



HAYCO

Okanagan Lake Limnology Presentation to the Water Stewardship Council

Jim Stronach, PhD, PEng
June 10, 2010

Hayco's Tasks

Preparation of four technical memos:

- Hazard Inventory and Review
- Review Chemical Limnology
- Categorize and Rate Risk
- Source Delineation and Pollution Transport Modelling

Part of a larger study: Associated Engineering, City of Kelowna

Modelling Memo

- Hayco prepared a report in 2001 examining limnology of Okanagan Lake, including a hindcast of the 1996 *Cryptosporidium* outbreak
- Interior Health letter
 - Reviewed the Hayco report, raised some issues that should also be addressed, and that could in fact be addressed by the modelling

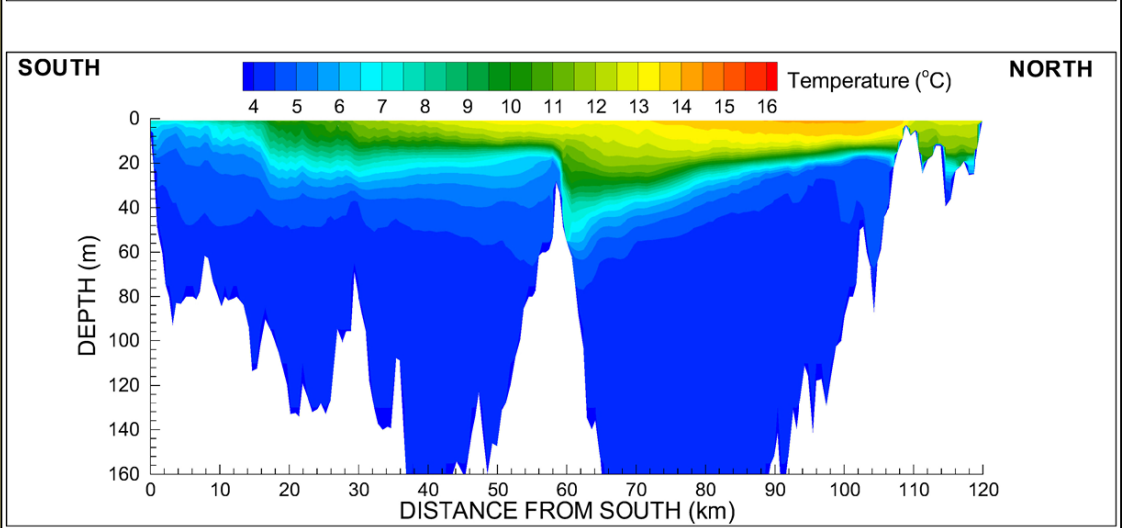
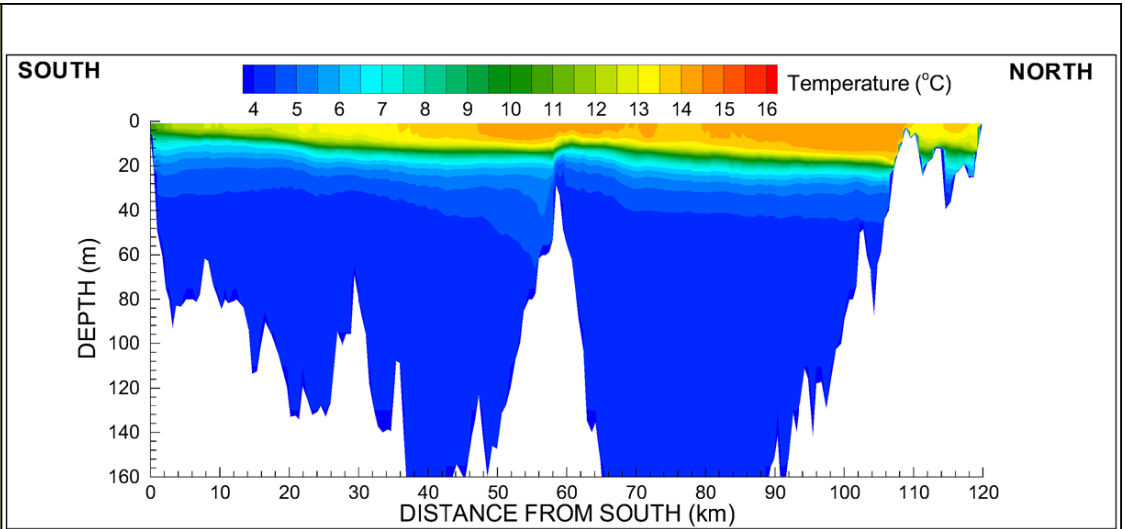
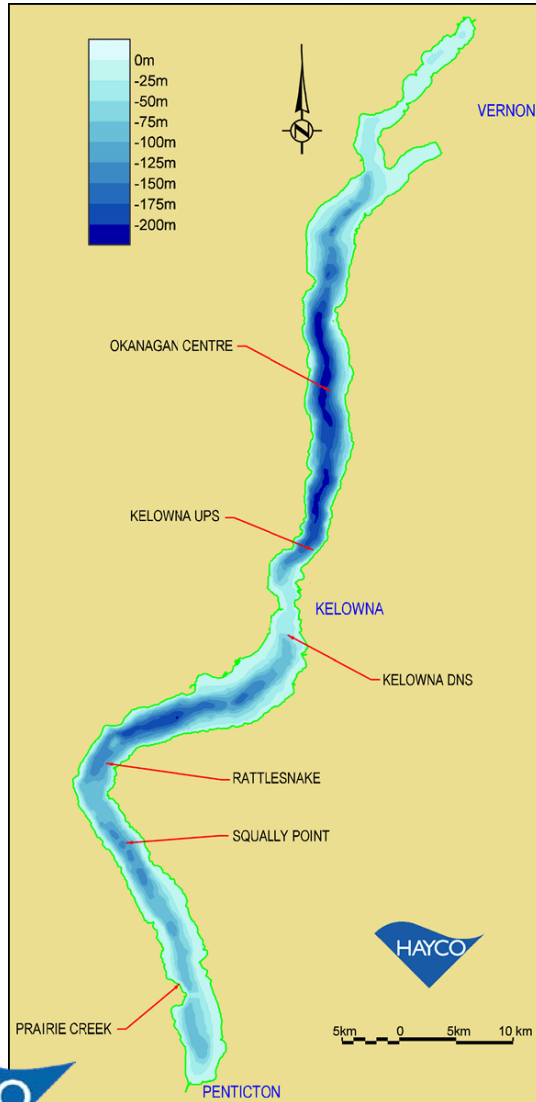
Interior Health Comments (summarized)

- Develop something equivalent to a “watershed control program”
- Develop cost/risks/benefits associated with source improvement efforts
- Augment report to include trends in water quality and pathogen concentrations
- Identify/characterize other pollutant sources
- Develop links to health risks
- Recommendations for protection

