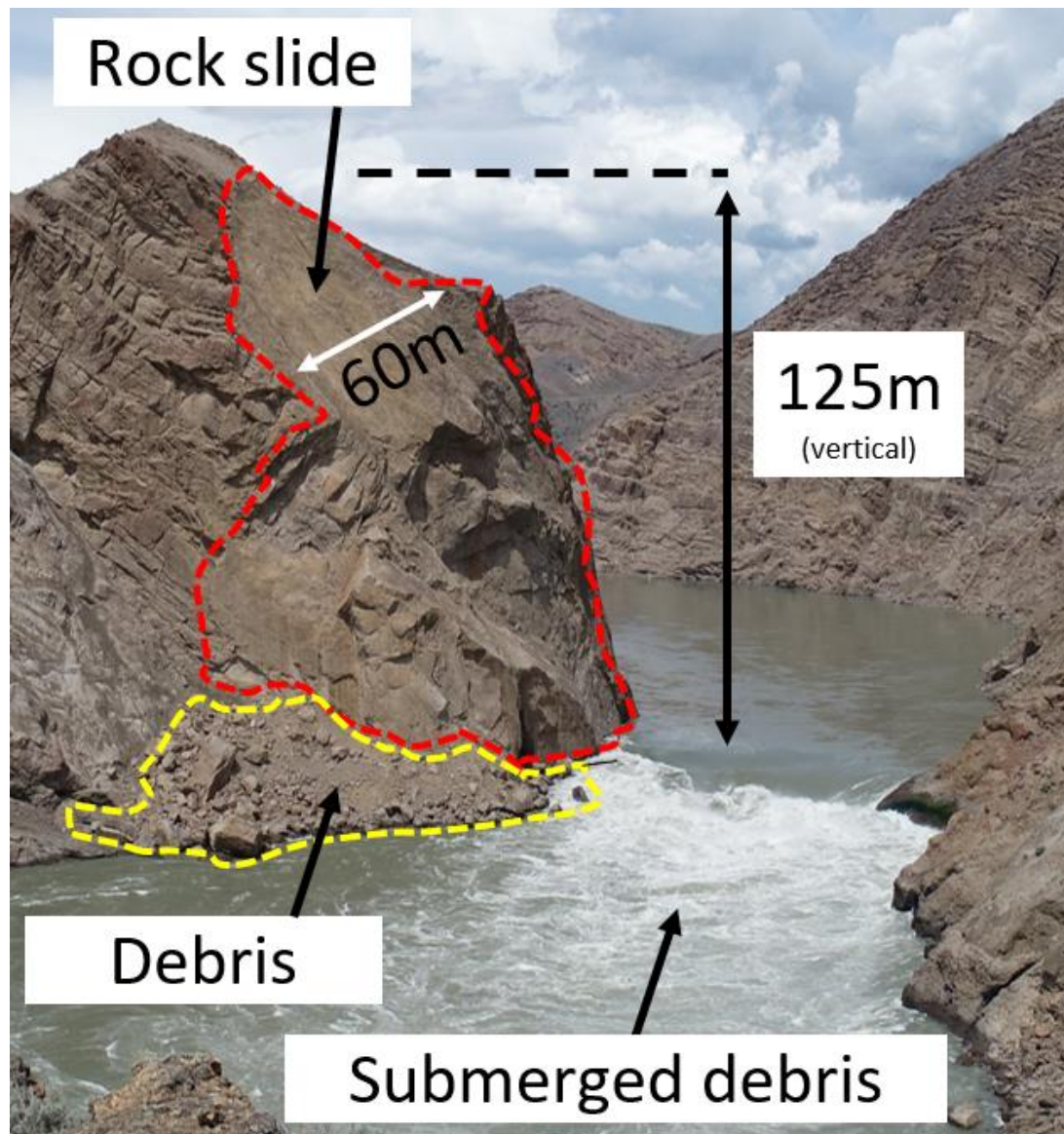




Big Bar Landslide: Update

Forum, April 7, 2020



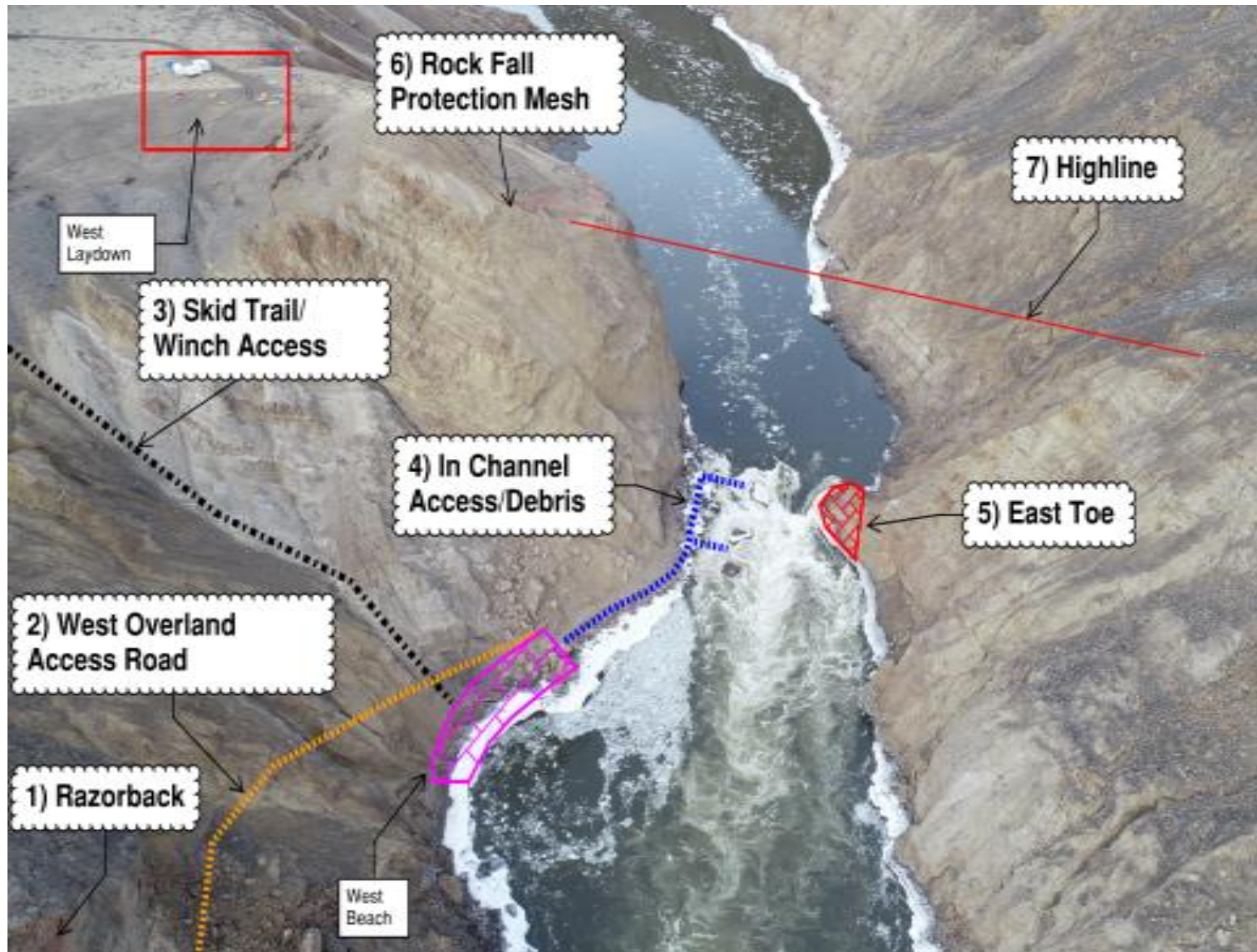


Winter Construction

Following a competitive process, Public Services and Procurement Canada, on behalf of Fisheries and Oceans Canada, awarded a contract to Peter Kiewit Sons ULC on December 31, 2019 for remediation work on the Big Bar landslide site.

