

# Strategies for Mitigation of Environmental Impacts from a Closed Municipal Landfill

Steven Rose<sup>1</sup>, Paul MacLatchy<sup>2</sup>,  
Greg Bickerton<sup>3</sup>, Dale VanStempvoort<sup>3</sup>

NATO - CCMS Pilot Study Meeting  
Cardiff, Wales  
May 23-26, 2004



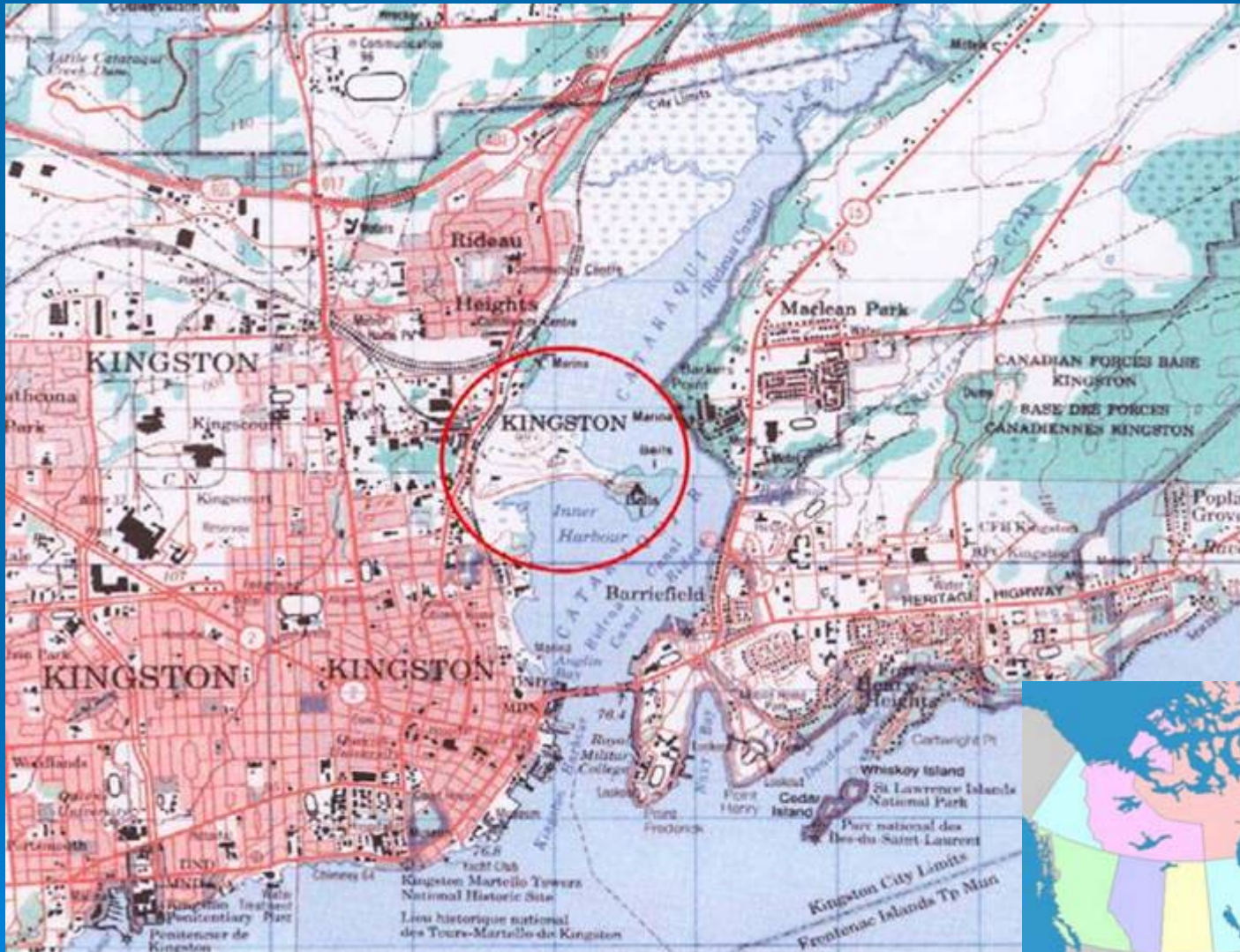
Environment  
Canada

Environnement  
Canada

# Outline

- Site Location / Setting / History
- Site Characterization & Contaminants
- Current Site Management / Long-Term Objectives
- Feasibility Studies
- Complementary Studies

