of Special Concern' because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as 'Species of Special Concern' is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long-term viability" (CDFW 2020b); **CDFW_WL** (California Department of Fish and Wildlife Watch List): "The CDFW maintains a list consisting of taxa that were previously designated as "Species of Special Concern" but no longer merit that status, or which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status" (CDFW 2020b); **IUCN_LC** (International Union for Conservation of Nature Least Concern): "when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened" (IUCN 2012); **IUCN_NT** (International Union for Conservation of Nature Near Threatened): "when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN 2012); **IUCN_VU** (International Union for Conservation of Nature Vulnerable): "when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable…, and it is therefore considered to be facing a high risk of extinction in the wild" (IUCN 2012); **IUCN_EN** (International Union for Conservation of Nature Endangered): "when the best available evidence indicates that it meets any of the criteria A to E for Endangered…,and it is therefore considered to be facing a very high risk of extinction in the wild" (IUCN 2012); **NABCI_RWL** (North American Bird Conservation Initiative Red Watch List): "species with extremely high vulnerability" (CDFW 2019);									

Scientific Name	Common Name	Fed. Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Study Area
NMFS_SC (National Marine Fisheries Service Species of Concern): "species about which NOAA's NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act" (CDFW 2020b); **USFS_S** (U.S. Forest Service Sensitive): "plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and/or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (CDFW 2020b); **USFWS_BCC** (U.S. Fish and Wildlife Service Birds of Conservation Concern): "The goal of the Birds of Conservation Concern 2008 report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as Federally Threatened or Endangered) that represent our highest conservation priorities and draw attention to species in need of conservation action" (CDFW 2020b); **WBWG_H**- (Western Bat Working Group High Priority): "those species considered the highest priority for funding, planning, and conservation actions. Information about status and threats to most species could result in effective conservation actions being implemented should a commitment to management exist. These species are imperiled or are at high risk of imperilment" (BCI 1998); **WBWG_LM**- (Western Bat Working Group Low Priority): "most of the existing data support stable populations of the species, and that the potential for major changes in status in the near future is considered unlikely. While there may be localized concerns, the overall status of the species is believed to be secure" (BCI 1998); **WBWG_M**- (Western Bat Working Group Medium Priority): "a level of concern that should warrant closer evaluation, more research, and conservation actions of both the species and possible threats" (BCI 1998); **XERCES_IM** (Xerces Society Imperiled): species "at high risk of extinction because of highly restricted range, rare populations (often 20 or fewer), steep declines, or other factors" (National Research Council 2007).								
Potential to Occur: Moderate Potential: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found in the Project Area. High Potential: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on in the Project Area									

Project construction will require the removal of up to 0.40 acres of riparian vegetation for access to the creek channel, dewatering of the Rowdy and Dominie Creek channels, use of heavy machinery to demolish and remove infrastructure, multiple truck trips to off-haul demolition and transport rock and new infrastructure to the site, and general movement of heavy machinery throughout the Project Area which may compact soils or inadvertently damage vegetation and thus temporarily degrade habitat quality. These construction activities have the potential to adversely affect wildlife and plant species.

Special-status Plant Species

A field investigation for special-status plant species occurred on June 12, 2020, and is included in the Biological Resources Report attached as Appendix E (GHD 2020a). No special-status plants were observed during the survey, however nine special-status plants have moderate potential to occur within the Project Area based upon available habitat and database records (GHD 2020a). The former industrial area proposed for use as Potential Staging Area 3 located east of Rowdy Creek was not surveyed for botanical resources, and therefore it is possible that a special-status plant may occur within this section of the Project Area. If Potential Staging Area 3 is utilized under the Project, it shall be surveyed for special-status plant species prior to use. Additionally, if three years pass between the initial botanical survey and construction, i.e. if construction occurs after June 12, 2023, an additional botanical survey would be necessary throughout the Project area to ensure no special-status plants would be adversely impacted by implementation of the Project. Mitigation Measure BIO-1 would ensure any potential impacts to special-status plants would be avoided and thus less than significant would occur.

Mitigation Measure BIO-1: Pre-construction Botanical Survey

If Staging Area 3 is utilized in the Project, up to two seasonally appropriate pre-construction surveys for special-status plant species shall be performed by a qualified botanist within the Staging Area 3 limits. The survey(s) shall occur during the appropriate blooming time (spring and/or summer) for the target species prior to construction.

If more than three years pass between the existing botanical survey (completed in June 2020) and construction in the areas previously surveyed area, the Project Area shall be re-surveyed for special-status plant species. Up to two surveys may occur, and shall be completed during the appropriate blooming time (spring and/or summer) for the target species prior to construction.

If pre-construction surveys determine that special-status species are present within the survey area Project footprint, these plants will be avoided to the extent feasible. If avoidance is not feasible, they shall be conserved by measures appropriate for the individual species which may include methods such as plant relocation, seed collection, and/or nursery plant propagation.

With the implementation of Mitigation Measure BIO-1, potential impacts to special-status plants would be less than significant.

Special-status Mammals

A review of existing habitat at the Project Area in conjunction with biological database searches indicated one special-status mammals have moderate potential to occur at or near the Project site, including the North American Porcupine.

North American Porcupines are primarily nocturnal, but can sometimes be seen during the day. They

are approximately 27 inches in length with yellowish quills on the head, rump, and upper surfaces of the tail. Their range extends across mainland Canada, Alaska, and the western and northeastern United States. They use a wide variety of habitats, but are most common in montane conifer, Douglas fir, and alpine dwarf-shrub. Although there are numerous records of this species within five miles of the Project, the closest known record within 0.5 miles of the Project Area is from 1960 (CDFW 2020a). Due to lack of high quality habitat onsite this species is expected to have a moderate potential to occur onsite, and thus no impacts are expected to occur to this species. The species is highly mobile and, if present, is expected to leave the Project Area once construction activity commences. Up to 0.40 acres of riparian habitat would be removed in association with this Project but will be replaced with equal or higher quality riparian habitat following Project construction. Substantial foraging habitat suitable for this species is present in the surrounding area in upstream Rowdy and Dominie Creeks to the north.

Mammals, such as the North American Porcupine, may enter the Project Area at night when equipment is not in use. Should this species enter into a dewatered channel, it would have access out of the channel via either the existing rock or proposed rock that occurs in the channel. A less than significant impact to mammals would occur.

Bats

As indicated by the database searches, two special-status bat species (which are technically mammals) have the potential to be present at or near the Project site, including:

- Silver-haired Bat (*Lasionycteris noctivagans*) – moderate potential
- Yuma myotis (*Myotis yumanensis*) – moderate potential

Habitat for bats (structures, tree cavities, loose bark, forest, etc.) is present within or near the Project site. Vegetation and structures (such as the Hatchery Access Road and Highway 101 bridges) within the Project site may provide habitat to a variety of bat species. Construction of the Project may adversely impact special-status bat species through the removal or modification of vegetation or structures and due to ground disturbance. Although no actual bridges would be removed under the Project, structures connected to the Hatchery Access Road bridge would be removed which may provide habitat for bat species. The impact is considered potentially significant. Mitigation Measure BIO-2 has been incorporated into the project to ensure potential impacts to special-status bats would be less than significant.

Mitigation

Mitigation Measure BIO-2 would reduce the impact of the Project on special-status bats to less-than-significant levels by requiring pre-construction surveys by qualified biologists prior to work in applicable habitats, and measures to avoid take of species.

Mitigation Measure BIO-2: Protect Special-Status Bats

A qualified bat biologist shall conduct pre-construction surveys for special-status bats during the spring or summer prior to construction in areas where potential maternity roosts may be disturbed/removed (including trees greater than 12 inches diameter at breast height [dbh] or structures with crevices). If Project work will take place between August 16 and March 31, no surveys shall be required because there will be no impact to roosting bats, as this period is outside of the maternity season. If Project work occurs within the maternity season, then survey methodology should include visual examination of suitable habitat areas for signs of bat use and may utilize ultrasonic detectors to determine if

special-status bat species utilize the vicinity. All trees greater than 12 inches dbh planned for removal and structures within 100 feet of the Hatchery Access Road bridge planned for removal will be examined. If bats exist, species presence and site use patterns should be documented, including roost sites. Bat presence in the Project may vary seasonally and annually. Surveys should be conducted in a manner to detect the presence of hibernating or torpid bats, reproductive colonies and/or migratory stop-over roosts. If no bat utilization or roosts are found, then no further study or action is required. If bats are found to utilize the Project vicinity, or presence is assumed, a bat specialist should be engaged to advise the best method to prevent impact. This may include, but will not be limited to:

- Consultation with the California Department of Fish and Wildlife to determine appropriate measures for protecting bats with young if present, and for implementing measures to exclude non-breeding bat colonies during construction process.
- Phased removal of trees where selected limbs and branches not containing cavities are removed on the first day, with the remainder of the tree removed on the second day.

The implementation of Mitigation Measures BIO-2 would protect against potential Project impacts to special-status bats, sufficiently reducing the potential effect to be **less than significant**.

Special-status Birds

A reconnaissance level site visit was conducted by GHD in June 2020 as a component of the Biological Resources Report to observe and document habitat conditions within the Project Area (see Appendix E – Biological Resources Report). The study area includes patches of disturbed shrub and ruderal habitat, and a native riparian corridor. The riparian corridor was dominated by red alder, and also contained Sitka willow, shining willow, bigleaf maple, coast redwood, Sitka spruce, western red cedar and grand fir (GHD 2020a). The riparian understory contained invasive Himalayan blackberry, and native thimbleberry, common ladyfern and western swordfern (GHD 2020a), see Environmental Setting (above) for additional vegetation observations within the study area. Upland and previously disturbed areas are dominated by ruderal and invasive species. Potential Staging Area 3 was not surveyed, however according to Google Earth aerial imagery this area is the site of a former mill operation, is paved and does not support woody vegetation and may incidentally support opportunistic herbaceous vegetation. According to the review of various databases conducted as a component of the Biological Resources Report, the following special-status birds that have a moderate or high potential to occur in the Project Area:

Passerines:

- Bank Swallow (*Riparia riparia)* – moderate potential
- Little Willow Flycatcher (*Empidonax traillii brewsteri*) – moderate potential
- Black Swift (*Cypseloides niger*) – moderate potential

Wading birds:

- Great Egret (*Ardea alba*) – moderate potential
- Great Blue Heron (*Ardea herodias)* – moderate potential
- Snowy Egret (*Egretta thula)* – moderate potential
- Black-crowned Night Heron (*Nycticorax nycticorax)* – moderate potential

Raptors:

- Northern Harrier (*Circus hudsonius*) – moderate potential

- White-tailed Kite (*Elanus leucurus*) – moderate potential
- Bald Eagle (*Haliaeetus leucocephalus*) – moderate potential
- Osprey (*Pandion haliaetus*) – moderate potential
- Double-crested Cormorant (*Phalacrocorax auritus*) – moderate potential

The Project Area offers habitat for the three groupings of birds via the riparian corridor, conifer trees, and aquatic conditions. Each species has occurred in the study area; species occurrences are detailed in Table 4.4-1 above. If nesting passerines, wading birds or raptors were present in trees at the Project site, including the riparian corridor, construction noise and/or vegetation removals would have the potential to impact the species. The impact is considered potentially significant. Mitigation Measure BIO-3 would ensure any impacts to passerines, wading birds and raptors, including migratory and nesting birds, would be **less than significant**.

Mitigation

Mitigation Measure BIO-3 would reduce the impact of the Project on nesting passerines, wading birds or raptors to less-than-significant levels by requiring pre-construction surveys by qualified biologists prior to work in applicable habitats, and measures to avoid take of species. Mitigation Measure BIO-3 would also reduce a potential impact to nesting passerines, wading birds or raptors in the unsurveyed area (Potential Staging Area 3) by requiring pre-construction surveys to confirm the absence of protected species, or to implement avoidance measures, as described in the measure.

Mitigation Measure BIO-3: Protect Special-status, Migratory, and Nesting Birds

Ground disturbance and vegetation clearing shall be conducted, if possible, during the fall and/or winter months and outside of the avian nesting season (March 15 – August 15) to avoid any direct effects to special-status and protected birds. If ground disturbance or vegetation clearing cannot be confined to the fall and/or winter outside of the nesting season, a qualified ornithologist shall conduct pre-construction surveys within the vicinity of the Project Area, to check for nesting activity of native birds and to evaluate the site for presence of raptors and special-status bird species. The ornithologist shall conduct at minimum a one day pre-construction survey within the 7 - day period prior to vegetation removal and ground-disturbing activities. If ground disturbance and vegetation removal work lapses for seven days or longer during the breeding season, a qualified ornithologist shall conduct a supplemental avian pre-construction survey before project work is reinitiated.

If active nests are detected within the construction footprint or within 500 feet of construction activities, the ornithologist shall flag a buffer around each nest. Construction activities shall avoid nest sites until the ornithologist determines that the young have fledged or nesting activity has ceased. If nests are documented outside of the construction (disturbance) footprint, but within 500 feet of the construction area, buffers would be implemented as needed. In general, the buffer size for common species would be determined on a case-by-case basis in consultation with the CDFW and, if applicable, with USFWS. Buffer sizes would take into account factors such as (1) noise and human disturbance levels at the construction site at the time of the survey and the noise and disturbance expected during the construction activity; (2) distance and amount of vegetation or other screening between the construction site and the nest; and (3) sensitivity of individual nesting species and behaviors of the nesting birds.

If active nests are detected during the survey, the qualified ornithologist shall monitor all nests at least once per week to determine whether birds are being disturbed. Activities that might, in the opinion of the qualified ornithologist, disturb nesting activities (e.g., excessive noise), shall be prohibited within the buffer zone until such a determination is made. If signs of disturbance or distress are observed, the qualified ornithologist shall immediately implement adaptive measures to reduce disturbance. These measures may include, but are not limited to, increasing buffer size, halting disruptive construction activities in the vicinity of the nest until fledging is confirmed or nesting activity has ceased, placement of visual screens or sound dampening structures between the nest and construction activity, reducing speed limits, replacing and updating noisy equipment, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from noise-sensitive receptors, reducing the number of noisy construction activities occurring simultaneously, and/or reorienting and/or relocating construction equipment to minimize noise at noise-sensitive receptors.

With the implementation of Mitigation Measure BIO-3, potential impacts to special-status, migratory, and nesting birds would be **less than significant**.

Special-status Amphibian and Reptile Species

As indicated by the database searches, five special-status amphibian species and one special-status reptile species have the potential to be present at or near the Project site, including:

- Northern Red-legged Frog (*Rana aurora*) – high potential
- Foothill Yellow-legged Frog (*Rana boylii*) – high potential
- Southern Torrent Salamander (*Rhyacotriton variegatus*) – high potential
- Pacific Tailed Frog (*Ascaphus truei*) – moderate potential
- Del Norte Salamander (*Plethodon elongatus*) – moderate potential
- Western Pond Turtle (*Emys marmorata*) – moderate potential

Numerous records of Northern Red-legged Frog, Foothill Yellow-legged Frog, Southern Torrent Salamander and Pacific Tailed Frog have been recorded within five miles of the Project Area in the last decade (CDFW 2020). Less frequent observations have been recorded for the Del Norte Salamander and Western Pond Turtle in the last decade (CDFW 2020). Suitable habitat for all species listed above exists within the Project Area due to the aquatic habitat, riparian corridor and adjacent meadow. Implementation of the Project has the potential to adversely affect special-status amphibians and the Western Pond Turtle through dewatering, trampling, earth movement and ground disturbance vibrations. This potential impact to special-status amphibians and the Western Pond Turtle is considered potentially significant.

Mitigation

Mitigation Measure BIO-4 would reduce the impact of the Project on special-status amphibians and reptiles to less-than-significant levels by requiring pre-construction surveys by qualified biologists prior to work in applicable habitats, and measures to avoid take of species.

Mitigation Measure BIO-4: Protect Special-status Amphibians and Reptiles

No more than one week prior to commencement of ground disturbance (including dewatering) within 100 feet of Dominie or Rowdy Creeks or Staging Areas 1, 2 or 3, a

qualified biologist shall perform a pre-construction survey and shall relocate any individual special-status amphibians or Western Pond Turtle, or egg masses of amphibians, or reptile eggs that occur within the work impact zone to nearby suitable habitat. Relocation of other special-status amphibians, reptiles or egg masses incidentally observed during the survey shall also take place. Special-status amphibians anticipated to occur within the Project Area include: Northern Red-legged Frog, Foothill Yellow-legged Frog, Southern Torrent Salamander, Pacific Tailed Frog, and Del Norte Salamander.

In the event that a special-status amphibian or Western Pond Turtle is observed in an active construction zone, the contractor shall halt construction activities in the area where observed and the frogs or turtles shall be moved to a safe location in similar habitat outside of the construction zone.

With the implementation of Mitigation Measure BIO-4, potential impacts to special-status amphibians and reptiles would be less than significant.

Special-status Fish and Aquatic Species

As indicated by the database searches, five special-status fish and two special-status lamprey species have the potential to be present in Rowdy or Dominie Creeks, including:

- Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*) – high potential
- Coho Salmon (*Oncorhynchus kisutch*) – high potential
- Steelhead (*Oncorhynchus mykiss irideus)* – high potential
- Chinook Salmon (*Oncorhynchus tshawytscha)* – high potential
- Eulachon (*Thaleichthys pacificus*) – moderate potential
- Pacific Lamprey (*Entosphenus tridentatus*) – high potential
- Western Brook Lamprey (*Lampetra richardsoni*) – high potential

It is highly anticipated that all of these species will be encountered during Project construction (dewatering), with the exception of Chinook Salmon due to its life cycle which results in the species migrating out of freshwater systems in June. It is moderately anticipated that Eulachon may be encountered during dewatering due lack of observations and the cryptic nature of this species. It is probable that the five remaining species occur in Rowdy and Dominie Creeks, due to suitable habitat, the Hatchery's influence, and previous occurrences.

To create the dry conditions within Rowdy and Dominie Creeks to allow for in-channel earthwork to take place, creek flows will be diverted (dewatering) around the construction zone. It is assumed that the entire length of both creeks within the Project Area will be dewatered, totaling approximately 675 feet of dewatering in Rowdy Creek, and 550 feet of dewatering in Dominie Creek, and that dewatering of both creeks will occur concurrently. Coffer dams would be installed in the upstream portions of Dominie and Rowdy Creeks and at the downstream extent of Rowdy Creek to isolate the work area. A clear water bypass made of PVC piping (or similar material) will be set up transport creek water from the upstream portions of Dominie and Rowdy Creeks around the work area to downstream of the work area and coffer dam in Rowdy Creek. To avoid potential impingement or entrainment of fish at the upstream point of the bypass hose piping, screened fittings and filters compliant with NMFS and CDFW mesh requirements (including at least 27% porosity with openings no more than 2.38 mm maximum width to exclude juvenile salmonids [CDFW 2002]) will be installed and maintained over hose ends. Block nets will be installed at least ten feet upstream of the bypass piping to prevent entrainment of impingement of fish against intake hosing.

The isolated creeks will then be dewatered, and all aquatic species within the dewatered section will be relocated. It is anticipated that aquatic species relocation will occur in 300-500 foot sections moving from downstream to upstream. Block nets would be installed to create the sections from which species would be relocated. Following completion of a species relocation within a 300-500 foot section, the upstream block net would then become the downstream block net as the fisheries biologist and crew move upstream to continue species relocation in the next section. Captured individuals shall be kept in insulated coolers or buckets equipped with battery operated aerators and lids to meet required water quality parameters (e.g. water temperature at 18° C or less and at least 3 mg/L dissolved oxygen) to promote survival. Captured species would be released upstream or downstream of the Project site (likely in upper Rowdy Creek within TDN-owned property). All dewatering and species relocation will be reviewed by CDFW and NMFS through the permitting process prior to completion of ESA and CESA consultation and within the Biological Assessment required for the Project.

The primary consideration in water management for this Project will likely be completing the instream work prior to a major rainfall event. Typically the dry season window is between June 15th and October 15th, however, the Rowdy Creek watershed has shown to exhibit rapid runoff response time, and therefore any rainfall event occurring during construction could pose an issue to the bypass system and any work in progress at the time. To minimize this risk, completing the instream work as quickly in the season as possible, and having a robust water diversion system will likely be necessary. Due to the nature of the work, the Project will be constructed during a single season.

At the end of the construction activities the dewatered channel will need to be rewatered. Rewatering activities typically consist of allowing small amounts of flow to enter the upstream portion of the channel until the entire channel is flowing. If the flowing water has high turbidity, then rewatering will be directed to the nuisance water area for groundwater infiltration until the incoming flow appears less turbid and of acceptable water quality (clear water). The upstream channel flow is incrementally increased until downstream turbidity levels are at acceptable limits. Once the entire flow has been returned to the channel, all the remaining dewatering structures are removed.

If a special-status aquatic species were to be harmed or if there were any incidental take of special-status species during dewatering, a significant impact will occur. In order to avoid significant impacts from dewatering and species relocation to these species, Mitigation Measures BIO-5, BIO-6, BIO-7 and BIO-8 are proposed which are described below.

Mitigation

Mitigation Measures BIO-5, BIO-6, BIO-7 and BIO-8 would reduce the impact of the Project on special-status fish and lamprey to less-than-significant levels by requiring pre-construction fish and lamprey removal by qualified biologists prior to work in applicable habitats, and measures to avoid take of species.

Mitigation Measure BIO-5: Seasonal Work Windows.

To protect the most vulnerable life stages of sensitive fish species that occur within the Project Area, all in-channel work shall be restricted to the permitted instream work period, most typically between June 15 and October 15. This seasonal work window correlates to the dry season. With concurrence from resource agencies and dependent on weather conditions, the work window may be extended.

Mitigation Measure BIO-6: Native Aquatic Species Relocation.

Before any de-watering activities begin in any creeks or channels within the Project Area, coffer dams or earthen sediment plugs shall be constructed to separate the work area from the stream channel. In deeper or larger areas, water levels shall first be lowered to manageable levels using methods to protect fish and other special-status aquatic species, such as slow drawdown and the use of filters. A qualified fisheries biologist or aquatic ecologist shall then perform appropriate seining, dip netting, or other trapping procedures to a point at which the biologist is assured that almost all fish individuals within the construction area have been caught. These individuals shall be kept in insulated coolers equipped with battery operated aerators to meet required water quality parameters (e.g. water temperature and dissolved oxygen) and ensure survival, and shall be relocated to an appropriate flowing channel segment or other appropriate habitat (approved by the NMFS and/ or the CDFW). If fish mortalities occur, these individuals shall be collected and frozen for delivery to NMFS. Construction activities shall be prohibited from unnecessarily disturbing aquatic habitat. Introduced species shall be documented and reported to the CDFW. Introduced species may be euthanized contingent on permission from the CDFW.

Mitigation Measure BIO-7: Dewatering

All work related to the dewatering of Rowdy and Dominie Creeks shall be conducted during the permitted instream work window (most typically June 15 through October 15). Screened fittings and filters compliant with NMFS and CDFW mesh requirements shall be maintained over hose ends during dewatering to prevent entrainment of any fish (including at least 27% porosity with openings no more than 2.38 mm maximum width to exclude juvenile salmonids). With cofferdams or similar barriers in place, water management in and around the construction work area shall take place. Water from upstream Rowdy and Dominie Creeks held above the upstream cofferdams, or similar barriers, shall be diverted downstream via piping or other conveyance past the work area to be discharged below the downstream cofferdam, or similar barrier, in Rowdy Creek. Block nets shall be installed at least ten feet upstream of the bypass piping to prevent entrainment of impingement of fish against intake hosing. Diversion intake and discharge ends shall be located in the channel in a manner to promote water diversion while minimizing disturbance, sediment transfer, and water turbidity. Effort shall be made to achieve diversion of water around the work area through gravity piping, but pumping may be required due to area topography. As necessary, pumps shall be placed on absorbent pads.

Mitigation Measure BIO-8: Rewatering

After construction work within a dewatered area is completed block nets, pumps and other Project related products and materials shall be removed from the construction area (unless biotechnical control materials are to remain in place). Construction areas shall not be connected to receiving waters until stream banks have been stabilized with biotechnical control fabric, or similar material as called for in the construction plans and specifications. Imported or clear diversion water shall be washed over the construction area to wash fine sediment into the interstitial spaces further sealing the lower bed layers. Water will pass through the work area until it appears clear at the downstream extent (“running clear”). The intent is to allow the constructed channel work area to receive some water to allow sediment to settle through the substrate rather than be carried into receiving waters. Water that appears dirty shall be pumped from the downstream extent of the work area to the designated construction water infiltration area. The dewatered channel will not be

connected to receiving waters until stream banks have stabilized, streambed material has been flushed and pumped to the designated infiltration area, and water is “running clear”. A sediment curtain will be installed in Rowdy Creek downstream of the reconnection area to reduce the amount of sediment carried downstream during reconnection activities.

A Biological Assessment will be prepared for this Project and may contain differently worded or more restrictive measures to protect state and federally listed species. If conflicting, measures in the Biological Assessment will supersede the Mitigation Measure(s) presented in this ISMND. Mitigation Measures BIO-5, BIO-6, BIO-7 and BIO-8 will reduce potential impacts to special-status fish, and lamprey by requiring seasonal work windows, and specifications during fish and lamprey relocation, channel dewatering and rewatering. These impacts will be reduced to a **less than significant level with mitigation**.

b, c) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service, including wetlands? (Less than Significant Impact)

An aquatic resources delineation was conducted by GHD on June 12, 2020 within the Project Area to determine whether wetlands and/or other Waters of the U.S. were present in the Project Area (GHD 2021b), and attached to this ISMND as Appendix F. No wetlands were observed within the surveyed area. No wetlands are identified on the National Wetland Inventory (NWI), however Other Waters of the U.S. (Dominie and Rowdy Creek) are identified in NWI (see Figure 4.4-1 in Appendix A). Although Potential Staging Area 3 was not surveyed, per Google Earth aerial imagery it appears to be an area of uplands and is covered by pavement. Riparian habitat within the Project Area accounts for approximately 0.78 acres, and is dominated by red alder forest which is rated “S4” and is therefore not considered a Sensitive Natural Community (GHD 2020a). No Sensitive Natural Communities were identified within the Project Area (GHD 2020a).

Temporary impacts are anticipated to Waters of the U.S. (Rowdy and Dominie Creek) during dewatering and construction, however these impacts are unavoidable due to the nature of the Project. Implementation of the Project will ultimately benefit aquatic resources through improved channel complexity and greater interconnectivity of flow via the roughened channel. Project operation will have no impact on aquatic resources.

Up to 0.40 acres of riparian habitat would be removed under Access Scenario 1 which involves use of an easement along the eastern bank of Rowdy Creek. Riparian vegetation would be cut, however the roots would remain intact, to allow for construction equipment access to the Rowdy Creek channel. Other areas of riparian habitat may be adversely affected by construction equipment, however it is anticipated that up to 0.40 acres would be the maximum area of riparian vegetation removal. All areas where riparian vegetation is removed or adversely affected would be re-planted under the proposed Project. Vegetation proposed to be planted under the Project includes: bigleaf maple*,* Sitka spruce*,* shining willow, red alder, cottonwood, twinberry, salmonberry, California brome (*Bromus carinatus*), blue wild rye (*Elymus glaucus*), red fescue (*Festuca rubra*), meadow barley (*Hordum brachyantherum*), and hybrid wheatgrass (*Elymus triticum*). See Page V-101 in the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B for a spatial depiction of proposed revegetation. This area may expand depending on whether Access Scenario 1 is utilized. Construction-related impacts to riparian habitat would be temporary. Operation of the Project would have no impact on riparian habitat. A **less than significant impact** would occur.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? (Less than Significant Impact)

The core purpose of this Project is to improve volitional passage of migrating anadromous fish upstream of the Rowdy Creek weir and concrete apron on Dominie Creek. Installation of the roughened channel will increase channel bed elevation downstream of the weir, where the existing drop between the concrete weir and pool is only passable for fish at the highest flows. Project construction will cause a temporary adverse impact to aquatic species due to dewatering and relocation, however the Project will have long-term benefits to aquatic species. Operation of the Project will retain functionality of the Hatchery, which intentionally blocks migration of anadromous fish when they are catching fish for processing via the picket fence. When the Hatchery is not operating, the picket fence will be in the down position, and following Project construction fish will be able to swim past the weir (with the picket fence in the down position) due to the increase in channel bed elevation. The Project would have no impact on migrating terrestrial species. A **less than significant impact** would occur.

e, f) Conflict with any local policies or ordinances protecting biological resources, or provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan? (No Impact)

Of the special-status species identified in Table 4.4-1, the Project would cause the most impactful disturbance to aquatic species due to the necessary dewatering. However, ultimately implementation of the Project will most benefit aquatic species. Of the fish identified in Table 4.4-1, Coho Salmon is listed as threatened under the federal and state Endangered Species Act, summer-run Steelhead is a candidate species for listing as endangered under the California Endangered Species Act, and Eulachon is listed as threatened under the federal Endangered Species Act. However, summer-run Steelhead have not been observed in Rowdy Creek at the vicinity of the Hatchery, rather winter-run Steelhead have been observed (Jacobs pers. comm. 2021). The existing weir is across Rowdy Creek has been identified as one of the most substantial anadromous fish barriers remaining in coastal California outside of major dams (Parish and Garwood 2016). The proposed Project upholds recovery plans for the two listed species, and will benefit the candidate species, and all other aquatic species via the vast improvement of fish access to 11.5 miles of upstream habitat on Rowdy Creek, and 1.6 miles of upstream habitat on Dominie Creek the Project will grant. **No impact** would occur as the Project will not have a conflict with any local policies, or adopted Habitat Conservation Plans or other conservation plans.

4.5 Cultural Resources

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?			✓	
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?		✓		
c) Disturb any human remains, including those interred outside of formal cemeteries?		✓		

Environmental Setting

For the purpose of this Section, the study area (known as the Area of Potential Effect in National and State Historic Preservation communications) includes the Project Area and the surrounding 0.5 mile area. In June 2020 a site specific cultural and historic resources investigation was completed by Roscoe and Associates. The field survey included the Project Area, however did not include Potential Staging Area 3 due to a change in Project design following the survey. The remainder of the Project Area was surveyed via a pedestrian survey and includes a vertical depth of five feet in the creek channels and six inches in staging areas and creek terraces. The database and records search included a buffer of 0.5 miles and therefore Potential Staging Area 3 was included in the records search, however was not included in the field survey.

There is a long history of intensive use of the Smith River area, both in the pre-contact with European settlers and historical periods which are considered post-contact with European settlers. The Project Area was traditionally occupied by the Tolowa Native American Tribal Group who, at the time of first European contact, resided in eight principal villages along the coast (Roscoe and Associates 2020). These groups were well organized, and would procure various coastal and inland resources seasonally (Roscoe and Associates 2020). Following contact with European settlers, the Smith River valley became populated during the first wave of the gold rush in the early 1850's (Bearss 1969 in Roscoe and Associates 2020). Starting in the 1860's timber production and fisheries played an important role in the development of the economy of Del Norte County, followed by tourism, recreation and continued timber production following World War II (Roscoe and Associates 2020).

According to dialogue with the TDN's THPO, the Project is located in an area known to be good for fishing, and no villages are known to have been present in the vicinity of the confluence of Rowdy and Dominie Creeks (Roscoe and Associates 2020). According to the Northwest Information Center (NWIC), five cultural resource investigations have occurred inside the Project Area (with the earliest investigation dating to 1972), and 13 cultural resource investigations have occurred within 0.5 miles of the study area (with the earliest investigation dating to 1987).

Following review of completed studies, the sacred lands database, communication with nearby tribes, and a pedestrian survey, one potentially historic resource was observed along Rowdy Creek. The potentially historic resource are bridge abutments from the Denbar Lumber Company believed to be circa the 1940s. No alterations or removal of the identified bridge abutments are proposed under the Project, and the bridge abutments are not considered eligible for either the National Register of

Historic Places (NRHP) or the California Register of Historic Places (CRHP) (Roscoe and Associates 2020). Outside of the study area, one cultural site and four historic-era structures were identified at least 0.37 miles outside of the study area to the south and west (i.e. not towards Potential Staging Area 3).

Regulatory Setting

National Historic Preservation Act, Section 106

The proposed Project must comply with Section 106 of the National Historic Preservation Act (NHPA), because the Project requires a permit from the USACE. Section 106 of the NHPA requires that, before beginning an undertaking, a federal agency, or projects that the USACE fund or permit, must take into account the effects of the undertaking on historic properties and afford the Advisory Council on Historic Preservation and other interested parties an opportunity to comment on these actions.

Cultural resource significance is evaluated in terms of eligibility for listing in the NRHP. NRHP significance criteria applied to evaluate the cultural resources for this Project are defined in 36 CFR 60.4 as follows:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association, and*
>
> *A. That are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *B. That are associated with the lives of persons significant in our past; or*
>
> *C. That embody the distinctive characteristics of type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *D. That have yielded, or may be likely to yield, information important in prehistory or history.*

California Register of Historic Resources

Cultural resource significance is evaluated in terms of eligibility for listing in the CRHR. The State Historical Resources Commission has designed the CRHR program for use by state and local agencies, private groups and citizens to identify, evaluate, register and protect California's historical resources. The Register is the authoritative guide to the state's significant historical and archaeological resources. CRHR criteria for designation include:

- **Criterion 1**. Associated with events that have made a significant contribution to the broad patterns of local or regional history or the cultural heritage of California or the United States.
- **Criterion 2.** Associated with the lives of persons important to local, California or national history.
- **Criterion 3.** Embodies the distinctive characteristics of a type, period, region or method of construction or represents the work of a master or possesses high artistic values.
- **Criterion 4.** Has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California or the nation.

The CRHR criteria is nearly identical to the federal NRHP criteria, and are used in tandem as "1/A" or "2/B" when identifying impacts. There is a slight difference in meaning between the CRHR and NRHP regarding Criterion 3 (Criterion C in the NRHP), which will be evaluated when determining impacts and significance.

a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5? (Less than Significant Impact)

One potential historic resource was identified in the study area. The potential historic resource are bridge abutments associated with the Denbar Lumber Company circa 1940's, which is located on both sides of Rowdy Creek in the most upstream portion of the study area.

Significance criteria applied to evaluate cultural resource eligibility, are defined by the quality of significance in American history, architecture, archeology, engineering, and culture, present in, districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association. The resources must also be at least 50 years of age. In addition to meeting these qualities, resources must meet at least one of four NRHP and CRHR criteria, including, associations with important events in history (Criterion A/1) or the lives of important persons (Criterion B/2), representing distinctive characteristics of a type, period or method of construction (Criterion C/3) or that have, or could yield information important to the understanding of the past (Criterion D/4).

The identified abutments supported a bridge that appears to have been associated with the Denbar Lumber Company property (Metskers 1949 in Roscoe and Associates 2020) constructed during the post World War II lumber boom in Del Norte County. A 1948 aerial image of the property shows a few large buildings and structures, likely part of a lumber mill operation. No other information regarding the Denbar Lumber Company was found during the cultural resources investigation and the ownership succession of the property is unknown. The buildings with which the bridge appears to be associated, were completely demolished sometime between 2000 and 2003. Most of the bridge, except apparently for the abutments, was demolished during this time as well. While the identified bridge abutments may retain some aspects integrity of location, setting, design and materials, integrity of workmanship, feeling, and association were lost when the bridge span and associated buildings were removed (Roscoe and Associates 2020).

According to Roscoe and Associates (2020), due to this loss of integrity, the identified bridge abutments do not appear eligible under Criterion A/1 as they do not retain significant integrity to convey their association with the historically significant post WWII lumber industry boom in Smith River and Del Norte County as a whole. The bridge abutments do not appear eligible under Criterion B/2, as the Denbar Lumber Company did not play a major role in the post- WWII lumber boom in the area and the background research did not identify any important persons with which they were associated. The bridge abutments do not appear eligible under Criterion C/3 because they do not embody the distinctive characteristics of type, period, or method of construction, and do not represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction. Lastly, the bridge abutments do not appear eligible under Criterion D/4 because the construction type and materials are common, and they are unlikely to yield information important in prehistory or history. The bridge abutments are not considered eligible for either the NRHP or the CRHP and the Project would not alter or remove the identified bridge abutments, therefore a **less than significant impact** to historic resources would occur from construction and operation of the Project.

b, c) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5, or disturbance of human remains including those interred outside of formal cemeteries? (Less than Significant Impact with Mitigation)

No archaeological resources or records of an archaeological resource have been observed or documented within the study area, however one cultural and four historic resources have been documented within 0.50 miles of the study area (Roscoe and Associates 2020). The Project predominantly involves removal and replacement of infrastructure, and instream improvements which will require limited excavation and mostly addition of engineered streambed material (rock), all located within creek channels. Due to the conveyance of stream channels, it is unlikely that archaeological resources would be discovered during Project construction. Although the possibility of uncovering archaeological materials or human remains in these areas is relatively low, all projects that propose subsurface disturbances, have the potential for inadvertent discoveries which could result in a potentially significant impact to cultural resources. In the event that archaeological materials or human remains are unearthed, Mitigation Measures CR-1 and CR-2 would be implemented to ensure that the materials and remains are handled properly. Mitigation Measures CR-1 and CR-2 provide recommendations that would ensure potential Project impacts on inadvertently discovered archaeological resources or human remains are eliminated or reduced to less than significant levels.

Mitigation Measure CR-1: Inadvertent Discovery of Archaeological Material

The following provides means of responding to the circumstance of a significant discovery during implementation of the proposed Project. If cultural materials for example: chipped or ground stone, historic debris, building foundations, or bone are discovered during ground-disturbance activities, work shall be stopped within 20 meters (66 feet) of the discovery, per the requirements of CEQA (Title 14 CCR 15064.5 (f)). Tolowa Dee Ni' Nation representatives shall be immediately notified and work near the archaeological finds shall not resume until a professional archaeologist, who meets the Secretary of the Interior's Standards and Guidelines, has evaluated the materials and offered recommendations for further action.

Mitigation Measure CR-2: Inadvertent Discovery of Human Remains

If human remains are discovered during project construction, work will stop at the discovery location, within 20 meters (66 feet), and any nearby area reasonably suspected to overlie adjacent to human remains (Public Resources Code, Section 7050.5). Tolowa Dee Ni' Nation representatives shall be immediately notified. If the Del Norte County Coroner determines that the remains are of Native American origin, it is necessary to comply with state laws relating to the disposition of Native American burials, which fall within the jurisdiction of the NAHC (Public Resources Code, Section 5097). The coroner will contact the NAHC. The descendants or most likely descendants of the deceased will be contacted, and work will not resume until they have made a recommendation to the landowner or the person responsible for the excavation work for means of treatment and disposition, with appropriate dignity, of the human remains and any associated grave goods, as provided in Public Resources Code, Section 5097.98.

With implementation of Mitigation Measures CR-1 and CR-2, potential impacts to archaeological resources and human remains would be **less than significant**.

4.6 Energy

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?			✓	
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?			✓	

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. Del Norte County is one of the few regions of California served by Pacific Power (a division of PacifiCorp), which is headquartered in Oregon. Pacific Power offers renewable and nonrenewable energy sources. Energy at the Hatchery is supplied through photovoltaic panels, which supplies approximately 75-80% of electricity needs, with the remaining energy sourced from Pacific Power. The Project includes installation of an electrical control building, which would house operating equipment such as controllers, motors and compressors. Proposed equipment and infrastructure under the Project would replace existing and outdated equipment and infrastructure, and therefore there would be no substantial operational increase in energy use.

a) Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation? (Less than Significant Impact)

Construction of the Project will involve a variety of earthwork and building practices, involving the use of heavy equipment as discussed in Section 2.4. Construction will require the use of fuels, primarily gas, diesel, and motor oil. All material proposed for demolition will be off-hauled to a disposal facility located within 20 miles of the Project, similarly, materials proposed for use in the Project will be sourced from within 20 miles. The California Air Resources Board's (CARB) regulation for In-Use Off-Road Diesel-Fueled Fleets (Off-Road Regulation) contains a limit on unnecessary idling. The Off-Road Regulation states: "No vehicle or engines subject to this regulation may idle for more than 5 consecutive minutes." This limit applies to all off-road diesel vehicles subject to the regulation, unless the vehicle is idling for specific circumstances as defined in the regulation or a waiver granted. Additionally, CARB has adopted an Airbone Toxic Control Measure (ATCM) for diesel-fueled commercial trucks that limits idling to five minutes or less.

Equipment idling times will be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes or less (as required by regulation). Because construction will not encourage activities that will result in the use of large amounts of fuel and energy in a wasteful manner, impacts related to the inefficient use of construction-related fuels will be **less than significant**.

Operation of the Project will be substantially similar to existing operational activities, and will include

periodic maintenance of infrastructure, including structural repairs, and potential removal of debris around the picket fence, fish trap and return channel. These activities will generally be supported by vehicles and use of hand-held tools, and its unlikely that heavy equipment would be utilized for Project operation and maintenance. The use of fossil-fuel powered equipment to support these operational and maintenance activities will be periodic and short-term. These activities will not result in a substantial increase in energy use, and will not result in inefficient, wasteful, or unnecessary consumption of fuels or other energy resources. The Project does not propose modifications to the Hatchery or public visitation of the Hatchery. Because the Project would not result in an increase in operational activity over the baseline conditions, there would be **no impact** to energy resources from Project operation.

b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency? (Less than Significant)

The Project will not conflict with or inhibit the implementation of the State EAP, SB 1389, SB 100, AB 1007, or other state regulations that are applicable to the Project because the Project will not inefficiently utilize energy due to compliance with regulations which limits idling time, and will use energy sourced from the Pacific Power grid which is in compliance with the aforementioned plans. The Project will temporarily require the use of construction equipment in order to construct the components of the Project, however these activities will be temporary and will not interfere with the broader energy goals of the state. The Project will therefore not conflict with or obstruct a state or local plan for renewable energy or energy efficiency, as no component of the Project will require an energy source, beyond the temporary use of construction equipment. A **less than significant impact** will occur.

4.7 Geology and Soils

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?				✓
ii) Strong seismic ground shaking?				✓
iii) Seismic related ground failure, including liquefaction?			✓	
iv) Landslides?			✓	
b) Result in substantial soil erosion or the loss of topsoil?			✓	
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on, or off, site landslide, lateral spreading, subsidence, liquefaction or collapse?			✓	
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?			✓	
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				✓
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		✓		

Environmental Setting

The Smith River Valley is located on an uplifted marine terrace that has been cut by the previous migrations of the Smith River, and at the proposed Project location, a thick surface loam is topping Pleistocene aged marine terrace deposits (Strand 1963 in Roscoe and Associates 2020).

For the purpose of this Section, the study area is the same as the Project Area. According to the Geotechnical Investigation (GHD 2018) prepared for this Project and attached to this ISMND as Appendix G, the study area is described to include the following:

> *The site is located in the Coast Ranges geomorphic province. The site is mapped as Quaternary (Pliocene to Holocene) alluvium and marine deposits consisting of unconsolidated to semi-consolidated alluvium, lake, playa, and terrace deposits (Jennings, 1977 updated 2010).*
>
> *The site vicinity is located near the subduction zone of the Juan de Fuca Plate, Gorda Plate, Pacific Plate, and the North American Plate. The nearest fault with historic displacement is the Stephens Pass Fault, located approximately 122 miles to the southeast. The next closest active fault is the San Andreas fault zone, Shelter Cove section, located 126 miles to the south. According to the Alquist-Priolo Earthquake Fault Zone Act, the surrounding project area is not within a Special Studies Zone.*
>
> *The site vicinity is generally characterized as having high seismicity. Using the USGS Seismic Hazard Tool Website considering the site location, ASCE 7-10/NEHRP, and Type C soils, the Peak Ground Acceleration (PGA) is 0.61g. Strong ground shaking at the site should be expected during an earthquake.*
>
> *Based on the results of our field mapping and subsurface exploration, the subsurface materials generally consisted of fill comprised of brown, loose to very dense gravel and silty gravel to depths of 2 to 15 feet below ground surface (bgs). The fill material was underlain by dense very dense silty gravel, medium dense cobbles, medium dense to dense clayey sand, very dense gravel to depths of 7 to 20 feet in all borings but Boring B-2. In Boring B-2, the fill material was underlain by bedrock at 8 feet bgs. In Borings B-1 to B-4, Basalt bedrock was encountered at depths of 7 to 20 feet bgs (Elev 33 to 43 feet, mean sea level).* Borings B-1, B-2 and B-3 are located immediately west of the existing diversion, fish trap and stairs, respectively. Boring B-4 is located west of the existing Dominie Creek walkway located at the confluence.
>
> *Fresh basalt bedrock was encountered at Elevation 33 to 43 feet MSL in Borings B-1 to B-4. Typically, when the augers used during our exploration cannot penetrate bedrock, conventional excavating equipment cannot penetrate it. The augers only penetrated into the bedrock a few inches in most borings (2 feet in boring B-4). Therefore, the bedrock will be very difficult to excavate with a conventional excavator.*

The Project has been designed to comply with the site-specific recommendations identified in the Project's Geotechnical Investigation (GHD 2018). This includes design in accordance with site preparation and earthwork, retaining wall construction, seismic and foundation design criteria, surface drainage and erosion control, as well as site preparation and grading recommendations included in the report. The geotechnical recommendations are incorporated into the Final Design Plans (GHD and Michael Love & Associates 2018a) attached as Appendix B and specifications for the Project and will be implemented during construction.

a, i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. (No Impact)

The study area is not within an active fault area. The nearest fault with historic displacement is the Stephens Pass Fault, located approximately 122 miles to the southeast (GHD 2018). The next closest

active fault is the San Andreas fault zone, Shelter Cove section, located 126 miles to the south (GHD 2018). According to the Alquist-Priolo Earthquake Fault Zone Act, the study area is not within a Special Studies Zone (GHD 2018). The Project would not rupture a known earthquake fault because it is not within 122 miles of a known earthquake fault. Therefore, **no impact** would occur.

a, ii) Strong seismic ground shaking? (No Impact)

The Project is not within an active fault area, and therefore implementation of the Project would have no effect on seismicity or cause strong seismic ground shaking. **No impact** would occur.

a.iii, a.iv, c, d) Liquefaction, landslides, or otherwise unstable soils? (Less than Significant Impact)

Soils in the study area include Bigtree-Mystery complex (2 to 9% slopes), Tillas (0 to 2% slopes) and Tillas.(2 to 9% slopes), see Figure 4.7-1 in Appendix A The soils are fairly susceptible to liquefaction as they are rated 33.7, 40.7, and 41.9, respectively, assuming a rating of 100 equates to a high liquid limit meaning a high capacity to hold water while maintaining a plastic or semi-solid state (NRCS 2021). Liquefaction occurs when loosely packed, water-logged sediments at or near the ground surface lose their strength in response to strong ground shaking (USGS 2021). The Project does not include the creation of water-logged sediments or other areas of aquatic features beyond what already exists (i.e. no additional creek channel would be created), and would therefore not increase the risk of liquefaction above and beyond existing risk.

The study area is relatively flat and soils are considered to have “slight” erosion hazard potential (NRCS 2021). Therefore, in combination with the flat terrain and “slight” erosion hazard, the potential for a landslide to occur would not increase above existing conditions. Although soils are considered to be relatively stable per the “slight” erosion hazard characterization, BMPs would be implemented during construction as appropriate to minimize erosion and transport of sediment to receiving waters or other sensitive areas as specified in Environmental Protection Action 2 – Construction BMPs (Section 2.7.2). Additionally, the Project will be constructed in the dry season up to four months, and erosion due to precipitation is not anticipated. Soils within the study area are relatively stable, and because the study area is flat, and implementation of the Project would be constructed in the dry season and would incorporate Environmental Protection Action 2, the potential for liquefaction, landslides or otherwise unstable soils to become problematic are considered to be a **less-than-significant impact.**

b) Result in substantial soil erosion or the loss of topsoil? (Less than Significant Impact)

Erosion is the action of surface processes such as water flow or wind that remove soil, rock or dissolved materials from the Earth’s surface, and then transports it to another location. Construction activities, including cut, fill, removal of vegetation, and operation of heavy equipment would disturb soil and, therefore, have the potential to cause erosion. The vast majority of proposed Project activities would occur within creek channels or along the channel banks. Under Access Scenario 1, approximately 0.40 acres of riparian vegetation would be removed from along the eastern bank of Rowdy Creek. It is expected that the vegetation would be cut and that roots would stay intact, thereby retaining the soil structure and not substantially contributing to potential erosion.

In other Project components, such as construction of the access roads, infrastructure demolition and removal, and the installation of replacement infrastructure, soil is expected to become exposed and loose which may enter into the dewatered channels. With implementation of the Project during the dry season (June 15 – October 15), and use of construction BMPs listed in Environmental Protection

Action 2 – Construction BMPs (Section 2.7.2), a substantial amount of soil would not enter into the dewatered channels because of an absence of precipitation and use of barriers such as straw wattles. However, some soil is expected to enter the channels because the proposed construction work is located within the channels, and therefore it is unavoidable. It is expected that when the channels within the Project Area are re-watered, a sediment plume would occur downstream due to the limited accumulation of soil, and other sediment resulting from instream and riparian construction work. Additionally, implementation of Environmental Protection Action 1 - Stormwater Pollution Prevention Plan (SWPPP, Section 2.7.1) would require erosion control prevention measures during and after construction to ensure substantial soil erosion does not occur within the Project Area.

All grading areas will be revegetated and/or stabilized to ensure no bare or exposed soils occur following construction. With the implementation of the above referenced Environmental Protection Actions, the risk of substantial soil erosion or loss of topsoil will be minimized, and the potential impact will be **less than significant**.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater? (No Impact)

No wastewater disposal systems or septic tanks are proposed under the Project. Therefore, the soil quality would not need to support such infrastructure. **No impact** would occur.

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature? (Less than Significant Impact with Mitigation)

The proposed Project activities would not require modification of any known unique geologic features. Excavation and earthmoving activities would primarily occur within areas of previous disturbance associated with the initial installation of infrastructure now proposed for removal. The roughened channel would predominantly include adding rocks and other fill to the channel to raise channel bed elevation, although some excavation would occur within the channel. It is unlikely that Project construction would impact paleontological resources because excavation would predominantly occur in areas of previous disturbance. Additionally, Project work is associated with a geomorphically relatively new landscape due to the flooding, creek meandering and scouring that has occurred over thousands of years, and unique paleontological resources are not expected to be encountered in the creek beds. However, the potential exists for encountering previously undiscovered paleontological resources during Project construction. This potential impact would be considered significant, therefore Mitigation Measure GEO-1 is included in the event paleontological resources are inadvertently discovered within the Project Area during construction, reducing the potential impact to be **less than significant with mitigation**.

Mitigation

Mitigation Measure GEO-1 would be implemented in the event a paleontological resource is inadvertently discovered.

Mitigation Measure GEO-1: Protect Paleontological Resources during Construction

In the event that fossils are encountered during construction (i.e., bones, teeth, or unusually abundant and well-preserved invertebrates or plants), construction activities shall be diverted away from the discovery within 50 feet of the find, and a professional palaeontologist shall be notified to document the discovery as needed, to evaluate the

potential resource, and to assess the nature and importance of the find. Based on the scientific value or uniqueness of the find, the palaeontologist may record the find and allow work to continue, or recommend salvage and recovery of the material, if it is determined that the find cannot be avoided. The palaeontologist shall make recommendations for any necessary treatment that is consistent with currently accepted scientific practices. Any fossils collected from the area shall then be deposited in an accredited and permanent scientific institution where they will be properly curated and preserved.

Mitigation Measure GEO-1 will reduce the impact of construction activities on unknown paleontological resources to a less-than-significant level by addressing discovery of unanticipated buried resources and preserving and/or recording those resources consistent with appropriate laws and requirements.

4.8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?			✓	
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?				✓

Environmental Setting

This section evaluates potential impacts related to greenhouse gas (GHG) emissions resulting from construction and operation of the Project against significance thresholds derived from applicable local, state, or federal policies, or from Appendix G of the CEQA Guidelines.

The CEQA Guidelines generally address greenhouse gas emissions as a cumulative impact due to the global nature of climate change (Pub. Resources Code, § 21083(b)(2)). As the California Supreme Court explained, "because of the global scale of climate change, any one project's contribution is unlikely to be significant by itself" (Cleveland National Forest Foundation v. San Diego Assn. of Governments (2017) 3 Cal.5th 497, 512). In assessing cumulative impacts, it must be determined if a project's incremental effect is "cumulatively considerable" (CEQA Guidelines Sections 15064(h)(1) and 15130).

To make this determination, the incremental impacts of the project must be compared with the effects of past, current, and probable future projects. Although climate change is ultimately a cumulative impact, not every individual project that emits greenhouse gases must necessarily be found to contribute to a significant cumulative impact on the environment. For the purpose of this Section, the study area includes the Project Area, the entire North Coast Unified Air Quality Management District's air basin, and the State of California.

The NCUAQMD has not adopted regulations regarding the evaluation of greenhouse gas (GHG) emissions in a CEQA document and has not established CEQA significance criteria to determine the significance of impacts with regard to GHGs.

The Del Norte County, as Lead Agency for the Project, has elected to apply the Bay Area Air Quality Management District (BAAQMD) adopted operational threshold of significance for projects other than stationary source such as residential, commercial, industrial, and public land uses and facilities projects of 1,100 MTCO2e per year to determine the Project's impact for generation of GHGs. For project construction, BAAQMD does not have quantitative GHG emission thresholds (BAAQMD 2017). However, South Coast Air Quality Management District's recommended methodology is to annualize construction emissions over an assumed 30-year operational life of the Project and are included in the operational emissions to assess the Project's potential GHG impact.

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? (Less than Significant Impact)

Construction GHG emissions were calculated by using CalEEMod 2016.3.2. Details regarding the construction schedule, construction activities, equipment inventory, assumptions, and data used to calculate construction-related GHG emissions are available in Appendix D (CalEEMod Emissions Report). Project construction is estimated to generate 527.9 metric tons of carbon dioxide equivalent (MTCO2e).

Following construction, the Project would not result in an increase in traffic because the Project would not necessitate additional staffing at the facility nor substantially increase the number of visitors, deliveries of materials or supplies compared to current baseline conditions. Additionally, periodic repairs to infrastructure, and removal of debris in and around the proposed picket fence, fish trap, and return channel would be substantially similar in scope and duration and would not deviate from existing operational activities. Therefore, because the Project does result in new on-road mobile emissions (the main emissions source category for most development projects), and because the operational activities would be similar to existing activities, the operational emissions were not quantified. Annualized construction emissions would be 17.60 MTCO2e per year. The Project's GHG emissions are less than the BAAQMD's threshold of 1,100 MTCO2e per year. Therefore, the Project's GHG impact would be **less than significant**.

b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases? (No Impact)

This analysis uses the California Air Resources Board (CARB) *2017 Climate Change Scoping Plan* as the applicable greenhouse gas reduction strategy (CARB 2017). Del Norte County does not have an adopted greenhouse gas reduction strategy.

The 2017 Climate Change Scoping Plan provides strategies for meeting the mid-term 2030 greenhouse gas reduction target set by Senate Bill (SB) 32. The 2017 Climate Change Scoping Plan also identifies how the State can substantially advance toward the 2050 greenhouse gas reduction target of Executive Order S-3-05, which consists of reducing greenhouse gas emissions to 80 percent below 1990 levels. The recommendations cover several key sectors, including: energy and industry; transportation; natural and working lands; waste management; and water. The recommended measures in the 2017 Scoping Plan are broad policy and regulatory initiatives that will be implemented at the State level and do not relate to the construction and operation of individual projects. The project would not impede the State developing or implementing the greenhouse gas reduction measures identified in the Scoping Plan. Therefore, the project would not conflict with AB 32 or the 2017 Climate Change Scoping Plan. **No impact** would result.

4.9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?		✓		
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		✓		
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				✓
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				✓
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?				✓
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				✓
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?				✓

Environmental Setting

The study area for this section includes the Project Area and downstream portion of waterbodies originating in the Project Area (i.e. Rowdy Creek, Dominie Creek and the Smith River) that may be impacted by the use of hazardous materials under the Project. Due to the proposed demolition of concrete and asphalt infrastructure, a pre-demolition survey was conducted to characterize existing infrastructure for asbestos. This survey is required for commercial facility demolition under the

National Emissions Standards for Hazardous Air Pollutants. A Naturally Occurring Asbestos (NOA) soil sampling survey was also conducted to assess the general presence of naturally occurring asbestos in the site soils that could be encountered during Project area disturbance. The entire Project Area was surveyed except for Potential Staging Area 3, which was added into the Project Area boundary after the survey occurred. No demolition is proposed in this area. The survey for asbestos-containing infrastructure (to be demolished), and NOA yielded the absence of asbestos, however given it is infeasible for the survey to sample every area of proposed ground disturbance it is possible that NOA may be potentially present.

Historical land use information on the Project Area was determined using hazardous materials, and historical and cultural resource reports prepared for the Project or within the Project vicinity, including the following: Asbestos and Naturally Occurring Asbestos (NOA) Soil Sampling Assessment for the Rowdy and Dominie Creek Fish Passage Improvement Project (GHD 2020b), Cultural Resources Investigation Report for the Tolowa Dee-ni' Nation Rowdy and Dominie Creek Fish Passage Project (Roscoe and Associates 2020). Historic aerial imagery indicates a lumber mill was operating on the east side of Highway 101, where Potential Staging Area 3 is located.

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? (Less than Significant with Mitigation)

Construction of the Project will include demolition and off-hauling of Hatchery infrastructure, installation of replacement infrastructure and of the roughened channel, and will therefore require use of a variety of heavy machinery and equipment. All construction activities will be conducted in accordance with Environmental Protection Action 2 which states that the contractor will make adequate preparations, including training and providing equipment, to contain oil or other hazardous materials spills, and in accordance with Mitigation Measure AIR-1 (BMPs to Reduce Air Pollution) which states that all haul trucks transporting loose material off-site shall be covered. Herbicides arenot proposed for use under the Project.

An asbestos and naturally occurring asbestos survey was conducted within the Project Area (except for Potential Staging Area 3) by GHD in 2020. The survey included sampling of infrastructure proposed for demolition, and naturally occurring asbestos in soils within areas planned for disturbance. All samples yielded Non-Detect results for asbestos and naturally occurring asbestos (see Appendix H for the Asbestos and NOA Survey [GHD 2020b]). However, since naturally occurring asbestos is known to exist in small and large quantities within the Smith River watershed, and noted on geological maps in the vicinity's mountainous slopes, and because the naturally occurring asbestos survey didn't include inspection of every Project surface to be graded or disturbed, the potential to generate fugitive dust with naturally occurring asbestos is a real possibility. If naturally occurring asbestos were to become airborne, a potentially significant impact would occur. Implementation of Mitigation Measure AIR-1 would require the contractor to water all exposed surfaces (e.g. parking areas, soil piles, active graded areas, excavations and unpaved access roads) at least twice per day in areas of active construction. The mitigation measure also states that should excessive heat or wind cause dust to become airborne, additional watering will be implemented to prevent dusty conditions. With implementation of AIR-1, a potentially significant impact involving fugitive dust containing naturally occurring asbestos would be avoided because areas that could create dust will be watered to prevent dust from occurring. A **less than significant impact with mitigation** would occur.

In terms of Project operation, propane may be utilized by the Hatchery, however no propane would be utilized under the Project and the Project would not modify existing use of propane by the Hatchery.

Due to the absence of asbestos in demolition areas, and absence of naturally occurring asbestos in all areas surveyed, and incorporation of Mitigation Measures HAZ-1, and AIR-1 and Environmental Protection Action 2, the potential environmental impact from transportation, use and disposal of hazardous materials will be reduced to **less than significant with mitigation**.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment? (Less than Significant Impact with Mitigation)

The Project would utilize heavy machinery to perform construction-related tasks including demolition, excavation, infrastructure installation, grading and transportation of materials, including the majority of work occurring within the Rowdy and Dominie Creek channels. There is always the possibility when equipment is operating that an accident could occur and fuel could be released onto the soil. Should an accident involving release of fuel into the soil or Rowdy or Dominie Creek occur, a potentially significant impact could occur. Mitigation Measure HAZ-1 is proposed to reduce this potentially significant impact.

Mitigation

Implementation of Mitigation Measure HAZ-1 would require protective measures to ensure hazardous materials do not inadvertently impact waters or water quality.

Mitigation Measure HAZ-1: Protection of Waters from Hazardous Materials

Equipment on site during construction would be required to have emergency spill cleanup kits immediately accessible in the case of any fuel or oil spills. Equipment would not be refueled or maintained within 100 feet of Rowdy or Dominie Creek channels. If equipment must be washed, it would be washed off-site.

With the incorporation of Mitigation Measure HAZ-1, equipment on site during construction would be required to have emergency spill cleanup kits immediately accessible in the case of any fuel or oil spills, and equipment would not be refueled near any perennial wetland or other waterway. On-site equipment washing would not occur. The potential impact to the public or environment would be less than significant with incorporation of Mitigation Measure HAZ-1.

Additionally, all construction activities will be conducted in accordance with Environmental Protection Action 2 which states that the contractor will make adequate preparations, including training and providing equipment, to contain oil or other hazardous materials spills, and in accordance with Mitigation Measure AIR-1 (BMPs to Reduce Air Pollution) which requires all trucks transporting loose material off-site shall be covered to minimize public and environment hazardous materials impacts. A **less than significant impact with mitigation** would occur.

Project operation will not deviate from existing operation, and will therefore not cause any new impacts involving potential hazards or hazardous materials.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? (No Impact)

The Project is not located within one-quarter mile of an existing or proposed school. The closest

school, Smith River Elementary School, is approximately 0.41 miles from the Project Area. If hazardous emissions or acute hazardous materials, substances or waste was to occur, the potential range of influence would be diminished due to distance from the Project Area. Additionally, Smith River Elementary School is not located on the route that trucks will likely utilize. Therefore, **no impact** would occur.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment? (No Impact)

The Project Area is not listed under GeoTracker or the Department of Toxic Substances Control (DTSC) databases as a generator, transporter, or facility under Government Code Section 65962.5. The nearest adjoining listed properties in GeoTracker have a listing status of case closed. As the Project Site is not listed as a generator or transporter of hazardous materials in the GeoTracker and DTSC databases and the General Plan provides substantial information in support of waste management policies, the potential impact to the public or the environment is unlikely. Therefore**, no impact** would occur.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area? (No Impact)

The Project is not located within an airport land use plan, and is not within two miles of a public airport or public use airport. The closest public airport is approximately 11.5 miles from the Project Area. Therefore, **no impact** would occur.

f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? (No Impact)

The Project would be subject to the Continuity of Operations Plan and the Del Norte County General Plan. The Continuity of Operations Plan is designed to provide guidance for Del Norte County personnel and staff in general, as well as provide direction for how the County can provide critical operations in the event of an emergency or disaster situation, and initiate the necessary steps of the restoration and recovery process (Del Norte County 2018). The Project would not conflict with the plans presented in the Continuity of Operations Plan because the Hatchery is not a County facility and is not managed by the County. Controlled traffic will be necessary during Project construction, which is further described in Section 4.17 – Transportation, however emergency access will always be retained during construction activities which would uphold the Continuity of Operations Plan. The Continuity of Operations Plan serves as Del Norte County's Emergency Operations Plan, and includes evacuation sites and discussion that each County department should determine an appropriate evacuation route (Del Norte County 2018). No designated evacuation sites are within the Project Area or vicinity. The Project would be consistent with the Continuity of Operations Plan and General Plan and would not impair or conflict with the policies listed. **No impact** would occur.

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires? (No Impact)

Construction of the Project would cause a temporary increase in the number of people within the Project Area due to the presence of construction workers and managers. Construction equipment has the potential to cause a wildland fire through the use of equipment on long or unmaintained

grasses which could ignite due to close proximity to the engine. Grassy areas are currently within the Project Area and equipment is proposed to utilize these areas. Environmental Protection Action 2 – Construction BMPs states that grassy areas that would be utilized by construction equipment shall be mowed before construction, and shall be mowed again if grasses grow to an unsafe length (approximately greater than 8 inches). With incorporation of Environmental Protection Action 2, this potential significant impact would be avoided. Operation of the Project would not change Hatchery operations from existing conditions, which includes public tours, class field trips and other periodic events, and no impact from Project operations is expected. **No impact** would occur.

4.10 Hydrology and Water Quality

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?			✓	
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?			✓	
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
i) Result in substantial erosion or siltation on- or off-site?		✓		
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?				✓
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?				✓
iv) Impede or redirect flood flows?			✓	
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?				✓
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?				✓

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. The majority of the Project includes the instream portions of Rowdy and Dominie Creeks, riparian corridor along Rowdy Creek, a vacant field surrounded by development, a meadow surrounded by shrubs and trees, a small segment of Highway 101, and a former industrial area east of Highway 101. The confluence of Rowdy and Dominie Creeks is approximately 1.75 miles upstream from the Smith River, located in the relatively flat alluvial fan of the Smith River (see Figure 1 in Appendix A).

The Rowdy Creek watershed area above the Dominie Creek confluence is 29.4 square miles. The Dominie Creek watershed area is 3.7 square miles; the combined watershed area is 33.1 square miles (GHD and Michael Love & Associates 2018b). Neither Rowdy Creek nor Dominie Creek are currently gaged for flow monitoring. Therefore, to estimate peak flows at the Project site predictive methods were applied during Project feasibility analysis (GHD 2015). Peak flows for the 2-, 5-, 10-, 25-, 50-, and 100-year flow events are presented below in Table 4.10-1 (Predicted Flows at Project Site). These flows were estimated using two different methods: statistical analysis of nearby historical USGS stream gages (following USGS 1982 protocols), and USGS regional regression equations (following Gotvald et al, 2012). Flow data provided in the Flood Insurance Study for Del Norte County and Caltrans as-built drawings of the Rowdy Creek Highway 101 bridge were also used to estimate peak flows.

Table 4.10-1 – Predicted Flows at Project Site[1]

	Peak Flows (cfs) for Recurrence Interval					
Channel Reach	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Rowdy Creek (Upstream of Dominie Creek)	3,657	5,548	8,860	8,922	12,485	13,895
Dominie Creek	489	826	1,063	1,365	1,592	1,824
Combined	4,146	6,375	9,923	10,287	14,077	15,719

The presence of the existing weir has modified the Rowdy Creek channel within the Project Area. The presence of the concrete weir has resulted in aggraded sediment, and thus a higher bed elevation, on the upstream side of the weir, and a deep scour pool downstream of the weir (see Image 1-1 in Section 1.5.2).

A gravel bar, also known as the “channel spine,” exists in Rowdy Creek downstream of the Highway 101 bridge. The gravel bar is located downstream of the Highway 101 bridge pier, which has allowed sediment to build and aggrade behind the pier. Two flow pathways in upper Rowdy Creek have resulted from this gravel bar formation. The proposed roughened channel has been designed to place Engineered Streambed Material (ESM) strategically to retain the gravel bar, and the hydrology (two flow pathways) it supports while reducing potential of upstream channel adjustment.

Groundwater within the Smith River basin flows from the mountains to the east, towards Lake Earl and the Pacific Ocean to the west (GHD 2015). Recharge of groundwater is from rainfall infiltration, subsurface flow from the east, influent seepage from streams and the infiltration of irrigation water (DWNR 1987 in GHD 2015). The majority of groundwater leaves the basin through springs and seeps, which drain into the ocean; however some groundwater is lost through evapotranspiration of plants.

Hydrology and water quality policies listed in the Del Norte County General Plan that relate to the proposed Project include the following:

Policy 1.B.1: The County shall seek to maintain, and where feasible, enhance the existing

[1] Source: GHD and Michael Love & Associates 2018b

quality of all water resources in order to ensure public health and safety and the biological productivity of waters.

Policy 1.B.3: The County shall continue to follow all existing and future Federal and State water quality standards.

Policy 1.B.6: The County shall encourage community programs designed to improve the quality of fisheries and other water resources, including the voluntary incorporation of conservation buffers where pesticide and fertilizer application is a regular occurrence and public outreach and awareness related to home and business opportunities to improve fisheries and water resources.

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality? (Less than Significant Impact)

The Project involves work on two tributary waterways to the Smith River. The Smith River watershed is not on the Clean Water Act 303(d) list of impaired water bodies. Therefore although no site-specific water quality control plan pursuant to the Clean Water Act exists for the Smith River watershed, federal and state water quality standards apply to the Project. The Project will seek coverage under SWRCB Order No. 2009-0009-DWQ, Waste Discharge Requirements for Discharges of Storm Water Runoff Associated with Construction and Land Disturbance Activities. A SWPPP would be prepared to address pollutant sources, BMPs and other requirements specified in the Order, per Environmental Protection Action 1. Due to the instream work proposed under the Project, a Clean Water Act Section 404 permit from the USACE, Section 401 Water Quality Certification from the NCRWQCB and EPA, and Lake and Streambed Alteration Agreement from CDFW would be secured prior to construction. These permits would list water quality standards that the Project would adhere to. Locally, the Project upholds the policies listed in the Del Norte County General Plan through the enhancements proposed to aquatic habitat, biological productivity and hydrology, adherence to federal and state water quality standards (in forthcoming permits), and through the addition of gravel along the western bank of Rowdy Creek. The Project will maintain the existing water right and diversion along Rowdy Creek (6 cfs maximum) for the Hatchery, and replace diversion housing; water will continue to be sourced from Rowdy Creek surface waters via a stilling well. The Project does not propose waste management or wastewater services therefore waste discharge requirements do not apply.

Project construction will require dewatering of both Rowdy and Dominie Creeks (as discussed in Section 4.4 – Biological Resources), and installation of a temporary clear water bypass system to route water around the construction area. Although construction will occur during the dry season, and erosion control BMPs will be utilized to reduce the amount of sediment entering the channel during construction, it is expected that when the channels are re-watered there will be a temporary sediment pulse due to construction in the channel. This sediment pulse is anticipated to wash downstream during the first few large precipitation events following construction and would be temporary in nature. All disturbed surfaces would be treated with mulch or straw to limit sediment from entering Rowdy or Dominie Creeks and thus lower Smith River. Following the first few large precipitation events after construction, Project-related sediment pulses are not expected to occur.

Due to the adherence to federal, state and local water quality standards (through forthcoming permits), implementation of Environmental Protection Actions 1 (SWPPP) and 2 (Construction BMPs), and the temporary nature of the sediment pulse following construction, implementation of the Project would not substantially degrade surface or ground water quality. A **less than significant impact** would occur.

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin? (Less than Significant Impact)

Groundwater was encountered at 12 feet to 20 feet below ground surface (elevation 41 to 35 feet) near the Hatchery and 20 feet below ground surface (elevation 45 feet) at the Dominie Creek bridge (GHD 2018). The depth of groundwater is expected to vary over time due to seasonal variations and other factors such as creek level and changes to site drainage. Construction of the Project includes the installation of a roughened channel which would raise the creek bed elevation in Rowdy Creek in certain areas. This increase in creek bed elevation would benefit groundwater by increasing available subsurface material for water to infiltrate.

Operation of the Project would not modify existing diversion rates, just diversion housing would be replaced during construction. The Hatchery's diversion is sourced from surface water via the stilling well, not groundwater. Due to the absence of diversion modification, and the increase in channel bed substrate for water to infiltrate into, a **less than significant impact** would occur.

c, i) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site? (Less than Significant Impact with Mitigation)

Construction of the Project would include replacement of some instream infrastructure, complete demolition and removal of some instream infrastructure, and the installation of a roughened channel made of ESM. To complete this work, construction equipment would need to operate from within the channel and/or from the channel banks. Construction work areas would be dewatered before instream construction work began. Incorporation of Environmental Protection Action 2 would be implemented which requires the incorporation of construction BMPs into Project construction, which would reduce potential sedimentation or erosion from entering the work area. When water is returned to the construction work area, it is expected that a pulse of sediment would result downstream of the Project Area, however the pulse would be temporary and is not expected to be substantial. During Project operation, substantial erosion or siltation would not occur because all creek banks and areas of disturbance would have erosion and sediment control measures in place until disturbed areas are stabilized. Measures may include revegetation, silt curtains, straw wattles or other similar accepted BMPs.

Installation of the roughened channel is the primary design feature of this Project. It would be installed to overcome the existing vertical drop caused by the weir while maintaining the existing grade upstream within Rowdy and Dominie Creeks. Successful installation of the roughened channel would create aquatic habitat diversification through the strategic creation of riffles and pools. The Basis of Design Report (GHD and Michael Love & Associates 2018b, attached as Appendix C) considered the existing channel geometries, intended use of the Project site, and design criteria and guidelines to design the roughened channel. For example, the proposed diversion housing would be located on the bank of Pool 5RR (along river right) of Rowdy Creek, and during low flow conditions it is important that all flow goes preferentially towards this pool. To help facilitate this, the thalweg at the top of Chute 5RR is set 0.5 feet below the thalweg at the top of Chute 5RL (river left). Therefore, half a foot of water would be entering Chute 5RR before any flow enters Chute 5RL. As flows increase, Chute 5RR would continue to receive more flow than Chute 5RL which is also due to the bend in the channel, the additional flow would help scour Pool 5RR to maintain the pool in front of the diversion screen structure. The roughened channel is intentionally designed to promote habitat continuity (lack of disconnected pools) while also encouraging flow towards the diversion intake.

Each Chute would have structure boulders known as “rock bands,” which would connect to the channel banks for stability. Upper Rowdy Creek (above the weir) is wider than lower Rowdy Creek, and therefore there is an increased potential for a rock band boulder to move out of place and threaten the stability of the Chute and potentially the channel. In the upper reaches there are two flow pathways around the channel spine (Highway 101 gravel bar); the rock banks have been designed to connect to the channel spine which increases the structural support and reduces risk of erosion (GHD and Michael Love & Associates 2018b).

The lower reach contains one flow pathway extending from existing rock slope protection on river right to proposed bankline rock on river left. Much of the lower reach is perched, meaning the proposed channel bed elevation would be greater than the existing channel bed elevation. Constructing a channel under these conditions can be challenging because there is high potential for flow to go subsurface. This would result in a significant impact due to the alteration in stream course. To avoid this potential significant impact, Mitigation Measure HYD-1 is proposed.

> **Mitigation Measure HYD-1: Construction Methods to Ensure Proper Flow Pathways**
>
> During construction, the channel shall be correctly sealed through a series of lifts. Each lift shall be one foot in thickness, comprised of Engineered Streambed Material and containing adequate compaction and jetting methods prior to completion. To accomplish this, the contract documents shall include specific language describing that the contractor must show that the water remains flowing on the surface for each lift. The entire roughened channel will have a series of three lifts.

The Project would result in altered hydrology and thalweg within Rowdy Creek, however the proposed modifications would not result in substantial erosion or siltation on- or off-site because the roughened channel would be installed properly under Mitigation Measure HYD-1. Incorporation of Mitigation Measure HYD-1 would reduce the potential impact to the stream course to a less-than-significant level. Therefore, a **less than significant impact with mitigation** would occur.

c, ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? (Less than Significant Impact)

Implementation of the Project would not include the addition of impervious infrastructure, with the exception of the proposed electrical control building which would be located in an area proposed to be graveled. The building would be six feet by twelve feet, and would not substantially increase the rate or amount of surface runoff because of the relatively small footprint of the building, and because it would be located on top of and next to pervious graveled areas. All other proposed infrastructure would replace existing infrastructure and would therefore not increase the rate or amount of surface runoff which would result in flooding on- or off-site. Therefore, a **less than significant impact** would occur.

c, iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? (No Impact)

Implementation of the Project would not modify existing stormwater drainage around Rowdy and Dominie Creeks. Therefore **no impact** would occur.

c, iv) Impede or redirect flood flows? (Less than Significant Impact)

According to FEMA's Flood Insurance Rate Map, Rowdy Creek is considered to be within Zone AE, and Dominie Creek is considered to be within Zone A (FEMA 2021). Zones AE and A are considered special flood hazard areas, however, Rowdy and Dominie Creek are not classified as regulatory floodways (FEMA 2021). FEMA states that until a regulatory floodway is designated, no substantial improvement shall be permitted in Zone AE or Zone A unless it is demonstrated that the improvement will not increase the water surface elevation of the base flood more than one foot (FEMA 2002) (44 CFR 60.3(c)(10)). Modeling of existing and predicted conditions were completed in the Basis of Design Report (GHD and Michael Love & Associates 2018b) to understand potential flood impacts and to determine whether water surface elevation of base flood (100-year) levels would potentially increase.

Modeling was completed to compare the Rowdy Creek and Dominie Creek water surface elevation profiles between existing and predicted conditions (see Figure 9-4 and Figure 10-2 excerpted below from Appendix C – Basis of Design Report [GHD and Michael Love & Associates 2018b]).Note that the Main Channel Distance (ft) values shown on Figure 9-4 and Figure 10-2 align with the thalweg values shown on pages C-102 and C-103 in Appendix B – Final Design Plans (GHD and Michael Love & Associates 2018a).

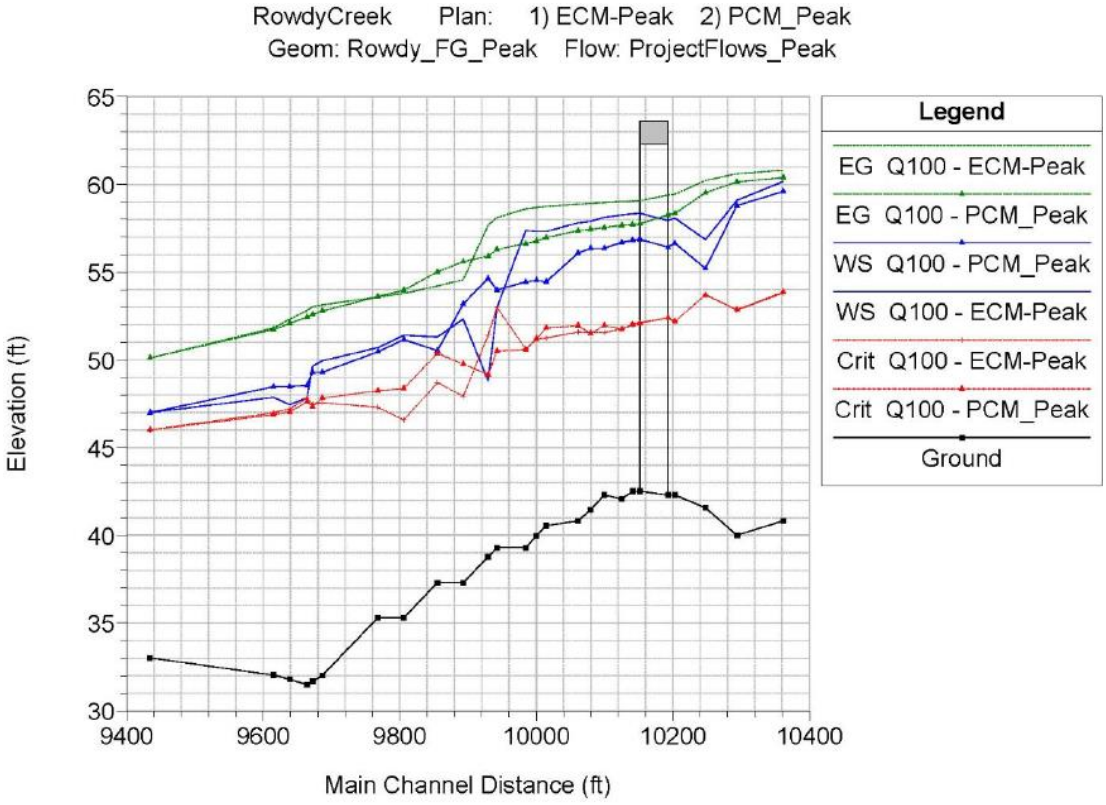


Image 4-1. Rowdy Creek Existing and Post-Project Water Surface (WS) Elevations Through Project Reach and Under Highway 101[2]

In Rowdy Creek, at the furthest downstream end of the Project Area, the proposed Project conditions model indicates a slight rise (maximum ~0.8 feet) in the water surface elevation profile from

[2] Each column represents 40 feet. Note the Existing Conditions Modeling (ECM) is a blue straight line, and the Proposed Conditions Modeling (PCM) is a blue line with notches. The vertical symbol at approximately 10,160 feet is the Highway 101 bridge.

approximately 9,400 to 9,680 feet (which is 760 to 480 feet downstream of the existing Highway 101 bridge). Within this segment, water surface elevation peaks at elevation 49 feet, which is attributed to the proposed slightly elevated channel bed and the increased roughness. Although a rise is predicted, the flow would remain contained within the banks (see page C-102 in Appendix B (Final Design Plans) and note that the topographical values max out at an elevation of 54 feet on the river bank).

Further upstream, from approximately 9,680 to 9,880 feet there is a predicted decrease in water surface elevation, however it follows the same general trajectory as existing conditions. At 9,880 feet the water surface elevation is predicted to peak at elevation 53 feet, which is within the channel banks.

Upstream from approximately 9,880 to 9,960 feet there is an increase in water surface elevation of approximately six feet to a maximum of 55 feet. This location is where the existing tailwater pool and weir are located, and will receive ESM to intentionally increase the channel bed elevation (see page C-103 in Appendix B). Flow in this location is anticipated to remain within the channel banks.

The water surface elevation within the furthest upstream segement (from approximately 9,960 to 10,360 feet) is predicted to be lower in elevation as compared to existing conditions, which is attributed to the decrease in the backwater effect caused by the existing weir. This segment of Rowdy Creek is ancitipated to remain within its banks.

Throughout the Project Area, the predicted conditions model indicates that the water surface profile will increase and decrease throughout the stream reach relative to the existing conditions. The downstream extent of area, which incorporates conditions upstream of it (including the increase in water surface elevation immediately downstream of the weir), is predicted to increase up to approximately 0.8 feet. This downstream extent continues to decrease and settle to the existing water surface elevation. Therefore, although there is a segment of the modeled Project reach that yields an increase in water surface elevation greater than 1.0 feet, which remains contained within the channel, the downstream extent of the entire modeled reach yields a predicted water surface elevation that is less than a 1.0 foot increase compared to existing water surface elevation.

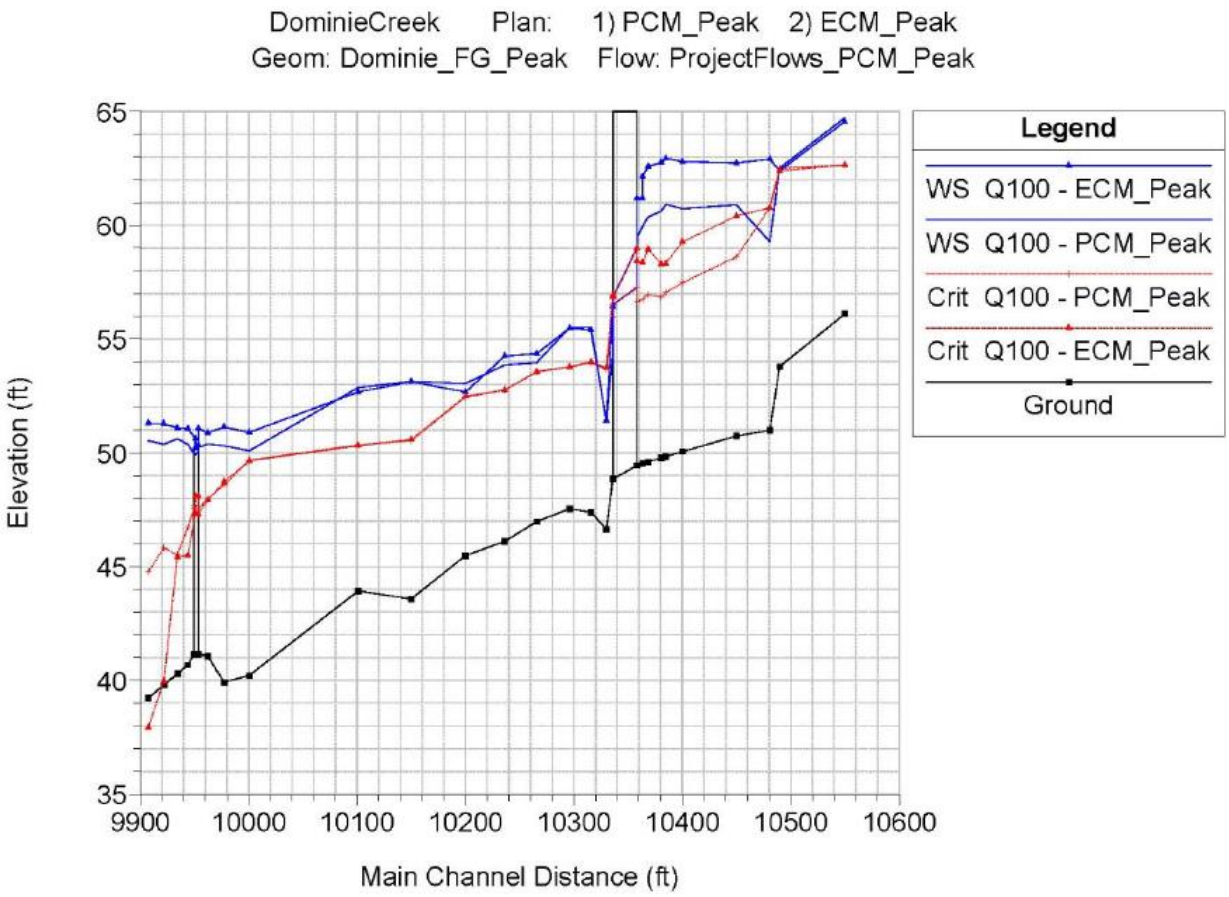


Image 4-2. Dominie Creek Existing and Post-Project Water Surface (WS) Elevations Through Project Reach and Under Hatchery Access Road Bridge[3]

With respect to Dominie Creek, the predicted conditions model indicates a decrease in water surface elevation of up to one foot from approximately 9,900 feet (the confluence with Rowdy Creek) to 10,080 feet, due to the removal of the concrete apron, and pier. Further upstream in the section of Dominie Creek between the upstream and downstream proposed work areas, which are outside of the Project Area, would remain unchaged. At the upstream portion of the Project Area (approximately 10,340 feet and above) the predicted water surface elevation decreases by approxiately three feet due to the removal of the existing sluice gate, fish ladder center wall and fish ladder from below the Hatchery Access Road bridge. According to the predicted conditions model, water surface elevation would decrease which aligns with FEMA parameters for development within a floodplain (44 CFR 60.3(c)(10)) (FEMA 2002). All flow is predicted to remain contained between the banks.

The Project would either replace or completely remove instream infrastructure. No new instream or riparian infrastructure is proposed that doesn't currently exist within Rowdy and Dominie Creeks, with the exception of the diversion housing which includes additional housing materials compared to what currently exists. The Project would not result in an increase to water surface elevation of base flood levels more than one foot at the downstream extent of each creek, and due to a net reduction in instream infrastructure would not impede or redirect flows more than existing conditions. A **less than**

[3] Each column represents 20 feet. Note that the Existing Conditions Modeling (ECM) is a blue line with notches, and the Predicted Conditions Modeling (PCM) is a blue straight line. The vertical symbol at approximately 10,350 ft is the Hatchery Access Road bridge, and the vertical symbol at approximately 9,950 feet is the concrete apron at the Dominie Creek/Rowdy Creek confluence.

significant impact would occur.

d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation? (No Impact)

As discussed in question (c), the Project is located in FEMA-designated special flood hazard zones (Zones A and AE), which states that no substantial improvement shall be permitted unless it is demonstrated that the improvement will not increase the water surface elevation of the base flood more than one foot (FEMA 2002). Modeling of the proposed Project yields water surface elevation of base flood levels would decrease in Dominie Creek, and would not increase more than one foot in Rowdy Creek at the downstream extent of the modeled area (GHD and Michael Love & Associates 2018b). The Project is located outside of the tsunami inundation map, approximately 1.25 miles east of the predicted tsunami inundation boundary (CEMA 2009). The Project is not in close proximity to a semi-enclosed waterbody, therefore there is no potential that the Project could increase risk of a seiche occuring. The Project would not exacerbate flood hazards, and is outside of tsunami and seiche zones, therefore there would be no increased risk of inundation and associated risk of pollutant release. **No impact** would occur.

e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan? (No Impact)

The Smith River watershed is not on the Clean Water Act 303(d) list of impaired water bodies. Therefore no water quality control plan specific to the Clean Water Act exists. The Project is located in a low and/or very low priority basin in relation to the Sustainable Groundwater Management Act (SGMA) (DWR 2020). Therefore, it is optional to develop a Groundwater Sustainability Plan; no such SGMA plan which includes the Project Area currently exists. The Project would result in a temporary pulse of sediment downstream of the Project Area after water is returned to the channel following construction. This temporary pulse of sediment would settle downstream and would not result in a permanent or consistent impact. The Project would improve hydrology through the installation of the roughened channel which would cause increased diversity of run, riffle and pool features. There would not be a conflict with policies related to hydrology and water quality listed in the Del Norte County General Plan because the Project would enhance the biological productivity of waters, and would comply with federal and state water quality standards. Therefore, **no impact** would occur.

4.11 Land Use and Planning

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?				✓
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?				✓

Environmental Setting

For the purposes of this Section, the study area is the same as the Project Area. The Project is located in the unincorporated community of Smith River, in Del Norte County, California. The Project's disturbance extent is up to 3.6 acres and includes approximately 675 feet of Rowdy Creek and 550 feet of Dominie Creek (115 feet near Hatchery Access Road bridge and 62 feet before confluence, and the area in between would be dewatered although no instream work is proposed), the adjacent riparian corridors and creek banks, access routes and staging areas. The Project area is bound to the east by former industrial land that is now vacant, to the north by a vacant commercial parcel, to the west by the Rowdy Creek Mobile Park and to the south by Rowdy Creek (see Figure 2 – Project Area). The Project Area is owned by the TDN, Smith River Fire Protection District, Green Diamond Resource Company and private property owners, and includes the assessor parcel numbers (APNs) listed below in Table 4.11-1.

a) Physically divide an established community? (No Impact)

The Project predominantly occurs within the instream portions of Rowdy and Dominie Creeks, and along the banks of both creeks. Site access is anticipated to occur through the Hatchery (owned by TDN), private property or via an easement owned by TDN, and would not result in a permanent division within the private property (see Section 2.4 for a description of Construction Site Access). A community exists west of the Project Area. All Project work, including equipment staging, would occur within the limits of the Project Area (see Figure 2). Operation, including Project maintenance, would remain within the boundaries of the Project Area and be conducted by Hatchery staff under the direction of TDN, during normal operational hours. **No impact** to the adjacent established community would occur from construction or operation of the Project.

b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect? (No Impact)

The Del Norte County General Plan was certified in January 2003 and guides land use decisions and development in Del Norte County through the use of land use designations, goals, policies, standards and implementation measures. Based upon land use designations, the County assigns zoning designations to lands to further guide land use and development. Figure 4.11-1 – Parcel and Zoning Overview, and Table 4.11-1 display the land use designations and zoning within the Project Area by APN.

Table 4.11-1. Land Use and Zoning Designations within the Project Area

APN	Ownership	Land Use Designation	Zoning Designation
103-080-043	TDN	Light Industrial	General Commercial (C-4)
103-080-026	TDN	Light Industrial	General Commercial (C-4)
103-080-028	Smith River Fire Protection District	General Commercial	General Commercial (C-3)
103-080-063	Private	General Industrial	Manufacturing (M)
103-080-056	Private	General Industrial	Manufacturing (M)
103-080-044	Private	General Industrial	Manufacturing (M)
103-072-002	Private	General Commercial	Central Business (C-2)
103-080-014	Private	General Industrial	Manufacturing (M)

Construction would occur within the instream portions of Rowdy and Dominie Creeks, which occur on APNs -043, -044, and -002, and predominantly along the river right banks of Rowdy Creek, located on APN 103-080-043, which is zoned General Commercial (C-4). Waterways are considered a public trust resource, regulated federally by the USACE and at the state level by the RWQCB under the Clean Water Act. Coordination with USACE and RWQCB to obtain Clean Water Act Sections 404 and 401 permits would be conducted, and permits would be obtained prior to construction to protect and disclose impacts to water resources.

According to Del Norte County zoning code, demolition and replacement of infrastructure and habitat improvement work are not listed as a permitted use under General Commercial (C-4) zoning designation. Therefore, it is expected that communication with Del Norte County may be necessary prior to construction on all non-tribally owned lands. Implementation of the Project would temporarily halt operations of the Hatchery, however would not modify long-term use of the Hatchery as compared to existing baseline use. The remaining parcels within the Project Area would be used for site access and/or staging, which would cause a temporary disruption in land uses for up to one construction season, but no long-term modifications to existing land uses. It is anticipated that private landowners whom allow staging and/or access via their property would be compensated for the inconvenience, and their property would be returned to pre-Project condition following construction. Therefore the Project would not conflict with the Del Norte County General Plan. The Project would not conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project that was adopted for the purpose of avoiding or mitigating an environmental effect. **No impact** would occur.

Operation of the Project would occur from the Hatchery, located on APN -043, and would not modify existing land uses. No operational impact would occur.

4.12 Mineral Resources

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
f) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				✓
g) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				✓

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area**.** Del Norte County has a wealth of mineral resources including rock, sand, gravel, chromium, gold and copper. Sand, gravel and rock are the primary type of product mined in Del Norte County (OMR 2012). Del Norte County has numerous records of abandoned mines, and one record of an intermittently operating mine (MSHA 2020). Mining provides an input of vital importance to a number of key activities in the construction industry, primarily the raw materials for concrete used in foundations. Mining materials are also used for road construction, maintenance, repair, timber operations and other important uses.

The closest permitted mining operation appears to be located along the Smith River approximately 3.5 miles south of the study area. According to an independently managed database of mining claims (Diggings 2020), there are two USGS record of mineral resources labeled as “Unnamed Gold Occurrence” and “Del Norte Camp Gold Mine” located approximately 3.25 miles west of the study area. It is unknown whether the USGS record of mineral resource locations have been mined recently.

a, b) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state, or a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan? (No Impact)

According to the Office of Mining and Reclamation (OMR) Lead Agency Review report for Del Norte County (OMR 2012) and independently operated mining claim database (Diggins 2020), there are no mining operations in the study area. There are no known mineral resources or USGS records within the Project footprint. The closest occurrence of intermittent mining activities is 3.5 miles south of the Project Area. Due to the absence of mining operations and identified mineral resources in the Project Area, construction and operation of the Project would have **no impact** on mineral resources.

4.13 Noise

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?			✓	
b) Result in generation of excessive groundborne vibration or noise levels?			✓	
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				✓

Environmental Setting

The study area for this Section includes the Project Area and adjacent lands to the west where a small residential neighborhood exists (Rowdy Creek Mobile Park) and may be impacted by construction or operational noise. The neighborhood is considered a sensitive receptor; of which approximately eight sensitive receptors are located approximately 90 feet away from the western edge of the Project Area, spanning from near the confluence to the downstream portion of the Project where the roughened channel is proposed. Existing noise sources in the Project vicinity are associated with Highway 101, the Hatchery, and Fred Haight Drive in the western vicinity of the Project. Noise sources include passenger vehicles, commercial trucks, and the use of pumps and other equipment at the Hatchery.

Sound (noise) levels are measured in decibels (dB), and community noise levels are measured in terms of A-weighted sound level. The A-weighted scale of frequency accounts for the sensitivity of the human ear, which is less sensitive to low frequencies and correlates well with human perceptions of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Equivalent noise level (Leq) is the sound level corresponding to the steady-state sound level containing the same total energy as a time-varying signal over a given period. Leq is designed to average all of the loud and quiet sound levels occurring over a time period.

a) Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? (Less than Significant Impact)

There will be a substantial temporary increase in ambient noise during construction due to the use of heavy equipment necessary to carry out the Project. The Project Area's zoning designations are presented in Table 4.11-1 – Land Use and Zoning Designations within the Project Area and Figure 4.11-1, and include General Commercial (C-3), General Commercial (C-4), Central Business (C-2), and Manufacturing (M). As mentioned above, a residential community exists within the study area, to the west of the Project Area.

According to the Del Norte County General Plan Policy 2.H.1, single and multi-family residential areas are considered to be "noise sensitive". Noise-related policies listed in the Del Norte County General Plan include Policies 2.H.3 and 2.H.4 below which are in relation to stationary noise sources, i.e. operational noise. There is no mention of policies regarding construction-derived noise in the Del Norte County General Plan.

> *Policy 2.H.3 – Stationary Noise*
>
> *Proposed projects which include potentially significant noise generation (i.e. with the potential to exceed the standards shown on Table 2-2) or development of new land uses adjacent to an existing or proposed stationary source of noise shall be required to submit a noise study that includes specific recommendations for mitigation. This policy does not apply to noise levels associated with agricultural and gravel extraction (but not processing) operations.*
>
> *Policy 2.H.4*
>
> *In the event that acceptable outdoor noise levels cannot be achieved by various noise mitigation measures, indoor noise levels for residential users should be designed to not exceed 45 CNEL/Ldn with windows and doors closed.*

Table 4.13-1 Maximum Noise Exposure for Noise Sensitive and Other Uses Due to Stationary Noise Sources (Hourly Leq in dB[1,2]) (Table 2-2)

Duration	Day (7 a.m. to 10 p.m.)	Night (10 p.m. to 7 a.m.)
Sensitive Land Uses		
Residential	62	57
Other Sensitive Land Uses	52	47
Other Land Uses		
Commercial Uses	62	57
Industrial and Heavy Commercial Uses	67	62

[1.] As determined at the property line of the receiver, when determining effectiveness of noise mitigation measures, the standards may be applied on the receptor side of noise barriers or other property-line noise mitigation measures.

[2.] Sound level measurements shall be made with the noise meter set to the slow response setting.

Table source: Mintier & Associates et al. 2003.

Equipment that may be used in Project construction is listed in Section 2.4 (Project Schedule and Equipment) and include excavators, backhoes, front end loaders, concrete saws, jackhammers, horizontal directional drills, winches, pumps, chainsaws, fork lifts, compactors, air compressors, generator sets, and pneumatic tools. Pile driving is not proposed under the Project. Typical noise

levels emitted by proposed equipment range from 74 dB to 89 dB (FHA 2017). It can be assumed that equipment will be operating continuously during construction hours (7:00 a.m. to 6:00 p.m. Monday through Friday and intermittently on weekends) from June 15 through October 15.

The closest sensitive receptor is approximately 90 feet west of construction work near the confluence of Rowdy and Dominie Creeks. Assuming the inverse square law, which states that a doubling of the distance from a noise source will reduce the sound by 6 dB, sound would be reduced by approximately 5 dB at 90 feet away (because the noise is measured at 50 feet from the noise source), and the existing riparian corridor would further attenuate an estimated 1-2 dB of noise. This distance would result in some noise attenuation, however noise levels at the sensitive receptors would range from approximately 68 dB to 84 dB which exceeds the maximum stationary noise levels presented in the Del Norte County General Plan. There are no policies regulating construction noise in the Del Norte County General Plan.

Typical activities at those noise levels include a normal conversation (60 dB), busy street traffic (70 dB), vacuum cleaner (80 dB), and a lawn mower (90 dB) (Caltrans 2021). Construction would be temporary, lasting up to four months, and would cease by 6 p.m. daily so as not to disrupt the evening and night timeframes. The property owner of the Rowdy Creek Mobile Park, where sensitive receptors occur, is aware of and supportive of the Project. Project operation would not modify noise levels from existing levels.

Due to the temporary nature of construction, Project support from the adjacent property owner, and absence of proposed changes to operational noise levels, this temporary increase in noise levels during Project construction is considered **less than significant**.

b) Result in generation of excessive groundborne vibration or noise levels? (Less than Significant Impact)

Excessive noise levels were discussed in question (a). Groundborne vibrations are likely to be experienced locally during use of the jackhammer, concrete saw and compactors during infrastructure demolition and installation of the roughened channel. Installation of replacement infrastructure is not anticipated to produce excessive groundborne vibration. Project activities will be short-term and temporary. Pile driving will not occur. Demolition will likely occur within approximately three weeks, and installation of the roughened channel will likely occur within two months. All construction work will occur within one construction season likely in either 2022 or 2023. The Project does not propose equipment which would create operational groundborne vibrations. Due to the short-term and temporary nature of Project construction activities, a **less than significant impact** relating to groundborne vibrations will occur.

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? (No Impact)

The Project is not located within the vicinity of a private airstrip or an airport land use plan, or within two miles of a public airport. The closest airport is approximately 11.5 miles from the study area. **No impact** would occur.

4.14 Population and Housing

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				✓
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?				✓

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. The Project Area is within the community of Smith River, a census-designated place that includes commercial and residential uses. The community of Smith River had a population of 868 in the 2010 census. The Rowdy Creek Mobile Park exists 50 feet west of the Project Area, and the larger community of Smith River extends beyond the mobile home park to the west. North, south and east of the Project Area consists of open space, with one residence located approximately 150 feet from the eastern access route, and a few commercial-related structures located 650 feet south of the Project Area.

a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? (No Impact)

The Project includes the demolition of instream hatchery-related infrastructure, installation of some replacement infrastructure and instream habitat improvement elements. The purpose of the Project is to improve volitional fish access to upstream Rowdy and Dominie Creeks beyond the Hatchery, while retaining operational function of the Hatchery into the future. The Project would not modify the scale of Hatchery production and therefore would not cause an increase or decrease in need for staffing. Project operation, including maintenance of replacement infrastructure, would be conducted by Hatchery staff during normal business hours. No housing is proposed under this Project, and no unplanned population growth is expected from construction and operation of the Project. Therefore, **no impact** would occur.

b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere? (No Impact)

No homes or people will be displaced as a result of Project construction or operation. Therefore, **no impact** will occur.

4.15 Public Services

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire Protection?				✓
Police protection?				✓
Schools?				✓
Parks?				✓
Other public facilities?			✓	

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. Public services in the vicinity of the Project are provided by Del Norte County and volunteers. Specifically, in the vicinity of the Project, police protection is provided by Del Norte County Sheriff's Office, and fire protection is provided by the Smith River Fire Protection District and the CAL FIRE Humboldt Del Norte Unit located in Crescent City. The Smith River Elementary School is located approximately 0.4 miles west of the Project Area. The closest park is approximately three miles west of the Project Area. A U.S. Postal Service office (Post Office) is located immediately north of the Project Area, along Hatchery Access Road which is the western access route and is within the Project Area. The western staging area (Potential Staging Area 2) is located approximately 100 feet east of the front of the Post Office. Five Post Office parking spaces located outside of the Project Area exist between the Post Office and the western staging area.

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for public services? (Less than Significant Impact)

The Project involves the construction and operation of infrastructure to improve fish passage at the Hatchery located on land owned by the TDN, a federally recognized tribe. The demolished and replacement infrastructure would occur within the Rowdy and Dominie Creek channels and along the western Rowdy Creek bank on TDN property. The existing land-based Hatchery buildings are outside of the Project Area and would not be modified under this Project. Police, ambulance and fire protection services are not expected to be affected by Project because Project activities do not involve

residences, businesses or situations where theft would typically occur. A qualified contractor that is trained in proper construction techniques and safety would carry out construction activities, and therefore police, ambulance and fire services are not expected to be needed. There is a chance for sparks to be generated during construction due to concrete work, however the contractor will have water onsite to extinguish any rogue sparks. The nearest school is 0.4 miles to the west and may be seasonally affected by the Project due to traffic calming measures on Highway 101 for construction equipment access, however the Project is not located along primary routes to the school beyond Highway 101. The nearest park is approximately three miles away and the Project would have no impact on park use.

The Post Office is located next to the western access route (Access Scenario 3) within the Project Area (see Figure 2). Due to use of the western access route for passenger vehicle access, equipment access and trucks to off-haul demolished materials and deliver construction materials, there is potential that congestion may occur at the Post Office. All Project-related machinery, vehicles and equipment would not block access to the Post Office building or to the parking spots outside the Post Office during construction. Although access to the Post Office would be retained throughout construction, additional traffic would be temporarily present along Hatchery Access Road. Therefore, a **less than significant impact** would occur.

Operation of the Project would include maintenance of proposed infrastructure. Operation would be conducted by Hatchery staff during regular business hours and would be similar to existing maintenance carried out. Therefore, there would be no substantial change above and beyond existing conditions during Project Operation. No operational impact would occur.

4.16 Recreation

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				✓
b) Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?				✓

Environmental Setting

For the purpose of this Section, the study area includes the Project Area and Hatchery. The Hatchery offers recreational opportunities to visitors, where they can see Chinook Salmon and Steelhead at various points in their life cycle. The closest park or other recreational facility is approximately 0.4 miles west of the study area.

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated? (No Impact)

The Project would demolish and replace instream infrastructure and install a roughened channel within portions of the Dominie and Rowdy Creek channels to improve aquatic habitat and fish access upstream. The Hatchery hosts tours and field trips to learn about Chinook Salmon and Steelhead. During Project construction, the Hatchery would be temporarily closed to the public. Operation of the Project would not result in modifications to the Hatchery's educational and community outreach programs. Therefore, construction and operation of the Project would not increase use of existing neighborhood or regional parks. **No impact** would occur.

b) Include or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment? (No Impact)

The Project does not include or require the construction or expansion of recreational facilities. Therefore, **no impact** would occur.

4.17 Transportation

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?				✓
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?				✓
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		✓		
d) Result in inadequate emergency access?		✓		

Environmental Setting

For the purpose of this Section, the study area is the same as the Project Area. The Project site is located just off of Highway 101, within the southeastern portion of the unincorporated community of Smith River. Highway 101 does not have any bicycle or pedestrian facilities on either side of the roadway. Existing access to the Project site and Hatchery is via Fred D. Haight Drive and Hatchery Access Road. Class II bike lanes and pedestrian facilities are located on both sides of N. Fred D. Haight Dr. During construction, access into the Project site will occur from one of two routes from the east, either from Highway 101 utilizing Caltrans' right-of-way into an easement held by the TDN along the eastern bank of Rowdy Creek (Access Scenario 1), or via Highway 101 directly into Potential Staging Area 1 (located on APN 103-080-044) which is adjacent to Rowdy Creek, or via an existing driveway located on APN 103-080-014 which would connect to Potential Staging Area 1 (collectively Access Scenario 2). Construction access from the west includes use of Hatchery Access Road and the existing Hatchery parking area (Access Scenario 3). A Caltrans Encroachment Permit will be attained should Access Scenarios 1 or 2 be implemented, due to use of the Caltrans right-of-way.

Redwood Coast Transit provides transit service to and from Smith River and Arcata. No stops are located within the Project Area, however the route would utilize Highway 101.

a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities? (No Impact)

Construction of the Project would result in a short-term increase in vehicle trips on roadways in the vicinity of the Project site, including N. Fred D. Haight Drive and Highway 101. The addition of construction-related traffic would occur during daytime hours between 7 a.m. and 6 p.m. and would not substantially affect congestion on local or state roadway segments because trips would occur at differing periods of the day and would represent a small percentage of the capacity of the roadways. Construction is not expected to require installation of utility improvements within Highway 101, other local roadways, or other public rights of way that could affect traffic access or flow.

Following construction, the Project would not result in an increase in vehicle trips associated with Hatchery operation, as the facility operations would remain equivalent to existing conditions. Because the proposed Project would not represent an increase in the intensity of the use taking place on-site, and would not require additional staffing or maintenance visits, no conflicts with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities, have been identified. Therefore, **no impact** would result.

See impact "c" below for a discussion of potential impacts relative to traffic hazards during construction.

b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)? (No Impact)

In November 2017, the Governor's Office of Planning and Research (OPR) released a technical advisory containing recommendations regarding the assessment of vehicle miles travelled (VMT). VMT refers to the amount and distance of automobile travel attributable to a project. The term "automobile" refers to on-road passenger vehicles, specifically cars and light trucks.

The movement of heavy trucks and equipment associated with the construction of the Project is not considered for the purposes of determining transportation impacts under this section. Project operation is not expected to increase VMT because the upgrades to the Hatchery would not necessitate increasing the number of staff nor would they create a reason for additional members of the public to visit the site. Therefore, the Project would not conflict with or be inconsistent with an applicable threshold of significance adopted per CEQA Guidelines section 15064.3, subdivision (b). **No impact** would result.

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? (Less than Significant Impact with Mitigation)

Construction

Construction of the Project would likely occur in 2022 or 2023 and would be completed over an approximately four month period (June 15 through October 15). The number of construction-related vehicles traveling to and from the Project site would vary on a daily basis. In addition to haul trucks, it is anticipated that construction crew trips would also be required to travel to and from the site on a daily basis. No construction activities would occur within roads or the public right-of-way, besides access. Depending on the access scenario implemented, the Project may temporarily modify driveway or roadway configurations, turning radii, or lane widths because trucks and/or other equipment would need to cross Highway 101 to access potential staging areas or the construction zone. This may result in a temporary incompatible use however, this potential impact will be **less than significant with mitigation**. See Mitigation Measure TR-1 below.

Operation

Operation of the Project would not include changes to the existing roadway system, nor would it require incompatible uses to utilize the roadways in the immediate vicinity of the Project site. Therefore, operation of the Project would nor create potential hazards due to geometric design features or incompatible uses. No impact would result in the operational phase.

Mitigation

Mitigation Measure TR-1 would reduce the temporary impact of construction activities on roadway functionality to a less-than-significant level by requiring the selected Project contractor to develop and implement appropriate traffic controls if Access Scenario 1 and/or 2 is implemented.

Mitigation Measure TR-1: Traffic Control Plan

If Project access involves Scenario 1 and/or 2, the selected Project contractor shall develop and implement a temporary Traffic Control Plan consistent with Caltrans standards to be used during construction. The Traffic Control Plan shall outline the work zones, activities, necessary traffic calming measures, and measures to ensure emergency access is retained. The Traffic Control Plan shall be submitted to Caltrans for review and approval prior to the start of construction.

d) Result in inadequate emergency access? (Less than Significant Impact with Mitigation)

All roadways would continue to be accessible during the construction phase. No lane closures or detours are proposed that could potentially compromise emergency access. However, the Project would require haul trucks to cross Highway 101 from Staging Area 3 to the Project site. If an emergency vehicle needs to access the Highway during this time, a potential delay could occur that could be considered significant. This potential impact will be addressed in the Traffic Control Plan, as required by Mitigation Measure TR-1. This potential impact is considered **less than significant with mitigation**.

Once construction is completed, the existing roadways, access routes, and adjacent driveways would continue to operate as under existing conditions. No impact to emergency access is anticipated to result during Project operation.

4.18 Tribal Cultural Resources

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a tribal cultural resource listed or eligible for listing in the California Register of Historic Resources, or in a local register of historic resources as defined in Public Resources Code section 5020.1(k)?				✓
b) Cause a substantial adverse change in the significance of a tribal cultural resource that is a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to the criteria set forth in subdivision (c) of the Public Resources Code section 5024.1? In applying the criteria set forth in subdivision (c) of the Public Resources Code section 5024.1, the lead agency shall consider the significance of the resource to a California Native American Tribe.				✓

Environmental Setting

For this Section, the study area includes the Project Area. Tribal cultural resources include resources that are of specific concern to California Native American tribes, with knowledge of such resources limited to tribal people. The study area is located in Tolowa Dee-ni' Nation ancestral lands. The Tolowa Dee-ni', like other northwestern tribes, used a variety of coastal and terrestrial resources to subsist and thrive in their territorial range. Particularly important resources include: salmon, deer, acorns and berries.

On April 19, 2021, the County of Del Norte notified California Native American tribes culturally affiliated with the study area in writing pursuant to CEQA and Public Resources Code (PRC) Section 21080.3.1 as provided by the Native American Heritage Commission (NAHC). Letters were sent to representatives of the Tolowa Dee-ni' Nation, Elk Valley Rancheria, and Karuk Tribe. No responses have been received to date, and no Tribes requested formal consultation for the Project.

See Section 4.5 – Cultural Resources for a summary of the cultural resources investigation conducted by Roscoe and Associates in the summer of 2020, and area of field investigation (note that Potential Staging Area 3 was added into the Project Area after tribes were consulted, however was included in the records database search). Due to the absence of responses from notified tribes, and absence of archaeological resources considered eligible for registration under the California Register of Historic Resources as reported in the cultural resources inventory and evaluation (Roscoe and Associates 2020), no tribal cultural resources are considered to be present in the study area.

a,b) Cause a substantial adverse change in the significance of a tribal cultural resource? (No Impact)

As noted above the cultural resources evaluation did not identify resources that meet the criteria of a tribal cultural resource, nor did any of the notified tribes respond to the letter sent to them regarding the Project. Potential Staging Area 3 is a former lumber mill and use of the area for staging would not result in excavation or permanent impacts to this area. Therefore, due to the absence of known tribal cultural resources, **no impact** will occur.

4.19 Utilities and Service Systems

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electrical power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?			✓	
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?				✓
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				✓
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?			✓	
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?			✓	

Environmental Setting

For the purpose of this Section, the study area includes the Project Area. Existing utilities and service systems within the study area include segments of piping for water conveyance which connect to the Hatchery facility. There is no electric service or infrastructure within the study area, however electricity is available at the adjacent Hatchery which is powered by photovoltaic panels and supplemented by Pacific Power. There is no potable water or wastewater utilities or telephone connectivity within the study area, however those services are available at the Hatchery office. There is wireless cell phone and internet service within the study area.

a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electrical power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects? (Less than Significant Impact)

The proposed Project does not include the construction of new or expanded wastewater treatment, stormwater drainage, electrical power, natural gas or telecommunication facilities. The Project would install new water diversion infrastructure and housing along Rowdy Creek (river right), upstream of the proposed fish trap. The diversion infrastructure and housing would replace the existing stilling well and pumps. Proposed diversion infrastructure would consist of two 15 horsepower submersible

pumps and housing for a third pump, fish screens, valves, pressure reducers, piping, a hydraulic brush screen cleaner, and metal grates on top. Each pump will have the capacity to pump approximately 2 cfs, for a total of 4 cfs, which is the approximate maximum water intake the existing Hatchery piping system can accommodate. If the full water right of 6 cfs is desired at a later date, an additional pump would be installed in the housing proposed under this Project. Additional piping would be installed within the Hatchery either at surface or subsurface level, and would be completed under a separate project. The new diversion infrastructure and housing would be installed when Rowdy Creek is dewatered.

An electrical control building is proposed in an area of uplands west of Rowdy Creek, to house connections between the proposed infrastructure to the Hatchery's electricity supply. Power for the building would come from the service panel located within the existing trough building (outside of the Project Area). Electricity demand will be similar to existing conditions. Installation of the electrical control building is intended to house connections, and would not substantially expand electricity use. Additionally, 75-80% of electricity at the Hatchery is sourced from renewable energy, thereby reducing this potential impact. Because the Project would not require or result in expansion of utilities, a **less than significant impact** would occur.

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years? (No Impact)

The Project would improve infrastructure to support Hatchery operations and improve habitat for aquatic species. The Project does not propose to create new sources of water, such as a new well or new diversion, rather the only component of the Project that relates to water supply is the proposed replacement diversion infrastructure and housing. The proposed diversion infrastructure and housing would replace the existing stilling well and pumps, but would not modify the source of water rather just the equipment necessary for the diversion. TDN may choose to increase their water diversion to utilize their full water right (6 cfs) in the future, independent of this Project. If that were to happen additional piping would be required as mentioned above. The Project does not propose to modify water usage, rather would modify diversion equipment. The water diversion supports operation of the Hatchery, which has been in consistent operation since 1972, and no changes to the rate or diversion is proposed under the Project. Therefore, it is anticipated that there will be adequate water supplies to serve the Project. **No impact** would occur.

c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments? (No Impact)

No wastewater services are proposed under the Project. A porta potty is anticipated to be utilized during construction, which will be serviced in accordance with the supplier's schedule. Because the Project does not propose wastewater services, **no impact** would occur.

d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals? (Less than Significant Impact)

The California Integrated Waste Management Act (CIWMA), also known as Assembly Bill 939, required each jurisdiction in the State to divert 50% of its solid waste from landfill or transformation facilities by 2000, and established a statewide diversion of 75% by 2020 for all municipal solid waste. The CIWMA also required each County to prepare a Countywide Integrated Waste Management

Plan, which is the main planning document for solid waste management in each County. The Plan states a disposal target of 4.0 pounds per capita per day, as noted in comments on the five year review of the Plan (Solid Waste Task Force 2019). A copy of the Plan was requested numerous times, however was not delivered to GHD. The Del Norte County Solid Waste Management Authority is the principal planning entity for solid waste management in the County, addressing source reduction, household hazardous waste, and countywide landfill capacity needs.

Construction of the Project would include demolition of up to approximately 1,000 cubic yards of infrastructure listed in Section 2.1. The infrastructure to be demolished would predominantly consist of concrete with some metal fixtures, such as the picket fence and sluice gate. The demolished materials would be brought to an appropriate disposal facility such as a land fill estimated to occur within 20 miles of the Project. Demolition of the infrastructure would be a one-time activity under this Project, and would not be recurring. Trash generated by construction workers would be disposed of in garbage and recycling bins either at the Hatchery or set up within the construction area. No other construction-related waste is anticipated.

Operation of the Project would not result in waste because the Project proposes to demolish and replace infrastructure and improve habitat conditions via a roughened channel, and does not include public access or the generation of products or goods that could become waste. Public access to the Hatchery would continue independent of this Project and the Project does not pose any changes to existing public access. Due to the temporary, one-time nature of waste generation during construction, absence of waste generation during operation, a **less than significant impact** would occur.

e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste? (Less than Significant Impact)

No toxic waste would be generated from construction or operation of the Project. Asbestos was not identified in the materials proposed for demolition and removal (GHD 2020b). The Project will adhere to policies listed in the Del Norte County General Plan related to solid waste disposal. These policies include:

> *Policy 7.D.1. The County shall direct the solid waste management agency in ensuring that solid waste facilities do not violate State standards for contamination or surface or groundwater.*
>
> *Policy 7.D.3. The County should seek funding to accommodate alternative disposal methods.*
>
> *Policy 7.D.4. The County shall promote, in conjunction with the solid waste management agency, maximum use of solid waste source reduction, recycling, composting, and environmentally safe transformation of wastes.*
>
> *Policy 7.D.5. The solid waste management agency in conjunction with the County of Del Norte shall require that all new development complies with applicable provisions of the Del Norte Integrated Waste Management Plan.*

The Project would result in a temporary large amount of solid waste (up to 1,000 cy). This waste would not contain toxic waste or asbestos and would adhere to state and local management and reduction statutes as listed in the General Plan. Due to the temporary large amount of solid waste, a **less than significant impact** would occur.

4.20 Wildfire

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?				✓
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?				✓
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?				✓
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides as a result of runoff, post-fire slop instability, or drainage changes?				✓

Environmental Setting

For the purpose of this Section, the study area includes the Project Area and adjoining properties that could feasibly be impacted should a wildfire occur within the Project Area. The study area includes the instream portions of Rowdy and Dominie Creeks, riparian corridor along Rowdy Creek, a vacant field surrounded by development, a meadow surrounded by shrubs and trees, adjacent areas of Highway 101, the vacant former industrial area east of Highway 101, the Hatchery, and residential and business structures immediately west of the Project Area.

The majority of the study area is located within a Local Responsibility Area (LRA) and is therefore within the service area of the Smith River Fire Protection District (SRFPD). The SRFPD provides fire protection and emergency response services to the Smith River community, including responding to motor vehicle accidents, rescue calls, and incidents involving hazardous materials. The portion of the study area along and east of Highway 101 is within the State Responsibility Area (SRA) and therefore within the service area of the California Department of Forestry and Fire Protection (CAL FIRE). Highway 101 acts as the boundary between the LRA, to the west, and the SRA, to the east.

The SRFPD has two stations: Station #1 is located adjacent to the Project Area, and Station #2 is located in Hiouchi, approximately 10.5 miles from the Project. The SRFPD participates in countywide emergency response coordination and planning, and has mutual aid agreements with all of the fire protection districts in Del Norte County, as well as Crescent City Fire, the National Park Service, CAL

FIRE, the U.S. Forest Service, the Smith River Rancheria, Pelican Bay Prison, and Harbor Fire and Brookings Fire in Oregon (Del Norte LAFCO 2015).

CAL FIRE is responsible for the suppression of wildland fires within SRAs. Approximately 64% of the District area and 80% of the sphere of influence areas are located within a designated SRA. CAL FIRE stations are staffed during declared fire season, typically June to October, and engines may respond to calls other than wildland fires if they are available and the call will not affect their core responsibilities. Although the State is responsible for wildland fire suppression within the SRA, CAL FIRE relies on local fire departments to respond to such incidents and provide initial attack to ensure that the fires are suppressed at the earliest possible stage.

In 2017 there was a fire in the vicinity of the Project which destroyed several buildings. The fire was extinguished in a coordinated fashion between four fire districts, including the SRFPD (LoCo 2017).

a) Substantially impair an adopted emergency response plan or emergency evacuation plan? (No Impact)

The Project would be subject to the Del Norte Fire Safe Plan and Del Norte County General Plan. The Fire Safe Plan identifies risks and mitigations to reduce risks from wildfire in Del Norte County and provides residents with a step-by-step guide on how to fire-safe their homes, structures, and community, and how to best deal with an impending wildfire (Del Norte Fire Safe Council 2005). The General Plan lists policies to prevent and minimize the risk of loss of life, injury, and property damage resulting from unwanted fires (Mintier & Associates et al. 2003). Policies which pertain to the proposed Project include the application of the Uniform Fire Code for new roads or other development that is also consistent with the Public Resources Code Fire Safe Standards, avoidance or review of development in areas identified as high or extreme fire hazard areas, review of projects before approved to ensure adequate fire-fighting services are available, and the requirement that development within SRAs conform to the fire safe standards adopted by the County and approved by the CAL FIRE (Mintier & Associates et al. 2003).

The Project involves the demolition and replacement of instream infrastructure and habitat improvements, and does not propose any modifications to existing adopted emergency response or evacuation plans. Ingress and egress access would be maintained throughout construction, and Project operation would uphold existing emergency and evacuation routes. Proposed development includes equipment to support ongoing Hatchery operations and would utilize existing fire protection water supplies, which are presumed to be in conformance with the Uniform Building Code. The Project Area is predominantly located in a high fire hazard area, and partially within a very high fire hazard area east of Highway 101 (CAL FIRE 2008). The Project includes infrastructure to improve function of the existing Hatchery and would not exacerbate fire risk above and beyond existing conditions. The Project would not modify use of the Hatchery above and beyond existing use, and the need for fire-fighting services would not change. Therefore construction and operation of the Project would not substantially impair, or alter, an adopted emergency response or evacuation plan. The Project would have **no impact** on emergency response or emergency evacuation plans.

b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire? (No Impact)

The Project is centered around segments of Rowdy and Dominie Creeks in a relatively flat area. The Project would not permanently modify or otherwise affect slope, however may include the placement of rock to support access of construction equipment that could temporarily modify slopes adjacent to Rowdy Creek. Should this occur, rock would be removed and existing slopes would be restored

following construction. Modifications to subsurface instream channel bed is planned to occur, however such changes would have no effect on wildfire risk. With incorporation of Environmental Protection Action 2 – Construction BMPs, the potential fire risk of equipment sparking a wildfire in long grasses would be avoided because grasses would be mowed prior to construction, and risk of wildfire from rogue sparks would be avoided by requiring the contractor to perform demolition and any necessary work that could produce sparks with extreme caution. The prevalence of prevailing winds would remain unchanged during Project construction and operation. Because the Project would not permanently modify slope or have an effect on prevailing winds, the wildfire risk would remain unchanged. **No impact** would occur.

c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment? (No Impact)

Existing roads which also serve as fuel breaks (Hatchery Access Road, Fred Haight Blvd., Highway 101), energy infrastructure, utilities and emergency water sources would continue to service the Project during construction and operation. No additional infrastructure to protect against wildfire is proposed or is reasonably foreseeable due to construction and operation of the Project. Therefore, **no impact** would occur.

d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides as a result of runoff, post-fire slop instability, or drainage changes? (No Impact)

Construction and operation of the Project would not exacerbate fire risk above and beyond existing fire risk (see above). The Project involves demolition and replacement of instream infrastructure and installation of a roughened channel to improve habitat conditions and fish access upstream. The proposed Project elements do not include land-based changes to drainage pathways into Rowdy or Dominie Creeks, such as stormwater improvements. Minor instream drainage changes are expected via the demolition of instream infrastructure that is not planned for replacement, such as proposed work in Dominie Creek at the Hatchery Access Road bridge and confluence. None of the infrastructure proposed for removal currently acts as a complete barrier to flow (see Images 1-4, 1-5 and 1-6). The sluice gate acts as the most substantial impediment to flow when it is positioned to intentionally block flow, however even then it is not completely blocking flow (see Image 1-5). Additionally, modeling of post-Project conditions indicate that implementation of the Project would not result in an increase to water surface elevation of base flood levels more than one foot at the downstream extent of each creek (GHD and Michael Love & Associates 2018b) which is in compliance with FEMA regulatory floodway code (44 CFR 60.3). Therefore construction and operation of the Project would not expose people or structures to significant risks resulting from post-fire slope instability because the Project would not exacerbate fire risk, or to downstream flooding due to drainage changes because drainage would only change minimally and the site is relatively flat. **No impact** would occur.

4.21 Mandatory Findings of Significance

	Potentially Significant Impact	Less-than-Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		✓		
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			✓	
c) Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly?		✓		

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory? (Less than Significant Impact with Mitigation)

Construction and operation of the Project will substantially increase volitional fish passage opportunities for ESA-listed Coho Salmon and other anadromous salmonids and will improve the quality of the aquatic environment as compared to existing conditions. The predominant environmental impacts include dewatering and species relocation, which has the potential to stress and lead to take of fish and other relocated species, removal of riparian vegetation to allow construction access, and noise. The portions of the riparian corridor that may be removed would be replanted with California-native grass and tree species (as shown on page V-101 of Appendix B). Noise impacts will be temporary and will occur during the stated construction timeframe, for a single construction season which is necessary to implement this Project. Noise impacts will not persist following construction.

Although the Project will have construction-related impacts to wildlife, vegetation, air quality, energy resources, hazardous materials, hydrology, noise, and transportation, and potential impacts to cultural and paleontological resources, these impacts will be reduced to a less than significant level with implementation of the following Mitigation Measures:

- AIR-1: Best Management Practices to Reduce Air Pollution;
- BIO-1: Pre-construction Botanical Survey;
- BIO-2: Protect Special-status Bats;
- BIO-3: Protect Special-status, Migratory, and Nesting Birds;
- BIO-4: Protect Special-status Amphibians and Reptiles;
- BIO-5: Seasonal Work Windows;
- BIO-6: Native Aquatic Species Relocation;
- BIO-7: Dewatering;
- BIO-8: Rewatering;
- CR-1: Inadvertent Discovery of Archaeological Material;
- CR-2: Inadvertent Discovery of Human Remains;
- GEO-1: Protect Paleontological Resources During Construction;
- HAZ-1: Protection of Waters from Hazardous Materials;
- HYD-1: Construction Methods to Ensure Proper Flow Pathways;
- TR-1: Traffic Control Plan;
- Environmental Protection Action 1: Stormwater Pollution Prevention Plan (SWPPP); and
- Environmental Protection Action 2: Construction BMPs

With incorporation of the mitigation measures and environmental protection actions listed above, impacts will be reduced to a less than significant level. Operation of the Project will not degrade the quality of the environment. The Project will significantly benefit special-status and threatened aquatic species, via the upstream access that will be restored to anadromous species. The impacts will be **less than significant with mitigation**.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)? (Less than Significant Impact)

Cumulative impacts are defined as "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts" (CEQA Guidelines Section 15355). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The following agencies were contacted to discuss nearby projects that may, in addition to the proposed Project, cause a cumulative environmental impact: Del Norte County, Caltrans, the National Park Service and City of Crescent City. Efforts to identify cumulative projects included outreach to the TDN (Project sponsor), Del Norte County (CEQA Lead Agency), and Caltrans. Projects considered in cumulative impact analysis are shown below in Table

4-21.1. Single-family homes and other similar small-scale projects were not included because of their negligible contribution to cumulative effects.

Table 4.21-1. Projects Considered for Cumulative Impact Analysis

Project Name	Project Description	Estimated Construction Schedule	Project Location
Dominie Creek Fish Passage	Removal of box culvert which serves as an obstruction to fish passage, and replacement with a full span bridge.	Fall 2020 begin construction, fish relocation summer 2021. Project completed as of May 2021.	Highway 101 and Dominie Creek, approximately 200 feet upstream of the Project.
Recirculation Tank Installation	Installation of recirculation tanks at the Hatchery to support operations.	Fall 2021	At Hatchery, near Potential Staging Area 2.
Dr. Fine Bridge	Bridge replacement over Smith River on Highway 101.	October 2021 through 2025 (estimated)	Approximately 3.5 miles south of the Project, located along the Smith River.
Road widening near Fort Dick	Approximately 0.8 miles of road widening along Highway 197.	Currently on hold due to litigation	Approximately 6.25 miles south of the Project, located near the Smith River.
Road widening at Ruby Van Deventer Park	Road widening to improve park ingress and egress.	Currently on hold due to litigation	Approximately 5.5 miles south of the Project, located near the Smith River.
Jedediah Smith Redwoods State Park Culvert Replacement	Culvert rehabilitation on tributary drainages to the Smith River.	May 2021 through October 2022 (estimated)	Northern portion of Jedediah Smith Redwoods State Park along Highway 199, approximately 8.25 miles south of the Project.
Highway 199 Culvert Rehabilitation	Culvert rehabilitation on tributary drainages to the Middle Fork Smith River.	May 2021 through October 2021 (estimated)	California/Oregon border to Hiouchi, along the Middle Fork Smith River located approximately 9.75 miles south of the Project.
Redwoods Rising: Mill Creek Ecosystem Restoration Project	CA Dept. of Parks and Recreation and the National Park Service under the banner of Redwoods Rising,	Project is in the planning phase.	Located in Del Norte Coast Redwoods State Park (DNCRSP) and a portion of Redwood National Park, within the Mill Creek

Project Name	Project Description	Estimated Construction Schedule	Project Location
	propose to rehabilitate 34,080 acres within the greater Mill Creek area. Project components will include: vegetation management actions including forest thinning, snag creation, crown manipulation, tree planting, manual and mechanical vegetation removal, and fuels reduction. Abandoned logging roads and related infrastructure will be removed. Aquatic restoration will include placement of large wood in streams to enhance habitat and stream function.		watershed, which is north of the Prairie Creek watershed, and drains to the Smith River.
Crescent City ADA Project	Highway improvements to meet ADA requirements	Spring 2021	Southern Crescent City, approximately 12 miles south of the Project.
Panther and Hunter Creek Bridge Replacement	Replacement of bridge	December 2018 to December 2021	Near mouth of Klamath River, approximately 26 miles south of the Project.

Resource categories that were deemed to have no impact on the environment are not considered in cumulative impact analysis because construction and operation will yield no impact that could contribute cumulatively. Resource categories that will yield no impact on the environment (and which are not considered in cumulative impact analysis), include: Land Use and Planning, Mineral Resources, Population and Housing, Recreation, and Wildfire.

Aesthetics. As discussed in Section 4.1 – Aesthetics , the Project will have less than significant short-term impacts on the existing visual character of Project Area visible from Highway 101 during construction due to the occurrence of construction activities and the presence of staging areas. Nearby projects that could cumulatively affect aesthetics include the Dominie Creek Fish Passage, Recirculation Tank Installation and the Dr. Fine Bridge Project. The Dominie Creek Fish Passage project is completed and will not cumulatively contribute to aesthetic impacts, the Recirculation Tank Installation Project is expected to be completed by October 2021 and therefore will not cumulatively adversely affect aesthetics. The Dr. Fine Bridge Project is located 3.5 miles south of the Project, and

is adequate to spatially separate to avoid cumulative impacts to aesthetics. The Project will be constructed in a single construction season, and therefore will only overlap with the Dr. Fine Bridge Project construction which will last for one season. Operationally, there will be no impact because construction equipment will not be onsite. Cumulative construction-related and operational aesthetics impacts will be less than significant.

Agriculture and Forest Resources. As discussed in Section 4.2 – Agriculture and Forest Resources, up to 0.40 acres of riparian vegetation may be removed under the Project, which would be replanted. No impacts will occur to agriculture resources and are therefore not discussed further. No projects listed above, with the exception of the Dr. Fine Bridge Replacement Project, involve substantial riparian vegetation removal. The Dr. Fine Bridge Replacement Project would result in up to four acres of temporary impacts, and less than 0.300 acres of temporary impacts to riparian habitat. As is standard, any riparian vegetation removal would be replaced with appropriate species, and the Dr. Fine Bridge Replacement Project includes a mitigation measure (Riparian-1) in its Environmental Impact Report (EIR) explaining proposed revegetation (Caltrans 2020). Therefore, the Project would not cumulatively contribute to adverse impacts to forest resources. Cumulative construction-related and operational impacts to forest resources will be less than significant.

Air Quality, Energy, and Greenhouse Gases. Implementation of the proposed Project in addition to all projects listed above would result in air quality, energy, and greenhouse gas emission-related impacts. However due to the temporal and spatial sequencing of the projects, i.e. they will not all occur in one single season, the air quality, energy, and greenhouse gas emissions will be below applicable thresholds for a potentially significant impact. None of the projects listed above (with the exception of the Recirculation Tank Installation Project) would require substantial operational energy inputs (and thus result in emissions), besides regular maintenance. The Hatchery sources approximately 75-80% of their electricity from renewable resource (photovoltaic panels), and therefore operation of the proposed Project and the Recirculation Tank Installation Project would not result in emissions that exceed applicable thresholds. Thus, the cumulative construction and operation emissions and energy consumption of the projects would remain below applicable thresholds and would remain less than significant.

Biological Resources. The proposed Project in addition to the Highway 199 Culvert Rehabilitation, Jedediah Smith Redwoods State Park Culvert Replacement projects and the completed Dominie Creek Fish Passage Project are anticipated to have short term adverse impacts on aquatic species due to either species relocation or temporary instream sediment pulses. These adverse impacts are short term, and measures will be put in place to reduce adverse environmental impacts in accordance with each project's permits. Implementation of these projects will ultimately benefit aquatic biological resources through properly functioning culverts, reduction in long-term sediment deposition, and improved fish access via the removal of barriers. The Dr. Fine Bridge is anticipated to yield impacts to biological resources, however the project will comply with mitigation measures stated in its EIR, and permit conditions from resource agencies to minimize environmental impacts. Other project listed are either on hold or are outside of the Smith River watershed. Operation of all projects listed, in addition to the proposed Project, above will not adversely impact biological resources. Cumulative construction-related and operational impacts to biological resources will be less than significant.

Cultural and Tribal Cultural Resources. By their nature, cultural and tribal cultural resources are site-specific. Historic and cultural resource investigations would be completed for all projects listed above, including required consultation with affected tribes, to identify any cultural or historic resources present on either site. All projects would include standard measures for inadvertent discovery and reporting. As a result, any cumulative impact would remain less than significant.

Geology and Soils. All projects listed above, in addition to the proposed Project, will utilize construction BMPs to minimize sediment delivery into receiving waterways, in accordance with each project's permits. The projects involve infrastructure improvements to mitigate risk for environmental impacts such as mass wasting or large scale erosion. The listed projects would not increase the risk of seismic activity or related hazards, such as tsunamis or liquefaction. While construction of many of the projects listed above would require excavation, grading, and soil relocation, incorporation of BMPS would ensure sediment related impacts were avoided. Any cumulative impact would be less than significant.

Hazards and Hazardous Materials. None of the projects listed above in addition to the proposed Project would result in a significant impact related to hazards and hazardous materials. All projects would incorporate standard BMPS for spill prevention and response, including avoidance of refueling and equipment maintenance near Waters of the U.S. or perennial wetlands. The proposed Project will comply with spill prevention measures, as required by Mitigation Measure HAZ-1, and will prevent dust that could potentially contain naturally occurring asbestos, as required by Mitigation Measure AIR-1, thereby reducing any potential asbestos-related impact. Any cumulative impact would be less than significant.

Hydrology and Water Quality. All projects listed above, including the proposed Project, that occur near waterways will incorporate construction BMPS to prevent or reduce entry of fine sediment (from erosion) to receiving waterways. Some unavoidable impacts to water quality are anticipated, such as those associated with bridge replacement projects were dewatering is not possible. However due to the spatial and temporal sequencing of the projects, implementation of the proposed Project would not result in a cumulative adverse impact exceeding water quality standards. Operation of all projects listed above would not adversely affect hydrology or water quality. Cumulative construction-related and operational impacts to hydrology and water quality will be less than significant.

Noise. Projects located near the proposed Project which could contribute noise include the Dominie Creek Fish Passage and Recirculation Tank Installation projects. Both of these projects are anticipated to be completed by the time the proposed Project will be constructed. Therefore the temporary noise associated with the proposed Project would not cumulatively contribute to other construction-related noise sources. The Recirculation Tank Installation Project will involve the use of pumps, however the pumps will be housed within the Hatchery and will replace existing pumps. Operation of the two projects in the vicinity of the proposed Project will not produce noise above and beyond existing conditions. Other projects listed above are not located in the vicinity of the proposed Project and would not cumulatively contribute to noise impacts. Cumulative construction-related and operational noise impacts will be less than significant.

Public Services. Of the projects listed above, the long-term projects (greater than one construction season) are not located near a government facility, rather they are located on a bridge. Therefore, although some projects may occur near a government facility, such as the U.S. Postal Office (as is the situation under the proposed Project), any potential congestion or increased wait time would be minimal. The proposed Project will have no impact on response time for public services, such as fire or police protection, and therefore is not considered in cumulative impact analysis. Cumulative construction-related and operational impacts to public services will be less than significant.

Transportation. Of the projects listed above, three are within 3.5 miles of the proposed Project. The Dominie Creek Fish Passage Project is completed and therefore will not cumulatively affect transportation under the proposed Project. The Recirculation Tank Installation Project is anticipated to be completed prior to construction of the proposed Project and would not cause a cumulative impact to transportation. The Dr. Fine Bridge Replacement Project is located 3.5 miles south of the

proposed Project, and will involve the use of traffic control. Due to the distance and rural character of the Project vicinity, it is not expected that traffic control measures implemented under the proposed Project and the Dr. Fine Bridge Project will result in substantial delays, however some congestion may occur. The proposed Project will be constructed in one season, and therefore any congestion or delays would be short term. Operation of the proposed Project will have no impact on transportation. Cumulative construction-related and operational transportation impacts will be less than significant.

Utilities and Service Systems. The projects listed above will involve some degree of demolition and disposal which has the potential to overwhelm local disposal facilities. The majority of the projects listed above are Caltrans projects, which typically plan disposal of their materials far in advance. Additionally, the temporal sequencing of projects will likely relieve congestion at disposal facilities. Operation of the proposed Project will not result in the need of utilities of service systems or involve disposal of refuse. Cumulative construction-related and operational utilities and service system impacts will be less than significant.

c) Does the project have environmental effects which would cause substantial adverse effects on human beings, either directly or indirectly? (Less than Significant Impact with Mitigation)

As described in Section 2 – Project Description, the Project is a habitat enhancement project designed to improve ecological processes. The most substantial environmental effects that could affect humans include noise and potential asbestos exposure. Noise impacts will be temporary (one season) and will occur within the designated daily construction timeframe, and are therefore not considered to have a substantial adverse effect. Potential adverse impacts related to asbestos exposure will be mitigated through the prevention of dust via site watering (Mitigation Measure AIR-1), and therefore will not create a substantial adverse effect on humans. All potential impacts have been reduced to a level that will be less than significant with the implementation of appropriate mitigation measures. The Project will be implemented in accordance with federal, state and local environmental regulations and therefore will not cause a direct or indirect substantial adverse effect on humans. There will be **less than significant impacts with mitigation.**

5. References

California Department of Fish and Wildlife (CDFW). 2002. California Salmonid Stream Habitat Restoration Manual.

California Department of Fish and Wildlife (CDFW). 2020. California Natural Diversity Database. Available at: https://wildlife.ca.gov/Data/CNDDB

California Department of Forestry and Fire Protection (CALFIRE). 2008. Fire Hazard Severity Zones Maps. Available at: https://osfm.fire.ca.gov/divisions/wildfire-planning-engineering/wildland-hazards-building-codes/fire-hazard-severity-zones-maps/

California Department of Transportation (Caltrans). 2017. California Scenic Highways. ArcGIS map viewer. Available at: https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=f0259b1ad0fe4093a5604c9b838a486a

California Department of Transportation (Caltrans). 2020. Dr. Fine Bridge Replacement Project. Final Environmental Impact Report/Environmental Assessment with Finding of No Significant Impact. March. Available at: https://files.ceqanet.opr.ca.gov/83208-5/attachment/W7IhHHQzbqj4Jfhz5dmUhYm6yp3XVYqOuJ057iSXeH-OET9B3nbtHkempVB_w0dKZnS1Ajdo5wUokmTW0

California Department of Transportation (Caltrans). 2021. Typical Noise Levels, Intensity and the Decibel Scale. Available at: https://dot.ca.gov/programs/maintenance/pavement/noise-levels

California Emergency Management Agency (CEMA). 2009. Tsunami Inundation Map for Emergency Planning. Smith River Quadrangle. March.

D.J. Warren & Associates, Inc. (DJWA) and Meridian Environmental, Inc. 2018. Rowdy Creek Fish Hatchery Infrastructure and Operations Report. Prepared for the Tolowa Dee-ni' Nation. January.

Del Norte County. 2018. Continuity of Operations Plan. September.

Del Norte County. 2020. Del Norte County Code, 20 – Zoning. Available at: http://ccode.dnco.org/?Title=20&Chapter=29&Section=20

Del Norte Fire Safe Council. 2005. Del Norte Fire Safe Plan – Community Wildfire Protection Plan. Available at: https://www.fs.usda.gov/nfs/11558/www/nepa/48363_FSPLT2_291808.pdf

Del Norte Local Agency Formation Commission (Del Norte LAFCO). 2015. Countywide Fire Services Municipal Service Review & Sphere of Influence Update.

Department of Water Resources, State of California (DWR). 2020. Sustainable Groundwater Management Act prioritization map.

Diggings. 2020. Independent Mine Claim map. Available at: https://thediggings.com/usa/california/del-norte-ca015/map

Federal Emergency Management Agency (FEMA). 2002. CFR, Title 44 Emergency management and Assistance, Part 60 Criteria for Land Management and Use. Technical Report.

Federal Emergency Management Agency (FEMA). 2021. National Flood Hazard Layer FIRMette.

Federal Highway Administration (FHA). 2017. Construction Noise Handbook. U.S. Department of Transportation. Available at: https://www.fhwa.dot.gov/Environment/noise/construction_noise/handbook/handbook09.cf

m

GHD and Michael Love & Associates. 2015. Rowdy Creek Fish Passage Improvement Project Final Feasibility Study. Technical Report.

GHD and Michael Love & Associates. 2018a. 100% Design Plans. Rowdy and Dominie Creek Fish Passage Improvement Project. August. Prepared for the Tolowa Dee-ni' Nation.

GHD and Michael Love & Associates. 2018b. Dominie and Rowdy Creek Fish Passage Improvement Project. Final Basis of Design Report. August. Prepared for the Tolowa Dee-ni' Nation.

GHD. 2018c. Geotechnical Investigation for the Rowdy Creek Fish Passage Improvement, Del Norte County, California. Prepared for the Tolowa Dee-ni' Nation. May.

GHD. 2020a. Biological Resources Report. Rowdy and Dominie Creek Fish Passage Improvement Project. Prepared for the Tolowa Dee-ni' Nation. August.

GHD. 2020b. Technical Memorandum – TDN – Rowdy and Dominie Creek Fish Passage Improvement Project – Asbestos and NOA Soil Sampling Assessment. August.

GHD. 2021a. California Emissions Estimator Model (CalEEMod). Developed for the California Air Pollution Officers Association. Available at: http://www.caleemod.com/

GHD. 2021b. Aquatic Resources Delineation Report. Rowdy and Dominie Creek Fish Passage Improvement Project. Prepared for the Tolowa Dee-ni' Nation. April.

GHD and Michael Love & Associates. 2018. Dominie and Rowdy Creek Fish Passage Improvement Project, Final Basis of Design Report.

Garwood and Larson. 2014. Reconnaissance of salmonid redd abundance and juvenile salmonid spatial structure in the Smith River with emphasis on Coho Salmon (*Oncorhynchus kisutch*). Final report to the California Department of Fish and Wildlife Fisheries Restoration Grant Program, Grantee agreement: P1010504. Prepared on behalf of the Smith River Alliance and the California Department of Fish and Wildlife Anadromous Fisheries Resource and Monitoring Program. March.

Gotvald, A. J., Barth, N. A., Veilleux, A. G., & Parrett, C. 2012. Methods for Determining Magnitude and Frequency of Floods in California, Based on Data through Water Year 2006. Technical Report.

Lang, M. 2005. California Department of Transportation (Caltrans) District 1 Pilot Fish Passage Assessment Study: Volume 1 – Overall Results. Caltrans, Sacramento, CA. 198pp.

Lost Coast Outpost (LoCo). 2017. Multiple Del Norte Fire Agencies Work Together to Extinguish Four-Building Blaze in Smith River. Available at: https://lostcoastoutpost.com/2017/may/6/multiple-del-nortre-fire-agencies-work-together-ex/

Mine Safety and Health Administration (MSHA). 2020. Mine Data Retrieval System. Available at: https://www.msha.gov/mine-data-retrieval-system

Mintier & Associates, Jones & Stokes Associates, Steve Lowens, P.E. and Del Norte County Community Development Department. 2003. Del Norte County General Plan. January 28.

Natural Resources Conservation Service (NRCS). 2021. Web Soil Survey. Available at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Office of Mine Reclamation (OMR). 2012. Lead Agency Review – Del Norte County. Department of Conservation.

Parish, M. and J. Garwood. 2016. Winter Distributions, Movements and Habitat use by Juvenile Salmonids throughout the Lower Smith River Basin and Estuary, Del Norte County,

California. Final Report to the California Department of Fish and Wildlife, Fisheries Restoration Grant Program, Contract: P1410545. Smith River Alliance, Crescent City, CA.

Roscoe and Associates. 2020. A Cultural Resources Investigation Report for the Tolowa Dee-Ni' Nation Rowdy and Dominie Creek Fish Passage Project Smith River Del Norte County, California. August.

Rowdy Creek Fish Hatchery (RCFH). 2016. 5-Year Management Plan: 2016/2017 through 2020/2021.

Rowdy Creek Fish Hatchery (RCFH). 2018. Hatchery and Genetic Management Plan.

Ward, K., D. Fong, M. Reichmuth, B. Pryon, E. Bell, A. Jacobson and C. Shoulders. 2017. Effectiveness and Validation Monitoring Report, Part 1. Redwood Creek Restoration at Muir Beach, 2009-2016. National Park Service, Northern Hydrology and Engineering, Stillwater Sciences, U.C. Berkeley. February 28.

Wild Salmon Center (WSC). 2013. Salmon Stronghold: Smith River. Monitoring program on California salmon stronghold critical to fishery management. February. https://www.wildsalmoncenter.org/2013/02/01/smith-river/

U.S. Geological Survey (USGS). 1982. Guidelines for Determining Flood Flow Frequency, 17B. Technical Report.

U.S. Geological Survey (USGS). 2021. What is liquefaction? Available at: https://www.usgs.gov/faqs/what-liquefaction?qt-news_science_products=0#qt-news_science_products

This page is intentionally left blank

6. Report Preparers

6.1 Del Norte County

Heidi Kunstal, Director of Del Norte County Community Development Department

6.2 Tolowa Dee-ni' Nation

Jennifer Jacobs, Fisheries Program Manager, Reviewer

Erika Partee, Natural Resources Director, Reviewer

6.3 GHD

Kerry McNamee, Environmental Planner, Lead Author

Chryss Meier, Environmental Planner, Contributor

Matthew Tolley, Environmental Scientist, Contributor

Haley Cahill, Environmental Planner, Contributor

Misha Schwarz, Technical Director, Reviewer

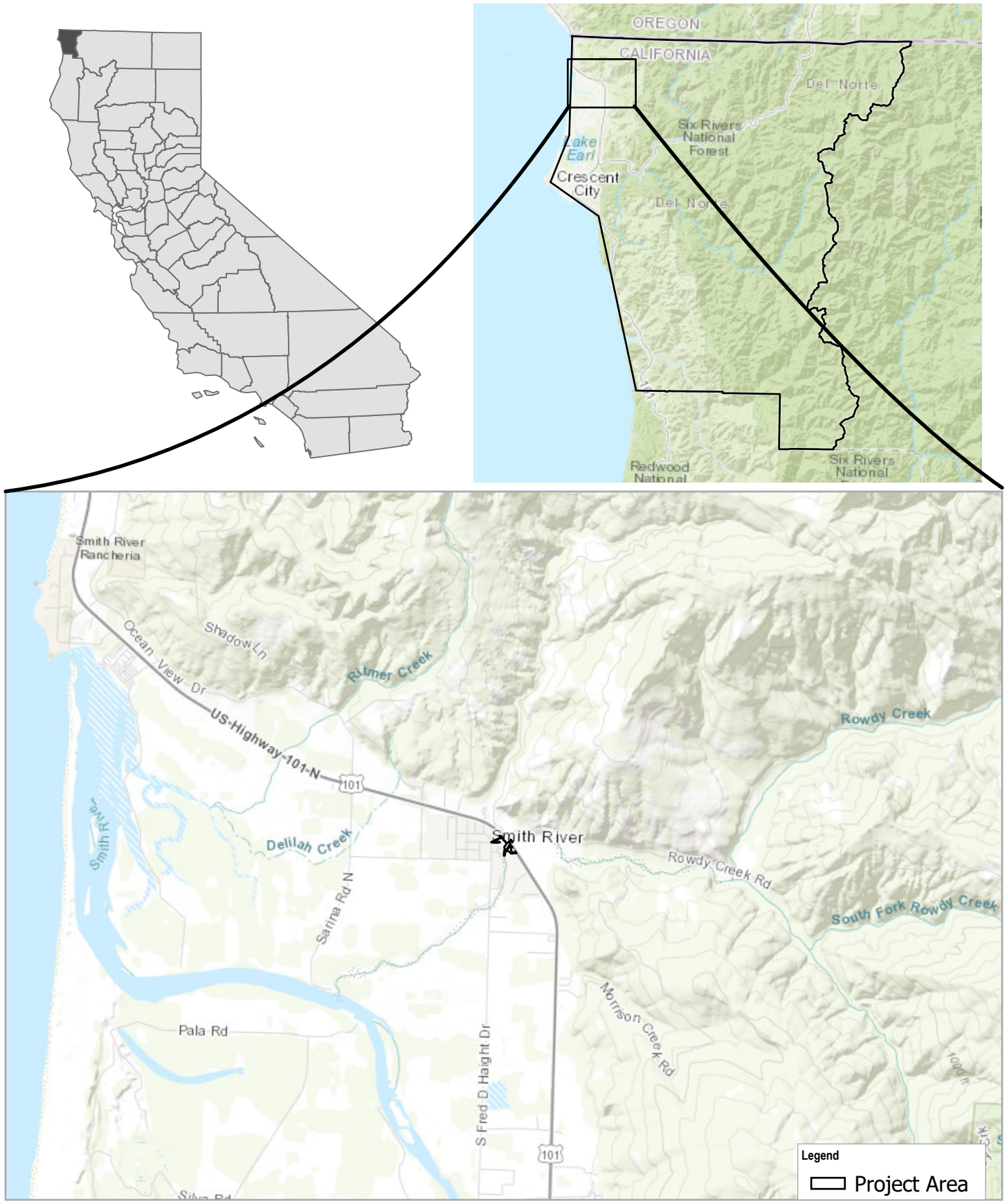
Jeremy Svehla, Project Engineer and Project Manager, Reviewer

6.4 Sub-consultants

Roscoe and Associates, Cultural Resource Specialists

Appendices

Appendix A Figures



Paper Size ANSI A

0 2,500 5,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

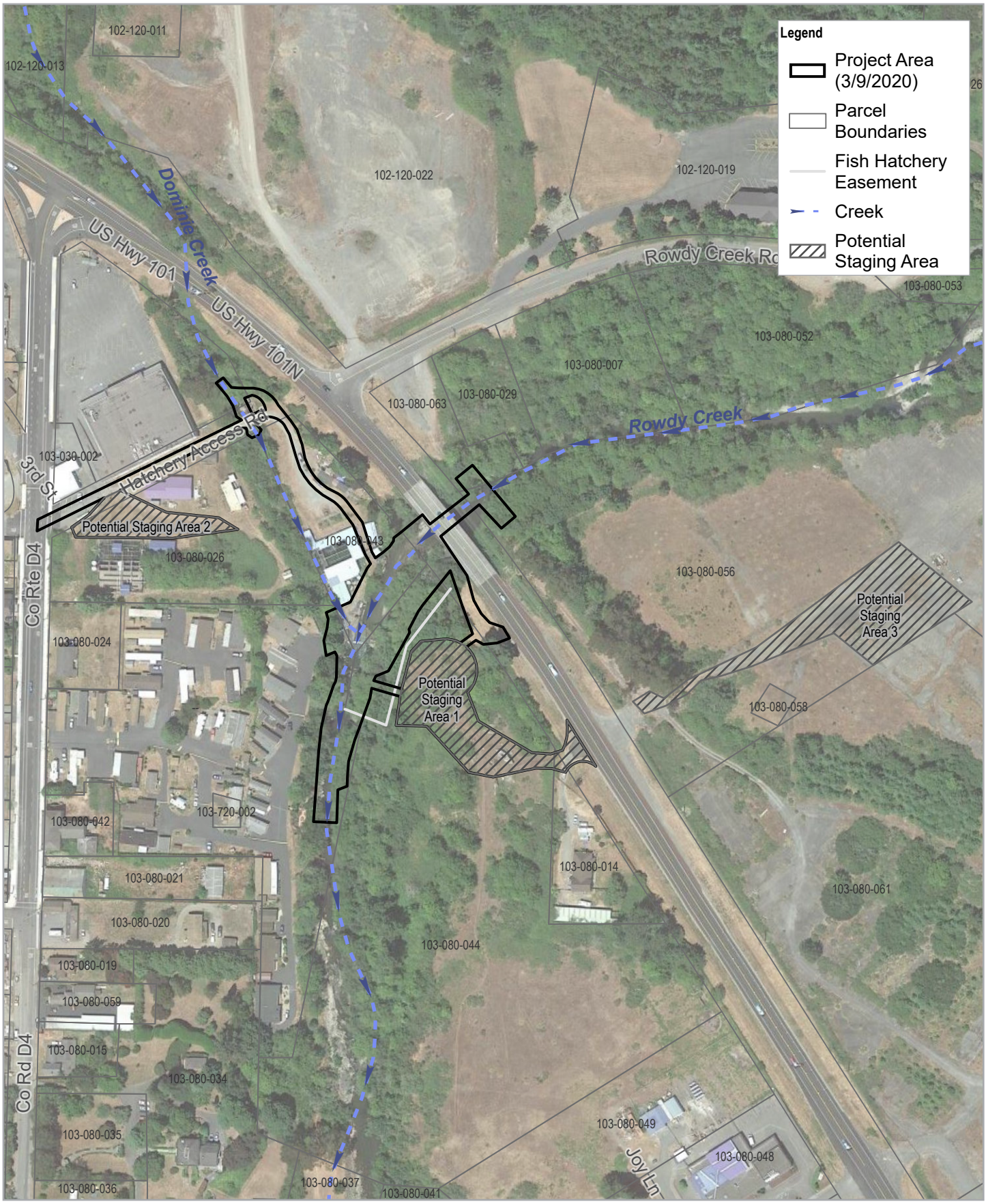
Project No. **11209093**
Revision No. **-**
Date **Mar 2020**

Vicinity Map

FIGURE 1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_001_Vicinity
Print date: 09 Mar 2020 - 17:00

Data source: World_Topo_Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community. Created by: jclark2



Paper Size ANSI A

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

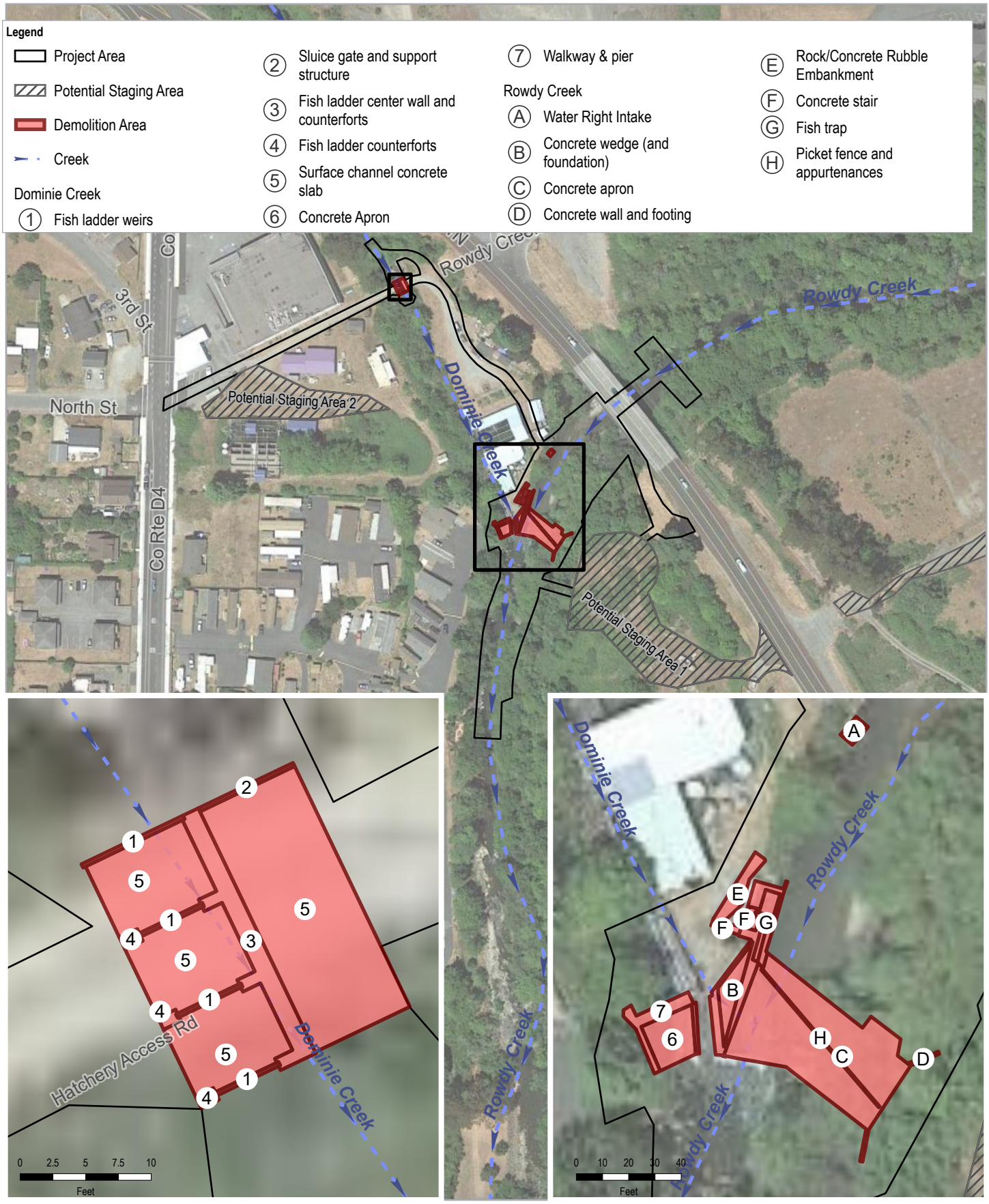
Project No. **11209093**
Revision No. **-**
Date **May 2021**

Project Area

FIGURE 2

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISMND\11209093_ISMND\11209093_ISMND.aprx - 11209093_002_ProjectArea_RevC
Print date: 19 May 2021 - 16:24

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

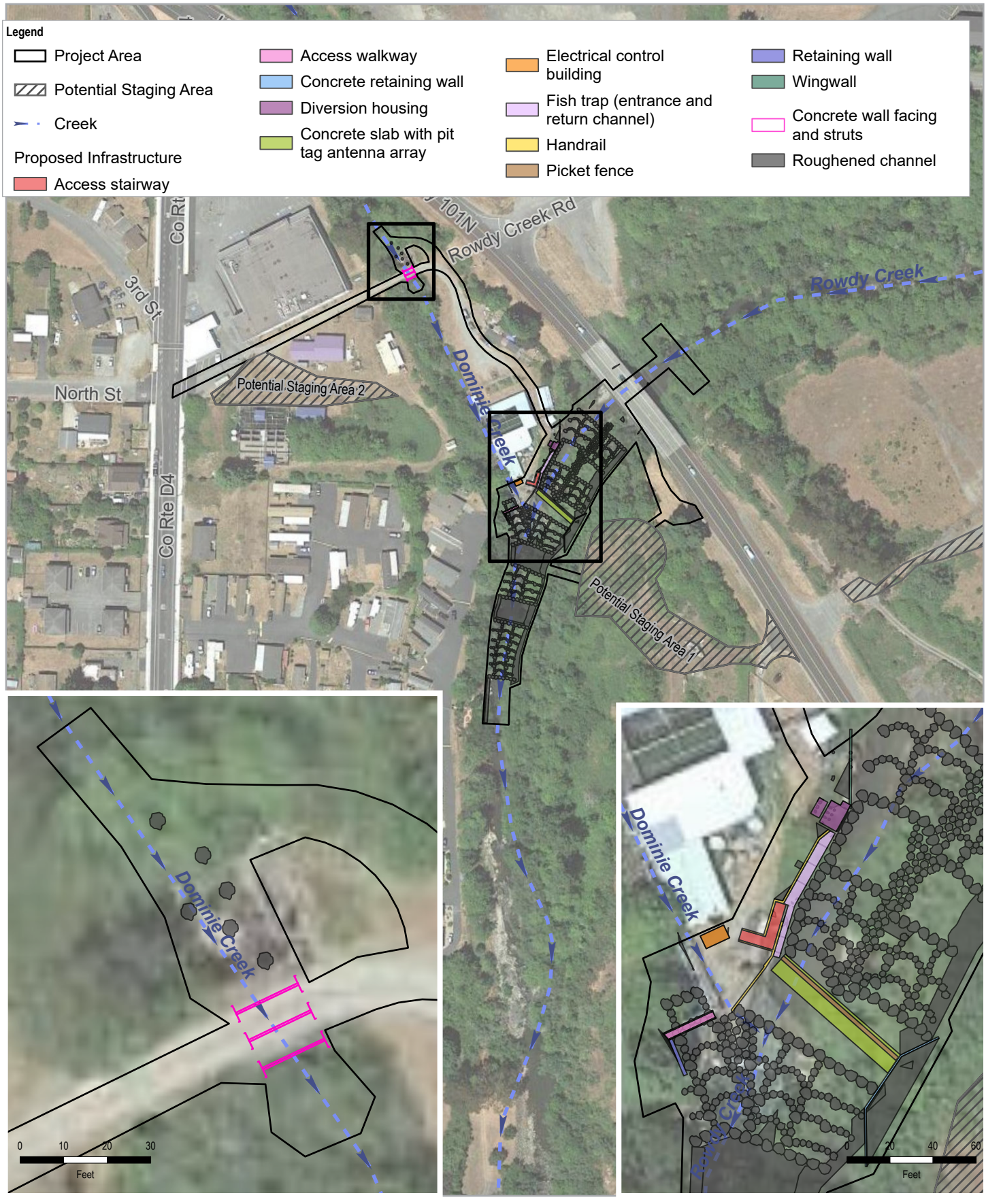
Project No. **11209093**
Revision No. **-**
Date **May 2021**

Demolition Areas

FIGURE 3

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISMND\11209093_ISMND\11209093_ISMND.aprx - 11209093_003_DemolitionAreas_RevB
Print date: 19 May 2021 - 17:11

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **May 2021**

Proposed Project Components

FIGURE 4

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISMND\11209093_ISMND\11209093_ISMND.aprx - 11209093_004_ProposedInfra_RevB
Print date: 19 May 2021 - 17:23

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2

Paper Size ANSI A

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

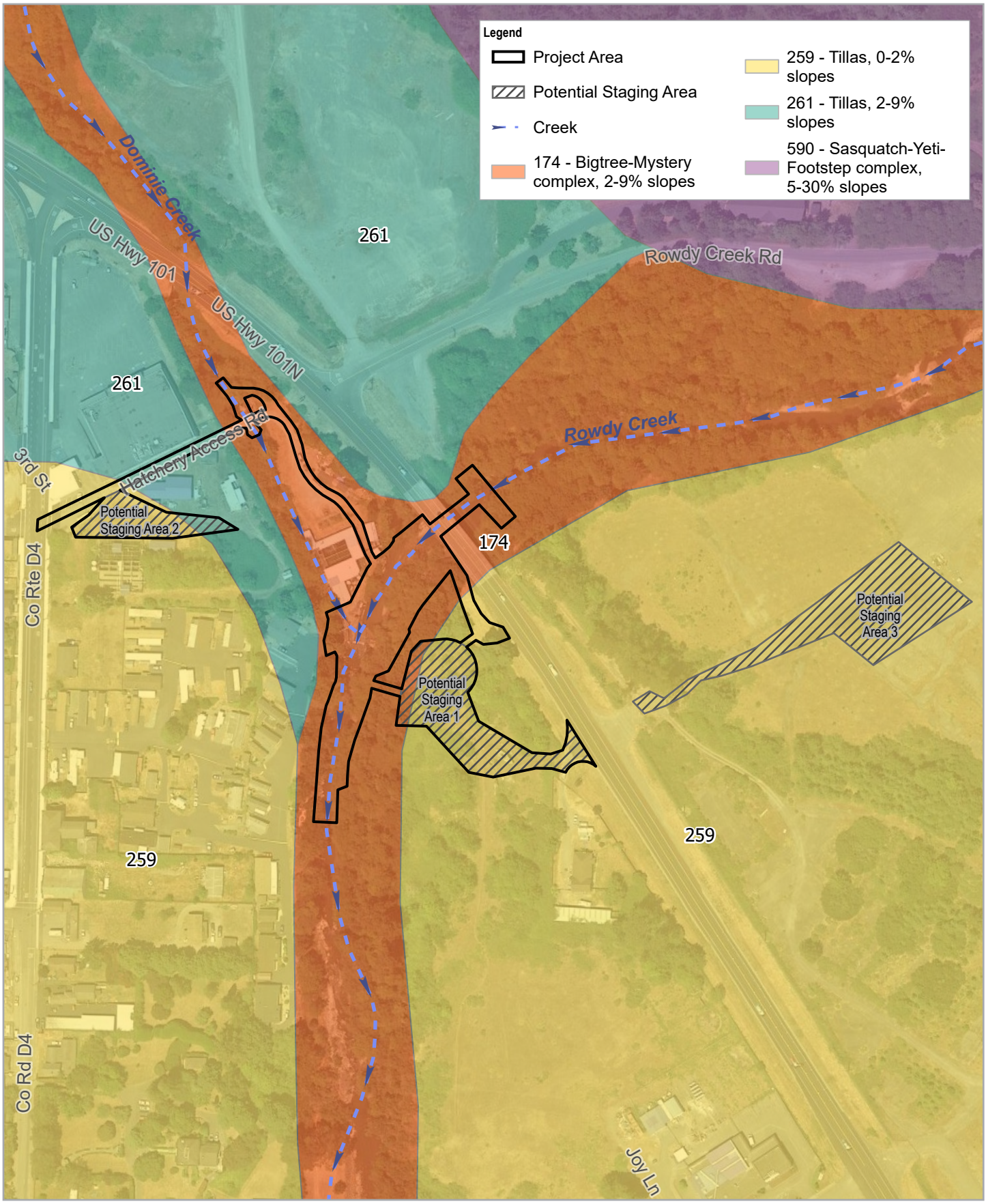
Project No. **11209093**
Revision No. **-**
Date **May 2021**

National Wetland Inventory

FIGURE 4.4-1

G:\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_004-04-1_NWI
Print date: 04 Jun 2021 - 12:02

Data source: National Wetland Inventory, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jlopez4



Paper Size ANSI A

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

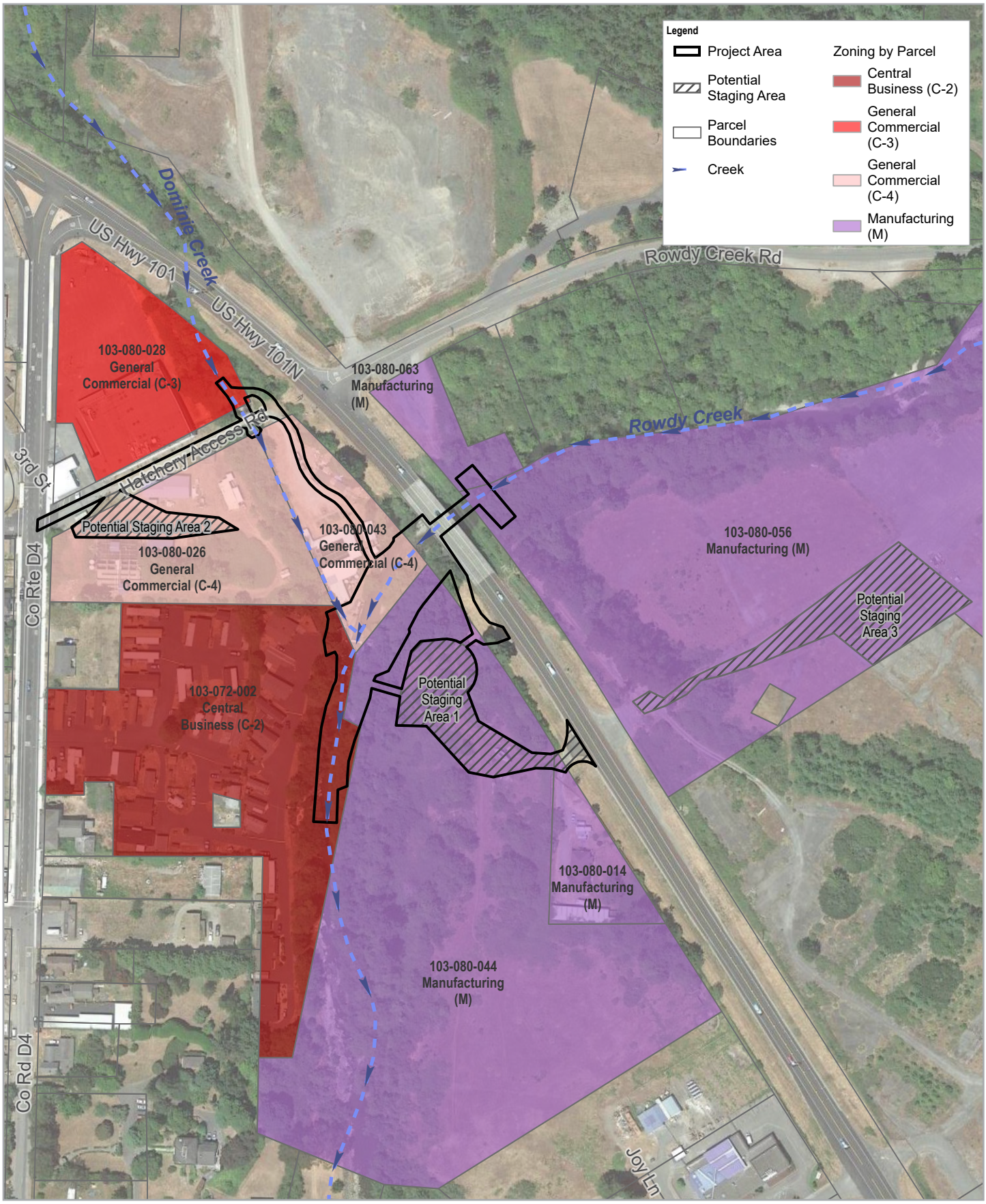
Project No. **11209093**
Revision No. **-**
Date **May 2021**

NRCS Soil Units

FIGURE 4.7-1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISMND\11209093_ISMND\11209093_ISMND.aprx - 11209093_004-07-1_SoilUnits
Print date: 19 May 2021 - 18:11

Data source: NRCS Web Soil Survey, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2



Paper Size ANSI A

0 60 120 180 240

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **Apr 2020**

Parcel and Zoning Overview

FIGURE 4.11-1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISMND\11209093_ISMND\11209093_ISMND.aprx - 11209093_004-11-1_ParcelZoningOverview
Print date: 19 May 2021 - 17:47

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2

Appendix B Final Design Plans

TOLOWA DEE-NI' NATION

DOMINIE AND ROWDY CREEK FISH PASSAGE IMPROVEMENT PROJECT

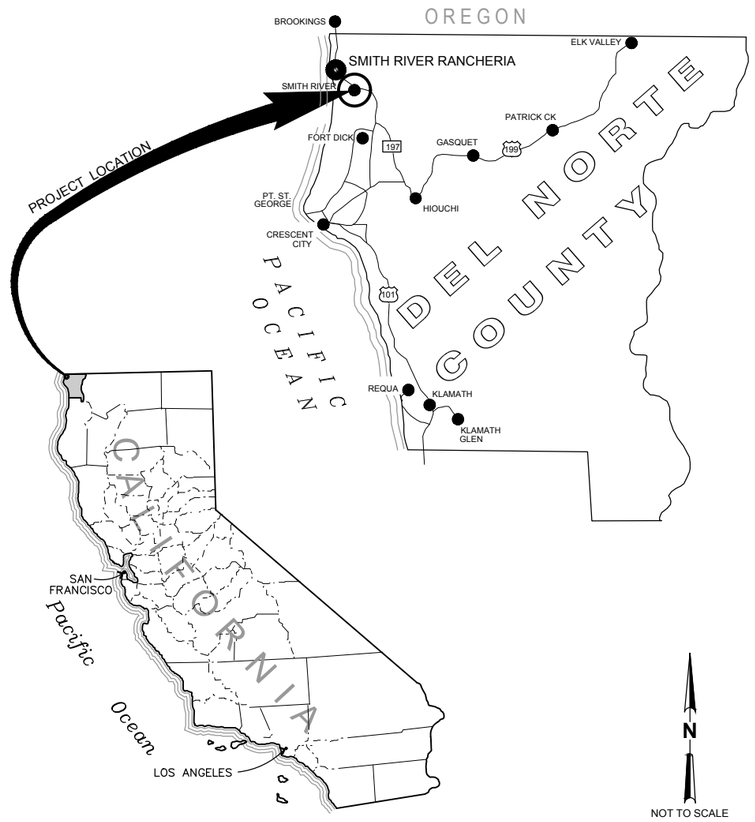
AUGUST 2018

PREPARED BY

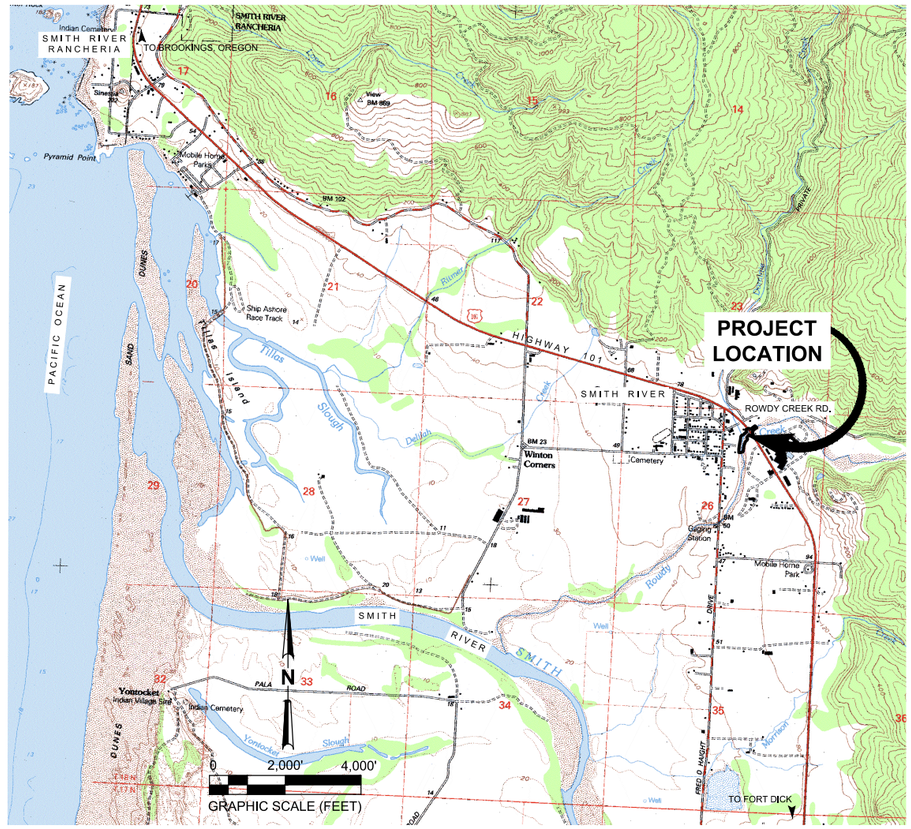
GHD

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

AREA MAP



LOCATION MAP



100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C 79169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK
Project No. 11125168
Original Size: ANSI D
Drawing: G-001
Sheet 1 of 49

Plot Date: 1 August 2018 - 8:55 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_G-001_Cover Sheet.dwg

SHEET INDEX

GENERAL			
SHEET NUMBER	DRAWING	SITE	SHEET TITLE
1	G-001	ROWDY & DOMINIE CREEK	COVER SHEET
2	G-002	ROWDY & DOMINIE CREEK	SHEET LIST & DESIGN CRITERIA
3	G-003	ROWDY & DOMINIE CREEK	LEGEND & GENERAL NOTES
4	G-004	ROWDY & DOMINIE CREEK	ROCK GRADATION AND PLACEMENT NOTES
5	G-005	ROWDY & DOMINIE CREEK	ACCESS, WATER MANAGEMENT & EROSION CONTROL PLAN

CIVIL			
SHEET NUMBER	DRAWING	SITE	SHEET TITLE
6	C-101	ROWDY & DOMINIE CREEK	PLAN VIEW SHEET INDEX
7	C-102	ROWDY CREEK	EXISTING & DEMOLITION PLAN VIEW 1 OF 2
8	C-103	ROWDY CREEK	EXISTING & DEMOLITION PLAN VIEW 2 OF 2
9	C-104	DOMINIE CREEK	EXISTING & DEMOLITION PLAN & VIEW
10	C-105	ROWDY CREEK	PLAN & PROFILE 1 OF 2
11	C-106	ROWDY CREEK	PLAN & PROFILE 2 OF 2
12	C-107	ROWDY CREEK	HATCHERY FACILITY PLAN
13	C-108	ROWDY & DOMINIE CREEK	ADDITIONAL PROFILES
14	C-109	DOMINIE CREEK	PLAN & PROFILE
15	C-301	ROWDY & DOMINIE CREEK	CIVIL CROSS SECTIONS
16	C-501	ROWDY CREEK	SLIDE GATE DETAILS
17	C-502	ROWDY & DOMINIE CREEK	TYPICALS AND DETAILS, 1 OF 4
18	C-503	ROWDY & DOMINIE CREEK	TYPICALS AND DETAILS, 2 OF 4
19	C-504	ROWDY & DOMINIE CREEK	TYPICALS AND DETAILS, 3 OF 4
20	C-505	ROWDY & DOMINIE CREEK	TYPICALS AND DETAILS, 4 OF 4
21	C-506	ROWDY & DOMINIE CREEK	WATER AND FISH MANAGMENT
22	V-101	ROWDY & DOMINIE CREEK	REVEGETATION PLAN
23	V-501	ROWDY & DOMINIE CREEK	REVEGETATION DETAILS

STRUCTURAL			
SHEET NUMBER	DRAWING	SITE	SHEET TITLE
24	S-001	ROWDY & DOMINIE CREEK	STRUCTURAL ABBREVIATIONS AND SYMBOLS
25	S-002	ROWDY & DOMINIE CREEK	STRUCTURAL NOTES
26	S-003	ROWDY & DOMINIE CREEK	SPECIAL INSPECTIONS
27	S-101	ROWDY & DOMINIE CREEK	STRUCTURAL SITE PLAN OVERVIEW
28	S-102	DOMINIE CREEK	RETAINING WALL PLAN
29	S-103	ROWDY & DOMINIE CREEK	WALL IMPROVEMENTS
30	S-104	ROWDY CREEK	HATCHERY PLAN SOUTH END
31	S-105	ROWDY CREEK	HATCHERY PLAN NORTH END
32	S-106	DOMINIE CREEK	BRIDGE IMPROVEMENTS PLAN
33	S-301	DOMINIE CREEK	WALL ELEVATION
34	S-302	ROWDY CREEK	EAST WALL ELEVATION
35	S-303	ROWDY CREEK	HATCHERY WALL ELEVATIONS
36	S-401	ROWDY & DOMINIE CREEK	STRUCTURAL TYPICAL SECTIONS 1 OF 3
37	S-402	ROWDY & DOMINIE CREEK	STRUCTURAL TYPICAL SECTIONS 2 OF 3
38	S-403	ROWDY & DOMINIE CREEK	STRUCTURAL TYPICAL SECTIONS 3 OF 3
39	S-500	ROWDY & DOMINIE CREEK	TYPICAL STRUCTURAL DETAILS
40	S-501	ROWDY & DOMINIE CREEK	TYPICAL STRUCTURAL REINFORCING DETAILS
41	S-502	ROWDY & DOMINIE CREEK	SOIL NAIL AND MISCELLANEOUS DETAILS
42	S-503	ROWDY & DOMINIE CREEK	HANDRAIL & GRATING DETAILS
43	S-504	ROWDY CREEK	DIVERSION SCREEN DETAILS
44	S-505	ROWDY CREEK	MISC METAL FABRICATION DETAILS

ELECTRICAL			
SHEET NUMBER	DRAWING	SITE	SHEET TITLE
45	E-001	ROWDY & DOMINIE CREEK	ELECTRICAL ABBREVATIONS, SYMBOLS AND NOTES
46	E-101	ROWDY & DOMINIE CREEK	ELECTRICAL SITE PLAN
47	E-401	ROWDY & DOMINE CREEK	ENLARGED ELECTRICAL CONTROL BUILDING
48	E-501	ROWDY & DOMINIE CREEK	ELECTRICAL DETAILS
49	E-601	ROWDY & DOMINIE CREEK	SINGLE LINE DIAGRAM & PANEL SCHEDULE

DESIGN PARAMETERS

PUMP
- OPERATING POINT TO STORAGE TANK: 300 GPM AT 44' TDH
- OPERATING POINT TO RACEWAYS: 1,000 GPM AT 45' TDH

FISH SCREEN
- MAXIMUM DIVERSION RATE
  - FISH TRAP OPERATION: 5.9 CFS
  - HATCHERY OPERATION: 6.0 CFS
- WIRE SPACING: 1/16"

PICKET FENCE
- OPEN AREA PERCENT: 50%
- BAR SIZE AND SPACING: 1" BARS, 2" O.C.
- LOW OPERATIONAL FLOW (ROWDY CREEK): 26 CFS
- HIGH OPERATIONAL FLOW (ROWDY CREEK): 271 CFS

AWS PIPE
- LOW OPERATIONAL FLOW: 1.7 CFS
- HIGH OPERATIONAL FLOW: 5.9 CFS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 72169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK SHEET LIST & DESIGN CRITERIA
Project No. 11125168
Original Size: ANSI D
Drawing: G-002
Sheet 2 of 49

Plot Date: 1 August 2018 - 8:55 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_G-002_Sheet Index.dwg

ABBREVIATIONS:

±	APPROXIMATE
AWS	AUXILIARY WATER SYSTEM
CL, ℄	CENTERLINE
ESM	ENGINEERED STREAMBED MATERIAL
(E)	EXISTING
(N)	NEW/PROPOSED
N.T.S.	NOT TO SCALE
RL	RIVER LEFT
RR	RIVER RIGHT
RSP	ROCK SLOPE PROTECTION
TYP.	TYPICAL

3 — SECTION OR DETAIL DESIGNATION

C-503 — SHEET WHERE DETAIL OR SECTION OCCURS

TOPOGRAPHIC:

EXISTING	PROPOSED	
		PROPERTY LINE
		EASEMENT BOUNDARY
X		FENCE LINE
E OHD		OVERHEAD ELECTRIC LINE
///		EDGE OF ROAD
XX		FISH EXCLUSION FENCE
40	40	CONTOUR LINE
	101+50	CHANNEL CENTER LINE
		LIMITS OF DISTURBANCE
		EASEMENT
		MATCH LINE
		3/4" CRUSHED GRAVEL
		CONSTRUCTION ENTRANCE
		GRATING (CIVIL)
		ROCK SLOPE PROTECTION
		VISIBLE BEDROCK IN PLAN
		CONCRETE
		BANKLINE ROCK
		ENGINEERED STREAMBED MATERIAL
		NATIVE BACKFILL MATERIAL
		CONCRETE DEMOLITION
		CLEARING AND GRUBBING
		STRUCTURAL BACKFILL
		BEDROCK IN SECTION

ABBREVIATIONS:

NOTE: CONTACT ENGINEER FOR ABBREVIATIONS NOT LISTED.

ABS	ACRYLONITRILE BUTADIENE STYRENE
AC	ASBESTOS CONCRETE
ACP	ASBESTOS CONCRETE PIPE
APPROX	APPROXIMATE
AWS	AUXILIARY WATER SYSTEM
BMPS	BEST MANAGEMENT PRACTICES
CFS	CUBIC FEET PER SECOND
CL	CENTER LINE
CM	CONSTRUCTION MANAGER
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
CONC	CONCRETE
DIA, ⌀	DIAMETER
DP	DIVERSION PIPE
DWG	DRAWING
E	EASTING
(E)	EXISTING
EG	EXISTING GRADE (GROUND)
EL/ELEV	ELEVATION
FL	FLOW LINE
FG	FINISHED GRADE (GROUND)
FF	FINISHED FLOOR
FT, '	FOOT/FEET
FW	FISHWAY
G	GAS
GALV	GALVANIZED
GPM	GALLONS PER MINUTE
IN, "	INCHES
H	HORIZONTAL
HDPE	HIGH DENSITY POLYETHYLENE
HYD	FIRE HYDRANT
INV/IE	INVERT ELEVATION
IR	IRRIGATION
L	LEFT
LF	LINEAR FOOT/FEET
LWD	LARGE WOODY DEBRIS
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
N	NORTHING
NIC	NOT IN CONTRACT
NO.	NUMBER
NOM.	NOMINAL
(N)	NEW
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHE	OVERHEAD ELECTRIC
OHT	OVERHEAD TELEPHONE
OP	OPERATION
PP	POWER POLE
PT	POINT
PVC	POLYVINYL CHLORIDE
R	RIGHT
REQ'D	REQUIRED
RCP	REINFORCED CONCRETE PIPE
RSP	ROCK SLOPE PROTECTION
RW	REDWOOD
SD	STORM DRAIN
SF	SQUARE FOOT/FEET
SIM	SIMILAR
SS	SANITARY SEWER
SSFM	SANITARY SEWER FORCE MAIN
SST	STAINLESS STEEL
STA	STATION
STL	STEEL
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
T	TELEPHONE
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TDH	TOTAL DYNAMIC HEAD
TOW	TOP OF WALL
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
UHMW	ULTRA HIGH MOLECULAR WEIGHT
V	VERTICAL
W/	WITH
W	WATER
WSE	WATER SURFACE ELEVATION
XS	CROSS SECTION

GENERAL NOTES

1. PROJECT REQUIRES A CLASS A GENERAL ENGINEERING CONTRACTOR'S LICENSE IN THE STATE OF CALIFORNIA.
2. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO THE COMMENCEMENT OF WORK AND REPORT ANY DISCREPANCIES TO THE ENGINEER. SHOULD EXISTING CONDITIONS DIFFER FROM THOSE SHOWN OR INDICATED, OR IF IT APPEARS THAT THESE PLANS DO NOT ADEQUATELY DETAIL THE WORK TO BE DONE, CONTRACTOR SHALL NOTIFY THE ENGINEER PRIOR TO CONTINUING WITH ANY RELATED WORK. NO ALLOWANCE WILL BE MADE ON CONTRACTOR'S BEHALF FOR ANY EXTRA EXPENSE RESULTING FROM FAILURE OR NEGLECT IN DETERMINING THE CONDITIONS UNDER WHICH WORK IS TO BE PERFORMED. NOTED DIMENSIONS TAKE PRECEDENCE OVER SCALE.
3. QUANTITIES OF ITEMS, LENGTH OF PROJECT, AND SITE CONDITIONS SHOWN IN THE PLANS ARE APPROXIMATE. ALL MATERIALS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR UNLESS OTHERWISE NOTED.
4. CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR THE JOB SITE DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE OWNER, GHD, AND THEIR REPRESENTATIVES HARMLESS FROM ANY AND ALL LIABILITY, REAL AND/OR ALLEGED, IN CONJUNCTION WITH THE PERFORMANCE OF THIS PROJECT.
5. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGES TO EXISTING STRUCTURES, ROADS, AND UTILITIES DURING CONSTRUCTION. ALL DAMAGE SHALL BE RESTORED TO EQUAL OR BETTER CONDITION AT THE CONTRACTOR'S EXPENSE.
6. A SET OF SIGNED CONTRACT DOCUMENTS (PLANS AND SPECIFICATIONS) WILL BE KEPT AT ALL TIMES AT THE JOB SITE ON WHICH ALL CHANGES OR VARIATIONS IN THE WORK ARE TO BE RECORDED AND/OR CORRECTED DAILY AND SUBMITTED TO THE OWNER WITH EVERY PROGRESS PAYMENT REQUEST.
7. CONTRACTOR SHALL NOTIFY THE OWNER AT LEAST 72 HOURS IN ADVANCE OF COMMENCEMENT OF ANY PART OF THE WORK AND SHALL COORDINATE CONSTRUCTION SCHEDULE ACCORDINGLY CONTRACTOR SHALL PROVIDE WEEKLY SCHEDULE UPDATES.
8. THE DESIGN FEATURES SHOWN ON THESE DESIGN PLANS SHALL NOT BE ALTERED OR MODIFIED IN ANY WAY DURING CONSTRUCTION WITHOUT THE EXPRESSED, WRITTEN DIRECTION AND APPROVAL OF THE CONSTRUCTION MANAGER.
9. ANY INFORMATION DERIVED FROM THE MAPS, PLANS, SPECIFICATIONS, PROFILES, DRAWINGS OR FROM THE ENGINEER WILL NOT RELIEVE THE CONTRACTOR FROM ANY RISK OR FROM FULFILLING THE TERMS OF THE CONTRACT.
10. NO WORK SHALL BE PERFORMED OUTSIDE OF THE DESIGNATED AREAS WITHOUT THE APPROVAL OF THE OWNER.
11. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING ADDITIONAL STAGING AREAS WITH THE OWNER BEYOND WHAT IS SHOWN ON THE PLANS.
12. UPON COMPLETION OF THE CONSTRUCTION PROJECT, THE CONTRACTOR SHALL LEAVE THE PROJECT AREA FREE OF DEBRIS AND UNUSED MATERIAL U.N.O. ALL DAMAGE CAUSED BY THE CONTRACTOR SHALL BE RESTORED TO AN "AS GOOD OR BETTER" CONDITION.
13. HOURS OF WORK: THE CONTRACTOR SHALL CONDUCT ALL WORK BETWEEN THE HOURS OF 7:00 A.M. AND 7:00 P.M., MONDAY THROUGH FRIDAY. A WORKING DAY IS DEFINED AS MONDAY THROUGH FRIDAY EXCLUDING WEEKENDS AND HOLIDAYS. WEEKEND AND HOLIDAY WORK WILL ONLY BE CONDUCTED AFTER PRIOR AUTHORIZATION FROM THE OWNER AND MUST BE REQUESTED A MINIMUM OF 72 HOURS BEFORE PROPOSED WORK. IF WEEKEND/HOLIDAY WORK IS AUTHORIZED, IT SHALL BE LIMITED TO 9:00 A.M. - 6 P.M. EQUIPMENT DELIVERY SHALL BE DURING HOURS OF WORK.
14. ANY MODIFICATIONS FROM PLANS NEED TO BE COMPLETED AND/OR APPROVED BY THE ENGINEER PRIOR TO IMPLEMENTATION.
15. THE CONTRACTOR SHALL COMPLETELY REVIEW, BE FAMILIAR WITH, AND ADHERE TO THE TERMS OF ALL PERMITS AND AGENCY APPROVALS FOR THIS PROJECT. THE OWNER WILL BE RESPONSIBLE FOR SECURING AND PROVIDING TO THE CONTRACTOR COPIES OF ALL PERMITS, CERTIFICATIONS, OR AUTHORIZATIONS UNLESS NOTED OTHERWISE. COPIES OF ALL PERMITS SHALL REMAIN ONSITE THROUGHOUT THE DURATION OF CONSTRUCTION.
16. NO SHUTDOWN OF THE PROJECT SITE IS ANTICIPATED. HOWEVER, UNFORESEEABLE CONDITIONS INCLUDING BUT NOT LIMITED TO FIRE, GEO-HAZARD CONDITIONS, OR RAINS COULD REQUIRE THE OWNER TO SUSPEND CONSTRUCTION ACTIVITIES AT ALL OR PART OF THE SITE FOR SAFETY REASONS AT NO COST TO THE OWNER. OR THEIR REPRESENTATIVES.
17. EXISTING VEGETATION SHALL BE PROTECTED AND LEFT UNDISTURBED AS MUCH AS PRACTICAL.
18. THE CONTRACTOR IS TO NOTIFY UNDERGROUND SERVICE ALERT PRIOR TO ANY GRADING OR EXCAVATION WITHIN THE SITE AT 811 OR 1-800-227-2600 AT MIN OF 48 HRS PRIOR TO ANY EXCAVATION OR GROUND DISTURBANCE.
19. NATIVE TOPSOIL THAT IS EXCAVATED SHALL BE SEGREGATED AND STOCKPILED ON SITE FOR RE-USE WHERE POSSIBLE. STOCKPILES TO BE LOCATED WITHIN THE STAGING AREA WHEN PRACTICAL AND COMPLETELY WITHIN THE LIMITS OF DISTURBANCE AT ALL TIMES.
20. ANY MATERIAL NOT UTILIZED ON SITE SHALL BE REMOVED FROM SITE AND DISPOSED OF IN A LEGAL MANNER CONSISTENT WITH APPLICABLE REGULATIONS SUCH AS COUNTY GRADING ORDINANCES AND PROJECT PERMITS. CONTRACTOR IS RESPONSIBLE FOR PROPER LEGAL DISPOSAL OF ALL MATERIALS TAKEN FROM SITE.
21. ANY PUMPS USED ON-SITE (DEWATERING ETC) SHALL BE PLACED ON ABSORBENT PADS. THE CONTRACTOR SHALL HAVE SPILL CONTAINMENT MATERIALS LOCATED AT THE SITE, WITH OPERATORS TRAINED IN SPILL CONTROL PROCEDURES. PUMPS SHALL BE SCREENED TO PREVENT INTAKE OF AQUATIC SPECIES.
22. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER UPON DISCOVERING DISCREPANCIES, ERRORS OR OMISSIONS IN THE PLANS. PRIOR TO PROCEEDING. THE DISCREPANCY SHALL BE RESOLVED TO THE SATISFACTION OF THE ENGINEER.
23. PERFORM GRADING IN ACCORDANCE WITH THE LATEST EDITION OF CHAPTER 33 OF THE CALIFORNIA BUILDING CODE AND APPLICABLE COUNTY REGULATIONS.
24. IN THE EVENT CULTURAL RESOURCES (I.E., HISTORICAL, ARCHAEOLOGICAL, AND PALEONTOLOGICAL RESOURCES, AND HUMAN REMAINS) ARE DISCOVERED DURING GRADING OR OTHER CONSTRUCTION ACTIVITIES, WORK SHALL BE HALTED MMEDIATELY WITHIN A 100 FOOT RADIUS OF THE FIND AND THE OWNER NOTIFIED. A QUALIFIED ARCHEOLOGIST SHALL BE CONSULTED FOR AN ON-SITE EVALUATION. ADDITIONAL MITIGATION MAY BE REQUIRED BY THE COUNTY PER THE ARCHEOLOGIST'S RECOMMENDATIONS. IF HUMAN BURIALS OR HUMAN REMAINS ARE ENCOUNTERED, THE CONTRACTOR SHALL ALSO NOTIFY THE COUNTY CORONER.
25. SHOULD GRADING OPERATIONS ENCOUNTER HAZARDOUS MATERIALS, OR WHAT APPEAR TO BE HAZARDOUS MATERIALS, THE CONTRACTOR SHALL STOP WORK IN THE AFFECTED AREA IMMEDIATELY AND CONTACT THE OWNER AND THE APPROPRIATE AGENCY FOR FURTHER INSTRUCTION.
26. THE CONSTRUCTION SITE AND STAGING AREAS SHALL BE MAINTAINED, AS NECESSARY, TO MINIMIZE THE EMISSION OF DUST AND PREVENT CREATION OF NUISANCE TO ADJACENT PROPERTIES.
27. CONSTRUCTION MATERIALS, DEBRIS, AND WASTE WILL NOT BE PLACED OR STORED WHERE IT CAN ENTER INTO OR BE WASHED BY RAINFALL INTO WATERS OF THE U.S./STATE.
28. THE CONTRACTOR SHALL TAKE PREVENTATIVE MEASURES TO AVOID ANY SPILLS OR LEAKS ON THE SITE FROM PETROLEUM PRODUCTS. AT A MINIMUM, STAGING, STORAGE, AND REFUELING AREAS AND ANY EQUIPMENT REPAIR OR SIMILAR ACTIVITY TAKE PLACE WHEN EQUIPMENT IS AT LEAST 100-FEET FROM ANY ACTIVE CREEK CHANNEL, OR DITCH. THE CONTRACTOR SHALL INSPECT AND IMMEDIATLEY FULLY CLEAN UP AND REPORT ANY SUCH LEAKS OR SPILLS THAT OCCUR ON THE SITE.
29. THE CONTRACTOR SHALL PROVIDE SHOP DRAWINGS, DETAILS AND STRUCTURAL CALCULATIONS FOR THE ITEMS PER THE CONTRACT DRAWINGS AND DESIGN CRITERIA.
    a. SUBMITTAL DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED FOR REVIEW TO THE ENGINEER.
    b. THE ENGINEER SHALL REVIEW ALL DEFERRED SUBMITTAL ITEMS, SIGN AND STAMP THEM AS APPROVED, AND FORWARD THEM TO THE BUILDING OFFICIAL WITH A NOTATION INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN FOUND TO BE IN GENERAL CONFORMANCE WITH THE DESIGN.
    c. THE DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THEIR DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE ENGINEER.

TOPOGRAPHIC SURVEY NOTES

1. TOPOGRAPHIC DATA IS BASED ON A SURVEY COMPLETED BY GUTIERREZ LAND SURVEYING.
2. HORIZONTAL DATUM IS NAD 83, STATE PLANES ZONE I.
3. VERTICAL DATUM IS NAVD 88.

DEWATERING NOTES

1. ALL IN-STREAM CONSTRUCTION ACTIVITIES WITHIN THE ROWDY AND DOMINIE CREEK CHANNEL, INCLUDING CHANNEL EXCAVATION AND DEWATERING, MAY ONLY BE CONDUCTED IN ACCORDANCE TO ALL PROJECT PERMITS AND RELATED CONDITIONS OF APPROVAL.
2. COFFER DAMS AND FISH SCREENS MUST BE INSTALLED AND FISH REMOVED FROM THE PROJECT AREA, CONTRACTOR SHALL COORDINATE WITH FISHERIES BIOLOGIST RESPONSIBLE FOR REMOVING FISH FOR SCHEDULING PLACEMENT OF FISH SCREENS, COFFER DAM AND DEWATERING PLAN. FISHERIES BIOLOGIST IS RESPONSIBLE FOR SITING THE BEST LOCATION FOR FISH SCREENS.
3. APPROPRIATE ENERGY DISSIPATION DEVISES WILL BE UTILIZED TO REDUCE OR PREVENT EROSION AT DISCHARGE END OF DEWATERING ACTIVITY.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C 79169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet: 0 — 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK
LEGEND & GENERAL NOTES
Project No. 11125168

Original Size: ANSI D
Drawing: G-003
Sheet 3 of 49

GENERAL ROCK NOTES

1. THE NOTES CONTAINED ON THIS SHEET ARE SUPPORTED BY THE TECHNICAL SPECIFICATIONS, IN PARTICULAR SECTION 31 05 16 ROCK FOR CHANNEL WORK. THE CONTRACTOR SHALL BE FAMILIAR WITH THE TECHNICAL SPECIFICATIONS AS WELL AS THESE NOTES AND THE DRAWINGS.
2. PRIOR TO ANY PROCUREMENT OF CHANNEL MATERIAL, THE CONTRACTOR SHALL SUBMIT A CHANNEL MATERIAL MANAGEMENT PLAN, SEE TECHNICAL SPECIFICATION 31 05 16 ROCK CHANNEL WORK FOR REQUIRED DETAILS.
3. ROCK PLACEMENT SHALL BE AT THE DISCRETION OF ENGINEER, BUT IS GENERALLY SHOWN.
4. ALL ROCK DIMENSIONS ARE MEASURED ALONG THE INTERMEDIATE AXIS, WHICH IS AN AXIS THAT IS NOT THE MINOR OR MAJOR AXIS. THE LEAST DIMENSION (MINOR AXIS) OF AN INDIVIDUAL ROCK FRAGMENT SHALL NOT BE LESS THAN ONE-THIRD THE GREATEST DIMENSION OF THE FRAGMENT.
5. ALL LARGE ROCK SHALL BE PLACED INDIVIDUALLY AND SECURED BY MACHINE TAMPING. FILLING VOIDS WITH SMALLER MATERIAL TO OBTAIN A COMPACT, LOW-PERMEABILITY MASS. ROCKS USED IN ROCK BANDS SHALL NOT BE CABLED TOGETHER.
6. NO VEHICLES OR EQUIPMENT ARE PERMITTED TO DRIVE ON THE CHANNEL AFTER ACHIEVING FINISHED GRADE.
7. UNLESS STATED OTHERWISE THE VERTICAL TOLERANCE FOR CHANNEL CONSTRUCTION SHALL BE ± 0.2 FT. BUT THE DIFFERENCE IN ELEVATION BETWEEN TWO ROCK BANDS FORMING A POOL MAY NOT EXCEED 0.2 FT. HORIZONTAL TOLERANCE FOR CHANNEL CONSTRUCTION SHALL BE ± 0.5 FT.

STRUCTURE ROCK

1. GENERAL

1.1. STRUCTURE ROCK INCLUDES ROCK FOR THE ROCK BANDS, WHICH ARE LOCATED AT THE UPSTREAM AND DOWNSTREAM ENDS OF EACH CHUTE, AND INTERNAL STRUCTURE ROCK, WHICH ARE SPECIFIC ROCKS LOCATED BETWEEN THE ROCK BANDS AS SHOWN IN PLAN VIEW (C-105, C-106 & C-107).

2. PRODUCTS

2.1. ROCK BAND ROCK

2.1.1. ROCKS TO BE USED IN ROCK BANDS ARE TO ARE TO BE ANGULAR, RIGID AND RESISTANT TO EROSION. FACES SHOULD BE UNEVEN AND ROUGH IN APPEARANCE.

2.1.2. ROCK FOR ROCK BANDS SHALL HAVE A MINIMUM SPECIFIC GRAVITY OF 2.5 AND SHALL BE DURABLE AND OF SUITABLE QUALITY, SOUND AND DENSE, FREE FROM CRACKS, SEAMS AND OTHER DEFECTS THAT INCREASE DETERIORATION FROM WEATHERING.

2.1.3. EXISTING ROCK MAY BE REUSED IF APPROVED BY THE ENGINEER.

2.1.4. ROCK BAND ROCK DIAMETERS, BY GROUP, ARE LISTED IN THE BELOW TABLE.

ROCK GROUP	RANGE OF DIAMETER (INCHES)
GROUP-A	66 - 72
GROUP-B	55 - 66

2.2. INTERIOR STRUCTURE ROCK

2.2.1. INTERIOR STRUCTURE ROCK ARE TO ARE TO BE RIGID AND RESISTANT TO EROSION. FACES SHOULD BE UNEVEN AND ROUGH IN APPEARANCE.

2.1.2. INTERIOR STRUCTURE ROCK SHALL HAVE A MINIMUM SPECIFIC GRAVITY OF 2.5 AND SHALL BE DURABLE AND OF SUITABLE QUALITY, SOUND AND DENSE, FREE FROM CRACKS, SEAMS AND OTHER DEFECTS THAT INCREASE DETERIORATION FROM WEATHERING.

2.1.3. EXISTING ROCK MAY BE USED IF APPROVED BY THE ENGINEER.

2.1.4. INTERIOR STRUCTURE ROCK DIAMETERS, BY GROUP, ARE LISTED IN THE BELOW TABLE.

ROCK GROUP	PERCENT INTERIOR STRUCTURE ROCK	RANGE OF DIAMETER (INCHES)
GROUP-A	SEE EXECUTION	66 - 72
GROUP-B	30	55 - 66
GROUP-C	60	45 - 55
GROUP-D	10	31 - 45

3. EXECUTION

3.1. ROCK BANDS

3.1.1. ROCK SHALL BE INDIVIDUALLY SELECTED AND PLACED.

3.1.2. ROCK PLACEMENT SHALL BE AT THE DISCRETION OF THE ENGINEER.

3.1.3. THE SUBGRADE MUST ACCOMMODATE THE PLACEMENT OF GROUPS B AND C ROCK.

3.1.4. GROUPS B AND C ROCK MUST FORM A STABLE BASE FOR GROUP A ROCK.

3.1.5. GROUP A ROCK IS PLACED ON GROUP B AND C ROCK SUCH THAT THE ROCK RESISTS ROLLING DUE TO GRAVITATIONAL AND HYDRAULIC FORCES.

3.1.6. ALL ROCK MUST HAVE AT LEAST THREE POINTS OF CONTACT.

3.1.7. FINISH GRADE IS MEASURED AT THE CONTACT POINT BETWEEN ADJACENT ROCKS.

3.1.8. GROUP A ROCK SHALL EXTEND ABOVE FINISHED GRADE AS NOTED IN THE DRAWING DETAILS. IF GROUP A ROCK EXTENDS GREATER THAN NOTED, THE CONTRACTOR MAY BE REQUIRED TO MODIFY THE ROCK IF DIRECTED BY THE ENGINEER.

