Water Data Management in ESRD

Adam Minke & Mike Coffill

Enterprise Data & Information Management
Alberta Environment and Sustainable Resource Development

August 2013
Water Data Group
Near-Real-Time/Historical

Senior Technologist & Supervisor
Karl Runions

Real-Time Data Technologists:
Otto Mahler
Mike Coffill
Zahid Qureshi
Adam Minke
Water Data Group Responsibilities

- Manage the Real-Time Data Collection Systems
- Provide data support for Field Staff
- Provide 24x7 Data Support
- Provide access to Hydro/Met Data
- Archive Historical ESRD Data
Contribution to Goals

- Support River Forecasting
- Support Dam Operation
- Support Irrigation Operation
- Support Agriculture’s Drought-Net Program

- Support risk management of floods and drought
- Support monitoring of health of rivers and lakes
- Support inter-provincial and international apportionment agreement
Data Collection: Working Together

- **Monitoring = Field Activity**
  - Field measurements
  - Equipment installation

- **Data Management = Office**
  - Telemetry decoding
  - Formatting and loading into database
  - Dissemination and archiving

- **Water Operations = Results**
  - Forecasting of flood events
  - Water Management
Realtime Data Communications

- Satellite DCPs (450)
- Phone Loggers (190)
- SCADA Data Transfer (20)
- FTP (15)
- Webpage Data Mining (36)
- Internal Database Transfer (250)
- Radio/CDMA (40)
- WISKI
- Bulk Historical Data Products
Data Sources

Distribution of Real-Time Data Sources

- Water Survey of Canada (40%)
- ESRD (32%)
- Environment Canada (13%)
- TransAlta Utilities (5%)
- USA (3%)
- ARD (7%)
Access to Other Historical Data Sources

- MSLL (Miscellaneous Streams and Lake Levels)
- Manual Snow Courses Data
- GOWN-Groundwater database
- Water Quality Information
- WSC Historical
- MSC Historical
- Others
Monitoring Locations

- Hydrometric
- Lakes
- Meteorological
- Snow
- Water Quality
- Ground Water
Hydrometric: Federal / Provincial

- **Hydrometric Agreement**
  - ~450 stations
  - Water Survey of Canada is main operator
  - ~45 stations operated by ESRD
  - 400+ with telemetry
  - recorders, data loggers, staff gauges

- **Parameters:**
  - River Stage
    - Flow / Discharge
  - Reservoir & Lake Level
  - Reservoir Gate Settings
  - Some WQ physical parameters
Lake Monitoring

- ~ 250 lakes
- Routinely visited by ESRD monitoring staff
  - Some have staff gauges
  - A few have recorders
- Many collected for 30+ years
- Readings also submitted by trained local observers
Meteorological

- ~ 500 Stations
- ESRD
- Alberta Agriculture & Rural Development
- MSC
- Parameters:
  - Precipitation
  - Air Temperature
  - Snow Depth & Water
  - Humidity
  - Wind speed & direction
  - etc.
Snow Pillow Sites: Near-Real-Time

- 17 Mountain Sites
  - 6 Operated by US SnoTel Program
- 4 Plains Area Sites
Snow Course Sites: Mountains & Plains
Water Quality Monitoring

Near-Real-Time
- 5 to 10 stations with telemetry, depending on time of year
  - DATASONDE

Overall Program
- ~400 WQ sites every year
- Mostly short or medium term only, depending on project
- Long Term River Network
  - 28 monitored
GOWN: Groundwater Observation Well Network

- ~150 water wells with continuous recorders
- 25 water wells with frequent manual observations
- Currently ~40 wells with GOES telemetry, with more scheduled in the future
WISKI: Managing Water Data
WISKI Explorer
WISKI Explorer

<table>
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<tr>
<th>Station Numbers by Site and Characteristic</th>
<th>AB / Alberta</th>
<th>Hydrometric</th>
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<td>Callum Creek at Waldo's Ranch</td>
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Ready, 2528 Records
WISKI Explorer
Database Structure: Timeseries

