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Critical Areas Report and Mitigation Plan



Satsop Right Bank Conservation Project Shoreline and Critical Areas Report and Mitigation Plan

Prepared for
Gray's Harbor Conservation District

August 2021

Prepared by
Parametrix

Satsop Right Bank Conservation Project Shoreline and Critical Areas Report and Mitigation Plan

Prepared for

Grays Harbor Conservation District

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1 INTRODUCTION

Parametrix prepared this shoreline and critical areas report and mitigation plan as part of the land use application for the Grays Harbor Conservation District's (applicant) Lower Satsop Right Bank Conservation Project (project). Parametrix characterized shoreline and critical areas conditions in a 13.31-acre project area located along the right (west) bank of the lower Satsop River. The project area is approximately 2,000 feet upstream from the confluence with the Chehalis River, within unincorporated Grays Harbor County, Washington. Project activities will occur in the parcels listed in Table 1 below.

Table 1. Project Area Tax Parcels

Parcel ID (Landowner)	Section	Township	Range
170701440010 (Contreras)	01	17N	7W
170701440020 (Chapman)	01	17N	7W
170701440030 (Chapman)	01	17N	7W
170701440040 (Chapman)	01	17N	7W
170712120030 (Willis)	12	17N	7W
170607220010 (Olympic View Dairy)	07	17N	6W

This critical areas and shoreline report was prepared in accordance with Grays Harbor County Code (GHCC) Chapter 18.06, addressing critical areas protection ordinance, critical aquifer recharge areas, frequently flooded area, and geologically hazardous areas; and the Grays Harbor County Shoreline Master Program (Grays Harbor County 2020).

Project Description

The project purpose is to provide protection of approximately 1,950 feet of streambank along the Lower Satsop River in order to reduce the current aggressive rate of erosion, conserve the right bank line, and generally preserve the river's migration corridor until the Lower Satsop Restoration and Protection Program's Phase II project is constructed (summer 2022).

Multiple projects have recently been completed along the Lower Satsop River focusing on flood protection and restoration. In 2019 and 2020, WDFW completed substantial restoration projects in the floodplain to remove dikes, revetments, and return river flows to floodplain areas previously inaccessible for decades. In 2020, Grays Harbor County constructed the Keys Road Flood Protection Project (i.e., Phase I of the Lower Satsop Restoration and Protection Program) that involved installation of engineered log jams and setback log structure revetments to protect Keys Road and associated infrastructure. Phase II of the Lower Satsop Restoration and Protection Program is currently in design and will be constructed in summer 2022. Recent significant bank erosion within the Right Bank project area has occurred, resulting in current and anticipated future loss of riparian habitat and adjacent farmland. Construction of this project in fall 2021 is intended to slow the rate of erosion until the Phase II project can be constructed.

The project will consist of installation of four-log jack spurs, continuous log rows, and log jacks installed in uplands set back 5 to 6 feet from the top of bank. Continuous log rows and individual or small

groupings of log jacks will be placed in 5-foot-deep excavated trenches, whereas log jack spurs will be in trenches up to 15 feet deep. Log rows will consist of two bundles of four logs each with ballast rocks secured on each end with cable or other suitable material. Log jacks will consist of a six-log tetrahedral structure with a ballast boulder contained inside. Structures will be bound together using all-thread rods to connect logs, and the ballast boulder will be contained within the structure using a cable sling. Slash material will be inserted within the jacks to provide potential for trapping sediment and providing fish habitat. Log jack spurs will consist of widely spaced structures made of dense groupings of log jacks. Spurs are intended to redirect the river away from the eroding bank. The log rows, log jacks, and tails of the spurs will be mostly buried with excavated soil. A temporary access road will provide access from Willis Farm Rd. and the staging area to the project area. The access road will consist of geotextile fabric and hog fuel (wood chips) and will be removed at the end of the three-year maintenance period.

The project will be constructed entirely in uplands. Dredging or discharge of materials into waters of the U.S. is not anticipated during construction. Only farmed land will be disturbed as part of the project. As bank erosion continues, the log-ballasted structures will sluff down onto the toe of the riverbank to provide long-term bank conservation conjointly with the Phase 2 project. The project will provide bank stability and will increase functions and values of fish habitat in the Satsop River; therefore, the project is considered self-mitigating. However, adaptive management measures will be in place to ensure project goals are achieved. All temporary impacts will be reseeded with pasture grass or crop seed (as specified by the farmer) following construction.

Project figures are provided in Appendix A, background maps are provided in Appendix B, and representative site photographs are provided in Appendix C.

2 CRITICAL AQUIFER RECHARGE AREAS

Per Article IV, Chapter 18.06 – Critical Areas Protection Ordinance, critical aquifer recharge areas (CARA) are a designated critical area to protect the public health and safety, prevent the degradation of groundwater aquifers used for potable water, and provide for regulations that prevent and control risks to the degradation of groundwater aquifers in Grays Harbor County. Aquifer recharge areas are those areas with geologic and hydrologic conditions that promote rapid infiltration of recharge waters to groundwater aquifers. The project area does not lie within any designated CARA protection areas (Grays Harbor County 2020). Additionally, the project activities do not include new development requiring compliance with GHCC Chapter 18.06. CARAs are therefore not discussed further in this document.

3 WETLANDS

The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI; USFWS, 2021) online mapping program indicates a now outdated alignment of the Satsop River and a series of freshwater forested/shrub wetlands east and outside of the project area (see Appendix B). A site visit was conducted by Taya K. MacLean, Parametrix Senior Scientist and certified Professional Wetland Scientist, on July 16, 2021. No wetlands were observed above the OHWM of the Satsop River within the project area. Therefore, wetlands are not addressed further in this report (Parametrix 2021).

4 FREQUENTLY FLOODED AREAS

Per Article IV, Section 44 of Grays Harbor County Ordinance No. 448, frequently flooded areas are defined as those areas identified by the Federal Insurance Administration in the Flood Insurance Study for Grays Harbor County and Incorporated Areas, dated February 3, 2017, and any revisions thereto, with accompanying Flood Insurance Rate Maps (FIRM). The entire project area is mapped as Flood Zone A (the 100-year floodplain; see Appendix B). A floodplain impacts assessment is being prepared by Parametrix to evaluate the effect of the project on 100-year water surface elevations and flood conveyance.

5 GEOLOGICALLY HAZARDOUS AREAS

The entire project area is mapped as Moderate to High liquefaction potential, with a National Earthquake Hazards Reduction Program (NEHRP) Site Class of "stiff soil to soft soil" (Grays Harbor County 2020; see Appendix B). No landslide hazards are mapped along the Lower Satsop River, but the project area is not within the mapped extent of tsunami hazard areas (Washington State Department of Natural Resources 2020; Figure 3 of Appendix A). The project contains no elements which could impact the liquefaction, earthquake, or tsunami hazard potential of the project area. Therefore, geological hazards are not addressed further in this report.

6 FISH AND WILDLIFE HABITAT CONSERVATION AREAS AND SHORELINE

Stream Type and Riparian Habitat Buffers

Waters of the Lower Satsop River occur adjacent to the project area. The ordinary high water mark (OHWM) of the Lower Satsop River was delineated at elevation 20.1 feet (NAVD88; Natural Systems Design 2020).

Per Article VI, Section 57, of Grays Harbor County Ordinance No. 448, streams are considered a water of the state, and thus the Satsop River is regulated by the County as a critical area, specifically as a Fish and Wildlife Habitat Conservation Area. The Lower Satsop River is designated as a Shoreline of the State (i.e., a Type S water, and as such is afforded a 150-foot buffer from OHWM (GHCC Chapter 18.06.630)).

Per the Grays Harbor County Shoreline Master Program, the shoreline environmental designation of the Satsop River is Rural Development, which is also assigned a 150-foot shoreline buffer (Grays Harbor County 2020). Watershed restoration, fish and wildlife habitat, and fish passage projects are uses allowed within standard stream buffers. Similarly, bank stabilization through bioengineered or soft armoring techniques may be permitted within the stream buffer if they will not degrade fish or wildlife habitat conservation area functions or processes on-site or in the surrounding area.

Vegetation and habitat within the 150-foot buffer in the project area consist entirely of farmed agricultural land with crops that include corn, pumpkins, and pasture. The project area does not include adjacent forested riparian habitat.

Fish and Wildlife Habitat Assessment

During the site visit on July 16, 2021, Parametrix staff reviewed the current plant community composition and wildlife habitats present within the project area. Review of the WDFW Priority Habitat and Species Inventory online data mapper indicated that the general vicinity of the project area at the confluence of the Satsop and Chehalis Rivers supports a variety of priority species and habitats described below (Washington Department of Fish and Wildlife 2021; see Appendix B).

General Habitat Conditions

The project area is located in agricultural fields. The in-stream and riparian woodland habitats are located within 300 feet of the eastern project boundary. General conditions of these habitats are described below.

Riparian Woodland

Riparian woodland plant community is not present within the project area, but does occur adjacent to the project area along the Satsop River floodplain. This habitat is generally dominated by deciduous native trees, primarily red alder (*Alnus rubra*), interspersed with scattered black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and bigleaf maple (*Acer macrophyllum*). Conifers are widely scattered and include primarily Douglas-fir (*Pseudotsuga menziesii*) and the occasional Sitka spruce (*Picea sitchensis*). The understory is dominated by a shrub community of vine maple (*Acer circinatum*), red-osier dogwood (*Cornus sericea*), beaked hazelnut (*Corylus cornuta*), salmonberry (*Rubus spectabilis*), trailing blackberry (*Rubus ursinus*), red elderberry (*Sambucus racemosa*), Nootka rose (*Rosa nutkana*), black gooseberry (*Ribes lacustre*), and snowberry (*Symphoricarpos albus*). The herbaceous ground layer is dominated by native sword fern (*Polystichum munitum*), stinging nettle (*Urtica dioica*), and Oregon man-root (*Marah oregana*). Low elevation areas within the forested wetlands support common touch-me-not (*Impatiens noli-tangere*). Non-native and invasive species include giant knotweed (*Polygonum sachalinensis*), Himalayan blackberry (*Rubus armeniacus*), and reed canarygrass (*Phalaris arundinacea*). Red alder snags and downed logs are common within the riparian woodland.

In-Stream Habitat

The project area is adjacent to the in-stream habitat of the Lower Satsop River. Within the project vicinity, the Lower Satsop River is classified as a freshwater riverine upper perennial with an unconsolidated bottom permanently flooded (R3UBH) feature, and areas of riverbanks within the floodplain are classified as freshwater riverine upper perennial with unconsolidated shore seasonally flooded (R3USC) features on the USFWS NWI mapping.

The river flows south with significant meanders that are surrounded by young floodplain forest and extensive gravel bars that are exposed during low water. River substrate consists of gravels and cobbles. Active streambank erosion brings sediments to the river affecting water quality. There is a fair amount of large woody debris and a variety of widths and depths of side channels and alcoves; these increase overall habitat complexity in the area. However, tall trees are rare along the banks, and thus, not much shade is provided over the river.

Agricultural Fields

A majority of the project area is upland consisting of farmland that is used for pasture, corn and grass production, a seasonal pumpkin patch for visitors, and a grass airstrip (Chapman Farms). The near-vertical eroded bank is void of riparian vegetation.

Wildlife Use

During the July 16, 2021, site visit, Parametrix identified or observed evidence of the following species within the project area and its immediate vicinity:

- American dipper (*Cinclus mexicanus*)
- Belted kingfisher (*Megaceryle alcyon*)
- Killdeer (*Charadrius vociferus*)
- Black-tail deer (tracks) (*Odocoileus hemionus columbianus*)
- Canada goose (*Branta canadensis*)
- Great blue heron (*Ardea herodias*)
- Cedar waxwing (nesting in in-stream wood structures) (*Bombycilla cedrorum*)
- Black bear (scat) (*Ursus americanus*)

Wildlife use of habitat within the project area is limited by human presence, periodic disturbance, and the open nature of pastures and crop fields. The edge habitat created at the interface of the woodland areas and the agricultural areas offers opportunity for small, disturbance-adapted mammals to find denning and foraging habitat. Such species include coyote (*Canis latrans*), bobcat (*Lynx rufus*), black bear, raccoon (*Procyon lotor*), various weasels and mink, and black-tail deer. Great blue herons (a state priority species) are commonly observed foraging in open field and forest edges, particularly in wet meadows and emergent wetland areas. Beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and river otter (*Lontra canadensis*) are typically present in and along the riparian edge and shoreline habitats along rivers (Knutson and Naef 1997). Various bats, including the big-brown bat and Yuma myotis, may similarly find appropriate roosting and foraging habitat in the riparian forests of the project area.

Bird nesting sites, including ground surface, tree limb, tree cavity, and shrub-located sites, are present throughout the woodland areas within both portions of the project area and along the shoreline of the river. Cool and moist soil conditions, a humus layer, a location near a water source, and areas where downed wood and dense vegetation are prevalent are prime conditions for riparian-associated reptiles and amphibians such as various species of garter snake (*Thamnophis sirtalis*), Western toad (*Anaxyrus boreas*), long-toed salamander (*Ambystoma macrodactylum*), Northwestern salamander (*Ambystoma gracile*), Pacific treefrog (*Pseudacris regilla*), Northern red-legged frog (*Rana aurora*), and roughskin newt (*Taricha granulosa*).

Priority Habitat and Species Inventory

Priority Species

Priority species include any species of local importance or endangered, threatened, sensitive, or candidate species that have a primary association with habitat on or adjacent to the project area. Below are priority species listed for the project area and its vicinity by the WDFW database.

Olympic mudminnow (*Novumbra hubbsi*)

Olympic mudminnow is Washington State–listed sensitive that is considered to be present within the Satsop River. Rural development within the watershed may pose a threat to mudminnow habitat. As response, WDFW developed management recommendations to protect Olympic mudminnow habitat from further degradation (Glasgow and Hallock 2009). Measures essential to the protection of this species include preventing alteration to the hydrology (diversions, withdrawals); providing mudminnow passage at the road crossings; maintaining riparian vegetation; limiting the use of herbicides, fertilizers, and other chemicals; and taking control of non-native warmwater fish species.

