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Preliminary Far-Field Modelling for IPP's Main Mill Outfall

Ocean, Coastal and River Engineering (OCRE) Research Centre

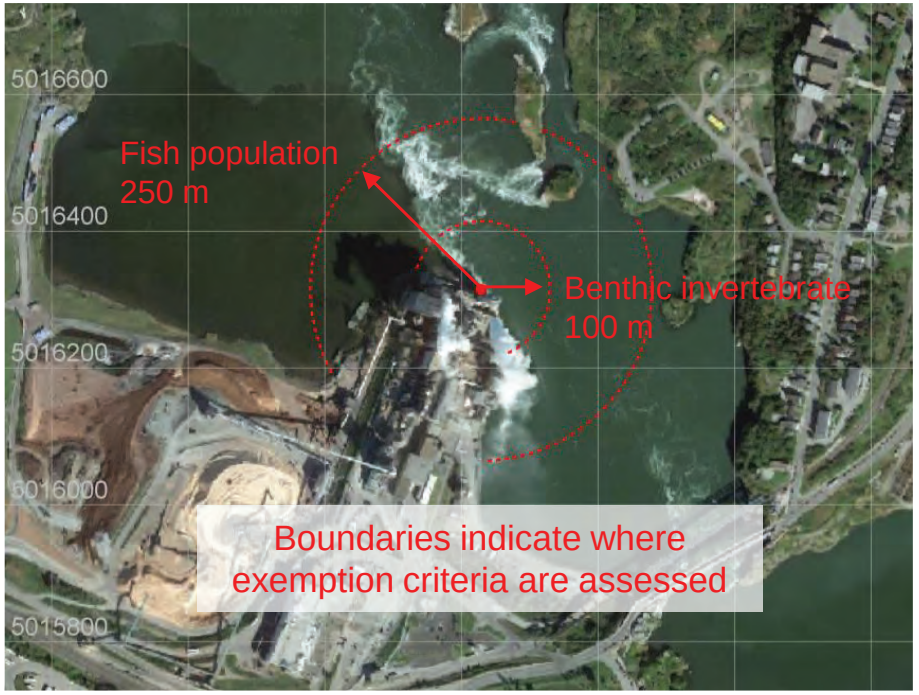
October 28, 2021

National Research Council Canada | Conseil national de recherches Canada

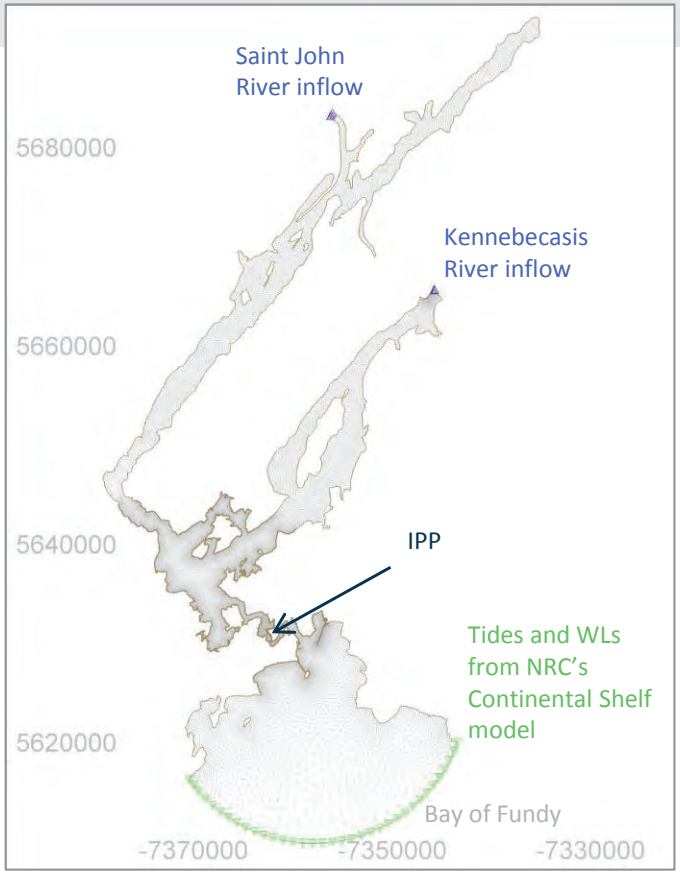
Canada

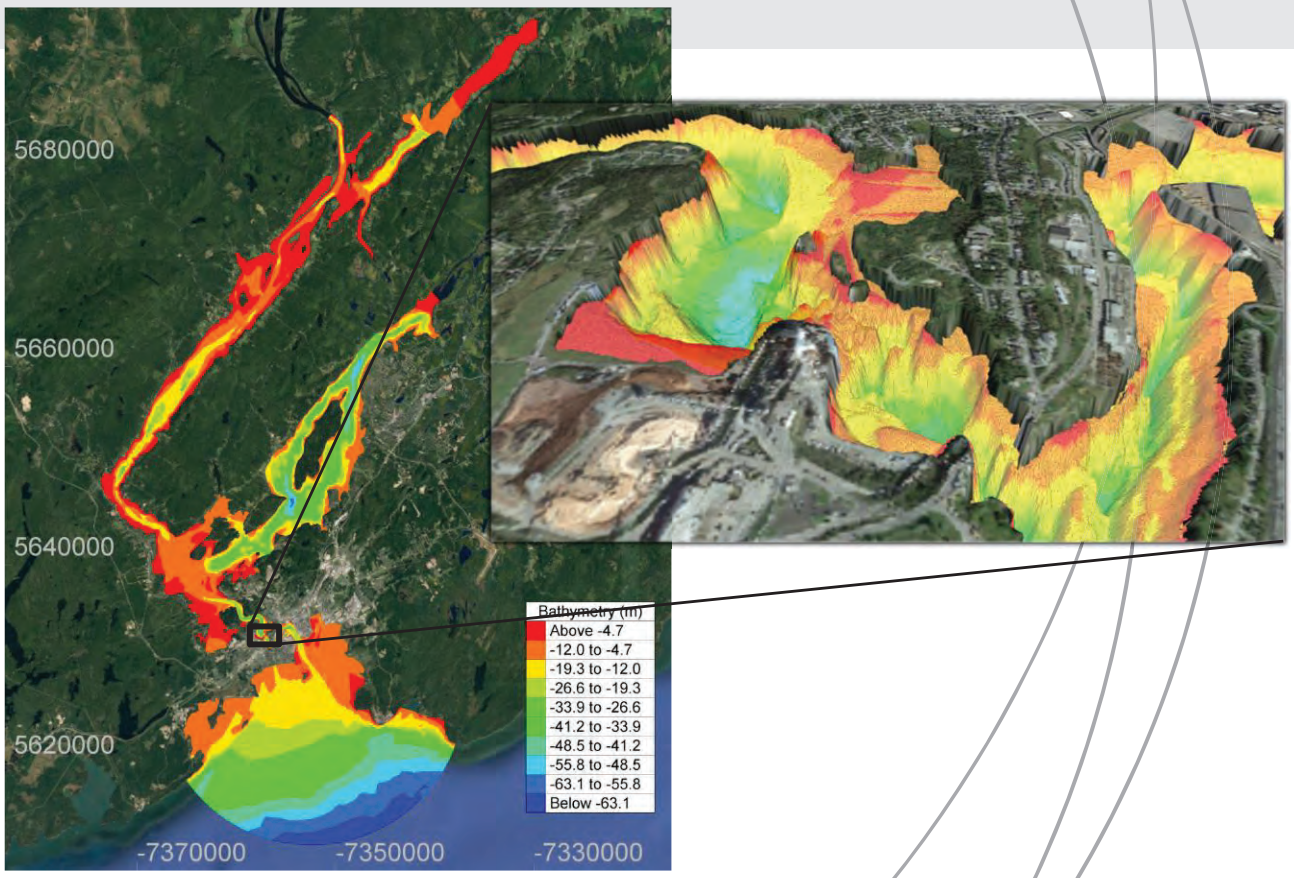
Objective

