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# **Building a Data and Hardware Management System for the National Automated Network**

**Real-Time Water Quality Monitoring Workshop 2009  
St. John's, Newfoundland and Labrador  
Denis Parent and Daniel Bastarache  
Water Quality Monitoring and Surveillance - Atlantic  
June 16-17, 2009**

# Outline - Key Points

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- Automated Data Management
  - Real-time capability
  - Data correction and archiving data
  - Data display
- Hardware Management
  - Managing hardware components
  - Station and deployment records
  - Calibration and maintenance records

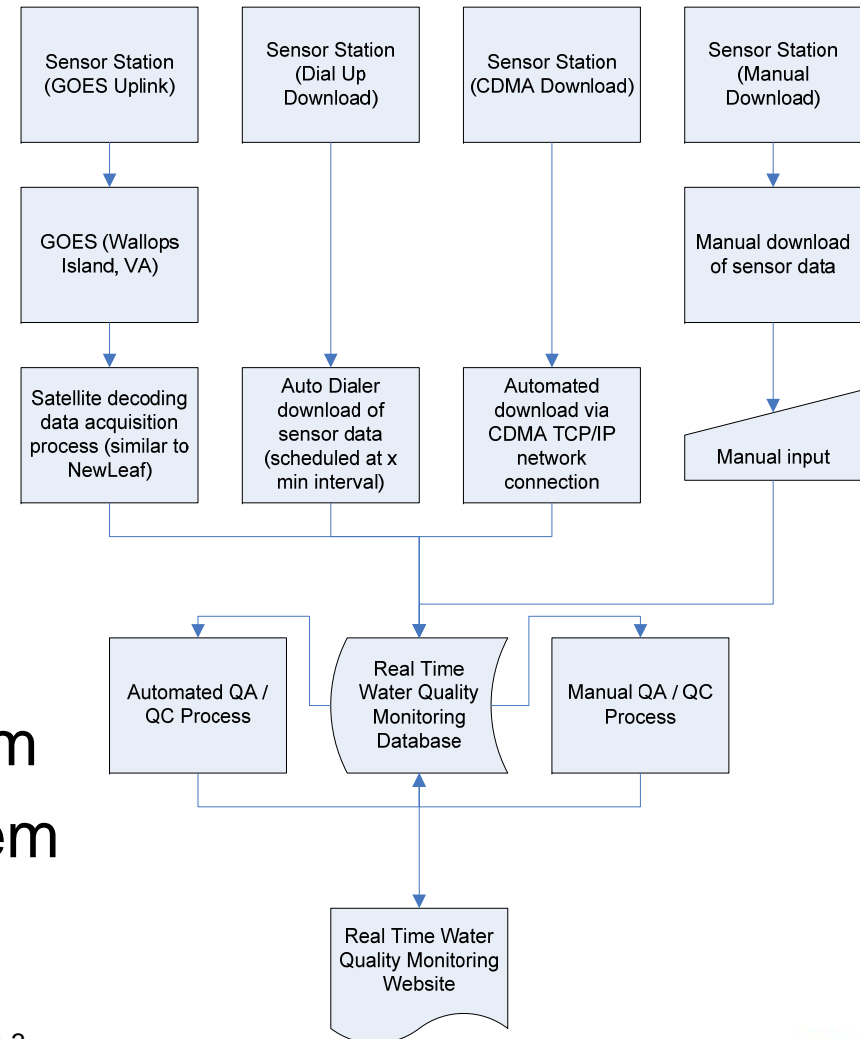
# Automated Data Management

## Challenges

- Characteristics of time-series data
- Volume of data
- Different data formats (e.g. different loggers, communication systems)

## Opportunities

- Existing WSC real-time system
- Success of NL real-time system
- Fraser River Buoy



