

Final

# LITTLE BEAR CREEK ADVANCE MITIGATION SITE PROJECT, SNOHOMISH COUNTY, WASHINGTON

## Mitigation Plan

Prepared for  
Snohomish County Public Works

March 2019





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## Mitigation Plan

Submitted to  
Snohomish County Public Works  
Transportation and Environment Services

Prepared for  
Snohomish County Public Works  
Transportation and Environment Services

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## Acronyms and Abbreviations

ACP-TIP	Annual Construction Plan – Transportation Improvement Program
Corps	U.S. Army Corps of Engineers
County	Snohomish County Public Works
EPA	Environmental Protection Agency
ESA	Environmental Science Associates
GMA	Growth Management Act
HGM	hydrogeomorphic
ILF	in-lieu fee
LBCAMS	Little Bear Creek Advance Mitigation Site
LWD	large woody debris
LWS	large woody structures
Mitigation Rule	Compensatory Mitigation for Losses of Aquatic Resources
NAVD	North American Vertical Datum
NRCS	Natural Resources Conservation Service
OHWM	ordinary high water mark
RM	river mile
TP	test pit
UGA	urban growth area
WRIA	Water Resource Inventory Area

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# 1. INTRODUCTION

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Snohomish County Public Works (County) proposes to construct and operate a 17-acre advance wetland mitigation site in the Little Bear Creek Subbasin (Figure 1). The project area is in unincorporated Snohomish County, at 58<sup>th</sup> Avenue SE and 238<sup>th</sup> Street SE in Section 34, Township 27 North, Range 5 East of the Willamette Meridian. The Little Bear Creek Advance Mitigation Site (LBCAMS) contains degraded wetlands, a habitat-impaired 450-foot-long reach of Little Bear Creek, and channelized spring-fed tributaries. Prior to its purchase by Snohomish County in 2017, the site had a long history of rural residential and agricultural use, which involved ditching, filling, grazing, and construction of interior roads and structures. These practices altered the hydrology of the wetlands, reduced the quality and complexity of aquatic and terrestrial habitats, affected instream conditions, and contributed to water quality problems in this portion of the subbasin.

The County will improve the functions and values of the wetlands and streams at the LBCAMS in a way that generates mitigation credits that can be used to offset unavoidable impacts of future road improvement projects identified in the County's 6-year Annual Construction Plan – Transportation Improvement Program (ACP-TIP) (Snohomish County, 2017a). Creating an advance mitigation project at the LBCAMS where credits can be consolidated and “banked” offers the County several advantages:

- Alleviates the need to find suitable compensatory mitigation sites for each road improvement project, which is increasingly difficult in developed and developing areas of Water Resource Inventory Area (WRIA) 8.
- Reduces uncertainty over whether the compensatory mitigation will be successful because the mitigation is constructed and credits are generated in advance of the impacts.
- Reduces the potential for temporal wetland impacts and can result in lower replacement ratios because the mitigation occurs in advance of impacts.
- Reduces the time and cost of future project permitting because the mitigation is established up-front.
- Reduces the time and cost associated with mitigation site design and construction because mitigation for multiple projects is combined in one location.
- Protects from future development a vulnerable but valuable wetland complex that is surrounded by residential and industrial development.
- Enables a more efficient use of limited resources in the maintenance and monitoring of mitigation projects because of consolidation.
- Increases cost efficiencies of public funds.

Through this mitigation plan, LBCAMS has potential for approximately 0.35 acre of wetland creation, 4.25 acres of wetland reestablishment, 0.52 acre of wetland rehabilitation, 6.62 acres of wetland

enhancement, 4.80 acres upland preservation with enhancement, and almost 190 linear feet of floodplain enhancement. The County expects to generate sufficient mitigation credits at the LBCAMS to offset wetland, stream, and buffer impacts associated with up to 11 planned road improvement projects over the next 10 years. Proposed mitigation actions include:

- Enhance wetland and stream buffers and upland areas by removing invasive vegetation and planting native species throughout the site.
- Remove structures, conduit, culverts, piping, utilities, and internal fencing, and decommission an existing well.
- Excavate fill and regrade to appropriate elevations for wetland creation, reestablishment, or rehabilitation.
- Use fill material to selectively plug internal drainages (ditches) to enhance site hydrology and return to historical wetland conditions.
- Create a tributary stream channel to Little Bear Creek and enhance existing tributary channel.
- Create complex microtopography to encourage habitat diversity and retain water on the site.
- Retain and/or install habitat features such as brush piles, habitat logs, stumps, standing snags, and root wads.
- Plant a diverse assemblage of native plants to establish forested and scrub-shrub wetland communities.
- Reconnect Little Bear Creek with its floodplain.
- Enhance instream habitat through the placement of large wood, creation of a floodplain bench, and enhancement of the riparian corridor.
- Plant new buffers and riparian vegetation in areas that were previously cleared.
- Retain and install exterior fencing to restrict unauthorized access.
- Establish a conservation easement or similar protective covenant to ensure long-term protection of the mitigation area.
- Monitor, maintain, and adaptively manage the site in perpetuity.

In addition to the 11 future projects that are identified in the County's 6-year ACP-TIP, LBCAMS could potentially provide compensatory mitigation for additional County projects in WRIA 8 based on updates to the Snohomish County Growth Management Act (GMA) Comprehensive Plan Transportation Element (Snohomish County, 2017b). The specific projects that would be mitigated at the LBCAMS are subject to change.

## 1.1 Mitigation Goals

The mitigation goal of this project is to develop the Little Bear Creek Advance Mitigation Site. Specifically: to develop sufficient wetland “credits” through functional uplift to offset “debits” incurred by Snohomish County due to unavoidable wetland impacts during future road construction and maintenance activities. These credits will be accrued as a result of a constructible design that maximizes ecological value and minimizes disturbance to existing functional habitat.

Following mitigation activities (i.e., wetland creation, reestablishment, rehabilitation, and enhancement, as well as floodplain enhancement), the site will support a diverse array of vegetation and habitats. The site will have buffers consisting of mixed coniferous and deciduous forest with an understory predominated by native shrub species. The upland forest will transition to slope and depressional wetlands with hummocky terrain supporting a continuum of native emergent to woody plant species.

Existing depressional wetlands will be enhanced through planting to promote structural diversity and habitat complexity. The amount/extent of depressional wetlands will be increased through removal of fill. Additionally, slope and depressional wetlands will be enhanced through placement of habitat features such as standing snags, habitat logs, and brush piles. Riverine wetlands will be expanded through creation of a floodplain bench graded to elevations that support rearing life stages of native salmonids.

Revegetation in the Little Bear Creek floodplain will expand and enhance native riparian forest, and the addition of large wood to the floodplain bench (outside the main stream channel) will create habitat complexity within the riparian corridor. The floodplain bench will also increase flood storage capacity and provide additional fish habitat during high flows.

Fill placement within ditches and portions of streams will disperse surface flows and support wetland creation and reestablishment. Culvert removal, creation of new stream channel, and enhancement of existing stream channels will increase habitat complexity, restore hydrologic connections with Little Bear Creek, and provide off-channel fish habitat.

## 1.2 Regulatory Context

The U.S. Army Corps of Engineers (Corps) and the Environmental Protection Agency (EPA) published a rule on Compensatory Mitigation for Losses of Aquatic Resources (Mitigation Rule) (33 Code of Federal Regulations [CFR] Parts 325 and 332, 40 CFR Part 230), in 2008. The Mitigation Rule defines three forms of compensatory mitigation: mitigation banks; in-lieu fee (ILF) programs; and permittee-responsible mitigation. Permittee-responsible mitigation is defined as aquatic resource restoration, establishment, enhancement, and/or preservation undertaken to provide compensatory mitigation, for which the permittee retains full responsibility. Although the Mitigation Rule does not specifically define advance mitigation as a compensatory mitigation strategy, advance mitigation fulfills several of the objectives cited in 33 CFR 332.3(a) because it reduces temporal losses of functions and reduces uncertainty over mitigation project success. Federal and state resource agencies therefore encourage advance mitigation as a preferable form of permittee-responsible mitigation.

Snohomish County Code (Chapter 30.62A.310) requires that project proponents take reasonable efforts to avoid and minimize impacts to wetlands, fish and wildlife habitat conservation areas, and buffers. The

County requires compensatory mitigation when impacts cannot be fully avoided consistent with the standard mitigation sequence. The County Code allows the use of mitigation banks and ILF programs as long as they provide “*equivalent treatment of the functions and values of the wetland, fish and wildlife habitat conservation area or buffer to offset the impacts to critical areas functions and values on the project site such that the total net impact will be no net loss of critical area functions and values in the watershed in which the impacts will occur*” (Chapter 30.62A.550). The Little Bear Creek Advance Mitigation project is substantively equivalent to a mitigation bank, with the primary difference being that the mitigation credits will be available only to the County for use on County-sponsored projects. The responsibility for the mitigation will not be transferred to a third party, but will reside with the County as the permittee in perpetuity. As such, the project is consistent with the requirements of Snohomish County Code.

The County is seeking federal, state, and local permits to construct the advance mitigation project and will proceed with the project at its own risk once the permits are granted. This means that, even if the compensatory mitigation is authorized by a permit, the County must still obtain approval from permitting agencies before the compensatory mitigation credits are considered adequate or suitable for any future project. At the time advance mitigation credits are proposed for use, agencies with jurisdiction over the impacting proposal will decide if the advance mitigation site provides the appropriate type and extent of compensation for the project’s unavoidable impacts. The agencies will also consider how the advance mitigation site is functioning prior to determining how much advance credit is needed to offset impacts. Credits can only be used once; once they are allocated to a project, they no longer accumulate value.

The Corps, along with the Washington State Departments of Ecology and Fish and Wildlife, published the Interagency Regulatory Guide on Advance Permittee-Responsible Mitigation in 2012 (Ecology et al., 2012). The guide identifies the circumstances under which these agencies will consider advance permittee-responsible compensatory mitigation for unavoidable impacts to aquatic resources. The guide supersedes the definitions for advance and excess mitigation found in Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance (Ecology et al., 2006a) and complements WDFW’s mitigation policy (POL-M5002) (WDFW, 1999).

Environmental Science Associates (ESA, a contractor working with the County) reviewed the guide, along with the following documents, to develop this mitigation plan:

- Ecology mitigation guidance based on best available science (Hruby et al., 2009; Hruby, 2012).
- Joint agency guidance provided in Wetlands Mitigation in Washington State: Parts 1 and 2 (Ecology et al., 2006a, 2006b).
- Ecology Wetland Mitigation Webpage (<https://ecology.wa.gov/Water-Shorelines/Wetlands/Mitigation>; Ecology, 2018a).
- Mitigation requirements in Snohomish County Chapter 30.62A – Wetlands and Fish & Wildlife Habitat Conservation Areas.

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## 2. PROJECT LOCATION AND SITE HISTORY

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This section provides a brief summary of the project location and historic use of the site. A brief description of the existing conditions of the Little Bear Creek Subbasin is also provided.

### 2.1 Project Location

The LBCAMS is in the south portion of the Little Bear Creek Subbasin in the Cedar/Sammamish Watershed (WRIA 8), just north of the King/Snohomish county line (Figure 2). Credits generated by the LBCAMS would be used by proposed road improvement projects that are scattered across the Swamp Creek, North Creek, and Little Bear Creek subbasins (Figure 2).

Little Bear Creek drains more than 15 square miles in south Snohomish County and north King County. The subbasin is characterized by a mix of rural, residential, and commercial land uses, but retains more natural land cover (impervious surface cover of about 13 percent) than the North or Swamp Creek subbasins (Snohomish County, 2017c). Most of the subbasin (about 72 percent) is unincorporated and located outside of designated urban growth areas (UGAs) (NHC, 2016).

### 2.2 Site History

The LBCAMS has been subject to recurrent logging, likely beginning sometime during the late 19<sup>th</sup> or early 20<sup>th</sup> century and continuing through at least the 1940s. The completion of nearby State Route 522 in the 1960s spurred surrounding development. By 1990, the project area was largely covered by young deciduous trees, but aerial photos indicate additional clearing occurred during the 1990s and early 2000s (Figure 3).

Extensive grazing occurred within the project area beginning in the early 2000s, expanding to include the majority of the project area by 2005, and continued until the County acquired the property in August 2017. Significant grazing pressure from llamas, cattle, and other unidentified ruminants appears to have resulted in tree mortality throughout the project area. Additionally, shallow ponds were excavated to support waterfowl, and several outbuildings were constructed and used to raise specialty species of birds. The site was actively grazed and modified until its purchase by the County.

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### 3. ADVANCE MITIGATION SERVICE AREA

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Snohomish County proposes to establish a Service Area for the LBCAMS that encompasses the Snohomish County portions of the North, Swamp, and Little Bear Creek subbasins (Figure 4). The Service Area is the geographic extent that the project area can be expected to provide appropriate compensation for impacts to wetlands and streams and their buffers. Often, a Service Area comprises an entire WRIA; however, Snohomish County does not propose to include the Puget Sound watersheds or McAleer Creek, Lyon Creek, and Bear Creek subbasins. Puget Sound watersheds drain to Puget Sound and are west of the Swamp Creek Subbasin; McAleer Creek and Lyon Creek are within the City limits of Mountlake Terrace and have no tributaries that flow into the adjacent Swamp Creek Subbasin. Bear Creek was not included in the Service Area because there are no anticipated impacting projects within the subbasin.

The Little Bear Creek Subbasin is an appropriate place to consolidate mitigation credits because it is less developed and less impacted than other areas of WRIA 8. Improving habitat and hydrology functions in the Little Bear Creek Subbasin through this mitigation project will provide sustainable, successful, and long-term functional lift throughout the Service Area.

Swamp Creek, North Creek, and Little Bear Creek share a similar geographic location and drain to a 5-mile-long reach of the Sammamish River near Bothell and Kenmore. Over decades, timber harvest, agricultural activities, and most recently urbanization have substantially altered the habitat and hydrology in the three subbasins. Both the Swamp Creek and North Creek subbasins have become more urbanized compared to the Little Bear Creek Subbasin, with the latter subbasin retaining greater forest cover (Figure 5). Development (conversion of pervious to impervious surface) in all three subbasins has resulted in a shift to surface-dominated runoff, causing higher and longer peak flows within the three mainstems and their tributaries (Kerwin, 2001). Road density is higher in Swamp Creek and North Creek than Little Bear Creek, which fragments habitat and increases stormwater runoff. However, all three subbasins share a similar number of stream crossings by roads and utilities that disrupt riparian corridors and hydrologic connectivity.

The riparian corridors within the North Creek, Swamp Creek, and Little Bear Creek subbasins are fragmented, and lack species and structural diversity. These riparian corridors typically contain invasive and ornamental species with few natives, more shrubs than trees, with deciduous trees dominating over coniferous species. These conditions have resulted in less large woody debris (LWD) input and poor instream habitat quality.

Urbanization and the associated increase in hardscape elevate peak stormwater flows, resulting in wider and more incised streams. Flashy stream hydrology during storm events results in poor streambank stability, increased sediment deposition, and lower quality instream habitat, particularly for salmonid spawning.

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## 4. EXISTING (BASELINE) SITE CONDITIONS

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### 4.1 LBCAMS Overview

The LBCAMS consists of four individual parcels encompassing 17 acres, all owned by Snohomish County. The north and west portions of the site steeply slope to the southeast, while the central and south portions gently slope south toward Little Bear Creek, which crosses the southeast corner of the property (Figure 6). The project area is located at approximately river mile (RM) 2.0 on Little Bear Creek. There is a residential subdivision immediately west of the site and scattered single-family homes to the south. Zoning of the project area and surrounding properties is Rural 5-acre, although the majority of homes to the west are on approximately half-acre lots. The project area is bordered on the east by 58<sup>th</sup> Avenue SE, and a vacant parcel(s) comprised of wetlands that straddle the immediate upstream reaches of Little Bear Creek. Just east of 58<sup>th</sup> Avenue SE is an area zoned and occupied by heavy industrial use, including the Woodinville Cadman Plant, Drywall Recycling, Cedar Grove Composting, and Schnitzer Steel (Figure 1).

#### 4.1.1 Land Use Modifications

Several metal culverts, instream catch-basins, and excavated ponds are present in the south portion of the site. The main residence was located in the northwest corner of the site, on the high point of the property. A gravel driveway extends south along the western third of the property from the residence to the area where the outbuildings are concentrated. At the time of purchase, the lower site contained a dilapidated mobile home with garbage and debris strewn around. Non-functioning trucks, drilling equipment, and other farm implements and debris were scattered across the wetland and fill areas. The County removed much of this debris upon acquisition of the property, in addition to livestock and exotic birds, to address some of the main nuisances. Currently, a total of 15 structures remain, including the now vacant residence, a pump house, small barns/sheds, and other formal and informal outbuildings. Eight buildings in the lower section of the site were constructed as animal containment outbuildings. Additionally, a pond was excavated and fenced to contain waterfowl just south of the east entrance driveway. Snohomish County intends to demolish the existing structures on the site, which are located outside of wetlands, to further eliminate nuisances that attract vandalism and the threat of theft (e.g., for on-site wiring and other miscellaneous materials with salvage value).

### 4.2 Fill

Past owners of the property placed fill to build driveways, create pads for buildings, and possibly to redirect flood flows from Little Bear Creek. The origin of the fill is unknown; some of it may have been imported, and some may have been excavated on-site and redeposited. The Snohomish County Public Works Department sampled 29 test pits (TPs) in filled areas on the site. Sample results indicate that the fill thickness ranges between 0.5 and 2.0 feet deep (average of approximately 1.7 feet) and is spread over approximately 3.5 acres. A Phase 1 site assessment conducted by the County indicated that the fill is clean, with no contaminated soils on-site. Fill consists primarily of topsoil, silty sand, crushed rock, gravelly sand, sandy gravel, and sand.

Based on the test pit profiles, many of the areas that were filled were originally wetland, resulting in the potential for approximately 4.25 acres of wetland reestablishment once fill material is removed. Preliminary estimates indicate that approximately 4,800 cubic yards of fill were imported to the site, much of which will be removed or relocated as part of the mitigation project.

### 4.3 Vegetative Communities

The site currently supports the following vegetation communities: upland pasture, upland deciduous forest, upland scrub-shrub, forested wetland, scrub-shrub wetland, emergent wetland, and riparian forest (Figure 6).

- **Upland pasture** is located mainly in the south portion of the site near the cluster of outbuildings. Most of this area was formerly a wetland area that was filled to support the previous development. Upland pasture is dominated by introduced grass species and weedy plants, such as common tansy (*Tanacetum vulgare*), dandelion (*Taraxacum officinale*), and burdock (*Arctium* sp.). This vegetation community is also present at the north end of the site, on the upland slope near the single-family residence.
- **Upland deciduous forest** occurs mostly along the west slope (west of the north-south gravel driveway) and is dominated by big leaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*). Himalayan blackberry (*Rubus armeniacus*) and sword fern (*Polystichum munitum*) are common in the understory.
- **Upland scrub-shrub** is located at the northeastern portion of the site. The slope and hilltop are dominated by woody invasive species, primarily Himalayan blackberry with a scattering of Scotch broom (*Cytisus scoparius*) and a variety of upland grasses interspersed in the area.
- **Forested wetland** composed of young deciduous species (red alder and black cottonwood [*Populus trichocarpa*], with scattered western redcedar [*Thuja plicata*]) primarily occurs in the southwest corner and in the north-central portion of the site. The red alder trees in the north-central portion of the site are stressed and many have died, likely due to a combination of long-term inundation and grazing damage. Several large diameter trees are scattered throughout this area, including western red cedar, black cottonwood, and Sitka spruce (*Picea sitchensis*).
- **Scrub-shrub wetland** is located within the north-central portion of the site, adjacent to the west of the north-south driveway. Salmonberry (*Rubus spectabilis*) and red-osier dogwood (*Cornus sericea*) dominate this wetland type.
- **Emergent wetland** occurs along the northeast portion and in the southeast area of the site, north of Little Bear Creek, and is dominated by mostly reed canarygrass (*Phalaris arundinacea*), other non-native grasses, and forbs. However, the presence of skunk cabbage (*Lysichiton americanus*) and large western redcedar stumps suggests that at some point in the past, this area was likely a forested cedar swamp wetland.
- **Riparian forest** occurs along the Little Bear Creek corridor. The forested corridor has relatively dense deciduous cover composed of red alder and black cottonwood, along with a few mature conifers (namely western redcedar) with an understory of salmonberry, red-osier dogwood, hardhack (*Spirea douglasii*), vine maple (*Acer circinatum*), and Himalayan blackberry. Monocultures of reed canarygrass are also found in this area, along the north bank of Little Bear Creek.

In addition to the predominantly native vegetative communities above, several areas of the site are dominated by large monocultures of invasive species (Appendix A, Sheet G08). Large Himalayan blackberry thickets are present in the north portion of the site, along the existing driveway, on the hillslope in the southwest portion of the site, as well as along the riparian corridor of Little Bear Creek. Reed canarygrass monocultures are present in several of the existing emergent wetland areas in the north and south portions of the site, as well as in areas of existing fill near several of the outbuildings to the west. Canada thistle (*Cirsium arvense*) is also present near these outbuildings. Japanese knotweed (*Fallopia japonica*) is present along the south bank of Little Bear Creek, and small concentrations of bamboo occur in pasture areas and near the residence at the top of the hill.

## 4.4 Soils

On-site soils mapped by the Natural Resources Conservation Service (NRCS) soil survey include Alderwood gravelly sandy loam, Everett very gravelly sandy loam, and Norma loam. Alderwood soils encompass the west and north portions of the project area, with Everett soils mapped in the central area. The Norma loam soil type is mapped north and south of Little Bear Creek (NRCS, 2018).

Alderwood gravelly sandy loam is not considered a hydric soil type, although it frequently has hydric inclusions. Everett very gravelly sandy loam is not considered a hydric soil type, and typically does not have hydric inclusions. Norma loam is a hydric soil type formed in depressions and drainageways from alluvial parent material.

The majority of soils observed on-site were hydric. Soil test pits, both hand dug shovel probes in wetland areas and geotechnical test pits in fill-altered upland areas, showed a high percentage of muck and mucky mineral soils throughout much of the project area (Figure 6). Several shovel probes revealed muck or mucky silt loam ranging from 12 to 27 inches deep. These organic soils are typically underlain by gravelly sandy loam or loamy sand of alluvial origin. Excavated test pits showed mucky soils still present beneath fill layers, including up to 7 feet of depth in select locations.

The majority of native soils within the project area showed evidence of hydric conditions, typically meeting hydric indicators for Histosol (A1) or Loamy Mucky Mineral (F1). Other indicators observed on-site include Loamy Gleyed Matrix (F2), Depleted Matrix (F3), Redox Dark Surface (F6), and Hydrogen Sulfide (A4) (as defined in Corps, 2010).

## 4.5 Wetlands

Ten wetlands were identified and delineated within the project area during field surveys conducted by ESA in 2018 (Figure 7). Four wetlands (A, C, GH, and J) are relatively large with multiple hydrogeomorphic (HGM) classes (Brinson, 1993) and Cowardin classes (Cowardin et al., 1979). The remaining six wetlands (E, F, K, L, M, N) are smaller and less complex in both vegetation structure and hydrologic variation. Wetlands are described in Table 1, *Wetlands at the LBCAMS*. Wetland delineation data plot forms, rating forms, and supporting photos are provided in the project's Baseline Conditions Report (ESA, 2018).

The areas identified and mapped as wetland occur in the north-central, central, and southern portions of the site in low-lying areas. These are the areas where most of the planned advance mitigation activities

(e.g., wetland creation, reestablishment, rehabilitation and enhancement) will occur. On-site wetlands are fragmented by interior roads and fill that disrupts the natural hydrologic pathways and impairs hydrologic and water quality functions. Removal of the fill and reestablishment of natural hydrologic process will improve the functions and values of the on-site wetlands.

**TABLE 1  
WETLANDS AT THE LBCAMS**

Wetland Name*	Size (acre)	Cowardin Classification <sup>1</sup>	HGM Classification <sup>2</sup>	Wetland Rating <sup>3</sup>	Required Wetland Buffer (ft) <sup>4</sup>	Comments/Photo Numbers in Appendix A of Baseline Conditions Report
A	2.82	PEM, PFO	Slope, Depressional	III	110	Overgrazed wetland pasture with depressional pockets. The southwest portion is forested.
C	0.96	PEM, PFO	Slope, Depressional, Riverine	III	110	Large wetland complex. Northeast portion is forested depressional pockets linked by stream. Central portion is sheet flow through emergent vegetation. Northwest portion is an excavated pond with emergent vegetation. South portion is riverine, adjacent to Little Bear Creek. Wetland extends offsite; acreage includes onsite portion only.
E	0.08	PEM, PFO	Depressional	III	60	Shallow depression.
F	0.01	PEM	Depressional	III	60	Small wetland surrounded by fill and formed by impounded water from Stream 1.
GH	7.00	PFO	Slope	III	110	Slope wetland upslope of outbuildings and along the forested hillslope to the west. Extends to the northwest and south, upslope of southern barn. Wetland extends offsite; acreage includes onsite portion only.
J	0.62	PEM, PSS, PFO	Slope	III	110	Slope wetland west of the north-south gravel drive. Located in alder forest and emergent areas. Many seeps and springs.
K	0.10	PEM	Depressional	III	60	Excavated pond, now a wetland; impounds water from Stream 1.
L	0.01	PEM	Depressional	III	60	Small wetland just north of fill pad for existing garage.
M	0.02	PEM	Slope	III	60	Small slope wetland associated with Stream 1.
N	0.01	PEM	Riverine	III	60	Small stream-fringe wetland associated with Stream 4.

\*No Wetlands B, D, or I exist; these identifiers were skipped.

Sources:

<sup>1</sup> Per Cowardin et al., 1979: PEM = palustrine emergent, PFO = palustrine forested; PSS = palustrine scrub-shrub.

<sup>2</sup> Brinson, 1993.

<sup>3</sup> Hruby, 2014.

<sup>4</sup> Snohomish County Code 30.62A.320.

## 4.6 Streams

Little Bear Creek and several tributary streams and ditches were identified during field surveys conducted by ESA in 2018. A brief description of these streams is provided below, including information on fish habitat. Stream characteristics are summarized in Table 2, *Streams at the LBCAMS*, with locations shown on Figure 7.

**TABLE 2  
STREAMS AND DITCHES AT THE LBCAMS**

Stream/Ditch*	Stream Type <sup>1</sup>	Fish Use <sup>2</sup>	Bankfull Width/Length within Project Area	Bank Condition	Channel Substrate	Comment
Little Bear Creek	S	Yes	20 to 25 feet/ 450 feet	Stable, 2- to 3-foot banks of fine material over much of the length. Minor bank sloughing and limited bank undercutting on the north bank where the stream alignment transitions from southwest to south. East stream bank near the south property boundary is higher, 5- to 7-feet. Heavily vegetated throughout.	Sand in bars and pools with medium gravel and cobble in riffles.	Limited woody debris in the stream that includes a few larger geomorphically significant pieces.
Stream 1	Fp/Np	Yes, for approx. 20 feet. Likely too narrow above center line (CL) Flag 2.	3 feet at mouth, narrows to 1.5 feet at west edge of project area/604 feet.	Fine, stable material; incised, 3-foot banks at mouth. 6-inch to 1-foot banks; vegetated at west end.	Small gravel at mouth. Mostly fines and fine gravel near west end.	Channelized stream fed by springs on west hillside, flows to Little Bear Creek. Passes through four small culverts, Wetland M, and three ponds (Wetlands F, K, and C).
Ditch 3	Ns	No	0.5 to 1 foot/ 293 feet	Fine, stable material, 4–6 inch banks.	Fine material, small gravel. Often choked with vegetation.	Small, narrow ditch carried in excavated grass swale. Fed by springs on west hillside above southern barn. Flows off-site before discharging to Little Bear Creek.
Stream 4	Fp/Np	Yes, for approx. 70 feet. Likely too narrow above CL Flag 3.	2 feet at mouth, narrows to 1 foot at north end/684 feet	Fine, stable material; incised 3 feet at mouth. Sheet-flow with minimal bed/banks through Wetland C (CL Flag 3–6). Banks 2–6 inches.	Deep fine material through wetland areas. Mixed gravel and fines in areas of faster flow.	Begins in Wetland A in north-central portion of project area, carried in an excavated ditch. Likely fed by groundwater and surface runoff. Flows to Little Bear Creek. Passes through four culverts and two catch basins.

Stream/Ditch*	Stream Type <sup>1</sup>	Fish Use <sup>2</sup>	Bankfull Width/Length within Project Area	Bank Condition	Channel Substrate	Comment
Ditch 5 (west of north-south driveway) Stream 5 (east of driveway)	Np	No	2.5 feet at confluence with Stream 4, 1.5 feet at driveway crossing/ 473 feet	Fine, stable material; 2–6 inch banks; mostly vegetated.	Fines and small gravel.	Stream fed by springs on west hillside in Wetland J. Crosses under driveway and joins Stream 4.
Ditch 6	Ns	No	0.5 to 1 foot/ 95 feet	Fine, stable material, 4–6 inch banks.	Fine material, with vegetation.	Small, narrow ditch oriented at angle on slope face. Likely intercepts groundwater associated with upslope seeps and Stream 1.

\*Stream 2 does not exist; this identifier was skipped.

<sup>1</sup> Washington Administrative Code (WAC) 222-16-030; F=Fish bearing; Np=Non-fish bearing perennial; Ns=Non-fish bearing seasonal; U=Unknown.

<sup>2</sup> WDFW, 2018.

## 4.6.1 Little Bear Creek

Little Bear Creek flows through the south portion of the project area from northeast to southwest (Figure 7). Approximately 450 linear feet of channel is located within the project area. In this reach, Little Bear Creek is 20 to 25 feet wide, primarily contains pool and riffle habitats, and has moderate floodplain connectivity where bank heights are low. LWD is scarce in the upstream portion of the project area, but a few geomorphically significant pieces are located within the channel. ESA observed minimal bank erosion, attributed to a combination of fine bank material and dense riparian vegetation established to the high water mark (OHWM). However, minor bank sloughing and limited bank undercutting was observed on the north stream bank where the stream alignment transitions from southwest to south. In this area, flow and path relative to the bank and flow velocity have resulted in unstable bank conditions. The dominant channel substrate in this segment of Little Bear Creek is small gravel, although pockets of fine sediments are also present.

Anadromous salmon species access and use almost all of the Little Bear Creek system during different life stages. Salmonid species that use the project area for spawning include fall Chinook (*Oncorhynchus tshawytscha*) (from RM 0 to 6.8), sockeye (*O. nerka*) (from RM 0 to 8.3), and coho salmon (*O. kisutch*) (from RM 0 to 7.2). Kokanee presence is also mapped in the project area (to RM 5.1); steelhead trout have not been documented, although the species is presumed to be present and use the segment of stream that flows through LBCAMS (WDFW, 2018).

## 4.6.2 On-site Tributaries to Little Bear Creek

Several tributary streams and ditches to Little Bear Creek were observed on-site (Figure 7). These tributaries appear to have been artificially created or expanded, as evidenced by side-cast material along the banks. As such, these tributaries effectively serve as conduits to facilitate drainage of the associated wetlands. Ditching and piping was primarily done for agricultural purposes, to lower local groundwater tables, and/or to quickly channel runoff from the hillside (from seeps) away from pastures and structures. These small channels tend to be choked with reed canarygrass and other vegetation and are generally not suitable for or accessible to fish.

## 4.7 Stream and Wetland Buffer Conditions

The streams and wetlands within the LBCAMS generally have degraded buffers as a result of past clearing and heavy livestock use. The buffer along Little Bear Creek consists primarily of young age class deciduous trees with an understory of salmonberry and invasive Himalayan blackberry. A few mature conifers are located in the riparian buffer, although overall canopy cover remains far less than historic conditions.

Buffers on the tributary streams are highly degraded. These channels are frequently immediately adjacent to existing outbuildings or gravel driveways. Where vegetated buffers do exist, they primarily consist of short pasture grasses.

Wetland buffers are similar to tributary stream buffers. Several wetlands are adjacent to or coincident with streams and share a common buffer. Wetlands within the central portion of the project area have been impacted by buildings, paved areas, or historic grazing. Dead trees are common along the wetland edge where grazing was allowed. Wetlands on the fringes of the project area tend to have more intact buffers. Specifically, Wetlands GH and J have a relatively intact second-growth mixed forest buffer on one side for at least 100 feet.

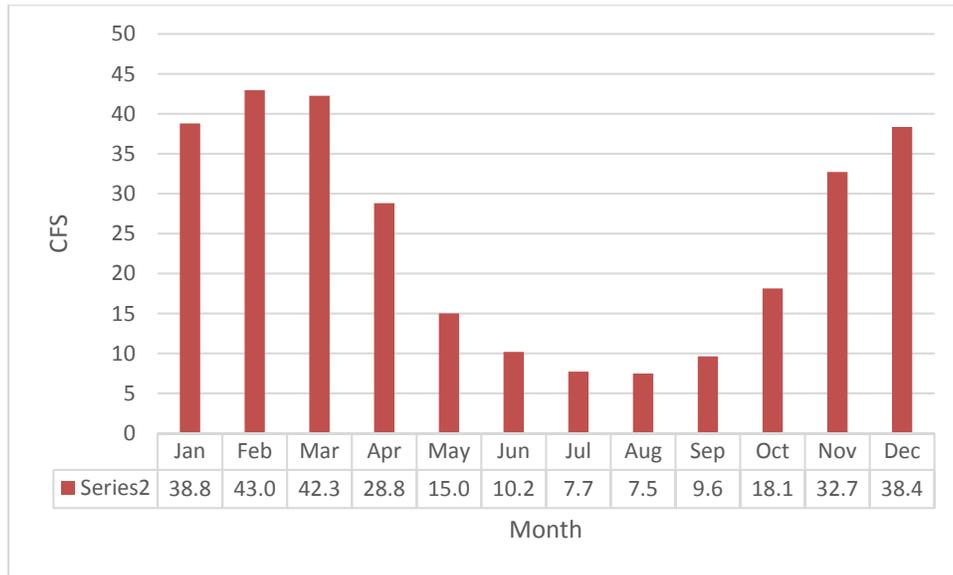
## 4.8 Hydrology

Site hydrology is described below, based on a review of existing information and from observations during the field surveys conducted by ESA in 2018.

### 4.8.1 Surface Water Hydrology

#### ***Little Bear Creek***

Little Bear Creek is a rain-driven system with a groundwater base flow component. King County maintains a gauge on Little Bear Creek approximately 4,500 stream feet downstream of the site. This gauge captures flows through the project site plus flows from Howell Creek, the last major tributary to join Little Bear Creek before its confluence with the Sammamish River. ESA conducted a unit area analysis on this gauge to derive the flows that likely occur on site (Exhibit 1). Stream hydrology follows regional precipitation patterns, with relatively steady, high flows from December through March. Summer low flows occur in June through September (King County Hydrologic Information Center, 2018).

**EXHIBIT 1: AVERAGE MONTHLY FLOWS IN LITTLE BEAR CREEK (2013 – 2018)\***

Source: King County Hydrologic Information Center 2018.

\*2018 data not included for the months of October, November, and December.

Little Bear Creek appears to respond relatively quickly to rainfall events, with flows rising quickly to their peak and then tapering off gradually over the next several days. This is promising for the creation of a floodplain bench, as it would be expected to remain inundated for several days after a storm event.

ESA monitored water levels and water temperature in Little Bear Creek at the 58<sup>th</sup> Avenue SE bridge from April through August 2018. Overall patterns matched well with the downstream gauge. Water levels reached their maximum depth of 4.5 feet during a rain storm on April 27 then dropped gradually over the following week to a depth of approximately 1 foot, where they remained for the rest of the monitoring period.

### ***Overland Flows/Stormwater***

As described in the *Baseline Conditions Report* (ESA, 2018), the site is at the downstream end of the Little Bear Creek basin. As such, it has the potential to receive considerable overland flow inputs. The neighborhood to the north and west of the site is served by a stormwater system that discharges into an open ditch at the southwest corner of the intersection of 58<sup>th</sup> Avenue SE and 238<sup>th</sup> Street SE. Under high flow conditions, some flow from this ditch enters Wetland A; the remaining flow continues south (along 58<sup>th</sup> Avenue SE, within the road right-of-way, outside of the property boundary) and enters a catch basin located approximately at the driveway entrance to the project site. Flow is discharged from the driveway culvert into an open ditch that flows south until about 20 to 30 feet north of Little Bear Creek, where the ditch turns to the southwest and eventually discharges to the stream. Groundwater appears to be a much more significant driver of wetland hydrology in Wetland A than stormwater, as explained below.

## 4.8.2 Groundwater Hydrology

Year-round seeps feed tributaries on the west side of the LBCAMS and appear to be a significant source of hydrology to the slope and depressional wetlands (Figure 7). Springs and seeps are common in the Little Bear Creek subbasin and occur where the advance outwash surfaces. Much of the baseflow observed in Little Bear Creek during the summer emerges at these and similar spring locations (Golder, 2005).

The County dug 29 test pits on the site in fill and upland areas outside of the existing wetland boundaries and installed three shallow groundwater monitoring wells; two were installed within wetlands and one within upland. The test pits provided an indication of early spring groundwater levels on the site, while the monitoring wells tracked the fluctuations in groundwater levels into the dry season. ESA has monitored the three groundwater wells over an 11-month period; results are presented below in Table 3, *Groundwater Surface Elevations*. Note that negative elevations indicate depth below ground surface; elevation of zero indicates groundwater at the surface. Monitoring is ongoing and will continue post-construction at Wells A-C. Groundwater information is being used to inform the grading plan, specifically the location and depth of fill removal. Based on the values below, the water table is generally at the soil surface at Well A, 15 inches below the surface at Well B, and 10 inches below the surface at Well C. The latter two wells experienced significant drops in groundwater elevations during the dry season, but groundwater returned to near the surface during mid-winter 2018.

**TABLE 3**  
**GROUNDWATER SURFACE ELEVATIONS (FEET, NAVD 88)**

Sample Date	Well A El. 121.5 feet	Well B El. 135.5 feet	Well C El. 134.7 feet
4/9/2018	0	-13	-15
4/19/2018	0	-19.5	-13.5
5/7/2018	0	-24.5	-14.5
5/22/2018	0	-29.5	-19.5
6/13/2018	0	-25.5	-11.5
7/3/2018	0	-21.25	-11.5
7/20/2018	0	-31.5	-17
7/31/2018	0	-33.5	-19.5
8/15/2018	-1.0	-34.5	-18.5
11/9/2018	-1.0	-15.5	-9
12/3/2018	0.5	-10.5	-9.25
12/19/2018	0.25	-2.25	-7.5
1/30/2019	0	0	0
2/1/2019	0	0	0
2/14/2019	0	-0.5	-6.5
2/20/2019	0	0	0
3/4/2019	0.5	0	0

To put the groundwater data into a broader context, ESA reviewed the Ecology Statewide Conditions web page (Ecology, 2018b). Between 2015 and 2018, Snohomish County has been considered moderately dry to abnormally dry with respect to drought conditions; 2018 is listed as abnormally dry. Between 2015 and 2018, streamflows in Snohomish County ranged from low to much below normal flows, with 2018 listed as a below normal stream flow year (Ecology, 2018b). While Snohomish County maintains multiple stream gauges in the vicinity, ESA was not able to locate a summary of regional precipitation information. At a minimum, we know that 2018 can be considered a dry year; the groundwater elevations observed likely represent low levels and would likely be higher in wet years.

