# RDOS Park Rill, Horn, and Kearns Creek Floodplain Mapping Project

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# Outline

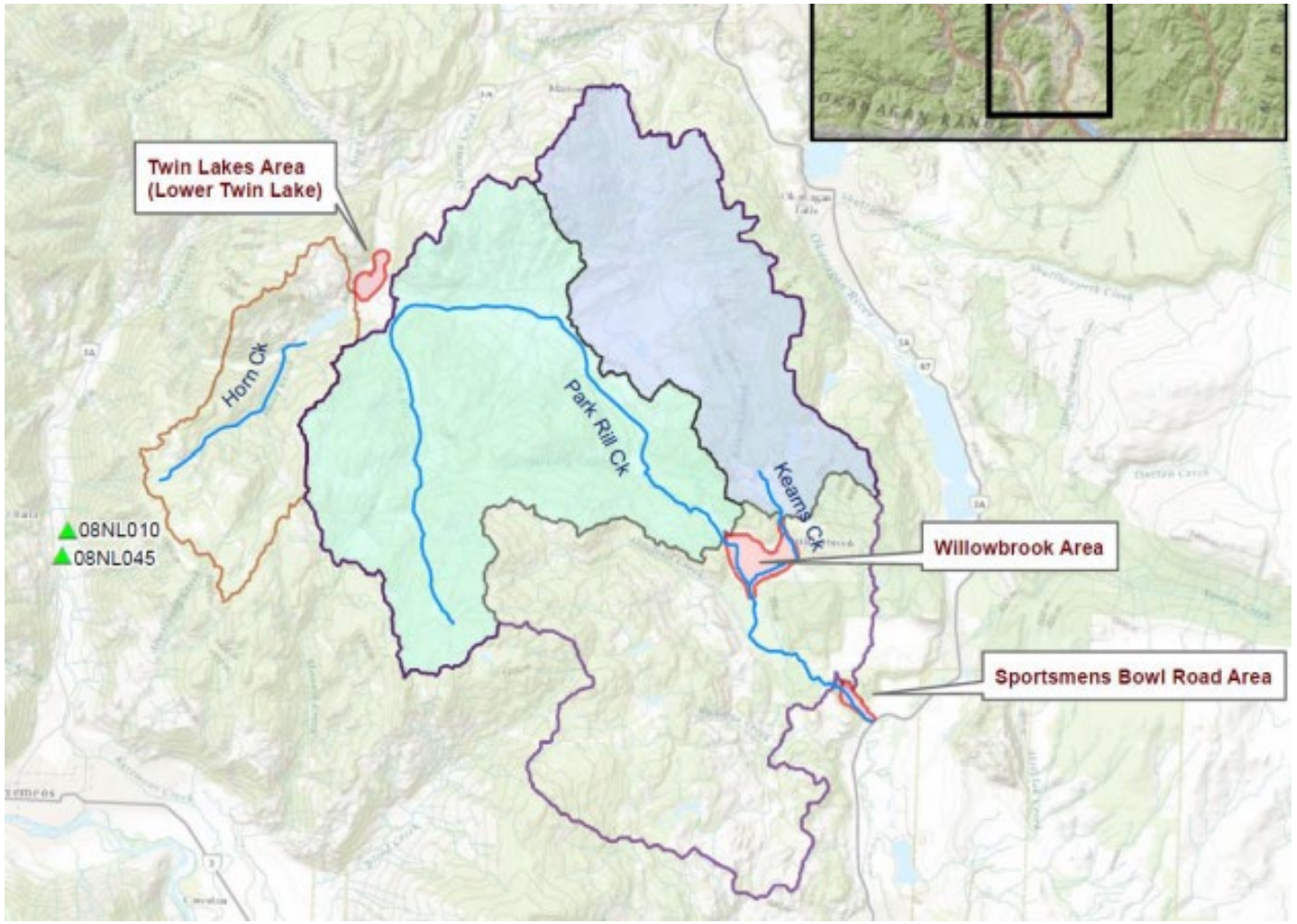
- Background
- Study Objectives
- Hydrologic Analysis
- Channel Assessment
- Riverine and Lake Modelling
- Flood Hazard and FCL Mapping
- Consequence Characterization
- Flood Mitigation Measures