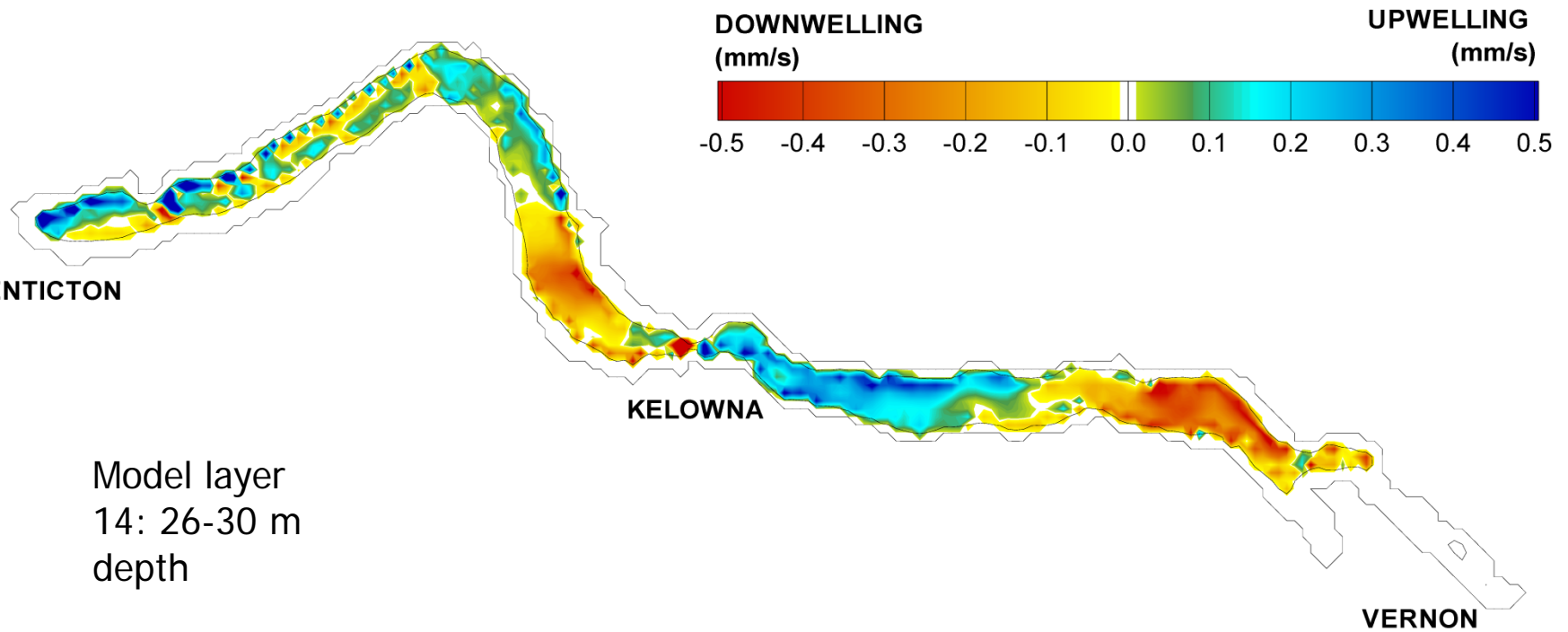
Other relevant studies:

- Summerland WQ
- Stormwater for a site on west side of lake
- Nearshore Geomorphological Modelling

Drinking Water Source Protection

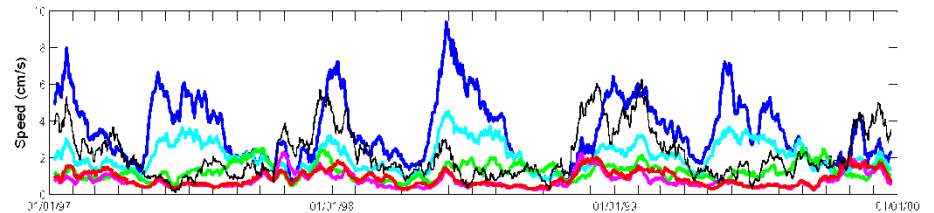
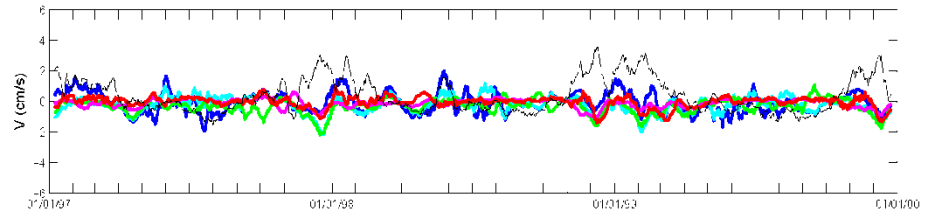
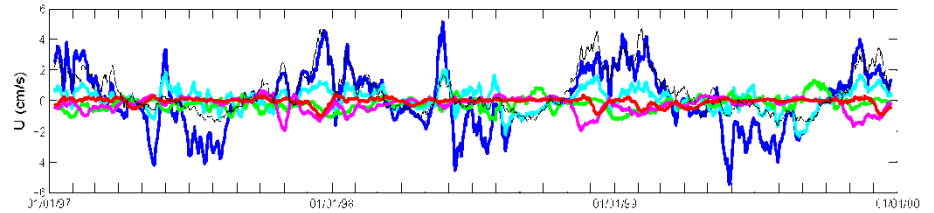
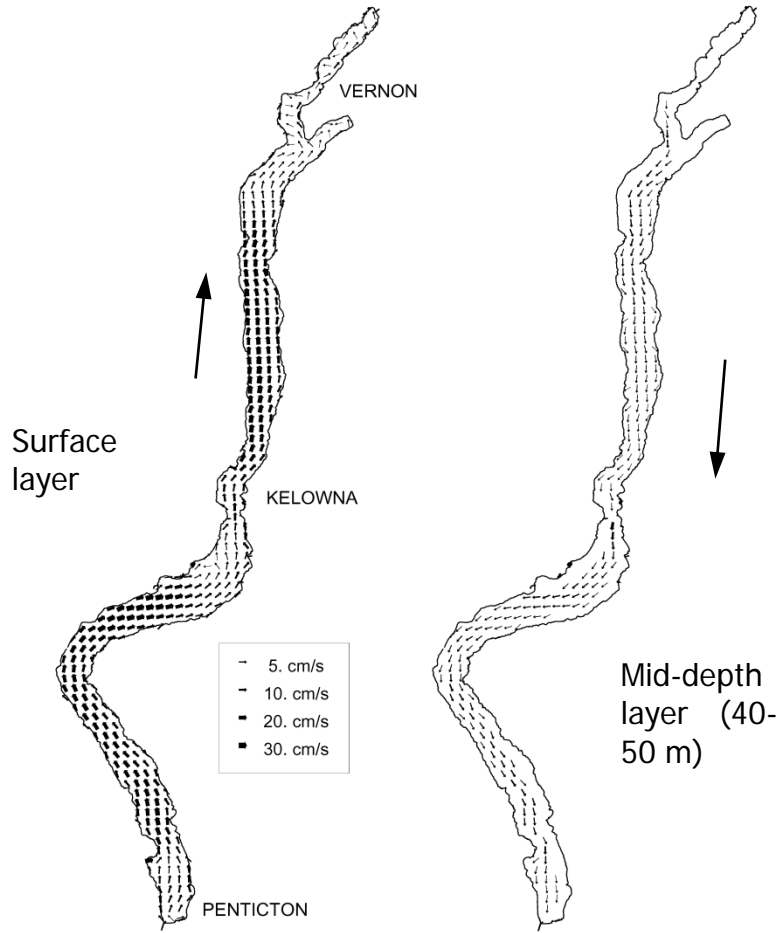