Work onsite began as of January 14, 2020, including:

West Bank	East Toe	Channel Work (In River)
<ul style="list-style-type: none"> Removal of loose rock and installation of rock fall protection consisting of wire mesh anchored to the west bank cliff face to prevent loose rock from falling into the work areas below. To gain access to the boulders in the river channel, overland temporary access will be constructed to support hauling in heavy equipment. 	<ul style="list-style-type: none"> Drilling and blasting the rock along the east bank of the river (the East Toe) to increase the width of the river channel. Widening the narrow part of river to help reduce the speed of the water in the area of the slide. This work is expected to be complete late February 2020. Some of this work is planned to occur in parallel with clearing the in-channel boulders and other debris. 	<ul style="list-style-type: none"> Drilling and blasting large boulders that fell into the river channel as part of the slide, and removal of additional upstream in-water slide material. The targeted substantial completion date for this work is March 15, 2020.



Project Management Coordination

Inter-agency team supports development and implementation of various components of the 2019-2021 project plan:

- Governments have dedicated staff on the Big Bar response project until spring 2021.
- Canada (DFO, PSPC), BC (FLNRORD) and First Nations all expected to play a role in project oversight and delivery.
- Particularly important are specific skill sets, including engineering, procurement, biological support and Indigenous engagement coordination.





Winter Construction - Site





Razor Back Access Road



Figure 4- Feb 7 Razorback



Kiewit – Aerial Image of Overland West Access Embankment Armoring Operation Sta 1+240 to Sta 1+440 approx.





Razor Back Access Road



Kiewit – Aerial Image of the Slide Area & Fingers Built to Access the Large In-River Boulders (south finger removed)



Archeological Significance

The site has had extensive archeological assessments conducted throughout the duration of the response. We acknowledge the work completed and the cultural sacrifice of the communities agreeing to have the site disturbed in the best interest of getting fish home for future generations.



- This very special site has been impacted the most through construction to create access for machinery to remove slide debris. Thus has received the most archaeological investigation efforts.
- Diagnostic (i.e. dateable) projectile points from both Plateau Horizon (2400-1200 years BP) and Kamloops Horizon (1200-200 years BP).
- Metal projectile point and historic nail recovered, indicating site's continued use after European colonization.
- Multiple layers of dense charcoal, burned/processed bone, rolled birch bark, and lithic tools – almost exclusively over the edge of the landform: appears drying, smoking, and processing took place here followed by sweeping the area clean for multiple uses.
- Definitive physical evidence of continuous indigenous use and occupation of the landscape at the Big Bar Slide location for *at least* 2500 years.



Peter Kiewit Sons ULC Contract

Remove rock to improve flow conditions and allow natural fish passage – after East Toe Blast





