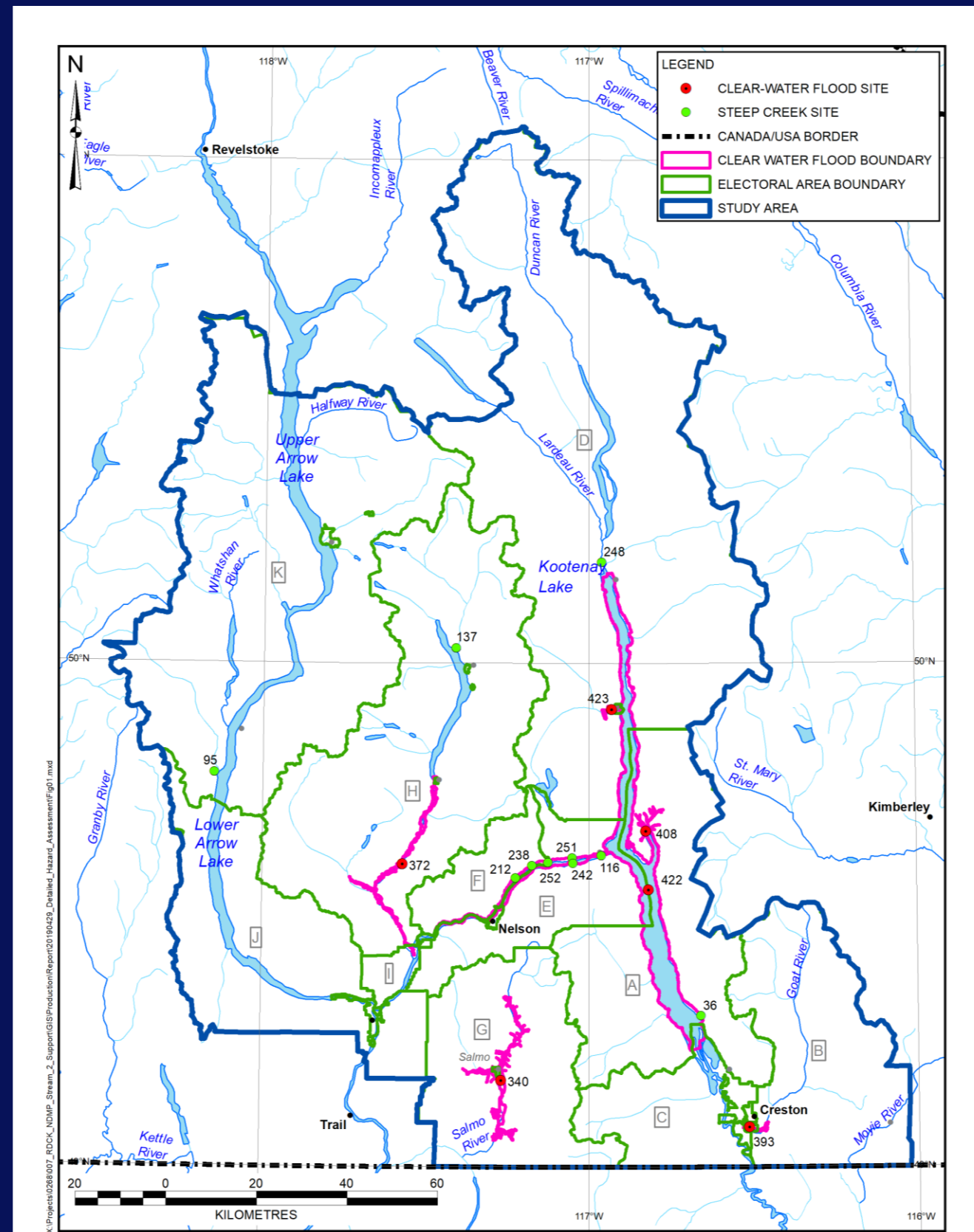


Regional District of Central Kootenay Floodplain and Steep Creek Study



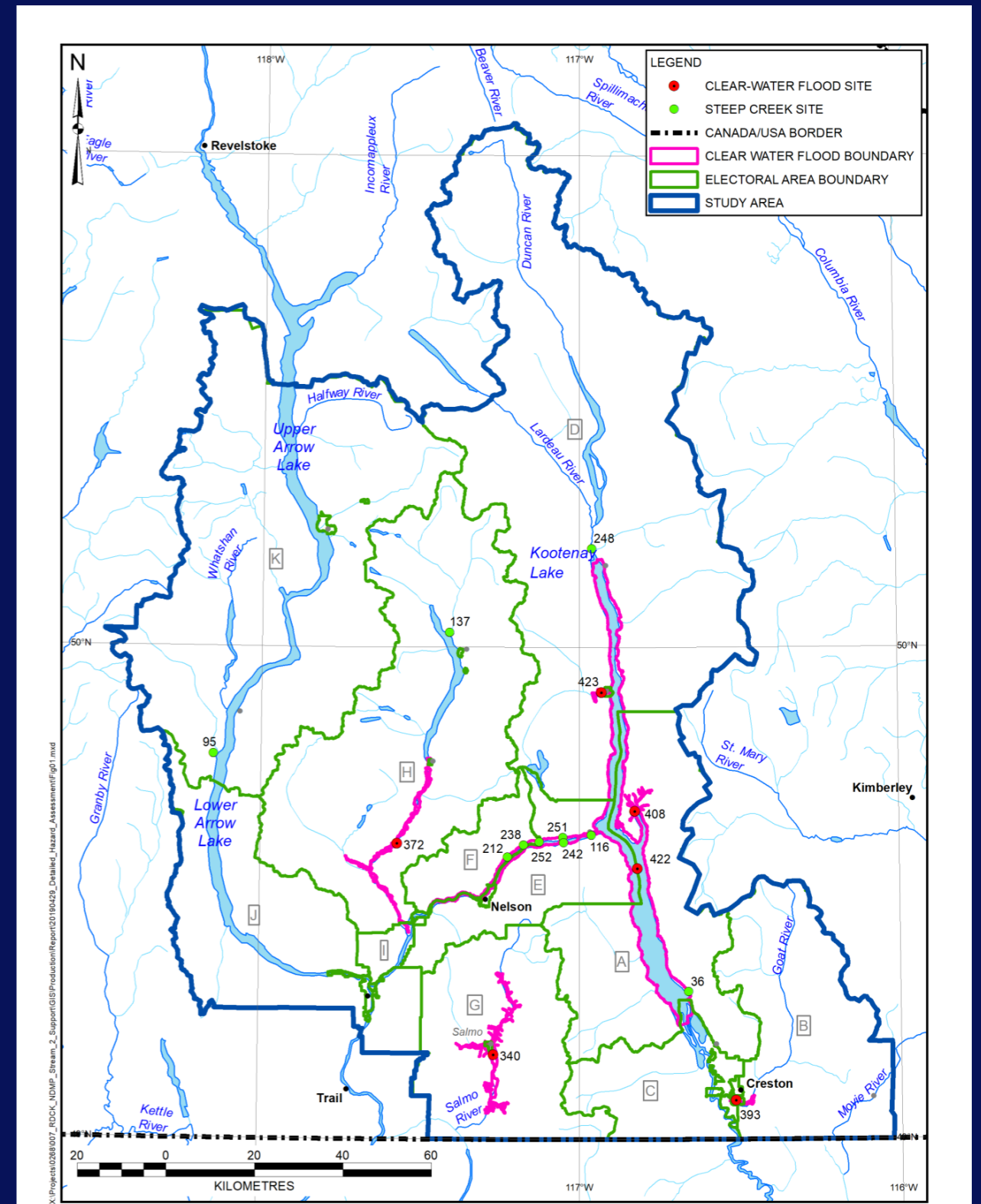
BGC Field Plan
June 28, 2019

Purpose of this meeting:

- Provide refresher on scope of work and BGC's team
- Provide summary of upcoming fieldwork:
 - Activities and schedule.
 - Health and Safety
- Discuss communications and land owner permissions
- Receive feedback from RDCK and answer questions

BGC will complete floodplain mapping and steep creek geohazards assessments for 16 high priority areas in 2019-2020.

Site	Process	Code	Jurisdiction	Name
Floodplain	Flood (6)	340	Village of Salmo	Salmo River
		372	Village of Slocan	Slocan River
		393	Town of Creston	Goat River
		408	Electoral Area A	Crawford Creek
		379	Village of Burton	Burton Creek
		423	Village of Kaslo	Kaslo River
Steep Creek	Flood (4)	212	Electoral Area F	Duhamel Creek
		252	Electoral Area F	Kokanee Creek
		248	Electoral Area D	Cooper Creek
		137	Electoral Area H	Wilson Creek
	Debris Flood (5)	242	Electoral Area E	Harrop Creek
		95	Electoral Area K	Eagle Creek
		116	Electoral Area E	Procter Creek
		251	Electoral Area E	Redfish Creek
		238	Electoral Area F	Sitkum Creek
