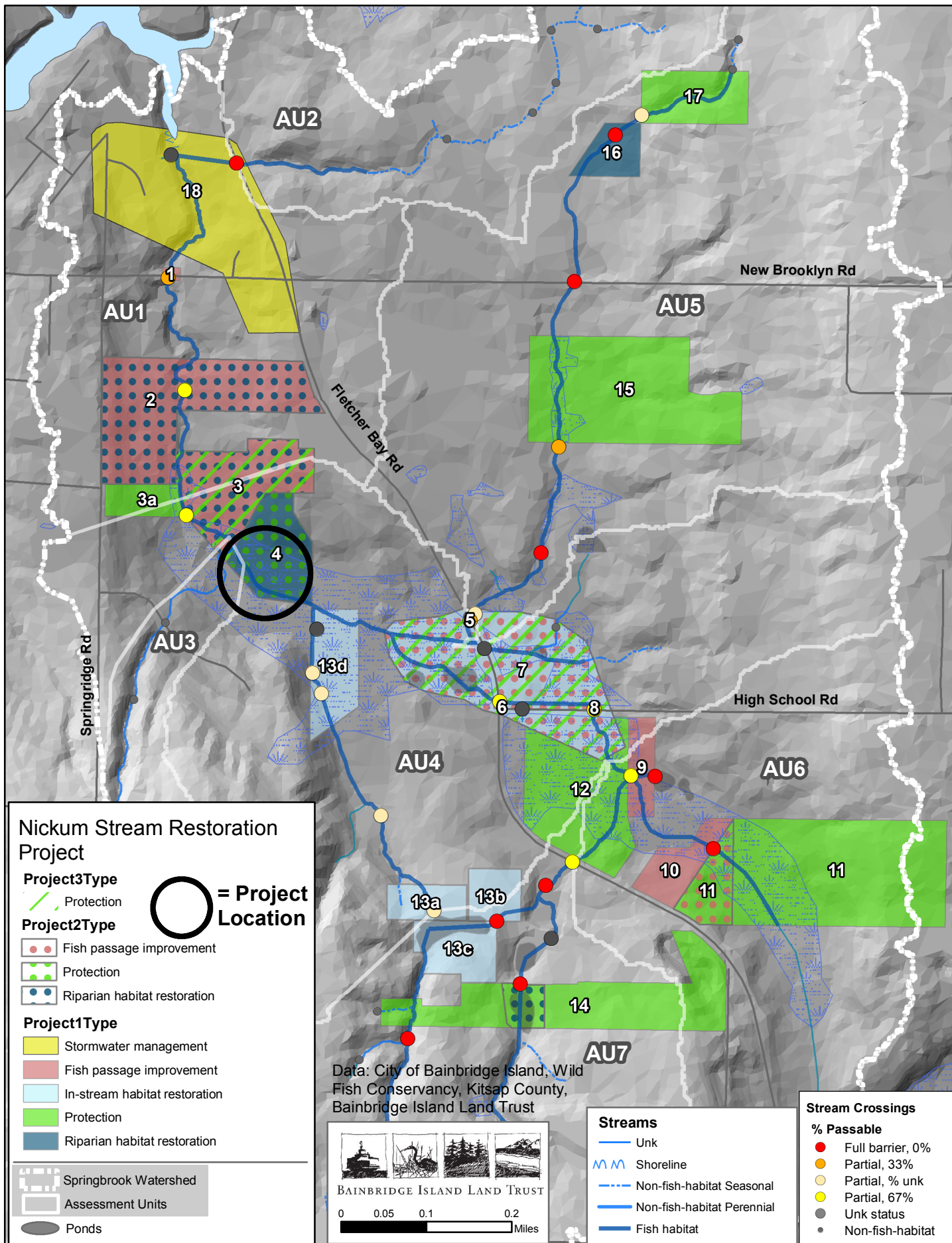


Appendix III Project 4

Nickum Stream and Riparian Restoration Project

Conceptual Design



Nickum Stream and Riparian Restoration

Site Description

From river mile 0.63 to 0.74 Springbrook Creek runs along the southwestern edge of a 5.88 acre parcel belonging to Will and Cathy Nickum. In this reach, the stream meanders down an unconfined low gradient valley bottom of approximately 1.5 acres with adjacent wooded wetlands with an average bankfull measurement of 6.3 ft. The left bank of the valley floor is densely forested with an over story of alder, ash, mature willow, and red osier dogwood. The Nickum property is located on the right bank of the channel. The right-bank portion of the valley has been cleared of native vegetation and is currently dominated by invasive reed canary grass. The stream exists wholly within the Nickum parcel at this time. The associated wetland forest and upland riparian area uphill of the left bank of the stream is owned by three separate landowners and is comprised of intact mature mixed forest and wooded wetlands.

Where Springbrook Creek enters the Nickum property it runs within the forested section of the valley floor. This upper section of stream extends for 450 ft. providing excellent low-gradient salmonid rearing habitat with undercut banks and instream large woody debris. Downstream from this section, a left bank avulsion diverges from the main stem, carrying a portion of the flow through the adjacent forested wetlands. At this point the right bank channel, carrying the majority of the flow, turns northeast toward a recently cleared section of the valley bottom which is now dominated by reed canary grass with lack of tree cover. At this point the channel runs along the edge of the tree line for approximately 150 ft. at which point the avulsed channel rejoins with the mainstem flows. Here, the combined flows turn north, leaving the edge of the tree line and entering the cleared valley floor. This lower section of channel is now choked with invasive reed canary-grass for approximately 100 ft. The stream then exits the Nickum property under an existing fence that collects wood debris and reenters forested habitat at the property boundary. There are a series of small footpaths used by the landowners within the seasonal (avulsed) stream channel and riparian area.

