Real-Time Water Quality Monitoring Network in Newfoundland and Labrador

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Department of Environment and Conservation
Water Resources Management Division

Overview

- Objectives of Real-Time Water Quality Monitoring Program in NL
- Real-Time Water Quality Monitoring Network in NL
  - Provincial Government Stations
  - Industry Partnership Stations
  - Federal Partnership Stations
- Instrumentation
- Site Selection and Deployment
- Communication and Datalogging
- Maintenance / Calibration
- Quality Assurance / Quality Control
- Data Management
- Data Reporting
- Reaction to Emerging Issues
- Key Messages / Path Forward

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Objectives of Real-Time Water Quality Monitoring Program in NL

- Obtain a continuous record of water quality information at selected locations; complement traditional forms of water quality monitoring
- Provide up-to-date water quality information to the public through departmental webpage
- Provide an early warning of adverse water quality incidents
- Allow government and industry to address water quality events on a proactive basis through mitagative interventions

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Real-Time Water Quality Monitoring Network in NL

- **Network consists of :**
  - **4 stations - provincial government**
    (all 4 stations established)
  - **21 stations – industry partnership**
    (9 stations established; 12 stations in progress)
  - **3 stations – federal government partnership**
    (2 stations established; 1 station in progress)

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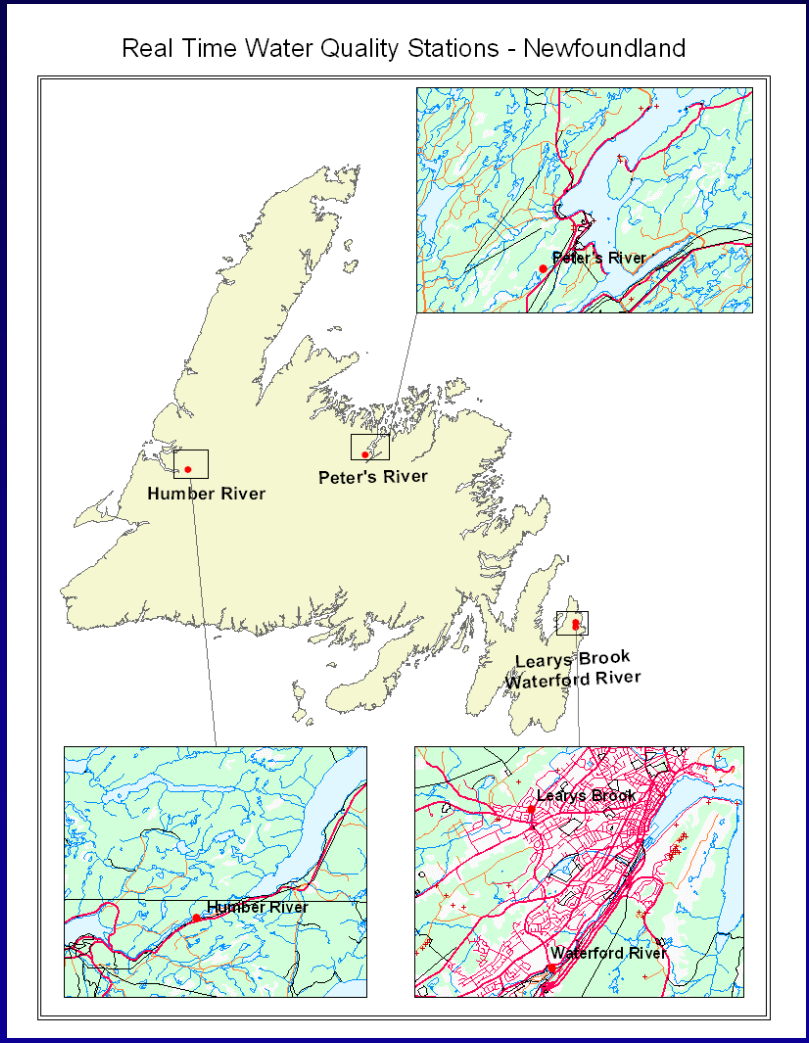
Partnership is the Key to Success

Provincial Government Stations

- There are a total of four real-time water quality monitoring stations established as solely provincially owned and operated.

  - Leary's Brook (Eastern)
  - Waterford River (Eastern)
  - Peter's River (Central)
  - Humber River (Western)



