

Churchill Marine Observatory - Environmental Observing (CMO-EO) System

DETAILS

English: Churchill Marine Observatory - Environmental Observing (CMO-EO). Led by the University of Manitoba, the Churchill Marine Observatory (CMO) is a major research infrastructure funded by the Canada Foundation for Innovation (CFI) in partnership with the provincial governments of Manitoba and Alberta and numerous other governmental, industrial, and nongovernmental organizations, including the Arctic Research Foundation. Once completed, CMO (www.umanitoba.ca/ceos/research/CMO.html) will be a globally unique, highly innovative, multidisciplinary research facility based out of Churchill, Manitoba, adjacent to North America's only Arctic deep-water port. The core CMO infrastructure is comprised of 1) the Oil-in-Sea-Ice Mesocosm (OSIM) with two saltwater sub-pools, to be located in Churchill, which is designed to simultaneously accommodate contaminated and control experiments on various scenarios of oil spills in sea ice, and 2) the Environmental Observatory (EO) system, which includes a 65 ft research vessel (MV William Kennedy), one cabled oceanographic mooring in the Churchill estuary, and four oceanographic moorings to be distributed along the main shipping channel across Hudson Bay and Strait. Although the CMO science program is designed around studies on the detection, impact and mitigation of spills of oil and related contaminants in sea ice-covered waters, the CMO-EO system will be predominantly used to assist in data gathering in support of increasing our baseline knowledge of general oceanography (including physical, chemical and biological oceanographic investigations) and oceanographic monitoring capacity within the Hudson Bay complex, including Hudson Bay, Foxe Basin and Hudson Strait. Therefore, collaborations with existing and future projects will support recovery and deployment of additional moorings. Under this broad mandate, the CMO-EO system will plan to operate throughout the Hudson Bay complex every year over the next 7-years and beyond, with specific regional foci for different years based on secured research funding. Currently, the CMO research vessel is docked in Summerside, PEI. In July 2018, we plan to bring the CMO research vessel to Hudson Bay where we will plan to deploy the four CMO-EO oceanographic moorings along shipping lanes, recover moorings deployed via the CCGS Amundsen as part of the University of Manitoba-led Hudson Bay System Study (BaySys) in southern Hudson Bay and then carry out coastal oceanographic sampling around Southampton Island (nearby Coral Harbour and Nauyasat) in support of the Southampton Island Marine Ecosystem Project (SIMEP), and near Chesterfield Inlet as part of the GENICE (Microbial Genomics for Oil Spill Preparedness in Canada's Arctic Marine Environment) project. In support of SIMEP, an additional mooring will be deployed at the southern end of Roes Welcome Sound. Oceanographic moorings will consist of: electronic sensors (for temperature, salinity, dissolved oxygen, chlorophyll fluorescence, coloured dissolved organic matter, underwater light, and pH), low power acoustics similar in power to depth sounders used on small boats (for water velocity and backscatter from zooplankton and fish), hydrophones (to listen for marine mammals and ship noise), and sequential sediment traps (to measure export of planktonic organic matter from the surface ocean). Sampling via the CMO-EO research vessel will include: deployment of similar sensors to those mentioned above; water samples for ocean geochemistry including carbonate system parameters and dissolved nutrients, bacterial abundance, primary production, and stable isotopes; nets to collect zooplankton and fish samples, box and gravity cores to collect sediment and benthic organism samples; a 24 ft zodiac launched from the research vessel to collect water and benthic samples closer to the coasts and to deploy scientific SCUBA divers who will assess species composition and biomass of macroalgae (e.g., kelp) within shallow waters; and a remotely operated vehicle to obtain video measurements of the benthic environment to map out organism distributions. Timing of the 2018 research activities will approximately follow: August 1-20 for the SIMEP project and August 21-24 for the GENICE project. The CMO-EO system involves the long-term deployment of our research vessel and oceanographic moorings in the Hudson Bay complex and therefore, will consist of annual research activity reports and updates as part of a seasonal (ice-free) multi-year program operating over at the next 7-years and beyond.