Specific Goals

The main goal of Nickum property project is to improve the quality and quantity of salmon rearing habitat, improve fish passage in the stream (which is now compromised by reed canary grass), and improve water quality and large wood recruitment by restoring the associated riparian habitat in this unconfined low-gradient reach of Springbrook Creek. This will be accomplished by reestablishing an intact riparian corridor and natural channel processes in the section of stream now choked by invasive reed canary grass. For both Options 1 and 2 the project team recommended the largest riparian buffer that

the landowner was willing to support, understanding that greater buffer widths represent a more natural condition at the site and convey greater ecological benefits to the stream and riparian community. The project team presented 2 alternative replanting buffer width based on conversations with the landowners. Conceptual design drawing Sheet 2 illustrates the approximate boundaries for 100 foot and 200 foot buffers. A 200 ft buffer encompassing approximately 2.6 acres of planting more fully accommodates the potential for future channel migration into the currently cleared valley bottom.

Limiting Factors addressed by this project: High water temperatures, low dissolved oxygen, sediment, degraded conditions for benthic macroinvertebrates, degraded riparian habitat, and fish passage barriers.

Design Elements: Wild Fish Conservancy performed in stream and associated riparian assessments, examined LIDAR elevations, performed topographical surveys, discussed the restoration options with the project team and landowner. The selected restoration option was agreed to by the landowner.

Option 1 (Sheet 3)

Option 1 is a two tiered approach to address the section of channel now choked by the recently established reed canarygrass. At the existing avulsion we propose to plug the main channel with woody debris and wood cuttings, and with minor (hand equipment) excavation to encourage all flows to pass into the forested left bank avulsion channel. The exact geometry and course of the forested left bank avulsion channel will be determined during the final design and permitting process. The plugging of the main channel using existing woody debris to force the avulsion, and the amount of excavation in the avulsed channel would be the minimal needed to encourage summer flows in to the avulsed channel. Downstream from the plug, the right bank channel would be flooded from the downstream direction (backwatered) providing seasonal off channel habitat during times of high flow. During storm events, the plugged main channel would still function to accommodate and convey high flows. Throughout the valley floor we propose an aggressive planting regime of native trees and shrubs to mimic the well-established stand of shrubs adjacent to the cleared area.

Pros

Taking advantage of the avulsion channel running through adjacent wooded wetlands produces a linear gain of approximately 150 ft. of high quality forested channel with very little excavation. This will replace the compromised stretch of stream running along the edge of the tree line which is being encroached upon by reed canary grass and compromising fish passage. In time, the aggressive planting plan will help outcompete the reed canary grass and reestablish a healthy riparian corridor. The fence at the north end of the property will be retrofitted or replaced

in a manner that allows stream-borne debris to flow downstream. This approach requires no heavy machinery, is therefore least impactful to existing critical areas and most cost effective.

Cons

The lower 100 ft. of channel will lack satisfactory shade cover until the native plantings grow to adequate heights. The reed canary grass will need to be carefully cleared around plantings during the spring and summer growing period to facilitate native plant growth.

Option 2 (Sheet 5)

Option 2 is similar to Option 1, but with more extensive excavation. As in Option 1, in this approach we propose to plug the main channel with willow cuttings and woody debris, and utilize the 150 ft. of the avulsed channel through the forested wetland. However, we propose to then maintain flows in the forested wetland for a longer distance rather than return flows to the main channel through the natural course (into the reed canary grass monoculture). A 60 ft. long channel would be hand excavated at the northern edge of the forested wetland. At the property line, the new channel would turn north east and follow the fence line through the open field to the established stream corridor off of the Nickum property.

Pros

Keeping the channel within the forested wetland for nearly the entirety of the Nickum property produces a liner gain of 200 ft. of high quality forested channel. This will help mitigate the compromised stream reach running along the edge of the tree line as well as the section of channel running directly through the open reed canarygrass field. An aggressive planting plan will address the potential for future channel migration into the currently cleared valley bottom.

Cons

Option 2 requires a larger amount of excavation, likely requiring use of a track hoe within a wetland and riparian area causing potential permitting difficulties, impacts to wetlands, increased expense, and additional conditions associated with a permit. This approach has the potential to damage native trees and shrubs and changing the reach hydrology by affecting routing of water between an apparent spring seep and the open channel. There is a risk of the stream migrating back into the low elevation historic channel within the reed canarygrass. This would be undesirable if this occurred before native vegetation is mature.

Selected Option

The project team and the landowner preferred the conceptual channel modifications described in Option 1 in order to route summer low-flows through the existing forest for a longer distance than currently occurs. All agreed that Option 1 provided similar ecological benefit but at reduced cost and with fewer unintended impacts to the landscape compared to Option 2. The landowners deliberated riparian options at length and in the end decided they were more comfortable with a 100 foot buffer (1.29 acre) riparian planting rather than a larger one as they prefer to maintain some of the meadow / pasture habitat to which they are accustomed. The landowners are also interested in maintaining the existing simple footpath network through the meadow, wetland, and riparian areas in a way that minimizes riparian impacts and aid in plant maintenance activities. The footpath details would be determined in the final designs, with the input from permitting agencies.

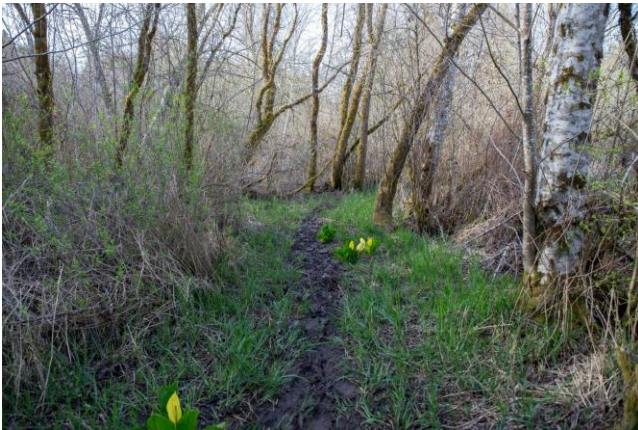


Existing Conditions:

Photo 1: Looking south main avulsion in stream – to the right the historical stream channel leads to the meadow which has been cleared.