Up/Downwelling



Model layer
14: 26-30 m
depth

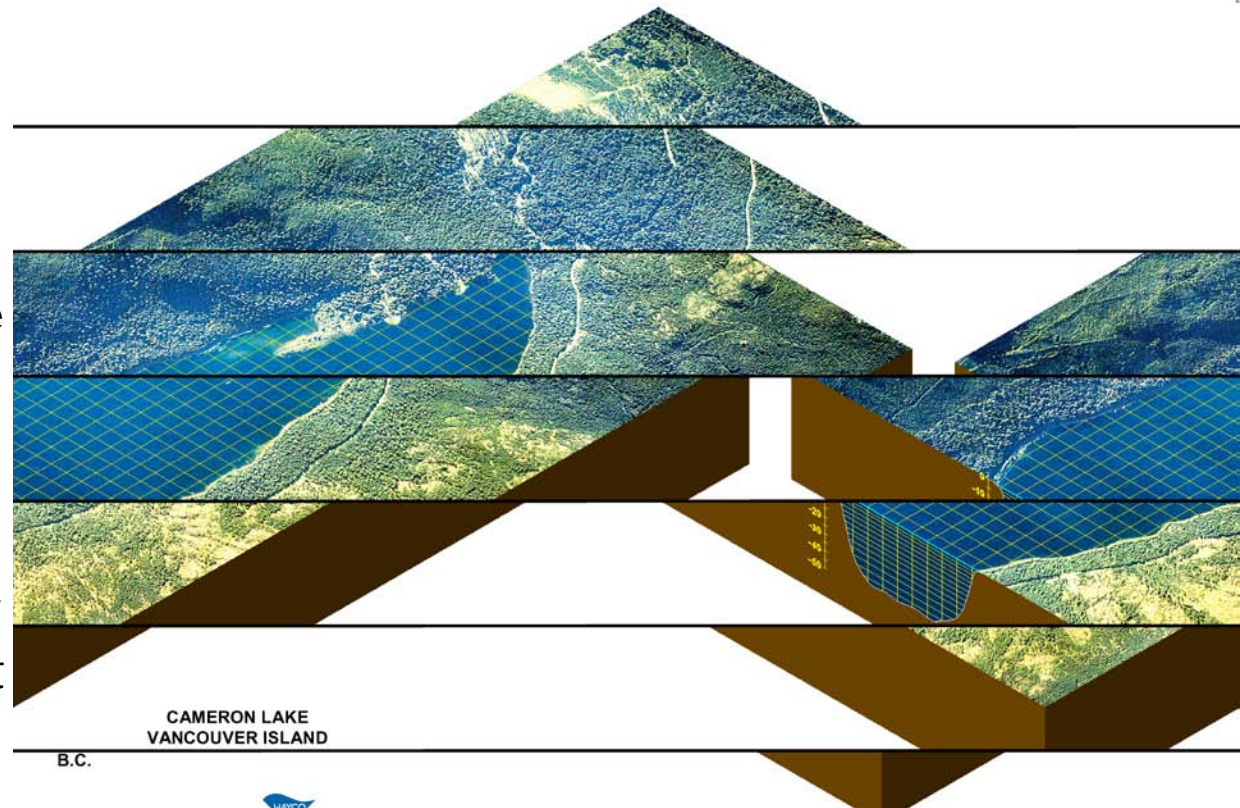
Current



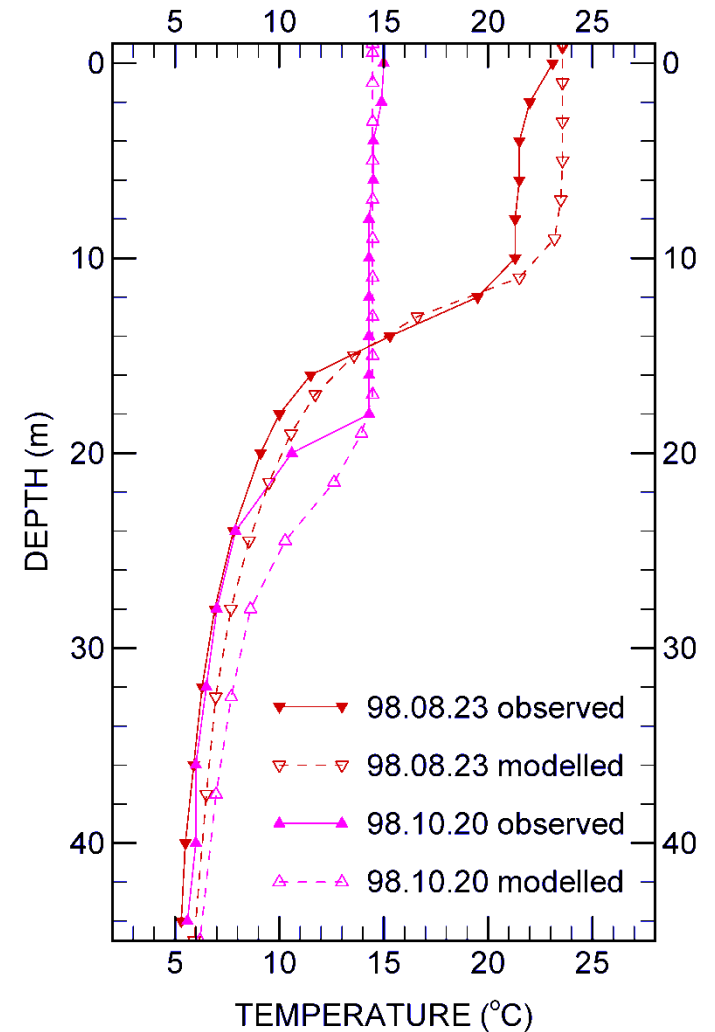
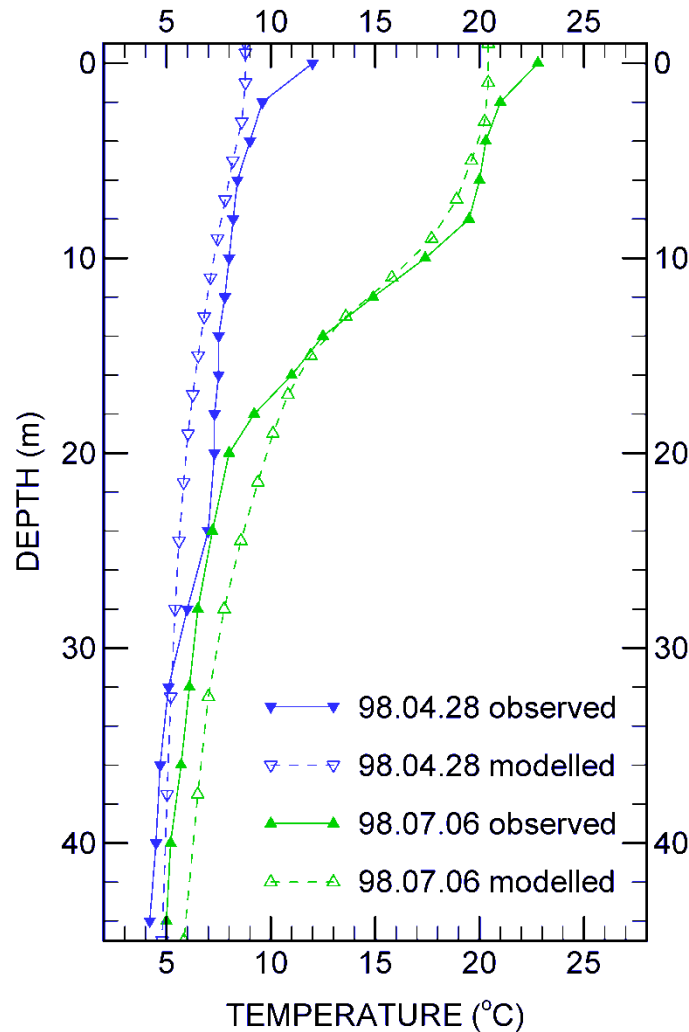
- 0-0.5 m deep
- 5-6 m deep
- 20-23 m deep
- 50-60 m deep
- 120-140 m deep
- Wind (m/s)