# Background

- Park Rill Creek, Horn Creek, and Kearns Creek are subject to flood peaks driven by snowmelt events
- Extensive flooding during the 2018 flood
- Frequent pumping from Twin Lakes to Park Rill Creek during period of high-water levels caused flooding in properties and creek erosion

# Study Objectives

- NHC was retained in 2022 to complete the RDOS' Park Rill, Horn, and Kearns Creek Floodplain Mapping Project
- Primary Objectives:
  - Prepare floodplain and flood hazard maps for Lower Twin Lake, Willowbrook and Sportsman Bowl Road
  - Assess consequences of flooding
  - Identify mitigation measures
  - Complete a visual inspection of a 12 km reach of Park Rill Creek

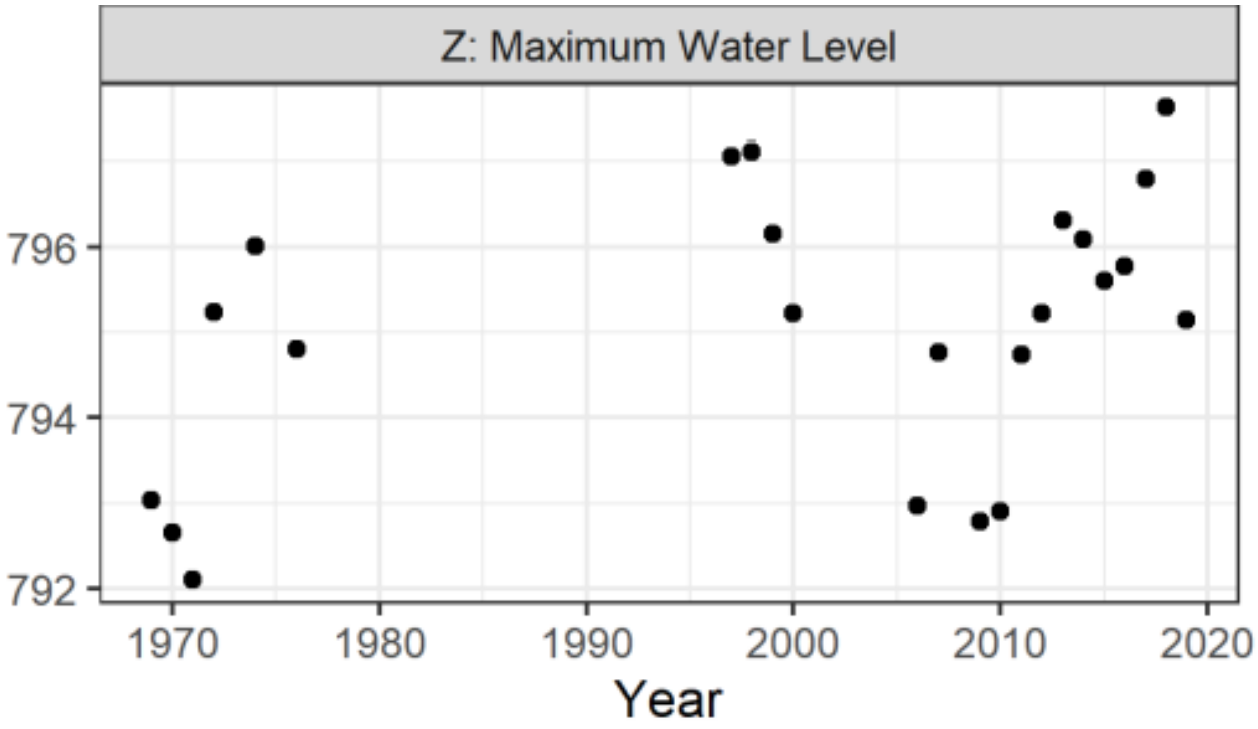


# Hydrologic Analysis - Park Rill Creek

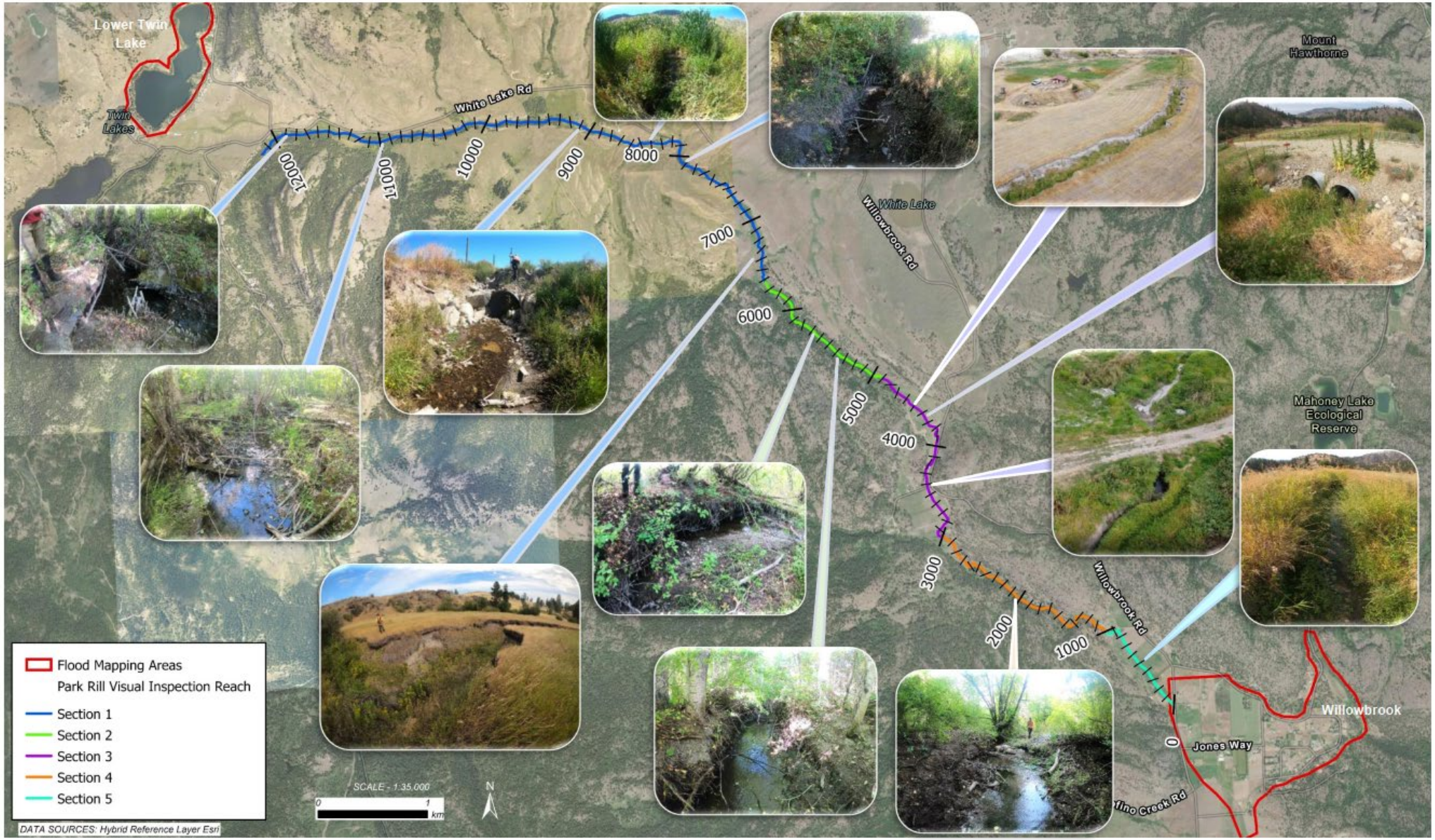
- Hydrologic analysis developed design flows (i.e. 200-year flow) and climate change adjustments as required by EGBC
- Design flows calculated for three locations: Kearns Creek, Park Rill Creek upstream of Willowbrook, and Park Rill Creek upstream of Sportsmen Bowl Road
- Limited historic data on Park Rill Creek – regional analysis used instead
- Climate change factors based on hydrologic modelling completed for the Okanagan Mainstem Mapping (10-13%)
- Long term monitoring would reduce uncertainty in estimates