# Site Location



SoftMap Technologies Inc., Topo 50, Southern Ontario





courtesy of City of Kingston



1953

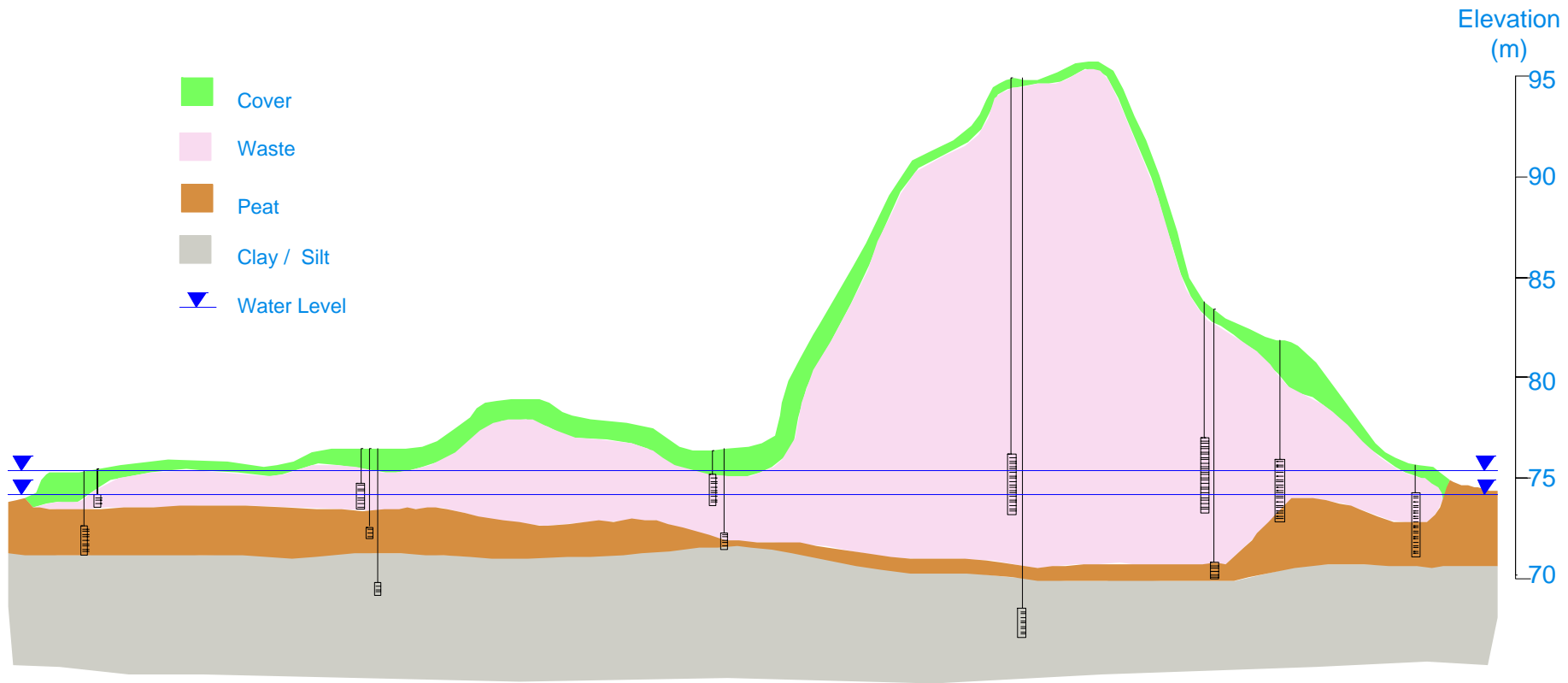


1962

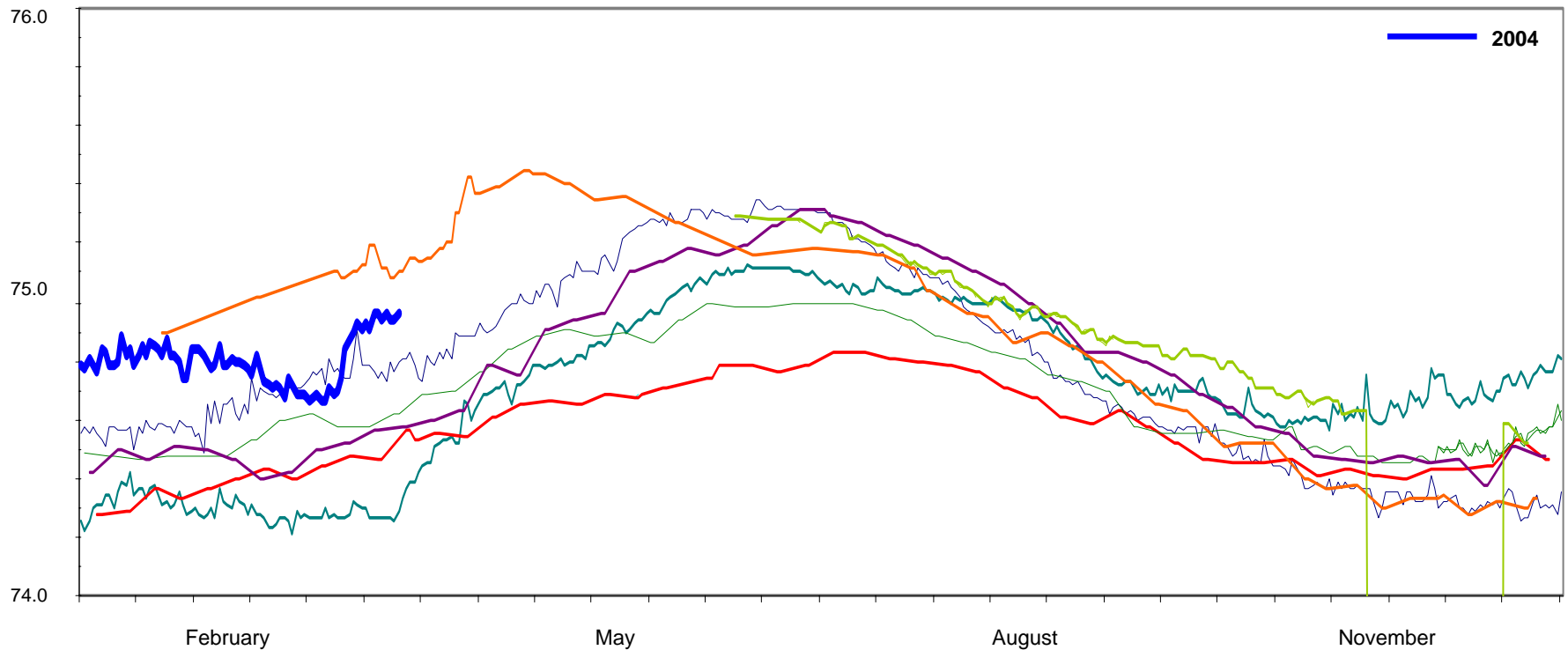


1971

# Site Characterization



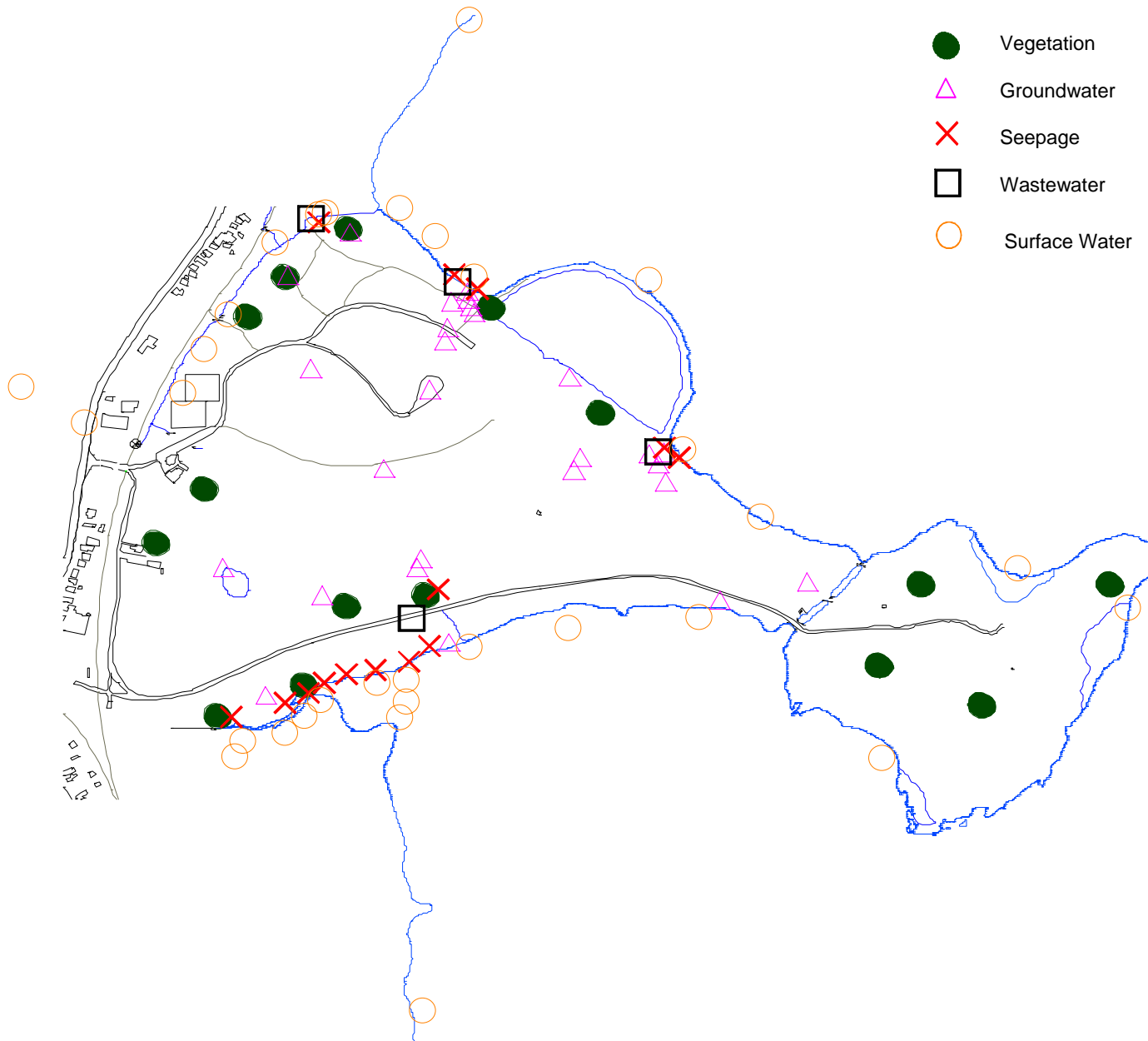
