Preliminary
Vedder River Gravel Excavation Sites for 2020
Notes and Excavation Layouts

Vedder River Management Area Committee
Draft - April 28, 2020

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The following notes and accompanying drawings are intended to provide a forum for discussion of potential sites for sediment removal in Summer 2020. The excavations generally follow program criteria for site selection and design.

Within limits, site selections and designs can be revised to address sediment removal targets identified for each reach or sub-reach. The focus for this set of excavations is on the freeboard limited area and Canal excavations that can influence the backwater curve. As well, two excavations immediately upstream of the sediment deposition area are included to help limit downstream movement of sediment into the freeboard limited area.

Estimated quantities have been calculated to take sloped edges into account. Specific LWD placements have not been shown although it is expected that most excavations will include some LWD features, depending on availability of material and opportunities at each site. Habitat excavations have been indicated where these are appropriate.

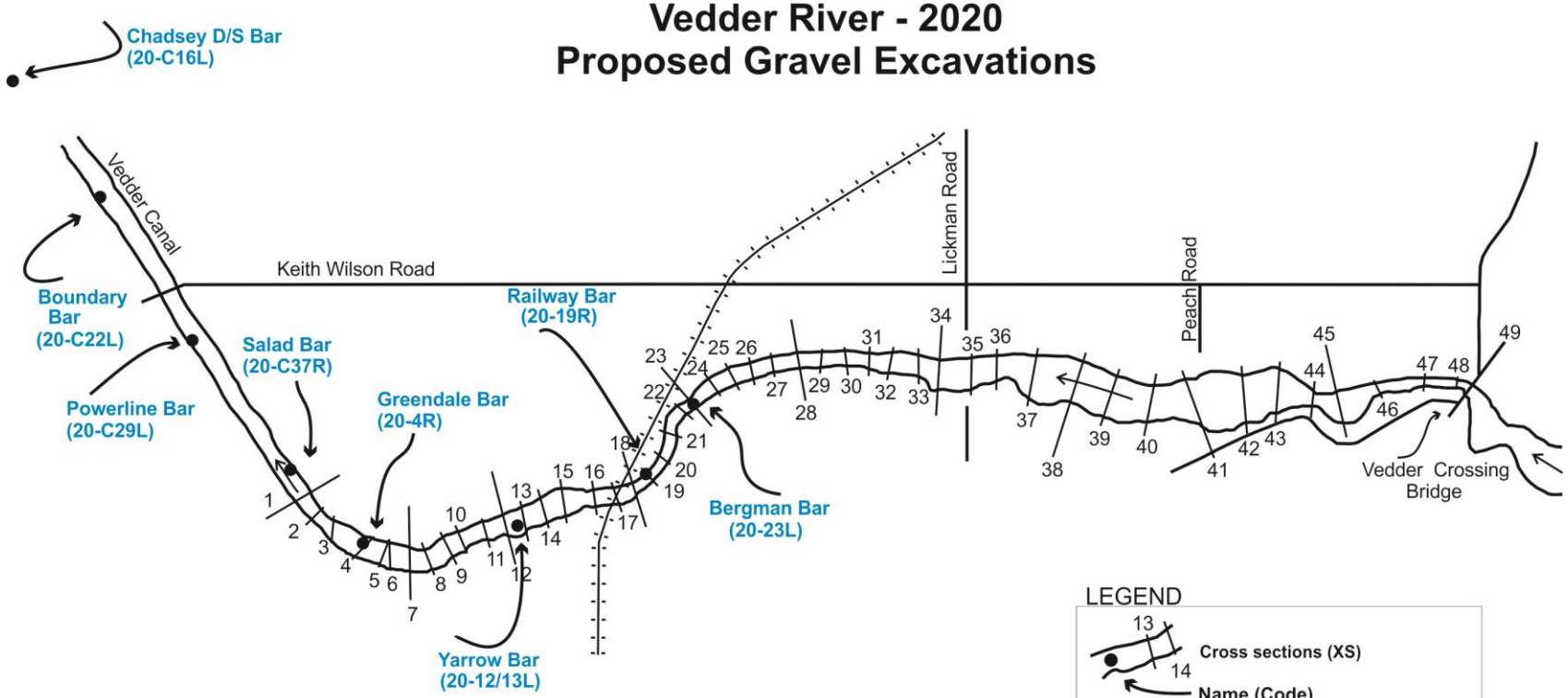
Designs and commentary provided are preliminary. Additional material including: agency permit applications and support documents, site specific mitigation plans, construction drawings and an evaluation of anticipated net habitat changes will be prepared, for sites that are selected for excavation in 2020. The current freshet may also change conditions significantly and accordingly final excavations will be field fit to address specific conditions at the time of excavation.

All excavation designs incorporate slopes to maintain the integrity of the channel in the excavation areas and to ensure that anticipated changes yield optimal habitat outcomes. Low slopes are intended to limit risk of headcutting and spawning activity within the excavations. Steep slopes are generally intended to collapse into the pit to restore normal channel configurations with increased freeboard and minimal river impacts. Wide openings will be excavated to prevent trapping of fish by water fluctuations as the pit fills.

Table 1: Bars Considered and Anticipated Yield from Eight Proposed Candidate Sites

#	Bar Name	Plan Developed	VRTC 1 comments	Yield (m^3)	Comment
1	Bergman	Y		20,000	
2	Railway	Y		4,000	
3	Yarrow	Y		7,000	
4	Greendale	Y		6,000	
5	Salad (A)	Y		6,000	
6	Powerline	Y		8,000	
7	Boundary	Y		19,000	
8	Chadsey	Y		25,000	
	Total			**95,000**	

Vedder River - 2020
Proposed Gravel Excavations



LEGEND

13 — Cross sections (XS)

14 — Name (Code)

Code Format: (example:00-40R): Year of Excavation-Cross Section Number, and Bank Location (Left, Right, or Mid channel)

0 400 800 1200 1600 2000

Distance in Metres

Canal Reach — Lower Reach (XS 1 to XS 17) — Middle Reach — Upper Reach (XS 33 to Vedder Crossing)

Site Name: Bergman **Site Number:** 1
Identifier: 20-23L
Location: Adjacent to Bergman Stockpile, near the north end of Bergman Rd.

