DESIGN REPORT

NASON CREEK RM 4.7–RM 3.3 RESTORATION PROJECT

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January 2014

ICF International. 2014. *Design Report: Nason Creek RM 4.7–RM 3.3 Restoration Project*. January. (ICF 00098.13). Bellingham, WA. Prepared for the Chelan County Natural Resources Department, Wenatchee, WA.

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Acronyms and Abbreviations

2D	two-dimensional
Biological Strategy	Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region
BMPs	best management practices
CCNRD	Chelan County Natural Resources Department
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
DBH	diameter at breast height
Ecology	Washington State Department of Ecology
ESA	Endangered Species Act
ESCL	Erosion and Spill Control Lead
HEC-RAS	Hydrologic Engineering Centers River Analysis System
HUC	Hydrologic Unit Code
ICF	ICF International
JARPA	Joint Aquatic Resources Permit Application
LiDAR	light detection and ranging
NAD83	North American Datum 1983
NAVD88	North American Vertical Datum 1988
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OHWM	ordinary high water mark
project	Nason Creek RM 4.7–RM 3.3 Restoration Project
Recovery Plan	Upper Columbia Salmon Recovery Board Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan
REI	reach-based ecosystem indicators
RM	river mile
SR	State Route
SRFB	Salmon Recovery Fund Board
TMDL	Total Maximum Daily Load
UCRTT	Upper Columbia Regional Technical Team
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

Chapter 1
Overview

1.1 Summary

Nason Creek, a tributary to the Wenatchee River in Chelan County, Washington, contains spawning, rearing, and migration habitats for Endangered Species Act (ESA)-listed spring Chinook salmon, bull trout, and steelhead (Figure 1). In the 1940s, construction of the two-lane State Route (SR) 207 highway disconnected 77 acres of adjacent floodplain habitat in the lower 4.7 miles of Nason Creek, reducing the natural channel-migration process and access for juvenile salmonids to critical rearing and refuge habitats. The Nason Creek RM 4.7–RM 3.3 Restoration Project (project) aims to improve floodplain connectivity and existing habitat complexity, which would improve off-channel rearing and refuge habitats for juvenile steelhead and spring Chinook salmon.

The actions proposed in this report include the following and are shown in Figure 2.

- **Bridge Abutment Removal at RM 4.7:** This action would remove 0.18 acre of fill associated with a relic abutment of a historical bridge. This action would restore channel migration potential and high flows to an existing high-flow side channel.
- **Parking Area Floodplain Fill Removal at RM 4.6:** This action would remove 0.67 acre of fill in the Nason Creek floodplain and restore wetland and tributary channel conditions.
- **Oxbow Large Woody Debris Enhancement at RM 3.9:** This action would add 28 pieces of large woody debris along with willow plantings to enhance side channel habitats reconnected by the Chelan County Natural Resources Department (CCNRD) in 2007.

These actions have been vetted through the Salmon Recovery Fund Board (SRFB) and Upper Columbia Regional Technical Team (UCRTT) review processes. Along with the three actions described in this report, CCNRD intends to also construct the Nason Creek RM 4.6 Floodplain Reconnection Project in the project reach. That project proposes the installation of two culverts under SR 207 to improve the connection to 13 acres of floodplain. The RM 4.6 Floodplain Reconnection Project has been described a separate design report and plan set.

This document summarizes the design methods and background of the three project elements listed above. The project design is supported by a SRFB grant (#12-1438) received by CCNRD in 2012. Engineering and technical assistance for this project have been provided by ICF International (ICF) under contract with CCNRD. This design report documents the development of the preferred alternative at the preliminary design stage as defined in the *Manual 18*, *Salmon Recovery Grants* (Salmon Recovery Fund Board 2013: Appendix D).

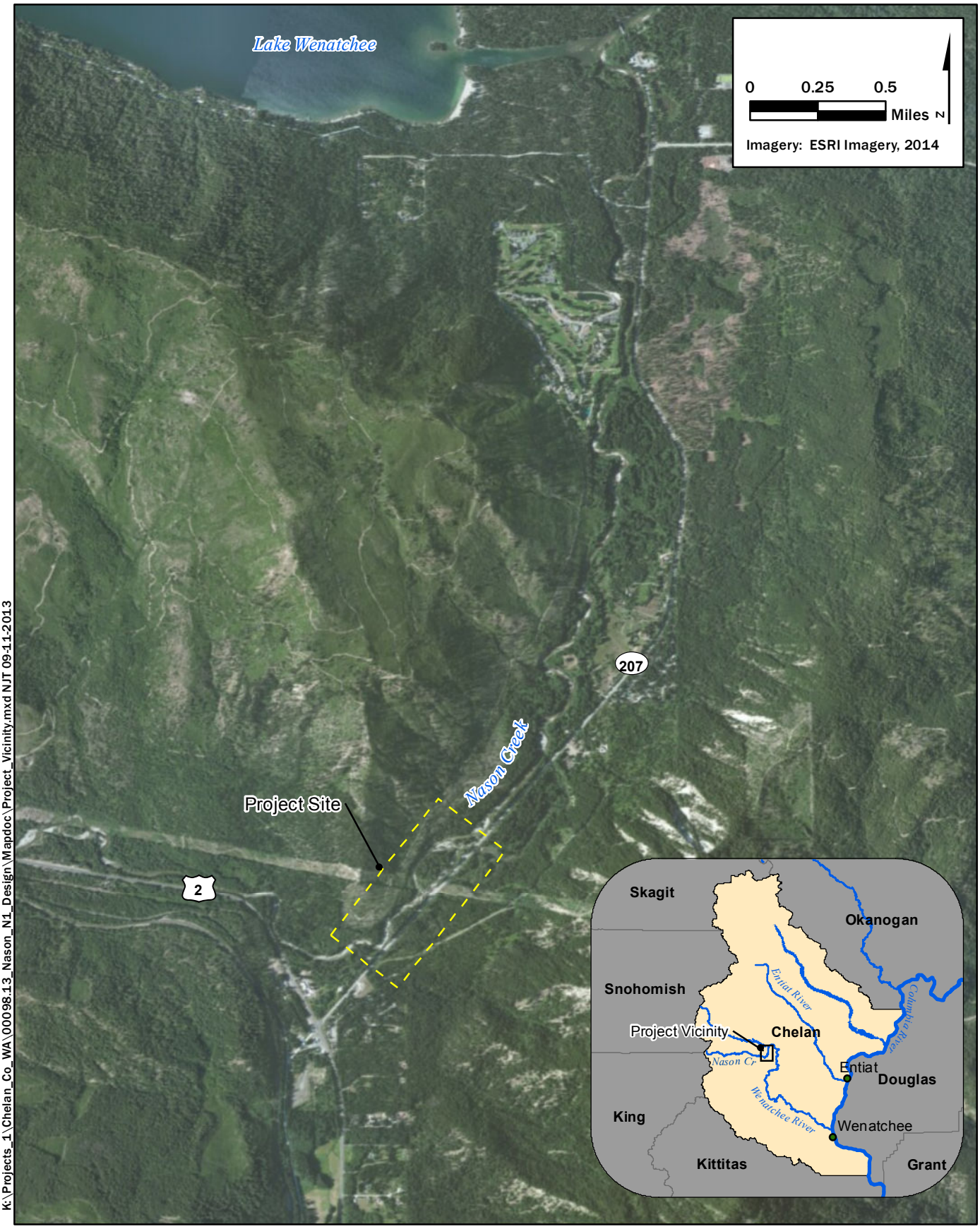

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Figure 1
Project Vicinity
RM 4.7 - RM 3.3 Restoration Project

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Figure 2
Project Overview
RM 4.7 - RM 3.3 Restoration Project

1.2 Project Area

The project area is in lower Nason Creek between river mile (RM) 4.7 and RM 3.3, in the Wenatchee River watershed, Chelan County, Washington (Figure 1). This section of Nason Creek flows north from Coles Corner adjacent to SR 207 in Chelan County. The project area is located in Township 26 North, Range 17 East WM, Section 9.

1.3 Ownership

There are multiple landowners associated with the project actions (Table 1).

Table 1. Landowners Associated with the Project Actions

Land	Landowner
Bridge Abutment Removal at RM 4.7	Longview Fiber
Parking Area Floodplain Fill Removal at RM 4.6	U.S. Forest Service
Oxbow Large Woody Debris Enhancement at RM 3.9	U.S. Forest Service

1.4 Project Purpose and Need

The purpose of the project is to improve floodplain function and enhance off-channel habitats for rearing and refuge for juvenile spring Chinook and steelhead during the high-flow season in Nason Creek. The project would restore floodplain function by removing floodplain fill associated with a parking area and a relict bridge abutment, while improving habitat complexity in peripheral habitats through the oxbow enhancements. Floodplain reconnection provides peripheral and transitional habitats, which is the highest priority ecological concern to be addressed in Nason Creek (Upper Columbia Regional Technical Team 2013).

The *Biological Strategy to Protect and Restore Salmonid Habitat in the Upper Columbia Region* (Biological Strategy) (Upper Columbia Regional Technical Team 2013) and the *Upper Columbia Salmon Recovery Board Upper Columbia Spring Chinook Salmon and Steelhead Recovery Plan* (Recovery Plan) (Upper Columbia Salmon Recovery Board 2007) have identified Nason Creek as the top priority for habitat restoration in the Wenatchee watershed. Nason Creek has a high potential to increase salmonid abundance and productivity; therefore, the restoration of ecosystem function through the reconnection of off-channel habitats and floodplain is a priority. Within Nason Creek, side-channel and/or off-channel reconnection is a Tier 1 action and top priority for addressing limiting habitat factors, improving channel function, and the recovery and long-term viability of salmonids in Nason Creek (Bureau of Reclamation 2009).

In lower Nason Creek, the largest impact on fish has been from human activities occurring outside of the main channel. The construction of roads, highways, and railroads has resulted in the reduction in natural habitat-forming processes, the disconnection of off-channel habitats and floodplains, and an increase in instream sedimentation (Andonaegui 2001). The construction of highways and roads with elevated embankments has disconnected about 29% (132.7 acres of 100-year floodplain) of historical channel paths and floodplain area in Lower Nason Creek (Bureau of Reclamation 2011).

1.5 Compatibility with the Regional Recovery Plan

The Recovery Plan (Upper Columbia Salmon Recovery Board 2007) references the Biological Strategy (Upper Columbia Regional Technical Team 2013) as the framework for prioritizing assessment units and actions within the region. This project targets priority fish species; it is located in a priority area and it addresses a priority action as described below.

1.5.1 Priority Fish Species

This project targets spring Chinook and steelhead, which are both listed for protection under the ESA. This project would provide potential habitat for bull trout, coho, and other fish species present in Nason Creek; however, design specifications are targeted for spring Chinook and steelhead juvenile use.

1.5.2 Priority Area

Nason Creek has been identified as the subwatershed, or assessment unit, with the highest priority for restoration actions in the Wenatchee watershed (Upper Columbia Regional Technical Team 2013).

1.5.3 Priority Action

This project would restore floodplain function through the removal of floodplain fill associated with a parking area and a relict bridge abutment, which addresses the highest priority ecological concern in the Nason Creek watershed (Upper Columbia Regional Technical Team 2013). The addition of large woody debris to existing off-channel habitats would also address a lack of complexity in the restored oxbow habitat. These actions have been designed to provide habitats for a critical life stage for spring Chinook and steelhead juveniles. The abutment and fill removal elements would improve natural channel migration process and would increase access and availability for spring Chinook and steelhead juveniles to rearing and high-flow refugia habitats.

1.6 Stakeholder Outreach

Community members have been supportive of the two previous Nason oxbow reconnection projects that were completed in 2007 and 2009 just downstream from this project. CCNRD has conducted multiple presentations at the Wenatchee Habitat Subcommittee meetings in Leavenworth, Washington, to present project concepts and alternatives within this open public forum. In addition, CCNRD has met multiple times with the project landowners, the U.S. Forest Service. Future public outreach will include a coordinated effort among CCNRD and U.S. Forest Service during the National Environmental Policy Act (NEPA) process as well as during the Joint Aquatic Resources Permit Application (JARPA) and permitting process.

1.7 Project Contacts

Table 2 lists the points of contact for the project proponent, consultant, and landowners.

Table 2. List of Contacts

Agency/Firm	Role	Contact	Phone/E-mail	Address
Chelan County Natural Resources Department	Project Proponent	Jennifer Goodridge, Natural Resource Specialist	(509) 667-6682 Jennifer.Goodridge@co.chelan.wa.us	316 Washington Street, Suite 401 Wenatchee, WA 98801
ICF International	Project Design	John Soden, Project Manager	(360) 510-0986 john.soden@icfi.com	1108 11th Street Suite 301 Bellingham, WA 98225
U.S. Forest Service	Project Review	Jeff Riviera, District Ranger	(509) 664-9200 Jriviera02@fs.fed.us	215 Melody Lane Wenatchee, WA 98801
Longview Fiber	Landowner	Wes Worden	wbworden@longviewtimber.com	

Chapter 2
Summary of Existing Conditions

This chapter provides a summary of the key environmental elements that have shaped the project's restoration approach. The summaries include the reach description, hydrology, and the environmental baseline. Documents containing additional details are referenced within each discussion.

2.1 Reach Description

Nason Creek is a perennial stream with a contributing drainage, at the project site, of approximately 103 miles from the eastern slopes of the Cascade Range and joining the Wenatchee River immediately downstream of Lake Wenatchee (Figure 1). The basin hydrology has a snowmelt-dominated flow regime; however, short duration high flows also occur in response to rainfall and rain-on-snow events. The watershed is primarily forested and 78% of the land area is federally owned. The upper basin is underlain by relatively hard, metamorphic rocks of the Nason Terrane, and the lower basin is underlain by less resistant, sedimentary rocks of the Chumstick formation (Cardno-Entrix 2012).

The Nason Creek drainage is divided into two 5th Field Hydrologic Unit Code (HUC) subwatersheds. The Upper Nason (HUC #170200110601) covers the headwaters to Whitepine Creek near RM 14.3, and the Lower Nason (HUC #170200110602) covers from Whitepine Creek to the Wenatchee River confluence. The Lower Nason Creek Reach is considered from RM 4.6 to RM 0 and includes the majority of the project reach (RM 4.7–RM 3.3).

2.1.1 Channel Confinement

The construction of highways and roads with elevated embankments has disconnected about 29% (132.7 acres of 100-year floodplain) of historical channel paths and floodplain area in Lower Nason Creek (Bureau of Reclamation 2011). This total includes 13 acres of disconnected floodplain habitat at the RM 4.6 Floodplain Reconnection project site, and another 54 acres downstream of the project site near RM 3.5–RM 3.9 that was hydrologically reconnected through culvert installation for SR 207 in 2007. The *Lower Nason Assessment of Geomorphic and Ecologic Indicators* (Bureau of Reclamation 2011) describes geomorphic changes resulting from floodplain constriction in lower Nason Creek:

> From River Mile 2.5–4.6 Nason Creek is an artificially confined pool-riffle type system. Bedrock controls the extent of westward lateral channel migration near RM 4.45 and restricts both lateral and vertical channel migration near RM 4.15. The following geomorphic channel changes are estimated to have occurred: (1) the channel length has been reduced by about 2,000 feet, (2) the channel gradient has been increased by about 17 percent, and (3) the channel sinuosity has decreased about 17 percent. Channelization and constraints on lateral channel migration have changed the geomorphology of the channel and have resulted in increased stream power and increased sediment transport capacity. These channel changes have reduced channel-floodplain interactions and may have degraded the long-term physical and ecological processes that create and sustain appropriate habitat complexity, connectivity, and variability.

As stated, the construction of SR 207 along its present alignment is the primary constraint to channel processes in the Lower Nason Creek reach. SR 207 was previously called the Secondary State Highway 15C and it was located on the hillside to the east of its current alignment. It was relocated to its current alignment to accommodate traffic at 60 miles per hour. The former alignment is now U.S. Forest Service roads 6603 and 6604. When the new alignment of SR 207 was constructed, Nason Creek was nearly 100 feet away from the highway embankment at the project site. In November 1995, a flood event on Nason Creek washed out a portion of SR 207 approximately 0.5 mile north of the intersection with SR 2 at Coles Corner (Milepost 0.36 to 0.40). WSDOT repaired the roadbed in 1995 and installed riprap along the banks of Nason Creek. The emergency road repair was constructed during high-water conditions; therefore, the toe of the slope was not well stabilized during installation. Thus, additional riprap was added to repair slumping in the riprap bank. This second repair did not completely fix the toe of slope of the highway embankment that is in the creek channel, and it did not restore the minimum width of the highway shoulder. In 2011, WSDOT maintenance crews installed additional riprap to reinforce the toe of slope and slightly expand the width of the bank protection to create a road shoulder consistent with road safety standards. This project also included the installation of four rock barbs to help deflect streamflow energy away from the highway embankment (Appendix A, Photo 5).

A project performed by CCNRD in 2007, with cooperation from WSDOT, installed culverts through the SR 207 embankment fill at RM 3.9 and RM 3.5 to reconnect the creek's main channel to a remnant channel and floodplain and create additional off-channel habitat. At this site, the channel constructed in the 1940s west of SR 207 remains the primary channel, and approximately 1% to 10% of the total flow in the creek is directed into the remnant channel and floodplain via the culverts. The 2007 project generated dramatic improvement to secondary channel habitat in the reach by reconnecting floodplain areas. There is actually a greater area of perennial channel habitat in the reach now than existed before the SR 207 construction project because of the additional channel created by excavation. This off-channel habitat is the location of the proposed large woody debris enhancement at RM 3.9 that is described in this report. Existing conditions still affect geomorphic and ecologic processes in the reach; however, natural bank erosion and wood recruitment are improving habitats.

2.2 Hydrology

The Washington State Department of Ecology (Ecology) has operated a streamflow gage on Nason Creek near the mouth since June 2002. The location of the Ecology gage is relatively close to the project site and should provide a good representation of streamflow in Nason Creek at the project site because the contributing drainage basin is less than 5% different at the gage than at the project site. The gage records water surface stage at 15-minute intervals. Those data are converted to flow rates using a stage discharge rating curve developed by Ecology from several flow measurements taken at the gage. The gage data constitute the only available record of flows on Nason Creek.

Mean daily flow exceedance probabilities were determined using the recorded mean daily flows at the Ecology gage. Mean daily flow rates for each year the gage has been operational were put into a spreadsheet and exceedance probabilities were calculated for each day of the year from that data set. A useful flow statistic for habitat-design purposes is the mean daily flow 50% exceedance. This is the flow rate that is expected to occur on any selected day during a typical year. The target species and life stage intended to benefit from the project would have a certain time of year when the

habitat benefit being designed would be useful. Knowing the timing of the fish usage and the expected flow rate during that time provides a flow rate to design the project to accommodate. For example, a key time when the habitat should be functional at the project site is during the early May through late June snowmelt, which at the project site is typically 600 cubic feet per second (cfs) or greater, so 600 cfs is a key flow rate for habitat design. A graph of the mean daily flow 50% exceedance and fish usage throughout the year is shown in Figure 3.

To design the project to be structurally sound it is necessary to evaluate performance during instantaneous peak flows, commonly referred to as flood events. Peak flows at the project site were obtained by performing a log-Pearson Type III statistical analysis on the highest instantaneous flow rate recorded each year. The length of record at the Ecology gage is shorter than desirable for calculating rare peak flow events such as the 100-year flood; however, it provides the only source of actual flow rate data recorded consistently on Nason Creek and should provide a more reliable result than a synthetic flow analysis based on streamflow gages located in nearby streams. The calculated 2-year peak flow from the statistical analysis is 2,730 cfs, and the 100-year peak flow is 6,780 cfs. Table 3 summarizes the distribution of flow for a range of discharges.

Table 3. Nason Creek Main Channel

Return Interval	Total Nason Creek Flow (cfs)
Low summer flow	50
typical spring runoff	600
2-year	2,730
100-year	6,780

cfs = cubic feet per second

2.3 Environmental Baseline

This chapter describes the environmental baseline conditions in the project area as they primarily relate to the habitat requirements of ESA-listed species that currently use Nason Creek in the project area. This summary of conditions was derived from various sources, including baseline field surveys, site and aerial photograph interpretation, a reach assessment developed by Reclamation (2011), and other relevant literature.

2.3.1 Fish Use

Nason Creek contains major spawning areas for ESA-listed spring Chinook salmon and steelhead, and is a bull trout core area (Upper Columbia Regional Technical Team 2013). The Nason Creek drainage supports the second strongest population of spawning spring Chinook in the Wenatchee subbasin (Andonaegui 2001). In the spring (May through June), both spring Chinook and steelhead juveniles are rearing in lower Nason Creek. The end of spring is also the start of the in-migration for adult spring Chinook. Spring Chinook salmon spawning occurs from mid-August through mid-September, with the majority of spring Chinook redds located in the lower 15.8 river miles. A 2005 survey identified 186 redds in Nason Creek. Eggs remain in the gravel until hatching in December, and fry emerge in January and February. Juveniles spend about 1 year in fresh water before smolting and ocean emigration between April and June (Raekes pers. comm.).

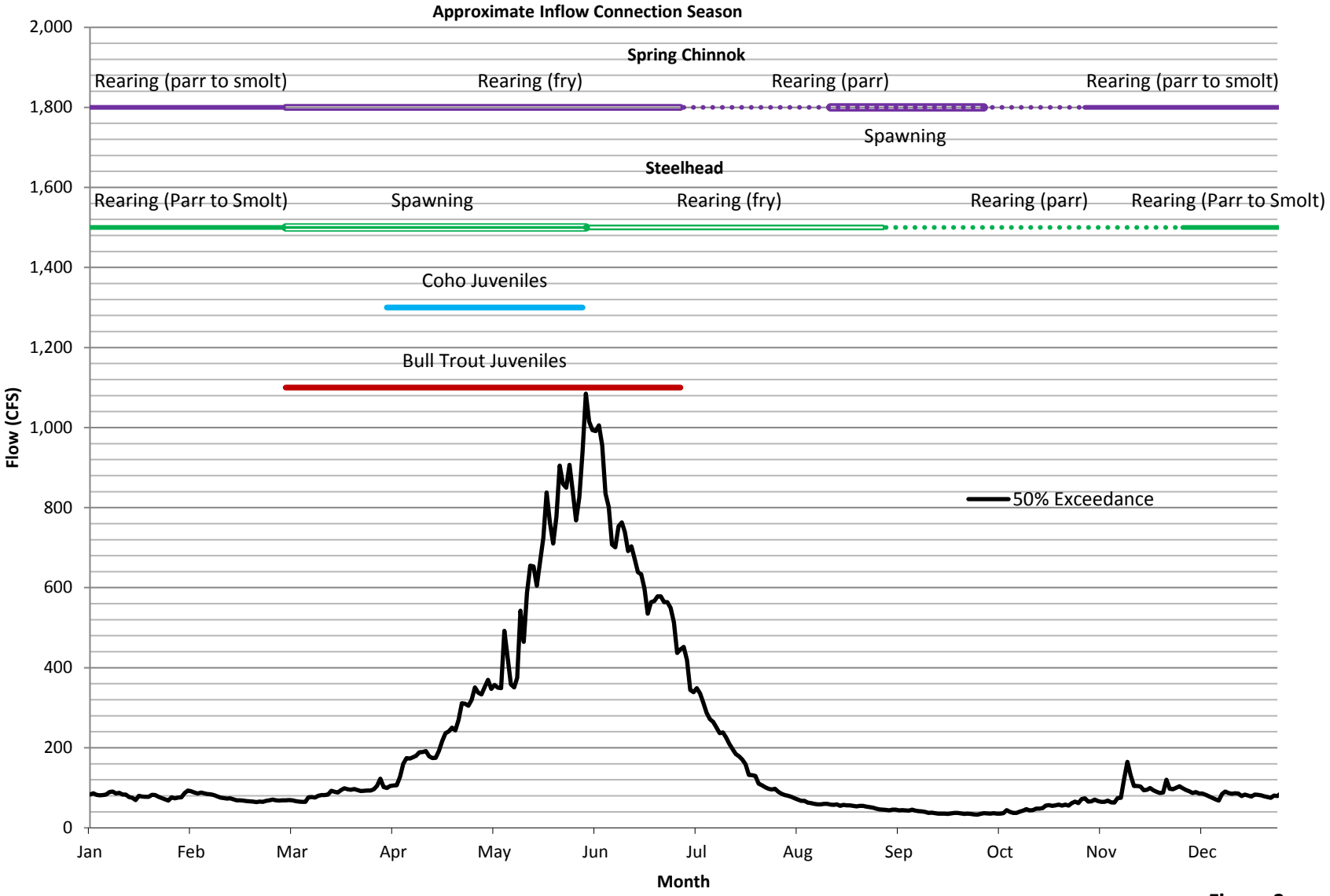


Figure 3
Life History Stage and Timing in Lower Nason Creek

Steelhead enter and begin to ascend the Columbia River in June and July. Upstream migration near the Wenatchee River peaks in early September; most adult steelhead have moved into tributary streams by November. Nason Creek steelhead counts averaged 152 redds per year from 2001 to 2005. Juvenile rearing lasts about 2 to 7 years prior to ocean emigration (Raekes pers. comm.).