# Hydrologic Analysis – Lower Twin Lake

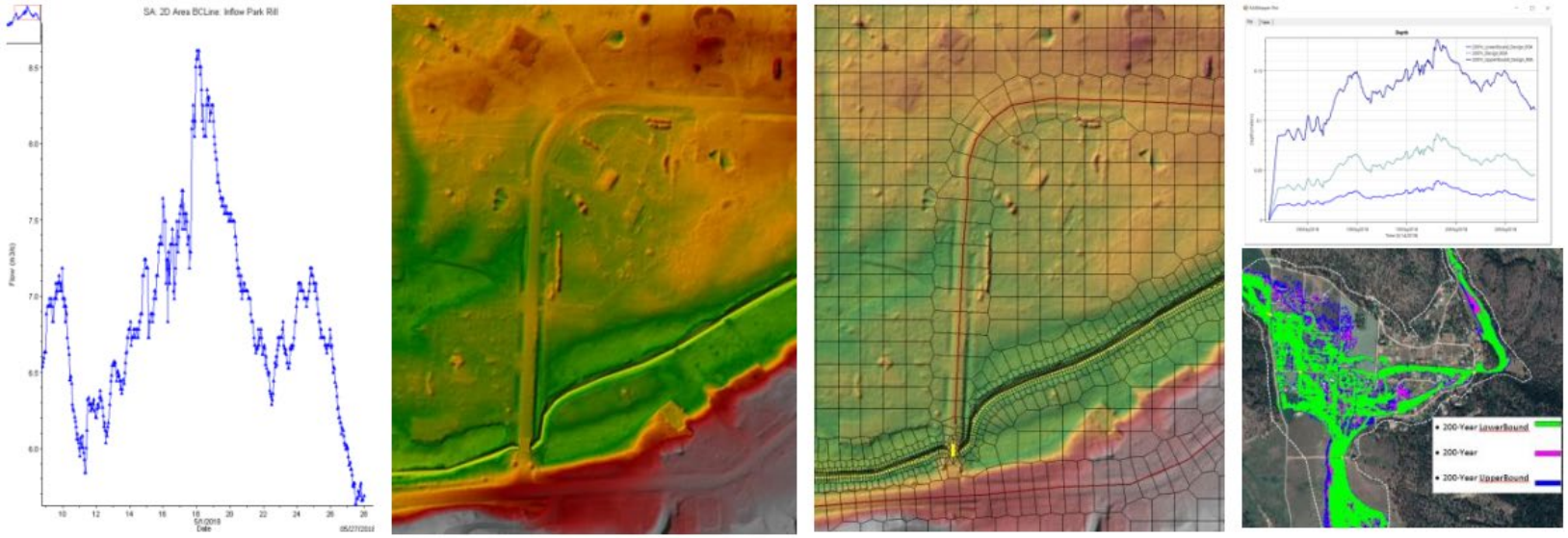
- Analysis of lake levels on Lower Twin Lake
- Complicated by pumping, sporadic record keeping, autocorrelation
- Naturalized lake levels (no pumping)
- Performed a frequency analysis that is dependent on the pre-freshet water level
- Climate change based on relative increase to inflows (10 to 13%)