Previous Excavations: 1994, 1998, 2000, 2002, 2006, 2010, 2014, & 2016 (approximate location by XS identifier)

Stockpile: Bergman Stockpile

Length: 154 m
Avg. Width: 42 m
Depth: 4 m
Expected Gravel Yield: 20,000 m^3

Bar Access:
North on Bergman Road, past setback dyke to Bergman Stockpile. Upstream end of bar can be accessed with a constructed ramp from top of armoured bank. Culvert probably not required this year.

Objectives and Effectiveness:
The main purpose of this excavation would be to intercept gravel upstream of the area of freeboard limitation. The bar is estimated to have approximately 1m in height above low water levels

Mitigation Plans:
Mitigation measures described on the first page of this document apply at this location. The proposed outlet includes a connection to both the mainstem and the lower portion of the habitat channel. The downstream habitat is being maintained but due to the rapid aggradation upstream the upstream habitat component will likely be omitted. Excavation of these channels is straightforward and will contribute additional gravel with limited extra cost.

Habitat Considerations:
Maintaining the downstream low flow channel through the bar would increase habitat complexity at this location. The excavation extends to the left bank so that as the bar refills, more of the left bank habitat channel is likely to reform with water provided by sub-gravel flow. The habitat channel can be enhanced with LWD as has been done in past cycles.

Anticipated Outcome:
It is expected this excavation would refill quickly. However, a low flow channel through the middle of the bar may persist as occurred in 2016. This would be a large excavation that would allow for a significant amount of new material to be trapped.

Comments:

2020 Construction Drawing: Bergman Bar

Plan Date: April 24, 2020 Photo: April 9, 2020

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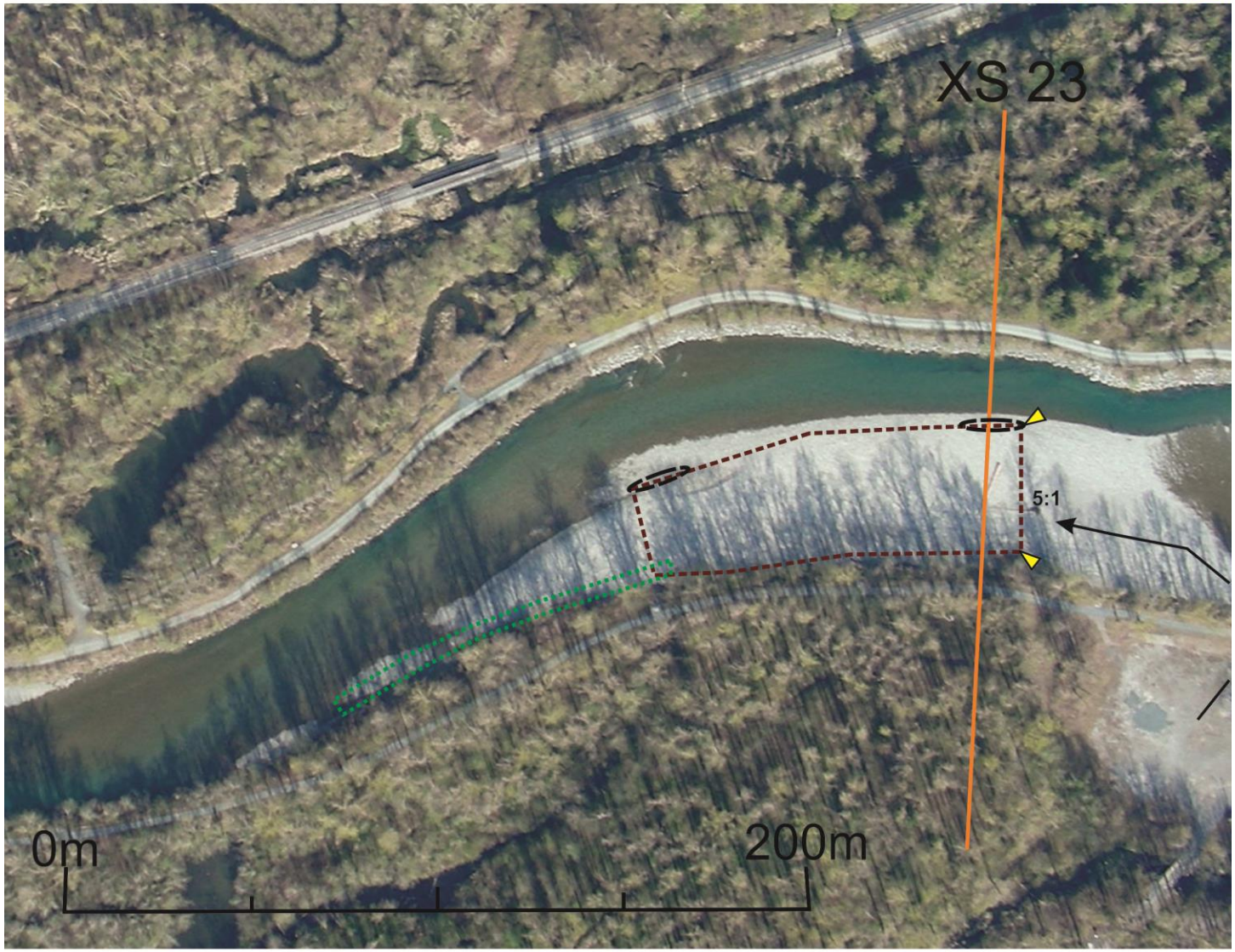

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 20,000m^3

Avg. Length = 154m

Width = 42m

Depth = 4m

Site Name: Railway Bar **Site Number:** 2
Identifier: 20-19R
Location: Approximately 180m upstream from the railway bridge

Previous Excavations: 1994, 1998, 2004, 2006, 2008, 2010, 2014, & 2016 (approximate location by XS identifier)

Stockpile: Hooge Stockpile

Length: 140 m
Avg. Width: 7 m
Depth: 3 m
Expected Gravel Yield: 4,000 m^3

Bar Access:
From Keith Wilson, south on Sinclair Rd., then east along the setback dyke to parking area and stockpile location. Proceed west along the trail following the existing bank protection works.

Objectives and Effectiveness:
Small excavation but should refill and reduce the amount of gravel moving downstream into the freeboard limited reach.

Mitigation Plans:
In addition to the mitigation measures described on the first page of this document, the excavation will avoid the riprap at the new culvert outlet to ensure that it does not slump into the pit.