Photo 2: Existing pathway and area for stream within riparian area.

Photo 3: Stream within meadow choked with reed canary grass and lack of riparian cover.





REKOW KENNETH E

SCALA DILVA & ALBERT

HATHAWAY KEVIN P & HOFFMAN LAURA A

NICKUM WILLIAM & CATHY

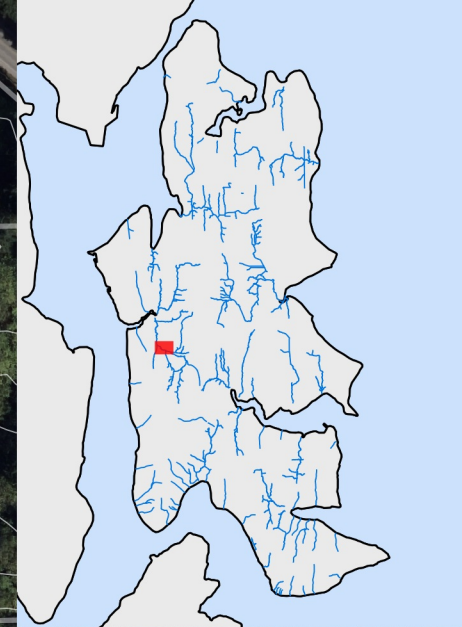
SMITH MARTIN & CATHY

HANSEN JASON D & LESLIE JONES

BOUNDY FREDERICK R & SHARON

Sheet 2





Sheets 3-5





Planting Plan

riparian planting

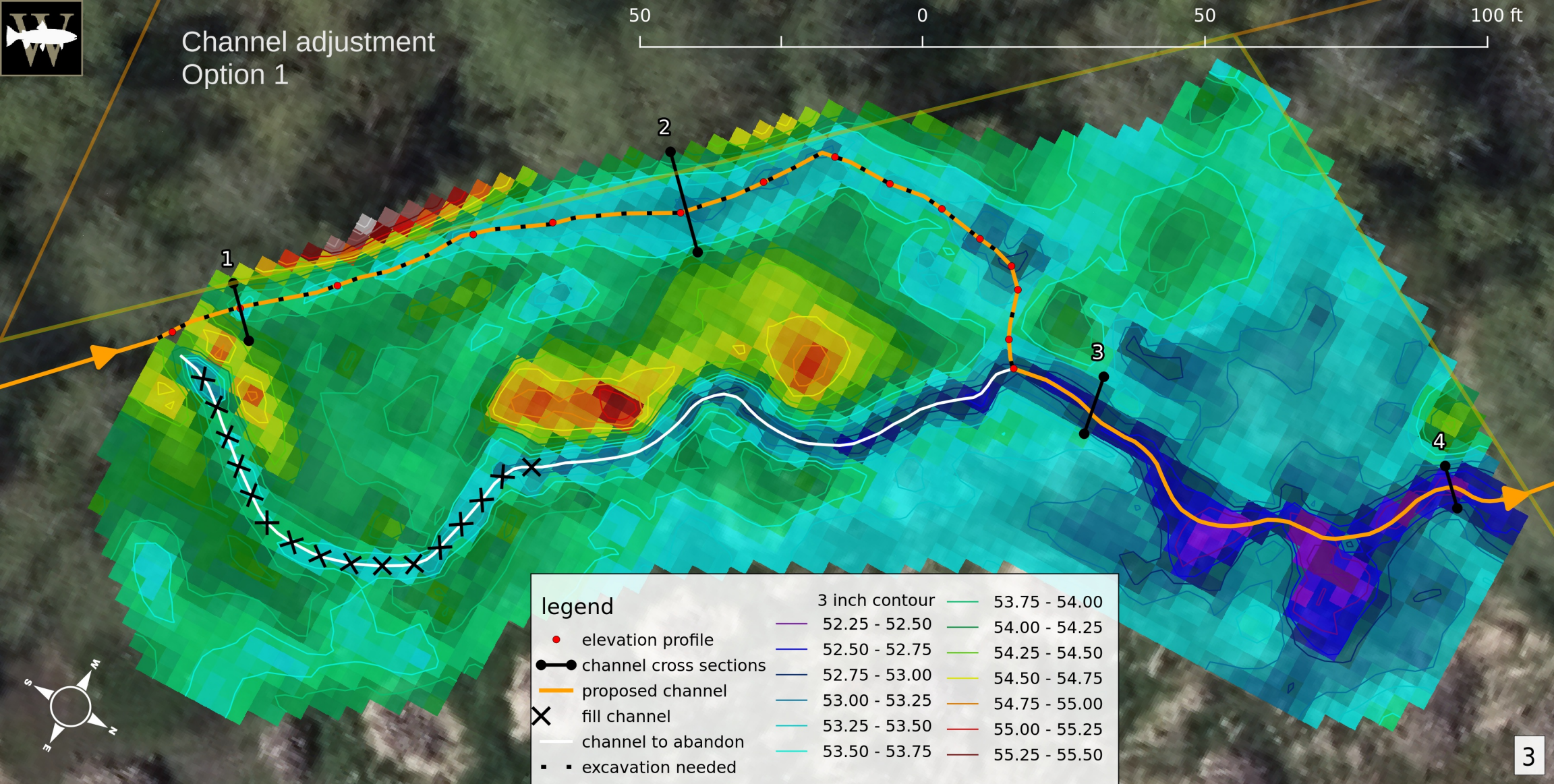
-  100 ft. buffer
-  200 ft. buffer
-  current channel
-  parcels