# Channel Assessment



# Riverine and Lake Modelling




Inflow & Boundary Conditions → DEM → Model Geometry → Model Verification

**Figure 7.1 Overview of steps undertaken for development of the HEC-RAS 2D models**

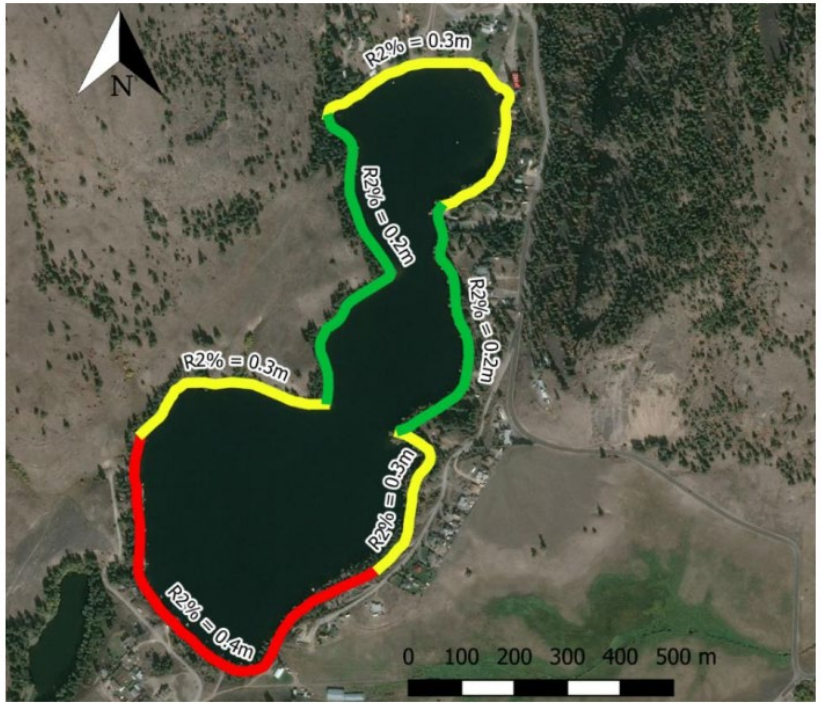
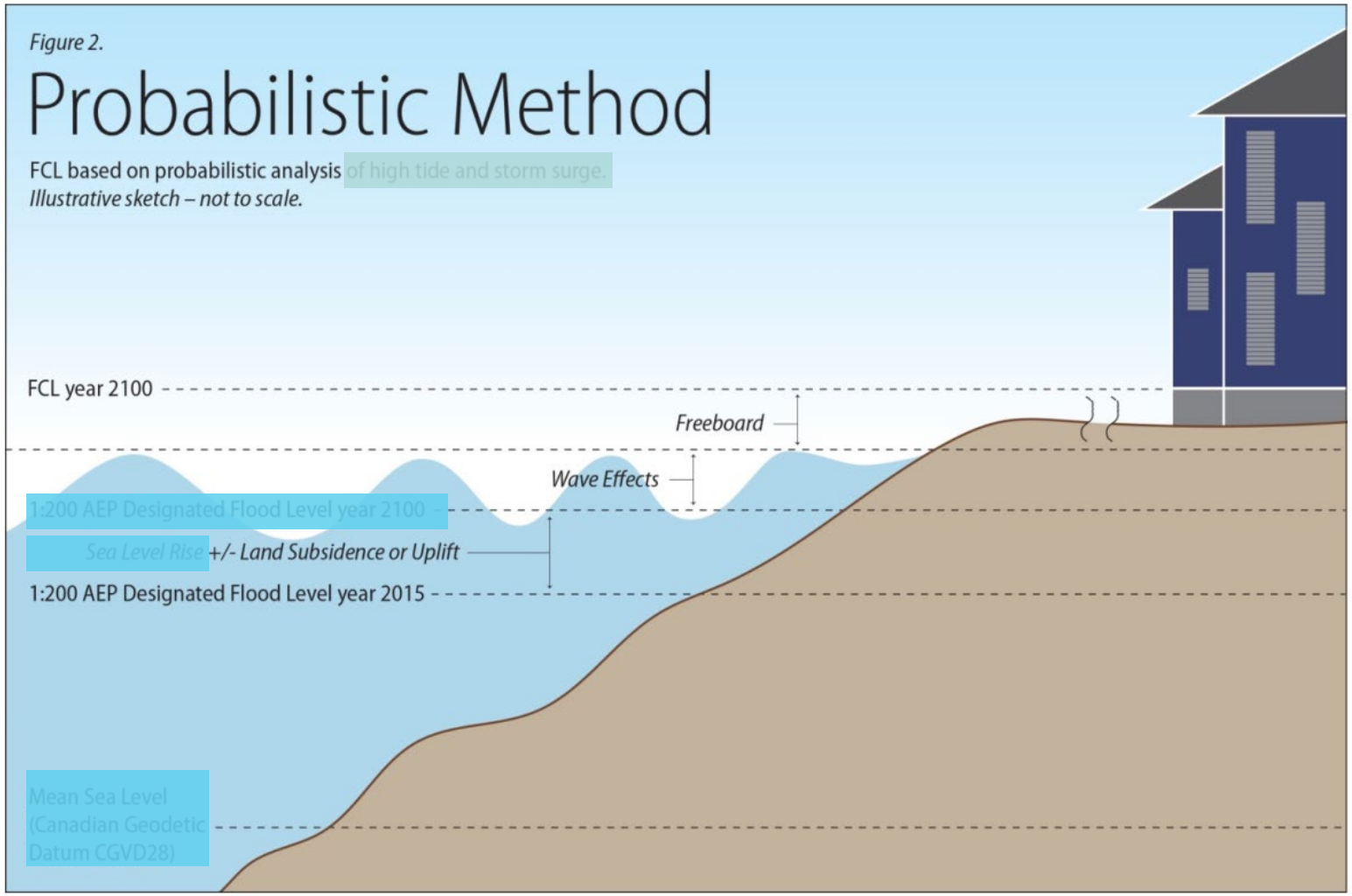