	Debris Flow (1)	36	Electoral Area A	Kuskonook Creek
Waterbody	Flood	422	Multiple Jur.	Kootenay Lake



Project Team

Regional District of Central Kootenay

Sangita Sudan (GM of Dev. Serv.)

Chrystal Williams (GIS)

Eileen Senyk (Planner)

AJ Evenson (Senior PM)

Project Review

M. Porter (overall)

M. Jakob (steep creeks, climate change)

R. Millar (hydrology)

Project Manager

K. Holm

Assistant PM

S. Kimball

Floodplain

E. Scordo (TL)

P. Grover +

“Go With the Flow” Team (modelling)

Survey Subcontractors (Midwest, Explore)

DF Steep Creeks

C.A. Lau, M. Busslinger (TL)

CW Steep Creeks

A. Akkerman (TL)

Geomatics PM

E. Wong

GIS

M. Buchanan

L. Lee

Study Integration

K. Holm, S. Kimball

Web/Database

A. Beck

Client
Regional District of Central Kootenay

BGC Project Managers/Directors
Kris Holm (PM)
Sarah Kimball (Assistant PM)
Anna Akkerman (PM - Kootenay Reservoir Study)

“Go With The Flow” Team (BGC)

Project Review
Hamish Weatherly
Rob Millar

Tech Lead (Overall Flood)
Elisa Scordo

Assistant PM
S. Kimball

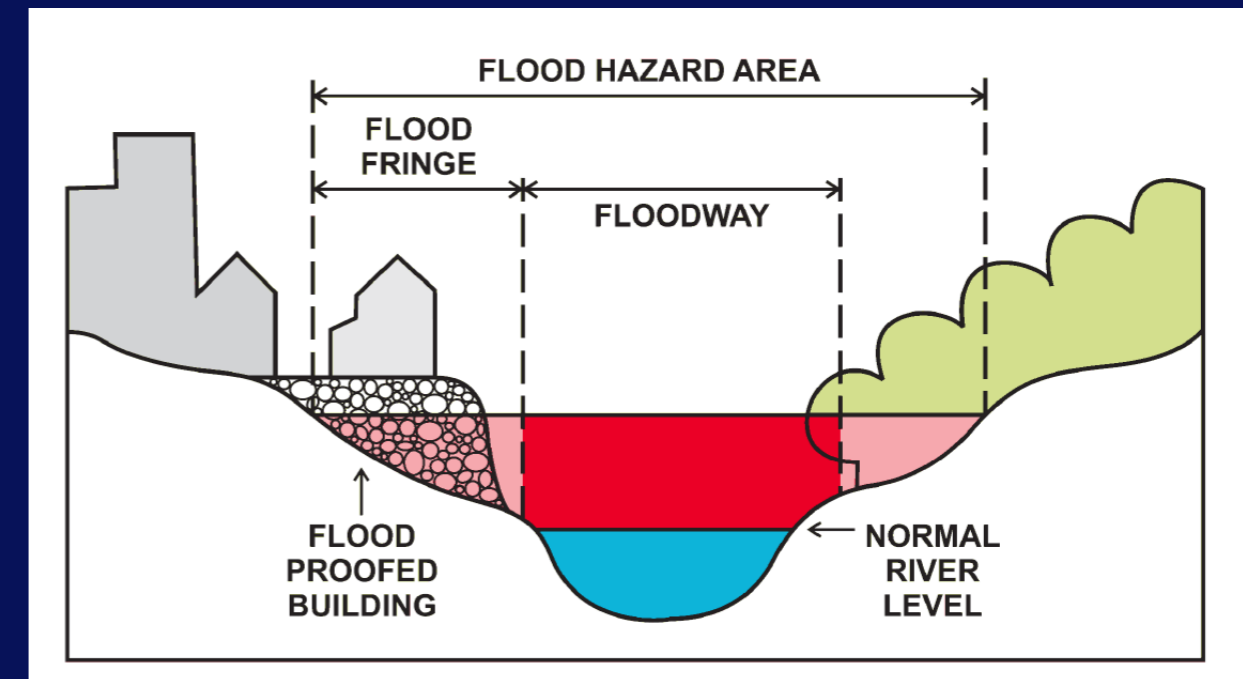
Hydrologic & Hydraulic Modelling
TL: Patrick Grover (TL)
Melissa Hairabedian Richard Carter & Marc Olivier Trottier (Modelling & Support)
Kai He (Data Scientist)

