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
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Water Quality Monitoring and Surveillance - Atlantic
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Outline - Key Points

- 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

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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

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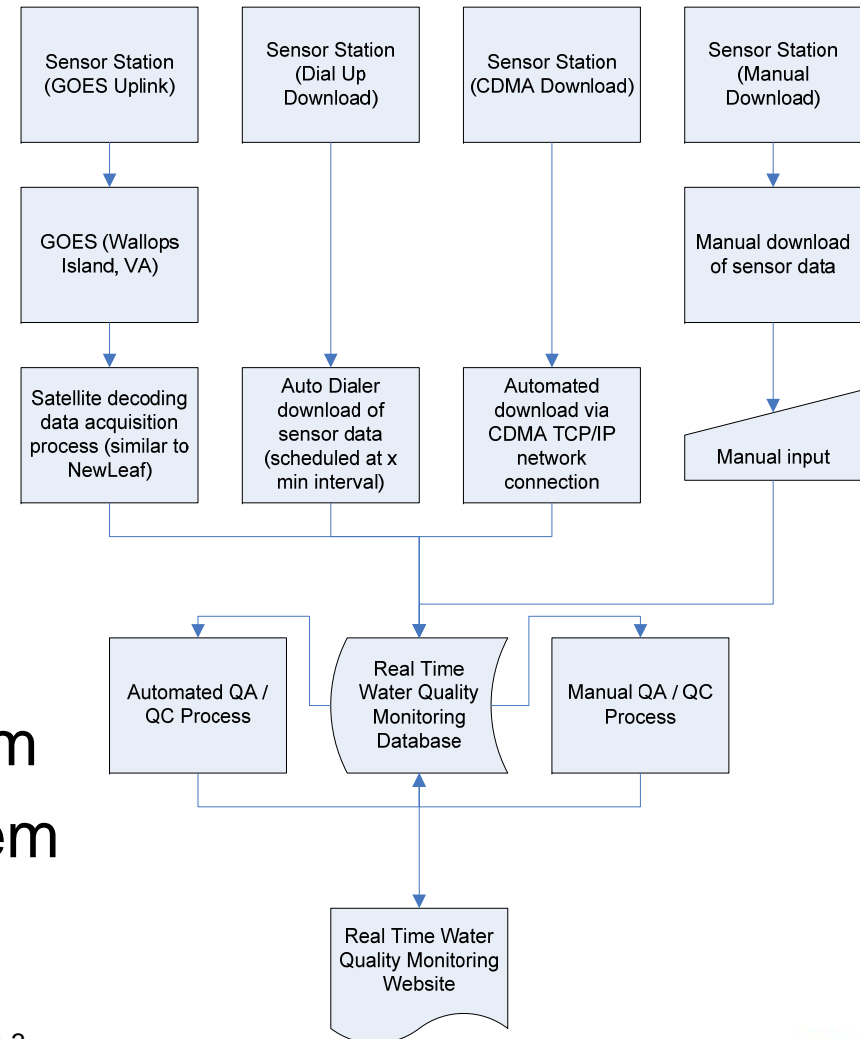
Automated Data Management

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

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Real-time Capability
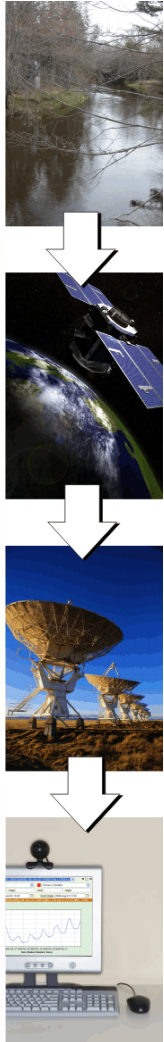
Data Management System needs to be dynamic with constant updates and have the ability to import data from multiple sources

- 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

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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

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Data Correction and Archiving Data