3.1.9. KEYING INTO BEDROCK FOR PLACEMENT MAY BE NECESSARY. ENGINEER TO APPROVE ALL BEDROCK MODIFICATION.

3.2. INTERIOR STRUCTURE ROCK

3.2.1. ROCK SHALL BE HAND SELECTED AND INDIVIDUALLY PLACED.

3.2.2. ROCK PLACEMENT SHALL BE AT THE DISCRETION OF THE ENGINEER.

3.2.3. ALL ROCK MUST BE IN CONTACT WITH ADJACENT ROCK.

3.2.4. ROCK SHALL BE PLACED SO THAT EACH ROCK IN A SERIES IS WORKING WITH THE OTHER ROCK TO COUNTERACT HYDRAULIC FORCES.

3.2.5. GROUP A ROCK IS PLACED APPROXIMATELY WHERE SHOWN IN THE DRAWINGS. GROUPS B, C, AND D ARE NOT SPECIFICALLY DESIGNATED ON THE PLANS BUT ARE TO BE THE ROCK USED (BASED ON THE GRADATION) TO BUILD THE INTERIOR STRUCTURE FEATURES AS GENERALLY SHOWN IN THE DRAWINGS.

3.2.6. FINISH GRADE IS MEASURED AT THE CONTACT POINT BETWEEN ADJACENT ROCKS.

3.2.7. ROCK MUST EXTEND ABOVE FINISHED GRADE BETWEEN APPROXIMATELY 1/4 TO 1/3 OF ITS DIAMETER.

3.2.8. ROCK MAY NOT EXTEND MORE THAN 1/3 OF ITS DIAMETER ABOVE FINISHED GRADE.

3.2.9. ENGINEERED STREAMBED MATERIAL (SEE BELOW) SUBGRADE MAY BE REQUIRED TO MEET FINISH GRADE REQUIREMENTS.

ENGINEERED STREAMBED MATERIAL (ESM)

1. GENERAL

1.1. ENGINEERED STREAMBED MATERIAL (ESM) IS ROCK MATERIAL PLACED BETWEEN AND TO SUPPORT STRUCTURE ROCK FEATURES.

2. PRODUCTS

2.1. EXISTING CHANNEL MATERIAL MAY BE REUSED IF APPROVED BY ENGINEER.

2.2. ALL MATERIAL LARGER THAN 8-INCH DIAMETER SHALL BE ANGULAR.

2.3. ENGINEERED STREAMBED MATERIAL SHALL HAVE A MINIMUM THICKNESS OF 4 FEET.

2.4. ENGINEERED STREAMBED MATERIAL SHALL FOLLOW THE BELOW GRADATION TABLE.

ROCK GROUP	VOLUME PERCENT OF ESM MIX	RANGE OF DIAMETER (INCHES)
GROUP-C	20	45 - 55
GROUP-D	20	31 - 45
GROUP-E	10	18 - 31
GROUP-F	10	13 - 18
GROUP-G	10	5.7 - 13
GROUP-H	10	0.6 - 5.7
GROUP-I	10	#10 SIEVE - 0.6
GROUP-J	10	<#10 SIEVE

3. EXECUTION

3.1. ESM PREPARATION AND PLACEMENT MUST FOLLOW THE APPROVED CHANNEL MATERIAL MANAGEMENT PLAN.

3.2. ESM MUST BE PLACED IN LIFTS. SEE DETAIL 2 SHEET C-503.

3.3. ESM SHOULD SURROUND AND FILL VOIDS AROUND STRUCTURE ROCKS.

3.4. EACH LIFT SHALL INCLUDE ROCK FROM ALL ROCK GROUPS.

3.5. EACH LIFT SHALL BE SEALED SO THAT WATER FLOWS ON THE SURFACE AND DOES NOT GO SUBSURFACE. THE CONTRACTOR SHALL SEAL THE SURFACE IN A METHOD APPROVED BY THE ENGINEER. IT IS RECOMMENDED THAT JETTING OR FLOODING AS WELL AS MECHANICAL MEANS BE USED.

3.6. THE FINAL LIFT SHALL BE ROUGH IN APPEARANCE WITH GROUPS C, D, AND E ROCK PROTRUDING APPROXIMATELY 1/4 TO 1/3 OF THE DIAMETER ABOVE FINISHED GRADE. GROUPS C, D, AND E ROCK SHALL NOT PROTRUDE MORE THAN 1/3 OF THE DIAMETER ABOVE FINISH GRADE.

CHANNEL SPINE ROCK

1. GENERAL

1.1. CHANNEL SPINE ROCK IS LARGE ROCK PLACED BETWEEN THE TWO UPPER RIVER LEFT AND RIVER RIGHT CHANNELS. THE PURPOSE OF THIS ROCK IS TO PROVIDE AN ANCHOR POINT FOR STRUCTURE ROCK.

2. PRODUCTS

2.1. ROCKS ARE TO ARE TO BE ANGULAR, RIGID AND RESISTANT TO EROSION. FACES SHOULD BE UNEVEN AND ROUGH IN APPEARANCE.

2.2. ROCK FOR ROCK BANDS SHALL HAVE A MINIMUM SPECIFIC GRAVITY OF 2.5 AND SHALL BE DURABLE AND OF SUITABLE QUALITY, SOUND AND DENSE, FREE FROM CRACKS, SEAMS AND OTHER DEFECTS THAT INCREASE DETERIORATION FROM WEATHERING.

2.3. EXISTING ROCK MAY BE USED IF APPROVED BY THE ENGINEER.

2.4. THE CHANNEL SPINE SHALL BE APPROXIMATELY 4 FEET THICK.

2.5. CHANNEL SPINE ROCK SHALL FOLLOW THE BELOW GRADATION TABLE.

ROCK GROUP	PERCENT SPINE ROCK MIX	RANGE OF DIAMETER (INCHES)
GROUP-C	60	45 - 55
GROUP-D	40	31 - 45

2.6. CHANNEL SPINE ROCK SHALL HAVE VOIDS FILLED WITH THE FOLLOWING ROCK GRADATION.

ROCK GROUP	VOLUME PERCENT OF FILLER MIX	RANGE OF DIAMETER (INCHES)
GROUP-G	20	5.7 - 13
GROUP-H	50	0.6 - 5.7
GROUP-I	20	#10 SIEVE - 0.6
GROUP-J	10	<#10 SIEVE

3. EXECUTION

3.1. ROCK SHALL BE INDIVIDUALLY SELECTED AND INDIVIDUALLY PLACED.

3.2. ROCK PLACEMENT SHALL BE AT THE DISCRETION OF THE ENGINEER.

3.3. ALL ROCK MUST BE IN CONTACT WITH ADJACENT ROCK.

3.4. ROCK SHALL BE PLACED SO THAT EACH ROCK IN A SERIES IS WORKING WITH THE OTHER ROCK TO COUNTERACT HYDRAULIC FORCES.

3.5. PLACE FILLER MATERIAL IN ROCK VOIDS. TAMP FILLER MATERIAL. FOLLOW BY JETTING OR FLOODING

3.6. ROCK SHALL BE PLACED IN TWO LIFTS. EACH LIFT MUST BE SEALED SO WATER FLOWS ON THE SURFACE.

BANKLINE ROCK

1. GENERAL

1.6. BANKLINE ROCK IS LOCATED ALONG THE CHANNEL MARGINS WHERE SHOWN.

2. PRODUCTS

2.1. BANKLINE ROCKS ARE TO BE RIGID AND RESISTANT TO EROSION. FACES SHOULD BE UNEVEN, PROTRUDE INTO THE CHANNEL AND BE ROUGH IN APPEARANCE.

2.2. BANKLINE ROCKS SHALL BE 1/2 TON CLASS ROCK.

2.3. BANKLINE FILLER MATERIAL SHALL FOLLOW THE BELOW GRADATION TABLE.

ROCK GROUP	VOLUME PERCENT OF FILLER MIX	RANGE OF DIAMETER (INCHES)
GROUP-G	20	5.7 - 13
GROUP-H	50	0.6 - 5.7
GROUP-I	20	#10 SIEVE - 0.6
GROUP-J	10	<#10 SIEVE

3. EXECUTION

3.1. INSTALL BANKLINE ROCK WHERE SHOWN ON THE PLANS.

3.2. PLACE BANKLINE ROCK FILLER MATERIAL IN BANKLINE ROCK VOIDS. TAMP FILLER MATERIAL. FOLLOW BY JETTING OR FLOODING. CONTINUE UNTIL VOIDS VISUALLY APPEAR FILLED AND WATER REMAINS FLOWING ON THE SURFACE.

DOMINIE CREEK INDIVIDUALLY PLACED ROCK

4. PRODUCTS

4.1. ROCKS ARE TO BE RIGID AND RESISTANT TO EROSION. FACES SHOULD BE UNEVEN AND ROUGH IN APPEARANCE.

4.2. ROCK SHALL HAVE A MINIMUM SPECIFIC GRAVITY OF 2.5 AND SHALL BE DURABLE AND OF SUITABLE QUALITY, SOUND AND DENSE, FREE FROM CRACKS, SEAMS AND OTHER DEFECTS THAT INCREASE DETERIORATION FROM WEATHERING.

4.3. ROCK SHALL BE 1 TON.

5. EXECUTION

5.1. ROCK TO BE INDIVIDUALLY SELECTED AND PLACED AS DIRECTED BY ENGINEER.

5.2. THE EXISTING CHANNEL MATERIAL WILL BE MOVED AROUND AS DIRECTED BY THE ENGINEER TO ACCOMMODATE THE NEW ROCK AND TO ACHIEVE THE DESIRED CHANNEL SLOPE.

5.3. MECHANICAL TAMPING AND JETTING OR FLOODING WILL BE REQUIRED TO BED THE MATERIAL.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C 79169 — Exp. 6-30-20 — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

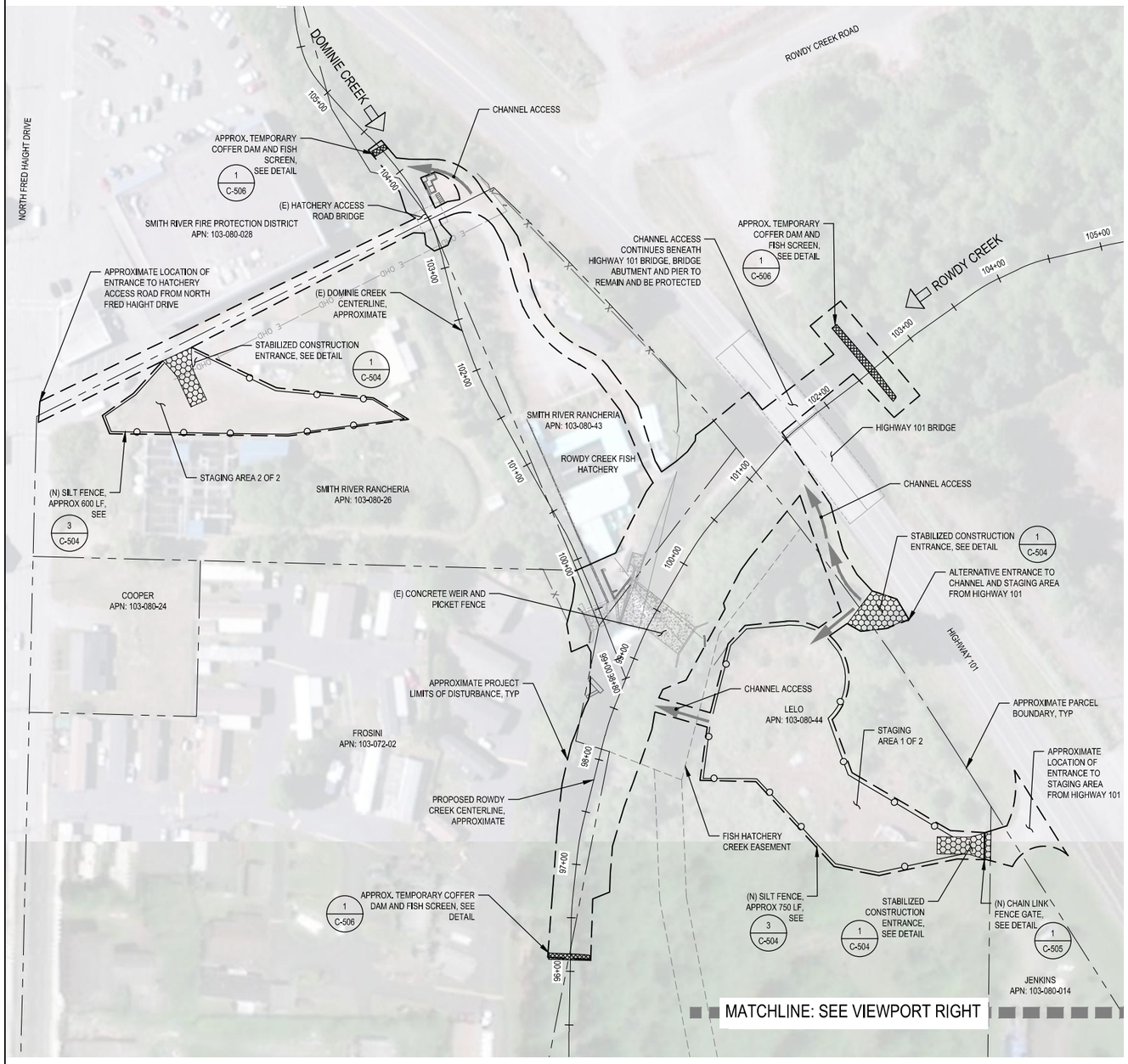
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

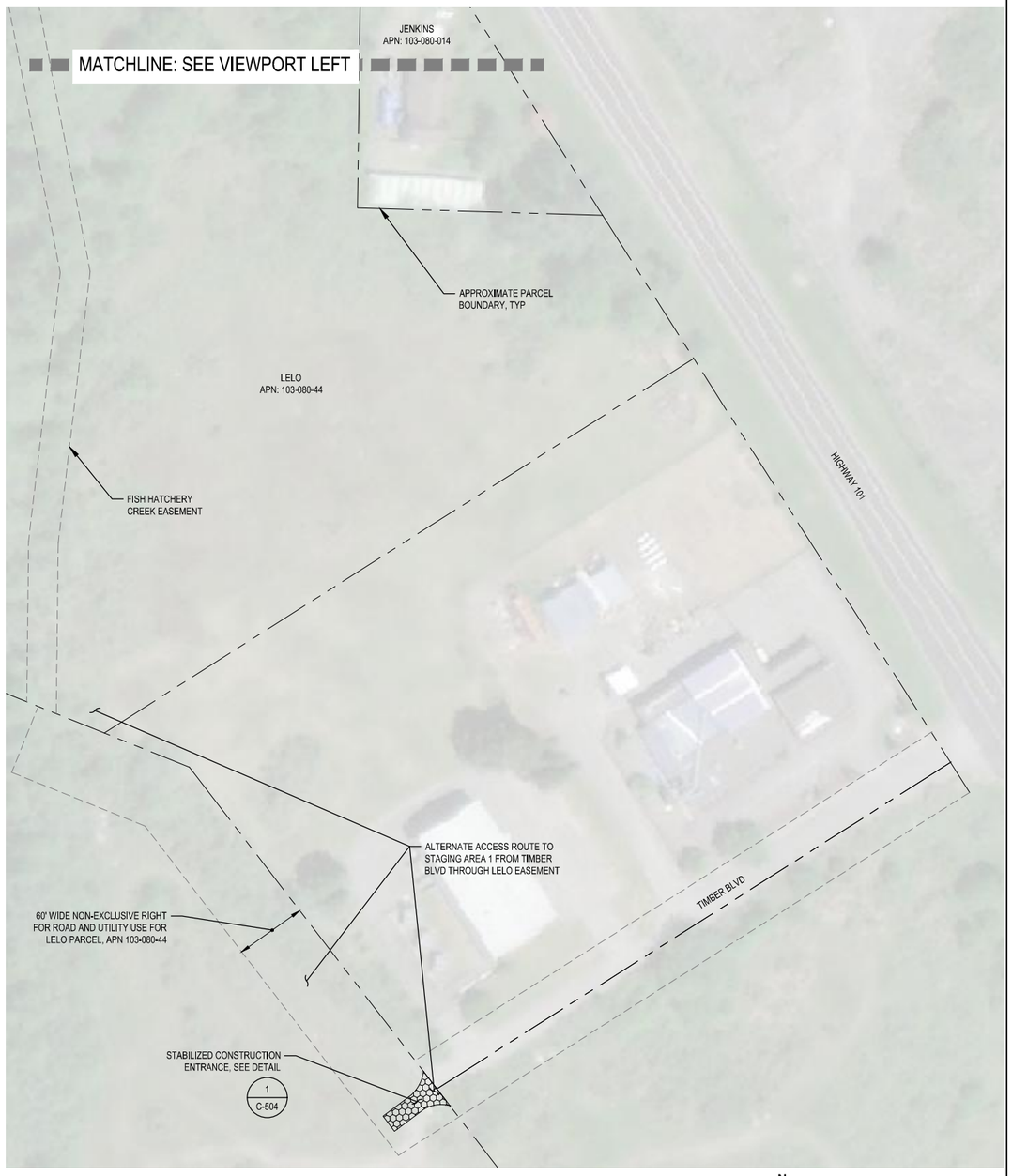
Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK
ROCK GRADATION AND PLACEMENT NOTES
Project No. 11125168

Original Size ANSI D | Drawing G-004 | Sheet 4 of 49

Plot Date: 1 August 2018 - 8:56 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_G-004_Rock Notes.dwg





N

0 60' 120'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 72163 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

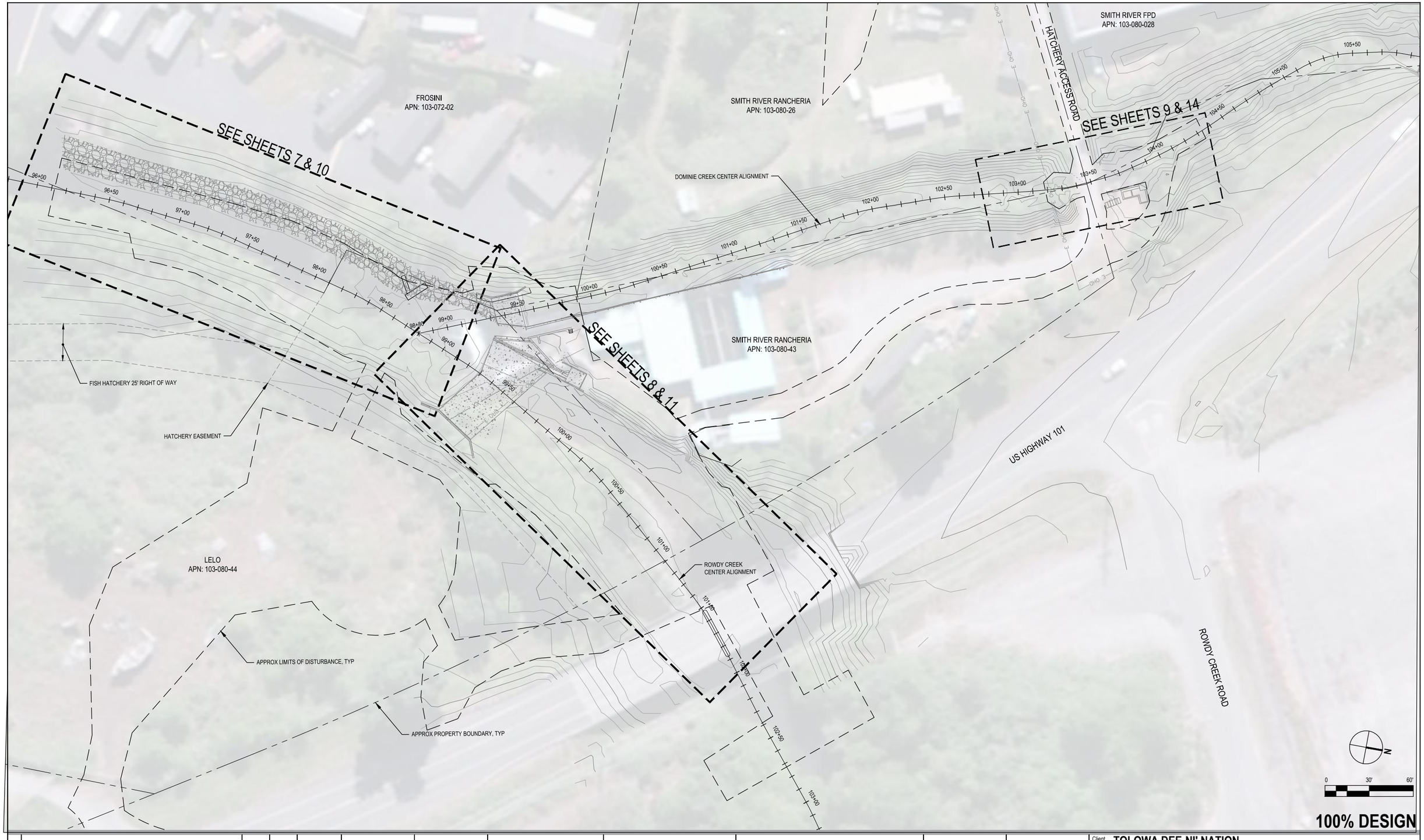
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK ACCESS, WATER MANAGEMENT & EROSION CONTROL PLAN
Project No. 11125168

Original Size ANSI D | Drawing G-005 | Sheet 5 of 49

Plot Date: 1 August 2018 - 9:14 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_G-005_Staging and Access Plan.dwg



100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER
JEREMY SHANE SVEHLA
No. C79169
Exp.
CIVIL
STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.
© 2018 GHD

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK
PLAN VIEW SHEET INDEX
Project No. 11125168
Original Size ANSI D
Drawing C-101
Sheet 6 of 49

Plot Date: 1 August 2018 - 9:02 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-101_Sheet Index.dwg

FROSINI
APN: 103-072-002

(E) RSP ON RIVER RIGHT BANK DOWNSTREAM OF DOMINIE CREEK CONFLUENCE TO REMAIN AND BE PROTECTED. TYP.

(E) REDWOOD HABITAT LOGS TO REMAIN AND BE PROTECTED

(E) THALWEG ALIGNMENT

DOMINIE CREEK CENTER ALIGNMENT

ROWDY CREEK CENTER ALIGNMENT

APPROXIMATE PROPERTY BOUNDARY, TYP.

APPROXIMATE LIMITS OF CLEARING AND GRUBBING, TYP

APPROXIMATE LIMITS OF DISTURBANCE, TYP

(E) VISIBLE BEDROCK TO REMAIN, TYP.

(E) BANK RSP TO REMAIN ONSITE AND BE USED FOR FINISHED GRADING BANKLINE ROCK AT ENGINEERS APPROVAL

MATCH LINE STA 98+90.00 SEE SHEET 8

APPROXIMATE EASEMENT BOUNDARY, TYP.

CHANNEL ACCESS

STAGING AREA 1

50 45 40 35 40 35

96+00 96+50 97+00 97+50 98+00 98+50 98+80

ROWDY EXISTING & DEMOLITION PLAN VIEW

SCALE 0 10' 20'

N

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER
JEREMY SHANE SVEHLA
No. C-78169
Exp.
CIVIL
STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK
EXISTING & DEMOLITION PLAN VIEW 1 OF 2
Project No. 11125168

Original Size ANSI D
Drawing C-102
Sheet 7 of 49

Plot Date: 1 August 2018 - 9:03 AM Plotted By: Brendan Byrd Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-102-104_ExistingConditions.dwg

2 EA (E) REDWOOD TREES AND STUMPS TO BE REMOVED AND DISPOSED, LOCATION APPROXIMATE

(E) 8" PVC PIPE TO BE TEMPORARILY CONNECTED ACROSS CHANNEL DURING CONSTRUCTIONN, THEN REPLACED AS SHOWN IN PLANS, SEE C-301

(E) WALKWAY & PEIR TO BE REMOVED AND DISPOSED

(E) CONCRETE RETAINING WALL TO REMAIN AND BE PROTECTED, TYP

SAWCUT CONCRETE ALONG APRON EDGE AT RETAINING WALL

(E) FISH LADDER, TO REMAIN

SAWCUT CONCRETE ALONG WEST EDGE AT WALL BOTTOM

(E) CONCRETE STAIR TO BE REMOVED AND DISPOSED

(E) ROCK WALL TO BE REMOVED AND DISPOSED

(E) CONCRETE SLAB WITH HATCHERY FACILITIES, TO REMAIN AND BE PROTECTED, TYP

(E) GANGWAY TO BE REMOVED AND DISPOSED

(E) WELL TO BE REMOVED AND DISPOSED

(E) THALWEG ALIGNMENT

(E) CONCRETE RUBBLE AND ROCK TO BE REMOVED AND DISPOSED, ROCK MAY BE REUSED ONSITE SUBJECT TO ENGINEERS APPROVAL

(E) VISIBLE BEDROCK TO REMAIN , TYP.

(E) HATCHERY FISH TRAP STRUCTURE TO BE REMOVED AND DISPOSED

(E) CONCRETE APRON TO BE REMOVED AND DISPOSED

(E) CONCRETE WEDGE TO BE REMOVED AND DISPOSED

APPROX PHOTO LOCATION, TYP 1 OF 2

DOMINIE CREEK CENTER ALIGNMENT

ROWDY CREEK CENTER ALIGNMENT

APPROXIMATE LIMITS OF CLEARING AND GRUBBING, TYP

APPROXIMATE PROPOSED EXTENTS OF CONCRETE/ROCK DEMOLITION, TYP

(E) CONCRETE WEIR, DEPTH UNKNOWN, TO BE REMOVED AND DISPOSED, SEE PHOTO THIS SHEET

(E) HYDRAULIC FISH EXCLUSION FENCE AND APPURTENANCES TO BE REMOVED AND DISPOSED

MATCH LINE STA 99+00.00 SEE SHEET 7

(E) CONCRETE WALL AND FOOTING TO BE REMOVED AND DISPOSED

(E) OVERHEAD ELECTRICAL TO REMAIN AND BE PROTECTED, TYP

(E) WATER LINE TO REMAIN AND BE PROTECTED, TYP

APPROXIMATE PROPERTY BOUNDARY, TYP.

APPROXIMATE LIMITS OF DISTURBANCE, TYP

HIGHWAY 101

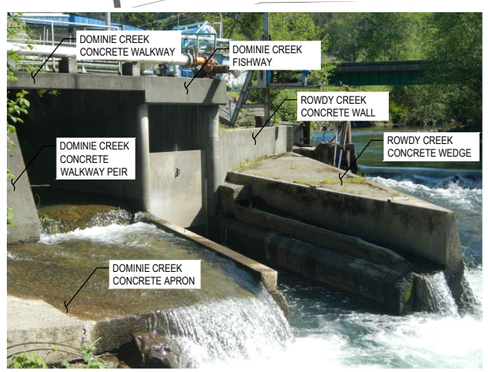
CHANNEL ACCESS UNDER HIGHWAY 101 BRIDGE

(E) HIGHWAY 101 BRIDGE PIER TO REMAIN AND BE PROTECTED, TYP

CHANNEL ACCESS FROM HIGHWAY 101

ROWDY EXISTING & DEMOLITION PLAN VIEW

SCALE 0 10' 20'



A EXISTING CONCRETE FEATURES FOR REFERENCE

B EXISTING WEIR PHOTO FOR REFERENCE (SEPTEMBER, 1998).

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C-79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

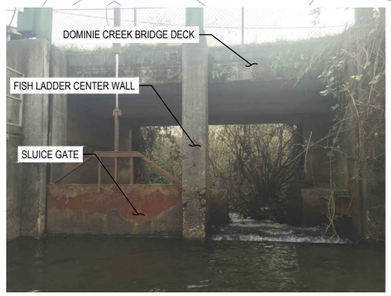
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK
EXISTING & DEMOLITION PLAN VIEW 2 OF 2
Project No. 11125168

Original Size ANSI D
Drawing C-103
Sheet 8 of 49

Plot Date: 3 August 2018 - 9:31 AM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-102-104_ExistingConditions.dwg



A SLUICE GATE AND FISH LADDER CENTER WALL

B FISHWAY WEIRS AND COUNTERFORT WALLS

(E) FISH LADDER BOTTOM SLAB TO BE REMOVED AND DISPOSED, SEE STRUCTURAL SHEET S-106 FOR ABUTMENT STABILIZATION IMPROVEMENTS

GREY HATCH DENOTES CONCRETE FEATURES TO BE REMOVED BENEATH DOMINIE CREEK BRIDGE

REMOVE (E) FISH LADDER COUNTERFORTS , TYP 1 OF 3 ON RIVER RIGHT

(E) FISH LADDER WIERS TO BE REMOVED AND DISPOSED, TYP 1 OF 4

(E) VISIBLE BEDROCK, TYP.

DOMINIE CREEK CENTER ALIGNMENT

(E) BEDROCK TO REMAIN AND BE PROTECTED, TYP

APPROXIMATE PHOTO LOCATION, TYP 1 OF 2

(E) FISH LADDER CENTER WALL AND COUNTERFORTS TO BE REMOVED AND DISPOSED

8" ALDER TO REMAIN AND BE PROTECTED

(E) SLUICE CHANNEL CONCRETE SLAB TO BE REMOVED AND DISPOSED, SEE STRUCTURAL SHEET S-106 FOR ABUTMENT STABILIZATION IMPROVEMENTS

(E) SLUICE GATE AND SUPPORT STRUCTURE TO BE REMOVED AND DISPOSED

(E) DIVERSION STRUCTURE, TO REMAIN

(E) METAL WALKWAY, TO REMAIN

(E) BRIDGE AND ABUTMENTS TO REMAIN AND BE PROTECTED, TYP

(E) CONCRETE STAIRS, TO REMAIN

LIMITS OF DISTURBANCE, TYP

CHANNEL ACCESS LIMIT VEGETATION REMOVAL FOR CHANNEL INGRESS/EGRESS

(E) OVERHEAD ELECTRICAL TO REMAIN AND BE PROTECTED, TYP

HATCHERY ACCESS ROAD

103+00

103+50

104+00

65 60 55 50

E OHD

DOMINIE EXISTING & DEMOLITION PLAN VIEW

SCALE

0 5' 10'

NOTE: NOT ALL TREES SURVEYED. UNLESS OTHERWISE NOTED, ALL VEGETATION TO REMAIN AND BE PROTECTED

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 78168 CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.
© 2018 GHD

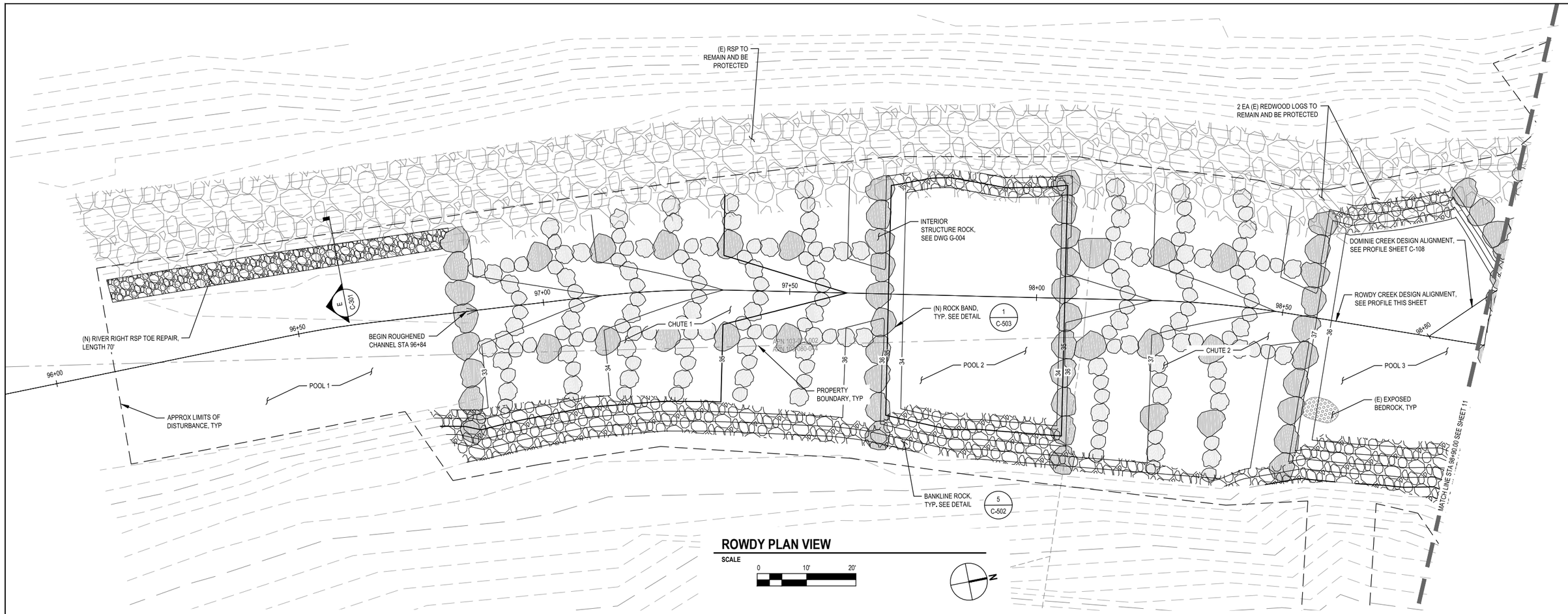
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

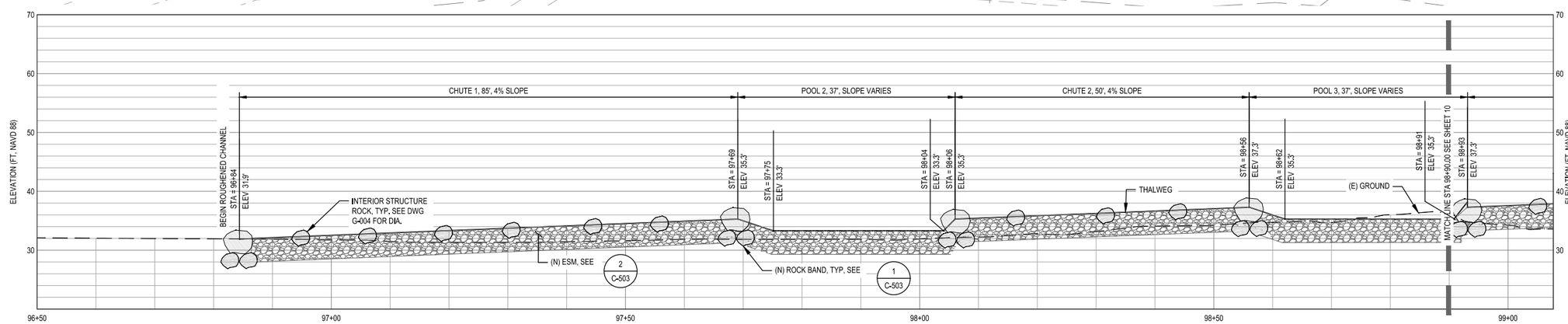
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title DOMINIE CREEK EXISTING & DEMOLITION PLAN & VIEW
Project No. 11125168
Original Size ANSI D
Drawing C-104
Sheet 9 of 49

Plot Date: 1 August 2018 - 9:03 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-102-104_ExistingConditions.dwg



ROWDY PLAN VIEW

SCALE 0 10' 20'



ROWDY CENTERLINE PROFILE

SCALE 0 10' 20'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization. © 2018 GHD

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK PLAN & PROFILE 1 OF 2
Project No. 11125168

Original Size ANSI D
Drawing C-105
Sheet 10 of 49

Plot Date: 1 August 2018 - 9:04 AM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-105-107 & 109_Plans&Profiles.dwg

(N) HANDRAIL, TYP

(N) ELECTRICAL CONTROL BUILDING, SEE ELECTRICAL SITE PLAN E-101

(N) ACCESS STAIRWAY

(N) 3/4" CRUSHED GRAVEL, MIN 6" THICK

(N) ROWDY CREEK HATCHERY FACILITY IMPROVEMENTS, SEE DWG C-107 FOR PLAN AND PROFILE

APPROX LIMITS OF DISTURBANCE, TYP

(N) METAL ACCESS WALKWAY, SEE C-301

(N) SOIL ANCHOR AND SHOTCRETE RETAINING WALL IN FRONT OF (E) RETAINING WALL, SEE S-102

(N) 8" PVC WATER LINE, SEE SECTION A SHEET C-301 FOR DETAIL

CONNECT (N) WALL TO (E) WALL, SEE S-104

BACKFILL (E) DOMINIE CREEK FISHWAY WITH ESM TO EL 41.0'

DOMINIE CREEK CENTER ALIGNMENT SEE PROFILE SHEET C-108

(N) TRAP ENTRANCE

(N) SCOUR PROTECTION ROCK AGAINST HATCHERY FACILITY, SEE SECTIONS SHEET C-301

(N) RETURN CHANNEL, SEE PROFILE SHEET C-107

(E) EXPOSED BEDROCK, TYP

END RIVER RIGHT ROUGHENED CHANNEL

UPPER CHANNEL RIVER RIGHT THALWEG, SEE DRAWING C-108 FOR PROFILE

HIGHWAY 101

(N) PICKET FENCE, SEE DETAIL, FENCE TO BE COMPOSED OF 3 SEGMENTS OF EQUAL LENGHT

CHUTE 3

POOL 5 CONNECTION

(E) BRIDGE PIER TO REMAIN AND BE PROTECTED, TYP

ROWDY CREEK CENTER ALIGNMENT SEE PROFILE THIS SHEET

MATCH LINE STA 98+90.00 SEE SHEET 10

(N) CONCRETE SLAB WITH PIT TAG ANTENNA ARRAY, SEE C-503

UPPER CHANNEL RIVER LEFT THALWEG, SEE DRAWING C-108 FOR PROFILE

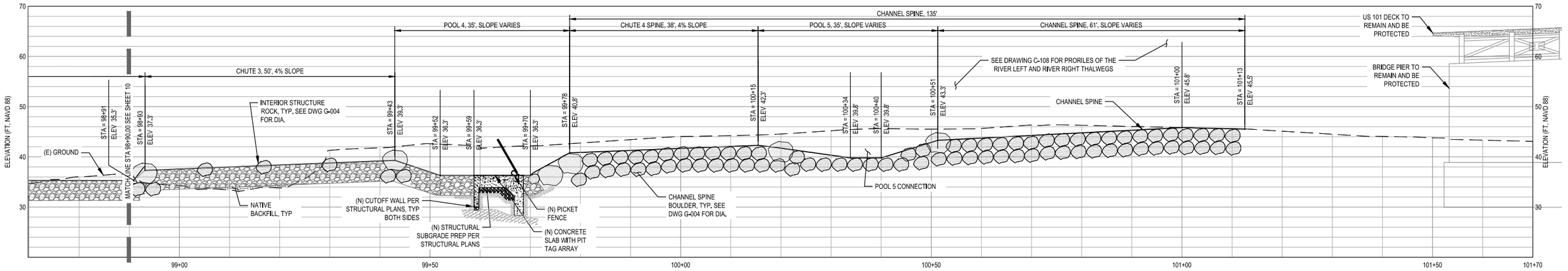
END RIVER LEFT ROUGHENED CHANNEL

BANK LINE ROCK, TYP, SEE DETAIL 5 C-502

(N) CONCRETE RETAINING WALL, SEE SHEET S-302

ROWDY PLAN VIEW

SCALE 0 10' 20'



ROWDY CENTERLINE PROFILE

SCALE 0 10' 20'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

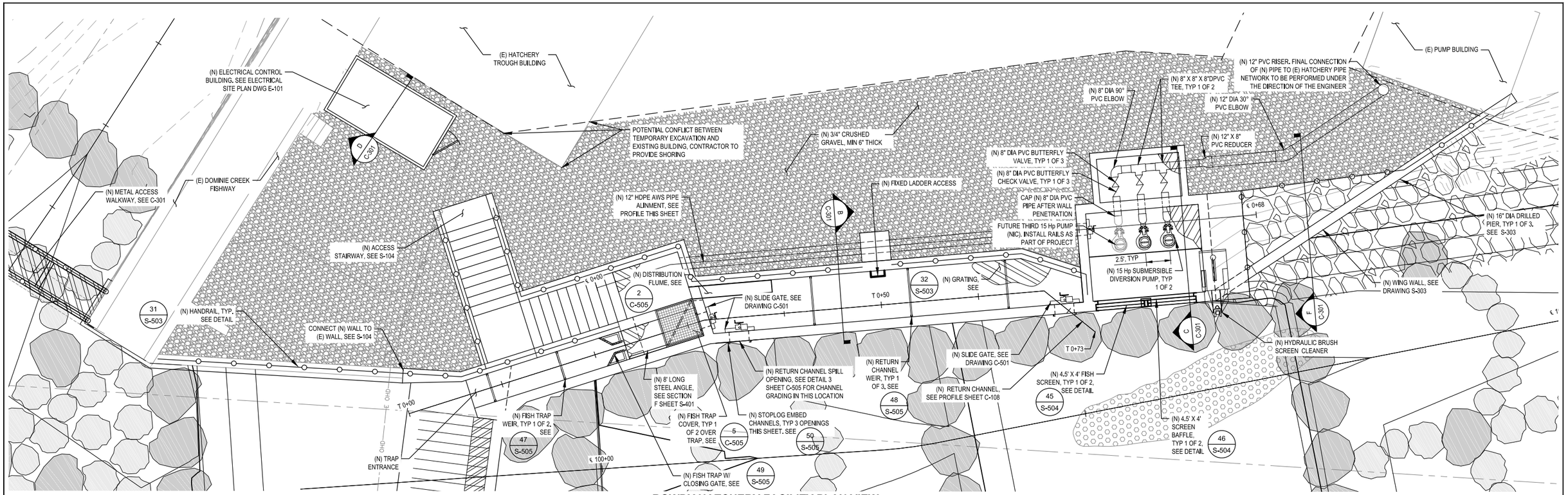
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK PLAN & PROFILE 2 OF 2
Project No. 11125168

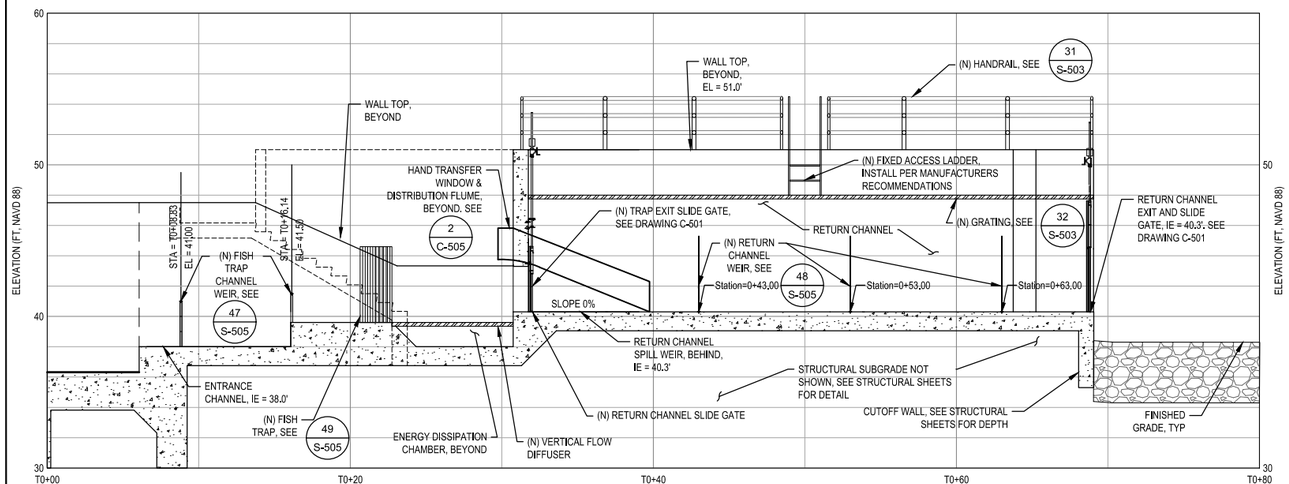
Original Size ANSI D
Drawing C-106
Sheet 11 of 49

Plot Date: 1 August 2018 - 9:05 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-105-107 & 109_Plans&Profiles.dwg



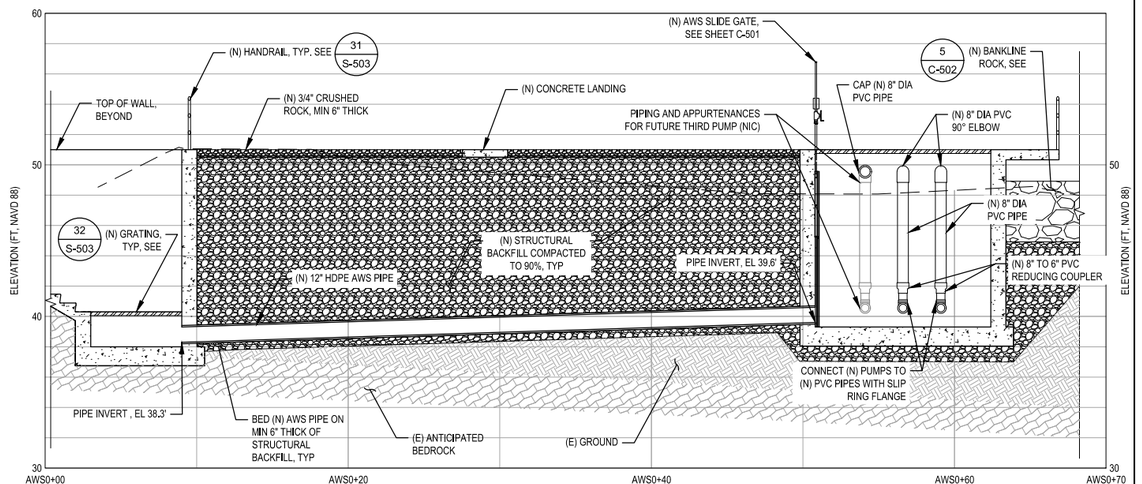
ROWDY HATCHERY FACILITY PLAN VIEW

SCALE 0 5' 10'



HATCHERY TRAP CENTERLINE PROFILE

SCALE 0 5' 10'



AWS CENTERLINE PROFILE

SCALE 0 5' 10'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLEY No. C 78169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

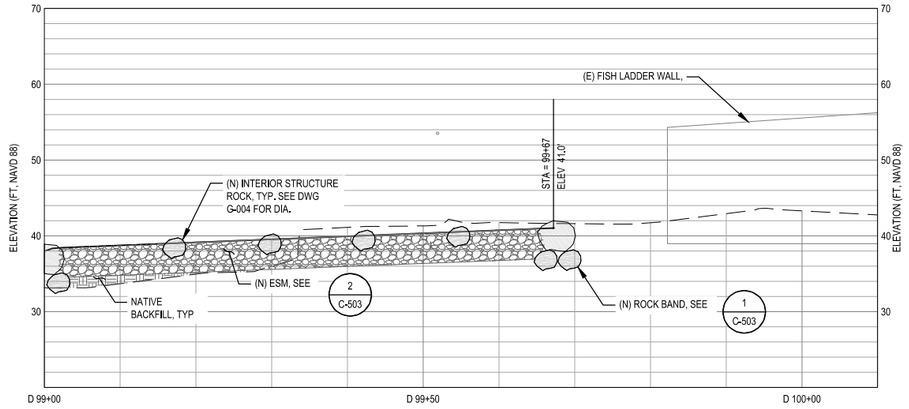
Drawn	B. BYRD	Designer	pTJ
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

This document shall not be used for construction unless signed and sealed for construction.

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK HATCHERY FACILITY PLAN
Project No. 11125168

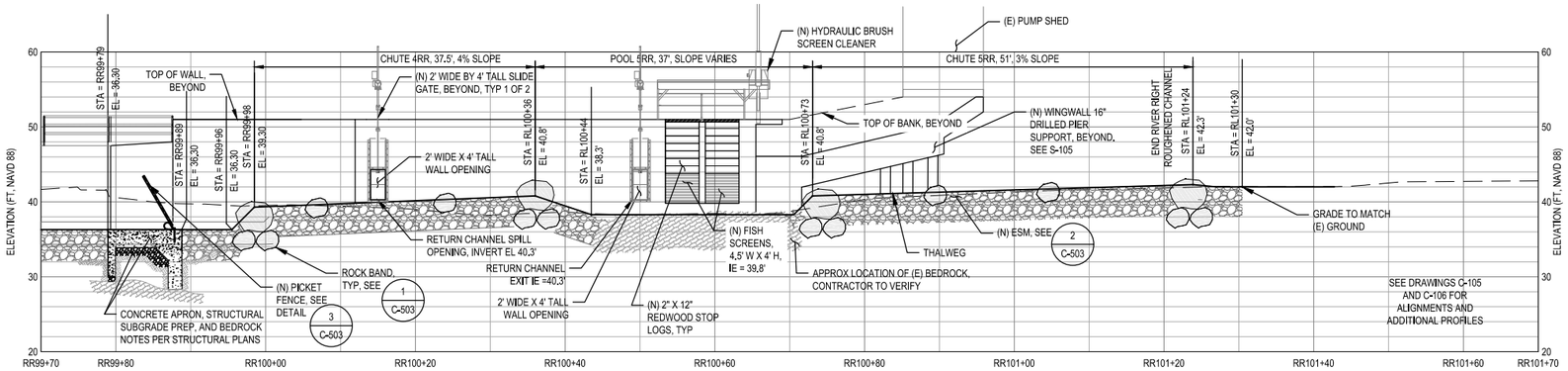
Original Size ANSI D
Drawing C-107
Sheet 12 of 49

Plot Date: 1 August 2018 - 9:05 AM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-105-107 & 109_Plans&Profiles.dwg



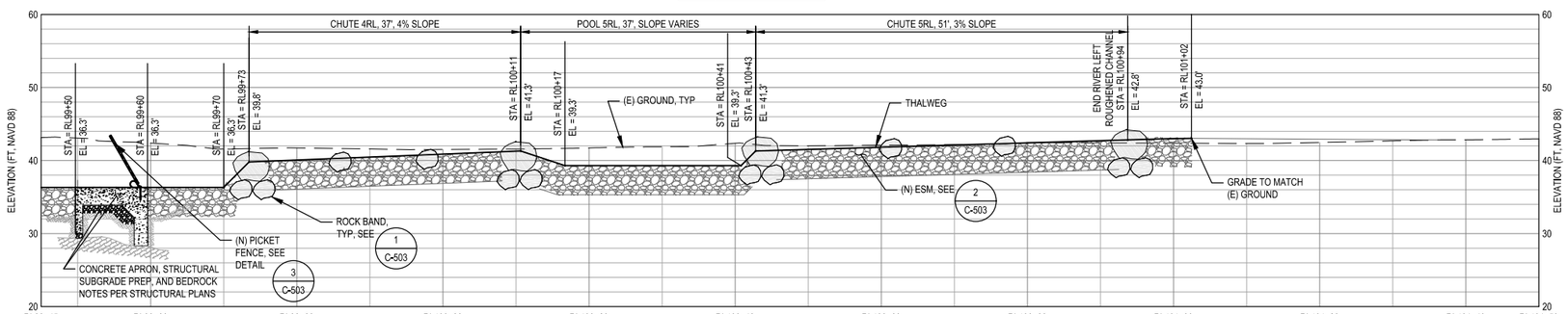
DOMINIE DESIGN CENTERLINE PROFILE

SCALE 0 10' 20'



UPPER CHANNEL RIVER RIGHT THALWEG PROFILE

SCALE 0 10' 20'



UPPER CHANNEL RIVER LEFT THALWEG PROFILE

SCALE 0 10' 20'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C 78169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet

0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

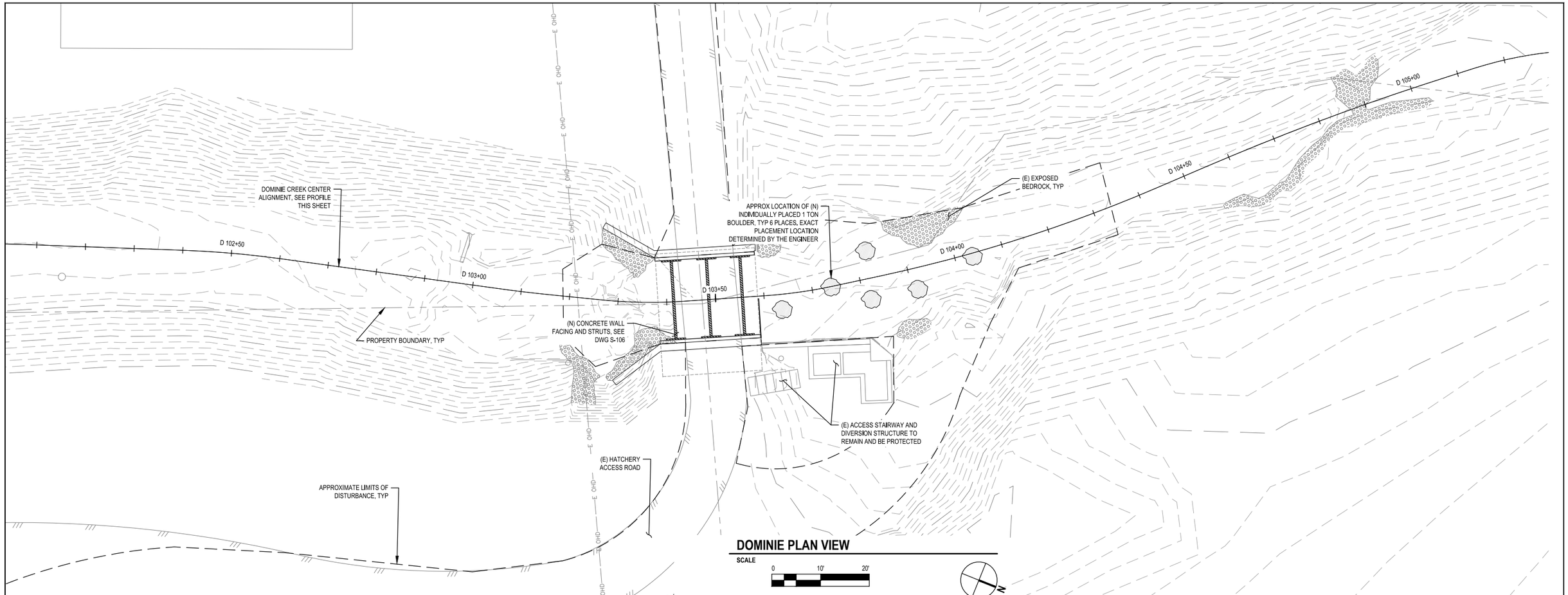
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK ADDITIONAL PROFILES
Project No. 11125168

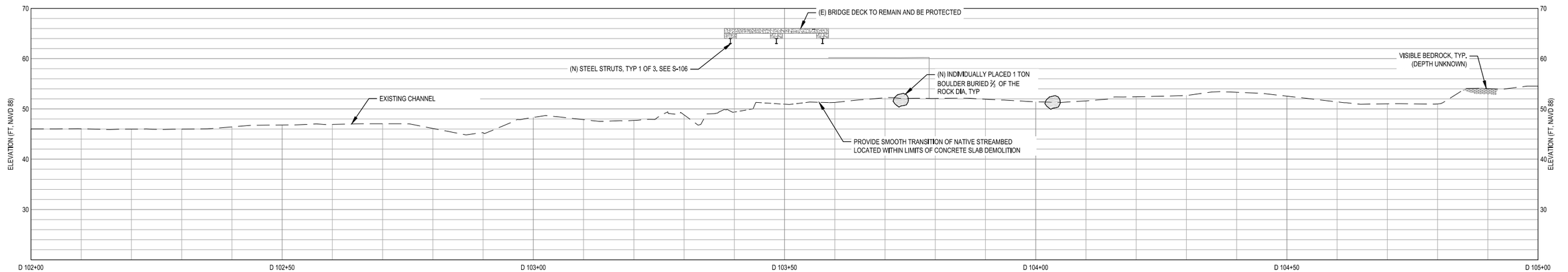
Original Size ANSI D
Drawing C-108
Sheet 13 of 49

Plot Date: 1 August 2018 - 9:06 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-108_Additional Profiles.dwg



DOMINIE PLAN VIEW

SCALE 0 10' 20'



DOMINIE CENTERLINE PROFILE

SCALE 0 10' 20'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

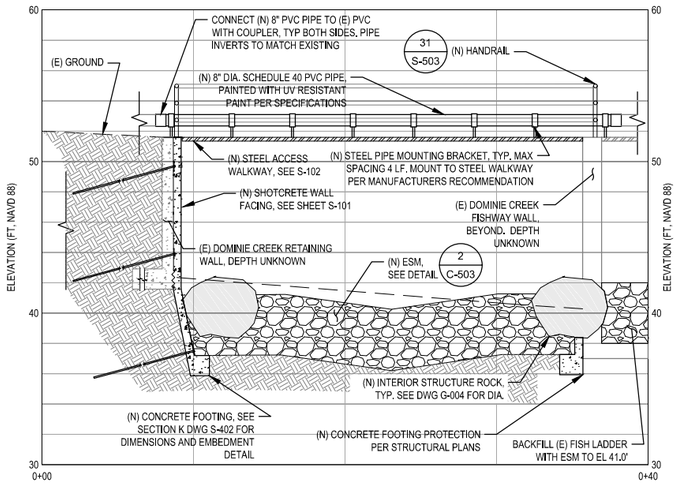
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title DOMINIE CREEK PLAN & PROFILE
Project No. 11125168

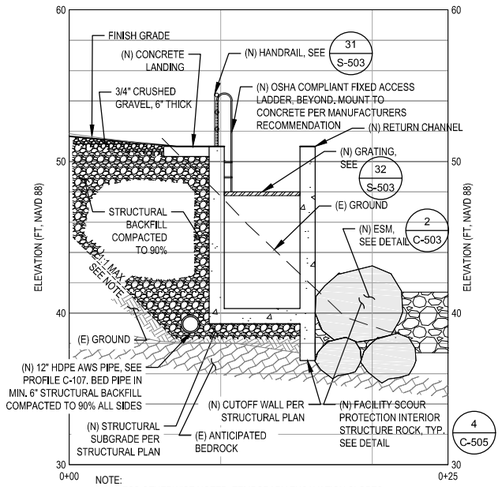
Original Size ANSI D | Drawing C-109 | Sheet 14 of 49

Plot Date: 1 August 2018 - 9:07 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-105-107 & 109_Plans&Profiles.dwg



A DOMINIE RETAINING WALL AND PIPE CROSSING

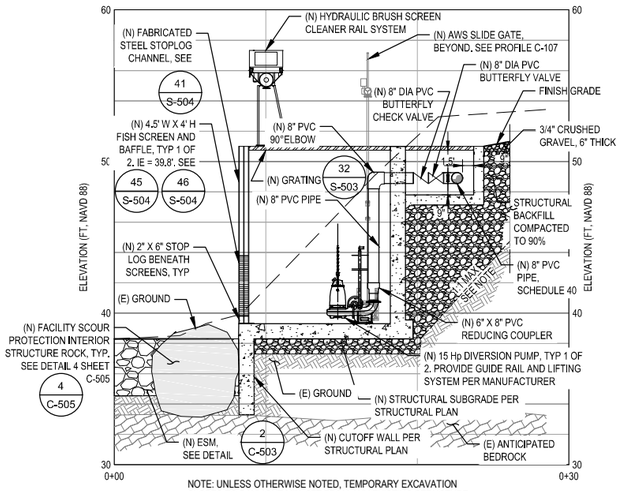
SCALE 0 5' 10'



NOTE:
1. UNLESS OTHERWISE NOTED, TEMPORARY EXCAVATION SLOPES TO DAYLIGHT MIN. 2FT FROM ANY EXISTING STRUCTURE.

B RETURN CHANNEL

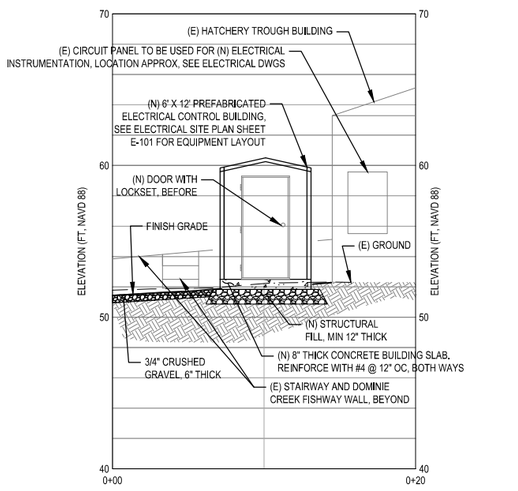
SCALE 0 5' 10'



NOTE: UNLESS OTHERWISE NOTED, TEMPORARY EXCAVATION SLOPES TO DAYLIGHT MIN. 2FT FROM ANY EXISTING STRUCTURE

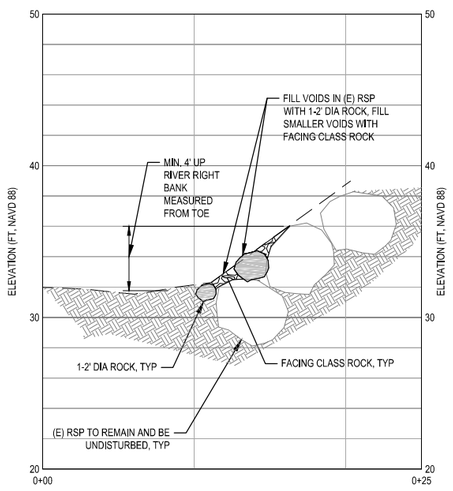
C DIVERSION STRUCTURE

SCALE 0 5' 10'



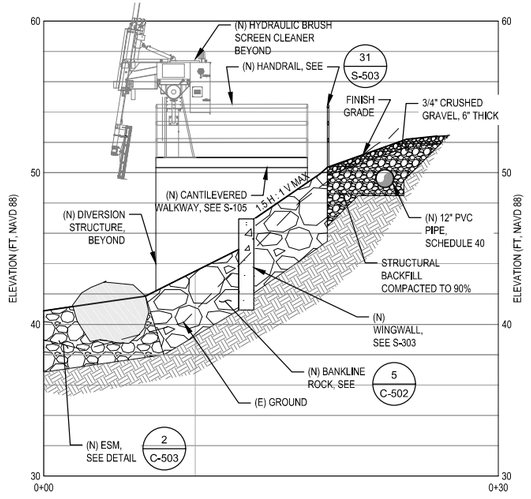
D ELECTRICAL CONTROL BUILDING

SCALE 0 5' 10'



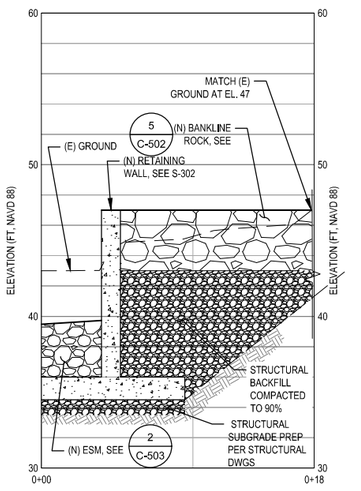
E DOWNSTREAM RIVER RIGHT RSP REPAIR

SCALE 0 5' 10'



F UPSTREAM WING WALL AND BANK RSP

SCALE 0 5' 10'



G ROWDY CREEK EAST WALL BACKFILL

SCALE 0 5' 10'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

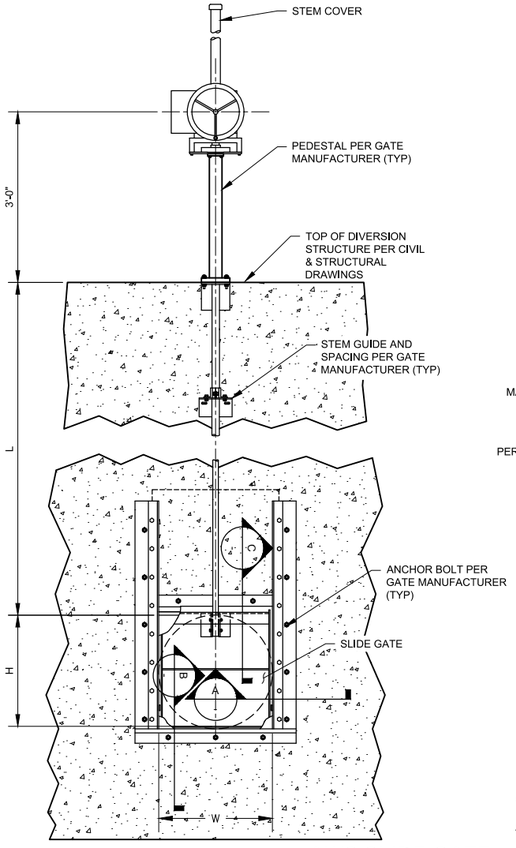
This document shall not be used for construction unless signed and sealed for construction.

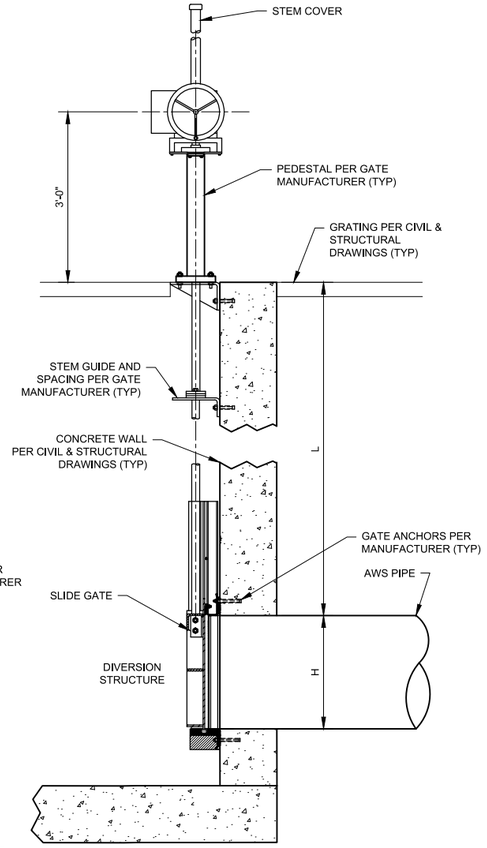
Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK CIVIL CROSS SECTIONS
Project No. 11125168

Original Size ANSI D
Drawing C-301
Sheet 15 of 49

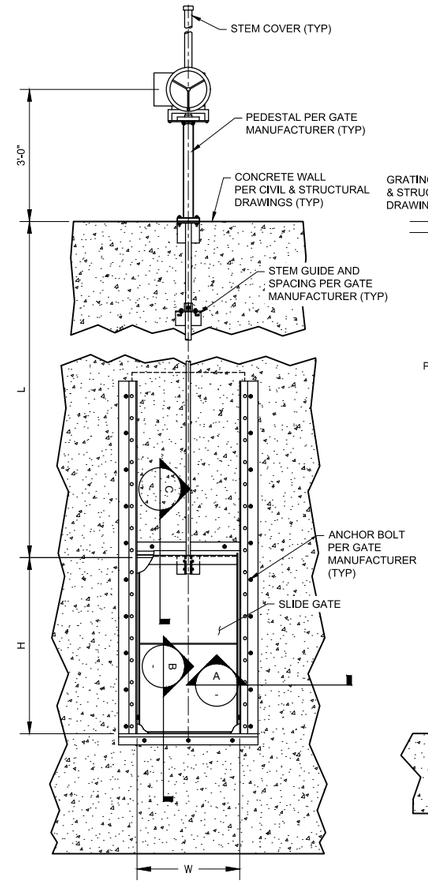
Plot Date: 1 August 2018 - 12:19 PM
Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-301_Cross Sections.dwg

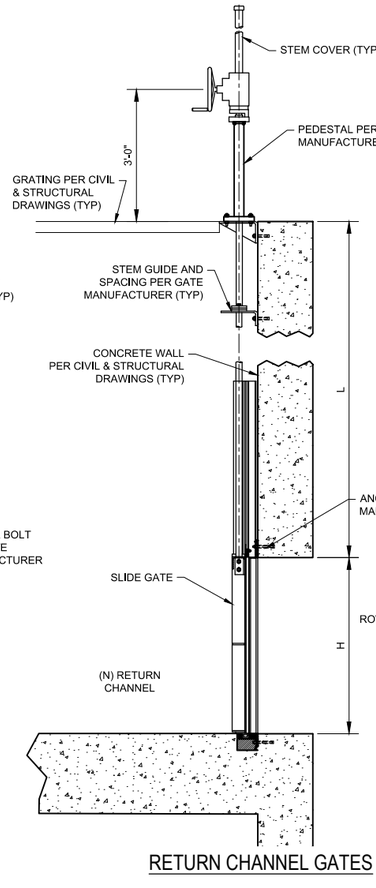


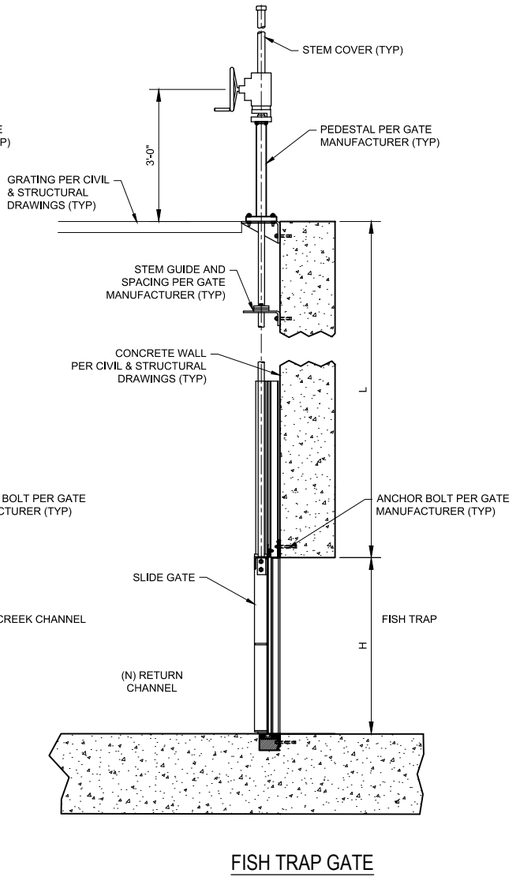


1 AWS SLIDE GATE

SCALE: NTS





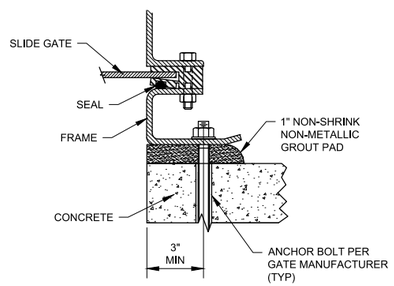


2 RETURN CHANNEL/TRAP SLIDE GATES

SCALE: NTS

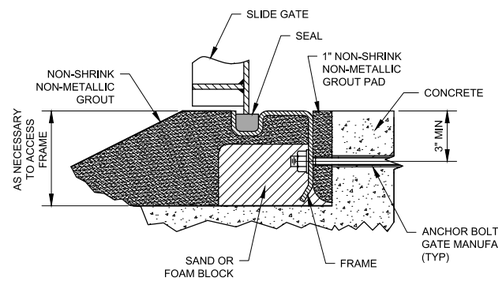
SLIDE GATE SCHEDULE											
GATE	DETAIL #	OPENING SHAPE	W (IN)	H (IN)	L (IN)	GATE INVERT (FT)	CLOSING DIRECTION	TOP SLIDE ELEVATION (FT, FULL OPEN)	TOP SLIDE ELEVATION (FT, FULL CLOSE)	MANUAL OR MOTORIZED	SPEC	HAS STOPLOG GUIDES?
AWS SLIDE GATE	1	RECTANGLE	12	12	10.4	39.6	DOWN	41.6	40.6	MANUAL	11 29 30	NO
UPSTREAM RETURN CHANNEL SLIDE GATE	2	RECTANGLE	24	48	6.7	40.3	DOWN	48.3	44.3	MANUAL	11 29 30	YES[1]
DOWNSTREAM RETURN CHANNEL SLIDE GATE	2	RECTANGLE	24	48	6.7	40.3	DOWN	48.3	44.3	MANUAL	11 29 30	YES[1]
FISH TRAP EXIT SLIDE GATE	2	RECTANGLE	18	36	9.2	40.3	DOWN	43.3	41.8	MANUAL	11 29 30	YES[1]

1. SEE DETAIL 50 S-505 FOR STOPLOG GUIDE AND EMBED DETAIL.



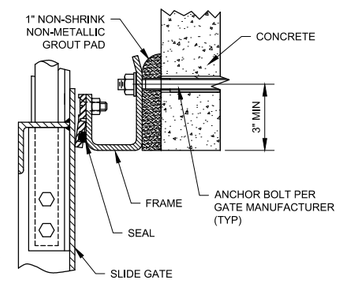
A SIDE MOUNT DETAIL

SCALE: NTS



B BOTTOM MOUNT DETAIL

SCALE: NTS



C TOP MOUNT DETAIL

SCALE: NTS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C 78169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

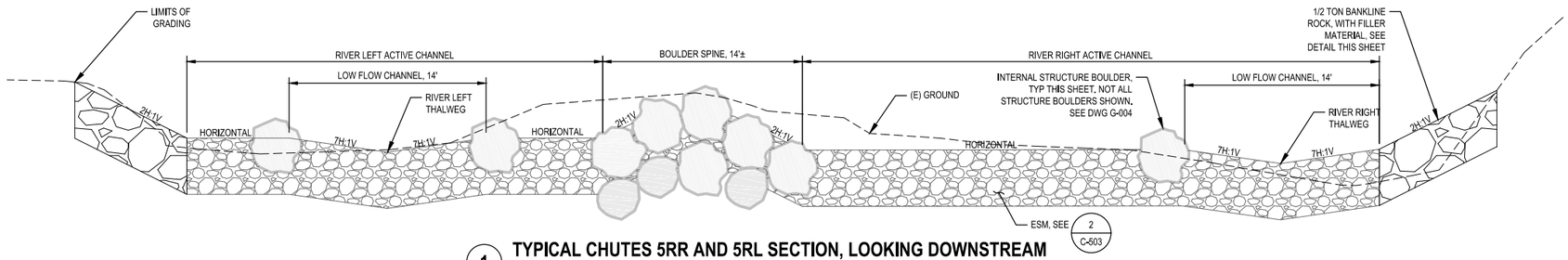
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	BB
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

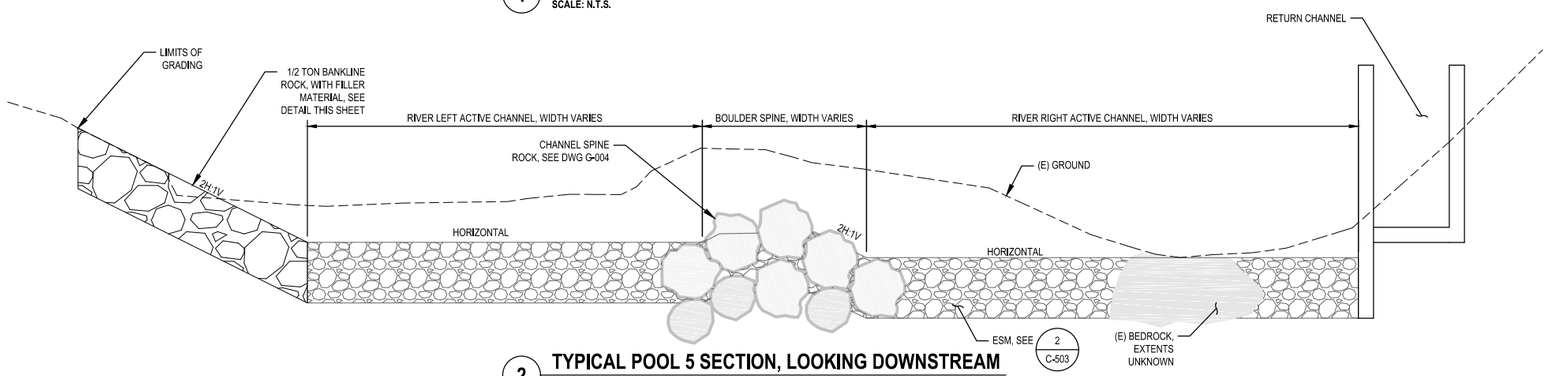
Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY CREEK SLIDE GATE DETAILS
Project No. 11125168
Original Size: ANSI D
Drawing: C-501
Sheet 16 of 49

Plot Date: 1 August 2018 - 9:09 AM
Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-501-505_Typical&Details.dwg



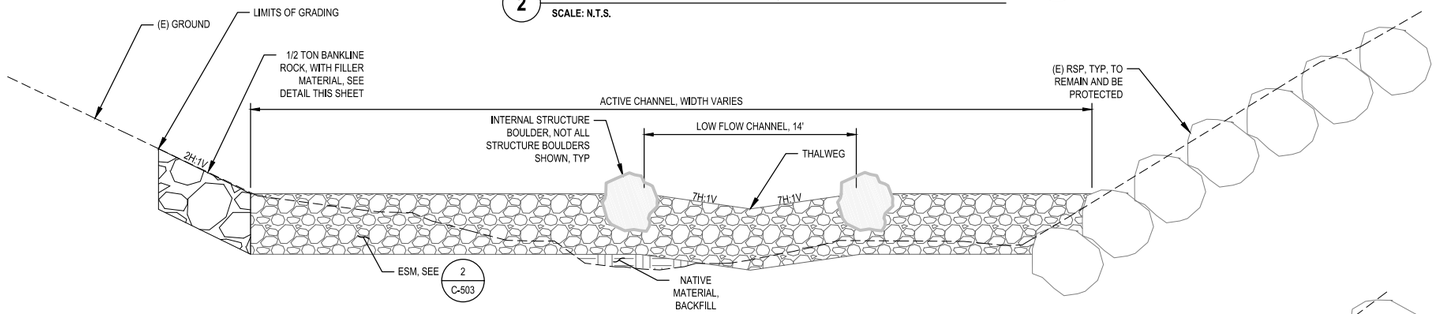
1 TYPICAL CHUTES 5RR AND 5RL SECTION, LOOKING DOWNSTREAM

SCALE: N.T.S.



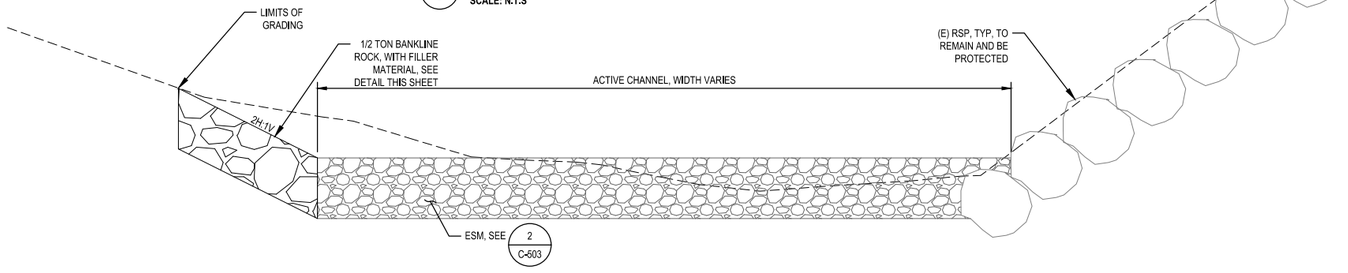
2 TYPICAL POOL 5 SECTION, LOOKING DOWNSTREAM

SCALE: N.T.S.



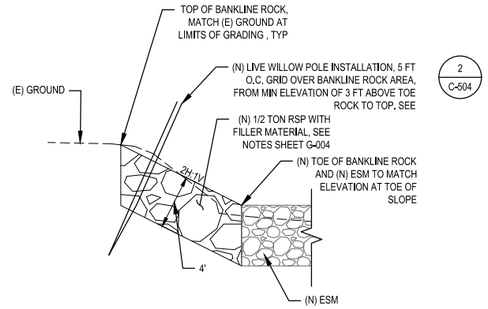
3 TYPICAL LOWER CHUTE SECTION, LOOKING DOWNSTREAM

SCALE: N.T.S



4 TYPICAL LOWER POOL SECTION, LOOKING DOWNSTREAM

SCALE: N.T.S.



5 TYPICAL BANKLINE ROCK

SCALE: NOT TO SCALE

NOTE:
SEE SHEET G-004 FOR ROCK GRADATION AND PLACEMENT NOTES

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 78163 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

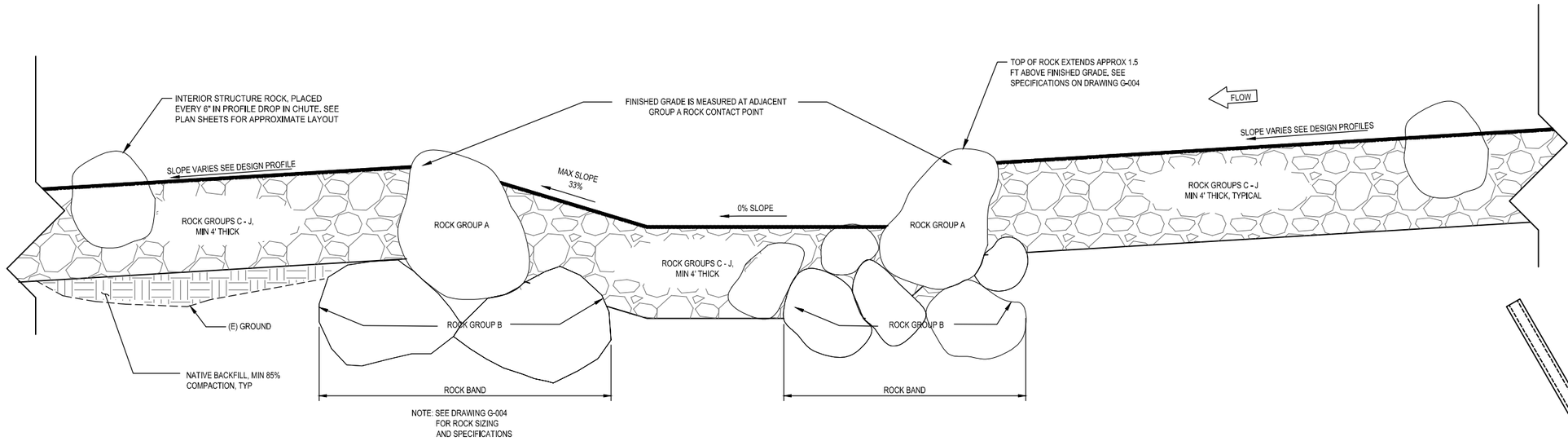
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	BB/NN	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK TYPICALS AND DETAILS, 1 OF 4
Project No. 11125168
Original Size ANSI D
Drawing C-502
Sheet 17 of 49

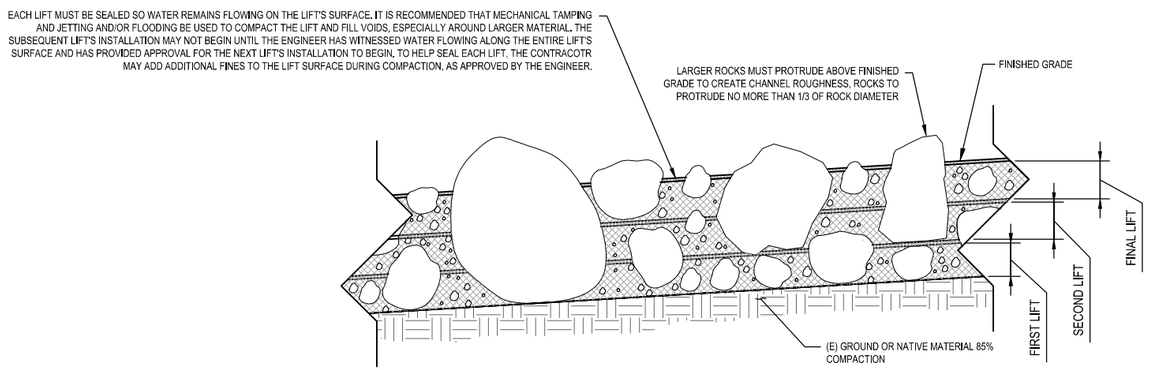
Plot Date: 1 August 2018 - 9:09 AM Plotted By: Brendan Byrd
Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-501-505_Typical&Details.dwg



1 ROUGHENED CHANNEL POOL AND CHUTE DETAIL

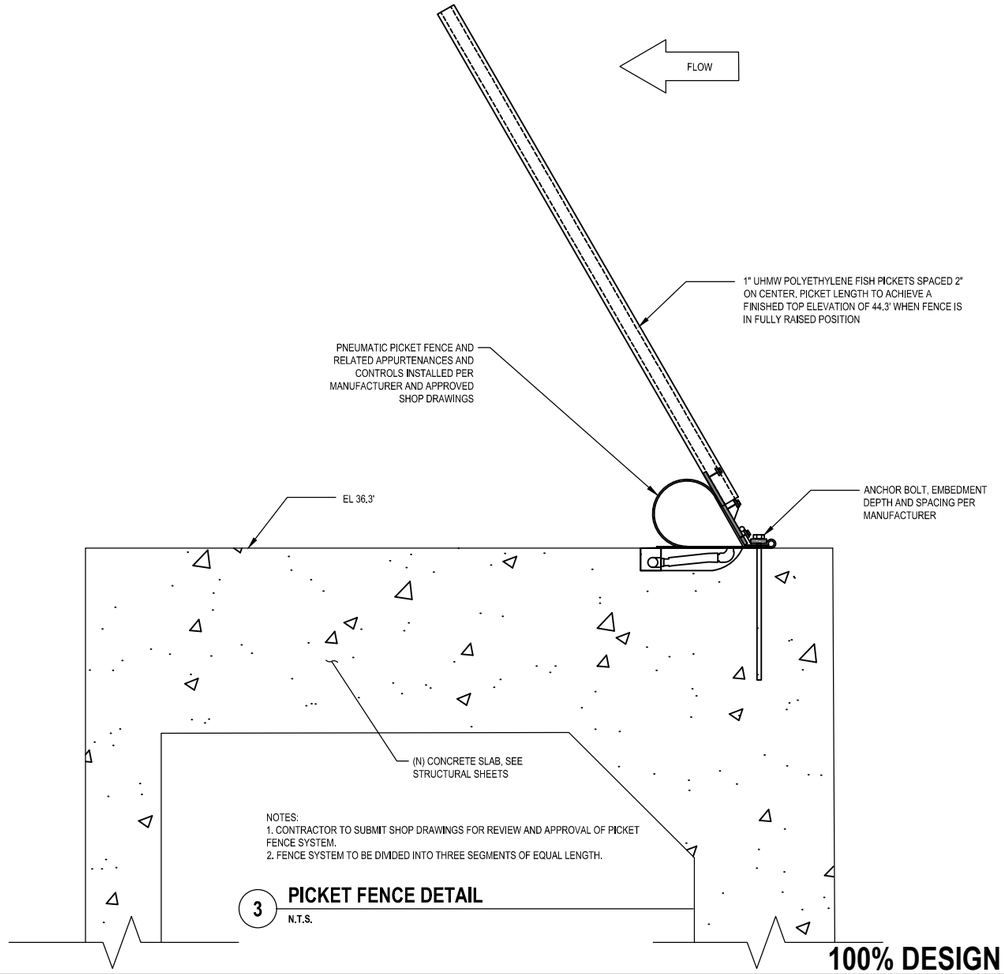
N.T.S.

NOTE:
SEE SHEET G-004 FOR ROCK GRADATION AND PLACEMENT NOTES



2 ROUGHENED CHANNEL PROFILE ESM PLACEMENT DETAIL

N.T.S.



3 PICKET FENCE DETAIL

N.T.S.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 79169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

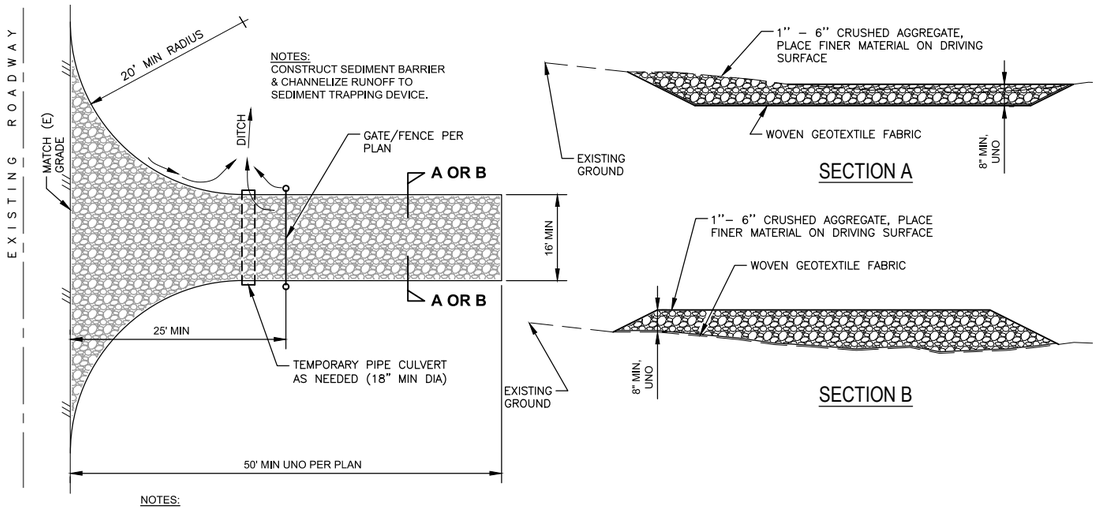
This document shall not be used for construction unless signed and sealed for construction.

Drawn	BB/NN	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK TYPICALS AND DETAILS, 2 OF 4
Project No. 11125168

Original Size ANSI D
Drawing C-503
Sheet 18 of 49

Plot Date: 2 August 2018 - 10:26 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-501-505_Typical&Details.dwg

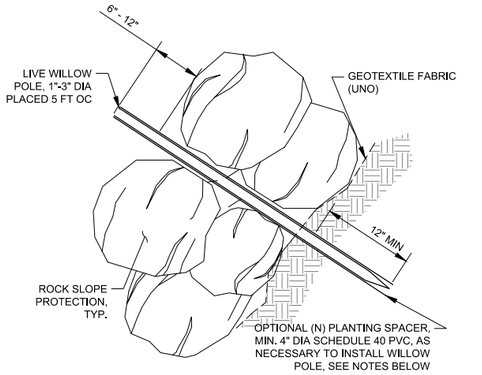


NOTES:

1. ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC ROADWAY, AND DEGRADATION OF EXISTING PAVEMENT.
2. INSTALL CORRUGATED STEEL PANEL GRATES OR TIRE WASHING STATION AS NEEDED TO PREVENT TRACKING OF MUD ONTO PUBLIC ROAD.
3. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS MUST BE REMOVED IMMEDIATELY.
4. ACCESSES SHALL BE INSPECTED DAILY AND AFTER EACH RAINFALL WITH MAINTENANCE PROVIDED BY THE CONTRACTOR AS NECESSARY.
5. ALL TEMPORARY CONSTRUCTION ENTRANCES TO BE REMOVED AT COMPLETION OF CONSTRUCTION.
6. GEOTEXTILE FABRIC SHALL BE WOVEN, MIRAFI 500x OR APPROVED EQUAL.

1 TYPICAL STABILIZED ROCK CONSTRUCTION ENTRANCE

N.T.S.

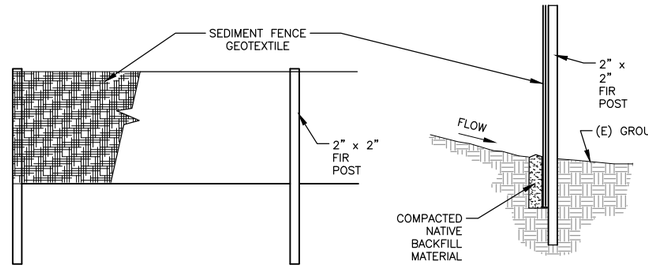


NOTES:

1. LIVE WILLOW POLES SHALL BE HARVESTED FROM NATIVE STOCK AT LOCATION AUTHORIZED BY THE TRIBE.
2. LIVE WILLOW POLES SHALL BE INSTALLED WITHIN 5-DAYS OF HARVESTING AND STORED WITH POINTED-END SUBMERGED IN WATER.
3. LIVE WILLOW POLES SHALL BE INSTALLED BETWEEN SEPTEMBER 15 AND OCTOBER 15.
4. IF INSTALLATION OF RSP OCCURS PRIOR TO SEPTEMBER 15 WHERE LIVE WILLOW POLES ARE SPECIFIED, SPACERS SHALL BE INSTALLED PER THE DETAIL.
5. IF USED, SPACERS SHALL BE REMOVED AND DISPOSED OF BY CONTRACTOR UPON INSTALLATION OF WILLOW POLES.

2 TYP LIVE WILLOW POLE PLANTING IN RSP

N.T.S.



NOTES:

1. FILTER FABRIC SHALL BE INSTALLED IN A CONTINUOUS ROLL TO AVOID THE USE OF JOINTS. WHERE JOINTS ARE NECESSARY SPLICE FABRIC TOGETHER ONLY AT A SUPPORT POST WITH A MINIMUM 6" OVERLAP. SECURELY FASTEN BOTH ENDS TO THE POST.
1. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 12".
2. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4" WIDE AND 6" DEEP ALONG THE LINE OF POSTS UPHILL FROM THE BARRIER. TRENCH SHALL FOLLOW THE CONTOUR.
3. TRENCH SHALL BE BACKFILLED WITH NATIVE MATERIAL.
4. INSPECT AND REPAIR AFTER EACH RAINFALL. INSPECT DAILY DURING PROLONGED RAINFALL.
5. REMOVE SEDIMENT WHEN IT REACHES APPROXIMATELY ONE THIRD THE HEIGHT ABOVE GROUND PORTION OF THE FENCE.
6. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE FILTER FENCE IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE AND SEEDED.

3 TYPICAL SILT FENCE DETAIL

N.T.S.

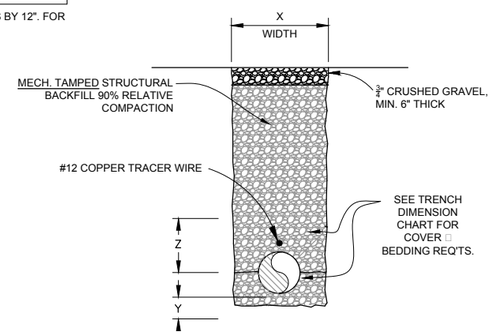
TRENCH DIMENSION CHART

PIPE SIZE	(X) TRENCH WIDTH MIN.	(X) TRENCH WIDTH MAX.	(Y) BEDDING (MIN)	(Z) COVER (MIN)
1"	6"	18"	3"	16"
3"	15"	21"	3"	16"
6"	18"	24"	6"	16"
8"	20"	26"	6"	16"
10"	22"	28"	6"	16"
12"	24"	30"	6"	16"
15"	27"	33"	6"	16"

FOR MULTIPLE PIPE TRENCHES SEPARATE PIPES BY 12". FOR CONDUITS IN PIPE TRENCH SEPARATE BY 6".

NOTES:

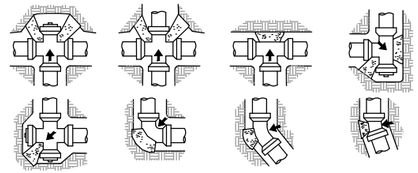
1. WIDER TRENCHES MAY REQUIRE HIGHER STRENGTH PIPE AND/OR SPECIAL BEDDING.
2. DIFFERING TRENCH WIDTHS REQUIRE PRIOR APPROVAL OF ENGINEER.
3. IN UNSTABLE SOILS INCREASE THE TRENCH WIDTH TO 5 PIPE DIAMETERS FOR PVC PIPE.
4. IN MAKING EXCAVATIONS FOR THIS PROJECT, THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR PROVIDING □ INSTALLING ADEQUATE SHEETING, SHORING □ BRACING AS MAY BE NECESSARY AS A PRECAUTION AGAINST SLIDES OR CAVE-INS, AND TO PROTECT ALL (E) IMPROVEMENTS OF ANY KIND, EITHER ON PUBLIC OR PRIVATE PROPERTY, FULLY FROM DAMAGE.
5. PLACE LEAN CONCRETE BACKFILL IN TRENCH WHEN MINIMUM PIPE COVER NOT POSSIBLE UNDER ROADWAYS, DRIVEWAYS, SIDEWALKS OR ACCESSIBILITY RAMPS.



TRENCH FOR NEW PVC WATER PIPING

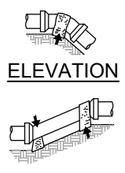
4 TYP TRENCH DETAIL

N.T.S.



PLAN VIEWS

NTS



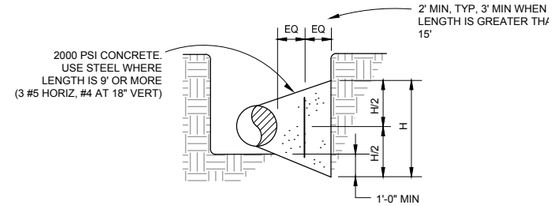
ELEVATION

ELEVATION

NOTES:

1. CONCRETE THRUST BLOCKS ARE TO BE POURED AGAINST UNDISTURBED EARTH OR STRUCTURAL BACKFILL.
2. KEEP CONCRETE CLEAR OF JOINTS AND ACCESSORIES.
3. VOLUMES AND SPECIAL BLOCKING DETAILS SHOWN ON THE PLANS TAKE PRECEDENCE OVER VOLUMES AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAIL.
4. ALL BURIED PIPE EXCEPT FLANGED, SCREWED, SOLVENT WELDED PVC OR WELDED STEEL PIPE SPECIFIED TO BE PRESSURE TESTED SHALL BE PROVIDED WITH CONCRETE THRUST BLOCKS AT ALL DIRECTIONAL CHANGES UNLESS OTHERWISE NOTED.
5. THRUST BLOCKS SHALL NOT BE LOCATED OR SIZED TO ENCASE ADJACENT PIPES OR FITTINGS.
6. THE SIZE AND WEIGHT OF ALL UPLIFT THRUST BLOCKS SHALL BE AS DETERMINED BY ENGINEER.
7. A FRICTION COEFFICIENT OF 0.20 SHALL BE USED BETWEEN THE BEDDING MATERIAL AND PIPE.
8. THE BEARING AREAS ARE BASED ON TEST PRESSURE OF 150 PSI AND ALLOWABLE SOIL BEARING STRESS OF 1000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, USE THE FOLLOWING EQUATION:

BEARING AREA = (TEST PRESSURE / 150) x (1000 / SOIL BEARING STRESS) x (TABLE VALUE)



TYPICAL SECTION

NTS

BEARING AREA OF THRUST BLOCK IN SQ. FT.

PIPE SIZE	TEE, WYE, PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED A1	TEE PLUGGED A2	45° BEND	22 ½ ° BEND	11 ¼ ° BEND
3	1.5	2	2	1.5	1.5	1	1
4	1.5	2	2	1.5	1.5	1	1
6	3	4.5	4.5	3	2.5	1.5	1
8	5	7	7	5	4	2	1
10	8	12	12	8	7	3	2
12	12	17	17	12	10	5	3

5 TYP THRUST BLOCK DETAIL

N.T.S.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SICHER — No. C 79169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.
© 2018 GHD

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

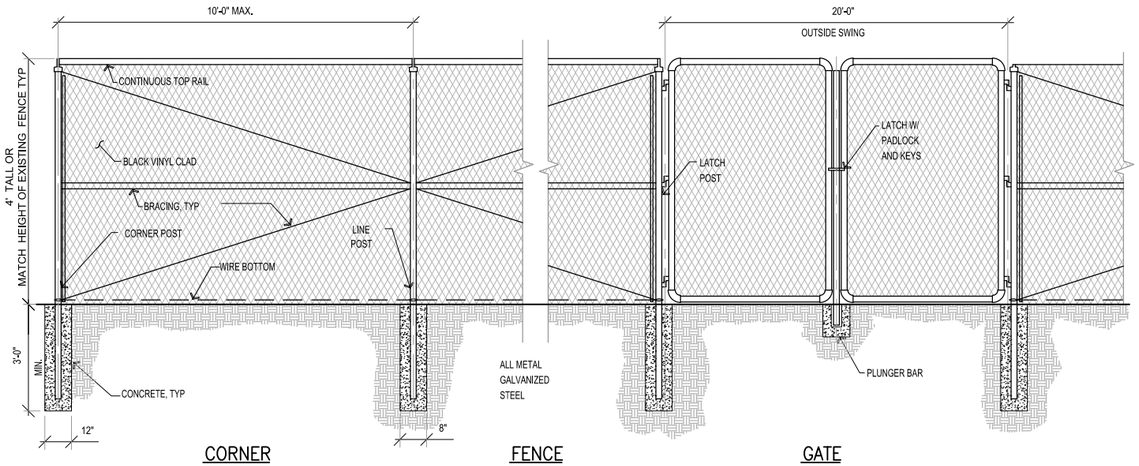
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK TYPICALS AND DETAILS, 3 OF 4
Project No. 11125168
Original Size ANSI D
Drawing C-504
Sheet 19 of 49

Plot Date: 1 August 2018 - 9:09 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-501-505_Typical&Details.dwg

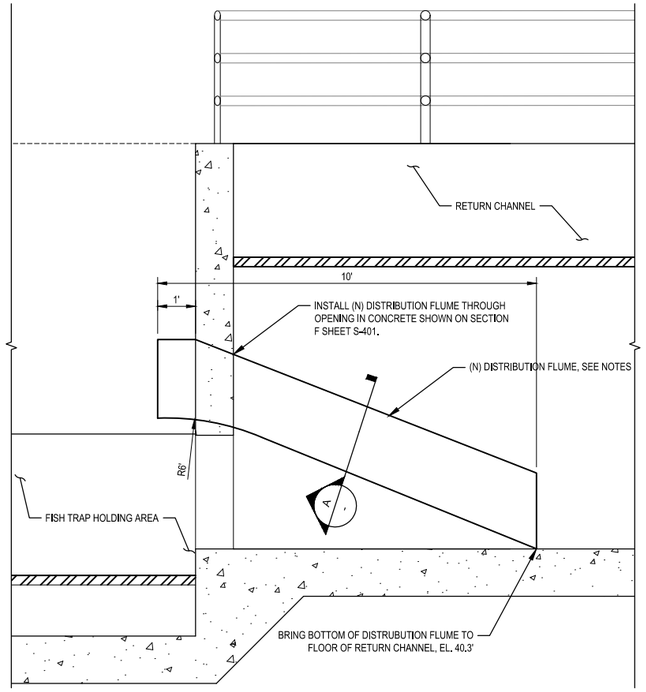


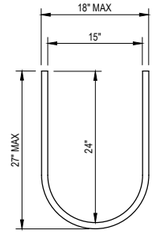
FENCE POST NOTE:

TERMINAL POSTS SHALL BE 2-3/8" DIAMETER AND LINE POSTS SHALL BE 1-5/8" DIAMATER.

1 TYPICAL CHAIN LINK FENCING AND GATES

N.T.S.



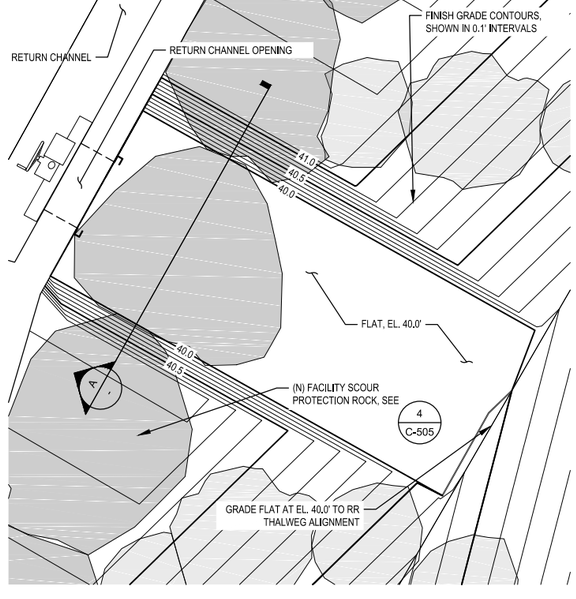


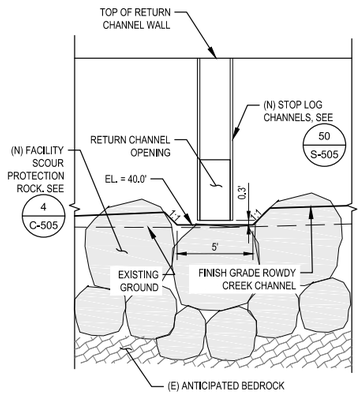
SECTION A

NOTES:
1. CONTRACTOR TO SUBMIT SHOP DRAWINGS FOR THE PROPOSED DISTRIBUTION FLUME DESIGN FOR APPROVAL BY THE ENGINEER.
2. DISTRIBUTION FLUME TO BE CONSTRUCTED OF FIBERGLASS, HDPE, OR OTHER MATERIAL APPROVED BY THE ENGINEER.
3. DISTRIBUTION FLUME INTERIOR TO HAVE SMOOTH EDGES AND TRANSITIONS TO PREVENT FISH INJURY.
4. DISTRIBUTION FLUME TO BE MOUNTED FROM BENEATH OR TO THE WEST RETURN CHANNEL WALL ONLY. FLUME TO BE MOUNTED IN A MANNER THAT IS REMOVABLE.
5. THE MAX EXTERIOR DIMENSIONS IN SECTION A ARE FOR SCHEMATIC PURPOSES. ALL NECESSARY COMPONENTS REQUIRED TO FABRICATE AND FASTEN THE DISTRIBUTION FLUME TO THE RETURN CHANNEL, WHICH COULD INCLUDE COMPONENTS SUCH AS FRAMES OR STIFFENER BARS ARE NOT SCHEMATICALLY SHOWN IN THE SECTION.

2 DISTRIBUTION FLUME

N.T.S.

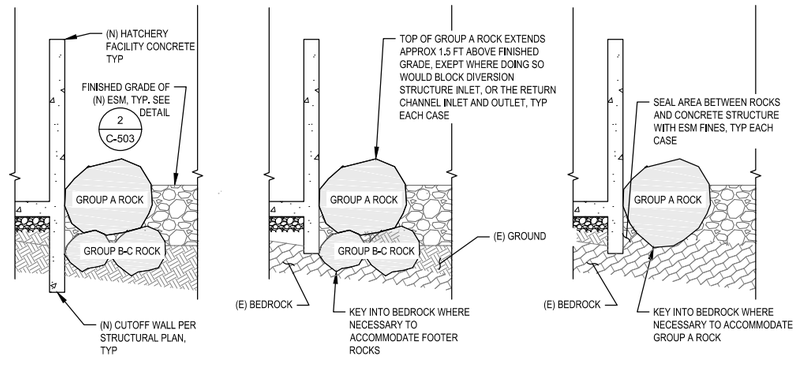




SECTION A

3 RETURN CHANNEL SPILL OPENING AREA GRADING

N.T.S.



CASE 1: NO BEDROCK ENCOUNTERED

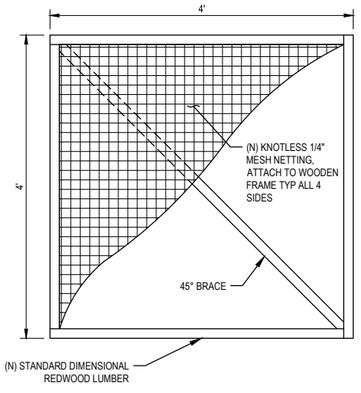
CASE 2: BEDROCK ENCOUNTERED AT FOOTER ROCK BOTTOM ELEVATION

CASE 3: BEDROCK ENCOUNTERED AT GROUP A ROCK BOTTOM ELEVATION

NOTES:
1. FACILITY SCOUR PROTECTION ROCK TO BE PLACED AGAINST NEW HATCHERY FACILITY CONCRETE STRUCTURE LOCATED BETWEEN THE PICKET FENCE AND THE DIVERSION STRUCTURE, APPROXIMATE ROWDY CREEK RIVER RIGHT ALIGNMENT STATIONS 99+70 - 100+51.

4 HATCHERY FACILITY SCOUR PROTECTION ROCK PLACEMENT

N.T.S.



5 FISH TRAP COVER PANEL

N.T.S.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER
JEREMY SHANE SVEHLA
No. C-78169
Exp.
CIVIL
STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.
© 2018 GHD

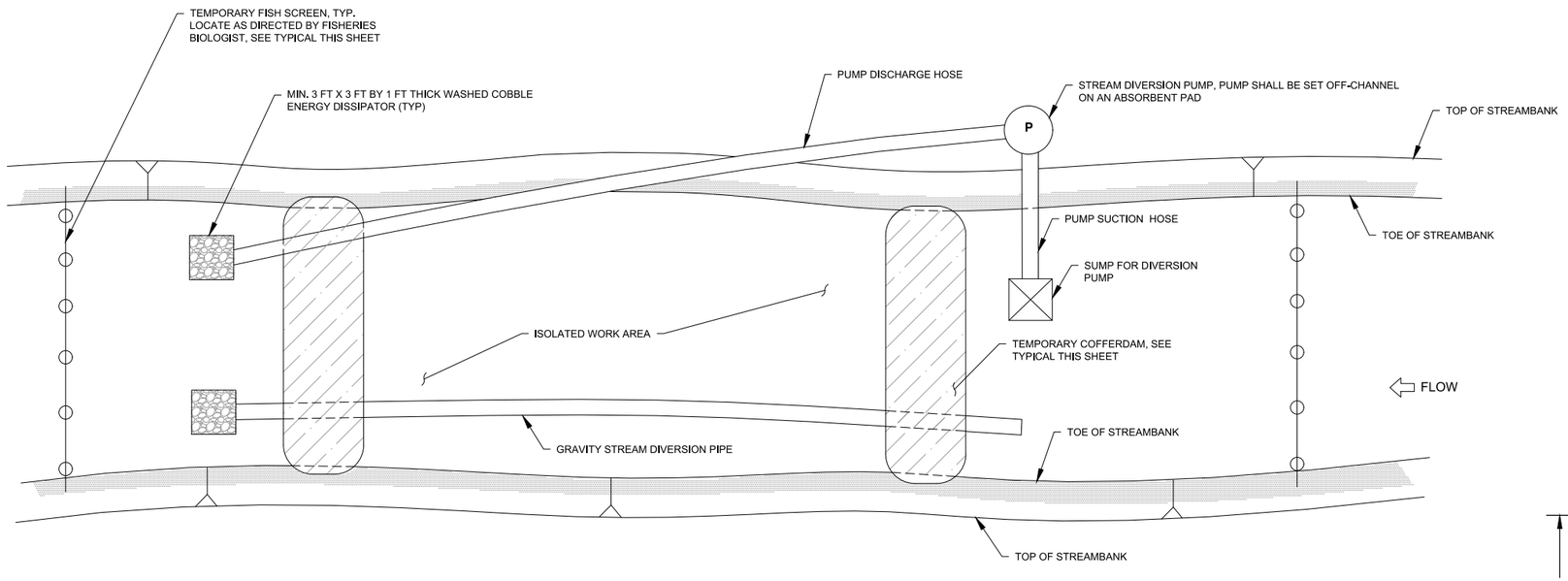
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	B. BYRD	Designer	pTJ/JS/BB/ML
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA/M. LOVE
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK
TYPICALS AND DETAILS, 4 OF 4
Project No. 11125168
Original Size ANSI D
Drawing C-505
Sheet 20 of 49

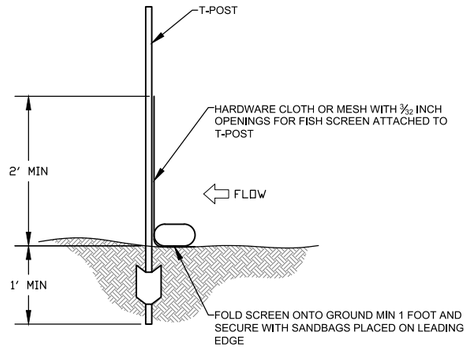
Plot Date: 1 August 2018 - 9:09 AM Plotted By: Brendan Byrd Filename: \\ghdnetghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-501-505_Typical&Details.dwg



TEMPORARY CLEAR WATER DIVERSION

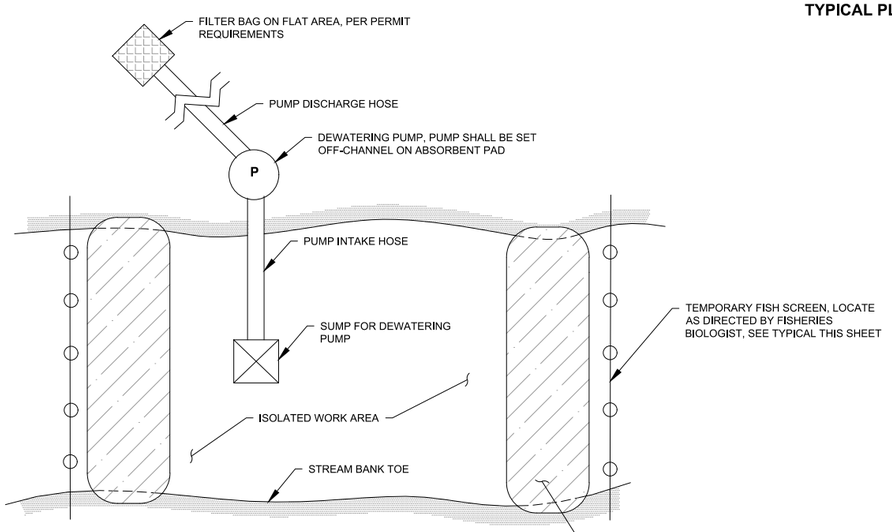
TYPICAL PLAN (NTS)

NOTES:
1. SEE TECHNICAL SPECIFICATIONS FOR ADDITIONAL WATER MANAGEMENT SPECIFICATIONS.
2. ALL CLEAR WATER MUST BE DIVERTED AROUND THE ISOLATED PROJECT AREA AND RETURNED TO THE DOWNSTREAM CHANNEL. CLEAR WATER MAY NOT BE USED FOR ANY CONSTRUCTION PURPOSES.
3. NUISANCE WATER ENCOUNTERED DURING EXCAVATION SHALL BE MANAGED/DISCHARGED IN ACCORDANCE TO PROJECT PERMITS.



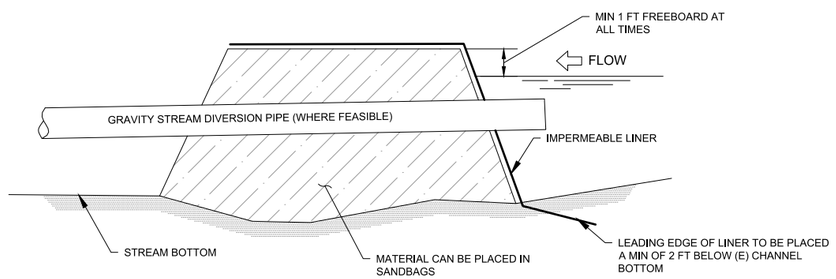
TEMPORARY FISH SCREEN

TYPICAL PROFILE (NTS)



TEMPORARY DEWATERING MEASURES

TYPICAL PLAN (NTS)



TEMPORARY COFFERDAM ON (E) STREAMBED

TYPICAL PROFILE (NTS)

1 WATER AND FISH MANAGEMENT DETAILS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — JEREMY SHANE SVEHLA — No. C-79169 — Exp. — CIVIL — STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	B. BYRD
Drafting Check	J. SVEHLA
Project Manager	J. SVEHLA
Designer	pTJ/JS/BB/ML
Design Check	J. SVEHLA/M. LOVE
Date	AUGUST 2018
Scale	AS SHOWN

This document shall not be used for construction unless signed and sealed for construction.

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK WATER AND FISH MANAGMENT
Project No. 11125168
Original Size ANSI D
Drawing C-506
Sheet 21 of 49

Plot Date: 1 August 2018 - 9:10 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_C-506_Water and Fish Management.dwg

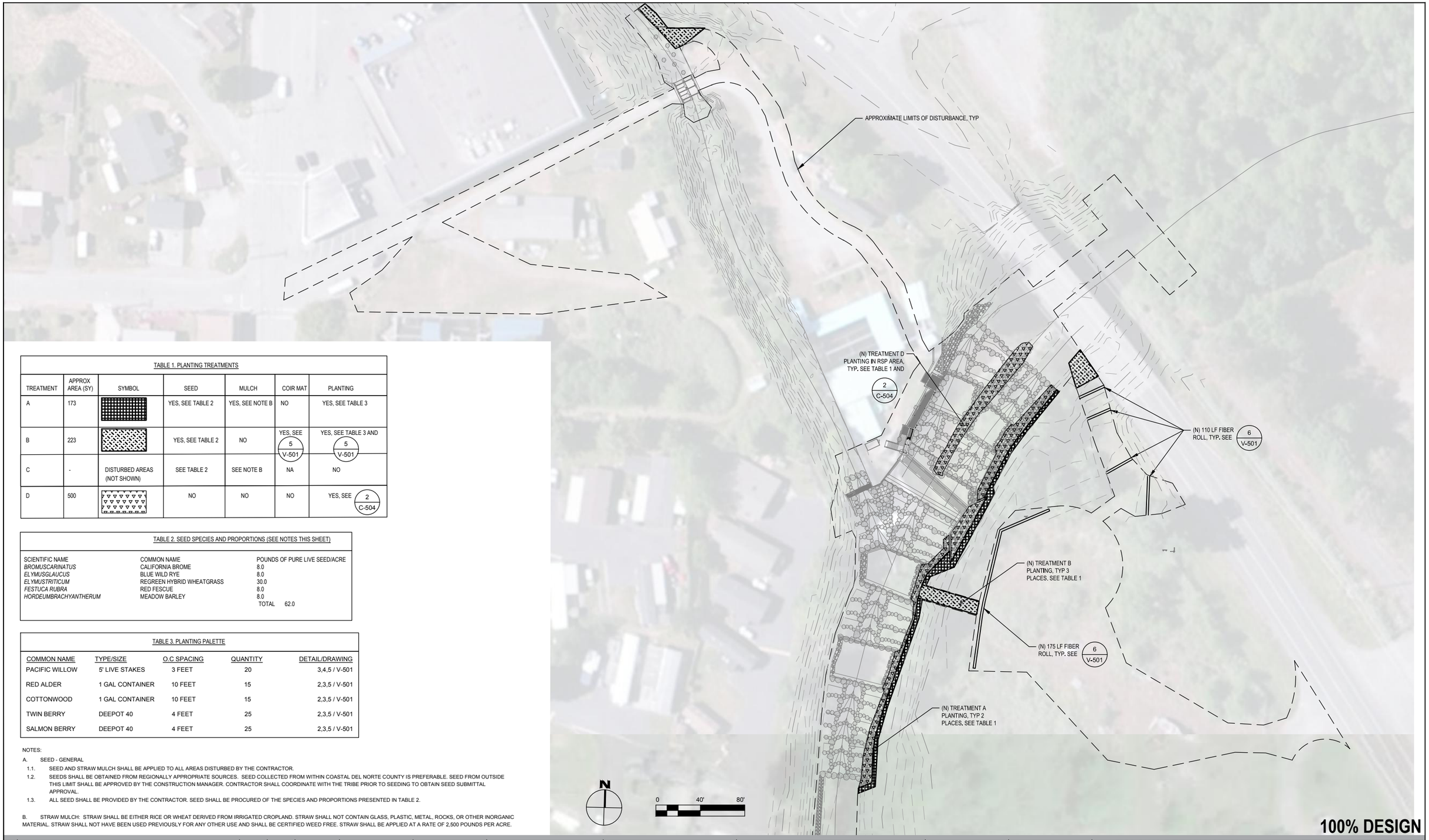


TABLE 1. PLANTING TREATMENTS

TREATMENT	APPROX AREA (SY)	SYMBOL	SEED	MULCH	COIR MAT	PLANTING
A	173		YES, SEE TABLE 2	YES, SEE NOTE B	NO	YES, SEE TABLE 3
B	223		YES, SEE TABLE 2	NO	YES, SEE 5 / V-501	YES, SEE TABLE 3 AND 5 / V-501
C	-	DISTURBED AREAS (NOT SHOWN)	SEE TABLE 2	SEE NOTE B	NA	NO
D	500		NO	NO	NO	YES, SEE 2 / C-504

TABLE 2. SEED SPECIES AND PROPORTIONS (SEE NOTES THIS SHEET)

SCIENTIFIC NAME	COMMON NAME	POUNDS OF PURE LIVE SEED/ACRE
BROMUSCARINATUS	CALIFORNIA BROME	8.0
ELYMUSGLAUCUS	BLUE WILD RYE	8.0
ELYMUSTRITICUM	REGREEN HYBRID WHEATGRASS	30.0
FESTUCA RUBRA	RED FESCUE	8.0
HORDEUMBRACHYANTHERUM	MEADOW BARLEY	8.0
	TOTAL	62.0

TABLE 3. PLANTING PALETTE

COMMON NAME	TYPE/SIZE	O.C SPACING	QUANTITY	DETAIL/DRAWING
PACIFIC WILLOW	5' LIVE STAKES	3 FEET	20	3,4,5 / V-501
RED ALDER	1 GAL CONTAINER	10 FEET	15	2,3,5 / V-501
COTTONWOOD	1 GAL CONTAINER	10 FEET	15	2,3,5 / V-501
TWIN BERRY	DEEPOT 40	4 FEET	25	2,3,5 / V-501
SALMON BERRY	DEEPOT 40	4 FEET	25	2,3,5 / V-501

NOTES:

A. SEED - GENERAL

1.1. SEED AND STRAW MULCH SHALL BE APPLIED TO ALL AREAS DISTURBED BY THE CONTRACTOR.

1.2. SEEDS SHALL BE OBTAINED FROM REGIONALLY APPROPRIATE SOURCES. SEED COLLECTED FROM WITHIN COASTAL DEL NORTE COUNTY IS PREFERABLE. SEED FROM OUTSIDE THIS LIMIT SHALL BE APPROVED BY THE CONSTRUCTION MANAGER. CONTRACTOR SHALL COORDINATE WITH THE TRIBE PRIOR TO SEEDING TO OBTAIN SEED SUBMITTAL APPROVAL.

1.3. ALL SEED SHALL BE PROVIDED BY THE CONTRACTOR. SEED SHALL BE PROCURED OF THE SPECIES AND PROPORTIONS PRESENTED IN TABLE 2.

B. STRAW MULCH: STRAW SHALL BE EITHER RICE OR WHEAT DERIVED FROM IRRIGATED CROPLAND. STRAW SHALL NOT CONTAIN GLASS, PLASTIC, METAL, ROCKS, OR OTHER INORGANIC MATERIAL. STRAW SHALL NOT HAVE BEEN USED PREVIOUSLY FOR ANY OTHER USE AND SHALL BE CERTIFIED WEED FREE. STRAW SHALL BE APPLIED AT A RATE OF 2,500 POUNDS PER ACRE.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 78169 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

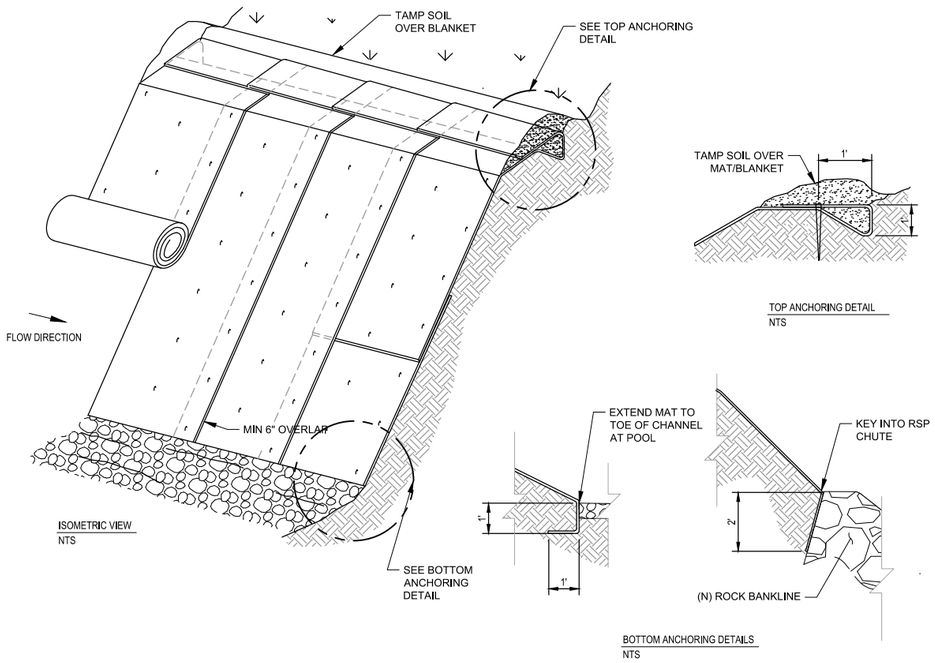
This document shall not be used for construction unless signed and sealed for construction.

Drawn	B. BYRD	Designer	B. BYRD
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK REVEGETATION PLAN
Project No. 11125168

Original Size ANSI D
Drawing V-101
Sheet 22 of 49

Plot Date: 1 August 2018 - 9:10 AM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_V-101-501_Revegetation.dwg

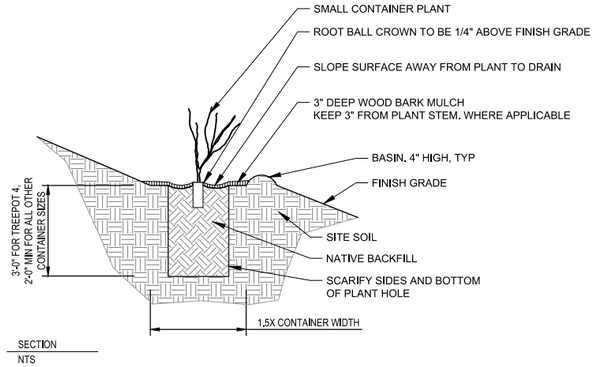


NOTES:

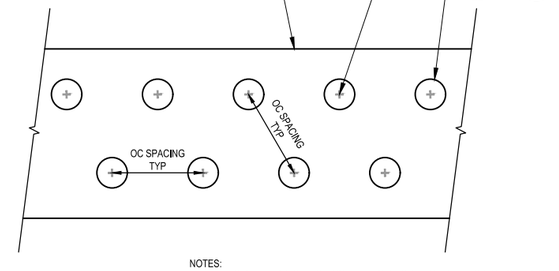
1. BIODEGRADABLE MAT TO BE INSTALLED AS SHOWN IN THE PLAN, PER THIS DETAIL, PER THE MANUFACTURER'S WRITTEN INSTRUCTIONS OR AS DIRECTED BY THE CONSTRUCTION MANAGER.
2. BIODEGRADABLE MAT SHALL BE ROLANKA BIO D-MAT 70 OR APPROVED EQUAL.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS. MAT SHALL HAVE GOOD SOIL CONTACT.
4. APPLY PERMANENT SEED BEFORE PLACING MAT.
5. LAY MAT LOOSELY AND STAKE 1 FOOT ON CENTER AND MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH.
6. CONTRACTOR SHALL PROVIDE SAMPLE OF MAT AND MANUFACTURER'S INSTALLATION RECOMMENDATIONS TO THE CONSTRUCTION MANAGER FOR REVIEW/APPROVAL PRIOR TO INSTALLATION.
7. MAT TO BE INSTALLED AFTER GRADING COMPLETE

1 COIR MAT PLACEMENT

SCALE: NTS



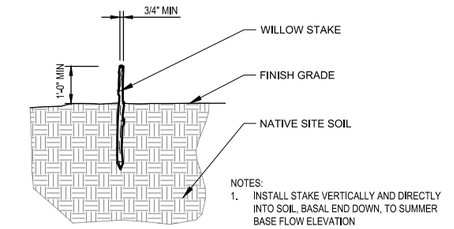
2 CONTAINER PLANT INSTALLATION



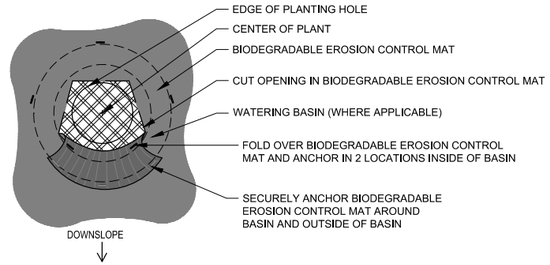
NOTES:

1. THIS DETAIL PRESENTS A SCHEMATIC DIAGRAM OF PLANT SPACING AND IS NOT INTENDED TO SHOW EXACT PLANTING LOCATIONS.
2. SEE PLANTING SCHEDULE ON SHEET V-101 FOR OC SPACING OF INDIVIDUAL SPECIES.

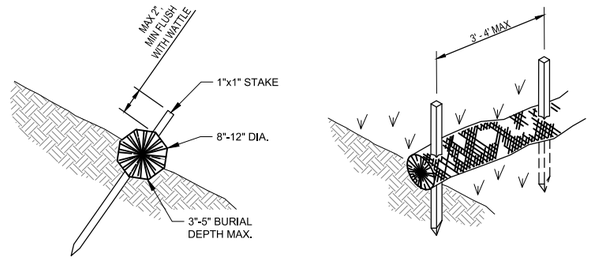
3 TYPICAL PLANT LAYOUT



4 WILLOW STAKE INSTALLATION



5 COIR MAT AT PLANTING



NOTES:

1. ADJACENT ROLLS SHALL TIGHTLY ABUT, DO NOT OVERLAP ROLLS.
2. REMOVE & REPLACE FIBER ROLLS AS SOON AS STRAW FILLING BEGINS TO DEGRADE
3. REFER TO MANUFACTURERS INSTALLATION INSTRUCTIONS FOR INSTALLATION USING ROPE AND STAKES

6 TYPICAL STRAW WATTLE (FIBER ROLL)

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER JEREMY SHANE SVEHLA No. C 78163 Exp. CIVIL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	B. BYRD
Drafting Check	J. SVEHLA	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK REVEGETATION DETAILS
Project No. 11125168
Original Size ANSI D
Drawing V-501
Sheet 23 of 49

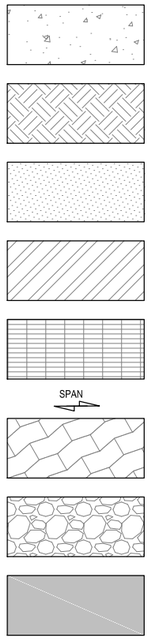
Plot Date: 1 August 2018 - 9:10 AM
Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_V-101-501_Revegetation.dwg

STRUCTURAL ABBREVIATIONS

AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABV	ABOVE
ACI	AMERICAN CONCRETE INSTITUTE
ADD'L	ADDITIONAL
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AITC	AMERICAN INSTITUTE OF TIMBER CONSTRUCTION
ALT	ALTERNATE
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
APA	AMERICAN PLYWOOD ASSOCIATION
ARCH	ARCHITECT/ARCHITECTURAL
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWS	AMERICAN WELDING SOCIETY
&	AND
@	AT
B	BOTTOM
B/	BOTTOM OF
BB	BOTTOM BARS
BLDG	BUILDING
BLKG	BLOCKING
BM	BEAM
BN	BOUNDARY NAIL
BO	BOND
BOW	BOTTOM OF WALL
BRG	BEARING
BS	BOTH SIDES
BTWN	BETWEEN
C	CHANNEL
C/C	CENTER TO CENTER
CANT	CANTILEVER
CAP	CAPACITY
CBC	CALIFORNIA BUILDING CODE
CF	CONTRACTOR FURNISHED
CI	CONTRACTOR INSTALLED
CJ	CONTRACTION/CONTROL JOINT
CL	CENTERLINE
CLG	CEILING
CLR	CLEAR
CMU	CONCRETE MASONRY UNIT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS
COORD	COORDINATE
CRSI	CONCRETE REINFORCING STEEL INSTITUTE
CTR/CTR'D	CENTER/CENTERED
d	PENNY (NAIL SIZE)
DBL	DOUBLE
DET	DETAIL
DF	DOUGLAS FIR
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DISCONT	DISCONTINUE
DL	DEAD LOAD
DN	DOWN
Do	DITTO
DP	DEEP
DWG	DRAWING
DWL	DOWEL
E	EXISTING
EA	EACH
EF	EACH FACE
EG	EXISTING GRADE
EL	ELEVATION
EMBED	EMBEDMENT
EN	EDGE NAIL
ENGR	ENGINEER
EQ	EQUAL
EQUIP	EQUIPMENT
ETC	ET CETERA
EW	EACH WAY
EWEF	EACH WAY EACH FACE
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FULL HEIGHT
FIN	FINISH
FL	FLOOR
FLG	FLANGE
FN	FACE NAIL
FND	FOUNDATION
FO	FACE OF
FOM	FACE OF MASONRY
FOW	FACE OF WALL
FRMG	FRAMING
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FAR SIDE
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GF	GOVERNMENT FURNISHED
GRT	GROUT
GSN	GENERAL STRUCTURAL NOTES
GYP	GYPSUM
HAS	HEADED ANCHOR STUDS
HD	HAND
HEF	HORIZONTAL EACH FACE
HIF	HORIZONTAL INSIDE FACE
HK	HOOK
HM	HOLLOW METAL
HOF	HORIZONTAL OUTSIDE FACE
HORIZ	HORIZONTAL
HP	HIGH POINT
HSS	HOLLOW STRUCTURAL SECTION
HT	HEIGHT
IBC	INTERNATIONAL BUILDING CODE
ID	INSIDE DIAMETER
IE	FOR EXAMPLE
INFO	INFORMATION
INT	INTERIOR
INTERMED	INTERMEDIATE
INTERSECT	INTERSECTION
INV	INVERT
JST	JOIST
JT	JOINT
L	ANGLE
LG	LONG
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LOC	LOCATION
LONGIT	LONGITUDINAL
LP	LOW POINT
LT	LEFT
MACH	MACHINE
MAINT	MAINTENANCE
MAS	MASONRY
MAX	MAXIMUM
MB	MACHINE BELT
MC	MISCELLANEOUS CHANNEL
MCJT	MASONRY CONTROL JOINT
MECH	MECHANICAL
MFR	MANUFACTURER
MIN	MINIMUM
MNTG	MOUNTING
MO	MASONRY OPENING
MOD	MODIFIED
MTL	METAL
N	NEW
NIC	NOT IN CONTRACT
NOM	NOMINAL
NS	NEAR SIDE
NTS	NOT TO SCALE
#	NUMBER
OC	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPG	OPENING
OPP	OPPOSITE
PEB	PRE ENGINEERED BUILDING
PEMB	PRE ENGINEERED METAL BLDG
PL	PLATE
PLCS	PLACES
PLYWD	PLYWOOD
PNL	PANEL
PREFAB	PREFABRICATED
PT	POINT, PRESSURE TREATED
PVMT	PAVEMENT
QTY	QUANTITY
R	RADIUS
RC	RELATIVE COMPACTION
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
RF	ROOF
RM	ROOM
SCHED	SCHEDULE
SHT	SHEET
SIM	SIMILAR
SP	SPACE/SPACES
SPC'G	SPACING
SPEC	SPECIFICATIONS
SST	STAINLESS STEEL
STD	STANDARD
STIFF	STIFFENER
STL	STEEL
STRUCT	STRUCTURAL
SYMM	SYMMETRICAL
T	TOP
T/	TOP OF
T & B	TOP AND BOTTOM
TB	TOP OF BAR
THK	THICK
TOC	TOP OF CONCRETE
TOF	TOP OF FOOTING/FOUNDATION
TOG	TOP OF GRATING
TOS	TOP OF STEEL
TOW	TOP OF WALL
TS	TUBE STEEL
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UNC	UNITED SCREW THREADS, COARSE
UNO	UNLESS NOTED OTHERWISE
UON	UNLESS OTHERWISE NOTED
VEF	VERTICAL EACH FACE
VERT	VERTICAL
VIF	VERTICAL INSIDE FACE
VOF	VERTICAL OUTSIDE FACE
W/	WITH
W OR WF	WIDE FLANGE (BEAM)
W/O	WITHOUT
WP	WORK POINT
WS	WATERSTOP
WT	WEIGHT

STRUCTURAL SYMBOLS AND LEGEND

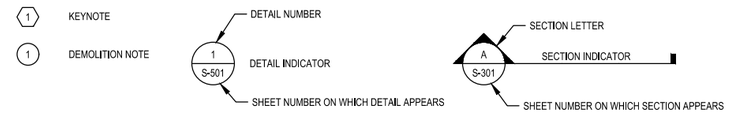
MATERIALS



SHEET GENERAL NOTES

1. ABBREVIATIONS AND SYMBOLS ON THIS SHEET APPLY ONLY TO THE STRUCTURAL DRAWINGS, REFER TO OTHER DISCIPLINES FOR APPLICABLE ABBREVIATIONS AND SYMBOLS NOT PROVIDED HERE.
2. THIS IS A STANDARD STRUCTURAL ABBREVIATIONS AND SYMBOLS SHEET, THEREFORE, SOME ABBREVIATIONS AND SYMBOLS MAY APPEAR ON THIS SHEET AND MAY NOT BE UTILIZED ON THIS PROJECT.
3. MATERIAL HATCHES SHOWN HERE INDICATE TYPICAL HATCH PATTERNS TO BE USED; HOWEVER, VARIATIONS OF THESE PATTERNS MAY BE NECESSARY TO DEMONSTRATE OR EMPHASIZE CERTAIN FEATURES ON THIS PLAN. IF SO, A NOTE WILL BE PROVIDED TO INDICATE ANY CHANGES.

ANNOTATION



100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — MARK L. CROWELL — No. 023019 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK
STRUCTURAL ABBREVIATIONS AND SYMBOLS
Project No. 11125168

Original Size ANSI D | Drawing S-001 | Sheet 24 of 49

Plot Date: 1 August 2018 - 2:33 PM Plotted By: Brendan Byrd
Filename: \\ghdnetghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-001_StructuralAbbrevs&Symbols.dwg

GENERAL

1. DESIGN CRITERIA:

   CALIFORNIA BUILDING CODE (CBC) 2016.

   AMERICAN CONCRETE INSTITUTE (ACI):

   ACI "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318-14)

   ACI "DETAILING MANUAL" (ACI SP-66).

   STAIRS AND HANDRAILS: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS 29 CFR.

   SOIL NAIL RETAINING WALL: GEOTECHNICAL ENGINEERING CIRCULAR (GEC) NO. 7 (2015), FEDERAL HIGHWAY ADMINISTRATION (FHWA).

2. LOADS:

   GRATING LIVE LOAD:
   FOOT TRAFFIC: 60 PSF (WALKWAYS AND ELEVATED PLATFORMS) OR 300 LB CONCENTRATED LOAD

   SOIL EQUIVALENT EARTH PRESSURES:
   ACTIVE PRESSURE = 80 PCF
   SEISMIC ACTIVE PRESSURE = 15 PCF (ADD'L)

   SOIL PASSIVE PRESSURE: 400 PCF

   WIND DESIGN CRITERIA PER 2016 CBC
   BASIC WIND SPEED: 110 MPH
   WIND EXPOSURE: C
   IMPORTANCE FACTOR "I": 1,00

   SEISMIC LOADS:

   SEISMIC IMPORTANCE FACTOR: I = 1,00
   OCCUPANCY CATEGORY: II
   MAPPED SPECTRAL RESPONSE ACCELERATIONS:
   SS = 1,334G S1 = 0,656G
   SDS = 0,889G SD1 = 0,569G

   SITE CLASS: C

3. UNLESS NOTED OTHERWISE, REFER TO DRAWINGS OTHER THAN STRUCTURAL FOR FINISHES, SLOPES, DEPRESSIONS, OPENINGS CURBS, STAIRS, RAMPS, TRENCHES, EQUIPMENT AND LOCATIONS AND EXTENT OF SUCH CONDITIONS.

4. CONTRACTOR TO COORDINATE ALL NEW WORK WITH EXISTING SITE CONDITIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER PRIOR TO CONSTRUCTION.

5. DETAILS OR CONDITIONS NOT FULLY DEVELOPED ON STRUCTURAL DOCUMENTS ARE SIMILAR TO DEVELOPED DETAILS.

6. REFER TO GEOTECHNICAL REPORT REGARDING SITE CONDITIONS, EXCAVATION, SHORING REQUIREMENTS, UNDERPINNING, BACKFILL BEHIND WALLS AND SUBDRAINAGE PREPARATIONS.

7. ALL BUILDING FOUNDATION PLANS, FLOOR PLANS AND ROOF PLANS TO BE COORDINATED WITH GENERAL NOTES AND TYPICAL DETAILS AS APPLICABLE.

8. THE STRUCTURES HAVE BEEN DESIGNED TO BE STABLE AND SELF SUPPORTING AFTER THE CONSTRUCTION IS COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY FOR THE STRUCTURE'S STABILITY DURING CONSTRUCTION. THIS RESPONSIBILITY ALSO INCLUDES BUT IS NOT LIMITED TO METHOD AND SEQUENCE OF ERECTION, TEMPORARY SHORING AND TEMPORARY BRACING.

9. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO FOLLOW ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION.

10. CONTRACTOR SHALL COORDINATE ALL CONCRETE POUR SEQUENCING THROUGH DIMENSIONED SHOP DRAWINGS TO BE PREPARED BY THE CONTRACTOR. SHOP DRAWINGS SHALL BE PREPARED IN CONFORMANCE WITH SPECIFICATIONS AND BE COORDINATED WITH ALL CIVIL, STRUCTURAL, AND OTHER PERTINENT DESIGN INFORMATION. SHOP DRAWINGS SHALL INCLUDE THE PROPOSED LOCATIONS OF ALL CONSTRUCTION JOINTS. SHOP DRAWINGS SHALL BE PREPARED AND SUBMITTED WITH ADEQUATE TIME FOR REVIEW BY THE DISTRICT PRIOR TO CONSTRUCTION. FOR SCHEDULING PURPOSES, THE CONTRACTOR SHALL ANTICIPATE A MINIMUM OF TWO ROUNDS OF SHOP DRAWING SUBMITTALS AND REVIEWS.

FOUNDATIONS

1. FOUNDATION DESIGN FOR DOMINIE AND ROWDY CREEK FISH PASSAGE IMPROVEMENT PROJECT IS BASED ON CRITERIA AND RECOMMENDATIONS PRESENTED IN "GEOTECHNICAL INVESTIGATION ROWDY CREEK FISH PASSAGE IMPROVEMENT, DEL NORTE COUNTY CALIFORNIA, TOLOWA DEE-NI' NATION" BY GHD INC., DATED AUGUST, 2017.

2. ALLOWABLE SOIL BEARING PRESSURES:
   DEAD LOAD = 3,000 PSF
   DEAD PLUS LIVE LOAD = 4,500 PSF
   BEARING PRESSURES MAY BE INCREASED 33.3% FOR TOTAL DESIGN LOADS THAT INCLUDE WIND OR SEISMIC LOADS

TEMPORARY SHORING

1. TEMPORARY SHORING SHOWN ON THE PLANS TO BE DESIGNED, INSTALLED AND REMOVED BY THE CONTRACTOR.

2. SEE GEOTECHNICAL REPORTS LISTED ABOVE IN THE FOUNDATION SECTION FOR INFORMATION REGARDING SITE SOIL CHARACTERISTICS.

3. SEE SHORING AND TRENCH SAFETY SECTION IN THE SPECIFICATIONS FOR FURTHER INFORMATION.

CONCRETE

1. ALL CONCRETE SHALL BE NORMAL WEIGHT, WITH A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.

2. CONCRETE REINFORCING COVER SHALL BE AS FOLLOWS:

   CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH.....3 INCHES
   ALL OTHER CONDITIONS UNO.....2 INCHES

3. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM DIMENSIONS. CONTRACTOR TO REVIEW FORMING, REINFORCING DETAILS AND ANY EMBEDDED ITEMS AND DETERMINE PRIOR TO FABRICATION OF ANY REINFORCING, PLACEMENT REQUIREMENTS AND CLEARANCES.

4. ALL WALLS AND SLABS HAVE BEEN DESIGNED WITH REBAR NECESSARY TO PREVENT SHRINKAGE, THEREFORE EXPANSION JOINTS ARE NOT REQUIRED, UNO.

5. CONTRACTOR TO SUBMIT CONSTRUCTION POUR SEQUENCE PLAN, INDICATING ALL PLANNED CONSTRUCTION JOINTS

6. EPOXY ANCHORS SHALL UTILIZE SIMPSON SET-XP INSTALLED PER ESR-2508, OR APPROVED EQUAL.

7. ALL CONSTRUCTION JOINTS SHALL BE KEYED PER TYPICAL CONSTRUCTION JOINT DETAIL.

REINFORCING

1. REINFORCING NOT SHOWN ON TYPICAL SECTION CUTS, SEE STRUCTURAL DETAIL FOR REINFORCING INFORMATION.

2. ALL CONCRETE REINFORCING SHALL BE ASTM A615, Fy = 60 KSI, UNLESS NOTED OTHERWISE.

3. REINFORCING SHALL EXTEND CONTINUOUS FOR THE DIMENSION SHOWN.

4. NO WELDING OF ANY REINFORCING IS PERMITTED, UNLESS SPECIFICALLY STATED ON THE PLANS. REINFORCEMENT TO BE WELDED TO MEET THE REQUIREMENTS OF ASTM A706.

5. LOCATE ALL REINFORCING AS SHOWN ON DRAWINGS AND FASTEN SECURELY.

6. LAP SPLICES AND DEVELOPMENT LENGTHS ARE SHOWN ON THE STRUCTURAL TYPICAL DETAIL DRAWING.

7. REINFORCEMENT SHALL BE PLACES SO AS NOT TO COME IN CONTRACT WITH METALLIC CONCRETE PENETRATIONS.

8. AT ALL WALLS, BOTTOM LAYER OF FOUNDATION/SLAB REINFORCING PERPENDICULAR TO WALL SHALL TERMINAL WITH STANDARD HOOKS.

STEEL

1. DETAIL, FABRICATE, AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (LATEST EDITION AND SUPPLEMENTS).

2. ANCHOR BOLTS: ASTM F1554 GRADE 36.

3. ALL STEEL BARS & PLATES SHALL BE ASTM A36 UNLESS OTHERWISE NOTED.

4. ALL STEEL SHAPES SHALL BE ASTM A992 GRADE 50 UNLESS OTHERWISE NOTED.

5. ALL HSS SHALL BE ASTM A500 GRADE B.

6. ALL PIPES TO BE ASTM A53 GRADE B.

7. ALL THREADED RODS: ASTM F1554 GRADE 36.

8. BOLTED CONNECTIONS, UNLESS NOTED OTHERWISE: 3/4-INCH DIAMETER A325-N BOLTS.

9. INSTALL HIGH STRENGTH BOLTS IN ACCORDANCE WITH SECTION 8 OF THE "SPECIFICAITONS FOR STRUCTURAL JOINTS USING ASTM HIGH STRENGTH BOLTS", 2009 EDITION.

10. PROVIDE BEVELED WASHERS ON ALL CONNECTION TO SLOPING FLANGES OF W SECTIONS AND CHANNELS WHERE SLOPE EXCEEDS 1:20.

11. ANCHOR RODS SHALL BE ALL THREADED ANCHOR RODS WITH NUT. THE EMBEDDED NUT SHALL BE TACK WELDED TO THE ANCHOR ROD TO PREVENT ROTATION DURING TIGHTENING.

12. BOLT HOLES IN STEEL SHALL BE "STANDARD" (1/16-INCH LARGER IN DIAMETER THAN THE NOMINAL BOLT SIZE, UNLESS OTHERWISE NOTED).

13. WELDING ELECTRODES (FILLER METAL): E70XX (70 KSI), WITH EXACT FILLER METAL SELECTED BY THE FABRICATOR.

14. WELD LENGTHS CALLED FOR ON THE PLANS ARE THE NET EFFECTIVE LENGTH REQUIRED. WHERE LENGTH OF WELD IS NOT SHOWN IT SHALL BE THE FULL LENGTH OF THE JOINT.

15. COMPLETE PENETRATION WELDS SHALL BE MADE WITH PROPER BACKING WHEREVER POSSIBLE. AFTER WELDING REMOVE BACKING BARS AND GRIND SMOOTH. FULL PENETRATION WELDS MADE WITHOUT PROPER BACKING SHALL HAVE THE ROOT GOUGED BEFORE WELDING IS STARTED FROM THE OTHER SIDE EXCEPT AS PROVIDED IN AWS D1.1.

16. ALL BUTT AND GROOVE WELDS SHALL BE FULL PENETRATION, UNLESS NOTED OTHERWISE.

17. ALL SPLICING OF MEMBERS SHALL BE AS SHOWN ON THE DRAWINGS. ANY SPLICING OF THE STEEL MEMBERS PROPOSED BY THE STEEL FABRICATOR SHALL BE SHOWN ON SHOP DRAWINGS AND APPROVED BY THE ENGINEER PRIOR TO FABRICATION.

18. MINIMUM PLATE THICKNESS IS 3/8 INCH UNLESS OTHERWISE NOTED. MINIMUM WELD IS 1/4 INCH UNLESS OTHERWISE NOTED.

19. ALL STEEL FABRICATION AND DETAILS TO COMPLY WITH MOST STRINGENT OF THE LATEST EDITION OF: AISC CODE, AWS CODE, AND THE 2016 CBC.

20. ALL WELDING TO BE BY AWS CERTIFIED WELDERS AND SHALL CONFORM TO ALL 2016 CBC AND AWS REQUIREMENTS. ALL WELDERS SHALL BE PRE-QUALIFIED BY THE PROJECT WELDING INSPECTOR FOR THE WELD TYPES AND POSITIONS USED IN THE PROCEDURES THEY WILL BE PERFORMING.

21. UNLESS NOTED OTHERWISE, ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIP GALVANIZED.

PERMANENT SOIL NAIL ANCHORS

1. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION (CALTRANS) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION WITH EDITION DATED 2015, AS WELL AS THE PROJECT SPECIFICATIONS, PROJECT DRAWINGS, AND PROJECT GEOTECHNICAL INVESTIGATION REPORT.

2. SOIL NAIL WALL HAS BEEN DESIGNED IN ACCORDANCE WITH THE PARAMETERS SET FORTH IN THE GEOTECHNICAL REPORT BY GHD INC., DATED AUGUST 2017 AND IN ACCORDANCE WITH THE FHWA GEOTECHNICAL ENGINEERING CIRCULAR NO. 7 (2015).

3. TOTAL LENGTH OF THE TEST SOIL NAIL ASSEMBLY EQUALS EMBEDMENT LENGTH PLUS EXTRA LENGTH REQUIRED FOR JACKING EQUIPMENT.

4. PROCEDURE FOR INSTALLATION OF SOIL NAIL ANCHORS, CONSTRUCTION SEQUENCE, MATERIALS, AND VERIFICATION/TEST NAIL REQUIREMENTS SHALL BE PER THE PROJECT SPECIFICATIONS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — No. 93019 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK STRUCTURAL NOTES
Project No. 11125168

Original Size ANSI D
Drawing S-002
Sheet 25 of 49

Plot Date: 1 August 2018 - 2:33 PM Plotted By: Brendan Byrd Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-002-003_Structural Notes.dwg

STRUCTURAL SPECIAL INSPECTIONS

TABLE 1705.3 - CONCRETE

ITEM 1: INSPECT REINFORCEMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI
ITEM 2: REINFORCING BAR WELDING: a. VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A706; ☒ PERIODIC ☐ CONTINUOUS b. INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM 5/16"; AND ☒ PERIODIC ☐ CONTINUOUS c. INSPECT ALL OTHER WELDS. ☐ PERIODIC ☒ CONTINUOUS	**AGENCY # (QUALIF.):** AWS-CWI
ITEM 4: INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS. a. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLUDED ORIENTATION TO RESIST SUSTAINED TENSION LOADS. ☐ PERIODIC ☒ CONTINUOUS b. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.a. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI
ITEM 5: VERIFY USE OF REQUIRED DESIGN MIX. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI
ITEM 6: PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE. ☐ PERIODIC ☒ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CFTT, ACI-STT
ITEM 7: INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES. ☐ PERIODIC ☒ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI
ITEM 8: VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI
ITEM 9: INSPECT PRESTRESSED CONCRETE FOR: a. APPLICATION OF PRESTRESSING FORCES; AND ☐ PERIODIC ☒ CONTINUOUS b. GROUTING OF BONDED PRESTRESSING TENDONS. ☐ PERIODIC ☒ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CFTT, ACI-STT
ITEM 10: INSPECT ERECTION OF PRECAST CONCRETE MEMBERS. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CFTT, ACI-STT
ITEM 11: VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CFTT, ACI-STT
ITEM 12: INSPECT FORMWORK FOR SHAPE, LOCATION, AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** ACI-CCI, ICC-RCSI

STRUCTURAL STEEL (AISC 360)

ITEM 1: MATERIAL VERIFICATION OF HIGH-STRENGTH BOLTS, NUTS, AND WASHERS.	**AGENCY # (QUALIF.):** AWS/AISC-SSI, ICC-SWSI
SCOPE: A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED CONSTRUCTION DOCUMENTS. ☒ PERIODIC ☐ CONTINUOUS B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED. ☒ PERIODIC ☐ CONTINUOUS	
ITEM 2: INSPECTION OF HIGH-STRENGTH BOLTING:	**AGENCY # (QUALIF.):** AWS/AISC-SSI, ICC-SWSI
SCOPE: A. BEARING-TYPE CONNECTIONS. ☒ PERIODIC ☐ CONTINUOUS B. SLIP-CRITICAL CONNECTIONS ☐ PERIODIC ☒ CONTINUOUS	
ITEM 3: MATERIAL VERIFICATION OF STRUCTURAL STEEL	**AGENCY # (QUALIF.):** PE/SE
SCOPE: A. IDENTIFICATION MARKINGS TO CONFORM TO ASTM STANDARDS SPECIFIED IN THE APPROVED DOCUMENTS. ☒ PERIODIC ☐ CONTINUOUS B. MANUFACTURER'S MILL TEST REPORTS ☒ PERIODIC ☐ CONTINUOUS	
ITEM 4: MATERIAL VERIFICATION OF WELD FILLER MATERIALS.	**AGENCY # (QUALIF.):** AWS-CWI, ASNT
SCOPE: A. IDENTIFICATION MARKINGS TO CONFORM TO AWS DESIGNATION LISTED IN THE WPS. ☒ PERIODIC ☐ CONTINUOUS B. MANUFACTURER'S CERTIFICATE OF COMPLIANCE REQUIRED. ☒ PERIODIC ☐ CONTINUOUS	
ITEM 5: INSPECTION OF WELDING:	**AGENCY # (QUALIF.):** AWS-CWI, ASNT
SCOPE: A. STRUCTURAL STEEL 1) COMPLETE AND PARTIAL PENETRATION GROOVE WELDS. ☐ PERIODIC ☒ CONTINUOUS 2) MULTIPASS FILLET WELDS. ☐ PERIODIC ☒ CONTINUOUS 3) SINGLE-PASS FILLET WELDS > 5/16". ☐ PERIODIC ☒ CONTINUOUS 4) SINGLE-PASS FILLET WELDS <= 5/16". ☒ PERIODIC ☐ CONTINUOUS 5) FLOOR AND ROOF DECK WELDS. ☒ PERIODIC ☐ CONTINUOUS B. REINFORCING STEEL 1) VERIFICATION OF WELDABILITY OF REINFORCING STEEL OTHER THAN ASTM A706. ☒ PERIODIC ☐ CONTINUOUS 2) REINFORCING STEEL-RESISTING FLEXURAL AND AXIAL FORCES IN INTERMEDIATE AND SPECIAL MOMENT FRAMES, AND BOUNDARY ELEMENTS OF SPECIAL REINFORCED CONCRETE SHEAR WALLS, AND SHEAR REINFORCEMENT. ☐ PERIODIC ☒ CONTINUOUS 3) SHEAR REINFORCEMENT ☐ PERIODIC ☒ CONTINUOUS 4) OTHER REINFORCING STEEL ☒ PERIODIC ☐ CONTINUOUS	

TABLE 1705.6 - INSPECTION OF SOILS

ITEM 1: VERIFY MATERIALS BELOW FOOTINGS ARE ADEQUATE TO ACHIEVE THE DESIRED BEARING CAPACITY. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** PE/GE
ITEM 2: VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** PE/GE
ITEM 3: PERFORM CLASSIFICATION AND TESTING OF CONTROLLED FILL MATERIALS, PERFORM SIEVE TESTS (ASTM D422 & D1140); ATTERBERG LIMIT TEST (ASTM D4318) AND MODIFIED PROCTOR TESTS (ASTM D1557) OF EACH SOURCE OF FILL MATERIAL. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** PE/GE
ITEM 4: VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESSES DURING PLACEMENT AND COMPACTION OF CONTROLLED FILL. TEST DENSITY OF EACH LIFT OF FILL BY NUCLEAR METHODS (ASTM D6938) OR SAND CONE (ASTM D1556), VERIFY EXTENT AND SLOPE OF FILL PLACEMENT, VERIFY COMPACTION OF FILL AND BACKFILL MATERIAL TO 95 PERCENT OF ASTM D 1557. TEST EACH LIFT AT RANDOMLY SELECTED LOCATIONS EVERY 1000 SQUARE FEET OF FILL OR 50 LINEAR FOOT OF WALL OR CONTINUOUS FOOTING, WHICHEVER IS GREATER. PERFORM A MINIMUM OF ONE TEST PER ISOLATED FOOTING. PERFORM 3 TEST MINIMUM PER LIFT. ☐ PERIODIC ☒ CONTINUOUS	**AGENCY # (QUALIF.):** PE/GE
ITEM 5: PRIOR TO PLACEMENT OF CONTROLLED FILL, OBSERVE SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY. ☒ PERIODIC ☐ CONTINUOUS	**AGENCY # (QUALIF.):** PE/GE
NOTES: SEE GENERAL STRUCTURAL NOTES FOR REFERENCE GEOTECHNICAL REPORT AND DESIGN BEARING CAPACITIES. THIS INPECTION APPLIES TO ALL SOIL AND FILL BELOW THE CMU RETAINING WALL AND SOIL AND FILL AS PART OF THE MSE RETAINING WALL.	

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — No. 93019 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

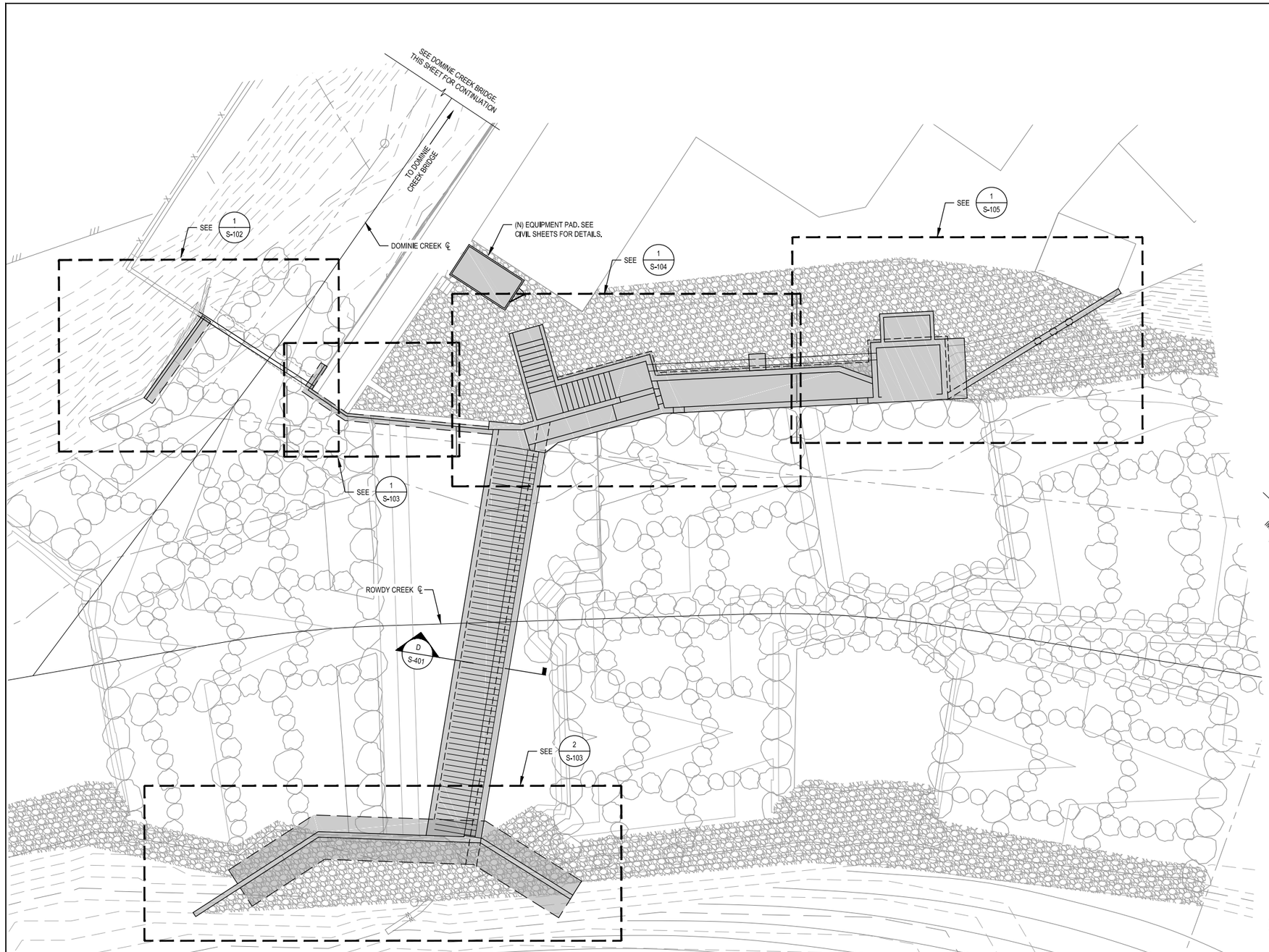
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

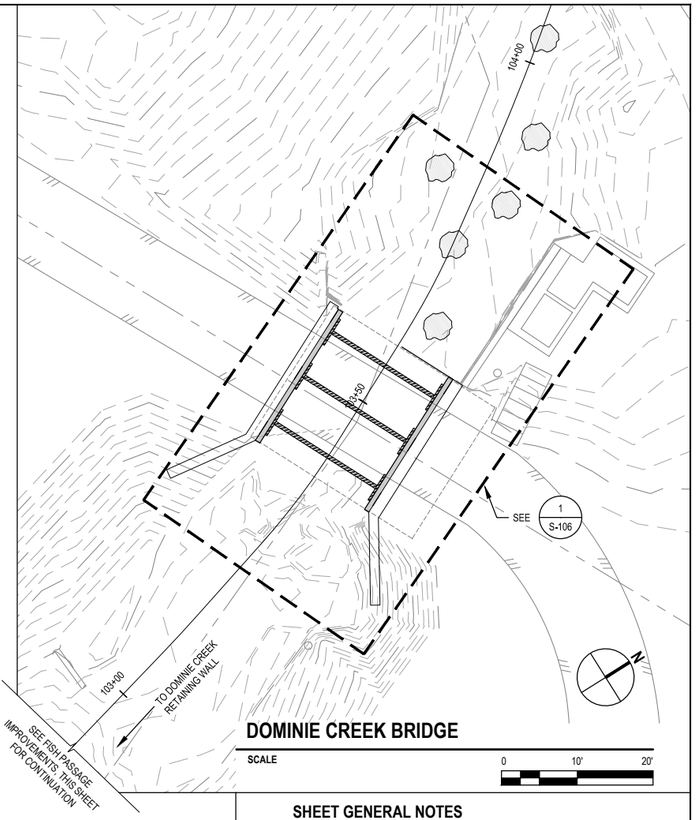
Client **TOLOWA DEE-NI' NATION**
Project **DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT**
Title **ROWDY & DOMINIE CREEK SPECIAL INSPECTIONS**
Project No. **11125168**
Original Size **ANSI D**
Drawing **S-003**
Sheet **26** of **49**

Plot Date: 1 August 2018 - 2:33 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-002-003_Structural Notes.dwg



ROWDY/DOMINIE CREEK PROJECT IMPROVEMENTS SITE OVERVIEW

SCALE 0 10' 20'



DOMINIE CREEK BRIDGE

SCALE 0 10' 20'

SHEET GENERAL NOTES

1. SEE CIVIL PLANS FOR DEMOLITION OF EXISTING STRUCTURES.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL No. 83019 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

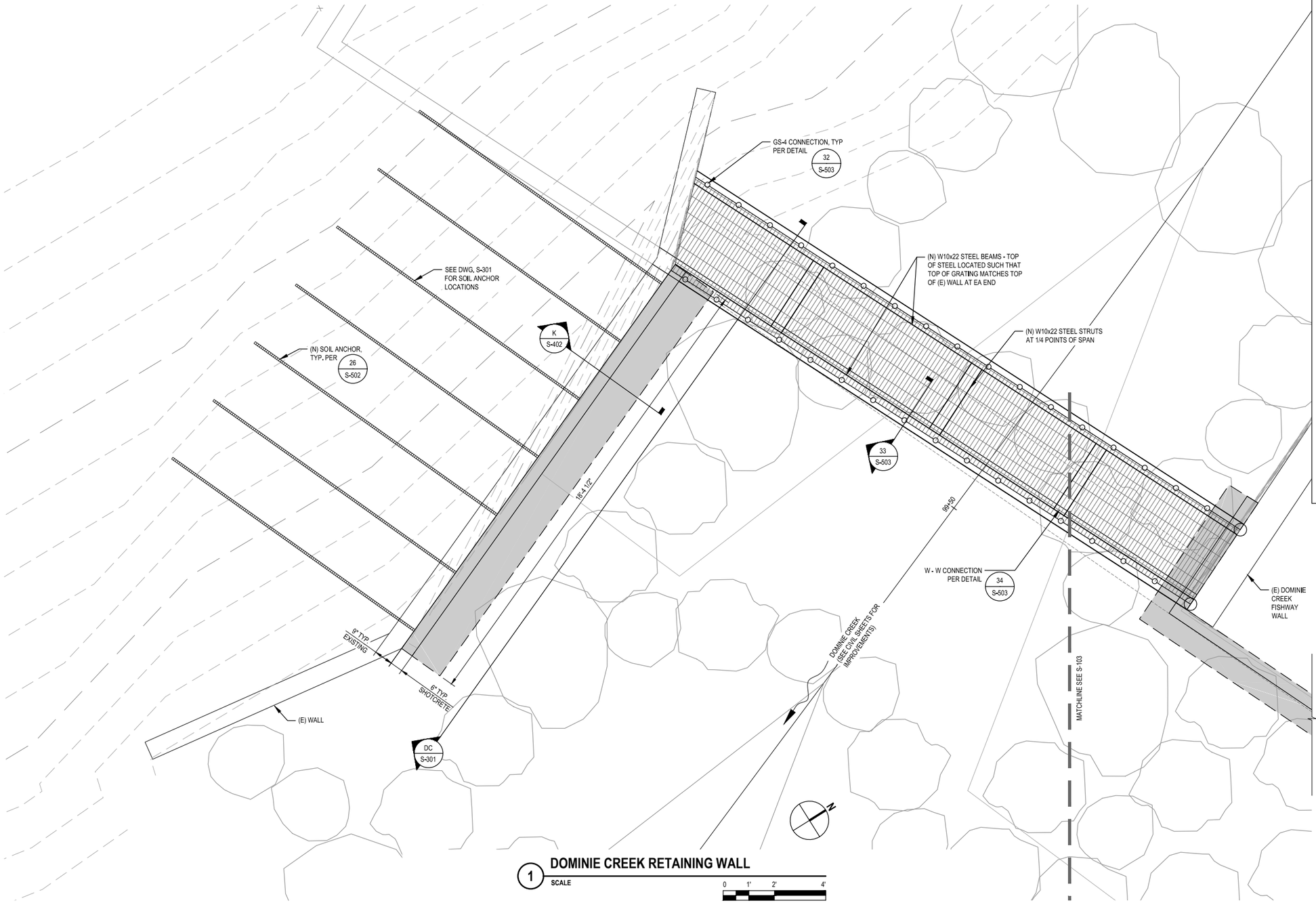
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK STRUCTURAL SITE PLAN OVERVIEW
Project No. 11125168

Original Size ANSI D
Drawing S-101
Sheet 27 of 49

Plot Date: 1 August 2018 - 2:34 PM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg

SHEET GENERAL NOTES

1. FIELD VERIFY ALL DIMENSIONS AND LOCATION OF (E) STRUCTURES PRIOR TO CONSTRUCTION.



1 **DOMINIE CREEK RETAINING WALL**

SCALE 0 1' 2' 4'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL No. 93019 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

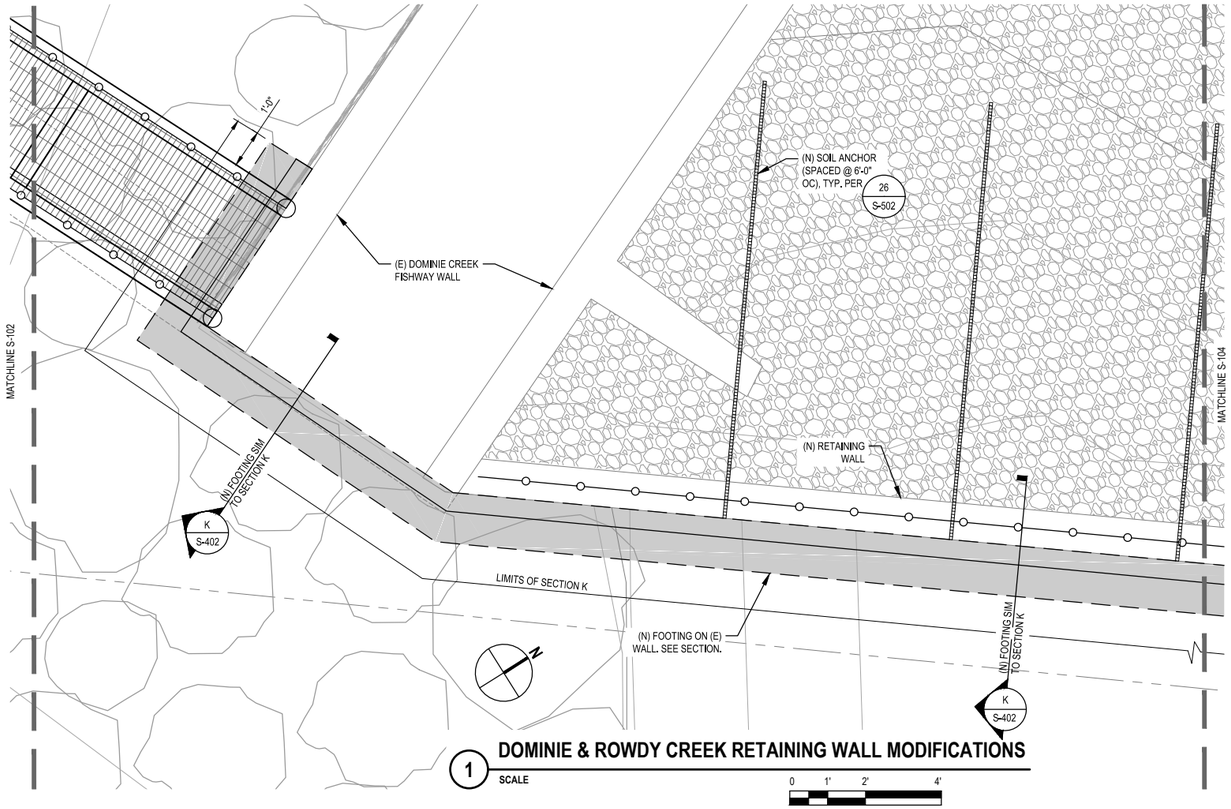
Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title DOMINIE CREEK RETAINING WALL PLAN
Project No. 11125168
Original Size ANSI D
Drawing S-102
Sheet 28 of 49

Plot Date: 1 August 2018 - 2:34 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg

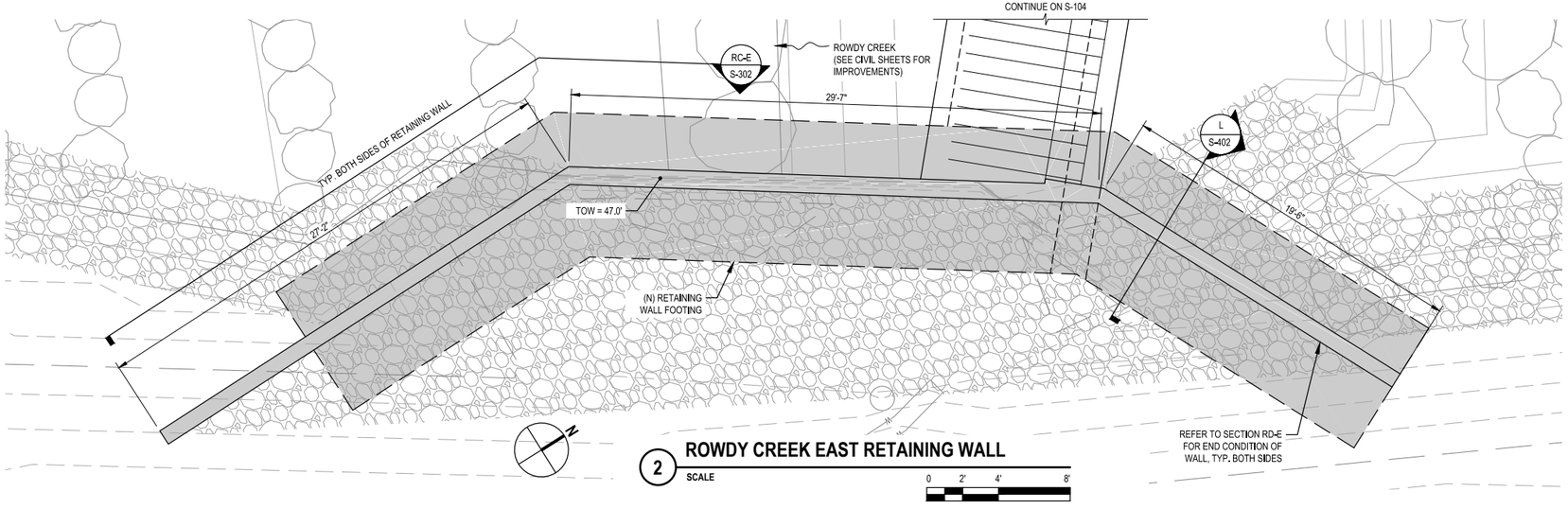
SHEET GENERAL NOTES

1. FIELD VERIFY ALL DIMENSIONS AND LOCATION OF (E) STRUCTURES PRIOR TO CONSTRUCTION.



1 **DOMINIE & ROWDY CREEK RETAINING WALL MODIFICATIONS**

SCALE 0 1' 2' 4'



2 **ROWDY CREEK EAST RETAINING WALL**

SCALE 0 2' 4' 8'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — No. 30019 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet

0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	S. GOULD	Designer	B. CROWELL
Drafting Check	J. SVEHLA	Design Check	S. PEACOCK
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK WALL IMPROVEMENTS
Project No. 11125168

Original Size ANSI D

Drawing **S-103**

Plot Date: 1 August 2018 - 2:34 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg

(N) EQUIPMENT PAD, SEE CIVIL PLANS FOR DETAILS

REFERENCE CIVIL PLANS FOR EXCAVATION AND BACKFILL INFORMATION

(E) PIPE COLUMN, TO REMAIN AND BE PROTECTED, TYP.

CONTRACTOR TO PROVIDE SHORING AT CORNER OF BUILDING AS NECESSARY DURING EXCAVATION

E S-401

STAIR LANDING FF = 52.0'

TOW = 52.5'

TOW = 52.5'

5'-0"

6"

6"

(N) GRATING PER 32 S-503

F S-401

TOW = 51.0'

(N) HANDRAIL PER TYP 31 S-502

1'-0"

A S-303

TOW = 51.0'

(N) 3' x 3' x 5" THK. CONCRETE SLAB ON GRADE

G S-401

MATCHLINE S-105

(N) SOIL ANCHOR (SPACED @ 6'-0" OC), TYP, PER 26 S-502

TOW = 51.0'

7'-0"

TOG = 40.3'

CHAMBER FF = 38.0'

5'-0"

SPAN

1'-0"

(N) PREMANUFACTURED ALUMINUM LADDER

MATCHLINE S-103

CONNECT TO (E) WALL, APPROX. TOW = 47.5'

A S-303

FF = 46.2'

TOW = 43.3'

TOG = 39.6'

FF = 38.0'

TOW = 43.3'

FF = 38.0'

B S-302

FF (UNDER GRATING) = 40.3'

SPAN

5'-0"

TOG = 48.0'

FF (BELOW GRATING) = 40.3'

OPENING FF = 40.3'

TOW = 51.0'

TOW = 51.0'

1'-0"

TOW = 47.5'

TOW = 47.5'

FF = 39.6'

SPAN

C S-303

TOW = 47,5'

3'-0"

FF = 38,0'

FF = 39.6'

PROVIDE BLOCKOUTS IN GRATING TO FIT AROUND GATE CONTROL STEMS, TYP.

B S-303

(N) FOOTING SIM. TO SECTION K

LIMITS OF SECTION K

APRON FF = 36.3'

FF = 38.0'

K S-402

C S-303

E S-401

D S-401

100+00

ROWDY CREEK (SEE CIVIL SHEETS FOR CREEK ALIGNMENT)

BREAK FROM S-103

N

1 FISH TRAP PLAN - SOUTH

SCALE 0 1' 2' 4'

SHEET GENERAL NOTES

1. FIELD VERIFY ALL DIMENSIONS AND LOCATION OF (E) STRUCTURES PRIOR TO CONSTRUCTION.
2. ALL WALLS SHALL BE TYPE 1, UNLESS NOTED OTHERWISE. REFERENCE DETAIL 11/S-501 FOR WALL REINFORCING.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL Exp. 9/30/19 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

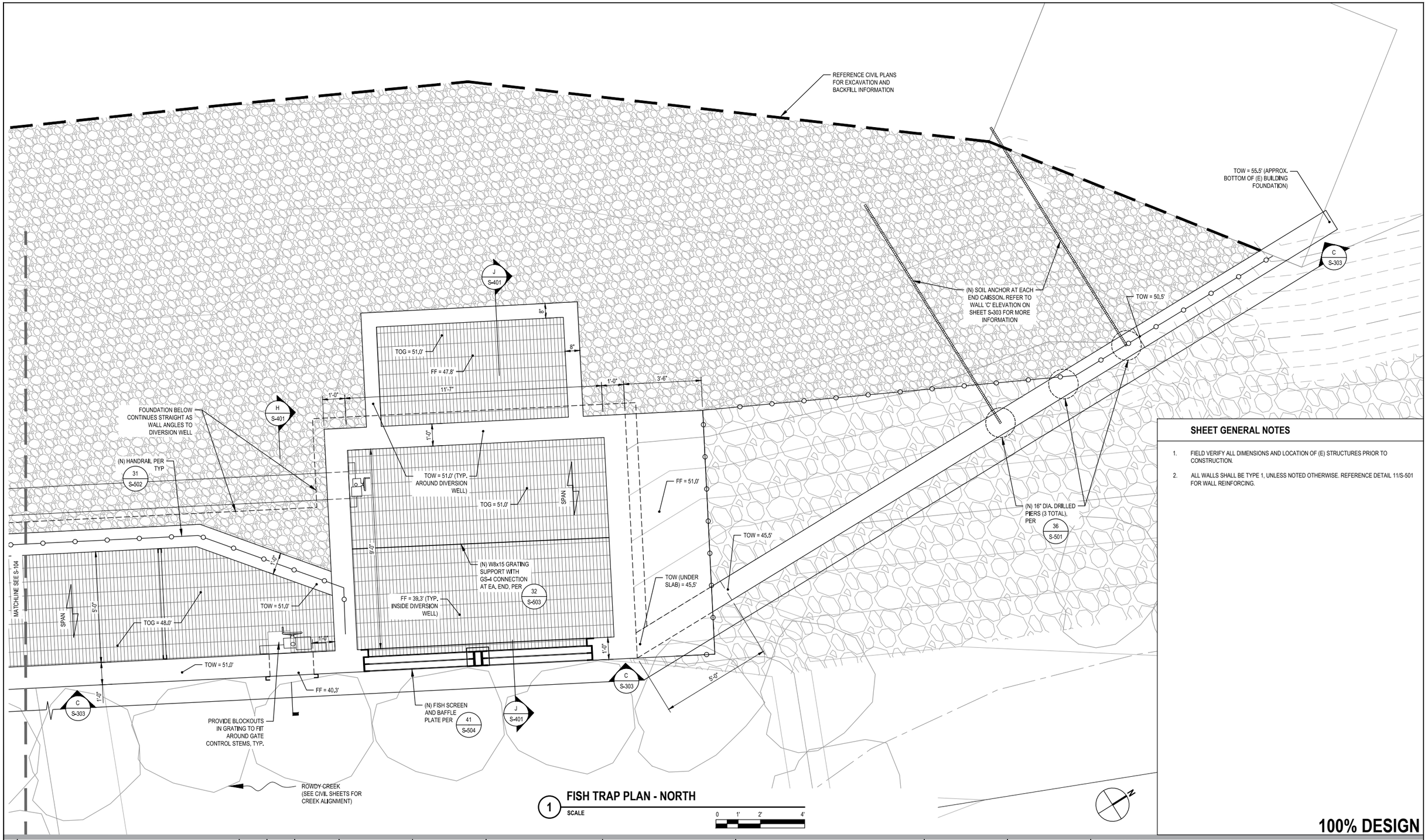
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK HATCHERY PLAN SOUTH END
Project No. 11125168
Original Size ANSI D
Drawing S-104
Sheet 30 of 49

Plot Date: 1 August 2018 - 2:35 PM Plotted By: Brendan Byrd Filename: \\ghdnetghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg



1 **FISH TRAP PLAN - NORTH**

SCALE 0 1' 2' 4'

SHEET GENERAL NOTES

1. FIELD VERIFY ALL DIMENSIONS AND LOCATION OF (E) STRUCTURES PRIOR TO CONSTRUCTION.
2. ALL WALLS SHALL BE TYPE 1, UNLESS NOTED OTHERWISE. REFERENCE DETAIL 11/S-501 FOR WALL REINFORCING.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN I. CROWELL No. 903019 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client **TOLOWA DEE-NI' NATION**
Project **DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT**
Title **ROWDY CREEK HATCHERY PLAN NORTH END**
Project No. **11125168**
Original Size **ANSI D**
Drawing **S-105**
Sheet **31** of **49**

Plot Date: 1 August 2018 - 2:35 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg

SHEET GENERAL NOTES

1. REFER TO CIVIL SHEETS FOR DEMOLITION PLANS.
2. NEW STRUTS SHOWN REPRESENT A REFLECTED VIEW AT UNDER SIDE OF (E) BRIDGE. REFERENCE SECTION FOR CLARITY.

1 **DOMINIE CREEK BRIDGE**

SCALE 0 1' 2' 4'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL No. 83019 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	B. CROWELL
Drafting Check	J. SVEHLA	Design Check	S. PEACOCK
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

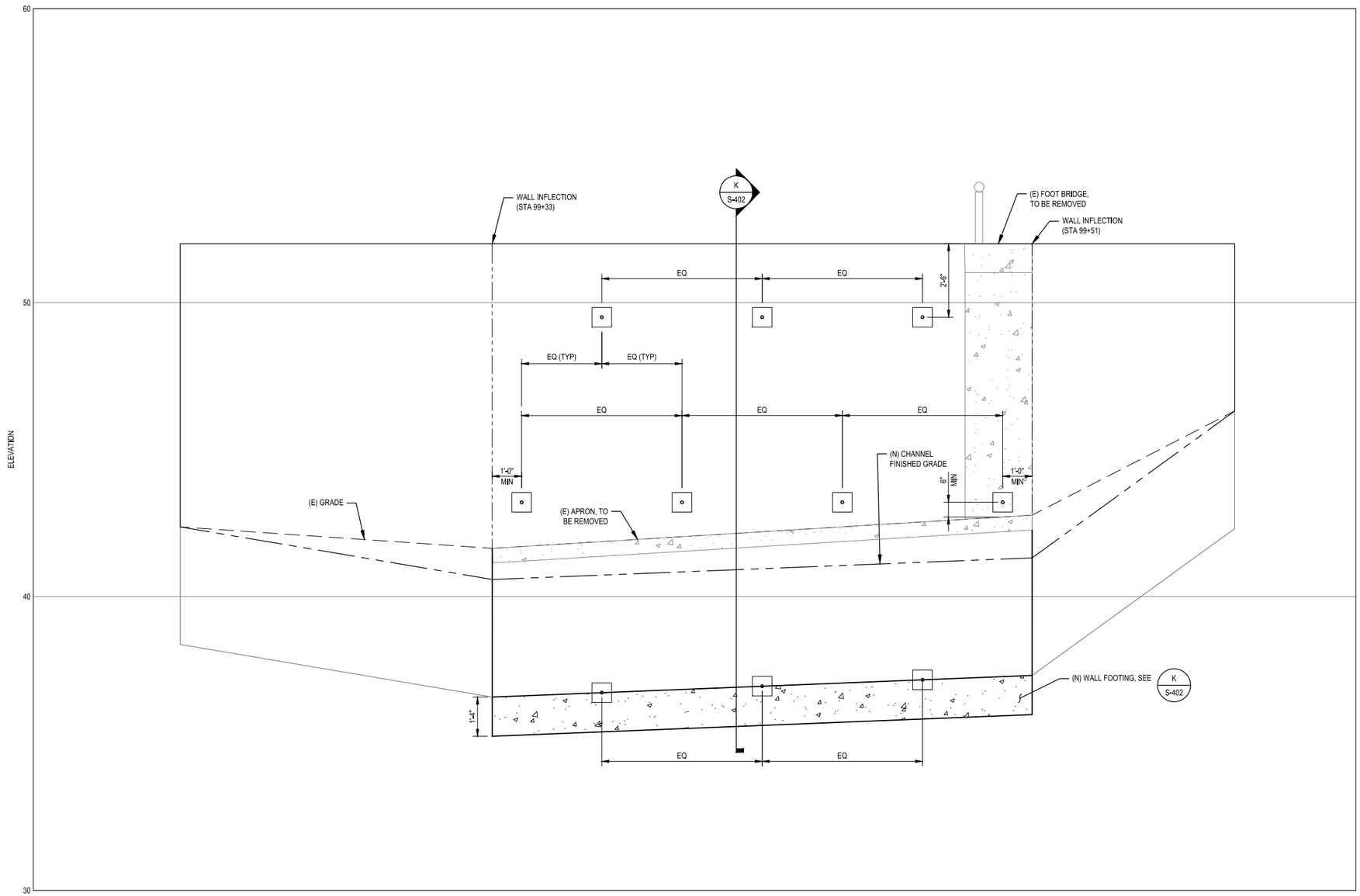
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title DOMINIE CREEK BRIDGE IMPROVEMENTS PLAN
Project No. 11125168

Original Size ANSI D
Drawing **S-106**
Sheet 32 of 49

Plot Date: 1 August 2018 - 2:35 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-100_StructuralSite.dwg

SHEET GENERAL NOTES

1. BACKFILL STRUCTURE PER CIVIL PLANS AND SPECIFICATIONS, TYP.
2. ANTICIPATED BEDROCK LOCATION VARIES. LIMITED INFORMATION IS CONTAINED IN BORING LOGS IN GEOTECHNICAL REPORT. CONTRACTOR TO VERIFY LOCATIONS IN FIELD AND PREPARE SUBGRADE AS SHOWN IN SECTIONS FOR VARYING CONDITION OF BEDROCK AND NON-BEDROCK.
3. WHEN STRUCTURE DOES NOT POUR NEAT TO BEDROCK. SCARIFY AND RECOMPACT UPPER 12" MINIMUM OF IN-SITU SUBGRADE TO 95% RELATIVE COMPACTION. ADD ENGINEERED FILL AS REQUIRED TO ACHIEVE COMPACTION.



DOMINIE CREEK WALL ELEVATION

SCALE 0 2' 4'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER
BRIAN L. CROWELL
Exp. 8/30/19
STRUCTURAL
STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

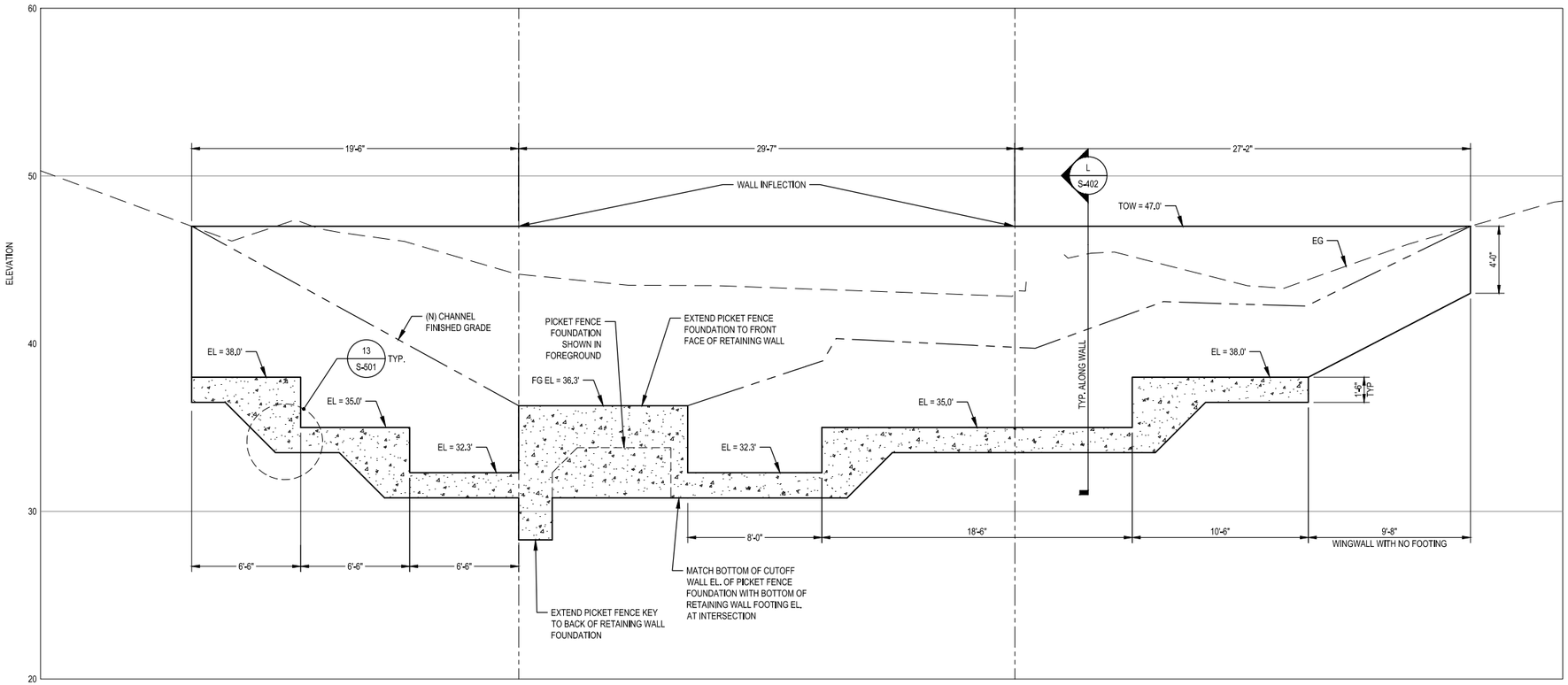
Drawn	S. GOULD	Designer	B. CROWELL
Drafting Check	J. SVEHLA	Design Check	S. PEACOCK
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title DOMINIE CREEK WALL ELEVATION
Project No. 11125168
Original Size ANSI D
Drawing **S-301**
Sheet 33 of 49

Plot Date: 1 August 2018 - 2:35 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-301-302_Wall Elevations.dwg

SHEET GENERAL NOTES

1. BACKFILL STRUCTURE PER CIVIL PLANS AND SPECIFICATIONS, TYP.
2. ANTICIPATED BEDROCK LOCATION VARIES. LIMITED INFORMATION IS CONTAINED IN BORING LOGS IN GEOTECHNICAL REPORT. CONTRACTOR TO VERIFY LOCATIONS IN FIELD AND PREPARE SUBGRADE AS SHOWN IN SECTIONS FOR VARYING CONDITION OF BEDROCK AND NON-BEDROCK.
3. WHEN STRUCTURE DOES NOT POUR NEAT TO BEDROCK. SCARIFY AND RECOMPACT UPPER 12" MINIMUM OF IN-SITU SUBGRADE TO 95% RELATIVE COMPACTION. ADD ENGINEERED FILL AS REQUIRED TO ACHIEVE COMPACTION.



ROWDY CREEK EAST WALL ELEVATION

SCALE 0 4' 8'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL Exp. 8/30/19 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet 0 1"

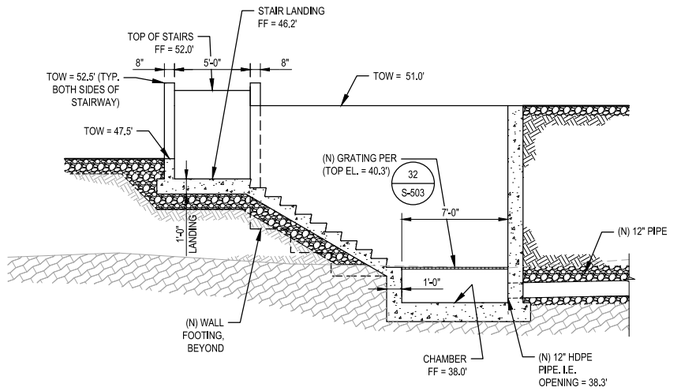
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. PEACOCK
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

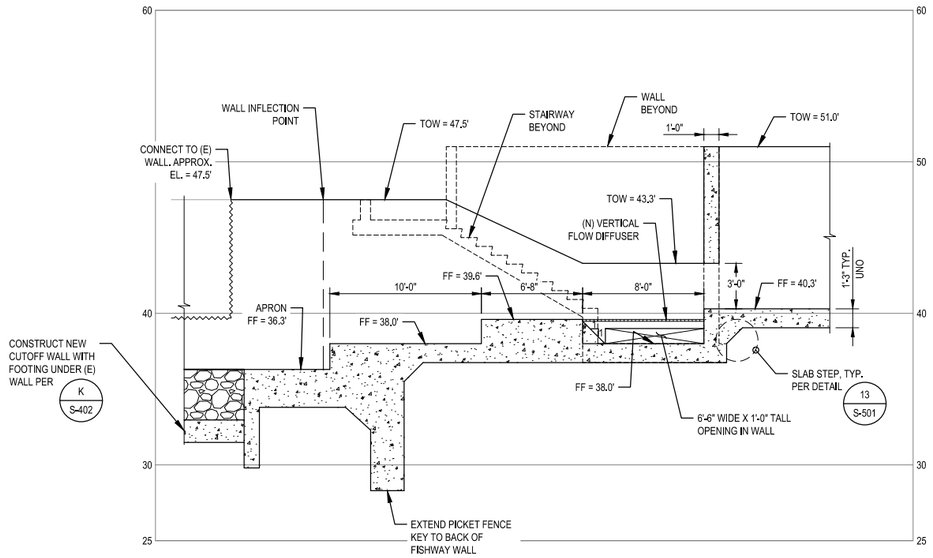
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK EAST WALL ELEVATION
Project No. 11125168
Original Size ANSI D
Drawing S-302
Sheet 34 of 49

Plot Date: 1 August 2018 - 2:35 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-301-302_Wall Elevations.dwg



A WALL A SECTION

SCALE 0 5' 10'

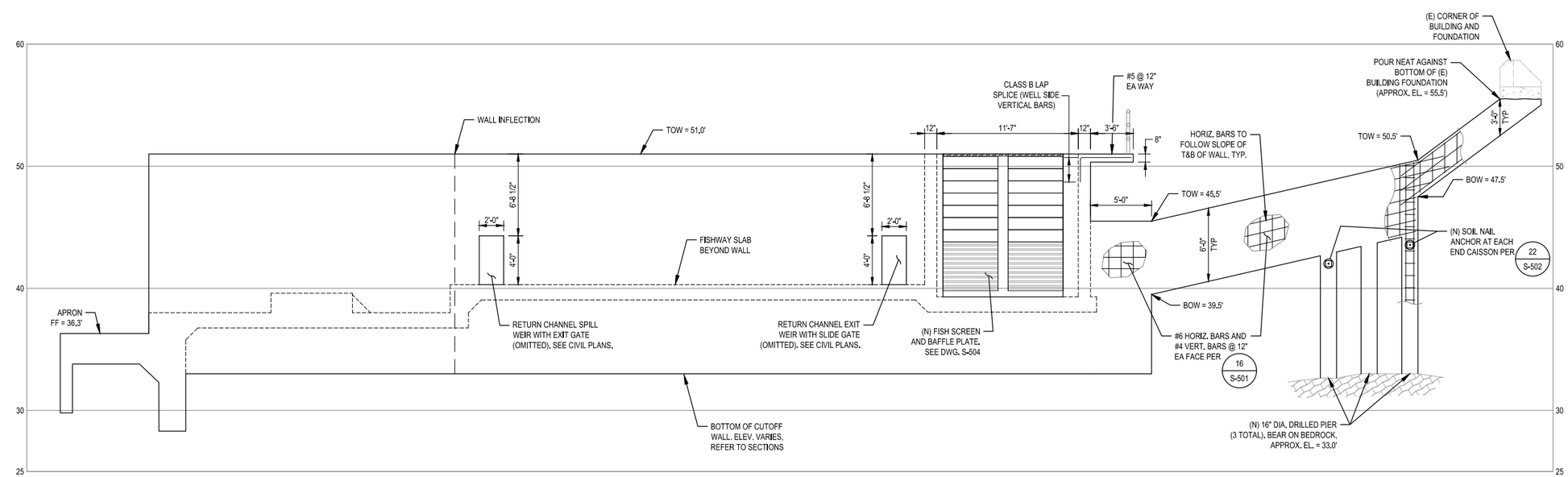


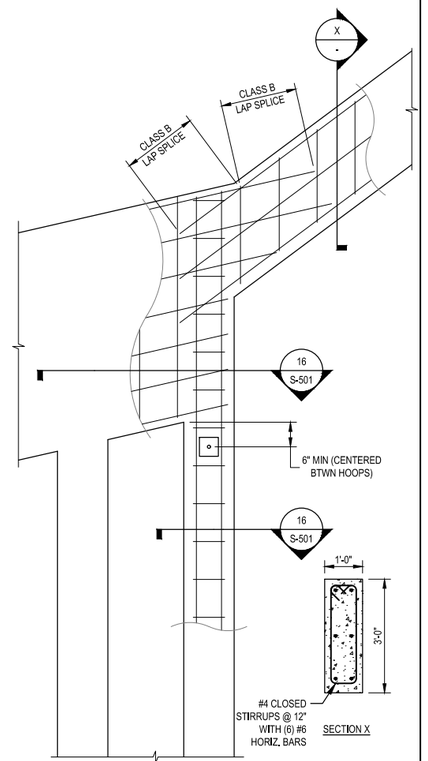
B WALL B SECTION

SCALE 0 5' 10'

SHEET GENERAL NOTES

1. BACKFILL STRUCTURE PER SPECIFICATIONS.
2. FOUNDATION THICKNESS IS 1'-3" TYPICAL, UNLESS NOTED OTHERWISE.
3. STOPLOGS, GATES, HANDRAILS, FLUME, LADDER, AND OTHER STRUCTURE APPURTENANCES OMITTED FOR CLARITY. REFER TO CIVIL SHEETS FOR LOCATIONS.
4. WALL REINFORCEMENT PER DETAIL 31, SHEET S-501, UNLESS NOTED OTHERWISE.
5. ANTICIPATED BEDROCK LOCATION VARIES. LIMITED INFORMATION IS CONTAINED IN BORING LOGS IN GEOTECHNICAL REPORT. CONTRACTOR TO VERIFY LOCATIONS IN FIELD AND PREPARE SUBGRADE AS SHOWN IN SECTIONS FOR VARYING CONDITION OF BEDROCK AND NON-BEDROCK.
6. WHEN STRUCTURE DOES NOT POUR NEAT TO BEDROCK. SCARIFY AND RECOMPACT UPPER 12" MINIMUM OF IN-SITU SUBGRADE TO 95% RELATIVE COMPACTION. ADD ENGINEERED FILL AS REQUIRED TO ACHIEVE COMPACTION.





100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL No. S-13013 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

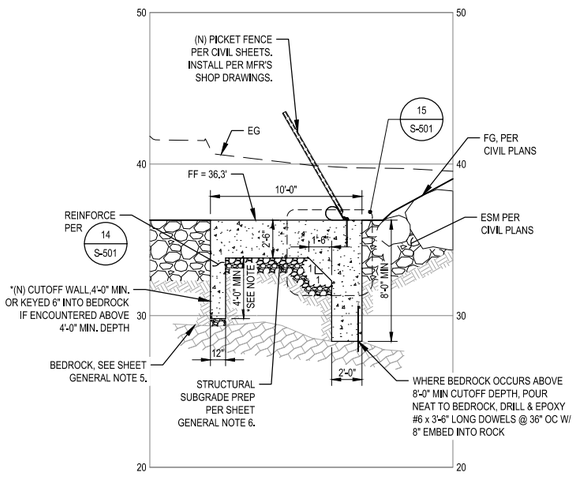
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK HATCHERY WALL ELEVATIONS
Project No. 11125168

Original Size ANSI D
Drawing S-303
Sheet 35 of 49

Plot Date: 1 August 2018 - 2:36 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-301_WallElevations.dwg

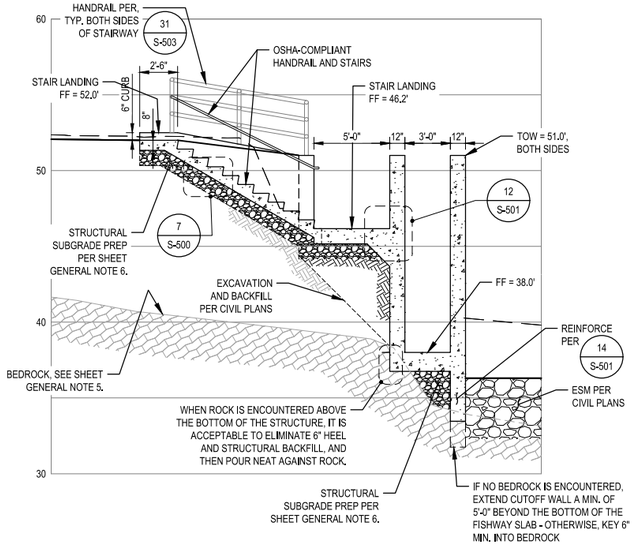
SHEET GENERAL NOTES

1. BACKFILL STRUCTURE PER SPECIFICATIONS.
2. FOUNDATION THICKNESS IS 1'-3" TYPICAL, UNLESS NOTED OTHERWISE.
3. STOPLOGS, GATES, HANDRAILS, FLUME, LADDER, AND OTHER STRUCTURE APPURTENANCES OMITTED FOR CLARITY. REFER TO CIVIL SHEETS FOR LOCATIONS.
4. WALL REINFORCEMENT PER DETAIL 31, SHEET S-501, UNLESS NOTED OTHERWISE.
5. ANTICIPATED BEDROCK LOCATION VARIES. LIMITED INFORMATION IS CONTAINED IN BORING LOGS IN GEOTECHNICAL REPORT. CONTRACTOR TO VERIFY LOCATIONS IN FIELD AND PREPARE SUBGRADE AS SHOWN IN SECTIONS FOR VARYING CONDITION OF BEDROCK AND NON-BEDROCK.
6. WHEN STRUCTURE DOES NOT POUR NEAT TO BEDROCK. SCARIFY AND RECOMPACT UPPER 12" MINIMUM OF IN-SITU SUBGRADE TO 95% RELATIVE COMPACTION. ADD ENGINEERED FILL AS REQUIRED TO ACHIEVE COMPACTION.