Habitat Considerations:
Significant chum salmon spawning has been noted in the channel along the right bank at the downstream portion of the bar and this has been maintained concurrently with this excavation in the past. This work may continue but with the recent habitat works, a prior discussion with DFO is needed. Abundant pink salmon spawning has also been recorded between the downstream end of the bar and the railway bridge. Maintenance of these habitats is a critical concern in the design of this excavation.

Anticipated Outcome:
It is expected this excavation pit will refill quickly and the general configuration of the river at this location will be maintained.

Comments:

2020 Proposed Excavations: Railway Bar (20-19R)

Plan Date: April 24, 2020 Photo: April 9, 2020

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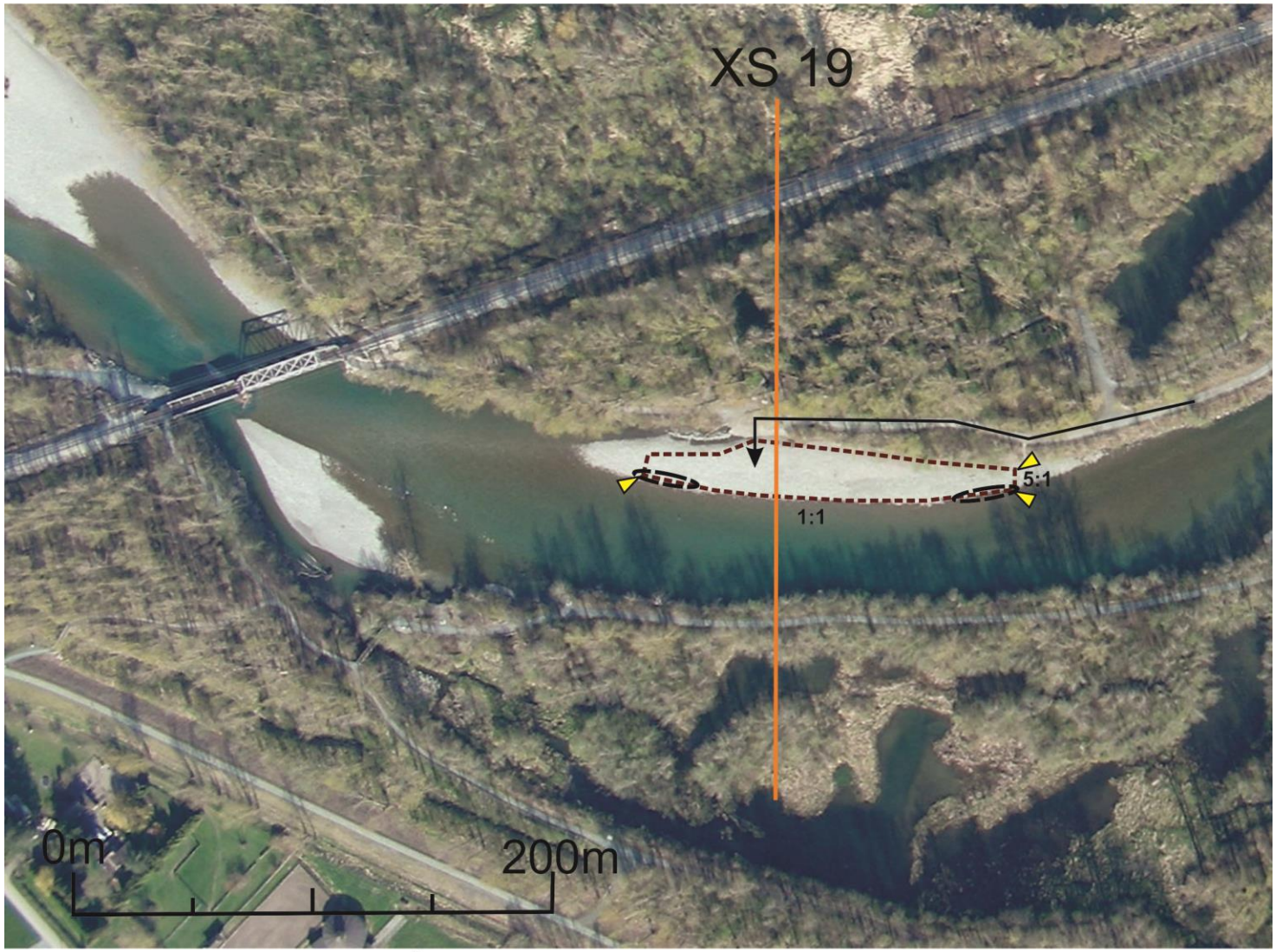

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 4,000m^3

Avg. Length = 140m

Width = 7m

Depth = 3m

Site Name: Yarrow Bar **Site Number:** 3
Identifier: 20-12/13L
Location: North end of Wilson Road

Previous Excavations: 1994, 1995, 1996, 1998, 2000, 2004, 2006, 2008, 2010, 2012, 2014, & 2016 (approximate location by XS identifier)

Stockpile: Wilson Road Stockpile (or restored stockpile located along setback dyke near the railway)

	PIT	SCALP
Length:	98 m	93 m
Avg. Width:	18 m	20 m
Depth:	3.5 m	0.5 m
Expected Gravel Yield:	6,000 m^3	1,000 m^3

Bar Access:
From north end of Wilson Road, around the perimeter of the stockpile site to avoid wells. A culvert will likely be required.

Objectives and Effectiveness:
This excavation is at the upstream end of freeboard limited zone and is expected to contribute to increased floodway capacity. In addition to the excavation a scalp is being proposed to encourage flow toward the left bank across the main bar and increase riffle habitat in this area.

Mitigation Plans:
The mitigation measures described on the first page of this document will be followed. Measures including “stand-by” silt fencing, sediment traps and strict maintenance would be incorporated to prevent input of sediment into the river or habitat channel related to any culverts that are required.

Habitat Considerations:
LWD features, will be incorporated where suitable. The proposed scalp will also provide new riffle habitat across the bar and enhance the pool habitat remaining from the prior excavation. Minor excavations to improve low flow connectivity to left bank microchannel is proposed. be protected as well as eddy pool near the upstream end of the excavation

Anticipated Outcome:
This excavation would be expected to refill while potentially providing additional braided low flow channels which would further additional habitat at this location.

