



כֵּל דִּלְגָּבִי

Who: York University, Cambridge Bay, Nunavut  
What: This project will consist of water sampling and workshop activities as part of Caroline's PhD research looking at optimizing water safety in Cambridge Bay through participatory modelling. The central research question explored in this project is: Can access to safe drinking water in Cambridge Bay be improved using participatory system dynamics modelling? The two main goals of the project are to collect quantitative and qualitative data that will be used to build the model and to use the model to identify water management, treatment, and policy leverage points that can be used to improve access to clean and safe drinking water for Cambridge Bay residents.

Key objectives:

1. Conduct an in-depth desktop review of water safety policy regulations and frameworks in Nunavut and water quality and operational records in Cambridge Bay
2. Identify technical water safety problems throughout the water system in Cambridge Bay from source to tap by assessing existing infrastructure and in-situ operational procedures and by collecting water quality samples from multiple points within the system
3. Gather qualitative data related to water access, policy, governance, and cultural considerations via participatory stakeholder engagement activities like public forums and focus groups
4. Use participatory system dynamics modelling to identify key technical, policy, and cultural leverage points, weigh the risk of different safety water hazards, and ultimately improve water treatment and water policy in Cambridge Bay.

Once the stakeholders have validated the baseline model, the model will be manipulated by the researchers and the stakeholders to explore how technical and policy changes could lead to improved access to clean and safe drinking water for the residents of Cambridge Bay.

Water Sampling: Caroline Duncan employed youth will take water samples from the water source, multiple points within the water treatment plant (before and after filtration; after UV disinfection; after initial chlorination; within the storage tank; and during water truck filling); distribution, and from the cisterns and taps in 10 to 12 buildings in the community. Community members will be asked if they would like to volunteer for sampling in advance. Individuals that would like to volunteer will be required to allow researchers to access their cisterns and taps for a short period that is convenient for them. Water samples will be analyzed for standard water chemistry parameters, metals, and bacterial content. Samples will be analyzed in-house at the Canadian High Arctic Research Center by the students for basic water quality analysis and sent to an accredited lab for more extensive analysis. Each month approximately 70 samples will be taken. Approximately 840 L of water will be collected within the year for sampling. A CGS employee will be available to support the students with monthly sampling and analysis.

Workshops: Caroline will organize workshops in Cambridge Bay to assess water system risks and factors impacting water safety. Subsequently, she will develop a dynamic model of the water system. The workshops will also share the water quality data collected by the employed students. These students will help Caroline run the workshops.

Why: water safety research in Nunavut is crucial for ensuring access to safe drinking water in the communities, the holistic approach of this project goes beyond regulations, actively involving communities in understanding their water systems and recommending improvements. This participatory approach fosters ownership and long-term sustainability. Capacity building is a key focus, employing students to receive water operator training and certification and establishing a potential succession plan for water plants. This investment in youth not only promotes personal development but also local employment and expertise. The research's impact is far-reaching. It will identify weaknesses and areas for improvement by integrating socioeconomic, cultural and political factors. Enabling Cambridge Bay to apply for funding more effectively in water infrastructure. The project aligns with the

