SUBMITTED TO:
Mark Burrus
H.W. Lochner
915 118th Avenue SE, Suite 130
Bellevue, Washington 98005

BY:
Shannon & Wilson, Inc.
400 N. 34th St., Suite 100
Seattle, Washington 98103

(206) 632-8020
www.shannonwilson.com

WETLAND AND STREAM MITIGATION REPORT

HARBOUR REACH CORRIDOR PROJECT

MUKILTEO, WASHINGTON

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

January 15, 2019

21-1-12561-203

TABLE OF CONTENTS

Page

TABLES

Page

EXHIBITS

APPENDICES

WETLAND AND STREAM MITIGATION REPORT FOR THE HARBOUR REACH CORRIDOR PROJECT MUKILTEO, WASHINGTON

1.0 INTRODUCTION

Shannon & Wilson was contracted by HW Lochner on behalf of the City of Mukilteo (City) to develop a mitigation plan for adverse impacts to wetlands, streams, and their buffers along Harbour Reach Drive between Harbour Pointe Boulevard SW and Beverly Park Road (Sheet 1 in Appendix A). The project area contains six wetlands (A through F) and three streams (1, 2, and 3). This report will summarize the proposed temporary and permanent impacts to these critical areas and their buffers and provide the mitigation plan details required by City of Mukilteo Municipal Code (MMC) Section 17.52B.140 and 17.52C.140.

The proposed stream and wetland impacts and the proposed mitigation were authorized by the U.S. Army Corps of Engineers on August 9, 2018, via Nationwide Permit 14.

2.0 EXISTING CONDITIONS

On-site wetland and streams were identified and assessed in the field in November 2016 and summarized in a report titled "Revised Wetland and Stream Delineation Report for the Harbour Reach Drive Extension Project" (Shannon & Wilson, 2017a). The existing conditions of the impacted critical areas and buffers (Wetlands A and D, Streams 1 and 3) are summarized below, as well as two wetlands (E and F) that were not part of the initial study area but are near the proposed project.

2.1 Wetland A

Wetland A is a narrow fringe along Stream 1 between Harbour Pointe Boulevard SW to the north and Blue Heron Boulevard and the Travis Business Park to the south. Primarily native shrubs and groundcovers dominate the wetland, but there are also red alders and a few western red cedars at the edge of the wetland. The most common shrub was salmonberry throughout and localized patches of devil's club. Groundcover species include skunk cabbage, lady fern, western jewelweed, stinging nettle, and piggy-back plant. The only noted invasive species was Robert's geranium, which is not listed on the Snohomish County noxious weed list.

The wetland is fed by multiple sources of hydrology, including tributaries of North Fork Picnic Point Creek, which join at the east end of the delineated portion of Wetland A. A high water

table, slope runoff, and precipitation likely also support the stream and wetland community. At the time of the summer site visit, primary indicators of hydrology were not apparent; however, drainage patterns, geomorphic position, and site visits conducted in other seasons suggest the hydrology criterion is satisfied. Wetland A is classified as a riverine Category II wetland with a standard buffer of 165 feet required by the City (MMC 17.52B.100.B).

2.2 Wetland D

Wetland D is a depressional wetland located in a natural gully that was modified in 1991 by constructing a fill embankment at the downstream end of the gully to create an impoundment that collects surface drainage and piped stormwater runoff. A concrete stormwater pipe discharges into Wetland D at the base of the concrete wall along South Road. According to City drainage maps, the water is collected from South Road and possibly the large development to the east. The lower, central portions of the depression are vegetated primarily with reed canarygrass, and a variety of sparser sedges and other herbs. The scrub-shrub and forest edges of the wetland include western red cedar, red alder, Pacific and other willows, red-osier dogwood, and salmonberry. Snags, stumps, and downed wood are abundant, and evidence of recent beaver activity was noted.

In addition to stormwater inflow, the wetland is likely also maintained by groundwater and precipitation; the primary source of hydrology varies by season. Based on visits conducted during both summer and winter months, the wetland is seasonally ponded. Wetland D is classified as a depressional Category II wetland with a standard buffer of 165 feet required by the City (MMC 17.52B.100.B). Wetland D is included in the site's native growth protection area shown on the Harbour Pointe Industrial Park binding site plan (W&H Pacific, 1991).

2.3 Wetland E

Wetland E is located east of Harbour Reach Drive and is in a narrow-forested strip bordered by the Travis Business Park to the north and South Road to the south. It appears to have been created by impoundment of Stream 3 to form a detention facility. Wetland E was not formally delineated or classified in 2016 as no impacts to it or its buffer were anticipated at that time. However, it was observed during the field study and it appeared generally consistent with the boundaries shown on the City's *Streams, Wetlands & Watersheds map* (City, 2010). The Harbour Pointe Industrial Park binding site plan (W&H Pacific, 1991) also shows the original wetland boundaries prior to impoundment and the designated Native Growth Protection Area (Exhibit 1).

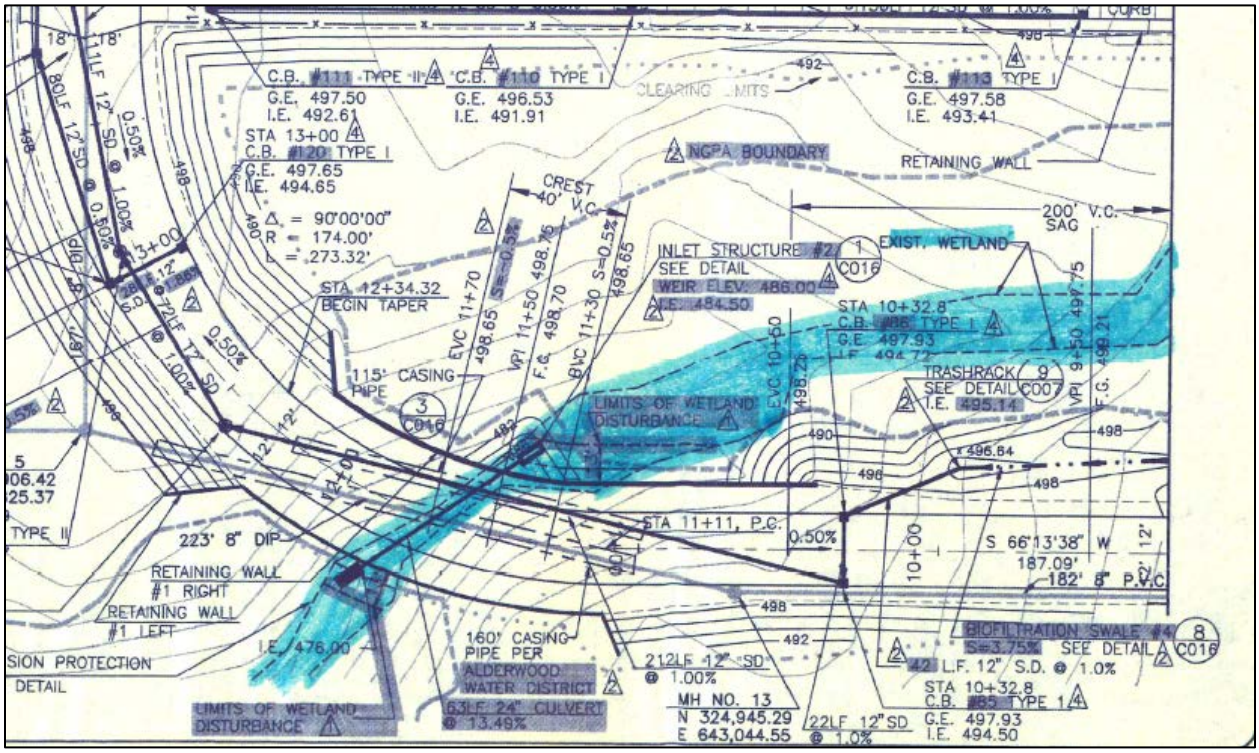


Exhibit 1. Excerpt from Harbour Pointe Industrial Park Phase I Grading & Drainage Plan, Sheet C014, Issued August 2, 1991 (W&H Pacific). Note the boundary of the Native Growth Protection Area (NGPA).

2.4 Wetland F

Wetland F (Pond "M") is a long depression east of Harbor Reach Drive and north of Harbour Pointe Boulevard SW on a City-owned parcel. Wetland F was not formally delineated in 2016 as no impacts to it or its buffer were anticipated at that time. It appears to have been created by the City to serve as a detention pond in the early 1990s by impoundment of a tributary to Stream 1. The sideslopes to the northwest were graded at 3:1, and a berm was constructed along the southeast boundary, with the original tributary stream relocated to flow along the southeast side of the new berm (Exhibit 2).

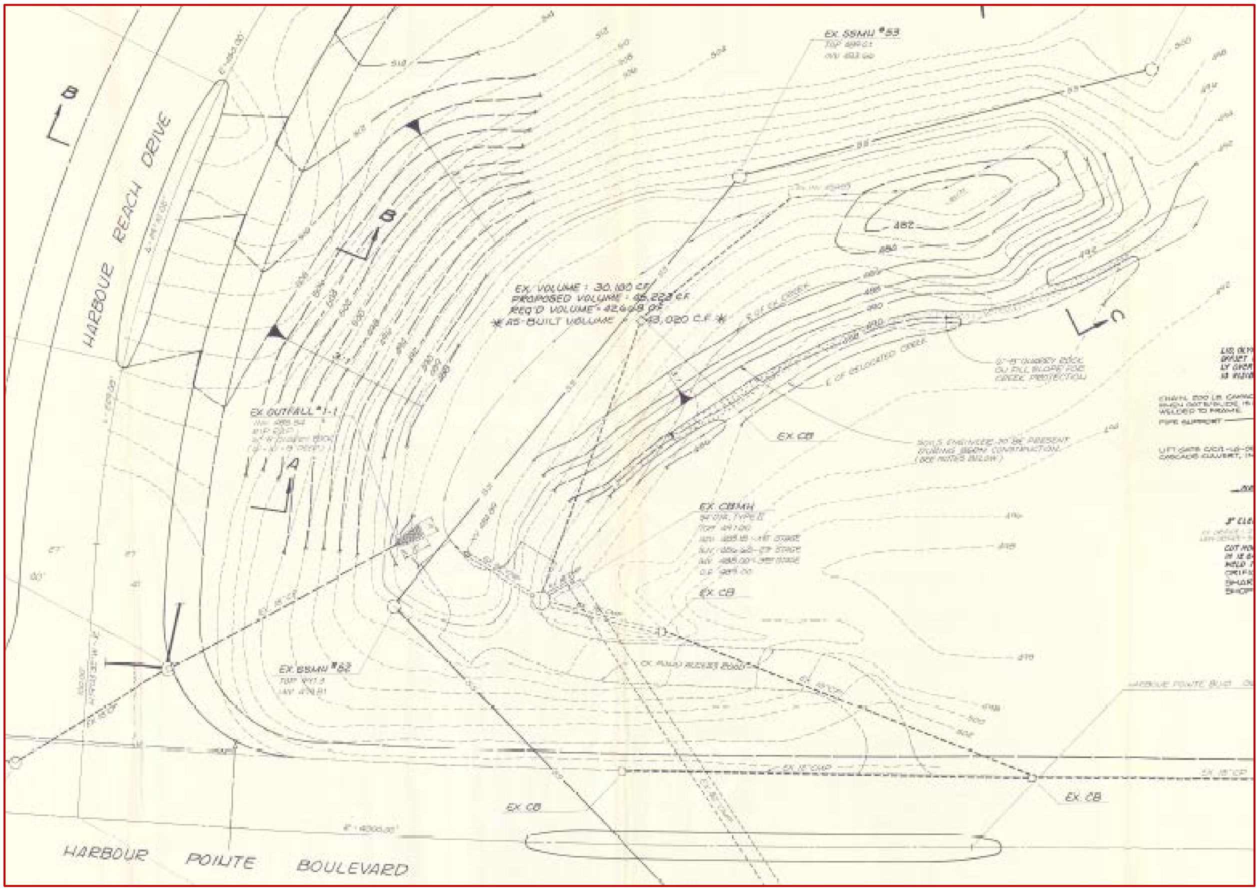


Exhibit 2. Excerpt from Pond "M" Plan for Harbour Point Sector 15, Sheet 12, As-built dated October 18, 1990 (Lovell-Sauerland & Associates, Inc.).

2.5 Stream 1

Stream 1, which flows through Wetlands A and F, has had some flow during most of the seasons in which site visits have been conducted in 2015, 2016, and 2017. Some ponding, but no flow, was observed in late October 2017. The stream forks just upstream of the proposed new stream crossing, with one branch passing underneath Harbour Pointe Boulevard SW to the north and the other originating from the east near Cyrus Way. According to the stream crossing assessment (Shannon & Wilson, 2017b), "…the slope of the North Fork channel bed upstream of the proposed crossing is 0.7 percent and the slope of the North Fork channel bed downstream of the proposed crossing is 1.03 percent. The average channel bed slope in the vicinity of the proposed North Fork channel crossing is 1.0 percent." The average bankfull width was measured as 7.4 feet. The stream bed is a mix of gravels and sands. Numerous pieces of large and small wood are present in the stream, and the channel is modestly incised in some areas, with stretches

of undercut bank. No fish were observed. Stream 1 is classified as a Type 3 stream with a 150-foot standard buffer required by the City (MMC 17.52C.090.A).

2.6 Stream 3

Stream 3 has been dry during most summer, fall, and winter site visits, with flows only observed following rain events. The stream emerges from a culvert at the base of a high retaining wall on the south side of South Road, and then flows southwest and west where it ultimately joins the large Picnic Point Creek wetland system and merges with the Stream 1 and Stream 2 flows. On the north side of South Road, the stream is impounded, forming Wetland E in a narrow strip of forest. According to the stream crossing assessment (Shannon & Wilson, 2017b), "[t]he average channel bed slope in the vicinity of the proposed South Fork channel crossing is four percent." The average bankfull width was measured as 6.5 feet. The stream bed is primarily coarse gravel with sand and some cobbles. Woody debris is less abundant in the project area, but increases downstream. The channel is substantially incised in the vicinity of the proposed crossing but is less incised farther downstream. Based on the City's classification, other reports, flow conditions, and lack of fish observations, Stream 3 is classified as a Type 5 stream with a standard buffer of 50 feet required by the City (MMC 17.52C.090.A).

2.7 Uplands

The upland areas adjacent to the streams and wetlands are mixed forest (conifer and deciduous), with similar species assemblages throughout. The common trees include Douglas-fir, western hemlock, western red cedar, big-leaf maple, and red alder. The shrub layer is dominated by salmonberry, red elderberry, red huckleberry, devil's club, Oregon grape, salal, and small amounts of invasive Himalayan and evergreen blackberry. Sword fern, Pacific bleeding heart, Pacific dewberry, and false lily-of-the-valley are the dominant groundcovers.

3.0 PROPOSED IMPACTS

Temporary and/or permanent impacts will occur in the aforementioned streams, wetland, and/or their buffers as a result of the road crossings and stormwater conveyance and outfalls.

3.1 Mitigation Sequencing

MCC 17.52B.120 states that:

> "…After careful consideration of the potential impacts and a determination that impacts are unavoidable, unavoidable impacts to wetlands not exempt under Section 17.52B.040 or

meeting the criteria for a reasonable use exception in Section 17.52.025 shall be mitigated. Mitigation actions by an applicant shall occur in the following priority sequence:

1. Avoiding the impact altogether by not taking a certain action or parts of actions;
2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation (e.g., use of appropriate technology, consideration of alternative site plans and building layouts and/or reductions in the density or scope of the proposal);
3. Rectifying the impact by repairing, rehabilitating or restoring the affected environment;
4. Reducing or eliminating the impact or hazard over time by preservation and maintenance operations during the life of the action;
5. Compensating for the impact by replacing, enhancing or otherwise providing equivalent or greater wetland functions;
6. Monitoring the impact and taking appropriate corrective measures."

The project design process and selection of a preferred alternative sequentially included all of the standard mitigation sequencing steps. To the extent practicable considering the project costs and the necessary location of the two new road connections, impacts to streams and wetland have been avoided and then minimized.

3.1.1 Avoid and Minimize

The two new stream crossings have been designed consistent with Washington State Department of Fish and Wildlife's (WDFW) *Water Crossing Design Guidelines* (Barnard and others, 2013). The crossing of Stream 1 has a larger-diameter culvert (26 feet) spanning the wetland and stream than the minimum required by City code and WDFW, which substantially reduces the impacts to Stream 1 and Wetland A. The proposed complete span of the wetland with a 26-foot-wide culvert allows the hydrologic connection to be maintained between the wetland areas on the east and west sides of the future road. The road footprint has been kept as narrow as possible at stream and wetland crossings by using vertical retaining walls rather than side slopes. The wide span of the Stream 1/Wetland A culvert also allows area wildlife to move freely along the wetland/stream corridor.