## 5. RATIONALE FOR SELECTING THE LBCAMS

Snohomish County selected the LBCAMS using the principles and methods outlined in *Selecting Wetland Mitigation Using a Watershed Approach* (Hruby et al., 2009). This approach recognizes that it can be difficult to sustain and conserve wetlands in highly altered or urbanized settings where development pressures are greatest. In these situations, it may be preferable to compensate for unavoidable impacts to wetlands by locating mitigation sites in drainages that are more ecologically intact—where functions can be sustained over time. By locating mitigation sites in the appropriate watershed context, there is a greater opportunity to achieve net gains in wetland functions and restore degraded watershed processes.

Ecology assesses the potential of a wetland mitigation site to provide sustainable mitigation in a watershed context through consideration of multiple ecological conditions and functions. Table 4, *Potential for Suitable Mitigation at the LBCAMS*, summarizes how these ecological considerations are addressed at the LBCAMS.

**TABLE 4  
POTENTIAL FOR SUSTAINABLE MITIGATION AT THE LBCAMS**

<b>Ecology's Wetland Sustainability Considerations</b>	<b>Characteristics of the LBCAMS Project Area</b>
Identify the watershed processes that have been altered within the hydrologic unit where the mitigation site is located.	Commercial, industrial, and residential development (conversion of pervious to impervious surfaces), deforestation, filling of wetlands, and stream channelization have all occurred throughout the subbasin, significantly altering the natural watershed process.
Will the mitigation activities result in a wetland of the appropriate HGM class in that landscape setting?	Yes. LBCAMS will be composed of depressional, slope, and riverine wetlands that are characteristic of landforms and historic conditions adjacent to Little Bear Creek and its tributaries throughout the subbasin.
Will the primary source of water to the mitigation site be appropriate for the HGM class?	Yes. Year-round seeps on the west side of the LBCAMS and precipitation are the primary source of hydrology to the slope and depressional wetlands (Figure 7). These hydrology sources and Little Bear Creek supply water to the riverine wetlands. In addition, stormwater from surrounding areas is discharged during high flow events in the northeast corner of the site along 58 <sup>th</sup> Avenue SE and flows through a roadside ditch (located within the right-of-way), Stream 4, as well as through both the depressional and riverine wetlands.
Will the site have an adequate water supply to maintain a wetland without engineering the delivery of water that requires long-term control or maintenance?	Yes. Seeps along the west side of the property and Little Bear Creek have year-round discharge. Native soils under the fill have high organic content, indicating development under low oxygen conditions. Excavation of over 29 test pits within the existing fill areas found perched underground hydrology associated with these native organic layers.
Will the mitigation activities maintain hydric soils, if they exist, at the site?	Yes. Soil excavation will be limited to removal of fill (Appendix A, Sheet G09) and reestablishment of native soil surfaces. Modifications are planned to enhance surface water storage and reestablish wetlands in areas that were filled. Hillside seeps and associated tributaries to Little Bear Creek will provide sufficient hydrology to wetland creation areas and will maintain wetland soils.
Can the mitigation be designed to control aggressive plant species?	Yes. Invasive plant cover is most prevalent adjacent to Little Bear Creek and in areas that were heavily grazed. Fill removal and grading activities will remove some of the invasive plant material and seed bank, and facilitate preparation of the soils and revegetation with native planting stock; future maintenance and monitoring activities will be focused to minimize and eliminate invasive plant cover.

Mitigation at the LBCAMS will be sustainable and able to compensate for watershed processes that are impaired in the Swamp Creek, North Creek, and Little Bear Creek subbasins; the first two subbasins are almost fully encumbered by UGA boundaries and have heavily altered watershed processes. Once the LBCAMS is constructed, the project area will contain extensive wetlands that are hydrologically supported by perennial groundwater seeps along the west slope, precipitation, and seasonal stormwater inputs, as well as an enhanced riparian / floodplain corridor.

According to Ecology's *Puget Sound Watershed Characterization*, the LBCAMS is in an area that is rated high for overall restoration of water flow processes and high for restoration of water quality functions (Ecology, 2018c). The high restoration designation for water flow processes indicates that the project area provides important water delivery, water storage, and discharge/recharge processes that have been significantly degraded. Determination of high restoration potential for water quality functions indicates that the project area has high capacity to move, store, and deliver sediment, metals, pathogens, and nitrogen and phosphorus; these processes have also been significantly degraded. Restoration of the water flow and water quality processes at the LBCAMS could provide significant functional uplift not only to the project area, but for downstream aquatic resources, including the Sammamish River.

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## 6. MITIGATION ACTIONS AND ANTICIPATED ECOLOGICAL UPLIFT

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### 6.1 Mitigation Treatment Areas

The site can be divided into treatment areas defined by the type of mitigation to be performed (Appendix A, Sheet G09):

- Wetland creation areas (approximately 0.35 acre)
- Wetland reestablishment area (approximately 4.25 acres)
- Wetland rehabilitation areas (approximately 0.52 acre)
- Wetland enhancement areas (approximately 6.62 acres)
- Floodplain enhancement areas (approximately 190 linear feet)
- Upland preservation with enhancement area (approximately 4.80 acres)

The proposed mitigation actions are briefly described below. Mitigation actions proposed in specific treatment areas, as well as the anticipated ecological benefit of each action, are summarized in Table 5, *LBCAMS Constraints, Treatment Areas, Mitigation Actions, and Anticipated Functional Lift*, Section 7.

#### 6.1.1 Wetland Mitigation Actions

##### ***Wetland Creation***

Wetland creation will occur in areas that are currently upland areas with native upland soils. These areas will be converted to wetland through the removal of native soil and grading to target elevations to establish a hydrologic connection. Wetland will be created along the south bank of Little Bear Creek through the grading of the floodplain bench. Wetland creation will also occur along the hillslope in the southwest portion of the site and in the central portion of the site, north of the east-west driveway and along the north-south driveway. These areas will also be planted with native woody vegetation to facilitate development of high value wetland communities.

Wetland creation areas are identified on Sheet G09, and design details for these areas can be found on Sheets C02–C05 of the 90% Plan Set (Appendix A). Sheet L01 provides a planting overview, and planting details for these areas can be found on Sheets L02–L05.

##### ***Wetland Reestablishment***

The wetland reestablishment areas are those areas that were formerly wetland and contain hydric soils, but have been filled or drained. Mitigation actions in these areas are designed to return natural and historic functions to the former wetland. Wetland reestablishment will include the following:

- *Removal of fill* – Grading to appropriate elevations to facilitate wetland conditions in the central portion of the site and along the north-south interior driveway. Because the site topography is highly varied and depths to groundwater also vary, there is no single target elevation for wetland reestablishment.
- *Grading of wetland depressions* – Minor grading will create depressions to engage groundwater during the wet season and form ephemeral shallow open water habitat intended for use by amphibians.
- *Removal of invasive plant species* – Invasive species will be mowed or removed using hand-held equipment. These actions will focus on the monocultures of Canada thistle and reed canarygrass near the existing outbuildings to the west, as well as the small patches of bamboo and Himalayan blackberry in the current upland pasture (Appendix A, Sheet G08). Invasive species will be removed in other areas as needed.
- *Planting* – Reestablish appropriate native vegetation communities using native trees, shrubs, and emergent species tolerant of saturated soil conditions.

Wetland reestablishment areas are identified on Sheet G09, and design details for this area can be found on Sheets C03–C06 of the 90% Plan Set (Appendix A). Sheet L01 provides a planting overview, and planting details for these areas can be found on Sheets L03–L06.

### ***Wetland Rehabilitation***

The wetland rehabilitation areas are located where wetland conditions exist but their characteristics or functions are substantially altered or degraded, primarily in the central portion of the site, where wetlands are surrounded by fill material. By removing fill and recreating wetland conditions, hydrologic connections to the reestablished wetlands will occur. Although rehabilitation will not increase the wetland acreage, it will create a gain in hydrologic function. Subsequently planting these areas with structurally diverse, native vegetation similar to vegetation in the wetland reestablishment area will also make these currently isolated areas part of a larger vegetated corridor, resulting in a gain in habitat function.

Wetland rehabilitation areas are identified on Sheet G09, and design details for these areas can be found on Sheets C04 and C05 of the 90% Plan Set (Appendix A). Sheet L01 provides a planting overview, and planting details for these areas can be found on Sheets L04 and L05.

### ***Wetland Enhancement***

The wetland enhancement areas are those areas currently delineated as wetland, all of which will receive treatment to enhance their ecological functioning. Wetland enhancement is proposed primarily in existing wetland areas west of 58<sup>th</sup> Avenue SE, riparian and wetland areas northwest of Little Bear Creek, and existing wetland areas along the hillslope in the southwest portion of the site. Generally, actions in the wetland enhancement areas are designed to provide a lift in the ecological habitat function of these areas, while maintaining or improving hydrologic functions. Treatments will vary based on the needs of the individual wetland, but will generally involve the following key design elements:

- *Build hummocks and swales through the wetland* – Minor grading will occur to restore topographic features, such as hummocks and swales, which will allow for more diverse vegetation and a greater range of habitat type. Hummocks will be composed of suitable fill

materials from the excavated swales, or from elsewhere on-site. Hummocks will be planted with facultative species. Swales will create drainage pathways through the wetlands and improve the hydrological regime of the existing wetlands and streams. Swales will be revegetated with facultative wetland and obligate wetland species.

- Install a “training habitat log” – A habitat log will be installed where stormwater currently overflows from the existing roadside ditch along 58<sup>th</sup> Avenue SE, onto the site. The log will help direct water farther onto the site, rather than spilling back into the ditch. This will allow water to sheet flow over the wetland, slowing the flow of water and providing a lift in the hydrological and water quality functions of the on-site wetland area.
- Retain or install habitat features – Existing habitat features such as stumps, logs, rock piles, snags, and brush piles will be preserved and used on-site to the extent practical. If sufficient materials are not available at the site, they will be imported (from an approved off-site location) and used to construct habitat features. Habitat features will increase the habitat structure and function.
- Remove invasive plants – Removal of invasive plant species will focus on the monocultures of Himalayan blackberry and reed canarygrass in the existing emergent wetland areas and along the bank of Little Bear Creek, as well as the removal of Himalayan blackberry from the wet seeps along the hillslope to the west (Appendix A, Sheet G08). Blackberry will be removed by hand and grubbed, and an approved aquatic herbicide will be applied as needed. Reed canarygrass will be mowed and sprayed with an approved aquatic herbicide. Invasive species will be removed in other areas as needed.
- Planting – Replace with appropriate native vegetation communities using native trees, shrubs, and emergent species tolerant of saturated soil conditions.

Wetland enhancement areas are identified on Sheet G09, and design details for these areas can be found on Sheets C02–C06 of the 90% Plan Set (Appendix A). Sheet L01 provides a planting overview, and planting details for these areas can be found on Sheets L02–L06.

### **Installation of Native Vegetation Communities in the Wetland Mitigation Treatment Areas**

Six general plant communities will be established throughout the four wetland mitigation treatment areas described above. These plant communities will be adaptively managed over the proposed 10-year monitoring program. Each plant community is described below, and proposed planting schedules detailed in the 90% design plans for each are included in Appendix A.

- Woodland Hummock Wetland Enhancement (Planting Mix C) will be installed on the wetland hummocks within the wetland enhancement area. Plants within this community primarily include tree and taller shrub species to support a more diverse assemblage. Installed plants will be primarily facultative and facultative wetland species.
- Wetland Enhancement (Planting Mix D) includes trees, shrub, and emergent species adapted for wet conditions. This community will be planted in areas that are currently wetland but lack structural diversity. These planting areas will be outside of the graded hummocks and swales. Installed plants will be primarily facultative and facultative wetland tree, shrub, and emergent species.

- *Wetland Understory Enhancement (Planting Mix E)* will be installed in the existing forested wetland areas that lack a structurally diverse understory, primarily in the south portion of the site and along the hillslope to the southwest. Installed plants will include shrub and emergent species adapted for wet conditions, primarily facultative and facultative wetland species.
- *Wetland Creation/Reestablishment/Rehabilitation (Planting Mix F)* will be installed in areas that are currently upland. These areas will be cleared and grubbed, then graded to an appropriate elevation to create wetland hydrology. The vegetation palette is similar to the wetland enhancement planting mix but will have greater species and structural diversity. Most of this plant community will be installed in the large wetland reestablishment area in the center of the site (including the interspersed wetland rehabilitation areas) as well as the wetland creation areas in the north portion of the site, along the north-south driveway, and along the hillslope to the southwest. Installed plants will be primarily facultative and facultative wetland tree, shrub, and emergent species.
- *Wetland Reestablishment/Rehabilitation (8-inch depth max.) (Planting Mix G)* will be installed within the graded swales within the wetland enhancement area and the larger graded wetland depressions within the wetland reestablishment areas and wetland rehabilitation area. This community includes emergent species able to tolerate a maximum of 8 inches of standing water during the wet seasons. Species will include a mix of facultative wetland and obligate emergent species.

### ***Tributary Actions to Support Wetland Mitigation***

The mitigation project involves filling streams and ditches to disperse surface flows and support wetland creation and reestablishment, resulting in the conversion of waters of the U.S. from open channel to vegetated wetland. Proposed 90% design plans that depict mitigation actions are included in Appendix A.

#### **Stream 1**

The headwaters of Stream 1 is a concentration of hillslope seep outflow that is collected into a 20-foot-long culvert, which discharges to a defined channel (Sheet G04). The mitigation project involves removing the culvert and filling approximately 160 linear-feet of open channel (approximately 480 square feet) near the headwaters to disperse flow to the south and reestablish wetland habitat (Appendix A, Sheet G09). During construction, perennial flows will be temporarily routed away from the channel and dispersed onto the adjacent hillslope. Three clay ditch blocks will be installed approximately every 50 feet within the channel to discourage flows within the filled stream bed.

As the open channel portion of Stream 1 flows downslope, it continues through a series of culverts, short segments of open channel, and constructed wetland-ponds before discharging to the north bank of Little Bear Creek (Sheet G04). Culverts and wetland ponds will be removed and regraded, respectively, during project construction as this area is proposed for wetland reestablishment, rehabilitation, and enhancement.

#### **Ditch 3**

Ditch 3 is in the southwest portion of the project area and flows off-site to the south before discharging to Little Bear Creek (Sheet G04). The entire 220-linear-feet (approximately 660 square feet) of on-site ditch will be filled, and four clay ditch blocks installed, to disperse flows and support the reestablishment of wetland hydrology in the large pasture area and within the ditch (Appendix A, Sheet G09). Work will be conducted in the dry during the in-water work window between July 1<sup>st</sup> and August 31<sup>st</sup>.

### Ditch 5

Ditch 5, on the west side of the north-south driveway, will be completely filled (290-linear-feet and 870 square feet) to facilitate wetland reestablishment between Wetland J and Wetland A (Sheet G04; Appendix A, Sheet G09). Removal of the north-south driveway and filling of the ditch will reestablish wetland habitat. This work will also result in fill placed within 11-linear-feet (approximately 30 square feet) of Stream 5 on the east side of the north-south interior driveway.

### Ditch 6

Ditch 6 will be completely filled (95-linear-feet and 285 square feet) to facilitate wetland reestablishment downslope of Wetland GH and adjacent to Wetland M (Sheet G04; Appendix A, Sheet G09). Ditch fill will reestablish wetland habitat by dispersing rather than concentrating groundwater that expresses at the up-gradient portion of the ditch.

## 6.1.2 Floodplain and Riparian Mitigation Actions along Little Bear Creek

Enhancement of the Little Bear Creek floodplain and riparian corridor will occur on the south bank of Little Bear Creek and in the south portion of Wetland C, respectively. Proposed 90% design plans that depict mitigation actions are included in Appendix A.

The intent of the floodplain bench design is twofold: first, to increase the area of frequently inundated floodplain; and second, to vary local hydraulic conditions, increasing the heterogeneity of the stream habitat. Field reconnaissance indicated that Little Bear Creek is slightly incised (2 to 4 feet) within the valley bottom. During a site visit, ESA noted the presence of coarse woody debris embedded in the stream bank, which may indicate the wood was covered by sediment deposition. This historic movement of sediment may have been a result of previous clearing and subsequent hillslope erosion.

Additional restoration opportunities may exist along Little Bear Creek both up- and downstream of the LBCAMS. The mitigation project is designed to create wetland mitigation credits while not precluding or impeding additional future salmon or stream restoration projects. Although the advance mitigation project will improve stream, floodplain, and riparian habitat, the County is not seeking stream or fish credits. If any of the 11 proposed road improvement projects results in impacts to fish or fish habitat, compensatory mitigation for those impacts would not occur at the LBCAMS unless regulators agree that the site provides adequate mitigation opportunities.

### ***Floodplain Bench Creation and Riparian Enhancement***

In addition to the grading of the floodplain bench, key design elements include the placement of large wood structures along the bank of the stream, installation of willow poles, the addition of streambed material, and revegetation with riverine- wetland-appropriate species. Other stream and floodplain mitigation actions include the following:

- *Creation of a floodplain bench* – Excavation of a small floodplain bench, 1 to 2 feet above the channel thalweg, on the south bank of the stream will create frequently inundated areas that are valuable rearing habitat for juvenile salmonids. Inset floodplain benches also vary local hydraulic conditions (depth, velocity, stream power, etc.), which results in increased stream sediment

sorting and the deposition of gravels valuable for salmonid spawning habitat. An increase in floodplain inundation would also expand the riverine wetlands.

- *Install large wood structures* – Two large woody structures (LWS) will be installed at the upstream and downstream extents of the newly created floodplain bench along the south bank of Little Bear Creek and outside of OHWM. In addition to impeding bank erosion, these structures will also increase cover for fish, provide substrate for benthic macroinvertebrates, and promote habitat heterogeneity.
- *Installation of willow poles and stakes* – Willow poles and stakes will be installed throughout the wetland creation portion of the floodplain bench to provide vegetative erosion control, enhance fish habitat, and provide stream cover.
- *Addition of streambed material* – A cluster of approximately six, 1- to 2-ton boulders will be set within the stream channel, on top of the existing streambed material. The addition of this boulder cluster will restore structural complexity and hydraulic diversity where currently homogenous conditions exist.
- *Removal of invasive species* – Before construction, invasive vegetation will be removed, by hand, grubbed, and mowed when necessary and will focus on the knotweed and Himalayan blackberry populations along the banks of Little Bear Creek (Appendix A, Sheet G08). Invasive species will be removed in other riparian areas as needed. Approved aquatic herbicides will be applied as needed.

### **Installation of Native Vegetation Communities in the Floodplain and Riparian Mitigation Treatment Areas**

Two plant communities will be established within the areas of floodplain creation and riparian enhancement as described above. These plant communities will be adaptively managed over the proposed 10-year monitoring program. A description of each plant community is below, and proposed planting schedules for each are included in Appendix A.

- *Riparian Enhancement (Planting Mix H)* will be installed on both banks of Little Bear Creek, upstream and downstream of the created floodplain bench, to provide bank stability and overhanging vegetative cover to the stream. This community will also be installed directly behind the floodplain bench and function as a transition zone between wetland and upland conditions. Plantings will primarily include facultative wetland tree, shrub, and emergent species that can tolerate wet conditions during times of high flow.
- *Floodplain Wetland Creation (Planting Mix I)* will occur within the portion of the graded floodplain that will be hydrologically engaged most frequently. Plantings will include willow pole live cuttings that are adapted to tolerate frequent inundation. Plants will be installed within the floodplain to stabilize banks and provide overhanging cover to Little Bear Creek.

## ***Tributary Mitigation Actions***

### **Stream 1**

The mitigation project involves creating a new Stream 1 channel, extending from the confluence with Little Bear Creek upgradient approximately 200-linear-feet (1,430 square feet). The channel will measure approximately 7-feet-wide with 3:1 banks that will be planted with native, emergent species. The source of stream hydrology will be groundwater expressing at the headwaters of the new stream channel, which is located at toe-of-slope of the western hillside (Appendix A, Sheet G09).

### **Stream 4**

Perineal flows from Stream 4 begin within Wetland A, continue through a large area of fill material via culvert, then flow through Wetland C, before discharging to Little Bear Creek (Figure 7). The area of fill is proposed for removal to support the reestablishment of wetland conditions and to facilitate day-lighting (i.e., rehabilitation) of 880-linear-feet (6,160 square feet) of new stream channel (Appendix A, Sheet G09). Similar to Stream 1, the channel will measure approximately 7-feet-wide with 3:1 banks that will be planted with native, emergent species. During construction, stream flows will be diverted into a bypass culvert and discharged to Wetland C.

## **6.1.3 Upland Mitigation Actions**

### ***Upland Preservation with Enhancements***

Upland areas are classified in the mitigation plan as upland preservation with enhancement areas (Appendix A, Sheet G09). Invasive vegetation will be removed in these areas and native, structurally diverse plantings will be installed to provide a lift in habitat function. Upland preservation with enhancement areas include the forested hillslope to the west of the site, the area to the southeast of Little Bear Creek, the house site on the northwest corner of the property, and the bare slope on the north end of the property. On the forested hillslope and upland areas to the north of the site, invasive vegetation removal will focus on large Himalayan blackberry thickets (Appendix A, Sheet G08). Removal of invasive species in the remainder of the upland preservation with enhancement areas will occur as needed and by hand where possible. Blackberry will be removed by hand and grubbed, and an approved herbicide will be applied as necessary. Reed canarygrass will be mowed and sprayed with an approved herbicide. The understory of the sparsely vegetated forested areas will then be planted with native shrubs.

In upland areas that are not currently forested, structures and unsuitable fill soils will be removed, topsoil will be added, and the areas will be planted with native trees and shrubs. After enhancements, these upland areas will be preserved, along with the remainder of the site. The enhancement of these upland areas will result in a functional lift in ecological buffer function and provide a higher degree of protection to the adjacent wetlands. The preservation of these upland areas will ensure that buffer functions are provided in perpetuity.

### ***Installation of Native Vegetation Communities in the Upland Mitigation Treatment Areas***

Two plant communities will be installed in the upland preservation with enhancement areas. These plant communities will be adaptively managed over the proposed 10-year monitoring program. A description of each plant community is below, and proposed planting schedules for each are included in Appendix A.

- *Upland Enhancement (Planting Mix A)* will occur at the site of the house and adjacent slope at the north end of the property; these areas are currently sparsely vegetated. Installed plantings will include a mix of coniferous and deciduous trees and upland shrub species.
- *Upland Understory Enhancement (Planting Mix B)* will occur in existing forested areas that lack a diverse understory. This community will be established in the forested upland hillslope in the west portion of the site, as well as in the forested area southeast of Little Bear Creek. This community includes a mix of native shrub species that will add a multi-layered understory to these forested areas and improve species diversity.

Upland preservation with enhancement areas are identified on Sheet G09, and design details for these areas can be found on Sheets C02–C06 of the 90% Plan Set (Appendix A). Sheet L01 provides a planting overview, and planting details for these areas can be found on Sheets L02–L05.

### ***Fill Placement***

Large areas of fill material were imported to the site to support previous land use activities. Imported materials range from gravels to sandy loam. Re-use of fill material on-site serves several functions: to reduce off-haul costs, to develop visual buffer screens for wildlife using the site, and to develop topographic/habitat variability. Three upland locations have been identified for fill placement: (1) the top-of-slope adjacent to 238<sup>th</sup> Street SE, (2) the base of the north slope, and (3) the area immediately north of the driveway entrance off of 58<sup>th</sup> Avenue SE. At the top-of-slope, approximately 1,500 cubic yards of excavated soils will be placed, capped with clean on-site soil, and planted with native upland tree and shrub species (Appendix A, Planting Mix A, Sheets C02 and L02). Approximately 690 cubic yards of material will be placed at the base of the north slope, capped, and planted with the same plant palette (Appendix A, Sheets C02 and L02). Fill will also be placed north of the vehicle entrance and will take the form of a long broad berm. This berm will be capped with clean soil excavated from on-site and planted with native upland vegetation (Planting Mix A). The berm will be approximately 150 cubic yards of gravels and soils combined (Appendix A, Sheets C04 and L04).

## 7. SUMMARY OF FUNCTIONAL BENEFITS

The mitigation opportunities described above were identified based on site constraints described in ESA's *Baseline Conditions Report* (2018). Table 5, *LBCAMS Constraints, Treatment Areas, Mitigation Actions, and Anticipated Functional Lift*, lists site constraints, locations (Appendix A, Sheet G09), mitigation actions to address the constraint, and anticipated ecological response and benefit.

**TABLE 5**  
**LBCAMS CONSTRAINTS, TREATMENT AREAS, MITIGATION ACTIONS, AND ANTICIPATED FUNCTIONAL LIFT**

<b>Constraint to Ecological Function</b>	<b>Treatment Area(s)</b>	<b>Mitigation Action</b>	<b>Anticipated Functional Response/Ecological Benefit</b>
Stormwater input from off-site	Wetland Enhancement	<ul style="list-style-type: none"> <li>Install "trainer log" at outfall.</li> </ul>	<ul style="list-style-type: none"> <li>Increased hydrologic residence time.</li> </ul>
Wetland drainage via constructed ditches	Wetland Reestablishment	<ul style="list-style-type: none"> <li>Fill Ditch 3, Ditch 5, and Ditch 6 to restore wetlands and improve remaining streams.</li> </ul>	<ul style="list-style-type: none"> <li>Streams will flow through appropriately sized channels that will allow for overbank flooding.</li> <li>Increased residence time for surface and groundwater.</li> </ul>
Wetlands with limited water storage	Wetland Reestablishment and Wetland Enhancement	<ul style="list-style-type: none"> <li>Construct wetland hummocks.</li> <li>Excavate depressions.</li> </ul>	<ul style="list-style-type: none"> <li>Increases micro-topography and restores habitat complexity.</li> <li>Increased retention of sheetflow.</li> <li>Increased depressional wetland area.</li> <li>Increased buffer (visual, from road).</li> <li>Creation of shallow depressions to impound surface water to increase depressional wetland extent.</li> <li>Depressions will be deep enough to create an ephemeral pond for amphibian egg-laying structures, thus increasing habitat structure and function.</li> </ul>
Invasive non-native vegetation	All	<ul style="list-style-type: none"> <li>Vegetation management/ remove non-native plants.</li> </ul>	<ul style="list-style-type: none"> <li>Increased wetland habitat diversity through removal of monoculture stands of invasive species.</li> <li>Increased buffer diversity (facilitates recruitment of native species by removal of competing species).</li> <li>Non-native trees removed will remain on-site to provide material for creation of brush piles, girdled for snags, or LWD resulting in greater habitat complexity.</li> </ul>
Invasive non-native vegetation	All	<ul style="list-style-type: none"> <li>Excavate top 6" of soil in select locations where needed.</li> <li>Apply clean wood mulch.</li> <li>Plant native vegetation and/or native seed mix.</li> </ul>	<ul style="list-style-type: none"> <li>Expose native seedbank for passive revegetation.</li> <li>Increase structural habitat diversity by removing monoculture stands of plants.</li> </ul>
Lack of habitat complexity	All	<ul style="list-style-type: none"> <li>Preserve existing "nurse stumps" and snags.</li> <li>Install habitat logs, brush piles, and snag-out existing trees.</li> </ul>	<ul style="list-style-type: none"> <li>Preserves existing habitat features (e.g., nesting cavities).</li> <li>Provides cover and structural diversity to site.</li> </ul>
Lack of habitat complexity	All	<ul style="list-style-type: none"> <li>Remove fill.</li> <li>Construct hummocks.</li> <li>Repurpose native rock into habitat features when possible.</li> </ul>	<ul style="list-style-type: none"> <li>Diversification of habitat through creation of microtopographic features.</li> </ul>

<b>Constraint to Ecological Function</b>	<b>Treatment Area(s)</b>	<b>Mitigation Action</b>	<b>Anticipated Functional Response/Ecological Benefit</b>
Lack of habitat complexity	All	<ul style="list-style-type: none"> <li>• Revegetation.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased structural and spatial habitat diversity as a result of a diverse native plant palette.</li> </ul>
Compromised buffer integrity	Upland Preservation with Enhancement	<ul style="list-style-type: none"> <li>• Revegetation.</li> <li>• Vegetation management.</li> </ul>	<ul style="list-style-type: none"> <li>• Increased species diversity.</li> <li>• Increased structural diversity through planting of mixed successional palette.</li> <li>• Reduction or elimination of homogenous stands of non-native vegetation.</li> </ul>
Limited instream and riparian habitat	Riparian/Stream Enhancement	<ul style="list-style-type: none"> <li>• Excavate floodplain bench.</li> <li>• Install LWS upstream and downstream of the floodplain bench, outside of OHWM.</li> <li>• Install a cluster of boulders in the channel.</li> </ul>	<ul style="list-style-type: none"> <li>• Expansion of riverine wetlands.</li> <li>• Development of rearing habitat for juvenile salmonids.</li> <li>• Increased sediment sorting with a focus on gravel deposition valuable for salmonid spawning habitat.</li> <li>• LWS increase cover for fish.</li> <li>• LWS provide substrate for benthic macroinvertebrates.</li> <li>• LWS (and associated scour) promote habitat heterogeneity.</li> </ul>
Limited functions within tributaries	Wetland Reestablishment and Enhancement	<ul style="list-style-type: none"> <li>• Remove culverts.</li> <li>• Create tributary channels.</li> <li>• Revegetate banks with emergent species.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved hydrologic connection with Little Bear Creek.</li> <li>• Off-channel fish habitat.</li> <li>• Increased habitat diversity.</li> </ul>

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## 8. CREDIT GENERATION FRAMEWORK

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There is no single specified method for determining how and when credits will be generated through advance mitigation. The Advance Mitigation Guidance document (Ecology et al., 2012) indicates that permit applicants should propose “*appropriate ratios for credit use based on impact type, and quality of and functions provided by the aquatic resources at the impact site.*” The guide recommends standard ratios for impacts to wetland category and type outlined in Wetlands in Washington State – Part 1 (Ecology et al., 2006a).

For LBCAMS, the number and type of available credits will be determined using Ecology’s Credit-Debit Method (Hruby, 2012). The method calculates credits based on an estimate of functional lift provided by the creation, reestablishment, rehabilitation, and enhancement of the wetlands and the preservation of uplands on-site. Functional lift is estimated by comparing the existing (pre-project) functions provided by on-site wetlands with the anticipated future functions of the site after the mitigation actions are implemented.

The current wetland functions were documented using the Ecology Wetland Rating System based on existing conditions of the depressional and slope wetlands on-site. Expected future wetland ratings were then estimated by using the anticipated future site conditions following mitigation actions. The 90% design plans were used to estimate future conditions. Table 6 compares the functional lift before and after project construction for Wetlands A and C according to Ecology’s Credit-Debit Method:

**TABLE 6  
LBCAMS WETLANDS A AND C FUNCTIONAL LIFT**

	<b>Existing (pre-project) function score</b>	<b>Expected (post-project) function score (based on 90% design)</b>	<b>Expected credit based on functional lift</b>
Water Quality	7	8	1
Hydrologic	6	7	1
Habitat	5	6	1

In this example, each functional category is expected to be lifted by one point.

The Credit-Debit Method multiplies this 1-point lift by the area proposed for enhancement (3.86 acres) to result in 3.86 credits for Wetlands A and C.<sup>1</sup> Similar calculations were completed for the creation, reestablishment, rehabilitation, enhancement, and preservation areas. The method provides credits in a currency called “acre-points” that can be compared with the “acre-points” lost at the impact site (i.e., debits) Based on the preliminary calculations, the LBCAMS is expected to generate a total of:

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<sup>1</sup> Only includes Wetlands A and C enhancement treatment area that is located outside of buffers and therefore generates credits.

- 42.2 water quality credits.
- 37.3 hydrologic credits.
- 34.2 habitat credits.

Preliminary Credit calculation worksheets are in Appendix B.

Results of the Credit-Debit Method are preliminary and may be revised based on changes in the design or new assumptions regarding future site conditions.

The number of available credits could vary depending on several factors, such as the width of a site protective buffer that encircles LBCAMS. Wetland mitigation projects are typically required to designate a protective buffer area along the perimeter of the project to protect the wetland functions from off-site disturbance. In general, the north and east project boundaries will have a 50-foot wide protective buffer area to provide a screen between the wetlands and disturbance from 238<sup>th</sup> Street SE and 58<sup>th</sup> Avenue SE (Figure 8). The southern-most project boundary will have a 75-foot buffer to screen the LBCAMS from the adjacent residential building. The remaining boundaries will be prescribed a 25-foot buffer, except as noted on Figure 8 where the buffer will extend 25 feet from the toe-of-slope at several locations. Buffer areas do not generate credits despite the area containing enhanced and/or reestablished wetland or enhanced upland.

A portion of the mitigation plan includes the rehabilitation of existing wetlands. These wetlands (G, GH, J, and M) are currently disconnected from the larger wetlands that contain small streams that flow to the south and discharge to Little Bear Creek. Grading of the upland areas around these small wetlands will result in wetland rehabilitation by repairing the hydrologic processes that were disconnected through past land uses. Surface water will flow unimpeded from the larger wetland to the north (Wetland A) into and through these smaller wetlands. That surface water will also connect with Little Bear Creek to the south. This return of a hydrologic process is expected to have significant functional benefits to the wetlands.

The Credit-Debit Method treats wetland rehabilitation the same as wetland enhancement. The County is requesting approval to value rehabilitation credits more than enhancement credits. In other words, rehabilitation areas would generate more credits than enhancement areas due to the additional functional lift provided by rehabilitation. Section 5.2.1 of the interagency guidance document *Wetland Mitigation in Washington State Part 1* refers to rehabilitation and reestablishment as the first choice for agencies for compensation. Furthermore, Section 5.2.3 states that enhancement “*is less preferred than restoration (re-establishment and rehabilitation) or creation (establishment).*” For these reasons, it seems appropriate that rehabilitation would generate more credits than enhancement in the Credit-Debit Method. The County requests that the credits generated by the Credit-Debit Method for rehabilitated wetlands be increased by 50 percent to account for the additional functional lift. Applying the multiplier to rehabilitation credits increases the total credit generation of the site by approximately one credit:

- 42.7 water quality credits.
- 37.6 hydrologic credits.
- 34.5 habitat credits.

The general policy of the regulatory agencies is that advance mitigation sites should not generate mitigation credit until the site has been functioning and meeting the required performance standards for a minimum of 2 calendar years after earth work and planting have been completed. However, at LBCAMS, the shallow groundwater table and existence of former wetlands underneath fill material (i.e., reestablishment areas) should allow the site to achieve hydrology, installed vegetation, and other performance standards beginning in Year 1. A detailed credit release schedule as it applies to the proposed performance standards is included in Section 10.

## 9. CONSIDERATIONS FOR USING LBCAMS

As noted above, the County is seeking approval to use the LBCAMS as advance mitigation for unavoidable impacts caused by future roadway projects. For any permitted unavoidable impact, there will be one or more regulatory agencies with permitting authority and jurisdiction. For example, for “isolated” wetlands, local jurisdictions would have regulatory authority under applicable critical areas ordinances and Ecology would also have authority as provided under RCW 90.48. The Corps has authority for determining whether a wetland or other aquatic resource is “isolated” for purposes of establishing federal Clean Water Act jurisdiction.

Given the complex regulatory framework and the variability of permitted impact projects, determinations of which local, state, tribal, and federal agencies have jurisdiction (i.e., regulatory authority) will be made on a case-by-case basis at the time County seeks a permit.

### 9.1 Mitigation Sequencing

The existence of the LBCAMS does not change the requirement for permit applicants to adhere to the “mitigation sequence” required by federal, state, tribal, and local agencies. For example, the Clean Water Act requires that project proponents demonstrate that all avoidance and minimization measures have been taken before a determination that remaining impacts are unavoidable (40 CFR 230.10(a) and (d)). Once a determination is made that impacts are unavoidable, compensatory mitigation is required.

Snohomish County Code 30.91M.120 defines mitigation as being composed of the following steps:

1. Avoiding the impact altogether by not taking a certain action or parts of an action;
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps to avoid or reduce impacts;
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing, enhancing, or providing substitute resources or environments; and/or
6. Monitoring the impact and taking appropriate corrective measures.

The following steps show how the LBCAMS would fit into the mitigation sequence:

1. County will design the project to avoid impact.
2. If avoidance is not achieved, minimize the impact to the extent possible.
3. Determine whether the LBCAMS provides appropriate compensation for loss of wetland functions and can achieve appropriate ecological lift to offset impacts.

The federal rule (33 CFR 332.3(b) and 40 CFR 230) mandates considering the use of mitigation banks prior to the use of in-lieu fee mitigation programs prior to the use of permittee-responsible mitigation. The LBCAMS will provide mitigation similar to that of a mitigation bank; the distinction between the two is that LCBAMS will only mitigate for County projects whereas a mitigation bank serves multiple applicants through the sale of credits to different entities.

The steps for documenting mitigation sequencing and use of the LBCAMS include the following actions:

- County completes data collection and a preliminary site and impacts assessment and provides to the applicable regulatory agencies and permitting entities for review.
- The applicable regulatory agencies and permitting entities review the proposed development project to ensure impacts are avoided and minimized to the maximum extent practicable.
- The permitting agencies determine if the LBCAMS provides the best option for compensating for unavoidable impacts; if so then the County completes a Site Use Plan to determine the amount of credits needed to offset the impact (or debit). The Site Use Plan is then provided to the applicable regulatory agencies and permitting entities.
- The agencies will approve or deny the permit conditioned on releasing credits from the LBCAMS for mitigation.
- Statement of credit release sent to Corps, Ecology, and any other applicable regulatory or permitting entities which issued the permit conditioned upon purchasing credits from the LBCAMS.

# 10. MITIGATION GOALS, OBJECTIVES, PERFORMANCE STANDARDS

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## 10.1 Mitigation Goals

The overall goal of the wetland, stream, and associated buffer mitigation is to replace the habitats and functions lost or altered as a result of former land use and compensate for functional impacts resulting from the 11 County-planned transportation projects. Specific mitigation goals include the following:

- Create approximately 0.35-acre of depressional and slope wetland with a structurally diverse native plant community and hydrologic connections to onsite streams and/or groundwater.
- Reestablish approximately 4.25 acres of wetland by removing fill and restoring wetland hydrology and vegetation.
- Rehabilitate approximately 0.52-acre of wetland by removing fill, planting native plant species, and restoring historic hydrologic connections to wetlands that are currently isolated.
- Enhance approximately 6.62 acres of wetlands through the removal of invasive species and the planting of native trees and shrubs.
- Enhance approximately 190 linear feet of Little Bear Creek floodplain by creating a floodplain bench that will increase the frequency of inundation.
- Preserve with enhancement approximately 4.80 acres of uplands (wetland and stream buffers) through the removal of building, refuse, and invasive species, and the planting of native trees and shrubs.

