

Annual Weather Station Maintenance Report

2016



Government of Newfoundland & Labrador
Department of Environment and Climate Change
Water Resources Management Division

Prepared by:

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Overview

The Department of Environment and Climate Change’s Water Resources Management Division (WRMD) operates and maintains a network of automated weather stations across the province. Reliable weather data is needed to support water resources management decisions and policy development. This network (see table below) is maintained by Environmental Scientists within WRMD.

Automated Weather Stations in Operation (2016)

	Camera	Snow Monitoring	Meteorological
Pippy Park in St. John's			✓
Exploits River at Badger East of Stadium	✓		✓
Sandy Lake near Birchy Narrows (Camp 55)	✓	✓	✓
Humber River At Humber Village Bridge	✓		✓
Upper Humber River above Black Brook	✓	✓	✓
Churchill River at End of Mud Lake Road	✓		✓
Muskrat Falls MET	✓		✓
Waterford River at Kilbride	✓		
Exploits River at Badger Steps	✓		
Steady Brook 470 meters above Confluence to Humber River	✓		
Churchill River Above Grizzle Rapids	✓		

Purpose

Annual maintenance and accuracy checks are necessary to ensure not only the longevity of the equipment but, more importantly, to ensure the accuracy and validity of the data that is being reported by the stations. This is necessary to ensure ongoing program reliability, effectiveness and delivery of high quality results for the existing automated weather station network.

Pippy Park Weather Station

Station Details:

- Station Identification: NLENCL0001
- Station Installed: August 2004
- Parameters measured every fifteen minutes and downloaded three times daily:
 - Air Temperature
 - Relative Humidity
 - Precipitation
 - Wind Speed
 - Wind Direction
- Site Selection Rationale: Pilot weather station test site, verified that this particular technology can be integrated without issues within our existing infrastructure. Microclimate exists at this site due to the height of surrounding trees and development in close proximity to the weather station.
- Date Visited: November 2nd, 2016
- Location: N 47° 35' 16.7" W 52° 44' 1.3"
- Elevation: 332 ft

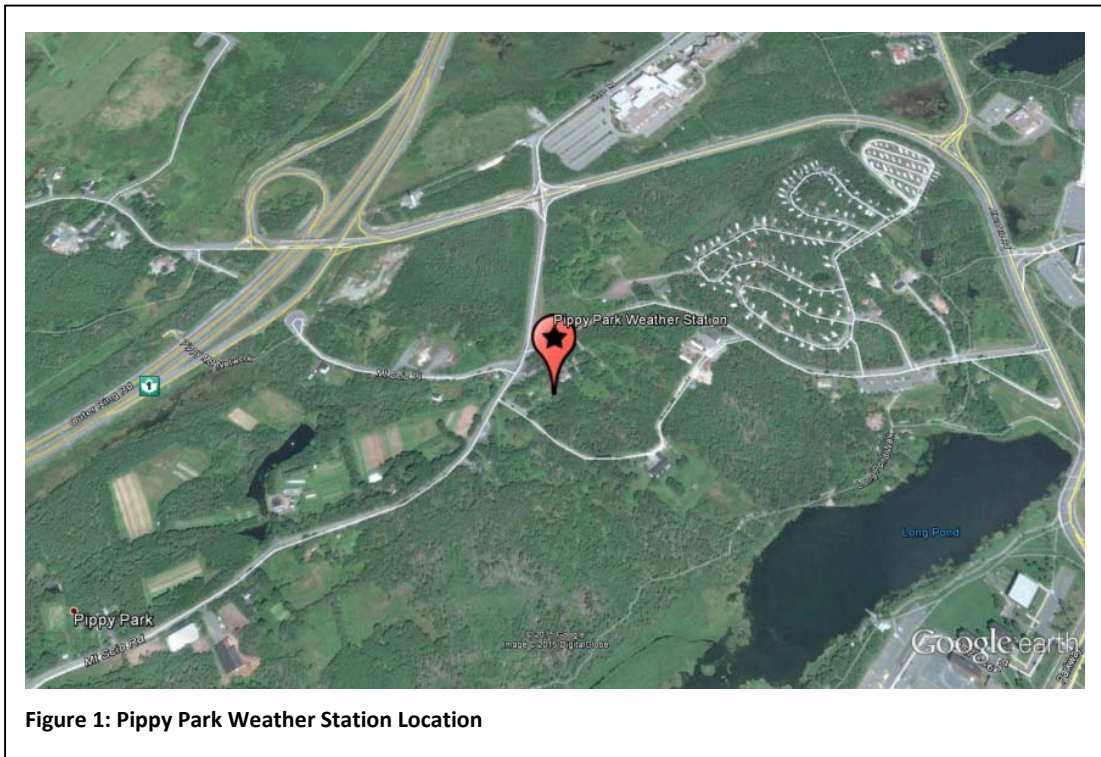


Figure 1: Pippy Park Weather Station Location

Tasks accomplished:

- Datalogger:
 - Replaced desiccant
- Anemometer:
 - Replaced the bearings, O-rings

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- Tipping Bucket
 - Verified tipping bucket was within calibration and no debris present
- Air Temperature/Humidity
 - Sensor calibrated and verified

Follow-up tasks required:

- WRMD staff to remove excess vegetation
- Purchase new Pipe for Tipping Bucket

Exploits River at Badger East of Stadium

Station Details:

- Station Identification: NLENCL0002
- Station Installed: September 2008
- Image taken and transmitted every hour
- Parameters measured every fifteen minutes and downloaded three times daily:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale: WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the community of Badger in the Exploits River Basin.
- Date Visited: July 19th, 2016
- Location: N 48° 58' 29.83" W 56° 2' 4.43"
- Elevation: 289 ft

