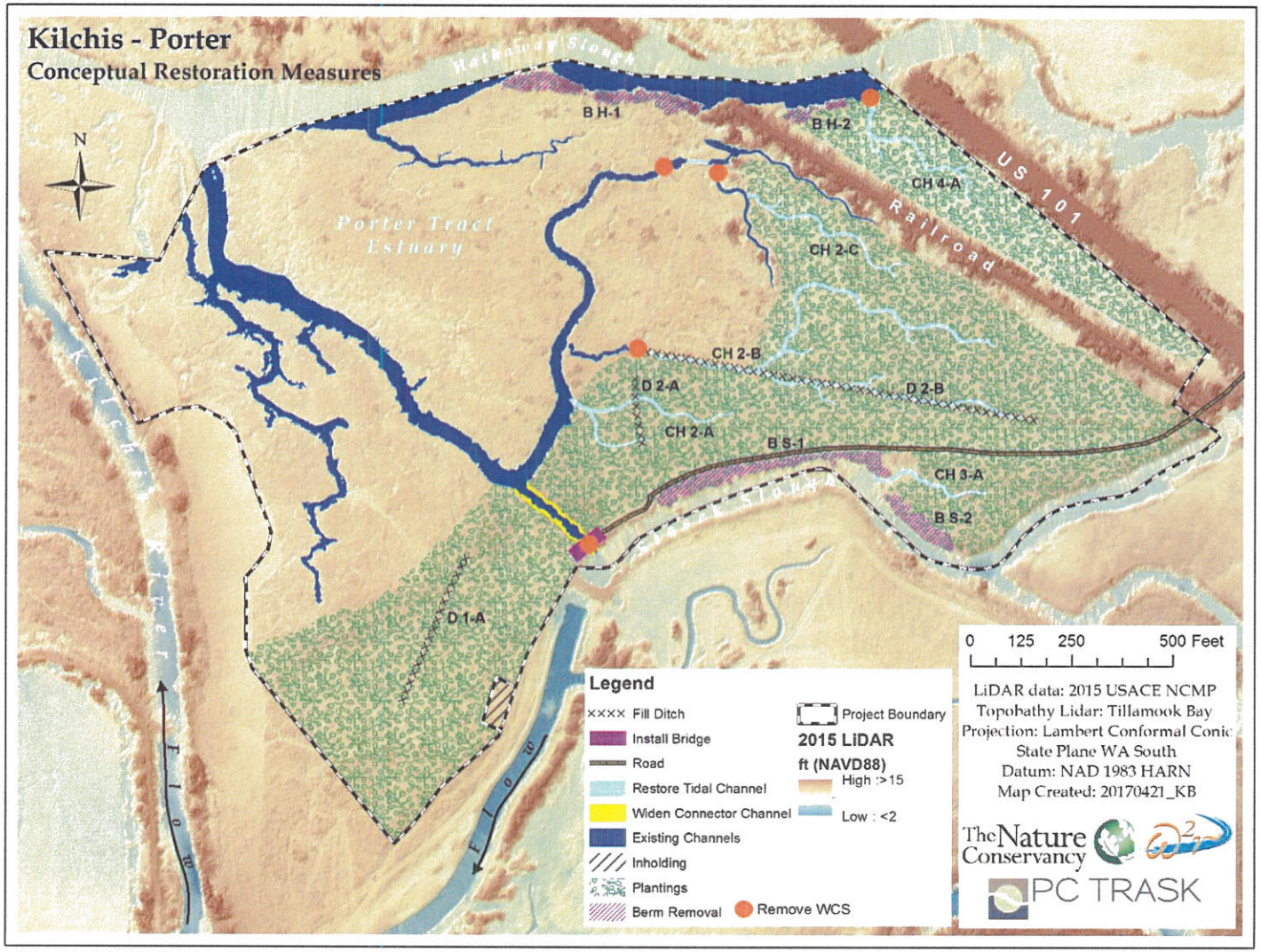

Figure 5. Porter Tract Conceptual Restoration Design.

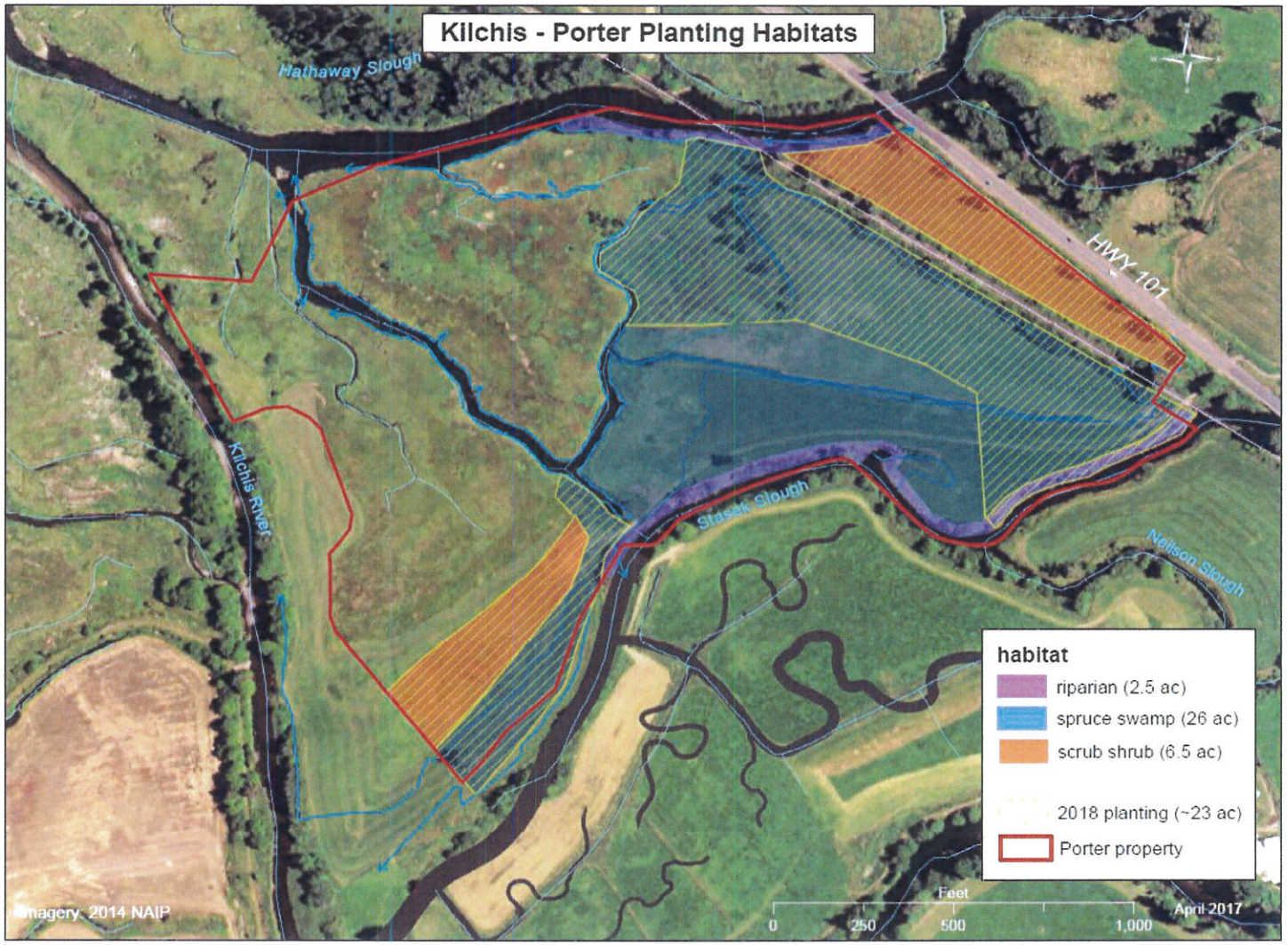

Figure 6. Porter Tract Planting Zones

Table 4. Plant materials for Phase1 and Phase 2 Planting

		Habitats			
Species	Common Name	Spruce Swamp (26 ac)	Riparian Forest (2.5 ac)	Tidal Scrub Shrub (6.5 ac)	Totals
Alnus rubra	Red Alder	800	375	0	**1,175**
Lonicera involucrata	Twinberry	12,300	375	0	**12,675**
Malus fusca	Crabapple	6,100	0	0	**6,100**
Picea sitchensis	Sitka Spruce	4,600	375	0	**4,975**
Populus trichocarpa	Cottonwood	1,500	450	0	**1,950**
Rhamnus purshiana	Cascara	0	375	0	**375**
Rubus parviflorus	Thimbleberry	0	225	0	**225**
Rubus spectabilis	Salmonberry	0	375	0	**375**
Sambucus racemosa	Red Elderberry	7,700	600	0	**8,300**
Spiraea douglasii	Spirea	8,500	375	0	**8,875**
Thuja plicata	Western Red Cedar	0	75	0	**75**
Salix sp.	Hooker's, Sitka Willow	35,500	3,900	18,200	**57,600**
	Plant Totals=	**77,000**	**7,500**	**18,200**	**102,700**
	Overall Plants/AC	3,000	3,000	2,800	--
	Plant Cluster/AC	2,100	2,000	1,100	--

4.8 Cut and Fill Balance

Preliminary cut and fill balances have been calculated based on LiDAR elevations supplemented with on the ground survey data collected by W2r. The cut and fill balance of excavated material is derived from the LiDAR surface and should be considered approximate.

Excavation is required for construction of the tidal channels, widening of the Porter connection channel, and lowering the Stasek Slough and Hathaway Slough dikes. The total material generated from dike removal is estimated to be 2,970 CY. Channel construction would require approximately 10,300 CY of excavation. The quantity of material needed to fill ditches is 2,000 CY. Since the amount of material required for filling ditches is small relative to the berm removal and channel excavation quantities, a large quantity of material, approximately 11,300 CY, would be placed onsite such as subsided areas and mounds.

4.9 Estimate of Probable Construction Costs

Detailed construction cost estimates were developed for comparison to construction contractor bids. The estimates were intended to document cost of restoration measures being considered.

Site preparation and other general markups and unit costs are based on recent estuary restoration projects in Oregon. Quantities are based on earthwork take-offs and measurements in AutoCAD based on the LiDAR-defined topography (and adjusted based on the LiDAR bias and engineering experience). Quantity estimates are conservative and rounded up in some cases as appropriate to account for the numerous variables and unknown site conditions.

The following assumptions were made in developing the cost estimate:

- General site preparation markups: total of 6% of other direct costs.
- Channel excavation earthwork: $8 per cubic yard ($/CY) to reflect relatively good working conditions; this unit cost includes low mound construction because mounds are located close to the channels.
- Native wetland seeding: $3,000 per acre ($/AC), a typical native erosion control seeding cost; this seeding will be completed by the construction contractor.
- Riparian and wetland revegetation: $7,000 to $8,000 per acre ($/AC) to reflect a high level (density, etc.) of revegetation similar to previous TNC revegetation costs. This work is assumed to occur outside the construction contract by TNC staff.
- Low berm and dike removal earthwork: $7/CY.
- Wood habitat structure logs: $400 per log, assuming coniferous species and relative small diameter (12-16") and common lengths (20 to 40 feet; 12-foot pier logs).

A cost detail for the construction work items is summarized in Table 5 below.

Table 5. Construction cost estimate detail.

No.	Spec Section	Item	Qty	Unit	Unit Cost	Total Cost	Notes
		Site Preparation				**$ 52,000**	
1	0210	Mobilization (5%)	1	LS	$ 24,000	$ 24,000	Percent of direct constr. costs
2	0225	Work Zone Traffic Control	1	LS	$ 10,000	$ 10,000	Flaggers, traffic signage, constr. entrance
3	0245	Temp Water Management & Dewatering	1	LS	$ 10,000	$ 10,000	Dewatering & diversions, cofferdams
4	0280	Erosion Control	1	LS	$ 8,000	$ 8,000	Straw wattles, turbidity curtains
		Earthwork				**$ 164,660**	
5	0305	Construction Survey Work	1	LS	$ 10,000	$ 10,000	Constractor responsible for survey
6	0305	Demo Connection Channel Culvert	1	EA	$ 4,000	$ 4,000	Approx. 4' timber box culvert
7	0305	Demo Water Control Structures	4	EA	$ 2,000	$ 8,000	Porter SL, near US 101, WCS, small x-ing
8	0320	Clearing/Grubbing	1	LS	$ 10,000	$ 10,000	Access, channels, clearing/grubbing
9	0330	Fill Ditch along 101	1,070	CY	$ 10.00	$ 10,700	Does not include fill along Sandpiper Ditch
10	0330	Excavate Channels	10,320	CY	$ 9.00	$ 92,880	Includes mound construction - all channel exc.
11	0330	Hathaway & Stasek Slough Dike Removal	2,960	CY	$ 8.00	$ 23,680	Remove portion of dike and regrade onsite
13	0390	Streambed Material	90	TN	$ 60.00	$ 5,400	Scour protection at crossing for bridge 1
		Structural				**$ 89,000**	
14	0575	Pedestrian Bridge 1 & Abutment System	1	LS	$ 55,000	$ 55,000	Across connector channel, 45' long
15	0575	Pedestrian Bridge 2 & Abutment System	1	LS	$ 34,000	$ 34,000	Across small slough to north, 25' long
		Revegetation				**$ 219,850**	
16	1030	Native Erosion Control Seeding	7.5	AC	$ 3,000	$ 22,500	Placed on mounds; incl. prep., 1-yr maintence
17	1040	Riparian Species	3.6	AC	$ 6,000	$ 21,600	Placed on mounds; incl. prep., 1-yr maintence
18	1040	Wetland Species	26.7	AC	$ 5,000	$ 133,500	Scrub / shrub, sedges; incl. prep., 1-yr maintenance
19	1042	Wood Habitat Structures	65	EA	$ 650.00	$ 42,250	Assume imported, small logs
		TOTAL				***$ 525,600***	

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Appendix A
Engineering Plans – Porter Tract Estuary Restoration

FINAL DESIGN SPECIFICATIONS

PORTER TRACT ESTUARY RESTORATION PROJECT

TILLAMOOK COUNTY, OREGON

RENEWS: 6/30/2019

Amanda Jones
Final Design
2019-02-18 15:27-08:00

CONSTRUCTION SPECIFICATIONS

SPECIAL PROVISIONS

February 2019

FINAL DESIGN

The Nature Conservancy
Protecting nature. Preserving life.™

WOLF WATER RESOURCES

1001 SE Water Ave, Suite 180
Portland, OR 97214
503.207.6688

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Table of Contents

STANDARD SPECIFICATIONS

INTRODUCTION

The following Amendments and Special Provisions shall be used in conjunction with the 2018 Oregon Department of Transportation (ODOT) Oregon Standard Specifications for Construction, hereafter "Standard Specifications".

AMENDMENTS NOT RELATED TO PROJECT SCOPE OF WORK

The following is a list of current Amendments to the Standard Specifications which do not relate to any items in this project's scope of work and have not been included in this document. If any of these amendments do become necessary for the progress of the work, the Contracting Agency will provide a copy to the Contractor. Copies of all current amendments are also available at the Oregon Department of Transportation internet web site at http://www.oregon.gov/ODOT/HWY/SPECS/Pages/2018_Standard_Specifications.aspx

Section 00205 – Field Laboratory, Weight house, Etc.
Section 00335 - Blasting Methods and Protection of Excavation Backslopes
Section 00396 - Shotcrete Slope Stabilization
Section 00398 - Rock Slope Stabilization and Reinforcement
Section 00406 - Tunneling, Boring, and Jacking
Section 00410 - Common Provisions for Pipe Lining
Section 00411 - Pipe Bursting and Slip lining
Section 00412 - Cured in Place Pipe lining
Section 00415 - Video Pipe Inspection
Section 00430 - Subsurface Drains
Section 00432 - Wearing Surface Drains
Section 00435 - Prefabricated Vertical Drains
Section 00440 - Commercial Grade Concrete
Section 00450 - Structural Plate Shaped Structures
Section 00460 - Paved Culvert End Slopes
Section 00470 - Manholes, Catch Basins, and Inlets
Section 00475 - Drain Wells
Section 00480 - Drainage Curbs
Section 00490 - Work on Existing Sewers and Structures
Section 00495 - Trench Resurfacing
Section 00501 - Bridge Removal
Section 00503 - Bridge Deck Cold Plane Pavement Removal
Section 00512 - Drilled Shafts
Section 00535 - Resin Bonded Anchor Systems
Section 00536 - Internal Shear Anchors
Section 00538 - Crack Injecting Existing Bridges
Section 00550 - Precast Prestressed Concrete Members

Section 00555 - Post-Tensioning
Section 00556 - Multi-Layer Polymer Concrete Overlay
Section 00559 - Silica Fume and Latex Modified Concrete Overlays
Section 00581 - Bridge Drainage Systems
Section 00582 - Bridge Bearings
Section 00583 - Electrical Conduit In Structures
Section 00584 - Elastomeric Concrete Nosing
Section 00585 - Expansion Joints
Section 00586 - Expansion Joints, Modular
Section 00587 - Bridge Rails
Section 00591 - Spray Waterproofing Membrane
Section 00593 - Powder Coating Metal Structures
Section 00594 - Preparing and Coating Metal Structures
Section 00595 - Reinforced Concrete Box Culverts
Section 00597 - Sound Walls
Section 00599 - Concrete Slope Paving
Section 00620 - Cold Plane Pavement Removal
Section 00622 - Grinding Concrete Pavement
Section 00635 - Grid-Rolled Aggregate Subbase
Section 00640 - Aggregate Base and Shoulders
Section 00641 - Aggregate Subbase, Base, and Shoulders
Section 00705 - Emulsified Asphalt Prime Coat and Emulsified Asphalt Fog Coat
Section 00706 - Emulsified Asphalt Slurry Seal Surfacing
Section 00710 - Single Application Emulsified Asphalt Surface Treatment
Section 00711 - Pre-Coated Aggregate Asphalt Surface Treatment
Section 00715 - Multiple Application Emulsified Asphalt Surface Treatment
Section 00730 - Emulsified Asphalt Tack Coat
Section 00735 - Emulsified Asphalt Concrete Pavement
Section 00740 - Commercial Asphalt Concrete Pavement (CACP)
Section 00743 - Porous Asphalt Concrete (PAC)
Section 00744 - Asphalt Concrete Pavement
Section 00745 - Asphalt Concrete Pavement - Statistical Acceptance
Section 00746 - Crack Sealing Flexible Pavements
Section 00748 - Asphalt Concrete Pavement Repair
Section 00749 - Miscellaneous Asphalt Concrete Structures
Section 00754 - Plain Concrete Pavement Repair
Section 00755 - Continuously Reinforced Concrete Pavement
Section 00756 - Plain Concrete Pavement
Section 00758 - Reinforced Concrete Pavement Repair
Section 00759 - Miscellaneous Portland Cement Concrete Structures
Section 00810 - Metal Guardrail
Section 00811 - Cable Barrier
Section 00812 - Adjusting and Repairing Guardrail

Section 00815 – Bollards
Section 00820 - Concrete Barrier
Section 00822 - Glare Shields
Section 00830 - Impact Attenuators
Section 00840 - Delineators and Milepost Marker Posts
Section 00842 - Facility Identification Markers
Section 00850 - Common Provisions for Pavement Markings
Section 00851 - Pavement Marking Removal
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Section 00950 - Removal of Electrical Systems
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Section 00962 - Metal Illumination and Traffic Signal Supports
Section 00963 - Signal Support Drilled Shafts
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Section 00921 - Major Sign Support Drilled Shafts
Section 00990 - Traffic Signals
Section 01070 - Mailbox Supports
Section 01100 - Water Supply Systems

AMENDMENTS TO THE STANDARD SPECIFICATIONS

The following Amendments to the Standard Specifications are made a part of this contract and supersede any conflicting provisions of the Standard Specifications.

Each Amendment contains all current revisions to the applicable section of the Standard Specifications and may include references which do not apply to this particular project. The deletion, amendment, alteration, or addition to any subsection or portion of the Standard Specifications is meant to pertain only to that particular portion of the section, and in no way should it be interpreted that the balance of the section does not apply unless stated as such.

All instances of text within the standard specifications that contain "Agency" or "ODOT" shall be replaced by, refer to, or imply "The Nature Conservancy" or "TNC". All instances of text within the Amendments, Special Provisions, and Plans that contain Contracting Agency Representative (CAR) shall also be replaced by, refer to, or imply TNC.

Italicized wording in the following sections are taken from the Standard Specifications and show the modifications for this project.

SECTION 00100 – GENERAL CONDITIONS

00150.60 – Construction Equipment Restrictions

Amend this section with the following:

(d) Protection of Sensitive Wetland Areas and Waterbodies – All construction equipment operating in the wetland, channel, and berm and culvert removal shall exclusively use biobased hydraulic fluids. Biobased hydraulic fluids include those made with renewable resources such as natural vegetable oil. All equipment working in the channel area must be steam-cleaned prior to construction activities at the site to remove contaminants that may enter the project site.

SECTION 00220 – ACCOMMODATIONS FOR PUBLIC TRAFFIC

00220.40 – General Requirements

Amend this section with the following:

For safety and security, the public shall not access any parts of the construction work limits, along the construction access and haul route, to the channel grading areas, or to the culvert and berm removal areas as shown on the Plans, or any other areas of the site where active construction is taking place. Exceptions to this must be mutually agreed upon by the Contractor, and TNC.

SECTION 00280 – EROSION AND SEDIMENT CONTROL

SECTION 00280.15 Run-of Control Materials:

(a) Check Dams – Furnish check dam material meeting the following requirements:

Supplement this list with the following:

- *Meter bulkbags. – Durable, weather-resistant bulk material bags of approximately one meter (3.2 feet) in width, depth, and height. Fill meter-sized bulk bags with firmly-packed fine PCC 3/8" -0 aggregate, or round 3/8" – 3/16" pea gravel.*

SECTION 00225 – WORK ZONE TRAFFIC CONTROL

00225.02(a) Temporary Signs

Add the following to the end of this subsection:

Install a 54-inch "TRUCKS LEAVING HIGHWAY 500 FT" sign in advance of each entrance point to the work area at sign spacing "A" from the "TCD Spacing Table" shown on the Standard Drawings. Install a 54-inch "TRUCKS ENTERING HIGHWAY 500 FT" sign in advance of each exit point from the work area at sign spacing "A" from the "TCD Spacing Table" shown on the Standard Drawings.

00225.05 (b) Traffic Control Plan

Amend this section with the following:

The contractor shall submit a Traffic Control Plan to the Nature Conservancy and the Engineer at the pre-construction meeting for approval. The contractor shall provide stamped Working Drawings according to 00153.35 that include the proposed TCP showing all TCM and quantities of TCD.

SECTION 00290 – ENVIRONMENTAL PROTECTION

SECTION 00290.30 Pollution Control

Revise paragraph (b) to read:

A "Pollution Control Plan Contractor Packet" is available from ODOT:
https://www.portlandoregon.gov/transportation/article/657807

SECTION 00310 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

00310.44 Earthwork in Connection with Removal

Supplement this paragraph with the following:

All removal, haul off, and legal disposal of all encountered debris and structures required to remove the Connection Channel Culvert shown on the Plans is included in the "Demo Connection Channel Culvert" bid item.

Excavation required to remove the culvert and berm at the Porter Connection Channel shall not be considered incidental to this pay item because the excavation quantity is large. Excavation required to remove the berm is included in the "Excavate Channels" pay item.

All minor excavation, removal, haul off, and legal disposal of all encountered debris and structures required to remove water control structures (tide gates, culverts, etc.) shown on the Plans shall be considered incidental to the "Demo Water Control Structures" bid item.

SECTION 00320 – CLEARING AND GRUBBING

Supplement paragraph(a) Clearing Trees and Other Vegetation with the following:

Salvage native trees and brush that are cleared within the construction limits according to Special Provision Section 01041 Brushpiles and Salvaged Logs.

SECTION 00330 – EARTHWORK

00330.41 Excavations

Supplement this section with the following:

Earthwork quantities are approximate. Quantities were calculated based on bank volumes between existing grade and finish grade surfaces. Existing grade surfaces were developed using LiDAR topographic data which can have variable accuracy due to vegetative cover, open water, and other sources of error.

***Channel Excavation** includes earthen berm removal, channel construction, haul, regrading, and compaction of this material in the low mounds as shown on the Plans. The upper 18 inches (or depth otherwise that completely captures reed canarygrass rootmass) of all channel excavation shall be kept separate and disposed of in the lowest lift (at the bottom or buried to the extent possible) of the low mounds as directed by the CAR.*

All work for excavating material, hauling material, and finish grading surfaces is included in the "Excavate Channel" bit item.

***Dike Removal** includes the Hathaway and Stasek Slough dike removal, haul, regrading, and compaction of this material in the low mounds as shown on the Plans. The upper 18 inches (or depth otherwise that completely captures reed canarygrass rootmass) of all dike removal shall be kept separate and disposed of in the lowest lift (at the bottom or buried to the extent possible) of the low mounds as directed by the CAR.*

All work for excavating material, hauling material, and finish grading surfaces is included in the "Hathaway & Stasek Slough Dike Removal" bit item.

***Low Mounds** and **Ditch Fills** shall be as indicated on the Plans. Excavation material from Channel Excavation, and all other excavation areas shall be placed and final graded in an undulating finished surface, with heights of fill not to exceed 2.5 feet, or as otherwise directed by the CAR. Final finish*

grading of the mounds shall facilitate drainage, and not result in ponded areas or excessive erosion. Grading shall allow future access to and use of these areas by the landowner (TNC), and shall not result in unsafe conditions for users of the property.

Placement, grading, and compaction of excavation material in the Low Mounds and ditch fill along the Sandpiper Channel is included in the "Excavate Channel" bid item.

Placement, grading, and compaction of excavation material in the ditch along 101 is included in the "Fill Ditch along 101" bid item.

Fill placed in the Low Mounds and ditch fills shall be compacted in lifts not to exceed 12-inches. Compaction shall be to a firm condition. Acceptance of compaction methods and final compaction shall be determined by the CAR. The surface of the compacted fill shall be prepared for planting according to Section 1040 of these Specifications.

SECTION 00390 – STREAMBED MATERIAL

Supplement this section with the following:

Work under this section consists of furnishing and placing streambed material that is resistant to scour and erosion from flows in the Porter Connector Channel bridge. Streambed material shall be placed for scour protection under the new bridge as shown on the Plans.

(a) General - Streambed rock shall consist of round (river run) rock and conform to all provisions of this section. Angular (quarry run) rock shall not be used for streambed rock. Rock shall have a minimum specific unit weight of 2.5.

(b) Gradation Requirements - Streambed rock shall be well-graded and follow the class and weight of rock below.

Streambed Material:

Rock Size Range (Inch)	% Passing by Weight
8 - 12	100
6 – 8	50
2 - 6	20
1/2	5

(c) Control Sample – Contractor shall coordinate with the Engineer to visually inspect the proposed streambed material for meeting gradation requirements prior to delivery of material to the work site.

Engineer inspection shall be performed **at the quarry** as coordinated by the contractor. The Contractor shall not deliver streambed material to the work site until Engineer inspection and approval is given.

Construction

(a) Rock for streambed material shall be placed as shown on the Plans. The minimum layer thickness of Streambed Material shall be 24 inches unless otherwise shown. Key in streambed material into the sideslopes and channel bottom by the dimensions shown on the Plans.
(b) Bridge concrete pile caps and helical piles shall be embedded (covered) by streambed material by the dimensions shown on the Plans.
(c) Place streambed rock by excavator bucket. Placement of rock by end-dumping shall not be allowed. Use the back of the excavator bucket to form, smooth, and slope the surface of the streambed material as shown on the Plans and to ensure rock-to-rock contact.
(d) Rock shall be embedded and buried with 1 foot of native channel material so that no rock is exposed at the channel finished grade lines.

All work to place streambed material is considered incidental to the "Bridge Construction" bid item.

SECTION 00510 – STRUCTURE EXCAVATION AND BACKFILL

00510.46 Preparation of Foundations

Supplement this section with the following:

The contractor (or bridge designer if not the contractor) shall submit bridge live load, dead load, lateral load reactions, anchor bolt locations, bridge bearing pad, helical pile and precast reinforced-concrete pile cap layout to the CAR and Engineer. Contractor is responsible to obtain all needed soils, hydraulic, and survey data and analysis required to construct abutments if not already available.

The bridge abutments system shall comply with requirements of geotechnical engineering report (October 5th, 2018, Geotechnics LLC) available upon request from the CAR.

SECTION 00570 – TIMBER STRUCTURES

Supplement this section with the following:

00570.12 Timber Fabrication

Replace this section with the following:

All glulam members and sawn timber to be incised and fully fabricated in a plant with facilities for performing work specified. Factory drill all holes to the extent possible. All bridge timber shall be Alaskan Yellow Cedar sealed with nontoxic, environmentally friendly sealant. Pressure treatment shall be prohibited from all timber members.

00570.13 Timber Storage

Supplement this section with the following:

The Contractor is responsible for handling and protection of bridge members after arrival at destination. All bridge materials shall be unloaded and handled with a forklift or crane using nylon slings. Any damage must be reported immediately to the bridge supplier's engineering department.

00570.40 Treated Timber

Supplement this section with the following:

Install the timber bridge according to manufacturer's shop details and installation drawings. Set structural members in locations and to elevations indicated on the Plans. Make provisions for erection loads and provide temporary bracing to maintain bridge true and plumb, and in true alignment until completion of erection. Do not field cut, drill, or alter structural members without written approval from the timber bridge company's professional engineer.

SECTION 01030 – SEEDING

01030.14 Fertilizer

Replace this section with the following:

Fertilizer shall not be used.

01030.13 Seed Supplement paragraph (f) with the following:

Areas to receive loose seeding are shown in the Plans.

Native Erosion Control Seed shall meet the Native Plant Seeding standard. Native Erosion control Seed Mix shall be composed as per the table in the plans:

BOTANICAL NAME	COMMON NAME	LBS PLS/ ACRES
Alopecurus geniculatus	water foxtail	1.09
Bromus carinatus	California brome	12.20
Carex obnupta	slough sedge	0.71
Deschampsia cespitosa	tufted hairgrass	1.02
Hordeum brachyantherum	meadow barley	25.11

01030.60 General

Supplement this section with the following:

- ***Native Erosion Control Seed Mix*** *– 90% coverage of ground surface or greater*

SPECIAL PROVISIONS

INTRODUCTION TO THE SPECIAL PROVISIONS

The work on this project shall be accomplished in accordance with the Standard Specifications of the Oregon Department of Transportation (ODOT). The Standard Specifications, as modified or supplemented by the Amendments to the Standard Specifications and these Special Provisions, all of which are made a part of the Contract Documents, shall govern all of the Work.

These Special Provisions are made up of both General Special Provisions (GSPs) from various sources, which may have project-specific fill-ins; and project-specific Special Provisions. Each Provision supplements, modifies, or replaces the comparable Standard Specification, or is a new Provision. Where conflicts between standard or amended standard specifications and special provisions arise, the more stringent specification shall govern.

Also incorporated into the Contract Documents by reference are:

- *Manual on Uniform Traffic Control Devices for Streets and Highways*, currently adopted edition, with Oregon State modifications, if any.

Contractor shall obtain copies of these publications, at Contractor's own expense.

PART 00100 – GENERAL CONDITIONS

DESCRIPTION OF WORK

This contract provides for the construction of tidal channels, removal of five culverts/tide gates and associated earthen berms, construction of two bridges, and other associated work for restoration of the Porter Tract Estuary Project. Construction requires sequencing grading to prevent upstream tidal flows through sloughs into respective channel grading areas. Work also includes seeding of native erosion control seed mix, temporary erosion and traffic control, and other work, all in accordance with the attached Contract Plans, these Contract Provisions, and the Standard Specifications. The project is located in Tillamook County, Oregon.

SECTION 00110.20 - DEFINITIONS

This Section is supplemented with the following:

All references in the Standard Specifications to the terms "State", "Department of Transportation", "Secretary of Transportation", "Secretary", "Headquarters", and "State Treasurer" shall be revised to read "Contracting Agency" (The Nature Conservancy, hereafter "TNC")".

All references to "State Materials Laboratory" shall be revised to read "Contracting Agency designated location".

The venue of all causes of action arising from the advertisement, award, execution, and performance of the contract shall be in the Superior Court of Tillamook County.

Additive

A supplemental unit of work or group of bid items, identified separately in the proposal, which may, at the discretion of the Contracting Agency, be awarded in addition to the base bid.

Alternate

One of two or more units of work or groups of bid items, identified separately in the proposal, from which the Contracting Agency may make a choice between different methods or material of construction for performing the same work.

Contracting Agency Representative (CAR)

TNC's representative.

Contract Documents

See definition for "Contract".

Contract Time

The period of time established by the terms and conditions of the contract within which the work must be physically completed.

Dates

Bid Opening Date

The date on which the Contracting Agency publicly opens and reads the bids.

Award Date

The date of the formal decision of the Contracting Agency to accept the lowest responsible and responsive bidder for the work.

Contract Execution Date

The date the Contracting Agency officially binds the agency to the contract.

Notice to Proceed Date

The date stated in the Notice to Proceed on which the contract time begins.

Substantial Completion Date

The day the Engineer determines the Contracting Agency has full and unrestricted use and benefit of the facilities, both from the operational and safety standpoint, and only minor incidental work, replacement of temporary substitute facilities, or correction or repair remains for the physical completion of the total contract.

Physical Completion Date

The day all of the work specified in the contract is physically completed. All documentation required by the contract and required by law does not necessarily need to be furnished by the Contractor by this date.

Completion Date

The day all the work specified in the contract is completed and all the obligations of the Contractor under the contract are fulfilled by the Contractor. All documentation required by the contract and required by law must be furnished by the Contractor before establishment of this date.

Final Acceptance Date

The date on which the Contracting Agency accepts the work as complete.

Logs

The lower trunk of a large tree.

Notice of Award
The written notice from the Contracting Agency to the successful bidder signifying the Contracting Agency's acceptance of the bid.

Notice to Proceed
The written notice from the Contracting Agency or Engineer to the Contractor authorizing and directing the Contractor to proceed with the work and establishing the date on which the contract time begins.

Rootwads
The lower root fan of a large tree.

Roughened Rock Toe
A streambank constructed with imported streambed cobble for ballast of logs and scour protection, native streambed materials, and wood habitat structures to form a natural streambank for bank protection and aquatic habitat improvement.

Traffic
Both vehicular and non-vehicular traffic, such as pedestrians, bicyclists, wheelchairs, and equestrian traffic.

Wood Habitat Structures (WHS)
Logs (with or without root wads) placed in groups in the project area to enhance in-stream and riparian habitat.

SECTION 00120 – BID REQUIREMENTS AND PROCEDURES

00120.05 REQUESTS FOR SOLICITATION DOCUMENTS

Amend this section and replace it with the following:

Information as to where Bid Documents can be obtained or reviewed will be found in the Call for Bids (Advertisement for Bids) for the work.

After award of the contract, plans and specifications will be issued to the Contractor at no cost as detailed below:

To Prime Contractor	No. of Sets	Basis of Distribution
Reduced plans (11" x 17") and Contract Provisions	1	Furnished automatically upon award.
Large plans (e.g., 22" x 34") and Contract Provisions	2	Furnished only upon request.

Additional plans and Contract Provisions may be purchased by the Contractor by payment of the cost stated in the Call for Bids.

SECTION 00170 – LEGAL RELATIONS AND RESPONSIBILITIES

00170.02 PERMITS, LICENCES AND TAXES

Amend this section as follows:

The Contracting Agency has obtained the below-listed permit(s) for this project. A copy of the permit(s) is attached as an appendix for informational purposes. All contacts with the permitting agency concerning the below-listed permit(s) shall be through the Contracting Agency. The Contractor shall obtain additional permits as necessary. All costs to obtain and comply with additional permits shall be included in the applicable bid items for the work involved.

Name of document	Permitting Agency	Permit Reference #
Joint Permit Application (JPA)	Joint – State of OR & USACE, Portland District	Pending
Dept. of the Army Section 404 Permit	USACE, Portland District	(See JPA – above)
1200C Stormwater Discharge Permit	OR Dept. of Env Quality (DEQ)	Pending
DSL Fill-Removal Permit	OR Dept. of State Lands	(See JPA – above)
Grading Permit	Tillamook County	Pending
Floodplain Permit	Tillamook County	Pending

SECTION 00180 – PROSECUTION AND PROGRESS

This section is supplemented with the following:

This project shall be physically completed within *** 45 *** working days.

The contractor shall provide submittals for items including but not limited to:

Submittal	Schedule / Milestone
Construction Schedule	Pre-construction meeting
Site Access Plan	Pre-construction meeting
Traffic Control Plan	Pre-construction meeting
Environmental Protection Plan	Pre-construction meeting
Water Management Plan	Pre-construction meeting
Erosion & Sed. Control Plan	Pre-construction meeting
Bridge and Abutment Plan	Pre-construction meeting

Product Data/Samples/Certificates for

Native Erosion Control Seeding	4 weeks prior to installation
Wood Habitat Structure Materials	4 weeks prior to installation
Straw Wattle / Erosion Control Materials	2 weeks prior to installation
Aggregate/Rock Materials	2 weeks prior to installation

PART 00200 – TEMPORARY FEATURES AND APPURTENANCES

SECTION 00245 – TEMPORARY WATER MANAGEMENT

Section 00245, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00245.00 Scope - This work consists of furnishing, installing, operating, maintaining, and removing temporary water management facilities in work areas.

Water management will be required to prevent tidal waters from flowing into and through existing slough channel grading areas. The existing tide gate between the railroad track and US 101 shall be closed prior to excavation to prevent water from flowing onto the site. Water levels should be maintained as low as possible (at low tide elevations) in the work areas to minimize saturation of soils primarily within the excavation work areas.

Tidal connections shall be completed after all other grading is complete and final excavations shall be done at low tide to minimize turbidity.

00245.02 Definitions:

Temporary Water Management Facility (System) - A facility that conveys water around work areas, removes water from work areas, and treats and discharges water at locations outside work areas.

00245.03 Temporary Water Management Plan - The CAR Temporary Water Management Plan (TWMP) is a concept plan. Before beginning work in regulated work areas, submit working drawings of a Contractor-developed TWMP, according to 00150.35, based on either the CAR concept plan or an independent plan that meets water quality and environmental guideline requirements and does not affect neighboring properties or water rights.

Include at least the following information:

- The sequence and schedule for dewatering and re-watering.
- Porter Slough isolation from tidal flows during culvert removal and construction of the bridge.

- How the stream flow will be routed and conveyed around or through the work areas.
- How the culvert removal work areas will be drawn down for excavation and removal of structures.
- How the pumped water will be treated before it is discharged downstream.
- Discuss all construction stages.
- A list of on-site backup materials and equipment.
- Listing of dewatering pump(s) type and capacity.

The Engineer's written approval shall be received before beginning in-water work.

00245.10 Materials - Furnish materials meeting the following requirements:

Plastic Sheeting	00280.14(a)
Bulk Bags (meter size sandbags)	00280.15(a)
Water Intake Screening	00290.34(c)

Furnish pumps that are:

- Self-priming.
- Equipped with a variable speed governor.
- Equipped with a power source.
- Standby power (backup generator)
- Able to pump water that contains soft and hard solids.

00245.40 Fish Removal - The CAR or ODFW biologists will remove fish and aquatic life from the isolation work areas. The contractor shall allow them access into the isolation work areas before and after installation of the temporary water management facilities and provide pumping as needed to accomplish removal as follows:

- **Before Installation of Facilities** - Before installing temporary water management facilities fish and aquatic life will be removed within the proposed isolated work area.

- **After Installation of Facilities** - After installing temporary water management facilities, the water level will be reduced through the isolated work area. All fish and aquatic life will be removed as the water level is reduced. The isolation area shall not be de-watered until all fish and aquatic life have been removed.

- Installation of the cofferdams shall take place at low tide to minimize fish entrapment.

00245.42 Operation - Operate temporary water management as follows:

- Maintain water flow downstream (and upstream) of and through the work area for the duration of the diversion to prevent water from "backing-up" upstream.

- Clean and repair any temporary bypass culvert(s) and check valve to maintain adequate flow and protection of aquatic life.
- Cofferdam shall have min. elevation of 11 feet NAVD88 to prevent overtopping from daily tidal fluctuations.

00245.44 Removal - Remove the temporary water management facility and restore the sloughs channels as approved by the Engineer.

00245.80 Measurement - No measurement of quantities will be made for temporary water management facilities.

The estimated quantities of materials required for the temporary water management facility are:

Temporary Water Management Facility at Porter Connector Channel and all new channel connections:

Turbidity Curtain	As necessary
Plastic Sheeting	As necessary
Bulk Bags and Small Sandbags	As necessary
Dewatering pumps	As necessary

00245.90 Payment - The accepted quantities of temporary water management facilities will be paid for at the Contract lump sum amount for the item Temporary Water Management Facility (System).

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for designing, maintaining, operating, moving, and removing the facility.

SECTION 00250 – TEMPORARY ACCESSS ROADS

DESCRIPTION

Work under this section consists of constructing new temporary work access roads and improving existing access roads. Use of existing access roads and construction of new temporary work access roads will be required for construction of the project, including mobilization and demobilization of equipment, machinery, and vehicles, and for haul of excavations to the onsite disposal areas.

New temporary access roads may be required and shall minimize to the extent practicable construction impacts on the existing access road and adjacent areas. Trees removed for temporary access roads shall be used for habitat features.

CONSTRUCTION

Existing Access Roads

Improvements to the existing access roads may include leveling of the road, placement of gravel to stabilize the roadbed, and repair and minimize ruts and erosion. All Contractor-proposed improvements shall be flagged, reviewed and approved by the CAR before commencement of this work.

Before leaving the site and completion of construction, the Contractor shall restore all existing access roads. Restoration shall generally return the road to its previous condition and level of use and may include regrading and removal of ruts, stabilization of roadbed with crushed aggregate, and revegetation with erosion control mix as described in these Specifications.

New Temporary Access Roads

All clearing, grading and other work required for new temporary access roads shall be flagged, reviewed and approved by the CAR before commencement of this work.

New temporary access be constructed on an as needed basis only. The actual location shall be the responsibility of the Contractor.

- Temporary roads shall follow the contour of the natural terrain to the extent possible. Slopes should not exceed 10 percent.
- All grades should be sufficient to provide drainage but should not exceed 4 percent.
- Temporary roadbeds shall be no greater than 15 feet wide unless otherwise approved by the CAR.
- Both existing and new temporary roads may require periodic dressing with aggregate. Vegetated or seeded areas adjacent to the roads and parking areas should be checked periodically to ensure that a vigorous stand of vegetation is maintained.

Before leaving the site and completion of construction, the Contractor shall remove all new temporary access roads and restore these areas. Restoration shall generally return the site to its previous condition and may include regrading, scarification of compacted soils, and revegetation as shown in the Plans and as described in these Specifications.

MEASUREMENT AND PAYMENT

Temporary Access Roads shall be considered incidental to the site "Mobilization / Demob." bid item.

PART 00500 – BRIDGES

SECTION 00575 – PREFABRICATED BRIDGE AND ABUTMENT SYSTEM

Section 00575, which is not a Standard Specification, is included in this Project by Special Provision.

00575.00 Scope

This section includes the design, fabrication, supply, and erection of the prefabricated (pre-engineered) bridge and abutment systems as shown on the Plans and described in these Specifications. A conceptual

design of the prefabricated bridge and abutment systems is depicted on the Plans. The Contractor shall be responsible for the final design, fabrication, supply, and erection of the prefabricated bridge and abutment system including pile supports.

The prefabricated bridges shall be timber and meet the specifications and dimensions shown in the plans. The bridge may be preconstructed or constructed on site. The supplier shall furnish all materials including connecting steel and hardware for a complete installation.

The bridge abutments shall be per the manufacture. Abutments shall be precast reinforced concrete or another material that meets approval of the Engineer except that **cast-in-place concrete shall not be allowed**. Bridge abutments shall comply with the requirements of the geotechnical engineering report.

The bridge abutments shall be supported by helical pile as indicated on the Plans. The abutment shall include or accommodate some means of structural-mechanical connection between each helical pile and the abutment such as a welded, bolted, or similar connection method that meets the approval of the Engineer and the manufacturer.

BRIDGE SUPPLIER QUALIFICATIONS:
The bridge supplier must be a company specializing in the design and fabrication of prefabricated bridges, with a minimum of five (5) years documented experience. Accepted manufacturers include:

Western Wood Structures, Inc.
P.O. Box 130
Tualatin, OR 97062-0130
(800) 547-5411
www.westernwoodstructures.com

Pacific Bridge Construction
P.O. Box 1711
Sandy, OR 97055
(971) 563-9401
www.pacbridgeinc.com

BIG R Bridge
P.O. Box 1290
Greeley, CO 80632-1290
(970) 347-2227
www.bigrbridge.com

HELICAL PILE SUPPLIER QUALIFICATIONS:
The pile supplier must be a company specializing in the design and fabrication of helical piles, with a minimum of five (5) years documented experience. Accepted manufacturers include:

PLI Systems, Inc
3045 SE 61st Ct.
Hillsboro, OR 97213
(503) 649-8111
www.plisystems.com

McDowell NW Pile King Inc.
7414 NE 47th Ave
Vancouver, WA 98661
(503) 283-8920
www.pileking.com

00575.20 Submittals

Submit shop drawings and product data under the provisions of Section 00150.37. Shop drawings shall include: general layout of the bridge structure, abutment, and helical piles and structural design, bridge elevation and cross section, and fabrication details for all wood members and steel assemblies. Include all pertinent dimensions, wood grades, drilled holes, fasteners, cambers, connectors, and types of preservative treatment. Shop drawings to be stamped by a registered engineer, licensed to practice in the state of Oregon.

a) Submit design calculations stamped by a registered engineer licensed to practice in the state of Oregon.
b) Furnish an AITC or APA-EWS Certificate of Conformance stating that the glulam members conform to the specifications (if applicable).
c) Furnish a WCLIB or WWPA Certificate of Conformance for all sawn lumber.
d) Furnish a Certificate of Treatment stating that the glulams and sawn timber have been sealed with environmentally safe products in accordance with the specifications and permits.
e) Certified test reports shall be furnished for the structural bridge elements, high strength bolts, elastomeric bearing pads, and anchor bolts.
f) Provide a written warranty against defects in material and workmanship for period of five (5) years.

MEASUREMENT

00575.80 Measurement

The timber bridge and abutment systems will be measured separately for each bridge, abutment, and pile support on a lump sum basis. Bid items are differentiated by bridge length.

PAYMENT

00575.90 Payment

The "prefabricated bridge and abutment system" bid items will be paid for at the Contract unit price on a lump sum basis. Payment will be in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified. No separate or additional payment will be made for hardware, fasteners, preservative treatment, coatings.

PART 01000 – RIGHT OF WAY DEVELOPMENT AND CONTROL

SECTION 01041 – BRUSHPILES AND SALVAGED LOGS

DESCRIPTION

Work under this section consists of 1) salvaging logs within the work limits, 2) placing salvaged logs in grading area as shown on the Plans, and 3) placing salvaged vegetation as brushpiles in accordance with the Plans and these Special Provisions.

MATERIALS

During clearing activities, salvage the two large Spruce trees along Hathaway Slough for reuse in the channel grading areas as habitat wood. These logs shall have their rootwads intact. Salvage branches and limbs for use in brush piles. Ends and limbs shall not be trimmed as broken ends and limbs are preferred.