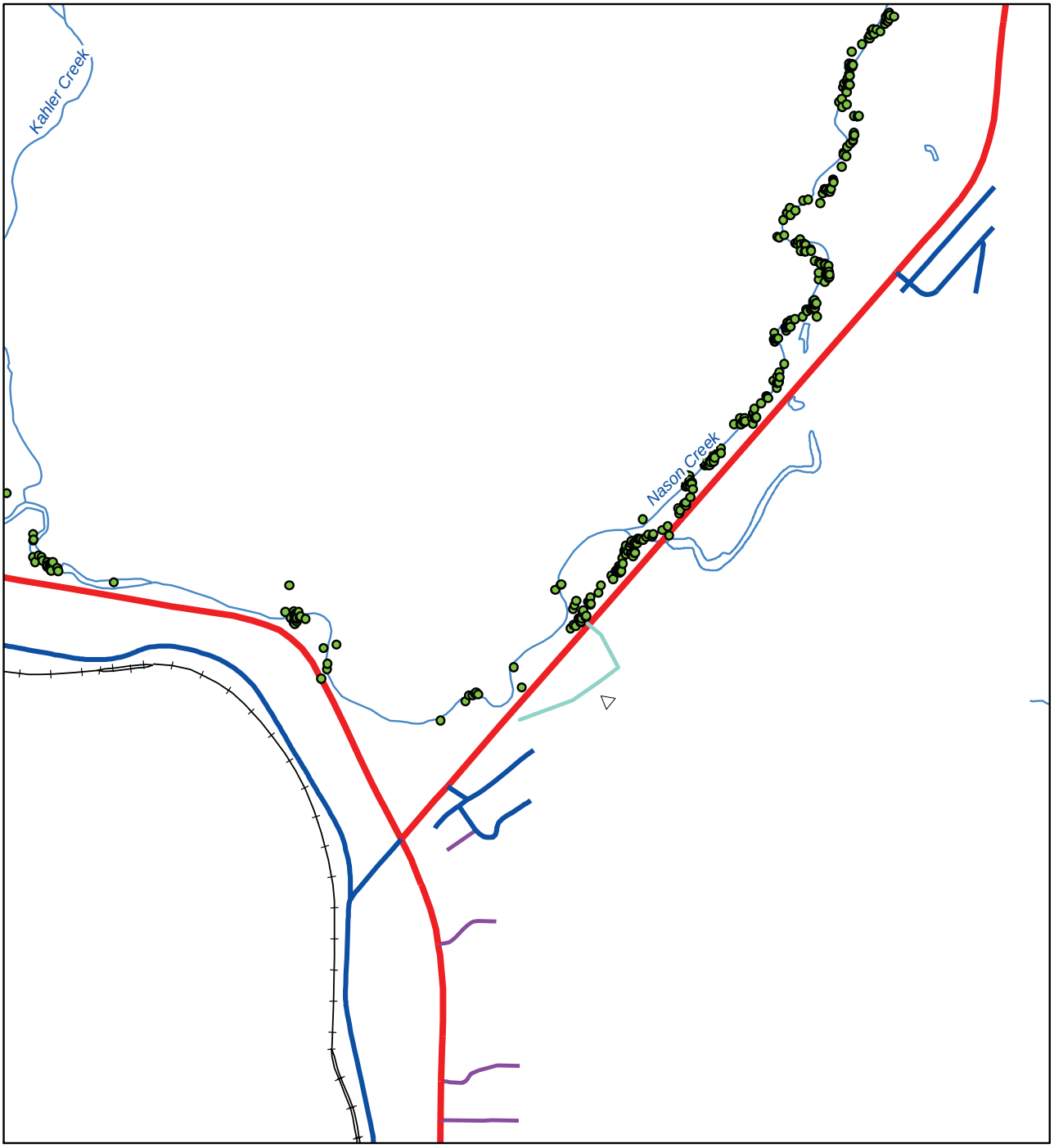
Bull trout typically overwinter from December to May, and migrate upstream to spawning grounds from May to mid-October, and adult bull trout migrate back to overwintering habitats from October to December. The Nason Creek bull trout population is depressed and typically has less than 15 redds each year. Spawning occurs in the upper reaches of the watershed, but not in the project reach (Raekes pers. comm.).

Figure 3 shows the life history stage for spring Chinook and steelhead and the timing relative to the 50% exceedance flows in lower Nason Creek.

Figures 4 and 5 show proximity of the site to known redd locations for spring Chinook and steelhead, respectively. Newly emerged juvenile fry would be seeking high-flow refuge and rearing habitats in the project reach during the spring to early summer period. Providing rearing habitats during high-flow conditions is important so that juvenile fry that emerge from redds are not prematurely flushed downstream. Most juvenile fry (about 90%) remain in Nason Creek so providing rearing and refuge habitat for that life stage is important, whereas more than 70% of subyearlings outmigrate by late summer (Cram pers. comm.).

The summary for each REI is provided below. The thresholds for each of the ratings can be found in Appendix A of the Reclamation (2011) assessment.

- **Water Quality and Quantity—At Risk.** Water quality and quantity were at risk because of the following: water temperature was found to be unacceptable for salmon spawning, core summer salmonid habitat, rearing and migration (U.S. Forest Service 2006), and classified as a Category 4a waterbody that was included in the Wenatchee River Watershed Temperature Total Maximum Daily Load (TMDL) that was approved by the U.S. Environmental Protection Agency on August 3, 2007; Ecology moderate quality finding for turbidity which may be exacerbated by anthropogenic disturbances; and an overall Ecology Water Quality Index rating of 70 (moderate water quality) for this Class AA water body suggests a potential systemic water quality and/or quantity problem occurring in the watershed.
- **Habitat Access—Adequate.** Habitat access was adequate because there are no mainstem barriers that prevent fish passage to the upper watershed or tributaries in this reach.
- **Habitat Quantity—Adequate.** Habitat quantity was adequate because of the following: channel substrate was comprised of gravels and small cobbles that are being transported from upstream to this reach; fine sediment deposition appears to be transient and fluctuating through time; large wood frequency exceeded the adequate REI criteria and Vegetation structure was adequate for both long- and short-term recruitment potential; pool frequency (11 pools per mile) exceeded the REI criteria and had cover provided by wood, canopy cover, and depth; and off-channel habitat was present as side channels with low energy that were accessible and had cover.
- **Channel Condition and Dynamics—At Risk.** Channel condition and dynamics were at risk because of the following: improved roads that have disrupted floodplain connectivity and channel floodplain; bank hardening has restricted lateral channel migration; and anthropogenic disturbances have changed channel gradient and that may have increased stream power.



Locator Map

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Source: Chelan County.

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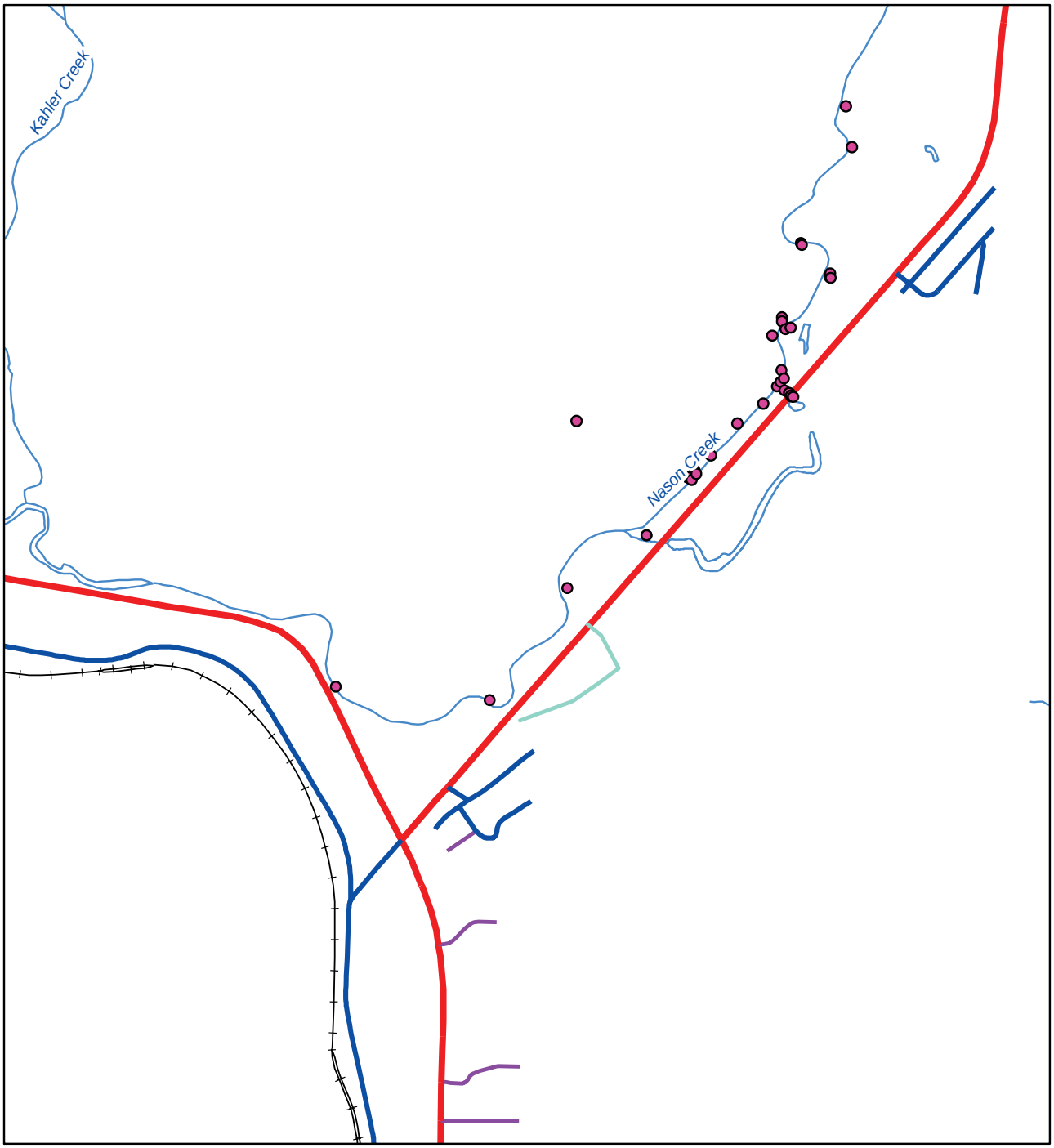
Figure 4

2005–2007 Spring Chinook Spawning Locations in Mainstem Nason Creek

Nason Creek–RM 4.6 Floodplain Reconnection Project



Locator Map

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Source: Chelan County.

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Figure p

2005–2012 Steelhead Spawning Locations in Mainstem Nason Creek

Nason Creek–RM 4.6 Floodplain Reconnection Project

- **Riparian/Upland Vegetation—At Risk.** Riparian/upland vegetation was at risk because of the following: road construction, timber harvests, and floodplain development have altered the vegetation structure; channel-floodplain interactions have been disrupted in about 29% of the reach and may have altered vegetation composition; most of the woody vegetation along a 30-meter buffer zone adjacent to the active channel was available for recruitment; and canopy cover, based on vegetation structure along a 10-meter buffer zone, comprised about 92% woody vegetation that provides appropriate stream cover for thermal shading, leaf litter inputs, and connectivity between physical and ecological processes.

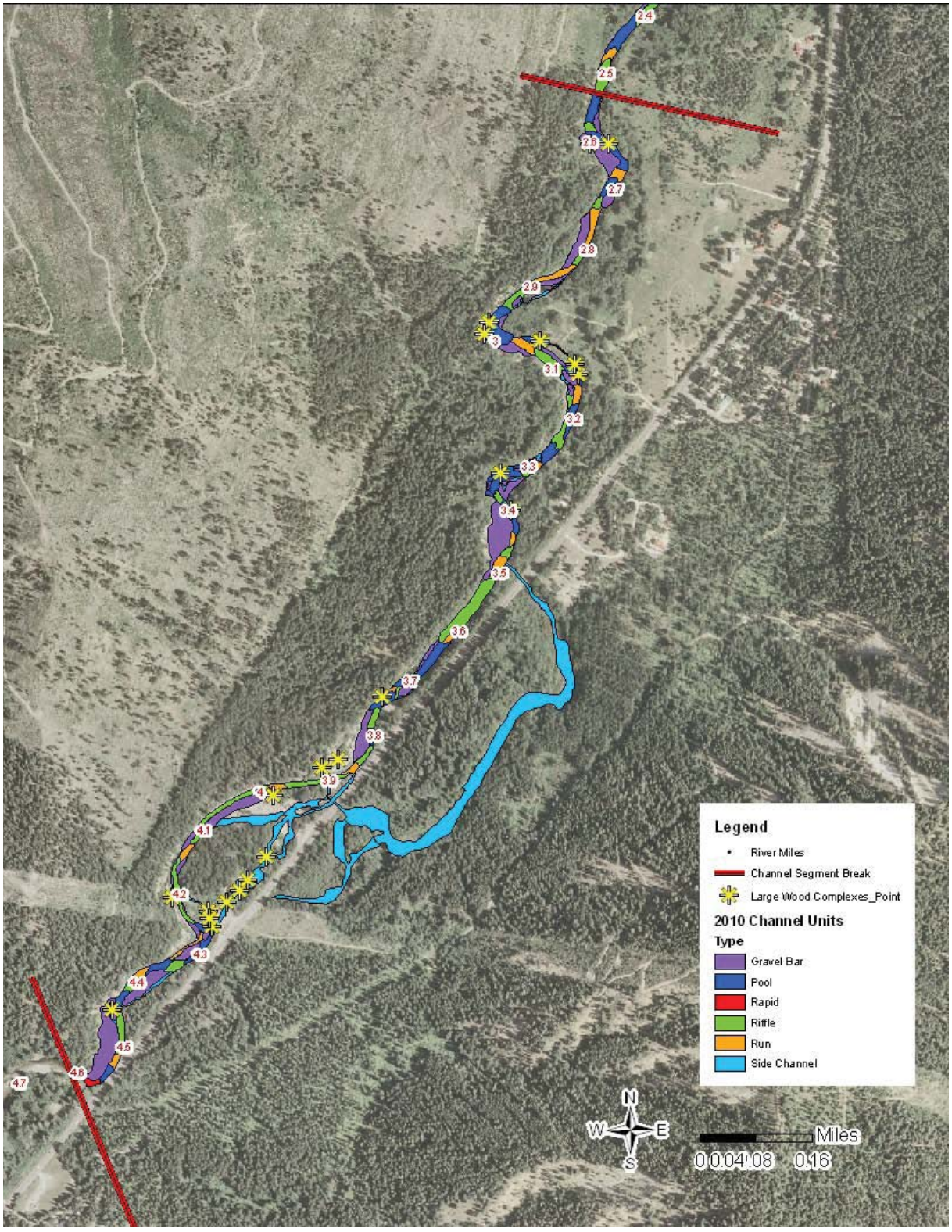
The Reclamation (2011) assessment included mapping channel units in Channel Segment A (RM 4.6–RM 2.5), which includes the project reach. The assessment mapped pools, riffles, runs, rapids, and side channels in Nason Creek. Table 4 shows the percentage of each within Channel Segment A.

Table 4. Channel Unit Percentages within Channel Segment A

Rapids	Pools	Side Channels	Riffles	Runs
1%	22%	46%	20%	11%

This channel segment has a high percentage of side channels because a historical channel path was reconnected for off-channel habitat in 2007 by CCNRD. The reconnected channel path provides about 6.61 acres of off channel habitat and represents about 57% of the total side channel units mapped within Channel Segment A (Figure 6) (Bureau of Reclamation 2011: Figure 14).

Within Segment A about 20 wood complexes were observed in the mainstem as small log jams, along meander bend apexes, throughout natural side channels, and on the active floodplain. The wood influences channel morphology by providing a forcing agent that contributes to pool and side channel creation, channel switching, and island formation (Bureau of Reclamation 2011).



Source: Bureau of Reclamation 2011.

Figure 6
Channel Segment A: Visual Representation of Channel Units
Nason Creek–RM 4.6 Floodplain Reconnection Project

Chapter 3
Alternatives Analysis

CCNRD has been working with the Bureau of Reclamation, Bonneville Power Administration, U.S. Forest Service, Wenatchee Habitat Subcommittee, Upper Columbia Regional Technical Team, and WSDOT to systematically identify a reach-based restoration strategy for this section of lower Nason Creek RM 4.6 through RM 3.3. In March 2010, CCNRD obtained grant funds from EcoTrust to evaluate alternatives to improve fish habitat and reduce streamflow velocities against the highway embankment near RM 4.6. CCNRD evaluated six alternatives for stream restoration in the project area (Chelan County Natural Resources Department 2011). Concurrently, Reclamation completed the *Assessment of Geomorphic and Ecologic Indicators in Lower Nason Creek (RM 0–RM 4.6)* (Bureau of Reclamation 2011).

Upon completion of the 2011 alternatives analysis, RTT and the landowner (U.S. Forest Service) wanted to evaluate the feasibility of relocating SR 207. This feasibility study was funded by Bonneville Power Administration and developed six road relocation options. The cost of road relocation ranged from $10 to over $22 million. In addition, the feasibility study indicated that there may be avalanche hazards in the vicinity of the some of the road relocation options.

Since there $10 to $22 million were not available to relocate SR 207 and since several of the options lacked WSDOT and landowner support, CCNRD developed a reach-scale restoration approach to improve floodplain connectivity, instream complexity, and existing side channel habitat in RM 4.7 through RM 3.3 of Nason Creek.

The following restoration actions were described in the 2012 SRFB preproposal:

1. **Bridge Abutment Fill Removal (RM 4.7):** Remove 1,225 cubic yards of material (0.18 acre) associated with a relic bridge abutment at RM 4.7 to improve floodplain connectivity, channel migration, and side channel connectivity.
2. **Parking Area Floodplain Fill Removal (RM 4.6):** Remove 2,300 cubic yards of material (0.67 acre) associated with a parking area adjacent to SR 207 to improve channel-floodplain interactions near RM 4.6.
3. **Oxbow Large Woody Debris Enhancement (RM 0.9 through RM 3.3):** Remove a beaver dam to increase flow velocity in the 2007 oxbow to improve Chinook spawning and steelhead and Chinook rearing habitat between RM 3.9 and RM 3.3.
4. **Install Engineered Log Jams (RM 4.6 through RM 3.7):** Install three large engineered log jams to increase habitat complexity and enhance connections to floodplain near RMs 3.7, 4.3, and 4.6.
5. **Floodplain Reconnection (RM 4.6):** Replace two culverts under SR 207 to reconnect 0.9 acre of high-water refuge and juvenile rearing habitat near RM 4.6.
    a. This action is currently in the 30% design and permitting phase and will be submitted for permitting under a separate JARPA by the CCNRD in the winter of 2014.

Funding reviewers requested that the pre-proposal be split into two final proposals. The first 4 actions listed above were funded by SRFB in 2012. A winter 2013 storm dropped wood in the vicinity of the proposed engineered log jams and the landowner (U.S. Forest Service) requested removing that project element. Those grant funds were used to advance the RM 4.6 floodplain

reconnection action to preliminary design stage and this project element is described in a separate design report. The following describes the evolution of each of the first three actions in the previous list.

3.1 Bridge Abutment Fill Removal—RM 4.7

This action proposes to remove a former bridge abutment that encroaches on the river-left floodplain at RM 4.7. This bridge was washed out during the 1990 flood and the remaining bridge abutments consist of approximately 1,225 cubic yards of riprap and sediment over 0.18 acre (Appendix A, Photos 1 and 2). The removal of abutment fill would restore channel migration to river left, restore the confluence of a tributary just upstream of the bridge abutment, and increase activation of an adjacent side channel (Figure 7).

The removal of the abutment fill was identified as project KOZ-19 in the *Kahler Reach Assessment* (Bureau of Reclamation 2009). In 2009, CCNRD and the Wenatchee Habitat Subcommittee conducted a prioritization of the projects identified in the *Kahler Reach Assessment*. KOZ-19 ranked as a low biological benefit for reconnection of processes (ICF Jones & Stokes 2009); however, this was likely because the evaluation only looked at the benefit of floodplain reconnection at infrequent high-flow events. KOZ-19 ranked moderate to high for social feasibility, construction feasibility, and cost. Thus, the overall feasibility ranked highest for process reconnection (ICF Jones & Stokes 2009). Two alternatives were discussed for implementation at this project site.

- **Alternative 1:** Remove fill and backfill above floodplain onsite. This alternative reduces the costs of hauling material off site while achieving the goal of removing the relic abutment material. This alternative has landowner support and is the preferred alternative.
- **Alternative 2:** Remove fill and haul off site. This alternative would require an increase in construction costs in association with hauling material offsite.

3.2 Parking Area Floodplain Fill Removal—RM 4.6

This action proposes to remove fill within the floodplain and wetlands areas associated with a parking area adjacent to SR 207 at RM 4.6 (Figure 7) (Appendix A, Photos 3 and 4). The parking area is a gravel pad surrounded by a raised berm of gravels and native soils that currently routes a small intermittent stream around the perimeter of the filled area. The total fill removal would be approximately 2,300 cubic yards over 0.67 acre.

The removal of floodplain fill associated with the parking area was identified as project KOZ-20 in the *Kahler Reach Assessment* (Bureau of Reclamation 2009). In 2009, CCNRD and the Wenatchee Habitat Subcommittee conducted a prioritization of the projects identified in the Kahler Reach Assessment. KOZ-20 ranked as a low biological benefit for reconnection of processes (ICF Jones & Stokes 2009); however, this was because the evaluation only looked at the benefit of floodplain reconnection at infrequent high flow events. KOZ-20 ranked moderate to high for social feasibility, construction feasibility, and cost. Thus, the overall feasibility ranked highest for process reconnection (ICF Jones & Stokes 2009).

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Figure 7
Bridge Abutment Fill Removal & Parking Area Fill Removal Sites

Four alternatives were discussed for implementation at this project site.

- **Alternative 1:** Remove fill, restore wetland habitat, and create a split flow channel through the restored floodplain for the small tributary stream. This alternative would remove the floodplain fill and achieve wetland restoration; however, due to the low-flow quantity in the tributary stream, a split channel would reduce flow depths and fish passage so this alternative was rejected.
- **Alternative 2:** Remove fill, restore wetland habitat, and create a single channel for the small tributary stream. This alternative would remove the floodplain fill, achieve wetland restoration, and maintain the single-channel geometry exhibited by the tributary channel. This alternative is the preferred alternative since it would restore the wetland and stream habitats as close to pre-impact conditions as possible.
- **Alternative 3:** Remove berm only and leave the parking area fill in place. This action would only remove the raised berm that forms the perimeter of the parking area. This would not remove the fill and restore wetland or stream functions. Based on the two-dimensional (2D) hydraulic modeling of existing conditions, the expected flow velocities during the large flood events needed to inundate the fill area (about a 5-year event) would not have the velocities to flush or remove the remaining fill material so this alternative was rejected.
- **Alternative 4:** Remove fill only. This alternative would restore wetland functions but would not restore the adjacent tributary channel through the site so this alternative was rejected.

3.3 Oxbow Large Woody Debris Enhancement—RM 3.9

This action proposes to enhance habitat conditions in the historical channel that was reconnected by CCNRD in 2007 near RM. 3.9 (Figure 2). The oxbow currently conveys approximately 10% of Nason Creek flows because when this project was developed in 2006, stakeholders did not want to redirect more flow into the oxbow and potentially impact existing spawning habitat in the mainstem. However, since the oxbow is wide enough to convey the mainstem flows, the existing flow through the upstream area spreads out and it lacks vegetative cover.

When the 2007 culverts were installed under SR 207 to hydrologically reconnect the oxbow, there was a decision made to see how the oxbow functioned prior to proposing any additional enhancement (earthwork) actions within the oxbow. Monitoring in 2008 and 2010 by Ecology, Yakama Nation indicates that juvenile salmonids are present in the oxbow. However, during a fall 2011 site visit with the U.S. Forest Service, the following alternatives were developed to enhance fish habitat in this area.

- **Alternative 1:** Remove the beaver dam at the downstream end of oxbow. This action would increase flow velocities through the historical channel areas thereby helping to flush accumulated fine and organic sediments to expose gravels and cobbles. This alternative was rejected by the U.S. Forest Service and UCRTT since beaver activity is considered a natural process, the dam would likely be rebuilt, and dam removal was considered only a short-term fix.
- **Alternative 2:** Install 10 to 15 pieces of unanchored large woody debris in the upstream end of the oxbow area. This alternative would provide additional cover, gravel recruitment, scour, and support for riparian plant growth. The upstream end of the reconnected habitat occupies a wide

and shallow area with little complexity or cover. The addition of wood would increase cover habitat with little risk of disturbance to existing habitats during construction. This alternative was rejected because it would result in too little benefit for the cost of mobilizing construction equipment and overall construction.

- **Alternative 3:** Install 20 to 30 pieces of unanchored large woody debris, brush bundles, and willow stakes in the upstream end of the project area. This alternative would provide additional cover, gravel recruitment, scour, and support for riparian plant growth. This alternative would increase cover habitat with little risk of disturbance to existing habitats during construction. This alternative is the preferred alternative because it provides the greatest biological benefit with limited disturbance and relatively low construction costs.

Chapter 4
Project Design

This chapter presents the design approach, the goals and objectives of the three project elements, details of the construction, and the resulting habitat benefits. Construction details are presented in Chapter 5, and 30% construction plans are provided in Appendix D.

4.1 Design Approach

The three project actions are considered simple "fixes" within the Nason Creek floodplain to improve natural channel process, restore floodplain habitats, and enhance existing off-channel habitats. These actions are also considered low risk because they involve the removal of in-channel hazards (bridge abutment removal), the removal of fill outside of the main channel (parking area), and the installation of wood outside of the mainstem channel (oxbow enhancement).

Design has been guided by repeated field reconnaissance by experienced river restoration engineers and biologists. The design has been refined through the examination of existing topography, and the analysis of 2D hydraulic modeling of proposed conditions. Grading, planting, and woody debris design has been based on desired proposed conditions. The follow describes the topographic and hydrologic data used in design.

4.1.1 Project Topography

A topographic map of the sites was developed from light detection and ranging (LiDAR) data collected by Reclamation in October 2006. Additional detail was needed for developing the construction plans so topographic data using traditional ground survey methods were collected by a professional land surveyor and used as a base for the construction plans. Landline Surveyors collected field data and created the topographic map in August 2010. The map includes elevation contours at a 1-foot interval, typical planimetric features (e.g., edge of pavement, utilities, and edge of water) and property lines in portions of the project area. The map uses North American Vertical Datum 1988 (NAVD88) for the vertical datum and North American Datum 1983 (NAD83) for the horizontal coordinate system, which allows correlation with survey data previously collected for other studies. In 2013, ICF and CCNRD staff also conducted a profile bed survey of the oxbow and surveyed several points in the parking lot fill removal area and the oxbow enhancement area to guide design development.

4.1.2 Hydraulic Model Development

A numerical hydraulic model was developed and used to simulate a range of flows during existing conditions and with the proposed fill removal and oxbow enhancement areas to determine site hydraulics. The hydraulics were analyzed using an SRH-2D hydraulic model, a 2D depth-averaged velocity finite element model. The model was run using a steady-state flow condition for all scenarios analyzed. Due to the simplicity of these projects, a proposed-conditions model run was not executed.

The model results provide information about flow-velocity depths and shear-stress forces in the channel and floodplain throughout the project area. The following discussion details assumptions used in developing the SRH-2D model and the results of the proposed conditions analysis.