- WISKI stores data in separate timeseries
- Unique timeseries for each layer of data
- Each layer is transparent & allows edits to be visible

Timeseries Prefixes & Naming:

- O. Original
- V. Validated
- P. Production
- C. Calculated
- A. Aggregated
- S. Statistical

Examples:
- O.NRT
- O.Readings-Gauge
- O.Corrections-Datum
Data Availability

• We acquire data from many sources to support operations
• Many operated through partnerships with other agencies
  – Water Survey Canada
  – Alberta Agriculture and Rural Development
  – TransAlta Utilities, etc.
• ESRD only owns and operates a portion of these stations
  ~100 Met Stations, ~ 45 Hydro Stations
• Collaboration vital for supplying data & supporting our operations
  – ESRD primary focus is near-real-time data
Alberta’s River Basin Website

http://www.environment.alberta.ca/apps/basins

• Near-real-time data
  – Water Level & Streamflow
  – Reservoir & Lake levels
  – Snow
  – Meteorological
  – Etc.
Data Availability: Our Role

- Our mandate is to only QA/QC, manage, and distribute historical data from stations owned and operated by ESRD.
  - ~100 Met Stations, ~ 45 Hydro Stations, Lake Levels
- When third party data is requested, Data Management prefers to re-direct them to the original sources for the final, official archive.
  - Example: WSC publishes historical stream flow
- If not available, we provide the preliminary data
  - Minimum QA/QC processes for internal purposes
  - Subject to revision
Data Requests: Rivers

- **Gauge Height (Water Level)**
  - P.NRT (15 minute & before corrections)
  - C.Merged (15 minute & after corrections)
  - A.60 (hourly)

- **Streamflow**
  - C.Merged-NRT (15 minute)
  - A.60 hourly
  - A.DayMean
  - A.MonthMean
  - A.YearMean
Oldman River near Lethbridge
Water Level
Rating Curve Management
SKED
Oldman River near Lethbridge Streamflow Aggregates
Oldman River near Lethbridge
Streamflow: Tabular View

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<th>Date</th>
<th>Time</th>
<th>Stream Flow [m³/s]</th>
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Data Management: Quality Codes

- Each data point has quality code
- Users can define automatic quality flags
- Edited data maintains audit trail
  Tracks:
  - User
  - Date edited
  - Time period
  - Descriptions
- Quality codes displayed when graphing
Data Requests: Precipitation

- Precipitation
  - NRT (15 min) accumulated
  - NRT (15 min) de-accumulated
  - Hourly Total
  - Day Total
  - Month Total
  - Year Total

- Snow
  - Snow Pillow
  - Snow Survey (program began ~1970)
    - Depth (once per month)
    - Snow Water Equivalent
Data Requests:
Snow Pillow
Data Requests: Snow Course

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Data Requests: MSLL

- Miscellaneous Stream and Lake Levels
- ~250 active Lakes monitored
  - Many discontinued Lakes
- WL measured at least 3 times per year
- 30+ years of data
- Data not available on web

- Miscellaneous Steams monitored by ESRD
  - Non-recording sites for projects, etc.
  - Hundreds of sites
Resources & Contacts

- Alberta’s River Basin Website
  http://www.environment.alberta.ca/apps/basins
- ESRD Surface Water Quantity Data Requests
  AENV.dmNRT@gov.ab.ca
  adam.minke@gov.ab.ca
- Alberta Agriculture and Rural Development
  http://agriculture.alberta.ca/acis/
- Alberta Groundwater Observation Well Network (GOWN)
  http://environment.alberta.ca/apps/GOWN/
- ESRD Water Quality Data Requests
  swq.requests@gov.ab.ca
- Water Survey of Canada
  www.ec.gc.ca/rhc-wsc
- Meteorological Service of Canada
  http://climate.weather.gc.ca/index_e.html
  climate.services@ec.gc.ca
Type 4 River Station: NRT Water Level (HG)