Before First In River Channel Blast





First In River Channel Blast – March 5





After First In River Blast – March 5

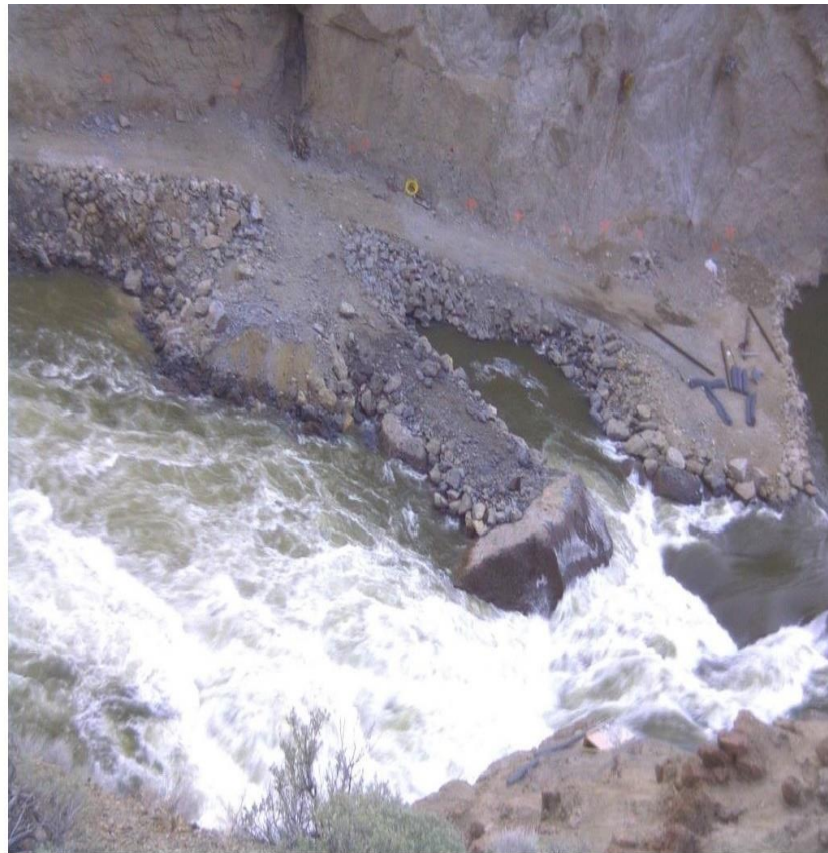




Second In River Channel Blast – March 9



Before



After





Preparing for Third In River Channel Blast



McCaws Drilling & Blasting – Loading M9 In-River Boulder for Blast





Third In River Channel Blast – March 12





After Third In River Channel Blast



SNC – Flow @ Slide Site Immediately After M9 In-River Boulder Blast (Flow 564m³/sec @ 5pm)





Before Fourth In River Channel Blast



McCaws Drilling & Blasting – Before Tower Rock & In-River Boulder Blast





Fourth In River Channel Blast



McCaws Drilling & Blasting – Blast of P8 & Un-Named Oversized Boulder @ North Finger





After Fourth In River Channel Blast



North Finger – P8 & Un-Named Oversized Boulder After Blast





Before Fifth West Bench Blast





After Fifth West Bench Blast



SNC – Flow @ 3:44pm (540m³/sec approx.)





East Toe Outcropping Blast



Figure 4- In-Channel - North Outcrop Blast March 29





After East Toe Outcropping Blast





Prepping for Second East Toe Blast



Pacific Blasting – Air Track Drilling on East Toe Upstream Rock Outcrop Previously Blasted





Construction of 'Nature-like' Fishway



Kiewit – Looking Upstream @ West Bench from Sta 1+555



SNC – Looking West @ West Bench Upstream Sta 1+562 to Downstream Sta 1+512





Construction of 'Nature-like' Fishway



SNC – Aerial Image Looking Downstream @ West Bench Rip Rap & Select Boulders





Construction of 'Nature-like' Fishway



SNC – Sta 1+493 Looking Downstream @ Select Boulders on West Bench Natural Fishway (Select Boulders Marked with Paint)





Pre Winter Construction



Big Bar Landslide – Before Finger Construction (2020-02-28)





Post Winter Construction



Big Bar Landslide – West Bench Natural Fishway Construction & In-River Excavation (2020-03-25)