The LiDAR topographic data from 2006 formed the basis for most of the model geometry, and the ground survey topographic data supplemented the LiDAR data by providing topography and bathymetry of areas in the creek channel that were underwater at the time the LiDAR was collected. The model geometry includes a stream length of more than 9,000 feet along the main channel, which is significantly longer than the channel length through the project area; however, due to split channel flow at the downstream end of the project it was necessary to extend the simulation domain much farther downstream to establish a reliable downstream boundary condition. The model geometry includes the oxbow reconnection project constructed in 2007, the proposed floodplain reconnection project site (RM 4.6), and the floodplain fill sites.

The model finite element mesh includes 67,329 elements. SRH-2D allows each element in the mesh to be assigned a roughness coefficient by creating multiple "material types" and assigning one of the defined material types to each element. For this model, eight unique material types were created with Manning's *n* values ranging from 0.028 at paved surfaces to 0.110 through a dense log jam in a natural side channel of the creek. These values were based on field observations of bed material, in-stream wood deposition, and vegetation density, and then adjusted based on model simulation results compared to measured water surface elevations at the proposed upstream and downstream culvert connections during known flow rates.

Downstream boundary conditions on the main creek channel were set based on previous HEC-RAS modeling of the creek at the 2007 oxbow reconnection project. The upstream boundary conditions were set to the total flow rate in Nason Creek for the flow condition being simulated.

The hydraulic model was validated by comparing measured water surface elevations to simulated water surface elevations at three locations within the project area during four unique flow rates. After some adjustment of Manning's roughness coefficients, the simulated water surface elevations consistently agreed with the measured water surface elevations, which provide confidence that the model is a good simulation.

A range of flows was analyzed to provide information on flow distributions and hydraulic parameters over a range of conditions. The set ranged from a mean daily flow typical of late spring and early summer snowmelt runoff up to the 100-year peak flow. Low flows, the types that occur during the late summer dry season and during much of the winter when temperatures remain below freezing, were not simulated because the project is intended to provide high-flow habitat. Model outputs for depth and velocity for the 2-year peak flow and 100-year peak flow for existing conditions are shown in Appendix C.

4.2 Goals and Objectives

Based on the project's purpose and need, the overall goal of the project is to address critical habitat-limiting factors in Nason Creek, a spawning and rearing tributary for spring-run Chinook salmon and summer steelhead in the Wenatchee River Basin. The following are additional goals and objectives of the project.

Goal 1. Provide high-flow refugia and rearing habitat for adult and juvenile spring Chinook and juvenile steelhead in Lower Nason Creek.

Objective 1. Remove 0.85 acre of floodplain fill to restore natural channel processes, such as improved activation of an existing side channel and enhanced floodplain connectivity.

Goal 2. Enhance existing off-channel habitats associated with the 2007 oxbow reconnection project.

Objective 2. Alter flow and sediment deposition patterns in the 2007 oxbow by adding instream structure through placement of large wood, and willow bundles.

Objective 3. Shrubby vegetation establishment within the channel (on and around the large wood) and on the edges will provide shade and cover to increase fish use of this area.

Goal 3. Minimize the disturbance and removal of existing floodplain vegetation during construction.

Objective 4. The fill removal areas will be as small as possible to achieve hydraulic connectivity while preserving vegetation.

Objective 5. The construction of the oxbow enhancement elements will be conducted with hand tools to reduce access and construction impacts.

4.3 Restoration Actions

4.3.1 Bridge Abutment Fill Removal—RM 4.7

This action proposes to remove a former bridge abutment that forms a hard point on river left at RM 4.7. Removing the 1,225 cubic yards (0.18 acre) of bridge abutment fill would enhance activation of a nearby side channel, restore the confluence of a tributary just upstream of the abutment fill, and allow greater river migration to river left (Figure 7). Fill removal for the bridge abutment would be accessed from the north side of Nason Creek through Longview Timber property and then disposed of on site within the footprint of the historical roadbed. This area is well above the 100-year floodplain and outside of the channel migration zone. The disturbed slopes would be restored with seeding, and planting native riparian trees and shrubs. See grading plan and cross sections in Appendix D.

4.3.1.1 Riparian Restoration

Following grading this area would be seeded and planted with native shrubs similar to the adjacent floodplain area. Three riparian communities have been developed for the area based on expected hydrologic conditions. Please refer to the plans in Appendix D for the proposed planting plan. Grading would be performed in a manner that preserves as much existing native vegetation in the floodplain to maintain as much native vegetation as possible. Plant species selected for these communities would be based on observations of existing native species growing in the Nason Creek floodplain and expected hydraulic and soil conditions. Table 5 lists the proposed plants, elevation, and size.

Riparian restoration will include the installation of a brush mat consisting of willow cuttings to be placed adjacent to the stream bank at OHW. A pre-planted coir sedge mat will be installed behind

the brush mat. The intent of these two plantings is to provide bank stability within the recently excavated stream bank and immediate vegetative cover. Please refer to Appendix D for details.

Riparian replanting would be incorporated into the site seeding and erosion control plan. All planting areas would also be seeded with a native seed mix (Appendix D).

Table 5. Proposed Plants for Riparian Restoration

Planting Area (elevation in feet)	Common Name	Species Name	Size
D (1,964–1,965 feet)	Pacific willow	*Salix lasiandra*	TP 414 Treepot
	Nootka rose	*Rosa nutkana*	TP 414 Treepot
	Red-osier dogwood	*Cornus sericea*	TP 414 Treepot
	Douglas spirea	*Spirea douglasii*	TP 414 Treepot
(1,965–1,970 feet)	Black cottonwood	*Populus balsamifera*	TP 414 Treepot
	Scouler's willow	*Salix scouleriana*	TP 414 Treepot
	Nootka rose	*Rosa nutkana*	TP 414 Treepot
	Douglas spirea	*Spirea douglasii*	TP 414 Treepot
F (1,970 feet +)	Black cottonwood	*Populus balsamifera*	TP 414 Treepot
	Blue elderberry	*Sambucus nigra*	TP 414 Treepot
	Ponderosa pine	*Pinus ponderosa*	TP 414 Treepot
	Oceanspray	*Holodiscus discolor*	TP 414 Treepot
	Serviceberry	*Amelanchier alnifolia*	TP 414 Treepot
	Woods rose	*Rosa woodsii*	TP 414 Treepot
	Snowberry	*Symphoricarpos alba*	TP 414 Treepot

4.3.2 Parking Area Floodplain Fill Removal—RM 4.6

This action is designed to remove 2,300 cubic yards (0.67 acre) of fill associated with a gravel parking area located in the Nason Creek floodplain at RM 4.6 (Figure 7) (Appendix A, Photos 3 and 4). Currently this fill area is accessible from a driveway off of SR 207 and is open to public use. The fill is surrounded by wetland and a small intermittent creek that runs north along SR 207 and then around the existing fill before flowing into Nason Creek. The *Kahler Reach Assessment* (U.S. Bureau of Reclamation 2009) concluded that with or without the fill this area was inundated at 5,000 cfs the 50-year flow event. For reference, the 2-year flow is 2,730 cfs and the 100-year flow is 6,780 cfs. Thus, the parking lot is inundated with or without fill removal at very high flows. The subsequent hydraulic modeling conducted by ICF indicates that once the fill is removed the area would be inundated at approximately the 5-year event and higher. Thus, most of the time, this area would function primarily as a stream and wetland complex. However, during high flows (5-year event and higher) this fill removal provides increased flood prone area and increased flood-storage capacity. In addition, the stream channel through this area would provide high-flow refuge habitat for spring Chinook and steelhead.

4.3.2.1 Earthwork

The area of fill currently used as a parking lot would be removed and disposed of off site. Access to remove the 2,300 cubic yards of parking lot fill (0.67 acre) would be from an existing pull-out from SR 207. Based on a wetland reconnaissance it is assumed that the fill area occupies historical wetland habitats. The excavation would remove 2 to 3 feet of fill to match the adjacent floodplain wetland elevations and support hydrophytic vegetation (Appendix D).

The small tributary stream channel would be reestablished through the fill removal area. At the south side of the fill the channel would be routed north through the restoration area and then reconnect with its current channel at the north side of the fill prior to its confluence with Nason Creek. The proposed channel dimensions are based on the existing channel dimensions, which would average 2 feet deep and 10 feet in top width with a v-shaped bottom (Appendix D). Two logs would be placed across the old stream channel to divert flows into the newly restored creek channel. Staging for the fill removal would occur in an area identified by the contractor and approved of by Chelan County to ensure that no wetland or sensitive resources would be affected.

4.3.2.2 Riparian Restoration

Following grading this area would be seeded and planted with native shrubs similar to the adjacent floodplain area. Three riparian communities have been developed for the area based on expected hydrologic conditions. Please refer to the plans in Appendix D for the proposed planting plan. Grading would be performed in a manner that preserves as much existing native vegetation in the floodplain to maintain as much native vegetation as possible. Plant species selected for these communities would be based on observations of existing native species growing in the Nason Creek floodplain and expected hydraulic and soil conditions. Table 6 lists the proposed plants, elevation, and size.

Riparian replanting would be incorporated into the site seeding and erosion control plan. All planting areas would also be seeded with a native seed mix (Appendix D).

Table 6. Proposed Plants for Riparian Restoration

Planting Area (elevation in feet)	Common Name	Species Name	Size
A (1,961–1,963 feet)	Pacific willow	*Salix lasiandra*	TP 414 Treepot
	Nootka rose	*Rosa nutkana*	TP 414 Treepot
	Red-osier dogwood	*Cornus sericea*	1 TP 414 Treepot
	Douglas spirea	*Spirea douglasii*	TP 414 Treepot
	Carex	*Carex obnupta*	plugs
B (1,963–1,964 feet)	Black cottonwood	*Populus balsamifera*	TP 414 Treepot
	Twinberry	*Lonicera involucrate*	TP 414 Treepot
	Nootka rose	*Rosa nutkana*	TP 414 Treepot
	Douglas spirea	*Spirea douglasii*	TP 414 Treepot
	Oceanspray	*Holodiscus discolor*	TP 414 Treepot
	Serviceberry	*Amelanchier alnifolia*	TP 414 Treepot
	Scouler's willow	*Salix scouleriana*	TP 414 Treepot
	Snowberry	*Symphoricarpos alba*	TP 414 Treepot

Planting Area (elevation in feet)	Common Name	Species Name	Size
C (1,964–1,965 feet)	Black cottonwood	*Populus balsamifera*	TP 414 Treepot
	Blue elderberry	*Sambucus nigra*	TP 414 Treepot
	Ponderosa pine	*Pinus ponderosa*	TP 414 Treepot
	Oceanspray	*Holodiscus discolor*	TP 414 Treepot
	Serviceberry	*Amelanchier alnifolia*	TP 414 Treepot
	Woods rose	*Rosa woodsii*	TP 414 Treepot
	Snowberry	*Symphoricarpos alba*	TP 414 Treepot

4.3.3 Oxbow Large Woody Debris Enhancement—RM 3.9

This action proposes to enhance conditions in the oxbow habitat at RM 3.9 that was hydrologically reconnected by the CCNRD via the installation of two 12-foot- diameter culverts along SR 207 in 2007 (Appendix A, Photo 6). When this feature was hydrologically reconnected to Nason Creek in 2007, there was no additional habitat enhancement work completed in the existing oxbow (Appendix A, Photo 6). Since 2007, monitoring efforts have shown that the oxbow is used by juvenile and adult salmonids as off-channel refuge, rearing, and spawning habitat. Given the abundant fish use, the CCNRD has worked with the U.S. Forest Service to propose the enhancement of habitats within the upstream area of the oxbow where wide, shallow habitats have persisted since the 2007 reconnection.

This action proposes to install large wood, and willow bundles in the upstream area to add structure to the oxbow channel and to make some wider areas narrower. In some areas, the placement of large wood and brush bundles would locally alter flow dynamics and sediment deposition patterns and create scour to initiate depositional areas on the edges of the oxbow. This would create slightly higher areas on the edges of the oxbow that can be planted to increase vegetation structure at the water's edge, which would add edge complexity and overhanging vegetation as well as instream cover to improve fish rearing habitat.

There are four specific habitat structures within the oxbow enhancement area (Appendix D, Sheet 13).

- **Habitat Structure 1.** Place seven logs with rootwads ranging from 20 to 30 feet in length on an existing gravel bar. The intent of this structure is to induce scour and deposition and improve flow depth/pool formation, while protecting existing willow and cottonwood saplings.
- **Habitat Structure 2.** Place four logs with rootwads 20 feet in length on existing gravel bar in the flow shadow of the Area 1 structure. The intent of this structure is to induce scour and deposition and improve flow depth/pool formation, while protecting willow plantings. This area would also include the addition willow bundles.
- **Habitat Structure 3.** Place nine logs with rootwads ranging from 15 to 30 feet in length on an existing gravel bar. The rootwads would be facing flows to induce scour and pool formation, while creating a depositional area in the velocity shadow of the structure. Willow bundles would be added as well in areas where sediment accumulation is expected.
- **Habitat Structure 4.** Place eight treetops with branches 30 feet in length around the perimeter of the open water habitat. This action would provide cover along the margins of the oxbow habitat for juvenile salmonids.

The wood would be staged off site and flown in by helicopter to minimize access disturbance. Traffic control would be required if the helicopter flies over SR 207 to deliver the wood. All wood, brush bundles, and vegetation would be placed by hand with a WCC work crew. CCNRD does not anticipate the need for earth-moving equipment or any vegetation clearing to complete the oxbow enhancements.

4.4 Construction Details

The following describes details common to all three of the proposed actions.

4.4.1 Site Preparation

Site preparation activities would include the following.

- Create a staging area and site access measures.
- Prepare the traffic control as required for projects entering SR 207.
- Clear and grub the site. No clearing or grubbing would occur in association with the oxbow enhancements.
- Protect existing native vegetation.

4.4.2 Staging Area and Site Access

The staging area would use existing cleared areas off of SR 207 and near the work areas. The staging areas would be large enough to accommodate the storage of equipment, tools, and materials. Staging would occur in an area identified by the contractor and approved of by Chelan County to ensure that no wetland or sensitive resources would be affected. Due to the proximity of the project to Nason Creek and adjacent wetland, the staging may be within the typical minimum standard of 150 feet from wetland or other sensitive habitats. Sediment fencing would be placed around the perimeter of the staging areas. Refueling would occur in the staging areas once per day because most equipment requires daily refueling. A spill prevention control and countermeasures plan would be developed by the contractor and spill containment gear including absorbent pads would be available on site.

4.4.3 Traffic Control Plan

A traffic control plan may be necessary for the parking area fill removal and oxbow enhancement project elements. CCNRD would work with WSDOT to develop an appropriate traffic control plan based on the proposed construction activities. This plan would be provided in the final construction plans.

4.4.4 Clearing and Grubbing

Clearing and grubbing activities would include removing existing debris and vegetation within and beyond the project footprint as necessary to construct the parking area fill removal and abutment project actions. Native woody material removed during clearing and grubbing activities would remain on site. Cut vegetation would either be left in piles as upland brush pile habitat or spread out amongst the planting area to provide weed suppression. Only one cottonwood larger than 6 inches

DBH would be removed to construct the parking area fill removal; 0.18 acre of shrub vegetation would be removed for the abutment removal element; and no vegetation would be removed for the oxbow enhancement elements.

4.4.5 Protection of Existing Native Vegetation

Protection of native vegetation would include installing perimeter fencing to delineate the extent of clearing activities and identify the vegetation to be preserved. Additional preconstruction surveys may be necessary to determine the number of trees to be preserved. It would be the responsibility of the contractor to maintain the perimeter fencing throughout the construction of the project to ensure protection of vegetation.

4.4.6 Grading and Earthwork

Grading activities and earthwork associated with the fill removal and abutment project elements are estimated to take 2 weeks to complete and would occur in summer 2014. The grading activities listed below are shown in the Design Sheets in Appendix D.

- Removal of parking area fill and bridge abutment.
- Grade stream channel through parking area floodplain fill removal site.

4.4.7 Construction Sequencing

In-water work that affects the main channel of Nason Creek and the tributary stream through the parking fill area would be constructed within the U.S. Army Corps of Engineers (Corps)/Washington Department of Fish and Wildlife (WDFW)-approved in-water work window (July 1 through August 15).

To avoid and minimize the potential for sediments to be carried into Nason Creek during removal of the bridge abutment, the equipment would work from the bank and in the dry. The abutment removal is expected to take 1 day of in-water work. The work area would be isolated from the main Nason Creek by coffer dams. The exact locations of cofferdams and pumps (the need for pumping would be determined by the contractor) would be determined at the time of construction. Generally they would be as near the limits of earthwork as the contractor determines is appropriate.

No work isolation is proposed for the oxbow enhancement elements because equipment would not be entering the water. The logs would be lowered by helicopter to the project areas and then maneuvered in place by hand crews.

4.5 Conservation Measures and Best Management Practices

Temporary erosion and sediment control consists of implementing standard erosion control best management practices (BMPs) and minimizing the input of sediment into Nason Creek. Standard BMPs for the site would include the installation of silt fencing at the edge of the clearing limits for the project, vehicle fueling and maintenance performed at approved locations a distance away from

the creek, covering of excavated material with straw mulch, and hydroseeding with native grass seed mix.

Below is a listing of conservation measures that follow typical BMPs listed in WDFW's Hydraulic Project Approval.

- Construction impacts will be confined to the minimum area necessary to complete the project and boundaries of clearing limits associated with site access and construction will be marked to avoid or minimize disturbance of riparian vegetation, wetlands, and other sensitive sites.
- The following actions will be completed before significant alteration of the project area.
    - flag the boundaries of clearing limits associated with site access and construction to prevent ground disturbance of critical riparian vegetation, wetlands, and other sensitive sites beyond the flagged boundary; and
    - ensure that a supply of sediment control materials are on site (e.g., silt fence, straw bales) and an oil-absorbing floating boom is available whenever surface water is present.
- Project operations will cease under high-flow conditions that may inundate the project area, except for efforts to avoid or minimize resource damage.
- Work below the ordinary high water mark (OHWM) of the Nason Creek will be completed during an approved extension to the in-water work window (July 1 through August 15).
- Spill prevention and cleanup kits will be on site when heavy equipment is operating within 25 feet of the water.
- All pumps used for dewatering will have screened intakes according to WDFW specifications and juvenile fish screening criteria. All sediment-laden water will be contained within a WDFW-approved or required gravel cofferdam or berm system. Floodplain areas will be isolated from Nason Creek, or will be routed or pumped to other floodplain areas, to a small settling basin, bioswale, non-stream connecting ditch or channel, uplands area, or other WDFW-approved detention or filtering system, and temporarily detained or filtered so as to allow the removal of fine sediments or other contaminants prior to being allowed to reenter Nason Creek.
- Temporary impoundment structures, commonly referred to as cofferdams, will be placed between the extents of channel grading and the river to keep water and fish from entering the active construction area. The cofferdam will consist of woven polyethylene gravel bags with a polyfilm sheet wrapped around them to minimize conveyance of water between the work site and the active flow in the river.
- All road fill components, bank and channel protection materials, instream fish habitat components, or other project materials will be commercially obtained and transported to the site from outside of the immediate project area. No existing instream or shoreline materials (e.g., logs, rocks, stream gravels, cobbles, woody debris, or any other instream or shorelines materials) found within or adjacent to the OHWM or wetted perimeter will be disturbed, relocated, or used for bank or channel protection.
- No mechanized equipment will enter or operate within the wetted perimeter of Nason Creek. Exceptions may be granted for work that is shown to be absolutely necessary if a low-impact walking excavator or other WDFW-approved equipment is used and further approval is obtained from WDFW for this or other WDFW-approved in-water machine work. Other than this potential exception, all regular land-based equipment will work from atop the bank or from the

dry streambed or shoreline zone only, unless further approval is given by WDFW. All mechanized equipment will work around all existing streamside or shoreline vegetation and instream fish habitats to the greatest extent possible, so as not to damage or destroy them. Equipment will not harm or damage the streambed, instream fish habitat, the streambank, or any native shoreline vegetation within the OHWM.

- All material used to construct instream structures will be clean of mud, dirt, and other material that could temporarily degrade water quality in the project area. If materials are required to be cleaned on site, a bermed wash-down area will be constructed to receive excess excavated material.
- Clearing limits will be marked with flagging wherever clearing is proposed in or adjacent to Nason Creek.
- Native materials, including large wood, native vegetation, weed-free topsoil, and native channel materials (gravel, cobble, and boulders) disturbed during site preparation will be saved on site for site restoration. When construction is finished, all streambanks, soils, and vegetation will be cleaned up and restored as necessary to renew ecosystem processes that form and maintain productive fish habitat. Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
- Earthwork (including drilling, excavation, dredging, filling, and compacting) will be completed as quickly as possible by implementing the following action.
    - During excavation, stockpile native streambed material above the bankfull elevation where it cannot reenter the stream for later use.
- Construction equipment will be limited to the practical minimum access and construction footprint required.
- A Pollution and Erosion Control Plan will be prepared and implemented to prevent pollution caused by survey, construction, operation, and maintenance activities. The plan will be available for inspection upon request by the National Marine Fisheries Service (NMFS) and contain the following elements:
    - the name and address of the party or parties responsible for accomplishment of the Pollution and Erosion Control Plan;
    - practices to prevent erosion and sedimentation associated with access roads, stream crossings, drilling sites, construction sites, borrow pit operations, haul roads, equipment and material storage sites, fueling operations and staging areas;
    - practices to confine, remove, and dispose of excess concrete, cement, and other mortars or bonding agents, including measures for washout facilities;
    - a description of any regulated or hazardous products or materials that will be used for the project, including procedures for inventory, storage, handling, and monitoring;
    - a spill containment and control plan with notification procedures, specific cleanup and disposal instructions for different products, quick response containment and cleanup measures that will be available on the site, proposed methods for disposal of spilled materials, and employee training for spill containment; and

  - practices to prevent construction debris from dropping into any stream or water body, and to remove any material that does drop with a minimum disturbance to the streambed and water quality.

- All temporary erosion controls will be in place and appropriately installed downslope of project activity within the riparian buffer area until site rehabilitation is complete.
- During construction, instream turbidity will be monitored and all erosion controls will be inspected—daily during the rainy season and weekly during the dry season, or more often if necessary—to ensure they are working adequately. If monitoring or inspection shows that the erosion controls are ineffective, work crews will be mobilized immediately to make repairs, install replacements, or install additional controls as necessary. Sediment will be removed from erosion controls once it has reached one-third of the exposed height of the control. "Working adequately" means no more than a 10% cumulative increase in natural stream turbidity will be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity.
- All discharge water created by construction (e.g., concrete washout, pumping for work area isolation, vehicle wash water, drilling fluids) will be treated as follows.
  - Facilities will be designed, built, and maintained to collect and treat all construction discharge water using the best available technology applicable to site conditions. Treatment will be provided to remove debris, nutrients, sediment, petroleum hydrocarbons, metals, and other pollutants likely to be present.
  - If construction discharge water is released using an outfall or diffuser port, velocities will not exceed 4 feet per second, and the maximum flow of any aperture will not exceed 4 cubic feet per second.
  - Construction discharge water will not be released within 300 feet upstream of spawning areas.
  - Pollutants, including green concrete, contaminated water, silt, welding slag, or sandblasting abrasive will not be allowed to contact any wetland or the 2-year floodplain, except cement or grout when abandoning a drill boring or installing instrumentation in the boring.
- Use of heavy equipment will be restricted as follows:
  - When heavy equipment will be used, the equipment selected must have the least adverse effect on the environment (e.g., minimally sized, low ground pressure equipment).
  - Only enough supplies and equipment to complete a specific job will be stored on site.
  - Vehicle staging, cleaning, maintenance, refueling, and fuel storage will be completed, except for that needed to service boats, in a vehicle staging area placed 150 feet or more from any stream, water body, or wetland, unless otherwise approved in writing by NMFS.
  - All vehicles operated within 150 feet of any stream, water body, or wetland will be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected in the vehicle staging area will be repaired before the vehicle resumes operation. Document inspections in a record that is available for review upon request by NMFS.
  - Before operations begin and as often as necessary during operation, all equipment that will be used below the OHWM will be steam cleaned until all external oil, grease, mud, and other visible contaminates are removed. All cleaning in the staging area will be completed.

  - All stationary power equipment (e.g., generators, cranes, stationary drilling equipment) operated within 150 feet of any stream, water body, or wetland will be diapered to prevent leaks, unless suitable containment is provided to prevent potential spills from entering any stream or water body.

- A hazardous material spill kit will be located on site.
- The contractor will designate at least one employee as the Erosion and Spill Control Lead (ESCL). The ESCL will be responsible for installing and monitoring erosion control measures and maintaining spill containment and control equipment. The ESCL will also be responsible for ensuring compliance with all local, state, and federal erosion and sediment control requirements. Moreover, the ESCL will be responsible for inspecting all temporary erosion and sediment control measures on a regular basis, as well as maintaining and repairing such measures and ensuring their continued performance.
- Dewatering may be performed to maintain drier conditions in the areas of excavation. Dewatering is not a required part of the project but will be an allowable item performed if determined necessary by the contractor. Water pumped from excavations as part of dewatering will be discharged in upland areas, a minimum of 100 feet away from wetlands or the main Nason Creek channel. Discharge areas for dewatering will be selected to encourage infiltration of the discharge into the ground and/or to sheet flow through upland vegetation which will filter sediments out of the flow.

Chapter 5
References

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Appendix A
Photographs

Photo 1. Bridge abutment fill removal on river left facing downstream at low flow, September 5, 2012.

Photo 2. Bridge abutment fill removal at 1,500 cfs, May 15, 2013.

Photo 3. Parking area floodplain fill removal area facing west towards Nason Creek.

Photo 4. Parking area floodplain fill removal area facing east towards SR 207.

Photo 5. Riprap along SR 207 downstream of the parking area fill removal site.

Photo 6. Upstream 12-foot diameter culvert in SR 207 constructed in 2007 to reconnect partial creek flows to oxbow area. Facing from oxbow west towards SR 207.

Photo 7. Oxbow enhancement area facing west from SR 207 road prism. LWD will be placed on near gravel bar, far vegetated bars and along the habitat margins to the left of the photo area.