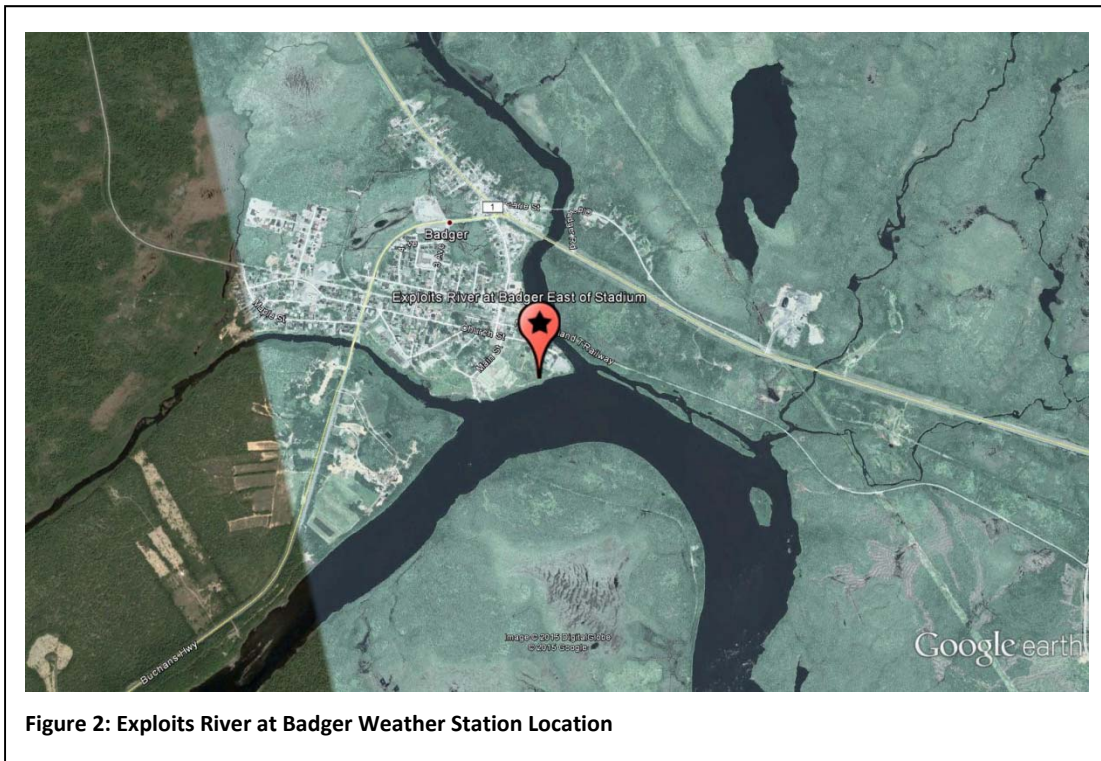


Figure 2: Exploits River at Badger Weather Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000
 - Replaced desiccant
- Camera:

- Model: CC640
 - Cleaned enclosure and replaced desiccant
- Anemometer:
 - Model: RM Young Alpine
 - Serial: Young 05178A Rev D
 - Replaced the bearings, O-rings
 - Bottom propeller magnet was hard to remove from the propeller shaft; will need to be replaced next year
- Temperature/Relative Humidity:
 - Model: HMP45C
 - Sensor chip was in good working order no need to be replaced
 - Cleaned and calibrated Temperature/Relative Humidity chip
 - LiCl: 11.19 K2SO4: 95.67 Temperature 32
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50
 - Serial: C8767
 - Replaced SR50 transducer due to pitting and peeling
- Barometric Pressure:
 - Model: Young 61205V
 - Serial: BP05005
 - Model 61205V barometer requires no regular maintenance
- Precipitation
 - Model: Texas Electronics TE525WS
 - Cleared funnel and bucket portion of the unit for debris
- Solar Radiation
 - Model: Kipp & Zonen SP LITE Pyranometer
 - Serial: 080135
 - Cleaned lens
- Compound
 - Changed locks on the compound, camera, battery and datalogger enclosure

Follow-up tasks required:

- Order a new propeller shaft
- Regular scheduled maintenance

Sandy Lake near Birchy Narrows (Camp 55)

Station Details:

- Station Identification: NLENCL0005
- Station Installed: November 2010
- Image taken and transmitted once a day at 12pm NST
- Parameters measured every fifteen minutes and downloaded three times daily:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Snow Water Equivalent (TI)
 - Snow Water Equivalent (K)
 - Soil Moisture
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale: Snow monitoring involves determining the extent of snow cover (SE) and its snow water equivalent (SWE). SWE is a measurement of both the depth of snow and its density. It represents the depth of water that would result if the entire snow cover melted at once. Snow monitoring provides essential information for flood forecasting, hydropower generation, and for climate change adaptation in the province. WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the communities of Deer Lake and Steady Brook in the Humber River Basin.
- Date Visited: July 20th, 2016
- Location: N 49° 16' 28.30" W 56° 51' 5.80"
- Elevation: 393 ft