- Numerically evaluate far-field plume dilution characteristics for the MMO at two different discharges: existing high discharge (*High Q*) and future low discharge (*Low Q*).
- Comment on threshold for exemption criteria for fish population and benthic invertebrate surveys.

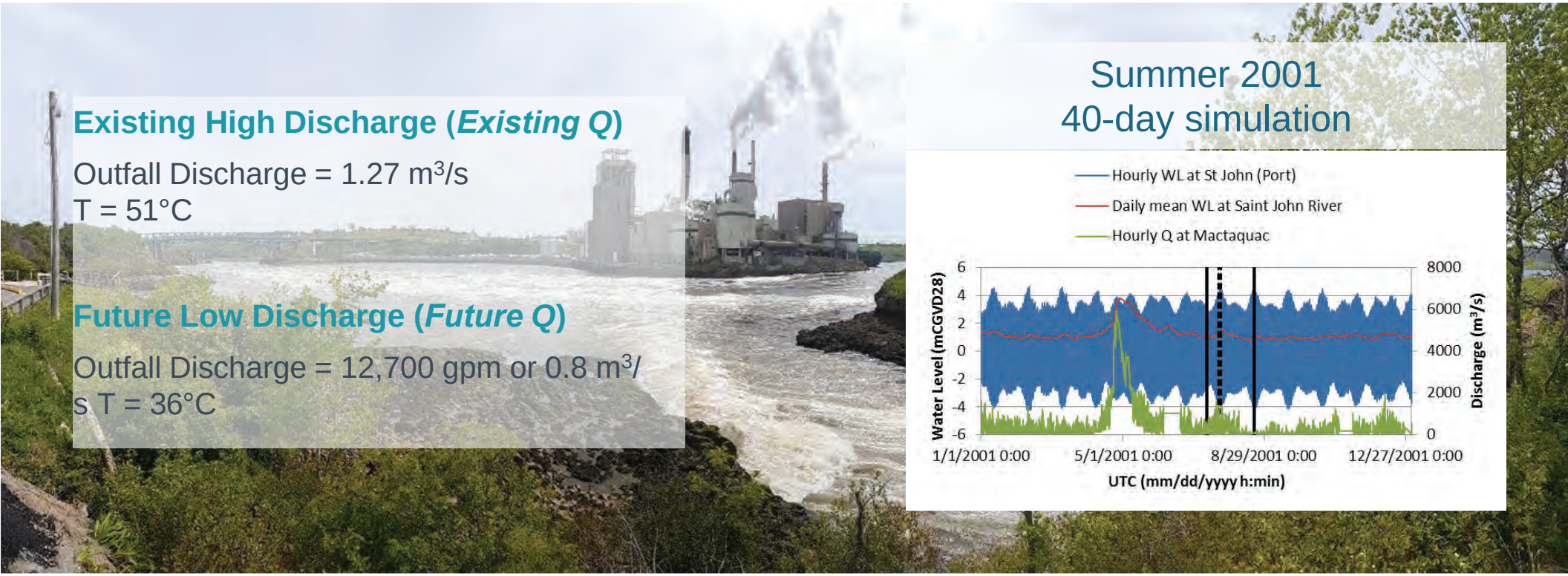


TELEMAC-3D Hydrodynamic / Far-Field Plume Model





Modelling Scenarios for Main Mill Outfall



Existing High Discharge (*Existing Q*)