## 10.2 Objectives and Performance Standards

The LBCAMS will result in a substantial increase in wetland functions. Because these functional gains will be used as credits to offset debits incurred by the County due to unavoidable wetland impacts of future road projects, the County must document that these functional lifts have occurred before the release of credits can occur. The success of the LBCAMS and the subsequent release of credits will be determined by meeting the project objectives in Table 7 – *Project Monitoring Criteria and Performance Standards*. Methods of evaluation as well as possible contingency measure for each performance standard are also included.

**TABLE 7  
PROJECT MONITORING CRITERIA AND PERFORMANCE STANDARDS**

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
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**Water Quality Objective 1: Establish native tree and shrub cover in all wetland and upland treatment areas.<sup>^</sup> Functions provided include: reduced surface flow velocity; nutrient, pollutant, and sediment filtering; and increased groundwater exchange.**

<b>WQ1*</b> : In all Wetland Mitigation and Upland Preservation with Enhancement* treatment areas, cover of native species (installed and desirable volunteer) should be at least at the following percentages:	Year 1				N/A	
	Year 2				15% cover <sup>#</sup>	
	Year 3				25% cover <sup>#</sup>	
	Year 5				45% cover <sup>#</sup>	
	Year 7				60% cover <sup>#</sup>	
	Year 10				70% cover <sup>#</sup>	

**Evaluation Approach** – Cover will be estimated using sub-samples (e.g., plots, line-intercept transects) that cover a minimum of 20 percent of the planting areas.

\*Within the Wetland Enhancement and Upland Preservation with Enhancement treatment areas, existing trees taller than 20 feet at the time of construction that are located within both Planting Mix B (Upland Understory Enhancement) and Planting Mix E (Wetland Understory Enhancement) will be recorded in the as-built and will not count toward the standard. These two planting areas contain mature trees that should not be included in monitoring data.

<sup>^</sup> Within the Wetland Reestablishment, Wetland Rehabilitation, and Wetland Enhancement treatment areas, do not survey Planting Mix G as part of this performance standard because this planting area only contains emergent species.

<sup>#</sup> Within the Wetland Enhancement and Upland Preservation with Enhancement treatment areas, the percent cover performance standard for each monitoring year will be 5 percent less than listed in the table for both Planting Mix B (Upland Understory Enhancement) and Planting Mix E (Wetland Understory Enhancement). These two planting areas are located under existing canopy resulting in slower growth rates of installed plants.

**Contingency** – Install additional plants if necessary. Identify substitute native species that are adapted to site conditions. Install protective collars to reduce herbivore damage, if needed. Control invasive species that may be outcompeting planted stock.

**Water Quality Objective 2: Create seasonally flooded swales and depressions. Functions provided include: increased biogeochemical cycling and increased nutrient, pollutant, and sediment filtering.**

<b>WQ2</b> : In areas only planted with emergent species (i.e., Planting Mix G), full or partial inundation will last for at least two months during each monitoring year.	Year 1	All Years	All Years	All Years	N/A	N/A
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					

**Evaluation Approach** – Visual observations of swales and depressions for either inundation or signs of inundation.

**Contingency** – Minor grading if necessary; likely using hand-held tools or small equipment (e.g., mini skid steer) to deepen depressions

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
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**Hydrologic Objective 1: Establish wetland hydrology through the removal of fill and grading soils to engage groundwater and maintain wetland hydrology in all wetland areas. Functions provided include: increased water storage, hydrologic connectivity, and groundwater recharge.**

<b>HY1a:</b> Within all wetland areas, soils will be saturated within the upper 12 inches for a minimum of two weeks during the growing season.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>N/A</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					
<b>HY1b:</b> In areas only planted with emergent species (i.e., Planting Mix G) soils will be saturated to the soil surface for 6 months, including at least the period from March through June.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>N/A</b>	<b>N/A</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					

**Evaluation Approach** – Shallow wells and/or observation of hand-dug holes.

**Contingency** – Modify surface drainage features or minor grading if necessary.

**Hydrologic Objective 2: Create, reestablish, rehabilitate, or enhance 10.38 acres\* of wetlands. Functions provided include: increase water storage and maintenance of dry-period stream flows with reduced downstream flooding, erosion, and stream degradation.**

<b>HY2:</b> At a minimum, wetland acreage should be as shown at right.	Year 1	<b>5.33 acres</b>	<b>4.18 acres</b>	<b>0.52-acre</b>	<b>N/A</b>	<b>N/A</b>
	Year 2	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	
	Year 3	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	
	Year 5	<b>5.33 acres</b>	<b>4.18 acres</b>	<b>0.52-acre</b>	<b>0.35-acre</b>	
	Year 7	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	
	Year 10	<b>5.33 acres</b>	<b>4.18 acres</b>	<b>0.52-acre</b>	<b>0.35-acre</b>	

**Evaluation Approach** – Delineation at end of Year 1, Year 5, and Year 10

\*Treatment area total located outside of the site protective buffers.

**Contingency** – Evaluate hydrologic monitoring data and determine appropriate corrective actions.

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
<b>Habitat Objective 1: Remove non-native, invasive vegetation in wetland, riparian, and upland mitigation areas. Functions provided include: increased habitat diversity, forage opportunities, and refuge for native wildlife species.</b>						
<b>HA1a*:</b> Himalayan blackberry, English ivy, and other noxious weeds (excluding reed canarygrass) will not exceed 20 percent coverage in any treatment area.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
Year 10						
<b>HA1b*:</b> Reed canarygrass will not exceed 35 percent coverage in any treatment area.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
Year 10						
<b>HA1c*:</b> Invasive knotweed species will be eradicated from all mitigation areas.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
Year 10						
<b>Evaluation Approach</b> – Cover will be estimated using sub-samples (e.g., plots, line-intercept transects) that cover a minimum of 20 percent of the treatment areas.						
<b>Contingency</b> – Eliminate or reduce the abundance of non-native invasive species.						
<b>Habitat Objective 2: Create structurally diverse vegetative communities throughout the site. Functions provided include: increased microclimate variability, habitat diversity, and refuge for native species.</b>						
<b>HA2:</b> A minimum of two native coniferous species and five native woody shrub species will be established within each treatment area.	Year 1	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>	<b>All Years</b>
	Year 2					
	Year 3					
	Year 5					
	Year 7					
Year 10						

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
<b>Habitat Objective 3: Create topographic diversity and variation within the wetland enhancement and reestablishment areas. Functions provided include: increase habitat complexity, interspersions of habitats, and vegetation species diversity.</b>						
<b>HA3:</b> Installed hummocks should remain stable compared to as-built.	Year 1	All Years	All Years	N/A	N/A	N/A
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					
<b>Evaluation Approach</b> – Visual observations during vegetation monitoring. Woody species diversity will be assessed across all treatment areas, but not within Planting Mixes G and I, which are only planted with emergent species.						
<b>Contingency</b> – Install supplemental plantings to meet diversity standards and stabilize hummocks.						
<b>Habitat Objective 4: Provide habitat for amphibians. Functions provided include: increased wildlife and vegetation species diversity, interspersions of habitat, and forage opportunities.</b>						
<b>HA4:</b> In areas only planted with emergent species (i.e., 8-inch swales and depressions), thin-stemmed emergent vegetation should have at least 30 percent cover.	Year 1	N/A	N/A	N/A	N/A	N/A
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					
<b>Evaluation Approach</b> – Visual observations during vegetation monitoring.						
<b>Contingency</b> – Addition of thin-stemmed emergent vegetation in graded swales and depressions as necessary.						
<b>Habitat Objection 5: Enhance habitat functions of wetland areas by installing habitat features. Functions provided include: increased wildlife refuge, habitat complexity, and wildlife species diversity.</b>						
<b>HA5:</b> Habitat features (including installed brush piles, habitat logs, snags and root wads) will retain structural integrity and be equivalent in number to the as-built.	Year 1	All Years	All Years	All Years	All Years	All Years
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					
<b>Evaluation Approach</b> – Visual observations during vegetation monitoring.						
<b>Contingency</b> – Supplement with additional features as necessary.						

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
<b>Riparian Objective 1: Create a stable vegetated floodplain bench on the south bank of Little Bear Creek through grading and the addition of large wood and willow poles. Functions provided include: temperature moderation, organic matter input, flood storage capacity, fish refuge during high flows, and sediment sorting.</b>						
<b>HA-R1:</b> The floodplain bench will show signs of being engaged during high flows and will not show signs of avulsion or significant erosion.	Year 1	N/A	N/A	N/A	All Years	N/A
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					

**Evaluation Approach** – Visual observations during monitoring visits.

**Contingency** – Adjust bank height, channel morphology, or roughness to alter amounts of overbank flow. Add, remove, or relocate willow poles as necessary.

**Riparian Objective 2: Increase the amount of large woody material adjacent to Little Bear Creek to improve stream habitat and stabilize the south bank of the stream. Functions provided include: increased riparian habitat diversity, slope stability, bank stabilization, sediment sorting, and fish refuge during flood flows.**

Performance Standard	Year	Wetland Enhancement Area*	Wetland Reestablishment Area	Wetland Rehabilitation Area	Wetland Creation Area	Upland Preservation with Enhancement*
<b>HA-R2:</b> Large woody structures will remain intact and not result in significant bank erosion.	Year 1	N/A	N/A	N/A	All Years	N/A
	Year 2					
	Year 3					
	Year 5					
	Year 7					
	Year 10					

**Evaluation Approach** – Visual observations during monitoring visits. The inspection should look for evidence of structure movement, erosion and scour, cover creation, sediment trapping, and development of pools.

**Contingency** – Adjust location and/or anchors of large woody material and install temporary erosion control measures as needed.

\*Performance standards only apply to credit-generating areas located outside of the perimeter site buffer.

# 11. CREDIT RELEASE SCHEDULE

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Credit release for LBCAMS will begin one-year following completion of construction of the mitigation actions, including all grading and plantings. Monitoring will occur during Year 0 (as-built monitoring) and once Year 1 performance standards are achieved, the County would seek release of available credits.

If only a portion of the performance standards are achieved for any given monitoring period, the corresponding percentage of credits would be available for that year. For example, under Performance Standard H1a, if performance standards are achieved for wetland creation, reestablishment, and rehabilitation, but not enhancement, then only three-quarters of the credits would be available for that monitoring period. For Performance Standard WQ2, which is applicable only to wetland reestablishment and enhancement areas; if the reestablishment performance standard is achieved, but the enhancement standard is not, then only half the credits would be available for a given monitoring period.

However, full credits can become available once performance standards are achieved in a subsequent monitoring period (i.e., previous monitoring period remaining credits are available once applicable performance standards are achieved).

Table 8 – LBCAMS Credit Release Schedule documents the credit release schedule for LBCAMS.

**TABLE 8**  
**LBCAMS CREDIT RELEASE SCHEDULE**

Performance Standard	Number of Credits Released**						TOTAL
	Year						
	1	2	3	5	7	10	
WQ1	---	5	6	7.5	7.5	7.5	42.5
WQ2	1	1	2	2	2	1	
HY1a	0.5	1.5	2	3	3	3	37.5
HY1b	0.5	0.5	1.5	1.5	1.5	1	
HY2	4	---	---	7	---	7	
HA1a	1	1	1	1	1	1	34.5
HA1b	1	1	1	1	1	1	
HA1c	0.5	0.5	0.5	0.5	0.5	1	
HA2	0.5	0.5	0.5	0.5	0.5	0.5	
HA3	0.5	0.5	0.5	1	0.5	1	
HA4	---	--	0.5	1	0.5	1	
HA5	0.5	0.5	0.5	0.5	0.5	0.5	
HA-R1	0.5	0.5	0.5	0.5	0.5	0.5	
HA-R2	0.5	0.5	0.5	0.5	0.5	0.5	
<b>TOTAL</b>	<b>11</b>	<b>13</b>	<b>17</b>	<b>27.5</b>	<b>19.5</b>	<b>26.5</b>	

\*Credit estimates may change slightly as the project progresses to 100% design.

#Credit generation is calculated using the area of mitigation treatment located outside of the site protective buffers.

At the time the County proposes to use credits generated by LBCAMS for a specific project, an Advance Mitigation Site Use Plan (Use Plan) will be submitted to the permitting agencies for review and approval. In general, after County has documented the type and extent of wetlands impacted by the proposed project, they will use Ecology's Credit-Debit Method to determine the number of debits resulting from the project. To mitigate for project impacts, the number of credits used to offset debits must be at least equivalent. A Credit Ledger will be developed to track the number of available credits, by functional type, and the number of credits used for specific projects.

As noted in Section 6.1.2, additional mitigation opportunities exist on- and offsite along Little Bear Creek that are outside the scope of the project and the proposed project has been designed to not preclude or impede any additional future salmon or stream restoration projects. While the proposed project will improve stream and fish habitat onsite, no stream improvement credits will be generated.

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## 12. MONITORING AND ADAPTIVE MANAGEMENT

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The County proposes a 10-year monitoring and adaptive management period for the LBCAMS project. The main objective for mitigation monitoring is to document the level of success in meeting the goals, objectives, and performance standards of the project. Monitoring will begin during construction and continue on a near annual basis according to the schedule as indicated in Table 7 – *LBCAMS Credit Release Schedule* above. If the project meets Year 10 performance standards before the 10-year monitoring program is complete, the monitoring period may be reduced if approved by regulatory agencies. If the project has not met all performance standards by the end of the monitoring period, the monitoring period may be extended until the performance standards are met.

### 12.1 As-built Documentation

An as-built report will be developed and submitted to applicable regulatory agencies after construction of LBCAMS. The as-built report will reflect final grading, topography, planting, and construction. The as-built will reflect all changes made during the construction process, and show the dimensions and locations of all elements of construction. The reports will also include descriptions of plantings, wetland boundaries, established photo points, piezometers (or other monitoring wells or gauges), and other relevant data.

An initial stem count of the installed vegetation will be conducted following construction. A qualified biologist or landscape designer will conduct the as-built review and draft the report. The as-built report will be used as the basis for monitoring of plant survival. Performance standards monitoring will begin the first full growing season after construction is complete and the plants have been installed.

### 12.2 Data Collection

Emergent, shrub, and tree cover will be evaluated quantitatively and qualitatively 1 year after construction, as well as in Years 2, 3, 5, 7, and 10. Data collection will occur between June 1<sup>st</sup> and September 15<sup>th</sup>. Examples of the types of information that will be recorded during each of the monitoring site visits is listed below:

- Survival rates of installed vegetation during plant warranty period based on sub-sample of the mitigation area (e.g., plots, line-intercept transects). Random transects and/or randomly selected plots will be established within each Mitigation Treatment Area and will be re-visited each monitoring year required by the monitoring plan.
- General plant health assessment and plant aerial coverage from established sampling points and/or transects (e.g., line-intercept).
- Presence of undesirable plants (weedy and/or non-native species) with estimated percent cover.
- Groundwater depths in the wetland creation area during the early growing season (e.g., March–May) using shallow monitoring wells or hand-dug holes.

- 
- Photo documentation of site conditions from established photo points.
  - Impacts to the wetland buffer from human use (e.g., dumping of debris).
  - Signs and observations of wildlife use.
  - Channel stability (e.g., monitored by site surveys of cross-sections and visual observations and photo documentation throughout the length of channel modifications).

## 12.3 Reporting

Monitoring reports will be prepared by a qualified biologist or landscape designer for review and approval by regulatory agencies. The reports will compare the performance standards described in the mitigation plan to the field observations during monitoring, and will assess if performance standards were achieved. As performance standards are achieved during each monitoring year, the corresponding credits will be released according to the Credit Release Schedule (Section 11.0), after regulatory approval. If performance standards are not achieved, contingency recommendations, such as species replacements or other maintenance activities, will be specified in the morning report (see *Maintenance* section below). Monitoring reports will be submitted by the end of each monitoring year to the appropriate permitting agencies including the Corps, Ecology, WDFW, and County (Planning and Development Services).

## 12.4 Maintenance

Maintenance of the mitigation area will begin after completion of the project and continue, as needed, for 10 years. After the initial planting acceptance by the project biologist, the landscaping contractor will be responsible for plant survival for a period of one year. The County will provide maintenance, as necessary. Maintenance could include, but may not be limited to:

- Water or irrigate during dry periods, determined at a later design phase;
- Remove non-native or invasive plant species;
- Supplement soil amendments and/or mulch;
- Provide fencing around woody plants to prevent animal damage;
- Provide or repair fencing to prevent vandalism or damage caused by humans; and
- Install supplemental plantings as needed.

Required maintenance, based on monitoring results, will be implemented by the County. For the final mitigation plan, the County will determine how corrective measures will be addressed (e.g., which department(s) will provide funding) should they be necessary.

## 12.5 Contingency

If any portion of the mitigation project is not successful, a contingency plan will be implemented. Such plans are prepared on a case-by-case basis to remedy any aspects of the mitigation that do not meet the

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performance standards. The plan, if required, would be developed in cooperation with the regulatory agencies. Contingency actions as related to performance standards are included in Table 6 – *Project Monitoring Criteria and Performance Standards*.

## **12.6 Site Protection**

The County will execute and file a restrictive covenant on the LBCAMS to provide permanent protection for the site (except for the purposes of monitoring, maintenance, or contingency actions associated with the project) with the Snohomish County Auditor's office. Documented proof of the protective covenant will be provided to the regulatory agencies. The northern and eastern boundaries of the site will be fenced and all boundaries will be permanently marked with signage.

## 13.LIMITATIONS

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Within the limitations of schedule, budget, scope-of-work, and seasonal constraints, we warrant that this study was conducted in accordance with generally accepted environmental science practices, including the technical guidelines and criteria in effect at the time this study was performed, as outlined in the Methods section. The results and conclusions of this report represent the authors' best professional judgment, based upon information provided by the project proponent in addition to that obtained during the course of this study. No other warranty, expressed or implied, is made.

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# Figures



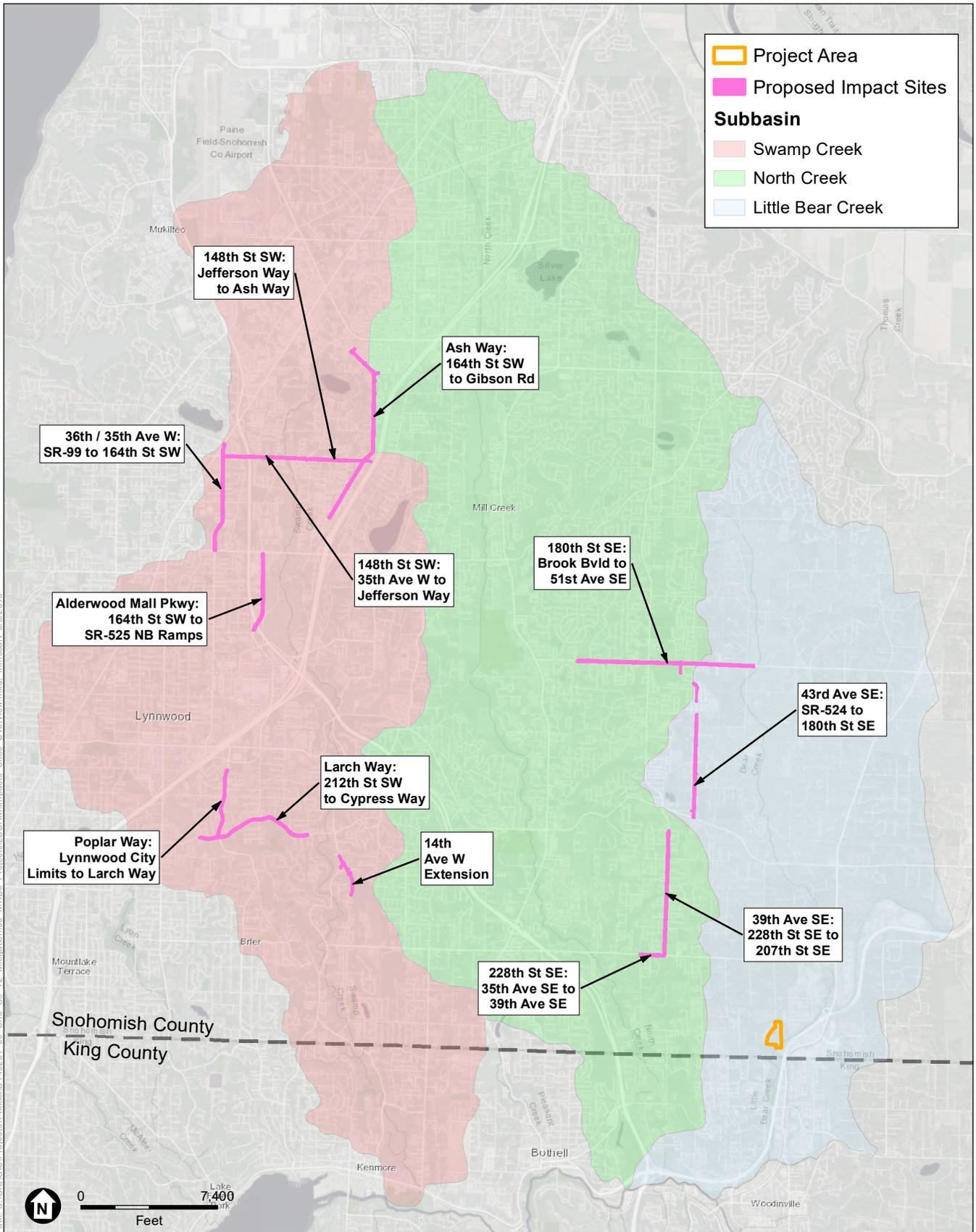


SOURCE: NAIP, 2015; ESA, 2018

Little Bear Creek Advance Mitigation Site

**Figure 1**  
Project Vicinity





SOURCE: DigitalGlobe, 2016; ESA, 2017

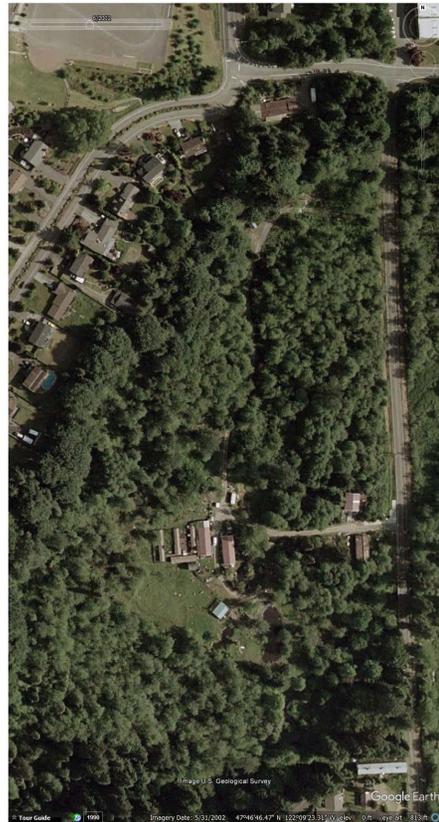
Little Bear Creek Advance Mitigation Site