The footprint of the existing north-south segment of South Road between the two new roadway sections to the north and south will not be widened, except at the southern terminus where a roundabout will be installed. This eliminates temporary and permanent impacts to Stream 2; Wetlands B, C, and D; and their buffers. The roundabout will require some additional encroachment into the buffer of Stream 3 but will not encroach into the NGPA of Wetland E. The crossing of Stream 3 also meets City code and WDFW standards for culvert span width necessary for fish and streamflow passage.

The stream crossing plans were provided to both WDFW and the Tulalip Tribes for review early in the design process, and revised per their feedback.

3.1.2 Rectify

Plantings of trees, shrubs, and/or groundcover will be installed to restore temporary impacts to the wetland, streams, and associated buffers. The construction sequencing for the restoration activities will include decompaction and amending of soils; hydroseeding where necessary; and the installation of plants that will include the appropriate number of trees, shrubs, and groundcover as determined by the amount of disturbance. See Section 4.0 and Appendix A of this report for a more detailed description of the wetland and buffer restoration.

3.1.3 Reduce or Eliminate

In order to ensure that performance standards are being met, maintenance will be conducted as needed at the mitigation sites. The contractor will be responsible for maintaining the planting areas for the first year following construction and the City for the remainder of the monitoring period. Maintenance will include activities such as watering, weeding, replacing or adding plants, removing all classes of noxious weeds, and implementing any other activities that facilitate the success of the project.

3.1.4 Compensate

The majority of the project's permanent impacts are to stream and wetland buffer (net loss of 31,507 square feet). The buffers are generally located in a high-quality, native forest with limited on-site opportunity for restoration or enhancement. The City's *Critical Areas Mitigation Program* (CAMP) specifies that "[o]ff-site compensation for buffer impacts shall use the Mukilteo Habitat Reserve (MHR)" (ESA, 2011). The MHR is an in-lieu fee component of the CAMP that provides funding for preservation and enhancement of three sites located in the Japanese Gulch sub-basin. While the project is not located in the Japanese Gulch sub-basin, the CAMP has explicitly expanded the service area for the MHR to include the Picnic Point sub-basin in recognition of the shared "hydrologic and habitat functions provided within the sub-basins…" and their joint contributions to the ecologic functions of the nearshore environment of Mukilteo.

In addition to use of the City's CAMP in-lieu fee program to compensate for permanent buffer impacts, Wetland D will be enhanced to compensate for permanent impacts to Wetland A. Opportunities to enhance Wetland A are not available considering its existing condition in a

mostly protected native forest corridor. Creation of new wetland is not feasible on the City-owned properties in the project area except at the expense of native upland forest.

See Section 4.0 and the plans in Appendix A for more detail about the proposed compensation for permanent and temporary impacts to wetland and stream/wetland buffers.

3.1.5 Monitor

On-site restoration of temporarily impacted wetland and buffers associated with Wetland A/Stream 1 and the enhanced Wetland D will be monitored for five years, with detailed reports provided to the U.S. Army Corps of Engineers (Corps), Washington State Department of Ecology (Ecology), and the City in Years 1, 2, 3, and 5, or as otherwise required by the agencies. See Section 7.0 of this report for a description of the monitoring protocol and conditions that would trigger preparation of and compliance with a Contingency Plan (Section 8.0).

3.2 Permanent Impacts

New roadway sections will be constructed from Harbour Pointe Boulevard SW to Blue Heron Boulevard (north section) and from South Road to Beverly Park Road (south section). The northern section will cross Stream 1 and Wetland A; the southern section will cross Stream 3. A 2-foot thickness of naturally occurring water-rounded aggregate will be placed 2 feet below the regraded channel and new streambed material bottom to provide scour protection.

Stormwater detention vaults and modular wetland treatment facilities will be constructed in the road footprint, but conveyance and their outfalls will be located in the buffers of Wetland A and Streams 1 and 3. The two outfalls will be bubble-up energy dissipaters in 48-inch concrete catch basins topped with a birdcage grate and will be located as close to the walls as feasible. From the detention vault to the outfalls, the treated stormwater will flow through high-density polyethylene pipe anchored to the ground surface with manta rays.

Using the project design information provided by HW Lochner and Perteet in October and November 2018, the proposed project could permanently impact critical areas and their buffers in the following ways:

TABLE 1
PERMANENT IMPACTS

Critical Area	Permanent Alterations	
	Type	Approximate Area (square feet)
Stream 1/Wetland A Buffer	Replacement with roadway and addition of stormwater conveyance and outfall.	24,136
Stream 3 Buffer	Replacement with roadway and addition of stormwater conveyance and outfall.	7,483
	Net Stream/Wetland Buffer Impact	31,619
Wetland A	Crossing with bottomless arch (shade and conversion to realigned stream channel)	692

3.3 Temporary Impacts

Temporary impacts to Wetland A, Streams 1 and 3, and their associated buffers will result from activities associated with the installation of the culverts, stormwater conveyance, and road. Using the project design information provided by Lochner and Perteet in October and November 2018, the proposed project could temporarily impact critical areas and their buffers in the following ways:

TABLE 2
TEMPORARY IMPACTS

Critical Area	Temporary Alterations	
	Approximate Area (square feet)	Type
Stream 1	949	Modification (grade and fills) of the existing channel in, upstream of, and downstream of the culvert to create a realigned channel that will have long-term stability while allowing for passage of flow and fish. A water line will also cross under Stream 3 immediately west of the retaining wall and be placed in a trench approximately 5 feet below the channel. Potential impacts to water quality will be avoided and minimized through use of BMPs. Stream 1 is expected to have little to no flow during construction; Stream 3 is expected to be dry.
Wetland A	317	
Stream 3	1,731	
Stream 1/Wetland A Buffer	9,526	Clearing and other disturbance to construct roadway, walls, stormwater infrastructure, and culverts with reconfigured channels. Potential impacts to water quality will be avoided and minimized through use of BMPs. Streams 1 and 3 are expected to have flows less than 1 cubic foot per second during construction.
Stream 3 Buffer	4,124	

Note:
BMP = Best Management Practices

4.0 PROPOSED MITIGATION

Unavoidable adverse impacts to wetlands, streams, and buffer functions require compensatory mitigation through restoration, creation, or enhancement actions on or adjacent to the site where feasible, on sites identified in the City's CAMP report (ESA, 2011), or on other sites in Mukilteo or its urban growth area identified through a watershed approach (MMC 17.52B.130.A and MMC 17.52C.110). A 2008 federal rule titled "Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (Federal Rule) 33 CFR Section 332.3(b)" establishes preferences for aquatic resource compensation in the following order:

1. Wetland mitigation banks,
2. In-lieu fee programs,
3. Permittee-responsible mitigation under a watershed approach,
4. Permittee-responsible mitigation through on-site and in-kind mitigation, and lastly
5. Permittee-responsible mitigation through off-site and/or out-of-kind mitigation.

Per City code, credits from approved mitigation banks may be used when impacts are located within the service area specified in the bank's certification and in some cases in basins adjacent to the drainage basin for specific wetland functions (MMC 17.52B.130.C.5). There are currently no approved wetland or habitat mitigation banks, or wetland in-lieu fee programs, that include the Project site in their service areas.

The impacted critical areas and their buffers are generally located in a high-quality, native forest with limited on-site opportunity for restoration or enhancement. The City's code requires that permanent impacts to non-estuarine or non-interdunal Category II wetlands be mitigated at a ratio of 12:1 if the impact is compensated through wetland enhancement (MMC 17.52B.130.B). The permanent wetland impacts total 692 square feet, and thus require 8,304 square feet of enhancement. Proposed enhancement will occur in Wetland D, which is currently dominated by dense reed canarygrass in the central portions of the wetland. After localized reed canarygrass trimming around each willow pole location, the poles will be installed and then ringed with mulch.

As shown in Table 1, the proposed project is expected to permanently impact 31,619 square feet of combined Stream 1/Wetland A buffer and Stream 3 buffer. The City's CAMP specifies that "[o]ff-site compensation for buffer impacts shall use the Mukilteo Habitat Reserve (MHR)." The MHR is an in-lieu fee component of the CAMP that provides funding for preservation and enhancement of three sites located in the Japanese Gulch sub-basin. While the project is not located in the Japanese Gulch sub-basin, the CAMP has explicitly expanded the service area for

the MHR to include the Picnic Point sub-basin in recognition of the shared "hydrologic and habitat functions provided within the sub-basins…" and their joint contributions to the ecologic functions of the nearshore environment of Mukilteo. The City's CAMP identifies a per-square-foot cost for buffer mitigation to establish the in-lieu fee amount, and considers the existing condition (e.g., cover by native woody vegetation). Because the impacted wetland and stream buffer areas have a conifer cover greater than 30 percent, the impact area must be doubled to determine the mitigation area, which comes to a total of approximately 63,238 square feet (1.45 acres).

Detailed restoration and mitigation plans are provided in Appendix A.

4.1 Environmental Goals and Objectives

Per MMC 17.52B.140.A.1, the following section provides the goals and objectives of the proposed mitigation.

Goal 1: Restore native vegetation communities in temporarily disturbed wetland and buffer areas.

Objective 1a: Establish a vegetation community with a mix of native conifer and deciduous tree species and a diverse native understory.

Objective 1b: Prevent establishment of invasive species.

Goal 2: Ensure the reconstructed stream channels underneath the new culverts are stable and allow passage of flow and fish.

Objective 2: Provide smooth transitions between the reconstructed stream channel sections and the existing up- and downstream channels.

Goal 3: Increase structural diversity in the reed canarygrass community in Wetland D.

Objective 3: Install willow poles in dense reed canarygrass, and manage the grass with cutting and mulch to allow the willows to mature.

4.2 Best Available Science

Per MMC 17.52B.140.A.1.b and c, the following section provides a "review of the best available science supporting proposed mitigation and a description of the report author's experience to date in restoring or creating the type of critical area proposed," as well as "[a]n analysis of the likelihood of success of the compensation project."

Ecology's *Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1)* (Ecology and others, 2006) remains one of the best scientific resources describing

how a mitigation plan should be developed, from site and plant selection to site preparation and maintenance. That report states that "Compensatory mitigation projects that contribute to the functioning of a larger landscape are preferable to simply replacing acreage at the site of the impact." The proposed mitigation restores temporarily impacted wetland and stream and wetland buffers on site, and utilizes the City's CAMP, which was developed using a watershed approach, to compensate for permanent buffer impacts.

As applicable, other recommendations in the Ecology report are followed, such as decompacting soil, increasing soil's organic content, and carefully choosing plants with consideration of anticipated hydroperiod, among others.

The proposed site restoration and wetland enhancement have a high probability of success for several reasons. Common barriers to successful wetland and buffer mitigation include a lack of summer irrigation or intense sun exposure. Wetlands A and D have reliable sources of water and the remaining forest surrounding Wetland A/Stream 1 will provide shade that minimizes the drying effects of the summer sun. Volunteer native species from the adjacent wetland and upland area are likely to quickly supplement the installed vegetation. The restoration and mitigation areas are also City-owned, and thus will be reliably maintained and monitored per the City, Ecology, and Corps requirements, and are unlikely to face future threats from development or degradation after the close of the formal monitoring period.

Consultant resumes for the senior authors/designers of this *Wetland and Stream Mitigation Plan* report and stream/wetland plan are included in Appendix B.

4.3 Public Agency Utility Exception

The proposed roadway extension requires intrusions into a wetland, two streams, and their buffers to a greater degree than is allowed under the City's critical areas regulations. Accordingly, the project will likely require a Public Agency and Utility Exception (PAUE). Table 3 provides an analysis of how the project meets the criteria to be granted a PAUE as outlined in MMC 17.52.022.B.

TABLE 3
PUBLIC AGENCY UTILITY EXCEPTION COMPLIANCE ANALYSIS

Approval Criteria (Excerpted verbatim from MMC 17.52.022.B)	Compliance Analysis
A critical areas and/or geotechnical report must be prepared delineating all the critical areas and identifying the best location(s) to place the facilities with the least disruption to these critical areas with consideration given to the proposed mitigation and short- and long-term impacts and improvements.	A wetland and stream delineation report, geotechnical report, and this mitigation report have been prepared to describe existing conditions, make recommendations about design, and assess impacts and associated mitigation. Extension of an existing roadway through existing City-owned rights-of-way does not allow for much flexibility in road placement. However, Wetland A/Stream 1 are fortunately at their narrowest where the proposed culvert and road crossing are proposed. The Stream 3 crossing is also in an ideal location as that immediate area is already impacted to some degree by South Road and trails.
A mitigation plan must be prepared using best available science showing a net improvement to the critical area(s) affected by the alignment of the roadway... If on-site mitigation is not feasible, off-site mitigation that improves the function of critical areas in Mukilteo or MUGA can be considered. Mitigation could include, but not be limited to, opening up of stream corridors, enhancement of riparian corridors, creation or restoration of old degraded wetland sites, stabilization of landslide areas, improving natural hydrology and the inclusion of public access trails and viewpoints.	Appendix A of this report includes a mitigation plan addressing temporary and permanent wetland impacts, and temporary stream/wetland buffer impacts. Wetland mitigation will be conducted in Wetland D, which is adjacent to the project corridor and in the same sub-basin. Permanent buffer impacts will be mitigated through the City's CAMP in-lieu fee program.
The agency shall enter into a long-term monitoring and maintenance agreement with the city to ensure that the mitigation site(s) remain in healthy and thriving conditions. Monitoring shall be for a minimum of three years and can be terminated or extended by the city if warranted by annual inspections and monitoring reports.	Section 7.0 of this report includes a long-term monitoring program. Maintenance requirements are detailed on the plans in Appendix A.
The applicant shall obtain all required state and federal approvals for work within wetlands or waters.	The City's Public Works Department has applied to the U.S. Army Corps of Engineers, and Washington Department of Ecology to obtain a Section 404 Clean Water Act permit and a Section 401 Water Quality Certification. The Corps issued a letter stating the project qualified for a Nationwide Permit 14 and was pre-certified for a Section 401 Water Quality Certification. Once the City has issued its SEPA determination for the project, the applicant can apply for a Hydraulic Project Approval from WDFW. As noted previously, the applicant has already coordinated with and sought input from WDFW during the early stream-crossing design phase.

Note:
MUGA = Municipal Urban Growth Areas

5.0 PERFORMANCE STANDARDS

Per MMC 17.52B.140.2, the following section provides "measurable specific criteria for evaluating whether or not the goals and objectives of the mitigation project have been successfully attained and whether or not the requirements of this chapter have been met."

5.1 Performance Standards for Objectives 1a, 1b, and 3

Native plant survival and invasive cover standards are established to measure enhancement plan success. The proposed performance standards are summarized in Table 4.

TABLE 4
VEGETATION PERFORMANCE STANDARDS

Monitoring Year	Survival (%)	Native Woody Cover (%)[2]	Invasive/Non-Native Cover (%)
Wetland A Restoration of Temporarily Disturbed Areas			
Year 1	100[1]	--	≤5
Year 2	--	≥10	≤10[3]
Year 3	--	≥30	
Year 5	--	≥70	
Wetland A/Stream 1 Buffer Restoration of Temporarily Disturbed Areas			
Year 1	100[1]	--	≤5
Year 2	--	≥10	≤10[3]
Year 3	--	≥30	
Year 5	--	≥70	
Wetland D Enhancement			
Year 1	100[1]	--	The purpose of the enhancement is to increase structural diversity and control the dense reed canarygrass community sufficient to allow the installed plantings to compete.
Year 2	--	≥10	
Year 3	--	≥30	
Year 5	--	≥70	

Notes:
[1] 100 percent (%) survival criteria shall be met by replacing all mortalities the first year after planting.
[2] Includes native plants that are naturally recruiting.
[3] If weed cover exceeds 10% during vegetation monitoring, this performance standard can be met by removing weeds within 60 days of vegetation monitoring.

5.2 Performance Standards for Objective 2

1. The reconstructed stream channels will not present a barrier to fish passage at otherwise passable flows.

2. The stream channels will not show signs of excessive scour or erosion.

6.0 DETAILED CONSTRUCTION PLAN

See Appendix A for detailed stream and wetland mitigation plans.

7.0 MONITORING PROGRAM

Per MMC 17.52B.150.A and 17.52C.150.A, monitoring of the restoration areas shall be conducted for a minimum of five years. Reports will be provided to the City, the Corps, and Ecology for the Baseline and Years 1, 2, 3, and 5.

Monitoring shall be conducted at the following time intervals:

- At the time of construction;
- Approximately 30 days after planting to prepare an as-built plan and Baseline Monitoring Report; and
- Near the end of the growing season of Years 1, 2, 3, and 5 to perform vegetation and channel monitoring. Year 1 monitoring cannot occur until at least one year after installation of mitigation (e.g., if the plantings are installed in March 2020, the Year 1 monitoring visit will be conducted in summer 2021).

Below we have outlined proposed monitoring methods, success criteria, and a reporting schedule.