Salmon, Steelhead, and Trout

The WDFW PHS database lists the following salmon, steelhead, and trout populations as occurring within the lower Satsop River:

- Chinook (*Oncorhynchus tshawytscha*)
- Coho (*O. kisutch*)
- Dolly varden/bull trout (*Salvelinus malma*/*S. confluentus*)
- Steelhead (*O. mykiss*)
- Chum (*O. keta*)
- Resident coastal cutthroat (*O. clarkii*)

WDFW provides a guidance on planning activities in salmon, steelhead, and trout habitats as the state salmonid recovery efforts (Knight 2009), which highlights the importance of the integration of local land use planning programs and state salmonid recovery efforts. Potential planning tools for managing the impacts to aquatic habitat include the following:

- Protection of channel migration zone/floodplain
- Protection of riparian vegetation
- Protection adjacent wetlands
- Large woody debris recruitment
- In-stream work window standards
- Stormwater management

Trumpeter Swan (*Cygnus buccinator*)

Regular concentrations of trumpeter swan are documented in Chehalis River Valley. The project location is mapped as trumpeter swan overwintering area. The WDFW developed general management recommendations for bird priority species (Larsen et al. 2004), which may include the following:

- Retain water levels
- Protect foraging areas
- Maintain diversity of water bodies, such as shallow water and deep-water lakes, sloughs, rivers, marshes
- Limit disturbance at foraging areas from hunting, fishing, boating, and other recreational activities
- Limit the use of insecticide near sensitive riparian and wetland areas

Yuma Myotis (*Myotis yumanensis*) and Big Brown Bat (*Eptesicus fuscus*)

Bats may forage on insects above the project area but are not expected to roost or hibernate there. They may use adjacent riparian woodlands or structures as nesting or roosting habitat. All species of

bats are classified as protected wildlife and cannot be hunted, trapped, or killed. The WDFW makes exceptions for bats found in or immediately adjacent to an occupied building. WDFW's management recommendations focuses on the preventing human - wildlife conflicts (Link 2005), such as sealing all potential entry holes in dwellings, or excluding and relocating bats from human dwelling.

Northern Spotted Owl (*Strix occidentalis*)

Northern spotted owl is federally listed threatened, and Washington State listed endangered. Although the Priority Habitats and Species (PHS) database include one or more records of Northern spotted owl on or adjacent to the project area, there are no large areas of old growth or mature tree stands in the project vicinity, and this species is absent from the project area.

Management recommendations for owl species include preserving large old trees with nest cavities; protecting large, forested areas for foraging; retaining snags, logs, and fallen trees at the sites; and limiting herbicide application (Larsen et al. 2004).

Priority Habitats

Priority Habitats are habitat types or elements with unique or significant value to a large number of species. A Priority Habitat may consist of a unique vegetation type (such as riparian or old-growth mature forest), dominant plant species (such as Oregon white oak woodland), or a specific habitat feature (such as snags, logs, cliffs, or caves). WDFW encourages local jurisdictions to consider how land use patterns collectively affect fish and wildlife habitat functions. WDFW management recommendations to local jurisdictions focus on a key recommendation, such as:

- Carrying out common land use activities without further degrading the habitat
- Establishing regulatory buffers
- Planning and implementing restoration and adaptive management
- Using best available science
- Establishing a monitoring framework

Specific Priority Habitat management recommendations provided by WDFW (WDFW 2000) are summarized below.

Waterfowl Concentrations

The Chehalis River Valley is listed as a waterfowl concentration habitat. WDFW offers recommendations for managing projects with potential impacts to Priority Habitat (Larsen et al. 2004). Essential management practices in protecting waterfowl concentration areas may include the following:

- Retain the water levels
- Protect foraging areas
- Maintain diversity of shallow and deep-water bodies such as lakes, rivers, sloughs, marshes
- Limit disturbance at foraging areas from hunting, fishing, boating, and other recreational activities
- Limit the use of insecticides and other chemicals near sensitive riparian and wetland areas

Freshwater Emergent Wetlands and Freshwater Forested/Shrub Wetlands

Freshwater wetlands present near the project area are associated with the riparian corridor of the Satsop River. There are not wetlands within 300 feet of the project area and no buffers extend on to the project site (Natural Systems Design 2020). However, wetlands are mapped on the other side of the lower Satsop River, immediately across from the site. The Washington State Department of Ecology and WDFW developed an integrated scientific comprehensive approach for protecting and managing wetlands. The approach includes prioritized wetland protection on the landscape/watershed level using ecological principles in making decisions about land use (Granger et al. 2005). Many problems cannot be managed only within the wetland or small area itself. The Department of Ecology invites local agencies, landowners, and project owners to consider a checklist of factors about protecting or managing wetlands:

- Examine the impacts in a regional (or landscape) context
- Plan for long-term change and unexpected events
- Preserve rare landscape elements and critical habitats
- Retain large contiguous or connected areas that contain critical habitats
- Implement land uses that are compatible with the natural processes

Riverine

In addition to the key recommendations listed above for wetland habitats, avoiding bank hardening and restricting channel migration, unless they address an imminent threat as an emergency activity is also recommended (Rentz et al. 2020).

7 ALTERNATIVES AND IMPACT ANALYSIS

Alternatives Analysis

Under the no action scenario, this project would not get built and the bank would continue to erode until the until the Lower Satsop Restoration and Protection Program's Phase II project is constructed (summer 2022), representing 115 or more of bank loss. However, because the Phase II project is being devising based on predictive models for conditions with far less erosion, the Phase II project would need to be redesigned to account for significant bank loss would occur between October 2021 and when the Phase II project is constructed. The proposed project is meant to slow erosion and be forward compatible with the Phase II project. As such, a no action scenario is not preferred.

Several alternative bank conservation designs were considered including the proposed design, use of riprap, excavating a new channel, and placement of structures in-stream outside of the in-water work window (Northwest Hydraulic Consultants 2021). These alternatives were discussed with the Lower Satsop Restoration and Protection Program Advisory Committee (July 2021), which included all permitting agencies. It was determined that these alternatives were not practicable due to the potential for adverse effects to fish life and to fish habitat, project costs, and permitting constraints on the project timeline and environmental impacts associated with working outside of the in-water work window for fish (July 14-August 31).

To identify possible design alternatives, Integrated Streambank Protection Guidelines (ISPG) were used to evaluate and rank potential solutions that may be appropriate for the site (Cramer et. al, 2003; Northwest Hydraulic Consultants 2021). These included log structures, rock (riprap) armoring, woody plantings, soil reinforcement, and bank reshaping. Due to various site constraints (cost, landowner permission, fish habitat), design alternatives selected for the project include buried log structures that will self-deploy as they sluff to the toe of the riverbank along with the installation of woody plantings as an adaptive management measure as they are more likely to succeed once the bank approaches a more stable configuration.

Project Impacts

The project is completely avoiding impacts to adjacent riparian area critical habitats. The project will ultimately result in the conservation of the riverbank, thereby preserving trumpeter swan habitat. The project does not propose any sealed structures and will not affect bats. However, the project will result in unavoidable impacts within the shoreline protective buffer and will result in engineered log structures eventually engaging with the stream channel as erosion continues. Keep in mind that without the project, the area where impacts will occur would be eroded away if no action were taken. Also, the project has been designed to be self-mitigating, including the use of log structures that promote fish habitat while providing bank stability as well as incorporating willow plantings as the bank erodes. All temporary impacts will be reseeded with pasture grass or crop seed (as specified by the farmer) following construction.

The project will result in excavation of approximately 23,000 square feet (0.53 acres) of native soil material (approximately 17,500 cubic yards), placement of approximately 5,300 cubic yards of rock and log material in the form of ballasted log jacks and log bundles, and backfilling with native soil. All excavated soil will remain on-site and will be backfilled directly into excavated areas or spread and graded in upland areas adjacent to the completed installation. Excavation will occur to a depth of up to 20 feet below ground surface. Ground disturbance will occur only within approximately 200,000 square feet (4.6 acres) of farmed uplands. No grading or structure placement will occur in the staging and access areas. No impacts will occur waterward of the bank or below the OHWM of the Satsop River.

The staging area will be located in an upland field accessed from Willis Farm Road. The staging area and project entry point will consist of a graveled construction entrance. Soil will be temporarily stockpiled adjacent to excavation areas. Following installation of structures, excavated soils will be replaced and the site will be graded to even contours. Grass seed and/or mulch will be installed in all temporarily impacted areas upon project completion (unless another cover crop is selected for installation by the farmer). Silt fence will be installed along the outer limits of the project area where needed to protect environmentally sensitive areas. No additional stormwater measures are anticipated.

Dump trucks will be used to haul logs and rock material to the staging area. The log jacks, log jack spurs, and continuous log row structures will be assembled in the staging area using chainsaws, tracked excavators, and hand tools. Once assembled, the structures will be placed with a tracked crane or excavator. Tracked excavators will be used to excavate, stockpile excavated material adjacent to areas of excavation, and replace native soil. Off-road dump trucks may be used to transport log jacks, log row bundles, and soil within the project area.

A temporary access road is proposed to provide a stabilized surface for on-site construction traffic and access for adaptive management activities. The road will be 15 feet wide and will include 80-foot diameter turn-arounds near each end, for a total area of approximately 1.43 acres (62,260 square feet)

square feet. The road will consist of geotextile and/or geogrid laid on the existing ground surface, with approximately 1 foot of hog fuel (wood chips) placed on top, for a total volume of approximately 2,400 cubic yards. The hog fuel and geotextile/geogrid will be removed prior to the end of the 3-year maintenance period, and the area will be restored to pre-existing conditions by seeding with grass seed and/or mulch (unless another cover crop is selected for installation by the farmers). No long-term adverse environmental effects will occur from this activity.

The project has been designed to be self-mitigating. Log structures will engage with the river as erosion occurs, thereby conserving the bank and also providing valuable fish habitat. Adaptive management measures will ensure that the structures perform as intended and that bioengineering be incorporated where feasible as structures sluff into position. Ultimately, the project will not result in significant adverse effects to the shoreline environment.

Cumulative Impacts

Multiple projects have recently been completed along the Lower Satsop River, focusing on flood protection and restoration. In 2019 and 2020, WDFW completed substantial restoration projects in the floodplain to remove dikes and revetments and to return river flows to floodplain areas previously inaccessible for decades. In 2020, Grays Harbor County constructed the Keys Road Flood Protection Project (i.e., Phase I of the Lower Satsop Restoration and Protection Program) that involved installation of engineered log jams and setback log structure revetments to protect Keys Road and associated infrastructure. Phase II of the Lower Satsop Restoration and Protection Program is currently in design and will be constructed in summer 2022. The Phase I and Phase II Lower Satsop Restoration and Protection Program projects are part of the Chehalis Basin Strategy that aims for flood protection and habitat restoration. The Chehalis Basin Strategy is a 10-year partnership of agency, tribal, and independent scientists; private landowners; utility managers; fishers, farmers, and foresters; and local leaders.

Cumulatively, the proposed project will work in concert with the other structural projects along the Satsop River within the Chehalis Basin to provide flood protection and habitat restoration with ultimately overall beneficial effects.

8 MITIGATION PLAN

Mitigation Sequencing

The project design followed the mitigation sequencing (GHCC 18.06.200) listed below:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
 - Disturbance to the limited riparian vegetation adjacent to the project area will be avoided by placing continuous log rows on more stable land above the top of bank beyond the limits of riparian vegetation and by designating temporary access routes and staging areas away from riparian vegetation.
 - The project will avoid construction-related impacts by not proposing in-water construction outside of the WDFW-designated work window (July 15 to August 31) for the Satsop River.

2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation, by using appropriate technology, or by taking affirmative steps, such as project redesign, relocation, or timing, to avoid or reduce impacts.
 - The design was based on the analysis of channel migration and erosion to focus bank conservation actions in the most effective areas, thereby minimizing total volume of structures needed.
 - The access road will minimize potential impacts as it will be temporary and constructed using wood chips (hog fuel) placed over geotextile fabric. No grading will be required and the material will be removed and the vegetation restored at the end of the project.
3. Rectifying the impact to wetlands, critical aquifer recharge areas, frequently flooded areas, and habitat conservation areas by repairing, rehabilitating, or restoring the affected environment to the historical conditions or the conditions existing at the time of the initiation of the project.
 - The project is designed to be self-mitigating. Temporary impacts within the shoreline/critical area buffer would be rectified by a long-term reduction of the anticipated erosion rates. When completed, the project will provide direct benefits by conservation of the bank, thereby minimizing downstream sedimentation which would negatively affect fish habitat and downstream dredge management operations in Grays Harbor. Log structures and willow plantings will also provide in-stream habitat structure, complexity, and cover.
4. Minimizing or eliminating the hazard by restoring or stabilizing the hazard area through engineered or other methods.
 - Construction activities will be set back from the bank to avoid and minimize potential for bank failure during excavation. The project will use engineered log structures (log jacks, log row bundles, and log jack spurs) to reduce stream power and stabilize banks. Reducing or eliminating the impact or hazard over time by preservation and maintenance operations during the life of the action.
 - It is expected that over time, the structures would sluff into the river onto the toe of the riverbank as erosion occurs. Structures have been designed to embed into the river bottom and lock together as they sluff and are not expected to migrate from the riverbank into the channel. Structures would continue to provide bank stability as future bank erosion occurs.
5. Compensating for the impact to wetlands, critical aquifer recharge areas, frequently flooded areas, and habitat conservation areas by replacing, enhancing, or providing substitute resources or environments.
 - The project is designed to be self-mitigating, resulting in no more than minimal adverse environmental effects and in environmental long-term benefits. Additionally, engineered structures and future riparian plantings will provide an uplift in valuable fish and riparian habitat functions by providing habitat structure, complexity, and vegetative cover along the riverbank. Adaptive management measures will be implemented to ensure that bank conservation and fish habitat goals are achieved.
7. Monitoring the hazard.
 - Monitoring will be conducted over a three year adaptive management period to monitor the success of the project and will include a web camera, agency coordination, and annual site visits

and reporting. Monitoring will inform the effectiveness of the project and implementation of adaptive management measures.