Channel adjustment Option 1

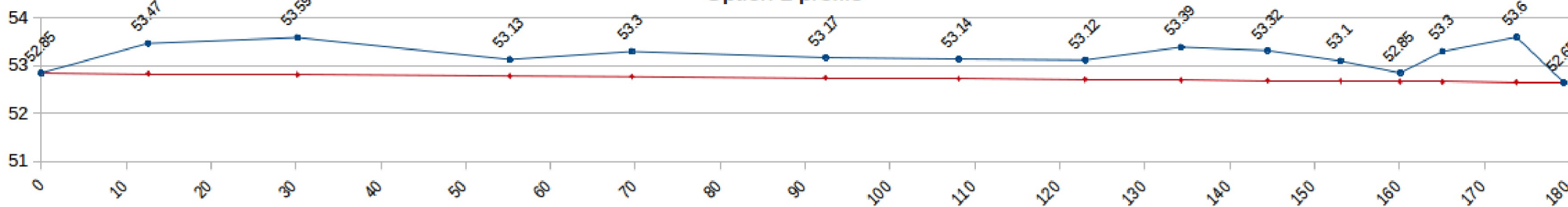
50 0 50 100 ft



3

—●— surveyed elevations —◆— Re-grade: .11% slope

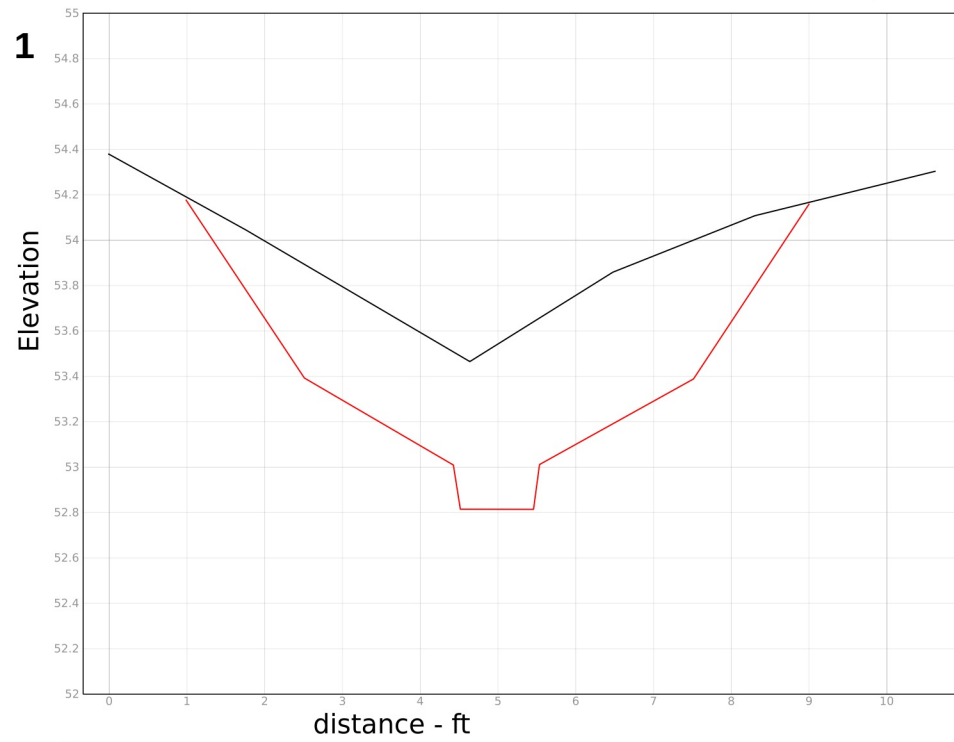
Option 1 profile



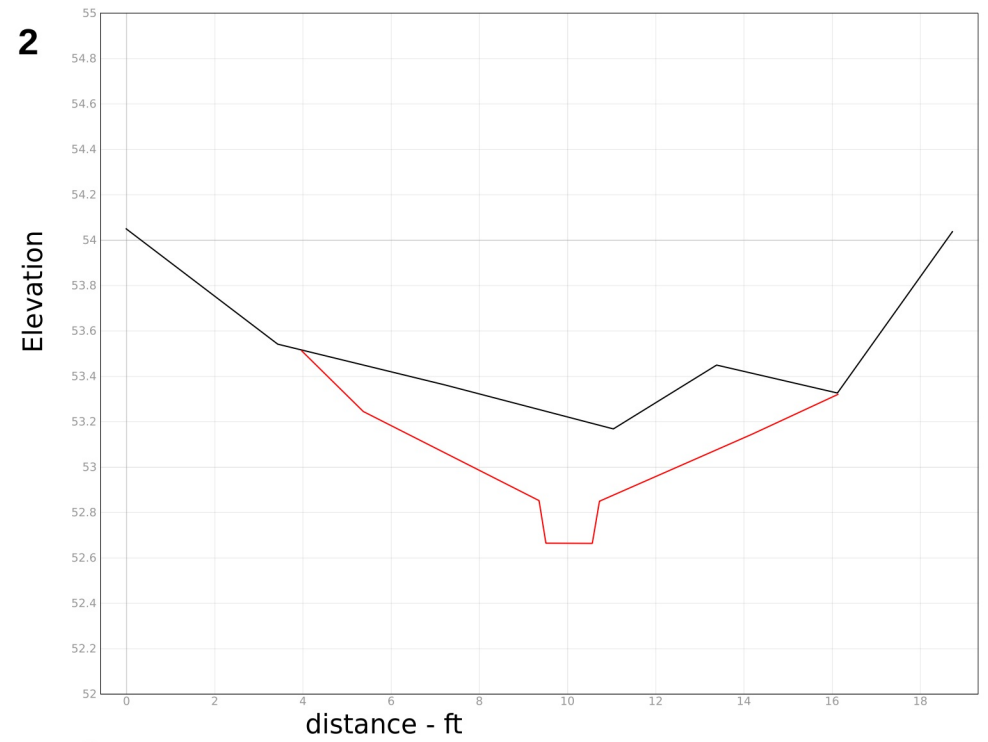