Hydrodynamic Model, H3D

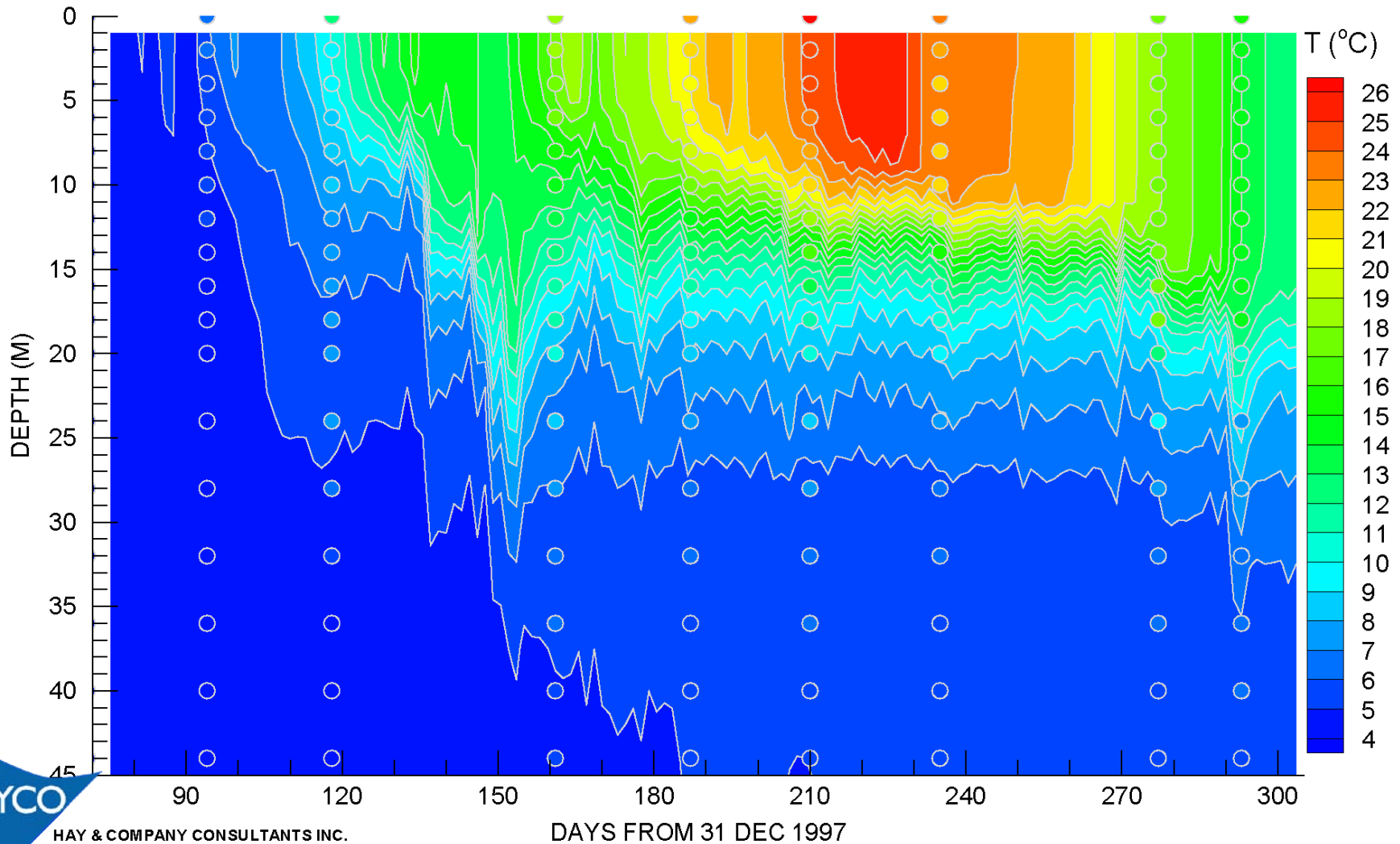
- Three-dimensional time-stepping numerical model
- Computes u , v , w velocities on a rectangular grid in x , y , z dimensions
- Finer vertical resolution near surface
- Grid sizes are constant in x and y dimensions
- Assesses impact of discharges in freshwater and marine environment



Model Calibration

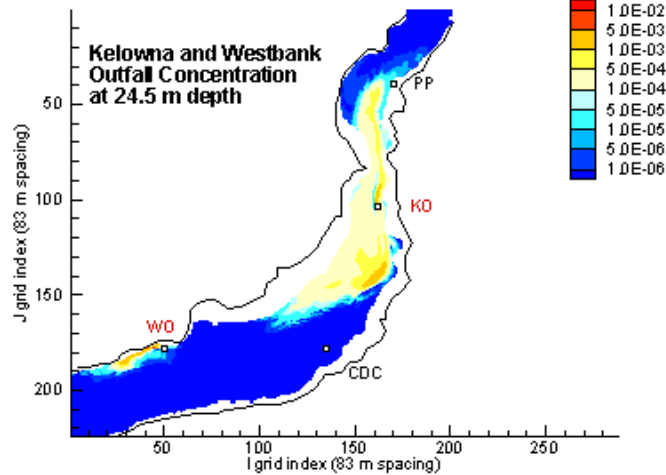


Model Calibration

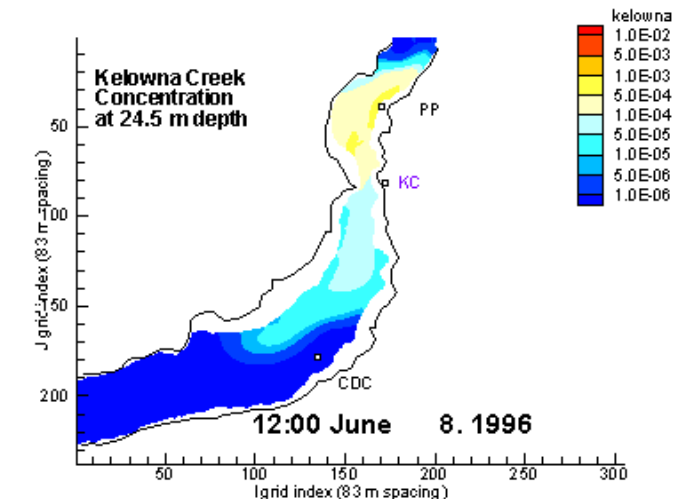
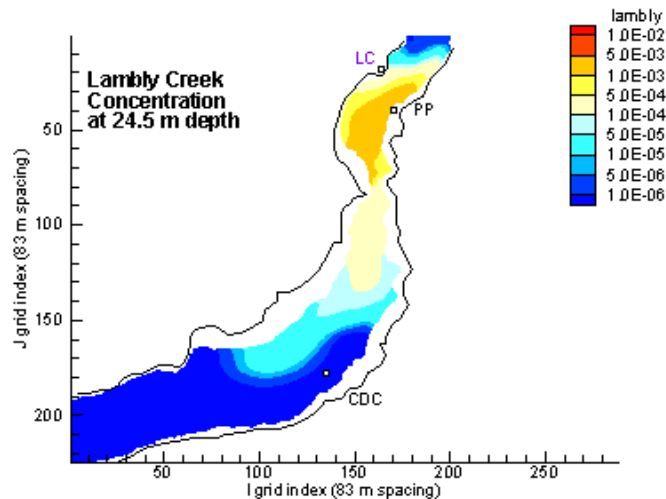
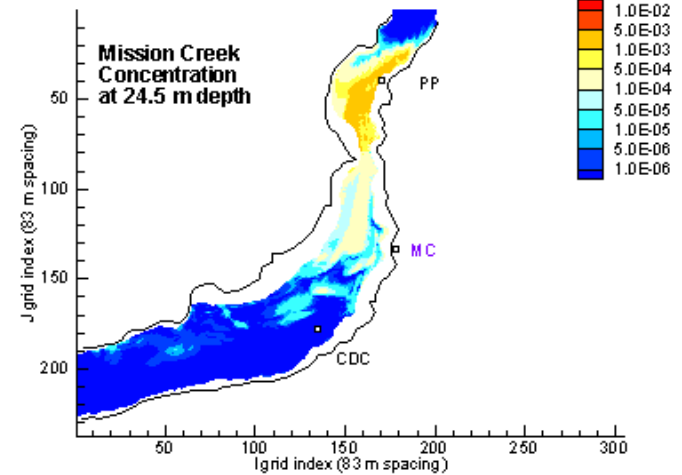