Appendix B
Hydrology

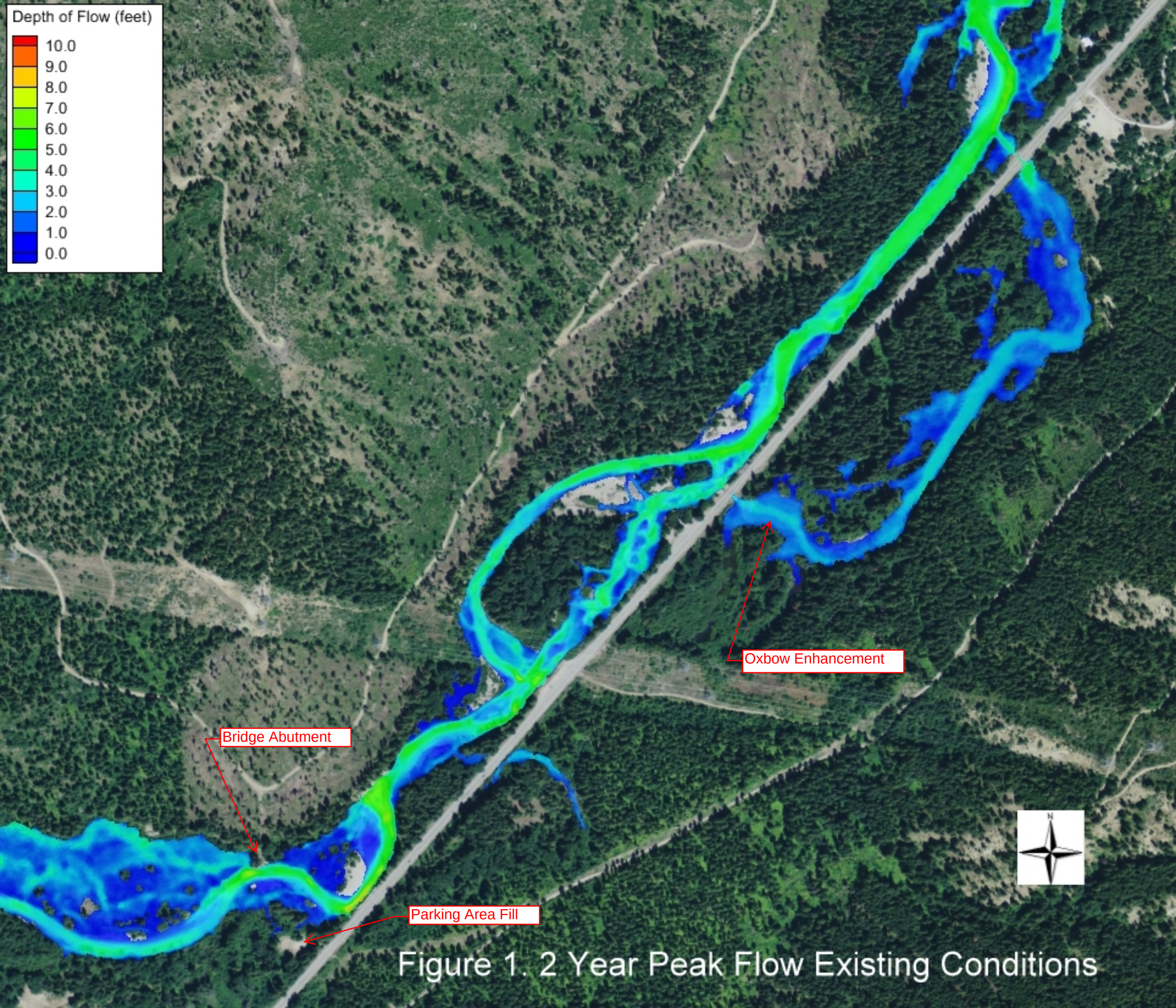


Figure 1. 2 Year Peak Flow Existing Conditions

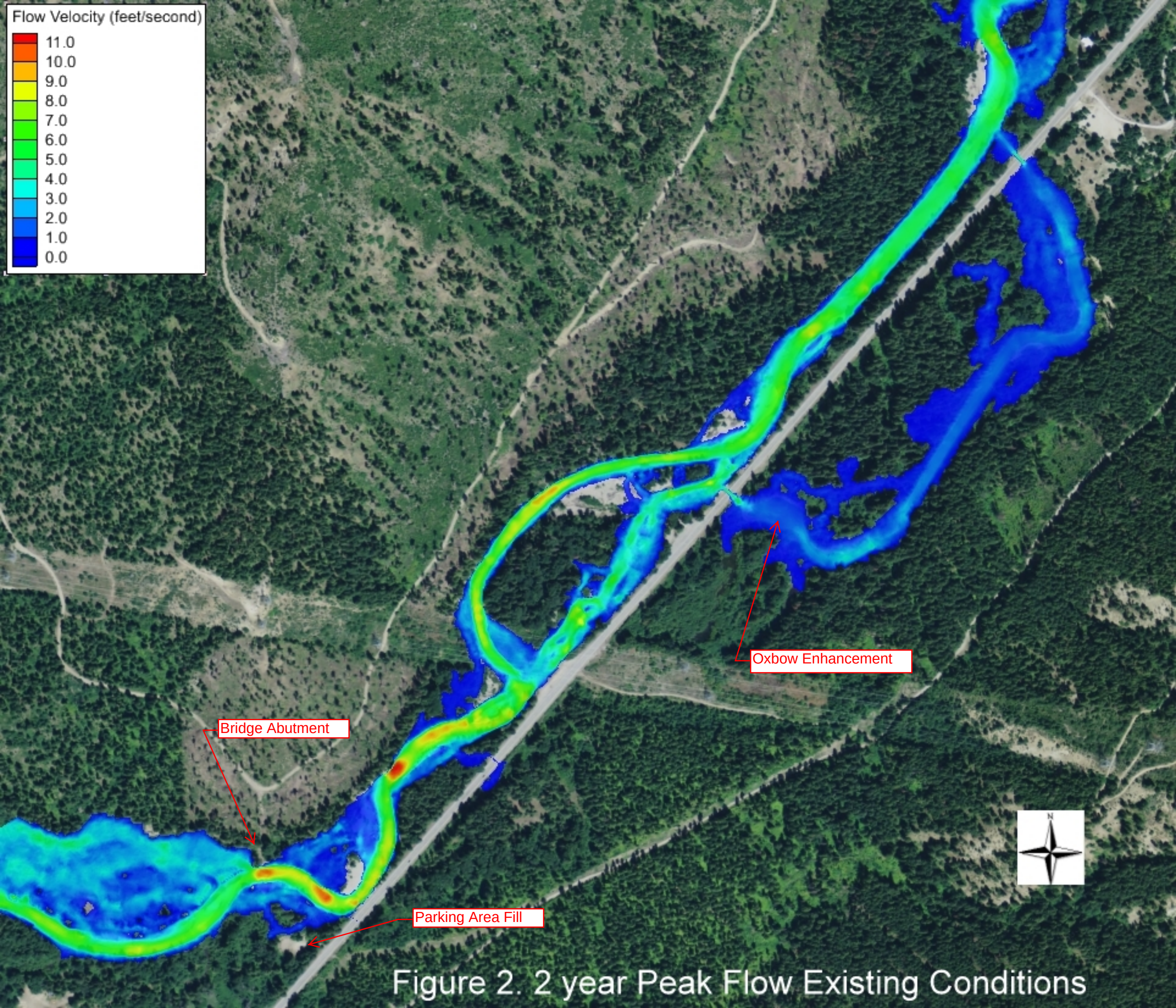


Figure 2. 2 year Peak Flow Existing Conditions

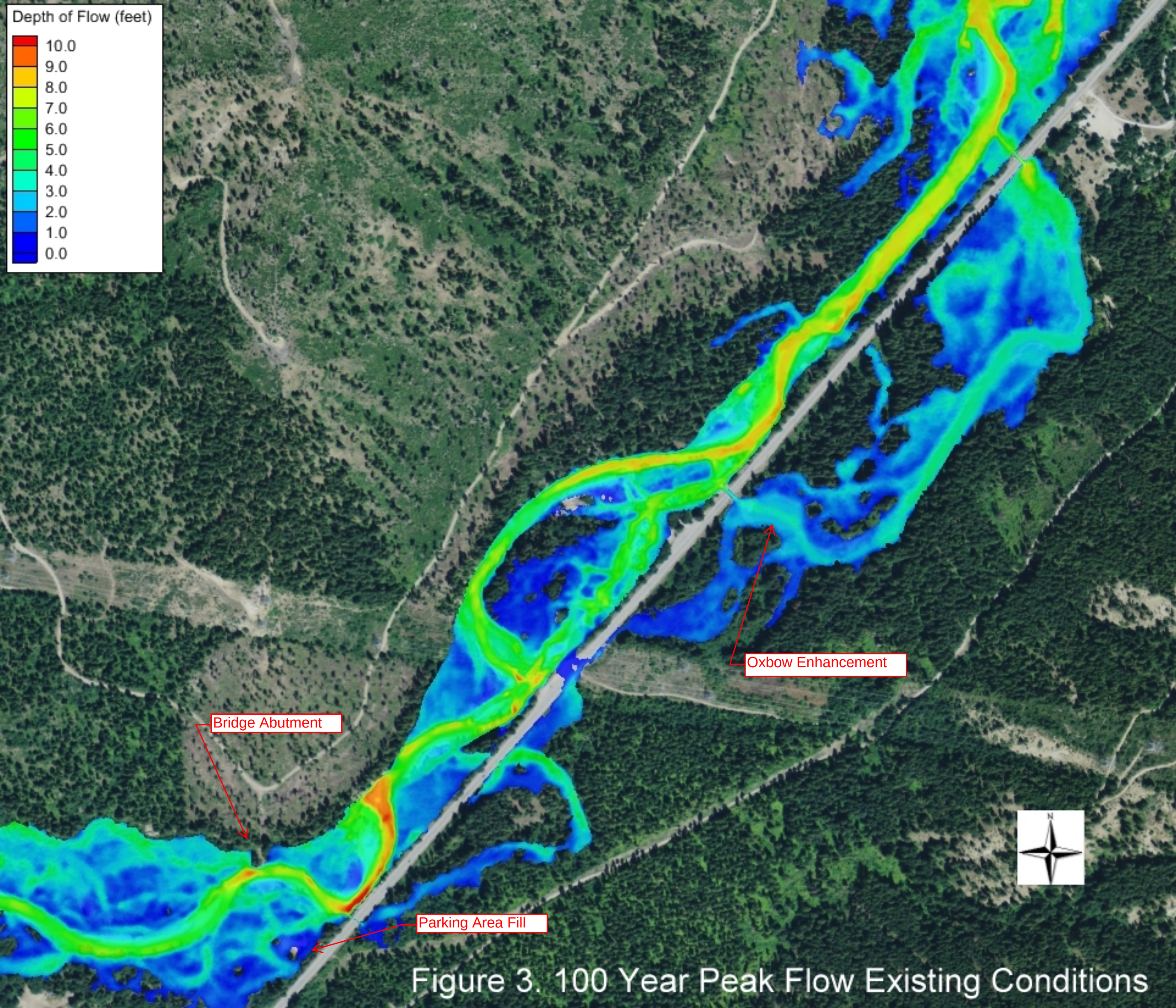


Figure 3. 100 Year Peak Flow Existing Conditions

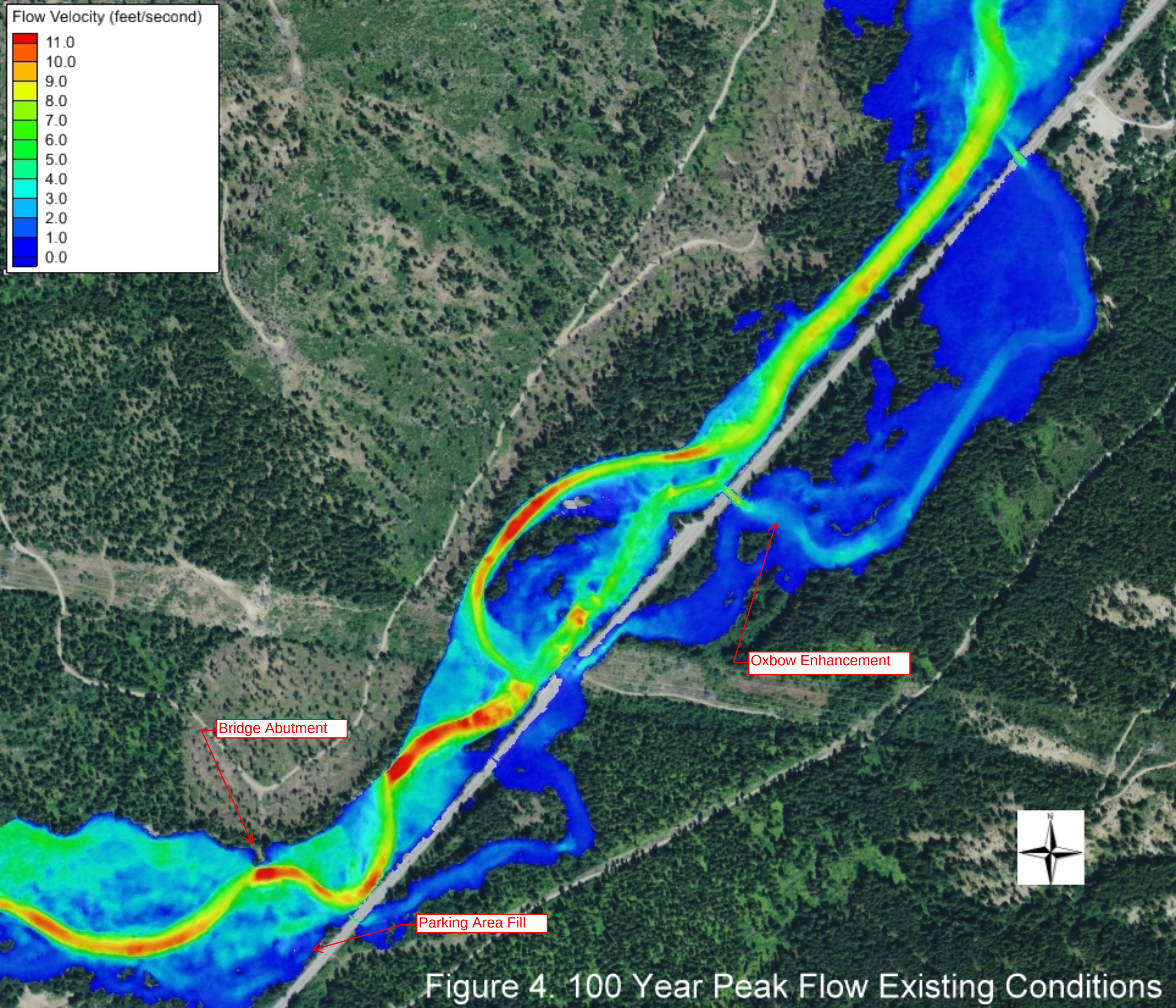
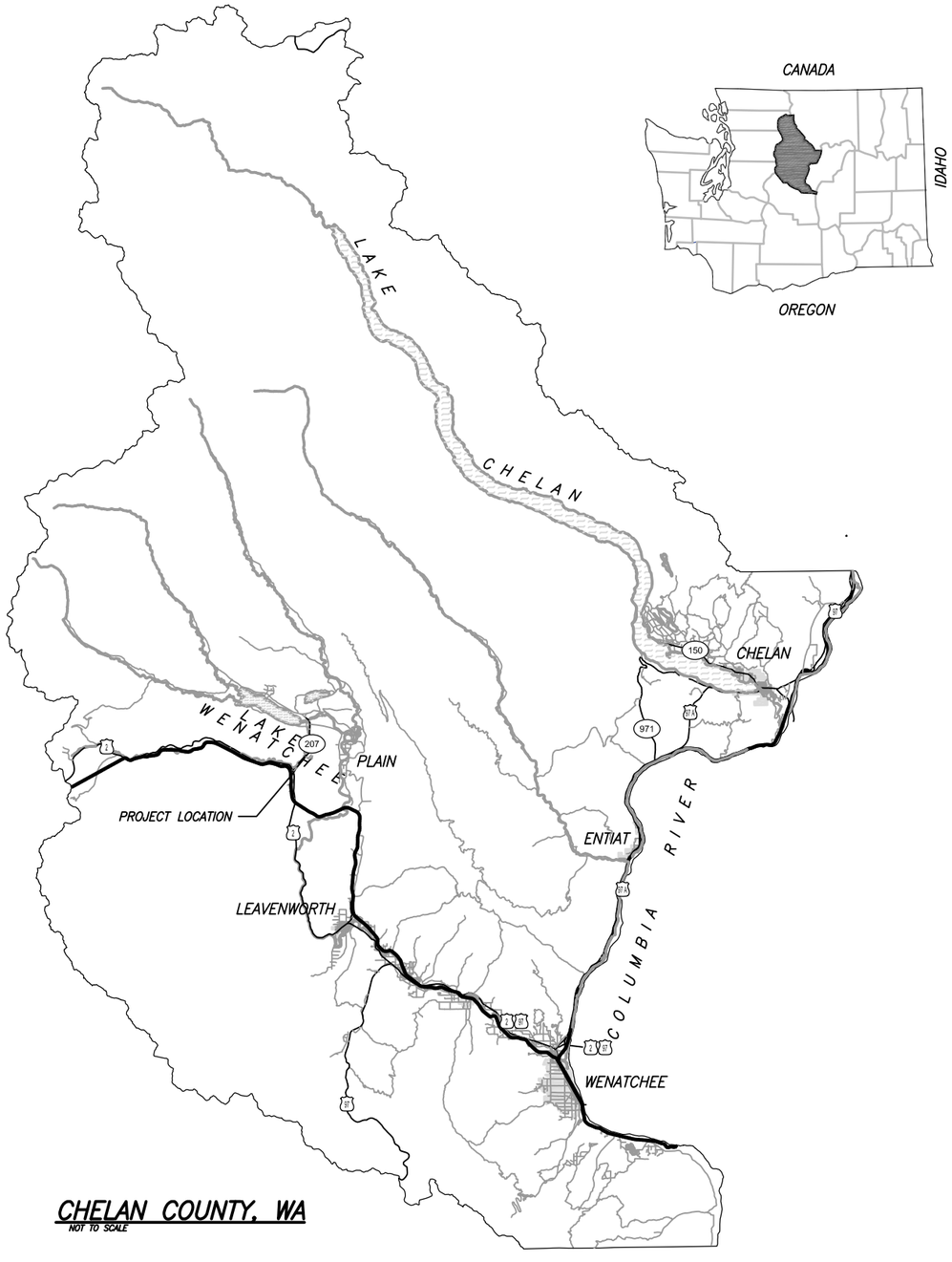
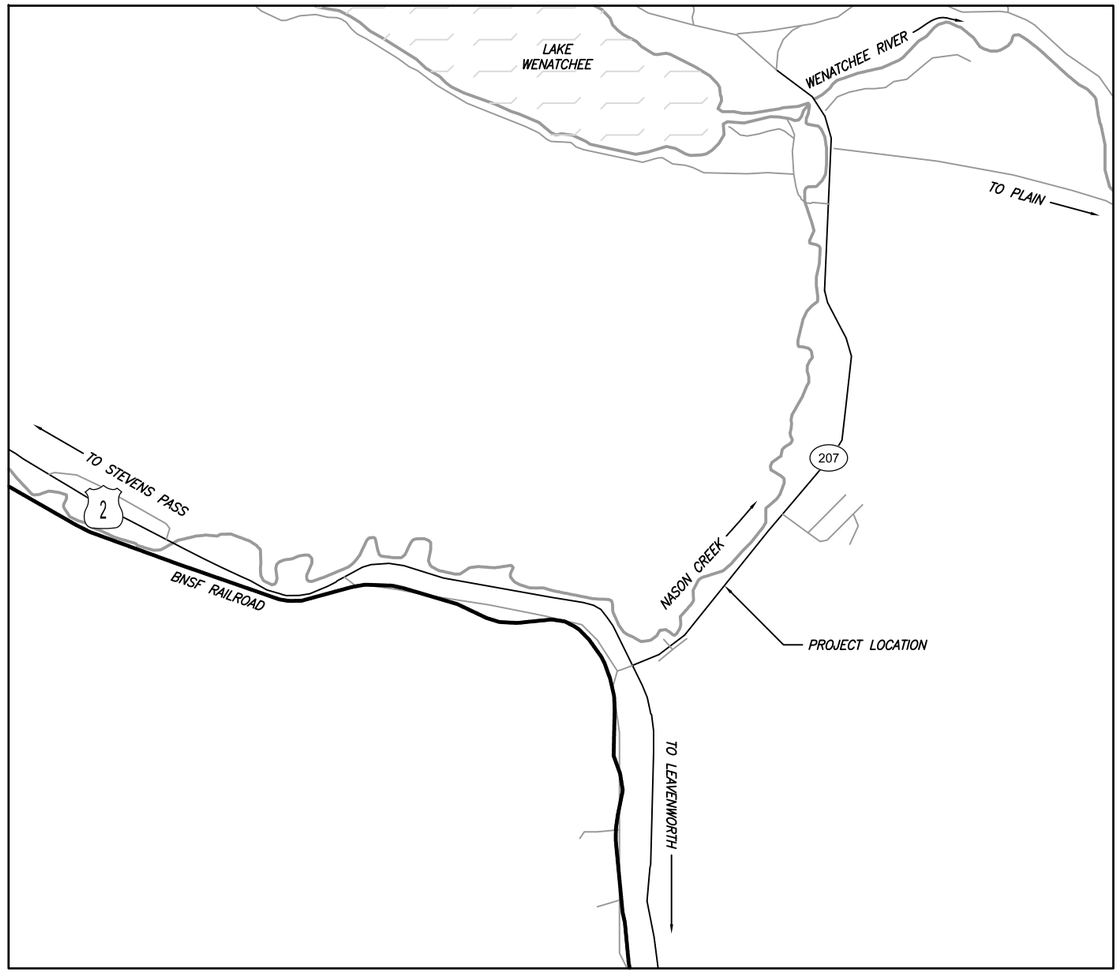


Figure 4. 100 Year Peak Flow Existing Conditions

Appendix C
Design Plans





PROJECT VICINITY MAP
NOT TO SCALE

NASON CREEK

River Mile 4.7 - River Mile 3.3 Restoration Project

CCNRD-2013.xx

Designed By: S. SEVILLE/D. STRATTEN
Drawn by: D. STRATTEN
Project Inspector:
Survey Crew:
JAN. 7 2014

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Date:	Description:	Made by:

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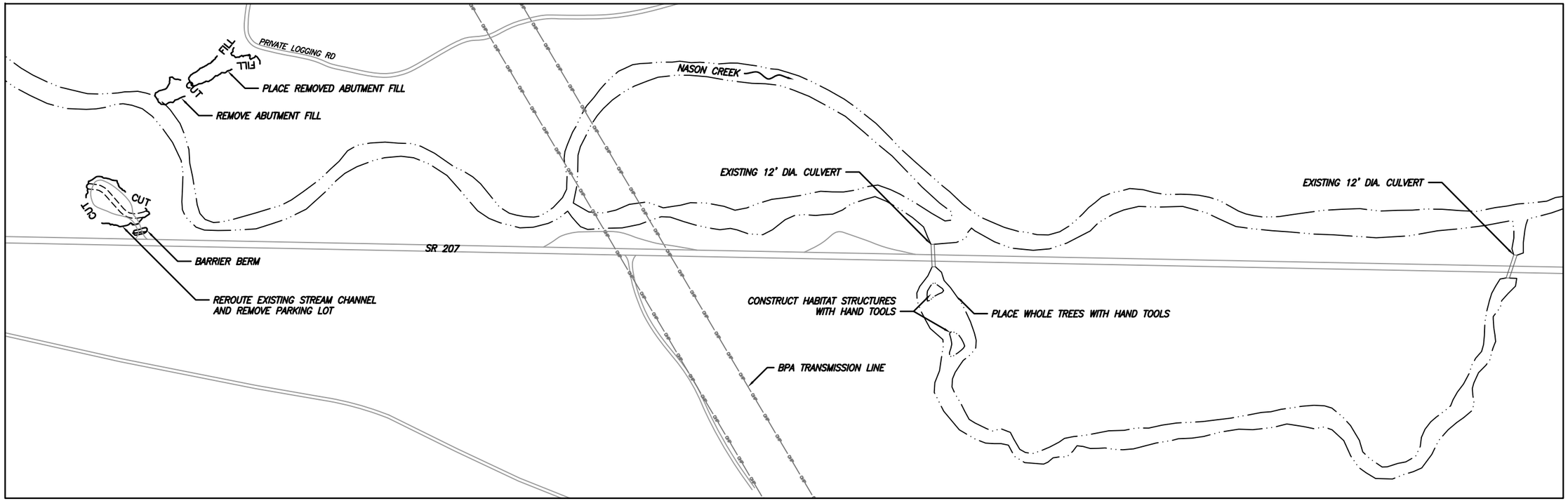
COVER SHEET

Nason Creek
RM 4.7 - RM 3.3
Restoration Project



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SHEET INDEX	
SHEET #	SHEET TITLE
1	COVER SHEET
2	OVERVIEW
3	GENERAL NOTES AND QUANTITIES
4	SITE ACCESS
5	GRADING STAGING AND SITE PREP
6	HABITAT STRUCTURE STAGING AND SITE PREP
7	GRADING OVERVIEW
8	PARKING LOT REMOVAL PLAN
9	PARKING LOT REMOVAL SECTIONS
10	ABUTMENT REMOVAL EXCAVATION PLAN
11	ABUTMENT REMOVAL FILL PLAN
12	ABUTMENT REMOVAL SECTIONS
13	HABITAT STRUCTURE OVERVIEW
14	HABITAT STRUCTURE DETAILS
15	HABITAT STRUCTURE DETAILS
16	PLANTING PLAN
17	PLANTING PLAN
18	PLANTING DETAILS
19	PLANTING DETAILS

PRELIMINARY PLANS
SUBJECT TO REVISION

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Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