Option 1 channel cross

— ground profile — design profile

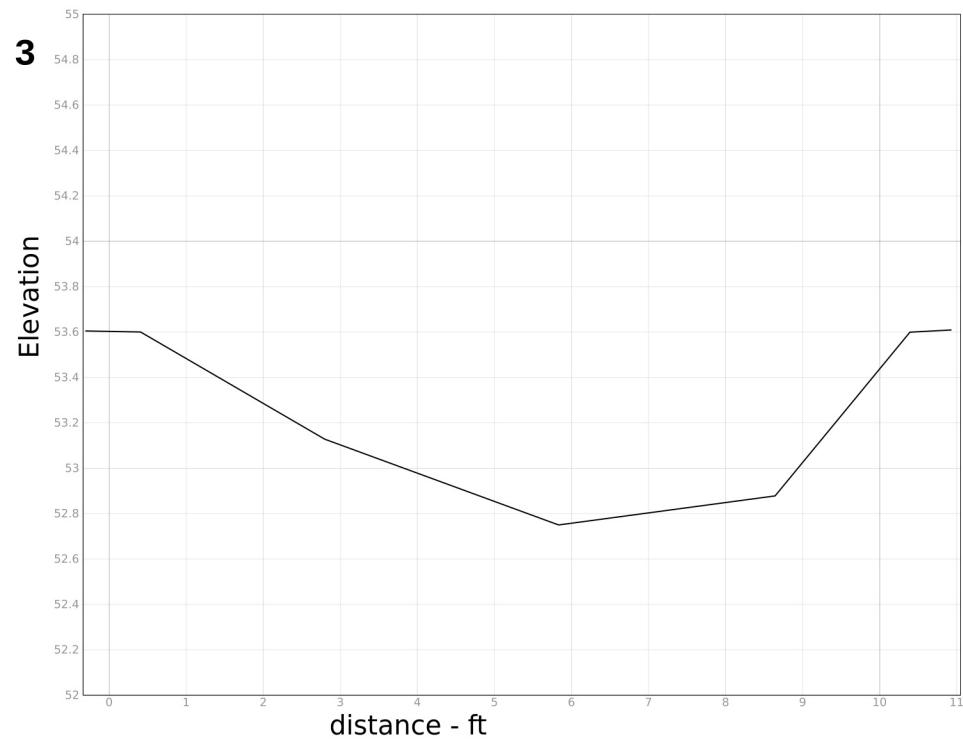
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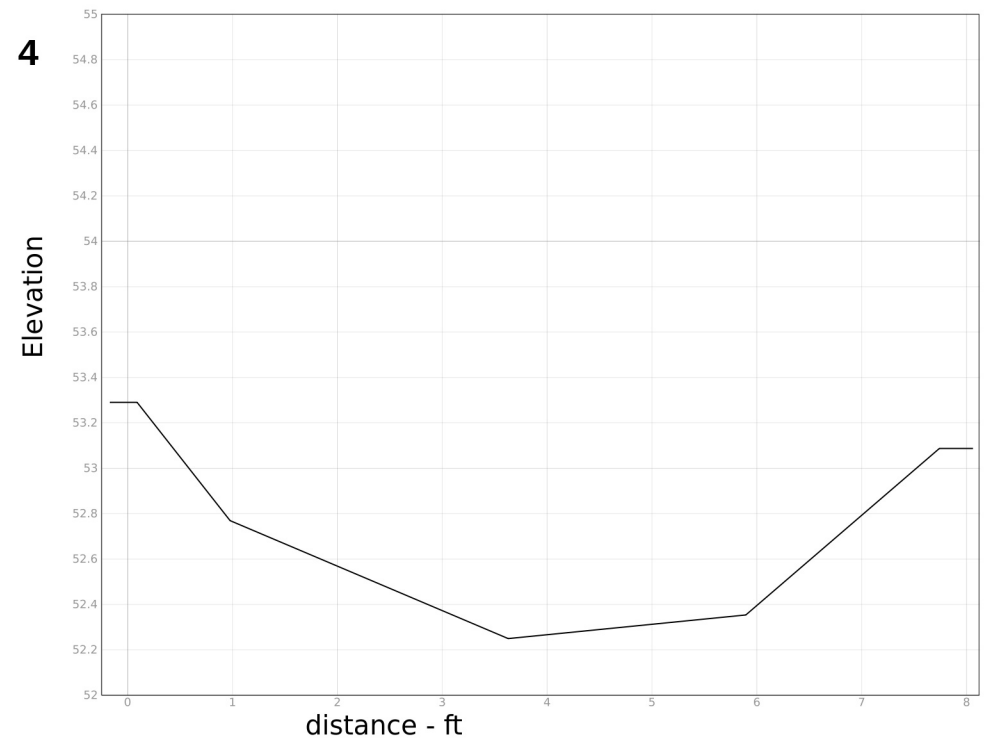
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3