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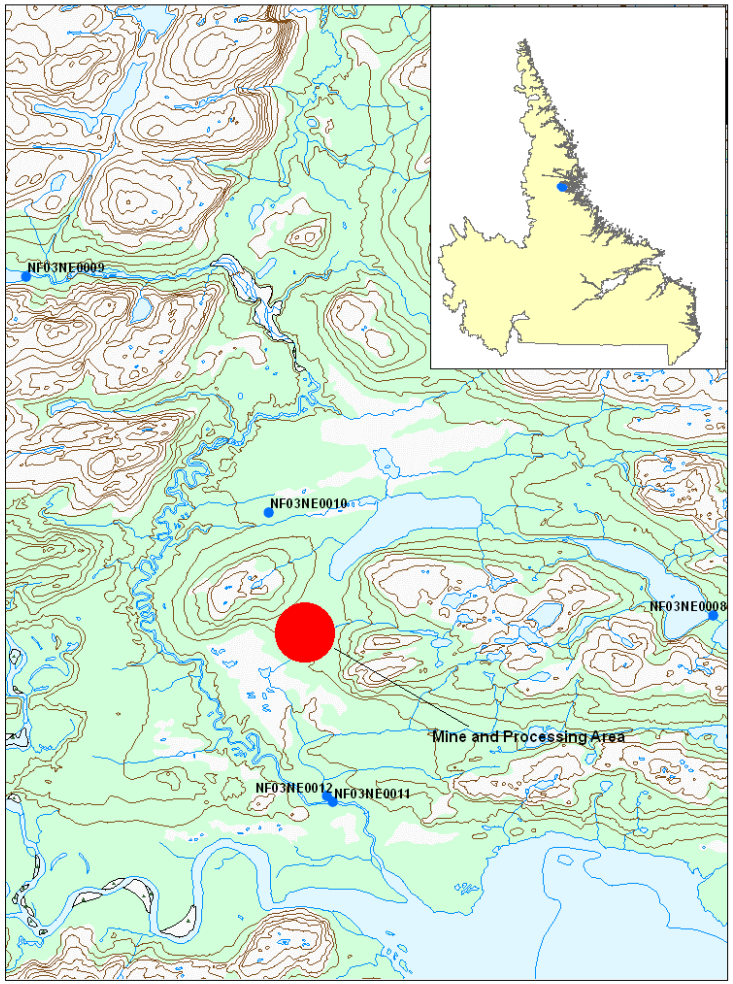
Industry Partnership Stations - VBNC

- There are a total of five real-time water quality monitoring stations established in Voisey's Bay, Labrador (see map below)

  - Upper Reid Brook (SW)
  - Lower Reid Brook (SW)
  - Tributary to Lower Reid Brook (SW)
  - Camp Pond Brook (SW)
  - Well at Tailings Dam (GW)

- There is an additional station located on Rattling Brook in Long Harbour NL; proposed location for processing facility



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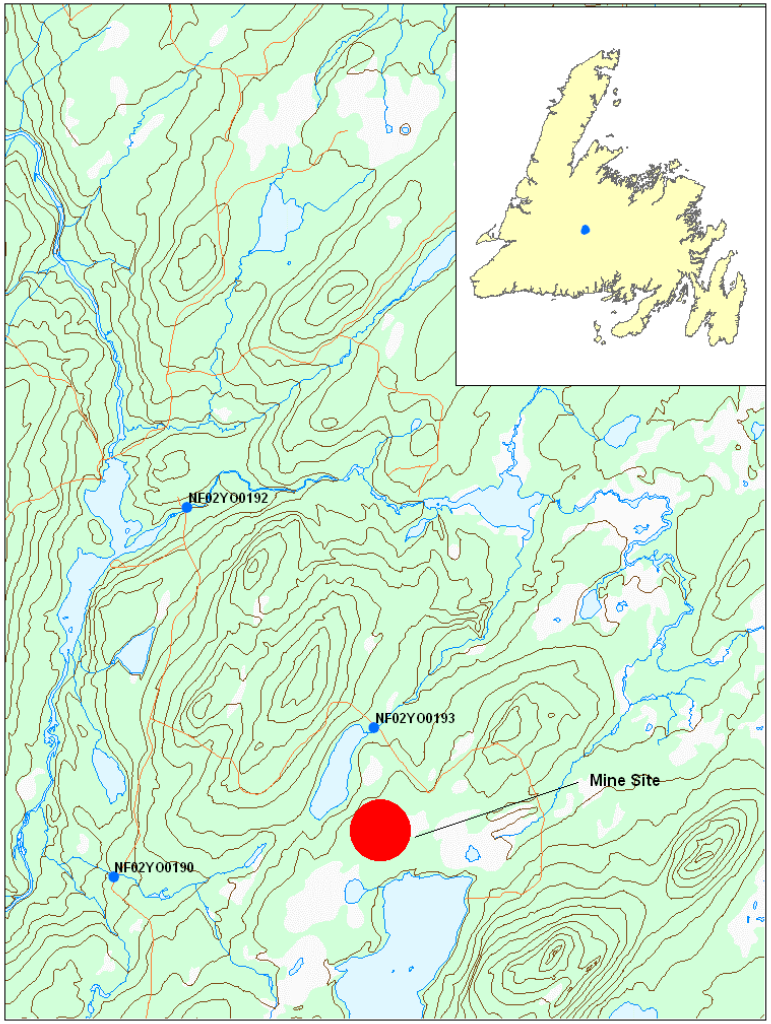
Industry Partnership Stations - Aur Resources Inc.

- There are a total of three real-time water quality monitoring stations established at the Duck Pond Mine Site.

  - Gills Pond Brook (SW)
  - East Pond Brook (SW)
  - Well after Tailings Dam (GW)



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Industry Partnership Stations - In Progress / Negotiation

- Iron Ore Company of Canada

  - 2 stations to be established June 2007

- NL Refining Corporation

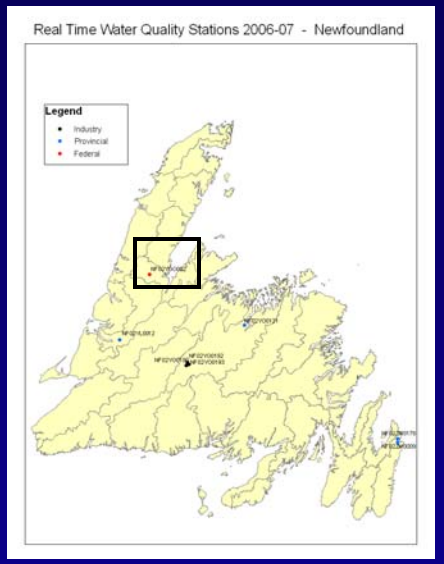
  - 2 stations to be established (Summer 2007 & Summer 2008)

- NL Hydro - Lr. Churchill Hydroelectric Generation Project

  - 8 stations to be established (Summer 2007 & Summer 2008)

Federal Partnership Stations

- There are a total of three real-time water quality monitoring stations joint federally-provincially owned and operated.