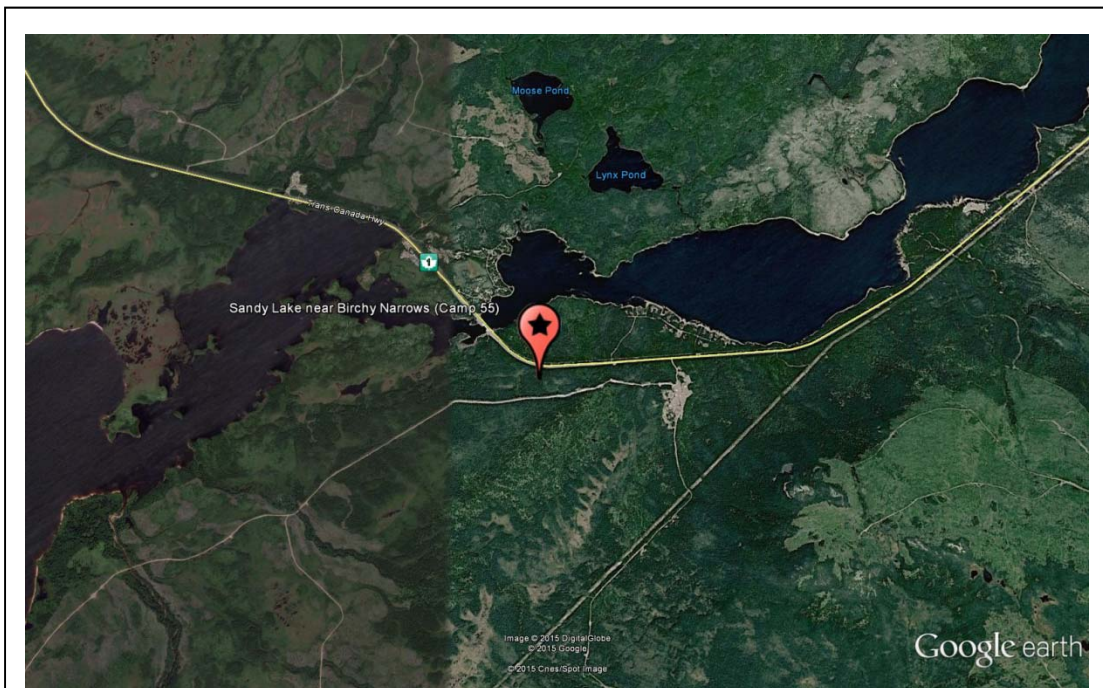


Figure 3: Sandy Lake near Birchy Narrows (Camp 55) Snow Monitoring Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000
 - Replaced desiccant
 - 3.486V on internal battery
- Camera:
 - Model: CC640
 - Serial: 01654
 - Cleaned enclosure and replaced desiccant
- Anemometer:
 - Model: RM Young 05103-10
 - Serial: Young 05178A Rev D
 - Replaced the bearings, O-rings
- Temperature/Relative Humidity:
 - Model: HC-S3
 - Cleaned sensor - note: this is an old sensor that is no longer manufactured
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50A
 - Serial: 2999
 - Replaced SR50 transducer due to pitting and peeling
 - Sensor is working properly but did note the degradation of the sensor housing and left an extra sensor at the west coast office for switch out if there is an issue with sensor performance
- Barometric Pressure:
 - Model: Young 61302V
 - Serial: BPA1405
 - Checked the QDP Hydro Vent hydrophobic filter. The 61302V is not field serviceable nor can it be field calibrated
- Precipitation
 - Model: Texas Electronics TE525WS
 - Serial: 42377-1009
 - Cleared funnel and bucket portion of the unit for debris and balanced sensor
- Solar Radiation
 - Model: Kipp & Zonen SP LITE Pyranometer
 - Serial: 091169
 - Cleaned lens
- Compound
 - Battery Box requires sanding and Tremclad paint to prevent the enclosure to rust (See Figure 4)
 - Changed locks on the compound

Follow-up tasks required:

- Battery Box requires sanding and Tremclad paint to prevent the enclosure to rust

- Lubrication is required on the drop pins for the tower
- Regular scheduled maintenance



Figure 4: Battery Box Enclosure Rust conditions at Sandy Lake near Birchy Narrows (Camp 55)

Humber River At Humber Village Bridge

Station Details:

- Station Identification: NLENCL0003
- Station Installed: September 2009
- Image taken hourly and transmitted three times daily
- Parameters measured every fifteen minutes and downloaded three times daily:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale: WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the communities of Deer Lake and Steady Brook in the Humber River Basin.
- Date Visited: July 20-21st, 2016
- Location: N 48° 58' 58.21" W 57° 45' 38.04"
- Elevation: 25 ft



Tasks accomplished:

- Datalogger:
 - Model: CR1000

- Replaced desiccant
- Humidity Card was replaced
- Camera:
 - Model: CC640
 - Serial: 01511
 - Cleaned enclosure and replaced desiccant
- Anemometer:
 - Model: RM Young Alpine
 - Serial: Young 05178A Rev D
 - Replaced the bearings, O-rings
- Temperature/Relative Humidity:
 - Model: HMP45C
 - Sensor chip replaced on July 21st due to precipitation on July 20th
 - Calibrated Temperature/Relative Humidity chip
 - LiCl: 11.36 K2SO4: 97.47 Temperature 25.5
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50A
 - Serial: 5808
 - Replaced SR50 transducer due to pitting and peeling
- Barometric Pressure:
 - Model: 65205V
 - Serial: BP05888
 - Model 65205V barometer requires no regular maintenance
- Precipitation
 - Model: Texas Electronics TR-525USW
 - Serial: 49063-109
 - Cleared funnel and bucket portion of the unit for debris
 - Needs replacement in 2017 due to wear
- Solar Radiation
 - Model: Kipp & Zonen SP LITE Pyranometer
 - Serial: 080395
 - Cleaned lens
 - Noted corrosion on mounting arm (See Figure 6), order replacement
- Compound
 - Door is skewed
 - Cross piece on the fence needs replacement
 - Vegetation removal required
 - Changed locks on the compound, camera, battery and datalogger enclosure