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OVERVIEW

Nason Creek RM 4.7 - RM 3.3 Restoration Project

GENERAL NOTES

1. ANY ITEM NOT SPECIFICALLY DISCUSSED IN THE GENERAL CONTRACT FOR THIS PROJECT OR IN NOTES ON SHEETS IN THIS PLAN SET SHALL BE AS DESCRIBED IN THE STANDARD SPECIFICATIONS FOR ROADS, BRIDGES, AND MUNICIPAL CONSTRUCTION, 2012 PUBLISHED BY THE STATE OF WASHINGTON DEPARTMENT OF TRANSPORTATION. THE CONTRACTOR IS RESPONSIBLE TO BE FAMIILIAR WITH THE STANDARD SPECIFICATIONS AND TO HAVE THE STANDARD SPECIFICATIONS AT THE PROJECT SITE TO ENSURE THAT CONSTRUCTION OF THE PROJECT IS IN CONFORMANCE WITH THE STANDARD SPECIFICATIONS.
2. THE DRAWINGS AND NOTES IN THIS PLAN SET SUPERSEDE ANY ITEMS IN THE STANDARD SPECIFICATIONS.
3. HORIZONTAL DATUM: STATE PLANE COORDINATE SYSTEM, WASHINGTON NORTH ZONE, NAD $^{83}/_{91}$, US SURVEY FEET. VERTICAL DATUM: NAVD88, FEET.
4. TOPOGRAPHIC MAPPING OF THE PROJECT AREA WAS PERFORMED BY LANLINE SURVEYORS IN 2006. SUPPLEMENTAL TOPOGRAPHIC MAPPING OUTSIDE THE AREA OF CONSTRUCTION IS BASED ON LIDAR IMAGING, CHELAN COUNTY, WASHINGTON.
5. ELEVATIONS AND DISTANCES SHOWN ARE IN FEET AND DECIMALS WITH CONTOUR INTERVALS AT ONE FOOT INCREMENTS.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR GENERAL SAFETY DURING CONSTRUCTION, AND ALL WORK SHALL CONFORM TO PERTINENT SAFETY REGULATIONS AND CODES. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE PROVISIONS OF OSHA AND NRS CHAPTER 618, IN THE CONSTRUCTION PRACTICES FOR ALL EMPLOYEES DIRECTLY ENGAGED IN THE CONSTRUCTION OF THIS PROJECT.
7. SEVERAL UTILITY LINES ARE PRESENT IN THE PROJECT AREA AND ARE NOT SHOWN ON THE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING UTILITIES PRIOR TO CONSTRUCTION AND PROTECTING UTILITIES DURING CONSTRUCTION AS DESCRIBED IN SECTION 1-07.17 OF THE STANDARD SPECIFICATIONS. THE TELEPHONE NUMBER FOR THE ONE CALL CENTER FOR UTILITY LOCATES IS 1-800-424-5555.
8. PRIOR TO COMMENCEMENT OF WORK, THE CONTRACTOR SHALL PROVIDE THE CONTRACTING AGENCY WITH A DETAILED CONSTRUCTION SCHEDULE. THE CONTRACTOR SHALL NOT BEGIN ANY CONSTRUCTION WORK UNTIL THE PROJECT SCHEDULE AND WORK PLAN HAVE BEEN APPROVED BY THE CONTRACTING OFFICER.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE SITE IN A NEAT AND ORDERLY MANNER THROUGHOUT CONSTRUCTION.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING, AT THE CONTRACTOR'S EXPENSE, ALL CONSTRUCTION PERMITS AS REQUIRED BY THE LOCAL AGENCIES. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR AND EQUIPMENT REQUIRED TO COMPLY WITH ALL APPLICABLE PERMIT CONDITIONS AND REQUIREMENTS.
11. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONSTRUCTION STAKING AND LAYOUT UNLESS OTHERWISE SPECIFIED IN THE DRAWINGS.
12. THE CONTRACTOR SHALL PLACE TEMPORARY COFFERDAMS BETWEEN THE ACTIVELY FLOWING CREEK OR PONDED WATER AND THE EXTENTS OF ANY EARTHWORK TO KEEP WATER AND FISH FROM ENTERING THE ACTIVE CONSTRUCTION AREA. ALL IN-WATER WORK, INCLUDING CONSTRUCTION OF TEMPORARY COFFERDAMS, ABUTMENT REMOVAL, AND COFFERDAM REMOVAL, SHALL BE COMPLETED BETWEEN JULY 1, AND AUGUST 10, 2014.
13. THE CONTRACTOR SHALL NOTIFY THE CONTRACTING OFFICER A MINIMUM OF 5 WORKING DAYS IN ADVANCE OF COFFERDAM CONSTRUCTION TO COORDINATE FISH REMOVAL. THE CONTRACTING AGENCY WILL BE RESPONSIBLE FOR ALL FISH REMOVAL AND HANDLING.
14. DEWATERING WITHIN COFFERDAMS SHALL BE PERFORMED TO THE EXTENT NECESSARY TO COMPLETE THE WORK SHOWN ON THESE PLANS. DISCHARGE FROM DEWATERING WITHIN THE WORK AREA SHALL BE ROUTED TO FLOODPLAIN AREAS, A SMALL SETTLING BASIN, BIOSWALE, NON-STREAM CONNECTING DITCH, UPLANDS AREA, OR OTHER WDFW-APPROVED DETENTION OR FILTERING SYSTEM, AND TEMPORARILY DETAINED OR FILTERED SO AS TO ALLOW THE REMOVAL OF FINE SEDIMENTS OR OTHER CONTAMINANTS PRIOR TO BEING ALLOWED TO REENTER NASON CREEK. ALL PUMPS USED BY THE CONTRACTOR FOR DEWATERING SHALL HAVE SCREENED INTAKES THAT MEET WDFW SPECIFICATIONS AND JUVENILE FISH SCREENING CRITERIA.
15. ALL EQUIPMENT CONDUCTING IN-WATER WORK, WORKING WITHIN THE ACTIVELY FLOWING CREEK CHANNEL, WORKING WITHIN AN AREA SEPARATED FROM THE ACTIVELY FLOWING CHANNEL BY A COFFERDAM, AND WORKING ON THE TOP OF A BANK ADJACENT TO THE ACTIVELY FLOWING CREEK, SHALL USE VEGETABLE OIL FOR HYDRAULIC FLUID.

SUMMARY OF QUANTITIES

ITEM NO.	TOTAL QUANITITY	UNITS	ITEM
1	LUMP SUM	L.S.	MOBILIZATION
2	0.91	ACRE	CLEARING AND GRUBBING
3	1,050	L.F.	HIGH VISIBILITY FENCE
4	LUMP SUM	L.S.	COFFERDAM
5	575	C.Y.	DITCH EXCAVATION INCL. HAUL
6	1,825	C.Y.	FLOODPLAIN EXCAVATION
7	LUMP SUM	L.S.	CHANNEL PLUG
8	1,325	C.Y.	ABUTMENT EXCAVATION
9	1,325	C.Y.	PLACEMENT OF EXCAVATED ABUTMENT MATERIAL
10	LUMP SUM	L.S.	HABITAT STRUCTURE #1
11	LUMP SUM	L.S.	HABITAT STRUCTURE #2
12	LUMP SUM	L.S.	HABITAT STRUCTURE #3
13	LUMP SUM	L.S.	HABITAT STRUCTURE #4
14	0.32	ACRE	SEEDING - WETLAND MIX
15	0.78	ACRE	SEEDING - UPLAND MIX
16	2.2	TON	STRAW MULCH
17	2775	EACH	CONTAINER PLANT - TP414 TREEPOT
18	260	EACH	CONTAINER PLANT - 10 CI PLUG
19	6	EACH	WILLOW BUNDLE
20	58	L.F.	BRUSH MAT
21	3	EACH	PRE-PLANTED COIR SEDGE MAT
22	1,000	DOLLAR	EROSION/WATER POLLUTION CONTROL
23	LUMP SUM	L.S.	SPCC PLAN

LEGEND

- OHW — ORDINARY HIGH WATER MARK
- WL — WETLAND BOUNDARY
- BPA — BPA TRANSMISSION LINE
- CG — LIMIT OF CLEARING AND GRUBBING
- HVF — HIGH VISIBILITY FENCE
- CUT — LIMIT OF EXCAVATION
- FILL — LIMIT OF FILL

Designed By: S. SEVILLE/D. STRATTEN
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Project Inspector:
Survey Crew:
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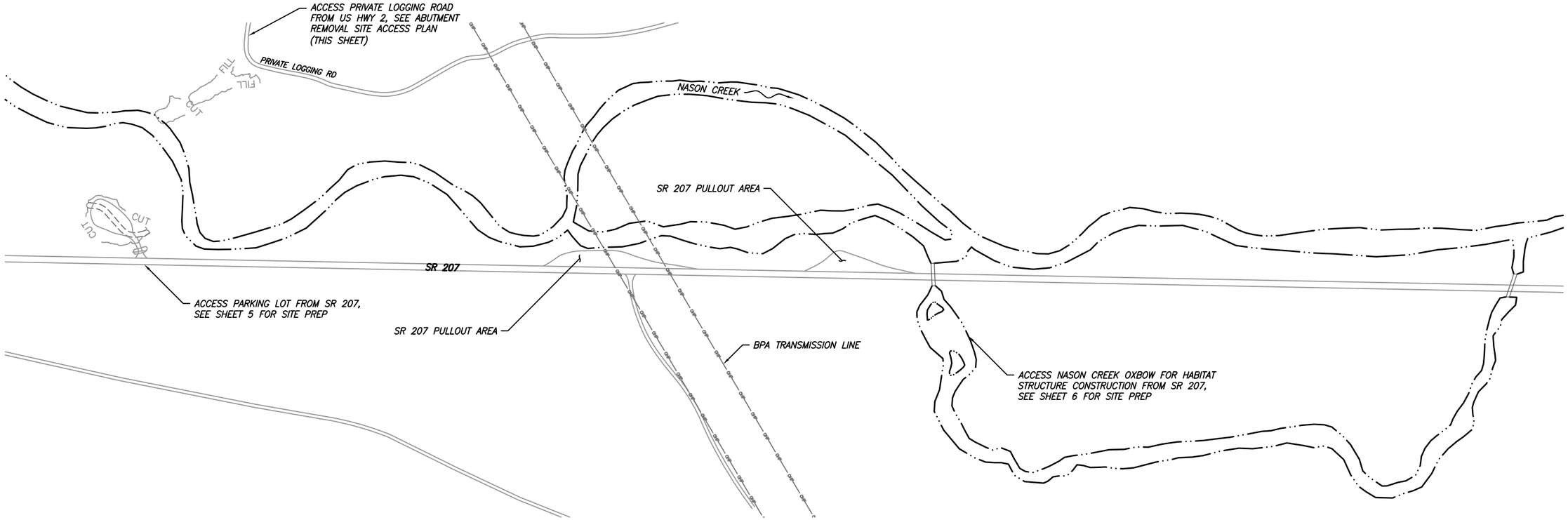
GENERAL NOTES AND QUANTITIES

Nason Creek
RM 4.7 - RM 3.3
Restoration Project



SITE ACCESS PLAN

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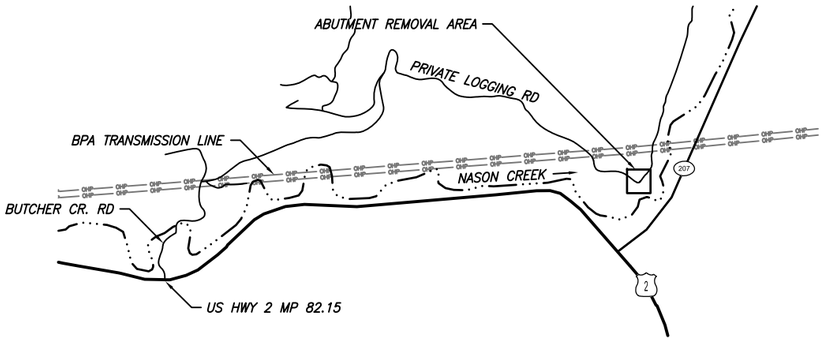

ABUTMENT REMOVAL SITE ACCESS PLAN

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NOTES

1. THE CONTRACTOR SHALL ACCESS THE PARKING LOT REMOVAL AND HABITAT STRUCTURE PROJECT AREAS FROM SR 207. SEE SHEETS 5 AND 6 FOR SITE PREP.
2. SITE ACCESS TO THE ABUTMENT REMOVAL PROJECT AREA WILL BE FACILITATED THROUGH THE CONTRACTING AGENCY; THE CONTRACTING AGENCY WILL SECURE ACCESS TO THE PRIVATE LOGGING RD SHOWN ON THIS SHEET AND WILL OBTAIN PERMISSION TO ACCESS THE SITE VIA THE PRIVATE RD ON BEHALF OF THE CONTRACTOR.

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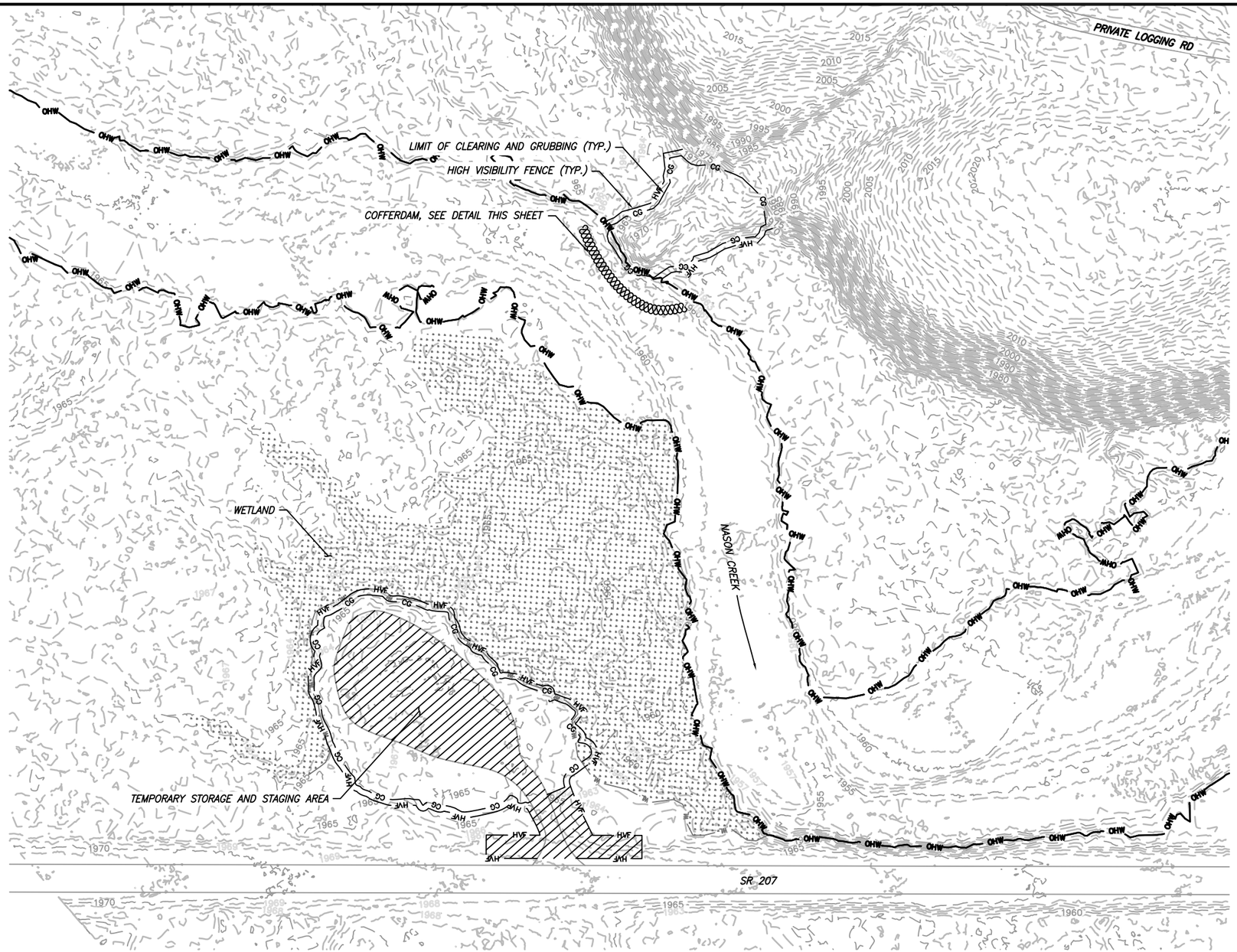
SITE ACCESS

Nason Creek
RM 4.7 - RM 3.3
Restoration Project



STAGING AND SITE PREPARATION – GRADING

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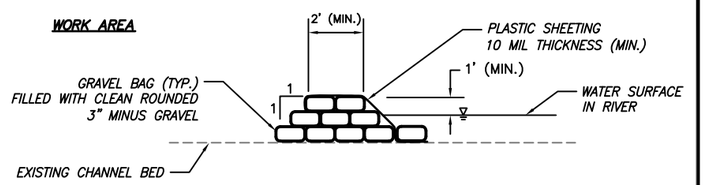

COFFERDAM DEATIL – TYPICAL SECTION

NOTES

1. THE LIMITS OF EXCAVATION SHALL SERVE AS THE LIMITS OF CLEARING AND GRUBBING AND SHALL BE STAKED PRIOR TO CLEARING AND GRUBBING.
2. THE CONTRACTOR SHALL INSTALL HIGH VISIBILITY FENCE AT THE LIMITS OF EXCAVATION TO CLEARLY MARK THE LIMITS OF CLEARING AND GRUBBING. HIGH VISIBILITY FENCE AND THE LIMITS OF CLEARING AND GRUBBING ARE SHOWN OFFSET ON THIS SHEET FOR VISUAL CLARITY.
3. THE EXISTING PARKING LOT AND DRIVEWAY MAY BE USED AS A TEMPORARY STAGING AND STORAGE AREA.
4. EQUIPMENT AND WORK VEHICLES REQUIRED FOR ABUTMENT REMOVAL AND PLACEMENT OF EXCAVATED ABUTMENT MATERIAL MAY BE STAGED ON THE PRIVATE LOGGING ROAD IN PULLOUTS AS CLOSE TO THE PROJECT SITE AS POSSIBLE. EQUIPMENT AND WORK VEHICLES SHALL NOT BLOCK TRAFFIC ON THE PRIVATE LOGGING ROAD.

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JAN. 7 2014

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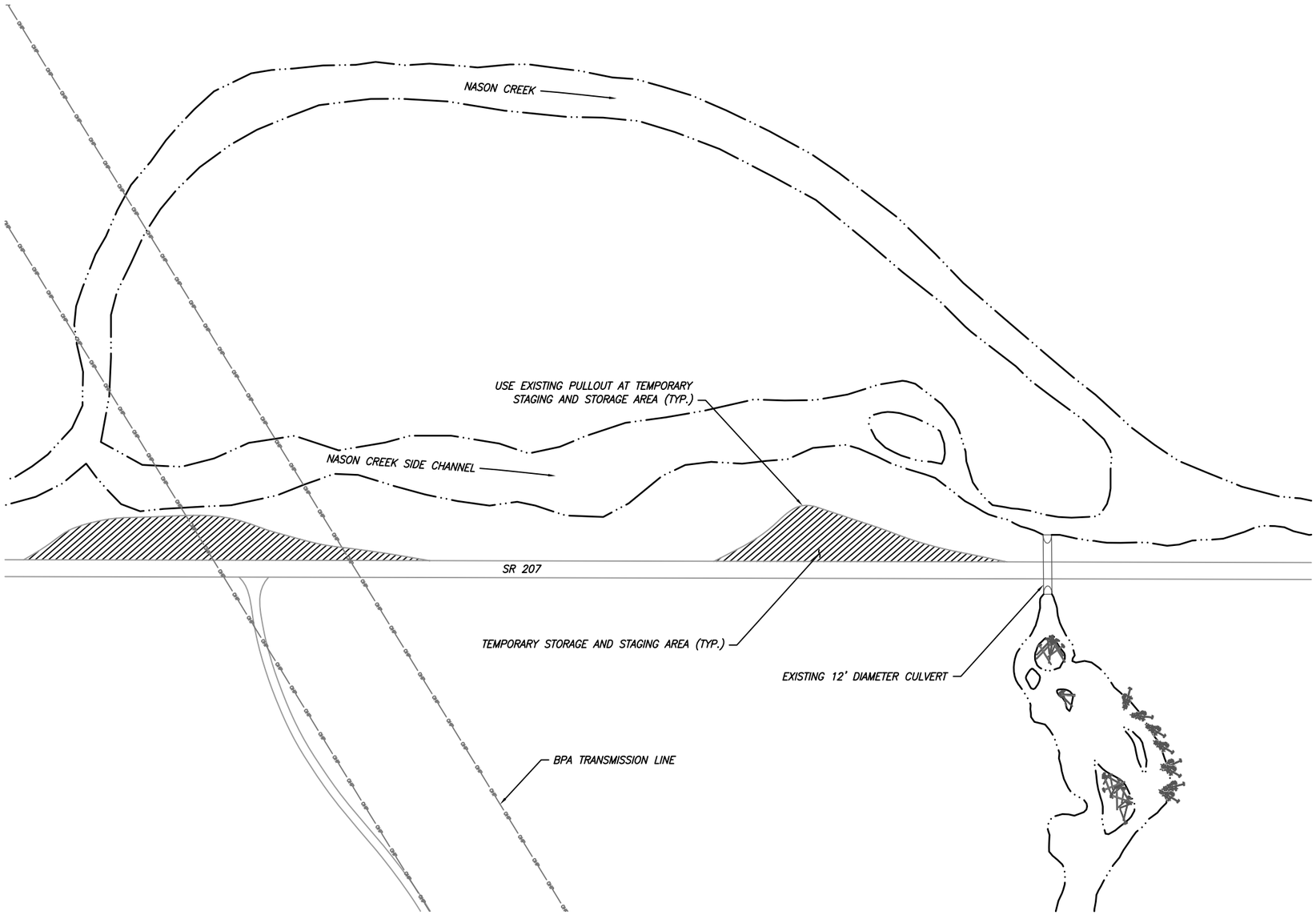
GRADING STAGING AND SITE PREP

Nason Creek Parking Lot and Abutment Removal Project

Sheet 5 of 19 | CCONR-2013.xx



NOTES

1. THERE IS LIMITED SPACE AVAILABLE FOR STAGING AND STORAGE OF WORK RELATED VEHICLES AND EQUIPMENT NEAR THE HABITAT STRUCTURES. THE CONTRACTOR SHALL MAKE USE OF EXISTING PULLOUTS ON SR 207 FOR TEMPORARY STAGING AND STORAGE AREAS.

50 0 50 100 150
SCALE OF FEET

PRELIMINARY PLANS
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Survey Crew:
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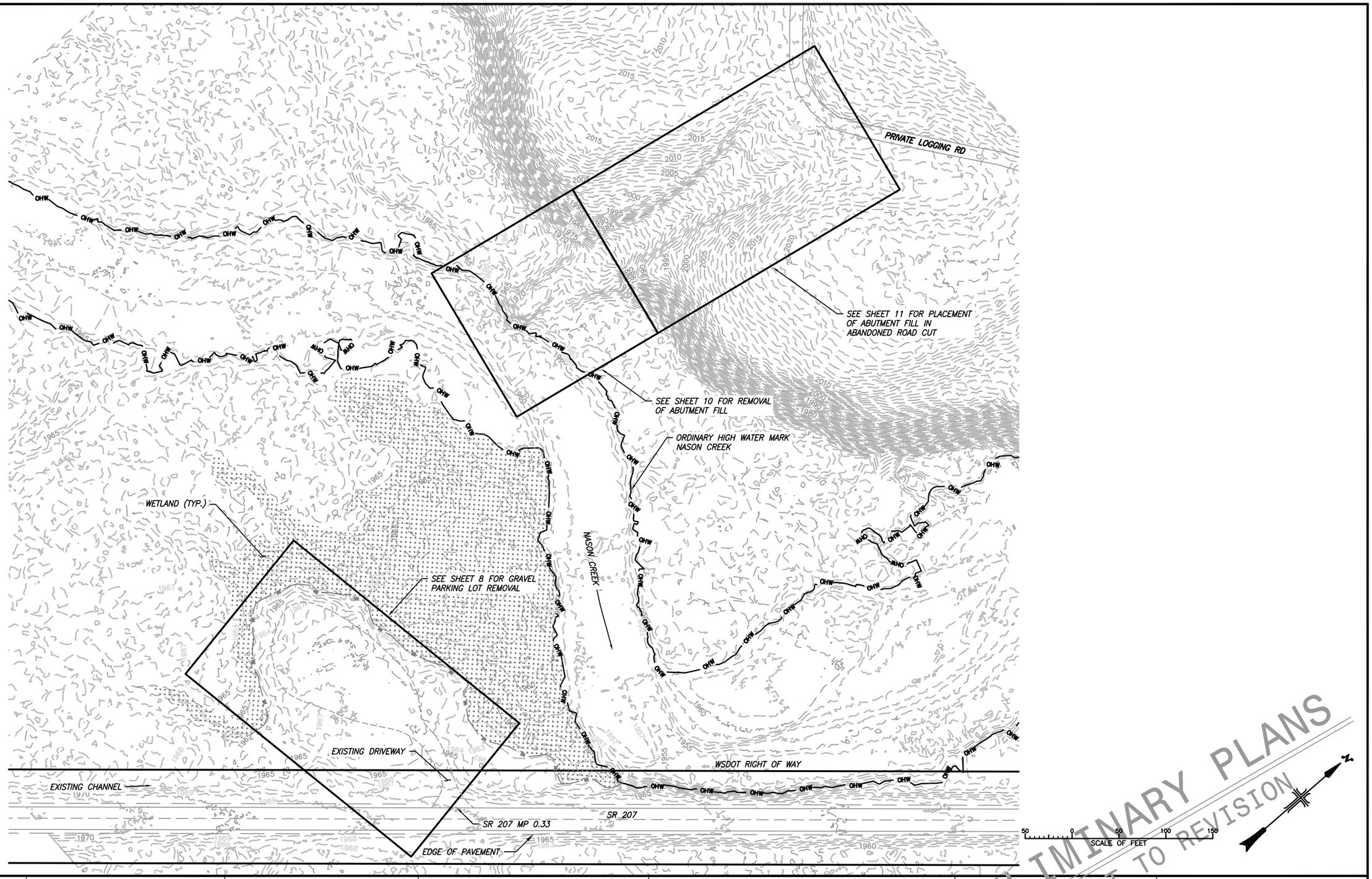
HABITAT STRUCTURE STAGING AND SITE PREP