Climate Change
Pascal Szeftel

Geomatics
Sophol Tran

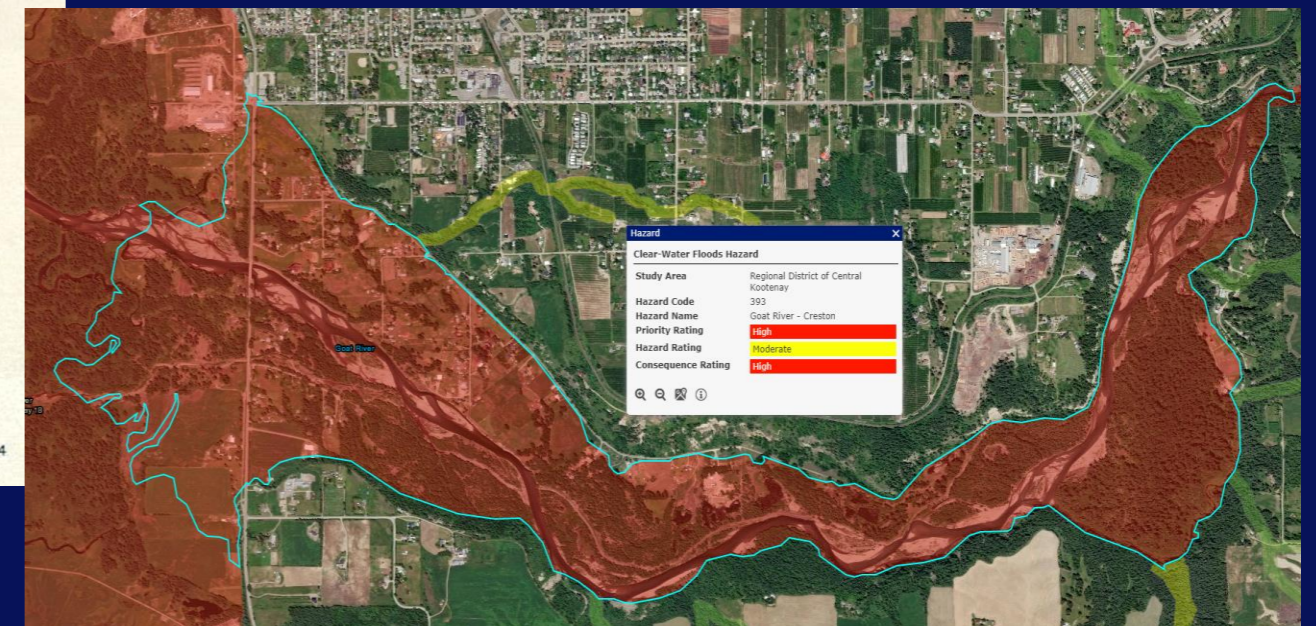
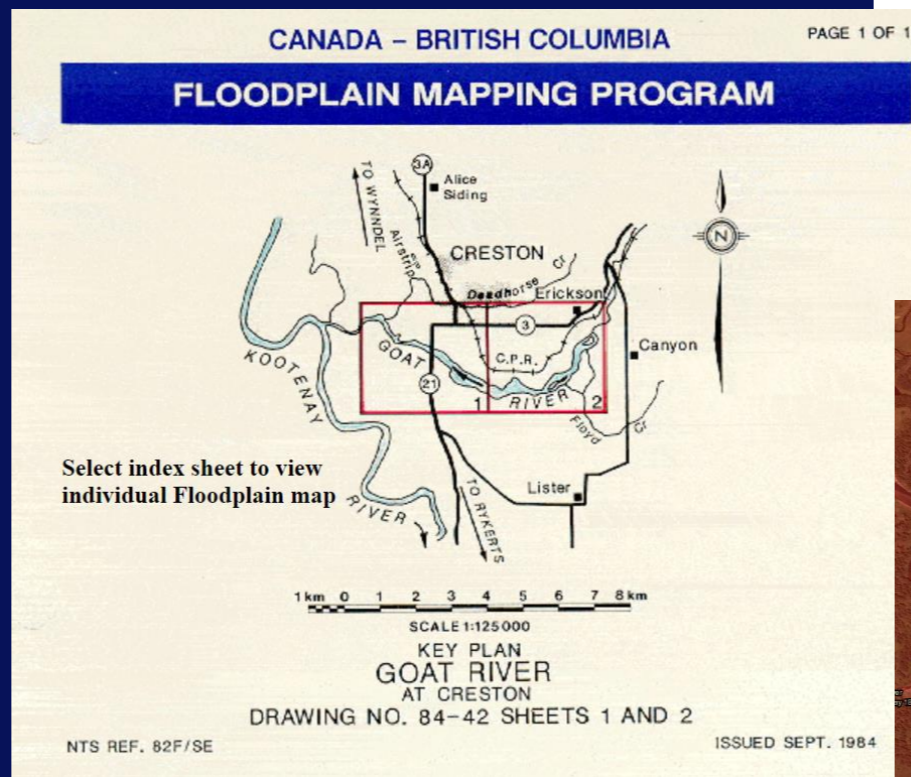
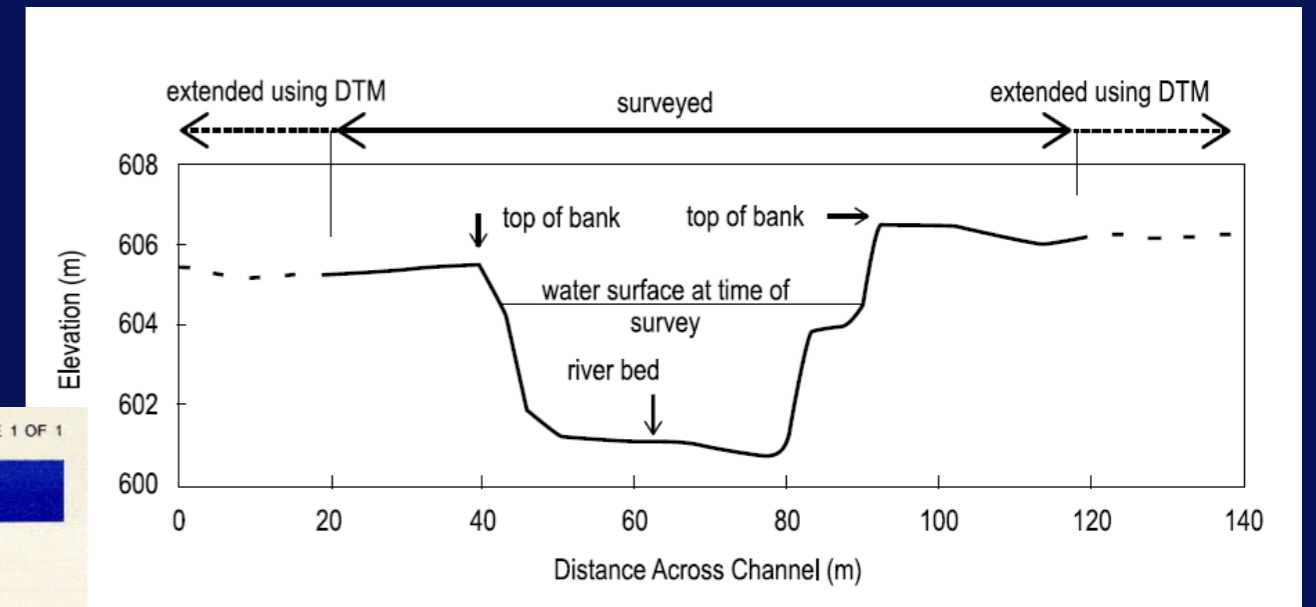
Flood Hazards – Primary Tasks