**Figure 2**  
Proposed Impact Sites Overview





1990  
No northern driveway, no grazing



2002  
Northern driveway present, grazing near buildings  
Grazing expanded to the north wetland by 2005



2015  
Most recent leaf-off photo.



2017  
Most current aerial photo

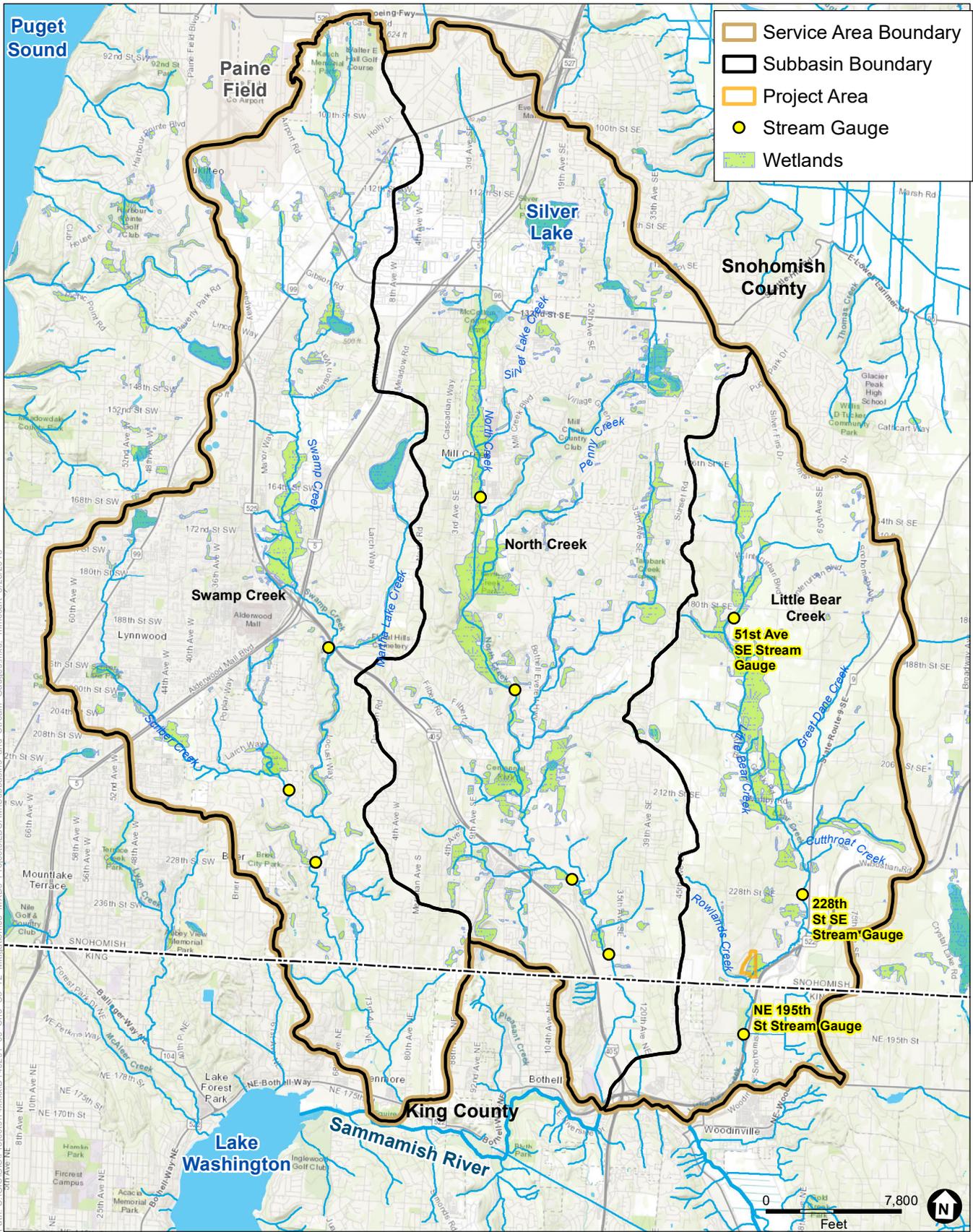
SOURCE: ESA 2017; Google Earth 2017

Little Bear Creek Advance Mitigation Site

**Figure 3**  
Habitat Change at LBCAMS; 1990 to 2017





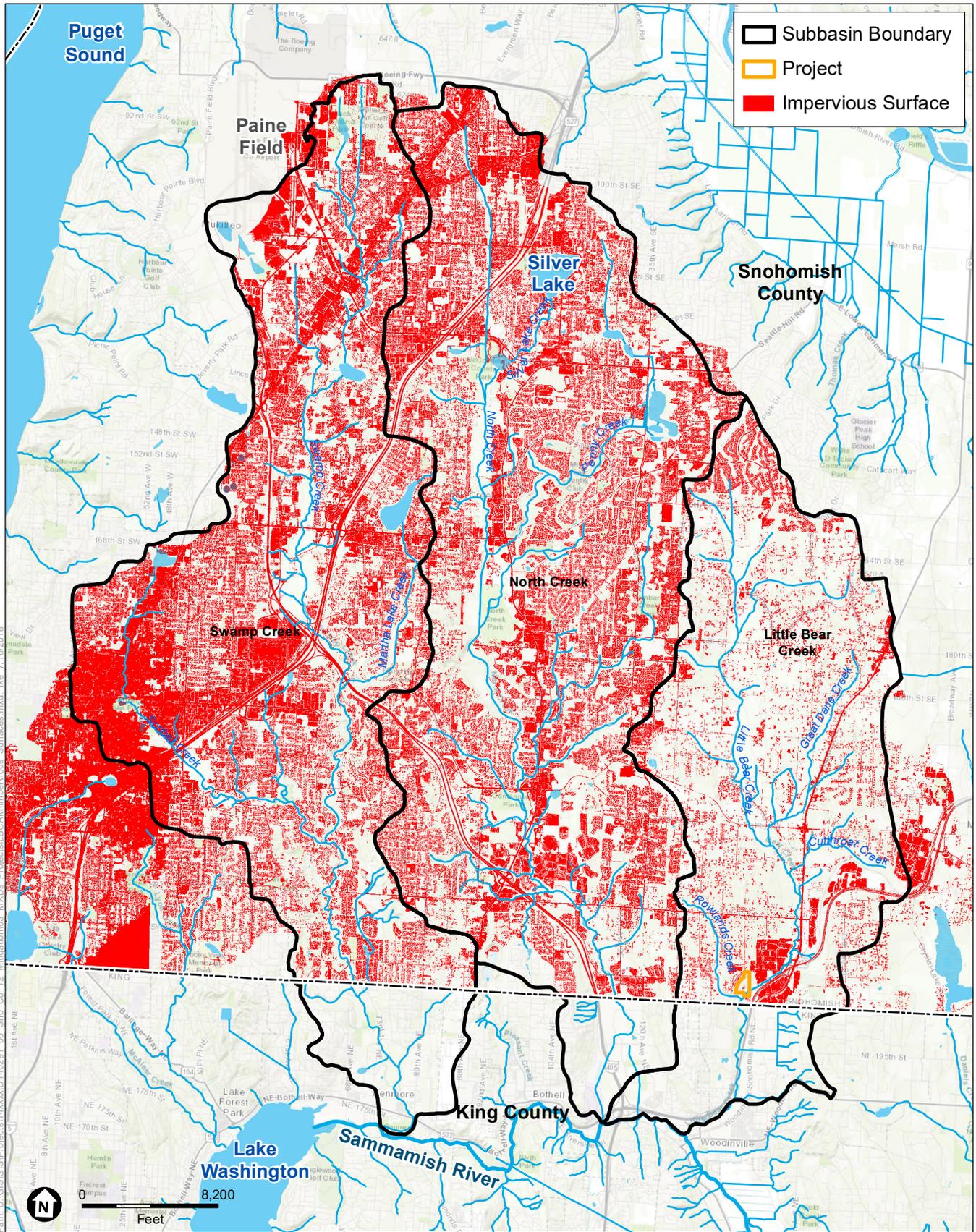


SOURCE: ESRI, 2018; ESA, 2017; Snohomish County, 2018

Little Bear Creek Advance Mitigation Site

**Figure 4**  
Service Area, Subbasins, and Stream Gauges

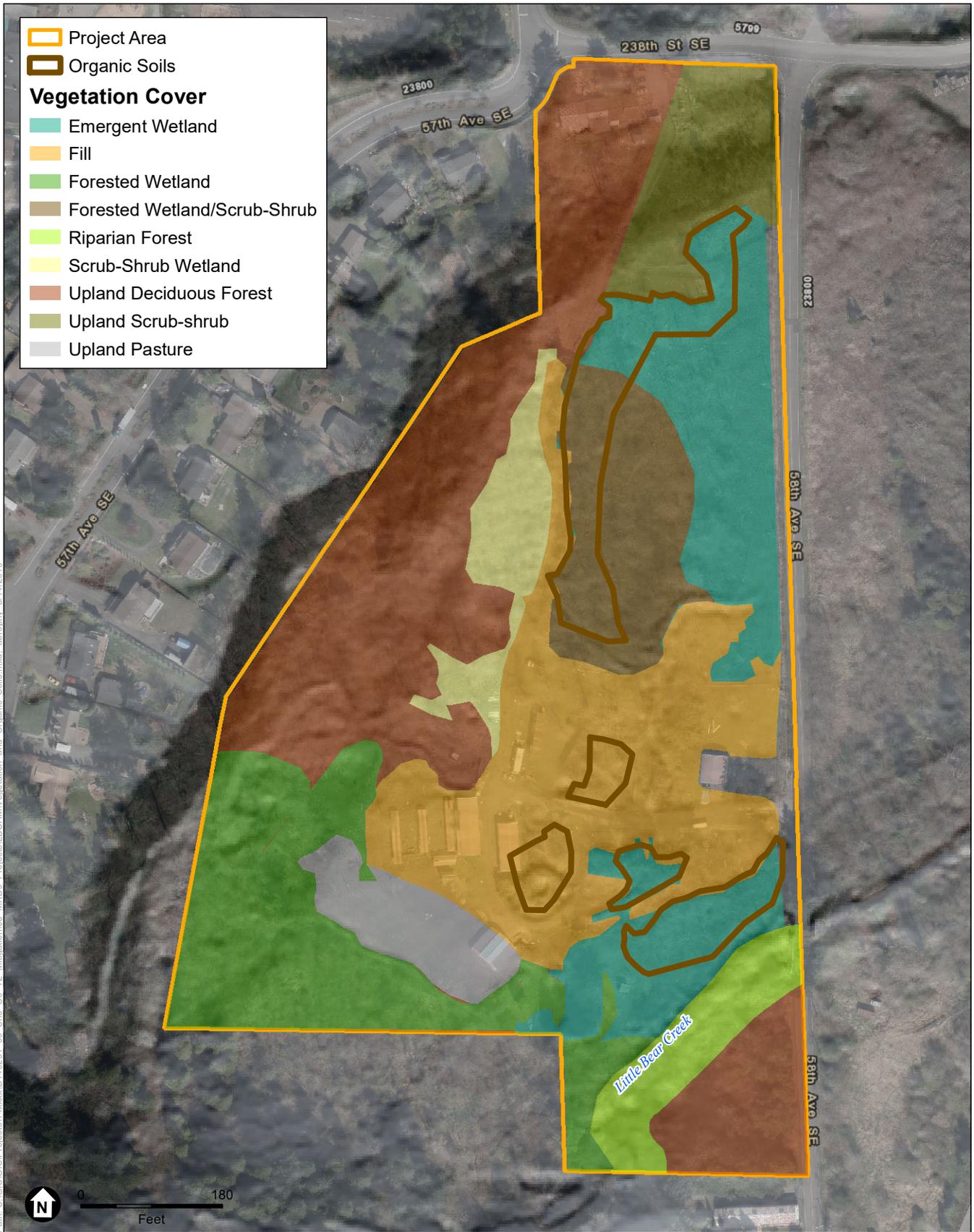




SOURCE: ESRI, 2018; ESA, 2017

Little Bear Creek Advance Mitigation Site

**Figure 5**  
Impervious Surfaces

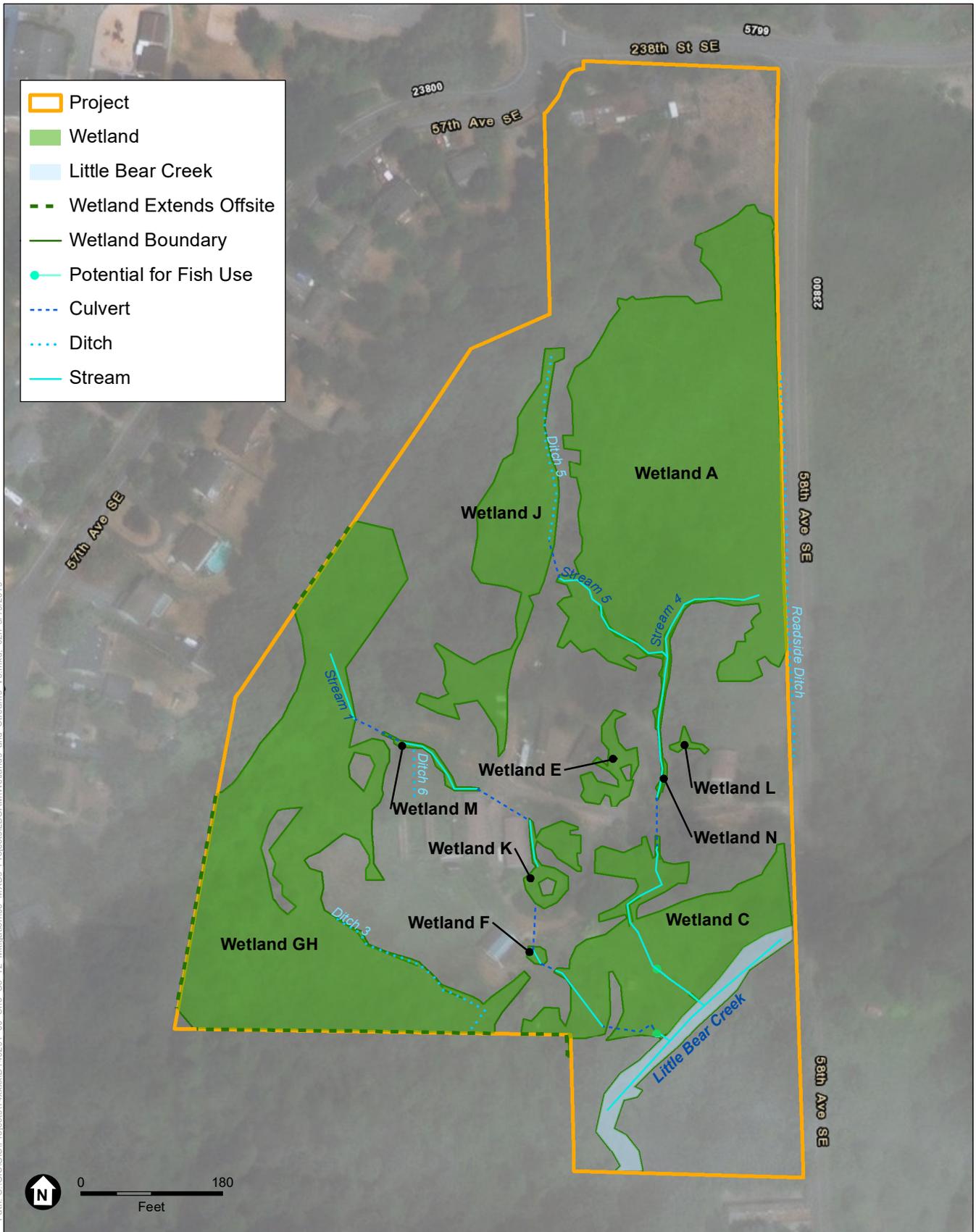


SOURCE: DigitalGlobe, 2016; ESA, 2017

Little Bear Creek Advance Mitigation Site

**Figure 6**  
Vegetation and Organic Soils





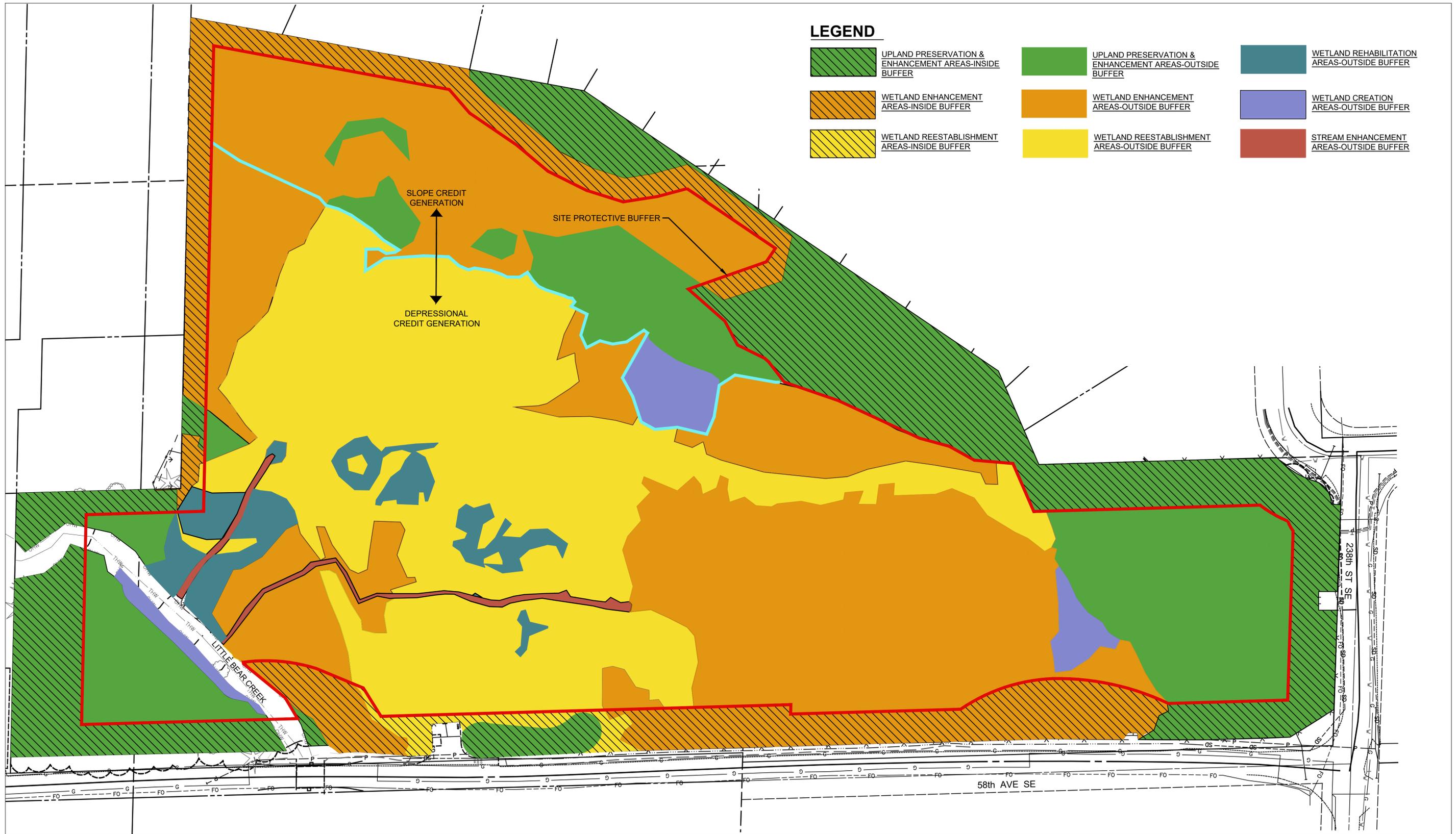
SOURCE: DigitalGlobe, 2016; ESA, 2018

Little Bear Creek Advance Mitigation Site

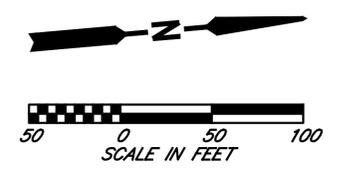
**Figure 7**  
Wetlands and Streams







**Figure 8**  
Credit Generation





# Appendix A

## **90% Design Plans**

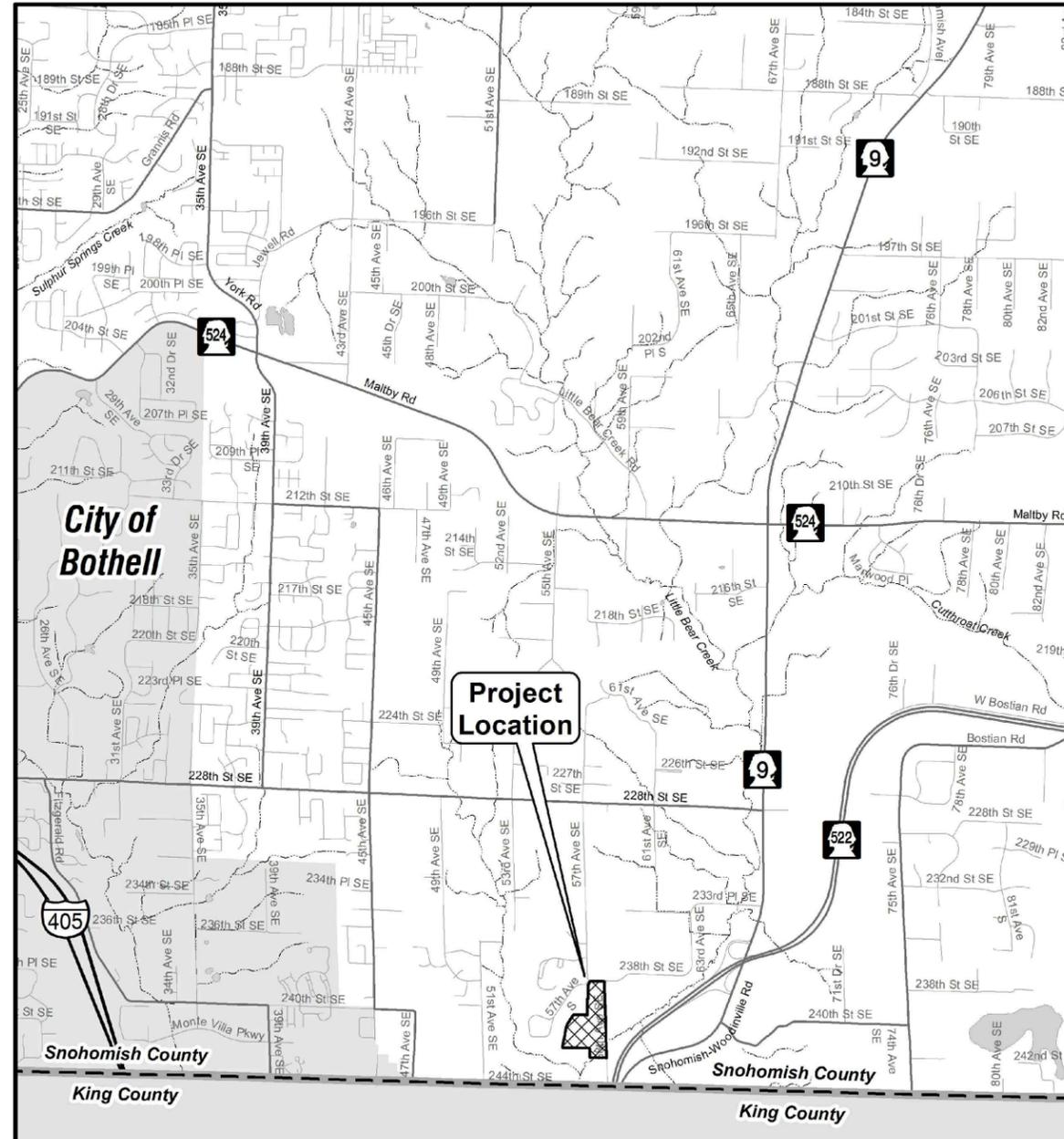


# LITTLE BEAR CREEK ADVANCED MITIGATION SITE

## RC1730, UPI# 17-0071

### SHEET INDEX

SHEET NO.	REF SHEET NO.	SHEET TITLE
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3	G03	GENERAL NOTES
4	G04	EXISTING CONDITIONS
5	G05	PROPOSED ACCESS AND BENCHMARKS
6	G06	GRADING LAYOUT
7	G07	SITE PREPARATION
8	G08	INVASIVE VEGETATION REMOVAL
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36	L10	PLANTING DETAILS
37	L11	SOIL PREPARATION DETAILS



VICINITY MAP  
NTS

PRELIMINARY  
90 PERCENT SUBMITTAL  
NOT FOR CONSTRUCTION



Snohomish County Officials

DIRECTOR OF PUBLIC WORKS  
*STEVEN E. THOMSEN, P.E.*

COUNTY ENGINEER  
*DOUGLAS W. McCORMICK, P.E.*

EXECUTIVE  
*DAVE SOMERS*

COUNCIL MEMBERS  
*NATE NEHRING – DIST. 1*  
*BRIAN SULLIVAN – DIST. 2*  
*STEPHANIE WRIGHT – DIST. 3*  
*TERRY RYAN – DIST. 4*  
*SAM LOW – DIST. 5*

THIS SPACE  
RESERVED  
FOR DIGITAL  
SIGNATURE



2/27/2019 5:00:03 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\G03 GENERAL NOTES.DWG

## NOTES

### GENERAL

- THE GOAL OF THIS PROJECT IS HABITAT CREATION AND RESTORATION.
  - PRESERVE EXISTING VEGETATION, AS SHOWN
  - AVOID UNNECESSARY SOIL COMPACTION
  - BUILD FEATURES IN NATURAL, CURVED LINES AS SHOWN ON PLANS
- REMOVAL OF SEDIMENT AND VEGETATION SHALL NOT EXCEED THE MINIMUM REQUIRED TO COMPLETE THE PROJECT TO THE LINES AND GRADES SHOWN ON THE DRAWINGS.
- MOST STRUCTURES, FOUNDATIONS, AND KNOWN UTILITIES ON SITE WILL BE DEMOLISHED BY OTHERS BEFORE CONSTRUCTION BEGINS.
- A SIGNED SET OF WORKING PLANS AND SPECIFICATIONS SHALL BE KEPT AT THE JOB SITE AT ALL TIMES ON WHICH ALL CHANGES OR VARIATIONS IN THE WORK ARE TO BE RECORDED AND/ OR CORRECTED DAILY AND SUBMITTED TO THE OWNER AT THE COMPLETION OF WORK. ALL CHANGES TO BE APPROVED BY THE ENGINEER.

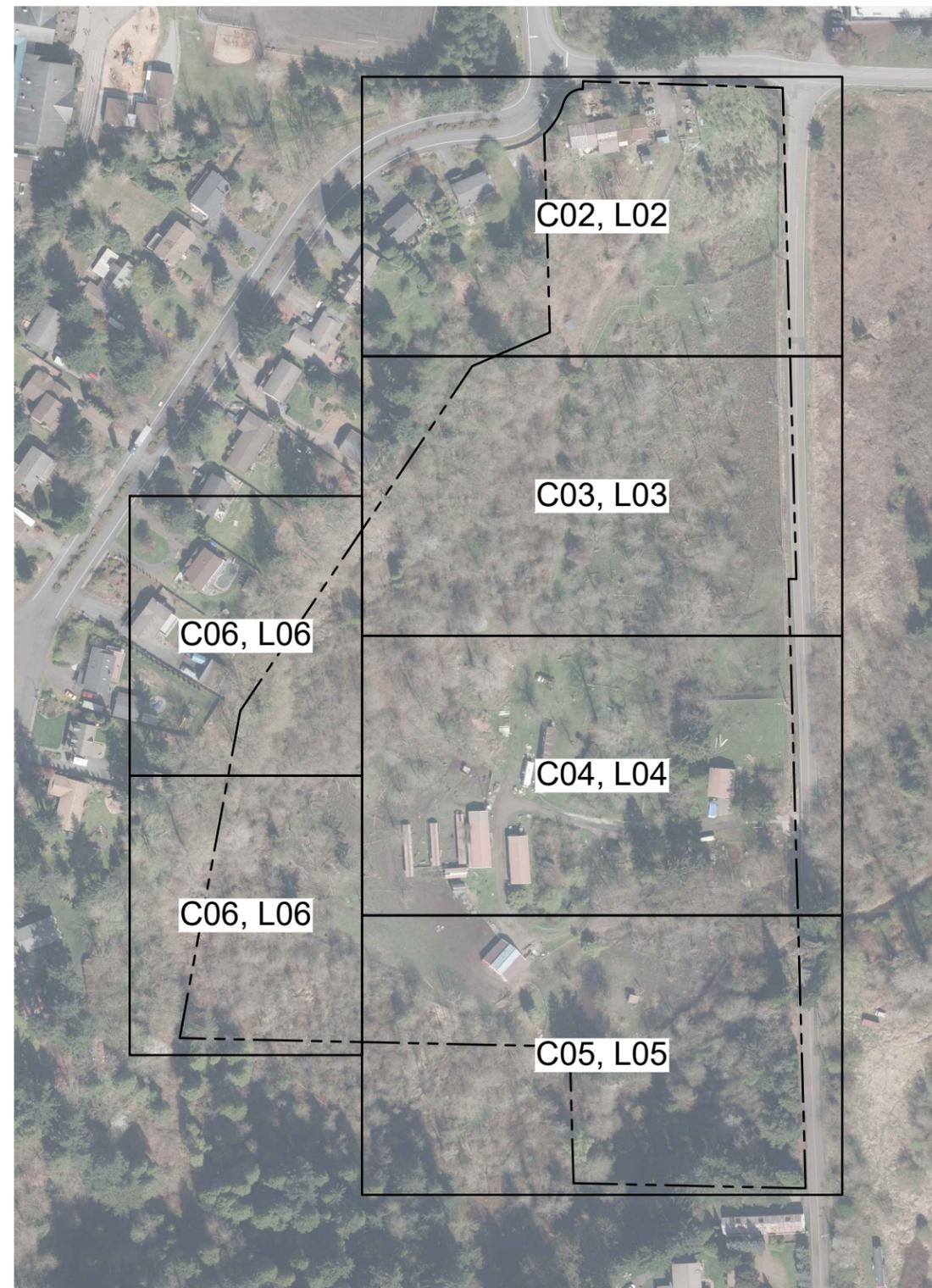
### UTILITIES

- THE CONTRACTOR SHALL MAKE ITS OWN ASSESSMENT REGARDING THE PRESENCE OF EXISTING UTILITIES AND VERIFY ALL UTILITY INFORMATION AS REQUIRED BY LAW.
- CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT (USA), 1-800-227-2600 OR 811, A MINIMUM OF 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

### EROSION AND SEDIMENT CONTROL

- ALL GRADING SHALL COMPLY WITH TITLE 30.63A AND 30.63B OF THE SNOHOMISH COUNTY UNIFIED DEVELOPMENT CODE.
- THE CONTRACTOR WILL IDENTIFY AN EROSION AND SEDIMENT CONTROL LEAD. THE LEAD SHALL IMPLEMENT THE TESC PLAN AND THE SWPPP AND UPDATE THE SWPPP AS REQUIRED.
- FIELD MARKING: BEFORE PERFORMING ANY SITE DISTURBING ACTIVITY INCLUDING CLEARING OR GRADING, THE CLEARING LIMITS SHALL BE LOCATED AND STAKED BY THE PROJECT SURVEYOR, OR AS DIRECTED BY THE ENGINEER.
- THE TEMPORARY EROSION AND SEDIMENT CONTROL FACILITIES SHALL BE CONSTRUCTED PRIOR TO ANY GRADING OR EXTENSIVE LAND CLEARING IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER. IN NO EVENT SHALL SEDIMENT LADEN RUNOFF CAUSE A VIOLATION OF TURBIDITY OR ANY OTHER STATE WATER QUALITY STANDARD.
- CLEARING, GRADING AND RE-VEGETATION ACTIVITIES SHALL BE TIMED TO MINIMIZE EXPOSED GROUND.
- SOIL STABILIZATION: DURING THE DRY SEASON (APRIL 1 TO SEPTEMBER 30), NO SOILS SHALL BE EXPOSED FOR MORE THAN SEVEN DAYS. DURING THE WET SEASON (OCTOBER 1 THROUGH MARCH 3) NO SOILS SHALL BE EXPOSED FOR MORE THAN TWO DAYS. IF EXPOSED SOILS WILL REMAIN UNWORKED FOR MORE THAN THE NUMBER OF DAYS LISTED, THEY SHALL BE STABILIZED BY SUITABLE APPLICATION OF SOIL STABILIZATION BMP'S, SUCH AS SEEDING, FERTILIZING, AND MULCHING. DURING THE WET SEASON, SEEDED SLOPES SHOULD BE COVERED WITH CLEAR PLASTIC TO FACILITATE NEW GRASS GROWTH.
- PROTECTION OF ADJACENT PROPERTIES: PROPERTIES ADJACENT TO THE PROJECT SITE SHALL BE PROTECTED FROM SEDIMENT DEPOSITION.
- CONTROL OF OFF-SITE EROSION: PROPERTIES AND WATERWAYS DOWNSTREAM FROM THE PROJECT SITE SHALL BE PROTECTED FROM EROSION DUE TO INCREASES IN THE CONCENTRATION, VOLUME, VELOCITY, AND/OR PEAK FLOW RATE OF STORM WATER RUNOFF FROM THE PROJECT SITE.
- MAINTENANCE: ALL EROSION AND SEDIMENT CONTROL FACILITIES AND PRACTICES SHALL BE INSPECTED ON A REGULAR BASIS AND SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. INSPECTION AND MAINTENANCE SHALL BE PERFORMED A MINIMUM OF ONCE A WEEK, IMMEDIATELY FOLLOWING A MAJOR STORM EVENT, AT LEAST ONCE DURING PROLONGED RAINFALL.
- FOR ALL TEMPORARY OR PERMANENT SEEDING, THE CONTRACTOR SHALL PROVIDE SUFFICIENT IRRIGATION TO ASSURE THE GROWTH AND VITALITY OF THE SEEDED AREAS.
- ALL STORM DRAIN INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT STORMWATER RUNOFF SHALL NOT ENTER THE CONVEYANCE SYSTEM WITH FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.
- EXPOSED AREAS AND/OR SLOPES SHALL BE PROTECTED FROM EROSION FLOWS AND CONCENTRATED FLOWS UNTIL PERMANENT SITE COVER AND DRAINAGE CONVEYANCE SYSTEMS ARE IN PLACE.
- SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH BMP'S WITHIN 24 HOURS OF FORMATION.
- THE TESC FACILITIES SHOWN ON THESE PLANS ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE 'ESC' FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
- THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 48 HOURS FOLLOWING A MAJOR STORM EVENT.
- ROADWAYS AND OTHER PAVED AREAS SHALL BE MAINTAINED TO BE FREE AND CLEAR OF TRACKED SEDIMENT. ADDITIONAL MEASURES, SUCH AS STREET SWEEPING, MAY BE REQUIRED.
- REMOVAL OF TESC MEASURES: THE CONTRACTOR SHALL REMOVE ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL BMP'S AND ACCUMULATED SEDIMENT WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THEY ARE NO LONGER NECESSARY, AS DIRECTED BY THE ENGINEER.
- THE CONTRACTOR SHALL SUBMIT A SPILL PREVENTION, CONTROL AND COUNTERMEASURES PLAN (SPCC) FOR APPROVAL. WASTES GENERATED FROM THE PROJECT SHALL BE DISPOSED OF IN AN APPROVED MANNER.

## KEY MAP



**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK



REVIEWED AND APPROVED FOR CONSTRUCTION

\_\_\_\_\_  
SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**GENERAL NOTES**

REFERENCE SHEET NO.  
**G03**

SHEET  
**3**  
OF  
**37**  
SHEETS



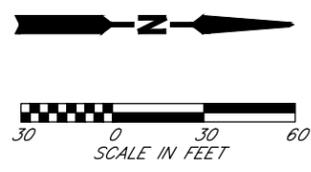


SECTION 34, T27N, R5E, W.M.

FILL PLACEMENT AREA		
POINT NUMBER	NORTHING	EASTING
F1	615940.7216	1643557.6140
F2	615871.9936	1643461.8323
F3	615841.2472	1643351.8911
F4	615897.9086	1643306.8950
F5	615953.7229	1643343.9563
F6	615949.9021	1643384.5965
F7	615947.4834	1643470.6840

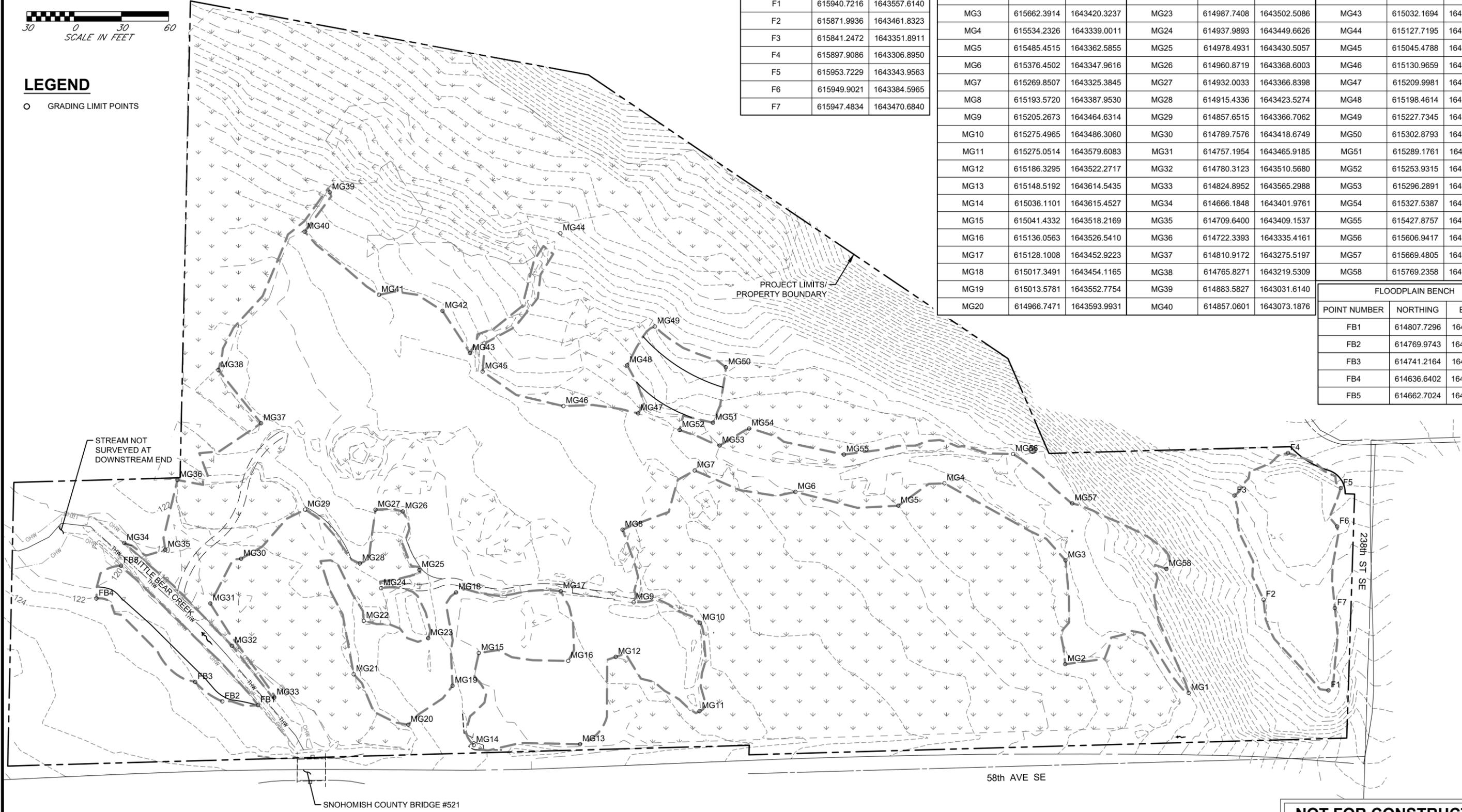
MAIN GRADING AREA			MAIN GRADING AREA			MAIN GRADING AREA		
POINT NUMBER	NORTHING	EASTING	POINT NUMBER	NORTHING	EASTING	POINT NUMBER	NORTHING	EASTING
MG1	615792.7966	1643560.3941	MG21	614908.9560	1643540.6668	MG41	614935.8343	1643139.8590
MG2	615662.0692	1643529.9560	MG22	614919.6426	1643484.2863	MG42	615002.9866	1643156.8388
MG3	615662.3914	1643420.3237	MG23	614987.7408	1643502.5086	MG43	615032.1694	1643201.3753
MG4	615534.2326	1643339.0011	MG24	614937.9893	1643449.6626	MG44	615127.7195	1643074.8855
MG5	615485.4515	1643362.5855	MG25	614978.4931	1643430.5057	MG45	615045.4788	1643220.8847
MG6	615376.4502	1643347.9616	MG26	614960.8719	1643368.6003	MG46	615130.9659	1643257.3587
MG7	615269.8507	1643325.3845	MG27	614932.0033	1643366.8398	MG47	615209.9981	1643265.0478
MG8	615193.5720	1643387.9530	MG28	614915.4336	1643423.5274	MG48	615198.4614	1643214.2937
MG9	615205.2673	1643464.6314	MG29	614857.6515	1643366.7062	MG49	615227.7345	1643173.2800
MG10	615275.4965	1643486.3060	MG30	614789.7576	1643418.6749	MG50	615302.8793	1643216.4287
MG11	615275.0514	1643579.6083	MG31	614757.1954	1643465.9185	MG51	615289.1761	1643274.9731
MG12	615186.3295	1643522.2717	MG32	614780.3123	1643510.5680	MG52	615253.9315	1643282.6472
MG13	615148.5192	1643614.5435	MG33	614824.8952	1643565.2988	MG53	615296.2891	1643299.0843
MG14	615036.1101	1643615.4527	MG34	614666.1848	1643401.9761	MG54	615327.5387	1643281.1339
MG15	615041.4332	1643518.2169	MG35	614709.6400	1643409.1537	MG55	615427.8757	1643308.5483
MG16	615136.0563	1643526.5410	MG36	614722.3393	1643335.4161	MG56	615606.9417	1643308.0342
MG17	615128.1008	1643452.9223	MG37	614810.9172	1643275.5197	MG57	615669.4805	1643360.1202
MG18	615017.3491	1643454.1165	MG38	614765.8271	1643219.5309	MG58	615769.2358	1643429.3504
MG19	615013.5781	1643552.7754	MG39	614883.5827	1643031.6140			
MG20	614966.7471	1643593.9931	MG40	614857.0601	1643073.1876			

FLOODPLAIN BENCH		
POINT NUMBER	NORTHING	EASTING
FB1	614807.7296	1643573.2821
FB2	614769.9743	1643569.3240
FB3	614741.2164	1643548.8361
FB4	614636.6402	1643460.6364
FB5	614662.7024	1643426.0802



**LEGEND**

○ GRADING LIMIT POINTS



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2/27/2019 5:00:50 PM - HANNAH SNOW - \\\SAESA\PROJECTS\SEA14\XXXXID140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CAD\DWGS\90% DESIGN\G06 GRADING AREA.DWG

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
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HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK



REVIEWED AND APPROVED FOR CONSTRUCTION

SNOHOMISH COUNTY ENGINEER

DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**GRADING LAYOUT**

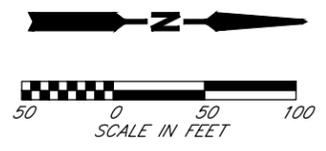
REFERENCE SHEET NO. **G06**

SHEET **6** OF 37 SHEETS

SECTION 34, T27N, R5E, W.M.

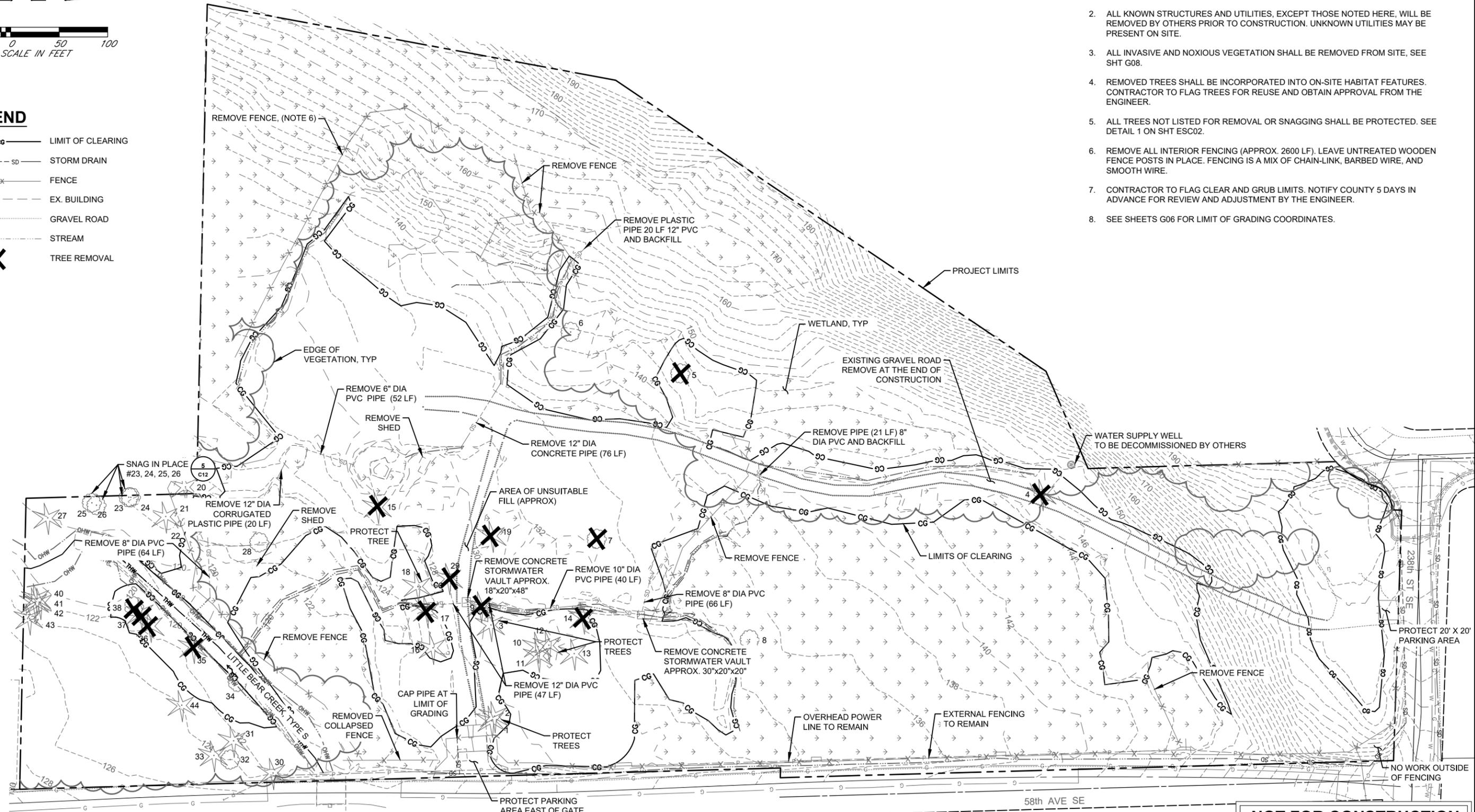
NOTES

1. INSTALL ALL TESC BMPS PRIOR TO STARTING SITE PREPARATION. SEE SHTS ESC01 AND ESC02.
2. ALL KNOWN STRUCTURES AND UTILITIES, EXCEPT THOSE NOTED HERE, WILL BE REMOVED BY OTHERS PRIOR TO CONSTRUCTION. UNKNOWN UTILITIES MAY BE PRESENT ON SITE.
3. ALL INVASIVE AND NOXIOUS VEGETATION SHALL BE REMOVED FROM SITE, SEE SHT G08.
4. REMOVED TREES SHALL BE INCORPORATED INTO ON-SITE HABITAT FEATURES. CONTRACTOR TO FLAG TREES FOR REUSE AND OBTAIN APPROVAL FROM THE ENGINEER.
5. ALL TREES NOT LISTED FOR REMOVAL OR SNAGGING SHALL BE PROTECTED. SEE DETAIL 1 ON SHT ESC02.
6. REMOVE ALL INTERIOR FENCING (APPROX. 2600 LF). LEAVE UNTREATED WOODEN FENCE POSTS IN PLACE. FENCING IS A MIX OF CHAIN-LINK, BARBED WIRE, AND SMOOTH WIRE.
7. CONTRACTOR TO FLAG CLEAR AND GRUB LIMITS. NOTIFY COUNTY 5 DAYS IN ADVANCE FOR REVIEW AND ADJUSTMENT BY THE ENGINEER.
8. SEE SHEETS G06 FOR LIMIT OF GRADING COORDINATES.



LEGEND

- LIMIT OF CLEARING
- STORM DRAIN
- FENCE
- EX. BUILDING
- GRAVEL ROAD
- STREAM
- TREE REMOVAL



**NOT FOR CONSTRUCTION**

2/27/2019 5:01:06 PM - HANNAH SNOW - I:\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\G07 SITE PREPARATION.DWG

DATE	NO.	REVISION	BY
10/12/18			



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HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB	DRAWN BY: AMF, RK

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

\_\_\_\_\_  
SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

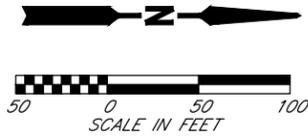
**SITE PREPARATION**

REFERENCE SHEET NO. **G07**

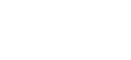
SHEET **7** OF **37** SHEETS

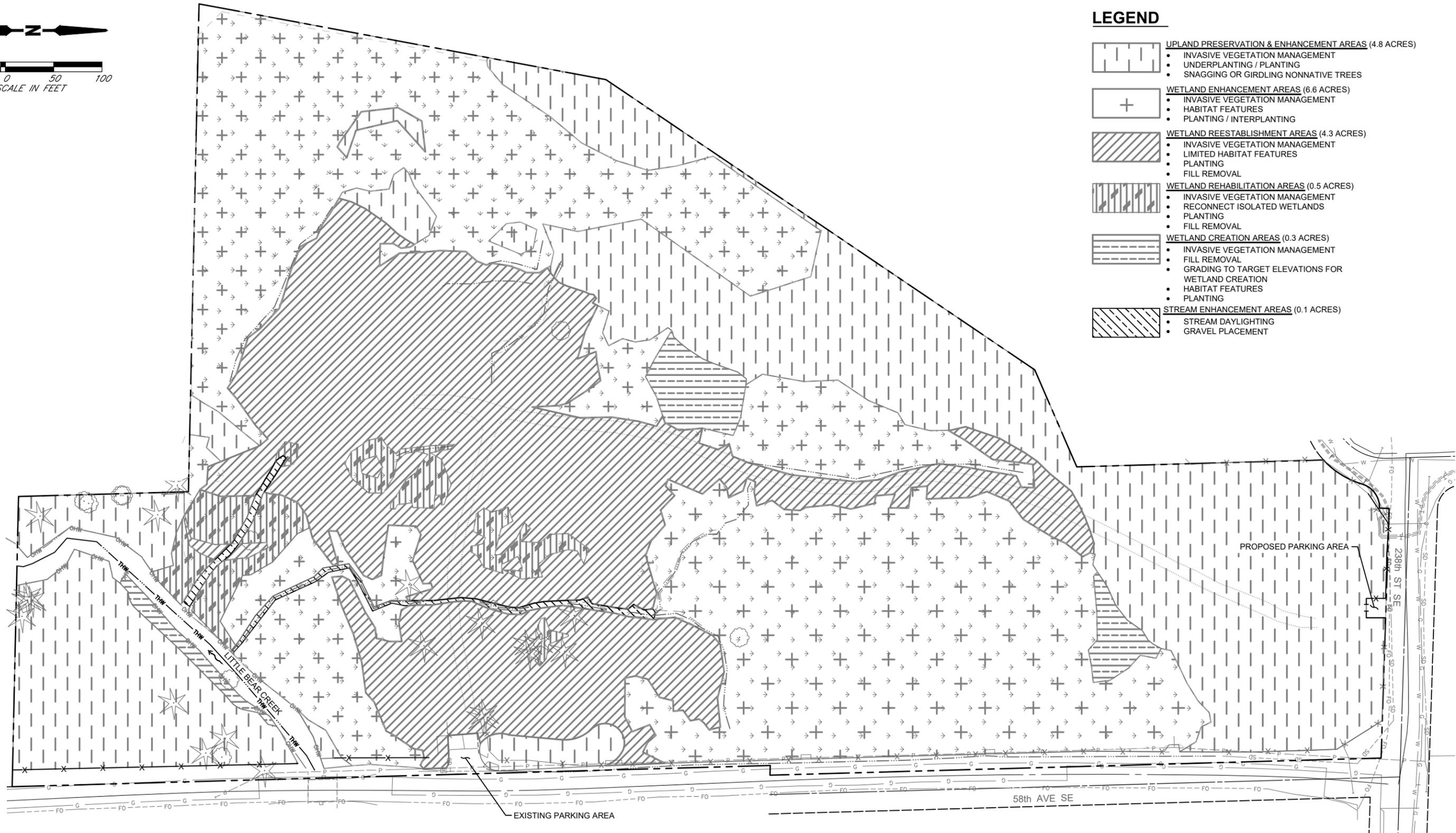


SECTION 34, T27N, R5E, W.M.