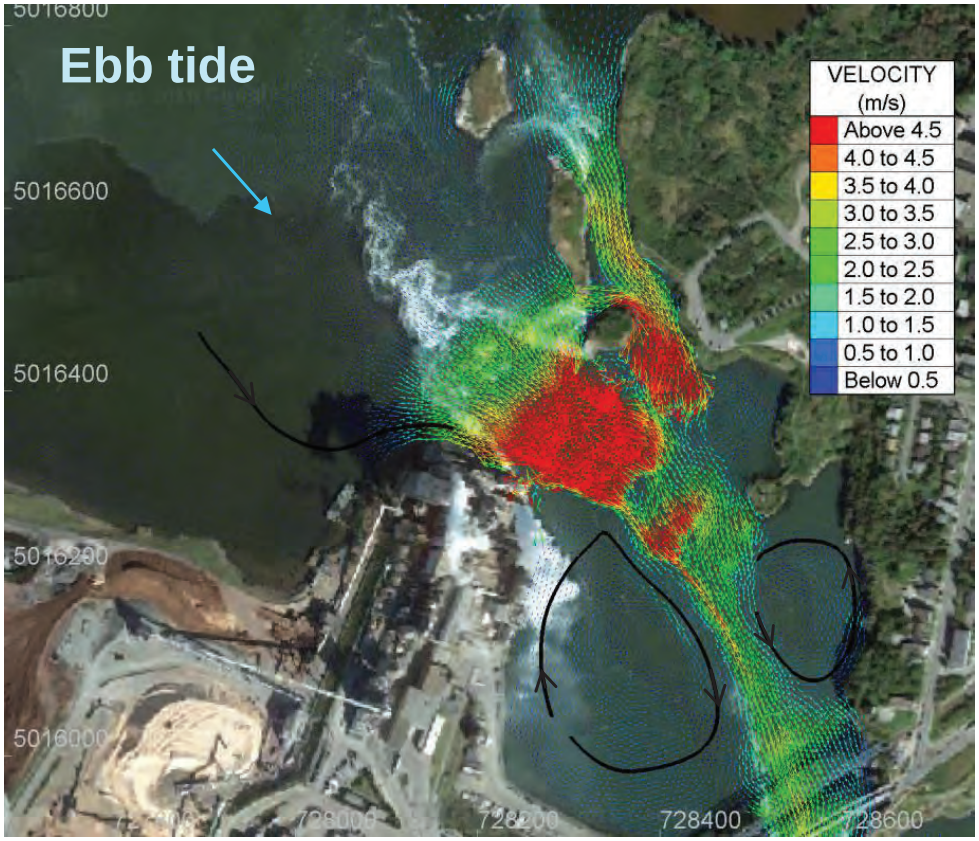
Outfall Discharge = 1.27 m^3/s
T = 51°C

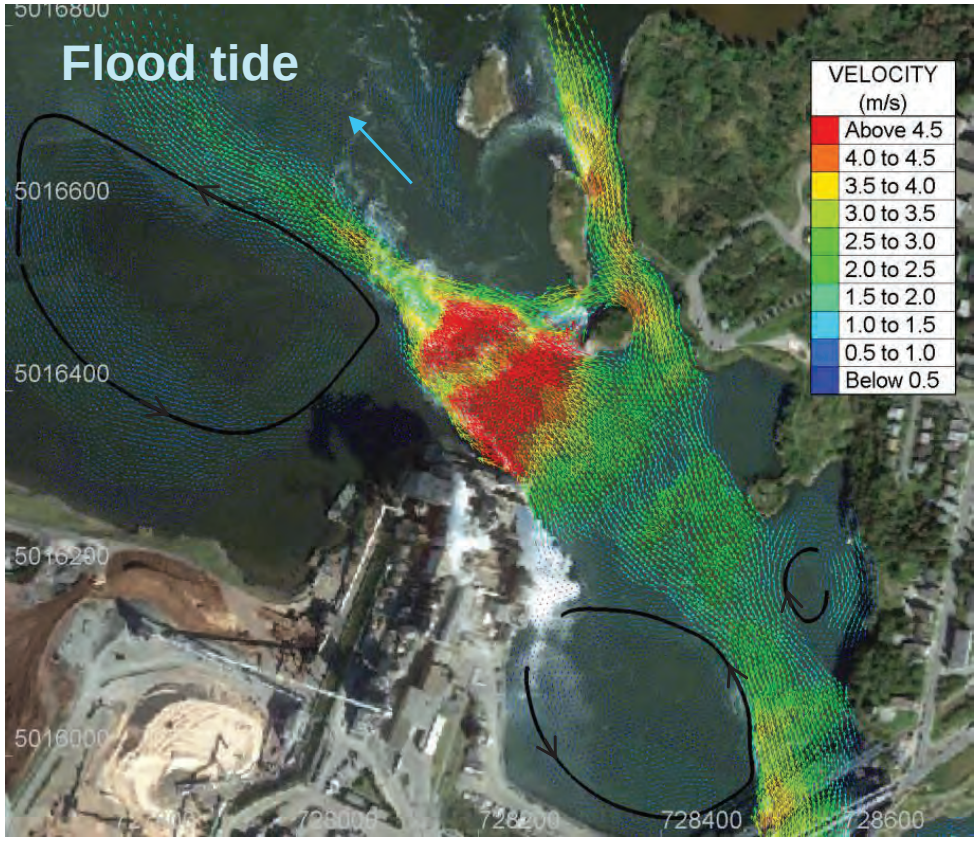
Future Low Discharge (*Future Q*)

Outfall Discharge = 12,700 gpm or 0.8 m^3/s T = 36°C

Summer 2001
40-day simulation

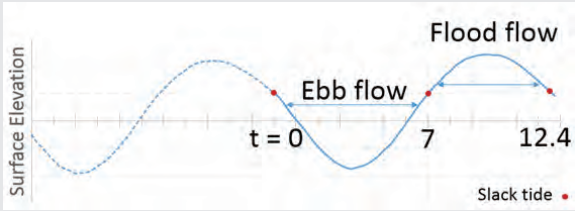
Hydrodynamic Model Results
Circulation patterns