Brushpile material, if approved for use by the CAR, may be salvaged onsite during clearing activities. Materials for brush piles shall be derived from native species only and shall not contain noxious weeds or non-native species which shall be hauled and disposed of offsite.

CONSTRUCTION

Brushpiles shall be arranged along the side slopes of the Low Mounds above elevation 10 as directed in the field by the CAR.

Large salvaged logs shall be placed as follows unless directed otherwise in the field by the CAR:

1. Sharpen the end of the tree trunk to a point.
2. Drive the sharpened end of the log into the finish grade surface, angling the log along the side slope of the channels as shown on the Plans. Drive the log one-quarter of its overall length into the soil.
3. Push the log rootwad into the soil so that the roots are partially embedded into the soil.

MEASUREMENT AND PAYMENT

All equipment, labor, and materials required for placement of brushpiles and salvaged logs shall be considered incidental to Clearing and Grubbing. No additional payment shall be made for placement of Brushpiles or salvaged logs.

SECTION 01042 – WOOD HABITAT STRUCTURES

DESCRIPTION

This work shall consist of furnishing and placing all Wood Habitat logs and rootwads as shown in the plans and specified here.

MATERIALS

Materials will meet the following requirements:

- **General:** Tree species shall be Douglas Fir, Hemlock, Cedar, Spruce and Alder that are disease free, have limited rot or decay (Utility Grade 95 minimum), and be clean of dirt and debris. Large Wood for stream placement will be limited to Douglas Fir and Cedar species.

- **Log Sourcing:** Large Wood may originate from one or more of the following sources:
  a. Forest Stewardship Council (FSC) certified timber,
  b. Healthy Forest, Healthy Communities (HFHC) timber,
  c. Northwest urban salvage timber or other approved Northwest salvage timber,
  d. Utility grade and 12"+3 SAW LWD originating from approved Oregon Department of Forestry Timber Sales,
  e. Owner Supplied LWD.

- **Log Supplier List:** The following supplier list is provided to assist with Large Wood sourcing and procurement:

Log Supplier	Contact Person/e-mail	Telephone No.
Trout Mountain Forestry	Scott Ferguson Scott@troutmountain.com	503-222-9772
Hyla Woods	Peter Hayes peter@hylawoods.com	971-678-9466
NW Natural Resource Group	Kirk Hansen kirk@nnrg.org	360-316-9317
Integrated Resource Management	Mark Barnes marc@irmforestry.com	541-929-3408
Warm Springs Forest Industries	Chris Ketcham Chris.ketcham@vanport-intl.com	541-553-1148
Warm Springs Forest Manager	Jim Rice Jim.rice@wstribes.org	541-553-2006

- **Diameter:** The diameter of the LWD *without rootwads* measured at breast height from base of tree trunk are 16-24 inches with a tolerance of +/- 4 inches. The diameter of the LWD *with rootwads* measured at breast height from base of tree trunk are 18-36 inches with a tolerance of +/- 4 inches.

- **Length**: Logs shall range in length from 12 – 40 feet (including the rootwad) as shown in the plans.

Rootwads: Rootwads shall be attached to the trunk and have a minimum fan diameter of 4 feet. Rootwads shall have a stout root structure with roots that are at least 2 inches in diameter. All twigs and

branches (except for the roots) shall be removed to stubs no longer than four inches. Branches shall be reserved and interwoven into the imbedded rootwad to provide greater structure and complexity.

CONSTRUCTION

1. Embed the wood habitat structures as shown on the plans. Embed by sharpening the end of the log and driving it into undisturbed ground instead of over excavating wherever possible.
2. Visible log ends shall be broken in a manner that does not compromise the integrity of the log. Ends may be broken prior to installation. No visible saw cut ends will be allowed.

MEASUREMENT AND PAYMENT

The "Wood Habitat Structures" bid item will be measured and payed per each log placed.

CONCEPT DESIGN REPORT

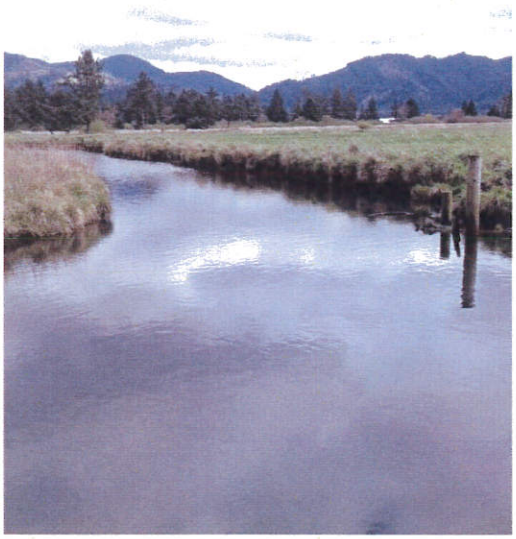
The Nature Conservancy
Protecting nature. Preserving life.™

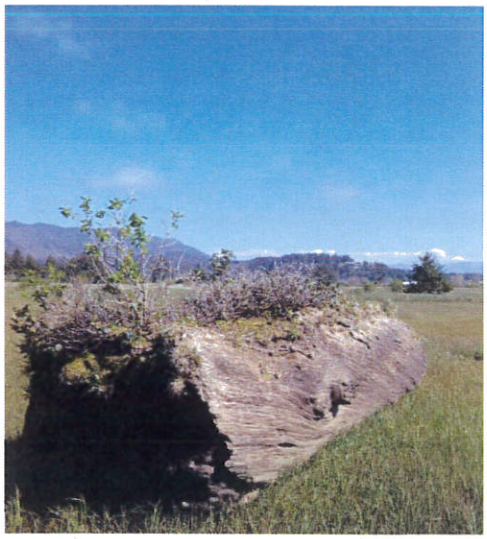
Porter Tract Restoration

Kilchis Estuary Preserve

Feasibility Analysis and Conceptual Restoration Plan

Revised
November 2017





Cover photos:

Level logger installation near Hathaway Slough
Tributary of Hathaway Slough
Nurse log in the mid-marsh habitat within the Porter Tract

Prepared by:

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Tables

1) Introduction

The Nature Conservancy (TNC) seeks to continue restoration of rare tidal wetland habitats along the margins of Tillamook Bay with restoration of the Porter Tract, an approximately 60-acre parcel in Tillamook County, Oregon. The Porter Tract is in the lower Kilchis River watershed, one of the five large river tributaries to Tillamook Bay. The restoration site is situated approximately one mile from the mouth of the Kilchis River, and is influenced by both river flow and ocean tides. The Porter Tract would become part of the recently restored Kilchis Estuary Preserve (former Dooher Property) that was constructed in 2015 by the TNC. The cumulative area of these restoration efforts would result in 127 acres of high functioning estuarine habitat.

The overall goal of the Kilchis Estuary Preserve project is to restore freshwater and tidal hydrologic connections to the Porter Tract wetlands, providing off-channel rearing habitat for salmonids and re-establishing spruce swamp habitat. TNC has retained the Wolf Water Resources (W2r) and Phil Trask and Associates (PCTA) team to assist in developing baseline physical processes data for the site, conduct a feasibility analysis, and develop a restoration plan for the property.

1.1 Background

A significant majority of historic tidal wetlands adjacent to Tillamook Bay have been lost due to agricultural and other developments. Approximately 85 percent of the historic tidal marsh and 91 percent of historic tidal swamp has been lost due to diking or other major tidal restrictions (Ewald and Brophy 2012); most of these wetlands have been converted to agricultural uses (TBNEP 1999). The high losses of tidal swamp (forested and shrub tidal wetland) are typical of the Oregon coast; tidal spruce swamp habitats have suffered over 95 percent loss in Oregon (Christy 2004).

The TNC has prioritized conservation and restoration of tidal wetland habitats that support salmonids and other estuary-dependent species including forage fish, juvenile groundfish species, marine invertebrates, waterfowl, shorebirds and many terrestrial species that spend some portion of their life histories in tidal wetlands. One of the primary limiting factors for salmonids in the Kilchis River system is the lack of off-channel rearing habitat in low-lying areas, especially habitat in the salt-freshwater transition zone of the estuary. Coho salmon populations have been particularly affected by this loss, as access to tidal sloughs are limited by tide gates which also contribute to poor water quality in those sloughs (TBNEP 1999). In addition to habitat loss, tidal wetlands such as these are expected to be affected by sea level rise and other local effects of climate change such as changes in storm frequencies and storm surges, and changes in streamflow.

1.2 Overview of Report Organization

This report presents feasibility analyses relevant to the restoration of the Porter Tract (Figure 1). Feasibility information includes historic and current conditions in Tillamook Bay, recent site topography and bathymetry data in adjacent channels, and site impairments. This report also documents feasibility analyses of concepts for restoration of the site. Feasibility questions focus on site elevations in the wetland, revegetation, tidal channel re-creation, Stasek Slough and Hathaway Slough dike removal, and options for vehicle and pedestrian crossings of Hathaway Slough tributaries. Furthermore, flood risks were evaluated with two-dimensional hydrodynamic modeling intended to identify and/or minimize potential adverse effects on properties upstream and adjacent to the Porter Tract.

Figure 1. Porter Tract and adjacent Kilchis Wetland Preserve.

Our general approach to development of the conceptual restoration plan follows a typical planning framework that has been successfully applied to numerous conceptual restoration design projects. The process begins with a definition of project goals and objectives, opportunities and constraints, a simple conceptual model of expected habitat development, and criteria to be used in alternatives evaluation (feasibility analysis). The next step in the planning process is to characterize existing site conditions. The final steps are alternatives development, evaluation, and selection (selection by TNC based on the alternative evaluation), and documentation of the conceptual plan. The hydrodynamic model developed during the previous Kilchis restoration will be used for evaluating and refining the restoration measures to meet habitat, flood protection, and other objectives.

2) Project Understanding

2.1 Goals and Objectives

Continuing from the Kilchis Estuary Preserve restoration, the overall goal for the Porter Tract restoration is to restore estuarine habitat for listed and other native estuarine-dependent species. Towards this end, the following objectives were identified:

- Restore freshwater and tidal connections.
- Provide off-channel rearing habitat for salmonids.
- Restore spruce swamp habitat.
- Create habitat for estuary-dependent species including forage fish, juvenile groundfish species, marine invertebrates, waterfowl, shorebirds, and many terrestrial species that spend some portion of their life histories in tidal wetlands.
- Contribute to the improved understanding of tidal wetland restoration planning, design, and project construction by using a systematic, science-based adaptive management approach.
- Increase resiliency of restored hydrologic processes and the aquatic habitats they support to climate change.

Restoring freshwater and tidal connections reestablishes the processes that support and sustain natural habitats. One of the primary limiting factors for salmonids in the Kilchis River system is the availability of off-channel rearing habitat in low-lying areas, especially habitat in the salt / freshwater transition zone of the estuary (TBNEP 1999). Tidal wetland losses have been particularly severe for tidal spruce swamp habitats which have suffered over 95% loss in Oregon (Christy 2004).

Other important considerations, or operating principles, include:

- Cost-effectiveness of project implementation will be considered in the planning and design process.

- A focus on the restoration of natural processes rather than a form-based focus, so that the site may evolve under natural perturbations such as erosion, sedimentation, and other natural watershed processes.

- TNC proposes to plan and implement the project so productive relationships are developed and maintained with adjacent landowners and the community at large.

2.2 Constraints

The identification and ranking of constraints early in the design processes assist in framing the restoration feasibility process.

- Adjacent properties must maintain existing use and capacity, despite restored connectivity within the project area. Upslope properties must maintain adequate drainage, matching that of existing conditions or better.
- The project must not significantly increase the risk of offsite flooding in the area.
- Invasive species are present at the site, including nutria (who displace beneficial beaver colonization and whose burrows degrade the dikes) and reed canary grass (RCG), which will require active management to control RCG propagation under restored conditions.
- Access to various regions of the property is desired for maintenance of vegetation, monitoring, and private land access. This will require crossings (bridges or culverts) of multiple tidal channels.

3) Site Conditions

3.1 Site Assessment

Site assessments were conducted on July 27, 2016 and April 7, 2017. The initial site visit observations focused on site hydrology and flooding, geomorphology, vegetation, and identification of site constraints. The latter site visit was focused on gathering bathymetric and channel geometry data of the connector channel. Additional topographic elevation reconnaissance was also conducted to document the dimensions of diked areas along Stasek Slough and Hathaway Slough, as well as the connector channel geometry. The general site assessment and generation of restoration alternatives was also guided by post-construction observations of the Kilchis Estuary Preserve as well as desktop analysis of a nearby reference wetland southwest of the project site. These assessments are described in the following sections.

3.2 Land Use

Portions of the Porter Tract were managed for pastureland in the recent past. These areas were partially-diked and drained. The site is presumed to have subsided due to draining and decomposition of organic soils, though the level of subsidence is expected to be low in general and low relative to the Kilchis Estuary Preserve. The site is bordered by private land to the west, Hathaway Slough to the north, and Stasek Slough to the south. The closest existing infrastructure is a railroad corridor along the northeast boarder. Figure 1 shows the Porter Tract boundary, the adjacent Kilchis Estuary Preserve, and other sloughs and geographic features.

The earliest available aerial photograph from 1939 show numerous tidal channels across much of the site, especially the northwest portion of the tract. This more natural hydrologic condition contrasts with linear ditches and farmed areas in the southwest and east portions of the property. As with much of this region, this property was subject to timber operations and wetland conversion to pasture or other agricultural uses.

3.3 Drainage Infrastructure

3.3.1 Flow Control Structures

There are several flow control structures located within the project area. Two culverts facilitate crossing of ditches / channels along the northern portion of the site near Hathaway Slough. There is also a water control structure (culvert with dilapidated closure gate) in the interior of the site that drains much of the eastern portion of the property into Porter Slough.

A large timber, box culvert along the southern edge of the project area connects Porter Slough and Stasek Slough. Another culvert with tide gate is located between US 101 and the railroad northeast of the main project area. This culvert facilitates drainage of the topographically isolated area to Hathaway Slough.

Removing these structures is fundamental to the restoration of Stasek Slough and the rest of the wetland. Analysis of the impacts of removal of these structures is discussed in Section 5.1, Flood Analysis.

3.3.2 Dikes and Enhancement Natural Levees

The site is partially ringed by dikes and/or enhanced natural levees that were historically constructed to reduce flooding. For the purposes of this report, dikes refer to small and less distinct "improvements" built on top of the natural fluvial levees. Dikes exist in two locations along the boundary of the project area. The first is located along the project's southern boundary and Stasek Slough. A second string of dikes exist along the northern boundary of the project area along Hathaway Slough. Proposed dike removal areas shown on Figure 8 are represented by a purple cross hatch.

3.4 Topography and Bathymetry

3.4.1 Field Data Collection

Building off data collected from the Kilchis Estuary Preserve restoration project, field visits helped identify site constraints and characterize existing conditions. These features are portrayed in Figure 7 and serve as the basis for alternatives development.

Baseline monitoring continued from the first phase of Kilchis restoration for water surface elevations and temperature. As a result, the period of record now extends over several water years to capture tidal water levels and coastal storms. Topography data collected by Statewide Land Survey (SWLS) were used to capture profiles of important site features including potential restoration areas. This information was also used to improve the LIDAR elevation resolution and the gradient of vegetation communities. Updated water level data are currently in development and will be documented in a revised Conceptual Restoration Plan report or early in the detailed design phase of the project.

3.4.2 LiDAR Verification and Adjustment

Updated LiDAR data (2015) was downloaded from the 2015 U.S. Army Corps of Engineers National Coastal Mapping Program (NCMP) for Tillamook Bay, Oregon. The program Lastools was used to convert the data from ".laz" to ".las" format for compatibility with ESRI ArcMap software. In ArcMap, the .las data were converted to a multipoint dataset, which was used to build the digital elevation model (DEM). A hillshade was produced from the resulting DEM, which is used to help visualize the site topography. The derived LiDAR surface and hillshade are shown in Figure 2.

The LiDAR accuracy was assessed by comparing LiDAR values to ground survey points collected in 2012. The 2012 ground survey was primarily focused on the Kilchis Preserve property to the south; however, two transects on the Porter Tract provide a basis for land elevation comparisons on-site, and channel thalweg measurements with periodic cross sections adjacent to the Porter Tract property in Kilchis River and Hathaway Slough provide a basis for bathymetric comparisons. The comparison was accomplished by extracting the LiDAR value from the cell underneath each SWLS data point and creating a new attribute field populated with the difference between the SWLS and LiDAR elevations (SWLS value minus LiDAR value).

Overall, the LiDAR values appear to exhibit the normal range of offsets between LiDAR and ground surface elevations (+1 to +3 feet). Offsets often correspond to the density of vegetation on the ground surface (i.e. how obscured the ground is from LiDAR access). The two transects on the Porter Tract indicate that the LiDAR is between 1 to 3 feet higher than the SWLS points, whereas LiDAR immediately to the south on the Kilchis site appears to be about 1 foot higher than SWLS points. This discrepancy in offsets is probably due to the difference in vegetation types; the transects in the Porter Tract property are more densely vegetated, whereas the Kilchis property to the south had shorter grasses at the time of the LiDAR flight.

LiDAR accuracy is important to consider because plants are especially sensitive to land elevations in the tidal range. To improve LiDAR accuracy for these purposes, the LiDAR-based topographic surface was adjusted based on the SWLS data comparison. The adjustment was applied only to areas targeted for planting (the southern and eastern portions of the Porter Tract site). Because of the lack of SWLS data in these areas, an average offset could not be calculated and used to apply an adjustment to the LiDAR. Instead, an average offset was derived from areas in the Kilchis Preserve site with similar vegetation. The resulting average offset was 0.8 feet; this value was used to lower (or subtract from) the LiDAR data in the targeted planting areas of the Porter Tract property. Figure 3 and Figure 4 depict the LiDAR data pre- and post-adjustment, highlighting the targeted areas in a black polygon. The SWLS survey data are displayed in Figure 4 with their corresponding elevations; the LiDAR color ramp contrasts the discrepancies between the two datasets. It is important to note that the adjustments applied to the LiDAR surface are based from preliminary analyses and are only suitable for application in planting plan creation.

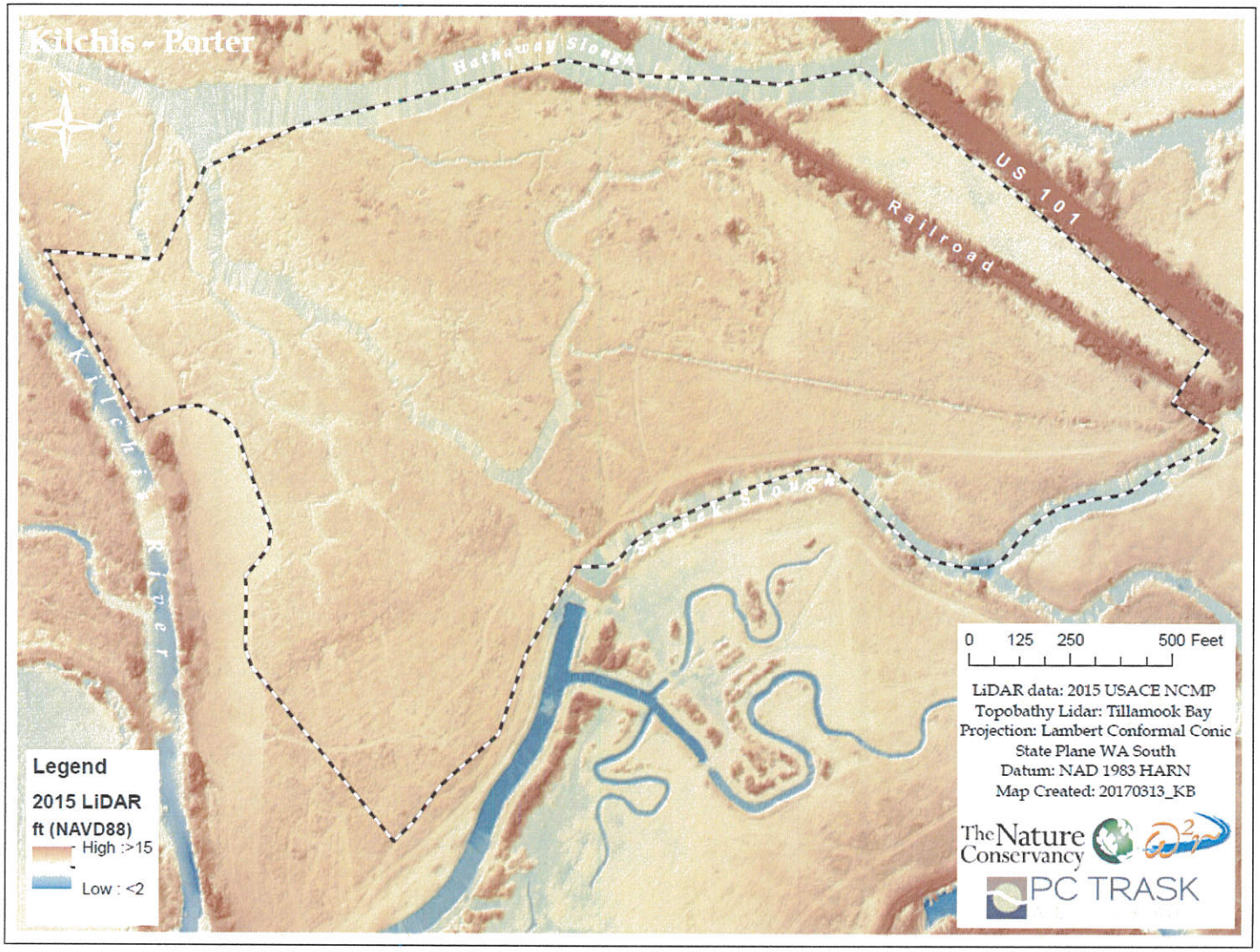

Figure 2. Initial LiDAR derived digital elevation model.

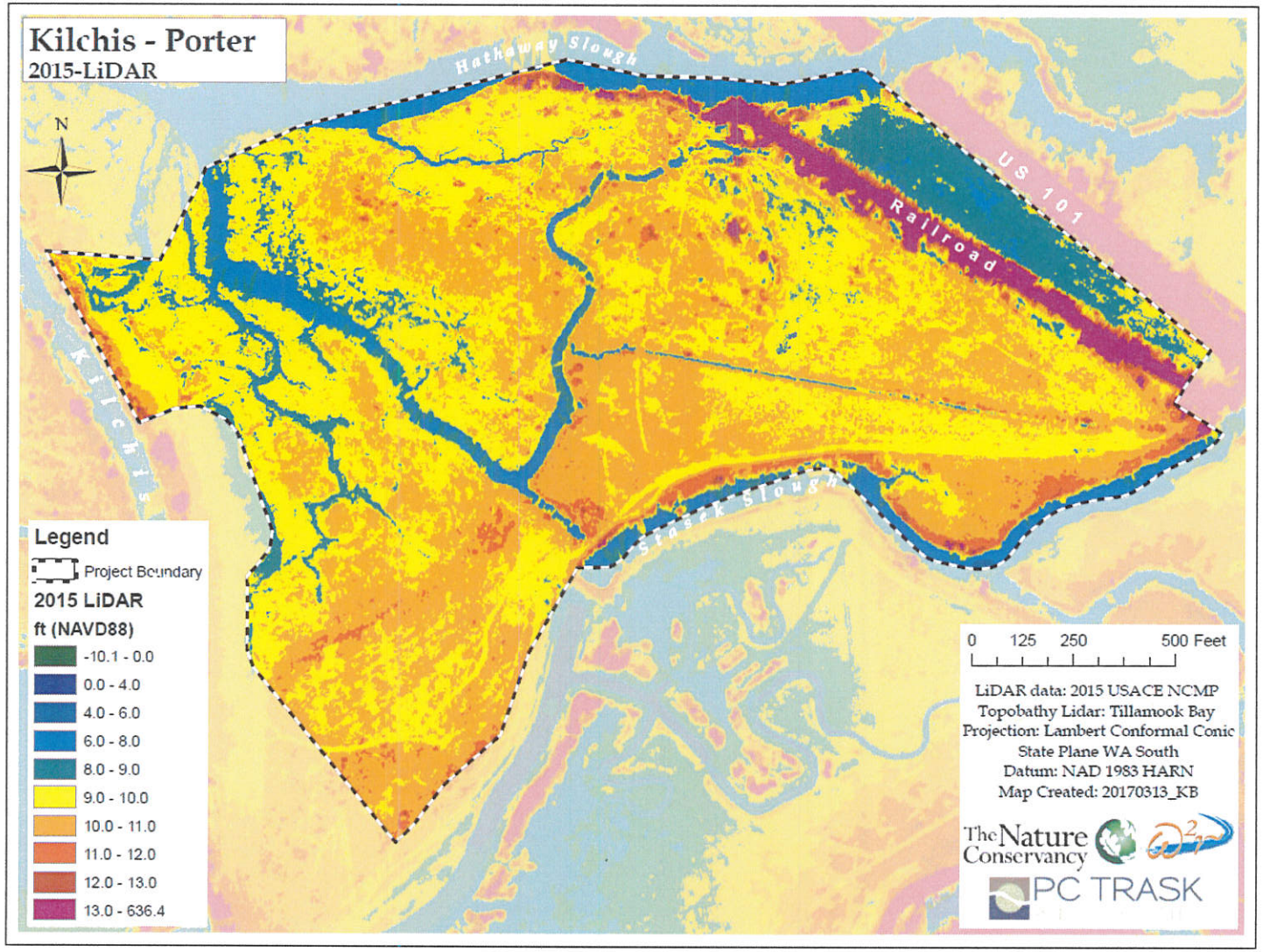

Figure 3. Pre-adjustment LiDAR digital elevation model.

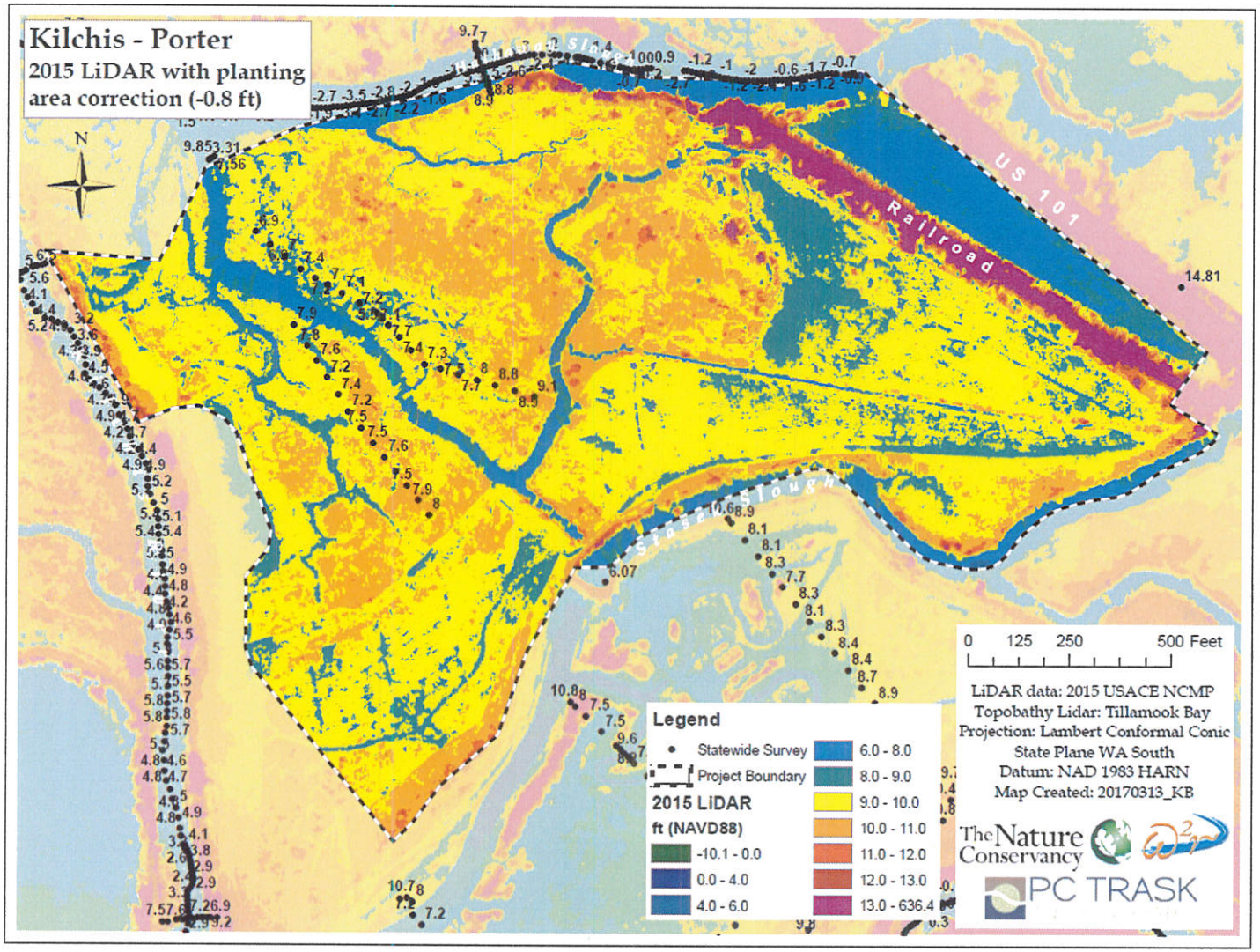

Figure 4. Post-adjustment LiDAR digital elevation model with State Wide Land Survey overlay.

3.5 Hydrology and Flooding

3.5.1 Kilchis River

The Kilchis River flows through an unimpaired watershed that drains approximately 46,920 acres (65 sq. miles). The watershed drains the west slope of the relatively low elevation Coast Range and is generally steep in slope. Because of the steep slope, runoff response during rainfall events is relatively quick, especially under saturated ambient soil conditions. For example, peak flows are high in magnitude and occur with 24 hours of the peak precipitation. In contrast, dry season flows are relatively low due to high permeability of the tertiary volcanic soils and sedimentary rocks that underlie much of the watershed. The results are extreme seasonal flow variability, with high stream flows in the wet season and low flows in the dry season (Follensbee 1998).

3.5.2 Tidal Water Level Data

Tidal datums and extreme tides for the project site are documented below in Table 1.

Table 1. Tidal and extreme water levels.

Datum / Recurrence Interval	NOAA Gage at Garibaldi – For Reference (Feet NAVD88)	Water Level (Feet NAVD88)
FEMA Base Flood	--	11 – 12*
50-Yr	--	11.8
25-Yr	--	11.6
10-Yr	--	11.5
Highest obs. / Ord. high water (OHW)	11.55	11.42
MHHW	7.93	7.80
MHW	7.22	7.01
MTL	4.10	3.89
MLW	0.98	0.98
NAVD88	--	0.00
MLLW	-0.38	-0.33

Source: ESA PWA 2013

Note that ordinary high water at the site was taken to be approximately equivalent to the recent, observed high water level (i.e., still water level) in the period of record. Storm surge and wave runup may result in total water levels above the still water level that is recorded at NOAA and other gaging stations.

4) Formulation of Restoration Alternatives

A summary of restoration concepts and discussed alternatives are depicted in Figure 7. Alternative channels, berm removal areas, alternative planting locations are highlighted in orange. Individual aspects of feasibility and cost/benefit were discussed during the conceptual design phase with TNC staff. In general, preferred design elements represented in the conceptual design (Figure 8) were determined

feasible based on cost, site observations, reference material, and overall ecological benefit. The following sections briefly describe the methodology and basis for selecting the preferred design.

4.1 Channel Configuration and Density

The conceptual design of the channel network was based on the historical pattern of channels as well as on a reference site within the tidal tributary drainages of Tillamook Bay. The earliest photographs of the site date from 1939 (Figure 5). Based on the historical records, an initial sketch of the approximate historic channel network was developed. From this sketch and subsequent discussions with the project team, a GIS-based conceptual plan was developed. Channel configuration and density were then further refined by computing the combined density of constructed and tertiary channels present at the Kilchis Estuary Preserve. Channel densities were also calculated for the entirety of Porter Tract and for the channel 2 (CH2) drainage area. A reference site (Figure 6) with a similar drainage area and elevation range located 1.5 miles southwest of the Porter Tract was used to determine the appropriate channel density for the CH2 drainage area. Table 2 summarizes the channel density assessment results. The preferred channel configuration, number, location, and plan form of proposed tidal channels are shown in the Figure 8.

The intent is for the restored channels to be excavated, rather than rely on passive channel formation. Because the wetland surface is relatively high in the tidal range, these channels may not form completely or in a reasonable time frame on their own.

Table 2. Channel density assessment.

Parameter	Constructed Kilchis Channels	Constructed Kilchis Channels incl. Pilot/ Tertiary Channels	Porter Tract (Overall)	Reference Site	Porter Tract Channel 2 Only
Site Area (AC)	70	70	60	16	16.5
Total Channel Length (LF)	6,680	8,684	8,920	3,270	3,730
Total Channel Length per Area (Density) (LF/AC)	***95.4***	***124.1***	***148.7***	***204.4***	***226.1***

4.2 Dike Removal

Two partial tidal dikes would be removed under the preferred restoration plan. These dikes are low and easily accessed, making them cost effective to remove. The dikes are located along Hathaway Slough to the east and west of the railroad, and west of Neilson Slough and east of the connector channel on the north side of Stasek Slough. Removing these barriers would restore complete hydrologic connectivity and sediment and nutrient exchange processes.

Figure 5. Historic 1939 photograph of the Porter Tract and Kilchis Estuary Preserve.

4.2.1 Stasek Slough Dike Removal

Dike removal would involve lowering the dike completely to the wetland surface. Originally, the apparent berm along Stasek Slough (BS-3 in Figure 7) was included as part of the alternatives matrix. Further site assessment revealed that eastern extent of Stasek Slough did not appear to have any man-made dike along it. Thus, the upstream extent the apparent berm was removed from the restoration plan. The lengths, elevations, widths, and other dimensions of the remaining southern portion were calculated in GIS based on the LiDAR data. The total estimated volume of material to be removed 1,390 cubic yards (CY).

4.2.2 Hathaway Slough Dike Removal

Dike removal along Hathaway Slough would involve lowering the dike completely to the wetland surface. This involves removing a small area of diked material east of the railroad. A longer stretch of dike would be removed west of the railroad. Dike lengths, elevations, widths, and other dimensions were calculated in GIS based on the LiDAR data. The total estimated volume of material to be removed 750 CY.

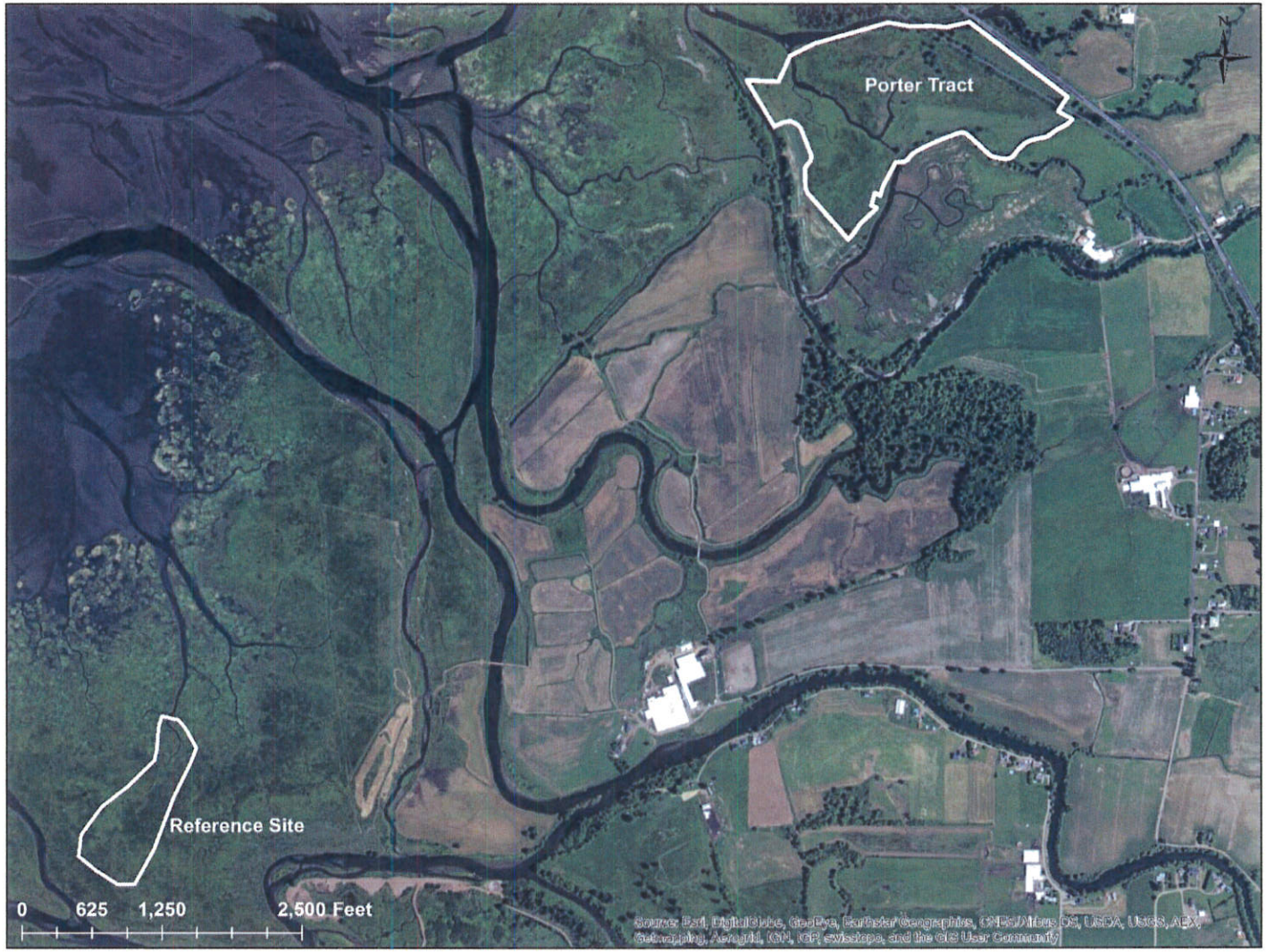

Figure 6. Reference site location and proximity to the Porter Tract.

4.3 Filling Drainage Ditches

Excavation material from channel construction and dike removal would be beneficially reused onsite, reducing the overall costs associated with project materials. For the most part, excavated material would be used to fill agriculture drainage ditches and as backfill at new bridge placements.

Filling the drainage ditches would also assist in natural channel system development, restore wetland topography to a state closer to pre-disturbance conditions, and reduce the risk of stranding of juvenile fishes transported into the wetland during high water events. Specific locations of the existing ditches are shown on conceptual plan (Figure 8). Based on aerial photographs, LiDAR data and field observations, there are an estimated 500 LF of ditches onsite, requiring approximately 140 CY of fill material. These estimates will be refined during the design phase of the project.

4.4 Low Mounds and Fill Areas

The balance of excess excavation material can be used to raise the lowest areas of the site and to create low mounds that can be used for plantings and topographic diversity. Areas that have subsided due to drainage and decomposition of organic soils or areas used as borrow pits for dike repairs would be prioritized. Raising low areas to re-establish intertidal elevations to pre-disturbance conditions would support desired target wetland classes such as Sitka spruce tidal swamp. Reusing excess excavation material to raise low areas or create low mounds would also reduce the cost of excavation by eliminating off-haul and disposal. The restoration plan will not necessarily seek material from channel and dike excavation for raising subsided areas, but it may utilize excess material to help achieve cost savings compared to transporting excavated material offsite.

Placing fill along the tops of the bank of larger channels would simulate a natural wetland surface that slopes gradually downward away from the channel because of higher sedimentation close to the channel. In general, fill would be placed to elevations ranging from approximately one to two feet below MHHW. Final decisions on the final placement of excavated material and specific heights or locations of potential fill placement will be made in discussion with TNC.

For the conceptual design, it was assumed as a conservative estimate that an average of 1.5 feet of fill is placed over 3.5 acres. The volume of this fill is 5,460 CY. Depending on design refinement during the next phase of the project, this quantity may change substantially.

4.5 Conceptual Vegetation Modeling

Post-restoration plant community development at the site would be a function of several factors including groundwater regime, soil conditions, and salinity levels. Successful vegetation establishment also requires an understanding of its relationship to elevation. Estuary wetland vegetation is in part a function of moisture tolerance. Estuary communities colonize along an elevation gradient with respect to tidal inundation patterns. For example, Sitka spruce swamps tend to thrive along the edges of tide where surface water inundation is less frequent. Native emergent communities depend on regular exposure to tides. Invasive species like reed canarygrass to thrive along the high edges of high tide zones, but it germination and colonization capacity is strained in lower marsh zones.

Information collected in areas adjacent to restoration site helps guide potential treatments needed for achieving desired vegetation. In general, the planting zones developed for Phase I are applicable to the Porter Tract (see

Table 3 in the following section). Spot checks of elevation conducted during the reconnaissance phase verified planting zone elevations. This table was also used to query the LIDAR and delineate planting zones described above. This general approach formed the basis for a more precise planting strategy described in Section 5.2. Site elevations and tidal levels are documented in previous sections. For other factors such as salinity and tidal inundation, uncertainties remain due to limited or unreliable monitoring data. Other lessons learned during the Kilchis Preserve restoration including modifying the planting layout given microtopographic variations will also be incorporated into the planting design.

4.6 Connector Channel Crossing Structure

As the most expensive component of the proposed restoration, thorough consideration was made when considering alternatives for structures necessary to cross the connector channel between Porter and Stasek Sloughs. Currently, the crossing on the connector channel is an earthen berm with a dilapidated wooden box culvert. Field observations have determined that this culvert is undersized and restricting tidal flows. Furthermore, a large amount of debris (concrete, wood, and natural material) is exacerbating restriction at the invert on Stasek Slough.

To restore full tidal connectivity and enhance storm drainage for upstream properties, two alternatives to replace the dysfunctional structure were evaluated. The alternatives include a light duty timber bridge (Alternative 1) and a heavy-duty steel bridge (Alternative 2). An elliptical steel plate culvert was also considered as a heavy duty crossing alternative, but it is not described separately in this analysis because its material and installation costs are similar to the steel bridge (Alternative 2).

The purpose of maintaining the connector channel crossing is to allow TNC staff to access and maintain the western portion of the project site and to maintain access to the inholding property adjacent to Stasek Slough. A light duty timber bridge is cost effective and functional for TNC needs; however, additional coordination maybe required with stakeholders before selecting a crossing type.

4.7 Wood Habitat Structures

Woody habitat structures (WHSs) would be placed in newly created and existing tidal channels within the site to provide cover, as well as hydraulic and habitat complexity for estuarine fishes and other wildlife. WHSs cause scour and deposition-induced channel bedforms which result in a greater variability of in-channel habitats. Woody debris is also currently lacking in the Kilchis River estuary, where many log complexes of varying scales were removed during historic agricultural development (Follensbee 1998).

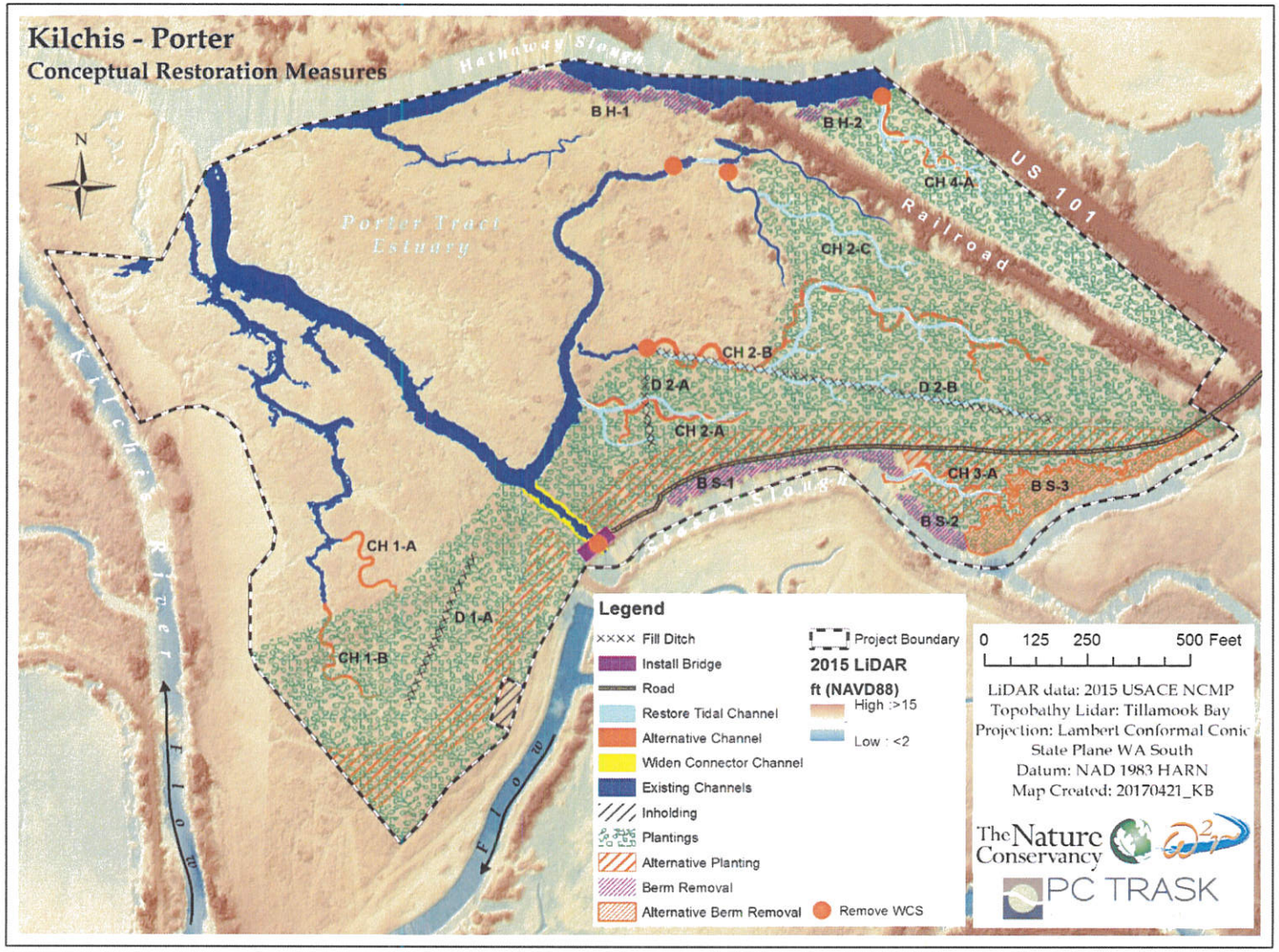

Figure 7. Summary of Restoration Alternatives.