**LEGEND**

-  **UPLAND PRESERVATION & ENHANCEMENT AREAS (4.8 ACRES)**
  - INVASIVE VEGETATION MANAGEMENT
  - UNDERPLANTING / PLANTING
  - SNAGGING OR GIRDLING NONNATIVE TREES
-  **WETLAND ENHANCEMENT AREAS (6.6 ACRES)**
  - INVASIVE VEGETATION MANAGEMENT
  - HABITAT FEATURES
  - PLANTING / INTERPLANTING
-  **WETLAND REESTABLISHMENT AREAS (4.3 ACRES)**
  - INVASIVE VEGETATION MANAGEMENT
  - LIMITED HABITAT FEATURES
  - PLANTING
  - FILL REMOVAL
-  **WETLAND REHABILITATION AREAS (0.5 ACRES)**
  - INVASIVE VEGETATION MANAGEMENT
  - RECONNECT ISOLATED WETLANDS
  - PLANTING
  - FILL REMOVAL
-  **WETLAND CREATION AREAS (0.3 ACRES)**
  - INVASIVE VEGETATION MANAGEMENT
  - FILL REMOVAL
  - GRADING TO TARGET ELEVATIONS FOR WETLAND CREATION
  - HABITAT FEATURES
  - PLANTING
-  **STREAM ENHANCEMENT AREAS (0.1 ACRES)**
  - STREAM DAYLIGHTING
  - GRAVEL PLACEMENT



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2/27/2019 5:01:31 PM - HANNAH SNOW - I:\SALES\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\G09 SITE OVERVIEW.DWG

10/12/18			
DATE	NO.	REVISION	BY



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK

**PRELIMINARY**



**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

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SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**



FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**MITIGATION GOALS**

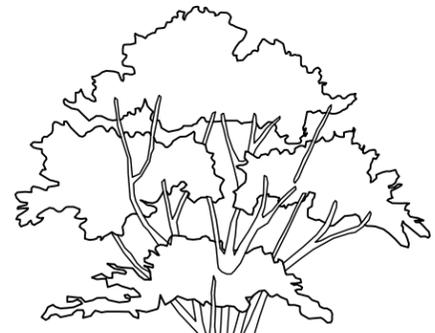
REFERENCE SHEET NO.  
**G09**

SHEET  
**9**  
OF  
**37**  
SHEETS

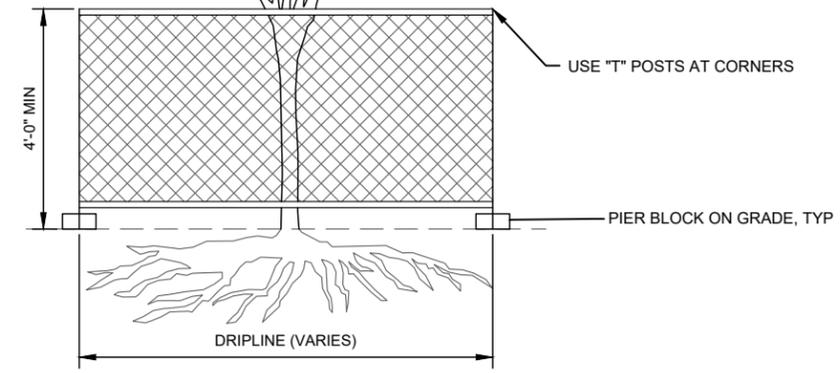


2/27/2019 5:01:44 PM - HANNAH SNOW - \\ESAS\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\ESC02 ESC DETAILS.DWG

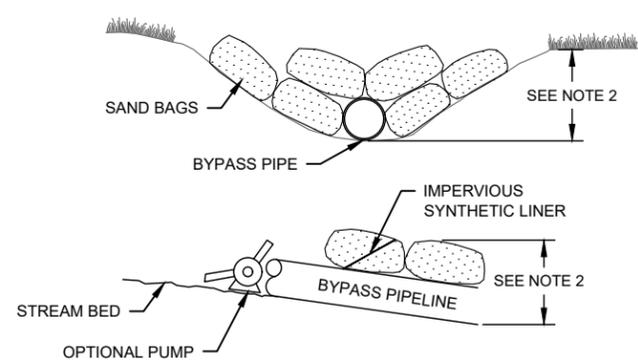
SECTION 34, T27N, R5E, W.M.



- NOTES:
- HIGH VISIBILITY FENCE SHALL BE PLACED AT THE DRIPLINE OF THE TREE TO BE SAVED. FENCE SHALL COMPLETELY ENCIRCLE THE TREE(S). INSTALL FENCE POSTS USING PIER BLOCKS ONLY. AVOID DRIVING POSTS OR STAKES INTO MAJOR ROOTS.
  - FOR ROOTS OVER 1-INCH DIAMETER THAT ARE DAMAGED DURING CONSTRUCTION, MAKE A CLEAN, STRAIGHT CUT TO REMOVE THE DAMAGED PORTION. ALL EXPOSED ROOTS SHALL BE TEMPORARILY COVERED WITH DAMP BURLAP TO PREVENT DRYING AND SHALL BE COVERED WITH SOIL AS SOON AS POSSIBLE.
  - WORK WITHIN PROTECTION FENCE SHALL BE DONE MANUALLY. NO STOCKPILING OF MATERIALS, VEHICULAR TRAFFIC, OR STORAGE OF EQUIPMENT OR MACHINERY SHALL BE ALLOWED WITHIN THE LIMIT OF THE FENCING.

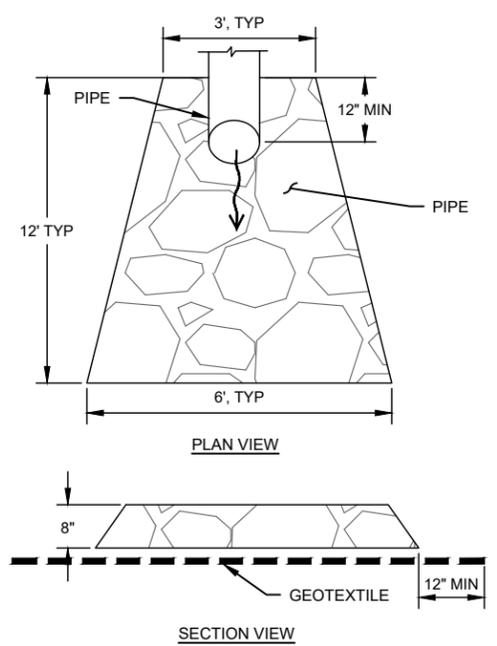


1 TREE PROTECTION NTS  
DETAIL



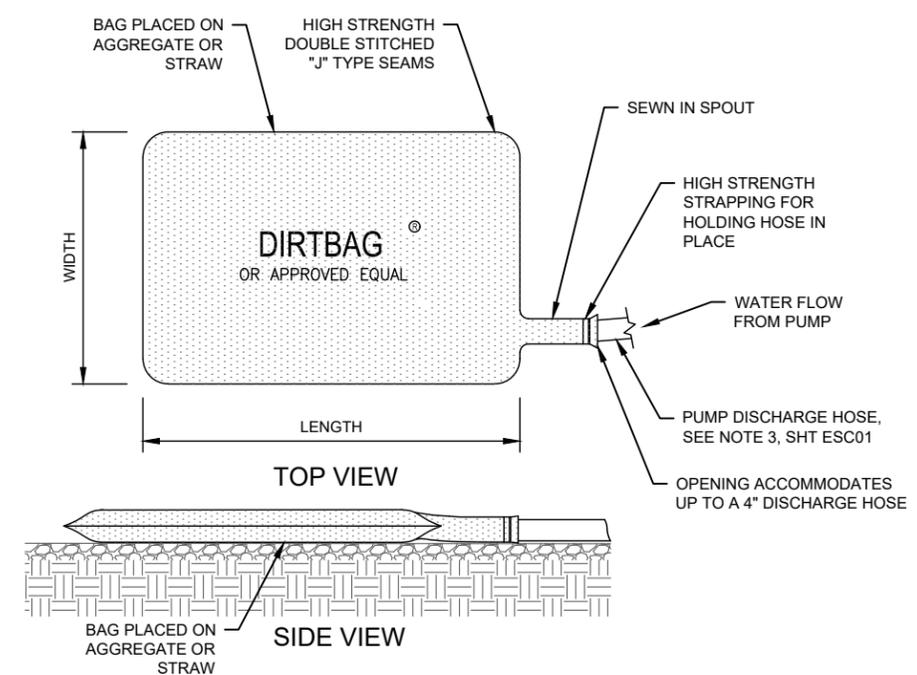
- NOTES:
- THE CONTRACTOR SHALL NOT WORK DIRECTLY WITHIN STREAM 1 OR STREAM 4 WITHOUT A TEMPORARY STREAM DIVERSION PLAN, PER SPECIFICATIONS.
  - THE HEIGHT OF THE DIVERSION STRUCTURES SHALL BE HIGH ENOUGH TO PREVENT OVERTOPPING AND ALLOW ENOUGH FREEBOARD FOR INCLEMENT WATER CONDITIONS. STRUCTURE HEIGHTS AND MATERIALS SHALL BE INCLUDED IN THE CONTRACTOR'S TEMPORARY STREAM DIVERSION PLAN.
  - SEE SPECIFICATIONS FOR THE CONSTRUCTION PERIOD FLOW RATE AND DIVERSION REQUIREMENTS.

3 TEMPORARY STREAM DIVERSION STRUCTURE NTS  
DETAIL



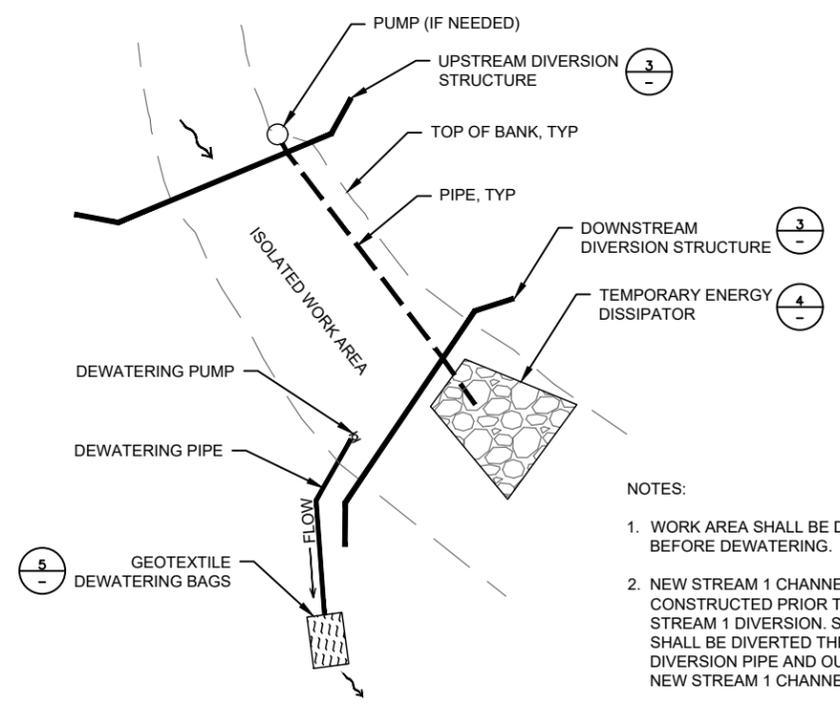
- NOTES:
- GEOTEXTILE SHALL EXTEND 12" BEYOND THE EDGES OF THE TEMPORARY ENERGY DISSIPATOR TO PREVENT QUARRY SPALLS FROM MIXING WITH THE STREAMBED MATERIALS.
  - GEOTEXTILE AND QUARRY SPALLS SHALL BE COMPLETELY REMOVED AFTER USE.

4 TEMPORARY ENERGY DISSIPATOR NTS  
DETAIL



- NOTES:
- THE GEOTEXTILE BAG SHALL BE ATTACHED TO THE EFFLUENT PIPE FROM THE DEWATERING PUMP. THE PLACEMENT OF THE GEOTEXTILE BAG SHALL BE INCLUDED IN THE CONTRACTOR'S TEMPORARY STREAM DIVERSION PLAN.
  - AVOID PLACEMENT OF THE GEOTEXTILE BAG ABOVE STEEP SLOPES OR WHERE SATURATED SOIL CONDITIONS MAY CAUSE SOIL INSTABILITY.
  - INSTALL THE GEOTEXTILE BAG ON A MILD SLOPE WITH THE INLET ORIENTED UP SLOPE SO INCOMING WATER FLOWS DOWNHILL THROUGH THE BAG. DISPOSE OF CAPTURED SEDIMENT OFFSITE.
  - THE GEOTEXTILE BAG IS FULL WHEN IT NO LONGER CAN EFFICIENTLY FILTER SEDIMENT OR PASS WATER AT A REASONABLE RATE. DISPOSE OF THE GEOTEXTILE BAG OFF SITE.

5 GEOTEXTILE DEWATERING BAG NTS  
DETAIL



- NOTES:
- WORK AREA SHALL BE DE-FISHED BEFORE DEWATERING.
  - NEW STREAM 1 CHANNEL TO BE CONSTRUCTED PRIOR TO EXISTING STREAM 1 DIVERSION. STREAM 1 SHALL BE DIVERTED THROUGH DIVERSION PIPE AND OUTFALL INTO NEW STREAM 1 CHANNEL.

2 TYPICAL WORK AREA DEWATERING NTS  
DETAIL

**NOT FOR CONSTRUCTION**

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REVIEWED AND APPROVED FOR CONSTRUCTION

SNOHOMISH COUNTY ENGINEER

DATE APPROVED:

SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS

FUNDING NO.

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

EROSION CONTROL DETAILS

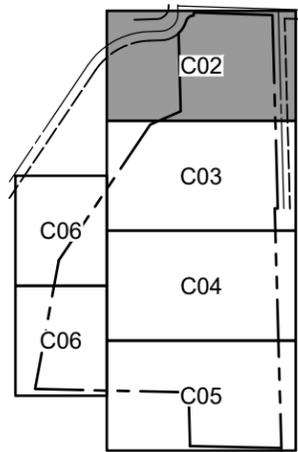
REFERENCE SHEET NO. ESC02

SHEET 11 OF 37 SHEETS



2/27/2019 4:39:29 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA14\XXXXID140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CAD\DWG\90% DESIGN\C02 GRADING PLAN, 1 OF 5.DWG

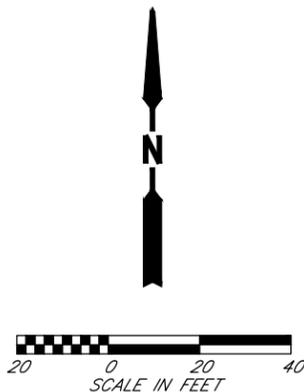
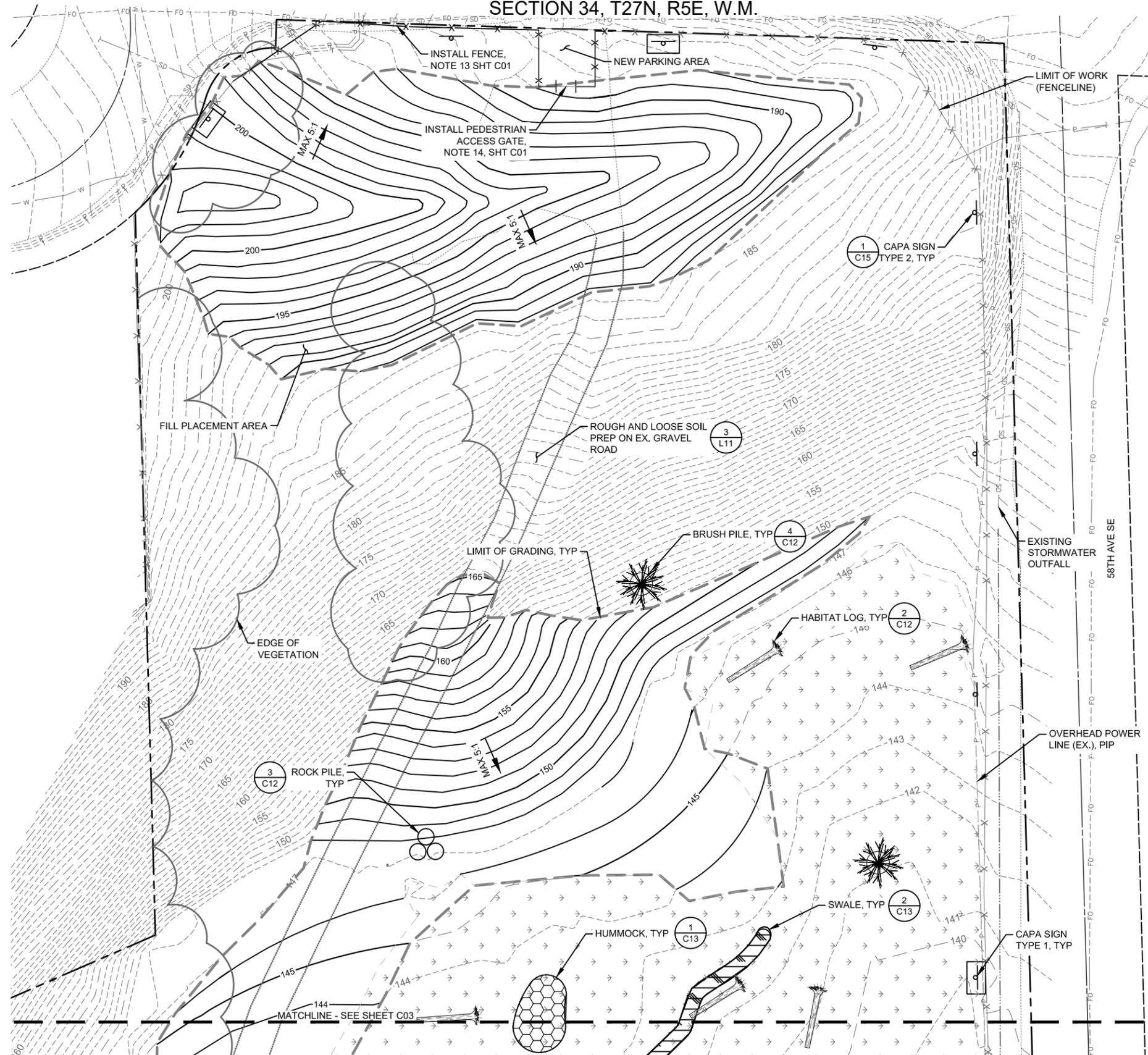
SECTION 34, T27N, R5E, W.M.



**SITE KEY**

**NOTES**

1. SEE SHEETS G02 AND C01 FOR LEGEND.



**NOT FOR CONSTRUCTION**

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HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
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REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

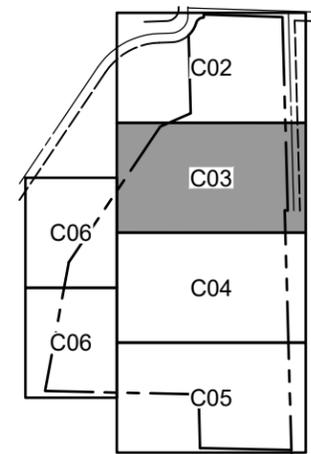
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**GRADING PLAN, 1 OF 5**

REFERENCE SHEET NO.	C02
SHEET	13
OF	37
SHEETS	

2/27/2019 4:39:59 PM - HANNAH SNOW - \\ESA\PROJECTS\SEA14\XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CAD\DWG\90%\_DESIGN\C03 GRADING PLAN, 2 OF 5.DWG

SECTION 34, T27N, R5E, W.M.  
MATCHLINE - SEE SHEET C02



**NOTES**

1. SEE SHEETS G02 AND C01 FOR LEGEND.
2. FILL DITCH WITH MATERIAL EXCAVATED FROM SITE, PER SPECIFICATIONS.



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LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**GRADING PLAN, 2 OF 5**

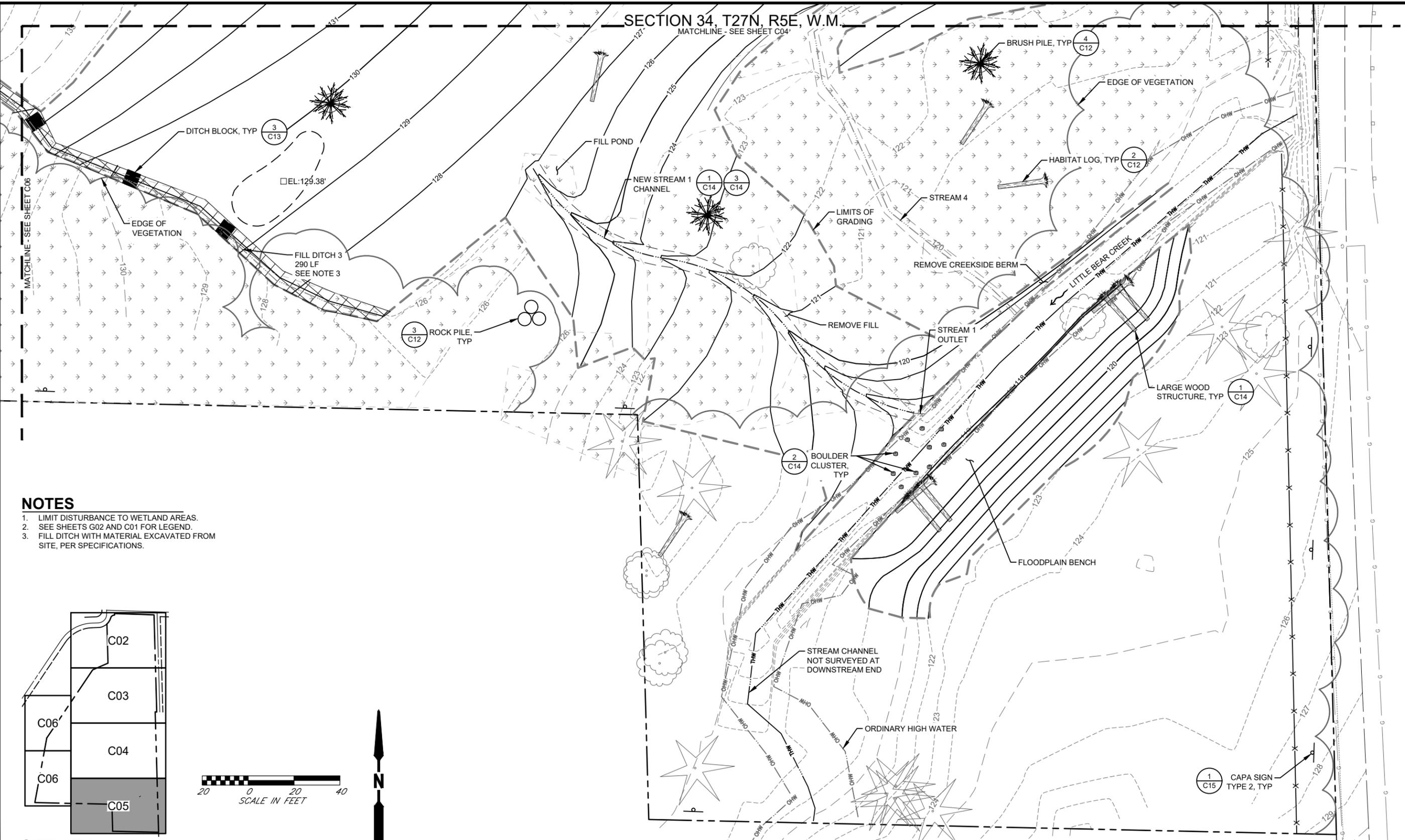
REFERENCE SHEET NO. **C03**

SHEET **14** OF **37** SHEETS



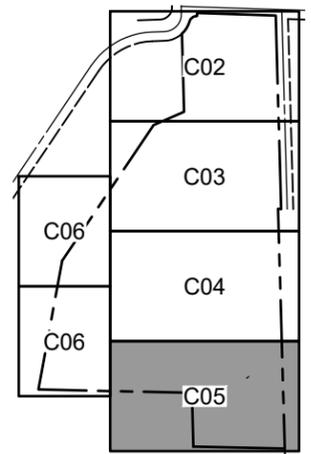
2/27/2019 4:41:06 PM - HANNAH SNOW - I:\SALES\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C05 GRADING PLAN, 4 OF 5.DWG

SECTION 34, T27N, R5E, W.M.  
MATCHLINE - SEE SHEET C04



**NOTES**

1. LIMIT DISTURBANCE TO WETLAND AREAS.
2. SEE SHEETS G02 AND C01 FOR LEGEND.
3. FILL DITCH WITH MATERIAL EXCAVATED FROM SITE, PER SPECIFICATIONS.



**SITE KEY**



**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

SNOHOMISH COUNTY ENGINEER

DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO.

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

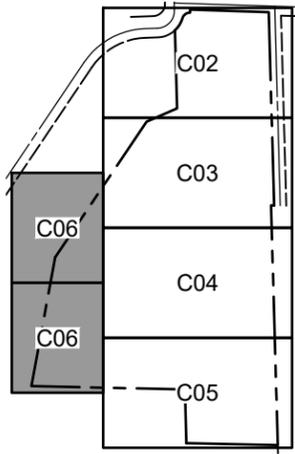
**GRADING PLAN, 4 OF 5**

REFERENCE SHEET NO.  
**C05**

SHEET  
16  
OF  
37  
SHEETS

2/27/2019 4:41:40 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C06 GRADING PLAN, 5 OF 5.DWG

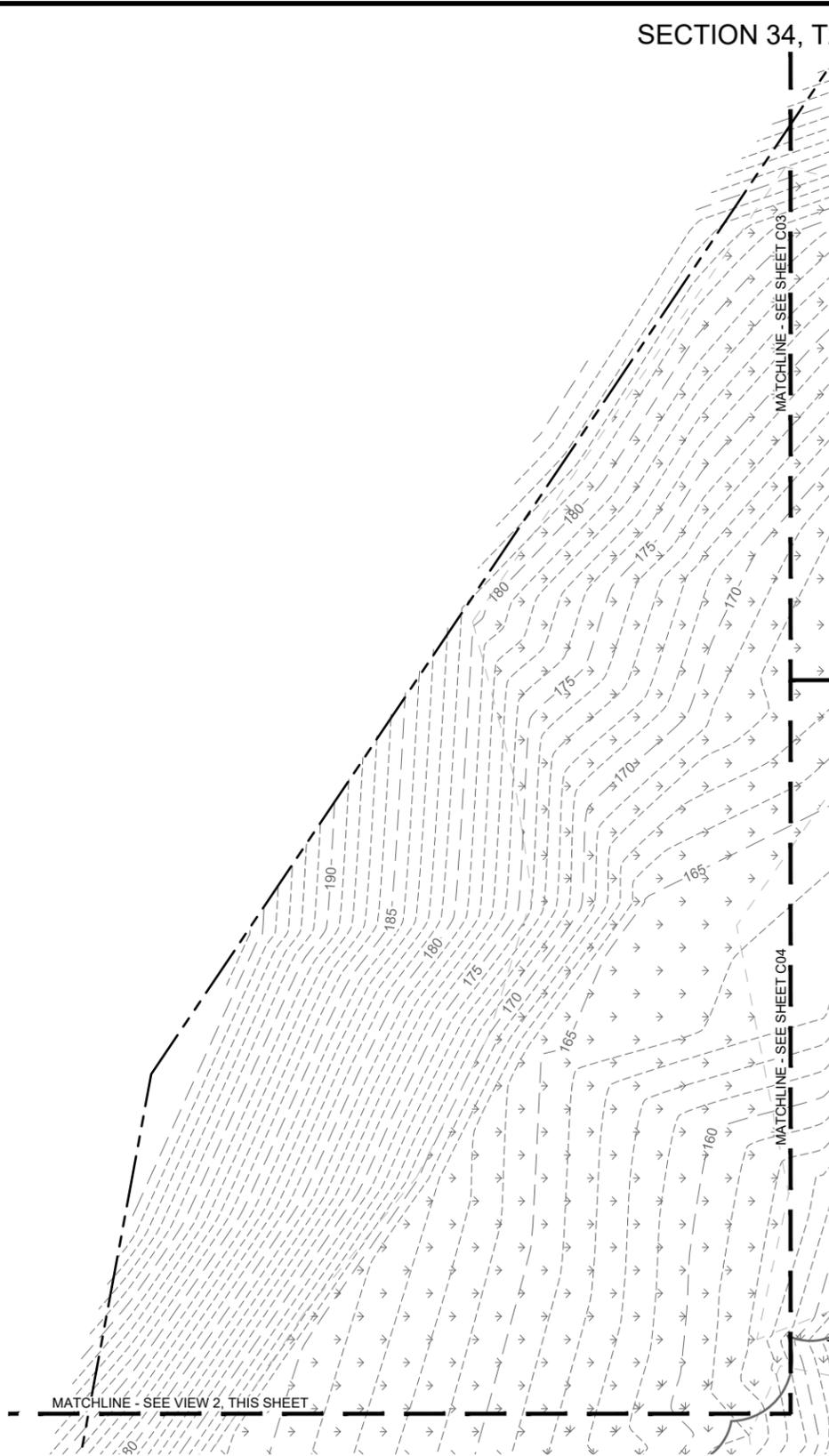
SECTION 34, T27N, R5E, W.M.



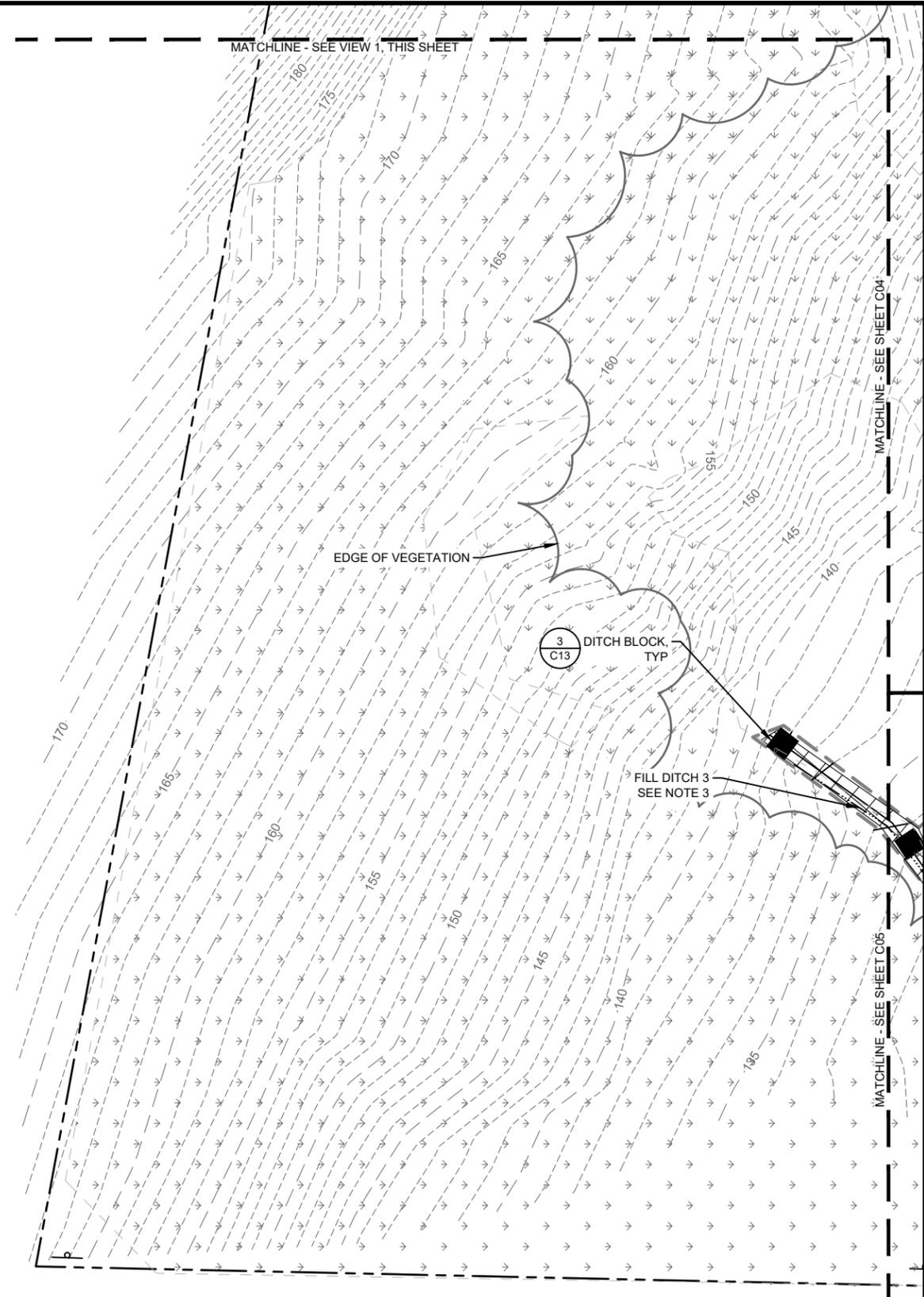
**SITE KEY**

**NOTES**

1. SEE SHEETS G02 AND C01 FOR LEGEND.
2. UNDELINEATED WETLANDS MAY EXIST IN THESE AREAS. MINIMIZE DISTURBANCE TO WETLANDS.
3. FILL DITCH WITH MATERIAL EXCAVATED FROM SITE, PER SPECIFICATIONS.



**VIEW 1**



**VIEW 2**

**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK



REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

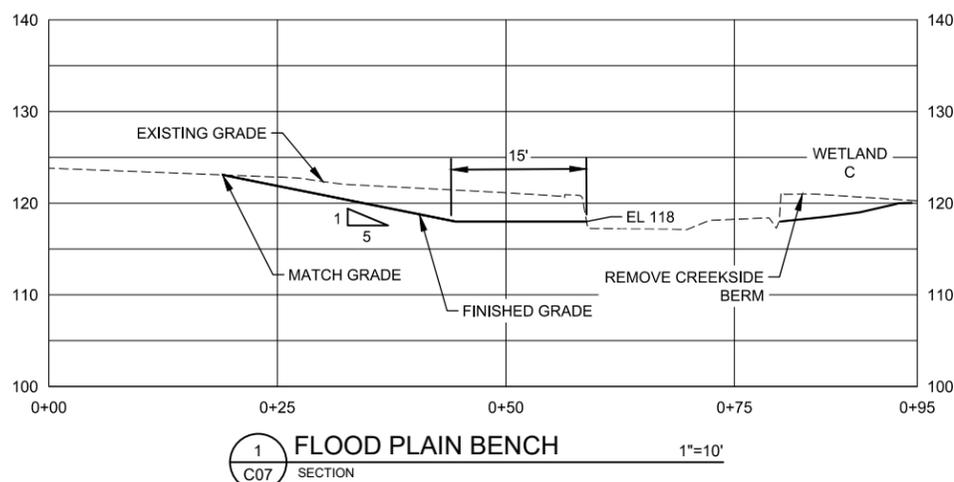
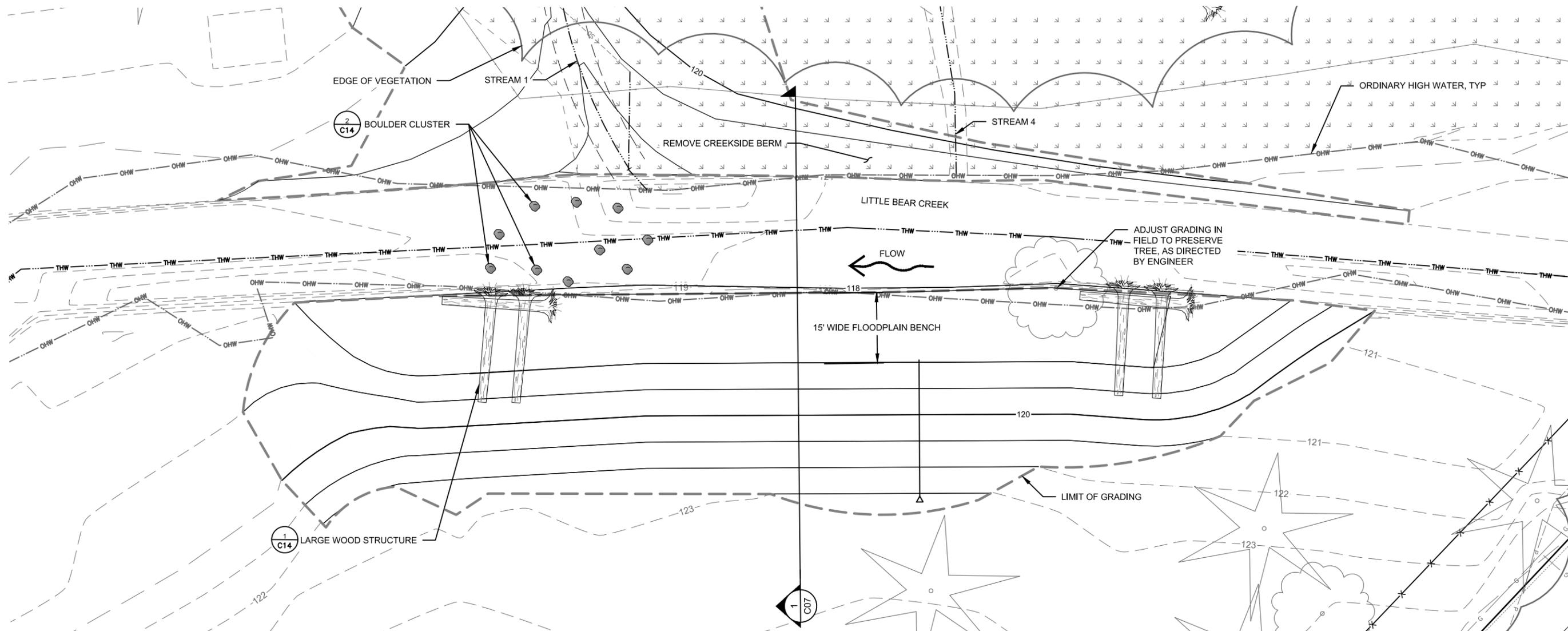
FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**GRADING PLAN, 5 OF 5**

REFERENCE SHEET NO.
C06
SHEET 17 OF 37 SHEETS

SECTION 34, T27N, R5E, W.M.