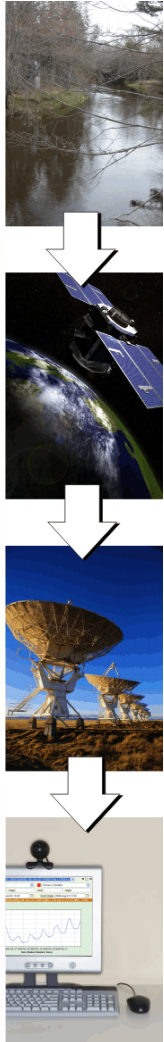
# Automated Data Management

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## Current data management system

- Database developed and tested in the last two years primarily with Atlantic stations
- Raw data from 17 stations currently being transferred to national automated database located on server in Pacific region
- Access to data available to EC staff internally, and externally to partners (e.g. NS Environment, DFO) through password protected website
- Limited to sites that are co-located with Water Survey of Canada stations
- Work underway to bring additional stations (e.g. Quebec sites) on-line

# Real-time Capability



***Data Management System needs to be dynamic with constant updates and have the ability to import data from multiple sources***

- Near real-time measurements
- Data from multiple stations
- Convert data in any format to a standard format for populating database
- Web-reporting tool that can draw data from the database to present in graphical or tabular format

# Real-time Capability



## Short-term goals

- Move data access outside the firewall
- Connect additional stations
- Use web-services to get data from sources other than WSC into database

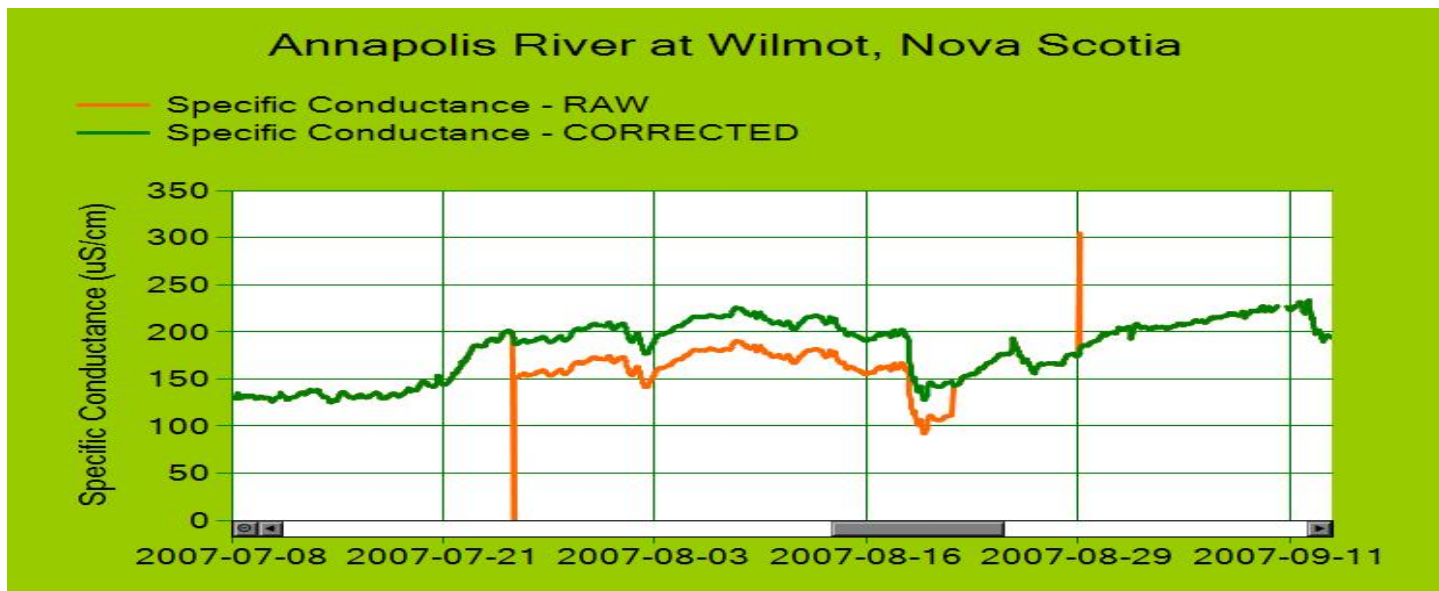
## Long-term goals

- Simple data QA/QC *on-the-fly*
- Email alarms
- Predicting chemical concentrations