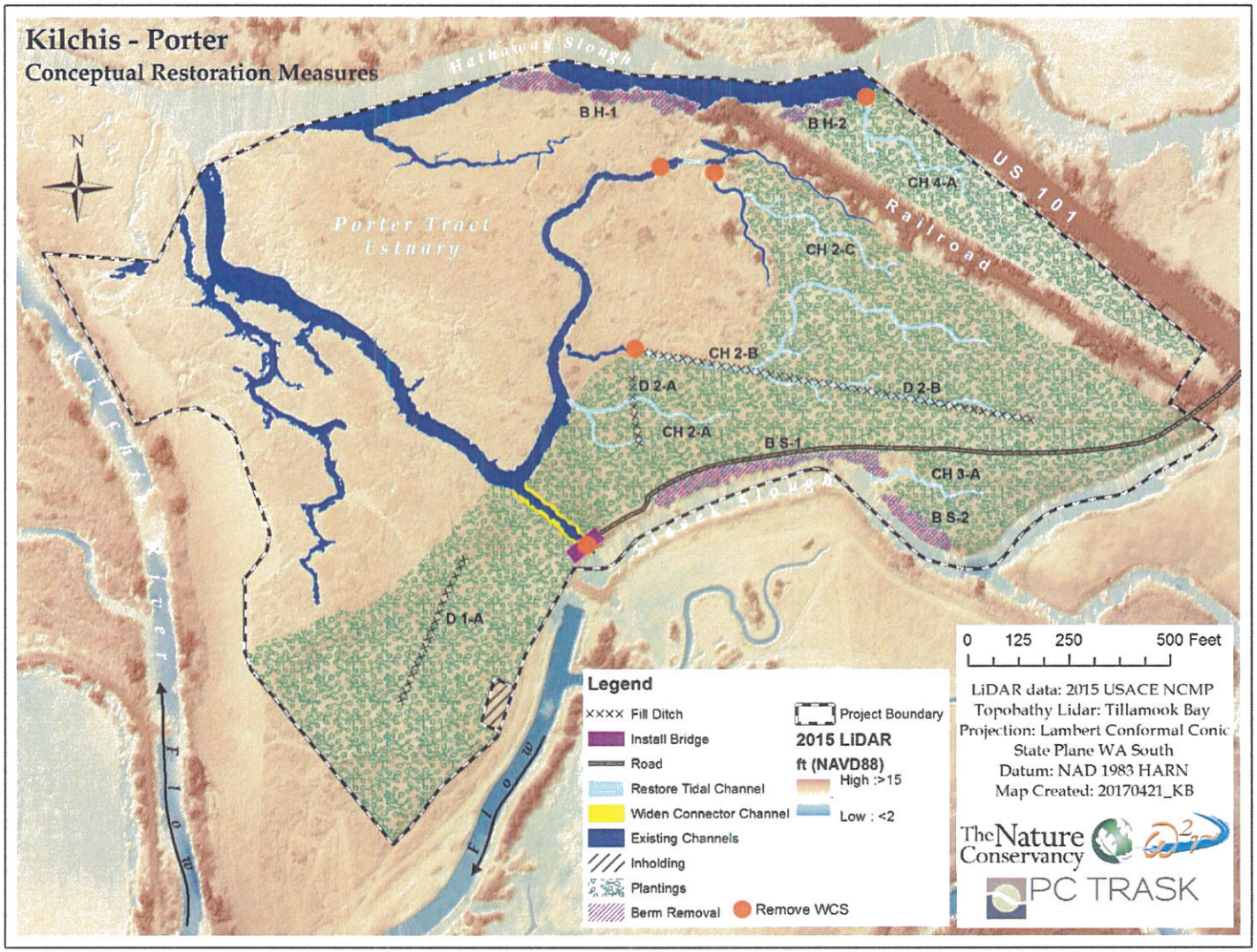

Figure 8. Elements of the preferred conceptual restoration plan.

The intent of wetland restoration is to allow the tidal channels to adjust, migrating laterally and vertically within the wetland, in response to changes in the tidal prism and, also episodic scour and sedimentation. Because WHS logs may be subject to periodic scour and displacement, the restoration design assumes this is an acceptable natural, morphological process. However, we do not expect significant loss of logs, and accumulation of new woody debris would likely be as prevalent as log displacement.

WHSs placed in clusters or groups of 1 to 3 logs are likely appropriate for tidal channels of the sizes within the site. Logs within the clusters would be buried and/or driven into the channel embankment to resist flotation and displacement. The logs will not require rock, anchors, or other ballasting mechanisms due to the relatively low velocities in the tidal channels and sufficient embedment into the wetland soils.

The specific number of logs appropriate for the site is not known. The conceptual design assumes approximately 25 total logs would be required for approximately 12 to 15 individual clusters.

5) Assessment of The Conceptual Plan

5.1 Hydrodynamic Modeling

5.1.1 Post-2015 Storm Geomorphic and Flood Assessment

Hydrodynamic modeling assessment of channel and site changes in response to the 2015 through 2017 storms was recently completed (ESA 2017, see Appendix A). The purpose of this assessment was to survey the geomorphic changes in the channels and wetland, simulate 2015 to 2017 storm conditions to see if site changes might have exacerbated inundation surrounding the Kilchis Estuary Preserve, and make recommendations for the Porter Tract restoration.

Results of the assessment include that significant geomorphic changes in the Kilchis project site (wetlands and channels) as well as the Kilchis River have occurred since the December 2015 storm. Sediment deposition generally on the order to 1 to 2 feet was noted in many channels and wetland areas in the southwest portion of the restored Kilchis Preserve. In the river, bed elevation changes were variable with some erosion and deposition occurring upstream of the restoration (± 2 feet generally), consistent deposition on the order of 2 to 4 feet occurring adjacent to the river dike removal locations, and highly variable bed elevation changes also noted downstream of the dike removal near Squeedunk Slough.

Several significant storms have occurred since restoration of the Kilchis Estuary Preserve. The December 2015 storm was estimated to be between a 10- and 50-year event (over 14,000 cfs), and several other significant storms occurred in 2016 and 2017, the next largest occurring on February 9, 2017 (an approximate 2- to 10-year event of approximately 9,700 cfs). Simulations of the largest flood events since 2015 were conducted using updated topographic and bathymetric data. Model results generally showed fair comparison with observed water levels on the Kilchis River, the interior of the Kilchis Preserve (Channel 2), and Hathaway Slough. The largest uncertainty in the results is likely the estimation of the magnitude and timing of Kilchis River flows which is based on scaling gaged flow records from the Wilson River.

Another finding of the assessment was that water level results in the Kilchis River during extreme events such as the December 2015 storm were not particularly sensitive to bathymetric changes in the river (as-built versus post-2015 storm river bed elevations). It was hypothesized that bed elevations have much less control on water levels than do the increased storage and conveyance capacity associated with the restored Preserve.

The model also showed significant inundation of the properties adjacent to Stasek and Nielsen Sloughs and upstream of US 101 during the peak of the December 2015 and the January and February 2017 storms. It appears that inundation of these regions occurs initially from tidal water levels (from the west, Hathaway Slough, etc.), and during higher Kilchis River flows inundation also occurs from the Kilchis River upstream of US 101 (flowing west into Stasek and Nielsen Sloughs from their upstream ends). However, in each of these simulations including the December 2015 event the Dooher residence located east of the Preserve is surrounded by high water, but it is not inundated - consistent with observations of the landowner during the actual event.

Based on the updated model simulations, several recommendations from the assessment were made. These included to continue to monitor the river and Preserve for sediment accretion and scour, survey the crest elevations of any low berms surrounding properties that might be sensitive to inundation, better determine the effect of the Squeedunk log jam on flow into this slough and in the Kilchis River, and reconsider excavation of the aggraded channels in the Preserve if it can be done in a way to minimize future flows and sedimentation into the channels.

5.1.2 Porter Tract Restoration Assessment

As part of the development of the conceptual restoration plan, the hydrodynamic model described in the previous section was further modified to include the new channels, filled ditches, and other restoration features outlined in Section 4. The primary purpose of these model refinements was to determine if the proposed restoration features on the Porter Tract might have an effect on flood water levels on the properties adjacent to the Preserve. The model was also used to characterize expected benefits in wetland hydrology in the new channel networks.

A comparison of the existing (i.e., current, or post-2015 to 2017 storms) and proposed model geometries is shown in Figure 9. The figure shows existing conditions topography in the top pane and proposed conditions topography in the bottom pane. Elevations bands are color-shaded from +20 feet NAVD88 to -3.0 feet NAVD88. The proposed conditions geometry reflects new channels, filled ditches, removed water control structures, as well as small mounds of fill for topographic relief/diversity located around the channel 2 network (north of Stasek Slough).

Inundation Results

Inundation results between existing and proposed conditions were compared under the December 2015 storm hydrology. Results are shown during two snapshots in time: December 8 at 12:00pm during the approximate peak of tidal water levels (see Figure 10) and December 9 at 1am during the peak of the Kilchis River flows (see Figure 11). The top panels in each figure show color-shaded water surface elevations (WSEs) in feet NAVD88.

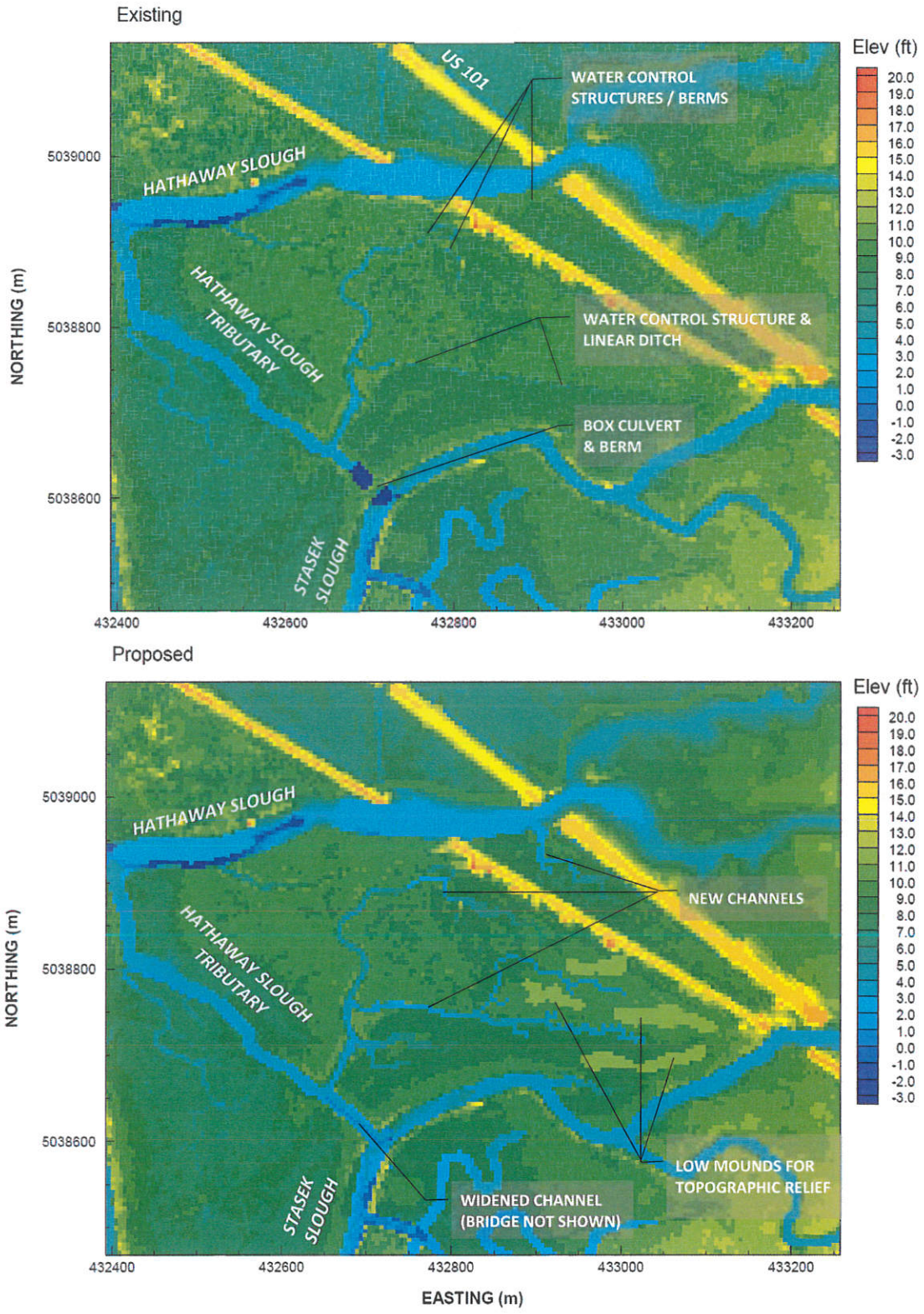

Figure 9 Comparison of Existing (Top) and Proposed (Bottom) Hydrodynamic Model Geometries.

In Figure 10 during peak tidal water levels which occur approximately 12 hours before peak river flows, water levels are very similar between existing and proposed conditions. Peak water levels under both conditions peak between 10.5 and 11.0 feet NAVD88 in the Porter Tract and Kilchis wetlands. The inundation extents around US 101 and Stasek and Nielsen Sloughs are also nearly identical. Very little difference is seen between either water surface elevations or inundation extents.

In Figure 11 during peak river water levels, water levels throughout the model domain are noticeably higher than they were in Figure 10. At this moment in time the river has overtopped its banks and flowing into Stasek and Nielsen Sloughs from their upstream ends, consistent with the prior modeling analysis (ESA 2017). The water surface elevations and inundation extents are also very similar between existing and proposed conditions. This result is as expected, as the relatively minor channel creation and expansion of the connector channel as part of the proposed restoration plan are not anticipated to exacerbate inundation during extreme tidal or fluvial water levels.

Post Storm Drainage Expediency

Results were also evaluated following the flood event when water is receding from the region to determine if proposed restoration actions such as opening the connector channel may aid drainage from key areas such as the properties around Stasek and Nielsen Sloughs. Figure 12 shows the inundation snapshot approximately 14 hours after the peak flows in the Kilchis River. The figure shows small reductions in water surface elevations on the order of 0.5 feet. The callouts in the figure show water surface elevations in Stasek Slough upstream of the connector channel around 11 to 11.5 feet NAVD88, while water surface elevation under proposed conditions vary around 10.5 to 11 feet NAVD88. The small decrease (improvement in drainage) does not appear to persist for more than a few hours.

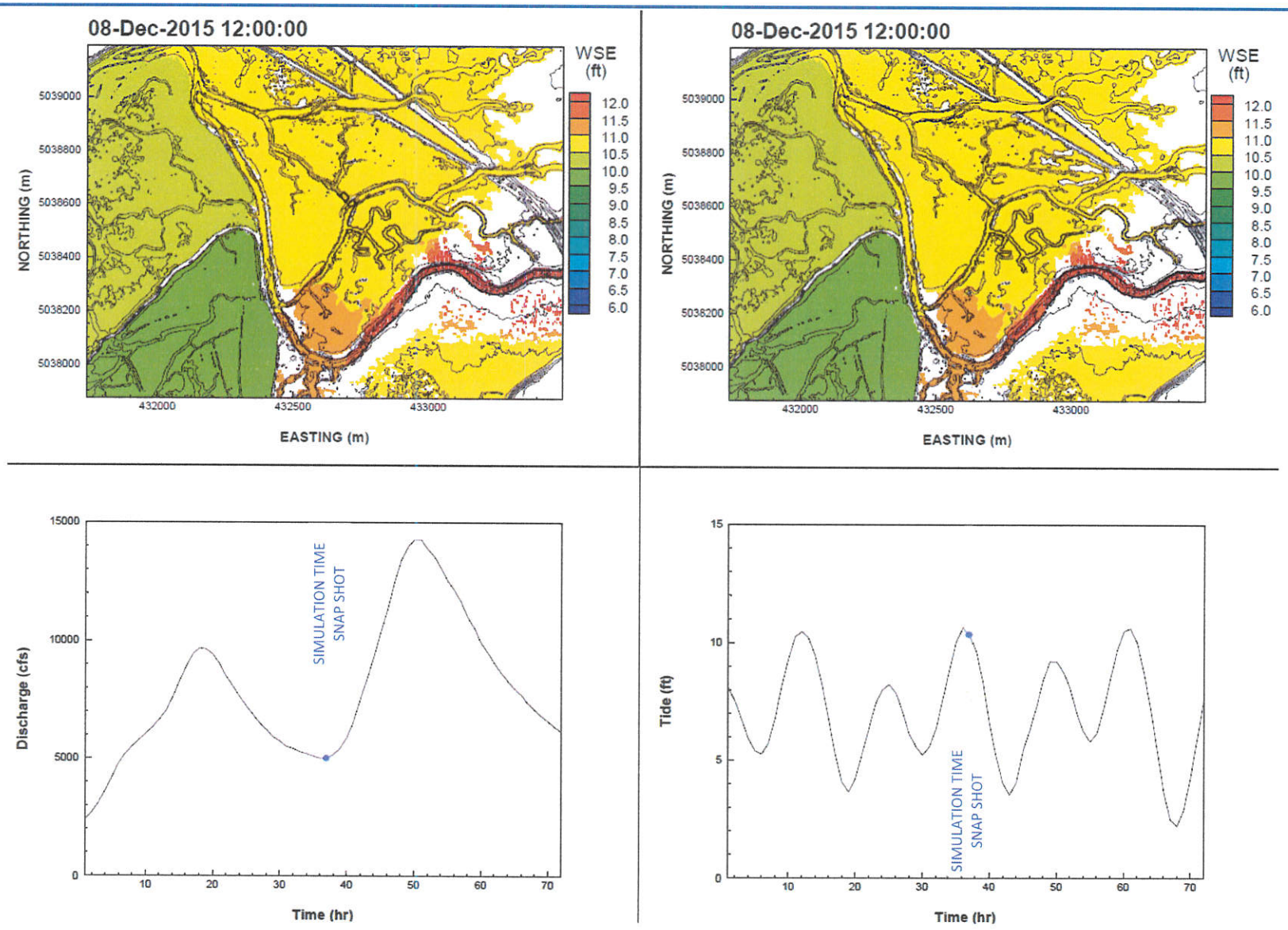

Figure 10 Snapshot of Peak Inundation Extents (12/8/2015) Under Existing (Left) and Proposed (Right) Conditions.

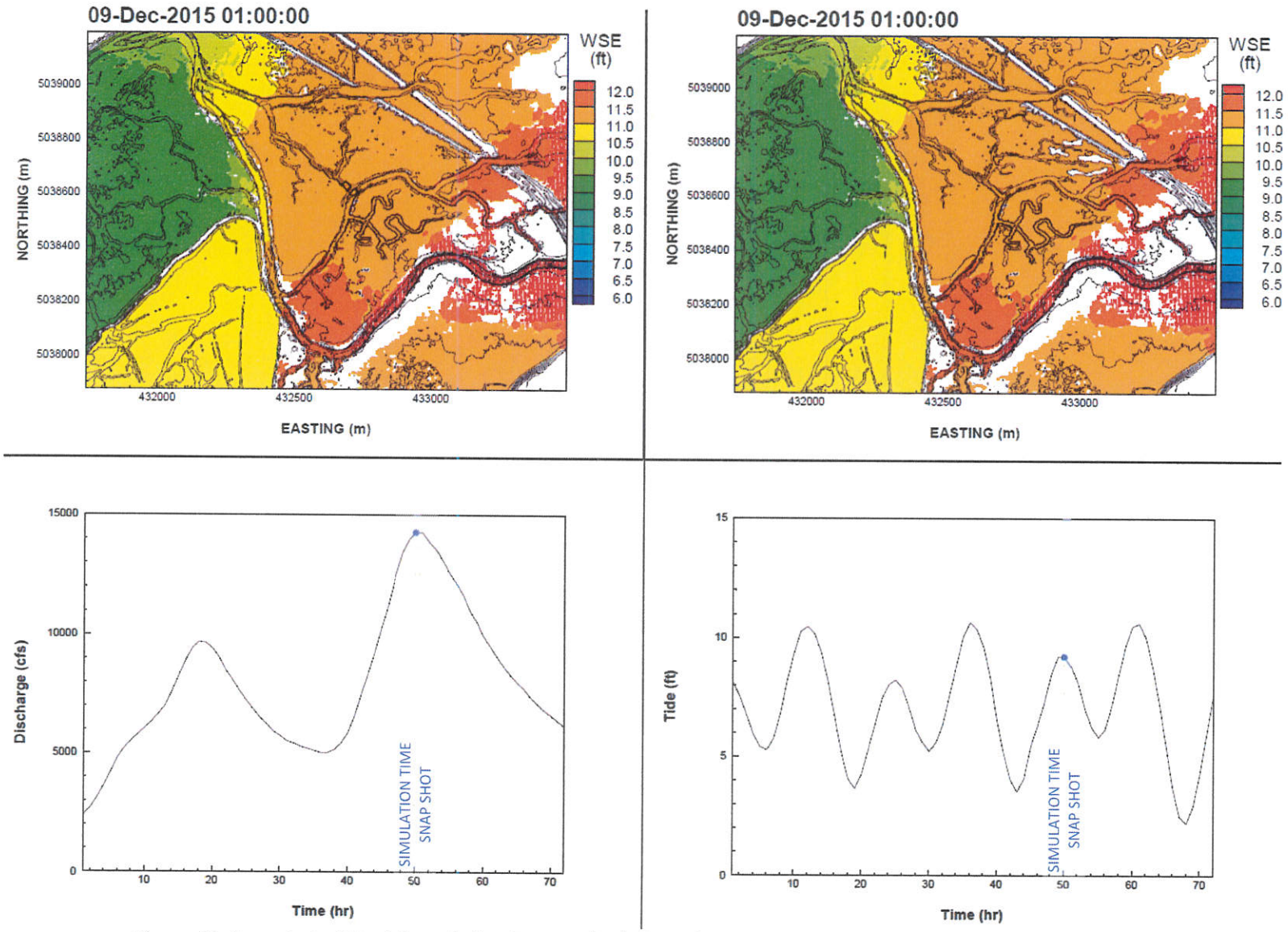

Figure 11 Snapshot of Peak Inundation Extents (12/9/2015) Under Existing (Left) and Proposed (Right) Conditions.

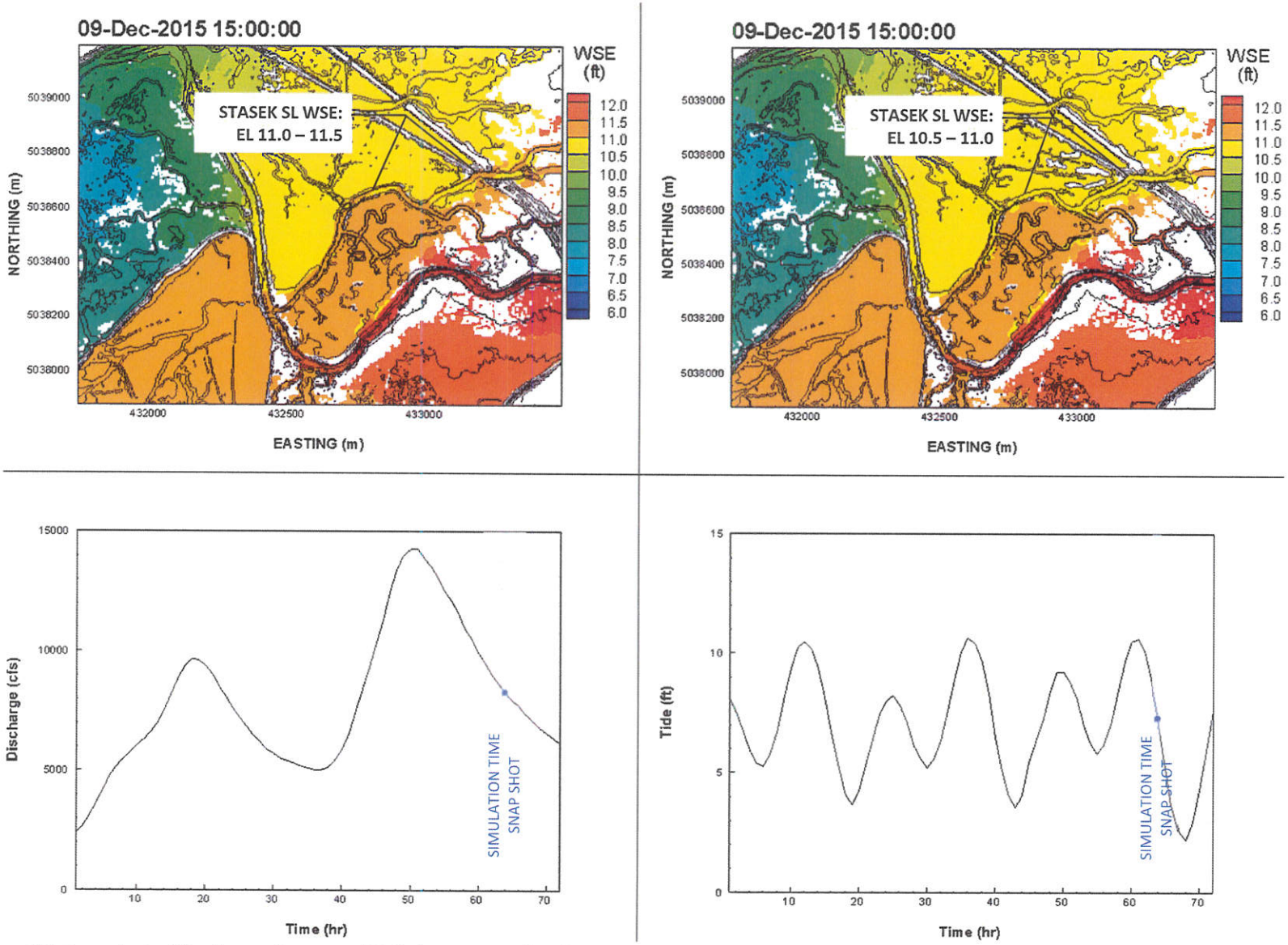

Figure 12 Snapshot of Drainage Patterns (12/9/2015 15:00) Following the Flood Peak Under Existing (Left) and Proposed (Right) Conditions.

5.2 Planting Strategy

The Porter Tract currently includes regions of well-developed, native estuarine marsh on the northern portion of the site adjacent to Hathaway Slough as seen on Figure 13. This native patch transitions to a mix of native estuarine plants and relic pasture grasses to the south and east. We recommend a planting strategy that jump starts the desired estuarine species, supports existing marsh species, and increases wetland species heterogeneity. The planting plan is also informed by the initial response of planting activities from the Kilchis Preserve restoration project. Soil testing information will also be valuable to increase the likelihood of success for certain plants. If possible reference site information should be applied to verify plant list and target proper elevations.

Sitka-spruce swamp development patterns depend on complex successional patterns. These processes can last centuries to achieve climax stage development. Hummock-hollow formation is dependent in part by nurse logs and sediment deposition patterns. Nurse logs add roughness to marsh surface that can facilitate additional debris and sediment deposits. New restoration techniques are being applied to jump-start Sitka spruce development patterns. Examples include the Fort Clatsop and Kandoll restoration projects in the Columbia River Estuary. This includes the disposal of excess fill material to emulate topographic hummocks. Hummocks or low mounds were also created on the adjacent Kilchis Preserve restoration project and have proved successful.

The current planting plan includes hummocks and plantings intended to facilitate spruce colonization over time. The zones depicted in Figure 13 and Table 3 offer enough area to adaptively manage the plantings for sea level rise. Some consideration may be warranted to develop transition zones in anticipation of marsh upward migration patterns from 1 foot of sea level rise within a 50-year planning horizon. Figure 13 below is a conceptual plan developed by TNC staff depicting position and orientation of potential plant communities at the site.

A strong revegetation effort is advisable to minimize reed canarygrass spread and impact on existing native vegetation communities. The initial effort might include both dense herbaceous plantings and well-planned woody plantings to jump-start shading-out of reed canarygrass and development of swamp habitat. In existing dense stands of reed canarygrass, herbicide use, scalping and offsite disposal of the reed canarygrass root mat is advisable, followed by intensive herbaceous and woody species plantings.

Low salinity levels may make it more difficult to control reed canarygrass after restoration. Disturbed sites that are low in salinity (e.g. less than 10 PPT) favor reed canarygrass. If salinity monitoring suggests that internal salinities will be less than 10 parts per thousand (PPT), woody plantings tolerant of very wet conditions (e.g. willow) may be the best approach, even on lower elevation areas. Willow plantings are relatively cheap and can be effective in controlling reed canarygrass. Retaining desirable native vegetation to the extent practicable is also recommended.

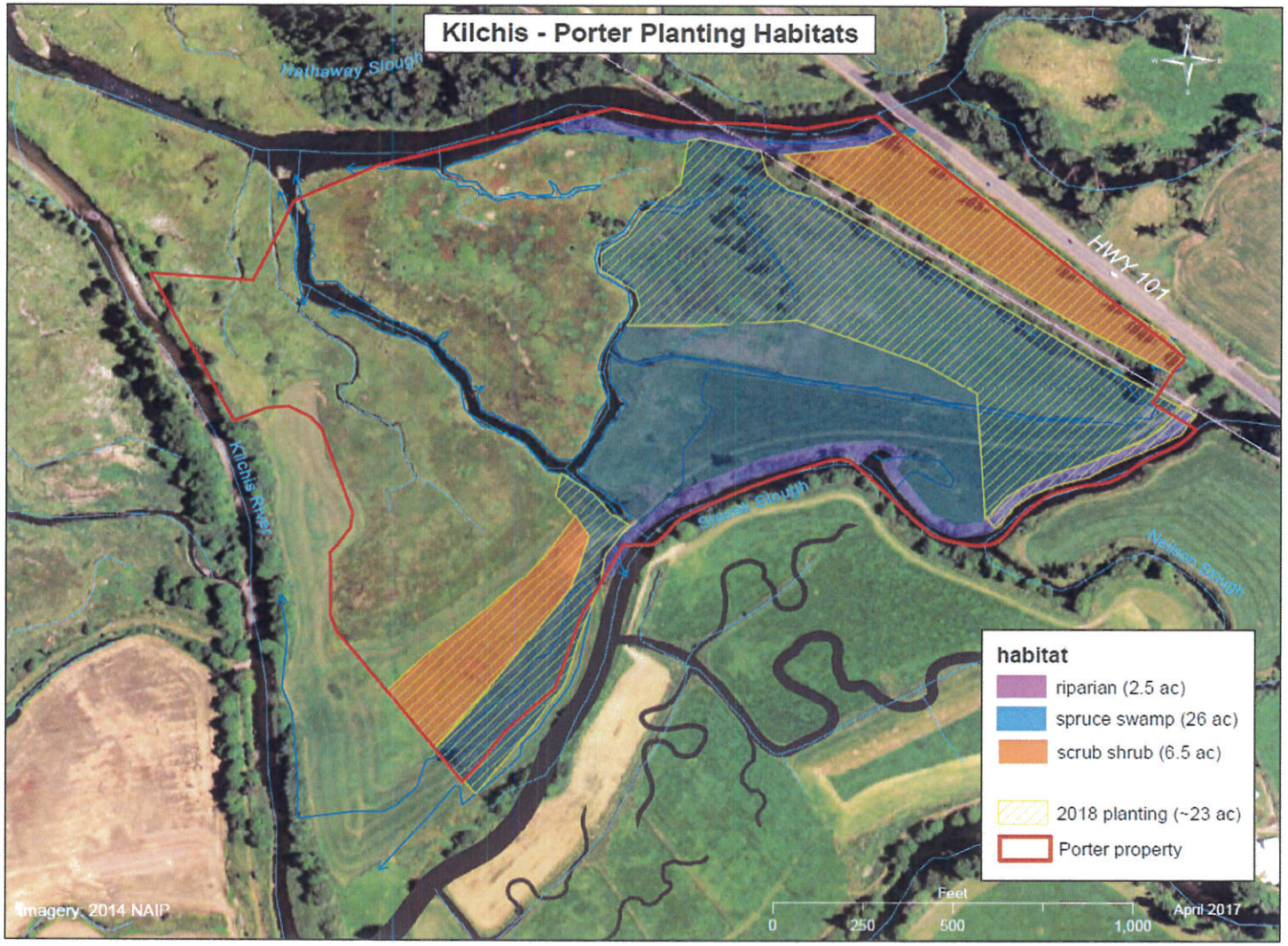

Figure 13. Porter Tract Planting Zones

Table 3. Plant materials for Phase1 and Phase 2 Planting

		Habitats			
Species	Common Name	Spruce Swamp (26 ac)	Riparian Forest (2.5 ac)	Tidal Scrub Shrub (6.5 ac)	Totals
Alnus rubra	Red Alder	800	375	0	**1,175**
Lonicera involucrata	Twinberry	12,300	375	0	**12,675**
Malus fusca	Crabapple	6,100	0	0	**6,100**
Picea sitchensis	Sitka Spruce	4,600	375	0	**4,975**
Populus trichocarpa	Cottonwood	1,500	450	0	**1,950**
Rhamnus purshiana	Cascara	0	375	0	**375**
Rubus parviflorus	Thimbleberry	0	225	0	**225**
Rubus spectabilis	Salmonberry	0	375	0	**375**
Sambucus racemosa	Red Elderberry	7,700	600	0	**8,300**
Spiraea douglasii	Spirea	8,500	375	0	**8,875**
Thuja plicata	Western Red Cedar	0	75	0	**75**
Salix sp.	Hooker's, Sitka Willow	35,500	3,900	18,200	**57,600**
	Plant Totals=	**77,000**	**7,500**	**18,200**	**102,700**
	Overall Plants/AC	3,000	3,000	2,800	--
	Plant Cluster/AC	2,100	2,000	1,100	--

5.3 Cut and Fill Balance

Preliminary cut and fill balances have been calculated based on LiDAR elevations and not on ground survey data; thus, these calculations should be considered preliminary. Modifications to the cut and fill balance will be done in the engineering design phase of the project when supplemental survey data are collected.

Excavation is required for construction of the tidal channels, widening of the connector channel, and lowering the Stasek Slough and Hathaway Slough dikes. The total material generated from berm removal is estimated to be 2,140 CY. Channel construction would require approximately 3,200 CY of excavation. The quantity of material needed to fill ditches is 140 CY. Since the amount of material required for filling ditches is small relative to the berm removal and channel excavation quantities, a large quantity of material, approximately 5,400 CY, would be placed onsite such as subsided areas and mounds.

5.4 Passive Versus Active Channel Creation

Passive tidal channel creation is a restoration approach whereby the channel network is not fully or partially excavated during construction. If a restored tidal wetland is only breached and/or only pilot channels are excavated, future channel development relies on the tidal inundation and drainage to scour channels primarily through head-cutting and incision until the channel size and extent comes into equilibrium with the tidal prism and drainage area. Passive channel creation is best applied to large sites with wetland elevations substantially below MHHW (e.g., Cornu and Sadro 2002).

In the Porter Tract wetland, the lowest elevations are approximately 7 to 8 feet NAVD88, less than 1 feet below MHHW which is 7.8 feet NAVD88. Consequently, incorporating passive channel formation is not recommended. It is not likely that pilot channels would evolve in a reasonable time frame (e.g., 5 to 10 years) or that a complex tributary channels network would form. The relatively well-developed channel network shown in the conceptual plan is intended to be constructed to full width and depth. The geometries of the channels would be determined during the design phase, though for estimates of excavation quantities and costs, depths and widths varied from 2 to 7 feet and 3 to 8 feet, respectively.

5.5 Connector Channel Evaluation

The connector channel is a man-made channel created between 1955 and 1966 based on aerial photographs from these years (ESA PWA 2013). Presumable the channel was constructed when the Lower Stasek Slough was filled/disconnected from the river. The connector was required to drain rainfall-runoff and floodwaters from the Kilchis River into Tillamook Bay via Hathaway Slough (see Figure 8).

During the Kilchis Estuary Preserve project in 2015, the connector channel was kept in place as a secondary drainage pathway as an issue to be re-evaluated during a second phase of restoration (the current Porter Tract restoration). Currently, the preferred restoration plan for the Porter Tract includes slightly widening the channel and providing a crossing structure for maintenance access to the other side. This approach may be justified by the following:

- The secondary drainage pathway facilitates restoration buy-in from the adjacent landowner, who wishes for the channel to remain open.
- The connector channel is practical as a redundant drainage pathway.
- Based on the 1955 aerial photograph, the channel was constructed at the location of an existing natural channel, so the current channel serves as drainage from the adjacent marsh into the south tributary of Hathaway Slough as it did historically.
- The proposed connector channel is not large relative to Stasek Slough.
    - The estimated cross-sectional areas of the widened connector channel and Stasek Slough are approximately 130 SF and 550 SF, respectively. The widened channel is only 20% of the size of the Stasek Slough.
    - It is estimated that the connector channel is not large enough to significantly influence tidal or storm hydraulics or sedimentation in the lower (west) portion of Stasek Slough. The potential negative risks of keeping the secondary connection are not high.

- The size of the tidal channel network as well as the size of the channels themselves that were constructed on the Kilchis Preserve in 2015 are considered conservative (on the high side of what is estimated to be appropriate). The channel network and geometry errored on the high side to provide improved initial tidal aquatic habitat, and to ensure that habitat could evolve appropriately under combined fluvial and tidal processes. Thus, tidal hydraulics are likely sufficient to support a secondary drainage pathway such as the connector channel without a significant detrimental geomorphic response.
- Secondary and distributary tidal channels networks are common in natural or least-disturbed settings. A nearby example is the Squeedunk Slough distributary channel located southwest of the Kilchis Estuary Preserve. Squeedunk Slough apparently began as a small distributary (avulsed) channel based on early site photographs (thought its size is believed to have been enhanced by the landowner).

5.6 Conceptual Cost Estimates

Planning level construction cost estimates were developed to inform project feasibility. The estimates were intended to document general cost ranges of restoration options being considered. This information can be used for project budgeting, and it also informs decision making in case cost/restoration trade-offs will be required.

5.5.1 Cost Basis and Assumptions

General markups and unit costs are based on recent estuary restoration projects in Oregon. Quantities are based on earthwork take-offs and measurements in GIS from the adjusted LiDAR-defined topography. Quantity estimates are generally conservative and rounded up as appropriate to account for the pre-design stage of the project and numerous variables and unknown site conditions.

The following assumptions were made in developing the cost estimate:

- General site preparation markups: total of 10% of other direct costs
- General earthwork: $7 to $10 per cubic yard ($/CY) to reflect relatively dry working conditions
- Revegetation: $7,000 to $8,000 per acre ($/AC) to reflect a high level (density, etc.) of revegetation similar to previous TNC revegetation costs.
- Low berm and dike removal earthwork: $7/CY
- Design contingencies: 25% to account for primarily minor design details not yet included in the estimate

5.5.2 Detailed Cost Estimate

Costs are estimated for two restoration alternatives that contrast the costs of light duty (alternative 1) and heavy duty (alternative 2) connector channel crossing options - see Table 4 below.

Table 4. Construction cost estimates for two restoration alternatives.

Item	Qty	Unit	Unit Cost	Total Cost Alt. 1 Light Duty Crossing	Total Cost Alt. 2 Heavy Duty Crossing	Notes
Site Preparation				**$ 64,000**	**$ 68,800**	
Mobilization / Demob.			4%	$ 25,600	$ 27,500	Percent of direct constr. costs
Erosion Control, Clearing/Grubbing			4%	$ 25,600	$ 27,500	Access, erosion, clearing/grubbing
Site & Water Management			2%	$ 12,800	$ 13,800	Dewatering & diversions
Earthwork				**$ 60,180**	**$ 60,180**	
Demo Connector Channel Culvert	1	EA	$ 3,000	$ 3,000	$ 3,000	Approx. 4' timber box culvert
Demo Other Culverts	3	EA	$ 2,000	$ 6,000	$ 6,000	Porter SL and near US 101
Fill Linear Ditches	140	CY	$ 8.00	$ 1,120	$ 1,120	Includes ditches 1-a, 2-a
Excavate / Widen Connector Channel	410	CY	$ 8.00	$ 3,280	$ 3,280	Assume regrade onsite
Excavate Channel 2	2,360	CY	$ 8.00	$ 18,880	$ 18,880	Includes 5 Tributaries
Excavate Channel 3	160	CY	$ 8.00	$ 1,280	$ 1,280	
Excavate Channel 4	230	CY	$ 8.00	$ 1,840	$ 1,840	
Excavate Abandoned/Collapsed Farm Crossings	180	CY	$ 10.00	$ 1,800	$ 1,800	Remove native material, buried water structures
Stasek Dike Removal & Regrade Onsite	1,390	CY	$ 7.00	$ 9,730	$ 9,730	Remove portion of dike
Hathaway Dike Removal & Regrade Onsite	750	CY	$ 7.00	$ 5,250	$ 5,250	Remove portion of dike
Streambed Gravel at Bridge/Culvert Crossings	400	TN	$ 20.00	$ 8,000	$ 8,000	Scour protection at crossings
Structural				**$ 66,000**	**$ 90,000**	
Alt 1.: Light Duty Timber Bridge (ATV, Pedestrians)	**1**	**LS**	**$ 38,000**	**$ 38,000**	--	Across connector channel (light duty), 40' length
Alt 2.: Heavy Duty Steel Bridge/Culvert (Trucks)	**1**	**LS**	**$ 62,000**	--	**$ 62,000**	Across connector channel (hvy duty steel bridge or culvert)
Install Timber Pedestrian Bridge - Porter SL North	1	LS	$ 28,000	$ 28,000	$ 28,000	14' long timber bridge
Revegetation				**$ 224,100**	**$ 224,100**	
Riparian Species	3.4	AC	$ 8,000	$ 27,200	$ 27,200	Placed on mounds; incl. prep., 1-yr maintence
Wetland Species	26.7	AC	$ 7,000	$ 186,900	$ 186,900	Scrub / shrub, sedges; incl. prep., 1-yr maintenance
Place Habitat / Nurse Logs	25	EA	$ 400.00	$ 10,000	$ 10,000	Assume imported, small logs
Direct Subtotal				***$ 414,280***	***$ 443,080***	
Design Contingency			25%	$ 103,570	$ 110,770	Considering conceptual phase of project
CONSTRUCTION TOTAL				***$ 518,000***	***$ 554,000***	*(rounded up)*
(Percent Difference Between Alts.)					*6.9%*	

Both alternatives assume Stasek Slough and Hathaway Slough dike removals and regrading onsite, as well as a high-level of site revegetation.

The direct construction subtotal for alternative 1 is approximately $414,000. This includes general site preparation, earthwork, structural (earthen berms), a light duty crossing at the connector channel, and revegetation. When factoring in contingency for design, the total is approximately $520,000. This total is relevant for comparison with construction bids.

Alternative 2 with the heavy-duty steel bridge (or comparable steel plate culvert) has higher costs associated with site preparation (dewatering, temporary shoring, etc.) and structure costs. The direct construction subtotal for alternative 2 is approximately $443,000. The addition of the design contingency totals approximately $550,000. Cost comparison between alternatives shows a 7% cost difference. Note that the construction costs for the two alternatives do not include project management, engineering design, permitting, construction management or other design and construction phase costs.

6) Summary of The Conceptual Plan Development

Based on the above feasibility analysis, the following recommendations for restoration of the Porter Tract Restoration are made. In general, these recommendations are reflected in the Conceptual Plan shown in Figure 8. The preferred approach for these and all other restoration measures are described below.

Channel Configuration

The recommended approach for the tidal channel network within the wetland is to fully construct the channels to the appropriate depth, width, and extent. Passive channel evolution (passive restoration) may not be effective or may require a long period of time due to the relatively high wetland elevations and corresponding limited tidal prism over much of the site, especially the south and east regions where the channels would be constructed.

Connector Channel Crossing

The most cost effective option for the connector channel crossing structure is a light duty bridge. This option could include a glulam-type timber structure designed for ATVs or other lightweight vehicle use.

If a heavy duty crossing structure is necessary for large equipment access, a refurbished railcar bridge is recommended over a steel plate culvert for its structure-based cost efficiency, and to reduce the expected high costs of excavation and dewatering necessary to install a large-span culvert.

Stasek Slough and Hathaway Slough Dike Removals

Full dike removal is the preferred restoration approach. If implemented, post-restoration conditions would more closely mimic pre-development conditions and would enhance connectivity with the adjacent sloughs. Full removal would maximize sediment delivery to the site, improving resilience to sea level rise.

Planting

A preliminary planting strategy has been developed to re-establish native vegetation communities for (from lowest to highest elevation) mid-marsh and willow, high-marsh and willow, Sitka spruce tidal swamp, and Sitka spruce riparian forest. Some species would be planted, while others are expected to colonize from the existing seed bank. Herbaceous species plantings are recommended at all elevation zones. A high level of revegetation effort is recommended for the site. High revegetation effort would increase the likelihood of plant establishment and success and reduce the risk of invasive species recolonization.

Hydrodynamic Assessment of Recent Site Changes and Flood Risks

Updated topographic surveying and two-dimensional hydrodynamic modeling was performed to assess changes to the wetland, river channel, and sloughs surrounding the Preserve following several large storms from 2015 to 2017. Model results show that the river, recently restored tidal channels, and wetland surfaces have changed significantly since the December 2015 storm. Significant accretion has occurred at many locations including several restored channels and the Kilchis River channel adjacent to the river bank where levees were removed. Model results also showed that peak water levels during the simulated storms were not particularly sensitive to bathymetric changes in the Kilchis River, and that river bed elevations have much less control on water levels than do the increased storage and conveyance capacity associated with the restored Preserve.

The hydrodynamic model was further modified to include the new channels, filled ditches, and other restoration features associated with the conceptual restoration plan. Results of simulation of the restored Porter Tract indicate no increase in inundation extents or water surface elevations when compared to existing (i.e., current / post-storm) conditions. This result is as expected, as the relatively localized channel creation and expansion of the connector channel as part of the restoration plan are not anticipated to exacerbate inundation during extreme tidal or fluvial water levels. Further, there appear to be small, short term improvements in drainage following extreme events during which the enlarged connector channel appears to aid drainage especially from Stasek Slough.

Costs of Restoration

The cost scenarios developed for this feasibility analysis incorporate contingencies and will be refined during future design and engineering phases, especially the channel and dike removal earthwork quantity estimates. A light duty crossing over the connector channel has a lower associated cost than the more robust heavy-duty bridge installation.

The construction costs for the project regardless of the channel crossing alternative are likely to be in the range of $500k, without significant changes to the scope of the restoration. This cost range is considered low to moderate given the large area, approximately 60 acres, of wetland and over 4,000 linear feet of channel habitats created and enhanced through the Porter Tract restoration.

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Appendix A
Draft Technical Memorandum
Kilchis River Wetland Restoration Project: Resurvey and Hydrodynamic Modeling Update

September 14, 2017
Environmental Science Associates

FLOOD ANALYSIS MEMO

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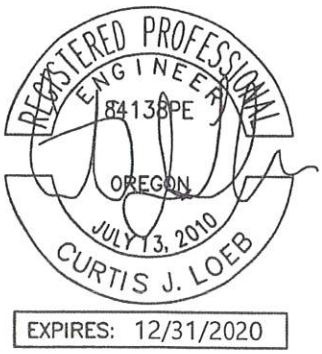

Technical Memorandum

Date: REVISED 9/22/2019

To: Dick Vander Schaaf, Project Manager
Associate Coast and Marine Conservation Director
The Nature Conservancy of Oregon

From: Curtis Loeb, PE, Principal Engineer
Wolf Water Resources
Portland, OR

Project: Porter Tract Restoration -
Kilchis Estuary Preserve

Subject: Flood Analysis Memo

Introduction

The Nature Conservancy of Oregon (TNC) seeks to continue restoration of tidal wetland habitats along the margins of Tillamook Bay with restoration of the Porter Tract, an approximately 60-acre parcel in the floodplain of the Kilchis River in Tillamook County west of Highway 101 and north of the town of Tillamook. The Porter Tract is located in the lower Kilchis River watershed, one of the five large river tributaries to Tillamook Bay. The restoration site is situated approximately one mile from the mouth of the Kilchis River and is influenced by both river flow and ocean tides. The Porter Tract is north of and adjacent to the recently restored Kilchis Estuary Preserve (former Dooher Property) that was constructed in 2015 by the TNC. The cumulative area of these restoration efforts would result in 127 acres of high functioning estuarine habitat.