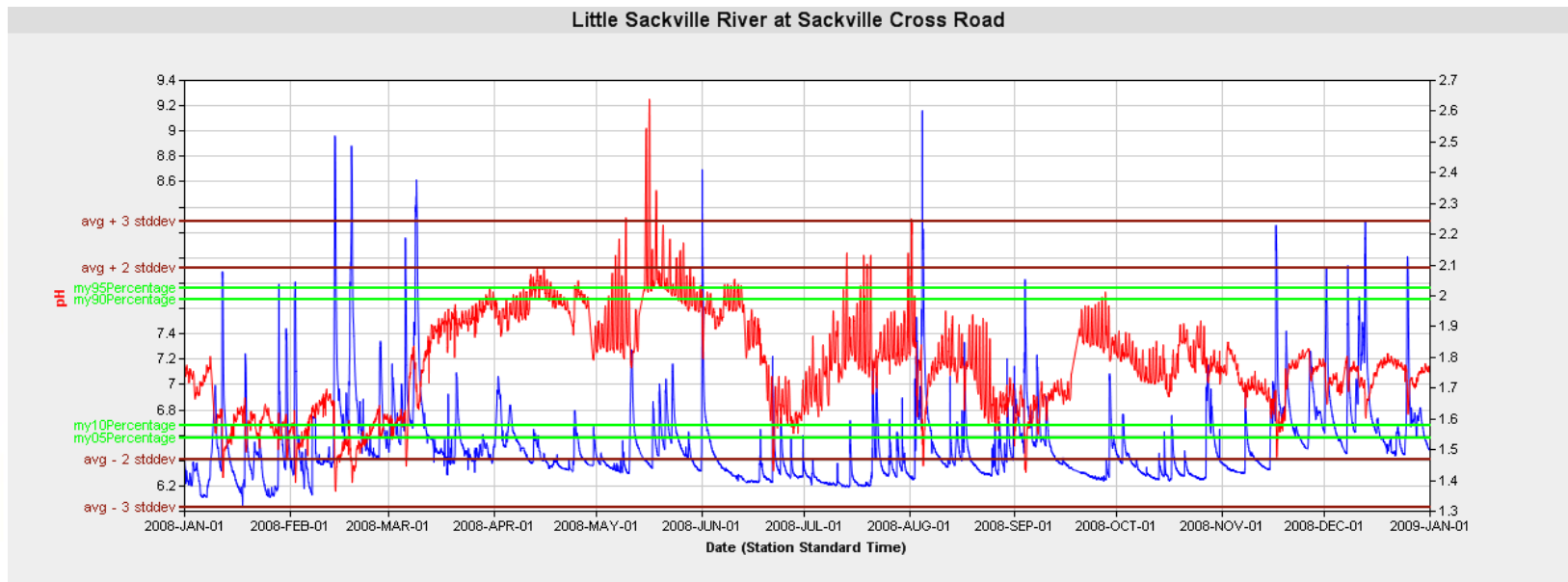***Beyond simple QA/QC (e.g. obvious outliers), there is a need to validate and correct raw data and store results***

