Pilot Collaborative Water Monitoring Program, Northeastern British Columbia (NTS 094A, Parts of 093P, O, 094B, G, H): An Overview

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Project Background

Northeastern British Columbia (BC) is an area of active and historical natural gas development, mining, forestry and other activities. Projects such as the Province of BC's Northeast Water Strategy (NEWS) and Regional Strategic Environmental Assessment (RSEA) and results of the Scientific Review of Hydraulic Fracturing in British Columbia (Scientific Hydraulic Fracturing Review Panel, 2019) have identified the need to

- increase water monitoring in BC's Northeast region,
- address Treaty 8 First Nations' concerns over water quantity and quality, and
- combine Traditional Knowledge with scientific data to better understand local water resources.

Over the past 100 years, the Water Survey of Canada has monitored streamflow at 54 stations in northeastern BC, however, only 29 stations are active today. Both surface and groundwater quality have been monitored randomly and inconsistently at numerous locations across the northeast; historically, there was little effort to correlate water quantity with water quality. This lack of baseline data, particularly in some of the smaller watersheds, makes it a challenge to manage water. Several needs have been identified in northeastern BC, specifically, the collection of scientific data to improve the understanding of surface water flow and correlated surface water quality and the collection of groundwater and climate monitoring data to 1) assess groundwater–surface water interaction, 2) assess groundwater quality and 3) improve watershed water balances. There is also an overarching need to develop a framework that relates the wealth of First Nations Traditional Knowledge to scientific data. This will begin bridging the data gap between these two methods of assessment.

In recognition of these needs, Geoscience BC initiated three overlapping projects summarized under the title of Pilot Collaborative Water Monitoring Program, Northeast B.C. (Figure 1):

1) Northeast B.C. Hydrometric Monitoring Project
   a) install four to six hydrometric stations to measure surface water quantity
2) Groundwater Quantity and Quality, Surface Water Quality and Climate Monitoring Project
   a) install groundwater monitoring well(s) to monitor quantity and quality
   b) install surface water quality monitoring sites, which will align with the hydrometric station locations to be installed as part of the Northeast B.C. Hydrometric Monitoring Project
   c) install climate stations to monitor local weather in the vicinity of groundwater and surface water monitoring sites
3) Traditional Knowledge Project
   a) gather Traditional Knowledge at each station/site to incorporate with Western science data

The three projects will be conducted in unison, were started in the fall of 2020 and will end by March 2023.

Program Description

The three projects will be conducted in collaboration with the Treaty 8 First Nations; all Treaty 8 First Nations have been invited to participate in the program. The first online meeting was held in December 2020. As part of the ongoing meetings with the First Nations communities, four to six hydrometric station locations will be selected within the pilot study area (Figure 2), ideally within medium to high disturbance watersheds (Johnson, 2015), which will align