Model Output

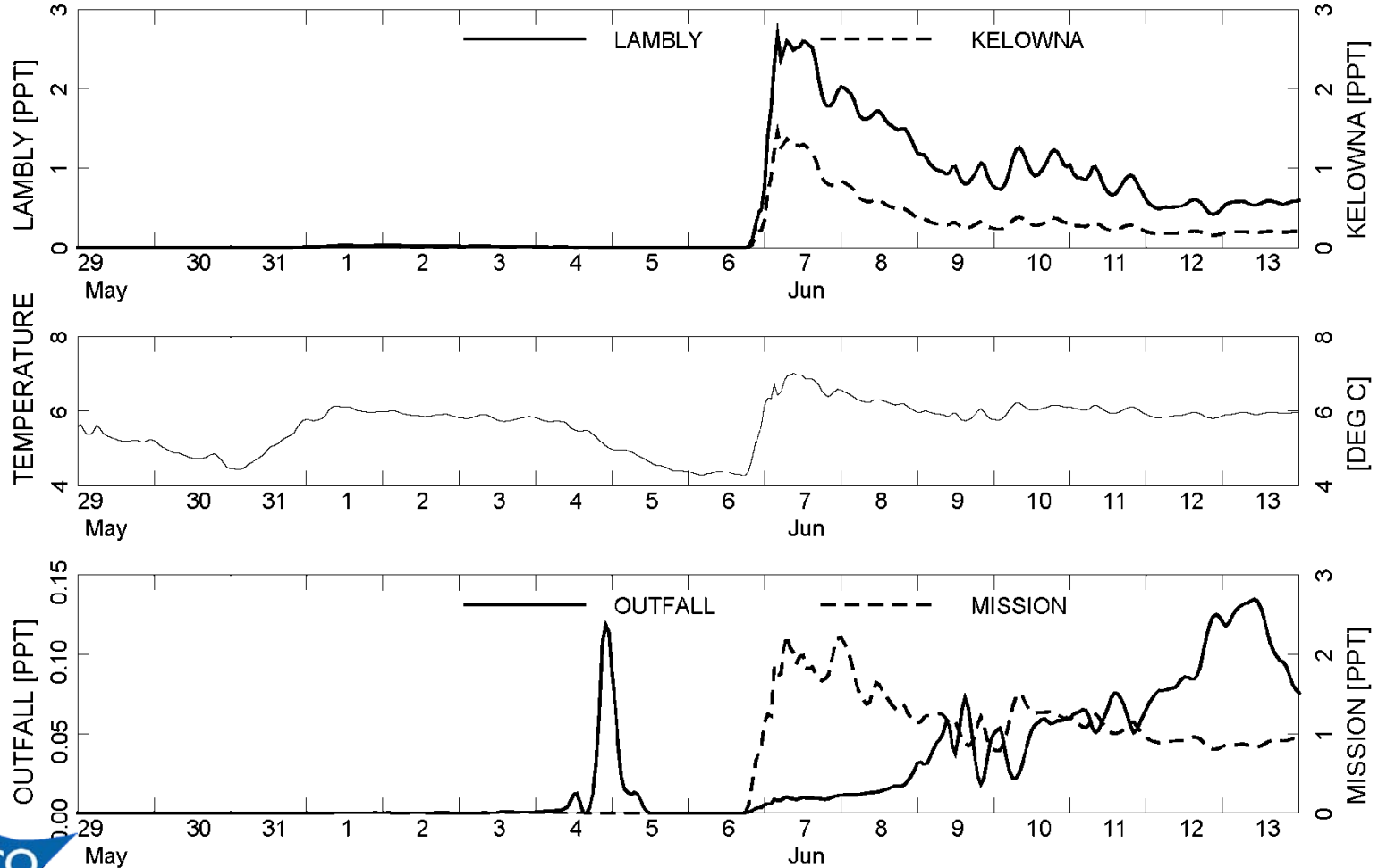
Okanagan Lake Numerical Model
1996 Hindcast - 83m Grid



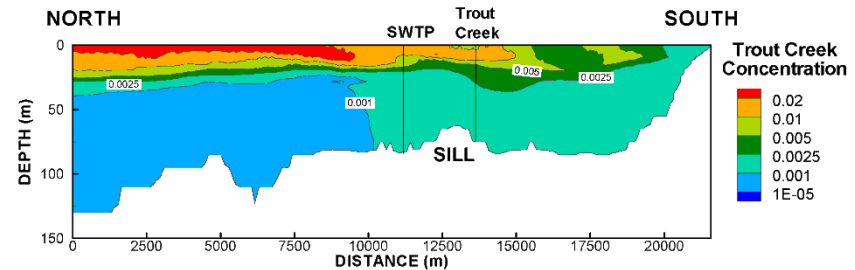
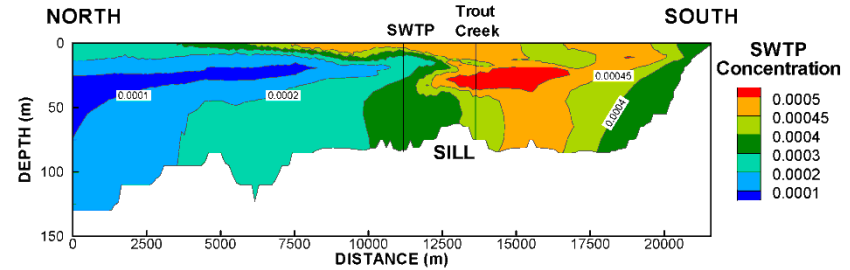
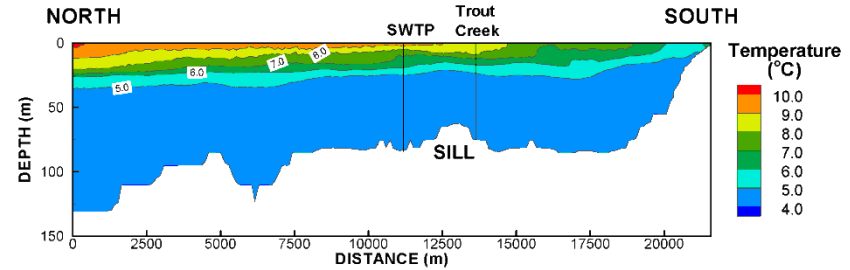
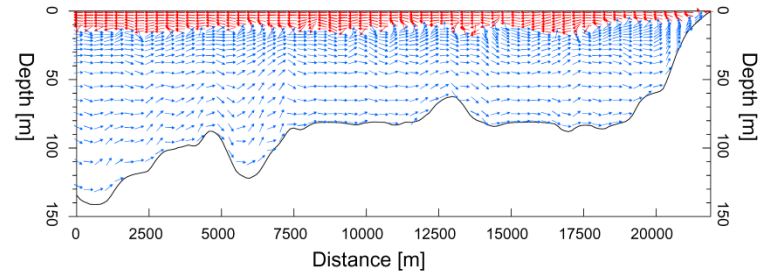
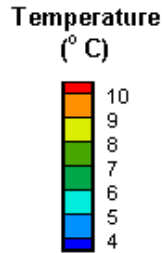
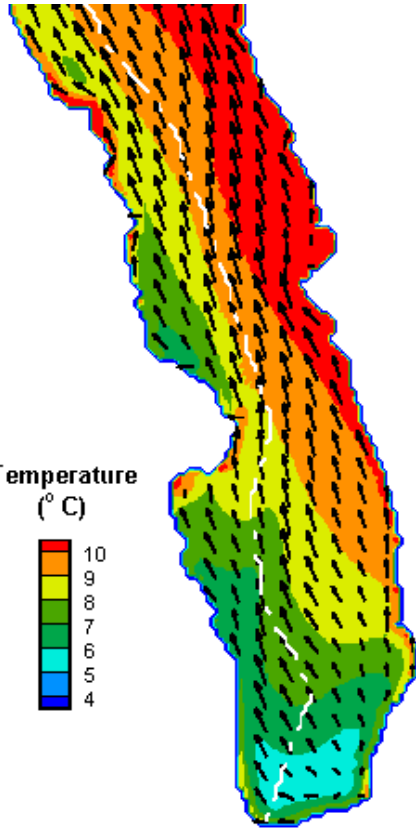
Hay & Company Consultants Inc.