**NOTES**

1. PRESERVE TREES NOT FLAGGED FOR REMOVAL OR SNAGGING AS TREE ISLANDS.
2. SEE SHEETS G02 AND C01 FOR LEGEND.



**NOT FOR CONSTRUCTION**

10/12/18			
DATE	NO.	REVISION	BY



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORIZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: BDT, ESB	DRAWN BY: ML, RK



REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:

**SNOHOMISH COUNTY  
DEPARTMENT OF  
PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**LITTLE BEAR CREEK DESIGN**

REFERENCE  
SHEET NO.  
**C07**

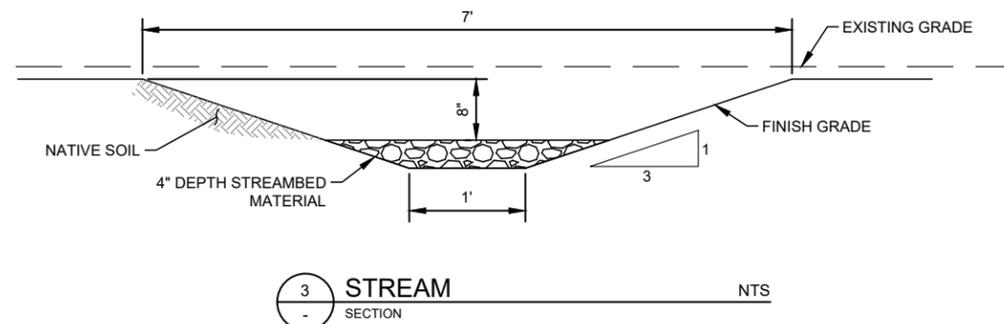
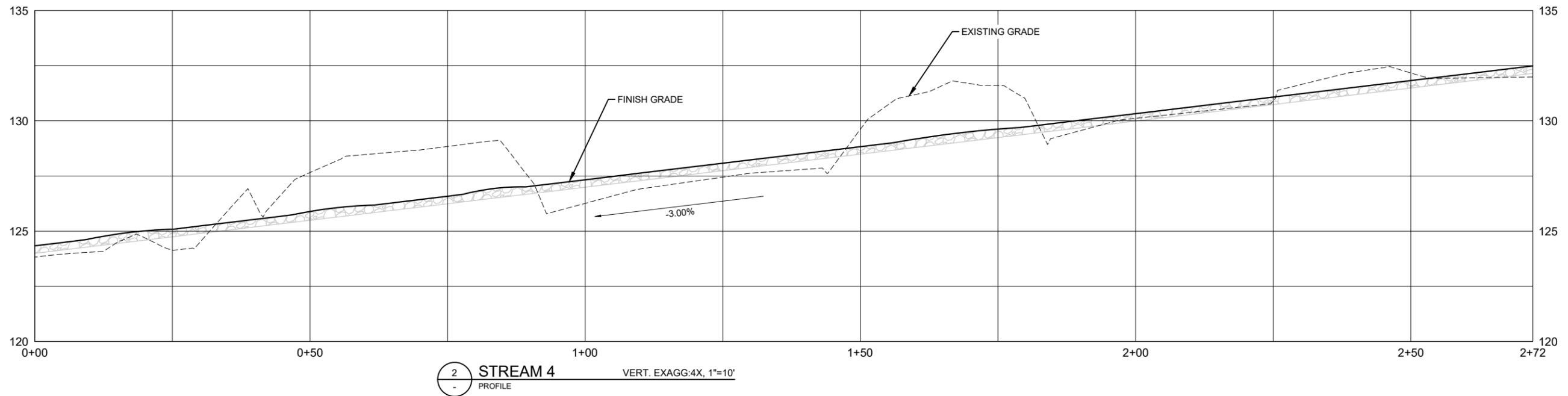
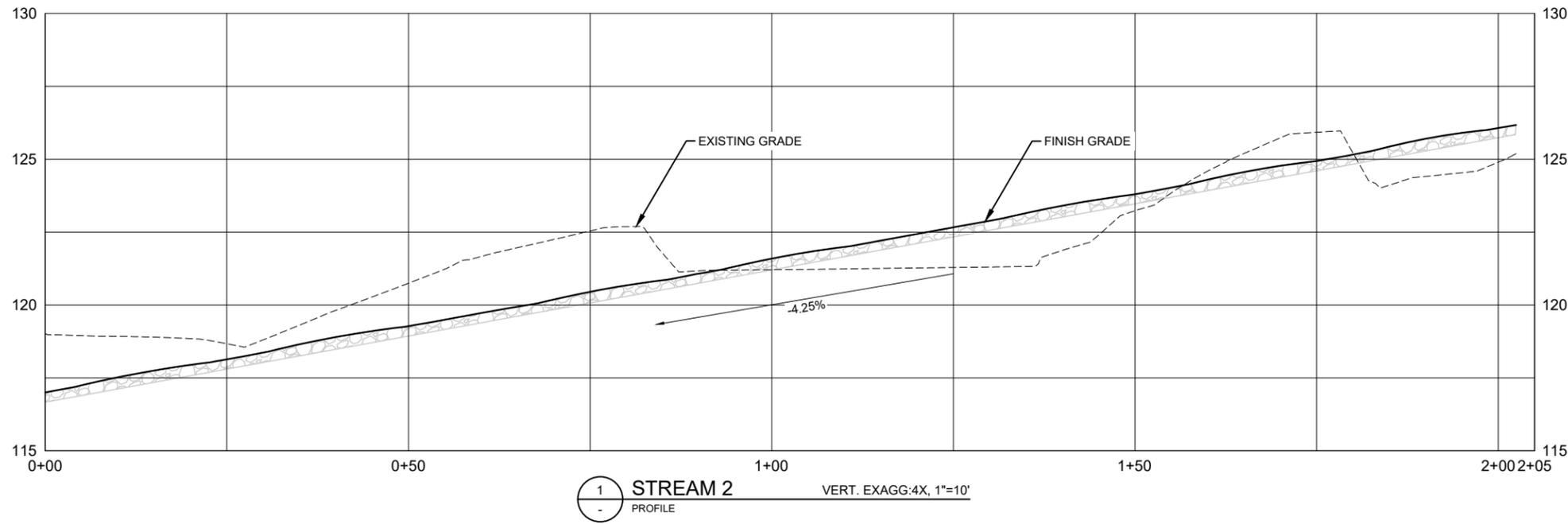
SHEET  
18  
OF  
37  
SHEETS

2/27/2019 4:42:02 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C07 LITTLE BEAR CREEK DESIGN.DWG

2/27/2019 4:42:18 PM - EBARTOLOMEO - I:\ESA\PROJECTS\SEA\14XXXX\140291\_00\_SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\WG\90% DESIGN\C08 STREAM PROFILES AND DETAILS.DWG

**NOTES**

1. STREAMBED MATERIAL SHALL BE 30% STREAMBED SEDIMENT AND 70% 4" STREAMBED COBBLE, BY VOLUME.
2. STREAMBED MATERIAL SHALL BE INSTALLED PER THE SPECIFICATIONS.



**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK



REVIEWED AND APPROVED FOR CONSTRUCTION

\_\_\_\_\_  
SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

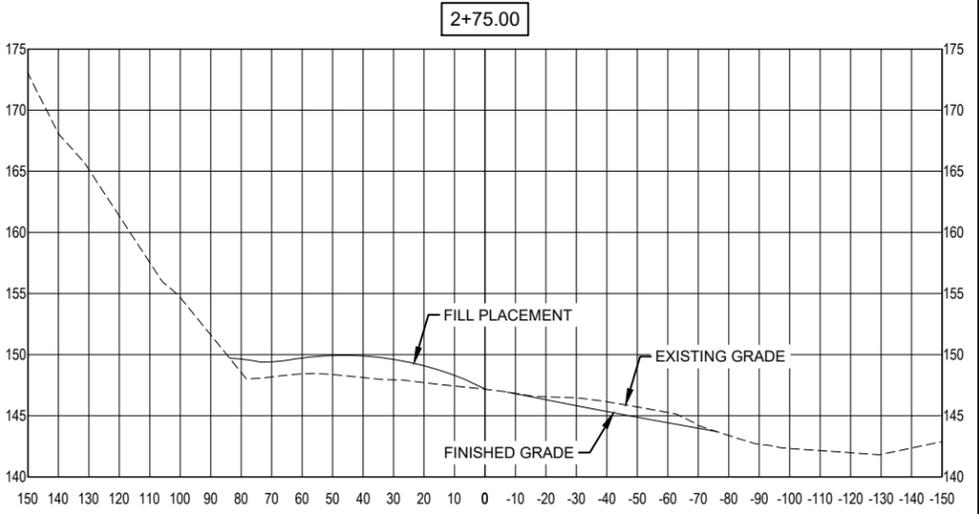
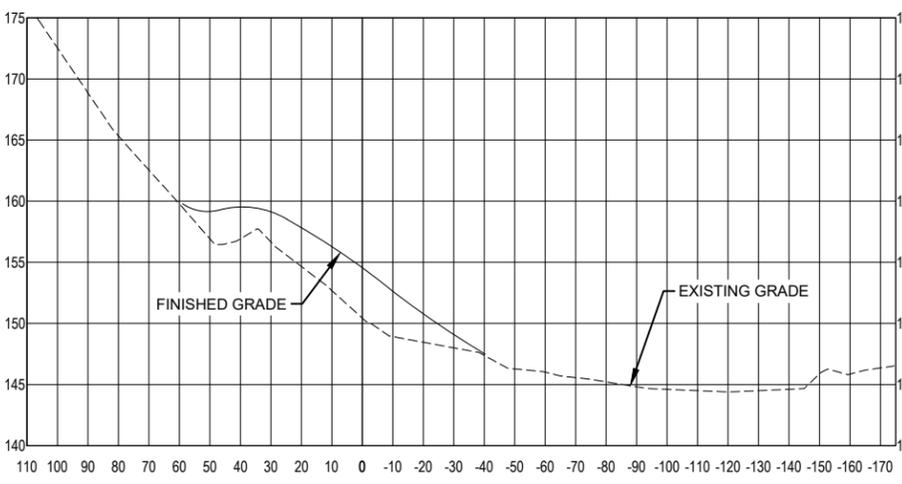
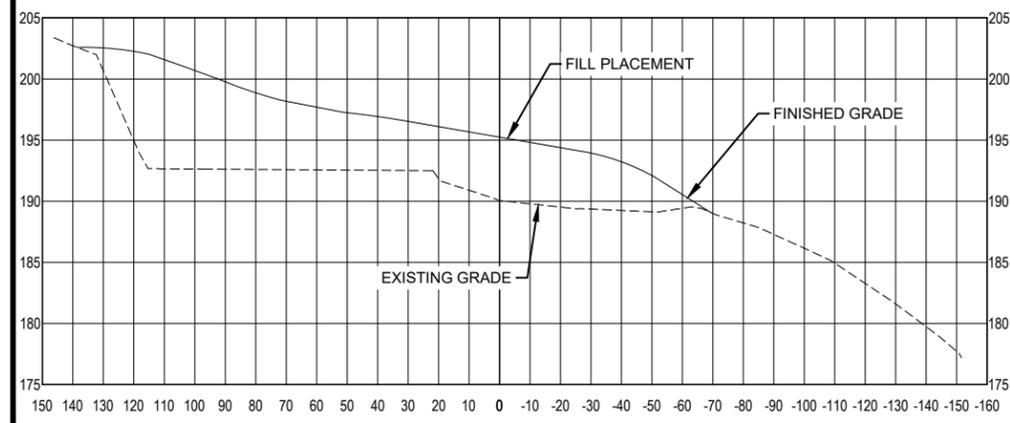
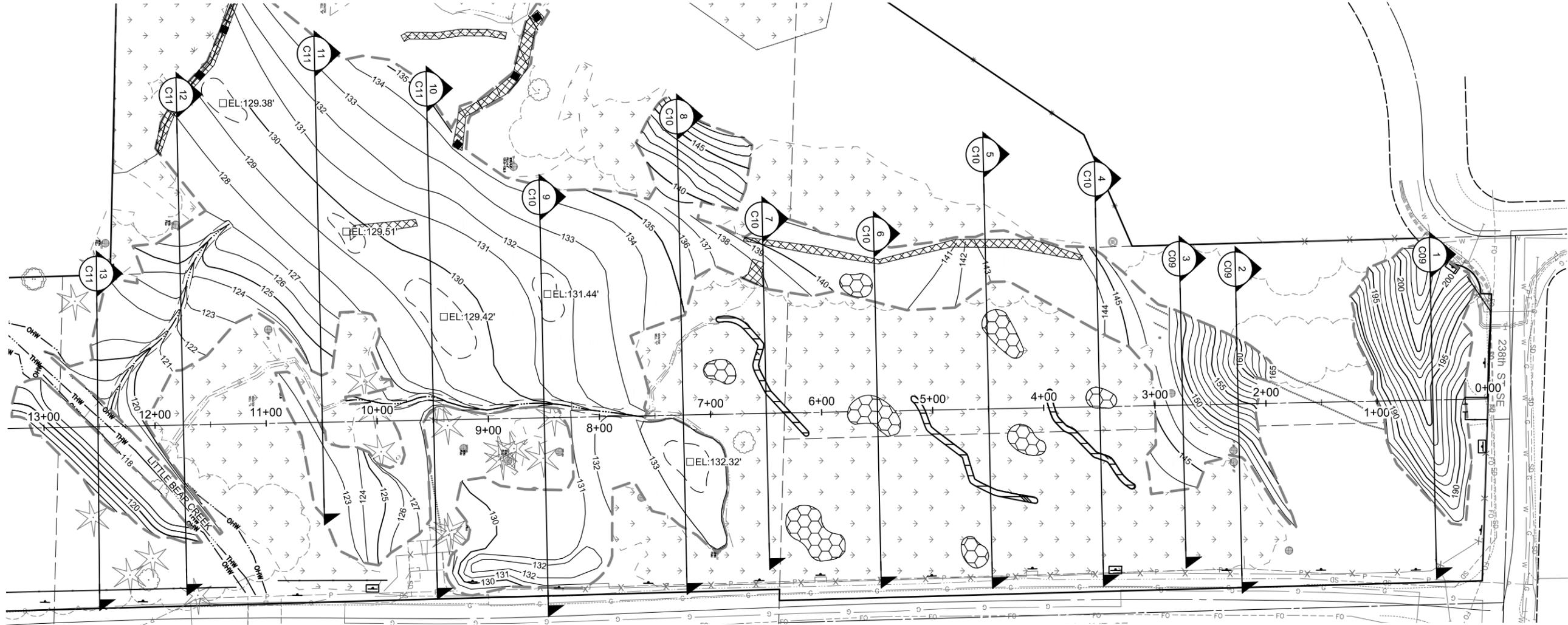
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**STREAM PROFILES**

REFERENCE SHEET NO.  
**C08**

SHEET  
**19**  
OF  
**37**  
SHEETS

SECTION 34, T27N, R5E, W.M.



**NOT FOR CONSTRUCTION**

2/27/2019 4:42:33 PM - HANNAH SNOW - I:\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C09 SITE SECTIONS.DWG

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB	DRAWN BY: AMF

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

SNOHOMISH COUNTY ENGINEER

DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

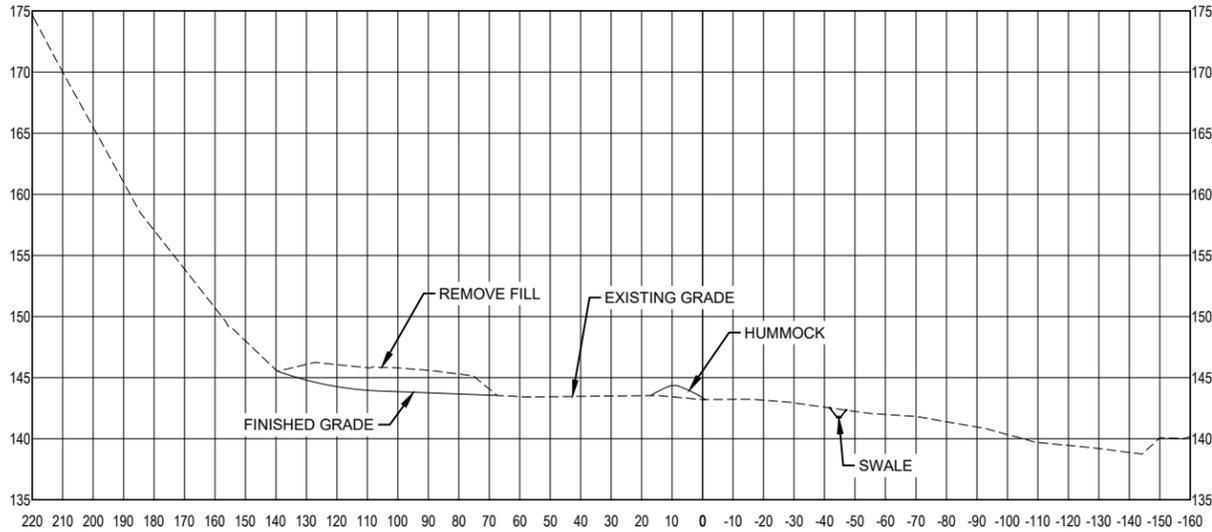
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**SITE SECTIONS, 1 OF 3**

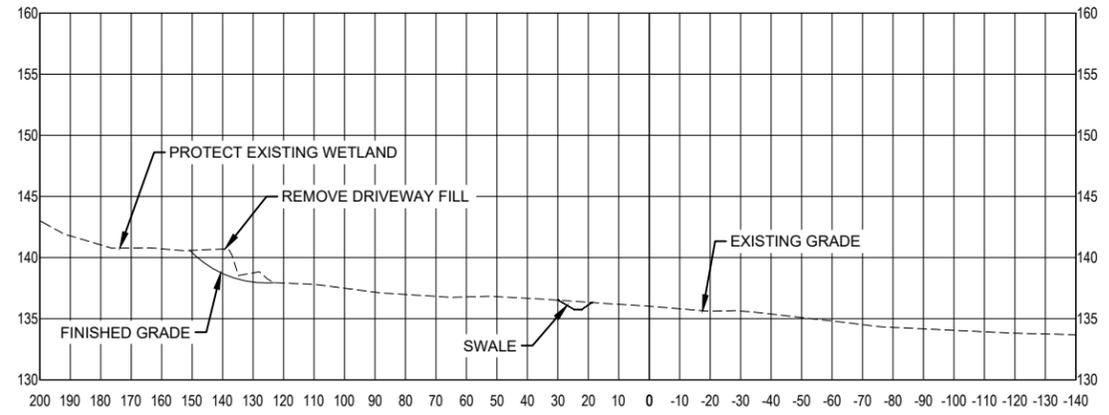
REFERENCE SHEET NO.  
**C09**

SHEET  
**20**  
OF  
**37**  
SHEETS

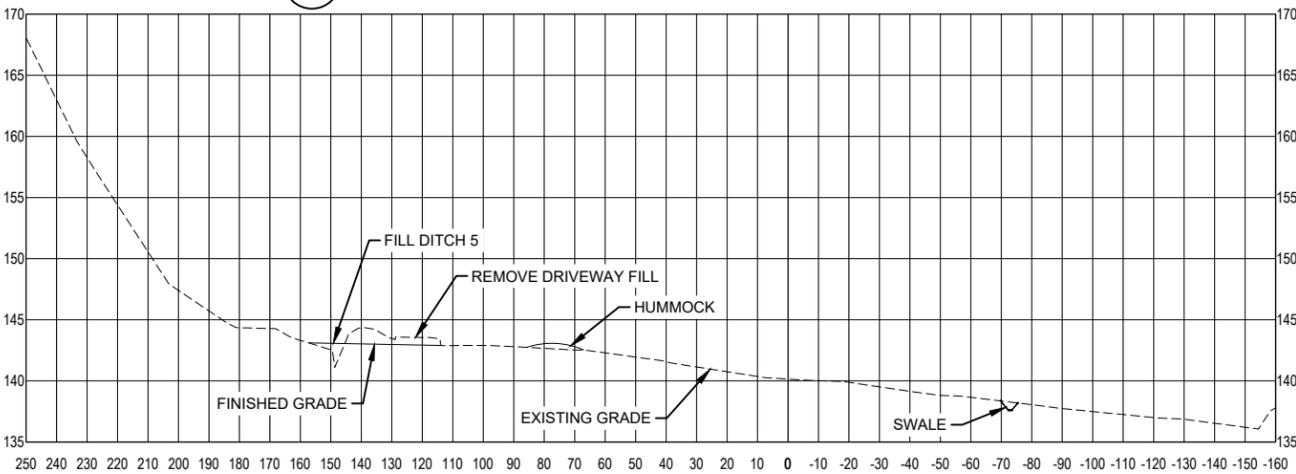
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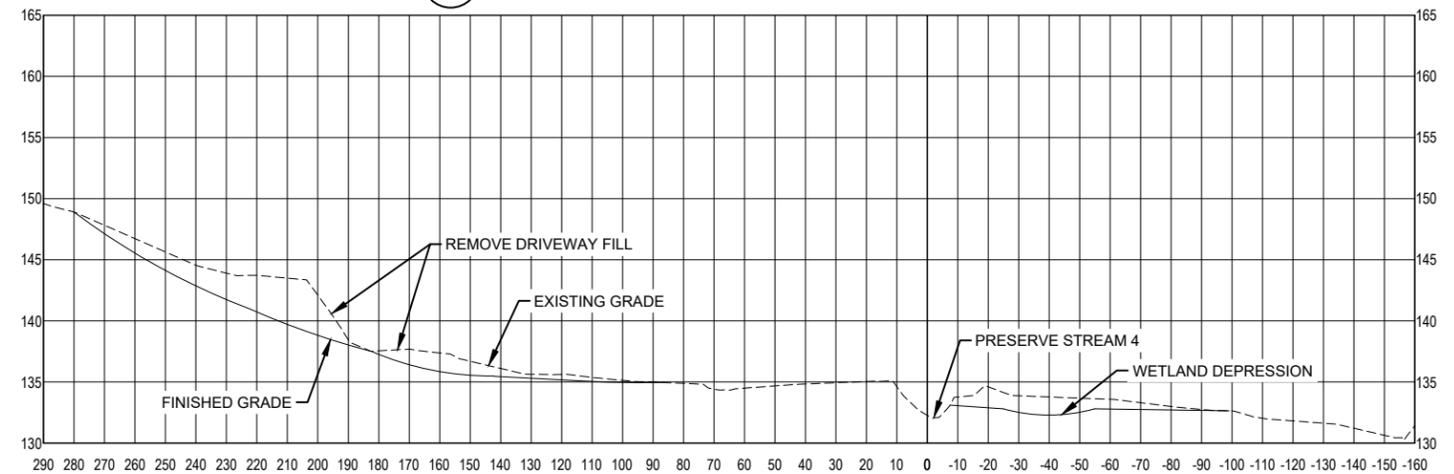
4 3+50 SECTION 1"=30'



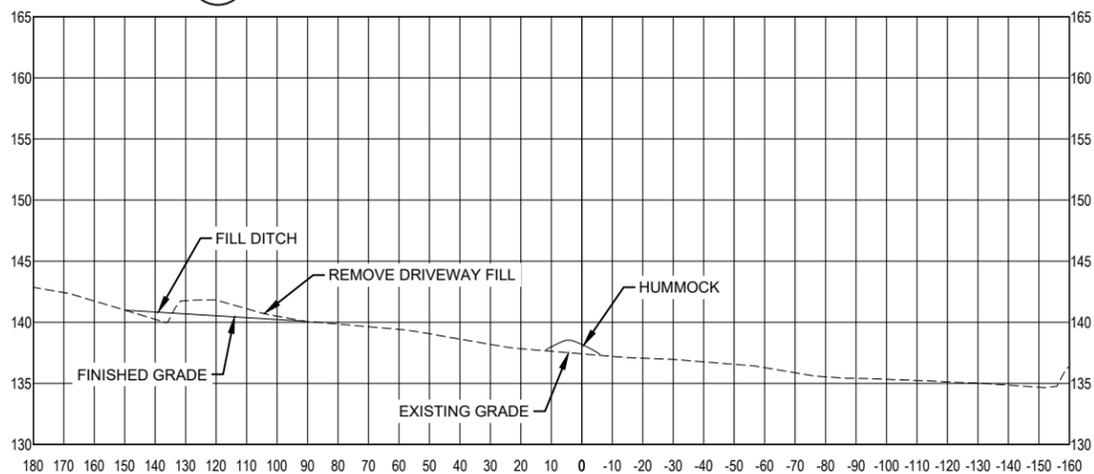
7 6+50 SECTION 1"=30'



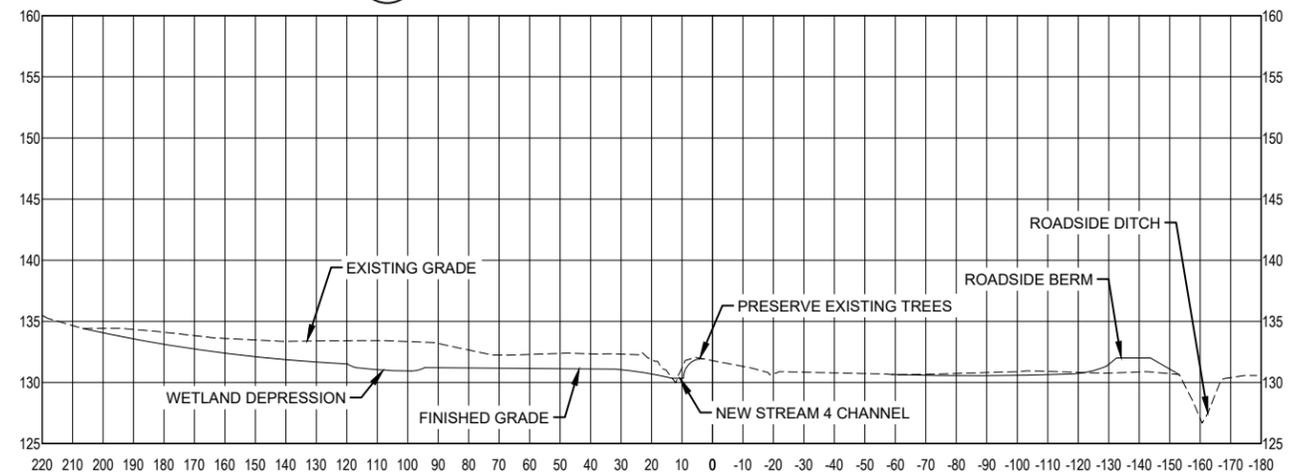
5 4+50 SECTION 1"=30'



8 7+25 SECTION 1"=30'



6 5+50 SECTION 1"=30'



9 8+50 SECTION 1"=30'

**NOT FOR CONSTRUCTION**

2/27/2019 4:42:47 PM - HANNAH SNOW - I:\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\WGS90% DESIGN\C10 SITE SECTIONS.DWG

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB	DRAWN BY: AMF



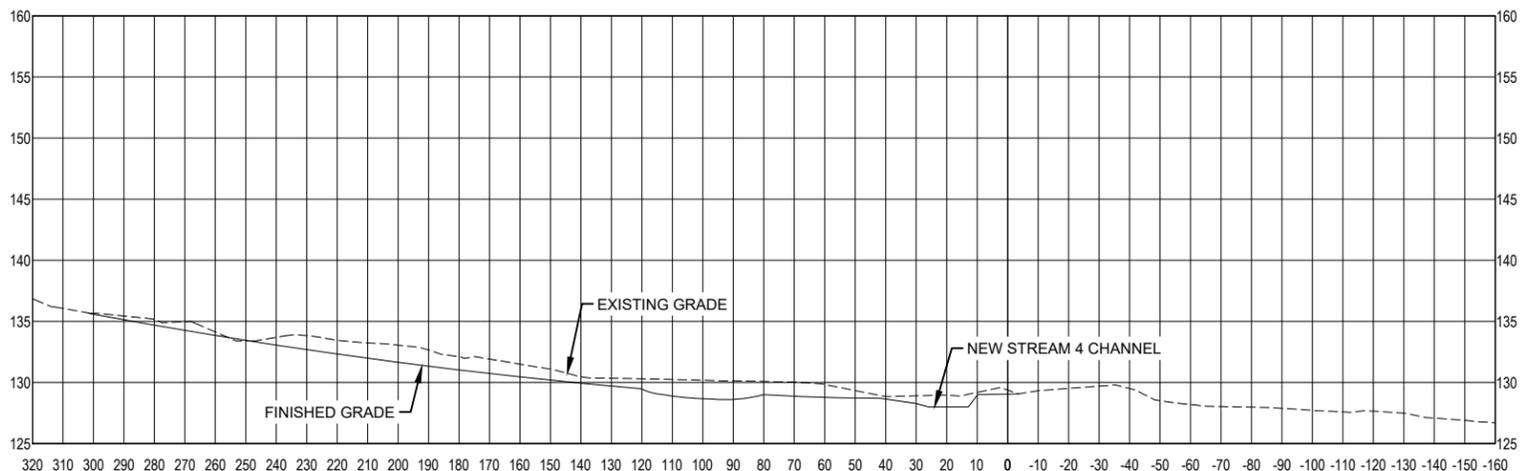
REVIEWED AND APPROVED FOR CONSTRUCTION  
SNOHOMISH COUNTY ENGINEER  
DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**  
FUNDING NO.

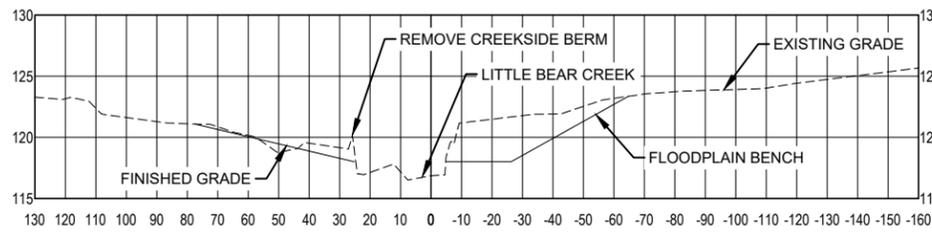
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE  
SITE SECTIONS, 2 OF 3

REFERENCE SHEET NO. C10  
SHEET 21 OF 37 SHEETS

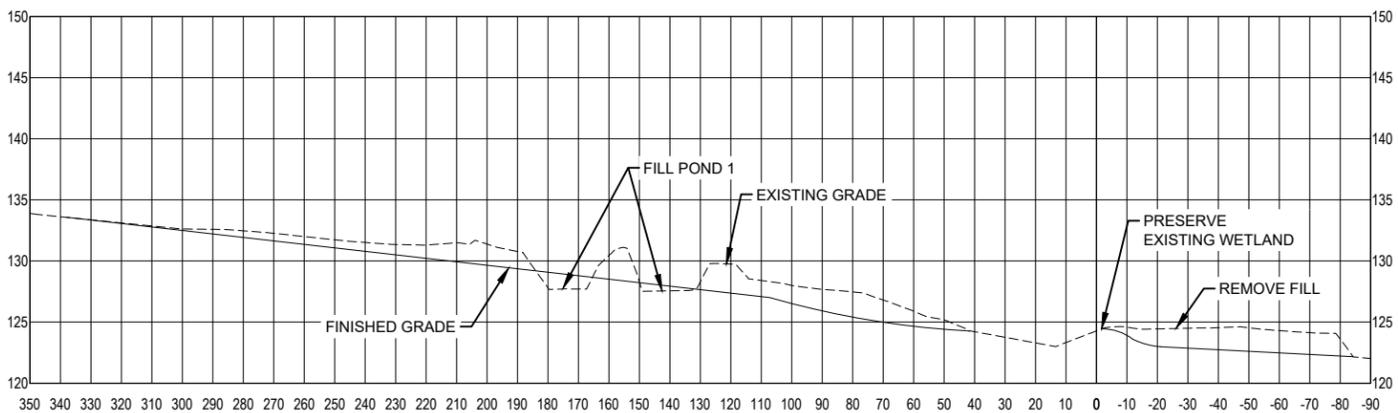
SECTION 34, T27N, R5E, W.M.



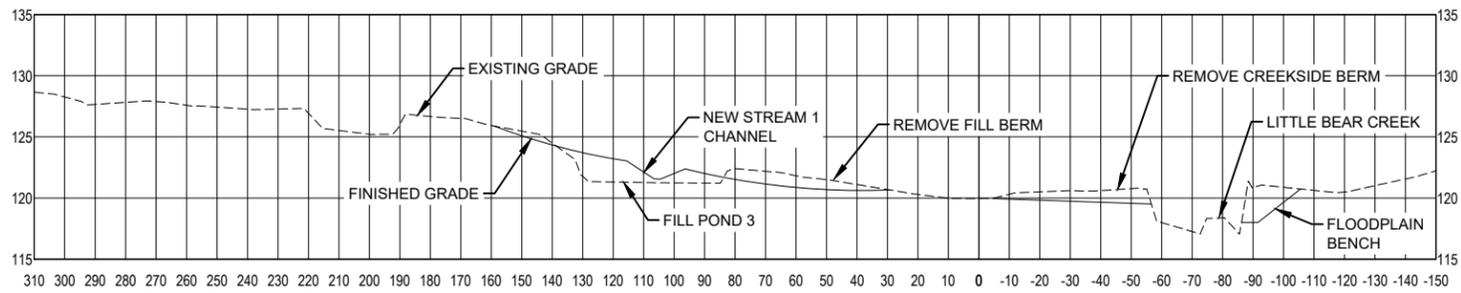
10 9+50 SECTION 1"=30'



13 12+50 SECTION 1"=30'



11 10+50 SECTION 1"=30'



12 11+75 SECTION 1"=30'

**NOTES**  
1. SEE SHEET C01 FOR SECTION LOCATIONS.

**NOT FOR CONSTRUCTION**

2/27/2019 4:43:01 PM - HANNAH SNOW - \\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C11 SITE SECTIONS.DWG

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORIZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB	DRAWN BY: AMF



REVIEWED AND APPROVED FOR CONSTRUCTION  
  
SNOHOMISH COUNTY ENGINEER  
  
DATE APPROVED:

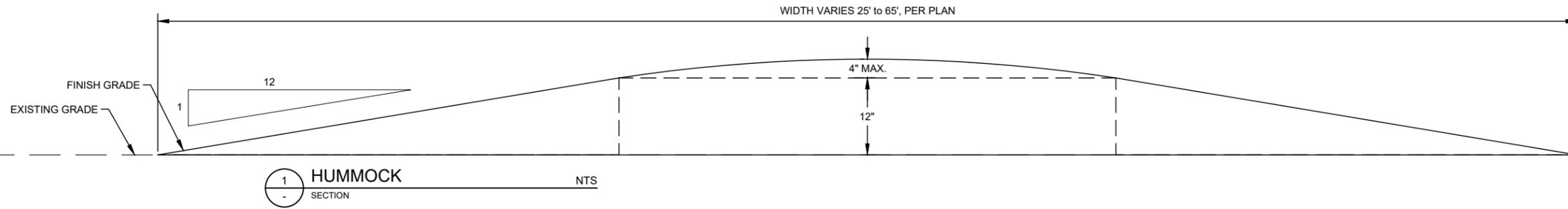
**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**  
  
FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE  
  
SITE SECTIONS, 3 OF 3

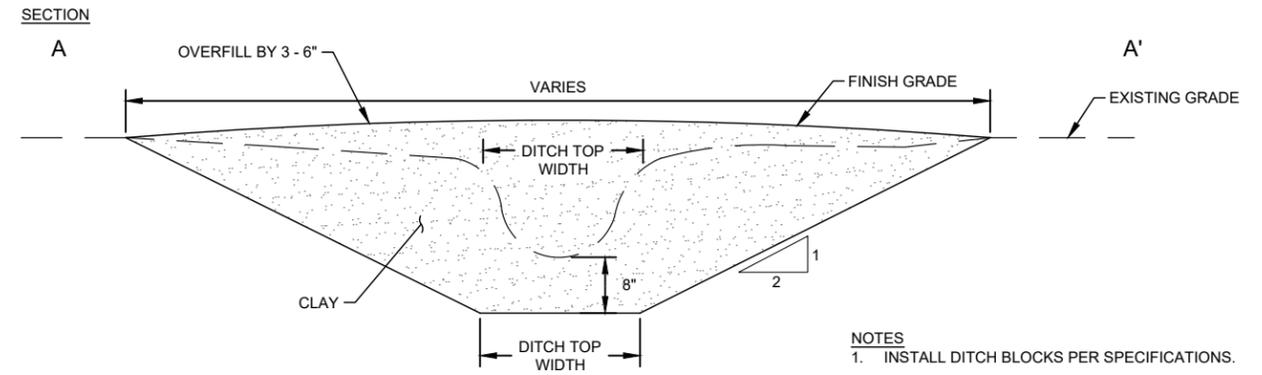
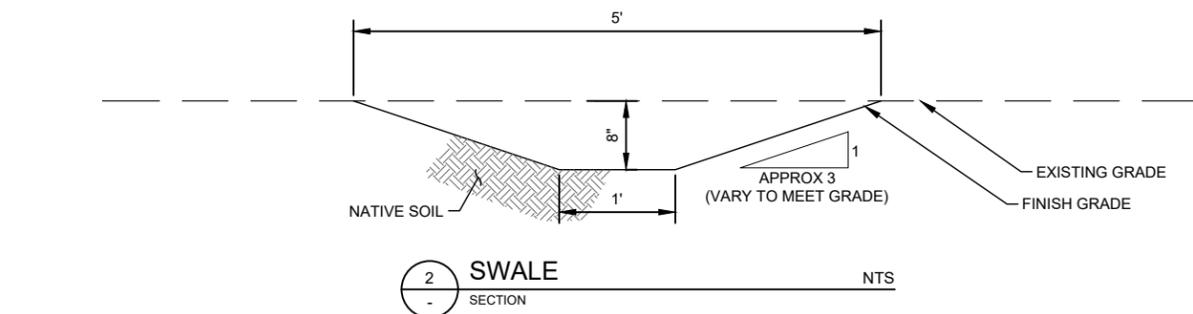
REFERENCE SHEET NO.  
**C11**  
  
SHEET **22** OF 37 SHEETS



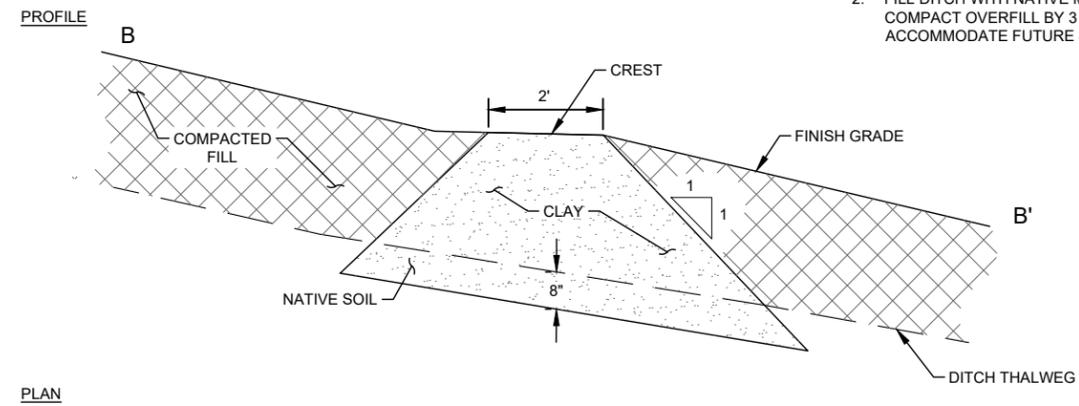
2/27/2019 4:43:17 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C13 DETAILS - GRADING.DWG



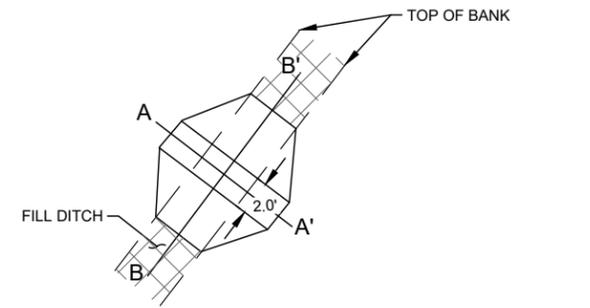
- NOTES**
1. CONSTRUCT HUMMOCKS FROM ORGANIC SOILS SALVAGED FROM GRADING ACTIVITIES AS SHOWN ON PLANS.
  2. CONSTRUCT HUMMOCKS AT A 12:1 FILL SLOPE UNTIL A TARGET THICKNESS OF 12" IS ACHIEVED, THEN GENTLY ROUND HUMMOCK TOP. MAXIMUM HUMMOCK HEIGHT TO EXCEED TARGET BY NO MORE THAN 4".
  3. COMPACT TO A FIRM AND UNYIELDING CONDITION.
  4. GRADING SHALL BE ROUNDED AND SMOOTH WITH NO ABRUPT BREAKS.



- NOTES**
1. INSTALL DITCH BLOCKS PER SPECIFICATIONS.
  2. FILL DITCH WITH NATIVE MATERIAL AND COMPACT OVERFILL BY 3 - 6" TO ACCOMMODATE FUTURE SETTLEMENT.