- Hydrological inputs (regional FFA, climate data, CC scenarios)
- Channel change desktop assessment
- Topographic survey data collection (bathymetry, sections, dikes, bridges)
- Field work (discharge, grain size)
- Hydraulic modelling
- Floodplain inundation mapping



Channel Surveys – Primary Tasks

- Cross sections
- Bathymetry
- Bridges, dykes, culverts characterization
- Thalweg locations
- Merged DEM



Survey Schedule



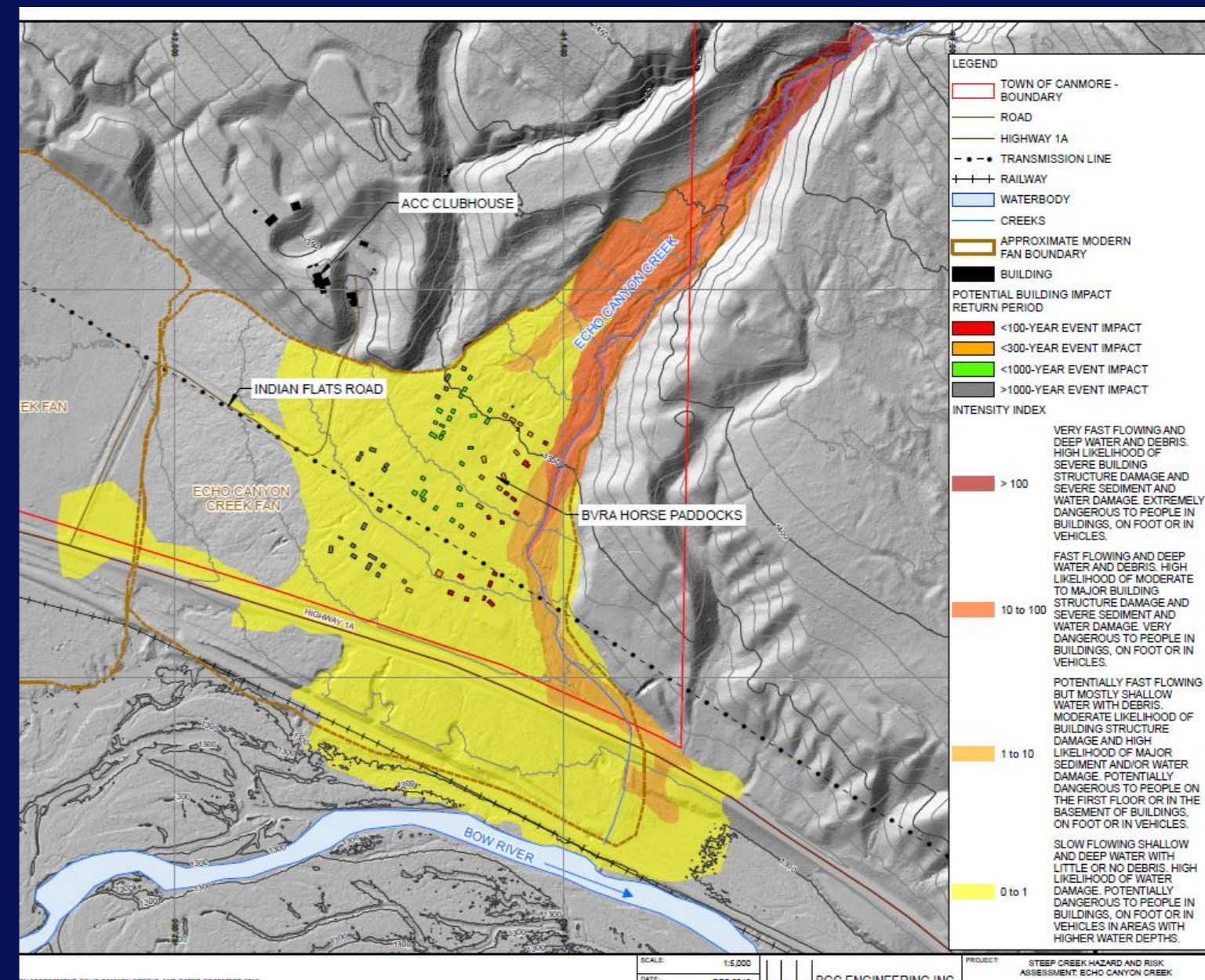
Survey Contractors
 — Explore Survey Inc.
 — Midwest Surveys