Model Output



Summerland Study

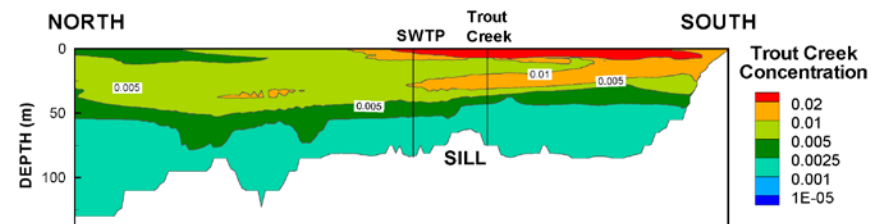
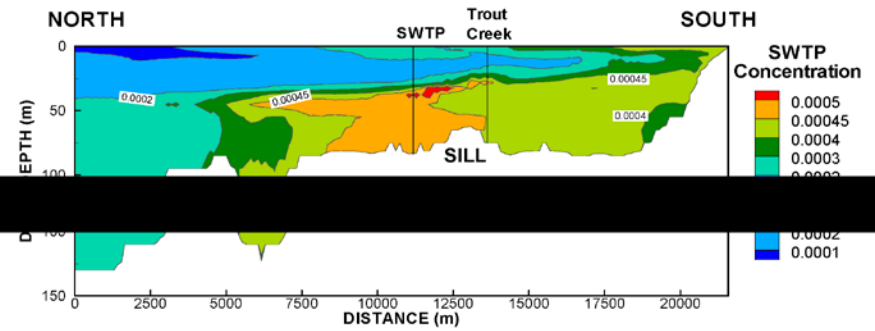
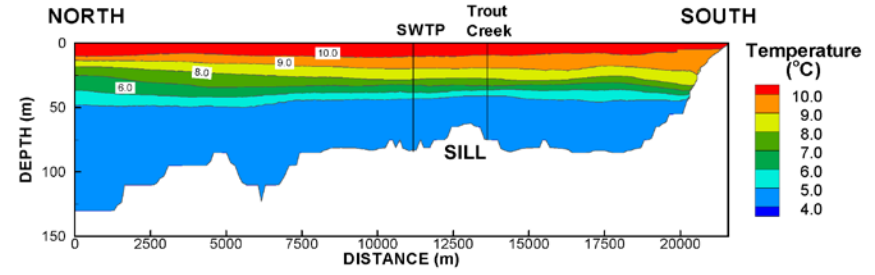
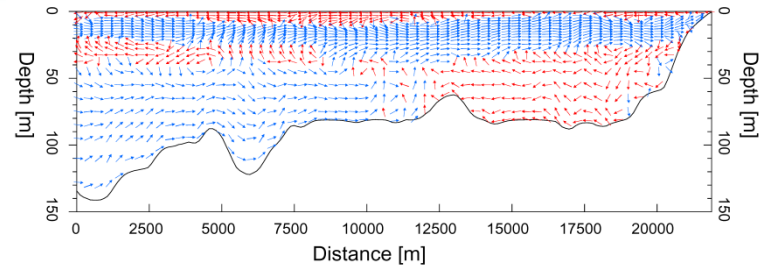
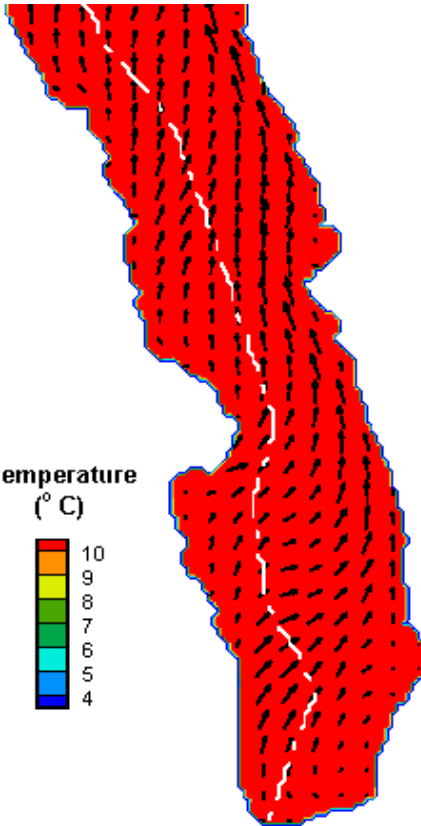