Follow-up tasks required:

- Order new precipitation sensor
- Compound needs landscaping
- Order replacement mounting arm

- Regular scheduled maintenance

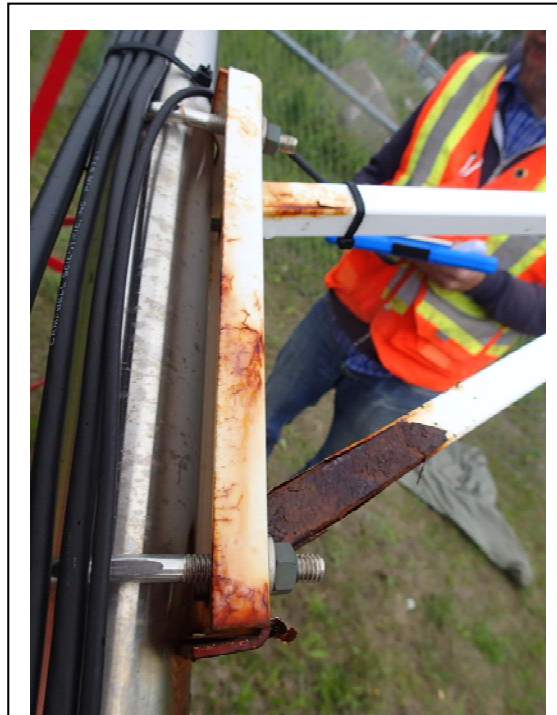


Figure 6: Solar Radiation mounting arm corrosion at Humber River at Humber Village Bridge Station

Upper Humber River above Black Brook

Station Details:

- Station Identification: NLENCL0007
- Station Installed: September 30th 2015
- Image taken and transmitted once a day at 12pm NST
- Parameters measured every fifteen minutes and transmitted every hour:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Snow Water Equivalent (TI)
 - Snow Water Equivalent (K)
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale: Snow monitoring involves determining the extent of snow cover (SE) and its snow water equivalent (SWE). SWE is a measurement of both the depth of snow and its density. It represents the depth of water that would result if the entire snow cover melted at once. WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the communities of Deer Lake and Steady Brook in the Humber River Basin.
- Date Visited: July 21st, 2016
- Location: N 49° 37' 6.24" W 57° 17' 41.20"
- Elevation: 992 ft

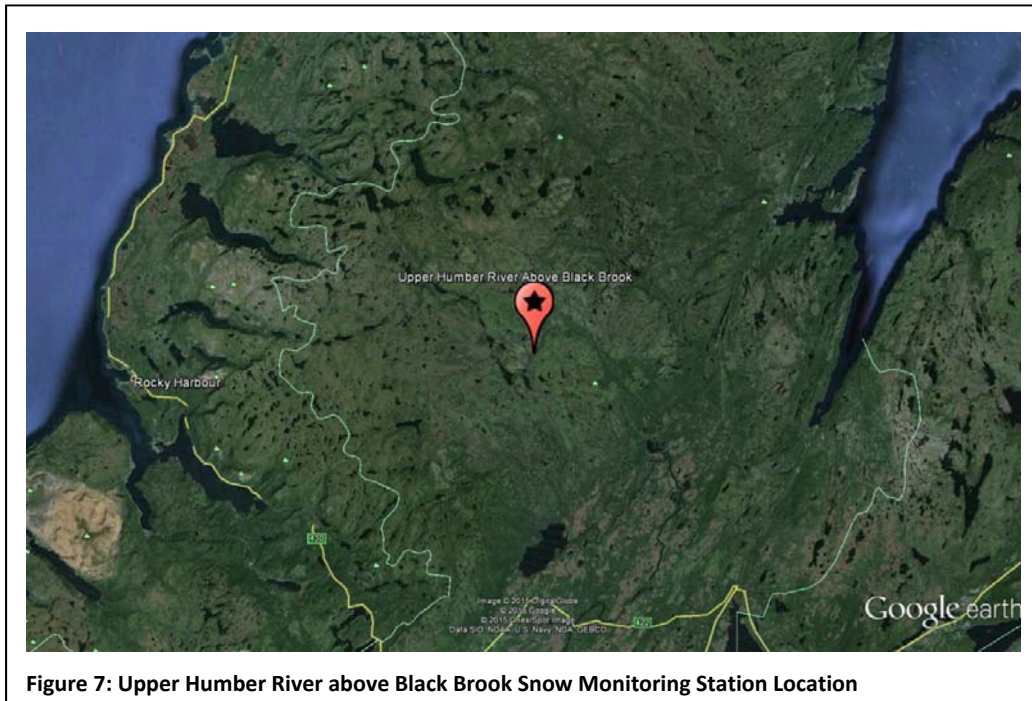


Figure 7: Upper Humber River above Black Brook Snow Monitoring Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000