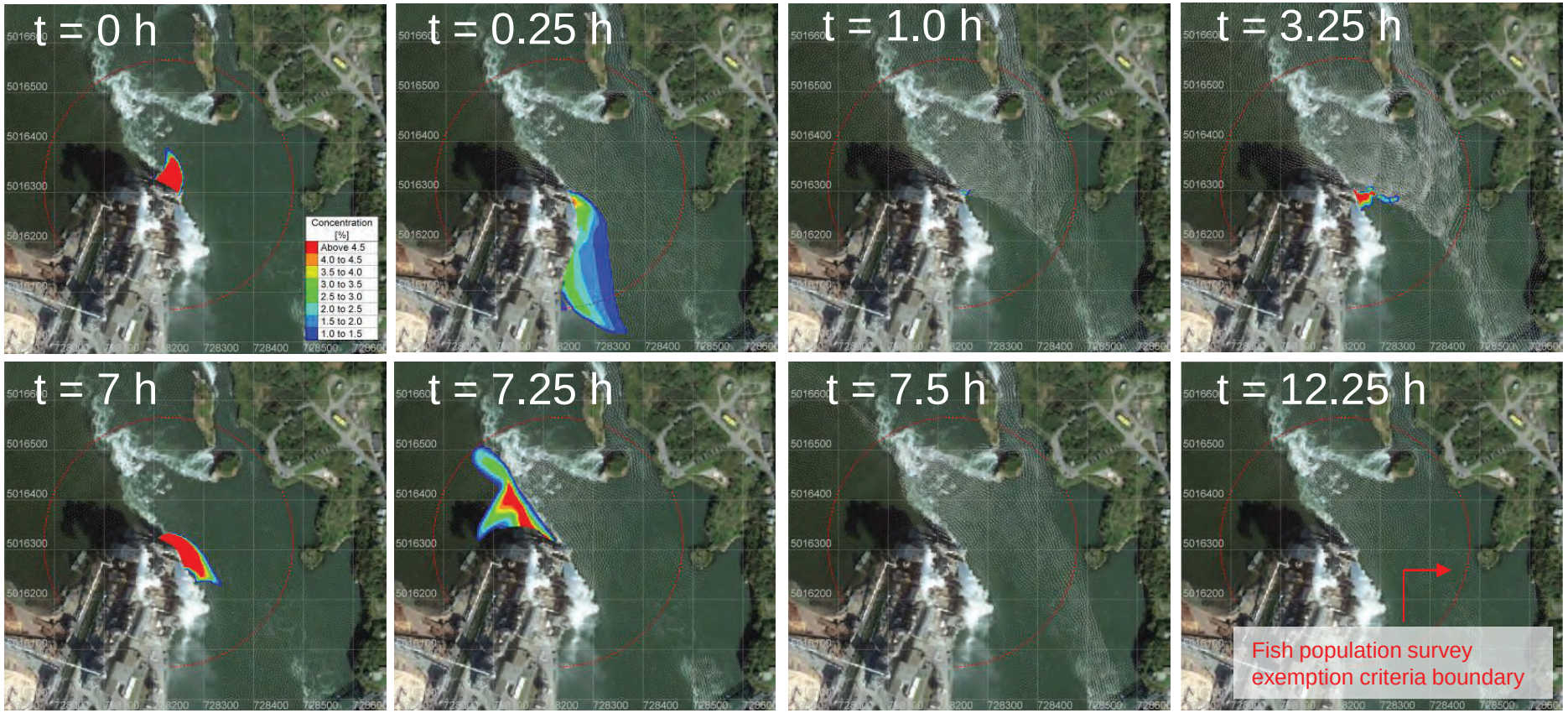




Surface plume dilution (*Existing Q*)

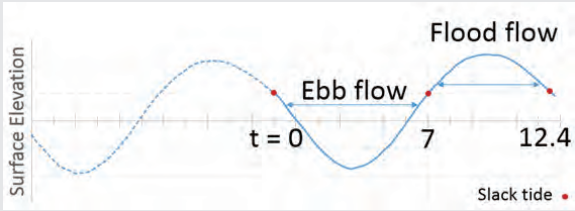
Effluent Discharge = 1.27 m³/s
Temperature = 51°C

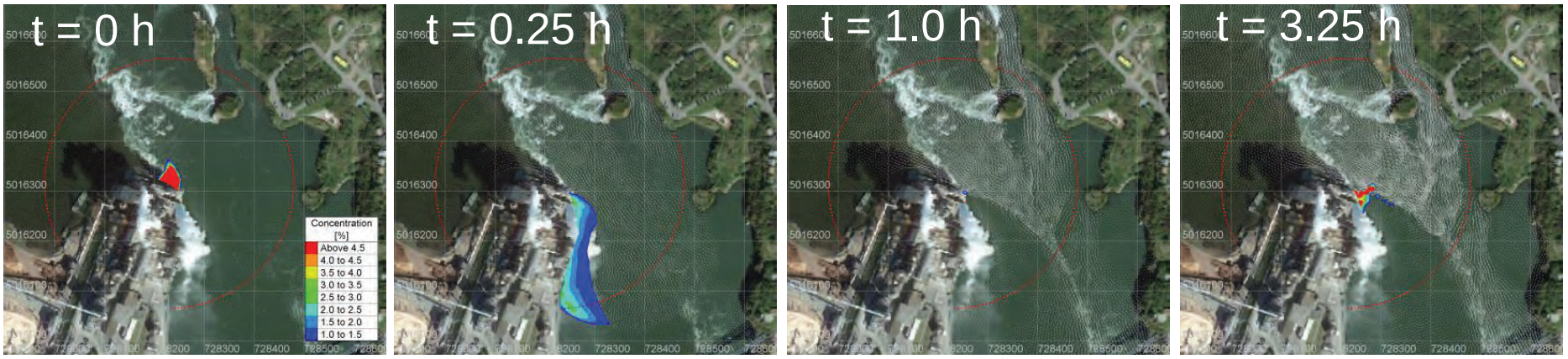


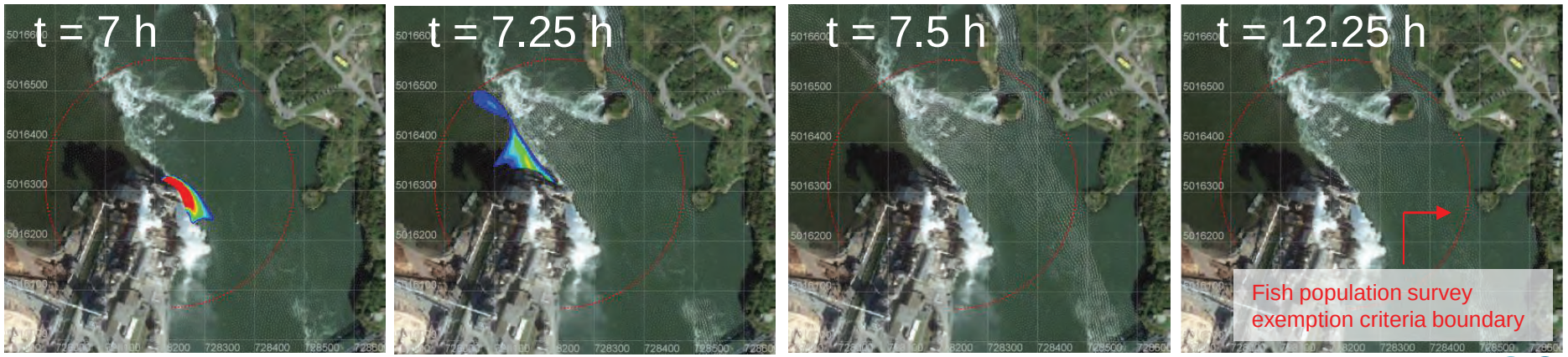


Surface plume dilution (*Future Q*)