- 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

Annapolis River at Wilmot, Nova Scotia
Specific Conductance - RAW
Specific Conductance - CORRECTED
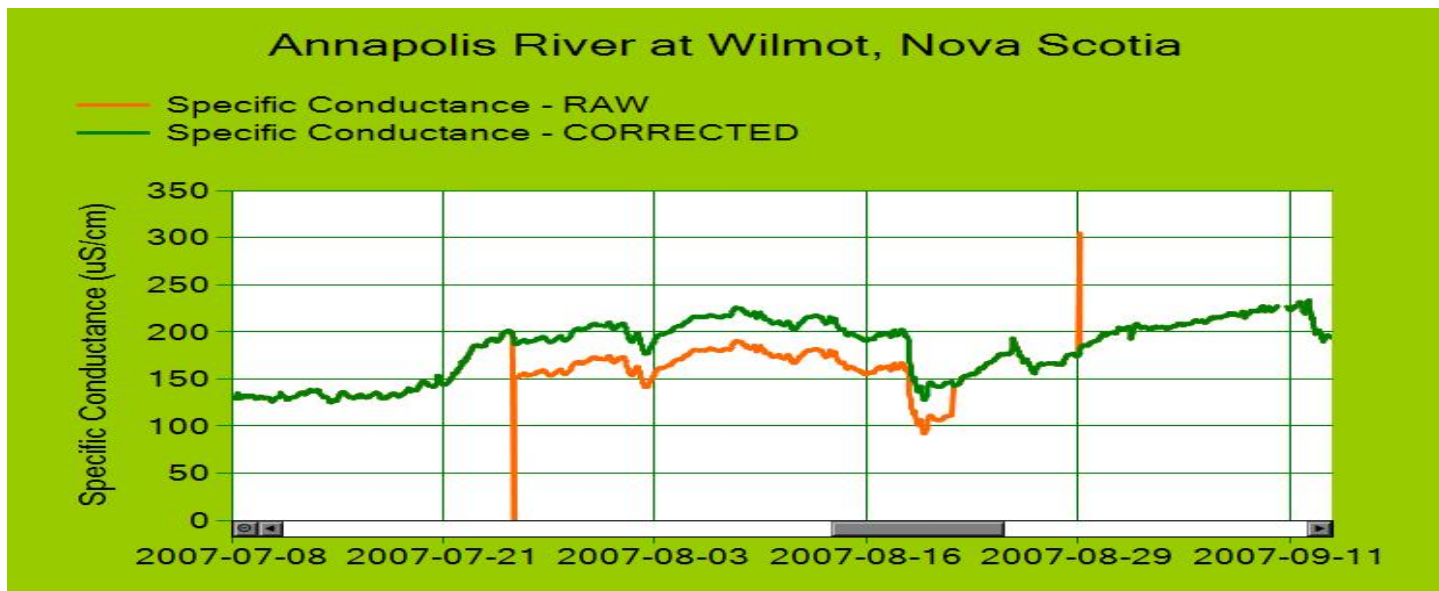
Data Correction and Archiving Data

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

Little Sackville River at Sackville Cross Road

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Data Correction and Archiving Data