Site	Estimated No. Days	Timing
Salmo River	35	July 2 to August 5
Slocan River	25	July 2 to 26
Burton Creek	9	July 11 to 19
Kaslo River	3	July 27 to 29
Crawford Creek	15	July 30 to August 13
Goat River	8	July 3 to 10

Steep creeks - Debris Floods & Debris Flows

(Harrop, Eagle, Procter, Redfish, Sitkum, Kuskonook Creeks)

- Historical events
- Frequency-Magnitude Assessment (regional, site-specific)
- Hydrologic inputs (comparative FFA, climate change)
- Field work (test pits, dendrochronology, watershed fly over, field sections, GSD)
- Modelling (debris flow runout - FLO2D, debris flood - sediment transport R&D)
- Composite hazard maps



Steep Creeks - Floods

(Duhamel, Kokanee, Cooper, Wilson Creeks)

- Hydrological inputs (regional FFA, climate data, CC scenarios)
- Potential topographic survey data collection (sections, dikes, bridges)
- Field work (erosion, grain size, steep creek processes)
- Hydraulic modelling
- Channel stability investigation (bank erosion, avulsion, aggradation)
- Floodplain inundation and hazard mapping

BGC Field Crews

- Floodplains:
 - Elisa Scordo and Marc Olivier Trottier (leads), Rob Millar (review)
 - Survey Crews (Explore & Midwest)
- Fans (flood):
 - Anna Akkerman and Marc Olivier Trottier (leads), Rob Millar (review)
- Fans (debris flood/flow)
 - Carrie-Ann Lau and Matthias Busslinger (leads); Matthias Jakob (review)

What does steep creeks fieldwork involve?

- **Field traversing by foot**
 - Recording geological details related to channel processes.
 - Mapping extent of deposits to estimate magnitude of events.
 - Mapping evidence of high-water marks.
- **Dendrochronology** to date debris flood or debris flow events (using 5 mm diam. increment borer).
- **Test pits** will be dug with an excavator for detailed mapping of flood deposits (thickness, age).