- Replaced desiccant
- Lithium Battery: 1.8 V needs replacement
- Camera:
 - Model: CC640
 - Serial: 01511
 - Cleaned enclosure and replaced desiccant
- Anemometer:
 - Model: RM Young Alpine
 - Serial: Young 05178A Rev D
 - Bearings replaced - noted corrosion (See Figure 8)
- Temperature/Relative Humidity:
 - Model: HC-S3
 - Cleaned sensor - note: this is an old sensor that is no longer manufactured
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50A
 - Serial: 1670
 - Verified no pitting and peeling present
- Barometric Pressure:
 - Model: 61302V
 - Serial: BPA140
 - Checked the QDP Hydro Vent hydrophobic filter. The 61302V is not field serviceable nor can it be field calibrated
- Precipitation
 - Model: Texas Electronics TR-525USW
 - Serial: 43230-210
 - Cleared funnel and bucket portion of the unit for debris
- Solar Radiation
 - Model: Kipp & Zonen SP LITE Pyranometer
 - Serial: 091168
 - Cleaned lens
- Compound
 - Changed locks on the compound and datalogger enclosure

Follow-up tasks required:

- Order new lithium battery
- Iridium connection not working troubleshooting required
- Regular scheduled maintenance



Figure 8: Anemometer bearing corrosion - Upper Humber River above Black Brook

Churchill River at End of Mud Lake Road

Station Details:

- Station Identification: NLENCL0004
- Station Installed: July 2010
- Image taken and transmitted every hour during winter months (October to May) and once a day at 12pm NST during the summer (June to September)
- Parameters measured every fifteen minutes and downloaded hourly:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale:
 - Snow monitoring provides essential information for flood forecasting, hydropower generation, ice monitoring, wildlife studies, and for climate change adaptation in the province.
 - Captures image of the ice road
 - Provides weather data to better understand water quality data for Churchill River
- Date Visited: July 25th, 2016
- Location: N 53° 20' 15.95" W 60° 11' 21.44"
- Elevation: 4 ft



Figure 9: Churchill River at end of Mud Lake Road Weather Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000
 - Replaced desiccant
- Camera:
 - Model: CC640
 - Cleaned enclosure and replaced desiccant
- Anemometer:
 - Model: RM Young
 - Serial: Young 05178A Rev A 46-07
 - Housing and Bearings replaced
- Temperature/Relative Humidity:
 - Model: HMP45C
 - Sensor chip was in good working order no need to be replaced
 - Cleaned and calibrated Temperature/Relative Humidity chip
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50A
 - Replaced SR50 transducer due to pitting and peeling
- Barometric Pressure:
 - Model: 61302V
 - Serial: BPA1406
 - Checked the QDP Hydro Vent hydrophobic filter. The 61302V is not field serviceable nor can it be field calibrated
- Precipitation
 - Model: Texas Electronics TE-525WS
 - Replaced due to wear
- Solar Radiation
 - Model: Kipp & Zonen SP LITE Pyranometer
 - Cleaned lens
- Compound
 - Vegetation upkeep
 - Changed locks

Follow-up tasks required:

- Regular scheduled maintenance.

Muskrat Falls MET

Station Details:

- Station Identification: NLENCL0006
- Station Installed: July 2014
- Parameters measured every fifteen minutes and downloaded hourly:
 - Air Temperature
 - Relative Humidity
 - Atmospheric Pressure
 - Dew Point Temperature
 - Wind Chill
 - Humidex
 - Precipitation
 - Wind Speed
 - Wind Direction
 - Snow Depth
 - Solar Radiation
 - Sunshine Hours
- Site Selection Rationale:
 - Provides essential meteorological information for construction site operations, water level analysis, flood forecasting, hydropower generation, wildlife studies, and climate change adaptation in the province.
 - Provides weather data for accurate interpretation of water quality data and related events along the Churchill River
- Date Visited: July 25th, 2016
- Location: N 53° 14' 43.64" W 60° 46' 42.15"
- Elevation: 39 ft