Buffer Determination

Projected rates of erosion are up to 115 feet of bank loss per year from June 2021 to June 2022 (4.39 acres) and from June 2022 to June 2023 (5.06 acres). The riverbank is actively eroding and, at the time of Parametrix's survey and critical areas site visit (June and July 2021, respectively), it consisted of near vertical banks at the water's edge ranging from 10 to 20 feet tall and fully void of riparian vegetation. Because of this projected loss, the project has been designed to provide bank stability for land within the next year's projected bank loss limits (i.e., up to 115 feet back from the surveyed bank limits) which would include the majority of the existing fish and wildlife critical habitat buffer. Therefore, instead of proposing a reduced buffer or buffer enhancements, it is assumed that critical area protections apply within 150 feet of the surveyed OHWM. Within this area, the project itself will be self-mitigating and will serve to protect and enhance the bankline and conserve shoreline and critical areas. Over the long term, conditions in the fish and wildlife habitat conservation area buffer resulting once the log structures have engaged with the river and stabilized will consist of the log structures, willow plantings along the bank, and upland areas which will continue to be used for agricultural crop production.

Mitigation Plan

Mitigation Goals and Objectives

The goal of the project is to promote bank conservation while minimizing environmental impacts. Construction must occur in fall 2021 to minimize bank loss and to be forward compatible with future restoration efforts in the reach. . The project has been designed to be self-mitigating by utilizing engineered log structures made primarily of natural materials that will engage with the river to provide fish habitat while also promoting bank stability and conservation, ultimately resulting in an increase functions and values of fish habitat in the Satsop River. Adaptive mitigation management measures will be in place to ensure project goals are achieved. Self-mitigation goals include:

- Stabilize bank using natural materials and bioengineering (self-mitigating)
- As log structures engage with the river, they will provide in-stream habitat complexity and cover for fish and other aquatic organisms
- Implement mitigation and adaptive management measures to ensure no loss of ecological function, including maintenance of structures, planting willows as structures stabilize, and ongoing agency coordination, mounting, and reporting.
- Seed temporarily disturbed areas with pasture grass and crop seed

Additionally, to ensure safety of river users, signage will be posted at local boat ramps and the applicant will coordinate with WDFW to post a notification on their website.

This adaptive mitigation plan was developed by qualified Parametrix scientists and by incorporating feedback received from local, state, and federal agencies during early coordination meetings for the project. A review of the best available science supporting the proposed mitigation was conducted and findings were integrated into this plan, including available hydraulic design analysis (Northwest Hydraulic Consultants 2021), published guidance from WDFW and as outlined in Grays Harbor County's

critical areas ordinance. By incorporating best available science and review of successful implementation of past projects having similar project elements, the self-mitigating design and adaptive management measures are anticipated to result in successful achievement of project goals.

Performance Standards, Specifications, and Monitoring

Adaptive mitigation measures will be conducted over a 3-year period following construction as the bank line erodes and structures engage with the river. Adaptive management measures will (1) ensure the project is implemented as planned and that structures properly engage with the river and (2) to ensure no loss of ecological function occurs. Adaptive management measures will include the following performance standards and specifications:

- Maintenance of structures within the channel to ensure they function properly, including ensuring structures do not migrate beyond the toe of the bank into the Satsop River channel or downstream.
- Shoreline planting of willow wattles (bioengineering) as the bank erodes and structures are sluffed into the river. Exact specifications to be determined during monitoring as structures stabilize.
- Monitoring to better inform adaptive management measures, including:
 - include installation of a web camera and annual site visits to aid in monitoring the site
 - on-going agency coordination with WDFW and the County
 - Provide an annual report summarizing adaptive management activities to WDFW and the County in Years 1 to 3 following construction.

Since the project is self-mitigating, these adaptive measures for the project are intended to be in place for 3 years and may overlap with future restoration efforts associated with Phase II of the Lower Satsop Restoration and Protection Program. At this time, it is not known where willow wattles will be needed or what exact structure maintenance needs will be implemented. Therefore, these adaptive management measures will be determined and implemented through regular coordination with WDFW. The annual report shall document milestones, successes, problems, and recommendations for adaptive management measures and activities.

Because the properties are private and will be farmed right up to the extent of the structures, no critical area signage, fencing, or upland/riparian mitigation is proposed.

Project Timeline

Construction is planned to be conducted from September through October 2021 (or into November if field conditions allow). The actual project start date will depend on contractor availability, but it is anticipated that staging and assembling of log jacks and log bundles outside of designated shoreline and riparian buffers may begin in September 2021, and that excavation and structure placement will begin once all environmental permits are received. Temporarily disturbed areas will be seeded immediately following construction. Adaptive management consisting of structure maintenance and planting of willow wattles for added bank stability (bioengineering) will continue as deemed necessary for 3 years following construction. Adaptive management measures may also be integrated into Phase II of the Lower Satsop Restoration and Protection Program.

Financial Assurance and Maintenance Easements

A maintenance agreement and/or temporary access/construction easement will be in place between the applicant and landowners prior to construction. Because Grays Harbor Conservation District is a public agency, a financial assurance is not required.

8 DISCLAIMER AND PROFESSIONAL QUALIFICATIONS

This report has been prepared by Parametrix for specific application to the Lower Satsop Right Bank Conservation Project. The information and data contained herein represent the best professional judgment of Parametrix in light of the knowledge and information and science available at the time of preparation and was prepared in accordance with generally accepted critical area management practices and guidance. This information should be considered preliminary until verified by Grays Harbor County and/or other respective permitting agencies.

This report was prepared by Irina Lapina, a Parametrix environmental scientist and certified Professional Wetland Scientist with over 16 years of professional experience evaluating aquatic and terrestrial resources and preparing technical reports. Irina has been working in the Pacific Northwest since 2016 and has completed a number of wetland delineation reports, critical areas assessments, and permit applications.

Taya K. MacLean, a Parametrix senior scientist, has over 20 years of experience conducting natural resources management projects in Washington and the western United States. Taya is a certified Professional Wetland Scientist and is trained by the Oregon Department of Transportation to prepare endangered species effects assessments for its Federal-Aid Highway Program. For this project, Taya conducted a site visit on July 16, 2021, to assess habitat conditions. Taya completed senior-level review of this document.

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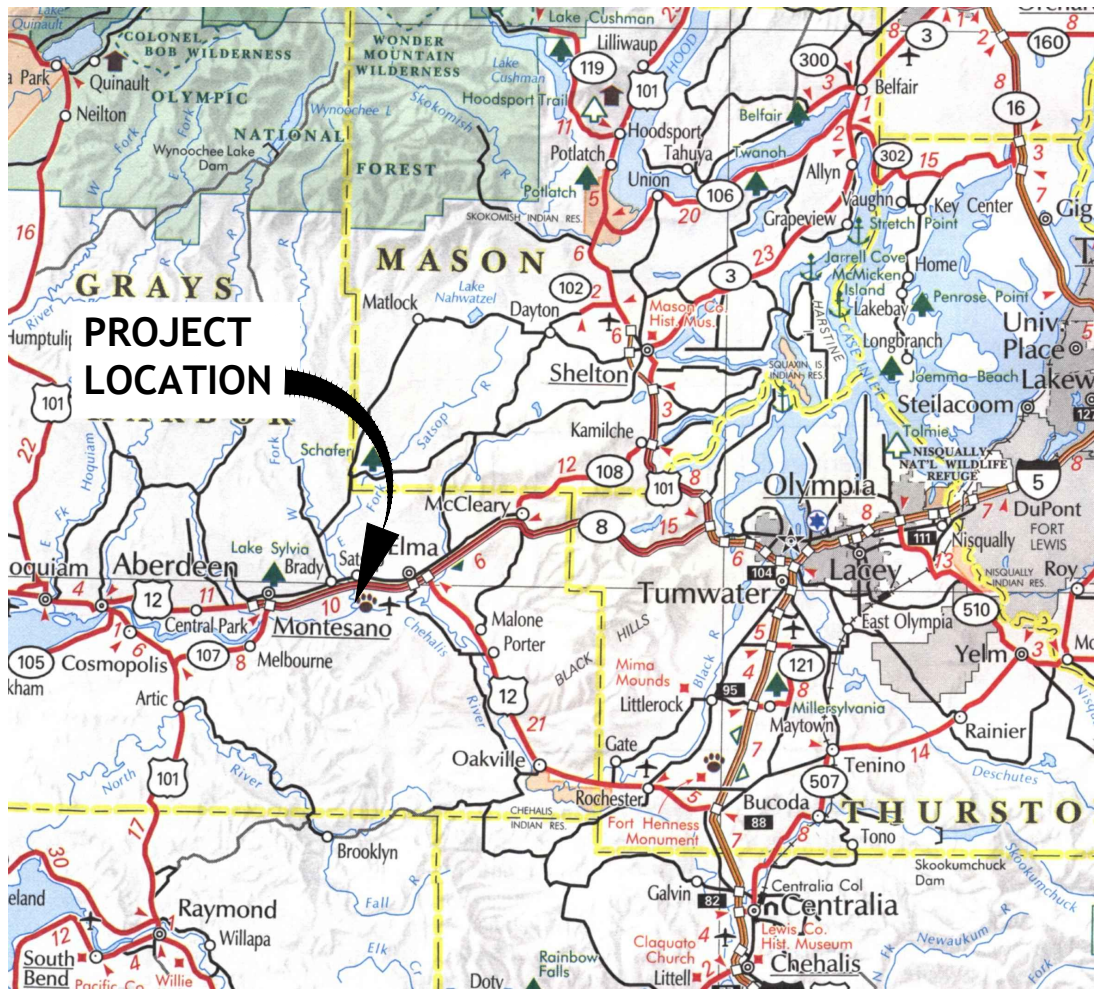
Appendix A

Figures

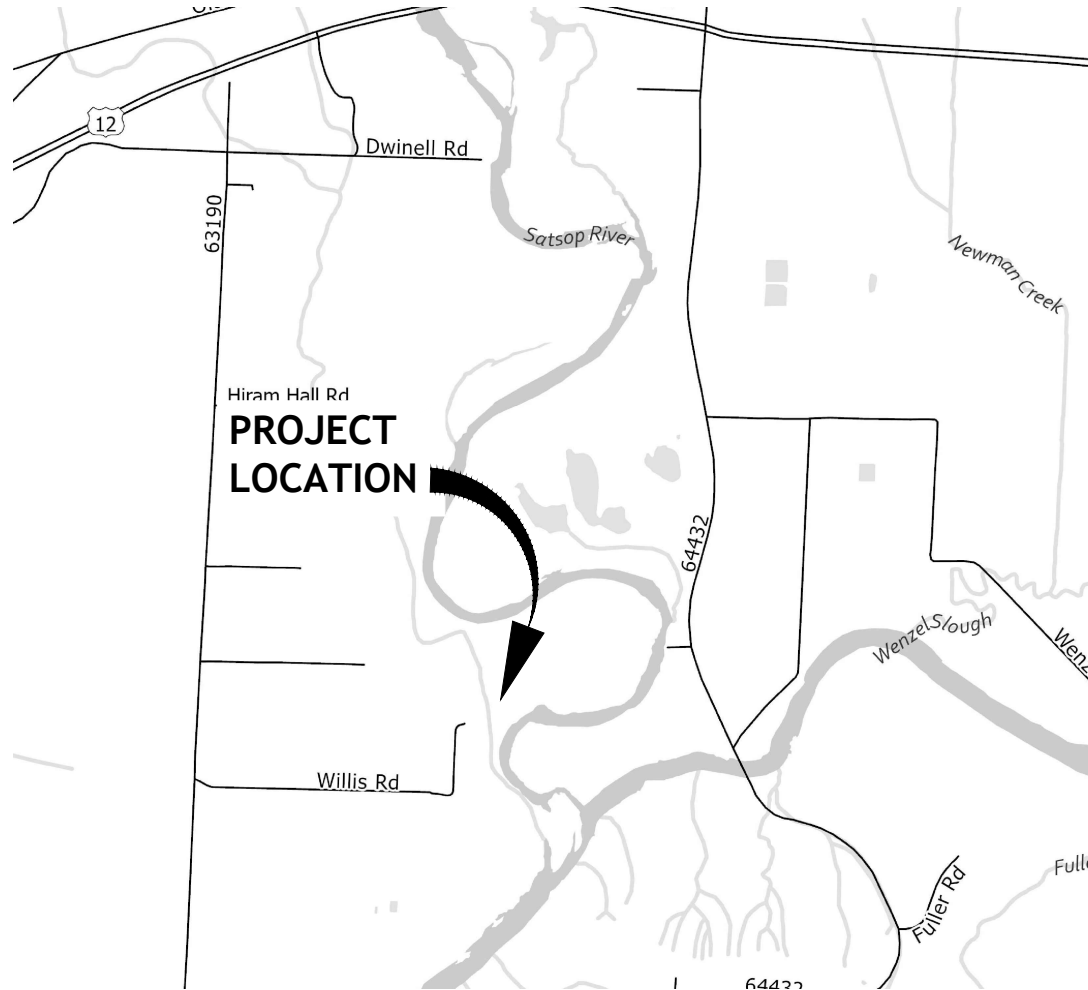


LOWER SATSOP RIGHT BANK CONSERVATION PROJECT

GRAYS HARBOR CONSERVATION DISTRICT



LOCATION MAP
NO SCALE



VICINITY MAP
NO SCALE

INDEX TO DRAWINGS		
SHT NO.	DWG NO.	SHEET TITLE
GENERAL		
1	G1	TITLE SHEET, LOCATION AND VICINITY MAPS, AND INDEX TO DRAWINGS
2	G2	GENERAL NOTES, LEGEND AND ABBREVIATIONS
CIVIL		
3	C1	EXISTING SITE PLAN
4	C2	SITE PLAN - PROPOSED - 1
5	C3*	SITE PLAN - PROPOSED - 2
6	C4*	SECTIONS
7	C5*	CONSTRUCTION SEQUENCING - 1
8	C6*	CONSTRUCTION SEQUENCING - 2
DETAILS		
9	DT1	LOG JACK DETAIL
10	DT2	LOG JACK SPUR DETAIL
11	DT3	CONTINUOUS LOG ROW DETAIL
TESC		
12	T1	STAGING AND ACCESS PLAN
13	T2*	TESC DETAILS - 1
14	T3*	TESC DETAILS - 2
* SHEET NOT INCLUDED IN PERMIT REVIEW SET		