- Main River (Newfoundland)

- Minipi River (Labrador)

- Southwest Brook (Miawapukek First Nation Pilot Project)

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Instrumentation

- **Hydrolab products:**

Datasonde®
Multiprobe

Minisonde®
Multiprobe

Quanta - G
Transmitter
and Display

Surveyor®
Datalogger and
Display

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Instrumentation

Surface Water:

- Temperature (°C)
- pH (pH units)
- Turbidity (NTU)
- Specific Conductance (µS/cm)
- Dissolved Oxygen (mg/L)
- % Saturation (%)
- Total Dissolved Solids (g/L)
- Ammonium (mg/L)
- Nitrate (mg/L)

Groundwater:

- Temperature (°C)
- pH (pH units)
- Redox (mV)
- Specific Conductance (mS/cm)
- Salinity (mg/L)
- Depth for Surface (m)

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Site Selection and Deployment

Deployment techniques are site-specific

Select sites that will provide meaningful data

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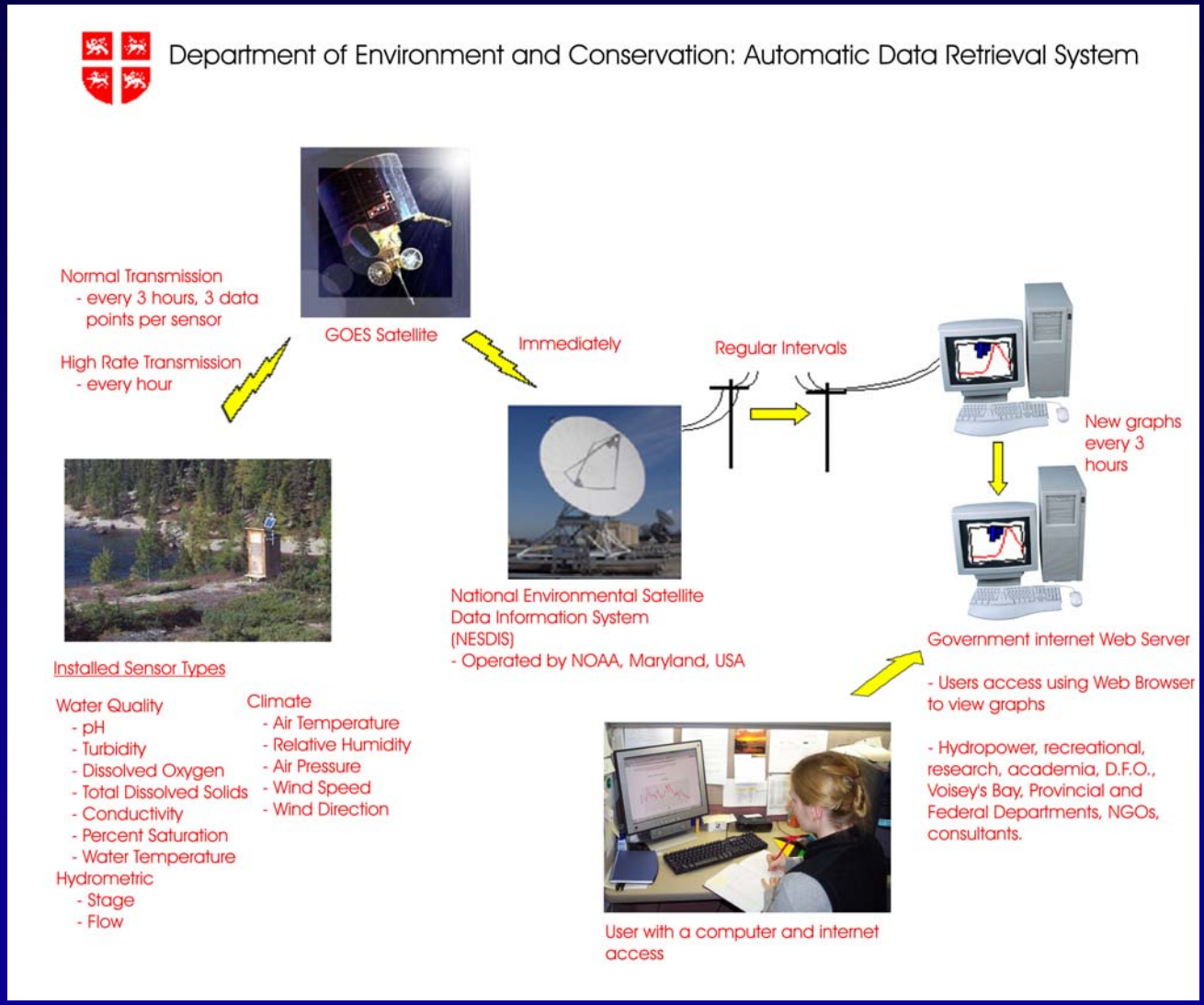
Communication and Datalogging