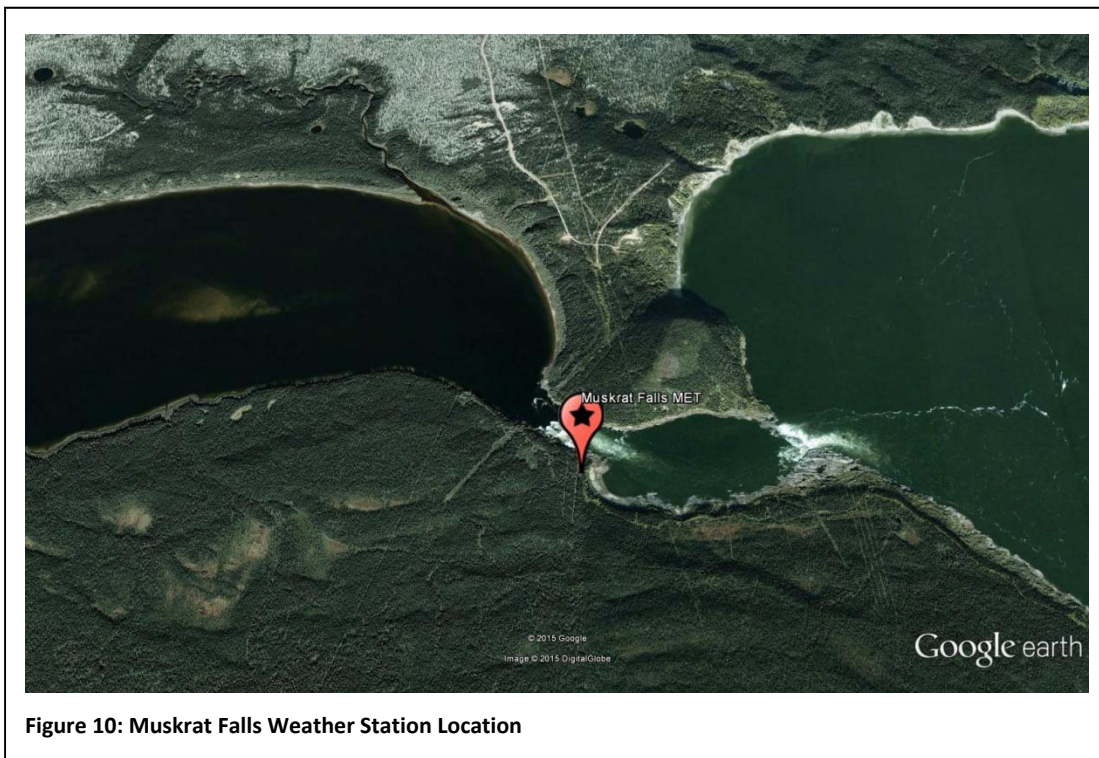


Figure 10: Muskrat Falls Weather Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000
 - Replaced desiccant
 - Lithium Battery: 3.46 V
- Cameras:
 - Model: CC5MPX
 - Verified working properly
- Anemometer:
 - Model: RM Young Alpine
 - Serial: Young 05178A Rev D
 - Full switch out with newly calibrated anemometer
- Temperature/Relative Humidity:
 - Model: HC2-S3-L
 - Cleaned sensor - note: this is an old sensor that is no longer manufactured
- Snow Depth Sensor:
 - Model: Sonic Ranger SR50A
 - Serial: 1670
 - Replaced transducer due to pitting and peeling
- Barometric Pressure:
 - Model: Vaisala PTB110
 - Serial: J1660083
 - Checked the QDP Hydro Vent hydrophobic filter. This sensor is not field serviceable nor can it be field calibrated
- Precipitation
 - Model: Texas Electronics TE-525WS
 - Serial: 53322-1012
 - Cleared funnel and bucket portion of the unit for debris
- Solar Radiation
 - Model: Kipp & Zonen SP LITE2 Pyranometer
 - Cleaned lens

Follow-up tasks required:

- Nalcor to install an anchor for a tower winch
- Regular scheduled maintenance

Waterford River at Kilbride

Station Details:

- Station Identification: NF02ZM0009
- Station Installed: July 21st 2015
- Image taken and transmitted every hour
- Site Selection Rationale: Provides essential information for visual image of changing water levels in this urban stream.
- Date Visited: June 15th, 2016
- Location: N 47° 31' 44.44" W 52° 44' 41.04"
- Elevation: 108 ft

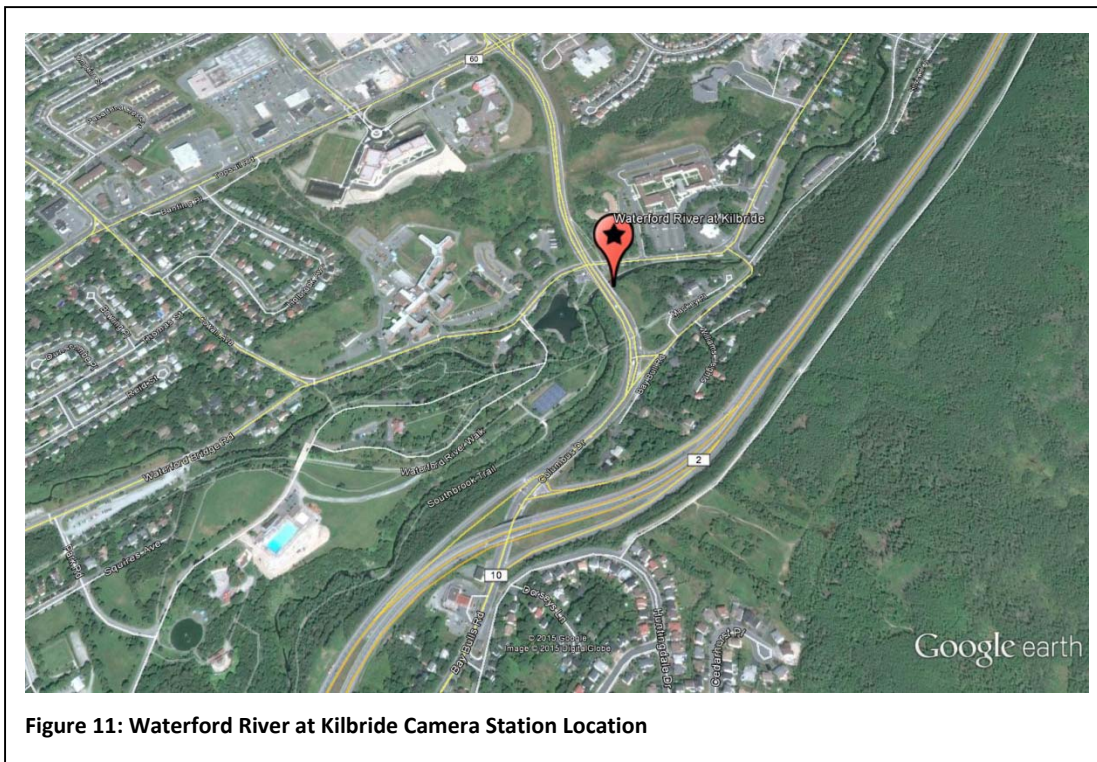


Figure 11: Waterford River at Kilbride Camera Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR800
 - Replaced desiccant
- Camera:
 - Cleaned lens
- Site:
 - NL Power needs to be called to trim trees from powerline.