COMPLETED: 2019-2020 In River Excavation

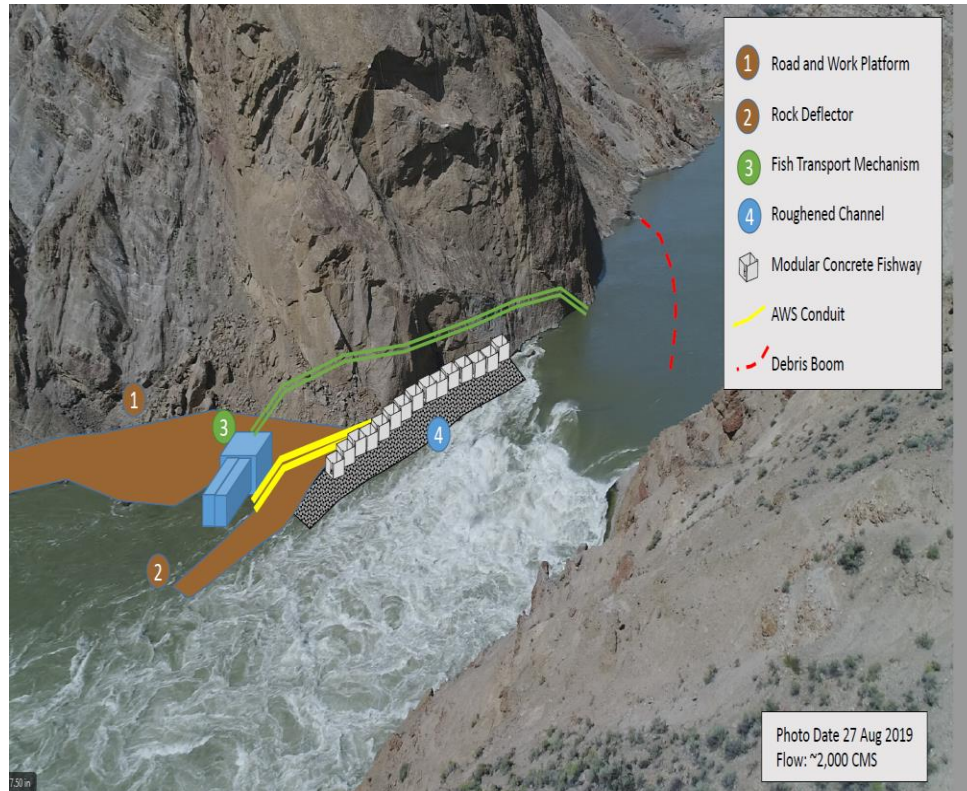


SNC – Looking Upstream from Boat @ Slide Area with West Bench & In-River Excavation Completed





Alternative Fish Passage & Conservation Enhancement



Spring & Summer Works Planning

- Critical time to complete designs and start procurement of new systems
- Critical monitoring will inform real-time passage and enhancement decisions and actions