1. **Installation**. A biologist will inspect and approve the plant materials, any soil amendments, and streambed materials prior to installation, including any substitutions. The biologist will also observe plant layout and perform spot checks of plant installation for compliance with the plan details. An engineer will approve the stream and wetland grading and streambed materials.
2. **Baseline Documentation**: Within 30 days of completion of the vegetation enhancement installation, the site will be visited to document the as-built condition. The final plant count by species will be verified, and any approved departures from the plan will be mapped and recorded. Recommendations for correcting any unauthorized plan deviations will be included in a Baseline Monitoring Report.

   Permanent photo points and monitoring transects will be established during the as-built site visit to provide a record of the entire monitoring area. These transects and points will be marked in the field with metal stakes, and then noted on the map. At least one transect will be located in a temporarily disturbed area of Wetland A, in a temporarily disturbed area of Wetland A/Stream 1 buffer, in a temporarily disturbed area of Stream 3 buffer, and in the Wetland D enhancement area, for a total of at least four transects. Methodology and the final number and placement of

transects will be determined and documented during the baseline monitoring effort. Photos taken from the photo points will be included in the report.

3. **Vegetation Monitoring**: Monitoring will be conducted by a qualified biologist and will consist of documenting plant mortality and health in Year 1 and estimating percent native cover every monitoring year thereafter. Vegetation monitoring will be completed prior to September 30. Percent cover of native species will be measured using the line-intercept method, or similar, as adapted during the fieldwork. Native volunteer species may be counted in the cover assessment. Monitoring will also include identifying maintenance needs as they relate to plant survival and weed control. Photos will be taken from each photo point.
4. **Stream Channel Monitoring**: An engineer will inspect the stream channels after all major flood events and in the spring for two years following construction to determine if excessive scour or erosion has occurred. In the remaining monitoring years, the biologist will photo-document the stream condition during the vegetation monitoring visits, and consult with the engineer if necessary.

The monitoring reports for the end-of-growing season monitoring visits will be submitted to the City and the Corps by October 31 of each reporting year, and will include the following description/data:

1. Site plan and location map.
2. History of the project, including date of plant installation, current year of monitoring, and restatement of performance standards.
3. Plant survival and/or cover of the installed vegetation, in the context of assessing achievement of performance standards.
4. Assessment of nuisance/exotic biota and recommendations for management.
5. Assessment of stream channel conditions.
6. Incidental observations of wildlife or their sign.
7. Color photographs taken from permanent photo points established during the baseline visit.
3. Summary of maintenance and contingency measures proposed for the next visit, and those completed since the most recent visit.

Any deficiency discovered during any monitoring or inspection visit must be corrected within 60 days.

8.0 CONTINGENCY PLAN

If any monitoring report reveals that the restoration and mitigation has failed in whole or in part, and if that failure is beyond the scope of routine maintenance or corrective measures (such as additional plantings or increased watering), a contingency plan shall be prepared and submitted. Contingency plans can include, but are not limited to, regrading; additional plant installation; erosion control; modifications to hydrology; and plant substitutions of type, size, quantity, and location. Once approved, contingency measures may be completed and the plan revised. If the failure is substantial, the City and/or the Corps may extend the monitoring period for the subsequent mitigation and restoration.

9.0 CLOSURE

The findings and conclusions documented in this report have been prepared for specific application to this project, and have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area, and in accordance with the terms and conditions set forth in our agreement. The conclusions and recommendations presented in this report are professional opinions based on interpretation of information currently available to us, and are made within the operational scope, budget, and schedule constraints of this project. No warranty, express or implied, is made.

Shannon & Wilson has prepared Appendix C, "Important Information About Your Wetland Delineation/Mitigation and/or Stream Classification Report," to assist you and others in understanding the use and limitations of our reports.

SHANNON & WILSON, INC.

Amy Summe
Senior Biologist/Permit Specialist

AJS:KLW/ajs

10.0 REFERENCES

Barnard, R. J.; Johnson, J.; Brooks, P.; and others, 2013, Water crossing design guidelines: Olympia, Wash., Washington State Department of Fish and Wildlife, 299 p., available: http://wdfw.wa.gov/licensing/sepa/2013/13005_design_guidelines.pdf.

City of Mukilteo (City), 2010, Stream, wetlands & watersheds maps. Available: http://mukilteowa.gov/wp-content/uploads/2016/01/map-streams.pdf.

ESA, 2011a, Wetland reconnaissance for the Harbour Reach Drive Extension. Memorandum to City of Mukilteo, April 26.

Shannon & Wilson, Inc., 2017a, Wetland and stream delineation report for the Harbour Reach Drive Extension Project: Prepared for City of Mukilteo on behalf of H.W. Lochner, Inc., January 11.

Shannon & Wilson, Inc., 2017b, Revised stream crossing assessment for the Harbour Reach Drive Extension Project: Prepared for City of Mukilteo on behalf of H.W. Lochner, Inc., April 21.

W&H Pacific, 1991, Harbour Pointe Industrial Park Phase I Development Plan. Prepared for Harbour Pointe Limited Partnership.

Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10, 2006, Wetland Mitigation in Washington State – Part 2: Developing Mitigation Plans (Version 1), Washington State Department of Ecology Publication #06-06-011b. Olympia, WA. Available: https://fortress.wa.gov/ecy/publications/documents/0606011b.pdf

APPENDIX A

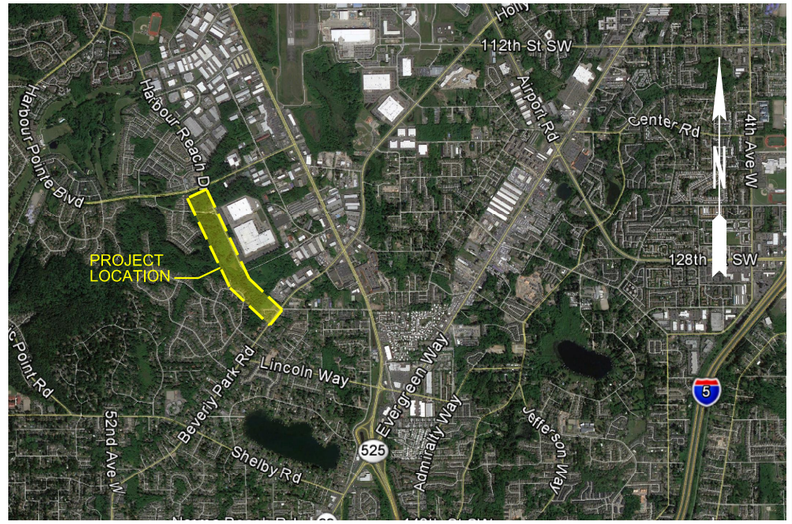
STREAM AND WETLAND MITIGATION PLAN

SITE PLAN

SCALE: 1" = 200'-0"

200 0 200 400

SCALE IN FEET



VICINITY MAP

SCALE: 1" = 500'-0"

500 0 500 1000

SCALE IN FEET

DRAWING NUMBER	SHEET	TITLE
SB01	104 of 238	STREAM / WETLAND SITE & VICINITY MAP
SB02	105 of 238	EXISTING CONDITION STREAM 1 & STREAM 3
SB03	106 of 238	STREAM 1 - STREAMBED RESTORATION PLAN
SB04	107 of 238	STREAM 1 - GRADING PLAN
SB05	108 of 238	STREAM 1 - ELEVATION & DETAILS
SB06	109 of 238	COIR LOG DETAIL
SB07	110 of 238	STREAM 1 - WETLAND "A" IMPACT
SB08	111 of 238	STREAM 1 - REVEGETATION PLAN
SB09	112 of 238	STREAM 1 - PLANT SCHEDULES
SB10	113 of 238	WETLAND "D" PLAN
SB11	114 of 238	STREAM 3 - STREAMBED RESTORATION PLAN
SB12	115 of 238	STREAM 3 - GRADING PLAN
SB13	116 of 238	STREAM 3 - ELEVATION & DETAILS
SB14	117 of 238	STREAM 3 - IMPACT
SB15	118 of 238	STREAM 3 - REVEGETATION PLAN
SB16	119 of 238	STREAM 3 - PLANT SCHEDULES
SB17	120 of 238	PLANTING DETAILS

NOTES:

1. INFORMATION PROVIDED BY CITY OF MUKILTEO, DRAINAGE INVENTORY MAPS, DATED JUNE 2013.
2. INFORMATION DERIVED FROM WH PACIFIC, HARBOUR POINTE LIMITED PARTNERSHIP, HARBOUR POINTE INDUSTRIAL PARK PHASE 1, PRELIMINARY DRAINAGE PLAN, DATED APRIL 12, 1991.

DATUM

NAVD OF 1988

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE

FILENAME: 211-12561-203-Fig.dgn

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

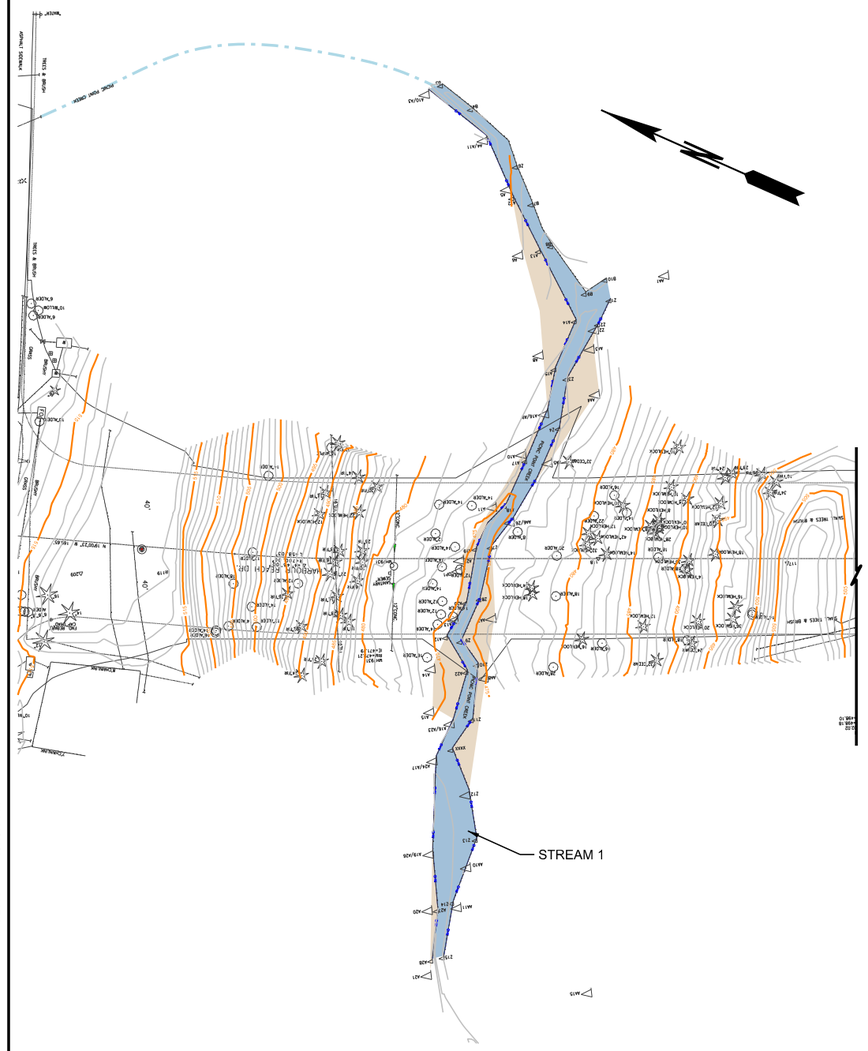
CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM / WETLAND SITE & VICINITY MAP

DRAWING NUMBER **SB01**

SHT 104 OF 238

K:\211\12561\211-12561-203-Fig.dgn 1/23/2019 1:03:18 PM 17x11 (in.)

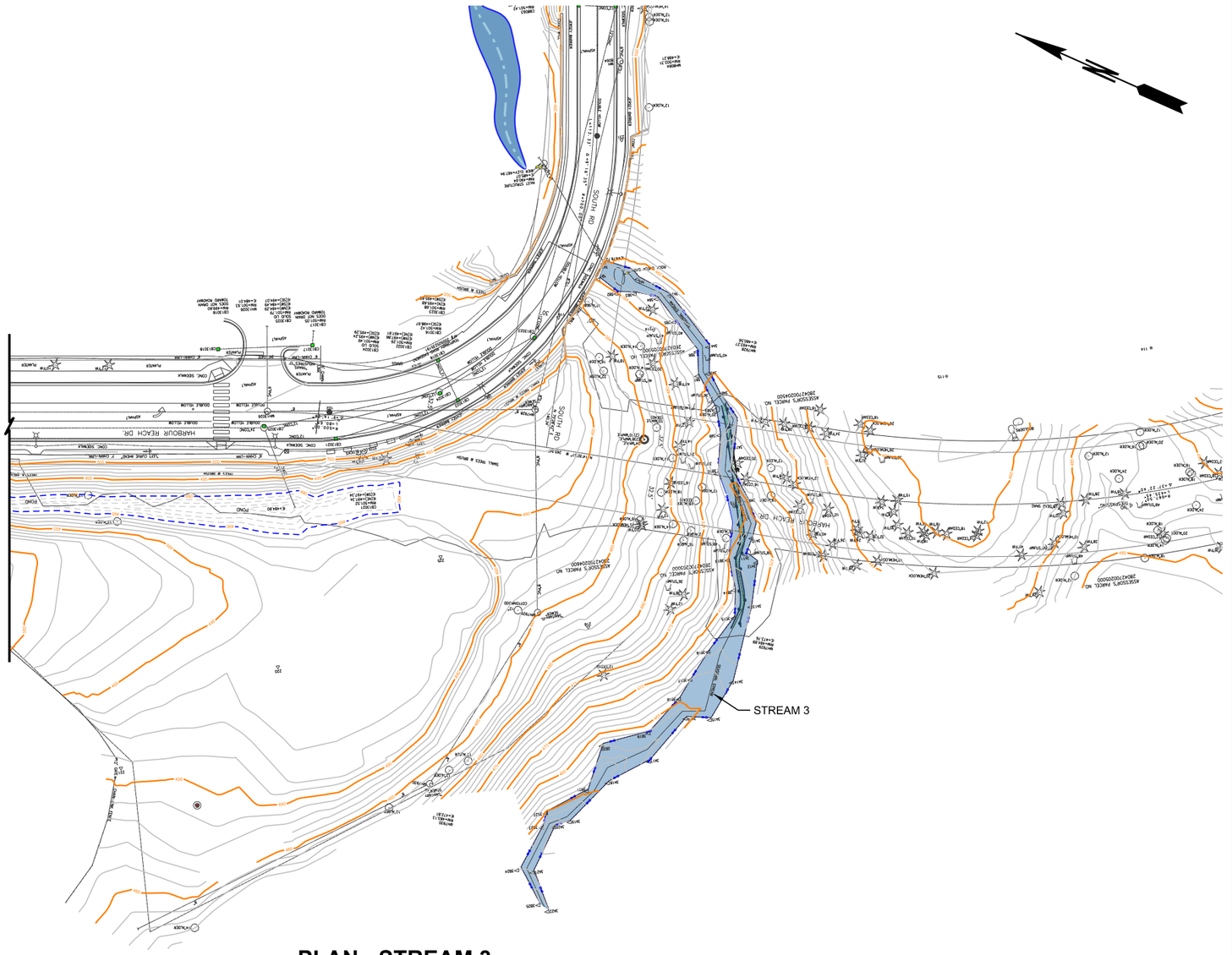


PLAN - STREAM 1

SCALE: 1" = 40'-0"

40 0 40 80

SCALE IN FEET



PLAN - STREAM 3

SCALE: 1" = 40'-0"

40 0 40 80

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/15/2019
DESIGNED BY	DATE
CJK	1/15/2019
DRAWN BY	DATE
DRC	1/15/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

EXISTING CONDITION STREAM 1 & STREAM 3

DRAWING NUMBER

SB02

SHT 105 OF 238

1/15/2019 3:45:49 PM

K:\21-1\12561\211-12561-203-Fig.dgn

17x11 (in.)

EXISTING WETLAND BOUNDARY

WETLAND "A"

STREAM 1

RESTORED STREAM 1

EXTENT OF TEMPORARY CONSTRUCTION IMPACTS SEE PLAN

A / SB04 A / SB07

A / SB05

C / SB05 TYPICAL

CULVERT

B / SB05

165' BUFFER

165' BUFFER

165' BUFFER

COIR LOG SEE DETAIL A / SB06

RESTORED STREAM CENTERLINE

EXISTING WETLAND BOUNDARY

WETLAND "A"

STREAM #1 FLOW

PLAN - STREAM 1

A

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/15/2019
DESIGNED BY	DATE
CJK	1/15/2019
DRAWN BY	DATE
DRC	1/15/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 1 - STREAMBED RESTORATION PLAN

DRAWING NUMBER **SB03**

SHT 106 OF 238

3:57:46 PM
1/15/2019
K:\21-1\12561\211-12561-203-Fig.dgn
17x11 (in.)