**Figure 6.1 Recommended runup values for use in flood mapping**

# Guidelines




- Flood Hazard Area Land Use Management Guidelines (amended 2018):
  - 1:200 or 1:500 year Annual Exceedance Probability (AEP) total water level (2100)
  - Allowance for regional uplift, or subsidence to the year 2100;
  - Estimated wave effects associated with the Designated Storm (1:200 or 1:500)
  - Minimum freeboard of 0.6 metres.

# Flood Hazard and FCL Mapping

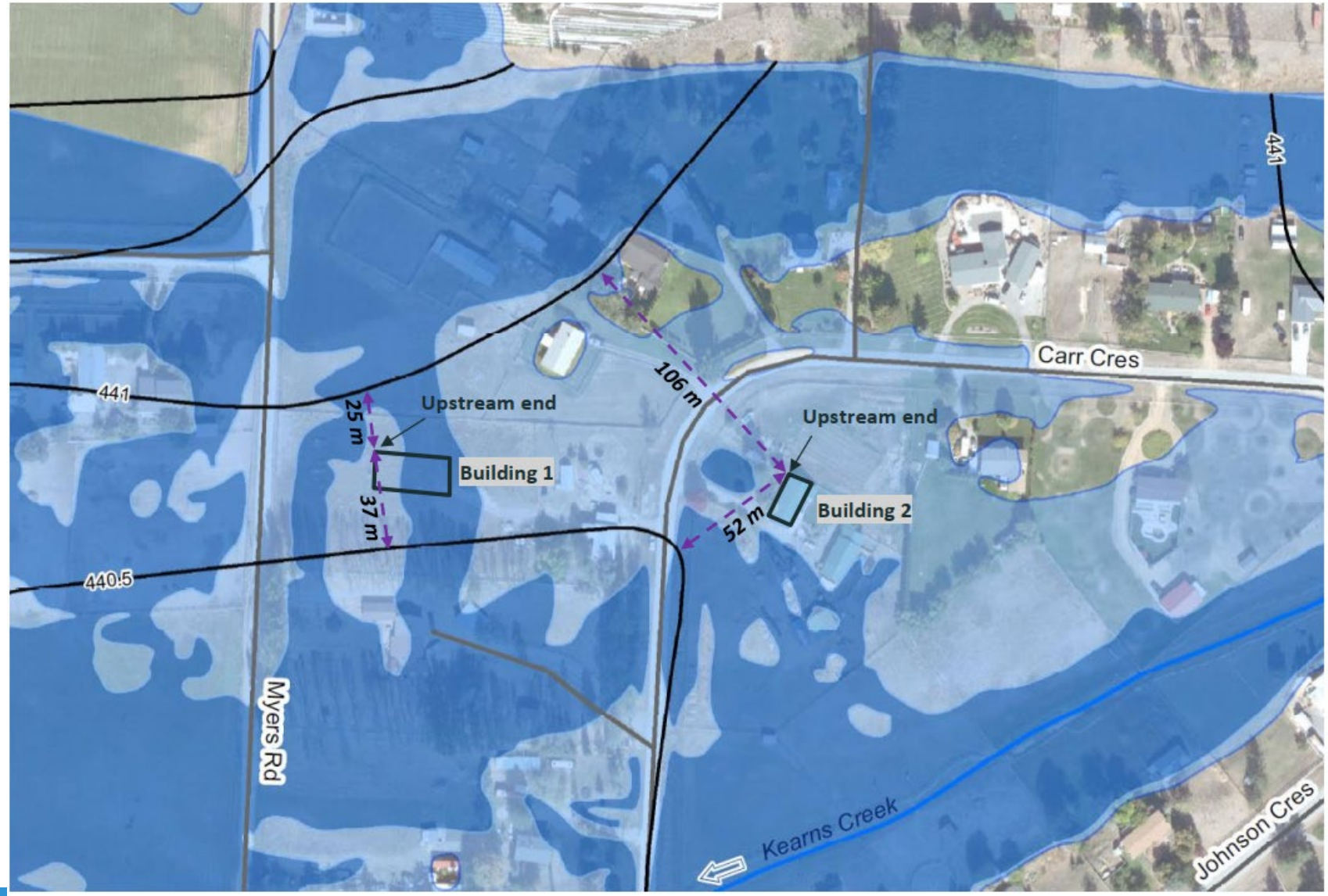



Figure 8.1 Example of FCL calculation for one hypothetical building and one existing building in Willowbrook