- Opportunities to engage and employ First Nations in significant portions of both projects
- External technical teams reviewed plans and directions
- No certainties

Alternative Fish Passage

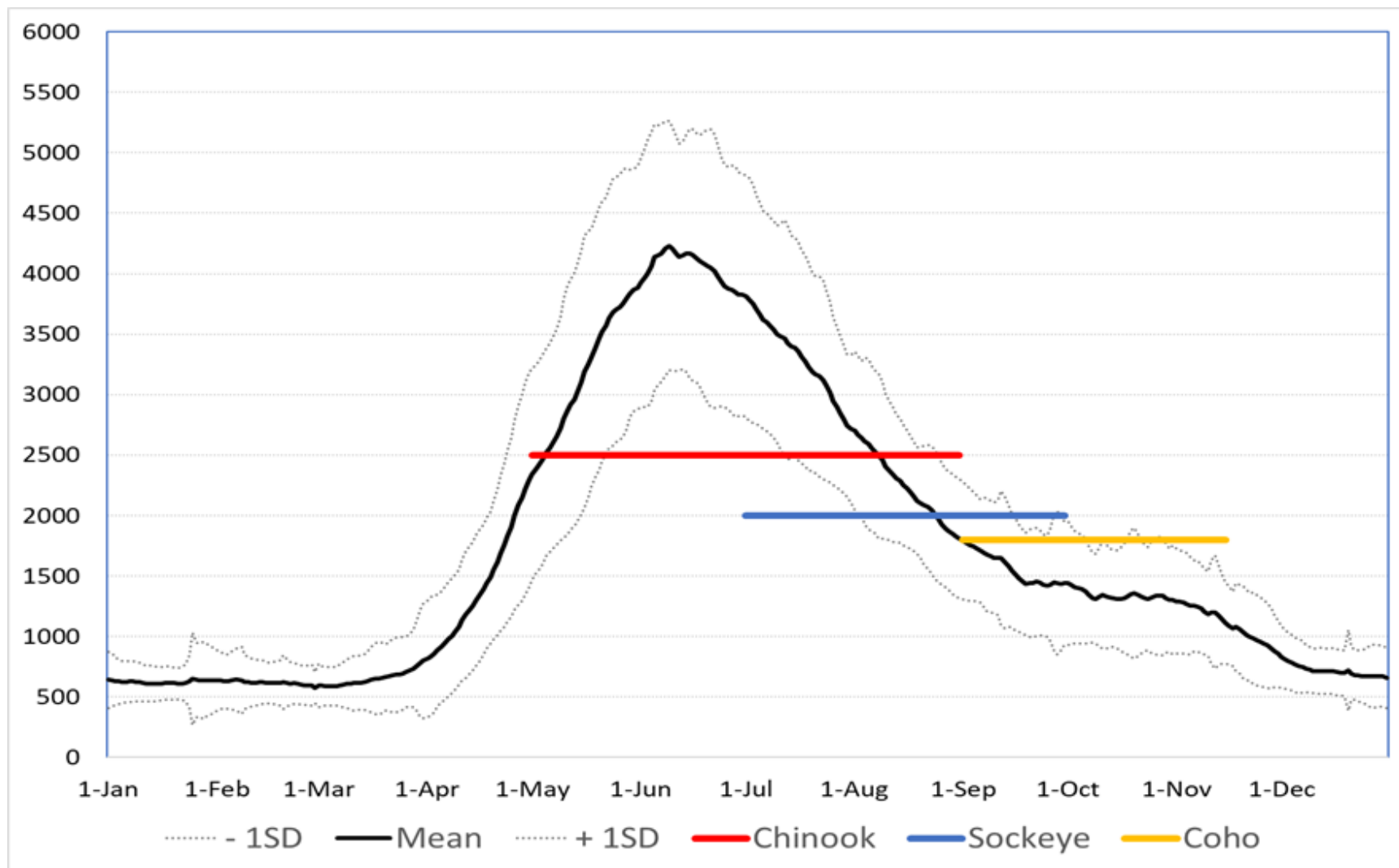
New river modelling information indicates low probability of fish getting through the slide site at all flow conditions following winter work.