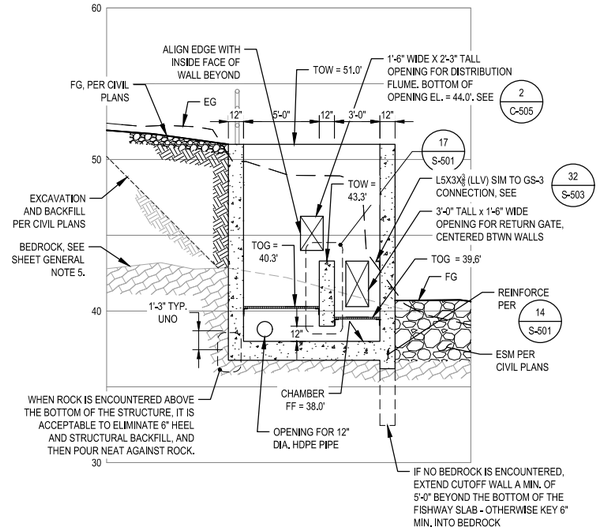
D **SECTION D, TYPICAL PICKET SLAB**

SCALE 0 5' 10'



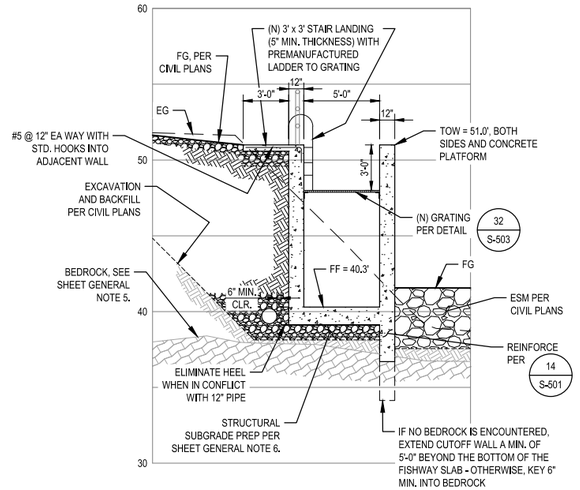
E **SECTION E**

SCALE 0 5' 10'



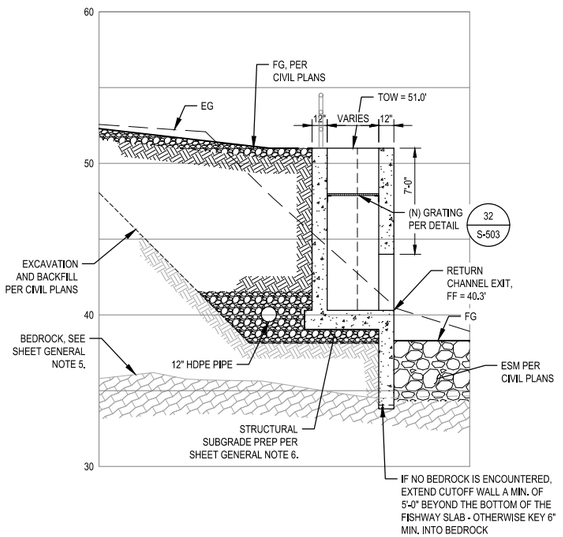
F **SECTION F**

SCALE 0 5' 10'



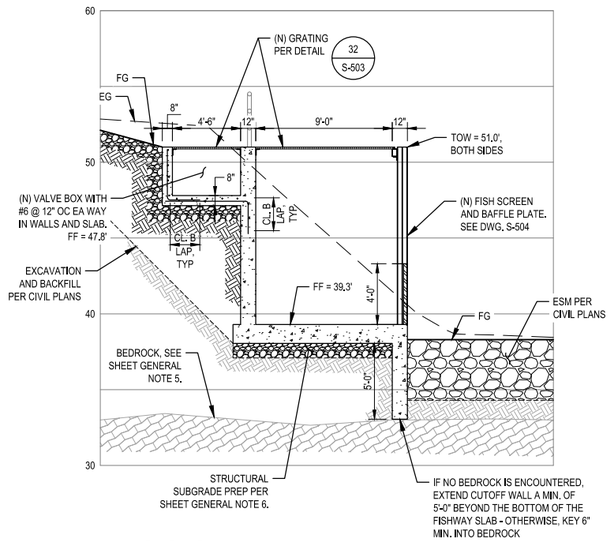
G **SECTION G**

SCALE 0 5' 10'



H **SECTION H**

SCALE 0 5' 10'



J **SECTION J**

SCALE 0 5' 10'

100% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet

0 1"

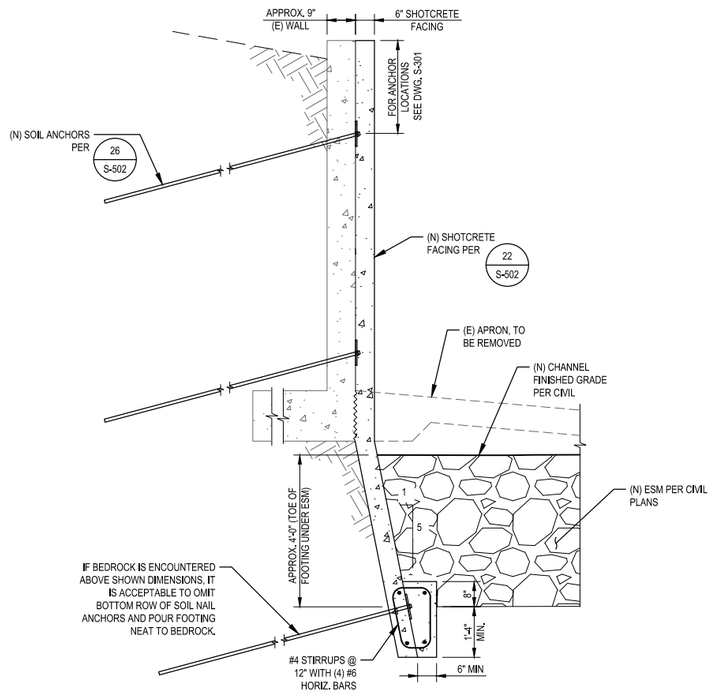
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	J. SVEHLA	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

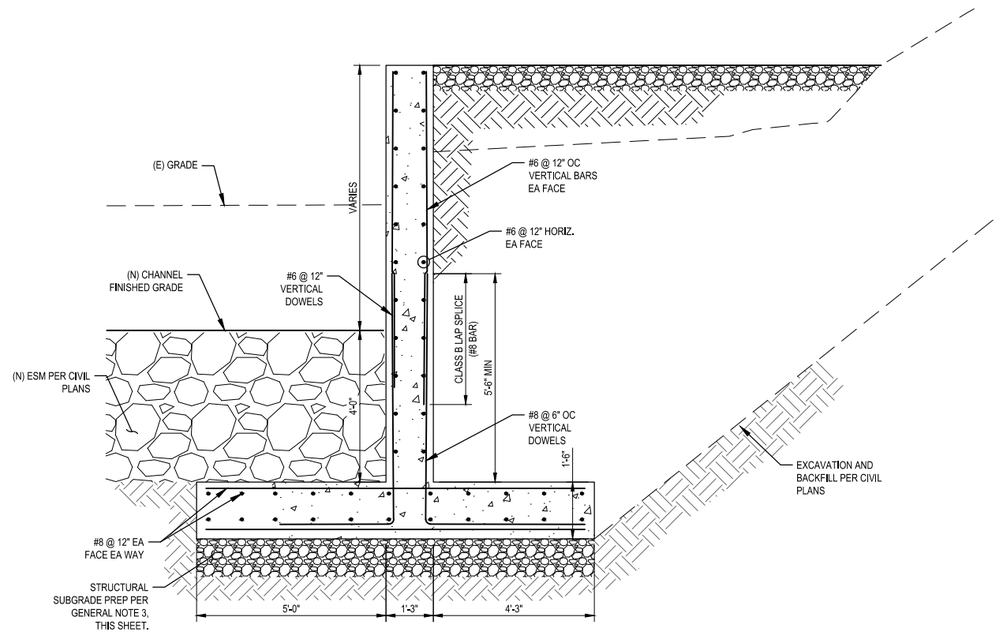
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK STRUCTURAL TYPICAL SECTIONS 1 OF 3
Project No. 11125168
Original Size ANSI D
Drawing S-401
Sheet 36 of 49

Plot Date: 1 August 2018 - 2:36 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-301_WallElevations.dwg



K **DOMINIE CREEK WALL TYPICAL SECTION**

SCALE 0 2' 4'



L **ROWDY CREEK EAST WALL TYPICAL SECTION**

SCALE 0 2' 4'

SHEET GENERAL NOTES

1. BACKFILL STRUCTURE PER CIVIL PLANS AND SPECIFICATIONS, TYP.
2. ANTICIPATED BEDROCK LOCATION VARIES. LIMITED INFORMATION IS CONTAINED IN BORING LOGS IN GEOTECHNICAL REPORT. CONTRACTOR TO VERIFY LOCATIONS IN FIELD AND PREPARE SUBGRADE AS SHOWN IN SECTIONS FOR VARYING CONDITION OF BEDROCK AND NON-BEDROCK.
3. WHEN STRUCTURE DOES NOT POUR NEAT TO BEDROCK. SCARIFY AND RECOMPACT UPPER 12" MINIMUM OF IN-SITU SUBGRADE TO 95% RELATIVE COMPACTION. ADD ENGINEERED FILL AS REQUIRED TO ACHIEVE COMPACTION.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — Exp. 9/30/19 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

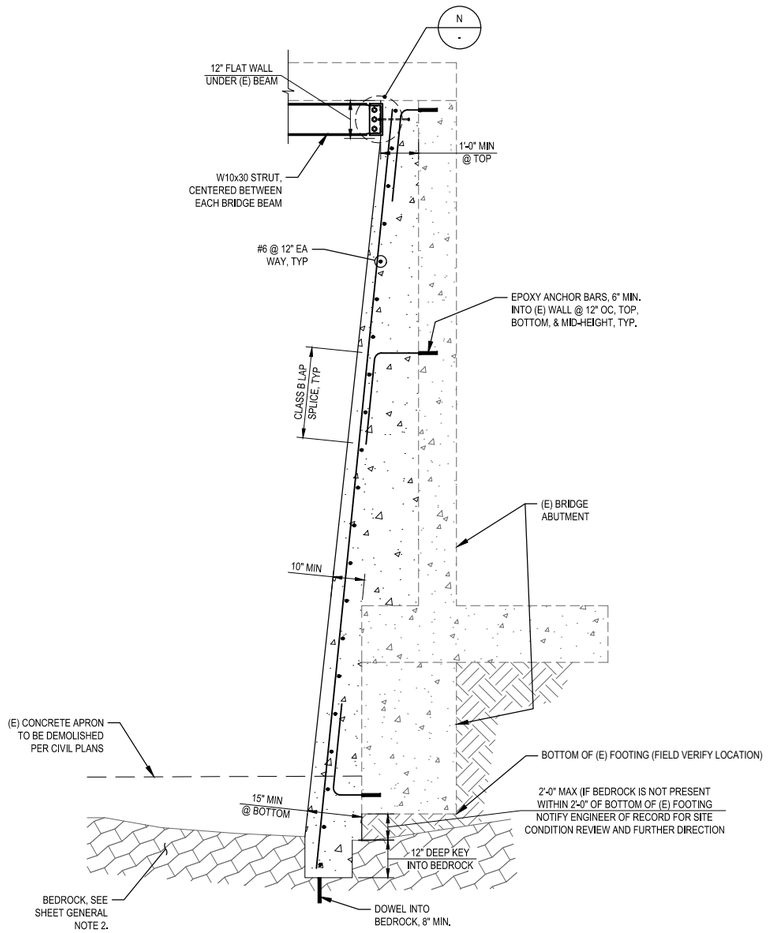
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	S. GOULD	Designer	B. CROWELL
Drafting Check	J. SVEHLA	Design Check	S. PEACOCK
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

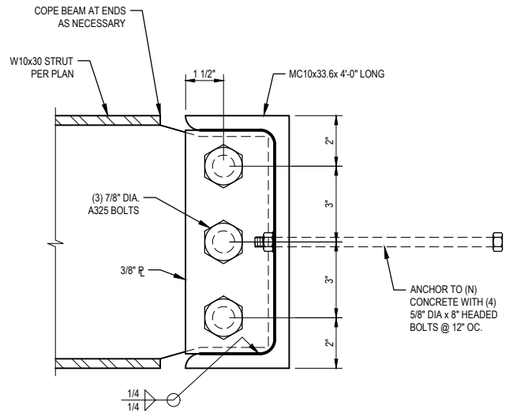
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK STRUCTURAL TYPICAL SECTIONS 2 OF 3
Project No. 11125168
Original Size ANSI D
Drawing **S-402**
Sheet 37 of 49

Plot Date: 1 August 2018 - 2:37 PM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-402_WallSections.dwg



DOMINIE BRIDGE ABUTMENT IMPROVEMENTS
TYPICAL SECTION

M SCALE 0 2' 4'



BEAM TO (N) CONCRETE DETAIL

N NTS

SHEET GENERAL NOTES

1. REFERENCE S-002 FOR GENERAL NOTES.
2. FIELD VERIFICATION OF BEDROCK LOCATION AT BASE OF (E) BRIDGE ABUTMENT REQUIRED.

100% DESIGN

No.	Issue	Drawn	Approved	Date

BRIAN L. CROWELL — REGISTERED PROFESSIONAL ENGINEER — STRUCTURAL — STATE OF CALIFORNIA — Exp: 9/30/19

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

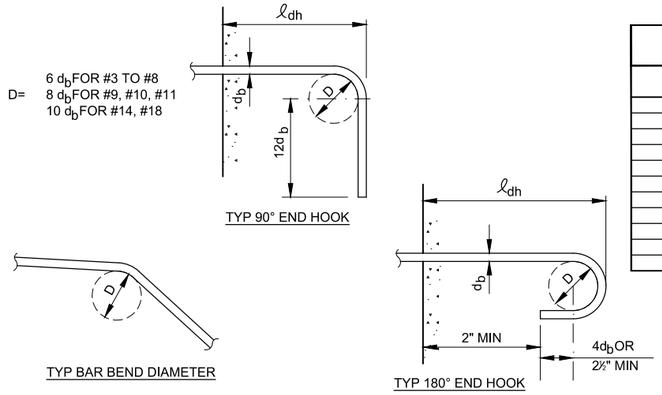
This document shall not be used for construction unless signed and sealed for construction.

Drawn	S. GOULD	Designer	B. CROWELL
Drafting Check	J. SVEHLA	Design Check	S. PEACOCK
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK
STRUCTURAL TYPICAL SECTIONS 3 OF 3
Project No. 11125168

Original Size ANSI D
Drawing **S-403**
Sheet 38 of 49

Plot Date: 1 August 2018 - 2:37 PM Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-402_WallSections.dwg



MINIMUM TENSION EMBEDMENT LENGTHS ℓ_{dh} (IN.) FOR STANDARD END HOOKS ON REINFORCING BARS

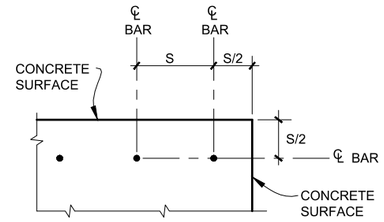
BAR SIZE	NORMAL WEIGHT CONCRETE, f'c, PSI			
	3000	4000	5000	6000
#3	6	6	6	6
#4	8	7	6	6
#5	10	9	8	7
#6	12	10	9	9
#7	14	12	11	10
#8	16	14	12	11
#9	18	15	14	13
#10	20	17	16	14
#11	22	19	17	16
#14	38	33	29	27
#18	50	43	39	35

1 TYP **BAR BENDS AND HOOK ENDS**

SCALE: NTS

NOTES:

1. LENGTHS SHOWN ARE FOR GRADE 60 UNCOATED BARS
2. LENGTHS SHOWN ARE IN INCHES
3. INCREASE LENGTHS 30% FOR LIGHT WEIGHT CONCRETE
4. TOP BARS: HORIZONTAL BARS WITH MORE THAN 12" OF FRESH CONCRETE CAST BELOW THEM
5. THE QUANTITY 's' IS DEFINED AS FOLLOWS:



DEVELOPMENT LENGTH (ℓ_d)

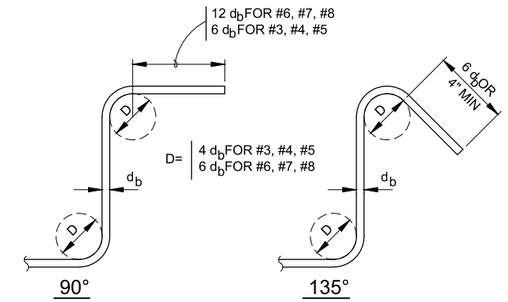
BAR SIZE	3000 PSI CONC (f'c)				4000 PSI CONC (f'c)				5000 PSI CONC (f'c)			
	TOP		OTHER		TOP		OTHER		TOP		OTHER	
	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"
#3	13	22	12	17	12	19	12	15	12	17	12	13
#4	18	29	14	22	15	25	12	19	14	23	12	17
#5	22	36	17	28	19	31	15	24	17	28	13	22
#6	26	43	20	33	23	37	18	29	20	34	16	26
#7	38	63	29	48	33	54	25	42	29	49	23	38
#8	43	72	33	55	37	62	29	48	34	56	26	43
#9	49	81	37	62	42	70	33	54	38	63	29	48
#10	56	89	43	69	49	78	38	60	44	69	34	54
#11	68	98	52	76	59	85	45	66	53	76	41	59

TENSION LAP SPLICE LENGTH (CLASS 'B' SPLICE)

BAR SIZE	3000 PSI CONC (f'c)				4000 PSI CONC (f'c)				5000 PSI CONC (f'c)			
	TOP		OTHER		TOP		OTHER		TOP		OTHER	
	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"	s ≥ 6"	s < 6"
#3	17	28	16	22	16	25	16	19	16	22	16	17
#4	23	38	18	29	20	33	16	25	18	29	16	23
#5	28	47	22	36	25	41	19	31	22	36	17	28
#6	34	56	26	43	29	49	23	38	26	44	20	34
#7	49	82	38	63	43	71	33	55	38	63	30	49
#8	56	93	43	72	49	81	38	62	44	72	34	56
#9	63	105	49	81	55	91	42	70	49	81	38	63
#10	73	116	56	90	63	101	49	78	57	90	44	70
#11	88	128	68	99	76	111	59	85	68	99	53	76

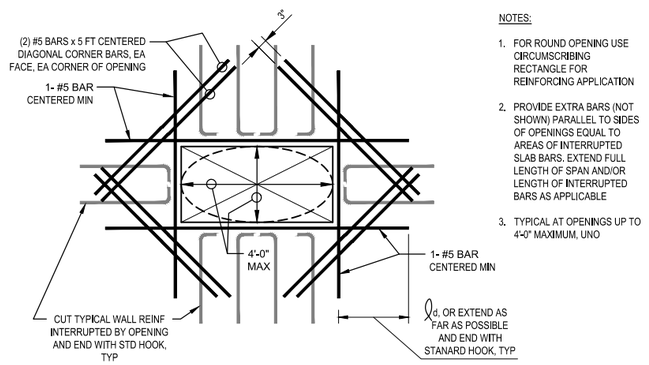
2 TYP **CONCRETE DEVELOPMENT AND LAP SPLICE DETAIL**

SCALE: NTS



3 TYP **STIRRUP AND TIED HOOKS**

SCALE: NTS

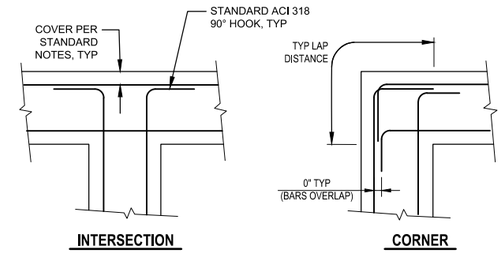


NOTES:

1. FOR ROUND OPENING USE CIRCUMSCRIBING RECTANGLE FOR REINFORCING APPLICATION
2. PROVIDE EXTRA BARS (NOT SHOWN) PARALLEL TO SIDES OF OPENINGS EQUAL TO AREAS OF INTERRUPTED SLAB BARS. EXTEND FULL LENGTH OF SPAN AND/OR LENGTH OF INTERRUPTED BARS AS APPLICABLE
3. TYPICAL AT OPENINGS UP TO 4'-0" MAXIMUM, UNO

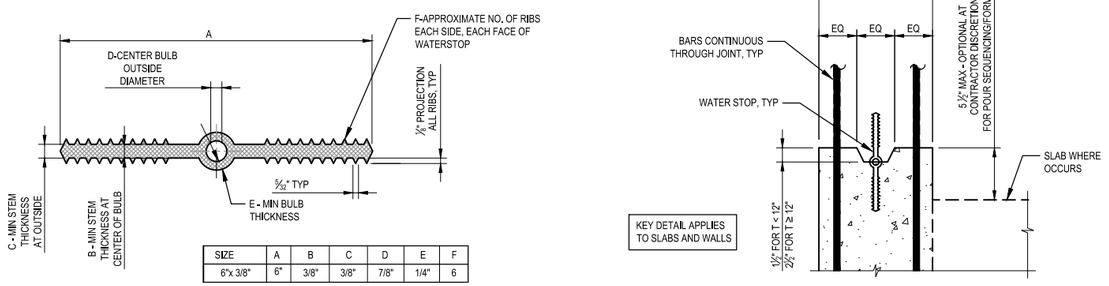
4 TYP **TYPICAL REINFORCEMENT AT WALL & SLAB OPENINGS**

SCALE: NTS



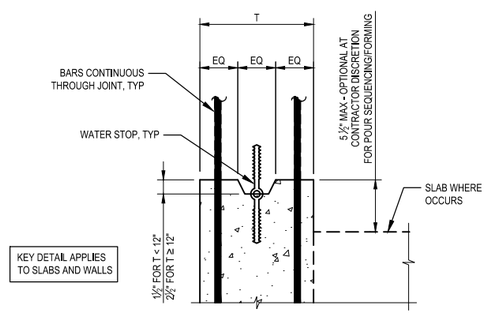
5 TYP **TYPICAL REINFORCEMENT AT INTERSECTIONS AND CORNERS**

SCALE: NTS



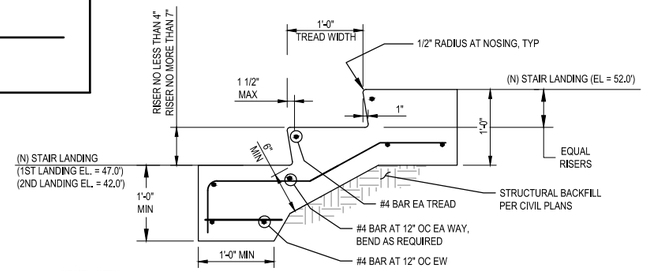
SIZE	A	B	C	D	E	F
6"x 3/8"	6"	3/8"	3/8"	7/8"	1/4"	6

PLASTIC WATERSTOP DETAIL



6 TYP **CONSTRUCTION JOINT DETAIL**

NTS



STAIR NOTES:

1. CONCRETE SHALL BE A LIGHT BROOM FINISH.
2. ALL EXTERIOR STAIR THREADS SHALL HAVE 2" WIDE MIN. WARNING STRIPES PER CURRENT BUILDING CODES.
3. STAIR RISE & TREAD TO BE DETERMINED FOR SITE CONDITIONS BASED ON REQUIREMENTS.
4. THE TOP AND BOTTOM LANDINGS SHALL SLOPE NO MORE THAN 1.5% IN ANY DIRECTION.
5. BASE OF CONCRETE TO BE 6" MIN BELOW FINISHED GRADE.

7 TYP **TYPICAL STAIR DETAIL**

SCALE: NTS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL Exp. 9/30/19 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet

0 1"

Reuse of Documents

This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. DAVIS	Designer	S. GOULD
Drafting Check	S. PEACOCK	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

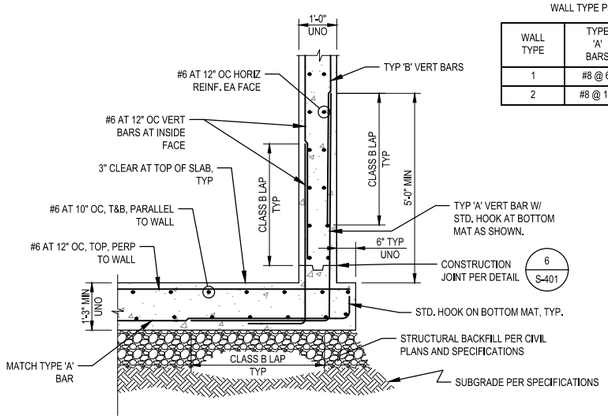
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK TYPICAL STRUCTURAL DETAILS
Project No. 11125168

Original Size ANSI D | Drawing S-500 | Sheet 39 of 49

Plot Date: 1 August 2018 - 2:37 PM Plotted By: Brendan Byrd Filename: \\ghdnetnghd\US\Eureka\Projects\11\11111125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-500_TypStructDtls.dwg

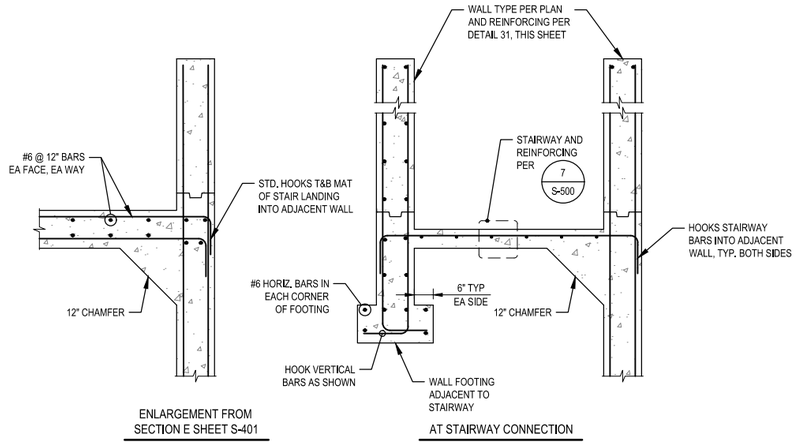
REINFORCING SCHEDULE
WALL TYPE PER PLAN

WALL TYPE	TYPE 'A' BARS	TYPE 'B' BARS
1	#8 @ 6"	#6 @ 12"
2	#8 @ 12"	#6 @ 12"



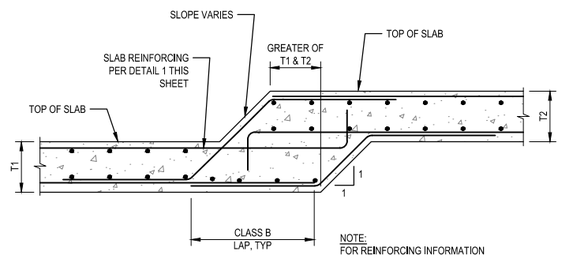
11 TYP TYPICAL CONCRETE WALL AND FOUNDATION SECTION

SCALE 0 1' 2' 4'



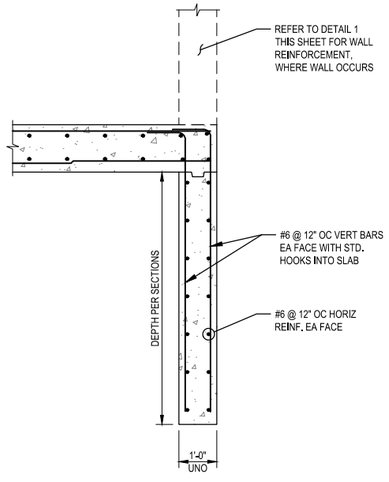
12 TYP SLAB STEP SECTION

SCALE 0 1' 2' 4'



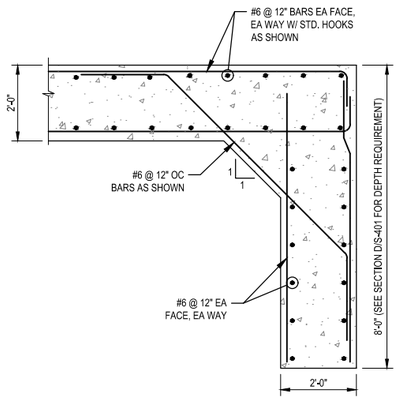
13 TYP TYPICAL SLAB STEP DETAIL

SCALE 0 1' 2' 4'



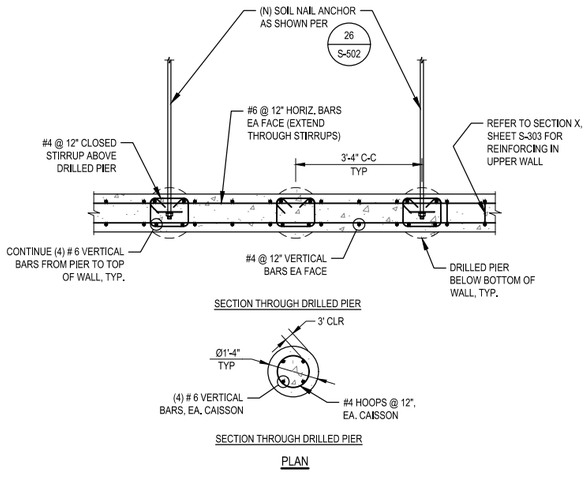
14 TYP TYPICAL CUTOFF WALL SECTION

SCALE 0 1' 2' 4'



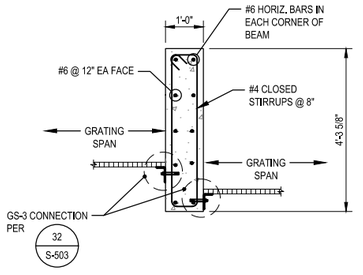
15 TYP FENCE FOUNDATION SECTION

SCALE 0 1' 2' 4'



16 TYP DRILLED PIER REINFORCING DETAIL

SCALE 0 1' 2' 4'



17 TYP CHAMBER BEAM SECTION

SCALE 0 1' 2' 4'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER BRIAN L. CROWELL No. 030019 STRUCTURAL STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.
© 2018 GHD

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

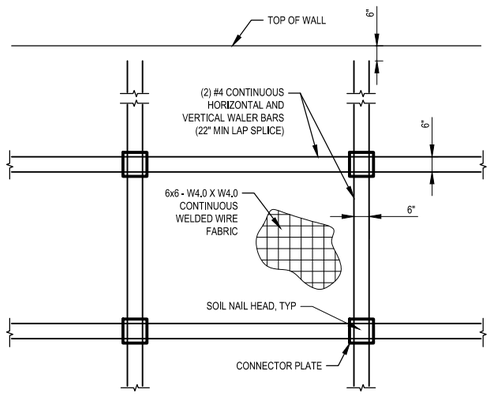
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. PEACOCK
Drafting Check	S. PEACOCK	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK
TYPICAL STRUCTURAL REINFORCING DETAILS
Project No. 11125168

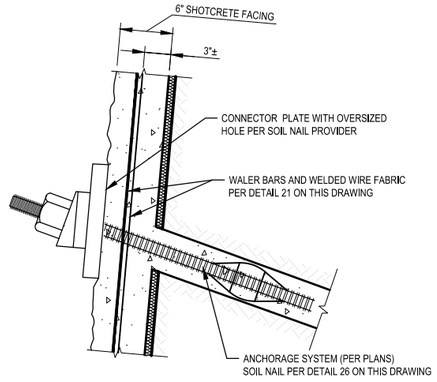
Original Size ANSI D
Drawing S-501
Sheet 40 of 49

Plot Date: 1 August 2018 - 2:38 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-501_StrucDtls.dwg



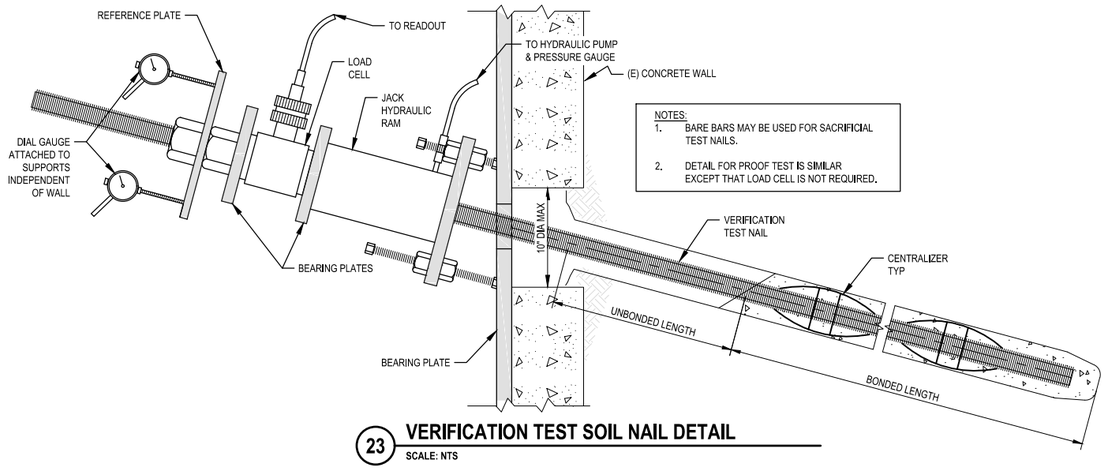
21 WALER BAR DETAILS

SCALE: NTS



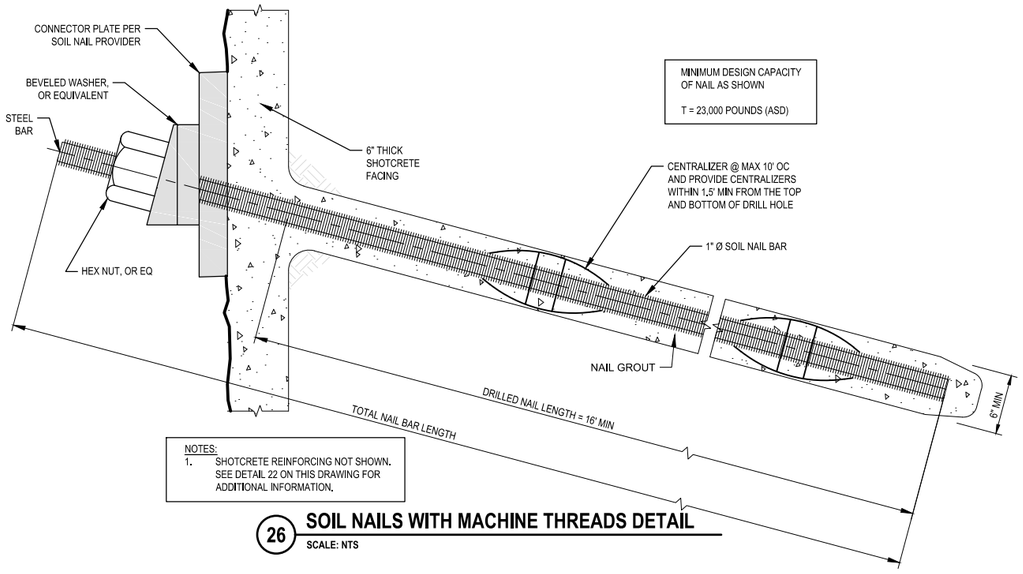
22 FINISHED WALL AND REINFORCING DETAIL

SCALE: NTS



23 VERIFICATION TEST SOIL NAIL DETAIL

SCALE: NTS



26 SOIL NAILS WITH MACHINE THREADS DETAIL

SCALE: NTS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — Exp. 9/30/19 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet

0 — 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

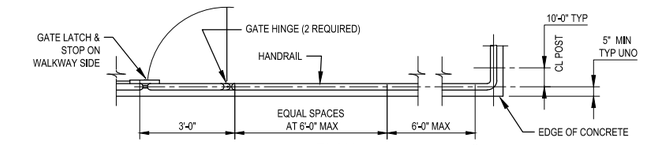
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

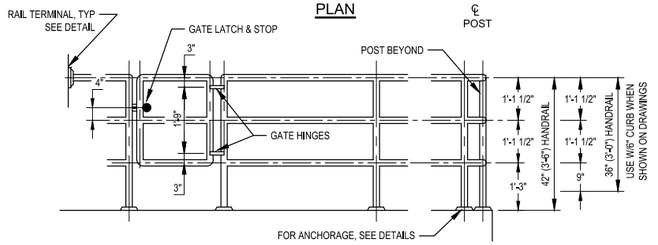
Drawn	S. DAVIS	Designer	S. GOULD
Drafting Check	S. PEACOCK	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

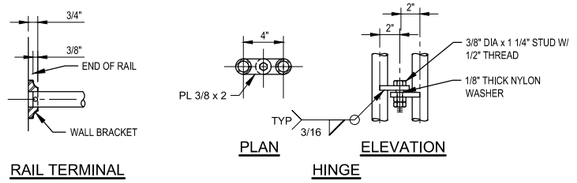
Client **TOLOWA DEE-NI' NATION**
Project **DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT**
Title **ROWDY & DOMINIE CREEK SOIL NAIL AND MISCELLANEOUS DETAILS**
Project No. **11125168**

Original Size **ANSI D**
Drawing **S-502**
Sheet **41** of **49**

Plot Date: 1 August 2018 - 2:38 PM
Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-502_StructSoilNailDtls.dwg

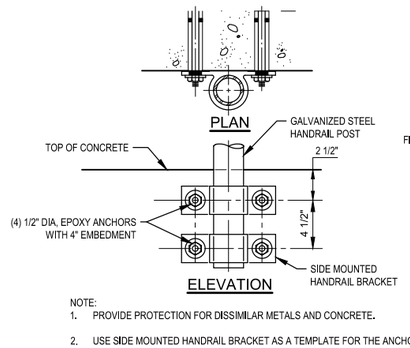






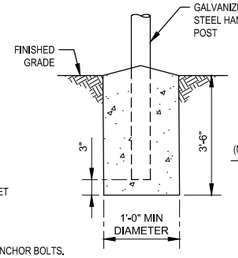
NOTES:
1. FASTEN RAIL TO WALL BRACKET PER MFR'S RECOMMENDATIONS.
2. WALL FLANGE TO BE MOUNTED TO WALL W/ (2) 3/16"Ø POST INSTALLED ANCHORS, 3" EMBEDMENT

THREE-RAIL HANDRAIL



NOTE:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS AND CONCRETE.
2. USE SIDE MOUNTED HANDRAIL BRACKET AS A TEMPLATE FOR THE ANCHOR BOLTS.

SIDE MOUNTED HANDRAIL POST ANCHORAGE



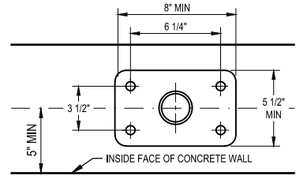
HANDRAIL FOOTING

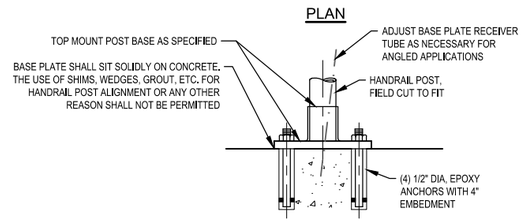
NOTES:

1. DETAILS SHOWN ARE MINIMUM REQUIREMENTS. CONTRACTOR'S ENGINEER TO DESIGN HANDRAILS AND HANDRAIL ANCHORAGE TO MEET REQUIREMENTS SHOWN ON PLANS AND WITHIN SPECIFICATION SECTION 05520 "HANDRAILS AND RAILINGS"
2. FOR CONCRETE STAIRS PLACE CENTER OF HANDRAIL 4" FROM EDGE OF CONCRETE UNLESS OTHERWISE NOTED ON PLANS
3. PLACE HANDRAIL POSTS OPPOSITE EACH OTHER WHERE HANDRAILS ARE PARALLEL
4. COAT ALL SURFACES OF ALUMINUM THAT COME IN CONTACT WITH CONCRETE IN ACCORDANCE WITH SPECIFICATIONS. PLACE NEOPRENE GASKET BETWEEN ALUMINUM AND STEEL
5. PROVIDE SLIPJOINT AT 24' MAX CENTERS FOR EXPANSION OF RAILS AND KICKPLATE. GAP AT TIME OF INSTALLATION SHALL BE BASED ON TEMPERATURE OF HANDRAIL (⅜" GAP AT T = 25° F, 0" GAP AT T = 100° F). AT CONCRETE EXPANSION JOINTS PROVIDE 1" GAP IN SLIP JOINT. INSERT SLEEVES TO BE LONG ENOUGH TO ALLOW FOR THE FULL RANGE OF MOVEMENT.
6. KICKPLATE MAY BE EXTRUDED OR BENT PLATE AND TO BE ATTACHED WITH STAINLESS STEEL BOLTS IN 5/16"X ¾" SLOTTED HOLES. BOLT KICKPLATE TO POST WITH BOTTOM ½" CLEAR (MAX) FROM SURFACE. FOR SIDE MOUNTED HANDRAIL, PROVIDE STANDARD SPACER BLOCK BETWEEN POST AND KICKPLATE TO MAINTAIN ½" MAXIMUM CLEAR SPACING. PROVIDE KICKPLATE AT ALL PLACES WHERE DROP FROM ONE LEVEL TO ANOTHER EXCEEDS 4'-0" AND WHERE SHOWN ON PLANS. HAND TIGHTEN AND CENTER PUNCH BOLT TO LOCK. SPLICE TO ACCOMMODATE TEMPERATURE EXPANSION PER NOTE 5.
7. STAIR RAILS ALONG WALLS TO BE FASTENED WITH STANDARD WALL BRACKET AT 5'-0" MAXIMUM. END OF RAILS TO HAVE CLOSURES. STAIR RAILS TO BE OFFSET TO PROVIDE 3" MIN CLEARANCE FROM ALL OBSTRUCTIONS
8. ALL HANDRAILS TO BE FIXED UNLESS OTHERWISE NOTED
9. ALL JOINTS FOR HANDRAIL TO BE COPED, WELDED, AND GROUND SMOOTH
10. FOR HANDRAIL MOUNTED TO BEAM OR STAIR CHANNEL, PROVIDE MANUFACTURE'S REINFORCED CONNECTION FROM PIPE POST TO PLATE. PLATE AND REINFORCED INSERTS TO BE ALUMINUM OR STAINLESS STEEL
11. MATERIAL FOR SLIP JOINT PLATE AND KICKPLATE CHANNEL TO BE OF THE SAME MATERIAL AS THE HANDRAIL.
12. RAIL/POST TUBING SHALL BE 1-1/2 INCH OUTSIDE DIAMETER OR LARGER.

31 HANDRAIL AND HANDRAIL SUPPORT DETAILS

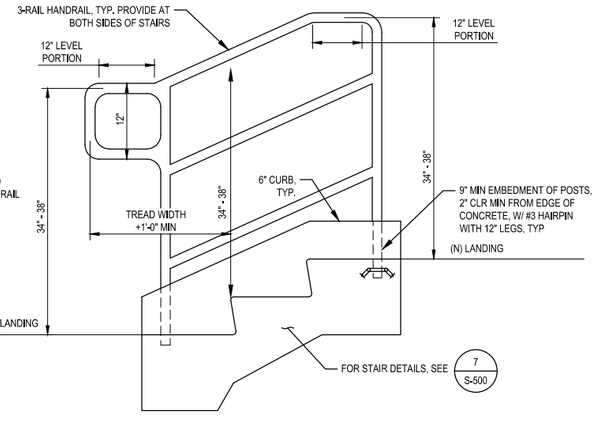
SCALE: NTS



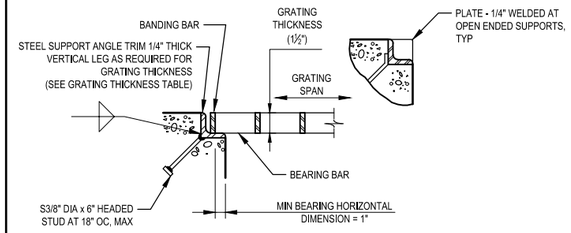


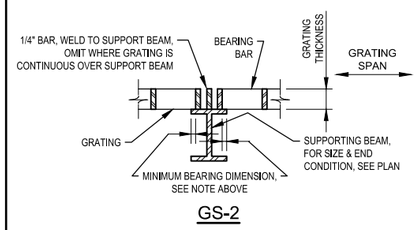
NOTE:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS AND FOR METAL TO CONCRETE INTERFACES.
2. PROVIDE BOLTED CONNECTIONS WITH NYLON LOCK NUTS FOR APPLICATIONS MOUNTED TO STEEL.

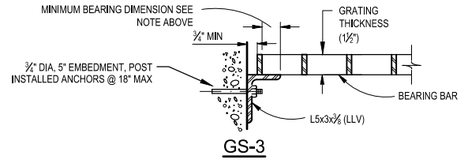
TOP MOUNTED HANDRAIL POST ANCHORAGE

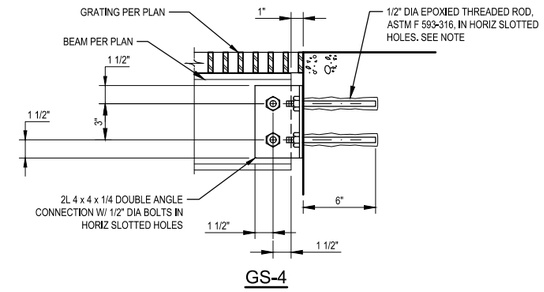


HANDRAIL AT STAIRWAY DETAILS







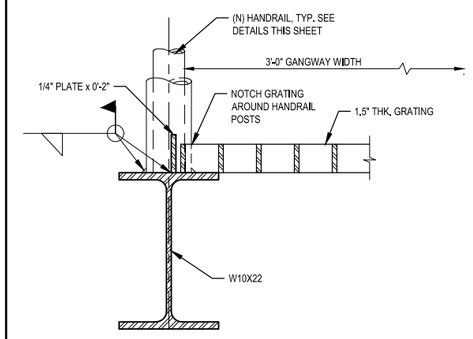


GRATING NOTES

1. EXTEND GRATING CONTINUOUSLY OVER GATE GUIDES AND GATES
2. NOTCH GRATING SUPPORTS AT GATES AS REQUIRED
3. WIDTH OF GRATING SECTIONS NOT TO EXCEED 3'-0" AND APPROXIMATELY 100 LBS. MAXIMUM.
4. SHOP DRAWINGS BASED ON FIELD DIMENSIONS ARE TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION
5. MATERIAL FOR SUPPORTS OF STEEL GRATING TO BE SAME AS GRATING EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE TO BE ASTM TYPE 316 STAINLESS STEEL
6. UNO ON PLANS, GRATING THICKNESS TO BE 1½" WITH A MAXIMUM SPAN OF 5'-0".
7. BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
8. BAND ALL EDGES WITH 3/16" x DEPTH OF BEARING BARS
9. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED
10. TYPE OF MATERIAL USED TO BE AS SPECIFIED IN THE SPECIFICATIONS. THIS STANDARD DETAIL INCLUDES 3 TYPES, ALTHOUGH ALL 3 MAY NOT BE INCLUDED IN PROJECT
11. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS NOT TO BE LESS THAN ¼" NOR GREATER THAN ½"
12. ALL GRATING SECTIONS, WHEN IN PLACE TO BE FIRMLY ANCHORED TO THEIR SUPPORTS
13. SEE CONCRETE SPECIFICATIONS FOR POST INSTALLED ANCHORS.

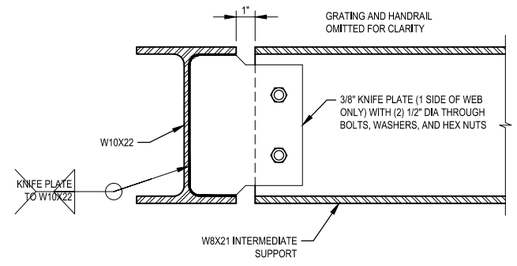
32 GRATING AND GRATING SUPPORT DETAILS

SCALE: NTS



33 GANGWAY GRATING DETAIL

SCALE: 3" = 1'-0"



34 GANGWAY W - W CONNECTION

SCALE: 3" = 1'-0"

100% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet (0 — 1")

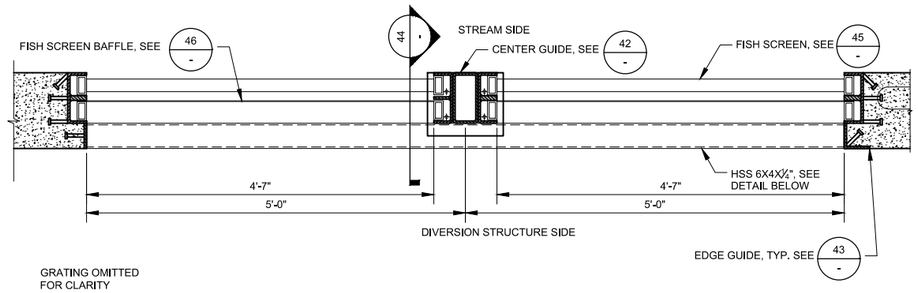
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. DAVIS	Designer	S.GOULD
Drafting Check	S. PEACOCK	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

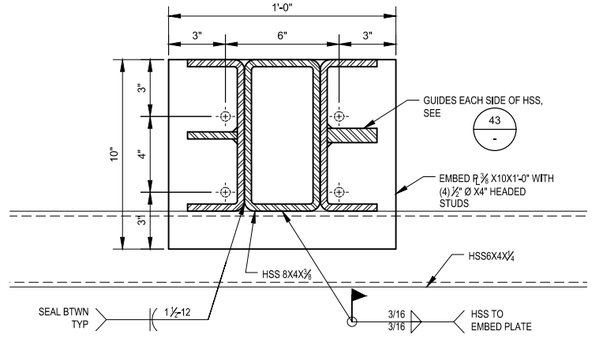
Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK HANDRAIL & GRATING DETAILS
Project No. 11125168
Original Size ANSI D
Drawing S-503
Sheet 42 of 49

Plot Date: 1 August 2018 - 2:38 PM
Plotted By: Brendan Byrd
Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-503_StructHandrail\Grtg.dwg



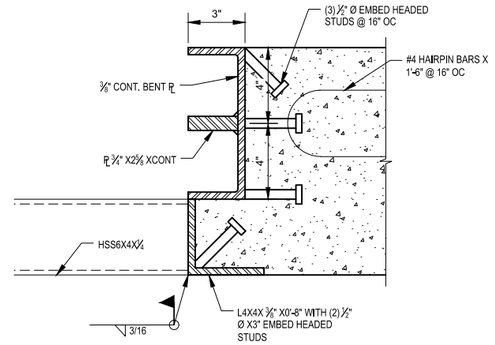
41 FISH SCREEN & BAFFLE DETAIL - PLAN VIEW

SCALE: 1" = 1'-0"



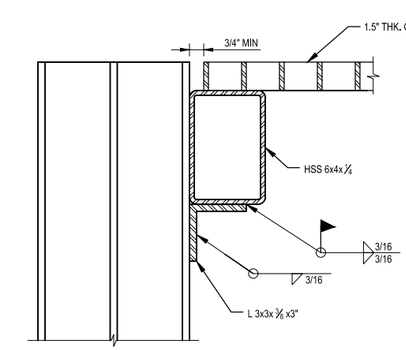
42 FISH SCREEN CENTER EMBED GUIDE DETAIL

SCALE: 3" = 1'-0"



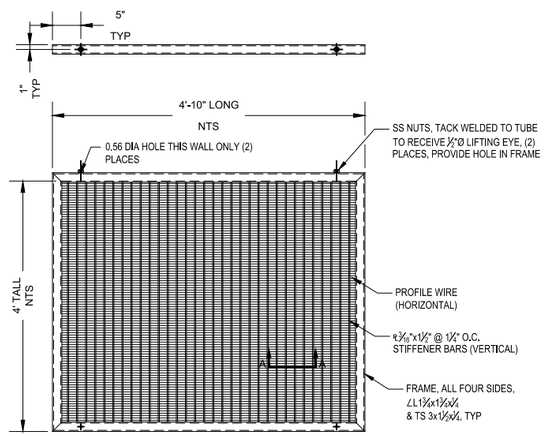
43 FISH SCREEN EDGE EMBED GUIDE DETAIL

SCALE: 3" = 1'-0"



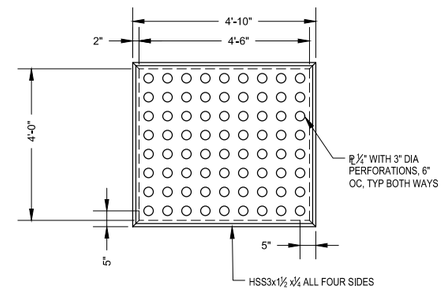
44 FISH SCREEN SECTION DETAIL

SCALE: 3" = 1'-0"



45 FISH SCREEN DETAIL

SCALE: NTS



46 FISH SCREEN BAFFLE PLATE DETAIL

SCALE: NTS

100% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet (0 — 1")

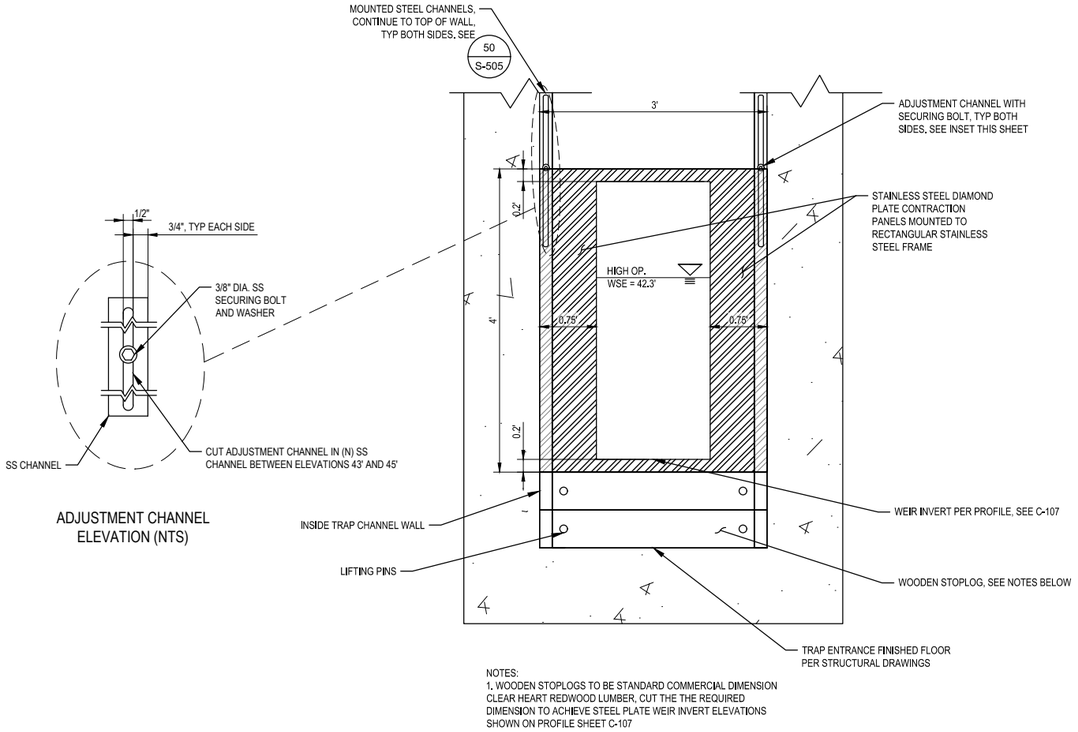
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	S. GOULD	Designer	S. GOULD
Drafting Check	S. PEACOCK	Design Check	B. CROWELL
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK DIVERSION SCREEN DETAILS
Project No. 11125168
Original Size ANSI D
Drawing S-504
Sheet 43 of 49

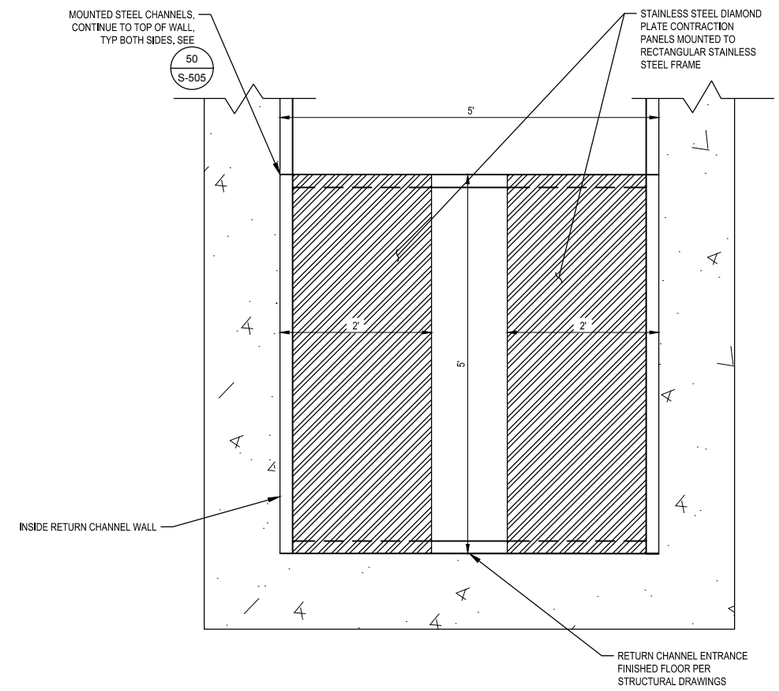
Plot Date: 1 August 2018 - 2:39 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-504_FishScreenDetails.dwg



NOTES:
1. WOODEN STOPLOGS TO BE STANDARD COMMERCIAL DIMENSION CLEAR HEART REDWOOD LUMBER, CUT THE THE REQUIRED DIMENSION TO ACHIEVE STEEL PLATE WEIR INVERT ELEVATIONS SHOWN ON PROFILE SHEET C-107

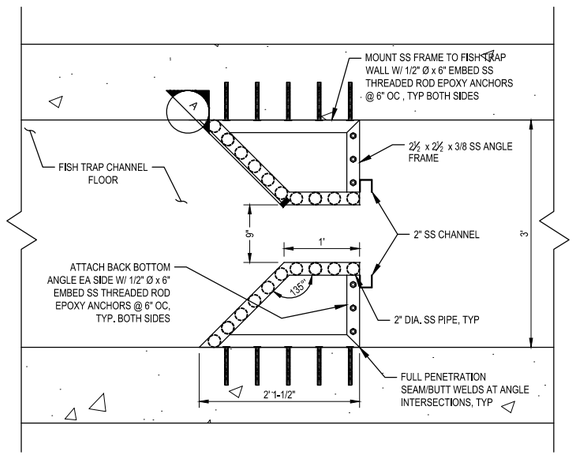
47 TYPICAL TRAP ENTRANCE WEIR

SCALE: 1" = 1'-0"



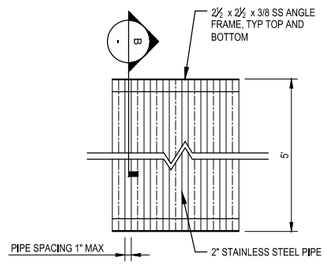
48 TYPICAL RETURN CHANNEL WEIR

SCALE: 1" = 1'-0"

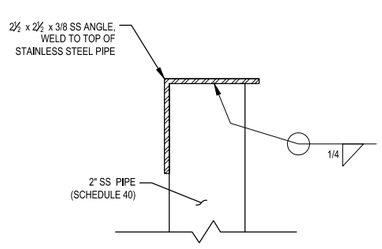


49 FISH TRAP

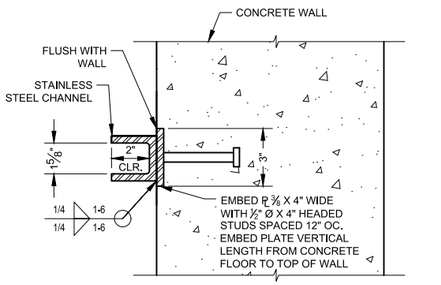
SCALE: NOT TO SCALE



A FISH TRAP ELEVATION

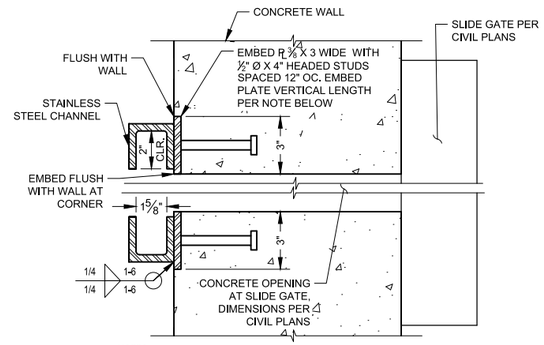


B FISH TRAP FRAME DETAIL



NOTES:
1. CHANNELS TO EXTEND FROM CONCRETE FLOOR ELEVATION TO TO OF WALL.
2. DETAIL TYPICAL FOR WEIR PLATE INSTALLATIONS, DETAILS 47 & 48 THIS SHEET.

WEIR PLATE EMBEDS



NOTES:
1. CHANNEL AND EMBED DETAIL AND DIMENSIONS TYPICAL EACH SIDE OF SLIDE GATE CONCRETE OPENING.
2. CHANNELS TO EXTEND FROM CONCRETE FLOOR/CHANNEL ELEVATION TO TO OF WALL.
3. DETAIL TYPICAL FOR SLIDE GATES WITH STOP LOGS, SEE GATE SCHEDULE C-501.

SLIDE GATE STOPLOG EMDEDS

50 CHANNEL MOUNTING AND EMBED DETAIL

SCALE: NOT TO SCALE

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — BRIAN L. CROWELL — No. 83079 — STRUCTURAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	B. BYRD	Designer	PTJ/JS/BB/BC
Drafting Check	JS/BC	Design Check	JS/BC
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

This document shall not be used for construction unless signed and sealed for construction.

Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY CREEK
MISC METAL FABRICATION DETAILS
Project No. 11125168
Original Size ANSI D
Drawing S-505
Sheet 44 of 49

Plot Date: 1 August 2018 - 2:39 PM Plotted By: Brendan Byrd Filename: \\ghdnet\ghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_S-504_FishScreenDetails.dwg

ABBREVIATIONS

(D)	DEMOLISH
(E)	EXISTING
(F)	FUTURE
(N)	NEW
A	AMPERES
AC	ALTERNATING CURRENT
AF	AMP FRAME
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AIC	AMPS INTERRUPTING CAPACITY
ANN	ANNUNCIATOR
ATS	AUTOMATIC TRANSFER SWITCH
AWG	AMERICAN WIRE GAUGE
BAT	BATTERY
BFG	BELOW FINISH GRADE
CATV	CABLE TELEVISION
C	CONDUIT
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CO	CONDUIT ONLY
CPT	CONTROL POWER TRANSFORMER
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
EF	EXHAUST FAN
EGU	ENGINE GENERATOR UNIT
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FC	FOOT CANDLE
FU	FUSE
GND	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GFI	GROUND FAULT INTERRUPTER
GFR	GROUND FAULT RELAY
HID	HIGH INTENSITY DISCHARGE
HOA	"HAND-OFF-AUTO" SWITCH
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HVAC	HEATING, VENTILATION & AIR-CONDITIONING
IG	ISOLATED GROUND
JB	JUNCTION BOX
KAIC	KILO-AMPS INTERRUPTING CAPACITY
KV	KILOVOLT
KVA	KILOVOLT-AMP
KW	KILOWATT
KWH	KILOWATT-HOUR
LPS	LOW PRESSURE SODIUM
LV	LOW VOLTAGE
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR	MANUFACTURER
MH	METAL HALIDE
MLO	MAIN LUGS ONLY
MV	MEDIUM VOLTAGE
NF	NON-FUSED
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
NTS	NOT TO SCALE
OC	ON CENTER
PA	PUBLIC ADDRESS
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
PB	PULL BOX, ELECTRICAL
RECPT	RECEPTACLE, OUTLET
RGS	RIGID GALVANIZED STEEL (CONDUIT)
RVSS	REDUCED VOLTAGE SOFT START
RTU	REMOTE TERMINAL UNIT
TV	TELEVISION MONITOR (SET)
TVSS	TRANS. VOLT. SURGE SUPPRESSOR
UF	UNDER FLOOR
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT-AMP
VFD	VARIABLE FREQUENCY DRIVE
WP	WEATHERPROOF
WPI	WEATHERPROOF IN USE
XFMR	TRANSFORMER

ELECTRICAL SYMBOLS LEGEND

DIAGRAM

- ALARM, INDICATING LIGHT, SIGNAL LIGHT OR STROBE
- AT / AF — CIRCUIT BREAKER - SIZE AND TYPE AS INDICATED
- XXX/X / NEMA XX — CIRCUIT BREAKER IN NEMA ENCLOSURE SIZE AND TYPE AS INDICATED
- OL — THERMAL OVERLOAD RELAY
- XXX/X / SIZE / OL — COMBINATION MOTOR CONTROLLER, STARTER, CIRCUIT BREAKER TYPE
- SHUNT TRIP
- DRAW-OUT TYPE CONNECTION
- DISCONNECT SWITCH WITH FUSE
- FUSE - SIZE AS INDICATED
- INTERLOCK, ELECTRICAL
- M — METER, ELECTRICAL
- M — MOTOR - SIZE AS INDICATED
- TRANSFER SWITCH, ATS: AUTOMATIC, MTS: MANUAL
- G — GENERATOR UNIT - RATED AS INDICATED
- TRANSFORMER, PAD MOUNT
- TRANSFORMER, DRY TYPE
- POTENTIAL TRANSFORMER WITH FUSE
- CURRENT TRANSFORMER
- SURGE ARRESTOR - LIGHTING
- GROUNDING ELECTRODE OR CONNECTION

SWITCHING

- CS1 — OCCUPANCY SENSOR, CEILING MOUNTED, LINE VOLTAGE

POWER

- +48" — DUPLEX RECEPTACLE, 20A 125V 2P 3W, GROUNDING TYPE, MOUNTING HEIGHT: +18" AFF UON
  - DENOTES HEIGHT IN INCHES AFF (INTERIOR) AFG (EXTERIOR)
- DUPLEX RECEPTACLE - SPLIT WIRED, SWITCHED
- DUPLEX RECEPTACLE - EMERGENCY POWER
- C — DUPLEX RECEPTACLE - CEILING MOUNTED
- FLOOR RECEPTACLE, 20A 125V 2P 3W, GROUNDING TYPE, FLUSH TYPE UON
- DOUBLE DUPLEX RECEPTACLE, 20A 125V 2P 3W, GROUNDING TYPE, MOUNTING HEIGHT: +18" AFF UON
- SINGLE RECEPTACLE, 20A 125V 2P 3W, GROUNDING TYPE, MOUNTING HEIGHT: +18" AFF UON
- OR — SPECIAL PURPOSE RECEPTACLE AS DESIGNATED SEE 'SPECIAL SYMBOLS' ON EACH SHEET
- DUAL SERVICE RECESSED FLOOR BOX WITH DUPLEX AND DATA RECEPTACLES
- J OR J — JUNCTION BOX, CODE SIZED UON
- FLOOR JUNCTION BOX
- DISCONNECT SWITCH - FUSED WHERE APPLICABLE
- MOTOR STARTER, COMBINATION WITH DISCONNECT SWITCH
- MOTOR STARTER OR CONTROLLER
- M — MOTOR CONNECTION
- CEILING EXHAUST FAN
- WH OR WH — WATER HEATER
- P — POWER POLE: P=POWER, T=TELEPHONE, D=DATA, C=COMBINATION
- TEST PORT
- OR — GROUND ROD
- GUY WIRE AND ANCHOR

ANNOTATION

- 1 — KEYNOTE
- 10 — RACEWAY, FEEDER OR CIRCUIT DESIGNATION (SEE SCHEDULE)
- A / 180 — DENOTES TYPE; LIGHTING FIXTURE TYPE DESIGNATION (SEE SCHEDULE); DENOTES WATTS
- 1 / E-501 — DETAIL NUMBER; DETAIL INDICATOR; SHEET NUMBER ON WHICH DETAIL APPEARS
- A / E-301 — SECTION LETTER; SECTION INDICATOR; SHEET NUMBER ON WHICH SECTION APPEARS
- WH / 1 — MECHANICAL EQUIPMENT DESIGNATION (SEE SCHEDULE)

EQUIPMENT

- MAIN SWITCHBOARD
- DISTRIBUTION PANEL BOARD
- COMBINATION METER/MAIN SERVICE PANEL
- OR — BRANCH CIRCUIT PANEL BOARD, SURFACE OR FLUSH MOUNTED
- OR — LIGHTING CONTROL PANEL
- OR — SIGNAL TERMINAL CABINET OR CONTROL PANEL SURFACE OR FLUSH MOUNTED
- SIGNAL TERMINAL BACKBOARD
- N30 — CONCRETE UNDERGROUND HAND HOLE (NUMBER DENOTES CHRISTY SIZE)
- T OR Δ — TRANSFORMER

CONDUIT

- CONDUIT INSTALLED ABOVE GRADE
- CONDUIT INSTALLED UNDERGROUND OR UNDER SLAB
- CONDUIT STUB-OUT WITH CAP
- FLEXIBLE CONDUIT WHIP TO LIGHT FIXTURE OR EQUIPMENT
- INDICATES CIRCUIT BREAKER I.D.
- CONDUIT HOME RUN TO DESIGNATED PANEL, TERMINAL, OR CONTROL CABINET
  EXAMPLES:
  - L1-4 — INDICATES BRANCH PANEL
  - L1-6,8 — COMMA INDICATES MULTIPLE SINGLE POLE CIRCUITS
  - L1-10/12 — SLASH INDICATES MULTI-POLE CIRCUIT

NOTE FOR CONDUIT: THE TIC MARKS INDICATE THE QUANTITY OF #12 AWG WIRES OR, IF INDICATED, THE QUANTITY OF OTHER SIZE WIRE OR CABLES.

SEE THE SINGLE LINE DIAGRAM FOR FEEDER SIZES.
EXAMPLES: /// = (3) #12; // #10 = (2) #10; / F1 = (1) TYPE F1 CABLE. SEE CABLE SCHEDULE.

OBJECT LINES

- NEW OBJECTS (HEAVY CONTINUOUS LINES, UNDERGROUND CONDUIT HEAVY DASHED LINES)
- EXISTING OBJECTS TO REMAIN. MAY INCLUDE NEW CIRCUITING ETC. (FINE CONTINUOUS LINES, UNDERGROUND CONDUIT FINE DASHED LINES)
- EXISTING OBJECTS TO BE DEMOLISHED (EXTRA FINE DASHED LINES, SCREENED)

LIGHTING

- LIGHTING FIXTURE, SURFACE MOUNTED
- ADJUSTABLE SPOT OR FLOOD (ARROW INDICATES AIMING)

GENERAL ELECTRICAL NOTES

1. ALL WORK SHALL CONFORM TO AND BE PERFORMED IN ACCORDANCE WITH CODES, STANDARDS, AND ORDINANCES AS SET FORTH BY THE AUTHORITIES HAVING JURISDICTION AND THEIR LATEST ADOPTED EDITIONS OF THE FOLLOWING PUBLICATIONS:
   (A) NATIONAL ELECTRICAL CODE (NEC)
   (B) NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
   (C) AMERICANS WITH DISABILITIES ACT (ADA)
2. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN ALL EQUIPMENT IN A SAFE AND FUNCTIONAL CONDITION. KEEP DEAD FRONT EQUIPMENT IN PLACE WHILE EQUIPMENT IS ENERGIZED. CONDUCT ALL CONSTRUCTION OPERATIONS IN A SAFE MANNER FOR EMPLOYEES AS WELL AS OTHER WORK PERSONS OR ANYONE VISITING THE JOB SITE. PROVIDE BARRIERS, FLAGS, TAPE, ETC. AS REQUIRED TO MAINTAIN SAFETY.
3. INFORMATION SHOWN AS EXISTING CONDITIONS WAS PRIMARILY GAINED FROM "AS BUILT" DRAWINGS AND LIMITED FIELD INVESTIGATION. BEFORE CONSTRUCTION, VISIT SITE TO VERIFY EXISTING CONDITIONS AND MAKE ALLOWANCE FOR VARIATIONS FROM THAT SHOWN.
4. DEMOLITION WORK SHOWN WAS PREPARED FOR THE CONVENIENCE OF THE CONTRACTOR. THE ENGINEER DOES NOT REPRESENT THAT ALL ITEMS WHICH MAY REQUIRE DEMOLITION HAVE BEEN SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CAREFULLY EXAMINE THE SITE AND THE CONTRACT DOCUMENTS AND TO PERFORM ALL DEMOLITION AND RECONSTRUCTION WHICH MAY BE REQUIRED FOR THE PROPER EXECUTION AND COMPLETION OF THE WORK.
5. INTERCEPT, EXTEND, REROUTE, REPULL CONDUCTORS AND OTHERWISE MODIFY EXISTING CONDUCTORS OF ALL SYSTEMS AS REQUIRED TO MAINTAIN AND/OR ESTABLISH PROPER FUNCTION AND SATISFY DESIGN INTENT. REMOVE ALL ABANDONED CONDUCTORS AND CONDUIT.
6. PRIOR TO COMMENCING WORK, COORDINATE WITH OWNER'S REPRESENTATIVE. WHERE DISCONNECTING, MODIFYING OR WORKING ON EXISTING EQUIPMENT OR SYSTEMS, PROVIDE A WRITTEN METHOD OF PROCEDURE OUTLINING DATES, TIMES, DURATION AND DESCRIPTION OF PROPOSED WORK PRIOR TO COMMENCING WORK FOR APPROVAL.
7. PRIOR TO COMMENCING WORK, COORDINATE WITH OTHER TRADES TO PREVENT CONFLICTS.
8. ALL EQUIPMENT SHALL BE LISTED AND LABELED PER RECOGNIZED ELECTRICAL TESTING LABORATORY AND INSTALLED PER THE LISTING REQUIREMENTS AND THE MANUFACTURERS INSTRUCTIONS.
9. ALL EQUIPMENT SHALL BE GROUNDED PER THE REQUIREMENTS OF CEC ARTICLES 250. EQUIPMENT GROUNDING CONDUCTORS SHALL BE INSTALLED IN ALL POWER SYSTEM RACEWAYS.
10. PULLROPES: ANY RACEWAY WITHOUT CABLE OR WIRE SHALL BE INSTALLED WITH MINIMUM 200 POUND TEST PULL LINE.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — Kevin R. Lyons — No. E-12901 — Exp. 12/31/17 — ELECTRICAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet (0 — 1")

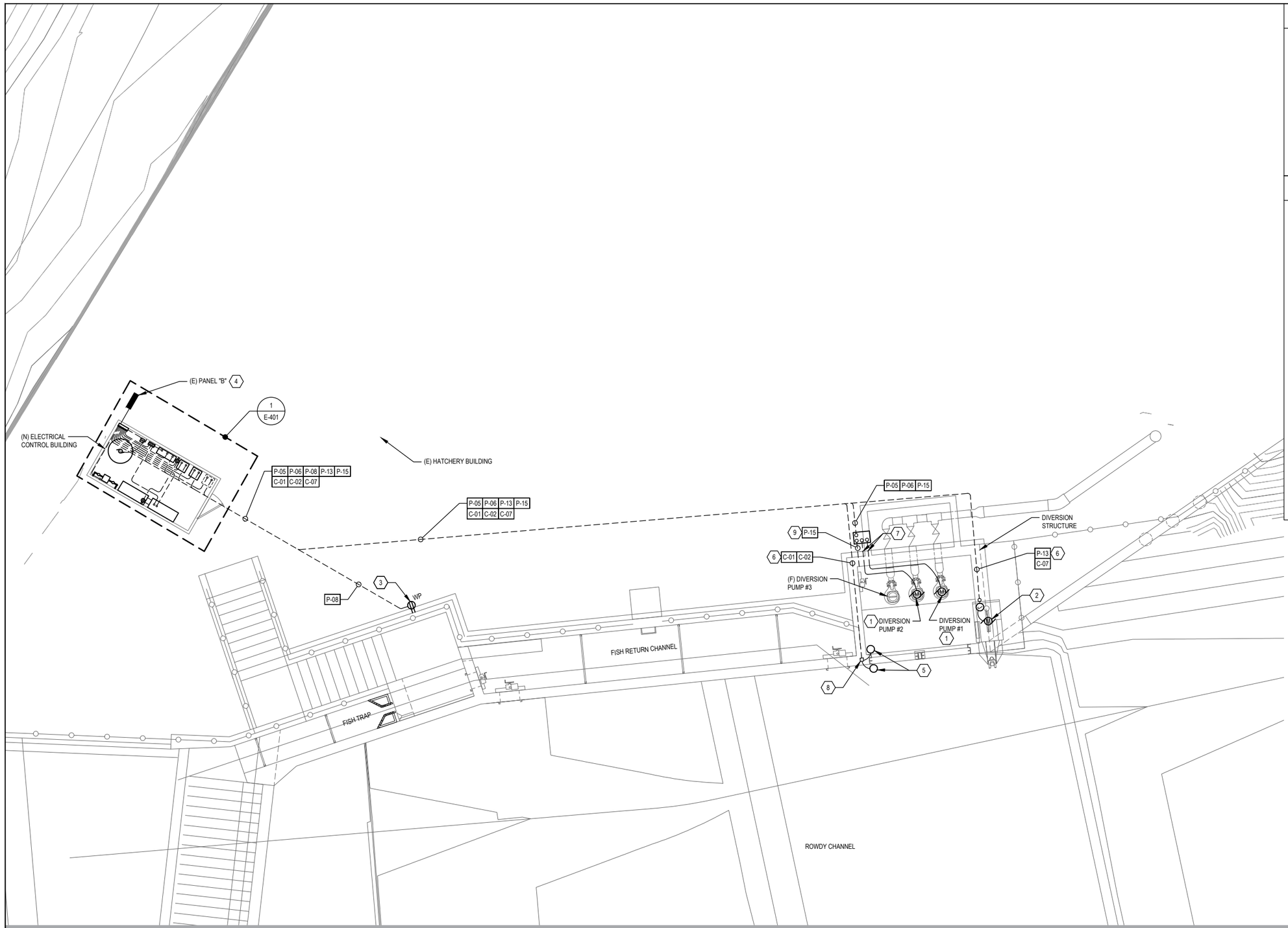
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	JJVL	Designer	RPG
Drafting Check	RPG	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK ELECTRICAL ABBREVATIONS, SYMBOLS AND NOTES
Project No. 11125168
Original Size ANSI D
Drawing E-001
Sheet 45 of 49

Plot Date: 1 August 2018 - 9:15 AM
Plotted By: Brendan Byrd
Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_E-001_ElectricalAbbrev_Symbols_Notes.dwg



SHEET GENERAL NOTES

1. SEE SINGLE-LINE DIAGRAM AND PANEL SCHEDULE FOR CIRCUITING SCHEDULES.
2. SEE CONDUIT AND CABLE SCHEDULE FOR CONDUIT AND WIRE SIZES.

SHEET KEYNOTES

1. 15 HP SUBMERSIBLE DIVERSION PUMP.
2. HYDRAULIC BRUSH SCREEN CLEANER.
3. SUMP PUMP RECEPTACLE.
4. REMOVE (E) PANEL. PROVIDE (N) PER PANEL SCHEDULE. SEE DETAIL 3/E-501 FOR VARIOUS EQUIPMENT DEMOLITION.
5. LEVEL TRANSDUCER. REFER TO DETAIL 5/E-501 FOR LEVEL TRANSDUCER MOUNTING.
6. ROUTE CONDUIT IN WALL IN BETWEEN REBAR. SECURE CONDUIT TO REBAR.
7. PENETRATE WALL WITH CONDUIT. REFER TO DETAIL 1/E-501 FOR CONDUIT PENETRATION.
8. PROVIDE 4" x 4" FD BOX FOR SUBMERSIBLE LEVEL TRANSDUCER CABLE. STUB UP CONDUIT INTO BOTTOM OF PULLBOX. ROUTE CABLES OUT SIDE OF PULLBOX TO LEVEL TRANSDUCER. REFER TO DETAIL 5/E-501 FOR SUBMERSIBLE LEVEL TRANSDUCER MOUNTING.
9. PROVIDE SPARE CONDUIT FOR FUTURE DIVERSION PUMP. CAP ENDS TO PREVENT ENTRANCE OF DIRT AND WATER.

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — Ryan P. Gaydos — No. E-19825 — Exp. 12/31/17 — ELECTRICAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

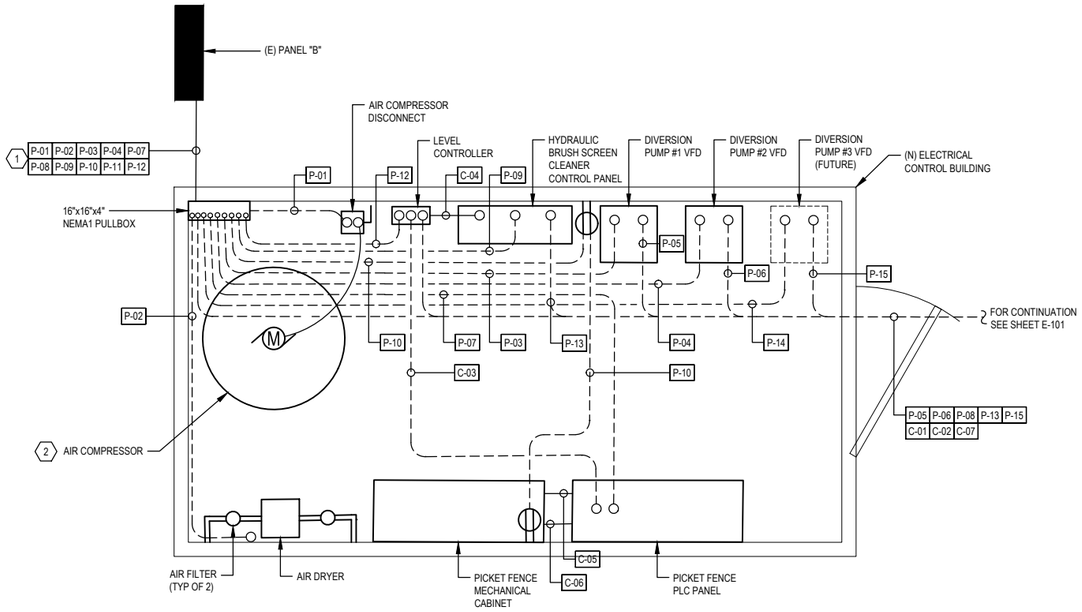
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

This document shall not be used for construction unless signed and sealed for construction.

Drawn	JJVL	Designer	RPG
Drafting Check	RPG	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
		Scale	AS SHOWN

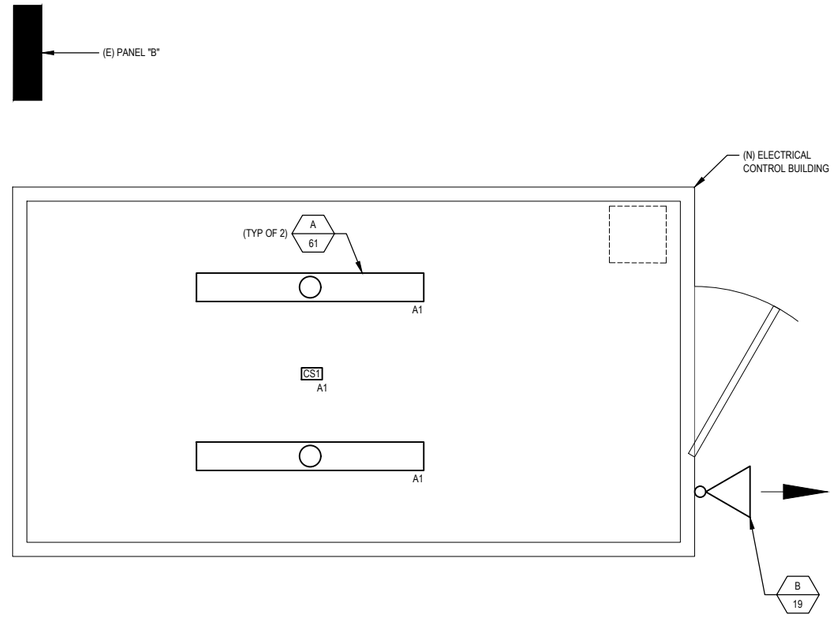
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINIE CREEK ELECTRICAL SITE PLAN
Project No. 11125168
Original Size ANSI D
Drawing E-101
Sheet 46 of 49

Plot Date: 1 August 2018 - 9:16 AM Plotted By: Brendan Byrd
Filename: \\ghdnetghd\US\Eureka\Projects\11\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_E-101_Electrical Site Plan.dwg



1 ELECTRICAL CONTROL BUILDING - POWER PLAN

3/4"=1'-0"



2 ELECTRICAL CONTROL BUILDING - LIGHTING PLAN

3/4"=1'-0"

LIGHTING FIXTURE SCHEDULE

TAG	FIXTURE DESCRIPTION	MANUFACTURER	MODEL	LAMP	FIXTURE INPUT WATTS	MOUNTING	NOTES
A	SURFACE MOUNT LED LUMINAIRE, SUITABLE FOR WET, DAMP AND/OR COLD LOCATIONS. 4100K COLOR TEMPERATURE. 60,000 HOUR L80 LIFE.	HOLOPHANE	EMS4 LED 4L IMACD DIM	LED	61	CEILING	USE MOUNTING BRACKET TO ACCOMMODATE CEILING RIBS
B	TRADITIONAL WALL PACK DESIGN WITH HIGH-OUTPUT LEDS WITH PHOTOCELL. FOR OUTDOOR APPLICATIONS. 100,000 HOUR L95 LIFE.	LITHONIA	TWS LED 1 50K 120	LED	19	WALL	WITH WATTSTOPPER EW-200-120-G MOTION SENSOR

SHEET GENERAL NOTES

1. SEE SINGLE-LINE DIAGRAM AND PANEL SCHEDULE FOR CIRCUITING SCHEDULES.
2. SEE CONDUIT AND CABLE SCHEDULE FOR CONDUIT AND WIRE SIZES.

SHEET KEYNOTES

1. PROVIDE (1) 2-INCH LIQUID-TIGHT FLEXIBLE METAL CONDUIT TO ROUTE CIRCUITS BETWEEN (E) PANEL B AND CONTROL BUILDING PULLBOX.
2. MAKE FINAL CONNECTION TO AIR COMPRESSOR WITH LIQUID-TIGHT FLEXIBLE METAL CONDUIT (4-FT MAXIMUM LENGTH).

N

0 1' 2' 3'

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — Ryan P. Gyllenskog — No. E-19000 — Exp. 12/31/17 — ELECTRICAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

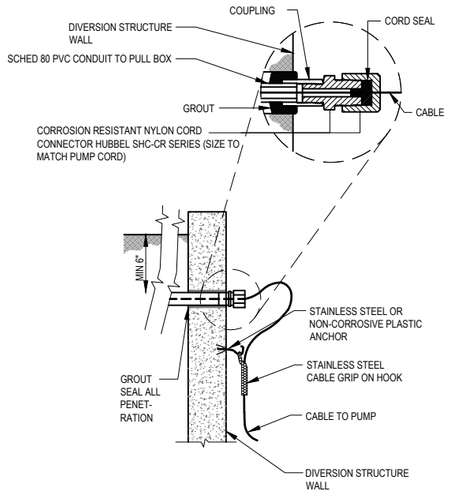
GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 F 1 707 444 8330 W www.ghd.com

Drawn	TVR	Designer	RPG
Drafting Check	JJVL	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

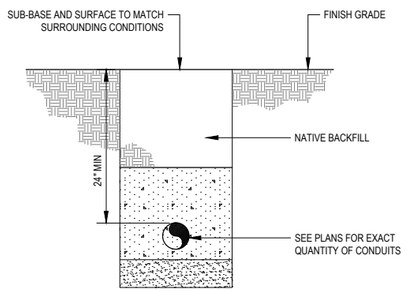
Client TOLOWA DEE-NI' NATION
Project DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title ROWDY & DOMINE CREEK ENLARGED ELECTRICAL CONTROL BUILDING
Project No. 11125168

Original Size ANSI D | Drawing E-401 | Sheet 47 of 49

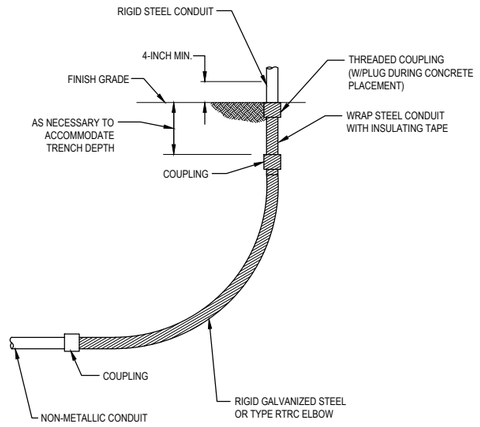
Plot Date: 1 August 2018 - 9:16 AM Plotted By: Brendan Byrd
Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_E-401_Electrical Building Plan.dwg



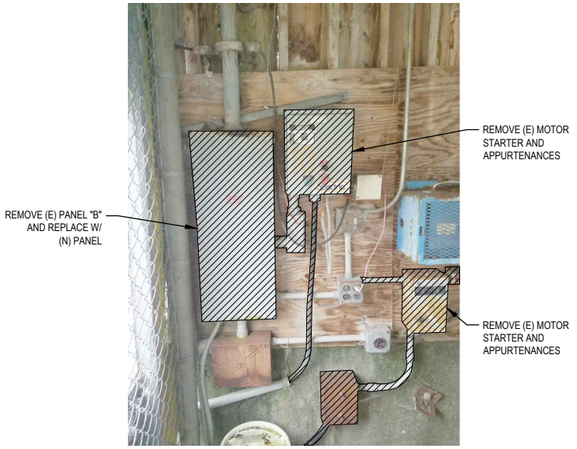
1 DIVERSION STRUCTURE CONDUIT PENETRATION NOT TO SCALE



2 TYPICAL TRENCH NOT TO SCALE

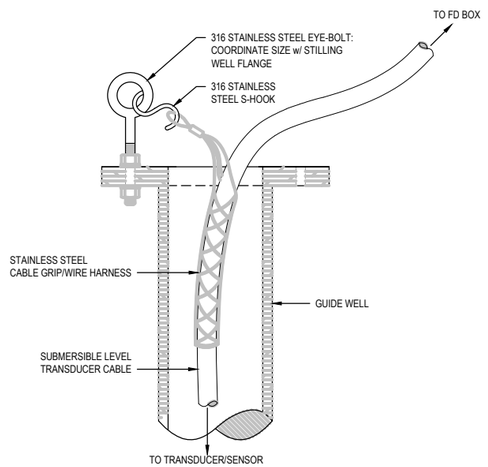


3 TYPICAL CONDUIT STUB-UP NOT TO SCALE



NOTE:
MISCELLANEOUS DEVICES AND APPURTENANCES SHALL REMAIN, UNLESS OTHERWISE NOTED.

4 EQUIPMENT DEMOLITION NOT TO SCALE



NOTES:

1. COORDINATE FINAL DEPTH OF SUBMERSIBLE TRANSDUCER/SENSOR AND BOTTOM OF THE STILLING WELL WITH ACTUAL CONDITIONS.

5 SUBMERSIBLE LEVEL TRANSDUCER MOUNTING NOT TO SCALE

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — Richard P. Guggisberg — No. E-18620 — Exp. 12/31/17 — ELECTRICAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 1"

Reuse of Documents
This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	JJVL	Designer	RPG
Drafting Check	RPG	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client **TOLOWA DEE-NI' NATION**
Project **DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT**
Title **ROWDY & DOMINIE CREEK ELECTRICAL DETAILS**
Project No. **11125168**
Original Size **ANSI D**
Drawing **E-501**
Sheet **48** of **49**

Plot Date: 1 August 2018 - 9:16 AM Plotted By: Brendan Byrd Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_E-501_Electrical Details.dwg

PANEL SCHEDULE

PANEL NAME: **B** | VOLTAGE: 240/120 | NEMA RATING: 1 | MOUNTING: SURFACE | NOTES: REPLACES EXISTING PANEL
MAINS RATING: 200 A MCB | PHASE: 3 | AIC RATING: 10000 | LOCATION: UTILITY CONTROL BLDG
BUS RATING: 225 A | WIRE: 4 | DEMAND FACTOR: STD

CKT NO.	USE	DESCRIPTION	BKR SIZE	CKT KVA	CKT AMPS	WIRE SIZE	WIRE LENGTH (FT)	VOLTAGE DROP %	PHASE	VOLTAGE DROP %	WIRE LENGTH (FT)	WIRE SIZE	CKT AMPS	CKT KVA	BKR SIZE	DESCRIPTION	USE	CKT NO.
1	M	10 HP AIR COMPRESSOR	50/3	3.36	28.00	6	20	0.18	A	1.08	75	12	5.00	0.60	20/1	PORTABLE PUMP RECEPTACLE	M	2
3	M		50/3	3.36	28.00	6	20	0.18	B	0.94	75	6	38.42	4.61	50/3	HYDRAULIC BRUSH SCREEN CLEANER	M	4
5	M		50/3	3.36	28.00	6	20	0.18	C	0.94	75	6	38.42	4.61	50/3		M	6
7	M	15 HP DIVERSION PUMP #1	50/3	4.56	38.00	6	90	1.11	A	0.94	75	6	38.42	4.61	50/3		M	8
9	M		50/3	4.56	38.00	6	90	1.11	B	1.30	60	12	7.50	0.90	20/1	(E) FISH FEEDER	O	10
11	M		50/3	4.56	38.00	6	90	1.11	C	1.81	60	12	20.83	2.50	30/2	(E) WELDER RECEPTACLE	O	12
13	L	(E) LIGHTING	20/1	0.50	4.17	12	2	0.02	A	1.81	60	12	20.83	2.50	30/2		O	14
15	M	15 HP DIVERSION PUMP #2	50/3	4.56	38.00	6	90	1.11	B	0.43	20	12	7.50	0.90	20/1	(UNKNOWN)	O	16
17	M		50/3	4.56	38.00	6	90	1.11	C	0.23	20	12	4.00	0.48	20/1	PICKET FENCE CONTROLS	O	18
19	M		50/3	4.56	38.00	6	90	1.11	A	0.09	30	12	1.00	0.12	20/1	AIR DRYER & DRAIN VALVES	O	20
21	O	LEVEL CONTROLLER	20/1	0.12	1.00	12	20	0.06	B						50/3		M	22
23	R	CONTROL BUILDING RECEPTACLE	20/1	0.36	3.00	12	30	0.25	C						50/3	DIVERSION PUMP #3 (FUTURE)	M	24
25	L	CONTROL BUILDING LIGHTING	20/1	0.12	1.00	12	40	0.11	A						50/3		M	26
27		SPARE	20/1						B						20/1	SPARE		28
29		SPARE	20/1						C						20/1	SPARE		30

CONNECTED KVA		DEMAND KVA	DEMAND AMPS
PHASE A:	20.9	22.2	185.3
PHASE B:	19.0	20.2	168.0
PHASE C:	20.4	21.6	179.9

STD DEMAND LOAD BASED ON 125% OF THE LARGEST MOTOR AND 100% OF THE REMAINING MOTORS, 125% OF CONTINUOUS LOADS, 100% OF NONCONTINUOUS LOADS, AND 50% OF RECEPTACLE LOADS BEYOND THE FIRST 10KVA

USE LEGEND

ID	LOAD TYPE	ASSUMED PF
H	HVAC	0.85
L	LIGHTING	0.80
M	MOTOR	0.85
R	RECEPTACLE	0.80
P	PANEL	0.85
O	OTHER	0.85

VOLTAGE DROP CALCULATION

VOLTAGE DROP IS BASED ON THE IEEE RED BOOK AND 2011 NEC CHAPTER 9 TABLE 9 FORMULA:

VD = I * (R * PF + X * SIN(ACOS(PF)) * L
WITH AN ADDITIONAL MULTIPLIER OF 2 FOR SINGLE PHASE AND 1.732 FOR 3-PHASE LOADS

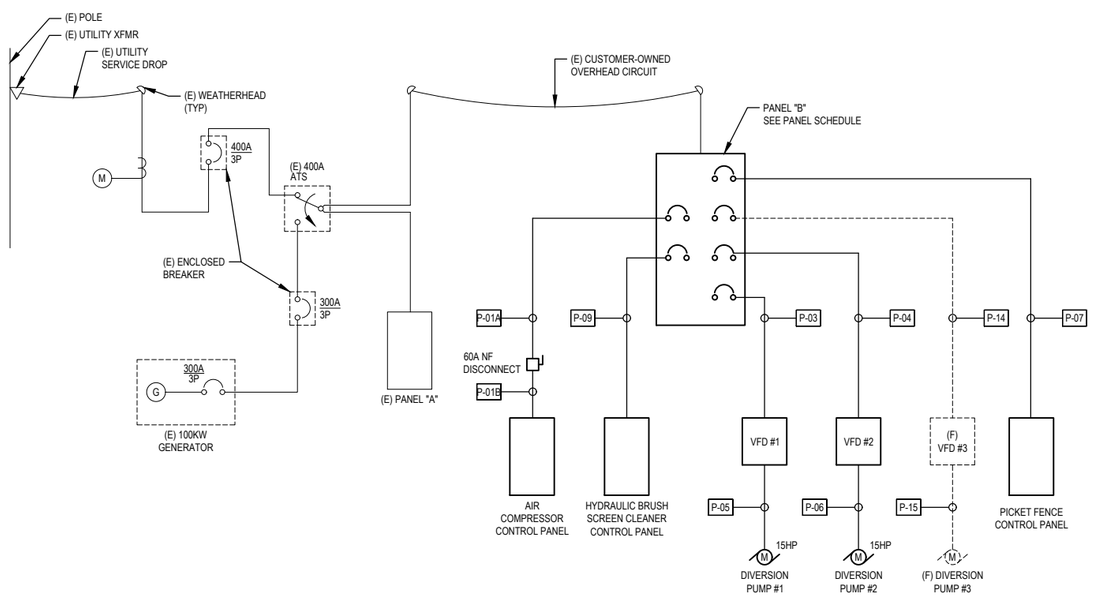
R AND X VALUES ARE TAKEN FROM 2011 NEC CHAPTER 9 TABLE 9.

ASSUMPTIONS:

POWER FACTOR	VARIES BY LOAD TYPE
CONDUIT TYPE	RGS
WIRE MATERIAL	CU

CONDUIT AND CABLE SCHEDULE

CKT #	DESCRIPTION	FROM	TO	CONDUIT SIZE	CABLE SIZE
P-01A	240V BRANCH CIRCUIT	PANEL B	AIR COMPRESSOR DISCONNECT	1-1/4"	3- #6 AWG, 1- #10 GND
P-01B	240V BRANCH CIRCUIT	AIR COMPRESSOR DISCONNECT	AIR COMPRESSOR	1-1/4"	3- #6 AWG, 1- #10 GND
P-02	120V BRANCH CIRCUIT	PANEL B	AIR DRYER	3/4"	2- #12 AWG, 1-#12 GND
P-03	240V BRANCH CIRCUIT	PANEL B	DIVERSION PUMP #1 VFD	1-1/4"	3- #6 AWG, 1- #10 GND
P-04	240V BRANCH CIRCUIT	PANEL B	DIVERSION PUMP #2 VFD	1-1/4"	3- #6 AWG, 1- #10 GND
P-05	240V MOTOR FEEDER	DIVERSION PUMP #1 VFD	DIVERSION PUMP #1	1-1/4"	1- #6 AWG SHIELDED POWER CABLE
P-06	240V MOTOR FEEDER	DIVERSION PUMP #2 VFD	DIVERSION PUMP #2	1-1/4"	1- #6 AWG SHIELDED POWER CABLE
P-07	120V BRANCH CIRCUIT	PANEL B	PICKET FENCE PLC PANEL	3/4"	2- #12 AWG, 1-#12 GND
P-08	120V BRANCH CIRCUIT	PANEL B	PORTABLE PUMP RECEPTACLE	3/4"	2- #12 AWG, 1-#12 GND
P-09	240V BRANCH CIRCUIT	PANEL B	HYDRAULIC BRUSH SCREEN CLEANER CONTROL PANEL	1"	3- #6 AWG, 1- #10 GND
P-10	120V BRANCH CIRCUIT	PANEL B	CONTROL BUILDING RECEPTACLES	3/4"	2- #12 AWG, 1-#12 GND
P-11	120V BRANCH CIRCUIT	PANEL B	CONTROL BUILDING LIGHTING	3/4"	2- #12 AWG, 1-#12 GND
P-12	120V BRANCH CIRCUIT	PANEL B	LEVEL CONTROLLER	3/4"	2- #12 AWG, 1-#12 GND
P-13	240V BRANCH CIRCUIT	HYDRAULIC BRUSH SCREEN CLEANER CONTROL PANEL	HYDRAULIC BRUSH SCREEN CLEANER	1"	3- #12 AWG, 1-#12 GND
P-14	240V BRANCH CIRCUIT	PANEL B	DIVERSION PUMP #3 VFD (FUTURE)	1-1/4"	PULL STRING ONLY
P-15	240V MOTOR FEEDER	DIVERSION PUMP #3 VFD (FUTURE)	DIVERSION PUMP #3 (FUTURE)	1-1/4"	PULL STRING ONLY
C-01	WET WELL LEVEL	LEVEL CONTROLLER	TRANSDUCER #1	1"	MANUFACTURER'S COAXIAL CABLE
C-02	CREEK LEVEL SIGNAL	LEVEL CONTROLLER	TRANSDUCER #2		MANUFACTURER'S COAXIAL CABLE
C-03	CREEK LEVEL SIGNAL	LEVEL CONTROLLER	PICKET FENCE PLC PANEL	3/4"	1- #16 TSP INSTRUMENTATION CABLE
C-04	SCREEN CLEANER RUN SIGNAL	LEVEL CONTROLLER	HYDRAULIC BRUSH SCREEN CLEANER CONTROL PANEL	3/4"	(2) #14 AWG
C-05	PRESSURE SIGNALS	PICKET FENCE MECHANICAL PANEL	PICKET FENCE PLC PANEL	1"	2- #16 TSP INSTRUMENTATION CABLE
C-06	CONTROL SIGNALS	PICKET FENCE MECHANICAL PANEL	PICKET FENCE PLC PANEL	1-1/4"	(10) #14 AWG
C-07	CONTROL AND STATUS SIGNALS	HYDRAULIC BRUSH SCREEN CLEANER CONTROL PANEL	HYDRAULIC BRUSH SCREEN CLEANER	2"	(3) #8 AWG, (22) #12 AWG



1 **SINGLE-LINE DIAGRAM**
SCALE: NTS

100% DESIGN

No.	Issue	Drawn	Approved	Date

REGISTERED PROFESSIONAL ENGINEER — Kevin R. Engstrom — No. E 19600 — Exp. 12/31/17 — ELECTRICAL — STATE OF CALIFORNIA

Bar is one inch on original size sheet
0 — 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822 -2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	###	Designer	RPG
Drafting Check	RPG	Design Check	J. SVEHLA
Project Manager	J. SVEHLA	Date	AUGUST 2018
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client: TOLOWA DEE-NI' NATION
Project: DOMINIE & ROWDY CREEK FISH PASSAGE IMP. PROJECT
Title: ROWDY & DOMINIE CREEK
SINGLE LINE DIAGRAM & PANEL SCHEDULE
Project No. 11125168
Original Size: ANSI D
Drawing: E-601
Sheet 49 of 49

Plot Date: 1 August 2018 - 9:16 AM | Plotted By: Brendan Byrd | Filename: \\ghdnetghd\US\Eureka\Projects\111\11125168 tolowa fish passage design\06-CAD\Sheets\11125168_E-601_Electrical SLD_Schedules.dwg

Appendix C Basis of Design Report

Dominie and Rowdy Creek Fish Passage Improvement Project

Final Basis of Design Report

August 2018

Prepared for: Tolowa Dee-ni' Nation

Prepared by:

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD | 718 Third Street Eureka California 95501 United States

11125168| 60 | August 2018

Dominie and Rowdy Creek
Fish Passage Improvement Project

Final Basis of Design Report

Prepared for:

Tolowa Dee-ni'-Nation

Prepared by:

P. Travis James P.E.
Senior Project Engineer
License No. C76663
Michael Love & Associates, Inc.
ptjames@h2odesigns.com • (707) 826-2411 x5

Steven Pearl
Engineering Staff
Michael Love & Associates, Inc.
pearl@h2odesigns.com • (707) 826-2411 x6

Jeremy Svehla P.E.
Project Manager
License No. C72169
GHD, Inc.
jeremy.svehla@ghd.com • (707) 443-8326

Brendan Byrd
Project Engineer
GHD, Inc.
brendan.byrd@ghd.com • (707) 443-8326

Brian Crowell S.E.
Structural Engineer
License No. S5216
GHD, Inc.
brian.crowell@ghd.com • (707) 443-8326

August 2018

Table of Contents

1. Introduction 1
2. Project Goals and Objectives 3
2.1 Project Goal 3
2.2 Project Objectives 3
3. Background 4
3.1 Previous Work, Concurrent Work, and Relevant Studies 4
3.1.1 Feasibility Study 4
3.1.2 Caltrans Dominie Creek Crossing at Highway 101 4
3.1.3 Fish Monitoring Studies 4
3.1.4 Hatchery Management Plan 5
3.1.5 Rowdy Creek Erosion Report 6
3.1.6 Rowdy Creek Fish Hatchery Infrastructure and Operations Report 6
4. Preliminary Investigations 6
4.1 Topographic Survey 6
4.2 Geomorphic Assessment 7
4.3 Geotechnical Analysis 7
4.4 Structural Analysis 7
5. Hydrology 8
5.1 Peak Flows 8
5.2 Fish Passage Design Flows 9
6. CDFW and NMFS Fish Passage Design Guidelines for California 12
7. Analysis Methodologies 14
7.1 Flood Hydraulic Analysis Methodology 14
7.1.1 Existing Flood Mapping 14
7.1.2 Duplicate Effective Model and Existing Conditions Model 14
7.1.3 Proposed Conditions Model 16
7.2 Fish Passage Hydraulic Analysis Methodology 16
7.2.1 Rowdy Creek 16
7.2.2 Dominie Creek 17
7.2.3 Hydraulic Roughness at Fish Passage Flows 17
7.3 Picket Fence Hydraulic Analysis Methodology 17
7.4 Roughened Channel Engineered Streambed Material Gradation Sizing 18
8. Existing Site Description 19
8.1 Rowdy Creek 19
8.1.1 Infrastructure 19
8.1.2 Geomorphology 22
8.2 Dominie Creek 23
8.2.1 Infrastructure 23
8.2.2 Geomorphology 26
8.3 Other Infrastructure 28
8.4 Existing Geotechnical Conditions 28
8.5 Existing Flood Conditions 28
8.5.1 Rowdy Creek 28
8.5.2 Dominie Creek 29
8.6 Existing Fish Passage Conditions 30
8.6.1 Rowdy Creek 30
8.6.2 Dominie Creek 33
9. Proposed Project- Rowdy Creek Components 34
9.1 Description 34
9.1.1 Demolition 34
9.1.2 Roughened Channel 34
9.1.3 Picket Fence 40

9.1.4 Fish Trap 41
9.1.5 Diversion Facility 46
9.1.6 Electrical Control Building 48
9.1.7 Fish Monitoring 49
9.2 Anticipated Geomorphic Response 49
9.3 Anticipated Fish Passage Performance 49
9.4 Anticipated Flood Impacts 52
9.5 Structural and Foundation Elements 53
9.6 Constructability Considerations 54
9.6.1 Water Management 54
9.6.2 Site Access 54
9.6.3 Rock Sourcing 55
9.6.4 Bedrock 55
9.6.5 Demolition of Existing Concrete 55
9.7 Anticipated Maintenance Requirements 55
10. Proposed Project-Dominie Creek Components 56
10.1 Description 56
10.1.1 Confluence with Rowdy Creek 56
10.1.2 Existing Bridge and Diversion Facility Reach 57
10.2 Structural and Foundation Elements 57
10.3 Anticipated Geomorphic Response 58
10.4 Anticipated Fish Passage Performance 59
10.5 Anticipated Flood Impacts 59
10.6 Constructability Considerations 60
10.6.1 Water Management 60
10.6.2 Site Access 61
10.6.3 Bedrock 61
10.7 Anticipated Maintenance Requirements 61
11. Opinion of Probable Construction Cost 61
12. Environmental Compliance 64
13. References 65

Index of Figures

Figure 1-1. Project Vicinity and Location Map 2
Figure 4-1 Watershed map of Rowdy and Dominie Creek. 10
Figure 7-1 Rowdy Creek Diversion Weir (looking south towards river left bank). 19
Figure 7-2 Fish Trap (looking downstream from river right). 20
Figure 7-3 Hatchery Diversion Infrastructure (looking towards right bank). 21
Figure 7-4 Diversion Intake (submerged looking upstream) 21
Figure 7-5. Rowdy Creek existing thalweg profile with average slopes and existing infrastructure noted. 22
Figure 7-6 Dominie Creek Concrete Apron (looking upstream). 23
Figure 7-7 Outer Fish Ladder Wall on Dominie Creek (looking upstream). 24
Figure 7-8 Dominie Creek Diversion Structure (looking upstream). 25
Figure 7-9 Dominie Creek Diversion Structure (looking downstream). 25
Figure 7-10 Dominie Creek Highway 101 Culvert Crossing (looking upstream). 26
Figure 7-11. Dominie Creek's longitudinal thalweg profile from the Rowdy Creek confluence to upstream of Highway 101. 27
Figure 7-12. Rowdy Creek ECM peak flow water surface profile results. 29
Figure 7-14. Dominie Creek Flood Analysis HEC-RAS Profile Results. 30
Figure 7-16. Existing conditions Rowdy Creek HEC-RAS water surface profile results for the fish passage design flows. 31
Figure 7-17. Existing conditions Rowdy Creek HEC-RAS velocity profile results for the low fish passage design flows. 32

Figure 7-18. Existing conditions Rowdy Creek HEC-RAS velocity profile results for the high fish passage design flows. 32
Figure 9-1. A chute and pool roughened channel in Alum Rock Park, San Jose, CA following completion of construction. 35
Figure 9-2. Rowdy Creek design profiles. 37
Figure 9-3. Rowdy Creek proposed water surface profiles for fish passage design flows. 51
Figure 9-4. Rowdy Creek Profile, comparison of ECM and PCM results. 53
Figure 10-1. Dominie Creek's high, low, and anticipated vertical adjustment potential profiles. 59
Figure 10-2. Dominie Creek Profile, comparison of ECM and PCM results. 60

Index of Tables

Table 4-1 Comparison of Predicted Peak Flows per Square Mile of Drainage Area. 11
Table 4-2 Selected Peak Flows Scaled by Drainage Area. 11
Table 4-3 Project Peak Flows. 12
Table 4-4 Estimated Fish Passage Design Flow for Project Site, based on NMFS and CDFW Criteria. 12
Table 5-1. Regulatory agency fish passage criteria and guidelines utilized to evaluate existing and proposed conditions. 13
Table 6-1. Channel roughness coefficients for ECM cross-sections. 15
Table 7-1. Rowdy Creek existing fish passage hydraulic results at the concrete weir. Underlined values fail to meet the design criterion. 31
Table 9-1. Rowdy Creek ESM rock gradation by percentile and rock diameter. 38
Table 9-2. Rock groups for rock bands by volume percent of mix and range of rock diameter sizes. 39
Table 9-3. Rock groups for ESM between rock bands by volume percent of mix and range of rock diameter. 39
Table 9-4. Regulatory agency picket barrier criteria and guidelines utilized for this project. 40
Table 9-5. Upper operational flows for differing picket open areas meeting NMFS (2011) through velocity criterion of 1.25 fps. A picket open area of 50% (bold) was selected for the proposed project. 41
Table 9-6. Regulatory agency pool and weir fishway criteria and guidelines utilized for this project. 42
Table 9-7. Regulatory agency fish trap criteria and guidelines utilized for this project. 42
Table 9-8. Trap entrance channel and pool and weir fishway dimensions. 43
Table 9-9. Rowdy Creek Hatchery Trap Facility Operational Range. 45
Table 9-10. Rowdy Creek Hatchery Trap Facility's hydraulic conditions at the low and high operational flows. 46
Table 9-11. Regulatory agency fish screen criteria and guidelines utilized for this project. 46
Table 9-12. Hydraulic results for the proposed diversion screen on Rowdy Creek. 48
Table 9-13. Rowdy Creek maximum velocity and minimum depth for fish passage design flows. Underlined values indicate the design criterion was not met. 50
Table 11-1. Planning level opinion of probable construction cost. 63

Appendices

Appendix A – Final Design Drawings

Appendix B – Final Geotechnical Report

Appendix C – Updated Flow Exceedance Curve

Appendix D – FEMA FIRM and Selected FIS Pages

Appendix E – ECM and PCM HEC-RAS Plan View Drawings

Appendix F – Existing Weir Design Sketches

Appendix G – Selected Caltrans' Highway 101 As-Built Drawings

Appendix H – Rowdy and Dominie Creek Existing Conditions Model Flood Analysis Results

Appendix I – Rowdy Creek Existing Conditions Fish Passage Model Results

Appendix J – Rowdy Creek Hydraulic Support

Appendix K – Rowdy Creek Proposed Fish Passage Hydraulic Results

Appendix L – Rowdy Creek Proposed Conditions Flood Analysis Results

Appendix M – Dominie Creek Proposed Flood Analysis Results

1. Introduction

The Dominie and Rowdy Creek Fish Passage Improvement Project (Project) focuses on improving fish passage conditions at the confluence of these two creeks to benefit salmonids, Pacific lamprey, and other aquatic species while also improving in-channel and fish collection infrastructure for the Rowdy Creek Fish Hatchery. The Project is located on the Tolowa Dee-ni' Nation (TDN) property in Smith River, California (Figure 1-1).

This Basis of Design Report (Report) provides a summary of the existing conditions and describes the proposed improvements. This Report identifies the project goals, objectives, design criteria and decisions, description of the existing conditions, description of the proposed project, proposed project's anticipated fish passage conditions, anticipated monitoring and maintenance, and limitations and uncertainties associated with implementation and project performance. The final design drawings are included in Appendix A.

The organization of this Report is as follows:

Section 2 - Background: Related work completed previously or that is currently being completed as well as other relevant studies is presented within this section.

Section 3 – Preliminary Investigations: Work completed as part of the final design effort is presented in this section.

Section 4 - Hydrology: A summary of the hydrology completed for the Feasibility Study is presented in this section.

Section 5 – CDFW and NMFS Fish Passage Design Guidelines for California: The current criteria and guidelines related to fish passage design is presented in this section.

Section 6 – Analysis Methodologies: The different methods used in design and analysis are presented in this section.

Section 7 – Existing Site Conditions: The existing conditions of both creeks and the site in general is presented in this section.

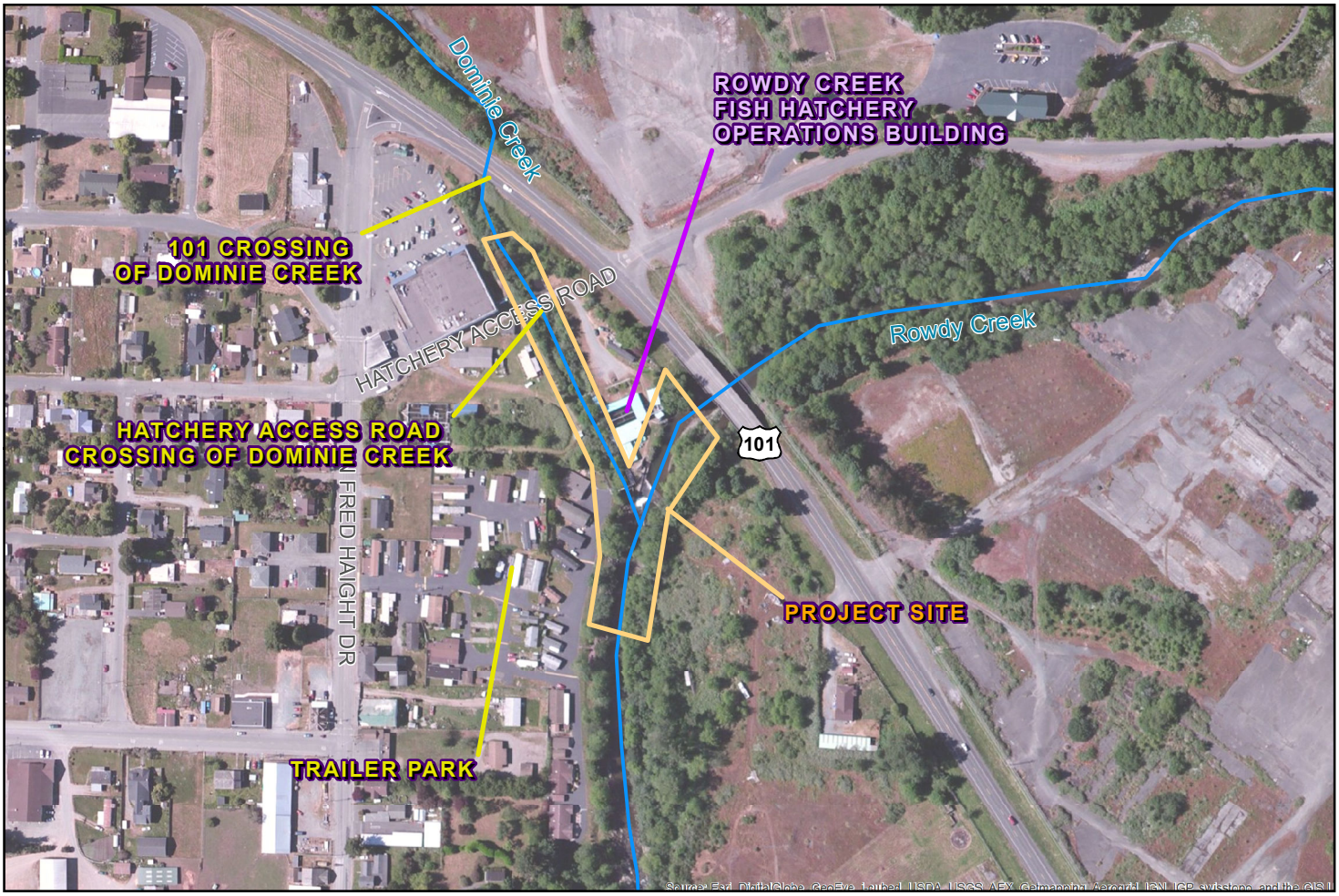
Section 8 – Project Goals and Objectives: The goals and objectives of the project are presented in this section.

Section 9 – Rowdy Creek Proposed Project: The proposed design for Rowdy Creek is presented in this section as well as anticipated impacts.

Section 10 – Dominie Creek Proposed Project: The proposed design for Dominie Creek is presented in this section as well as anticipated impacts.

Section 11 – Opinion of Probable Construction Costs: The opinion of proposed construction costs for the project are presented in this section.

Section 12 – Environmental Compliance: The list of anticipated permits and environmental documents that will be necessary for project implementation.



Interstate Highway
Limited Access
Highway

Paper Size ANSI A

0 125 250 500 Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

Tolowa Dee-Ni' Nation
Rowdy Creek Fish Passage Improvement Project

Job Number 11125168
Revision A
Date 19 Jul 2018

Project Vicinity and Location Map

Figure 1-1

718 Third Street Eureka, CA 95501 T 707 443 8326 F 707 444 8330 E eureka@ghd.com W www.ghd.com

\\ghdnet\ghd\US\Eureka\Projects\111\11125168 Tolowa Fish Passage Design\08-GIS\Maps\Figures\F1_Vicinity_RowdyCreekHatchery.mxd

2. Project Goals and Objectives

This section presents the project goal, objectives, fish passage design criteria, and fish passage design flows, which were established during the Feasibility Study.

2.1 Project Goal

The goal of the project is to improve fish passage conditions for all age classes of salmonids on Rowdy Creek at the Rowdy Creek Fish Hatchery facility and to improve fish passage conditions on Dominie Creek at the Rowdy Creek confluence and at the Hatchery Access Road.

2.2 Project Objectives

The project objectives include the following:

- Remove the existing Hatchery concrete weir on Rowdy Creek to provide volitional fish passage when the Hatchery is not collecting fish over the range of fish passage design flows while meeting regulatory criteria.
- Improve the Hatchery fish trapping facility on Rowdy Creek to minimize delay and handling of fish not to be collected by the Hatchery.
- Construct a new Hatchery water diversion structure on Rowdy Creek that meets regulatory criteria, and allows the maximum water right diversion of 6 cfs
- Improve Dominie Creek at the Rowdy Creek confluence to provide volitional fish passage over the range of fish passage design flows while meeting regulatory criteria.
- Remove the existing Hatchery infrastructure on Dominie Creek below the Hatchery Access Road Bridge to improve fish passage conditions while protecting the bridge structure.

3. Background

The Project is located at the Rowdy Creek Fish Hatchery, situated at the confluence of Dominie Creek with Rowdy Creek, approximately 1.75 miles upstream from the Smith River. The Smith River is considered the “crown jewel” of California by the North American Salmon Stronghold Partnership (WSC, 2017). The Smith River supports several populations of salmonids including Chinook and coho salmon and steelhead and cutthroat trout. Coho salmon (*Oncorhynchus kisutch*) within the Smith River watershed are a listed under the Federal and California Endangered Species Acts. The Smith River watershed is also important for Pacific Lamprey as well as other aquatic and terrestrial species. Several studies have been previously completed in support of this Project and are summarized below.

3.1 Previous Work, Concurrent Work, and Relevant Studies

Work previously completed, work currently being conducted, and other studies relevant to this project are discussed in this section.

3.1.1 Feasibility Study

In February of 2015, the Rowdy Creek Fish Passage Improvement Project Final Feasibility Study (GHD, 2015), herein referred to as the Feasibility Study, was completed with funding through the California Department of Fish and Wildlife (CDFW) Fisheries Restoration Grant Program (FRGP). The Feasibility Study provided a description of existing conditions of Rowdy and Dominie Creeks and included the development of seven alternatives to improve fish passage conditions on the two creeks. Stakeholder participation was a key component during the development of the Feasibility Study. The stakeholder participation culminated with a ranking of the developed alternatives as they compared to the developed project criteria. This process produced the apparent best alternative. The Tolowa Dee-Ni’ Nation (formerly known as the Smith River Rancheria) then selected the preferred alternative: Alternative D. Alternative D includes the reconstruction of Rowdy Creek with a new roughened channel, the reconfiguration of in-channel Rowdy Creek Hatchery (Hatchery) infrastructure, and modification of the in-channel Hatchery infrastructure on Dominie Creek, and some Dominie channel reconstruction. This Report focuses on developing Alternative D to the final design level.

3.1.2 Caltrans Dominie Creek Crossing at Highway 101

Currently, Caltrans maintains a concrete box culvert at the Dominie Creek crossing of Highway 101 which was installed in 1950 when the highway was realigned. Caltrans is actively working on designs to improve the crossing and plans to replace the existing culvert with a bridge in 2020. The project teams have been collaborating on project development since 2016.

3.1.3 Fish Monitoring Studies

There have been several fish monitoring studies completed for the Smith River Basin, covering Rowdy and Dominie Creek. The following paragraphs highlight some of these studies, all of which were completed on behalf of the Smith River Alliance and the California Department of Fish and Wildlife Anadromous Fisheries Resource and Monitoring Program.

A study titled *Reconnaissance of Salmonid Redd Abundance and Juvenile Salmonid Spatial Structure in the Smith River with Emphasis on Coho Salmon* (Garwood and Larson, 2014) was completed in March of 2014. The study investigated two essential viability metrics of salmonids in the Smith River basin, primarily focusing on coho salmon. A field verified GIS model was developed to create sample frames for adult and juvenile salmonids throughout the basin. For the 2011-2012 and 2012-2013 seasons, 388 and 398 spawning ground surveys were completed, 389 and 129 live adult coho salmon observations were made, 82 and 24 coho salmon carcasses were recovered, and 90 and 25 individual coho salmon redds were verified. A majority of the observations were made in the Mill Creek basin with the exception of one live observation made in the Rowdy Creek basin and one carcass recovered in the Morrison Creek basin. The Rowdy Creek Fish Hatchery weir is recommended to be removed or modified in the study to increase the available habitat and spatial distribution of salmonids.

A second study titled *Winter Distributions, Movements, and Habitat use by Juvenile Salmonids throughout the Lower Smith River Basin and Estuary, Del Norte County, California* (Parish and Garwood, 2016) was completed in November 2016. The study was initiated to fill in salmonid distribution gaps of previous studies since only 45% of the total winter estuary sampling frame was surveyed in 2015. A total of 200 habitats across 24 reaches of the total estimated winter salmonid rearing habitat using various surveying methods. The sampling methods were chosen to maximize detections of coho salmon. The study successfully identified consistently occupied non-natal habitat among the coastal plain. The results were found to be similar from the previous winter indicating that the four primary drainages containing habitat are important winter rearing locations regardless of flow regime. The Rowdy Creek basin is also mentioned the report, highlighting the various channel alterations that reduces or eliminates passage to the known spawning and rearing habitats that have been identified as part of the study.

A third study titled *2011-2016 Salmonid Redd Abundance and Juvenile Salmonid Spatial Structure in the Smith River Basin, California and Oregon* (Walkley and Garwood, 2017) was completed in February 2017. The study was a continuation of the 2014 study to offer five year summaries of surveys as well as surveys not previously reported. Over the 5 years, observation results were primarily made in the Mill Creek basin as before with the exception of 9 live observations and 4 carcasses recovered in Rowdy Creek, as well as one live observation made in Hurdy Gurdy Creek and one carcass recovered in Morrison Creek. The report also highlights the passage barrier at the Rowdy Creek Hatchery, recognizing the need for modifications to the facility.

3.1.4 Hatchery Management Plan

A draft of the Rowdy Creek Fish Hatchery's *5-Year Management Plan* (RCFH, 2017) is currently under review by the regulatory agencies. Once accepted, the plan will extend into year 2021. The plan outlines the hatchery program goals and guidelines, rearing plans for chinook and steelhead, sources of funding, and general facility operation and infrastructure. The plan also discusses the current and past effects of the facility on wild fish populations, which are uncertain. Research and supporting information is provided throughout the report to indicate that the facility operations has minimal impacts. Improvements to the Rowdy Creek and Dominie Creek aprons are included in the five-year plan to improve fish passage.

3.1.5 Rowdy Creek Erosion Report

In the late 1990's Del Norte County initiated the development of a report to characterize the erosion which was occurring in Rowdy Creek between the Highway 101 Bridge and Fred Haight Drive crossings (LaRue, 1999). The report concludes that due to periods of heavy rainfall in the 1990's, and the encroachment of concrete improvements along the channels right bank, aggressive erosion has resulted in vertical adjustment of the creek bed downstream of the Highway 101 bridge for a distance of approximately 1,300 feet. The report also notes that, due to the high energy nature of the system and current land use around the channel, the only realistic solution to control erosion is bank armoring/protection.

3.1.6 Rowdy Creek Fish Hatchery Infrastructure and Operations Report

In 2018 D.J. Warren & Associates led a project team that developed the Rowdy Creek Fish Hatchery Infrastructure and Operations Report (D.J. Warren & Associates, 2018). The report investigated operational and infrastructure issues currently facing the Hatchery, and offers subsequent feasible, cost effective potential solutions for the Tribe to consider while making decisions in the future. While much of the report focuses on the Hatchery program itself (which is largely outside the scope of this project), there are also some recommendations regarding the water storage and conveyance system. The report notes that the storage and conveyance system is generally undersized to meet Hatchery conveyance goals. The report also notes that the Hatchery's current water resuse intake location is not a desirable location from which to draw recirculation water. Although these issues themselves are also outside of the scope of this project, these components, if addressed, would have direct connection to the pumping and diversion system being design part of the project.

4. Preliminary Investigations

The following sections present the preliminary investigations completed to support the Project final design.

4.1 Topographic Survey

As part of the Feasibility Study (2015), much of Rowdy Creek near the Dominie Creek confluence was surveyed. This included a topographic survey to 1-foot accuracy in the channel and adjacent to the channel up-and downstream of the Hatchery weir. A longitudinal thalweg profile was also surveyed beyond the topographic survey limits on Rowdy Creek. The longitudinal thalweg profile extends approximately 540 feet downstream of the weir and 1,200 feet upstream of the weir. Based on recent site visits, it does not appear that the thalweg or channel morphology has changed since the Feasibility Study survey

To supplement the Feasibility Study survey, a topographic survey, with 1-foot accuracy, was completed by Gutierrez Land Surveying (GLS) and GHD as part of the final design effort, between the confluence and the Hatchery Access Road crossing. Caltrans had recently completed a topographic survey of Dominie Creek extending from the Hatchery Access Road crossing through the Highway 101 crossing and extending approximately 300 feet upstream of the highway crossing. Caltrans survey information was integrated by GLS into the Project survey. AdditionallyGLS

conducted a records search and determined the approximate property boundary of the Hatchery parcels. These boundaries are shown on the plans.

4.2 Geomorphic Assessment

The Feasibility Study included a detailed geomorphic assessment. This included researching old photographs and field investigations. The field investigations focused primarily on Rowdy Creek. More recently, a field based geomorphic assessment was completed for Dominie Creek. Staff from Michael Love and Associates (MLA) and GHD walked Dominie Creek from the confluence to approximately 1,000 feet upstream of the Highway 101 crossing. Notable geomorphic and channel features were marked on maps. Two 300-foot tape reals were dispensed to coordinate the current location in the field to the stationing called out on the maps.

The purpose of the assessment was to better understand the potential response of the channel to any channel modifications made as part of this project. The results of this effort are represented in the drawings, figures, and discussions within this Report where relevant to this project.

4.3 Geotechnical Analysis

Geotechnical recommendations for design development and construction were needed for this project. In July of 2017, six exploratory borings were drilled in the areas surrounding the existing Rowdy Creek concrete apron, fish trap and diversion facility, the bank downstream of the Dominie Creek confluence with Rowdy Creek, and the Dominie Creek access bridge. The Final Geotechnical Report is included in Appendix B and a summary of is provided in Section 8.4.

4.4 Structural Analysis

The existing Rowdy and Dominie Creek channels contain several concrete components, many of which will be subject to change or demolition as part of the proposed project. The goal of the structural analysis was to determine what impact, if any, removing or altering these components will have on other existing structures, and to what extent can the work in these areas be modified in order to preserve other existing features. The proposed work involving existing hatchery facility/concrete components generally falls into two categories 1) structures to be removed and replaced, and 2) structures to be removed.

Existing structures located adjacent to those that are proposed to be removed and replaced, which include the Rowdy Creek east retaining wall, and fish trap/stairway area, will only be destabilized during demolition and construction. The new features in these areas are designed in accordance with current structural standards, in additional to the geotechnical and hydraulic design parameters that have been developed through parallel efforts in this project. Upon project completion, the peripheral components will again be able to rely on these features for structural support, scour protection, and stability.

Structures that are proposed to be removed without replacement present a different challenge than those mentioned previously. Many of these components have been added over time, and therefore in their current state likely offer structural support, or creek scour protection to various other structures located peripherally or directly behind them. In these instances, demolition and removal of features without some sort of subsequent improvement or permanent stabilization may result in

weakening and/or failure of other structures proposed to remain. The following paragraphs outline the efforts taken to develop design solutions primarily under this category of work.

Attempts have been made to obtain structural record drawings for all of the features listed above. To date, only design sketches of the existing concrete weir have been obtained. GHD has also reached out to the County to obtain as-built drawings for the Hatchery Access Road bridge, however the County was unable to locate such drawings.

With little to no existing drawings depicting how the concrete features near the hatchery were constructed, GHD and MLA staff conducted numerous field visits to determine how these structures were build, in what sequence, and how they interact with one another. After field inspection, it appears evident that most of the infrastructure proposed to be demolished were “add on” items. As an example, the fish ladder and sluice gate beneath the Dominie Creek bridge appear to have been constructed much later than the bridge itself, based on the visual appearance of concrete weathering and joints. This would indicate that the bridge would have been constructed to be stable under conditions that did not rely on the fishway or sluice gate components themselves, and that their removal would have minimal impact. However, given the unknown nature of design and construction, and how the structural conditions have changed over time as new features have been added, a different, more conservative approach in these types of areas has been developed.

The Final Design (Appendix A) incorporates protections to existing elements constructed at the location where existing features are to be removed. The design intent of these features, which include scour walls, buried footings, soil nails, and shotcrete facing, is to provide the same level of structural protection, or better, than the previous features. Further discussion of each of the proposed improvement/protections can be found in Sections 9.5 and 10.2.

5. Hydrology

The project hydrology is presented within this section which includes the project peak flows and fish passage flows developed for the Project.

5.1 Peak Flows

The Feasibility Study presented the methodology used to determine the peak flows and, and a summary is provided below.

The Rowdy Creek watershed area above the Dominie Creek confluence is 29.4 square miles (Figure 4-1). The Dominie Creek watershed area is 3.7 square miles, so the combined watershed area is 33.1 square miles.

Neither Rowdy Creek nor Dominie Creek are currently gaged for flow monitoring. Therefore, predictive methods were applied to estimate peak flows for the project site. Peak flows for the 2-, 5-, 10-, 25-, 50-, and 100-year flow events were estimated using two different methods: statistical analysis (following USGS, 1982) of nearby historical USGS stream gages and USGS regional regression equations (following Gotvald et al, 2012). Flow data provided in the Flood Insurance Study (FIS) for Del Norte County and Caltrans as built drawings of the Rowdy Creek Hwy 101 Bridge were also used.

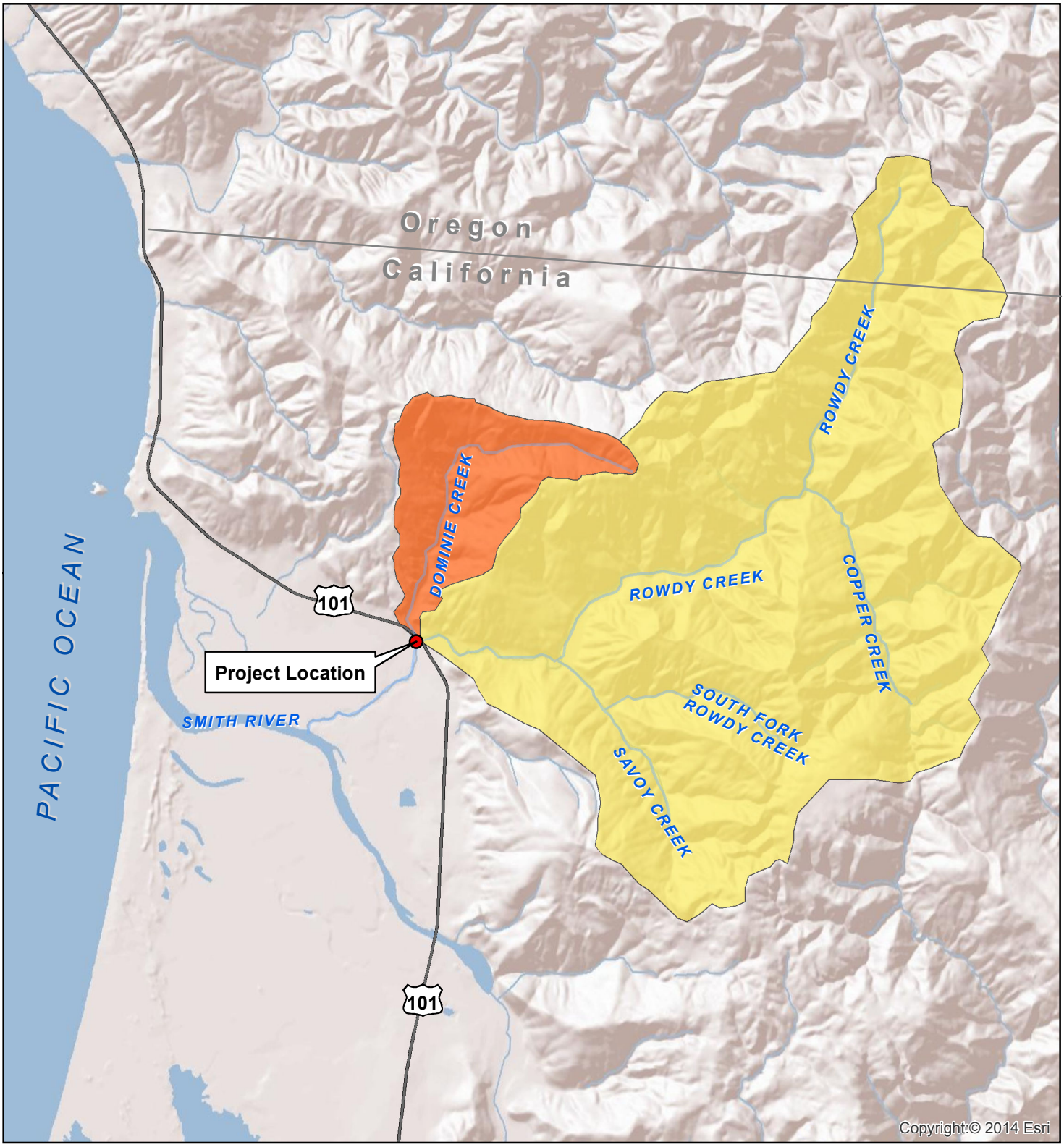
Table 5-1 summarizes the different peak flows by predictive method. The peak flows are normalized by drainage area. The average of the different methods was calculated, excluding Mill Creek flows. Mill Creek flows were excluded because they were consistently less than the flows calculated by the other methods and Mill Creek's data record length was short.

Table 5-2 presents the selected peak flows by drainage area. When the FEMA FIS provided a value for Rowdy Creek, that value was used. Otherwise, for Rowdy Creek, the average peak flow was used. The regional regression results were used for Dominie Creek. Table 5-3 presents the final peak flows used for the project, which are the

Table 5-2 results multiplied by the respective drainage areas. The combined flow (a sum of the two creek flows) was used to design features downstream of the confluence.

5.2 Fish Passage Design Flows

The Feasibility Study presented the methodology used to develop fish passage design flows. Fish passage design flows define the range of flows that fish should be provided passage at facilities. Both NMFS (2001) and CDFW (CDFG, 2002) define low and high passage design flows for different age classes of salmonids using annual exceedance calculated using daily average flows. The fish passage design flows for the project are presented in Table 5-4. The fish passage flows identified in the Feasibility Study inadvertently omitted some of the average daily flow values. All the values omitted reported no flow (i.e. the channel was dry). These values have been added to the calculations. The values lowered slightly (e.g. adult high flow was 1,395 cfs and is now 1,384 cfs). The updated project exceedance curve, which are used to determine the fish passage flows (see Feasibility Study) is included in Appendix C.



Dominie Creek Watershed

Rowdy Creek Watershed

Paper Size ANSI A

0 3,200 6,400 12,800 Feet

Map Projection: Albers
Horizontal Datum: North American 1983
Grid: NAD 1983 Albers

N

Tolowa Dee-Ni' Nation
Rowdy Creek Fish Passage Improvement Project

Job Number 11125168
Revision A
Date 19 Jul 2018

Watersheds

Figure 4-1

718 Third Street Eureka, CA 95501 **T** 707 443 8326 **F** 707 444 8330 **E** eureka@ghd.com **W** www.ghd.com

\\ghdnet\ghd\US\Eureka\Projects\111\11125168 Tolowa Fish Passage Design\08-GIS\Maps\Figures\F5-1_Watersheds.mxd

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:jclark2

Table 5-1 Comparison of Predicted Peak Flows per Square Mile of Drainage Area.

	Peak Flows (cfs/mi^2) for Recurrence Interval					
Predictive Method	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Peak Flow Statistical Analysis						
Rowdy Creek Gage (1957 - 1962)	121	151	169	188	201	213
Mill Creek Gage (1974 - 1981)	100	127	144	162	175	188
USGS Regional Regression						
Rowdy Creek (above Dominie)	120	192	241	303	349	396
Dominie Creek	132	223	287	369	430	493
FEMA FIS						
Approx. 11,500 feet upstream of Smith Confluence	Not Reported	Not Reported	301	Not Reported	425	473
CALTRANS						
Hwy 101 Rowdy Creek Bridge	Not Reported	Not Reported	Not Reported	Not Reported	491	544
Average[1]	124	189	249	287	379	424

1. Does not include Mill Creek flows

Table 5-2 Selected Peak Flows Scaled by Drainage Area.

	Peak Flows (cfs/mi^2) for Recurrence Interval					
Channel Reach	**2-Year**	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Rowdy Creek (Upstream of Dominie Creek)	124	189	301	303	425	473
Dominie Creek	132	223	287	369	430	493

Table 5-3 Project Peak Flows.

Channel Reach	Peak Flows (cfs) for Recurrence Interval					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Rowdy Creek (Upstream of Dominie Creek)	3,657	5,548	8,860	8,922	12,485	13,895
Dominie Creek	489	826	1,063	1,365	1,592	1,824
Combined	4,146	6,375	9,923	10,287	14,077	15,719

Table 5-4 Estimated Fish Passage Design Flow for Project Site, based on NMFS and CDFW Criteria.

Salmonid Species and Age Class	Rowdy Creek Upstream of Dominie Creek (cfs)		Dominie Creek at Confluence (cfs)		Combined (cfs)	
	Low Passage Design Flow	High Passage Design Flow	Low Passage Design Flow	High Passage Design Flow	Low Passage Design Flow	High Passage Design Flow
Juvenile Salmonids	1	396	1	50	1	446
Adult Resident	2	698	2	93	2	786
Adult Anadromous	54	1,384	7	176	60	1,559

6. CDFW and NMFS Fish Passage Design Guidelines for California

CDFG (2002), CDFG (2010), NFMS (1997), NMFS (2001), and NMFS (2011) and provide fish passage and fish protection design guidelines and criteria. Some of the criteria and guidelines utilized to evaluate existing and proposed conditions are presented in Table 6-1. Additional criteria and guidelines will be presented as necessary.

The lifestage and species for each criterion/guideline is listed. If only “adult” is listed, then it refers to both adult resident and anadromous salmonids. Some of the criteria or guidelines presented in the table are not self-explanatory such as the energy dissipation factor (EDF) and approach and sweeping velocity. EDF indicates how turbulent the water will be. This is generally applied to water plunging into pools over a structure but can also be applied to roughened channels. A high value indicates high turbulence and a low value indicates low turbulence. Currently, CDFW only has a criterion for adult anadromous salmonids.

Approach and sweeping velocity refer to the velocity vectors perpendicular to and parallel to a screen face, respectively. So, the approach velocity is the velocity is in front of a screen, going

towards it (not the velocity through the screen) and sweeping is the velocity going past the screen, sweeping fish and debris along.

Table 6-1. Regulatory agency fish passage criteria and guidelines utilized to evaluate existing and proposed conditions.

Fish Passage Criteria/Guidelines		Value
Maximum Water Velocity (Structure <60 feet)[1]	Juvenile	1 fps
	Adult Resident	4 fps
	Adult Anadromous	6
Minimum Water Depth	Juvenile	0.5 feet
	Adult Resident	0.67
	Adult Anadromous	1.0 feet
Maximum Water Surface Drop	Juvenile	0.5 feet
	Adults[2]	1.0 feet
Minimum Pool Depth	Juvenile	NA
	Adults	2 feet
Maximum Average Channel Slope	Juvenile & Adults	4%
Roughened Channel Energy Dissipation Factor (EDF)	Adult Anadromous	7 ft-lbs/s/ft^3

1. fps = feet per second (ft/s)
2. When only “Adult” is listed, it refers to both resident and anadromous

7. Analysis Methodologies

This section presents the methodologies applied to various analyses conducted for this project. Any additional analysis applied but not presented in this section will be presented as necessary within other sections of this Report.

7.1 Flood Hydraulic Analysis Methodology

The purpose of conducting a flood analysis is to determine what impacts a project may have on the existing 1% annual chance flood conditions of a creek or floodplain. Generally FEMA would provide a FEMA accepted hydraulic model (if one had been developed) of the creek/floodplain. Then a designer would run the model to ensure it executes and that the results match those presented in the FEMA Flood Insurance Study (FIS) and the Flood Insurance Rate Map (FIRM). This executed model would be referred to as the duplicate effective model (DEM). Then the designer would update the FEMA cross-sections (if necessary) and add additional cross-sections (if necessary) to develop the existing conditions model that matches the results of new survey and is more applicable to the site specific conditions. This updated model would be referred to as the existing conditions model (ECM), which would provide the basis for comparing the existing and proposed hydraulic conditions. The FIS and FIRM for this project area are included in Appendix D. Unfortunately, after two requests spanning several years, FEMA was been unable to locate their accepted hydraulic model for this project's area. Therefore, a commonly accepted approach was taken to assess impacts to the 1% annual change flood water surface elevation, which is presented in the following sections.

7.1.1 Existing Flood Mapping

Rowdy Creek is within a FEMA mapped floodplain and has been identified as a Zone AE special flood hazard area (SFHA), and therefore, the limits and base flood elevations (BFE) for the 1% annual chance flood (100-year flood event) have been identified as well as the limits of the 0.2% annual chance flood (500-year flood event) for Rowdy Creek (Map Number 06015C0042F, Revised 2010). Dominie Creek has been identified as a Zone A SFHA, and therefore, only the limits of the 1% annual chance flood have been identified (no BFEs).

7.1.2 Duplicate Effective Model and Existing Conditions Model

Because FEMA was unable to provide their accepted hydraulic model, no duplicate effective model (DEM) was produced. Therefore, existing conditions models (ECMs) for Rowdy and Dominie Creek were developed without any FEMA sections.

The ECMs were developed using the Army Corp of Engineer's one-dimensional HEC-RAS hydraulic model (ACOE, 2010). The two creeks were modelled separately (versus developing a single model with a confluence) due to the complex nature of the confluence. The ECMs were executed as steady-state models in mixed flow regime modes. Both models use normal depth as their upstream boundary. Both models use the NAVD88 vertical datum and California State Plan, Zone 1 for the horizontal datum. The development of the two models are discussed separately in the following sections.

7.1.2.1 Rowdy Creek

There are a total of 25 cross-sections defining the existing conditions of Rowdy Creek. The three most upstream sections are located upstream of the old Highway 101 bridge crossing. The bridge abudments remain but the deck is no longer present. The old bridge crossing constricts the channel much more than the existing Highway 101 bridge, which is located just downstream. The existing bridge includes a singe pier. The bridge and pier were included in the model. Between Highway 101 and the Dominie Creek confluence, there are nine sections. The sections are located at changes in topography or infrastructre and as need to accurately model the proposed conditions (discussed below), but included in the ECM to provide a comparison. Appendix E includes a plan view indicating the location of the modelled sections. The channel stationing selected for this Project match the FIS profile stationing.

Cross-sections 9942.70 and 9929.53 are located on the existing concrete weir. Section 9893.12 is located immediately downstream of the Dominie Creek confluence. The remaining five interal sections extend to the limits of the surface model. The downstream boundary section (Section 9434.43) is located at a bedrock section of channel. The water surface profile of Rowdy Creek, provided in the FIS, was utilized to calibrate the downstream boundary condition of the Rowdy Creek ECM to the 1% annual chance BFE; all other flows utilized normal depth as the downstream boundary.

The roughness coeficients for overbank flow were all set at 0.06. The roughness coeficients for the channel features are presented in Table 7-1.

Table 7-1. Channel roughness coefficients for ECM cross-sections.

Cross-Sections	Channel Roughness Coefficient	Notes
10362 – 9984.67	0.045	Upstream of concrete weir
9942.7 & 9929.53	0.02	Concrete weir
9893.12 & 9855.46	0.06	Boulder cascade
9806.29 – 9434.43	0.045	Downstream of boulder cascade

7.1.2.2 Dominie Creek

There are a total of 28 cross-sections were created to model Dominie Creek as well as two bridge crossings and an inline structure. The most upstream bridge is the Hatchery Access Road, which also includes the Hatchery's diversion structure, which includes a gate that was modelled as an inline structure, a pier, and a fish ladder. The most downstream bridge is associated with a walkway and includes a single, large pier. Besides sections needed to describe the bridges, the remainder of the sections were located at changes in channel form or where infrastructure is located. The overbank roughness coefficients were set at 0.06 and the channel roughness coefficients were set at 0.05 for all sections.

The Dominie Creek model utilizes the Rowdy Creek model's water surface elevation at the confluence (Rowdy ECM Section 9855.46) for the downstream boundary condition.

Existing flood conditions are presented in Section 8.5.

7.1.3 Proposed Conditions Model

The proposed conditions models (PCMs) were developed using the Army Corp of Engineer's one-dimensional HEC-RAS hydraulic model (ACOE, 2010). Like the ECM, the two creeks were modelled separately. The PCMs were executed as a steady-state models in mixed flow regime modes. Both models use normal depth as their upstream boundary. Both models use the NAVD88 vertical datum and California State Plan, Zone 1 for the horizontal datum. The following sections describe the development of the PCMs for Rowdy and Dominie creeks. Appendix C includes a plan view indicating the location of the PCM sections.

7.1.3.1 Rowdy Creek

The Rowdy PCM shares the same cross-section locations as the Rowdy ECM. The channel geometry was updated to match the proposed design changes. The overbank roughness coefficients remain the same at 0.06. All of the channel roughness coefficients were increased to 0.055 except the downstream boundary section (9434.43), which remained 0.045. The increase is required due to the change in roughness of the proposed channel.

7.1.3.2 Dominie Creek

The Dominie PCM shares the same cross-section locations as the Dominie ECM. The channel geometry was updated to match the proposed design changes, which are focused around the two bridges and include the removal of the center piers and the inline structure, and the refacing of the Dominie Access bridge abutments. The channel roughness and upstream boundary conditions remain unchanged from the ECM. The downstream boundary was updated to match the Rowdy Section 9855.46 water surface elevations.

Anticipated impacts to flood conditions are presented in Sections 9.4 and 10.5.

7.2 Fish Passage Hydraulic Analysis Methodology

Fish passage hydraulic analysis is an iterative exercise dependent on many design variables (e.g. rock sizes, channel slopes, channel shape). The following details the methodology used to evaluate the fish passage performance for existing and proposed conditions.

7.2.1 Rowdy Creek

A HEC-RAS model was developed for both existing and proposed conditions, referred to as the existing fish passage model (HEC-RAS EFPM) and the proposed fish passage model (HEC-RAS PFPM), respectively.

The roughness calculations presented in Section 7.2.3 were used in the HEC-RAS PFPM model. The roughness calculations also determine hydraulic conditions relative to fish passage (e.g. velocity). The results of the equations developed by Mussetter (1989) will be reported.

7.2.2 Dominie Creek

There are two primary fish passage related issues addressed by this project on Dominie Creek. First, the concrete apron located at the confluence and second the diversion fish ladder and sluice gate located below the Access Road Bridge. Because this project proposes to remove these facilities and allow the channel to naturally adjust, there is no reason to develop a fish passage model for existing or proposed conditions. Therefore, none was developed. Section 8.6.2 does present a qualitative description of fish passage conditions on Dominie Creek.

7.2.3 Hydraulic Roughness at Fish Passage Flows

At fish passage design flows, the flow depth is shallow relative to the size of rock projecting from the bed of the roughened chute. The depth of flow (or hydraulic radius) divided by the D_{84} particle size (which is the rock having an intermediate diameter that is greater than 84% of the rock found in the channel) is referred to as the relative submergence and is a measure of the hydraulic roughness created by the bed material at a given flow. At lower flows, hydraulic roughness is very sensitive to changes in relative submergence. CDFG (2009) provides a number of depth-dependent equations for predicting hydraulic roughness. Their applicability depends on the relative submergence that they were derived. The one recommended for low relative submergence occurring during fish passage flows is by Mussetter (1989). Variables in the equation are water surface slope, water depth, D_{84}, and D_{50}.

Using the equation by Mussetter (1989), the rocks sizes used in the roughened channel (see Section 9.1.2), and a water surface slope of 0.028 ft/ft (the overall average slope of the proposed channel), Manning's roughness coefficients were calculated for the range of fish passage flows. These depth-varying roughness coefficients were entered into the chute cross sections within HEC-RAS using the vertical variable *n* option. Note that at flows below approximately 15 cfs, the equation is being applied to shallower conditions than it was derived, decreasing the accuracy of the predicted Manning's roughness coefficient. See Section 9.3 for results.

7.3 Picket Fence Hydraulic Analysis Methodology

NMFS (2011) provides a design criterion for velocity (1.25 fps) through a picket fence fish barrier, among other criteria (see Section 9.1.3). The proposed picket fence will span the entire channel and be placed within a pool. Placing it within a pool provides slower velocities and when the picket fence is lowered, fish have volitional passage. To analyze the velocity through the proposed picket fence, the following methodology was followed.

The HEC-RAS PFPM was executed at various flows to determine the depth of flow within the pool where the picket fence is located. The sectional area of the flow was determined. The sectional area was then reduced by 40% to 67% to account for the loss of space due to the picket fence bars; regulatory minimal reduction area is 40%, the maximum bar spacing is 1 inch. The velocity through the picket was then determined using the reduced area and the evaluated flow. This was an iterative process to determine the appropriate flow and sectional area reduction that results in the maximum velocity criterion of 1.25 fps. The results of the analysis is presented in Section 9.1.3.

7.4 Roughened Channel Engineered Streambed Material Gradation Sizing

The material gradation for the rock chute was sized for stability up to the 100-year discharge using methods outlined in CDFG (2009). The method uses the stable D30 particle size calculated using USACE methods as the starting point for developing the overall gradation of the engineered streambed material (ESM) for the rock chute.

The USACE (1994) method recommends a relatively uniform gradation for riprap, with D_{85}/D_{15} ratios ranging from 1.7 to 2.7. The result is a very porous mixture of similarly sized rocks, with voids composing 35% or more of the volume. The D_{85}/D_{15} ratio in a natural coarse bedded channel is commonly between 8 and 14, with smaller rocks filling the voids between larger rock, reducing bed porosity and maintaining flows on top of the streambed. Therefore, CDFG (2009) recommends filling the voids with smaller material. To achieve this, CDFG (2009) recommends the D30 from the USACE sizing equations for a uniform riprap gradation ($D_{30\text{-}USACE}$) be scaled by 1.5 to achieve a suitable $D_{84\text{-}ESM}$ for the ESM in a roughened channel. Once the $D_{84\text{-}ESM}$ has been determined, it is used to calculate the $D_{50\text{-}ESM}$ and $D_{100\text{-}ESM}$. These calculations are presented as Equations 1 through 3.

$$D_{84\text{-}ESM} = 1.5\ D_{30\text{-}ACOE} \qquad \textbf{Equation 1}$$

$$D_{50\text{-}ESM} = 0.4\ D_{84\text{-}ESM} \qquad \textbf{Equation 2}$$

$$D_{100\text{-}ESM} = 2.5\ D_{84\text{-}ESM} \qquad \textbf{Equation 3}$$

CDFG (2009) recommends the ESM contain particles smaller than $D_{50\text{-}ESM}$ with between 5 and 10 percent fines (≤ 2mm) to control porosity. Equations 4 and 5 were used for this purpose.

$$D_{16\text{-}ESM} = 0.32^{(1/n)}\ D_{\mathbf{50\text{-}ESM}} \qquad \textbf{Equation 4}$$

$$D_{8\text{-}ESM} = 0.16^{\mathbf{(1/n)}}\ D_{50\text{-}ESM} \qquad \textbf{Equation 5}$$

Where: $0.45 \leq n \leq 0.70$
Such that: $D_{8\text{-}ESM} \approx 2$ mm

The gradation results for the Rowdy Creek roughened channel are presented in Section 9.1.2.

8. Existing Site Description

Summaries of the existing conditions for Rowdy and Dominie Creek are presented in this section. A detailed description of the two creeks was presented in the Feasibility Study. Existing condition drawings are included in Appendix A.

The project site is located at the confluence of Dominie Creek and Rowdy Creek near the community of Smith River, California (Figure 1-1, page 2). The general project site is located at Latitude 41.927943° and Longitude -124.144305°.

8.1 Rowdy Creek

8.1.1 Infrastructure

The primary feature within Rowdy Creek within the Project area is the diversion weir. The diversion weir is located immediately upstream of the Dominie Creek confluence. Design sketches of the weir were obtained during background research and are included in Appendix F. The diversion weir includes a concrete apron, a picket fence, and adjacent concrete walls as well as the entrance to the fish trap (Figure 8-1). The concrete apron ranges from 60 to 68 feet wide (perpendicular to flow). The apron is approximately 30 feet long (parallel to flow). It is not known what material the apron is built on, bedrock is not visible. The thickness of the concrete is not known but it appears to be approximately 2 feet thick. The concrete apron is perched approximately 3 feet above the tailwater pool. The tailwater pool control is a series of large boulders that span the channel approximately 40 feet downstream.

Figure 8-1 Rowdy Creek Diversion Weir (looking south towards river left bank).

The picket fence (Figure 8-1) is used to block fish upstream movement and directs them to the Hatchery's trap (Figure 8-2). The picket fence is 69 feet long and is skewed relative to the channel flow direction; the river right end is more upstream than the river left end.

The entrance to the fish trap is a box concrete channel that is approximately 2 feet wide (Figure 8-2). Fish enter the box channel and swim towards the trap. The velocities are kept relatively high within the channel but quickly decrease at the entrance to the trap as the channel floor drops approximately 2 ft. The fish trap is a steel bar structure that is approximately 5 feet tall, 9 feet long, and 5 feet wide. The trap opens via a hinged top. The fish trap and channel are separated by a concrete wall and a series of steel baffles.

Figure 8-2 Fish Trap (looking downstream from river right).

The Hatchery's Rowdy Creek diversion pump intake is located approximately 80 feet upstream of the fish trap (Figure 8-3) on river right. The river right bank between the diversion and fish trap is heavily armored with stacked concrete slabs and is near vertical. The Hatchery diversion consists of gangway and stilling well. During high flows water is pumped from the stilling well, during lower flows the pumps must be placed directly into the channel as shown in Figure 8-3. At the time of the survey, the two pump intakes were not positioned in the stilling well but rather directly in the channel (Figure 8-4). Immediately downstream of the intakes and visible in Figure 8-3 is a relatively deep pool with a bedrock bottom.

Figure 8-3 Hatchery Diversion Infrastructure (looking towards right bank).

Figure 8-4 Diversion Intake (submerged looking upstream).

The Highway 101 bridge crossing, maintained by Caltrans, is located approximately 200 feet upstream of the concrete weir. The Highway 101 bridge was installed in the early 1950's based on design drawings (Appendix G).

The Highway 101 bridge deck was widened in the early 1990's. There is a single pier located near the center of the channel. Based on visual observations and review of record drawings, the bridge's pier footing is currently not exposed and extends well below the current channel bed. A mid-channel gravel bar has formed downstream of the pier, nearly extending to the concrete apron.

8.1.2 Geomorphology

Figure 8-5 presents the existing thalweg profile for Rowdy Creek. The thalweg data was collected in the fall 2014 but based on recent site visits, appears unchanged. The profile indicates where bedrock was noted along the thalweg. Other bedrock was visible during the survey, but not along the thalweg. See Appendix A for the locations of other bedrock features. The profile has been separated into two reaches: lower and upper. The overall slope of the channel is 0.6% and the slope of the weir is 2.9%.

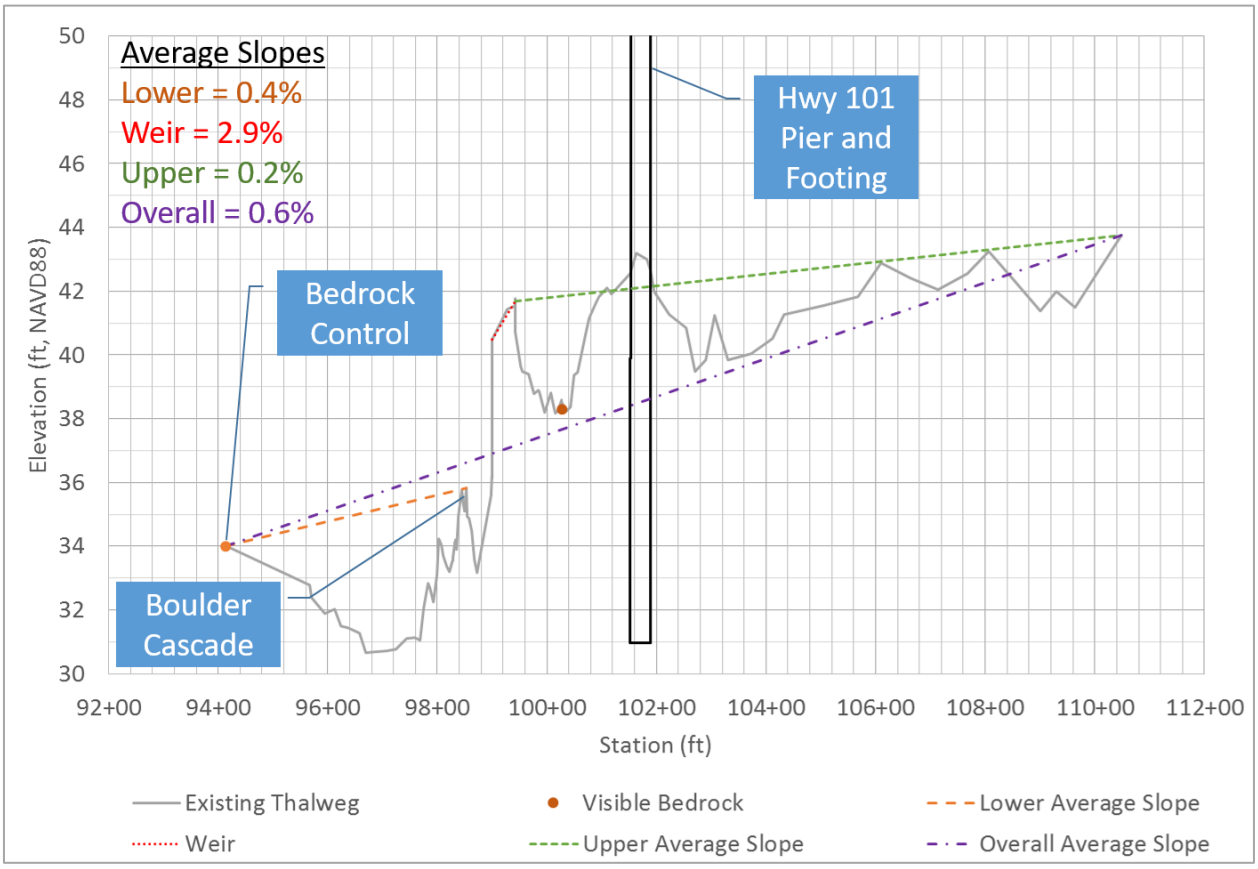


Figure 8-5. Rowdy Creek existing thalweg profile with average slopes and existing infrastructure noted.

8.1.2.1 Lower Reach

The lower reach has an average slope of 0.4%. The downstream end is controlled by bedrock. The upstream end is controlled by large boulders placed there to create a backwater pool to help improve fish passage (see the Feasibility Study for more details). The channel would likely have a less-steep slope if the boulder cascade was not present, which would result in poorer fish passage conditions and likely structural complications of the weir. The long pool downstream of the boulder cascade is primarily composed of small grain sand.

8.1.2.2 Upper Reach

The upper reach is controlled by the concrete weir. The upper reach slope is 0.2%. Based on field observations, this slope appears to continue further upstream. Highway 101 crosses the channel along this reach but appears to have minimal impact on the upstream channel. A long island bar is present downstream of the highway 101 crossing. Refer to the Feasibility Study for additional details.

Bedrock was noted within the pool immediately upstream of the weir. The visibly portion of the bedrock is approximately 25 feet long and 8 feet wide.

8.2 Dominie Creek

8.2.1 Infrastructure

There is a channel spanning concrete apron on Dominie Creek. The concrete apron is located at the confluence (Figure 8-6). As seen in Figure 8-6, the concrete apron is perched, has a cross-slope, and is sloped downstream. There is a single pier in the center of the channel at the upstream end of the apron. Adjacent to the pier, on both sides of the channel, is a concrete sill. The pier is associated with the foot bridge above, which is also used as a pipe crossing.

Also visible in Figure 8-6 is the entrance (sluice gate) to the Hatchery fish ladder. The fish ladder is discussed further in the Feasibility Study. The fish ladder's outside wall extends approximately 145 feet upstream on Dominie Creek and confines the channel (Figure 8-7).

Figure 8-6 Dominie Creek Concrete Apron (looking upstream).

Figure 8-7 Outer Fish Ladder Wall on Dominie Creek (looking upstream).

Approximately 380 feet upstream of the confluence is the Dominie Creek diversion structure (Figure 8-8). The diversion structure includes a diversion dam, fish ladder, and diversion screens. The diversion dam and ladder is located under the Hatchery's access road crossing, which is a bridge owned by the County. The crossing, ladder, and dam infrastructure rest on visible bedrock. The diversion dam and ladder are separated by a wall running the width of the road crossing. The width of both openings is 8 ft. The diversion dam is comprised of a sluice gate that rests on two flash boards. The ladder consists of 3 pools separated by flashboards. The ladder overcomes approximately 5 feet of elevation.

Immediately upstream of the diversion dam are the diversion intake screens. The screens cover an opening in the wall where the pump intakes are located.

Figure 8-8 Dominie Creek Diversion Structure (looking upstream).

Figure 8-9 Dominie Creek Diversion Structure (looking downstream).

The Highway 101 culvert crossing, maintained by Caltrans, is located approximately 650 feet upstream of the confluence. The box culvert is approximately 10 feet wide, 10 feet tall, and 70 feet long and was installed in 1950 (Figure 8-10). This crossing is currently being planned to be replaced by Caltrans (Caltrans, 2016).

Figure 8-10 Dominie Creek Highway 101 Culvert Crossing (looking upstream).

8.2.2 Geomorphology

Dominie Creek is an entrenched channel. The channel is entrenched from the Rowdy Creek confluence to upstream of Highway 101. The active channel width is approximately 18 feet. The channel has been divided into three separate reaches: lower, middle, and upper reach (Figure 8-11).

8.2.2.1 Lower Reach

At the downstream end of the lower reach is the concrete apron. The concrete apron helps maintain grade through this reach. The fish ladder wall extends the lower third of this reach and the thalweg runs along the wall. There has been some bank slumping on river right, across the channel from the fish ladder wall. The bed material includes large chunks of concrete and asphalt, as well as natural material. The average slope of this reach is 2.0%. At the upstream end, at the diversion structure, the channel bed includes large boulders that control the grade. It is assumed that those boulders were placed in the channel to help backwater the fish ladder entrance pool and the help protect the banks and some of them have rolled into the channel. Bedrock is visible at the upstream end of this reach.

8.2.2.2 Middle Reach

The middle reach extends from the diversion structure to the Highway 101 crossing. This reach has an average slope of 3.3%, which is much steeper than the adjacent reaches. The primary reason

that has emerged for why this reach can maintain a steeper slope is that this reach has much larger bed material, likely material that was imported into the channel.

At the upstream end of this reach is the Highway 101 culvert with an outlet apron and outlet. Below the outlet there are large boulders that appear to have been placed to help backwater the outlet. Further, there is rock slope protection (RSP) boulders all along the right bank. Lastly, bedrock is present at several locations. As seen in Figure 8-11, on bedrock control point was noted in the field in this reach. Other bedrock was noted along the banks. See the drawings in Appendix A for their locations.

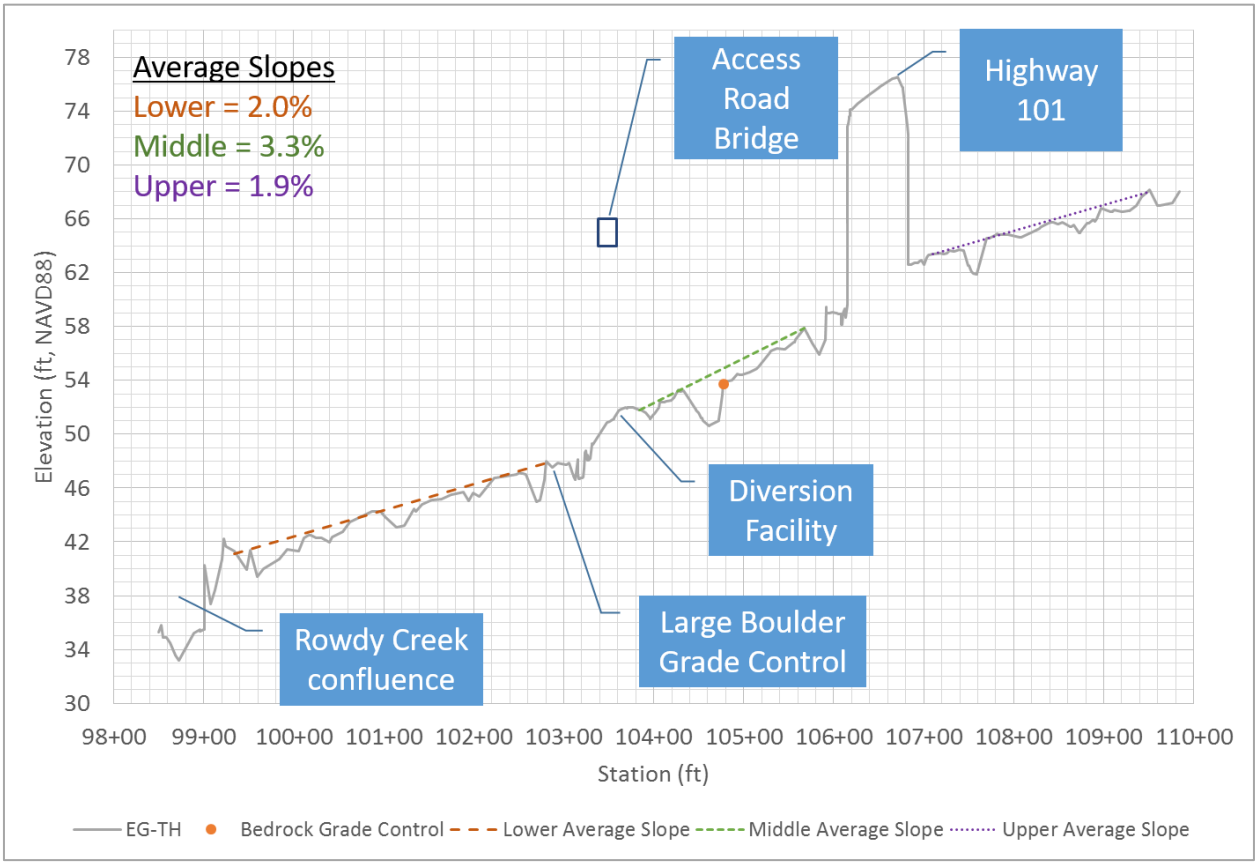


Figure 8-11. Dominie Creek's longitudinal thalweg profile from the Rowdy Creek confluence to upstream of Highway 101.

8.2.2.3 Upper Reach

The upper reach extends upstream from the Highway 101 culvert. The average slope of this reach is 1.9%, similar to the lower reach. Upstream of the culvert the channel bed is concrete and the banks are lined with concrete-sacks. Beyond this, the channel is natural but still entrenched. At approximately the limits of survey, the right bank is experiencing erosion, which is adjacent to Highway 101. Also, immediately upstream of the limits of survey is an old redwood bridge crossing that has failed and is creating a large wood jam that is also impounding sediment.

This project is not expected to affect the upper reach because of the bedrock control point shown in Figure 8-11. The anticipated geomorphic impacts of the proposed improvements on Dominie Creek are presented in Section 10.3.

8.3 Other Infrastructure

In addition to other Hatchery infrastructure presented in the Feasibility Study, there are other items to present as they may impact construction such as the high voltage overhead line and a water main pipe over the Dominie Creek Hatchery access road bridge.Other underground utilities may exist that were not observed above ground during the topographic surveys.

8.4 Existing Geotechnical Conditions

As noted in Section 3.3, a Geotechnical Investigation was conducted during July of 2017. The results of the investigation concluded that the subsurface materials in the project area generally consist of gravels and clayey sands overlying weathered to fresh bedrock. The improvements proposed as part of the finaldesign plans have been designed based on the available sub-surface geologic information and recognize the limitations of boring depths and extents. The full geotechnical report, which includes recommendations for earthwork, foundations, walls, and seismic consideration, can be found in Appendix B.

8.5 Existing Flood Conditions

The flood conditions of the two channels are presented within this section. Refer to Section 7.1 for the applied methodology.

8.5.1 Rowdy Creek

The Rowdy Creek ECM model results do not match the FEMA FIS profile (Appendix D) upstream of the existing concrete weir, it is approximately 3.4 feet higher. This is likely due to the FEMA model not including adequate detail at the concrete weir structure and so the profile does not capture the backwater effects. The ECM water surface profile does match the FIS water surface profile near the Highway 101 bridge and downstream of the Dominie Creek confluence. Although there are differences between the ECM and FIS results, the ECM is accepted as the base model for comparison to proposed conditions as it was developed following standard model development procedures and includes detailed surveyed cross sections.

Based on the ECM, the 100-year flood event water surface is contained within the channel banks for all but a few sections near the Hatchery; the location where overtopping occurs does not extend far laterally as the ground level continues to rise. These results agree with the interpretation of the FEMA FIRM (Appendix D).

Figure 8-12 and **Error! Reference source not found.** present the ECM water surface profile results . See Appendix H for additional data and figures.

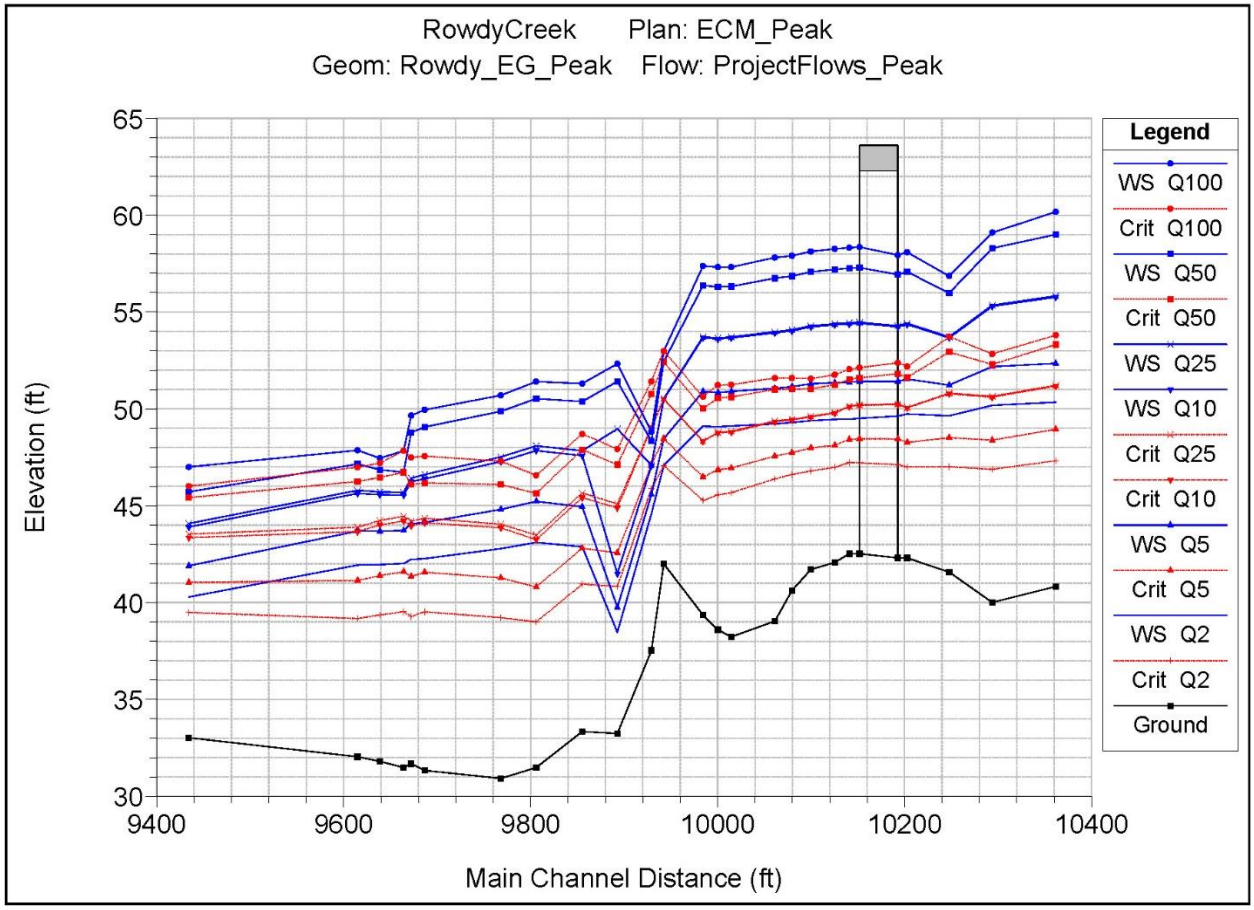


Figure 8-12. Rowdy Creek ECM peak flow water surface profile results.

8.5.2 Dominie Creek

The FIS does not include a water surface profile for Dominie Creek and so no comparison to the ECM water surface profile is possible. The ECM is accepted as the base model for comparison to proposed conditions as it was developed following standard model development procedures and includes detailed surveyed cross sections.

A profile of the Dominie Creek flood water surface profiles are presented in Figure 8-13 . Dominie Creek contains the 100-year (Q100) flood event with ample freeboard. The diversion structure at the Access Road creates a backwater, but the bridge is not overtopped. Additional data and figures are included in Appendix H. A map of the section locations is included in Appendix E.

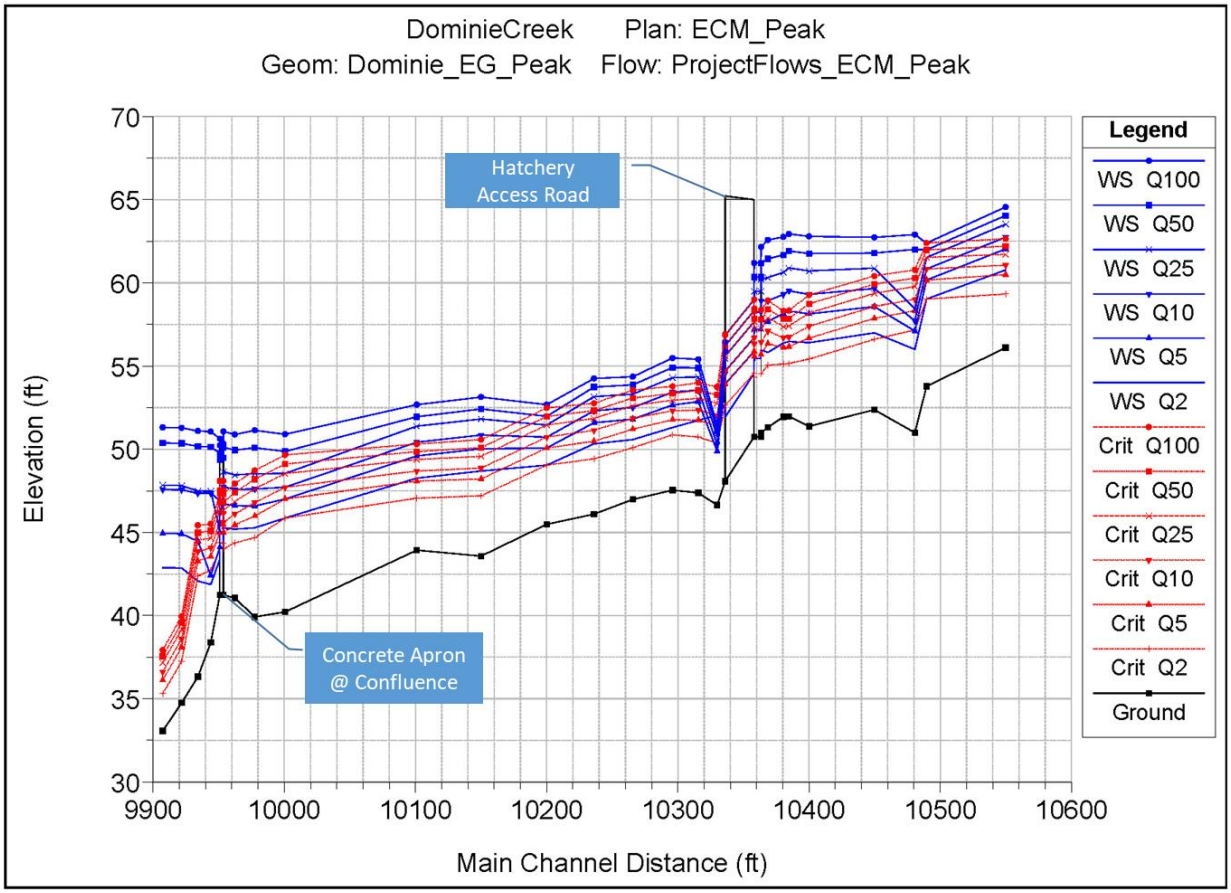


Figure 8-13. Dominie Creek Flood Analysis HEC-RAS Profile Results.

8.6 Existing Fish Passage Conditions

The existing fish passage conditions are presented in this section. Refer to Section 7.2 for the analysis and methodology applied.

8.6.1 Rowdy Creek

The primary fish passage barrier on Rowdy Creek is the concrete weir. The weir is a partial barrier to adults and a complete barrier to juveniles. Table 8-1 presents the fish passage hydraulic results at the fish passage design flows at the concrete weir. Figure 8-14 and Figure 8-15 present the water surface profiles and velocity profiles for the fish passage design flows, respectively. The design criteria was presented in Section 6. The supporting data is included in Appendix I.

At all flows, the velocity criterion is violated for all species and age classes. The drop criterion is violated at all flows except the adult anadromous high design flow. The depth criterion is violated at all low design flows.

Table 8-1 would indicate that no adults successfully navigate the weir structure, but fish do manage to pass this structure. It is likely that it is the stronger fish that are able to make it. For even strong fish, the weir likely does cause delay as fish are witnessed making several attempts prior to passing the structure.

Table 8-1. Rowdy Creek existing fish passage hydraulic results at the concrete weir. Underlined values fail to meet the design criterion.

Salmonid Species and Age Class	Design Flow* (cfs)	Hydraulic Properties at Weir		
		Max Velocity (fps)	Min Depth (ft)	Max Drop (ft)
Juvenile Salmonids	1	2.8	0.2	5.6
	396	9.7	2.2	4.2
Adult Resident	2	3.4	0.2	5.6
	698	10.3	2.2	3.5
Adult Anadromous	54	6.2	0.7	4.8
	1,384	11.9	3.0	2.2

*At the concrete weir

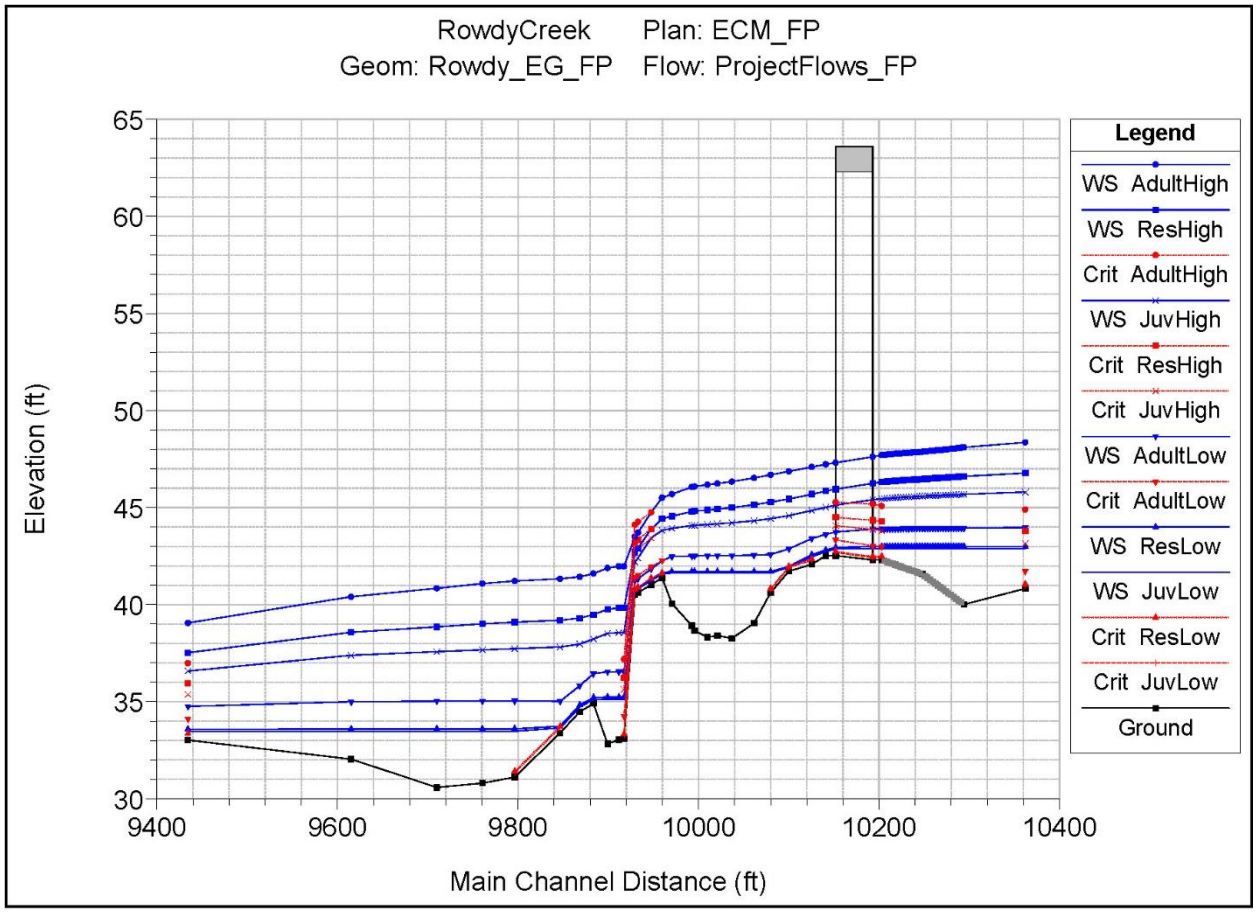


Figure 8-14. Existing conditions Rowdy Creek HEC-RAS water surface profile results for the fish passage design flows.

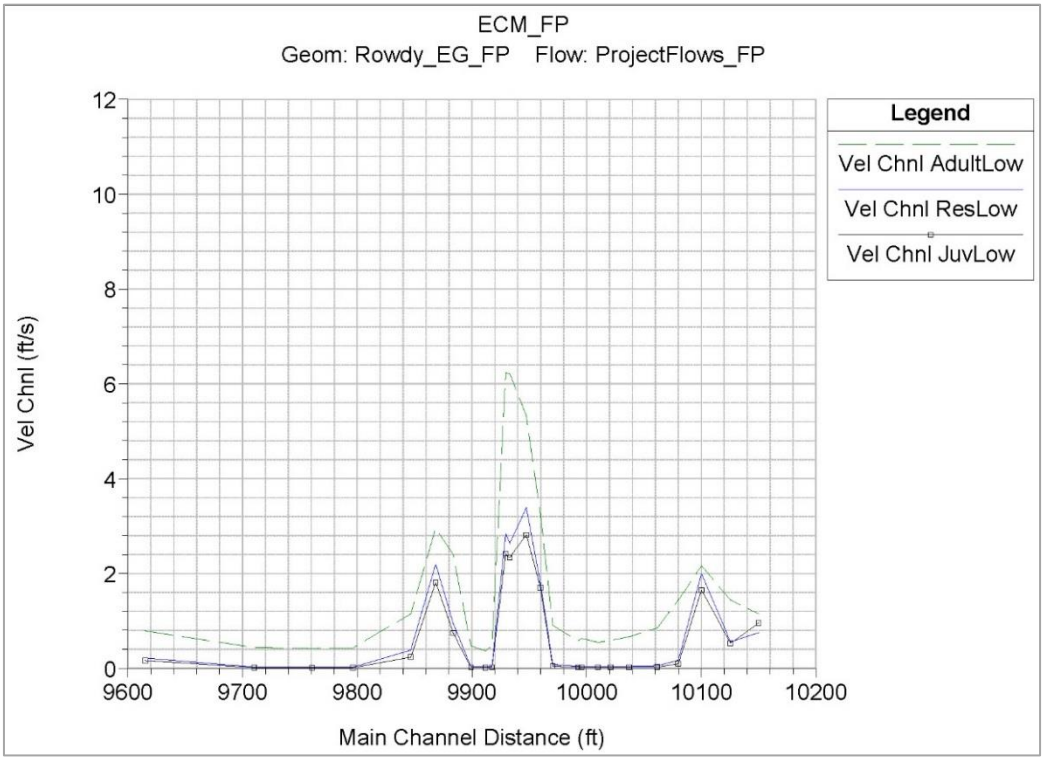


Figure 8-15. Existing conditions Rowdy Creek HEC-RAS velocity profile results for the low fish passage design flows.

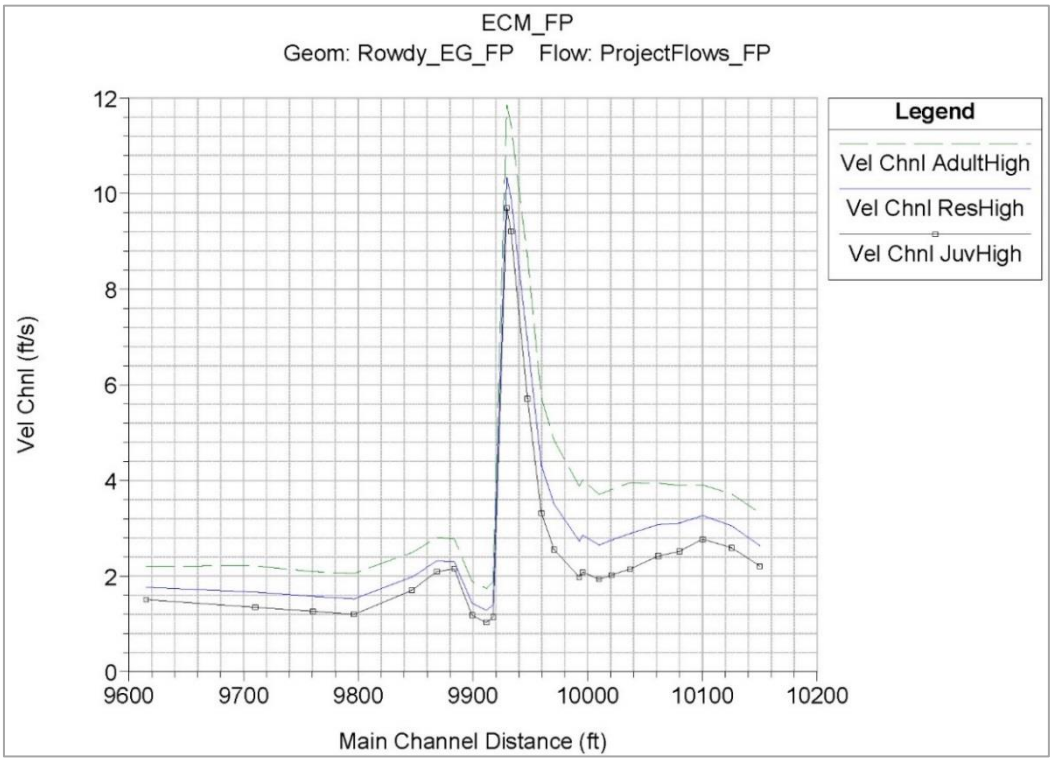


Figure 8-16. Existing conditions Rowdy Creek HEC-RAS velocity profile results for the high fish passage design flows.

8.6.2 Dominie Creek

There are two facilities on Dominie Creek that affect fish passage: the concrete apron at the confluence and the diversion structure at the access road crossing. Fish spawning studies have shown that some adults are able to navigate these two structures (Walkley and Garwood, 2017). During site visits, steelhead have been seen in the outlet pool at Highway 101 and kelts in the pool upstream of the diversion structure. Therefore, the facilities are not complete barriers to adults. Although they are not complete barriers, they are likely barriers, or at least delay migration, for some adults and are complete barriers to juveniles.

The concrete apron at the confluence is perched approximately 3 feet and flow across it is shallow and has high velocities. The fish ladder at the diversion facility has poor entrance conditions. Fish have to jump into the most downstream pool versus swimming into the first pool and that pool's depth is only 1-foot, which is less than CDFW's pool depth criterion (2 feet). The jump to the middle pool (of three) is 1 foot, which meets adult criterion (1 foot) but not juvenile criterion (0.5 feet). The pool's depth is 1.9 feet deep, which does not meet criterion. The jump to the most upstream pool is also 1 foot and this pool's depth is 2.6 feet. To exit the ladder, the fish must jump approximately a foot into the exit pool. Although the ladder does not meet all of CDFW's adult criteria, it is close enough and some fish are able to pass. Further, turbulence in this ladder has been very high during surveys, which likely causes delay for adults and a barrier to juveniles.

Downstream migrating kelts and juveniles must also utilize the ladder the move downstream as the diversion sluice gate is down most of the time. The kelts witnessed in the field hovered at the ladder's exit (upstream end) during the entire site visit. They appeared very hesitant to go over the flashboard where the flow was very shallow.

9. Proposed Project- Rowdy Creek Components

In accordance to the Project goals and objectives presented in Section 2, this section describes the proposed project components on Rowdy Creek. The following section describes the proposed project components on Dominie Creek.

9.1 Description

The following sections provide design details for the Rowdy Creek components of this fish passage improvement project. The work includes demolition of the existing concrete weir, existing concrete wedge, the existing retaining wall on river left, existing water diversion structure, and the existing fish trap facility; constructing a new roughened channel; constructing new picket fence infrastructure; constructing a new fish trap; constructing a new diversion facility; and rebuilding the channel bank on river right. The final design drawings are included in Appendix A.

9.1.1 Demolition

The demolition sheets in the final plans (Appendix A) indicate what is proposed to be demolished as part of this project. Additional details are provided below.

9.1.1.1 Existing Hatchery Weir, Adjacent Facilities, and Trap

Demolishing the existing weir and river left retaining wall can be achieved by standard construction methods and their removal is not expected to impact the remaining infrastructure. Based on available design sketches, from when the weir was constructed, it appears that the concrete wedge located on river right adjacent to the weir was added to the channel as part of that design (see Appendix F). Removal of this weir will expose and potentially undermine portions of existing walls and slopes behind the wedge. Therefore new concrete wall elements including soil anchors have been added to this area. Removal of existing infrastructure to construct the new trap will be achieved by creating a temporary cut slope in the hill adjacent to the trap.

9.1.1.2 River Right Bank Upstream of Hatchery Trap

The channel bank from the Hatchery trap to approximately the diversion well is comprised of stacked concrete rubble and other non-native materials. These materials will be difficult to connect to the new roughened channel boulder framework, and the new fish trap and diversion structures will require much of the space along this bank. Therefore, the bank will be reconstructed by laying back a temporary cut slope to accommodate the new concrete wall and rock slope protection

9.1.2 Roughened Channel

The primary design feature of this project is rebuilding the channel to overcome the existing vertical drop caused by the weir while maintaining the existing grade upstream within Rowdy Creek and Dominie Creek. The reconstruction approach is commonly referred to a roughened channel, in particular a chute and pool roughened channel, as the roughened channel includes a series of chutes and pools. Figure 9-1 presents a roughened channel constructed in Alum Rock Park, San Jose, CA. The Alum Rock channel has an overall channel slope of 4% with 6% chutes and horizontal pools. The proposed channel for Rowdy Creek will share characteristics with the Alum

Rock design but Rowdy Creek's design has varying chute slopes and a less steep overall slope. The Rowdy Creek channel is also wider than the Alum Rock Park channel. The Rowdy Creek roughened channel design is presented in the following sections.

Figure 9-1. A chute and pool roughened channel in Alum Rock Park, San Jose, CA following completion of construction.

9.1.2.1 Design Criteria and Guidelines

The design criteria and guidelines applied to the roughened channel design were presented in Section 6, Table 6-1.

9.1.2.2 Channel Geometry

Referring to the drawings included in Appendix A, there are a series of 5 chutes and 5 pools comprising the proposed roughened channel. Pools 1 through 4 and Chutes 1 through 3 are channel spanning. Chutes 4 and 5 and Pool 5 have two separate flow paths, separated by a long boulder structure referred to as the "channel spine." The channel spine mimics and provides a continuation of the existing bar downstream of the Highway 101 pier.

The region of the channel upstream of Pool 4 is referred to as the upper reach and Pool 4 and below is referred to as the lower reach. The upper reach has a split channel for three main reasons: low flow concentration, scour, and structural support.

The newly constructed diversion structure (Section 9.1.5) will be located on the bank of Pool 5RR (RR stands for river-right). Under low flow conditions, its important that all flow goes preferentially towards this pool. To help facilitate this, the thalweg at the top of Chute 5RR is set 0.5 feet below the thalweg at the top of Chute 5RL (RL stands for river-left) (Figure 9-2). Therefore, half a foot of water will be entering Chute 5RR before any flow enters Chute 5RL.

As flows increase, Chute 5RR will continue to receive more flow than Chute 5RL. This is also due to the bend in the channel. This additional flow will help scour Pool 5RR to maintain the pool in front of the diversion screen structure.

Lastly, the channel is separated to help support of the channel material structurally. The channel is wide and the top and bottom of the chutes are vulnerable to erosion. Chute structure boulders, referred to as “rock bands,” need to connect to the channel banks for stability. Because the channel is wide, there is an increased potential for a rock band boulder to move out of place and threaten the stability of the chute and potentially the channel. The channel spine will provide a mid-channel point to connect the rock bands to, which increases the structural support for the channel and therefore increases the security of the channel.

Figure 9-2 presents the design profiles indicating the slope of each chute. Chutes 1 has a slope of 4% with a 3.4-foot drop across the chute. Chutes 2, and 3 all have a slope of 4% with a 2-foot drop across the chutes. Chutes 4RL and 4RR have 4% slopes with a 1.5-foot drop across the chutes. Chutes 5RR and 5RL have 3% slopes with a 1.5-foot drop across the chutes. The new channel is approximately 331 feet long, overcomes 7 vertical feet, and has an overall average slope of 2.1%.

The picket fence is set at an angle across the channel within Pool 4. This is the help move fish towards the trap entrance, when operating. For this reason, the Chute 4RL is moved downstream slightly when compared to Chute 4RR. This is to help scour the picket fence on this side of the channel.

At the top and bottom of each chute is a rock band structure which forms the bounds of a constructed pool. The thalweg elevation at the toe of one chute and the crest of the next downstream chute are the same and so the pool has a horizontal slope. The residual depth in each constructed pool is 2 feet except Pool 4, which has a residual depth of 3 feet and Pool 5RR, which has a residual depth of 2.5 feet. Pool 1’s is not a constructed pool (its downstream boundary is native bedrock) but has a residual depth of 1.8 feet.

The cross-sectional shape of the channel varies. The drawings in Appendix A include four typical sections: upper reach chute, Pool 5, lower channel chute, and lower reach chute. As described above, the upper reach is divided by the channel spine into two sub-chutes. Each side has a 7H:1V (horizontal to vertical) slope, which forms a low flow channel. The low flow channel concentrates flow to improve fish passage conditions.

The lower chutes differ from the upper reach chutes in that there is only one low flow channel. The full channel width extends to the existing rock slope protection (rsp) on river right and to new bankline rock on river left. Much of the lower reach is perched, meaning that the new channel bed elevation is greater than the existing bed elevation. Constructing a channel under these conditions can be challenging as there is a high potential for flow to go subsurface. During construction, it will be critical that the channel be correctly sealed through adequate compaction and jetting methods prior to completion. To accomplish this, the contract documents include specifically language

describing that the contractor must show that the water remains flowing on the surface for each lift; in total there will be three lifts.

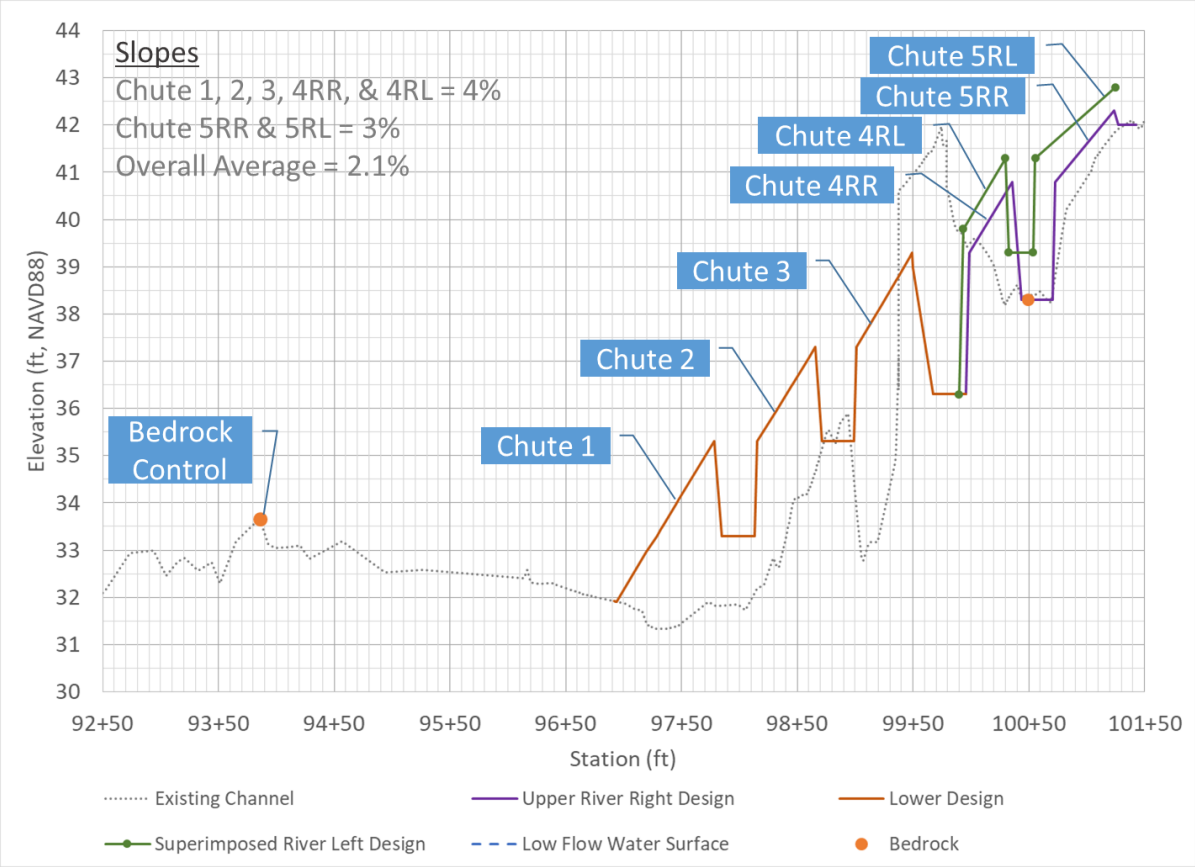


Figure 9-2. Rowdy Creek design profiles.

9.1.2.3 Engineered Streambed Material

The roughened channel is comprised of engineered streambed material (ESM). The methodology used to determine the gradation of the ESM was presented in Section 7.4. The results are presented in Table 9-1. The methodology applied resulted in $D_{100\text{-}ESM}$ having a 9.6-foot diameter. Experience has found that the methodology often over-sizes $D_{100\text{-}ESM}$. A $D_{100\text{-}ESM}/D_{84\text{-}ESM}$ ratio between 1.5 at 2.0 has been found to provide a more practical rock size for the largest rock in the gradation while still providing sufficient ESM stability. For this project, a ratio of 1.5 was applied, which results in a 6.0-foot $D_{100\text{-}ESM}$.

Table 9-1. Rowdy Creek ESM rock gradation by percentile and rock diameter.

Rock Designation	Percentile	Diameter
$D_{100\text{-}ESM}$	100	6.0 ft*
$D_{84\text{-}ESM}$	84	3.7 ft
$D_{50\text{-}ESM}$	50	1.5 ft
$D_{16\text{-}ESM}$	16	0.6 inch
$D_{8\text{-}ESM}$	8	<2 mm

* The result of Equation 3 was 9.4 feet but was reduced, see text for reasoning.

Although the Table 9-1 results are valuable, a contractor may have difficulty understanding how to create the correct ratios of material. Therefore, the ESM gradation is often further divided into rock groups and instead of providing a single rock diameter, a range is provided. For this project, the ESM has been divided into 10 groups, Rock Groups A – J. These groups are further separated by where they are placed in the channel. Some rock will be placed in rock bands and the others will be placed between rock bands. The rock included in a rock band, Groups A and B, are presented in Table 9-2. The ESM material to be placed between the rock bands is presented in Table 9-3. There are two other rock features included as part of this project, channel spine rock and bankline rock. Both will be discussed separately below and they do not count with respect to the ESM percentages.

Rock bands provide the structure of the roughened channel. They are constructed at each end of a chute and maintain the chute's grade. They are constructed using the largest of the ESM mixture ($\geq D_{84\text{-}ESM}$). The Group B rock is used to provide a stable platform for the Group A rock. The rock bands have an arched shape where the most upstream rock is located near the center of the chute. This allows the rocks to work together, creating a robust structure.

Table 9-2. Rock groups for rock bands by volume percent of mix and range of rock diameter sizes.

Rock Group	Volume Percent of ESM Mix	Rock Intermediate Diameter Range	
		Low	High
A	8	5.5 ft	6.0 ft
B	8	4.6 ft	5.5 ft

Table 9-3. Rock groups for ESM between rock bands by volume percent of mix and range of rock diameter.

Rock Group	Volume Percent of ESM Mix	Rock Intermediate Diameter Range (in)	
		Low	High
C	20	45	55
D	20	31	45
E	10	18	31
F	10	13	18
G	10	5.7	13
H	10	0.6	5.7
I	10	#10 Sieve	0.6
J	10	< #10 Sieve	

The material placed between the rock bands (including within the pools) has smaller diameter than the material placed in the rock bands (≤ $D_{84\text{-}ESM}$). This mixture of rock is placed in lifts and each lift is sealed to prevent water from flowing subsurface. Some larger rock protrudes through the lifts to provide structure. The objective is to place the final lift so the bed is rough and has large rock protruding a third of its diameter above the channel bed. This roughness decreases the flow velocity, increases the flow depth, and creates varied flow paths.

9.1.2.4 Channel Spine

The channel spine rock will be comprised of rock from Groups C and D with filler material from Groups G – J. Refer to construction drawings for percentage breakdown.

9.1.2.5 Bankline Rock

Bankline rock is rock that is placed along the edge of the channel, along the bank. It is placed to help protect the banks and to keep the flow within the roughened channel. The bankline rock will be

½ ton class rock.. The ½ ton class rock will leave large voids. The voids be filled using Rock Groups G – J. The voids are planted with willow stakes prior to being filled.

9.1.3 Picket Fence

The picket fence details are presented in this section. The purpose of the picket fence is to create a barrier to fish at selected times for Hatchery collection activities.

9.1.3.1 Design Criteria and Guidelines

NMFS (2011) provides criteria and guidelines for picket fence barrier design. The criteria utilized to design the proposed picket are presented in Table 9-4.

Table 9-4. Regulatory agency picket barrier criteria and guidelines utilized for this project.

Fish Passage Criteria/Guidelines		Value
Picket Barrier Opening	Juvenile & Adults	≤1 inch
Picket Barrier Through Velocity	Juvenile & Adults	≤1.25 fps or half the velocity of adjacent passage routes[1]
Picket Barrier Head Differential	Juvenile & Adults	≤0.3 feet
Picket Barrier Minimum Freeboard[2]	Juvenile & Adults	2 feet
Picket Barrier Porosity	Juvenile & Adults	≥40% open area

1. Whichever is lower
2. At high fish passage design flow

9.1.3.2 Layout

The drawings included in Appendix A show the location and orientation of the proposed picket fence. The picket fence is located in Pool 4. The picket fence is set a skew to the flow. This is to help direct fish towards the fish trap. The picket fence will have multiple sections. Therefore, the operator may only need to raise the section closest to the trap while leaving the remaining section(s) down. This will depend on whether the Hatchery is meeting their broodstock program targets. Based on conversations with picket system manufacturers, the angle of the raised pickets is approximately 60 degrees, but can vary. Therefore, the final length of the pickets won't be known until construction but assuming a raised angle of 60 degrees and following regulatory freeboard requirements under high operation conditions (discussed below), the pickets will be approximately 9.25 feet long.

The picket fence will lay approximately flat when not in use to provide fish volitional passage. If the Hatchery were to cease operation, the picket fence could be removed and only the concrete slab will remain, which will have no impact on fish passage conditions.

The concrete slab foundation is 10 feet wide and extends the length of the pool. A cutoff wall extending to bedrock will be placed on the upstream end, and a conditional cutoff wall (based on a

minimum depth criterion), will be placed on the downstream end. The slab will be constructed to prevent movement of the foundation from hydraulic forces when the gate it fully open (in a raised position).

9.1.3.3 Hydraulics

The methods applied to analyze the picket fence hydraulics is presented in Section 7.3. The results are presented in Table 9-5. The picket open area ranged from 40% to 67% with 1 inch openings between the picket bars. The width of the picket bars ranged from 1.5 inches to 0.5 inches. For this Project, an open area of 50% was selected which results in an upper picket fence operation flow of 236.7 cfs. This flow also meets the freeboard criterion (2 feet). This flow and resulting hydraulic properties were used as the basis for the trap and auxiliary water system design, which are presented in Section 9.1.4.