# Data Correction and Archiving Data

***Beyond simple QA/QC (e.g. obvious outliers), there is a need to validate and correct raw data and store results***

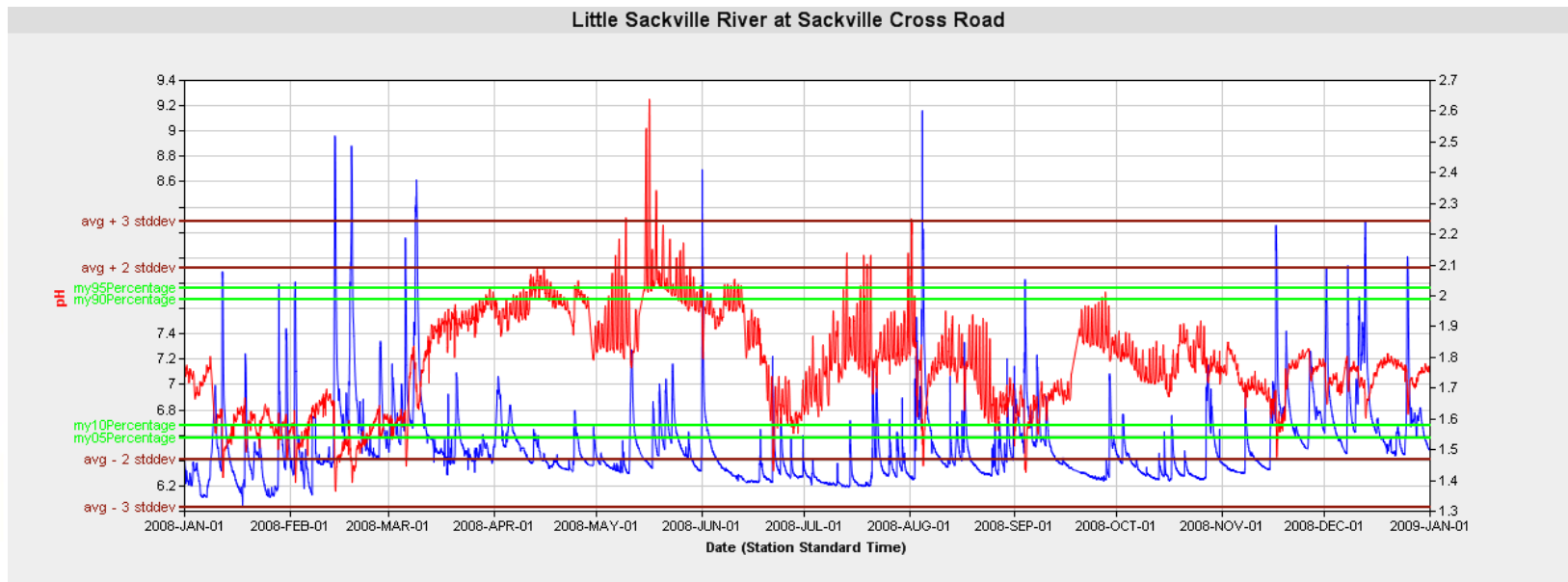
- Database is set up to accept corrected values
- Codes required to indicate level of QA/QC
- Need an interface to correct data and/or ability for the use of external time-series software such as Aquarius used by WSC and USGS to connect to database



# Data Correction and Archiving Data

***Raw and final corrected data needs to be archived in accessible formats for user downloads***

- Raw and corrected data (at monitoring interval)
- Summary statistics (hourly, daily, weekly, monthly...)
- Access to meta-data, such as QA/QC validation codes





# Data Correction and Archiving Data

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## Short-term goals

- Fully document data correction procedures
- Develop national validation codes
- Connect external correction software to database

## Long-term goals

- Data correction interface for database
- Data extraction tool for web-site to download raw and processed data externally