PROPOSED CULVERT

FACE OF PROPOSED CONCRETE HEAD WALL, SEE PLAN CU-2

EXTENTS OF TEMPORARY CONSTRUCTION IMPACTS

COIR LOG, SEE DETAIL A / SB06

COIR LOG, SEE DETAIL A / SB06

WETLAND "A"

STREAM #1 FLOW

CENTERLINE OF RESTORED STREAM

EXISTING WETLAND BOUNDARY

STREAM #1 FLOW

WETLAND "A"

PLAN - STREAM 1 (A)

SCALE: 1" = 5'-0"

5' 0 5' 10'

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/15/2019
DESIGNED BY	DATE
CJK	1/15/2019
DRAWN BY	DATE
DRC	1/15/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Flg.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 1 - GRADING PLAN

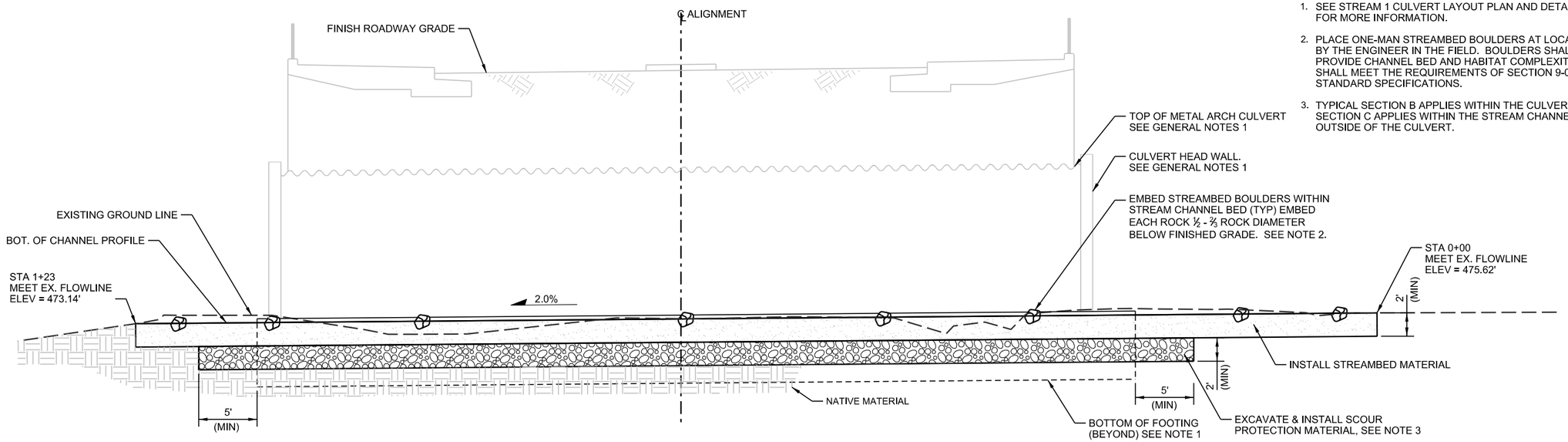
DRAWING NUMBER **SB04**

SHT 107 OF 238

K:\21-11\12561\211-12561-203-Flg.dgn 1/15/2019 11:27:10 PM 17x11 (in.)

GENERAL NOTES

1. SEE STREAM 1 CULVERT LAYOUT PLAN AND DETAILS (CU-2 AND CU-3) FOR MORE INFORMATION.
2. PLACE ONE-MAN STREAMBED BOULDERS AT LOCATIONS IDENTIFIED BY THE ENGINEER IN THE FIELD. BOULDERS SHALL BE PLACED TO PROVIDE CHANNEL BED AND HABITAT COMPLEXITY. BOULDER MATERIALS SHALL MEET THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
3. TYPICAL SECTION B APPLIES WITHIN THE CULVERT. TYPICAL SECTION C APPLIES WITHIN THE STREAM CHANNEL RESTORATION AREA OUTSIDE OF THE CULVERT.



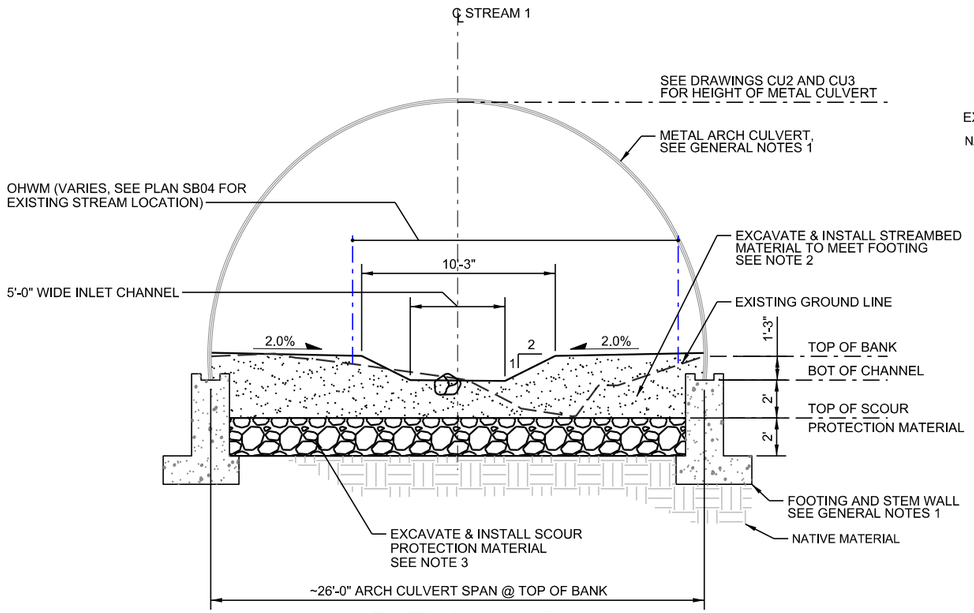
PROPOSED STREAM 1 CENTERLINE PROFILE

A SB03

SCALE: 1" = 5'-0"

5 0 5 10

SCALE IN FEET



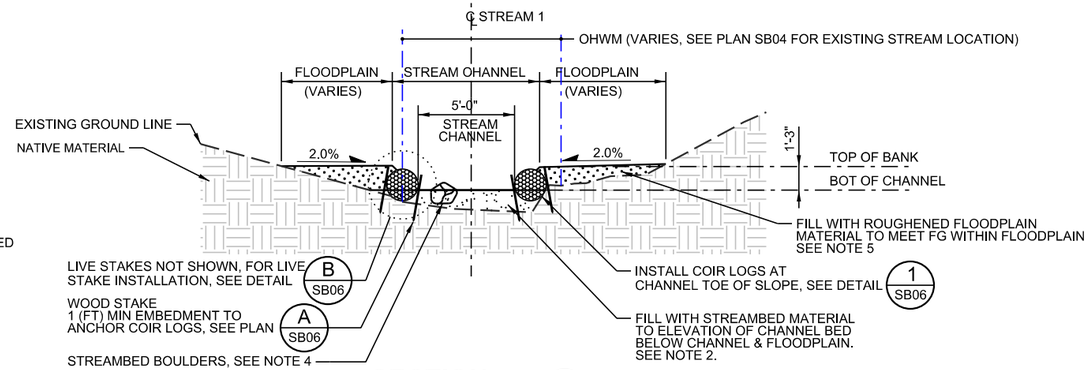
SECTION

B SB03

SCALE: ¼ " = 1'-0"

4 0 4 8

SCALE IN FEET



SECTION

C SB03

SCALE: NTS

NOTES:

1. SEE SB03, STREAM 1 - STREAMBED RESTORATION PLAN FOR MORE INFORMATION.
2. STREAMBED MATERIALS SHALL CONSIST OF A MIX COMPOSED OF 50% BY VOLUME STREAMBED SEDIMENTS AND 50% BY VOLUME 12" STREAMBED COBBLES PER THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
3. SCOUR PROTECTION MATERIALS SHALL CONSIST OF WATER ROUNDED AGGREGATES MEETING THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS AND SHALL HAVE A GRADATION MEETING THE REQUIREMENTS FOR CLASS A EROSION AND SCOUR PROTECTION ROCK AS DESCRIBED IN SECTION 9-13.4(2) OF THE WSDOT STANDARD SPECIFICATIONS. BACKFILL VOIDS IN EROSION AND SCOUR PROTECTION ROCK WITH NATIVE MATERIAL.
4. EMBED STREAMBED BOULDERS WITHIN STREAM CHANNEL BED (TYP) EMBED EACH ROCK ½ - ⅔ ROCK DIAMETER BELOW FINISHED GRADE. PLACE ONE-MAN STREAMBED BOULDERS AT LOCATIONS IDENTIFIED BY THE ENGINEER IN THE FIELD. BOULDERS SHALL BE PLACED TO PROVIDE CHANNEL BED AND HABITAT COMPLEXITY. BOULDER MATERIALS SHALL MEET THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
5. ROUGHENED FLOODPLAIN MATERIAL SHALL CONSIST OF A MIX COMPRISED OF 50% BY VOLUME STREAMBED MATERIALS AND 50% BY VOLUME TOPSOIL TYPE B. TOPSOIL TYPE B SHALL MEET THE REQUIREMENTS OF SECTION 9-14.1 OF THE WSDOT STANDARD SPECIFICATIONS.

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019		
DESIGNED BY	DATE		
CJK	1/23/2019		
DRAWN BY	DATE		
DRC	1/23/2019		
CHECKED BY	DATE		
APPROVED BY	DATE		
FILENAME: 211-12561-203-Fig.dgn			

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

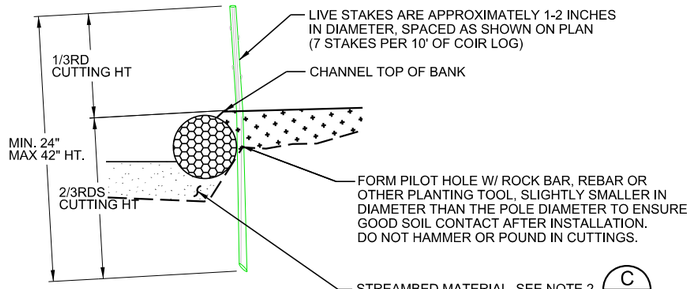
CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 1 - ELEVATION & DETAILS

DRAWING NUMBER **SB05**

SHT 108 OF 238

K:\21-1\12561\211-12561-203-Fig.dgn
1/23/2019 2:07:49 PM
17x11 (in.)



NOTES:

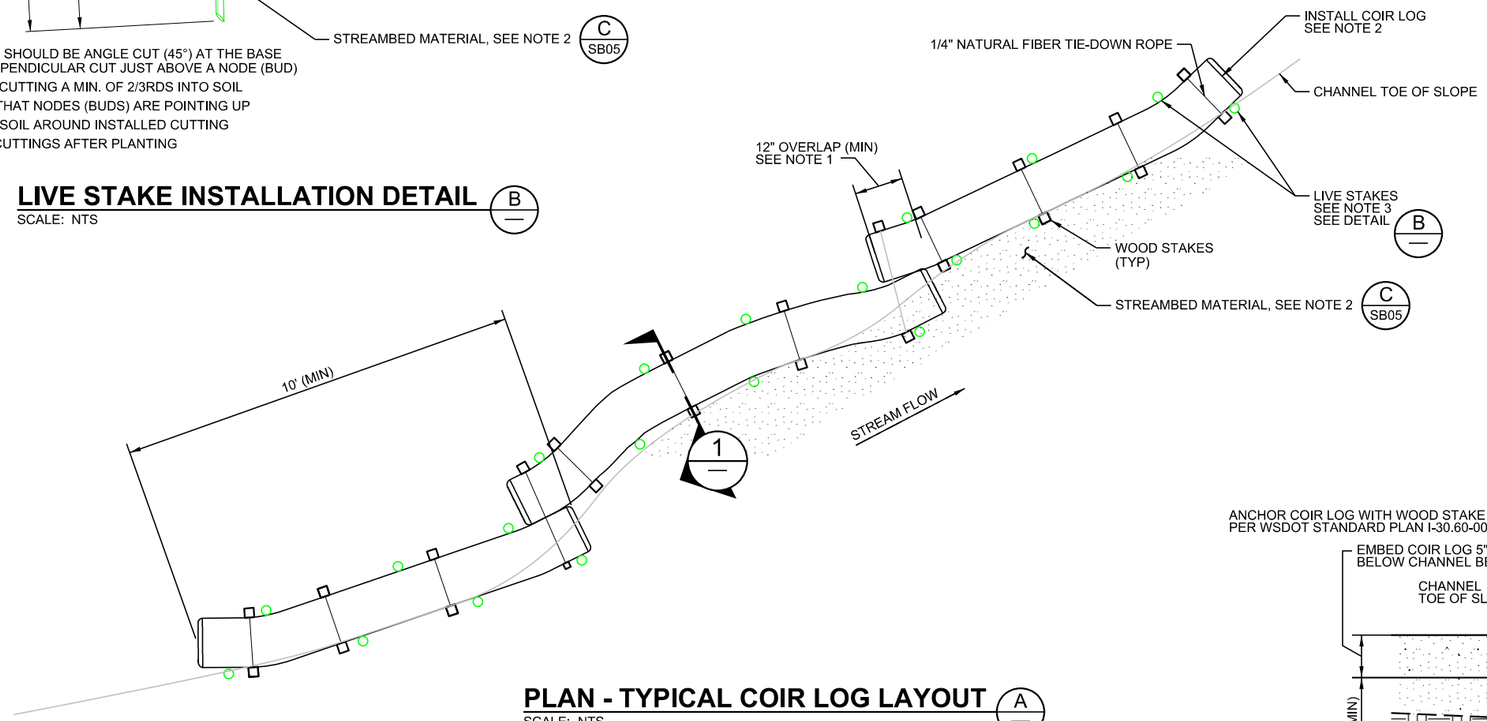
1. CUTTING SHOULD BE ANGLE CUT (45°) AT THE BASE AND PERPENDICULAR CUT JUST ABOVE A NODE (BUD)
2. INSTALL CUTTING A MIN. OF 2/3RDS INTO SOIL
3. INSURE THAT NODES (BUDS) ARE POINTING UP
4. FIRM UP SOIL AROUND INSTALLED CUTTING
5. WATER CUTTINGS AFTER PLANTING

LIVE STAKE INSTALLATION DETAIL (B)

SCALE: NTS

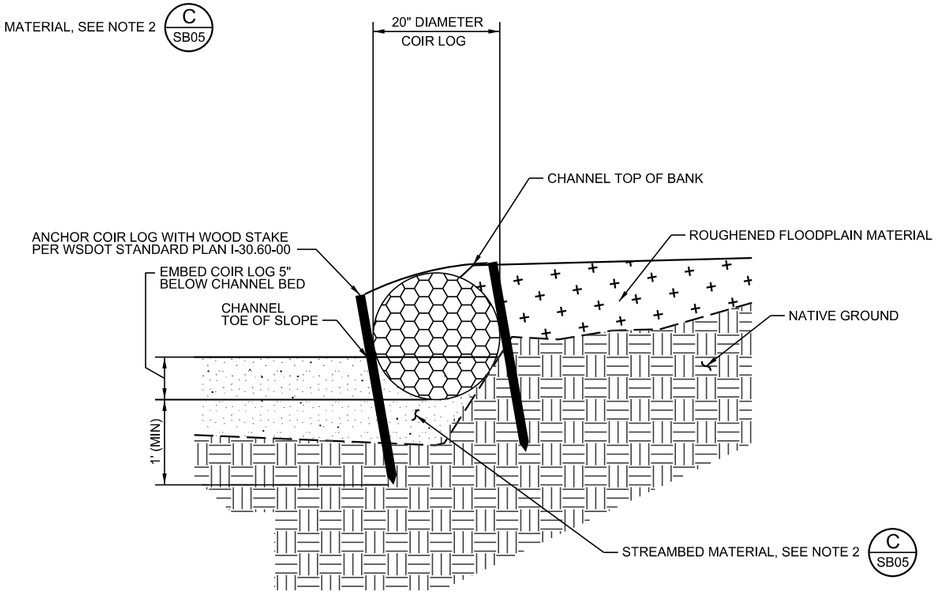
NOTES:

1. OVERLAP COIR LOGS WITH ORIENTATION TO FLOW AS SHOWN TO PREVENT WATER FROM MOVING BETWEEN LOGS.
2. COIR LOGS MATERIALS SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATION 9-14.5(7). INSTALL COIR LOGS IN ACCORDANCE WITH STANDARD SPECIFICATION 8-01.3(6)A.
3. HAND PUSH SITKA WILLOW (Salix sitchensis) STAKES AS SHOWN ON PLAN. LIVE STAKES SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATION 9-14.6.
4. SEE SB04 AND SB12 FOR COIR LOG LAYOUT.



PLAN - TYPICAL COIR LOG LAYOUT (A)

SCALE: NTS



TYPICAL SECTION (1)

SCALE: NTS

Stream 1/Stream 3 Coir Logs

Common Name	Scientific Name	Quantity	Size/Condition	Spacing
Sitka willow	*Salix sitchensis*	224	1-2" diameter poles	as shown on plan

Based on estimated 7 live stakes per 10-foot length of log (Stream 1: 12 logs, Stream 3: 20 logs).