It is recommended that the end of the picket fence (and possibly additional spaces along the fence) remain free of pickets to offer fish upstream of the picket fence a place to move downstream of the pickets. The velocity reported in Table 9-5 is the velocity through the picket fence, the velocity upstream of the picket fence at the high design flow is approximately 0.6 fps.

Table 9-5. Upper operational flows for differing picket open areas meeting NMFS (2011) through velocity criterion of 1.25 fps. A picket open area of 50% (bold) was selected for the proposed project.

Picket Open Area	Bar Width (in)	Bar O.C. Spacing (in)	Water Depth (ft)	Flow Area (ft^2)	Reduced Area (ft^2)	Flow (cfs)	Through Velocity (fps)
40%	1.5	2.5	5.1	366.5	146.6	183.2	1.25
50%	**1.0**	**2.0**	**5.3**	**378.7**	**189.4**	**236.7**	**1.25**
57%	0.7	1.7	5.4	388.1	221.8	277.2	1.25
67%	0.5	1.5	5.5	398.9	265.9	332.4	1.25

9.1.4 Fish Trap

The existing fish trap facility will be demolished as part of the project and a new one constructed (Appendix A). The objective of the trap is to collect fish while minimize handling of fish not intended for the Hatchery broodstock program and to return them safely to the channel upstream of the picket fence while allowing the Hatchery to meet their collection goals. The trap facility includes an entrance fishway, auxiliary water source, energy dissipation chamber, holding pool, fish return flume and gate, and a fish return channel. The following sections present the trap design details.

9.1.4.1 Design Criteria and Guidelines

NMFS (2011) provides criteria and guidelines for fish trap design. The criteria utilized to design the proposed trap facilities are presented in Table 9-6 and Table 9-7 for pool and weir fishways and traps, respectively.

Table 9-6. Regulatory agency pool and weir fishway criteria and guidelines utilized for this project.

Fish Passage Criteria/Guidelines		Value
Maximum drop over weir	Adult	1.0 feet
Minimum Depth over Weir Crest	Adult	1.0 feet
Maximum Fishway Slope	Adult	10%
Minimum Pool Depth	Adult	2.0 feet
Wall Freeboard	Adult	3.0 feet
Max Energy Dissipation Factor (EDF)	Adult	4.0 ft-lb/s/ft^3

Table 9-7. Regulatory agency fish trap criteria and guidelines utilized for this project.

Fish Passage Criteria/Guidelines		Value
Water Temperature, Oxygen Content, and pH.	Adults	Same as the Creek
Vertical Diffuser Maximum Velocity	Adults	1 fps
Fish Removal from Trap	Adults	At Least Daily
Trap Volume	Adults	0.25 ft^3 per pound of fish trapped
Minimum Water Supply	Adults	0.67 gpm[1]
Minimize Jumping from Holding Pool	Adults	5 feet freeboard, darkened environment, netting, or sprinklers
Crowder Bar Spacing	Adults	7/8 inch
Crowder Maximum Side Gap	Adults	1 inch
Trapping Mechanism Maximum Bar Spacing	Adults	1 inch
Holding Pool Egress Minimum Opening Area	Adults	3 ft^2
Distribution Flume Minimum Width (or diameter) and Depth	Adults	15 inches and 24 inches

1. gallons per minute

9.1.4.2 Entrance Channel with Pool and Weir Fishway

When the picket fence is raised, fish will move towards the trap entrance channel. The entrance channel includes a pool and weir fishway, which leads to the fish holding pool. The dimensions of the entrance channel and pool and weir fishway are presented in Table 9-8. The dimensions

presented in Table 9-8 meet the criteria presented in Table 9-6. The resulting hydraulics are presented in the *Fish Trap Facility Hydraulics* section below.

Table 9-8. Trap entrance channel and pool and weir fishway dimensions.

Description	Value
Entrance Channel Width	3 feet
Entrance Channel Length	~17 feet
Weir Width	1.5 feet
Drop Over Weir	0.5 feet
Weir Spacing	7.5 feet
Fishway Slope	6.7%
Number of Weirs	2
Pool Depth	3 feet

9.1.4.3 Auxiliary Water System

An auxiliary water system (AWS) will provide flow to the trap holding pool via an 12 inch pipe and energy dissipation chamber. The pipe draws water from the diversion facility structure (Section 9.1.5). A slide gate will be used to control flow into the pipe.

Pipe flow will discharge into an energy dissipation chamber (EDC) prior to flowing into the holding pool via a vertical floor diffuser. The EDC will be covered with grating and will serve as a platform for Hatchery staff to collect fish from the trap holding area. The resulting hydraulics are presented in the Fish Trap Facility Hydraulics section below.

9.1.4.4 Holding Pool

Fish will enter the holding pool via the pool and weir fishway after passing through the trapping mechanism. The trapping mechanism follows NMFS (2011) criteria and guidelines and will be a vee-trap constructed of stainless steel pipe. The trapping mechanism will be a total of 5 feet high to help prevent jumping injury, and will have a 1-foot throat to help prevent fish exiting the trap. On the inside of the trap (within the holding pool), there will be two stainless steel channels were a gate panel can be inserted once the trap is full and Hatchery staff want to begin removing fish.

The holding pool is 8 feet long and 3 feet wide and therefore the floor diffuser below the trap has an area of 24 square feet. The depth within the trap varies based on trap flow and therefore the volume of the holding pool varies. Using the NMFS (2011) 0.25 ft^3 per pound of fish and an average fish weight of 11.2 lbs, which is an average of the average weights for Chinook and coho salmon and steelhead (USFS, 2017), results in a trap capacity of approximately 10 fish before the trap must be closed and cleared.

The wall around the trap, and the fish trap itself will provide sufficient freeboard to minimize the risk of jumping injury for fish once in the holding pool. There is however the wall which separates the holding pool from the energy dissipation chamber, which only provides approximately 1-foot of freeboard (which is so Hatchery staff can lean over the center wall and work with the fish). To

minimize jumping risk along this wall, a netting panel with a wooden frame will be used that can lay on top of the trap. There will be a total of two panels, which can be installed or removed individually, each measuring 4' x 4'.

9.1.4.5 Fish Crowder

At the 30% design phase, the initial intent was to develop the design of a fish crowder system, designed to NMFS guidelines. However, upon further development of the facility design, it has been determined that a crowder system may not be necessary for regular operations. The trap holding pool is relatively narrow, and it may turn out that working in the area is quite similar to how Hatchery Staff currently remove fish from the existing holding area. Additionally, the design team felt that a crowder system, if one was necessary, would likely be more usefully developed once the facility was constructed, and staff had ideas of what would work, and where the want the concentration points within the holding pool to be.

9.1.4.6 Fish Trap Flume and Gate

The design drawings in Appendix A present both a gate and a flume for moving fish not to be collected for the Hatchery broodstock program from the holding pool to the return channel and then ultimately back to Rowdy Creek. One objective of this project is to minimize handling of these fish. Therefore, the gate is included so that the fish are not handled but it may not always be possible to operate the gate; the gate may malfunction or be buried in sediment or the hydraulics, especially at high flow operations, may not be favorable. When the gate is not operable, fish will be collected by trained personnel and lifted up to and placed within the return flume. The flume will need to be wetted during release, which can be accomplished by installing a small submersible pump and nozzle system that pulls water from the energy dissipation chamber. To accommodate the submersible pump, an exterior electrical outlet has been placed on the top of the wall near the energy dissipation chamber. Once the operator places the fish in the flume, the fish will slide down the flume and enter the return channel. The flume is approximately 8 feet long. The flume's cross sectional geometry has been sized to meet minimum NOAA criteria, which is 15" wide and 24" high, and will be smooth to minimize fish injury potential.

When the gate is used, fish will be attracted towards the opening by the flow through the gate. Once all the fish have exited the holding pool, the gate can be closed. Should the attraction flow prove ineffective at guiding the fish out of the holding pool, hatchery staff could guide them out with a typical net, or, as noted earlier a fish crowder could be developed.

9.1.4.7 Fish Return Channel

The fish return channel connects Pool 5RR to the trap. Fish not collected by the Hatchery, but do enter the trap, will be released to the return channel, either via the trap exit gate or flume. The return channel is approximately 37.5 feet long and 5 feet wide. There are three gates that allow water to enter/exit the return channel. The most upstream gate allows flow from Pool 5 to enter the return channel via a 2-foot wide by 4-foot tall opening that is flush with the return channel floor elevation, 40.3 feet. Flow into the return channel will be controlled by a vertical slot panel based on flow calculations developed by Rajaratnam (1986). The vertical slot panel will be constructed of metal and attached to the return channel walls. The panel will include a 1.0-foot opening in the center but will otherwise be solid. This will force all of the flow through the slot. In total there are

three vertical panel slots, spaced 10 feet apart beginning downstream at Trap Alignment STA 43+00, with identical dimensions. As flow moves through each slot, there will be a headloss. This will permit a larger operational range of the trap exit gate as there will be less head differential under high flow operations.

For water to flow into the return channel, another gate will need to be opened, either the trap exit gate or the downstream return channel spill gate. The downstream return channel spill gate is 2-foot wide by 4-foot high with an invert elevation at the return channel floor, elevation 40.3 feet. This gate may be used at any time but will likely be used for higher flow fish trap operations as the trap gate will be preferred during low flow operations. The return channel spill gate could will also be used to flush sediment from the return channel. The trap exit gate opening is 1.5 feet wide by 3.0 feet high with an invert elevation of 40.3 feet. All gate openings will include exterior mounted guides for installing flashboards. This provides operational flexibility as well as a means to close a gate should it fail while in the raised position. The return channel hydraulics are presented in the following section.

9.1.4.8 Fish Trap Facility Hydraulics

The fish trap facility will be operational over a range of Rowdy Creek flows to remain within the criteria presented in this Report. Any deviation from the criteria will be discussed. The operational range is presented in Table 9-13. The low operational flow is at 26 cfs and the high operational flow is 237 cfs. The low operational flow's limiting factor was the depth over the weir crest (discussed below) and the anticipation of fish movement; the adult low fish passage design flow is 54 cfs. Although fish may be moving at flows lower than 54 or 40 cfs, the number moving at this flow is assumed to be small. The high operational flow's limiting factor is the velocity at the picket fence, which was discussed in Section 9.1.3.

Table 9-9. Rowdy Creek Hatchery Trap Facility Operational Range.

Operational Flow	Value	Limiting Factor
Low	26 cfs	Depth over weir crest, anticipated fish movement
High	271cfs	Picket fence velocity

A summary of the hydraulic conditions at the low and high operational flows are presented in Table 9-10. Supporting data is included in Appendix J. The results presented in Table 9-10 all meet the criteria presented in this Report with the exception of the depth over the weirs. NMFS (2011) criterion for the depth is 1.0-foot. A variance will be required from the agency for this facility. Although below the criterion, the depth should not create a fish passage barrier or pose a risk to the fish.

Table 9-10 presents the low and high operations for when the Trap Exit and Upstream Return Gate are open (the downstream return spill gate is closed). When both are open, there is flow entering the trap holding area from two sources. It is likely that the flow from the AWS will decrease from what is shown once flow from the return channel enters as the head within the trap will increase so

the values shown in Table 9-10 should be viewed as bounds. It is recommended that the operator will decrease the AWS flow, especially at higher flows, once the Trap Exit Gate has been opened. This will create more stable hydraulics. Should the hydraulics create unwanted affects within the holding pool, it is recommended that the Return Channel Spill Gate be opened in conjunction with the Trap Exit Gate or instead of it. In the event of the latter, then the Trap Flume will need to be utilized to transfer fish from the trap to the return channel.

Table 9-10. Rowdy Creek Hatchery Trap Facility's hydraulic conditions at the low and high operational flows.

Operation	Rowdy Creek Flow (cfs)	Trap & Return Gate Open?	Auxiliary Water System Flow (cfs)	Entrance Channel Conditions				Trap	Return Channel
				Downstream Velocity (fps)	Upstream Velocity (fps)	Fishway		Floor Diffuser Velocity (fps)	Flow (cfs)
						Min Weir Depth (ft)	EDF (ft-lb/s/ft3)		
Low operation	26	No	1.7	0.2	0.2	0.5	0.7	0.1	NA
		Yes		0.3	0.4	0.7	1.2	0.1	1.1
High Operation	271	No	5.9	0.5	0.7	0.8	NA[1]	0.5	NA
		Yes		0.8	1.3	0.8	NA[1]	0.5	4.5

1. Flow not plunging, backwatered from Chute 3 crest.

9.1.5 Diversion Facility

A new diversion facility will be constructed for use by the Hatchery. The following sections describe the design of this facility.

9.1.5.1 Design Criteria and Guidelines

NMFS and CDFW have criteria and guidelines for fish screening facilities. Table 9-11 presents the values used for this project.

Table 9-11. Regulatory agency fish screen criteria and guidelines utilized for this project.

Fish Passage Criteria/Guidelines		Value
Active[1] Screen Approach Velocity	Juvenile & Adults	≤0.33 fps
Passive[2] Screen Approach Velocity	Juvenile & Adults	≤0.2 fps
Screen Sweeping Velocity	Juvenile & Adults	>Approach Velocity[3] or 2x Approach Velocity[4]

1. Self-cleaning screen system 2. Non-self-cleaning screen system 3. NMFS (2011) 4. CDFG (2010)

9.1.5.2 Description

The diversion facility is located on the banks of Pool 5RR. The facility will be a concrete stilling well outfitted with a diversion screen and baffle, pump and piping system. The facility is designed to include an active cleaning system, meaning there is an automatic screen brush system.

The total screen length is 9 feet and the height is 4 feet, accomplished by using two 4.5-foot wide screens. The total effective screen area is 36 ft^2. The screen will be constructed of stainless steel profile or wedge wire, with spacing conforming to NMFS criteria and oriented horizontally to accommodate the brush cleaning system. The screens will be mounted to tubesteel frames, which will slide into steel channels mounted at the face of the structure along the creek. On top of the screen, wooden stop logs will be placed up to the elevation of the top of the concrete structure to prevent high flows from overtopping the screens. Having the screens mounted in the channels in this fashion will also allow hatchery staff to pull the screens and install stop logs should the well need to be dewatered or maintained.

Directly behind the screens will be stationary perforated baffle plates. These plates will help to redistribute the flow velocity coming through the screens when pumping and AWS demands are occurring, which should minimize 'hot spots' (localized areas of high velocity) on the screen. The perforations on the plate will be 3" diameter, spaced 6" on center in all directions. The plates will be installed in steel channels similar to the fish screens.

The fish screen cleaning system will be mounted to the top of the diversion structure, with a boom arm that extends down to the screens and brushes longitudinally with stream flow. The cleaning system will be operated using headloss across the screens, measured using two pressure transducers (one on each side of the diversion structure). The setpoint at which the screen brush actuates will be dynamic, and can be changed based on the time of year or Hatchery staff preference.

Based on discussions with Hatchery staff, the maximum permissible diversion (water right) for the Hatchery is 6 cfs. However, current Hatchery plumbing systems can only safely accommodate approximately 4 cfs. Therefore, the proposed Project diversion pumping system has been designed to provide the maximum diversion potential that the Hatchery's current facility can accommodate (4 cfs), while allowing for expansion in the future for the full 6 cfs diversion. This will be accomplished by two 15 Hp variable frequency drive (VFD)-operated submersible pumps, located within the diversion structure behind the fish screens. Each pump is sized for a maximum flow rate of approximately 2 cfs, and using the VFD the pump can be ramped down to a flow rate of approximately 300 gpm to pump to the storage tank. This gives the current facility the ability to operate under a wide range of flows, and if one pump were to go offline, the second would be able to meet minimum demands independently. The space, mounting rails, and plumbing will be installed in this project to accomated a third pump, should the Hatchery upgrade its plumbing system in the future. At that time, using all three pumps in parallel would provide the total 6 cfs flow. It should also be noted that the installation of a third pump would also likely require an upgrade to the electrical service drop used for the electrical control building (discussed below). This issue, similar to the plumbing, would need to be addressed prior to operating all three pumps in parallel.

The auxiliary water system (AWS) will also allow water to be passively drawn from the diversion structure. The AWS will operate up to 6 cfs, therefore, the maximum water passing through the fish screen would be 12 cfs.

9.1.5.3 Hydraulics

Table 9-12 presents the hydraulic results for the proposed fish screen on the diversion structure. The diversion flow assumes that the Hatchery is only diverting 10% of the Rowdy Creek flow or a maximum of 6 cfs, whichever is less. The trap flow values are based on the AWS hydraulic modeling results (Section 9.1.4.3).

At the high trap operational flow (271 cfs) the total flow is 11.9 cfs. At this flow, the approach velocity at the diversion screen is 0.33 fps, which equals the regulatory criterion value (Table 9-11). For all other flows analyzed, the approach velocity was less than 0.33 fps. Regulatory agencies state that the sweeping velocity be greater than the approach velocity (NMFS, 2011) or twice the approach velocity (CDFW, 2010). These are not satisfied at the 40 and 54 cfs flows. A variance from the agencies will be required.

Table 9-12. Hydraulic results for the proposed diversion screen on Rowdy Creek.

Channel Flow (cfs)	Diversion Flow[1] (cfs)	AWS Flow (cfs)	Total Flow (cfs)	Pool 5 WSE Elev (ft)	Effective Screen Depth (ft)	Chnl/ Sweep Velocity (fps)	Approach Velocity (fps)	Sweep Greater than Approach?
1	0.1	0.0	0.1	42.7	2.4	0.01	0.00	Yes
26[2]	2.6	1.7	4.3	42.2	2.4	0.1	0.20	No
54[3]	5.4	3.3	8.7	42.6	2.8	0.2	0.33	No
271[4]	6.0	5.9	11.9	44.2	4.0	0.8	0.33	Yes
1384[5]	6.0	0.0	6.0	46.5	4.0	2.4	0.17	Yes

1. Assumes that the Hatchery only withdraws 10% of the Rowdy Creek flow.
2. Trap low operational flow 3. Low adult flow 4. Trap high operational flow 5. High adult flow

9.1.6 Electrical Control Building

Several of the components discussed above will require electrical connections and an area to house operating equipment such as controllers, motors, and compressors. The current facility does not have adequate space to accommodate these features, therefore, a new control building is proposed as part of the Project. The building is proposed near the Hatchery's trough building, in between the Dominie Creek fishway and the Rowdy Creek fish trap. The building will be a prefabricated fiberglass structure on a cast in place concrete pad, and will house all of the new pumping, picket fence, fish screen brush and all miscellaneous electrical components. Power for the building will come from the service panel located within the existing trough building.

9.1.7 Fish Monitoring

The Hatchery and TDN have expressed interest in incorporating a pit tag array, or other fish monitoring system, to help inform current and future Hatchery operations. No specific monitoring system or installation method has been shown in the final design plans as the Hatchery/TDN desired monitoring methods associated with the Project have not yet been defined. The system could be installed either with antennaes incorporated into the new picket fence concrete apron, or with antennas located along either bank of the channel. Should TDN elect in the future to install the system as part of the project, the plans would need to be udated appropriately to include the type of installation desired. If the project were to be constructed without including the pit tag array as a part of the work, the only installation option would be to install the system on either bank of the channel.

It should be noted that accommodations for no other monitoring systems have been included in the final design plans. Should TDN elect in the future to include another style of monitoring system into the design prior to construction, potential changes in the final construction plans may be required to accommodate whatever system is selected.

9.2 Anticipated Geomorphic Response

Geomorphic response is defined as a change in the channel/creek geometry resulting from up- or downstream geomorphic processes. Very little geomorphic response is expected upstream and downstream of the roughened channel on Rowdy Creek. The top of Chute 5RR and 5RL are at elevations slightly greater than the existing channel elevation, and therefore will help maintain the upstream channel bed elevation.

9.3 Anticipated Fish Passage Performance

The anticipated fish passage performance for the proposed Rowdy Creek improvements are presented in this section. The methodologies followed were presented in Section 7.2. Appendix K includes supporting information. Section 7.2.3 presented the methodology used to determine the channel roughness for fish passage design flows. The methodology first requires that the D84-ESM rock size be determined, which was presented in Table 9-1. Appendix K includes results for the vertically varied Manning's roughness coefficient used in the models.

The HEC-RAS proposed fish passage model results and results based on the Mussetter (1989) equations are summarized in Table 9-13. The HEC-RAS water surface profile for the fish passage design flows are presented in Figure 9-3. Some of the results presented in Table 9-13 do not meet the design criteria. This is not uncommon for these modeling approaches as they represent averages. In reality, a roughened channel comprises many flow paths with varying depths and velocities.

With respect to turbulence, the Mussetter equations often exceed the criterion (only an adult anadromous criterion has been established, 7 ft-lbs/s/ft3, but any value greater than this was underlined in Table 9-13). The Washington Department of Fish and Wildlife (WDFW, 2013) citing work done by Tappel (2010) argue that a criterion threshold of 7 ft-lbs/s/ft3 is too low. They have found favorable passage conditions at 10 ft-lbs/s/ft3 for 4% sloped channels and up to 18 ft-lbs/s/ft3 for 6% sloped channels.

Table 9-13. Rowdy Creek maximum velocity and minimum depth for fish passage design flows. Underlined values indicate the design criterion was not met.

Salmonid Species and Age Class	Design Flow[1] (cfs)	HEC-RAS Results		Muessetter's (1989) Equations		
		Max Velocity (fps)	Min Depth (ft)	4% Chute Velocity (fps)	4% Chute Depth (ft)	4% Chute EDF (ft-lbs /s/ft^3)
Juvenile Salmonids	1/1	2.1	0.2	0.3	0.5	0.7
	396/ 446	3.1	3.0	2.9	4.1	7.3
Adult Resident	2/2	2.4	0.3	0.4	0.6	0.9
	698/ 786	4.3	3.9	3.7	5.2	9.2[2]
Adult Anadro-mous	54/60	4.0	1.1	1.1	2.0	7.3[2]
	1,384/ 1,559	5.0	5.3	4.8	6.9	11.9[2]

1. Upstream of Dominie Creek/Downstream of Dominie Creek
2. WDFW (2013) argues that 7 ft-lbs/s/ft^3 threshold is too low and that it should be 10 ft-lbs/s/ft^3 for 4% slope

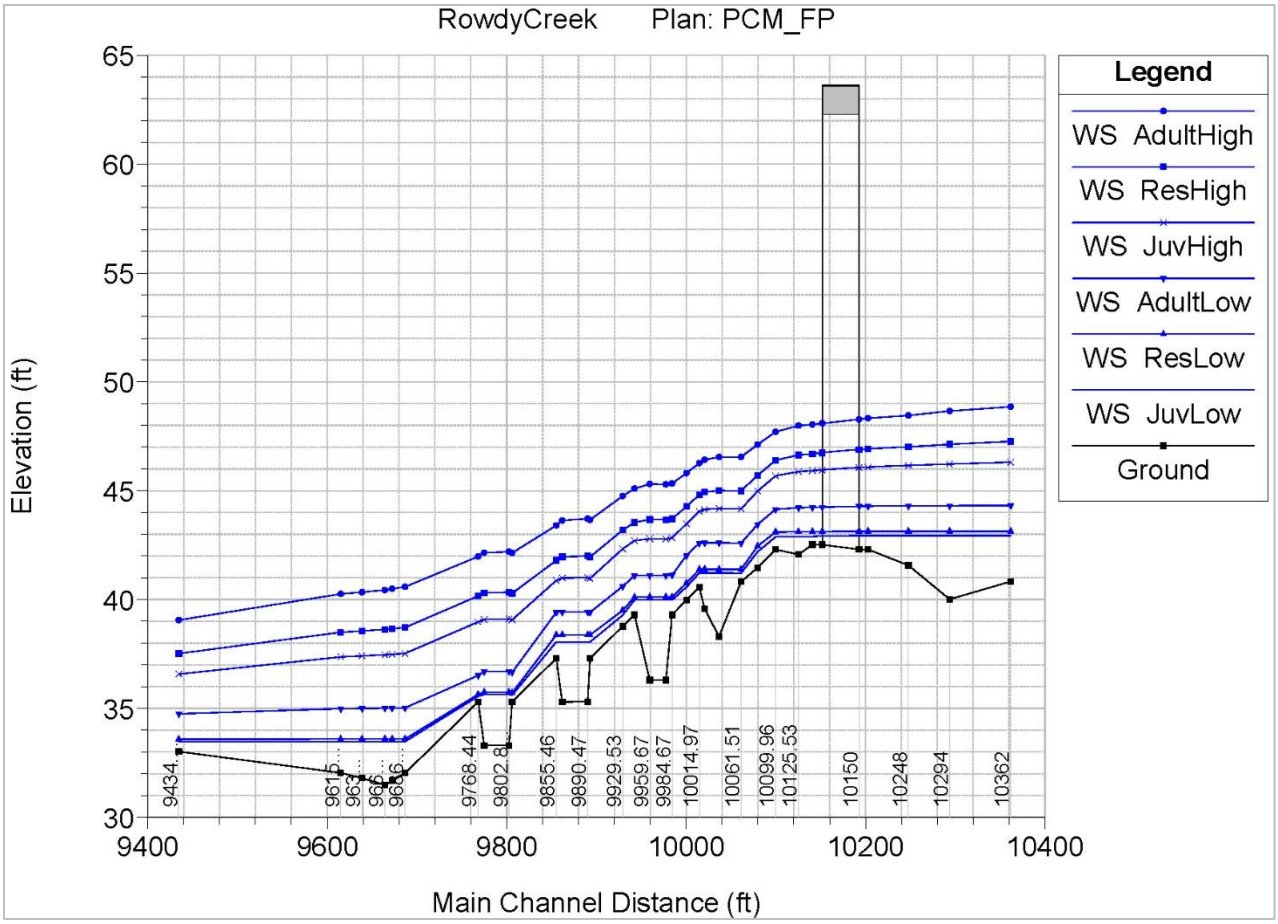


Figure 9-3. Rowdy Creek proposed water surface profiles for fish passage design flows.

9.4 Anticipated Flood Impacts

Rowdy Creek is not located within a regulatory floodway and FEMA (2002) (44 CFR 60.3(c)(10)) states that until a regulator floodway is designated no substantial improvement shall be permitted in Zone AE (the FEMA zone the Rowdy Creek has been assigned) unless it is demonstrated that the improvement will not increase the water surface elevation of the base flood more than one foot. This is the criterion for which the ECM and PCM results were compared.

Figure 9-4 presents a profile comparison of the Rowdy ECM and PCM (see Appendix L for additional figures and data tables). As seen, the PCM model indicates a slight rise (maximum ~0.8 feet) in the water surface profile downstream of the existing concrete weir. Although there is a rise, the flow remains contained within the banks. This rise is attributed to the slightly elevated channel bed and the increased roughness. There is a greater difference in water surface profiles at the existing concrete structure due to the large drop in the ECM model. For these sections, the energy grade line (EGL) will be used for comparison. Using the EGL, the difference between the PCM and ECM is 1.0 feet. Any increase if flooding on adjacent property will be to the river right, which is owned by this Project's proponent.

Upstream of the existing concrete weir, the PCM predicts a decrease in the water surface profile. This is due to the decrease in the backwater effect caused by the weir.

Overall, the PCM does indicate that the water surface profile and energy grade line will increase at some locations when compared to the ECM but these increases are within the parameters set by FEMA for a floodplain (44 CFR 60.3(c)(10)) (FEMA, 2002).

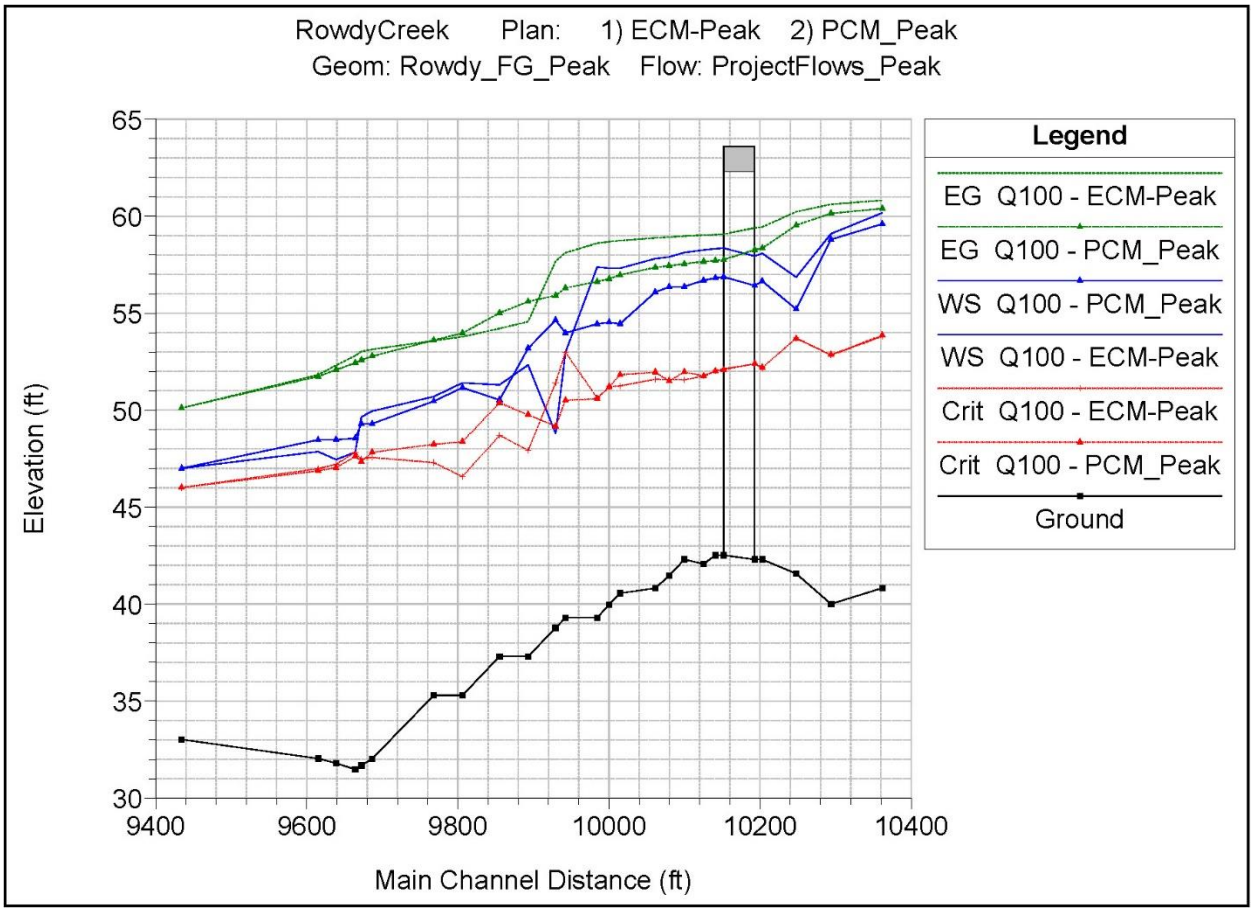


Figure 9-4. Rowdy Creek Profile, comparison of ECM and PCM results.

9.5 Structural and Foundation Elements

The structural designs of the hatchery facility improvements (fish trap, return channel and diversion structure) have incorporated stabilization of existing infrastructure to remain, as well as retaining the soil slope behind the structure, while also preventing undercutting along the channel side toe. Geotechnical information indicates bedrock is likely to be encountered at the base of structure. In most areas a cutoff wall along the toe will extend to this bedrock, or where bedrock is not present, to a depth as to minimize potential for scour undercutting. Hill side walls are designed for soil retaining based on geotechnical prescribed loading. Creek side walls are designed for hydraulic loads. From the upstream corner of the diversion structure, extending along the side of the slope, a concrete wall has been designed to provide added stabilization and slope protection. The wall will extend over the top of three new drilled concrete piers, with a beam element extending beyond the piers to support the eastern corner of the existing pump house slab.

Extending off the southern end of the hatchery facility, towards the confluence of Dominie Creek, the existing concrete wedge structure will be removed. While the depth of concrete foundation immediately behind the wedge (at the base of the retained soil slope) is unknown, it is anticipated that the base of existing wall foundations will be exposed and undermined. New foundation and wall elements will be created in this location including installation of soil anchors to stabilize the

walls and slope. Depth of new foundations will extend to bedrock or to a depth as to minimize scour undermining the wall.

The picket fence will be supported on a thickened mat foundation 10 feet wide, continuous across the creek. A cutoff wall below the foundation will extend to bedrock and the foundation has been sized considering buoyancy effects as to minimize movement of the system. The eastern end of the foundation ties into a new slope retaining wall that has been designed based on geotechnical prescribed soil loads.

9.6 Constructability Considerations

The following is a description of some of the constructability considerations that are most relevant to the Rowdy Creek improvements, including water management, site access, and rock sourcing.

9.6.1 Water Management

Water management and control is essential in any project conducted in-stream. Summer base flows in Rowdy Creek will be required to be diverted through a typical clear water coffer dam and bypass system and discharged downstream of the Project reach. Given the grade, it is anticipated a gravity bypass pipe and coffer dam with fish screens will be used, however, pumping may be necessary during times when there is limited space within the channel to complete the work while maintaining necessary gravity pipe slopes.

The primary consideration in water management for this project will likely be completing the in-stream work prior to a major rainfall event. Typically the window is between June 15th and October 15th, however, the Rowdy Creek watershed has shown to exhibit rapid runoff response time, and therefore any rainfall event occurring during construction could pose an issue to the diversion system and any work in progress at the time. To minimize this risk, completing the instream work as quickly in the season as possible, and having a robust water diversion system will likely be necessary. Due to the nature of the work, the project will likely need to be constructed during a single season.

Nuisance water in the Rowdy Creek channel will likely not be a major issue, given the raising of the channel bed that will occur in most areas. However, the cutoff wall that will be installed as part of the picket fence concrete pad will have to extend down to bedrock in the existing stream channel, and therefor dewatering this area will likely be necessary.

9.6.2 Site Access

As shown on the final design plans, access into the Rowdy Creek channel is likely to be feasible from two primary locations along the south (river left) bank. However, each of the proposed access routes have some limitations or uncertainties which will ha to be considered prior to in-stream work.

The first access is shown along the existing Highway 101 Bridge through the Caltrans easement will likely be the simplest route into the channel. The challenge with this route will be the ingress/egress to the easement from Highway 101, as there will be minimal room to turn around or orient a large truck that needs to enter or exit to or from the bridge itself. This access point will also require securing an encroachment permit from Caltrans.

The second proposed access is near the existing concrete weir on the river left bank, which is connected to staging area 1 shown on APN 103-080-044. Access to this staging area, and subsequently the channel, will depend on the ability to secure a temporary constuction easement through APN 103-080-014, which owns the ingress/egress rights to Highway 101. Should securing an easement through that parcel prove to be difficult or infeasible, another option to access the staging area exists. As shown on sheet G-005 of the final design plans, the property (and staging area 1) could be accessed from Timber Blvd, through an easement held by the APN 103-080-044.

9.6.3 Rock Sourcing

Although rock sourcing isn't typically a concern with projects located in northern California, it should be noted that a reasonable percentage of the rock used in the construction of the Rowdy Creek roughend channel is proposed to be between 3.5 –and 6 feet in diameter. To ensure a full supply of this size of material during a likely compressed in-stream work timeframe, the contractor will need to make arrangements with the local quarry in advance of beginning construction activities, such that the quarry has adequate time to produce the rock.

9.6.4 Bedrock

As conveyed on the plans it is anticipated that bedrock will be encountered during construction. Although it is anticipated that encountering bedrock will not preclude the contractor from being able to execute the project as designed, there is in general some uncertainty as to how the rock formations will look once excavation and demolition has begun. As described in the Geotechnical Report, the rock encountered is anticipated to be difficult to remove with a standard excavator, and may require hammering or blasting.

9.6.5 Demolition of Existing Concrete

As conveyed on the plans there are a number of existing concrete features that will be demolished. Based on the limited design and construction information there may be some unanticipated conditions that may occur during demolition. Good construction management, including the removal of structures under the supervision of the project structural and/or geotechnical engineer is advised.

9.7 Anticipated Maintenance Requirements

The Rowdy Creek roughened channel will require very little or no maintenance. As discussed in the next section, the largest uncertainty associated with this project is potential of debris and sediment deposition to accumulate on the picket fence and weir. It may be necessary for Hatchery staff to occasionally remove debris/sediment that settles on the fence/weir.

The trap may also require periodic maintenance to remove debris that settles. It is anticipated that the debris will be fine-grained sediment. As mentioned in the fish trap discussion, the return channel may also require removal of fine-grained sediment followinglarge storm events.

The trap gates will require maintenance per the manufacturer's recommendations. The design intent is that the gates will be lowered during high flow events, and therefore will not be exposed to damage during these events.

The diversion facility may require maintenance to remove fine sedimentsthat pass through the screen and into the stilling well during high flow events. Additionally, Hatchery staff will likely have to remove leaves or other large debris material from the screen face, as these items will not be removed by a brush system. It is possible that large debris moving downstream could contact and damage the screen, in this case the screen would require maintenance or replacement to restore to working condition.

10. Proposed Project-Dominie Creek Components

The following sections describe the proposed project on Dominie Creek. The drawings are included in Appendix A.

10.1 Description

Proposed project components on Dominie Creek will primarily include removal of existing infrastructure from the channel at both the confluence and at the access road crossing.

10.1.1 Confluence with Rowdy Creek

During the Feasibility Study, it was anticipated that Dominie Creek would require boulder weirs or similar channel-spanning structure to overcome the drop at the confluence. Based on the final design of Rowdy Creek bed elevations, boulder weirs/channel-spanning structures are not necessary. The final design completed for Rowdy Creek will raise the channel bed at the confluence to approximately the elevation of the existing apron. The existing channel conditions on Dominie Creek upstream of the apron do not require any fish passage improvements and therefore construction will not extend further on Dominie Creek. The only work to be completed at the confluence will be to remove the existing concrete apron and the concrete pier and foot bridge, installing a rock band (see Section 9.1.2.), and to stabilize the existing river right retaining wall.

The wall will need to be stabilized upon removal of the apron, due to the fact that the apron provides scour and foundation protection. For long term stability, soil nails with a shotcrete facing and a scour protection wall are proposed. This improvement option was determined to be more favorable than removing the wall entirely to rebuilt, and will also result in fewer impact to the adjoining property. While working in the area, the two large redwood trees located just behind the wall will also be removed.

The existing foot bridge supports an 8-inch pipe. How this pipe gets dealt with during construction will depend on if the Hatchery elects to maintain operations during project construction. If the Hatchery elects to close operations for the construction window, the pipe can simply be removed and reinstalled when the new metal crossing is complete. If the Hatchery elects to maintain operations, a temporary pipe and support system over the creek will be required.

The final piece of work in this area is the backfilling of the existing Dominie Creek fish ladder. The new roughened channel will raise the bed elevation at the fish ladder, and therefore the bottom of the structure would otherwise be below grade if it was not filled. The design shown on the final plans proposes to fill the bottom of the fish ladder up to elevation 41.0 (ft, NAVD 88), which is the elevation of the channel bed at this location.

10.1.2 Existing Bridge and Diversion Facility Reach

Similar to the confluence, no channel reconstruction is proposed at the existing bridge and diversion facility and the work proposed includes removal of the existing in-channel weirs/fish ladder and stabilization of the bridge abutments. Demolition includes the removal of the fish ladder on river right beneath the bridge, which is composed of a floor, a center wall, three sets of counterfort walls and wooden flashboards. The sluice gate system, also located under the bridge, will be removed and is composed of a concrete floor, a center pier at the upstream bridge face, and the sluice gate itself. The remainder of the diversion facility, which includes the screen and intake on the river left bank approaching the bridge from upstream, will remain and be abandoned.

The bridge's abutments appear to lie on bedrock, although in some areas it is difficult to discern. As such, it's likely that the original bridge was designed to be stable without the presence of the fish ladder and sluice gate infrastructure now located beneath. However, the current loading at the bridge abutments with the infrastructure, and the fact that there is anticipated to be some vertical adjustment of the channel (discussed below) compels the design to include some improvements to the bridge abutments to ensure that the finished project leaves the bridge in equal or better structural condition. The improvements to the bridge include a new concrete facing that will be anchored into the existing abutment concrete, which will extend from the bridge soffit all the way to bedrock in the channel. In addition to the facing, steel struts will be added on each concrete beam underneath the bridge. Upon completion of the demolition and bridge improvements, native channel material will be used to create a smooth transition between the limits of excavation and demolition beneath the bridge.

Once the infrastructure has been removed from beneath the bridge, the channel will adjust. To help control the degree to which the upstream channel adjusts, large boulders will be placed in the channel, similar to the boulders placed at the confluence. The boulders will create roughness, which will decrease the water velocity and likely cause bed material to settle, which will cause the bed to degrade less than if left on its own. The anticipated geomorphic response is discussed in more detail in Section 10.3.

10.2 Structural and Foundation Elements

Structural modifications and improvements along Dominie Creek are limited to the area at the confluence of Dominie Creek with Rowdy Creek, and at the hatchery access road bridge crossing Dominie Creek.

Modifications at the confluence area include removal of an existing concrete apron between the existing western slope retaining wall and the existing Dominie Creek fishway. Foundation improvements at the base of the fishway will be constructed similarly and tie into the new slope improvements along Rowdy Creek at the removal of the concrete wedge. Removal of the apron immediately in front of the existing western slope retaining wall has potential to increase stresses on the remaining wall footing. Therefore, new soil anchors will be added to the existing retaining wall by drilling through the wall to install the new anchors. A new facing layer of shotcrete will be added to the wall along with a new cutoff wall below the base of the existing wall to minimize scour and undermining.

Upstream from the confluence, at the hatchery access road bridge, several pieces of in channel existing fish passage infrastructure are slated for demolition to improve the channel hydraulics. These concrete elements do not appear to have been specifically constructed with the intent of strengthening or supporting the existing bridge abutments, but removal of the existing concrete apron could allow for destabilization of the abutments and/or future undermining. In order to mitigate against these possibilities, a new facing wall in front of the existing abutments has been designed to span from a key constructed in bedrock at or below the base of abutment, spanning to new steel compression struts at the underside of the bridge. This system will work to prevent movement of the abutments while also guarding against scour at their base.

10.3 Anticipated Geomorphic Response

Minor geomorphic response is anticipated due to the removal of the infrastructure at the confluence. This is because the new rock band constructed at the confluence is at approximately the same elevation as the existing concrete apron, which should result in little to upstream bed adjustment. The individually placed boulders may cause some aggradation of the channel.

The removal of the diversion infrastructure at the Access Road will result in a channel bed adjustment. To help understand the potential impact, the high and low vertical adjustment potential (VAP) profiles were developed (Figure 10-1). The high VAP indicates a possible profile the channel might aggrade to, should the channel aggrade. Conversely, the low VAP profile indicates a possible profile should the channel degrade. If the channel should degrade to the low VAP profile, a water surface drop may form at the bedrock control. The drop will likely resemble other drops in the system. The addition of the hand placed boulders in the channel upstream of the Access Road crossing should limit the profile from degrading to the low VAP.

Figure 10-1 also includes the anticipated VAP profile. This is the anticipated average slope of the channel after adjustment.

Caltrans' culvert replacement project at Highway 101 is not expected to affect this project and based on the VAP profiles presented here, this project is not anticipated to affect the Caltrans' project. It is possible that some larger sediment may migrate more readily into the middle and lower reaches after the Caltrans culvert is replaced, assuming the upper reach's channel grade steepens. There does not appear to be any consequences for this occurring as Dominie Creek has ample freeboard at even the highest peak flows.

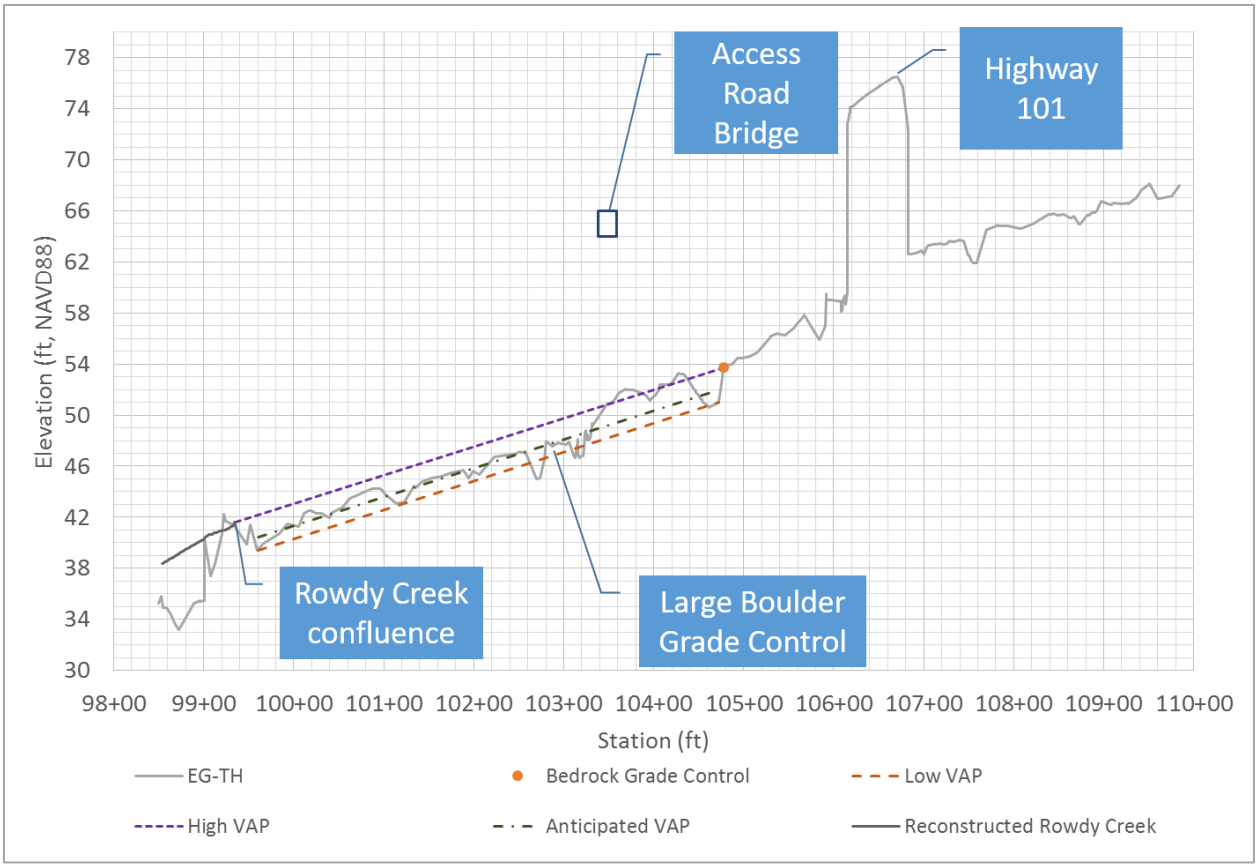


Figure 10-1. Dominie Creek's high, low, and anticipated vertical adjustment potential profiles.

10.4 Anticipated Fish Passage Performance

The proposed project is anticipated to provide volitional fish passage at the two modified locations on Dominie Creek. Because the proposed work does not include the construction of a hydraulic fish passage structure (e.g. fish fishway or roughened channel), no fish passage models have been developed. It is anticipated that once the infrastructure has been removed from the channel, the bed will match other reaches of Dominie Creek. See Section 10.3 for a discussion on the anticipated channel response.

10.5 Anticipated Flood Impacts

Dominie Creek is not located within a regulatory floodway and FEMA (2002) (44 CFR 60.3(c)(10)) states that until a regulator floodway is designated no substantial improvement shall be permitted in Zone AE (the FEMA zone the Dominie Creek has been assigned) unless it is demonstrated that the improvement will not increase the water surface elevation of the base flood more than one foot. This is the criterion for which the ECM and PCM results were compared.

Figure 10-2 presents the water surface profile comparison of the ECM and PCM for Dominie Creek. Work to be completed in Dominie Creek is comprised mostly of removing existing infrastructure. The removal of the existing gate and fish ladder at the existing diversion structure result in a decrease in the PCM water surface upstream when compared to the ECM. Similarly, the removal of the existing pier at the dowstream bridge, as well as the decrease in the water surface within

Rowdy Creek (which is used as the boudnary condition), results in a decrease in the water surface elevation. The remainder of the sections geometry remained unchaged but do show some water surface differences but all are within the FEMA floodplain tollerance for increases (44 CFR 60.3(c)(10)) (FEMA, 2002) and all flow remains contained between the banks. See Appendix M for additional figures and data tables.

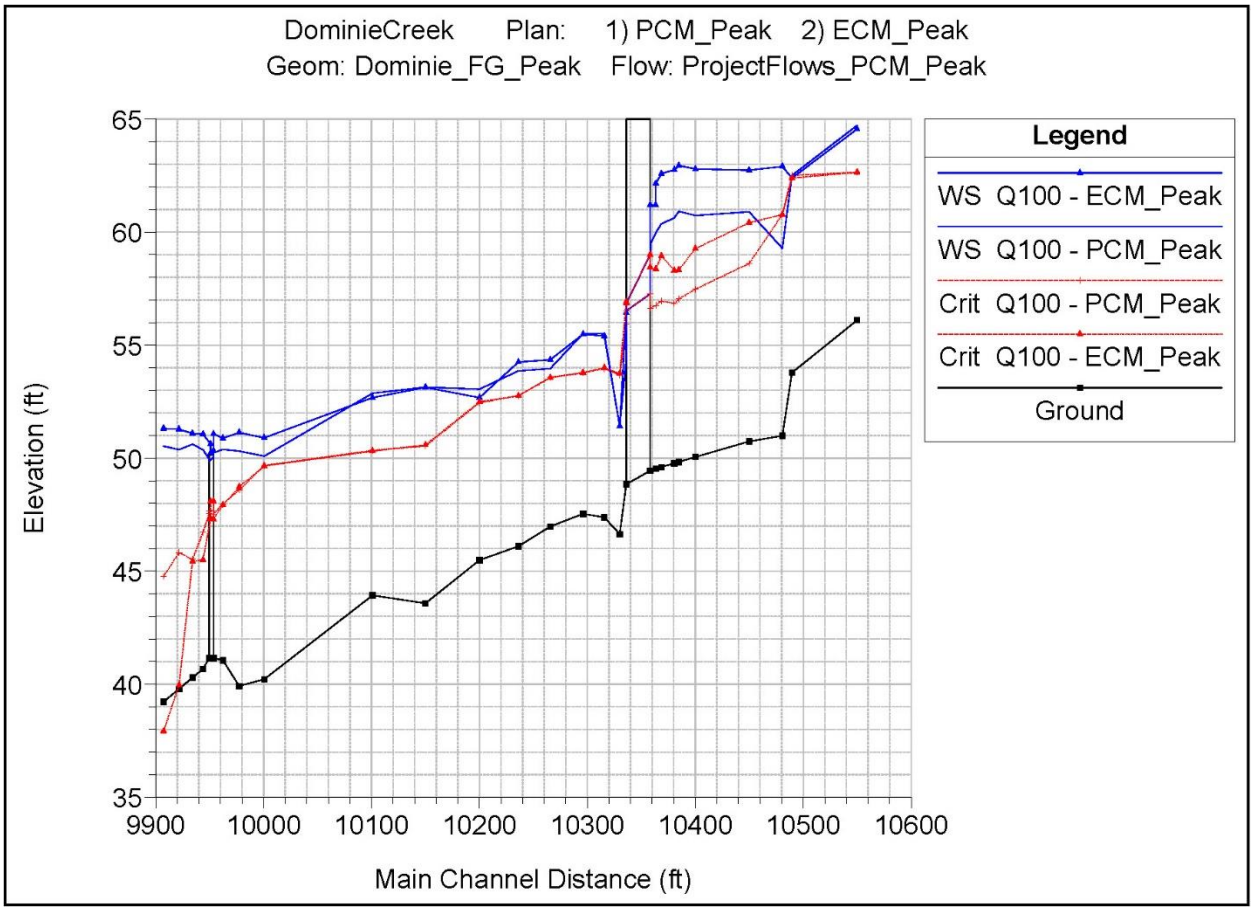


Figure 10-2. Dominie Creek Profile, comparison of ECM and PCM results.

10.6 Constructability Considerations

The following is a description of some of the constructability considerations that are most relevant to the Dominie Creek improvements, including water management, and site access.

10.6.1 Water Management

Dominie Creek will likely pose many of the same challenges as Rowdy Creek in regards to water management. A clear water bypass will be required just upstream from the existing water diversion structure, down to below the project limits of disturbance in Rowdy Creek. Due to the work that will be occurring in the lower portions of Dominie Creek, and the likelihood that access to the water diversion structure and ladder will occur through the Dominie Creek channel, it will likely be necessary to pump the bypass water as channel space will be quite limited.

Unanticipated rain events could pose the same challenge in Dominie Creek as it could in Rowdy Creek. Therefore, it would be similarly advisable to complete the instream work as early in the construction season as possible, and to also have a robust bypass system should it need to handle higher flows.

10.6.2 Site Access

Site access into Dominie Creek could occur from the west (river left) bank near the existing water diversion structure, or from the confluence with Rowdy Creek. In either case, the size of the equipment the contractor can use will be limited due to the space available in the existing channel, the steep right bank in Dominie Creek, and the hatchery's ladder wall on the left bank. Removing demolished concrete material from the channel will likely have to be done in small loads.

10.6.3 Bedrock

One uncertainty is the exact competence of the bedrock control. Bedrock was visible in the field on both banks and extending into the channel. The bedrock was not seen for approximately a foot of the channel and it is possible the bedrock visible on both banks does not touch. If this is the case, the bedrock that is present will likely be sufficient to arrest any head cut that might migrate upstream as a result of this project.

10.7 Anticipated Maintenance Requirements

Maintenance of the Dominie Creek project components is not anticipated.

11. Opinion of Probable Construction Cost

A planning level opinion of probable construction cost was completed based on the attached final design plans. Table 11.1 contains an itemized list of estimated unit construction costs in addition to an estimating contingency. An estimating contingency is typically used to account for uncertainties such as material and construction cost volatility and the potential variations in material quantities and the lack of specific design details associated with the current design level of this project.

The project generally consists of the demolition of several existing concrete features, the import and placement of engineered streambed material and boulders, the installation of the new picket fence system, and the installation of several new concrete features including the Rowdy Creek diversion facility and the reconstructed river right bank near the hatchery. At this point the components of the project are fairly well defined, however, there could be some changes or further detailing as the Hatchery operations and long-term improvement plans evolve.

In addition, site conditions such as bedrock, dewatering, and the presence of endangered species increase construction costs. The risks associated with working in these environments are much higher relative to typical construction projects. Project construction costs are subject to variations in contractor bidding, labor rates, material costs and availability, permitting conditions, site accessibility, general economic pressures and other unforeseen costs associated with a project in the current planning level. Given these potential variations, GHD and MLA make no warranty, express or implied, that actual project costs will not vary from the provided OPC. Construction-

related professional services will be required to implement and oversee construction and should be considered for project budgeting. These services include compiling the bid packages(s), bidding assistance, construction management, inspection and monitoring for environmental compliance and testing.

Dominie and Rowdy Creek Fish Passage Improvement Project

Planning Level Opinion of Probable Construction Cost
Based on Final Design Drawings
August 2018

Item No	Item Description	Quantity	Unit	Unit Cost	Total
1	Mobilization/Demobilization	1	LS	$ 126,000	$125,000
2	Erosion, Sediment Control, and Water Management	1	LS	$ 175,000	$175,000
3	Clearing and Grubbing	1	LS	$ 25,000	$25,000
4	Demolition and Disposal	1	LS	$ 100,000	$100,000
5	Excavation	1	LS	$ 30,000	$30,000
6	Native Backfill	1	LS	$ 10,000	$10,000
7	Shoring and Trench Safety	1	LS	$ 20,000	$20,000
8	3/4" Crushed Gravel	1	LS	$ 3,000	$3,000
9	Dominie Creek Rock and Rowdy Creek Roughened Channel and Bank Lining RSP	9,700	TON	$ 125	$1,212,500
10	Rowdy Creek Reinforced Concrete and Structural Appurtenances	1	LS	$ 540,000	$540,000
11	Dominie Creek Shotcrete and Soil Anchor Retaining Wall and Appurtenances	1	LS	$ 62,000	$62,000
12	Dominie Creek Bridge Abutment Facing and Steel Struts	1	LS	$ 25,000	$25,000
13	Rowdy Creek Shotcrete and Soil Anchor Wall	1	LS	$ 50,000	$50,000
14	Furnish and Install Picket Fence and Related Components	1	LS	$ 350,000	$350,000
15	AWS Pipe	1	LS	$ 8,000	$8,000
16	Slide Gates	4	EA	$ 9,000	$36,000
17	Prefabricated Electrical Building	1	LS	$ 30,000	$30,000
18	Furnish and Install Hydraulic Fish Screen Brush System	1	LS	$ 215,000	$215,000
19	Fish Trap Metal Weirs	2	EA	$ 5,000	$10,000
20	Return Channel Metal Weirs	3	EA	$ 3,000	$9,000
21	15 Hp Diversion Pumps, Piping, and Related Appurtenances	1	LS	$ 115,000	$115,000
22	Distribution Flume and Submersible Water Pump	1	LS	$ 15,000	$15,000
23	Fish Trap	1	LS	$ 12,500	$12,500
24	Fish Screen and Baffle Plates	1	LS	$ 12,000	$24,000
25	Electrical Components	1	LS	$ 50,000	$50,000
26	Seed and Mulch	1	LS	$ 10,000	$10,000
27	Revegetation	1	LS	$ 20,000	$20,000
				Subtotal:	$3,282,000
				Estimating Contingency @15%:	$493,000
				Total Planning Level Opinion of Probable Construction Cost:	**$3,775,000**

NOTE: This opinion reflects probable construction costs obtainable for the project location on the date this opinion was prepared. Due to inflation of labor, material and equipment costs and nature of contruction cost volitility, prices may vary. Variations of -15% to +15% commonly applies to estimating contingencies.

12. Environmental Compliance

Prior to construction, the Project will be required to obtain the following regulatory approvals and supporting documents:

1. Wetland Delineation & Biological Survey Report
2. USACE Section 404 Permit
3. NCRWQCB Section 401 Permit
4. CDFW CESA Coordination
5. CDFW 1602 Streambed Alteration Agreement
6. County Grading & Building Permit
7. NMFS/USFWS Biological Assessment
8. Habitat Mitigation and Monitoring Plan (HMMP)
9. State Historic/Tribal Heritage Preservation Office Assistance
10. Endangered Species Act Compliance
11. Cultural Resources Investigation
12. NEPA Environmental Assessment
13. Stormwater Pollution Prevention Plan (SWPPP)
14. Asbestos Sruvey and Carb 435 Compliance
15. CEQA Initial Study and Mitigated Negative Declaration
16. Caltrans Encroachment Permit

13. References

Caltrans. (2016, 10). *2015 Fish Passage Annual Report, Report to the Legislature.* Tech. rep., California Department of Transportation, Division of Environmental Analysis.

CDFG. (2002). *Culvert Criteria for Fish Passage.* Tech. rep., California Department of Fish and Game.

CDFG. (2009). Part XII: Fish Passage Design and Implementation. In *California Salmonid Stream Habitat Restoration Manual* (4th ed., Vol. II). California Department of Fish and Game. Retrieved from http://www.dfg.ca.gov/fish/resources/habitatmanual.asp

CDFG. (2010). *Salmonid Stream Habitat Restoration Manual, Parts I - VIII.* Tech. rep., CDFW.

D.J. Warren & Associates. (2018). *Rowdy Creek Fish Hatchery Infrastructure and Operations Report.*

FEMA. (2002). *CFR,Title 44 Emergency Management and Assistance, Part 60 Criteria for Land Management and Use.* Tech. rep., Federal Emergency Management Agency.

FHWA. (2009). *Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance.* Tech. rep., Federal Highway Administration.

Garwood, J. M., & Larson, M. D. (2014). *Reconnaissance of salmonid redd abundance and juvenile salmonid spatial structure in the Smith River with emphasis on Coho Salmon.* Tech. rep., California Department of Fish and Wildlife and The Smith River Alliance.

GHD. (2015). *Rowdy Creek Fish Passage Improvement Project Final Feasibility Study.* Tech. rep., GHD.

Gotvald, A. J., Barth, N. A., Veilleux, A. G., & Parrett, C. (2012). *Methods for Determining Magnitude and Frequency of Floods in California, Based on Data through Water Year 2006.* Tech. rep., U.S. Geologic Survey.

Isbash, S. (1936). Construction of dams by depositing rock in running water.

LaRue, G. W. (1999). *Rowdy Creek Erosion at Smith River, California.* Smith River: Del Norte County.

Limerinos, J. T. (1970). *Determination of the Manning Coefficient From Measured Bed Roughness in Natural Channels.* Tech. rep., USGS and California Department of Water Resources.

Montgomery, D. R., & Buffington, J. M. (1997). Channel-reach morphology in mountain drainage basins. *Geological Society of America Bulletin, 109*, 596-611.

Mussetter, R. A. (1989). *Dynamics of mountain streams.* Tech. rep., Colorado State Engineering.

Mussetter, R. A. (1989). *Dynamics of mountain streams.* Tech. rep., Colorado State Engineering.

NMFS. (1997). *Fish Screening Criteria for Anadromous Salmonids.* National Marine Fisheries Service, Southwest Region.

NMFS-NW. (2011). *Anadromous Salmonid Passage Facility Design.* National Marine Fisheries Service, Northwest Region.

NMFS-NW. (2011). *Anadromous Salmonid Passage Facility Design.* National Marine Fisheries Service, Northwest Region.

NMFS-SW. (1997). *Fish Screening Criteria for Anadromous Salmonids.* National Marine Fisheries Service, Southwest Region.

NMFS-SW. (2001, September). *Guidelines for Salmonid Passage at Stream Crossings.* Tech. rep., NOAA National Marine Fisheries.

NMFS-SW. (2001, 9). *Guidelines for Salmonid Passage at Stream Crossings.* Tech. rep., NOAA National Marine Fisheries.

Parish, M., & Garwood, J. (2016). *Winter Distributions, Movements, and Habitat use by Juvenile Salmonids throughout the Lower Smith River Basin and Estuary, Del Norte County, California.* Tech. rep., The Smith River Alliance.

Rajaratnam, N., Van der Vinne, G., & Katopodis, C. (1986). Hydraulics of vertical slot fishways. *Journal of Hydraulic Engineering, 112*, 909-927.

RCFH. (2017). *Draft 5-Year Management Plan.* Tech. rep., Rowdy Creek Fish Hatchery.

Tapple, P. (2010). *Design and Construction of Roughened Channels for Fish Passage in Washington State.* Tech. rep.

USACE. (1994). *Hydarulic Design of Flood Control Channels.* Tech. rep., U.S. Army Corp of Engineers.

USACE. (2010). *HEC-RAS, River Analysis System Hydraulic Reference Manual: Version 4.1.* Tech. rep., U.S. Army Corps of Engieers, Hydrologic Engineering Center.

USFS. (2017, 10). Basic facts of Salmon/ Steelhead. Retrieved from https://www.fs.usda.gov/detail/r6/plants-animals/fish/?cid=fsbdev2_027105

USFS. (2017, October). Salmon/ Steelhead. *Salmon/ Steelhead*. Retrieved from https://www.fs.usda.gov/detail/r6/plants-animals/fish/?cid=fsbdev2_027105

USGS. (1982). *Guidelines for Determining Flood Flow Frequency, 17B.* Tech. rep., USGS.

Walkley, J., & Garwood, J. M. (2017). *2011-2016 Salmonid Redd Abundance and Juvenile Salmonid Spatial Structure in the Smith River Basin, California and Oregon.* Tech. rep., Smith River Alliance and Califiornia Department of Fish and Wildlife.

WDFW. (2013). *Water Crossing Design Guidelines.* Tech. rep., Washington Department of Fish and Wildlife.

WSC. (2017). Retrieved from https://www.wildsalmoncenter.org/2013/02/01/smith-river/

WSC. (2017). Wild Salmon Center. Retrieved from https://www.wildsalmoncenter.org/2013/02/01/smith-river/

Appendices

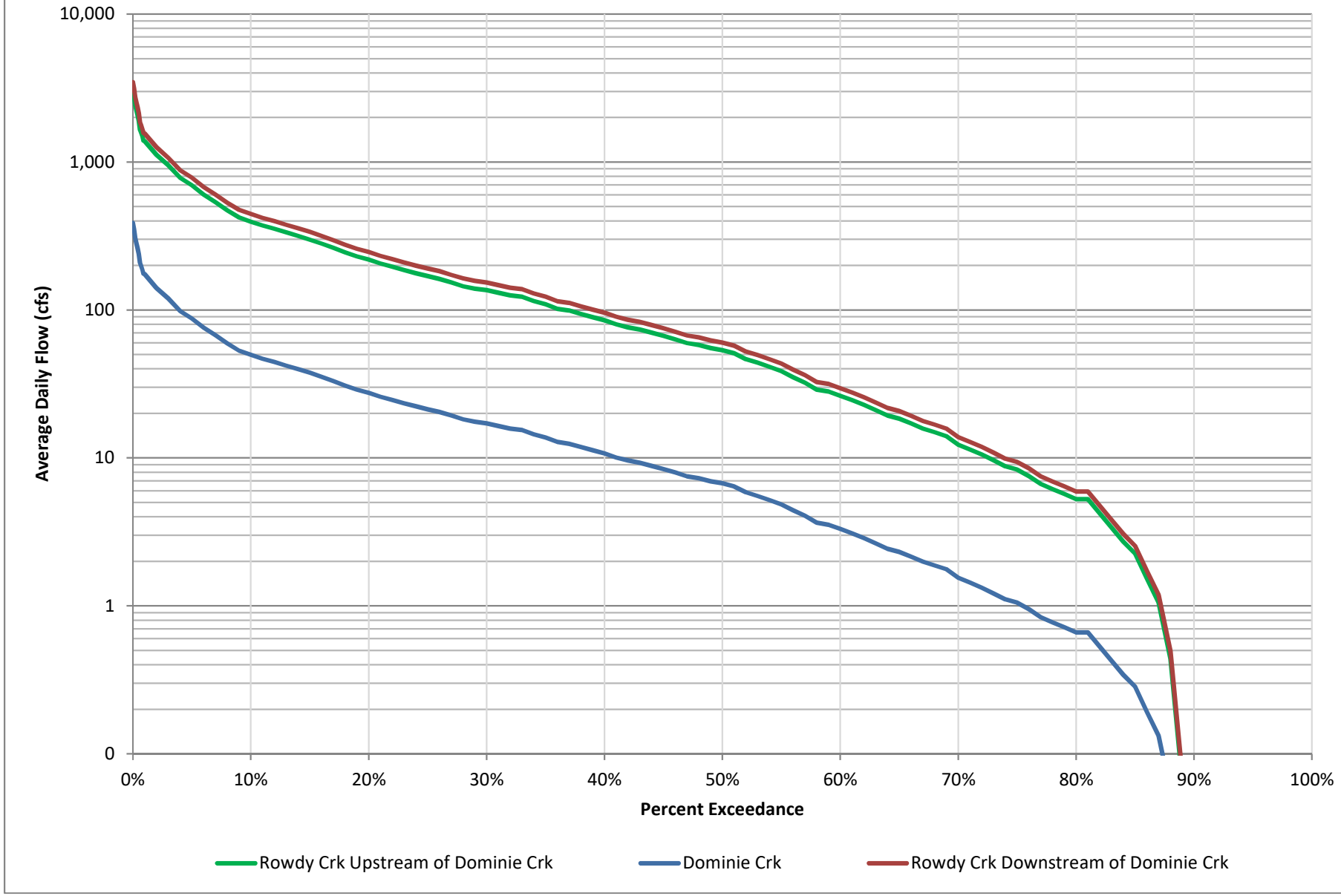
Appendix A- Final Design Plans

Appendix B- Final Geotechnical Report

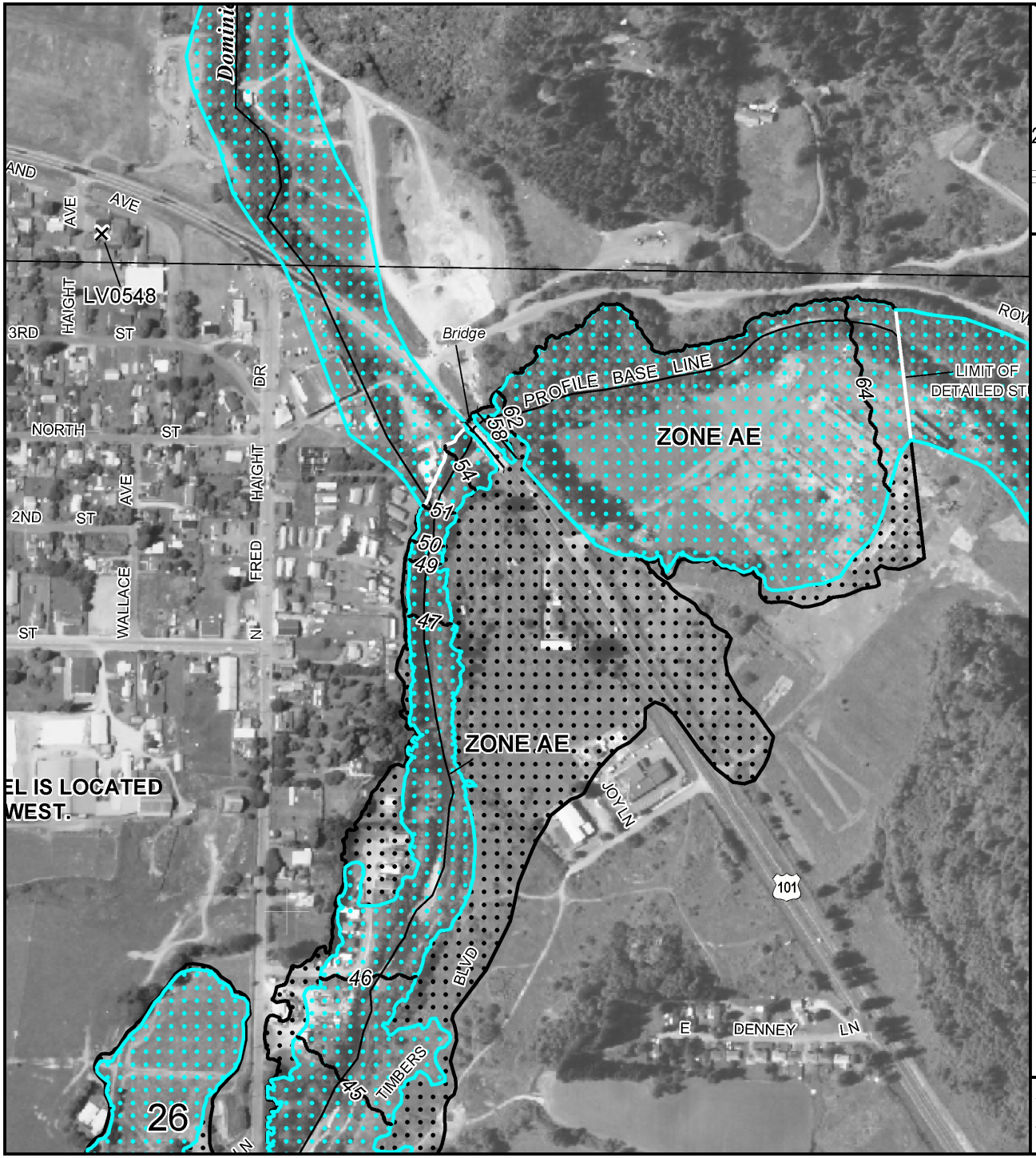
Appendix C- *Updated Flow Exceedance Curve*

Project Exceedance Curves

Based Rowdy Creek Gage WY 1958 - 1962



Appendix D- *FEMA FIRM and Selected FIS Pages*



MAP SCALE 1" = 500'

250 0 500 1000 FEET METE

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0042F

FIRM

FLOOD INSURANCE RATE MAP

DEL NORTE COUNTY CALIFORNIA

AND INCORPORATED AREAS

PANEL 42 OF 675

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DEL NORTE COUNTY	065025	0042	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06015C0042F

MAP REVISED
NOVEMBER 26, 2010

Federal Emergency Management Agency

FLOOD INSURANCE STUDY

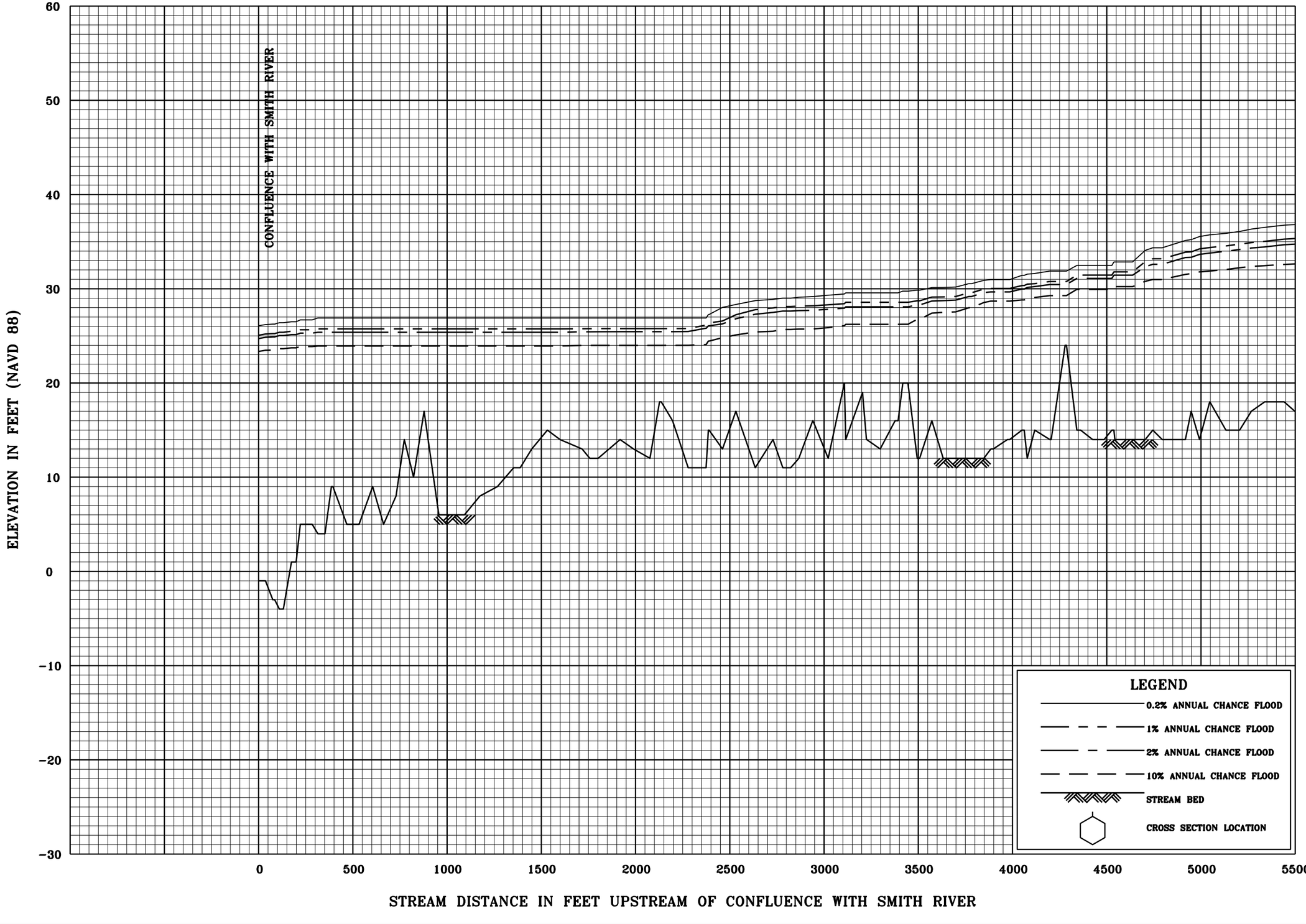
DEL NORTE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

Community Name	Community Number
CRESCENT CITY, CITY OF	060039
DEL NORTE COUNTY	
UNINCORPORATED AREAS	065025

Selected pages relevant to Rowdy and Dominie Creek Fish Passage Improvment project.

REVISED:
NOVEMBER 26, 2010

Federal Emergency Management Agency
FLOOD INSURANCE STUDY NUMBER
06015CV000B



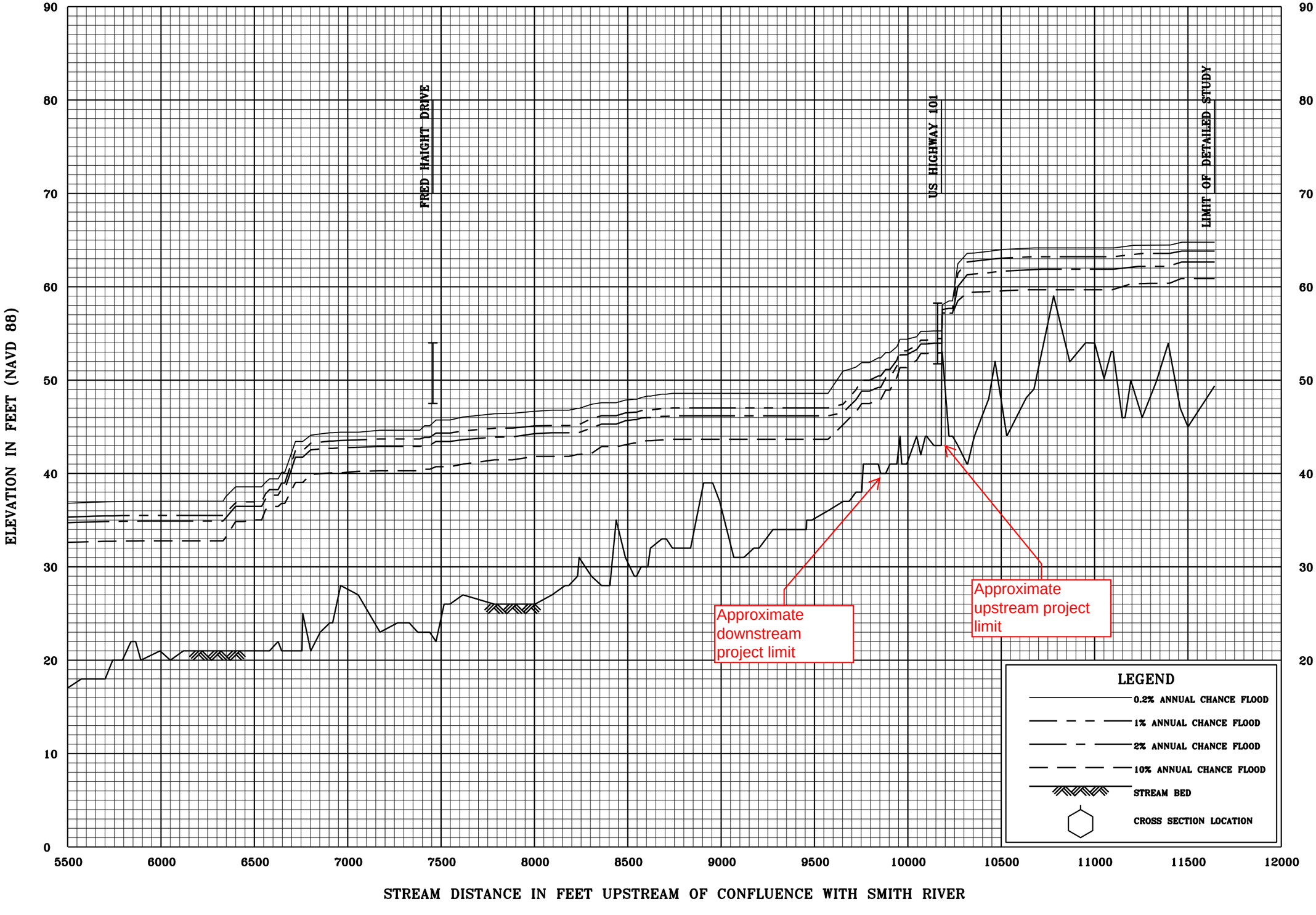
FLOOD PROFILES

ROWDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DEL NORTE COUNTY, CA
AND INCORPORATED AREAS

02P



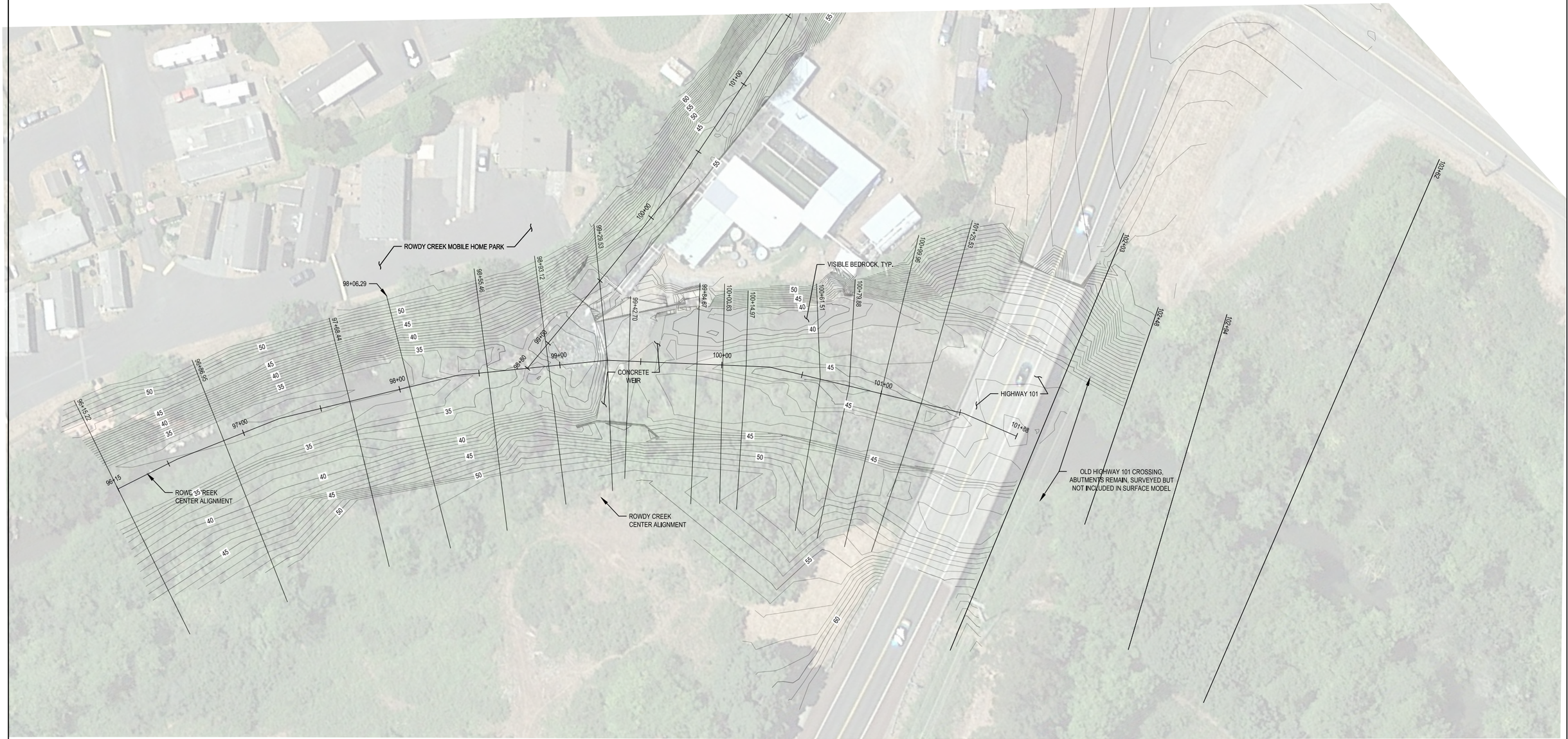
FLOOD PROFILES

ROWDY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

DEL NORTE COUNTY, CA
AND INCORPORATED AREAS

Appendix E- *ECM and PCM HEC-RAS Plan View Drawings*



ROWDY CREEK PLAN VIEW

SCALE

0 30' 60'

N

90% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet

0 1"

Reuse of Documents

This document and the ideas and designs incorporated herein, as an instrument of professional service, is the property of GHD and shall not be reused in whole or in part for any other project without GHD's written authorization.

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	**STP**	Designer	**pTJ**
Drafting Check	**JS**	Design Check	**JS**
Project Manager	**JS**	Date	**SEPT. 2017**
This document shall not be used for construction unless signed and sealed for construction.		Scale	**AS SHOWN**

Client

Project

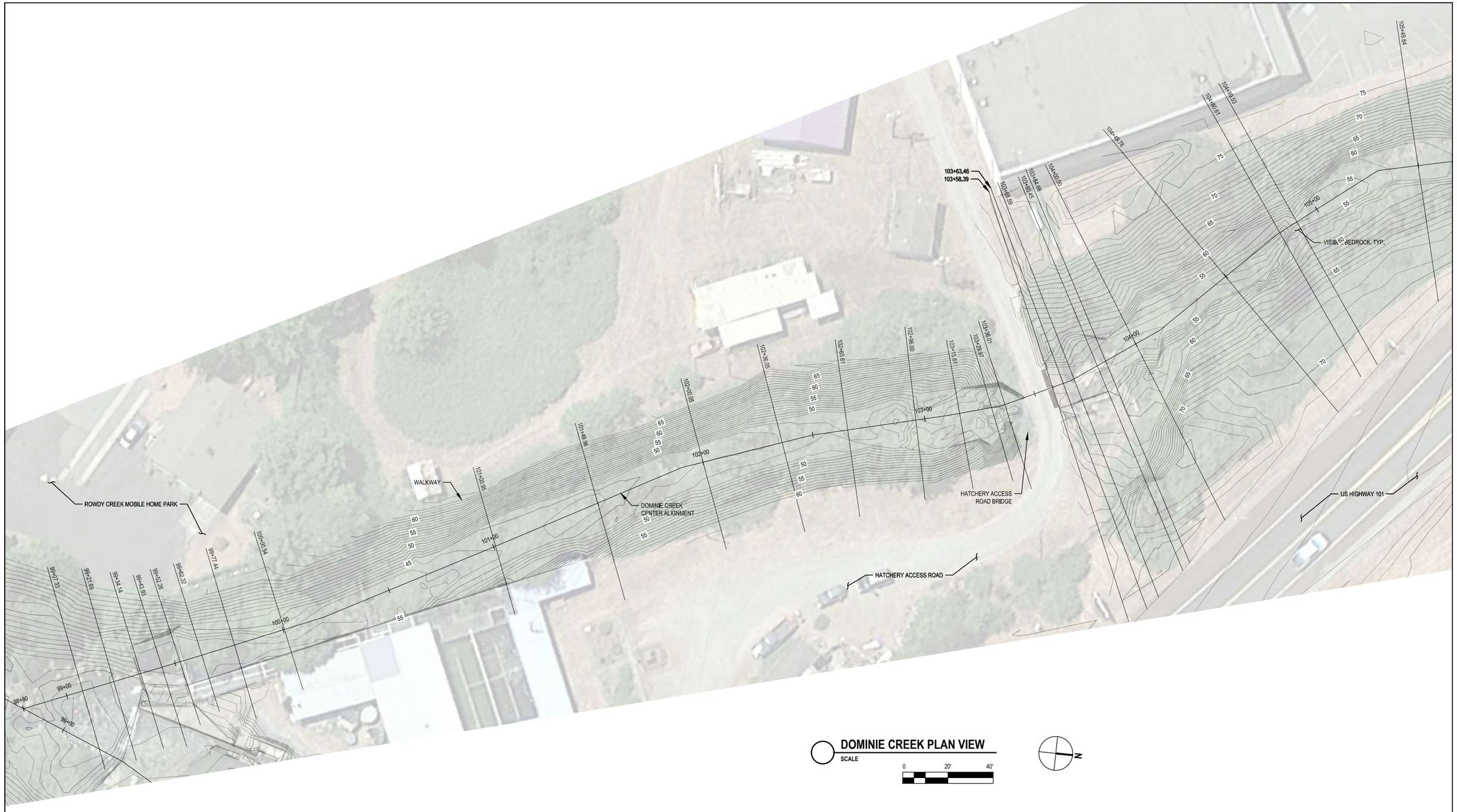
Title **ROWDY CREEK**
PEAK EXISTING CONDITIONS MODEL SECTION LOCATIONS

Project No. **11125168**

Original Size **ANSI D**

Sheet No.

Plot Date: 12 June 2018 - 2:33 PM Plotted By: PTJames Filename: Q:\Rowdy Creek\7_CAD-GIS\Civil3D\Data\11125168_HEC-RAS_ECM_Flood.dwg



DOMINIE CREEK PLAN VIEW

SCALE 0 20' 40'

N

90% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet
0 1"

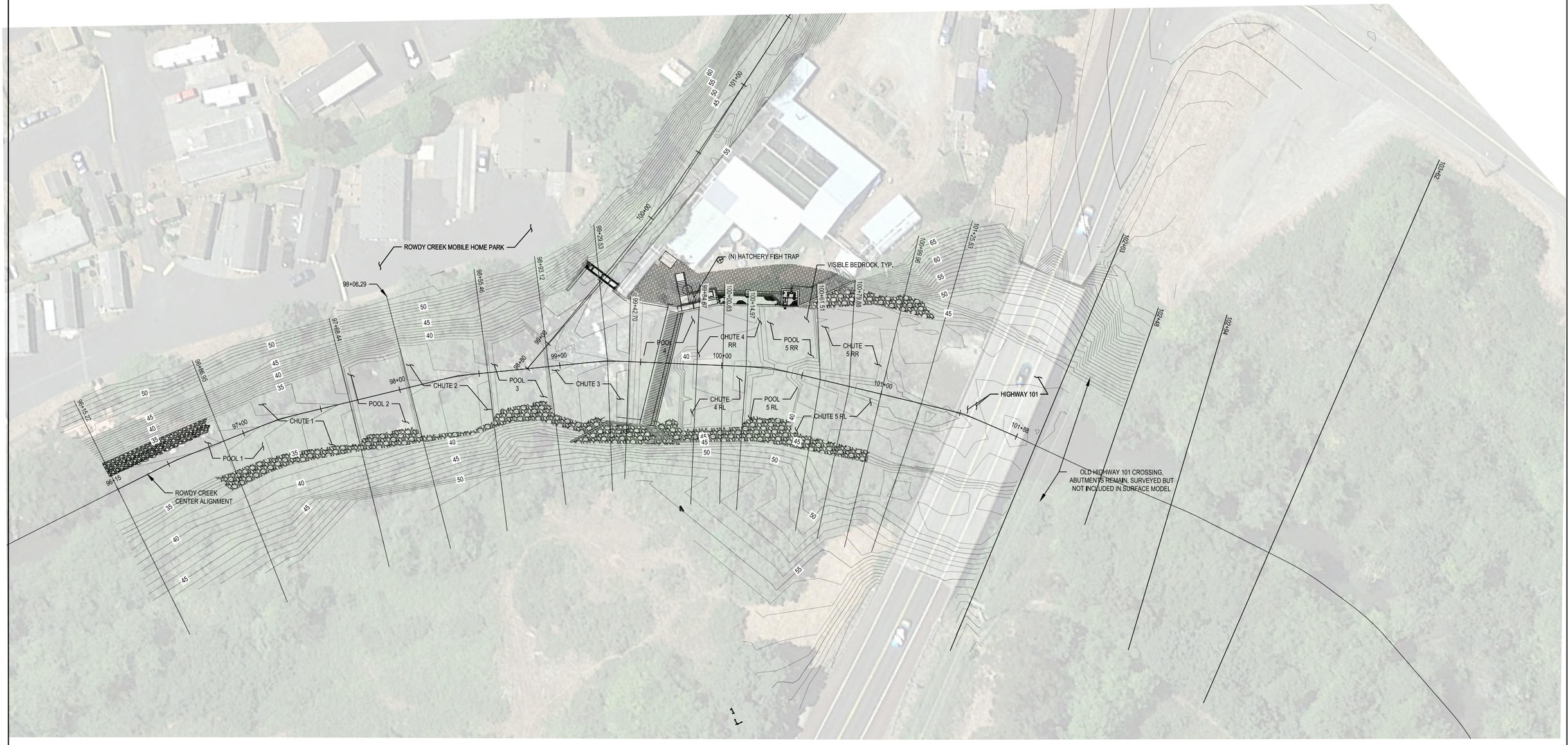
Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	###	Designer	###
Drafting Check	##	Design Check	##
Project Manager	JS	Date	SEPT. 2017
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client
Project
Title **DOMINIE CREEK**
PEAK EXISTING CONDITIONS MODEL SECTION LOCATIONS
Project No. **11125168**
Original Size **ANSI D**
Sheet No.

Plot Date: 12 June 2018 - 2:33 PM Plotted By: PTJames Filename: Q:\Rowdy Creek\7_CAD-GIS\Civil3D\Data\11125168_HEC-RAS_ECM_Flood.dwg



ROWDY CREEK PCM PLAN VIEW

SCALE

0 30' 60'

N

90% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet

0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	STP	Designer	pTJ
Drafting Check	JS	Design Check	JS
Project Manager	JS	Date	SEPT. 2017
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client

Project

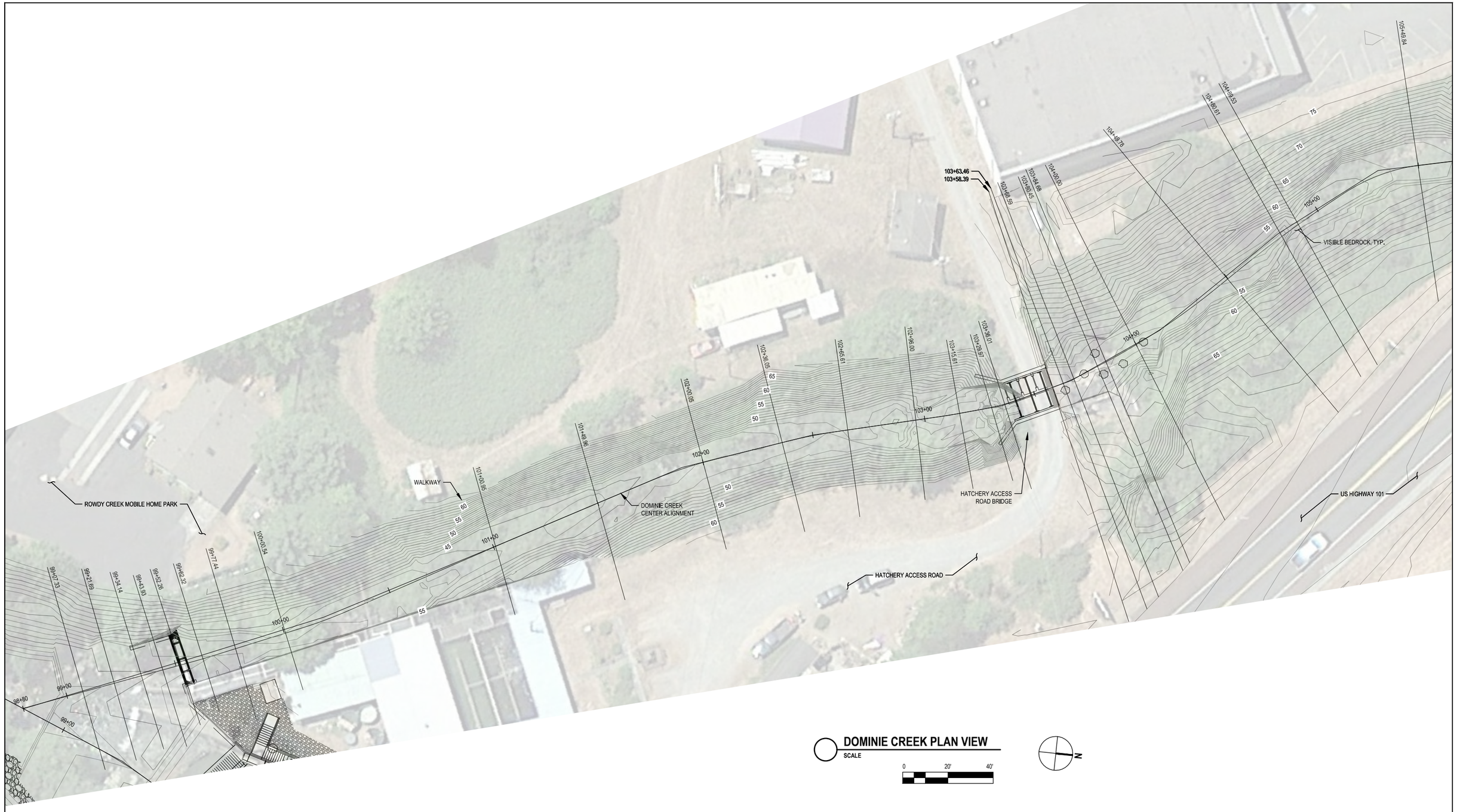
Title **ROWDY CREEK**
PEAK PROPOSED CONDITIONS MODEL SECTION LOCATIONS

Project No. **11125168**

Original Size **ANSI D**

Sheet No.

Plot Date: 12 June 2018 - 2:33 PM Plotted By: PTJames Filename: Q:\Rowdy Creek\7_CAD-GIS\Civil3D\Data\11125168_HEC-RAS_PCM_Flood.dwg



DOMINIE CREEK PLAN VIEW

SCALE

0 20' 40'

N

90% DESIGN

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size sheet

0 1"

Michael Love & Associates
Hydrologic Solutions
PO Box 4477 • Arcata, CA 95518 • (707) 822-2411

GHD Inc.
718 Third Street
Eureka California 95501 USA
T 1 707 443 8326 **F** 1 707 444 8330 **W** www.ghd.com

Drawn	###	Designer	###
Drafting Check	##	Design Check	##
Project Manager	JS	Date	SEPT. 2017
This document shall not be used for construction unless signed and sealed for construction.		Scale	AS SHOWN

Client

Project

Title **DOMINIE CREEK**
PEAK PROPOSED CONDITIONS MODEL SECTION LOCATIONS

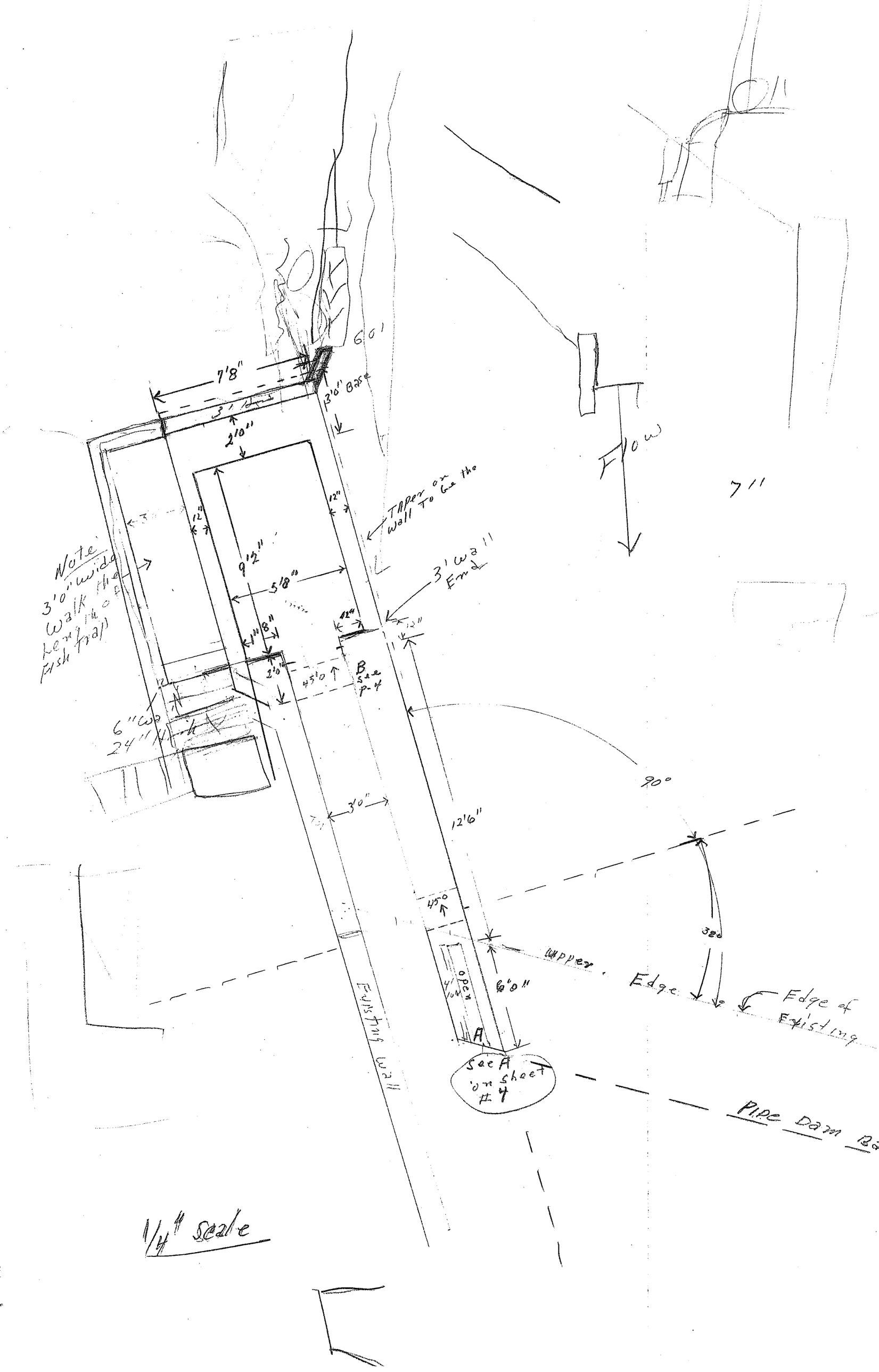
Project No. **11125168**

Original Size **ANSI D**

Sheet No.

Plot Date: 12 June 2018 - 2:33 PM Plotted By: PTJames Filename: Q:\Rowdy Creek\7_CAD-GIS\Civil3D\Data\11125168_HEC-RAS_PCM_Flood.dwg

Appendix F- *Existing Weir Design Sketches*


7'8"
3'0" Base
2'10"
12"
12"
9'2"
5'8"
1'11"8"
2'0"
45°0
B
See P.4
6"ø
24"
Taper or Go the wall To
3' w all
End
Note
3'0" wide
walk
Fish trail
3'0"
12'6"
90°
45°
6'0"
Open
A
See A on sheet #4
Existing wall
Flow
7 11
32ø
Upper Edge
Edge of Existing
Pipe Dam
1/4" Scale

74'-10"

El. 46.74 = 1986 Flood stage At F.L.

El. 44.24 = 1964 Flood Stage At F.L.

El. 42.21
could be 5' H

El. 39.50 = Top of low slant Wall At Apex - N W Cor.

El. 36.21 = Top of Slab N.W. Cor.

20'+or-

10'-3"

Slab

℄ Elect. Barrier

Bollard Post

13'

5'-2"

8'-9"

7'-3½"

5'-4½"

+37.00?

39.22?

6'6"

4" Conc. grouting for Fish Barrier 67'-0"

X 38.46

4" Conc. Slab

36.92

37.16

1'-10"

37.41

Pipes 3 10 Approx 280 c.f.s

37.44

37.91

39'-8"

X 38.16

6'

4'-1½" Ht

9'-4½"

9'-4½"

9'-4½"

9'-4½"

38.90

23'-4"

Slab

3'

36.21

elev 1.00 Bottom side

Slab

30' long pipe

B

6'

41.21

1'-6"

3'

36.00

36.21

Slab edge NW Cor

6'-0"

38.16 = SWC

1' Slab

Footing

Brace

Brace

A

ctr. of Bracket

20" [illegible]

Note:
All Drawings are Not to same Scale
Check Dimensions shown

134" 35" 35" 134"

18°

128°

3'

2'

Edge of Slab - UP River

E

73'-6"

14°

6'0"

36'9"

Slab thick

3/4" x 24" x 24" Base plate Rigid Babbitted Pillow Blocks (Bearings)
3/4 Slot for

Ability To Raise + lower Rt will
When Vertical = 4'9" hi.
When Flat = 0'-10" hi. +-

52°

80°

90°

34

36'9"

3" oil well pipe -
Pipe Wall = 3/4" Thick.

Concrete Base & Rd for Gate outside wall.

4'9"

WALL 3'Ht.

Flow

Vert. [illegible]
10"

Existing slant Wall

N

3/8" SCALE

8"

3'-0"

Top el. 40.30

Existing

A

1'-0" WALL

9'2" ID

4"

Fish Trap 54" Hi
60" Wide

9'-0"

F

3' Top

Base 4'0

4"

obstruction
11'+-

3'-0"

3"

5'6"

Slope Gate

Lower Top of this area

2'-5"

1'-0"

2'-6"

3'-0"

Top

6"

2'-0"

E

11'-4"

50°

30°

12'-4"

66°

Existing upriver Slab Edge

Pipes 6'-6"

D

4'-9" Hi

Water flow

Exis
N. Sla
el. 4c

9'2" ID

slab line

Creek bed

54"

El. 37.30

4"

El

Flo. — Exist Slab + Footing

12"

dead water

27"

3"

2'

Ex Slab

Tie

Floor

12"

4'6"

15"

2'-1"

4'-

Pipe rack - see pg #1

40.30

4'9"

4'6"

60°

6"

4'10"

60"

3"

El. 37.30

12"

slab line

45° slope, ℄ edge of vert Wall.

Exist
N. Slant
el. 40.3

9'2" ID

C

dead wtr

27" 24"

Floor

12

15"

Wall Footing

4'6

hinge

23'-6" leading edge of slab

23' leading edge To Pipe rack

South Wall Elev.

3/8" scale

(A) capability of closing fish flo when basket is removed. use slide gate

(B) Ability To raise El. 37.30 by 3'- on demand. via Air or Hyd

(C) Ability To raise Wall C by 1'-0" on demand. via Air or Hyd.

(D) Need detail of Welded rock And Pillow blocks.

(E) Need detail of Power drive.

(F) Need detail of Fish basket.

Pg. #

Exist Stone Wall

Exist Stone Wall

Existing Stone Wall

17"

14"

9'2" I.D.

3'

Raceway

F/O

3'0"

Note: Re-channel bank to 2:1 slope as directed

18"

5'8" I.D.

5'

10'

4"

54" Hi

1'4"

4

8'

4"

18"

3/4

7'8"

Exist slab edge

2'

Note See H next Sheet 4 of 4

Exist Creek Bed

2'-9"

Fish Basket

Bead Water

12'

54"

Elev 37.30

18"

12"

4'-0"

12"

10'

2'

2'

Existing Slab + footings

Slab Angle

4'-0"

1/4" Scale

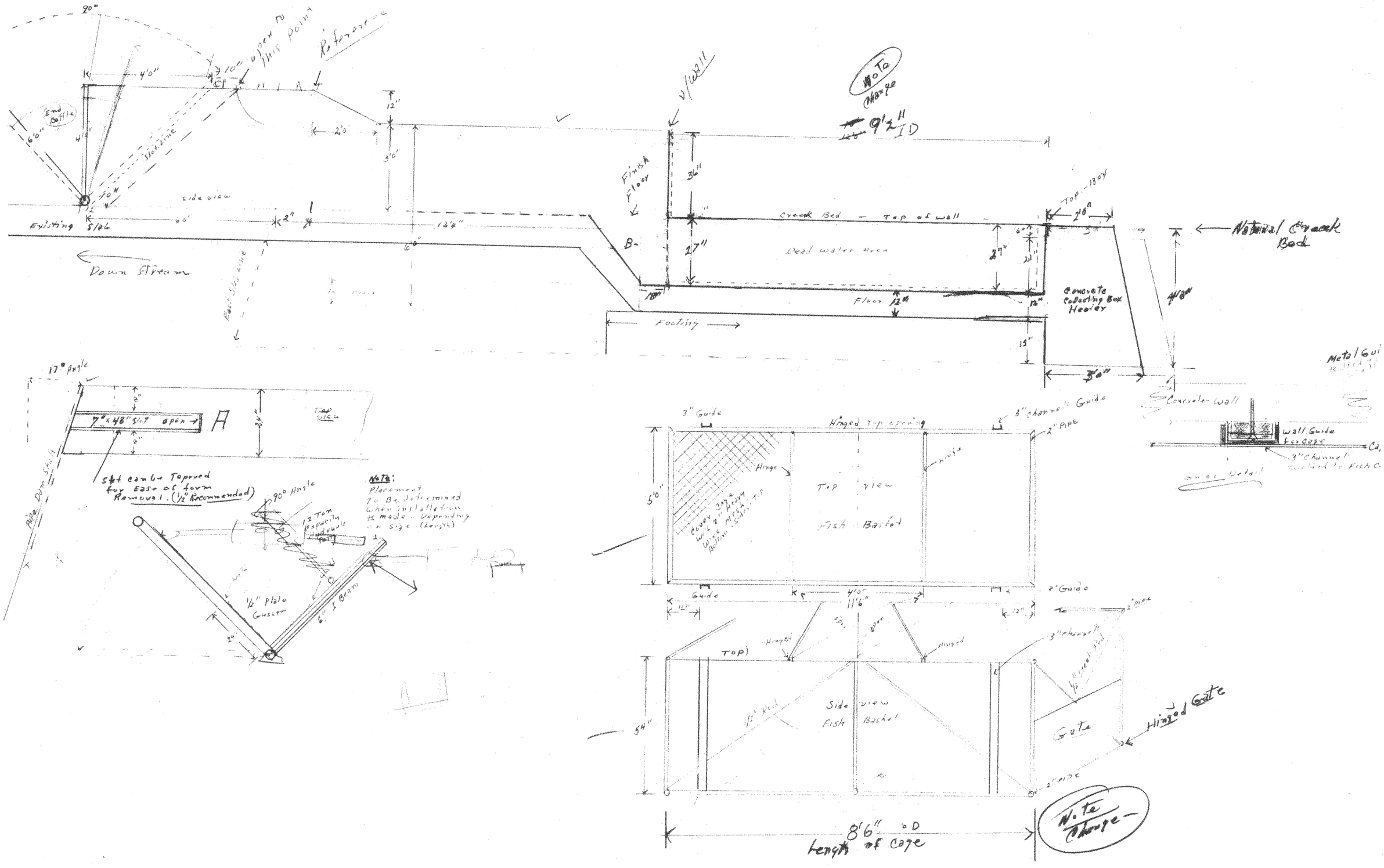
Note: See Sheet #4 for Profile Detail

Weld Cast

40.30

37.30

37.30


90°
4'0"
10" opening to this point
Reference
End Baffle
16'0"
4'0"
Slot Line
2'0"
12"
3'0"
Side View
Existing
S/walk
6'0"
2"
12'4"
6"
Down Stream
Fish Slot Line
Finish Floor
36"
27"
B-
Creek Bed — Top of wall
Dead water Area
Floor
12"
Footing
Top — 130.4
2'6"
Natural Creek Bed
4'8"
Concrete Collecting Box Heavy
3'0"
Concrete wall
wall Guide for Gate
3" Channel welded to Fish C.
Side Detail
17° Angle
2"
7"x48" Slot open
A
Top View
Pipe Dam Shell
Slot can be Tapered for Ease of form Removal. (½" Recommended)
90° Angle
12 Ton Capacity Hoist
Note:
Placement To Be determined when installation is made. Depending on size (length)
½" Plate Gusset
6" I Beam
3" Guide
Hinged Top opening
3" channel Guide
2" Pipe
Hinge
Top View
Fish Basket
5'0"
Cover Cage w/ 2" Mesh Wire Mesh Bottom Sides Top
Guide
4'0"
11'6"
2" Guide
Top)
Hinged
Side View
Fish Basket
Gate
Hinged Gate
54"
8'6" OD
Length of Cage
Note Change
Note Change
9'2" ID

Appendix G- *Selected Caltrans' Highway 101 As-Built Drawings*

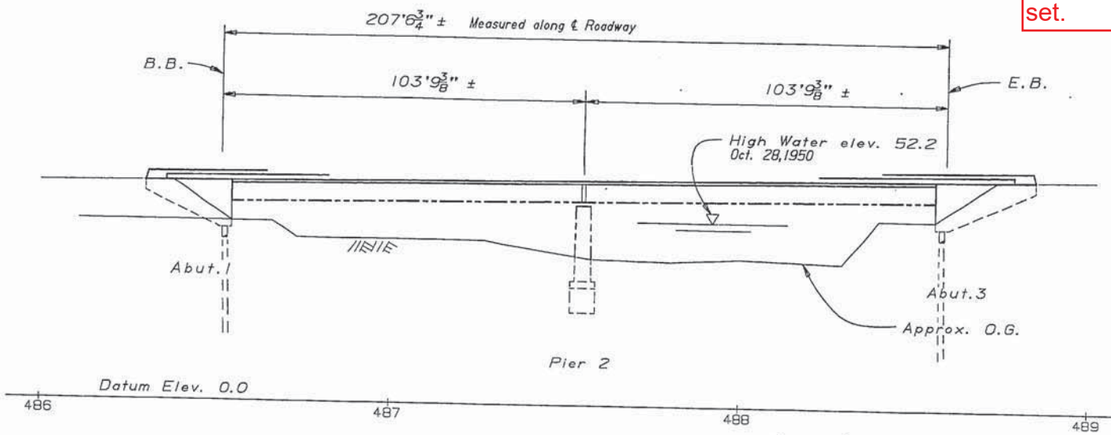
This drawing set is a sub-set of the As-Built plan set.

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	DN	101	36.3/40.7	23	31

jack L Abcarius
REGISTERED ENGINEER — CIVIL

REGISTERED PROFESSIONAL ENGINEER
J. Abcarius
No. 40459
Exp. 3-31-91
CIVIL
STATE OF CALIFORNIA

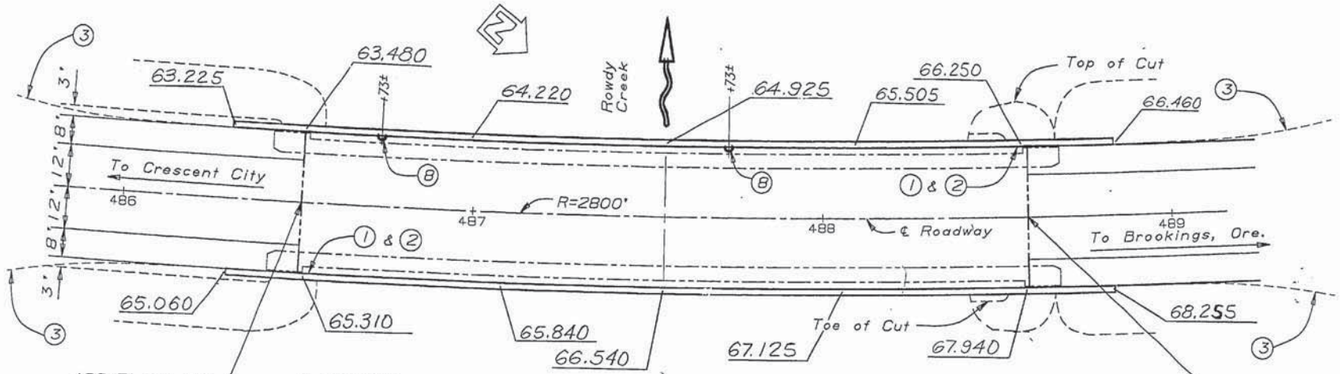
6-18-90
PLANS APPROVAL DATE



ELEVATION
1"=20'

PILE DATA
16" ø C.I.D.H. PILES

LOCATION	DESIGN LOADING (SERVICE LOAD)	SPECIFIED TIP ELEVATION
ABUT. 1	100 TONS	14
ABUT. 3	100 TONS	14



℄ Roadway
R=2800'
Δ=42°26'30"
T=1087.22'
L=2074.09'

PLAN
1"=20'

APPROXIMATE QUANTITIES

BRIDGE REMOVAL (PORTION)	LUMP SUM
RECONSTRUCT STRUCTURAL STEEL GIRDERS	LUMP SUM
16" CAST-IN-DRILLED-HOLE CONCRETE PILING	152 LF
DRILL AND BOND DOWEL	84 LF
WATERSTOP	26 LF
JOINT SEAL (MR 1/2")	25 LF

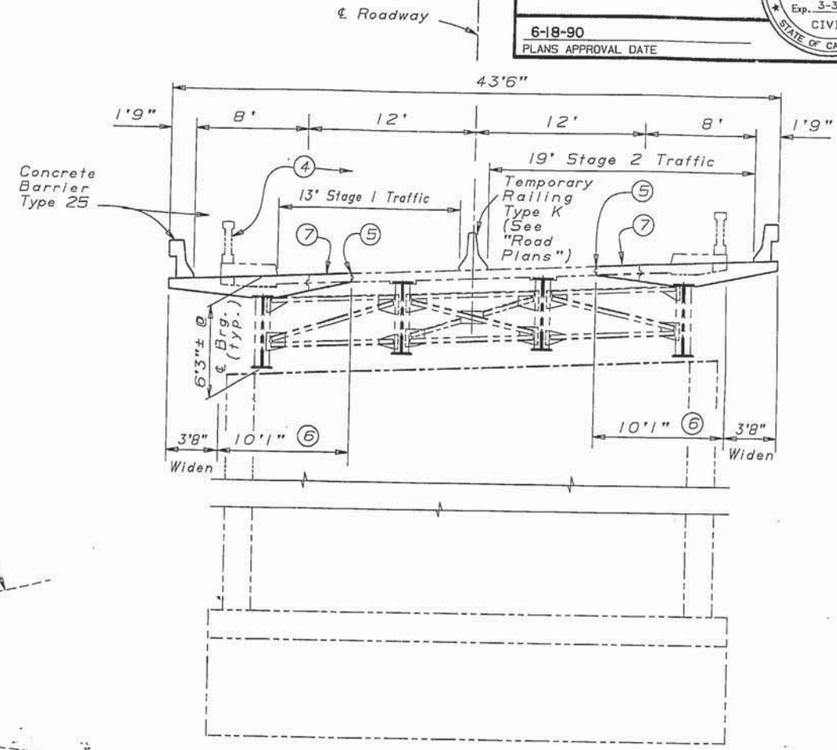
FINAL PAY QUANTITIES

STRUCTURE EXCAVATION (TYPE D)	56 CY
STRUCTURE BACKFILL (BRIDGE)	36 CY
STRUCTURAL CONCRETE, BRIDGE	247 CY
BAR REINFORCING STEEL (BRIDGE)	54,000 LB
MISCELLANEOUS METAL (BRIDGE)	1,200 LB
CONCRETE BARRIER (TYPE 25)	484 LF

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

For Construction Sequence see "Girder Details" sheet.
For General Notes see "Typical Section" sheet.

1. Paint "Bridge No. 1-23"
2. Paint "Rowdy Creek Br."
3. M.B.G.R. see Road Plans
4. Remove exist. curb, railing and deck overhang
5. Match exist. grade and cross slope.
6. Limit of exist. deck removal
7. 3'0" Closure Pour
8. Deck Drain (B7-5 / 7-3) Type B



TYPICAL SECTION
1"=5'

AS BUILT MJ 10-21-91
CORRECTIONS B OM. Bruder
CONTRACT NO. 01-197144
DATE 9-26-91

AS BUILT
CORRECTIONS B
CONTRACT NO.
DATE

INDEX TO PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	FOUNDATION PLAN
3	ABUTMENTS
4	ABUTMENT JOINT DETAILS
5	TYPICAL SECTION
6	GIRDER DETAILS
7	BEARING DETAILS
8	LOG OF TEST BORINGS
9	LOG OF TEST BORINGS (AS BUILT)

STANDARD PLANS DATED JANUARY 1988

A62-C	EXCAVATION AND BACKFILL - BRIDGE
B0-1	BRIDGE DETAILS
B0-3	BRIDGE DETAILS
B0-5	BRIDGE DETAILS
B2-3	16" CAST-IN-DRILLED-HOLE CONCRETE PILE
B6-21	JOINT SEALS (MAX. MR = 2")
B7-5	DECK DRAINS
B11-30	TEMPORARY RAILING TYPE K
B11-53	CONCRETE BARRIER TYPE 25

Standard Plan Sheet No.
Detail No.

Ted Jensen 12/89
DESIGN ENGINEER

	BY	CHECKED
DESIGN	M. Kotal 5/89	D.Valls 7/89
DETAILS	Bill Svoboda 5-89	D.Valls 7/89
QUANTITIES	W Svoboda 12-89	Ray Mon 12-89

LOAD FACTOR DESIGN	LIVE LOADING: HS20-44 AND ALTERNATIVE AND PERMIT DESIGN LOAD		
LAYOUT	BY M. Kotal 5/89	CHECKED D.Valls 7/89	
SPECIFICATIONS	BY R.J. Anderson 2-90	PLANS AND SPECS COMPARED Ted Jensen 2-90	

DS OSD 2138 (CADD 4/89)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS: 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 5

CU 01
EA 197141

BRIDGE NO.	1-23
POST MILE	39.63

ROWDY CREEK BRIDGE (WIDEN)
GENERAL PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES (PRELIMINARY STAGE ONLY): 5-1-89 | 6-1-89 | 7-14-89 | 9-28-89 | 10-24-89 | 10-30-89 | 11-1-89 | 11-13-89 | 12-18-89 | 12/27/89

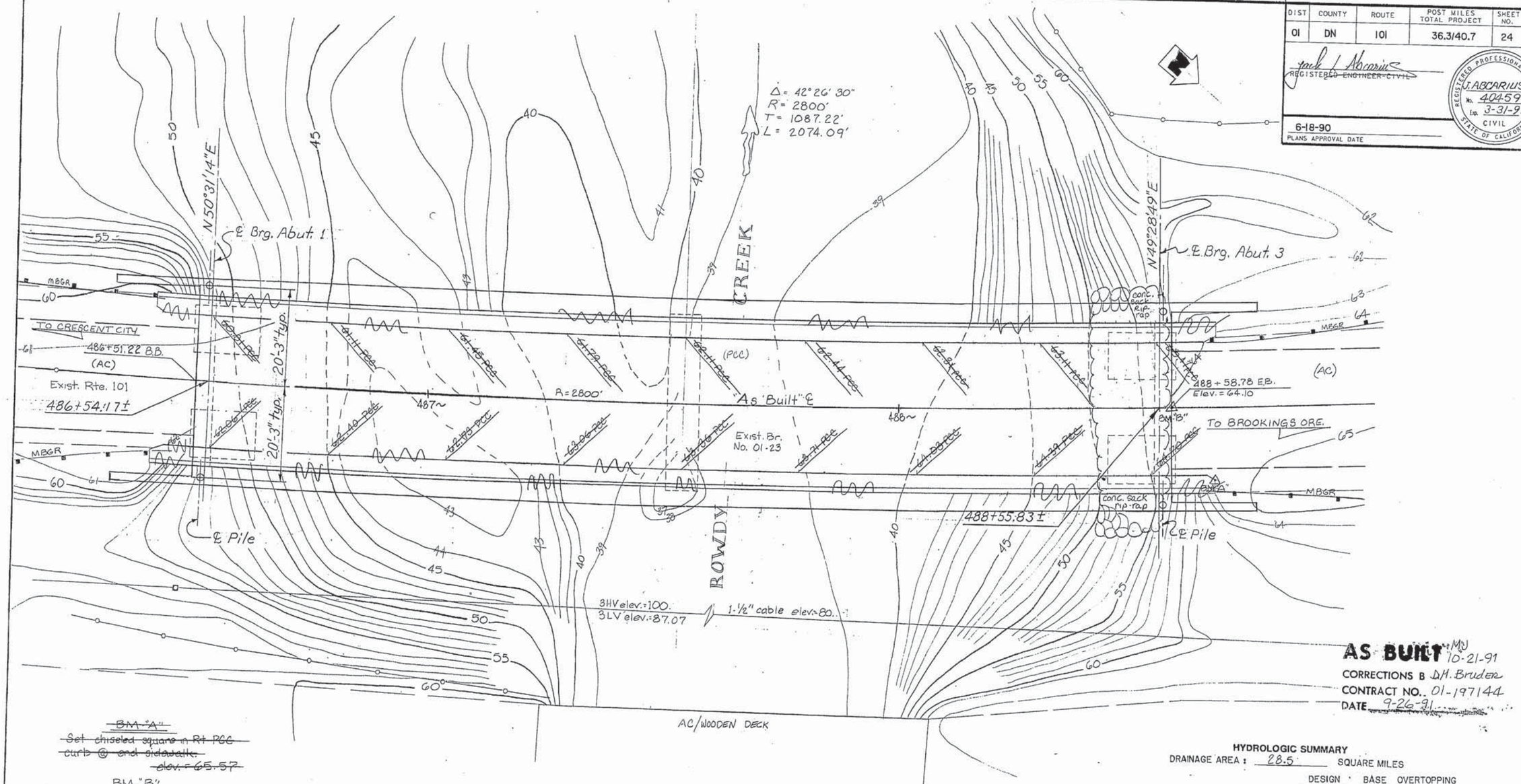
SHEET	OF
1	9

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	DN	101	36.3/40.7	24	31

jack J. Abcarius
REGISTERED ENGINEER-CIVIL

REGISTERED PROFESSIONAL ENGINEER
J. ABCARIUS
No. 40459
Exp. 3-31-91
CIVIL
STATE OF CALIFORNIA

6-18-90
PLANS APPROVAL DATE



~~BM-"A"~~
~~Set chiseled square in Rt PCC curb @ end sidewalk.~~
~~elev.=65.57~~

BM-"B"
℄ Br. @ E.B. on pcc.
elev. = 64.10

AS BUILT MJ 10-21-91
CORRECTIONS B DH. Bruder
CONTRACT NO. 01-197144
DATE 9-26-91

HYDROLOGIC SUMMARY

DRAINAGE AREA : 28.5 SQUARE MILES

	DESIGN FLOOD	BASE FLOOD	OVERTOPPING FLOOD
FREQUENCY (YEARS)	50	100	*
DISCHARGE (CUBIC FEET PER SECOND)	14,000	13,500	
WATER SURFACE (ELEVATION AT BRIDGE)	48.5	49.5	

FLOOD PLAIN DATA ARE BASED UPON INFORMATION AVAILABLE WHEN THE PLANS WERE PREPARED AND ARE SHOWN TO MEET FEDERAL REQUIREMENTS. THE ACCURACY OF SAID INFORMATION IS NOT WARRANTED BY THE STATE AND INTERESTED OR AFFECTED PARTIES SHOULD MAKE THEIR OWN INVESTIGATION.

* In excess of 300yrs.

PRELIMINARY INVESTIGATION SECTION

SCALE 1"=10'	DATUM As Built Datum dated 1/16/1990	PHOTOGRAMMETRY AS OF:	DRAWN	BY D.COLLINS 7/89	
ALIGNMENT TIES: As Builts		SURVEYED BY	TRACED	BY D.COLLINS 7/89	
DS OSD 2145 (4/89)		FIELD CHECKED BY PJC 6/89	CHECKED	BY	

DESIGN	BY M. Kotal 11-89	CHECKED D. Valls 11-89
DETAILS	BY [signature] 11-89	CHECKED D. Valls 11-89
QUANTITIES	BY [signature] 12-89	CHECKED [signature] 12-89

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF STRUCTURES
STRUCTURE DESIGN 5

CU 01101
EA 197141

PR-0123-1

BRIDGE NO.	ROWDY CREEK BRIDGE (WIDEN)
01-23	
POST MILE 39.63	FOUNDATION PLAN

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY)

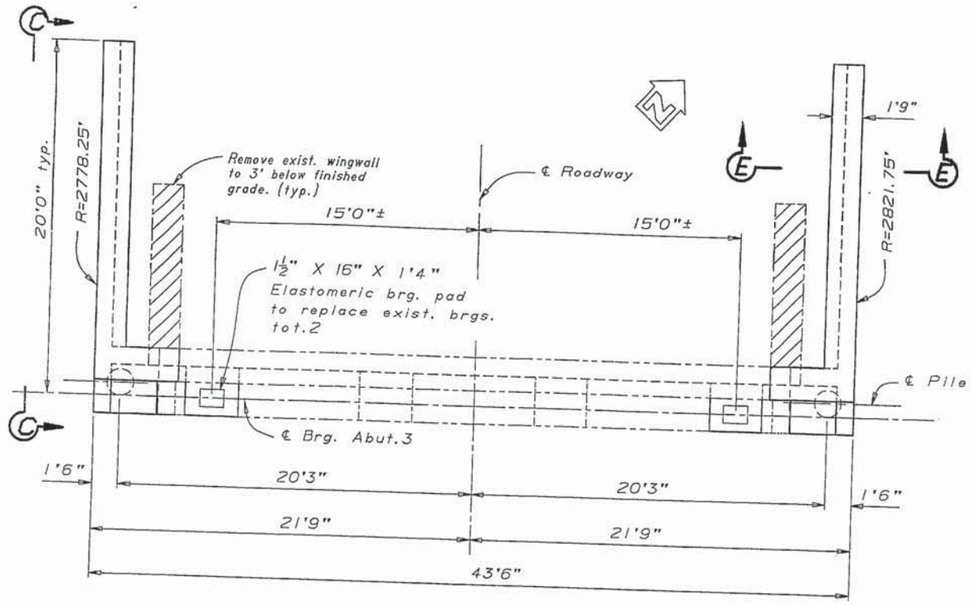
SHEET 2 OF 9

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS
01	DN	101	36.3/40.7	25	31

Jack L. Abcarius
REGISTERED ENGINEER — CIVIL

REGISTERED PROFESSIONAL ENGINEER
J. Abcarius
No. 40459
Exp. 3-31-91
CIVIL
STATE OF CALIFORNIA

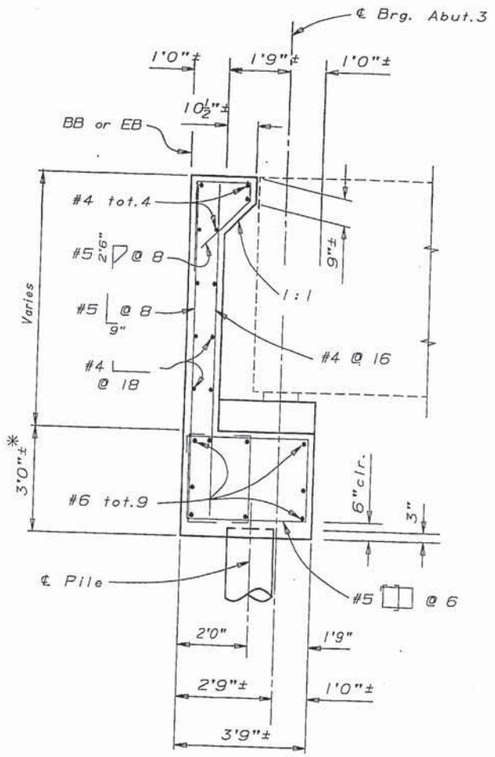
6-18-90
PLANS APPROVAL DATE



PLAN - ABUTMENT 3

¼"=1'0"

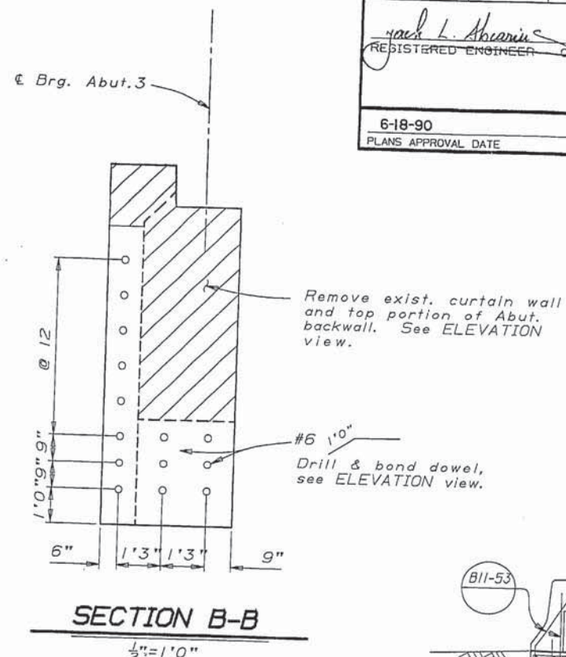
Note:
Abut.3 shown
Abut.1 similar



SECTION A-A

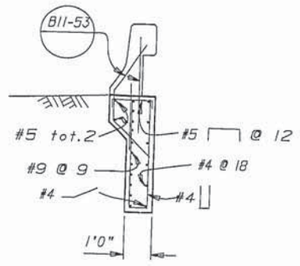
½"=1'0"

* Match existing.



SECTION B-B

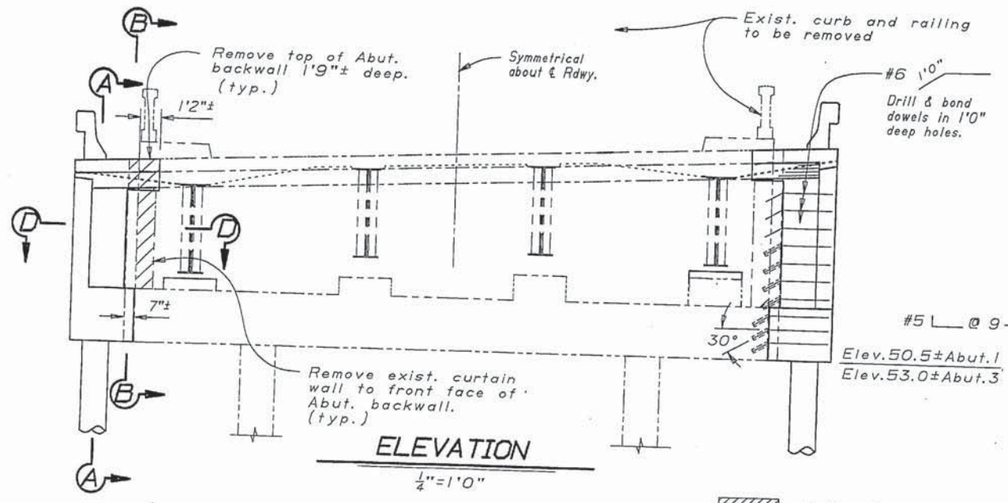
½"=1'0"



SECTION E-E

⅜"=1'0"

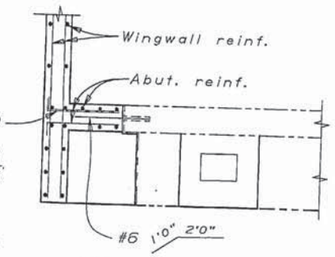
NO CORRECTIONS THIS SHEET
AS BUILT MJ 10-21-91
CORRECTIONS B DM Bruder
CONTRACT NO. 01-197144
DATE 7-26-91



ELEVATION

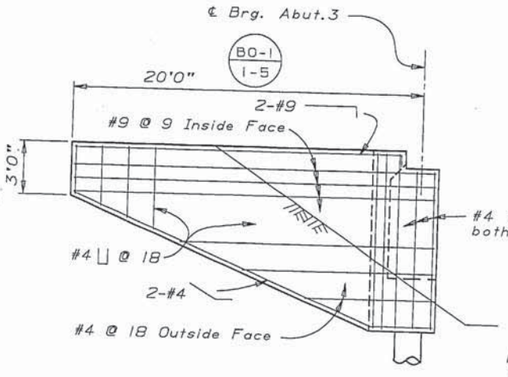
¼"=1'0"

Bridge Removal



SECTION D-D

⅜"=1'0"



ELEVATION C-C

¼"=1'0"

NOTE:
THE CONTRACTOR SHALL VERIFY ALL CONTROLLING FIELD DIMENSIONS BEFORE ORDERING OR FABRICATING ANY MATERIAL.

DESIGN	BY M. Kotai 6/89	CHECKED C.Valls 7/89	STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION	DIVISION OF STRUCTURES STRUCTURE DESIGN 5	BRIDGE NO. 1-23
DETAILS	BY Bill Svoboda 6-89	CHECKED D.Valls 7/89			POST MILE 39.63
QUANTITIES	BY W.F.Svoboda 12-89	CHECKED R. Morin 12-89			ROWDY CREEK BRIDGE (WIDEN) ABUTMENTS

DS 050 2139 (CADD 4/89)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

CU 01
EA 197141

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES (PRELIMINARY STAGE ONLY): 6-29-89 | 8-29-89 | 9-30-89 | 10-24-89 | 10-30-89 | 11-1-89 | 11-13-89 | 12-27-89

S	OF
3	9

FED. ROAD DIV NO	STATE	PROJ NO	FISCAL YEAR	BRIDGE NO	TOTAL SHEETS
7	CAL.			22	28

F-287(9)

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
1	DN	44	A	1	7

Pl. 39 1:

DATE APPROVED January 16, 1950.

PROFILE GRADE +1.32%

TOTAL LENGTH OF BRIDGE = 207'-6¾"

100'-0" 100'-3" 2'-11¾"

0'-10" 0'-10"

2'-1⅛"

Low steel Elev 54.7

~~Estimated high water El. 50.7~~

High Water 12-22-50 El. 52.2

El. 54

℄ Profile

El. 29.0

El. 28.0

Tremie seal

~~El. 27.0~~ See Sheet 2 for Fdn. Elev.

Datum elev: 0.0

487

ELEVATION

SH. NO	INDEX TO PLANS TITLE
1	GENERAL
2	FOUNDATION PLAN
3	ABUTMENT
4	PIER
5	STEEL LAYOUT
6	DECK DETAILS
7	LOG OF FOUNDATION BORINGS

0'-10" 3'-0" 28'-0" 3'-0" 2" 2" Prot. Girds. 4.4% ℄ Super

SECTION

Scale: 1"=6'-0"

BRIDGE DEPARTMENT

184+32.31 B.C.

Crescent City N 33°55'W

186+51.22 B.B. El 161.36

Deck drain

Deck Drain

Creek

Rowdy

488+58.78 E.B. El. 64.10

Brookings, Ore.

Shoulder

Shoulder

Prot.

date

Bridge No. 1-23

50' Metal Plate Guard Rail by others.

3 light clearance marker by others.

Riprap placed by District

Shoulder drain by others

Toe of Slope

Δ = 4.2° 26' 30"

R = 2800'

T = 1087.22'

L = 2074.09'

½" Joints in curb at ¼ points of span Fill with exp. material

Nail in log about 1'0 Rt. Sta. 488+85

PLAN

For general notes see Sheet no. 2.

AS BUILT PLANS
Contract No. 51-011C3
Date Completed
Document No. 10001113

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS ROWDY CREEK
LOCATED 11 MI. EAST OF THE TOWN OF SMITH RIVER
IN DEL NORTE COUNTY
GENERAL PLAN

LL.H20 S16-44

SCALE: 1"=10'-0" & 1"=6'-0"	BRIDGE 1-23	FILE	DRAWING C-65-1

PREL. DRAWING NO. P-65-23 7-9-34

Submitted for	By	Date	Checked	Date
DESIGN				
DETAILS				
QUANTITIES				
SPECIFICATIONS				

Revised Alignment & Grade 8-4-

Revised to Conform to Revised Alignment & Grade 8-4-

Revised to Conform to Revised Alignment & Grade 8-4-

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND WHICH I AM FULL DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ____ SIGNATURE ____ TITLE ____

F-287(3)

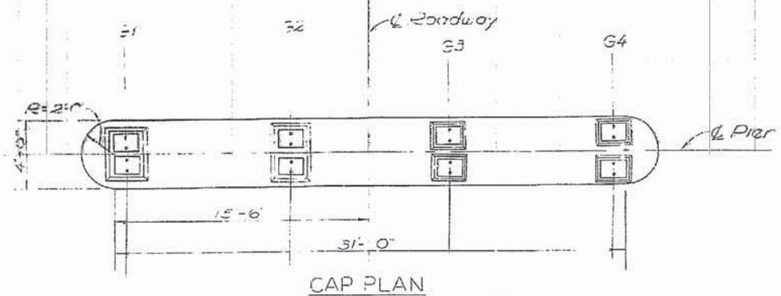
FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CAL.			25	28

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
1	LIN	44	A	4	7

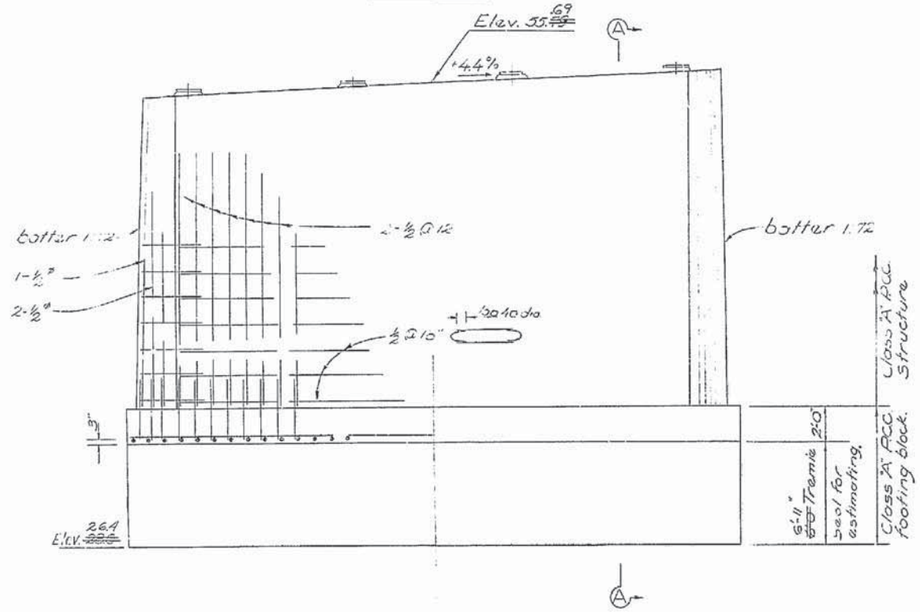
BRIDGE ENGINEER — CIVIL AND STRUCTURAL ENGINEER — LICENSE 1416

DATE APPROVED January 16, 1950

BRIDGE DEPARTMENT

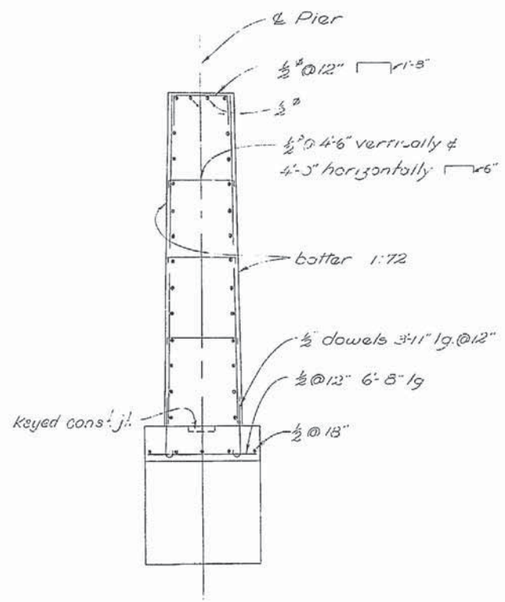


CAP PLAN



ELEVATION

PLAN



SECTION A-A

TOP OF BEARING RIB ELEVATIONS

	G1	G2	G3	G4
Span 1	56.~~78~~	56.13	57.07	57.~~24~~ 41
Span 2	56.~~78~~	56.13	57.09	57.~~26~~ 43

AS BUILT PLANS
Contract No. 51-011113
Date Completed
Document No. 10001113

MICROFILMED

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BRIDGE ACROSS [illegible] WDY CREEK

PIER

SCALE	BRIDGE	FILE	DRAWING
¼"=1'-0"	1-23		C-65-4

PREL. DRAWING NO B65 [illegible]

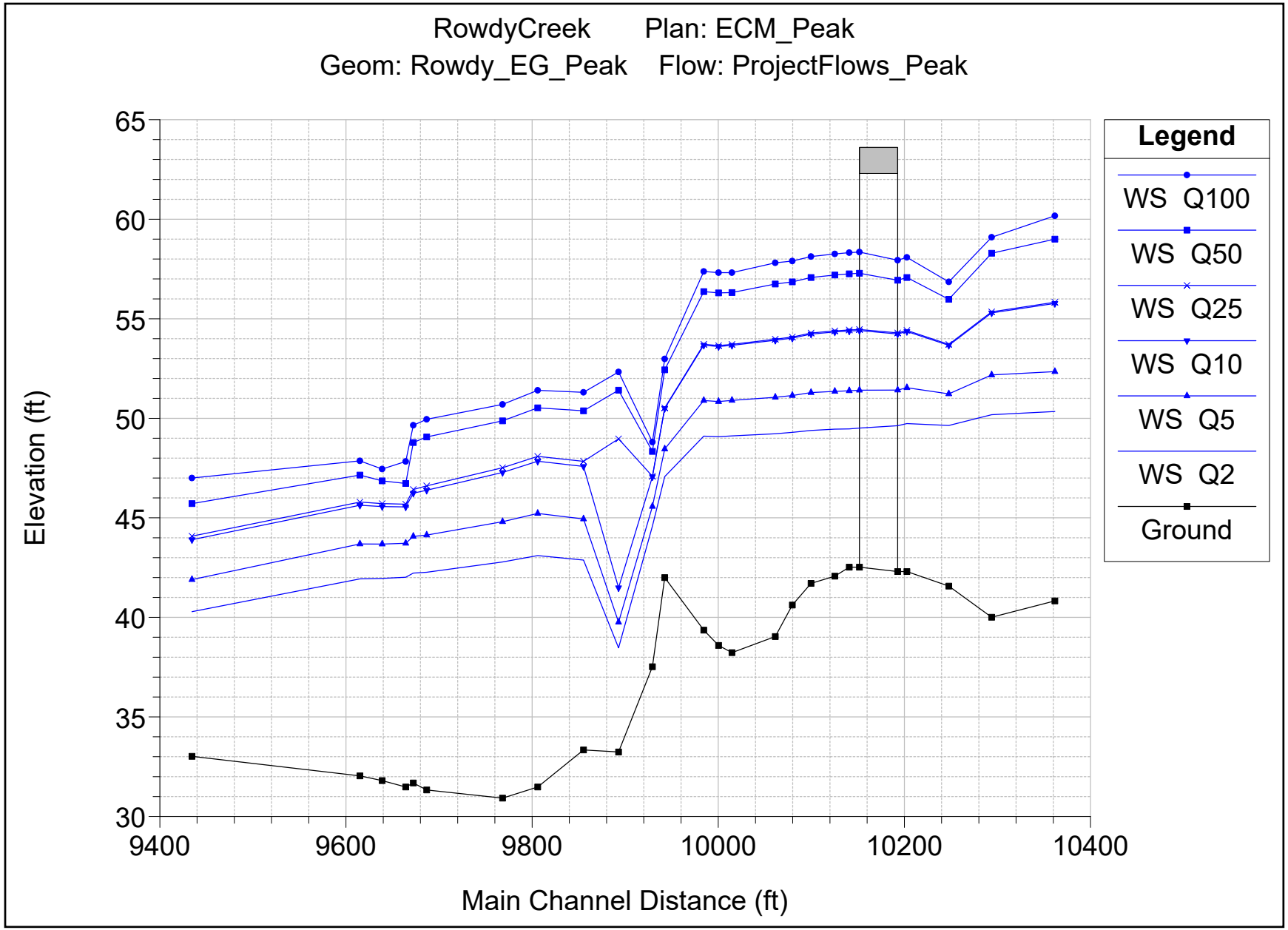
Submitted by
DESIGN
DETAILS
QUANTITIES
SPECIFICATIONS
Approved Recommended for Publication

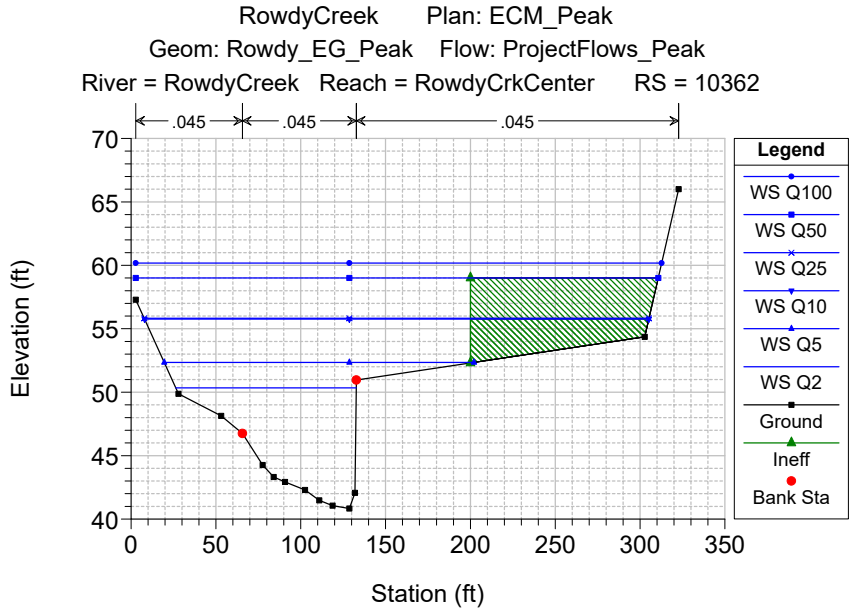
Revised to conform to as built plans 1956

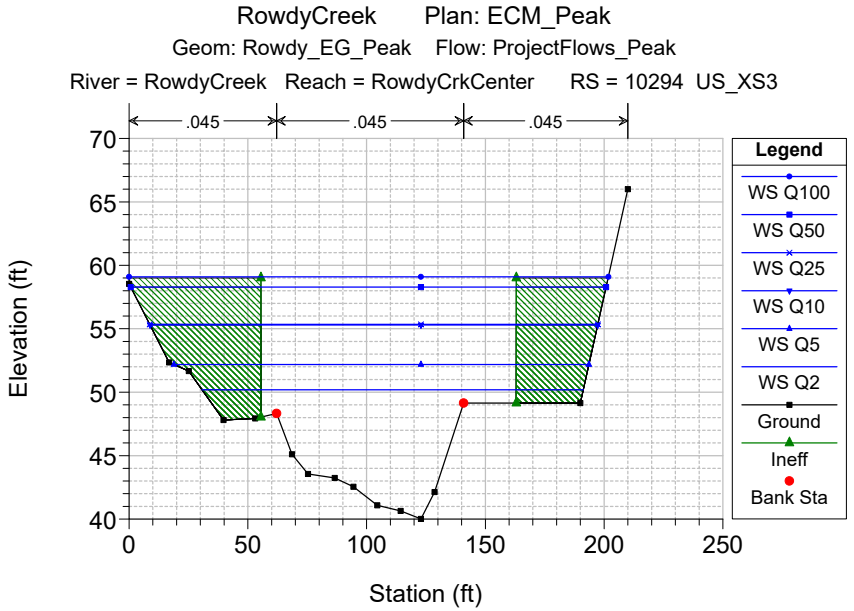
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

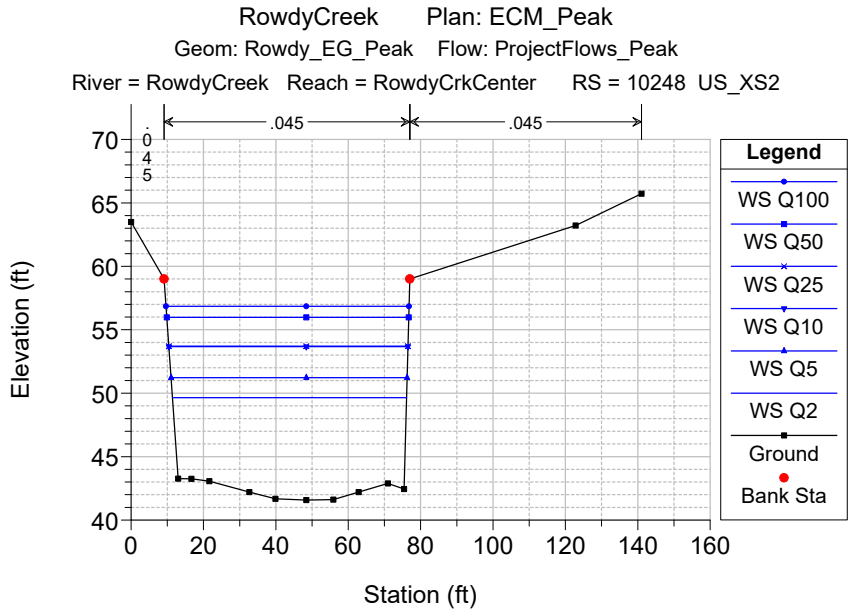
DATE [illegible] SIGNATURE [illegible] TITLE [illegible]

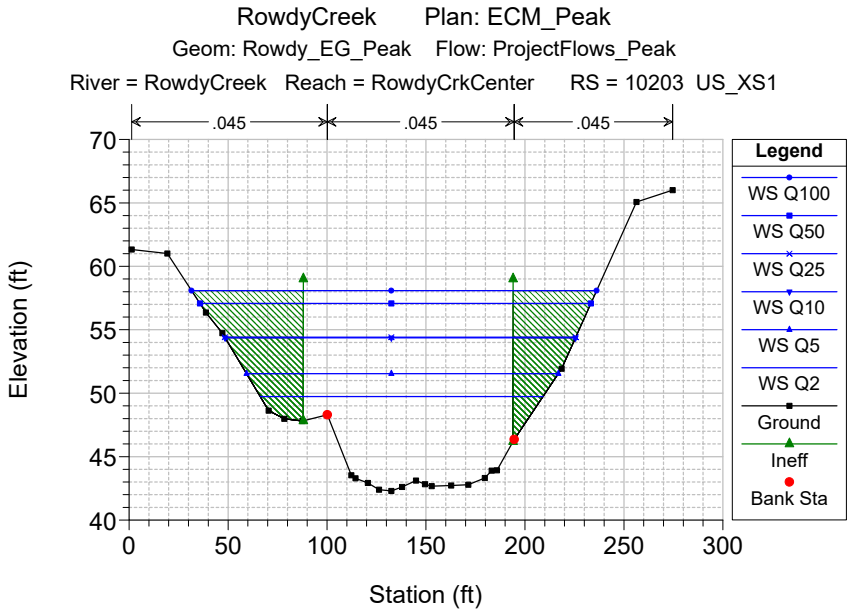
Appendix H- *Rowdy and Dominie Creek Existing Conditions Model Flood Analysis Results*

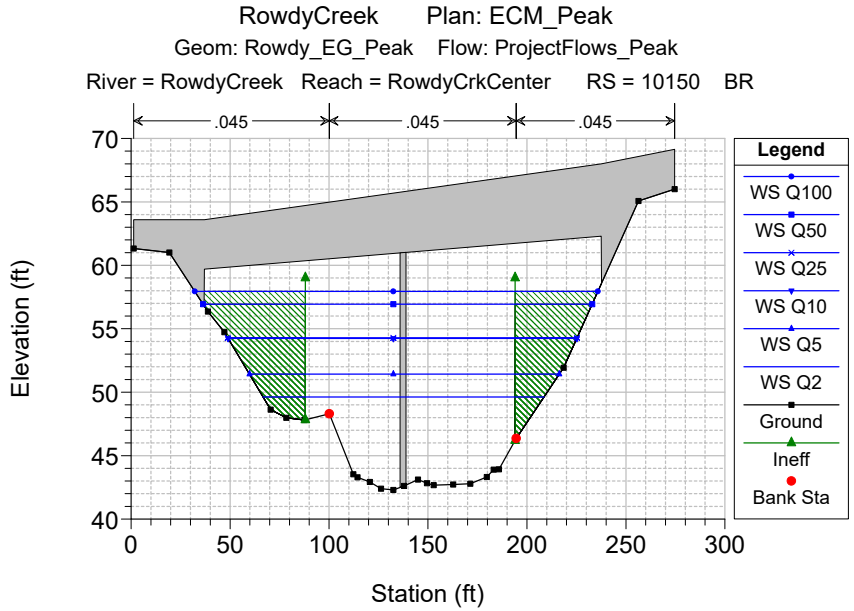

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
Elevation (ft)
65
60
55
50
45
40
35
30
9400
9600
9800
10000
10200
10400
Main Channel Distance (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground

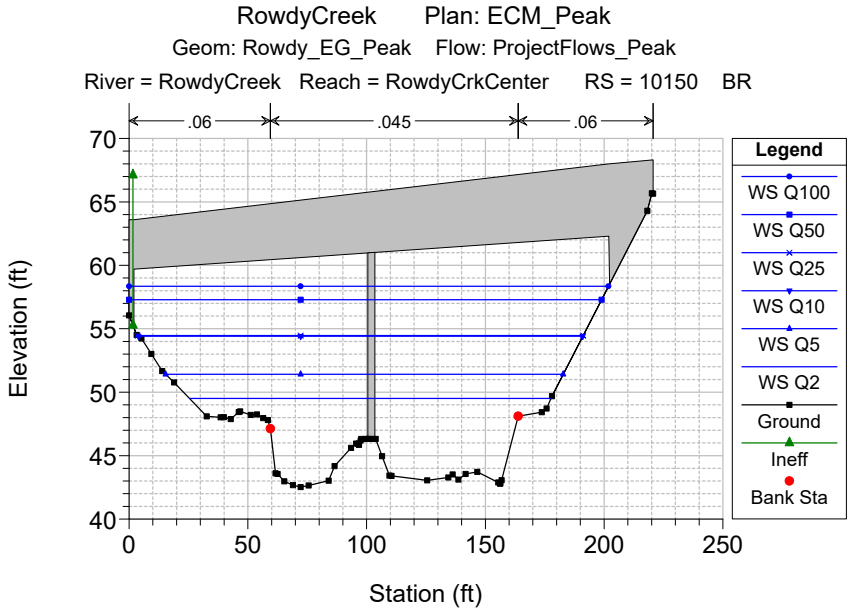

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10362
.045
.045
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

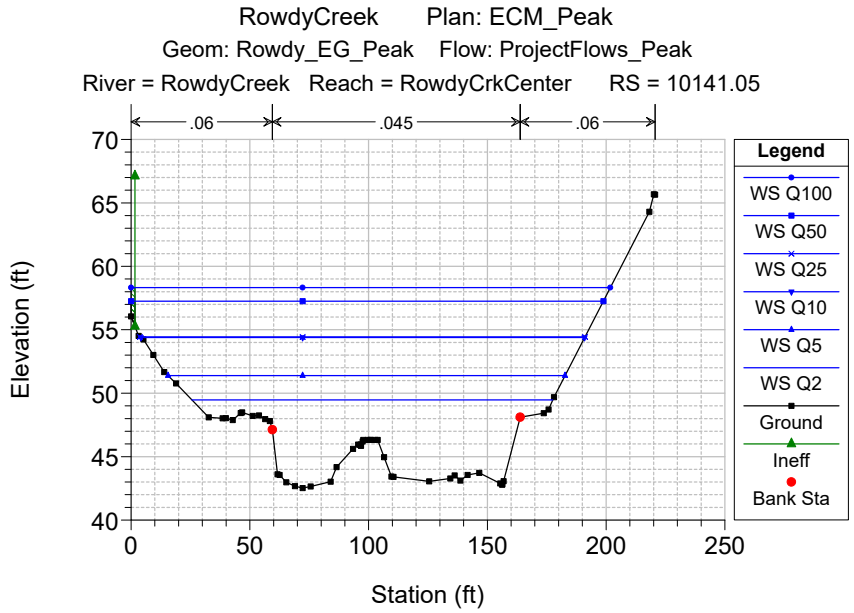

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10294 US_XS3
.045
.045
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

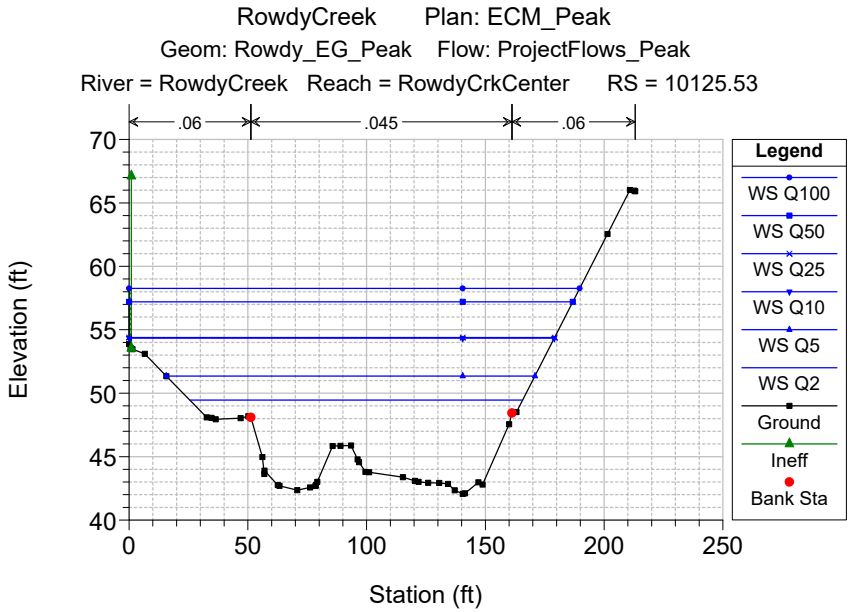

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10248 US_XS2
.045
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

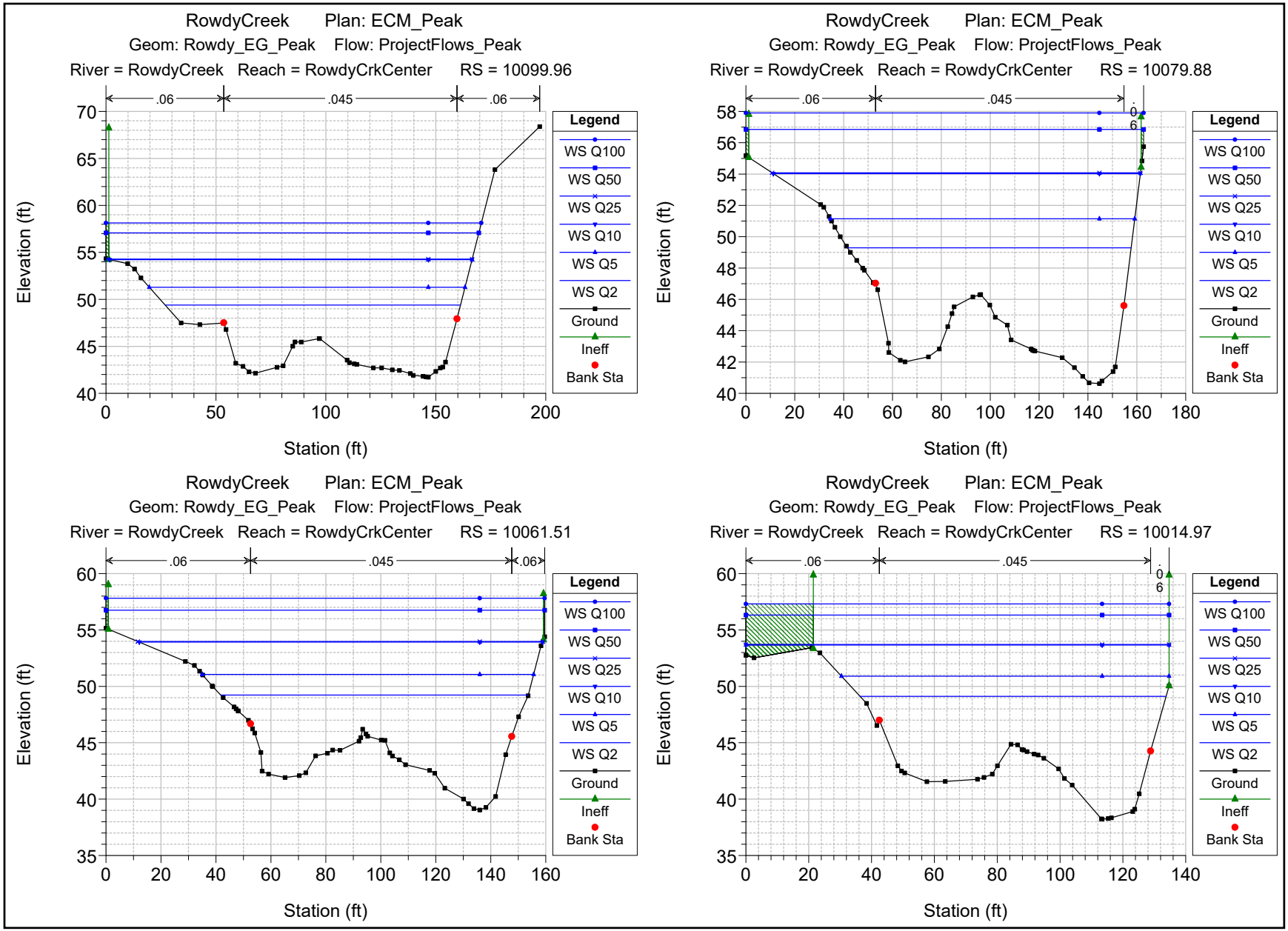

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10203 US_XS1
.045
.045
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

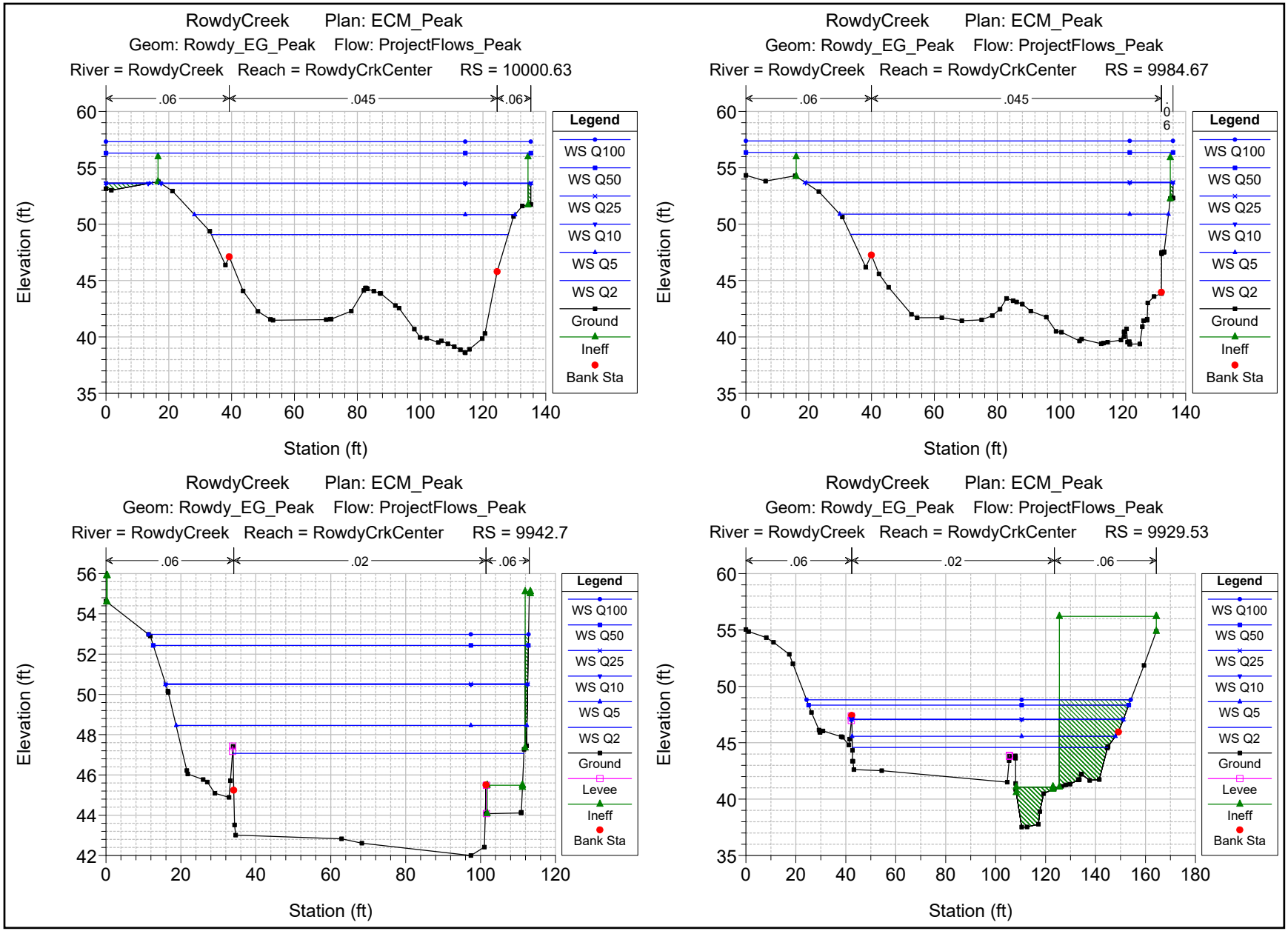

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.045
.045
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

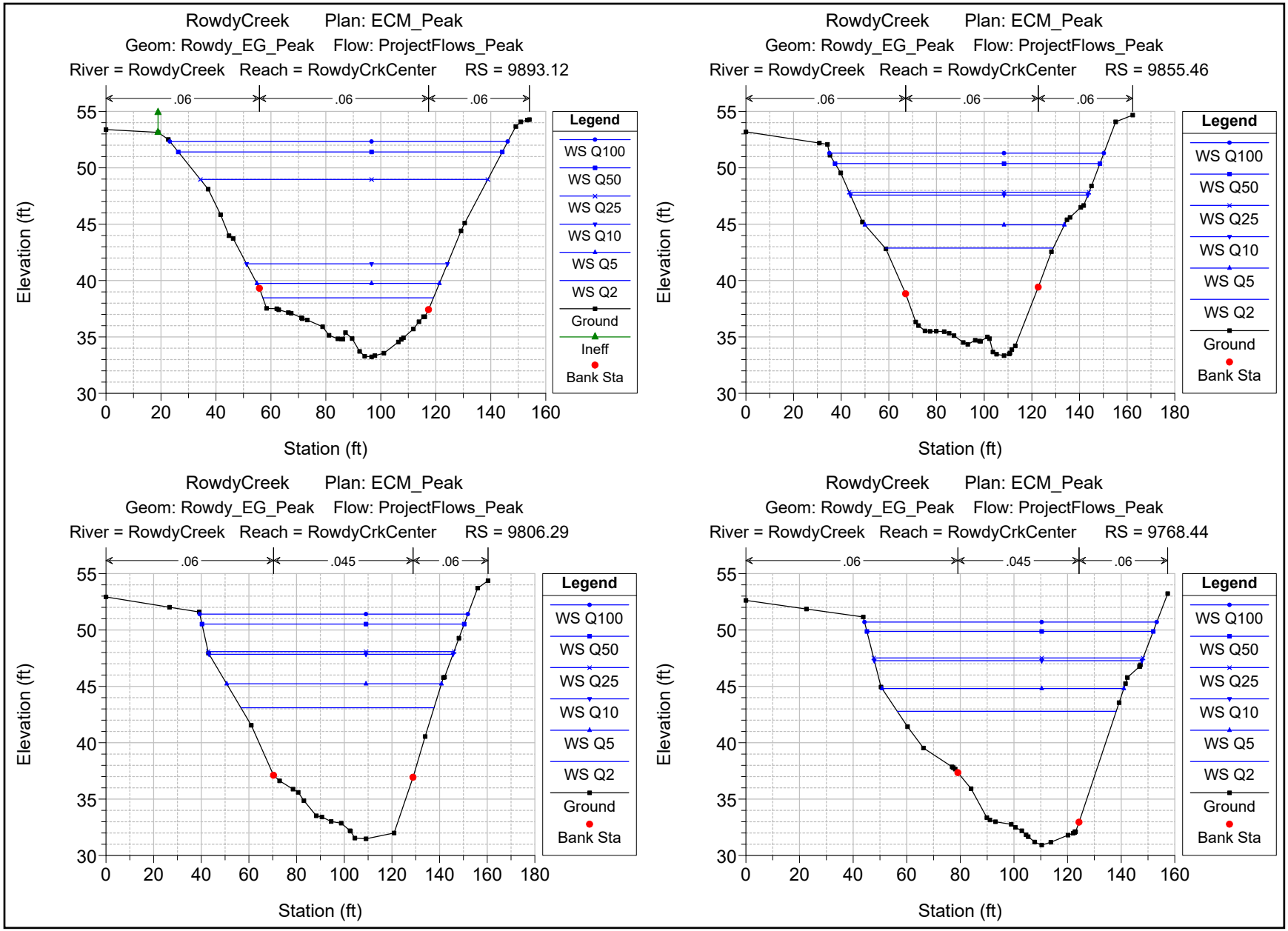

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

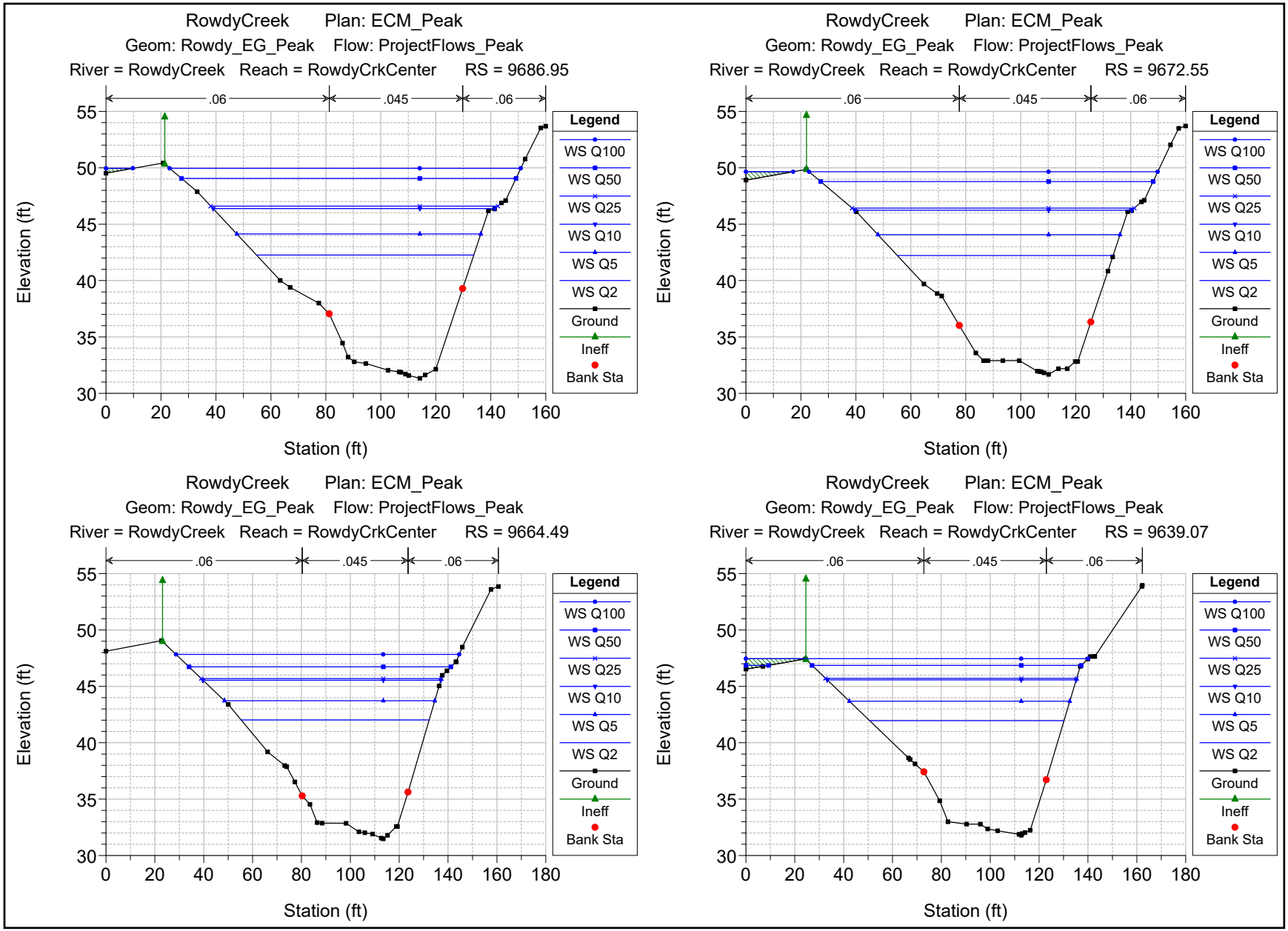

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10141.05
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

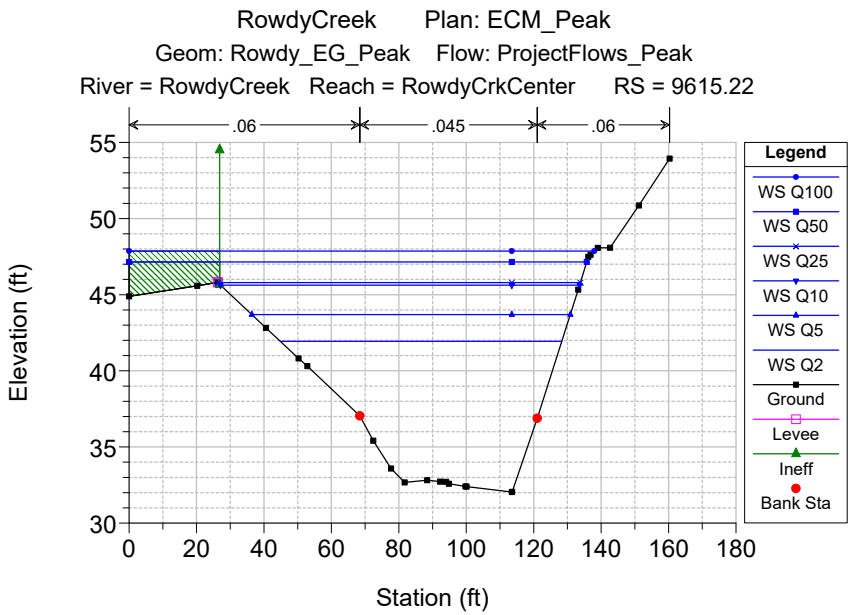

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10125.53
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

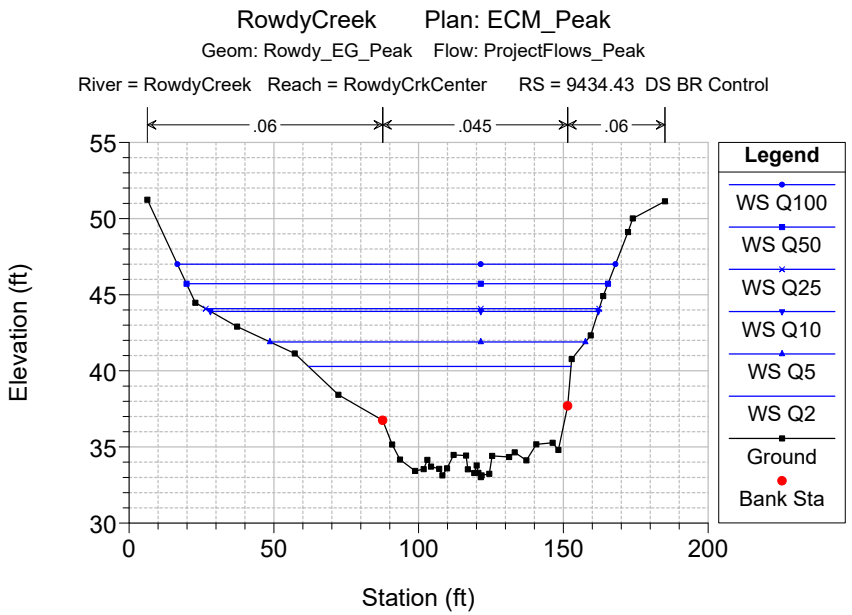

RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10099.96
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10079.88
.06
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10061.51
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10014.97
.06
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10000.63
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9984.67
.06
.045
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9942.7
.06
.02
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9929.53
.06
.02
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta


RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9893.12
.06
.06
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9855.46
.06
.06
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9806.29
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9768.44
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta


RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9686.95
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9672.55
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9664.49
RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9639.07
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9615.22
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta


RowdyCreek Plan: ECM_Peak
Geom: Rowdy_EG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9434.43 DS BR Control
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

HEC-RAS Plan: ECM-Peak River: RowdyCreek Reach: RowdyCrkCenter

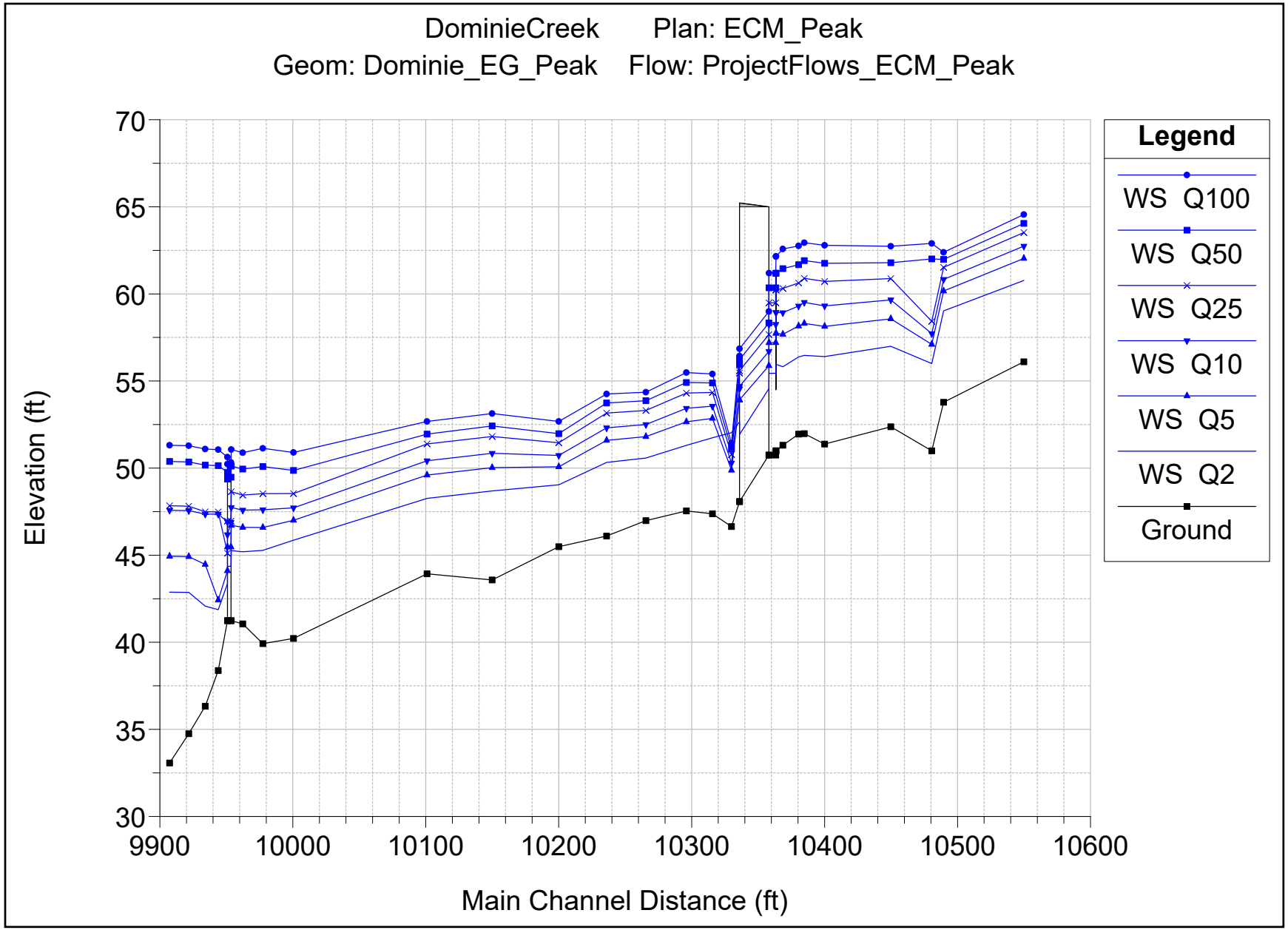
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10362	Q2	3657.00	40.83	50.34	47.32	51.03	0.003353	6.82	577.43	106.36	0.44
RowdyCrkCenter	10362	Q5	5548.00	40.83	52.35	48.95	53.15	0.003030	7.55	845.78	182.55	0.43
RowdyCrkCenter	10362	Q10	8860.00	40.83	55.77	51.17	56.43	0.001863	7.26	1483.20	297.26	0.35
RowdyCrkCenter	10362	Q25	8922.00	40.83	55.83	51.21	56.49	0.001849	7.25	1494.68	297.57	0.35
RowdyCrkCenter	10362	Q50	12485.00	40.83	59.00	53.32	59.61	0.001309	7.05	2116.54	307.97	0.31
RowdyCrkCenter	10362	Q100	13895.00	40.83	60.17	53.80	60.82	0.001317	7.41	2478.37	309.98	0.31
RowdyCrkCenter	10294	Q2	3657.00	40.01	50.18	46.88	50.80	0.002833	6.35	599.94	160.52	0.42
RowdyCrkCenter	10294	Q5	5548.00	40.01	52.18	48.39	52.95	0.002635	7.21	814.16	174.75	0.42
RowdyCrkCenter	10294	Q10	8860.00	40.01	55.30	50.61	56.26	0.002271	8.14	1149.45	188.48	0.41
RowdyCrkCenter	10294	Q25	8922.00	40.01	55.35	50.65	56.32	0.002266	8.16	1155.36	188.69	0.41
RowdyCrkCenter	10294	Q50	12485.00	40.01	58.29	52.29	59.44	0.002030	8.90	1471.33	200.17	0.40
RowdyCrkCenter	10294	Q100	13895.00	40.01	59.10	52.83	60.61	0.002486	10.20	1567.44	201.81	0.45
RowdyCrkCenter	10248	Q2	3657.00	41.57	49.64	47.01	50.59	0.005029	7.83	466.96	64.68	0.51
RowdyCrkCenter	10248	Q5	5548.00	41.57	51.23	48.51	52.70	0.006293	9.73	569.98	65.23	0.58
RowdyCrkCenter	10248	Q10	8860.00	41.57	53.67	50.77	55.95	0.007620	12.13	730.18	66.06	0.64
RowdyCrkCenter	10248	Q25	8922.00	41.57	53.71	50.81	56.01	0.007638	12.17	733.03	66.07	0.64
RowdyCrkCenter	10248	Q50	12485.00	41.57	55.98	52.93	59.08	0.008604	14.13	883.87	66.85	0.68
RowdyCrkCenter	10248	Q100	13895.00	41.57	56.85	53.72	60.23	0.008838	14.75	942.32	67.15	0.69
RowdyCrkCenter	10203	Q2	3657.00	42.30	49.73	47.00	50.31	0.003024	6.12	609.42	142.82	0.43
RowdyCrkCenter	10203	Q5	5548.00	42.30	51.54	48.27	52.30	0.002897	7.09	800.61	157.49	0.44
RowdyCrkCenter	10203	Q10	8860.00	42.30	54.36	50.05	55.39	0.002613	8.22	1100.39	177.01	0.44
RowdyCrkCenter	10203	Q25	8922.00	42.30	54.42	50.08	55.44	0.002609	8.24	1105.70	177.35	0.44
RowdyCrkCenter	10203	Q50	12485.00	42.30	57.07	51.62	58.35	0.002417	9.17	1387.49	197.55	0.44
RowdyCrkCenter	10203	Q100	13895.00	42.30	58.08	52.19	59.44	0.002341	9.46	1494.58	204.68	0.44
RowdyCrkCenter	10150		Bridge									
RowdyCrkCenter	10141.05	Q2	3657.00	42.52	49.47	47.23	50.04	0.003667	6.10	639.75	151.90	0.45
RowdyCrkCenter	10141.05	Q5	5548.00	42.52	51.38	48.42	52.01	0.002875	6.58	944.56	167.16	0.42
RowdyCrkCenter	10141.05	Q10	8860.00	42.52	54.39	50.12	55.07	0.002087	7.01	1476.23	186.83	0.38
RowdyCrkCenter	10141.05	Q25	8922.00	42.52	54.44	50.14	55.12	0.002078	7.02	1486.10	187.38	0.38
RowdyCrkCenter	10141.05	Q50	12485.00	42.52	57.26	51.52	57.97	0.001648	7.32	2030.09	198.84	0.35
RowdyCrkCenter	10141.05	Q100	13895.00	42.52	58.32	52.04	59.05	0.001522	7.40	2241.89	201.77	0.34
RowdyCrkCenter	10125.53	Q2	3657.00	42.07	49.46	46.98	49.97	0.003212	5.79	656.90	140.15	0.43
RowdyCrkCenter	10125.53	Q5	5548.00	42.07	51.36	48.11	51.96	0.002656	6.38	937.60	155.28	0.41
RowdyCrkCenter	10125.53	Q10	8860.00	42.07	54.34	49.78	55.04	0.002025	6.96	1437.89	179.03	0.38
RowdyCrkCenter	10125.53	Q25	8922.00	42.07	54.39	49.81	55.09	0.002015	6.97	1447.37	179.17	0.38
RowdyCrkCenter	10125.53	Q50	12485.00	42.07	57.20	51.25	57.95	0.001633	7.33	1957.80	186.83	0.35
RowdyCrkCenter	10125.53	Q100	13895.00	42.07	58.26	51.76	59.02	0.001520	7.44	2156.51	189.73	0.34
RowdyCrkCenter	10099.96	Q2	3657.00	41.71	49.39	46.79	49.88	0.002969	5.71	671.42	134.30	0.41
RowdyCrkCenter	10099.96	Q5	5548.00	41.71	51.29	47.99	51.90	0.002548	6.38	935.80	143.61	0.40
RowdyCrkCenter	10099.96	Q10	8860.00	41.71	54.23	49.58	54.98	0.002106	7.18	1380.02	164.80	0.39
RowdyCrkCenter	10099.96	Q25	8922.00	41.71	54.28	49.61	55.03	0.002099	7.19	1388.64	165.83	0.39
RowdyCrkCenter	10099.96	Q50	12485.00	41.71	57.07	51.04	57.89	0.001743	7.63	1853.96	169.56	0.37
RowdyCrkCenter	10099.96	Q100	13895.00	41.71	58.13	51.56	58.97	0.001635	7.77	2032.07	170.70	0.36
RowdyCrkCenter	10079.88	Q2	3657.00	40.62	49.29	46.61	49.82	0.002999	5.85	639.36	116.14	0.42
RowdyCrkCenter	10079.88	Q5	5548.00	40.62	51.15	47.74	51.84	0.002776	6.72	862.72	124.63	0.42
RowdyCrkCenter	10079.88	Q10	8860.00	40.62	54.03	49.44	54.92	0.002416	7.70	1253.86	150.23	0.41
RowdyCrkCenter	10079.88	Q25	8922.00	40.62	54.08	49.47	54.97	0.002409	7.72	1261.55	150.77	0.41
RowdyCrkCenter	10079.88	Q50	12485.00	40.62	56.85	51.02	57.84	0.002041	8.26	1701.88	162.78	0.39
RowdyCrkCenter	10079.88	Q100	13895.00	40.62	57.90	51.59	58.92	0.001930	8.44	1876.07	162.78	0.39
RowdyCrkCenter	10061.51	Q2	3657.00	39.04	49.22	46.38	49.77	0.002942	5.93	633.30	111.85	0.41
RowdyCrkCenter	10061.51	Q5	5548.00	39.04	51.06	47.56	51.78	0.002839	6.89	846.70	120.58	0.42
RowdyCrkCenter	10061.51	Q10	8860.00	39.04	53.92	49.34	54.87	0.002549	7.97	1224.06	146.73	0.42
RowdyCrkCenter	10061.51	Q25	8922.00	39.04	53.97	49.38	54.92	0.002543	7.98	1231.53	147.31	0.42
RowdyCrkCenter	10061.51	Q50	12485.00	39.04	56.75	51.01	57.79	0.002169	8.55	1664.94	159.63	0.40
RowdyCrkCenter	10061.51	Q100	13895.00	39.04	57.81	51.59	58.88	0.002029	8.68	1833.33	159.63	0.39
RowdyCrkCenter	10014.97	Q2	3657.00	38.23	49.12	45.67	49.64	0.002394	5.81	643.66	97.41	0.38
RowdyCrkCenter	10014.97	Q5	5548.00	38.23	50.90	46.95	51.65	0.002596	7.01	823.87	104.29	0.41
RowdyCrkCenter	10014.97	Q10	8860.00	38.23	53.66	48.80	54.73	0.002624	8.42	1125.15	134.70	0.43
RowdyCrkCenter	10014.97	Q25	8922.00	38.23	53.71	48.85	54.79	0.002622	8.44	1130.71	134.70	0.43
RowdyCrkCenter	10014.97	Q50	12485.00	38.23	56.32	50.61	57.66	0.002540	9.49	1426.02	134.70	0.44
RowdyCrkCenter	10014.97	Q100	13895.00	38.23	57.31	51.24	58.74	0.002487	9.82	1538.63	134.70	0.44
RowdyCrkCenter	10000.63	Q2	3657.00	38.59	49.08	45.56	49.60	0.002394	5.83	638.37	94.51	0.38
RowdyCrkCenter	10000.63	Q5	5548.00	38.59	50.84	46.85	51.61	0.002639	7.07	811.44	102.09	0.41
RowdyCrkCenter	10000.63	Q10	8860.00	38.59	53.61	48.76	54.69	0.002672	8.49	1115.55	131.14	0.43
RowdyCrkCenter	10000.63	Q25	8922.00	38.59	53.66	48.79	54.75	0.002670	8.51	1121.27	132.37	0.44
RowdyCrkCenter	10000.63	Q50	12485.00	38.59	56.30	50.57	57.61	0.002515	9.45	1485.90	135.26	0.44
RowdyCrkCenter	10000.63	Q100	13895.00	38.59	57.32	51.22	58.69	0.002428	9.71	1623.20	135.26	0.43

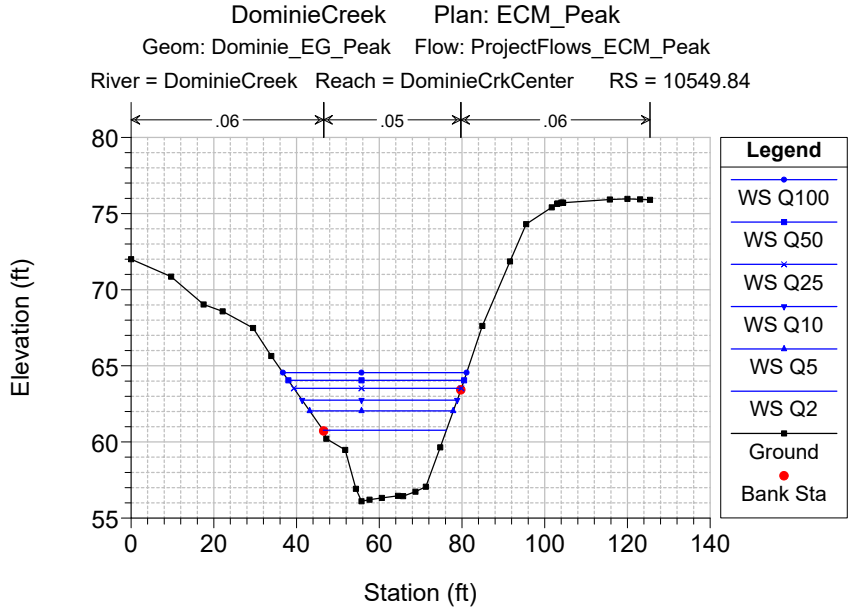
HEC-RAS Plan: ECM-Peak River: RowdyCreek Reach: RowdyCrkCenter (Continued)

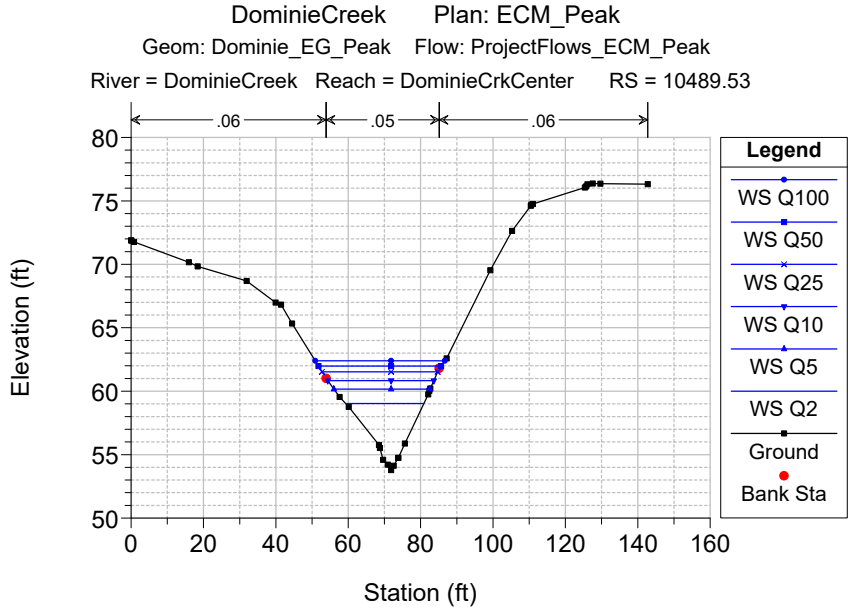
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9984.67	Q2	3657.00	39.36	49.10	45.27	49.54	0.001972	5.32	697.82	100.50	0.34
RowdyCrkCenter	9984.67	Q5	5548.00	39.36	50.89	46.49	51.54	0.002183	6.46	881.04	104.65	0.38
RowdyCrkCenter	9984.67	Q10	8860.00	39.36	53.67	48.31	54.61	0.002262	7.85	1186.46	116.95	0.40
RowdyCrkCenter	9984.67	Q25	8922.00	39.36	53.72	48.34	54.66	0.002262	7.87	1192.15	117.22	0.40
RowdyCrkCenter	9984.67	Q50	12485.00	39.36	56.36	50.02	57.53	0.002191	8.84	1546.51	135.98	0.41
RowdyCrkCenter	9984.67	Q100	13895.00	39.36	57.38	50.63	58.61	0.002127	9.10	1684.62	135.98	0.41
RowdyCrkCenter	9942.7	Q2	3657.00	42.00	47.07	47.07	49.25	0.003855	11.96	329.46	77.64	1.00
RowdyCrkCenter	9942.7	Q5	5548.00	42.00	48.46	48.46	51.21	0.003450	13.56	476.87	93.65	0.99
RowdyCrkCenter	9942.7	Q10	8860.00	42.00	50.49	50.49	54.22	0.003171	15.87	669.17	96.63	1.00
RowdyCrkCenter	9942.7	Q25	8922.00	42.00	50.52	50.52	54.27	0.003174	15.91	672.07	96.68	1.00
RowdyCrkCenter	9942.7	Q50	12485.00	42.00	52.44	52.44	57.08	0.002970	17.78	858.77	100.13	1.00
RowdyCrkCenter	9942.7	Q100	13895.00	42.00	52.98	52.98	58.11	0.003062	18.72	912.95	101.43	1.02
RowdyCrkCenter	9929.53	Q2	3657.00	37.52	44.59	45.87	48.94	0.016943	16.74	218.50	102.25	1.82
RowdyCrkCenter	9929.53	Q5	5548.00	37.52	45.57	47.14	50.87	0.013640	18.47	300.32	105.44	1.71
RowdyCrkCenter	9929.53	Q10	8860.00	37.52	47.06	49.03	53.84	0.011203	20.89	424.15	108.75	1.63
RowdyCrkCenter	9929.53	Q25	8922.00	37.52	47.09	49.06	53.90	0.011190	20.94	426.11	108.81	1.63
RowdyCrkCenter	9929.53	Q50	12485.00	37.52	48.34	50.78	56.64	0.010353	23.26	569.42	128.23	1.62
RowdyCrkCenter	9929.53	Q100	13895.00	37.52	48.81	51.42	57.67	0.010073	24.06	616.66	129.85	1.62
RowdyCrkCenter	9893.12	Q2	4146.00	33.24	38.47	40.84	46.91	0.217557	23.32	178.41	62.09	2.40
RowdyCrkCenter	9893.12	Q5	6374.00	33.24	39.76	42.56	49.18	0.154571	24.71	260.90	66.44	2.13
RowdyCrkCenter	9893.12	Q10	9923.00	33.24	41.49	44.88	52.42	0.113897	26.76	381.99	73.12	1.94
RowdyCrkCenter	9893.12	Q25	10287.00	33.24	48.97	45.09	50.70	0.006508	11.04	1041.52	104.55	0.53
RowdyCrkCenter	9893.12	Q50	14077.00	33.24	51.41	47.12	53.50	0.006463	12.31	1313.11	117.90	0.55
RowdyCrkCenter	9893.12	Q100	15719.00	33.24	52.33	47.93	54.57	0.006475	12.79	1423.93	122.93	0.55
RowdyCrkCenter	9855.46	Q2	4146.00	33.34	42.88	40.95	44.29	0.010869	9.62	448.04	70.48	0.62
RowdyCrkCenter	9855.46	Q5	6374.00	33.34	44.94	42.80	46.84	0.010858	11.30	607.05	83.71	0.64
RowdyCrkCenter	9855.46	Q10	9923.00	33.34	47.58	45.42	50.02	0.010513	13.07	851.16	99.59	0.66
RowdyCrkCenter	9855.46	Q25	10287.00	33.34	47.84	45.66	50.32	0.010431	13.20	876.46	100.60	0.66
RowdyCrkCenter	9855.46	Q50	14077.00	33.34	50.38	47.89	53.14	0.009421	14.19	1145.18	111.18	0.64
RowdyCrkCenter	9855.46	Q100	15719.00	33.34	51.31	48.71	54.21	0.009257	14.63	1250.10	115.16	0.65
RowdyCrkCenter	9806.29	Q2	4146.00	31.48	43.10	38.99	43.87	0.002435	7.16	623.44	81.05	0.41
RowdyCrkCenter	9806.29	Q5	6374.00	31.48	45.22	40.81	46.37	0.002815	8.81	804.99	90.14	0.45
RowdyCrkCenter	9806.29	Q10	9923.00	31.48	47.84	43.25	49.53	0.003263	10.85	1057.16	102.34	0.51
RowdyCrkCenter	9806.29	Q25	10287.00	31.48	48.09	43.48	49.83	0.003292	11.03	1082.26	103.20	0.51
RowdyCrkCenter	9806.29	Q50	14077.00	31.48	50.52	45.64	52.70	0.003439	12.50	1342.19	110.09	0.53
RowdyCrkCenter	9806.29	Q100	15719.00	31.48	51.41	46.57	53.79	0.003542	13.12	1440.27	112.59	0.55
RowdyCrkCenter	9768.44	Q2	4146.00	30.92	42.79	39.22	43.75	0.003052	8.27	587.50	81.65	0.46
RowdyCrkCenter	9768.44	Q5	6374.00	30.92	44.80	41.27	46.22	0.003601	10.16	761.01	90.20	0.52
RowdyCrkCenter	9768.44	Q10	9923.00	30.92	47.28	43.86	49.36	0.004256	12.53	995.64	99.87	0.58
RowdyCrkCenter	9768.44	Q25	10287.00	30.92	47.52	44.04	49.65	0.004290	12.72	1019.50	100.51	0.59
RowdyCrkCenter	9768.44	Q50	14077.00	30.92	49.87	46.09	52.51	0.004490	14.36	1263.32	106.80	0.61
RowdyCrkCenter	9768.44	Q100	15719.00	30.92	50.70	47.30	53.58	0.004651	15.09	1352.58	109.01	0.63
RowdyCrkCenter	9686.95	Q2	4146.00	31.33	42.26	39.52	43.44	0.004289	8.93	516.86	79.07	0.52
RowdyCrkCenter	9686.95	Q5	6374.00	31.33	44.13	41.57	45.85	0.005014	10.95	673.69	88.77	0.59
RowdyCrkCenter	9686.95	Q10	9923.00	31.33	46.39	44.12	48.90	0.005935	13.51	887.05	102.57	0.66
RowdyCrkCenter	9686.95	Q25	10287.00	31.33	46.61	44.35	49.19	0.005981	13.71	909.94	104.45	0.66
RowdyCrkCenter	9686.95	Q50	14077.00	31.33	49.07	46.18	52.06	0.005756	15.06	1188.93	121.70	0.67
RowdyCrkCenter	9686.95	Q100	15719.00	31.33	49.95	47.56	53.13	0.005766	15.63	1299.50	137.52	0.67
RowdyCrkCenter	9672.55	Q2	4146.00	31.68	42.22	39.28	43.37	0.003911	8.83	527.64	78.53	0.51
RowdyCrkCenter	9672.55	Q5	6374.00	31.68	44.07	41.34	45.77	0.004696	10.93	681.17	88.10	0.58
RowdyCrkCenter	9672.55	Q10	9923.00	31.68	46.24	43.96	48.82	0.005776	13.67	884.89	100.88	0.66
RowdyCrkCenter	9672.55	Q25	10287.00	31.68	46.42	44.20	49.10	0.005893	13.93	903.74	102.65	0.67
RowdyCrkCenter	9672.55	Q50	14077.00	31.68	48.78	46.10	51.96	0.005858	15.48	1169.17	120.95	0.69
RowdyCrkCenter	9672.55	Q100	15719.00	31.68	49.65	47.49	53.03	0.005881	16.08	1277.02	144.07	0.69
RowdyCrkCenter	9664.49	Q2	4146.00	31.48	42.02	39.53	43.32	0.004525	9.52	503.46	76.93	0.55
RowdyCrkCenter	9664.49	Q5	6374.00	31.48	43.72	41.59	45.70	0.005644	11.90	642.29	86.10	0.64
RowdyCrkCenter	9664.49	Q10	9923.00	31.48	45.55	44.21	48.71	0.007574	15.29	809.41	97.38	0.75
RowdyCrkCenter	9664.49	Q25	10287.00	31.48	45.68	44.46	48.98	0.007806	15.63	822.91	98.23	0.77
RowdyCrkCenter	9664.49	Q50	14077.00	31.48	46.73	46.73	51.71	0.010826	19.39	929.62	107.18	0.92
RowdyCrkCenter	9664.49	Q100	15719.00	31.48	47.83	47.83	52.81	0.009950	19.56	1053.38	115.95	0.89
RowdyCrkCenter	9639.07	Q2	4146.00	31.80	41.96	39.36	43.18	0.004510	9.08	505.01	79.55	0.54
RowdyCrkCenter	9639.07	Q5	6374.00	31.80	43.68	41.39	45.52	0.005462	11.27	651.35	90.22	0.62
RowdyCrkCenter	9639.07	Q10	9923.00	31.80	45.57	44.00	48.43	0.007038	14.30	832.53	101.89	0.72
RowdyCrkCenter	9639.07	Q25	10287.00	31.80	45.72	44.23	48.69	0.007227	14.60	847.49	102.79	0.73
RowdyCrkCenter	9639.07	Q50	14077.00	31.80	46.86	46.46	51.24	0.009631	17.87	969.07	119.45	0.85
RowdyCrkCenter	9639.07	Q100	15719.00	31.80	47.46	47.20	52.31	0.010171	18.90	1036.51	140.12	0.88

