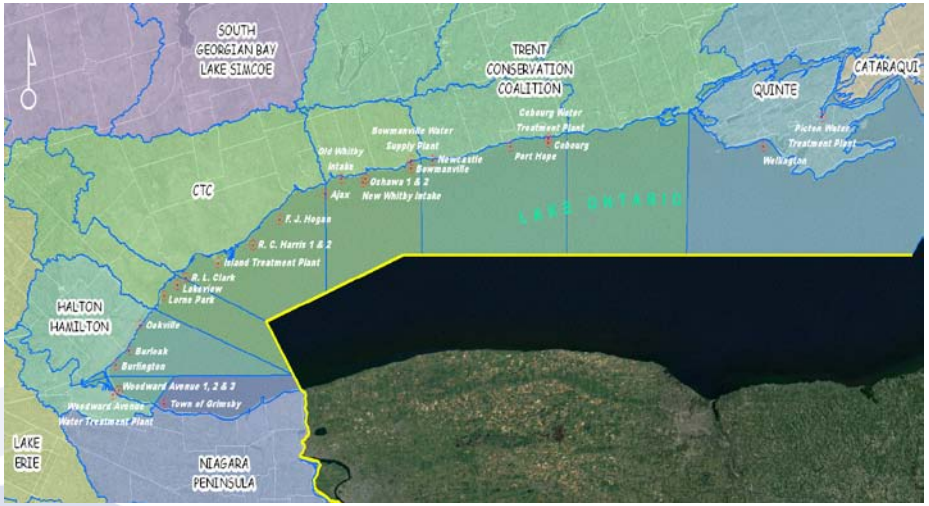
Lake Ontario Collaborative Study

Status Update



Presentation to TCC Source Protection Committee
May 14, 2010

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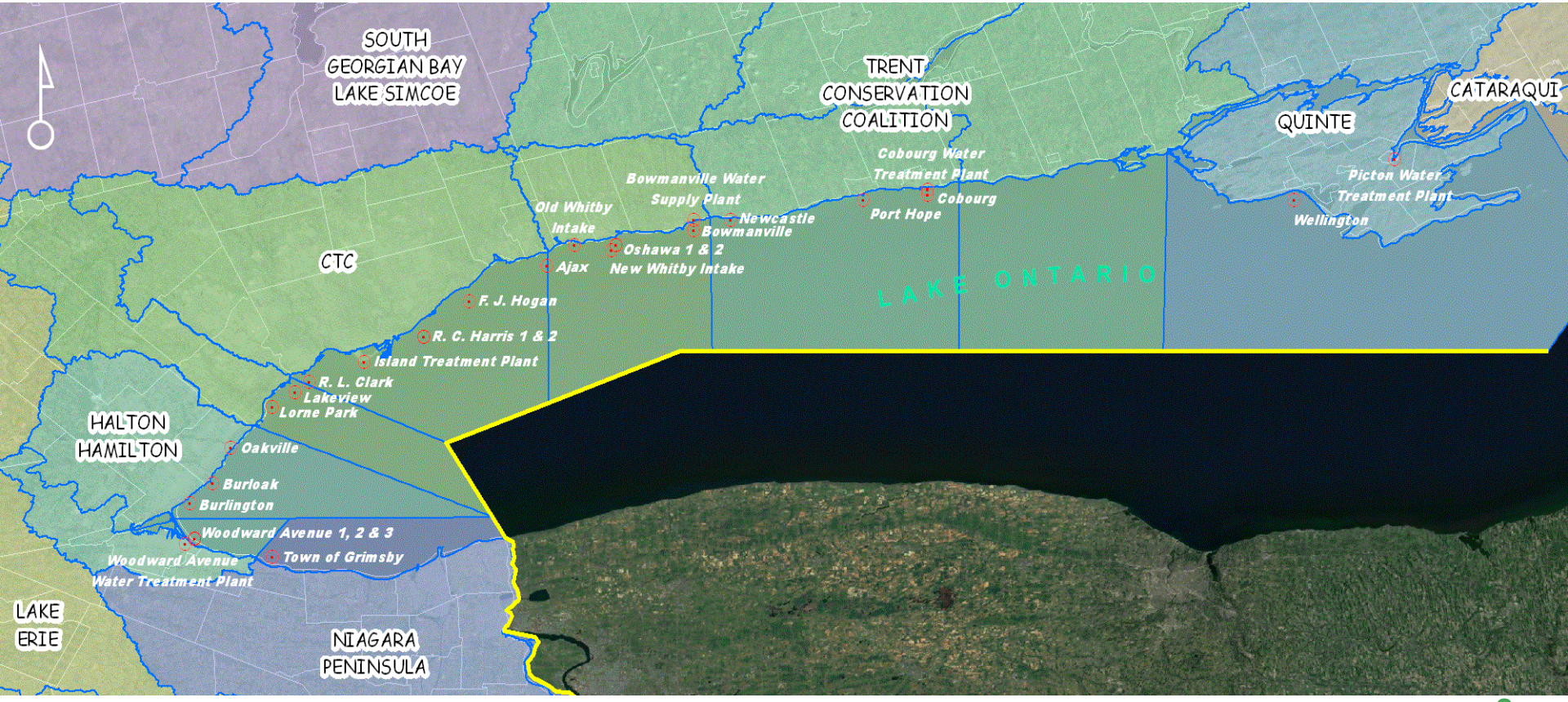
Collaborative Study to Protect Lake Ontario Drinking Water



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What are we investigating?