Inuinnaqtun: Kina: York Ilihaqpaalliqlivat, Caroline DuncanHuna: Hapkunani havaagharnit imarmik qauyihainiaqtut ayuiqhaqtitaulutiklu hulilukaaqhutik ilauplutik taaffuma Caroline-ngum PhD-nut qauyihagtainut imaqmiittaamik qayangnaiqhimayaamik Iqaluktuuttiaqmi ilaupkaiplutik. Qitqaninngaalluaqtuq apiqhuutauyuq ihivriuqtauniaqtuq hapkunani havaagharnit: Amirnaittumik imaqaqtitauyaamik Iqaluktuuttiaqmi ihuaqhivaallirniaqqa ilaupkaiplutik havauhiqaqhutik? Malruk inirimalluaqtait havaagharnit hapkunani taimaa katitirilutik amigaittunik nakuuyuniklu naunaitkutighanik atuqtauyughat hanayunit maliktaghaq taamnalu maliktaghaq ilittuqhitiiliuluni imaqmik munaqhiyunik, halummaqhiyunik, maligaghaliuqhimayuniklu atuqtauyughanik ihuaqhautighatut halumayumik imaqaqtitauyaamik amirnaittumiklu imiqtaghamik Iqaluktuuttiaqmiutat. Inirimalluaqtait: 1. Ihivriuttiaqlugit ikpatimiittunik imaq qayangnaiyautainut maligaghanik maliktaghanik havaaghaniklu Nunavunmi imaplu aturuminaqnia aulapkaiyillu naunaitkutainit Iqaluktuuttiaqmi 2. Ilttuqhaqlugit ayuqnaqtut imaqmik qayangnaiyautinut ihuilitauyut immap hanguvianit Iqaluktuuttiaqmi imiqtarvianit kuvivianut qauyihaiplugit atuqtauyut ikluqpait atauttiknullu aulapkainiqmut ihivriuqhiplutik katitiquhutiklu imaqmik qimilruktaghainik amihuuyunit katitiquvingnit hanguviit iluani 3. Katitiqulutik nakuuyunik naunaitkutanik imaq atuqpauhianik, maligaghainik, ataniqtuqtuiyut, ilitquhiknullu atuqpauhiinik ilauyunik katimapkaiplutik hulilukaaqtittiqlutik taimaatut inungnik katimapkaiplutik ihumagilluaqtunillu katimaqatigiingnik 4. Ilaupkailutik havauhiqaqtumik maliktaghaqarlutik ilittuqhariamik inirimalluaqtait ayuqnaqtunit, maligaghanit, ilitquhirnullu ihumaalutininik, ihumagilugit aallait imaqmi qayangnautit, ihuaqhivaalliqlugit imaqmik halumaiyautait imaqmiklu maligaghaliuqhimayut Iqaluktuuttiaqmi. Taapkua ilauyut naammagigumitku naunaitkutalluanut maliktaghat, taamna maliktauyughaq ihivriuqtauniaqtuq qauyihaiyinit ilauyunillu naunaiyailutik qanuq ayuqnaqtunik maligaghaniklu aallannguqtiqhimayut ihuaqhivaalliutauniariaghait atuqtitauyaamik halumayumik amirnaittumiklu niuqaqtaghamik imaqmik nunallaarmiunit Iqaluktuuttiaqmi. Imaqmik Qauyihaiyut: Caroline Duncan havaktitauyuq inulrammik qauyihagtauyughanik imiqtarahuaq imiqtarvingmit, amihuulutik imiqtarvighait halummaqhivingnit quyaginnagumitku (hivuani kinguanilu halumaiyautiliqtuqviat; UV-mit halummaqtaarumik; avuhitaarumik qakuqhitinik; talvani imautingnit; immiqhiplutiklu imiqtautinik); agyaqtaqhutik, imautinillu kuviviinillu talvani 10-nik 12-nikluunit ikluqpangnit nunallaarmi. Nunallaarmiut apiriyauniaqtut ilauyumayaaghainik qauyihaiyunut pitinnatik. Inuit ikayurumayut qauyihaiyunut qauyihainik imiqtaqtittiyaghaat imautainit kuviviinillu naittumik hivikittumik ihuariyaigut upluqhiutikkut. Immat qauyihagtaghat ihivriuqtauniaqtut immap avugiingniagut, haviqariaghaat, halumailruiniklu. Ihivriuqtaghat qauyihagtauniaqtut havakvingnit talvani Kanatami Ukiuqtaqtumi Qauyihagvianit ilihaqtunit qanurininganianik ihivriuqhilutik tuyuqtaulutiklu ilitariyaayumit ihivriuttiaqtauyaamik. Tatqiqhiutit tamaat haniani 70-nguniaqtut ihivriuqtaghat. Haniani 840 L imaqmik katitirahuat ukiuq atuqtillugu qauyihagtauyughaq. Nunalingni Kavamatkunnilu Pivikhaqautikkut havaktiqarniat

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mut, katimapkainiaqhimaplutik Hikutirvia 2023-mit Qiqailruq 2025-mut.

## Personnel

Personnel on site: 3

Days on site: 30

Total Person days: 90

Operations Phase: from 2023-11-01 to 2025-08-31

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Location for various water sampling points	Sampling sites	Municipal	N/A	N/A	Cambridge Bay

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ፍጥነት ማረጋገጫ	Jim McEachern	Municipality of Cambridge Bay	2023-04-05

$\Delta^{\alpha} \Gamma^{\beta} \Delta^{\gamma} \Lambda^{\delta} \Sigma^{\epsilon} \Pi^{\zeta}$

$a^{\dagger}r d^{a_b}\sigma^b \wedge c_n d n^e \Delta D\sigma d^{f_b}D^c$   $\cap \cap f^f \omega r^c:$

## Kitikmeot

$\epsilon \Delta t^{\alpha} j^c$      $\Lambda J^{\alpha} e D \dot{N}$      $\nabla^{\alpha} r^{\beta} C D P L \dot{\chi}^c$

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ᐃᓕᐸᓂᓄᓇᐅᑦᑎᓈᓂᓄᓇ ᐃᓕᐸᓂᓄᓇᐅᑦᑎᓈᓂᓄᓇ	License to perform research activities in Nunavut	Not Yet Applied		
ᐃᓕᐸᓂᓄᓇᐅᑦᑎᓈᓂᓄᓇ	Ethics Board for ethical approval from York University	Not Yet Applied		
ᐃᓕᐸᓂᓄᓇᐅᑦᑎᓈᓂᓄᓇ ᐃᓕᐸᓂᓄᓇᐅᑦᑎᓈᓂᓄᓇ	Water license for research purposes	Applied, Decision Pending		

## Project transportation types

Transportation Type	Transportation Mode	Length of Use
Land		

### Project accomodation types

[illegible]

◀▷↳♂◀<sup>96</sup>▷<sup>96</sup>

[illegible]

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Sample Bottles	3000	1L	Samples bottles for water collection will be of various size, between 250 ml and 1 L. It is not anticipated that this research will exceed 5 m3 water use.