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The overall goal of the Kilchis Estuary Preserve project is to restore freshwater and tidal hydrologic connections to the Porter Tract wetlands, providing off-channel rearing habitat for salmonids and re-establishing spruce swamp habitat. Specific objectives and constraints of the project are described in the Basis of Design Report (W2r 2019).

Restoration measures proposed for the Porter Tract Restoration include:

- Tidal channel creation,
- Restoration / expansion of the connector channel between the Hathaway Slough tributary channel and Stasek Slough,
- Filling linear drainage ditches,
- Removing man-made dikes and berms along sloughs,
- Removal of water control structures (tidegates, culverts, and berms),
- Two new pedestrian bridges for vegetation maintenance,
- Wood habitat structures in the tidal channels as cover habitat and organic substrate for rearing habitat for juvenile salmonids,
- Site revegetation with native grasses, shrubs, and woody plants

The scope and purpose of this memo is to summarize any potential changes in flood conditions under proposed restoration actions using a 2-dimensional hydrodynamic model of the Kilchis River and its broader fluvial and tidally-influenced floodplain including the Porter Tract. Evaluation of flood conditions compares existing conditions to those under the above proposed restoration actions at key locations around the site to determine the timing and magnitude of any changes.

Hydrodynamic Model Development

A two-dimensional hydrodynamic model was originally developed for the Dooher Property (Kilchis River Estuary Restoration Phase1; ESA 2014). Model geometry or topographic extents along the Kilchis River and Tillamook Bay tidelands are described in the Phase 1 report. This report also describes model calibration to observed water levels, and hydrologic (tidal water level and riverine flow) boundary condition scenario development to examine typical tidal conditions as well as extreme storm events.

The Phase 1 model was updated to reflect Porter Tract Concept Restoration Designs (W2r 2017), and then it was updated for minor revisions associated with the final engineering designs (W2r 2019). The most recent changes to the model to reflect final restoration design are described in the letter report by Northwest Hydraulic Consultants (NHC 2019), which is included in Attachment A. The final restoration design overview and associated changes to the hydrodynamic model geometry are included in Figure 1 and Figure 2, respectively.

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Figure 1 Porter Tract restoration site overview indicating restored channels, filled ditches, dike removals, new bridges, and low mounds.

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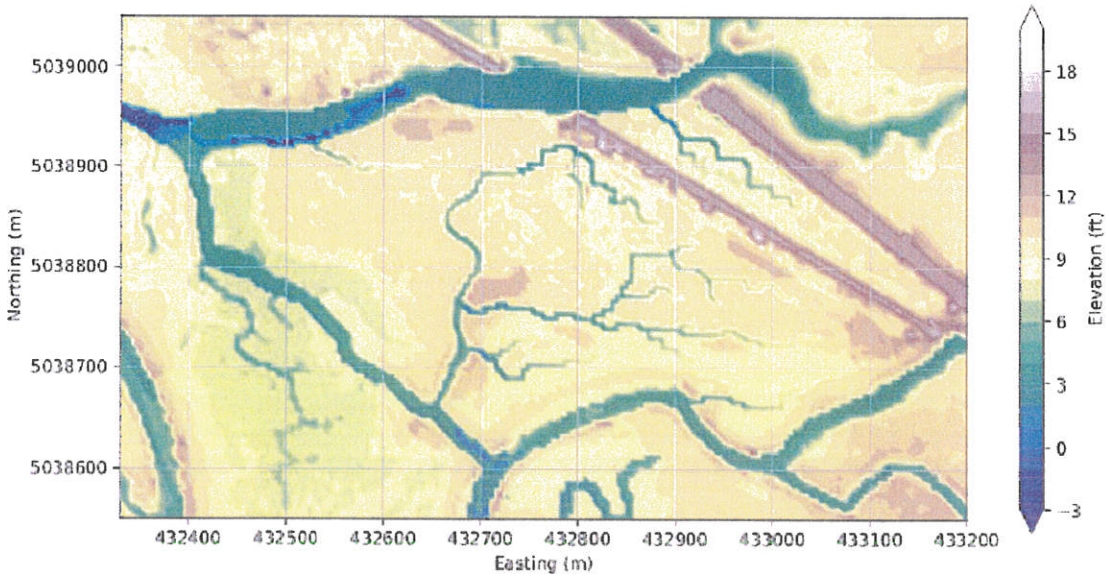
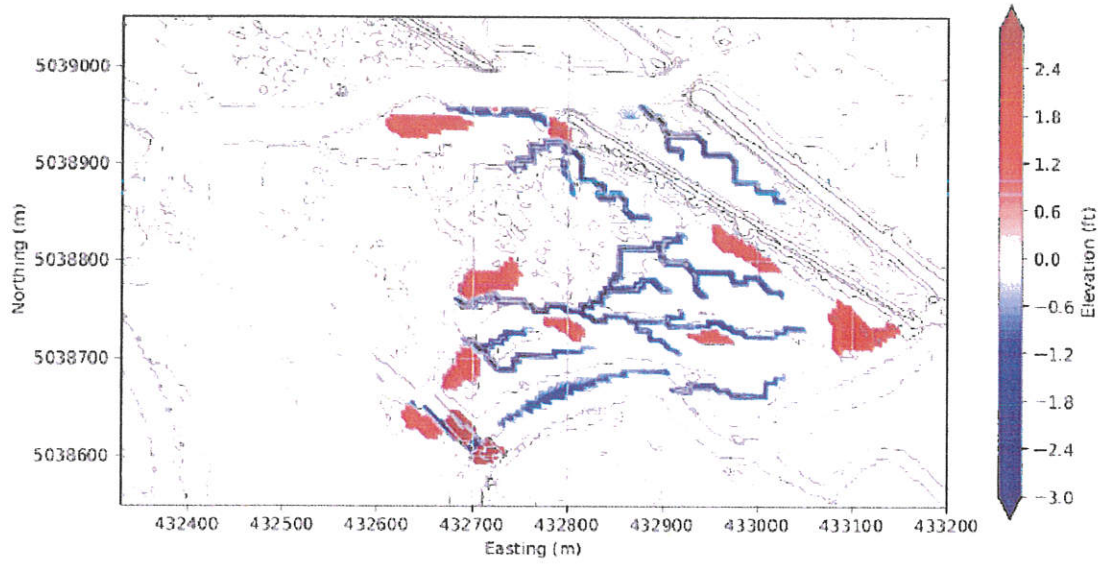


Topography with proposed restoration measures.



Differences between existing topography and proposed topography.

Figure 2 Hydrodynamic model geometry (top) and changes in topography (bottom) reflecting the restoration design (NHC 2019).

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Model results

Results of the hydrodynamic model simulations are presented in the NHC memo (2019). Model simulations examined two hydrologic scenarios: representative base flood conditions which included the December 2015 storm with peak water levels of 12 feet NAVD88 approximating the base flood condition (1% annual chance occurrence event); and, typical winter /tidally-dominant conditions represented by the January 2017 storm which experienced a low-level storm followed by typical tidal fluctuations. The combined flow/tidal boundary conditions are shown in the NHC report in Attachment A, and results of the **representative base flood scenario** are summarized and interpreted below.

Representative base flood conditions

Time series comparison of water levels under existing and proposed (detailed design) conditions at Stasek Slough and Hathaway Slough are shown in Figure 3 and Figure 4, respectively.

Comparison of water levels under existing and proposed (restoration) conditions indicate that there is **no increase in base flood water levels** during the coincident peaks of tidal and riverine water levels overall (site-wide) and also at the two key locations examined (Stasek and Hathaway Sloughs below their respective Highway 101 crossings).

The reasons for no increase in base flood levels are that (1) base flood water levels are very high (approximately elevation 12 feet NAVD88) relative to general land and former berms elevations which range from approximately 7 to 10 feet NAVD88, and (2) accordingly, there is no existing or current barrier to either riverine- or tidally-based water levels of this magnitude. Water depths during the base flood are approximately 2 to 5 feet across the floodplain. For any flood events more extreme than those simulated in the model (i.e., those with combined water levels higher than elevation 12 feet NAVD88 especially events driven by tidal/ocean conditions including storm surge and wind setup), water level comparisons would be similar (no increase) due to even greater relative depths across the floodplain within and adjacent to the project limits.

Non-peak riverine flow / high tide conditions

At **Stasek Slough** during non-peak / high tide conditions (i.e. tidal water levels at or above MHHW), water levels under proposed conditions show a minor decrease that appear to be due to improved drainage as a result of the expanded connector channel between Stasek Slough and the tributary to Hathaway Slough. The general decrease is small, on the order of 0 to 0.5 feet, and is most pronounced during the falling limb of the tide, when waters are draining from Stasek Slough.

At **Hathaway Slough** during non-peak / high tide conditions, there is a corresponding minor increase in water levels (0 to 0.5 feet) on the same order of magnitude as the decreases in Stasek Slough. The short term increases also occur during the falling limb of the tide. The minor increase appears to be due to additional / faster drainage from Stasek Slough into the Hathaway Slough tributary.

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During non-peak but elevated Kilchis River conditions, there is a very minor (maximum of between 0.1 to 0.2 feet, or approximately 1 to 2 inches) increase in water levels in Hathaway Slough when water levels are between 10 and 11 feet NAVD88. The increase is very small and is close to the level of precision of the hydrodynamic model. This small increase appears to be due to slightly more Kilchis River overflows reaching Hathaway Slough through the expanded connector channel. However, during the instance (few hours) when tides peak in concert with elevated Kilchis River flows and water surface elevations reach 12 feet NAVD88, any difference in water levels goes to 0, as flood waters once again overwhelm the general vicinity of the Porter Tract (see 12/10/2015 approximately 1300 hours).

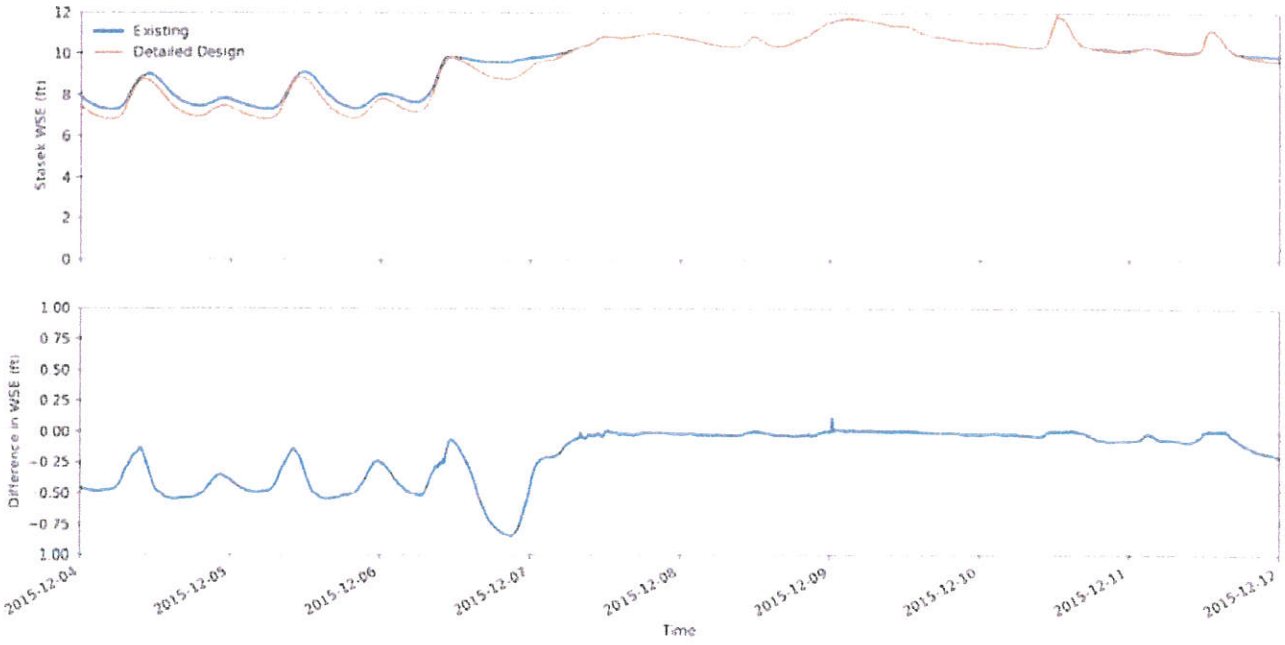

Figure 3 Comparison of water levels in Stasek Slough under existing and proposed conditions for the December 2015 peak flood event.

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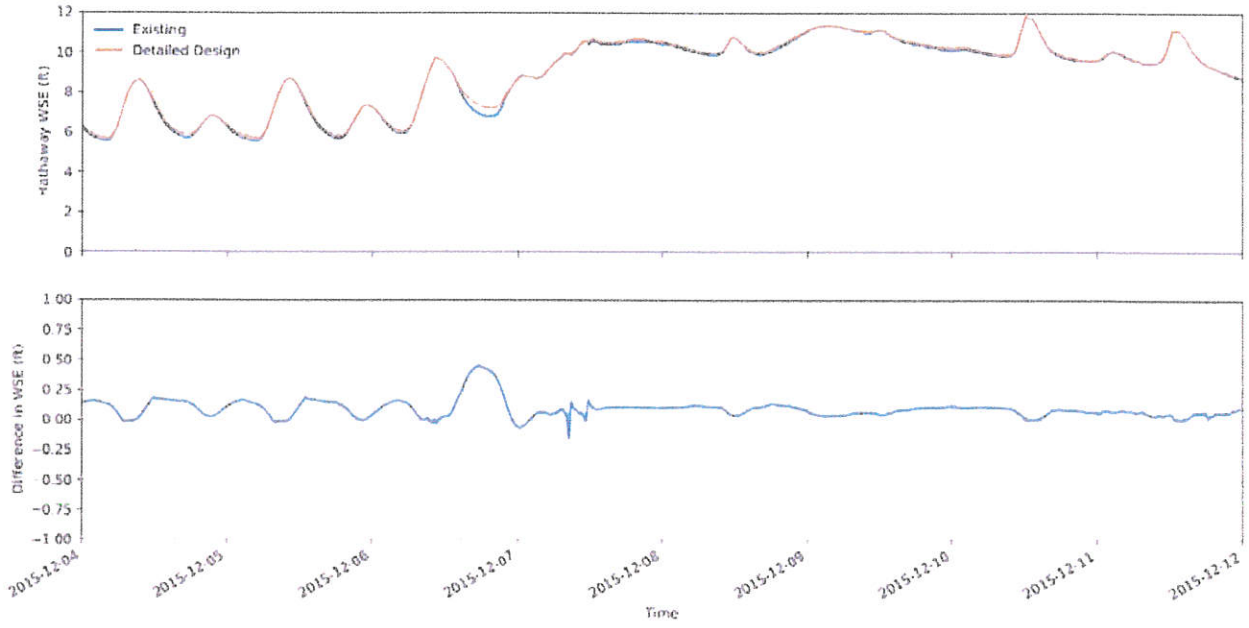

Figure 4 Comparison of water levels in Hathaway Slough under existing and proposed conditions for the December 2015 peak flood event.

FEMA Flood Map

The Tillamook County Flood Insurance Rate Map and Flood Insurance Study was updated in 2018 (FEMA 2018). The updated map is shown below in Figure 5.

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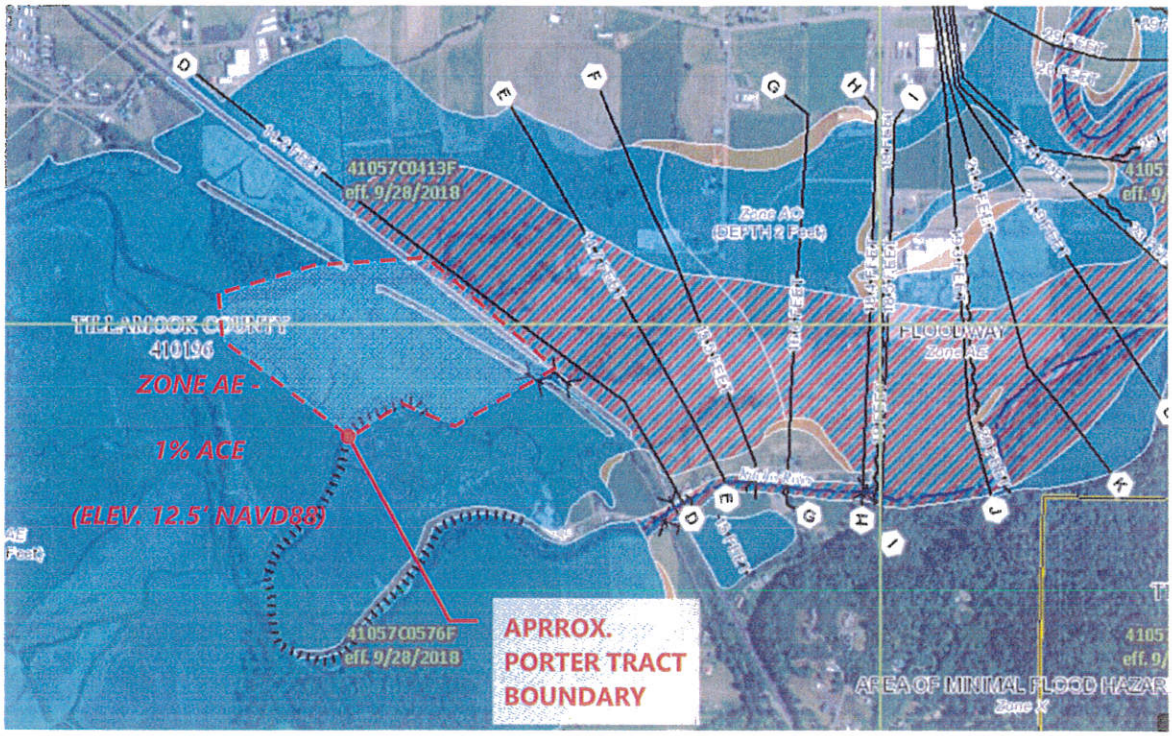

Figure 5 2018 FEMA flood insurance rate map shown with approximate Porter Tract Project limits and adjacent region marked as floodplain (light blue/green shading).

Tillamook County Land Use

The Tillamook County Department of Community Development (County) enforces land development restrictions through the Land Use Ordinance (LUO) to promote appropriate uses of land and to protect and promote health and safety of the public (Tillamook County LUO 2015). LUOs were updated in 2015 to conform to current statutes and administrative rules, and to update requirements to achieve desired outcomes and generally to improve the structure and content of the LUOs.

The Porter Tract is zoned partially in the Estuary Natural (EN) and Farm (F-1) zones (see Figure 6).

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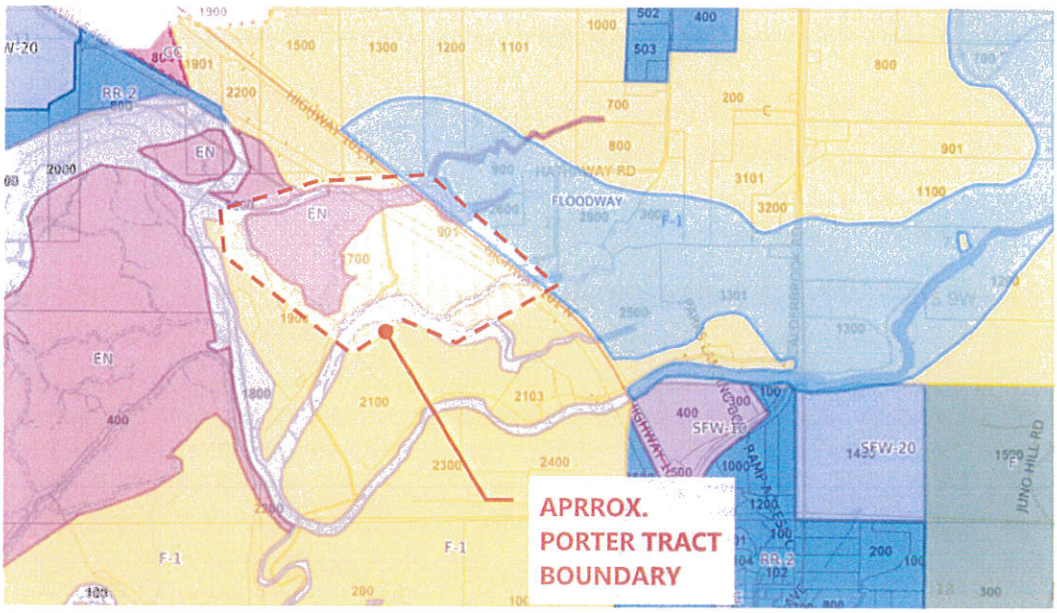

Figure 6 Tillamook County land use zones overlain on the Porter Tract (Tillamook Co. 2019).

Developments in the Floodway and Floodplain

Section 3.510 (8) of the Tillamook County Land Use Ordinances (LUO) states that that encroachments (e.g., fill, new construction, substantial improvements, and other development) within the demarcated floodway of a watercourse such as the Kilchis River must provide for conveyance of the base flood (one percent annual chance of occurrence) event without resulting in any increase in flood levels. The floodway is the portion of a river that actively conveys flows and frequently has high velocities along with debris.

In contrast, the floodplain is the general area beyond the floodway and active conveyance zone that is inundated by the base flood event. The Porter Tract project is wholly within the FEMA-designated floodplain (Zone AE, 1% annual chance occurrence demarcated), as the floodway ends on the upstream side of Highway 101. For agricultural-zoned lands within the floodplain such as those surrounding and including the Kilchis project site, the LUO does not generally restrict increases in water levels. Thus, the LUO does not preclude the anticipated minor, short-term and non-peak rise in water levels of approximately 0.1 feet within and adjacent to the project site that occurs during flood levels below the base flood. And to reiterate the prior section of this memo describing model results, flood levels during the base flood are not anticipated to change under proposed conditions.

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References

ESA 2014. Kilchis River Tidal Wetland Restoration Design, Supplemental Hydrodynamic Modeling Assessment of Flooding and Evolved Bed Conditions. Memo prepared by Environmental Science Associates (ESA), Portland, OR, prepared for The Nature Conservancy of Oregon, July 2014

FEMA 2018. Federal Emergency Management Agency Flood Insurance Study, Tillamook and Incorporated Areas, Volumes 1 and 2, effective Sep. 28, 2018.

NHC 2019. Kilchis River Estuary Porter Tract Restoration – Detailed Design, Hydrodynamic Model Results. Letter Report prepared by Northwest Hydraulic Consultants (NHC); prepared for Wolf Water Resources, Portland, Oregon, revised 7/8/2019.

Tillamook Co. 2019. Tillamook County GIS Portal. URL: http://tillamookcountymaps.co.tillamook.or.us/geomoose2

W2r 2019. Porter Tract Restoration, Kilchis Estuary Preserve - Basis of Design Report (Final Design). Report prepared by Wolf Water Resources, Portland, OR; prepared for The Nature Conservancy of Oregon, February 2019.

W2r 2017. Porter Tract Restoration, Feasibility Analysis and Conceptual Design. Report prepared by Wolf Water Resources, Portland, OR; prepared for The Nature Conservancy of Oregon, November 2017.

Attachment A

Kilchis River Estuary Porter Tract Restoration – Detailed Design, Hydrodynamic Model Results, Northwest Hydraulic Consultants, revised 7/8/2019.

HYDRODYNAMIC MODEL

30 Gostick Place | North Vancouver, BC V7M 3G3 | 604.980.6011 | www.nhcweb.com

nhc
northwest hydraulic consultants ltd

NHC Ref. No. 3004562

8 July 2019

Wolf Water Resources
1001 SE Water Ave, Suite 180
Portland, OR
97214

Attention: **Curtis Loeb, MS, PE**
Restoration Engineer

Via email: cloeb@wolfwaterresources.com

Re: **Kilchis River Estuary Porter Tract Restoration – Detailed Design**
Hydrodynamic Model Results

Dear Mr. Loeb:

This letter report provides the methodology and results for the hydrodynamic modeling completed by Northwest Hydraulic Consultants Ltd. (NHC) for Wolf Water Resources Inc. (W^2r) regarding the detailed design of the Kilchis River Estuary Porter Tract Restoration Project (the Project).

1 INTRODUCTION

Wolf Water Resources Inc. is working strategically with the Nature Conservancy to restore fish habitat in the Kilchis River Estuary. Hydrodynamic modeling and analyses were conducted by NHC for W^2r to examine the potential hydraulic impacts of the proposed detailed design restoration measures (**Figure 1**). This work is a continuation of the hydraulic model that was previously completed for the conceptual design. The detailed design measures include:

1. Expanding the connector channel to about 35' wide at all locations;
2. Filling all the linear ditches;
3. Excavating Channels shown in the detailed design drawings and removing the water control structures on them;
4. Removing the pretty small berm areas to El. 9 ft along Stasek and berm area along Hathaway Slough to the north; and

5. Placing low mounds to 18" to 30" above existing grade;

This report presents the modeling methodology, analyses and results for the scope of work.

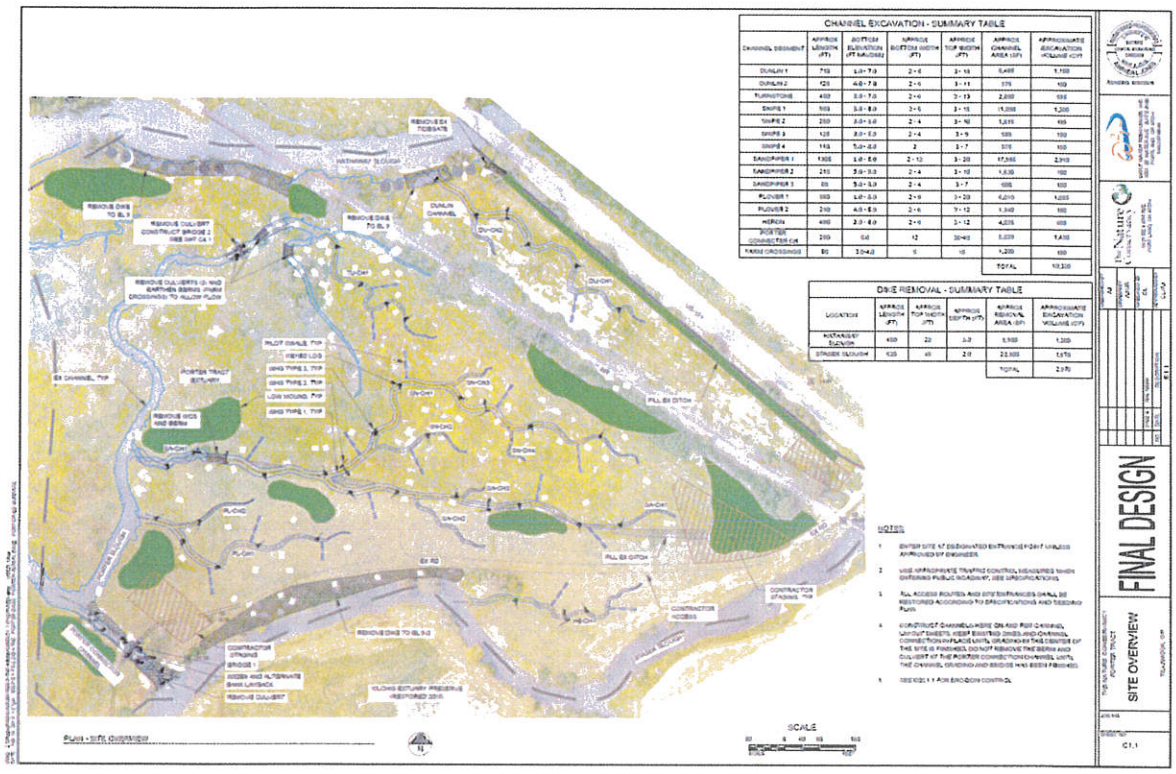

Figure 1. Site overview of detailed design restoration measures – provided by W²r on May 6, 2019

2 MODEL METHODOLOGY

2.1 Hydrodynamic Model Verification

A previously-calibrated Delft3D model of Kilchis River estuary was provided to NHC by W²r for the conceptual design phase of the project. This model was verified by NHC and W²r for the earlier phase with of the model verification findings provided in Attachment I. The current model is wholy suitable for the purposes of this study.

2.2 Model Geometry

The following updates to the model geometry were made for the proposed Porter Tract Restoration scheme:

1. Removed berms along the north side of Hathaway Slough and Stasek Slough;

2. Widened the connector channel and removed the culvert;

3. Linear ditches were not visible given the model resolution, therefore no changes were made to the geometry in these locations;

4. Fill areas were added to the model geometry where indicated by W^2r by increasing the elevation of the existing ground by 24";

5. Removed water control structures as indicated by matching the surrounding stream bed elevations; and,

6. Additional channels TU-CH, DU-CH, SA-CH, SN-CH, PL-CH, and HE-CH were added to the model geometry based on the alignment and depths provided by W^2r.

Figure 4 and **Figure 5** show the existing topography and the proposed geometry. **Figure 6** shows the bed elevation changes between the existing and proposed model geometries.

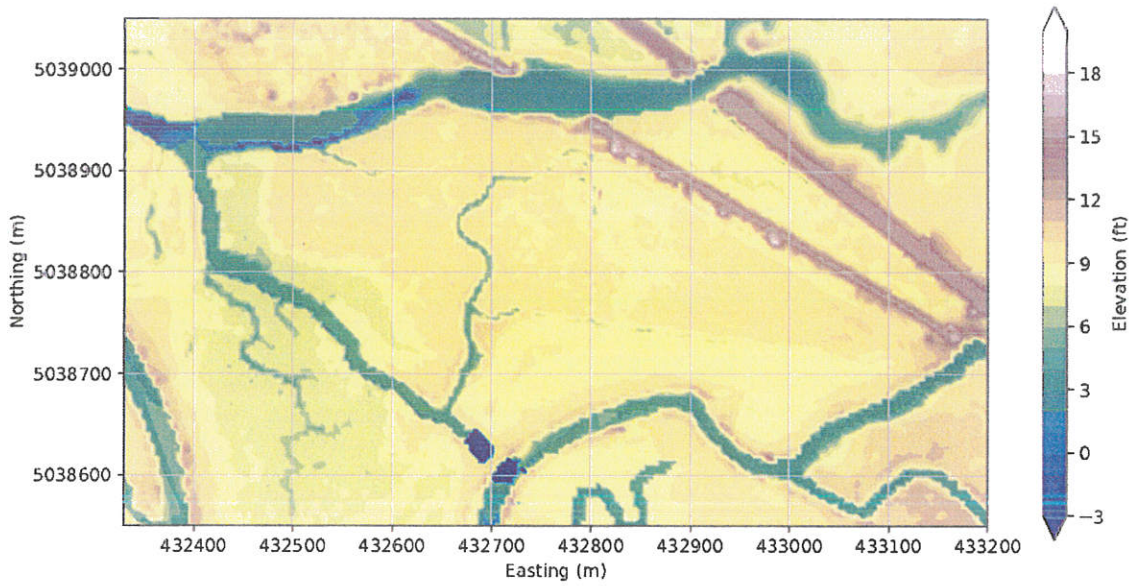

Figure 2. Existing topography.

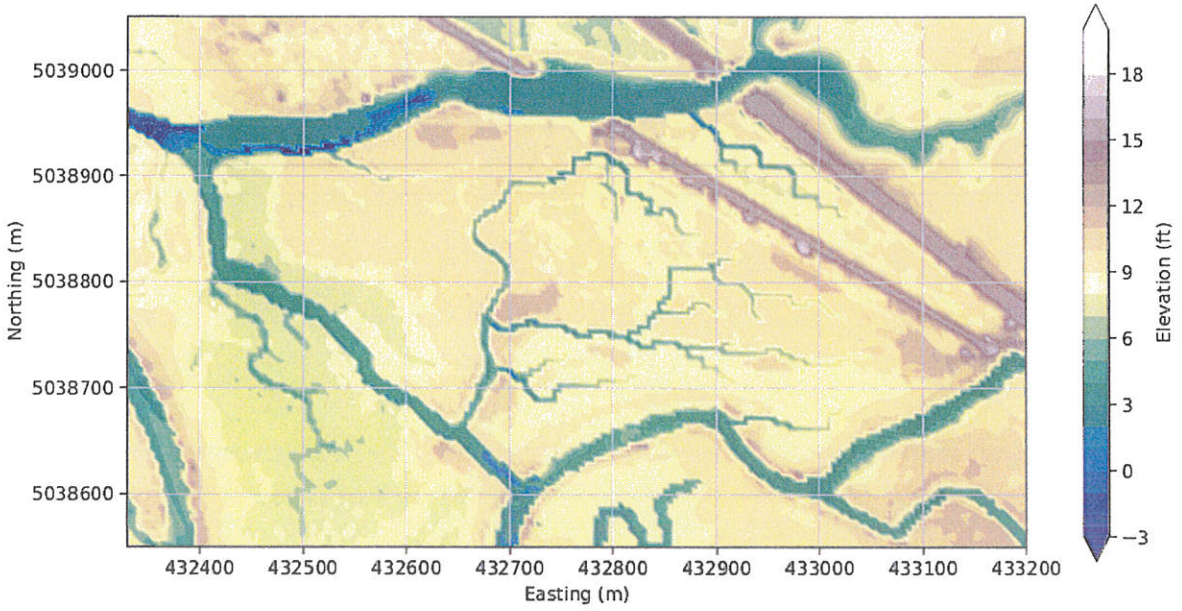

Figure 3. Topography with proposed restoration measures.

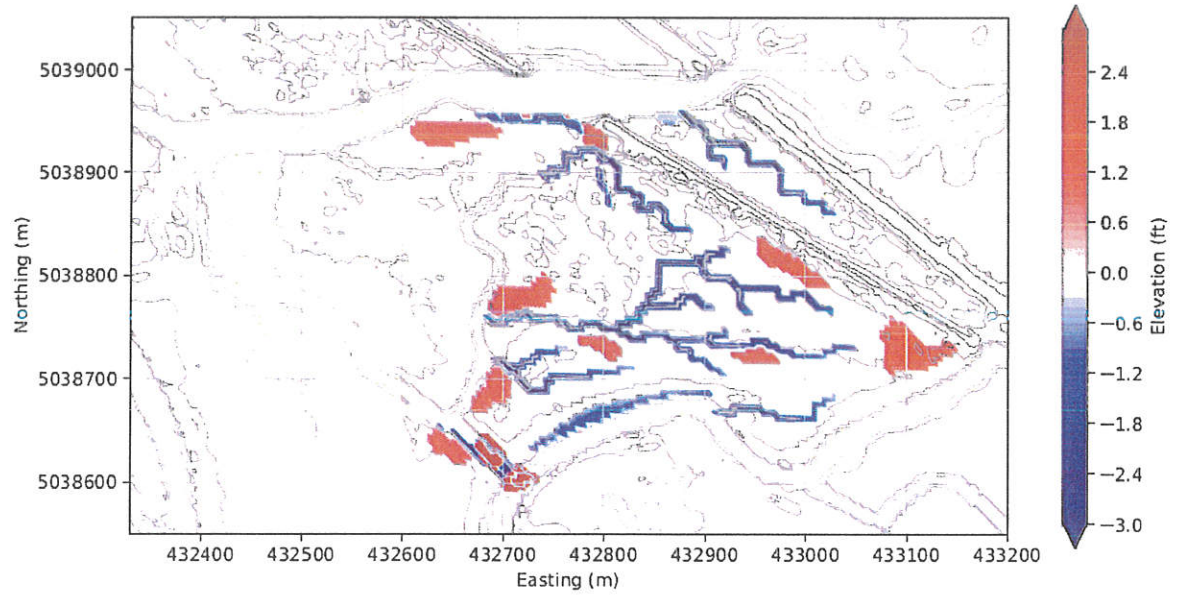

Figure 4. Differences between existing topography and proposed topography.

2.3 Simulation Period

The hydrodynamic model simulations were conducted using the December 2015 and the January 2017 periods to simulate the peak flow and the typical conditions, respectively. Boundary conditions for the two simulations are shown in **Figure 7** and **Figure 8**. Model results are provided in the following section.

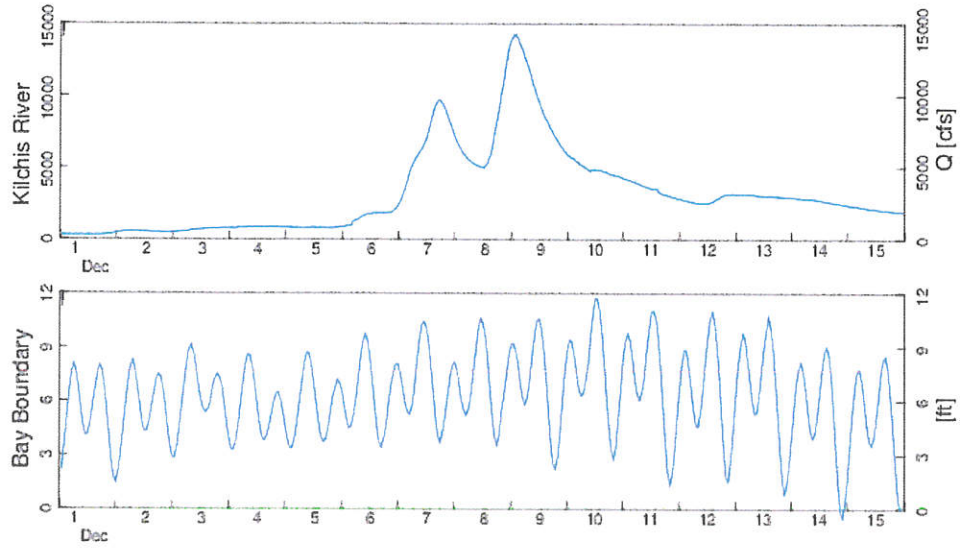

Figure 5. December 2015 model boundary conditions.

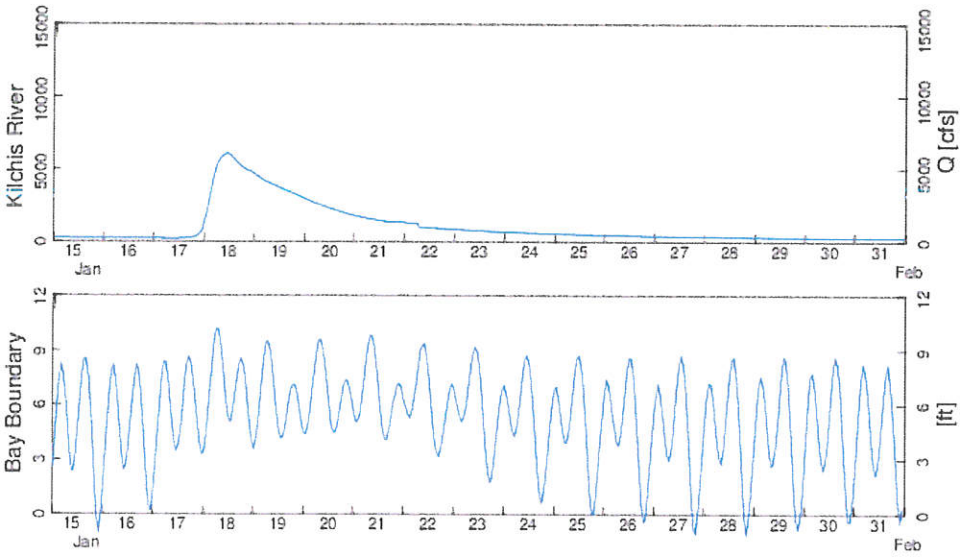

Figure 6. January 2017 model boundary conditions.

3 MODEL RESULTS

The inundation extents for the existing and proposed models are shown in **Figure 9** and **Figure 10** for the December 2015 peak flow scenario. The water level differences are shown in **Figure 11**. The change in water level resulting from the Porter Tract Restoration at Stasek Slough is shown in **Figure 12**; water levels are reduced during normal flow conditions, but there are no changes to the water level during peak flow.

The change in water levels at Hathaway Slough are shown in **Figure 13**; there is a slight increase in water levels during normal flow conditions, and again, no change during peak flows. The slight increase in water levels at Hathaway Slough are a result of increased flow through the Porter Connector Channel during ebb tide. The water levels during the ebb tide on December 6, 2015 at 18:00 are shown in **Figure 14** and **Figure 15** for the existing and proposed models, respectively. The water level differences are shown in **Figure 16**.