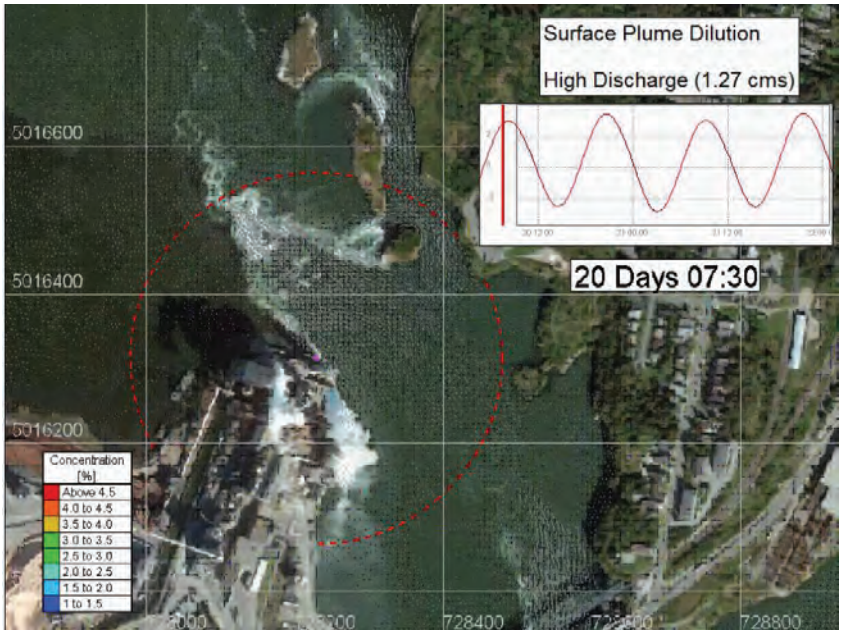
Effluent Discharge = 0.8 m³/s
Temperature = 36°C

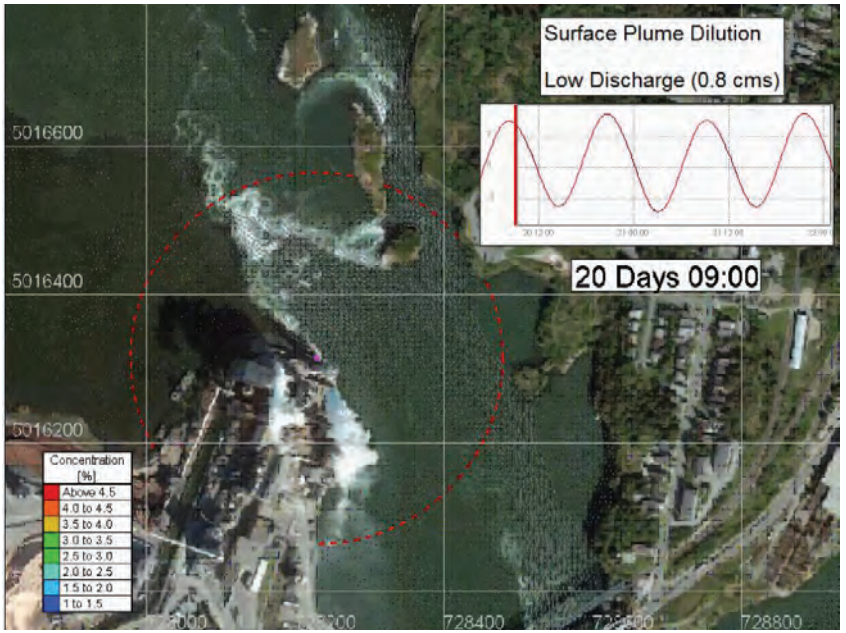






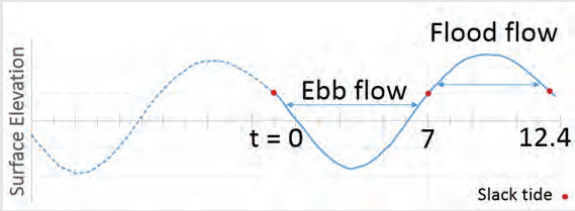
Surface plume dilution (video)

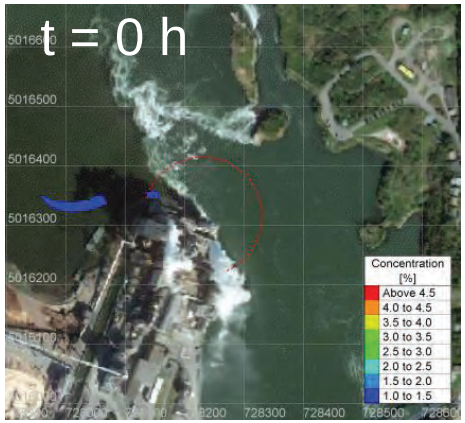


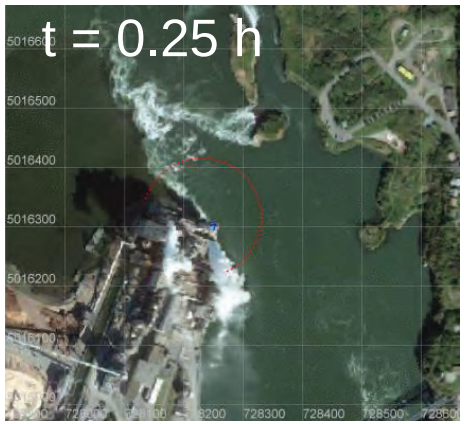


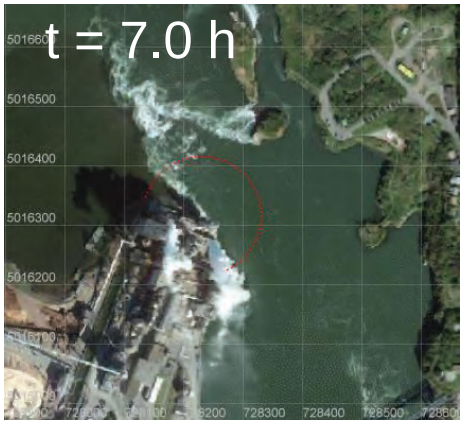
Near-bed plume dilution (*Existing Q*)