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

COIR LOG DETAIL

DRAWING NUMBER **SB06**

SHT 109 OF 238

1/23/2019 1:16:49 PM
K:\21-1\12561\211-12561-203-Fig.dgn
17x11 (in.)

NOTE:
WORK OUTSIDE LIMITS WILL REQUIRE ADDITIONAL SITE RESTORATION CONSISTENT WITH PLANT SCHEDULES ON SHEET SB09.

EXISTING WETLAND BOUNDARY

165' BUFFER

EXTEND OF TEMPORARY CONSTRUCTION IMPACT

165' BUFFER

165' BUFFER

TYPE 2 - 48" CATCH BASIN WITH A DEBRIS CAGE, SURROUNDED BY QUARRY SPALLS

4' x 6' MODULAR WETLAND

PROPOSED CULVERT, SEE PLANS AND DETAILS ON CU-1 THRU CU-5

WETLAND "A"

STREAM #1 FLOW

EXISTING WETLAND BOUNDARY

TEMPORARY STREAM IMPACTS	(949 SQ FEET)
PERMANENT WETLAND IMPACTS	(692 SQ FEET)
PERMANENT BUFFER IMPACTS	(24,136 SQ FEET)
TEMPORARY WETLAND IMPACTS	(317 SQ FEET)
TEMPORARY BUFFER IMPACTS	(9,526 SQ FEET)

PLAN - STREAM 1

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/16/2019
DESIGNED BY	DATE
CJK	1/16/2019
DRAWN BY	DATE
DRC	1/16/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

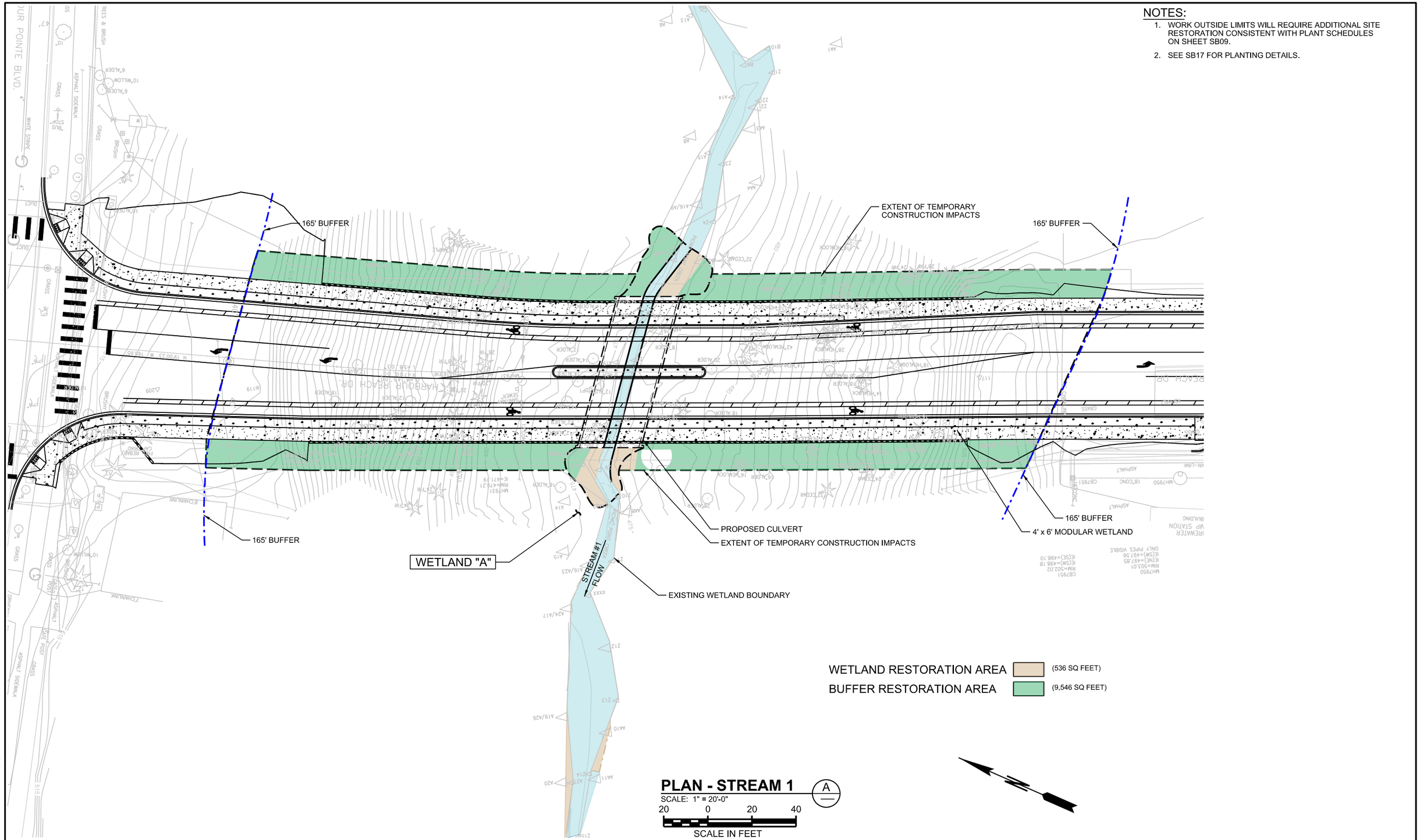
STREAM 1 - WETLAND "A" IMPACT

DRAWING NUMBER
SB07
SHT 110 OF 238

K:\21-1\12561\211-12561-203-Fig.dgn
1/16/2019 10:50:30 AM
17x11 (in.)

NOTES:

1. WORK OUTSIDE LIMITS WILL REQUIRE ADDITIONAL SITE RESTORATION CONSISTENT WITH PLANT SCHEDULES ON SHEET SB09.
2. SEE SB17 FOR PLANTING DETAILS.



PLAN - STREAM 1

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/16/2019
DESIGNED BY	DATE
CJK	1/16/2019
DRAWN BY	DATE
DRC	1/16/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 1 - REVEGETATION PLAN

DRAWING NUMBER
SB08
SHT 111 OF 238

K:\21-11\12561\211-12561-203-Fig.dgn
1/16/2019 12:04:24 AM
17x11 (in.)

NOTES:

1. PLANT SCHEDULES FOR STREAM 3 ON DRAWING NUMBER SB16.
2. SEE SB06 FOR COIR LOG SCHEDULES.
3. IMMEDIATELY AFTER SOIL PREPARATION, HAND SEED, BROADCAST SEED, OR HYDROSEED EXPOSED SOILS WITH THE APPROPRIATE NATIVE EROSION-CONTROL SEED MIX SPECIFIED ON THE PLANS: BUFFER OR WETLAND. IF SEED IS APPLIED USING HYDROSEED, IT SHOULD BE MIXED WITH A TACKIFIER AND MULCH AT RATIOS RECOMMENDED BY THE SEED SUPPLIER. IF OTHER METHODS ARE USED, THE SEED SHOULD BE ROLLED OR TRACKED TO PROVIDE GOOD SOIL CONTACT, WATERED, AND THEN COVERED WITH HYDROMULCH OR TWO INCHES OF STRAW MULCH.
4. FOR PLANTING DETAILS, SEE DRAWING NUMBER SB17.

Wetland A Restoration Area

Common Name	Scientific Name	Quantity	Size/Condition	Spacing
Trees				
Pacific willow	*Salix lucida*	2	1-2" diameter poles	12-ft. O.C.
Western red cedar	*Thuja plicata*	2	2-gal container	12-ft. O.C.
Shrubs				
Sitka willow	*Salix sitchensis*	5	1-2" diameter poles	6-ft. O.C.
Twinberry	*Lonicera involucrata*	10	1-gal container	6-ft. O.C.

Based on estimated wetland revegetation area of 536 square feet.
Final counts should be adjusted based on the actual area disturbed during construction.

Wetland A/Stream 1 Buffer Restoration Area

Common Name	Scientific Name	Quantity	Size/Condition	Spacing
Trees				
Douglas-fir	*Pseudotsuga menziesii*	17	2-gal container	12-ft. O.C.
Western hemlock	*Tsuga heterophyla*	17	2-gal container	12-ft. O.C.
Big-leaf maple	*Acer macrophyllum*	16	2-gal container	12-ft. O.C.
Western red cedar	*Thuja plicata*	16	2-gal container	12-ft. O.C.
Shrubs				
Oregon grape	*Mahonia nervosa*	66	1-gal container	6-ft. O.C.
Snowberry	*Symphoricarpos albus*	66	1-gal container	6-ft. O.C.
Red elderberry	*Sambucus racemosa*	66	1-gal container	6-ft. O.C.
Salal	*Gaultheria shallon*	66	1-gal container	6-ft. O.C.
Groundcover				
Sword Fern	*Polystichum munitum*	576	4" pot	4-ft. O.C.

Based on estimated buffer revegetation area of 9,546 square feet.
Final counts should be adjusted based on the actual area disturbed during construction.

Native Seed Mixes

Common Name	Scientific Name	% By Weight	Seeds / Lb of Mix	Notes
Wetland				
Slough sedge	*Carex obnupta*	42	179,340	See Note 1
Sawbeak sedge	*Carex stipata*	38	199,500	See Note 1
Small-fruited bulrush	*Scirpus microcarpus*	3	246,000	See Note 1
Dagger-leaf rush	*Juncus ensifolius*	1	167,772	See Note 1
Slender rush	*Juncus tenuis*	1	16,000,000	See Note 1
Common spikerush	*Eleocharis palustris*	15	93,000	See Note 1
Buffer				
Blue wildrye	*Elymus glaucus*	50	55,000	See Note 2
Red fescue	*Festuca rubra rubra*	30	10,000	See Note 2
California brome	*Bromus carnatius*	10	10,000	See Note 2
Spike bentgrass	*Agrostis exarata*	10	380,000	See Note 2

1. Wetland Seed Mix application rate 0.5 lb/1,000 sq feet
2. Buffer Seed Mix application rate 1.0 lb/1,000 sq feet

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

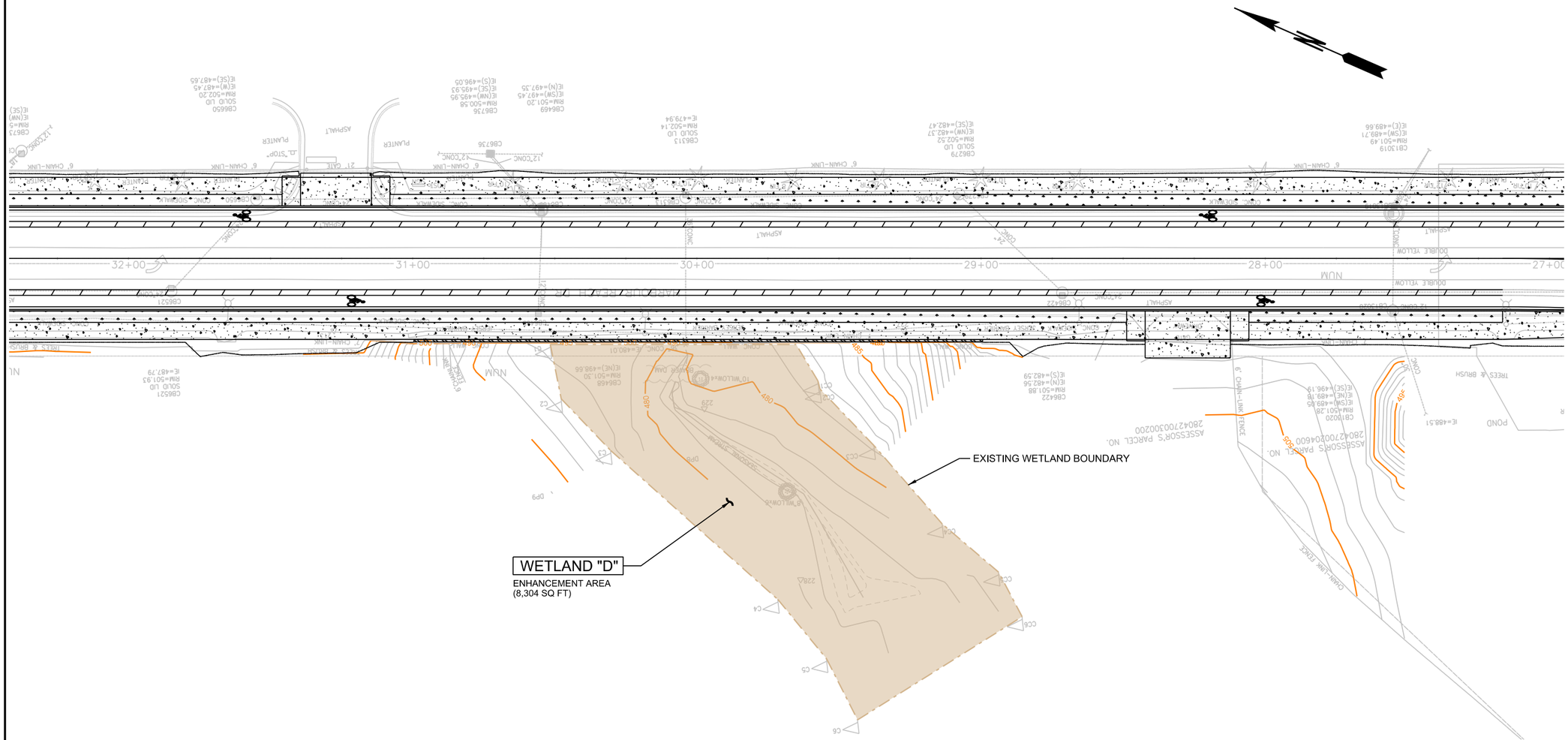
CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 1 - PLANT SCHEDULES

DRAWING NUMBER
SB09

SHT 112 OF 238



PLAN - WETLAND "D"

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

Wetland D Enhancement

Common Name	Scientific Name	Quantity	Size/Condition	Spacing
Trees				
Sitka willow	*Salix sitchensis*	29	1-2" diameter poles	12-ft. O.C.
Pacific willow	*Salix lucida*	29	1-2" diameter poles	12-ft. O.C.

Based on 12:1 enhancement ratio for impacts to 692 square feet of Wetland A.

Willow stakes shall be placed in Wetland D as field-directed by a biologist.

NOTES:

1. SEE LIVE STAKE DETAILS AND NOTES ON SB17.
2. IN THE WETLAND D ENHANCEMENT AREA, USE A STRING TRIMMER OR OTHER EQUIPMENT TO REMOVE REED CANARYGRASS ABOVE THE GROUND SURFACE PRIOR TO PLACING THE LIVE STAKES.
3. COVER ALL BARE AREAS AND A 3-FOOT-DIAMETER AROUND EACH LIVE STAKE IN WETLAND D WITH THREE INCHES OF GUARANTEED WEED-FREE, COARSE WOOD CHIP MULCH. WOOD CHIPS SHALL BE MOVED AWAY FROM PLANT STEMS TO PREVENT STEM ROT.

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

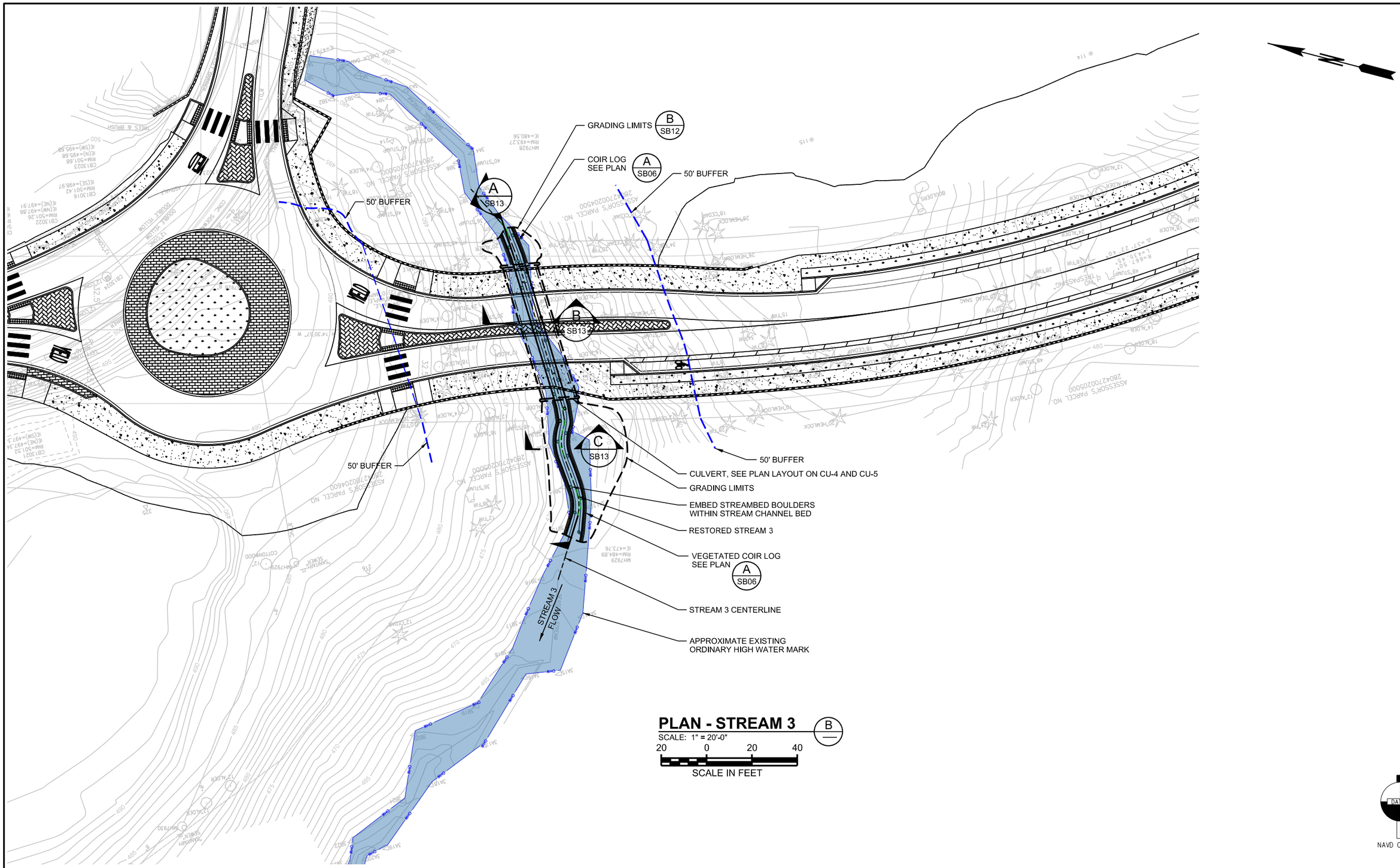
CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

WETLAND "D" PLAN

DRAWING NUMBER
SB10

SHT 113 OF 238

K:\211\12561\211-12561-203-Fig.dgn 1/23/2019 1:33:55 PM 17x11 (in.)