Maintenance/Calibration

- Essential that instruments are properly maintained and calibrated using standard solutions in order to ensure accurate data collection

- Instruments should be maintained and calibrated on a monthly basis

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Maintenance/Calibration

- Instruments must be maintained and calibrated in a temperature-controlled atmosphere

- Keep a record of all maintenance and calibration that has been done on the instrument (ie: journal)

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Quality Assurance/Quality Control

- Important to adhere to strict QA/QC procedures
- Ensure maintenance/calibration procedures are followed closely
- Upon reinstallation, Minisonde readings must coincide accurately with Datasonde readings (ie. fall within an acceptable range)
- Grab sample taken for comparison purposes

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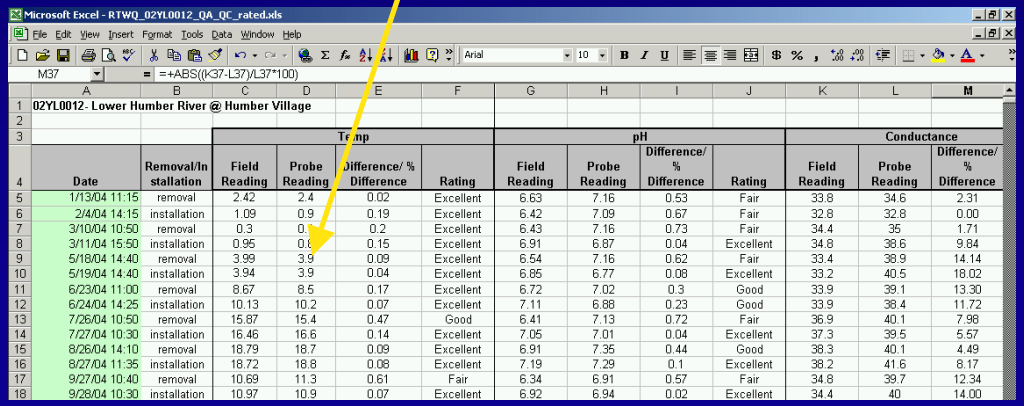
Quality Assurance/Quality Control

- Calibration and Maintenance Form is critical for QA/QC procedures

- All information recorded in QA/QC spreadsheets



Microsoft Excel - RTWQ_02YL0012_QA_QC_rated.xls

=+ABS((K37-L37)/L37*100)

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	02YL0012- Lower Humber River @ Humber Village												
2													
3			Temp				pH				Conductance		
4	Date	Removal/Installation	Field Reading	Probe Reading	Difference/ % Difference	Rating	Field Reading	Probe Reading	Difference/ % Difference	Rating	Field Reading	Probe Reading	Difference/ % Difference
5	1/13/04 11:15	removal	2.42	2.4	0.02	Excellent	6.63	7.16	0.53	Fair	33.8	34.6	2.31
6	2/4/04 14:15	installation	1.09	0.9	0.19	Excellent	6.42	7.09	0.67	Fair	32.8	32.8	0.00
7	3/10/04 10:50	removal	0.3	0.1	0.2	Excellent	6.43	7.16	0.73	Fair	34.4	35	1.71
8	3/11/04 15:50	installation	0.95	0.8	0.15	Excellent	6.91	6.87	0.04	Excellent	34.8	38.6	9.84
9	5/18/04 14:40	removal	3.99	3.9	0.09	Excellent	6.54	7.16	0.62	Fair	33.4	38.9	14.14
10	5/19/04 14:40	installation	3.94	3.9	0.04	Excellent	6.85	6.77	0.08	Excellent	33.2	40.5	18.02
11	6/23/04 11:00	removal	8.67	8.5	0.17	Excellent	6.72	7.02	0.3	Good	33.9	39.1	13.30
12	6/24/04 14:25	installation	10.13	10.2	0.07	Excellent	7.11	6.88	0.23	Good	33.9	38.4	11.72
13	7/26/04 10:50	removal	15.87	15.4	0.47	Good	6.41	7.13	0.72	Fair	36.9	40.1	7.98
14	7/27/04 10:30	installation	16.46	16.6	0.14	Excellent	7.05	7.01	0.04	Excellent	37.3	39.5	5.57
15	8/26/04 14:10	removal	18.79	18.7	0.09	Excellent	6.91	7.35	0.44	Good	38.3	40.1	4.49
16	8/27/04 11:35	installation	18.72	18.8	0.08	Excellent	7.19	7.29	0.1	Excellent	38.2	41.6	8.17
17	9/27/04 10:40	removal	10.69	11.3	0.61	Fair	6.34	6.91	0.57	Fair	34.8	39.7	12.34
18	9/28/04 10:30	installation	10.97	10.9	0.07	Excellent	6.92	6.94	0.02	Excellent	34.4	40	14.00