# River Elevations (masl)



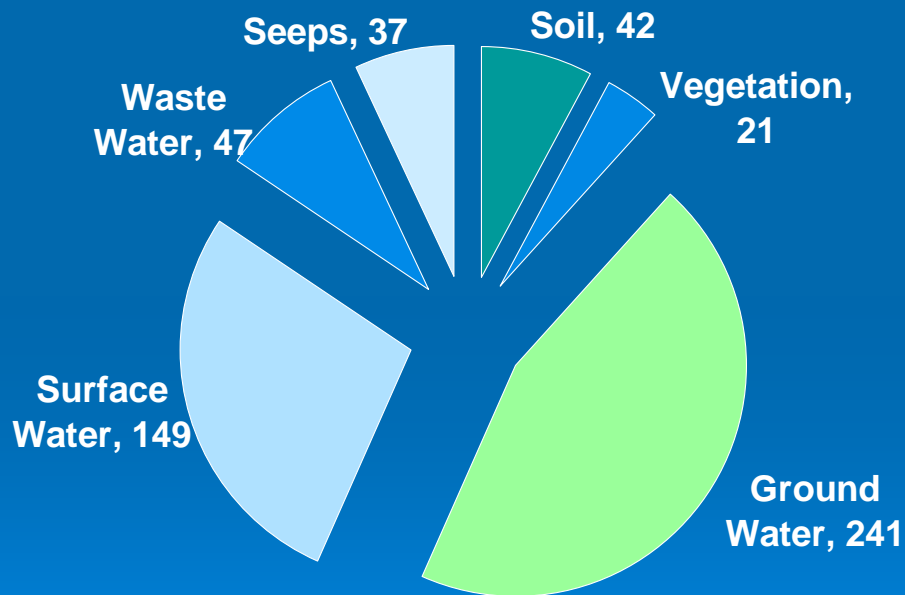
# Groundwater Flow







# Site Chemistry ~ 540 Samples



## ➤ Contaminants of Concern

- Iron
- Ammonia

# Current Site Management

- Weekly Site Observation Visits
- Periodic Sampling
- Active Groundwater Pumping