PLAN - STREAM 3

B

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

DATUM

NAVD OF 1988

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/24/2019
DESIGNED BY	DATE
CJK	1/24/2019
DRAWN BY	DATE
DRC	1/24/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 3 - STREAMBED RESTORATION PLAN

DRAWING NUMBER

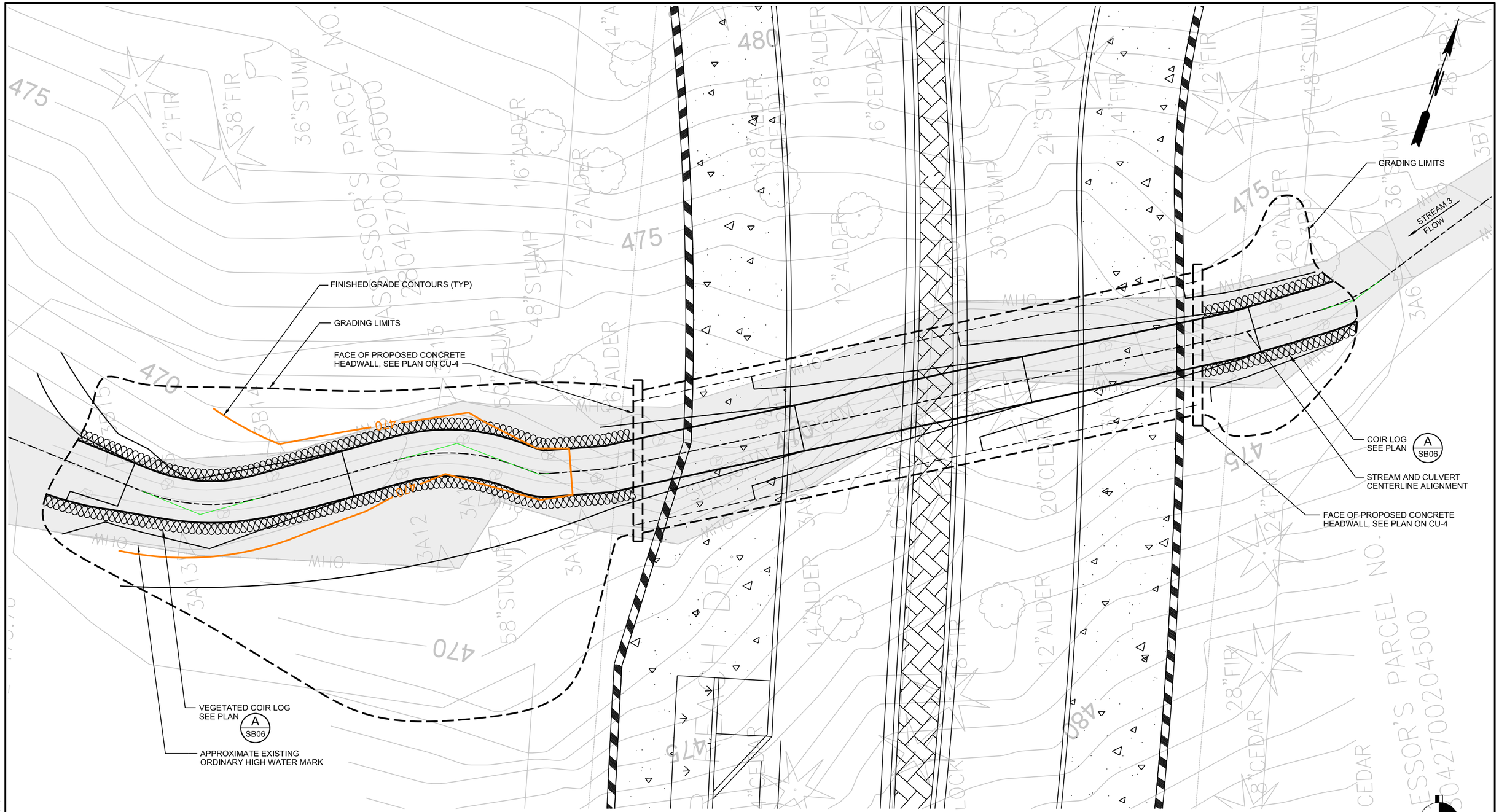
SB11

SHT 114 OF 238

1/24/2019 11:25:25 AM

K:\21-1\12561\211-12561-203-Fig.dgn

17x11 (in.)



PLAN - STREAM 3 (B)

SCALE: 1" = 5'-0"

5' 0 5' 10'

SCALE IN FEET

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 3 - GRADING PLAN

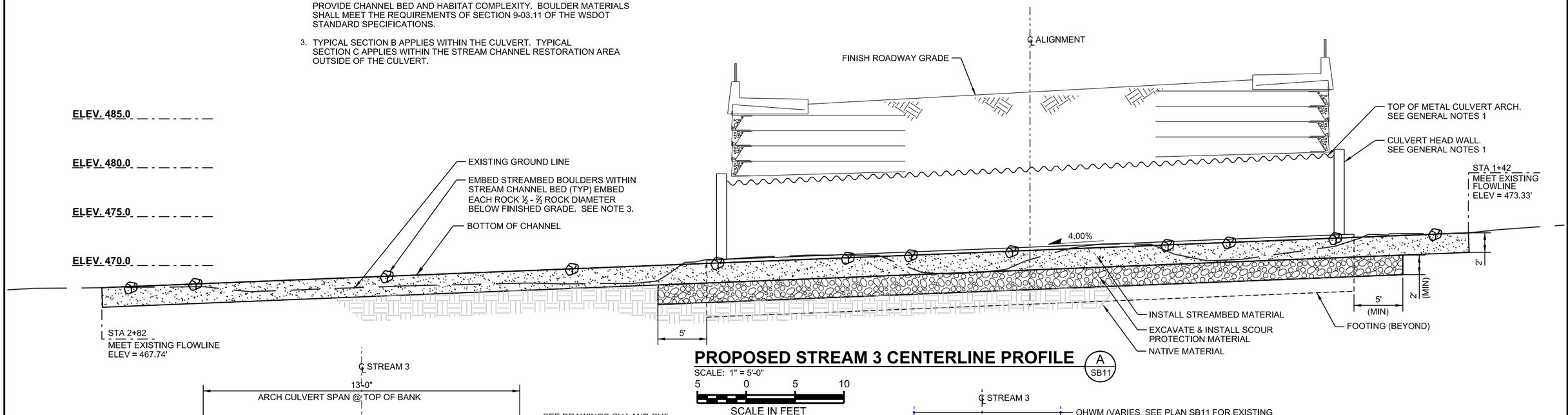
DRAWING NUMBER **SB12**

SHT 115 OF 238

1/23/2019 1:35:58 PM
K:\21-1\12561\211-12561-203-Fig.dgn
17x11 (in.)

GENERAL NOTES

1. SEE STREAM 3 CULVERT LAYOUT PLAN AND DETAILS (CU-4 AND CU-5) FOR MORE INFORMATION.
2. PLACE ONE-MAN STREAMBED BOULDERS AT LOCATIONS IDENTIFIED BY THE ENGINEER IN THE FIELD. BOULDERS SHALL BE PLACED TO PROVIDE CHANNEL BED AND HABITAT COMPLEXITY. BOULDER MATERIALS SHALL MEET THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
3. TYPICAL SECTION B APPLIES WITHIN THE CULVERT. TYPICAL SECTION C APPLIES WITHIN THE STREAM CHANNEL RESTORATION AREA OUTSIDE OF THE CULVERT.

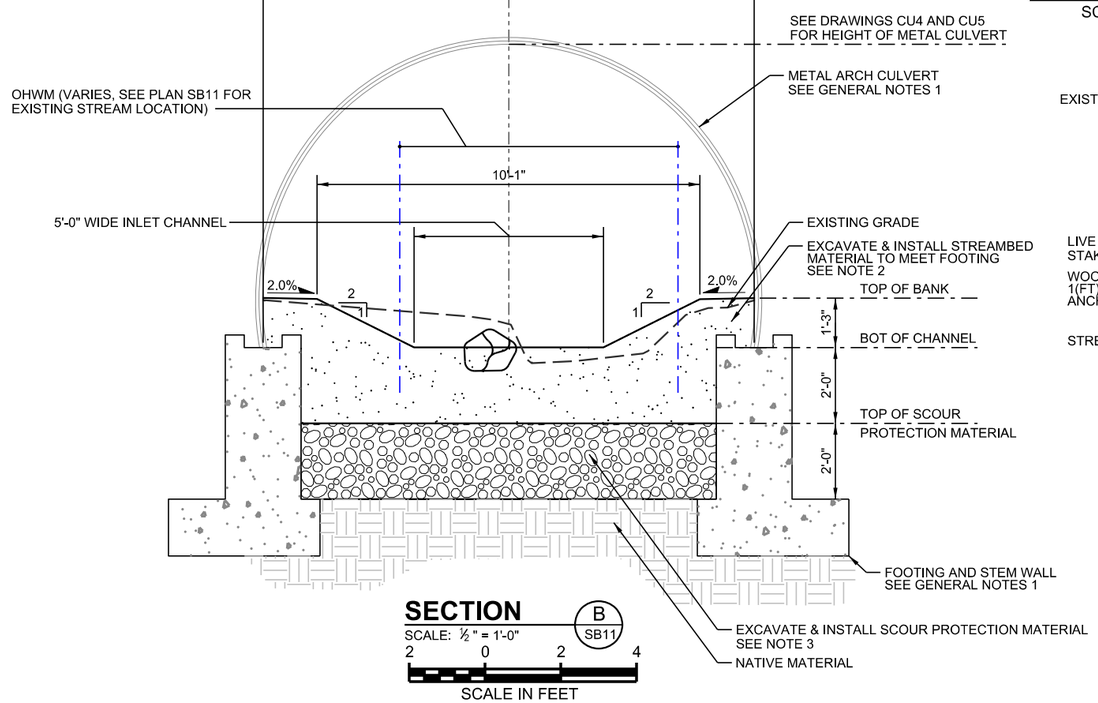


PROPOSED STREAM 3 CENTERLINE PROFILE (A / SB11)

SCALE: 1" = 5'-0"

5 0 5 10

SCALE IN FEET

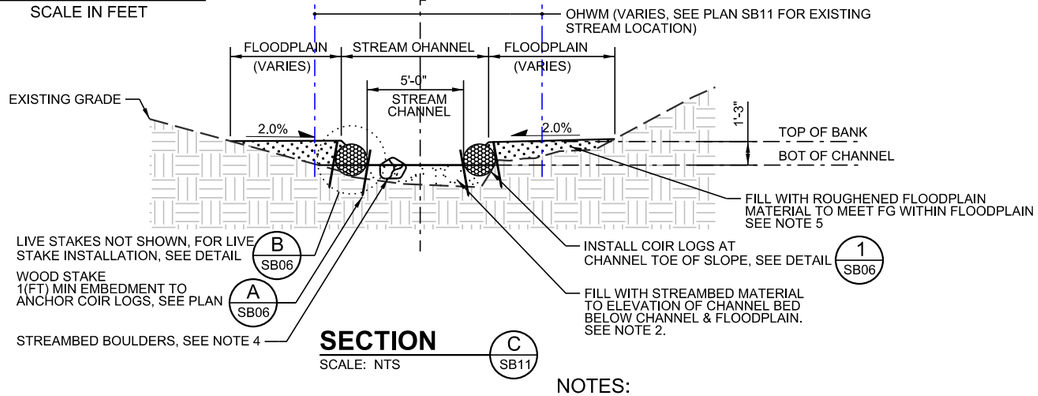


SECTION (B / SB11)

SCALE: ½ " = 1'-0"

2 0 2 4

SCALE IN FEET



SECTION (C / SB11)

SCALE: NTS

NOTES:

1. SEE SB11, STREAM 3 - STREAMBED RESTORATION PLAN FOR MORE INFORMATION.
2. STREAMBED MATERIALS SHALL CONSIST OF A MIX COMPOSED OF 50% BY VOLUME STREAMBED SEDIMENTS AND 50% BY VOLUME 12" STREAMBED COBBLES PER THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
3. SCOUR PROTECTION MATERIALS SHALL CONSIST OF WATER ROUNDED AGGREGATES MEETING THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS AND SHALL HAVE A GRADATION MEETING THE REQUIREMENTS FOR CLASS A EROSION AND SCOUR PROTECTION ROCK AS DESCRIBED IN SECTION 9-13.4(2) OF THE WSDOT STANDARD SPECIFICATIONS. BACKFILL VOIDS IN EROSION AND SCOUR PROTECTION ROCK WITH NATIVE MATERIAL.
4. EMBED STREAMBED BOULDERS WITHIN STREAM CHANNEL BED (TYP) EMBED EACH ROCK ½ - ⅔ ROCK DIAMETER BELOW FINISHED GRADE. PLACE ONE-MAN STREAMBED BOULDERS AT LOCATIONS IDENTIFIED BY THE ENGINEER IN THE FIELD. BOULDERS SHALL BE PLACED TO PROVIDE CHANNEL BED AND HABITAT COMPLEXITY. BOULDER MATERIALS SHALL MEET THE REQUIREMENTS OF SECTION 9-03.11 OF THE WSDOT STANDARD SPECIFICATIONS.
5. ROUGHENED FLOODPLAIN MATERIAL SHALL CONSIST OF A MIX COMPRISED OF 50% BY VOLUME STREAMBED MATERIALS AND 50% BY VOLUME TOPSOIL TYPE B. TOPSOIL TYPE B SHALL MEET THE REQUIREMENTS OF SECTION 9-14.1 OF THE WSDOT STANDARD SPECIFICATIONS.