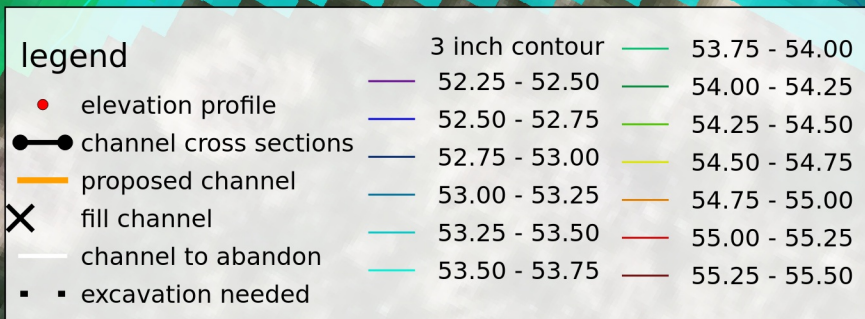
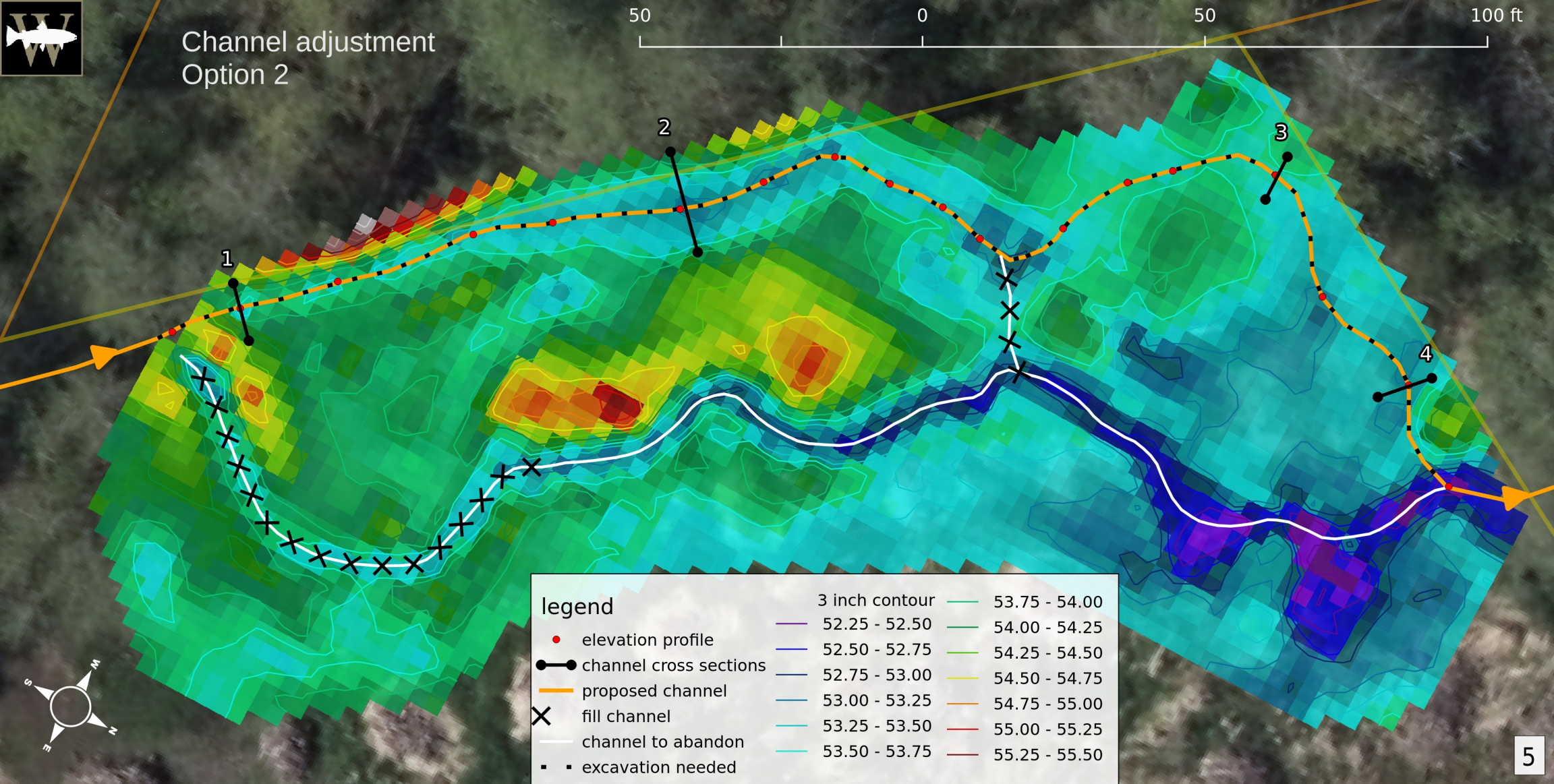
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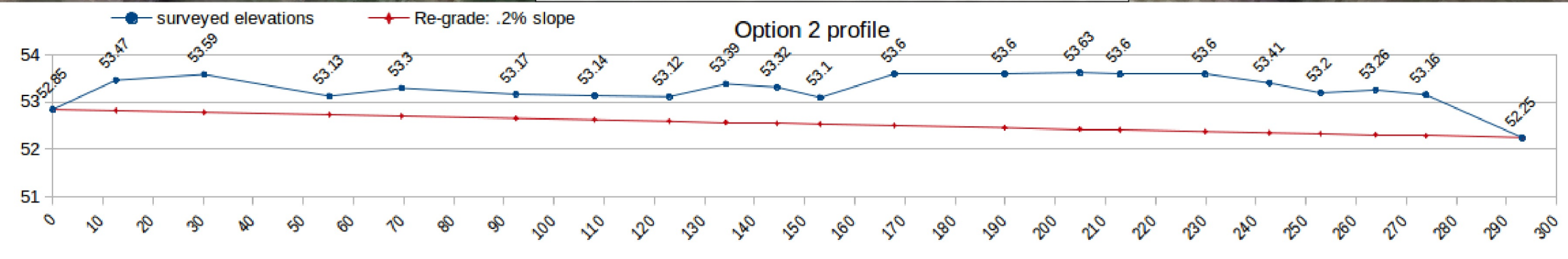