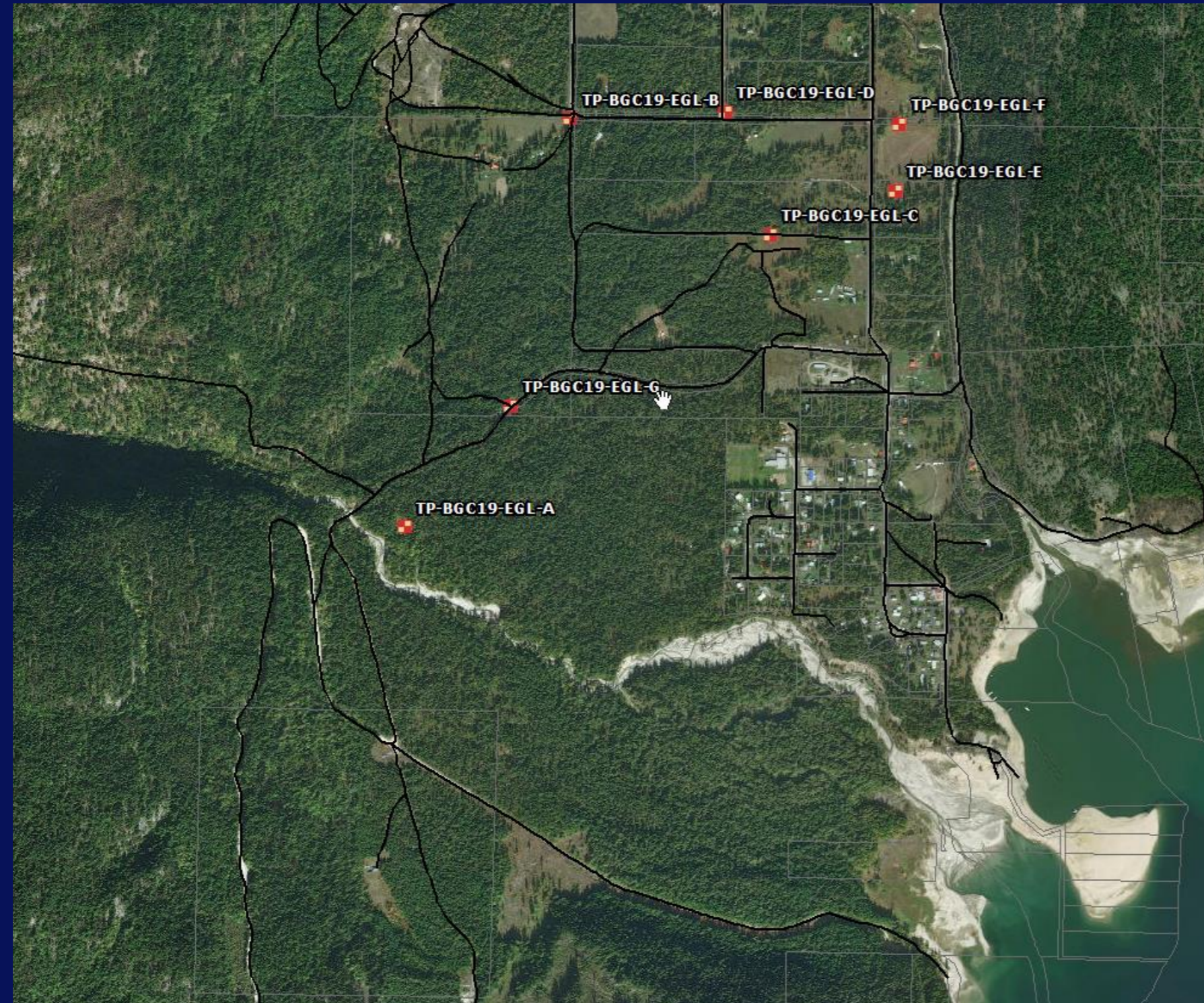


Harrop Creek – Proposed Test Pits



- Proposed 23 location options (due to tight schedule, many different properties). Not all will be used
- Will only dig about 4 to 5 test pits to approx. 4 m depth to obtain thickness and possibly age of deposits
- Pits will be backfilled after stratigraphic logging

Eagle Creek – Proposed Test Pits



- Proposed 7 locations. Not all will be used.
- Will only dig about 4 to 5 test pits to approx. 4 m depth to obtain thickness and possibly age of deposits
- Pits will be backfilled after stratigraphic logging

Example of Typical Test Pit



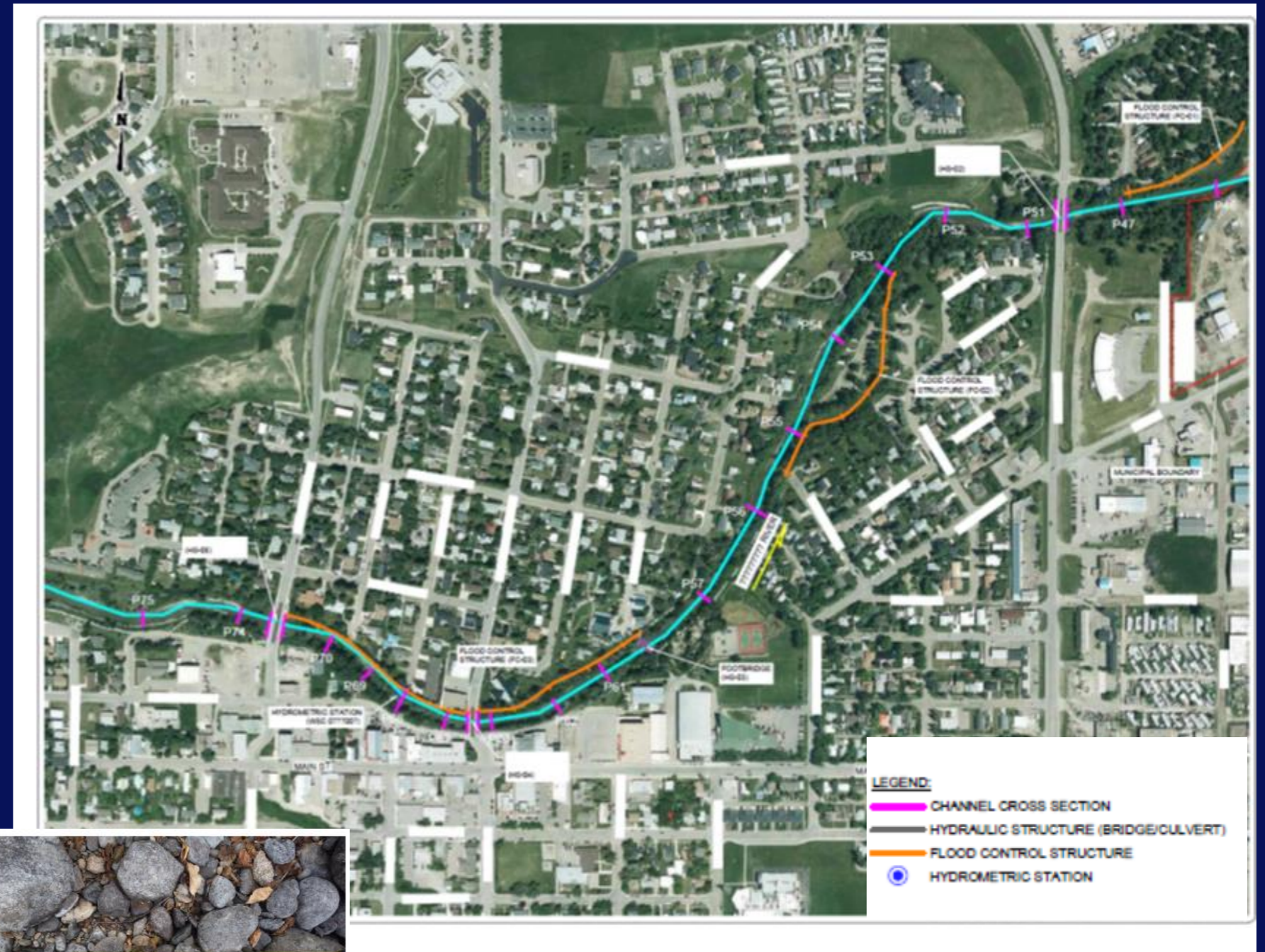
Steep Creeks Field Mapping - Watershed

- Assessing geomorphic processes in watershed from helicopter reconnaissance (no ground truthing).
- Taking photos and notes from the air.