- The location and nature of activities that could pose risks to drinking water intakes in Lake Ontario
- Assessing the conditions under which risks might occur & magnitude of the risks
  - Lake Ontario is an excellent water supply source
  - Objective of source water protection – examine what additional protection for our Drinking Water Source can be achieved through SWP

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INTAKE PROTECTION ZONES – LAKE ONTARIO INTAKES

- Assessment Report Technical Rules require the delineation of the following Intake Protection Zones (IPZs) for municipal drinking water intakes in Great Lakes::
  - IPZ-1 (Part VI.3)
  - IPZ-2 (Part VI.4)
  - IPZ-3 (Part VI.5)
- Delineation of IPZ-1 and 2 for Lake Ontario intakes, including Newcastle WTP, Cobourg WTP and Port Hope WTP completed as part of Phase 1 Study.
- This work was completed by Stantec Consultants (modelling by Baird) to meet MOE Guidance Module 4 – Surface Water Vulnerability Analysis.
- Phase 1 Reports issued by Stantec to municipalities in early 2008.
- Addendum to Phase 1 Reports for Newcastle WTP, Cobourg WTP and Port Hope WTP issued by Stantec in early May 2010.
- Addendum was to revise IPZ 1 and 2 to ensure compliance with Technical Rules
- Delineation of IPZ-3 underway as part of Phase 3 Spill Scenario Modelling

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IPZ-1 and 2 Delineation Methodology for Great Lakes Intakes

- The IPZ-1 is a circle with a 1km radius around the intake crib - Rule 61 (1) (a)
- The IPZ-2 was delineated using a hydrodynamic model which included data inputs from water movement, winds, currents, temperature, precipitation, etc. – Rule 65
- IPZ-2 hydrodynamic modeling was completed by Baird as a subconsultant to Stantec – Supported by Environment Canada Modelers
- IPZ-2 delineated to a time of travel distance of 2hrs; minimum response time to shutdown of an intake – Rule 66; *The 10 year wind event used as driving force*

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IPZ-1 and 2 Delineation Methodology (continued)

- Extent of IPZ-2 for each intake projected shoreward to land (except for Toronto Islands WTP) to account for data gap/uncertainty in nearshore zone.
- Upland area of IPZ-2 extended inland to Regulation Limit or 120m (whichever greater) and to include transport pathways such as storm sewersheds;
- IPZ-2 extended up tributaries (where present) using 2hr TOT method; Tributary flow data used where available; professional judgment used where flow data not available
- Modeling methods vetted through MOE Great Lakes Technical Experts Workshops in December 2008 and June 2009.

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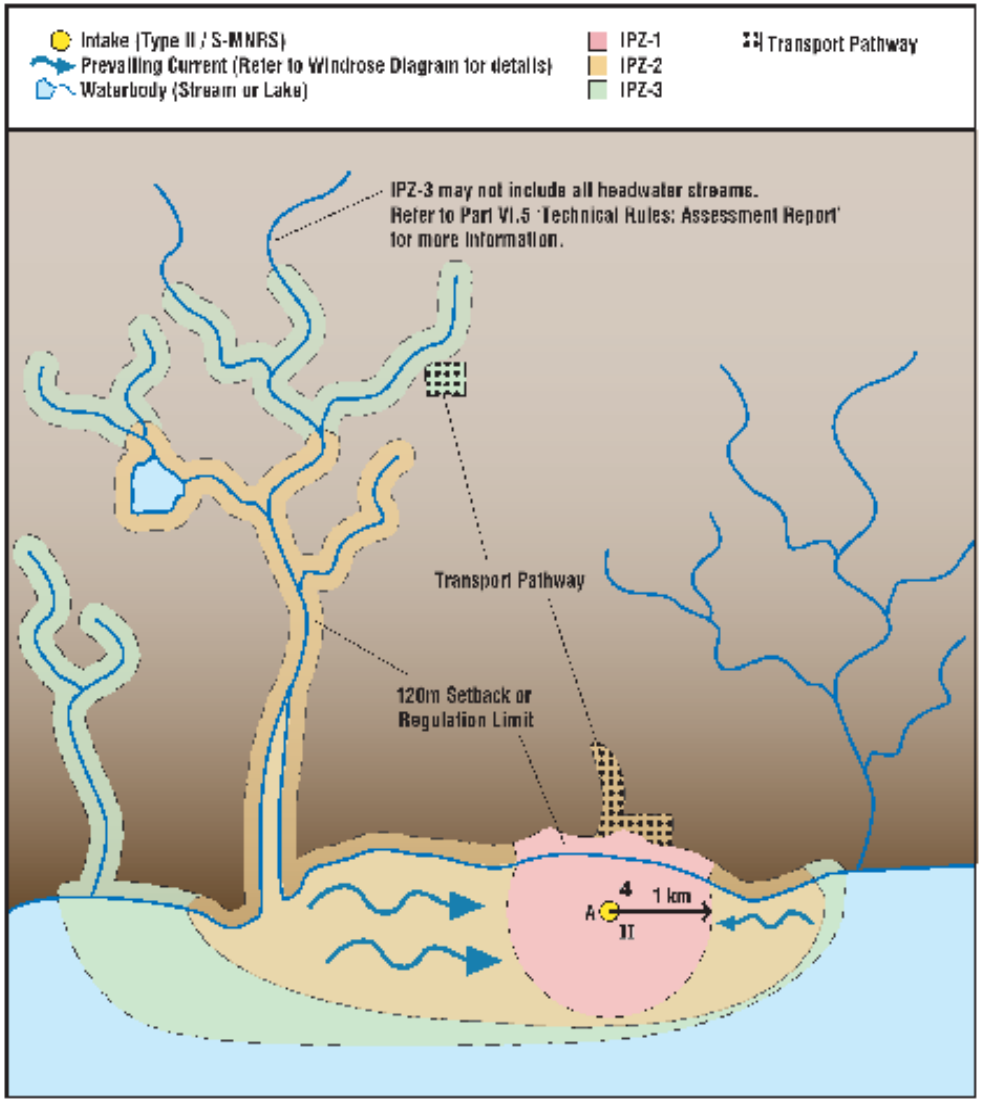

Intake Protection Zones Type A Intakes: Great Lake

- Intake
- Prevailing Current
- Waterbody (Stream or Lake)
- IPZ-1
- IPZ-2
- IPZ-3