PERMIT REVIEW SET
NOT FOR CONSTRUCTION

REVISIONS	DATE	BY	DESIGNED CFO
			DRAWN CFO
			CHECKED ####
			APPROVED ####

ONE INCH AT FULL SCALE, IF NOT, SCALE ACCORDINGLY
FILE NAME PS7132001G-01
JOB No. 217-7132-001
DATE 08/21

PRELIMINARY



PROJECT NAME
LOWER SATSOP RIGHT BANK CONSERVATION PROJECT
MONTESANO, WA

TITLE SHEET, LOCATION AND VICINITY MAPS, AND INDEX TO DRAWINGS
--

DRAWING NO. 1 OF 14
G1

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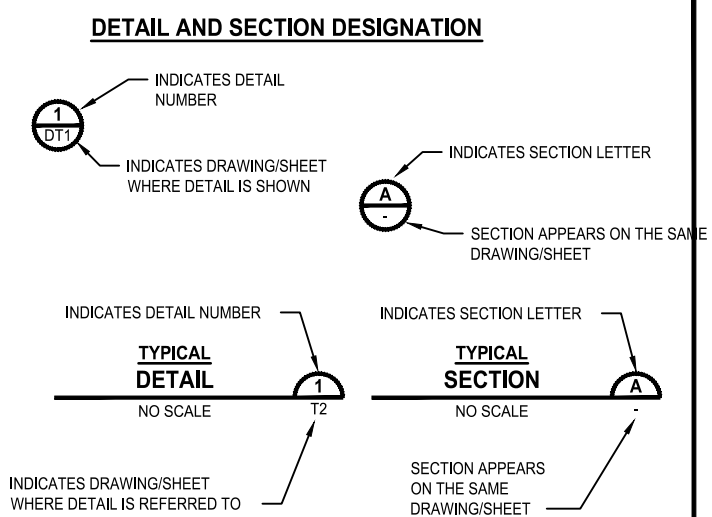
LEGEND		
DESCRIPTION	PROPOSED	EXISTING
MAJOR CONTOURS		
MINOR CONTOURS		
2022 PROJECTED BANKLINE	- - - - -	
2023 PROJECTED BANKLINE	=====	
SHADOW LINE	=====	
AREA OF POTENTIAL EFFECT	- - - - -	
RIPARIAN VEGETATION LIMIT	
SHORELINE BUFFER	- - - - -	
PARCEL BOUNDARY	- - - - -	
TEMP ACCESS ROAD	- - - - -	

LEGEND		
DESCRIPTION	PROPOSED	EXISTING
CONTINUOUS LOG ROW		
LOG JACK		
LOG JACK SPUR		
STAGING/ STOCKPILING AREA		
LOG JACK SPUR EXCAVATED AREA		

DATUM

VERTICAL DATUM NAVD88

ABBREVIATIONS	
AC	ACRE
APE	AREA OF POTENTIAL EFFECT
APPROX	APPROXIMATE
CL	CENTERLINE
CLR	CLEAR, CLEARANCE
CONST	CONSTRUCT, CONSTRUCTION
CY	CUBIC YARD
DT	DETAIL
DWG	DRAWING
EA	EACH
ENGR	ENGINEER
EXIST	EXISTING
FIG	FIGURE
FT	FEET, FOOT
IN	INCH
LWM	LARGE WOODY MATERIAL
NTS	NOT TO SCALE
OHWM	ORDINARY HIGH WATER MARK
REQD	REQUIRED
SF	SQUARE FEET
SPEC	SPECIFICATION
STA	STATION
T	TON
TEMP	TEMPORARY
TESC	TEMPORARY EROSION SEDIMENT CONTROL
TOB	TOP OF BANK
TYP	TYPICAL
U	UPSIDE DOWN
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT



PERMIT REVIEW SET
NOT FOR CONSTRUCTION

REVISIONS	DATE	BY	DESIGNED
			CFO
			DRAWN
			CFO
			CHECKED
			RSR
			APPROVED
			####

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FILE NAME PS7132001G-01
JOB No. 217-7132-001
DATE 08/21

PRELIMINARY

Parametrix
ENGINEERING · PLANNING · ENVIRONMENTAL SCIENCES

PROJECT NAME
LOWER SATSOP RIGHT BANK CONSERVATION PROJECT
MONTESANO, WA

GENERAL NOTES, LEGEND, AND ABBREVIATIONS

DRAWING NO. 2 OF 14
G2

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LAYOUT: C1

2018 SATSOP RIVER
HORIZONTAL ALIGNMENT

CHAPMAN
239 BRADY LOOP RD E
170701440030

CHAPMAN
239 BRADY LOOP RD E
170701440020

CHAPMAN
239 BRADY LOOP RD E
170701440040

STATE OF WASHINGTON WILDLIFE
600 CAPITOL WAY N
170606330010

STATE OF WASHINGTON DEPT OF GAME
905 E HERON
170607210060

OLYMPIC VIEW DAIRY
83 WILLIS ROAD
170607220010

WILLIS
83 WILLIS RD
170712110010

OLYMPIC VIEW DAIRY
83 WILLIS ROAD
170701410010

CONTRERAS NORBERTO & ROSALINA
45 N BLOCKHOUSE RD
170701440010

CONTRERAS NORBERTO & ROSALINA
45 N BLOCKHOUSE RD
170701410030

TOP OF BANK

LUBBE
186 BRADY LOOP RD E
170701430020

CHAPMAN
239 BRADY LOOP RD E
170701430010

CHAPMAN
239 BRADY LOOP RD E
170701430030

CHAPMAN
239 BRADY LOOP RD E
170701430040

APE. SEE SHEET T1

WILLIS
16 WILLIS RD
170712120030

OLYMPIC VIEW DAIRY
64 WILLIS ROAD
170712140010

OLYMPIC VIEW DAIRY
83 WILLIS ROAD
170712110020

RESTAU DELBERT L & BETTY J
273 BRADY LOOP RD E
170712110040

MORENO
271 E BRADY LOOP RD
170712110030

MCNEIL
269 E BRADY LOOP RD
170712120020

OLYMPIC VIEW DAIRY
83 WILLIS ROAD
170712120010



SCALE IN FEET
0 200 400

- NOTES
1. SURVEY AND AERIAL IMAGERY COMPLETED JUNE 4, 2021.
 2. PARCEL DATA INCLUDES: OWNER, ADDRESS, AND PARCEL NUMBER.

PERMIT REVIEW SET
NOT FOR CONSTRUCTION

REVISIONS	DATE	BY	DESIGNED
			RSR
			DRAWN
			CFO
			CHECKED
			####
			APPROVED
			####

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FILE NAME
PS7132001C-01
JOB No.
217-7132-001
DATE
08/21

PRELIMINARY



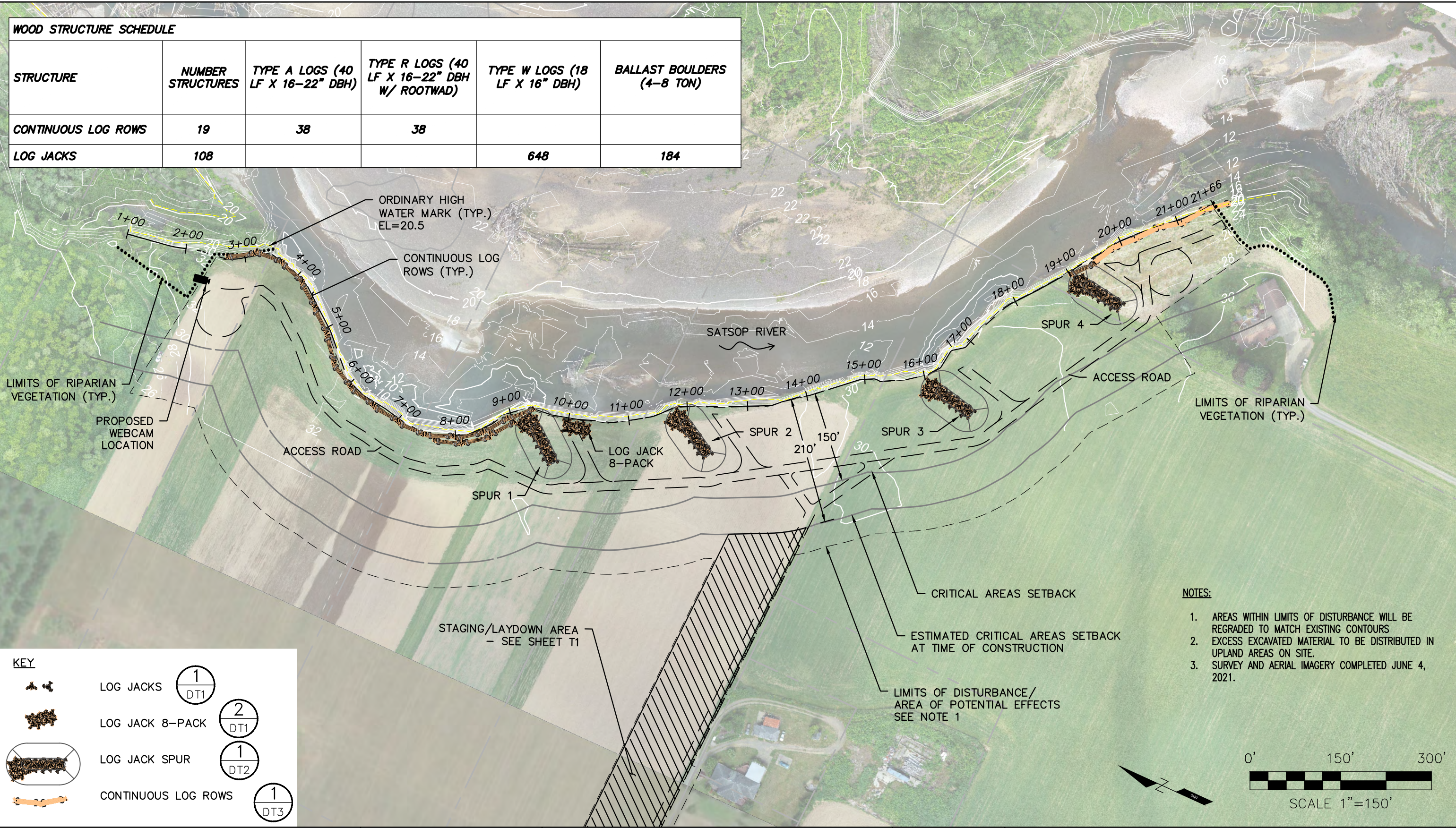
PROJECT NAME
LOWER SATSOP RIGHT BANK CONSERVATION PROJECT
MONTESANO, WA

EXISTING SITE PLAN

DRAWING NO. 3 OF 14
C1


WOOD STRUCTURE SCHEDULE


STRUCTURE	NUMBER STRUCTURES	TYPE A LOGS (40 LF X 16-22" DBH)	TYPE R LOGS (40 LF X 16-22" DBH W/ ROOTWAD)	TYPE W LOGS (18 LF X 16" DBH)	BALLAST BOULDERS (4-8 TON)
CONTINUOUS LOG ROWS	19	38	38		
LOG JACKS	108			648	184





- NOTES:
- 1. AREAS WITHIN LIMITS OF DISTURBANCE WILL BE REGRADED TO MATCH EXISTING CONTOURS
 - 2. EXCESS EXCAVATED MATERIAL TO BE DISTRIBUTED IN UPLAND AREAS ON SITE.
 - 3. SURVEY AND AERIAL IMAGERY COMPLETED JUNE 4, 2021.