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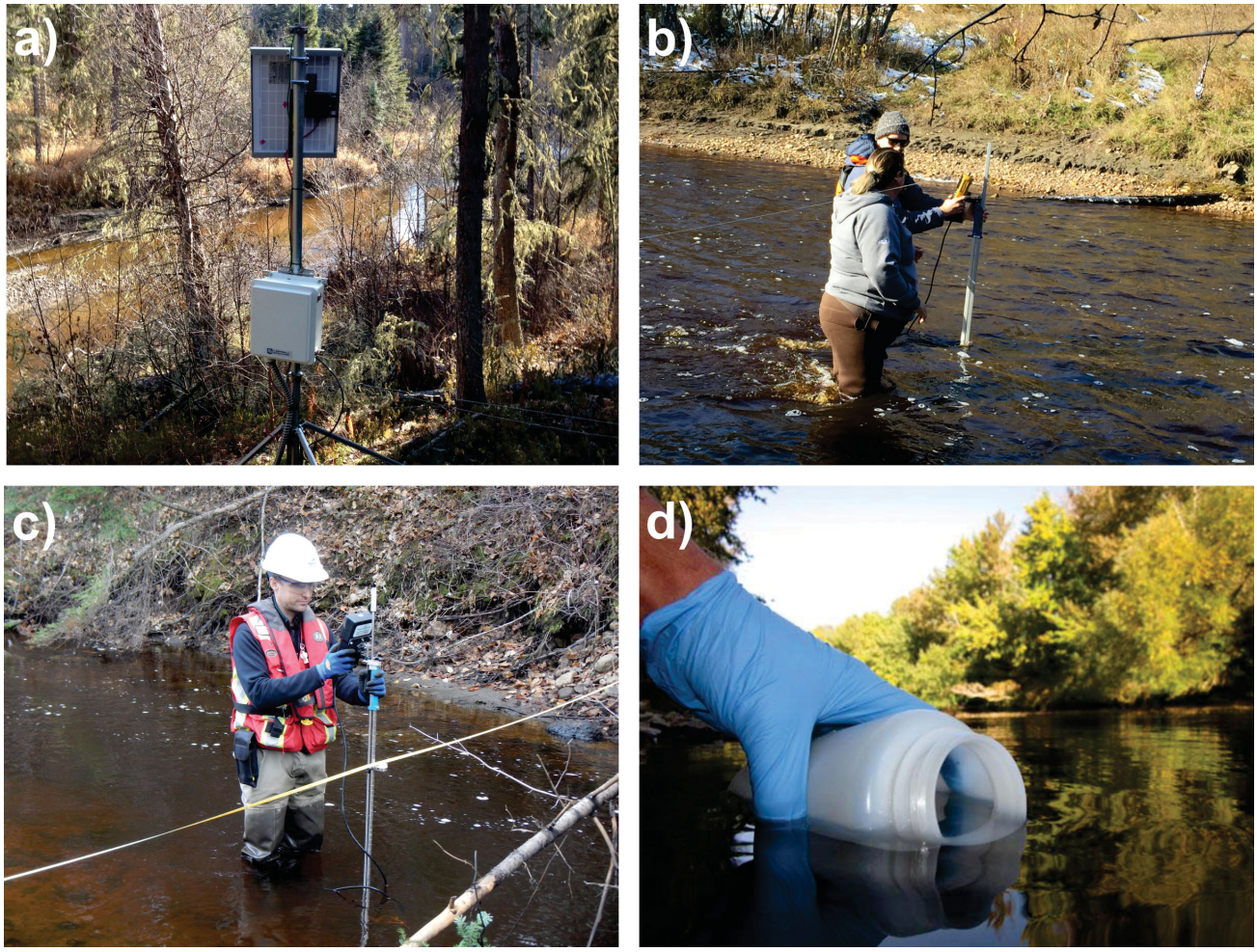

Figure 1. A selection of the equipment to be installed and data to be collected at the chosen sampling sites: **a)** data communication equipment, **b)** First Nations training, **c)** streamflow measurement and **d)** water quality sampling.

with the RSEA process. Sites will initially be selected through a desktop review and confirmed through field site visits in the spring/early summer of 2021. The equipment will be installed during the field season of 2021 and data collection and associated sampling will continue through to the end of 2022 to capture two full seasons of data. Hydrometric stations to measure surface water quantity will be installed at all the selected sites, and surface water quality sampling will be conducted where possible. Groundwater wells (for groundwater quantity and quality monitoring) and climate monitoring equipment will be installed at selected sites where possible.

The Treaty 8 First Nations will be invited to be a part of the entire process, from selecting the station locations to installing the equipment to collecting the data. In addition, First Nations will be invited to share their Traditional Knowledge at each site. This collaborative program is designed to be a two-way learning process—capturing data with a study design that will build scientific knowledge and including Traditional Knowledge to help bridge the gap between the learnings gained from monitoring and Indigenous values, which will then be conserved. The program is scheduled to wrap up in 2023 with a final report. However, conversations have been initiated with industry and government to continue this project beyond 2023.

Summary

This pilot water monitoring study takes a collaborative approach with First Nations, government and consultants working together to select water and climate monitoring locations in northeastern British Columbia. The combining of Traditional Knowledge and Western science can be used to inform decisions and support the rights of the Treaty 8 First Nations. By collecting the different types of surface water, groundwater and climate data, it will hopefully lead to a better understanding of the health of the study area watersheds and the overall water balance.