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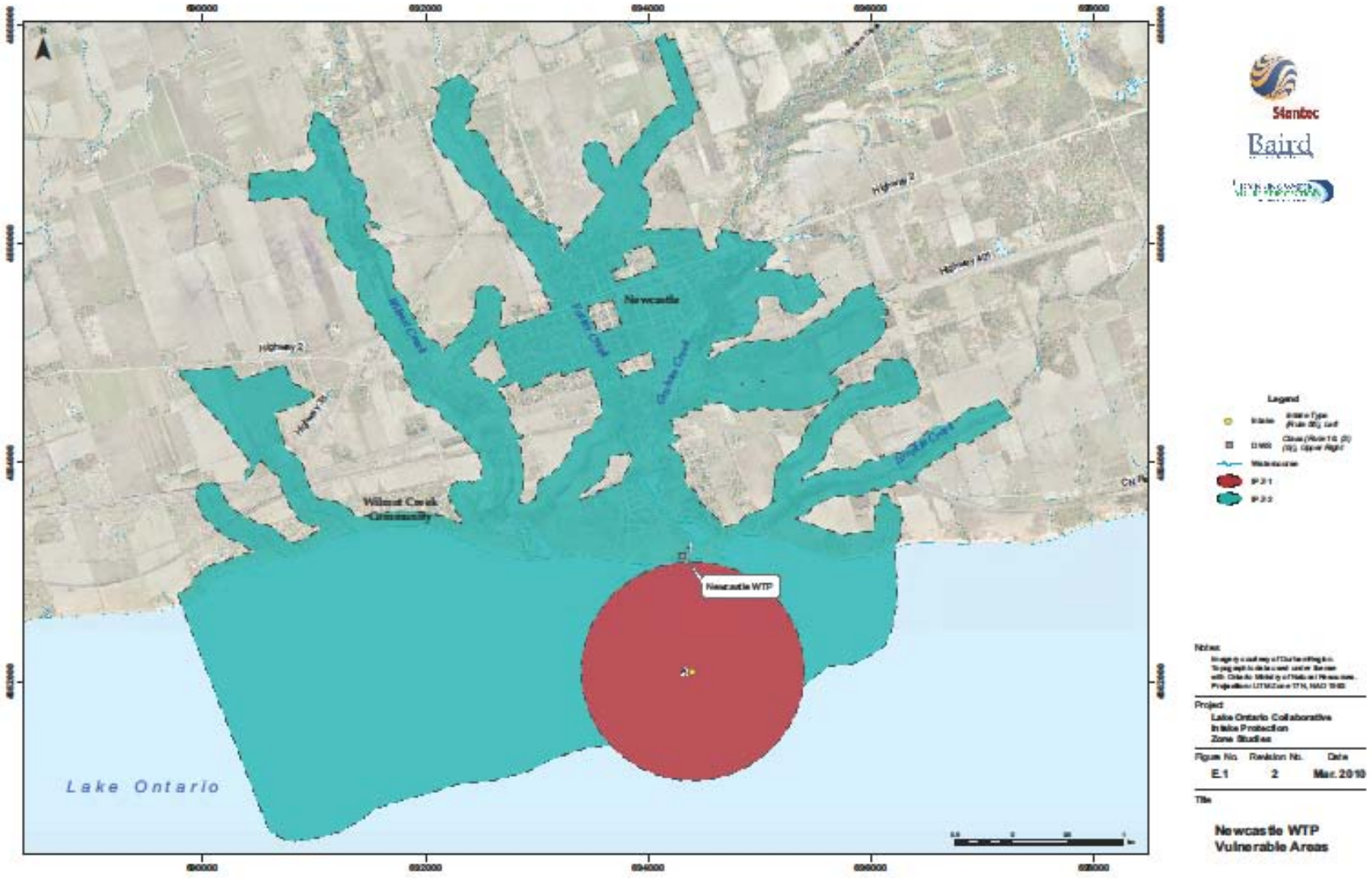
Newcastle IPZ 1 & 2