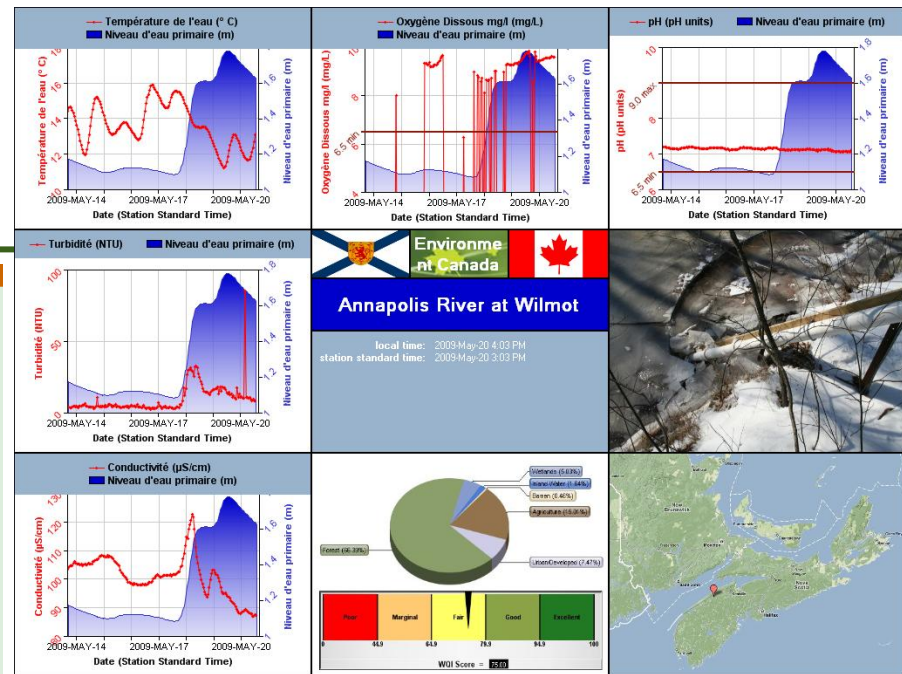
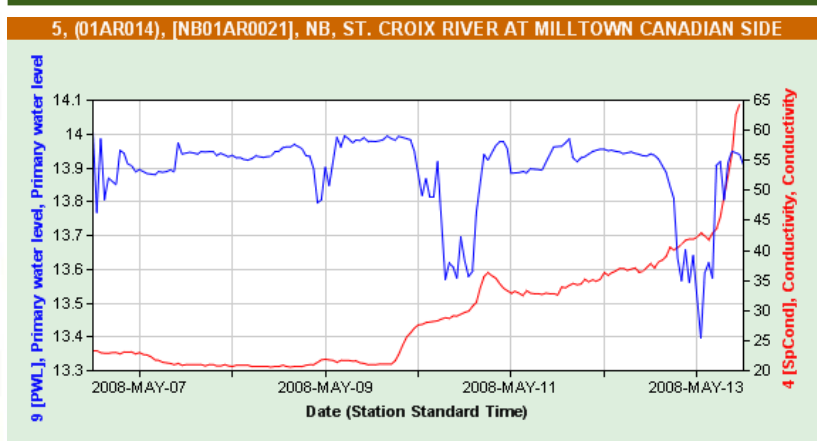
# Data Display