[illegible]

ሥራገር የፋይናንስ ሪፖርት	የፋይናንስ አጠቃላይ የፋይናንስ ሪፖርት	የፋይናንስ ደረሰኝ የፋይናንስ ሪፖርት	እውነተኛ አጠቃላይ የፋይናንስ ሪፖርት	ቴክኒካል የፋይናንስ ሪፖርት	እውነተኛ የፋይናንስ ሪፖርት	ሥራገር የፋይናንስ ሪፖርት
Information is not available						

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▷ <sup>c</sup> ▷ CĬ <sup>ᶜᵇ</sup> ◁▷ <sup>ᶜᵇ</sup> C▷σ▷ <sup>ᶜᵇ</sup> ▷ <sup>ᶜᵇ</sup>	ᶜᵇ▷ <sup>ᶜᵇ</sup> ΔΓ <sup>ᶜᵇ</sup> C <sup>ᶜᵇ</sup> C <sup>ᶜᵇ</sup> σ▷ <sup>ᶜᵇ</sup> ◁ <sup>c</sup>	⊆P <sup>c</sup> ΔΓ <sup>ᶜᵇ</sup> C <sup>ᶜᵇ</sup> C <sup>ᶜᵇ</sup> σ▷ <sup>ᶜᵇ</sup> ◁ <sup>c</sup>
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$\triangleleft^b C d^c$ 
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[illegible]
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Water sampling events will provide a big picture of the water quality from source to tap in Cambridge Bay. Youth will be hired to take water samples, which will positively impact employment. Additionally, by taking water samples from various locations within the drinking water system, we will be able to identify areas to recommend improvements to drinking water infrastructure and indirectly have a positive impact on human health.



# **Additional Information**

**SECTION A1: Project Info**

**SECTION A2: Allweather Road**

**SECTION A3: Winter Road**

**SECTION B1: Project Info**

**SECTION B2: Exploration Activity**

**SECTION B3: Geosciences**

**SECTION B4: Drilling**

**SECTION B5: Stripping**

**SECTION B6: Underground Activity**

**SECTION B7: Waste Rock**

**SECTION B8: Stockpiles**

**SECTION B9: Mine Development**

**SECTION B10: Geology**

**SECTION B11: Mine**

**SECTION B12: Mill**

**SECTION C1: Pits**

**SECTION D1: Facility**

**SECTION D2: Facility Construction**

**SECTION D3: Facility Operation**

**SECTION D4: Vessel Use**

**SECTION E1: Offshore Survey**

**SECTION E2: Nearshore Survey**

### SECTION E3: Vessel Use

## SECTION F1: Site Cleanup

## SECTION G1: Well Authorization

## SECTION G2: Onland Exploration

## SECTION G3: Offshore Exploration

## SECTION G4: Rig

## SECTION H1: Vessel Use

## SECTION H2: Disposal At Sea

## SECTION 11: Municipal Development

[illegible]

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[illegible]

### Miscellaneous Project Information

$\alpha \rightarrow \Delta^{\text{fb}} \text{CD} \sigma^{\text{fb}} \Gamma^{\text{C}} \quad \Delta^{\text{b}} \text{CD} \Gamma^{\text{L}} \Gamma^{\text{C}} \quad \text{fb} \Delta^{\text{C}} \sigma^{\text{fb}} \Gamma^{\text{C}} \quad \langle \text{CD} \Gamma^{\text{L}} \Gamma^{\text{L}} \text{fb} \text{CD} \sigma^{\text{fb}} \Gamma^{\text{C}} \rangle$

## Cumulative Effects

## Impacts

[illegible][illegible]
$$(P = \langle b \rangle \Delta \langle p \rangle \cap \langle a \rangle \langle b \rangle^c, N = \langle b \rangle \langle b \rangle^c \langle p \rangle \langle a \rangle \langle b \rangle^c \langle \langle \langle p \rangle \langle a \rangle \langle b \rangle^c \rangle^c \rangle, M = \langle b \rangle \langle b \rangle^c \langle p \rangle \langle p \rangle^c \langle b \rangle \langle a \rangle \langle b \rangle^c \langle \langle \langle \langle p \rangle \langle a \rangle \langle b \rangle^c \rangle^c \rangle, U = \langle b \rangle \langle p \rangle \langle a \rangle \langle b \rangle^c \langle \langle \langle p \rangle \langle a \rangle \langle b \rangle^c \rangle^c \rangle)$$

1	polygon	Location for various water sampling points
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