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

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Data Display

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 ☹

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Data Display
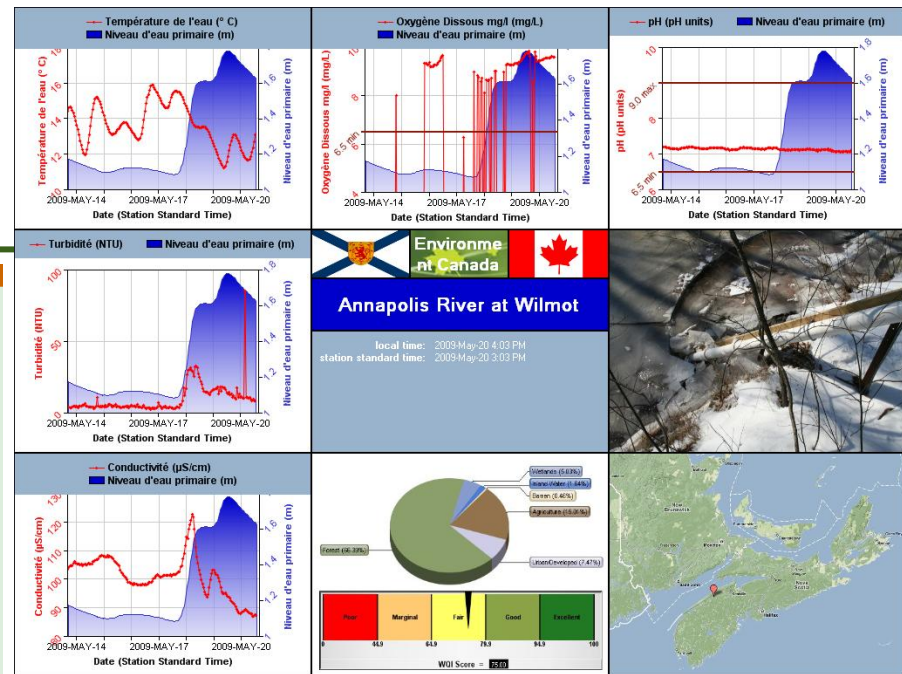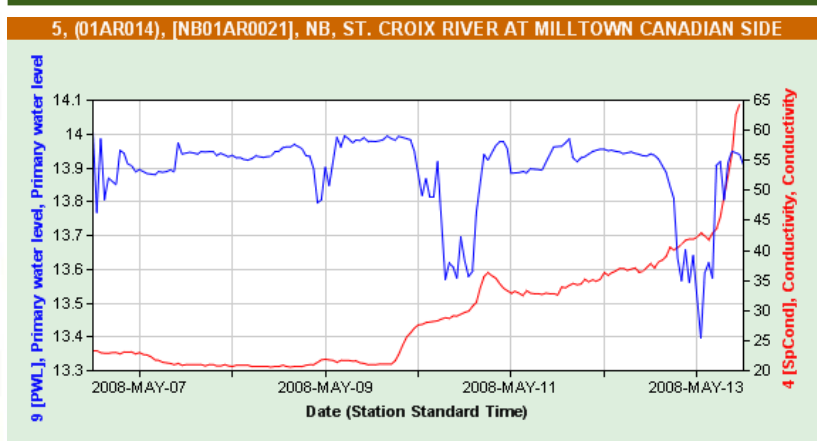
Current EC displays
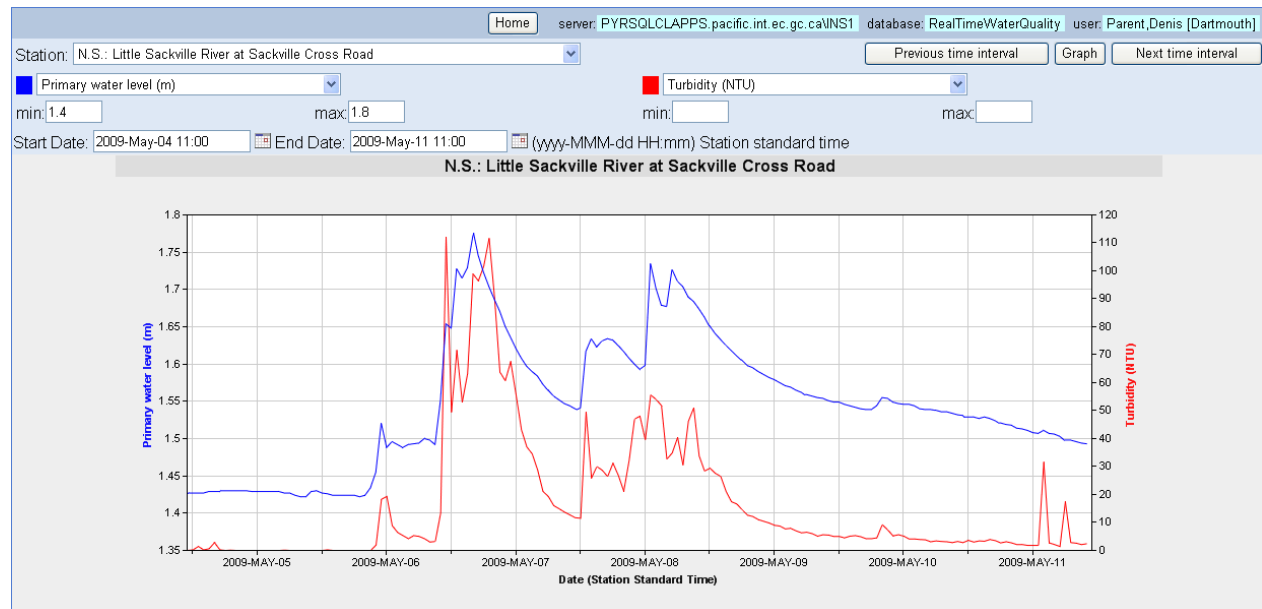
Hardware Management

- 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

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Managing hardware components

Station Information

Managing hardware components

Sonde and sensor information

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

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

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Path Forward – Key Points

- 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

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Questions?

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