KEY

 LOG JACKS 1 DT1

 LOG JACK 8-PACK 2 DT1

 LOG JACK SPUR 1 DT2

 CONTINUOUS LOG ROWS 1 DT3

Parametrix
ENGINEERING · PLANNING · ENVIRONMENTAL SCIENCES
1019 39th Ave. SE, Suite 100
Puyallup, WA 98374

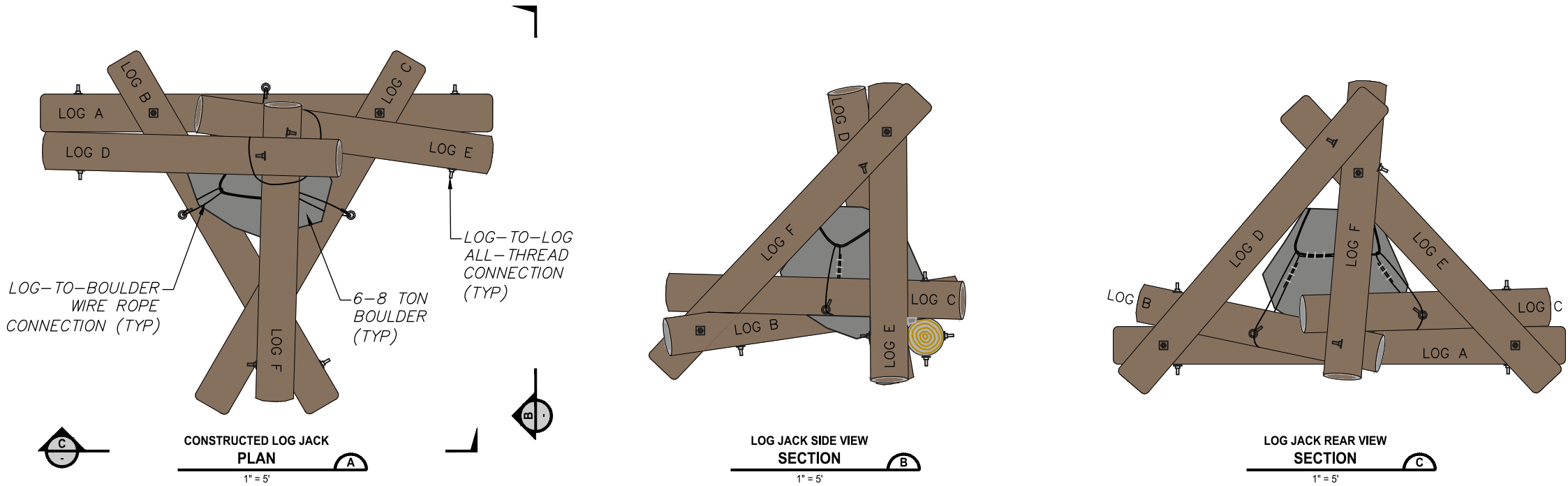
nhc
northwest hydraulic consultants
12787 gateway drive south
tukwila, washington 98168-3308
phone: (206) 241-6000
fax: (206) 439-2420

PRELIMINARY – NOT FOR
CONSTRUCTION

Job:2006723
Rev:
Drft: CB
Chkd: JL
Date: 30Jul21

Lower Satsop Right Bank Conservation Project
SITE PLAN - PROPOSED
Shoreline Permit

C2

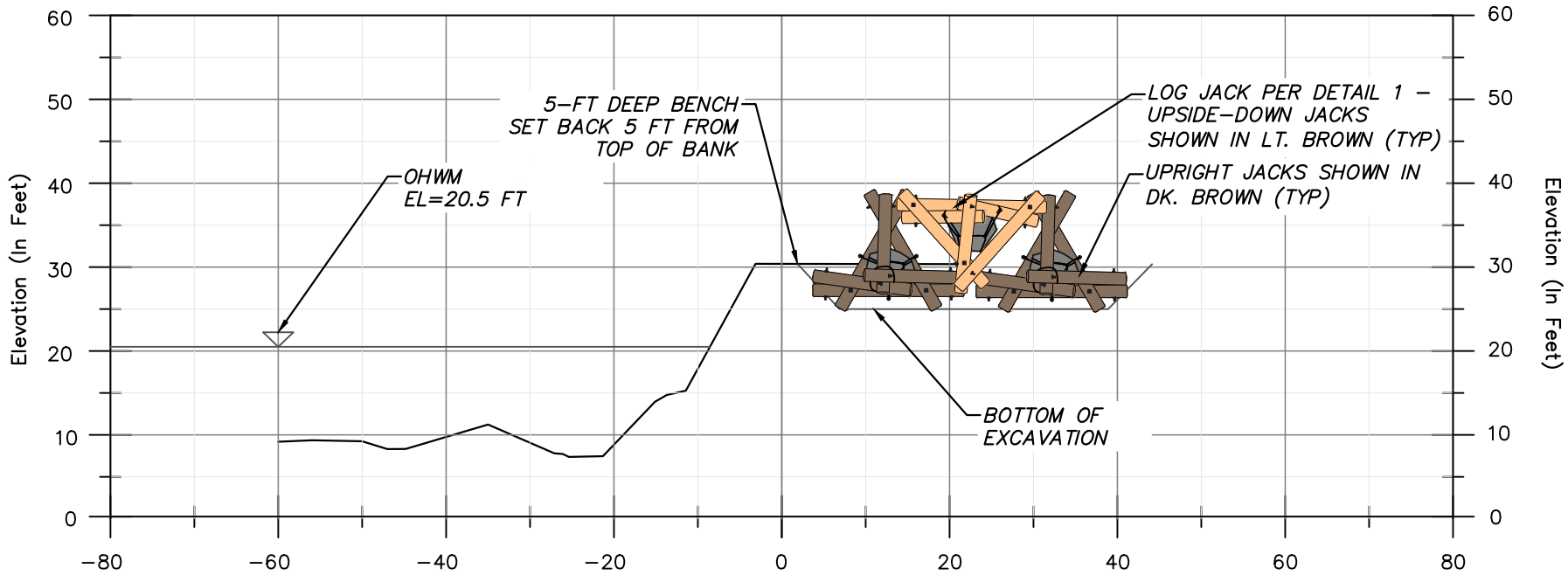


THE LOG JACK IN THE IMAGE ABOVE IS TYPICAL AND FOR ILLUSTRATION ONLY. DISCREPANCIES EXIST BETWEEN THE IMAGE AND THE LOG JACK DESIGN. SLASH NOT SHOWN FOR CLARITY.

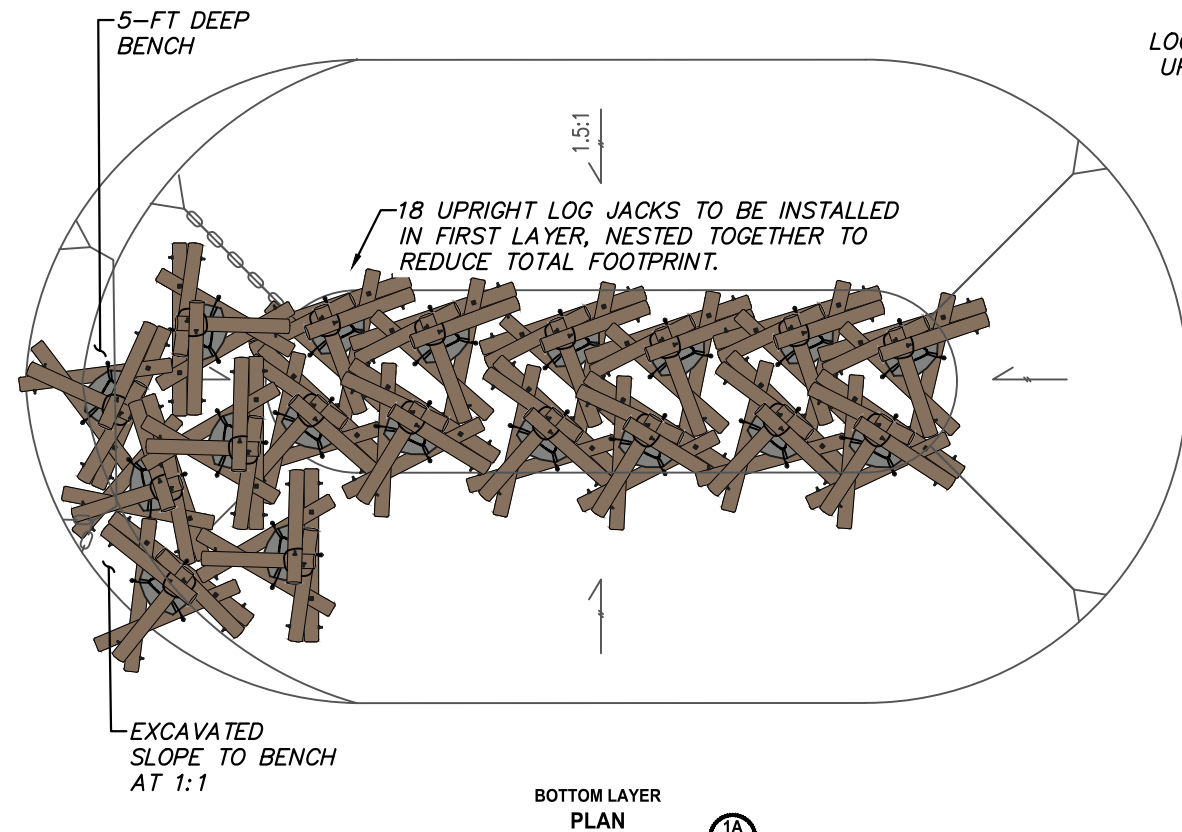
1 LOG JACK UNIT - TYPICAL PLAN & SECTION VIEWS
SCALE: 1"=20'

NOTES FOR LOG JACK CONSTRUCTION:

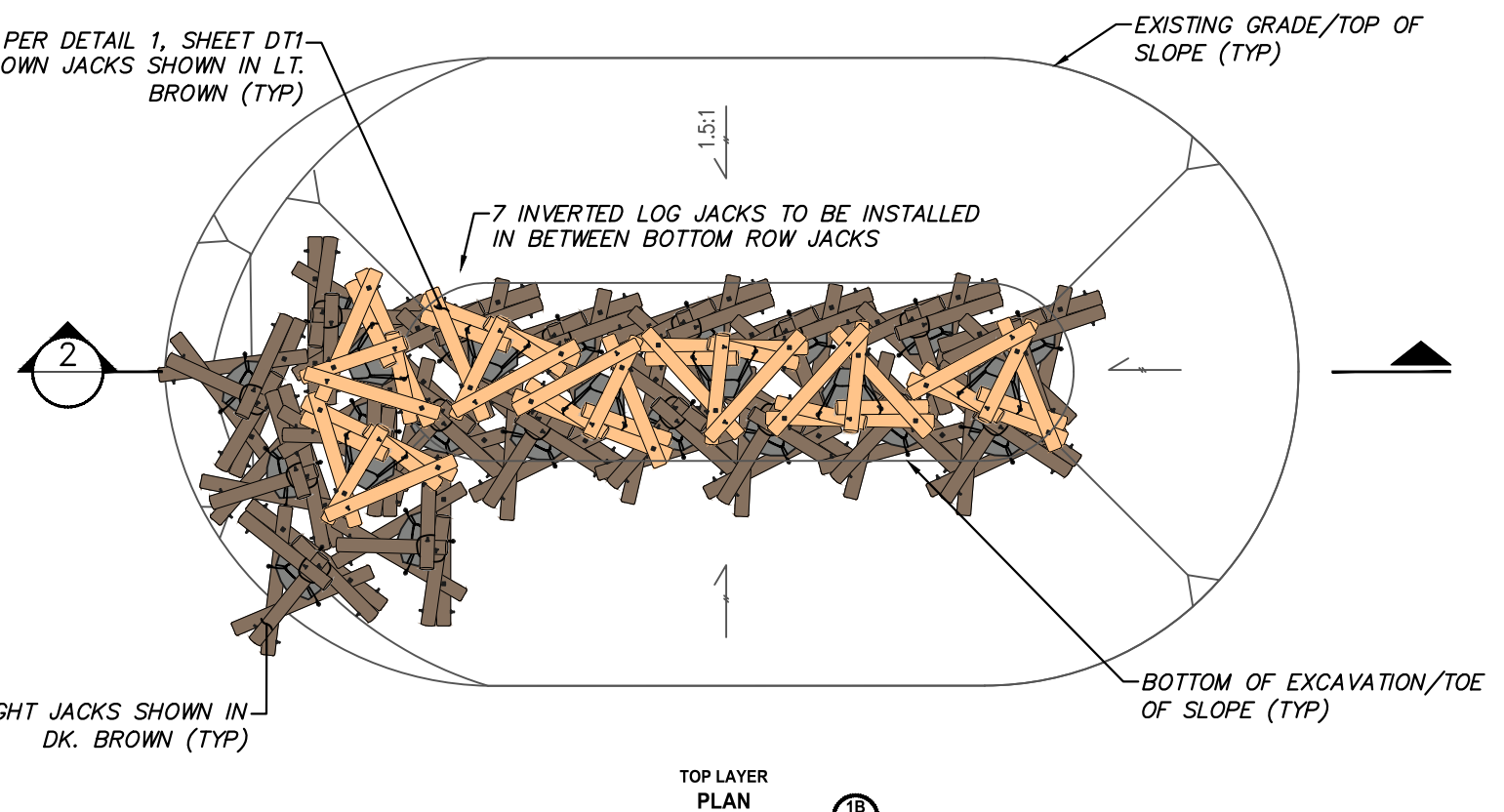
- LOG JACKS SHALL BE CONSTRUCTED FROM DOUGLAS FIR, WESTERN RED CEDAR OR SITKA SPRUCE, 18 FEET IN LENGTH AND 16 TO 22 INCHES IN DIAMETER.
- 6-8 TON BOULDERS SHALL BE USED FOR LOG JACK BALLAST.
- LOGS AND BOULDERS ARE NOT SYMMETRICAL AND HAVE NATURALLY OCCURRING VARIATIONS THAT NECESSITATE CUSTOM FITTING. THE CONTRACTOR WILL MODIFY THE LOG-TO-LOG AND LOG-TO-BOULDER CONNECTIONS SO THAT THE COMPLETED JACK IS A TIGHT AND COMPACT UNIT. THERE SHOULD BE NO PLAY IN THE LOG- TO-LOG CONNECTIONS. THE BOULDER SHOULD BE SECURELY CONTAINED WITHIN AND IN CONTACT WITH A MINIMUM OF 5 LOGS.
- REMOVE ALL BARK BETWEEN LOG- TO-LOG CONNECTIONS.
- FOR ALL LOG-TO-LOG CONNECTIONS, USE CHAINSAW LOG DEBARKER OR SIMILAR SO THAT ONE LOG NESTLES INTO THE OTHER. THE LOG- TO-LOG CONNECTION MUST NOT BE A SINGLE POINT OF CONTACT. A TYPICAL LOG NOTCH WILL BE ~1 0" WIDE BY ~2" DEEP CUT AT THE APPROPRIATE ANGLE.
- ALL LOG-TO-LOG ALL-THREAD CONNECTIONS MUST BE MADE THROUGH THE CENTER OF THE LOG WITH A MINIMUM OF 18" BETWEEN THE ALL-THREAD AND THE LOG END.
- FOR ALL LOG-TO-LOG CONNECTIONS, PEEN THE ALL-THREAD TO A DEPTH OF 1/2 THE THREAD DEPTH IN TWO OPPOSING LOCATIONS IMMEDIATELY AGAINST THE NUT. LEAVE NO MORE THAN 3" OF ALL-THREAD EXPOSED PAST THE NUT.
- WIRE ROPE SHOULD BE MECHANICALLY TENSIONED TO ~¾ OF THE ROPE WORKING LOAD. FOR LOG JACKS PLACED UPSIDE DOWN, THE TOPS OF LOGS D, E, AND F SHOULD BE TRIMMED TO AN EVEN HEIGHT, LEAVING A MINIMUM OF 18" BEYOND THE CONNECTION POINTS.
- COMPLETED LOG JACKS CAN BE TRIMMED DURING PLACEMENT TO FACILITATE FITTING THEM ADJACENT TO ONE ANOTHER, LEAVING A MINIMUM OF 18" BEYOND THE CONNECTION POINTS.