# Groundwater Pumping



# Groundwater Extraction

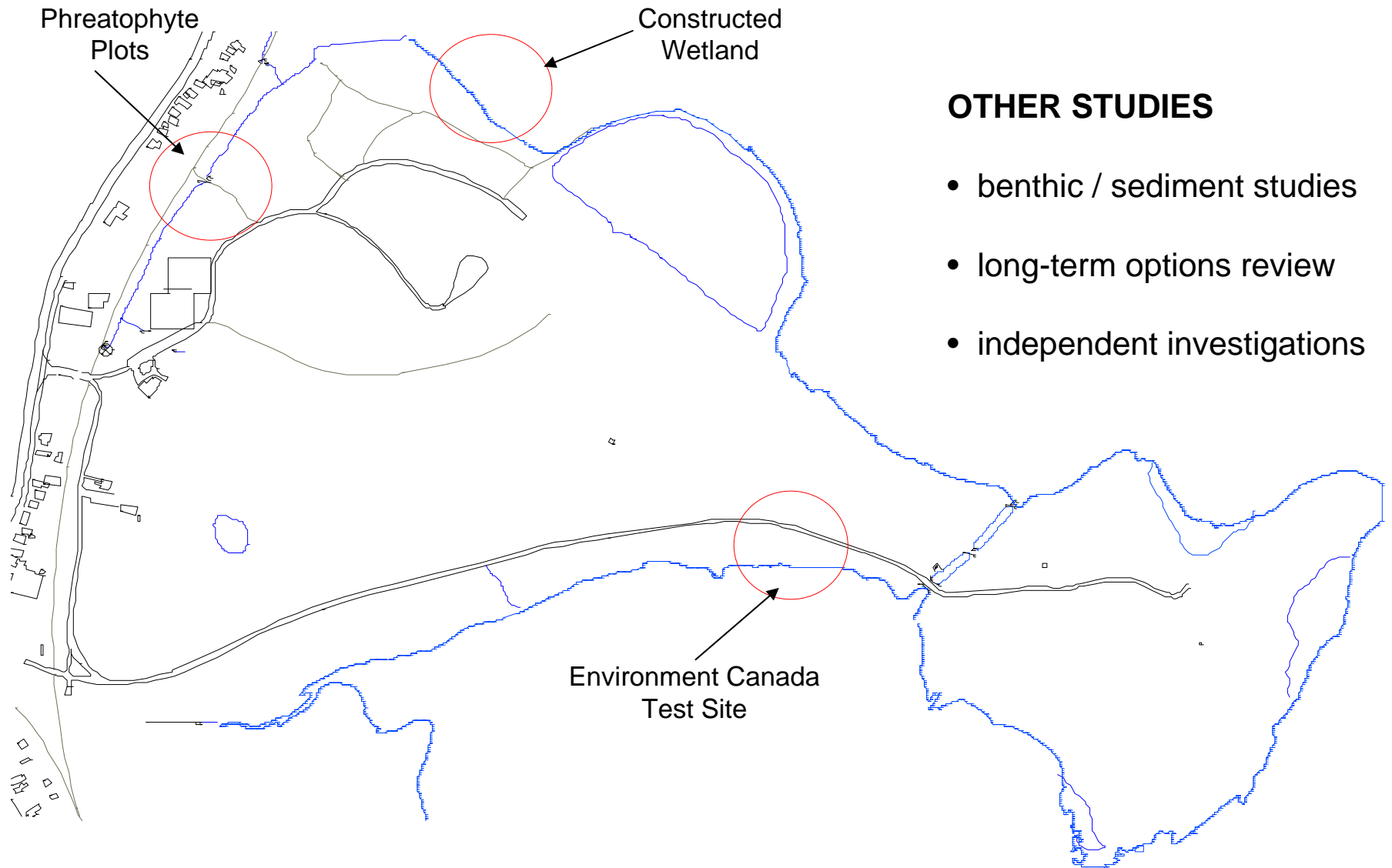
- active seepage management
- labour intensive
- water taking by permit
- costly



# Long-Term Management Objectives

- maintain site use
- less active (more passive) site management
- mitigated environmental impacts
- regulatory compliance
- public acceptance

# Feasibility Studies

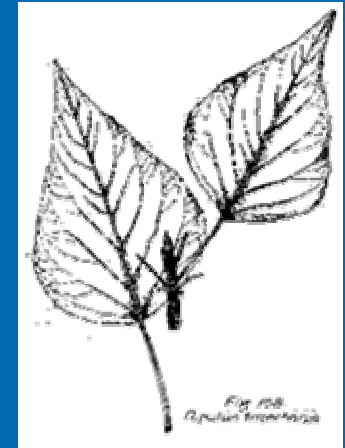


## OTHER STUDIES

- benthic / sediment studies
- long-term options review
- independent investigations