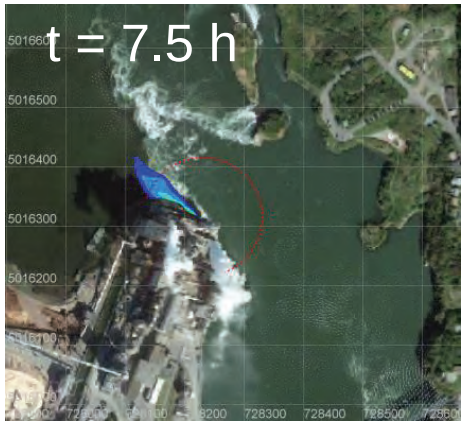
Effluent Discharge = 1.27 m³/s
Temperature = 51°C

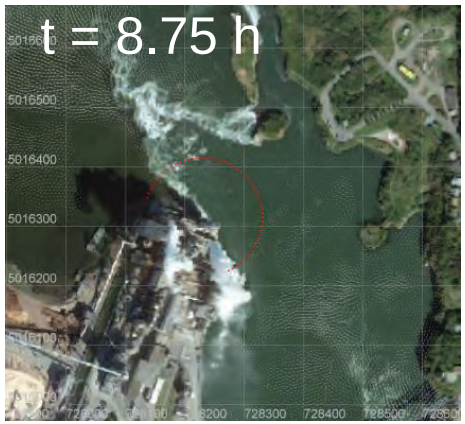


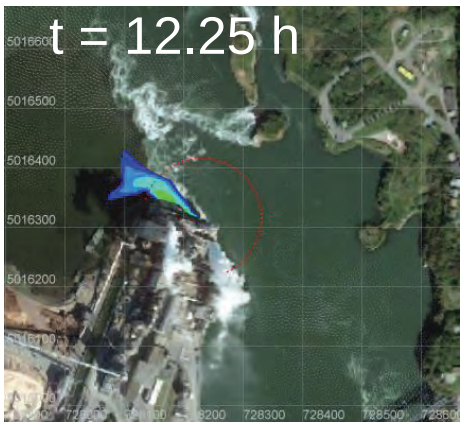


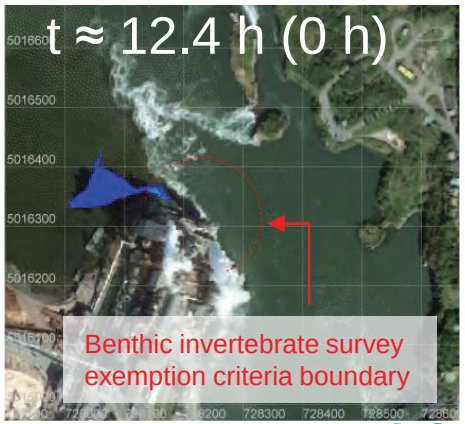






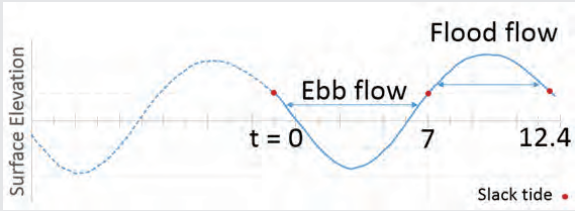


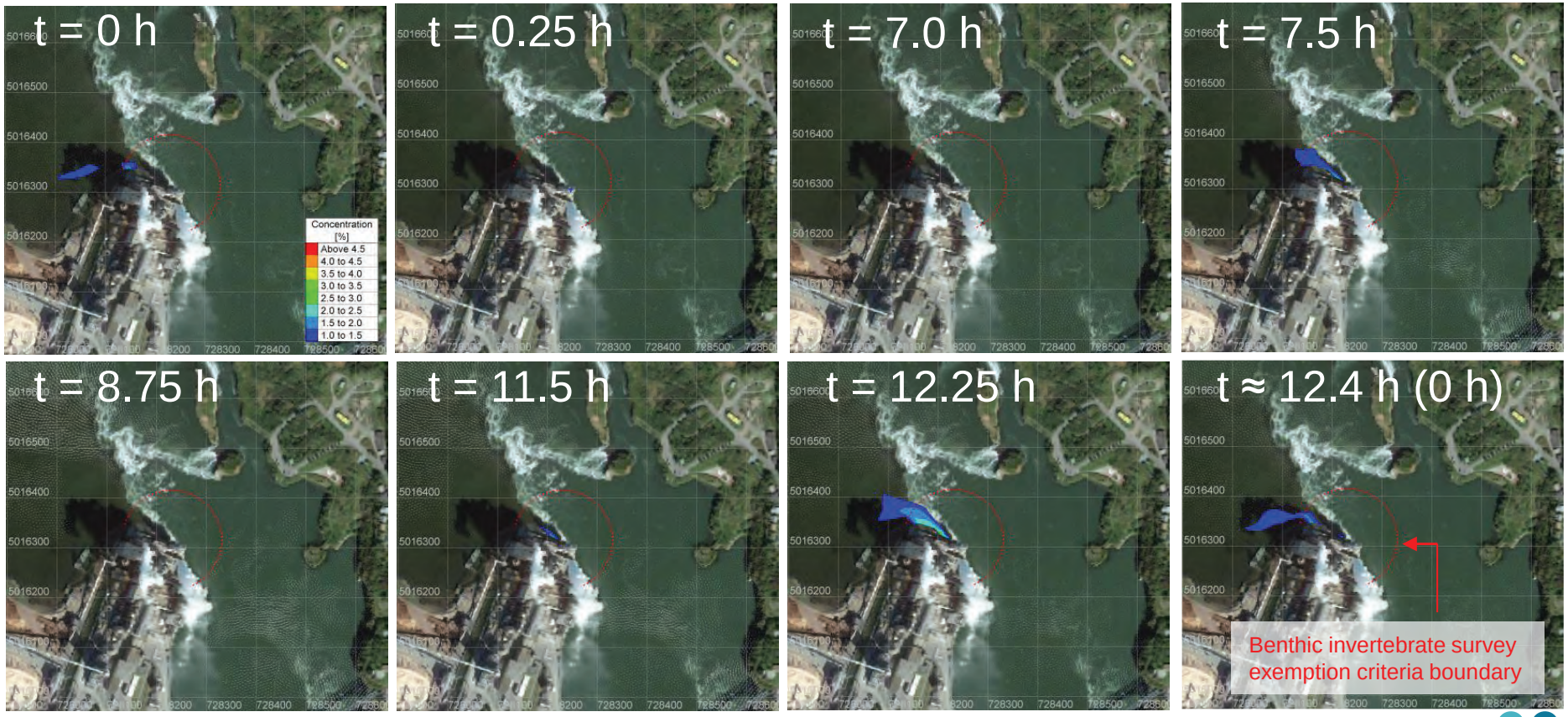




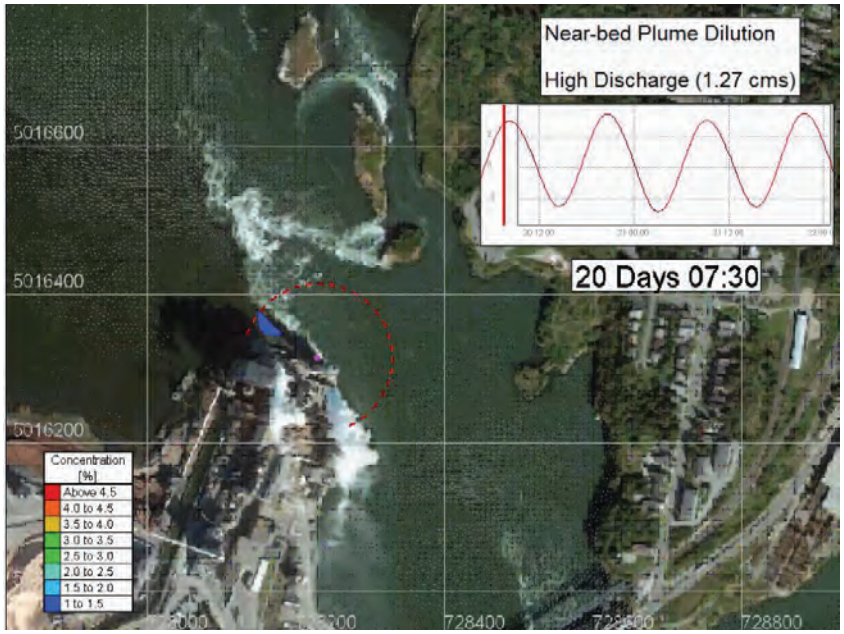