2 LOG JACK 8-PACK - SECTION
SCALE: 1"=20'



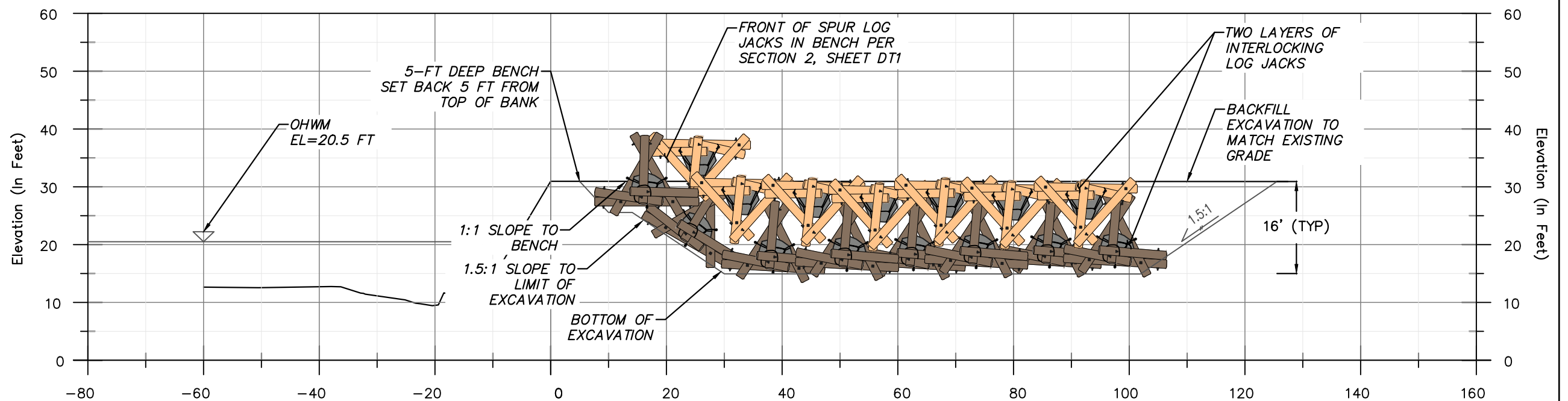
LOG JACK PER DETAIL 1, SHEET DT1
UPSIDE-DOWN JACKS SHOWN IN LT. BROWN (TYP)



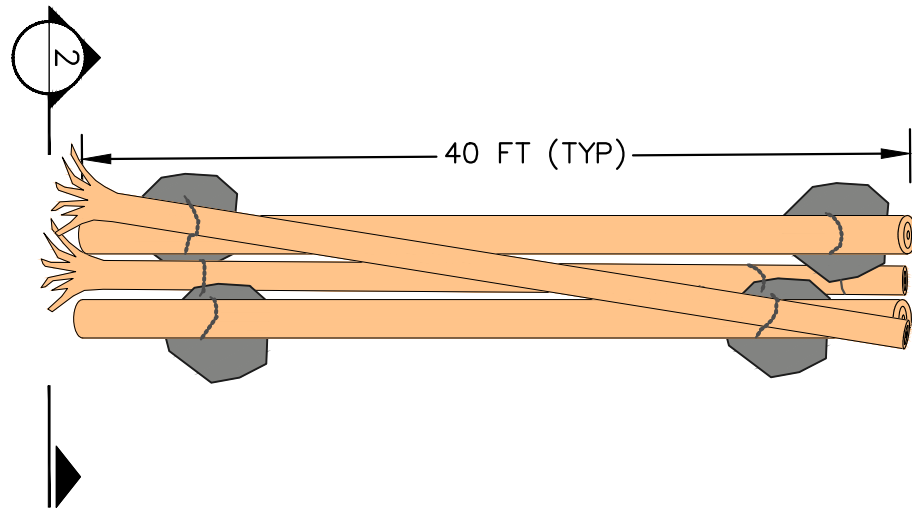
1 LOG JACK SPUR - PLAN
SCALE: 1"=20'

NOTES ON LOG JACK SPUR CONSTRUCTION:

- LOG JACKS ARE HELD TOGETHER BY FRICTION IN THE SPUR CONFIGURATION - NO ANCHORING BETWEEN ADJACENT UNITS WILL OCCUR.
- ALL EXCAVATED SLOPES ARE 1.5:1 UNLESS NOTED OTHERWISE
- PACK SLASH INTO JACK VOIDS BEFORE BACKFILLING
- STOCKPILE EXCAVATED SOILS AND BACKFILL EXCAVATION TO MATCH EXISTING CONTOURS.



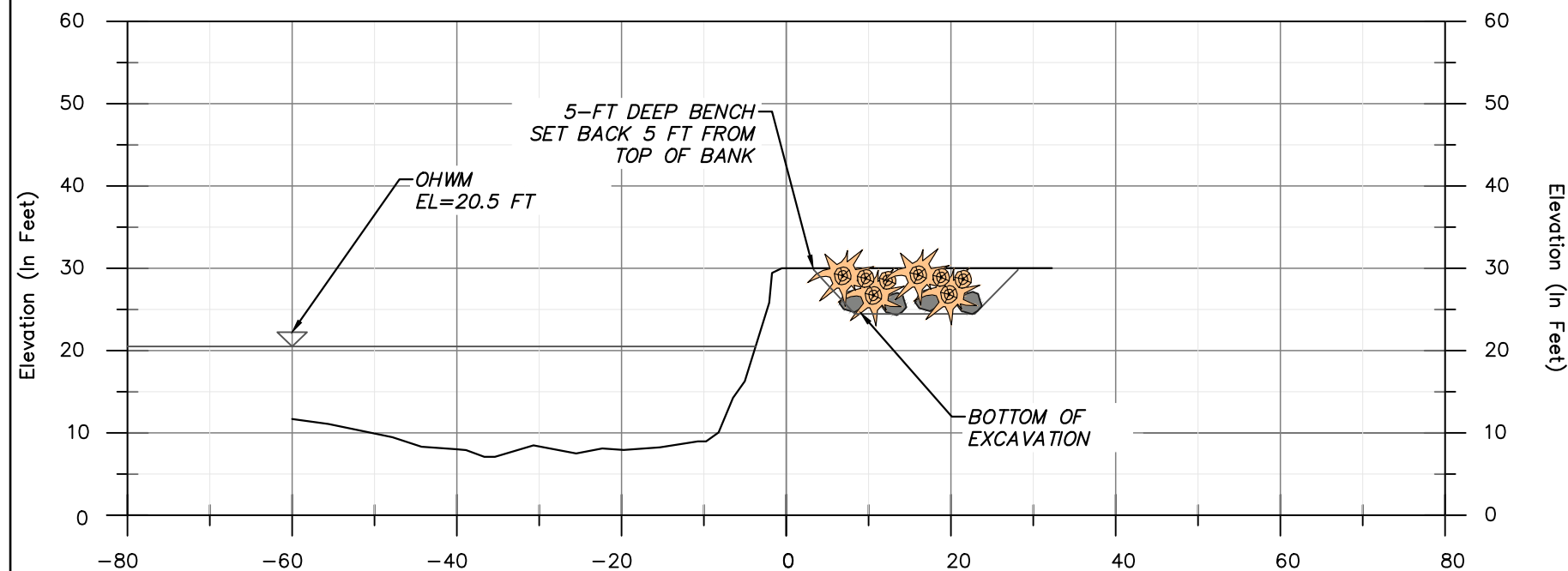
2 LOG JACK SPUR - SECTION
SCALE: 1"=20'



NOTES FOR CONTINUOUS LOG ROWS:

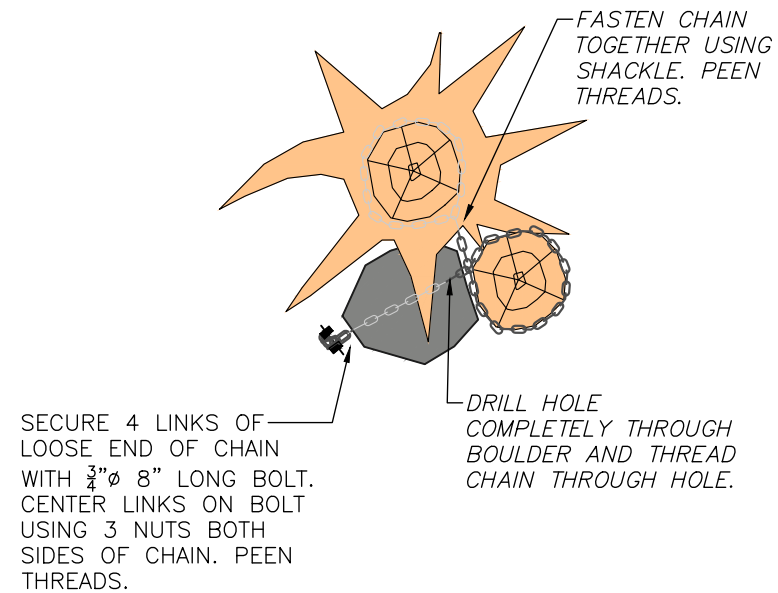
1. EACH UNIT CONSISTS OF FOUR LOGS (TWO WITH ROOTWADS) AND FOUR BALLAST BOULDERS CONNECTED WITH CHAIN.
2. ASSEMBLED UNITS WILL BE INSTALLED WITHIN A 5 FOOT DEEP TRENCH, SET BACK MINIMUM 5 FEET FROM TOP OF BANK.
3. UNITS WILL BE INSTALLED END-TO-END, ADJACENT UNITS WILL NOT BE CHAINED OR CONNECTED TOGETHER.