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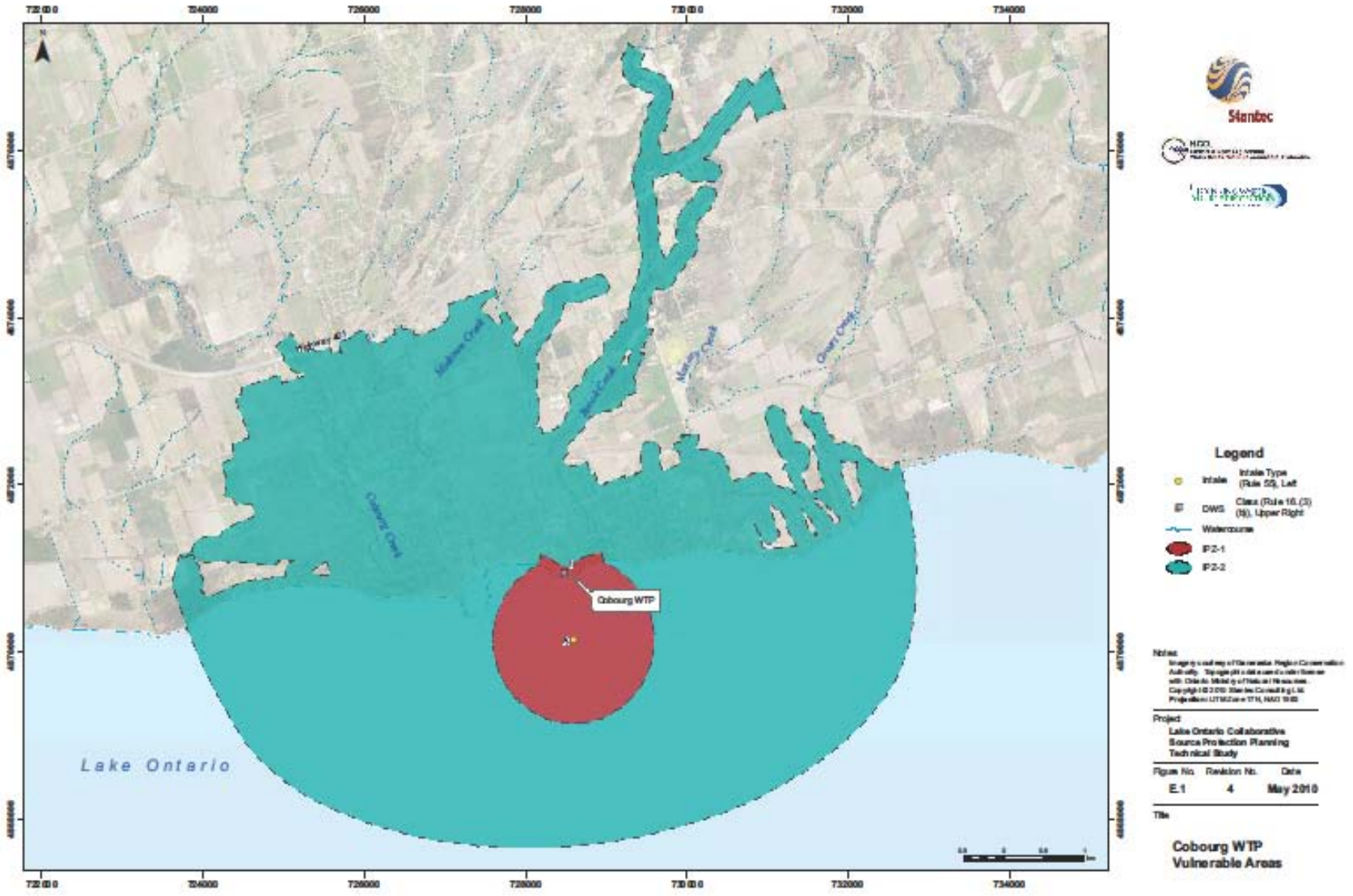
Cobourg IPZ 1 & 2



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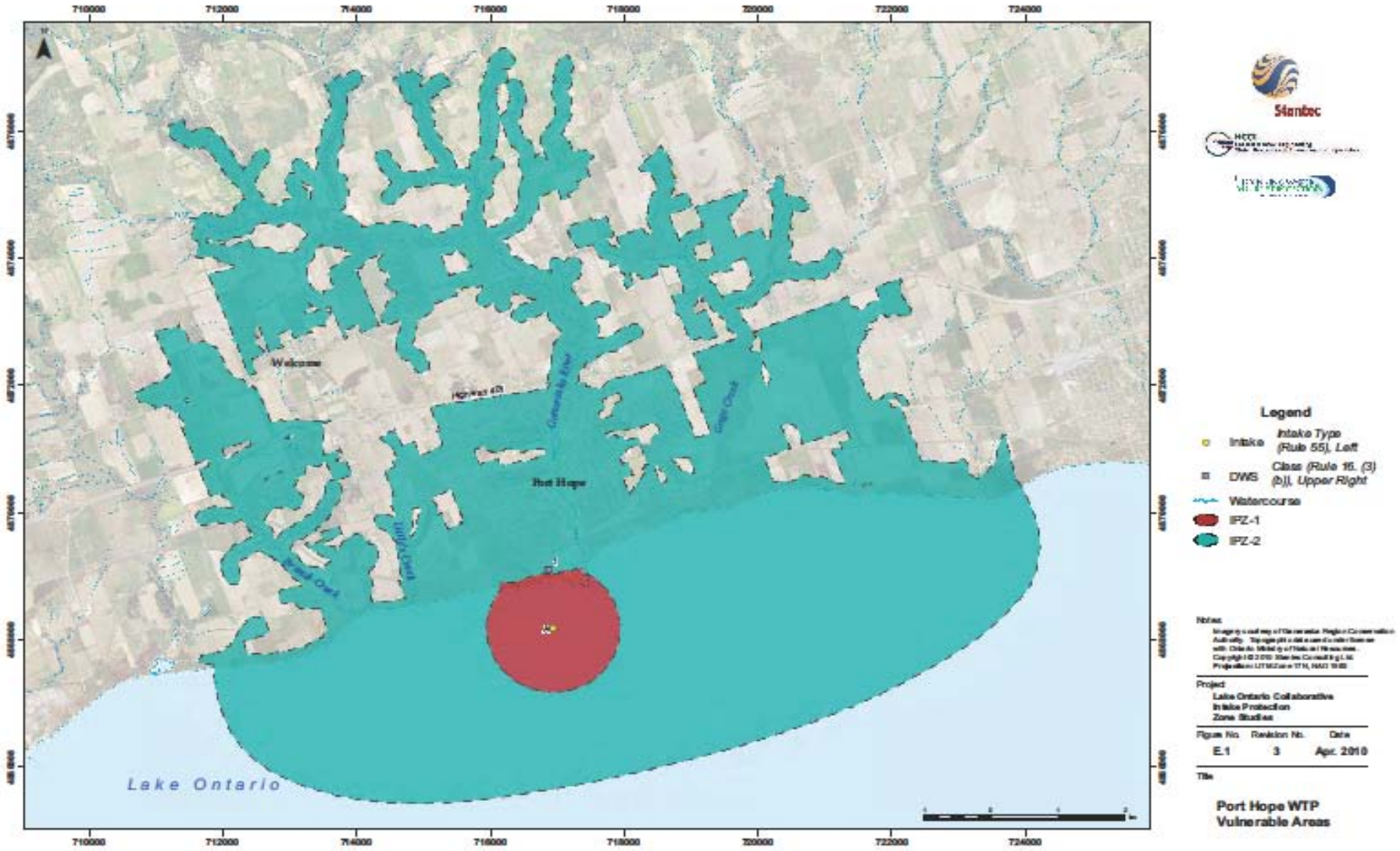
Port Hope IPZ 1 & 2