Channel adjustment Option 2

50 0 50 100 ft

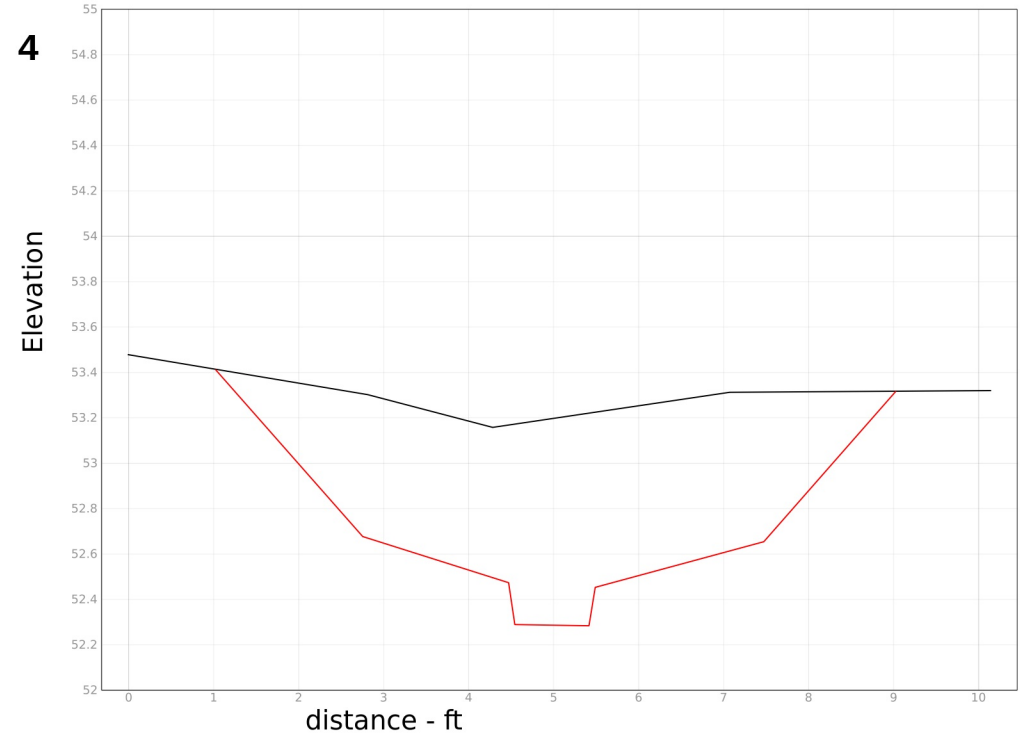
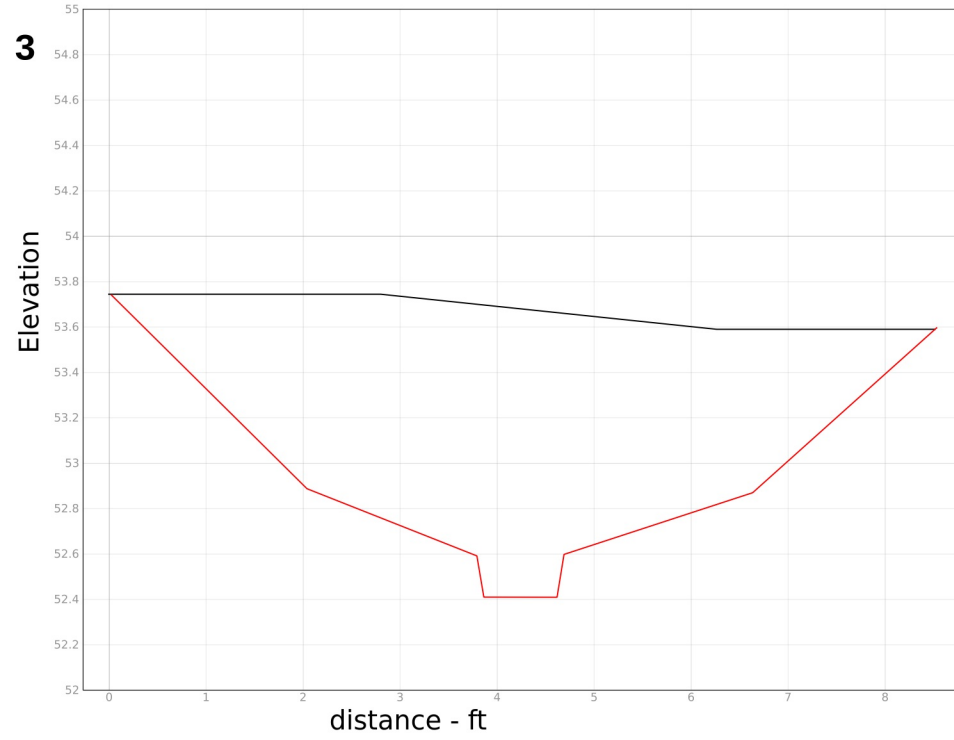
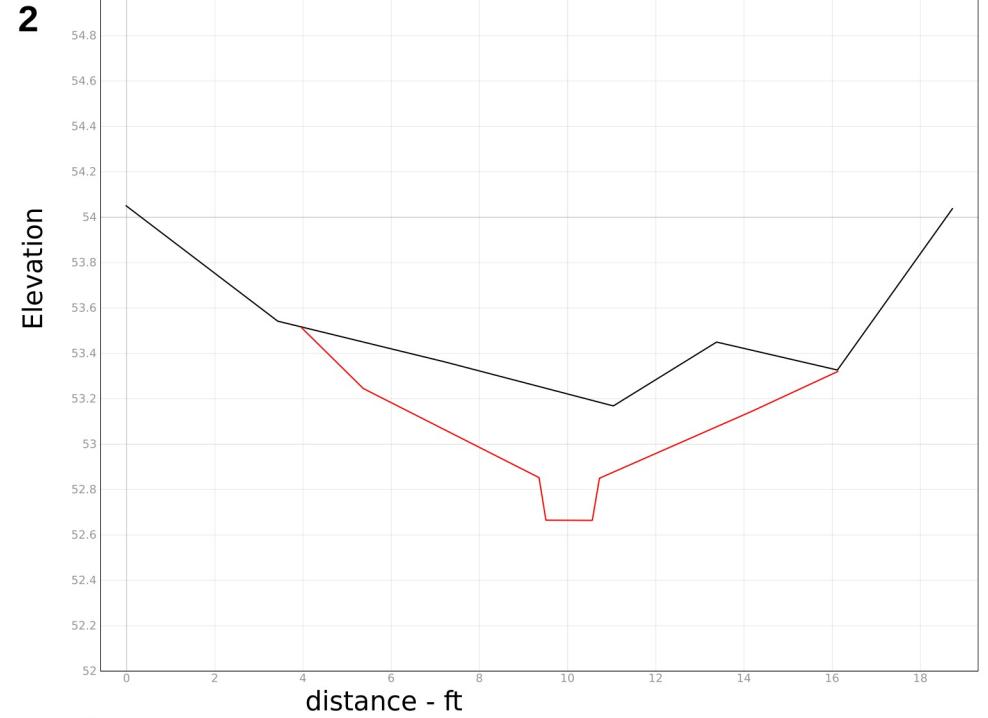
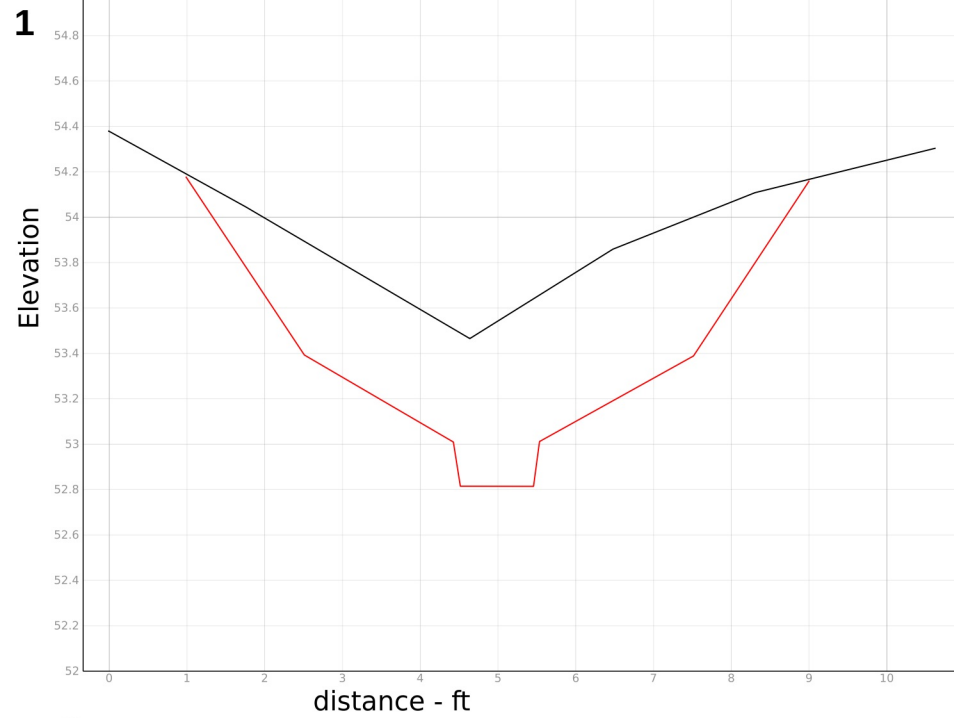