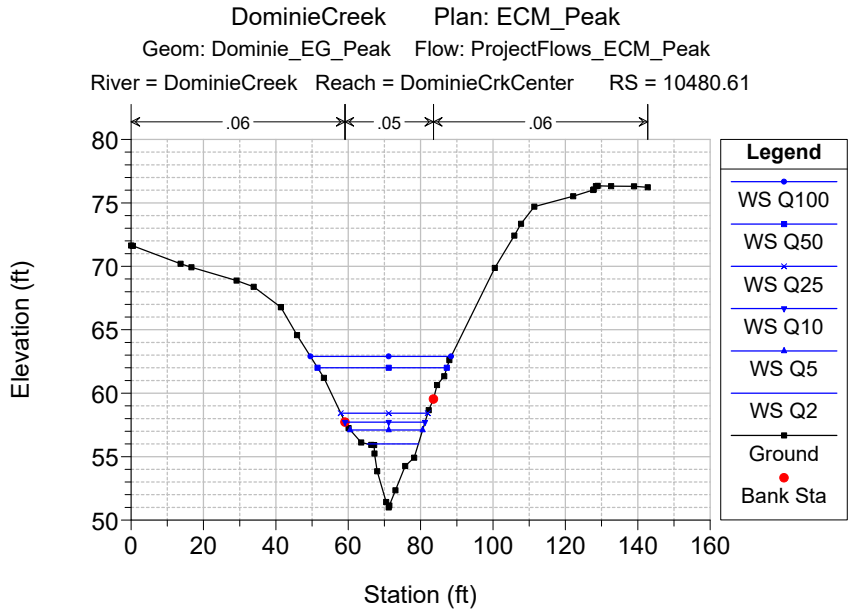
HEC-RAS Plan: ECM-Peak River: RowdyCreek Reach: RowdyCrkCenter (Continued)

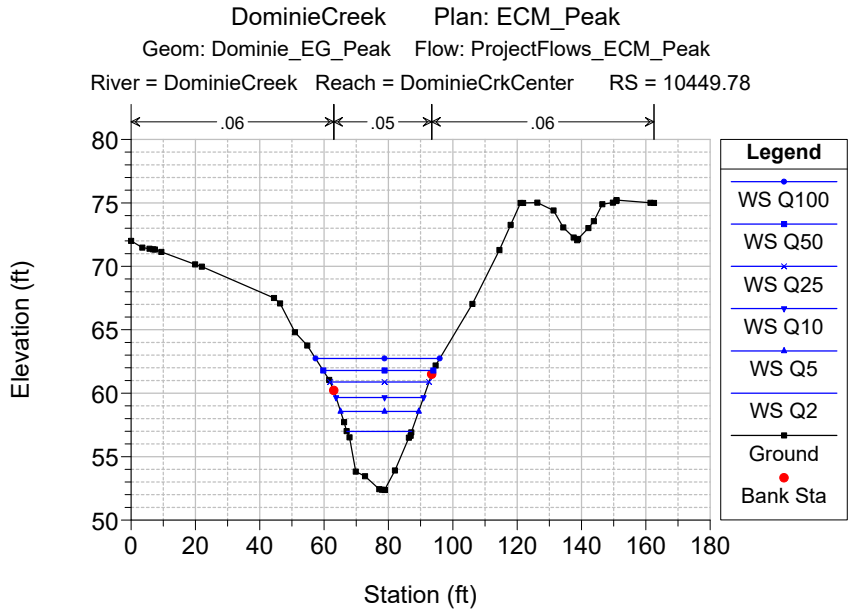
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9615.22	Q2	4146.00	32.04	41.94	39.17	43.05	0.004093	8.66	530.50	83.51	0.52
RowdyCrkCenter	9615.22	Q5	6374.00	32.04	43.69	41.14	45.34	0.004895	10.71	686.40	94.45	0.59
RowdyCrkCenter	9615.22	Q10	9923.00	32.04	45.63	43.66	48.18	0.006201	13.51	881.69	106.57	0.68
RowdyCrkCenter	9615.22	Q25	10287.00	32.04	45.79	43.89	48.43	0.006331	13.77	898.81	107.56	0.69
RowdyCrkCenter	9615.22	Q50	14077.00	32.04	47.15	46.25	50.81	0.007832	16.41	1045.72	135.74	0.78
RowdyCrkCenter	9615.22	Q100	15719.00	32.04	47.86	46.98	51.82	0.008016	17.16	1123.51	137.99	0.79
RowdyCrkCenter	9434.43	Q2	4146.00	33.02	40.28	39.49	41.90	0.010011	10.41	431.46	90.69	0.75
RowdyCrkCenter	9434.43	Q5	6374.00	33.02	41.90	41.04	44.07	0.010007	12.22	589.68	108.98	0.78
RowdyCrkCenter	9434.43	Q10	9923.00	33.02	43.90	43.35	46.75	0.010002	14.29	835.15	133.98	0.81
RowdyCrkCenter	9434.43	Q25	10287.00	33.02	44.08	43.53	46.98	0.010002	14.47	859.30	135.92	0.82
RowdyCrkCenter	9434.43	Q50	14077.00	33.02	45.72	45.42	49.15	0.010003	16.05	1091.14	145.58	0.84
RowdyCrkCenter	9434.43	Q100	15719.00	33.02	47.00	46.00	50.11	0.008075	15.48	1281.38	151.33	0.77

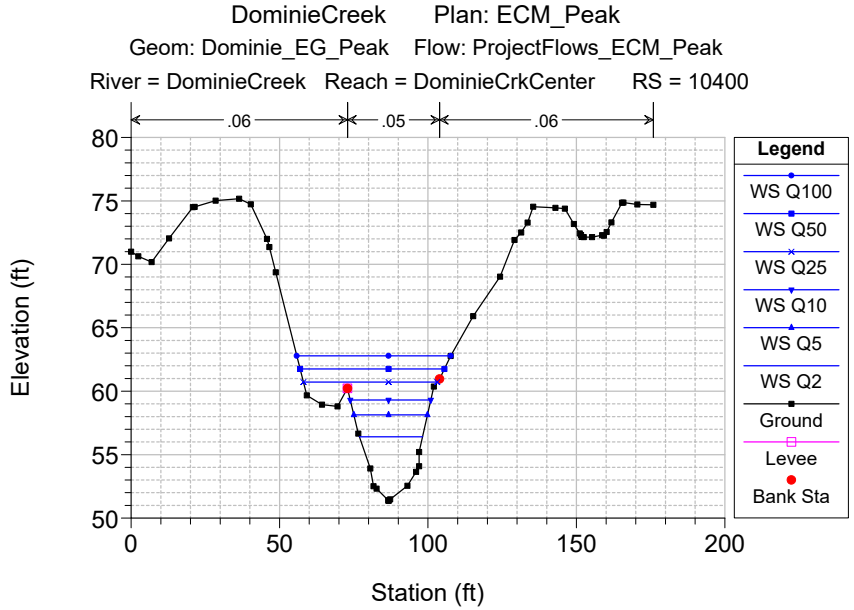

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
Elevation (ft)
70
65
60
55
50
45
40
35
30
9900
10000
10100
10200
10300
10400
10500
10600
Main Channel Distance (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground

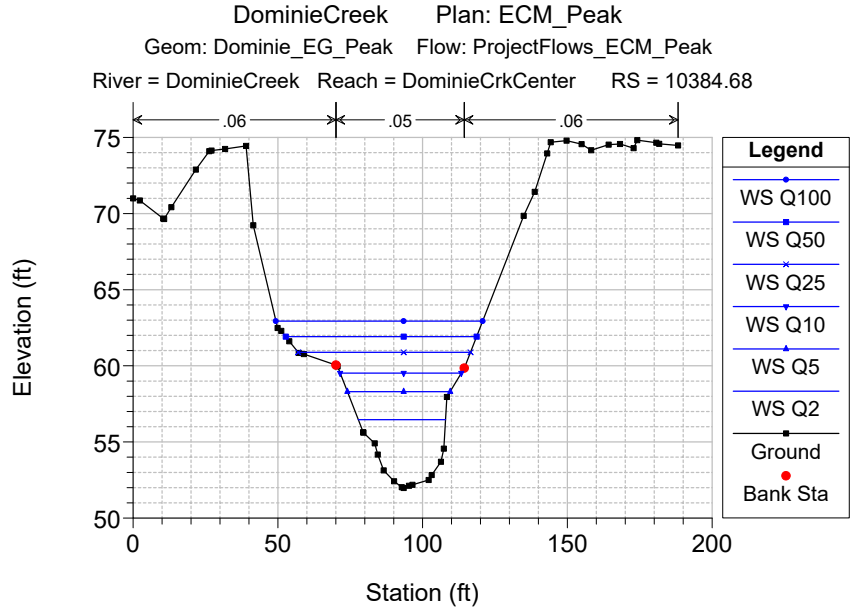

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10549.84
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

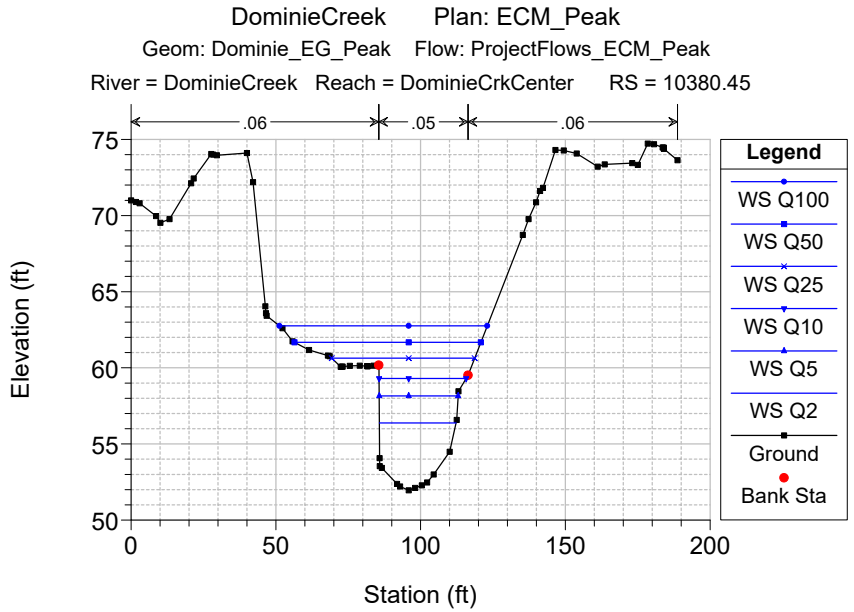

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10489.53
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

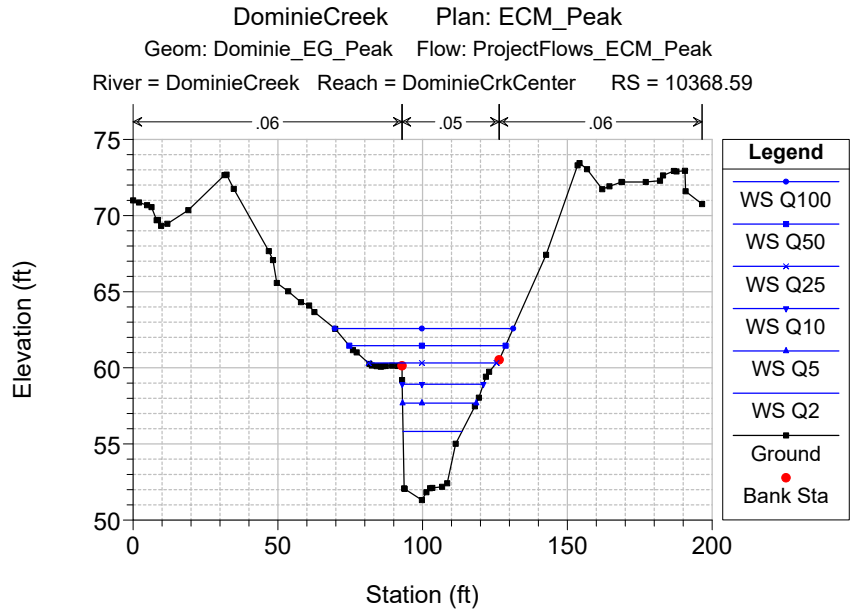

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10480.61
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

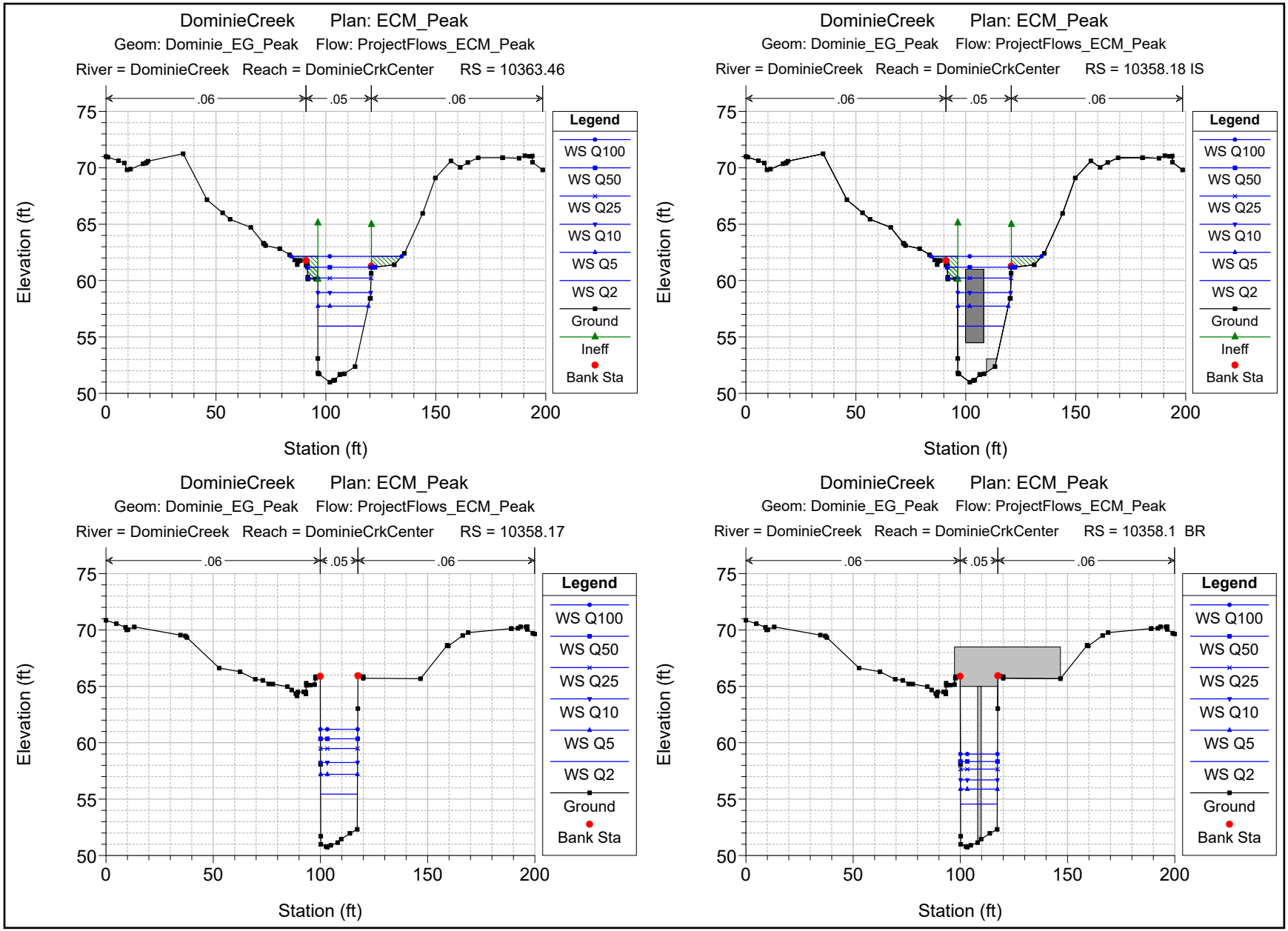

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10449.78
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

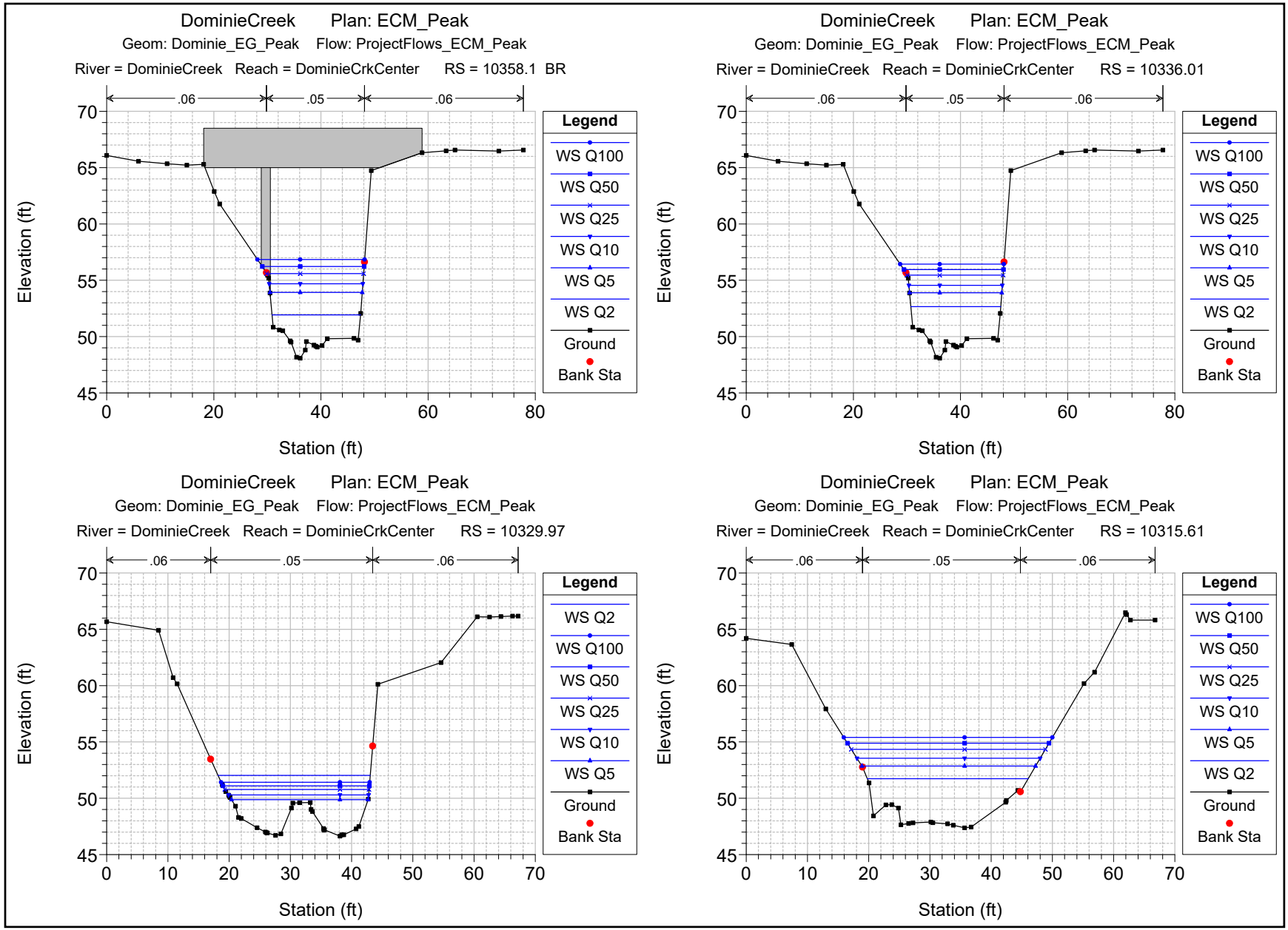

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10400
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Bank Sta

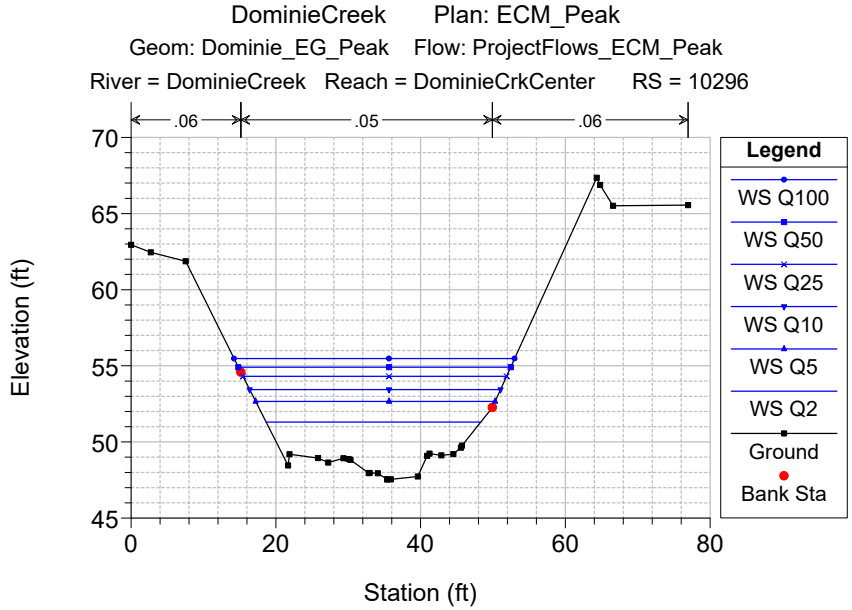

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10384.68
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

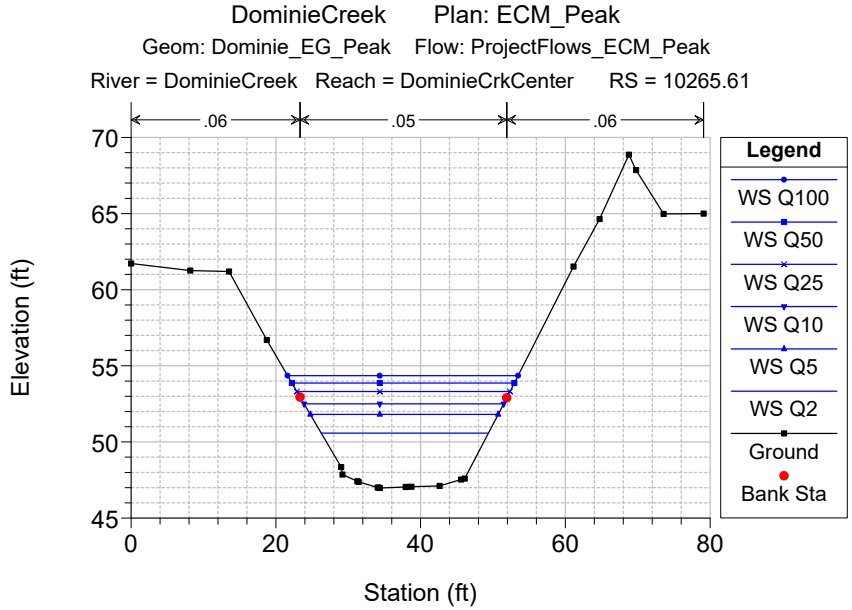

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10380.45
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

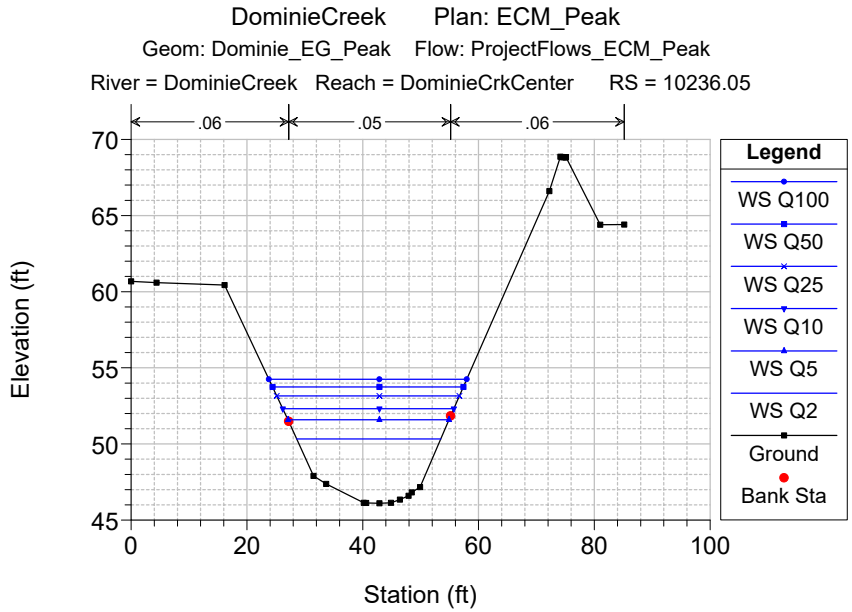

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10368.59
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

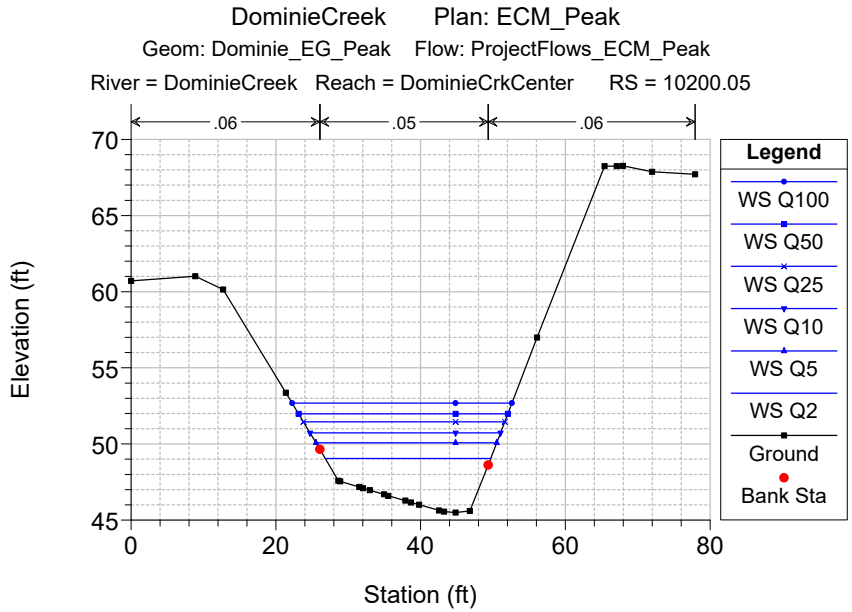

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10363.46
.06
.05
.06
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10358.18 IS
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10358.17
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10358.1 BR

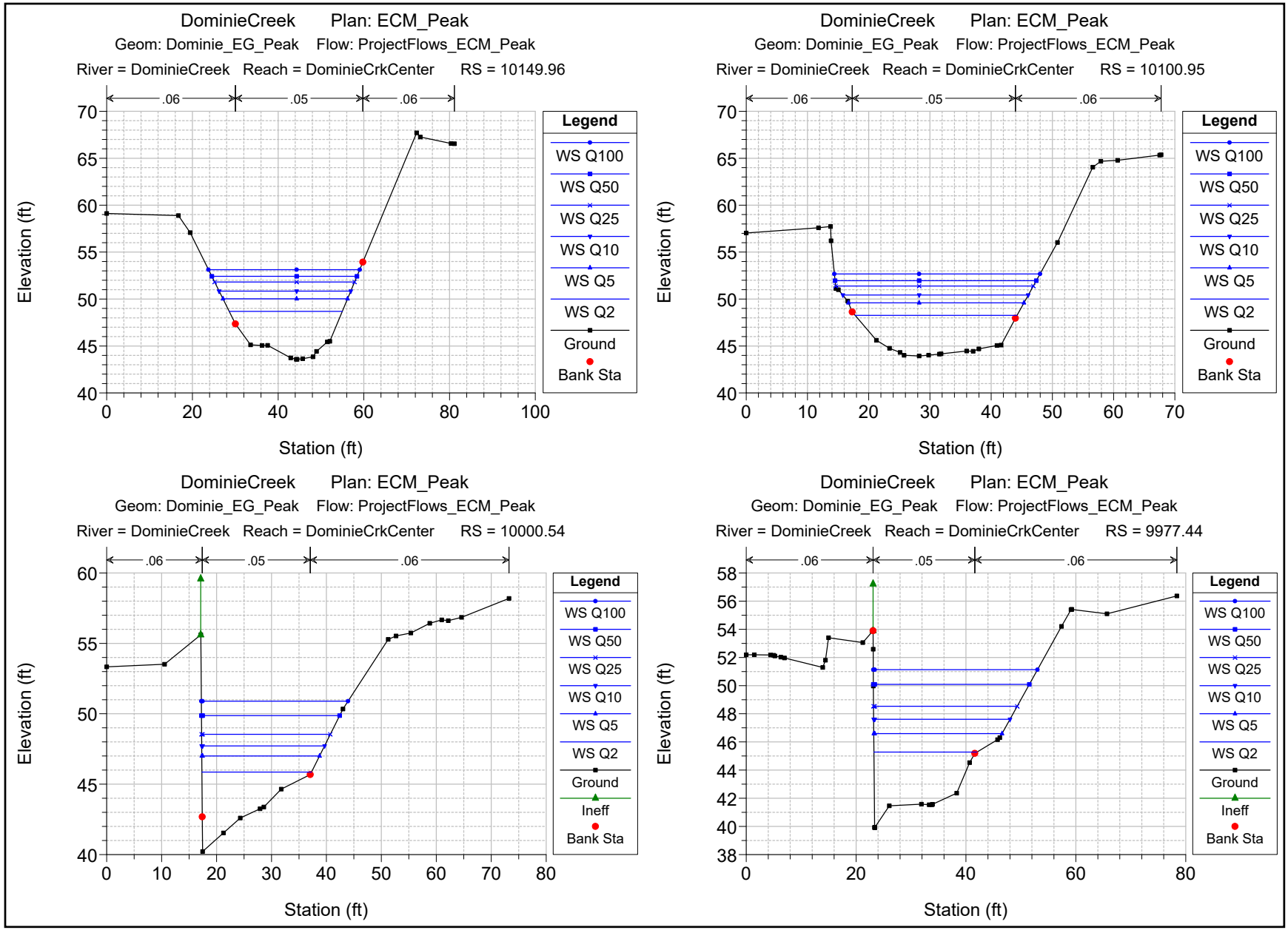

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10358.1 BR
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10336.01
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10329.97
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q2
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
Ground
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10315.61
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

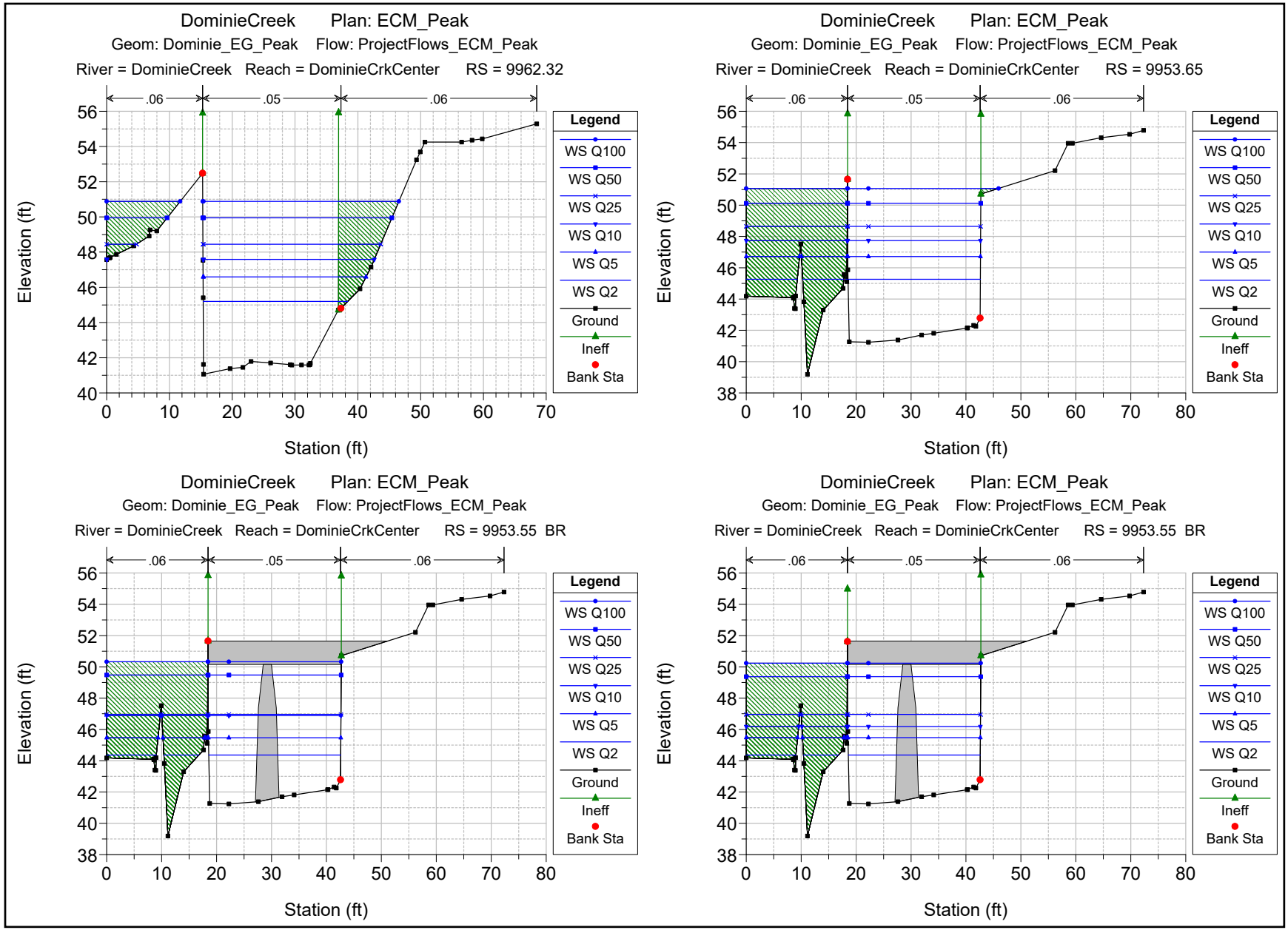

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10296
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

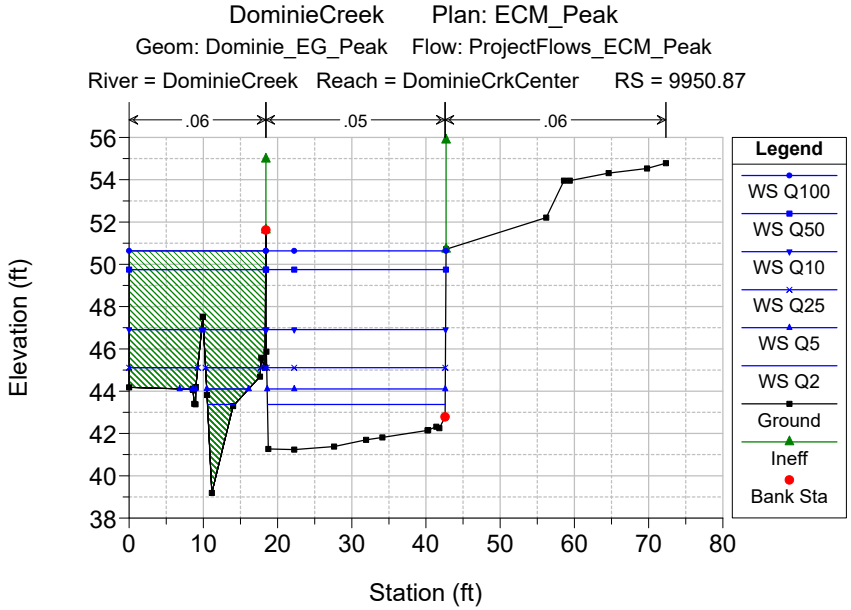

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10265.61
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

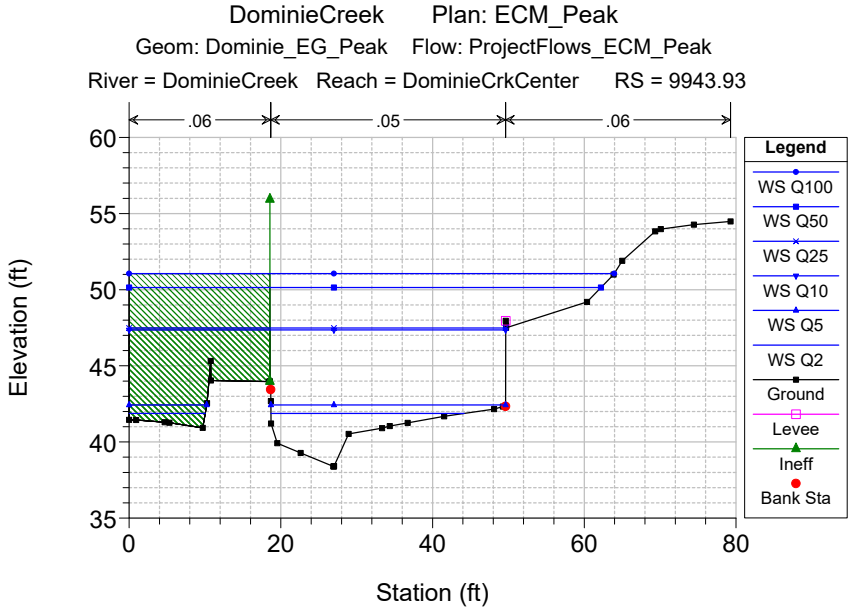

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10236.05
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

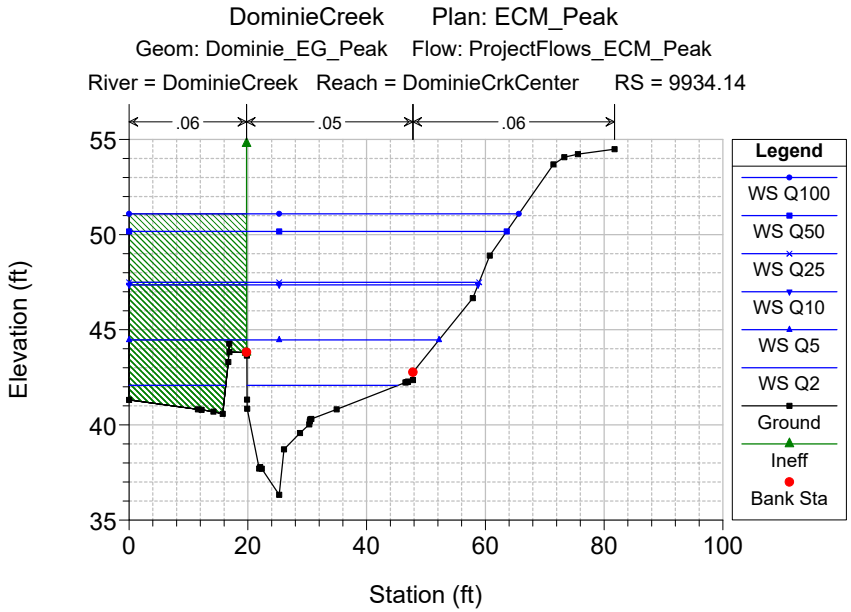

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10200.05
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

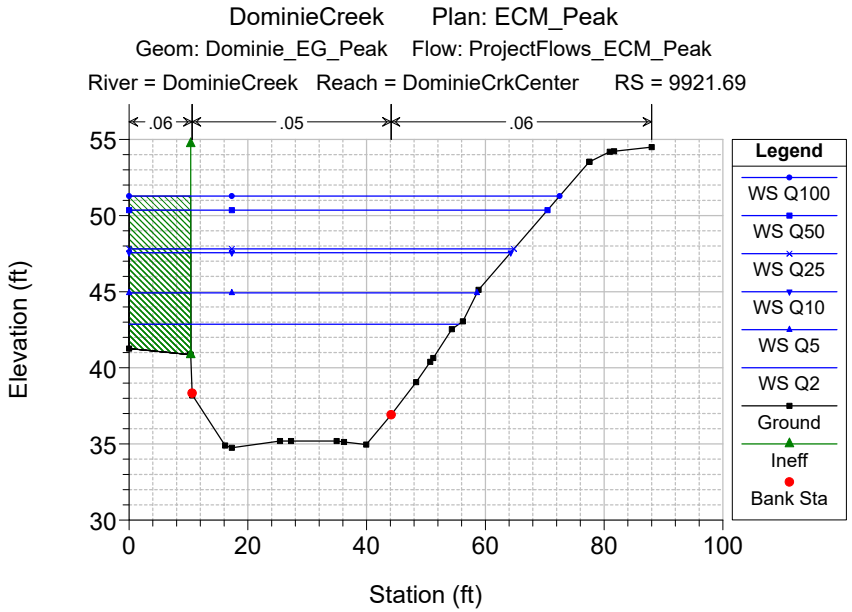

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10149.96
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10100.95
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 10000.54
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9977.44
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

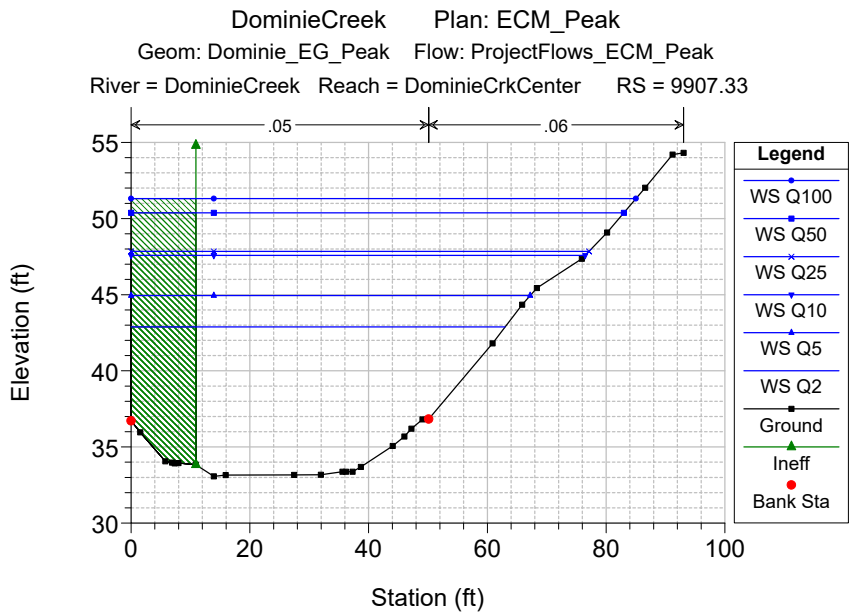

DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9962.32
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9953.65
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9953.55 BR
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9953.55 BR
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9950.87
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q10
WS Q25
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9943.93
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta


DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9934.14
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9921.69
.06
.05
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: ECM_Peak
Geom: Dominie_EG_Peak Flow: ProjectFlows_ECM_Peak
River = DominieCreek Reach = DominieCrkCenter RS = 9907.33
.05
.06
Elevation (ft)
Station (ft)
55
50
45
40
35
30
0
20
40
60
80
100
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

HEC-RAS Plan: ECM_Peak River: DominieCreek Reach: DominieCrkCenter

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10549.84	Q2	489.00	56.10	60.77	59.33	61.20	0.007676	5.26	93.05	29.77	0.52
DominieCrkCenter	10549.84	Q5	826.00	56.10	62.04	60.50	62.64	0.007423	6.25	133.89	34.70	0.54
DominieCrkCenter	10549.84	Q10	1063.00	56.10	62.74	61.07	63.46	0.007510	6.83	159.40	37.45	0.55
DominieCrkCenter	10549.84	Q25	1365.00	56.10	63.53	61.72	64.37	0.007583	7.45	189.94	40.49	0.56
DominieCrkCenter	10549.84	Q50	1592.00	56.10	64.05	62.20	64.99	0.007484	7.87	211.66	42.49	0.57
DominieCrkCenter	10549.84	Q100	1824.00	56.10	64.56	62.64	65.58	0.007373	8.24	233.65	44.42	0.57
DominieCrkCenter	10489.53	Q2	489.00	53.78	59.03	59.03	60.29	0.031335	9.01	54.30	21.61	1.00
DominieCrkCenter	10489.53	Q5	826.00	53.78	60.16	60.16	61.74	0.029868	10.09	81.86	26.55	1.01
DominieCrkCenter	10489.53	Q10	1063.00	53.78	60.83	60.83	62.57	0.028380	10.57	100.60	29.31	1.01
DominieCrkCenter	10489.53	Q25	1365.00	53.78	61.53	61.53	63.48	0.026708	11.23	121.83	31.97	1.00
DominieCrkCenter	10489.53	Q50	1592.00	53.78	61.98	61.98	64.11	0.025649	11.72	136.68	33.85	0.99
DominieCrkCenter	10489.53	Q100	1824.00	53.78	62.39	62.39	64.71	0.024761	12.24	151.05	35.82	0.99
DominieCrkCenter	10480.61	Q2	489.00	50.99	56.00	57.17	59.56	0.120957	15.13	32.31	14.13	1.76
DominieCrkCenter	10480.61	Q5	826.00	50.99	57.10	58.32	61.05	0.107581	15.95	51.79	20.05	1.75
DominieCrkCenter	10480.61	Q10	1063.00	50.99	57.72	59.01	61.90	0.095876	16.41	64.77	22.12	1.69
DominieCrkCenter	10480.61	Q25	1365.00	50.99	58.43	59.78	62.85	0.079641	16.89	81.14	24.07	1.59
DominieCrkCenter	10480.61	Q50	1592.00	50.99	62.01	60.29	63.25	0.009590	9.12	187.08	35.74	0.61
DominieCrkCenter	10480.61	Q100	1824.00	50.99	62.90	60.78	64.11	0.008064	9.08	220.29	38.87	0.58
DominieCrkCenter	10449.78	Q2	489.00	52.37	56.99	56.61	58.04	0.021796	8.24	59.37	20.20	0.85
DominieCrkCenter	10449.78	Q5	826.00	52.37	58.57	57.86	59.76	0.017362	8.75	94.40	24.30	0.78
DominieCrkCenter	10449.78	Q10	1063.00	52.37	59.66	58.58	60.83	0.014176	8.68	122.49	27.20	0.72
DominieCrkCenter	10449.78	Q25	1365.00	52.37	60.88	59.36	62.04	0.011413	8.67	157.76	30.75	0.66
DominieCrkCenter	10449.78	Q50	1592.00	52.37	61.79	59.92	62.93	0.009406	8.59	187.27	34.25	0.61
DominieCrkCenter	10449.78	Q100	1824.00	52.37	62.74	60.41	63.84	0.007506	8.46	221.81	38.61	0.56
DominieCrkCenter	10400	Q2	489.00	51.38	56.40	55.42	57.13	0.012847	6.83	71.63	21.25	0.66
DominieCrkCenter	10400	Q5	826.00	51.38	58.14	56.67	58.99	0.010646	7.40	111.68	24.80	0.61
DominieCrkCenter	10400	Q10	1063.00	51.38	59.31	57.38	60.18	0.009080	7.48	142.13	27.13	0.58
DominieCrkCenter	10400	Q25	1365.00	51.38	60.71	58.19	61.49	0.007002	7.19	203.65	45.06	0.52
DominieCrkCenter	10400	Q50	1592.00	51.38	61.76	58.74	62.45	0.005326	6.89	252.62	48.63	0.46
DominieCrkCenter	10400	Q100	1824.00	51.38	62.79	59.27	63.43	0.004130	6.66	304.67	51.90	0.42
DominieCrkCenter	10384.68	Q2	489.00	51.98	56.47	55.16	56.89	0.007488	5.19	94.27	30.16	0.52
DominieCrkCenter	10384.68	Q5	826.00	51.98	58.31	56.16	58.75	0.005383	5.37	153.87	35.52	0.45
DominieCrkCenter	10384.68	Q10	1063.00	51.98	59.52	56.74	59.95	0.004531	5.30	200.75	41.83	0.43
DominieCrkCenter	10384.68	Q25	1365.00	51.98	60.89	57.40	61.31	0.003329	5.21	267.56	59.52	0.38
DominieCrkCenter	10384.68	Q50	1592.00	51.98	61.91	57.85	62.31	0.002560	5.08	331.70	65.93	0.34
DominieCrkCenter	10384.68	Q100	1824.00	51.98	62.94	58.33	63.30	0.002014	4.94	402.60	71.41	0.31
DominieCrkCenter	10380.45	Q2	489.00	51.95	56.38	55.13	56.85	0.008035	5.47	89.35	26.48	0.53
DominieCrkCenter	10380.45	Q5	826.00	51.95	58.15	56.11	58.72	0.006433	6.03	137.01	27.26	0.47
DominieCrkCenter	10380.45	Q10	1063.00	51.95	59.30	56.70	59.91	0.006120	6.27	169.64	30.07	0.46
DominieCrkCenter	10380.45	Q25	1365.00	51.95	60.63	57.38	61.27	0.005133	6.44	219.21	49.38	0.43
DominieCrkCenter	10380.45	Q50	1592.00	51.95	61.67	57.85	62.27	0.004082	6.32	278.83	64.39	0.40
DominieCrkCenter	10380.45	Q100	1824.00	51.95	62.76	58.30	63.28	0.003135	6.03	352.50	71.79	0.36
DominieCrkCenter	10368.59	Q2	489.00	51.31	55.82	55.05	56.67	0.017122	7.42	65.92	20.34	0.73
DominieCrkCenter	10368.59	Q5	826.00	51.31	57.68	56.35	58.58	0.012960	7.61	108.55	25.48	0.65
DominieCrkCenter	10368.59	Q10	1063.00	51.31	58.92	57.10	59.79	0.010252	7.49	141.96	28.03	0.59
DominieCrkCenter	10368.59	Q25	1365.00	51.31	60.31	57.89	61.17	0.008791	7.43	185.66	44.21	0.55
DominieCrkCenter	10368.59	Q50	1592.00	51.31	61.45	58.42	62.20	0.006257	7.00	241.89	53.99	0.48
DominieCrkCenter	10368.59	Q100	1824.00	51.31	62.58	58.94	63.22	0.004494	6.59	307.13	61.64	0.42
DominieCrkCenter	10363.46	Q2	489.00	50.99	55.96	54.53	56.52	0.009261	6.02	81.24	20.95	0.54
DominieCrkCenter	10363.46	Q5	826.00	50.99	57.74	55.71	58.47	0.008781	6.87	120.28	22.96	0.53
DominieCrkCenter	10363.46	Q10	1063.00	50.99	58.93	56.42	59.73	0.008158	7.16	148.36	24.04	0.51
DominieCrkCenter	10363.46	Q25	1365.00	50.99	60.23	57.24	61.12	0.007802	7.59	179.74	28.80	0.49
DominieCrkCenter	10363.46	Q50	1592.00	50.99	61.19	57.81	62.14	0.007321	7.84	203.02	30.26	0.48
DominieCrkCenter	10363.46	Q100	1824.00	50.99	62.15	58.36	63.16	0.006703	8.06	226.44	50.35	0.47
DominieCrkCenter	10358.18		Inl Struct									
DominieCrkCenter	10358.17	Q2	489.00	50.75	55.44	54.34	56.22	0.014291	7.06	69.25	17.17	0.62
DominieCrkCenter	10358.17	Q5	826.00	50.75	57.20	55.57	58.27	0.014597	8.31	99.38	17.23	0.61
DominieCrkCenter	10358.17	Q10	1063.00	50.75	58.25	56.33	59.52	0.015204	9.04	117.55	17.27	0.61
DominieCrkCenter	10358.17	Q25	1365.00	50.75	59.48	57.20	60.98	0.015952	9.83	138.91	17.32	0.61
DominieCrkCenter	10358.17	Q50	1592.00	50.75	60.35	57.83	62.01	0.016505	10.34	153.94	17.35	0.61
DominieCrkCenter	10358.17	Q100	1824.00	50.75	61.20	58.45	63.01	0.017048	10.82	168.61	17.38	0.61
DominieCrkCenter	10358.1		Bridge									
DominieCrkCenter	10336.01	Q2	489.00	48.08	52.66	52.66	54.15	0.038216	9.80	49.92	16.77	1.00
DominieCrkCenter	10336.01	Q5	826.00	48.08	53.89	53.92	56.00	0.038893	11.65	70.91	17.21	1.01
DominieCrkCenter	10336.01	Q10	1063.00	48.08	54.55	54.70	57.14	0.041894	12.91	82.37	17.44	1.05
DominieCrkCenter	10336.01	Q25	1365.00	48.08	55.46	55.62	58.45	0.042079	13.89	98.24	17.92	1.05
DominieCrkCenter	10336.01	Q50	1592.00	48.08	55.95	56.28	59.37	0.044443	14.86	107.21	18.58	1.08
DominieCrkCenter	10336.01	Q100	1824.00	48.08	56.44	56.91	60.26	0.045673	15.71	116.48	19.35	1.10

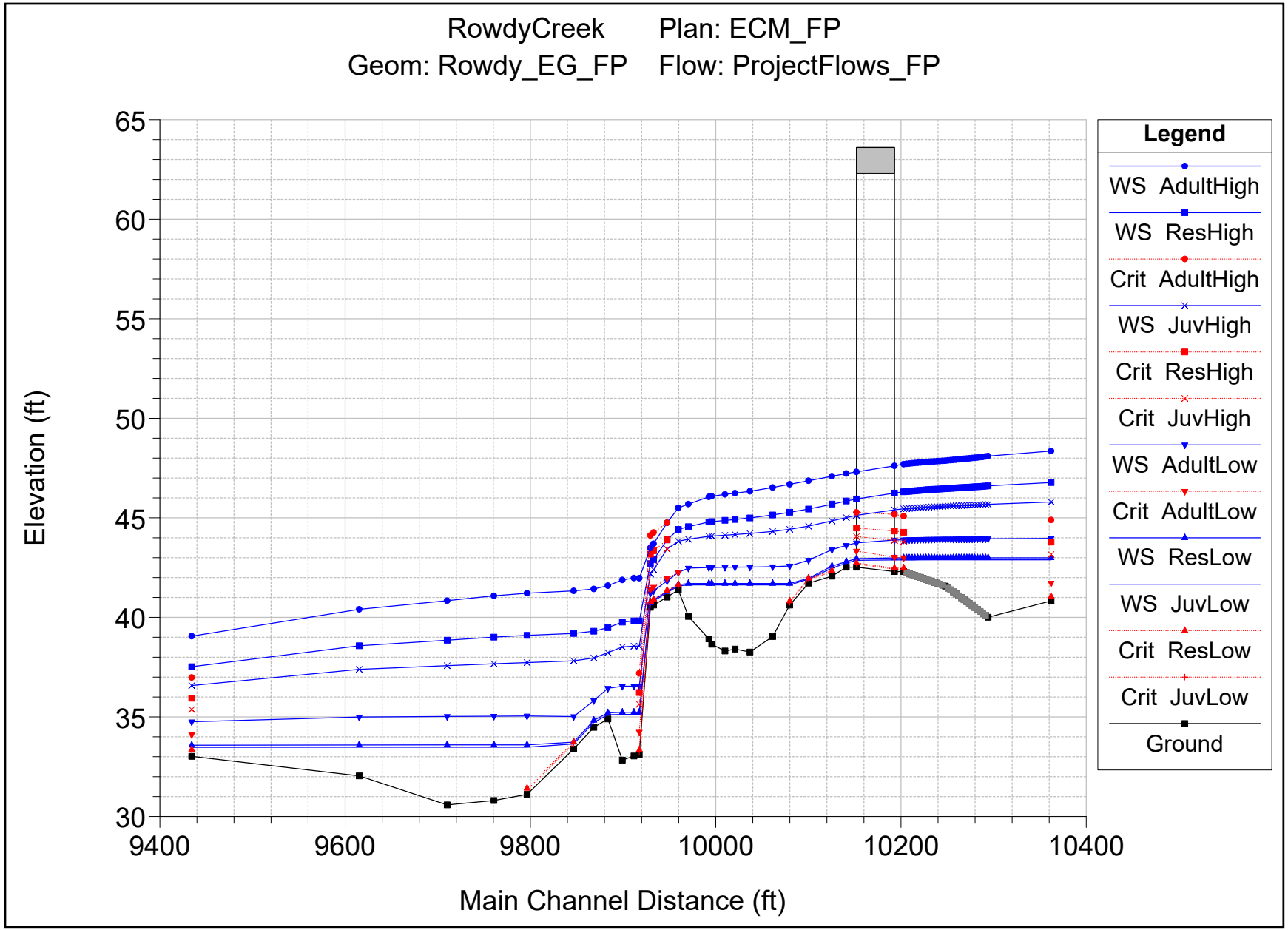
HEC-RAS Plan: ECM_Peak River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10329.97	Q2	489.00	46.64	52.03	50.36	52.44	0.007135	5.12	95.53	24.86	0.46
DominieCrkCenter	10329.97	Q5	826.00	46.64	49.88	51.40	55.22	0.205143	18.55	44.54	22.31	2.31
DominieCrkCenter	10329.97	Q10	1063.00	46.64	50.29	52.03	56.34	0.189265	19.73	53.88	22.87	2.26
DominieCrkCenter	10329.97	Q25	1365.00	46.64	50.77	52.76	57.61	0.176319	20.97	65.08	23.57	2.22
DominieCrkCenter	10329.97	Q50	1592.00	46.64	51.11	53.26	58.50	0.169819	21.83	72.94	23.93	2.20
DominieCrkCenter	10329.97	Q100	1824.00	46.64	51.42	53.74	59.37	0.164941	22.63	80.61	24.26	2.19
DominieCrkCenter	10315.61	Q2	489.00	47.38	51.74	50.74	52.30	0.010699	6.02	81.86	26.28	0.59
DominieCrkCenter	10315.61	Q5	826.00	47.38	52.86	51.74	53.72	0.011716	7.48	112.42	28.37	0.64
DominieCrkCenter	10315.61	Q10	1063.00	47.38	53.55	52.34	54.59	0.011602	8.23	132.64	29.92	0.65
DominieCrkCenter	10315.61	Q25	1365.00	47.38	54.34	53.06	55.59	0.011495	9.04	156.98	31.69	0.67
DominieCrkCenter	10315.61	Q50	1592.00	47.38	54.89	53.54	56.28	0.011409	9.57	174.60	32.91	0.67
DominieCrkCenter	10315.61	Q100	1824.00	47.38	55.40	54.00	56.93	0.011354	10.07	191.96	34.08	0.68
DominieCrkCenter	10296	Q2	489.00	47.54	51.31	50.87	52.02	0.017987	6.76	72.39	29.67	0.76
DominieCrkCenter	10296	Q5	826.00	47.54	52.66	51.77	53.46	0.012777	7.19	114.90	33.09	0.68
DominieCrkCenter	10296	Q10	1063.00	47.54	53.43	52.32	54.32	0.011220	7.56	141.19	34.66	0.65
DominieCrkCenter	10296	Q25	1365.00	47.54	54.31	52.94	55.30	0.010154	7.99	172.29	36.43	0.63
DominieCrkCenter	10296	Q50	1592.00	47.54	54.91	53.35	55.97	0.009476	8.29	194.63	37.64	0.62
DominieCrkCenter	10296	Q100	1824.00	47.54	55.48	53.78	56.62	0.008917	8.58	216.39	38.78	0.61
DominieCrkCenter	10265.61	Q2	489.00	46.98	50.58	50.10	51.45	0.018112	7.49	65.30	23.10	0.78
DominieCrkCenter	10265.61	Q5	826.00	46.98	51.81	51.20	52.97	0.017578	8.66	95.36	25.96	0.80
DominieCrkCenter	10265.61	Q10	1063.00	46.98	52.50	51.86	53.85	0.017617	9.32	114.06	27.59	0.81
DominieCrkCenter	10265.61	Q25	1365.00	46.98	53.31	52.62	54.85	0.016645	9.97	137.12	29.46	0.80
DominieCrkCenter	10265.61	Q50	1592.00	46.98	53.86	53.08	55.55	0.015717	10.41	153.73	30.72	0.79
DominieCrkCenter	10265.61	Q100	1824.00	46.98	54.35	53.55	56.20	0.015353	10.91	169.07	31.84	0.80
DominieCrkCenter	10236.05	Q2	489.00	46.10	50.33	49.42	50.96	0.011462	6.35	76.95	24.88	0.64
DominieCrkCenter	10236.05	Q5	826.00	46.10	51.59	50.48	52.46	0.011742	7.50	110.09	27.81	0.66
DominieCrkCenter	10236.05	Q10	1063.00	46.10	52.31	51.14	53.34	0.011257	8.15	130.85	29.53	0.67
DominieCrkCenter	10236.05	Q25	1365.00	46.10	53.16	51.85	54.37	0.010573	8.83	156.73	31.56	0.66
DominieCrkCenter	10236.05	Q50	1592.00	46.10	53.74	52.32	55.07	0.010216	9.28	175.50	32.95	0.66
DominieCrkCenter	10236.05	Q100	1824.00	46.10	54.25	52.76	55.72	0.010168	9.77	192.66	34.18	0.67
DominieCrkCenter	10200.05	Q2	489.00	45.49	49.04	49.04	50.26	0.030372	8.87	55.19	22.86	1.00
DominieCrkCenter	10200.05	Q5	826.00	45.49	50.07	50.07	51.76	0.027432	10.44	79.87	24.98	1.00
DominieCrkCenter	10200.05	Q10	1063.00	45.49	50.73	50.73	52.67	0.025054	11.22	96.63	26.33	0.98
DominieCrkCenter	10200.05	Q25	1365.00	45.49	51.45	51.45	53.71	0.023543	12.14	116.27	27.83	0.98
DominieCrkCenter	10200.05	Q50	1592.00	45.49	51.98	51.97	54.43	0.022330	12.68	131.22	28.92	0.97
DominieCrkCenter	10200.05	Q100	1824.00	45.49	52.68	52.49	55.13	0.019075	12.73	151.91	30.36	0.92
DominieCrkCenter	10149.96	Q2	489.00	43.58	48.69	47.20	49.13	0.006384	5.30	92.97	26.41	0.49
DominieCrkCenter	10149.96	Q5	826.00	43.58	50.03	48.22	50.68	0.006823	6.49	130.05	29.09	0.52
DominieCrkCenter	10149.96	Q10	1063.00	43.58	50.85	48.86	51.62	0.006901	7.08	154.60	30.73	0.53
DominieCrkCenter	10149.96	Q25	1365.00	43.58	51.81	49.57	52.71	0.006852	7.65	185.22	32.66	0.54
DominieCrkCenter	10149.96	Q50	1592.00	43.58	52.42	50.10	53.41	0.007010	8.09	205.27	33.87	0.55
DominieCrkCenter	10149.96	Q100	1824.00	43.58	53.13	50.58	54.18	0.006734	8.32	229.96	35.30	0.54
DominieCrkCenter	10100.95	Q2	489.00	43.93	48.26	47.05	48.76	0.008453	5.68	86.19	26.42	0.55
DominieCrkCenter	10100.95	Q5	826.00	43.93	49.60	48.08	50.31	0.007792	6.77	123.21	28.66	0.56
DominieCrkCenter	10100.95	Q10	1063.00	43.93	50.42	48.69	51.26	0.007390	7.36	147.36	30.28	0.56
DominieCrkCenter	10100.95	Q25	1365.00	43.93	51.39	49.38	52.36	0.006952	7.96	177.55	32.28	0.56
DominieCrkCenter	10100.95	Q50	1592.00	43.93	51.95	49.86	53.05	0.007051	8.49	195.97	32.85	0.57
DominieCrkCenter	10100.95	Q100	1824.00	43.93	52.67	50.31	53.84	0.006568	8.75	219.98	33.58	0.56
DominieCrkCenter	10000.54	Q2	489.00	40.22	45.86	45.86	47.20	0.032073	9.28	52.80	19.97	1.00
DominieCrkCenter	10000.54	Q5	826.00	40.22	47.00	47.00	48.86	0.027797	10.95	76.45	21.45	0.99
DominieCrkCenter	10000.54	Q10	1063.00	40.22	47.72	47.72	49.87	0.025743	11.81	92.10	22.37	0.98
DominieCrkCenter	10000.54	Q25	1365.00	40.22	48.54	48.54	51.03	0.024030	12.75	110.88	23.44	0.97
DominieCrkCenter	10000.54	Q50	1592.00	40.22	49.87	49.11	51.95	0.015168	11.75	143.17	25.16	0.80
DominieCrkCenter	10000.54	Q100	1824.00	40.22	50.90	49.66	52.88	0.012061	11.52	169.80	26.71	0.73
DominieCrkCenter	9977.44	Q2	489.00	39.92	45.28	44.69	46.26	0.021920	7.97	61.35	18.73	0.77
DominieCrkCenter	9977.44	Q5	826.00	39.92	46.59	45.99	47.98	0.021484	9.52	89.48	23.34	0.78
DominieCrkCenter	9977.44	Q10	1063.00	39.92	47.61	46.79	49.06	0.018374	9.80	114.05	24.82	0.73
DominieCrkCenter	9977.44	Q25	1365.00	39.92	48.53	47.62	50.18	0.018275	10.57	137.48	26.14	0.73
DominieCrkCenter	9977.44	Q50	1592.00	39.92	50.09	48.19	51.41	0.012107	9.57	179.95	28.39	0.59
DominieCrkCenter	9977.44	Q100	1824.00	39.92	51.13	48.73	52.41	0.010520	9.45	210.39	29.89	0.55
DominieCrkCenter	9962.32	Q2	489.00	41.06	45.20	44.36	45.92	0.014128	6.83	71.64	23.02	0.66
DominieCrkCenter	9962.32	Q5	826.00	41.06	46.59	45.45	47.62	0.013405	8.12	101.73	25.97	0.66
DominieCrkCenter	9962.32	Q10	1063.00	41.06	47.59	46.11	48.74	0.012274	8.63	123.24	27.37	0.64
DominieCrkCenter	9962.32	Q25	1365.00	41.06	48.45	46.87	49.89	0.013171	9.62	141.83	33.08	0.66
DominieCrkCenter	9962.32	Q50	1592.00	41.06	49.94	47.41	51.24	0.009644	9.14	174.16	39.75	0.57
DominieCrkCenter	9962.32	Q100	1824.00	41.06	50.88	47.93	52.25	0.009115	9.38	194.47	42.96	0.55
DominieCrkCenter	9953.65	Q2	489.00	41.24	45.26	44.01	45.76	0.008112	5.67	86.35	41.00	0.53
DominieCrkCenter	9953.65	Q5	826.00	41.24	46.72	45.00	47.44	0.007966	6.81	121.40	42.13	0.53
DominieCrkCenter	9953.65	Q10	1063.00	41.24	47.74	45.60	48.56	0.007469	7.29	146.02	42.53	0.52
DominieCrkCenter	9953.65	Q25	1365.00	41.24	48.65	46.32	49.67	0.008030	8.14	168.02	42.58	0.54

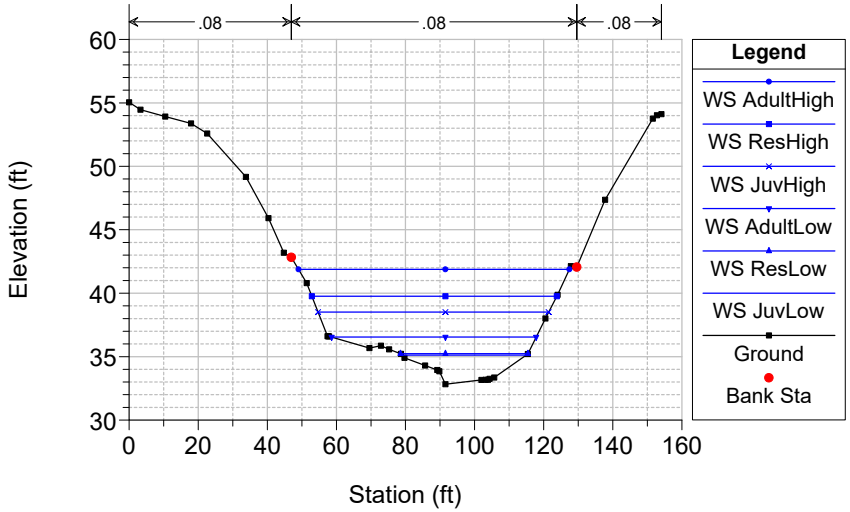
HEC-RAS Plan: ECM_Peak River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	9953.65	Q50	1592.00	41.24	50.12	46.82	51.07	0.006125	7.83	203.65	42.64	0.48
DominieCrkCenter	9953.65	Q100	1824.00	41.24	51.07	47.30	52.08	0.005846	8.06	226.73	45.92	0.46
DominieCrkCenter	9953.55		Bridge									
DominieCrkCenter	9950.87	Q2	489.00	41.24	43.37	44.01	45.59	0.088631	11.94	40.96	27.58	1.61
DominieCrkCenter	9950.87	Q5	826.00	41.24	44.11	44.99	47.19	0.079566	14.10	58.60	31.81	1.59
DominieCrkCenter	9950.87	Q10	1063.00	41.24	46.91	45.61	48.02	0.011709	8.43	126.17	42.23	0.65
DominieCrkCenter	9950.87	Q25	1365.00	41.24	45.11	46.32	49.35	0.072445	16.51	82.71	40.72	1.57
DominieCrkCenter	9950.87	Q50	1592.00	41.24	49.75	46.82	50.79	0.007004	8.19	194.72	42.63	0.51
DominieCrkCenter	9950.87	Q100	1824.00	41.24	50.63	47.30	51.74	0.006730	8.46	216.20	42.67	0.50
DominieCrkCenter	9943.93	Q2	489.00	38.38	41.87	42.72	44.73	0.149136	13.57	36.02	35.52	2.01
DominieCrkCenter	9943.93	Q5	826.00	38.38	42.43	43.55	46.35	0.162673	15.89	51.97	41.17	2.16
DominieCrkCenter	9943.93	Q10	1063.00	38.38	47.36	44.07	47.78	0.002905	5.19	205.05	49.64	0.36
DominieCrkCenter	9943.93	Q25	1365.00	38.38	47.48	44.67	48.15	0.004495	6.54	209.01	49.64	0.44
DominieCrkCenter	9943.93	Q50	1592.00	38.38	50.14	45.10	50.59	0.001959	5.39	311.80	62.21	0.31
DominieCrkCenter	9943.93	Q100	1824.00	38.38	51.06	45.50	51.53	0.001843	5.56	352.71	63.95	0.31
DominieCrkCenter	9934.14	Q2	489.00	36.33	42.08	42.38	43.50	0.052875	9.57	51.08	41.69	1.19
DominieCrkCenter	9934.14	Q5	826.00	36.33	44.47	43.28	45.21	0.011065	6.95	121.43	52.21	0.60
DominieCrkCenter	9934.14	Q10	1063.00	36.33	47.36	43.85	47.74	0.002898	5.04	225.61	58.78	0.33
DominieCrkCenter	9934.14	Q25	1365.00	36.33	47.49	44.52	48.08	0.004470	6.34	230.75	58.95	0.42
DominieCrkCenter	9934.14	Q50	1592.00	36.33	50.17	44.98	50.55	0.001938	5.15	341.01	63.59	0.29
DominieCrkCenter	9934.14	Q100	1824.00	36.33	51.09	45.43	51.49	0.001836	5.32	382.33	65.65	0.28
DominieCrkCenter	9921.69	Q2	489.00	34.75	42.86	37.25	42.92	0.000285	1.86	283.37	55.55	0.12
DominieCrkCenter	9921.69	Q5	826.00	34.75	44.92	38.10	45.00	0.000342	2.39	379.64	58.59	0.14
DominieCrkCenter	9921.69	Q10	1063.00	34.75	47.56	38.59	47.64	0.000236	2.34	514.35	64.26	0.12
DominieCrkCenter	9921.69	Q25	1365.00	34.75	47.81	39.17	47.93	0.000361	2.93	527.84	64.81	0.15
DominieCrkCenter	9921.69	Q50	1592.00	34.75	50.35	39.56	50.46	0.000248	2.75	673.58	70.46	0.13
DominieCrkCenter	9921.69	Q100	1824.00	34.75	51.28	39.95	51.40	0.000260	2.94	730.23	72.51	0.13
DominieCrkCenter	9907.33	Q2	489.00	33.07	42.88	35.31	42.91	0.000107	1.32	394.11	62.98	0.08
DominieCrkCenter	9907.33	Q5	826.00	33.07	44.94	36.12	44.99	0.000148	1.78	505.58	67.21	0.09
DominieCrkCenter	9907.33	Q10	1063.00	33.07	47.58	36.63	47.63	0.000114	1.80	665.89	76.46	0.09
DominieCrkCenter	9907.33	Q25	1365.00	33.07	47.84	37.18	47.91	0.000176	2.27	683.02	77.11	0.11
DominieCrkCenter	9907.33	Q50	1592.00	33.07	50.38	37.56	50.45	0.000128	2.16	858.87	83.00	0.09
DominieCrkCenter	9907.33	Q100	1824.00	33.07	51.31	37.92	51.38	0.000136	2.31	926.85	85.03	0.10

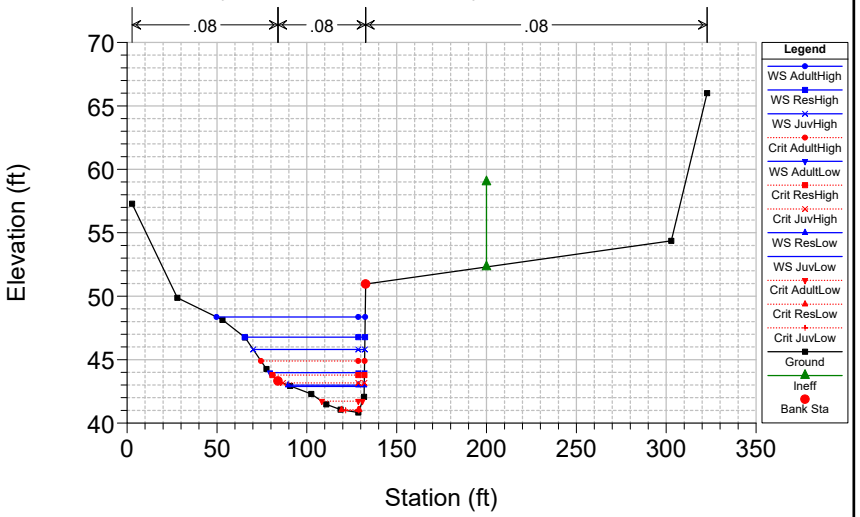
Appendix I- *Rowdy Creek Existing Conditions Fish Passage Model Results*


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
Elevation (ft)
65
60
55
50
45
40
35
30
9400
9600
9800
10000
10200
10400
Main Channel Distance (ft)
Legend
WS AdultHigh
WS ResHigh
Crit AdultHigh
WS JuvHigh
Crit ResHigh
Crit JuvHigh
WS AdultLow
Crit AdultLow
WS ResLow
WS JuvLow
Crit ResLow
Crit JuvLow
Ground

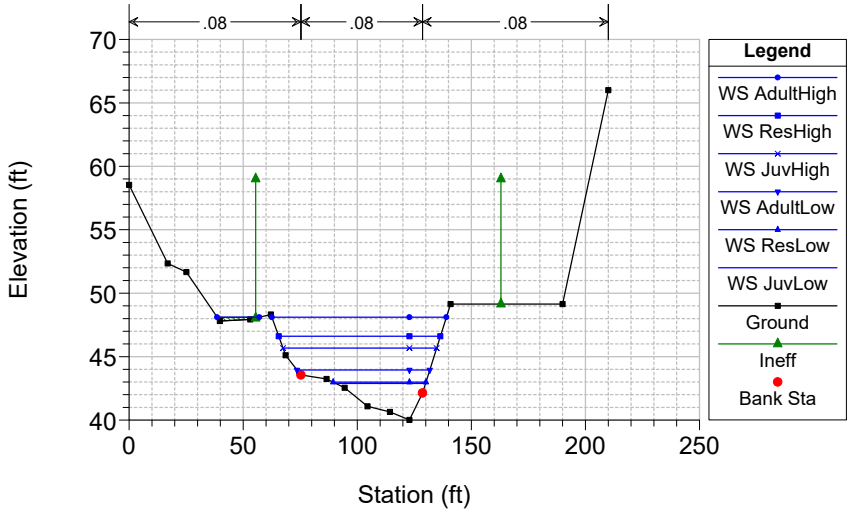
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9899.21



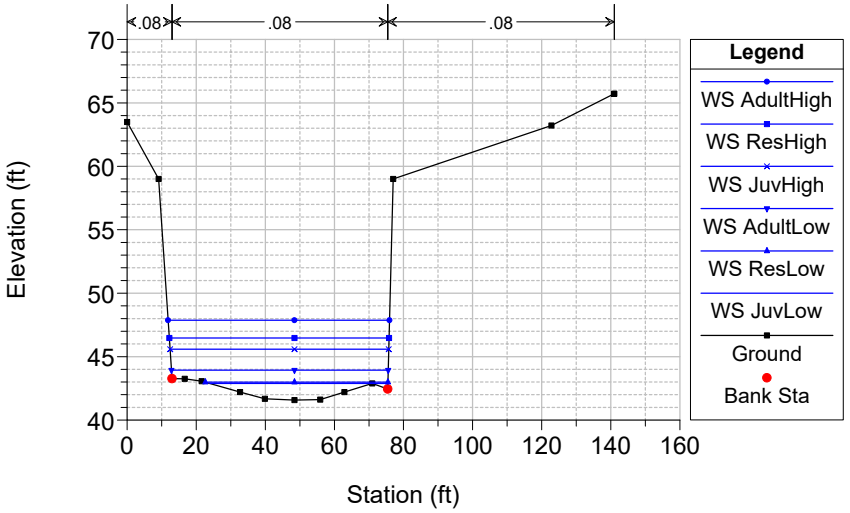
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10362



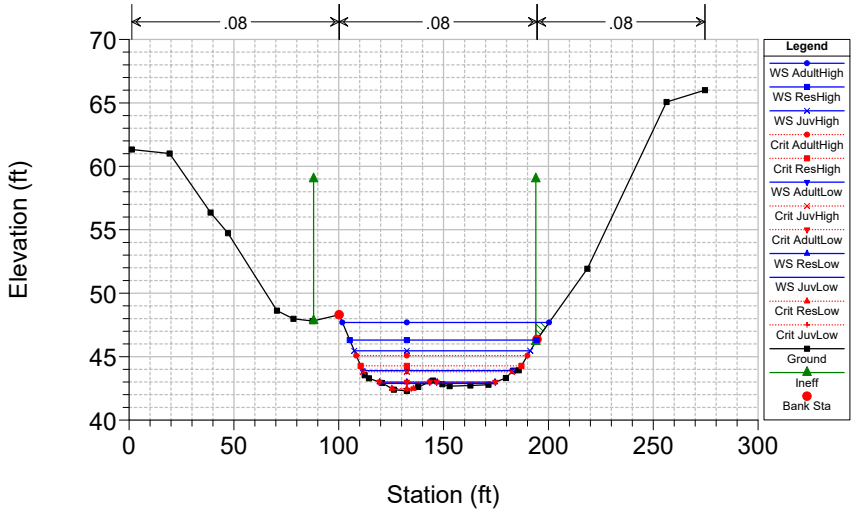
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10294 US_XS3



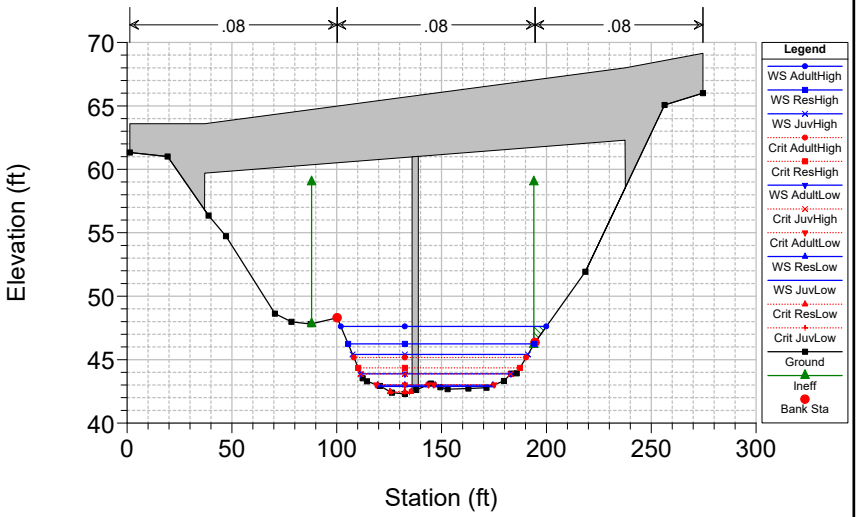
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10248 US_XS2



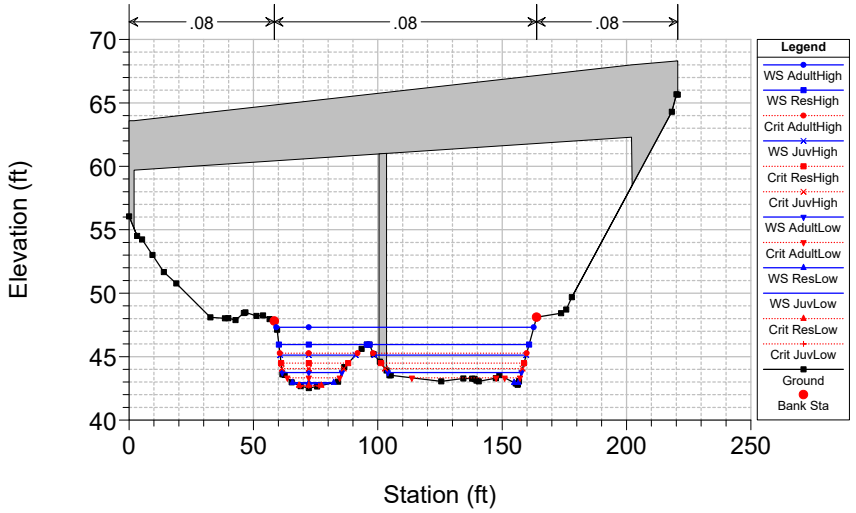
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10203 US_XS1



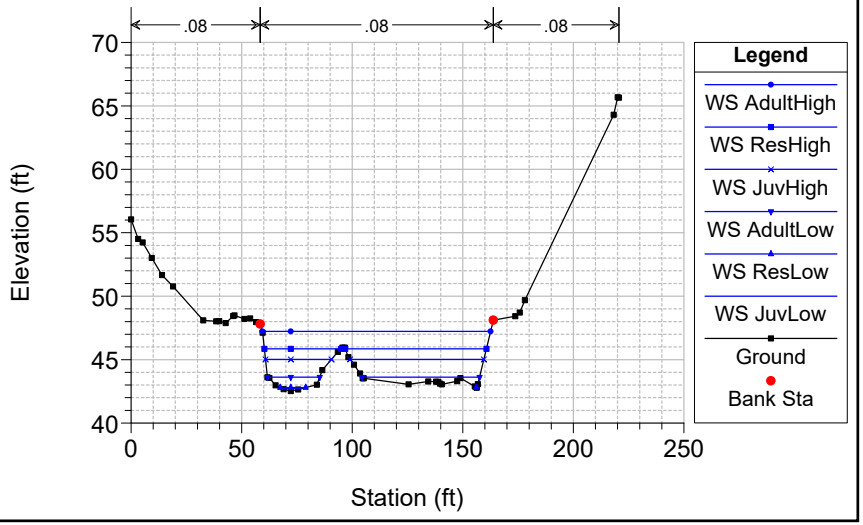
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR Highway 101



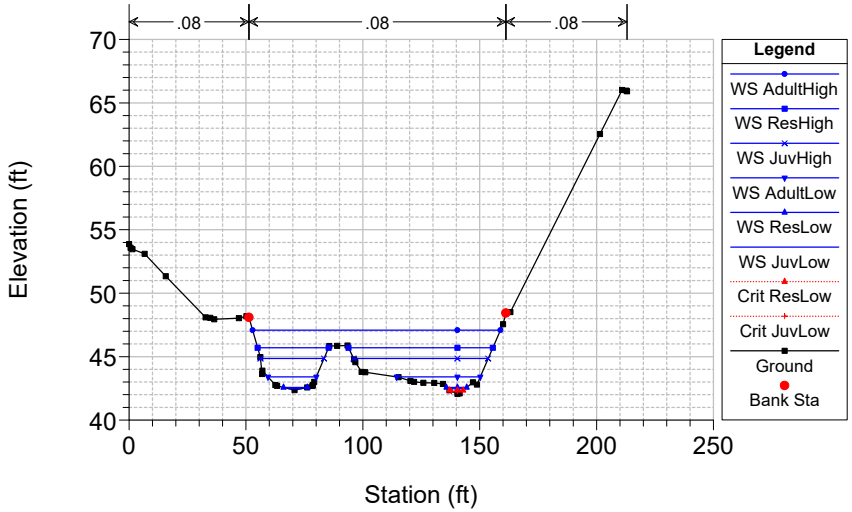
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR Highway 101



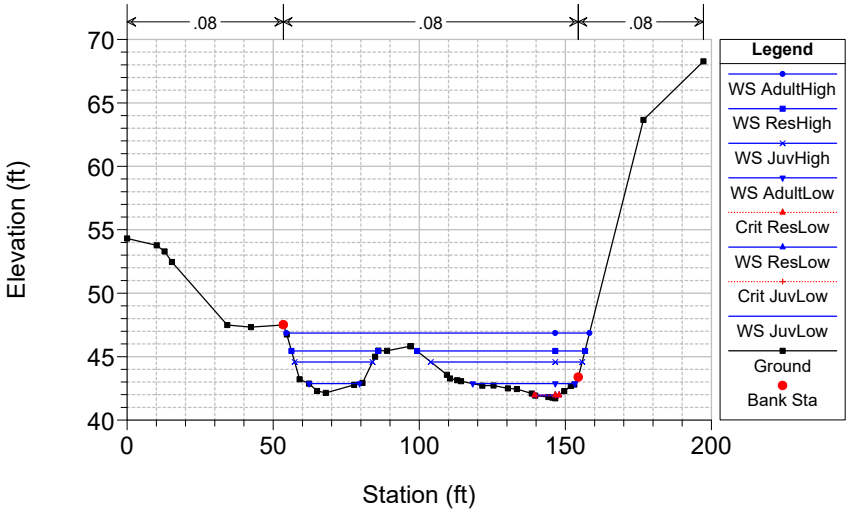
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10141.05



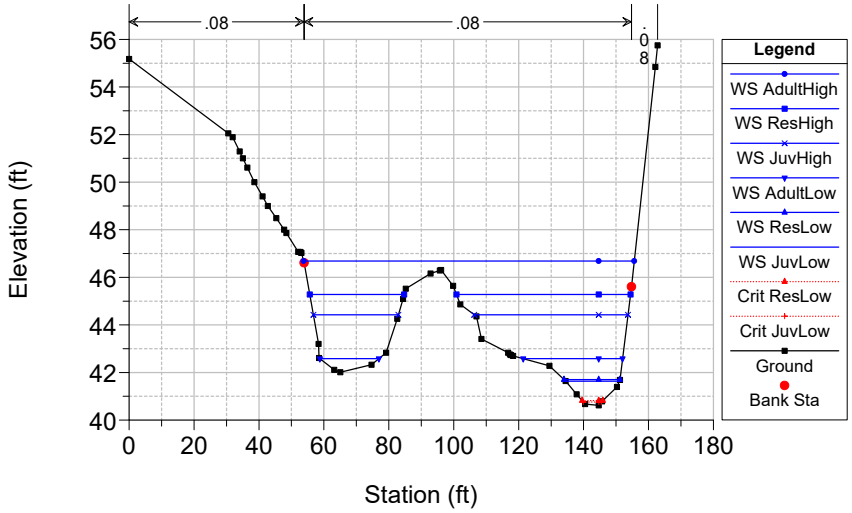
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10125.53



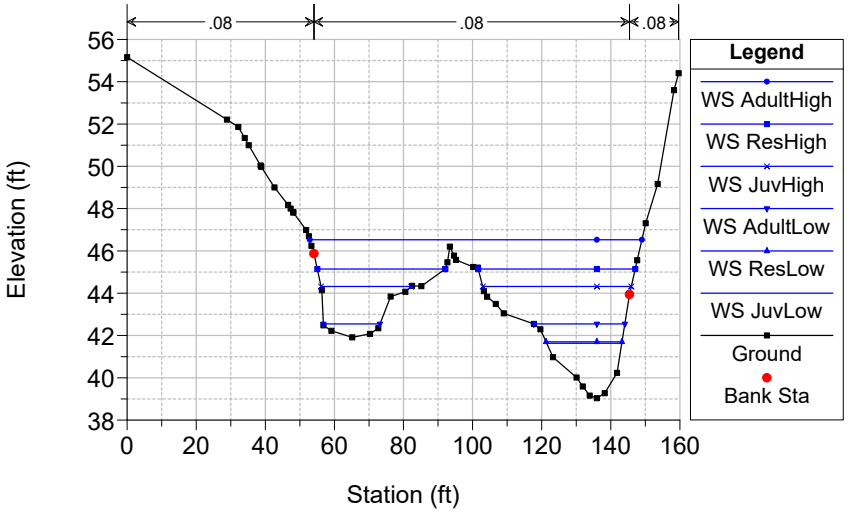
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10100.21

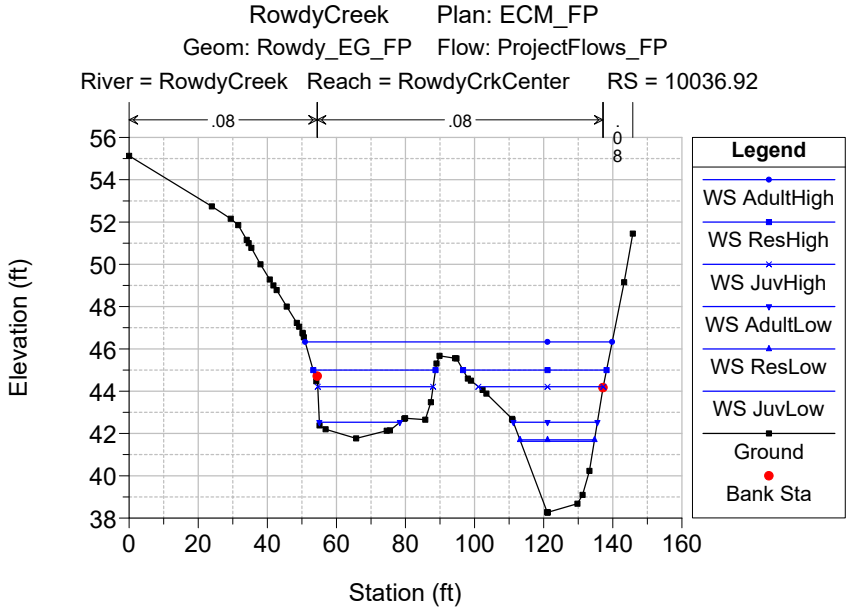


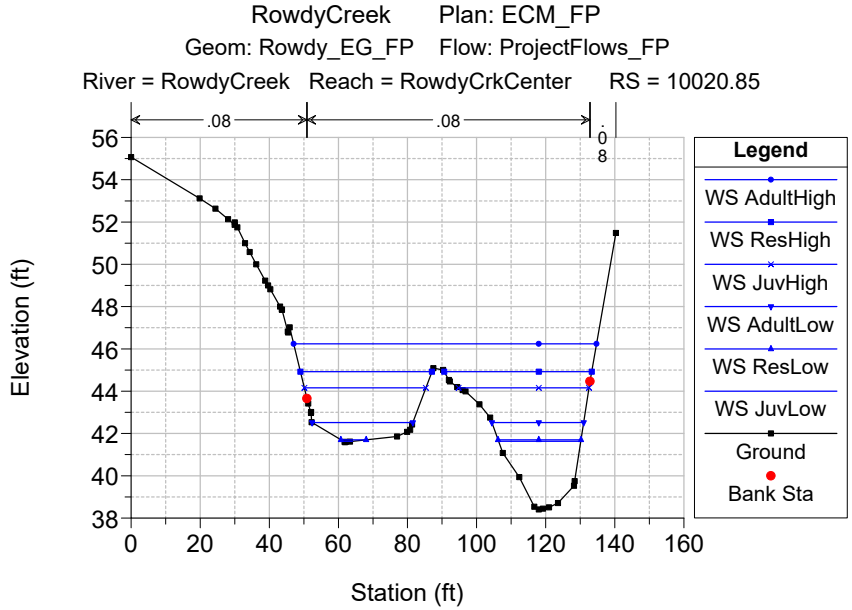
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10079.88

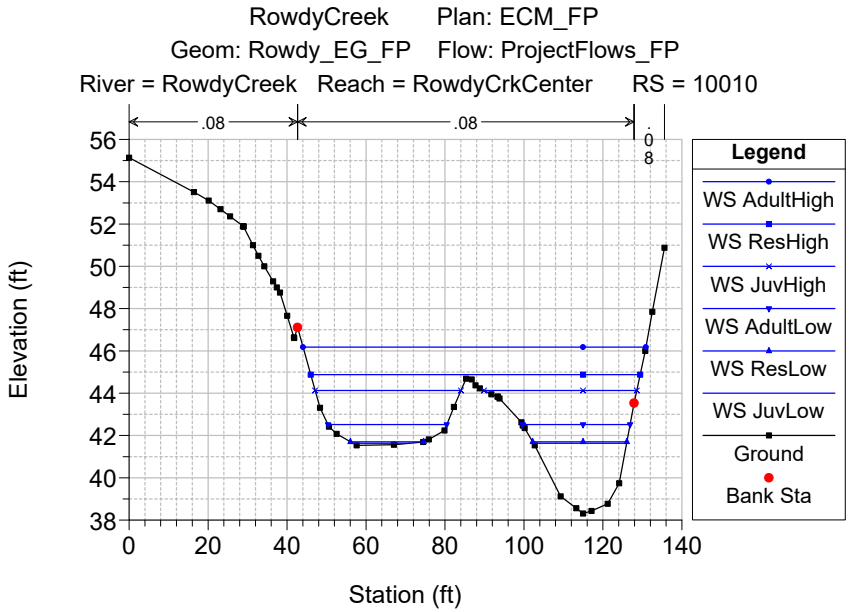


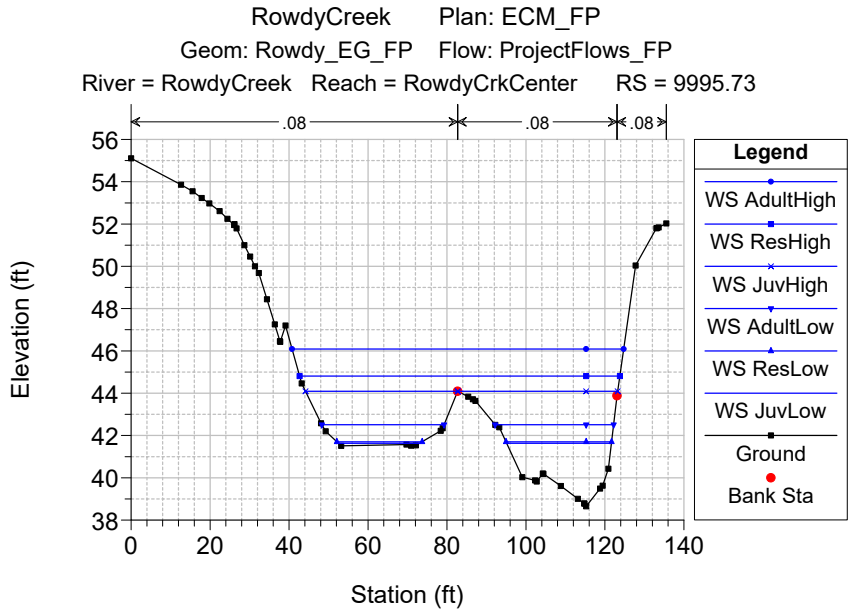
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10061.51

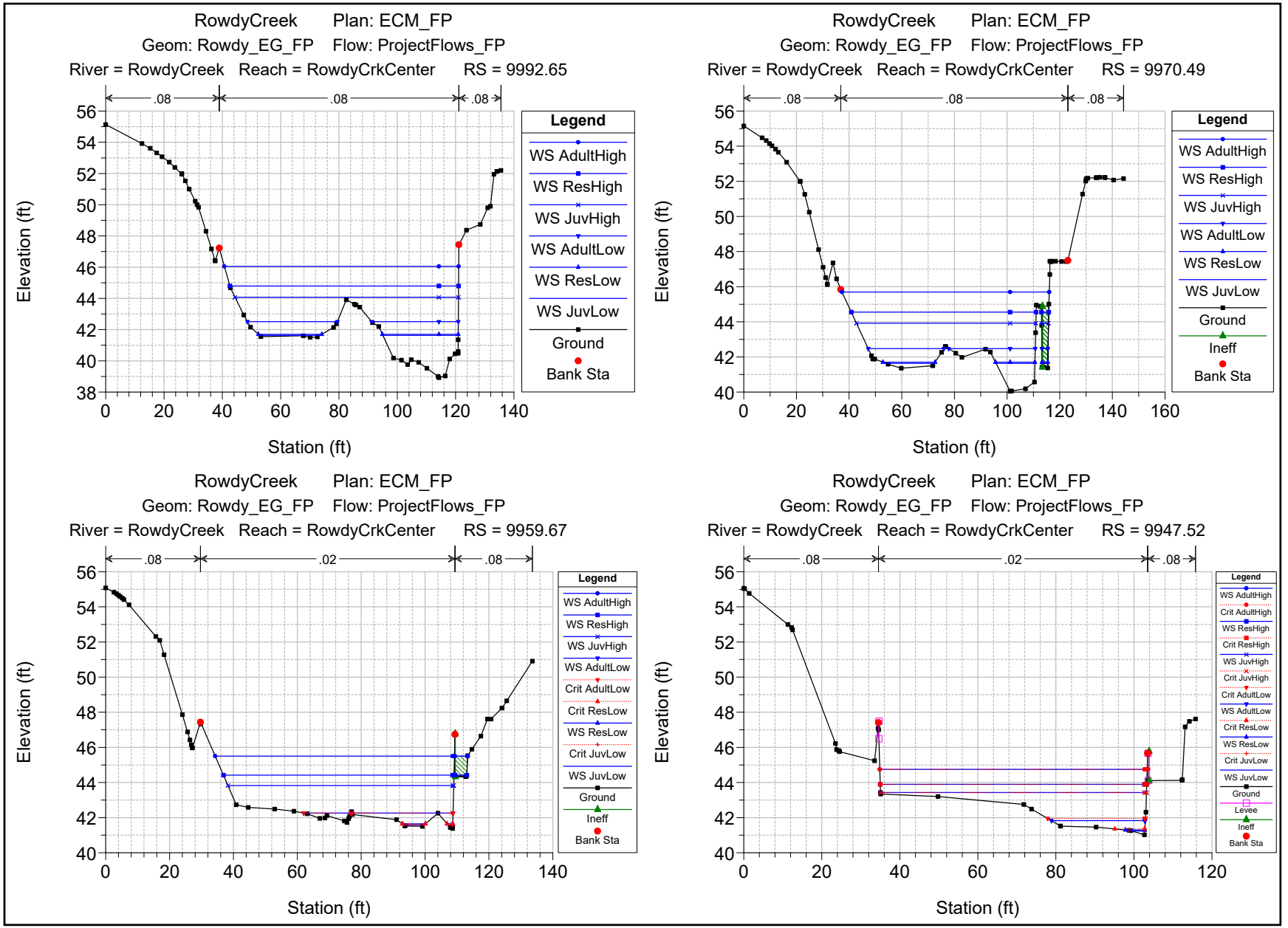


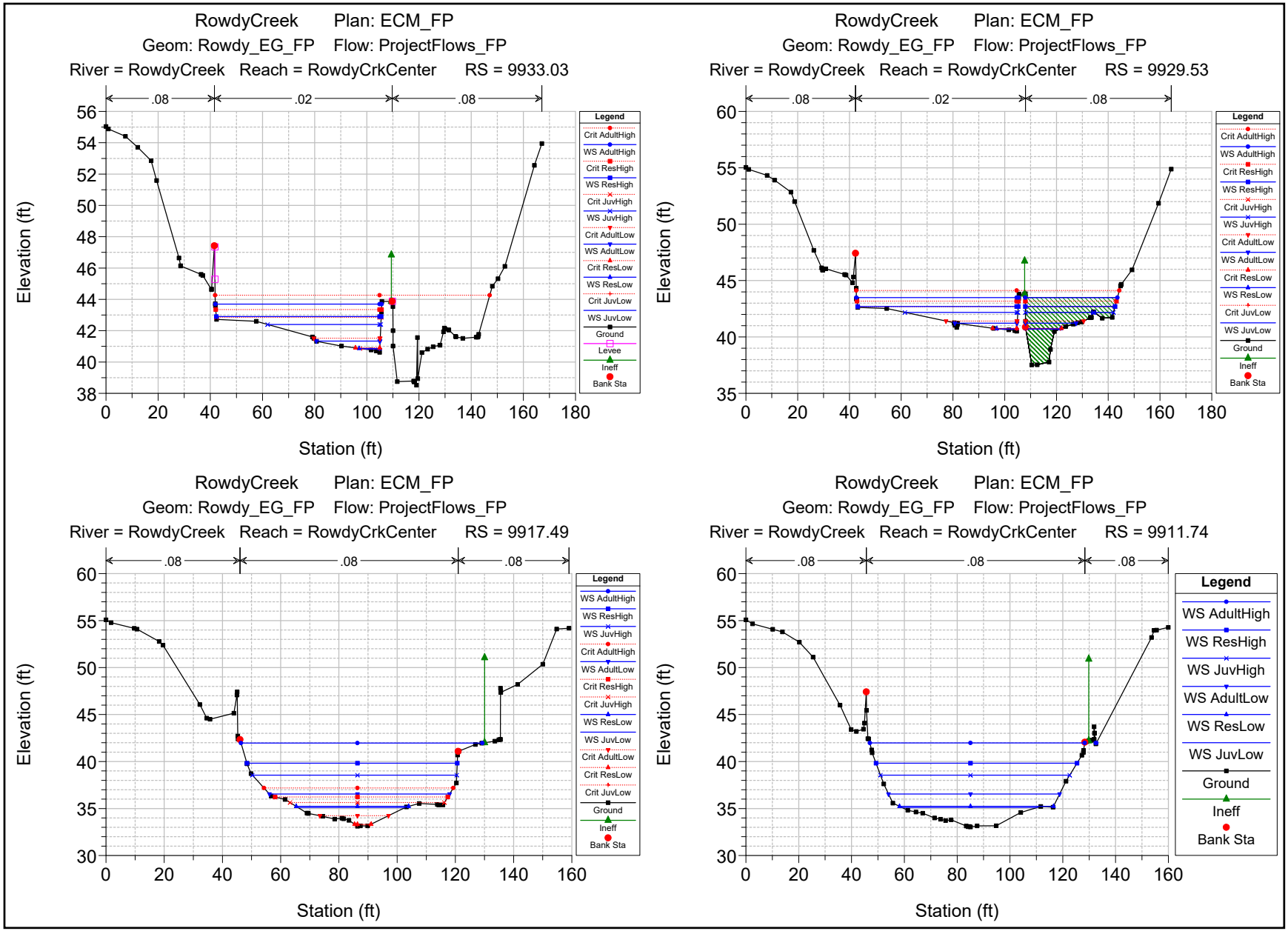

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10036.92
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

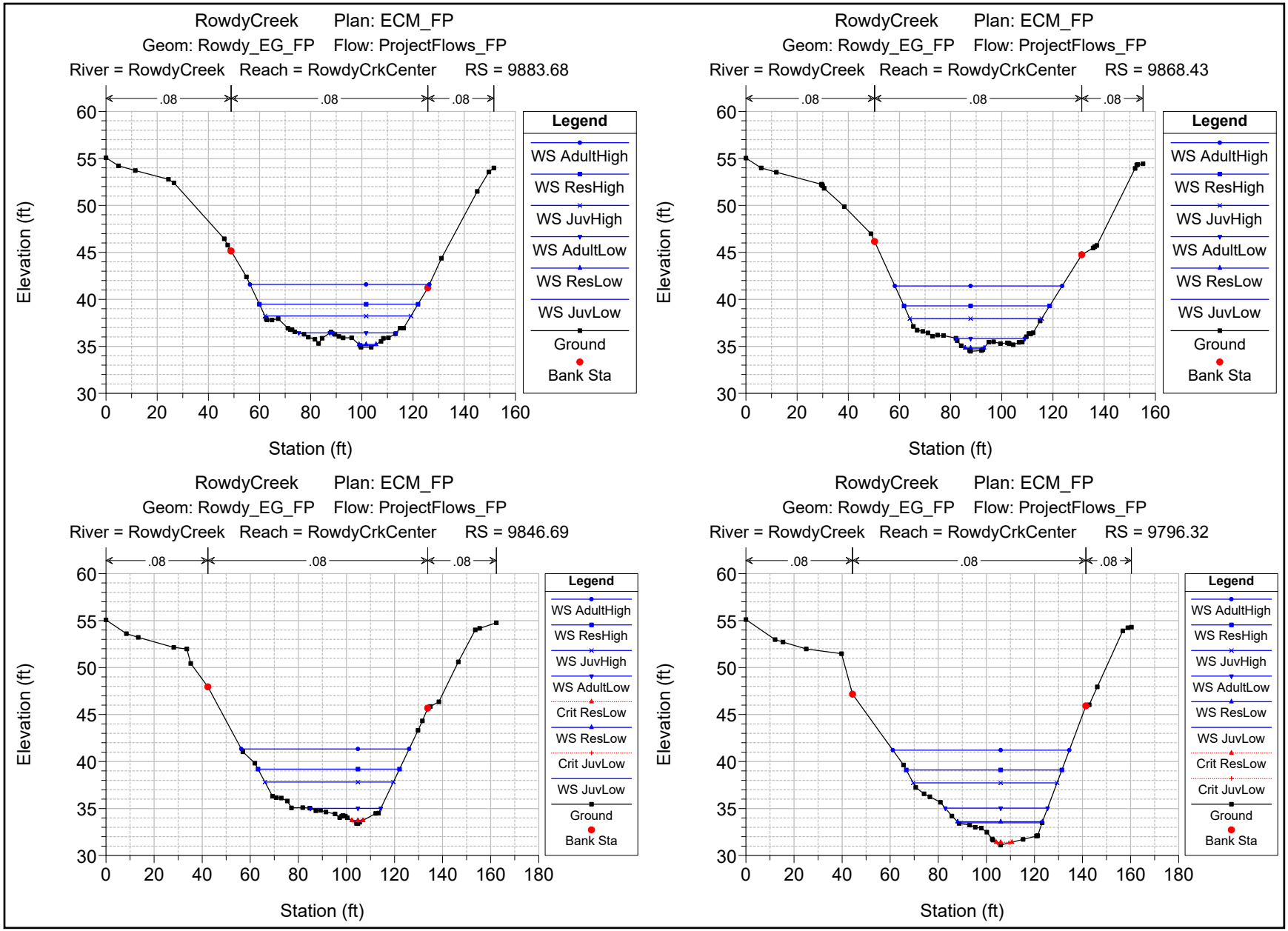

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10020.85
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

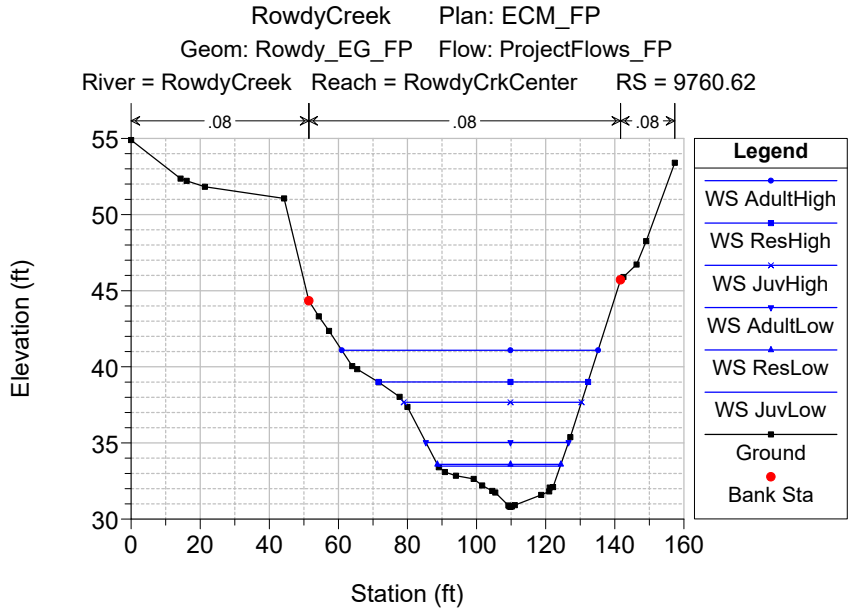

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10010
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

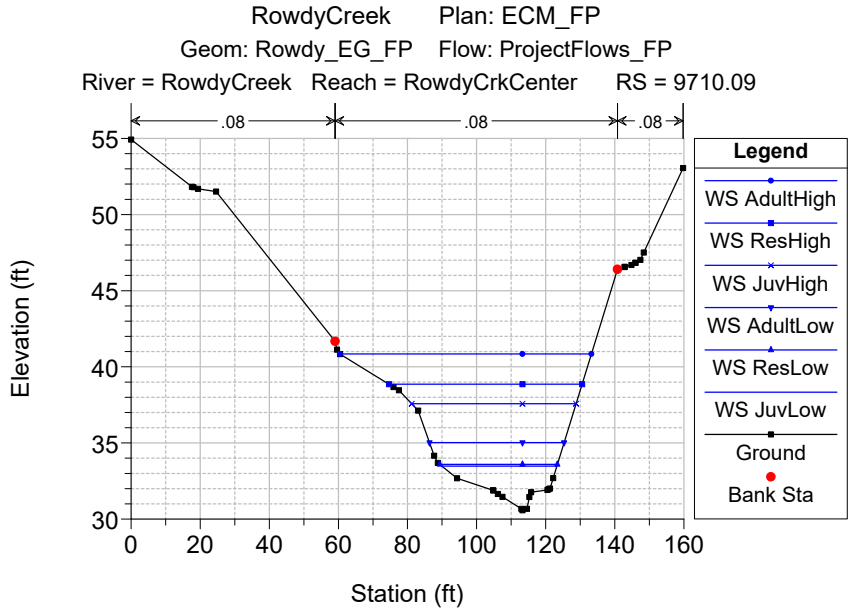

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9995.73
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

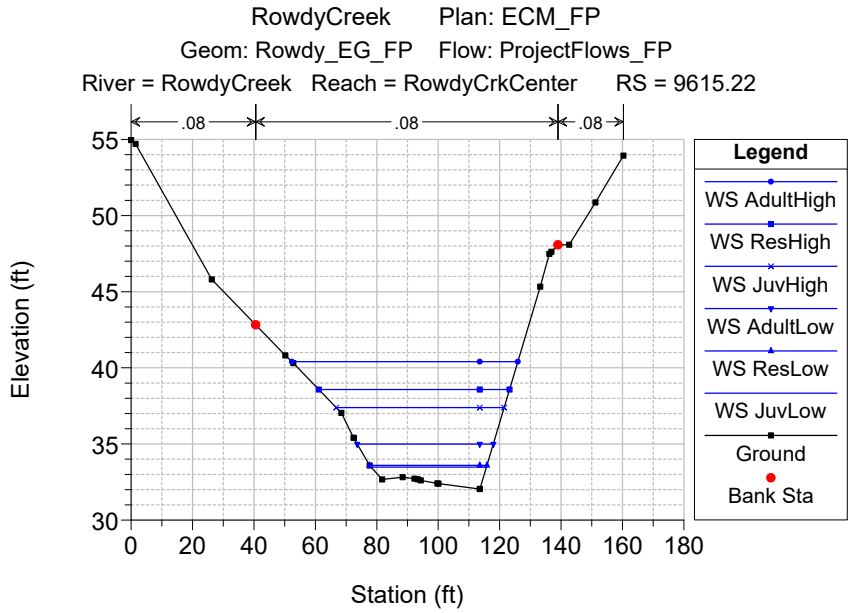

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9992.65
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9970.49
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9959.67
.08
.02
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
Crit AdultLow
Crit ResLow
WS ResLow
Crit JuvLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9947.52
.08
.02
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
Crit AdultHigh
WS ResHigh
Crit ResHigh
WS JuvHigh
Crit JuvHigh
Crit AdultLow
WS AdultLow
Crit ResLow
WS ResLow
Crit JuvLow
WS JuvLow
Ground
Levee
Ineff
Bank Sta

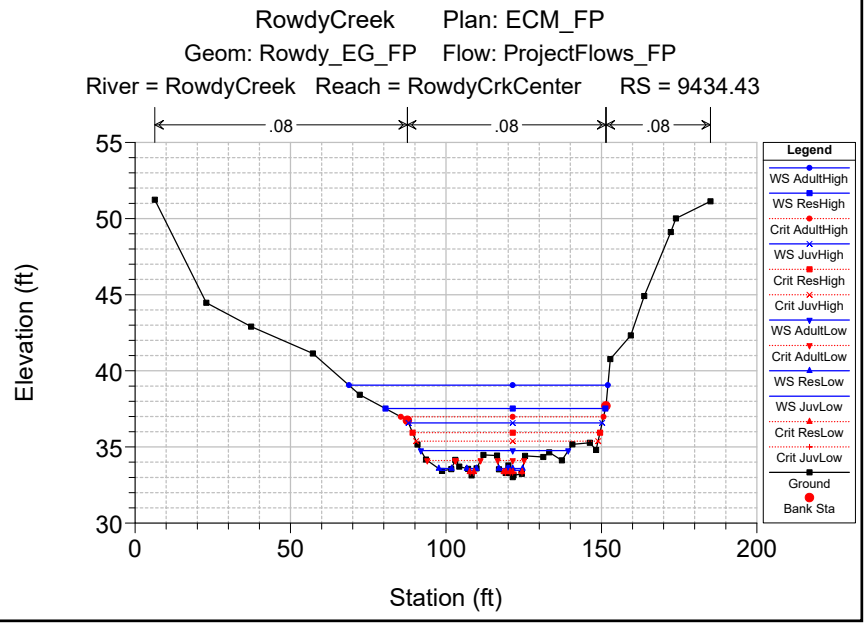

RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9933.03
.08
.02
.08
Elevation (ft)
Station (ft)
Legend
Crit AdultHigh
WS AdultHigh
Crit ResHigh
WS ResHigh
Crit JuvHigh
WS JuvHigh
Crit AdultLow
WS AdultLow
Crit ResLow
WS ResLow
Crit JuvLow
WS JuvLow
Ground
Levee
Ineff
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9929.53
.08
.02
.08
Elevation (ft)
Station (ft)
Legend
Crit AdultHigh
WS AdultHigh
Crit ResHigh
WS ResHigh
Crit JuvHigh
WS JuvHigh
Crit AdultLow
WS AdultLow
Crit ResLow
WS ResLow
Crit JuvLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9917.49
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
Crit AdultHigh
WS AdultLow
Crit ResHigh
Crit JuvHigh
WS ResLow
WS JuvLow
Crit AdultLow
Crit ResLow
Crit JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9911.74
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9883.68
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9868.43
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9846.69
RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9796.32
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Crit ResLow
Crit JuvLow
Ground
Bank Sta


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9760.62
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9710.09
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9615.22
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: ECM_FP
Geom: Rowdy_EG_FP Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9434.43
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
Crit AdultHigh
WS JuvHigh
Crit ResHigh
Crit JuvHigh
WS AdultLow
Crit AdultLow
WS ResLow
WS JuvLow
Crit ResLow
Crit JuvLow
Ground
Bank Sta

HEC-RAS Plan: ECM-FP River: RowdyCreek Reach: RowdyCrkCenter

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10362	JuvLow	1.00	40.83	42.89	40.99	42.89	0.000001	0.02	48.52	40.67	0.00
RowdyCrkCenter	10362	ResLow	2.00	40.83	42.99	41.05	42.99	0.000003	0.04	52.65	42.42	0.01
RowdyCrkCenter	10362	AdultLow	54.00	40.83	43.97	41.72	43.97	0.000348	0.54	100.20	52.54	0.07
RowdyCrkCenter	10362	JuvHigh	396.00	40.83	45.80	43.16	45.86	0.002135	2.02	205.55	62.07	0.18
RowdyCrkCenter	10362	ResHigh	698.00	40.83	46.78	43.79	46.89	0.003038	2.76	268.46	66.95	0.22
RowdyCrkCenter	10362	AdultHigh	1384.00	40.83	48.36	44.89	48.58	0.004448	3.95	385.90	82.72	0.28
RowdyCrkCenter	10294	JuvLow	1.00	40.01	42.89		42.89	0.000000	0.02	64.22	39.38	0.00
RowdyCrkCenter	10294	ResLow	2.00	40.01	42.99		42.99	0.000001	0.03	68.20	40.70	0.00
RowdyCrkCenter	10294	AdultLow	54.00	40.01	43.95		43.95	0.000234	0.47	117.10	58.21	0.06
RowdyCrkCenter	10294	JuvHigh	396.00	40.01	45.68		45.73	0.001624	1.83	226.47	67.36	0.16
RowdyCrkCenter	10294	ResHigh	698.00	40.01	46.61		46.70	0.002364	2.55	290.34	70.84	0.21
RowdyCrkCenter	10294	AdultHigh	1384.00	40.01	48.10		48.30	0.003518	3.73	400.70	94.96	0.26
RowdyCrkCenter	10248	JuvLow	1.00	41.57	42.89		42.89	0.000002	0.02	40.95	51.57	0.00
RowdyCrkCenter	10248	ResLow	2.00	41.57	42.99		42.99	0.000007	0.04	46.14	52.86	0.01
RowdyCrkCenter	10248	AdultLow	54.00	41.57	43.94		43.94	0.000405	0.52	103.51	62.74	0.07
RowdyCrkCenter	10248	JuvHigh	396.00	41.57	45.59		45.65	0.002166	1.92	207.62	63.30	0.19
RowdyCrkCenter	10248	ResHigh	698.00	41.57	46.47		46.58	0.003070	2.67	263.25	63.60	0.23
RowdyCrkCenter	10248	AdultHigh	1384.00	41.57	47.87		48.11	0.004593	3.96	352.88	64.08	0.30
RowdyCrkCenter	10203	JuvLow	1.00	42.30	42.89	42.42	42.89	0.000150	0.09	11.18	45.34	0.03
RowdyCrkCenter	10203	ResLow	2.00	42.30	42.99	42.48	42.99	0.000218	0.13	15.93	51.35	0.04
RowdyCrkCenter	10203	AdultLow	54.00	42.30	43.90	43.00	43.91	0.001378	0.71	75.73	71.78	0.12
RowdyCrkCenter	10203	JuvHigh	396.00	42.30	45.45	43.81	45.52	0.003678	1.99	198.92	83.93	0.23
RowdyCrkCenter	10203	ResHigh	698.00	42.30	46.31	44.28	46.41	0.004305	2.56	272.89	89.16	0.26
RowdyCrkCenter	10203	AdultHigh	1384.00	42.30	47.70	45.09	47.89	0.005060	3.47	398.57	98.63	0.29
RowdyCrkCenter	10150		Bridge									
RowdyCrkCenter	10141.05	JuvLow	1.00	42.52	42.72		42.74	0.059907	1.04	0.97	8.88	0.55
RowdyCrkCenter	10141.05	ResLow	2.00	42.52	42.80		42.82	0.047052	1.14	1.75	11.61	0.52
RowdyCrkCenter	10141.05	AdultLow	54.00	42.52	43.62		43.65	0.015477	1.43	37.73	76.82	0.36
RowdyCrkCenter	10141.05	JuvHigh	396.00	42.52	45.02		45.12	0.009710	2.57	154.00	90.30	0.35
RowdyCrkCenter	10141.05	ResHigh	698.00	42.52	45.85		45.99	0.008667	3.00	232.57	98.55	0.34
RowdyCrkCenter	10141.05	AdultHigh	1384.00	42.52	47.22		47.44	0.007648	3.72	372.45	103.26	0.34
RowdyCrkCenter	10125.53	JuvLow	1.00	42.07	42.48	42.27	42.48	0.007544	0.48	2.10	13.03	0.21
RowdyCrkCenter	10125.53	ResLow	2.00	42.07	42.57	42.34	42.58	0.007738	0.55	3.66	18.87	0.22
RowdyCrkCenter	10125.53	AdultLow	54.00	42.07	43.40		43.44	0.011593	1.48	36.39	56.43	0.33
RowdyCrkCenter	10125.53	JuvHigh	396.00	42.07	44.85		44.96	0.010479	2.70	146.89	84.80	0.36
RowdyCrkCenter	10125.53	ResHigh	698.00	42.07	45.69		45.85	0.009315	3.15	221.53	92.07	0.36
RowdyCrkCenter	10125.53	AdultHigh	1384.00	42.07	47.09		47.31	0.008446	3.80	364.44	106.08	0.36
RowdyCrkCenter	10100.21	JuvLow	1.00	41.72	41.92	41.92	41.95	0.160416	1.48	0.68	7.59	0.87
RowdyCrkCenter	10100.21	ResLow	2.00	41.72	41.96	41.96	42.02	0.192568	1.98	1.01	8.44	1.01
RowdyCrkCenter	10100.21	AdultLow	54.00	41.72	42.87		42.94	0.036127	2.16	25.05	52.28	0.55
RowdyCrkCenter	10100.21	JuvHigh	396.00	41.72	44.58		44.70	0.010024	2.77	143.53	78.54	0.36
RowdyCrkCenter	10100.21	ResHigh	698.00	41.72	45.45		45.61	0.009377	3.27	214.90	87.15	0.36
RowdyCrkCenter	10100.21	AdultHigh	1384.00	41.72	46.86		47.10	0.008574	3.91	357.42	103.79	0.37
RowdyCrkCenter	10079.88	JuvLow	1.00	40.62	41.63	40.76	41.63	0.000047	0.09	10.60	16.52	0.02
RowdyCrkCenter	10079.88	ResLow	2.00	40.62	41.70	40.82	41.70	0.000141	0.17	11.77	17.24	0.04
RowdyCrkCenter	10079.88	AdultLow	54.00	40.62	42.58		42.62	0.008703	1.44	37.50	48.83	0.29
RowdyCrkCenter	10079.88	JuvHigh	396.00	40.62	44.43		44.53	0.007017	2.52	157.42	73.57	0.30
RowdyCrkCenter	10079.88	ResHigh	698.00	40.62	45.28		45.43	0.007847	3.11	224.75	82.71	0.33
RowdyCrkCenter	10079.88	AdultHigh	1384.00	40.62	46.68		46.92	0.008759	3.90	355.24	101.83	0.37
RowdyCrkCenter	10061.51	JuvLow	1.00	39.04	41.63		41.63	0.000001	0.03	34.76	21.72	0.00
RowdyCrkCenter	10061.51	ResLow	2.00	39.04	41.70		41.70	0.000005	0.06	36.28	21.98	0.01
RowdyCrkCenter	10061.51	AdultLow	54.00	39.04	42.55		42.56	0.001304	0.85	63.43	42.71	0.12
RowdyCrkCenter	10061.51	JuvHigh	396.00	39.04	44.32		44.41	0.005723	2.42	163.91	69.12	0.28
RowdyCrkCenter	10061.51	ResHigh	698.00	39.04	45.14		45.29	0.007465	3.08	227.60	82.49	0.32
RowdyCrkCenter	10061.51	AdultHigh	1384.00	39.04	46.52		46.76	0.008125	3.94	354.10	96.13	0.36
RowdyCrkCenter	10036.92	JuvLow	1.00	38.26	41.63		41.63	0.000000	0.02	49.57	21.34	0.00
RowdyCrkCenter	10036.92	ResLow	2.00	38.26	41.70		41.70	0.000002	0.04	51.06	21.57	0.00
RowdyCrkCenter	10036.92	AdultLow	54.00	38.26	42.53		42.54	0.000669	0.66	81.29	47.60	0.09
RowdyCrkCenter	10036.92	JuvHigh	396.00	38.26	44.21		44.29	0.003976	2.14	184.66	69.55	0.23
RowdyCrkCenter	10036.92	ResHigh	698.00	38.26	45.00		45.13	0.005604	2.89	242.20	76.96	0.28
RowdyCrkCenter	10036.92	AdultHigh	1384.00	38.26	46.33		46.57	0.007330	3.95	354.36	88.88	0.34
RowdyCrkCenter	10020.85	JuvLow	1.00	38.41	41.63		41.63	0.000000	0.02	51.21	26.49	0.00
RowdyCrkCenter	10020.85	ResLow	2.00	38.41	41.70		41.70	0.000002	0.04	53.22	31.33	0.01
RowdyCrkCenter	10020.85	AdultLow	54.00	38.41	42.52		42.53	0.000539	0.59	92.01	55.77	0.08
RowdyCrkCenter	10020.85	JuvHigh	396.00	38.41	44.16		44.23	0.003377	2.02	195.76	72.93	0.22
RowdyCrkCenter	10020.85	ResHigh	698.00	38.41	44.92		45.04	0.004942	2.75	254.48	80.75	0.27
RowdyCrkCenter	10020.85	AdultHigh	1384.00	38.41	46.24		46.46	0.006262	3.81	367.21	87.68	0.32

HEC-RAS Plan: ECM-FP River: RowdyCreek Reach: RowdyCrkCenter (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10010	JuvLow	1.00	38.31	41.63		41.63	0.000001	0.02	54.27	38.12	0.00
RowdyCrkCenter	10010	ResLow	2.00	38.31	41.70		41.70	0.000003	0.04	57.07	42.43	0.01
RowdyCrkCenter	10010	AdultLow	54.00	38.31	42.52		42.52	0.000442	0.55	98.66	57.34	0.07
RowdyCrkCenter	10010	JuvHigh	396.00	38.31	44.13		44.19	0.003021	1.94	204.80	75.64	0.21
RowdyCrkCenter	10010	ResHigh	698.00	38.31	44.88		44.98	0.004543	2.65	264.50	83.44	0.26
RowdyCrkCenter	10010	AdultHigh	1384.00	38.31	46.18		46.39	0.005858	3.71	375.47	86.85	0.31
RowdyCrkCenter	9995.73	JuvLow	1.00	38.65	41.63		41.63	0.000001	0.02	50.65	47.11	0.00
RowdyCrkCenter	9995.73	ResLow	2.00	38.65	41.70		41.70	0.000002	0.04	53.95	48.35	0.00
RowdyCrkCenter	9995.73	AdultLow	54.00	38.65	42.51		42.51	0.000381	0.63	98.48	60.98	0.07
RowdyCrkCenter	9995.73	JuvHigh	396.00	38.65	44.09		44.15	0.002985	2.08	207.57	79.05	0.21
RowdyCrkCenter	9995.73	ResHigh	698.00	38.65	44.81		44.92	0.004244	2.85	265.64	81.13	0.25
RowdyCrkCenter	9995.73	AdultHigh	1384.00	38.65	46.09		46.31	0.005786	4.02	370.93	84.00	0.31
RowdyCrkCenter	9992.65	JuvLow	1.00	38.92	41.63		41.63	0.000001	0.02	45.91	46.62	0.00
RowdyCrkCenter	9992.65	ResLow	2.00	38.92	41.70		41.70	0.000005	0.04	49.17	47.82	0.01
RowdyCrkCenter	9992.65	AdultLow	54.00	38.92	42.51		42.51	0.000588	0.58	93.14	60.55	0.08
RowdyCrkCenter	9992.65	JuvHigh	396.00	38.92	44.08		44.14	0.003437	1.97	200.53	76.65	0.22
RowdyCrkCenter	9992.65	ResHigh	698.00	38.92	44.79		44.91	0.004924	2.73	256.13	78.42	0.27
RowdyCrkCenter	9992.65	AdultHigh	1384.00	38.92	46.05		46.29	0.006802	3.88	356.32	80.35	0.33
RowdyCrkCenter	9970.49	JuvLow	1.00	40.05	41.63		41.63	0.000013	0.05	20.76	35.27	0.01
RowdyCrkCenter	9970.49	ResLow	2.00	40.05	41.70		41.70	0.000040	0.09	23.11	37.03	0.02
RowdyCrkCenter	9970.49	AdultLow	54.00	40.05	42.48		42.49	0.002712	0.91	59.37	63.97	0.16
RowdyCrkCenter	9970.49	JuvHigh	396.00	40.05	43.92		44.03	0.007133	2.55	155.03	70.80	0.30
RowdyCrkCenter	9970.49	ResHigh	698.00	40.05	44.56		44.75	0.010219	3.51	199.00	73.02	0.37
RowdyCrkCenter	9970.49	AdultHigh	1384.00	40.05	45.69		46.06	0.014828	4.86	284.99	78.73	0.45
RowdyCrkCenter	9959.67	JuvLow	1.00	41.38	41.58	41.58	41.63	0.017181	1.71	0.59	7.81	1.10
RowdyCrkCenter	9959.67	ResLow	2.00	41.38	41.65	41.65	41.70	0.009954	1.80	1.11	9.00	0.90
RowdyCrkCenter	9959.67	AdultLow	54.00	41.38	42.26	42.26	42.43	0.007969	3.27	16.49	46.42	0.97
RowdyCrkCenter	9959.67	JuvHigh	396.00	41.38	43.82		43.99	0.001045	3.32	119.28	70.68	0.45
RowdyCrkCenter	9959.67	ResHigh	698.00	41.38	44.42		44.71	0.001220	4.31	161.85	75.86	0.51
RowdyCrkCenter	9959.67	AdultHigh	1384.00	41.38	45.50		46.01	0.001354	5.73	241.47	78.84	0.56
RowdyCrkCenter	9947.52	JuvLow	1.00	41.02	41.24	41.28	41.36	0.029340	2.81	0.36	3.25	1.50
RowdyCrkCenter	9947.52	ResLow	2.00	41.02	41.30	41.36	41.48	0.037327	3.38	0.59	4.95	1.72
RowdyCrkCenter	9947.52	AdultLow	54.00	41.02	41.83	41.95	42.27	0.016791	5.32	10.16	24.08	1.44
RowdyCrkCenter	9947.52	JuvHigh	396.00	41.02	43.43	43.43	43.94	0.006008	5.71	69.38	68.16	1.00
RowdyCrkCenter	9947.52	ResHigh	698.00	41.02	43.90	43.90	44.64	0.005415	6.90	101.10	68.29	1.00
RowdyCrkCenter	9947.52	AdultHigh	1384.00	41.02	44.75	44.75	45.92	0.004797	8.67	159.65	68.60	1.00
RowdyCrkCenter	9933.03	JuvLow	1.00	40.62	40.82	40.85	40.91	0.031851	2.33	0.43	5.64	1.49
RowdyCrkCenter	9933.03	ResLow	2.00	40.62	40.87	40.90	40.98	0.029231	2.63	0.76	7.89	1.49
RowdyCrkCenter	9933.03	AdultLow	54.00	40.62	41.34	41.52	41.94	0.028565	6.21	8.69	24.42	1.83
RowdyCrkCenter	9933.03	JuvHigh	396.00	40.62	42.40	42.86	43.71	0.016236	9.21	42.99	43.39	1.63
RowdyCrkCenter	9933.03	ResHigh	698.00	40.62	42.90	43.35	44.43	0.016048	9.91	70.40	63.20	1.66
RowdyCrkCenter	9933.03	AdultHigh	1384.00	40.62	43.70	44.27	45.73	0.010753	11.44	120.96	63.80	1.46
RowdyCrkCenter	9929.53	JuvLow	1.00	40.51	40.69	40.73	40.78	0.036671	2.42	0.41	18.78	1.59
RowdyCrkCenter	9929.53	ResLow	2.00	40.51	40.73	40.77	40.86	0.036645	2.84	0.70	21.19	1.66
RowdyCrkCenter	9929.53	AdultLow	54.00	40.51	41.22	41.41	41.82	0.028976	6.23	8.66	43.64	1.83
RowdyCrkCenter	9929.53	JuvHigh	396.00	40.51	42.18	42.68	43.64	0.019600	9.70	40.82	77.26	1.77
RowdyCrkCenter	9929.53	ResHigh	698.00	40.51	42.70	43.18	44.36	0.018107	10.34	67.50	96.67	1.75
RowdyCrkCenter	9929.53	AdultHigh	1384.00	40.51	43.49	44.12	45.67	0.011904	11.85	116.75	98.33	1.53
RowdyCrkCenter	9917.49	JuvLow	1.00	33.11	35.12	33.27	35.12	0.000002	0.02	40.44	36.98	0.00
RowdyCrkCenter	9917.49	ResLow	2.00	33.11	35.24	33.33	35.24	0.000005	0.04	44.62	38.63	0.01
RowdyCrkCenter	9917.49	AdultLow	54.00	33.11	36.55	34.24	36.55	0.000282	0.47	115.28	61.91	0.06
RowdyCrkCenter	9917.49	JuvHigh	396.00	33.11	38.56	35.64	38.60	0.001413	1.59	248.77	70.19	0.15
RowdyCrkCenter	9917.49	ResHigh	698.00	33.11	39.82	36.23	39.89	0.001667	2.06	339.15	72.25	0.17
RowdyCrkCenter	9917.49	AdultHigh	1384.00	33.11	41.97	37.19	42.09	0.001969	2.78	500.27	82.92	0.19
RowdyCrkCenter	9911.74	JuvLow	1.00	33.04	35.12		35.12	0.000001	0.02	60.53	51.52	0.00
RowdyCrkCenter	9911.74	ResLow	2.00	33.04	35.24		35.24	0.000002	0.03	66.60	58.31	0.00
RowdyCrkCenter	9911.74	AdultLow	54.00	33.04	36.55		36.55	0.000130	0.36	148.41	64.80	0.04
RowdyCrkCenter	9911.74	JuvHigh	396.00	33.04	38.56		38.59	0.000918	1.39	285.38	71.67	0.12
RowdyCrkCenter	9911.74	ResHigh	698.00	33.04	39.82		39.88	0.001211	1.84	379.06	76.13	0.15
RowdyCrkCenter	9911.74	AdultHigh	1384.00	33.04	41.98		42.07	0.001546	2.52	549.76	81.60	0.17
RowdyCrkCenter	9899.21	JuvLow	1.00	32.83	35.12		35.12	0.000001	0.02	48.00	35.96	0.00
RowdyCrkCenter	9899.21	ResLow	2.00	32.83	35.24		35.24	0.000003	0.04	52.04	36.90	0.01
RowdyCrkCenter	9899.21	AdultLow	60.00	32.83	36.54		36.55	0.000334	0.52	114.84	59.19	0.07
RowdyCrkCenter	9899.21	JuvHigh	446.00	32.83	38.51		38.57	0.001896	1.86	239.92	66.76	0.17
RowdyCrkCenter	9899.21	ResHigh	786.00	32.83	39.76		39.85	0.002325	2.41	325.81	70.91	0.20
RowdyCrkCenter	9899.21	AdultHigh	1559.00	32.83	41.88		42.04	0.002841	3.22	483.61	78.39	0.23
RowdyCrkCenter	9883.68	JuvLow	1.00	34.90	35.11		35.12	0.030629	1.01	0.99	5.64	0.43
RowdyCrkCenter	9883.68	ResLow	2.00	34.90	35.21		35.23	0.029825	1.24	1.62	6.68	0.44

HEC-RAS Plan: ECM-FP River: RowdyCreek Reach: RowdyCrkCenter (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9883.68	AdultLow	60.00	34.90	36.44		36.52	0.026800	2.35	25.58	37.13	0.50
RowdyCrkCenter	9883.68	JuvHigh	446.00	34.90	38.23		38.48	0.019608	4.00	111.37	57.03	0.51
RowdyCrkCenter	9883.68	ResHigh	786.00	34.90	39.49		39.76	0.012424	4.22	186.09	61.99	0.43
RowdyCrkCenter	9883.68	AdultHigh	1559.00	34.90	41.59		41.95	0.008954	4.79	325.51	70.13	0.39
RowdyCrkCenter	9868.43	JuvLow	1.00	34.48	34.73		34.74	0.021333	0.86	1.16	6.46	0.36
RowdyCrkCenter	9868.43	ResLow	2.00	34.48	34.83		34.85	0.021502	1.08	1.86	7.40	0.38
RowdyCrkCenter	9868.43	AdultLow	60.00	34.48	35.82		35.98	0.048473	3.19	18.81	26.87	0.67
RowdyCrkCenter	9868.43	JuvHigh	446.00	34.48	37.96		38.20	0.016503	3.96	112.68	51.53	0.47
RowdyCrkCenter	9868.43	ResHigh	786.00	34.48	39.30		39.58	0.011233	4.24	185.51	56.89	0.41
RowdyCrkCenter	9868.43	AdultHigh	1559.00	34.48	41.43		41.81	0.009190	4.94	315.53	65.38	0.40
RowdyCrkCenter	9846.69	JuvLow	1.00	33.39	33.65	33.65	33.71	0.182814	2.08	0.48	3.53	1.00
RowdyCrkCenter	9846.69	ResLow	2.00	33.39	33.73	33.73	33.82	0.172354	2.41	0.83	4.68	1.01
RowdyCrkCenter	9846.69	AdultLow	60.00	33.39	35.02		35.13	0.031027	2.70	22.24	29.35	0.55
RowdyCrkCenter	9846.69	JuvHigh	446.00	33.39	37.82		37.95	0.006710	2.97	150.12	53.43	0.31
RowdyCrkCenter	9846.69	ResHigh	786.00	33.39	39.19		39.38	0.006000	3.46	227.49	58.89	0.31
RowdyCrkCenter	9846.69	AdultHigh	1559.00	33.39	41.33		41.62	0.006189	4.27	364.80	69.81	0.33
RowdyCrkCenter	9796.32	JuvLow	1.00	31.11	33.48	31.33	33.48	0.000001	0.02	45.04	34.72	0.00
RowdyCrkCenter	9796.32	ResLow	2.00	31.11	33.60	31.42	33.60	0.000003	0.04	49.05	35.33	0.01
RowdyCrkCenter	9796.32	AdultLow	60.00	31.11	35.05		35.05	0.000290	0.57	105.77	42.57	0.06
RowdyCrkCenter	9796.32	JuvHigh	446.00	31.11	37.73		37.78	0.001566	1.83	244.29	59.82	0.16
RowdyCrkCenter	9796.32	ResHigh	786.00	31.11	39.10		39.19	0.002015	2.39	329.39	64.70	0.19
RowdyCrkCenter	9796.32	AdultHigh	1559.00	31.11	41.21		41.38	0.002794	3.28	475.11	73.38	0.23
RowdyCrkCenter	9760.62	JuvLow	1.00	30.80	33.48		33.48	0.000001	0.02	51.42	35.31	0.00
RowdyCrkCenter	9760.62	ResLow	2.00	30.80	33.59		33.59	0.000002	0.04	55.49	35.75	0.01
RowdyCrkCenter	9760.62	AdultLow	60.00	30.80	35.04		35.04	0.000238	0.54	111.09	41.29	0.06
RowdyCrkCenter	9760.62	JuvHigh	446.00	30.80	37.67		37.73	0.001531	1.92	232.85	51.44	0.16
RowdyCrkCenter	9760.62	ResHigh	786.00	30.80	39.01		39.11	0.002354	2.56	307.20	60.67	0.20
RowdyCrkCenter	9760.62	AdultHigh	1559.00	30.80	41.08		41.27	0.003410	3.47	449.49	74.16	0.25
RowdyCrkCenter	9710.09	JuvLow	1.00	30.58	33.48		33.48	0.000001	0.02	49.98	33.30	0.00
RowdyCrkCenter	9710.09	ResLow	2.00	30.58	33.59		33.59	0.000002	0.04	53.84	34.08	0.01
RowdyCrkCenter	9710.09	AdultLow	60.00	30.58	35.03		35.03	0.000258	0.56	106.47	38.97	0.06
RowdyCrkCenter	9710.09	JuvHigh	446.00	30.58	37.58		37.64	0.001818	2.07	215.69	47.59	0.17
RowdyCrkCenter	9710.09	ResHigh	786.00	30.58	38.85		38.98	0.002885	2.80	281.22	55.89	0.22
RowdyCrkCenter	9710.09	AdultHigh	1559.00	30.58	40.84		41.07	0.004590	3.81	409.12	72.77	0.28
RowdyCrkCenter	9615.22	JuvLow	1.00	32.04	33.48		33.48	0.000003	0.03	34.94	37.57	0.01
RowdyCrkCenter	9615.22	ResLow	2.00	32.04	33.59		33.59	0.000007	0.05	39.27	38.23	0.01
RowdyCrkCenter	9615.22	AdultLow	60.00	32.04	34.99		35.00	0.000405	0.62	97.03	44.31	0.07
RowdyCrkCenter	9615.22	JuvHigh	446.00	32.04	37.39		37.46	0.002130	2.07	215.03	54.72	0.18
RowdyCrkCenter	9615.22	ResHigh	786.00	32.04	38.57		38.69	0.003107	2.77	284.04	62.10	0.23
RowdyCrkCenter	9615.22	AdultHigh	1559.00	32.04	40.41		40.63	0.004586	3.82	408.41	73.60	0.29
RowdyCrkCenter	9434.43	JuvLow	1.00	33.02	33.47	33.30	33.48	0.010012	0.58	1.74	9.66	0.24
RowdyCrkCenter	9434.43	ResLow	2.00	33.02	33.58	33.36	33.59	0.010005	0.65	3.09	14.36	0.25
RowdyCrkCenter	9434.43	AdultLow	60.00	33.02	34.76	34.11	34.79	0.010006	1.56	38.34	47.36	0.31
RowdyCrkCenter	9434.43	JuvHigh	446.00	33.02	36.58	35.38	36.73	0.010006	3.12	142.98	62.28	0.36
RowdyCrkCenter	9434.43	ResHigh	786.00	33.02	37.52	35.94	37.75	0.010002	3.87	205.38	70.72	0.38
RowdyCrkCenter	9434.43	AdultHigh	1559.00	33.02	39.06	36.98	39.44	0.010004	5.02	324.66	83.30	0.41

Appendix J- *Rowdy Creek Trap Hydraulic Support*

Trap Pool and Weir Fishway Design Calculations

Project: Rowdy Creek Fish Trap Ladder

Date: 8/1/2018
By: pTJ

DESIGN INPUTS

Total Weir Width	**W**	**3.00**	**ft**
Drop height between weirs	**DH**	**0.5**	**ft**
Residual Pool Depth	**P**	**3**	**ft**
Effective Pool Length	**Leff**	**7**	**ft**
Weir Spacing On-Center	**Loc**	**7.5**	**ft**

Fishway Slope	So	0.067	ft/ft
Depth when Weir is Fully Wetted	Hwet	0.00	ft
Desired dry shoulder width at High Design Q		0.00	ft
Pool Depth when Weir becomes Submerged	Dsc	3.50	ft

Section 1

Width	Length1	1.50	ft

Section 2

Top Width	Length2	0.0	ft
Side Slope	Slope2	1.0	H:1V
Wier Coeficient	CV_2	0.578	
Height to fully wet	Height2	0.00	ft

Section 3

Top Width	Length3	0.00	ft
Side Slope	Slope3	5.0	H:1V
Wier Coeficient	CV_3	0.621	
Height to fully wet	Height3	0.00	ft

Bypass Sill (optional one-sided sloped or horizontal)

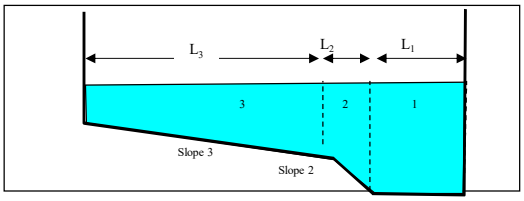
Top Width	L_sill	0.0	ft
Side Slope (*set to zero for a horizontal weir*)	SS_sill	0.0	H:1V
Triangular Wier Coeficient	CV_sill	0.607	
Height to fully wet	H_sill	N/A	ft
Height of Sill Crest above apron	P_sill	0.0	ft

Horiz. Weir Coeficient	**Cs**	= 0.602+0.075(h/P)	
V-Notch Weir coeficient	**Cv**	=0.6071-0.00087446*Ø+6.1039x10^-6*Ø^2	
Gravity	g	32.2	ft/s2

DESIGN FLOWS

Low Op Flow	1.7	cfs
Adult Low Flow Op	3.3	cfs
High Picket Flow	5.9	cfs

Under current design, weirs backwatered at High Picket flow.



Design Elevations

No. of Weirs	N_weirs	**2**	
Entrance Weir Crest El.	EL_entr	**41.00**	ft
Exit Weir Crest El.	EL_exit	**41.50**	ft

Backwatered By Pool 4 at High Picket

	Description of Flow:	Low Op Flow	Adult Low Flow	High Picket Flow							
	Current AWS Analysis Trap WSE:	**42.09**	**42.17**	~~**42.33**~~		**NA**					
	Trap WSE:	**42.00**	**42.31**	~~**42.92**~~	**41.50**	**41.50**	**41.50**	**41.50**	**41.50**	**41.50**	**ft**
	Difference	**0.09**	**-0.15**	~~**-0.59**~~		**NA**					
Ho	**Upstream Head above Crest**	**0.50**	**0.81**	~~**1.42**~~	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**ft**
QLadder	**Total Flow in Fish Ladder**	**1.7**	**3.3**	~~**6.5**~~	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**cfs**
EDF	**Energy Disipation Factor**	**0.74**	**1.29**	~~**2.19**~~	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**ft-lb/s/ft^3**
	RC Pool 4 WSE	40.24	40.58	~~41.86~~							
	WSE in Fishway Pool 1	41.50	41.81	~~42.42~~							
	Drop at Entrance Weir	1.26	1.23	~~0.56~~							
	Section 1										
Q1	nonsubmerged Flow:	1.74	3.67	8.63	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q1sub	**Flow w/Submergance**	**1.74**	**3.30**	**6.50**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**cfs**
	Section 2 (Not Used)										
Q2	nonsubmerged Flow (untruncated V):	0.22	0.74	2.95	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q2untrunc_sub	Flow w/Submergance (untruncated V):	0.22	0.67	2.23	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q2trunc	Truncated Portion of Flow (nonsubmerged):	0.22	0.74	2.95	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q2trunc_sub	Truncated Portion of Flow w/Submergance:	0.22	0.67	2.23	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q2s	**Total Flow w/ Submergance:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**cfs**
	Section 3 (Not Used)										
Q3	nonsubmerged Flow (untruncated one-sided V):	1.17	3.97	15.87	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q3untrunc_sub	Flow w/Submergance (untruncated V):	1.17	3.57	11.96	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q3trunc	Truncated Portion of Flow (nonsubmerged):	1.17	3.97	15.87	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q3trunc_sub	Truncated Portion of Flow w/Submergance:	1.17	3.57	11.96	0.00	0.00	0.00	0.00	0.00	0.00	cfs
Q3s	**Total Flow w/ Submergance:**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**cfs**

Rowdy Creek Trap's AWS When Rowdy Crk Low Operational Flow

Parameters

Parameter	Value
HGL in Pool 5RR (ft)	42.21
Diversion Flow (cfs)	1.7
Diversion Flow (gpm)	763
Div. Pipe 1 Dia. (in)	12
Div. Pipe 1 Area (SF2)	0.8
Div. Pipe 2 Dia. (in)	0
Div. Pipe 2 Area (SF)	0.0
Div. Pipe 3 Dia. (in)	0
Div. Pipe 3 Area (SF)	0.0
Gravity (ft/s2)	32.2
Hazen Williams: A	10500
Hazen Williams: C	150
Screen base elev. (ft)	39.8
Depth over screen (ft)	2.41
Screen Length (ft)	9
Screen Surface Area (SF)	21.69
Fish Ladder Exit Invert (ft)	41.50

Friction Loss

Section	Variable	Value
All Pipe 1	Flow (cfs)	1.70
	Velocity (ft/s)	2.16
	Flow (gpm)	763.0
	Length (ft)	41.58
	# Instances	1
	h_{Lf} (ft)	0.01
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.16
	Flow (gpm)	763.0
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.16
	Flow (gpm)	763.0
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.16
	Flow (gpm)	763.0
	Length (ft)	8
	# Instances	0
	h_{Lf} (ft)	0.00

Results

Total Friction Loss	0.01
Total Minor Loss	0.11
Total Head Loss	*0.12*
Resulting HGL in Trap (ft)	**42.09**
Depth above Ladder Exit (ft)	**0.59**

Current HGL in Trap needed by weir 42.00

Difference 0.09

Minor Loss

Feature	Variable	Value
Fish Screen	Flow (cfs)	1.70
	Surface Area (SF)	21.69
	Velocity (ft/s)	0.1
	K	2
	# Instances	1
	h_{Lm} (ft)	0.000
Entrance Loss	Flow (cfs)	1.70
	Velocity (ft/s)	2.2
	K	0.5
	# Instances	1
	h_{Lm} (ft)	0.04
Exit Loss	Flow (cfs)	1.70
	Velocity (ft/s)	2.2
	K	1
	# Instances	1
	h_{Lm} (ft)	0.073
Not Used	Flow (cfs)	1.7
	Velocity (ft/s)	2.2
	K	0.3
	# Instances	0
	h_{Lm} (ft)	0.00
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.2
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.2
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
Not Used	Flow (cfs)	0
	Velocity (ft/s)	0.0
	K	0.1
	# Instances	1
	h_{Lm} (ft)	0.00
Not Used	Flow (cfs)	1.70
	Velocity (ft/s)	2.2
	K	0.2
	# Instances	0
	h_{Lm} (ft)	0.00

Rowdy Creek Trap's AWS When Rowdy Crk Q = 54 cfs (Adult Low Design Flow)

Parameters

Parameter	Value
HGL in Pool 5RR (ft)	42.63
Diversion Flow (cfs)	3.3
Diversion Flow (gpm)	1491
Div. Pipe 1 Dia. (in)	12
Div. Pipe 1 Area (SF2)	0.8
Div. Pipe 2 Dia. (in)	0
Div. Pipe 2 Area (SF)	0.0
Div. Pipe 3 Dia. (in)	0
Div. Pipe 3 Area (SF)	0.0
Gravity (ft/s2)	32.2
Hazen Williams: A	10500
Hazen Williams: C	150
Screen base elev. (ft)	39.8
Depth over screen (ft)	2.83
Screen Length (ft)	9
Screen Surface Area (SF)	25.47
Fish Ladder Exit Invert (ft)	41.50

Friction Loss

Section	Variable	Value
All Pipe 1	Flow (cfs)	3.321289
	Velocity (ft/s)	4.23
	Flow (gpm)	1490.6
	Length (ft)	41.58
	# Instances	1
	h_{Lf} (ft)	0.05
Not Used	Flow (cfs)	3.321289
	Velocity (ft/s)	4.23
	Flow (gpm)	1490.6
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	3.321289
	Velocity (ft/s)	4.23
	Flow (gpm)	1490.6
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	3.321289
	Velocity (ft/s)	4.23
	Flow (gpm)	1490.6
	Length (ft)	8
	# Instances	0
	h_{Lf} (ft)	0.00

Results

Total Friction Loss	0.05
Total Minor Loss	0.42
Total Head Loss	*0.46*
Resulting HGL in Trap (ft)	**42.17**
Depth above Ladder Exit (ft)	**0.67**

Current HGL in Trap needed by weir 42.31

-0.15

Minor Loss

Feature	Variable	Value
Fish Screen	Flow (cfs)	3.321289
	Surface Area (SF)	25.47
	Velocity (ft/s)	0.1
	K	2
	# Instances	1
	h_{Lm} (ft)	0.001
Entrance Loss	Flow (cfs)	3.321289
	Velocity (ft/s)	4.2
	K	0.5
	# Instances	1
	h_{Lm} (ft)	0.14
Exit Loss	Flow (cfs)	3.321289
	Velocity (ft/s)	4.2
	K	1
	# Instances	1
	h_{Lm} (ft)	0.278
	Flow (cfs)	3.3
	Velocity (ft/s)	4.2
	K	0.3
	# Instances	0
	h_{Lm} (ft)	0.00
	Flow (cfs)	3.321289
	Velocity (ft/s)	4.2
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
	Flow (cfs)	3.321289
	Velocity (ft/s)	4.2
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
	Flow (cfs)	0
	Velocity (ft/s)	0.0
	K	0.1
	# Instances	1
	h_{Lm} (ft)	0.00
	Flow (cfs)	3.321289
	Velocity (ft/s)	4.2
	K	0.2
	# Instances	0
	h_{Lm} (ft)	0.00

Rowdy Creek Trap's AWS When Rowdy Crk High Picket Operational Flow

Parameters

Parameter	Value
HGL in Pool 5RR (ft)	43.78
Diversion Flow (cfs)	5.9
Diversion Flow (gpm)	2646
Div. Pipe 1 Dia. (in)	12
Div. Pipe 1 Area (SF2)	0.8
Div. Pipe 2 Dia. (in)	0
Div. Pipe 2 Area (SF)	0.0
Div. Pipe 3 Dia. (in)	0
Div. Pipe 3 Area (SF)	0.0
Gravity (ft/s2)	32.2
Hazen Williams: A	10500
Hazen Williams: C	150
Screen base elev. (ft)	39.8
Depth over screen (ft)	3.98
Screen Length (ft)	9
Screen Surface Area (SF)	35.82
Fish Ladder Exit Invert (ft)	41.50

Friction Loss

Section	Variable	Value
All Pipe 1	Flow (cfs)	5.90
	Velocity (ft/s)	7.51
	Flow (gpm)	2646.4
	Length (ft)	41.58
	# Instances	1
	h_{Lf} (ft)	0.14
Not Used	Flow (cfs)	5.90
	Velocity (ft/s)	7.51
	Flow (gpm)	2646.4
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	5.90
	Velocity (ft/s)	7.51
	Flow (gpm)	2646.4
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00
Not Used	Flow (cfs)	5.896567
	Velocity (ft/s)	7.51
	Flow (gpm)	2646.4
	Length (ft)	0
	# Instances	0
	h_{Lf} (ft)	0.00

Results

Total Friction Loss	0.14
Total Minor Loss	1.31
Total Head Loss	*1.45*
Resulting HGL in Trap (ft)	**42.33**
Depth above Ladder Exit (ft)	**0.83**

Trap WSE backwatered	42.33
	0.00

The weirs are backwatered at under this operation

Minor Loss

Feature	Variable	Value
Fish Screen	Flow (cfs)	5.90
	Surface Area (SF)	35.82
	Velocity (ft/s)	0.2
	K	2
	# Instances	1
	h_{Lm} (ft)	0.001
Entrance Loss	Flow (cfs)	5.90
	Velocity (ft/s)	7.5
	K	0.5
	# Instances	1
	h_{Lm} (ft)	0.44
Exit Loss	Flow (cfs)	5.90
	Velocity (ft/s)	7.5
	K	1
	# Instances	1
	h_{Lm} (ft)	0.875
Not Used	Flow (cfs)	5.9
	Velocity (ft/s)	7.5
	K	0.3
	# Instances	0
	h_{Lm} (ft)	0.00
Not Used	Flow (cfs)	5.90
	Velocity (ft/s)	7.5
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
Not Used	Flow (cfs)	5.90
	Velocity (ft/s)	7.5
	K	1
	# Instances	0
	h_{Lm} (ft)	0.000
Not Used	Flow (cfs)	0
	Velocity (ft/s)	0.0
	K	0.1
	# Instances	1
	h_{Lm} (ft)	0.00
Not Used	Flow (cfs)	5.90
	Velocity (ft/s)	7.5
	K	0.2
	# Instances	0
	h_{Lm} (ft)	0.00

Trap Channel Entrance and Exit Channel Hydraulics

Variables	Value
Entrance Chnl Floor Elev. (ft)	38
Entrance Chnl Width (ft)	3
Exit Chnl Width (ft)	3
Exit Chnl Floor Elev. (ft)	39.6
Weir Width (ft)	1.5

				Trap Entrance Channel				Exit Channel				At Exit Weir	
Operation	Rowdy Flow (cfs)	Retrun & Trap Gate Open?	Trap Flow (cfs)	Pool 4 WSE (ft)	Depth (ft)	Area (ft^2)	Velocity (fps)	Trap WSE (ft)	Depth (ft)	Area (ft^2)	Velocity (fps)	Depth (ft)	Velocity (fps)
Low Flow	26	No	1.7	40.8	2.8	8.4	0.20	42.09	2.49	7.46	0.23	0.59	NA
		Yes	2.8				0.33	42.23			0.38		
Adult Low Design	54	No	3.3	41.11	3.11	9.33	0.36	42.31	2.71	8.14	0.41	0.81	NA
		Yes	5.0				0.54	42.31			0.62		
High Picket	271	No	5.9	42.33	4.33	12.99	0.45	42.33	2.73	8.19	0.72	0.83	4.74
		Yes	10.4				0.80	42.33			1.27		

Vertical Panel Slot Hydraulics

Global Variables	
Gravity (ft/s^2)	32.2
Slot Widths (ft)	1

Low Picket Operation

Operational Variables		Slot	Floor Elev (ft)	Sill Height (ft)	Slot Invert (ft)	Width (ft)	Head Loss (ft)	Upstream Depth (ft)	Upstream WSE (ft)	Slot Velocity (fps)
Tailwater	42.00	Trap Gate	40.3	0	40.3	1.5	0.03	1.73	42.03	0.42
Flow (cfs)	1.1	Slot 1	40.3	0	40.3	1	0.06	1.80	42.10	0.61
C_d	0.3	Slot 2	40.3	0	40.3	1	0.06	1.86	42.16	0.59
Pool 5 WSE (ft)	42.21	Slot 3	40.3	0	40.3	1	0.06	1.91	**42.21**	0.57

Adult Low Flow Operation

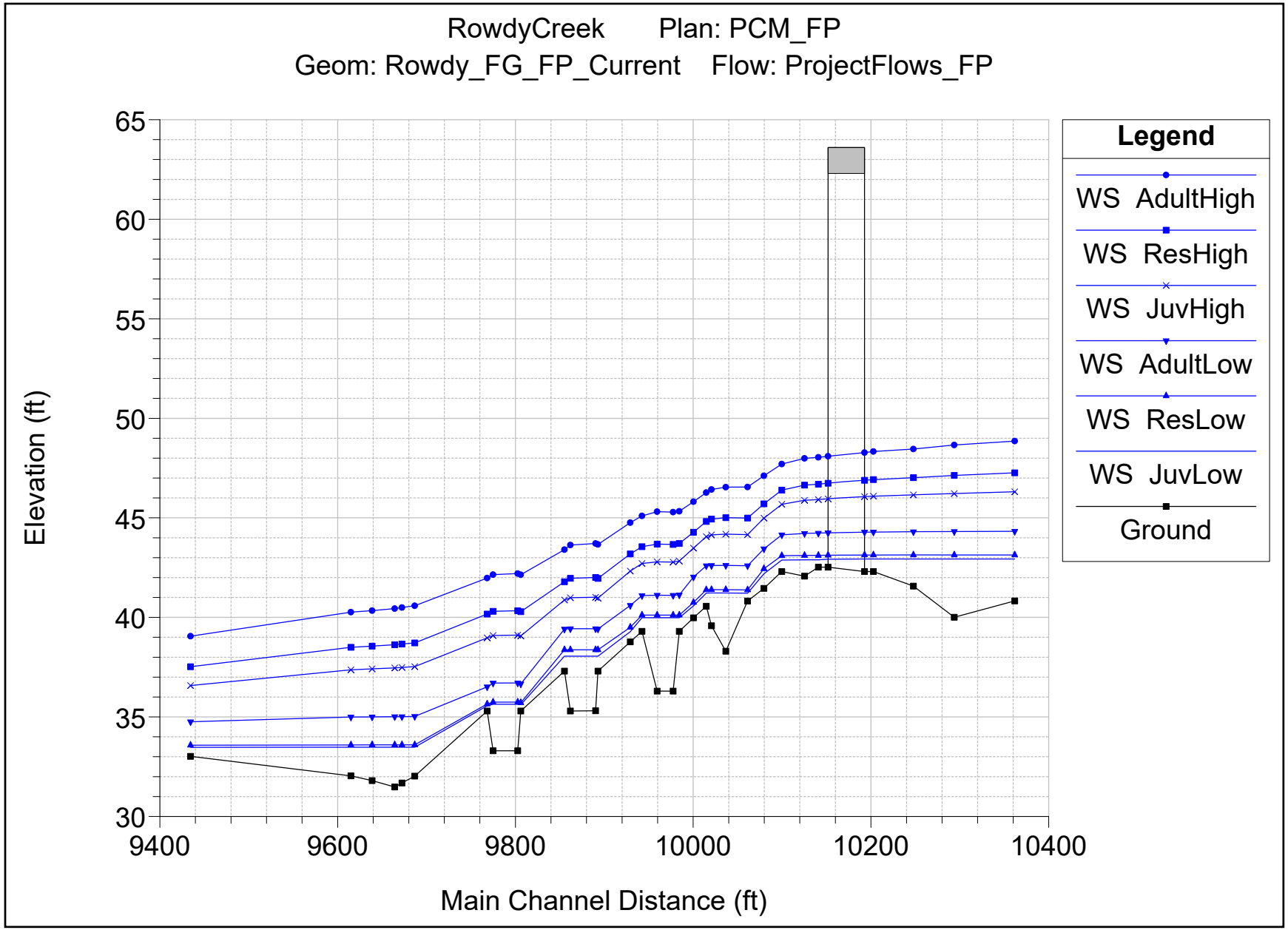
Operational Variables		Location	Floor Elev (ft)	Sill Height (ft)	Slot Invert (ft)	Width (ft)	Head Loss (ft)	US Depth (ft)	US WSE (ft)	Slot Velocity (fps)
Tailwater	42.31	Trap Gate	40.3	0	40.3	1.5	0.05	2.10	42.36	0.54
Flow (cfs)	1.7	Slot 1	40.3	0	40.3	1	0.11	2.17	42.47	0.78
C_d	0.3	Slot 2	40.3	0	40.3	1	0.10	2.27	42.57	0.75
Pool 5 WSE (ft)	42.63	Slot 3	40.3	0	40.3	1	0.09	2.36	**42.66**	0.72

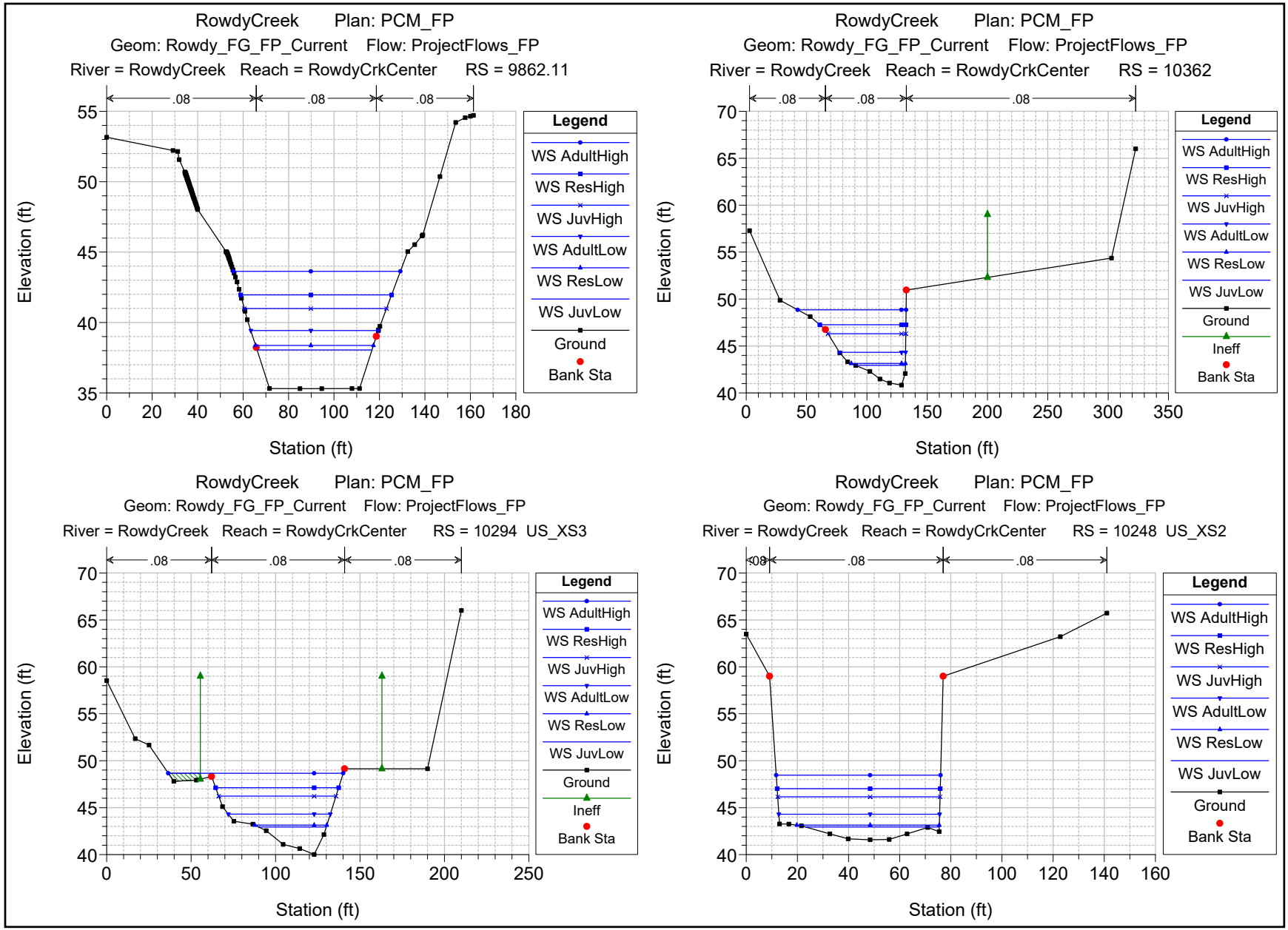
High Picket Operation

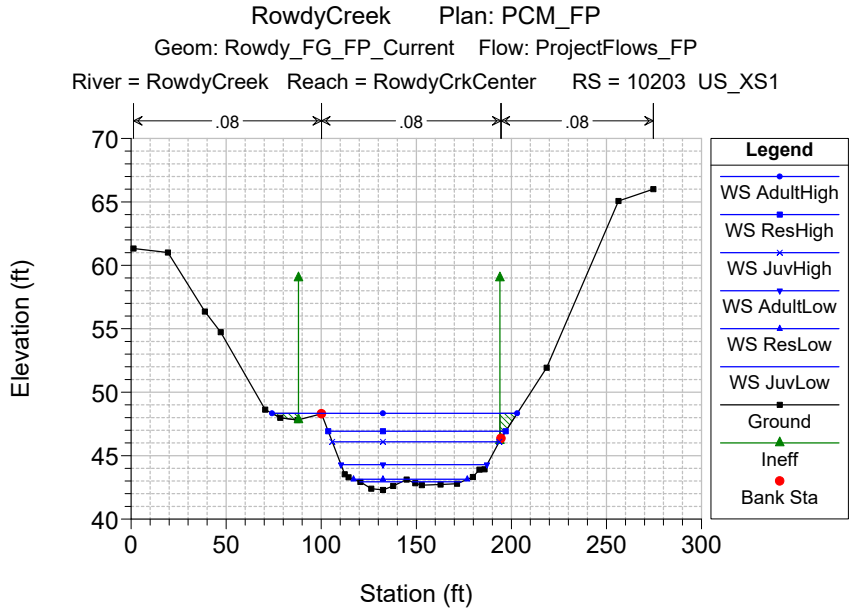
Operational Variables		Location	Floor Elev (ft)	Sill Height (ft)	Slot Invert (ft)	Width (ft)	Head Loss (ft)	US Depth (ft)	US WSE (ft)	Slot Velocity (fps)
Tailwater	42.33	Trap Gate	40.3	0	40.3	1.5	0.35	2.10	42.68	1.43
Flow (cfs)	4.5	Slot 1	40.3	0	40.3	1	0.44	2.82	43.12	1.60
C_d	0.3	Slot 2	40.3	0	40.3	1	0.35	3.17	43.47	1.42
Pool 5 WSE (ft)	43.78	Slot 3	40.3	0	40.3	1	0.29	3.46	**43.76**	1.30

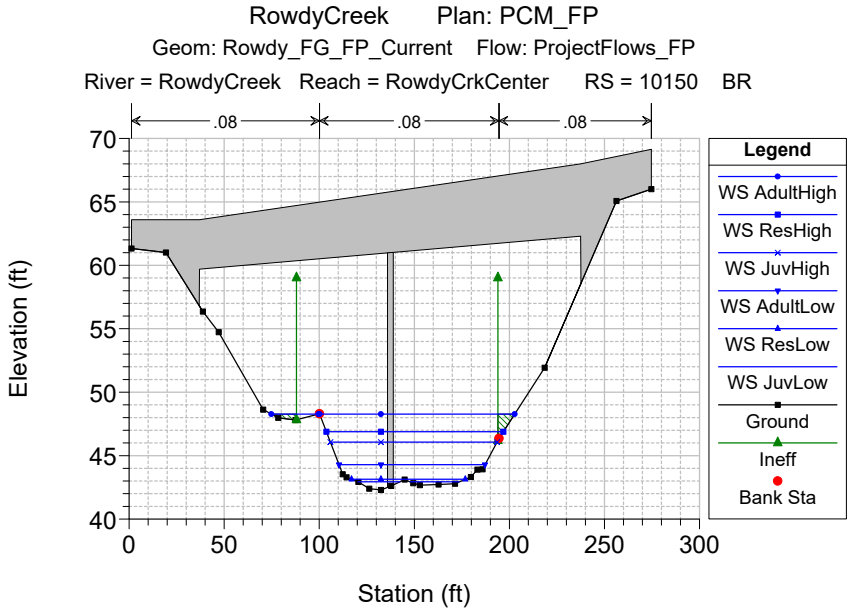
Cell Needs to meet Pool 5 WSE

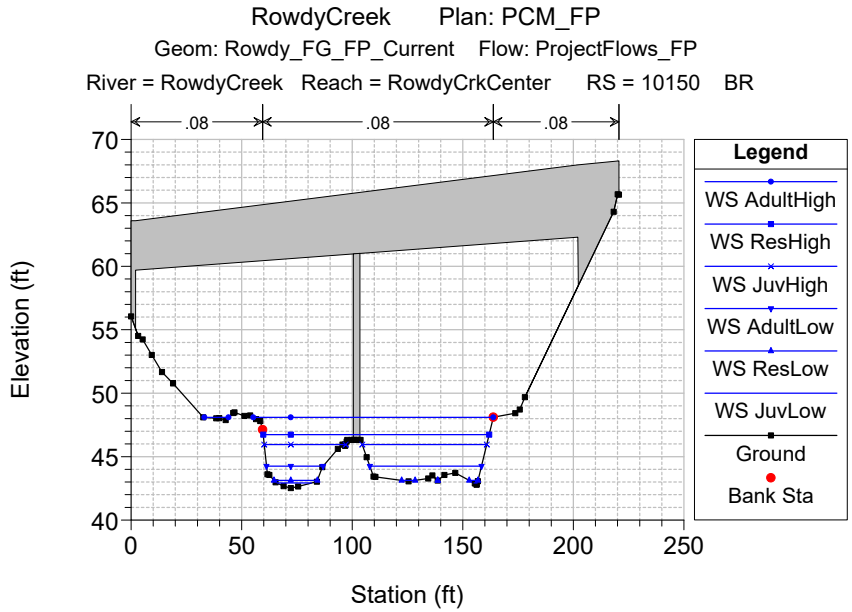
Appendix K- *Rowdy Creek Proposed Fish Passage Hydraulic Results*

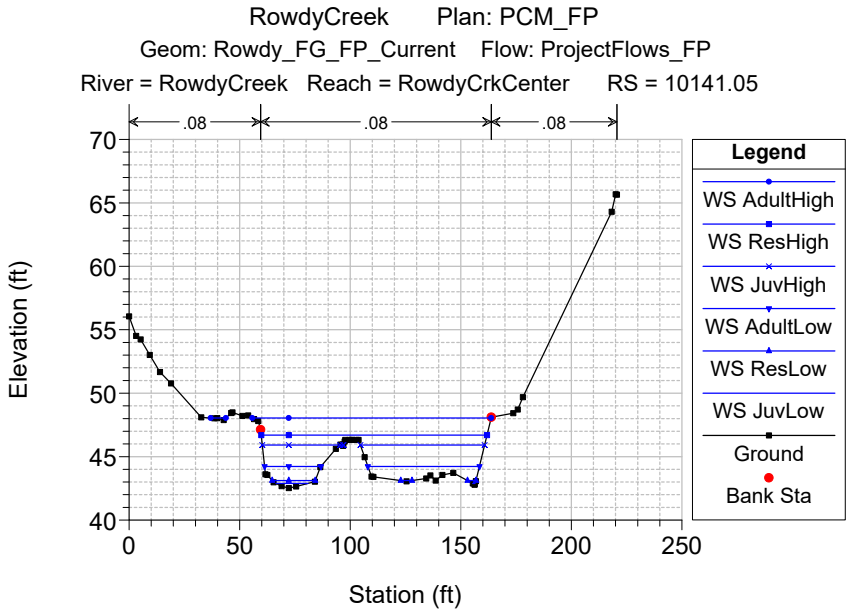

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
Elevation (ft)
65
60
55
50
45
40
35
30
9400
9600
9800
10000
10200
10400
Main Channel Distance (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground

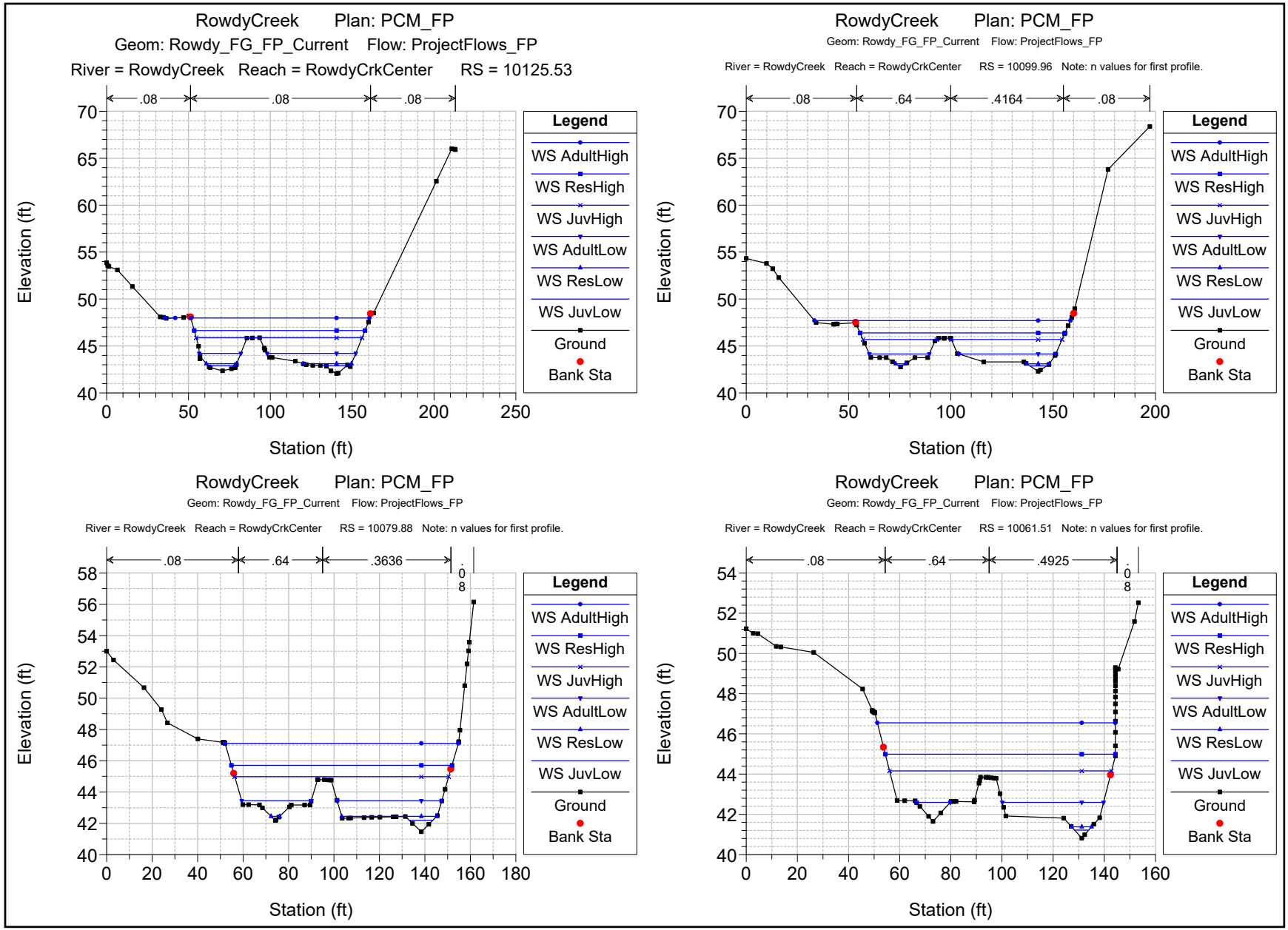

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9862.11
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10362
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10294 US_XS3
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10248 US_XS2
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

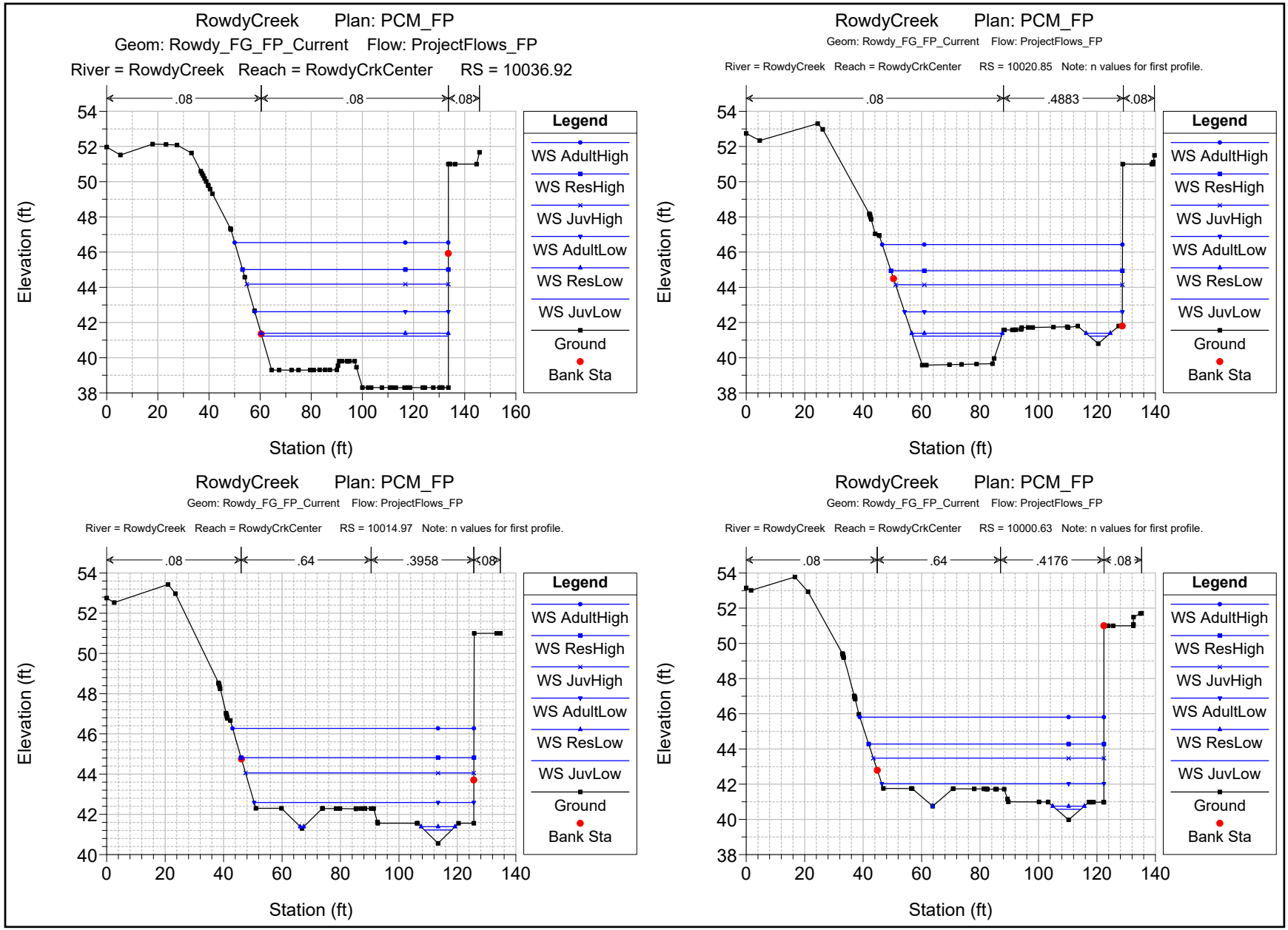

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10203 US_XS1
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta

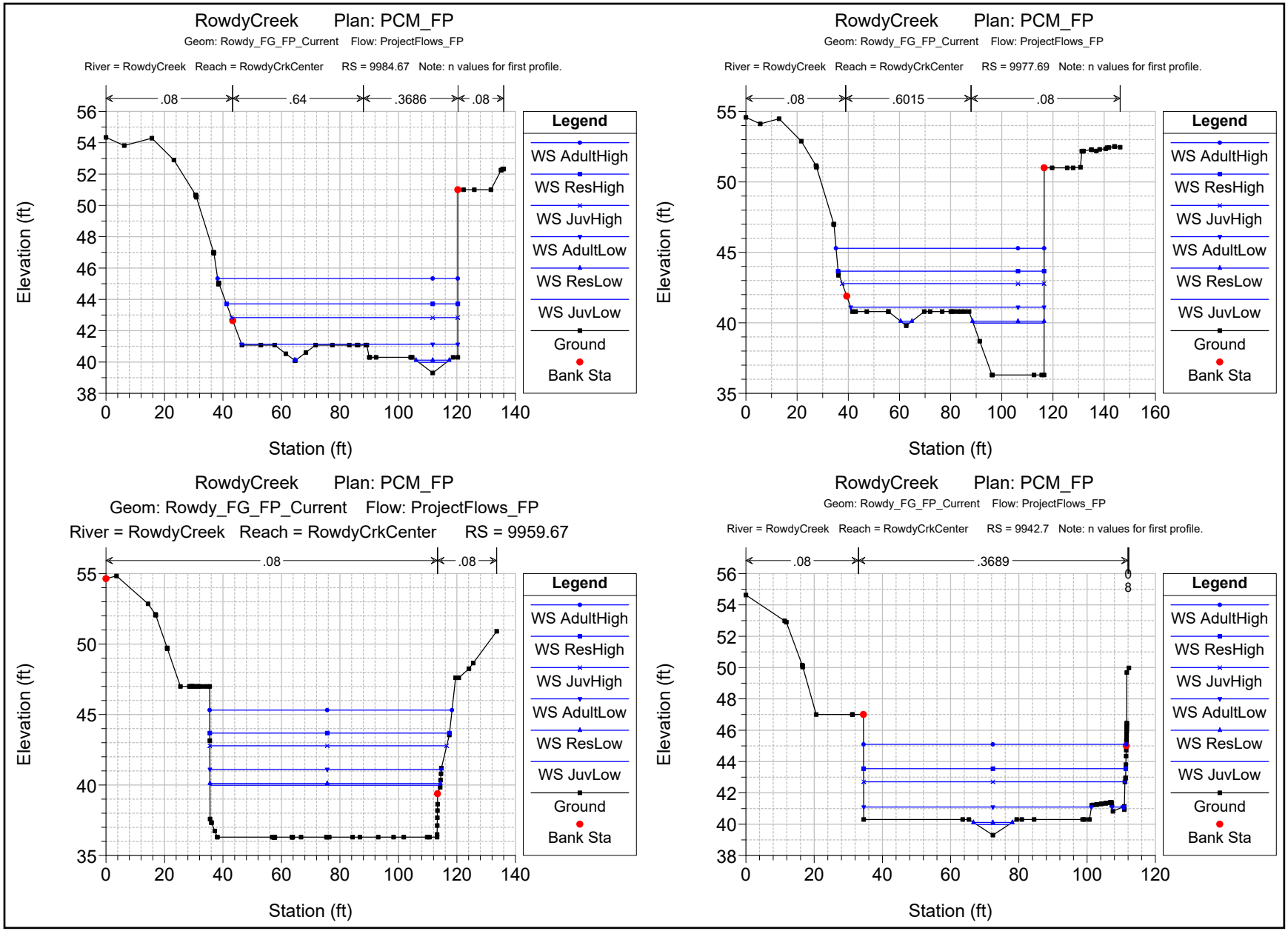

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta

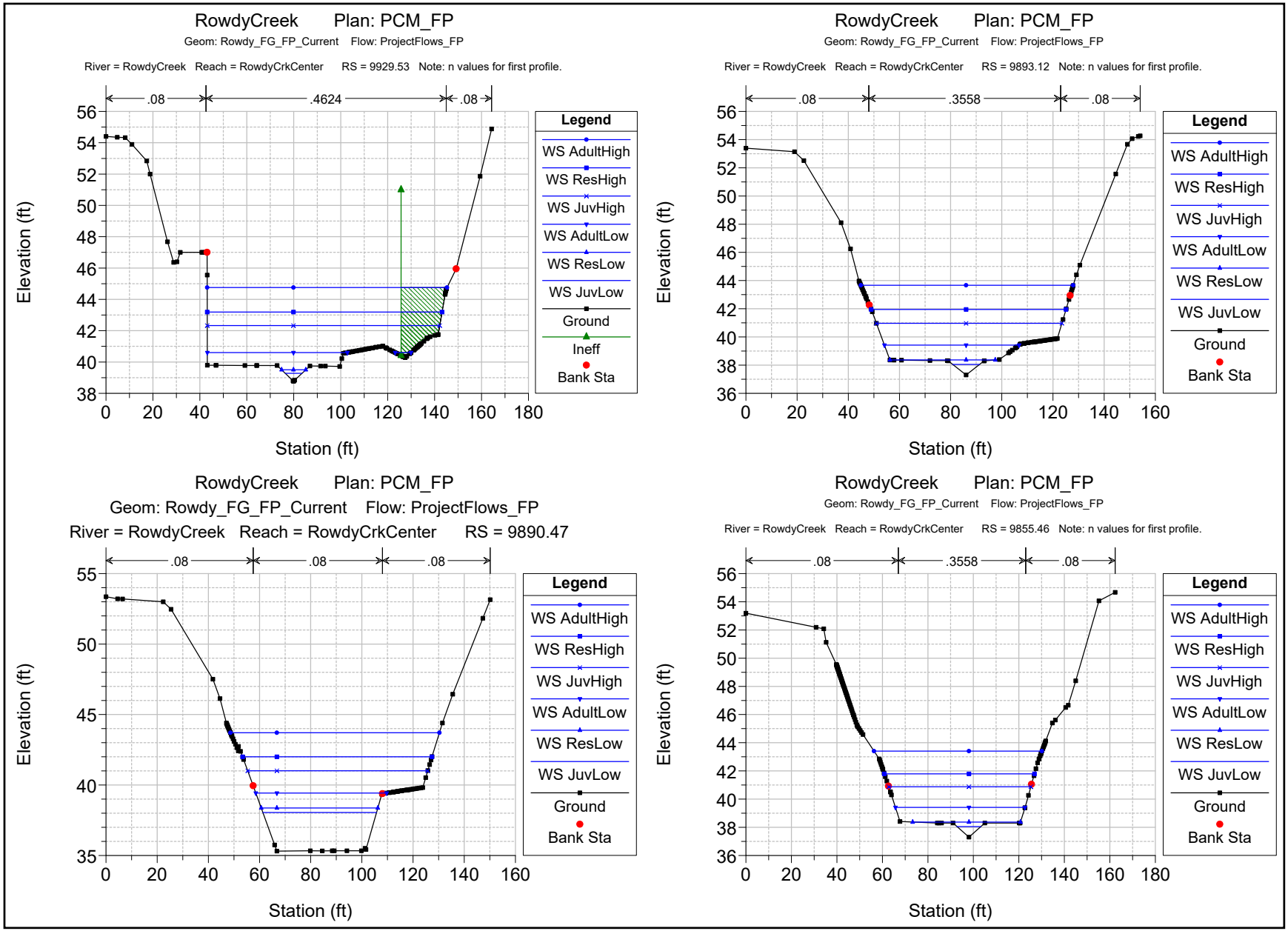

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

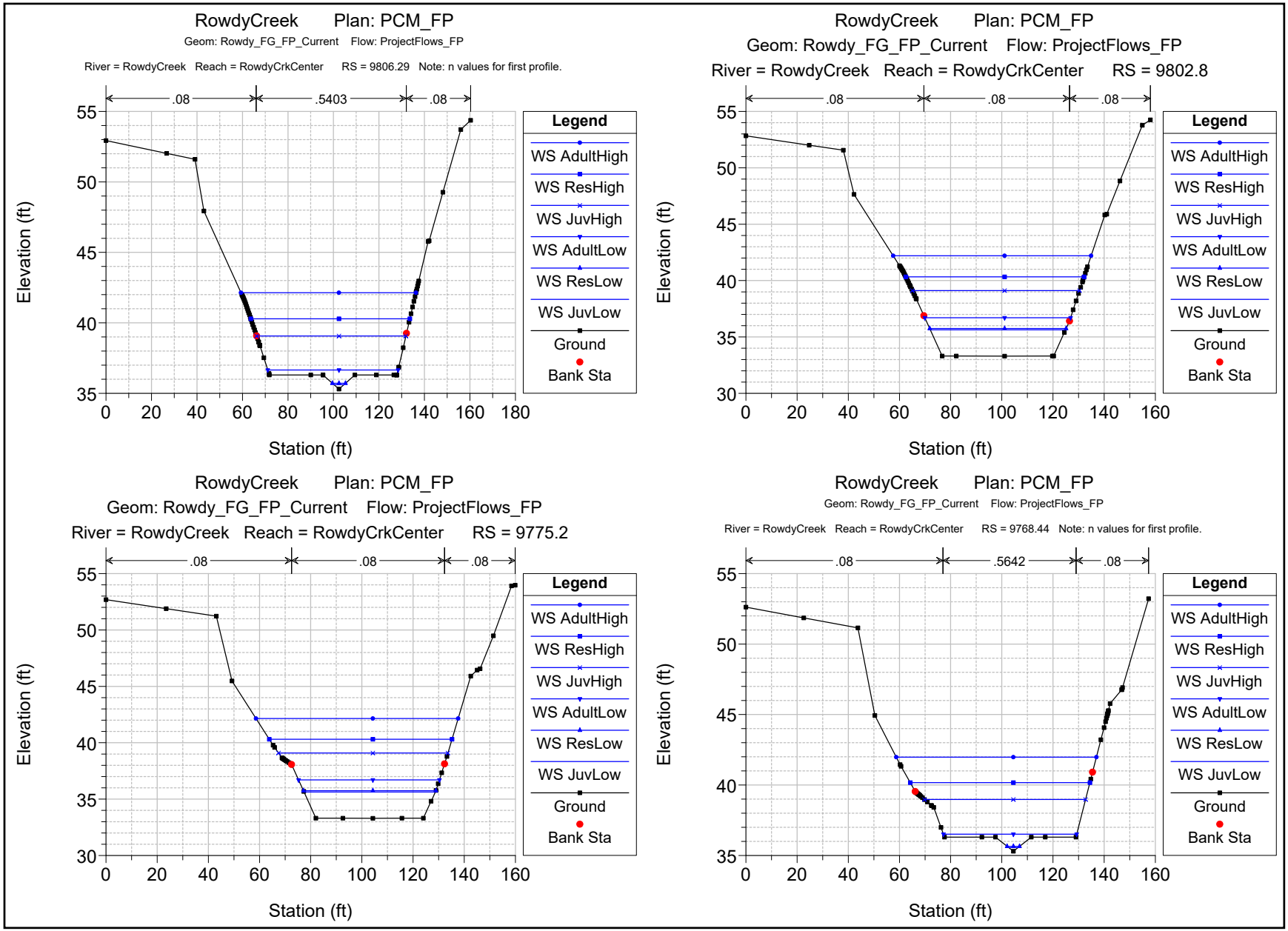

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10141.05
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

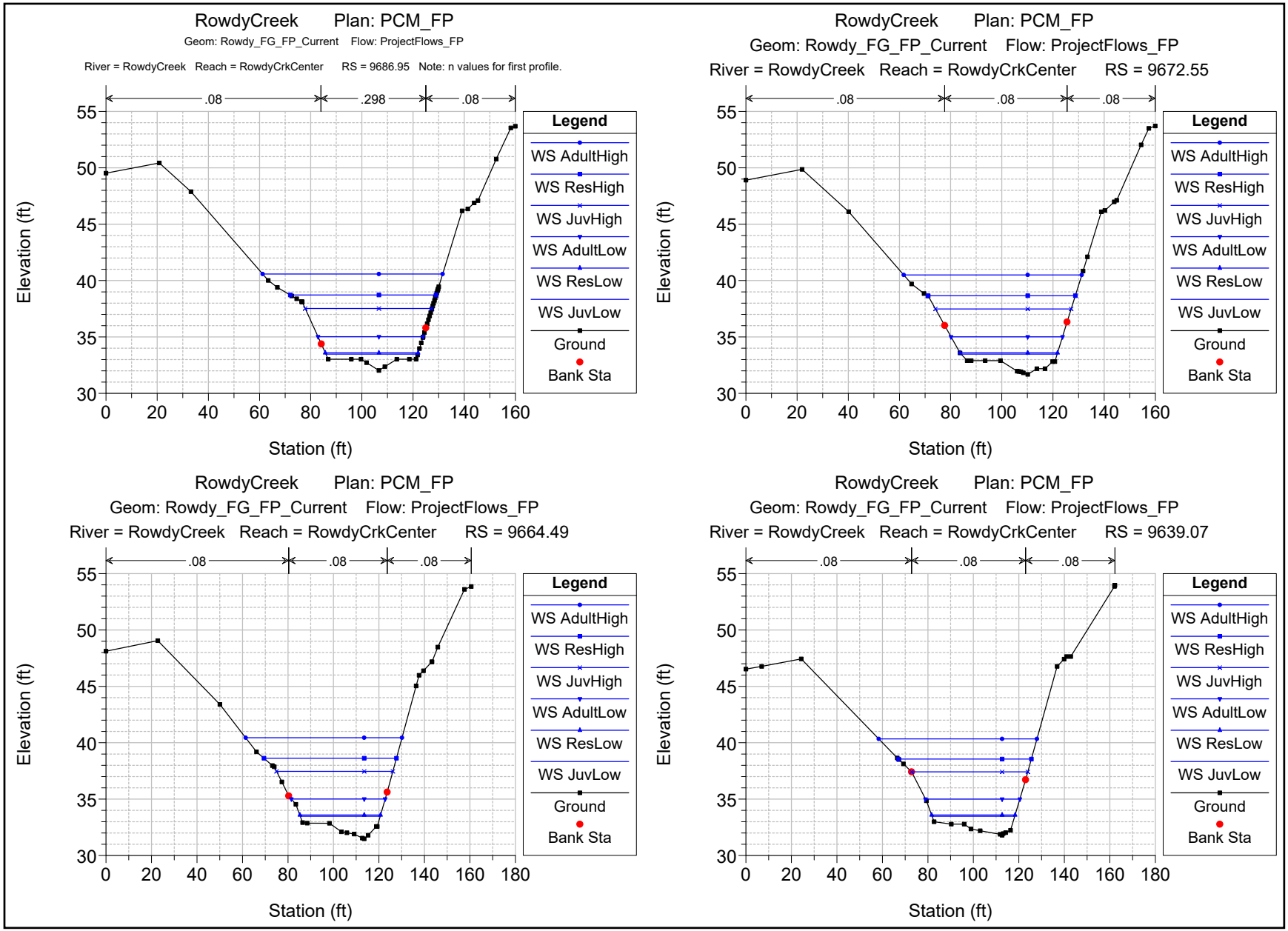

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10125.53
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10099.96 Note: n values for first profile.
.08
.64
.4164
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10079.88 Note: n values for first profile.
.08
.64
.3636
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10061.51 Note: n values for first profile.
.08
.64
.4925
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

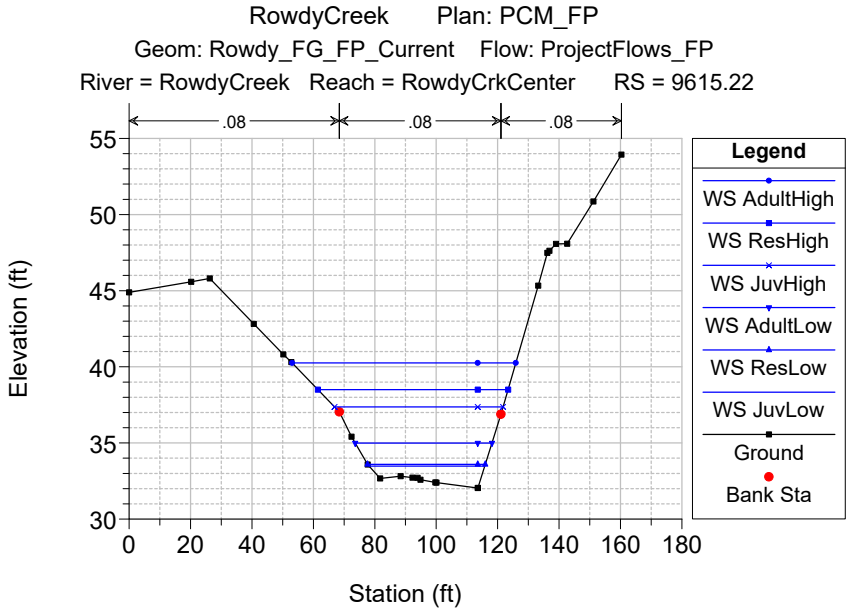

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10036.92
.08
.08
.08
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
Elevation (ft)
Station (ft)
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10020.85 Note: n values for first profile.
.08
.4883
.08
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
Elevation (ft)
Station (ft)
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10014.97 Note: n values for first profile.
.08
.64
.3958
.08
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
Elevation (ft)
Station (ft)
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 10000.63 Note: n values for first profile.
.08
.64
.4176
.08
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
Elevation (ft)
Station (ft)

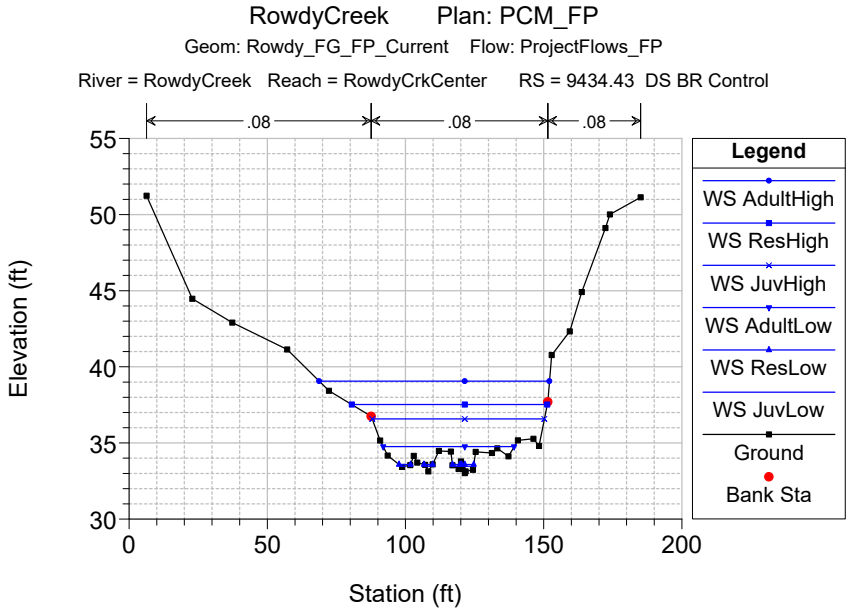

RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9984.67 Note: n values for first profile.
.08
.64
.3686
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9977.69 Note: n values for first profile.
.08
.6015
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9959.67
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9942.7 Note: n values for first profile.
.08
.3689
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9929.53 Note: n values for first profile.
.08
.4624
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Ineff
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9893.12 Note: n values for first profile.
.08
.3558
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9890.47
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9855.46 Note: n values for first profile.
.08
.3558
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9806.29 Note: n values for first profile.
.08
.5403
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9802.8
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9775.2
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9768.44 Note: n values for first profile.
.08
.5642
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9686.95 Note: n values for first profile.
.08
.298
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9672.55
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9664.49
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta
RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9639.07
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9615.22
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta


RowdyCreek Plan: PCM_FP
Geom: Rowdy_FG_FP_Current Flow: ProjectFlows_FP
River = RowdyCreek Reach = RowdyCrkCenter RS = 9434.43 DS BR Control
.08
.08
.08
Elevation (ft)
Station (ft)
Legend
WS AdultHigh
WS ResHigh
WS JuvHigh
WS AdultLow
WS ResLow
WS JuvLow
Ground
Bank Sta

HEC-RAS Plan: PCM_FP River: RowdyCreek Reach: RowdyCrkCenter

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10362	JuvLow	1.00	40.83	42.94	40.99	42.94	0.000001	0.02	50.34	41.49	0.00
RowdyCrkCenter	10362	ResLow	2.00	40.83	43.14	41.04	43.14	0.000002	0.03	59.03	44.90	0.01
RowdyCrkCenter	10362	AdultLow	54.00	40.83	44.32	41.72	44.33	0.000223	0.45	119.28	54.87	0.05
RowdyCrkCenter	10362	JuvHigh	396.00	40.83	46.31	43.16	46.35	0.001545	1.67	237.76	64.56	0.15
RowdyCrkCenter	10362	ResHigh	698.00	40.83	47.26	43.81	47.35	0.002319	2.32	302.09	71.43	0.19
RowdyCrkCenter	10362	AdultHigh	1384.00	40.83	48.86	44.88	49.03	0.003312	3.34	429.16	90.00	0.24
RowdyCrkCenter	10294	JuvLow	1.00	40.01	42.94	40.26	42.94	0.000000	0.02	65.98	39.97	0.00
RowdyCrkCenter	10294	ResLow	2.00	40.01	43.14	40.34	43.14	0.000001	0.03	74.28	42.63	0.00
RowdyCrkCenter	10294	AdultLow	54.00	40.01	44.31	41.19	44.31	0.000150	0.39	138.54	60.40	0.05
RowdyCrkCenter	10294	JuvHigh	396.00	40.01	46.22	42.67	46.26	0.001148	1.50	263.61	69.41	0.14
RowdyCrkCenter	10294	ResHigh	698.00	40.01	47.13	43.53	47.20	0.001845	2.13	328.08	72.82	0.18
RowdyCrkCenter	10294	AdultHigh	1384.00	40.01	48.66	44.55	48.81	0.002917	3.11	446.92	103.53	0.23
RowdyCrkCenter	10248	JuvLow	1.00	41.57	42.94	41.65	42.94	0.000002	0.02	43.26	52.15	0.00
RowdyCrkCenter	10248	ResLow	2.00	41.57	43.14	41.69	43.14	0.000004	0.04	54.03	55.72	0.01
RowdyCrkCenter	10248	AdultLow	54.00	41.57	44.30	42.22	44.31	0.000219	0.43	126.56	62.86	0.05
RowdyCrkCenter	10248	JuvHigh	396.00	41.57	46.16	43.35	46.20	0.001429	1.62	243.75	63.49	0.15
RowdyCrkCenter	10248	ResHigh	698.00	41.57	47.02	43.84	47.10	0.002336	2.34	298.52	63.79	0.19
RowdyCrkCenter	10248	AdultHigh	1384.00	41.57	48.46	44.75	48.65	0.003960	3.54	390.47	64.28	0.25
RowdyCrkCenter	10203	JuvLow	1.00	42.30	42.93	42.43	42.94	0.000091	0.08	13.29	48.00	0.03
RowdyCrkCenter	10203	ResLow	2.00	42.30	43.14	42.48	43.14	0.000066	0.08	24.18	59.84	0.02
RowdyCrkCenter	10203	AdultLow	54.00	42.30	44.29	43.01	44.29	0.000506	0.51	105.16	76.79	0.08
RowdyCrkCenter	10203	JuvHigh	396.00	42.30	46.09	43.82	46.13	0.001746	1.56	253.46	87.82	0.16
RowdyCrkCenter	10203	ResHigh	698.00	42.30	46.92	44.28	46.99	0.002395	2.13	327.81	93.32	0.20
RowdyCrkCenter	10203	AdultHigh	1384.00	42.30	48.33	45.10	48.47	0.003263	3.02	460.83	128.93	0.24
RowdyCrkCenter	10150		Bridge									
RowdyCrkCenter	10141.05	JuvLow	1.00	42.52	42.89	42.68	42.89	0.002981	0.34	2.98	15.60	0.14
RowdyCrkCenter	10141.05	ResLow	2.00	42.52	43.11	42.73	43.11	0.001169	0.26	7.61	28.43	0.09
RowdyCrkCenter	10141.05	AdultLow	54.00	42.52	44.23	43.34	44.24	0.001327	0.68	78.84	75.98	0.12
RowdyCrkCenter	10141.05	JuvHigh	396.00	42.52	45.92	44.12	45.97	0.003078	1.80	219.89	91.63	0.20
RowdyCrkCenter	10141.05	ResHigh	698.00	42.52	46.69	44.57	46.78	0.004146	2.36	295.57	102.09	0.24
RowdyCrkCenter	10141.05	AdultHigh	1384.00	42.52	48.04	45.37	48.20	0.004657	3.18	436.13	114.85	0.27
RowdyCrkCenter	10125.53	JuvLow	1.00	42.07	42.89	42.27	42.89	0.000080	0.08	11.79	32.21	0.02
RowdyCrkCenter	10125.53	ResLow	2.00	42.07	43.11	42.34	43.11	0.000077	0.09	21.22	48.11	0.03
RowdyCrkCenter	10125.53	AdultLow	54.00	42.07	44.22	42.99	44.22	0.000762	0.57	94.82	79.54	0.09
RowdyCrkCenter	10125.53	JuvHigh	396.00	42.07	45.88	43.91	45.92	0.002639	1.66	239.06	101.35	0.19
RowdyCrkCenter	10125.53	ResHigh	698.00	42.07	46.64	44.37	46.72	0.003317	2.20	317.63	104.34	0.22
RowdyCrkCenter	10125.53	AdultHigh	1384.00	42.07	47.99	45.15	48.13	0.004023	3.00	461.31	115.40	0.26
RowdyCrkCenter	10099.96	JuvLow	1.00	42.30	42.88	42.55	42.88	0.097764	0.40	2.49	9.87	0.14
RowdyCrkCenter	10099.96	ResLow	2.00	42.30	43.10	42.64	43.10	0.050185	0.37	5.36	15.81	0.11
RowdyCrkCenter	10099.96	AdultLow	54.00	42.30	44.15	43.46	44.16	0.045958	0.92	58.86	76.63	0.18
RowdyCrkCenter	10099.96	JuvHigh	396.00	42.30	45.68	44.33	45.75	0.037831	2.12	187.07	90.18	0.26
RowdyCrkCenter	10099.96	ResHigh	698.00	42.30	46.40	44.74	46.51	0.038936	2.72	256.60	100.17	0.30
RowdyCrkCenter	10099.96	AdultHigh	1384.00	42.30	47.70	45.54	47.90	0.033339	3.52	396.79	125.14	0.32
RowdyCrkCenter	10079.88	JuvLow	1.00	41.46	42.19	41.72	42.19	0.017217	0.27	3.77	10.49	0.08
RowdyCrkCenter	10079.88	ResLow	2.00	41.46	42.45	41.81	42.45	0.022528	0.22	9.28	45.62	0.08
RowdyCrkCenter	10079.88	AdultLow	54.00	41.46	43.45	42.60	43.46	0.027578	0.80	67.85	76.65	0.15
RowdyCrkCenter	10079.88	JuvHigh	396.00	41.46	44.98	43.49	45.05	0.032568	2.02	196.10	94.15	0.25
RowdyCrkCenter	10079.88	ResHigh	698.00	41.46	45.70	43.94	45.81	0.031428	2.64	265.01	97.03	0.28
RowdyCrkCenter	10079.88	AdultHigh	1384.00	41.46	47.11	44.75	47.29	0.026716	3.42	405.85	102.68	0.29
RowdyCrkCenter	10061.51	JuvLow	1.00	40.82	41.22	41.08	41.23	0.802142	0.91	1.10	5.52	0.36
RowdyCrkCenter	10061.51	ResLow	2.00	40.82	41.38	41.17	41.40	0.345641	0.90	2.22	7.85	0.30
RowdyCrkCenter	10061.51	AdultLow	54.00	40.82	42.59	42.06	42.62	0.087647	1.30	41.67	52.79	0.26
RowdyCrkCenter	10061.51	JuvHigh	396.00	40.82	44.16	43.02	44.25	0.059667	2.46	161.10	86.79	0.32
RowdyCrkCenter	10061.51	ResHigh	698.00	40.82	44.99	43.46	45.13	0.044062	2.98	234.67	89.95	0.32
RowdyCrkCenter	10061.51	AdultHigh	1384.00	40.82	46.55	44.29	46.76	0.031391	3.70	377.15	93.07	0.32
RowdyCrkCenter	10036.92	JuvLow	1.00	38.30	41.23	38.32	41.23	0.000000	0.01	167.64	72.90	0.00
RowdyCrkCenter	10036.92	ResLow	2.00	38.30	41.39	38.34	41.39	0.000000	0.01	179.88	73.24	0.00
RowdyCrkCenter	10036.92	AdultLow	54.00	38.30	42.61	38.72	42.61	0.000023	0.20	270.55	75.67	0.02
RowdyCrkCenter	10036.92	JuvHigh	396.00	38.30	44.18	39.85	44.20	0.000374	1.02	391.98	78.81	0.08
RowdyCrkCenter	10036.92	ResHigh	698.00	38.30	45.01	40.31	45.04	0.000718	1.55	457.62	80.46	0.11
RowdyCrkCenter	10036.92	AdultHigh	1384.00	38.30	46.54	41.15	46.63	0.001324	2.43	583.66	83.53	0.16
RowdyCrkCenter	10020.85	JuvLow	1.00	39.58	41.23	39.65	41.23	0.000001	0.02	45.00	36.36	0.00
RowdyCrkCenter	10020.85	ResLow	2.00	39.58	41.39	39.68	41.39	0.000003	0.04	51.34	39.37	0.01
RowdyCrkCenter	10020.85	AdultLow	54.00	39.58	42.61	40.15	42.61	0.000270	0.41	130.86	74.52	0.05
RowdyCrkCenter	10020.85	JuvHigh	396.00	39.58	44.14	41.70	44.18	0.002615	1.60	247.75	77.61	0.16
RowdyCrkCenter	10020.85	ResHigh	698.00	39.58	44.94	42.24	45.02	0.004040	2.25	310.00	79.21	0.20
RowdyCrkCenter	10020.85	AdultHigh	1384.00	39.58	46.43	43.05	46.59	0.005609	3.24	430.11	82.22	0.24