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Vulnerability Assessment

- Vulnerability Assessment initially undertaken by Stantec and presented in January 2008 reports to municipalities – Guidance Module # 4
- Vulnerability for Newcastle, Cobourg and Port Hope WTPs Re-Assessed by Stantec (and reviewed by LOC Project Team) as part of May 2010 Addenda to Phase 1 Reports - *To comply with Part VIII of Technical Rules*

Vulnerability (***V***) = ***B*** x ***C***

where:

- ***B*** is the area vulnerability factor
- ***C*** is the source vulnerability modifying factor

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Vulnerability Assessment (continued)

Area Vulnerability (*B*)

Considered but not limited to the following factors to assign ***B*** to IPZs of each intake:

- Runoff Generation Potential (more runoff – higher ***B***)
- Land cover, soil type, permeability of the land and the slope of any setbacks (for land portion of IPZs)
- Transport pathways (higher ***B*** for numerous pathways and/or faster transport potential)

Source Vulnerability Modifying Factor (*C*)

Considered but not limited to the following factors for each intake:

- Depth of Intake (deeper intake – lower ***C***)
- Distance of Intake from Land (further from shore – lower ***C***)
- Historical Records Quality Records (no past incidences – lower ***C***)

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Vulnerability Assessment (continued)

Vulnerability Score for Great Lakes Intakes

Part VIII – Assessment Report Technical Rules

Intake Type	Area Vulnerability Factor (*B*)		Source Vulnerability Modifying Factor (*C*)	Vulnerability Score (*V*)	
	IPZ-1	IPZ-2		IPZ-1	IPZ-2
Great Lakes	10	7 to 9	0.5 to 0.7	5 to 7	3.5 to 6.3

CANNOT GET A SIGNIFICANT DRINKING WATER THREAT IN IPZ-1 AND 2 FOR GREAT LAKES INTAKES USING VULNERABILITY SCORING METHODOLOGY

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IPZ Vulnerability Scoring and Uncertainty Rating
Newcastle WTP, Cobourg WTP and Port Hope WTP

Municipality	Intake Location	Intake Protection Zone (IPZ)	Vulnerability			Uncertainty Level Rating	
			Area Vulnerability Factor	Source Vulnerability Factor	Vulnerability Score	IPZ Delineation	Vulnerability Score
Region of Durham	Newcastle WTP	IPZ-1	10	0.5	5	Low	Low
		IPZ-2	8	0.5	4	High	Low
Town of Cobourg	Cobourg WTP	IPZ-1	10	0.5	5	Low	Low
		IPZ-2	8	0.5	4	High	Low
Town of Port Hope	Port Hope WTP	IPZ-1	10	0.5	5	Low	Low
		IPZ-2	8	0.5	4	High	Low

Note: Information obtained from Addendums to LOC Phase 1 Report for Newcastle (Durham), Cobourg and Port Hope dated May 2010 by Stantec Consulting

THREATS ASSESSMENT

- Vulnerability Scoring Methodology for IPZ-1 and 2 for Great Lakes Intake can only result in *low or moderate threats*;

- Only way to get a Significant Drinking Water Threat for a Great Lakes Intake is by identification of a drinking water issue as per Rule 114 or through Spill Scenario Modelling in accordance with Rule 130, for a land use activity.

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Issues Evaluation

An issues evaluation has been conducted for all drinking water intakes included in the LOC Study Area to identify any drinking water issues in accordance with Part XI.1 Rule 114;

- The LOC drinking water issues evaluation was technically initiated in 2006 as part of the Phase 1 study.
- Further information for the issues evaluation purposes was gathered as part of the Phase 2 study.
- Additional “issues” related data and information has been gathered by the LOC project team as part of the on-going Phase 3 study.

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Issues Evaluation (continued)

The issues evaluation methodology included the following components:

- Interviews and discussion with water treatment plant operators;
- Review of existing and available “raw” and “treated” water testing data for each water treatment plant – DWIS and Annual Reports (O.Reg 170/03 of *SDWA, 2002*.
- Comparison of raw and treated water testing results to Ontario drinking water standards, objectives and guidance.

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What are we doing?

Phase 3 Study

- Review and Compilation of Municipal Data Sources (Contaminant Source Inventory, Raw Water Quality, Precipitation)
- Continued Pathogen Study
- Algal Toxin Monitoring
- Ongoing Watershed Pollutant Loading Studies
- On-going Issues Evaluation
- Spill Scenario Modeling and Delineation of IPZ-3

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Spill Scenario Modelling (Phase 3)

Industrial, Commercial and Municipal Facilities:

- Identifying the location and possible materials released under normal operation and spill scenarios
- Using established lake models, predict under what conditions contaminants could reach drinking water intakes
- Predict the concentration of key parameters and assess risks using MOE technical rules
- Evaluate historical raw water analyses at drinking water plants to assess whether there are observed elevations of parameters that may be linked to storm events or past spill or weather conditions

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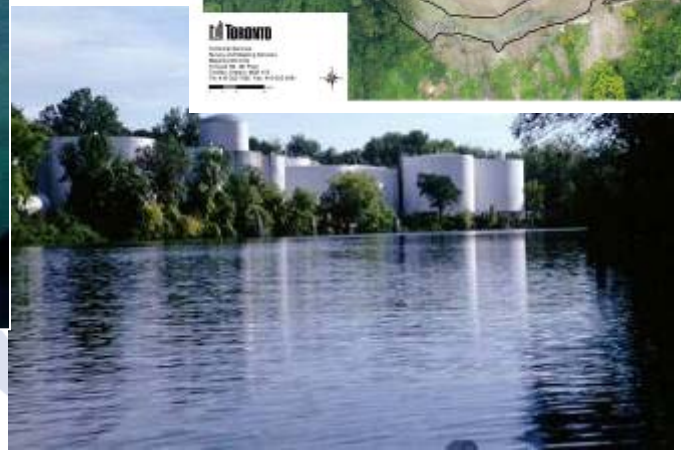
What are some of the upstream risks to drinking water?