PLAN



**3** DITCH BLOCK NTS  
- DETAIL

**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK



REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:

**SNOHOMISH COUNTY  
DEPARTMENT OF  
PUBLIC WORKS**

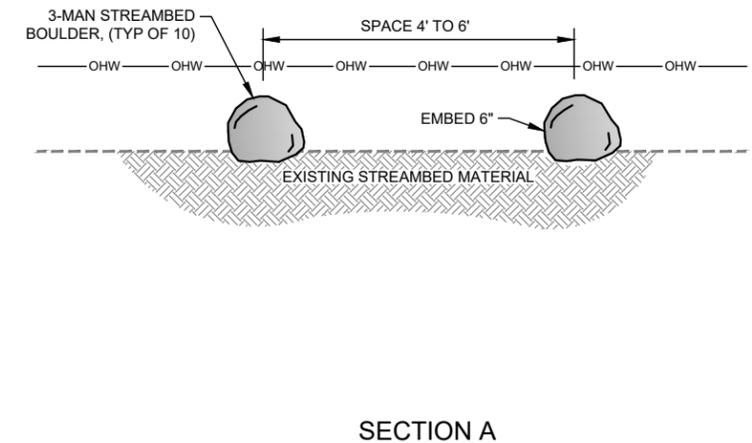
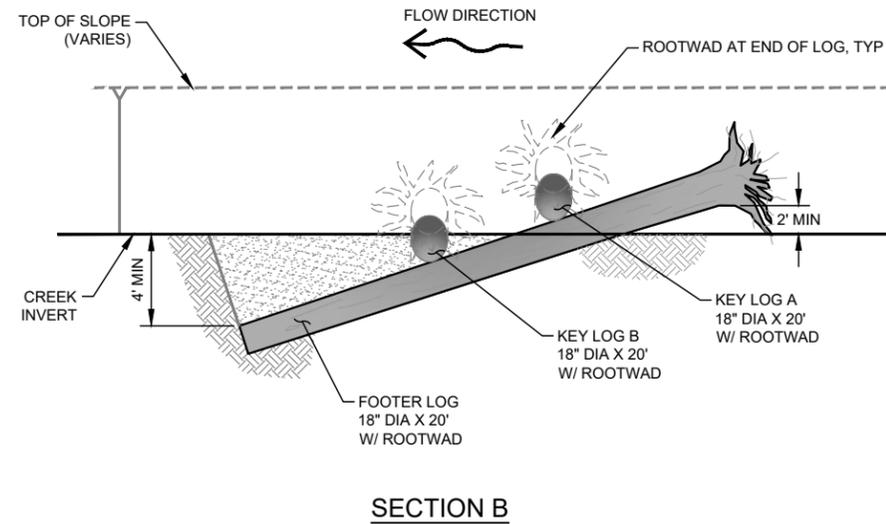
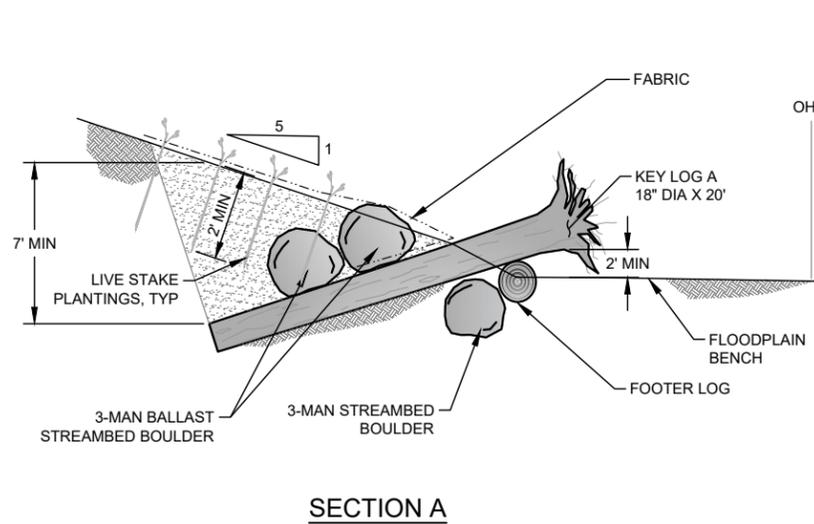
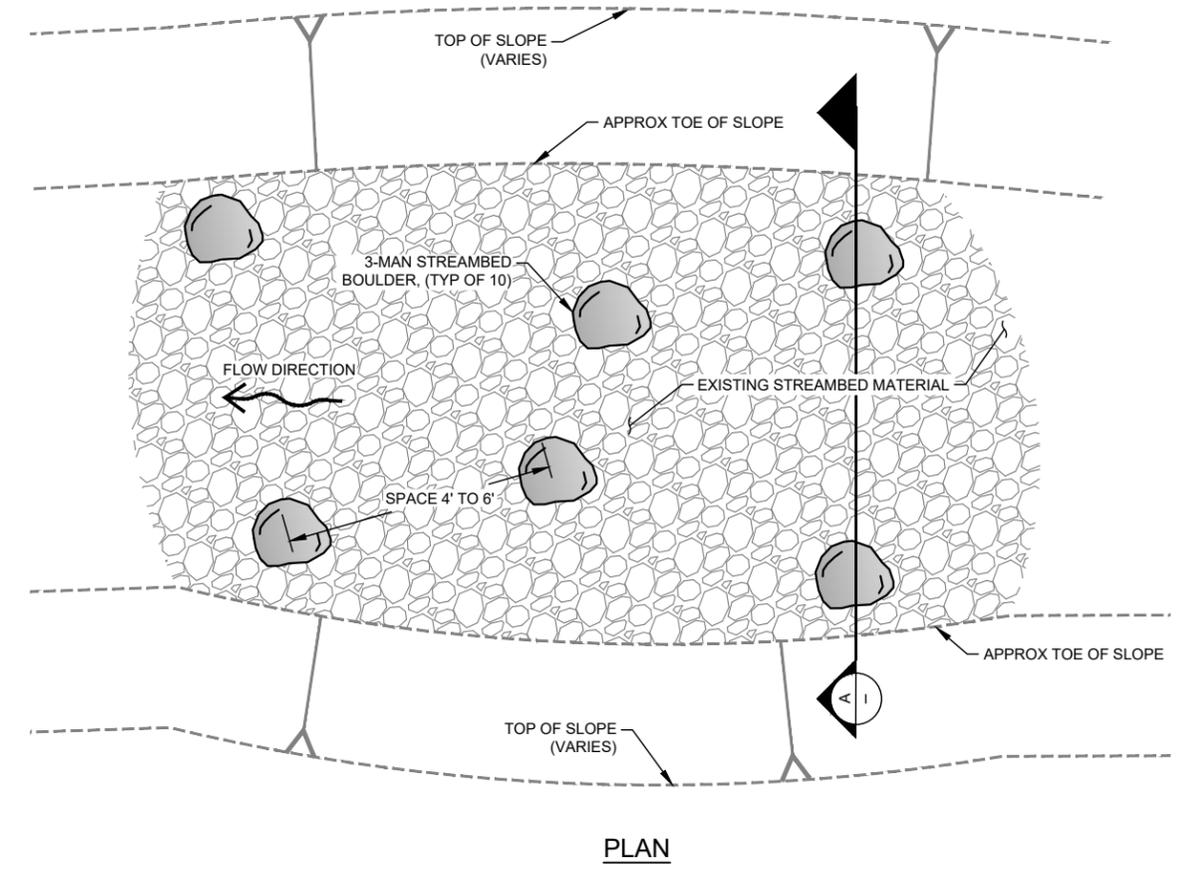
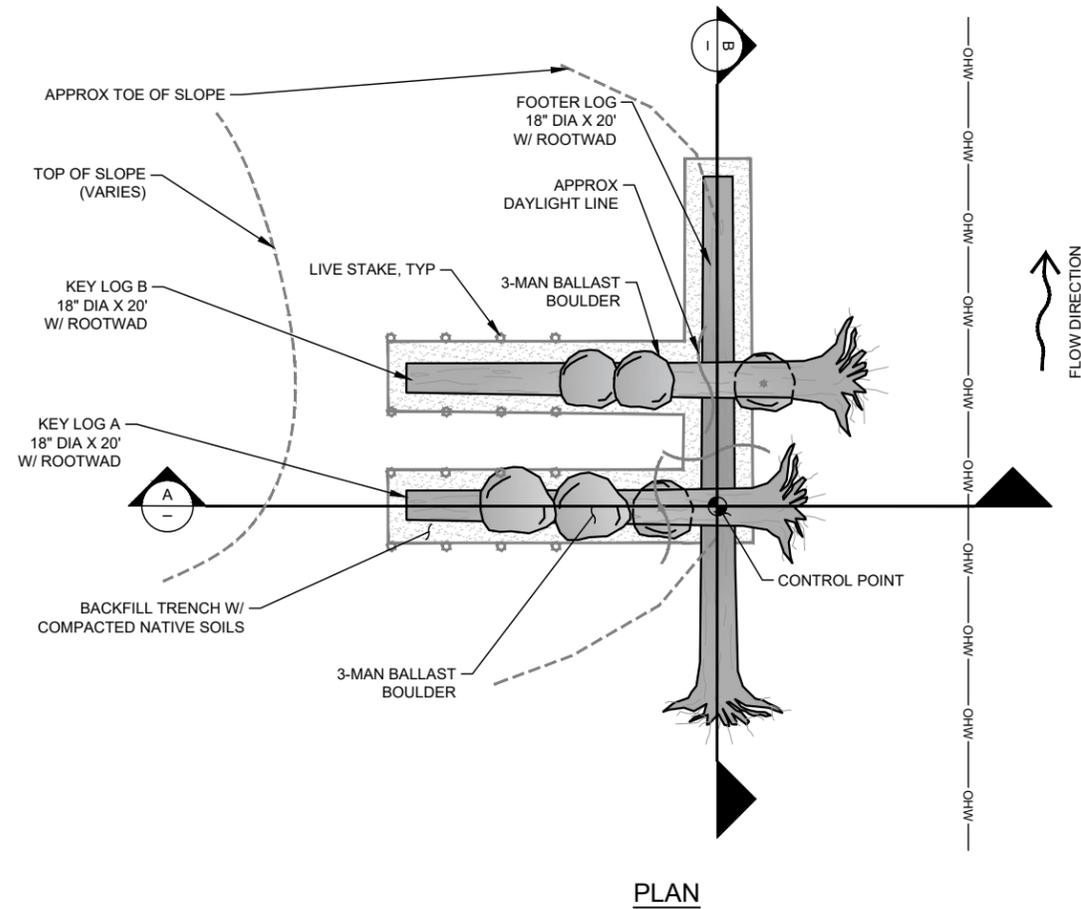
FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**DETAILS - GRADING**

REFERENCE SHEET NO. <b>C13</b>
SHEET <b>24</b> OF <b>37</b> SHEETS

2/27/2019 4:43:27 PM - EGUTIERREZ - \\ESAS\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\C14 STREAM DETAILS, 1 OF 2.DWG



1 - LARGE WOOD STRUCTURE NTS  
DETAIL

2 - BOULDER CLUSTER NTS  
DETAIL

**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

SNOHOMISH COUNTY ENGINEER

DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

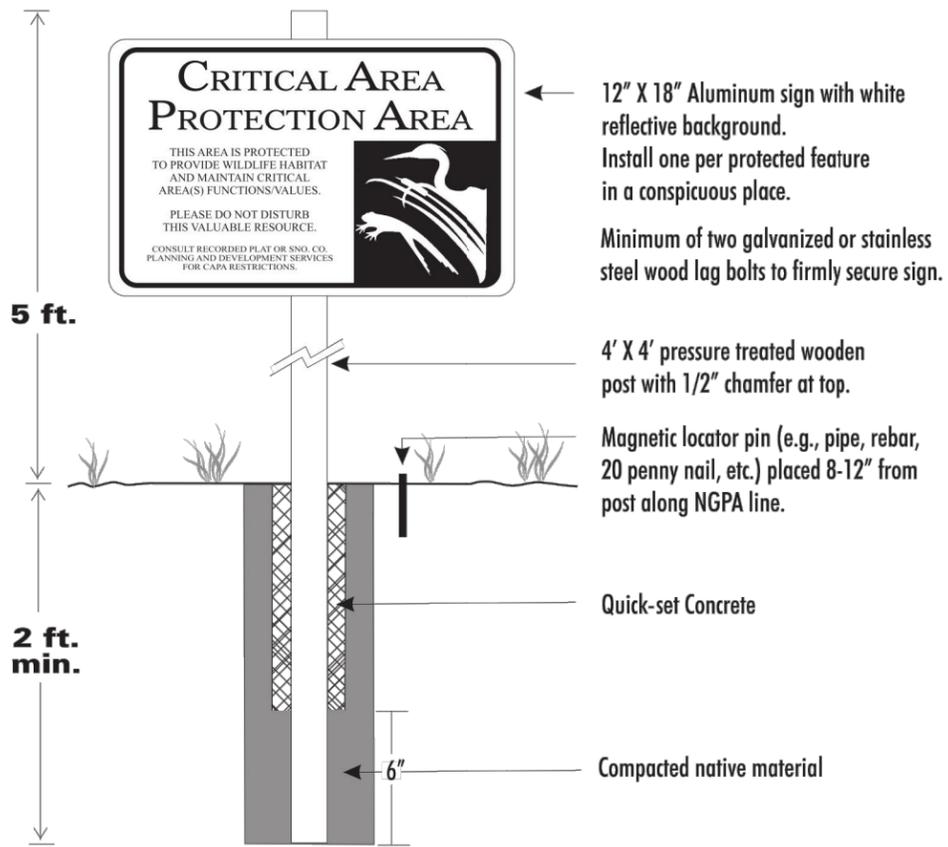
**STREAM DETAILS**

REFERENCE SHEET NO. C14

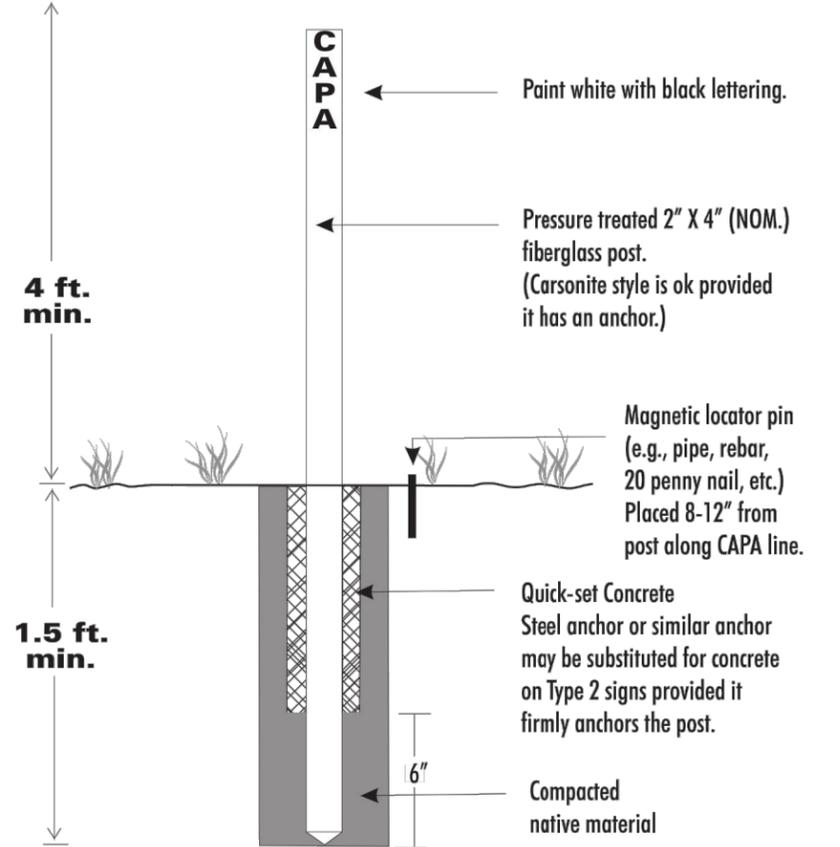
SHEET 25 OF 37 SHEETS

# Critical Area Protection Area Sign Installation Guidelines

## TYPE 1 SIGN



## TYPE 2 SIGN



**NOTES:**

1. CAPA signs shall be placed as shown around the perimeter of the Critical Area Protection Area. Minimum placement shall include one Type 1 sign per wetland, and at least one Type 1 sign shall be placed in any lot that borders the Critical Area Protection Area, unless otherwise approved by the County biologist.
2. Sign placement shall be subject to the approval of Snohomish County. Alternative sign designs may be submitted to Snohomish County for approval.
3. All signs must be secure and permanent.
4. Sign materials to be provided by the contracting agency.

**NOT FOR CONSTRUCTION**

10/12/18							
DATE	NO.	REVISION	BY				



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ESB, BDT	DRAWN BY: AMF, RK

PRELIMINARY

90% DESIGN

REVIEWED AND APPROVED FOR CONSTRUCTION

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SNOHOMISH COUNTY ENGINEER

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DATE APPROVED: \_\_\_\_\_

SNOHOMISH COUNTY  
DEPARTMENT OF  
PUBLIC WORKS

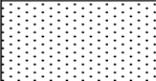
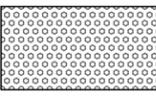
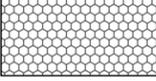
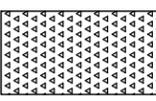
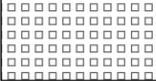
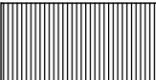
FUNDING NO. \_\_\_\_\_

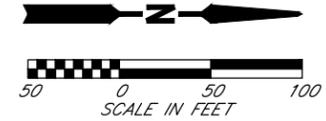
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE  
**CRITICAL AREA PROTECTION AREA  
SIGNAGE**

REFERENCE SHEET NO.  
**C15**  
SHEET  
26  
OF  
37  
SHEETS

2/27/2019 4:43:59 PM - HANNAH SNOW - I:\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\WGS90% DESIGN\L01 PLANTING OVERVIEW PLAN.DWG

**PLANTING LEGEND**

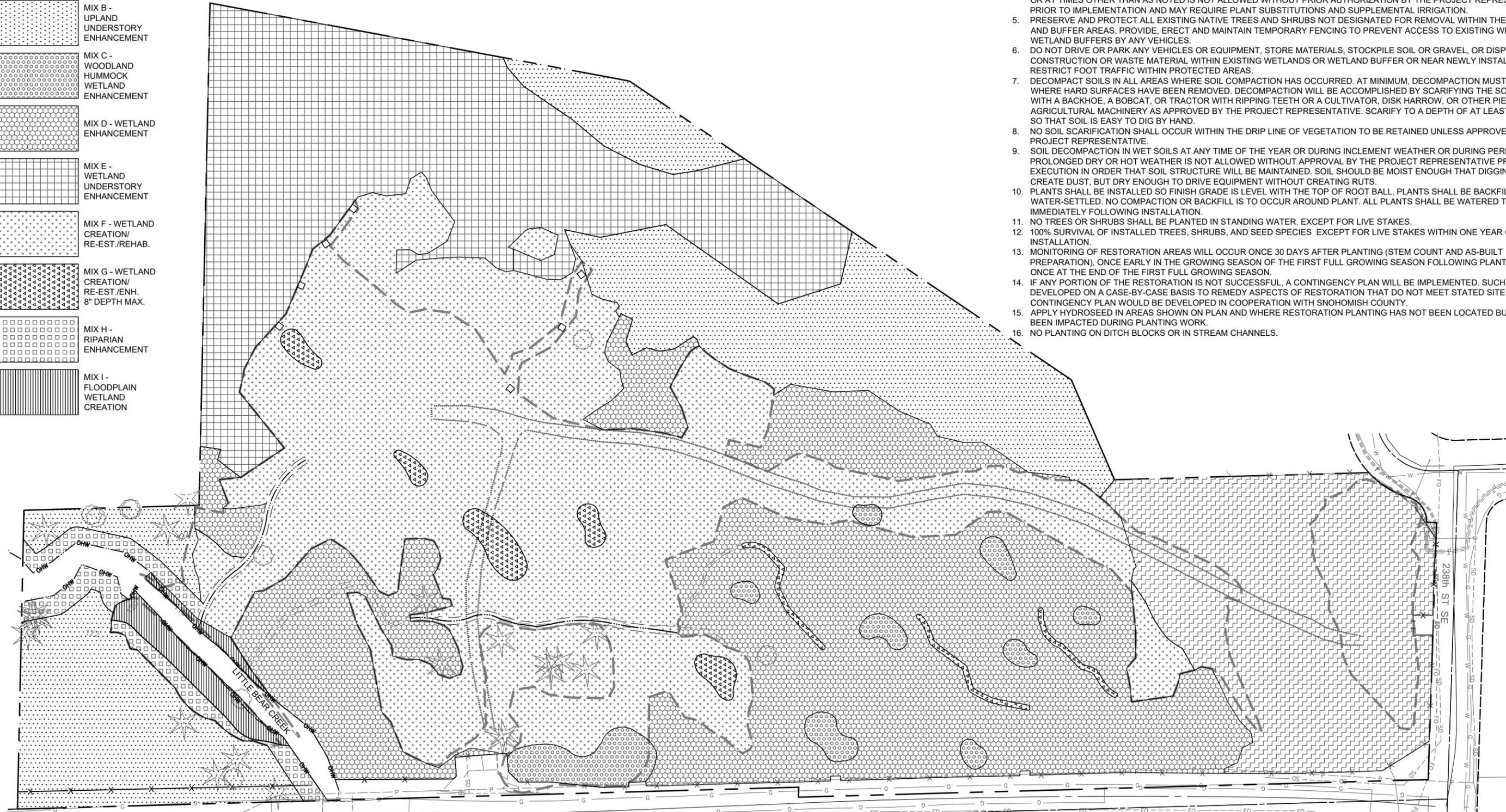
-  MIX A - UPLAND ENHANCEMENT
-  MIX B - UPLAND UNDERSTORY ENHANCEMENT
-  MIX C - WOODLAND HUMMOCK WETLAND ENHANCEMENT
-  MIX D - WETLAND ENHANCEMENT
-  MIX E - WETLAND UNDERSTORY ENHANCEMENT
-  MIX F - WETLAND CREATION/RE-EST./REHAB.
-  MIX G - WETLAND CREATION/RE-EST./ENH. 8" DEPTH MAX.
-  MIX H - RIPARIAN ENHANCEMENT
-  MIX I - FLOODPLAIN WETLAND CREATION



SECTION 34, T27N, R5E, W.M.

**NOTES**

1. FOR PLANTING AND SEEDING SCHEDULES SEE SHEETS L07, L08, & L09.
2. FOR PLANTING & SOIL PREPARATION DETAILS SEE SHEETS L10 & L11.
3. ALL WORK IN SATURATED SOILS AT ANY TIME OF THE YEAR OR DURING INCLEMENT WEATHER IS NOT ALLOWED WITHOUT APPROVAL BY THE PROJECT REPRESENTATIVE PRIOR TO EXECUTION, AND MAY REQUIRE USE OF TECHNIQUES AND EQUIPMENT DESIGNED TO MINIMIZE IMPACTS TO SATURATED SOILS OR ADJACENT AREAS OF STANDING WATER.
4. PLANTING OF WOODY MATERIAL SHOULD OCCUR BETWEEN OCTOBER 1 AND MARCH 1 TO TAKE ADVANTAGE OF SEASONAL RAINS AND GREATER AVAILABILITY OF PLANT MATERIAL. PLANTING DURING ABNORMALLY HOT, DRY, OR FREEZING WEATHER, OR AT TIMES OTHER THAN AS NOTED IS NOT ALLOWED WITHOUT PRIOR AUTHORIZATION BY THE PROJECT REPRESENTATIVE PRIOR TO IMPLEMENTATION AND MAY REQUIRE PLANT SUBSTITUTIONS AND SUPPLEMENTAL IRRIGATION.
5. PRESERVE AND PROTECT ALL EXISTING NATIVE TREES AND SHRUBS NOT DESIGNATED FOR REMOVAL WITHIN THE WETLAND AND BUFFER AREAS. PROVIDE, ERECT AND MAINTAIN TEMPORARY FENCING TO PREVENT ACCESS TO EXISTING WETLANDS OR WETLAND BUFFERS BY ANY VEHICLES.
6. DO NOT DRIVE OR PARK ANY VEHICLES OR EQUIPMENT, STORE MATERIALS, STOCKPILE SOIL OR GRAVEL, OR DISPOSE OF ANY CONSTRUCTION OR WASTE MATERIAL WITHIN EXISTING WETLANDS OR WETLAND BUFFER OR NEAR NEWLY INSTALLED PLANTS. RESTRICT FOOT TRAFFIC WITHIN PROTECTED AREAS.
7. DECOMPACT SOILS IN ALL AREAS WHERE SOIL COMPACTION HAS OCCURRED. AT MINIMUM, DECOMPACTION MUST OCCUR WHERE HARD SURFACES HAVE BEEN REMOVED. DECOMPACTION WILL BE ACCOMPLISHED BY SCARIFYING THE SOIL SURFACE WITH A BACKHOE, A BOBCAT, OR TRACTOR WITH RIPPING TEETH OR A CULTIVATOR, DISK HARROW, OR OTHER PIECE OF AGRICULTURAL MACHINERY AS APPROVED BY THE PROJECT REPRESENTATIVE. SCARIFY TO A DEPTH OF AT LEAST 12 INCHES SO THAT SOIL IS EASY TO DIG BY HAND.
8. NO SOIL SCARIFICATION SHALL OCCUR WITHIN THE DRIP LINE OF VEGETATION TO BE RETAINED UNLESS APPROVED BY THE PROJECT REPRESENTATIVE.
9. SOIL DECOMPACTION IN WET SOILS AT ANY TIME OF THE YEAR OR DURING INCLEMENT WEATHER OR DURING PERIODS OF PROLONGED DRY OR HOT WEATHER IS NOT ALLOWED WITHOUT APPROVAL BY THE PROJECT REPRESENTATIVE PRIOR TO EXECUTION IN ORDER THAT SOIL STRUCTURE WILL BE MAINTAINED. SOIL SHOULD BE MOIST ENOUGH THAT DIGGING DOESN'T CREATE DUST, BUT DRY ENOUGH TO DRIVE EQUIPMENT WITHOUT CREATING RUTS.
10. PLANTS SHALL BE INSTALLED SO FINISH GRADE IS LEVEL WITH THE TOP OF ROOT BALL. PLANTS SHALL BE BACKFILLED AND WATER-SETTLED. NO COMPACTION OR BACKFILL IS TO OCCUR AROUND PLANT. ALL PLANTS SHALL BE WATERED THOROUGHLY IMMEDIATELY FOLLOWING INSTALLATION.
11. NO TREES OR SHRUBS SHALL BE PLANTED IN STANDING WATER. EXCEPT FOR LIVE STAKES.
12. 100% SURVIVAL OF INSTALLED TREES, SHRUBS, AND SEED SPECIES EXCEPT FOR LIVE STAKES WITHIN ONE YEAR OF INSTALLATION.
13. MONITORING OF RESTORATION AREAS WILL OCCUR ONCE 30 DAYS AFTER PLANTING (STEM COUNT AND AS-BUILT PREPARATION), ONCE EARLY IN THE GROWING SEASON OF THE FIRST FULL GROWING SEASON FOLLOWING PLANTING, AND ONCE AT THE END OF THE FIRST FULL GROWING SEASON.
14. IF ANY PORTION OF THE RESTORATION IS NOT SUCCESSFUL, A CONTINGENCY PLAN WILL BE IMPLEMENTED. SUCH PLANS ARE DEVELOPED ON A CASE-BY-CASE BASIS TO REMEDY ASPECTS OF RESTORATION THAT DO NOT MEET STATED SITE GOALS. THE CONTINGENCY PLAN WOULD BE DEVELOPED IN COOPERATION WITH SNOHOMISH COUNTY.
15. APPLY HYDROSEED IN AREAS SHOWN ON PLAN AND WHERE RESTORATION PLANTING HAS NOT BEEN LOCATED BUT SITE HAS BEEN IMPACTED DURING PLANTING WORK.
16. NO PLANTING ON DITCH BLOCKS OR IN STREAM CHANNELS.



**NOT FOR CONSTRUCTION**

10/12/18			
DATE	NO.	REVISION	BY



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG	DRAWN BY: DMS

**PRELIMINARY**



**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

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SNOHOMISH COUNTY ENGINEER

---

DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**



FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**PLANTING OVERVIEW PLAN**

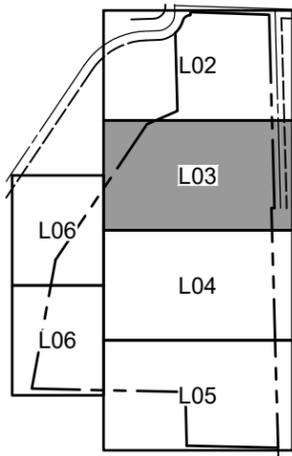
REFERENCE SHEET NO.  
**L01**

SHEET  
**27**  
OF  
**37**  
SHEETS



2/27/2019 4:45:01 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CAD\DWG\90% DESIGN\L03 PLANTING PLAN, 2 OF 5.DWG

SECTION 34, T27N, R5E, W.M.  
MATCHLINE - SEE SHEET L02



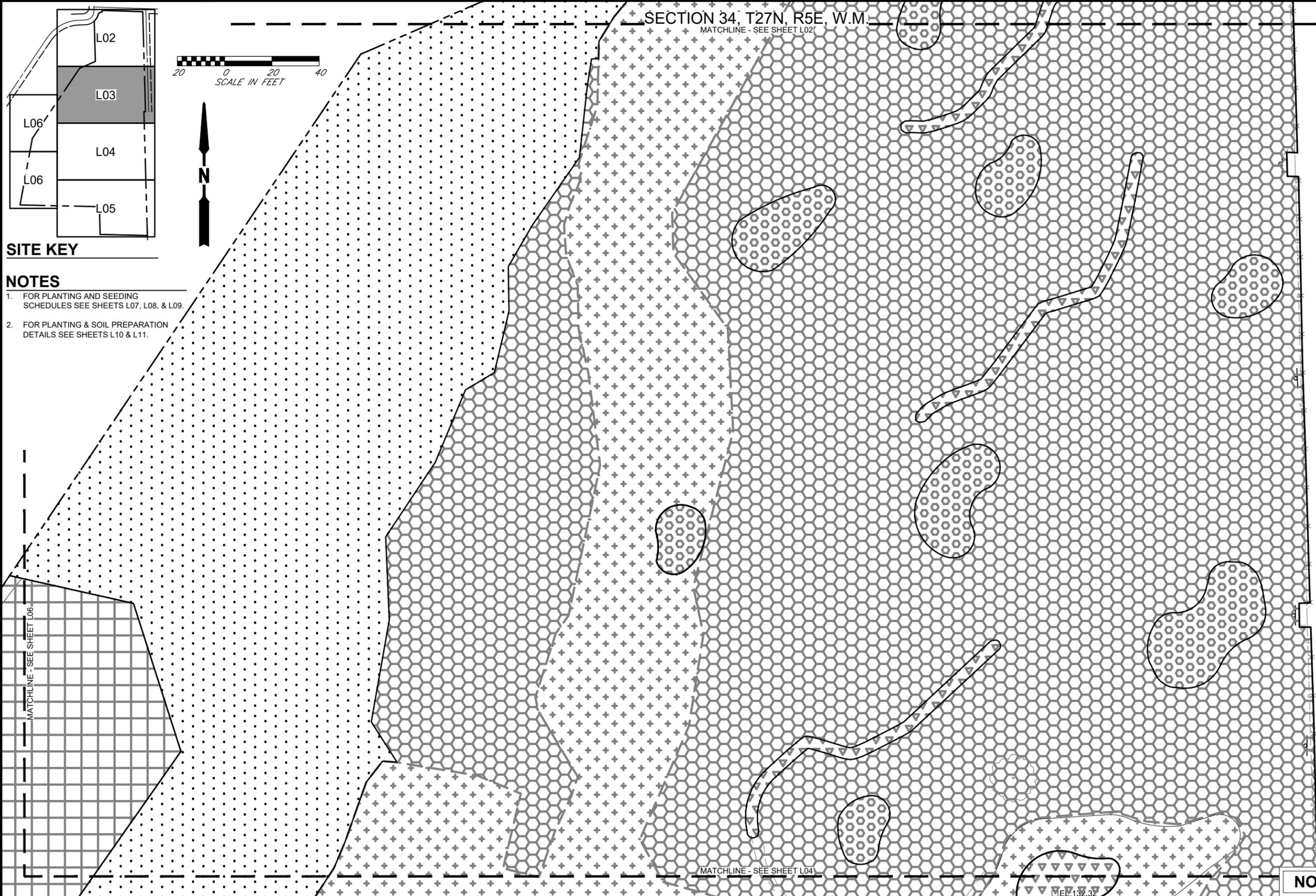
**SITE KEY**

**NOTES**

1. FOR PLANTING AND SEEDING SCHEDULES SEE SHEETS L07, L08, & L09.
2. FOR PLANTING & SOIL PREPARATION DETAILS SEE SHEETS L10 & L11.

**PLANTING LEGEND**

- MIX A - UPLAND ENHANCEMENT
- MIX B - UPLAND UNDERSTORY ENHANCEMENT
- MIX C - WOODLAND HUMMOCK WETLAND ENHANCEMENT
- MIX D - WETLAND ENHANCEMENT
- MIX E - WETLAND UNDERSTORY ENHANCEMENT
- MIX F - WETLAND CREATION/RE-EST./REHAB.
- MIX G - WETLAND CREATION/RE-EST./ENH. 8" DEPTH MAX.
- MIX H - RIPARIAN ENHANCEMENT
- MIX I - FLOODPLAIN WETLAND CREATION



**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG, ESB	DRAWN BY: ABG

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

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SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**PLANTING PLAN, 2 OF 5**

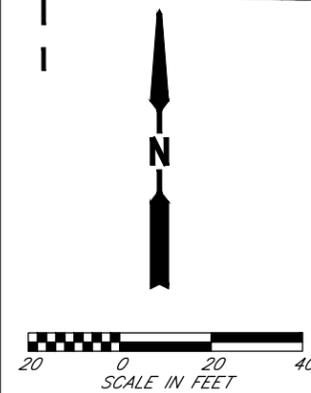
REFERENCE SHEET NO.	L03
SHEET	29
OF	37
SHEETS	



SECTION 34, T27N, R5E, W.M.  
MATCHLINE - SEE SHEET L04

SNOHOMISH COUNTY BRIDGE #521

2/27/2019 4:46:03 PM - HANNAH SNOW - \\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\L05 PLANTING PLAN, 4 OF 5.DWG

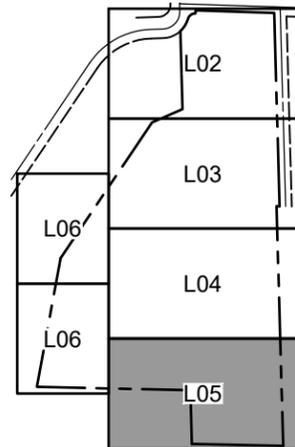


**NOTES**

- FOR PLANTING AND SEEDING SCHEDULES SEE SHEETS L07, L08, & L09.
- FOR PLANTING & SOIL PREPARATION DETAILS SEE SHEETS L10 & L11.

**PLANTING LEGEND**

	MIX A - UPLAND ENHANCEMENT		MIX F - WETLAND CREATION/RE-EST./REHAB.
	MIX B - UPLAND UNDERSTORY ENHANCEMENT		MIX G - WETLAND CREATION/RE-EST./ENH. 8" DEPTH MAX.
	MIX C - WOODLAND HUMMOCK WETLAND ENHANCEMENT		MIX H - RIPARIAN ENHANCEMENT
	MIX D - WETLAND ENHANCEMENT		MIX I - FLOODPLAIN WETLAND CREATION
	MIX E - WETLAND UNDERSTORY ENHANCEMENT		



**SITE KEY**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG, ESB	DRAWN BY: ABG

**PRELIMINARY**

**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

\_\_\_\_\_  
SNOHOMISH COUNTY ENGINEER

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**PLANTING PLAN, 4 OF 5**

**NOT FOR CONSTRUCTION**

REFERENCE SHEET NO. **L05**

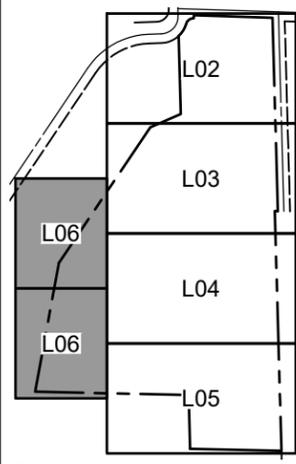
SHEET **31** OF **37** SHEETS

2/27/2019 4:46:38 PM - HANNAH SNOW - I:\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\L06 PLANTING PLAN, 5 OF 5.DWG

SECTION 34, T27N, R5E, W.M.

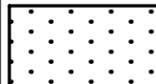
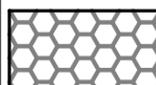
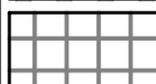
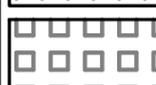
**NOTES**

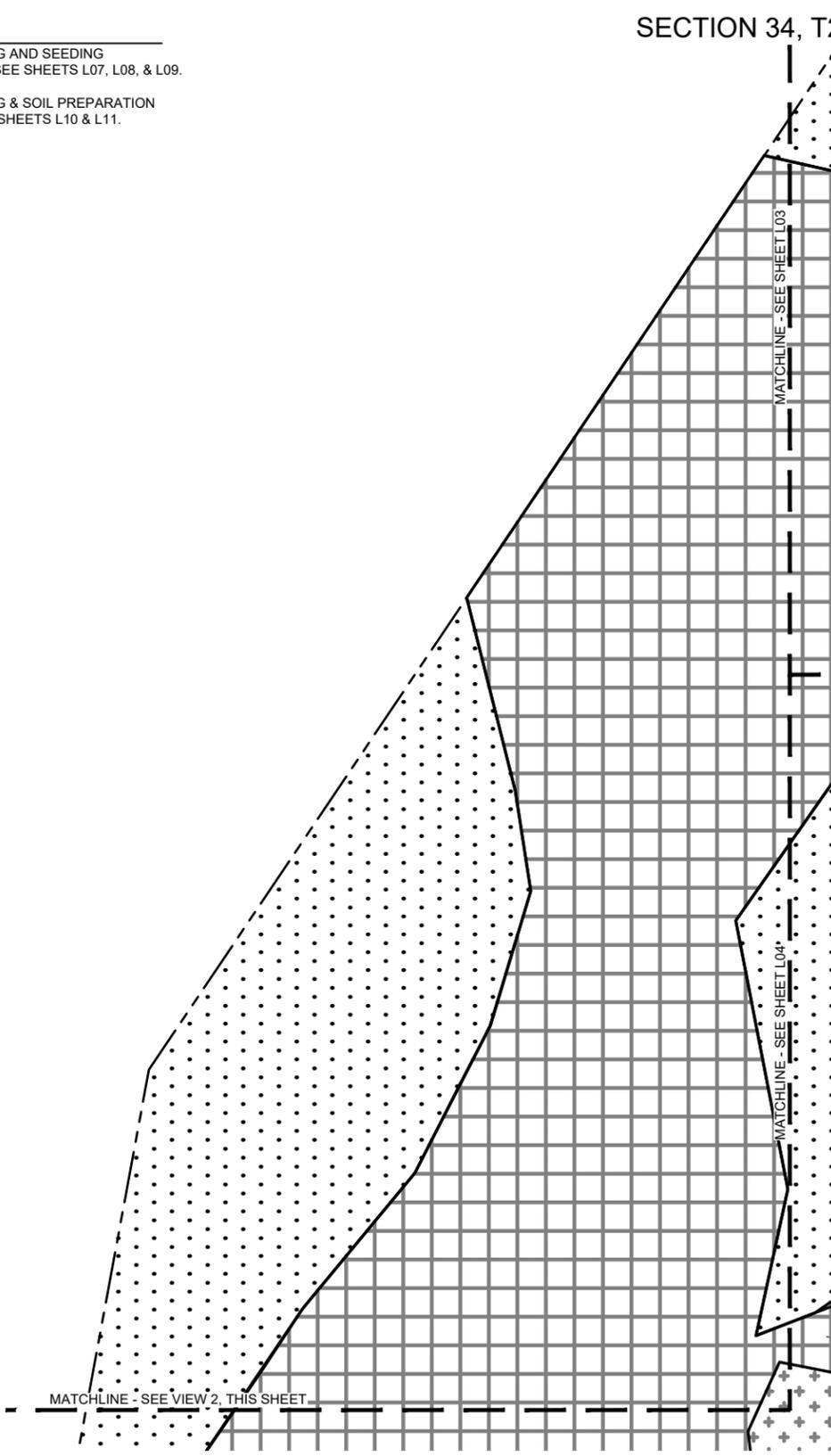
1. FOR PLANTING AND SEEDING SCHEDULES SEE SHEETS L07, L08, & L09.
2. FOR PLANTING & SOIL PREPARATION DETAILS SEE SHEETS L10 & L11.