12:00 hrs May 31, 1998



Drinking Water Source Protection

Summerland Study

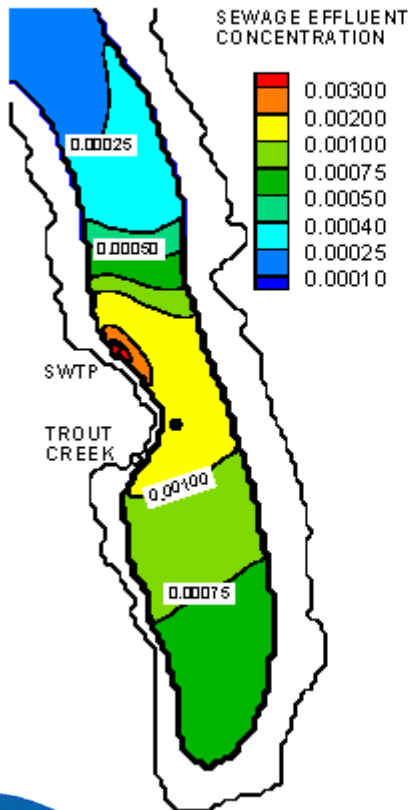


18:00 hrs June 4, 1998

Summerland Risk Management

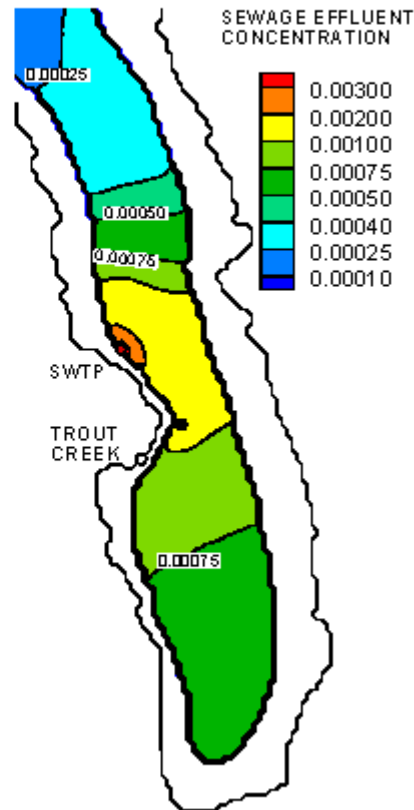
30 to 35 m

Initial sewage effluent concentration = 1.0



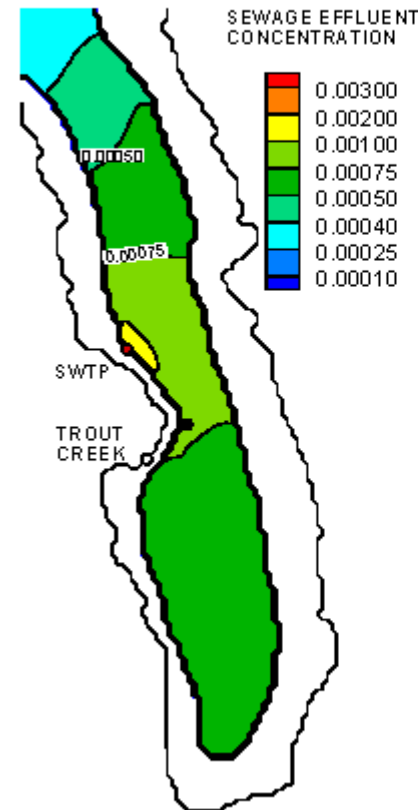
35 to 40 m

Initial sewage effluent concentration = 1.0



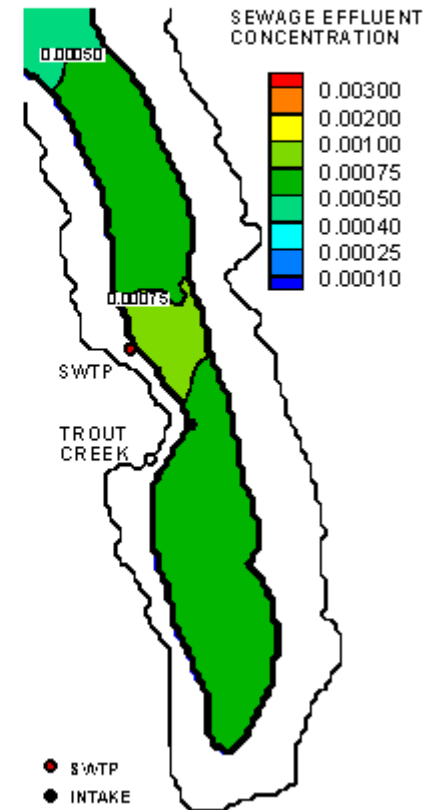
40 to 50 m

Initial sewage effluent concentration = 1.0



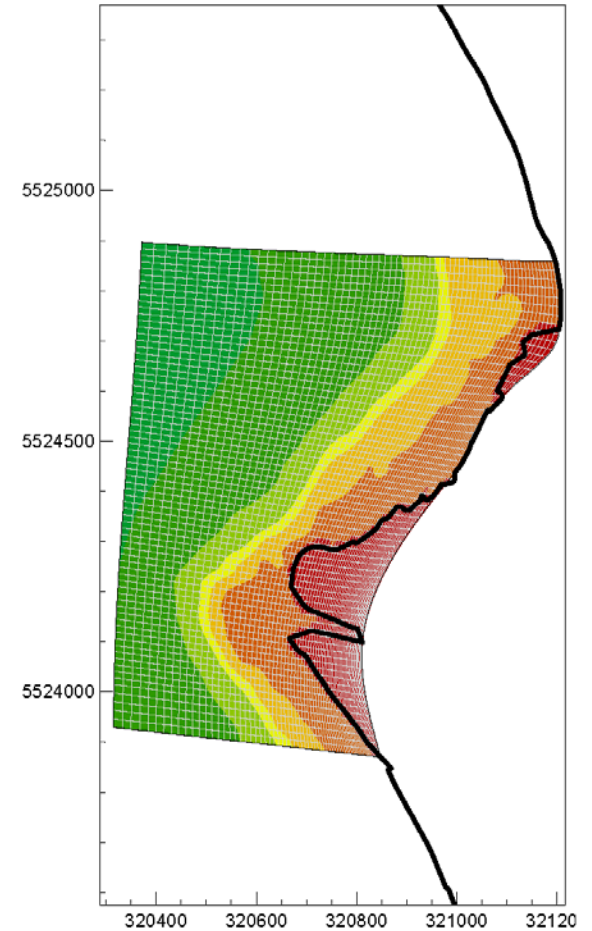
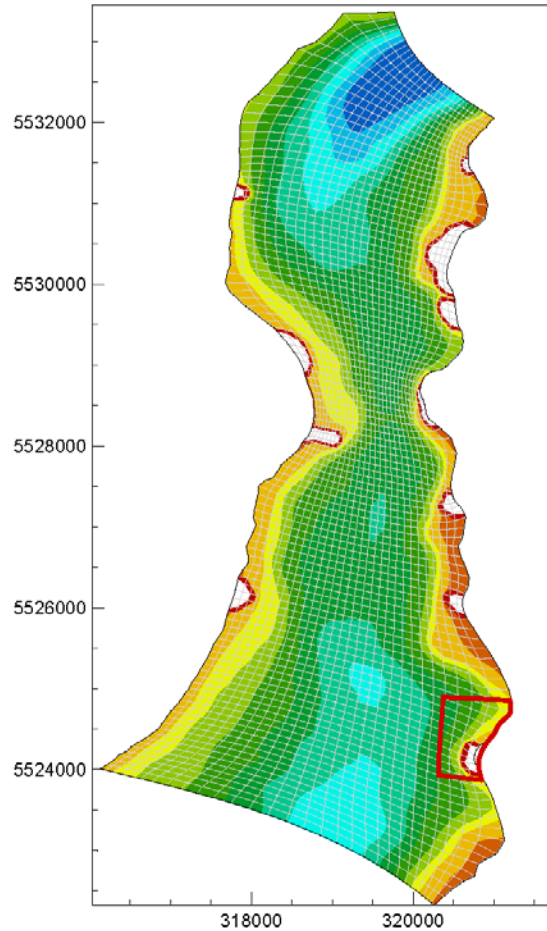
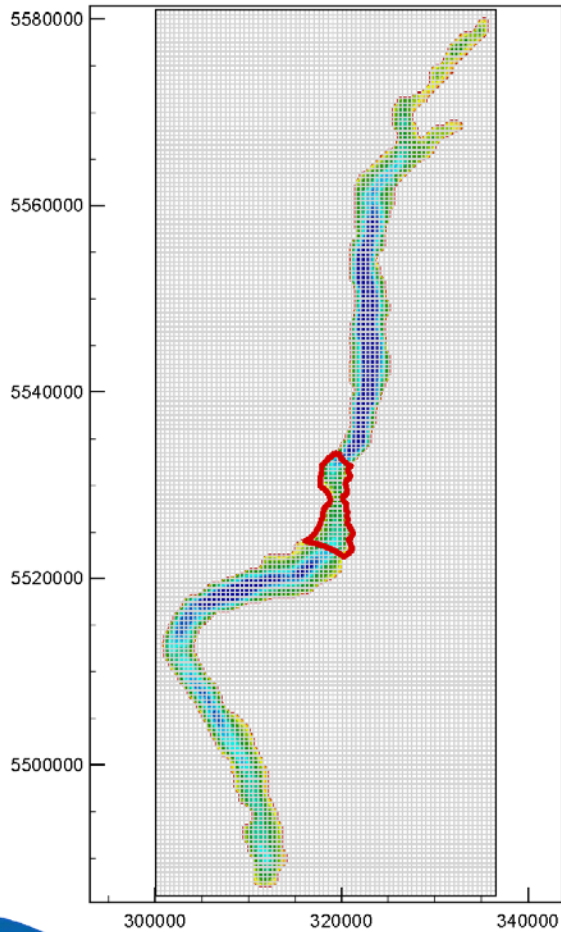
50 to 60 m