# Phreatophyte Tree Plots

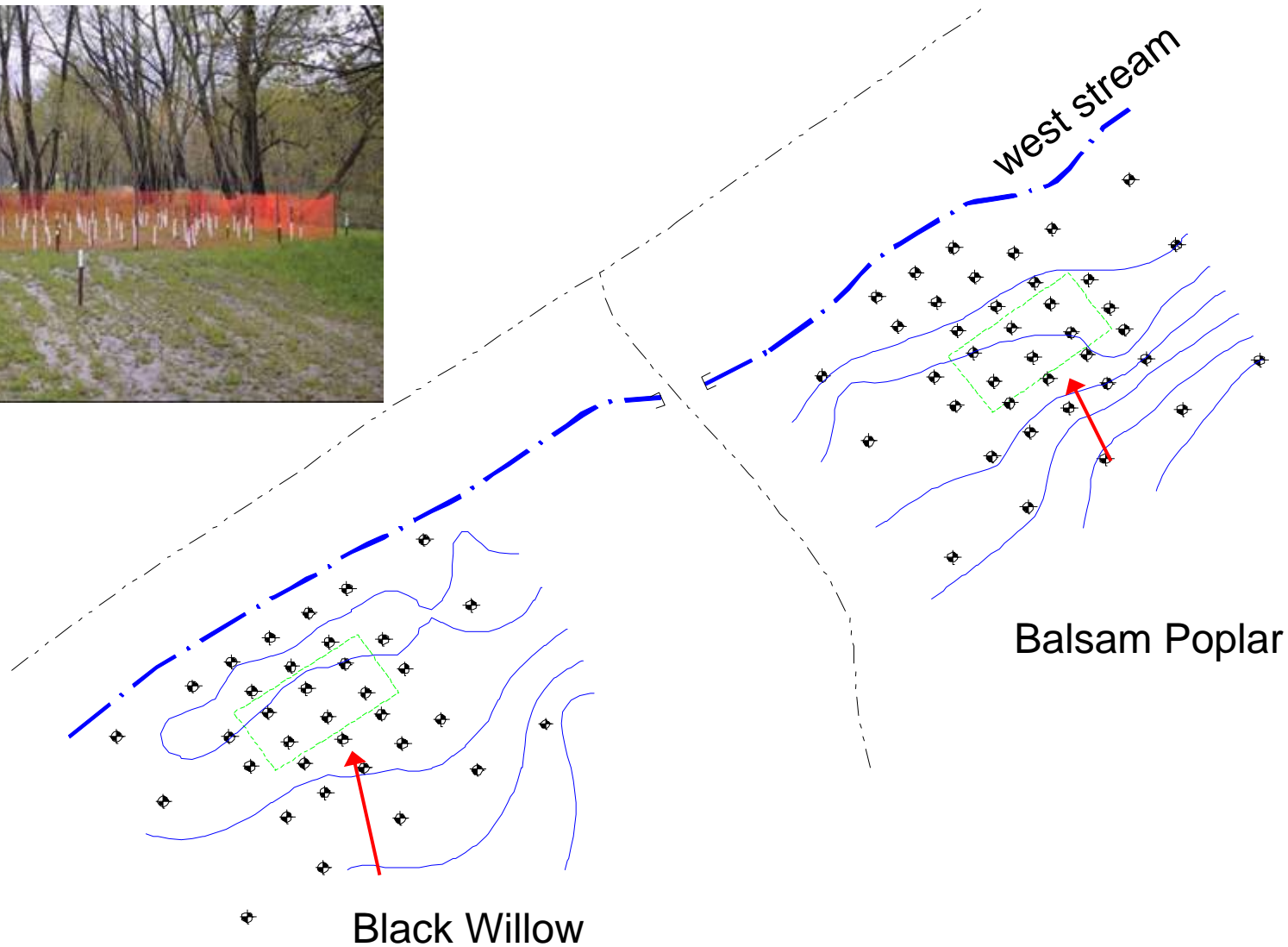
- *Salix nigra*  
(black willows)
- *Populus balsamifera*  
(balsam poplars)



- hydraulic control of shallow groundwater
- native species
- willows already on-site