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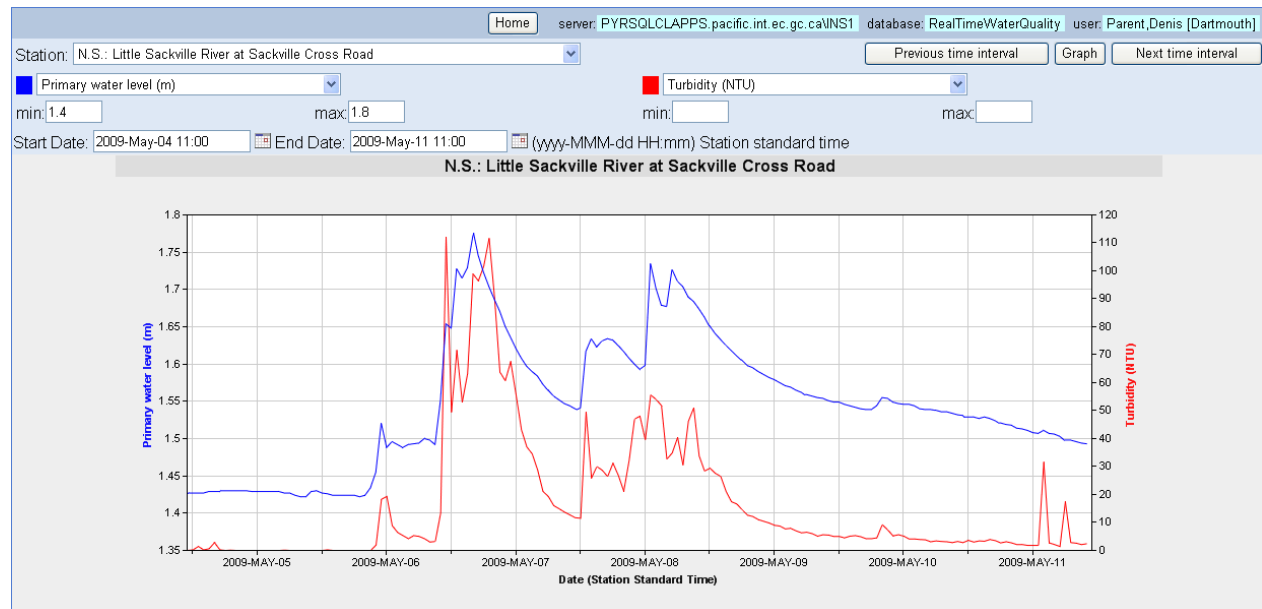
***Raw data must be displayed in near real-time for the most benefit from automated monitoring***

- Internal website display – yes 😊
- Display screens in high traffic areas for program information and early warning – yes 😊
- External website for the general public – not yet 😞

# Data Display



## Current EC displays



# Hardware Management

- User Needs
  - Track inventory, assess performance of sondes and sensors, enable reports, document station visits and deployments, track maintenance and calibrations, etc.
- Monitoring components included
  - Stations
  - Dataloggers
  - Sondes and Sensors
  - Sonde Set-ups
  - Deployments
  - Field Visits
  - Calibration and maintenance



# Managing hardware components

## Station Information

Data Loggers Deployments Field Visits Offices Sensors Setups Sondes **Stations** Technicians VMVs

6 of 21 Search Home server: PYRSQLCLAPPS.pacific.int.ec.gc.ca/NS1 database: RealTimeWaterQuality user: Parent,Denis [Dartmouth]

Station ID: 17  
 WSC ID: 01DC005  
 ENVIRODAT ID: NS01DC0001  
 Province: NS  
 Name (en): Annapolis River at Wilmot  
 Name (fr): Annapolis River at Wilmot  
 Description (en): Annapolis River at Wilmot, Nova Scotia  
 Description (fr): Annapolis River at Wilmot, Nova Scotia  
 Longitude: -65.029722  
 Latitude: 44.949722  
 Time Zone: AST, Atlantic Standard Time, UTC - 4h  
 Active Indicator:   
 Show in display application:   
 Creation Date \*: 2006-08-03 10:13:00 AM

[Edit](#) [Delete](#) [New](#)

\* Station Standard Time

Data Loggers Deployments Field Visits Offices Sensors Setups Sondes **Stations** Technicians VMVs

Sonde ID	Serial No	Asset No	Service Start Date *	Service End Date *	Deployment Start Date *	Deployment End Date *
3	SN070200044961	J82282	2007-Mar-31 00:00		2008-Sep-19 12:03	2008-Sep-23 11:00
8	SN060300043804	J82130	2006-Mar-01 00:00		2008-Oct-03 10:35	2008-Nov-14 11:30
1	SN060300043821	J82131			2008-Nov-14 12:15	2009-Mar-17 11:00
14	SN060300043807	J82132	2006-Mar-31 00:00		2009-Mar-17 12:00	2009-Apr-28 12:00