# Consequence Characterization

**Table 9.9 Lower and upper bound population counts**

| Study Area | Population Per-building (mean) | Total Population | Population Count – Lower Bound | Population Count – Upper Bound |
|---|---|---|---|---|
| Lower Twin Lake | 2.24 | 52 | 38 | 43 |
| Willowbrook | 1.53 | 164 | 3 | 43 |
| Sportsmens Bowl Rd | 1.36 | 27 | 0 | 15 |
| **Total** | | **243** | **41** | **101** |

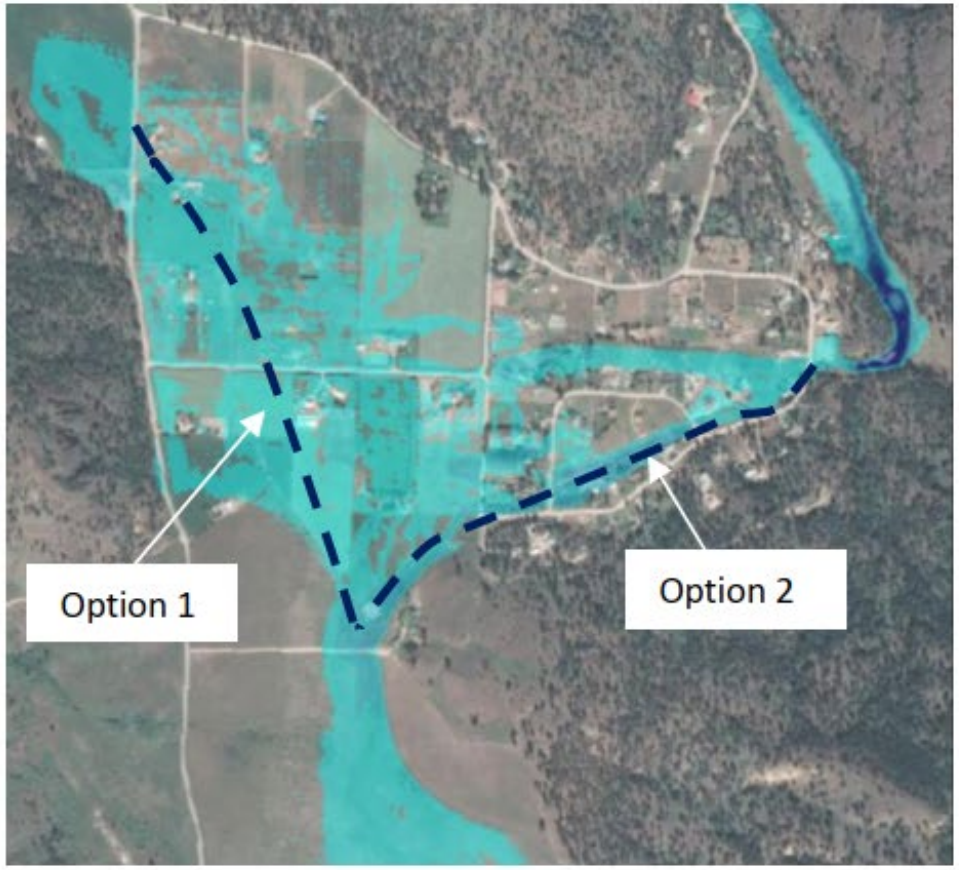
**Table 9.8 Lower and upper bound building counts**