- Discharges from tributaries during storm events
- Spills into tributaries upstream



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What are some of the in lake risks to drinking water?

- Dredging
- Spills from Ships
- Anchors damaging inlet/outlet pipes

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What are some of the lake-side risks to drinking water?

Direct Discharges and Spills to Lake Ontario

- Petrochemical facilities
- Wastewater Treatment Plants & Storm Water
- Industrial Activities, including Bulk Fuel Storage
- Nuclear Power Stations

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Initial Spill/Discharge Scenarios

- Ontario Power Generation Pickering Nuclear Facility: Simulate a discharge of tritium from the Pickering site, emulating the release volumes and activity associated with the 1992 and 1996 spills.
- Hamilton Harbour: Simulate a release of a Light Non-Aqueous Phase Liquid such as a petroleum product from a facility/site in Hamilton Harbour to evaluate potential impacts to the Woodward Avenue WTP in Halton-Hamilton Source Protection Region and Grimsby WTP in Niagara Peninsula Source Protection Region.
- Quinte Source Protection Area: Simulate an "anomalous" wastewater treatment plant discharge from a wastewater treatment plant near the Wellington WTP in Prince Edward County to evaluate the potential effects to the Wellington WTP.
- Release in vicinity of Port Hope/Cobourg: Simulate a release of pollutants in the vicinity of these water treatment plants from the shore/tributary. A suitable spill scenario activity will be identified with consultation with local municipalities and SPAs through the Contaminant Source Inventory process.
- Peel-Halton Regions: Simulate a release of petroleum from a bulk petroleum fuel storage facility in the Mississauga-Oakville area to evaluate potential effects to the Lakeview WTP and Lorne Park WTP in Peel Region and Oakville WTP, Burloak WTP and Burlington WTP in Halton Region.

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Scenarios (continued)

- City of Toronto CSOs: Simulate a combined sewer overflow (CSO) release in the City of Toronto to evaluate the potential effects to the F.J Horgan WTP, Toronto Island WTP, R.C. Harris WTP, R.L. Clark WTP and other water treatment plants downcurrent of the event.

- Durham Region: Simulate a release from a sanitary sewer break or WWTP anomalous release in Duffins Creek to evaluate the potential effects to the Ajax WTP and other water treatment plants downstream/downcurrent.

- Liquid Manure Storage Lagoon Release: Simulate a large quantity release of liquefied manure from a large storage lagoon such as the Maple Lodge Farms facility near the Credit River in Peel Region.

- Chemical release in a Tributary to Lake Ontario: Simulate a release of chemicals from a storage, commercial or industrial facility in one of the Lake Ontario tributaries.

- Miscellaneous Spill Scenario: Simulate a spill release scenario for a land use activity that is not considered in the first nine (9) scenarios. This miscellaneous scenario, if needed, would be identified through the Contaminant Source Inventory.

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NEXT STEPS

- Complete Initial Spill Scenario Models (December 2010)
- Delineation of IPZ-3 for initial spill scenarios, where necessary
- Expand Lake Ontario Pathogen Study Area through municipal consortium (underway)
- Quantitative Microbial Risk Assessment (QMRA) for all municipalities? (lessons learned from Peel Region QMRA)
- Provide data to Source Protection Committees for updated assessment reports (early 2011?)

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CONCLUSIONS FOR NEWCASTLE, COBOURG AND PORT HOPE WTPS

- Delineations of IPZs 1 and 2 meet the Technical Rules;
- Issues Evaluation has been conducted in accordance with Technical Rules – *based on reviewed available data to date, no existing drinking water issues have been identified;*
- *No Significant Drinking Water Threats* have been identified to date; vulnerability scoring methodology does not allow for Significant Drinking Water Threats in IPZ-1 and IPZ-2;
- Vulnerability Score of 5 in IPZ-1 for Newcastle, Cobourg and Port Hope results in potential *Low Threats only*; moderate threats are not possible (need at least a 6);
- Vulnerability Score of 4 in IPZ-2 for Newcastle, Cobourg and Port Hope *does not allow* for any drinking water threats; score is below threshold for low threats;
- Spill Scenario modelling to identify any significant threats (and associated delineation of IPZ-3) is on-going for all LOC intakes; anticipated completion in late Fall 2010;