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Operations Phase: from 2018-06-26 to 2025-08-26

Activities

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Oceanographic Mooring - CMO-1	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	170 km from Arviat, 520 km from Harry Gibbons MBS
Oceanographic Mooring - CMO-2	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	300 km to Coral Harbour, 250 km to Harry Gibbons MBS
Oceanographic Mooring - CMO-3	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	125 km to Coral Harbour, 100 km to East Bay MBS
Oceanographic Mooring - CMO-4	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	200 km to Cape Dorset, 250 km to East Bay MBS
Oceanographic Mooring - SIMEP Project	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	150 km to Chesterfield Inlet, 230 km to Coral Harbour, 120 km to Harry Gibbons MBS
SIMEP Project Scientific Cruise Track	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	Will accomplish community visits with our research vessel in both Coral Harbour and Nauyasat. Cruise track stays away 60 km from Harry Gibbons MBS and at least 1 km from East Bay MBS
GENICE Project Sampling Region	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	Chesterfield Inlet is adjacent to the sampling region, 220 km to Harry Gibbons MBS
Churchill Marine Observatory- Environmental Observatory Study Region	Marine Based Activities	Marine	Marine based activities proposed in this application do not access known site history information	Marine based activities proposed in this application do not access known archaeological sites	Nunavut Communities: Arviat, Rankin Inlet, Chesterfield Inlet, Baker Lake, Coral Harbour, Nauyasat, Hall Beach, Igloodik, Cape Dorset, Kimmirut, Sanikiluaq. Protected

					areas: East Bay MBS, Akimiski Island MBS, Dewey Soper MBS, Harry Gibbons MBS, McConnell River MBS, Ukkusiksalik National Park
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Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Coral Harbour	Louisa Kalai (Acting Manager)	Aiviit HTO	2018-01-08
Coral Harbour	Leonie Pameolik (SAO)	Hamlet of Coral Harbour	2018-01-08
Naujaat	Dolly Mablik (Manager)	Arviq HTO	2018-01-08
Naujaat	Robert Hedley (SAO)	Hamlet of Naujaat	2018-01-08
Chesterfield Inlet	Janice Issaluk (Manager)	Aqigiq HTO	2018-01-08
Chesterfield Inlet	Roy Mullins (SAO)	Hamlet of Chesterfield Inlet	2018-01-08

Authorizations

Indicate the areas in which the project is located

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Fisheries and Oceans Canada	Application will be submitted in the coming months	Not Yet Applied		
Nunavut Research Institute	Application will be submitted if we are successful with NIRB	Not Yet Applied		

Project transportation types

Transportation Type	Quantity	Proposed Use	Length of Use
Water	0	The RV William Kennedy is a research vessel jointly owned by the University of Manitoba and the Arctic Research Foundation.	

Project accommodation types

Other,

Material Use

Equipment to be used (including drills, pumps, aircraft, vehicles, etc)

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Boat	1	20 m long	RV William Kennedy is a research vessel jointly owned by the University of Manitoba and the Arctic Research Foundation. At the present, the vessel operates out of Summerside, Prince Edward Island. We plan to use it to conduct oceanographic sampling.
Boat	1	7.3 m long	Zodiac Hurricane skiff aboard the RV William Kennedy. Used for access to land and oceanographic sampling in shallow water.
Rosette with integrated CTD system	1	1 m x 1 m x 1.25 m	Lowered into the ocean from the RV William Kennedy to collect water sampling using its 12-5L sampling bottles. The integrated CTD system electronically measures temperature, salinity, dissolved oxygen, fluorescence, turbidity, and underwater light.
Caged CTD with integrated sensors	1	1.1 m x 0.35 m x 0.35 m	Lowered into the ocean from the RV William Kennedy to electronically measure temperature, salinity, dissolved oxygen, fluorescence, turbidity, and underwater light.
Box Corer	1	0.4 m x 0.45 m x 1.70 m	Lowered from the RV William Kennedy. Small box core (25 x 25 x 50 cm sample box) for collecting sediment samples.
Gravity Corer	1	1.5 m x 0.3 m x 0.3 m	Lowered from the RV William Kennedy. Small gravity corer (0.75 m) for collecting sediment samples.
Flow through system	1	0.3 m x 0.5 m x 0.6 m	Shipboard system integrated into the ship's seawater intake. Measures sea surface temperature, conductivity, dissolved oxygen, and fluorescence.
Plankton Nets	5	0.6 m x 0.6 m x 1.5 m	Plankton samples will be collected using 3 different nets: (1) 2x traditional plankton nets (0.6 m x 0.6 m x 1.5 m), (2) 2x bongo nets (1.5 m x 0.6 x 1.5 m), (3) beam trawl (3 m x 0.5 m x 2 m). These nets are lowered from the RV William Kennedy.
Oceanographic Mooring	5	200-250 m long (anchored to ocean floor and extends upwards to 30 m below ocean surface)	Each of the 5 moorings will hold the following in order from the bottom-up: an anchor, two bottom acoustic releases; a CTD with dissolved oxygen DO sensor; a Passive Acoustic Monitoring sensor; a sediment trap; a CTD with DO sensor; a zooplankton and fish acoustic