| Area | # of Buildings | Building Count – Lower Bound | Upper Count – Lower Bound |
|---|---|---|---|
| Lower Twin Lake | 27 | 17 | 19 |
| Willowbrook | 132 | 2 | 28 |
| Sportsmens Bowl Rd | 21 | 0 | 11 |
| **Total** | **180** | **19** | **58** |

**Table 9.10 Length of road inundated per road type (m)**

| Study Area | Loose | Paved | Rough | Total |
|---|---|---|---|---|
| Lower Twin Lake | - | 340 | 114 | 454 |
| Willowbrook | - | 254 | 143 | 397 |
| Sportsmens Bowl Rd | - | 812 | 59 | 871 |
| **Total** | - | **1,406** | **316** | **1,722** |

# Flood Mitigation Measures



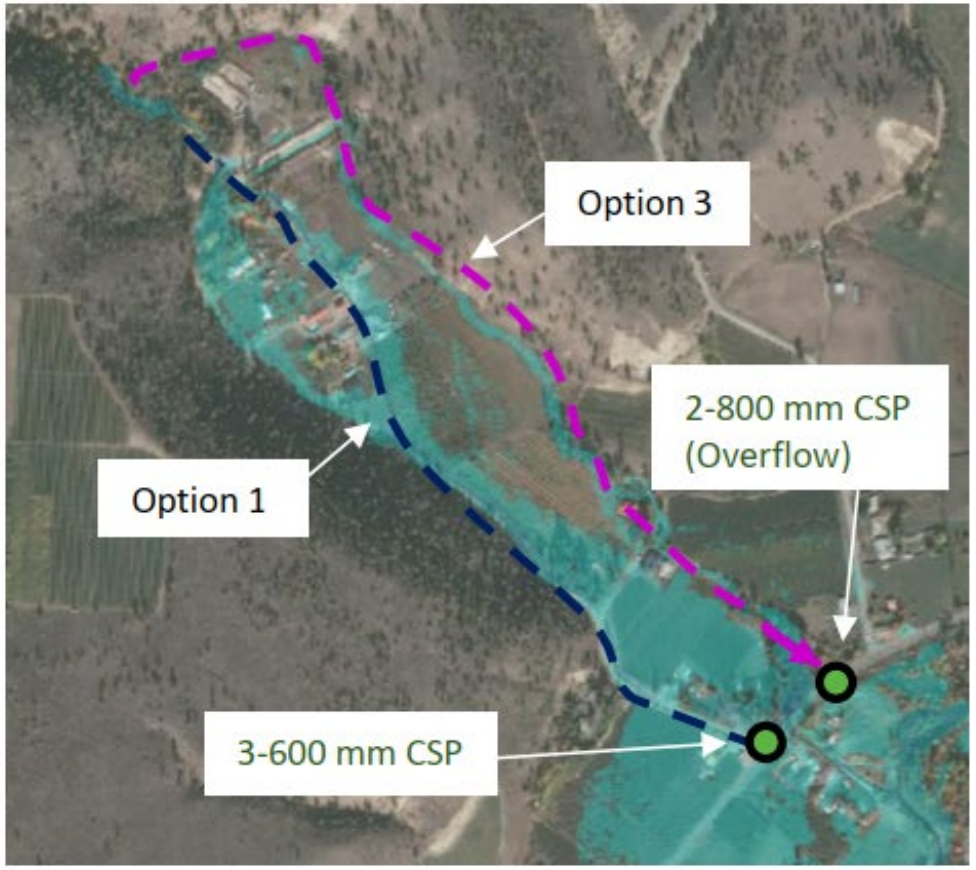




**Figure 10.6** Flow conveyance improvement concepts for Willowbrook (left) and Sportsmens Bowl Road (right). Proposed upgrade reaches are shown in blue and diversion alignments in pink

# Zoning Bylaw