# Managing hardware components

## Sonde and sensor information

Data Loggers Deployments Field Visits Offices Sensors Setups **Sondes** Stations Technicians VMVs


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 server: PYRSQLCLAPPS.pacific.int.ec.gc.ca\INS1 database: RealTimeWaterQuality user: Parent,Denis [Dartmouth]

Sonde ID	14
Serial No	SN060300043807
Asset No	J82132
Sonde Type	Hydrolab: Datasonde 5X
Service Start Date *	2006-Mar-31 00:00
Service End Date *	
Warranty Expire Date *	2008-Mar-31 00:00
Memory Size	
Number of Ports	5

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\* Station Standard Time

Data Loggers Deployments Field Visits Offices **Sensors** Setups **Sondes** Stations Technicians VMVs

	Sensor ID	Serial No	Asset No	Service Start Date *	Service End Date *
<input type="checkbox"/>	84	060300104459		2006-Mar-31 00:00	
<input type="checkbox"/>	85	060100103866		2006-Mar-31 00:00	
<input type="checkbox"/>	86	060301000922		2006-Mar-31 00:00	2008-Sep-23 15:04
<input type="checkbox"/>	87	060300104486		2006-Mar-31 00:00	
<input type="checkbox"/>	88	0603000000363		2006-Mar-31 00:00	
<input type="checkbox"/>	106	080701003853		2008-Sep-22 11:54	
<input type="checkbox"/>	107	060300104527		2006-Mar-31 12:00	

# Station visits and deployment records

Tracks station visits and deployments by sonde or by station

- Sonde deployment history
- Station deployment history
- Additional reports could be developed

The screenshot shows a PDF document titled "SondeDeploymentHistory.pdf" in Adobe Reader. The document content is as follows:

Sonde Deployment history		
sonde ID: 13	asset number: 382116	serial number: SN060300043819
model: Datasonde 5X	manufacturer: Hydrolab	
start date:		
deployment ID: 145	start date: 2008-Sep-18 03:10 PM	end date: 2008-Oct-16 06:20 PM
sonde deployed at station: Bear River at St.Margarets		
station description: Approximately 50 m upstream of hwy 16, Kings Co.		
province: Prince Edward Island		
deployment ID: 146	start date: 2008-Oct-17 07:52 AM	end date: 2008-Dec-01 12:56 PM
sonde deployed at station: Bear River at St.Margarets		
station description: Approximately 50 m upstream of hwy 16, Kings Co.		
province: Prince Edward Island		
deployment ID: 147	start date: 2008-Dec-02 09:13 AM	end date: 2009-Mar-11 12:33 PM
sonde deployed at station: Bear River at St.Margarets		
station description: Approximately 50 m upstream of hwy 16, Kings Co.		
province: Prince Edward Island		
deployment ID: 167	start date: 2009-Mar-11 06:30 PM	end date:
sonde deployed at station: Bear River at St.Margarets		
station description: Approximately 50 m upstream of hwy 16, Kings Co.		
province: Prince Edward Island		

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# Calibration and maintenance records

- Currently using standard electronic form in Excel
- Need to have a standard form that can input data for calibration and maintenance into hardware management database
- Information from calibrations will be readily available for corrections if contained in a standard format in database





# Path Forward – Key Points

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- Automated Data Management
  - **Make data (graphing functions and data download) available outside the firewall**
  - Use of web-services to get data from sources other than WSC co-located sites
  - Connect data correction software to the automated database to enable corrected data fields to be populated (in conjunction with documentation of data QA/QC procedures)
- Hardware Management
  - Integrate calibration and maintenance records into automated database
  - Encourage users to fill in data and keep up to date
  - User feedback to the development team to improve functionality

# Questions?

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**Daniel Bastarache**

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