Calibration and Maintenance Form

Station: 02ZE0033 –*Southwest Brook Below Southwest Pond*

Task:	**Monthly Maint/Calib**	X	**Remarks:** QA/QC readings done with a DataSonde 5X with the Serial #: 05030043820
	Special Maint/Calib		
	Warranty/Service		
	Other		
Hydrolab Removal	**Date:** m/d/y	02/22/07	
	Time:	1118 NST	
Hydrolab Reinstallation	**Date:** m/d/y	02/22/07	
	Time:	1502 NST	
Minisonde Readings Before Removal of Hydrolab	**Time:**	1502 NST	**Nitrate:** 1.90 mg/L
	Temp:	0.35 °C	**Turbidity:** 0.0 NTU
	pH:	4.54 Units	
	Cond:	18.3 µS/cm	
	DO:	14.31 mg/L	
	DO %:	98.9 %	
	TDS:	0.0117 g/L	
Minisonde Readings After Reinstallation of Hydrolab	**Time:**	1138 NST	**Nitrate:** 3.11 mg/L
	Temp:	0.70 °C	**Turbidity:** 0.0 NTU
	pH:	4.44 Units	
	Cond:	18.3 µS/cm	
	DO:	14.61 mg/L	
	DO %:	101.9 %	
	TDS:	0.0120 g/L	
Water Quality Sample Taken	**Date:** m/d/y	02/22/07	
	Time:	1430 NST	
	Sample Number:	2007-5607-00-SI-SP	

Sampler: Joanne Sweeney
Date:
Signature: _____

Please fax to ATTN: Renee Paterson at (709) 729-0320

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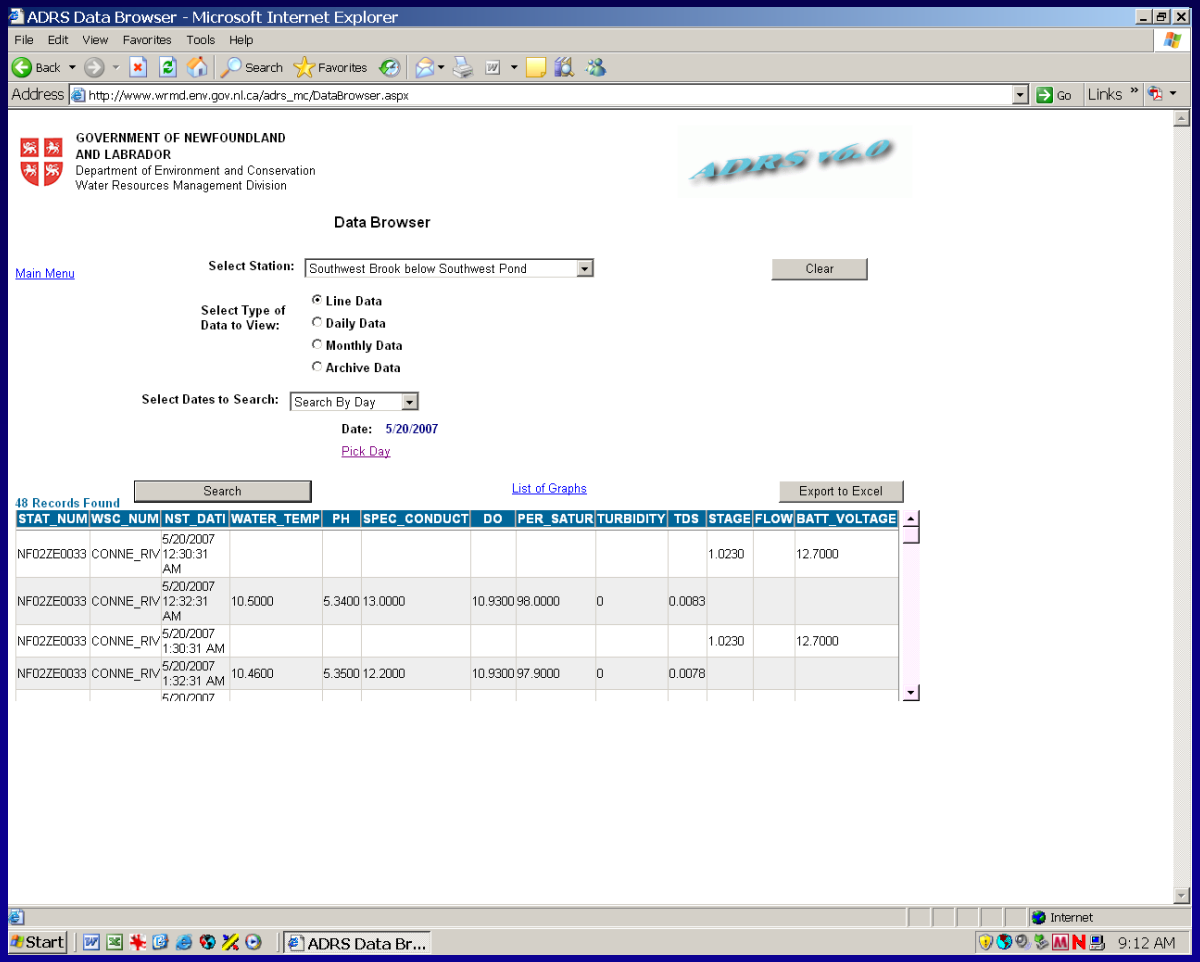
Data Management