# Phreatophyte Tree Plots



# Phreatophytes - Challenges & Stressors



Weather

Shoot Blight

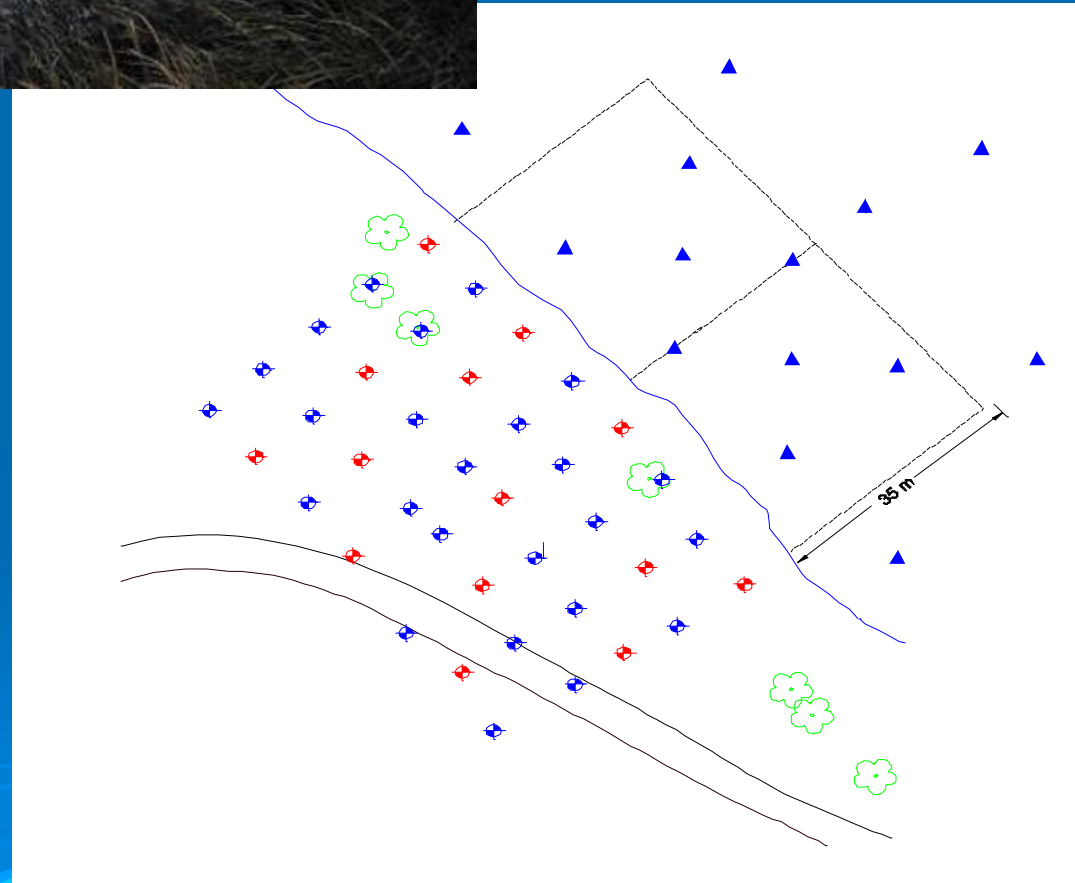
Caterpillars

Vandalism

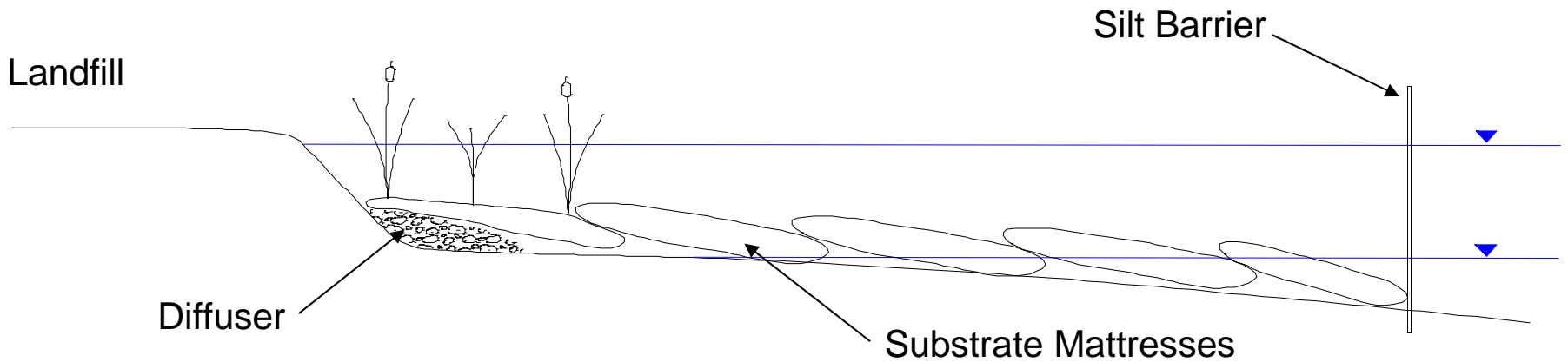
# Constructed Wetland



- shallow fringe wetland
- in-water construction
- 2 - 35 m x 35 m cells
- cattails vegetation