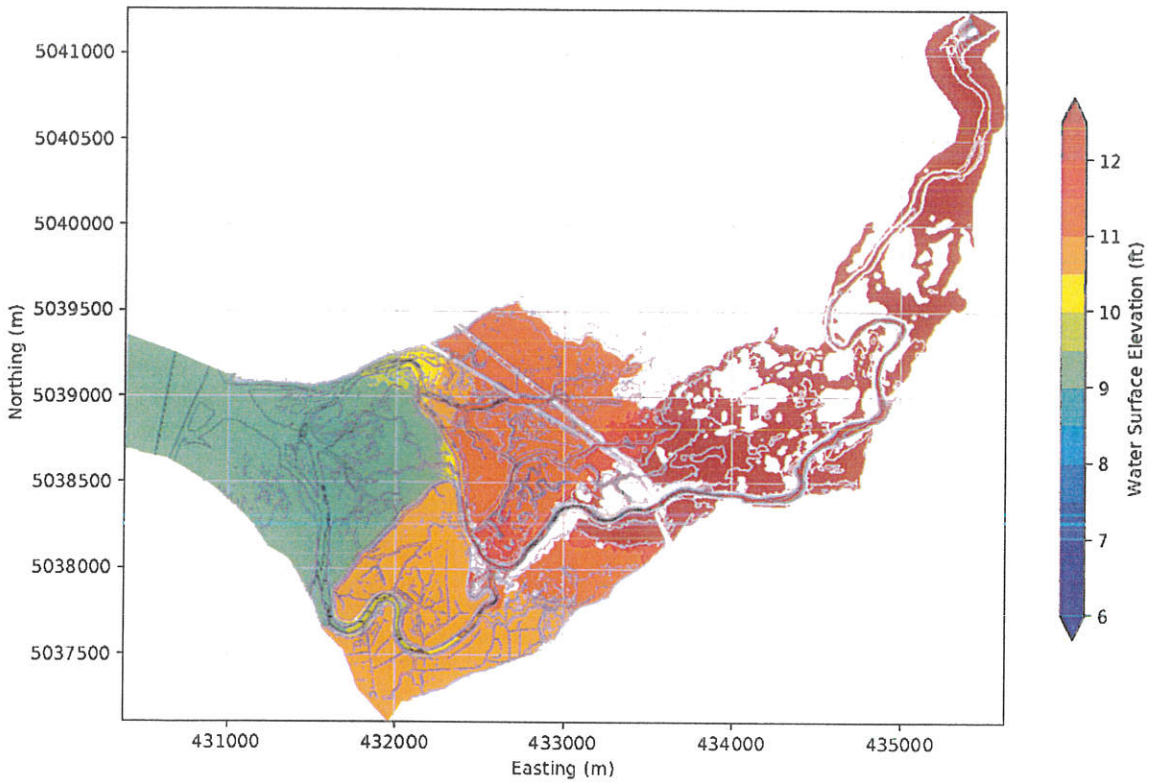

Figure 7. Water surface elevation on December 9th, 2015 01:00 – Existing conditions

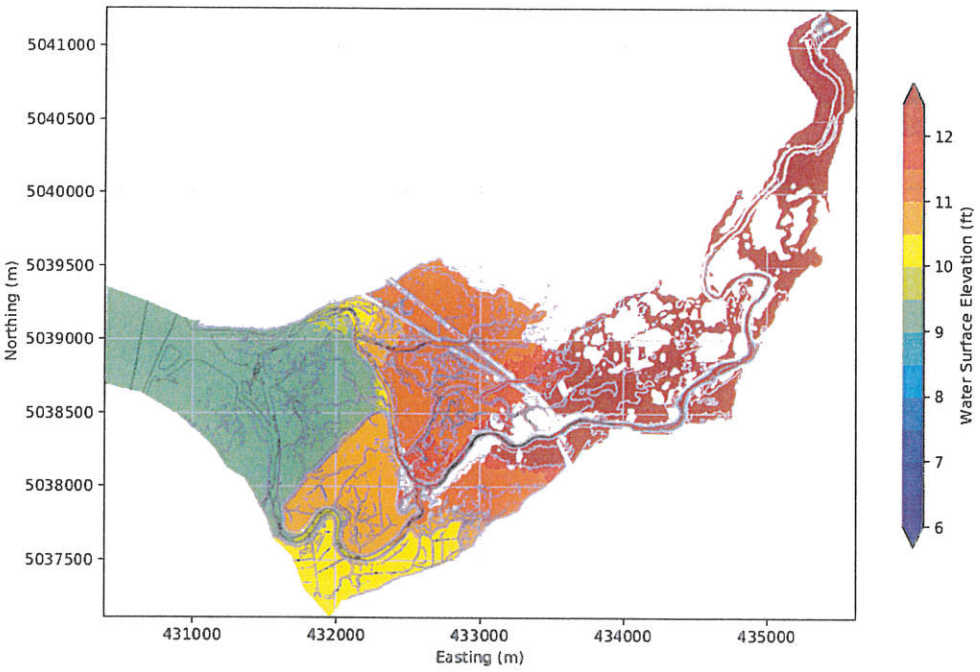

Figure 8. **Water surface elevation on December 9th, 2015 01:00 – with proposed restoration measures**

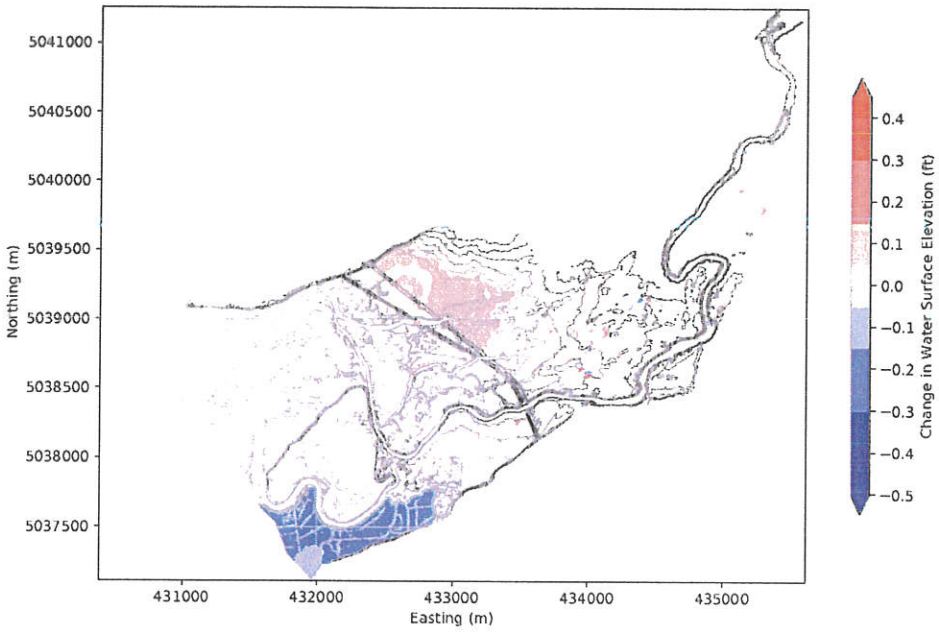

Figure 9. **Differences in water surface elevation on December 9th, 2015 01:00**

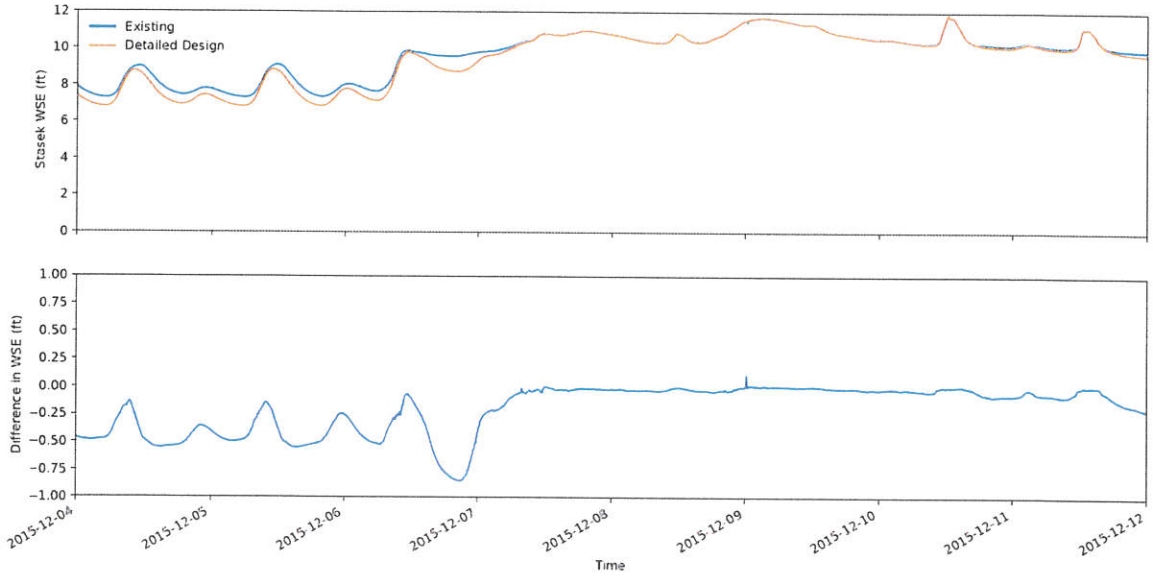

Figure 10. Change in water level at Stasek Slough – 2015 December simulation

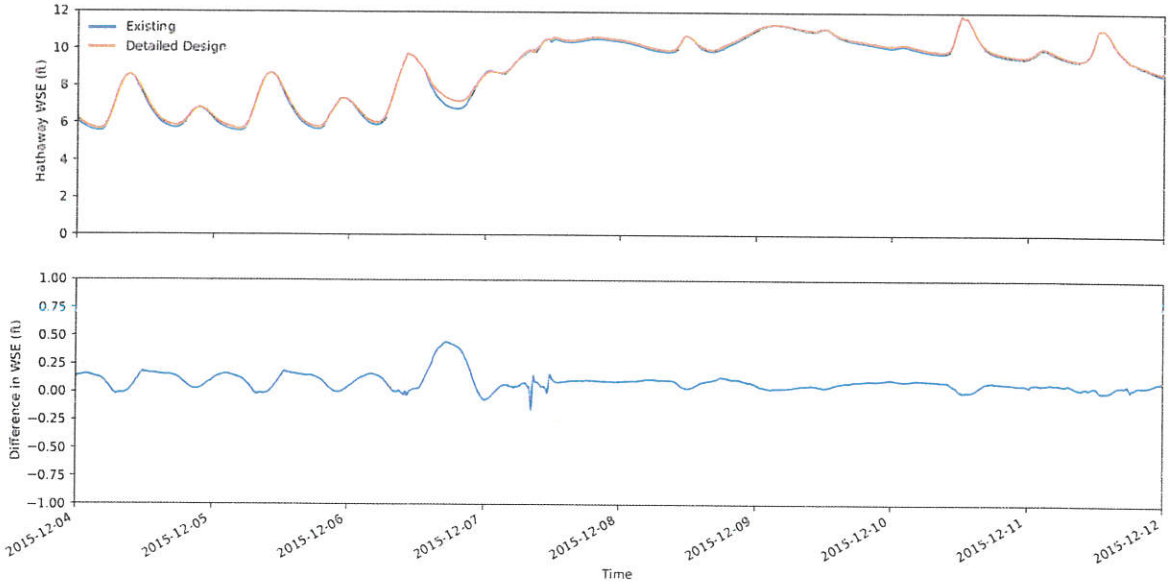

Figure 11. Change in water level at Hathaway Slough – 2015 December simulation

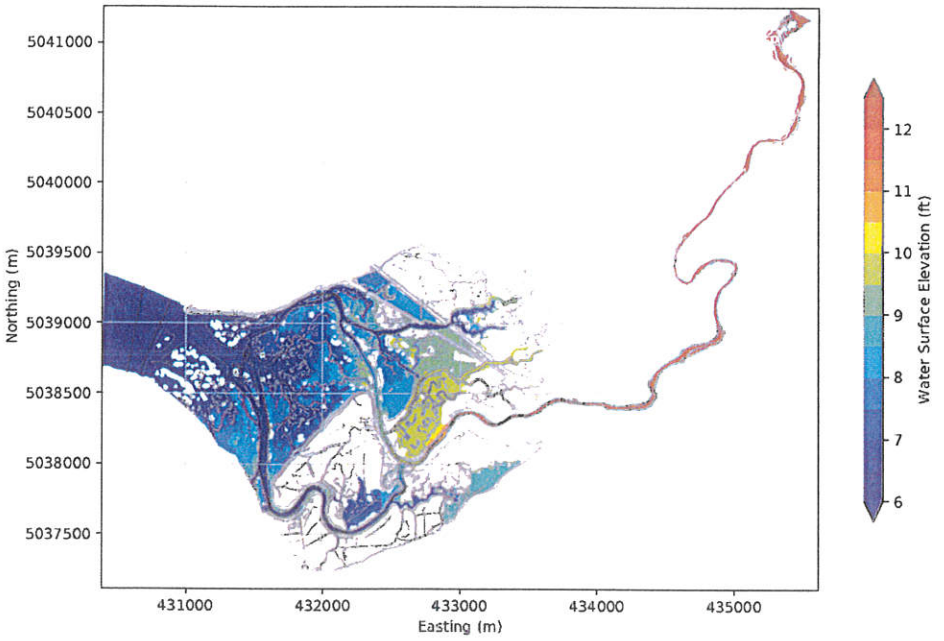

Figure 12. Water surface elevation on December 6th, 2015 18:00 – Existing conditions

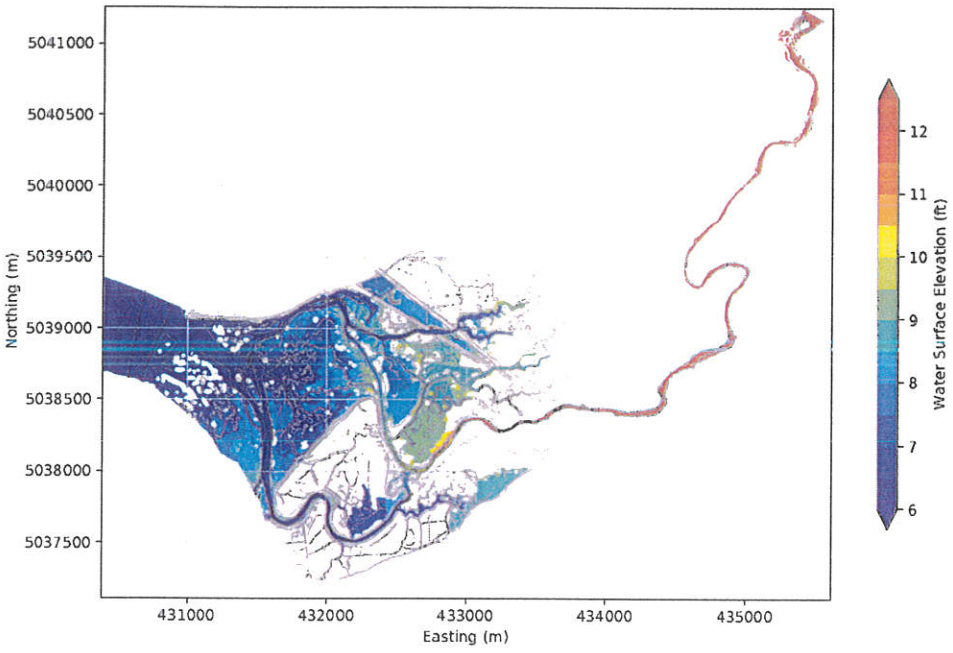

Figure 13. Water surface elevation on December 9th, 2015 18:00 – with proposed restoration measures

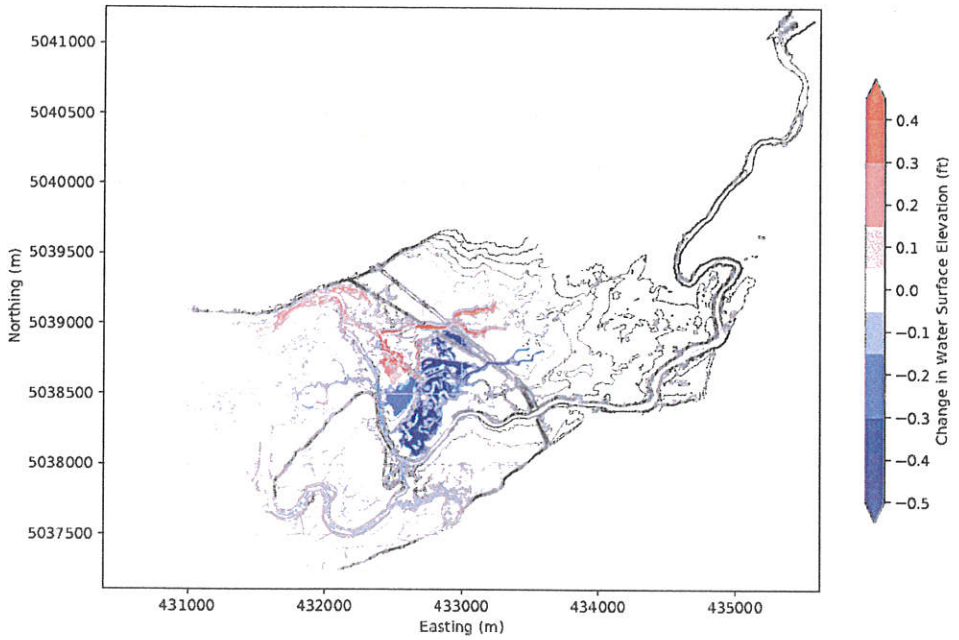

Figure 14. Differences in water surface elevation on December 6th, 2015 18:00

Time-series of water levels at selected monitoring locations **(Figure 14, Table 1)** for each simulations are provided in the EXCEL file attached with this report.

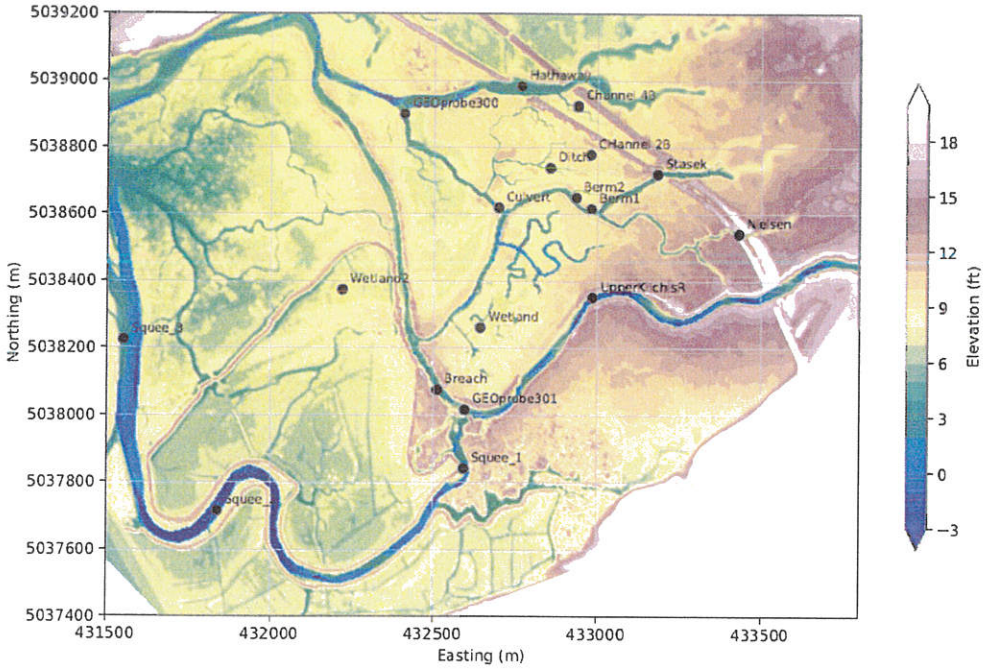

Figure 15. Monitoring station locations

Table 1. Monitoring station coordinates (UTM)

Monitoring Station	Northing (m)	Easting (m)
UpperKilchisR	5038350	432984
Squee_1	5037841	432590
Squee_2	5037715	431837
Squee_3	5038225	431551
GEOprobe300	5038899	432405
GEOprobe301	5038016	432593
Hathaway	5038982	432763
Stasek	5038719	433181
Nielsen	5038540	433429
Breach	5038075	432508
Wetland	5038261	432640
Wetland2	5038373	432219
Channel 2B	5038778	432977
Channel 4B	5038923	432937
Culvert	5038619	432694
Ditch	5038738	432853
Berm1	5038615	432979
Berm2	5038649	432932

4 SUMMARY

Delft3D hydrodynamic modeling simulations were conducted to evaluate the potential hydraulic impacts of proposed restoration measures for the detailed design phase of the project. Modelling inputs files from a previously calibrated model were provided by W²r. No additional work was conducted to verify model's ability to reproduce the December 2015 flood and the January 2017 events, which were used for the hydraulic impact assessment. The results conclude:

1. Overall, the changes in water surface elevations expected with the Project are minor (± 0.1 m) for the peak flow scenario (December 2015) and for the typical conditions scenario (January 2017);

2. Water levels resulting from the Project at Stasek Slough are reduced during normal flow conditions and unchanged during the peak flow event for both the January 2017 and December 2015 model events; and

3. Water levels at Hathaway Slough are slightly increased during normal flow conditions, and unchanged during peak flows for both the January 2017 and December 2015 model events.

5 CLOSURE

We hope this work and report meets your current needs. If you have any questions or would like to further discuss these findings, please contact Edwin Wang at our North Vancouver office at (604) 980-6011 or by email (ewang@nhcweb.com).

Sincerely,

Northwest Hydraulic Consultants Ltd.

Prepared by:

Unsigned draft

Laura Ramsden, EIT, Hydrotechnical Engineer

Reviewed by:

Unsigned draft

Barry Chilibeck, P.Eng., Principal-in-Charge

Prepared by:

Unsigned draft

Edwin Wang, P.Eng., Hydrotechnical Engineer

Enc.

Attachment I - Kilchis River Estuary Porter Tract Restoration Hydrodynamic Model Results – Conceptual Design

DISCLAIMER

This document has been prepared by **Northwest Hydraulic Consultants Ltd.** for the benefit of **Wolf Water Resources** for specific application to the **Kilchis River Estuary**. The information and data contained herein represent **Northwest Hydraulic Consultants Ltd.** best professional judgment in light of the knowledge and information available to **Northwest Hydraulic Consultants Ltd.** at the time of preparation, and was prepared in accordance with generally accepted engineering practices.

Except as required by law, this report and the information and data contained herein are to be treated as confidential and may be used and relied upon only by **Wolf Water Resources**, its officers and employees. **Northwest Hydraulic Consultants Ltd.** denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents.

MANAGEMENT PLAN

Kilchis Estuary Preserve Management Plan 2013-2023

Project/Site Name: Kilchis Estuary Preserve

OWEB Grant Numbers: 212-107 (Dooher); 215-9901 (Porter)

Location: Lower Kilchis River, Tillamook County Oregon

Date: October 18, 2013; Revised June 20, 2014; Revised August 8, 2018

Plan Preparer: Dick Vander Schaaf, Debbie Pickering & Catherine Dunn

dvanderschaaf@tnc.org dpickering@tnc.org cdunn@tnc.org

The Nature Conservancy

Table of Contents

Figures

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Appendices

Introduction

General description of the easement location

The Kilchis Wetlands site (the Property), now known as the Kilchis Estuary Preserve, is located on the lower Kilchis River near Tillamook Bay in Tillamook County, T1S, R10W, Section 12. The site is located between the cities of Bay City and Tillamook, west of Highway 101 and occupies 126.69 acres in two parcels of 66.43 acres referred to as the Dooher tract and 60.26 acres referred to as the Porter tract (Figure 1). The Property was previously managed as pasture for dairy cows and hay production; portions of the Porter tract remain in native tidal wetland habitat. Recently, the landowners abandoned dairy farming and in 2010, The Nature Conservancy (TNC), with assistance from the Oregon Watershed Enhancement Board (OWEB), purchased the Dooher tract for permanent conservation. A conservation easement granted to OWEB covering the tract, was conveyed on August 13, 2012. The Porter tract was acquired in March 2016 with funds provided by a US Fish & Wildlife Service Coastal Wetlands grant to OWEB; a conservation easement was granted to OWEB on July 13, 2016 to cover the Porter tract of the Property.

General site description

The Property is located within the Tillamook Bay watershed which is comprised of five rivers, the Miami, Kilchis, Wilson, Trask and Tillamook, that drain into Tillamook Bay from the Coast Range. The Property lies between the Kilchis River on the south and west and Hathaway Slough on the north with the eastern boundary being defined by Highway 101, Stasek and Nielson Sloughs. Private farmland borders the western edge of the Porter tract (Figure 2). Squeedunk Slough, one of the least degraded Sitka spruce swamps in the Tillamook Bay system, is located across the Kilchis River from the Dooher tract and serves as a reference site for restoration of the preserve.

The property lies mostly below 11.5' elevation, which defines the maximum extent of tidal wetlands in coastal Oregon, indicating much of the land was tidally influenced prior to construction of dikes and ditches for agricultural purposes. This is supported by historic vegetation mapping (Figure 3). The Property is essentially flat with little topographic relief evident; this is due to the general nature of tidal wetlands as well as the long history of agricultural use of the site. Active restoration has been underway at the Dooher tract of the Property since 2015 and restoration has been in the planning stages for the Porter tract since 2018.

Like the other four watersheds in the Tillamook Bay basin, the Kilchis River watershed has lost much of its original estuarine, emergent, scrub-shrub, and forested wetland areas to diking, draining and the conversion of land to agriculture and other human uses. Restoring these tidal habitats including tidal channels at the Kilchis Project area will greatly benefit salmon and is the primary management objective for the site.

The Preserve is located at the transition zone between brackish and fresh water tidal wetlands. Lack of rearing habitat in brackish-fresh water transition zones is one of the primary limiting factors for salmonids in the Kilchis River system. The Kilchis River is a free-flowing (undammed) watershed that drains approximately 46,920 acres (65 sq. miles). The watershed drains the west slope of the relatively low elevation Coast Range and consists of steep sub-drainages. Because of the steep slopes, runoff response during rainfall events is relatively

quick, especially under saturated soil conditions. For example, peak flows are high in magnitude and occur within 24 hours of the peak precipitation. In contrast, dry season flows are relatively low due to high permeability of the tertiary volcanic soils and sedimentary rocks that underlie much of the watershed. (ESA et al. 2013.)

Description of the team or committee that prepared the plan
The management plan for the Property has been prepared by The Nature Conservancy with assistance from consultants, agencies and other organizations. Individuals responsible for drafting this management plan and/or the restoration plan are:

Dick Vander Schaaf, TNC Associate Director, Coast and Marine Program
Debbie Pickering, TNC Oregon Coast Ecologist
Allison Aldous, TNC Wetlands Scientist
Catherine Dunn, TNC Oregon Coast Stewardship Coordinator

Consultation, advice and restoration plan review has been provided by:

Environmental Science Associates (ESA)
Tillamook Estuaries Partnership (TEP)
Estuary Technical Group, Institute for Applied Ecology (ETG)
Oregon Department of Fish & Wildlife (ODFW)
US Fish & Wildlife Service (USFWS)

Summary of OWEB conservation values
The OWEB Conservation Easement authorizes use of the property for recreation, education, or conservation or scientific studies as long as that use does not impair the conservation values of the property. Any activities or uses of the property that are inconsistent with the purposes of the conservation easement or detrimental to the conservation values of the property are prohibited including: subdividing, commercial activities, construction, altering the land surface or water courses, dumping, off-road vehicle or bicycle use, discharging firearms, and releasing hazardous substances.

Conservation Values from the Kilchis River (Dooher) Conservation Easement Baseline Inventory Documentation Report (Vander Schaaf 2012):

The conservation values of the Dooher tract reside in its tremendous restoration potential for salmon species that utilize tidal wetlands and tidal channels. Since fall 2015 the site has been reconnected to river and tidal flows, agricultural ditches have been filled and revegetation activities have restored historic wetland and riparian habitats.

The 2015 Dooher tract restoration removed dikes from the Kilchis River and Stasek Slough, revegetated riparian habitats along these waterways, re-created tidal channels within the interior of the site, and revegetated the entire site with native tidal marsh species (Figure 9). The riparian habitat supports bird species such as rufous hummingbird, willow flycatcher, and Pacific-slope flycatcher. The site also provides habitat for bald eagle, great-blue heron, and northern red-legged frog. The restored tidal marsh habitat supports wetland bird species, provides resting spots for juvenile salmon during high flows, and is key to the high primary productivity that characterizes coastal estuaries.

Most of the restored Dooher tract is tidally-influenced wetland habitat. Prior to restoration the 66 acre Dooher tract was managed as pasture for dairy farming operations. Tidal channels were no longer present and only a portion of Stasek Slough remained as it had become disconnected from the river. Prior to restoration Stasek Slough drained to Hathaway Slough through a ditch that is on the Porter tract of the Preserve (see Figure 2). Restoration of the Dooher tract focused on reconnecting Stasek Slough to the Kilchis River and restoring hydrologic connectivity throughout the site.

Conservation Values from the Kilchis River (Porter) Conservation Easement Baseline Inventory Documentation Report (Vander Schaaf 2016):

Approximately 33 acres of the 60 acre Porter tract is covered in native tidal wetland vegetation, primarily high salt marsh (Cowardin class E2EMP) grading into scrub-shrub tidal wetlands (Cowardin class E2SSP) on the higher ground. The tidal wetlands are dominated by Lyngby sedge (*Carex lyngbyei*) and Pacific silverweed (*Potentilla anserina*) with Sitka spruce and twinberry (*Lonicera involucrata*) on suitable micro-sites. The native tidal wetland is located between Hathaway Slough and an unnamed tidal channel off the slough (Figure 10). The native marsh is dissected by many sinuous tidal channels that provide high-quality estuarine habitat for fish and wildlife. The remainder of the Porter tract is covered by pastures that are dominated by introduced pasture grasses but still retain patches of native wetland vegetation such as spikerush (*Eleocharis sp.*) and native sedges (*Carex sp.*). The pastures on the property regularly flood during high tides and during high winter-time river flows; ditches and water control structures currently drain the pastures.

Healthy Watershed Function

The restored riparian and wetland habitats on the Property will be very important for future watershed function, because they will shade the Kilchis River and tidal sloughs, serve as a source of wood and vegetative input to the tidal system, provide habitat for wildlife and collect sediment and woody debris during winter storm events. Preserving the eventual integrity of the Property's wetlands will help to maintain water temperature, sediment load, and nutrient balance, thereby benefitting water quality in the Kilchis River and associated tidelands.

Sloughs, tidal marshes, and riparian habitat are important for salmonid species in the Kilchis River which include chum, coho, Chinook, winter steelhead and sea-run cutthroat trout. The salmon utilize these habitats during rearing and migration phases of their lives. During winter high flows, sloughs and tidal wetlands provide off-channel refugia to juvenile salmon, protecting them from floodwaters that may injure juvenile fish and/or transport them prematurely out to sea. Restoring the Property to naturally functioning wetlands will benefit salmonids and a host of other OWEB priority species.

The restored Dooher tract includes 0.8 miles of one side of the Kilchis River to the south and west of the property, and over 3.6 miles of tidal channels including Stasek and Nielson Sloughs, for a total of 4.2 stream miles. In addition to the restored waterways, the entire tract (66 acres) has been planted with native tidal wetland vegetation appropriate to the habitats at the site.

The proposed restoration design (Figure 14) for the Porter tract (Wolf Water Resources 2017) will

result in 3700' of recreated tidal channels and 1900' of dikes removed to improve the hydrologic function of the site. Approximately half of the 60-acre site will undergo revegetation activities that will focus on planting native wetland-compatible species and invasive weed treatments. The Porter restoration will also remove and/or correct several water control structures that currently impede normal hydrologic function at the site.

OWEB Priority Ecological Systems- based on the completed restoration for the Dooher tract (Figure 5):

- Tidal Spruce Swamp - 30 acres
- Tidal Marsh (scrub-shrub) - 20 acres
- Riparian Forest/woodland - 16 acres

OWEB Priority Ecological Systems- based on the proposed conceptual restoration plan for the Porter tract (Figure 6):

- Tidal Spruce Swamp - 26 acres
- Tidal Marsh - 32 acres
- Riparian Forest/woodland - 2 acres

The Tidal Marsh ecological system at the Dooher tract is primarily represented by scrub-shrub plant communities dominated by Hookers willow, twinberry, red elderberry and Douglas spirea. At slightly lower elevations in the Project area the Tidal Marsh ecological system is represented by herbaceous plant communities dominated by slough sedge, Lyngby sedge, small-fruited bulrush and tufted hairgrass. The herbaceous tidal marsh plant communities occupy less than an acre on the Dooher tract and are not the primary focus of marsh revegetation activities there. In contrast, the 33 acre native marsh on the Porter tract (Figure 10) is dominated by herbaceous tidal marsh communities with small inclusions of Spruce Swamp habitat, hence, this community is much more prominently represented on this tract. Re-establishing woody vegetation has been the primary focus of our revegetation efforts at both the Dooher and Porter tracts as it is consistent with the goals of restoring the priority ecological systems noted above.

At-risk Plant Communities

This project does not conserve any OWEB priority at-risk plant communities. However, it restores a significant area of potential Sitka spruce swamp habitat which has suffered the greatest percentage losses of any coastal wetland communities in Oregon. Sitka spruce swamps occur at the interface of tidal saltwater and freshwater habitats. Tidal spruce swamps used to dominate the Tillamook Basin and provide protective rearing habitat for salmon smolts during high water. The swamps are also important roosting habitat for raptors and provide potential nesting habitat for marbled murrelets and great blue herons.

OWEB Priority Species

- Chum Salmon
- Coho Salmon (listed as Threatened under the federal Endangered Species Act)
- Steelhead

  Northern red-legged frog
- Marbled murrelet

- Bald Eagle - possible nest sites
- Great-blue Heron - possible nest sites
- Dunlin
- Band-tailed pigeon
- Pacific slope flycatcher
- Willow flycatcher
- Rufous hummingbird

Additional animal species that might benefit from this project are listed in Table 1.

Landowner coordination:
The Kilchis River is bordered by a dike extending westward from Possetti Road that has restricted high flows and floodwaters from accessing the adjacent lands which include the Dooher tract of the Preserve. A non-exclusive access easement with the previous owners, Sean and Judy Dooher, established by Partition Plat 2010-20 and further described by an easement recorded as document #2010-006978, allows for repair and maintenance of approximately 100 feet of the dike beyond the TNC Dooher tract boundary to protect the Dooher barns and structures from flooding in an emergency. This portion of the dike was not removed in the 2015 restoration activities at the site. Along with the sale of the property, the Dooher's also granted two access easements to the Conservancy across their retained home site property and the dike easement the Conservancy granted to them (Figure 7).

A power line was once located on the Dooher tract but has been removed. The holder of the power line easement was not willing to remove the easement from the Property's title.

Private lands border the Dooher tract across Stasek Slough to the east and across the Kilchis River to the south and west of the Preserve. These lands are accessed via roads that are not associated with the Preserve properties.

The Porter tract has a 0.1 acre private inholding owned by Ben and Marylou Hathaway located along the banks of Stasek Slough that does not have a legal access easement attached to it (Figure 11). The small inholding is marked on the ground with corner fence posts and has been located by a recorded survey. The Porter tract is crossed by the Port of Tillamook Bay railroad line that includes a defined ownership along the line that runs parallel to Highway 101 on the eastern edge of the tract. Access to the Porter tract is from Highway 101 and across the railroad tracks at an unimproved crossing (Figure 11). The western edge of the Porter tract borders farmland owned by Gienger Farms. The 8 acre farmland is managed for grass production and is accessed by Geingers by crossing the Kilchis River at a shallow ford during low flows. The northern boundary of the Porter tract lies along Hathaway Slough, a natural tidal waterway that connects with the Kilchis River and Tillamook Bay. Properties on north side of Hathaway Slough include farmland and natural wetlands.

There are no other reserved rights in the deeds or conservation easements for the Property.

The expressed landowner rights that are included in the Kilchis Project properties are managed through regular, informal contacts with the specific landowners. The primary landowners with rights are Shawn and Judy Dooher who live next door to the Dooher tract of the Preserve. TNC staff meets informally with Shawn Dooher several times a year to discuss any management issues

that may have arisen. This arrangement has been sufficient and there is no anticipated need to change it. TNC has been meeting with Mike Prince, a neighbor of the Porter tract, regarding restoration plans for the site. As engineering plans are formalized in late 2018, TNC will spend more time with Prince to jointly examine the plans and discuss restoration activities.

TNC has had regular interactions with Geinger Farms who are neighbors across the Kilchis River to the west and own farmland adjacent to the Porter tract. During the Porter acquisition, TNC and Geinger Farms worked together to resolve taxlot boundary discrepancies and to adjust ownerships that resulted in more native wetland habitat in TNC ownership and more farmland in Geinger ownership. We continue to discuss activities with Geinger Farms regularly and have a good working relationship with them.

Adjacent land uses and landscape context

Land use in low-lying portions of the Tillamook Bay watershed is dominated by dairy farming. The uplands are state and private forest lands and are used primarily for timber production. Rural residential development is increasing at the fringes of the lowlands that border the upland forests. Simplification of riparian habitats has resulted in the loss of backwater and tidal channels; reduction in tidal wetland habitat is primarily due to conversion to agriculture, ditching and diking activities. Water quality issues from agricultural land uses are also a concern to the conservation values of the Tillamook Bay watershed.

The Property borders active dairy farms on several sides. Most of the neighboring farmlands are protected by dikes as they mostly lie below the elevation of maximum tidal extent (11.5'). Farmlands not protected by dikes are prone to inundation during higher high tides and high river flows. Three single-family residences are adjacent to the eastern boundary of the Dooher tract but there are no residences adjacent to the Porter tract. (Figure 2).

History

The Property is near a documented Native American village site at Kilchis Point that lies approximately 1 mile to the north (see Figure 3). Historically the Property was at the edge of Tillamook Bay in the early 1900s and may have been too wet for year-round occupancy but it could have been utilized for seasonal fishing and natural resources gathering. Tillamook Basin was settled in the mid to late 1800s with dairy farming becoming the dominant use in the lowlands. A cultural resource survey of the Dooher tract prior to restoration activities in 2015 revealed no cultural resources. Similar surveys will be conducted on the Porter tract before restoration activities begin there.

Past site alterations and disturbances

Historically, the site was covered by tidal marsh and Sitka spruce swamp, but it was diked off from river and tidal flow in the early 1900s to convert the land to agricultural uses. Ditches were dug to drain the wetlands and pasture grasses were planted for improved forage for dairy cows. The land surface has subsided in parts of the Dooher tract relative to historic elevations due to intensive agricultural use. Subsidence does not appear to be as much of an issue on the Porter tract as it wasn't as intensively farmed as the Dooher tract and tides are not as restricted on this tract.

There are many water control structures including tide gates on the Property that facilitated pasture drainage on the farms, enhancing agricultural use of the site and restricting tidal

inundation during most tide cycles. These structures have been removed on the Dooher tract as part of the site restoration and will be removed on the Porter tract as part of the planned restoration work there.

A conceptual restoration plan has been developed for the Porter tract by Wolf Water Resources (W2R 2017). Ditches and low dikes or levees along sloughs exist on half the property with the remaining portion of the site composed of natural tidal marsh with no restrictive dikes (Figure 12). The Porter tract was approximately half spruce swamp and half tidal marsh habitat before conversion to farmland.

In addition to the dikes and ditches mentioned above, the pastures were leveled and smaller tidal channels were obliterated. Farming also required removal of the Sitka spruce and other woody vegetation to support cultivation of forage species for dairy herds. During the restoration work on the Dooher tract, buried logs were regularly encountered as tidal channels were being excavated.

A power line was once located on the Dooher tract but has been removed. The holder of the power line easement was not willing to remove the easement from the Property's title.

Purpose and Goals

The overall goal of the project is to restore estuarine habitat for special status and other native estuarine-dependent species on the Kilchis Estuary Preserve, to the maximum extent possible while minimizing negative impacts to neighboring properties.

More specifically, the focus at this site is to:

- Restore freshwater and tidal connections
- Provide off-channel rearing habitat for salmonids and marine species
- Provide prudent protection of neighboring properties
- Restore tidal wetland and riparian plant communities
- Increase climate change resilience of the site and its aquatic habitats, through restoration of natural hydrologic and sedimentation processes
- Contribute to the improved understanding of tidal wetland restoration planning, design, and project construction by using a science-based adaptive management approach.

The two tracts will require extensive restoration overall to return them to functioning natural wetlands.

Restoration activities began at the Dooher tract in 2015 and included eliminating agricultural activities, re-creating 8600' of tidal channels, planting tidal marsh and riparian vegetation across the entire 66 acre site, filling 5000' of existing ditches and removing water control structures as needed within the Property, and lowering 3700' of dikes along the Kilchis River and Stasek Sloughs to restore tidal and riverine flows. All this without disturbing or increasing flooding on neighboring properties. Additionally, measures have been taken to control and/or eradicate invasive species from the Property. In 2016 and 2017 re-vegetation of the entire Dooher tract took place. The active phase of the Dooher tract restoration is now completed and the Preserve is now managed for general stewardship goals that include suppression of weedy species, monitoring plantings and tidal channels, maintaining plantings to minimize competing vegetation and responding to major site perturbations such as flooding.

Restoration activities planned for the Porter tract include re-creating tidal channels, filling agricultural ditches and removing water control structures, planting half the site with native wetland species to complement the other half of the site that is in native wetland vegetation, and establishing natural hydrologic function in an existing ditch and box culvert system. The ditch and culvert will be re-engineered to provide natural flows between Stasek Slough and Hathaway Slough. Channel crossings will also be developed at the Porter tract to allow for site management and access (Figure 14).

Inventory and Analysis

Restoration planning for the Property has utilized OWEB Technical Assistance Grants #212-1012) for the Dooher tract and # 215-8005 for the Porter tract. A separate grant from the Wildlife Conservation Society was used to develop a hydrodynamic model for the Dooher tract that incorporated the effects of climate change to determine what restoration strategies or actions provided conditions conducive to tidal wetland development. After the initial restoration construction work was completed on the Dooher tract, a major flood event swept through Tillamook Bay in December 2015. A re-survey project including updated hydrodynamic modeling of the lower Kilchis River was completed in 2017 to assess how conditions may have changed at the site post-restoration and flooding. Results from the re-survey project showed that while river bathometric changes did occur, the projected hydrologic benefits of the restoration were still in force and the newly restored tidal wetlands likely acted to reduce overall flood impacts in the area.

The Kilchis River Tidal Wetlands Restoration Conceptual Plan (ESA et al 2013) included extensive inventory and analysis information for the Dooher tract restoration project. Site reconnaissance was conducted in April 2012. Observations focused on site hydrology and flooding, geomorphology, and vegetation. Some portions of this information are excerpted below.

Inventory and analysis of the Porter tract has also been conducted and is referenced in the Feasibility Analysis and Conceptual Restoration Plan for the site (Wolf Water Resources 2017).

Climate

The Oregon coastal climate is characterized by generally moderate temperatures year-round, significant rainfall that falls mainly from the fall through spring months and ranges from 100 inches per year at immediate coastal areas to 160 inches or more in the coastal mountains, and winter storms that bring high winds and rain to the region. The Kilchis Project area receives typical coastal weather with temperatures further moderated by cool coastal fog in the summer. The climate is not stable at the coast, however, as climate change impacts are resulting in a gradual elevation of temperatures by 2 degrees or more by 2050 (Dalton et al 2017), causing drier summers and lower flows in coastal rivers. In addition, the warming climate is responsible for sea level rise effects that will bring potentially dramatic changes in coastal estuaries and tidelands as those found at the Kilchis Wetlands Project area. Climate change is also expected to result in more extreme temperature events and in changes in overall precipitation, although these precipitation changes may not be significant at the coast (Dalton et al 2017). Of greater concern for the Kilchis Project area is the possibility that climate change will result in more frequent and severe storms in coming years that will cause increased coastal flooding and property damage. Coastal flooding will be exacerbated by sea level rise as well in future years. Climate change effects were modeled for the Kilchis Project and factored into the overall restoration design (ESA 2013).

Geology

The Oregon coast has a relatively recent geologic history with the Coast Range emerging from the ocean only 20 million years ago, being formed mostly as pillow basalts under the sea and then uplifted by tectonic action (Bishop and Allen 1996). The flat terrain of the Kilchis Project area is indicative of the depositional origins of the landscape but to the west at Cape Meares, there remains a prominent basalt headland whose origins date back to Columbia River basalt flows from approximately 15 million years ago. The real story of geology of the Kilchis Project area, though, is with the Kilchis River that flows a short 15 miles from its headwaters in the Coast Range to Tillamook Bay. The Kilchis River carries considerable a bedload of sediment and gravel that has been deposited in what is now the Kilchis tidelands. These river-borne depositions have been matched by ocean depositions brought to the site by tides and storms as well as by much larger events such as tsunamis that can change coastal elevations by as much as three feet or more at one time. Because the depositions continue to occur on a regular basis, there is a deep layer of fine materials which include sediments, gravels and organic matter across the Kilchis Project area.

Vegetation

The 126-acre site initially consisted of mostly pastureland that was diked from the Kilchis River and sloughs since prior to the 1930s. Native wetlands were present on approximately half of the Porter tract (Figure 10) but the remaining lands on the Porter tract and all the Dooher tract were covered by non-native pasture grasses. Pre-restoration vegetative conditions are described in the conceptual restoration plans (ESA 2012 and W2R 2017) from various locations on the project site and included in Table 2. Plant species names from this inventory are summarized in Table 3.

Restoration activities began on the Dooher tract in 2015 and re-vegetation actions over the course of 2016-2017 resulted in the entire 66 acre tract being re-vegetated with native species. Elevation, inundation regime (both tidal and fluvial), and post-restoration salinity and groundwater regimes are key determinants of the post-restoration habitat targets for the site (Figure 5). Plantings included over 16 native species, mostly trees and shrubs, with over 170,000 individual plants installed. The most commonly planted species included:

- 120,000 Hookers willow
- 8500 Sitka spruce
- 15,000 Twinberry
- 11,500 Douglas spirea
- 2800 Red elderberry

Willows were the dominant species planted in the scrub-shrub tidal marsh habitat and were also planted heavily in both the spruce swamp and riparian habitats (Figure 5). Protective cages have been installed on approximately 2200 plants, mostly spruce, redcedar and cottonwood to reduce beaver damage.

On the Porter tract, groundwork restoration activities are in the planning stages as of 2018 but re-vegetation activities began in winter 2018 on approximately 13 acres (Figure 16). The areas of re-vegetation are largely outside of the planned ground-disturbing actions. As with the Dooher tract re-vegetation, the most commonly planted species was Hookers willow with Sitka spruce, Douglas spirea and twinberry also included in the plantings. The remainder of the re-vegetation work on the Porter tract will occur after the groundwork restoration is completed. The native wetlands on the Porter tract (Figure 10) are dominated by slough sedge (*Carex obnupta*) and Lyngby sedge (*Carex lyngbeyi*).

On both the Dooher and Porter tracts, TNC has done some experimental planting of herbaceous plugs in areas that have proved particularly challenging to revegetating with woody species due to low elevations that are impacted by more brackish waters or tend to remain wetter and don't dry out between tides. The planted species have included slough sedge,Lyngby sedge, and small-fruited bulrush, but overall areas covered by these planting actions have been small, less than an acre in total.

Hydrology

The Kilchis Project area is influenced hydrologically by the Kilchis River as well as by Tillamook Bay and nearby tidal sloughs: Hathaway, Stasek, Nielson and Squeedunk, that connect the bay to Project area (Figure 1). The Kilchis River flows through an unimpaired watershed that drains approximately 46,920 acres (65 sq. miles). The steeply-sloped watershed is located on the west slope of the relatively low elevation Coast Range. Because of the steep slope, runoff response during rainfall events is relatively quick, especially under saturated ambient soil conditions. For example, peak flows are high in magnitude and occur with 24 hours of the peak precipitation. In contrast, dry season flows are relatively low due to high permeability of the tertiary volcanic soils and sedimentary rocks that underlie much of the watershed. The results are extreme seasonal flow variability, with high stream flows in the wet season and low flows in the dry season (Follensbee 1998).

One of the primary objectives of the Kilchis restoration project is to restore tidal function to the site which has, for the most part, been cut off from tidal connectivity for 80 years. Connectivity has been restored to the Dooher tract (see restoration plan in Figure 9) that recreated tidal sloughs and connected them to the Kilchis River as well as reconnected the Kilchis River floodplain to the wetlands by lowering dikes. The Porter tract is partially connected to tides along the lower reaches of Hathaway Slough with full connectivity restored across the entire site after the proposed restoration is completed (Figure 14).

Tidal datums and extreme tides for the project site are documented below in Table 1.

Table 1. Tidal and extreme water levels.

Datum / Recurrence Interval	NOAA Gage at Garibaldi – For Reference (Feet NAVD88)	Water Level (Feet NAVD88)
FEMA Base Flood	--	11 – 12*
50-Yr	--	11.8
25-Yr	--	11.6
10-Yr	--	11.5
Highest obs. / Ord. high water (OHW)	11.55	11.42
MHHW	7.93	7.80
MHW	7.22	7.01
MTL	4.10	3.89
MLW	0.98	0.98
NAVD88	--	0.00

MLLW	-0.38	-0.33

Source: ESA PWA 2013

Note that ordinary high water at the site was taken to be approximately equivalent to the recent, observed high water level (i.e., still water level) in the period of record. Storm surge and wave runup may result in total water levels above the still water level that is recorded at NOAA and other gaging stations.

FEMA Flood Characterization

Increasing flood risk to neighboring properties is a primary feasibility consideration because restoration relies upon lowering dikes and removal of tide gates on the property. As with most estuary systems, flooding near the project is a function of tidal water levels in combination with Kilchis River winter flows during high precipitation events. It was noted during the 2012 site visit that it was the perception of the previous landowners (Doohers) that flooding of the site typically originates from Tillamook Bay, when tidal waters overtop the Kilchis River dike and Hathaway Slough located downstream (north) of the project site (ESA 2012).

All properties adjacent to and including the wetland are within the 100-year floodplain. These areas are completely inundated during base flood events by water levels reaching 14 feet and higher NAVD88 according to the FEMA Flood Insurance Rate Map. During events of this magnitude, most of the enhanced levees and dikes are overtopped. Hydrodynamic modeling of the project has shown that restoration will have no impact on flood levels during these extreme events.

Soils

The NRCS maps two soil types on the site: Coquille silt loam (diked) and Nehalem silt loam (frequently flooded) (Figure 8). Coquille silt loams are extensive within Oregon's tidal wetlands (Brophy 2007); Nehalem soils form on alluvium in floodplains of Oregon's coastal rivers.

Fish and Wildlife

The Kilchis Project area is dominated by tidal marshes that provide habitat for number of fish and wildlife species. The Kilchis River hosts several anadromous fish species that pass through the Project area as both out-migrating smolts and incoming adult fish. These species include Pacific chum salmon, Chinook salmon, coho salmon, steelhead and searun cutthroat trout. The restored tidal marshes and tidal channels on the Dooher tract provide critical over-winter habitat for juvenile salmon, giving them refuge during high river flow events in backwater habitats.

In addition to salmon species, there are estuary fish species that are also found in the Project area. These may include three-spine stickleback, shiner perch and sculpin species as well as transient juvenile marine fish species as well (Ellis 2002). At the lower reaches of the site, where tidal influences are strongest there may also be occasional use by juvenile stages of marine invertebrate species such as Dungeness crab.

The tidal wetlands and sloughs also provide habitat for many avian species. Ducks including mallards, canvasbacks, pintails and teal are commonly encountered at the site while common and hooded mergansers along with belted kingfishers can be found in the reach of the Kilchis River that adjoins the Project area. There are also many common wetland and shorebirds such as snipe, great blue heron, egrets, sandpiper and killdeer found at the site as well as western gulls that are ubiquitous throughout the area. Lastly, birds of prey including bald eagle, barn owls and red-

tailed hawks roost in the riparian area and prey on wildlife at the site.
Many other species of wildlife are more secretive than birds and fish species at the Project area but some common ones that are known to frequent the site include beaver, muskrat, nutria, field mice, voles and deer and elk on occasion. The restoration of the tidal marshes and accompanying sloughs at the site is enriching habitats for fish and wildlife leading to more diverse assemblages of species and greatly increased numbers of some of the target fish species such as salmon.

Infrastructure
The Kilchis Project area tracts were previously managed as dairy farms and had related infrastructure associated with such enterprises included in the initial acquisitions. While neither the Dooher nor the Porter tracts had any structures on them (barns, sheds, homes) there were dikes, ditches, fences and water control structures on the properties. In addition, on the Porter tract there is a railroad track located on an elevated berm that spans the property near the eastern boundary (Figure 1).

With restoration of the Dooher tract, all ditches, interior dikes, fencing and water control structures have been removed. The dike that borders the Kilchis River has had two sections removed to allow for flood and tidal flows onto the restored wetlands; the removed sections totaled 1250 linear feet or approximately half of the dike along the river on the Dooher tract.

The proposed restoration for the Porter tract (Figure 14) calls for removal of dikes along Hathaway Slough totally 280 linear feet and removal of low dikes along Stasek Slough. Dike removal will allow for full tidal exchange to occur within the restored wetlands. All dikes removed on Dooher and Porter tracts are being lowered to the 2 year flood elevation or 9 feet.