5



Option 2 channel cross

— ground profile — design profile



**Wild Fish Conservancy
Cost Estimate Template**

Revised 8/27/2018

Project Name: **Nickum**
Date: 08/27/18
Estimate By: JG
Stream: Springbrook Creek
Proposed Correction: Re-route channel through forested reach, riparian planting

Description	Unit	Quantity	Cost	Amount	Sub Total
Mobilization / Site Preparation					
Mobilize	L.S.	1	\$0	\$0	
Bypass	L.S.	1	\$0.00	\$0	
Access	L.S.	1	\$0.00	\$0	
Erosion Control	L.S.	1	\$500.00	\$500	
Utilities	L.S.	0	\$0.00	\$0	
MOBILIZATION SUB TOTAL					\$500
Excavation					
Channel Excavation - manual	hours	150	\$60.00	\$9,000	
EXCAVATION SUBTOTAL					\$9,000
Stream Channel and Bioengineering					
Revegetation	Acres	1.3	\$20,000.00	\$26,000	Costs of invasive control, native plants, and installation included.
STREAM CHANNEL AND BIOENGINEERING SUBTOTAL					\$26,000
CONSTRUCTION TOTAL					\$35,500
Sales Tax	9.60%			\$3,408	
Engineering	30%			\$10,650.00	Includes final designs and construction oversight.
Fish Exclusion				\$1,350	
Project management				\$6,000	
Indirect costs	25%			\$8,875.00	
Permitting	10%			\$3,550	
Contingency (construction)	10%			\$3,550.00	
PROJECT TOTAL					\$72,883