Comments:

2020 Proposed Excavations: Yarrow Bar (20-12/13L)

Plan Date: April 24, 2020 Photo: April 9, 2020

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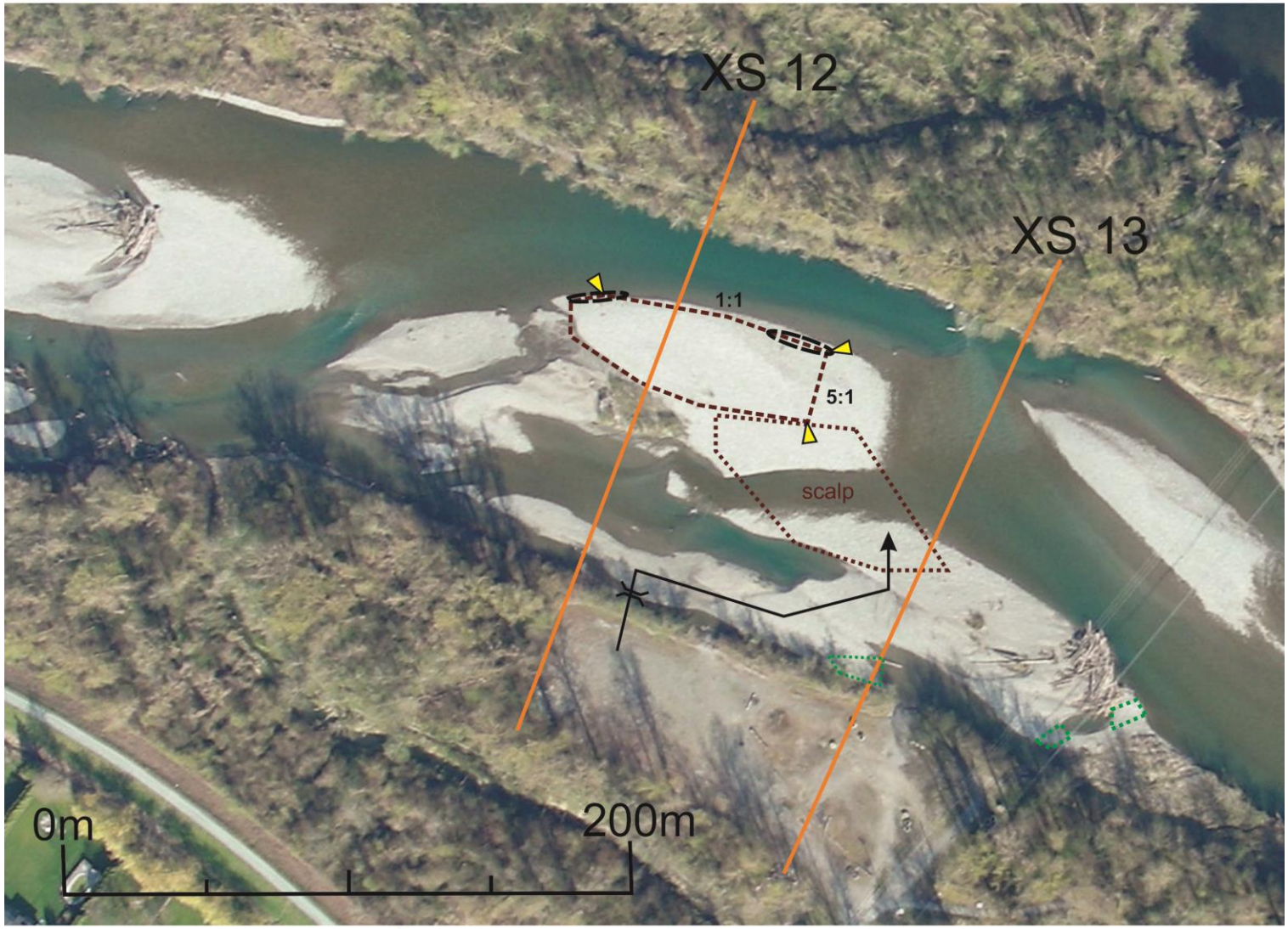

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume (pit) = 6,000m^3

Avg. Length = 98m
Width = 18m
Depth = 3.5m

Volume (scalp) = 1,000m^3

Avg. Length = 93m
Width = 20m
Depth = 0.5m

Site Name: Greendale Bar **Site Number:** 4
Identifier: 20-4R
Location: Adjacent (upstream) to Greendale Stockpile

Previous Excavations: 1994, 1998, 2000, 2004, 2006, 2008, 2010, & 2012 (approximate location by XS identifier)

Stockpile: Greendale Stockpile

	PIT (Downstream)	PIT (Upstream)
Length:	86 m	36 m
Avg. Width:	21 m	27 m
Depth:	3 m	2.5 m
Expected Gravel Yield:	5,000 m^3	1,000 m^3

Bar Access:
Along north dike access road from east end of Keith Wilson Bridge to parking area at Greendale Stockpile. Thence along the Rotary Trail to existing access point Two culverts would be required to reach the D/S bar area on the vegetated island.

Objectives and Effectiveness:
Improve channel capacity in the freeboard limited section of the river. May help to reduce erosional energy against the left bank at this location. A smaller pit is also being proposed at the upstream end of Greendale Bar to encourage flow through the channel between the vegetated island and the right bank.

Mitigation Plans:
The mitigation measures described on the first page of this document will be followed. Culverts or possibly a bridge would be required to excavate the pit on the island and measures would be incorporated to reduce input of sediment into the river.

Habitat Considerations:
The opening to the secondary channel along the right bank will be re-excavated and enhanced in an effort to improve flow and habitat along the right bank. This excavation is relatively risky from the habitat perspective as it is proximal to existing high habitat values located around the vegetated island.

Anticipated Outcome:
It is expected that the upstream excavation will refill quickly with the downstream excavation potentially delayed.