Initial sewage effluent concentration = 1.0

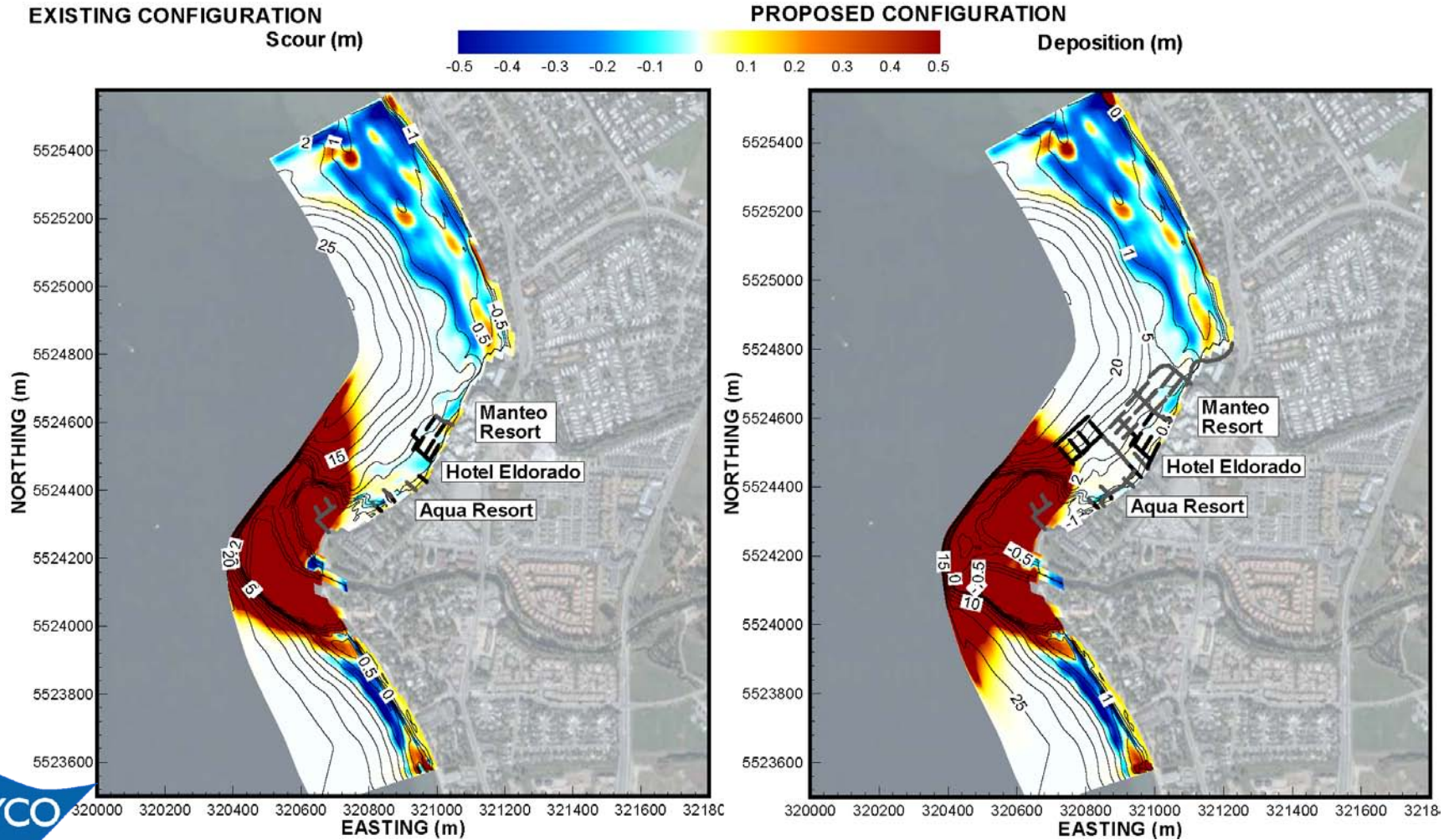


- SWTP
- INTAKE
- TROUT CREEK

Model Grids



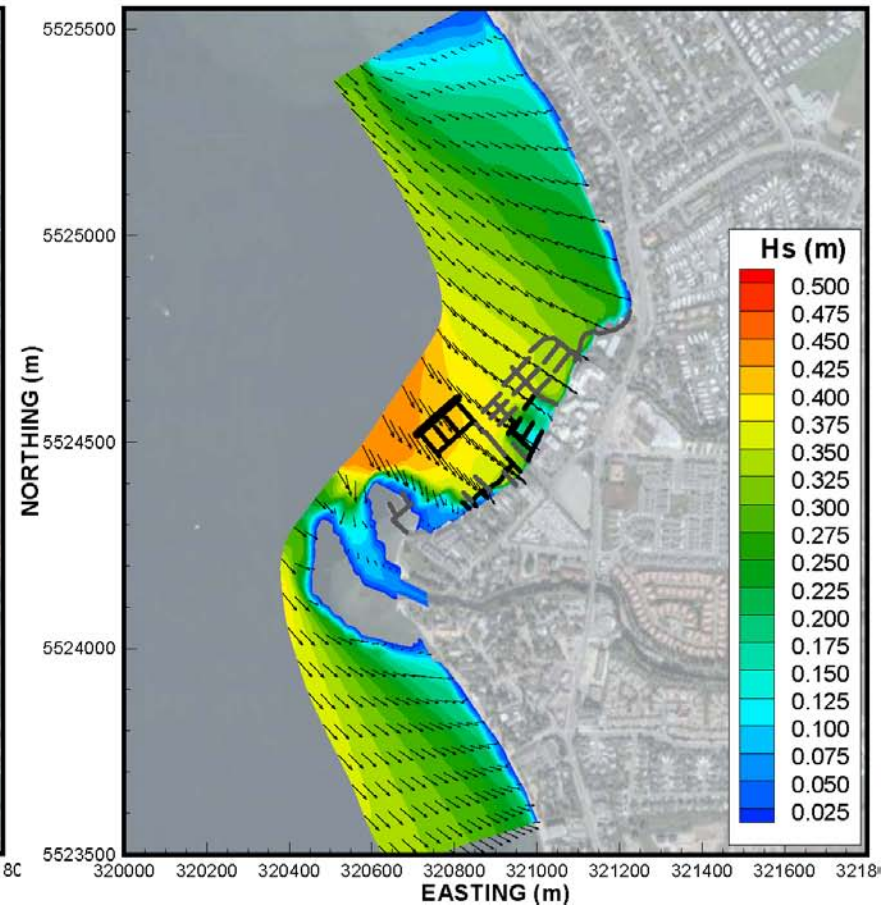
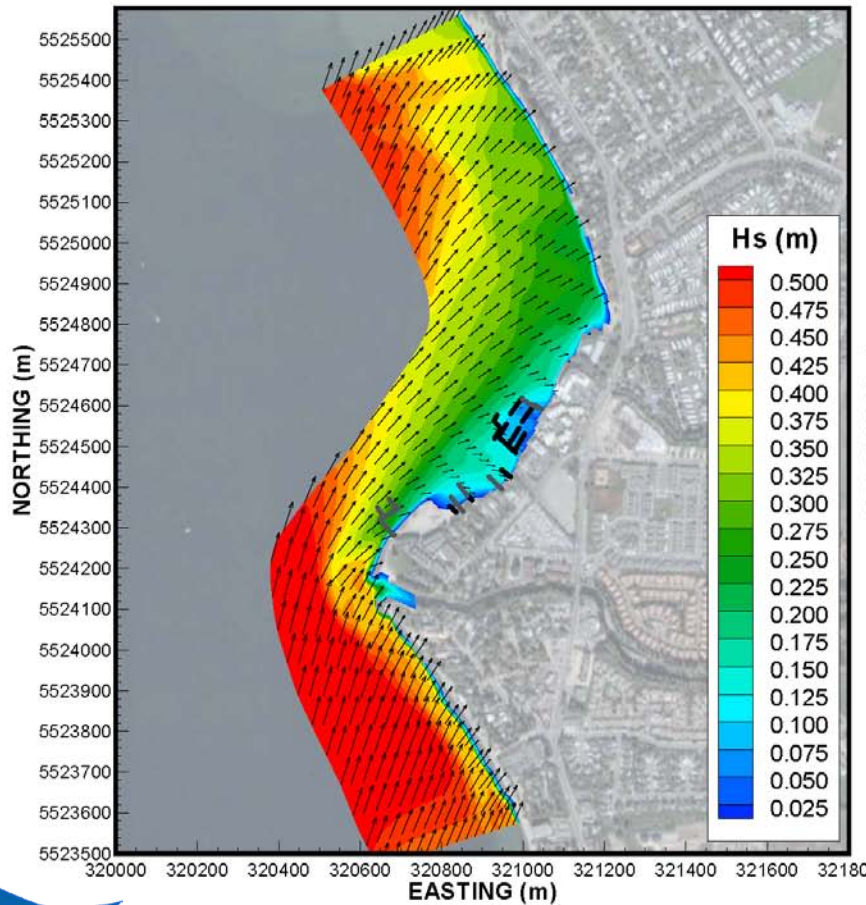
Sedimentation



Wave Fields

January 6, 1997 at 3:00

August 15, 1997 at 15:00





Hay & Company Consultants
A Division of EBA Engineering
Consultants Ltd.



Thank you



Other relevant studies:

- Summerland WQ
- Stormwater for a site on west side of lake
- Nearshore Geomorphological Modelling