Need to escalate construction of a 'nature-like' fishway:

- COMPLETED – Prepare the West Bench and roughen the surface to provide for fish passage
- UNDERWAY – Build additional short fishway to collect fish under higher flows

Additional planned measures:

- Use intake collector if the pump system does not function as intended
- Truck to French Bar for release
- Reinststate beach seining and fish wheels below the slide
- Groom fishing beaches before freshet



1952 to 2019 WSC Texas Creek





'Nature-like' Fishway



Kiewit – West Bench Natural Fishway Rip Rap Looking Upstream from Sta 1+465 (Completed Today)



Fish Pump & Platform



- Intended to capture and transport fish past the slide site, with minimal delay and handling
- Fish can also be collected here and transported around the slide by truck, if necessary
- Kiewit is constructing contingency planning requirements prior to freshet, including the placement of large boulders for the 'nature-like' fishway and fish platform for mechanical fish pump system



Conservation Enhancement

Plans for Conservation Fish Culture:

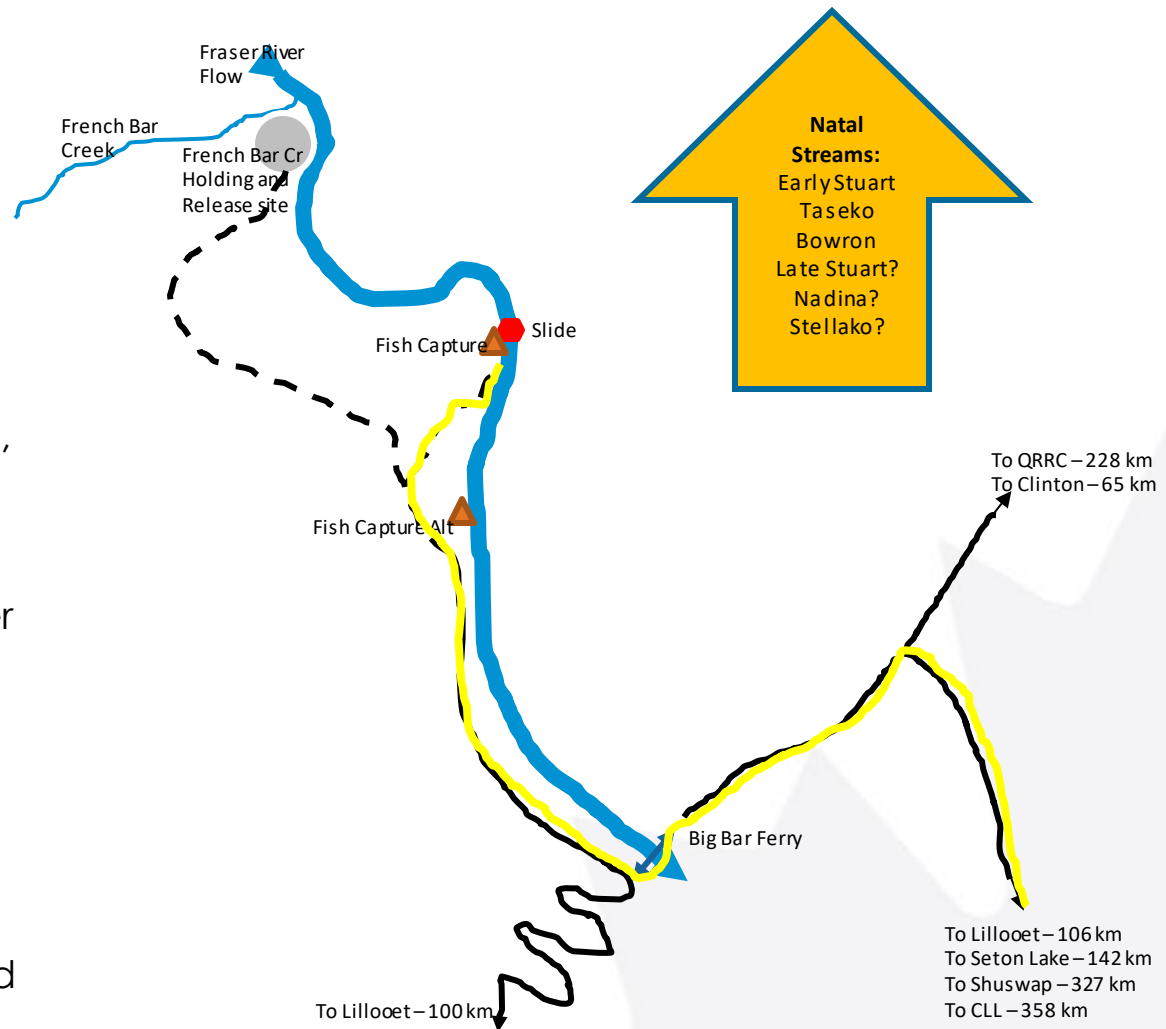
- Draft plan developed by a team of internal and external experts
- Approach based on response to success of winter work
- Balance biological risks
- Developing Sockeye and Chinook population priorities based on stock status and trends, genetic baseline, biological risk analysis, and enhancement potential

Passage Ability	Transport	Capture Location		Strategy
		Slide	Natal	
Good (Volitional Passage)	No assisted transport	No	Maybe	Stock Specific terminal collection, depending on escapement
Poor (Limited Volitional Passage, similar to 2019)	Assisted transport	Yes	Yes	Collect fish downstream of slide, and if possible in natal streams. Focus on early run stocks, and summer if flow/passage conditions do not improve
Significant Impact (No Volitional Passage / Delay)	Assisted transport	Yes	No	Collect fish downstream of slide, focus on all early run and summer run stocks



