



New

Scientific Research

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[illegible]

Operations Phase: from 2022-05-20 to 2022-06-25

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|---|--|----------------|--------------------------------------|---|--|
| South Baffin / David Strait | Scientific/International Polar Year Research | Marine | Not being studied before | Not relevant | Far away from the protected areas / communities |
| David Strait | Scientific/International Polar Year Research | Marine | None | None | Far away from the communities and protected area; considering the thick sea ice and RRS Discovery can only work in 1/10 sea ice and open water, the research area will be much limited and will likely to be very far away from the land |
| Proposed ship track - David Strait, South Baffin and Labrador Sea | Scientific/International Polar Year Research | Marine | None | None | Considering the thick sea ice and RRS Discovery can only work in 1/10 sea ice and open water, the research area will be much limited and will likely to be very far away from the land |

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|----------|---------------|----------------------|--------------------------|
| Δ ሼጋ Δ ሻ | Not contacted | Environmental Agency | 2022-05-30 |

$\epsilon \Delta^{\alpha} j^{\beta} \wedge J^{\alpha} e_{\beta} \dot{N} \ll R^{\alpha} r^{\beta} C D P L \dot{\chi}^{\gamma}$

[illegible]

Transboundary

South Baffin

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

| <p>ሲቪል ሥርዓት ባለገባቸው የሥነ ምግባር ፍርድ ቤቶች ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> | <p>የፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> | <p>ፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> | <p>የፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> | <p>የፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> |
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| <p>የፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት ለፍርድ ቤቱ የሥነ ምግባር ፍርድ ቤት</p> | Not Applicable | Not Yet Applied | | |

Project transportation types

| Transportation Type | Transportation Mode | Length of Use |
|---------------------|-------------------------------|---------------|
| Water | Royal Research Ship DISCOVERY | |

Project accomodation types

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Λ⁹δ^c Δ⁹ρ²Δ⁹ Δ⁹CDσ²Δ⁹Δ⁹ Δ⁹Δ⁹ρ²Δ⁹ Δ⁹Δ⁹Δ⁹, Γ⁹Δ⁹Δ⁹Δ⁹, Δ⁹Δ⁹Δ⁹Δ⁹, Δ⁹Δ⁹Δ⁹Δ⁹

| ᐃᐅᐅᐅᐅᐅ ᐱᐅᐅᐅᐅ ᐃᐅᐅᐅᐅᐅ ᐃᐅᐅᐅᐅ ᐅᐅᐅᐅᐅᐅᐅᐅᐅ | ᐅᐅᐅᐅᐅᐅᐅ | ᐃᐅᐅᐅᐅᐅᐅᐅ - ᐅᐅᐅᐅᐅᐅᐅᐅ | ᐅᐅᐅᐅᐅ ᐃᐅᐅᐅᐅᐅᐅᐅᐅ |
|---|---------|---------------------|--|
| Research Ship RRS Discovery | 1 | 96 m long | To carry out scientific research on the sources of airborne particles that are important for the clouds and climate in the Arctic |
| Sea containers for hosting scientific instruments | 3 | 2.4 * 2.6*6.1 m | Measure the chemical composition and physical properties of airborne particles and gaseous pollutants |
| Airborne particle samplers | 12 | 05*0.5*1.5m | To collect airborne particles for offline chemical comosition analyses |
| Aerosol analysers | 30 | 0.8*1*1.2m | Measure the chemical composition and physical properties of airborne particles |
| Gas analysers | 20 | 0.5*0.5*1m | To measure the concentrations of various gases in the air |

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| ᐱᓇᑦᑕᐅᓄᓂ ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ | ᐃᓪᑲᐅᓄᓂ ᐱᓚᐅᓄᓂ ᐱᓚᐅᓄᓂ |
|------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------------------------|
| Chemical - acids | hazardous | 3 | 1 | 3 | Liters | Chemical reagents for research |
| chemicals - organic solvents | hazardous | 6 | 2 | 12 | Liters | For use within different instruments |
| Diesel | fuel | 14 | 14 | 196 | Cubic Meters | low sulphur fuel |
| chemicals - bases / neutral | hazardous | 8 | 1 | 8 | Kg | For use in the lab |

$\Delta L^{\epsilon_b} \quad \triangleleft^{\epsilon_b} C \triangleright \dot{L}^{\epsilon_b} \triangleright^{\epsilon_b}$

[illegible]

through an underway pump to the laboratory. The amount of water we will use is minimal - we will take a very small amount of water to measure water chemistry.

along the research cruise track (which is shown in the project map).