1 CONTINUOUS LOG ROW UNIT - PLAN
SCALE: 1"=20'

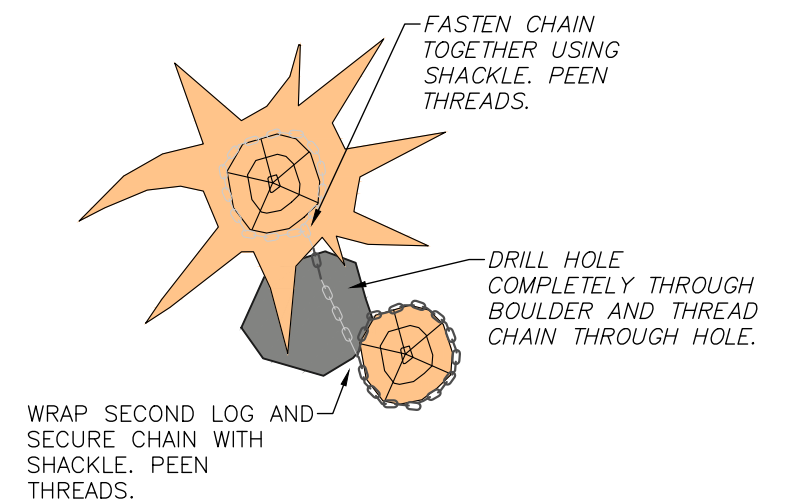


2 CONTINUOUS LOG ROW INSTALLATION - SECTION
SCALE: 1"=20'

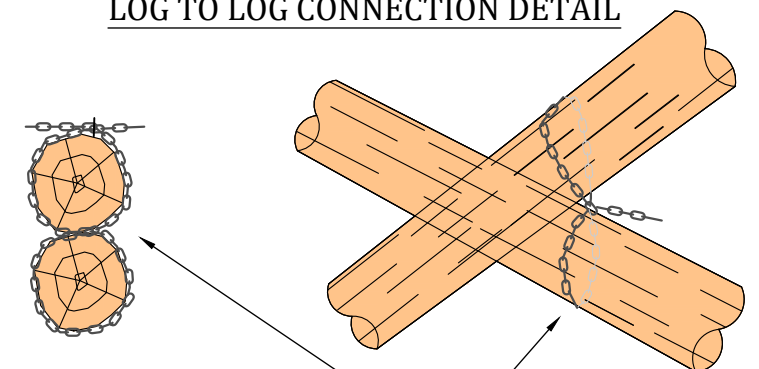
LOG TO LOG TO BOULDER CONNECTION DETAIL



LOG TO BOULDER TO LOG CONNECTION DETAIL



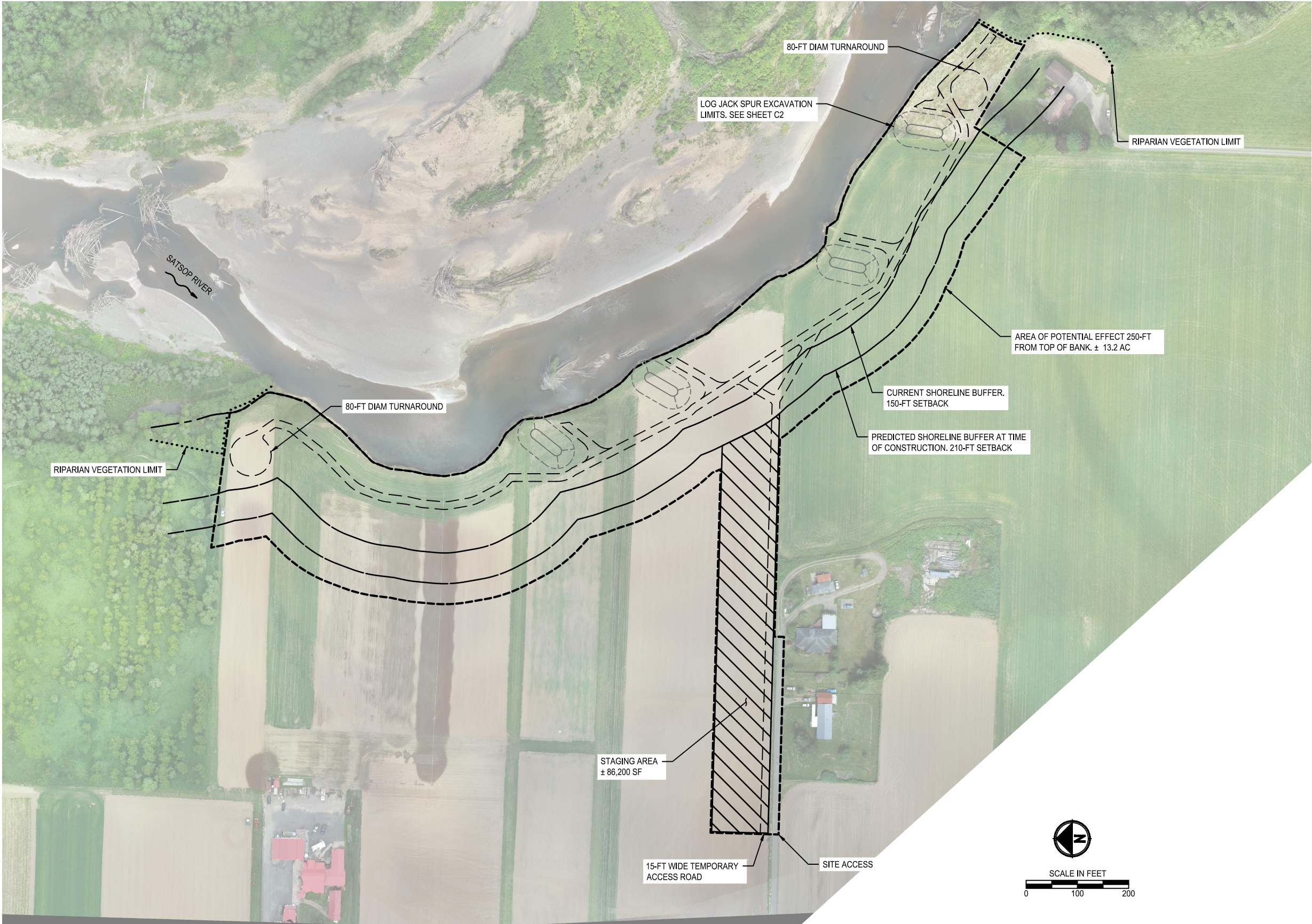
LOG TO LOG CONNECTION DETAIL



NOTES FOR LOG TO BOULDER AND LOG TO LOG CONNECTIONS:

- PROVIDE 2" DEEP NOTCH AND SEAT CHAIN WITHIN THE GROOVE. USE STAPLES TO SECURE CHAIN WITHIN NOTCH.
- BOULDERS AS CLOSE TO EACH LOG AS POSSIBLE, NO SLACK IN THE CHAIN UNLESS OTHERWISE NOTED.

PATH: U:\PSO\Projects\Clients\7132- Graye Harbor Conservation District\217-7132-001 Satsop RB Protection\995\cadd\DWG PLOTTED BY: alecda DATE: Friday, July 30, 2021 2:57:17 PM LAYOUT: T1



- NOTES
1. SURVEY AND AERIAL IMAGERY COMPLETED JUNE 4, 2021.
 2. SITE ACCESS SHALL BE FROM THE WILLIS PROPERTY'S PRIVATE ROAD.
 3. TEMPORARY ACCESS ROAD SHALL BE 15-FT WIDE AND CONSIST OF GEOTEXTILE AND HOG FUEL (WOOD CHIPS). ACCESS ROAD SHALL BE INSTALLED AND MAINTAINED THROUGH THE DURATION OF THE PROJECT AND REMOVED PRIOR TO THE END OF THE 3-YEAR MAINTENANCE PERIOD. FOLLOWING REMOVAL, AREA WILL BE RESTORED TO PRE-EXISTING CONDITIONS AND RE-SEEDED WITH PASTURE GRASS OR CROP.
 4. GRAVEL CONSTRUCTION ENTRANCE SHALL BE INSTALLED AND MAINTAINED THROUGH THE DURATION OF THE PROJECT.
 5. WILLOW WATTLES OR OTHER BIOENGINEERING TECHNIQUES MAY BE INSTALLED AT UNDETERMINED LOCATIONS ALONG THE BANK FOLLOWING EROSION AS STRUCTURES SLUFF DOWN TO THE RIVERBANK, PER THE ADAPTIVE MANAGEMENT PLAN.
 6. MAINTENANCE AGREEMENT AND/ OR TEMPORARY ACCESS/ CONSTRUCTION EASEMENT WILL BE IN PLACE BETWEEN APPLICANT AND LANDOWNERS PRIOR TO CONSTRUCTION.

PERMIT REVIEW SET
NOT FOR CONSTRUCTION

REVISIONS	DATE	BY	DESIGNED
			RSR
			DRAWN
			CFO
			CHECKED
			RSR
			APPROVED
			####

ONE INCH AT FULL SCALE, IF NOT, SCALE ACCORDINGLY
FILE NAME
PS7132001T-01
JOB No.
217-7132-001
DATE
08/21

PRELIMINARY



PROJECT NAME
LOWER SATSOP RIGHT BANK CONSERVATION PROJECT
MONTESANO, WA

STAGING AND ACCESS PLAN

DRAWING NO. 12 OF 14
T1

Appendix B

Background Maps

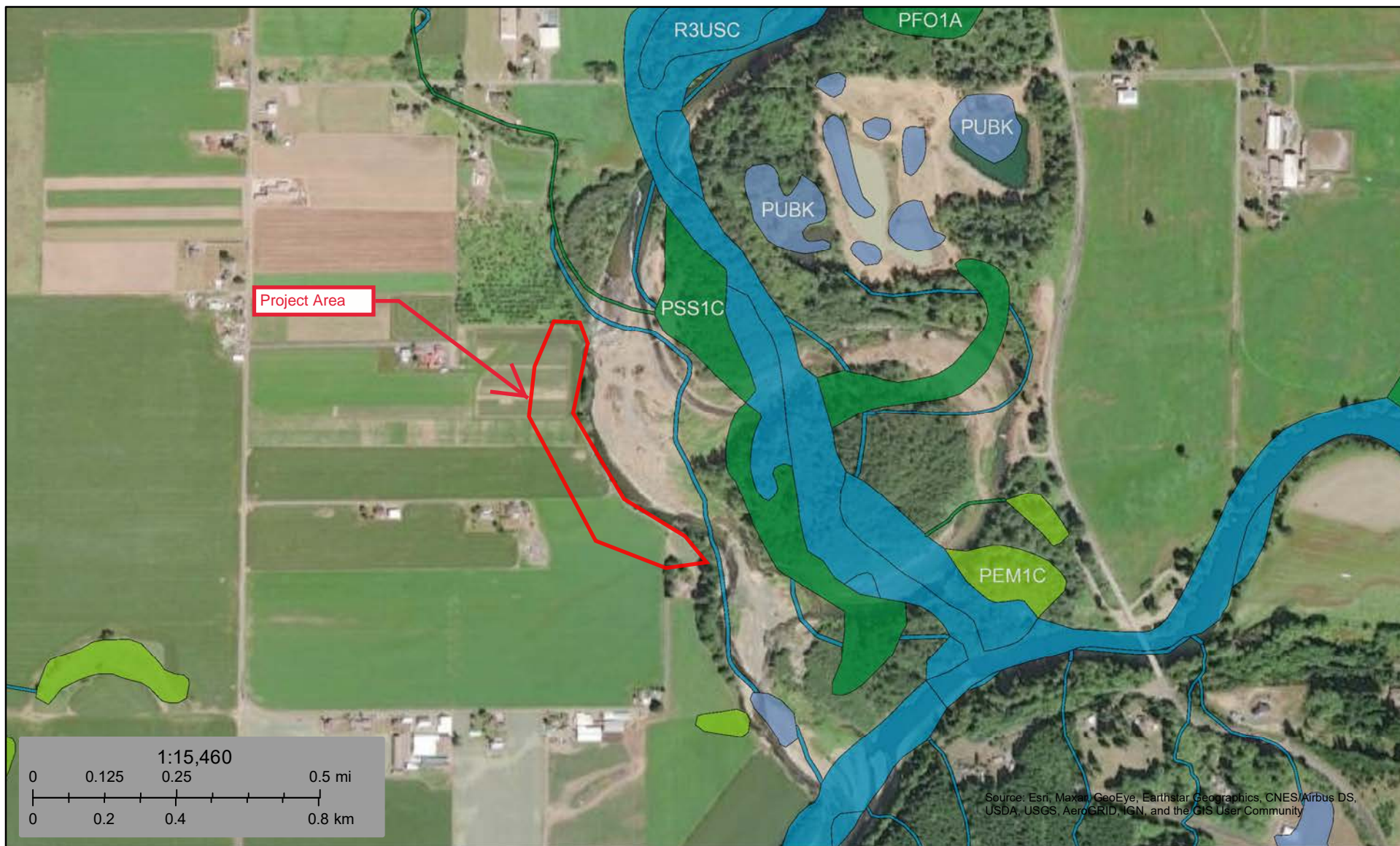




U.S. Fish and Wildlife Service



National Wetlands Inventory

Satsop

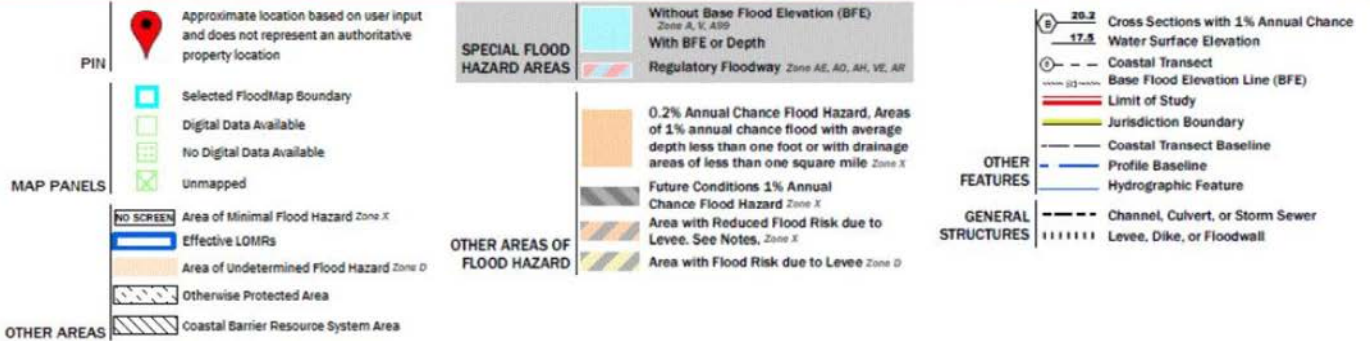
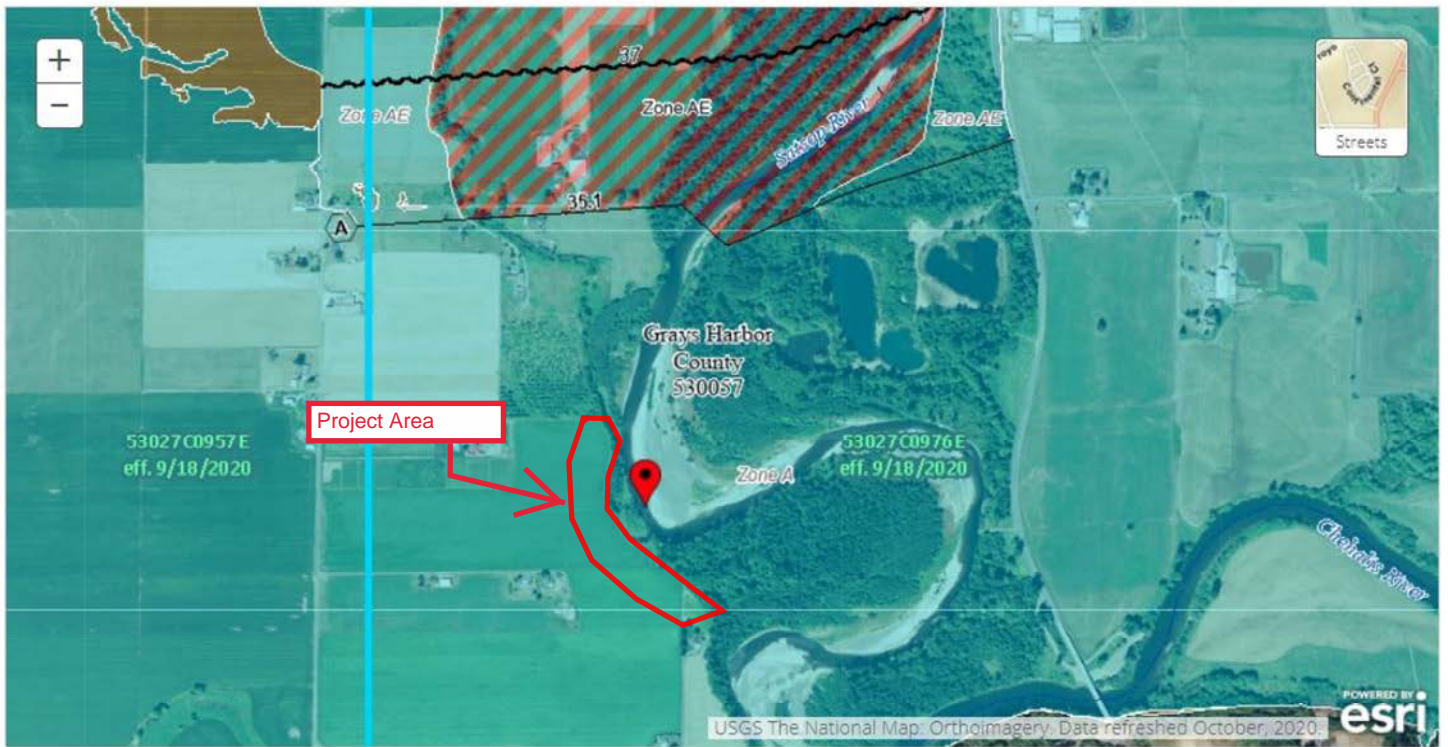