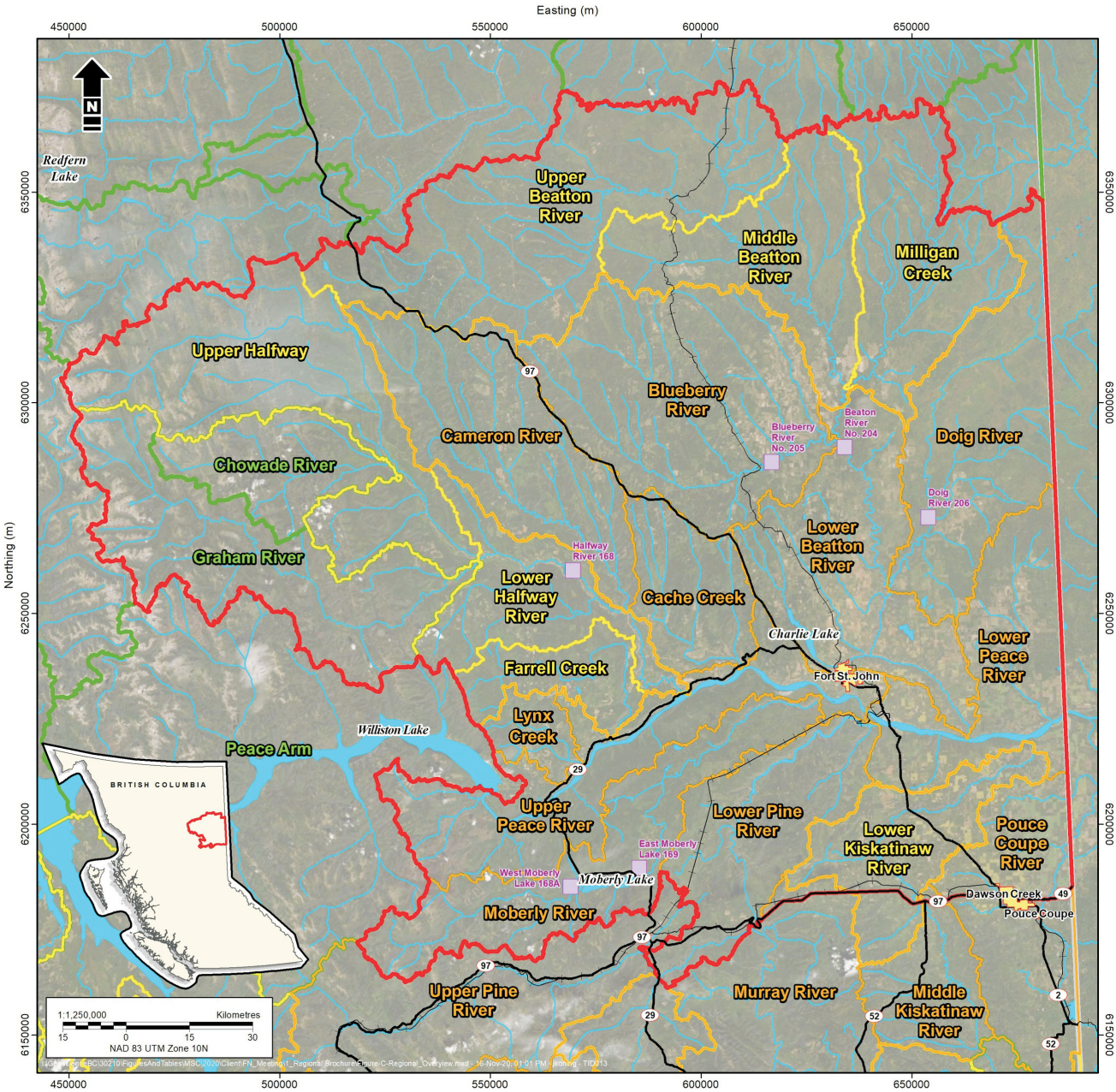

Figure 2. The proposed Pilot Collaborative Water Monitoring Program study area in northeastern British Columbia is outlined in red. First Nation communities are indicated by purple squares. Each of the watersheds has been ranked based on disturbance levels, which align with the Regional Strategic Environmental Assessment process. The colour of the watershed boundaries and names indicate the level of disturbance: orange is high, yellow is medium and green is low.

The long-term goals of the program are to

- expand surface water, groundwater and climate monitoring across northeastern British Columbia,
- continue collaborating with First Nations to build water and climate monitoring capacity,
- increase common understanding of water at several key locations and develop better tools for cross-cultural dialogue about shared waters, and
- develop an effective monitoring approach to assist with watershed health assessments and identify changes in watershed health.

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