Follow-up tasks required:

- Regular scheduled maintenance

Exploits River at Badger Steps

Station Details:

- Station Identification: NLENCM0001
- Station Installed: November 2009
- Image taken and transmitted every hour
- Site Selection Rationale: Snow monitoring provides essential information for flood forecasting, hydropower generation and for climate change adaptation in the province. WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the community of Badger in the Exploits River Basin.
- Date Visited: July 19th, 2016
- Location: N 48°56'25.86" W 55°58'42.98"
- Elevation: 330 ft

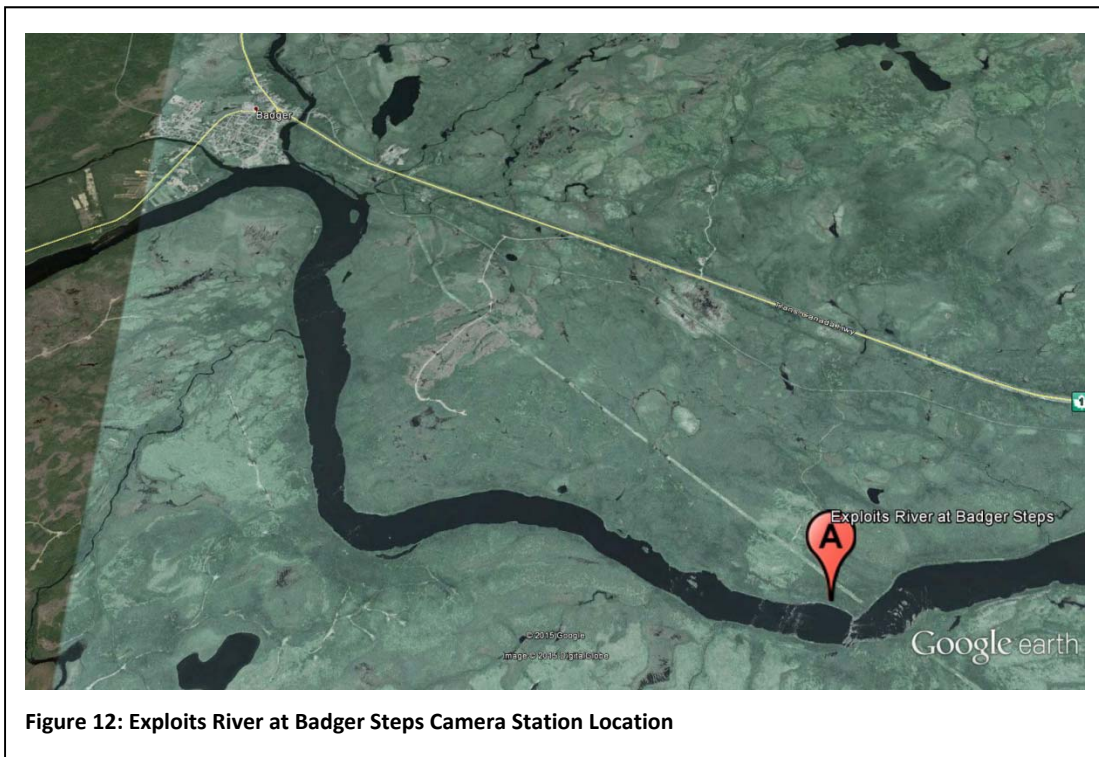


Figure 12: Exploits River at Badger Steps Camera Station Location

Tasks accomplished:

- Datalogger:
 - Model: CR1000
 - Replaced desiccant
- Camera:
 - Model: CC640
 - Replaced desiccant
- Site:

- Site was overgrown needs landscaping
- Changed Locks

Follow-up tasks required:

- Site is highly overgrown and needs specialised landscaping due to the steep incline to ensure the viewpoint needed for the flood forecasting model
- Regular scheduled maintenance