# Constructed Wetland – Schematic Section



# Constructed Wetland - Monitoring

## ➤ Quarterly sampling

- surface water
- substrate
- groundwater

## ➤ Chemical Analyses

- nitrogen
- iron
- indicators

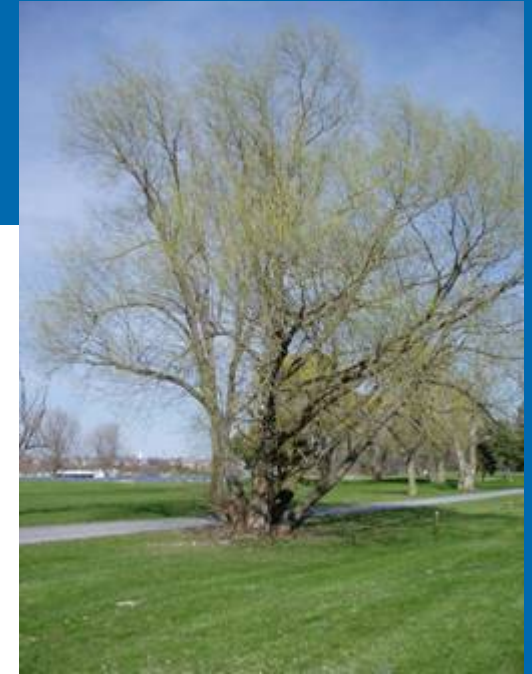
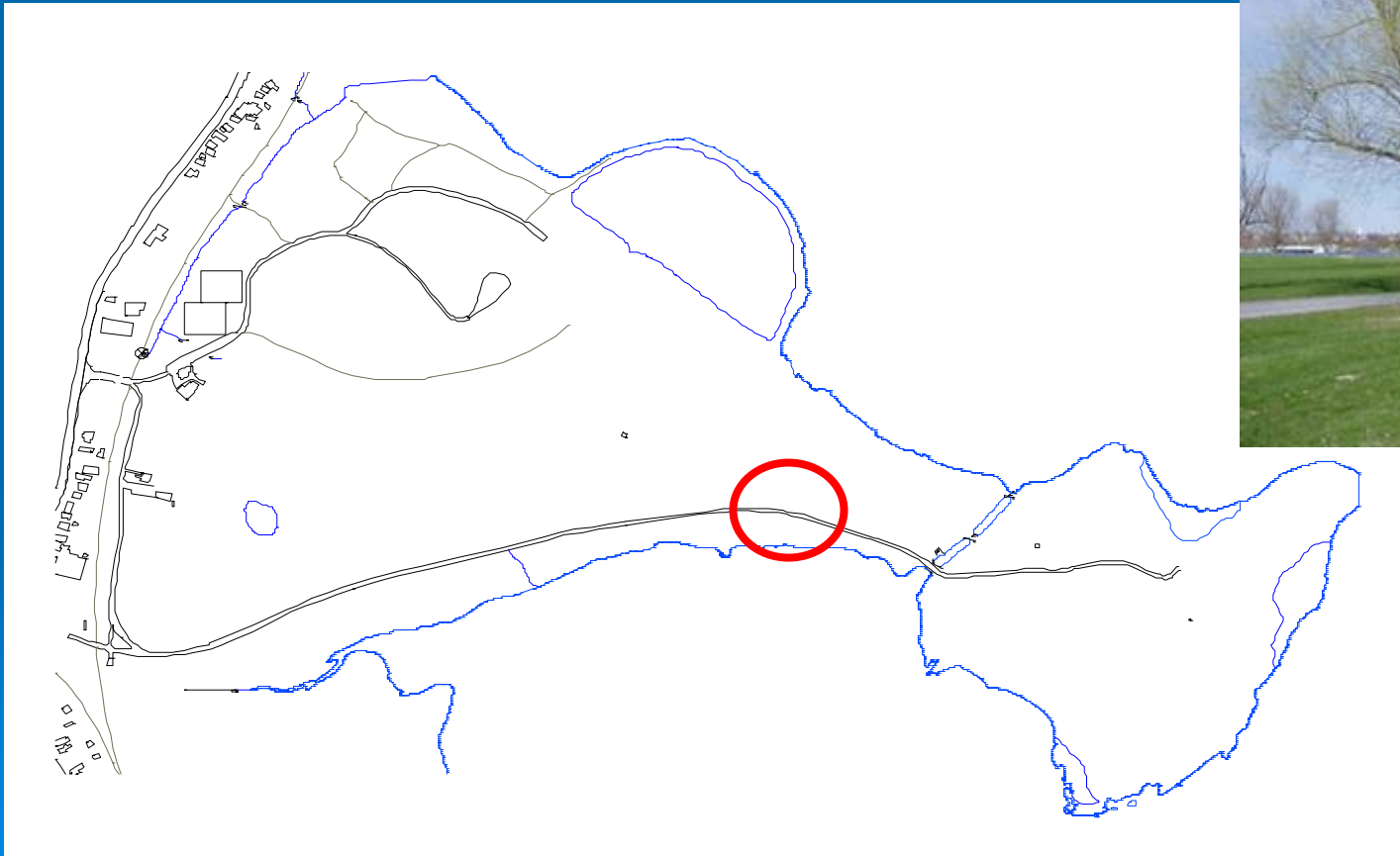


# Constructed Wetland – First Season Growth

- little growth before late July
- cattails (from seeds & rhizomes)
- grasses, sedges, rushes
- populated by birds, fish, amphibians