Nason Creek Parking Lot and Abutment Removal Project



PRELIMINARY PLANS
SUBJECT TO REVISION

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Drawn by: D. STRATTEN	Date: / Description: / Made by:	
Project Inspector:		
Survey Crew:		
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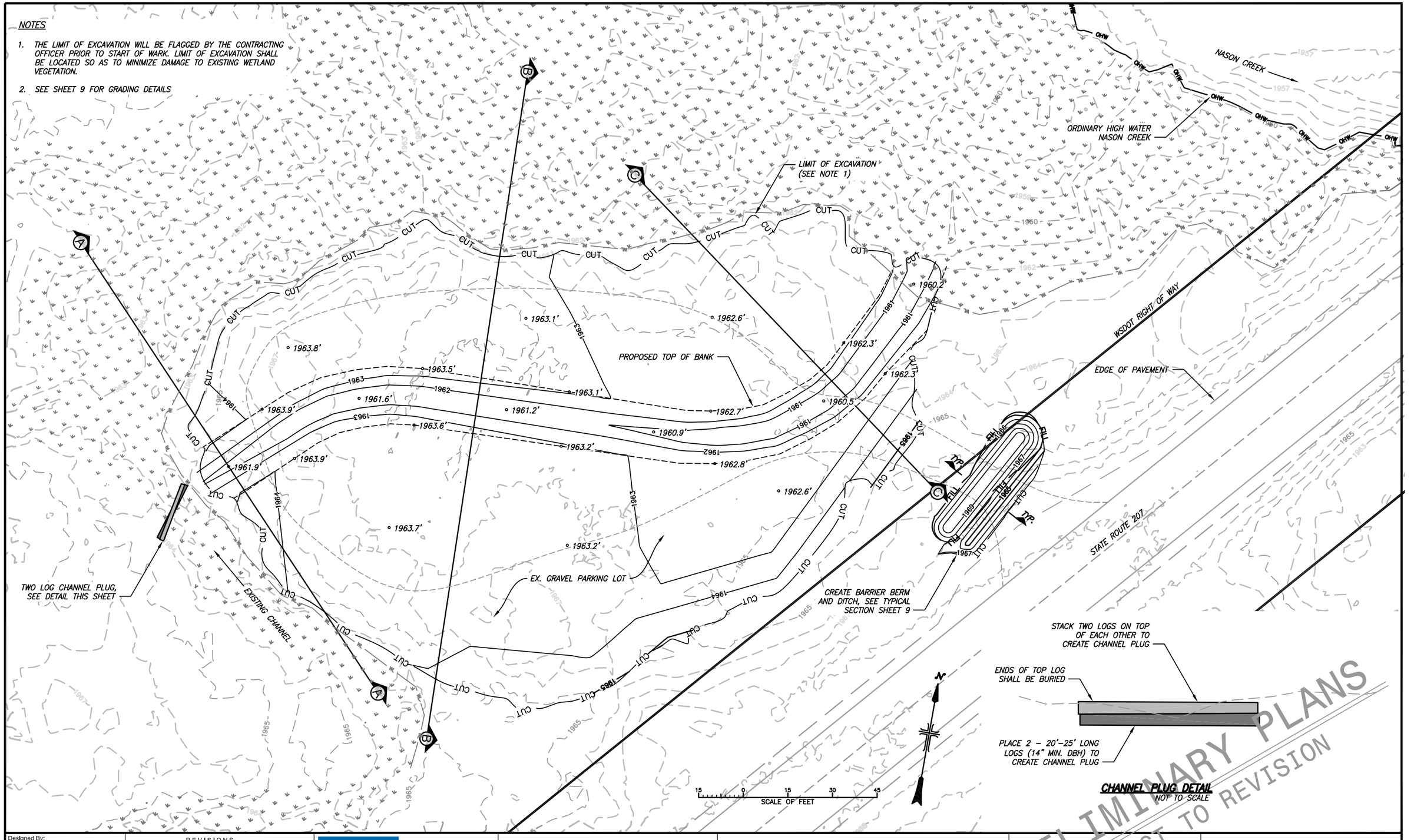
GRADING OVERVIEW

Nason Creek Parking Lot and Abutment Removal Project

Sheet 7 of 19 | CCNRD-2013.xx

NOTES

1. THE LIMIT OF EXCAVATION WILL BE FLAGGED BY THE CONTRACTING OFFICER PRIOR TO START OF WARK. LIMIT OF EXCAVATION SHALL BE LOCATED SO AS TO MINIMIZE DAMAGE TO EXISTING WETLAND VEGETATION.
2. SEE SHEET 9 FOR GRADING DETAILS



CHANNEL PLUG DETAIL
NOT TO SCALE

PRELIMINARY PLANS
SUBJECT TO REVISION

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Drawn by: D. STRATTEN	Date:	Description:	Made by:
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Survey Crew:			
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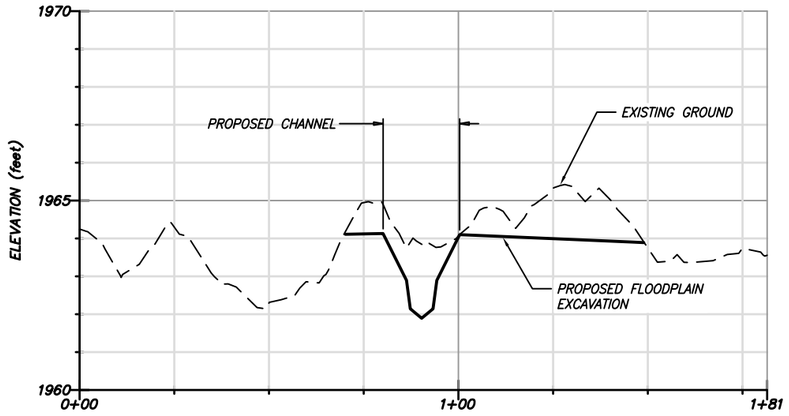
PARKING LOT REMOVAL PLAN

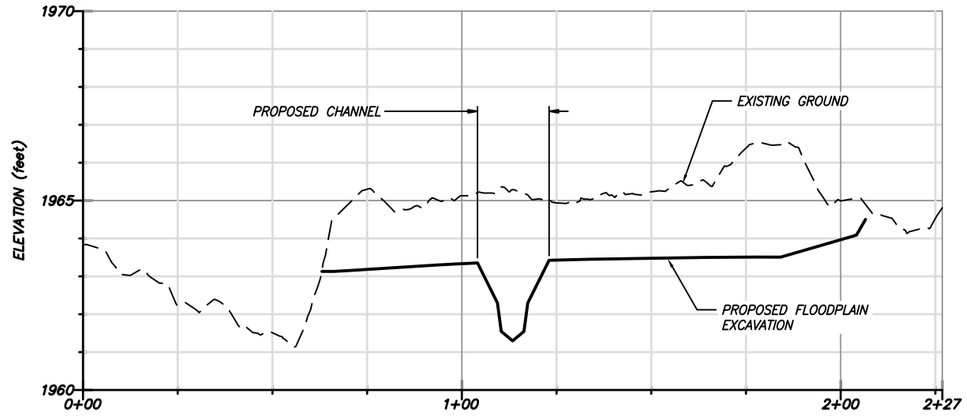
Nason Creek Parking Lot and Abutment Removal Project

NOTES

1. SEE SHEET 8 FOR LOCATION OF CROSS-SECTIONS SHOWN ON THIS SHEET.
2. VERTICAL DIMENSIONS ARE EXAGGERATED BY A FACTOR OF 10 ON THIS SHEET. REFERENCE THE Y-AXIS FOR DEPTHS AND ELEVATIONS.



SECTION A



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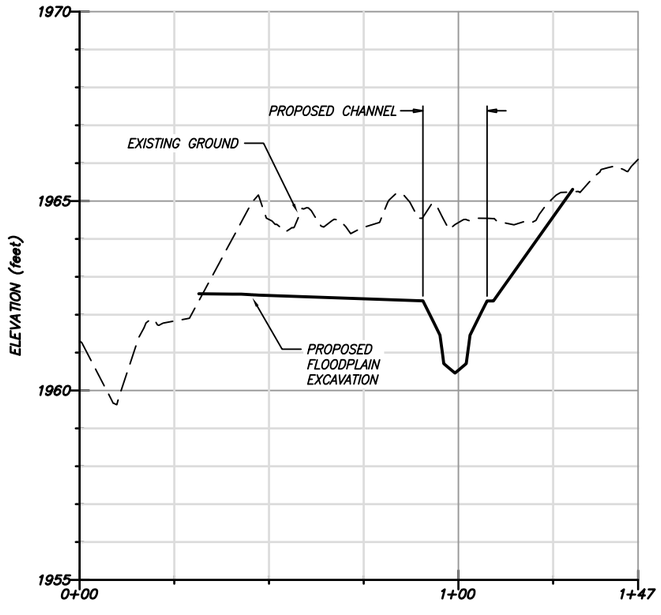
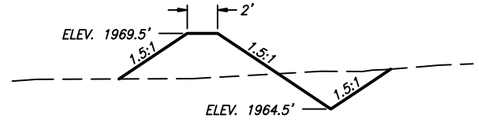


SECTION C



BARRIER BERM AND DITCH – TYPICAL SECTION
NOT TO SCALE

PRELIMINARY PLANS
SUBJECT TO REVISION

Designed By: S. SEVILLE/D. STRATTEN	REVISIONS		
Drawn by: D. STRATTEN	Date:	Description:	Made by:
Project Inspector:			
Survey Crew:			
JAN. 7 2014	As-Built Date:	by:	

ICF INTERNATIONAL

Chelan County
Natural Resource Department
316 Washington Street, Suite 401
Wenatchee, Washington, 98801
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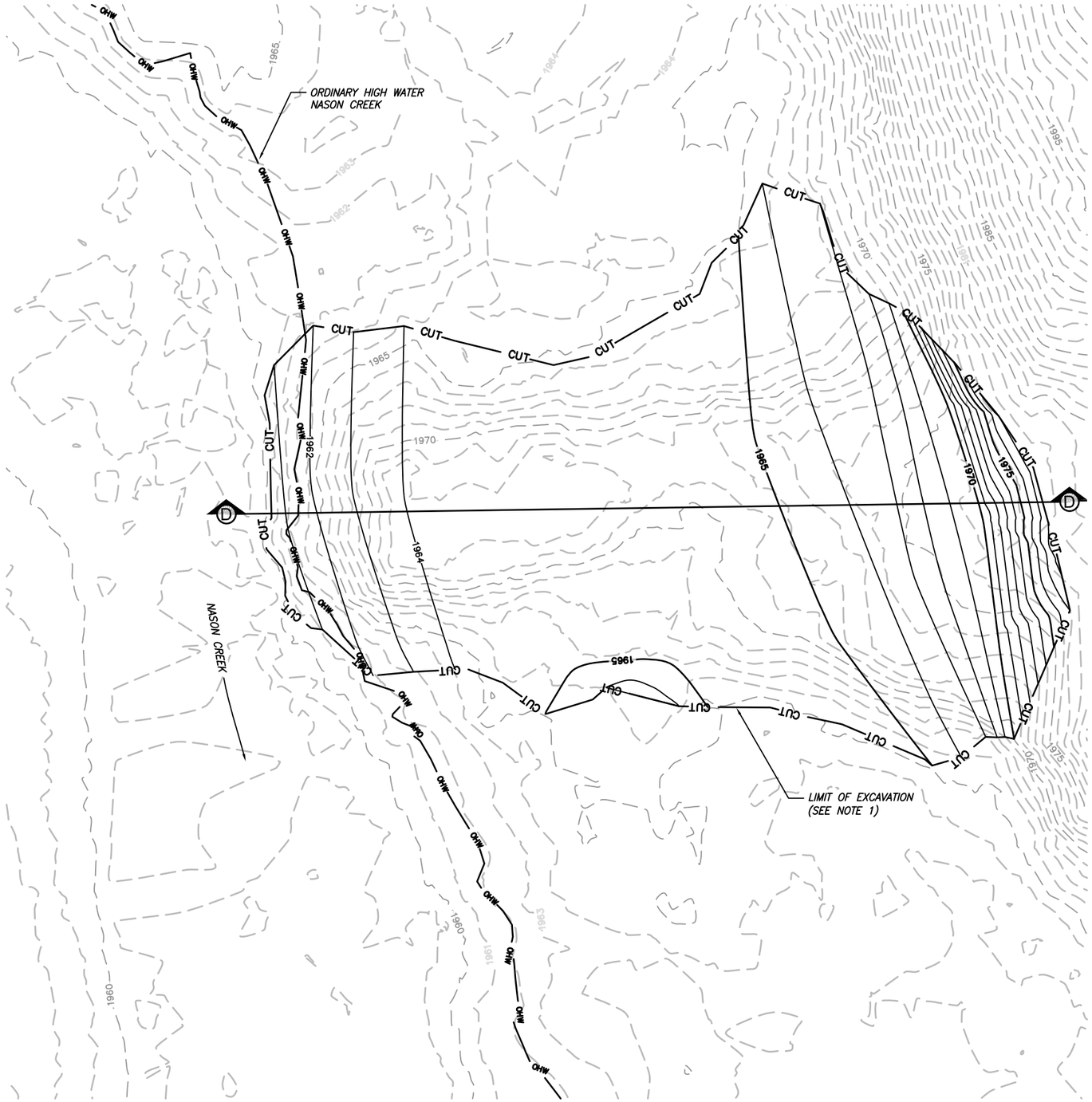
Website: www.co.chelan.wa.us

PARKING LOT REMOVAL SECTIONS

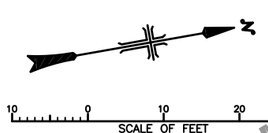
Nason Creek Parking Lot and Abutment Removal Project

CCNRD-2013.xx



NOTES

1. THE LIMIT OF EXCAVATION WILL BE FLAGGED BY THE CONTRACTING OFFICER PRIOR TO START OF EXCAVATION. LIMIT OF EXCAVATION SHALL BE LOCATED SO AS TO MINIMIZE DAMAGE TO EXISTING VEGETATION.
2. SOIL REMOVED FROM THE SITE OF THE EXISTING ABUTMENT SHALL BE PLACED IN THE FORMER ROAD CUT. CUT AND FILL TO BALANCE FOR WORK SHOWN ON THIS SHEET AND SHEET 11.
3. SEE SHEET 12 FOR GRADING DETAILS.



Designed By: S. SEVILLE/D. STRATTEN	REVISIONS		
	Date:	Description:	Made by:
Drawn by: D. STRATTEN			
Project Inspector:			
Survey Crew:			
JAN. 7 2014	As-Built Date:	by:	

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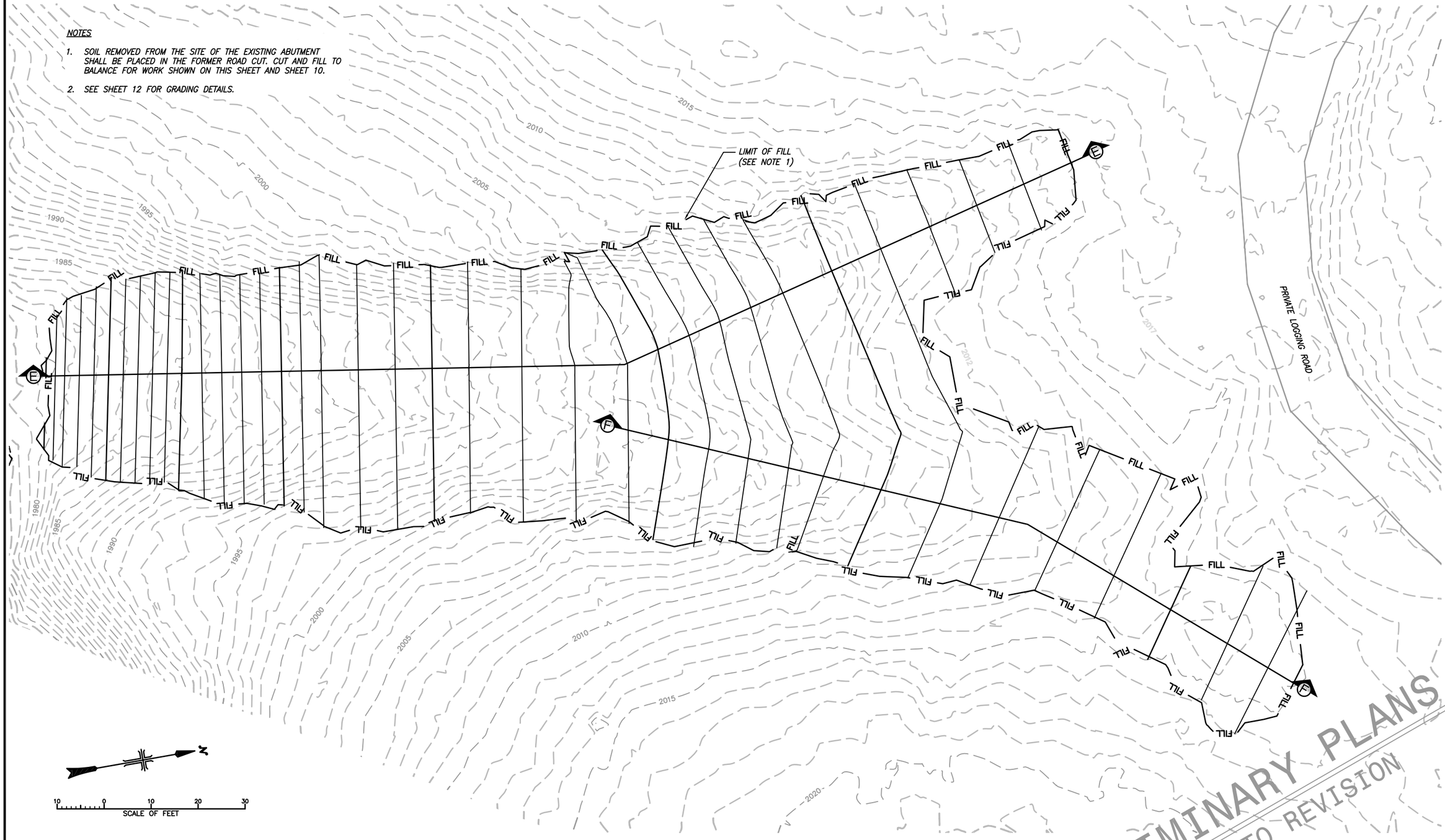
ABUTMENT REMOVAL EXCAVATION PLAN

Nason Creek Parking Lot and Abutment Removal Project

Sheet 10 of 19 | CCNRD-2013.xx

NOTES

1. SOIL REMOVED FROM THE SITE OF THE EXISTING ABUTMENT SHALL BE PLACED IN THE FORMER ROAD CUT. CUT AND FILL TO BALANCE FOR WORK SHOWN ON THIS SHEET AND SHEET 10.
2. SEE SHEET 12 FOR GRADING DETAILS.



PRELIMINARY PLANS
SUBJECT TO REVISION

Designed By: S. SEVILLE/D. STRATTEN	REVISIONS		
	Date:	Description:	Made by:
Drawn by: D. STRATTEN			
Project Inspector:			
Survey Crew:			
JAN. 7 2014	As-Built Date:	by:	

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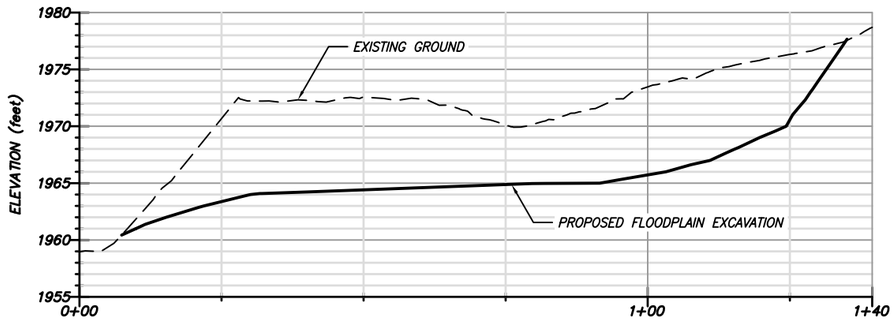
ABUTMENT REMOVAL FILL PLAN

Nason Creek Parking Lot and Abutment Removal Project

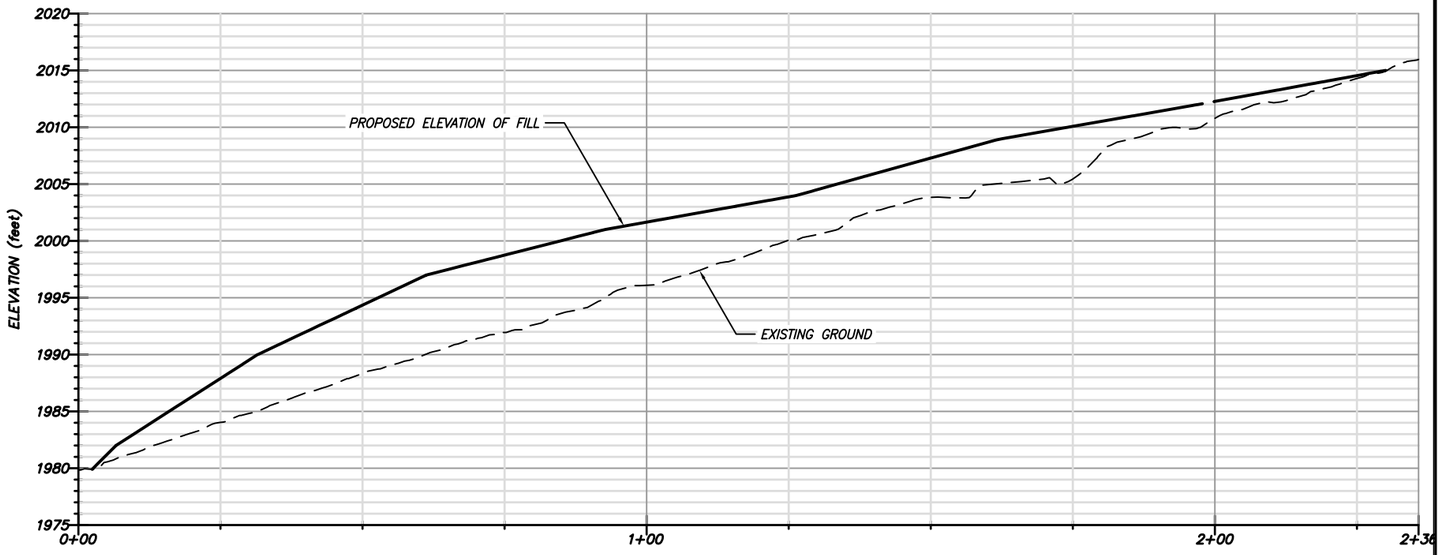
Sheet 11 of 19 | *CCNRD-2013.xx*

NOTES

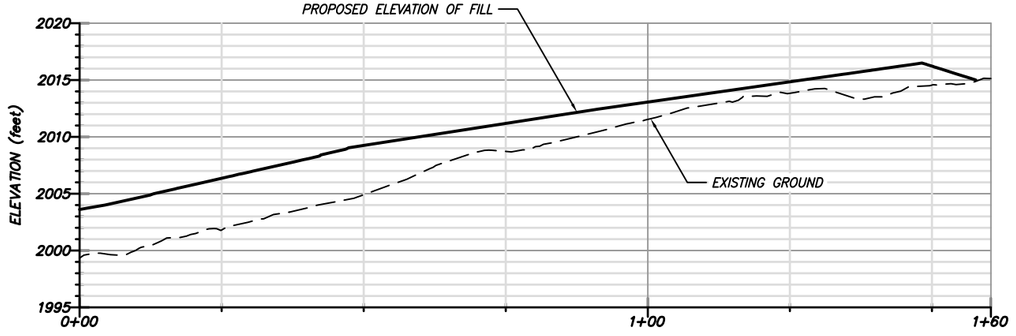
1. SEE SHEETS 10 AND 11 FOR CROSS-SECTION LOCATIONS.
2. VERTICAL DIMENSIONS ARE EXAGGERATED BY A FACTOR OF 2 ON THIS SHEET. REFERENCE THE Y-AXIS FOR DEPTHS AND ELEVATIONS.