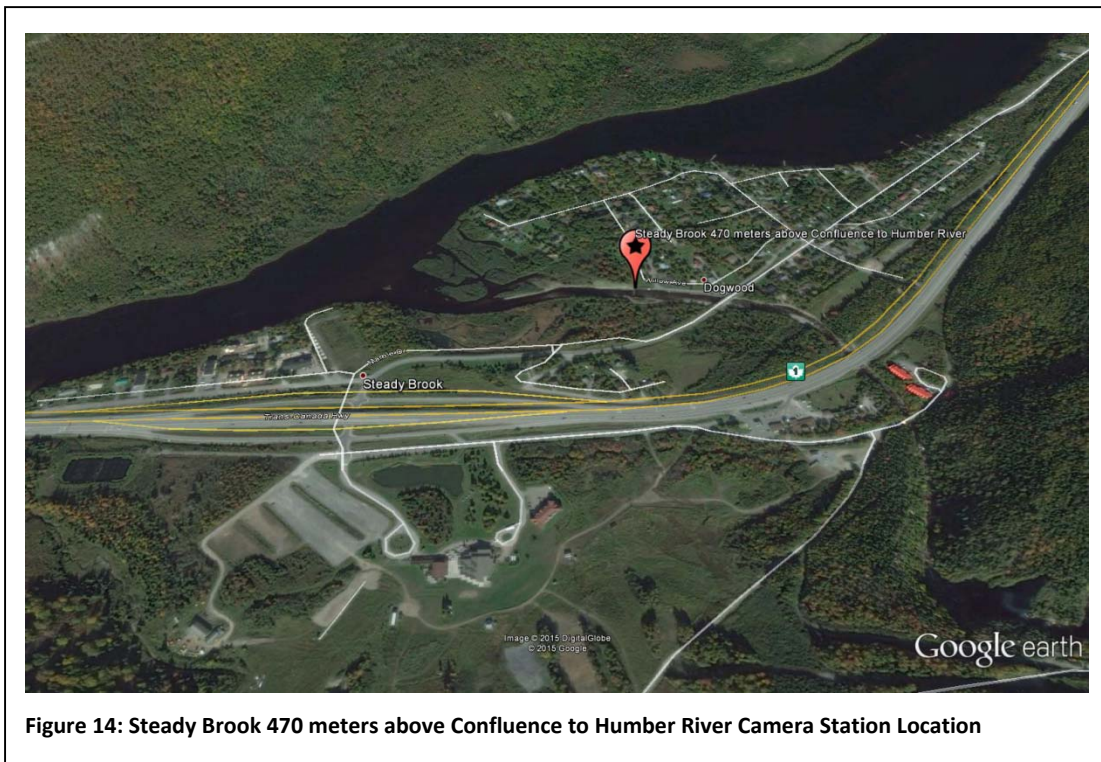


Figure 13: Overgrowth at Exploits River at Badger Steps camera station

Steady Brook 470 meters above Confluence to Humber River

Station Details:

- Station Identification: 02YL012
- Station Installed: June 23rd 2015
- Image taken and transmitted every hour
- Site Selection Rationale: WRMD provides flood forecasting services, in which snow monitoring has been integrated, for the communities of Deer Lake and Steady Brook in the Humber River Basin.
- Date Visited: July 21st, 2016 revisited Sept 28th, 2016
- Location: N 48° 57' 11.59" W 57° 49' 40.02"
- Elevation: 24 ft



Tasks accomplished:

- Datalogger:
 - Model: CR800
 - Replaced desiccant
- Camera:
 - Model: CC5MPX
 - Serial: 1862
 - Camera and datalogger weren't working properly, reset datetime on camera configuration
- September 28th
 - Troubleshoot station configuration as the station wasn't working properly

- Reset Datalogger, camera with no success found it was hardware failure sent equipment back to supplier for repair

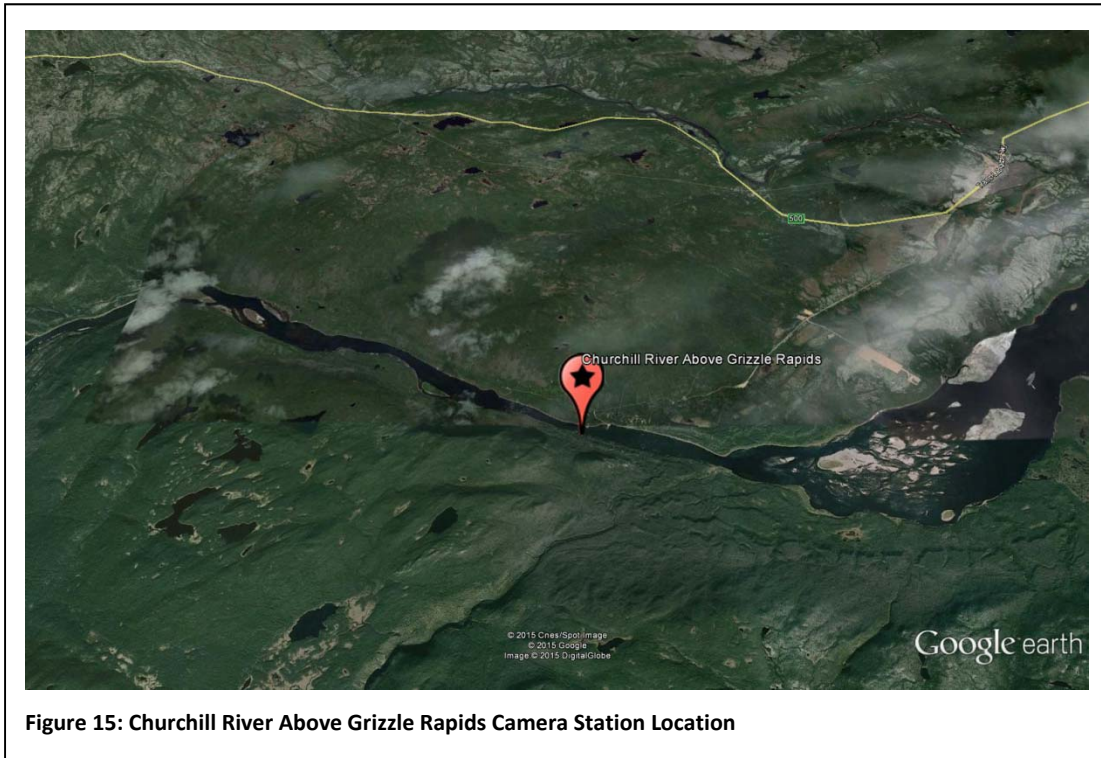
Follow-up tasks required:

- Equipment will need to be reinstalled after repair
- Regular scheduled maintenance

Churchill River Above Grizzle Rapids Camera Station

Station Details:

- Station Identification: 03OE013
- Station Installed: December 2009
- Image taken and transmitted every hour during winter months (October to April) and once a day at 12pm NST during the summer (May to September)
- Site Selection Rationale: Snow monitoring provides essential information for flood forecasting, hydropower generation, ice monitoring, wildlife studies, and for climate change adaptation in the province.
- Date Visited: October 2nd, 2016 via Labrador staff
- Location: N 52° 58' 12.33 W 61° 26' 43.40
- Elevation: 194 ft



Tasks accomplished:

- Station discontinued October 2nd 2016

The next scheduled annual maintenance trip will be completed by September 2017.