Comments:

2020 Proposed Excavations: Greendale Bar (20-4R)

Plan Date: April 24, 2020 Photo: April 9, 2020

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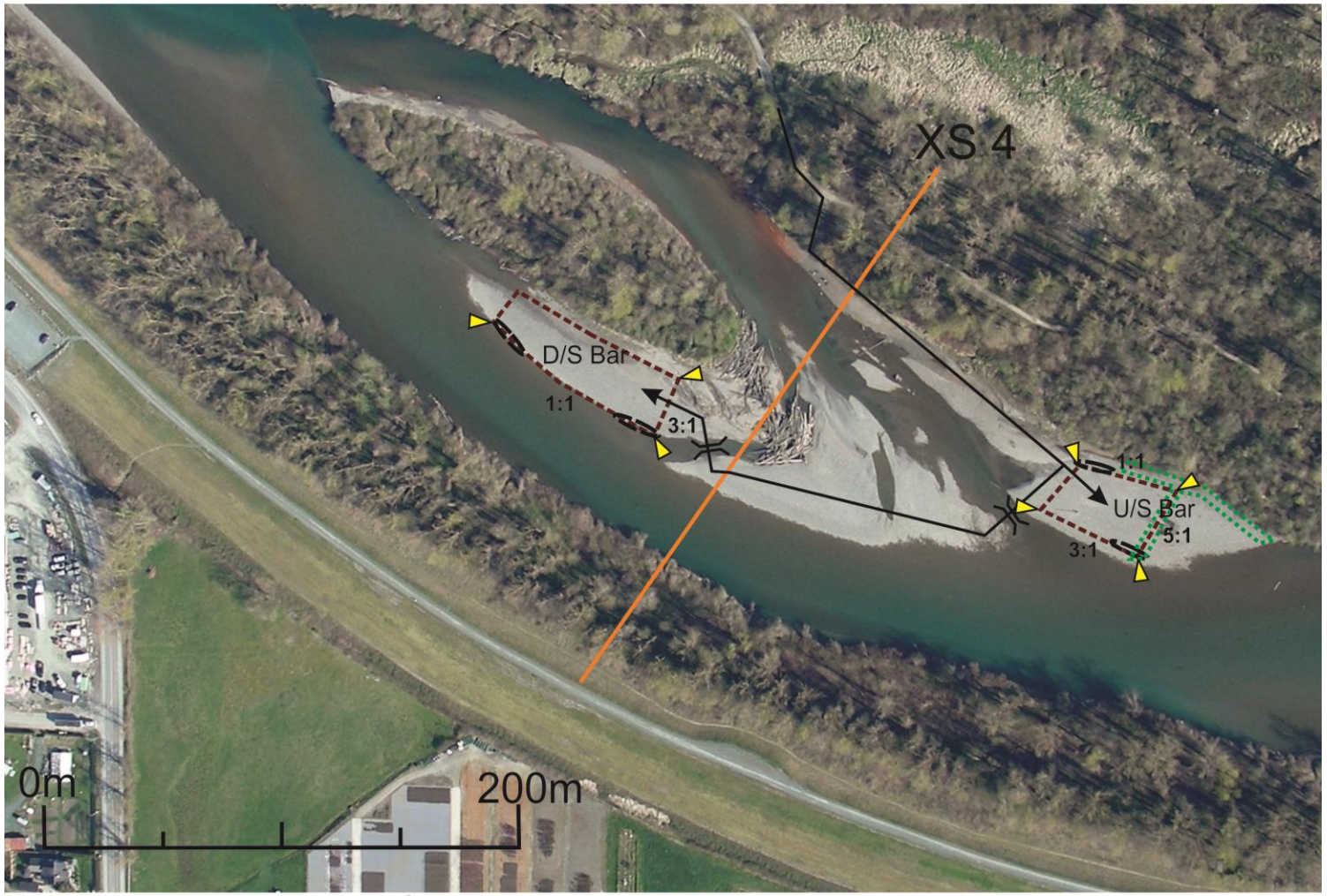

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume (d/s) = 5,000m^3

Avg. Length = 86m
Width = 21m
Depth = 3m

Volume (u/s) = 1,000m^3

Avg. Length = 36m
Width = 27m
Depth = 2.5m

Site Name: Salad Bar A **Site Number:** 5
Identifier: 20-Canal 37R
Location: Adjacent (downstream) to Greendale Stockpile

Previous Excavations: 1994, 2004, 2006, 2008, & 2014 (approximate location by XS identifier)

Stockpile: Greendale Stockpile

Length: 118 m
Avg. Width: 26 m
Depth: 2.5 m
Expected Gravel Yield: 6,000 m^3

Bar Access:
East along Dyke Crest Rd. from east end of Keith Wilson Bridge to blocked access road approximately 100m west of the parking area at the Greendale Stockpile site. The access road would need to be unblocked and at least two culverts would be required to reach the bar.

Objectives and Effectiveness:
Lower water levels in the freeboard limited area through backwater curve reduction

Mitigation Plans:
The mitigation measures described on the first page of this document will be followed. A culvert would be required, and measures would be incorporated to reduce input of sediment into the river.

Habitat Considerations:
The excavation design is intended to preserve the existing right bank secondary channel and the adjacent glide tail and riffles. This is key as this feature contributes to the key pink salmon spawning habitat at this location.

Anticipated Outcome:
It is anticipated that this excavation will return to its original configuration.

Comments:

2020 Proposed Excavations: Salad Bar A (20-C 37)

Plan Date: April 24, 2020 Photo: April 9, 2020

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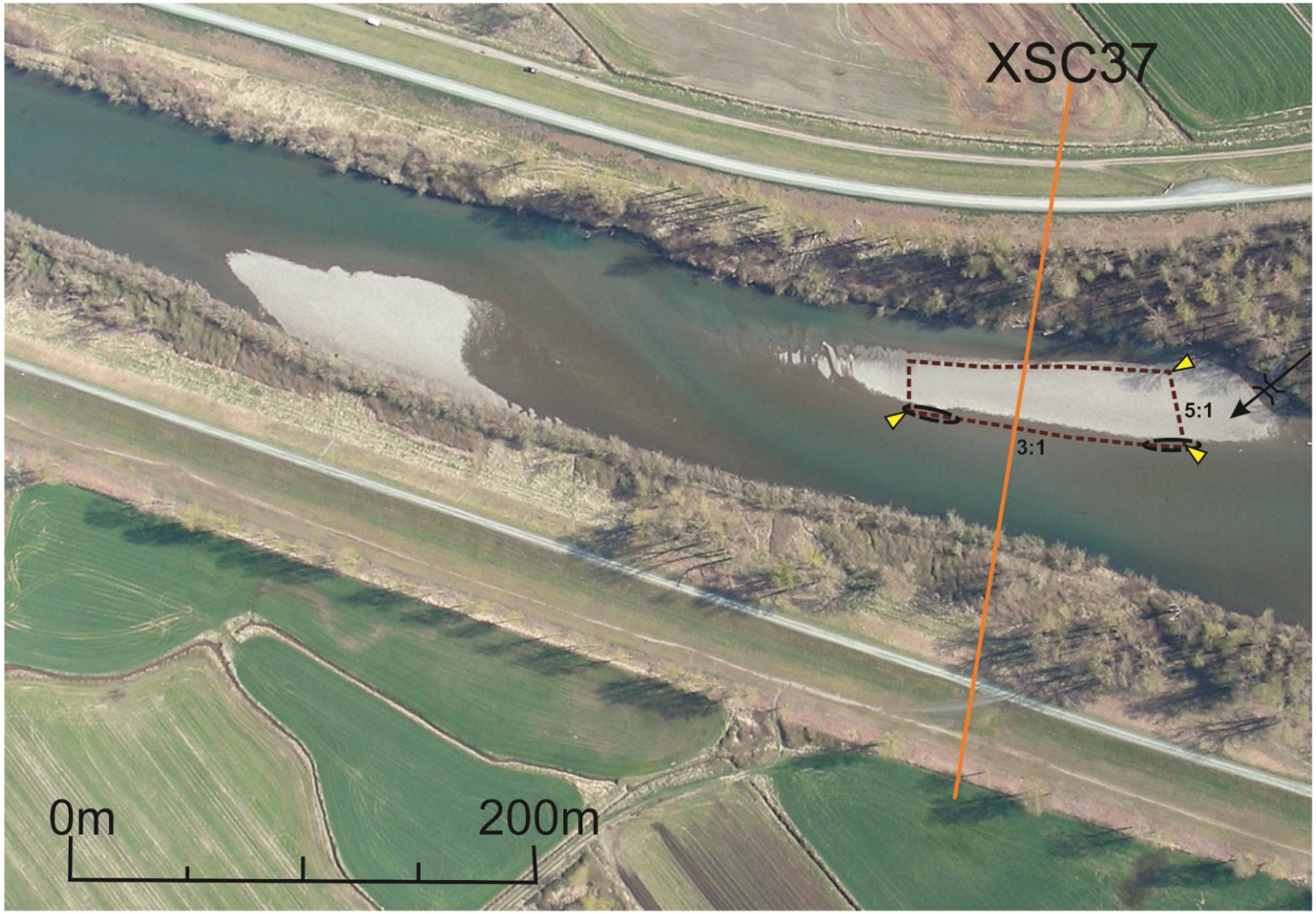

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 6,000m^3

Avg. Length = 118m

Width = 26m

Depth = 2.5m

Site Name: Powerline Bar **Site Number:** 6
Identifier: 20-Canal 29L
Location: 200 m upstream of Keith Wilson Bridge

Previous Excavations: 1994 & 2004 (approximate location by XS identifier)

Stockpile: Boundary Road Stockpile

Length: 121 m
Avg. Width: 23 m
Depth: 3 m
Expected Gravel Yield: 8,000 m^3

Bar Access:
North along the left bank dike road from the Fisherman's Corner parking lot to Keith Wilson Bridge. The existing ramp down from the dyke road allows trucks to travel under the bridge and thence upstream to the bar access point. A ramp down to the bar will need to be constructed and at least one culvert would be required.

Objectives and Effectiveness:
Lower water levels in the freeboard limited area through backwater curve reduction

Mitigation Plans:
General mitigation measures as outlined on the first page of this document.

Habitat Considerations:
Protection of the secondary channel along the left bank is required. The lateral riffle downstream of the bar will be enhanced by scalping the downstream end of Powerline Bar.

Anticipated Outcome:
It is expected this excavation will provide additional riffle habitat as it slowly refills.

Comments:
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2020 Proposed Excavations: Powerline Bar (20-C 29L)

Plan Date: April 24, 2020 Photo: April 9, 2020

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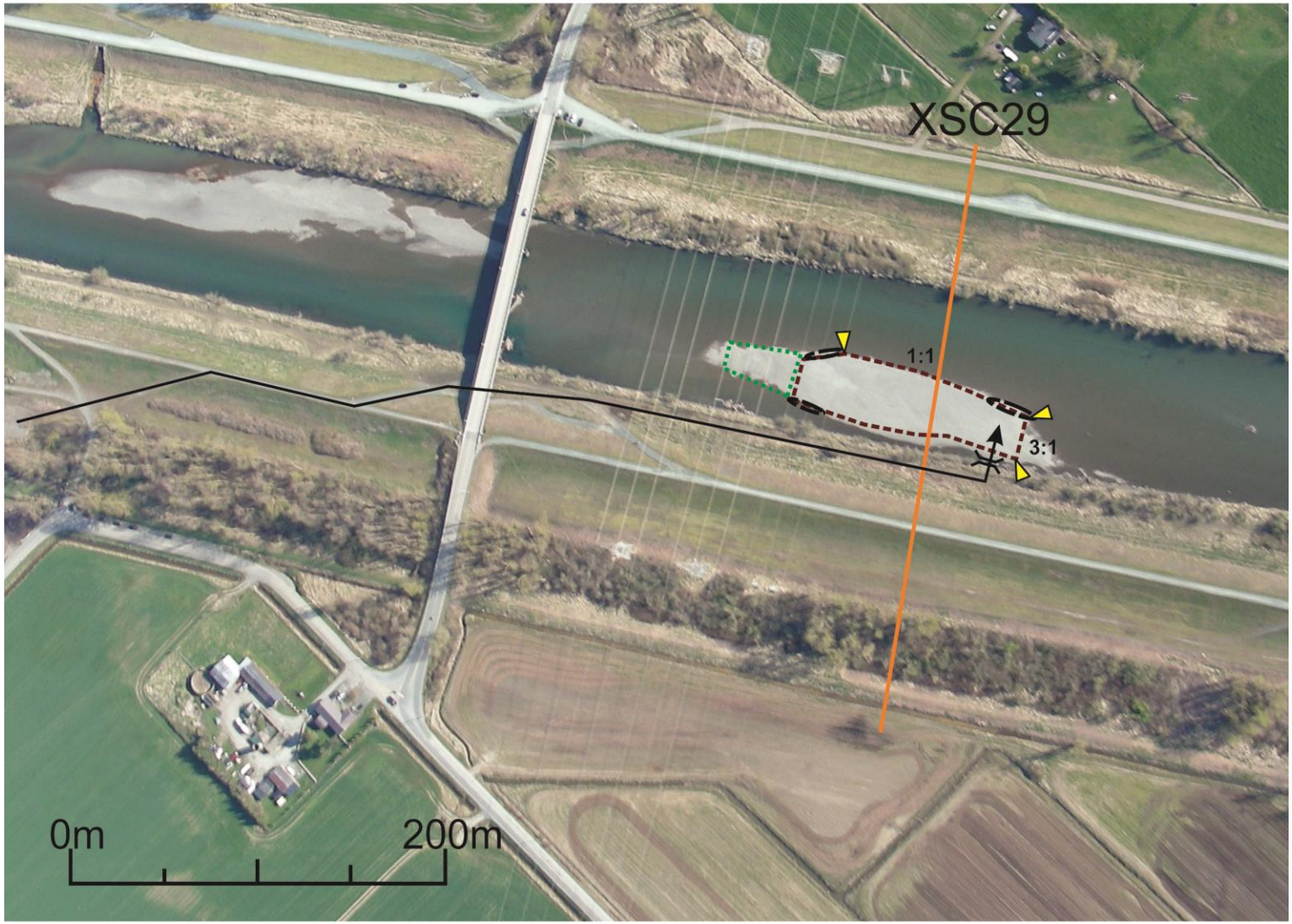