HEC-RAS Plan: PCM_FP River: RowdyCreek Reach: RowdyCrkCenter (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10014.97	JuvLow	1.00	40.56	41.22	40.82	41.22	0.033023	0.32	3.08	9.29	0.10
RowdyCrkCenter	10014.97	ResLow	2.00	40.56	41.39	40.91	41.39	0.040657	0.41	4.88	12.87	0.12
RowdyCrkCenter	10014.97	AdultLow	54.00	40.56	42.59	41.77	42.60	0.039096	0.89	60.89	75.16	0.17
RowdyCrkCenter	10014.97	JuvHigh	396.00	40.56	44.06	42.74	44.14	0.040066	2.28	173.42	78.13	0.27
RowdyCrkCenter	10014.97	ResHigh	698.00	40.56	44.82	43.18	44.96	0.038825	2.99	233.19	79.66	0.31
RowdyCrkCenter	10014.97	AdultHigh	1384.00	40.56	46.27	43.97	46.51	0.034254	3.95	351.17	82.58	0.33
RowdyCrkCenter	10000.63	JuvLow	1.00	39.98	40.58	40.24	40.58	0.064700	0.40	2.49	8.35	0.13
RowdyCrkCenter	10000.63	ResLow	2.00	39.98	40.75	40.33	40.75	0.048063	0.48	4.16	10.80	0.14
RowdyCrkCenter	10000.63	AdultLow	54.00	39.98	42.03	41.20	42.04	0.039484	0.89	60.95	75.98	0.17
RowdyCrkCenter	10000.63	JuvHigh	396.00	39.98	43.48	42.17	43.56	0.040673	2.29	173.42	78.87	0.27
RowdyCrkCenter	10000.63	ResHigh	698.00	39.98	44.28	42.61	44.41	0.036788	2.95	237.03	80.47	0.30
RowdyCrkCenter	10000.63	AdultHigh	1384.00	39.98	45.81	43.39	46.04	0.031835	3.81	362.40	83.52	0.31
RowdyCrkCenter	9984.67	JuvLow	1.00	39.30	39.98	39.56	39.98	0.024797	0.31	3.25	9.54	0.09
RowdyCrkCenter	9984.67	ResLow	2.00	39.30	40.12	39.65	40.12	0.034476	0.43	4.66	11.90	0.12
RowdyCrkCenter	9984.67	AdultLow	54.00	39.30	41.13	40.52	41.16	0.082872	1.30	41.57	73.95	0.31
RowdyCrkCenter	9984.67	JuvHigh	396.00	39.30	42.83	41.51	42.92	0.040017	2.32	170.53	77.36	0.28
RowdyCrkCenter	9984.67	ResHigh	698.00	39.30	43.71	41.97	43.85	0.034322	2.92	239.45	79.12	0.29
RowdyCrkCenter	9984.67	AdultHigh	1384.00	39.30	45.33	42.76	45.55	0.028977	3.75	369.93	82.15	0.30
RowdyCrkCenter	9977.69	JuvLow	1.00	36.30	39.98	36.34	39.98	0.000000	0.01	88.73	30.26	0.00
RowdyCrkCenter	9977.69	ResLow	2.00	36.30	40.12	36.37	40.12	0.000002	0.02	92.95	32.41	0.00
RowdyCrkCenter	9977.69	AdultLow	54.00	36.30	41.11	36.89	41.11	0.001629	0.38	142.18	75.57	0.05
RowdyCrkCenter	9977.69	JuvHigh	396.00	36.30	42.78	38.48	42.81	0.006063	1.46	271.19	78.88	0.14
RowdyCrkCenter	9977.69	ResHigh	698.00	36.30	43.67	39.43	43.73	0.007137	2.05	341.88	80.52	0.17
RowdyCrkCenter	9977.69	AdultHigh	1384.00	36.30	45.29	41.40	45.42	0.008406	2.94	473.21	81.32	0.21
RowdyCrkCenter	9959.67	JuvLow	1.00	36.30	39.98	36.33	39.98	0.000000	0.00	285.07	78.76	0.00
RowdyCrkCenter	9959.67	ResLow	2.00	36.30	40.12	36.33	40.12	0.000000	0.01	295.67	78.80	0.00
RowdyCrkCenter	9959.67	AdultLow	54.00	36.30	41.11	36.55	41.11	0.000008	0.14	374.16	79.11	0.01
RowdyCrkCenter	9959.67	JuvHigh	396.00	36.30	42.79	37.25	42.80	0.000170	0.78	508.38	80.99	0.05
RowdyCrkCenter	9959.67	ResHigh	698.00	36.30	43.68	37.68	43.70	0.000346	1.21	581.03	81.95	0.08
RowdyCrkCenter	9959.67	AdultHigh	1384.00	36.30	45.31	38.46	45.37	0.000710	1.96	715.43	82.83	0.12
RowdyCrkCenter	9942.7	JuvLow	1.00	39.30	39.98	39.58	39.98	0.024952	0.31	3.25	9.53	0.09
RowdyCrkCenter	9942.7	ResLow	2.00	39.30	40.11	39.65	40.12	0.034783	0.43	4.64	11.39	0.12
RowdyCrkCenter	9942.7	AdultLow	54.00	39.30	41.10	40.47	41.11	0.034836	0.89	60.41	69.87	0.17
RowdyCrkCenter	9942.7	JuvHigh	396.00	39.30	42.71	41.23	42.78	0.032155	2.17	182.41	76.56	0.25
RowdyCrkCenter	9942.7	ResHigh	698.00	39.30	43.55	41.70	43.67	0.031010	2.83	246.95	76.83	0.28
RowdyCrkCenter	9942.7	AdultHigh	1384.00	39.30	45.10	42.48	45.32	0.030666	3.78	365.90	77.01	0.31
RowdyCrkCenter	9929.53	JuvLow	1.00	38.77	39.28	39.03	39.29	0.177882	0.54	1.84	7.20	0.19
RowdyCrkCenter	9929.53	ResLow	2.00	38.77	39.50	39.12	39.51	0.062638	0.53	3.80	10.34	0.15
RowdyCrkCenter	9929.53	AdultLow	54.00	38.77	40.60	39.95	40.62	0.040057	0.98	55.11	66.45	0.18
RowdyCrkCenter	9929.53	JuvHigh	396.00	38.77	42.32	40.83	42.39	0.027265	2.05	193.04	99.07	0.24
RowdyCrkCenter	9929.53	ResHigh	698.00	38.77	43.19	41.29	43.30	0.025588	2.64	264.54	100.08	0.26
RowdyCrkCenter	9929.53	AdultHigh	1384.00	38.77	44.76	42.05	44.95	0.024508	3.51	394.01	102.21	0.28
RowdyCrkCenter	9893.12	JuvLow	1.00	37.30	38.05	37.56	38.05	0.013829	0.25	3.94	10.50	0.07
RowdyCrkCenter	9893.12	ResLow	2.00	37.30	38.37	37.65	38.37	0.018523	0.22	8.99	41.18	0.08
RowdyCrkCenter	9893.12	AdultLow	60.00	37.30	39.42	38.56	39.44	0.027478	1.02	58.87	52.63	0.17
RowdyCrkCenter	9893.12	JuvHigh	446.00	37.30	40.97	39.64	41.09	0.047095	2.74	163.01	72.49	0.32
RowdyCrkCenter	9893.12	ResHigh	786.00	37.30	41.96	40.23	42.13	0.039925	3.33	236.19	76.14	0.33
RowdyCrkCenter	9893.12	AdultHigh	1559.00	37.30	43.66	41.16	43.94	0.030767	4.20	372.13	82.99	0.34
RowdyCrkCenter	9890.47	JuvLow	1.00	35.31	38.05	35.36	38.05	0.000000	0.01	107.36	44.42	0.00
RowdyCrkCenter	9890.47	ResLow	2.00	35.31	38.37	35.37	38.37	0.000000	0.02	121.87	45.57	0.00
RowdyCrkCenter	9890.47	AdultLow	60.00	35.31	39.43	35.79	39.43	0.000071	0.35	172.08	51.13	0.03
RowdyCrkCenter	9890.47	JuvHigh	446.00	35.31	41.01	37.01	41.06	0.001048	1.70	276.28	70.38	0.13
RowdyCrkCenter	9890.47	ResHigh	786.00	35.31	42.00	37.74	42.09	0.001665	2.42	347.78	74.00	0.17
RowdyCrkCenter	9890.47	AdultHigh	1559.00	35.31	43.71	39.04	43.89	0.002556	3.55	480.98	81.67	0.23
RowdyCrkCenter	9862.11	JuvLow	1.00	35.30	38.05	35.33	38.05	0.000000	0.01	123.81	50.56	0.00
RowdyCrkCenter	9862.11	ResLow	2.00	35.30	38.37	35.35	38.37	0.000000	0.01	140.31	51.85	0.00
RowdyCrkCenter	9862.11	AdultLow	60.00	35.30	39.43	35.71	39.43	0.000049	0.31	197.27	56.08	0.03
RowdyCrkCenter	9862.11	JuvHigh	446.00	35.30	40.99	36.84	41.03	0.000820	1.58	290.01	62.56	0.12
RowdyCrkCenter	9862.11	ResHigh	786.00	35.30	41.96	37.51	42.04	0.001412	2.32	352.74	66.44	0.16
RowdyCrkCenter	9862.11	AdultHigh	1559.00	35.30	43.64	38.71	43.82	0.002392	3.54	469.58	73.44	0.22
RowdyCrkCenter	9855.46	JuvLow	1.00	37.30	38.05	37.56	38.05	0.013872	0.25	3.94	10.50	0.07
RowdyCrkCenter	9855.46	ResLow	2.00	37.30	38.37	37.65	38.37	0.015430	0.20	10.05	47.41	0.08
RowdyCrkCenter	9855.46	AdultLow	60.00	37.30	39.42	38.51	39.43	0.019202	0.89	67.23	56.98	0.14
RowdyCrkCenter	9855.46	JuvHigh	446.00	37.30	40.87	39.46	41.00	0.043195	2.89	154.25	62.46	0.32
RowdyCrkCenter	9855.46	ResHigh	786.00	37.30	41.79	40.04	42.01	0.040207	3.69	213.39	66.00	0.35
RowdyCrkCenter	9855.46	AdultHigh	1559.00	37.30	43.41	41.08	43.76	0.036937	4.84	325.26	73.84	0.38
RowdyCrkCenter	9806.29	JuvLow	1.00	35.30	35.61	35.56	35.65	3.339604	1.45	0.69	4.39	0.65
RowdyCrkCenter	9806.29	ResLow	2.00	35.30	35.72	35.65	35.76	2.459708	1.65	1.21	5.83	0.64

HEC-RAS Plan: PCM_FP River: RowdyCreek Reach: RowdyCrkCenter (Continued)

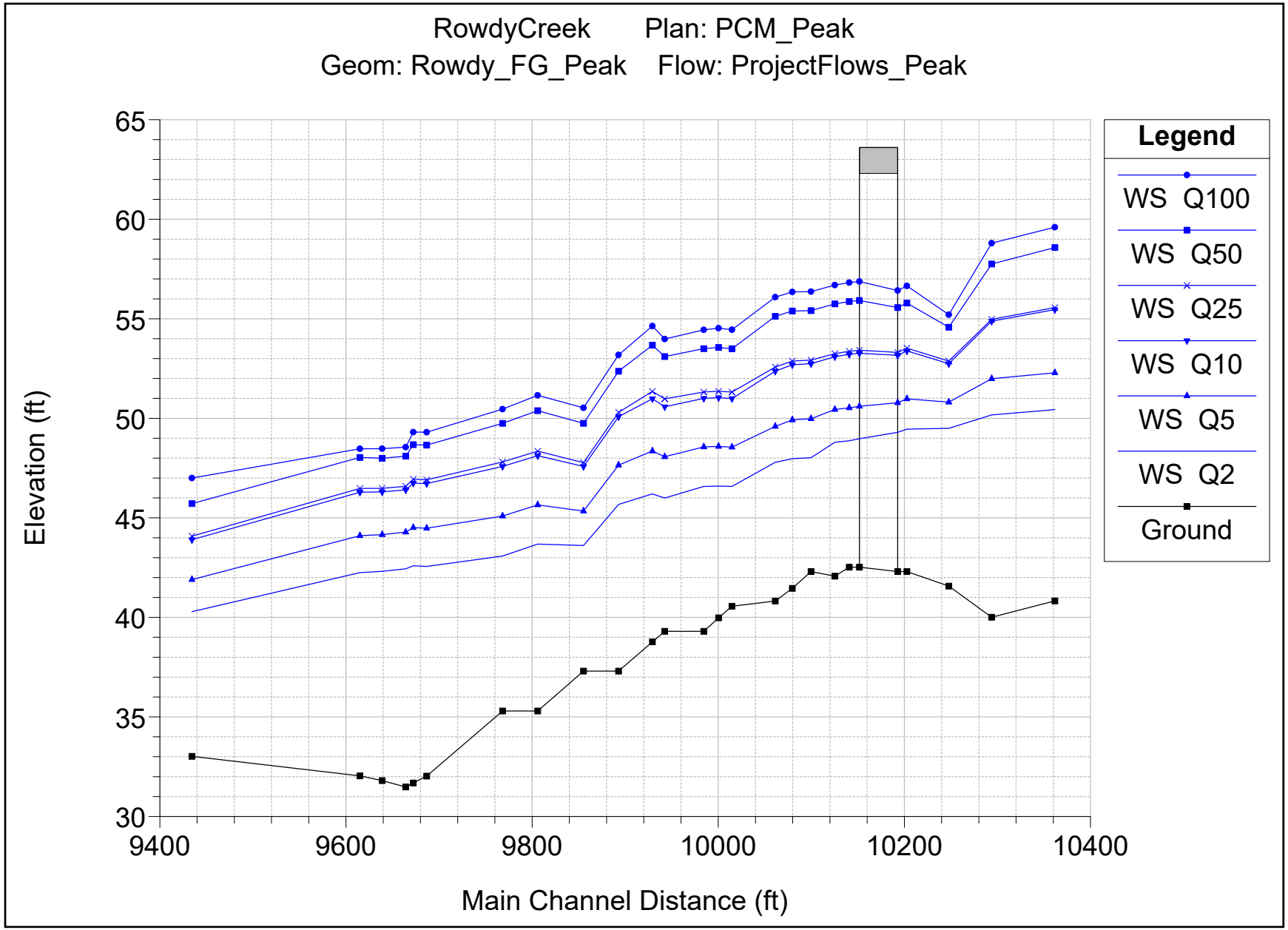
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9806.29	AdultLow	60.00	35.30	36.66	36.49	36.73	0.560278	2.20	27.23	57.29	0.56
RowdyCrkCenter	9806.29	JuvHigh	446.00	35.30	39.07	37.40	39.17	0.032234	2.54	175.47	65.62	0.27
RowdyCrkCenter	9806.29	ResHigh	786.00	35.30	40.29	37.96	40.43	0.025495	3.06	258.06	69.92	0.27
RowdyCrkCenter	9806.29	AdultHigh	1559.00	35.30	42.14	38.97	42.39	0.021034	4.00	393.83	76.92	0.29
RowdyCrkCenter	9802.8	JuvLow	1.00	33.30	35.64	33.33	35.64	0.000000	0.01	112.34	52.86	0.00
RowdyCrkCenter	9802.8	ResLow	2.00	33.30	35.74	33.34	35.74	0.000000	0.02	118.03	53.29	0.00
RowdyCrkCenter	9802.8	AdultLow	60.00	33.30	36.71	33.69	36.71	0.000084	0.35	171.13	56.96	0.04
RowdyCrkCenter	9802.8	JuvHigh	446.00	33.30	39.11	34.75	39.14	0.000649	1.43	318.11	65.35	0.11
RowdyCrkCenter	9802.8	ResHigh	786.00	33.30	40.34	35.39	40.40	0.000996	2.03	400.85	69.70	0.14
RowdyCrkCenter	9802.8	AdultHigh	1559.00	33.30	42.20	36.53	42.34	0.001640	3.08	537.65	77.34	0.19
RowdyCrkCenter	9775.2	JuvLow	1.00	33.30	35.64	33.33	35.64	0.000000	0.01	108.64	51.31	0.00
RowdyCrkCenter	9775.2	ResLow	2.00	33.30	35.74	33.35	35.74	0.000000	0.02	114.16	51.74	0.00
RowdyCrkCenter	9775.2	AdultLow	60.00	33.30	36.70	33.70	36.70	0.000092	0.36	165.41	55.05	0.04
RowdyCrkCenter	9775.2	JuvHigh	446.00	33.30	39.09	34.79	39.12	0.000742	1.46	308.47	66.17	0.11
RowdyCrkCenter	9775.2	ResHigh	786.00	33.30	40.30	35.44	40.37	0.001108	2.06	392.06	71.37	0.14
RowdyCrkCenter	9775.2	AdultHigh	1559.00	33.30	42.15	36.60	42.29	0.001771	3.08	530.84	78.99	0.19
RowdyCrkCenter	9768.44	JuvLow	1.00	35.30	35.56	35.56	35.63	9.445877	2.08	0.48	3.67	1.01
RowdyCrkCenter	9768.44	ResLow	2.00	35.30	35.65	35.65	35.73	7.198567	2.36	0.85	4.88	0.99
RowdyCrkCenter	9768.44	AdultLow	60.00	35.30	36.51	36.51	36.69	2.077372	3.33	18.02	52.05	1.00
RowdyCrkCenter	9768.44	JuvHigh	446.00	35.30	38.97	37.47	39.10	0.036646	2.84	157.08	62.97	0.32
RowdyCrkCenter	9768.44	ResHigh	786.00	35.30	40.17	38.07	40.34	0.027099	3.32	237.15	70.19	0.31
RowdyCrkCenter	9768.44	AdultHigh	1559.00	35.30	41.98	39.15	42.25	0.020746	4.23	371.50	78.21	0.33
RowdyCrkCenter	9686.95	JuvLow	1.00	32.03	33.48	32.31	33.48	0.000143	0.04	22.82	35.90	0.01
RowdyCrkCenter	9686.95	ResLow	2.00	32.03	33.60	32.38	33.60	0.000318	0.07	26.96	36.29	0.02
RowdyCrkCenter	9686.95	AdultLow	60.00	32.03	35.03	33.27	35.04	0.004730	0.73	82.37	41.12	0.09
RowdyCrkCenter	9686.95	JuvHigh	446.00	32.03	37.53	34.52	37.61	0.010759	2.28	195.78	49.56	0.19
RowdyCrkCenter	9686.95	ResHigh	786.00	32.03	38.72	35.28	38.86	0.012839	3.09	258.20	57.01	0.23
RowdyCrkCenter	9686.95	AdultHigh	1559.00	32.03	40.58	36.61	40.85	0.014467	4.21	378.46	70.36	0.27
RowdyCrkCenter	9672.55	JuvLow	1.00	31.68	33.48	31.91	33.48	0.000003	0.03	35.24	37.56	0.01
RowdyCrkCenter	9672.55	ResLow	2.00	31.68	33.59	31.99	33.59	0.000007	0.05	39.57	38.16	0.01
RowdyCrkCenter	9672.55	AdultLow	60.00	31.68	35.01	32.93	35.02	0.000388	0.61	97.61	43.58	0.07
RowdyCrkCenter	9672.55	JuvHigh	446.00	31.68	37.49	34.18	37.55	0.001799	2.08	216.99	53.04	0.17
RowdyCrkCenter	9672.55	ResHigh	786.00	31.68	38.66	34.93	38.79	0.002504	2.87	282.01	57.66	0.21
RowdyCrkCenter	9672.55	AdultHigh	1559.00	31.68	40.50	36.21	40.76	0.003629	4.17	399.72	69.54	0.27
RowdyCrkCenter	9664.49	JuvLow	1.00	31.48	33.48	31.73	33.48	0.000002	0.03	37.75	35.15	0.00
RowdyCrkCenter	9664.49	ResLow	2.00	31.48	33.59	31.82	33.59	0.000005	0.05	41.80	35.52	0.01
RowdyCrkCenter	9664.49	AdultLow	60.00	31.48	35.01	32.68	35.02	0.000389	0.63	95.66	41.26	0.07
RowdyCrkCenter	9664.49	JuvHigh	446.00	31.48	37.46	34.12	37.54	0.001870	2.18	209.54	51.14	0.18
RowdyCrkCenter	9664.49	ResHigh	786.00	31.48	38.63	34.91	38.77	0.002672	3.03	272.68	58.26	0.22
RowdyCrkCenter	9664.49	AdultHigh	1559.00	31.48	40.44	36.25	40.72	0.003900	4.38	388.55	68.75	0.28
RowdyCrkCenter	9639.07	JuvLow	1.00	31.80	33.48	32.03	33.48	0.000002	0.03	36.71	36.35	0.00
RowdyCrkCenter	9639.07	ResLow	2.00	31.80	33.59	32.09	33.59	0.000006	0.05	40.89	36.73	0.01
RowdyCrkCenter	9639.07	AdultLow	60.00	31.80	35.00	32.85	35.01	0.000389	0.63	95.85	41.49	0.07
RowdyCrkCenter	9639.07	JuvHigh	446.00	31.80	37.41	34.15	37.49	0.002153	2.15	207.58	51.07	0.19
RowdyCrkCenter	9639.07	ResHigh	786.00	31.80	38.56	34.91	38.69	0.002932	2.95	270.28	58.51	0.23
RowdyCrkCenter	9639.07	AdultHigh	1559.00	31.80	40.34	36.28	40.62	0.004155	4.27	384.53	69.56	0.28
RowdyCrkCenter	9615.22	JuvLow	1.00	32.04	33.48	32.21	33.48	0.000003	0.03	34.92	37.67	0.01
RowdyCrkCenter	9615.22	ResLow	2.00	32.04	33.59	32.27	33.59	0.000007	0.05	39.26	38.33	0.01
RowdyCrkCenter	9615.22	AdultLow	60.00	32.04	34.99	32.94	35.00	0.000405	0.62	97.17	44.51	0.07
RowdyCrkCenter	9615.22	JuvHigh	446.00	32.04	37.37	34.19	37.43	0.002039	2.08	214.67	54.89	0.18
RowdyCrkCenter	9615.22	ResHigh	786.00	32.04	38.50	34.93	38.62	0.002762	2.85	280.65	61.91	0.22
RowdyCrkCenter	9615.22	AdultHigh	1559.00	32.04	40.26	36.23	40.52	0.003895	4.12	399.49	72.85	0.27
RowdyCrkCenter	9434.43	JuvLow	1.00	33.02	33.47	33.30	33.48	0.010012	0.58	1.74	9.66	0.24
RowdyCrkCenter	9434.43	ResLow	2.00	33.02	33.58	33.36	33.59	0.010005	0.65	3.09	14.36	0.25
RowdyCrkCenter	9434.43	AdultLow	60.00	33.02	34.76	34.11	34.79	0.010006	1.56	38.34	47.36	0.31
RowdyCrkCenter	9434.43	JuvHigh	446.00	33.02	36.58	35.39	36.73	0.010006	3.12	142.98	62.28	0.36
RowdyCrkCenter	9434.43	ResHigh	786.00	33.02	37.52	35.94	37.75	0.010002	3.87	205.38	70.72	0.38
RowdyCrkCenter	9434.43	AdultHigh	1559.00	33.02	39.06	36.97	39.44	0.010004	5.02	324.66	83.30	0.41

Tabulated PCM HEC-RAS Results for Fish Passage Design Flows												
	Juvenile				Adult Resident				Adult Anadromous			
	Low Design Flow		High Design Flow		Low Design Flow		High Design Flow		Low Design Flow		High Design Flow	
River STA	Depth	Velocity	Depth	Velocity	Depth	Velocity	Depth	Velocity	Depth	Velocity	Depth	Velocity
10141.05	0.4	0.3	3.4	1.8	0.6	0.3	4.2	2.4	1.7	0.7	5.5	3.2
10125.53	0.8	0.1	3.8	1.7	1.0	0.1	4.6	2.2	2.2	0.6	5.9	3.0
10099.96	0.6	0.4	3.4	2.1	0.8	0.4	4.1	2.7	1.9	0.9	5.4	3.5
10079.88	0.7	0.3	3.5	2.0	1.0	0.2	4.2	2.6	2.0	0.8	5.7	3.4
10061.51	0.4	0.9	3.3	2.5	0.6	0.9	4.2	3.0	1.8	1.3	5.7	3.7
10036.92	2.9	0.0	5.9	1.0	3.1	0.0	6.7	1.6	4.3	0.2	8.2	2.4
10020.85	1.7	0.0	4.6	1.6	1.8	0.0	5.4	2.3	3.0	0.4	6.9	3.2
10014.97	0.7	0.3	3.5	2.3	0.8	0.4	4.3	3.0	2.0	0.9	5.7	4.0
10000.63	0.6	0.4	3.5	2.3	0.8	0.5	4.3	3.0	2.1	0.9	5.8	3.8
9984.67	0.7	0.3	3.5	2.3	0.8	0.4	4.4	2.9	1.8	1.3	6.0	3.8
9977.69	3.7	0.0	6.5	1.5	3.8	0.0	7.4	2.1	4.8	0.4	9.0	2.9
9959.67	3.7	0.0	6.5	0.8	3.8	0.0	7.4	1.2	4.8	0.1	9.0	2.0
9942.7	0.7	0.3	3.4	2.2	0.8	0.4	4.3	2.8	1.8	0.9	5.8	3.8
9929.53	0.5	0.5	3.6	2.1	0.7	0.5	4.4	2.6	1.8	1.0	6.0	3.5
9893.12	0.8	0.3	3.7	2.7	1.1	0.2	4.7	3.3	2.1	1.0	6.4	4.2
9890.47	2.7	0.0	5.7	1.7	3.1	0.0	6.7	2.4	4.1	0.4	8.4	3.6
9862.11	2.8	0.0	5.7	1.6	3.1	0.0	6.7	2.3	4.1	0.3	8.3	3.5
9855.46	0.8	0.3	3.6	2.9	1.1	0.2	4.5	3.7	2.1	0.9	6.1	4.8
9806.29	0.3	1.5	3.8	2.5	0.4	1.7	5.0	3.1	1.4	2.2	6.8	4.0
9802.8	2.3	0.0	5.8	1.4	2.4	0.0	7.0	2.0	3.4	0.4	8.9	3.1
9775.2	2.3	0.0	5.8	1.5	2.4	0.0	7.0	2.1	3.4	0.4	8.9	3.1
9768.44	0.3	2.1	3.7	2.8	0.4	2.4	4.9	3.3	1.2	3.3	6.7	4.2
9686.95	1.5	0.0	5.5	2.3	1.6	0.1	6.7	3.1	3.0	0.7	8.6	4.2
9672.55	1.8	0.0	5.8	2.1	1.9	0.1	7.0	2.9	3.3	0.6	8.8	4.2
9664.49	2.0	0.0	6.0	2.2	2.1	0.1	7.2	3.0	3.5	0.6	9.0	4.4
9639.07	1.7	0.0	5.6	2.2	1.8	0.1	6.8	3.0	3.2	0.6	8.5	4.3
9615.22	1.4	0.0	5.3	2.1	1.6	0.1	6.5	2.9	3.0	0.6	8.2	4.1
Velocity Max		2.1		2.9		2.4		3.7		3.3		4.8
Velocity Avg		0.3		2.0		0.3		2.6		0.8		3.6
Depth Min	0.3		3.3		0.4		4.1		1.2		5.4	
Depth Avg	1.4		4.6		1.6		5.6		2.7		7.2	

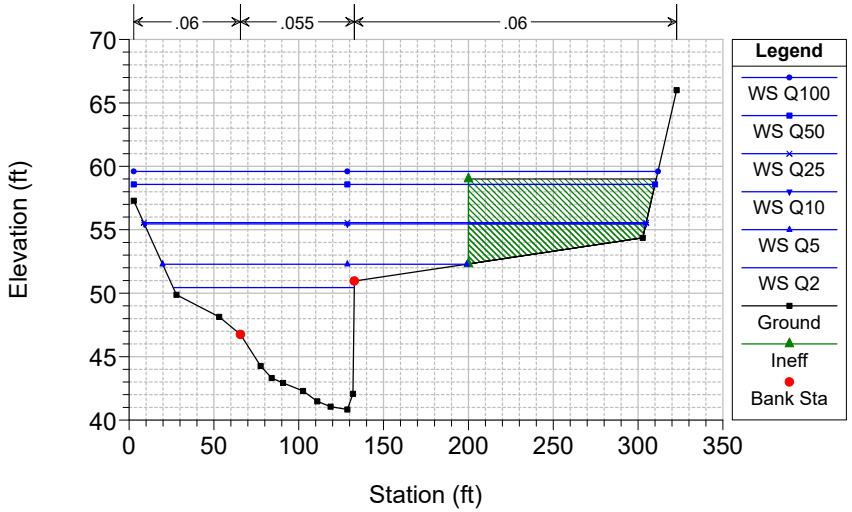
Manning's roughness coefficients used in the HEC-RAS proposed fish passage model and the SRH-2D proposed fish passage model.

Stage (ft)	Manning's *n*
0.10	1.575
0.71	0.342
1.31	0.207
1.92	0.162
2.52	0.14
3.13	0.117
3.73	0.095
4.34	0.094
4.94	0.086
5.55	0.081
6.15	0.077
6.76	0.074
7.36	0.072
7.97	0.07
8.57	0.068
9.18	0.067
9.78	0.066
10.39	0.065
10.99	0.064
11.60	0.063

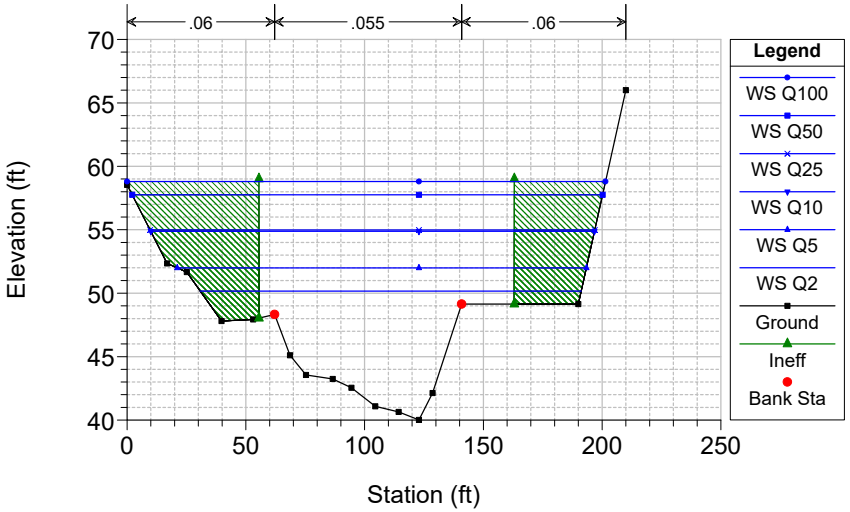
Appendix L- *Rowdy Creek Proposed Conditions Flood Analysis Results*


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
Elevation (ft)
65
60
55
50
45
40
35
30
9400
9600
9800
10000
10200
10400
Main Channel Distance (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground

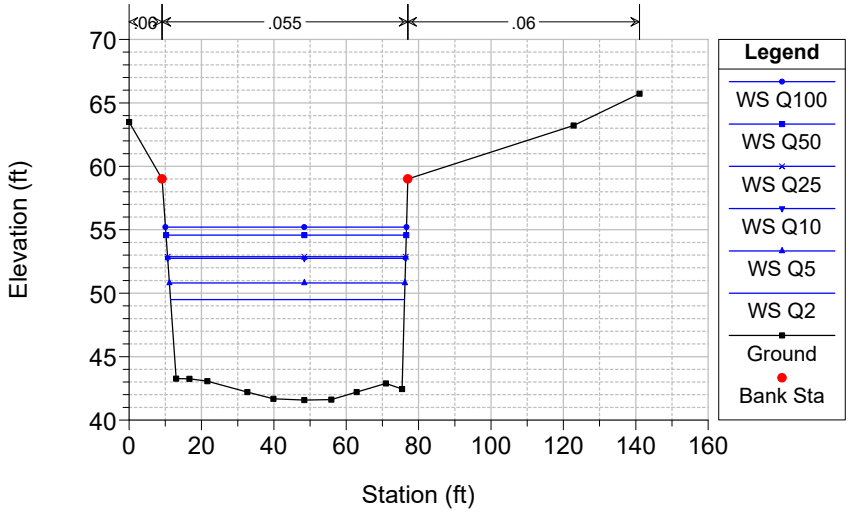
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10362



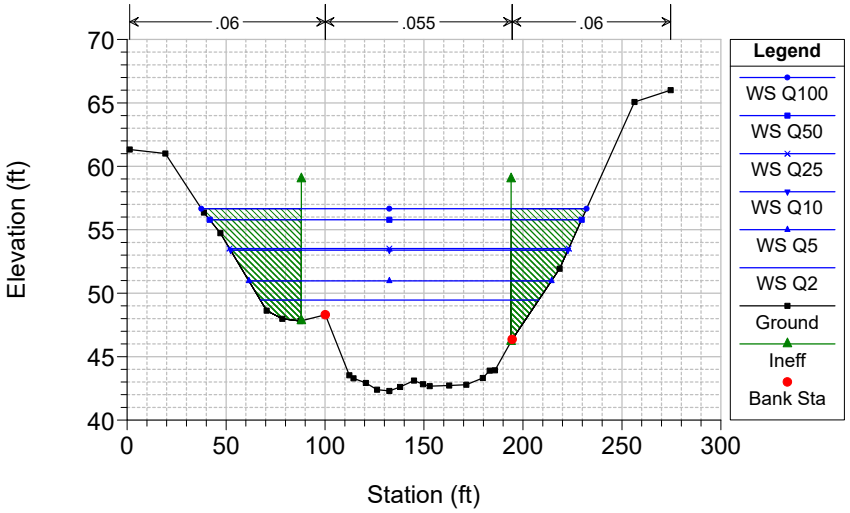
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10294 US_XS3

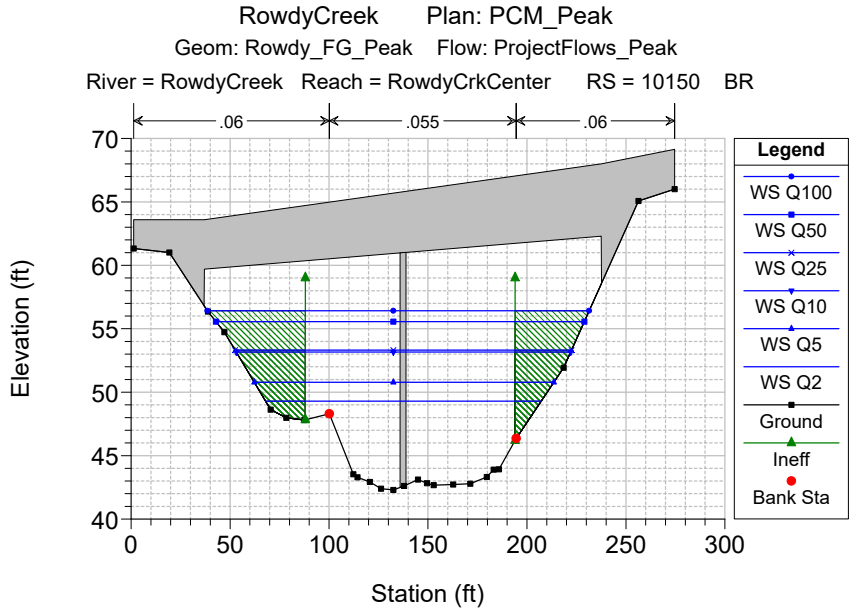


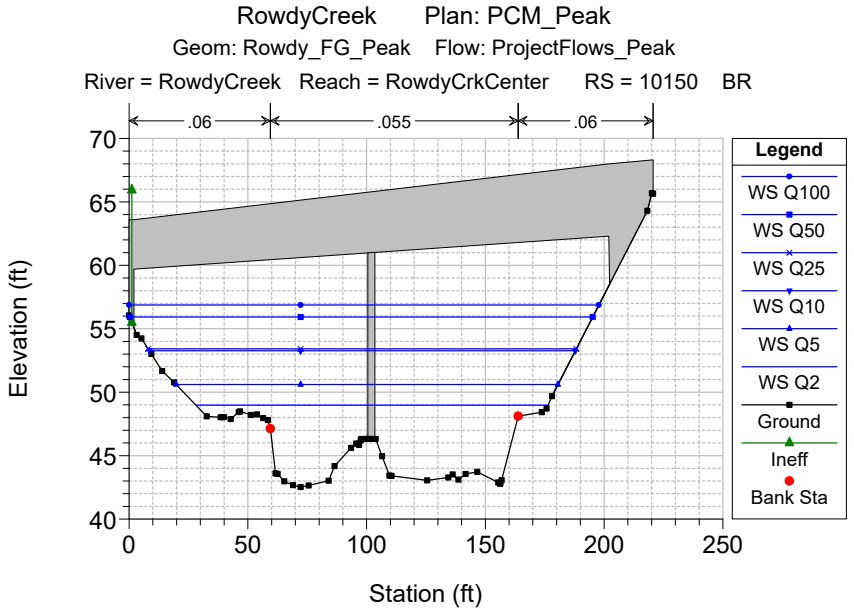
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10248 US_XS2

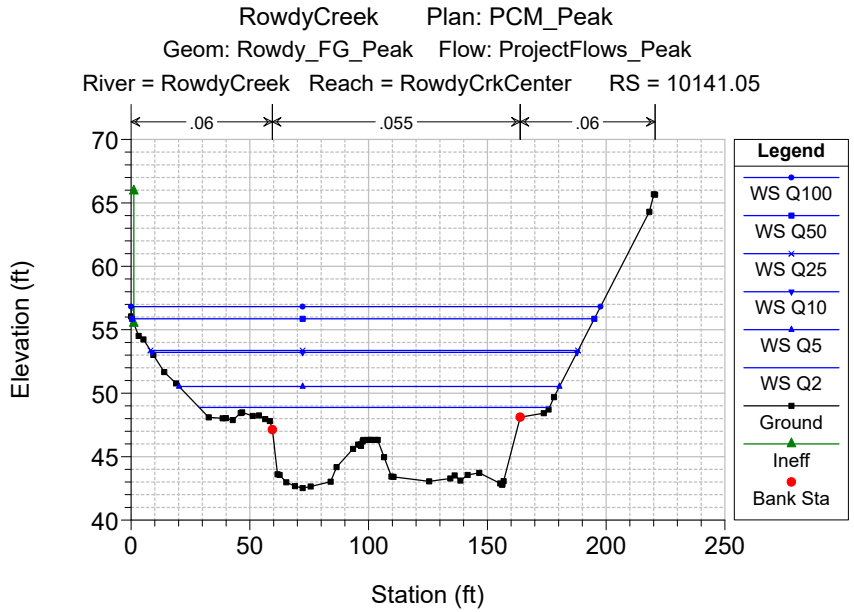


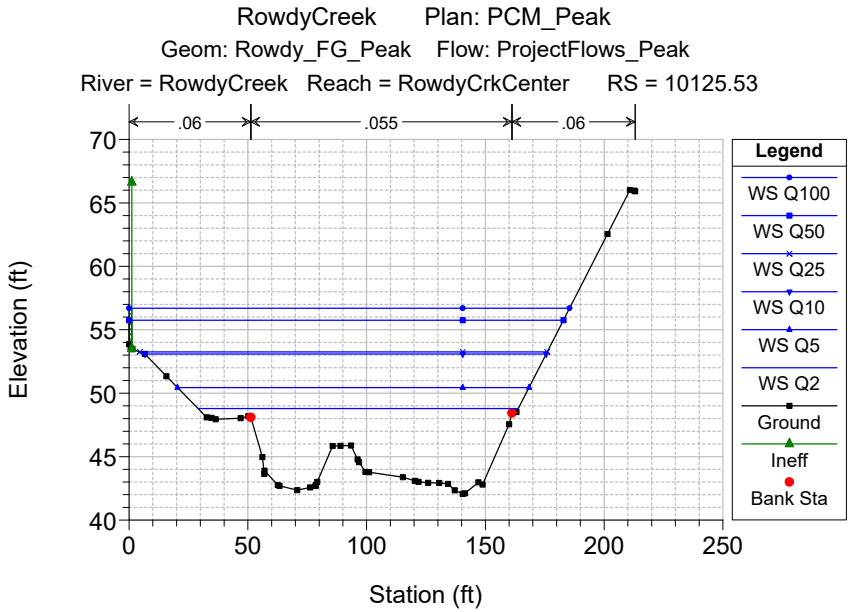
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10203 US_XS1

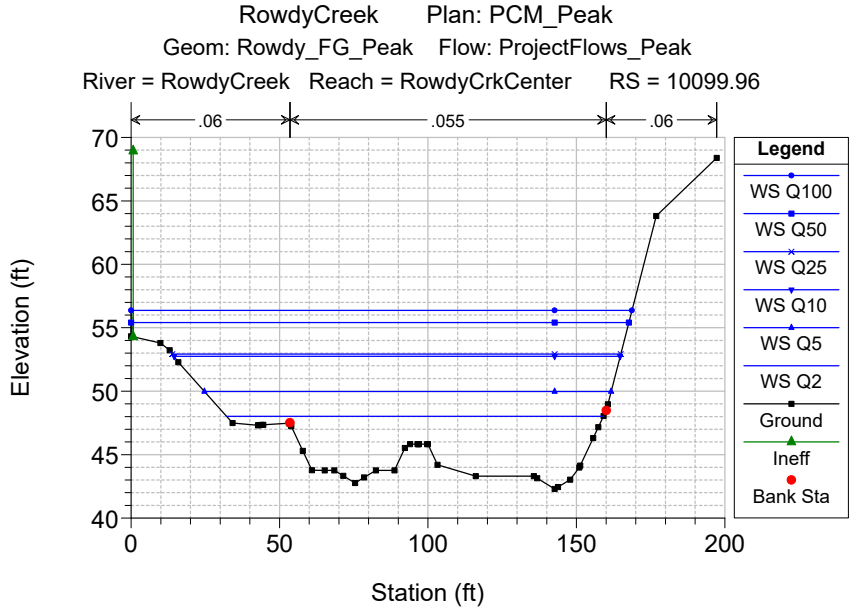


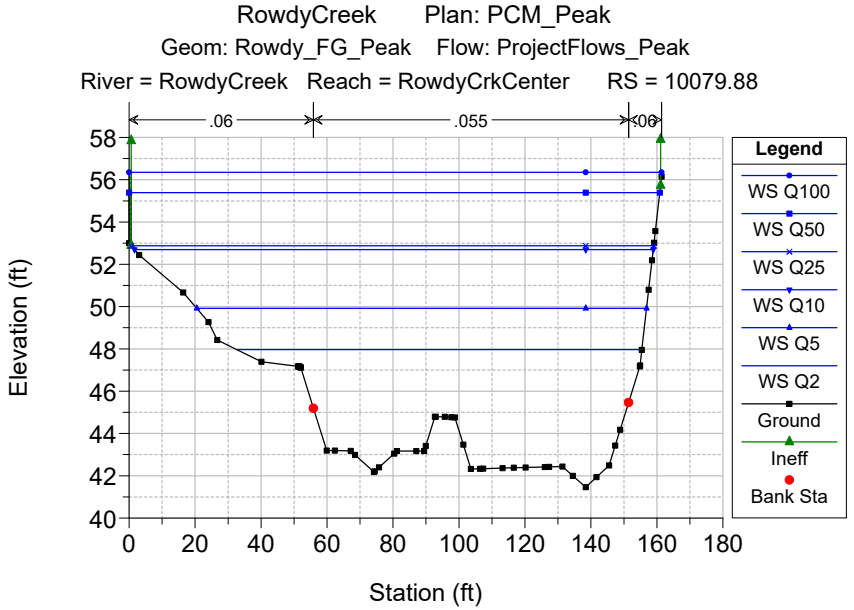

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

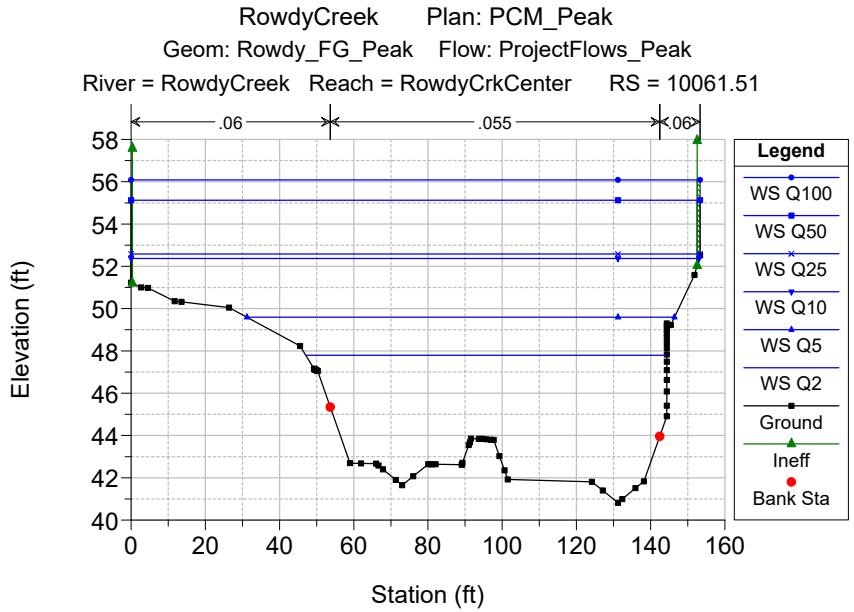

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10150 BR
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

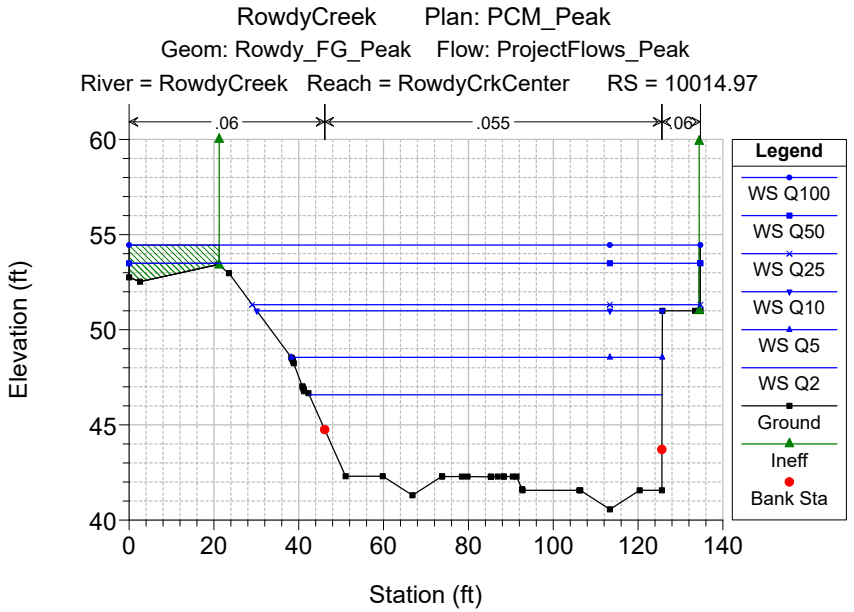

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10141.05
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

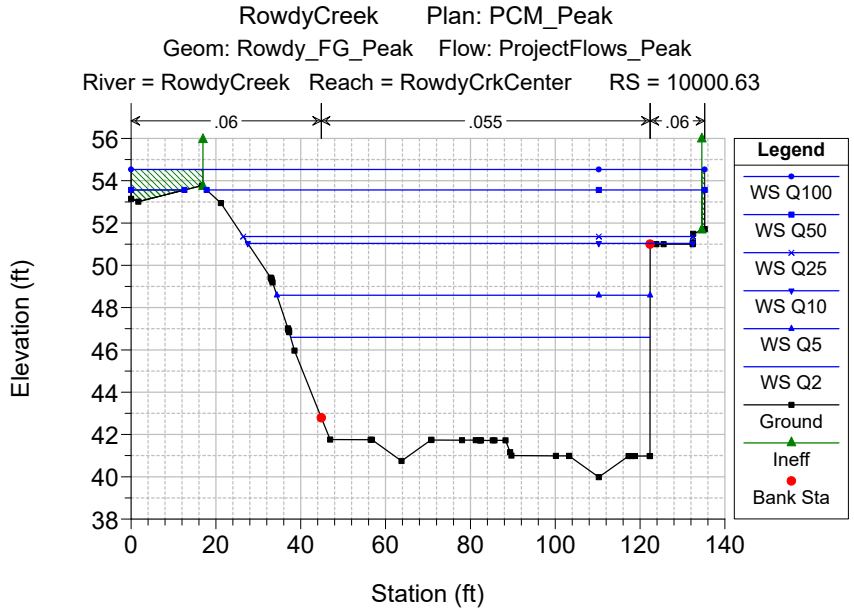

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10125.53
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

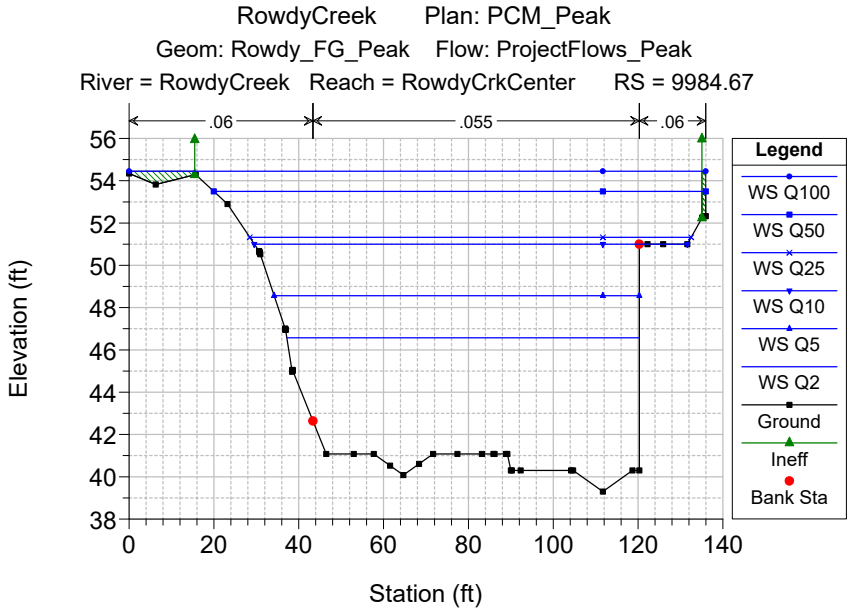

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10099.96
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

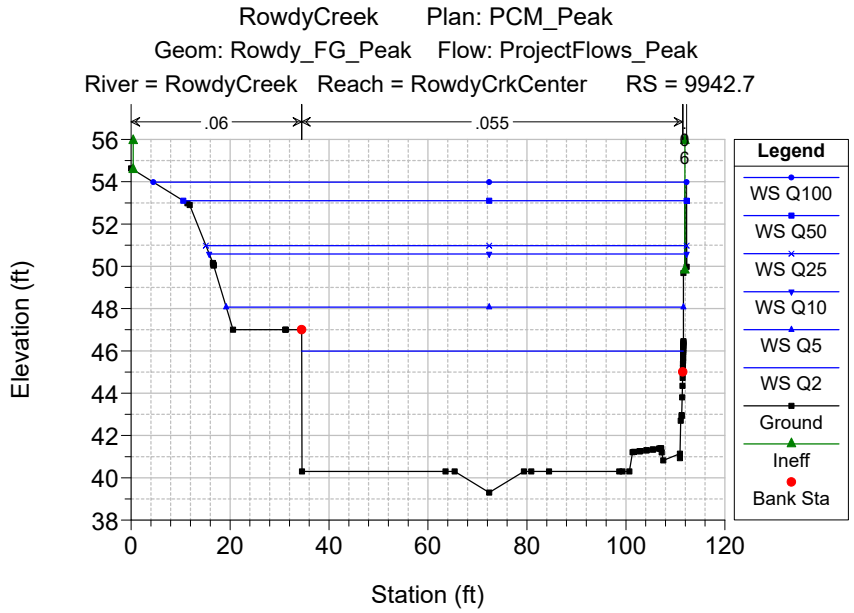

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10079.88
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

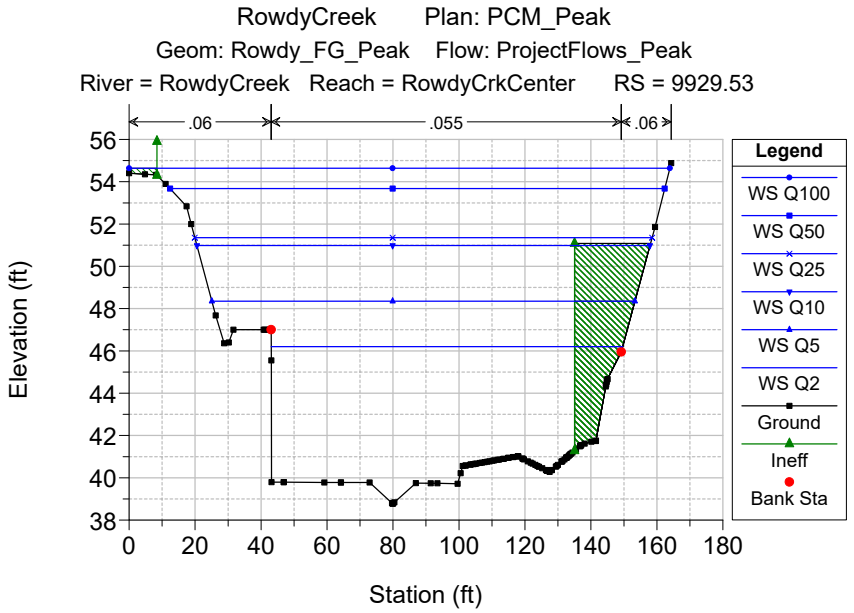

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10061.51
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

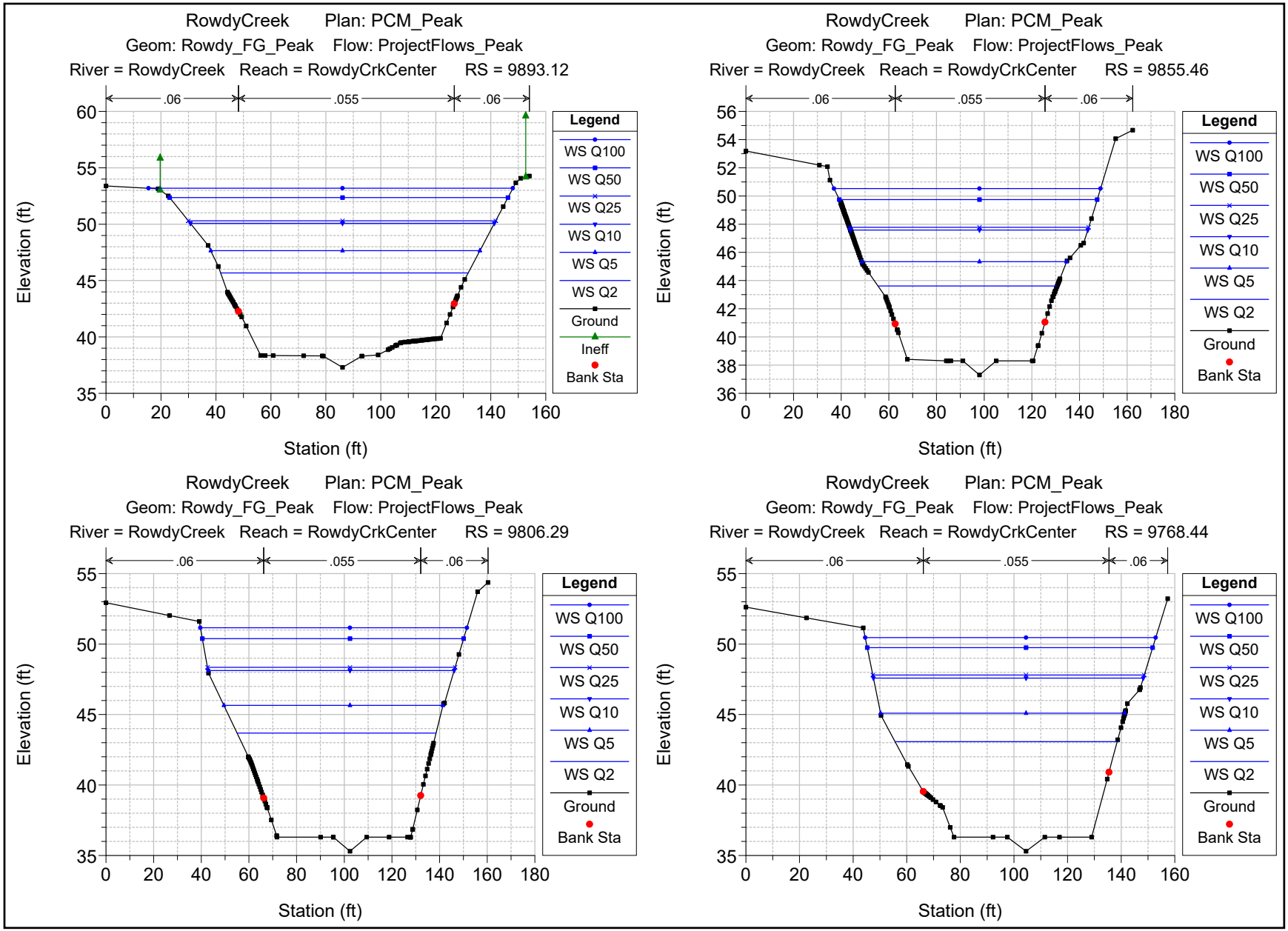

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10014.97
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

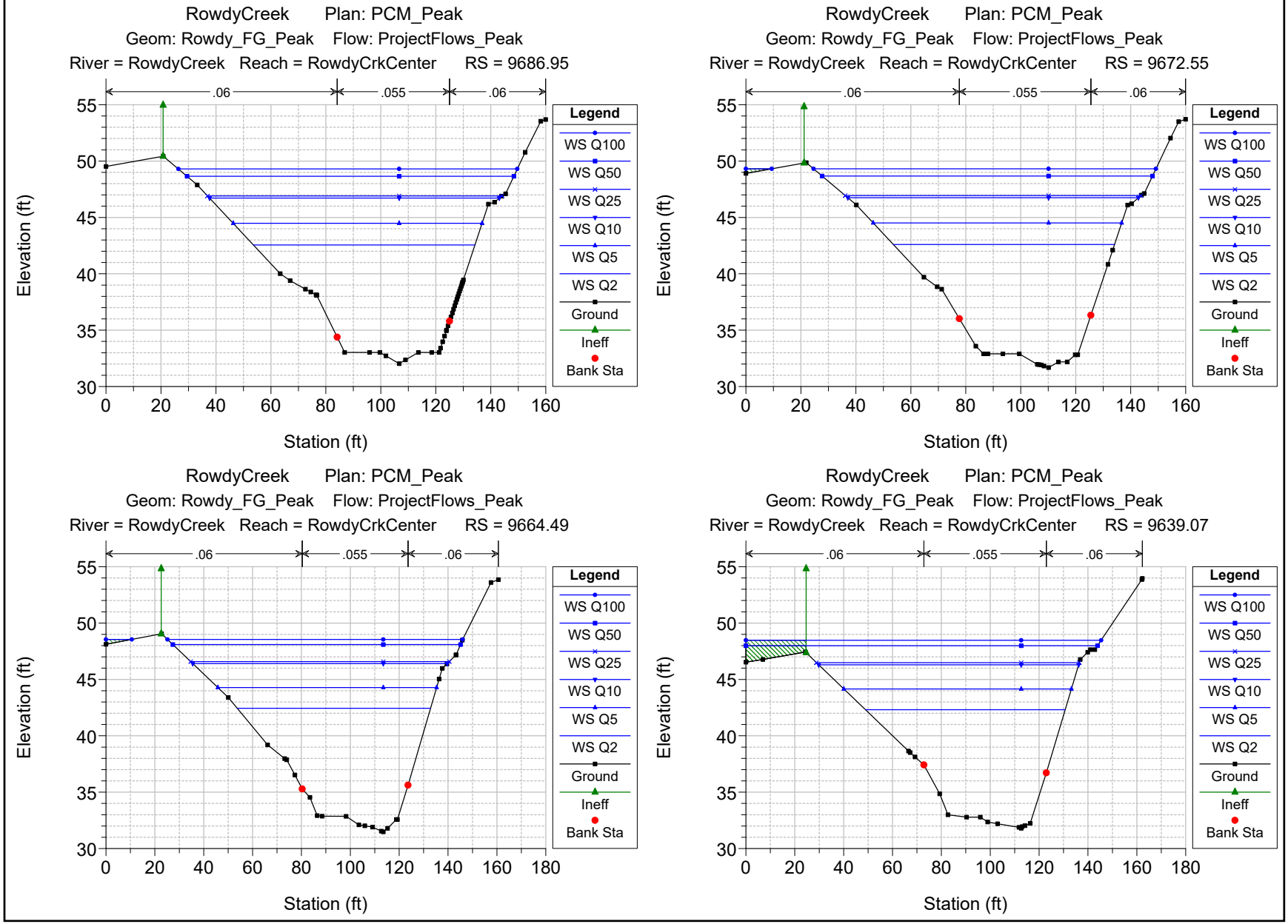

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 10000.63
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

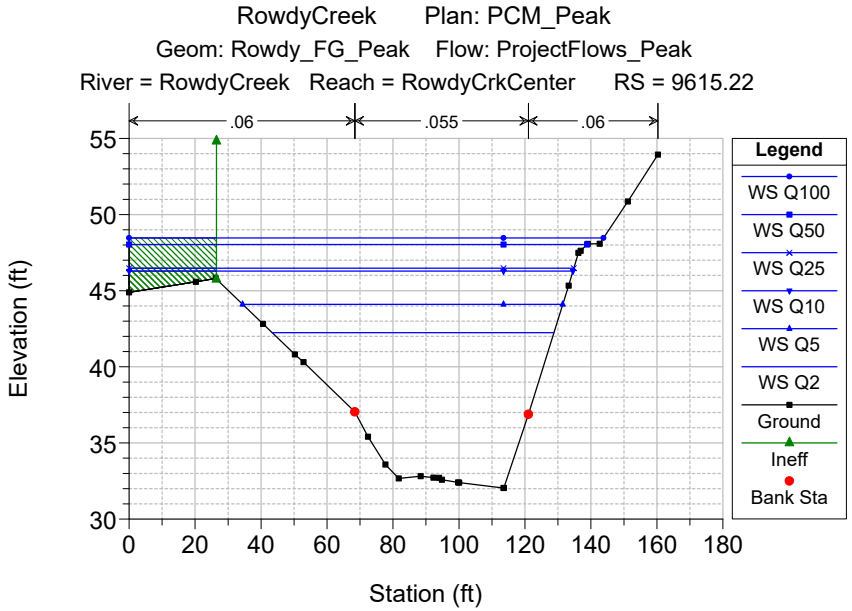

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9984.67
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

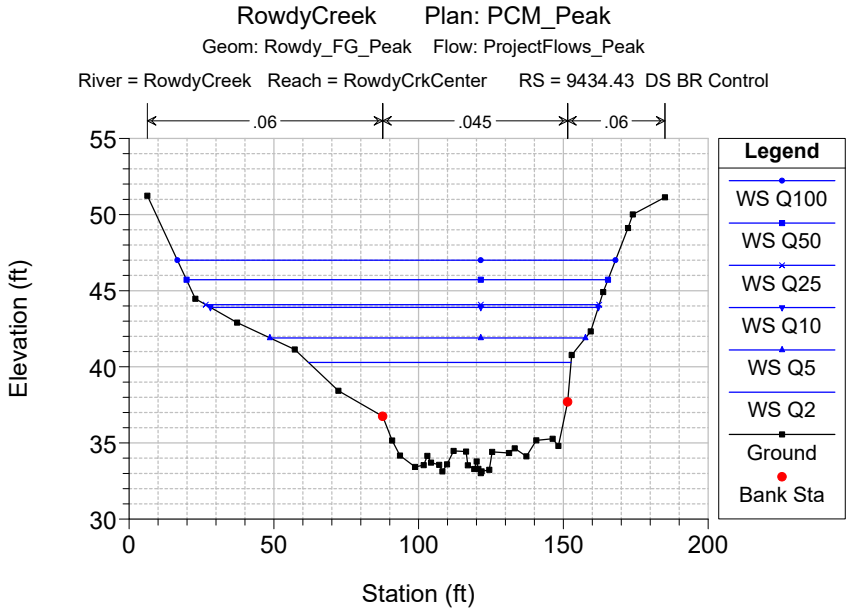

RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9942.7
.06
.055
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9929.53
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreekCenter RS = 9893.12
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreekCenter RS = 9855.46
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreekCenter RS = 9806.29
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreekCenter RS = 9768.44
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreek RS = 9686.95
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreek RS = 9672.55
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreek RS = 9664.49
RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCreek RS = 9639.07
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9615.22
.06
.055
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


RowdyCreek Plan: PCM_Peak
Geom: Rowdy_FG_Peak Flow: ProjectFlows_Peak
River = RowdyCreek Reach = RowdyCrkCenter RS = 9434.43 DS BR Control
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

HEC-RAS River: RowdyCreek Reach: RowdyCrkCenter

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10362	Q2	ECM-Peak	3657.00	40.83	50.34	47.32	51.03	0.003353	6.82	577.43	106.36	0.44
RowdyCrkCenter	10362	Q2	PCM_Peak	3657.00	40.83	50.44	47.32	51.11	0.004819	6.74	587.87	106.71	0.43
RowdyCrkCenter	10362	Q5	ECM-Peak	5548.00	40.83	52.35	48.95	53.15	0.003030	7.55	845.78	182.55	0.43
RowdyCrkCenter	10362	Q5	PCM_Peak	5548.00	40.83	52.28	48.93	53.12	0.004755	7.70	834.68	179.26	0.44
RowdyCrkCenter	10362	Q10	ECM-Peak	8860.00	40.83	55.77	51.17	56.43	0.001863	7.26	1483.20	297.26	0.35
RowdyCrkCenter	10362	Q10	PCM_Peak	8860.00	40.83	55.46	51.18	56.22	0.003259	7.73	1424.73	295.70	0.38
RowdyCrkCenter	10362	Q25	ECM-Peak	8922.00	40.83	55.83	51.21	56.49	0.001849	7.25	1494.68	297.57	0.35
RowdyCrkCenter	10362	Q25	PCM_Peak	8922.00	40.83	55.56	51.21	56.31	0.003190	7.69	1443.36	296.20	0.38
RowdyCrkCenter	10362	Q50	ECM-Peak	12485.00	40.83	59.00	53.32	59.61	0.001309	7.05	2116.54	307.97	0.31
RowdyCrkCenter	10362	Q50	PCM_Peak	12485.00	40.83	58.58	53.34	59.27	0.002352	7.60	2033.57	307.25	0.34
RowdyCrkCenter	10362	Q100	ECM-Peak	13895.00	40.83	60.17	53.80	60.82	0.001317	7.41	2478.37	309.98	0.31
RowdyCrkCenter	10362	Q100	PCM_Peak	13895.00	40.83	59.60	53.86	60.40	0.002515	8.20	2301.35	309.00	0.35
RowdyCrkCenter	10294	Q2	ECM-Peak	3657.00	40.01	50.18	46.88	50.80	0.002833	6.35	599.94	160.52	0.42
RowdyCrkCenter	10294	Q2	PCM_Peak	3657.00	40.01	50.17	46.88	50.79	0.004285	6.38	598.10	160.43	0.42
RowdyCrkCenter	10294	Q5	ECM-Peak	5548.00	40.01	52.18	48.39	52.95	0.002635	7.21	814.16	174.75	0.42
RowdyCrkCenter	10294	Q5	PCM_Peak	5548.00	40.01	51.99	48.38	52.81	0.004289	7.43	794.24	172.28	0.44
RowdyCrkCenter	10294	Q10	ECM-Peak	8860.00	40.01	55.30	50.61	56.26	0.002271	8.14	1149.45	188.48	0.41
RowdyCrkCenter	10294	Q10	PCM_Peak	8860.00	40.01	54.88	50.61	55.94	0.003921	8.55	1104.76	186.85	0.44
RowdyCrkCenter	10294	Q25	ECM-Peak	8922.00	40.01	55.35	50.65	56.32	0.002266	8.16	1155.36	188.69	0.41
RowdyCrkCenter	10294	Q25	PCM_Peak	8922.00	40.01	54.98	50.64	56.04	0.003860	8.53	1115.20	187.23	0.43
RowdyCrkCenter	10294	Q50	ECM-Peak	12485.00	40.01	58.29	52.29	59.44	0.002030	8.90	1471.33	200.17	0.40
RowdyCrkCenter	10294	Q50	PCM_Peak	12485.00	40.01	57.75	52.30	59.02	0.003539	9.39	1413.21	198.06	0.43
RowdyCrkCenter	10294	Q100	ECM-Peak	13895.00	40.01	59.10	52.83	60.61	0.002486	10.20	1567.44	201.81	0.45
RowdyCrkCenter	10294	Q100	PCM_Peak	13895.00	40.01	58.80	52.85	60.14	0.003420	9.66	1525.84	201.46	0.43
RowdyCrkCenter	10248	Q2	ECM-Peak	3657.00	41.57	49.64	47.01	50.59	0.005029	7.83	466.96	64.68	0.51
RowdyCrkCenter	10248	Q2	PCM_Peak	3657.00	41.57	49.50	47.01	50.49	0.008002	7.99	457.49	64.63	0.53
RowdyCrkCenter	10248	Q5	ECM-Peak	5548.00	41.57	51.23	48.51	52.70	0.006293	9.73	569.98	65.23	0.58
RowdyCrkCenter	10248	Q5	PCM_Peak	5548.00	41.57	50.81	48.52	52.43	0.010904	10.22	542.85	65.08	0.62
RowdyCrkCenter	10248	Q10	ECM-Peak	8860.00	41.57	53.67	50.77	55.95	0.007620	12.13	730.18	66.06	0.64
RowdyCrkCenter	10248	Q10	PCM_Peak	8860.00	41.57	52.74	50.78	55.46	0.014773	13.24	669.21	65.74	0.73
RowdyCrkCenter	10248	Q25	ECM-Peak	8922.00	41.57	53.71	50.81	56.01	0.007638	12.17	733.03	66.07	0.64
RowdyCrkCenter	10248	Q25	PCM_Peak	8922.00	41.57	52.87	50.82	55.56	0.014415	13.16	677.85	65.79	0.72
RowdyCrkCenter	10248	Q50	ECM-Peak	12485.00	41.57	55.98	52.93	59.08	0.008604	14.13	883.87	66.85	0.68
RowdyCrkCenter	10248	Q50	PCM_Peak	12485.00	41.57	54.57	52.93	58.45	0.017877	15.80	790.21	66.37	0.81
RowdyCrkCenter	10248	Q100	ECM-Peak	13895.00	41.57	56.85	53.72	60.23	0.008838	14.75	942.32	67.15	0.69
RowdyCrkCenter	10248	Q100	PCM_Peak	13895.00	41.57	55.21	53.70	59.54	0.019001	16.70	832.24	66.58	0.83
RowdyCrkCenter	10203	Q2	ECM-Peak	3657.00	42.30	49.73	47.00	50.31	0.003024	6.12	609.42	142.82	0.43
RowdyCrkCenter	10203	Q2	PCM_Peak	3657.00	42.30	49.45	47.00	50.09	0.005295	6.43	579.89	140.56	0.46
RowdyCrkCenter	10203	Q5	ECM-Peak	5548.00	42.30	51.54	48.27	52.30	0.002897	7.09	800.61	157.49	0.44
RowdyCrkCenter	10203	Q5	PCM_Peak	5548.00	42.30	50.98	48.26	51.87	0.005579	7.67	741.20	152.93	0.49
RowdyCrkCenter	10203	Q10	ECM-Peak	8860.00	42.30	54.36	50.05	55.39	0.002613	8.22	1100.39	177.01	0.44
RowdyCrkCenter	10203	Q10	PCM_Peak	8860.00	42.30	53.39	50.05	54.65	0.005440	9.12	996.82	170.46	0.51
RowdyCrkCenter	10203	Q25	ECM-Peak	8922.00	42.30	54.42	50.08	55.44	0.002609	8.24	1105.70	177.35	0.44
RowdyCrkCenter	10203	Q25	PCM_Peak	8922.00	42.30	53.52	50.08	54.76	0.005270	9.06	1010.89	171.35	0.50
RowdyCrkCenter	10203	Q50	ECM-Peak	12485.00	42.30	57.07	51.62	58.35	0.002417	9.17	1387.49	197.55	0.44
RowdyCrkCenter	10203	Q50	PCM_Peak	12485.00	42.30	55.79	51.63	57.37	0.005121	10.22	1251.65	187.97	0.51
RowdyCrkCenter	10203	Q100	ECM-Peak	13895.00	42.30	58.08	52.19	59.44	0.002341	9.46	1494.58	204.68	0.44
RowdyCrkCenter	10203	Q100	PCM_Peak	13895.00	42.30	56.65	52.20	58.35	0.005029	10.60	1343.06	194.59	0.51
RowdyCrkCenter	10150			Bridge									
RowdyCrkCenter	10141.05	Q2	ECM-Peak	3657.00	42.52	49.47	47.23	50.04	0.003667	6.10	639.75	151.90	0.45
RowdyCrkCenter	10141.05	Q2	PCM_Peak	3657.00	42.52	48.87	47.22	49.61	0.008184	6.92	550.17	147.42	0.55
RowdyCrkCenter	10141.05	Q5	ECM-Peak	5548.00	42.52	51.38	48.42	52.01	0.002875	6.58	944.56	167.16	0.42
RowdyCrkCenter	10141.05	Q5	PCM_Peak	5548.00	42.52	50.53	48.45	51.35	0.006556	7.49	804.60	160.15	0.51
RowdyCrkCenter	10141.05	Q10	ECM-Peak	8860.00	42.52	54.39	50.12	55.07	0.002087	7.01	1476.23	186.83	0.38
RowdyCrkCenter	10141.05	Q10	PCM_Peak	8860.00	42.52	53.21	50.13	54.09	0.004622	7.89	1261.82	179.01	0.45
RowdyCrkCenter	10141.05	Q25	ECM-Peak	8922.00	42.52	54.44	50.14	55.12	0.002078	7.02	1486.10	187.38	0.38
RowdyCrkCenter	10141.05	Q25	PCM_Peak	8922.00	42.52	53.37	50.15	54.22	0.004400	7.78	1289.71	179.97	0.45
RowdyCrkCenter	10141.05	Q50	ECM-Peak	12485.00	42.52	57.26	51.52	57.97	0.001648	7.32	2030.09	198.84	0.35
RowdyCrkCenter	10141.05	Q50	PCM_Peak	12485.00	42.52	55.87	51.50	56.76	0.003504	8.11	1758.81	194.64	0.41
RowdyCrkCenter	10141.05	Q100	ECM-Peak	13895.00	42.52	58.32	52.04	59.05	0.001522	7.40	2241.89	201.77	0.34
RowdyCrkCenter	10141.05	Q100	PCM_Peak	13895.00	42.52	56.82	52.01	57.72	0.003214	8.18	1944.33	197.63	0.40
RowdyCrkCenter	10125.53	Q2	ECM-Peak	3657.00	42.07	49.46	46.98	49.97	0.003212	5.79	656.90	140.15	0.43
RowdyCrkCenter	10125.53	Q2	PCM_Peak	3657.00	42.07	48.79	46.98	49.47	0.007364	6.60	566.11	134.89	0.52
RowdyCrkCenter	10125.53	Q5	ECM-Peak	5548.00	42.07	51.36	48.11	51.96	0.002656	6.38	937.60	155.28	0.41
RowdyCrkCenter	10125.53	Q5	PCM_Peak	5548.00	42.07	50.44	48.12	51.25	0.006188	7.32	799.30	148.02	0.50
RowdyCrkCenter	10125.53	Q10	ECM-Peak	8860.00	42.07	54.34	49.78	55.04	0.002025	6.96	1437.89	179.03	0.38
RowdyCrkCenter	10125.53	Q10	PCM_Peak	8860.00	42.07	53.09	49.80	54.01	0.004658	7.94	1219.25	168.98	0.46
RowdyCrkCenter	10125.53	Q25	ECM-Peak	8922.00	42.07	54.39	49.81	55.09	0.002015	6.97	1447.37	179.17	0.38
RowdyCrkCenter	10125.53	Q25	PCM_Peak	8922.00	42.07	53.25	49.83	54.14	0.004455	7.85	1245.63	171.51	0.45
RowdyCrkCenter	10125.53	Q50	ECM-Peak	12485.00	42.07	57.20	51.25	57.95	0.001633	7.33	1957.80	186.83	0.35
RowdyCrkCenter	10125.53	Q50	PCM_Peak	12485.00	42.07	55.75	51.25	56.70	0.003564	8.21	1691.37	182.88	0.42
RowdyCrkCenter	10125.53	Q100	ECM-Peak	13895.00	42.07	58.26	51.76	59.02	0.001520	7.44	2156.51	189.73	0.34
RowdyCrkCenter	10125.53	Q100	PCM_Peak	13895.00	42.07	56.69	51.76	57.66	0.003297	8.31	1864.41	185.46	0.41
RowdyCrkCenter	10099.96	Q2	ECM-Peak	3657.00	41.71	49.39	46.79	49.88	0.002969	5.71	671.42	134.30	0.41
RowdyCrkCenter	10099.96	Q2	PCM_Peak	3657.00	42.30	48.02	47.32	49.15	0.016283	8.55	437.08	127.01	0.75
RowdyCrkCenter	10099.96	Q5	ECM-Peak	5548.00	41.71	51.29	47.99	51.90	0.002548	6.38	935.80	143.61	0.40
RowdyCrkCenter	10099.96	Q5	PCM_Peak	5548.00	42.30	49.98	48.52	51.03	0.009312	8.38	695.58	137.01	0.61
RowdyCrkCenter	10099.96	Q10	ECM-Peak	8860.00	41.71	54.23	49.58	54.98	0.002106	7.18	1380.02	164.80	0.39
RowdyCrkCenter	10099.96	Q10	PCM_Peak	8860.00	42.30	52.75	50.04	53.85	0.006051	8.72	1093.36	150.25	0.52
RowdyCrkCenter	10099.96	Q25	ECM-Peak	8922.00	41.71	54.28	49.61	55.03	0.002099	7.19	1388.64	165.83	0.39
RowdyCrkCenter	10099.96	Q25	PCM_Peak	8922.00	42.30	52.92	50.08	54.00	0.005704	8.58	1120.16	150.99	0.51
RowdyCrkCenter	10099.96	Q50	ECM-Peak	12485.00	41.71	57.07	51.04	57.89	0.001743	7.63	1853.96	169.56	0.37

HEC-RAS River: RowdyCreek Reach: RowdyCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	10099.96	Q50	PCM_Peak	12485.00	42.30	55.41	51.45	56.57	0.004583	9.06	1519.00	167.65	0.47
RowdyCrkCenter	10099.96	Q100	ECM-Peak	13895.00	41.71	58.13	51.56	58.97	0.001635	7.77	2032.07	170.70	0.36
RowdyCrkCenter	10099.96	Q100	PCM_Peak	13895.00	42.30	56.37	51.96	57.54	0.004171	9.13	1680.05	168.70	0.46
RowdyCrkCenter	10079.88	Q2	ECM-Peak	3657.00	40.62	49.29	46.61	49.82	0.002999	5.85	639.36	116.14	0.42
RowdyCrkCenter	10079.88	Q2	PCM_Peak	3657.00	41.46	47.97	46.52	48.83	0.009226	7.50	504.41	122.83	0.59
RowdyCrkCenter	10079.88	Q5	ECM-Peak	5548.00	40.62	51.15	47.74	51.84	0.002776	6.72	862.72	124.63	0.42
RowdyCrkCenter	10079.88	Q5	PCM_Peak	5548.00	41.46	49.92	47.76	50.84	0.006532	7.85	760.04	136.37	0.52
RowdyCrkCenter	10079.88	Q10	ECM-Peak	8860.00	40.62	54.03	49.44	54.92	0.002416	7.70	1253.86	150.23	0.41
RowdyCrkCenter	10079.88	Q10	PCM_Peak	8860.00	41.46	52.69	49.48	53.72	0.004894	8.49	1166.04	157.24	0.48
RowdyCrkCenter	10079.88	Q25	ECM-Peak	8922.00	40.62	54.08	49.47	54.97	0.002409	7.72	1261.55	150.77	0.41
RowdyCrkCenter	10079.88	Q25	PCM_Peak	8922.00	41.46	52.88	49.51	53.87	0.004630	8.36	1194.74	158.36	0.47
RowdyCrkCenter	10079.88	Q50	ECM-Peak	12485.00	40.62	56.85	51.02	57.84	0.002041	8.26	1701.88	162.78	0.39
RowdyCrkCenter	10079.88	Q50	PCM_Peak	12485.00	41.46	55.39	50.96	56.46	0.003794	8.80	1595.48	160.87	0.44
RowdyCrkCenter	10079.88	Q100	ECM-Peak	13895.00	40.62	57.90	51.59	58.92	0.001930	8.44	1876.07	162.78	0.39
RowdyCrkCenter	10079.88	Q100	PCM_Peak	13895.00	41.46	56.35	51.50	57.44	0.003536	8.92	1749.03	161.43	0.43
RowdyCrkCenter	10061.51	Q2	ECM-Peak	3657.00	39.04	49.22	46.38	49.77	0.002942	5.93	633.30	111.85	0.41
RowdyCrkCenter	10061.51	Q2	PCM_Peak	3657.00	40.82	47.79	46.11	48.66	0.008371	7.52	495.37	97.29	0.57
RowdyCrkCenter	10061.51	Q5	ECM-Peak	5548.00	39.04	51.06	47.56	51.78	0.002839	6.89	846.70	120.58	0.42
RowdyCrkCenter	10061.51	Q5	PCM_Peak	5548.00	40.82	49.59	47.32	50.69	0.007280	8.48	683.03	115.22	0.56
RowdyCrkCenter	10061.51	Q10	ECM-Peak	8860.00	39.04	53.92	49.34	54.87	0.002549	7.97	1224.06	146.73	0.42
RowdyCrkCenter	10061.51	Q10	PCM_Peak	8860.00	40.82	52.37	49.19	53.60	0.005567	9.21	1075.04	153.08	0.51
RowdyCrkCenter	10061.51	Q25	ECM-Peak	8922.00	39.04	53.97	49.38	54.92	0.002543	7.98	1231.53	147.31	0.42
RowdyCrkCenter	10061.51	Q25	PCM_Peak	8922.00	40.82	52.58	49.22	53.76	0.005203	9.03	1106.83	153.32	0.50
RowdyCrkCenter	10061.51	Q50	ECM-Peak	12485.00	39.04	56.75	51.01	57.79	0.002169	8.55	1664.94	159.63	0.40
RowdyCrkCenter	10061.51	Q50	PCM_Peak	12485.00	40.82	55.12	51.39	56.37	0.004242	9.46	1493.99	153.32	0.47
RowdyCrkCenter	10061.51	Q100	ECM-Peak	13895.00	39.04	57.81	51.59	58.88	0.002029	8.68	1833.33	159.63	0.39
RowdyCrkCenter	10061.51	Q100	PCM_Peak	13895.00	40.82	56.09	51.96	57.36	0.003952	9.58	1640.70	153.32	0.46
RowdyCrkCenter	10014.97	Q2	ECM-Peak	3657.00	38.23	49.12	45.67	49.64	0.002394	5.81	643.66	97.41	0.38
RowdyCrkCenter	10014.97	Q2	PCM_Peak	3657.00	40.56	46.58	45.94	48.06	0.017531	9.77	376.69	83.20	0.79
RowdyCrkCenter	10014.97	Q5	ECM-Peak	5548.00	38.23	50.90	46.95	51.65	0.002596	7.01	823.87	104.29	0.41
RowdyCrkCenter	10014.97	Q5	PCM_Peak	5548.00	40.56	48.55	47.24	50.20	0.012327	10.35	545.63	87.50	0.71
RowdyCrkCenter	10014.97	Q10	ECM-Peak	8860.00	38.23	53.66	48.80	54.73	0.002624	8.42	1125.15	134.70	0.43
RowdyCrkCenter	10014.97	Q10	PCM_Peak	8860.00	40.56	50.99	49.19	53.16	0.010812	11.94	769.21	95.65	0.70
RowdyCrkCenter	10014.97	Q25	ECM-Peak	8922.00	38.23	53.71	48.85	54.79	0.002622	8.44	1130.71	134.70	0.43
RowdyCrkCenter	10014.97	Q25	PCM_Peak	8922.00	40.56	51.32	49.22	53.35	0.009707	11.58	803.15	105.68	0.66
RowdyCrkCenter	10014.97	Q50	ECM-Peak	12485.00	38.23	56.32	50.61	57.66	0.002540	9.49	1426.02	134.70	0.44
RowdyCrkCenter	10014.97	Q50	PCM_Peak	12485.00	40.56	53.49	51.10	55.97	0.009116	12.88	1040.55	134.70	0.67
RowdyCrkCenter	10014.97	Q100	ECM-Peak	13895.00	38.23	57.31	51.24	58.74	0.002487	9.82	1538.63	134.70	0.44
RowdyCrkCenter	10014.97	Q100	PCM_Peak	13895.00	40.56	54.45	51.82	56.97	0.008426	13.06	1149.11	134.70	0.65
RowdyCrkCenter	10000.63	Q2	ECM-Peak	3657.00	38.59	49.08	45.56	49.60	0.002394	5.83	638.37	94.51	0.38
RowdyCrkCenter	10000.63	Q2	PCM_Peak	3657.00	39.98	46.59	45.36	47.75	0.012297	8.69	428.52	84.75	0.66
RowdyCrkCenter	10000.63	Q5	ECM-Peak	5548.00	38.59	50.84	46.85	51.61	0.002639	7.07	811.44	102.09	0.41
RowdyCrkCenter	10000.63	Q5	PCM_Peak	5548.00	39.98	48.59	46.67	49.96	0.009909	9.49	600.72	88.02	0.62
RowdyCrkCenter	10000.63	Q10	ECM-Peak	8860.00	38.59	53.61	48.76	54.69	0.002672	8.49	1115.55	131.14	0.43
RowdyCrkCenter	10000.63	Q10	PCM_Peak	8860.00	39.98	51.04	48.62	52.93	0.009765	11.21	824.19	104.97	0.63
RowdyCrkCenter	10000.63	Q25	ECM-Peak	8922.00	38.59	53.66	48.79	54.75	0.002670	8.51	1121.27	132.37	0.44
RowdyCrkCenter	10000.63	Q25	PCM_Peak	8922.00	39.98	51.36	48.65	53.14	0.008851	10.90	857.96	106.07	0.60
RowdyCrkCenter	10000.63	Q50	ECM-Peak	12485.00	38.59	56.30	50.57	57.61	0.002515	9.45	1485.90	135.26	0.44
RowdyCrkCenter	10000.63	Q50	PCM_Peak	12485.00	39.98	53.56	50.45	55.76	0.008554	12.22	1104.16	130.03	0.61
RowdyCrkCenter	10000.63	Q100	ECM-Peak	13895.00	38.59	57.32	51.22	58.69	0.002428	9.71	1623.20	135.26	0.43
RowdyCrkCenter	10000.63	Q100	PCM_Peak	13895.00	39.98	54.53	51.21	56.77	0.007955	12.40	1218.12	135.26	0.60
RowdyCrkCenter	9984.67	Q2	ECM-Peak	3657.00	39.36	49.10	45.27	49.54	0.001972	5.32	697.82	100.50	0.34
RowdyCrkCenter	9984.67	Q2	PCM_Peak	3657.00	39.30	46.58	44.76	47.53	0.008846	7.86	472.82	83.13	0.57
RowdyCrkCenter	9984.67	Q5	ECM-Peak	5548.00	39.36	50.89	46.49	51.54	0.002183	6.46	881.04	104.65	0.38
RowdyCrkCenter	9984.67	Q5	PCM_Peak	5548.00	39.30	48.57	46.07	49.77	0.007903	8.87	641.00	86.14	0.55
RowdyCrkCenter	9984.67	Q10	ECM-Peak	8860.00	39.36	53.67	48.31	54.61	0.002262	7.85	1186.46	116.95	0.40
RowdyCrkCenter	9984.67	Q10	PCM_Peak	8860.00	39.30	51.00	48.02	52.74	0.008390	10.72	855.83	102.11	0.59
RowdyCrkCenter	9984.67	Q25	ECM-Peak	8922.00	39.36	53.72	48.34	54.66	0.002262	7.87	1192.15	117.22	0.40
RowdyCrkCenter	9984.67	Q25	PCM_Peak	8922.00	39.30	51.32	48.06	52.97	0.007663	10.46	888.85	104.06	0.56
RowdyCrkCenter	9984.67	Q50	ECM-Peak	12485.00	39.36	56.36	50.02	57.53	0.002191	8.84	1546.51	135.98	0.41
RowdyCrkCenter	9984.67	Q50	PCM_Peak	12485.00	39.30	53.50	49.91	55.60	0.007768	11.91	1127.85	116.01	0.58
RowdyCrkCenter	9984.67	Q100	ECM-Peak	13895.00	39.36	57.38	50.63	58.61	0.002127	9.10	1684.62	135.98	0.41
RowdyCrkCenter	9984.67	Q100	PCM_Peak	13895.00	39.30	54.45	50.59	56.63	0.007409	12.19	1239.38	135.98	0.58
RowdyCrkCenter	9942.7	Q2	ECM-Peak	3657.00	42.00	47.07	47.07	49.25	0.003855	11.96	329.46	77.64	1.00
RowdyCrkCenter	9942.7	Q2	PCM_Peak	3657.00	39.30	45.99	44.46	47.09	0.011388	8.41	435.02	77.11	0.62
RowdyCrkCenter	9942.7	Q5	ECM-Peak	5548.00	42.00	48.46	48.46	51.21	0.003450	13.56	476.87	93.65	0.99
RowdyCrkCenter	9942.7	Q5	PCM_Peak	5548.00	39.30	48.07	45.79	49.40	0.009233	9.26	611.15	92.42	0.59
RowdyCrkCenter	9942.7	Q10	ECM-Peak	8860.00	42.00	50.49	50.49	54.22	0.003171	15.87	669.17	96.63	1.00
RowdyCrkCenter	9942.7	Q10	PCM_Peak	8860.00	39.30	50.58	47.97	52.37	0.008785	10.89	847.07	96.48	0.60
RowdyCrkCenter	9942.7	Q25	ECM-Peak	8922.00	42.00	50.52	50.52	54.27	0.003174	15.91	672.07	96.68	1.00
RowdyCrkCenter	9942.7	Q25	PCM_Peak	8922.00	39.30	50.98	48.00	52.65	0.007778	10.51	885.75	97.16	0.57
RowdyCrkCenter	9942.7	Q50	ECM-Peak	12485.00	42.00	52.44	52.44	57.08	0.002970	17.78	858.77	100.13	1.00
RowdyCrkCenter	9942.7	Q50	PCM_Peak	12485.00	39.30	53.10	49.86	55.26	0.008016	12.05	1094.88	101.72	0.59
RowdyCrkCenter	9942.7	Q100	ECM-Peak	13895.00	42.00	52.98	52.98	58.11	0.003062	18.72	912.95	101.43	1.02
RowdyCrkCenter	9942.7	Q100	PCM_Peak	13895.00	39.30	53.98	50.51	56.30	0.007887	12.49	1186.84	107.79	0.60
RowdyCrkCenter	9929.53	Q2	ECM-Peak	3657.00	37.52	44.59	45.87	48.94	0.016943	16.74	218.50	102.25	1.82
RowdyCrkCenter	9929.53	Q2	PCM_Peak	3657.00	38.77	46.20	43.72	46.85	0.005618	6.48	564.75	106.52	0.46
RowdyCrkCenter	9929.53	Q5	ECM-Peak	5548.00	37.52	45.57	47.14	50.87	0.013640	18.47	300.32	105.44	1.71
RowdyCrkCenter	9929.53	Q5	PCM_Peak	5548.00	38.77	48.35	44.89	49.15	0.004718	7.21	787.01	128.28	0.44
RowdyCrkCenter	9929.53	Q10	ECM-Peak	8860.00	37.52	47.06	49.03	53.84	0.011203	20.89	424.15	108.75	1.63
RowdyCrkCenter	9929.53	Q10	PCM_Peak	8860.00	38.77	50.98	46.68	52.08	0.004580	8.54	1082.12	137.35	0.46
RowdyCrkCenter	9929.53	Q25	ECM-Peak	8922.00	37.52	47.09	49.06	53.90	0.011190	20.94	426.11	108.81	1.63

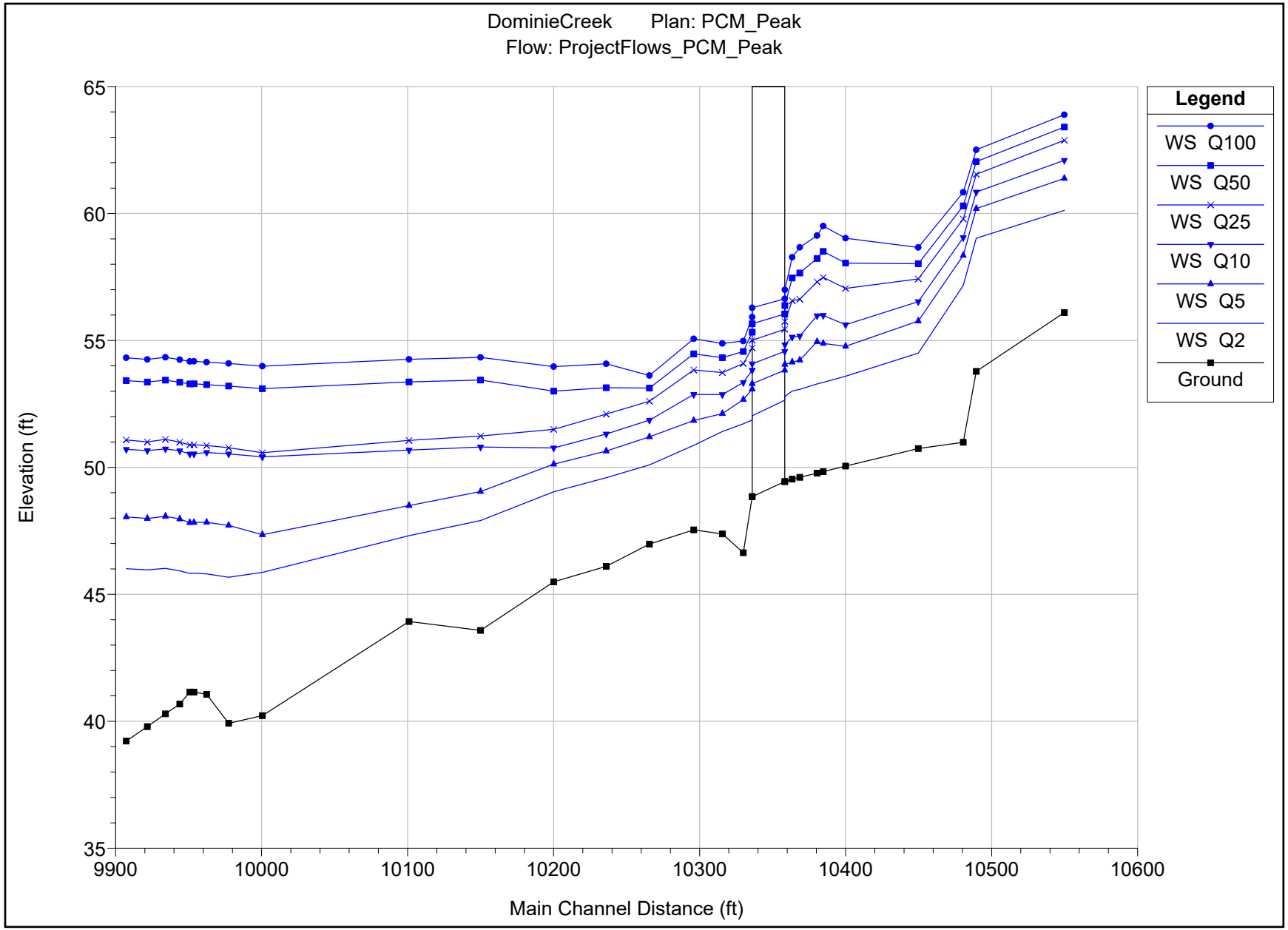
HEC-RAS River: RowdyCreek Reach: RowdyCrkCenter (Continued)

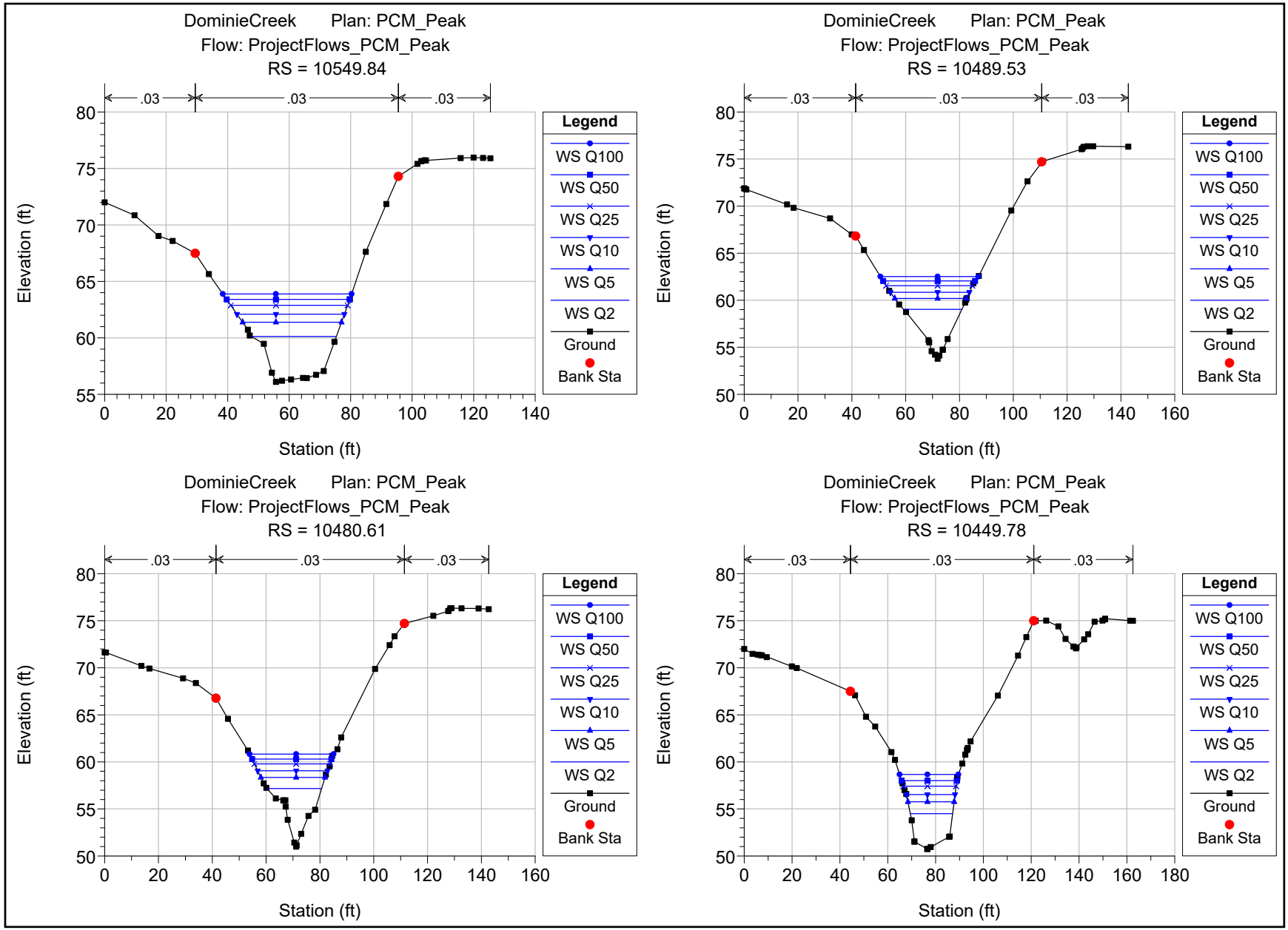
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9929.53	Q25	PCM_Peak	8922.00	38.77	51.35	46.72	52.37	0.004906	8.23	1131.05	138.63	0.46
RowdyCrkCenter	9929.53	Q50	ECM-Peak	12485.00	37.52	48.34	50.78	56.64	0.010353	23.26	569.42	128.23	1.62
RowdyCrkCenter	9929.53	Q50	PCM_Peak	12485.00	38.77	53.67	48.55	54.91	0.004543	9.12	1463.17	149.93	0.46
RowdyCrkCenter	9929.53	Q100	ECM-Peak	13895.00	37.52	48.81	51.42	57.67	0.010073	24.06	616.66	129.85	1.62
RowdyCrkCenter	9929.53	Q100	PCM_Peak	13895.00	38.77	54.63	49.17	55.91	0.004277	9.31	1610.57	163.92	0.45
RowdyCrkCenter	9893.12	Q2	ECM-Peak	4146.00	33.24	38.47	40.84	46.91	0.217557	23.32	178.41	62.09	2.40
RowdyCrkCenter	9893.12	Q2	PCM_Peak	4146.00	37.30	45.67	43.41	46.60	0.006748	7.77	546.10	90.05	0.53
RowdyCrkCenter	9893.12	Q5	ECM-Peak	6374.00	33.24	39.76	42.56	49.18	0.154571	24.71	260.90	66.44	2.13
RowdyCrkCenter	9893.12	Q5	PCM_Peak	6374.00	37.30	47.65	44.90	48.90	0.006551	9.09	731.62	97.95	0.54
RowdyCrkCenter	9893.12	Q10	ECM-Peak	9923.00	33.24	41.49	44.88	52.42	0.113897	26.76	381.99	73.12	1.94
RowdyCrkCenter	9893.12	Q10	PCM_Peak	9923.00	37.30	50.08	46.93	51.82	0.006675	10.82	984.25	110.62	0.57
RowdyCrkCenter	9893.12	Q25	ECM-Peak	10287.00	33.24	48.97	45.09	50.70	0.006508	11.04	1041.52	104.55	0.53
RowdyCrkCenter	9893.12	Q25	PCM_Peak	10287.00	37.30	50.30	47.14	52.09	0.006689	10.97	1008.67	111.83	0.57
RowdyCrkCenter	9893.12	Q50	ECM-Peak	14077.00	33.24	51.41	47.12	53.50	0.006463	12.31	1313.11	117.90	0.55
RowdyCrkCenter	9893.12	Q50	PCM_Peak	14077.00	37.30	52.36	49.01	54.60	0.006831	12.39	1251.18	123.11	0.60
RowdyCrkCenter	9893.12	Q100	ECM-Peak	15719.00	33.24	52.33	47.93	54.57	0.006475	12.79	1423.93	122.93	0.55
RowdyCrkCenter	9893.12	Q100	PCM_Peak	15719.00	37.30	53.19	49.76	55.60	0.006842	12.91	1354.95	132.55	0.60
RowdyCrkCenter	9855.46	Q2	ECM-Peak	4146.00	33.34	42.88	40.95	44.29	0.010869	9.62	448.04	70.48	0.62
RowdyCrkCenter	9855.46	Q2	PCM_Peak	4146.00	37.30	43.61	43.61	46.02	0.024613	12.52	340.81	75.19	0.97
RowdyCrkCenter	9855.46	Q5	ECM-Peak	6374.00	33.34	44.94	42.80	46.84	0.010858	11.30	607.05	83.71	0.64
RowdyCrkCenter	9855.46	Q5	PCM_Peak	6374.00	37.30	45.34	45.34	48.32	0.021232	14.08	480.46	86.01	0.94
RowdyCrkCenter	9855.46	Q10	ECM-Peak	9923.00	33.34	47.58	45.42	50.02	0.010513	13.07	851.16	99.59	0.66
RowdyCrkCenter	9855.46	Q10	PCM_Peak	9923.00	37.30	47.59	47.59	51.24	0.018501	15.85	690.49	99.60	0.92
RowdyCrkCenter	9855.46	Q25	ECM-Peak	10287.00	33.34	47.84	45.66	50.32	0.010431	13.20	876.46	100.60	0.66
RowdyCrkCenter	9855.46	Q25	PCM_Peak	10287.00	37.30	47.77	47.77	51.50	0.018427	16.04	709.34	100.35	0.92
RowdyCrkCenter	9855.46	Q50	ECM-Peak	14077.00	33.34	50.38	47.89	53.14	0.009421	14.19	1145.18	111.18	0.64
RowdyCrkCenter	9855.46	Q50	PCM_Peak	14077.00	37.30	49.75	49.63	54.02	0.016821	17.41	914.91	108.23	0.91
RowdyCrkCenter	9855.46	Q100	ECM-Peak	15719.00	33.34	51.31	48.71	54.21	0.009257	14.63	1250.10	115.16	0.65
RowdyCrkCenter	9855.46	Q100	PCM_Peak	15719.00	37.30	50.53	50.38	55.01	0.016322	17.92	1000.77	111.87	0.91
RowdyCrkCenter	9806.29	Q2	ECM-Peak	4146.00	31.48	43.10	38.99	43.87	0.002435	7.16	623.44	81.05	0.41
RowdyCrkCenter	9806.29	Q2	PCM_Peak	4146.00	35.30	43.68	41.40	44.75	0.007079	8.39	517.60	83.52	0.55
RowdyCrkCenter	9806.29	Q5	ECM-Peak	6374.00	31.48	45.22	40.81	46.37	0.002815	8.81	804.99	90.14	0.45
RowdyCrkCenter	9806.29	Q5	PCM_Peak	6374.00	35.30	45.65	43.06	47.11	0.007180	9.91	690.25	91.96	0.57
RowdyCrkCenter	9806.29	Q10	ECM-Peak	9923.00	31.48	47.84	43.25	49.53	0.003263	10.85	1057.16	102.34	0.51
RowdyCrkCenter	9806.29	Q10	PCM_Peak	9923.00	35.30	48.12	45.29	50.13	0.007376	11.77	932.45	103.30	0.61
RowdyCrkCenter	9806.29	Q25	ECM-Peak	10287.00	31.48	48.09	43.48	49.83	0.003292	11.03	1082.26	103.20	0.51
RowdyCrkCenter	9806.29	Q25	PCM_Peak	10287.00	35.30	48.35	45.49	50.40	0.007384	11.92	955.86	103.94	0.61
RowdyCrkCenter	9806.29	Q50	ECM-Peak	14077.00	31.48	50.52	45.64	52.70	0.003439	12.50	1342.19	110.09	0.53
RowdyCrkCenter	9806.29	Q50	PCM_Peak	14077.00	35.30	50.39	47.51	52.97	0.007690	13.51	1173.38	109.70	0.64
RowdyCrkCenter	9806.29	Q100	ECM-Peak	15719.00	31.48	51.41	46.57	53.79	0.003542	13.12	1440.27	112.59	0.55
RowdyCrkCenter	9806.29	Q100	PCM_Peak	15719.00	35.30	51.16	48.37	53.97	0.007847	14.15	1258.66	111.89	0.65
RowdyCrkCenter	9768.44	Q2	ECM-Peak	4146.00	30.92	42.79	39.22	43.75	0.003052	8.27	587.50	81.65	0.46
RowdyCrkCenter	9768.44	Q2	PCM_Peak	4146.00	35.30	43.08	41.60	44.40	0.010526	9.28	460.66	82.89	0.65
RowdyCrkCenter	9768.44	Q5	ECM-Peak	6374.00	30.92	44.80	41.27	46.22	0.003601	10.16	761.01	90.20	0.52
RowdyCrkCenter	9768.44	Q5	PCM_Peak	6374.00	35.30	45.09	43.22	46.78	0.009474	10.59	635.93	91.17	0.65
RowdyCrkCenter	9768.44	Q10	ECM-Peak	9923.00	30.92	47.28	43.86	49.36	0.004256	12.53	995.64	99.87	0.58
RowdyCrkCenter	9768.44	Q10	PCM_Peak	9923.00	35.30	47.58	45.40	49.80	0.008999	12.29	874.90	100.68	0.66
RowdyCrkCenter	9768.44	Q25	ECM-Peak	10287.00	30.92	47.52	44.04	49.65	0.004290	12.72	1019.50	100.51	0.59
RowdyCrkCenter	9768.44	Q25	PCM_Peak	10287.00	35.30	47.81	45.56	50.07	0.008985	12.44	897.29	101.28	0.66
RowdyCrkCenter	9768.44	Q50	ECM-Peak	14077.00	30.92	49.87	46.09	52.51	0.004490	14.36	1263.32	106.80	0.61
RowdyCrkCenter	9768.44	Q50	PCM_Peak	14077.00	35.30	49.75	47.54	52.62	0.009330	14.12	1099.02	106.47	0.69
RowdyCrkCenter	9768.44	Q100	ECM-Peak	15719.00	30.92	50.70	47.30	53.58	0.004651	15.09	1352.58	109.01	0.63
RowdyCrkCenter	9768.44	Q100	PCM_Peak	15719.00	35.30	50.46	48.24	53.61	0.009572	14.82	1175.51	108.38	0.71
RowdyCrkCenter	9686.95	Q2	ECM-Peak	4146.00	31.33	42.26	39.52	43.44	0.004289	8.93	516.86	79.07	0.52
RowdyCrkCenter	9686.95	Q2	PCM_Peak	4146.00	32.03	42.56	39.97	43.72	0.005962	9.17	527.49	80.60	0.52
RowdyCrkCenter	9686.95	Q5	ECM-Peak	6374.00	31.33	44.13	41.57	45.85	0.005014	10.95	673.69	88.77	0.59
RowdyCrkCenter	9686.95	Q5	PCM_Peak	6374.00	32.03	44.48	41.98	46.11	0.006828	11.09	691.57	90.55	0.58
RowdyCrkCenter	9686.95	Q10	ECM-Peak	9923.00	31.33	46.39	44.12	48.90	0.005935	13.51	887.05	102.57	0.66
RowdyCrkCenter	9686.95	Q10	PCM_Peak	9923.00	32.03	46.72	44.46	49.09	0.008097	13.61	908.93	105.40	0.65
RowdyCrkCenter	9686.95	Q25	ECM-Peak	10287.00	31.33	46.61	44.35	49.19	0.005981	13.71	909.94	104.45	0.66
RowdyCrkCenter	9686.95	Q25	PCM_Peak	10287.00	32.03	46.91	44.68	49.36	0.008226	13.85	929.32	107.09	0.65
RowdyCrkCenter	9686.95	Q50	ECM-Peak	14077.00	31.33	49.07	46.18	52.06	0.005756	15.06	1188.93	121.70	0.67
RowdyCrkCenter	9686.95	Q50	PCM_Peak	14077.00	32.03	48.66	46.81	51.83	0.009417	16.03	1126.73	118.91	0.71
RowdyCrkCenter	9686.95	Q100	ECM-Peak	15719.00	31.33	49.95	47.56	53.13	0.005766	15.63	1299.50	137.52	0.67
RowdyCrkCenter	9686.95	Q100	PCM_Peak	15719.00	32.03	49.30	47.83	52.78	0.009910	16.89	1204.69	123.29	0.74
RowdyCrkCenter	9672.55	Q2	ECM-Peak	4146.00	31.68	42.22	39.28	43.37	0.003911	8.83	527.64	78.53	0.51
RowdyCrkCenter	9672.55	Q2	PCM_Peak	4146.00	31.68	42.60	39.30	43.59	0.004901	8.31	557.21	80.46	0.47
RowdyCrkCenter	9672.55	Q5	ECM-Peak	6374.00	31.68	44.07	41.34	45.77	0.004696	10.93	681.17	88.10	0.58
RowdyCrkCenter	9672.55	Q5	PCM_Peak	6374.00	31.68	44.51	41.36	45.97	0.005783	10.19	720.90	90.41	0.53
RowdyCrkCenter	9672.55	Q10	ECM-Peak	9923.00	31.68	46.24	43.96	48.82	0.005776	13.67	884.89	100.88	0.66
RowdyCrkCenter	9672.55	Q10	PCM_Peak	9923.00	31.68	46.75	43.92	48.92	0.007055	12.67	937.27	105.72	0.60
RowdyCrkCenter	9672.55	Q25	ECM-Peak	10287.00	31.68	46.42	44.20	49.10	0.005893	13.93	903.74	102.65	0.67
RowdyCrkCenter	9672.55	Q25	PCM_Peak	10287.00	31.68	46.94	44.15	49.19	0.007181	12.91	957.87	107.57	0.61
RowdyCrkCenter	9672.55	Q50	ECM-Peak	14077.00	31.68	48.78	46.10	51.96	0.005858	15.48	1169.17	120.95	0.69
RowdyCrkCenter	9672.55	Q50	PCM_Peak	14077.00	31.68	48.67	46.10	51.64	0.008354	15.06	1156.25	120.22	0.67
RowdyCrkCenter	9672.55	Q100	ECM-Peak	15719.00	31.68	49.65	47.49	53.03	0.005881	16.08	1277.02	144.07	0.69
RowdyCrkCenter	9672.55	Q100	PCM_Peak	15719.00	31.68	49.31	47.35	52.58	0.008835	15.90	1233.99	133.91	0.69
RowdyCrkCenter	9664.49	Q2	ECM-Peak	4146.00	31.48	42.02	39.53	43.32	0.004525	9.52	503.46	76.93	0.55
RowdyCrkCenter	9664.49	Q2	PCM_Peak	4146.00	31.48	42.44	39.53	43.54	0.005493	8.84	536.16	79.11	0.50
RowdyCrkCenter	9664.49	Q5	ECM-Peak	6374.00	31.48	43.72	41.59	45.70	0.005644	11.90	642.29	86.10	0.64
RowdyCrkCenter	9664.49	Q5	PCM_Peak	6374.00	31.48	44.28	41.57	45.90	0.006594	10.88	691.48	89.56	0.57
RowdyCrkCenter	9664.49	Q10	ECM-Peak	9923.00	31.48	45.55	44.21	48.71	0.007574	15.29	809.41	97.38	0.75

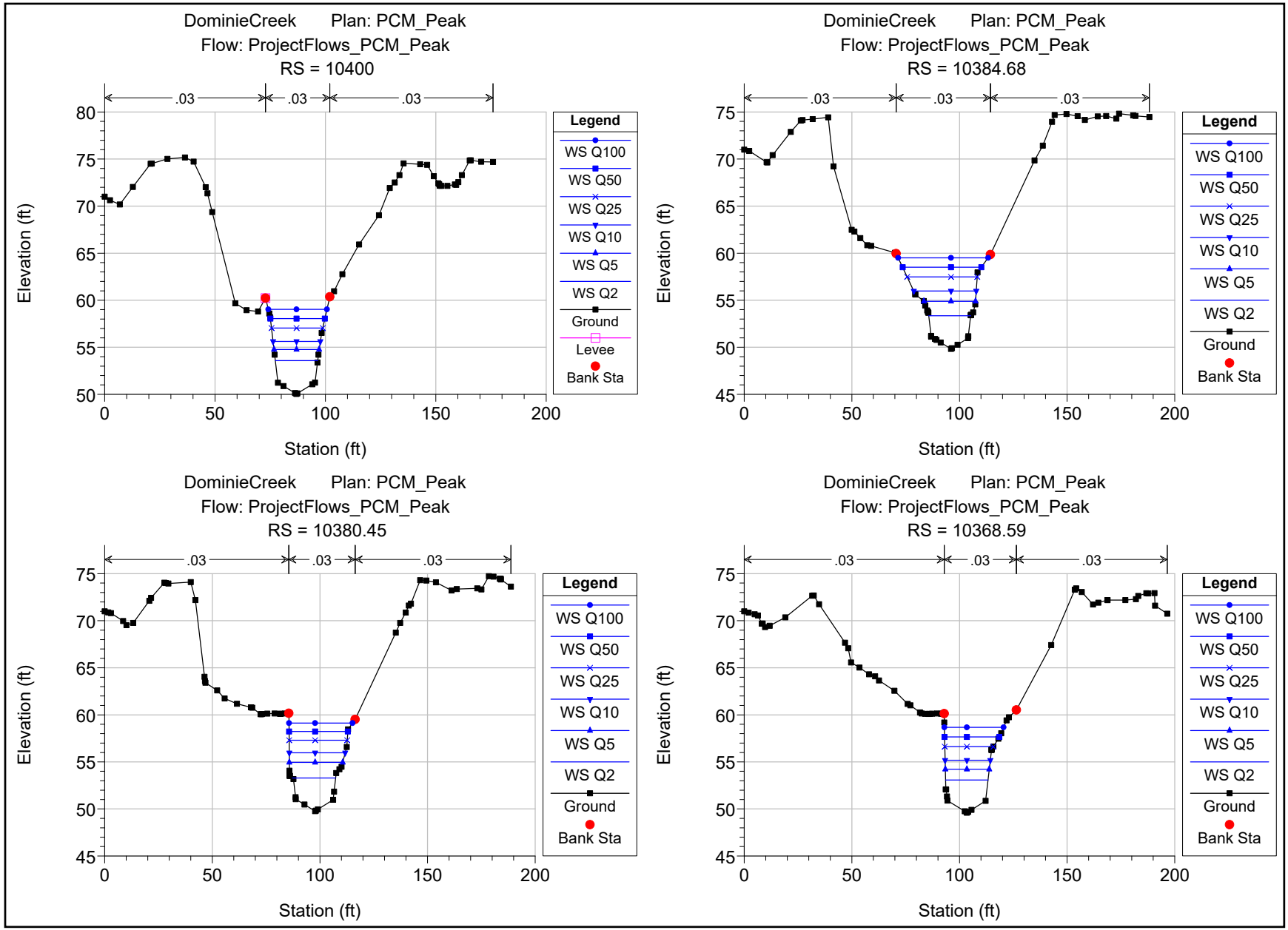
HEC-RAS River: RowdyCreek Reach: RowdyCrkCenter (Continued)

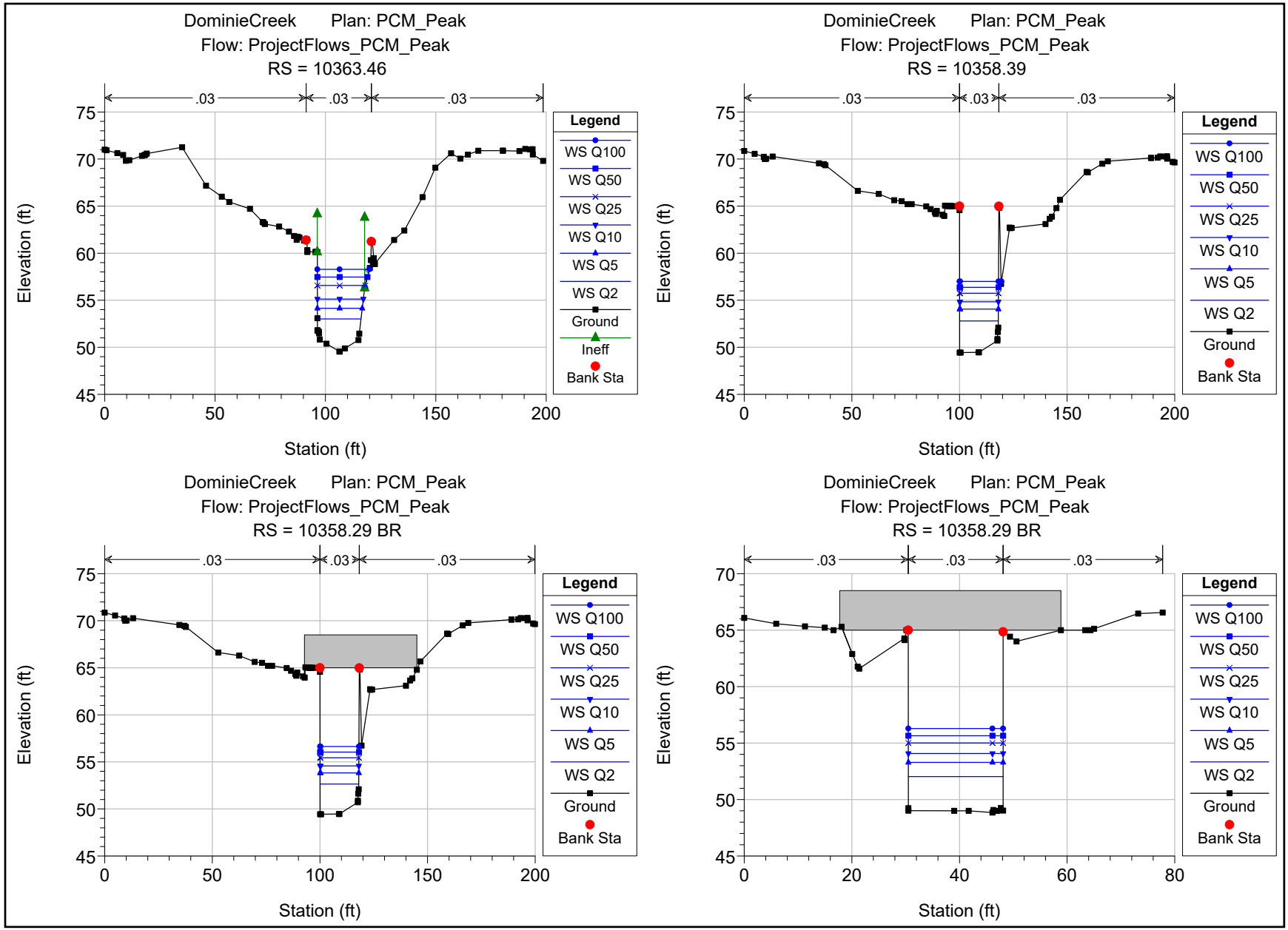
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RowdyCrkCenter	9664.49	Q10	PCM_Peak	9923.00	31.48	46.41	44.11	48.83	0.008180	13.58	895.90	104.16	0.65
RowdyCrkCenter	9664.49	Q25	ECM-Peak	10287.00	31.48	45.68	44.46	48.98	0.007806	15.63	822.91	98.23	0.77
RowdyCrkCenter	9664.49	Q25	PCM_Peak	10287.00	31.48	46.59	44.35	49.10	0.008350	13.84	914.58	105.85	0.66
RowdyCrkCenter	9664.49	Q50	ECM-Peak	14077.00	31.48	46.73	46.73	51.71	0.010826	19.39	929.62	107.18	0.92
RowdyCrkCenter	9664.49	Q50	PCM_Peak	14077.00	31.48	48.10	46.50	51.52	0.010194	16.39	1084.38	117.74	0.74
RowdyCrkCenter	9664.49	Q100	ECM-Peak	15719.00	31.48	47.83	47.83	52.81	0.009950	19.56	1053.38	115.95	0.89
RowdyCrkCenter	9664.49	Q100	PCM_Peak	15719.00	31.48	48.55	47.61	52.44	0.011237	17.54	1138.52	131.42	0.78
RowdyCrkCenter	9639.07	Q2	ECM-Peak	4146.00	31.80	41.96	39.36	43.18	0.004510	9.08	505.01	79.55	0.54
RowdyCrkCenter	9639.07	Q2	PCM_Peak	4146.00	31.80	42.32	39.39	43.39	0.005680	8.56	533.76	81.76	0.50
RowdyCrkCenter	9639.07	Q5	ECM-Peak	6374.00	31.80	43.68	41.39	45.52	0.005462	11.27	651.35	90.22	0.62
RowdyCrkCenter	9639.07	Q5	PCM_Peak	6374.00	31.80	44.16	41.42	45.72	0.006636	10.47	695.11	93.17	0.56
RowdyCrkCenter	9639.07	Q10	ECM-Peak	9923.00	31.80	45.57	44.00	48.43	0.007038	14.30	832.53	101.89	0.72
RowdyCrkCenter	9639.07	Q10	PCM_Peak	9923.00	31.80	46.30	43.97	48.59	0.007955	12.92	908.90	106.42	0.63
RowdyCrkCenter	9639.07	Q25	ECM-Peak	10287.00	31.80	45.72	44.23	48.69	0.007227	14.60	847.49	102.79	0.73
RowdyCrkCenter	9639.07	Q25	PCM_Peak	10287.00	31.80	46.48	44.20	48.84	0.008089	13.15	928.41	107.55	0.64
RowdyCrkCenter	9639.07	Q50	ECM-Peak	14077.00	31.80	46.86	46.46	51.24	0.009631	17.87	969.07	119.45	0.85
RowdyCrkCenter	9639.07	Q50	PCM_Peak	14077.00	31.80	47.99	46.36	51.20	0.009778	15.55	1099.95	143.91	0.71
RowdyCrkCenter	9639.07	Q100	ECM-Peak	15719.00	31.80	47.46	47.20	52.31	0.010171	18.90	1036.51	140.12	0.88
RowdyCrkCenter	9639.07	Q100	PCM_Peak	15719.00	31.80	48.48	47.04	52.08	0.010607	16.54	1157.68	145.40	0.75
RowdyCrkCenter	9615.22	Q2	ECM-Peak	4146.00	32.04	41.94	39.17	43.05	0.004093	8.66	530.50	83.51	0.52
RowdyCrkCenter	9615.22	Q2	PCM_Peak	4146.00	32.04	42.25	39.20	43.23	0.005241	8.21	556.85	85.46	0.48
RowdyCrkCenter	9615.22	Q5	ECM-Peak	6374.00	32.04	43.69	41.14	45.34	0.004895	10.71	686.40	94.45	0.59
RowdyCrkCenter	9615.22	Q5	PCM_Peak	6374.00	32.04	44.10	41.16	45.53	0.006071	10.02	726.22	97.05	0.54
RowdyCrkCenter	9615.22	Q10	ECM-Peak	9923.00	32.04	45.63	43.66	48.18	0.006201	13.51	881.69	106.57	0.68
RowdyCrkCenter	9615.22	Q10	PCM_Peak	9923.00	32.04	46.29	43.63	48.34	0.007115	12.26	952.26	134.55	0.60
RowdyCrkCenter	9615.22	Q25	ECM-Peak	10287.00	32.04	45.79	43.89	48.43	0.006331	13.77	898.81	107.56	0.69
RowdyCrkCenter	9615.22	Q25	PCM_Peak	10287.00	32.04	46.48	43.86	48.59	0.007197	12.45	972.98	134.81	0.60
RowdyCrkCenter	9615.22	Q50	ECM-Peak	14077.00	32.04	47.15	46.25	50.81	0.007832	16.41	1045.72	135.74	0.78
RowdyCrkCenter	9615.22	Q50	PCM_Peak	14077.00	32.04	48.04	46.18	50.87	0.008519	14.59	1144.19	138.81	0.67
RowdyCrkCenter	9615.22	Q100	ECM-Peak	15719.00	32.04	47.86	46.98	51.82	0.008016	17.16	1123.51	137.99	0.79
RowdyCrkCenter	9615.22	Q100	PCM_Peak	15719.00	32.04	48.47	46.87	51.74	0.009497	15.71	1194.12	143.82	0.71
RowdyCrkCenter	9434.43	Q2	ECM-Peak	4146.00	33.02	40.28	39.49	41.90	0.010011	10.41	431.46	90.69	0.75
RowdyCrkCenter	9434.43	Q2	PCM_Peak	4146.00	33.02	40.28	39.49	41.90	0.010011	10.41	431.46	90.69	0.75
RowdyCrkCenter	9434.43	Q5	ECM-Peak	6374.00	33.02	41.90	41.04	44.07	0.010007	12.22	589.68	108.98	0.78
RowdyCrkCenter	9434.43	Q5	PCM_Peak	6374.00	33.02	41.90	41.04	44.07	0.010007	12.22	589.68	108.98	0.78
RowdyCrkCenter	9434.43	Q10	ECM-Peak	9923.00	33.02	43.90	43.35	46.75	0.010002	14.29	835.15	133.98	0.81
RowdyCrkCenter	9434.43	Q10	PCM_Peak	9923.00	33.02	43.90	43.35	46.75	0.010002	14.29	835.15	133.98	0.81
RowdyCrkCenter	9434.43	Q25	ECM-Peak	10287.00	33.02	44.08	43.53	46.98	0.010002	14.47	859.30	135.92	0.82
RowdyCrkCenter	9434.43	Q25	PCM_Peak	10287.00	33.02	44.08	43.53	46.98	0.010002	14.47	859.30	135.92	0.82
RowdyCrkCenter	9434.43	Q50	ECM-Peak	14077.00	33.02	45.72	45.42	49.15	0.010003	16.05	1091.14	145.58	0.84
RowdyCrkCenter	9434.43	Q50	PCM_Peak	14077.00	33.02	45.72	45.42	49.15	0.010003	16.05	1091.14	145.58	0.84
RowdyCrkCenter	9434.43	Q100	ECM-Peak	15719.00	33.02	47.00	46.00	50.11	0.008075	15.48	1281.38	151.33	0.77
RowdyCrkCenter	9434.43	Q100	PCM_Peak	15719.00	33.02	47.00	46.00	50.11	0.008075	15.48	1281.38	151.33	0.77

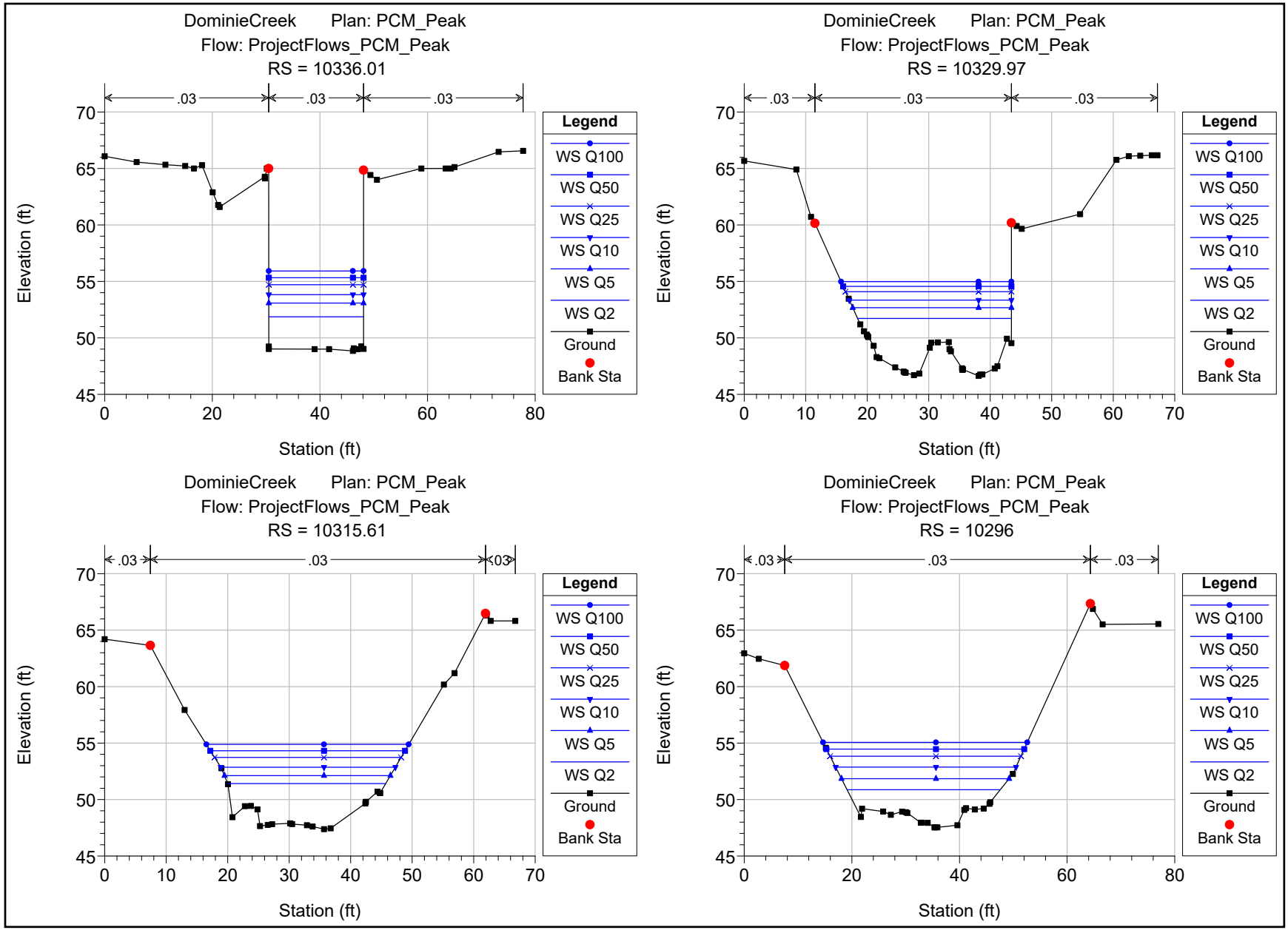
Appendix M- *Dominie Creek Proposed Flood Analysis Results*

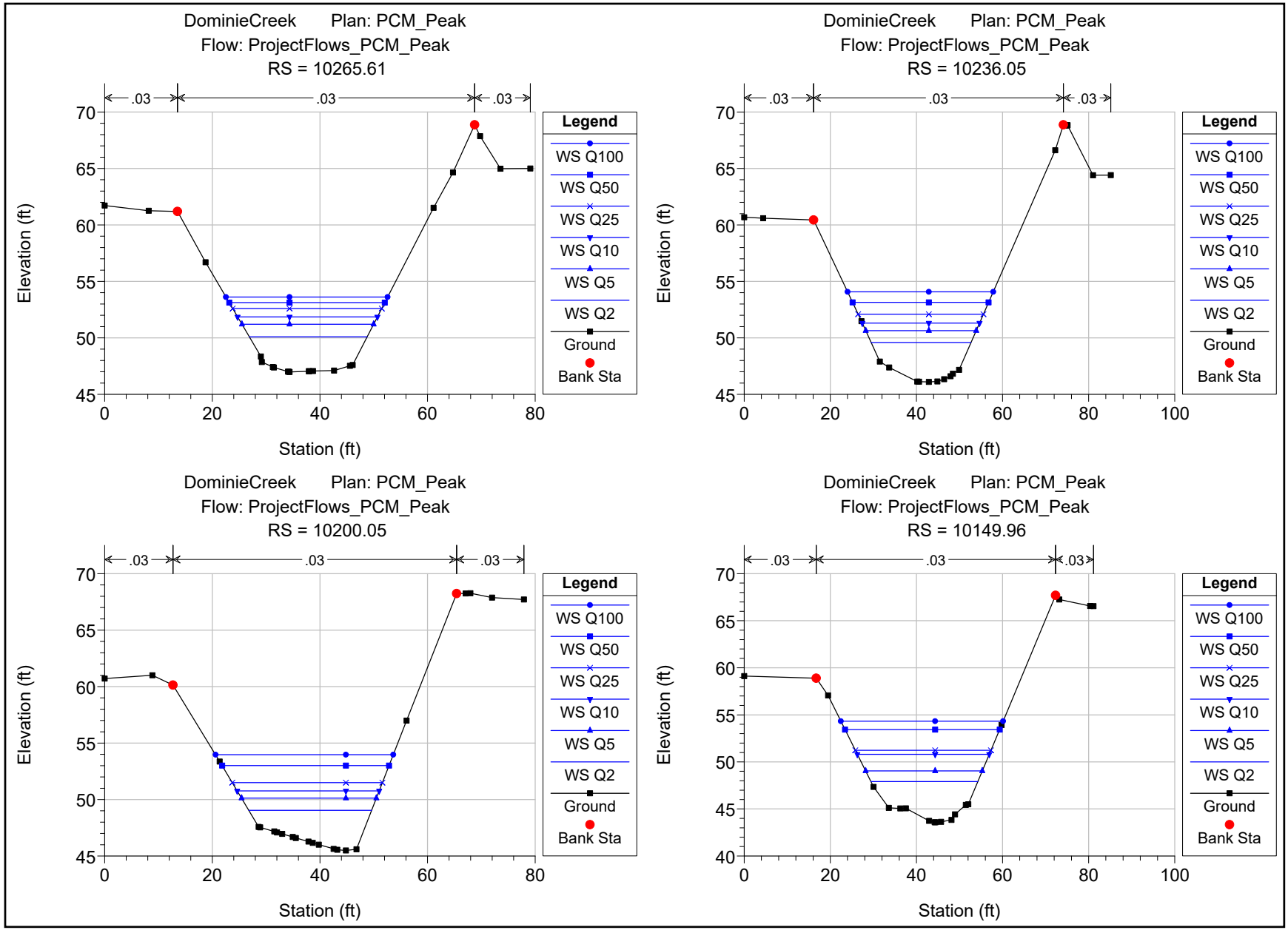

DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
Elevation (ft)
65
60
55
50
45
40
35
9900
10000
10100
10200
10300
10400
10500
10600
Main Channel Distance (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground

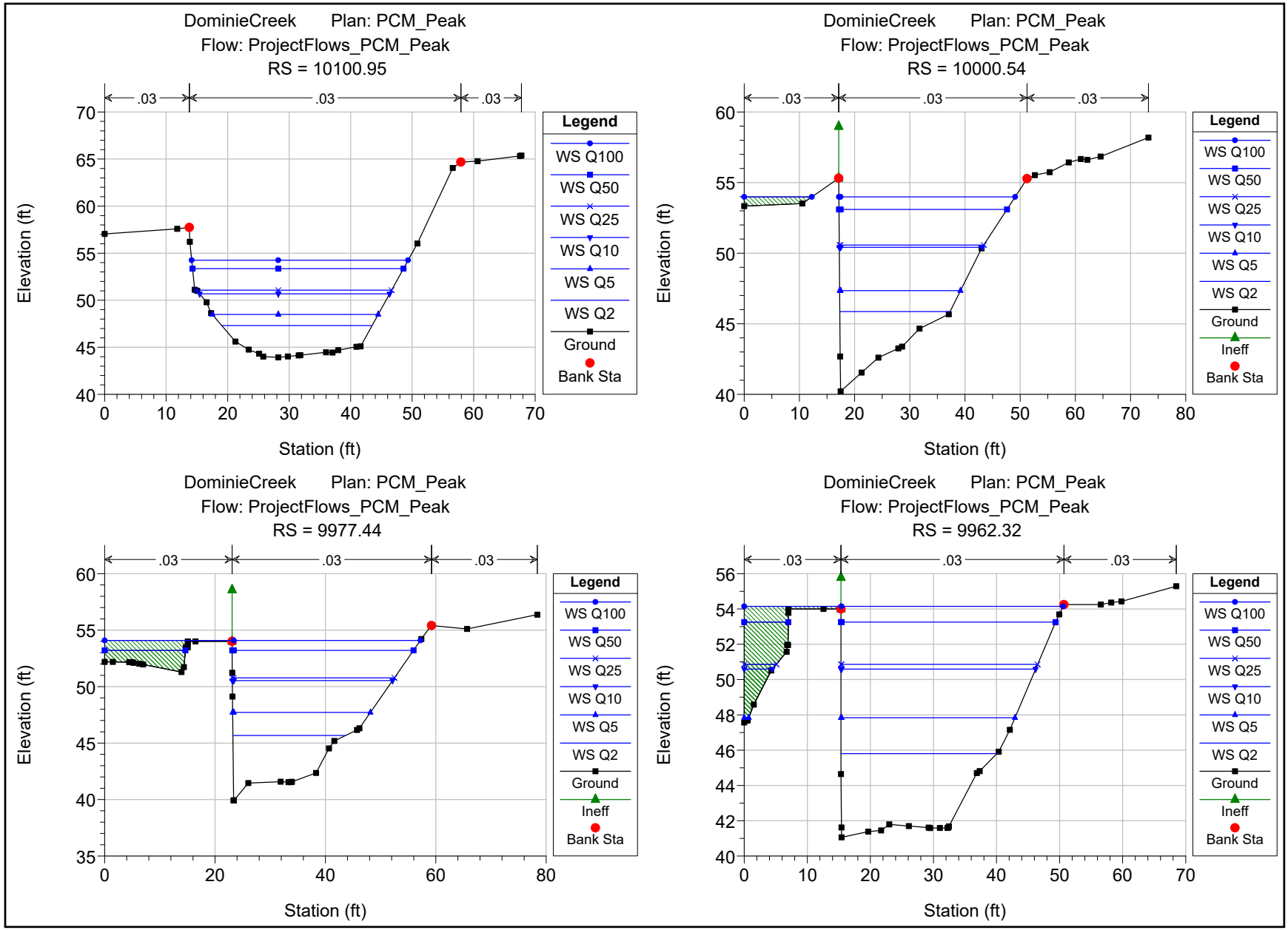

DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10549.84
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10489.53
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10480.61
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10449.78
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

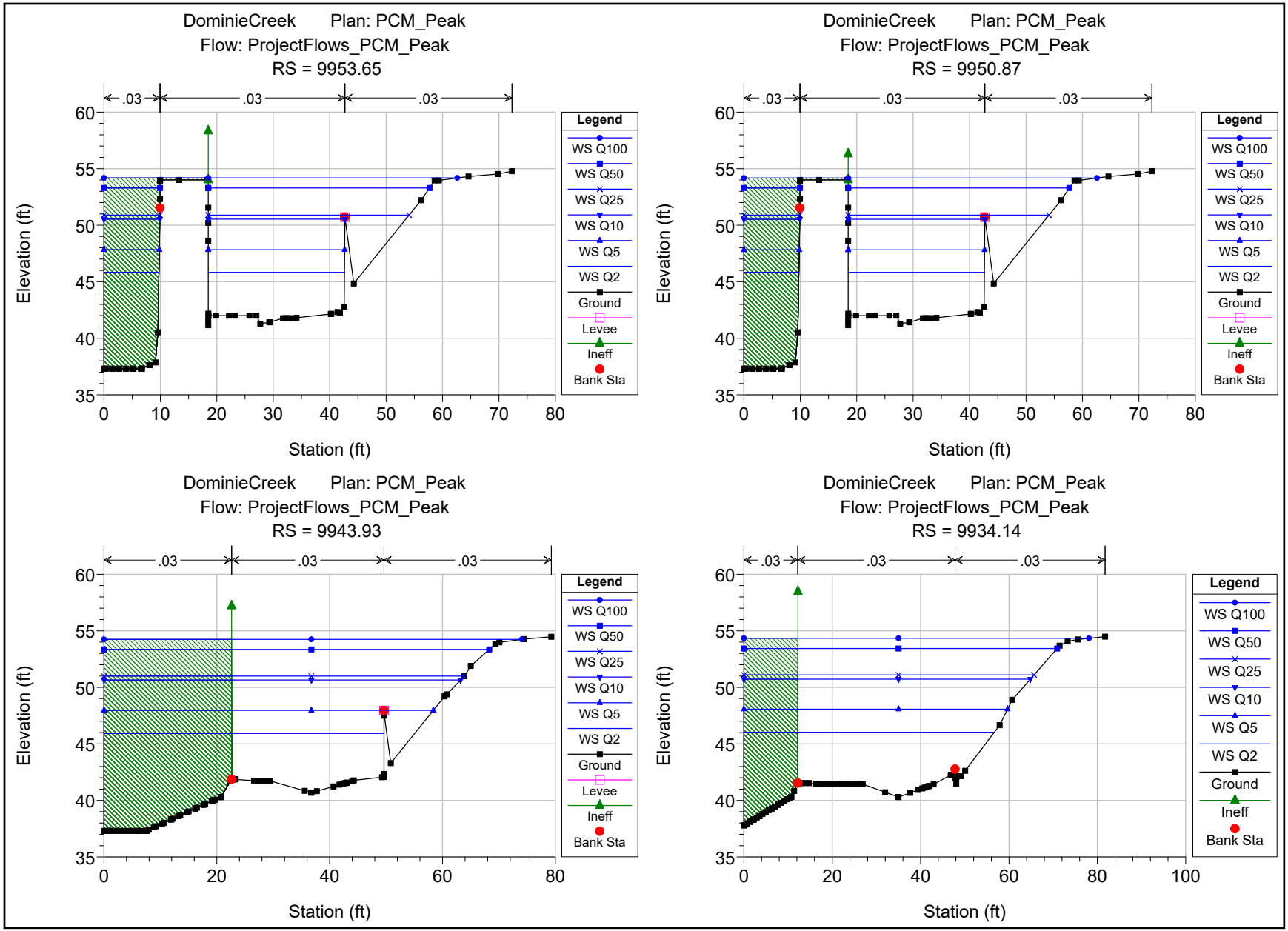

DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10400
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10384.68
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10380.45
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10368.59
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

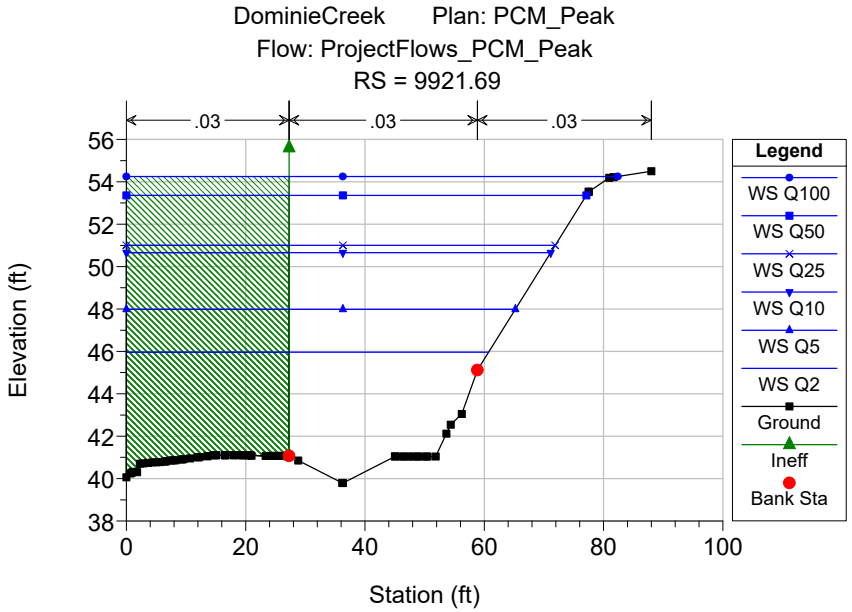

DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10363.46
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10358.39
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10358.29 BR
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10358.29 BR
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta

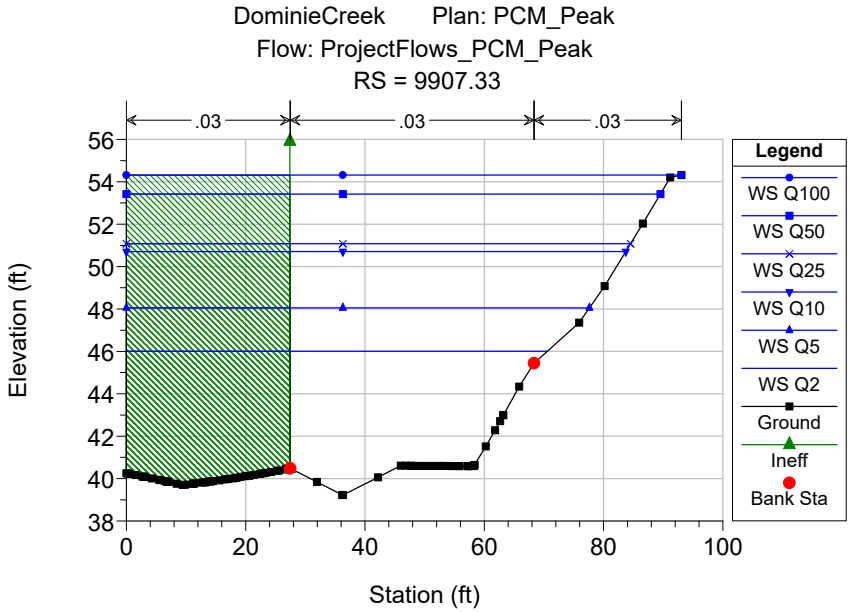

DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10336.01
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10329.97
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10315.61
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10296
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta


DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10265.61
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10236.05
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10200.05
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10149.96
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta


DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10100.95
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 10000.54
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9977.44
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9962.32
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9953.65
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9950.87
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9943.93
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Levee
Ineff
Bank Sta
DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9934.14
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9921.69
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta


DominieCreek Plan: PCM_Peak
Flow: ProjectFlows_PCM_Peak
RS = 9907.33
.03
.03
.03
Elevation (ft)
Station (ft)
Legend
WS Q100
WS Q50
WS Q25
WS Q10
WS Q5
WS Q2
Ground
Ineff
Bank Sta

HEC-RAS River: DominieCreek Reach: DominieCrkCenter

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10549.84	Q2	PCM_Peak	489.00	56.10	60.12		60.79	0.005252	6.57	74.39	27.62	0.71
DominieCrkCenter	10549.84	Q2	ECM_Peak	489.00	56.10	60.04		60.77	0.004801	6.86	72.16	27.00	0.69
DominieCrkCenter	10549.84	Q5	PCM_Peak	826.00	56.10	61.38		62.23	0.004753	7.38	112.00	32.15	0.70
DominieCrkCenter	10549.84	Q5	ECM_Peak	826.00	56.10	61.26		62.24	0.004246	8.05	108.10	31.67	0.68
DominieCrkCenter	10549.84	Q10	PCM_Peak	1063.00	56.10	62.09		63.04	0.004626	7.82	135.93	34.93	0.70
DominieCrkCenter	10549.84	Q10	ECM_Peak	1063.00	56.10	61.97		63.09	0.004018	8.67	131.77	34.46	0.68
DominieCrkCenter	10549.84	Q25	PCM_Peak	1365.00	56.10	62.89		63.95	0.004511	8.28	164.77	38.01	0.70
DominieCrkCenter	10549.84	Q25	ECM_Peak	1365.00	56.10	62.78		64.04	0.003818	9.33	160.64	37.58	0.68
DominieCrkCenter	10549.84	Q50	PCM_Peak	1592.00	56.10	63.41		64.55	0.004471	8.60	185.09	40.03	0.70
DominieCrkCenter	10549.84	Q50	ECM_Peak	1592.00	56.10	63.33		64.68	0.003690	9.74	181.88	39.72	0.68
DominieCrkCenter	10549.84	Q100	PCM_Peak	1824.00	56.10	63.89		65.12	0.004450	8.90	204.89	41.88	0.71
DominieCrkCenter	10549.84	Q100	ECM_Peak	1824.00	56.10	63.83		65.28	0.003610	10.14	202.51	41.66	0.68
DominieCrkCenter	10489.53	Q2	PCM_Peak	489.00	53.78	59.03	59.03	60.29	0.011280	9.01	54.30	21.61	1.00
DominieCrkCenter	10489.53	Q2	ECM_Peak	489.00	53.78	59.00	59.00	60.29	0.011175	9.12	53.67	21.47	1.00
DominieCrkCenter	10489.53	Q5	PCM_Peak	826.00	53.78	60.19	60.19	61.74	0.010488	10.00	82.62	26.67	1.00
DominieCrkCenter	10489.53	Q5	ECM_Peak	826.00	53.78	60.17	60.17	61.80	0.009418	10.30	82.10	26.59	0.96
DominieCrkCenter	10489.53	Q10	PCM_Peak	1063.00	53.78	60.85	60.85	62.57	0.010132	10.53	100.91	29.36	1.00
DominieCrkCenter	10489.53	Q10	ECM_Peak	1063.00	53.78	60.83	60.83	62.67	0.008574	11.02	100.53	29.30	0.95
DominieCrkCenter	10489.53	Q25	PCM_Peak	1365.00	53.78	61.54	61.54	63.48	0.009880	11.15	122.38	32.03	1.01
DominieCrkCenter	10489.53	Q25	ECM_Peak	1365.00	53.78	61.58	61.58	63.64	0.007821	11.74	123.63	32.18	0.93
DominieCrkCenter	10489.53	Q50	PCM_Peak	1592.00	53.78	62.04	62.04	64.08	0.009585	11.46	138.93	34.17	1.00
DominieCrkCenter	10489.53	Q50	ECM_Peak	1592.00	53.78	62.09	62.09	64.29	0.007448	12.22	140.40	34.37	0.92
DominieCrkCenter	10489.53	Q100	PCM_Peak	1824.00	53.78	62.51	62.51	64.65	0.009412	11.74	155.33	36.39	1.00
DominieCrkCenter	10489.53	Q100	ECM_Peak	1824.00	53.78	62.59	62.59	64.90	0.007041	12.60	158.24	36.76	0.91
DominieCrkCenter	10480.61	Q2	PCM_Peak	489.00	50.99	57.17	57.17	58.48	0.012690	9.21	53.11	20.32	1.00
DominieCrkCenter	10480.61	Q2	ECM_Peak	489.00	50.99	57.17	57.17	58.48	0.012653	9.20	53.17	20.33	1.00
DominieCrkCenter	10480.61	Q5	PCM_Peak	826.00	50.99	58.35	58.35	60.03	0.011744	10.41	79.32	23.86	1.01
DominieCrkCenter	10480.61	Q5	ECM_Peak	826.00	50.99	58.90		60.16	0.006819	9.04	93.00	25.50	0.79
DominieCrkCenter	10480.61	Q10	PCM_Peak	1063.00	50.99	59.05	59.05	60.92	0.011188	10.98	96.80	25.97	1.00
DominieCrkCenter	10480.61	Q10	ECM_Peak	1063.00	50.99	60.27		61.37	0.004098	8.50	130.75	29.39	0.64
DominieCrkCenter	10480.61	Q25	PCM_Peak	1365.00	50.99	59.78	59.78	61.91	0.011033	11.71	116.58	28.14	1.01
DominieCrkCenter	10480.61	Q25	ECM_Peak	1365.00	50.99	61.22		62.45	0.003798	9.11	160.01	32.93	0.63
DominieCrkCenter	10480.61	Q50	PCM_Peak	1592.00	50.99	60.30	60.30	62.58	0.010710	12.11	131.49	29.45	1.01
DominieCrkCenter	10480.61	Q50	ECM_Peak	1592.00	50.99	62.09		63.30	0.003221	9.13	189.99	36.01	0.60
DominieCrkCenter	10480.61	Q100	PCM_Peak	1824.00	50.99	60.83	60.83	63.20	0.010293	12.36	147.63	31.19	1.00
DominieCrkCenter	10480.61	Q100	ECM_Peak	1824.00	50.99	62.94		64.13	0.002768	9.11	222.03	39.05	0.56
DominieCrkCenter	10449.78	Q2	PCM_Peak	489.00	50.74	54.50	54.50	55.94	0.011678	9.63	50.79	17.67	1.00
DominieCrkCenter	10449.78	Q2	ECM_Peak	489.00	52.37	56.61	56.61	57.99	0.011292	9.42	51.89	19.02	1.01
DominieCrkCenter	10449.78	Q5	PCM_Peak	826.00	50.74	55.77	55.77	57.69	0.011257	11.12	74.25	19.34	1.00
DominieCrkCenter	10449.78	Q5	ECM_Peak	826.00	52.37	58.88		59.94	0.004254	8.28	102.25	25.14	0.67

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10449.78	Q10	PCM_Peak	1063.00	50.74	56.53	56.53	58.72	0.011090	11.90	89.36	20.35	1.00
DominieCrkCenter	10449.78	Q10	ECM_Peak	1063.00	52.37	60.24		61.23	0.002889	8.08	138.92	28.77	0.58
DominieCrkCenter	10449.78	Q25	PCM_Peak	1365.00	50.74	57.42	57.42	59.88	0.010896	12.59	108.42	22.09	1.00
DominieCrkCenter	10449.78	Q25	ECM_Peak	1365.00	52.37	61.17		62.33	0.002849	8.82	166.97	31.77	0.59
DominieCrkCenter	10449.78	Q50	PCM_Peak	1592.00	50.74	58.02	58.02	60.67	0.010793	13.06	121.88	23.11	1.00
DominieCrkCenter	10449.78	Q50	ECM_Peak	1592.00	52.37	62.03		63.20	0.002525	8.97	195.72	35.28	0.56
DominieCrkCenter	10449.78	Q100	PCM_Peak	1824.00	50.74	58.66	58.62	61.41	0.010381	13.29	137.23	24.56	0.99
DominieCrkCenter	10449.78	Q100	ECM_Peak	1824.00	52.37	62.88		64.05	0.002245	9.05	227.34	39.30	0.54
DominieCrkCenter	10400	Q2	PCM_Peak	489.00	50.05	53.59	53.59	54.95	0.011436	9.36	52.22	19.17	1.00
DominieCrkCenter	10400	Q2	ECM_Peak	489.00	51.38	56.92	55.42	57.46	0.003083	5.90	82.87	22.38	0.54
DominieCrkCenter	10400	Q5	PCM_Peak	826.00	50.05	54.77	54.77	56.62	0.011059	10.92	75.63	20.45	1.00
DominieCrkCenter	10400	Q5	ECM_Peak	826.00	51.38	59.07	56.67	59.64	0.002245	6.09	135.60	26.65	0.48
DominieCrkCenter	10400	Q10	PCM_Peak	1063.00	50.05	55.62	55.49	57.63	0.010045	11.39	93.34	21.42	0.96
DominieCrkCenter	10400	Q10	ECM_Peak	1063.00	51.38	60.46	57.38	60.98	0.001693	5.85	192.56	44.00	0.42
DominieCrkCenter	10400	Q25	PCM_Peak	1365.00	50.05	57.05	56.32	58.89	0.007298	10.90	125.20	23.23	0.83
DominieCrkCenter	10400	Q25	ECM_Peak	1365.00	51.38	61.49	58.19	62.05	0.001521	6.16	239.76	47.79	0.41
DominieCrkCenter	10400	Q50	PCM_Peak	1592.00	50.05	58.05	56.91	59.82	0.006160	10.67	149.13	24.69	0.77
DominieCrkCenter	10400	Q50	ECM_Peak	1592.00	51.38	62.38	58.74	62.93	0.001294	6.15	283.77	50.61	0.39
DominieCrkCenter	10400	Q100	PCM_Peak	1824.00	50.05	59.03	57.47	60.73	0.005359	10.47	174.18	26.57	0.72
DominieCrkCenter	10400	Q100	ECM_Peak	1824.00	51.38	63.25	59.26	63.78	0.001126	6.15	328.82	53.50	0.37
DominieCrkCenter	10384.68	Q2	PCM_Peak	489.00	49.83	53.35	53.35	54.70	0.011467	9.33	52.41	19.43	1.00
DominieCrkCenter	10384.68	Q2	ECM_Peak	489.00	51.98	57.06		57.35	0.001620	4.35	112.40	31.55	0.41
DominieCrkCenter	10384.68	Q5	PCM_Peak	826.00	49.83	54.88	54.57	56.31	0.008414	9.58	86.23	23.97	0.89
DominieCrkCenter	10384.68	Q5	ECM_Peak	826.00	51.98	59.24		59.54	0.001144	4.36	189.33	40.39	0.36
DominieCrkCenter	10384.68	Q10	PCM_Peak	1063.00	49.83	55.98		57.29	0.006746	9.18	115.82	29.02	0.81
DominieCrkCenter	10384.68	Q10	ECM_Peak	1063.00	51.98	60.61		60.89	0.000850	4.27	251.50	54.49	0.32
DominieCrkCenter	10384.68	Q25	PCM_Peak	1365.00	49.83	57.48		58.59	0.004365	8.43	161.94	32.56	0.67
DominieCrkCenter	10384.68	Q25	ECM_Peak	1365.00	51.98	61.64		61.96	0.000773	4.56	314.04	64.27	0.31
DominieCrkCenter	10384.68	Q50	PCM_Peak	1592.00	49.83	58.50		59.52	0.003596	8.09	196.88	36.55	0.61
DominieCrkCenter	10384.68	Q50	ECM_Peak	1592.00	51.98	62.53		62.85	0.000660	4.58	373.78	70.07	0.29
DominieCrkCenter	10384.68	Q100	PCM_Peak	1824.00	49.83	59.51		60.43	0.003020	7.72	236.24	41.79	0.57
DominieCrkCenter	10384.68	Q100	ECM_Peak	1824.00	51.98	63.40		63.70	0.000570	4.57	435.73	72.92	0.28
DominieCrkCenter	10380.45	Q2	PCM_Peak	489.00	49.77	53.29	53.29	54.61	0.011477	9.24	52.95	20.12	1.00
DominieCrkCenter	10380.45	Q2	ECM_Peak	489.00	51.95	57.01		57.34	0.001731	4.61	106.10	26.86	0.41
DominieCrkCenter	10380.45	Q5	PCM_Peak	826.00	49.77	54.95	54.50	56.23	0.007548	9.08	90.97	24.77	0.84
DominieCrkCenter	10380.45	Q5	ECM_Peak	826.00	51.95	59.13		59.52	0.001437	5.02	164.43	29.51	0.38
DominieCrkCenter	10380.45	Q10	PCM_Peak	1063.00	49.77	55.97	55.12	57.26	0.006062	9.10	116.86	25.99	0.76
DominieCrkCenter	10380.45	Q10	ECM_Peak	1063.00	51.95	60.46		60.88	0.001222	5.15	211.10	48.11	0.35
DominieCrkCenter	10380.45	Q25	PCM_Peak	1365.00	49.77	57.31		58.55	0.004650	8.96	152.40	26.96	0.66
DominieCrkCenter	10380.45	Q25	ECM_Peak	1365.00	51.95	61.47		61.94	0.001182	5.57	266.13	61.97	0.35

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10380.45	Q50	PCM_Peak	1592.00	49.77	58.23		59.48	0.004085	8.97	177.41	27.28	0.62
DominieCrkCenter	10380.45	Q50	ECM_Peak	1592.00	51.95	62.39		62.83	0.000997	5.51	326.82	69.16	0.33
DominieCrkCenter	10380.45	Q100	PCM_Peak	1824.00	49.77	59.13		60.39	0.003857	9.00	202.77	29.51	0.60
DominieCrkCenter	10380.45	Q100	ECM_Peak	1824.00	51.95	63.28		63.69	0.000847	5.43	391.49	76.37	0.31
DominieCrkCenter	10368.59	Q2	PCM_Peak	489.00	49.61	53.07	53.06	54.41	0.011616	9.29	52.61	19.73	1.00
DominieCrkCenter	10368.59	Q2	ECM_Peak	489.00	51.31	56.81		57.30	0.002907	5.59	87.47	23.12	0.51
DominieCrkCenter	10368.59	Q5	PCM_Peak	826.00	49.61	54.23	54.22	56.07	0.011250	10.90	75.78	20.43	1.00
DominieCrkCenter	10368.59	Q5	ECM_Peak	826.00	51.31	58.97		59.49	0.002172	5.77	143.28	28.12	0.45
DominieCrkCenter	10368.59	Q10	PCM_Peak	1063.00	49.61	55.18	54.92	57.10	0.009553	11.13	95.47	21.00	0.92
DominieCrkCenter	10368.59	Q10	ECM_Peak	1063.00	51.31	60.33		60.85	0.001904	5.77	186.38	44.38	0.43
DominieCrkCenter	10368.59	Q25	PCM_Peak	1365.00	49.61	56.63		58.43	0.007261	10.78	126.66	22.61	0.80
DominieCrkCenter	10368.59	Q25	ECM_Peak	1365.00	51.31	61.35		61.91	0.001742	6.09	236.28	53.29	0.42
DominieCrkCenter	10368.59	Q50	PCM_Peak	1592.00	49.61	57.66		59.37	0.006386	10.51	151.43	25.43	0.76
DominieCrkCenter	10368.59	Q50	ECM_Peak	1592.00	51.31	62.27		62.81	0.001413	6.00	288.51	59.52	0.39
DominieCrkCenter	10368.59	Q100	PCM_Peak	1824.00	49.61	58.67		60.29	0.005481	10.23	178.30	27.55	0.71
DominieCrkCenter	10368.59	Q100	ECM_Peak	1824.00	51.31	63.17		63.67	0.001176	5.90	344.91	66.86	0.36
DominieCrkCenter	10363.46	Q2	PCM_Peak	489.00	49.54	53.01	53.01	54.34	0.011639	9.28	52.69	19.75	1.00
DominieCrkCenter	10363.46	Q2	ECM_Peak	489.00	50.99	56.88	54.53	57.25	0.001799	4.84	101.08	21.99	0.40
DominieCrkCenter	10363.46	Q5	PCM_Peak	826.00	49.54	54.14	54.14	56.00	0.011442	10.94	75.48	20.32	1.00
DominieCrkCenter	10363.46	Q5	ECM_Peak	826.00	50.99	58.99	55.71	59.46	0.001722	5.51	149.90	24.05	0.39
DominieCrkCenter	10363.46	Q10	PCM_Peak	1063.00	49.54	55.13	54.85	57.04	0.009516	11.10	95.79	20.82	0.91
DominieCrkCenter	10363.46	Q10	ECM_Peak	1063.00	50.99	60.30	56.42	60.84	0.001652	5.85	181.56	28.82	0.38
DominieCrkCenter	10363.46	Q25	PCM_Peak	1365.00	49.54	56.57	55.66	58.38	0.007118	10.82	126.15	21.71	0.79
DominieCrkCenter	10363.46	Q25	ECM_Peak	1365.00	50.99	61.19	57.24	61.89	0.001938	6.72	203.01	30.25	0.41
DominieCrkCenter	10363.46	Q50	PCM_Peak	1592.00	49.54	57.46	56.23	59.32	0.006284	10.96	145.30	22.70	0.74
DominieCrkCenter	10363.46	Q50	ECM_Peak	1592.00	50.99	61.97	57.81	62.77	0.001960	7.17	222.12	48.65	0.42
DominieCrkCenter	10363.46	Q100	PCM_Peak	1824.00	49.54	58.28	56.76	60.23	0.005842	11.20	162.82	23.61	0.72
DominieCrkCenter	10363.46	Q100	ECM_Peak	1824.00	50.99	62.73	58.36	63.62	0.001971	7.58	240.64	56.65	0.42
DominieCrkCenter	10358.39	Q2	PCM_Peak	489.00	49.44	52.79	52.63	54.08	0.010946	9.08	53.83	17.99	0.93
DominieCrkCenter	10358.39	Q2	ECM_Peak	489.00	50.75	56.65	54.54	57.21	0.005014	6.02	81.21	15.63	0.47
DominieCrkCenter	10358.39	Q5	PCM_Peak	826.00	49.44	54.06	53.83	55.86	0.011082	10.79	76.56	18.02	0.92
DominieCrkCenter	10358.39	Q5	ECM_Peak	826.00	50.75	58.55	55.86	59.41	0.006510	7.44	111.02	15.74	0.49
DominieCrkCenter	10358.39	Q10	PCM_Peak	1063.00	49.44	54.83	54.57	56.97	0.011350	11.74	90.53	18.04	0.92
DominieCrkCenter	10358.39	Q10	ECM_Peak	1063.00	50.75	59.72	56.69	60.77	0.007390	8.21	129.51	15.81	0.51
DominieCrkCenter	10358.39	Q25	PCM_Peak	1365.00	49.44	55.74	55.43	58.27	0.011722	12.77	106.88	18.06	0.93
DominieCrkCenter	10358.39	Q25	ECM_Peak	1365.00	50.75	60.27	57.65	61.79	0.010411	9.88	138.21	15.85	0.59
DominieCrkCenter	10358.39	Q50	PCM_Peak	1592.00	49.44	56.38	56.04	59.18	0.012004	13.45	118.41	18.07	0.93
DominieCrkCenter	10358.39	Q50	ECM_Peak	1592.00	50.75	60.82	58.29	62.65	0.012214	10.83	146.97	15.89	0.63
DominieCrkCenter	10358.39	Q100	PCM_Peak	1824.00	49.44	57.00	56.63	60.07	0.012297	14.07	129.63	18.28	0.93
DominieCrkCenter	10358.39	Q100	ECM_Peak	1824.00	50.75	61.32	58.94	63.48	0.014135	11.77	154.92	15.93	0.67

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10358.29			Bridge									
DominieCrkCenter	10358.17	Q2	ECM_Peak	489.00	50.75	54.75	54.56	56.14	0.016537	9.47	51.66	15.52	0.91
DominieCrkCenter	10358.17	Q5	ECM_Peak	826.00	50.75	56.12	55.86	58.11	0.018854	11.32	72.98	15.60	0.92
DominieCrkCenter	10358.17	Q10	ECM_Peak	1063.00	50.75	56.99	56.69	59.33	0.020145	12.28	86.53	15.65	0.92
DominieCrkCenter	10358.17	Q25	ECM_Peak	1365.00	50.75	58.00	57.65	60.76	0.021752	13.34	102.36	15.71	0.92
DominieCrkCenter	10358.17	Q50	ECM_Peak	1592.00	50.75	58.71	58.32	61.76	0.022919	14.03	113.46	15.75	0.92
DominieCrkCenter	10358.17	Q100	ECM_Peak	1824.00	50.75	59.09	58.97	62.71	0.026459	15.26	119.54	15.78	0.98
DominieCrkCenter	10336.01	Q2	PCM_Peak	489.00	48.85	51.86	51.86	53.32	0.013754	9.67	50.56	17.61	1.01
DominieCrkCenter	10336.01	Q2	ECM_Peak	489.00	48.08	52.65	52.65	54.15	0.013847	9.82	49.81	16.77	1.00
DominieCrkCenter	10336.01	Q5	PCM_Peak	826.00	48.85	53.08	53.08	55.12	0.013745	11.46	72.05	17.62	1.00
DominieCrkCenter	10336.01	Q5	ECM_Peak	826.00	48.08	53.90	53.90	56.00	0.013935	11.63	71.03	17.21	1.01
DominieCrkCenter	10336.01	Q10	PCM_Peak	1063.00	48.85	53.83	53.83	56.25	0.014035	12.48	85.17	17.62	1.00
DominieCrkCenter	10336.01	Q10	ECM_Peak	1063.00	48.08	54.68	54.68	57.13	0.014022	12.58	84.50	17.49	1.01
DominieCrkCenter	10336.01	Q25	PCM_Peak	1365.00	48.85	54.71	54.71	57.56	0.014417	13.57	100.63	17.62	1.00
DominieCrkCenter	10336.01	Q25	ECM_Peak	1365.00	48.08	55.61	55.61	58.44	0.014028	13.51	101.07	18.10	1.01
DominieCrkCenter	10336.01	Q50	PCM_Peak	1592.00	48.85	55.32	55.32	58.49	0.014722	14.28	111.51	17.62	1.00
DominieCrkCenter	10336.01	Q50	ECM_Peak	1592.00	48.08	56.26	56.26	59.35	0.013638	14.10	113.13	19.08	1.00
DominieCrkCenter	10336.01	Q100	PCM_Peak	1824.00	48.85	55.92	55.92	59.39	0.015050	14.94	122.06	17.62	1.00
DominieCrkCenter	10336.01	Q100	ECM_Peak	1824.00	48.08	56.90	56.90	60.21	0.013067	14.61	125.62	20.09	0.99
DominieCrkCenter	10329.97	Q2	PCM_Peak	489.00	46.64	51.72		52.18	0.003326	5.50	88.89	24.99	0.51
DominieCrkCenter	10329.97	Q2	ECM_Peak	489.00	46.64	51.70		52.18	0.003368	5.61	87.23	24.53	0.52
DominieCrkCenter	10329.97	Q5	PCM_Peak	826.00	46.64	52.67		53.50	0.004619	7.30	113.20	25.80	0.61
DominieCrkCenter	10329.97	Q5	ECM_Peak	826.00	46.64	52.63		53.50	0.004754	7.47	110.60	25.46	0.63
DominieCrkCenter	10329.97	Q10	PCM_Peak	1063.00	46.64	53.34		54.37	0.005016	8.13	130.69	26.36	0.64
DominieCrkCenter	10329.97	Q10	ECM_Peak	1063.00	46.64	53.29		54.37	0.005190	8.34	127.53	26.11	0.66
DominieCrkCenter	10329.97	Q25	PCM_Peak	1365.00	46.64	54.09		55.37	0.005475	9.06	150.62	26.97	0.68
DominieCrkCenter	10329.97	Q25	ECM_Peak	1365.00	46.64	54.02		55.36	0.005682	9.29	146.89	26.82	0.70
DominieCrkCenter	10329.97	Q50	PCM_Peak	1592.00	46.64	54.56		56.04	0.005882	9.74	163.46	27.36	0.70
DominieCrkCenter	10329.97	Q50	ECM_Peak	1592.00	46.64	54.47		56.02	0.006151	10.01	159.03	27.26	0.73
DominieCrkCenter	10329.97	Q100	PCM_Peak	1824.00	46.64	54.98		56.67	0.006366	10.43	174.84	27.70	0.73
DominieCrkCenter	10329.97	Q100	ECM_Peak	1824.00	46.64	54.93		56.68	0.006479	10.62	171.76	27.71	0.75
DominieCrkCenter	10315.61	Q2	PCM_Peak	489.00	47.38	51.41		52.10	0.005608	6.66	73.37	25.69	0.69
DominieCrkCenter	10315.61	Q2	ECM_Peak	489.00	47.38	51.41		52.10	0.005608	6.66	73.37	25.69	0.69
DominieCrkCenter	10315.61	Q5	PCM_Peak	826.00	47.38	52.12		53.37	0.008170	8.98	92.00	26.98	0.86
DominieCrkCenter	10315.61	Q5	ECM_Peak	826.00	47.38	52.12		53.37	0.008170	8.98	92.00	26.98	0.86
DominieCrkCenter	10315.61	Q10	PCM_Peak	1063.00	47.38	52.87		54.25	0.007475	9.43	112.67	28.39	0.83
DominieCrkCenter	10315.61	Q10	ECM_Peak	1063.00	47.38	52.86		54.25	0.007499	9.45	112.54	28.38	0.84
DominieCrkCenter	10315.61	Q25	PCM_Peak	1365.00	47.38	53.74		55.25	0.006876	9.88	138.22	30.34	0.82

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10315.61	Q25	ECM_Peak	1365.00	47.38	53.74		55.25	0.006876	9.88	138.21	30.34	0.82
DominieCrkCenter	10315.61	Q50	PCM_Peak	1592.00	47.38	54.32		55.93	0.006588	10.18	156.41	31.65	0.81
DominieCrkCenter	10315.61	Q50	ECM_Peak	1592.00	47.38	54.32		55.93	0.006592	10.18	156.38	31.65	0.81
DominieCrkCenter	10315.61	Q100	PCM_Peak	1824.00	47.38	54.88		56.58	0.006362	10.46	174.43	32.90	0.80
DominieCrkCenter	10315.61	Q100	ECM_Peak	1824.00	47.38	54.87		56.57	0.006412	10.49	173.95	32.87	0.80
DominieCrkCenter	10296	Q2	PCM_Peak	489.00	47.54	50.87	50.87	51.91	0.011678	8.22	59.52	28.46	1.00
DominieCrkCenter	10296	Q2	ECM_Peak	489.00	47.54	50.87	50.87	51.91	0.011678	8.22	59.52	28.46	1.00
DominieCrkCenter	10296	Q5	PCM_Peak	826.00	47.54	51.85	51.77	53.19	0.010060	9.30	88.79	31.16	0.97
DominieCrkCenter	10296	Q5	ECM_Peak	826.00	47.54	51.85	51.77	53.19	0.010062	9.30	88.78	31.15	0.97
DominieCrkCenter	10296	Q10	PCM_Peak	1063.00	47.54	52.87	52.32	54.05	0.006491	8.71	121.98	33.52	0.81
DominieCrkCenter	10296	Q10	ECM_Peak	1063.00	47.54	52.87	52.32	54.05	0.006517	8.73	121.81	33.51	0.81
DominieCrkCenter	10296	Q25	PCM_Peak	1365.00	47.54	53.84		55.04	0.005248	8.79	155.36	35.48	0.74
DominieCrkCenter	10296	Q25	ECM_Peak	1365.00	47.54	53.84		55.04	0.005249	8.79	155.36	35.48	0.74
DominieCrkCenter	10296	Q50	PCM_Peak	1592.00	47.54	54.47		55.71	0.004790	8.93	178.18	36.75	0.72
DominieCrkCenter	10296	Q50	ECM_Peak	1592.00	47.54	54.47		55.71	0.004793	8.94	178.14	36.75	0.72
DominieCrkCenter	10296	Q100	PCM_Peak	1824.00	47.54	55.06		56.35	0.004483	9.11	200.31	37.94	0.70
DominieCrkCenter	10296	Q100	ECM_Peak	1824.00	47.54	55.05		56.34	0.004516	9.13	199.79	37.91	0.70
DominieCrkCenter	10265.61	Q2	PCM_Peak	489.00	46.98	50.10	50.10	51.35	0.011076	9.00	54.35	21.91	1.01
DominieCrkCenter	10265.61	Q2	ECM_Peak	489.00	46.98	50.10	50.10	51.35	0.011076	9.00	54.35	21.91	1.01
DominieCrkCenter	10265.61	Q5	PCM_Peak	826.00	46.98	51.20	51.20	52.86	0.010387	10.33	79.99	24.47	1.01
DominieCrkCenter	10265.61	Q5	ECM_Peak	826.00	46.98	51.20	51.20	52.86	0.010384	10.32	80.00	24.47	1.01
DominieCrkCenter	10265.61	Q10	PCM_Peak	1063.00	46.98	51.86	51.86	53.74	0.010092	11.01	96.57	25.99	1.01
DominieCrkCenter	10265.61	Q10	ECM_Peak	1063.00	46.98	51.88	51.88	53.74	0.009969	10.96	96.99	26.02	1.00
DominieCrkCenter	10265.61	Q25	PCM_Peak	1365.00	46.98	52.60	52.60	54.73	0.009819	11.71	116.57	27.71	1.01
DominieCrkCenter	10265.61	Q25	ECM_Peak	1365.00	46.98	52.60	52.60	54.73	0.009818	11.71	116.57	27.71	1.01
DominieCrkCenter	10265.61	Q50	PCM_Peak	1592.00	46.98	53.13	53.13	55.41	0.009584	12.12	131.33	28.91	1.00
DominieCrkCenter	10265.61	Q50	ECM_Peak	1592.00	46.98	53.13	53.13	55.41	0.009562	12.11	131.43	28.92	1.00
DominieCrkCenter	10265.61	Q100	PCM_Peak	1824.00	46.98	53.62	53.62	56.05	0.009412	12.51	145.83	30.05	1.00
DominieCrkCenter	10265.61	Q100	ECM_Peak	1824.00	46.98	53.68	53.62	56.05	0.009089	12.35	147.69	30.19	0.98
DominieCrkCenter	10236.05	Q2	PCM_Peak	489.00	46.10	49.59	49.42	50.65	0.008776	8.24	59.31	23.22	0.91
DominieCrkCenter	10236.05	Q2	ECM_Peak	489.00	46.10	49.56	49.42	50.64	0.009160	8.37	58.45	23.13	0.93
DominieCrkCenter	10236.05	Q5	PCM_Peak	826.00	46.10	50.64	50.49	52.11	0.008886	9.72	84.95	25.67	0.94
DominieCrkCenter	10236.05	Q5	ECM_Peak	826.00	46.10	50.69	50.48	52.12	0.008556	9.59	86.09	25.77	0.93
DominieCrkCenter	10236.05	Q10	PCM_Peak	1063.00	46.10	51.31	51.13	52.98	0.008583	10.35	102.73	27.24	0.94
DominieCrkCenter	10236.05	Q10	ECM_Peak	1063.00	46.10	51.44		53.00	0.007841	10.02	106.08	27.53	0.90
DominieCrkCenter	10236.05	Q25	PCM_Peak	1365.00	46.10	52.10	51.86	53.95	0.008195	10.94	124.82	29.11	0.93
DominieCrkCenter	10236.05	Q25	ECM_Peak	1365.00	46.10	52.44	51.85	54.03	0.006594	10.11	134.96	29.93	0.84
DominieCrkCenter	10236.05	Q50	PCM_Peak	1592.00	46.10	53.14		54.75	0.005957	10.18	156.44	31.59	0.81
DominieCrkCenter	10236.05	Q50	ECM_Peak	1592.00	46.10	53.14		54.75	0.005963	10.18	156.38	31.59	0.81
DominieCrkCenter	10236.05	Q100	PCM_Peak	1824.00	46.10	54.08		55.55	0.004775	9.75	187.14	33.83	0.73

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10236.05	Q100	ECM_Peak	1824.00	46.10	54.14		55.58	0.004630	9.64	189.25	33.98	0.72
DominieCrkCenter	10200.05	Q2	PCM_Peak	489.00	45.49	49.04	49.04	50.27	0.011307	8.89	55.02	22.81	1.01
DominieCrkCenter	10200.05	Q2	ECM_Peak	489.00	45.49	49.04	49.04	50.26	0.010926	8.87	55.20	22.87	1.00
DominieCrkCenter	10200.05	Q5	PCM_Peak	826.00	45.49	50.12	50.12	51.74	0.010418	10.20	80.95	25.05	1.00
DominieCrkCenter	10200.05	Q5	ECM_Peak	826.00	45.49	50.08	50.08	51.76	0.009834	10.43	79.94	24.98	1.00
DominieCrkCenter	10200.05	Q10	PCM_Peak	1063.00	45.49	50.77	50.77	52.61	0.010125	10.91	97.44	26.37	1.00
DominieCrkCenter	10200.05	Q10	ECM_Peak	1063.00	45.49	50.73	50.73	52.66	0.008952	11.19	96.79	26.34	0.98
DominieCrkCenter	10200.05	Q25	PCM_Peak	1365.00	45.49	51.49	51.49	53.60	0.009874	11.65	117.19	27.88	1.00
DominieCrkCenter	10200.05	Q25	ECM_Peak	1365.00	45.49	51.46	51.46	53.70	0.008387	12.09	116.48	27.84	0.97
DominieCrkCenter	10200.05	Q50	PCM_Peak	1592.00	45.49	53.01		54.51	0.005447	9.85	161.66	31.00	0.76
DominieCrkCenter	10200.05	Q50	ECM_Peak	1592.00	45.49	52.68	51.98	54.52	0.005153	11.04	152.13	30.38	0.79
DominieCrkCenter	10200.05	Q100	PCM_Peak	1824.00	45.49	53.97		55.36	0.004408	9.47	192.52	33.01	0.69
DominieCrkCenter	10200.05	Q100	ECM_Peak	1824.00	45.49	53.75		55.41	0.003785	10.55	185.75	32.59	0.70
DominieCrkCenter	10149.96	Q2	PCM_Peak	489.00	43.58	47.91		48.61	0.004963	6.71	72.88	24.84	0.69
DominieCrkCenter	10149.96	Q2	ECM_Peak	489.00	43.58	47.85		48.60	0.004719	7.01	71.36	24.72	0.70
DominieCrkCenter	10149.96	Q5	PCM_Peak	826.00	43.58	49.05		50.06	0.005271	8.06	102.51	27.12	0.73
DominieCrkCenter	10149.96	Q5	ECM_Peak	826.00	43.58	48.87		50.04	0.005106	8.80	97.64	26.76	0.76
DominieCrkCenter	10149.96	Q10	PCM_Peak	1063.00	43.58	50.80		51.55	0.002800	6.94	153.13	30.63	0.55
DominieCrkCenter	10149.96	Q10	ECM_Peak	1063.00	43.58	50.44		51.40	0.002740	8.00	142.34	29.92	0.59
DominieCrkCenter	10149.96	Q25	PCM_Peak	1365.00	43.58	51.24		52.28	0.003644	8.19	166.65	31.50	0.63
DominieCrkCenter	10149.96	Q25	ECM_Peak	1365.00	43.58	50.75		52.14	0.003756	9.70	151.60	30.53	0.70
DominieCrkCenter	10149.96	Q50	PCM_Peak	1592.00	43.58	53.44		54.12	0.001788	6.61	240.94	35.92	0.45
DominieCrkCenter	10149.96	Q50	ECM_Peak	1592.00	43.58	53.27		54.10	0.001454	7.61	234.76	35.57	0.46
DominieCrkCenter	10149.96	Q100	PCM_Peak	1824.00	43.58	54.33		55.02	0.001653	6.66	273.84	37.70	0.44
DominieCrkCenter	10149.96	Q100	ECM_Peak	1824.00	43.58	54.22		55.06	0.001294	7.71	269.54	37.48	0.44
DominieCrkCenter	10100.95	Q2	PCM_Peak	489.00	43.93	47.31	47.06	48.27	0.008098	7.88	62.06	24.44	0.87
DominieCrkCenter	10100.95	Q2	ECM_Peak	489.00	43.93	47.21	47.05	48.26	0.009130	8.21	59.57	24.17	0.92
DominieCrkCenter	10100.95	Q5	PCM_Peak	826.00	43.93	48.49		49.73	0.007210	8.93	92.50	26.98	0.85
DominieCrkCenter	10100.95	Q5	ECM_Peak	826.00	43.93	48.51		49.74	0.006910	8.90	92.92	26.96	0.84
DominieCrkCenter	10100.95	Q10	PCM_Peak	1063.00	43.93	50.68		51.41	0.002686	6.83	155.53	30.88	0.54
DominieCrkCenter	10100.95	Q10	ECM_Peak	1063.00	43.93	50.38		51.23	0.002719	7.40	146.21	30.20	0.56
DominieCrkCenter	10100.95	Q25	PCM_Peak	1365.00	43.93	51.06		52.09	0.003622	8.15	167.48	31.82	0.63
DominieCrkCenter	10100.95	Q25	ECM_Peak	1365.00	43.93	50.66		51.92	0.003770	9.02	154.72	30.79	0.67
DominieCrkCenter	10100.95	Q50	PCM_Peak	1592.00	43.93	53.36		54.03	0.001695	6.53	243.76	34.30	0.43
DominieCrkCenter	10100.95	Q50	ECM_Peak	1592.00	43.93	53.26		54.00	0.001383	7.03	239.66	34.17	0.43
DominieCrkCenter	10100.95	Q100	PCM_Peak	1824.00	43.93	54.26		54.94	0.001590	6.64	274.76	35.19	0.42
DominieCrkCenter	10100.95	Q100	ECM_Peak	1824.00	43.93	54.21		54.97	0.001238	7.16	272.61	35.12	0.42
DominieCrkCenter	10000.54	Q2	PCM_Peak	489.00	40.22	45.86	45.86	47.19	0.013803	9.25	52.84	19.97	1.00
DominieCrkCenter	10000.54	Q2	ECM_Peak	489.00	40.22	45.86	45.86	47.20	0.011550	9.28	52.79	19.96	1.00

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	10000.54	Q5	PCM_Peak	826.00	40.22	47.35	47.02	48.85	0.010120	9.84	83.94	21.90	0.89
DominieCrkCenter	10000.54	Q5	ECM_Peak	826.00	40.22	47.01	47.01	48.86	0.009962	10.93	76.52	21.45	0.99
DominieCrkCenter	10000.54	Q10	PCM_Peak	1063.00	40.22	50.41	47.73	51.13	0.002839	6.76	157.17	25.90	0.48
DominieCrkCenter	10000.54	Q10	ECM_Peak	1063.00	40.22	50.16	47.72	50.99	0.002070	7.44	150.54	25.54	0.50
DominieCrkCenter	10000.54	Q25	PCM_Peak	1365.00	40.22	50.58	48.53	51.69	0.004354	8.46	161.43	26.18	0.60
DominieCrkCenter	10000.54	Q25	ECM_Peak	1365.00	40.22	50.19	48.55	51.55	0.003355	9.50	151.42	25.58	0.63
DominieCrkCenter	10000.54	Q50	PCM_Peak	1592.00	40.22	53.10	49.08	53.83	0.002207	6.84	232.83	30.44	0.44
DominieCrkCenter	10000.54	Q50	ECM_Peak	1592.00	40.22	53.02	49.11	53.85	0.001348	7.55	230.49	30.31	0.42
DominieCrkCenter	10000.54	Q100	PCM_Peak	1824.00	40.22	53.99	49.62	54.75	0.002144	7.00	260.48	44.19	0.43
DominieCrkCenter	10000.54	Q100	ECM_Peak	1824.00	40.22	53.97	49.66	54.84	0.001259	7.76	259.95	43.87	0.42
DominieCrkCenter	9977.44	Q2	PCM_Peak	489.00	39.92	45.67	44.69	46.45	0.006019	7.08	69.10	20.43	0.68
DominieCrkCenter	9977.44	Q2	ECM_Peak	489.00	39.92	44.69	44.69	46.13	0.013627	9.62	50.83	17.63	1.00
DominieCrkCenter	9977.44	Q5	PCM_Peak	826.00	39.92	47.71	46.07	48.49	0.004061	7.08	116.64	24.97	0.58
DominieCrkCenter	9977.44	Q5	ECM_Peak	826.00	39.92	47.11	46.00	48.18	0.005376	8.41	101.84	24.09	0.65
DominieCrkCenter	9977.44	Q10	PCM_Peak	1063.00	39.92	50.53	46.78	51.00	0.001648	5.52	192.75	29.04	0.38
DominieCrkCenter	9977.44	Q10	ECM_Peak	1063.00	39.92	50.33	46.80	50.85	0.001690	6.04	186.75	28.73	0.37
DominieCrkCenter	9977.44	Q25	PCM_Peak	1365.00	39.92	50.77	47.56	51.50	0.002461	6.83	199.78	29.39	0.46
DominieCrkCenter	9977.44	Q25	ECM_Peak	1365.00	39.92	50.49	47.63	51.32	0.002603	7.57	191.51	28.97	0.46
DominieCrkCenter	9977.44	Q50	PCM_Peak	1592.00	39.92	53.21	48.09	53.72	0.001389	5.78	275.50	47.50	0.35
DominieCrkCenter	9977.44	Q50	ECM_Peak	1592.00	39.92	53.20	48.18	53.74	0.001340	6.17	275.13	50.57	0.32
DominieCrkCenter	9977.44	Q100	PCM_Peak	1824.00	39.92	54.09	48.61	54.65	0.001378	5.98	305.19	57.22	0.35
DominieCrkCenter	9977.44	Q100	ECM_Peak	1824.00	39.92	54.15	48.71	54.72	0.001303	6.33	307.16	57.31	0.32
DominieCrkCenter	9962.32	Q2	PCM_Peak	489.00	41.06	45.80	44.37	46.30	0.003255	5.65	86.51	24.71	0.53
DominieCrkCenter	9962.32	Q2	ECM_Peak	489.00	41.06	44.99	44.36	45.81	0.006251	7.29	67.07	22.43	0.73
DominieCrkCenter	9962.32	Q5	PCM_Peak	826.00	41.06	47.83	45.53	48.38	0.002340	5.91	139.86	28.29	0.46
DominieCrkCenter	9962.32	Q5	ECM_Peak	826.00	41.06	47.25	45.45	48.04	0.003225	7.13	115.85	26.88	0.54
DominieCrkCenter	9962.32	Q10	PCM_Peak	1063.00	41.06	50.59	46.19	50.95	0.001079	4.82	220.36	35.31	0.32
DominieCrkCenter	9962.32	Q10	ECM_Peak	1063.00	41.06	50.30	46.11	50.83	0.001360	5.84	181.89	40.97	0.36
DominieCrkCenter	9962.32	Q25	PCM_Peak	1365.00	41.06	50.86	46.92	51.42	0.001603	5.96	228.86	36.27	0.39
DominieCrkCenter	9962.32	Q25	ECM_Peak	1365.00	41.06	50.44	46.87	51.28	0.002138	7.39	184.81	41.43	0.45
DominieCrkCenter	9962.32	Q50	PCM_Peak	1592.00	41.06	53.26	47.42	53.68	0.000975	5.19	306.93	41.01	0.30
DominieCrkCenter	9962.32	Q50	ECM_Peak	1592.00	41.06	53.02	47.41	53.70	0.001307	6.61	240.85	49.08	0.35
DominieCrkCenter	9962.32	Q100	PCM_Peak	1824.00	41.06	54.15	47.91	54.60	0.000987	5.40	337.63	50.55	0.31
DominieCrkCenter	9962.32	Q100	ECM_Peak	1824.00	41.06	53.91	47.93	54.68	0.001326	7.01	260.17	50.24	0.36
DominieCrkCenter	9953.65	Q2	PCM_Peak	489.00	41.15	45.83	44.25	46.25	0.002735	5.17	94.56	33.87	0.46
DominieCrkCenter	9953.65	Q2	ECM_Peak	489.00	41.24	44.69	44.36	45.72	0.010502	8.15	60.03	36.80	0.84
DominieCrkCenter	9953.65	Q5	PCM_Peak	826.00	41.15	47.83	45.23	48.35	0.002298	5.79	142.73	33.97	0.42
DominieCrkCenter	9953.65	Q5	ECM_Peak	826.00	41.24	47.12	45.46	47.99	0.005281	7.48	110.56	39.27	0.58
DominieCrkCenter	9953.65	Q10	PCM_Peak	1063.00	41.15	50.53	45.83	50.94	0.001296	5.11	208.11	34.12	0.31
DominieCrkCenter	9953.65	Q10	ECM_Peak	1063.00	41.24	50.28	46.15	50.82	0.002436	5.85	182.11	42.65	0.38

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	9953.65	Q25	PCM_Peak	1365.00	41.15	50.89	46.55	51.38	0.001607	5.80	251.41	45.51	0.34
DominieCrkCenter	9953.65	Q25	ECM_Peak	1365.00	41.24	50.41	46.94	51.26	0.003813	7.39	185.18	42.66	0.47
DominieCrkCenter	9953.65	Q50	PCM_Peak	1592.00	41.15	53.29	47.05	53.65	0.000944	5.02	341.30	49.15	0.26
DominieCrkCenter	9953.65	Q50	ECM_Peak	1592.00	41.24	53.04	47.61	53.68	0.002007	6.42	248.88	57.34	0.35
DominieCrkCenter	9953.65	Q100	PCM_Peak	1824.00	41.15	54.18	47.53	54.57	0.000965	5.29	377.13	62.63	0.27
DominieCrkCenter	9953.65	Q100	ECM_Peak	1824.00	41.24	53.94	48.13	54.65	0.001990	6.76	270.77	58.57	0.36
DominieCrkCenter	9950.87	Q2	PCM_Peak	489.00	41.15	45.82	44.25	46.24	0.002754	5.18	94.35	33.87	0.46
DominieCrkCenter	9950.87	Q2	ECM_Peak	489.00	41.24	44.40	44.35	45.67	0.014239	9.04	54.13	35.83	0.98
DominieCrkCenter	9950.87	Q5	PCM_Peak	826.00	41.15	47.82	45.23	48.34	0.002306	5.79	142.56	33.97	0.42
DominieCrkCenter	9950.87	Q5	ECM_Peak	826.00	41.24	47.10	45.46	47.98	0.005337	7.51	110.13	39.26	0.58
DominieCrkCenter	9950.87	Q10	PCM_Peak	1063.00	41.15	50.53	45.84	50.93	0.001297	5.11	208.02	34.12	0.31
DominieCrkCenter	9950.87	Q10	ECM_Peak	1063.00	41.24	50.26	46.14	50.80	0.002457	5.87	181.61	42.65	0.38
DominieCrkCenter	9950.87	Q25	PCM_Peak	1365.00	41.15	50.89	46.55	51.38	0.001610	5.80	251.24	45.51	0.34
DominieCrkCenter	9950.87	Q25	ECM_Peak	1365.00	41.24	50.36	46.94	51.22	0.003892	7.44	183.96	42.66	0.48
DominieCrkCenter	9950.87	Q50	PCM_Peak	1592.00	41.15	53.29	47.05	53.65	0.000945	5.02	341.19	49.14	0.26
DominieCrkCenter	9950.87	Q50	ECM_Peak	1592.00	41.24	52.87	47.61	53.53	0.002114	6.52	244.94	57.12	0.36
DominieCrkCenter	9950.87	Q100	PCM_Peak	1824.00	41.15	54.18	47.54	54.57	0.000966	5.29	377.01	62.59	0.27
DominieCrkCenter	9950.87	Q100	ECM_Peak	1824.00	41.24	53.78	48.12	54.51	0.002085	6.86	266.91	58.35	0.36
DominieCrkCenter	9943.93	Q2	PCM_Peak	489.00	40.68	45.92	43.66	46.18	0.001126	4.09	119.61	49.63	0.34
DominieCrkCenter	9943.93	Q2	ECM_Peak	489.00	38.38	45.13	42.72	45.33	0.000800	3.61	135.79	49.59	0.30
DominieCrkCenter	9943.93	Q5	PCM_Peak	826.00	40.68	47.97	44.57	48.27	0.000895	4.50	195.30	58.37	0.31
DominieCrkCenter	9943.93	Q5	ECM_Peak	826.00	38.38	47.54	43.55	47.78	0.000530	3.93	210.68	49.64	0.27
DominieCrkCenter	9943.93	Q10	PCM_Peak	1063.00	40.68	50.65	45.13	50.87	0.000424	3.90	297.56	63.20	0.23
DominieCrkCenter	9943.93	Q10	ECM_Peak	1063.00	38.38	50.51	44.07	50.69	0.000251	3.44	327.80	62.92	0.19
DominieCrkCenter	9943.93	Q25	PCM_Peak	1365.00	40.68	50.99	45.79	51.33	0.000612	4.80	311.50	63.86	0.27
DominieCrkCenter	9943.93	Q25	ECM_Peak	1365.00	38.38	50.76	44.67	51.04	0.000377	4.30	339.08	63.41	0.24
DominieCrkCenter	9943.93	Q50	PCM_Peak	1592.00	40.68	53.35	46.25	53.61	0.000366	4.31	413.44	68.28	0.22
DominieCrkCenter	9943.93	Q50	ECM_Peak	1592.00	38.38	53.18	45.10	53.40	0.000232	3.89	452.32	67.88	0.19
DominieCrkCenter	9943.93	Q100	PCM_Peak	1824.00	40.68	54.24	46.71	54.54	0.000374	4.57	455.58	74.07	0.23
DominieCrkCenter	9943.93	Q100	ECM_Peak	1824.00	38.38	54.11	45.50	54.36	0.000234	4.10	499.81	72.12	0.20
DominieCrkCenter	9934.14	Q2	PCM_Peak	489.00	40.29	46.02	43.06	46.13	0.000384	2.71	189.59	56.66	0.22
DominieCrkCenter	9934.14	Q2	ECM_Peak	489.00	36.33	45.13	42.38	45.32	0.000836	3.51	143.44	53.92	0.28
DominieCrkCenter	9934.14	Q5	PCM_Peak	826.00	40.29	48.07	43.79	48.21	0.000312	3.11	284.14	59.69	0.21
DominieCrkCenter	9934.14	Q5	ECM_Peak	826.00	36.33	47.56	43.28	47.76	0.000556	3.75	233.32	59.03	0.24
DominieCrkCenter	9934.14	Q10	PCM_Peak	1063.00	40.29	50.73	44.25	50.84	0.000163	2.79	416.18	64.83	0.16
DominieCrkCenter	9934.14	Q10	ECM_Peak	1063.00	36.33	50.53	43.86	50.67	0.000262	3.23	356.77	64.39	0.18
DominieCrkCenter	9934.14	Q25	PCM_Peak	1365.00	40.29	51.11	44.78	51.27	0.000233	3.43	436.28	65.68	0.19
DominieCrkCenter	9934.14	Q25	ECM_Peak	1365.00	36.33	50.79	44.52	51.02	0.000393	4.02	368.63	64.98	0.22
DominieCrkCenter	9934.14	Q50	PCM_Peak	1592.00	40.29	53.44	45.15	53.58	0.000147	3.14	567.08	70.90	0.16
DominieCrkCenter	9934.14	Q50	ECM_Peak	1592.00	36.33	53.20	44.99	53.38	0.000245	3.65	484.04	70.37	0.18

HEC-RAS River: DominieCreek Reach: DominieCrkCenter (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
DominieCrkCenter	9934.14	Q100	PCM_Peak	1824.00	40.29	54.34	45.51	54.49	0.000153	3.36	621.63	78.12	0.16
DominieCrkCenter	9934.14	Q100	ECM_Peak	1824.00	36.33	54.14	45.44	54.34	0.000249	3.85	532.91	74.32	0.18
DominieCrkCenter	9921.69	Q2	PCM_Peak	489.00	39.79	45.96	42.89	46.12	0.000533	3.19	154.09	60.72	0.25
DominieCrkCenter	9921.69	Q2	ECM_Peak	489.00	34.75	45.24	37.26	45.27	0.000037	1.34	395.39	59.12	0.08
DominieCrkCenter	9921.69	Q5	PCM_Peak	826.00	39.79	47.99	43.79	48.20	0.000464	3.75	226.27	65.21	0.25
DominieCrkCenter	9921.69	Q5	ECM_Peak	826.00	34.75	47.67	38.10	47.71	0.000048	1.76	520.18	64.50	0.09
DominieCrkCenter	9921.69	Q10	PCM_Peak	1063.00	39.79	50.66	44.34	50.83	0.000241	3.36	335.64	71.14	0.19
DominieCrkCenter	9921.69	Q10	ECM_Peak	1063.00	34.75	50.60	38.59	50.64	0.000036	1.75	688.35	71.00	0.08
DominieCrkCenter	9921.69	Q25	PCM_Peak	1365.00	39.79	51.00	44.97	51.26	0.000350	4.15	350.85	71.90	0.23
DominieCrkCenter	9921.69	Q25	ECM_Peak	1365.00	34.75	50.90	39.17	50.97	0.000054	2.20	706.89	71.68	0.10
DominieCrkCenter	9921.69	Q50	PCM_Peak	1592.00	39.79	53.36	45.40	53.57	0.000217	3.77	462.15	77.12	0.19
DominieCrkCenter	9921.69	Q50	ECM_Peak	1592.00	34.75	53.28	39.57	53.35	0.000043	2.15	859.17	76.96	0.09
DominieCrkCenter	9921.69	Q100	PCM_Peak	1824.00	39.79	54.25	45.82	54.48	0.000223	4.00	508.36	82.41	0.19
DominieCrkCenter	9921.69	Q100	ECM_Peak	1824.00	34.75	54.23	39.94	54.30	0.000047	2.33	924.01	81.96	0.09
DominieCrkCenter	9907.33	Q2	PCM_Peak	489.00	39.22	46.01	42.14	46.09	0.000259	2.33	210.79	70.59	0.18
DominieCrkCenter	9907.33	Q2	ECM_Peak	489.00	33.07	45.25	35.32	45.27	0.000017	1.03	523.14	67.91	0.05
DominieCrkCenter	9907.33	Q5	PCM_Peak	826.00	39.22	48.05	42.94	48.17	0.000236	2.77	306.72	77.63	0.18
DominieCrkCenter	9907.33	Q5	ECM_Peak	826.00	33.07	47.68	36.13	47.71	0.000024	1.39	672.46	76.71	0.07
DominieCrkCenter	9907.33	Q10	PCM_Peak	1063.00	39.22	50.71	43.43	50.80	0.000127	2.51	448.63	83.72	0.14
DominieCrkCenter	9907.33	Q10	ECM_Peak	1063.00	33.07	50.61	36.60	50.64	0.000019	1.41	875.51	83.50	0.06
DominieCrkCenter	9907.33	Q25	PCM_Peak	1365.00	39.22	51.08	43.99	51.22	0.000184	3.09	469.61	84.53	0.17
DominieCrkCenter	9907.33	Q25	ECM_Peak	1365.00	33.07	50.92	37.18	50.96	0.000029	1.76	898.11	84.18	0.07
DominieCrkCenter	9907.33	Q50	PCM_Peak	1592.00	39.22	53.42	44.38	53.54	0.000118	2.84	609.13	89.53	0.14
DominieCrkCenter	9907.33	Q50	ECM_Peak	1592.00	33.07	53.30	37.57	53.34	0.000024	1.74	1078.58	89.28	0.07
DominieCrkCenter	9907.33	Q100	PCM_Peak	1824.00	39.22	54.32	44.76	54.45	0.000120	3.01	665.99	93.04	0.14
DominieCrkCenter	9907.33	Q100	ECM_Peak	1824.00	33.07	54.25	37.95	54.30	0.000026	1.88	1153.99	91.95	0.07

Appendix D CalEEMod Emissions Report

Rowdy and Dominie Creek Fish Passage Project

Del Norte County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	2.70	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	113
Climate Zone	14			**Operational Year**	2022
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Construction Only

Land Use - 2.7 acre site

Construction Phase - Project-specific phasing

Off-road Equipment - Project-Specific Fleet Mix and Activity

Trips and VMT - Default Worker Trips and Hauling (based on Material Movement)

Demolition - Demo export ID'd in Material Movement

Grading - 1,000 cy concrete export, 2,000 cy soil export, 5,000 cy rock import. Assumed Phased work

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	20.00	30.00
tblConstructionPhase	NumDays	3.00	20.00
tblConstructionPhase	NumDays	3.00	120.00
tblConstructionPhase	NumDays	6.00	80.00
tblConstructionPhase	NumDays	220.00	80.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialExported	0.00	2,000.00
tblGrading	MaterialExported	0.00	1,000.00
tblGrading	MaterialImported	0.00	5,000.00
tblLandUse	LotAcreage	0.00	2.70
tblOffRoadEquipment	HorsePower	158.00	162.00
tblOffRoadEquipment	HorsePower	158.00	162.00
tblOffRoadEquipment	HorsePower	97.00	64.00
tblOffRoadEquipment	OffRoadEquipmentType		Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	UsageHours	8.00	6.70

tblOffRoadEquipment	UsageHours	8.00	3.80
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	6.00	10.00
tblOffRoadEquipment	UsageHours	8.00	20.00
tblOffRoadEquipment	UsageHours	7.00	10.00
tblOffRoadEquipment	UsageHours	7.00	10.00
tblOffRoadEquipment	UsageHours	7.00	10.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.3104	3.0088	2.8703	5.4300e-003	0.3440	0.1429	0.4869	0.1728	0.1371	0.3098	0.0000	473.9651	473.9651	0.0806	0.0000	475.9805
Maximum	**0.3104**	**3.0088**	**2.8703**	**5.4300e-003**	**0.3440**	**0.1429**	**0.4869**	**0.1728**	**0.1371**	**0.3098**	**0.0000**	**473.9651**	**473.9651**	**0.0806**	**0.0000**	**475.9805**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	1 Dewatering	Site Preparation	6/15/2021	11/1/2021	6	120	
2	2 Demolition	Demolition	6/15/2021	7/19/2021	6	30	
3	3 Site Preparation	Site Preparation	2/15/2021	3/12/2021	5	20	
4	4 Grading	Grading	6/15/2021	9/15/2021	6	80	
5	5 Building Construction	Building Construction	6/15/2021	9/15/2021	6	80	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
1 Dewatering	Excavators	1	0.80	162	0.38
1 Dewatering	Generator Sets	1	24.00	84	0.74
1 Dewatering	Graders	0	8.00	187	0.41
1 Dewatering	Pumps	1	24.00	84	0.74
1 Dewatering	Scrapers	0	8.00	367	0.48
1 Dewatering	Skid Steer Loaders	1	0.80	65	0.37
1 Dewatering	Tractors/Loaders/Backhoes	0	7.00	97	0.37
2 Demolition	Concrete/Industrial Saws	1	6.70	81	0.73
2 Demolition	Excavators	1	20.00	158	0.38
2 Demolition	Rubber Tired Dozers	0	8.00	247	0.40
2 Demolition	Skid Steer Loaders	1	20.00	65	0.37
2 Demolition	Tractors/Loaders/Backhoes	1	20.00	97	0.37
3 Site Preparation	Excavators	1	10.00	162	0.38

3 Site Preparation	Generator Sets	1	10.00	84	0.74
3 Site Preparation	Graders	0	8.00	187	0.41
3 Site Preparation	Scrapers	0	8.00	367	0.48
3 Site Preparation	Skid Steer Loaders	1	10.00	65	0.37
3 Site Preparation	Tractors/Loaders/Backhoes	1	10.00	97	0.37
4 Grading	Excavators	1	10.00	158	0.38
4 Grading	Graders	1	10.00	187	0.41
4 Grading	Rubber Tired Dozers	1	10.00	247	0.40
4 Grading	Tractors/Loaders/Backhoes	1	10.00	97	0.37
5 Building Construction	Bore/Drill Rigs	1	7.50	221	0.50
5 Building Construction	Cranes	0	8.00	231	0.29
5 Building Construction	Forklifts	0	7.00	89	0.20
5 Building Construction	Generator Sets	1	3.80	84	0.74
5 Building Construction	Skid Steer Loaders	1	10.00	65	0.37
5 Building Construction	Tractors/Loaders/Backhoes	1	10.00	97	0.37
5 Building Construction	Welders	0	8.00	46	0.45
3 Site Preparation	Tractors/Loaders/Backhoes	1	10.00	64	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
1 Dewatering	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
2 Demolition	4	10.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
3 Site Preparation	5	13.00	0.00	125.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
4 Grading	4	10.00	0.00	625.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
5 Building Construction	4	0.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 1 Dewatering - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1347	1.1670	1.3650	2.4100e-003		0.0631	0.0631		0.0630	0.0630	0.0000	207.3561	207.3561	0.0120	0.0000	207.6560
Total	**0.1347**	**1.1670**	**1.3650**	**2.4100e-003**	**0.0000**	**0.0631**	**0.0631**	**0.0000**	**0.0630**	**0.0630**	**0.0000**	**207.3561**	**207.3561**	**0.0120**	**0.0000**	**207.6560**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.1100e-003	4.4000e-003	0.0352	5.0000e-005	4.6000e-003	5.0000e-005	4.6500e-003	1.2300e-003	5.0000e-005	1.2800e-003	0.0000	4.4164	4.4164	3.3000e-004	0.0000	4.4246
Total	**5.1100e-003**	**4.4000e-003**	**0.0352**	**5.0000e-005**	**4.6000e-003**	**5.0000e-005**	**4.6500e-003**	**1.2300e-003**	**5.0000e-005**	**1.2800e-003**	**0.0000**	**4.4164**	**4.4164**	**3.3000e-004**	**0.0000**	**4.4246**

3.3 2 Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0233	0.2276	0.3057	4.7000e-004		0.0118	0.0118		0.0110	0.0110	0.0000	40.8176	40.8176	0.0114	0.0000	41.1029
Total	**0.0233**	**0.2276**	**0.3057**	**4.7000e-004**	**0.0000**	**0.0118**	**0.0118**	**0.0000**	**0.0110**	**0.0110**	**0.0000**	**40.8176**	**40.8176**	**0.0114**	**0.0000**	**41.1029**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.2800e-003	1.1000e-003	8.8000e-003	1.0000e-005	1.1500e-003	1.0000e-005	1.1600e-003	3.1000e-004	1.0000e-005	3.2000e-004	0.0000	1.1041	1.1041	8.0000e-005	0.0000	1.1062
Total	**1.2800e-003**	**1.1000e-003**	**8.8000e-003**	**1.0000e-005**	**1.1500e-003**	**1.0000e-005**	**1.1600e-003**	**3.1000e-004**	**1.0000e-005**	**3.2000e-004**	**0.0000**	**1.1041**	**1.1041**	**8.0000e-005**	**0.0000**	**1.1062**

3.4 3 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					6.0000e-005	0.0000	6.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0122	0.1191	0.1523	2.4000e-004		6.2600e-003	6.2600e-003		5.9300e-003	5.9300e-003	0.0000	20.8145	20.8145	4.8100e-003	0.0000	20.9346
Total	**0.0122**	**0.1191**	**0.1523**	**2.4000e-004**	**6.0000e-005**	**6.2600e-003**	**6.3200e-003**	**1.0000e-005**	**5.9300e-003**	**5.9400e-003**	**0.0000**	**20.8145**	**20.8145**	**4.8100e-003**	**0.0000**	**20.9346**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.4000e-004	0.0200	0.0125	5.0000e-005	1.0200e-003	1.0000e-004	1.1200e-003	2.8000e-004	9.0000e-005	3.8000e-004	0.0000	4.6813	4.6813	8.0000e-005	0.0000	4.6832
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1100e-003	9.5000e-004	7.6200e-003	1.0000e-005	1.0000e-003	1.0000e-005	1.0100e-003	2.7000e-004	1.0000e-005	2.8000e-004	0.0000	0.9569	0.9569	7.0000e-005	0.0000	0.9587
Total	**1.7500e-003**	**0.0210**	**0.0201**	**6.0000e-005**	**2.0200e-003**	**1.1000e-004**	**2.1300e-003**	**5.5000e-004**	**1.0000e-004**	**6.6000e-004**	**0.0000**	**5.6382**	**5.6382**	**1.5000e-004**	**0.0000**	**5.6419**

3.5 4 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.3280	0.0000	0.3280	0.1684	0.0000	0.1684	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0958	1.0473	0.5669	1.1700e-003		0.0468	0.0468		0.0431	0.0431	0.0000	102.9713	102.9713	0.0333	0.0000	103.8039
Total	**0.0958**	**1.0473**	**0.5669**	**1.1700e-003**	**0.3280**	**0.0468**	**0.3748**	**0.1684**	**0.0431**	**0.2115**	**0.0000**	**102.9713**	**102.9713**	**0.0333**	**0.0000**	**103.8039**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.2200e-003	0.1000	0.0625	2.5000e-004	5.1200e-003	4.9000e-004	5.6100e-003	1.4100e-003	4.7000e-004	1.8800e-003	0.0000	23.4064	23.4064	3.9000e-004	0.0000	23.4161
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.4100e-003	2.9300e-003	0.0235	3.0000e-005	3.0600e-003	4.0000e-005	3.1000e-003	8.2000e-004	3.0000e-005	8.5000e-004	0.0000	2.9443	2.9443	2.2000e-004	0.0000	2.9498
Total	**6.6300e-003**	**0.1029**	**0.0860**	**2.8000e-004**	**8.1800e-003**	**5.3000e-004**	**8.7100e-003**	**2.2300e-003**	**5.0000e-004**	**2.7300e-003**	**0.0000**	**26.3507**	**26.3507**	**6.1000e-004**	**0.0000**	**26.3658**

3.6 5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0296	0.3185	0.3303	7.4000e-004		0.0143	0.0143		0.0134	0.0134	0.0000	64.4962	64.4962	0.0179	0.0000	64.9446
Total	**0.0296**	**0.3185**	**0.3303**	**7.4000e-004**		**0.0143**	**0.0143**		**0.0134**	**0.0134**	**0.0000**	**64.4962**	**64.4962**	**0.0179**	**0.0000**	**64.9446**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Rowdy and Dominie Creek Fish Passage Project - Rock Hauling

Del Norte County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Recreational	1.00	User Defined Unit	2.70	0.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	113
Climate Zone	14			**Operational Year**	2022
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Construction Only

Land Use - 2.7 acre site

Construction Phase - Project Rock Import

Off-road Equipment - Project-Specific Fleet Mix and Activity

Off-road Equipment - Rock Import Only

Trips and VMT - 9,700 Total Tons Rock Import, Truck Capacity 14 Tons, 693 Truck Deliveries, for 1,386 total Trips. Default Trip Length

Grading - 9,700 Total Tons Rock Import, Truck Capacity 14 Tons, 693 Truck Deliveries, for 1,386 total Trips

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	6.00	120.00
tblConstructionPhase	NumDaysWeek	5.00	6.00
tblGrading	MaterialImported	0.00	9,700.00
tblLandUse	LotAcreage	0.00	2.70
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblTripsAndVMT	HaulingTripNumber	959.00	1,386.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	7.1400e-003	0.2218	0.1387	5.5000e-004	0.0118	1.0800e-003	0.0129	3.2000e-003	1.0400e-003	4.2400e-003	0.0000	51.9061	51.9061	8.6000e-004	0.0000	51.9275
Maximum	**7.1400e-003**	**0.2218**	**0.1387**	**5.5000e-004**	**0.0118**	**1.0800e-003**	**0.0129**	**3.2000e-003**	**1.0400e-003**	**4.2400e-003**	**0.0000**	**51.9061**	**51.9061**	**8.6000e-004**	**0.0000**	**51.9275**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Rock Import	Grading	6/15/2021	11/1/2021	6	120	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Rock Import	Graders	0	8.00	187	0.41
Rock Import	Rubber Tired Dozers	0	8.00	247	0.40
Rock Import	Scrapers	0	8.00	367	0.48
Rock Import	Tractors/Loaders/Backhoes	0	7.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Rock Import	0	0.00	0.00	1,386.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Rock Import - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.3000e-004	0.0000	4.3000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**4.3000e-004**	**0.0000**	**4.3000e-004**	**7.0000e-005**	**0.0000**	**7.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	7.1400e-003	0.2218	0.1387	5.5000e-004	0.0114	1.0800e-003	0.0124	3.1300e-003	1.0400e-003	4.1700e-003	0.0000	51.9061	51.9061	8.6000e-004	0.0000	51.9275
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.1400e-003**	**0.2218**	**0.1387**	**5.5000e-004**	**0.0114**	**1.0800e-003**	**0.0124**	**3.1300e-003**	**1.0400e-003**	**4.1700e-003**	**0.0000**	**51.9061**	**51.9061**	**8.6000e-004**	**0.0000**	**51.9275**

Appendix E Biological Resources Report

Biological Resources Report

Rowdy and Dominie Creek Fish Passage Improvement Project

Prepared for the Tolowa Dee-ni' Nation

GHD | 718 Third Street, Eureka, California, 95501 USA

11209093 | 3.2 | Report No 1 | August 20, 2020

Table of Contents

List of Acronyms 1

1. Introduction 3

1.1 Project Background 3

1.2 Project Area Location and Description Surrounding Land Uses and Existing Setting 5

1.2.1 Rowdy Creek Existing Infrastructure 6
1.2.2 Dominie Creek Existing Infrastructure 6

1.3 Existing Geotechnical Conditions 6

1.4 Existing Operations 6

1.5 Project Purpose and Goals 8

2. Project Description 8

2.1 Proposed Project 8

2.1.1 Demolition and Removal 9
2.1.2 Replacement Infrastructure 10
2.1.3 Instream Enhancements 12
2.1.4 Project Schedule and Equipment 13

2.2 Operation and Maintenance 15

2.3 Definition of the Project Area 16

2.4 Other Public Agencies Whose Approval is Required 16

2.5 Known Ongoing and Previous Projects in the Area 16

3. Regulatory Background 16

3.1 Federal Jurisdiction 16

3.1.1 National Environmental Policy Act (NEPA) 16
3.1.2 Endangered Species Act (ESA) 17
3.1.3 Clean Water Act (CWA) 17
3.1.4 Executive Order 11990 18
3.1.5 Executive Order 13112, Invasive Species 19
3.1.6 Migratory Bird Treaty Act (MBTA) 19
3.1.7 Bald and Golden Eagle Protection Act (BGEPA) 20
3.1.8 Magnuson-Stevens Act 20
3.1.9 Sustainable Fisheries Act of 1996 21

3.2 State Jurisdiction 21

3.2.1 California Environmental Quality Act (CEQA) 21
3.2.2 Porter-Cologne Water Quality Act 21
3.2.3 California Endangered Species Act (CESA) 22
3.2.4 Other State Special Status Species and Communities 22
3.2.5 Sensitive Natural Communities (SNCs) 22
3.2.6 California Fish and Game Code (FGC) 23

3.3 Local Jurisdiction 24

3.3.1 City Regulations or General Plans 24

3.3.2 County Grading Permit 24
4. Methods 24
4.1 Project Study Boundary (PSB) 24
4.2 Preliminary Investigation 25
4.2.1 Database Searches (CNDDB, CNPS, IPaC, and NOAA Fisheries) 25
4.2.2 National Wetlands Inventory (NWI) 25
4.3 Field Surveys 25
4.3.1 Special Status Plants and Sensitive Natural Communities 25
4.3.2 Wetland Reconnaissance Methods 26
5. Results 26
5.1 Summary of General Biological Resources 26
5.2 Special Status Plants 26
5.2.1 Special Status Plants and Sensitive Habitats 26
5.2.2 Plant Critical Habitat Within PSB 48
5.3 Sensitive Natural Communities Mapping 48
5.4 Wetlands 49
5.5 Wildlife Habitat Evaluation Results 49
5.5.1 Special Status Wildlife 49
5.5.2 Potential Impacts to Special Status Wildlife 1
5.5.3 Wildlife Critical Habitat Within PSB 1
5.6 Essential Fish Habitat 1
6. Summary of Potential Impacts and Avoidance and Minimization Measures 2
6.1 Proposed Avoidance and Minimization Measures 2
6.1.1 General 2
6.1.1.1 General Measures 3
6.1.2 Plants 3
6.1.3 Wildlife 4
6.1.3.1 Special Status Bats 4
6.1.3.2 Special Status Terrestrial Mammals 4
6.1.3.3 Nesting Birds 4
6.1.3.4 Special Status Reptiles and Amphibians 5
6.1.3.5 Special Status Fish and Mollusks 6
7. Conclusion 6
8. Literature Cited 7
9. List of Preparers 10
10. Appendices 10
Appendix A - Figures 11
Appendix B - CNDDB, CNPS, IPaC, and NOAA Fisheries Database Search Results 12
Appendix C – National Wetlands Inventory Results 13

Appendix D - Reconnaissance Site Visit Photographs 14
Appendix E - On-site Species List 15

Table Index

Table 1.1 Hatchery Production Goals 7
Table 3.1 NatureServe Conservation Status Ranks 23
Table 5.1 Potential for Special Status Plant Species to Occur in the Project Area 27
Table 5.2 Potential for Sensitive Natural Communities to Occur in the Project Area 48
Table 5.3 Potential for Special Status Wildlife Species to Occur in the Project Area and Project Study Boundary 51

Appendix Index

Appendix A Figures
Appendix B CNDDB, CNPS, IPaC, and NOAA Fisheries Database Search Results
Appendix C National Wetlands Inventory Results
Appendix D Reconnaissance Site Visit Photographs
Appendix E On-site Species Lists

List of Acronyms

AFS_TH	American Fisheries Society Threatened
AFS_VU	American Fisheries Society Vulnerable
APN	assessor parcel number(s)
BGEPA	Bald and Golden Eagle Protection Act
BLM_S	Bureau of Land Management Sensitive
BMP	best management practice(s)
BRR	Biological Resources Report
CDF_S	California Department of Forestry and Fire Protection Sensitive
CDFW	California Department of Fish and Wildlife
CDFW_FP	CDFW Fully Protected Animal
CDFW_SSC	CDFW Species of Special Concern
CDFW_WL	California Department of Fish and Wildlife Watch List
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWA	Clean Water Act
DOI	Department of the Interior
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESHA	environmentally sensitive habitat area
ESM	engineered streambed material
ESU	Evolutionarily Significant Unit
FD	Federally Delisted
FE	Federal Endangered
FE	Federal Endangered
FGC	California Fish and Game Code
FMP	Fisheries Management Plans
FT	Federal Threatened
HAPC	Habitat Areas of Particular Concern
IPaC	Information for Planning and Conservation
IUCN_EN	International Union for Conservation of Nature Endangered
IUCN_NT	International Union for Conservation of Nature Near Threatened
IUCN_VU	International Union for Conservation of Nature Vulnerable
ISMND	Initial Study/Mitigated Negative Declaration
LSAA	Lake and Streambed Alteration Agreement
MBPA	Migratory Bird Protection Act
MBTA	Migratory Bird Treaty Act

NABCI_RWL	North American Bird Conservation Initiative Red Watch List
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NMFS_SC	National Marine Fisheries Service Species of Concern
NOAA	National Oceanic and Atmospheric Administration
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
P	Proposed for Federal Listing
PIT	passive integrated transponder
PSB	Project Study Boundary
RSP	rock slope protection
RWQCB	Regional Water Quality Board
SC	State candidate for listing
SCC	State Coastal Conservancy
SE	State endangered
SNC	Sensitive Natural Community
SR	State rare
ST	State threatened
SWRCB	State Water Resources Control Board
TAG	Technical Advisory Group
TDN	Tolowa Dee-ni' Nation
USACE	U.S. Army Corps of Engineers
USFS_S	U.S. Forest Service Sensitive
USFWS	U.S. Fish and Wildlife Service
USFWS_BCC	U.S. Fish and Wildlife Service Birds of Conservation Concern
WBWG_H	Western Bat Working Group High Priority
WBWG_M	Western Bat Working Group Medium Priority
XERCES_IM	Xerces Society Imperiled

1. Introduction

The purpose of this Biological Resources Report (BRR) is to investigate and determine which sensitive biological resources (if any), including plants and wildlife species and their habitat, may occur in the footprint or vicinity of the Rowdy and Dominie Creek Fish Passage Improvement Project (hereafter "Project," described below). Species listed as endangered or threatened under the federal or state Endangered Species Act (ESA and CESA respectively) or their designated critical habitat, as well as California state special status species and habitats are the primary focus of this BRR. Common species without special protections are not considered in this BRR. The purpose of the BRR is to inform CEQA analysis and Project permit applications.