Automatic Data Retrieval System



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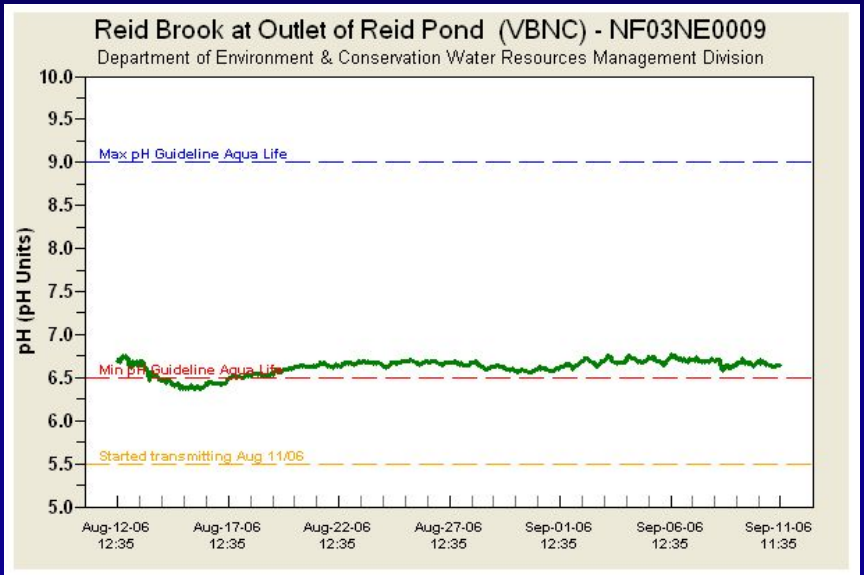
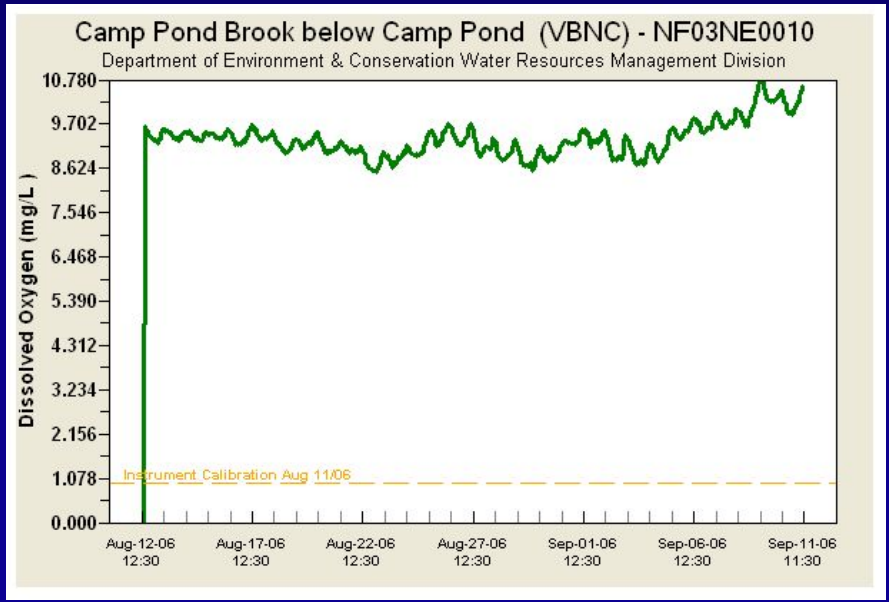
Data Reporting

- Rolling 30-day graphs of real-time water quality data are displayed on the Division web page for each parameter at each station





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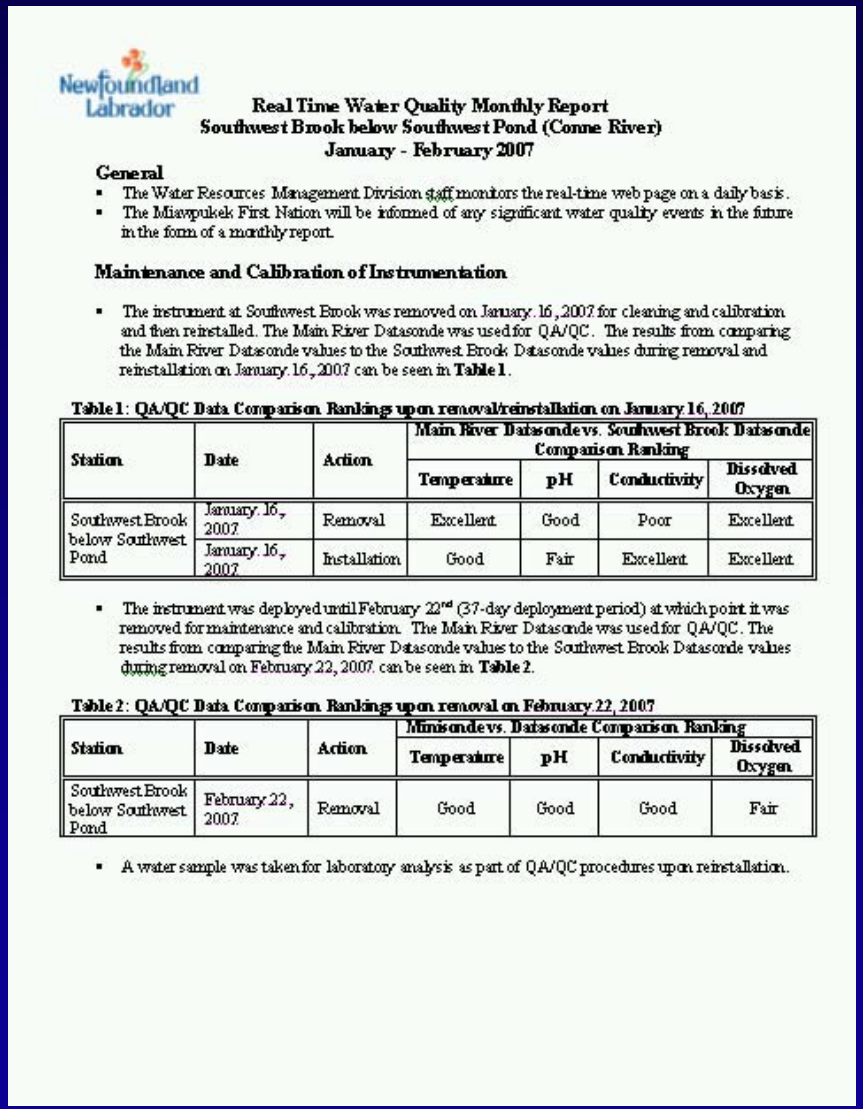
Data Reporting