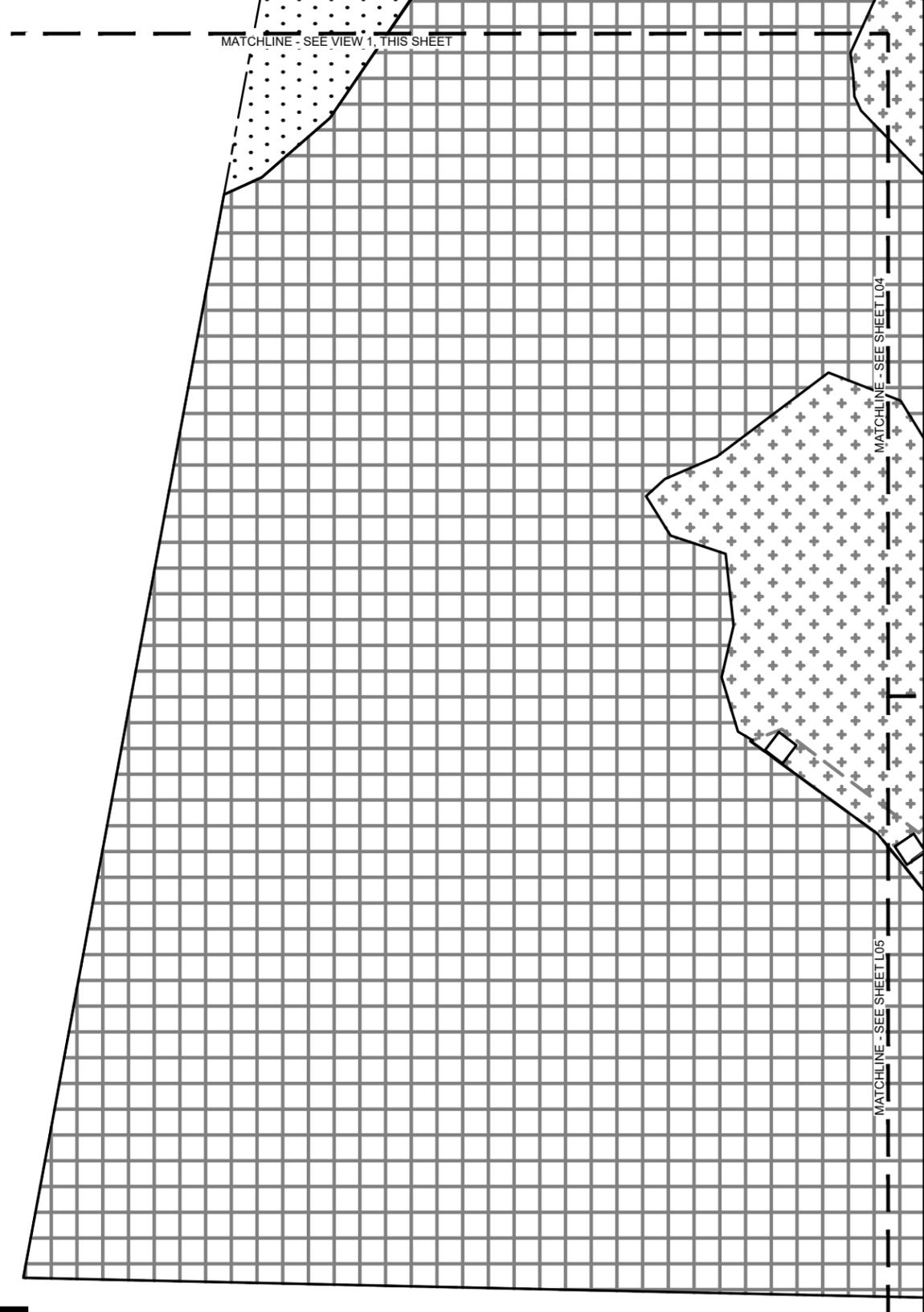
**SITE KEY**

**PLANTING LEGEND**

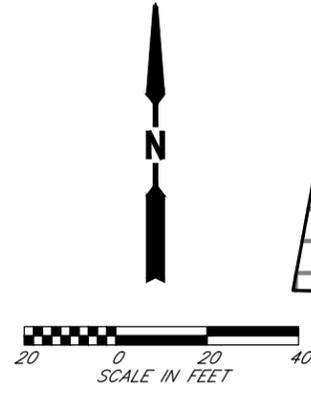
-  MIX A - UPLAND ENHANCEMENT
-  MIX B - UPLAND UNDERSTORY ENHANCEMENT
-  MIX C - WOODLAND HUMMOCK WETLAND ENHANCEMENT
-  MIX D - WETLAND ENHANCEMENT
-  MIX E - WETLAND UNDERSTORY ENHANCEMENT
-  MIX F - WETLAND CREATION/RE-EST./REHAB.
-  MIX G - WETLAND CREATION/RE-EST./ENH. 8" DEPTH MAX.
-  MIX H - RIPARIAN ENHANCEMENT
-  MIX I - FLOODPLAIN WETLAND CREATION



**VIEW 1**



**VIEW 2**



**NOT FOR CONSTRUCTION**

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG, ESB	DRAWN BY: ABG

**PRELIMINARY**



**90% DESIGN**

REVIEWED AND APPROVED FOR CONSTRUCTION

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SNOHOMISH COUNTY ENGINEER

---

DATE APPROVED: \_\_\_\_\_

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**



FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**PLANTING PLAN, 5 OF 5**

REFERENCE SHEET NO.  
**L06**

SHEET  
**32**  
OF  
**37**  
SHEETS



SECTION 34, T27N, R5E, W.M.

**PLANTING MIX D: WETLAND ENHANCEMENT (167,454 SF)**

SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY
TREES	FRAXINUS LATIFOLIA	OREGON ASH	1 GAL. CONT.	10'	5%	63
	PICEA SITCHENSIS	SITKA SPRUCE	1 GAL. CONT.	10'	15%	189
	SALIX HOOKERIANA	HOOKER WILLOW	1 GAL. CONT.	10'	10%	126
	SALIX LASIANDRA	PACIFIC WILLOW	1 GAL. CONT.	10'	10%	126
	SALIX SITCHENSIS	SITKA WILLOW	1 GAL. CONT.	10'	10%	126
	THUJA PLICATA	WESTERN REDCEDAR	1 GAL. CONT.	10'	50%	628
SHRUBS	CORNUS SERICEA	REDOSIER DOGWOOD	1 GAL. CONT.	5'	15%	565
	MYRICA GALE	SWEET GALE	1 GAL. CONT.	5'	1%	38
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5'	13%	490
	RIBES BRACTEOSUM	STINK CURRANT	1 GAL. CONT.	5'	10%	377
	ROSA PISOCARPA	CLUSTER ROSE	1 GAL. CONT.	5'	13%	490
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5'	13%	490
	SALIX SCOULERIANA	SCOULER'S WILLOW	1 GAL. CONT.	5'	20%	754
	SPIRAEA DOUGLASII	ROSE SPIRAEA	1 GAL. CONT.	5'	2%	75
	SALIX SCOULERIANA	AMERICAN CRANBERRYBUSH	1 GAL. CONT.	5'	13%	490
LIVE POLES AND LIVE STAKES	SALIX HOOKERIANA	HOOKER WILLOW	LIVE POLE	5'	16%	443
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE POLE	5'	16%	443
	SALIX SITCHENSIS	SITKA WILLOW	LIVE POLE	5'	18%	487
	SALIX HOOKERIANA	HOOKER WILLOW	LIVE STAKE	5'	16%	433
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE STAKE	5'	16%	433
	SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE	5'	18%	487
SEEDING	APPLY SEED MIX 2 - WETLAND					
SOIL PREPARATION	SOIL PREPARATION TYPE 2, EXCEPT AROUND LIVE POLES AND LIVE STAKES. SEE DETAIL 2 ON SHEET L11					
MULCH	INSTALL 4" DEPTH MULCH EXCEPT AROUND LIVE POLES AND LIVE STAKES					

**PLANTING MIX F: WETLAND CREATION/REESTABLISHMENT/REHABILITATION (209,481 SF)**

SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY
TREES	FRAXINUS LATIFOLIA	OREGON ASH	1 GAL. CONT.	10'	10%	157
	PICEA SITCHENSIS	SITKA SPRUCE	1 GAL. CONT.	10'	20%	314
	SALIX HOOKERIANA	HOOKER WILLOW	1 GAL. CONT.	10'	10%	157
	SALIX LASIANDRA	PACIFIC WILLOW	1 GAL. CONT.	10'	10%	157
	SALIX SITCHENSIS	SITKA WILLOW	1 GAL. CONT.	10'	10%	157
	THUJA PLICATA	WESTERN REDCEDAR	1 GAL. CONT.	10'	40%	629
SHRUBS	CORNUS SERICEA	REDOSIER DOGWOOD	1 GAL. CONT.	5'	15%	708
	MYRICA GALE	SWEET GALE	1 GAL. CONT.	5'	1%	47
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5'	15%	708
	RIBES BRACTEOSUM	STINK CURRANT	1 GAL. CONT.	5'	10%	472
	ROSA PISOCARPA	CLUSTER ROSE	1 GAL. CONT.	5'	14%	661
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5'	14%	661
	SALIX SCOULERIANA	SCOULER'S WILLOW	1 GAL. CONT.	5'	15%	708
	SPIRAEA DOUGLASII	ROSE SPIRAEA	1 GAL. CONT.	5'	1%	47
	VIBURNUM OPULUS AMERICANUM	AMERICAN CRANBERRYBUSH	1 GAL. CONT.	5'	15%	708
LIVE POLES AND LIVE STAKES	SALIX HOOKERIANA	HOOKER WILLOW	LIVE POLE	5'	16%	542
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE POLE	5'	16%	542
	SALIX SITCHENSIS	SITKA WILLOW	LIVE POLE	5'	18%	610
	SALIX HOOKERIANA	HOOKER WILLOW	LIVE STAKE	5'	16%	542
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE STAKE	5'	16%	542
	SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE	5'	18%	610
SEEDING	APPLY SEED MIX 2 - WETLAND					
SOIL PREPARATION	SOIL PREPARATION TYPE 2, EXCEPT AROUND LIVE POLES AND LIVE STAKES, SEE DETAIL 2 ON SHEET L11					
MULCH	INSTALL 4" DEPTH MULCH EXCEPT AROUND LIVE POLES AND LIVE STAKES					

**PLANTING MIX E: WETLAND UNDERSTORY ENHANCEMENT (111,210 SF)**

SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY
TREES	PSEUDOTSUGA MENZIESII	DOUGLAS-FIR	1 GAL. CONT.	10'	30%	116
	THUJA PLICATA	WESTERN REDCEDAR	1 GAL. CONT.	10'	40%	154
	TSUGA HETEROPHYLLA	WESTERN HEMLOCK	1 GAL. CONT.	10'	30%	116
SHRUBS	CORNUS SERICEA	REDOSIER DOGWOOD	1 GAL. CONT.	5'	15%	173
	MYRICA GALE	SWEET GALE	1 GAL. CONT.	5'	1%	12
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5'	13%	150
	RIBES BRACTEOSUM	STINK CURRANT	1 GAL. CONT.	5'	10%	116
	ROSA PISOCARPA	CLUSTER ROSE	1 GAL. CONT.	5'	13%	150
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5'	13%	150
	SALIX SCOULERIANA	SCOULER'S WILLOW	1 GAL. CONT.	5'	20%	231
	VIBURNUM OPULUS AMERICANUM	AMERICAN CRANBERRYBUSH	1 GAL. CONT.	5'	15%	173
	SEEDING	APPLY SEED MIX 2 - WETLAND				
SOIL PREPARATION	SOIL PREPARATION TYPE 2, SEE DETAIL 2 ON SHEET L11					
MULCH	INSTALL 4" DEPTH MULCH AT PLANTING AREA					

**PLANTING MIX G: WETLAND CREATION/REESTABLISHMENT/ENHANCEMENT 6" DEPTH MAX (7,917 SF)**

SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY	
GRASSES, RUSHES, & SEDGES	CAREX OBNUPTA	SLOUGH SEDGE	10" TUBE	3'	9%	91	
	CAREX STIPATA	SAWBEAK SEDGE	10" TUBE	3'	9%	91	
	ELEOCHARIS ACICULARIS	NEEDLE SPIKERUSH	10" TUBE	3'	8%	81	
	ELEOCHARIS PALUSTRIS	COMMON SPIKERUSH	10" TUBE	3'	9%	91	
	GLYCERIA BOREALIS	SMALL FLOATING MANNAGRASS	10" TUBE	3'	8%	81	
	GLYCERIA GRANDIS	AMERICAN MANNAGRASS	10" TUBE	3'	9%	91	
	GLYCERIA STRIATA	FOWL MANNAGRASS	10" TUBE	3'	8%	81	
	JUNCUS ENSIFOLIUS	SWORDLEAF RUSH	10" TUBE	3'	9%	91	
	SAGITTARIA LATIFOLIA	BROADLEAF ARROWHEAD	10" TUBE	3'	8%	81	
	SCHOENOPLECTUS ACUTUS	HARDSTEM BULRUSH	10" TUBE	3'	7%	71	
	SCIRPUS MICROCARPUS	SMALL FRUITED BULRUSH	10" TUBE	3'	9%	91	
	VERONICA AMERICANA	AMERICAN SPEEDWELL	10" TUBE	3'	7%	71	
	SEEDING	APPLY SEED MIX 2 - WETLAND					
	SOIL PREPARATION	INSTALL 3" DEEP LAYER OF COMPOST AND TILL INTO NATIVE SOIL, SEE NOTES SHEET L11					
	MULCH	DO NOT MULCH					

**NOT FOR CONSTRUCTION**

2/27/2019 4:47:01 PM - HANNAH SNOW - I:\ESA\PROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\L08 PLANTING SCHEDULE, 2 OF 3.DWG

10/12/18			
DATE	NO.	REVISION	BY



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG	DRAWN BY: DMS



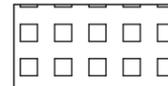
REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:



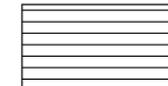
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE  
PLANTING SCHEDULE, 2 OF 3

REFERENCE SHEET NO. L08  
SHEET 34 OF 37 SHEETS

SECTION 34, T27N, R5E, W.M.



PLANTING MIX H: RIPARIAN ENHANCEMENT (9,562 SF)						
SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY
TREES	FRAXINUS LATIFOLIA	OREGON ASH	1 GAL. CONT.	10'	20%	22
	PICEA SITCHENSIS	SITKA SPRUCE	1 GAL. CONT.	10'	40%	44
	THUJA PLICATA	WESTERN REDCEDAR	1 GAL. CONT.	10'	40%	44
SHRUBS	CORNUS SERICEA	REDOSIER DOGWOOD	1 GAL. CONT.	5'	20%	66
	PHYSOCARPUS CAPITATUS	PACIFIC NINEBARK	1 GAL. CONT.	5'	20%	66
	RIBES BRACTEOSUM	STINK CURRANT	1 GAL. CONT.	5'	10%	33
	ROSA GYMNOCARPA	BALDHIP ROSE	1 GAL. CONT.	5'	15%	50
	RUBUS SPECTABILIS	SALMONBERRY	1 GAL. CONT.	5'	15%	50
	SALIX SCOULERIANA	SCOULER'S WILLOW	1 GAL. CONT.	5'	20%	66
	SEEDING	APPLY SEED MIX 2 - WETLAND				
SOIL PREPARATION	SOIL PREPARATION TYPE 2, SEE DETAIL 2 ON SHEET L11					
MULCH	INSTALL 4" DEPTH MULCH AT PLANTING AREA					



PLANTING MIX I: FLOODPLAIN WETLAND CREATION (6,481 SF)							
SYMBOL	SCIENTIFIC NAME	COMMON NAME	INSTALL SIZE	SPACING OC	DISTRIBUTION	QUANTITY	
LIVE POLES AND LIVE STAKES	SALIX HOOKERIANA	HOOKEER WILLOW	LIVE POLE	5'	10%	30	
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE POLE	5'	15%	45	
	SALIX SCOULERIANA	SCOULER'S WILLOW	LIVE POLE	5'	10%	30	
	SALIX SITCHENSIS	SITKA WILLOW	LIVE POLE	5'	15%	45	
	SALIX HOOKERIANA	HOOKEER WILLOW	LIVE STAKE	5'	10%	30	
	SALIX LASIANDRA	PACIFIC WILLOW	LIVE STAKE	5'	15%	45	
	SALIX SCOULERIANA	SCOULER'S WILLOW	LIVE STAKE	5'	10%	30	
	SALIX SITCHENSIS	SITKA WILLOW	LIVE STAKE	5'	15%	45	
	SEEDING	APPLY SEED MIX 2 - WETLAND					
	SOIL PREPARATION	INSTALL 3" DEEP LAYER OF COMPOST AND TILL INTO NATIVE SOIL, SEE NOTES SHEET L11					
MULCH	DO NOT MULCH						

SEED MIX 1 - UPLAND		
SCIENTIFIC NAME	COMMON NAME	DISTRIBUTION BY WEIGHT
BROMUS CARINATUS	CALIFORNIA BROME	20%
ELYMUS GLAUCUS	BLUE WILDRYE	25%
FESTUCA RUBRA	RED FESCUE	25%
LUPINUS POLYPHYLLUS	BIGLEAF LUPINE	10%
PRUNELLA VULGARIS	COMMON SELFHEAL	20%

SEED MIX 2 - WETLAND		
SCIENTIFIC NAME	COMMON NAME	DISTRIBUTION BY WEIGHT
AGROSTIS EXARATA	SPIKE BENTGRASS	35%
BECKMANNIA SYZIGACHNE	AMERICAN SLOUGHGRASS	10%
DESCHAMPSIA CESPITOSA	TUFTED HAIRGRASS	10%
GLYCERIA OCCIDENTALIS	WESTERN MANNAGRASS	5%
HORDEUM BRACHYANTHERUM	MEADOW BARLEY	40%

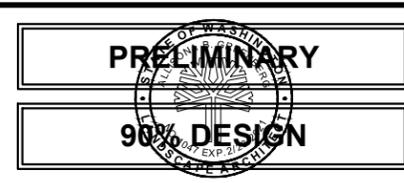
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2/27/2019 4:47:12 PM - HANNAH SNOW - I:\ESA\ESAPROJECTS\SEA\14XXXX\140291.00 SNOHOMISH COUNTY ON-CALL\TASK ORDER 2 - ADVANCE MITIGATION\08\_CADD\DWGS\90% DESIGN\L09 PLANTING SCHEDULE, 3 OF 3.DWG

DATE	NO.	REVISION	BY
10/12/18			



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG	DRAWN BY: DMS



REVIEWED AND APPROVED FOR CONSTRUCTION
SNOHOMISH COUNTY ENGINEER
DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**

FUNDING NO. \_\_\_\_\_

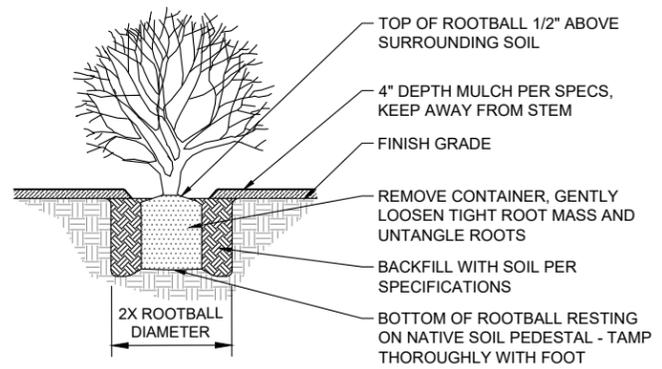
LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE

**PLANTING SCHEDULE, 3 OF 3**

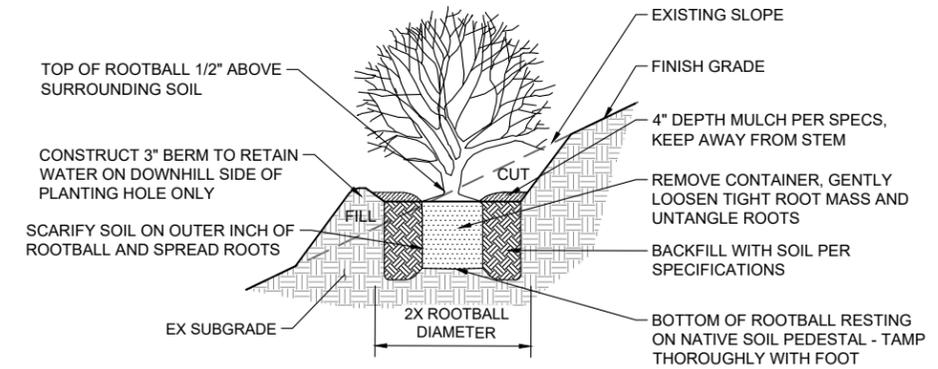
REFERENCE SHEET NO.  
**L09**

SHEET  
**35**  
OF  
**37**  
SHEETS

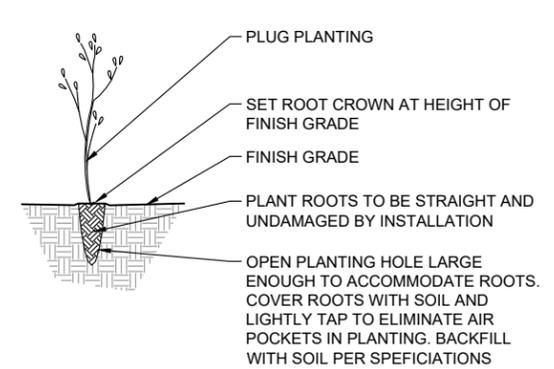
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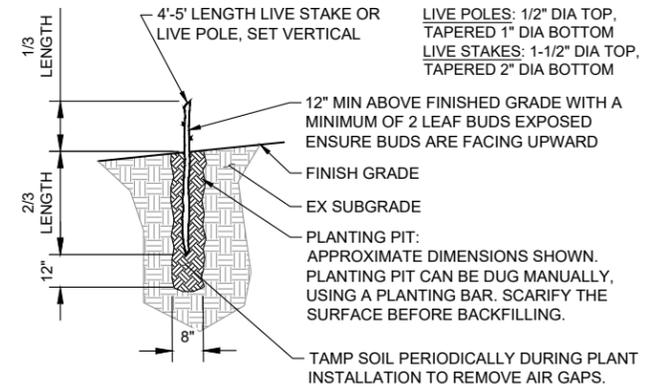
1 CONTAINER PLANTING NOT TO SCALE  
- DETAIL



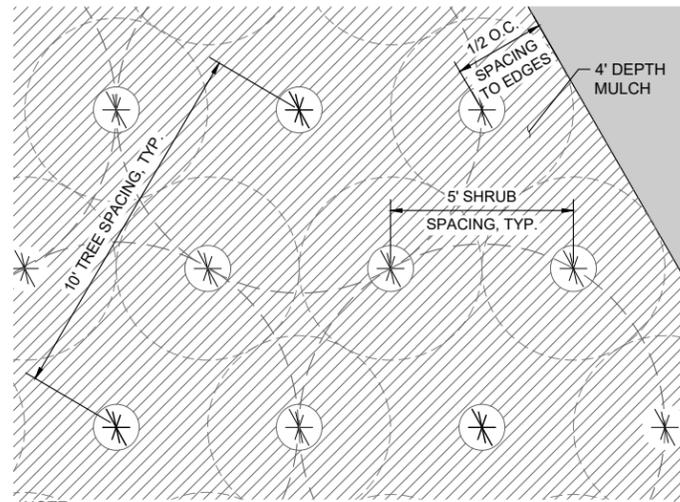
2 CONTAINER PLANTING ON SLOPE NOT TO SCALE  
- DETAIL



3 PLUG PLANTING NOT TO SCALE  
- DETAIL

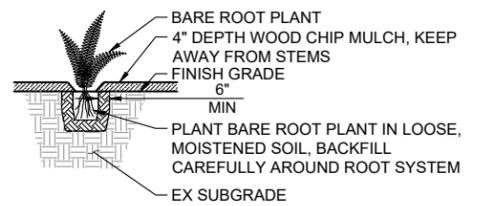


4 LIVE POLE AND LIVE STAKE PLANTING NOT TO SCALE  
- DETAIL

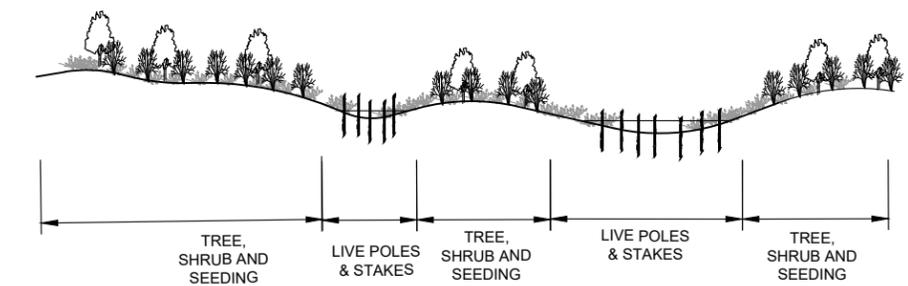


NOTE:  
1. MITIGATION PLANTING LAYOUT IS CONCEPTUAL AND INTENDED TO SHOW GROUPINGS OF SIMILAR SPECIES OF PLANTS.  
2. GROUP EACH SPECIES IN ODD-NUMBERED CLUSTERS OF 3 TO 9.  
3. PLANT LAYOUT AND TRIANGULAR SPACING MAY BE ADJUSTED TO MEET FIELD CONDITIONS WITH THE ACCEPTANCE OF THE ENGINEER.  
4. IN BUFFER RESTORATION AREA SURROUND EACH TREE WITH SHRUBS, RETAINING THE 6' O.C. SPACING OF THE SHRUBS AS SHOWN IN THIS DETAIL.

6 TREE & SHRUB PLANTING LAYOUT NOT TO SCALE  
- DETAIL PLAN



5 BARE ROOT PLANTING NOT TO SCALE  
- DETAIL



7 MOSAIC PLANTING NOT TO SCALE  
- SECTION

**NOT FOR CONSTRUCTION**

10/12/18				
DATE	NO.	REVISION	BY	



UPI NO.:	FED. AID PROJ. NO.:
SURVEY NO.:	FIELD BOOK(S):
HORZ. DATUM: LOCAL	VERT. DATUM: NAVD 88
DESIGNED BY: ABG	DRAWN BY: DMS



REVIEWED AND APPROVED FOR CONSTRUCTION  
  
SNOHOMISH COUNTY ENGINEER  
  
DATE APPROVED:

**SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS**  
  
FUNDING NO. \_\_\_\_\_

LITTLE BEAR CREEK  
ADVANCED MITIGATION SITE  
  
**PLANTING DETAILS**

REFERENCE SHEET NO. L10  
SHEET 36 OF 37 SHEETS





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# Appendix B

## Credit-Debit Forms



**Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Washington**

**Credit Worksheet** (corrected 2/20/18)

Project Little Bear Creek - Depressional Wetlands

Only fill in boxes that are highlighted. Use risk factors in table below.

Mitigation Project is:      Advanced x      Concurrent

**This spreadsheet can calculate credits for three separate mitigation sites.**

**Input Ratings for Functions from Scoring Sheet.**

	Site 1	Enhancement (A, C)		Site 2	Rehabilitation(G, H)		Site 3	Re-establishment	
<b>Insert a "1" in cell if creation or re-establishment</b>							1		
<b>Rating of Unit BEFORE mitigation</b>	Improving Water Quality			Improving Water Quality			Improving Water Quality		
		Hydrologic	Habitat		Hydrologic	Habitat		Hydrologic	Habitat
Site Potential (H,M,L)	M	L	M	L	L	M			
Landscape Potential (H,M,L)	M	M	L	M	M	L			
Value (H,M,L)	H	H	M	H	H	M			
Score for Wetland Unit	7	6	5	6	6	5	0	0	0

	Site 1			Site 2			Site 3			
<b>Rating of Unit AFTER mitigation</b>	Improving Water Quality			Improving Water Quality			Improving Water Quality			
		Hydrologic	Habitat		Hydrologic	Habitat		Hydrologic	Habitat	
Site Potential (H,M,L)	H	M	H	H	M	H	H	M	H	
Landscape Potential (H,M,L)	M	M	L	M	M	L	M	M	L	
Value (H,M,L)	H	H	M	H	H	M	H	H	M	
Score for Wetland Unit	8	7	6	8	7	6	8	7	6	
Lift in Functions		1	1	1	2	1	1	8	7	6

Your Landscape Potential BEFORE is not the same as AFTER - Make Sure your LP(after) conforms to Notes 4.1-4.4

Your Landscape Potential BEFORE is not the same as AFTER - Make Sure your LP(after) conforms to Notes 4.1-4.4

CREATION and RE-ESTABLISHMENT									
Acres created or re-established (aquatic bed, shrub, forest)							4.37		
Basic mitigation Credit	0	0	0	0	0	0	34.96	30.59	26.22
Risk Factor (see below)	1			1			1		
<b>CREDITS</b>	0	0	0	0	0	0	34.96	30.59	26.22
REHABILITATION AND ENHANCEMENT									
Acres rehabilitated or enhanced (aquatic bed, shrub, forest)	3.86			0.52					
Basic mitigation Credit	3.86	3.86	3.86	1.04	0.52	0.52	0	0	0
Risk Factor (see below)	1			1			1		
<b>CREDITS</b>	3.86	3.86	3.86	1.04	0.52	0.52	0	0	0
Acres rehabilitated or enhanced (emergent)									
Basic mitigation Credit	0	0	0	0	0	0	0	0	0
Risk Factor (see below)									
<b>CREDITS</b>	0	0	0	0	0	0	0	0	0
PRESERVATION									
Acres of wetlands preserved									
Score for wetland functions from Scoring Sheet									
Sum of scaling factors (Appendix E)									
<b>CREDITS</b>	0	0	0	0	0	0	0	0	0
Acres of upland preserved	2.14								
Habitat score for upland			5						
Sum of scaling factors (Appendix E)			0.15						
<b>CREDITS</b>			1.605				0		0

**TOTALS**

Function	Site 1			Site 2			Site 3		
	Improving Water Quality	Hydrologic	Habitat	Improving Water Quality	Hydrologic	Habitat	Improving Water Quality	Hydrologic	Habitat
Acre-points	<b>3.86</b>	<b>3.86</b>	<b>5.465</b>	<b>1.04</b>	<b>0.52</b>	<b>0.52</b>	<b>34.96</b>	<b>30.59</b>	<b>26.22</b>

**Total Credits by Function for Project**

Acre-points	Improving Water Quality		
	Hydrologic	Habitat	
<b>39.86</b>	<b>34.97</b>	<b>32.205</b>	

**Risk Factors:**

Type of Mitigation	Risk Factor
<p><b>Advance Mitigation</b></p> <p>The site meets <b>criteria in Charts 1 and 3</b> of the site selection guidance [i.e., identified in a local plan and is sustainable] <b>AND</b> meets the <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 for western Washington or #10-06-007 for eastern Washington are submitted)</p> <p><i>Advance means that at least two years has passed since plantings were completed <del>or one year since "as-built" plans were submitted to regulatory agencies.</del></i></p>	1.0
Advance mitigation without meeting criteria in Ecology publication #09-06-032 or #10-06-007	0.83
<p><b>Concurrent Mitigation</b></p> <p>Mitigation site meets <b>criteria in Charts 1 and 3</b> of the site selection guidance [i.e., identified in a local plan and is sustainable] <b>AND</b> meets the <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 or #10-06-007 are submitted)</p> <p><i>Risk factor applies to all types of mitigation.</i></p>	0.9
<p>Mitigation site chosen meets the <b>criteria in Charts 2 and 3</b> of the site selection guidance [i.e., identified as a site with potential and that is sustainable]; <b>AND</b> meets <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 or #10-06-007 are submitted)</p> <p><i>Risk factor applies to all types of mitigation.</i></p>	0.80
<p><i>Site does not meet criteria in site selection guide, or guide was not used.</i></p> <p><b>Re-establishment, rehabilitation, or enhancement</b> that results in an aquatic bed, shrub, or forest community</p>	0.67
<b>Re-establishment, rehabilitation, or enhancement</b> that results in an emergent community	0.5
<b>Creation</b> of an aquatic bed, shrub, or forest community with data showing there is adequate water to maintain wetland conditions 5 years out of every 10.	0.67
<b>Creation</b> of an emergent community with data showing there is adequate water to maintain wetland conditions 5 years out of every 10.	0.5
<b>Creation</b> of an aquatic bed, shrub, or forest community without adequate hydrologic data.	0.5
<b>Creation</b> of an emergent community without adequate hydrologic data.	0.4

**Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Washington**

**Credit Worksheet** (corrected 2/20/18)

Project

Only fill in boxes that are highlighted. Use risk factors in table below.

Mitigation Project is: Advanced  Concurrent

This spreadsheet can calculate credits for three separate mitigation sites.

**Input Ratings for Functions from Scoring Sheet.**

	Site 1	Enhancement (J, M,	Site 2	Slope Creation	Site 3				
<i>Insert a "1" in cell if creation or re-establishment</i>			1						
<b>Rating of Unit BEFORE mitigation</b>	Improving Water Quality			Improving Water Quality			Improving Water Quality		
	Hydrologic	Habitat	Hydrologic	Habitat	Hydrologic	Habitat	Hydrologic	Habitat	
Site Potential (H,M,L)	L	L	L						
Landscape Potential (H,M,L)	L	L	L						
Value (H,M,L)	H	H	L						
Score for Wetland Unit	5	5	3	0	0	0	3	3	3

	Site 1			Site 2			Site 3		
<b>Rating of Unit AFTER mitigation</b>	Improving Water Quality			Improving Water Quality			Improving Water Quality		
	Hydrologic	Habitat	Hydrologic	Habitat	Hydrologic	Habitat	Hydrologic	Habitat	
Site Potential (H,M,L)	M	M	M	m	m	m			
Landscape Potential (H,M,L)	L	L	L	l	l	l			
Value (H,M,L)	H	H	L	H	H	L			
Score for Wetland Unit	6	6	4	6	6	4	3	3	3
Lift in Functions	1	1	1	6	6	4	0	0	0

CREATION and RE-ESTABLISHMENT										
Acres created or re-established (aquatic bed, shrub, forest)				0.16						
Basic mitigation Credit	0	0	0	0.96	0.96	0.64	0	0	0	
Risk Factor (see below)				1						
<b>CREDITS</b>	0	0	0	0.96	0.96	0.64	0	0	0	
REHABILITATION AND ENHANCEMENT										
Acres created or re-established (emergent)										
Basic mitigation Credit	0	0	0	0	0	0	0	0	0	
Risk Factor (see below)	1			1						
<b>CREDITS</b>	0	0	0	0	0	0	0	0	0	
REHABILITATION AND ENHANCEMENT										
Acres rehabilitated or enhanced (aquatic bed, shrub, forest)	1.38									
Basic mitigation Credit	1.38	1.38	1.38	0	0	0	0	0	0	
Risk Factor (see below)	1									
<b>CREDITS</b>	1.38	1.38	1.38	0	0	0	0	0	0	
REHABILITATION AND ENHANCEMENT										
Acres rehabilitated or enhanced (emergent)										
Basic mitigation Credit	0	0	0	0	0	0	0	0	0	
Risk Factor (see below)	1									
<b>CREDITS</b>	0	0	0	0	0	0	0	0	0	
PRESERVATION										
Acres of wetlands preserved										
Score for wetland functions from Scoring Sheet										
Sum of scaling factors (Appendix E)										
<b>CREDITS</b>	0	0	0	0	0	0	0	0	0	0
PRESERVATION										
Acres of upland preserved										
Habitat score for upland										
Sum of scaling factors (Appendix E)										
<b>CREDITS</b>			0				0			0

TOTALS	Site 1			Site 2			Site 3		
	Improving Water Quality	Hydrologic	Habitat	Improving Water Quality	Hydrologic	Habitat	Improving Water Quality	Hydrologic	Habitat
Function									
Acre-points	<b>1.38</b>	<b>1.38</b>	<b>1.38</b>	<b>0.96</b>	<b>0.96</b>	<b>0.64</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total Credits by Function for Project</b>									
Acre-points	<b>2.34</b>	<b>2.34</b>	<b>2.02</b>						

**Risk Factors:**

Type of Mitigation	Risk Factor
<p><b>Advance Mitigation</b></p> <p>The site meets <b>criteria in Charts 1 and 3</b> of the site selection guidance [i.e., identified in a local plan and is sustainable] <b>AND</b> meets the <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 for western Washington or #10-06-007 for eastern Washington are submitted)</p> <p><i>Advance means that at least two years has passed since plantings were completed <del>or one year since "as-built" plans were submitted to regulatory agencies.</del></i></p>	1.0
Advance mitigation without meeting criteria in Ecology publication #09-06-032 or #10-06-007	0.83
<p><b>Concurrent Mitigation</b></p> <p>Mitigation site meets <b>criteria in Charts 1 and 3</b> of the site selection guidance [i.e., identified in a local plan and is sustainable] <b>AND</b> meets the <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 or #10-06-007 are submitted)</p> <p><i>Risk factor applies to all types of mitigation.</i></p>	0.9
<p>Mitigation site chosen meets the <b>criteria in Charts 2 and 3</b> of the site selection guidance [i.e., identified as a site with potential and that is sustainable]; <b>AND</b> meets <b>criteria in Charts 4-11</b> for the appropriate functions. (All worksheets for Chart 3 and in Appendix B of Ecology publication #09-06-032 or #10-06-007 are submitted)</p> <p><i>Risk factor applies to all types of mitigation.</i></p>	0.80
<p><i>Site does not meet criteria in site selection guide, or guide was not used.</i></p> <p><b>Re-establishment, rehabilitation, or enhancement</b> that results in an aquatic bed, shrub, or forest community</p>	0.67
<b>Re-establishment, rehabilitation, or enhancement</b> that results in an emergent community	0.5
<b>Creation</b> of an aquatic bed, shrub, or forest community with data showing there is adequate water to maintain wetland conditions 5 years out of every 10.	0.67
<b>Creation</b> of an emergent community with data showing there is adequate water to maintain wetland conditions 5 years out of every 10.	0.5
<b>Creation</b> of an aquatic bed, shrub, or forest community without adequate hydrologic data.	0.5
<b>Creation</b> of an emergent community without adequate hydrologic data.	0.4