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019	
DESIGNED BY	DATE	
CJK	1/23/2019	
DRAWN BY	DATE	
DRC	1/23/2019	
CHECKED BY	DATE	
APPROVED BY	DATE	
FILENAME: 211-12561-203-Fig.dgn		

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 3 - ELEVATION & DETAILS

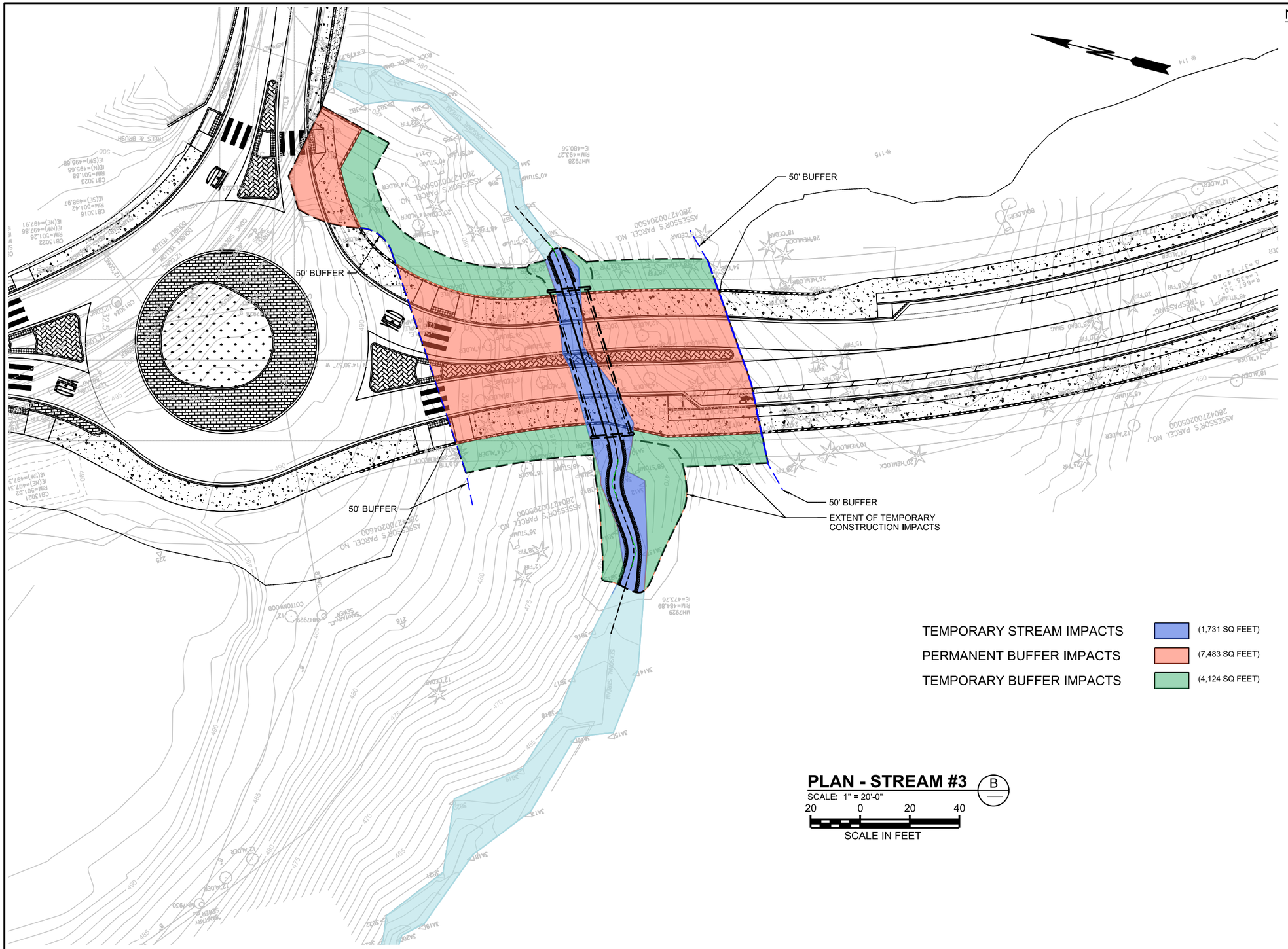
DRAWING NUMBER **SB13**

SHT 116 OF 238

2:06:35 PM 1/23/2019 K:\211-12561\211-12561-203-Fig.dgn 17x11 (in.)

NOTE:

WORK OUTSIDE LIMITS WILL REQUIRE ADDITIONAL SITE RESTORATION CONSISTENT WITH PLANT SCHEDULES ON SHEET SB09 AND SB16.



TEMPORARY STREAM IMPACTS	(1,731 SQ FEET)
PERMANENT BUFFER IMPACTS	(7,483 SQ FEET)
TEMPORARY BUFFER IMPACTS	(4,124 SQ FEET)

PLAN - STREAM #3

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

B

DATUM

NAVD OF 1988

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/15/2019
DESIGNED BY	DATE
CJK	1/15/2019
DRAWN BY	DATE
DRC	1/15/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

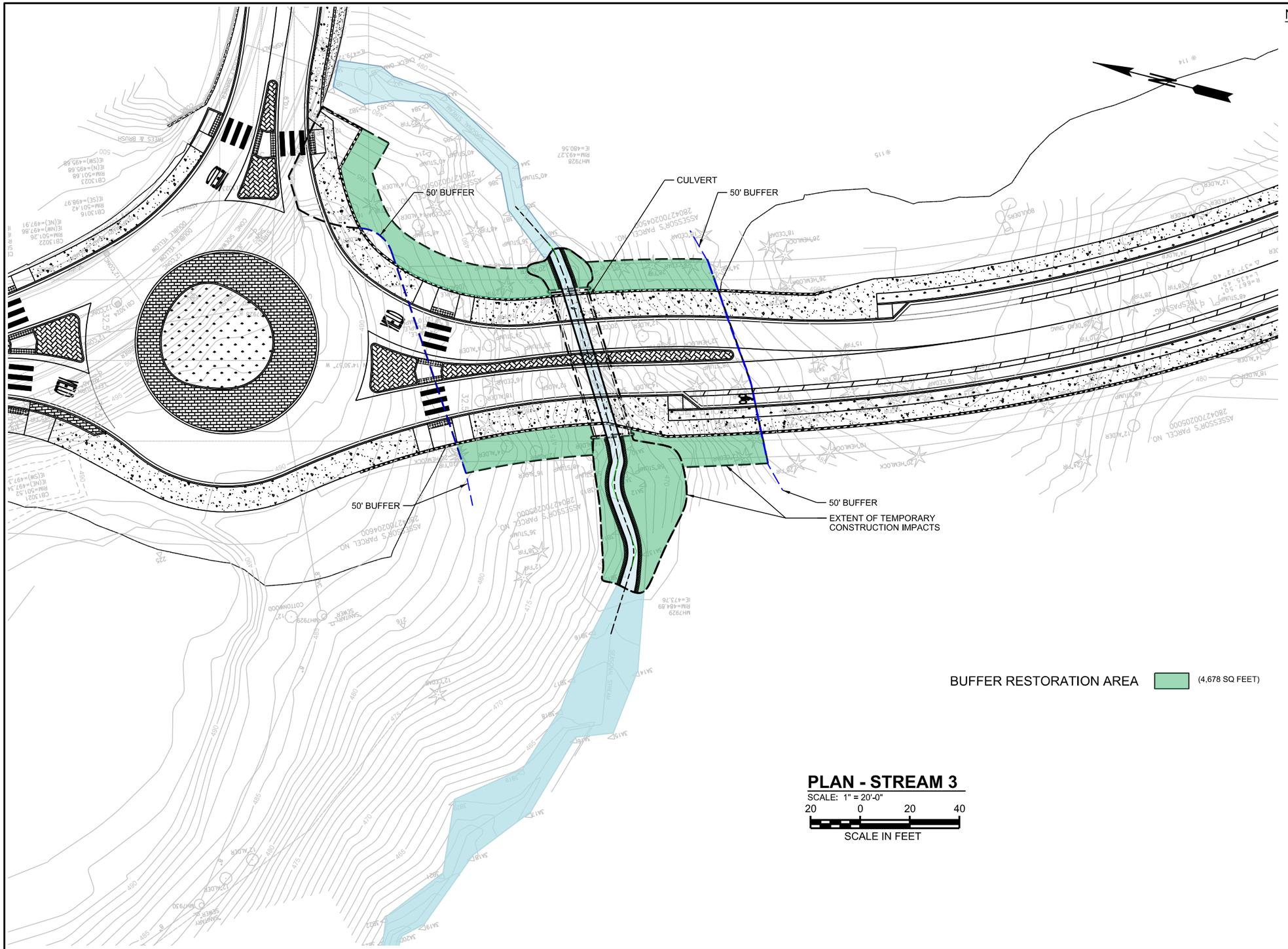
STREAM 3 - IMPACT

DRAWING NUMBER

SB14

SHT 117 OF 238

K:\21-11\12561\211-12561-203-Fig.dgn
1/15/2019 11:55:15 PM
17x11 (in.)



NOTES:

1. WORK OUTSIDE LIMITS WILL REQUIRE ADDITIONAL SITE RESTORATION CONSISTENT WITH PLANT SCHEDULES ON SHEETS SB09 AND SB16.
2. SEE SB17 FOR PLANTING DETAILS.

BUFFER RESTORATION AREA (4,678 SQ FEET)

PLAN - STREAM 3

SCALE: 1" = 20'-0"

20 0 20 40

SCALE IN FEET

DATUM

NAVD OF 1988

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/16/2019
DESIGNED BY	DATE
CJK	1/16/2019
DRAWN BY	DATE
DRC	1/16/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 3 - REVEGETATION PLAN

DRAWING NUMBER

SB15

SHT 118 OF 238

K:\21-1\12561\211-12561-203-Fig.dgn
1/16/2019 12:05:21 AM
17x11 (in.)

NOTES:

1. PLANT SCHEDULES FOR STREAM 1 ON DRAWING NUMBER SB09.
2. SEE SB06 FOR COIR LOG SCHEDULES.
3. SEE SB09 FOR NATIVE SEED MIXES.
4. IMMEDIATELY AFTER SOIL PREPARATION, HAND SEED, BROADCAST SEED, OR HYDROSEED EXPOSED SOILS WITH THE APPROPRIATE NATIVE EROSION-CONTROL SEED MIX SPECIFIED ON THE PLANS: BUFFER OR WETLAND. IF SEED IS APPLIED USING HYDROSEED, IT SHOULD BE MIXED WITH A TACKIFIER AND MULCH AT RATIOS RECOMMENDED BY THE SEED SUPPLIER. IF OTHER METHODS ARE USED, THE SEED SHOULD BE ROLLED OR TRACKED TO PROVIDE GOOD SOIL CONTACT, WATERED, AND THEN COVERED WITH HYDROMULCH OR TWO INCHES OF STRAW MULCH.
5. FOR PLANTING DETAILS, SEE DRAWING NUMBER SB17.

Stream 3 Buffer Restoration Area

Common Name	Scientific Name	Quantity	Size/Condition	Spacing
Trees				
Douglas-fir	*Pseudotsuga menziesii*	8	2-gal container	12-ft. O.C.
Western hemlock	*Tsuga heterophyla*	6	2-gal container	12-ft. O.C.
Big-leaf maple	*Acer macrophyllum*	11	2-gal container	12-ft. O.C.
Western red cedar	*Thuja plicata*	8	2-gal container	12-ft. O.C.
Shrubs				
Oregon grape	*Mahonia nervosa*	35	1-gal container	6-ft. O.C.
Snowberry	*Symphoricarpos albus*	35	1-gal container	6-ft. O.C.
Red elderberry	*Sambucus racemosa*	35	1-gal container	6-ft. O.C.
Salal	*Gaultheria shallon*	25	1-gal container	6-ft. O.C.
Groundcover				
Sword Fern	*Polystichum munitum*	282	4" pot	4-ft. O.C.

Based on estimated buffer revegetation area of 4,678 square feet.
Final counts should be adjusted based on the actual area disturbed during construction.

1/23/2019 1:46:50 PM
K:\21-1\12561\211-12561-203-Fig.dgn
17x11 (in.)

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

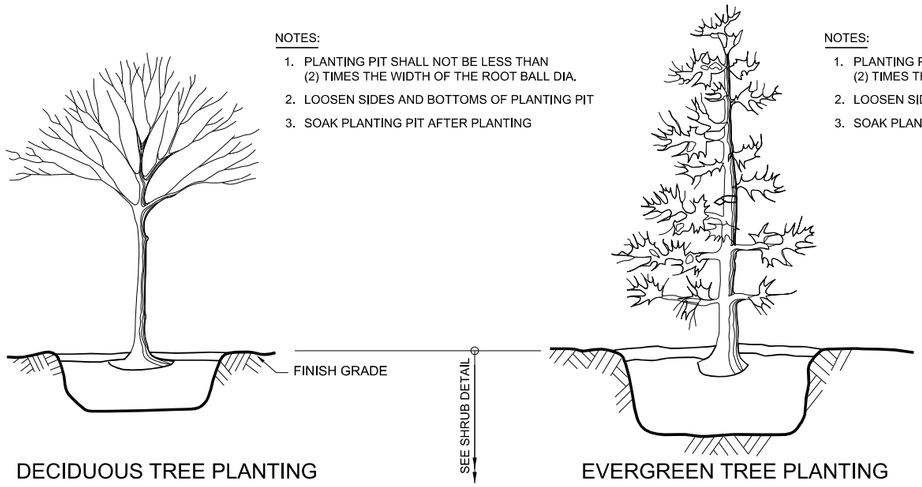
CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

STREAM 3 - PLANT SCHEDULES

DRAWING NUMBER
SB16

SHT 119 OF 238



NOTES:

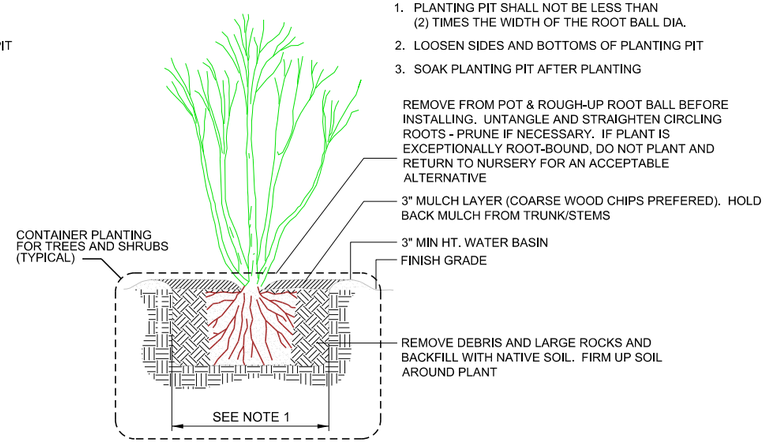
1. PLANTING PIT SHALL NOT BE LESS THAN (2) TIMES THE WIDTH OF THE ROOT BALL DIA.
2. LOOSEN SIDES AND BOTTOMS OF PLANTING PIT
3. SOAK PLANTING PIT AFTER PLANTING

NOTES:

1. PLANTING PIT SHALL NOT BE LESS THAN (2) TIMES THE WIDTH OF THE ROOT BALL DIA.
2. LOOSEN SIDES AND BOTTOMS OF PLANTING PIT
3. SOAK PLANTING PIT AFTER PLANTING

TREE PLANTING DETAIL (A)

SCALE: NTS

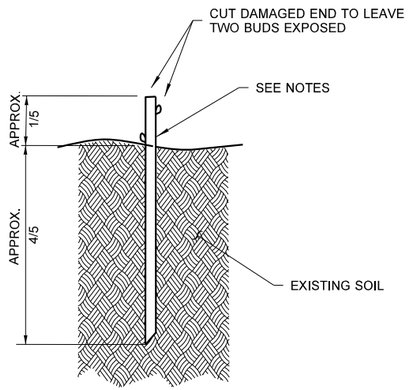


NOTES:

1. PLANTING PIT SHALL NOT BE LESS THAN (2) TIMES THE WIDTH OF THE ROOT BALL DIA.
2. LOOSEN SIDES AND BOTTOMS OF PLANTING PIT
3. SOAK PLANTING PIT AFTER PLANTING

SHRUB PLANTING DETAIL (B)

SCALE: NTS



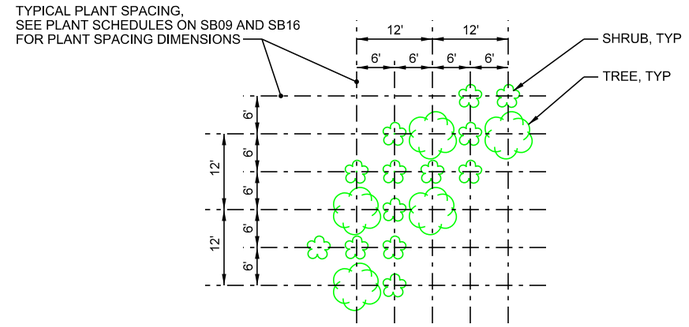
NOTES:

1. SEE PLANT SCHEDULE FOR SIZE, TYPE AND QUANTITY OF LIVE STAKE.
2. DO NOT USE AXE OR SLEDGE FOR DRIVING STAKES.
3. IN HARD GROUND USE AN IRON BAR OR STAR DRILL TO PREPARE THE HOLES FOR THE STAKE.
4. AVOID STRIPPING BARK OR BRUISING STAKES DURING INSTALLATION.
5. FILL VOID AROUND CUTTING WITH SOIL.
6. IN THE WETLAND D ENHANCEMENT AREA, USE A STRING TRIMMER OR OTHER EQUIPMENT TO REMOVE REED CANARYGRASS ABOVE THE GROUND SURFACE PRIOR TO PLACING THE LIVE STAKES.
7. COVER ALL BARE AREAS AND A 3-FOOT-DIAMETER AROUND EACH LIVE STAKE IN WETLAND D WITH THREE INCHES OF GUARANTEED WEED-FREE, COARSE WOOD CHIP MULCH. WOOD CHIPS SHALL BE MOVED AWAY FROM PLANT STEMS TO PREVENT STEM ROT.