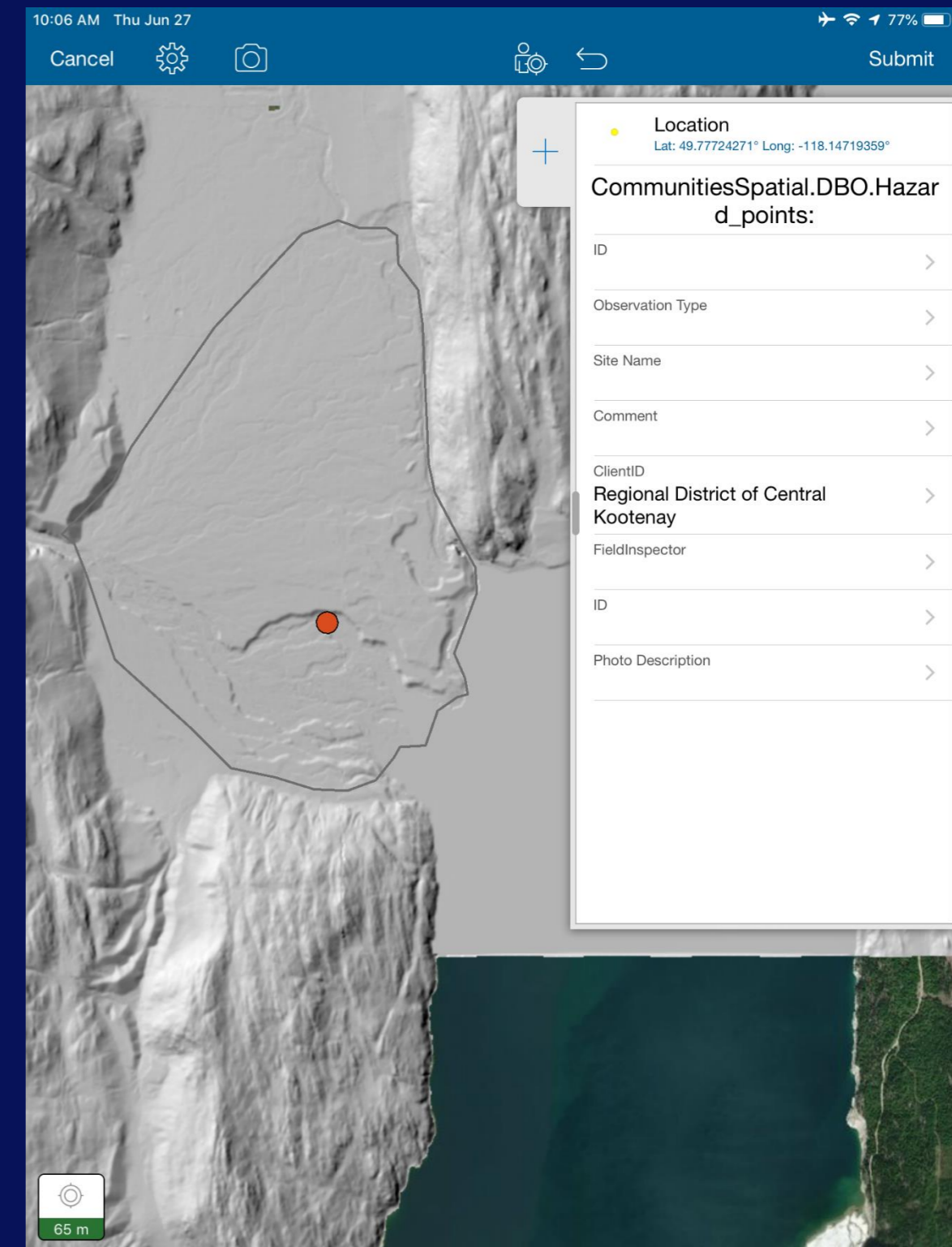
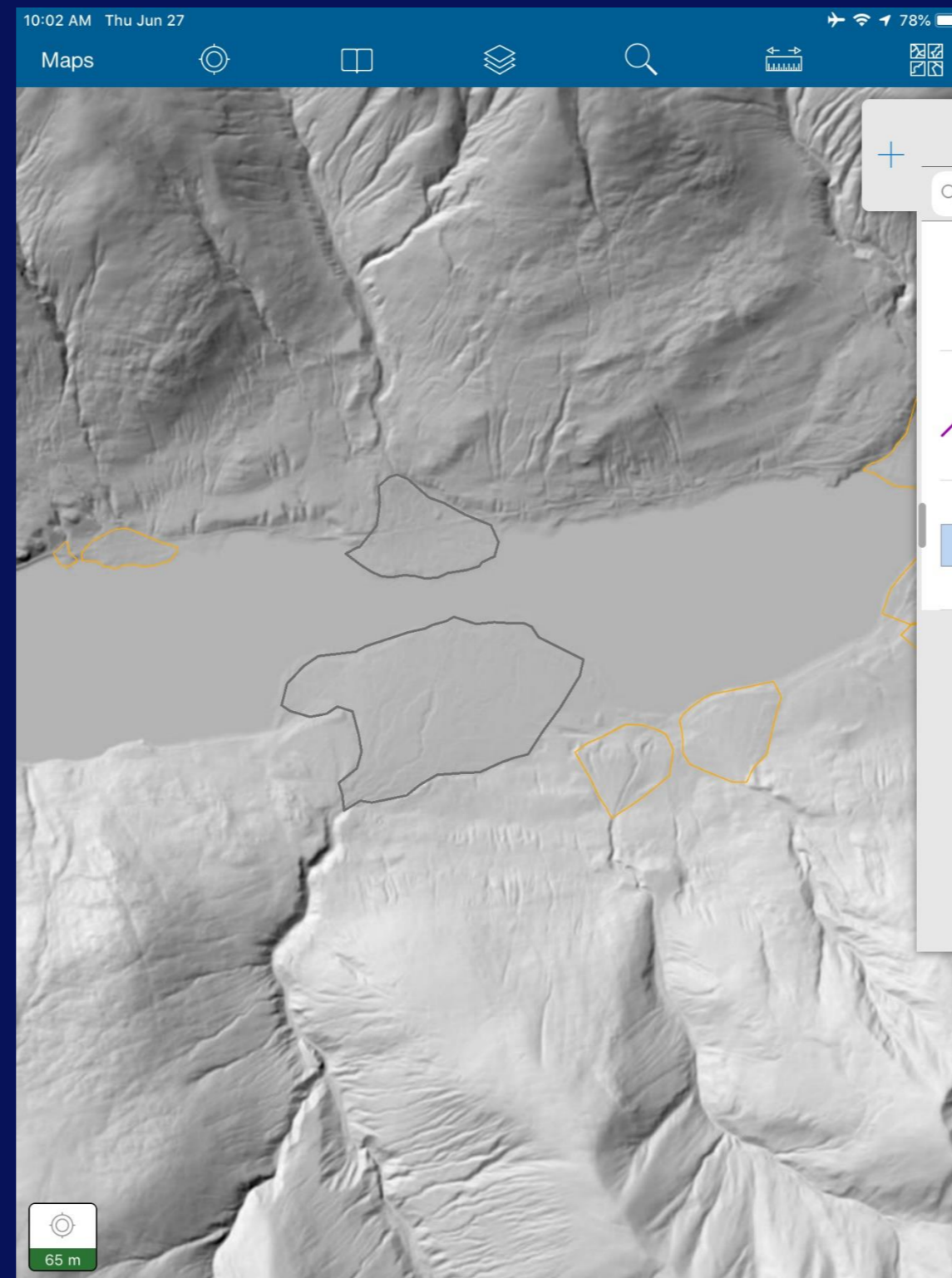
What does floodplain fieldwork involve?