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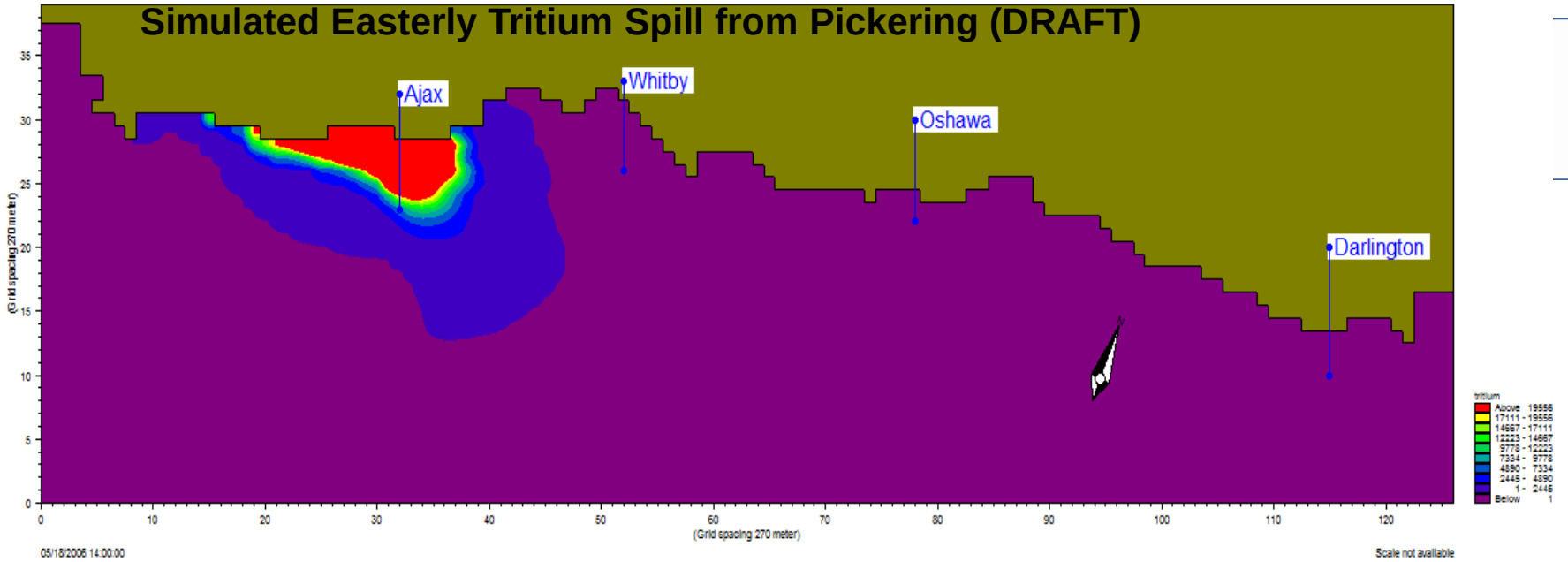
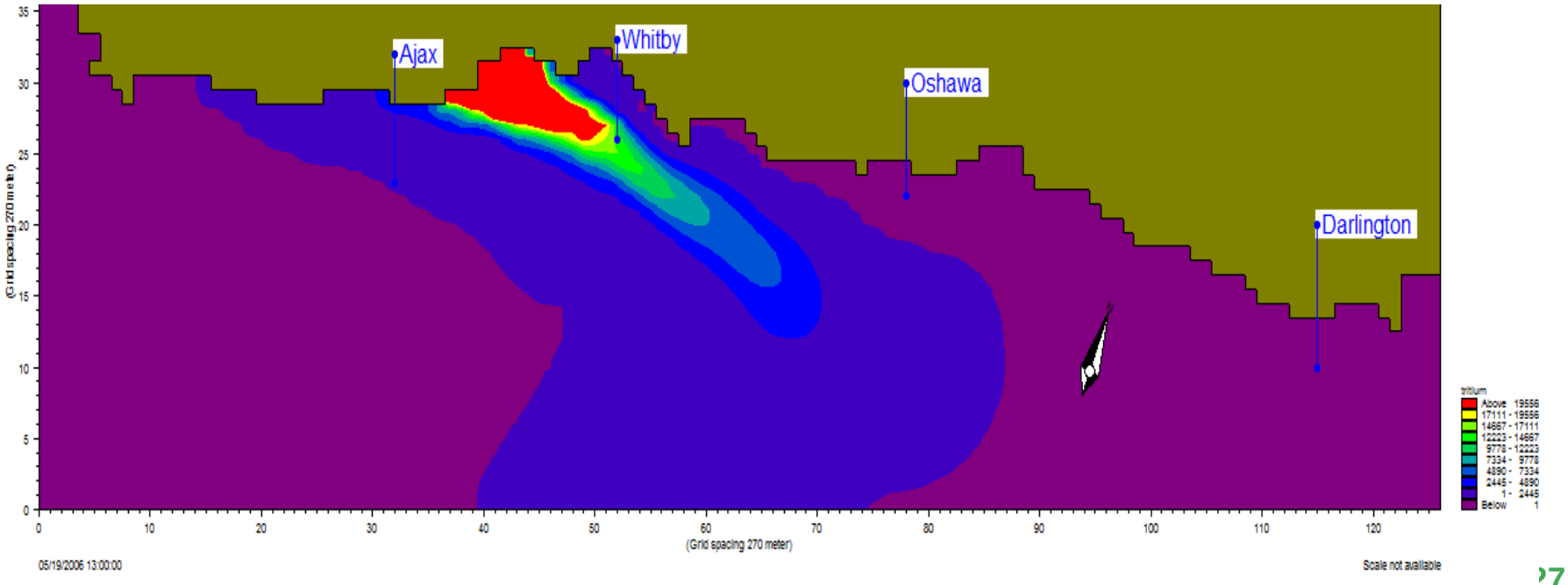
Simulated Easterly Tritium Spill from Pickering (DRAFT)