SECTION D



SECTION E



SECTION F

PRELIMINARY PLANS
SUBJECT TO REVISION

Designed By: S. SEVILLE/D. STRATTEN	REVISIONS		
	Date:	Description:	Made by:
Drawn by: D. STRATTEN			
Project Inspector:			
Survey Crew:			
JAN. 7 2014	As-Built Date:	by:	

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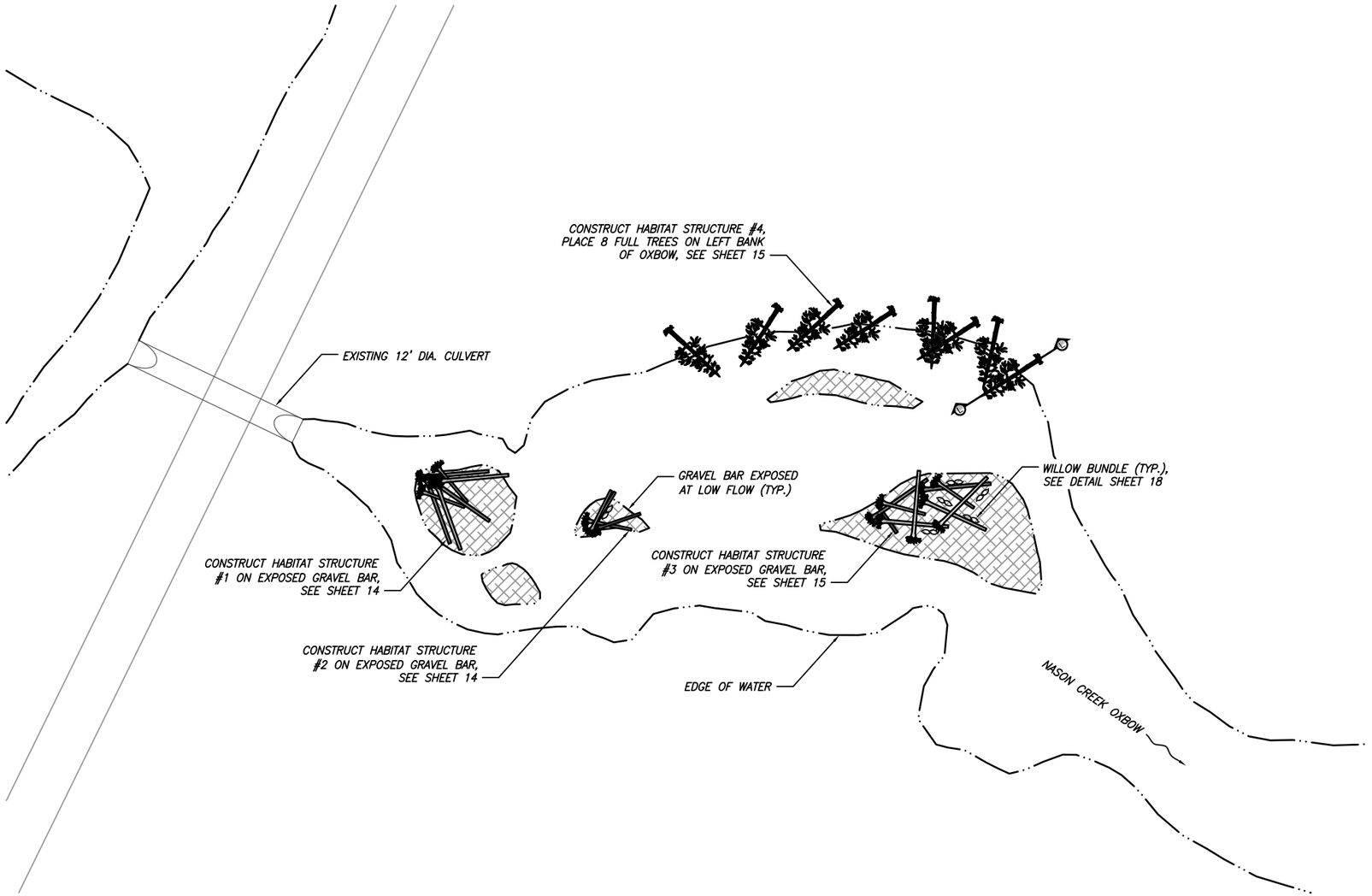
ABUTMENT REMOVAL SECTIONS

Nason Creek Parking Lot and Abutment Removal Project

CCNRD-2013.xx



HABITAT STRUCTURE OVERVIEW

30 0 30 60 90
SCALE OF FEET

NOTES

1. ALL LOGS AND TREES REQUIRED FOR CONSTRUCTION WILL BE SUPPLIED BY THE CONTRACTING AGENCY AND AND STAGED NEAR THE PROJECT SITE.
2. A HELICOPTER WILL BE USED TO TRANSPORT LOGS FROM THE STAGING AREA TO THE APPROPRIATE STRUCTURE LOCATION.
3. THE CONTRACTOR MAY NOT USE HEAVY EQUIPMENT TO MANIPULATE LOGS INTO POSITION. AFTER THE LOGS ARE DELIVERED TO THE APPROPRIATE STRUCTURE LOCATION THEY SHALL BE MANIPULATED USING HAND TOOLS (CHAINSAW WINCHES, CABLES, PRYBARS, ETC.).
4. THE CONTRACTOR SHALL MINIMIZE DAMAGE TO LOGS AND ROOTWADS WHILE MANIPULATING THEM INTO POSITION.
5. NO EXCAVATION IS REQUIRED TO CONSTRUCT THE HABITAT STRUCTURES SHOWN ON THIS SHEET. LOGS SHALL BE PLACED DIRECTLY ON TOP OF EXPOSED GRAVEL BARS, OR STACKED ON TOP OF EACH OTHER.
6. SEE SHEETS 14 AND 15 FOR DETAILS ON EACH HABITAT STRUCTURE.
7. A TOTAL OF 6 WILLOW BUNDLES SHALL BE INSTALLED AMONG HABITAT STRUCTURES 2 AND 3. THE EXACT LOCATIONS OF THE WILLOW BUNDLES WILL BE DETERMINED BY CONTRACTING OFFICER AT THE TIME OF CONSTRUCTION.

PRELIMINARY PLANS
SUBJECT TO REVISION

Designed By: S. SEVILLE/N. TRUSCOTT
Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

REVISIONS

Date:	Description:	Made by:

As-Built Date: by:

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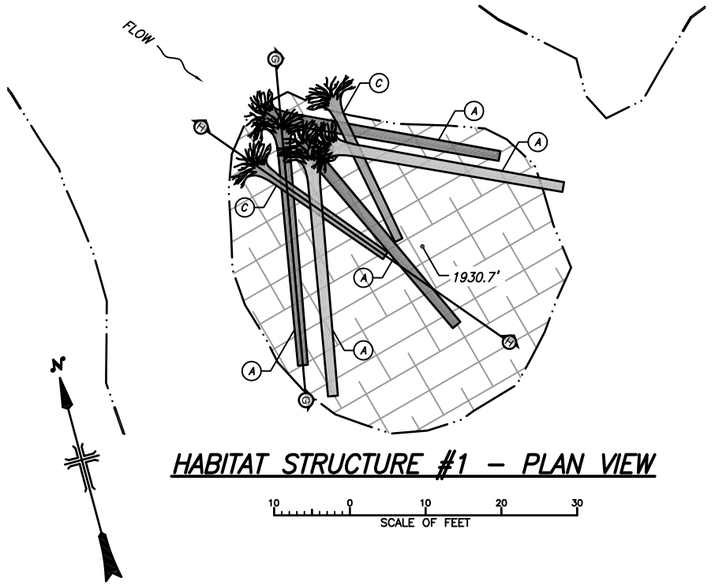
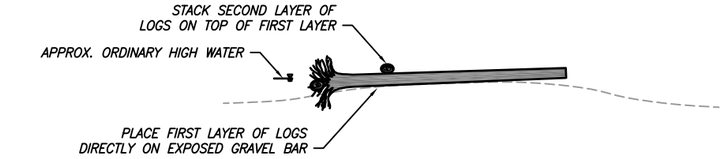
HABITAT STRUCTURE OVERVIEW

Nason Creek Parking Lot and Abutment Removal Project

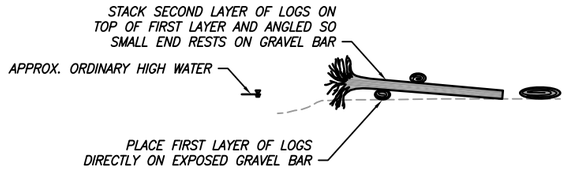
Sheet 13 of 19 | CCNRD-2013.xx



HABITAT STRUCTURE #1 – PLAN VIEW



SECTION G
NOT TO SCALE



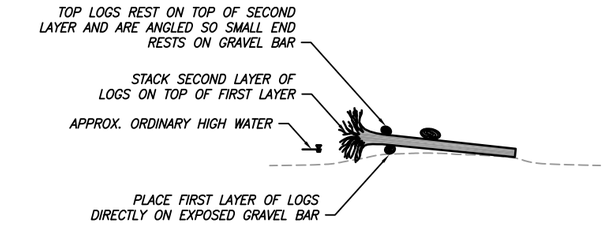
SECTION H
NOT TO SCALE

NOTES

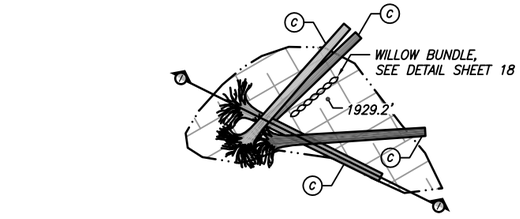
1. ALL LOGS AND TREES REQUIRED FOR CONSTRUCTION WILL BE SUPPLIED BY THE CONTRACTING AGENCY AND AND STAGED NEAR THE PROJECT SITE.
2. A HELICOPTER WILL BE USED TO TRANSPORT LOGS FROM THE STAGING AREA TO THE APPROPRIATE STRUCTURE LOCATION.
3. THE CONTRACTOR MAY NOT USE HEAVY EQUIPMENT TO MANIPULATE LOGS INTO POSITION. AFTER THE LOGS ARE DELIVERED TO THE APPROPRIATE STRUCTURE LOCATION THEY SHALL BE MANIPULATED USING HAND TOOLS (CHAINSAW WINCHES, CABLES, PRYBARS, ETC.).
4. THE CONTRACTOR SHALL MINIMIZE DAMAGE TO LOGS AND ROOTWADS WHILE MANIPULATING THEM INTO POSITION.
5. THE CONFIGURATION OF LOGS SHOWN ON THIS SHEET SHALL BE MATCHED AS CLOSE AS POSSIBLE. THE CONTRACTING OFFICER MAY ADJUST THE CONFIGURATION OF LOGS BASED ON EXISTING SITE CONDITIONS AT THE TIME OF CONSTRUCTION.

WOOD SCHEDULE

LOG TYPE	DESCRIPTION	HABITAT STRUCTURE #1 QUANTITY	HABITAT STRUCTURE #2 QUANTITY
A	30' LONG X 16" DIA. LOG WITH ROOTWAD	5	–
B	25' LONG X 14" DIA. LOG WITH ROOTWAD	–	–
C	20' LONG X 12" DIA. LOG WITH ROOTWAD	2	4
D	15' LONG X 12" DIA. LOG	–	–
E	30' LONG X 16" DIA. WHOLE TREE	–	–



SECTION I
NOT TO SCALE



HABITAT STRUCTURE #2 – PLAN VIEW

Designed By: S. SEVILLE/N. TRUSCOTT
Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

REVISIONS

Date:	Description:	Made by:
As-Built Date:	by:	

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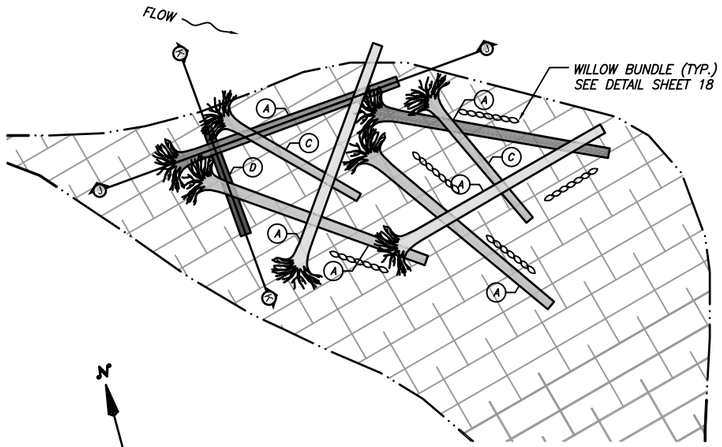
Website: www.co.chelan.wa.us

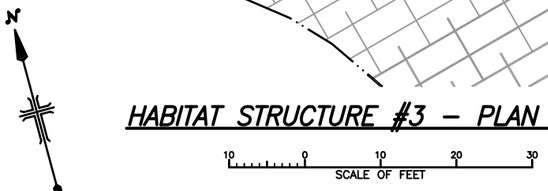
HABITAT STRUCTURE DETAILS

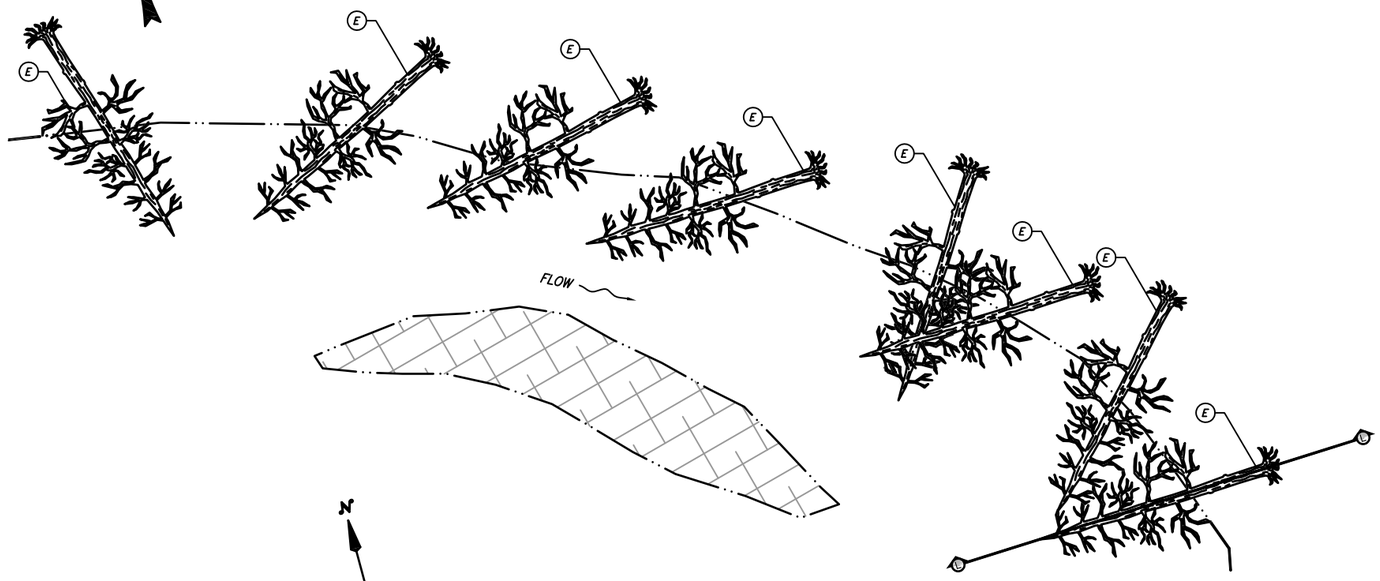
Nason Creek Parking Lot and Abutment Removal Project

Sheet 14 of 19 | CCNRD-2013.xx

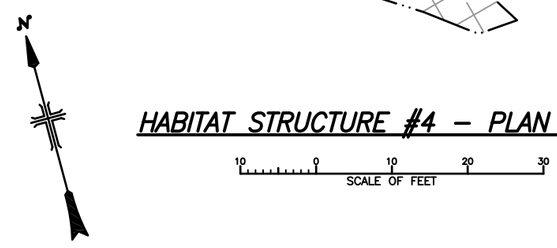


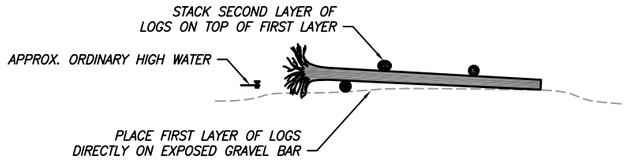
HABITAT STRUCTURE #3 – PLAN VIEW





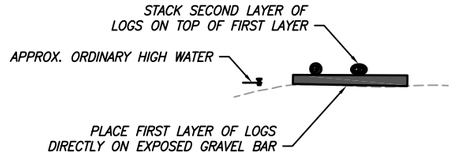
HABITAT STRUCTURE #4 – PLAN VIEW





SECTION J

NOT TO SCALE



SECTION K

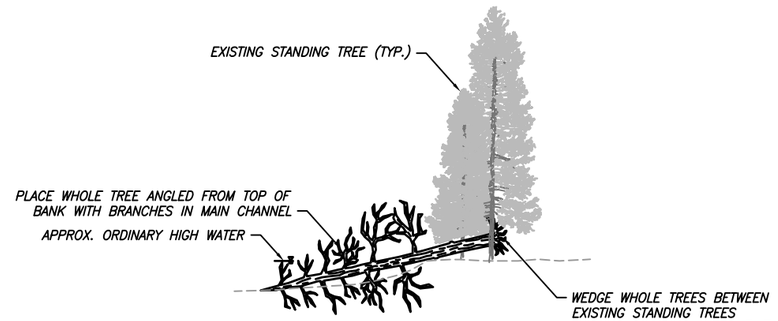
NOT TO SCALE

NOTES

1. ALL LOGS AND TREES REQUIRED FOR CONSTRUCTION WILL BE SUPPLIED BY THE CONTRACTING AGENCY AND AND STAGED NEAR THE PROJECT SITE.
2. A HELICOPTER WILL BE USED TO TRANSPORT LOGS FROM THE STAGING AREA TO THE APPROPRIATE STRUCTURE LOCATION.
3. THE CONTRACTOR MAY NOT USE HEAVY EQUIPMENT TO MANIPULATE LOGS INTO POSITION. AFTER THE LOGS ARE DELIVERED TO THE APPROPRIATE STRUCTURE LOCATION THEY SHALL BE MANIPULATED USING HAND TOOLS (CHAINSAW WINCHES, CABLES, PRYBARS, ETC.).
4. THE CONTRACTOR SHALL MINIMIZE DAMAGE TO LOGS AND ROOTWADS WHILE MANIPULATING THEM INTO POSITION.
5. THE CONFIGURATION OF LOGS SHOWN ON THIS SHEET SHALL BE MATCHED AS CLOSE AS POSSIBLE. THE CONTRACTING OFFICER MAY ADJUST THE CONFIGURATION OF LOGS BASED ON EXISTING SITE CONDITIONS AT THE TIME OF CONSTRUCTION.
6. WHOLE TREES PLACED AT HABITAT STRUCTURE #4 SHALL BE WEDGED BETWEEN EXISTING STANDING TREES WHENEVER POSSIBLE. THE LOCATIONS OF WHOLE TREES SHOWN ON THIS SHEET ARE SHOWN ONLY AS A REFERENCE TO THE GENERAL LOCATION TREES SHOULD BE PLACED. THE CONTRACTING OFFICER WILL DETERMINE THE EXACT LOCATION FOR EACH WHOLE TREE.

WOOD SCHEDULE

LOG TYPE	DESCRIPTION	HABITAT STRUCTURE #3 QUANTITY	HABITAT STRUCTURE #4 QUANTITY
A	30' LONG X 16" DIA. LOG WITH ROOTWAD	6	–
B	25' LONG X 14" DIA. LOG WITH ROOTWAD	–	–
C	20' LONG X 12" DIA. LOG WITH ROOTWAD	2	–
D	15' LONG X 12" DIA. LOG	1	–
E	30' LONG X 16" DIA. WHOLE TREE	–	8



SECTION L

NOT TO SCALE

Designed By: S. SEVILLE/N. TRUSCOTT
Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

REVISIONS

Date:	Description:	Made by:

As-Built Date: by:

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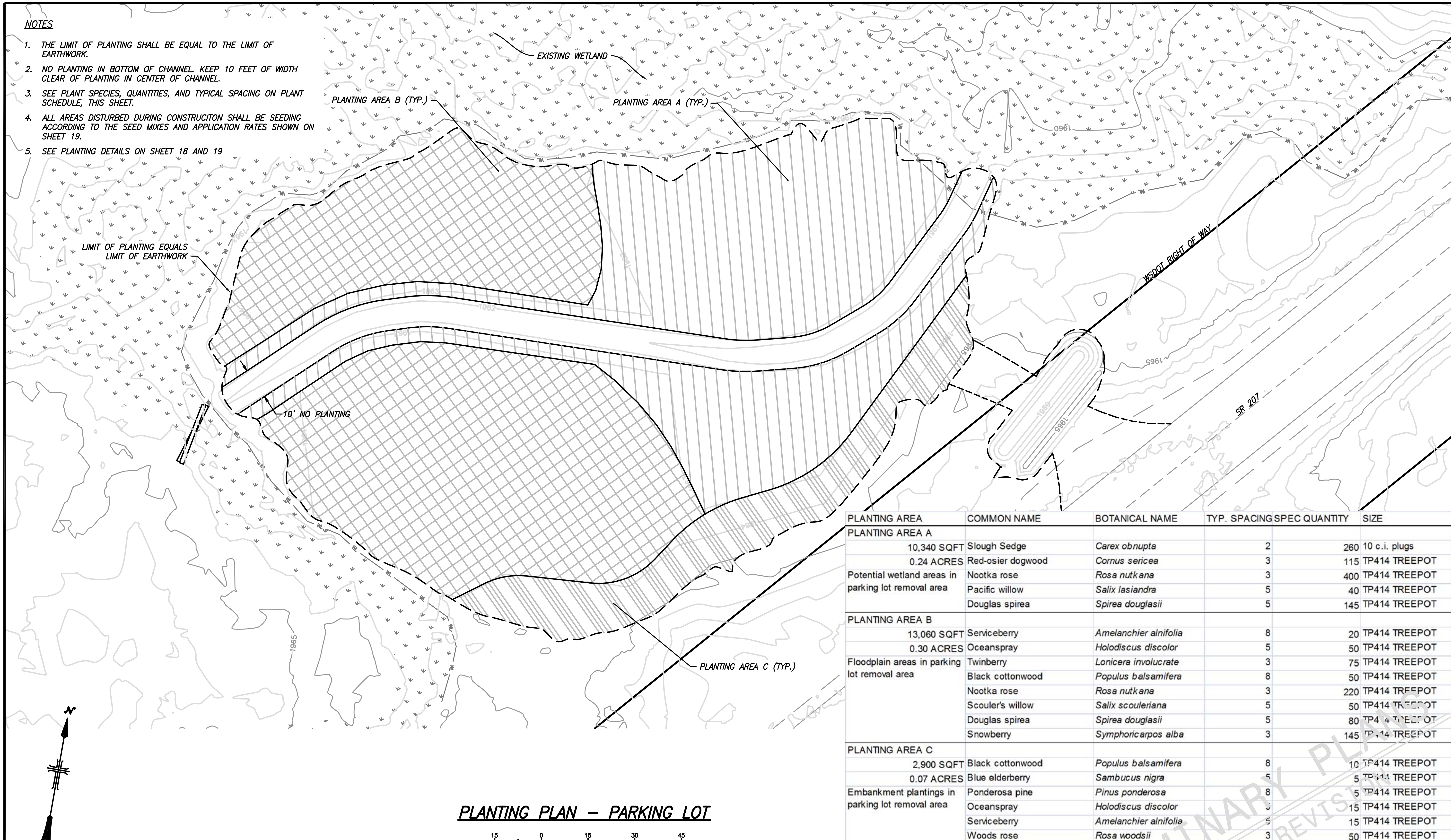
HABITAT STRUCTURE DETAILS

Nason Creek Parking Lot and Abutment Removal Project

Sheet 15 of 19 | CCNRD-2013.xx

NOTES

1. THE LIMIT OF PLANTING SHALL BE EQUAL TO THE LIMIT OF EARTHWORK.
2. NO PLANTING IN BOTTOM OF CHANNEL. KEEP 10 FEET OF WIDTH CLEAR OF PLANTING IN CENTER OF CHANNEL.
3. SEE PLANT SPECIES, QUANTITIES, AND TYPICAL SPACING ON PLANT SCHEDULE, THIS SHEET.
4. ALL AREAS DISTURBED DURING CONSTRUCITON SHALL BE SEEDING ACCORDING TO THE SEED MIXES AND APPLICATION RATES SHOWN ON SHEET 19.
5. SEE PLANTING DETAILS ON SHEET 18 AND 19



PLANTING PLAN – PARKING LOT

15 0 15 30 45 SCALE OF FEET

PLANTING AREA	COMMON NAME	BOTANICAL NAME	TYP. SPACING	SPEC QUANTITY	SIZE
PLANTING AREA A					
10,340 SQFT	Slough Sedge	*Carex obnupta*	2	260	10 c.i. plugs
0.24 ACRES	Red-osier dogwood	*Cornus sericea*	3	115	TP414 TREEPOT
Potential wetland areas in parking lot removal area	Nootka rose	*Rosa nutkana*	3	400	TP414 TREEPOT
	Pacific willow	*Salix lasiandra*	5	40	TP414 TREEPOT
	Douglas spirea	*Spirea douglasii*	5	145	TP414 TREEPOT
PLANTING AREA B					
13,060 SQFT	Serviceberry	*Amelanchier alnifolia*	8	20	TP414 TREEPOT
0.30 ACRES	Oceanspray	*Holodiscus discolor*	5	50	TP414 TREEPOT
Floodplain areas in parking lot removal area	Twinberry	*Lonicera involucrate*	3	75	TP414 TREEPOT
	Black cottonwood	*Populus balsamifera*	8	50	TP414 TREEPOT
	Nootka rose	*Rosa nutkana*	3	220	TP414 TREEPOT
	Scouler's willow	*Salix scouleriana*	5	50	TP414 TREEPOT
	Douglas spirea	*Spirea douglasii*	5	80	TP414 TREEPOT
	Snowberry	*Symphoricarpos alba*	3	145	TP414 TREEPOT
PLANTING AREA C					
2,900 SQFT	Black cottonwood	*Populus balsamifera*	8	10	TP414 TREEPOT
0.07 ACRES	Blue elderberry	*Sambucus nigra*	5	5	TP414 TREEPOT
Embankment plantings in parking lot removal area	Ponderosa pine	*Pinus ponderosa*	8	5	TP414 TREEPOT
	Oceanspray	*Holodiscus discolor*	5	15	TP414 TREEPOT
	Serviceberry	*Amelanchier alnifolia*	5	15	TP414 TREEPOT
	Woods rose	*Rosa woodsii*	3	50	TP414 TREEPOT
	Snowberry	*Symphoricarpos alba*	3	50	TP414 TREEPOT

Designed By: S. SEVILLE/D. STRATTEN
Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

REVISIONS		
Date:	Description:	Made by:

As-Built Date: by:

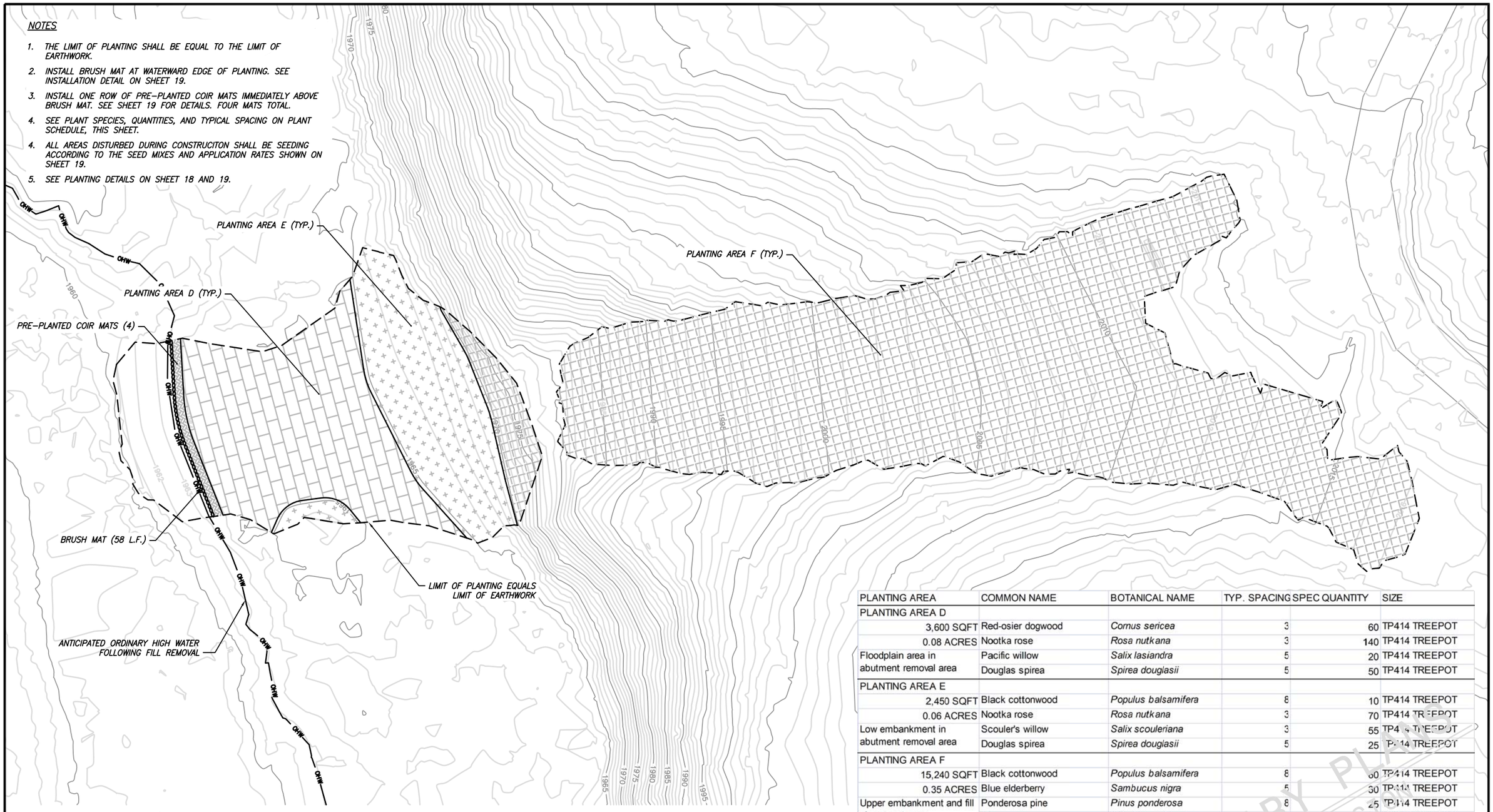
Chelan County
Natural Resource Department
316 Washington Street, Suite 401
Wenatchee, Washington, 98801
Phone: (509) 667-6567
Website: www.co.chelan.wa.us

PLANTING PLAN

Nason Creek Parking Lot and Abutment Removal Project

NOTES

1. THE LIMIT OF PLANTING SHALL BE EQUAL TO THE LIMIT OF EARTHWORK.
2. INSTALL BRUSH MAT AT WATERWARD EDGE OF PLANTING. SEE INSTALLATION DETAIL ON SHEET 19.
3. INSTALL ONE ROW OF PRE-PLANTED COIR MATS IMMEDIATELY ABOVE BRUSH MAT. SEE SHEET 19 FOR DETAILS. FOUR MATS TOTAL.
4. SEE PLANT SPECIES, QUANTITIES, AND TYPICAL SPACING ON PLANT SCHEDULE, THIS SHEET.
4. ALL AREAS DISTURBED DURING CONSTRUCITON SHALL BE SEEDING ACCORDING TO THE SEED MIXES AND APPLICATION RATE'S SHOWN ON SHEET 19.
5. SEE PLANTING DETAILS ON SHEET 18 AND 19.