# Environment Canada Test Site



# Sap Flow Probes

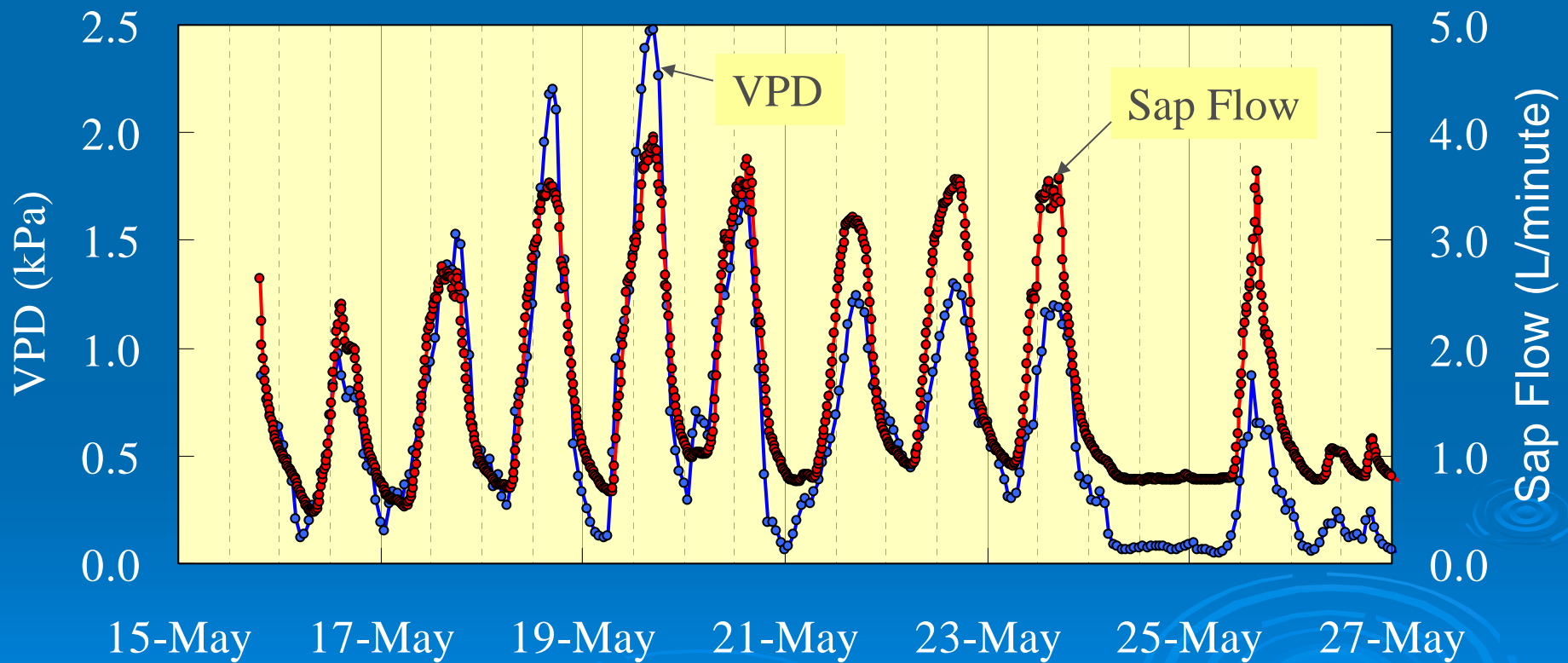




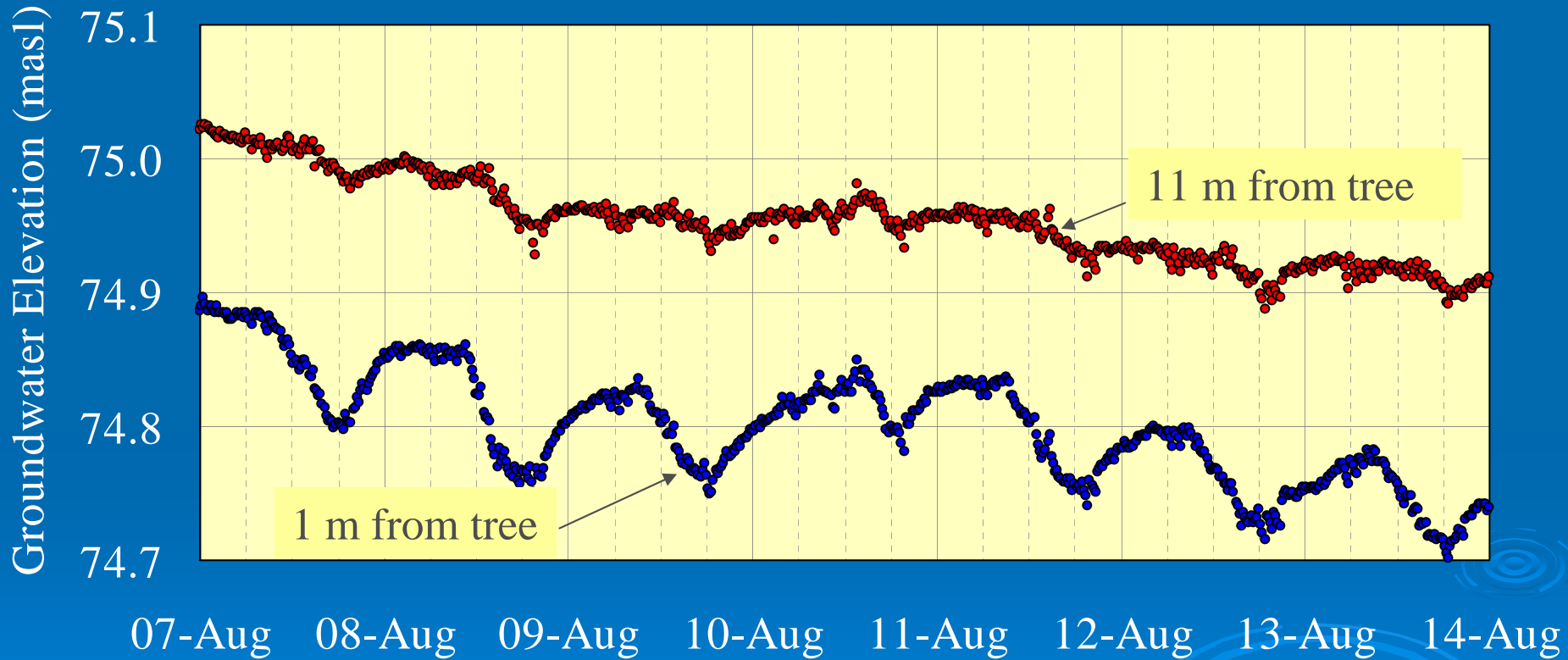
# Monitoring Well with LeveLogger



# Sap Flow & Vapour Pressure Deficit



# Water Level Fluctuations



# Future Work

- Continued Evaluation of Feasibility Technologies
- Assessment of Near Shore Impacts
- Evaluation of Long-term Management Options
- Public Consultation

# Additional Information

➤ [www.cityofkingston.ca/](http://www.cityofkingston.ca/)

residents/  
environment/  
bellepark/  
index.asp

➤ Steven Rose, P.Eng.  
Malroz Engineering Inc.  
[rose@malroz.com](mailto:rose@malroz.com)