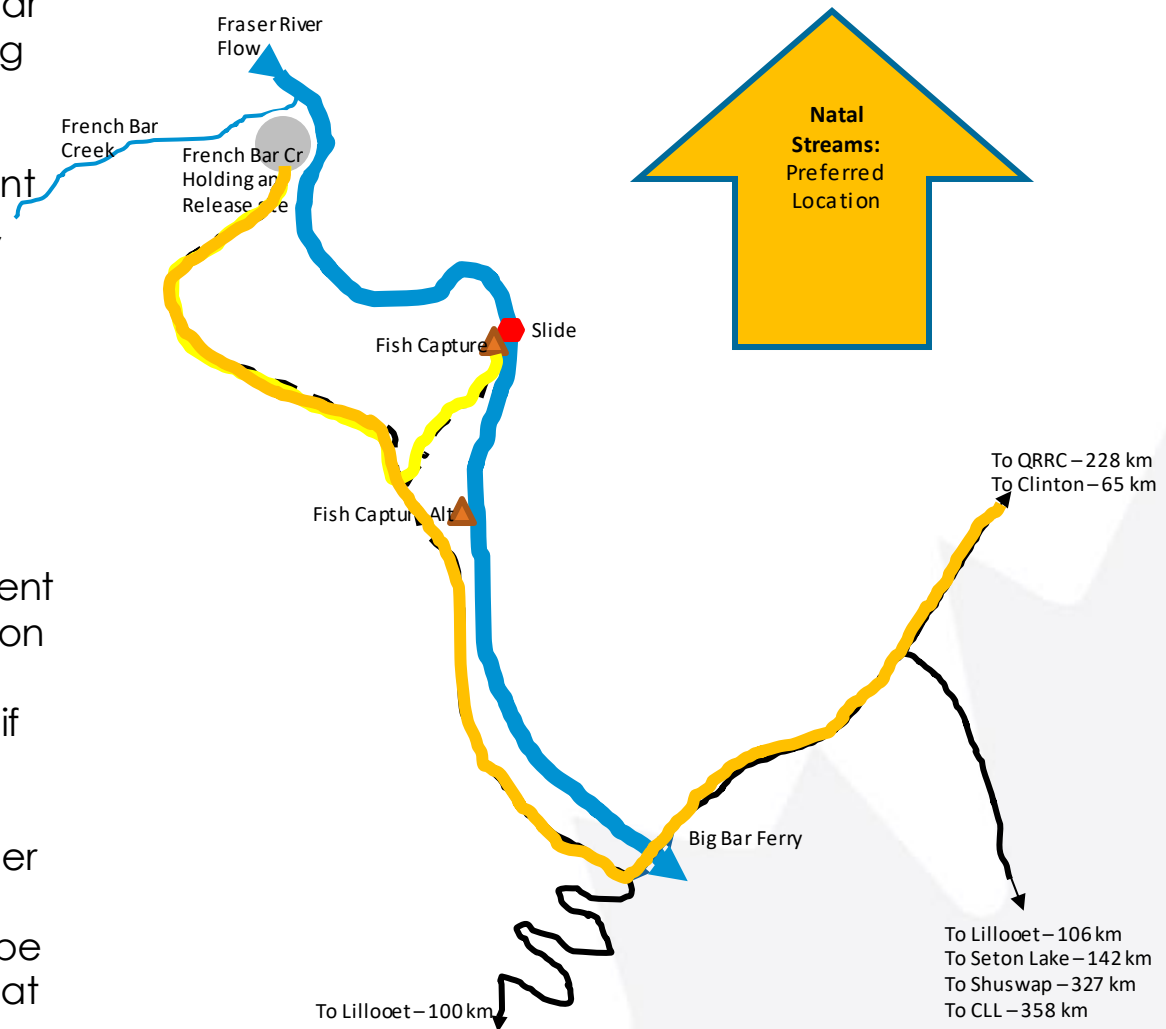
Sockeye Enhancement Plan

- Move ~400 Early Stuart Sockeye to CLL (move whatever CLL can handle) – genetic testing to occur at CLL
- Consider natal stream brood collection for Early Stuart, Taseko, Bowron if they can be captured and consider Late Stuart, Nadina, Stellako, Chilko, Quesnel if needed
- Have a contingency plan for later Sockeye stocks (Quesnel or Chilko) if required, catch at slide, hold locally in net pens in lakes, field egg takes – culture at Shuswap hatchery
- Other than Early Stuart, all other Sockeye culture to be conducted at Shuswap Falls hatchery
- Max incubation capacity 1.5M at Shuswap



Chinook Enhancement Plan

- Sort and hold Chinook at French Bar Creek – PIT tagging/genetic testing to occur while Chinook are at French Bar.
- Chinook selected for enhancement go to QRRC for extended holding, the others are released upstream. Primary incubation at QRRC and likely transfer of eyed eggs to another site. QRRC is preferred to manage handling stress and minimize fish moves.
- Consider natal stream brood collection for Chinook enhancement (field egg takes), primary incubation at QRRC
- Priorities for collection at slide site, if required: Tete Jeune, Willow, Bowron, Slim
- MGL tasked to see if there are other populations that are closely associated genetically, and may be captured in sufficient numbers to at the slide
- If collecting fish nataly, will need criteria to determine if they will be collected.



Spring / Summer Program - Considerations

- Critical to complete plans and necessary procurements in coming weeks/months
- Each phase is adaptively managed throughout the season
- Engage and employ First Nations for both projects
- External technical teams have reviewed plans and directions
- All program elements are being reassessed due to COVID-19 – protective measures are in place
- Work site safety is paramount
- Planning will occur for long-term solutions, and possible fall construction in 2020