PLANTING PLAN – ABUTMENT REMOVAL

15 0 15 30 45
SCALE OF FEET

PLANTING AREA	COMMON NAME	BOTANICAL NAME	TYP. SPACING	SPEC QUANTITY	SIZE
PLANTING AREA D					
3,600 SQFT	Red-osier dogwood	*Cornus sericea*	3	60	TP414 TREEPOT
0.08 ACRES	Nootka rose	*Rosa nutkana*	3	140	TP414 TREEPOT
Floodplain area in abutment removal area	Pacific willow	*Salix lasiandra*	5	20	TP414 TREEPOT
	Douglas spirea	*Spirea douglasii*	5	50	TP414 TREEPOT
PLANTING AREA E					
2,450 SQFT	Black cottonwood	*Populus balsamifera*	8	10	TP414 TREEPOT
0.06 ACRES	Nootka rose	*Rosa nutkana*	3	70	TP414 TREEPOT
Low embankment in abutment removal area	Scouler's willow	*Salix scouleriana*	3	55	TP414 TREEPOT
	Douglas spirea	*Spirea douglasii*	5	25	TP414 TREEPOT
PLANTING AREA F					
15,240 SQFT	Black cottonwood	*Populus balsamifera*	8	80	TP414 TREEPOT
0.35 ACRES	Blue elderberry	*Sambucus nigra*	5	30	TP414 TREEPOT
Upper embankment and fill placement area	Ponderosa pine	*Pinus ponderosa*	8	25	TP414 TREEPOT
	Oceanspray	*Holodiscus discolor*	5	90	TP414 TREEPOT
	Serviceberry	*Amelanchier alnifolia*	5	90	TP414 TREEPOT
	Woods rose	*Rosa woodsii*	3	255	TP414 TREEPOT
	Snowberry	*Symphoricarpos alba*	3	255	TP414 TREEPOT

Designed By: S. SEVILLE/D. STRATTEN
Drawn by: N. TRUSCOTT
Project Inspector:
Survey Crew:
JAN. 7 2014

REVISIONS

Date:	Description:	Made by:
As-Built Date:	by:	

Chelan County
Natural Resource Department
316 Washington Street, Suite 401
Wenatchee, Washington, 98801
Phone: (509) 667-6567
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PLANTING PLAN

Nason Creek Parking Lot and Abutment Removal Project

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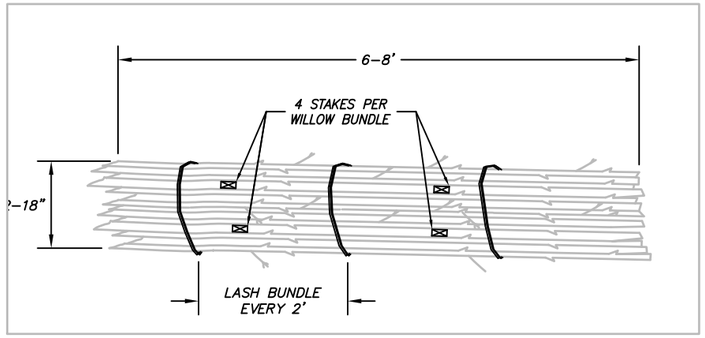
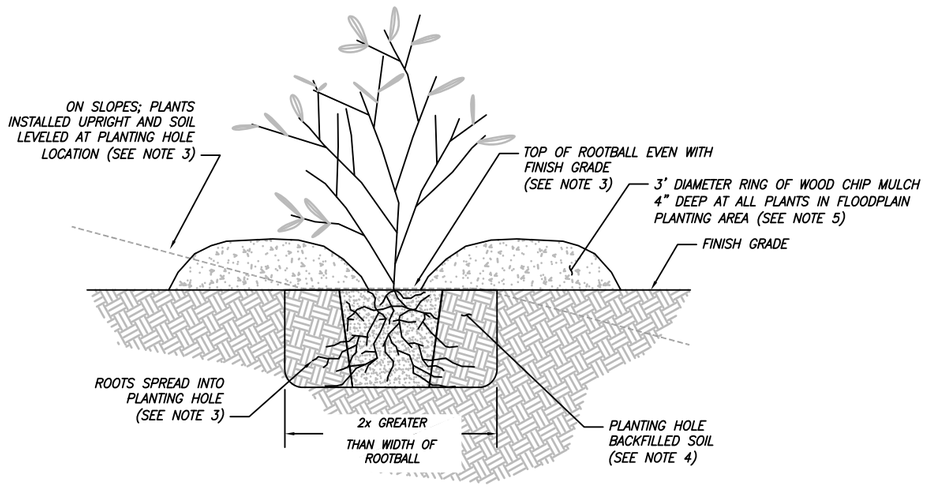
WILLOW BUNDLE INSTALLATION NOTES:

1. WILLOW BUNDLES SHALL BE COMPOSED OF DEAD BRANCHES OF NATIVE, NON-INVASIVE PLANTS AND LIVE DORMANT CUTTINGS OF SALIX EXIGUA (COYOTE WILLOW), SALIX LASIANADRA (PACIFIC WILLOW), AND SALIX SITCHESIS (SITKA WILLOW). DEAD BRANCHES SHALL CONSTITUTE NO MORE THAN 40% OF THE TOTAL BUNDLE CONTENT.
2. LIVE CUTTINGS SHALL BE ½ TO 2 INCHES IN DIAMETER AND 4 TO 8 FEET LONG. SIDE BRANCHES MAY BE LEFT INTACT. THE MATERIAL SHALL BE FREE OF DISEASE, ROT, OR INSECT INFESTATION.
3. DEAD BRANCHES SHALL BE PLACED ON THE INSIDE OF BUNDLES AND LIVE CUTTINGS SHALL BE ON THE OUTSIDE SUCH THAT THEY HAVE CONTACT WITH SOIL. LIVE CUTTINGS SHALL BE STAGGERED AND BUNDLED UNIFORMLY INTO 6 TO 8 FOOT LENGTHS THAT ARE 12 TO 18 INCHES IN DIAMETER. ORIENTATION OF BUDS ON THE CUTTINGS SHALL BE VARIED.
4. WILLOW BUNDLES SHALL BE TIED WITH JUTE TWINE A MINIMUM OF EVERY 2 FEET. TWINE SHALL BE WRAPPED A MINIMUM OF THREE TIMES AROUND BUNDLES AND SHALL BE SECURELY TIED.
5. WILLOW BUNDLE SHALL BE INSTALLED IN 4 TO 6 INCH DEEP TRENCH ADJACENT TO PLACED LOGS AS INDICATED BY CONTRACTING OFFICER. BUNDLES SHALL BE BACKFILLED AND BACKFILL PLACED AGAINST PLACED LOGS SUCH THAT APPPROXIMATELY ⅔ THE DIAMETER OF THE WILLOW BUNDLE IS BURIED.
6. BUNDLES SHALL BE PLACED IN TRENCH AND SECURED WITH A MINIMUM OF 4 STAKES PER BUNDLE. STAKES SHALL BE AT LEAST 3 FEET IN LENGTH.
7. BACKFILL AND WASH EXCAVATED SOIL AROUND THE BUNDLES SUCH THAT THE CUTTINGS MAKE GOOD CONTACT WITH THE SOIL BUT THE TOP OF THE BUNDLE IS EXPOSED.

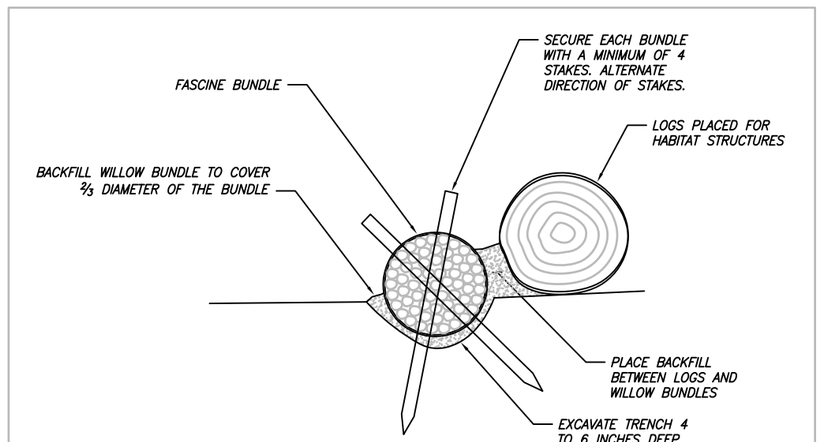


CONTAINER PLANT INSTALLATION NOTES:

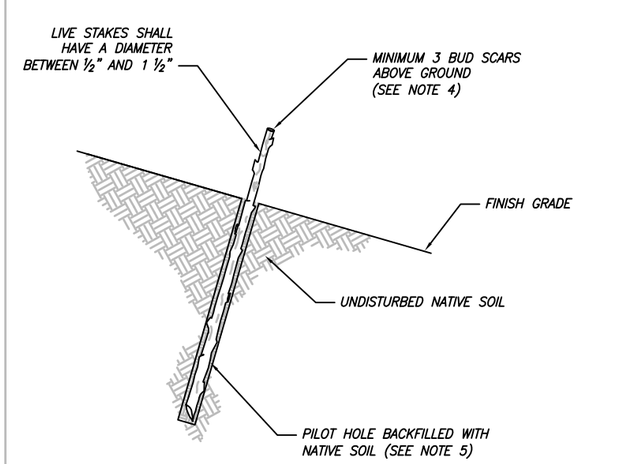
1. PRIOR TO INSTALLATION OF CONTAINER PLANT, CLEANLY PRUNE ANY BROKEN BRANCHES AND SCARIFY OUTER 1" OF ROOTBALL. CLEANLY PRUNE BROKEN, DEAD, OR DISEASED ROOTS. ROOTBOUND PLANTS SHALL BE REJECTED.
2. EXCAVATE CIRCULAR PLANTING HOLE WITH VERTICAL SIDES. SOIL SHALL BE EXCAVATED ONTO TARP OR CARDBOARD TO AVOID PLACING EXCAVATED SOIL DIRECTLY ONTO EROSION CONTROL BLANKET. SCARIFY SIDES AND BOTTOM OF PLANTING HOLE.
3. PLACE ROOTBALL ON UNDISTURBED NATIVE SOIL AT BASE OF PLANTING HOLE AND SPREAD ROOTS OUT TO SIDES OF HOLE. CLEANLY TRIM ANY ROOTS THAT ARE TOO LONG TO LAY STRAIGHT IN PLANTING HOLE. PLANTS SHALL BE UPRIGHT, PLUMB, AND TOP OF ROOTBALL SHALL BE EVEN WITH FINISH GRADE. WHEN PLANTING ON SLOPES, CREATE LEVEL PLANTING SURFACE TO ENSURE COVER OF ROOTS ON DOWNHILL SIDE OF PLANT.
4. BACKFILL PLANTING HOLE WITH SOIL EXCAVATED FROM PLANTING HOLE AND TAMP SOIL AROUND ROOTS. ANY TRASH OR DEBRIS FOUND IN EXCAVATED SOIL SHALL NOT BE USED TO BACKFILL THE PLANTING HOLE. BACKFILL SOIL SHALL MAKE GOOD CONTACT WITH THE ROOTBALL, LEAVING NO VOIDS.
5. ALL PLANTS IN THE FLOODPLAIN PLANTING AREA SHALL BE SURROUNDED BY A 3' DIA. 4" DEEP RING OF WOOD CHIP MULCH. TAPER MULCH NEAR PLANT BASE TO ENSURE THAT THE WOOD CHIP MULCH DOES NOT MAKE CONTACT WITH PLANT STEM. WOOD CHIP MULCH SHALL BE AS DESCRIBED IN SECTION 2900-2.03 OF THE SPECIAL PROVISIONS.
6. WITHIN 4 HOURS OF PLANT INSTALLATION, THOROUGHLY WATER IN EACH INSTALLED PLANT.



CONTAINER PLANT INSTALLATION



WILLOW BUNDLE INSTALLATION



LIVE STAKE INSTALLATION

LIVE STAKE INSTALLATION NOTES:

1. LIVE STAKES SHALL BE BETWEEN 1/2" AND 1 1/2" DIAMETER AND OF SPECIES AND LENGTH INDICATED ON THE PLANT SCHEDULE (SHEET 12).
2. LIVE STAKES WHICH ARE NOT PLANTED WITHIN 8 HOURS OF CUTTING SHALL BE SOAKED IN WATER FOR 24-72 HOURS PRIOR TO INSTALLATION. STAKES WHICH HAVE DEVELOPED ROOTS SHALL NOT BE USED.
3. IF NECESSARY, CREATE PILOT HOLE IN SOIL PRIOR TO INSTALLATION.
4. INSTALL STAKES PERPENDICULAR TO FINISH GRADE WITH BUDS ORIENTED UPWARD. IF STAKES MUST BE POUNDED IN, USE DEAD-BLOW HAMMER. INSTALL STAKES SUCH THAT 2 FEET MINIMUM OF THE LENGTH OF THE ENTIRE STAKE IS IN SOIL AND SUCH THAT A MINIMUM OF 3 BUD SCARS REMAIN ABOVE FINISH GRADE. AVOID DAMAGING THE BUDS PRIOR TO AND DURING STAKE INSTALLATION.
5. AFTER INSTALLATION, BACKFILL AND WASH SOIL INTO PILOT HOLE SUCH THAT SOIL MAKES GOOD CONTACT WITH THE STAKE, LEAVING NO VOIDS.
6. WITHIN 4 HOURS OF INSTALLATION, THOROUGHLY WATER IN EACH INSTALLED STAKE.

Designed By:	S. SEVILLE/D. STRATTEN
Drawn by:	N. TRUSCOTT
Project Inspector:	
Survey Crew:	
JAN. 7 2014	

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PLANTING DETAILS

Nason Creek Parking Lot and Abutment Removal Project

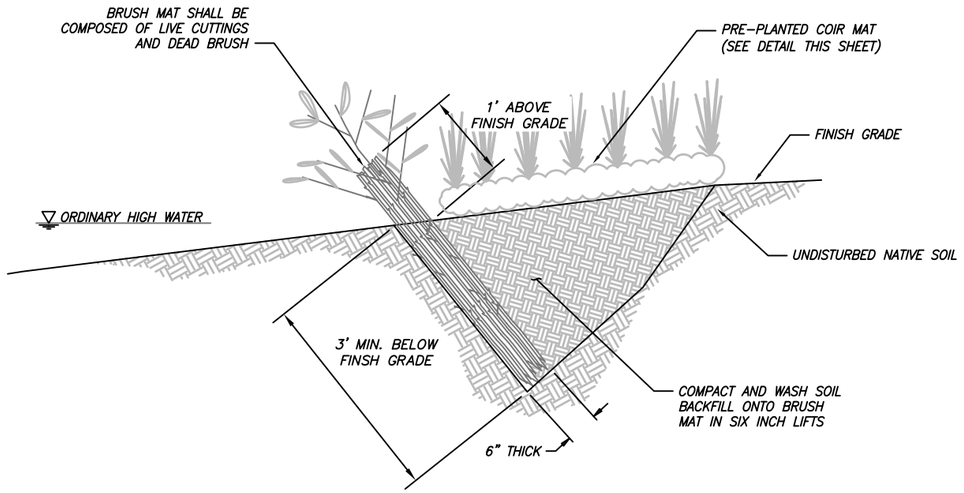
SEED MIXES

WETLAND SEED MIX	SPECIES NAME	COMMON NAME	LBS PLS/ACRE
0.32 ACRES PLANTING AREAS A & D	AGROTIS SCABRA	HAIR BENTGRASS	1
	DESCHAMPSIA CESPITOSA	TUFTED HAIRGRASS	2
	JUNCUS TENUS	SLENDER RUSH	1
	FUSTUCA RUBRA	RED FESCUE	4
	TRITICUM AESTIVUM X SECALE CEREALE	STERILE TRITICALE	60

UPLAND SEED MIX	SPECIES NAME	COMMON NAME	LBS PLS/ACRE
0.78 ACRES PLANTING AREAS B, C, E & F	ACHNATHERUM HYMENOIDES	INDIAN RICEGRASS	12
	AGROPYRON SPICATUM	BLUEBUNCH WHEATGRASS	12
	ELYMUS TRACHYCAULUS	BLUE WILD RYE	8
	FESTUCA IDAHOENSIS	IDAHO FESCUE	6
	TRITICUM AESTIVUM X SECALE CEREALE	STERILE TRITICALE	60
	POA SECUNDA	SANDBERG BLUEGRASS	4

SEEDING NOTES

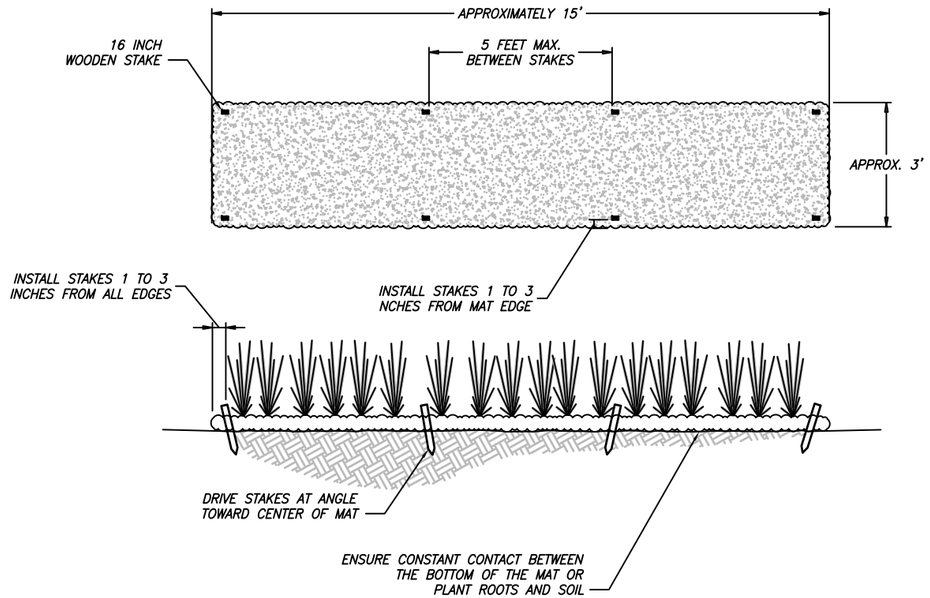
1. FOLLOWING CONSTRUCTION, ALL AREAS ABOVE SURFACE WATER DISTURBED DUE TO EARTHWORK, CLEARING, ACCESS, STAGING, OR OTHER CONSTRUCTION ACTIVITIES SHALL BE SEEDED ACCORDING TO THE SEED MIXES AND APPLICATION RATES SHOWN ON THIS SHEET.
2. ALL SEEDING AREAS SHALL BE PREPARED IN ACCORDANCE WITH SECTION 8-01.3 OF THE STANDARD SPECIFICATIONS. SEEDING AREAS NEED NOT BE CULTIVATED, BUT SHALL BE RAKED OR CHAINED TO ENSURE A FRIABLE SURFACE FREE OF SOIL CLUMPS LARGER THAN 2 INCHES IN DIAMETER.
3. APPLICATION OF SEED SHALL BE FOLLOWED BY THE APPLICATION OF STRAW MULCH APPLIED AT A RATE OF 2 TONS/ACRE.



BRUSH MAT INSTALLATION

BRUSH MAT INSTALLATION NOTES:

1. BRUSH MAT SHALL BE COMPOSED OF DEAD BRANCHES OF NATIVE, NON-INVASIVE PLANTS AND LIVE DORMANT CUTTINGS OF SALIX EXIGUA (COYOTE WILLOW), SALIX LASIANADRA (PACIFIC WILLOW), AND SALIX SITCHESIS (SITKA WILLOW). DEAD BRANCHES SHALL CONSTITUTE NO MORE THAN 40% OF THE TOTAL CONTENT.
2. LIVE CUTTINGS SHALL BE ½ TO 2 INCHES IN DIAMETER AND A MINIMUM OF 4 FEET LONG. SIDE BRANCHES MAY BE LEFT INTACT. THE MATERIAL SHALL BE FREE OF DISEASE, ROT, OR INSECT INFESTATION.
3. A TRENCH SHALL BE EXCAVATED FROM APPROXIMATELY 1963.5' ELEVATION TO 3 FEET BELOW FINISH GRADE. LIVE CUTINGS AND BRUSH SHALL BE PLACED UNIFORMLY ALONG THE TRENCH TO A COMRESSED DEPTH OF 6 INCHES. LIVE CUTTINGS SHALL BE INSTALLED WITH BUDS ORIENTED UPWARD AND SHALL BE EVENLY DISTRIBUTED THROUGHOUT THE MAT.
4. SOIL SHALL BE BACKFILLED IN SIX INCH LIFTS. THE FIRST LIFT SHALL BE WASHED INTO THE BRUSH MAT WITH WATER TO ELIMINATE VOIDS. SUPPLEMENTAL LIFTS SHALL BE COMPACTED..



PRE-PLANTED COIR MAT INSTALLATION DETAIL

PRE-PLANTED COIR MATS INSTALLATION NOTES:

1. PRE-PLANTED COIR MATS SHALL BE POPULATED WITH LIVE PLANTS INCLUDING AT LEAST 3 SPECIES FROM THE TABLE BELOW.
2. PLANTS SHALL BE MATURE ENOUGH AS TO PROVIDE COVERAGE TO APPROXIMATELY 50 PERCENT OF THE COIR MAT.
3. PRE-PLANTED COIR MAT DELIVERY SHALL BE SCHEDULED TO COINCIDE WITH IMMEDIATE JOB SITE INSTALLATION. IF MATS CANNOT BE IMMEDIATELY INSTALLED, THEY SHALL BE STORED IN A SHADY LOCATION FOR NO MORE THAN THREE DAYS AND SHALL BE KEPT THOROUGHLY SATURATED AND COVERED DURING THAT TIME.
4. PLANTING AREAS SHALL BE CLEARED OF LARGE ROCKS, TREE BRANCHES, OR OTHER OBJECTS THAT WOULD PREVENT THE MAT FROM MAKING DIRECT CONTACT WITH THE SOIL. VERY ROUGH GROUND SHALL BE SMOOTHED PRIOR TO MAT INSTALLATION.
5. MATS SHALL BE MOVED TO THE INSTALLATION SITE, UNROLLED AND STAKED DOWN. ENSURE THAT THE PLANT ROOTS AND THE BOTTOM OF THE MAT ARE IN DIRECT CONTACT WITH THE SOIL PRIOR TO STAKING. LEAVE NO VOIDS.
6. ALL EDGES SHALL BE STAKED WITH 16" WOODEN STAKES SPACED AT A MAXIMUM OF EVERY 5 FEET ALONG THE EDGE OF THE MAT. STAKES SHALL BE INSTALLED 1 TO 3 INCHES FROM THE EDGE OF THE MAT.
7. STAKES SHALL BE INSTALLED AT AN ANGLE TOWARD THE CENTER OF THE MAT. FOUR INCHES OF EACH STAKE SHALL REMAIN ABOVE THE SURFACE OF THE MAT.
8. MATS MAY BE INSTALLED IN UP TO 4 INCHES OF STANDING WATER.

PRE-PLANTED COIR MAT SPECIES SELECTION

ID	SPECIES NAME	COMMON NAME
CA	CAREX AQUATILIS	WATER SEDGE
CL	CAREX LANGUINOSA	WOOLY SEDGE
CN	CAREX NEBRASCENSIS	NEBRASKA SEDGE
CU	CAREX UTRICULATA	BEAKED SEDGE
JB	JUNCUS BALTICUS	BALTIC RUSH

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