Near-bed plume dilution (*Future Q*)

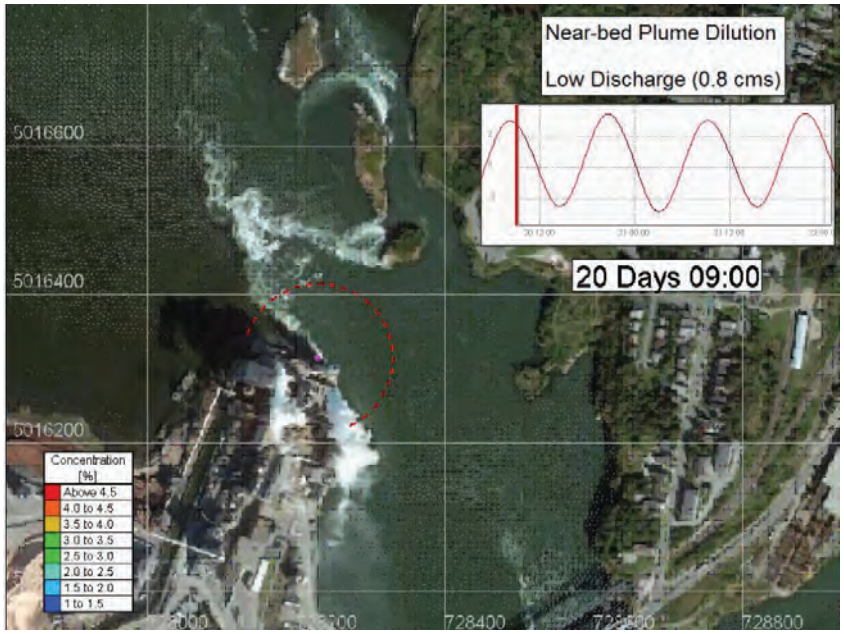
Effluent Discharge = 0.8 m³/s
Temperature = 36°C





Near-bed plume dilution (video)

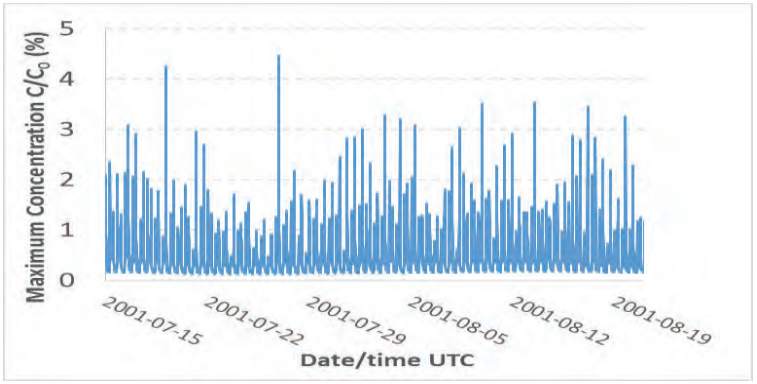


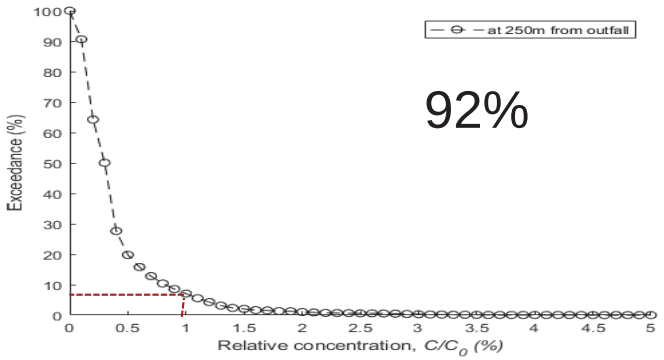


Concentration at Boundary for Fish Population Survey Exemption

Fish population criteria assessed throughout vertical column (250m radius)