TYPICAL LIVE STAKE INSTALLATION

LIVE POLE/STAKE DETAILS (C)

SCALE: NTS



TYPICAL PLANT SPACING DETAIL (D)

SCALE: NTS

NO.	DATE	BY	APPR.	REVISIONS

CJK	1/23/2019
DESIGNED BY	DATE
CJK	1/23/2019
DRAWN BY	DATE
DRC	1/23/2019
CHECKED BY	DATE
APPROVED BY	DATE
FILENAME: 211-12561-203-Fig.dgn	

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

CITY OF MUKILTEO

CITY OF MUKILTEO
HARBOUR REACH CORRIDOR
CITY OF MUKILTEO, SNOHOMISH COUNTY

PLANTING DETAILS

DRAWING NUMBER **SB17**

SHT 120 OF 238

K:\21-1\12561\211-12561-203-Fig.dgn 1/23/2019 2:05:27 PM 17x11 (in.)

APPENDIX B

RESUMES OF PRIMARY REPORT AUTHOR AND PLAN DESIGNERS

Amy J. Summe | Senior Biologist/Permit Specialist

EDUCATION

BS, Zoology, Washington State University, Pullman, Washington, 1997
BS, Environmental Science, Washington State University, Pullman, Washington, 1997

ADDITIONAL TRAINING

USACE-endorsed five-day course on wetland delineation, Wetland Training Institute
Using the Revised Washington State Wetland Rating System (2014) in Western Washington, Washington State Department of Ecology (Ecology)
Washington State Wetland Functions Assessment Methodology Training, Ecology
Biological Assessment Preparation for Transportation Projects, Washington State Department of Transportation (WSDOT)
Using the Field Indicators for Hydric Soils, Ecology
Puget Sound Watershed Characterization: Integrating Assessments Into Planning Decisions, Coastal Training Program

PROFESSIONAL SUMMARY

Amy Summe is a biologist and permitting specialist with 20 years of experience on public and private projects in Eastern and Western Washington. A thorough knowledge of Washington's environmental regulations coupled with wetland and shoreline expertise give Amy skills to help bring projects into compliance with State and Federal mandates and facilitate smooth permitting. Amy has successfully guided clients through the permitting process, including local critical areas and shoreline permits, SEPA, WDFW Hydraulic Project Approval, Section 10 and Section 404 Corps permits, 401 Water Quality Certification, NPDES Construction Stormwater and Hatchery Discharge permits, and other specialized Tribal approvals. Her education and background as a biologist complement her work as an environmental planner. Amy has also participated in Comprehensive Plan updates, led Shoreline Master Program updates, and updated local critical areas regulations.

RELEVANT EXPERIENCE

Clallam County, Lower Dungeness River Levee Setback, Clallam County, WA. Shannon & Wilson is providing services for the realignment of a 1 mile-long reach of the Lower Dungeness River U.S. Army Corps of Engineers (Corps) levee and the restoration of about 100 acres of associated floodplain on the right bank of the Dungeness River, approximately 5 miles north of the City of Sequim, Washington. To date, Amy has participated in OHWM delineation of the Dungeness River and Meadowbrook Creek, and updated mapping of floodplain wetlands. Amy will continue to provide permit support at the local, state and federal levels.

Whatcom County, Deming Levee Upstream Improvements, Deming, WA. Environmental documentation lead for design and implementation of a levee improvement on the Nooksack River. Amy prepared the Biological Assessment, and updated the wetland delineation report and mitigation plan report. She coordinated directly with U.S. Fish and Wildlife Service biologists regarding the Oregon spotted frog, a recently listed species.

City of Bellevue, 120th Avenue NE Corridor Project, Bellevue, WA. Biologist and environmental permit lead for a road widening and improvement project that has permanent impacts to wetlands. Following the loss of the originally planned wetland mitigation site, Amy worked closely with City staff, consulting design engineer, and the U.S. Army Corps of

Engineers to identify and permit a viable mitigation alternative in the short time remaining before the project went to bid. Two potential options were evaluated and pursued concurrently: use of the King County in-lieu-fee program and implementation of wetland enhancements on a City park property. Based on cost and the different permit approval timelines, Amy adapted a City- and Corps-approved enhancement plan for the City park property to be used for project mitigation. Additional documentation was also provided to the City to demonstrate compliance of the alternative mitigation with City critical areas regulations.

City of Mill Creek, 35th Ave Southeast Reconstruction Project, Mill Creek, WA. Biologist and environmental permit lead for a road improvement project that addresses road flooding issues, and includes stormwater improvements having minor wetland impacts. Following a change in the project design, Amy updated the draft Biological Evaluation, JARPA and SEPA Checklist to add permanent wetland impacts, and submitted environmental applications and documentation to local, state and federal agencies. She coordinated with City planning and engineering staff, consulting transportation engineer, and in-house hydraulic engineers to develop responses to City, WDFW, Muckleshoot Tribe, and Corps comments regarding the roadway/culvert design, mitigation, and fish passage.

Juanita Beach Park Bathhouse Replacement, Kirkland, WA. Biologist and environmental permit lead for public access and recreation improvements to a City park on the Lake Washington waterfront. Early in the project, Amy identified a need for updated wetland delineation of features surrounding the proposed work area. When the updated delineation revealed unexpected wetland conditions, Amy met with the City Parks department and the designing architect to develop a strategy for moving the project forward in a way that meets the community's needs and minimizes impacts to critical areas. Amy led development of a summary exhibit for the City's Parks Board to outline the different design and permitting options and cost and mitigation implications, and support decisionmaking. Applications have been submitted to the U.S. Army Corps of Engineers for Section 404 approval, and to Washington Department of Ecology for Section 401 Water Quality Certification. SEPA and Shoreline Variance submittals, along with a final mitigation plan for on- and off-site wetland and buffer mitigation will be submitted in the next few weeks to the City.

Port of Tacoma, Advance Mitigation Design and Permitting, Tacoma, WA. With a previous employer, Amy coordinated preparation of local, state and federal permit applications for an 18-acre stream and wetland complex that will provide advance mitigation for future unavoidable impacts on Port of Tacoma properties. The project will restore a ditched salmon-bearing stream and invasive species-dominated upland fill to a meandering stream with extensive floodplain, estuarine and forested wetlands, and public view stations. The Port subsequently incorporated the approved project into its Umbrella Wetland and Habitat Conservation Bank.

Lake Stevens School District, New Mid-High School, Lake Stevens, WA. With a previous employer, Amy led wetland and stream investigations on the site, and managed all local, state and federal permitting processes. She led preparation of the on-site wetland restoration plan. The project was the first private project to obtain approval to use a mitigation bank to compensate for permanent wetland impacts.

New Glacier Peak High School, Snohomish School District, WA. With a former employer, Amy led wetland investigations on the site in Snohomish County, and managed all local, state and federal permitting processes. She also coordinated development of the on-site mitigation plan.

Chad Krofta, PE | Senior Hydraulic Engineer

EDUCATION

MS, Civil & Environmental Engineering, University of California - Berkeley, 2004
BS, Civil & Environmental Engineering, University of Wisconsin - Madison, 2002

REGISTRATION

Registered Civil Engineer, California, 1/2006, License # 69656
Registered Civil Engineer, Washington, 9/2009, License #C46138
Registered Professional Engineer, Idaho, 10/2009, License #13958
Registered Professional Engineer, Oregon, 3/2011, License #84692
NCEES Record, National, 10/2009, License #39223

CERTIFICATIONS

Certified Floodplain Manager, 9/2016, Exp. 1/19, US-16-09299
ASCE Continuing Education– Streambank Stabilization for Restoration and Flood Control Projects, 2007

PROFESSIONAL SUMMARY

Mr. Krofta has over 13 years of experience in water resource engineering, project, and construction management. Throughout this time, he has successfully led innovative and sustainable drainage, flood mitigation, erosion control, hazardous waste remediation, and habitat restoration projects from planning, data collection, analysis and design to permitting and construction. His technical experience includes hydrologic and hydraulic modeling of streams, pipes, and culverts using WMS, WWHM, HEC-HMS, StreamStats, SWMM, HY-8, HydroCAD, HEC-RAS, and others; design of erosion control, flood mitigation, stormwater conveyance, and habitat enhancement features; engineering plan preparation using AutoCAD Civil 3d; specification production; and project cost estimation and risk/benefit analysis. engineering plan preparation using AutoCAD Civil 3d, specification production, and project cost estimation and risk/benefit analysis. Mr. Krofta is also familiar with the federal, state, and local regulatory and permitting structure applicable to water resource projects including the Clean Water Act, Safe Drinking Water Act, National Flood Insurance Act, Endangered Species Act, National and State Environmental Policy Act, Washington State Shoreline Management Act, county and municipal critical areas and floodplain development ordinances, and others. He routinely works within multidisciplinary teams to identify and integrate technical, economic, and regulatory requirements into project planning and design.

RELEVANT EXPERIENCE

South Puget Sound Salmon Enhancement Group, Titlow Park Shoreline Restoration, Tacoma, WA. The South Puget Sound Salmon Enhancement Group in cooperation with Metro Parks Tacoma is conducting habitat restoration within Metro Park's Titlow Park. Two undersized culvert crossings of the train tracks will be replaced with a new bridge to improved tidal connection to a former estuary and lagoon located within the park. Mr. Krofta has assisted in development of preliminary design studies for this project.

Kay's House Restoration Project, South Puget Sound Salmon Enhancement Group, Tacoma, WA. The South Puget Sound Salmon Enhancement Group in cooperation with Metro Parks Tacoma is conducting hazardous material remediation and habitat restoration within Metro Park's Titlow Park located adjacent to the Tacoma Narrows portion of the Puget Sound. Surficial soils

within the park have been impacted by arsenic, lead, and other heavy metals discharged by the former Asarco Company smelter located in Tacoma. Additionally, the portion of the park known as Kay's House includes several abandoned structures that contain lead paint and asbestos and the shoreline has been armored with a concrete bulkhead and rock riprap. Shannon & Wilson has assisted SPSSEG and Metro Parks Tacoma with soil contamination characterization, hazardous materials surveys, and shoreline restoration, demolition, and remediation engineering design for the Kay's House site. Construction is slated for the fall of 2016.

Deschutes River Mile 33 Habitat Restoration Project, Thurston County, WA. As project manager and lead engineer, Mr. Krofta is leading topographic survey, geotechnical and geomorphology studies, and hydraulic modeling as well as preliminary design for this aquatic habitat restoration project located on Weyerhaeuser forestland in Thurston County. The Deschutes River at this location has eroded into a logging road mobilizing fine sediments. This project will decommission the existing forest road and place large woody debris structures to reduce fine sediment loading to the river, cool water temperatures, and enhance existing aquatic habitat.

Middle Pilchuck River Rehabilitation Project, Snohomish County Department of Public Works, WA. Mr. Krofta assisted in the design of engineered log jams, flood fences, and side channel reconnection structures for this habitat rehabilitation project located on the Pilchuk River near Lake Stevens, Washington. This project improved aquatic habitat by adding large woody debris to improve pool and cover habitat, reconnect side channels, and reduce high summer water temperatures.

Keller Farm Mitigation Bank, Redmond, WA. Hydraulic Engineer. A property within the City of Redmond is currently under consideration for development of a new wetland mitigation bank. Mr. Krofta has assisted in preliminary hydrologic and hydraulic studies of the site in order to document baseline wetland conditions and provide recommendations for mitigation bank design.

North Fork Skagit River Levee Setback Project, Skagit County, WA. Mr. Krofta has assisted in the development of preliminary design documents for this levee setback project located within an agricultural parcel adjacent to the North Fork Skagit River. This project will setback 1800 linear feet of the existing levee in order to reconnect floodplain and off channel habitats. Feasibility studies included surface and groundwater monitoring, subsurface borings and geotechnical lab testing, a 2 dimensional hydraulic model, a seepage analysis, and an evaluation of levee setback and seepage mitigation design alternatives.

Harbour Reach Drive Extension Project, City of Mukilteo, WA. The City of Mukilteo is extending Harbour Reach Drive and installing two new crossings of Picnic Point Creek. Mr. Krofta has lead a site investigation to provide preliminary crossing design recommendations that meet WDFW stream crossing design guidelines for fish passage. He is currently leading preliminary through final design of the new crossings.

APPENDIX C
IMPORTANT INFORMATION ABOUT YOUR WETLAND DELINEATION/MITIGATION AND/OR STREAM CLASSIFICATION REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 21-1-12561-203

Date: January 5, 2019
To: Mark Burrus
Lochner

IMPORTANT INFORMATION ABOUT YOUR WETLAND DELINEATION/MITIGATION AND/OR STREAM CLASSIFICATION REPORT

A WETLAND/STREAM REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

Wetland delineation/mitigation and stream classification reports are based on a unique set of project-specific factors. These typically include the general nature of the project and property involved, its size, and its configuration; historical use and practice; the location of the project on the site and its orientation; and the level of additional risk the client assumed by virtue of limitations imposed upon the exploratory program. The jurisdiction of any particular wetland/stream is determined by the regulatory authority(s) issuing the permit(s). As a result, one or more agencies will have jurisdiction over a particular wetland or stream with sometimes confusing regulations. It is necessary to involve a consultant who understands which agency(s) has jurisdiction over a particular wetland/stream and what the agency(s) permitting requirements are for that wetland/stream. To help reduce or avoid potential costly problems, have the consultant determine how any factors or regulations (which can change subsequent to the report) may affect the recommendations.

Unless your consultant indicates otherwise, your report should not be used:

- If the size or configuration of the proposed project is altered.
- If the location or orientation of the proposed project is modified.
- If there is a change of ownership.
- For application to an adjacent site.
- For construction at an adjacent site or on site.
- Following floods, earthquakes, or other acts of nature.

Wetland/stream consultants cannot accept responsibility for problems that may develop if they are not consulted after factors considered in their reports have changed. Therefore, it is incumbent upon you to notify your consultant of any factors that may have changed prior to submission of our final report.

Wetland boundaries identified and stream classifications made by Shannon & Wilson, Inc. are considered preliminary until validated by the U.S. Army Corps of Engineers (Corps) and/or the local jurisdictional agency. Validation by the regulating agency(s) provides a certification, usually written, that the wetland boundaries verified are the boundaries that will be regulated by the agency(s) until a specified date, or until the regulations are modified, and that the stream has been properly classified. Only the regulating agency(s) can provide this certification.

MOST WETLAND/STREAM "FINDINGS" ARE PROFESSIONAL ESTIMATES.

Site exploration identifies wetland/stream conditions at only those points where samples are taken and when they are taken, but the physical means of obtaining data preclude the determination of precise conditions. Consequently, the information obtained is intended to be sufficiently accurate for design, but is subject to interpretation. Additionally, data derived through sampling and subsequent laboratory testing are extrapolated by the consultant who then renders an opinion about overall conditions, the likely reaction to proposed construction activity, and/or appropriate design. Even under optimal circumstances, actual conditions may differ from those thought to exist because no consultant, no matter how qualified, and no exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock, and time. Nothing can be done to prevent the unanticipated, but steps can be taken to help reduce their impacts. For this reason, most experienced owners retain their consultants through the construction or wetland mitigation/stream classification stage to identify variances, to conduct additional evaluations that may be needed, and to recommend solutions to problems encountered on site.

WETLAND/STREAM CONDITIONS CAN CHANGE.

Since natural systems are dynamic systems affected by both natural processes and human activities, changes in wetland boundaries and stream conditions may be expected. Therefore, delineated wetland boundaries and stream classifications cannot remain valid for an indefinite period of time. The Corps typically recognizes the validity of wetland delineations for a period of five years after completion. Some city and county agencies recognize the validity of wetland delineations for a period of two years. If a period of years have passed since the wetland/stream report was completed, the owner is advised to have the consultant reexamine the wetland/stream to determine if the classification is still accurate.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or water fluctuations may also affect conditions and, thus, the continuing adequacy of the wetland/stream report. The consultant should be kept apprised of any such events and should be consulted to determine if additional evaluation is necessary.

THE WETLAND/STREAM REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when plans are developed based on misinterpretation of a wetland/stream report. To help avoid these problems, the consultant should be retained to work with other appropriate professionals to explain relevant wetland, stream, geological, and other findings, and to review the adequacy of plans and specifications relative to these issues.

DATA FORMS SHOULD NOT BE SEPARATED FROM THE REPORT.

Final data forms are developed by the consultant based on interpretation of field sheets (assembled by site personnel) and laboratory evaluation of field samples. Only final data forms customarily are included in a report. These data forms should not, under any circumstances, be drawn for inclusion in other drawings because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to reduce the possibility of misinterpreting the forms. When this occurs, delays, disputes, and unanticipated costs are frequently the result.

To reduce the likelihood of data from misinterpretation, contractors, engineers, and planners should be given ready access to the complete report. Those who do not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of information always insulates them from attendant liability. Providing the best available information to contractors, engineers, and planners helps prevent costly problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because a wetland delineation/stream classification is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in written transmittals. These are not exculpatory clauses designed to foist the consultant's liabilities onto someone else; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

THERE MAY BE OTHER STEPS YOU CAN TAKE TO REDUCE RISK.

Your consultant will be pleased to discuss other techniques or designs that can be employed to mitigate the risk of delays and to provide a variety of alternatives that may be beneficial to your project.

Contact your consultant for further information.