1.1 Project Background

The Project is located in the Smith River watershed, , in the town of Smith River, Del Norte County (i.e., rugged northern extent of California) (**Appendix A - Figures, Figure 1 – Vicinity Map**). The Smith River has the unique status of being the last major free-flowing coastal river in California that drains to the Pacific Ocean. It is considered the "crown jewel" of California by the North American Salmon Stronghold Partnership (WSC 2013). The Smith River watershed encompasses 719 square miles of unique habitat within northwestern California and southern Oregon and is recognized for world-class salmon and Steelhead fishing. The Smith River supports several populations of salmonids including Chinook and Coho Salmon (*Oncorhynchus tshawytscha,* and *Oncorhynchus kisutch,* respectively), Steelhead (*Oncorhynchus mykiss*) and Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*). Within the Smith River watershed, Coho Salmon are listed under the Federal and California Endangered Species Acts. The Smith River watershed is also important for Pacific Lamprey (*Entosphenus tridentatus*; California Department of Fish and Wildlife Species of Special Concern) as well as other special status aquatic and terrestrial species. Although the Smith River contains areas of high quality habitat, land modifications and uses have resulted in a loss of wetlands, particularly in the lower watershed, which are thought to be contributors to the relatively low Chinook Salmon, Coho Salmon, and Steelhead numbers, as compared to historical records.

The Project Area is located at the Rowdy Creek Fish Hatchery (Hatchery), located at the confluence of Dominie Creek and Rowdy Creek within the Smith River watershed (**Appendix A** - Figures**, Figure 2 – Project Area**). The Rowdy Creek watershed area above the Dominie Creek confluence is 29.4 square miles and the Dominie Creek watershed area is 3.7 square miles, totaling a combined watershed area is 33.1 square miles. Both creeks contain instream Hatchery infrastructure that are barriers to fish passage. The Hatchery fish exclusion fencing (known as the picket fence) and associated concrete apron (large concrete slab) on Rowdy Creek (comprise the "diversion weir"), concrete entrance apron, water diversion screening facility, and associated diversion dam and fish ladder on Dominie Creek, have been identified as partial barriers to adult fish passage. With respect to juveniles, the hydraulic conditions, created by both concrete aprons, are a complete barrier to passage. The Hatchery diversion weir across Rowdy Creek is one of the most substantial anadromous fish barriers remaining in coastal California outside of major dams (Parish and Garwood 2016).

The Tolowa Dee-ni' Nation (TDN) own the Hatchery infrastructure and the property that the Hatchery operates on. The TDN is an advocate for improving conditions in the Rowdy Creek

watershed for all wildlife particularly salmonids and lamprey. The TDN promotes continuing the Hatchery broodstock programs. The TDN is implementing this Project.

In 2013, the California Department of Fish and Wildlife (CDFW), through its Fisheries Restoration Grant Program (FRGP), in partnership with the State Coastal Conservancy (SCC), awarded funds to TDN to conduct a feasibility study to assess infrastructure alternatives and operational improvements that would improve fish passage conditions at the Hatchery. As part of the Feasibility Study (GHD and Michael Love & Associates 2015), a Technical Advisory Group (TAG) was formed to develop and screen alternatives. The Feasibility Study considered the following alternatives:

A. Downstream roughened channel, repair existing concrete apron, replace picket fence, new trap, new diversion facility;

B. Downstream roughened channel, new diversion weir, new trap, new diversion facility;

C. River right fish ladder with river left roughened channel, new diversion weir, new trap, new diversion facility;

D. Roughened channel, new diversion weir, new trap, new diversion facility;

E. Full removal, roughened channel, new diversion structure, new fish ladder/trap on Dominie Creek at existing diversion structure;

F. Roughened channel, modified operational approach, new diversion facility;

G. Roughened channel, new diversion structure, new fish ladder/trap on Dominie at existing ladder;

H. No change;

I. Full removal, roughened channel, new diversion structure, modify existing fish ladder;

J. Full removal, roughened channel, electric barrier, new trap, new diversion structure.

The Feasibility Study documented the pros and cons of each alternative and the outcome of the TAG meeting, which assigned scores to each alternative. Alternative D was decided upon as the best apparent alternative because it would provide unimpeded passage for all life stages of salmonids, achieving the Project's primary goal, in addition to providing continued Hatchery operational opportunities that could contribute to advancing the science of watershed and fisheries management practices into the future (GHD and Michael Love & Associates 2015).

In 2015, TDN was awarded funding from CDFW's Wildlife Conservation Board to complete design plans and supporting Basis of Design Report for Alternative D (the "Project," as defined above). The Project designs were developed in accordance with the National Oceanic and Atmospheric Administration's (NOAA) Fisheries and CDFW fish passage guidelines, while maintaining the function of the Hatchery. The design plans have been approved by NOAA Fisheries and CDFW. The Basis of Design Report is available upon request.

1.2 Project Area Location and Description Surrounding Land Uses and Existing Setting

The town of Smith River is a moderately developed, rural town, located within ancestral land of the Tolowa Dee-ni' Nation. Highway 101 runs to the east and north, and a residential neighborhood exists in the southern vicinity of the Project Area. The Project Area represents the limit of disturbance associated with the Project, and is approximately 2.7 acres, see Figure 2 – Project Area. The following assessor parcel numbers (APNs) comprise the Project: 103-080-028, 103-080-026, 103-072-001, 103-080-044, 103-080-014, 103-080-043. A riparian corridor exists along both Rowdy and Dominie Creeks throughout the entire Project Area, except for the western bank of Rowdy Creek just south of the bridge (river right) at the Hatchery. Referencing creek banks is done from the downstream position; therefore river right is the western bank, and river left is the eastern bank, for this Project.

In 1968 the Hatchery was formed by the 15-member Kiwanis Club of Smith River, to increase and perpetuate the native runs of Steelhead and Chinook Salmon in the Smith River. The Hatchery was constructed in phases consisting of concrete diversion weirs; walls which intended to divert water and fish into sorting chambers for processing. This infrastructure is dated and inappropriate by today's standards, due to the extreme migrational barrier it creates for anadromous species such as Coho Salmon, Coastal Cutthroat Trout, Steelhead, and Chinook Salmon (collectively termed "salmonids") and Pacific Lamprey. It is a complete barrier for juvenile salmonids, and a mostly complete barrier for adult salmonids. Only at the highest flows can fish pass over the "picket fence" exclusion fencing. Due to the concrete apron, picket fence, and downstream flow direction of Rowdy Creek, approximately 11.5 miles of habitat on Rowdy Creek (Garwood and Larson 2014) and 1.6 miles of habitat on Dominie Creek (Lang 2005) are inaccessible to these species.

The instream portion of the Hatchery consists of a variety of infrastructure including: concrete retaining walls, concrete aprons, concrete weir, hydraulic fish exclusion fencing (picket fence) and appurtenances, fish ladder (on Dominie Creek), concrete fish trap, diversion piping and well. The land based portion of the Hatchery is located immediately west of the Project Area, and consists of an office, parking lot, Hatchery Access Road bridge, various piping and water storage/conveyances, fish raceways, photovoltaic panel arrays, back-up generator, access bridge over Dominie Creek, and amenities. The instream infrastructure is further described in Sections 1.3.1 and 1.3.2 below.

TDN contains two water rights at the property. One of the water rights allows the diversion of up to 2.2 cubic feet per second (cfs) from Dominie Creek. The other water right allows for the diversion of up to 6 cfs from Rowdy Creek. The diversion infrastructure on Dominie Creek at the Hatchery Access Road bridge, which includes the sluice gate, is to be removed (see Section 2.1.1), and therefore the 2.2 cfs of water from Dominie Creek would remain within the stream channel. TDN does not intend to give up this water right on Dominie Creek, rather they just would not utilize it. Upgrades are proposed at the diversion intake on Rowdy Creek (see Section 2.1.2) to meet NOAA/CDFW guidelines. There are no changes proposed to the water diversion rate on Rowdy Creek.

1.2.1 Rowdy Creek Existing Infrastructure

The primary feature on Rowdy Creek within the Project Area is the existing concrete diversion weir, which is located immediately upstream of the Dominie Creek confluence. The diversion weir includes a concrete apron, a picket fence, and adjacent concrete walls as well as the entrance to the fish trap. The concrete apron spans Rowdy Creek and ranges from 60 to 68 feet wide (perpendicular to flow). The apron is approximately 30 feet long (parallel to flow). The apron is built on the channel bed. The thickness of the concrete is variable, ranging between 2 and 4 feet thick. The concrete apron is perched approximately 3 feet above the tailwater pool which formed from scour. The tailwater pool control is a series of large boulders and bedrock that span the channel approximately 40 feet downstream.

1.2.2 Dominie Creek Existing Infrastructure

There is an existing perched concrete apron that spans the Dominie Creek channel at the confluence with Rowdy Creek. A fish ladder exists at the river left side of Dominie Creek, which leads fish into the Hatchery (this structure has not been in use). There is a single pier in the center of the channel at the upstream end of the apron that supports a foot bridge and a pipe crossing. The fish ladder is intended to provide upstream access for fish, however it is not used because of the labor it requires, limited Hatchery staff, and the increase in fish handling. The fish ladder's outside wall extends approximately 145 feet upstream on Dominie Creek and confines the channel.

1.3 Existing Geotechnical Conditions

A Geotechnical Investigation was conducted during July 2017 to support the final Project design. The results of the investigation concluded that the subsurface materials in the Project Area generally consist of gravels and clayey sands overlying weathered to fresh bedrock. The improvements proposed as part of the final design plans have been designed based on the available sub-surface geologic information and recognize the limitations of boring depths and extents. The full geotechnical report, which includes recommendations for earthwork, foundations, walls, and seismic consideration, is further discussed in the Project's Initial Study/Mitigated Negative Declaration (ISMND).

1.4 Existing Operations

Since 1973, Rowdy Creek Fish Hatchery has been rearing Chinook Salmon for release into the Smith River drainage. The number of Chinook Salmon produced has fluctuated from year to year, due to Hatchery production potential, funding, water control, and management objectives. The Steelhead Program began in 1982 in response to an increase in the popularity of drift boat fishing for Steelhead. An annual Steelhead Derby was started in 1983 to assist in support of the program.

The Hatchery is a significant center for environmental education. It supplies Chinook Salmon and Steelhead eggs to local schools for classroom education programs (originally started by California Sea Grant program and is now sponsored by Rural Human Services and coordinated with and supported by CDFW). The Hatchery also provides tours for visitors as well as local classrooms from Brookings, Grants Pass, and surrounding areas. The majority of these tours occur during the

spawning seasons so that students are able to witness, first hand, spawning techniques and learn the life cycles of anadromous fish.

The Hatchery operates two fish programs: Chinook Salmon (Program 1), and Steelhead (Program 2). Some program goals presented in the Rowdy Creek Fish Hatchery 5-Year Management Plan 2016/2017-2020/2021 include the following:

- Enhancement of Chinook Salmon and Steelhead in the Smith River, using Hatchery production to increase the number of catchable fish and improve sport and commercial angling opportunities, while also promoting the economic development of Del Norte County;
- Evaluate Steelhead fisheries in the Smith River resulting from the previous change of release site, from the U.S. Forest Service boat ramp at the forks to the County Boat Launch on Fred Haight Drive;
- Minimize the potential for impacts to natural stock in the Smith River;
- Provide monitoring of marked Hatchery production to obtain data essential to the integrated Hatchery program in the Smith River Basin. Marked hatchery production would be used to calculate Proportional Natural Influence;
- Supply eggs for classroom incubation projects, provide educational support to local classrooms, and information to the public through tours and presentations;
- Supply a portion of healthy, marked adult Chinook Salmon and Steelhead to the TDN for subsistence.

Current production goals identified in the Five-year Plan and the Hatchery's Trapping and Rearing Permit (2015 and 2016) are displayed in **Table 1.1**.

Table 1.1 Hatchery Production Goals

Program	Production Goal
Program 1 (Chinook Salmon)	Adult collection: 26 males and 26 females
	"Green eggs" (newly fertilized eggs) taken: 120,000-130,000
	Anticipated smolt release: 100,000 Chinook Salmon at 50-120 fish/pound (50-90 mm).
Program 2 (Steelhead)	Adult collection: 65 males and 65 females
	"Green eggs" taken: 160,000-170,000

Program	Production Goal
	Anticipated smolt releases: 80,000 at 5 to 10 fish/pound (110-230 mm)

Components of the Hatchery infrastructure appear to be at or near the end of its design life. The overall site layout, age, and nature of improvements and additions over a number of years have resulted in a hatchery that functions, yet is challenging to operate and to maintain. The condition of the water supply and distribution system is the primary constraint of the Hatchery (DJWA and Meridian Environmental 2018). The water supply quantity and layout creates major challenges for staff to maintain both the quality and quantity of the water needed for the two programs (DJWA and Meridian Environmental 2018). The proposed Project would allow the Hatchery diversion and fish trapping/handling to meet NOAA/CDFW guidelines, and would allow the Hatchery to meet its production goals.

1.5 Project Purpose and Goals

The goal of the Project is to improve fish passage conditions for all age classes of salmonids on Rowdy Creek at the Hatchery and to improve fish passage conditions on Dominie Creek at the Rowdy Creek confluence and beneath the Hatchery Access Road bridge, while maintaining Hatchery operations. The Project objectives include the following:

- Remove the existing Hatchery concrete weir on Rowdy Creek to provide volitional fish passage when the Hatchery is not collecting fish over the range of fish passage design flows while meeting regulatory criteria.
- Improve the Hatchery fish trapping facility on Rowdy Creek to minimize delay and handling of fish not to be collected by the Hatchery.
- Construct a new Hatchery water diversion structure on Rowdy Creek that meets regulatory criteria and allows the maximum water right diversion of 6 cfs.
- Improve Dominie Creek at the Rowdy Creek confluence to provide volitional fish passage over the range of fish passage design flows while meeting regulatory criteria.
- Remove the existing Hatchery infrastructure on Dominie Creek below the Hatchery Access Road Bridge to improve fish passage conditions while protecting the bridge structure.

2. Project Description

2.1 Proposed Project

The three major components of this Project are: demolition and removal, infrastructure replacement, and instream enhancement, which can collectively be considered “construction.” Not all Hatchery facility/concrete components proposed for demolition would be replaced, rather instream and bank infrastructure would be removed from Rowdy and Dominie Creeks at their confluence and from

within Dominie Creek below Hatchery Access Road, and replacement infrastructure would be installed in and along the banks of Rowdy Creek. The three components of the Project are further discussed below.

2.1.1 Demolition and Removal

A major component of this Project includes demolition and removal of instream infrastructure to accommodate the proposed improvements. The following infrastructure at the Rowdy and Dominie Creek confluence is planned for removal:

- Concrete apron in Dominie Creek at the confluence;
- Concrete wedge located between lower Dominie and Rowdy Creeks at the confluence;
- Access walkway, pipe crossing, and pier above Dominie Creek at the confluence;
- Rowdy Creek diversion weir (comprised of the concrete apron and picket fence that spans Rowdy Creek);
- Concrete stairs along Rowdy Creek river right bank;
- Fish trap along Rowdy Creek river right bank, including box channel, concrete wall, and steel baffles;
- Concrete rubble/riprap embankment along Rowdy Creek river right bank; and
- Diversion housing along Rowdy Creek river right bank, including stilling well and the gangway.

Along upper Dominie Creek, the following infrastructure located beneath or around the Hatchery Access Road bridge would be demolished and removed:

- Fish ladder weirs (3), flashboards, counterforts;
- Sluice gate and support structure;
- Sluice channel concrete slab (subsurface); and
- Fish ladder center wall.

The infrastructure to be removed are large concrete structures (i.e., the concrete apron on Rowdy Creek ranges from 60 to 68 feet wide and 30 feet long, and appears to be approximately 2 to 4 feet thick). After field inspection, it appears evident that most of the infrastructure proposed to be demolished were “add on” items. As an example, the fish ladder and sluice gate on Dominie Creek beneath the Hatchery Access Road bridge appear to have been constructed much later than the bridge itself, based on the visual appearance of concrete weathering and joints. This would indicate that the bridge would have been constructed to be stable under conditions that did not rely on the fish ladder or sluice gate components themselves, and that their removal would have minimal impact.

The Final Design incorporates protections to existing elements constructed at locations where existing features are to be removed such as existing concrete walls, buried footings, soil nails, and

shotcrete facing, to provide the same level of structural protection, or better, than the previous features.

2.1.2 Replacement Infrastructure

This component of the Project includes the construction and installation of the replacement infrastructure and equipment. The purpose of the infrastructure improvements is to maintain functionality of the Hatchery, allow for fish passage, and to divert flow for Hatchery operational use that meets NOAA guidelines. Proposed replacement infrastructure includes the following:

- **Access Walkway over Lower Dominie Creek**: A new access walkway would be located over lower Dominie Creek, near the confluence to provide continued access across the channel for Hatchery management and operational purposes. This walkway would consist of metal grating, and handrails on both side. A new 8 inch diameter PVC water line would be installed along the outer base of the walkway to replace the existing water line. During construction, either the water line would be temporarily disconnected, or a temporary PVC water line would be installed. A concrete retaining wall with soil anchors would be installed at the western terminus of the walkway located along Dominie Creek (river right) to reduce future erosion potential. The existing fish ladder and retaining wall, both located on lower Dominie Creek (river left, and river right, respectively) would remain in its current location and be protected. The fish ladder is intended to provide upstream access for fish, however it is not used because of the labor it requires, limited Hatchery staff, and the increase in fish handling. The fish ladder would not be used following Project construction.
- **Concrete Slab Foundation with Picket Fence:** A new hydraulic picket fence would be installed in the same approximate footprint as the existing concrete weir with fish exclusion picket fence. The proposed picket fence would be set askew to the flow to help direct fish towards the fish trap and would span across the entire channel. The proposed picket fence would have multiple sections and therefore the operator may only need to raise the section closest to the trap while leaving the remaining sections down. The picket fence would be actuated with automated compressed air to raise or lower during fish trapping periods. The picket fence would remain lowered during all non-trapping periods. It is anticipated that the pickets would be approximately 9.25 feet long. The picket fence would be supported on a thickened concrete slab foundation 10 feet wide, continuous across Rowdy Creek. A concrete cutoff wall below the foundation would extend to bedrock to minimize undermining of the slab.

A proposed passive integrated transponder (PIT) antenna array would be installed in conjunction with the picket fence, and would be able to detect fish that pass over or through it that are tagged with a PIT tag. Each PIT tag contains a unique identification number. Data sourced from PIT antennas contributes to the ongoing study of regional fish distribution. The proposed concrete foundation would be at the same elevation as the new roughened channel pool, and thus a residual depth of 3 feet water would remain at lower flows. Engineered streambed material (ESM) would be installed in conjunction with the concrete foundation and retaining wall, in order to raise the channel bed elevation and avoid channel disconnection. Another concrete retaining wall would be installed at the eastern terminus of the picket fence, along the Rowdy Creek bank opposite to the Hatchery (river left).

- **Access Stairway and Fish Trap:** A new concrete stairway would be located in approximately the same footprint as the former concrete stairway, along Rowdy Creek (river right) near the proposed picket fence. The stairway would allow access to the proposed fish trap. The new fish trap would be constructed adjacent to (north of) the proposed stairway. The fish trap would be concrete and would contain interconnected chambers including a holding pool, fish crowder, flume and gate, and return channel. At the downstream end of the fish trap is the trap entrance, and at the upstream end of the fish trap is both a gate and flume for returning fish not to be collected to the return channel opening, which allows fish access to upper Rowdy Creek. Both the gate and flume connect to the return channel. The flume would need to be wetted during release, which would be accomplished by installing a small submersible pump and nozzle system that pulls water from the energy dissipation chamber. To accommodate the submersible pump, an exterior electrical outlet has been designed on the top of the wall near the energy dissipation chamber. Once the operator places the fish in the flume, the fish would slide down the flume and enter the return channel. The flume is approximately 8 feet long. The flume's cross sectional geometry has been sized to meet minimum NOAA criteria, which is 15 inches wide and 24 inches high, and would be smooth to minimize fish injury potential.

The return channel would be open when the Hatchery is not trapping fish, or when fish need to be released. Metal grates would be located on the top of the fish trap. The fish trap would contain an OSHA-compliant fixed access ladder, which would be mounted to concrete. A concrete landing with handrail would be located at the edge of the fish ladder, allowing access to view the fish trap from above. A drainage pipe would be installed below the crushed gravel to collect and transport stormwater around the proposed infrastructure. A roughened channel including large rocks are proposed to be placed in Rowdy Creek to protect the proposed fish trap and diversion infrastructure from scouring.

- **Diversion Infrastructure:** New diversion infrastructure and housing would be installed along Rowdy Creek (river right), upstream of the proposed fish trap. The diversion infrastructure and housing would replace the existing stilling well and pumps. Proposed diversion infrastructure would consist of two 15 horsepower submersible pumps and housing for a third, pumps, fish screens, valves, pressure reducers, piping, a hydraulic brush screen cleaner, and metal grates on top. Each pump will have the capacity to pump approximately 2 cfs, for a total of 4 cfs, which is the approximate maximum the existing Hatchery piping system can accommodate. If the full water right of 6 cfs is desired at a later date, an additional pump can be added. The proposed fish screen design meets NOAA Fisheries criteria. The roughened channel including large rocks would be placed in Rowdy Creek to protect the diversion infrastructure from scouring, and ESM placed in the Rowdy Creek channel near the large rocks. A concrete wingwall would be installed upstream of the diversion for protection and bank stabilization. A cantilevered walkway is proposed along the top of the diversion structure. A handrail is proposed along the edge of the walkway, diversion housing, fish trap, and access stairway.

- **Dominie Bridge Structural Supports:** Upstream from the confluence, at the Hatchery Access Road bridge, several pieces of existing instream infrastructure are slated for demolition to improve the channel hydraulics. These concrete elements do not appear to

have been specifically constructed with the intent of strengthening or supporting the existing bridge abutments, but removal of the existing concrete apron could allow for destabilization of the abutments and/or future undermining. In order to mitigate against these possibilities, a new concrete facing wall would be anchored into the existing abutment concrete, which would extend from the bridge soffit to the bedrock in the channel. Additionally, steel struts would be added on each concrete beam underneath the bridge. This system would work to prevent movement of the abutments while also guarding against scour at their base. Designed improvements to the bridge abutments would ensure that the finished Project leaves the bridge in equal or better structural condition.

- **Electrical Control Building:** Several of the proposed components would require electrical connections and an area to house operating equipment such as controllers, motors, and compressors. The current facility does not have adequate space to accommodate these features, therefore, a new electrical control building is proposed as part of the Project. The proposed electrical control building would be constructed northeast of the proposed access walkway. The approximate 6 foot by 12 foot prefabricated electrical control building would house all of the new pumping, picket fence, fish screen brush, and all miscellaneous electrical components such as the existing water diversion (which would be improved under this Project and is described above). The electrical control building would have a concrete slab foundation approximately 8 inches thick. Power for the building would come from the service panel located within the existing trough building.

This infrastructure would allow for fish passage on lower and upper Dominie Creek, and on Rowdy Creek when the picket fence is not in use. This upgrade would result in a significant increase in the use of habitat in upper Rowdy and Dominie Creeks and thus the lower Smith River, an area that is lacking a variety of highly ecologically productive tributary creeks.

2.1.3 Instream Enhancements

In addition to demolition and infrastructure replacement, the Project proposes to enhance the channel beds within segments of Dominie Creek and Rowdy Creek for improved geomorphic function and aquatic organism passage. An approximately 400-foot long roughened channel would be installed throughout Rowdy Creek within the Project Area, and in the lower section of Dominie Creek. The purpose of the roughened channel is to overcome the existing vertical drop caused by the Rowdy Creek diversion weir, while maintaining the existing grade upstream within Rowdy and Dominie Creek. The roughened channel would provide interconnected transitional habitat and prevent further channel degradation upstream of the Highway 101 bridge pier. It is necessary to lower and increase the channel bed elevation in certain areas to allow for this transition.

The roughened channel is comprised of five rock chutes and five pools. The chutes and pools that comprise the “lower reach” (pools 1 through 4 and chutes 1 through 3) are channel spanning. The proposed Rowdy Creek weir would be located in pool 4. The “upper reach” (pool 5 and chutes 4 and 5) have two flow paths separated by a long boulder structure referred to as the “channel spine.” The channel spine mimics and provides a continuation of the existing gravel bar downstream of the Highway 101 bridge pier. The existing gravel bar would be integrated into the roughened “channel spine” grading. The full longitudinal channel width extends to the existing rock slope protection (rsp) on river right and to proposed bankline rock on river left. Much of the lower reach is perched,

meaning that the new channel bed elevation is greater than the existing bed elevation. Constructing a channel under these conditions can be challenging because there is a high potential for flow to go subsurface. During construction, it will be critical that the channel is correctly sealed through adequate compaction and jetting methods prior to completion.

ESM would be comprised of a gradation of rock ranging from up to 6 feet in diameter to gravel (GHD and Michael Love & Associates 2018). Rock bands define the upper and lower portion of a chute, provide the structure of the roughened channel, and maintain the chute's grade. They are constructed using the largest of the ESM mixture. Rock bands have an arched shape where the most upstream rock is located near the center of the chute. This allows the rocks to work together, creating a robust structure. The material placed between the rock bands (including within the pools) has smaller diameter than the material placed in the rock bands. This mixture of rock is placed in lifts and each lift is sealed to prevent water from flowing subsurface. Some larger rock protrudes through the lifts to provide habitat structure. The objective is to place the final lift so the bed is rough and has large rock protruding a third of its diameter above the channel bed. This roughness decreases the flow velocity, increases the flow depth, and creates varied flow paths.

The roughened channel would include a series of rock bands and chutes to raise the channel bed elevation in specific areas to create a gradient of contiguous flow, as opposed to areas of disconnected pools which are more noticeable during low flow conditions and can lead to fish stranding. For example, the weir on Rowdy Creek is currently perched approximately three feet above the tailwater pool. The proposed chutes would raise the channel bed elevation to offset the drop between the weir and pool, to allow fish volitional fish passage when the picket fence is not in operation.

In the lower extent of the Project Area, rock would be placed to prevent erosion along the western toe slope bank of Rowdy Creek (river right). In the upper extent of the Project Area along Dominie Creek, large boulders would be placed in the channel, similar to the boulders placed at the confluence, to help control the degree to which the channel adjusts following the removal of infrastructure from beneath the bridge. The boulders will create roughness, which will decrease the water velocity and likely cause bed material to settle, ensuring the bed will degrade less than if left on its own.

California native plant species would be planted along the banks; shrub and tree species to be planted include: Pacific willow (*Salix lucida*), red alder (*Alnus rubra*), cottonwood (*Populus spp.*), twinberry (*Lonicera involucrata*), and salmonberry (*Rubus spectabilis*). Grass seed to be sown would include seed from the following species: California brome, blue wild rye, red fescue, and meadow barley. Fast growing regreen hybrid wheatgrass would be used to provide quick vegetative cover while other grass species developed.

2.1.4 Project Schedule and Equipment

Construction of the Project would involve a variety of equipment (see list below). All construction (including demolition, installation of replacement infrastructure, and installation of the roughened channel) would occur from within the channel and from channel banks. Equipment would not be within the channel unless it has been dewatered.

Construction Duration and Hours

Demolition and construction activities would occur in a single construction season (June 15 through October 15).

Anticipated work hours would be 7:00 a.m. to 6:00 p.m. Monday through Friday, and intermittently on weekends.

Construction Equipment

A variety of construction equipment would be used to implement the Project. This would include, but not necessarily be limited to, excavators, backhoes, front end loaders, concrete saws, jackhammers, horizontal directional drills, winches, pumps, chainsaws, fork lifts, compactors, air compressors, generator sets, and pneumatic tools. A variety of trucks including cement mixers, haul trucks, and water trucks would also be required. Site preparation, including demolition, clearing and grading of the Project site as necessary would require the removal and off-haul of materials. This would include, but not necessarily be limited to, vegetation, concrete, asphalt and fill, and certain existing utilities that would be removed and replaced.

Construction Staging Areas

All work including stockpiling and staging would occur within the Project Area limits as shown on **Figure 2 – Project Area** (**Appendix A** - Figures. Construction staging would occur in two areas; the eastern staging area (Staging Area 1) is under private ownership, and the western staging area (Staging Area 2) is owned by TDN. The areas are uplands and contain grasses; one of the staging areas contains limited shrubs. All shrubs would be avoided as feasible. Access to Staging Area 1 would be from Highway 101, and access to Staging Area 2 would be from North Fred Haight Drive onto Hatchery Access Road.

Construction Site Access

Access into the Rowdy Creek channel is likely to be feasible from two primary locations along the Rowdy Creek eastern (river left) bank, and from one location along the Rowdy Creek western (river right) bank. However, each of the proposed access routes have some limitations further described below.

The first access occurs along the existing Highway 101 bridge over Rowdy Creek via the Caltrans easement, into the Rowdy Creek channel. This access point would require securing an encroachment permit from Caltrans. The second proposed access is near the existing concrete weir on the river left bank, which is connected to Staging Area 1 located on APN 103-080-044. There are two potential access locations to Staging Area 1, including securing a temporary construction easement through APN 103-080-014, which owns the ingress/egress rights to Highway 101, or via Timber Blvd through an easement held by the APN 103-080-044 (see page G-005 of the Final Design Plans in Appendix B).

Access to the Rowdy Creek river right and Dominie Creek would be possible utilizing the western staging area and Hatchery Access Road.

Construction Water Management

Streamflow diversion and water management during construction would be necessary for this Project to comply with regulatory requirements. Summer base flows in Rowdy Creek would be diverted through a typical clear water coffer dam and bypass system and discharged downstream of the Project reach to maintain continuous streamflow downstream. Given the grade, it is anticipated a gravity bypass pipe and coffer dam with fish screens would be used, however, pumping may be necessary during times when there is limited space within the channel to complete the work while maintaining necessary gravity pipe slopes.

The primary water management consideration for this Project is timing. The instream portion of the Project should be completed prior to a major rainfall event. Typically this window is between June 15th and October 15th, however, the Rowdy Creek and Dominie Creek watersheds have shown to exhibit rapid runoff response time, and therefore any rainfall event occurring during construction could increase streamflow so the diversion system would have to accommodate this potential increase in streamflow. To minimize this risk, completing the instream work as early in the season as possible and having a robust water diversion system would be necessary and as a requirement of the construction contract; the contractor would need to submit a Water Management Plan for review and approval prior to construction. Due to the nature of the work, the Project would be constructed during a single instream work season.

All construction components (demolition, infrastructure replacement, and instream enhancements), would require dewatering of the stream channels and native aquatic species relocation. Native species relocation would occur concurrently with dewatering, utilizing best management practices to reduce potential impacts to aquatic species. See Section 3.4 (Biological Resources) of the ISMND for a description native aquatic species relocation. Water pumped out of the construction work area would be discharged to permeable areas downstream of the construction work area within the Project Area. Nuisance water (the subsurface water that re-enters the work area following initial dewatering) in the Rowdy and Dominie Creek channels is anticipated to be encountered. Therefore dewatering of nuisance water in the instream portions of Rowdy and Dominie Creeks may be necessary, and would be discharged to permeable areas within the Project Area. Dewatering is further discussed in Section 3.4 (Biological Resources) of the ISMND.

2.2 Operation and Maintenance

Operation and maintenance of the Project would be completed by TDN and Hatchery staff, under the direction of TDN. Operation and maintenance is expected to include routine testing and maintenance of all equipment, including the picket fence to ensure it is in working condition (i.e. it can be taken out and put back into operation), water diversion, and cleaning of amenities. Removal of debris and sediment deposition in and around the picket fence, fish trap, and return channel is expected. The diversion facility may require maintenance to remove fine sediments that pass through the screen and into the stilling well during high flow events. Additionally, Hatchery staff will likely have to remove leaves or other large debris material from the screen face of the diversion, as these items will not be removed by a brush system. It is possible that large debris moving downstream could contact and damage the screen, in this case the screen would require maintenance or replacement to restore to working condition. Instream maintenance of the

roughened channel is not expected to be necessary. For the sake of this analysis, operation and maintenance activities are assumed to last for a minimum of 30 years.

2.3 Definition of the Project Area

The Project Area represents the limit of disturbance associated with the Project, and is approximately 2.7 acres. The following assessor parcel numbers (APNs) comprise the Project: 103-080-028, 103-080-026, 103-072-001, 103-080-044, 103-080-014, 103-080-043. Staging will take place within the Project Area, and will occur in two locations: in the northwest ("staging area 1 of 2") and southwest ("staging area 2 of 2"). The cumulative area where Project construction activities are planned to occur shall herein be defined as the Project Area (**Appendix A** - Figures**, Figure 2**).

2.4 Other Public Agencies Whose Approval is Required

The Project is outside of the California Coastal Zone; therefore a Coastal Development Permit would not be required. The Project will need to comply with Sections 404 and 401 of the Clean Water Act, California Department of Fish and Wildlife Lake and Streambed Alteration Agreement, the federal and California Endangered Species Acts, Section 106 of the National Historic Preservation Act, and Del Norte County Grading Permit,

2.5 Known Ongoing and Previous Projects in the Area

No other known projects have previously occurred or are currently taking place in the Dominie or Rowdy Creek watersheds.

3. Regulatory Background

Following is an overview of agencies that have potential oversight of the proposed Project related to biological resources. The regulatory setting is divided into sections on federal, state, and local jurisdiction.

3.1 Federal Jurisdiction

3.1.1 National Environmental Policy Act (NEPA)

The National Environmental Policy Act of 1969 (NEPA) requires federal agencies to prepare environmental documentation that discloses to decision-makers and the interested public a clear, accurate description of potential environmental effects resulting from proposed federal actions and reasonable alternatives to those actions. Through NEPA, the U.S. Congress directed federal agencies to integrate environmental factors in their planning and decision-making processes, and encourage and facilitate public involvement in decisions that affect the quality of the human environment. Federal agencies are required to consider the environmental effects of a Proposed Action, alternatives to the Proposed Action, and a No Action alternative (assessing the potential environmental effects of not undertaking the Proposed Action).

3.1.2 Endangered Species Act (ESA)

The ESA of 1973 (16 USC 1531 et seq.) establishes a national policy that all federal departments and agencies provide for the conservation of threatened and endangered species and their ecosystems. The Secretary of the Interior and the Secretary of Commerce are designated in the ESA as responsible for: (1) maintaining a list of species likely to become endangered within the foreseeable future throughout all or a significant portion of its range (threatened) and that are currently in danger of extinction throughout all or a significant portion of its range (endangered); (2) carrying out programs for the conservation of these species; and (3) rendering opinions regarding the impact of proposed federal actions on listed species. The ESA also outlines what constitutes unlawful taking, importation, sale, and possession of listed species and specifies civil and criminal penalties for unlawful activities.

Pursuant to the requirements of the ESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally listed or proposed species may be present in the project region, and whether the proposed project would result in a “take” of such species. The ESA prohibits “take” of a single threatened and endangered species except under certain circumstances and only with authorization from the USFWS or the National Oceanic and Atmospheric Administration (NOAA) Fisheries through a permit under Section 7 (for federal entities or federal actions) or 10(a) (for non-federal entities) of the Act. “Take” under the ESA includes activities such as “harass, harm, pursue, hunt shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.” USFWS regulations define harm to include “significant habitat modification or degradation.” On June 29, 1995, a U.S. Supreme Court ruling further defined harm to include habitat modification “…where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.”

In addition, the agency is required to determine whether the project is likely to jeopardize the continued existence of any species proposed to be listed under the ESA, or result in the destruction or adverse modification of critical habitat for such species (16 USC 1536[3][4]). If it is determined that a project may result in the "take" of a federally-listed species, a permit would be required under Section 7 or Section 10 of the ESA.

Critical Habitat is defined by the ESA as a specific geographic area containing features essential for the conservation of an endangered or threatened species. Under Section 7 of the ESA, critical habitat should be evaluated if designated for federally listed species that may be present in the project Action Area (federally designated term for a “Project Study Boundary”).

3.1.3 Clean Water Act (CWA)

The CWA (1977, as amended) establishes the basic structure for regulating discharges of pollutants into waters of the U.S. It gives the U.S. Environmental Protection Agency (EPA) the authority to implement pollution control programs, including setting wastewater standards for industry and water quality standards for contaminants in surface waters. The CWA makes it unlawful for any person to discharge any pollutant from a point source into navigable waters, without a permit under its provisions.

Discharge of fill material into “waters of the U.S.,” including wetlands, is regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA (33 USC 1251-1376). USACE

regulations implementing Section 404 define “waters of the U.S.” to include intrastate waters (such as, lakes, rivers, streams, wetlands, and natural ponds) that the use, degradation, or destruction of could affect interstate or foreign commerce. Wetlands are defined for regulatory purposes as “areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (33 CFR 328.3; 40 CFR 230.3). The placement of structures in “navigable waters of the U.S.” is also regulated by the USACE under Section 10 of the Federal Rivers and Harbors Act (33 USC 401 et seq.). Projects are approved by USACE under standard (i.e., individual) or general (i.e., nationwide, programmatic, or regional) permits. The type of permit is determined by the USACE and based on project parameters.

The USACE and the EPA announced the release of the Clean Water Rule on May 27, 2015 (80 FR 124: 37054-37127). The Rule is intended to ensure waters protected under the CWA are more precisely defined, more predictable, easier to understand, and consistent with the latest science. The intent is to: 1) clearly define and protect tributaries that impact the quality of downstream waters; 2) provide certainty in how far safeguards extend to nearby waters; 3) protect unique regional waters; 4) focus on streams instead of ditches; 5) maintain the status of waters associated with infrastructure (i.e., sewer systems); and 6) reduce the need for case specific analysis of all waters. The U.S. Court of Appeals for the Sixth Circuit stayed implementation of the Clean Water Rule pending further action of the court in October 2015. In response, the USACE and EPA resumed case-by-case analysis of waters of the U.S. determinations. Implementation of the Clean Water Rule was pending litigation prior to February 2017. An Executive Order (Restoring the Rule of Law, Federalism, and Economic Growth by Reviewing the “Waters of the United States” Rule) was signed on February 28, 2017, directing the USACE and EPA to review The Rule and publish for notice and comment a proposed rule rescinding or revising The Rule. The USACE and EPA subsequently published a Notice of Intention to Review and Rescind or Revise the Clean Water Rule in the Federal Register on March 6, 2017. The definition of “navigable waters” under the CWA along with The Rule is currently under review per the Executive Order.

The Fish and Wildlife Coordination Act requires consultation with the USFWS, NOAA Fisheries, and responsible state wildlife agency for any federally authorized action to control or modify surface waters. Therefore, any project proposed or permitted by the USACE under the CWA Section 404 must also be reviewed by the federal wildlife agencies and California Department of Fish and Wildlife (CDFW).

Section 401 of the CWA requires any applicant for a federal license or permit, which involves an activity that may result in a discharge of a pollutant into waters of the U.S., obtain a certification that the discharge will comply with applicable effluent limitations and water quality standards. CWA 401 certifications are issued by Regional Water Quality Control Boards (RWQCBs) under the California Environmental Protection Agency.

3.1.4 Executive Order 11990

Executive Order 11990 (1977) furthers the protection of wetlands under NEPA through avoidance of long and short-term adverse impacts associated with the destruction or modification of wetlands where practicable. The order requires all federal agencies managing federal lands, sponsoring federal projects, or funding state or local projects to assess the effects of their actions on wetlands.

The agencies are required to follow avoidance, mitigation, and preservation procedures. The Presidential Wetland Policy of 1993 and subsequent reaffirmation of the policy in 1995 supports effective protection and restoration of wetlands, while advocating for increased fairness of federal regulatory programs.

3.1.5 Executive Order 13112, Invasive Species

Executive Order 13112 was issued in 1999 to enhance federal coordination and response to the complex and accelerating problem of invasive species. It provides policy direction to promote coordinated efforts of federal, state, and local agencies in monitoring, detecting, preventing, evaluating, managing, and controlling the spread of invasive species and increasing the effectiveness of scientific research and public outreach affecting the spread and impacts of invasive species.

3.1.6 Migratory Bird Treaty Act (MBTA)

The MBTA of 1918 (16 USC 703-712) as amended established federal responsibilities for the protection of nearly all species of birds, their eggs, and nests. A migratory bird is defined as any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. The MBTA prohibits the take, possession, buying, selling, purchasing, or bartering of any migratory bird listed in 50 CFR Part 10, including feathers or other parts, nests, eggs, or products, except as allowed by implementing regulations (50 CFR 21). Only exotic species such as Rock Pigeons (*Columba livia*), House Sparrows (*Passer domesticus*), and European Starlings (*Sturnus vulgaris*) are exempt from protection.

In 2001, President Clinton defined “take” in Executive Order 13186 to include both “intentional” and “unintentional.” This was also the interpretation of the Act put forth in an earlier Solicitor’s Opinion (M-37041). However, in December of 2017, the Department of the Interior’s (DOI) Office of Solicitor argued via Opinion M-37050 that incidental take was not prohibited under the Migratory Bird Treaty Act (this interpretation of the Act was also upheld in 2015 by the 5th Circuit in *United States v. CITGO Petroleum Corp*.). Opinion M-37050 was the subject of a lawsuit between eight U.S. states and the U.S. DOI.

In January of 2020, representative Alan Lowenthal and 18 bipartisan sponsors introducted the federal Migratory Bird Protection Act (H.R. 5552). The purpose of this bill was to “[a]mend the Migratory Bird Treaty Act to affirm that the Migratory Bird Treaty Act’s prohibition on the unauthorized take or killing of migratory birds includes incidental take by commercial activities, and to direct the United States Fish and Wildlife Service to regulate such incidental take, and for other purposes” (H.R. 5552). As of March 2020, this bill has yet to pass the House (Congress.gov 2020).

In February of 2020, the USFWS proposed a new rule to define the scope of the MBTA (85 FR 5915). The rule specifies that “the Service proposes to adopt a regulation defining the scope of the MBTA's prohibitions to reach only actions directed at migratory birds, their nests, or their eggs” and essentially codifies M-37050 (85 FR 5915). Publc comment on this new proposed rule closed on March 19, 2020.

As of March 2020, the interpretation of “take” in the rule by the DOI did not include “incidental take.” This interpretation is currently the subject of litigation (Audubon 2020).

3.1.7 Bald and Golden Eagle Protection Act (BGEPA)

The Bald Eagle Protection Act was originally enacted in 1940 in order to protect the national emblem of the United States, the Bald Eagle (*Haliaeetus leucocephalus*). At this time, the Bald Eagle was experiencing significant population pressures from hunting, egg collection, and habitat loss (Buehler 2000). This act was expanded upon in 1962 to include protections for the Golden Eagle (*Aquila chrysaetos*). Similarly, the Golden Eagle was also experiencing precipitous population declines due to habitat loss, hunting, and electrocution from power lines (Kochert et al. 2002).

The current federal statute as amended (16 U.S.C. 668-668d) includes criminal penalties for anyone, including individuals, associations, partnerships, and corporations who “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner any bald eagle commonly known as the American eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof” without a permit (16 U.S.C. § 668a). “Take” is defined as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb” (16 U.S.C. § 668c). “Disturb” is defined as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior” (50 CFR 22.3). Broadly construed, “take” may be applied to the protection of habitat around nest sites (Wisch 2002). Civil and criminal penalties may include monetary fines, imprisonment, a cancellation of grazing agreements on federal land, and a loss of property that was used in violating the act (e.g. boat, gun, or car). According to the USFWS, “a violation of the Act can result in a fine of up to $100,000 ($200,000 for organizations), imprisonment for one year, or both, for a first offense. Penalties increase substantially for additional offenses, and a second violation of this Act is a felony” (USFWS 2016). However, the act allows for Bureau of Indian Affairs certified tribal members to use eagles and eagle parts for religious ceremonies, as well as exceptions for scientific or educational purposes, falconry, and in cases of livestock depredation (16 U.S.C. § 668a). Any employee of the Department of the Interior (DOI) may enforce the provisions of the statute and may arrest individuals for violations (16 U.S.C. § 668b).

In the case of development projects, a permit may be required if the project activity is near an active or inactive eagle nest, roosting site, or foraging site. This is particularly true if the project is near breeding habitat (as opposed to wintering habitat or migratory stop-over sites). The act applies to all activities that may impact eagles, including projects without a federal nexus. If there is a possibility that the project could “non-purposefully take” eagles (unavoidable take associated with, but not the purpose of an activity) the USFWS may issue a programmatic take permit. In this case, the permit is subject to conditions or mitigation measures to minimize impacts. Post-construction monitoring and annual reports may also be required (50 CFR 22.26).

3.1.8 Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) provides the federal government with the authority to manage fisheries in the U.S. Exclusive Economic Zone (EEZ) (from state waters which end 3 nautical miles offshore to a distance of 200 nautical miles). In addition, the Act mandates inter-agency cooperation in achieving protection, conservation, and enhancement of Essential Fish Habitat (EFH). The Act defines EFH as "Those waters and substrate

necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH: 'Waters' include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and “spawning, breeding, feeding, or growth to maturity” covers a species' full life cycle" (50 CFR 600.10). EFH designations serve to highlight the importance of habitat conservation for sustainable fisheries and sustaining valuable fish populations. EFH relates directly to the physical fish habitat and indirectly to factors that contribute to degradation of this habitat. Important features of EFH that deserve attention are adequate water quality, temperature, food source, water depth, and cover/vegetation.

3.1.9 Sustainable Fisheries Act of 1996

The Sustainable Fisheries Act (SFA) (Public Law 104-107) serves as an amendment to the MSFCMA to “authorize appropriations, to provide for sustainable fisheries, and for other purposes.” The SFA includes requirements for describing EFH in Fishery Management Plans (FMP) and also mandates the protection EFH. According to the SFA, “[o]ne of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States.” This act also mandates the delineation of EFH for all managed species.

3.2 State Jurisdiction

3.2.1 California Environmental Quality Act (CEQA)

CEQA applies to certain activities of state and local public agencies. A public agency must comply with CEQA when it undertakes an activity defined by CEQA as a "project." A project is an activity undertaken by a public agency or a private activity which must receive some discretionary approval. Under CEQA, a variety of technical studies including biological, cultural, traffic, and air quality studies as well as research and professional knowledge are considered to determine whether the project may have an “adverse effect” on the environment. Lead agencies are charged with evaluating the best available data when determining what specifically should be considered an “adverse effect” to the environment.

3.2.2 Porter-Cologne Water Quality Act

The Porter-Cologne Act provides for statewide coordination of water quality regulations by establishing the California State Water Resources Control Board. The State Board is the statewide authority that oversees nine separate RWQCBs that collectively oversee water quality at regional and local levels. California RWQCBs issue CWA Section 401 Water Quality Certifications for possible pollutant discharges into waters of the U.S. or state. On April 2, 2019 the California State Water Resources Control Board adopted new definitions and procedures for discharges of dredged or fill material to Waters of the State.

3.2.3 California Endangered Species Act (CESA)

The CESA includes provisions for the protection and management of species listed by the State of California as endangered, threatened, or designated as candidates for such listing (California Fish and Game Code (FGC) Sections 2050 through 2085). The CESA generally parallels the main provisions of the ESA and is administered by the CDFW, who maintains a list of state threatened and endangered species as well as candidate species. The CESA prohibits the "take" of any species listed as threatened or endangered unless authorized by the CDFW in the form of an Incidental Take Permit. Under FGC, "take" is defined as to "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."

3.2.4 Other State Special Status Species and Communities

The CDFW maintains a list of species of special concern. These are broadly defined as species that are of concern to the CDFW because of population declines and restricted distributions, and/or they are associated with habitats that are declining in California. The criteria used to define special status species are described by the CDFW. Impacts to special status plants, animals, and sensitive natural communities may be considered significant under CEQA.

State Species of Special Concern include those plants and wildlife species that have not been formally listed, yet are proposed or may qualify as endangered or threatened. In addition, USFWS Birds of Conservation Concern, and CDFW special status invertebrates are considered special status species by CDFW.

The CDFW administers the Native Plant Protection Act (Sections 1900–1913 of the FGC). These sections allow the California Fish and Game Commission to designate endangered and rare plant species and to notify landowners of the presence of such species. Plant species on California Native Plant Society's (CNPS) California Rare Plant Ranking (CRPR) Lists 1 and 2 are considered eligible for state listing as Endangered or Threatened pursuant to the California Fish and Game Code and CDFW has oversite of these special status plant species as a trustee agency. As part of the CEQA process, such species should be considered as they meet the definition of Threatened or Endangered under Sections 2062 and 2067 of the California Fish and Game Code. CRPR List 3 and 4 plants may warrant protection under CEQA Guidelines 15380 only in special circumstances. CDFW publishes and periodically updates lists of special status species which include, for the most part, the above categories. Additionally, there are 64 plant species designated as "rare" which is a special designation created before plants were rolled into CESA in the 1980s. The CESA and the Native Plant Protection Act (NPPA) required a project to have a "Scientific, Educational, or Management Permit" from CDFW for activities that would result in "take," possession, import, or export of state-listed plant species including research, seed banking, reintroduction efforts, habitat restoration, and other activities relating to any plant designated SE (State endangered), ST (State threatened), SR (State rare), or SC (State candidate for listing).

3.2.5 Sensitive Natural Communities (SNCs)

CDFW provides oversight of habitats (i.e., plant communities) listed as Sensitive in the California Natural Diversity Database (CNDDB) and on the California Sensitive Natural Communities List, based on global and state rarity rankings. The natural communities are broken down to alliance and

association levels for vegetation types affiliated with ecological sections in California. The alliances on the California Sensitive Natural Communities List coincide with A Manual of California Vegetation (Sawyer et al. 2009). CDFW considers alliances and associations with a state rank of S1 to S3 to be Sensitive. The application of ranking for determination of Sensitive Communities is summarized as follows in **Table 3.1** (NatureServe 2020):

Table 3.1 NatureServe Conservation Status Ranks

Name	Calculated Status Rank	Status Description
Score ≤ 1.5	G1, N1, S1	Critically Imperiled
1.5 ≤ Score ≤ 2.5	G2, N2, S2	Imperiled
2.5 ≤ Score ≤ 3.5	G3, N3, S3	Vulnerable
3.5 ≤ Score ≤ 4.5	G4, N4, S4	Apparently Secure
Score > 4.5	G5, N5, S5	Secure

3.2.6 California Fish and Game Code (FGC)

Lake or Streambed Alteration Agreement

Streams, lakes, and riparian vegetation that serve as habitat for fish and other wildlife species are subject to jurisdiction by the CDFW under Sections 1600-1616 of the FGC. Any activity that will do one or more of the following: 1) substantially obstruct or divert the natural flow of a river, stream, or lake; 2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or 3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake; generally require a 1602 Lake and Streambed Alteration Agreement (LSAA). The term “stream,” which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as follows: “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation” (14 CCR 1.72). In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife. Riparian is defined as, “on, or pertaining to, the banks of a stream;” therefore, riparian vegetation is defined as, “vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself.” Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from the CDFW.

Birds of Prey and Native Nesting Birds

Section 3503 of the FGC prohibits the take, possession, or needless destruction of the nest or eggs of any bird. Subsection 3503.5 specifically prohibits the take, possession, or destruction of any birds in the orders *Falconiformes* (hawks and eagles) or *Strigiformes* (owls) and their eggs or nests. These provisions, along with the federal MBTA, essentially serve to protect nesting native birds. Non-native species, including the European Starling, Rock Dove, and House Sparrow, are not afforded protection under the MBTA or FGC.

Fully Protected Species

The CDFW enforces the FGC, which provides protection for “fully protected birds” (Section 3511), “fully protected mammals” (Section 4700), “fully protected reptiles and amphibians” (Section 5050), and “fully protected fish” (Section 5515). As fully protected species, the CDFW cannot authorize any project or action that would result in “take” of these species even with an incidental take permit

Migratory Bird Protection Act (MBPA)

The California Migratory Bird Protection Act (MBPA) was introduced in the California State Assembly 2019 by Assembly Member Ash Kalra and co-sponsored by the National Audubon Society. The text of the Act specifies that it is unlawful to take or possess any migratory nongame bird as designated in the federal Migratory Bird Treaty Act (16 USC 703-712) before January 1, 2017. This upholds the interpretation of the MBTA under Clinton’s EO 13166, where “take” was defined as both “unintentional as well as intentional” (FGC 5315). Governor Gavin Newson signed the Act into law on September 27, 2019. The MBPA effectively closes the federal MBTA loophole on incidental take of migratory birds in California.

3.3 Local Jurisdiction

3.3.1 City Regulations or General Plans

The Del Norte County General Plan formalizes a long-term vision for the physical evolution of Del Norte County and outlines policies, standards, and programs to guide day-to-day decisions concerning Del Norte County's development (County of Del Norte 2013). It is designed to meet state general plan and coastal planning requirements. The proposed Project is analyzed for compliance with the General Plan in the ISMND.

3.3.2 County Grading Permit

The Project will comply with the Del Norte County Grading Permit requirements, which considers proposed removal of vegetation, slope and volume of area to be excavated and graded, and compliance with zoning.

4. Methods

4.1 Project Study Boundary (PSB)

For the purposes of this BRR, the Project Study Boundary (PSB) includes the Project Area as defined in **Section** Error! Reference source not found. (**Appendix A** - Figures **Figure 3 – Project Study Boundary**) and a circular buffer of 0.25 miles (radius). State special status wildlife species were evaluated at the level of the PSB. This large buffer around the Project Area is designed to account for any auditory and visual disturbance to wildlife or other resources, as well as other potential impacts such as increased sedimentation/turbidity from construction and increased dust.

State special status plant species and SNCs were evaluated at the Project Area level where disturbance is proposed.

4.2 Preliminary Investigation

4.2.1 Database Searches (CNDDB, CNPS, IPaC, and NOAA Fisheries)

A database search for sensitive plant and wildlife species that may occur in the Project vicinity was conducted. Database searches included the CNDDB (CDFW 2020a), CNPS Inventory of Rare and Endangered Vascular Plants (CNPS 2020), USFWS Information for Planning and Conservation (IPaC) (USFWS 2020), and the NOAA Fisheries West Coast Region California Species List Tools (NMFS 2020), and were conducted by GHD on April 17, 2020. The search encompassed seven U.S. Geological Survey (USGS) quadrangles (quads) centered on the Project Area quad (Smith River) and the surrounding six quads (High Divide, Mount Emily, Brookings, Fourth of July Creek, Crescent City, and Hiouchi). In addition, citizen science databases such as eBird, Bumble Bee Watch, Bat Acoustic Monitoring Visualization Tool (BAMVT) and iNaturalist were reviewed for additional local wildlife and botanical information (eBird 2020, Bumble Bee Watch 2020, BAMVT 2020, iNaturalist 2020).

Plant species on CNPS California Rare Plant Ranking (CRPR) Lists 1 and 2 are considered eligible for state listing as endangered or threatened pursuant to the California Fish and Game Code and CDFW has oversite of these special status plant species as a trustee agency. As part of the CEQA process, such species should be considered as they meet the definition of threatened or endangered under Sections 2062 and 2067 of the California Fish and Game Code. There are occasions where CRPR List 3 or 4 species might be considered of special concern particularly for the type locality of a plant, for populations at the periphery of a species range, or in areas where the taxon is especially uncommon or has sustained heavy losses, or from populations exhibiting unusual morphology. For this Project, scoping for special status plant species included plant species on CNPS California Rare Plant Ranking (CRPR) Lists 1 and 2.

4.2.2 National Wetlands Inventory (NWI)

A search of the NWI was conducted in early June 2020 in preparation for the formal wetland delineation, and on August 7, 2020 for the immediate Project vicinity.

4.3 Field Surveys

An on-site habitat evaluation and rare plant survey was conducted on June 12, 2020 by Kelsey McDonald and Joslyn Curtis, GHD botanists. The surveys were aimed to identify potential habitat for special status species, potential presence of Sensitive Natural Communities, and identify any special status plants. The surveys began at about 0800 and concluded around 1600 hours. Conditions were overcast, clearing up later in the day. Temperatures were in the upper 50 to low 60 degrees Fahrenheit (°F).

4.3.1 Special Status Plants and Sensitive Natural Communities

The surveyors conducted their search for special status plants and SNCs from west to east, beginning at the western staging area and Dominie Creek. The surveyors then investigated the confluence, along the western bank of Rowdy Creek, followed by walking the eastern bank of Rowdy Creek north to south, and traversing the eastern staging area.

4.3.2 Wetland Reconnaissance Methods

An aquatic resources delineation was completed on June 12, 2020 by GHD Botanists Kelsey McDonald and Joslyn Curtis. See separate Aquatic Resources Delineation Report prepared by GHD (2020).

5. Results

5.1 Summary of General Biological Resources

The PSB includes residential and other developed areas, patches of disturbed shrub and ruderal habitat, and a native riparian corridor. Disturbed shrub and ruderal habitat, with many invasive species, was observed in the eastern staging area. The eastern staging area was dominated by Himalayan blackberry (*Rubus armeniacus*), cotoneaster (*Cotoneaster spp.*), and coyotebrush (*Baccharis pilularis*), with many non-native species in the herbaceous layer including ox-eye daisy (*Leucanthemum vulgare*), klamathweed (*Hypericum perforatum*), slender oats (*Avena barbata*), and orchardgrass (*Dactylis glomerata*). Coast redwood (*Sequoia sempervirens*) Sitka spruce (*Picea sitchensis*), and native riparian trees and shrubs occur in the surrounding area. Disturbed ruderal habitat was observed around the gravel pavement at the western staging area, near the hatchery, and the bridge over Dominie Creek. Red alder (*Alnus rubra*) dominated the riparian canopy, with a diverse mixture of other native riparian trees, such as Sitka willow (*Salix sitchensis*), shining willow (*Salix lasiandra*), bigleaf maple (*Acer macrophylum*), and some conifers such as coast redwood, Sitka spruce, western red cedar (*Thuja plicata*), and grand fir (*Abies grandis*). Invasive Himalayan blackberry (*Rubus armeniacus*), native thimbleberry (*Rubus parviflorus*), common ladyfern (*Athyrium filix-femina*), and western swordfern (*Polystichum munitum*) were common in the riparian understory. See **Appendix E - On-site Species List** for a list of all plant species observed. The weir in question spans the Rowdy Creek channel. A pool exists upstream of the weir, downstream of a gravel bar. Concrete structures that occur within both Dominie and Rowdy Creeks have changed the natural state of the creeks. For example, Dominie Creek enters Rowdy Creek through a concrete channel.

5.2 Special Status Plants

5.2.1 Special Status Plants and Sensitive Habitats

No special status plant species were observed during the survey of the Project Area. However, nine special status plant species were found to have a moderate potential of occurring within the Project Area based on available habitat and database records. See **Table 5.1** (below) for the complete list of special status plants that may occur in the vicinity of the Project. The findings in **Table 5.1** are based on database and literature review and information from the rare plant survey (CDFW 2018a). A list of other, non-special status plant species observed on-site was recorded during the survey and is included in **Appendix E - On-site Species List.**

Table 5.1 Potential for Special Status Plant Species to Occur in the Project Area

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Abronia umbellata var. breviflora	pink sand-verbena	None	None	G4G5T2	S2	1B.1	BLM_S-Sensitive | SB_RSABG-Rancho Santa Ana Botanic Garden	Coastal dunes. Coastal dunes and coastal strand. Foredunes and interdunes with sparse cover. A. umbellata var. breviflora is usually the plant closest to the ocean. 0-75 m.	**No Potential.** No coastal dune habitat occurs in the Project Area.
Anthoxanthum nitens ssp. nitens	vanilla-grass	None	None	G5	S2	2B.3		Meadow & seep | Wetland. Meadows and seeps. Wet sites. 3-1895 m.	**Low Potential.** No wet meadows or seeps occur in the Project Area.
Arabis aculeolata	Waldo rockcress	None	None	G4	S2	2B.2	SB_BerrySB-Berry Seed Bank	Broadleaved upland forest | Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Broadleafed upland forest, lower montane coniferous forest, upper montane coniferous forest. Serpentine slopes and ridges. 405-1270 m.	**Low Potential.** No serpentine areas occur in the Project Area.
Arabis mcdonaldiana	McDonald's rockcress	FE	SE	G3	S3	1B.1	SB_BerrySB-Berry Seed Bank | SB_RSABG-Rancho Santa Ana Botanic Garden	Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Lower montane coniferous forest, upper montane coniferous forest.	**Low Potential.** No serpentine areas or coniferous forest occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
								Rocky outcrops, ridges, slopes, and flats on serpentine. 150-1830 m.	
Asplenium trichomanes ssp. trichomanes	maidenhair spleenwort	None	None	G5T5	S1	2B.1		Lower montane coniferous forest. Lower montane coniferous forest. On rocks. 185-200 m.	**Low Potential.** No rocky montane coniferous forest occurs in the Project Area.
Boechera koehleri	Koehler's stipitate rockcress	None	None	G3G4	S3	1B.3	USFS_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Chaparral, lower montane coniferous forest. Rocky, serpentine substrate. 120-1830 m.	**Low Potential.** No serpentine areas occur in the Project Area.
Bryoria spiralifera	twisted horsehair lichen	None	None	G1G2	S1S2	1B.1		North coast coniferous forest. North coast coniferous forest. Usually on conifers. 5-30 m.	**Low Potential.** Typically in coniferous forest on the immediate coast.
Calamagrostis crassiglumis	Thurber's reed grass	None	None	G3Q	S2	2B.1		Coastal scrub | Freshwater marsh | Marsh & swamp | Wetland. Coastal scrub, marshes and swamps. Usually in marshy swales surrounded by grassland or coastal scrub. 5-50 m.	**Low Potential.** No marsh habitat occurs in the Project Area.
Calicium adspersum	spiral-spored gilded-head pin lichen	None	None	G3G4	S1	2B.2	USFS_S-Sensitive	Lower montane coniferous forest | North coast coniferous	**Low Potential.** No old-growth conifer stands

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
								forest. Lower montane coniferous forest, north coast coniferous forest. Only known in California from a Sequoia sempervirens stand. Restricted throughout its range to old-growth conifer forests in relatively cool-humid stands. Restricted to aged bark of conifers, typically old-growth trees over 200 years of age. 200 m.	occur in the Project Area.
Cardamine angulata	seaside bittercress	None	None	G4G5	S3	2B.1		Lower montane coniferous forest | North coast coniferous forest | Wetland. North coast coniferous forest, lower montane coniferous forest. Wet areas, streambanks. 5-515 m.	**Moderate Potential.** Species can occur on streambanks.
Carex arcta	northern clustered sedge	None	None	G5	S1	2B.2		Bog & fen | North coast coniferous forest | Wetland. Bogs and fens, north coast coniferous forest. Mesic sites. 60-1405 m.	**Low Potential.** No bogs or other emergent wetlands occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Carex lenticularis var. limnophila	lagoon sedge	None	None	G5T5	S1	2B.2		Bog & fen | Marsh & swamp | North coast coniferous forest. Bogs and fens, marshes and swamps, north noast coniferous forest.Lakeshores, beaches. Often in gravelly substrates. 0-6 m.	**Low Potential**. No bogs or lakes occur in the Project Area.
Carex lyngbyei	Lyngbye's sedge	None	None	G5	S3	2B.2		Marsh & swamp | Wetland. Marshes and swamps (brackish).0-200 m.	**No Potential.** No tidally influenced wetlands occur in the Project Area.
Carex praticola	northern meadow sedge	None	None	G5	S2	2B.2		Meadow & seep | Wetland. Meadows and seeps. Moist to wet meadows. 15-3200 m.	**Low Potential.** No wet meadows occur in the Project Area.
Carex serpenticola	serpentine sedge	None	None	G4	S3	2B.3		Meadow & seep | Ultramafic | Wetland. Meadows and seeps. Mesic, serpentine sites. 20-1710 m.	**Low Potential.** Non-specific occurrence mapped near Smith River in CNDDB (overlapping 1 mile radius) (CDFW 2020a), but no serpentine substrate was observed in Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Carex viridula ssp. viridula	green yellow sedge	None	None	G5T5	S2	2B.3		Bog & fen | Marsh & swamp | North coast coniferous forest | Wetland. Bogs and fens, marshes and swamps (freshwater), north coast coniferous forest. Mesic sites. 0-1705 m.	**Low Potential**. No bogs, marshes, or other emergent wetlands occur in the Project Area.
Cascadia nuttallii	Nuttall's saxifrage	None	None	G4?	S1	2B.1		North coast coniferous forest. North coast coniferous forest. Cliff walls, moss-covered rocks along creeks; mesic sites. 35-80 m.	**Moderate Potential.** Species may occur on steep banks and rocks within riparian areas.
Castilleja elata	Siskiyou paintbrush	None	None	G3	S2S3	2B.2		Bog & fen | Lower montane coniferous forest | Ultramafic | Wetland. Lower montane coniferous forest, bogs and fens. Usually found on mesic serpentine soils; often associated with bogs, seeps, stream benches, and dry gullies. 60-2075 m.	**Low Potential.** No serpentine wetlands occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Castilleja litoralis	Oregon coast paintbrush	None	None	G3	S3	2B.2		Coastal bluff scrub | Coastal dunes | Coastal scrub. Coastal bluff scrub, coastal dunes, coastal scrub. Sandy sites. 5-255 m.	**No Potential.** No coastal scrub or dunes occur in the Project Area.
Cochlearia groenlandica	Greenland cochlearia	None	None	G4	S1	2B.3		Coastal bluff scrub. Coastal bluff scrub. Sea bird nesting areas on offshore rocks. 0-50 m.	**No Potential.** No coastal bluff scrub occurs in the Project Area.
Downingia willamettensis	Cascade downingia	None	None	G4	S2	2B.2		Cismontane woodland | Valley & foothill grassland | Vernal pool. Cismontane woodland, valley and foothill grasslands, vernal pools. Lake margins. 15-1110 m.	**No Potential**. No emergent wetlands do not occur in the Project Area.
Empetrum nigrum	black crowberry	None	None	G5	S1?	2B.2		Coastal bluff scrub | Coastal prairie. Coastal bluff scrub, coastal prairie.3-15 m.	**No Potential.** Species occurs on the immediate coast, and Project is located approximately 3.25 miles from the coastline.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Eriogonum pendulum	Waldo wild buckwheat	None	None	G4	S2S3	2B.2		Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Lower montane coniferous forest, upper montane coniferous forest. On dry, rocky ultramafic soils; open somewhat grassy areas within pine forest. 240-915 m.	**No Potential.** No dry, rocky ultramafic soils occur in the area.
Erysimum concinnum	bluff wallflower	None	None	G3	S2	1B.2		Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal dunes, coastal bluff scrub, coastal prairie. More or less a coastal generalist within coastal habitat types. 3-60 m.	**No Potential.** Species occurs on the immediate coast, and Project is located approximately 3.25 miles from the coastline.
Erythronium hendersonii	Henderson's fawn lily	None	None	G4	S2	2B.3	USFS_S-Sensitive	Lower montane coniferous forest. Lower montane coniferous forest.60-900 m.	**Low Potential.** No dry lower montane coniferous forest occurs in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Erythronium howellii	Howell's fawn lily	None	None	G3G4	S2	1B.3		Lower montane coniferous forest | North coast coniferous forest. Lower montane coniferous forest, north coast coniferous forest.120-1150 m.	**Low Potential.** Species typically occurs on dry slopes.
Erythronium oregonum	giant fawn lily	None	None	G4G5	S2	2B.2		Cismontane woodland | Meadow & seep | Ultramafic. Cismontane woodland, meadows and seeps. Openings. Sometimes on serpentine; rocky sites. 300-1435 m.	**Low Potential.** Species typically occurs in forest openings.
Fissidens pauperculus	minute pocket moss	None	None	G3?	S2	1B.2	USFS_S-Sensitive	North coast coniferous forest | Redwood. North coast coniferous forest. Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 30-1025 m.	**Moderate Potential.** Species may be found on streambanks along the North Coast.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Gentiana setigera	Mendocino gentian	None	None	G2	S2	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Lower montane coniferous forest | Meadow & seep | Ultramafic | Wetland. Lower montane coniferous forest, meadows and seeps. Meadows, seeps and bogs. Serpentine substrates. 120-1070 m.	**No Potential.** Typically occurs in wet mountain meadows.
Gilia capitata ssp. pacifica	Pacific gilia	None	None	G5T3	S2	1B.2		Chaparral | Coastal bluff scrub | Coastal prairie | Valley & foothill grassland. Coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland.5-1345 m.	**Low Potential.** No coastal scrub or prairie occur in the Project Area.
Gilia millefoliata	dark-eyed gilia	None	None	G2	S2	1B.2	BLM_S-Sensitive	Coastal dunes. Coastal dunes.1-60 m.	**No Potential.** No coastal dunes occur in area.
Hesperevax sparsiflora var. brevifolia	short-leaved evax	None	None	G4T3	S2	1B.2	BLM_S-Sensitive	Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal bluff scrub, coastal dunes, coastal prairie. Sandy bluffs and flats. 0-640 m.	**Low Potential.** No coastal scrub, prairie, or dunes occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Kopsiopsis hookeri	small groundcone	None	None	G4?	S1S2	2B.3		North coast coniferous forest. Open woods, shrubby places, generally on Gaultheria shallon. 120-1435 m.	**Low Potential.** Species typically occurs in open coniferous forest with Ericaceous species.
Lasthenia californica ssp. macrantha	perennial goldfields	None	None	G3T2	S2	1B.2		Coastal bluff scrub | Coastal dunes | Coastal scrub. Coastal bluff scrub, coastal dunes, coastal scrub.5-185 m.	**No Potential.** No coastal scrub or dunes occur in the Project Area.
Lathyrus japonicus	seaside pea	None	None	G5	S2	2B.1		Coastal dunes. Coastal dunes.3-65 m.	**No Potential.** No coastal dunes occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Lathyrus palustris	marsh pea	None	None	G5	S2	2B.2		Bog & fen | Coastal prairie | Coastal scrub | Lower montane coniferous forest | Marsh & swamp | North coast coniferous forest | Wetland. Bogs & fens, lower montane coniferous forest, marshes and swamps, north coast coniferous forest, coastal prairie, coastal scrub. Moist coastal areas. 2-140 m.	**Low Potential.** No emergent wetlands occur in the Project Area.
Lewisia oppositifolia	opposite-leaved lewisia	None	None	G3	S2	2B.2	USFS_S-Sensitive	Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest. In open, rocky, shallow soils; usually on decomposed serpentine. Mesic sites. 515-1220 m.	**No Potential.** No open, rocky serpentine areas occur in the Project Area.
Lilium occidentale	western lily	FE	SE	G1	S1	1B.1	SB_BerrySB-Berry Seed Bank	Bog & fen | Coastal bluff scrub | Coastal prairie | Coastal scrub | Freshwater marsh | Marsh & swamp | North coast coniferous forest | Wetland. Coastal scrub, freshwater marsh, bogs and fens, coastal	**Low Potential.** No coastal scrub or prairie occurs in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
								bluff scrub, coastal prairie, north coast coniferous forest, marshes and swamps. Well-drained, old beach washes overlain with wind-blown alluvium and organic topsoil; usually near margins of Sitka spruce. 3-110 m.	
Lysimachia europaea	arctic starflower	None	None	G5	S1	2B.2		Bog & fen | Meadow & seep | Wetland. Meadows and seeps, bogs and fens. Coastal boggy areas. 3-15 m.	**No Potential.** No bogs, wet meadows, or other emergent wetlands occur in the Project Area.
Moneses uniflora	woodnymph	None	None	G5	S2	2B.2		Broadleaved upland forest | North coast coniferous forest. Broadleafed upland forest, North Coast coniferous forest.50-260 m.	**Low Potential.** Species typically occurs in coniferous forest.
Monotropa uniflora	ghost-pipe	None	None	G5	S2	2B.2		Broadleaved upland forest | North coast coniferous forest. Broadleafed upland forest, north coast coniferous forest. Often under redwoods or western hemlock. 15-855 m.	**Moderate Potential.** Although species typically occurs in coniferous forest, may also occur in low-elevation mixed forest, and numerous occurrences are

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
									documented in the Smith River area (CDFW 2020a).
Oenothera wolfii	Wolf's evening-primrose	None	None	G2	S1	1B.1	BLM_S-Sensitive | SB_BerrySB-Berry Seed Bank	Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal bluff scrub, coastal dunes, coastal prairie, lower montane coniferous forest. Sandy substrates; usually mesic sites. 0-125 m.	**Low Potential.** Species typically found in sandy substrates on the immediate coast. Project is not located on the immediate coast, rather is located approximately 3.25 miles inland.
Packera bolanderi var. bolanderi	seacoast ragwort	None	None	G4T4	S2S3	2B.2		Coastal scrub | North coast coniferous forest. Coastal scrub, north coast coniferous forest. Sometimes along roadsides. 30-915 m.	**Low Potential.** Varietal typically occurs on steep slopes in coniferous forest or coastal scrub.
Phacelia argentea	sand dune phacelia	None	None	G2	S1	1B.1	SB_BerrySB-Berry Seed Bank	Coastal dunes. Coastal dunes. Stabilized and recently moving sand dunes. 3-25 m.	**No Potential**. No coastal dunes occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Pinguicula macroceras	horned butterwort	None	None	G4	S2	2B.2		Bog & fen | Ultramafic | Wetland. Bogs and fens. Meadow edges, seepage areas. Serpentine soil. 20-1830 m.	**No Potential.** No serpentine wetlands occur in the Project Area.
Piperia candida	white-flowered rein orchid	None	None	G3	S3	1B.2	BLM_S-Sensitive	Broadleaved upland forest | Lower montane coniferous forest | North coast coniferous forest | Ultramafic. North Coast coniferous forest, lower montane coniferous forest, broadleafed upland forest. Sometimes on serpentine. Forest duff, mossy banks, rock outcrops, and muskeg. 20-1615m.	**Low Potential.** Species typically occurs in lower montane coniferous and mixed forests, not usually in lower riparian areas.
Polemonium carneum	Oregon polemonium	None	None	G3G4	S2	2B.2		Coastal prairie | Coastal scrub | Lower montane coniferous forest. Coastal prairie, coastal scrub, lower montane coniferous forest.15-1525 m.	**Moderate Potential.** Species documented in riparian areas in the vicinity of Smith River. Records date from the 1930s and are generally mapped to the Smith River vicinity (CDFW 2020a).

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Potamogeton foliosus ssp. fibrillosus	fibrous pondweed	None	None	G5T2T4	S1S2	2B.3		Marsh & swamp | Wetland. Marshes and swamps. Shallow water, small streams. 5-1300 m.	**Moderate Potential.** Subspecies may occur in small streams.
Prosartes parvifolia	Siskiyou bells	None	None	G2	S1S2	1B.2		Lower montane coniferous forest, Upper montane coniferous forest. Often roadsides, disturbed areas, and burned areas	**Low Potential.** Species typically occurs in coniferous forest.
Pyrrocoma racemosa var. congesta	Del Norte pyrrocoma	None	None	G5T4	S2	2B.3		Chaparral | Lower montane coniferous forest | Ultramafic | Wetland. Chaparral, lower montane coniferous forest. Serpentine soils, from dry roadsides to damp hills; often in forest openings. Apparently equally likely to occur in wetlands or non-wetlands. 240-765 m.	**Low Potential.** No serpentine soils occur in the Project Area.
Ramalina thrausta	angel's hair lichen	None	None	G5?	S2S3	2B.1		North coast coniferous forest. North coast coniferous forest. On dead twigs and other lichens. 75-1390 m.	**Low Potential.** Species typically occurs in coniferous forest.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Romanzoffia tracyi	Tracy's romanzoffia	None	None	G4	S2	2B.3		Coastal bluff scrub | Coastal scrub. Coastal bluff scrub, coastal scrub. Rocky sites 15-300 m.	**No Potential.** No coastal bluff scrub occurs in the Project Area.
Sabulina howellii	Howell's sandwort	None	None	G4	S3	1B.3	BLM_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest, chaparral. Dry open places, often on serpentine hillsides and ridges, near Jeffrey pines. 550-1000 m.	**Low Potential.** The low elevation riparian corridor in the Project Area does not provide likely habitat.
Sagittaria sanfordii	Sanford's arrowhead	None	None	G3	S3	1B.2	BLM_S-Sensitive	Marsh & swamp | Wetland. Marshes and swamps. In standing or slow-moving freshwater ponds, marshes, and ditches. 0-605 m.	**Low Potential.** No marshes, swamps, or other emergent wetlands occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Sanguisorba officinalis	great burnet	None	None	G5?	S2	2B.2		Bog & fen | Broadleaved upland forest | Marsh & swamp | Meadow & seep | North coast coniferous forest | Riparian forest | Ultramafic | Wetland. Bogs and fens, meadows and seeps, broadleafed upland forest, marshes and swamps, north coast coniferous forest, riparian forest. Rocky serpentine seepage areas and along stream 5-1400 m.	**Moderate Potential.** Species may occur in riparian areas.
Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	None	None	G5T2	S2	1B.2	BLM_S-Sensitive	Coastal bluff scrub | Coastal prairie | North coast coniferous forest. Coastal bluff scrub, coastal prairie, north coast coniferous forest. Open coastal forest; roadcuts. 5-1255 m.	**Moderate Potential.** Subspecies may occur in a wide variety of open habitats, including disturbed areas. Previously documented nearby along Hwy 101 (CDFW 2020a).

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Sidalcea oregana ssp. eximia	coast checkerbloom	None	None	G5T1	S1	1B.2	BLM_S-Sensitive	Lower montane coniferous forest | Meadow & seep | North coast coniferous forest | Wetland. Meadows and seeps, north coast coniferous forest, lower montane coniferous forest. Near meadows, in gravelly soil. 5-1805 m.	**Moderate Potential.** May occur in disturbed brushy openings and riparian areas.
Silene scouleri ssp. scouleri	Scouler's catchfly	None	None	G5T4T5	S2S3	2B.2		Coastal bluff scrub, Coastal prairie, Valley and foothill grassland.	**No Potential.** Typically found on coastal bluffs on the immediate coast.
Silene serpentinicola	serpentine catchfly	None	None	G3	S3	1B.2	USFS_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Chaparral, lower montane coniferous forest. Serpentine openings, gravelly or rocky soils. 120-765 m.	**No Potential**. No rocky, serpentine soils occur in the Project Area.
Streptanthus howellii	Howell's jewelflower	None	None	G2G3	S2	1B.2	USFS_S-Sensitive	Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest. Dry serpentine slopes, in open pine woods or in brushy areas; on rocky soil. 300-1065 m.	**No Potential**. No rocky, serpentine slopes occur in the Project Area.

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
Vaccinium scoparium	little-leaved huckleberry	None	None	G5	S3	2B.2		Subalpine coniferous forest. Subalpine coniferous forest. Rocky, subalpine woods. Sometimes serpentine. 1035-2200 m.	**No Potential.** No subalpine forests occur in the Project Area.
Viola langsdorffii	Langsdorf's violet	None	None	G4	S1	2B.1		Bog & fen | Wetland. Bogs and fens. Coastal wet areas. 2-10 m.	**Low Potential.** No bogs or other emergent wetlands occur in the project area.
Viola palustris	alpine marsh violet	None	None	G5	S1S2	2B.2		Bog & fen | Coastal scrub | Wetland. Coastal scrub, bogs and fens. Swampy, shrubby places in coastal scrub or coastal bogs. 0-150 m.	**Low Potential.** No bogs or other emergent wetlands occur in the project area.
Viola primulifolia ssp. occidentalis	western white bog violet	None	None	G5T2	S2	1B.2	USFS_S-Sensitive	Bog & fen | Marsh & swamp | Ultramafic | Wetland. Bogs and fens, marshes and swamps. Streamside flats and bogs; serpentine soils. 120-855 m.	**Low Potential.** No bogs or other emergent wetlands occur in the project area.

Footnotes:

[1] General habitat, and microhabitat column information, reprinted from CNDDB (April 2020).

[2] Rankings from CNDDB (April 2020)

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area

Column Header Categories and Abbreviations:

FedList: Listing status under the federal Endangered Species Act (ESA)
FE = Federal Endangered.

CalList: Listing status under the California state Endangered Species Act (CESA)
SE = State Endangered.

GRank: Global Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of global imperilment - G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors; G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure—Common; widespread and abundant. Subspecies/variety level: "Subspecies/varieties receive a T-rank attached to the G-rank. With the subspecies/varieties, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety" (CDFW 2019); ? = " Denotes inexact numeric rank" (NatureServe 2020); Q = " Questionable taxonomy that may reduce conservation priority" (NatureServe 2020)

SRank: State Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of imperilment in the state (California) - S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state; S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state; S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state; S4 = Apparently Secure—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors; S5 = Secure—Common, widespread, and abundant in the state; SNR = State Not Ranked

RPlantRank: CNPS rankings for rare plants (CNPS 2020) - 1A = Plants presumed extinct in California; 1B = Plants rare, threatened or endangered in California and elsewhere; 2 = Plants rare, threatened, or endangered in California, but more common elsewhere; 3 = Plants about which more information is needed (a review list); 4 = Plants of limited distribution (a watch list); n/a = not applicable; Threat Code extensions and their meanings:" .1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat); .2 – Moderately threatened in California (20-80% of occurrences threatened / moderate degree and immediacy of threat); .3 – Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)" (CDFW 2020a).

Other Statuses

BLM_S (Bureau of Land Management Sensitive): "(1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species." (CDFW 2020b);
SB_BerrySB: Seed bank present at Berry Seed Bank
SB_RSABG: Seed bank present at Rancho Santa Ana Botanic Garden

Scientific Name	Common Name	Federall Listing	CA Listing	Global Rank[2]	State Rank[2]	Rare Plant Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area
SB_SBBG: Seed bank present at Santa Barbara Botanic Garden **SB_UCBBG**: Seed bank present at UC Berkeley Botanical Garden **USFS_S** (U.S. Forest Service Sensitive): “plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and/or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution” (CDFW 2020b).									
Potential to Occur: No Potential: Habitat in and adjacent to the Project Area is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime). Low Potential: Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found in the Project Area. Moderate Potential: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found in the Project Area. High Potential: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on in the Project Area Present: Detected or documented on-site.									

5.2.2 Plant Critical Habitat Within PSB

The Project Area and greater PSB do not contain designated critical habitat for any plant species (USFWS 2020).

5.3 Sensitive Natural Communities Mapping

The CNDDB listed three SNCs in the vicinity of the PSB as shown in **Table 5.2** (CDFW 2020a). These communities are from the 1986 Holland Classification System (Holland 1986). Current CEQA regulations require that impacts to SNCs identified in local or regional plans, policies, and regulations or by the CDFW or USFWS, are analyzed (ACEC 2020). CDFW currently classifies SNCs using the Manual of California Vegetation (CNPS 2020b), and posts updated SNCs list on Vegetation Classification and Mapping Program's website (CDFW 2019a). The riparian area is composed of red alder (*Alnus rubra*) forest, which is rated G5 S4, and not considered a SNC. The staging areas are highly altered and invaded, and are not considered natural communities.

Table 5.2 Potential for Sensitive Natural Communities to Occur in the Project Area

SNC Name	Global Rank[2]	State Rank[2]	General Habitat Description	Potential to Occur within Project Area
Coastal and Valley Freshwater Marsh	G3	S2.1	Marsh & swamp | Wetland	**No Potential.** The Project Area was investigated for potential freshwater wetlands, and none occur within the Project boundary. However, freshwater marshes could occur in the wider PSB.
Coastal Brackish Marsh	G2	S2.1	Marsh & swamp | Wetland	**No Potential.** The Project is located too far inland to be tidally influenced.
Northern Coastal Salt Marsh	G3	S3.2	Marsh & swamp | Wetland	**No Potential.** The Project is located too far inland to be tidally influenced.

Footnotes:

[1] General habitat, and microhabitat column information, reprinted from CNDDB (April 2020).

[2] Rankings from CNDDB (April 2020)

GRank: Global Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of global imperilment - G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors; G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure—Common; widespread and abundant. Subspecies/variety level: "Subspecies/varieties receive a T-rank attached to the G-rank. With the subspecies/varieties, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety" (CDFW

2019); ? = “ Denotes inexact numeric rank” (NatureServe 2020); Q = “ Questionable taxonomy that may reduce conservation priority” (NatureServe 2020)

Potential to Occur:

No Potential: Habitat in and adjacent to the Project Area is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Low Potential: Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found in the Project Area.

Moderate Potential: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found in the Project Area.

High Potential: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on in the Project Area

Present: Detected or documented on-site.

5.4 Wetlands

The NWI map identified Rowdy and Dominie Creeks as riverine habitat (**Appendix C – National Wetlands Inventory Results**). No three-parameter wetlands were identified during the June 12, 2020 aquatic resources delineation. The creeks are steep-banked and surrounded by riparian upland red alder forest. See separate Aquatic Resources Delineation Report (GHD 2020) for details.

5.5 Wildlife Habitat Evaluation Results

Rowdy Creek and the surrounding riparian area have the potential to support many special status species, and may serve as an important corridor for wildlife movement. Habitat value within the Project Area has been affected by armoring along the bank, the weir blocking fish passage, in-stream structures, nearby development, and the introduction of invasive species. However, the Rowdy Creek riparian area still supports a fairly mature and diverse native red alder forest with moderate to high canopy closure. Despite the bank armoring and flow impairment, the creek is still structurally complex, with pools, riffles, and a high range of substrate sizes. The creek and riparian area have a high potential to support nesting birds, breeding amphibians, Western Pond Turtles, and anadromous fish. It may also serve as an important wildlife passageway under Highway 101.

5.5.1 Special Status Wildlife

Silver-haired Bat (*Lasionycteris noctivagans*) and Yuma Myotis (*Myotis yumanensis*), as well as other sensitive bat species have a moderate potential to forage and roost in the Project Area and within the greater PSB. Presence of North American Porcupine *(Erethizon dorsatum)* in the Project Area and within the greater PSB is also possible.

The Project Area and greater PSB may provide foraging and some nesting habitat for migratory birds as well as several special status species of passerines, wading birds, and raptors. Twelve special status bird species have a moderate potential of occurring and/or breeding in the Project Area and the greater PSB.

One special status reptile, the Western Pond Turtle (*Emys marmorata*), has a moderate potential of occurring and/or breeding in the Project Area and within the greater PSB.

Five special status amphibian species have a moderate to high potential of occurring and/or breeding in the Project Area and within the greater PSB.

Six special status fish have a moderate to high potential of occurring and/or spawning within the Project Area and within the greater PSB, specifically in Rowdy and Dominie creeks.

Two special status aquatic mollusks have a moderate potential of occurring in the Project Area and within the greater PSB, specifically within Rowdy and Dominie creeks.

One special status insect, the Obscure Bumble Bee *(Bombus caliginosus*), has a moderate potential of occurring in the Project Area and within the greater PSB.

The results in **Table 5.3** are based on database and literature review and information from the reconnaissance field visit. No protocol-level special status wildlife surveys have been conducted on-site.

Table 5.3 Potential for Special Status Wildlife Species to Occur in the Project Area and Project Study Boundary

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
Mammals								
Erethizon dorsatum	North American Porcupine	None	None	G5	S3	IUCN_LC-Least Concern	Broadleaved upland forest | Cismontane woodland | Closed-cone coniferous forest | Lower montane coniferous forest | North coast coniferous forest | Upper montane coniferous forest. Forested habitats in the Sierra Nevada, Cascade, and Coast ranges, with scattered observations from forested areas in the Transverse Ranges. Wide variety of coniferous and mixed woodland habitat.	**Moderate Potential.** Numerous recent records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 1960 in the vicinity of Smith River, within 0.5 miles of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable (e.g., riparian forest) habitat for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Lasionycteris noctivagans	Silver-haired Bat	None	None	G5	S3S4	IUCN_LC-Least Concern | WBWG_M-Medium Priority	Lower montane coniferous forest | Oldgrowth | Riparian forest. Primarily a coastal and montane forest dweller, feeding over streams, ponds & open brushy areas. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes, and rarely under rocks. Needs drinking water.	**Moderate Potential.** Closest known record is from 2005 in Jedediah Smith Redwoods State Park, ~10 miles south of the Project Area (CDFW 2020a). This species primarily roosts in trees and will also roost in caves, crevices, mines, hollow trees, and buildings (Erickson et al. 2002). Both the Project Area and greater PSB contain suitable foraging and roosting habitat (e.g., buildings and trees) for this species. Given the presence of suitable habitat, this

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
								species has a moderate potential to occur in the Project Area and within the greater PSB.
Martes caurina humboldtensis	Humboldt Marten	None	SE	G5T1	S1	CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	North coast coniferous forest | Oldgrowth | Redwood. Occurs only in the coastal redwood zone from the Oregon border south to Sonoma County. Associated with late-successional coniferous forests, prefer forests with low, overhead cover.	**Low Potential.** Known population monitored as recently as 2018 on Six Rivers National Forest in the vicinity of Gasquet (Gamblin 2019). Both the Project Area and greater PSB do not contain suitable habitat (e.g. North Coast coniferous forest) for this species. However, there is ample suitable habitat on private timberlands within 1 mile. While the Project Area contains a few individual large conifers, coniferous forest habitat at the Project site would be considered marginal for the subspecies. Given the lack of high quality habitat for this subspecies in the Project Area and within the greater PSB, this subspecies has a low potential to occur.
Myotis yumanensis	Yuma Myotis	None	None	G5	S4	BLM_S-Sensitive | IUCN_LC-Least Concern | WBWG_LM-Low-Medium Priority	Lower montane coniferous forest | Riparian forest | Riparian woodland | Upper montane coniferous forest. Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies	**Moderate Potential.** Closest known record is from 2013 near Klamath, ~23 miles south of the Project Area (BAMVT 2020). This species roosts in buildings, trees, mines, caves, bridges, and rock crevices (Erickson et al. 2002). Both the Project Area and greater PSB contain suitable foraging and roosting (e.g., buildings and trees) habitat for this species. Given the presence of suitable habitat, this species has a moderate potential to

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
							in caves, mines, buildings or crevices.	occur in the Project Area and within the greater PSB.
Pekania pennanti	Fisher - West Coast DPS	None	ST	G5T2T3Q	S2S3	BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	North coast coniferous forest | Oldgrowth | Riparian forest. Intermediate to large-tree stages of coniferous forests and deciduous-riparian areas with high percent canopy closure. Uses cavities, snags, logs and rocky areas for cover and denning. Needs large areas of mature, dense forest.	**Low Potential.** Closest known record is from 1972 near Gasquet (CDFW 2020a). Both the Project Area and greater PSB do not contain suitable habitat (e.g., North Coast coniferous forest) for this species. However, there is ample suitable habitat on private timberlands within 1 mile. While the Project Area contains a few individual large conifers, coniferous forest habitat at the Project site would be considered marginal for the species. Given the lack of high quality habitat for this species in the Project Area and within the greater PSB, this species has a low potential to occur.
Birds								
Ardea alba	Great Egret	None	None	G5	S4	CDF_S-Sensitive | IUCN_LC-Least Concern	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp | Riparian forest | Wetland. Colonial nester in large trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	**Moderate Potential.** Closest known record is from 2018 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Ardea herodias	Great Blue Heron	None	None	G5	S4	CDF_S-Sensitive | IUCN_LC-	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp |	**Moderate Potential.** Closest known record is from 2019 in the town of Smith River, within the PSB (eBird

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						Least Concern	Riparian forest | Wetland. Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Brachyramphus marmoratus	Marbled Murrelet	FT	SE	G3G4	S1	CDF_S-Sensitive | IUCN_EN-Endangered | NABCI_RWL-Red Watch List	Lower montane coniferous forest | Oldgrowth | Redwood. Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.	**Low Potential.** Closest known record is from an unknown date near the Hutsinpillar Creek and Smith River confluence, ~3 miles south of the Project Area (CDFW 2020a). Although there is no suitable nesting habitat within the Project Area or greater PSB, there is ample suitable habitat on private timberlands within 1 mile. Closest designated critical habitat is ~3 miles west of the Project Area (USFWS 2020). Species may fly over the PSB to and from nest sites and foraging in the ocean. While the Project Area contains a few individual large conifers, coniferous forest habitat at the Project Site would be considered marginal for the species. Given the lack of high quality habitat for this species in the Project Area and within the greater PSB, this species has a low potential to occur.
Branta hutchinsii leucopareia	Cackling (=Aleutian	FD	None	G5T3	S3	CDFW_WL-Watch List	Artificial standing waters | Sacramento/San Joaquin	**Low Potential.** Closest known record is from 2011 in the Smith

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
	Canada) Goose						standing waters | Valley & foothill grassland. Winters on lakes and inland prairies. Forages on natural pasture or that cultivated to grain; loafs on lakes, reservoirs, ponds.	River Bottoms, within 1 mile of the Project Area (eBird 2020). Pasturelands at the limits of the PSB contain suitable seasonal foraging habitat. However, both the Project Area and greater PSB do not contain suitable nesting habitat (e.g., island or coastal habitat). Given the lack of suitable habitat for this species in the Project Area and limited seasonal foraging habitat within the greater PSB, this species has a low potential to occur.
Cerorhinca monocerata	Rhinoceros Auklet	None	None	G5	S3	CDFW_WL-Watch List | IUCN_LC-Least Concern	Off-shore islands and rocks along the California coast. Nests in a burrow on undisturbed, forested and unforested islands, and probably in cliff caves on the mainland.	**No Potential.** Closest known record is from 2009 in the Smith River Bottoms, within 1 mile of the Project Area (eBird 2020). The Project Area and greater PSB do not contain suitable habitat (e.g., island or coastal habitat) for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Charadrius nivosus nivosus	Western Snowy Plover	FT	None	G3T3	S2S3	CDFW_SSC-Species of Special Concern | NABCI_RWL-Red Watch List | USFWS_BCC-Birds of Conservation Concern	Great Basin standing waters | Sand shore | Wetland. Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Low Potential.** Closest known record is from 2019 at the Smith River Mouth, ~3 miles west of the Project Area (eBird 2020). The Project Area and greater PSB do not contain suitable habitat (e.g., beaches, graveled river bars) for this subspecies. Given the lack of suitable habitat for this subspecies in the Project Area and within the greater PSB, this subspecies has a low potential to occur.

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	FT	SE	G5T2T3	S1	BLM_S-Sensitive | NABCI_RWL-Red Watch List | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Riparian forest.Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.	**Low Potential.** No known records from 8-quad search area (CDFW 2020a, eBird 2020). Closest known record is from 2005 near Fortuna, ~97 linear miles south of the Project Area (eBird 2020). The Project Area and greater PSB do not contain suitable nesting and foraging (e.g., riparian forest) habitat for this subspecies. Given the lack of suitable habitat for this subspecies in the Project Area and within the greater PSB, this subspecies has a low potential to occur.
Circus hudsonius	Northern Harrier	None	None	G5	S3	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Coastal scrub | Great Basin grassland | Marsh & swamp | Riparian scrub | Valley & foothill grassland | Wetland. Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian scrub) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur and nest in the Project Area and within the greater PSB.
Coturnicops noveboracensis	Yellow Rail	None	None	G4	S1S2	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern |	Freshwater marsh | Meadow & seep. Summer resident in eastern Sierra Nevada in Mono County. Freshwater marshlands.	**No Potential.** Closest known record is from 1999 at the Smith River Estuary, ~2.5 miles west of the Project Area (CDFW 2020a). The Project Area and greater PSB do not contain suitable habitat (e.g., marsh) for this species. Humboldt

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						NABCI_RWL-Red Watch List | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern		Bay is outside the current occupied species' range (most recent occurrences from the San Francisco Bay estuary), and any nearby records would be considered highly incidental. This species has no potential to occur in the Project Area or within the greater PSB.
Cypseloides niger	Black Swift	None	None	G4	S2	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | NABCI_YWL-Yellow Watch List | USFWS_BCC-Birds of Conservation Concern	Coastal belt of Santa Cruz and Monterey counties; central & southern Sierra Nevada; San Bernardino & San Jacinto mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf; forages widely.	**Moderate Potential.** Closest known record is from 2010 along Pala Road, ~3 miles west of the Project Area (eBird 2020). Both the Project Area and greater PSB contain suitable seasonal foraging habitat. However, neither contain suitable nesting habitat (e.g., cliffs, waterfalls) for this species. Given the presence of suitable foraging habitat and recent nearby records, this species has a moderate potential to forage in the Project Area and within the greater PSB.
Egretta thula	Snowy Egret	None	None	G5	S4	IUCN_LC-Least Concern	Marsh & swamp | Meadow & seep | Riparian forest | Riparian woodland | Wetland. Colonial nester, with nest sites situated in protected beds of dense tules. Rookery sites situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
Elanus leucurus	White-tailed Kite	None	None	G5	S3S4	BLM_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern	Cismontane woodland | Marsh & swamp | Riparian woodland | Valley & foothill grassland | Wetland. Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Empidonax traillii brewsteri	Little Willow Flycatcher	None	SE	G5T3T4	S1S2	USFWS_BCC-Birds of Conservation Concern	Meadow & seep | Riparian woodland. Mountain meadows and riparian habitats in the Sierra Nevada and Cascades. Nests near the edges of vegetation clumps and near streams.	**Moderate Potential.** Closest known record is from 2016 along Rowdy Creek, ~0.6 miles from the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Fratercula cirrhata	Tufted Puffin	None	None	G5	S1S2	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Protected deepwater coastal communities. Open-ocean bird; nests along the coast on islands, islets, or (rarely) mainland cliffs. Requires sod or earth into which the birds can burrow, on	**No Potential.** Closest known record is from 2010 at the Smith River mouth, ~3 miles west of the Project Area (eBird 2020a). Both the Project Area and greater PSB do not contain suitable habitat (e.g., marine, islands) for this species. This species has no potential to

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
							island cliffs or grassy island slopes.	occur in the Project Area or within the greater PSB.
Haliaeetus leucocephalus	Bald Eagle	FD	SE	G5	S3	BLM_S-Sensitive | CDF_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Lower montane coniferous forest | Oldgrowth. Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	**Moderate Potential.** Closest known record is from 2019 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., large trees and fish-bearing waters) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Nycticorax nycticorax	Black-crowned Night-heron	None	None	G5	S4	IUCN_LC-Least Concern	Marsh & swamp | Riparian forest | Riparian woodland | Wetland. Colonial nester, usually in trees, occasionally in tule patches. Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.	**Moderate Potential.** Closest known record is from 2009 in the Smith River Bottoms, within 1 mile of the Project Area (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian woodland) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Oceanodroma furcata	Fork-tailed Storm-petrel	None	None	G5	S1	BLM_S-Sensitive | CDFW_SSC-Species of Special	Protected deepwater coastal communities. Colonial nester on small, offshore islets. Forages over the open ocean,	**No Potential.** Closest known records are from near Brookings, ~10.5 miles northwest of the Project Area (eBird 2020). Both the Project Area and greater PSB do not

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						Concern | IUCN_LC-Least Concern	usually well off-shore. Birds choose offshore islets which provide nesting crannies beneath rocks or sod for burrowing.	contain suitable habitat (e.g., marine, offshore islets) for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Pandion haliaetus	Osprey	None	None	G5	S4	CDF_S-Sensitive | CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest. Ocean shore, bays, freshwater lakes, and larger streams. Large nests built in tree-tops within 15 miles of a good fish-producing body of water.	**Moderate Potential.** Closest known record is from 2006 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Phalacrocorax auritus	Double-crested Cormorant	None	None	G5	S4	CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest | Riparian scrub | Riparian woodland. Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	**Moderate Potential.** Closest known record is from 2015 in the town of Smith River, within the PSB (eBird 2020). Both the Project Area and greater PSB contain suitable aquatic foraging habitat for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Phoebastria albatrus	Short-tailed Albatross	FE	N	G1	S1	CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable |	Offshore Japanese Islands | Northern Pacific Ocean | Sea of Okhotsk.Islands with bare ground/grass surrounded by cliffs.Nests consist of	**No Potential.** Species is extremely rare along the west coast of the U.S. (non-breeding season only). Only breeds on offshore islands in Japan and recently Midway atoll (BirdLife International 2020). Both

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						NABCI_RWL-Red Watch List	large scoops lined with grass in open, grassy areas. Forages at upwellings in the ocean. (CDFW 2020a)	Project Area and greater PSB do not contain any suitable habitat (e.g., islands, coastal areas) for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Riparia riparia	Bank Swallow	None	ST	G5	S2	BLM_S-Sensitive | IUCN_LC-Least Concern	Riparian scrub | Riparian woodland. Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**Moderate Potential.** Several records within immediate project vicinity, ~5 miles (CDFW 2020a). Closest known record is of a breeding colony from 2010 at the confluence of Rowdy Creek and the Smith River, ~1.5 miles south of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable foraging and nesting habitat (e.g., riparian woodland with vertical banks) for this species. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Strix occidentalis caurina	Northern Spotted Owl	FT	ST	G3T3	S2S3	CDF_S-Sensitive | IUCN_NT-Near Threatened | NABCI_YWL-Yellow Watch List	North coast coniferous forest | Oldgrowth | Redwood. Old-growth forests or mixed stands of old-growth and mature trees. Occasionally in younger forests with patches of big trees. High, multistory canopy dominated by big trees, many trees with cavities or broken tops, woody	**Low Potential.** Several activity centers and positive detections (as recently as 2015) approximately 1 mile north of Project Area (CDFW 2020a). Although there is no suitable nesting, roosting, or foraging habitat within the Project Area or greater PSB, there is ample suitable habitat on private timberlands within 1 mile. While the Project Area contains a few individual large conifers, coniferous

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
							debris, and space under canopy.(CDFW 2020a)	forest habitat at the Project site would be considered marginal for the subspecies. Given the lack of high quality habitat for this sub species in the Project Area and within the greater PSB, this subspecies has a low potential to occur.
Reptiles								
Emys marmorata	Western Pond Turtle	None	None	G3G4	S3	BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable | USFS_S-Sensitive	Aquatic | Artificial flowing waters | Klamath/North coast flowing waters | Klamath/North coast standing waters | Marsh & swamp | Sacramento/San Joaquin flowing waters | Sacramento/San Joaquin standing waters | South coast flowing waters | South coast standing waters | Wetland. A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	**Moderate Potential.** Closest known record is from 2008 at Del Norte County Regional Airport, ~10.5 miles southwest of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable habitat foraging and nesting habitt (e.g., Rowdy and Dominie Creeks, and adjacent uplands) for this species. Given the presence of suitable habitat, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Amphibians								

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
Ascaphus truei	Pacific Tailed Frog	None	None	G4	S3S4	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Aquatic | Klamath/North coast flowing waters | Lower montane coniferous forest | North coast coniferous forest | Redwood | Riparian forest. Occurs in montane hardwood-conifer, redwood, Douglas-fir & ponderosa pine habitats. Restricted to perennial montane streams. Tadpoles require water below 15 degrees C.	**Moderate Potential.** Numerous recent records within immediate project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2015 near the confluence of Rowdy Creek and South Fork Rowdy Creek, ~1.5 miles east of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Plethodon elongatus	Del Norte Salamander	None	None	G4	S3	CDFW_WL-Watch List | IUCN_NT-Near Threatened	Oldgrowth. Old-growth associated species with optimum conditions in the mixed conifer/hardwood ancient forest ecosystem. Cool, moist, stable microclimate, a deep litter layer, closed multi-storied canopy, dominated by large, old trees.	**Moderate Potential.** Closest known record is from 2008 along Rowdy Creek, ~2.5 miles northeast of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Rana aurora	Northern Red-legged Frog	None	None	G4	S3	CDFW_SSC-Species of Special Concern | IUCN_LC-Least	Klamath/North coast flowing waters | Riparian forest | Riparian woodland. Humid forests, woodlands, grasslands, and streamsides in	**High Potential.** Numerous recent records within immediate project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2016 along Morrison Creek, ~1 mile south of the Project Area (CDFW

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						Concern | USFS_S-Sensitive	northwestern California, usually near dense riparian cover.Generally near permanent water, but can be found far from water, in damp woods and meadows, during non-breeding season.	2020a). Both the Project Area and greater PSB contain suitable habitat (e.g., riparian forest) for this species. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the Project Area and within the greater PSB.
Rana boylii	Foothill Yellow-legged Frog	None	Northwest/North Coast clade not listed.	G3	S3	BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | USFS_S-Sensitive	Aquatic | Chaparral | Cismontane woodland | Coastal scrub | Klamath/North coast flowing waters | Lower montane coniferous forest | Meadow & seep | Riparian forest | Riparian woodland | Sacramento/San Joaquin flowing waters. Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	**High Potential.** Several records within immediate project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 1955 in Smith River along Morrison Creek, ~1 mile south of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the Project Area and within the greater PSB.
Rhyacotriton variegatus	Southern Torrent Salamander	None	None	G3G4	S2S3	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Lower montane coniferous forest | Oldgrowth | Redwood | Riparian forest. Coastal redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer habitats. Old growth	**High Potential.** Numerous recent records within immediate project vicinity, ~5 miles (CDFW 2020a). Closest known record is from 2001 along Rowdy Creek, within 0.5 miles of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable habitat for this species within Rowdy and

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
							forest. Cold, well-shaded, permanent streams and seepages, or within splash zone or on moss-covered rocks within trickling water.	Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a high potential to occur in the Project Area and within the greater PSB.
Fish								
Acipenser medirostris	Green Sturgeon	FT	None	G3	S1S2	AFS_VU-Vulnerable | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | NMFS_SC-Species of Concern	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. These are the most marine species of sturgeon. Abundance increases northward of Point Conception. Spawns in the Sacramento, Klamath, & Trinity Rivers. Spawns at temps between 8-14 C. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.	**Low Potential.** Occasional visitors in the Smith River (CalFish 2020). However, not known to spawn in the Smith River. The Project Area and greater PSB may contain suitable foraging habitat for this species within Rowdy and Dominie creeks. However, given the lack of high quality habitat for this species in the Project Area and within the greater PSB, and limited records for the watershed, this species has a low potential to occur.
Entosphenus tridentatus	Pacific Lamprey	None	None	G4	S4	AFS_VU-Vulnerable | BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters | South coast flowing waters. Found in Pacific Coast streams north of San Luis Obispo County, however regular runs in Santa Clara River. Size of runs is declining. Swift-current gravel-bottomed areas for spawning with water	**High Potential.** Known to occur in the Smith River watershed. The Project Area and greater PSB contain suitable spawning and rearing habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
							temps between 12-18 C. Ammocoetes need soft sand or mud.	
Eucyclogobius newberryi	Tidewater Goby	FE	None	G3	S3	AFS_EN-Endangered | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters | South coast flowing waters. Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**No Potential.** Closest known record is from 2010 in Tillas Slough, ~2.5 miles west of the Project Area. Both the Project Area and greater PSB do not contain brackish estuarine or lower stream reach habitat suitable for this species (USFWS 2005). The Project is located too far inland and upstream for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Lampetra richardsoni	Western Brook Lamprey	None	None	G4G5	S3S4	CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	Aquatic | Freshwater rivers and streams.	**High Potential.** Known to occur in the Smith River watershed. The Project Area and greater PSB contain suitable spawning and rearing habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Oncorhynchus clarkii clarkii	Coast Cutthroat Trout	None	None	G4T4	S3	AFS_VU-Vulnerable | CDFW_SSC-Species of Special	Aquatic | Klamath/North coast flowing waters. Small coastal streams from the Eel River to the Oregon border. Small,	**High Potential.** Known to occur throughout Smith River watershed (Hogan and Zuber 2012). Both the Project Area and greater PSB contain suitable spawning, rearing,

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
						Concern | USFS_S-Sensitive	low gradient coastal streams and estuaries. Needs shaded streams with water temperatures <18C, and small gravel for spawning.	and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Oncorhynchus kisutch pop. 2	Coho Salmon - southern Oregon / northern California ESU	FT	ST	G4T2Q	S2?	AFS_TH-Threatened	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. Federal listing refers to populations between Cape Blanco, Oregon and Punta Gorda, Humboldt County, California.State listing refers to populations between the Oregon border and Punta Gorda, California.	**High Potential.** Known to spawn in Rowdy Creek (Walkley and Garwood 2017). Both the Project Area and greater PSB contain suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Oncorhynchus mykiss irideus pop. 36	summer-run Steelhead Trout	None	SCE	G5T4Q	S2	CDFW_SSC-Species of Special Concern	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. No. Calif coastal streams south to Middle Fork Eel River. Within range of Klamath Mtns province DPS & No. Calif DPS. Cool, swift, shallow water & clean loose gravel for spawning, & suitably large pools in which to spend the summer.	**High Potential.** Known to occur throughout the Smith River watershed (CDFW 2012). Closest known records are from 1993 in the Smith River and North Fork Smith River, ~7 linear miles east of the Project Area (CDFW 2020a). Both the Project Area and PSB contain suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a high potential to occur in the Project

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
								Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Thaleichthys pacificus	Eulachon	FT	None	G5	S3		Aquatic | Klamath/North coast flowing waters. Found in Klamath River, Mad River, Redwood Creek, and in small numbers in Smith River and Humboldt Bay tributaries. Spawn in lower reaches of coastal rivers with moderate water velocities and bottom of pea-sized gravel, sand, and woody debris.	**Moderate Potential.** Closest known record is from 1975 at the Smith River Mouth, ~2.5 miles west of the Project Area (CDFW 2020a). Known to occur in small numbers in the Smith River (CDFW 2020a). Both the Project Area and PSB contain suitable spawning, rearing, and migratory habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat, this species has a moderate potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Mollusks								
Juga chacei	Chace Juga	None	None	G1	S1	USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters. Small, permanent streams at low to middle elevations in the Smith River drainage. Generally on gravel substrate, always in cold, clear, highly oxygenated, unpolluted, running water.	**Moderate Potential.** Closest known record is from 2017 in a tributary of the Smith River, ~5 miles south of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Margaritifera falcata	Western Pearlshell	None	None	G4G5	S1S2		Aquatic. Aquatic. Prefers lower velocity waters.	**Moderate Potential.** Closest known record is from below Dr. Fine Bridge

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
								of the Smith River within Jedediah Smith Redwoods State Park, ~3 miles south of the Project Area (CCC 2019). Both the Project Area and greater PSB contain suitable aquatic habitat for this species within Rowdy and Dominie creeks. Given the presence of suitable habitat and recent nearby records, this species has a moderate potential to occur in the Project Area and within the greater PSB (specifically within Rowdy and Dominie creeks).
Monadenia fidelis pronotis	Rocky Coast Pacific Sideband	None	None	G4G5T1	S1		Coastal bluff scrub. Coastal habitat around Point St. George in Del Norte County. Rocky, moist habitat with seashore plants, including iceplant.	**No Potential.** Closest known record is from 1974 in Tolowa Dunes State Park, ~10 miles southwest of the Project Area (CDFW 2020a). Both the Project Area and greater PSB do not contain suitable habitat (e.g., coastal bluff scrub) for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Insects								
Atractelmis wawona	Wawona Riffle Beetle	None	None	G1G3	S1S2		Aquatic. Aquatic; found in riffles of rapid, small to medium clear mountain streams; 2000-5000 ft elev. Strong preference for inhabiting submerged aquatic mosses.	**Low Potential.** Closest known record is from 2003 in Jedediah Smith Redwoods State Park, ~7 miles south of the Project Area (CDFW 2020a). The Project Area and greater PSB are located below the elevational range of this species. Given the lack of high quality habitat for this species in the Project Area and within the greater

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
								PSB, this species has a low potential to occur.
Bombus caliginosus	Obscure Bumble Bee	None	None	G4?	S1S2	IUCN_VU-Vulnerable	Coastal areas from Santa Barabara county to north to Washington state. Food plant genera include *Baccharis, Cirsium, Lupinus, Lotus, Grindelia* and *Phacelia*.	**Moderate Potential.** Closest known record is from 2011 between Lake Earl and Point Saint George, ~8.5 miles south of the Project Area (CDFW 2020a). The Project Area and greater PSB fall within the species current range (Hatfield et al. 2014). In addition, the Project Area and PSB are within the coastal fog belt and several of the species' food plants were observed on-site (**Appendix E** - On-site Species List). Given the presence of suitable habitat, this species has a moderate potential to occur in the Project Area and within the greater PSB.
Bombus occidentalis	Western Bumble Bee	None	SCE	G2G3	S1	USFS_S-Sensitive | XERCES_IM-Imperiled	Once common & widespread, species has declined precipitously from central CA to southern B.C., perhaps from disease.	**Low Potential.** Closest known record is from 1934 in the vicinity of Smith River, within 0.5 miles of the Project Area (CDFW 2020a). Although the PSB falls within the species pre-2002 range (according to ICUN Redlist), the range has contracted significantly in the last decade and now only includes the intermountain west and cascade regions of the US (Hatfield et al. 2015). Little habitat information is available for this species. Given the presence of nearby historical records, this species has a low potential to occur in the Project Area and within the greater PSB.

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
Coenonympha tullia yontockett	Yontocket Satyr	None	None	G5T1T2	S1		Coastal dunes. Coastal dunes north of Crescent City in Del Norte County. Grassy areas among dunes with coniferous lee slopes & grassy exposed slopes, also dunes around sphagnum bogs.	**No Potential.** Closest known record is from 1994 in the coastal dunes north of Lake Earl (CDFW 2020a). Both the Project Area and greater PSB do not contain suitable habitat (e.g., coastal dunes) for this species. This species has no potential to occur in the Project Area or within the greater PSB.
Limnephilus atercus	Fort Dick Limnephilus Caddisfly	None	None	G3G4	S1		Aquatic | Klamath/North coast flowing waters | Klamath/North coast standing waters. Known only from Fort Dick in Del Norte County.	**Low Potential.** Closest record and only known population is from 1963 at Fort Dick, ~3 miles south of the Project Area (CDFW 2020a). Both the Project Area and greater PSB contain suitable aquatic habitat for this species within Rowdy and Dominie creeks. However, this species is not known beyond Fort Dick. Thus, this species has a low potential to occur in the Project Area and within the greater PSB.
Polites mardon	Mardon Skipper	None	None	G2G3	S1	USFS_S-Sensitive | XERCES_IM-Imperiled	North coast coniferous forest. Known from western Washington State and extreme northwestern Del Norte County.	**Low Potential.** Closest known record is of a population from 1979 east of Smith River, ~1.5 miles east of the Project Area (CDFW 2020a). The Project Area and greater PSB do not contain suitable habitat (e.g. North Coast coniferous forest) for this species. Nonetheless, there is ample suitable habitat on private timberlands within 1 mile. While the Project Area contains a few individual large conifers, coniferous forest habitat at the Project site would be considered marginal for the species. Given the lack of high

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
								quality habitat for this species in the Project Area and within the greater PSB, this species has a low potential to occur.
Speyeria zerene hippolyta	Oregon Silverspot Butterfly	FT	None	G5T1	S1	XERCES_CI -Critically Imperiled	Coastal dunes. Coastal meadows in Del Norte County. The larvae feed only on the foliage of western dog violet (*Viola adunca*).	**Low Potential.** Two records within immediate Project vicinity, ~5 miles (CDFW 2020a). Closest known record is from the Clifford Kamph Memorial Park, ~4 miles northwest of the Project Area (CDFW 2020a). The Project and greater PSB do not contain suitable habitat (e.g., coastal dunes) for this subspecies. Given the lack of suitable habitat for this subspecies in the Project Area and within the greater PSB, this subspecies has a low potential to occur.

Footnotes:

[1] General habitat, and microhabitat column information, reprinted from CNDDB (April 2020).

[2] Rankings from CNDDB (April 2020)

Column Header Categories and Abbreviations:

FedList: Listing status under the federal Endangered Species Act (ESA)

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; P = Proposed for Federal Listing; FD = Federally Delisted

CalList: Listing status under the California state Endangered Species Act (CESA)

SE = State Endangered; SD = State Delisted; ST = State Threatened.

GRank: Global Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of global imperilment - G1 = Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors; G2 = Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors; G3 = Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors; G4 = Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure—Common; widespread and abundant. Subspecies/variety level: "Subspecies/varieties receive a T-rank attached to the G-rank. With the subspecies/varieties, the G-rank reflects the condition of the entire species, whereas the T-rank reflects the global situation of just the subspecies or variety" (CDFW 2019); ? = " Denotes inexact numeric rank" (NatureServe 2020); Q = " Questionable taxonomy that may reduce conservation priority" (NatureServe 2020)

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB
SRank: State Rank from NatureServe's Heritage Methodology (NatureServe 2020) (ranking according to degree of imperilment in the state (California) - S1 = Critically Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state; S2 = Imperiled—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state; S3 = Vulnerable—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state; S4 = Apparently Secure—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors; S5 = Secure—Common, widespread, and abundant in the state; SNR = State Not Ranked *RPlantRank*: CNPS rankings for rare plants (CNPS 2020) - 1A = Plants presumed extinct in California; 1B = Plants rare, threatened or endangered in California and elsewhere; 2 = Plants rare, threatened, or endangered in California, but more common elsewhere; 3 = Plants about which more information is needed (a review list); 4 = Plants of limited distribution (a watch list); n/a = not applicable; Threat Code extensions and their meanings:" .1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat); .2 – Moderately threatened in California (20-80% of occurrences threatened / moderate degree and immediacy of threat); .3 – Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)" (CDFW 2020a).							
Other Statuses (other federal or state listings may include)**:** **AFS_TH** (American Fisheries Society Threatened):"a taxon that is in imminent danger of becoming threatened throughout all or a significant portion of its range" (Jelks et al. 2008). **AFS_VU** (American Fisheries Society Vulnerable): "a taxon that is in imminent danger of becoming threatened throughout all or a significant portion of its range" (Jelks et al. 2008). **BLM_S** (Bureau of Land Management Sensitive): "(1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species." (CDFW 2020b); **CDF_S**: (California Department of Forestry and Fire Protection Sensitive): "those species that warrant special protection during timber operations" (CDFW 2020b); **CDFW_FP** (CDFW Fully Protected Animal): "This classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibians and reptiles, birds and mammals. Most of the species on these lists have subsequently been listed under the state and/or federal endangered species acts." (CDFW 2020b); **CDFW_SSC** (CDFW Species of Special Concern): "It is the goal and responsibility of the Department of Fish and Wildlife to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as 'Species of Special Concern' because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as 'Species of Special Concern' is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long-term viability" (CDFW 2020b); **CDFW_WL** (California Department of Fish and Wildlife Watch List): "The CDFW maintains a list consisting of taxa that were previously designated as "Species of Special Concern" but no longer merit that status, or which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status" (CDFW 2020b); **IUCN_LC** (International Union for Conservation of Nature Least Concern): "when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened" (IUCN 2012); **IUCN_NT** (International Union for Conservation of Nature Near Threatened): "when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN 2012);							

Scientific Name	Common Name	Federal Listing	CA Listing	Global Rank[2]	State Rank[2]	Other Status	Habitat Requirements[1]	Potential to Occur in the Project Area and PSB

IUCN_VU (International Union for Conservation of Nature Vulnerable): "when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable…, and it is therefore considered to be facing a high risk of extinction in the wild" (IUCN 2012);

IUCN_EN (International Union for Conservation of Nature Endangered): "when the best available evidence indicates that it meets any of the criteria A to E for Endangered…,and it is therefore considered to be facing a very high risk of extinction in the wild" (IUCN 2012);

NABCI_RWL (North American Bird Conservation Initiative Red Watch List): "species with extremely high vulnerability" (CDFW 2019);

NMFS_SC (National Marine Fisheries Service Species of Concern): "species about which NOAA's NMFS has some concerns regarding status and threats, but for which insufficient information is available to indicate a need to list the species under the Endangered Species Act" (CDFW 2020b);

USFS_S (U.S. Forest Service Sensitive): "plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density and/or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution" (CDFW 2020b);

USFWS_BCC (U.S. Fish and Wildlife Service Birds of Conservation Concern): "The goal of the Birds of Conservation Concern 2008 report is to accurately identify the migratory and non-migratory bird species (beyond those already designated as Federally Threatened or Endangered) that represent our highest conservation priorities and draw attention to species in need of conservation action" (CDFW 2020b);

WBWG_H- (Western Bat Working Group High Priority): "those species considered the highest priority for funding, planning, and conservation actions. Information about status and threats to most species could result in effective conservation actions being implemented should a commitment to management exist. These species are imperiled or are at high risk of imperilment" (BCI 1998);

WBWG_LM- (Western Bat Working Group Low Priority): "most of the existing data support stable populations of the species, and that the potential for major changes in status in the near future is considered unlikely. While there may be localized concerns, the overall status of the species is believed to be secure" (BCI 1998);

WBWG_M- (Western Bat Working Group Medium Priority): "a level of concern that should warrant closer evaluation, more research, and conservation actions of both the species and possible threats" (BCI 1998);

XERCES_IM (Xerces Society Imperiled): species "at high risk of extinction because of highly restricted range, rare populations (often 20 or fewer), steep declines, or other factors" (National Research Council 2007).

Potential to Occur:

No Potential: Habitat in and adjacent to the Project Area is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Low Potential: Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found in the Project Area.

Moderate Potential: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found in the Project Area.

High Potential: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on in the Project Area

Present: Detected or documented on-site.

5.5.2 Potential Impacts to Special Status Wildlife

If bat species are present in the Project Area or PSB during construction activities, the species or maternity colonies may be impacted by roost removal (tree removal, vegetation clearing) and elevated levels of ambient noise. Potential Project-related impacts to these species (if any) would be avoided through the implementation of measures described further in **Section 6.1.3.1**.

If North American Porcupines are present in the Project Area or PSB during construction activities, the species may be injured or trapped in open excavation pits. In addition, the species be impacted if rodenticides are used on-site. Potential Project-related impacts to this species (if any) would be avoided through the implementation of measures described further in **Section 6.1.3.2**.

If special status birds are present in the Project Area or PSB during construction activities, the species may be impacted by removal of nesting habitat, elevated levels of noise, and anthropogenic disturbance. Potential Project-related impacts to these species (if any) would be avoided through the implementation of measures described further in **Section 6.1.3.3**.

If special status reptiles and/or amphibians are present in the Project Area or PSB during construction activities, these species may be injured or killed via crushing, entrapment, or burying (related to ground disturbance). Potential Project-related impacts to these species (if any) would be avoided through the implementation of measures described further in **Section 6.1.3.4**.

If special status fish and mollusks are present in the Project Area or PSB during construction activities, these species may be injured or killed via crushing, entrapment, burying (related to ground disturbance) dewatering, or elevated levels of in-water sediment.

No impacts to Obscure Bumble Bees are expected as a result of Project construction (e.g., no significant impacts to nectar resources, nesting, or foraging habitat will occur). Therefore, the Project would have no impact on this species.

5.5.3 Wildlife Critical Habitat Within PSB

Critical habitat was designated for the Coho Salmon southern Oregon/northern California coasts Evolutionarily Significant Unit (ESU) effective June 4, 1999 (64 FR 24049), and encompasses accessible reaches of all rivers (including estuaries and tributaries) between the Mattole River in California and the Elk River in Oregon. This designation encompasses Rowdy and Dominie creeks, within the Project Area.

5.6 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the 1996 Sustainable Fisheries Act (Public Law 104-297), mandates inter-agency cooperation in achieving protection, conservation, and enhancement of Essential Fish Habitat (EFH). The Act defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH designations serve to highlight the importance of habitat conservation for sustainable fisheries and sustaining valuable fish populations. EFH relates directly to the physical fish habitat and indirectly to factors that contribute to degradation of this habitat. Important features

of EFH that deserve attention are adequate water quality, temperature, food source, water depth, and cover/vegetation.

EFH is designated for species managed in Fisheries Management Plans (FMP) under the MSA. EFH applies to species within the PSB for the proposed Project. Under the MSA, Rowdy and Dominie creeks are designated as EFH within the Pacific Coast Salmon FMP (Chinook, Coho, and Pink Salmon).

Specifically within the Pacific Coast Salmon FMP, Rowdy and Dominie creeks includes EFH for Chinook and Coho Salmon. The Pacific Coast Salmon FMP (as amended) was created to manage commercial and recreational salmon fisheries along the west coast of the U.S. In addition, the plan designates Habitat Areas of Particular Concern (HAPC) including complex channels and floodplains, thermal refugia, spawning habitat, estuaries, and marine and estuarine submerged aquatic vegetation (NOAA Fisheries 2020). Some of these HAPCs are present in Rowdy and Dominie creeks within the Project Area and PSB including some channel complexity, thermal refugia, and spawning habitat. The instream channels offer some complexities; however, because of the weir, sediment is trapped upstream. The natural habitat within the Project Area has been modified substantially. A deep pool immediately downstream of the weir offers thermal refugia, but also acts as an impediment to fish passage (in conjunction with the weir). There are some limited complex channels within the Project Area. A gravel bar which splits the Rowdy creek mainstem exists upstream of the weir. Riffles and pools exist within the Project Area. The channel doesn't meander -- rather, stays within the banks. The floodplain is disconnected from the channel.

Construction will result in temporary physical barriers to aquatic wildlife movement due to dewatering. However, Project activities are localized and temporary and are not expected to result in any long-term or significant impacts to water quality in terms of sediment disturbance. Following completion, the Project is expected to provide a long-term benefit to salmonid populations in the watershed and improve the quality of HAPCs within Rowdy and Dominie creeks.

6. Summary of Potential Impacts and Avoidance and Minimization Measures

Potential impacts will be addressed in detail in environmental review documents (FESA Biological Assessment) and associated permit applications. Project activities are localized and temporary and, within implementation of avoidance and minimization measures described below, are not expected to result in any long term or substantial impacts to special status plants or wildlife species.

6.1 Proposed Avoidance and Minimization Measures

6.1.1 General

General measures are recommended to protect the water quality of Rowdy and Dominie creeks from sediment and other contaminants. More specific measures are recommended for special status plants, bats, terrestrial mammals, birds, reptiles and amphibians, mollusks, and fish.

6.1.1.1 General Measures

- Silt fences will be deployed along creekside construction areas to prevent any sediment from flowing into Rowdy and Dominie creeks. If the silt fences are not adequately containing sediment, construction activity will cease until remedial measures are implemented that prevent sediment from entering the waters below the construction area.
- Construction materials, debris, or dredge material, will not be placed or stored where it may be allowed to enter into or be placed where it may be washed by rainfall into Rowdy and/or Dominie creeks.
- Best Management Practices (BMPs) will be implemented to prevent entry of storm water runoff into Rowdy and/or Dominie creeks, the entrainment of excavated contaminated materials leaving the site, and to prevent the entry of polluted storm water runoff into coastal waters during the transportation and storage of excavated materials.

6.1.2 Plants

Nine special status plant species were determined to have a moderate potential to occur within the Project Area:

Seaside bittercress (*Cardamine angulata*)
Nuttall's saxifrage (*Cascadia nuttallii*)
Minute pocket moss (*Fissidens pauperculus*)
Ghost pipe (*Monotropa uniflora*)
Oregon polemonium (*Polemonium carneum*)
Fibrous pondweed (*Potamogeton foliosus ssp. fibrillosus*)
Great burnet (*Sanguisorba officinalis*)
Siskiyou checkerbloom (*Sidalcea malviflora ssp. patula*)
Coast checkerbloom (*Sidalcea oregana ssp. eximia*)

The following conservation measures have been implemented to reduce potential impacts to special status plant species:

- Pre-construction surveys: Seasonally appropriate pre-construction surveys for special status plant species were completed on June 12, 2020 prior to ground disturbance (i.e., excavation, trenching or grading). Survey methods followed CDFW rare plant survey protocols, and were performed by qualified field botanists (CDFW 2018a). No rare plant populations were detected during the survey. If any incidental rare plant observations are made in the future, populations of special status plant species detected would be mapped, and populations would be flagged if avoidance is feasible and if populations are located adjacent to construction areas.
- The locations of any special status plant populations to be avoided shall be clearly identified in the contract documents (plans and specifications).
- If avoidance is not feasible, plants would be relocated in coordination with CDFW.

6.1.3 Wildlife

6.1.3.1 Special Status Bats

Habitat for bats (tree cavities, loose bark, riparian forest, bridges, etc.) is present in the Project Area (based on reconnaissance level surveys). Trees and vegetation on the Project site may also provide roosting habitat for a variety of bat species. Construction of the Project may adversely impact special status bat species through the removal or modification of trees and/or vegetation, ground disturbance, as well as potential noise disturbance.

If construction occurs during the bat maternity season (generally May 1st through August 30th), a qualified bat biologist shall conduct habitat surveys for special status bats. Survey methodology should include visual examination of suitable habitat areas for signs of bat use and may optionally utilize ultrasonic detectors to determine if special status bat species utilize the vicinity. Surveys shall be conducted within seven days prior to construction in any areas where potential maternity roosts may be disturbed/removed. Surveys shall be conducted by a qualified biologist. Surveys shall include a visual inspection of the impact area and any large trees/snags with cavities or loose bark. If the presence of a maternity roost is confirmed, roost removal will be prohibited during maternity season and no activity-generating noise greater than 88 dB (documented disturbance threshold; Bennett and Zurcher 2013) shall occur within 300 feet of the roost. If no bat utilization or roosts are found, then no further study or action is required. If bats are found to utilize the Project Site, or presence is assumed, a bat specialist should be engaged to advise the best method to prevent impact.

Project-related lighting shall be minimized if any work occurs at night, either contained within structures or limited by appropriate reflectors or shrouds and focused on areas needed for safety, security or other essential requirements.

6.1.3.2 Special Status Terrestrial Mammals

Potential Project impacts to terrestrial mammals are expected to be limited to ground disturbance/excavation. While elevated levels of noise in the Project Area may disturb terrestrial mammals in the vicinity, no impacts are expected as the species are highly mobile and likely to leave the area once noisy construction activities commence.

- Steep-sided excavations capable of trapping mammals shall be ramped or covered if left overnight.
- No pets (i.e., dogs) shall be allowed in the Project Area.
- No poisons (including anticoagulant rodenticides) or other potentially injurious materials attractive to mammals shall be utilized or left unattended during construction or operation activities.

6.1.3.3 Nesting Birds

Potential Project impacts to special status birds during construction may include habitat destruction, visual disturbance, and noise disturbance. The following measures are proposed.

- Ground disturbance and vegetation clearing shall be conducted, if possible, during the fall and/or winter months and outside of the avian nesting season (March 15 – August 15) to avoid any direct effects to special status and protected birds. If ground disturbance cannot be confined to work outside of the nesting season, a qualified ornithologist shall conduct pre-construction surveys within the vicinity of the Project Area, to check for nesting activity of native birds and to evaluate the site for presence of raptors and special status bird species. The ornithologist shall conduct at minimum a one day pre-construction survey within the 7-day period prior to vegetation removal and ground-disturbing activities. If ground disturbance or vegetation removal work lapses for seven days or longer during the breeding season, a qualified ornithologist shall conduct a supplemental avian pre-construction survey before project work is reinitiated.
- If active nests are detected within the construction footprint or up to 500 feet from construction activities, the ornithologist shall flag a buffer around each nest (assuming property access). Construction activities shall avoid nest sites until the ornithologist determines that the young have fledged or nesting activity has ceased. If nests are documented outside of the construction (disturbance) footprint, but within 500 feet of the construction area, buffers will be implemented as needed (buffer size dependent on species). Buffer sizes for common species would be determined on a case-by-case basis in consultation with the CDFW and, if applicable, with USFWS. Buffer sizes will take into account factors such as (1) noise and human disturbance levels at the construction site at the time of the survey and the noise and disturbance expected during the construction activity; (2) distance and amount of vegetation or other screening between the construction site and the nest; and (3) sensitivity of individual nesting species and behaviors of the nesting birds.
- If active nests are detected during the survey, the qualified ornithologist shall monitor all nests at least once per week to determine whether birds are being disturbed. Activities that might, in the opinion of the qualified ornithologist, disturb nesting activities (e.g., excessive noise), shall be prohibited within the buffer zone until such a determination is made. If signs of disturbance or distress are observed, the qualified ornithologist shall immediately implement adaptive measures to reduce disturbance. These measures may include, but are not limited to, increasing buffer size, halting disruptive construction activities in the vicinity of the nest until fledging is confirmed or nesting activity has ceased, placement of visual screens or sound dampening structures between the nest and construction activity, reducing speed limits, replacing and updating noisy equipment, queuing trucks to distribute idling noise, locating vehicle access points and loading and shipping facilities away from noise-sensitive receptors, reducing the number of noisy construction activities occurring simultaneously, and/or reorienting and/or relocating construction equipment to minimize noise at noise-sensitive receptors.

6.1.3.4 Special Status Reptiles and Amphibians

Impacts to special status reptiles and amphibians in the Project Area may include habitat destruction as well as injury or mortality as a result of crushing or burying from vehicle use and excavation/earth moving. In addition, elevated levels of noise may mask species calls during the breeding season (Northern Red-legged Frogs call during both the day and night, so daytime construction noise may impact species communication). To avoid impacts to special status reptile and amphibian species, the following avoidance and minimization measures are proposed:

- No more than one week prior to commencement of ground disturbance within 50 feet of suitable reptile/amphibian habitat (e.g., Rowdy and Dominie creek channels, riparian areas, damp meadows), a qualified biologist shall perform a pre-construction survey for Western Pond Turtles, Pacific Tailed Frog (*Ascaphus truei*), Del Norte Salamander (*Plethodon elongates*), Northern Red-legged Frog (*Rana aurora*), Foothill Yellow-legged Frog (*Rana boylii*), and Southern Torrent Salamander (*Rhyacotriton variegatus*). Any individuals or egg masses that occur within the work-impact zone would be relocated by the qualified biologist to nearby suitable habitat.
- In the event that a turtle, frog, and/or salamander is observed in an active construction zone, the contractor shall halt construction activities in the immediate area where observed and the turtle, frog, and/or salamander shall be moved to a safe location in similar habitat outside of the construction zone.

6.1.3.5 Special Status Fish and Mollusks

Impacts to special status fish or mollusks in the Project Area may include habitat destruction as well as injury or mortality as a result of crushing or burying from excavation/earth moving, dewatering, relocation, or increased levels of in-water sedimentation. In-water work will be limited to the seasonal work period (June 15 through October 15 pursuant to existing permit agreements) coinciding with low flows and outside of migratory and spawning seasons. A qualified fisheries biologist will be utilized to oversee dewatering and lead relocation of native aquatic species efforts. Dewatering and native aquatic species relocation will be conducted in accordance with CDFW and NMFS standards.

7. Conclusion

Nine special status plants have potential to occur within the Project Area where disturbance is proposed. Two special status bat species, one terrestrial mammal species, twelve special status bird species, one special status reptile, five special status amphibians, six special status fish, two special status aquatic mollusks, and one special status insect may occur in the Project Area or in immediately adjacent habitat within the PSB. With implementation of measures described in **Section 0**, potential Project-related impacts to sensitive plant and wildlife species will be avoided or minimized. More specific measures may be identified in subsequent environmental review and permit applications.

8. Literature Cited

American Council of Engineering Companies (ACEC). 2020. *2020 California Environmental Quality Act Statute & CEQA Guidelines.* ACEC, Sacramento, California, USA.

Baldwin, B. D. 2012. *The Jepson Manual, Second Edition*. University of California Press, Berkeley, California, USA.

Bat Acoustic Monitoring Visualization Tool (BAMVT). 2020. *Bat Acoustic Monitoring Visualization Tool: a companion to BatAmp*. Conservation Biology Institute, Corvallis, Oregon, USA. https://visualize.batamp.databasin.org (04/17/2020)

Bat Conservation International (BCI). 1998. Proceedings of the Western Bat Working Group workshop on ecology, conservation and management of western bat species – Western Bat Species Regional Priority Matrix. Western Bat Working Group workshop, February 9-13, 1998, Reno, Nevada, USA.

Bennett, V. J. & Zurcher, A. A., 2013. When corridors collide: Road-related disturbance in commuting bats. *The Journal of Wildlife Management* **77**:93–101.

Buehler, D. A. 2000. Bald eagle (*Haliaeetus leucocephalus*), version 2.0. A. F. Poole and F. B. Gill, editors. *The birds of North America online.* Cornell Lab of Ornithology, Ithaca, New York, USA. https://doi.org/10.2173/bna.506 (03/17/2020)

Bumble Bee Watch. 2020. *Bumble Bee Sightings Map.* Xerces Society for Invertebrate Conservation, Portland, Oregon, USA. https://www.bumblebeewatch.org/ (04/17/2020)

California Coastal Commission (CCC). 2019. Comments on Caltrans Notice of Completion of a Draft Joint Environmental Impact Report /Environmental Assessment, Dr. Fine Bridge Replacement Project, Bridge# 01-0020 on U.S. Highway 101 from post mile (PM) 35.8 to Fred D. Haight Drive at PM 36.5, Del Norte County (State Clearinghouse Number 201010203 7). State of California, Natural Resources Agency, California Coastal Commission, North Coast Regional Office, Arcata, California, USA.

California Department of Fish and Wildlife (CDFW). 2018a. Protocols for surveying and evaluating impacts to special status native plant populations and sensitive natural communities. State of California, Natural Resources Agency, Department of Fish and Wildlife, Sacramento, California, USA.

California Department of Fish and Wildlife (CDFW). 2019a. *California Sensitive Natural Communities.* State of California, Natural Resources Agency, Department of Fish and Wildlife, Vegetation Classification and Mapping Program, Sacramento, California, USA. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=153609&inline (06/05/2020)

California Department of Fish and Wildlife (CDFW). 2020a. *California Natural Diversity Database (CNDDB).* USGS 7.5 Minute Quadrangles. State of California, Natural Resources Agency, Department of Fish and Wildlife, Biogeographic Data Branch, Sacramento, California, USA. https://www.wildlife.ca.gov/Data/CNDDB (04/17/2020)

California Department of Fish and Wildlife (CDFW). 2020b. *Metadata - Description of CNDDB fields.* State of California, Natural Resources Agency, Department of Fish and Wildlife Biogeographic Data Branch, Sacramento, California, USA. https://map.dfg.ca.gov/ace/docs/CNDDB_QuickView_FieldDescriptions.htm (04/17/2020)

California Fish Website (CalFish). 2020. Green sturgeon. University of California, Agriculture and Natural Resources Department, Davis, California, USA. http://calfish.ucdavis.edu/species/?uid=35&ds=241 (08/06/2020)

California Native Plant Society (CNPS). 2020a. *CNPS Inventory of Rare Plants.* CNPS, Sacramento, California, USA. https://www.cnps.org/rare-plants/cnps-inventory-of-rare-plants (04/17/2020)

California Native Plant Society (CNPS). 2020b. *A manual of California vegetation, online edition.* CNPS, Sacramento, California, USA. http://www.cnps.org/cnps/vegetation/ (06/05/2020)

Congress.gov. 2020. H.R.5552 - Migratory Bird Protection Act of 2020. 116th Congress. https://www.congress.gov/bill/116th-congress/house-bill/5552/titles?q=%7B%22search%22%3A%5B%22Natural+Resources%22%5D%7D&r=25&s=1 (03/11/2020)

County of Del Norte. 2013. Planning Division: Documents. http://www.co.del-norte.ca.us/departments/community-development-department/planning-division/documents

D.J. Warren & Associates, Inc. (DJWA) and Meridian Environmental, Inc. 2018. Rowdy Creek Fish Hatchery Infrastructure and Operations Report. Prepared for the Tolowa Dee-ni' Nation. January.

Erickson, Gregg A., E. D. Pierson, et al. 2002. *Bat and bridges technical bulletin (Hitchhiker guide to bat roosts).* State of California, Department of Transportation, Sacramento, California, USA.

GHD and Michael Love & Associates. 2015. Rowdy Creek Fish Passage Improvement Project Final Feasibility Study. February. Prepared for the Smith River Rancheria.

GHD and Michael Love & Associates. 2018. Dominie and Rowdy Creek Fish Passage Improvement Project. Final Basis of Design Report. August. Prepared for the Tolowa Dee-ni' Nation.

GHD. 2020. Aquatic Resources Delineation Report for the Rowdy and Dominie Creek Fish Passage Improvement Project. Draft. August.

Gamblin, H. E. 2019. Distribution and habitat use of a recently discovered population of Humboldt martens in California. M.S. Thesis. Humboldt State University, Arcata, California, USA.

Garwood and Larson. 2014. Reconnaissance of salmonid redd abundance and juvenile salmonid spatial structure in the Smith River with emphasis on Coho Salmon (*Oncorhynchus kisutch*). Final report to the California Department of Fish and Wildlife Fisheries Restoration Grant Program, Grantee agreement: P1010504. Prepared on behalf of the Smith River Alliance and the California Department of Fish and Wildlife Anadromous Fisheries Resource and Monitoring Program. March.

Hogan, S. and C. Zuber. 2012. Smith River watershed 2012 summary report, State of California, Department of Fish and Wildlife, Heritage and Wild Trout Program, Sacramento, California, USA.

Holland, R.F. 1986. Preliminary descriptions of the terrestrial natural communities of California. State of California, Natural Resources Agency, Department of Fish and Game, Non-game Heritage Program, Sacramento, California, USA.

International Union for Conservation of Nature (IUCN). 2012. *IUCN Red List Categories and Criteria, version 3.1.* Second edition. IUCN, Gland, CH and Cambridge, UK.

Jelks, H. L., S. J. Walsh, N. M. Burkhead, S. Contreras-Balderas, E. Díaz-Pardo, D. A. Hendrickson, J. Lyons, N. E. Mandrak, F. McCormick, J. S. Nelson, S. P. Platania, B. A. Porter, C. B. Renaud, J. J. Schmitter-Soto, E. B. Taylor, and M. L. Warren, Jr. 2008. Conservation status of imperiled North American freshwater and diadromous fishes. *Fisheries* **33**(8):372-407.

Kochert, M. N., K. Steenhof, C. L. McIntyre and E. H. Craig. 2002. Golden eagle *(Aquila chrysaetos),* version 2.0. A. F. Poole and F. B. Gill, editors. *The birds of North America online.* Cornell Lab of Ornithology, Ithaca, New York, USA. https://doi.org/10.2173/bna.684 (03/17/2020)

Lang, M. 2005. California Department of Transportation (CalTrans) District 1 Pilot Fish Passage Assessment Study: Volume 1 – Overall Results. CalTrans, Sacramento, CA. 198pp.

NatureServe. 2020. *NatureServe Explorer: An online encyclopedia of life [web application].* Version 7.1. NatureServe, Arlington, Virginia. http://explorer.natureserve.org (04/17/2020)

National Audubon Society. 2020. Preventable Birds Deaths are No Longer Punishable Offenses. https://www.audubon.org/news/preventable-birds-deaths-are-no-longer-punishable-offenses (03/11/2020)

National Oceanic and Atmospheric Administration (NOAA) Fisheries. 2020. Habitat Areas of Particular Concern on the West Coast. https://www.fisheries.noaa.gov/west-coast/habitat-conservation/habitat-areas-particular-concern-west-coast

Parish, M. and J. Garwood. 2016. Winter distributions, movements, and habitat use by juvenile salmonids throughout the lower Smith River basin and estuary, Del Norte County, California. Final Report to the California Department of Fish and Wildlife Fisheries Restoration Grants Program, Grantee Agreement P1410545. Smith River Alliance, Crescent City, California, USA.

Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. *A manual of California vegetation, second edition*. California Native Plant Society. Sacramento, California, USA.

U.S. Fish and Wildlife Service (USFWS). 2002. General rare plant survey guidelines by the Endangered Species Recovery Program.

U.S. Fish and Wildlife Service (USFWS). 2016. The Bald and Golden Eagle Protection Act. U.S. Department of the Interior, Fish and Wildlife Service, Midwest Regional Office, Bloomington, Minnesota, USA. https://www.fws.gov/midwest/midwestbird/eaglepermits/bagepa.html (03/17/2020)

U.S. Fish and Wildlife Service (USFWS). 2020a. *IPaC - Information for Planning and Consultation.* Department of the Interior, U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, CA, USA. https://ecos.fws.gov/ipac (08/01/2020)

Walkley, J. and J. M. Garwood. 2017. 2011-2016 Salmonid Redd Abundance and Juvenile Salmonid Spatial Structure in the Smith River Basin, California and Oregon. Final Progress Report to the CDFW Fisheries Restoration Grants Program. Smith River Alliance, Crescent City, Oregon, USA and State of California, Department of Fish and Wildlife, Anadramous Fisheries Resource and Monitoring Program, Arcata, California, USA.

Wagschal, A., and E. Blevins. 2017. Western pearlshell mussel impact assessment: Dr. Fine Bridge replacement project. State of California Department of Transportation District 1. 39 pp.

Wild Salmon Center (WSC). 2013. Salmon Stronghold: Smith River. Monitoring program on California salmon stronghold critical to fishery management. February. https://www.wildsalmoncenter.org/2013/02/01/smith-river/

Wisch. 2002. Detailed discussion of the bald and golden eagle protection act. Michigan State University College of Law, Animal Law Legal and Historical Center, East Lansing, Michigan, USA. https://www.animallaw.info/article/detailed-discussion-bald-and-golden-eagle-protection-act (03/17/2020)

9. List of Preparers

Prepared by:

Elizabeth Meisman, Wildlife Biologist, GHD Inc., Eureka, CA

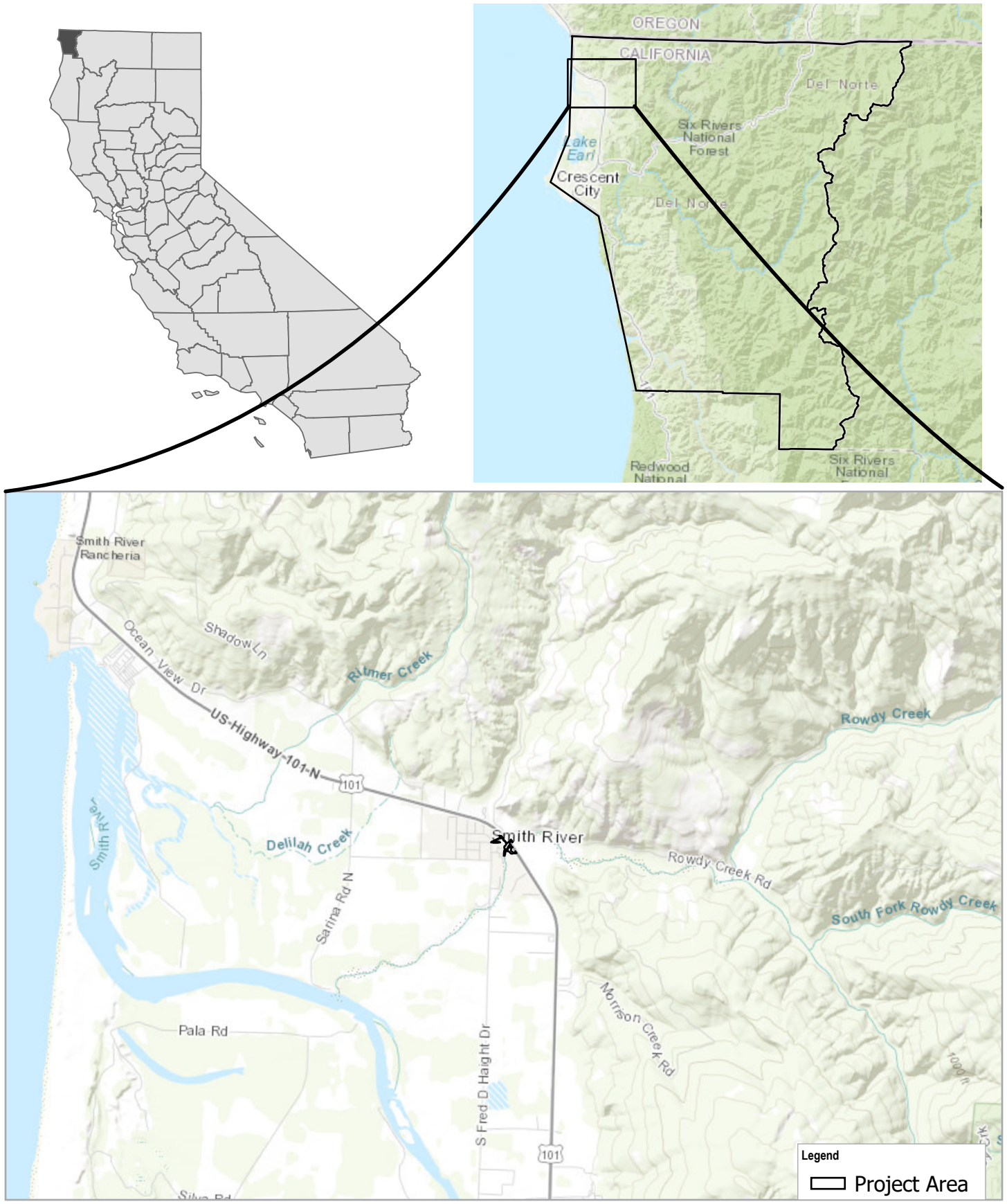
Kelsey McDonald, Botanist, GHD Inc., Eureka, CA

Kerry McNamee, Environmental Planner, GHD Inc., Roseville, CA

Genevieve Rozhon, Wildlife Biologist, GHD Inc., Eureka, CA

10. Appendices

Appendix A - Figures



Paper Size ANSI A

0 2,500 5,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **Mar 2020**

Vicinity Map

FIGURE 1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_001_Vicinity
Print date: 09 Mar 2020 - 17:00

Data source: World_Topo_Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community. Created by: jclark2

Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **August 2020**

Project Area

FIGURE 2

\\ghdnet\ghd\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\BRR\11209093_BRR.aprx - 11209093_002_ProjectArea
Print date: 14 Aug 2020 - 19:13

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: zporteous

Paper Size ANSI A

0 140 280 420 560

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

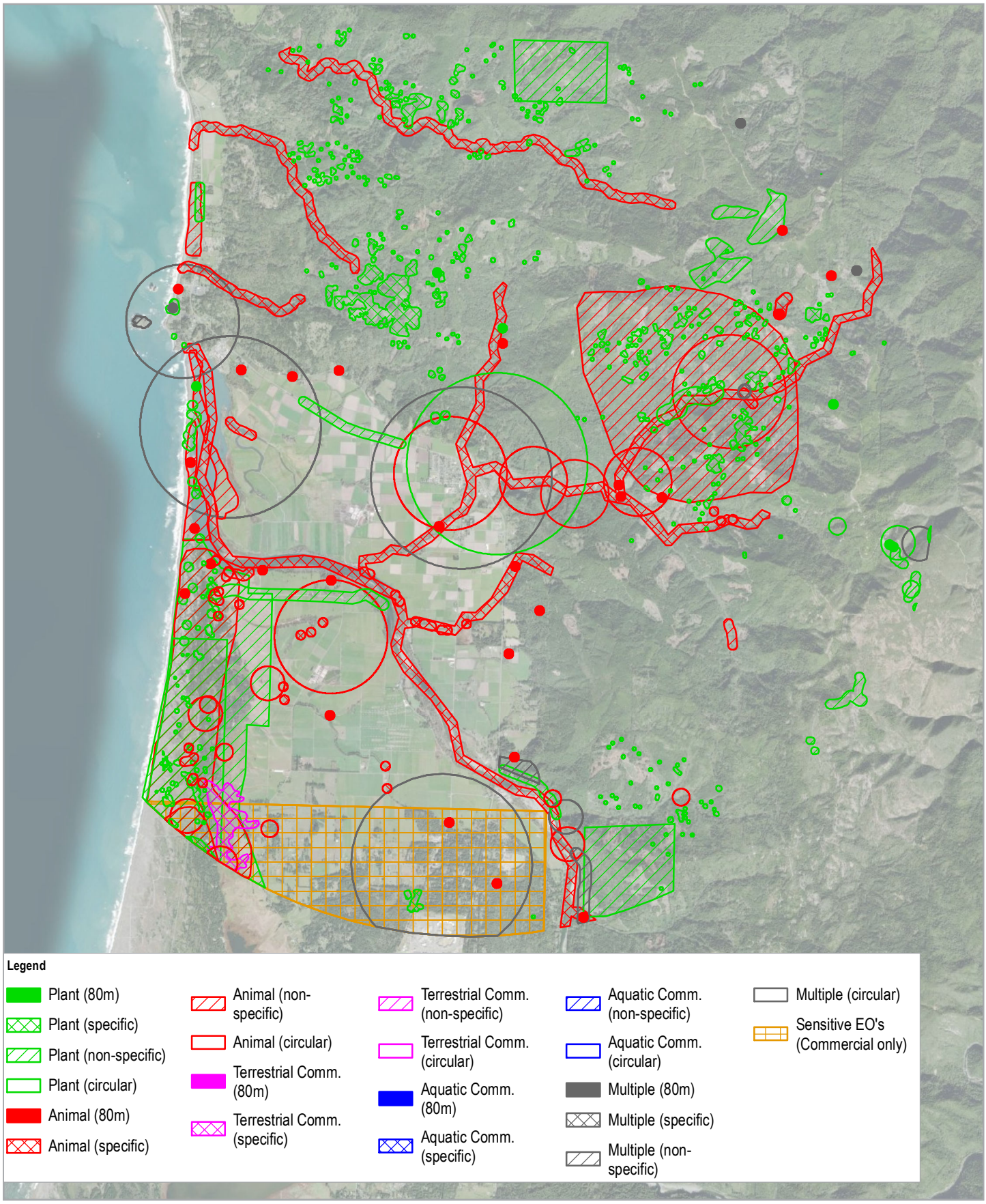
Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11290903**
Revision No. **-**
Date **August 2020**

Project Study Boundary

FIGURE 3

Data source: CNDDB Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: zporteous



Paper Size ANSI A

0 0.4 0.8 1.2 1.6

Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11290903**
Revision No. **-**
Date **August 2020**

CNDDB within 5 miles

FIGURE 4

Data source: CNDDB Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: zporteous

Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **July 2020**

National Wetland Inventory

FIGURE 5

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_005_NWI
Print date: 27 Jul 2020 - 13:04

Data source: National Wetland Inventory, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: zporteous

Appendix B - CNDDB, CNPS, IPaC, and NOAA Fisheries Database Search Results

Appendix B, Table 1. Rowdy and Dominie Creek Fish Passage Improvement Project – 7-Quad Database Search of CDFW CNDDB, CNPS Rare Plant Inventory, NOAA Fisheries West Coast Region California Species List Tools, and USFWS IPaC centered on Project quad (Smith River) on 04.17.2020. Quads included High Divide, Mount Emily, Brookings, Fourth of July Creek, Crescent City, and Hiouchi.

Scientific Name	Common Name	FedList	CalList	GRank[2]	SRank[2]	RPlant Rank[2]	Other Status	Habitat Requirements[1]
Mammals								
Erethizon dorsatum	North American Porcupine	None	None	G5	S3		IUCN_LC-Least Concern	Broadleaved upland forest | Cismontane woodland | Closed-cone coniferous forest | Lower montane coniferous forest | North coast coniferous forest | Upper montane coniferous forest. Forested habitats in the Sierra Nevada, Cascade, and Coast ranges, with scattered observations from forested areas in the Transverse Ranges. Wide variety of coniferous and mixed woodland habitat.
Lasionycteris noctivagans	Silver-haired Bat	None	None	G5	S3S4		IUCN_LC-Least Concern | WBWG_M-Medium Priority	Lower montane coniferous forest | Oldgrowth | Riparian forest. Primarily a coastal and montane forest dweller, feeding over streams, ponds & open brushy areas. Roosts in hollow trees, beneath exfoliating bark, abandoned woodpecker holes, and rarely under rocks. Needs drinking water.
Martes caurina humboldtensis	Humboldt Marten	None	SE	G5T1	S1		CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	North coast coniferous forest | Oldgrowth | Redwood. Occurs only in the coastal redwood zone from the Oregon border south to Sonoma County. Associated with late-successional coniferous forests, prefer forests with low, overhead cover.
Myotis yumanensis	Yuma Myotis	None	None	G5	S4		BLM_S-Sensitive | IUCN_LC-Least Concern | WBWG_LM-Low-Medium Priority	Lower montane coniferous forest | Riparian forest | Riparian woodland | Upper montane coniferous forest. Optimal habitats are open forests and woodlands with sources of water over which to feed. Distribution is closely tied to bodies of water. Maternity colonies in caves, mines, buildings or crevices.
Pekania pennanti	Fisher - West Coast DPS	None	ST	G5T2T3Q	S2S3		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	North coast coniferous forest | Oldgrowth | Riparian forest. Intermediate to large-tree stages of coniferous forests and deciduous-riparian areas with high percent canopy closure. Uses cavities, snags, logs and rocky areas for cover and denning. Needs large areas of mature, dense forest.
Birds								

Ardea alba	Great Egret	None	None	G5	S4		CDF_S-Sensitive | IUCN_LC-Least Concern	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp | Riparian forest | Wetland. Colonial nester in large trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.
Ardea herodias	Great Blue Heron	None	None	G5	S4		CDF_S-Sensitive | IUCN_LC-Least Concern	Brackish marsh | Estuary | Freshwater marsh | Marsh & swamp | Riparian forest | Wetland. Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.
Brachyramphus marmoratus	Marbled Murrelet	FT	SE	G3G4	S1		CDF_S-Sensitive | IUCN_EN-Endangered | NABCI_RWL-Red Watch List	Lower montane coniferous forest | Oldgrowth | Redwood. Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.
Branta hutchinsii leucopareia	Cackling (=Aleutian Canada) Goose	FD	None	G5T3	S3		CDFW_WL-Watch List	Artificial standing waters | Sacramento/San Joaquin standing waters | Valley & foothill grassland. Winters on lakes and inland prairies. Forages on natural pasture or that cultivated to grain; loafs on lakes, reservoirs, ponds.
Cerorhinca monocerata	Rhinoceros Auklet	None	None	G5	S3		CDFW_WL-Watch List | IUCN_LC-Least Concern	Off-shore islands and rocks along the California coast. Nests in a burrow on undisturbed, forested and unforested islands, and probably in cliff caves on the mainland.
Charadrius alexandrinus nivosus	Western Snowy Plover	FT	None	G3T3	S2S3		CDFW_SSC-Species of Special Concern | NABCI_RWL-Red Watch List | USFWS_BCC-Birds of Conservation Concern	Great Basin standing waters | Sand shore | Wetland. Sandy beaches, salt pond levees & shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.

Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	FT	SE	G5T2T3	S1		BLM_S-Sensitive | NABCI_RWL-Red Watch List | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Riparian forest.Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow, often mixed with cottonwoods, with lower story of blackberry, nettles, or wild grape.
Circus hudsonius	Northern Harrier	None	None	G5	S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Coastal scrub | Great Basin grassland | Marsh & swamp | Riparian scrub | Valley & foothill grassland | Wetland. Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.
Coturnicops noveboracensis	Yellow Rail	None	None	G4	S1S2		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | NABCI_RWL-Red Watch List | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Freshwater marsh | Meadow & seep. Summer resident in eastern Sierra Nevada in Mono County. Freshwater marshlands.

Cypseloides niger	Black Swift	None	None	G4	S2		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | NABCI_YWL-Yellow Watch List | USFWS_BCC-Birds of Conservation Concern	Coastal belt of Santa Cruz and Monterey counties; central & southern Sierra Nevada; San Bernardino & San Jacinto mountains. Breeds in small colonies on cliffs behind or adjacent to waterfalls in deep canyons and sea-bluffs above the surf; forages widely.
Egretta thula	Snowy Egret	None	None	G5	S4		IUCN_LC-Least Concern	Marsh & swamp | Meadow & seep | Riparian forest | Riparian woodland | Wetland. Colonial nester, with nest sites situated in protected beds of dense tules. Rookery sites situated close to foraging areas: marshes, tidal-flats, streams, wet meadows, and borders of lakes.
Elanus leucurus	White-tailed Kite	None	None	G5	S3S4		BLM_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern	Cismontane woodland | Marsh & swamp | Riparian woodland | Valley & foothill grassland | Wetland. Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.
Empidonax traillii brewsteri	Little Willow Flycatcher	None	SE	G5T3T4	S1S2		USFWS_BCC-Birds of Conservation Concern	Meadow & seep | Riparian woodland. Mountain meadows and riparian habitats in the Sierra Nevada and Cascades. Nests near the edges of vegetation clumps and near streams.
Fratercula cirrhata	Tufted Puffin	None	None	G5	S1S2		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Protected deepwater coastal communities. Open-ocean bird; nests along the coast on islands, islets, or (rarely) mainland cliffs. Requires sod or earth into which the birds can burrow, on island cliffs or grassy island slopes.

Haliaeetus leucocephalus	Bald Eagle	FD	SE	G5	S3		BLM_S-Sensitive | CDF_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Lower montane coniferous forest | Oldgrowth. Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water. Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.
Nycticorax nycticorax	Black-crowned Night-heron	None	None	G5	S4		IUCN_LC-Least Concern	Marsh & swamp | Riparian forest | Riparian woodland | Wetland. Colonial nester, usually in trees, occasionally in tule patches. Rookery sites located adjacent to foraging areas: lake margins, mud-bordered bays, marshy spots.
Oceanodroma furcata	Fork-tailed Storm-petrel	None	None	G5	S1		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Protected deepwater coastal communities. Colonial nester on small, offshore islets. Forages over the open ocean, usually well off-shore. Birds choose offshore islets which provide nesting crannies beneath rocks or sod for burrowing.
Pandion haliaetus	Osprey	None	None	G5	S4		CDF_S-Sensitive | CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest. Ocean shore, bays, freshwater lakes, and larger streams. Large nests built in tree-tops within 15 miles of a good fish-producing body of water.
Phalacrocorax auritus	Double-crested Cormorant	None	None	G5	S4		CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian forest | Riparian scrub | Riparian woodland. Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state. Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.

Phoebastria albatrus	Short-tailed Albatross	FE	N	G1	S1		CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable | NABCI_RWL-Red Watch List	Offshore Japanese Islands | Northern Pacific Ocean | Sea of Okhotsk.Islands with bare ground/grass surrounded by cliffs.Nests consist of large scoops lined with grass in open, grassy areas. Forages at upwellings in the ocean. (CDFW 2020a)
Riparia riparia	Bank Swallow	None	ST	G5	S2		BLM_S-Sensitive | IUCN_LC-Least Concern	Riparian scrub | Riparian woodland. Colonial nester; nests primarily in riparian and other lowland habitats west of the desert. Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.
Strix occidentalis caurina	Northern Spotted Owl	FT	ST	G3T3	S2S3		CDF_S-Sensitive | IUCN_NT-Near Threatened | NABCI_YWL-Yellow Watch List	North coast coniferous forest | Oldgrowth | Redwood.Old-growth forests or mixed stands of old-growth and mature trees. Occasionally in younger forests with patches of big trees..High, multistory canopy dominated by big trees, many trees with cavities or broken tops, woody debris, and space under canopy.(CDFW 2020a)
Reptiles								
Emys marmorata	Western Pond Turtle	None	None	G3G4	S3		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable | USFS_S-Sensitive	Aquatic | Artificial flowing waters | Klamath/North coast flowing waters | Klamath/North coast standing waters | Marsh & swamp | Sacramento/San Joaquin flowing waters | Sacramento/San Joaquin standing waters | South coast flowing waters | South coast standing waters | Wetland. A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.
Amphibians								
Ascaphus truei	Pacific Tailed Frog	None	None	G4	S3S4		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Aquatic | Klamath/North coast flowing waters | Lower montane coniferous forest | North coast coniferous forest | Redwood | Riparian forest. Occurs in montane hardwood-conifer, redwood, Douglas-fir & ponderosa pine habitats. Restricted to perennial montane streams. Tadpoles require water below 15 degrees C.

Plethodon elongatus	Del Norte Salamander	None	None	G4	S3		CDFW_WL-Watch List | IUCN_NT-Near Threatened	Oldgrowth. Old-growth associated species with optimum conditions in the mixed conifer/hardwood ancient forest ecosystem. Cool, moist, stable microclimate, a deep litter layer, closed multi-storied canopy, dominated by large, old trees.
Rana aurora	Northern Red-legged Frog	None	None	G4	S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Klamath/North coast flowing waters | Riparian forest | Riparian woodland. Humid forests, woodlands, grasslands, and streamsides in northwestern California, usually near dense riparian cover.Generally near permanent water, but can be found far from water, in damp woods and meadows, during non-breeding season.
Rana boylii	Foothill Yellow-legged Frog	None	Northwest/North Coast clade not listed; Other clades listed; check range map.	G3	S3		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | USFS_S-Sensitive	Aquatic | Chaparral | Cismontane woodland | Coastal scrub | Klamath/North coast flowing waters | Lower montane coniferous forest | Meadow & seep | Riparian forest | Riparian woodland | Sacramento/San Joaquin flowing waters. Partly-shaded, shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.
Rhyacotriton variegatus	Southern Torrent Salamander	None	None	G3G4	S2S3		CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Lower montane coniferous forest | Oldgrowth | Redwood | Riparian forest. Coastal redwood, Douglas-fir, mixed conifer, montane riparian, and montane hardwood-conifer habitats. Old growth forest. Cold, well-shaded, permanent streams and seepages, or within splash zone or on moss-covered rocks within trickling water.
Fish								

Acipenser medirostris	Green Sturgeon	FT	None	G3	S1S2		AFS_VU-Vulnerable | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | NMFS_SC-Species of Concern	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. These are the most marine species of sturgeon. Abundance increases northward of Point Conception. Spawns in the Sacramento, Klamath, & Trinity Rivers. Spawns at temps between 8-14 C. Preferred spawning substrate is large cobble, but can range from clean sand to bedrock.
Entosphenus tridentatus	Pacific Lamprey	None	None	G4	S4		AFS_VU-Vulnerable | BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters | South coast flowing waters. Found in Pacific Coast streams north of San Luis Obispo County, however regular runs in Santa Clara River. Size of runs is declining. Swift-current gravel-bottomed areas for spawning with water temps between 12-18 C. Ammocoetes need soft sand or mud.
Eucyclogobius newberryi	Tidewater Goby	FE	None	G3	S3		AFS_EN-Endangered | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters | South coast flowing waters. Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.
Lampetra richardsoni	Western Brook Lamprey	None	None	G4G5	S3S4		CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	
Oncorhynchus clarkii clarkii	Coast Cutthroat Trout	None	None	G4T4	S3		AFS_VU-Vulnerable | CDFW_SSC-Species of Special Concern | USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters. Small coastal streams from the Eel River to the Oregon border. Small, low gradient coastal streams and estuaries. Needs shaded streams with water temperatures <18C, and small gravel for spawning.

Oncorhynchus kisutch pop. 2	Coho Salmon - southern Oregon / northern California ESU	FT	ST	G4T2Q	S2?		AFS_TH-Threatened	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. Federal listing refers to populations between Cape Blanco, Oregon and Punta Gorda, Humboldt County, California.State listing refers to populations between the Oregon border and Punta Gorda, California.
Oncorhynchus mykiss irideus pop. 36	summer-run Steelhead Trout	None	SCE	G5T4Q	S2		CDFW_SSC-Species of Special Concern	Aquatic | Klamath/North coast flowing waters | Sacramento/San Joaquin flowing waters. No. Calif coastal streams south to Middle Fork Eel River. Within range of Klamath Mtns province DPS & No. Calif DPS. Cool, swift, shallow water & clean loose gravel for spawning, & suitably large pools in which to spend the summer.
Thaleichthys pacificus	Eulachon	FT	None	G5	S3			Aquatic | Klamath/North coast flowing waters. Found in Klamath River, Mad River, Redwood Creek, and in small numbers in Smith River and Humboldt Bay tributaries. Spawn in lower reaches of coastal rivers with moderate water velocities and bottom of pea-sized gravel, sand, and woody debris.
Mollusks								
Juga chacei	Chace Juga	None	None	G1	S1		USFS_S-Sensitive	Aquatic | Klamath/North coast flowing waters. Small, permanent streams at low to middle elevations in the Smith River drainage. Generally on gravel substrate, always in cold, clear, highly oxygenated, unpolluted, running water.
Margaritifera falcata	Western Pearlshell	None	None	G4G5	S1S2			Aquatic. Aquatic. Prefers lower velocity waters.
Monadenia fidelis pronotis	Rocky Coast Pacific Sideband	None	None	G4G5T1	S1			Coastal bluff scrub. Coastal habitat around Point St. George in Del Norte County. Rocky, moist habitat with seashore plants, including iceplant.
Insects								
Atractelmis wawona	Wawona Riffle Beetle	None	None	G1G3	S1S2			Aquatic. Aquatic; found in riffles of rapid, small to medium clear mountain streams; 2000-5000 ft elev. Strong preference for inhabiting submerged aquatic mosses.
Bombus caliginosus	Obscure Bumble Bee	None	None	G4?	S1S2		IUCN_VU-Vulnerable	Coastal areas from Santa Barabara county to north to Washington state. Food plant genera include Baccharis, Cirsium, Lupinus, Lotus, Grindelia and Phacelia.

Bombus occidentalis	Western Bumble Bee	None	SCE	G2G3	S1		USFS_S-Sensitive | XERCES_IM-Imperiled	Once common & widespread, species has declined precipitously from central CA to southern B.C., perhaps from disease.
Coenonympha tullia yontockett	Yontocket Satyr	None	None	G5T1T2	S1			Coastal dunes. Coastal dunes north of Crescent City in Del Norte County. Grassy areas among dunes with coniferous lee slopes & grassy exposed slopes, also dunes around sphagnum bogs.
Limnephilus atercus	Fort Dick Limnephilus Caddisfly	None	None	G3G4	S1			Aquatic | Klamath/North coast flowing waters | Klamath/North coast standing waters. Known only from Fort Dick in Del Norte County.
Polites mardon	Mardon Skipper	None	None	G2G3	S1		USFS_S-Sensitive | XERCES_IM-Imperiled	North coast coniferous forest. Known from western Washington State and extreme northwestern Del Norte County.
Speyeria zerene hippolyta	Oregon Silverspot Butterfly	FT	None	G5T1	S1		XERCES_CI-Critically Imperiled	Coastal dunes. Coastal meadows in Del Norte County. The larvae feed only on the foliage of western dog violet (Viola adunca).
Plants								
Abronia umbellata var. breviflora	pink sand-verbena	None	None	G4G5T2	S2	1B.1	BLM_S-Sensitive | SB_RSABG-Rancho Santa Ana Botanic Garden	Coastal dunes. Coastal dunes and coastal strand.Foredunes and interdunes with sparse cover. A. umbellata var. breviflora is usually the plant closest to the ocean. 0-75 m.
Angelica lucida	sea-watch	None	None	G5	S3	4.2		Coastal bluff scrub, Coastal dunes, Coastal scrub, Marshes and swamps (coastal salt).
Antennaria suffrutescens	evergreen everlasting	None	None	G4	S3	4.3		Lower montane coniferous forest (serpentinite).
Anthoxanthum nitens ssp. nitens	vanilla-grass	None	None	G5	S2	2B.3		Meadow & seep | Wetland. Meadows and seeps.Wet sites. 3-1895 m.
Arabis aculeolata	Waldo rockcress	None	None	G4	S2	2B.2	SB_BerrySB-Berry Seed Bank	Broadleaved upland forest | Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Broadleafed upland forest, lower montane coniferous forest, upper montane coniferous forest.Serpentine slopes and ridges. 405-1270 m.

Arabis mcdonaldiana	McDonald's rockcress	Endangered	Endangered	G3	S3	1B.1	SB_BerrySB-Berry Seed Bank | SB_RSABG-Rancho Santa Ana Botanic Garden	Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Lower montane coniferous forest, upper montane coniferous forest.Rocky outcrops, ridges, slopes, and flats on serpentine. 150-1830 m.
Arctostaphylos hispidula	Howell's manzanita	None	None	G4	S3	4.2		Chaparral (serpentinite or sandstone).
Arctostaphylos nortensis	Del Norte manzanita	None	None	G2	S2	4.3		Chaparral, Lower montane coniferous forest. often serpentinite
Arnica cernua	serpentine arnica	None	None	G5	S4	4.3		Lower montane coniferous forest (serpentinite).
Arnica spathulata	Klamath arnica	None	None	G3?	S3	4.3		Lower montane coniferous forest (serpentinite).
Asplenium trichomanes ssp. trichomanes	maidenhair spleenwort	None	None	G5T5	S1	2B.1		Lower montane coniferous forest. Lower montane coniferous forest.On rocks. 185-200 m.
Boechera koehleri	Koehler's stipitate rockcress	None	None	G3G4	S3	1B.3	USFS_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Chaparral, lower montane coniferous forest.Rocky, serpentine substrate. 120-1830 m.
Bryoria pseudocapillaris	false gray horsehair lichen	None	None	G3	S2	3.2		Coastal dunes (SLO Co.), North Coast coniferous forest (immediate coast). Usually on conifers
Bryoria spiralifera	twisted horsehair lichen	None	None	G1G2	S1S2	1B.1		North coast coniferous forest. North coast coniferous forest.Usually on conifers. 5-30 m.
Calamagrostis crassiglumis	Thurber's reed grass	None	None	G3Q	S2	2B.1		Coastal scrub | Freshwater marsh | Marsh & swamp | Wetland. Coastal scrub, marshes and swamps.Usually in marshy swales surrounded by grassland or coastal scrub. 5-50 m.
Calicium adspersum	spiral-spored gilded-head pin lichen	None	None	G3G4	S1	2B.2	USFS_S-Sensitive	Lower montane coniferous forest | North coast coniferous forest. Lower montane coniferous forest, north coast coniferous forest.Only known in California from a Sequoia sempervirens stand. Restricted throughout its range to old-growth conifer forests in relatively cool-humid stands. Restricted to aged bark of conifers, typically old-growth trees over 200 years of age. 200 m.

Calystegia atriplicifolia ssp. buttensis	Butte County morning-glory	None	None	G5T3	S3	4.2		Chaparral | Lower montane coniferous forest | Valley & foothill grassland. Chaparral, lower montane coniferous forest, valley and foothill grassland.Dry, mostly open slopes. Rocky substrates. 105-1645 m.
Cardamine angulata	seaside bittercress	None	None	G4G5	S3	2B.1		Lower montane coniferous forest | North coast coniferous forest | Wetland. North coast coniferous forest, lower montane coniferous forest.Wet areas, streambanks. 5-515 m.
Cardamine nuttallii var. gemmata	yellow-tubered toothwort	None	None	G5T3Q	S2	3.3		Lower montane coniferous forest | North coast coniferous forest | Ultramafic. Lower montane coniferous forest, north coast coniferous forest.On serpentine in a variety of aspects. 20-855 m.
Carex arcta	northern clustered sedge	None	None	G5	S1	2B.2		Bog & fen | North coast coniferous forest | Wetland. Bogs and fens, north coast coniferous forest.Mesic sites. 60-1405 m.
Carex lenticularis var. limnophila	lagoon sedge	None	None	G5T5	S1	2B.2		Bog & fen | Marsh & swamp | North coast coniferous forest. Bogs and fens, marshes and swamps, north noast coniferous forest.Lakeshores, beaches. Often in gravelly substrates. 0-6 m.
Carex lyngbyei	Lyngbye's sedge	None	None	G5	S3	2B.2		Marsh & swamp | Wetland. Marshes and swamps (brackish or freshwater).0-200 m.
Carex praticola	northern meadow sedge	None	None	G5	S2	2B.2		Meadow & seep | Wetland. Meadows and seeps.Moist to wet meadows. 15-3200 m.
Carex scabriuscula	Siskiyou sedge	None	None	G4G5	S4	4.3		Lower montane coniferous forest, Meadows and seeps, Upper montane coniferous forest. mesic, sometimes serpentinite seeps
Carex serpenticola	serpentine sedge	None	None	G4	S3	2B.3		Meadow & seep | Ultramafic | Wetland. Meadows and seeps.Mesic, serpentine sites. 20-1710 m.
Carex viridula ssp. viridula	green yellow sedge	None	None	G5T5	S2	2B.3		Bog & fen | Marsh & swamp | North coast coniferous forest | Wetland. Bogs and fens, marshes and swamps (freshwater), north coast coniferous forest.Mesic sites. 0-1705 m.
Cascadia nuttallii	Nuttall's saxifrage	None	None	G4?	S1	2B.1		North coast coniferous forest. North coast coniferous forest.Cliff walls, moss-covered rocks along creeks; mesic sites. 35-80 m.
Castilleja brevilobata	short-lobed paintbrush	None	None	G4	S3	4.2		Lower montane coniferous forest (serpentinite, edges and openings).

Castilleja elata	Siskiyou paintbrush	None	None	G3	S2S3	2B.2		Bog & fen | Lower montane coniferous forest | Ultramafic | Wetland. Lower montane coniferous forest, bogs and fens.Usually found on mesic serpentine soils; often associated with bogs, seeps, stream benches, and dry gullies. 60-2075 m.
Castilleja litoralis	Oregon coast paintbrush	None	None	G3	S3	2B.2		Coastal bluff scrub | Coastal dunes | Coastal scrub. Coastal bluff scrub, coastal dunes, coastal scrub.Sandy sites. 5-255 m.
Chrysosplenium glechomifolium	Pacific golden saxifrage	None	None	G5?	S3	4.3		North Coast coniferous forest, Riparian forest. Streambanks, sometimes seeps, sometimes roadsides
Cochlearia groenlandica	Greenland cochlearia	None	None	G4	S1	2B.3		Coastal bluff scrub. Coastal bluff scrub.Sea bird nesting areas on offshore rocks. 0-50 m.
Coptis laciniata	Oregon goldthread	None	None	G4?	S3?	4.2		Meadow & seep | North coast coniferous forest | Wetland. North coast coniferous forest, meadows and seeps.Mesic sites such as moist streambanks. 0-1000 m.
Cypripedium californicum	California lady's-slipper	None	None	G4	S4	4.2		Bogs and fens, Lower montane coniferous forest. seeps and streambanks, usually serpentinite
Cypripedium montanum	mountain lady's-slipper	None	None	G4	S4	4.2		Broadleafed upland forest, Cismontane woodland, Lower montane coniferous forest, North Coast coniferous forest.
Darlingtonia californica	California pitcherplant	None	None	G4	S4	4.2		Bogs and fens, Meadows and seeps. mesic, generally serpentinite seeps
Dicentra formosa ssp. oregana	Oregon bleeding heart	None	None	G5T4	S3	4.2		Lower montane coniferous forest (serpentinite).
Downingia willamettensis	Cascade downingia	None	None	G4	S2	2B.2		Cismontane woodland | Valley & foothill grassland | Vernal pool. Cismontane woodland, valley and foothill grasslands, vernal pools.Lake margins. 15-1110 m.
Empetrum nigrum	black crowberry	None	None	G5	S1?	2B.2		Coastal bluff scrub | Coastal prairie. Coastal bluff scrub, coastal prairie.3-15 m.
Epilobium rigidum	Siskiyou Mountains willowherb	None	None	G3G4	S3	4.3		Lower montane coniferous forest (serpentinite).
Erigeron cervinus	Siskiyou daisy	None	None	G4	S4	4.3		Lower montane coniferous forest, Meadows and seeps.

Eriogonum pendulum	Waldo wild buckwheat	None	None	G4	S2S3	2B.2		Lower montane coniferous forest | Ultramafic | Upper montane coniferous forest. Lower montane coniferous forest, upper montane coniferous forest.On dry, rocky ultramafic soils; open somewhat grassy areas within pine forest. 240-915 m.
Eriogonum ternatum	ternate buckwheat	None	None	G4	S4	4.3		Lower montane coniferous forest (serpentinite).
Erysimum concinnum	bluff wallflower	None	None	G3	S2	1B.2		Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal dunes, coastal bluff scrub, coastal prairie.More or less a coastal generalist within coastal habitat types. 3-60 m.
Erythronium hendersonii	Henderson's fawn lily	None	None	G4	S2	2B.3	USFS_S-Sensitive	Lower montane coniferous forest. Lower montane coniferous forest.60-900 m.
Erythronium howellii	Howell's fawn lily	None	None	G3G4	S2	1B.3		Lower montane coniferous forest | North coast coniferous forest. Lower montane coniferous forest, north coast coniferous forest.120-1150 m.
Erythronium oregonum	giant fawn lily	None	None	G4G5	S2	2B.2		Cismontane woodland | Meadow & seep | Ultramafic. Cismontane woodland, meadows and seeps.Openings. Sometimes on serpentine; rocky sites. 300-1435 m.
Fissidens pauperculus	minute pocket moss	None	None	G3?	S2	1B.2	USFS_S-Sensitive	North coast coniferous forest | Redwood. North coast coniferous forest.Moss growing on damp soil along the coast. In dry streambeds and on stream banks. 30-1025 m.
Gentiana setigera	Mendocino gentian	None	None	G2	S2	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Lower montane coniferous forest | Meadow & seep | Ultramafic | Wetland. Lower montane coniferous forest, meadows and seeps.Meadows, seeps and bogs. Serpentine substrates. 120-1070 m.
Gilia capitata ssp. pacifica	Pacific gilia	None	None	G5T3	S2	1B.2		Chaparral | Coastal bluff scrub | Coastal prairie | Valley & foothill grassland. Coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland.5-1345 m.
Gilia millefoliata	dark-eyed gilia	None	None	G2	S2	1B.2	BLM_S-Sensitive	Coastal dunes. Coastal dunes.1-60 m.
Hesperevax sparsiflora var. brevifolia	short-leaved evax	None	None	G4T3	S2	1B.2	BLM_S-Sensitive	Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal bluff scrub, coastal dunes, coastal prairie.Sandy bluffs and flats. 0-640 m.
Horkelia sericata	Howell's horkelia	None	None	G4	S3	4.3		Chaparral, Lower montane coniferous forest. serpentinite, clay

Hosackia gracilis	harlequin lotus	None	None	G3G4	S3	4.2		Broadleafed upland forest, Coastal bluff scrub, Closed-cone coniferous forest, Cismontane woodland, Coastal prairie, Coastal scrub, Meadows and seeps, Marshes and swamps, North Coast coniferous forest, Valley and foothill grassland. wetlands, roadsides
Iris innominata	Del Norte County iris	None	None	G4G5	S3	4.3		Lower montane coniferous forest (serpentinite).
Iris tenax ssp. klamathensis	Orleans iris	None	None	G4G5T4	S4	4.3		Lower montane coniferous forest (often in disturbed areas).
Iris thompsonii	Thompson?s iris	None	None	G3	S3	4.3		Lower montane coniferous forest, North Coast coniferous forest. Openings, usually mesic, often serpentinite, often edges, sometimes roadsides and streambanks
Kopsiopsis hookeri	small groundcone	None	None	G4?	S1S2	2B.3		North coast coniferous forest. North coast coniferous forest.Open woods, shrubby places, generally on Gaultheria shallon. 120-1435 m.
Lasthenia californica ssp. macrantha	perennial goldfields	None	None	G3T2	S2	1B.2		Coastal bluff scrub | Coastal dunes | Coastal scrub. Coastal bluff scrub, coastal dunes, coastal scrub.5-185 m.
Lathyrus delnorticus	Del Norte pea	None	None	G4	S3	4.3		Lower montane coniferous forest, North Coast coniferous forest. often serpentinite
Lathyrus japonicus	seaside pea	None	None	G5	S2	2B.1		Coastal dunes. Coastal dunes.3-65 m.
Lathyrus palustris	marsh pea	None	None	G5	S2	2B.2		Bog & fen | Coastal prairie | Coastal scrub | Lower montane coniferous forest | Marsh & swamp | North coast coniferous forest | Wetland. Bogs & fens, lower montane coniferous forest, marshes and swamps, north coast coniferous forest, coastal prairie, coastal scrub.Moist coastal areas. 2-140 m.
Lewisia oppositifolia	opposite-leaved lewisia	None	None	G3	S2	2B.2	USFS_S-Sensitive	Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest.In open, rocky, shallow soils; usually on decomposed serpentine. Mesic sites. 515-1220 m.
Lilium bolanderi	Bolander's lily	None	None	G4	S3S4	4.2		Chaparral, Lower montane coniferous forest. serpentinite

Lilium occidentale	western lily	Endangered	Endangered	G1	S1	1B.1	SB_BerrySB-Berry Seed Bank	Bog & fen | Coastal bluff scrub | Coastal prairie | Coastal scrub | Freshwater marsh | Marsh & swamp | North coast coniferous forest | Wetland. Coastal scrub, freshwater marsh, bogs and fens, coastal bluff scrub, coastal prairie, north coast coniferous forest, marshes and swamps.Well-drained, old beach washes overlain with wind-blown alluvium and organic topsoil; usually near margins of Sitka spruce. 3-110 m.
Lilium pardalinum ssp. vollmeri	Vollmer's lily	None	None	G5T4	S3	4.3		Bogs and fens, Meadows and seeps (mesic).
Listera cordata	heart-leaved twayblade	None	None	G5	S4	4.2		Bogs and fens, Lower montane coniferous forest, North Coast coniferous forest.
Lomatium howellii	Howell's lomatium	None	None	G4G5	S4	4.3		Chaparral, Lower montane coniferous forest. serpentinite
Lomatium tracyi	Tracy's lomatium	None	None	G4	S4	4.3		Lower montane coniferous forest, Upper montane coniferous forest. serpentinite
Lycopodium clavatum	running-pine	None	None	G5	S3	4.1		Lower montane coniferous forest (mesic), Marshes and swamps, North Coast coniferous forest (mesic). often edges, openings, and roadsides
Lysimachia europaea	arctic starflower	None	None	G5	S1	2B.2		Bog & fen | Meadow & seep | Wetland. Meadows and seeps, bogs and fens.Coastal boggy areas. 3-15 m.
Mitellastra caulescens	leafy-stemmed mitrewort	None	None	G5	S4	4.2		Broadleaved upland forest | Lower montane coniferous forest | Meadow & seep | North coast coniferous forest. Broadleafed upland forest, lower montane coniferous forest, meadows and seeps, north coast coniferous forest.Mesic sites. 5-1700 m.
Moneses uniflora	woodnymph	None	None	G5	S2	2B.2		Broadleaved upland forest | North coast coniferous forest. Broadleafed upland forest, North Coast coniferous forest.50-260 m.
Monotropa uniflora	ghost-pipe	None	None	G5	S2	2B.2		Broadleaved upland forest | North coast coniferous forest. Broadleafed upland forest, north coast coniferous forest.Often under redwoods or western hemlock. 15-855 m.
Oenothera wolfii	Wolf's evening-primrose	None	None	G2	S1	1B.1	BLM_S-Sensitive | SB_BerrySB-Berry Seed Bank	Coastal bluff scrub | Coastal dunes | Coastal prairie. Coastal bluff scrub, coastal dunes, coastal prairie, lower montane coniferous forest.Sandy substrates; usually mesic sites. 0-125 m.