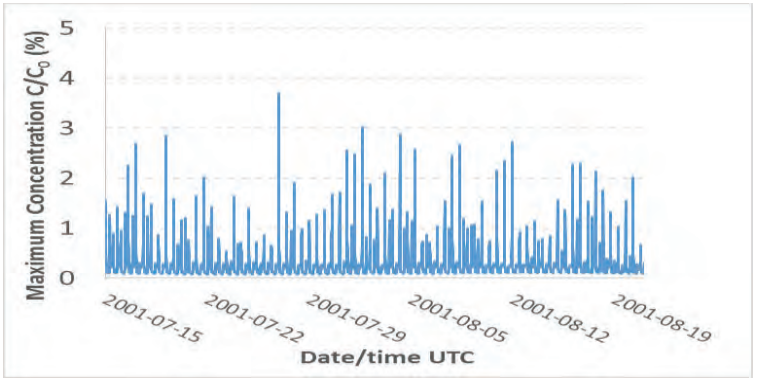
High Q

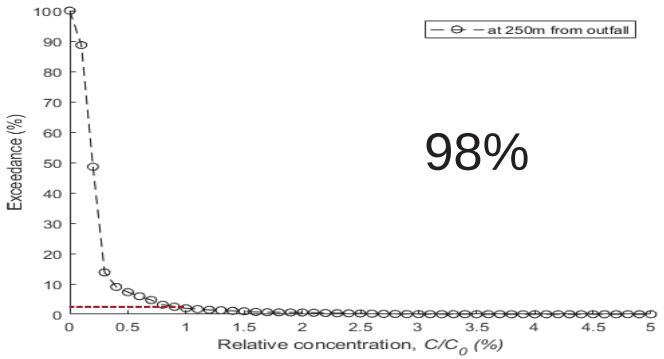




92%

Low Q



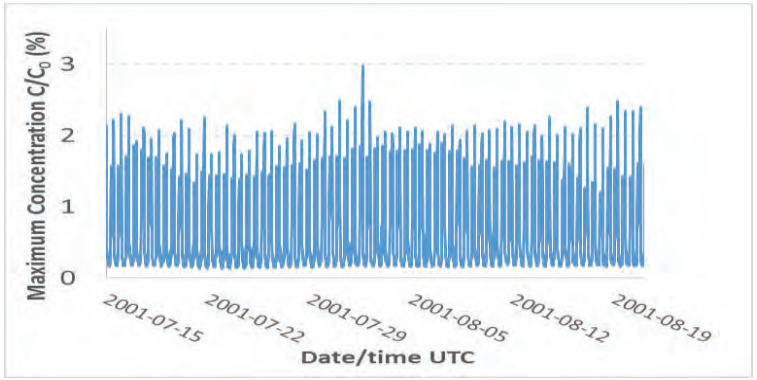


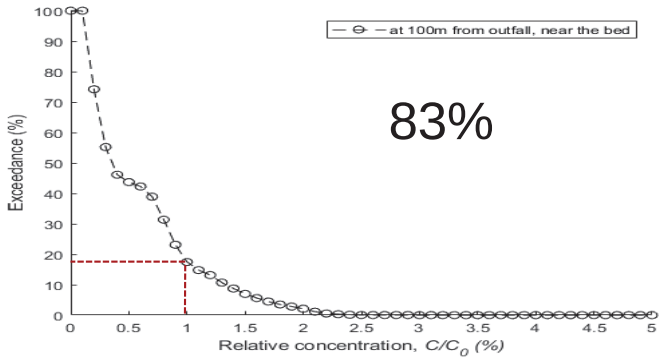
98%

Concentration at Boundary for Benthic Invertebrate Survey Exemption

Benthic invertebrate criteria assessed near-bed (100m radius)

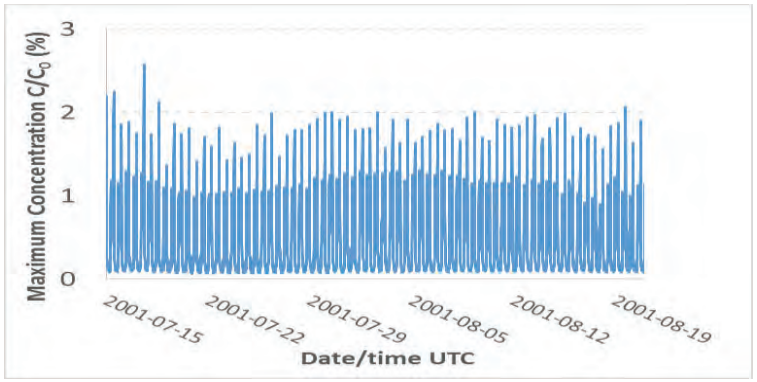
High Q

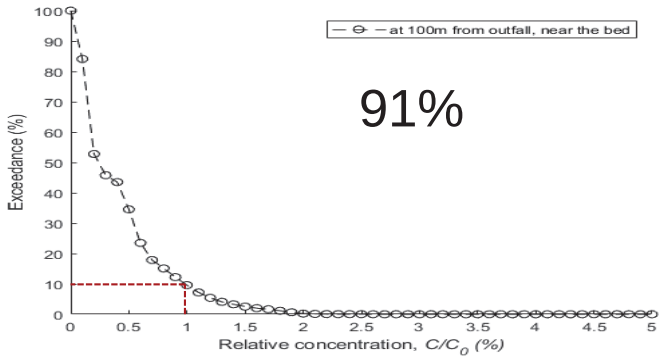




83%

Low Q





91%

Summary

Fish population survey exemption criteria:

Main mill outfall is below the threshold for exemption 92% of time at high discharges (Q = 1.27 m^3/s) and 98% at low discharges (Q = 0.8 m^3/s) along the vertical water column.

Benthic invertebrate survey exemption criteria:

Main mill outfall is below the threshold for exemption 83% of time at high discharges (Q = 1.27 m^3/s) and 91% at low discharges (Q = 0.8 m^3/s) near river bed.

NOTE: "Existing Q" refers to the current discharge from the Main Mill Outfall and "Future Q" refers to the discharge from the Main Mill Outfall after the Project is completed

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