July 27, 2021

Wetlands

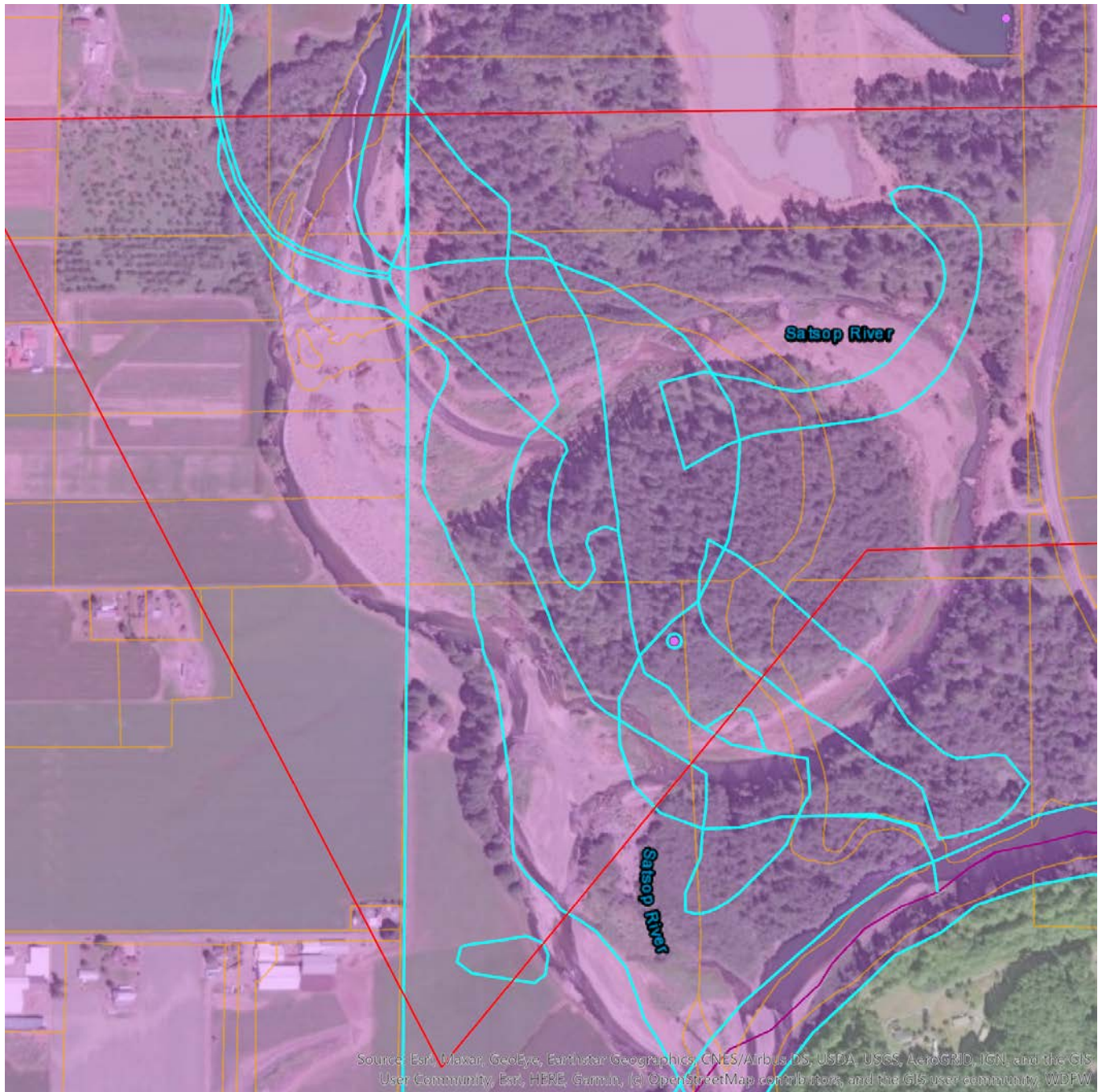
	Estuarine and Marine Deepwater		Freshwater Emergent Wetland		Lake
	Estuarine and Marine Wetland		Freshwater Forested/Shrub Wetland		Other
			Freshwater Pond		Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.





Priority Habitats and Species on the Web



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, WDFW.

Report Date: 06/22/2021

PHS Species/Habitats Overview:

Occurrence Name	Federal Status	State Status	Generalized Location
Olympic mudminnow	N/A	Sensitive	No
Chinook	Not Warranted	N/A	No
Summer Chinook	N/A	N/A	No
Coho	Candidate	N/A	No
Fall Chinook	N/A	N/A	No
Dolly Varden/ Bull Trout	N/A	N/A	No
Steelhead	Not Warranted	N/A	No
Winter Steelhead	N/A	N/A	No
Chum	Not Warranted	N/A	No
Rainbow Trout	N/A	N/A	No
Cutthroat	Candidate	N/A	No
Resident Coastal Cutthroat	N/A	N/A	No
Coho	N/A	N/A	No
Fall Chum	N/A	N/A	No
Trumpeter swan	N/A	N/A	No
Waterfowl Concentrations	N/A	N/A	No
Freshwater Emergent Wetland	N/A	N/A	No
Freshwater Forested/Shrub Wetland	N/A	N/A	No
Riverine	N/A	N/A	No
Yuma myotis	N/A	N/A	Yes
Big brown bat	N/A	N/A	Yes
Northern Spotted Owl	Threatened	Endangered	Yes

PHS Species/Habitats Details:

Olympic mudminnow	
Scientific Name	<i>Novumbra hubbsi</i>
Priority Area	Occurrence
Accuracy	1/4 mile (Quarter Section)
Notes	OLYMPIC MUDMINNOW IO 2 IN DENSELY VEGETATED SIDE CHANNEL SATSOP RV AT MOUTH.
Source Record	68074
Source Dataset	WS_OccurPoint
Source Date	WS_OccurPoint
Source Name	BEECHER, H/WDFW
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	Sensitive
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	Y
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/conservation/habitat/planning/ahg/index.html
Geometry Type	Points

Chinook	
Scientific Name	<i>Oncorhynchus tshawytscha</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Satsop Fall Chinook, Run: Fall, Status: Healthy
Source Record	1469
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Summer Chinook	
Scientific Name	<i>Oncorhynchus tshawytscha</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Chinook Salmon, Run Time: Summer, Life History: Anadromous
Source Record	59702
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	<i>Oncorhynchus kisutch</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Satsop Coho, Run: Unspecified, Status: Healthy
Source Record	3600
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chinook	
Scientific Name	<i>Oncorhynchus tshawytscha</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Chinook Salmon, Run Time: Fall, Life History: Anadromous
Source Record	59699
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Dolly Varden/ Bull Trout	
Scientific Name	<i>Salvelinus malma/S. confluentus</i>
Priority Area	Occurrence/Migration
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Bull Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	59705
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Steelhead	
Scientific Name	<i>Oncorhynchus mykiss</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Satsop Winter Steelhead, Run: Winter, Status: Depressed
Source Record	6595
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Winter Steelhead	
Scientific Name	<i>Oncorhynchus mykiss</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	59708
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Chum	
Scientific Name	<i>Oncorhynchus keta</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Chehalis Fall Chum, Run: Fall, Status: Healthy
Source Record	2671
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Rainbow Trout	
Scientific Name	<i>Oncorhynchus mykiss</i>
Priority Area	Occurrence/Migration
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Rainbow Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	59706
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Cutthroat	
Scientific Name	<i>Oncorhynchus clarki</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Chehalis Coastal Cutthroat, Run: Unspecified, Status: Unknown
Source Record	7580
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Cutthroat	
Scientific Name	<i>Oncorhynchus clarki</i>
Priority Area	Occurrence
Accuracy	NA
Notes	LLID: 1234883469809, Stock Name: Chehalis Coastal Cutthroat, Run: Unspecified, Status: Unknown
Source Record	7580
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Candidate
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Winter Steelhead	
Scientific Name	<i>Oncorhynchus mykiss</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Steelhead Trout, Run Time: Winter, Life History: Anadromous
Source Record	59709
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Chinook	
Scientific Name	<i>Oncorhynchus tshawytscha</i>
Priority Area	Occurrence
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Stock Name: Satsop Summer Chinook, Run: Summer, Status: Depressed
Source Record	1464
Source Dataset	SASI
Source Name	Not Given
Source Entity	WDFW Fish Program
Federal Status	Not Warranted
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Resident Coastal Cutthroat	
Scientific Name	<i>Oncorhynchus clarki</i>
Priority Area	Occurrence/Migration
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Cutthroat Trout, Run Time: Unknown or not Applicable, Life History: Unknown
Source Record	59698
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Coho	
Scientific Name	<i>Oncorhynchus kisutch</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Coho Salmon, Run Time: Unknown or not Applicable, Life History: Anadromous
Source Record	59704
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Fall Chum	
Scientific Name	<i>Oncorhynchus keta</i>
Priority Area	Breeding Area
Site Name	Satsop River
Accuracy	NA
Notes	LLID: 1234803469786, Fish Name: Chum Salmon, Run Time: Fall, Life History: Anadromous
Source Record	59701
Source Dataset	SWIFD
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
More Info	http://wdfw.wa.gov/wlm/diversty/soc/soc.htm
Geometry Type	Lines

Trumpeter swan	
Scientific Name	<i>Cygnus buccinator</i>
Priority Area	Regular Concentration
Site Name	CHEHALIS RIVER VALLEY
Accuracy	1/4 mile (Quarter Section)
Notes	TRUMPETER SWANS OVERWINTERING AREA. ROTATION OF CROPS, SIZE OF THE FIELDS, FLOOD CONDITIONS, AND COLD PERIODS DETERMINE THE LOCATION OF SWANS IN ANY GIVEN YEAR.
Source Record	913453
Source Dataset	PHSREGION
Source Name	BELL, GARY
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Waterfowl Concentrations	
Priority Area	Regular Concentration
Site Name	CHEHALIS VALLEY
Accuracy	1/4 mile (Quarter Section)
Notes	WATERFOWL WINTERING AREA. ROTATION OF CROPS, FIELD SIZE, FLOOD CONDITIONS, AND COLD PERIODS DETERMINE THE LOCATION OF WATERFOWL IN ANY GIVEN YEAR.
Source Record	902430
Source Dataset	PHSREGION
Source Name	SCHIRATO, GREG
Source Entity	WA Dept. of Fish and Wildlife
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026
Geometry Type	Polygons

Freshwater Emergent Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Emergent Wetland - NWI Code: PEM1C
Source Dataset	NWIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1A
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PFO1C
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Freshwater Forested/Shrub Wetland	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Freshwater Forested/Shrub Wetland - NWI Code: PSS1C
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Riverine	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Riverine - NWI Code: R3USC
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Riverine	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Riverine - NWI Code: R3USC
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Riverine	
Priority Area	Aquatic Habitat
Site Name	N/A
Accuracy	NA
Notes	Wetland System: Riverine - NWI Code: R3USC
Source Dataset	NWIIWetlands
Source Name	Not Given
Source Entity	US Fish and Wildlife Service
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	N
SGCN	N
Display Resolution	AS MAPPED
ManagementRecommendations	http://www.ecy.wa.gov/programs/sea/wetlands/bas/index.html
Geometry Type	Polygons

Yuma myotis	
Scientific Name	<i>Myotis yumanensis</i>
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Big brown bat	
Scientific Name	<i>Eptesicus fuscus</i>
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

Northern Spotted Owl	
Scientific Name	<i>Strix occidentalis</i>
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	Threatened
State Status	Endangered
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	Y
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00026

Yuma myotis	
Scientific Name	<i>Myotis yumanensis</i>
Notes	This polygon mask represents one or more records of the above species or habitat occurrence. Contact PHS Data Release (360-902-2543) for obtaining information about masked sensitive species and habitats.
Federal Status	N/A
State Status	N/A
PHS Listing Status	PHS Listed Occurrence
Sensitive	Y
SGCN	N
Display Resolution	TOWNSHIP
ManagementRecommendations	http://wdfw.wa.gov/publications/pub.php?id=00605

DISCLAIMER. This report includes information that the Washington Department of Fish and Wildlife (WDFW) maintains in a central computer database. It is not an attempt to provide you with an official agency response as to the impacts of your project on fish and wildlife. This information only documents the location of fish and wildlife resources to the best of our knowledge. It is not a complete inventory and it is important to note that fish and wildlife resources may occur in areas not currently known to WDFW biologists, or in areas for which comprehensive surveys have not been conducted. Site specific surveys are frequently necessary to rule out the presence of priority resources. Locations of fish and wildlife resources are subject to variation caused by disturbance, changes in season and weather, and other factors. WDFW does not recommend using reports more than six months old.

Appendix C

Representative Photographs





Photograph 1. Willis house. Downstream end of erosion. Photo taken from in-stream gravel bar. View S.



Photograph 2. Bank erosion at downstream end. Note slightly undercut bank and some cobbles below deep silt loam layer and in-stream wood. View W.



Photograph 3. Tall cutbank in central portion of study area. View W. (Photograph taken by Parametrix survey crew, June 20201)



Photograph 4. Gravel bar and large wood in foreground. On-site riparian vegetation and cutbank at north/upstream end of project area in background. View SW.



Photograph 5. Satsop River side channel and riparian vegetation (red alder, reed canary grass, Himalayan blackberry). View SE.



Photograph 6. Riparian vegetation and typical farmed upland conditions (planted corn with grassed field edges). View W.



Photograph 7. Typical upland farmed conditions (corn and pasture areas) where structures will be placed. Conditions also typical of staging area. River cutbank in background. View SE.



Photograph 8. River cutbank viewed from top of bank. View S.



Figure 1. Photograph Locations