$\triangleleft^b C d^c$
$$\Delta^b C d_c n_\sigma \Delta^a \sigma^a$$
[illegible]
$$4\epsilon\alpha\Gamma\triangleright C\dot{\sigma}^C\triangleright^C \quad 4^b\triangleright^{\epsilon_b}C\triangleright\Gamma L\downarrow^C$$

The ship will release air pollutants from the fuel burning. The impact is negligible due to the huge air volume in the study area. Chemicals: All chemicals will have accompanying COSHH and risk assessments. They will be stored, handled and disposed of appropriately as per standard NMF procedure. Ship's waste: All cardboard and paper products are incinerated at sea on the Discovery. Recyclable items are stored for appropriate recycling upon arrival into port. Any non-burnable or non-recyclable waste (e.g. batteries) is stored appropriately and disposed of upon arrival into port. Incidental waste: It is intended that all equipment will be recovered. Acoustic-based data collection The potential impacts associated with acoustic data collection relate to marine mammals. The primary concerns to marine mammals as a result of acoustic systems are considered to be masking effects, behavioural changes, and physiological effects such as temporary threshold shift (TTS) and permanent threshold shift (PTS). While it is difficult to be certain of the potential for physiological damage as a result of various acoustic activities, localised behavioural disturbance is considered a possibility. These concerns are considered below. Deep-water multibeam echosounder: The effects of multibeam echosounders on marine mammals has not been widely studied, such that it is unclear what impacts these may have on them. While Lurton and DeRuiter (2011) suggested that the risk of the sounds causing physiological auditory damage to marine mammals is likely to be low, a few studies have observed potential behavioural changes as an apparent result of

the operation of multibeam echosounders (Quick et al 2016; Cholewiak et al 2017). Due to this uncertainty, the JNCC have created a set of best-practice guidelines to follow in the case of deep-water multibeam echosounder surveys (see MEMP). With the proposed mitigation recommendations outlined in the MEMP, the effects of the multibeam echoso

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]

This research will primarily be on air composition. The ship will sail in open water with no sea ice or less 1/10 of sea ice. Air quality in the area is usually predicted to be extremely clean and that is the reason we are studying it. We expect that in the future when there are more ships, the emissions from the ships could significantly affect the sensitive Arctic environment and climate. It is predicted that sea ice will be completely melted in the summer long the Northwestern Passage. This makes Arctic shipping possible. The single ship we will use will have minimum impact on the noise level in the study area.

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The research cruise will sail in the David Strait and will be far away from wildlife species

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Not applicable - no direct engagement identified

Miscellaneous Project Information

Our ship RRS DISCOVERY will be 200 km away from the Iqaluit. Unfortunately we cannot have no engagement with the local communities as we are 100% on sea. Depending on the ice conditions at the time, it is highly unlikely that the ship will close within 90-100 nautical miles off Baffin Island or get closer than 40-60 nautical miles off the Labrador coast. Noting the location of the proposed sampling areas and her Ice Class limitations, it is anticipated that DISCOVERY will not come in direct contact with any local communities (including those who will hunt from sea ice) or protected areas ashore or enter any Canadian Marine Protected Area during the cruise. We do not expect to have any direct contact / engagement with the local community because the ship will not call at any Canadian port (for scientific and logistic reasons). Our results will eventually benefit all Nunavut communities as they contribute to a better understanding of the Arctic climate and climate change.

$\mathfrak{g} \supset \mathfrak{g}_A \oplus \mathfrak{g}_B \oplus \mathfrak{g}_C \oplus \mathfrak{g}_D \oplus \mathfrak{g}_E \oplus \mathfrak{g}_F \oplus \mathfrak{g}_G \oplus \mathfrak{g}_H \oplus \mathfrak{g}_I \oplus \mathfrak{g}_J \oplus \mathfrak{g}_K \oplus \mathfrak{g}_L \oplus \mathfrak{g}_M \oplus \mathfrak{g}_N \oplus \mathfrak{g}_O \oplus \mathfrak{g}_P \oplus \mathfrak{g}_Q \oplus \mathfrak{g}_R \oplus \mathfrak{g}_S \oplus \mathfrak{g}_T \oplus \mathfrak{g}_U \oplus \mathfrak{g}_V \oplus \mathfrak{g}_W \oplus \mathfrak{g}_X \oplus \mathfrak{g}_Y \oplus \mathfrak{g}_Z$

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Cumulative Effects

Impacts on the environment and wildlife is minimal.

Impacts

$\mathcal{L}(\mathcal{A}) \subseteq \mathcal{L}(\mathcal{B})$

[illegible]
$$(P = \langle b \rangle \Delta_P \cap \langle \bar{a} \rangle \langle \bar{b} \rangle^C, N = \langle b \rangle \bar{b}' \langle C \rangle \langle \bar{a} \rangle \langle \bar{b} \rangle^C \langle \bar{c} \rangle \Gamma' \langle \bar{c}' \rangle \langle \bar{b} \rangle \langle \bar{a} \rangle \langle \bar{b}' \rangle^C \rceil, M = \langle b \rangle \bar{b}' \langle C \rangle \langle \bar{a} \rangle \langle \bar{b} \rangle^C \langle \bar{c} \rangle \Gamma' \langle \bar{c}' \rangle \langle \bar{b} \rangle \langle \bar{a} \rangle \langle \bar{b}' \rangle^C \rceil, U = \langle \bar{b} \rangle \bar{b}' \langle \bar{a} \rangle \langle \bar{b}' \rangle^C \rangle)$$

| | | |
|---|----------|---|
| 1 | polygon | South Baffin / David Strait |
| 2 | polygon | David Strait |
| 3 | polyline | Proposed ship track - David Strait, South Baffin and Labrador Sea |

- | | | |
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