Oxalis suksdorfii	Suksdorf's wood-sorrel	None	None	G4	S3	4.3		Broadleafed upland forest, North Coast coniferous forest.
Packera bolanderi var. bolanderi	seacoast ragwort	None	None	G4T4	S2S3	2B.2		Coastal scrub | North coast coniferous forest. Coastal scrub, north coast coniferous forest.Sometimes along roadsides. 30-915 m.
Packera macounii	Siskiyou Mountains ragwort	None	None	G5?	S3	4.3		Chaparral, Lower montane coniferous forest. sometimes serpentinite, often in disturbed areas
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	None	None	G5T3T4	S3S4	4.2		Broadleafed upland forest, Chaparral, Coastal prairie, Valley and foothill grassland, Vernal pools. vernally mesic
Phacelia argentea	sand dune phacelia	None	None	G2	S1	1B.1	SB_BerrySB-Berry Seed Bank	Coastal dunes. Coastal dunes.Stabilized and recently moving sand dunes. 3-25 m.
Pinguicula macroceras	horned butterwort	None	None	G4	S2	2B.2		Bog & fen | Ultramafic | Wetland. Bogs and fens.Meadow edges, seepage areas. Serpentine soil. 20-1830 m.
Piperia candida	white-flowered rein orchid	None	None	G3	S3	1B.2	BLM_S-Sensitive	Broadleaved upland forest | Lower montane coniferous forest | North coast coniferous forest | Ultramafic. North Coast coniferous forest, lower montane coniferous forest, broadleafed upland forest.Sometimes on serpentine. Forest duff, mossy banks, rock outcrops, and muskeg. 20-1615 m.
Pityopus californicus	California pinefoot	None	None	G4G5	S4	4.2		Broadleafed upland forest, Lower montane coniferous forest, North Coast coniferous forest, Upper montane coniferous forest. mesic
Pleuropogon refractus	nodding semaphore grass	None	None	G4	S4	4.2		Lower montane coniferous forest, Meadows and seeps, North Coast coniferous forest, Riparian forest. Mesic
Poa piperi	Piper's blue grass	None	None	G4	S3	4.3		Chaparral, Lower montane coniferous forest. serpentinite, rocky
Polemonium carneum	Oregon polemonium	None	None	G3G4	S2	2B.2		Coastal prairie | Coastal scrub | Lower montane coniferous forest. Coastal prairie, coastal scrub, lower montane coniferous forest.15-1525 m.
Potamogeton foliosus ssp. fibrillosus	fibrous pondweed	None	None	G5T2T4	S1S2	2B.3		Marsh & swamp | Wetland. Marshes and swamps.Shallow water, small streams. 5-1300 m.
Prosartes parvifolia	Siskiyou bells	None	None	G2	S1S2	1B.2		Lower montane coniferous forest, Upper montane coniferous forest. Often roadsides, disturbed areas, and burned areas

Pyrrocoma racemosa var. congesta	Del Norte pyrrocoma	None	None	G5T4	S2	2B.3		Chaparral | Lower montane coniferous forest | Ultramafic | Wetland. Chaparral, lower montane coniferous forest.Serpentine soils, from dry roadsides to damp hills; often in forest openings. Apparently equally likely to occur in wetlands or non-wetlands. 240-765 m.
Ramalina thrausta	angel's hair lichen	None	None	G5?	S2S3	2B.1		North coast coniferous forest. North coast coniferous forest.On dead twigs and other lichens. 75-1390 m.
Ribes laxiflorum	trailing black currant	None	None	G5?	S3	4.3		North Coast coniferous forest. sometimes roadside
Romanzoffia tracyi	Tracy's romanzoffia	None	None	G4	S2	2B.3		Coastal bluff scrub | Coastal scrub. Coastal bluff scrub, coastal scrub.Rocky sites. 15-300 m.
Sabulina howellii	Howell's sandwort	None	None	G4	S3	1B.3	BLM_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest, chaparral.Dry open places, often on serpentine hillsides and ridges, near Jeffrey pines. 550-1000 m.
Sagittaria sanfordii	Sanford's arrowhead	None	None	G3	S3	1B.2	BLM_S-Sensitive	Marsh & swamp | Wetland. Marshes and swamps.In standing or slow-moving freshwater ponds, marshes, and ditches. 0-605 m.
Salix delnortensis	Del Norte willow	None	None	G4	S4	4.3		Riparian forest (serpentinite).
Sanguisorba officinalis	great burnet	None	None	G5?	S2	2B.2		Bog & fen | Broadleaved upland forest | Marsh & swamp | Meadow & seep | North coast coniferous forest | Riparian forest | Ultramafic | Wetland. Bogs and fens, meadows and seeps, broadleafed upland forest, marshes and swamps, north coast coniferous forest, riparian forest.Rocky serpentine seepage areas and along stream 5-1400 m.
Sanicula peckiana	Peck's sanicle	None	None	G4	S3	4.3		Chaparral, Lower montane coniferous forest. often serpentinite
Sedum laxum ssp. flavidum	pale yellow stonecrop	None	None	G5T3Q	S3	4.3		Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Upper montane coniferous forest. Serpentinite or volcanic
Sidalcea elegans	Del Norte checkerbloom	None	None	G4?	S2?	3.3		Chaparral, Lower montane coniferous forest. Serpentinite
Sidalcea malachroides	maple-leaved checkerbloom	None	None	G3	S3	4.2		Broadleaved upland forest | Coastal prairie | Coastal scrub | North coast coniferous forest | Riparian forest. Broadleafed upland forest, coastal prairie, coastal scrub, north coast coniferous forest, riparian forest.Woodlands and clearings near coast; often in disturbed areas. 4-765 m.

Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	None	None	G5T2	S2	1B.2	BLM_S-Sensitive	Coastal bluff scrub | Coastal prairie | North coast coniferous forest. Coastal bluff scrub, coastal prairie, north coast coniferous forest.Open coastal forest; roadcuts. 5-1255 m.
Sidalcea oregana ssp. eximia	coast checkerbloom	None	None	G5T1	S1	1B.2	BLM_S-Sensitive	Lower montane coniferous forest | Meadow & seep | North coast coniferous forest | Wetland. Meadows and seeps, north coast coniferous forest, lower montane coniferous forest.Near meadows, in gravelly soil. 5-1805 m.
Silene scouleri ssp. scouleri	Scouler's catchfly	None	None	G5T4T5	S2S3	2B.2		Coastal bluff scrub, Coastal prairie, Valley and foothill grassland.
Silene serpentinicola	serpentine catchfly	None	None	G3	S3	1B.2	USFS_S-Sensitive	Chaparral | Lower montane coniferous forest | Ultramafic. Chaparral, lower montane coniferous forest.Serpentine openings, gravelly or rocky soils. 120-765 m.
Streptanthus howellii	Howell's jewelflower	None	None	G2G3	S2	1B.2	USFS_S-Sensitive	Lower montane coniferous forest | Ultramafic. Lower montane coniferous forest.Dry serpentine slopes, in open pine woods or in brushy areas; on rocky soil. 300-1065 m.
Tauschia glauca	glaucous tauschia	None	None	G4	S4	4.3		Lower montane coniferous forest (gravelly, serpentinite).
Thermopsis gracilis	slender false lupine	None	None	G4	S4	4.3		Chaparral, Cismontane woodland, Lower montane coniferous forest, Meadows and seeps, North Coast coniferous forest. sometimes roadsides
Usnea longissima	Methuselah's beard lichen	None	None	G4	S4	4.2	BLM_S-Sensitive	Broadleaved upland forest | North coast coniferous forest | Oldgrowth | Redwood. North coast coniferous forest, broadleafed upland forest.Grows in the "redwood zone" on tree branches of a variety of trees, including big leaf maple, oaks, ash, Douglas-fir, and bay. 45-1465 m in California.
Vaccinium scoparium	little-leaved huckleberry	None	None	G5	S3	2B.2		Subalpine coniferous forest. Subalpine coniferous forest.Rocky, subalpine woods. Sometimes serpentine. 1035-2200 m.
Vancouveria chrysantha	Siskiyou inside-out-flower	None	None	G4	S3	4.3		Chaparral, Lower montane coniferous forest. serpentinite
Veratrum insolitum	Siskiyou false-hellebore	None	None	G4	S4	4.3		Chaparral, Lower montane coniferous forest. Clay
Viola langsdorffii	Langsdorf's violet	None	None	G4	S1	2B.1		Bog & fen | Wetland. Bogs and fens.Coastal wet areas. 2-10 m.
Viola palustris	alpine marsh violet	None	None	G5	S1S2	2B.2		Bog & fen | Coastal scrub | Wetland. Coastal scrub, bogs and fens.Swampy, shrubby places in coastal scrub or coastal bogs. 0-150 m.

Viola primulifolia ssp. occidentalis	western white bog violet	None	None	G5T2	S2	1B.2	USFS_S-Sensitive	Bog & fen | Marsh & swamp | Ultramafic | Wetland. Bogs and fens, marshes and swamps.Streamside flats and bogs; serpentine soils. 120-855 m.
Habitats								
Coastal and Valley Freshwater Marsh	Coastal and Valley Freshwater Marsh	Marsh	None	None	G3	S2.1		Marsh & swamp | Wetland
Coastal Brackish Marsh	Coastal Brackish Marsh	Marsh	None	None	G2	S2.1		Marsh & swamp | Wetland
Northern Coastal Salt Marsh	Northern Coastal Salt Marsh	Marsh	None	None	G3	S3.2		Marsh & swamp | Wetland

Appendix C – National Wetlands Inventory Results

U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetlands

August 7, 2020

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

Appendix D - Reconnaissance Site Visit Photographs

Some common vegetation observed along the creek banks. Pictured above: western sword fern (*Polystichum munitum*), and slender footed sedge (*Carex leptopoda*).

Creek bank conditions along Rowdy Creek.

View of Rowdy Creek from Highway 101 bridge, looking upstream (away from the Project).

Concrete weir infrastructure on Rowdy Creek, facing downstream.

Rowdy and Dominie Creek Fish Passage Improvement Project
Site Photographs – June 12, 2020

Rowdy Creek instream habitat conditions immediately downstream of the concrete weir.

Eastern bank conditions downstream of concrete weir on Rowdy Creek, and confluence with Dominie Creek which enters Rowdy Creek on left. Note the numerous drops from concrete infrastructure present at mouth of Dominie Creek, and downstream of concrete weir.

Rowdy and Dominie Creek Fish Passage Improvement Project
Site Photographs – June 12, 2020

Eastern staging area conditions,

Appendix E - On-site Species List

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Abies grandis	Grand fir	native	Tree	Pinaceae	FACU
Acer macrophyllum	Bigleaf maple	native	Tree	Sapindaceae	FACU
Alnus rubra	Red alder	native	Tree	Betulaceae	FAC
Eucalyptus globulus	Blue gum	invasive non-native	Tree	Myrtaceae	UPL
Frangula purshiana	Cascara sagrada	native	Tree	Rhamnaceae	FAC
Picea sitchensis	Sitka spruce	native	Tree	Pinaceae	FAC
Prunus sp.	Cultivated stone-fruit trees	non-native	Tree	Rosaceae	UPL
Salix lasiandra	Pacific willow	native	Tree	Salicaceae	FACW
Sequoia sempervirens	Coast redwood	native	Tree	Cupressaceae	UPL
Thuja plicata	Western red cedar	native	Tree	Cupressaceae	FAC
Baccharis pilularis	Coyote brush	native	Shrub	Asteraceae	UPL
Cotoneaster lacteus	Milkflower cotoneaster	invasive non-native	Shrub	Rosaceae	UPL
Cotoneaster pannosus	Woolly cotoneaster	invasive non-native	Shrub	Rosaceae	UPL
Cytisus scoparius	Scotch broom	invasive non-native	Shrub	Fabaceae	UPL
Hedera helix	English ivy	invasive non-native	Shrub	Araliaceae	FACU
Lonicera involucrata	Coast twinberry	native	Shrub	Caprifoliaceae	FAC
Oemleria cerasiformis	Oso berry	native	Shrub	Rosaceae	FACU
Physocarpus capitatus	Ninebark	native	Shrub	Rosaceae	FACW
Prunus laurocerasus	Cherry laurel	non-native	Shrub	Rosaceae	UPL
Rubus armeniacus	Himalayan blackberry	invasive non-native	Shrub	Rosaceae	FAC
Rubus parviflorus	Thimbleberry	native	Shrub	Rosaceae	FACU
Rubus spectabilis	Salmon berry	native	Shrub	Rosaceae	FAC
Rubus ursinus	California blackberry	native	Shrub	Rosaceae	FACU
Salix hookeriana	Coastal willow	native	Shrub	Salicaceae	FACW
Salix sitchensis	Coulter willow	native	Shrub	Salicaceae	FACW
Sambucus racemosa	Red elderberry	native	Shrub	Adoxaceae	FACU
Achillea millefolium	Yarrow	native	Herbaceous	Asteraceae	FACU
Acmispon parviflorus	Hill lotus	native	Herbaceous	Fabaceae	UPL
Agrostis capillaris	Colonial bentgrass	non-native	Herbaceous	Poaceae	FAC
Aira caryophyllea	Silvery hairgrass	non-native	Herbaceous	Poaceae	FACU
Anthoxanthum odoratum	Sweet vernal grass	invasive non-native	Herbaceous	Poaceae	FACU
Athyrium filix-femina	common ladyfern	native	Herbaceous	Woodsiaceae	UPL
Avena barbata	Slim oat	invasive non-native	Herbaceous	Poaceae	UPL
Bellis perennis	English lawn daisy	non-native	Herbaceous	Asteraceae	UPL
Briza maxima	Rattlesnake grass	invasive non-native	Herbaceous	Poaceae	UPL
Briza minor	Little rattlesnake grass	non-native	Herbaceous	Poaceae	FAC
Bromus diandrus	Ripgut brome	invasive non-native	Herbaceous	Poaceae	UPL
Bromus hordeaceus	Soft chess	invasive non-native	Herbaceous	Poaceae	FACU
Bromus sitchensis	Sitka brome	native	Herbaceous	Poaceae	UPL
Bromus vulgaris	Common brome	native	Herbaceous	Poaceae	FACU
Calamagrostis nutkaensis	Reedgrass	native	Herbaceous	Poaceae	FACW
Carex leptopoda	Slender-footed sedge	native	Herbaceous	Cyperaceae	FAC
Carex obnupta	Slough sedge	native	Herbaceous	Cyperaceae	OBL
Centaurea jacea	Brownray knapweed	non-native	Herbaceous	Asteraceae	FACU
Cerastium glomeratum	Large mouse ears	non-native	Herbaceous	Caryophyllaceae	FACU
Cortaderia jubata	Andean pampas grass	invasive non-native	Herbaceous	Poaceae	FACU
Crocosmia ×crocosmiiflora	Monbretia	invasive non-native	Herbaceous	Iridaceae	UPL
Cynosurus echinatus	Dogtail grass	invasive non-native	Herbaceous	Poaceae	UPL
Dactylis glomerata	Orchardgrass	invasive non-native	Herbaceous	Poaceae	FACU
Daucus carota	Carrot	non-native	Herbaceous	Apiaceae	FACU
Digitalis purpurea	Foxglove	invasive non-native	Herbaceous	Plantaginaceae	FACU
Dipsacus fullonum	Wild teasel	invasive non-native	Herbaceous	Dipsacaceae	FAC
Elymus glaucus	Blue wildrye	native	Herbaceous	Poaceae	FACU
Epilobium ciliatum	Slender willow herb	native	Herbaceous	Onagraceae	FACW
Equisetum telmateia ssp. braunii	Giant horsetail	native	Herbaceous	Equisetaceae	UPL
Erodium cicutarium	Coastal heron's bill	invasive non-native	Herbaceous	Geraniaceae	UPL
Erythranthe dentata	Tooth leaved monkeyflower	native	Herbaceous	Phrymaceae	UPL
Eschscholzia californica	California poppy	native	Herbaceous	Papaveraceae	UPL
Euphorbia peplus	Petty spurge	non-native	Herbaceous	Euphorbiaceae	UPL
Festuca bromoides	Brome fescue	non-native	Herbaceous	Poaceae	UPL
Festuca perennis	Italian rye grass	invasive non-native	Herbaceous	Poaceae	UPL
Festuca rubra	Red fescue	native	Herbaceous	Poaceae	FAC

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Fragaria chiloensis	Beach strawberry	native	Herbaceous	Rosaceae	FACU
Galium aparine	Cleavers	native	Herbaceous	Rubiaceae	FACU
Geranium dissectum	Wild geranium	invasive non-native	Herbaceous	Geraniaceae	UPL
Geranium robertianum	Robert's geranium	non-native	Herbaceous	Geraniaceae	FACU
Glyceria elata	Tall mannagrass	native	Herbaceous	Poaceae	FACW
Holcus lanatus	Common velvetgrass	invasive non-native	Herbaceous	Poaceae	FAC
Hypericum perforatum	Klamathweed	invasive non-native	Herbaceous	Ericaceae	FACU
Hypochaeris radicata	Hairy cats ear	invasive non-native	Herbaceous	Asteraceae	FACU
Juncus articulatus	Jointed rush	native	Herbaceous	Juncaceae	OBL
Juncus bufonius	Common toad rush	native	Herbaceous	Juncaceae	FACW
Lapsana communis	Common nipplewort	non-native	Herbaceous	Asteraceae	FACU
Lepidium didymum	Lesser swine cress	non-native	Herbaceous	Brassicaceae	UPL
Lepidium nitidum	Shining pepper grass	native	Herbaceous	Brassicaceae	FAC
Leucanthemum vulgare	Oxe eye daisy	invasive non-native	Herbaceous	Asteraceae	FACU
Linum bienne	Flax	non-native	Herbaceous	Linaceae	UPL
Lotus corniculatus	Bird's foot trefoil	non-native	Herbaceous	Fabaceae	FAC
Lupinus sp.	Lupine	native	Herbaceous	Fabaceae	UPL
Luzula parviflora	Small flowered wood rush	native	Herbaceous	Juncaceae	FAC
Lysichiton americanus	Yellow skunk cabbage	native	Herbaceous	Araceae	OBL
Lysimachia arvensis	Scarlet pimpernel	non-native	Herbaceous	Myrsinaceae	FAC
Lythrum hyssopifolia	Hyssop loosestrife	invasive non-native	Herbaceous	Lythraceae	UPL
Matricaria discoidea	Pineapple weed	native	Herbaceous	Asteraceae	FACU
Medicago lupulina	Black medick	non-native	Herbaceous	Fabaceae	FACU
Medicago polymorpha	California burclover	invasive non-native	Herbaceous	Fabaceae	FACU
Melilotus sp.	sweet clover	non-native	Herbaceous	Fabaceae	UPL
Mentha pulegium	Pennyroyal	invasive non-native	Herbaceous	Lamiaceae	OBL
Modiola caroliniana	Carolina bristle mallow	non-native	Herbaceous	Malvaceae	FACU
Oenanthe sarmentosa	Water parsley	native	Herbaceous	Apiaceae	OBL
Oxalis articulata ssp. rubra	Windowbox woodsorrel	non-native	Herbaceous	Oxalidaceae	UPL
Oxalis oregana	Redwood sorrel	native	Herbaceous	Oxalidaceae	FACU
Parentucellia viscosa	Yellow parentucellia	invasive non-native	Herbaceous	Orobanchaceae	FAC
Persicaria maculosa	Spotted ladysthumb	non-native	Herbaceous	Polygonaceae	FACW
Petasites frigidus var. palmatus	Western coltsfoot	native	Herbaceous	Asteraceae	UPL
Phacelia bolanderi	Bolander's phacelia	native	Herbaceous	Boraginaceae	UPL
Plantago coronopus	Cut leaf plantain	non-native	Herbaceous	Plantaginaceae	FAC
Plantago lanceolata	Ribwort	invasive non-native	Herbaceous	Plantaginaceae	FACU
Plantago major	Common plantain	non-native	Herbaceous	Plantaginaceae	FAC
Poa pratensis	Kentucky blue grass	invasive non-native	Herbaceous	Poaceae	FAC
Polycarpon tetraphyllum	Four leaved allseed	non-native	Herbaceous	Caryophyllaceae	UPL
Polygonum aviculare	Prostrate knotweed	non-native	Herbaceous	Polygonaceae	FAC
Polystichum munitum	Western sword fern	native	Herbaceous	Dryopteridaceae	FACU
Prunella vulgaris	Self heal	native	Herbaceous	Lamiaceae	FACU
Pseudognaphalium luteoalbum	Jersey cudweed	non-native	Herbaceous	Asteraceae	FACW
Ranunculus repens	Crowfoot, creeping buttercup	invasive non-native	Herbaceous	Ranunculaceae	FAC
Raphanus sativus	Jointed charlock	invasive non-native	Herbaceous	Brassicaceae	UPL
Rorippa curvisiliqua	Curvepod yellow cress	native	Herbaceous	Brassicaceae	OBL
Rumex acetosella	Sheep sorrel	invasive non-native	Herbaceous	Polygonaceae	FACU
Rumex crispus	Curly dock	invasive non-native	Herbaceous	Polygonaceae	FAC
Sagina procumbens	Arctic pearlwort	native	Herbaceous	Caryophyllaceae	FAC
Scirpus microcarpus	Mountain bog bulrush	native	Herbaceous	Cyperaceae	OBL
Scrophularia californica	California bee plant	native	Herbaceous	Scrophulariaceae	FAC
Sherardia arvensis	Field madder	non-native	Herbaceous	Rubiaceae	UPL
Silene gallica	Common catchfly	non-native	Herbaceous	Caryophyllaceae	UPL
Soliva sessilis	South american soliva	non-native	Herbaceous	Asteraceae	FAC
Sonchus asper	Spiny sowthistle	non-native	Herbaceous	Asteraceae	FACU
Spergularia rubra	Purple sand spurry	non-native	Herbaceous	Caryophyllaceae	FAC
Stachys ajugoides	Hedge nettle	native	Herbaceous	Lamiaceae	OBL
Stachys arvensis	Field hedge nettle	non-native	Herbaceous	Lamiaceae	UPL
Symphyotrichum chilense	Pacific aster	native	Herbaceous	Asteraceae	FAC
Taraxacum officinale	Red seeded dandelion	non-native	Herbaceous	Asteraceae	FACU
Tellima grandiflora	Fringe cups	native	Herbaceous	Saxifragaceae	FACU
Tolmiea diplomenziesii	pig-a-back plant	native	Herbaceous	Saxifragaceae	FAC

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Trifolium dubium	Shamrock	non-native	Herbaceous	Fabaceae	FACU
Trifolium pratense	Red clover	non-native	Herbaceous	Fabaceae	FACU
Trifolium repens	White clover	non-native	Herbaceous	Fabaceae	FAC
Triphysaria pusilla	Little owl's clover	native	Herbaceous	Orobanchaceae	UPL
Urtica dioica	Stinging nettle	native	Herbaceous	Urticaceae	FAC
Veronica americana	American brooklime	native	Herbaceous	Plantaginaceae	OBL
Veronica serpyllifolia	Thymeleaf speedwell	native	Herbaceous	Plantaginaceae	FAC
Vicia hirsuta	Hairy vetch	non-native	Herbaceous	Fabaceae	UPL
Vicia sativa	Spring vetch	non-native	Herbaceous	Fabaceae	UPL
Vicia tetrasperma	Four seeded vetch	non-native	Herbaceous	Fabaceae	UPL
Vinca major	Vinca	invasive non-native	Herbaceous	Apocynaceae	UPL

Appendix F Aquatic Resources Delineation Report

Aquatic Resources Delineation Report

Rowdy and Dominie Creek Fish Passage Improvement Project

Prepared for the Tolowa Dee-ni' Nation

GHD | 718 Third Street, Eureka, California, 95501 USA

11209093 | 3.1 | Report No 1 | April 21, 2021

Table of Contents

1. Introduction....1
   - 1.1 Site History....1
   - 1.2 Regulatory Background....2
     - 1.2.1 Federal....6
     - 1.2.2 State....8
     - 1.2.3 California Coastal Commission....9
   - 1.3 Summary....10
2. Methodology....10
   - 2.1 Aquatic resources delineation approach....10
   - 2.2 Botanical methodology....11
   - 2.3 Soils methodology....11
     - 2.3.1 Existing Soils Information....11
   - 2.4 Hydrology methodology....13
3. Results....13
4. Special Terms and Conditions....14
   - 4.1 Purpose of this Report....14
   - 4.1 Scope and Limitations....14
5. References....14

Attachments

Appendix A – Figures

Appendix B – Data Sheets

Appendix C – On-site Plant List

Appendix D – Site Photographs

Appendix E – Record of Climatological Observations and WETS Table

1. Introduction

On behalf of the Tolowa Dee-ni' Nation (TDN), GHD prepared this aquatic resources delineation report (also known as a wetland delineation report), and accompanying appendices, in support of the proposed Rowdy and Dominie Creek Fish Passage Improvement Project (Project) in Smith River, Del Norte County, CA (Figure 1). This report supports the Project's environmental documentation, permitting, and construction planning as deemed appropriate. The proposed Project Study Boundary (PSB) totals approximately 2.7 acres and includes the area around access routes, potential staging areas, and the demolition and construction areas of Rowdy Creek Fish Hatchery (Hatchery) infrastructure located in Rowdy and Dominie Creeks (Figure 2). This report is subject to, and must be read in conjunction with, the limitations set out in Section 4, Special Terms and Conditions, and the assumptions and qualifications contained throughout the report.

1.1 Site History

The Project is located within the stream channel and along the banks of portions of Rowdy and Dominie Creeks (see Figure 2). In-stream work would occur at the Rowdy and Dominie Creek confluence, and approximately 385 feet upstream and 285 feet downstream of the confluence in Rowdy Creek, and in an isolated area in upper Dominie Creek located 475 feet upstream of the confluence. The Project includes the removal and, in some instances, the replacement of Hatchery infrastructure in these areas. No modifications are proposed to the existing Hatchery structures (buildings, equipment), located outside of the PSB, or operation of the Hatchery.

In 1968 the Hatchery was formed by the 15-member Kiwanis Club of Smith River, to increase and perpetuate the native runs of Steelhead (*Oncorhynchus mykiss*) and Chinook Salmon (*Oncorhynchus tshawytscha)* in the Smith River. The instream portion of the Hatchery consists of a variety of infrastructure including: concrete retaining walls, concrete aprons, a concrete diversion weir with a "picket fence" and supporting equipment, concrete fish trap, diversion piping, stilling well, and fish ladder, and within Dominie Creek there is a sluice gate and shallow fish ladder (step pools). This infrastructure was installed shortly after the Hatchery was formed, and components of it have been replaced over the years. This existing infrastructure is dated and inappropriate by today's standards, due to the migrational barrier it creates for anadromous species such as Coho Salmon (*Oncorhynchus kisutch*), Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii)*, Steelhead, and Chinook Salmon (collectively termed "salmonids") and Pacific Lamprey (*Entosphenus tridentatus*). It is a complete barrier for juvenile salmonids, and a mostly complete barrier for adult salmonids. Only at the highest flows can adult salmonids pass over the picket fence diversion weir. Due to the concrete apron, deep pool immediately downstream of the apron, diversion weir, and downstream flow direction of Rowdy Creek, approximately 11.5 miles of habitat on Rowdy Creek (Garwood and Larson 2014) and 1.6 miles of habitat on Dominie Creek (Land 2005) are inaccessible to these species.

The land based portion of the Hatchery is located immediately west of Rowdy Creek, and consists of an office, parking lot, Hatchery Access Road bridge (over Dominie Creek), various piping and water storage/conveyances, fish raceways, photovoltaic panel arrays, back-up generator, and amenities. These structures and equipment would not be modified by the Project.

TDN contains two water rights at the property. One of the water rights allows the diversion of up to 2.2 cubic feet per second (cfs) from Dominie Creek, and the other allows for the diversion of up to 6 cfs from Rowdy Creek. The diversion infrastructure (sluice gate) on Dominie Creek (located at the

Hatchery Access Road bridge) would be removed under the Project, and therefore the 2.2 cfs of water from Dominie Creek would remain within the stream channel. TDN does not intend to give up this water right on Dominie Creek, rather would not utilize it. Upgrades are proposed at the diversion intake on Rowdy Creek to meet NOAA/CDFW guidelines. There are no changes proposed to the water diversion rate on Rowdy Creek.

1.2 Project Description

The goal of the Project is to improve fish passage conditions for all age classes of salmonids on Rowdy Creek at the Hatchery and to improve fish passage conditions on Dominie Creek at the Rowdy Creek confluence and beneath the Hatchery Access Road bridge, while maintaining Hatchery operations. The Project objectives include the following:

- Improve volitional fish passage on Rowdy Creek, when the Hatchery is not collecting fish, over the range of fish passage design flows while meeting regulatory criteria.
- Improve the Hatchery fish trapping facility on Rowdy Creek to minimize delay and handling of fish not to be collected by the Hatchery.
- Construct a new Hatchery water diversion structure on Rowdy Creek that meets regulatory criteria, and allows the maximum water right diversion of 6 cfs
- Improve Dominie Creek at the Rowdy Creek confluence to provide volitional fish passage over the range of fish passage design flows while meeting regulatory criteria.
- Remove the existing Hatchery infrastructure on Dominie Creek below the Hatchery Access Road Bridge to improve fish passage conditions while protecting the bridge structure.

The three major components of this Project are: demolition and removal, infrastructure replacement, and instream enhancement, which can collectively be considered “construction.” Not all Hatchery facility/concrete components proposed for demolition would be replaced, rather instream and bank infrastructure would be removed from Rowdy and Dominie Creeks at their confluence and from Dominie Creek below Hatchery Access Road, and replacement infrastructure would be installed in and along the banks of Rowdy Creek. The three components of the Project are further discussed below.

1.2.1 Demolition and Removal

A major component of this Project includes demolition and removal of instream infrastructure to accommodate the proposed improvements. The following infrastructure at the Rowdy and Dominie Creek confluence is planned for removal:

- Concrete apron in Dominie Creek at the confluence;
- Concrete wedge located between lower Dominie and Rowdy Creeks at the confluence;
- Access walkway, pipe crossing and pier above Dominie Creek at the confluence;
- Rowdy Creek diversion weir (comprised of the concrete apron and picket fence that spans Rowdy Creek);
- Concrete stairs along Rowdy Creek river right bank;
- Fish trap along Rowdy Creek river right bank, including box channel, concrete wall and steel baffles;
- Concrete rubble/riprap embankment along Rowdy Creek river right bank; and

- Diversion housing along Rowdy Creek river right bank, including stilling well and the gangway.

Along upper Dominie Creek, the following infrastructure located beneath or around the Hatchery Access Road bridge would be demolished and removed:

- Fish ladder weirs (3), flashboards, counterforts;
- Sluice gate and support structure;
- Sluice channel concrete slab (subsurface); and
- Fish ladder center wall.

The infrastructure to be removed are large concrete structures, i.e. the concrete apron on Rowdy Creek ranges from 60 to 68 feet wide and 30 feet long, and appears to be approximately 2 to 4 feet thick. After field inspection, it appears evident that most of the infrastructure proposed to be demolished were “add on” items. As an example, the fish ladder and sluice gate on Dominie Creek beneath the Hatchery Access Road bridge appear to have been constructed much later than the bridge itself, based on the visual appearance of concrete weathering and joints. This would indicate that the bridge would have been constructed to be stable under conditions that did not rely on the fish ladder or sluice gate components themselves, and that their removal would have minimal impact.

The Project’s final design incorporates protections to existing elements constructed at locations where existing features are to be removed such as existing concrete walls, buried footings, soil nails, and shotcrete facing, to provide the same level of structural protection, or better, than the previous features.

1.2.1. Replacement Infrastructure

This component of the Project includes the construction and installation of the replacement infrastructure and equipment. The purpose of the infrastructure improvements is to maintain functionality of the Hatchery, allow for fish passage and to divert flow for Hatchery operational use that meets NOAA guidelines. Proposed infrastructure which consists of the following:

- **Access Walkway over Lower Dominie Creek:** A new access walkway would be located over lower Dominie Creek, near the confluence to provide continued access across the channel for Hatchery management and operational purposes. This walkway would consist of metal grating, and handrails on both side. A new 8 inch diameter PVC water line would be installed along the outer base of the walkway, to replace the existing water line. During construction, either the water line would be temporarily disconnected, or a temporary PVC water line would be installed. A concrete retaining wall with soil anchors would be installed at the western terminus of the walkway located along Dominie Creek (river right) to reduce future erosion potential. The existing fish ladder and retaining wall, both located on lower Dominie Creek (river left, and river right, respectively) would remain in its current location and be protected. The fish ladder is intended to provide upstream access for fish, however it is not used because of the labor it requires, limited Hatchery staff, and the increase in fish handling. The fish ladder would not be used following Project construction.
- **Diversion Weir (Concrete Slab Foundation with Picket Fence):** A new diversion weir would be installed in the same approximate footprint as the existing diversion weir. The proposed diversion weir would have a picket fence, which would be set a skew to the flow to help direct fish towards the fish trap and would span across the entire channel. The

proposed picket fence would have multiple sections and therefore the operator may only need to raise the section closest to the trap while leaving the remaining sections down. The picket fence would be actuated with automated compressed air to raise or lower during fish trapping periods. The picket fence would remain lowered during all non-trapping periods. It is anticipated that the pickets would be approximately 9.25 feet long. The picket fence would be supported on a thickened concrete slab foundation 10 feet wide, continuous across Rowdy creek. A concrete cutoff wall below the foundation would extend to bedrock to minimize undermining of the slab.

A proposed passive integrated transponder (PIT) antenna array would be installed in conjunction with the picket fence, and would be able to detect fish that pass over or through it that are tagged with a PIT tag. Each PIT tag contains a unique identification number. Data sourced from PIT antennas contributes to the ongoing study of regional fish distribution. The proposed concrete foundation would be at the same elevation as the new roughened channel pool, and thus a residual depth of 3 feet water would remain at lower flows. Engineered streambed material (ESM) would be installed in conjunction with the concrete foundation and retaining wall, in order to raise the channel bed elevation and avoid channel disconnection. Another concrete retaining wall would be installed at the eastern terminus of the picket fence, along the Rowdy Creek bank opposite to the Hatchery (river left).

- **Access Stairway and Fish Trap:** A new concrete stairway would be located in approximately the same footprint as the former concrete stairway, located along Rowdy Creek (river right) near the proposed picket fence. The stairway would allow access to the proposed fish trap. The new fish trap would be constructed adjacent to (north of) the proposed stairway. The fish trap would be concrete and would contain interconnected chambers including a holding pool, fish crowder, flume and gate, and return channel. At the downstream end of the fish trap is the trap entrance, and at the upstream end of the fish trap is both a gate and flume for returning fish not to be collected to the return channel opening, which allows fish access to upper Rowdy Creek. Both the gate and flume connect to the return channel. The flume would need to be wetted during release, which would be accomplished by installing a small submersible pump and nozzle system that pulls water from the energy dissipation chamber. To accommodate the submersible pump, an exterior electrical outlet has been designed on the top of the wall near the energy dissipation chamber. Once the operator places the fish in the flume, the fish would slide down the flume and enter the return channel. The flume is approximately 8 feet long. The flume's cross sectional geometry has been sized to meet minimum NOAA criteria, which is 15 inches wide and 24 inches high, and would be smooth to minimize fish injury potential.

  The return channel would be open when the Hatchery is not trapping fish, or when fish need to be released. Metal grates would be located on the top of the fish trap. The fish trap would contain an OSHA-compliant fixed access ladder, which would be mounted to concrete. A concrete landing with handrail would be located at the edge of the fish ladder, allowing access to view the fish trap from above. A drainage pipe would be installed below the crushed gravel to collect and transport stormwater around the proposed infrastructure. A roughened channel including large rocks are proposed to be placed in Rowdy Creek to protect the proposed fish trap and diversion infrastructure from scouring.

- **Diversion Infrastructure:** New diversion infrastructure and housing would be installed along Rowdy Creek (river right), upstream of the proposed fish trap. The diversion infrastructure and housing would replace the existing stilling well and pumps. Proposed

diversion infrastructure would consist of two 15 horsepower submersible pumps and housing for a third, pumps, fish screens, valves, pressure reducers, piping, a hydraulic brush screen cleaner, and metal grates on top. Each pump will have the capacity to pump approximately 2 cfs, for a total of 4 cfs, which is the approximate maximum the existing Hatchery piping system can accommodate. If the full water right of 6 cfs is desired at a later date, an additional pump can be added. The proposed fish screen design meets NOAA Fisheries criteria. The roughened channel including large rocks would be placed in Rowdy Creek to protect the diversion infrastructure from scouring, and ESM placed in the Rowdy Creek channel near the large rocks. A concrete wingwall would be installed upstream of the diversion for protection and bank stabilization. A cantilevered walkway is proposed along the top of the diversion structure. A handrail is proposed along the edge of the walkway, diversion housing, fish trap and access stairway.

- **Dominie Bridge Structural Supports:** Within Dominie Creek, located upstream from the confluence at the Hatchery Access Road bridge, several pieces of existing instream infrastructure are slated for demolition to improve the channel hydraulics. These concrete elements do not appear to have been specifically constructed with the intent of strengthening or supporting the existing bridge abutments, but removal of the existing concrete apron could allow for destabilization of the abutments and/or future undermining. In order to mitigate against these possibilities, a new concrete facing wall would be anchored into the existing abutment concrete, which would extend from the bridge soffit to the bedrock in the channel. Additionally, steel struts would be added on each concrete beam underneath the bridge. This system would work to prevent movement of the abutments while also guarding against scour at their base. Designed improvements to the bridge abutments would ensure that the finished Project leaves the bridge in equal or better structural condition.
- **Electrical Control Building:** Several of the proposed components would require electrical connections and an area to house operating equipment such as controllers, motors, and compressors. The current facility does not have adequate space to accommodate these features, therefore, a new electrical control building is proposed as part of the Project. The proposed electrical control building would be constructed northeast of the proposed access walkway. The approximate 6 foot by 12 foot prefabricated electrical control building would house all of the new pumping, picket fence, fish screen brush and all miscellaneous electrical components such as the existing water diversion (which would be improved under this Project and is described above). The electrical control building would have a concrete slab foundation, approximately 8 inches thick. Power for the building would come from the service panel located within the existing trough building.

This infrastructure would allow for fish passage on lower and upper Dominie Creek, and on Rowdy Creek when the picket fence is not in use. This upgrade would result in an increase in the use of habitat in upper Rowdy and Dominie Creeks and thus the lower Smith River, an area that is lacking a variety of highly ecologically productive tributaries.

1.2.3. Instream Enhancements

In addition to demolition and infrastructure replacement, the Project proposes to enhance the channel beds within segments of Dominie Creek and Rowdy Creek for improved geomorphic function and to support volitional movement of fish and other aquatic life. An approximately 400-foot long roughened channel would be installed throughout Rowdy Creek and in the lower section of Dominie Creek. The purpose of the roughened channel is to overcome the existing vertical drop caused by the existing

Rowdy Creek diversion weir while maintaining the existing grade upstream within Rowdy and Dominie Creek. The roughened channel would consist of engineered streambed material (ESM) ranging from gravel to six foot diameter rock and is necessary to lower and increase the channel bed elevation in certain areas to support volitional fish movement.

The roughened channel is comprised of five rock chutes and five pools. The chutes and pools that comprise the "lower reach" (pools 1 through 4 and chutes 1 through 3) are channel spanning. The proposed Rowdy Creek diversion weir would be located in pool 4. The "upper reach" (pool 5 and chutes 4 and 5) have two flow paths separated by a long boulder structure referred to as the "channel spine." The channel spine mimics and provides a continuation of the existing gravel bar downstream of the Highway 101 bridge pier. The existing gravel bar would be integrated into the roughened "channel spine" grading.

Much of the lower reach is perched, meaning that the new channel bed elevation is greater than the existing bed elevation. Constructing a channel under these conditions can be challenging because there is a high potential for flow to go subsurface. During construction, it will be critical that the channel is correctly sealed through adequate compaction and jetting methods prior to completion.

Rock bands define the upper and lower portion of a chute, provide the structure of the roughened channel and maintain the chute's grade. They are constructed using the largest of the ESM mixture. The rock bands and chutes are used to raise the channel bed elevation in specific areas to create a gradient of contiguous flow, as opposed to areas of disconnected pools which are more noticeable during low flow conditions and can lead to fish stranding. For example, currently the weir on Rowdy Creek is perched approximately three feet above the tailwater pool. The proposed chutes would raise the channel bed elevation to offset the drop between the weir and pool, to allow fish volitional fish passage when the picket fence is not in operation.

In the lower extent of the Project Area, rock would be placed to prevent erosion along the western toe slope bank of Rowdy Creek (river right). In the upper extent of the Project Area along Dominie Creek, large boulders would be placed in the channel, similar to the boulders placed at the confluence, to help control the degree to which the channel adjusts following the removal of infrastructure from beneath the bridge. The boulders will create roughness, which will decrease the water velocity and likely cause bed material to settle, which would cause the bed to degrade less than if left on its own.

California native plant species would be planted along the banks; shrub and tree species to be planted include: Pacific willow, red alder, cottonwood, twin berry, and salmon berry. Grass seed to be sown would include seed from the following species: California brome, blue wild rye, red fescue, and meadow barley. Fast growing regreen hybrid wheatgrass would also be part of the seed mix and would be used to provide quick vegetative cover while other grass species developed.

1.3 Regulatory Background

1.3.1 Federal

Waters of the United States

The Code of Federal Regulations (CFR), 40 CFR § 120.2 states, "Waters of the United States means:

1. **Jurisdictional waters.** For purposes of the Clean Water Act, 33 U.S.C. 1251 et seq. and its implementing regulations, subject to the exclusion in paragraph (2) of this section, the term "waters of the United States" means:

i) The territorial seas, and waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide;

ii) Tributaries;

iii) Lakes and ponds, and impoundments of jurisdictional waters; and

iv) Adjacent wetlands.

2. **Non-jurisdictional waters.** The following are not "waters of the United States":

i) Waters or water features that are not identified in paragraph (1)(i, ii, iii, iv) of this definition;

ii) Groundwater, including groundwater drained through subsurface drainage systems;

iii) Ephemeral features, including ephemeral streams, swales, gullies, rills and pools;

iv) Diffuse stormwater run-off and directional sheet flow over upland;

v) Ditches that are not waters identified in paragraph (1)(i or ii), and those portions of ditches that occur adjacent to wetlands that do not satisfy the conditions of paragraph (3)(i) of this definition;

vi) Prior converted cropland;

vii) Artificially irrigated areas, including fields flooded for agriculture production, that would revert to upland should application of irrigation water to that area cease;

viii) Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters, so long as those artificial lakes and ponds are not impoundments of jurisdictional water that meet the conditions of paragraphs (3) (vi) of this definition;

ix) Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdicional waters for the purpose of obtaining fill, sand, or gravel;

x) Stormwater control features constructed or excavated in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off;

xi) Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention, and infiltration basins and ponds, constructed or excavated in upland or in non-jurisdictional waters; and

xii) Waste treatment systems.

3. **Definitions.** Below is an excerpt of some definitions from 40 CFR § 120.2 related to this Project.

i) *Ordinary High Water Mark*. The term ordinary high water mark means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.

ii) *Upland.* The term upland means any land area that under normal cicrumstances does not satisfy all three wetland factors (i.e. hydrology, hydrophytic vegetation, hydric soils) identified

in the wetlands definition, and does not lie below the ordinary high water mark or the high tide line of a jurisdictional water.

iii) *Wetlands.* The term wetlands means areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetlands Delineation Manual

In addition, the 1987 Corps of Engineers- Wetlands Delineation Manual states, "If hydrophytic vegetation is being maintained only because of (hu)man-induced wetland hydrology that would no longer exist if the activity (e.g., irrigation) were to be terminated, the area should not be considered a wetland," (USACE 1987).

1.3.2 State

The State Water Resources Control Board's (SWRCB) April 2019 *Procedures for Discharges of Dredged or Fill Material to Waters of the State* says, "An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation,

The Water Code defines "waters of the state" broadly to include "any surface water or groundwater, including saline waters, within the boundaries of the state." "Waters of the state" includes all "waters of the U.S." The following wetlands are waters of the state:

1. Natural wetlands,
2. Wetlands created by modification of a surface water of the state, and
3. Artificial wetlands that meet any of the following criteria:

    a. Approved by an agency as compensatory mitigation for impacts to other waters of the state, except where the approving agency explicitly identifies the mitigation as being of limited duration;

    b. Specifically identified in a water quality control plan as a wetland or other water of the state;

    c. Resulted from historic human activity, is not subject to ongoing operation and maintenance, and has become a relatively permanent part of the natural landscape; or

    d. Greater than or equal to one acre in size, unless the artificial wetland was constructed, and is currently used and maintained, primarily for one or more of the following purposes (i.e., the following artificial wetlands are not waters of the state unless they also satisfy the criteria set forth in 2, 3a, or 3b):

        i. Industrial or municipal wastewater treatment or disposal,

        ii. Settling of sediment,

        iii. Detention, retention, infiltration, or treatment of stormwater runoff and other pollutants or runoff subject to regulation under a municipal, construction, or industrial stormwater permitting program,

        iv. Treatment of surface waters,

v. Agricultural crop irrigation or stock watering,

vi. Fire suppression,

vii. Industrial processing or cooling,

viii. Active surface mining – even if the site is managed for interim wetlands functions and values,

ix. Log storage,

x. Treatment, storage, or distribution of recycled water, or

xi. Maximizing groundwater recharge (this does not include wetlands that have incidental groundwater recharge benefits); or

xii. Fields flooded for rice growing.

All artificial wetlands that are less than an acre in size and do not satisfy the criteria set forth in 2, 3.a, 3.b, or 3.c are not waters of the state. If an aquatic feature meets the wetland definition, the burden is on the applicant to demonstrate that the wetland is not a water of the state" (SWRCB 2019).

The April 2020 *Implementation Guidance for the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State* further clarifies, "Human activity can cause changes to the surrounding landscape (e.g., grading activities, road construction, direct hydromodification) such that wetlands form where wetlands did not previously exist. Where such artificial wetlands are now a relatively permanent part of the natural landscape, and are not subject to ongoing operation and maintenance, they are waters of the state. By requiring that the wetlands are relatively permanent, the framework excludes wetlands that are temporary or transitory. That they are part of the natural landscape also indicates the relative permanence of the wetlands and suggests that the wetland is self-sustaining without ongoing operation and maintenance activities, and provides similar ecosystem services as natural wetlands. By way of example, this category of wetlands includes situations where water flow is permanently redirected as the result of human activity, such as grading in another area, such that new wetlands form in areas that were previously dry. These wetlands may not be natural wetlands because they result from human activity and they were not formed by modifying a water of the state (rather they were an indirect result), but nevertheless they take on the function of natural wetlands such that they should be considered waters of the state. This category would not include artificial wetlands constructed for specific purposes listed in section II.3.d because the artificial wetland would likely require ongoing maintenance such that they would not be deemed "relatively permanent," and/or the artificial wetland is not part of the "natural landscape"" (SWRCB 2020).

1.3.3 California Coastal Commission

The California Coastal Act Section 30121 defines wetlands as "[L]ands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens" (CCC 2011). The Project is located outside of the Coastal Zone and therefore the California Coastal Act does not apply.

1.4 Summary

GHD conducted the aquatic resources delineation fieldwork on June 12th, 2020, and follow up visit to confirm soil analysis on August 7th, 2020. The delineation was conducted within the approximately 2.7 acre PSB, as shown in Figure 2 of Appendix A. GHD field staff walked throughout the PSB to observe indications of potential United States (U.S.) Army Corps of Engineers (USACE) three-parameters wetlands (based on wetland indicative vegetation, hydric soils, and wetland hydrology), and ordinary high water mark boundaries. No three parameter wetlands were observed within the PSB. The ordinary high water mark was mapped based upon physical indicators including shelving, changes in the character of soil (and rocky substrate), destruction of terrestrial vegetation, and/or the presence of litter and debris.

Figure 3 presents the results of the investigation and is provided in Appendix A. Datasheets documenting conditions observed during the investigation are included in Appendix B, and a complete species list with respective wetland indicator status' of all plants documented during the delineation efforts is provided in Appendix C. Photographs taken during the site visit are included in Appendix D and climatological data can be found in Appendix E.

2. Methodology

2.1 Aquatic resources delineation approach

Two GHD botanists conducted the aquatic resources delineation. To define a wetland, the USACE requires that vegetation, soil, and hydrology (three-parameters) all show wetland attributes (USACE 1987; USACE 2010). The aquatic resources delineation used USACE criteria from the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys and Coast Region* (USACE 2010), and *A Guide to Ordinary High Water Mark (OHWM) Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Region of the United States* (USACE 2014). The SWRCB also requires soils, vegetation and hydrology (three-parameters) to be present to be considered a State wetlands.

Typically, vegetation, soil, and hydrology data are collected in a transect across the upland/wetland boundary with two plots (upland/wetland) per transect. In general, the naming convention used on datasheets to designate upland or wetland plots associated with a transect is -U or -W, respectively. Ordinary high water mark data is typically collected via visual indicators showcasing the stage height of a waterway including natural line impressions on the bank, shelving, and/or the presence of litter and debris at a particular elevation. The naming convention used on datasheets to designate the ordinary high water mark boundary is OHWM followed by the point number.

Observed three-parameter wetland/upland boundaries and plots, and ordinary high water mark boundaries, are typically mapped in the field with a Trimble Geo 7X Handheld Global Positioning System (GPS) with the Global Navigation Satellite System (GNSS) capability running ArcPad geographic information system (GIS) software, which is attached to an external antenna to establish sub-meter accuracy.

Collected data is post-processed using GPS Pathfinder office, which referenced UNAVCO base stations. The ordinary high water mark GPS points were collected to record the aquatic resource's spatial extent. The points were then connected in the office using elevation data and ArcMap software for figure creation. Appendix B contains all datasheets recorded during the OHWM mapping.

2.2 Botanical methodology

Vegetation data collection consisted of listing the dominant species in the herbaceous, shrub, and tree layer observed throughout the PSB. The species' wetland indicator status for the Western Mountains, Valleys, and Coast Region was then denoted in the respective column, using the standard reference: *State of California 2016 Wetland Plant List* (Lichvar et al. 2016). This list classifies species based on the probability that they are found in wetlands (USACE 1987), ranging from Obligate (almost always in wetlands) [OBL], Facultative/wet (67% to 99% in wetlands) [FACW], Facultative (34% to 66% in wetlands) [FAC], Facultative/up (1% to 33% in wetlands) [FACU], or Uplands (less than 1% in wetlands) [UP]. Species that do not appear on the list are considered to be in the upland category (Lichvar et al. 2016). Standard procedures for documenting hydrophytic vegetation indicators were used per the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (USACE 2010). A complete list of plants documented at the site with respective wetland indicator status is included as Appendix C.

2.3 Soils methodology

Hydric soils were defined based on the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0) (*USACE 2010) procedures in combination with the Natural Resources Conservation Service's (NRCS) definitions presented in *Field Indicators of Hydric Soils in the United States* (USDA/NRCS 2018). Soil pits were dug to an approximate depth of 12 inches in various locations to confirm uplands. Data on soil color, texture, and redoximorphic features were recorded. Any observed redoximorphic features (iron concentrations) were noted along with their percentage within the soil matrix, and care was taken to distinguish chromas of 1 and 2 indicative of an iron-depleted soil within 12 inches of the soil surface (USACE 2010; USDA/NRCS 2016).

The *Munsell Soil Color Book* (COLOR, M. 2000) was used to describe the soil colors for the entire depth of the test pit. Moist, natural soil aggregate (ped) surfaces, which had not been crushed, were used to determine the soil's color. Soils with low chroma were verified as being hydric or upland with *Field Indicators of Hydric Soils in the United States* (Version 8.0, 2018).

2.3.1 Existing Soils Information

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) identifies three soil units: Bigtree-Mystery complex (2 to 9 percent slopes), Tillas (0 to 2 percent slopes), and Tillas (2 to 9 percent slopes), which occupies the PSB, other than water (see Figure 4 in Appendix A). A brief map unit description, as generated by the NRCS, is provided for each soil unit below (NRCS 2020).

While the soil units are informative, the mapping scales are usually too broad to characterize the small scale of the PSB features accurately.

Bigtree-Mystery complex, 2 to 9 percent slopes

The map unit composition is as follows: 50 percent Bigtree soils, 30 percent Mystery soils, and 20 percent minor components. The Bigtree and Mystery soil type setting includes alluvial fans, terraces, backslopes or toeslope of mountain bases with alluvium derived from sedimentary rock parent material.

For the Bigtree portion of the soil complex, depth to a restrictive feature is more than 80 inches. The natural drainage class is well-drained. The depth to the water table is more than 80 inches. There is no inherent ponding frequency and flooding is rare. The available water storage in a soil profile is high, or about 9.6 inches, and the capacity of the most limiting layer to transmit water is moderately high to high, or about 0.60 to 2.00 inches per hour. Irrigated land capability classification is not specified. Non-irrigated land capability classification is 2e. The hydrologic soil group is B. The soil series unit is inherently not hydric.

For the Mystery portion of the soil complex, depth to a restrictive feature is more than 80 inches. The natural drainage class is moderately well-drained. The depth to the water table is approximately 0 to 39 inches. There is no inherent ponding frequency and flooding is occasional. The available water storage in a soil profile is high, or about 10.9 inches, and the capacity of the most limiting layer to transmit water is moderately high to high, or about 0.60 to 2.00 inches per hour. Irrigated land capability classification is not specified. Non-irrigated land capability classification is 2e. The hydrologic soil group is C. The soil series unit is inherently not hydric.

The descriptions of the minor components, which are also inherently not hydric, are as follows: five percent Sasquatch, five percent Worswick, five percent Fluvents, and five percent Fluventic dystrudepts (NRCS 2020).

Tillas, 0 to 2 percent slopes

The map unit composition is as follows: 85 percent Tillas soils, and 15 percent minor components. The Tillas soil setting includes alluvial fans, and backslopes with alluvium derived from mixed sources of parent material.

Depth to a restrictive feature is more than 80 inches. The natural drainage class is well-drained. The runoff class is low. The depth to the water table is more than 80 inches. There is no inherent frequency of ponding or flooding. The available water storage in a soil profile is high, or about 9.1 inches, and the capacity of the most limiting layer to transmit water is moderately low to moderately high, or about 0.06 to 0.60 inches per hour. Irrigated land capability classification is 2e. Non-irrigated land capability classification is 2s. The hydrologic soil group is C. The soil series unit is inherently not hydric.

The descriptions of the minor components, which are mostly inherently not hydric except for the Weott soil series, are as follows: five percent Carlotta, five percent Hookton, three percent Urban land, and two percent Weott (NRCS 2020).

Tillas, 2 to 9 percent slopes

The map unit composition is as follows: 85 percent Tillas soils, and 15 percent minor components. The Tillas soil setting includes alluvial fans, and backslopes with alluvium derived from mixed sources of parent material.

Depth to a restrictive feature is more than 80 inches. The natural drainage class is well-drained. The runoff class is medium. The depth to the water table is more than 80 inches. There is no inherent frequency of ponding or flooding. The available water storage in a soil profile is moderate, or about 8.4 inches, and the capacity of the most limiting layer to transmit water is moderately low to moderately high, or about 0.06 to 0.60 inches per hour. Irrigated land capability classification is 2e. Non-irrigated land capability classification is 2e. The hydrologic soil group is C. The soil series unit is inherently not hydric.

The descriptions of the minor components, which are mostly inherently not hydric except for the Weott soil series, are as follows: five percent Carlotta, four percent Hookton, three percent Weott and three percent Urban land (NRCS 2020).Hydrology methodology.

2.3.2 Precipitation and Hydrology

GHD performed the investigation on June 12th, 2020, and had a follow up investigation focused on collecting soils data on August 7th, 2020. Weather conditions were partly sunny and clear at both visits. Weather data from the Smith River 1.1 SSE weather station recorded: 1.8-inches of precipitation to have fallen in the last 14-days, and zero precipitation falling the day of the June 12th 2020 survey (Appendix E NCEI 2020). The Smith River 1.1 SSE weather station recorded 0.09-inches of precipitation to have fallen in the last 14-days, and 0.02-inches of precipitation falling the day of the August 7th 2020 visit (Appendix E) (NCEI 2020).

A National Environmental Satellite station exists approximately one mile south of the Project, and the record of climateological observation (NCEI 2020) is provided in Appendix E. However, the Project vicinity does not have weather stations that have sufficient data to produce Wetlands (WETS) Climate Tables, and therefore the nearest station with a sufficient dataset was Crescent City McNamara AP, CA, located approximately 11 miles southwest of the Project site. This WETS table is also provided in Appendix E. Aerial photography was used to inform potential areas for investigation during fieldwork. The National Wetland Inventory Mapper was referenced before conducting fieldwork and is included as Figure 5 in Appendix A (NWI 2020). The FEMA flood hazard map is also included as Figure 6 in Appendix A. Wetland hydrology indicators, such as drainage patterns, material deposits, soil saturation, high water table, or surface water presence, were recorded in the field.

Hydrology within the PSB includes Rowdy and Dominie Creeks, and their confluence, which are all considered surface waters. Subsurface groundwater movement is assumed, however no gullies or seeps indicating primary groundwater movement were observed within the PSB.

3. Results

The PSB was surveyed, and hydrophytic vegetation was observed below the OHWM. No strongly hydrophytic vegetation was observed above the OHWM, and therefore no soil pits were dug at the June 12th 2020 site visit to check for hydric soil or wetlands hydrology. To confirm the absence of hydric soils, a second site visit was taken on August 7th, 2020. Soil borings were collected to approximately 12 inches below ground surface at five locations throughout the PSB within the approximate riparian corridor of Rowdy and Dominie Creeks. No redoximorphic conditions were observed in the four samples collected from along Rowdy Creek, and chromas were mostly 3 and 4, with one sample containing a chroma of 2. The sample from upper Dominie Creek contained some redoximorphic features, from approximately 10 to 12 inches below the surface, and had a chroma of 4. This sample is not considered a hydric soil due to the chroma of 4 and depth of redoximphic features. Due to the lack of hydrophytic vegetation above the OHWM, and absence of hydric soils, no three-parameter wetlands were observed in the PSB. The OHWM of Rowdy and Dominie Creeks was cataloged via a GPS unit and the results are shown on Figure 3 in Appendix A.

4. Special Terms and Conditions

4.1 Purpose of this Report

GHD prepared this report for the TDN, and the TDN may only use and rely on this report for the purpose agreed upon between GHD and the TDN, as set out in the scope and contract for work effort reported herein. GHD Inc. is not liable for any action arising out of the reliance of any third party on the information contained within this report. GHD otherwise disclaims responsibility to any entity other than the TDN arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

4.1 Scope and Limitations

This report does not authorize any individuals to develop, fill, or alter the delineated wetlands. Verification of the delineation by jurisdictional agencies is necessary prior to the use of this report for planning and development purposes. A USACE, agency-stamped, delineation map, and a jurisdictional approval letter are required to signify confirmation of delineation results. In situations where a field investigation determines that no jurisdictional wetlands occur, jurisdictional concurrence with these findings is recommended.

The delineation conclusions were based on the information available during the period of the investigation, which took place on June 12 and August 7, 2020. The opinions, conclusions, and any recommendations in this report are based on conditions encountered and information reviewed by the date of preparation of the report. Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change unless contracted to do so.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions, and any recommendations in this report are based on the information obtained from and testing undertaken at or in connection with specific sample points. Conditions at other locations of the site may be different from the conditions found at the specific sample points.

5. References

Lichvar et al. 2016. The National Wetland Plant List: 2016 wetland ratings. United States Army Corps of Engineers. http://acwc.sdp.sirsi.net/client/search/asset:asset?t:ac=$N/1012381

NCEI, National Centers for Environmental Information. 2020. “Data Tools: Find a Station SMITH RIVER 1.1 SSE, CA US US1CADN0006.” Climate Data Online. July. August.

NRCS, Natural Resources Conservation Service. 2020. Web Soil Survey.Accessed July 8. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

NWI, National Wetlands Inventory. 2020. National Wetlands Inventory mapper. Accessed July 2020. https://www.fws.gov/wetlands/data/Mapper.html.

SWRCB, State Water Resources Control Board. 2019. "Procedures for Discharges of Dredged or Fill Material to Waters of the State." Procedures, Sacramento, CA. https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/procedures_conformed.pdf.

SWRCB, State Water Resources Control Board. 2020. Implementation Guidance for the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State. Guidance, Sacramento, CA: State Water Resources Control Board. https://www.waterboards.ca.gov/water_issues/programs/cwa401/docs/dredge_fill/revised_guidance.pdf

USACE. 1987. Wetlands Delineation Manual, Tech. Rep 4-87-1. Waterways Experiment Station, United States Department of the Army Corps of Engineers (USACE).

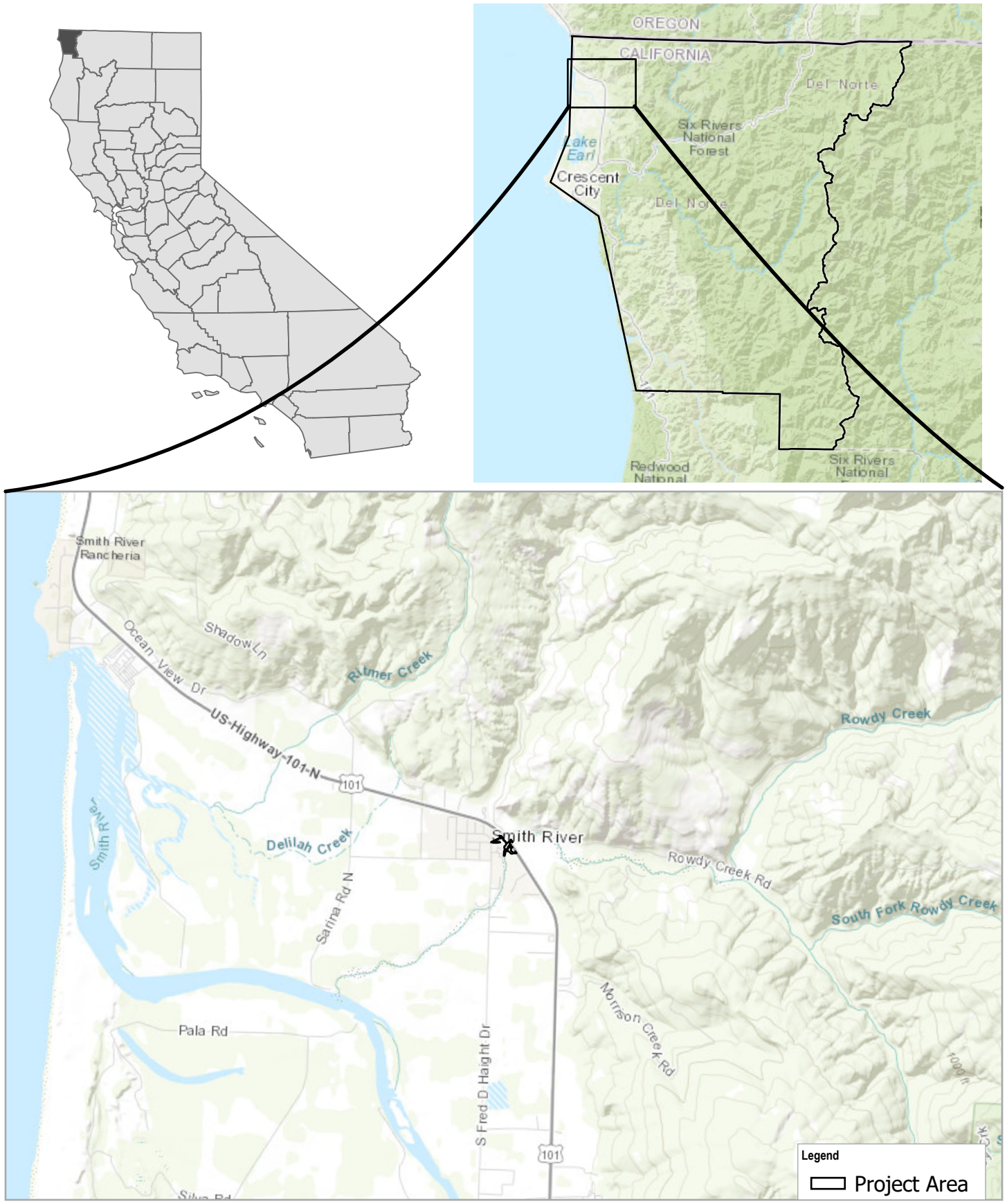
USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0). U.S. Army Corps of Engineers.

USACE. 2014. Wetlands Regulatory Assistance Program (WRAP): A Guide to Ordinary High Water Mark (OHWM) Delineation for Non-Perennial Streams in the Western Mountains, Valleys, and Coast Regional of the United States. U.S. Army Corps of Engineers. M. Mersel, and R. Lichvar. August.

USDA/NRCS, 2018. Field Indicators of Hydric Soils in the United States, Version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds). United States Department of Agriculture (USDA) and Natural Resources Conservation Service (NRCS) in cooperation with the National Technical Committee for Hydric Soils.

Appendices

Appendix A – Figures



Paper Size ANSI A

0 2,500 5,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

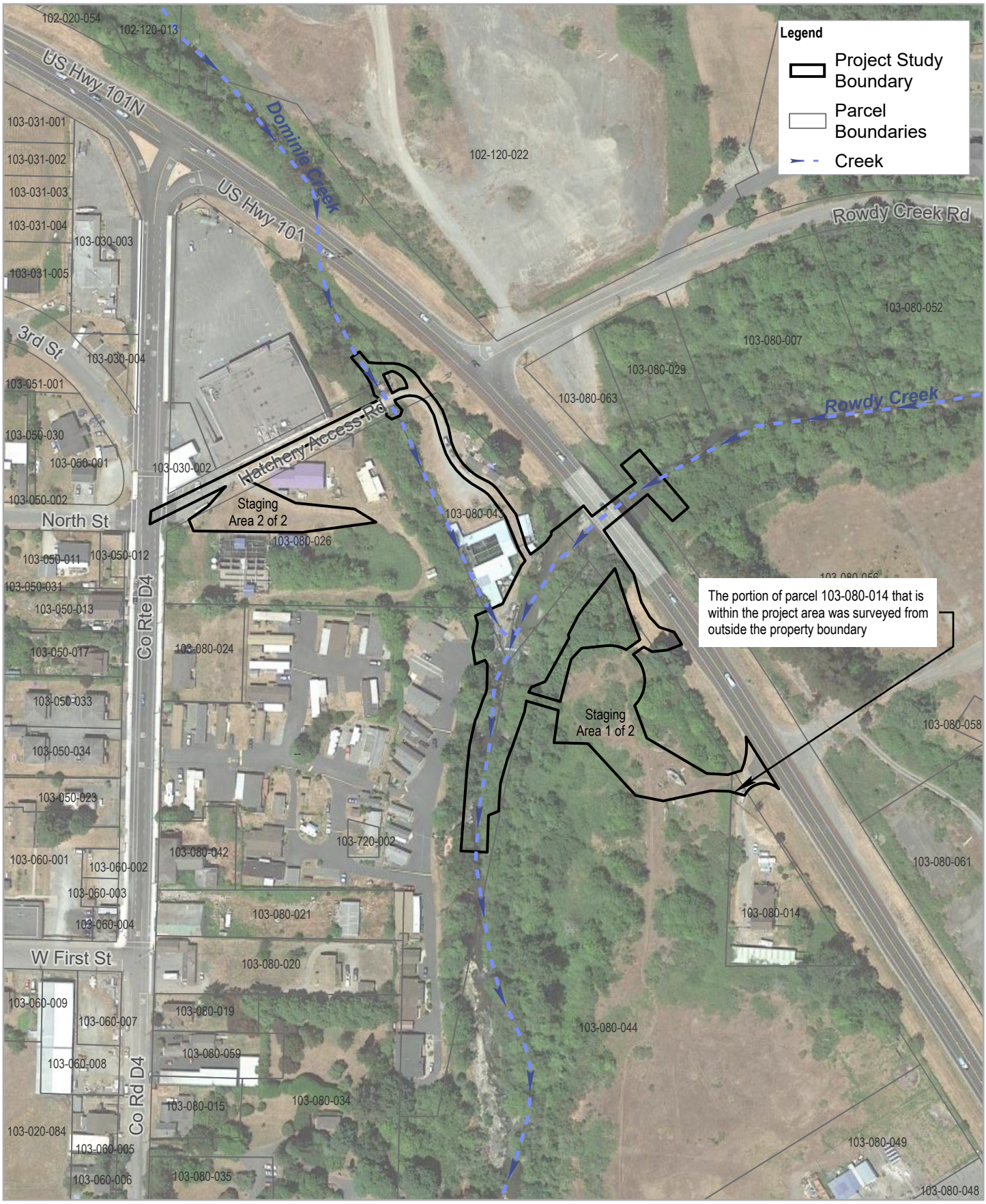
Project No. **11209093**
Revision No. **-**
Date **Mar 2020**

Vicinity Map

FIGURE 1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_001_Vicinity
Print date: 09 Mar 2020 - 17:00

Data source: World_Topo_Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

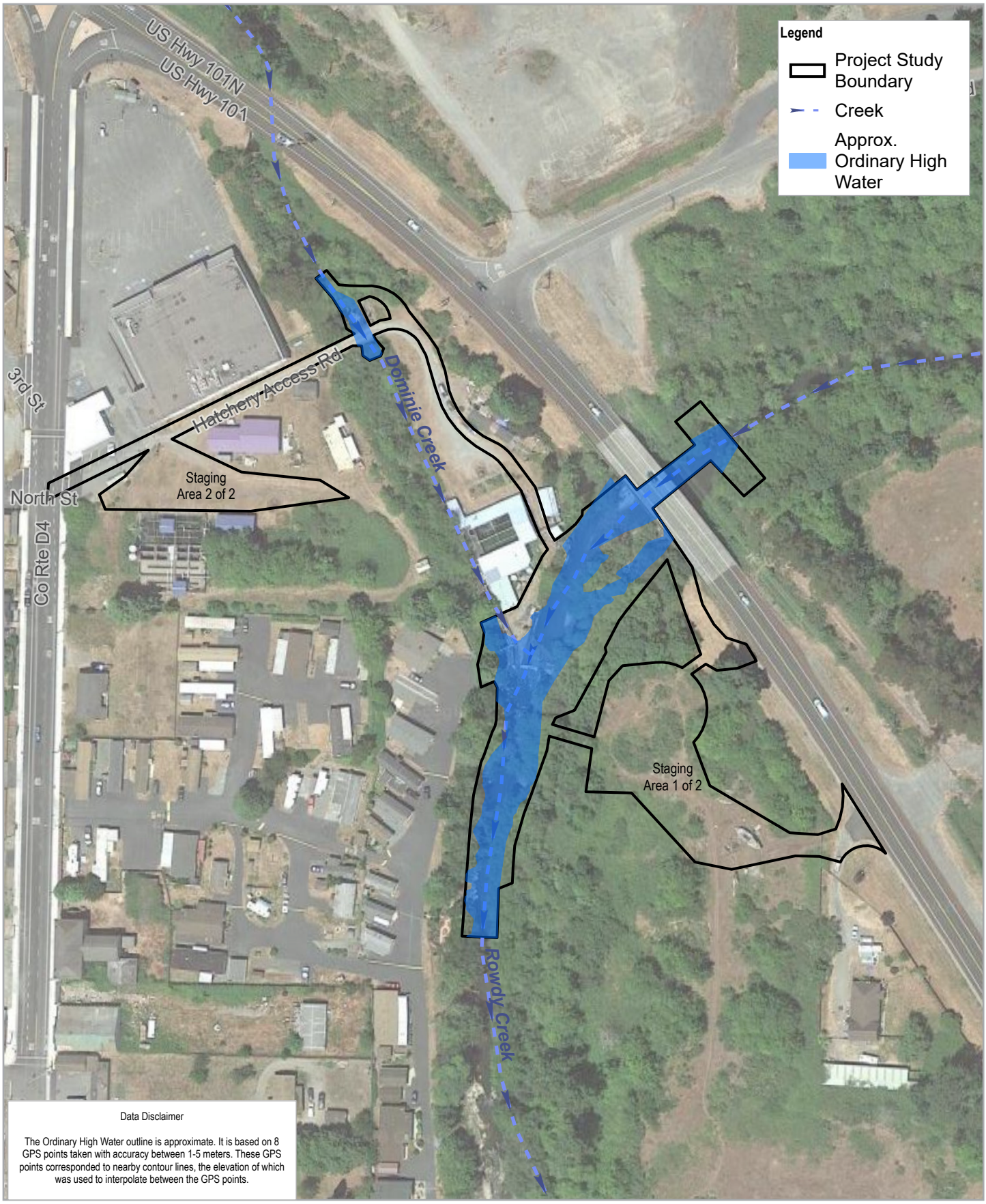
Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **August 2020**

Project Study Boundary

FIGURE 2

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_002_PSB
Print date: 25 Aug 2020 - 08:30



Paper Size ANSI A

0 40 80 120 160

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

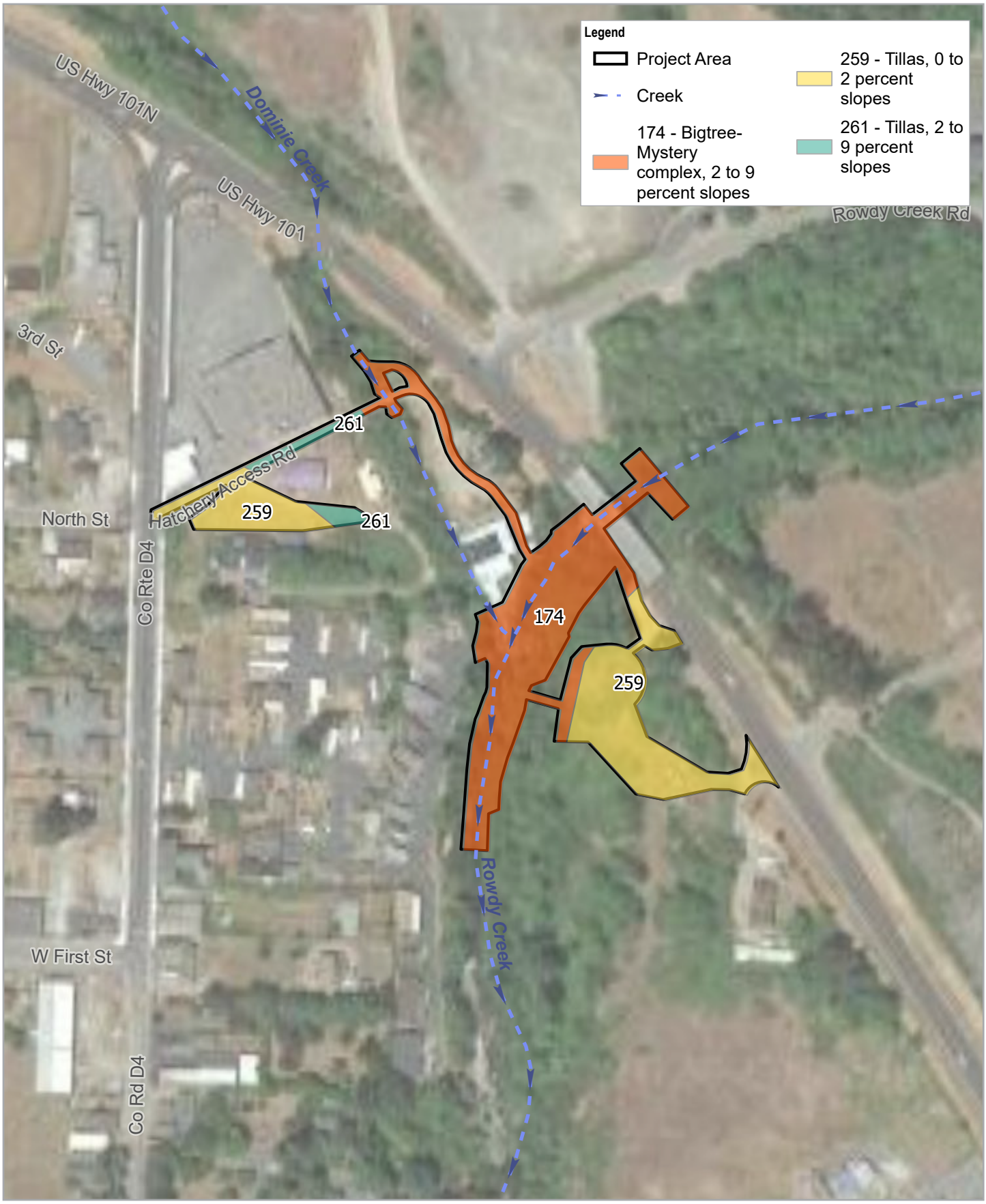
Project No. **11209093**
Revision No. **-**
Date **August 2020**

Aquatic Resources Delineation

FIGURE 3

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_003_AquaticResources
Print date: 25 Aug 2020 - 08:45

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Soil Units

Project No. **11209093**
Revision No. **-**
Date **July 2020**

FIGURE 4

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_004_SoilUnits
Print date: 27 Jul 2020 - 13:03

Data source: NRCS Web Soil Survey, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: zporteous

Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

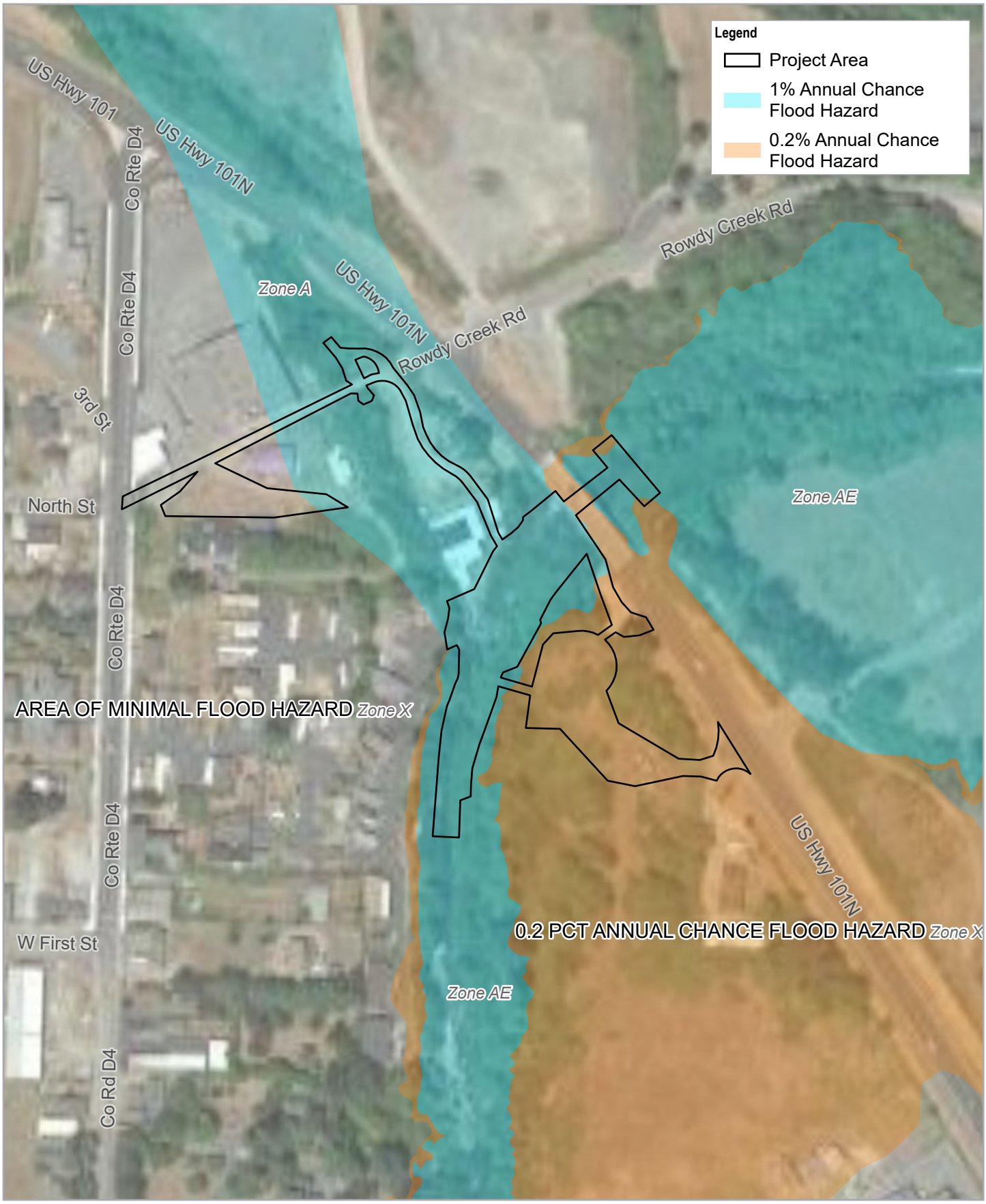
Project No. **11209093**
Revision No. **-**
Date **July 2020**

National Wetland Inventory

FIGURE 5

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_005_NWI
Print date: 27 Jul 2020 - 13:04

Data source: National Wetland Inventory, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: zporteous



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **July 2020**

FEMA Flood Hazard

FIGURE 6

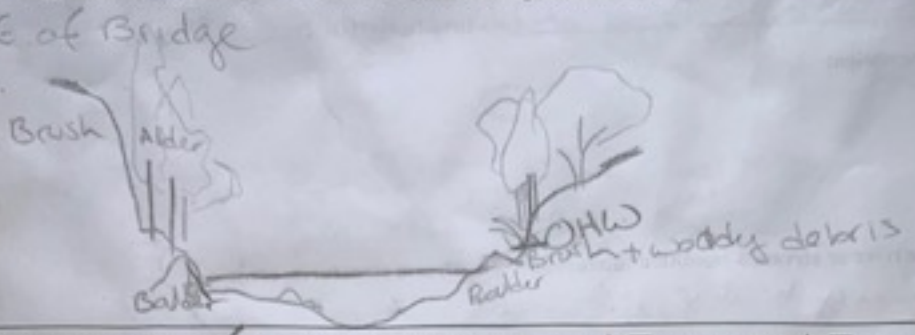
N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\AquaticResourceDelineation\11209093_AquaticResourceDelineation_1.aprx - 11209093_006_FEMA
Print date: 27 Jul 2020 - 13:07

Data source: FEMA Flood Hazard, Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: zporteous

Appendix B – Data Sheets

Datasheet # 1 **OHWM Delineation Datasheet** Page 1 of 2

Transect (cross-section) drawing: (choose a location that is representative of the dominant stream characteristics over some distance; label the OHWM and other features of interest along the transect; include an estimate of transect length)



Break in Slope at OHWM: ☑ Sharp (> 60°) | ☐ Moderate (30–60°) | ☐ Gentle (< 30°) | ☐ None

Notes/Description:
Nearly vertical

Sediment Texture: Estimate percentages to describe the general sediment texture above and below the OHWM

	Clay/Silt <0.05mm	Sand 0.05 – 2mm	Gravel .2mm – 1cm	Cobbles 1 – 10cm	Boulders >10cm	Developed Soil Horizons (Y/N)
Above OHWM	60	30	<1	<1	10	—
Below OHWM	30	30	15	15	5	—

Notes/Description:
Med-low flow. Steep bushy banks on either side w visible water stains on sediment deposition on veg.

Vegetation: Estimate absolute percent cover to describe general vegetation characteristics above and below the OHWM

	Tree (%)	Shrub (%)	Herb (%)	Bare (%)
Above OHWM	30	80	15	3
Below OHWM	5	5	5	85

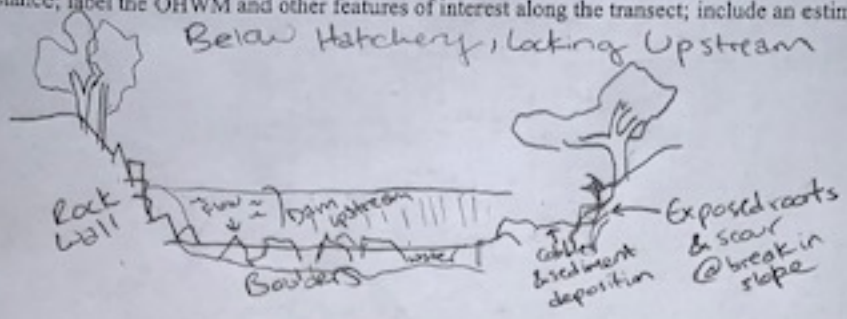
Notes/Description:
Vast majority of veg rooted above OHW.

Other Evidence: List/describe any additional field evidence and/or lines of reasoning used to support your delineation

- Break in slope
- Sediment
- vegetation line
- Water stained lvs & boulder
- Exposed roots

Datasheet # 2 **OHWM Delineation Datasheet** Page 2 of 2

Transect (cross-section) drawing: (choose a location that is representative of the dominant stream characteristics over some distance; label the OHWM and other features of interest along the transect; include an estimate of transect length)



Break in Slope at OHWM: ☑ Sharp (> 60°) | ☑ Moderate (30–60°) | ☐ Gentle (< 30°) | ☐ None
Notes/Description:

Sediment Texture: Estimate percentages to describe the general sediment texture above and below the OHWM

	Clay/Silt <0.05mm	Sand 0.05 – 2mm	Gravel 2mm – 1cm	Cobbles 1 – 10cm	Boulders >10cm	Developed Soil Horizons (Y/N)
Above OHWM	25	5	10	30	30	—
Below OHWM	5	10	20	35	30	—

Notes/Description:
Finer sediment scared away below OHWM.

Vegetation: Estimate absolute percent cover to describe general vegetation characteristics above and below the OHWM

	Tree (%)	Shrub (%)	Herb (%)	Bare (%)
Above OHWM	85	70	10	30 - leaf litter mostly
Below OHWM	1	5	5	90

Notes/Description:
Vast majority of vascular plants rooted above OHWM, some alders rooted at OHW with scoured roots.

Other Evidence: List/describe any additional field evidence and/or lines of reasoning used to support your delineation
- Exposed roots
- Sediment change

Appendix C – On-site Plant List

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Abies grandis	Grand fir	native	Tree	Pinaceae	FACU
Acer macrophyllum	Bigleaf maple	native	Tree	Sapindaceae	FACU
Alnus rubra	Red alder	native	Tree	Betulaceae	FAC
Eucalyptus globulus	Blue gum	invasive non-native	Tree	Myrtaceae	UPL
Frangula purshiana	Cascara sagrada	native	Tree	Rhamnaceae	FAC
Picea sitchensis	Sitka spruce	native	Tree	Pinaceae	FAC
Prunus sp.	Cultivated stone-fruit trees	non-native	Tree	Rosaceae	UPL
Salix lasiandra	Pacific willow	native	Tree	Salicaceae	FACW
Sequoia sempervirens	Coast redwood	native	Tree	Cupressaceae	UPL
Thuja plicata	Western red cedar	native	Tree	Cupressaceae	FAC
Baccharis pilularis	Coyote brush	native	Shrub	Asteraceae	UPL
Cotoneaster lacteus	Milkflower cotoneaster	invasive non-native	Shrub	Rosaceae	UPL
Cotoneaster pannosus	Woolly cotoneaster	invasive non-native	Shrub	Rosaceae	UPL
Cytisus scoparius	Scotch broom	invasive non-native	Shrub	Fabaceae	UPL
Hedera helix	English ivy	invasive non-native	Shrub	Araliaceae	FACU
Lonicera involucrata	Coast twinberry	native	Shrub	Caprifoliaceae	FAC
Oemleria cerasiformis	Oso berry	native	Shrub	Rosaceae	FACU
Physocarpus capitatus	Ninebark	native	Shrub	Rosaceae	FACW
Prunus laurocerasus	Cherry laurel	non-native	Shrub	Rosaceae	UPL
Rubus armeniacus	Himalayan blackberry	invasive non-native	Shrub	Rosaceae	FAC
Rubus parviflorus	Thimbleberry	native	Shrub	Rosaceae	FACU
Rubus spectabilis	Salmon berry	native	Shrub	Rosaceae	FAC
Rubus ursinus	California blackberry	native	Shrub	Rosaceae	FACU
Salix hookeriana	Coastal willow	native	Shrub	Salicaceae	FACW
Salix sitchensis	Coulter willow	native	Shrub	Salicaceae	FACW
Sambucus racemosa	Red elderberry	native	Shrub	Adoxaceae	FACU
Achillea millefolium	Yarrow	native	Herbaceous	Asteraceae	FACU
Acmispon parviflorus	Hill lotus	native	Herbaceous	Fabaceae	UPL
Agrostis capillaris	Colonial bentgrass	non-native	Herbaceous	Poaceae	FAC
Aira caryophyllea	Silvery hairgrass	non-native	Herbaceous	Poaceae	FACU
Anthoxanthum odoratum	Sweet vernal grass	invasive non-native	Herbaceous	Poaceae	FACU
Athyrium filix-femina	common ladyfern	native	Herbaceous	Woodsiaceae	UPL
Avena barbata	Slim oat	invasive non-native	Herbaceous	Poaceae	UPL
Bellis perennis	English lawn daisy	non-native	Herbaceous	Asteraceae	UPL
Briza maxima	Rattlesnake grass	invasive non-native	Herbaceous	Poaceae	UPL
Briza minor	Little rattlesnake grass	non-native	Herbaceous	Poaceae	FAC
Bromus diandrus	Ripgut brome	invasive non-native	Herbaceous	Poaceae	UPL
Bromus hordeaceus	Soft chess	invasive non-native	Herbaceous	Poaceae	FACU
Bromus sitchensis	Sitka brome	native	Herbaceous	Poaceae	UPL
Bromus vulgaris	Common brome	native	Herbaceous	Poaceae	FACU
Calamagrostis nutkaensis	Reedgrass	native	Herbaceous	Poaceae	FACW
Carex leptopoda	Slender-footed sedge	native	Herbaceous	Cyperaceae	FAC
Carex obnupta	Slough sedge	native	Herbaceous	Cyperaceae	OBL
Centaurea jacea	Brownray knapweed	non-native	Herbaceous	Asteraceae	FACU
Cerastium glomeratum	Large mouse ears	non-native	Herbaceous	Caryophyllaceae	FACU
Cortaderia jubata	Andean pampas grass	invasive non-native	Herbaceous	Poaceae	FACU
Crocosmia ×crocosmiiflora	Monbretia	invasive non-native	Herbaceous	Iridaceae	UPL
Cynosurus echinatus	Dogtail grass	invasive non-native	Herbaceous	Poaceae	UPL
Dactylis glomerata	Orchardgrass	invasive non-native	Herbaceous	Poaceae	FACU
Daucus carota	Carrot	non-native	Herbaceous	Apiaceae	FACU
Digitalis purpurea	Foxglove	invasive non-native	Herbaceous	Plantaginaceae	FACU
Dipsacus fullonum	Wild teasel	invasive non-native	Herbaceous	Dipsacaceae	FAC
Elymus glaucus	Blue wildrye	native	Herbaceous	Poaceae	FACU
Epilobium ciliatum	Slender willow herb	native	Herbaceous	Onagraceae	FACW
Equisetum telmateia ssp. braunii	Giant horsetail	native	Herbaceous	Equisetaceae	UPL
Erodium cicutarium	Coastal heron's bill	invasive non-native	Herbaceous	Geraniaceae	UPL
Erythranthe dentata	Tooth leaved monkeyflower	native	Herbaceous	Phrymaceae	UPL
Eschscholzia californica	California poppy	native	Herbaceous	Papaveraceae	UPL
Euphorbia peplus	Petty spurge	non-native	Herbaceous	Euphorbiaceae	UPL
Festuca bromoides	Brome fescue	non-native	Herbaceous	Poaceae	UPL
Festuca perennis	Italian rye grass	invasive non-native	Herbaceous	Poaceae	UPL
Festuca rubra	Red fescue	native	Herbaceous	Poaceae	FAC

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Fragaria chiloensis	Beach strawberry	native	Herbaceous	Rosaceae	FACU
Galium aparine	Cleavers	native	Herbaceous	Rubiaceae	FACU
Geranium dissectum	Wild geranium	invasive non-native	Herbaceous	Geraniaceae	UPL
Geranium robertianum	Robert's geranium	non-native	Herbaceous	Geraniaceae	FACU
Glyceria elata	Tall mannagrass	native	Herbaceous	Poaceae	FACW
Holcus lanatus	Common velvetgrass	invasive non-native	Herbaceous	Poaceae	FAC
Hypericum perforatum	Klamathweed	invasive non-native	Herbaceous	Ericaceae	FACU
Hypochaeris radicata	Hairy cats ear	invasive non-native	Herbaceous	Asteraceae	FACU
Juncus articulatus	Jointed rush	native	Herbaceous	Juncaceae	OBL
Juncus bufonius	Common toad rush	native	Herbaceous	Juncaceae	FACW
Lapsana communis	Common nipplewort	non-native	Herbaceous	Asteraceae	FACU
Lepidium didymum	Lesser swine cress	non-native	Herbaceous	Brassicaceae	UPL
Lepidium nitidum	Shining pepper grass	native	Herbaceous	Brassicaceae	FAC
Leucanthemum vulgare	Oxe eye daisy	invasive non-native	Herbaceous	Asteraceae	FACU
Linum bienne	Flax	non-native	Herbaceous	Linaceae	UPL
Lotus corniculatus	Bird's foot trefoil	non-native	Herbaceous	Fabaceae	FAC
Lupinus sp.	Lupine	native	Herbaceous	Fabaceae	UPL
Luzula parviflora	Small flowered wood rush	native	Herbaceous	Juncaceae	FAC
Lysichiton americanus	Yellow skunk cabbage	native	Herbaceous	Araceae	OBL
Lysimachia arvensis	Scarlet pimpernel	non-native	Herbaceous	Myrsinaceae	FAC
Lythrum hyssopifolia	Hyssop loosestrife	invasive non-native	Herbaceous	Lythraceae	UPL
Matricaria discoidea	Pineapple weed	native	Herbaceous	Asteraceae	FACU
Medicago lupulina	Black medick	non-native	Herbaceous	Fabaceae	FACU
Medicago polymorpha	California burclover	invasive non-native	Herbaceous	Fabaceae	FACU
Melilotus sp.	sweet clover	non-native	Herbaceous	Fabaceae	UPL
Mentha pulegium	Pennyroyal	invasive non-native	Herbaceous	Lamiaceae	OBL
Modiola caroliniana	Carolina bristle mallow	non-native	Herbaceous	Malvaceae	FACU
Oenanthe sarmentosa	Water parsley	native	Herbaceous	Apiaceae	OBL
Oxalis articulata ssp. rubra	Windowbox woodsorrel	non-native	Herbaceous	Oxalidaceae	UPL
Oxalis oregana	Redwood sorrel	native	Herbaceous	Oxalidaceae	FACU
Parentucellia viscosa	Yellow parentucellia	invasive non-native	Herbaceous	Orobanchaceae	FAC
Persicaria maculosa	Spotted ladysthumb	non-native	Herbaceous	Polygonaceae	FACW
Petasites frigidus var. palmatus	Western coltsfoot	native	Herbaceous	Asteraceae	UPL
Phacelia bolanderi	Bolander's phacelia	native	Herbaceous	Boraginaceae	UPL
Plantago coronopus	Cut leaf plantain	non-native	Herbaceous	Plantaginaceae	FAC
Plantago lanceolata	Ribwort	invasive non-native	Herbaceous	Plantaginaceae	FACU
Plantago major	Common plantain	non-native	Herbaceous	Plantaginaceae	FAC
Poa pratensis	Kentucky blue grass	invasive non-native	Herbaceous	Poaceae	FAC
Polycarpon tetraphyllum	Four leaved allseed	non-native	Herbaceous	Caryophyllaceae	UPL
Polygonum aviculare	Prostrate knotweed	non-native	Herbaceous	Polygonaceae	FAC
Polystichum munitum	Western sword fern	native	Herbaceous	Dryopteridaceae	FACU
Prunella vulgaris	Self heal	native	Herbaceous	Lamiaceae	FACU
Pseudognaphalium luteoalbum	Jersey cudweed	non-native	Herbaceous	Asteraceae	FACW
Ranunculus repens	Crowfoot, creeping buttercup	invasive non-native	Herbaceous	Ranunculaceae	FAC
Raphanus sativus	Jointed charlock	invasive non-native	Herbaceous	Brassicaceae	UPL
Rorippa curvisiliqua	Curvepod yellow cress	native	Herbaceous	Brassicaceae	OBL
Rumex acetosella	Sheep sorrel	invasive non-native	Herbaceous	Polygonaceae	FACU
Rumex crispus	Curly dock	invasive non-native	Herbaceous	Polygonaceae	FAC
Sagina procumbens	Arctic pearlwort	native	Herbaceous	Caryophyllaceae	FAC
Scirpus microcarpus	Mountain bog bulrush	native	Herbaceous	Cyperaceae	OBL
Scrophularia californica	California bee plant	native	Herbaceous	Scrophulariaceae	FAC
Sherardia arvensis	Field madder	non-native	Herbaceous	Rubiaceae	UPL
Silene gallica	Common catchfly	non-native	Herbaceous	Caryophyllaceae	UPL
Soliva sessilis	South american soliva	non-native	Herbaceous	Asteraceae	FAC
Sonchus asper	Spiny sowthistle	non-native	Herbaceous	Asteraceae	FACU
Spergularia rubra	Purple sand spurry	non-native	Herbaceous	Caryophyllaceae	FAC
Stachys ajugoides	Hedge nettle	native	Herbaceous	Lamiaceae	OBL
Stachys arvensis	Field hedge nettle	non-native	Herbaceous	Lamiaceae	UPL
Symphyotrichum chilense	Pacific aster	native	Herbaceous	Asteraceae	FAC
Taraxacum officinale	Red seeded dandelion	non-native	Herbaceous	Asteraceae	FACU
Tellima grandiflora	Fringe cups	native	Herbaceous	Saxifragaceae	FACU
Tolmiea diplomenziesii	pig-a-back plant	native	Herbaceous	Saxifragaceae	FAC

Scientific Name	Common Name	Status	Form	Family	Wetland Indicator Status
Trifolium dubium	Shamrock	non-native	Herbaceous	Fabaceae	FACU
Trifolium pratense	Red clover	non-native	Herbaceous	Fabaceae	FACU
Trifolium repens	White clover	non-native	Herbaceous	Fabaceae	FAC
Triphysaria pusilla	Little owl's clover	native	Herbaceous	Orobanchaceae	UPL
Urtica dioica	Stinging nettle	native	Herbaceous	Urticaceae	FAC
Veronica americana	American brooklime	native	Herbaceous	Plantaginaceae	OBL
Veronica serpyllifolia	Thymeleaf speedwell	native	Herbaceous	Plantaginaceae	FAC
Vicia hirsuta	Hairy vetch	non-native	Herbaceous	Fabaceae	UPL
Vicia sativa	Spring vetch	non-native	Herbaceous	Fabaceae	UPL
Vicia tetrasperma	Four seeded vetch	non-native	Herbaceous	Fabaceae	UPL
Vinca major	Vinca	invasive non-native	Herbaceous	Apocynaceae	UPL

Appendix D – Site Photographs

Some common vegetation observed along the creek banks. Pictured above: western sword fern (*Polystichum munitum*), and slender footed sedge (*Carex leptopoda*).

Creek bank conditions along Rowdy Creek.

View of Rowdy Creek from Highway 101 bridge, looking upstream (away from the Project).

Concrete weir infrastructure on Rowdy Creek, facing downstream.

Rowdy and Dominie Creek Fish Passage Improvement Project
Site Photographs – June 12, 2020

Rowdy Creek instream habitat conditions immediately downstream of the concrete weir.

Eastern bank conditions downstream of concrete weir on Rowdy Creek, and confluence with Dominie Creek which enters Rowdy Creek on left. Note the numerous drops from concrete infrastructure present at mouth of Dominie Creek, and downstream of concrete weir.

Rowdy and Dominie Creek Fish Passage Improvement Project
Site Photographs – June 12, 2020

Eastern staging area conditions,

Appendix E – Record of Climatological Observations and WETS Table

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 07/08/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 120 ft. Lat: 41.9153° N Lon: -124.1360° W

Station: **SMITH RIVER 1.1 SSE, CA US US1CADN0006**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	05	01																
2020	05	02																
2020	05	03																
2020	05	04																
2020	05	05																
2020	05	06																
2020	05	07																
2020	05	08																
2020	05	09																
2020	05	10																
2020	05	11																
2020	05	12				0.57												
2020	05	13				0.53												
2020	05	14				0.59												
2020	05	15				0.13												
2020	05	16				0.02												
2020	05	17				0.64												
2020	05	18				1.28												
2020	05	19				0.10												
2020	05	20				0.02												
2020	05	21				0.00												
2020	05	22				T												
2020	05	23				0.01												
2020	05	24				0.01												
2020	05	25				T												
2020	05	26				0.00												
2020	05	27				0.00												
2020	05	28				0.00												
2020	05	29				0.00												
2020	05	30				0.03												
2020	05	31				1.39												
		Summary				5.32		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Current Location: Elev: 120 ft. Lat: 41.9153° N Lon: -124.1360° W
Station: **SMITH RIVER 1.1 SSE, CA US US1CADN0006**

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 07/08/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	06	01				0.02												
2020	06	02				0.01												
2020	06	03				T												
2020	06	04				T												
2020	06	05				0.01												
2020	06	06				T												
2020	06	07				0.23												
2020	06	08				0.09												
2020	06	09				0.02												
2020	06	10				0.00												
2020	06	11				0.00												
2020	06	12				0.00												
2020	06	13																
2020	06	14																
2020	06	15																
2020	06	16																
2020	06	17																
2020	06	18																
2020	06	19																
2020	06	20																
2020	06	21																
2020	06	22																
2020	06	23																
2020	06	24																
2020	06	25																
2020	06	26																
2020	06	27																
2020	06	28																
2020	06	29																
2020	06	30																
		Summary				0.38		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

"A" values in the Precipitation Flag or the Snow Flag column indicate a multiday total, accumulated since last measurement, is being used.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 08/21/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 120 ft. Lat: 41.9153° N Lon: -124.1360° W
Station: **SMITH RIVER 1.1 SSE, CA US US1CADN0006**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	07	01																
2020	07	02																
2020	07	03																
2020	07	04																
2020	07	05																
2020	07	06																
2020	07	07																
2020	07	08																
2020	07	09																
2020	07	10																
2020	07	11																
2020	07	12																
2020	07	13																
2020	07	14																
2020	07	15																
2020	07	16																
2020	07	17																
2020	07	18																
2020	07	19																
2020	07	20																
2020	07	21																
2020	07	22																
2020	07	23																
2020	07	24				0.00												
2020	07	25				0.00												
2020	07	26				T												
2020	07	27				T												
2020	07	28				0.00												
2020	07	29				0.00												
2020	07	30																
2020	07	31				0.02												
		Summary				0.02		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

U.S. Department of Commerce
National Oceanic & Atmospheric Administration
National Environmental Satellite, Data, and Information Service

Record of Climatological Observations

These data are quality controlled and may not be identical to the original observations.

Generated on 08/21/2020

National Centers for Environmental Information
151 Patton Avenue
Asheville, North Carolina 28801

Current Location: Elev: 120 ft. Lat: 41.9153° N Lon: -124.1360° W
Station: **SMITH RIVER 1.1 SSE, CA US US1CADN0006**

Observation Time Temperature: Unknown Observation Time Precipitation: Unknown

Year	Month	Day	Temperature (F)			Precipitation					Evaporation		Soil Temperature (F)					
			24 Hrs. Ending at Observation Time		At Observation	24 Hour Amounts Ending at Observation Time				At Obs. Time			4 in. Depth			8 in. Depth		
			Max.	Min.		Rain, Melted Snow, Etc. (in)	Flag	Snow, Ice Pellets, Hail (in)	Flag	Snow, Ice Pellets, Hail, Ice on Ground (in)	24 Hour Wind Movement (mi)	Amount of Evap. (in)	Ground Cover (see *)	Max.	Min.	Ground Cover (see *)	Max.	Min.
2020	08	01				0.01												
2020	08	02																
2020	08	03				0.00												
2020	08	04				0.01												
2020	08	05				0.04												
2020	08	06				0.01												
2020	08	07				0.02												
2020	08	08																
2020	08	09																
2020	08	10																
2020	08	11																
2020	08	12																
2020	08	13																
2020	08	14																
2020	08	15																
2020	08	16																
2020	08	17																
2020	08	18																
2020	08	19																
2020	08	20																
2020	08	21																
2020	08	22																
2020	08	23																
2020	08	24																
2020	08	25																
2020	08	26																
2020	08	27																
2020	08	28																
2020	08	29																
2020	08	30																
2020	08	31																
Summary						0.09		0.0										

Empty, or blank, cells indicate that a data observation was not reported.

*Ground Cover: 1=Grass; 2=Fallow; 3=Bare Ground; 4=Brome grass; 5=Sod; 6=Straw mulch; 7=Grass muck; 8=Bare muck; 0=Unknown

"s" This data value failed one of NCDC's quality control tests.

"T" values in the Precipitation or Snow category above indicate a "trace" value was recorded.

WETS Table

WETS Station: CRESCENT CITY MCNAMARA AP, CA								
Requested years: 2000 - 2020								
Month	Avg Max Temp	Avg Min Temp	Avg Mean Temp	Avg Precip	30% chance precip less than	30% chance precip more than	Avg number days precip 0.10 or more	Avg Snowfall
Jan	54.6	41.7	48.1	8.40	5.27	10.15	13	-
Feb	54.2	41.5	47.9	6.61	4.11	7.99	11	-
Mar	54.5	42.7	48.6	7.90	5.50	9.39	13	-
Apr	55.6	44.0	49.8	5.18	3.42	6.22	10	-
May	58.1	46.9	52.5	2.24	0.85	2.71	5	-
Jun	60.5	49.3	54.9	1.37	0.59	1.61	3	-
Jul	-	-	-	-	-	-	-	-
Aug	62.8	52.4	57.6	0.32	0.10	0.35	1	-
Sep	62.7	49.8	56.3	1.11	0.34	1.25	2	-
Oct	60.6	47.3	53.9	4.37	1.54	5.25	6	-
Nov	57.1	44.0	50.6	7.36	4.87	8.83	11	-
Dec	54.2	41.6	47.9	11.46	7.20	13.83	14	-
Annual:					-	-		
Average	-	-	-	-	-	-	-	-
Total	-	-	-	-			-	-

GROWING SEASON DATES

Years with missing data:	24 deg = 1	28 deg = 1	32 deg = 2
Years with no occurrence:	24 deg = 20	28 deg = 20	32 deg = 4
Data years used:	24 deg = 20	28 deg = 20	32 deg = 19
Probability	24 F or higher	28 F or higher	32 F or higher
50 percent *	No occurrence	No occurrence	Insufficient data
70 percent *	No occurrence	No occurrence	Insufficient data
* Percent chance of the growing season occurring between the Beginning and Ending dates.			

STATS TABLE - total precipitation (inches)

Yr	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annl
1949										MT	4.40	5.83	10.23
1950	16.78	7.37	9.36	3.72	1.02	1.82	0.08	0.08	1.39	18.76	7.60	11.15	79.13
1951	10.19	9.81	5.79	1.92	1.63	0.01	T	0.08	2.16	6.97	11.07	12.27	61.90
1952	13.04	7.44	5.12	2.07	2.21	1.30	T	0.01	0.32	M0.02			31.53
1953													
1954						3.72	0.41	1.91	1.97	2.36	7.40	13.77	31.54
1955													
1956													
1957													
1958													
1959													
1960													
1961													
1962													

1963													
1964													
1965													
1966													
1967													
1968													
1969													
1970													
1971													
1972													
1973													
1974													
1975													
1976													
1977													
1978													
1979													
1980													
1981													
1982													
1983													
1984													
1985													
1986													
1987													
1988													
1989													
1990													
1991													
1992													
1993													
1994													
1995													
1996													
1997													
1998													
1999													
2000							M0.00	M0.06	M0.64	M6.08	3.47	4.06	14.31
2001	3.72	4.37	2.82	3.45	2.01	1.85	0.73	0.87	0.64	3.24	10.10	12.64	46.44
2002	10.04	4.87	4.55	3.21	1.47	1.27	0.06	0.06	M0.25	0.03	4.16	18.82	48.79
2003	11.00	3.58	8.85	13.05	1.28	0.08	0.03	0.23	0.39	0.84	7.88	17.81	65.02
2004	8.72	11.20	4.21	3.68	1.24	0.25	0.11	1.10	0.96	7.58	2.58	12.57	54.20
2005	5.19	2.35	8.49	8.92	6.36	3.42	0.14	0.07	0.46	5.01	11.31	16.50	68.22
2006	17.03	6.67	14.35	5.48	2.33	1.68	0.02	0.08	0.28	1.23	15.32	13.95	78.42
2007	M3.79	10.44	4.85	4.00	M1.18	1.43	0.88	0.14	1.63	M5.91	6.29	8.90	49.44
2008	9.59	4.35	5.37	2.31	0.14	0.52	0.06	1.17	0.08	2.24	7.36	13.44	46.63
2009	2.85	9.05	7.83	1.39	3.73	0.25	0.08	0.12	0.70	2.80	7.75	7.47	44.02
2010	10.42	7.84	7.85	8.52	3.85	5.53	0.02	0.10	2.67	6.60	8.38	13.59	75.37
2011	3.66	5.31	14.38	5.70	4.67	1.34	0.43	0.08	M0.05	5.62	7.15	4.34	52.73

2012	12.20	M2.21	17.38	6.38	1.46	3.23	0.34	0.37	0.07	6.52	12.32	14.09	76.57
2013	5.20	3.27	4.79	3.05	2.50	1.12	0.00	0.24	4.81	0.11	2.52	1.31	28.92
2014	2.15	9.49	7.31	2.32	1.76	1.56	0.20	0.04	3.35	6.30	3.84	10.69	49.01
2015	1.73	7.93	5.48	5.23	0.01	0.56	0.07	1.09	0.90	2.40	8.10	24.18	57.68
2016	14.43	3.81	10.11	2.74	0.38	0.28	1.03	0.00	T	18.68	13.28	13.14	77.88
2017	12.22	14.27	10.50	8.76	1.80	1.64	0.00	0.03	1.26	2.03	9.25	2.74	64.50
2018	10.60	3.21	11.41	5.36	0.48	0.70	T	T	0.20	1.58	4.57	7.15	45.26
2019	10.26	16.47	4.63	7.87	3.29	T	0.03	0.64	2.89	2.51	1.66	11.77	62.02
2020	13.27	1.57	2.86	2.27	4.79	0.65	M0.00						25.41
Notes: Data missing in any month have an "M" flag. A "T" indicates a trace of precipitation.													
Data missing for all days in a month or year is blank.													
Creation date: 2016-07-22													

GHD

718 Third Street

Eureka, CA 95501

T: 707.443.8326 F: 707.444.8330 E: info@ghd.com

G:\561\11209093\Workshare\Phase 03 - Wetland Delineation and BRR\Task 3.1 - Wetland Delineation

www.ghd.com

Appendix G Geotechnical Report

Geotechnical Investigation

Rowdy Creek Fish Passage Improvement
Del Norte County, California

Tolowa Dee-ni' Nation

GHD | 718 3rd St, Eureka CA 95501 USA

11125168 | May 2018

May 8, 2018

Tim Hoone
Tolowa Dee-ni' Nation
140 Rowdy Creek Road
Smith River, California 95567

Dear Mr. Hoone,

RE: Geotechnical Investigation, Rowdy Creek Fish Passage Improvement

GHD is pleased to present the attached report containing the results of our geotechnical investigation for the proposed Tolowa Dee-ni' Nation Rowdy Creek Fish Passage Improvement project in Del Norte County, California. It is our understanding that the proposed project consists of the construction of a new reinforced concrete weir, and a soil nail retaining wall.

The accompanying report presents our findings, conclusions, and recommendations developed from our geotechnical investigation. Contained in the report are geotechnical design criteria and recommendations for design and construction of the proposed improvements and earthwork recommendations. The results of the subsurface exploration and laboratory testing programs, which form the basis of our recommendations, are also included in the report. On the basis of our investigation, the site is suitable, from a geotechnical perspective, to receive the planned improvements provided the recommendations presented in the report are incorporated into the design and construction of the project.

If you have any questions regarding the information contained in this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

GHD

Christopher D. Trumbull, P.E., G.E., D.GE
Senior Geotechnical Engineer

Table of Contents

1. Introduction 5
   - 1.1 Project Description 5
   - 1.2 Purpose and Scope of Work 5
2. Field Exploration and Laboratory Testing 5
   - 2.1 Field Exploration 5
   - 2.2 Exploratory Borings 6
   - 2.3 Geotechnical Laboratory Testing 6
3. Geologic and Subsurface Conditions 6
   - 3.1 Site Conditions 6
   - 3.2 Geologic Conditions 7
   - 3.3 Subsurface Conditions 7
     - 3.3.1 Faulting 7
     - 3.3.2 Groundwater Conditions 7
4. Conclusions 7
   - 4.1 Seepage and Weir Erosion 8
   - 4.2 Ground Shaking 8
   - 4.3 Corrosion 8
5. Recommendations 9
   - 5.1 Site Preparation and Earthwork 9
     - 5.1.1 Site Preparation 9
     - 5.1.2 Weir Cutoff 9
     - 5.1.3 Earthwork 9
     - **5.1.3.1** Wet Weather Earthwork 9
     - **5.1.3.2** General Subgrade Preparation 9
     - **5.1.3.3** Engineered Fill 10
     - **5.1.3.1** Compaction 10
     - **5.1.3.2** Trench Backfill and Pipe Bedding 10
   - 5.2 Foundations 11
     - 5.2.1 Bearing Capacity 11
     - 5.2.2 Passive Resistance 11
   - 5.3 Soil Nail Walls 11
   - 5.4 Seismic Design 12
   - 5.5 Surface Drainage and Erosion Control 13
   - 5.6 Construction Observation 13
6. References 13
7. Limitations 14

Table Index

Table 4.1 Soil Corrosion Results 8

Table 5.1 Import Fill Specifications 10

Table 5.2 Seismic Design Criteria 12

Appendix Index

Appendix A Figures

Appendix B Logs of Borings

Appendix C Geotechnical Laboratory Test Results

Distribution

To: Tolowa Dee-ni' Nation

Tim Hoone

Grants & Contracts Manager

140 Rowdy Creek Road

Smith River, CA 95567

From: GHD

Christopher Trumbull, P.E., G.E., D.GE

Kyle M. Jermstad, E.I.T.

4080 Plaza Goldorado Circle, Suite B

Cameron Park, CA 95682

1. Introduction

This report presents the findings, conclusions, and recommendations developed from our geotechnical engineering investigation. The investigation was conducted in accordance with the Contract between Tolowa Dee-ni' Nation and GHD dated July 26, 2016.

1.1 Project Description

The project site is located west of US Highway 101 and north of the Smith River in Smith River, California as shown on Figure A-1. The project consists primarily of the design and construction of a new reinforced concrete weir and picket fence system, roughened channel, fish trap and water diversion structure, and the removal of several existing concrete components. The structures on the northwest side of Rowdy Creek will retain up to about 12 feet of backfill. The slope on the west side of the confluence (near Boring B-4) is oversteepened and failing; a soil nail and shotcrete wall is planned to retain the slope.

1.2 Purpose and Scope of Work

The purpose of this study was to evaluate the suitability of the project site, from a geotechnical perspective, for the proposed improvements. The main objectives of the investigation were to characterize the subsurface materials, perform engineering analyses, develop geotechnical recommendations and criteria, and document our findings, conclusions, and recommendations in this report.

The scope of our geotechnical investigation included the following tasks:

- A review of published geologic and geotechnical material pertaining to the site vicinity
- A field exploration program consisting of six exploratory borings drilled to a maximum depth of 22 feet within the site to characterize the subsurface conditions
- Geotechnical laboratory testing on select soil samples collected from the borings
- Engineering analyses to develop geotechnical design criteria and recommendations for the proposed project
- Preparation of this report

2. Field Exploration and Laboratory Testing

2.1 Field Exploration

Subsurface conditions encountered are summarized in Section 3.3. Locations of the explorations are presented in Appendix A. Logs of the borings were prepared based on the field logging, visual examination of the soil samples in the laboratory and the results of laboratory testing. The soil boring key and the logs of borings are presented in Appendix B.

2.2 Exploratory Borings

Six borings were drilled on July 25 and 26, 2016 at the approximate locations shown on the Exploration Map, Figure A-2. Two borings (B-6 and B-7) were drilled near the bridge over Dominie Creek and are not shown on Figure A-2, since the bridge evaluation is no longer needed. Boring B-5 was previously planned, but not drilled due to property access.

The borings were located in the field based on estimated distances from the existing structures, topographic maps, and proposed improvements. The borings were drilled to a maximum depth of approximately 22 feet under the supervision of Kyle Jermstad of GHD utilizing a track-mounted CME-55 drill rig equipped with 6-inch hollow stem augers and 4-inch solid flight augers and a 140-pound automatic hammer.

The number of blows required for each 6-inch increment of drive were recorded and the cumulative blow count for the 12 inches of drive (following the first 6 inches of "seating" drive), or fraction thereof where resistance was encountered, is presented in the logs of borings. The blow counts for each 6-inch interval presented in the logs are uncorrected and shown as they were recorded in the field. The standardized N_{60} value is also presented and is calculated based on blow counts and coefficients. Coefficients include corrections for hammer efficiency, borehole diameter, sampler type, and rod length. Both the samples and drill cuttings were visually classified in the field based on the Unified Soil Classification System (USCS) in general accordance with ASTM D2488.

2.3 Geotechnical Laboratory Testing

Laboratory testing was conducted on disturbed soil samples recovered during the site investigation. Tests conducted include the following:

- Standard Test Method for Particle-Size Analysis of Soils (ASTM D422)
- Method of Testing Soil and Waters for Sulfate Content (CTM 417)
- Method of Testing Soil and Waters for Chloride Content (CTM 422)
- Method for Estimating the Service Life of Steel Culverts (CTM 643)
- Redox Potential ASTM G-200
- Sulfate Reducing Bacteria AWWA C105/A25.5

Geotechnical laboratory test results are presented in Appendix C.

3. Geologic and Subsurface Conditions

3.1 Site Conditions

The project is located in Smith River, California in Del Norte County. The hatchery site is relatively flat consisting primarily of gravel and grass at the surface. Adjacent to Rowdy Creek, the slopes ranged from approximately 1:1 (H:V) to near vertical. Existing structures include piping, pumps, gates, and a weir. Scour was observed on the downstream side of the weir in the gravels and cobbles that the weir was founded on. The scour resulted in a void approximately 1- to 2-feet tall

and 1- to 3-feet deep. Vegetation consists of large coniferous Sequoia trees, smaller deciduous shrubs and trees, and blackberry bushes.

3.2 Geologic Conditions

3.2.1 Geology

The site is located in the Coast Ranges geomorphic province. The site is located at the confluence of Dominie Creek and Rowdy Creek, a tributary to the Smith River. The site is mapped as Quaternary (Pliocene to Holocene) alluvium and marine deposits consisting of unconsolidated to semi-consolidated alluvium, lake, playa, and terrace deposits (Jennings, 1977 updated 2010).

3.2.2 Faulting

The site vicinity is located near the subduction zone of the Juan de Fuca Plate, Gorda Plate, Pacific Plate, and the North American Plate. The nearest fault with historic displacement is the Stephens Pass Fault, located approximately 122 miles to the southeast. The next closest active fault is the San Andreas fault zone, Shelter Cove section, located 126 miles to the south. According to the Alquist-Priolo Earthquake Fault Zone Act, the surrounding project area is not within a Special Studies Zone.

3.3 Subsurface Conditions

3.3.1 Subsurface Materials

Based on the results of our field mapping and subsurface exploration, the subsurface materials generally consisted of fill comprised of brown, loose to very dense gravel and silty gravel to depths of 2 to 15 feet below ground surface (bgs). The fill material was underlain by dense very dense silty gravel, medium dense cobbles, medium dense to dense clayey sand, very dense gravel to depths of 7 to 20 feet in all borings but Boring B-2. In Boring B-2, the fill material was underlain by bedrock at 8 feet bgs. In Borings B-1 to B-4, Basalt bedrock was encountered at depths of 7 to 20 feet bgs (Elev 33 to 43 feet, MSL). Detailed descriptions of the materials encountered in the borings are presented in the boring logs in Appendix B.

3.3.2 Groundwater Conditions

Groundwater was encountered at 12 feet to 20 feet below ground surface (Elevation 41 to 35 feet) near the hatchery and 20 feet below ground surface (Elevation 45 feet) at the Dominie Creek bridge. The depth of groundwater is expected to vary over time due to seasonal variations and other factors such as creek level and changes to site drainage.

4. Conclusions

On the basis of our investigation, the site is suitable, from a geotechnical perspective, to receive the planned improvements provided the recommendations presented in the report are incorporated into the design and construction of the project.

4.1 Seepage and Weir Erosion

The materials encountered at the depth of the weir are highly permeable and erodible.

4.2 Excavatability

Fresh basalt bedrock was encountered at Elevation 33 to 43 feet MSL in Borings B-1 to B-4. Typically, when the augers used during our exploration cannot penetrate bedrock, conventional excavating equipment cannot penetrate it. The augers only penetrated into the bedrock a few inches in most borings (2 feet in boring B-4). Therefore, the bedrock will be very difficult to excavate with a conventional excavator.

4.3 Ground Shaking

The site vicinity is generally characterized as having high seismicity. Using the USGS Seismic Hazard Tool Website considering the site location, ASCE 7-10/NEHRP, and Type C soils, the Peak Ground Acceleration (PGA) is 0.61g. Strong ground shaking at the site should be expected during an earthquake.

4.4 Corrosion

A soils corrosivity analysis is important for estimating and mitigating the deterioration of buried ferrous metals and concrete. We performed corrosion testing on samples from Borings B-1, B-4, and B-7. Test results are summarized below in Table 4.1 and presented in detail in Appendix C.

Table 4.1 Soil Corrosion Results

Sample No.	Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Water Soluble Sulfates (ppm)	Water Soluble Chlorides (ppm)	Redox Potential (mV)	Points
B-1	1.5	6.70	2,650	52.1	4.8	(+) 205.00	1
B-4	1.5	5.35	7,240	1.4	3.9	(+) 140.00	0
B-7	5.5	4.77	2,680	99.4	9.8	(+)175.00	1

According to ACI 318, a sulfate concentration less than 1,000 parts per million is considered “not applicable” (i.e., no mitigation required). A water soluble chloride content of less than 500 ppm is generally non-corrosive to reinforced concrete.

To evaluate the potential for external corrosion potential on ductile iron pipe from soil, the 10-point system in C105/A21.5 (ANSI/AWWA, 1999) was used, which resulted in one points for B-1 and B-7, and zero points for B-4. The long life of historical unprotected pipe in soil with less than 10 points indicates a non-corrosive environment (AWWA 2005).

The provided corrosion test results are only an indicator of potential soil corrosivity for the sample tested at the selected depth interval. It is possible that corrosion potential can vary by sample location and depth. Based on the results of the tested samples, the soil may be generally characterized as non-corrosive.

Our scope of services does not include corrosion engineering; therefore, a detailed analysis of the corrosion test results is not included in this report.

5. Recommendations

5.1 Site Preparation and Earthwork

5.1.1 Site Preparation

General site preparation should include removal of the existing weir structure. Any loose fill material should be removed and replaced with engineered fill, placed and compacted as recommended in this report. Voids or depressions created by the removal of buried objects should be cleaned of all loose soil and debris and backfilled with engineered fill, placed and compacted as described below.

5.1.2 Weir Cutoff

To minimize undermining of the proposed weir, a cementitious cutoff should extend from the bottom of the weir to the top bedrock. We estimate the cutoff would be two to four feet below the bottom of the weir. Actual conditions should be confirmed by GHD geotechnical staff during construction.

5.1.3 Earthwork

5.1.3.1 Wet Weather Earthwork

At the time of our field exploration, the existing near surface soils were dry to moist. These soils could become unworkable during and shortly after periods of rainfall and require drying to a workable moisture content. Ripping and mixing the material during dry days, or chemical treatment, can speed drying. Due to the time-consuming process of reducing moisture in soil, it is recommended to protect the fill material from becoming saturated during heavy storm events with polyethylene sheeting.

5.1.3.2 Excavatability

Since the fresh bedrock was encountered in our borings at Elevations 33 to 43 feet MSL, hammering and/or blasting may be necessary to excavate the bedrock below these elevations. The depth to bedrock at each boring location can be found in the boring logs in Appendix B.

5.1.3.3 General Subgrade Preparation

To provide uniform support for the proposed improvements, the subgrade in all areas to receive structural improvements should be excavated to firm native soil or bedrock, moisture conditioned as necessary, and compacted as engineered fill. Upon completion of subgrade preparation, engineered fill should be placed as described below.

5.1.3.4 Engineered Fill

Engineered fill should consist of a homogenous mixture of soil and rock free of vegetation, organic material, and rubble. Highly plastic or organic soils should not be used for engineered fill but may be placed in landscape areas.

We anticipate most of the material generated from excavation to be suitable for use as engineered fill. Concrete debris as encountered in Boring B-1 should be broken and screened to meet the particle size specifications listed below in Table 5.1.

Imported materials from offsite to be used as engineered fill should meet the specifications listed below in Table 5.1. GHD should be provided test results and observe and approve import fill submittal in writing prior to the material being brought on site.

Table 5.1 Import Fill Specifications

Atterberg Limits (ASTM D4318)	Particle Size (ASTM C136 or D422)
PI < 15 LL < 40	100% passing the 6-inch sieve minimum of 85% passing the 2-1/2 inch sieve maximum of 30% passing the #200 sieve

5.1.3.1 Compaction

Engineered fill should be moisture conditioned as necessary, placed in horizontal loose lifts not exceeding 8 inches in thickness, and compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557 for fills less than 5 feet in thickness. For fills thicker than 5 feet that have improvements (pavements, slabs, foundations, etc.) above or within, fill should be compacted to 95 percent of the maximum dry density as determined by ASTM D1557. Placement of fill material should be verified by a GHD representative on a continuous basis. Nuclear density testing should be performed at a frequency of 4 per 1,000 cubic yards of fill or at a minimum of 4 tests per day. Trench backfill should be tested every lift at a frequency of 100 linear feet.

5.1.3.2 Trench Backfill and Pipe Bedding

Trench backfill should meet the engineered fill specifications detailed above. Trench backfill should be placed in lifts not exceeding 12 inches in thickness and compacted to 95% of ASTM D1557 by mechanical means only (no jetting). Pipe bedding shall conform to the pipe manufacturer's recommendations.

5.1.3.3 Temporary Slopes/Shoring

Temporary slopes and shoring should conform to OSHA standards. Shored excavations should be constructed from the top down in cuts not exceeding 5 vertical feet in depth. Excavation of subsequent cuts should not be performed until shoring of the adjacent upper cut has been completed. Protection of workers and adjacent structures, shoring design, and the stability of all temporary slopes should be contractually established as solely the responsibility of the contractor.

5.2 Foundations

Provided herein are the foundation recommendations to be used for the design of foundations.

5.2.1 Bearing Capacity

The proposed weir may be supported by a spread foundation bearing on weathered bedrock or bearing on the alluvial deposits with a cutoff. The foundation should be designed using allowable bearing capacities of 3,000 pounds per square foot (psf) for dead loads and 4,500 psf for dead plus live loads. The allowable bearing capacity can be increased by 1/3 for all loads including wind and seismic. Adjacent foundations or parallel utility trenches should be located such that the bottom of the foundations are below an imaginary 2:1 (H:V) plane projected up from the bottom of adjacent foundations or trenches. A cutoff wall should be constructed at the upstream side of the weir extending to bedrock, blocking passages for water.

For foundations and subgrade designed and prepared as recommended in this report, differential settlements are expected to be on the order of ¼-inch over 20 feet. Total settlements on the order of ½-inch are anticipated.

GHD geotechnical staff should observe the footing excavations prior to placing reinforcing steel or concrete to verify that the footings are founded on the appropriate materials.

5.2.2 Lateral Resistance

Passive resistance in the form of an equivalent fluid pressure (EFP) of 400 pounds per cubic foot (pcf) should be used if the upper foot of soils is ignored. A friction coefficient of 0.4 is recommended. If the foundation is poured against neatly excavated soil without the use of forms, both the friction coefficient and the passive resistance may be used in design. Passive earth pressures provided herein assume that the zone of interest is above groundwater table and on a relatively level surface. If these conditions are not met in any of the foundation locations, GHD should be contacted to provide a reduced passive earth pressure value.

If a structure is above a 2:1 slope projected from the bottom of the footing, the passive pressure will be translated to the structure.

5.3 Retaining Walls

5.3.1 Soil Nail Walls

The proposed soil nail wall near the confluence of Dominie and Rowdy Creeks is considered unrestrained and undrained and should be analyzed as an active condition. An undrained active EFP of 80 pcf should be used for wall analysis. If drainage is provided, a drained active EFP of 40 pcf may be used. The pressure distribution on the wall should be analyzed for a uniform distribution of ½ the EFP. The proposed wall should also be analyzed for a seismic condition, where the seismic increment acts as an additional EFP of 15 pcf, applied in a non-inverted triangular distribution.

The soil nails should be free stressing within the active failure wedge, assumed to be a line 60 degrees from horizontal projected up from the bottom of wall. Capacities of the soil nail should be developed from the bonded length behind the active failure wedge. The nails should have a minimum bonded length of 20 feet and be designed to resist the EFPs presented above in the bonded length of the anchor. An allowable soil nail bond strength of 10 psi should be utilized for design of the anchors. The soil nail inclination should be in the range of 10 to 15 degrees from horizontal.

Verification testing should be performed on a non-production soil nail to confirm the pullout capacity, as specified by FHWA, 2015. Proof testing of soil nails should also be accomplished on a minimum of 5 percent of the production soil nails by applying a sustained proof load and measuring nail movement over a specified period of time, as specified by FHWA, 2015. A load cell capable of providing a capacity of two times the design capacity of the anchors should be used. The load cell should have been calibrated by a certified laboratory within the last six months, and the certificate should be submitted to GHD prior to testing.

5.3.2 Structure Walls

The proposed structure walls on the northwest side of Rowdy Creek are considered a restrained and undrained condition and should be analyzed as an at-rest condition. An undrained at-rest EFP of 90 pcf should be used for wall analysis. If drainage is provided, a drained active EFP of 60 pcf may be used. The proposed wall should also be analyzed for a seismic condition, where the seismic increment acts as an additional EFP of 43 pcf, applied in a non-inverted triangular distribution.

5.4 Seismic Design

The seismic design criteria for the site (41.928 lat, -124.144 lon), listed in the table below, were developed in accordance with ASCE 7-10 and 2009 NEHRP based on the subsurface information obtained from our geotechnical investigation.

Table 5.2 Seismic Design Criteria

Parameter	Recommended Value	Reference (ASCE/SEI7-10)
Site Class	C	Table 20.3-1
Mapped MCE spectral response at short period (S_S)	1.334 g	Figure 22-1
Mapped MCE spectral response at 1 sec period (S_1)	0.656 g	Figure 22-2
Site coefficient (F_a)	1.000	Table 11.4-1
Site coefficient (F_v)	1.300	Table 11.4-2
MCE spectral response acceleration for short period (S_{MS})	1.334 g	Equation 11.4-1
MCE spectral response acceleration for 1 sec period (S_{M1})	0.853 g	Equation 11.4-2
Design Spectral Acceleration for short period (S_{DS})	0.889 g	Equation 11.4-3
Design Spectral Acceleration for 1 sec period (S_{D1})	0.569 g	Equation 11.4-4

5.5 Surface Drainage and Erosion Control

Drainage around foundations and structures should be constructed in a way such that soils near the structures do not become saturated. In general, all construction surfaces should be graded to drain to prevent water from ponding.

Erosion control measures should be implemented for exposed surfaces potentially subject to soil erosion. Best Management Practices to reduce erosion and transport of soil particles or turbid water into the drainage course flowing from the construction site must be employed. All conditions of existing water quality regulatory agency permits must be adhered to.

5.6 Construction Observation

Our conclusions and recommendations are contingent upon GHD being retained to provide intermittent observation and appropriate field and laboratory testing during site preparation to evaluate if the subsurface conditions are as anticipated. If the subsurface conditions are observed to be different from those described in this report, we should be notified immediately so that the changed conditions can be evaluated and our recommendations revised, if appropriate. The recommendations in this report are contingent upon our notification and review of changed conditions. The services proposed above would be performed on an as-needed basis under a supplemental task order.

6. References

American Concrete Institute. 2014. “ACI 318-14 Building Code Requirements for Structural Concrete and Commentary.”

American Society of Civil Engineers. 2013. “ASCE Standard ASCE/SEI 7-10.”

ANSI/AWWA. 1999. “C105/A21.5, American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.”

AWWA. Bonds et al. 2005. “Corrosion and Corrosion Control of Iron Pipe, AWWA Journal 97.6.”

California Building Standards Commission. 2016. “California Building Code.”

Federal Highway Administration. 2015. “Soil Nail Walls Reference Manual”

Federal Highway Administration. 1999. “Geotechnical Engineering Circular No. 4, Ground Anchors and Anchored Systems”

Jennings, Charles W. 1977. “Geologic Map of California: California Division of Mines and Geology, scale 1:750,000.”

Jennings, Charles W. 2010. “Fault Activity Map of California and Adjacent Areas, California Geologic Survey, 1:750,000 scale.”

U.S. Geologic Survey. June 12, 2014. U.S. Seismic Design Maps. http://earthquake.usgs.gov/designmaps/us/application.php

7. Limitations

This Geotechnical Investigation ("Report"):

- Has been prepared by GHD for the Tolowa Dee-ni' Nation (TDN) under the professional supervision of those senior partners and/or senior staff whose seals and signatures appear herein
- May only be used and relied on by TDN, which is responsible to ensure that all relevant parties to the project, including designers, contractors, subcontractors, etc., are made aware of this report in its entirety
- Must not be copied to, used by, or relied on by any person other than TDN without the prior written consent of GHD
- May only be used for the purpose of engineering design of the proposed structures at the project site described in this report (and must not be used for any other purpose)

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than TDN arising from or in connection with this Report.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this Report.

The services undertaken by GHD in connection with preparing this Report:

- In regard to site exploration and testing:
  - Site exploration and testing characterizes subsurface conditions only at the locations where the explorations or tests are performed; actual subsurface conditions between explorations may be different than those described in this report. Variations of subsurface conditions from those analyzed or characterized in this report are not uncommon and may become evident during construction. In addition, changes in the condition of the site can occur over time as a result of either natural processes (such as earthquakes, flooding, or changes in ground water levels) or human activity (such as construction adjacent to the site, dumping of fill, or excavating). If changes to the site's surface or subsurface conditions occur since the performance of the field work described in this report, or if differing subsurface conditions are encountered, we should be contacted immediately to evaluate the differing conditions to assess if the opinions, conclusions, and recommendations provided in this report are still applicable or should be amended.
- In regard to limitations:
  - Our scope of services was limited to the proposed work described in this report, and did not address other items or areas.
  - The geotechnical investigation upon which this report is based was conducted for the proposed structures at the project site described in this report. The conclusions and recommendations contained in this report are not valid for other structures and/or project sites. If the proposed project is modified or relocated, or if the subsurface conditions found

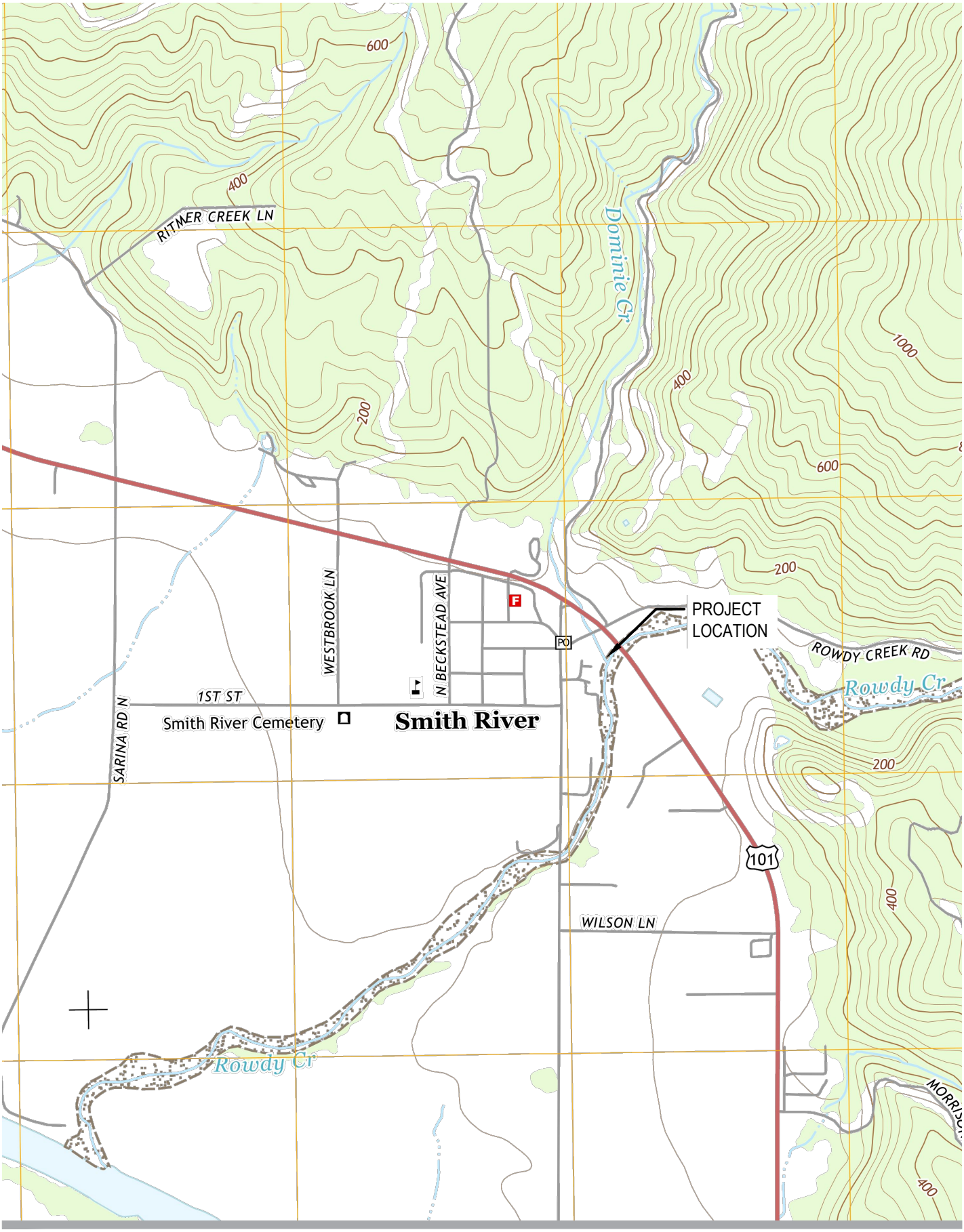
during construction differ from those described in this report, GHD should be provided the opportunity to review the new information or changed conditions to determine if our conclusions and recommendations need revision.

- Did not include evaluation or investigation of the presence or absence of wetlands
- Did not include a landslide evaluation
- Did not include a fault investigation

GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect. There is no warranty, either expressed or implied. GHD accepts no liability regarding completeness or accuracy of the information presented and/or provided to us, or any conclusions and decisions which may be made by the client or others regarding the subject site/project. Verification of our conclusions and recommendations is subject to our review of the project plans and specifications, and our observations of construction.

Subject to the paragraphs in this section of the Report, the interpretations of data, findings, conclusions, recommendations and professional opinions in this Report are based on the information reviewed, site conditions encountered, and samples collected during our field exploration and were developed in accordance with generally accepted geotechnical engineering principles and practices and as prescribed by the client. This Report is considered valid for the proposed project for a period of two years from the report date provided that the site conditions and development plans remain unchanged. With the passage of time, changes in the conditions of a property can occur due to natural processes or the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Depending on the magnitude of any changes, GHD may require that additional studies (at additional cost) be performed and that an updated report be issued. Additional studies may disclose information which may significantly modify the findings of this report. GHD will retain untested samples collected during our field investigation for a period not to exceed 60 days unless other arrangements are made with the client. After a period of two years from the report date, GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with those opinions, conclusions and any recommendations.

Appendix A
Figures



Tolowa Dee-ni' Nation
Rowdy Creek Fish Passage Improvement
Del Norte County, CA

Project No. **11125168**
Revision No. **0**
Date **8/10/17**

Vicinity Map

Figure A-1

1"=30' 0 15 30

N

GHD

Tolowa Dee-ni' Nation
Rowdy Creek Fish Passage Improvement
Del Norte County, CA

Project No. **11125168**
Revision No. **0**
Date **8/10/17**

Exploration Map

Figure A-2

Appendix B
Logs of Borings

EMPIRICAL CORRELATIONS WITH STANDARD PENETRATION RESISTANCE N VALUES*

FINE GRAINED SOIL	N Value * (Blows/ft)	Consistency	Unconfined Compressive Strength (tons/sq ft)
	0 - 2	Very Soft	<0.25
	3 - 4	Soft	0.25 - 0.50
	5 - 8	Medium Stiff	0.50 - 1.00
	9 - 15	Stiff	1.00 - 2.00
	16 - 30	Very Stiff	2.00 - 4.00
	>30	Hard	>4.00

COARSE GRAINED SOIL	N Value * (Blows/ft)	Relative Density
	0 - 4	Very Loose
	5 - 10	Loose
	11 - 30	Medium Dense
	31 - 50	Dense
	>50	Very Dense

*ASTM D 1586; number of blows of 140 pound hammer falling 30 inches to drive a 2-inch-O.D., 1.4-inch-I.D. sampler one foot.

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

MAJOR DIVISIONS			SYMBOLS	DESCRIPTIONS
COARSE GRAINED SOIL	GRAVEL AND GRAVELLY SOIL	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		LITTLE OR NO FINES	GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		APPRECIABLE AMOUNT OF FINES	GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOIL	CLEAN SANDS	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		LITTLE OR NO FINES	SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES	SM	SILTY SANDS, SAND - SILT MIXTURES
		APPRECIABLE AMOUNT OF FINES	SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOIL	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOIL			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

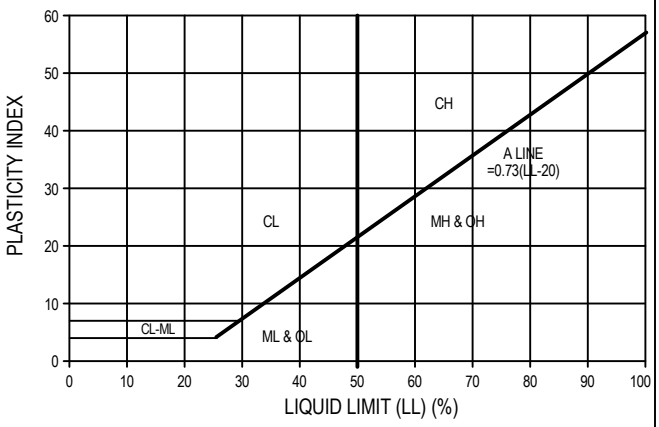
PARTICLE SIZE IDENTIFICATION

BOULDERS	>12 in
COBBLES	3 - 12 in
GRAVEL: COARSE	3/4 - 3 in
GRAVEL: FINE	No.4 - 3/4 in
SAND: COARSE	No.10 - No.4
SAND: MEDIUM	No.40 - No.10
SAND: FINE	No.200 - No.40
SILT	0.002 mm - No.200
CLAY	<0.002 mm

WELL GRADED - HAVING WIDE RANGE OF GRAIN SIZES AND APPRECIABLE AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES

POORLY GRADED - PREDOMINATELY ONE GRAIN SIZE, OR HAVING A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING

PLASTICITY CHART



SAMPLE SYMBOLS

- SPT (1.375 I.D.)
- California (2.0-inch I.D.)
- California Modified (2.5-inch I.D.)
- No Recovery
- Shelby Tube
- Auger Sample

WELL SYMBOLS

- Cement Grout
- Bentonite
- Filter Sand
- Screen in filter sand
- Slough
- RX (Bedrock)

WATER LEVEL SYMBOLS

- Water level at time of drilling.
- Water level measured at a specified time after drilling and sampling or well completion.

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Soil descriptions and stratum lines are interpretive, and actual changes may be gradual. Field descriptions may have been modified to reflect results of laboratory tests.
2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations.
3. Abbreviations:

CD = TX-CD	NR = No Recovery
CN = Consolidation	PR = Permeability
CR = Corrosivity	RV = R-Value
CU = TX-CU	TC = Cyclic Triaxial
DS = Direct Shear	UC = Unconfined Compression
EI = Expansion Index	UU = TX-UU (quick)
MDD = Maximum Density	ATD= At Time of Drilling

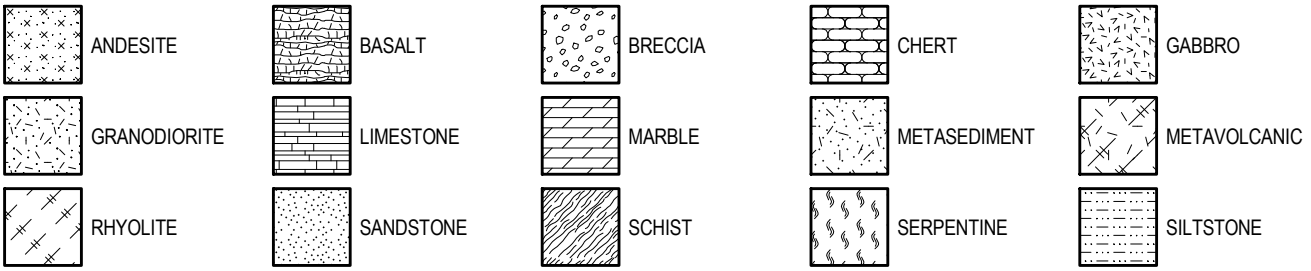
GHD

Tolowa Dee-ni' Nation
Rowdy Creek Fish Passage Improvement
Del Norte County, CA

Project No. 11125168
Revision No. 0
Date 8/23/2017

Soil Boring Key

COMMON ROCK SYMBOLS



Description: Lithologic description in this order: rock type, color, texture, grain size, foliation, weathering, strength, and other features followed by discontinuity descriptions A-H

KEY TO DESCRIPTIVE TERMS USED FOR ROCK

ROCK WEATHERING / ALTERATION

Description	Recognition
Residual Soil	Original minerals of rock have been enirely decomposed to secondary minerals, and original rock fabric is not apparent; material can be easily broken by hand.
Completely Weathered/Altered	Original minerals of rock have been almost entirely decomposed to secondary minerals, although original fabric may be intact; material can be granulated by hand.
Highly Weathered/Altered	More than half of the rock is decomposed; rock is weakened so that a minimum 2-inch-diameter sample can be broken readily by hand across rock fabric.
Moderately Weathered/Altered	Rock is discolored and noticeably weakened, but less than half is decomposed; a minimum 2-inch-diameter sample connot be broken readily by hand across rock fabric.
Slightly Weathered/Altered	Rock is slightly discolored, but not noticeably lower in strength than fresh rock.
Fresh	Rock shows no discoloration, loss of strength, or other effect of weathering/alteration.

ROCK STRENGTH

Description	Recognition	Approximate Uniaxial Compressive Strength (psi)
Extremely Weak Rock	Can be indented by thumbnail.	35 - 150
Very Weak Rock	Can be peeled by pocket knife.	150 - 700
Weak Rock	Can be peeled with difficulty by pocket knife.	700 - 3,500
Medium Strong Rock	Can be indented 5 mm with sharp end of pick.	3,500 - 7,200
Strong Rock	Requires one hammer blow to fracture.	7,200 - 14,500
Very Strong Rock	Requires many hammer blows to fracture.	14,500 - 35,000
Extremely Strong Rock	Can only be chipped with hammer blows.	>35,000

DISCONTINUITY DESCRIPTIONS

a — Dip of fracture surface measued relative to horizontal.

b — **Discontinuity Type:**
- F - Fault
- J - Joint
- Sh - Sheer
- Fo - Foliation
- V - Vein
- B - Bedding

c — **Discontinuity Width (Inches):**
- W - Wide (0.5-2.0)
- MW - Moderately Wide (0.1-0.5)
- N - Narrow (0.05-0.1)
- VN - Very Narrow (<0.05)
- T - Tight (0)

d — **Type of Infilling:**
- Ch - Chlorite
- Fe - Iron Oxide
- Fld - Feldspar
- No - None
- Mn - Manganese
- Py - Pyrite
- Qz - Quartz
- Sd - Sand

e — **Amount of Infilling:**
- Su - Surface Stain
- Sp - Spotty
- Pa - Partially Filled
- Fi - Filled
- No - None

f — **Surface Shape of Joint:**
- Wa - Wavy
- Pl - Planar
- St - Stepped
- Ir - Irregular

g — **Roughness of Surface:**
- Slk - Slickensided (surface has smooth, glassy finish with visual evidence of striations)
- S - Smooth (Surface appears smooth and feels so to the touch)
- SR - Slightly Rough (asperities on the discontinuity surfaces are distinguishable and can be felt)
- R - Rough (some ridges and side-angle steps are evident: asperities are clearly visible, and discontinuity surface feels very abrasive.
- VR - Very Rough (near-vertical steps and ridges occur on the discontinuity surface)

h — **Discontinuity Spacing (feet):**
- EW - Extremely Wide (>6)
- W - Wide (2-6)
- M - Moderate (0.7-2)
- C - Close (0.2-0.7)
- VC - Very Close (<0.2)

Lab Testing
- CI - Cerchar Index
- UC - Unconfined Compression Test
- PL - Point Load Index
- BS - Brazilian Splitting Test

Start Date:	7/26/17			Total Depth Drilled (ft bgs):	20.6
Drilling Method:	6-inch Hollow Stem Auger		Drilling Contractor: Taber Drilling	Arbitrary Ground Surface Elevation (ft MSL):	53
Drill Rig:	CME-55		Hammer Type/ Efficiency: Automatic Trip/ 87%	Hammer Weight / Drop:	140# / 30"
Logged By:	Kyle Jermstad	Reviewed By: C. Trumbull	Borehole Backfill: cement grout	Groundwater Depth (ft):	10ft ATD 12ft after 14

Remarks:

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}	% Passing No. 4 Sieve	% Passing No. 200 Sieve	Other Tests
52	0	FILL: Brown GRAVEL (GW), with concrete rubble, dry, dense								
	2			MC	1-1A 1-1	11 12 19	23			CR
50										
	4									
48										
	6			SPT	1-2	8 27 15	58	37	3	
46										
	8									
44										
	10	ATD becomes wet and loose		SPT	1-3	3 2 3	7			
42										
	12	14								
40										
	14									
38		NATIVE: Brown silty GRAVEL (GM), rounded, wet, very dense		SPT	1-4	50/5"	50+			
	16									
36										
	18									
34										
	20	Basalt, gray, weathered to fresh Boring terminated at 20' bgs		SPT	1-5	50/1"	50+			
32										
	22									
30										

Start Date:	**7/26/17**			Total Depth Drilled (ft bgs):	**8.0**
Drilling Method:	**4-inch Flight Auger**		Drilling Contractor: **Taber Drilling**	Arbitrary Ground Surface Elevation (ft MSL):	**51**
Drill Rig:	**CME-55**		Hammer Type/ Efficiency: **Automatic Trip/ 87%**	Hammer Weight / Drop:	**140# / 30"**
Logged By:	**Kyle Jermstad**	Reviewed By: **C. Trumbull**	Borehole Backfill: **cement grout**	Groundwater Depth (ft):	**Not Encountered ATD**
Remarks:					

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}
50	0	FILL: Light brown silty GRAVEL (GM)					
48	2						
46	4						
44	6						
42	8	Boring terminated at 8' bgs due to auger refusal.					
40	10						
38	12						
36	14						
34	16						
32	18						
30	20						
28	22						

Start Date:	7/25/17			Total Depth Drilled (ft bgs):	7.0
Drilling Method:	6-inch Hollow Stem Auger		Drilling Contractor: Taber Drilling	Arbitrary Ground Surface Elevation (ft MSL):	50
Drill Rig:	CME-55		Hammer Type/ Efficiency: Automatic Trip/ 87%	Hammer Weight / Drop:	140# / 30"
Logged By:	Kyle Jermstad	Reviewed By: C. Trumbull	Borehole Backfill: cement grout	Groundwater Depth (ft):	Not Encountered ATD

Remarks:

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}	% Passing No. 4 Sieve	% Passing No. 200 Sieve
48	2	FILL: Gray silty GRAVEL (GM), dry, medium dense		MC	3-1	7 10 12	17		
		Brown silty COBBLES, rounded, dry, medium dense							
46	4								
		Brown silty GRAVEL (GM), with sand and cobbles, fine to coarse grained rounded gravel, fine-grained sand, dry, dense to very dense		MC	3-2	8 9 50/5"	50+		
44	6								
		Boring terminated at 7' bgs due to auger refusal.							
42	8								
40	10								
38	12								
36	14								
34	16								
32	18								
30	20								
28	22								

Start Date:	**7/26/17**			Total Depth Drilled (ft bgs):	**22.0**
Drilling Method:	**6-inch Hollow Stem Auger**		Drilling Contractor: **Taber Drilling**	Arbitrary Ground Surface Elevation (ft MSL):	**55**
Drill Rig:	**CME-55**		Hammer Type/ Efficiency: **Automatic Trip/ 87%**	Hammer Weight / Drop:	**140# / 30"**
Logged By: **Kyle Jermstad**	Reviewed By: **C. Trumbull**		Borehole Backfill: **cement grout**	Groundwater Depth (ft):	**20ft ATD**
Remarks:					

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}	% Passing No. 4 Sieve	% Passing No. 200 Sieve	Other Tests
54	0	FILL: Brown silty GRAVEL (GM), subangular gravel, dry, very dense								
	2			MC	4-1A	21	65			CR
52					4	38				
	4					49				
50		becomes medium dense								
	6			SPT	4-2	10	22			
48						7				
	8	Brown clayey SAND (SC) with gravel, fine- to coarse-grained sand, fine gravel, trace silt, moist, dense				9				
46										
	10			SPT	4-3	15	35	76	29	
44						12				
	12					12				
42										
	14									
40										
	16			SPT	4-4	4	16			
38						4				
	18					6				
36										
	20	ATD ▽								
34		BASALT, gray, non foliated, weathered to fresh		SPT	4-5	35	50+			
	22					50/				
				SPT	4-6	50/3"	50+			
32		Boring terminated at 22 bgs due to refusal								

Start Date:	**7/26/17**			Total Depth Drilled (ft bgs):	**20.1**
Drilling Method:	**6-inch Hollow Stem Auger**		Drilling Contractor: **Taber Drilling**	Arbitrary Ground Surface Elevation (ft MSL):	**65**
Drill Rig:	**CME-55**		Hammer Type/ Efficiency: **Automatic Trip/ 87%**	Hammer Weight / Drop:	**140# / 30"**
Logged By: **Kyle Jermstad**	Reviewed By: **C. Trumbull**		Borehole Backfill: **cement grout**	Groundwater Depth (ft):	**20ft ATD**

Remarks:

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}	% Passing No. 4 Sieve	% Passing No. 200 Sieve
64		FILL (AB): Gray silty GRAVEL (GM), subargular gravel, dry							
	2	Dark brown clayey SAND (SC) with gravel, low plasticity fines, fine-grained sand, fine to coarse subrounded gravel, moist, medium dense		MC	6-1	17 11 12	17		
62									
	4								
60									
	6			MC	6-2	6 6 8	11		
58									
	8								
56									
	10			SPT	6-3	5 6 6	18		
54									
	12								
52		BASALT, gray, completely weathered							
	14								
50									
	16			SPT	6-4	38 17 10	42		
48									
	18								
46									
	20	ATD Boring terminated at 20'1" bgs due to refusal		SPT	6-5	50/1"	50+		
44									
	22								
42									

Start Date:	7/26/17			Total Depth Drilled (ft bgs):	20.3
Drilling Method:	6-inch Hollow Stem Auger		Drilling Contractor: Taber Drilling	Arbitrary Ground Surface Elevation (ft MSL):	68
Drill Rig:	CME-55		Hammer Type/ Efficiency: Automatic Trip/ 87%	Hammer Weight / Drop:	140# / 30"
Logged By:	Kyle Jermstad	Reviewed By: C. Trumbull	Borehole Backfill: cement grout	Groundwater Depth (ft):	Not Encountered ATD

Remarks:

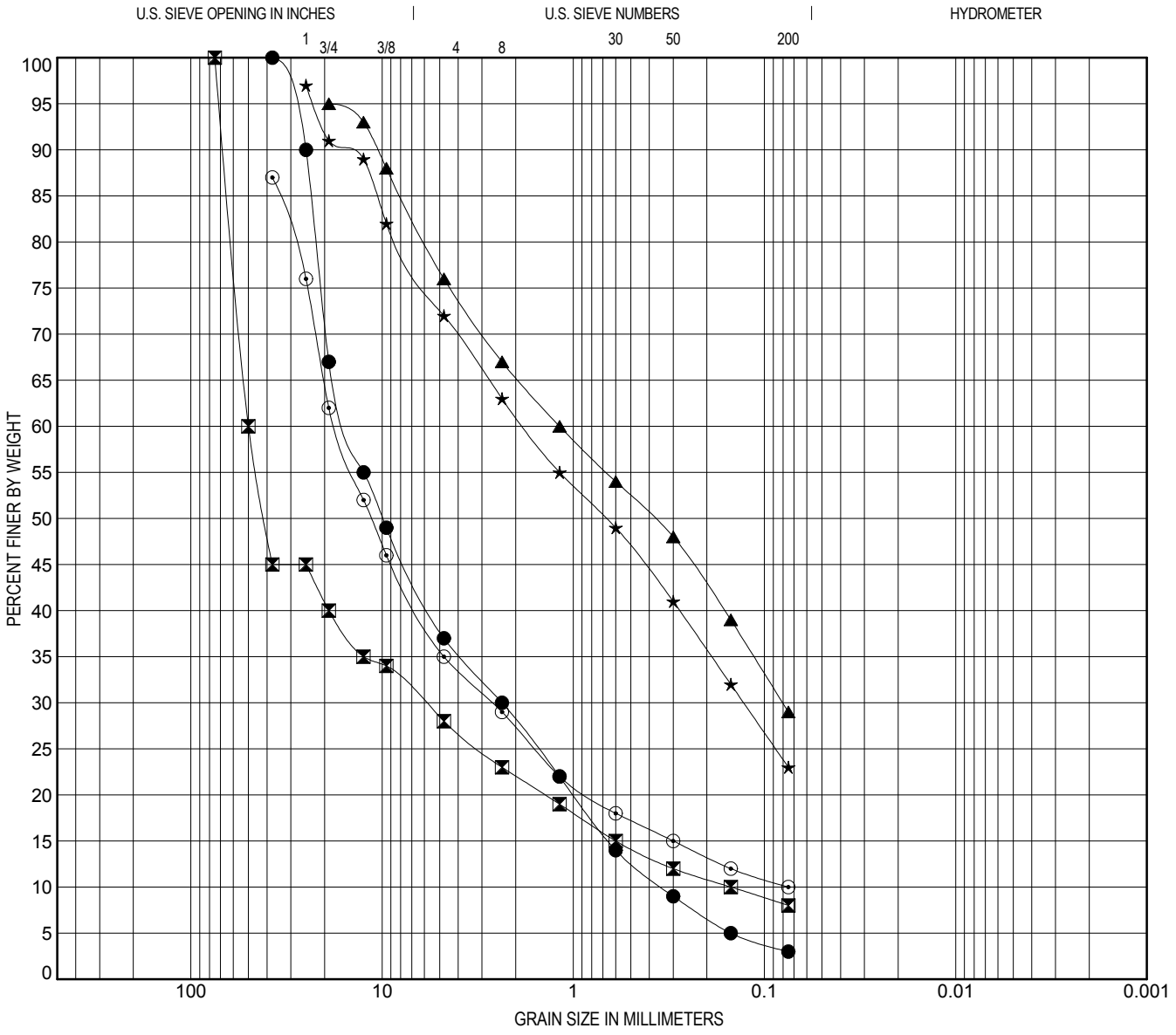
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}	% Passing No. 4 Sieve	% Passing No. 200 Sieve	Other Tests
		FILL: Brown GRAVEL (GW) with sand, fine to coarse, subrounded gravel, fine-grained sand, trace silt, dry, very dense		MC	7-1	50/6"	50+			
66	2									
64	4									
		becomes medium dense to dense		MC	7-2A 7-2B	6 5 10	11			CR
62	6									
60	8									
58	10			SPT	7-3A 7-3B	28 20 22	62	35	10	
56	12									
54	14									
		Brown GRAVEL (GW) with sand, fine to coarse grained subrounded gravel, fine- to coarse-grained sand, moist, very dense		SPT	7-4A 7-4B	18 27 50	120			
52	16									
		SANDSTONE, brown, weathered								
50	18									
48	20			SPT	7-5	50/3"	50+			
		Boring terminated at 20'3" bgs								
46	22									

Start Date:	**7/26/17**			Total Depth Drilled (ft bgs):	**1.0**
Drilling Method:	**Hand Tools**		Drilling Contractor:	**Taber Drilling**	Arbitrary Ground Surface Elevation (ft MSL): **48**
Drill Rig:	**CME-55**		Hammer Type/ Efficiency:	**N/A/ 87%**	Hammer Weight / Drop: **140# / 30"**
Logged By:	**Kyle Jermstad**	Reviewed By:	Borehole Backfill:		Groundwater Depth (ft): **Not Encountered ATD**
Remarks:					

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Type	Sample/Run No.	Blows/6"	N_{60}
		Brown sandy GRAVEL (GW), with cobbles and boulders, fine to coarse gravel, coarse-grained sand		BK	8-1		
		Boring terminated at 1' bgs due to refusal.					
46	2						
44	4						
42	6						
40	8						
38	10						
36	12						
34	14						
32	16						
30	18						
28	20						
26	22						

Appendix C
Geotechnical Laboratory Test Results

Boring ID	Depth (ft)	Description	Water Content (%)	Dry Density (pcf)	Maximum Size (mm)	%<#200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Other Tests
B-1	1.5	Brown silty GRAVEL (GM)								CR
B-1	5.0	Brown silty GRAVEL (GM)			37.5	3				
B-3	6.0	Brown silty GRAVEL (GM)			75	8				
B-4	1.5	Brown silty GRAVEL (GM)								CR
B-4	10.0	Brown clayey SAND (SC)			19	29				
B-6	6.0	Dark brown clayey SAND (SC)			25	23				
B-7	5.5	Brown GRAVEL (GW) with sand			4.75	0				CR
B-7	11.0	Brown GRAVEL (GW) with sand			37.5	10				



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	C_c	C_u
●	B-1	5.0	Brown silty GRAVEL (GM)				1.09	43.19
⊠	B-3	6.0	Brown silty GRAVEL (GM)				4.78	333.33
▲	B-4	10.0	Brown clayey SAND (SC)					
★	B-6	6.0	Dark brown clayey SAND (SC)					
⊙	B-7	11.0	Brown GRAVEL (GW) with sand				5.37	232.98

	Specimen Identification		D_{100}	D_{90}	D_{85}	D_{50}	D_{15}	D_{10}	%Gravel	%Sand	%Silt	%Clay
●	B-1	5.0	37.5	25	23.552	9.945	0.653	0.345	63.0	34.0	3.0	
⊠	B-3	6.0	75	67.77	64.421	41.274	0.6	0.15	72.0	20.0	8.0	
▲	B-4	10.0	19	10.602	7.989	0.378			19.0	47.0	29.0	
★	B-6	6.0	25	15.411	10.686	0.672			25.0	49.0	23.0	
⊙	B-7	11.0	37.5		34.835	11.407	0.3	0.075	52.0	25.0	10.0	

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/16/2017
Date Submitted 08/11/2017

To: Alex Fiorilli
GHD
4080 Plaza Goldorado Cir. B
Cameron Park, CA 95682

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 11125168 Site ID : SAM1 1-1A.
Thank you for your business.

* For future reference to this analysis please use SUN # 75010-156553.

EVALUATION FOR SOIL CORROSION

Soil pH	6.70	
Moisture	3.7 %	
Minimum Resistivity	2.65 ohm-cm (x1000)	
Chloride	4.8 ppm	00.00048 %
Sulfate	52.1 ppm	00.00521 %
Redox Potential	(+) 205 mv	
Sulfides	Presence - NEGATIVE	

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/16/2017
Date Submitted 08/11/2017

To: Alex Fiorilli
GHD
4080 Plaza Goldorado Cir. B
Cameron Park, CA 95682

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 11125168 Site ID : SAM2 4-1A.
Thank you for your business.

* For future reference to this analysis please use SUN # 75010-156554.

EVALUATION FOR SOIL CORROSION

Soil pH	5.35	
Moisture	3.0 %	
Minimum Resistivity	7.24 ohm-cm (x1000)	
Chloride	3.9 ppm	00.00039 %
Sulfate	1.4 ppm	00.00014 %
Redox Potential	(+) 140 mv	
Sulfides	Presence - NEGATIVE	

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/16/2017
Date Submitted 08/11/2017

To: Alex Fiorilli
GHD
4080 Plaza Goldorado Cir. B
Cameron Park, CA 95682

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 11125168 Site ID : SAM3 7-2A.
Thank you for your business.

* For future reference to this analysis please use SUN # 75010-156555.

EVALUATION FOR SOIL CORROSION

Soil pH	4.77		
Moisture	15.6 %		
Minimum Resistivity	2.68 ohm-cm (x1000)		
Chloride	9.8 ppm	00.00098	%
Sulfate	99.4 ppm	00.00994	%
Redox Potential	(+) 175 mv		
Sulfides	Presence - NEGATIVE		

METHODS
pH and Min.Resistivity CA DOT Test #643 Mod.(Sm.Cell)
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
Redox Potential ASTM G-200, Sulfides AWWA C105/A25.5

GHD

4080 Plaza Goldorado Circle
Suite B
Cameron Park, CA 95682 USA
T: 1 530 677 5515

Appendix H Asbestos and Naturally Occurring Asbestos Technical Memo

Technical Memorandum

08/25/2020

To:	Jennifer Jacobs, Tolowa Dee-ni' Nation	Ref. No.:	11209093.07
From:	Matt Tolley, Ryan Crawford, PG, GHD	Tel:	707 267 0958
cc:	Kerry McNamee, GHD		

Subject: **TDN – Rowdy and Dominie Creek Fish Passage Improvement Project – Asbestos and NOA Soil Sampling Assessment**

1. Introduction

The Tolowa Dee-ni' Nation (TDN) retained GHD to conduct an environmental soil assessment for Naturally Occurring Asbestos (NOA) including a pre-demolition survey for asbestos at the TDN Rowdy Creek Fish Hatchery (Hatchery). The assessments were conducted on April 22 and August 7, 2020 in support of the Rowdy and Dominie Creek Fish Passage Improvement Project (Project). The Project vicinity is presented in Figure 1 (Vicinity Map), located in Appendix A. A major component of the Project includes demolition and removal of instream infrastructure to accommodate the proposed improvements. A National Emissions Standards for Hazardous Air Pollutants pre-demolition survey is required for any commercial facility demotion. The pre-demolition survey was conducted to characterize existing infrastructure for asbestos in association with specific pieces of infrastructure to be demolished and removed during Project construction. A NOA soil sampling survey was conducted to assess the general presence of naturally occurring asbestos in the site soils to be encountered during Project area disturbance. The area surveyed for NOA in soils is presented in Figure 2 (Project Study Boundary) located in Appendix A. Serpentine rock is geologically prevalent in the Project area and can be geomorphically and fluvially transported great distances from the original source areas. NOA represents a potential public and worker health and safety hazard. The sampling was conducted to assess the potential asbestos exposure risk associated with Project demolition for residents living in the area, Hatchery personnel and contractors. This Technical Memorandum (Memo) presents the results of the asbestos and NOA soil sampling assessment, herein the survey.

1.1 Asbestos Sampling Survey

On April 22 2020, GHD conducted a National Emissions Standards for Hazardous Air Pollutants (NESHAP) pre-demolition survey at the Hatchery in association with planned Project actions. GHD collected a total of 32 bulk samples for Phase Light Microscopy (PLM) analysis from areas proposed for demolition. All samples were reported non-detect (ND) by the analyzing laboratory. Project demolition areas are presented in Figure 3 (Demolition Areas) located in Appendix A. A copy of laboratory analytical is located in Appendix B (Laboratory Analytical). A summary of sample results is provided below in Table 1.1 (Asbestos PLM Sample Results).

Table 1.1 Asbestos PLM Sample Results

Sample Number	Sample Description	Location	Analytical Result
11209093-Rowdy Creek (R1)	Concrete Box Channel Wall (grey)	Rowdy Creek - Fish Trap at Box Channel Wall Outlet at Hydraulic Arm Base	Non Detect (NAD)
R2	Concrete Stairs (grey)	Rowdy Creek - Fish Trap - River Right Bank - 1st Stair Landing at Corner	NAD
R3	Concrete Wall (grey)	Rowdy Creek - Fish Trap - River Right Bank at Fish Trap Upstream Entrance	NAD
R4	Concrete Riprap Wall (light/dark grey)	Rowdy Creek - Fish Trap - Right Bank - Upstream 1st Stair Landing - Above Fish Trap at Corner	NAD
R5	Paint (grey/silver)	Rowdy Creek - Fish Trap - Right Bank - Fence Hydraulic Arm Frame at Center West	NAD
R6	Concrete Foundation (grey)	Rowdy Creek - Fish Trap - Right Bank - Fence Hydraulic Arm Foundation at Center	NAD
R7	Concrete Stairs (grey)	Rowdy Creek - Fish Trap - River Right Bank - Fish Trap at Bottom Stair	NAD
R8	Concrete Riprap (light grey)	Rowdy Creek - Fish Trap - Right Bank - Adjoining 1st Stair Landing at Corner	NAD
R9	Concrete Headwall (grey)	Rowdy Creek - Fish Trap - Right Bank Wall at Center - Below Riprap	NAD
R10	Concrete Headwall (grey)	Rowdy Creek - Fish Trap - Right Bank - Upstream Wall at Center at Fish Trap Entrance	NAD
R11	Concrete Stair (grey)	Rowdy Creek - Fish Trap - Right Bank at Step	NAD
R12	Concrete Headwall (grey)	Rowdy Creek - Right Bank - Headwall Above Concrete Wedge	NAD
R13	Concrete Horizontal Access Walkway Support (grey)	Rowdy Creek and Dominie Creek Confluence - Fish Ladder (to remain) at Access Walkway at NE Corner	NAD
R14	Concrete Wedge (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at NW Corner	NAD
R15	Concrete Wedge Step (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at Downstream Concrete Wedge Drain at 12" O.D. 1/2 Pipe	NAD
R16	Concrete Wedge Drain (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at Downstream Concrete Drain Wall at Dominie Crk Fish Ladder	NAD
R17	12" O.D. Drain (white)	Rowdy Creek and Dominie Creek Confluence - Wedge Drain at Dominie Crk Fish Ladder	NAD
R18	Concrete Apron (grey)	Rowdy Creek - River Left Bank - Concrete Apron at SW Corner - Below Headwall	NAD
R19	Concrete Headwall (grey)	Rowdy Creek - River Left Bank - Headwall Above Concrete Curtain	NAD
R20	Concrete Riprap (dark grey)	Rowdy Creek - River Left Bank - Downstream From Apron/Headwall	NAD

Sample Number	Sample Description	Location	Analytical Result
R21	Concrete Apron (grey)	Rowdy Creek - River Left Bank - Concrete Apron at Center of Creek	NAD
R22	Concrete Riprap (dark grey)	Rowdy Creek - Right Bank - Diversion Housing at Concrete rubble/riprap	NAD
Dominie Creek (D-1)	Concrete Center Pier (grey)	Dominie Creek - Center Pier at NE corner at Confluence	NAD
D-2	Concrete Walkway (grey)	Dominie Creek - Access Walkway - Above Center Pier at Center North at Confluence	NAD
D-3	Concrete Walkway Support Structure (light grey)	Dominie Creek - Access Walkway - Above Center Pier at SE Corner	NAD
D-4	Concrete Curtain (light grey)	Dominie Creek - Confluence with Rowdy Creek - Concrete Curtain at NW Corner at Confluence	NAD
D-5	Concrete Riprap (dark grey/light grey)	Dominie Creek - Right Bank at Confluence	NAD
D-6	12" O.D. Pipe Gasket (black)	Dominie Creek - Pipe Crossing Walkway at Existing 12" O.D. Pipe at Confluence	NAD
D-7	8" O.D. Pipe Flange Gasket (red)	Dominie Creek - Pipe Crossing Walkway at Existing 8" O.D. Pipe Flange at Confluence	NAD
D-8	Concrete Channel Headwall (grey)	Dominie Creek - North Wall - Center at Diversion Structure	NAD
D-9	Concrete Sluice Gate Channel Wall (grey)	Dominie Creek - West Wall - Center at Diversion Structure at Left Channel	NAD
D-10	Concrete Channel Headwall (grey)	Dominie Creek - Center at Diversion Structure at Left Channel	NAD

1.2 NOA Soil Sampling Survey

On August 7, 2020, GHD conducted NOA soil sampling at 9 (nine) specific locations determined by the Project Limit of Disturbance (pictured in Figure 2 as the “Project Study Boundary”). The Limit of Disturbance was divided into three sections (North Staging Area, Creek Channel, and South Lot). Sample locations were determined using a Random Point Generation tool for representative sampling within the anticipated footprint of Project construction. Composite soil samples were collected from a vertical soil column (soil to surface), containerized, mixed, and representative composite sample collected as per California Air Resource Board (CARB) Test Method 435. Samples were reported by the analyzing laboratory to be non-detect via California Air Resource Board (CARB) Test Method 435, 1000 Point Count. Sample locations are noted below and found on Figure 2 (NOA Sample Location Map): A summary of sample locations and results is provided below in Table 1.2 (NOA Sample Results).

Table 1.2 NOA Soil Sample Results

Sample Number	Sample Description	Location	Analytical Result	Analysis
11209093-NOA-1	Soil (0-6")	North Staging Area 1 - (0-6" bgs)	NAD	CARB 435 PT CT 1000
11209093-NOA-2	Soil (0-6")	North Staging Area 2 - (0-6" bgs)	NAD	CARB 435 PT CT 1000
11209093-NOA-3	Soil (0-24")	Dominie Creek - East Bank above OWHM	NAD	CARB 435 PT CT 1000
11209093-NOA-4	Soil (0-12")	Rowdy Creek - Creek Channel 1 at Rock Slope	NAD	CARB 435 PT CT 1000
11209093-NOA-5	Soil (0-12")	Rowdy Creek - Creek Channel 2 at Rock Slope	NAD	CARB 435 PT CT 1000
11209093-NOA-6	Soil (0-12")	Rowdy Creek - Creek Channel 3 at Access Road/Rock Slope	NAD	CARB 435 PT CT 1000
11209093-NOA-7	Soil (0-24")	Rowdy Creek - Creek Channel 4 at Rock Slope at Bank	NAD	CARB 435 PT CT 1000
11209093-NOA-8	Soil (0-6")	Rowdy Creek - South Lot 1 at Staging Area	NAD	CARB 435 PT CT 1000
11209093-NOA-9	Soil (0-6")	Rowdy Creek - South Lot 2 at Access Area	NAD	CARB 435 PT CT 1000

2. Conclusion

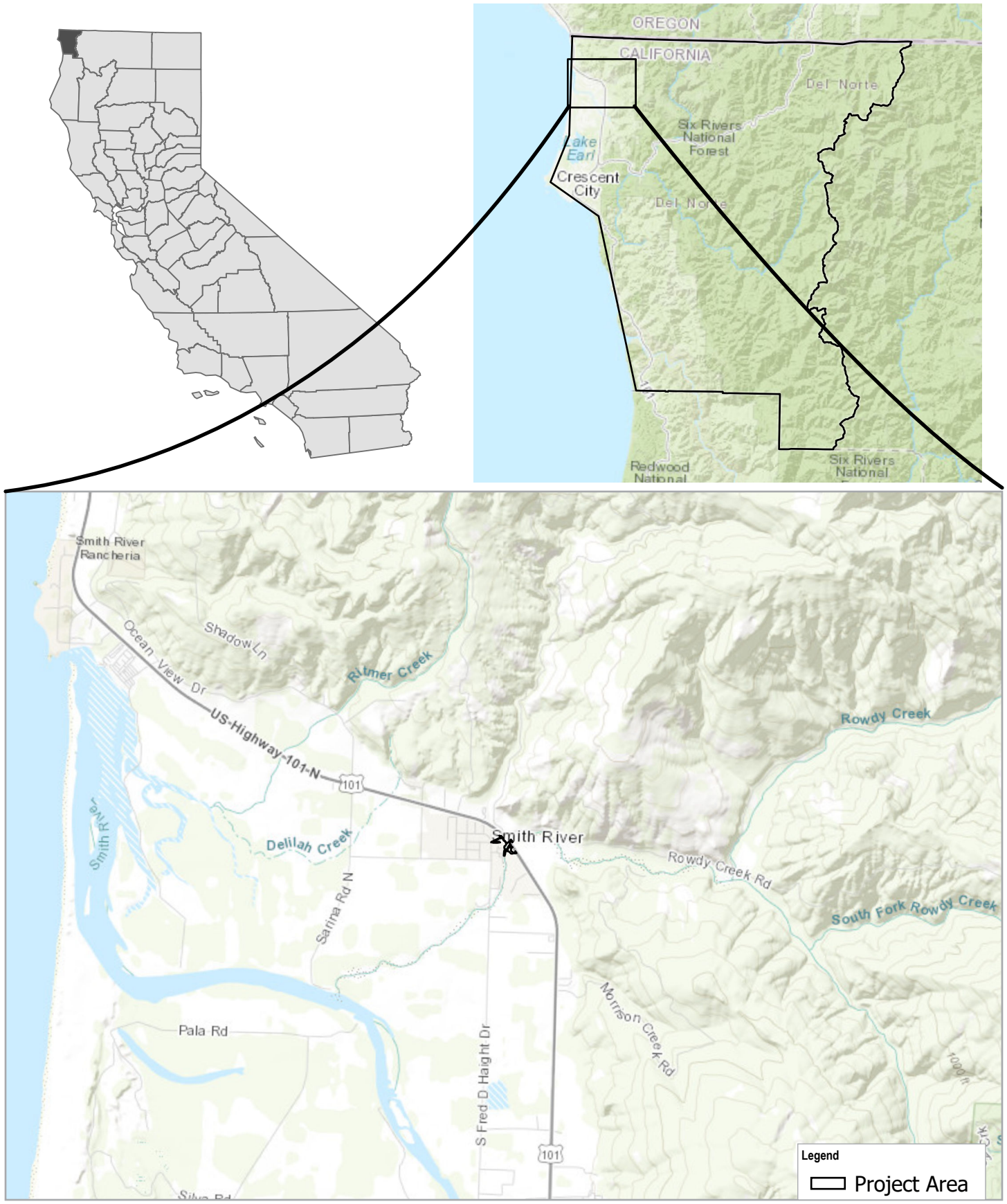
Since NOA is known to exist in small and large quantities within the Smith River watershed area and noted on geological maps in the vicinity's mountainous slopes, and a NOA survey doesn't include inspection and analysis of every Project surface to be graded and disturbed; the potential to generate naturally occurring asbestos containing fugitive dust is a real possibility. Therefore, GHD recommends an Asbestos Dust Mitigation Plan (ADMP) approved by the North Coast Unified Air Quality Management District (NCUAQMD) to support future construction activities. A component of the ADMP would include fugitive dust control measures to be employed by the contractor and perimeter air monitoring protocol for asbestos during construction work to monitor and document potential public and worker exposure to NOA.

Document Status

Rev # 0	Author/Editor	Approved for Issue	Signature/Stamp
		Ryan Crawford, PG	
1	Matt Tolley	August 26, 2020	

Appendices

Appendix A – Figures



Paper Size ANSI A

0 2,500 5,000

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

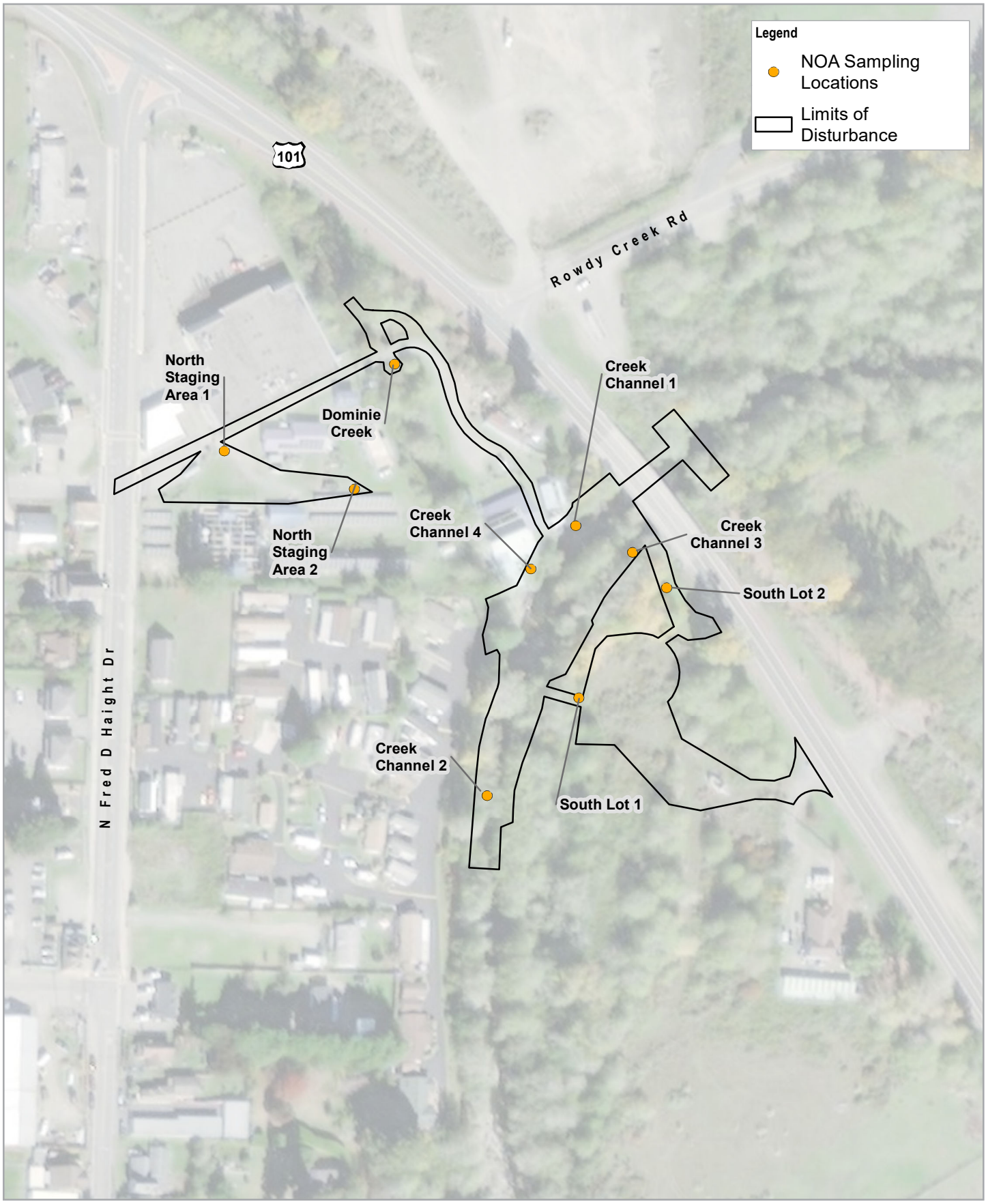
Project No. **11209093**
Revision No. **-**
Date **Mar 2020**

Vicinity Map

FIGURE 1

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_001_Vicinity
Print date: 09 Mar 2020 - 17:00

Data source: World_Topo_Map: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

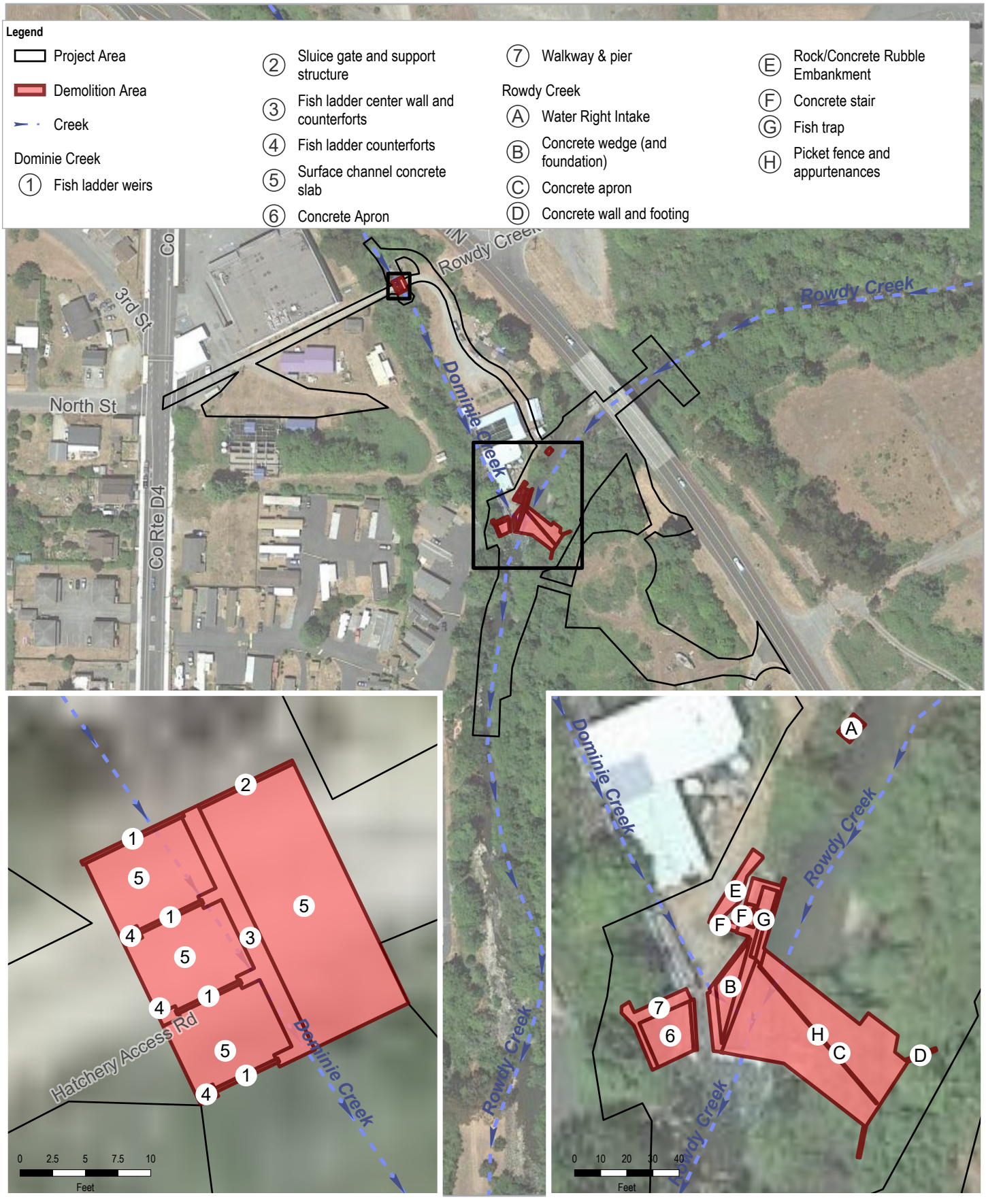
Naturally Occurring Asbestos Sampling Locations

Project No. 11209093
Revision No. -
Date June 2020

FIGURE 2

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\11209093_001_NOA_Sampling_RevA.mxd
Print date: 15 Jun 2020 - 10:28

Data source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community. Created by: jclark2



Paper Size ANSI A

0 50 100 150 200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

N

GHD

Tolowa Dee-ni' Nation
Rowdy and Dominie Creek
Fish Passage Improvement Project

Project No. **11209093**
Revision No. **-**
Date **Apr 2020**

Demolition Areas

FIGURE 3

N:\US\Eureka\Projects\561\11209093\GIS\Maps\Deliverables\ISNMD\11209093_ISMND\11209093_ISMND.aprx - 11209093_003_DemolitionAreas
Print date: 10 Apr 2020 - 09:06

Data source: Google Earth Imagery; Google Maps Sat: © OpenStreetMap (and) contributors, CC-BY-SA. Created by: jclark2

Appendix B – Laboratory Analytical Results

SGS FORENSIC LABORATORIES

Final Report

Bulk Asbestos Analysis

(EPA Method 40CFR, Part 763, Appendix E to Subpart E and EPA 600/R-93-116, Visual Area Estimation)
NVLAP Lab Code: 101459-0

GHD, Inc.
Project Manager
Consulting & Engineering
718 3rd Street
Eureka, CA 95501

Client ID: 1883
Report Number: B303408
Date Received: 05/01/20
Date Analyzed: 05/05/20
Date Printed: 05/05/20
First Reported: 05/05/20

Job ID/Site: 11209093.7 - TDN-Rowdy Creek Fish, Rowdy + Dominie Creeks

SGSFL Job ID: 1883
Total Samples Submitted: 32
Total Samples Analyzed: 32

Date(s) Collected: 04/22/2020

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
11209093-RowdyC-R1	12300886						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R2	12300887						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R3	12300888						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R4	12300889						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R5	12300890						
Layer: Silver/Grey Paint			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R6	12300891						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							

3777 Depot Road, Suite 409, Hayward, CA 94545 / Telephone: (510) 887-8828 (800) 827-FASI / Fax: (510) 887-4218

Report Number: B303408

Client Name: GHD, Inc. **Date Printed:** 05/05/20

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
11209093-RowdyC-R7	12300892						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R8	12300893						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R9	12300894						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R10	12300895						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R11	12300896						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R12	12300897						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R13	12300898						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R14	12300899						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							

3777 Depot Road, Suite 409, Hayward, CA 94545 / Telephone: (510) 887-8828 (800) 827-FASI / Fax: (510) 887-4218

Report Number: B303408

Client Name: GHD, Inc. **Date Printed:** 05/05/20

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
11209093-RowdyC-R15	12300900						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R16	12300901						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R17	12300902						
Layer: White Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R18	12300903						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R19	12300904						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R20	12300905						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R21	12300906						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-RowdyC-R22	12300907						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							

3777 Depot Road, Suite 409, Hayward, CA 94545 / Telephone: (510) 887-8828 (800) 827-FASI / Fax: (510) 887-4218

Report Number: B303408

Client Name: GHD, Inc. **Date Printed:** 05/05/20

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
11209093-DomineC-D1	12300908						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D2	12300909						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D3	12300910						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D4	12300911						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D5	12300912						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D6	12300913						
Layer: Black Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D7	12300914						
Layer: Red Non-Fibrous Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D8	12300915						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							

3777 Depot Road, Suite 409, Hayward, CA 94545 / Telephone: (510) 887-8828 (800) 827-FASI / Fax: (510) 887-4218

Report Number: B303408

Client Name: GHD, Inc. **Date Printed:** 05/05/20

Sample ID	Lab Number	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer	Asbestos Type	Percent in Layer
11209093-DomineC-D9	12300916						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							
11209093-DomineC-D10	12300917						
Layer: Grey Cementitious Material			**ND**				
Total Composite Values of Fibrous Components:		**Asbestos (ND)**					
Analyst: JNOMURA Date Analyzed: 05/05/20							

Tad Thrower, Laboratory Supervisor, Hayward Laboratory

Note: Limit of Quantification ('LOQ') = 1%. 'Trace' denotes the presence of asbestos below the LOQ. 'ND' = 'None Detected'.

3777 Depot Road, Suite 409, Hayward, CA 94545 / Telephone: (510) 887-8828 (800) 827-FASI / Fax: (510) 887-4218

718 3rd Street **Eureka, California** **Ph: (707) 443-8326** **Fax: (707) 444-8330**	**Contact Name:**	Matt Tolley	**Sample Date:**	4/22/2020
	Contact Email:	scott.harris@ghd.com, matt.tolley@ghd.com, alex.crowe@ghd.com	**Client:**	TDN - Rowdy Creek Fish
	Analysis Method:	PLM (Asbestos) - please provide result for each layer where multiple materials exist	**Site:**	Rowdy & Dominie Creeks
	Turnaround Time:	**Standard**	**Project #:**	11209093.7

11209093

Sample Number	Sample Description	Location	USEPA Material Type	Friability
11209093-Rowdy Creek (R1)	Concrete Box Channel Wall (grey)	Rowdy Creek - Fish Trap at Box Channel Wall Outlet at Hydraulic Arm Base	MM	NF
R2	Concrete Stairs (grey)	Rowdy Creek - Fish Trap - River Right Bank - 1st Stair Landing at Corner	MM	NF
R3	Concrete Wall (grey)	Rowdy Creek - Fish Trap - River Right Bank at Fish Trap Upstream Entrance	MM	NF
R4	Concrete Riprap Wall (light/dark grey)	Rowdy Creek - Fish Trap - Right Bank - Upstream 1st Stair Landing - Above Fish Trap at Corner	MM	NF
R5	Paint (grey/silver)	Rowdy Creek - Fish Trap - Right Bank - Fence Hydraulic Arm Frame at Center West	MM	NF
R6	Concrete Foundation (grey)	Rowdy Creek - Fish Trap - Right Bank - Fence Hydraulic Arm Foundation at Center	MM	NF
R7	Concrete Stairs (grey)	Rowdy Creek - Fish Trap - River Right Bank - Fish Trap at Bottom Stair	MM	NF
R8	Concrete Riprap (light grey)	Rowdy Creek - Fish Trap - Right Bank - Adjoining 1st Stair Landing at Corner	MM	NF
R9	Concrete Headwall (grey)	Rowdy Creek - Fish Trap - Right Bank Wall at Center - Below Riprap	MM	NF
R10	Concrete Headwall (grey)	Rowdy Creek - Fish Trap - Right Bank - Upstream Wall at Center at Fish Trap Entrance	MM	NF
R11	Concrete Stair (grey)	Rowdy Creek - Fish Trap - Right Bank at Step	MM	NF
R12	Concrete Headwall (grey)	Rowdy Creek - Right Bank - Headwall Above Concrete Wedge	MM	NF
R13	Concrete Horizontal Access Walkway Support (grey)	Rowdy Creek and Dominie Creek Confluence - Fish Ladder (to remain) at Access Walkway at NE Corner	MM	NF
R14	Concrete Wedge (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at NW Corner	MM	NF

Relinquished by: Matthew A. Tolley / [illegible]
Date/time: 4/29/20 @ 15:00 TO FEDEX

Received by: [illegible]
Date/time: RECEIVED MAY 01 2020 cjm FX

R15	Concrete Wedge Step (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at Downstream Concrete Wedge Drain at 12" O.D. 1/2 Pipe	MM	NF
R16	Concrete Wedge Drain (grey)	Rowdy Creek and Dominie Creek Confluence - Wedge at Downstream Concrete Drain Wall at Dominie Crk Fish Ladder	MM	NF
R17	12"O.D. Drain (white)	Rowdy Creek and Dominie Creek Confluence - Wedge Drain at Dominie Crk Fish Ladder	MM	NF
R18	Concrete Apron (grey)	Rowdy Creek - River Left Bank - Concrete Apron at SW Corner - Below Headwall	MM	NF
R19	Concrete Headwall (grey)	Rowdy Creek - River Left Bank - Headwall Above Concrete Curtain	MM	NF
R20	Concrete Riprap (dark grey)	Rowdy Creek - River Left Bank - Downstream From Apron/Headwall	MM	NF
R21	Concrete Apron (grey)	Rowdy Creek - River Left Bank - Concrete Apron at Center of Creek	MM	NF
R22	Concrete Riprap (dark grey)	Rowdy Creek - Right Bank - Diversion Housing at Concrete rubble/riprap	MM	NF
Domine Creek (D-1)	Concrete Center Pier (grey)	Dominie Creek - Center Pier at NE corner at Confluence	MM	NF
D-2	Concrete Walkway (grey)	Dominie Creek - Access Walkway - Above Center Pier at Center North at Confluence	MM	NF
D-3	Concrete Walkway Support Structure (light grey)	Dominie Creek - Access Walkway - Above Center Pier at SE Corner	MM	NF
D-4	Concrete Curtain (light grey)	Dominie Creek - Confluence with Rowdy Creek - Concrete Curtain at NW Corner at Confluence	MM	NF
D-5	Concrete Riprap (dark grey/light grey)	Domine Creek - Right Bank at Confluence	MM	NF
D-6	12" O.D. Pipe Gasket (black)	Dominie Creek - Pipe Crossing Walkway at Existing 12" O.D. Pipe at Confluence	MM	NF
D-7	8" O.D. Pipe Flange Gasket (red)	Dominie Creek - Pipe Crossing Walkway at Existing 8" O.D. Pipe Flange at Confluence	MM	NF
D-8	Concrete Channel Headwall (grey)	Dominie Creek - North Wall - Center at Diversion Structure	MM	NF
D-9	Concrete Sluice Gate Channel Wall (grey)	Dominie Creek - West Wall - Center at Diversion Structure at Left Channel	MM	NF
D-10	Concrete Channel Headwall (grey)	Dominie Creek - Center at Diversion Structure at Left Channel	MM	NF

Relinquished by: Michael A. Tuma / [signature]
Date/time: 4/29 / 3:15 PM to Fedex

Received by:
Date/time:

RECEIVED
MAY 01 2020
DPO

Please Reply To:

AmeriSci Los Angeles
24416 S. Main Street, Ste 308
Carson, California 90745
TEL: (310) 834-4868 • FAX: (310) 834-4772

FACSIMILE TELECOPY TRANSMISSION

To:	Scott Harris GHD	**From:**	Arturo A. Aldana
		AmeriSci Job #:	920081332
Fax #:		**Subject:**	PLM-CARB 435 - 1000 pt ct 5 day
		Client Project:	11209093.07; Tolowa Di Nee Nation; Rowdy Creek Fish Hatchery
Email:	scott.harris@ghd.com,matthew.tolley@ghd.com,alexander.crowe@ghd.com,RYAN.CRAWFORD@ghd.com		

Date: Tuesday, August 18, 2020
Time: 12:49:38
Comments:

Number of Pages: 4 (including cover sheet)

AmeriSci Los Angeles
24416 S. Main Street, Ste 308
Carson, California 90745
TEL: (310) 834-4868 • FAX: (310) 834-4772

PLM Bulk Asbestos Report

GHD
Attn: Scott Harris
718 3rd Street

Eureka, CA 95501

Date Received 08/12/20 **AmeriSci Job #** 920081332
Date Examined 08/18/20 **P.O. #** 38005125
Page 1 **of** 2

RE: 11209093.07; Tolowa Di Nee Nation; Rowdy Creek Fish Hatchery

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
11209093-NOA-1	920081332-01	*No*	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-6") / North Staging Area 1 - (O-6" Bgs)			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil			
Asbestos Types:			
Other Material: Non-Asbestos/Inert 100 %			
11209093-NOA-2	920081332-02	*No*	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-6") / North Staging Area 2 - (O-6" Bgs)			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil			
Asbestos Types:			
Other Material: Non-Asbestos/Inert 100 %			
11209093-NOA-3	920081332-03	*No*	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-24") / Dominie Creek - East Bank Above OWHM			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil			
Asbestos Types:			
Other Material: Non-Asbestos/Inert 100 %			
11209093-NOA-4	920081332-04	*No*	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-12") / Rowdy Creek - Creek Channel 1 At Rock Slope			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil			
Asbestos Types:			
Other Material: Non-Asbestos/Inert 100 %			
11209093-NOA-5	920081332-05	*No*	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-12") / Rowdy Creek - Creek Channel 2 At Rock Slope			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil			
Asbestos Types:			
Other Material: Non-Asbestos/Inert 100 %			

See Reporting notes on last page

PLM Bulk Asbestos Report

11209093.07; Tolowa Di Nee Nation; Rowdy Creek Fish Hatchery

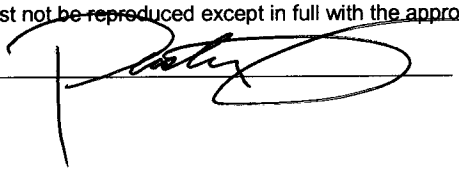
Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
11209093-NOA-6	920081332-06	***No***	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-12") / Rowdy Creek - Creek Channel 3 At Access Road / Rock Slope			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil **Asbestos Types:** **Other Material:** Non-Asbestos/Inert 100 %			
11209093-NOA-7	920081332-07	***No***	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-24") / Rowdy Creek - Creek Channel 4 At Rock Slope At Bank			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil **Asbestos Types:** **Other Material:** Non-Asbestos/Inert 100 %			
11209093-NOA-8	920081332-08	***No***	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-6") / Rowdy Creek - South Lot 1 At Staging Area			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil **Asbestos Types:** **Other Material:** Non-Asbestos/Inert 100 %			
11209093-NOA-9	920081332-09	***No***	NAD [1] (by 1000 pt ct) by Arturo A. Aldana on 08/18/20
Location: Soil (0-6") / Rowdy Creek - South Lot 2 At Access Area			
Analyst Description: Brown, Heterogeneous, Non-Fibrous, Soil **Asbestos Types:** **Other Material:** Non-Asbestos/Inert 100 %			

Reporting Notes:

(1) Sample analyzed by California Air Resources Board - Method 435 for serpentine aggregate using 1000 Point Count analysis.

Analyzed By: Arturo A. Aldana at ala; Date Analyzed: 8/18/2020 8/18/20

*NAD = no asbestos detected; Detection Limit <1%; Reporting Limits: CVES = 1%, 400 Pt Ct = 0.25%, 1000 Pt Ct = 0.1%; NA = not analyzed; NA/PS = not analyzed / positive stop; NVA = No Visible Asbestos; PLM (polarized light microscopy) Bulk Asbestos Analysis by EPA 600/R-93/116, including requirements for EPA 600/M4-82-020 per 40 CFR 763 (NVLAP Lab #200346-0); Note: PLM is not consistently reliable in detecting asbestos in floor coverings and similar NOB materials. TEM is currently the only method that can be used to determine if this material can be considered or treated as non-asbestos-containing in New York State (also see EPA Advisory for floor tile, FR 59, 146, 38970, 8/1/94). NIST Accreditation requirements mandate that this report must not be reproduced except in full with the approval of the laboratory. This PLM report relates ONLY to the items tested.

Reviewed By: 

920 81332

718 3rd Street
Eureka, California
Ph: (707) 443-8326
Fax: (707) 444-8330

Contact Name:	Matt Tolley	**Sample Date:**	8/7/2020
Contact Email:	matt.tolley@ghd.com, ryan.crawford@ghd.com	**Client:**	Tolowa Di Nee Nation
Analysis Method:	CARB 435 - 1000 PT CT (NOA/Asbestos)	**Site:**	Rowdy Creek Fish Hatchery
Turnaround Time:	**5 - DAY**	**Project #:**	11209093.07

PN: 11209093.07 - PO: 38005125

Sample Number	Sample Description	Location	Material Type	Analysis
11209093-NOA-1	Soil (0-6")	North Staging Area 1 - (0-6" bgs)	Soil	CARB 435 PT CT 1000
11209093-NOA-2	Soil (0-6")	North Staging Area 2 - (0-6" bgs)	Soil	CARB 435 PT CT 1000
11209093-NOA-3	Soil (0-24")	Dominie Creek - East Bank above OWHM	Soil	CARB 435 PT CT 1000
11209093-NOA-4	Soil (0-12")	Rowdy Creek - Creek Channel 1 at Rock Slope	Soil	CARB 435 PT CT 1000
11209093-NOA-5	Soil (0-12")	Rowdy Creek - Creek Channel 2 at Rock Slope	Soil	CARB 435 PT CT 1000
11209093-NOA-6	Soil (0-12")	Rowdy Creek - Creek Channel 3 at Access Road/Rock Slope	Soil	CARB 435 PT CT 1000
11209093-NOA-7	Soil (0-24")	Rowdy Creek - Creek Channel 4 at Rock Slope at Bank	Soil	CARB 435 PT CT 1000
11209093-NOA-8	Soil (0-6")	Rowdy Creek - South Lot 1 at Staging Area	Soil	CARB 435 PT CT 1000
11209093-NOA-9	Soil (0-6")	Rowdy Creek - South Lot 2 at Access Area	Soil	CARB 435 PT CT 1000

Relinquished by: Matthew Tolley / [signature] / CCST
Date/time: 8/10/20 @ 1615 / TO FEDEX

Recieved by: [signature]
Date/time: 8/12/20 @ 10:25