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 8,000m^3

Avg. Length = 121m

Width = 23m

Depth = 3m

Site Name: Boundary Bar **Site Number:** 7
Identifier: 20-Canal 22L
Location: 800 meters downstream of Keith Wilson Bridge

Previous Excavations: 2002 & 2014 (approximate location by XS identifier)

Stockpile: Boundary Road Stockpile

Length: 185 m
Avg. Width: 57 m
Depth: 2.5 m
Expected Gravel Yield: 19,000 m^3

Bar Access:
Northwest along the left bank dike road from the Fisherman's Corner parking lot. A ramp down from the dyke top to the low bank and then a second ramp down to the bar would be required. A culvert is not likely to be needed.

Objectives and Effectiveness:
To improve backwater curve reducing risk of dyke overtopping upstream in the freeboard limited section of the Vedder River.

Mitigation Plans:
General mitigation measures are outlined on the first page of this document. Excavation will extend to the bank with a buffer of approximately 5m to protect bank integrity.

Habitat Considerations:
The excavation will be constructed with habitat channels at the upstream and downstream ends of the bar against the left bank. Previously a habitat channel was provided along the full length but proved to be too shallow. Accordingly, excavation to the bank is proposed.

Anticipated Outcome:
Presence of fines and woody debris may limit the excavation depth. It is expected this excavation will remove a significant amount of sediment from the canal section of the Vedder River with no net impact to fish habitat values.

Comments:

2020 Proposed Excavations: Boundary Bar (20-C 22L)

Plan Date: April 24, 2020 Photo: April 9, 2020

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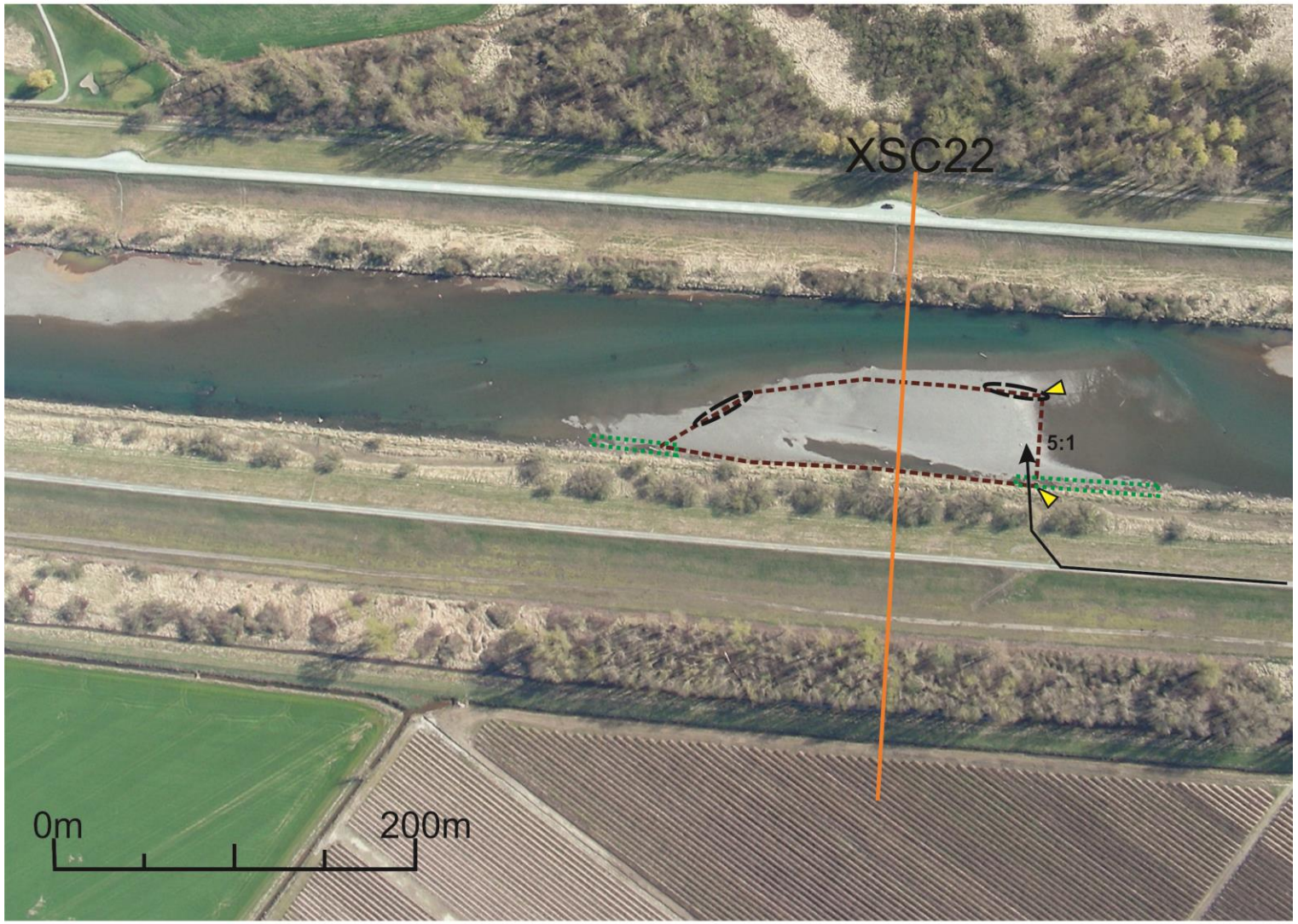