- Confirming survey cross section locations and sub-reaches
- Confirming location of hydraulic structures (bridges, culverts) and flood protection measures (dikes)
- Characterizing bed and bank materials (grain size analysis)
- Conducting discharge flow measurements for model calibration



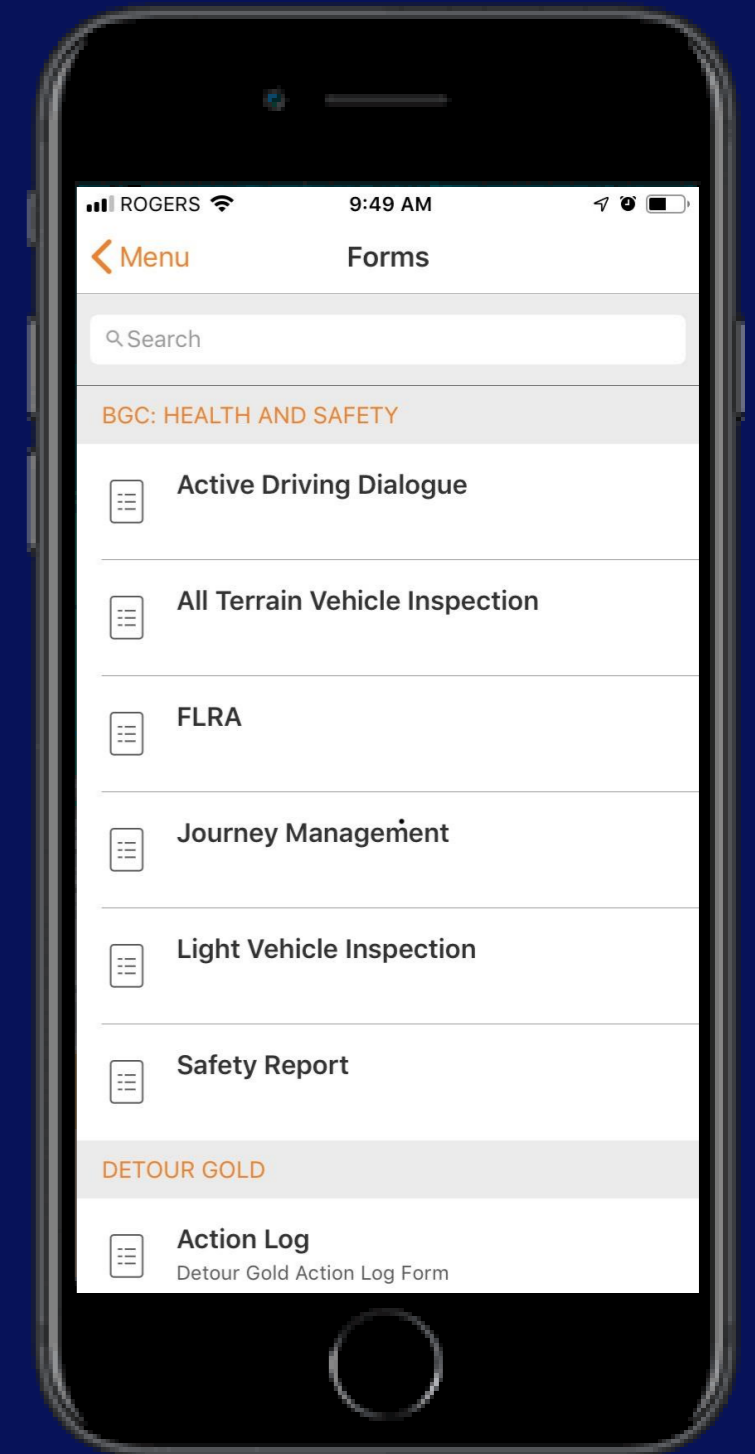
Examples of field data collection approach via Collector App, iPads.

- Hillshade of the DEM
- Points of interest
- Creek cross sections
- Roads
- Cadastral parcels
- Fan outlines
- MoTI Culverts
- Regulated dikes and dams
- Flood construction levels



Health and Safety

- Project specific Health and Safety Plan (HASP)
- Sub-contractors prequalified by BGC H&S Team
- Work in teams of 2, all staff are trained in first aid
- Kick off meeting with surveyors (week of June 24)
- Daily toolbox meetings → complete Field Level Risk Assessment
- Journey Management Plan → daily check-ins with Assistant PM/H&S Manager



Specifics on Sub-contractor Safety Tasks

- ✓ Pre-qualification tasks (safety record, liability insurance)
- ✓ Pre-field kick off meetings
- Daily toolbox meetings ->
 - Complete Field Level Risk Assessment (FLRA) for hazard identification that covers all areas of the study reach.
 - FLRA should be conducted at the start of each work day and, if necessary, adjustments should be made throughout the day if warranted on the basis of changing weather and/or flow conditions.

Additional Sub-Contractor Safety Tasks

- Standard PPE requirements
- Training, Swiftwater rescue
- Access routes, Landowner permissions
- Daily check-ins with BGC required