The existing railroad on the Porter tract is owned by the Port of Tillamook Bay. The railroad is currently leased to the Oregon Coast Scenic Railroad and most recently (2017-2018) is used by a Railriders venture that leads self-propelled rides on specially designed railcars. The rail line is maintained by selective brush cutting by the owner or lease and poses no threats to management or restoration of the Kilchis Preserve.

Cultural, Educational, and Aesthetic Resources
The Kilchis Preserve is located near a culturally rich site, Kilchis Point, in Tillamook Bay. Native Americans were known to use the Bay for its abundant natural resources and land surveys dating back to the GLO land surveys in the mid-1800s identified a village site potentially on the Dooher tract. To reduce the chance of disturbing cultural resources during restoration of the Dooher tract, TNC contracted for a cultural resource survey (Connolly and Hodges 2014). The survey did not detect significant cultural resources but did recommend that a trained archeologist be present during excavation activities associated with the restoration construction in 2015. No significant cultural resources were discovered during restoration. Similar cultural resource surveys will be undertaken during the planned restoration of the Porter tract in the future.

The Kilchis Preserve presents unique educational opportunities for tidal restoration practitioners and for persons interested in tidal wetland function in an agricultural landscape. Tours have been led on both the restored Dooher tract and the yet to be restored Porter tract to highlight these aspects at each site. TNC has given several presentations regarding the planning and restoration of the tidal marsh habitats at both local and national conferences with a special focus on how climate change impacts have been factored into the restoration design.

The Kilchis Preserve is not currently open to the public doe to a lack of suitable public access to the site. However, TNC is available to lead tours of the site to interested parties and can accommodate reasonable requests for visits with advance notification. Aesthetic resources at the Kilchis Preserve are noted by all who visit the site as well as by those who are site managers. The restored wetlands and tidal channels are vibrant examples of the immense productivity of tidal marshes and the ever presence of waterfowl and other bird species coupled with fall salmon runs give one an up-close seat of coastal nature viewing.

Priority Habitats and Current Conditions

The Kilchis Preserve is comprised on two adjoining tracts, the Dooher tract and the Porter tract immediately to the north (Figure 2); the tracts are separated by Stasek Slough which was restored to its former configuration during the Dooher wetland restoration project of 2015. The current condition of the Kilchis Project area is portrayed in a 2017 aerial image (Figure 2) showing the recreated tidal channels, lowered dikes, and complete re-vegetation of the Dooher tract. The 2017 image also shows the site preparation on the Porter tract that has focused on invasive species management; large areas of tan-colored vegetation have been treated and were planted by native wetland species in early 2018 (see Figure 17 for target habitats for revegetation activities).

As noted previously in the Summary of OWEB Conservation Values (p. 5 and Figure 5), the priority habitats at the Kilchis Preserve are the tidal wetlands, tidal channels and riparian areas that are present in either potential, existing or restored conditions depending on location and current restoration status. These habitats function in a complementary fashion with one another and cannot exist alone or without the necessary inputs that can be attributed to the other habitats. The completed restoration of the Dooher tract has led to the immediate use of these habitats by salmon species and other wetland dependent species including waterfowl. The planned restoration of the Porter tract will yield additional benefits for salmon and other species with more priority habitats including tidal wetlands and tidal channels being restored and recreated. The priority wetland habitats for both the Dooher and Porter tracts are shown in Figure 5, the restored tidal channels for the Dooher tract are shown in Figure 2 (2017) and the proposed restored tidal channels for the Porter tract are shown in Figure 14.

Inventory Data Analysis and Prioritized Resource Concerns

The inventory data for the Kilchis Project area and the surrounding Tillamook Bay estuary shows that tidal wetlands and more specifically, tidal freshwater wetland habitats that are characterized as Sitka spruce swamps have been significantly reduced in the area. This loss of habitat has constrained recovery of salmon species in Tillamook Bay which are dependent upon tidal marshes for juvenile rearing and for protection from high winter flows. The Kilchis Project area lies at the intersection of tidal freshwater and tidal saltwater marsh habitats. It provided a unique opportunity restore a transition zone that can serve existing habitat needs as well as future needs when climate change impacts may alter tidal marsh distribution.

Another feature of the Kilchis Project area is that it is located at a reach of the river that can deliver considerable sediment to its floodplain. This is critical for restoration purposes as portions of the Dooher tract have subsided after 80 years of farming activities. Using the river to naturally deliver sediments is an efficient and effective means to return the site elevation back to normal values relative to the surrounding lands.

Site inventory also showed that the Kilchis Project area was uniquely situated in that restoration of

the site would have minimal effects on neighboring properties. The Dooher tract is mostly surrounded by waterways with the Kilchis River bordering it on two sides and Stasek and Neilson Sloughs all but surrounding it on the remaining sides. The Porter tract complements the Dooher tract as it includes transitions to lower elevation tidal marshes including emergent tidal marsh habitat that is dominated by Lyngby sedge. Again, restoration of the Porter tract will have minimal impacts on neighboring properties as there are both natural barriers to effects such as sloughs as well as manmade barriers such as Highway 101 on its eastern border.

The highest priority for the Kilchis Project is to restore tidal wetlands and the associated tidal channels to provide habitat for juvenile salmon and other species. As noted above and in previous sections, tidal wetlands have suffered significant losses statewide and within Tillamook Bay these losses are upwards to 80% for tidal marshes (TBNEP 1998). Restoring tidal marshes in the lower Kilchis River will increase the overall area of functional marsh habitat in the Bay and will serve as protective over-winter habitat for juvenile salmonids in the Kilchis River system.

Another resource concern is that the continuing impacts of climate change like sea level rise will make future restoration of tidal marshes more and more difficult when it involves subsided farmlands. Subsided lands can be up to 6 feet lower than native wetlands in the same area due to ongoing farming activities. To restore subsided lands to tidal marshes requires accretion of sediments onto the marsh to elevations that will support emergent and/or woody marsh vegetation. If there is no addition of sediment the areas will become deeper water estuary habitats that are not as important to target salmon species and are much more difficult to restore to tidal marshes after the subsided areas are hydrologically reconnected. Sea level rise is continuing and will flood tidal marshes if they don't continue to receive sediments, even sites that may currently be at elevations that support tidal marsh habitats. The Kilchis Project will continue to receive regular sediment inputs that will dampen impacts of sea level rise on marsh elevations.

Threats to Conservation and Priorities for Restoration

The primary remaining conservation threat to the site that can be addressed by restoration is the lack of hydrologic connectivity across the Porter tract which includes the wetland floodplain, Stasek Slough and tidal influences of Tillamook Bay. The scope and severity of this threat are both very high; it is reversible though with a reasonable commitment of resources for restoration. Without this connectivity there cannot be effective use of the Porter tract by wildlife, especially salmon species that would use the area for juvenile rearing and refuge during periods of high water.

The Dooher tract has been successfully restored and revegetated with native wetland species as of 2018; managing invasive species is a regular stewardship activity for the tract. The previously farmed portion of the Porter tract is dominated by non-native pasture grasses with patches of the invasive reed canarygrass. There are also invasive blackberries, Canada thistle, and a few patches of English ivy mostly along the railroad berm. The scope and severity of the threat of invasive species is medium as revegetation contractors are aggressively attacking these species. Restoration of tidal inundation and return of natural hydrology will help eliminate the pasture grasses. Planting of native species and mowing of competing vegetation around the plantings should eventually suppress the reed canarygrass. The blackberries, thistle, and ivy will require ongoing maintenance. Overall the impacts of this threat are reversible with a commitment of resources for stewardship. Nutria are reported to be present at the site and they can be quite destructive of marsh habitats. More information will be needed about their abundance following

restoration to inform appropriate management.

One overarching threat to the Kilchis Project area is the long-term impact of climate change on coastal and estuary ecosystems. Projected climate change in the next 20-50 years is not expected to eliminate the conservation values of the property, making the severity of this threat during the term of this management plan lower. However, projected impacts of climate change between 50-100 years from now on the Oregon Coast include: sea level rise, increased storm intensity, increased temperature, changes in ocean chemistry and changes in the timing and pattern of precipitation. These changes may modify the long-term composition of the preserve's wetlands, but the site will retain important conservation values as habitat for aquatic and estuarine-dependent species. While the irreversibility of climate change itself is very high, its effects can be mitigated to a certain extent through restoration of natural processes such as tidal flows and sedimentation or accretion at the site. Restoration of native vegetation on the property can help reduce long-term threats by providing a natural buffer from the impacts of increased storm intensity. Plans to restore connectivity of the Porter tract wetlands and adjacent tidal sloughs will help to re- establish natural sediment regimes there, which will counteract some of the impacts of sea level rise. Reconnection has occurred on the Dooher tract and benefits from this have already begun with sediment deposition during high winter flows.

In summary, the priority threats to conservation values at the Kilchis Project area include ongoing hydrologic connectivity issues primarily on the Porter tract, and the overarching threat of climate change impacts that impact tidal wetlands and coastal areas in general. If one was to rate these threats, climate change would be the number one threat in scope, severity and irreversibility. That being stated, the Kilchis Project area does have some ability to counteract sea level rise impacts through marsh level accretion, especially on the Dooher tract which can directly receive sediments from the Kilchis River. Restoring hydrologic connectivity is key to mitigating sea level rise impacts; restoring tidal flows to the wetlands will also assist with invasive species management as many species are negatively affected by saline waters.

Desired Future Conditions

Most of the Property is former tidally-influenced wetland habitat. Long-term desired future conditions for the restored property are defined below for each of the tracts.

Dooher Tract

Restoration of the Dooher tract was initiated in 2015 with earthworks construction. Re-vegetation of the site continued for the following two years with plant establishment activities planned to continue until 2020. Restoration activities at the site are shown in Figure 9 with the exception of the low berm that was deemed not needed in the final engineering plan (ESA 2014).

1. Reconnection of Stasek Slough to the Kilchis River and recreating tidal channels will increase the quantity and quality of rearing areas and off-channel refugia available to salmonids as well as provide off-channel habitat for many marine species that are present in Oregon's estuaries;
2. Filled drainage ditches will result in a higher groundwater table, lower water temperatures, and increased base flow;
3. Lowered dikes will allow more natural water flow (both tidal and riverine) and sediment dynamics contributing to restoration of native wetland communities

including tidal marsh, forested swamps, and tidally-influenced freshwater wetlands;
4. Re-established native wetland plant communities will have only a minor component of non-native species thus enhancing their ecological functioning and resilience to climate change;
5. Restored riparian and forested swamp habitats will shade the Kilchis River and Stasek Slough, serve as a source of wood input, and collect sediment and woody debris during winter storm events;
6. Large wood in the channels will add complexity, enhance salmonid rearing and refuge in side channels, and foster invertebrate populations that are important prey for fish;
7. Large wood in the wetland areas will provide important habitat for amphibians, small mammals, birds and reptiles and will serve as establishment sites for spruce, hemlock, and non- wetland understory species, such as salal and huckleberry, adding diversity to the habitat; and
8. The restored site will provide high quality nesting, feeding, and nursery areas for a diverse array of at-risk fish and wildlife species, such as northern red-legged frog, bald eagle, peregrine falcon, Pacific lamprey, chum salmon, and federally threatened Oregon Coast coho salmon.

For a complete discussion of the completed restoration work for the Dooher tract, see Kilchis River (Dooher) Basis of Design Report, Plans and Specifications (ESA et al. 2014) and the Kilchis River (Dooher) As-Constructed Plans (ESA 2014).

Porter Tract

1. Recreated tidal channels will increase the quantity and quality of rearing areas and off-channel refugia available to salmonids as well as provide off-channel habitat for many marine species that are present in Oregon's estuaries;
2. Filled drainage ditches and removed water control structures will result in a higher groundwater table, lower water temperatures, and increased base flow;
3. Lowered dikes along Stasek and Hathaway Sloughs will allow for more regular tidal flows and sediment dynamics contributing to restoration of native wetland communities including tidal marsh, forested swamps, and tidally-influenced freshwater wetlands;
4. Re-established native wetland plant communities will have only a minor component of non-native species thus enhancing their ecological functioning and resilience to climate change;
5. Restored riparian and forested swamp habitats will serve as a source of wood input and collect sediment and woody debris during winter storm events;
6. Large wood in the channels will add complexity, enhance salmonid rearing and refuge in side channels, and foster invertebrate populations that are important prey for fish;
7. Large wood in the wetland areas will provide important habitat for amphibians, small mammals, birds and reptiles and will serve as establishment sites for spruce, hemlock, and non- wetland understory species, such as salal and huckleberry, adding diversity to the habitat;
8. Re-engineered connector ditch between Stasek and Hathaway Sloughs will increase connectivity between the two waterways and allow for greater tidal exchange on the Dooher tract;
9. The restored site will provide high quality nesting, feeding, and nursery areas for a

diverse array of at-risk fish and wildlife species, such as northern red-legged frog, bald eagle, peregrine falcon, Pacific lamprey, chum salmon, and federally threatened Oregon Coast coho salmon; and

10. Restricted-use bridges will create safe access to all parts of the tract over sloughs and channels.

For a more complete discussion of the proposed restoration work on the Porter tract and desired future condition see Porter Tract Restoration Conceptual Plan (W2R 2017).

Priority Management Strategies

The basic management strategy for the Property is to restore hydrologic ecological functions to the site by reconnecting the former wetlands to the river and sloughs through dike lowering and tidal channel reconstruction followed by planting of native species.

Restoration planning for the site was supported by a OWEB Technical Assistance Grants. Contractors (ESA and W2R) provided hydrodynamic modeling, engineering considerations and restoration scenarios evaluation. The contractors met regularly with TNC and other knowledgeable experts (for the Dooher tract) including: Rachel Hagerty, TEP restoration coordinator; Laura Brophy, ETG Director and estuary restoration consultant; and Amy Horstman, USFWS restoration biologist. Restoration principles for the site were developed and many site design factors were discussed and evaluated for use in the final concept plans. OWEB project review teams also were involved in both the Dooher and Porter restoration projects at numerous times. OWEB teams reviewed and commented on plans during acquisition, technical assistance and restoration grant phases of each of the projects. This resulted in input from team members who had varied backgrounds and perspectives and allowed for an iterative process for the development of restoration plans.

The Porter restoration planning benefited significantly from the Dooher tract restoration which was implemented in 2015 with earthworks construction followed by re-vegetation in 2016-2017. Consultation for the Porter tract restoration involved experts from TEP, USFWS and the Army Corps of Engineers. Porter tract restoration construction is planned for 2019-2020.

The Dooher tract restoration plan modeled two potential restoration scenarios. The first scenario would reconnect Stasek Slough to the Kilchis River and create several tidal channels on the Property but wouldn't lower the dike that restricts the Kilchis River from the site and its floodplain. The second scenario included lowering of the Kilchis dike along with the restoration actions in the first scenario. Both restoration scenarios were evaluated using a hydrodynamic model to predict resulting water elevations on the Property, in tidal channels and sloughs, and on adjacent lands under several hydrologic regimes that included: 1) peak river and tidal flows (winter storm), 2) highest tide with normal river flow, and 3) average high tide with normal river flow. In addition, the chosen design was evaluated under projected 2050 and 2100 climate change impacts for precipitation and sea level rise (ESA PWA et al. 2013).

The Kilchis dike lowering design (Figure 9) was selected because it restored full tidal function to the site to a far greater extent than more limited restoration scenarios. The tidal exchange under this design was more extensive on the site even during moderate high tides in summer months, which occur when river flows would not be contributing waters to the wetland habitats.

Highlights of the selected design was: 1) restoration and reconnection of Stasek Slough with the Kilchis River, 2) lowering of the Kilchis dike for a significant portion of its length, 3) creation of 2500' of tidal channels, 4) lowering of interior dikes and filling of ditches, and 5) extensive planting of tidal wetland species with an emphasis on spruce swamp restoration, (ESA PWA et al. 2013).

The Porter tract restoration plan follows along closely with the design that was implemented on the Dooher tract with tidal channel re-creation, dike lowering, marsh re-vegetation and reconnecting Stasek Slough with Hathaway Slough via the connector channel (W2R 2017). There are several water control structures to be removed in the Porter design and there will be tidal channel crossings developed for continued access to all parts of the site. The conceptual restoration plan is shown in Figure 14.

Goal 1. Restore freshwater and tidal connections over at least 90% of the property to provide off-channel habitats for salmonids and marine species while providing prudent protection to neighboring properties.

This goal addresses Desired Future Conditions #1, 2, and 3 for both the Dooher and Porter tracts.

Strategy 1.1: Implement restoration plan

Dooher Tract

The Nature Conservancy implemented the preferred restoration alternative for the Dooher tract and conducted the heavy earth-moving phase of the project in summer of 2015. Site restoration required significant site disturbance with considerable earthmoving using heavy equipment to lower a 1500' dike along the Kilchis River, fill nearly a mile of interior ditches, excavate 1600' of fill from Stasek Slough and recreate 2500' of tidal channels. Lowering of the Kilchis dike required careful engineering to leave a natural levee in place that supported riparian habitat development.

Hydrodynamic modeling for the project showed that in most instances the project will result in quicker dissipation of winter high water events because of the increase in off-channel wetland area available for floodwaters. This will have a positive effect on upstream lands and there will be no discernible impacts to downstream lands. Minor increased tidal heights of less than 1' for very limited durations (1 -2 hours) are projected during summer highest tides in localized areas.

Porter Tract

Restoration of the Porter tract is still in the planning stage but initial funding has been secured to initiate engineering, permitting and re-vegetation activities prior to restoration construction work. This initial work is being conducted in 2018 and may continue into 2019. Earthworks construction for the Porter tract is scheduled to occur in 2019-2020.

Half of the Porter tract is a natural tidal marsh in good condition that requires no major restoration efforts other than invasive species abatement. The remainder of the Porter tract will require extensive restoration akin to that which was conducted on the Dooher tract. One of the major aspects of the Porter tract restoration is restoring connectivity between the connector channel and Stasek Slough. The connector channel is currently a ditch with a failing box culvert that links tidal flows between Hathaway and Stasek Sloughs. Restoration of this channel will also benefit tidal exchange on the Dooher tract and will aid in drainage of upstream properties along Stasek Slough after high river flow events.

Goal 2. Restore the historic character of the site vegetation on 126 acres by planting native wetland and riparian vegetation and controlling competing and invasive species to achieve a 70% survival rate of plantings.

Desired Future Conditions #4 and 5 for both Dooher and Porter tracts will be addressed by these strategies:

Strategy 2.1: Implement restoration plantings

Dooher Tract

This portion of the restoration on the Dooher tract began in 2016 with half the site being planted and the remainder of the site being planted in 2017. For the purposes of defining restoration planting activities, the Property has been divided into three vegetative habitats: 1) tidal spruce swamp, 2) riparian forest, and 3) scrub-shrub and emergent tidal marsh (see Figure 5).

Plantings on the Dooher tract in each habitat included:

1) Sitka spruce tidal swamp: Sitka spruce, black twinberry, crabapple, Hookers willow, cascara, and spirea at the rate of 3000 plants/acre.
2) Riparian forest: Sitka spruce, red alder, cottonwood, western red cedar, red elderberry, salmonberry, willow and twinberry at the rate of 2000 plants/acre.
3) Tidal scrub-shrub marsh: Hooker's willow and twinberry at a rate of 2000 plants/acre.

In addition to the woody species noted above, herbaceous plugs were also installed on the Dooher tract in microhabitats that were either lower elevation than scrub-shrub habitats or tended to hold water due to insufficient drainage. The herbaceous species included slough sedge,Lyngbeyi sedge and small-fruited bulrush.

Planted trees were in the two to three-year-old age class and came as potted stock. Other plants were either potted, bare root or cuttings (willow). Trees were staked and caged near waterways for animal protection. Herbicides are being used to reduce competing vegetation until free to grow stage is reached for target species.

The earthmoving activities associated with dike lowering and ditch-filling resulted in areas dominated by bare ground. Erosion control native grasses were seeded onto the Dooher tract immediately after construction activities ceased in 2015. These seedings were effective during the major flood in December 2015. No additional site preparation for woody species plantings in 2016 was necessary in these areas but weed abatement was important here and willows were useful in reducing erosion and restricting weed encroachment. Preparation of areas not disturbed by heavy equipment included the use of herbicide and hand tools to scarify planting sites for trees and shrubs. In existing dense stands of reed canarygrass, herbicides were followed by dense plantings of woody species, primarily willows.

Willow cuttings were planted in clumps such that two or three individual willow cuttings were planted in one location to foster rapid spread of the plants. The general goal was to have planting densities be approximately 2000 plants (or plant clumps) per acre for all habitats. All planting activities occurred during the plant dormant season from November to April except for seeding of disturbed areas that took place as soon as practical after earthmoving activities were completed in early fall 2015.

Porter Tract
Similar planting specifications are being used on the Porter tract in spruce swamp, riparian and scrub-shrub habitats. Initial plantings in 2018 were made in areas that are expected to be minimally disturbed by proposed restoration construction activities (Figure 15). Planting activities on the Porter tract covered approximately 14 acres in 2018 and protective cages were installed on trees that are near waterways where beavers may be present.

Strategy 2.2: Maintain restoration plantings for successful establishment
Dooher Tract
The plant establishment plan for the Dooher tract was to have crews visit the site two or three times per year for three years to reduce competing vegetation around the plantings. This plant establishment work began the first summer growing season in 2016 after initial planting.

The contractor and crew also checked all plants for animal damage or other signs of stress and performed routine maintenance such as repairing any protective cages. Dead plants, were replaced to retain a 70% survival rate of plantings by the end of the project funding contract. As of 2018, all planted habitats on the Dooher tract were meeting the 70% survivorship rate.

Porter Tract
On the Porter tract, the recent (2018) plantings will have plant establishment treatments including herbicide circle spray and/or mowing 2-3 times a year beginning in Summer 2018. The plant establishment activities will continue for 3 years after planting depending upon need.

Strategy 2.3: Inventory and control priority invasive species
Dooher Tract
Over much of the Dooher tract, the cover of pasture grasses and reed canarygrass is being reduced by the restoration actions described above. A strong revegetation effort of dense willow plantings coupled with targeted herbicide spraying have been key to minimizing reed canarygrass spread and preventing it from dominating the site. Low salinity levels (e.g. less than 10 ppt) made it more difficult to control reed canarygrass after restoration but in some bare ground areas there has been considerable natural recruitment of native plants from seed that has reduced reed canarygrass cover. Willow plantings have been quite effective at providing rapid growth and shading out reed canarygrass in scrub-shrub habitats on the Dooher tract.

The plantings have been followed up with herbicide circle spray treatment to reduce competing vegetation, especially reed canarygrass, during the summer growing seasons for up to three years. Mowing between rows of plantings has also be employed. Effectiveness monitoring on the Dooher tract shows an increase in woody vegetation. Some of the herbaceous wetland species that have naturally recruited to the site such as small-fruited bulrush (*Scirpus microcarpus*) and spikerush (*Eleocharis* sp.) are growing into solid patches of native vegetation, significantly reducing the reed canarygrass in those areas.

There are a few patches of English ivy that were controlled before restoration at the Dooher tract.

The remainder of the invasive species known to be on site such as blackberries and Canada thistle we expect will ultimately be shaded and/or kept at low levels by native plantings. In the meantime, they are being controlled by herbicide spray and cutting to prevent them from going to seed and spreading to neighboring properties.

Porter Tract

Invasive species control on the Porter tract began in summer 2017 with treatments involving herbicide and mechanical cutting activities on reed canarygrass and blackberries. This work was conducted across the entire Porter tract although there were fewer patches of weeds encountered within the native tidal marsh habitats that comprise approximately half of the 60 acre site. Some of the areas slated for revegetation work in 2018 were previously dominated by invasive species. As of summer 2018 the plantings are establishing well.

Within invasive species treatment sites located in low-lying potential scrub-shrub habitat that were not planted in 2018, there has been significant recruitment of Pacific silverweed, a native tidal marsh species. It is likely that these plants did not seed into these invasive species sites but rather they had been present but suppressed by reed canarygrass.

Goal 3. Place large wood into created tidal channels to provide cover for salmonids and habitat for invertebrates, amphibians, small mammals, and reptiles.

This goal addresses Desired Future Conditions #6 & 7 for both Dooher and Porter tracts.

This aspect of the restoration was implemented during the earth-moving activities described in Goal 1 for the Dooher tract and will be put into effect on the Porter tract when tidal channel work is conducted in 2019-2020. The large wood has several purposes in the tidal channels: 1) it anchors the channel walls, 2) at provides a hard surface for channel bends or other higher velocity areas, 3) it creates roughness and hiding cover for aquatic species.

Implementation Plan and Schedule—Dooher Tract

Strategy	Action Steps	Timeframe	Lead	Status	Funding Source
Strategy 1.1: Implement restoration plan	• Facilitate permitting work done by contractors and agencies	Oct. 2013 – June 2014	Dick Vander Schaaf	Completed	DSL, Wildlife Conservation Society, OWEB
	• Finalize engineering plans	Dec. 2013 – June 2014	Dick Vander Schaaf	Completed	
	• Conduct cultural resources inventory	June-July 2014	Dick Vander Schaaf & contractor	Completed	
	• Finalize/sign grant agreement with DSL & OWEB	June – July	Dick Vander Schaaf	Completed	
	• Pre-implementation report to DSL	July 2014	Dick Vander Schaaf	Completed	
	• Develop construction bid specifications & issue	Jan 2015	Dick Vander Schaaf	Completed	
	• Evaluate bids and select contractor(s)	Feb 2015	Dick Vander Schaaf	Completed	
	• Prepare contracts	Mar 2015	Dick Vander Schaaf	Completed	
	• Provide on-site project management during construction	June-Sept 2015	Dick Vander Schaaf	Completed	
	• Seed/stabilize disturbed areas as soon after construction as feasible	Sept 2015	Contractor	Completed	
Strategy 2.1: Implement restoration plantings	• Consult with NORP on plant availability	May 2014	Dick Vander Schaaf, NORP	Completed	OWEB grant proposal
	• Submit OWEB grant proposal	Oct. 2014	Dick Vander Schaaf	Completed	
	• Finalize/sign grant agreement with OWEB	May 2015	Dick Vander Schaaf	Completed	
	• Finalize re-vegetation plans	Oct. 2015	Dick Vander Schaaf, & Partners	Completed	

Strategy	Action Steps	Timeframe	Lead	Status	Funding Source
Strategy 2.1: Implement restoration plantings (cont.)	• Develop planting bid specifications & issue RFB	Oct. 2015	Dick Vander Schaaf, NORP	Completed	
	• Evaluate bids and select contractor	Oct.-Nov. 2015	Dick Vander Schaaf	Completed	
	• Provide on-site management during planting	Nov. 2015-March 2017	TNC staff	Completed	OWEB grant proposal
Strategy 2.2: Maintain restoration plantings for successful establishment	• Manage plant release work for 3 years & replant as necessary	May/June 2016-Sept. 2019	TNC staff	On-going	
Strategy 2.3: Inventory and control priority invasive species	• Develop and implement weed mapping across the site	2015	TNC staff	Completed	TNC
	• Revisit prior English ivy patches 1-2 times per year and pull any shoots found	Annually May-July	TNC staff	Completed	
	• Spray Canada thistle plants prior to seed-set	Annually June-July	TNC staff	On-going	
Monitoring	• Meet with DSL to develop detailed site monitoring plan and sampling locations	July 2014	Dick Vander Schaaf, Debbie Pickering & other TNC staff	Completed	DSL/TNC
	• Conduct baseline monitoring	August 2015	TNC staff	Completed	DSL/WCS
	• Repeat photography at photo points following earth-moving & plantings	Sept./Oct. 2015	TNC staff	Completed	OWEB

Implementation Plan and Schedule—Porter Tract

Strategy	Action Steps	Timeframe	Lead	Status	Funding Source
Strategy 1.1: Implement restoration plan	• Facilitate permitting work done by contractors and agencies	June 2018-Jan 2020	Dick Vander Schaaf	On going	OWEB
	• Finalize engineering plans	August 2018	Dick Vander Schaaf	Planned	
	• Conduct cultural resources inventory	October 2018	Dick Vander Schaaf & contractor	Planned	
	• Finalize/sign grant agreement with OWEB (Coastal Wetlands)	Jan 2018	Dick Vander Schaaf	Planned	
	• Develop construction bid specifications &	Jan 2019	Dick Vander Schaaf	Planned	
	• Evaluate bids and select contractor(s)	Feb 2019	Dick Vander Schaaf	Planned	
	• Prepare contracts	Mar 2019	Dick Vander Schaaf	Planned	
	• Provide on-site project management during construction	June-Sept 2019	Dick Vander Schaaf	Planned	
	• Consult with OWEB for significant design changes	August 2018-Sept 2019	Dick Vander Schaaf	Planned	
	• Seed/stabilize disturbed areas as soon after construction as feasible	Sept 2019	Construction contractor	Planned	
Strategy 2.1: Implement restoration plantings	• Consult with NORP on plant availability	May 2018	Dick Vander Schaaf, NORP	Ongoing	OWEB grant proposal
	• Submit OWEB grant proposal	Oct. 2018	Dick Vander Schaaf	Planned	
	• Finalize/sign grant agreement with OWEB	April 2019	Dick Vander Schaaf	Planned	
	• Finalize re-vegetation plans	Oct. 2019	Dick Vander Schaaf & Partners	Planned	

Strategy	Action Steps	Timeframe	Lead	Status	Funding Source
Strategy 2.1: Implement restoration plantings (cont.)	• Develop planting bid specifications & issue RFB	Oct. 2018	Dick Vander Schaaf	Ongoing	OWEB grant proposal
	• Evaluate bids and select contractor	Oct.-Nov. 2018	Dick Vander Schaaf	Planned	
	• Provide on-site management during planting	Nov. 2017-March 2020	TNC staff	Ongoing	
Strategy 2.2: Maintain restoration plantings for successful establishment	• Manage plant release work for 3 years & replant as necessary	May/June 2018-Sept. 2022	TNC staff	On-going	
Strategy 2.3: Inventory and control priority invasive species	• Develop and implement weed mapping across the site	2019	TNC staff	Planned	TNC
	• Spray Canada thistle plants prior to seed-set	Annually June-July	TNC staff	On-going	
	• Conduct baseline monitoring	August 2019	TNC staff	Planned	OWEB
	• Repeat photography at photo points following earth-moving & plantings	Sept./Oct. 2019	TNC staff	Planned	OWEB
	• Initiate groundwater and salinity monitoring	Oct.-Nov. 2019	TNC staff	Planned	OWEB

Monitoring, Maintenance and Adaptive Management

Site monitoring involves several parameters that reflect ecological function in estuary wetlands as recommended in Brophy 2007, restoration concept plans (ESA et al. 2013) and by the granting organizations, OWEB and DSL (for Dooher tract only). The primary hydrologic parameter is assessed by monitoring water levels in the river and tidal sloughs with water level loggers. Locations of water level loggers have evolved as site restoration has been undertaken on the Dooher tract and is being planned on the Porter tract; the current locations of loggers as of 2018 is shown in Figure 17. A second set of parameters reflect progress in the restoration of native vegetation at the Property. Another potential parameter is the response of salmonids and other wildlife to the restored hydrology and wetlands although we are not actively monitoring this response at the site.

A monitoring plan has been developed and implemented for the Dooher tract and is included in the Appendix A. A monitoring plan for the Porter tract has been drafted and included in Appendix B; it will be finalized before the restoration activities at Porter have been completed. Monitoring activities are underway at the Porter tract including permanent photo points (Figure 12) and hydrologic monitoring in sloughs and ditches (Figure 17). Re-vegetation monitoring will begin at the Porter tract in Summer 2018 using 10 X 10 meter plots.

Monitoring plans will be adapted as needed to reflect changes in site management or recognition of a need to include additional monitoring parameters to meet observed site conditions. TNC has a yearly meeting for staff working on restoration and monitoring of the Kilchis Preserve to discuss findings and recommend any changes of management and/or monitoring. As monitoring plans change, TNC will notify OWEB and/or other funders and seek input from them for best ways to meet monitoring needs. Depending on the significance of the recommended management changes, TNC will notify OWEB when such changes may affect management direction or impact OWEB policies and principles. Before any significant management changes are made, TNC will meet with OWEB for consultation.

Dooher Tract Monitoring Parameters

1) Hydrology: continuous measurements to demonstrate tidal connectivity in the restored wetland are monitored by eight in-channel pressure transducers (*Solinst* Levelogger Edge) to measure depth and temperature. This data is used to compare temporal components of tidal hydrodynamics (e.g. periodicity and timing) of the constructed channels to the mainstem Kilchis River. Ambient barometric pressure is measured using an on-site barometer (*Solinst* Levelogger Gold). Instruments logged continuously at 30-minute intervals. The barometer and four original transducers on the Dooher tract started logging data on April 1, 2016. Site visits occur roughly on 3-month intervals, during which data are downloaded and transducers were cleaned to prevent fouling. The locations of the water level loggers are shown in Figure 17.

2) Native Vegetation:
    - Survivorship: Planting survivorship monitoring will occur annually for 3 years after vegetation is planted on both the Dooher and Porter tracts. In early fall, late the growing season but before leaf senescence, temporary 100m^2 plots are randomly selected to cover 1% of the planting area. The sampling is stratified to ensure that each planting habitat includes a proportionate share of the total sampling plots. In these plots, every plant is assessed for mortality and a

percentage of survival is calculated. If survivorship falls below 70%, adaptive management efforts will be considered.

- Vegetative cover: Plant community response and conversion from non-native to native species will be monitored using permanent line intercept transects. This intensive effort to sample the cover of key native and invasive species will occur for up to ten years on the Dooher tract. The details of this monitoring program are included in Appendix A.

3) Salmon Response: sampling salmon smolts in tidal channels will occur whenever ODFW can work the Property into their sampling schedule.
4) Photo Points: Photo points were established for the Dooher tract easement Baseline Documentation Report in February 2012 (Vander Schaaf 2012). After restoration designs were completed, 14 permanent photo monitoring points were established on the Dooher tract to capture structural changes in the plant communities and alterations in the channels over time (Figure 12 & Table 4). There are 28 photo monitoring points, half located on each property. Photographs are taken immediately after the earth-moving work is completed and repeated every 2 years thereafter.
5) Additional potential parameters may include: sediment accretion, channel morphology, ground surface elevations, soil organic matter content, & bird species occurrence.

Porter Tract Monitoring Parameters

1) Hydrology: monitored through recording water level logger gages in the river and in tidal channels on the tract (Figure 17). Water levels and temperature are monitored to determine tidal and river connections within the wetlands Four additional transducers were installed on April 6, 2017 to collect baseline data for the Porter tract. After restoration activities are completed on the Porter tract, water level logger locations may change to meet site conditions.
2) Native Vegetation: Plant survivorship monitoring within planting habitats will occur for 3 years after planting activities have occurred following OWEB protocols. In early fall, before leaf senescence, temporary 100 m^2 plots are randomly selected to cover 1% of the planting area. The sampling is stratified to ensure that each planting habitat includes a proportionate share of the total sampling plots. In these plots, every plant is assessed for mortality and a percentage of survival is calculated. If survivorship falls below 70%, adaptive management efforts will be considered.
3) Salmon Response: sampling salmon smolts in tidal channels will occur whenever ODFW can include the Property in their sampling schedule.
4) Photo Points: Fourteen permanent photo points (Figure 12 & Table 5) were established for the Porter tract easement Baseline Documentation Report in October 2015 (Rofsky 2015). Repeat photography at these locations will be used to track structural changes in the plant communities and alterations in the channels over time. Photo point photography will be repeated every 2 years through the active restoration phase of the project.
5) Additional potential parameters may include: sediment accretion, channel morphology, ground surface elevations, soil organic matter content, & bird species occurrence.

Plan Updates

Given the significant alterations planned for the site during the restoration, it is reasonable to expect this plan to cover just a 10 year period beginning when restoration actions were initiated on the Dooher tract (2013) with an opportunity to update it after five years to incorporate any

early results from monitoring. This timeframe should give TNC a better sense of how the site is adjusting to the restoration and if any further site management modifications are needed, which can be addressed in the next version of this management plan in 2023. By 2023 it is expected that active restoration activities will be completed for the Porter tract and the restored Dooher tract will be completely re-vegetated and functioning as a native tidal wetland. The current 2018 version of the Management Plan suffices as the five-year update. TNC will notify OWEB in 2023 before the scheduled 10 year plan update to include any new plan requirements.

Community Involvement and/or Educational Opportunities

This project has generated considerable interest in the local community and elsewhere on the North Coast. TNC has used the project as an opportunity to develop outreach materials and meet with landowners, agencies and local community groups to discuss the specific restoration goals and how the planned activities have met these goals and what challenges still exist. Outreach has also included presentations at regional or national meetings to discuss how climate change parameters were factored into hydrologic models that were in turn used in developing site restoration plans.

There have also been tours conducted at the site, particularly at the Dooher tract where restoration actions have been completed and where tidal marsh restoration is well established, and it is expected that tours will continue to be held on an as need basis. TNC responds to all formal requests for tours of the Kilchis Project area depending on availability of staff. Past tours have included County Commissioners, elected officials, state and national resource agency staff, project partners, community partners and private donors. Because of ongoing restoration activities, tours have not purposefully reached out to education-oriented groups at this time. TNC doesn't actively engage in environmental education but we make our preserves available for such activities to other groups.

The project has also interfaced with the local community as it grapples with how to accommodate wetland restoration in and amongst farmlands, especially in the Tillamook basin area. In 2016 the Oregon Legislature enacted SB1517 that directed Tillamook County to assess wetland restoration that falls within zoned EFU farmlands. Much of the Kilchis Project area is on EFU farmlands, however, the estuary conservation overlay zoning covers portions of the area including much of the Porter tract. The Nature Conservancy serves on a technical advisory committee that is assisting the County with implementing the Act. The experiences learned from the Kilchis Wetlands Restoration Project are playing a role in recommendations that the committee is making to the County. A progress report on the County progress is due to the Oregon Legislature in September 2018.

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FIGURES

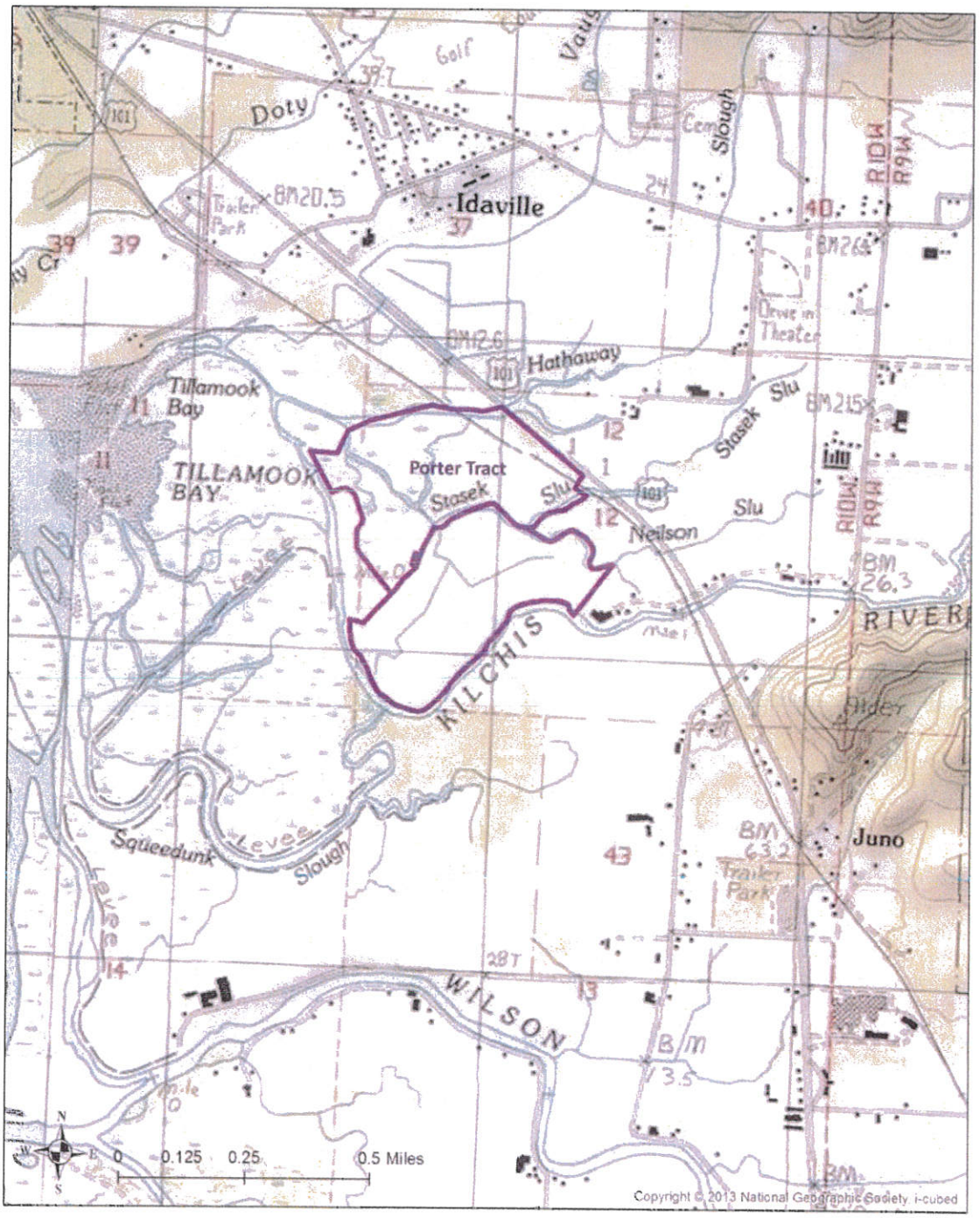

Figure 1. Kilchis Estuary Preserve, Tillamook County, Oregon

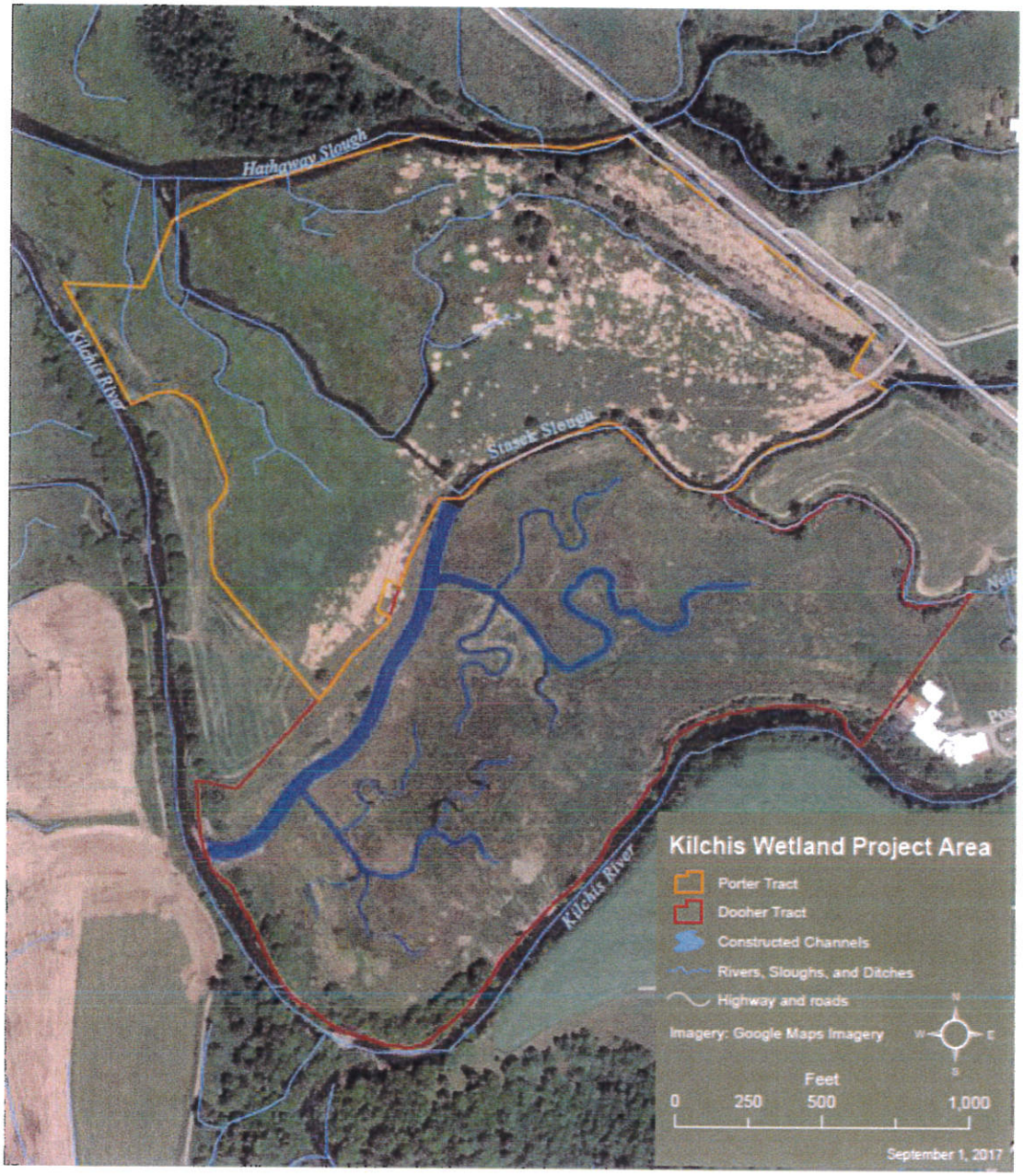

Figure 2 Kilchis Estuary Preserve aerial view

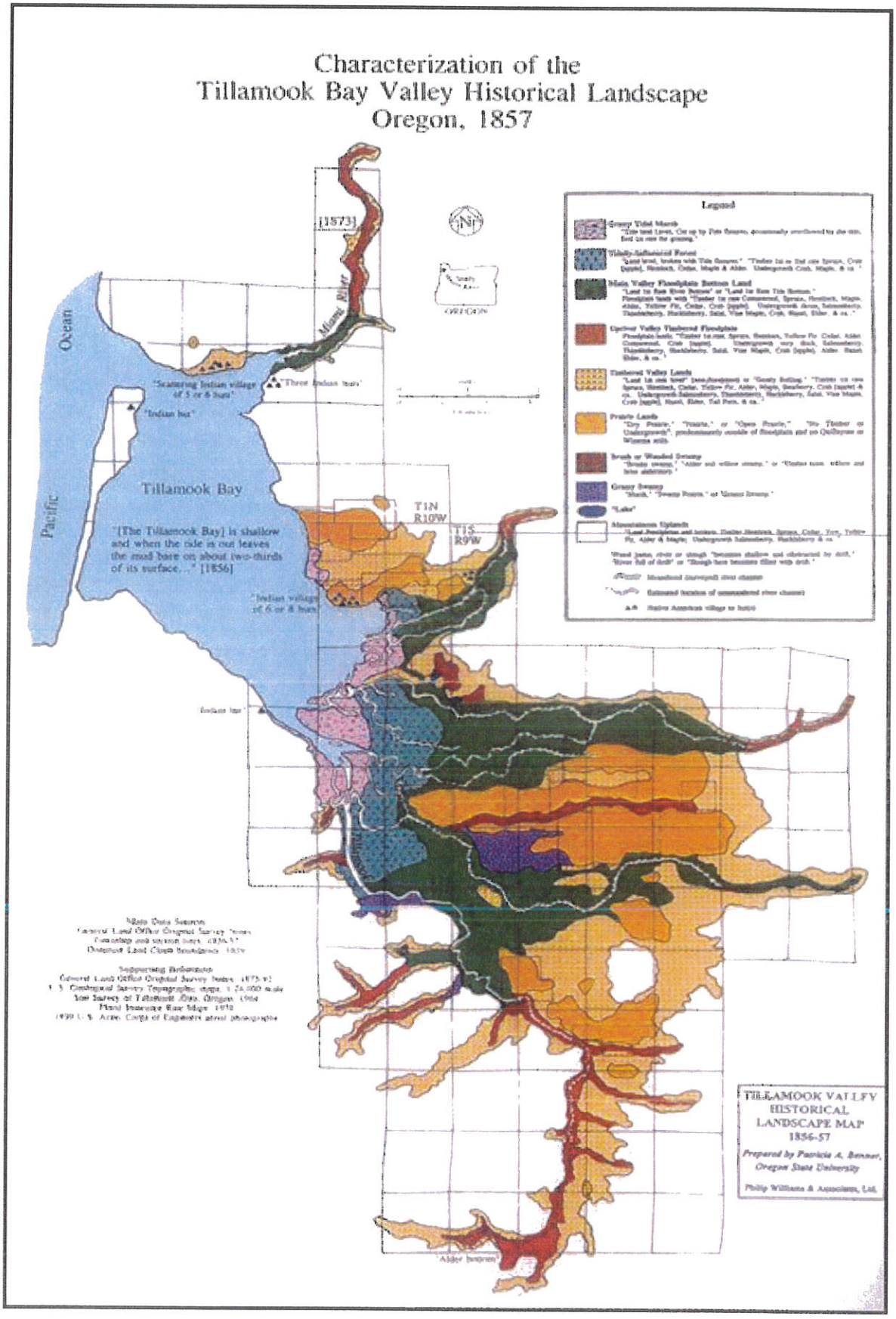

Figure 3. Historic vegetation map (by Patricia Benner; OSU)