- Monthly/Annual reports placed on the Division web page
- Monthly/Annual reports forwarded to industry
- Corrected data will be used for technical reports



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Real Time Water Quality Monthly Report
Southwest Brook below Southwest Pond (Conne River)
January - February 2007

General

- The Water Resources Management Division staff monitors the real-time web page on a daily basis.
- The Miawpukek First Nation will be informed of any significant water quality events in the future in the form of a monthly report.

Maintenance and Calibration of Instrumentation

- The instrument at Southwest Brook was removed on January 16, 2007 for cleaning and calibration and then reinstalled. The Main River Datasonde was used for QA/QC. The results from comparing the Main River Datasonde values to the Southwest Brook Datasonde values during removal and reinstallation on January 16, 2007 can be seen in **Table 1**.

Table 1: QA/QC Data Comparison Rankings upon removal/reinstallation on January 16, 2007

Station	Date	Action	Main River Datasonde vs. Southwest Brook Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
Southwest Brook below Southwest Pond	January 16, 2007	Removal	Excellent	Good	Poor	Excellent
	January 16, 2007	Installation	Good	Fair	Excellent	Excellent

- The instrument was deployed until February 22nd (37-day deployment period) at which point it was removed for maintenance and calibration. The Main River Datasonde was used for QA/QC. The results from comparing the Main River Datasonde values to the Southwest Brook Datasonde values during removal on February 22, 2007 can be seen in **Table 2**.

Table 2: QA/QC Data Comparison Rankings upon removal on February 22, 2007

Station	Date	Action	Minisonde vs. Datasonde Comparison Ranking			
			Temperature	pH	Conductivity	Dissolved Oxygen
Southwest Brook below Southwest Pond	February 22, 2007	Removal	Good	Good	Good	Fair

- A water sample was taken for laboratory analysis as part of QA/QC procedures upon reinstallation.

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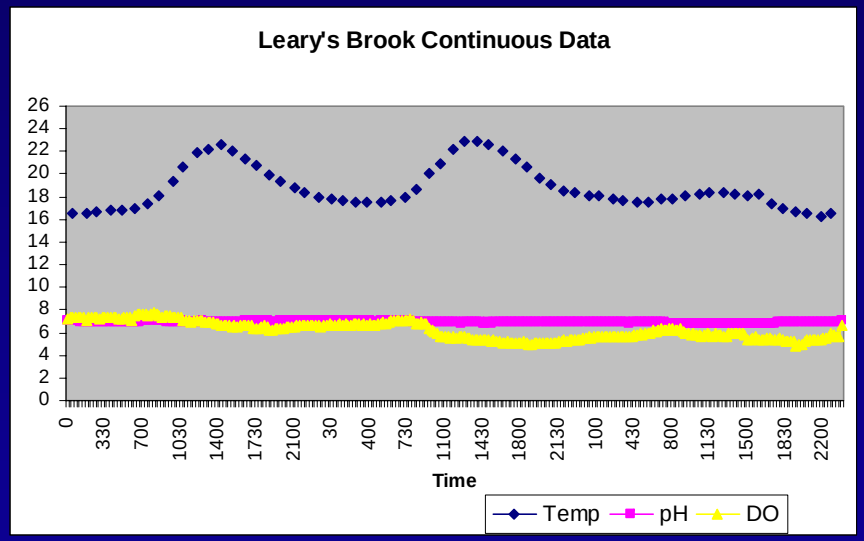
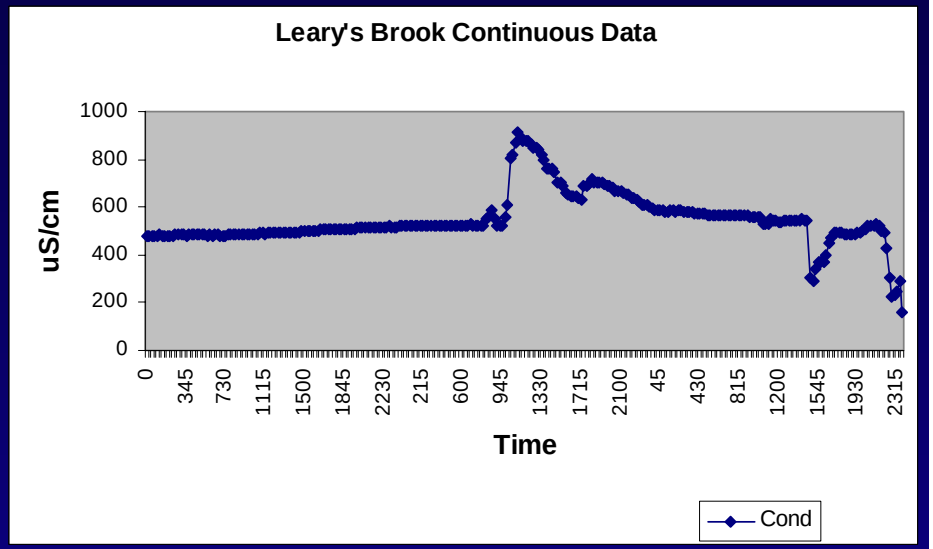
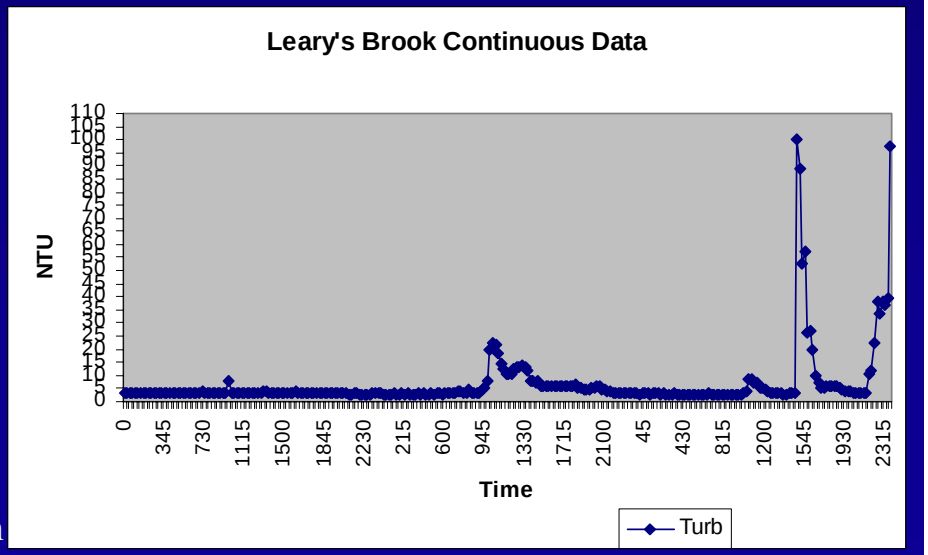
Reaction to Emerging Issues