			profiler; a sediment trap; acoustic doppler current profiler; a surface ice draft sensor with mounted fluorometer, CTD with DO sensor, and satellite beacon. One of the 5 moorings will also have a pH sensor.
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Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Diesel	fuel	4	35000	140000	Liters	Fuel for RV William Kennedy
Gasoline	fuel	1	200	200	Liters	Fuel for zodiac tender
Gluteraldehyde	hazardous	1	0.1	0.1	Liters	algal sample preservation
Hydrochloric Acid	hazardous	2	1	2	Liters	clean lab ware and preserve plankton samples
Mercuric Chloride	hazardous	1	0.15	0.15	Liters	preserving seawater samples
Buffered Formaldehyde	hazardous	2	4	8	Liters	sample preservation
Ethanol	hazardous	2	4	8	Liters	cleaning lab ware and sample preservation
Lugol's Acid	hazardous	1	0.1	0.1	Liters	algal sample preservation

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0		

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Marine Based Activities	Combustible wastes	280 L/yr	Used oil offloaded in Churchill and/or PEI	Disposed at approved combustible waste facility and according to Transport Canada regulations
Marine Based Activities	Greywater	12,000 L/yr	Greywater is cleaned then disposed	The research vessel has 2x Type II sewage treatment systems (Raritan Manager). This system is an on-board treatment device that uses biological or aerobic digestion-based system. After treatment the waste can be discharged. USCG Certified Type II Marine Sanitation Device and approved by Transport Canada.

Marine Based Activities	Non-Combustible wastes	150 garbage bags/yr	Offloaded in Churchill and/or PEI.	Disposed at approved refuse facility.
Marine Based Activities	Sewage (human waste)	200 L/yr	Pumped out using sewage pumper truck once each year	The research vessel has 2x Type II sewage treatment systems (Raritan Manager). This system is an on-board treatment device that uses biological or aerobic digestion-based system. After treatment the waste can be discharged. USCG Certified Type II Marine Sanitation Device and approved by Transport Canada.

Environmental Impacts:

No predicted impact from oceanographic sampling and data collection. Sampling as a whole is minimal. Oceanographic acoustics are very low power. Environmental impact is limited to the operation of the MV William Kennedy, which is Transport Canada certified and complies with Government of Canada regulations and Guidelines.

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

Please refer to Material and Water Use as well as Waste sections in this application.

SECTION H2: Disposal At Sea

Release of treated greywater will conform well beyond the guidelines and regulations for Transport Canada. Please see Waste section.

SECTION I1: Municipal Development

Description of Existing Environment: Physical Environment

Marine coastal and offshore

Description of Existing Environment: Biological Environment

Sea ice-influence ecosystem including sympagic, pelagic and benthic communities, as well as marine mammals, birds, and fish.

Description of Existing Environment: Socio-economic Environment

The marine environment being researched provides critical aspects of subsistence hunting, cultural activities, tourism, and commercial activities that support existing communities in the region.

Miscellaneous Project Information

Identification of Impacts and Proposed Mitigation Measures

We selected positive impacts for many aspects of the physical, biological, and human environment as the research we will accomplish stands to benefit these sectors. Noise and air quality may be potentially negatively impacted by acoustic sensors as well as our vessel's engines and exhaust. The impacts will be minimal if any due to the frequency and power of our acoustic sensors and very small footprint on the landscape. We will mitigate impacts on any biology by having a local guide on our vessel to assist in navigation around sensitive/protected regions.

Cumulative Effects

We believe the cumulative effect of our research will be positive.

Impacts

Identification of Environmental Impacts

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