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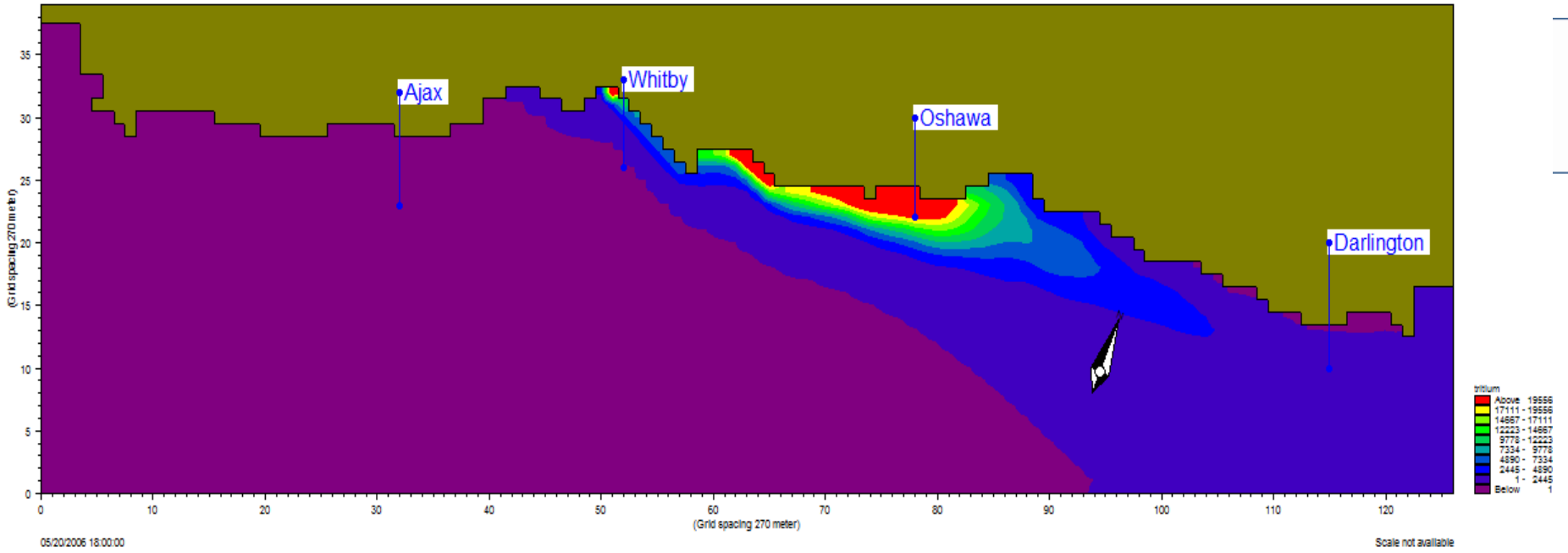
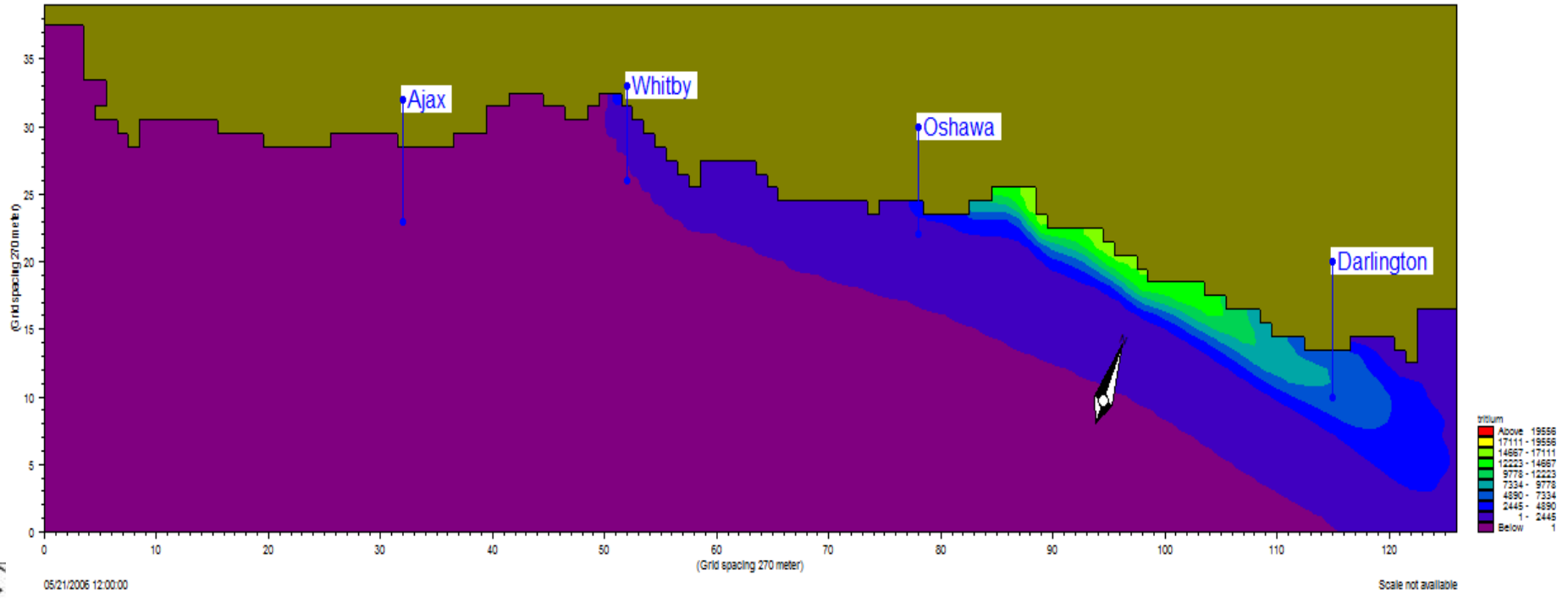

Ajax
Whitby
Oshawa
Darlington
(Grid spacing 270 meter)
(Grid spacing 270 meter)
tritium
Above 19556
17111 - 19556
14667 - 17111
12223 - 14667
9778 - 12223
7334 - 9778
4890 - 7334
2445 - 4890
1 - 2445
Below 1
05/20/2006 18:00:00
Scale not available


Ajax
Whitby
Oshawa
Darlington
(Grid spacing 270 meter)
(Grid spacing 270 meter)
tritium
Above 19556
17111 - 19556
14667 - 17111
12223 - 14667
9778 - 12223
7334 - 9778
4890 - 7334
2445 - 4890
1 - 2445
Below 1
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Scale not available

Simulated Tritium Concentrations at LOC WTP Intakes (draft)

Intake	Peak Level (Bq/L)	Time to Peak (hrs)	Duration of Initial Plume	Extended Second Passage
Bowmanville	1161	96	102	9 days
Newcastle	920	108	104	10 days
Port Hope	615 - 810 755 - 270	154	168 (with reversal) 16 days (384 hrs)	
Cobourg	535 - 810 525 - 270	202	132 7.5 days (180 hr)	

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