- On July 24th, 2004 there was a fish kill in Leary's Brook







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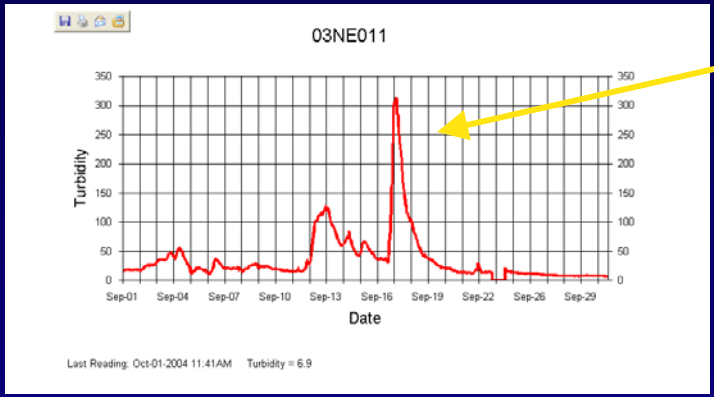
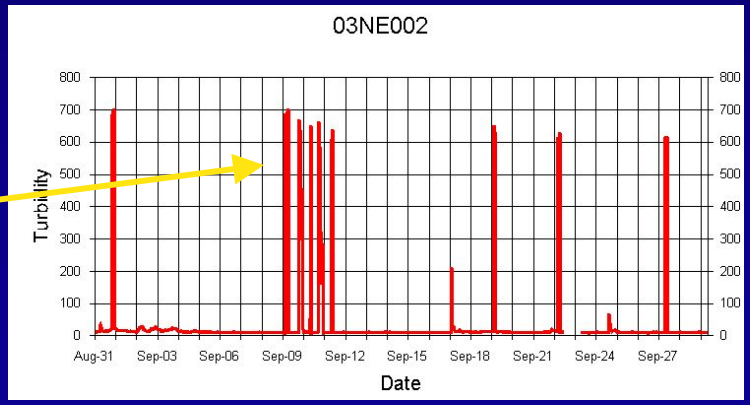
Reaction to Emerging Issues

- Able to identify and address water quality issues much more quickly minimizing the damage to the aquatic ecosystem.



Increased turbidity at Lower Reid Brook station due to surface runoff from construction activity in the ovoid area (Sept. 2004); instituted mitigative measures

Increased turbidity due to dewater activity and failure of settling pond pump at Camp Pond Brook station (Sept-Oct. 2003) during mine construction activities; instituted mitigative measures



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Voisey's Bay Nickel Company Limited
A subsidiary of Inco Limited

Key Messages / Path forward

- Continue to provide high quality data and reporting to industry and the general public
- Continue to use as a regulatory tool for all projects that impact water quality
- Continue to partner with industry to expand the real-time water quality network in NL
- Continue to apply mitagative interventions to emerging water quality events on a proactive basis

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Key Messages / Path forward

- Improve quality assurance/quality control program
- Work on regression analysis and extrapolation to other parameters of interest
- Incorporate an alarm system with the real-time instrumentation to alert owners/operators of issues with water quality
- Incorporate the ability to take grab samples with an autosampler triggered by the real-time instrumentation

Questions ??

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