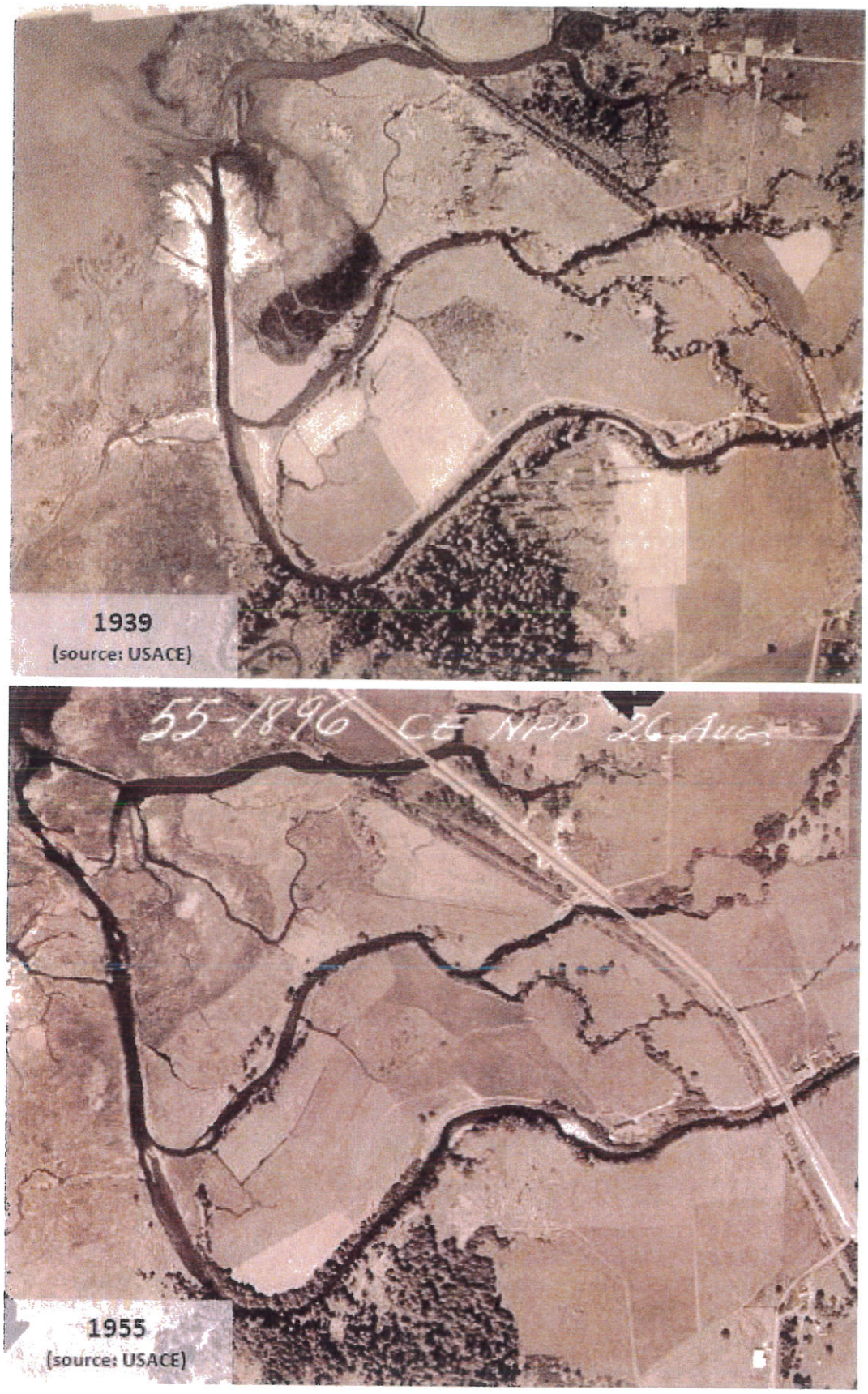

Figure 4. 1939 and 1955 air photos of the mouth of the Kilchis River

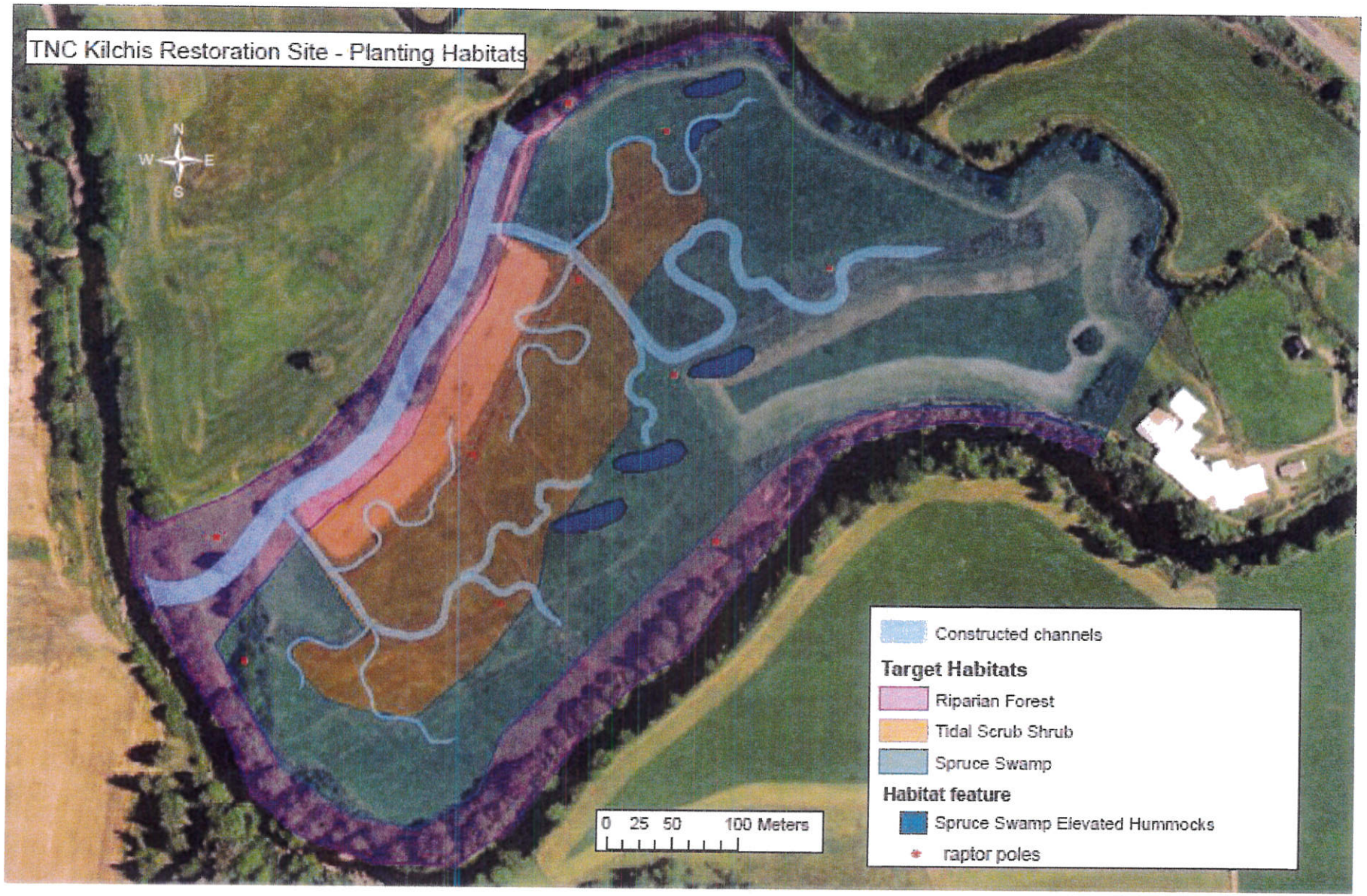

Figure 5. Dooher Tract Restored Habitats. Priority Ecological Systems and Constructed Channels.

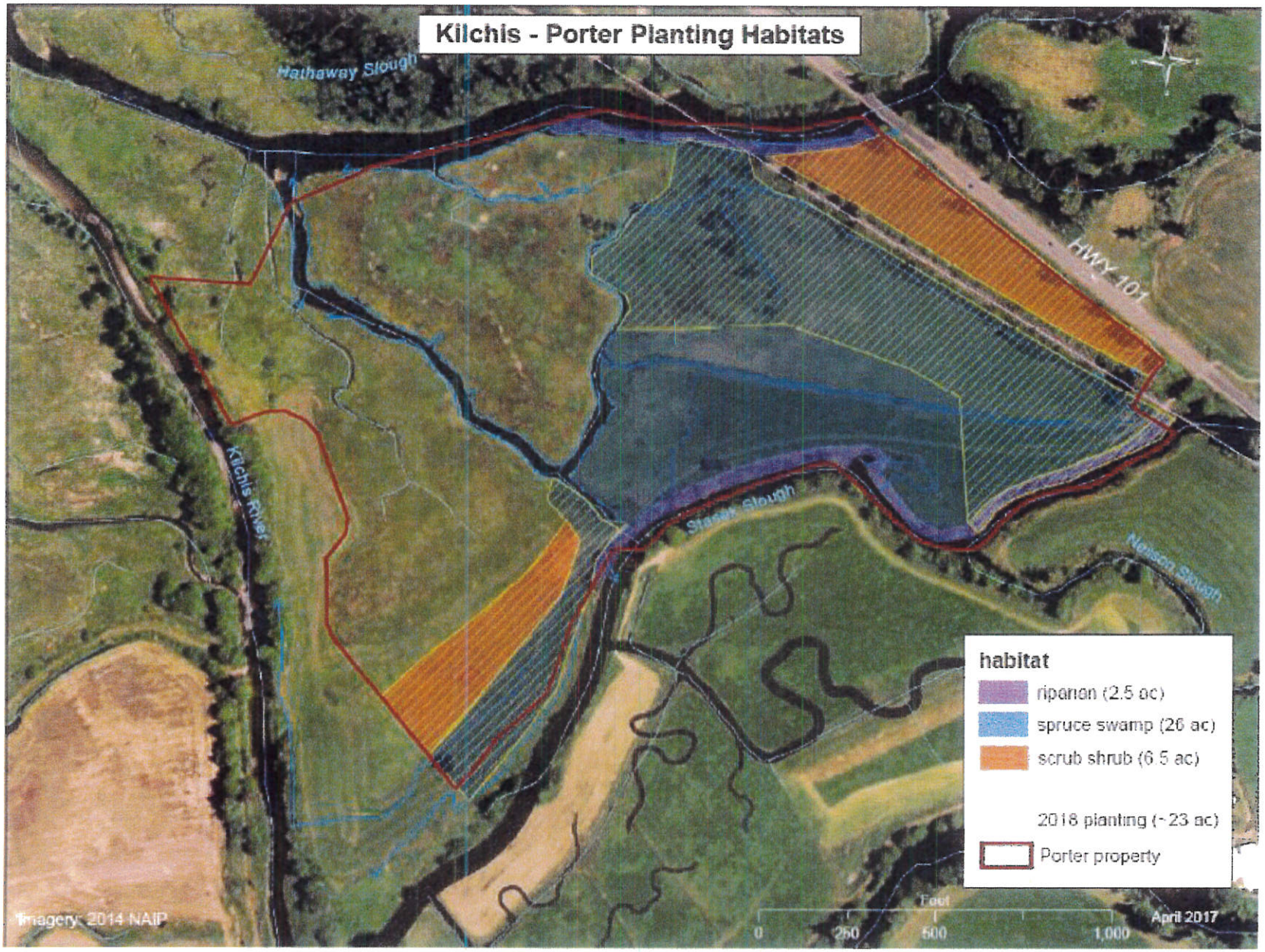

Figure 6. Porter Tract Proposed Restoration Habitats and OWEB Priority Ecological Systems.

Figure 7. Location of TNC access easements and Dooher dike maintenance easement.

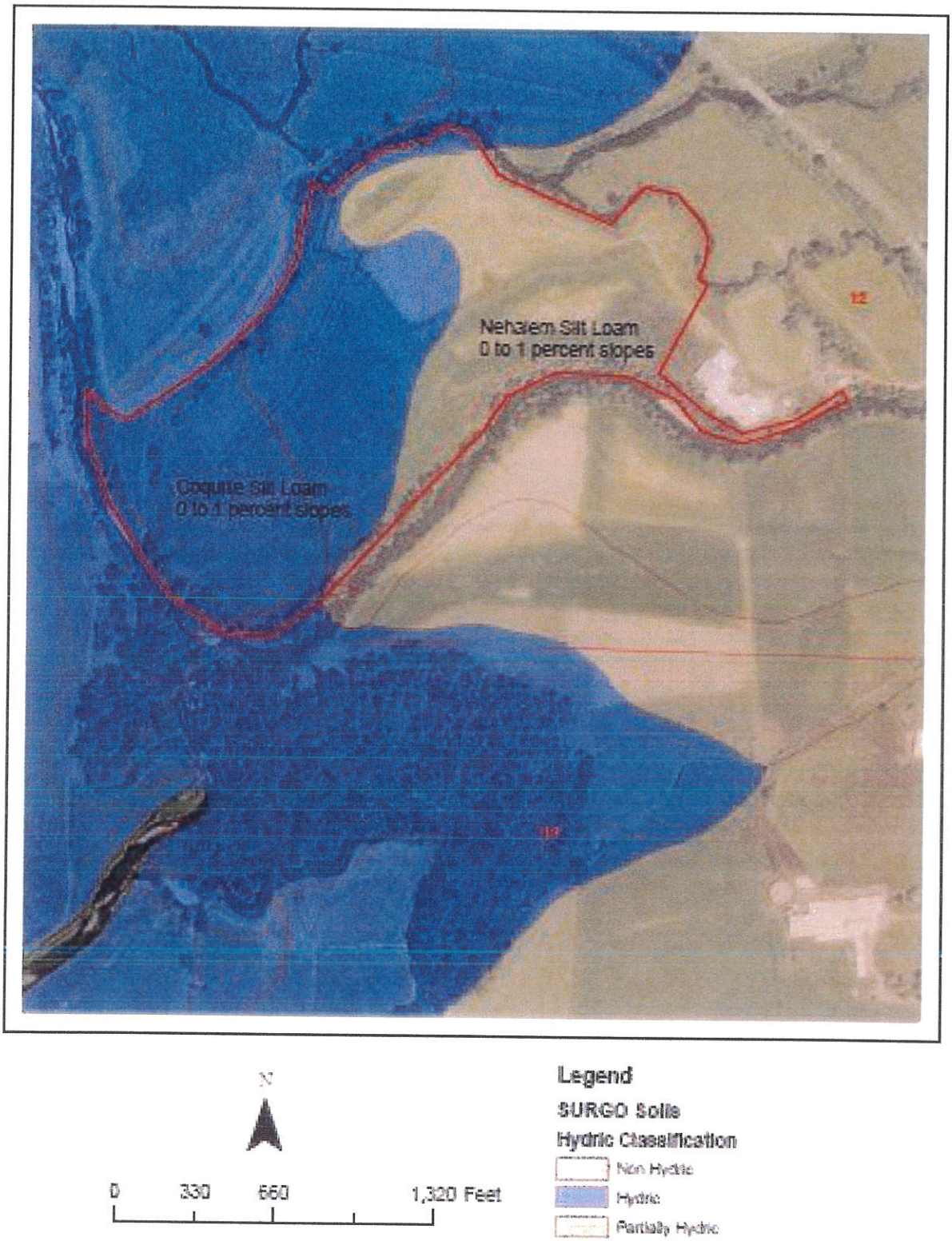

Figure 8. NRCS soils map of Kilchis Estuary Preserve.

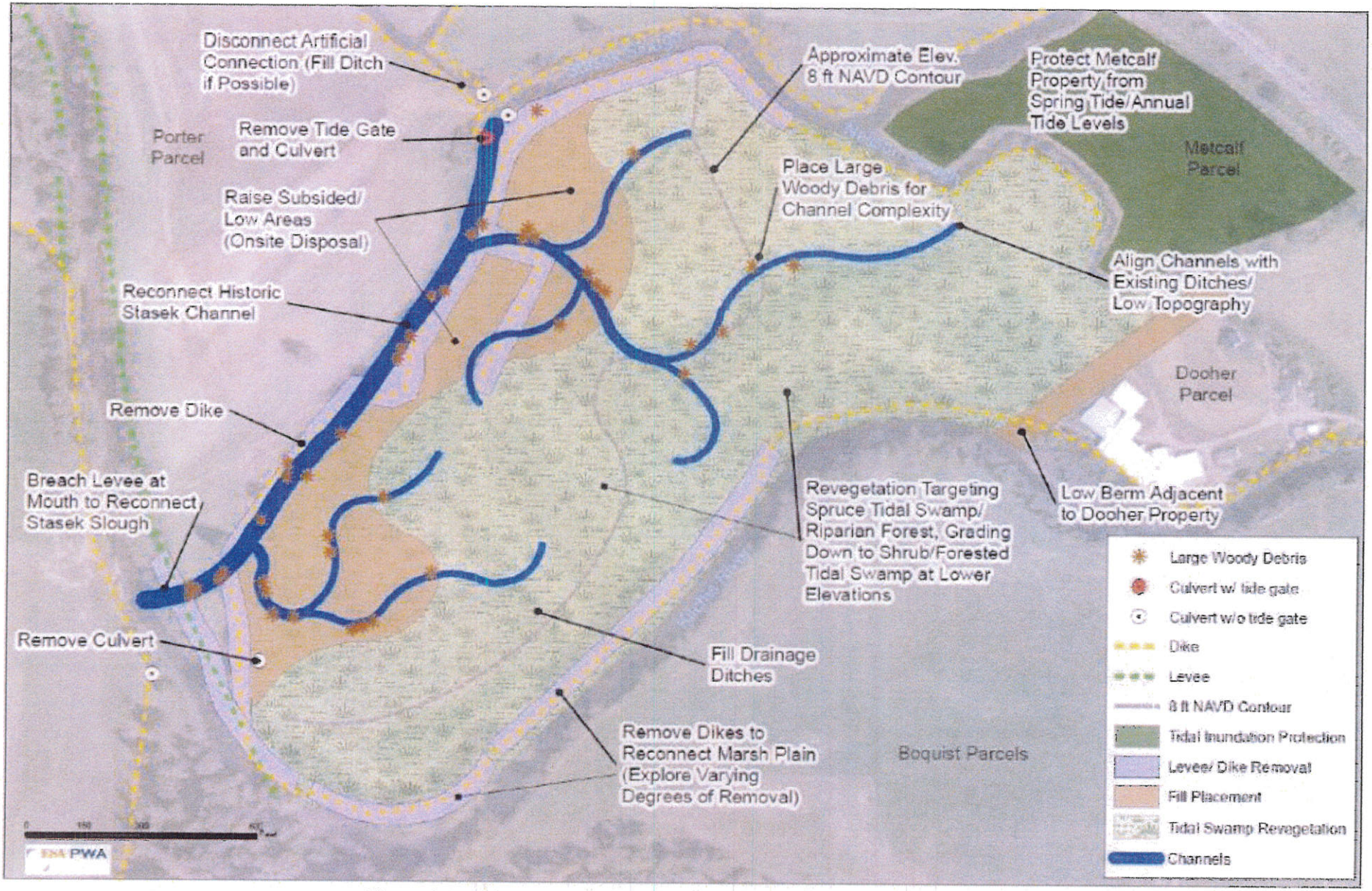

Figure 9. Dooher Tract Restoration Concept Plan Map (from ESA PWA et al. 2013)

Figure 10. Native Tidal Wetlands on Porter Tract

Figure 11 Porter Tract 0.1 acre Inholding shown as small rectangular area on southern boundary adjacent to Stasek Slough

Figure 12. Photo Point Monitoring Locations for Dooher and Porter Tracts

Figure 13. Porter Tract Past Site Alterations

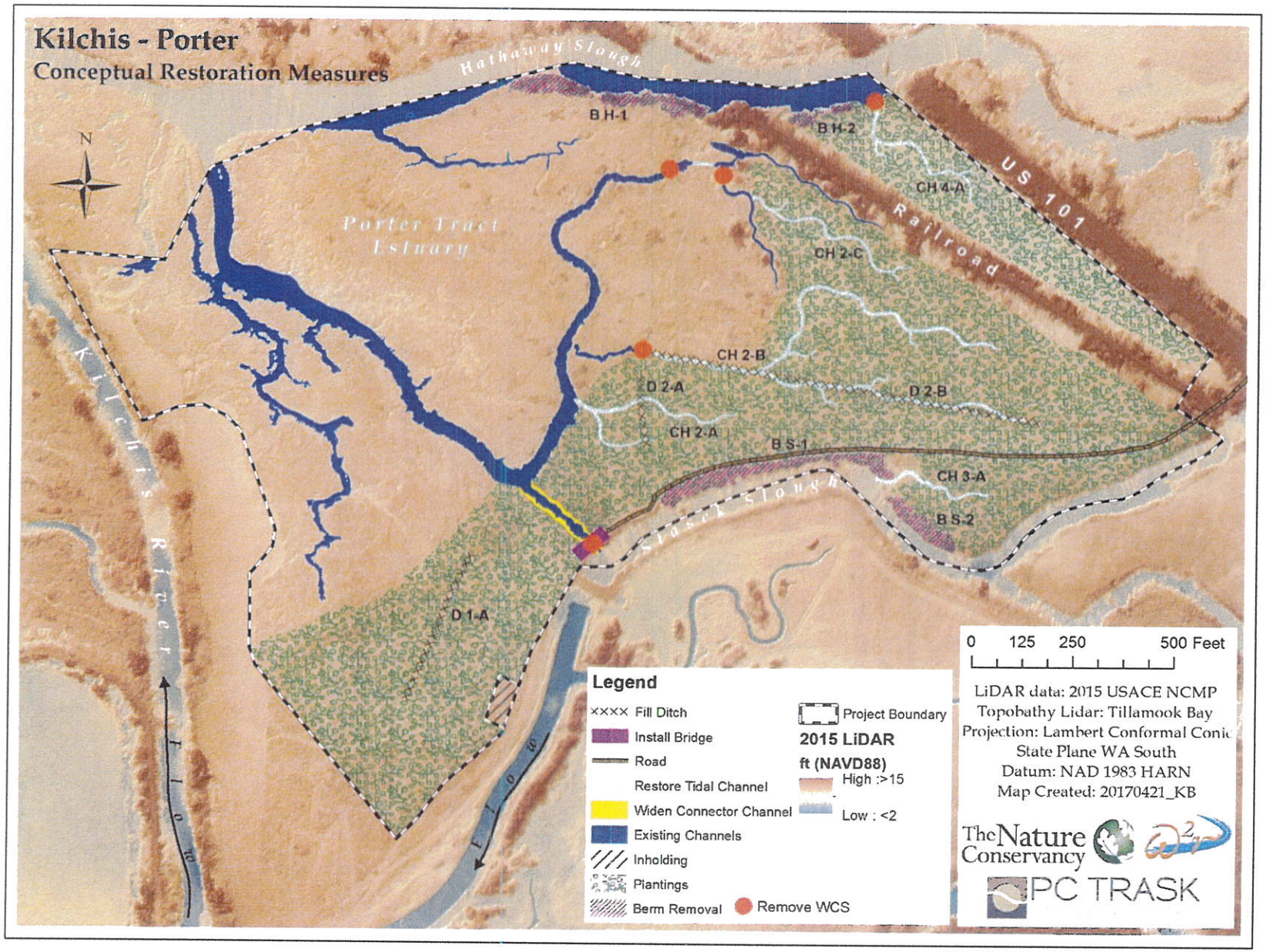

Figure 14 Porter Tract Conceptual Restoration Plan

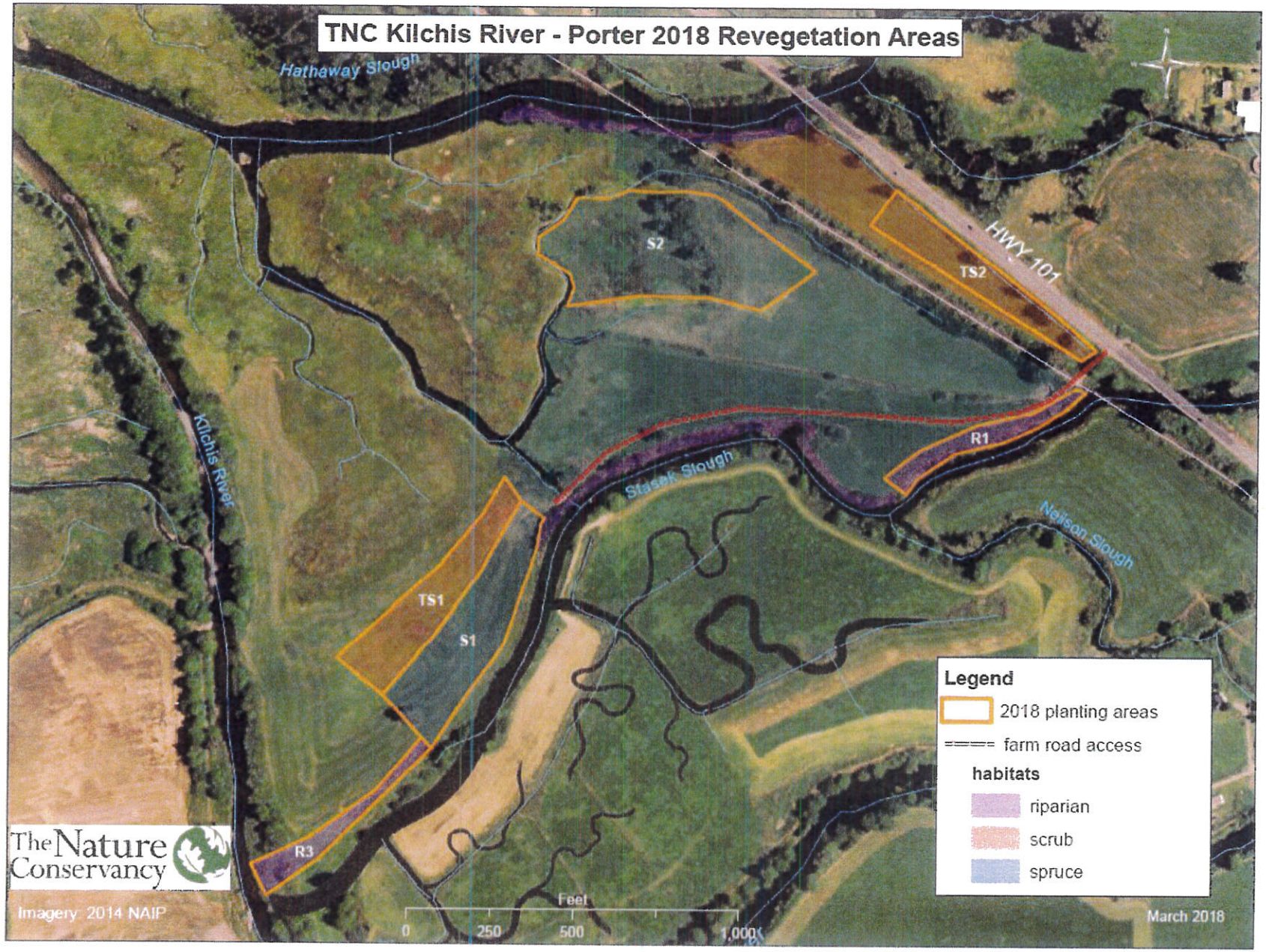

Figure 15 Kilchis Porter Tract 2018 Re-vegetation Areas

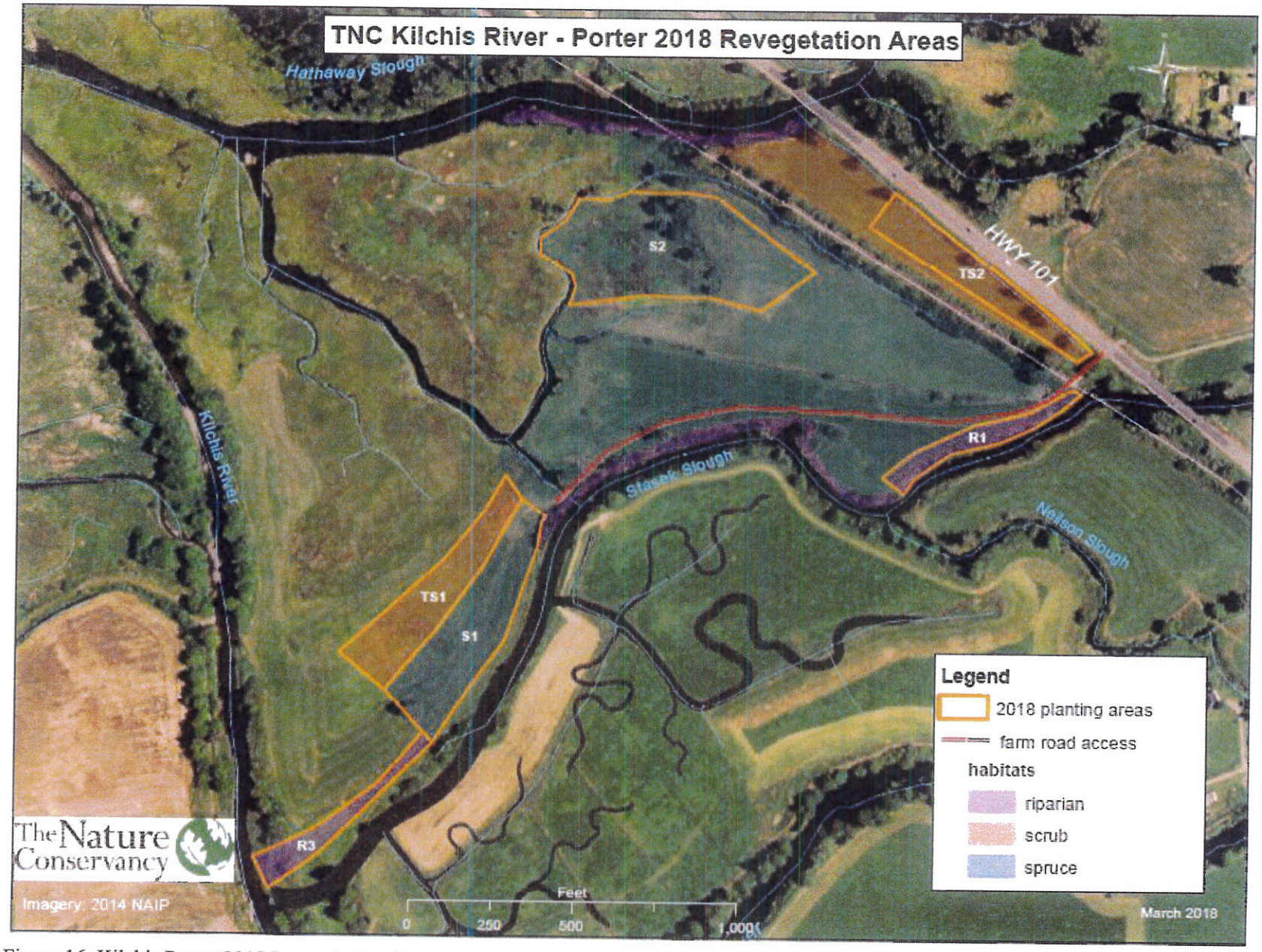

Figure 16. Kilchis Porter 2018 Revegetation Areas

Figure 17. Locations of Water Level Loggers at Kilchis Preserve for Hydrologic Monitoring

Table 1. Non-priority animals expected to benefit from Kilchis Estuary restoration

Fish/Aquatic species	Birds	Mammals
American shad	Bald eagle	Harbor seals
Bat ray	Osprey	Beaver
Bay goby	Northern harrier	River otter
Bay pipefish	Peregrine falcon	Raccoons
Bay shrimp	Great blue heron	Roosevelt elk
Blue mussel	Band-tailed pigeon	Black-tailed deer
Brown rockfish	Great egret	Little brown bat
California halibut	Snowy egret	
Chinook salmon	Canada goose	
Chum salmon	Mallard	
Coastal cutthroat trout	Northern pintail	
Coho salmon	American widgeon	
Copper rockfish	Cinnamon teal	
Deepbody anchovy	Brandt's cormorant	
Dungeness crab	Green heron	
English sole	Western sandpiper	
Eulachon	Dunlin	
Grass rockfish	Killdeer	
Green sturgeon	Greater yellowlegs	
Jacksmelt	Common snipe	
Leopard shark	Whimbrel	
Lingcod	Black-bellied plover	
Longfin smelt	Willet	
Night smelt	Vaux's swift	
Northern anchovy	Tree swallow	
Olympia oyster	Purple martin	
Pacific herring	Willow flycatcher	
Pacific lamprey	Swainson's thrush	
Pacific littleneck clam	Red-breasted sapsucker	
Pacific sand lance	Downy woodpecker	
Pacific sanddab	Pacific slope flycatcher	

Pacific staghorn sculpin
Shiner perch
Slough anchovy
Speckled sanddab
Spotted sandbass
Starry flounder
Steelhead
Surf smelt
Threadfin shad
Threespine stickleback
Topsmelt
White seabass
White sturgeon

Wilson's warbler
Chestnut-backed chickadee
Pacific wren
Yellow warbler
Hermit warbler
Black-throated grey warbler
Orange-crowned warbler
Rufus hummingbird

Table 2. ETG field notes, Kilchis restoration 4/16/12 site visit (from ESA PWA 2012). See Table 3 for plant species codes.

Map code	Notes
A	Vegetation dominated by reed canarygrass (PHAARU), meadow foxtail (ALOPRA), creeping bentgrass (AGRSTO) Veg indicates little or no salinity under current diked/tide gated conditions
B	Vegetation dominated by creeping bentgrass (AGRSTO) and water foxtail (ALOGEN) Vegetation indicates little or no salinity under current diked/tide gated conditions.
C	Vegetation along channel at C = PHAARU, slough sedge (CAROBN), JUNEFF Based on LiDAR, this area is probably subsided.
D	Vegetation dominated by ALOPRA, tall fescue (FESARU), AGRSTO
E	Veg in triangle between mowed area and channel = PHAARU
F	Vegetation dominated by ALOPRA and AGRSTO, with Pacific silverweed (POTANS) and Baltic rush (JUNBAL) interspersed
G	CAROBN, impounded area
H1	Large wooden box culvert, possible former tide gate, see photos, blocked by woody debris Channel between H1 and H2 appears to be an excavated artificial connection between Stasek and Hathaway sloughs
H2	Wood and rock remnants from likely former tide control structure
I	Fully tidal marsh; vegetation largely native, dominated by typical high marsh species (CARLYN, AGRSTO, JUNBAL, ARGEGE, OENSAR, LOTCOR, Rumex sp , HERMAX, DESCES, GALAPA) Channel edges dominated by CARLYN
J	Tide gate on small sub-tributary to Hathaway Sl -- see photos
K	Forb-rich high marsh, indicating very slightly brackish conditions, dominants include FESARU, ARGEGE, JUNBAL, common forbs includes ANGLUC, SYMSUB, ACHMILL, some CAROBN clones. Likely appropriate area for SIDHEN introductions if landowner is interested
L	Veg is similar to K, soil has hydric indicators at 4" below surface
M	FESARU, AGRSTO; likely freshwater wetland or transitional to upland
N	House here has never flooded, according to information received by Dick V.
P	TCCA culverts layer indicates culvert here (but no tide gate) Not viewed in the field
Q	Stasek Slough "sediment bench " Veg is introduced pasture grass, mostly FESARU and ALOPRA, soil looks like typical coastal alluvium deposit (likely silt loam), no obvious hydric indicators in surface 12"
R	Viewed the Squeedunk Swamp from this location; see photos.
S	Based on LiDAR, this area is probably subsided.
T	Tide gate between Stasek Slough and the diked pasture to the south This tide gate is functional -- see photos
U	Upstream limit of Neilson Slough dike as mapped by Mattison Appears accurate, based on LiDAR
V	Tide gate on upper end of tributary to Hathaway Slough. Appears to be functional -- see photos.

Table 3. Plant species codes used in field notes in Table 2. Kilchis restoration 4/16/12 site visit (from ESA PWA 2012).

Code	Sci. name	common name	Other names
AGRSTO	*Agrostis stolonifera*	creeping bentgrass	
ALOGEN	*Alopecurus geniculatus*	water foxtail	
ALOPRA	*Alopecurus pratensis*	meadow foxtail	
ANGLUC	*Angelica lucida*	sea-watch angelica	
CARLYN	*Carex lyngbyei*	Lyngbye's sedge	
CAROBN	*Carex obnupta*	slough sedge	
DESCES	*Deschampsia cespitosa*	tufted hairgrass	
FESARU	*Festuca arundinacea*	tall fescue	*Schedonorus phoenix, Lolium arundinaceum*
GALAPA	*Galium aparine*	common bedstraw	
HERMAX	*Heracleum maximum*	cow parsnip	
JUNBAL	*Juncus balticus*	Baltic rush	
JUNEFF	*Juncus effusus*	soft rush	
LOTCOR	*Lotus corniculatus*	birdsfoot trefoil	
OENSAR	*Oenanthe sarmentosa*	water parsley	
POTANS	*Potentilla anserina*	Pacific silverweed	*Argentina egedii*
PHAARU	*Phalaris arundinacea*	reed canarygrass	
Rumex	*Rumex sp.*	Dock	
SYMSUB	*Symphyotrichum subspicatum*	Douglas' aster	

Table 4. Monitoring Photo Point Locations Table

Photo Point #	Photograph #s	Description (view and location)	Latitude	Longitude
1	1.1 north 1.2 northwest	At southeastern boundary of subject property, east of photo point #2, north of Kilchis River, along dike road.	45° 29' 44.405"	123° 51' 20.001"
2	2.1 east 2.2 northwest 2.3 southwest	West of photo point #1, along bend in dike road, subject property to the north, river to the south.	45° 29' 44.526"	123° 51' 27.172"
3	3.1 northeast 3.2 northwest 3.3 southwest	Southwest of photo point #2, along dike road, subject property to the north, river to the south.	45° 29' 42.213"	123° 51' 30.706"
4	4.1 northwest	Looking northwest at interior mowed path running north and south across subject property.	45° 29' 37.579"	123° 51' 36.552"
5	5.1 southeast 5.2 northeast 5.3 west	Near western boundary of subject property, northwest of river bend.	45° 29' 35.093"	123° 51' 46.334"
6	6.1 southeast	Western boundary of subject property looking southeast, agricultural field on the left, riparian trees and vegetation on the right.	45° 29' 35.747"	123° 51' 48.499"
7	7.1 southeast 7.2 northeast 7.3 south	Western end of northern boundary of subject property.	45° 29' 41.147"	123° 51' 51.685"
8	8.1 north 8.2 east 8.3 south 8.4 west	Center of northern boundary of subject property, on bank of Stasek Slough near big Sitka spruce; building across the slough.	45° 29' 52.404"	123° 51' 37.036"
9	9.1 north 9.2 east 9.3 south 9.4 west	In the bend of Stasek Slough, in the northeastern portion of subject property.	45° 29' 50.560"	123° 51' 19.314"
10-19	Exact locations to be determined after restoration construction phase			

Table 5 Porter Photo Point Locations

Photo Point #	Photo Point Location	Latitude/Longitude	Photo #	Direction	Description of View
P1	Railroad bridge over Stasek Slough	45.498759° N 123.854970° W	1.1	280°	View of north bank of Stasek Slough on eastern portion of property
P2	Driveway northeast of railroad crossing	45.499086° N 123.855291° W	2.1	NW	Area between railroad and highway formerly dominated by reed canary grass.
P3	Railroad tracks, close to halfway between Stasek and Hathaway Sloughs	45.499783° N 123.857506° W	3.1	205°	Area north of drainage ditch where two new parallel channels will be excavated
			3.2	90°	Area between railroad and highway that occassionally floods in winter.
P4	Railroad tracks, NW of photo point 3	45.500543° N 123.859393° W	4.1	200°	View of the wet field southeast of one of two water control structures to be removed
			4.2	65°	Looking towards tide gate on Hathaway Slough
P5	Railroad tracks, NW of photo point 4	45.500613° N 123.859650° W	5.1	240°	Looking towards channel restoration area between two water control structures and Hathaway berm removal
P6	Railroad tracks, NW of photo point 5, about 10 ft from Hathaway Slough bridge	45.500824° N 123.860126° W	6.1	230°	Berm along Hathaway Slough
			6.2	195°	Channel restoration area near two water control structures
			6.pano	155-240°	Hathaway Slough bank near railroad bridge
P7	Railroad bridge over Hathaway Slough, close to south bank	needs to be re-GPS'ed	7.1	210°	Berm along Hathaway Slough
			7.pano	140-250°	Berm along Hathaway Slough
P8	Railroad bridge over Hathaway Slough, close to north bank	45.501176° N 123.861032° W	8.1	215°	Berm along Hathaway Slough
			8.2	150°	Berm along Hathaway Slough
			8.3	110°	Hathaway Slough bank around railroad bridge. Tide gate structure is on the bank left of the railroad.
P9	North bank of Hathaway Slough, northwest of railroad bridge	45.501355° N 123.861499° W	9.1	250°	Bank of Hathaway Slough

P10	Along eastern fork of Porter Slough, west of WCS	45.500252° N 123.861163° W	10.1	50°	Channel flowing into water control structure
P11	Berm on Stasek Slough NE of Porter Slough box culvert	45.497942° N 123.861167° W	11.1	280°	Porter Slough channel prior to widening
			11.2	215°	Porter Slough crossing over box culvert prior to bridge installation
			11.3	20°	Driest portion of property south of drainage dike
P12	Berm on Stasek Slough SW of Porter Slough box culvert	45.497625° N 123.861493° W	12.1	35°	Stasek Slough bank prior to installation of bridge over Porter Slough
			12.2	340°	Porter Slough channel prior to widening
			12.3	265°	Planting area on SW portion of property. Willows planted weeks prior to this photo are sticking out of the high tide flood
P13	North corner of Hathaway inholding	45.496821° N 123.862133° W	13.1	170° (seems wrong)	Planting area on southwest portion of property
			13.2	50°	View of Stasek Slough at confluence with Dooher tract Channel 2
P14	Near northeastern boundary of Geinger property boundary	45.498373° N 123.864665° W	14.1	230°	TNC property adjacent to Kilchis river. Round wooden post marks Geinger/TNC property boundary
			14.2	190°	Looking into center of property
			14.3	100°	Property line with Geinger is marked by large wooden posts. Mowed line and metal t-posts mark old property boundary.

Appendix A. Dooher Tract Monitoring Plan

1. Performance Standards—Hydrology

Performance Standard 1: Tidal effects, as measured by tidal levels, duration, and timing, in constructed tidal channels (for average high tides without influence of river flooding) mimic tidal effects occurring at control gages on the Kilchis River located on river mile 1.0.

Performance Standard 2: There shall be no fish entrapment in isolated pools at low tide (LMW).

Performance Standard 3: Floodwaters overtop constructed natural river levees during floods that reach or exceed river flood stage levels. Ordinary High Water (OHW) is 11.42 feet such that floodwaters exceeding this level will overtop the constructed levees.

Performance Standard 4: A wetland delineation light (DSL parameters) shall be conducted during a normal precipitation year, at least three growing seasons after construction, to identify the new wetland boundary and wetland acreage. Sampling will demonstrate that any areas filled during construction and located at a lower elevation than the upper edge of the new wetland boundary, meet wetland criteria.

2. Performance Standards—Vegetation

All cover standards are absolute cover unless stated otherwise. Habitats are distinguished by elevation and planting zones and include scrub-shrub (7-8.5' NAVD88), Sitka spruce tidal swamp (8.5' to wetland upper boundary) and Sitka spruce riparian forest (above wetland boundary).

Performance Standard 1: Cover of native species increases from initial planting levels after 5 years and is as least 25% after 10 years.

Performance Standard 2: Cover of key invasive species[1] does not increase from baseline levels after 5 years and is reduced by at least 15% from baseline after 10 years.

Performance Standard 3: Bare ground decreases to 20% or less after 5 years.

Performance Standard 4: Survival of planting stock is greater than 70% after 3 years (OWEB standard)[2].

Performance Standard 5: By Year 5 and thereafter, there are at least 3 different native species established in each habitat type. To qualify, a species must have at least 5% average cover in the habitat class and occur in at least 10% of the plots sampled.

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[1] Key invasive species include reed canary grass, non-native blackberries, Canada thistle, English ivy, bindweed, policeman's helmet, jewelweed, yellow-flag iris, purple loosestrife, and spartina.