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 19,000m^3

Avg. Length = 185m

Width = 57m

Depth = 2.5m

Site Name: Chadsey D/S **Site Number:** 8
Identifier: 20-Canal 16L
Location: 1,900 meters downstream of Keith Wilson Bridge

Previous Excavations: n/a

Stockpile: Boundary Road Stockpile

Length: 248 m
Avg. Width: 44 m
Depth: 2.5 m
Expected Gravel Yield: 25,000 m^3

Bar Access:
Northwest along the left bank dike road from the Fisherman's Corner parking lot. A ramp down from the dyke top to the low bank and then a second ramp down to the bar would be required. A culvert is not likely to be needed.

Objectives and Effectiveness:
This bar has not been previously excavated and it extends across approximately 2/3 of the channel. In addition to potential backwater benefit to the freeboard limited section of the river, this excavation should alleviate the erosion occurring on the right bank which appears to be new and related to the recent formation of this bar.

Mitigation Plans:
General mitigation measures are outlined on the first page of this document.

Habitat Considerations:
In addition to increasing wetted habitat in the lower canal area, the excavation will be constructed with habitat channels at the upstream and downstream ends of the bar against the left bank.

Anticipated Outcome:
This excavation will result in the largest sediment yield of all proposed excavations for the 2020 program. It is expected this excavation will remove a significant amount of sediment from the canal section of the Vedder River with minimal impact to fish habitat values while mitigating erosion on the right bank at this location.

Comments:

2020 Proposed Excavations: Chadsey D/S Bar (20-C 16L)

Plan Date: April 24, 2020 Photo: April 9, 2020

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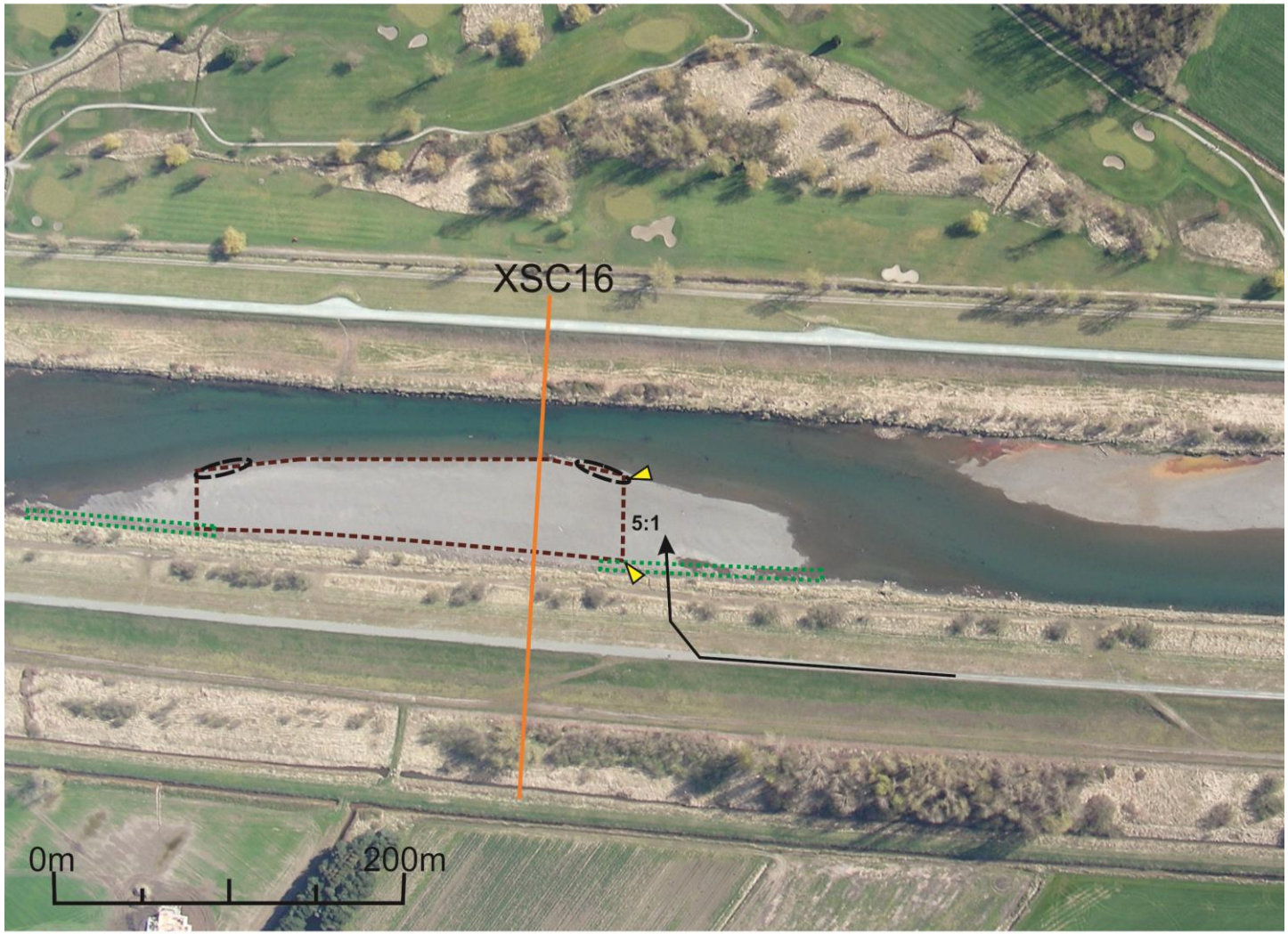

Culvert Crossing

Perimeter of proposed excavation

Habitat excavation

Slope change point

Pit openings

Access Route

Pit Slopes are 1.5:1 unless otherwise shown

Volume = 25,000m^3

Avg. Length = 248m

Width = 44m

Depth = 2.5m

View of eroding right bank across from Chadsey Bar