[2] 70% survival (OWEB standard) of the planted individuals and/or clumps of willows:

- 1345 native plant stems per acre in Spruce Swamp habitat,
- 922 stems per acre in Riparian Forest habitat, and
- 467 stems per acre in Scrub-Shrub Tidal marsh habitat

Dooher Tract Vegetation Monitoring Objectives and Methods

Vegetation Monitoring Objectives

1) Be 80% confident of detecting a 25% change in cover estimates of native plant species between pretreatment and 10 years post restoration plantings.
2) Be 80% confident of detecting a 15% change in cover estimates of non-native plant species between pretreatment and every other year post restoration plantings.
3) Be 80% confident of detecting a 10% change in cover estimates of bare ground between pretreatment and 5 years post restoration plantings.
4) Document mortality of planted stock each year for 3 years after planting.
5) Monitor for species diversity

Vegetation Monitoring Methods

Line intercept transects will be used to measure absolute percent cover of key native and key invasive species. This measurement comprises all instances where the species intersects the line, including ground and canopy cover. Species intercepting the measuring tape are recorded if they meet the gap size standards. The gap size sets rules for the minimum amount of cover a species must intercept the line to be measured. It also indicates the maximum size of gaps within a cover recording that can be ignored. The gap sizes are:

Bare soil: 5 cm
Gramminoids: 5 cm
Invasive species except blackberries: 5 cm
Blackberries: 10 cm
Trees and shrubs: 10 cm

Plants intercepting the transect line will be recorded as either native or invasive to measure cover for Vegetation Performance Standards 1 and 2. Key invasive species to be included in this measurement are listed below. Key native species noted below will be recorded individually to track native plant establishment for Vegetation Performance Standard 5.

i. Key invasive species include
   a. Reed canary grass, *Phalaris* arundinacea
   b. Non-native blackberries, *Rubus armeniacus* and *Rubus lacinatus*
   c. Canada thistle, *Cirsium arvense*
   d. English ivy, *Hedera helix*
   e. Bindweeds, *Convolvulus arvensis* and *Convolvulus sepium*
   f. Policeman's helmet and jewelweed, *Impatiens glandulifera* and *Impatiens noli-tangere*
   g. Yellow-flag iris, *Iris pseudacorus*
   h. Purple loosestrife, *Lythrum salicaria*
   i. Saltmeadow cordgrass, *Spartina patens*

ii. All trees and shrubs are to be recorded to species.
iii. Native gramminoids are to be recorded to genus. If several native species within a genus are adjacent, they will be recorded together. This is common for rushes in *Juncus*.
iv. Non-native gramminoids (except reed canary grass) are to be lumped together into a category called "other pasture grass"

Twenty 50-meter long permanent line intercept transects are established on the Dooher tract (Figure A). The random sampling is stratified by the three planting schemes for habitats based on elevation: Spruce swamp, scrub shrub, and riparian. In the spruce swamp habitat, the sampling was further stratified into diked, undiked, and constructed hummock habitats. In the scrub shrub habitat, the transects off a baseline captured samples in higher and lower elevations off the excavated reconnection of Stasek slough to the Kilchis River. The riparian habitat, the planting zone was too narrow and irregular to use a baseline so random points were selected along the major channel boundaries to establish start points for 50-meter transects angled so they would fit into the riparian planting zone.

Monitoring will occur every other year for up to 10 years. When the performance standards are met for a habitat zone, line intercept transects in that habitat zone can be dropped.

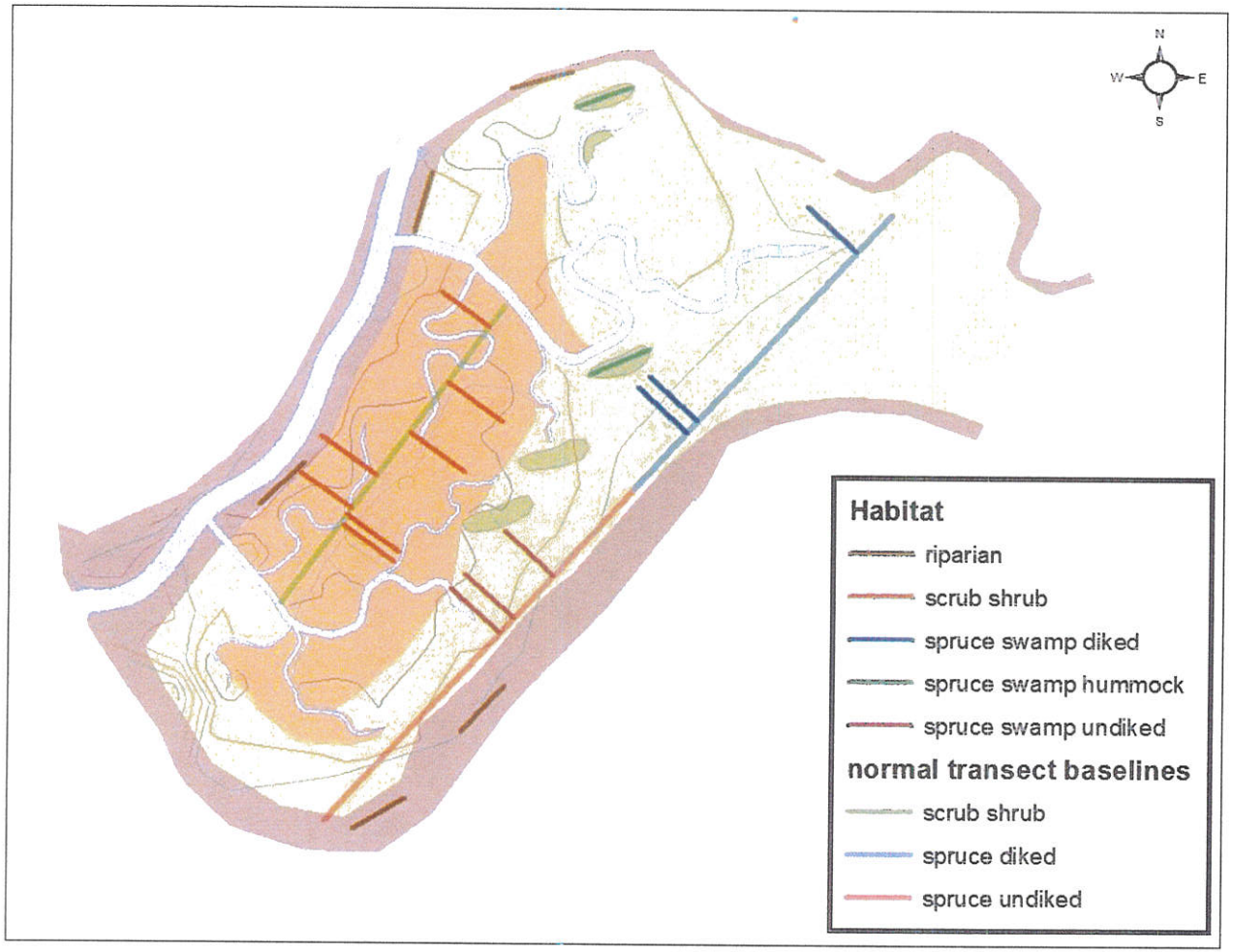

Figure A. Dooher tract line intercept vegetation monitoring locations

Random plots are used to monitor for survivorship of planted species. The plot locations are determined using a GPS to identify a cite a starting point for a 10 X 10 meter plot. Sufficient plots are taken to insure coverage in each of the target habitats (OWEB priority ecological systems).

Appendix B. Porter Tract Draft Monitoring Plan

Performance Standards

1. Vegetation Standards

Performance Standard 1: Survival of planting stock is greater than 70% after 3 years (OWEB standard)[3].

2. Hydrology Standards

Performance Standard 1: Tidal effects, as measured by tidal levels, duration, and timing, in constructed tidal channels (for average high tides without influence of river flooding) mimic tidal effects occurring at control gages on the Hathaway Slough.

Performance Standard 2: Floodwaters overtop constructed natural river levees during floods that reach or exceed 2 year exceedance river flood stage levels.

Vegetation Monitoring Methods

10 X 10 M (100m2) Plots: Randomly located plots will be used to determine survivorship of planted species in revegetated wetlands. Coordinates for randomly located plots will be generated by GPS unit. A sufficient number of plots will be placed in each of the major habitat types: riparian, scrub-shrub tidal marsh, and Sitka spruce swamp, to cover approximately 1% of the total revegetated area. This should insure repeatable values of survivorship that will identify any trends indicating if the re-vegetation standard is being met. If the standard is not being met in a given habitat, further analysis and consultation with OWEB will occur.

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[3] 70% survival (OWEB standard) of the planted individuals and/or clumps of willows:

- 1345 native plant stems per acre in Spruce Swamp habitat,
- 922 stems per acre in Riparian Forest habitat, and
- 467 stems per acre in Scrub-Shrub Tidal marsh habitat

EXHIBIT C

ODFW

LETTER

Oregon
Kate Brown, Governor

Department of Fish and Wildlife
West Region
4907 3rd Street
Tillamook, OR 97141
(503) 842-2741
Fax (503) 842-8385
ODFW.com

February 12, 2019

Dick Vander Schaaf
Associate Coast and Marine Conservation Director
The Nature Conservancy of Oregon
1634 SW Alder St, Portland, OR 97205

Re: ODFW Support for Kilchis Porter Tract Restoration

Mr. Vander Schaaf:

Thanks for the opportunity to review the draft restoration designs for the Kilchis Porter Tract Restoration Project. The purpose of this letter is to confirm our continued support of your effort to enhance or create over a mile of new tidal channels and plant the area with native tidal wetland plant species. We are happy to attest that the project is consistent protection of fish and wildlife habitat and will lead to a clear net benefit to fish and wildlife resources of the upper Tillamook Bay estuary.

Feel free to call me at 503.842.2741 x223 if we can be of any assistance.

Sincerely,

Chris Knutsen
District Manager
ODFW – North Coast Watershed District

DLCD COMMENTS

Hilary Foote

From: Daniel, Katherine <katherine.daniel@state.or.us>
Sent: Friday, December 13, 2019 2:36 PM
To: Hilary Foote
Cc: Adair, Celinda; Sarah Absher
Subject: EXTERNAL:Notice of Consolidated Review of 851-19-000510-PLNG and 851-19-000511-PLNG

Dear Hilary,

I have reviewed the materials available on the Tillamook County website for the above referenced project. The grading is limited to locations within the AE Zone of the floodplain. No portion of the project is located in the regulatory floodway which ends upstream from Highway 101. The project location is on the Kilchis River downstream of cross-section D as shown on FIRM panels 41057C0576F and 41057C0413F The requirements for encroachments within AE zones without floodways are contained in Tillamook Zoning Code Section 3.510(9)(e) with exceptions to this section located in Section 3.510(9)(f), which indicates that the Kilchis River downstream of cross-section C are not subject to the requirements of subsection (e). The applicant states that the exemptions from subsection (e) apply noting that cross-section C parallels Highway 101. This location appears to be designated as cross-section D rather than C. It is not clear to this reviewer that the project is within the exempted areas where heavy tidal influence and sheet flows make floodway designation inapplicable.

Nevertheless, the project appears to comply with the Tillamook County Flood Hazard Overlay regulations. The Kilchis River Estuary Porter Tract Restoration –Detailed Design Hydrodynamic Modeling Results report prepared by Northwest Hydraulic Consultants Ltd dated July 8, 2019 provides modeling of the proposed condition under typical and peak flow conditions. Figure 9 shows a rise in water surface elevation of less than 0.15 feet predominantly located northeast of the project location and northeast of Highway 101. This figure also shows smaller areas that will experience a rise of up to 0.4 feet in these locations. The base flood elevation of cross-section D is 14.2 feet. Figure 8 of the Northwest Hydraulic Consultants report shows modeling results of water surface elevation in the peak flow condition with proposed restoration will not exceed 11.5 feet.

Reductions in water surface elevation are also predicted by this modeling. Decreases of -0.15 to -0.3 feet are predicted south of Squeedunk Slough are shown in Figure 9 for the peak flow condition.

Although this hydraulic modeling does not utilize the traditional HEC-RAS modeling due to the tidal influence of the Pacific Ocean on the Kilchis River, the modeling allows the conclusion that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community. Therefore, whether the area is exempt from Section 3.510(9)(e) or not, the applicant has provided sufficient analysis to allow the conclusion that the project complies with Tillamook County's Flood Hazard Overly zone regulations.

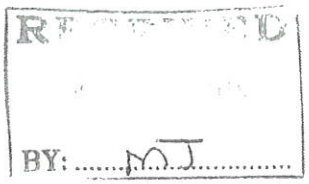
Thank you for the opportunity to comment.

Yours,
Katherine

HATHAWAY COMMENTS

Ben Hathaway
P.O. Box 635, Tillamook, OR 97141

December 12, 2019



Tillamook County Community Dept. of Development
1510 3rd St.
Tillamook, OR 97141
Attn: Hillary Foote

Dear Ms. Foote,

I, Ben Hathaway, as well as the surrounding neighbors and farmers wish to state that we are directly opposed to the second phase of the Nature Conservancy plan.

Let me outline in brief what our objectives are:

1. Lower the dikes along Hathaway and Stassek Slough approximately 1070 linear feet of dike, to elevate that which elevates the 2 year flood or annual exceedance levels of 9/10 feet (2150cy excavation materials).
2. Fill agricultural ditches, approximately 500 linear feet, 140 cy fill using excavated materials.
3. Re-excavate title channels, 5835 linear feet: 9790 cy excavated material.
4. Remove 5 water control constrictions to allow unrestricted title water access to the wetlands.
5. Remove the box culvert on the connector channel between Porter Stassek sloughs for improved title flow in the project area.
6. To build 2 light duty bridges over interior channels for site management and emergency access.
7. Re-vegetate the site with appropriate wetland species.
8. Create elevated mounds from excess excavated materials and plant with wetland species.

We, the Hathaways, not representing Bershire Hathaway's, but the Hathaway Trust, disagree with all of the Nature Conservancy's ideas and factoids. We plan on suing the Nature Conservancy in the amount of $10 billion dollars to restore the amount of damage already done.

We, the Hathaways, not a private entity plan on putting up the cash, not a bond, to sue any governmental agency and Nature Conservancy for their outrageous conduct.
Lowering the dikes on the Porter and Durrer properties have caused not only loss of farm land but have caused sentiment to plug (stop) the Kilchis River from being accessed by fish or man blocking and destroying the Kilchis River from being accessed from traveling East from the Hathaway property.

All you have to do is look at it, but I guess no one has.

The C run cutthroat access their annual spawning on or about mid-April. Mr. Dick Crossley and I witnessed none other than 9 bald-headed eagles and one (or a pair) of Peregrine diving and skimming the water killing the cutthroat eating them over your ridiculous adventure.
We the Hathaways, (personally) again, not representing any corporation (Berkshire Hathaway), are as we speak, drafting a law suit against the Nature Conservancy and any governmental entity which supports the Nature Conservancy in the amount of $10 billion dollars.

You have caused irreparable damage to the Hathaway, as well as other contiguous farmers, in your careless action. All you have to do is look at the damage you have caused by coming to my home on Kilchis Point to see what you have done and know that you now want to cause more damage. I note your intentions are to further the damage, as previously outlined, that you have already caused. You should look at the damage you have caused—not only to the fish—but to the contiguous property owners by your actions.

The banks that are contiguous to the Hathaway property are sloughing off and changing the whole nature of the bay which include the migration of cutthroat, steelhead, chum and salmon from migrating and spawning up the Kilchis River.

My boat ramp, although represented and approved by the commissioners who indicated would raise 1 to 2 inches, has raised 3 1/2 feet due to the removal of the dikes. This will further erode the fishing industry and spawning of the aforementioned fish while also impacting the farmers in our land area.

Not to be redundant, we the Hathaways, as Ben Hathaway, trustee of the Hathaway Trust will file suit against the Nature Conservancy and any governmental agency which approves or supports your new proposals.

Our suit will be brought to re-install the dikes you have torn down on the mentioned properties and to dredge, restore and bring back the status quo from your initial engagement.

Oh, by the way, you have caused the Kilchis River which ran by my home northwest to turn a considerable amount south and run into the Wilson River.

Is there no end to your idiocy?

Benjamin Henry Hathaway, JR.

cc: Tillamook County Creamery

Benjamin Hathaway, Jr.
P.O. Box 635, Tillamook, OR 97141

December 12, 2019

Board of Tillamook County Creamery

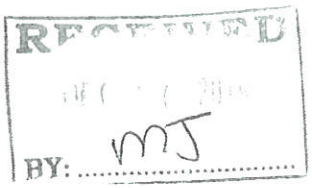
You are advised and given a copy of this letter to the Nature Conservancy et all.
Your promise to the farmers was to protect them.
Where are you when we need you?
Now I, as a registered independent have talked to Betsy Johnson, our Democratic Senator but also to our Democratic Governor who is also on board. Why are you not on board protecting the farmers as you said you would. Your promise was to protect the farm land with "No net loss of farmland". Well guess what's happened? Where are you when we need you? There are many outraged farmers including Don Averill, etc.
Is it that you are so big and large a corporation that you no longer care about Tillamook?
I suggest that you get on board and educate yourself to refute, restore the farm community which the Nature Conservancy seems bent on destroying.

Sincerely yours,
Benjamin Hathaway, Jr.

Benjamin Hathaway jr 12-13-2019

PRINCE COMMENTS

Micheal Prince
5055 Alderbrook Rd.
Tillamook, OR 97141
503-801-1280
msprince@outlook.com
GEO FARMS Inc.



December 15, 2019

To the Tillamook County Department of Community Development,

I am writing this letter to address the issue of the Floodway/Estuary/Floodplain Development Permit 851-19-000511-PLNG: The Nature Conservancy.

Since the beginning of this project in 2015 my farm and surrounding property have been affected by The Nature Conservancy's poor planning and execution. The result of their actions have negatively affected the way my farmland and property handle the accumulation of tidewater, rain fall and flooding. This is detrimental to the future of farming in this area and will only continue to get worse if not addressed.

The first project by The Nature Conservancy took out a stretch of dike along the Kilchis River starting behind former owner Sean Dooher's farm. This made all the water which used to go South into Casey Allen's property go toward the recently cleaned Stassek Slough. Now when it floods, there is twice as much water in this collection area causing it to backup into the fields along the east side of Highway 101. The willow and spruce trees that were planted will affect the flow of flood waters over time. They catch debris and aid in the accumulation of silt which us forcing water further and further up the Kilchis River Valley.

I expressed this concern to Dick from The Nature Conservancy only to be told it has helped the water drain faster. I disagree. The water is getting deeper and flooding Stassek Slough and the property that I lease from Sam Vermilyea. This project has made my fields unusable certain times of the year due to high water and residual fluctuation of the tides.

Once again I have expressed this to Dick with The Nature Conservancy repeatedly. Two years ago they were going to put water beacons around the Vermilyea property to measure the rising of the water. They never did.

The Nature Conservancy removed a tide gate in a small field between the railroad and Highway 101 which has caused even more flooding on that side of the property and made it impossible for me to access the neighboring property certain times of the year.

I was called a little over a year ago to meet with Dick again. Dick showed me where they wanted to clean and replace the culvert. This is supposed to help water flow out faster. Maybe, I don't know if this will help. It is yet to be seen.

There was never any word of lowering dikes and this is why I am writing this formal letter to you. I have been disappointed with the entire process involving The Nature Conservancy and I feel that the current issues must be resolved before they go any further.

In conclusion, I feel very strongly that the problems created by The Nature Conservancy must be addressed and resolved before we can move forward.

Sincerely,

Michael Prince

Geo Farms Inc.

TBFID COMMENTS

TILLAMOOK BAY FLOOD IMPROVEMENT DISTRICT
Post Office Box 806 • Tillamook, Oregon 97141
503-815-8164 • TBFID@tillamookoffice.com

To: Hillary Foote, Tillamook Co. Dept. of Community Dev. (TCDCD)
From: Tillamook Bay Flood Improvement District (TBFID)
Date: December 17, 2019, written comments
Re: TNC Kilchis Porter Tidal Wetland Restoration Project, Permit 851-19-000511-PLNG

The Tillamook Bay Flood Improvement District (TBFID), an ORS 554 Special (Water Control) District, territory extends north to south of Bay City. The Nature Conservancy (TNC) property and proposed "Kilchis Porter Tidal Wetland Restoration Project" is within the District flood control lands. On behalf of Kilchis River District members and TBFID, the District is submitting these written comments in opposition to TNC permit application 851-19-000511-PLNG approval.

A proposed second project on TNC Porter 30 acres is expected to further escalate flooding and loss of neighbors protected farm lands, as witnessed since the 2015 Project #1. Attached 2015 copies of Jo L Farms and Geo Farms letters addressing original TNC Project #1 problems that remain unresolved today, 4 years later. Secondly, attaching flood data from October 2017 post-Project #1 flood as example of accelerated flooding in area. No TNC hydraulic modeling subsequent to Project #1 and for Project #2 has been provided to the District for analysis. On-the-ground observations by witnesses attests to increased flooding, lack of drainage, and threats to structures, post-TNC Project #1. More county permit due diligence is needed to mitigate TNC Porter Projects #1 and #2 before permitting another wetlands project.

Regarding review criteria provided by TCDCD, the District comments are:
1) TCLUO 6.040 (4) Conditional Use criteria/"The proposed use will not alter the character of the surrounding area in a manner which substantially limits, impairs or prevents the use of surrounding properties for the permitted uses..."—Per criteria, TBFID supports SB 1517 and COLLABORATION amongst property owners. TBFID and landowners have not been included in proposed 30 acre project stating SB 1517 permitted projects, "...complements the land use patterns necessary for the stability of agricultural and associate farming practices," projects " that would provide the greatest benefits to ...flood mitigation and other values." 2015 Project #1 has not satisfied county permit criteria and Project #2 projected to compound issues.
2) TCLUO 6.060 (1a, 1b) Wetlands Restoration criteria: a) "The use will not force a significant change in accepted farm...practices on surrounding lands devoted to farm...use" and b) "The use will not significantly increase the cost of accepted farm...practices on surrounding lands devoted to farm...use."—Farm lands uses and costs escalated and revenues lost upon completion of TNC 2015 Project #1 and expect to increase exponentially with Project #2. Jo L Farms lost estimated 55 acres and counting post-2015 Project #1. Denial of TNC permit requested until problems solved.
3) TCLUO 3.510 (14b, 26)/Flood Hazard Overlay Zone: "The fill does not impede or alter drainage or the flow of floodwaters."—In-filling existing ditches without mitigation decreases drainage and flood waters exit. Projects in-fill, lowering of dikes, water control structure removals, elevated mounds with fill from ditches, and revegetation, projected to exacerbate areas drainage and flood water problems. TBFID and property owners have not seen TNC project plans to know these and other project concerns are mitigated. Consequently, TBIFD opposes TNC permit approval.

The $468,000 TNC-OWEB restoration grant #2 and prior buyout of Porter farm land has not satisfied District and property owners criteria for collaborative best uses of farm and wetlands as adopted in SB 1517 (2016). TBFID has not seen SB 1517 analysis of farm lands vs/wetlands use in Tillamook County to know if project meets the bills criteria. Locals have observed increased flooding after TNC Phase #1 Project.

Tillamook County Comprehensive Plan Goal 3 protects farm lands and flood damages. Farm lands are optimum conduits of flood waters for public safety and infrastructure protection. TNC has had 4 years to mitigate Project #1, to work with neighbors to approve optimum plans for wetlands and farm land uses. Rushing to approve the TNC Project #2 permit without due diligence of parties involved and public hearings is opposed. More thorough studies and monitoring are requested before moving forward with another TNC Porter Project. TBFID supports the permit application referral to the Tillamook County Planning Commission for further diligence and public involvement.

Respectfully, TBHEID Board & Associates

Cc: TCCA Board

April 24, 2015

2015 Copy

Don Averill, Jo L Farms
5205 Idaville Road
Tillamook, OR 97141

Tillamook County Board of Commissioners
Attn: Tim Josi, Chairperson
201 Laurel Avenue
Tillamook, OR 97141

Re: Hathaway Appeal Hearing for TNC Permit Application DPO-14-14(a)

Dear Commissioners,

Our multi-generational/multi-million dollar and heavily regulated farm business where we pasture, and grow grass and field corn, for our dairy cows is south of The Nature Conservancy (TNC) former Dooher Farm proposed restoration project. We learned about TNC project as a member of the Tillamook Bay Habitat & Estuary Improvement District (TBHEID). No one from TNC has contacted us about their project and fill-removal permit application to permanently change the farm land they bought to wetlands.

There is no proof our CAFO permit, drainage, sedimentation, erosion, and water table will not be affected by TNC project, that our high value protected resource won't become swamp land. Levee changes, the Hathaway-Stassik Slough culvert removal, forests, water and flood flows, all affect our farm land drainage characteristics.

The TNC Dooher project, combined with the pending Porter farm land buyout and wetlands restoration project, doubles the impacts to our farm and other bordering properties. Tillamook farming depends on farm land and we need more farm land, not less, as we expand and reinvest in the next generation. The economic costs of losing farmland has not been proven to us or our neighbors.

We expect the TNC to go through the same process we go through when we buy and change land uses. It is only fair they abide by the same rules and regulations as the County's Southern Flow Corridor Flood-Restoration Project.

Put us on the record as opposing TNC county permit application to redo our historical man-made infrastructures that have drained our farm land all these decades and generations. We hold TNC liable for any outright loss of our land use due to any negligence on their part.

Respectfully,

Jo L Farms, Inc.

April 24, 2015

2015 copy

George Prince, Geo Farms
4555 Alderbrook Road
Tillamook, OR 97141

Tillamook County Board of Commissioners
Attn: Tim Josi, Chairperson
201 Laurel Avenue
Tillamook, OR 97141

Re: Hathaway Appeal Hearing for TNC Permit Application DPO-14-14(a)

Dear Commissioners,

Our family farm borders The Nature Conservancy (TNC) former Dooher Farm and proposed restoration project. We learned about TNC project as a member of the Tillamook Bay Habitat & Estuary Improvement District (TBHEID). No one from TNC has contacted us about their project and fill-removal permit application to permanently convert the farm land they bought to wetlands.

Because our drainage systems are inter-connected, we need proof TNC project is compatible with our multi-generational/multi-million dollar and heavily regulated farm business where we pasture, and grow grass and field corn, for our dairy cows. How they use their land cannot impact the outright use we have for our land.

There is no proof our CAFO permit, drainage, sedimentation, erosion, and water table will not be affected by TNC project, that our high value protected resource won't become swamp land. The Hathaway-Stassik Slough culvert removal, alone, affects our farm land drainage characteristics by changing water (flood) flows.

The combined Dooher and Porter farm land buyout and change to only wetland, will double the impacts to our farm and other bordering properties. Tillamook farming depends on well drained farm land and we cannot afford to lose access to any of our land. The economic consequences of decreased production on our land due to over saturation of the soils is unacceptable.

We expect the TNC to go through the same process required by the county Oregon Solutions Southern Flow Corridor Project for a flood control-wetlands restoration project. It is only fair that everyone abides by the same rules and regulations.

Because of the above reasons, we want to be on the record as 1) opposing TNC county permit application to redo our historical man-made infrastructures that have drained our farm land all these decades and generations and 2) to let TNC know we hold them liable for any outright loss of our land use due to any negligence on their part.

Thank You Commissioners,

Geo Farms, Inc.

SHERIFF

Tillamook County Sheriff's Office

5995 Long Prairie Rd. Tillamook, OR 97141

Tilda,

With regards to the data about the October 21-22, 2017 Flood Event. This flood was the result of an early season Atmospheric River Event that brought substantial rainfall to northwest Oregon. It was the earliest flood event I could fine in the last 50 years. It resulted in the Wilson River, which is near the Kilchis River, being in the top 10 Wilson River Flood events, cresting just above 17'. Flood Level for the Wilson is 12'. I have no data for the Kilchis River levels.

The flooding, understandably, was the result of the heavy rains which included a 24hr maximum in Tillamook of 4.32", Lees Camp up Hwy 6 registered 9.3" and South Fork receiving 6.6". High tides during this period were not noteworthy.

This flood event was similar to the flood event of November 1999.

I would like to mention that during this event I did note that during my travel from my residence in Bay City, south into Tillamook, that the water levels on either side of Hwy 101 in the Idaville Flats area, from Idaville Rd. south to just north of Possetti Rd near Juno Hill, contained water levels I had not seen before, even during other record flood events. I began to keep a closer watch on this area as it appeared that, if it continued to rise, it could threaten water over Hwy 101. Again, I have not observed levels this high before or after this event. It was later, at one of the TBFID meetings, that I learned from their representative at the meeting, that it may have been the result of changes the Nature Conservancy had made in that area. It is also my understanding that it negatively impacted adjoining property during this time.

This is all the data that I have.

Regards,

Lt. Gordon McCraw, DEM
gmccraw@co.tillamook.or.us
503-842-3412

EXHIBIT D

Fish: Pacific Staghorn Sculpin and Starry Flounder.
Other: Several large sparse beds of Ghost or Mud Shrimp.

Significant Biological Functions
Primary production. Clam and other invertebrate production. Fish, bird and seal feeding area. Seal haul-out and bird resting area.

HISTORICAL ALTERATIONS
RIPARIAN VEGETATION
WATER QUALITY
HYDRAULIC CHARACTERISTICS
NAVIGATION AND PUBLIC ACCESS TO THE WATER
OTHER

MANAGEMENT UNIT: 28EN (Estuary Natural)

CATEGORY: Major tract of saltmarsh.

HABITATS:

Habitat Classification	Acres	% of Class in Estuary
tidal marsh (2.5.12)	41.4	4.3

Animals Present
Birds: Nesting area. Goose Point area most important Band-Tailed Pigeon watering area (only tow in bay).

Significant Biological Functions
Band-Tailed Pigeon watering area. Primary production.

HISTORICAL ALTERATIONS: This management unit, historically larger, was reduced in size by the placement of the Bay City sewage lagoons, by the access road to the lagoons and probably by development along Spruce and Salmon streets. A dike was constructed along the southern boundary of the southern most marsh in this management unit.

RIPARIAN VEGETATION: Shoreline is predominantly forested.

WATER QUALITY
HYDRAULIC CHARACTERISTICS
NAVIGATION AND PUBLIC ACCESS TO THE WATER
OTHER

MANAGEMENT UNIT: 29EC1 (Estuary Conservation 1)

CATEGORY: Area needed for maintenance or enhancement of biological productivity. Area needed for recreation use.

HABITATS:

Habitat Classification	Acres	% of Class in Estuary
subtidal unconsolidated bottom (1.1, 1.1.1)	186.4	8.0
tidal marsh (2.5.11)	1.5	0.2

Animals Present

Birds: nesting, feeding and resting on tideflats and marshes adjacent to this management unit.

Clams: Softshell (portions of beds associated with 24EN); Baltic (portions of beds associated with 27EN); California Softshell (portions of beds associated with 24EN).

Fish: Starry Flounder, Salmonids.

Biological Function
Fish feeding. Salmonid passage.

HISTORICAL ALTERATIONS: Piling has been placed in this management unit.

RIPARIAN VEGETATION: Shorelines are predominantly cleared agricultural lands. The shoreline of Kilchis Point is partly forested.

WATER QUALITY
HYDRAULIC CHARACTERISTICS
NAVIGATION AND PUBLIC ACCESS TO THE WATER
OTHER

MANAGEMENT UNIT: 30EN (Estuary Natural)

CATEGORY: Major tracts of saltmarsh.

HABITATS:

Habitat Classification	Acres	% of Class in Estuary
tidal marsh (2.5.11, 2.5.12)	236.9	24.7

Animals Present

Birds: nesting, feeding and resting area.

Significant Biological Functions
Primary production. Birn resting, feeding and nesting area.

HISTORICAL ALTERATIONS: A dike is located along the southern boundary of this management unit removing a large area of tidal marsh. A dike and fill for the Southern Pacific Railroad probably eliminated a large area of tidal marsh now mapped as Coquille soil by the U.S Soil Conservation Service.

RIPARIAN VEGETATION: Predominantly cleared agricultural land.

WATER QUALITY
HYDRAULIC CHARACTERISTICS
NAVIGATIION AND PUBLIC ACCESS TO THE WATER
OTHER

MANAGEMENT UNIT: 31EC1 (Estuary Conservation 1)

CATEGORY: Area needed for maintenance or enhancement of biological productivity.

HABITATS:

Habitat Classification	Acres	% of Class in Estuary
subtidal unconsolidated bottom (1.1)	17.1	0.7

Animals Present
Birds: nesting, feeding and resting on marshes adjacent to this management unit.
Fish: Chum and Coho Salmon.

Significant Biological Functions
Salmonid passage.

HISTORICAL ALTERATIONS: A dike is located along a portion of the northern bank of this management unit (see discussion for 30EN). Fill and piers have been placed for the crossing of Highway 101 and the Southern Pacific Railroad.

RIPARIAN VEGETATION: Predominantly cleared agricultural land with some trees and shrubs.

WATER QUALITY
HYDRAULIC CHARACTERISTICS
NAVIGATION AND PUBLIC ACCESS TO THE WATER
OTHER

MANAGEMENT UNIT: 32EC1 (Estuary Conservation 1)

CATEGORY: Area needed for enhancement of biological productivity.

EXHIBIT E

SIX RIVERS MEDIATOR SUMMARY

SIX RIVERS

Community Mediation
Facilitations
Mediator Training
Education

Kilchis Porter Project-Specific Collaborative Process: Mediator Summary

Date: June 15th, 2021

Goals and Scope: The intent of this Project-Specific Collaborative Process was to develop collaborative recommendations for conditional use review regarding the Conditional Use Permit for the Kilchis Porter Tidal Wetland Restoration Project. The goals for this process are described in Senate Bill 1517 as follows:

> Section 2: The Legislative Assembly finds and declares that Tillamook County experiences unique challenges related to the creation, restoration or enhancement of wetlands on lands zoned for exclusive farm use, including regularly occurring and devastating flood events and landowner conflicts. It is therefore in the public interest to establish a pilot program in Tillamook County that applies conditional use review for the creation, restoration or enhancement of wetlands on lands zoned for exclusive farm use, and that incorporates a means for stakeholders to engage in a collaborative process for ensuring the protection and enhancement of agricultural land uses and wetlands.

The scope of the collaborative process is described in Tillamook County Land Use Ordinance Article 6: Section 6.060: (1) Notwithstanding 6.040 or ORS 215.296(10), a CONDITIONAL USE for a WETLAND RESTORATION, ENHANCEMENT OR CREATION located on land zoned Farm (F-1) and authorized according to this Article shall only be subject to the following criteria:

a. The use will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; and
b. The use will not significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

Participants: Invited participants were defined as follows:

(a) The applicant;
(b) Any person whose use of the person's property may be adversely affected by the proposed use;
(c) Any person who is entitled to notice under ORS 215.416 (11)(c);
(d) Representatives of any state or federal agency that is involved in the project for which the application for the use was submitted or that has expertise related to issues raised by the application or by comments received by the governing body; and
(e) For the purpose of assisting in the project-specific collaborative process, any person with technical expertise in:
  (A) Creating, restoring or enhancing wetlands in Tillamook County;
  (B) Creating, restoring or enhancing wetlands in areas with site characteristics similar to those identified in the application for the use; or
  (C) The impacts of wetlands on agricultural operations.

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Based on this definition, the following individuals agreed to participate in the collaborative process. Two individuals did not participate in any of the mediation meetings; the other participants attended at least one or more of the mediation meetings.

Ben Hathaway (Property Owner), Robert Kabacy and Thomas Rask (attorney representatives)
Michael Prince (Property Owner)
Jon Cummings (Tillamook Bay Flood Improvement District - TBFID)
Tilda Jones (Tillamook Bay Flood Improvement District - TBFID)
Leo Kuntz (TBFID Consultant)
Don Best (TBDID Consultant)
Ray Monroe (Tillamook County Soil and Water Conservation District)
Chris Knutsen (Oregon Department of Fish and Wildlife)
Lisa Phipps (Department of Land Conservation and Development)
Hilary Foote (Department of Land Conservation and Development)
Curtis Loeb (Wolf Water Resources)
Dick Vanderschaaf (The Nature Conservancy)
Jena Carter (The Nature Conservancy)
Sarah Absher (Tillamook County Department of Community Development)
Paul Snyder (Tillamook County Creamery Association)
Mary Anne Cooper (Oregon Farm Bureau)

Kilchis Porter Project Area Definition: The Kilchis Wetlands site, now known as the Kilchis Estuary Preserve, is located on the lower Kilchis River near Tillamook Bay in Tillamook County, T1S, R10W, Section 12. The site is located between the cities of Bay City and Tillamook, west of Highway 101 and occupies 126.69 acres in two parcels of 66.43 acres referred to as the Dooher tract and 60.26 acres referred to as the Porter tract (Kilchis Estuary Preserve Management Plan, The Nature Conservancy). This summary also references the Dooher Project. The Dooher project is a separate project which has already gone through the land use review and permitting process.

Outcome: Mediation activities occurred between October 2020 and April 2021. Following the initial mediation session, The Nature Conservancy opted to continue the collaborative process. There have been substantial one-on-one mediation efforts to broker a settlement and five subsequent Zoom mediations. Several participating parties who agreed to represent all participating party interests drafted a mini-agreement to contract with a third-party hydraulic engineer, Vaughn Collins, for the purpose of reviewing both the Dooher Project and Porter Project hydrology. These parties, listed below, agreed to discuss the report when it is completed, as well as any mitigation or responsive actions it may indicate or imply. The full language of this mini-agreement is included in this summary. Parties were unable to reach full agreement on recommended project modifications or considerations within the 90-day extension provided for this Project-Specific Collaboration Process. The mediators determined that, due to the time constraints imposed by the land use review process and impasse between the parties, reaching meaningful agreement on proposed project modifications would not be possible prior to the completion of the third-party hydraulic review (as outlined in the mini-agreement).

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Collaborative Process Summary:

An initial mediation session was held on October 30, 2020 to solicit and integrate input from parties related to the following criteria:

a) The use will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use; and
b) the use will not significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use.

During the initial mediation session, Tillamook County Development Director provided a brief overview of the collaborative process guidelines. The Nature Conservancy then provided a summary of the proposed Kilchis Porter Project. Don Best (TBFID consultant), shared several slides including aerial photographs and historical maps of the region.

All participants were given an opportunity to share their comments or questions regarding the Project and conditional use criteria. Comments, questions, and suggestions that were brought forth in mediation are summarized in greater detail below.

For criteria A, *that the use will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use*, the main dispute involved anticipated impacts to drainage and the water table on properties adjacent to the Kilchis Porter Project area. In 2015, The Nature Conservancy conducted a restoration project on an adjacent tract of land – the Dooher Project. Adjacent landowners and TBFID representatives described observations of economic and ecological impacts after the Dooher Project implementation. According to those voicing concern, these observations of impact from the Dooher Project had not been predicted by hydrological modeling and have not been confirmed by The Nature Conservancy staff. Representatives from The Nature Conservancy, ODFW and Wolf Water Resources (W2R) stated that for both the previous and current Project, hydrological modeling was relied upon in the design. For the current Project, the model predicts little to no increase in flooding in the Project Area. Landowners expressed concerns that modeling is insufficient and requested analysis that takes local observations and previous project outcomes into account.

To resolve criteria A, participants agreed to contract with a third-party hydraulic engineer to review The Nature Conservancy models and answer specific questions. The outline of that agreement is included in this summary.

For criteria B, *that the use will not significantly increase the cost of accepted farm or forest practices on surrounding lands devoted to farm or forest use,* participants expressed concern that decreased drainage, or increased water table levels, would limit availability acreage to farm as well as limit the season for using farmland. Participants also reflected that other factors, such as regional climate change, might affect the cost of farm practices.

To resolve criteria B, several suggestions were made and are briefly described below. Future project modifications or actions may be explored based upon the third-party hydraulic review.

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The summary below captures the comments, concerns, and questions shared during mediation. Where specific property is mentioned, the property owner is noted. Otherwise, individuals associated with each comment are not named. The information in this summary is has been categorized thematically. The information is not prioritized and statements were not captured verbatim. Six Rivers Dispute Resolution Center makes no representation, warranty or claim that the information provided during mediation is current or accurate.

Participant Comments

Modelling

- Request for site-specific analysis needs to be conducted and incorporated into Project Plan. Previous project (Dooher Project) resulted in local impacts not predicted by modeling. The same model is used to plan Kilchis Porter Project.
- There are obstacles to groundwater monitoring. Need to explore opportunities and limitations related to groundwater monitoring, and pathways to make the permitting process easier for groundwater monitoring wells for restoration purposes.

Drainage and Water Flow

- Little to no elevation change across the Project site results in reduced drainage of tidewater and increased groundwater in adjacent properties.
- Gravel and silt accumulation in previous project area (Dooher Project) reduce drainage. The gravel accumulation results in water level changes not predicted in modeling.
- Historically, the Kilchis River had more drainage options to the Tillamook Bay, now limited due to regional infrastructure. Restoring the Kilchis to historic patterns could inhibit drainage.
- Frequent logjams inhibit drainage. Request to remove logjams regularly.
- Previous project (Dooher Project) increased subsurface water levels and reduced ability to farm in adjacent properties. In other, unrelated project areas were verified by the transfer of bacteria from formerly inaccessible drainage areas.
- During winter, adjacent fields have standing water and property owner cannot access the fields to plant. Tax lots 2600 and 2700 mentioned specifically by Michael Prince.
- Tidal flows in the Hathaway and Squeedunk sloughs were impacted by Dooher Project, such that one is unnaturally high and the other is unnaturally low, rather than balancing out.
- Flood conditions from recent years should be taken into consideration rather than 100 year flood model.
- TNC requests information about the specific timing and location of flooding.
- Explore the possibility of lowering the west side river bank on the Gienger property.

Maintenance and Monitoring

- Army Corps Flood Control Project infrastructure, within Project area, requires maintenance.
- Request for the Project Management Plan to include measuring and monitoring of Project effects on adjacent properties, both positive and negative.

- Request for management Plan to include actions that will be taken by TNC if Project results in unintended consequences, especially increased flooding to adjacent landowners.
- Previous Project area currently monitored by 8 loggers within the project site and in three other sloughs.

Comments not related to ordinance criteria

- Project area and tidal region is essential for salmon recovery, both commercially and ecologically
- Observation that previous project (Dooher Project) disrupted salmon access; salmon are taking a different route to reach upstream Kilchis.
- Observation that gravel accumulations create pools where salmon are trapped and easy prey for predatory birds. Some gravel creates shallow, warm pools, near the property of Ben Hathaway. It was noted that sediment accumulation in this location has been a chronic problem for decades.
- Gravel and silt accumulation in previous project area (Dooher Project) impacts salmonid access.
- Salmon continue to thrive in the drainage and restored areas needed for salmon recovery.
- Region contains historic uses not explicitly noted in the permit application
- Initial Project application was resubmitted after Covid-19 and cyber security issues at Tillamook County caused project review delays; therefore previously submitted public comments are not currently on website. To submit comment, public must re-send their comments related to the Kilchis Porter Project during upcoming comment period.

Participant Suggestions

The following suggestions were made by one or more participants. None of the following suggestions had full consensus or agreement by all participants.

- Measure slough water levels and/or groundwater levels on adjacent landowners' property as well as Project site. Install water beacons to document changes. Monitor for loss of agricultural land due to rising groundwater levels.
- Establish direct communication pathways between The Nature Conservancy project staff and adjacent landowners. Regularly schedule information exchange along with site visits to both Project area and adjacent land. Prior to permit approval, conduct a Project site area tour with all stakeholders.
- Establish communication connection between The Nature Conservancy and The Tillamook County Creamery Association
- Re-install key dikes to protect adjacent land during seasons of use (especially where agricultural land has become inaccessible due to rising subsurface water levels).
- Enhance connection to Stasek Slough to increase drainage
- Update Porter project hydrological analysis to include:
    - Current gravel deposition and impact on drainage
    - Inadvertent effects of different types of flooding events, taking climate change impacts into consideration
    - Past use of site by Army Corps of Engineers
    - Groundwater monitoring

- Reference both hydrological modeling and community observations to predict project outcomes and management.
- Negotiate a land swap with adjacent farmers, in which arable land is exchanged for wetlands
- The Nature Conservancy may buy out a portion of adjacent lands; adjacent farmer may then use the funds to buy a higher elevation piece of land
- Create a detour channel from project area across Hwy 101
- Explore current funding opportunity for installing a tide gate on agricultural lands
- Explore possibility of land raising by transporting earth to low elevation arable land
- Contract with Vaughn Collins, hydraulic engineer, to review the Dooher and Kilchis Porter project hydrological modelling using data inputs from TBFID and TNC.

Mini-Agreement: Vaughn Collins Scope of Work

Participants: Tilda Jones (Tillamook Bay Flood Improvement District - TBFID); Dick Vanderschaaf (The Nature Conservancy); Jena Carter (The Nature Conservancy); Paul Snyder (Tillamook County Creamery Association)

The parties involved in the Kilchis Porter Collaborative Process reached a mini-agreement to contract with Vaughn Collins, hydraulic engineer with NHC. Collins will review the Dooher and Kilchis Porter project hydrological modelling. This work will be paid for by The Nature Conservancy and The Tillamook County Creamery Association. TCCA and TNC will each cover 50% of the cost of this review.

Participating parties agree that the purpose of this review is to inform the following questions:

Dooher Project impacts analysis:

1) How did the Dooher project impact water levels in Hathaway Slough, Stasek Slough, and the Kilchis River (adjacent to the project site)?

2) What were the hydrological impacts of the Dooher Project regarding both drainage and flooding on farm properties adjacent the Dooher property and Stasek slough?

Kilchis Porter Project impacts analysis:

3) What are the anticipated impacts of the Kilchis Porter Project to neighboring farm properties regarding both drainage and flooding? How do the impacts of the initial Dooher and proposed Porter projects combine?

4) Review and, if needed, propose updates to the model, report and findings associated with Kilchis Porter permit.

5) If anticipated impacts are identified, what proposed actions could be considered to remediate or mitigate impacts to neighboring farm properties?

In addition, parties agree to request that Vaughn Collins evaluate the following:

6) Review the "staircase" theory per L. Kuntz 2017 NM memo, and the Kilchis River gradient from Highway 101

7) Review the flow control function of the existing box culvert on the Porter property and potential effects on drainage and flooding on farm properties adjacent to Hathaway Slough.

8) Review of Stasek Slough water levels versus Hathaway Slough levels and timing with tides

9) Analyze effects of proposed Hathaway Slough levee removal

10) Review flow control function of existing box culvert and potential effects on neighboring farm properties along Hathaway Slough

11) Analyze Dooher levee removal effects on the Kilchis River east of Highway 101

12) Review land accretion on former Dooher lands post-2015 TNC project and potential changes.

14) Analyze flooding and changes to subsurface water levels in adjacent farming properties, as well as the attributions of identified changes. Specifically, does the information currently available allow site specific subsurface water analysis? If yes, how was this analysis conducted? If no, what data is needed to conduct such an analysis?

Parties agree to provide the following information for Vaugh Collins to use in review:

1. Previously completed hydrological modelling of the Dooher and Kilchis Porter Projects, developed by ESA, Wolf Water Resources and Northwest Hydraulic Consultants Ltd, provided by the Nature Conservancy. This modelling includes the changes resulting from the Dooher project.

2. Water level logger data from TNC as needed by Collins to complete a full and accurate assessment.

3. Full Kilchis Porter permit application

4. Wolf Water Resources and D. Vander Schaaf as resource

5. Staircase theory memo from L. Kuntz

6. Other data inputs as requested by Collins to complete a full and accurate assessment

Agreements:

1. Collins will regard all data inputs as confidential and will not share any inputs with other parties
2. Collins' report, analysis and findings will initially be released to mediation parties only. The report and findings will be made fully public by 120 days following receipt of the analysis from Vaughn, or by mutual agreement by the parties, whichever occurs first.
3. The parties may not contact Vaughn Collins to expand the workload or add additional questions. The above agreed upon questions/requests comprise the full and final scope of work.
4. All clarifying questions or other inquiries from Collins during the analysis period will be shared with the entire group, even if the questions are only directed at one particular party.
5. Vaughn Collins will personally complete this review and assessment. Attempts to contact, discuss, or influence Vaughn's work will result in the immediate termination of this project.

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Disclaimer

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