NIRB Application for Screening #126161
Mars Exploration through Analog-site Drilling (MEAD)

Application Type: New

Project Type: Scientific Research

Application Date: Thursday, March 20, 2025

Period of operation: from 2025-07-27 to 2025-08-06

Project Proponent:
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DETAILS

Non-technical project proposal description

English: We propose to use a low-power, shallow (<1m depth) drill to excite the local surface, the vibrations then are sensed with geophones to create a shallow seismic map. This enables future Mars and lunar missions to generate target maps before drilling and sampling. MEAD drilling will also bring up small ~50gm samples that will be fed to two prototype Mars life-detection instruments and contribute to a study of microbial population changes in a polar desert (Haughton impact crater) in summer, above and below the frozen boundary (active layer, about 0.6m deep). MEAD results will improve our knowledge of where to look for possible Mars life, how to target it for sampling, and the efficacy of two potential life-detection instruments.

French: Nous proposons d'utiliser une foreuse de faible puissance et peu profonde (< 1 m de profondeur) pour exciter la surface locale. Les vibrations sont ensuite captées par des géophones afin de créer une carte sismique peu profonde. Cela permettra aux futures missions martiennes et lunaires de générer des cartes de cibles avant le forage et l'échantillonnage. Le forage MEAD permettra également de prélever de petits échantillons d'environ 50 g qui alimenteront deux prototypes d'instruments de détection de vie sur Mars et contribueront à l'étude de l'évolution des populations microbiennes dans un désert polaire (cratère d'impact Haughton) en été, au-dessus et en dessous de la limite gelée (couche active, environ 0,6 m de profondeur). Les résultats de MEAD amélioreront nos connaissances sur les endroits où rechercher une éventuelle vie sur Mars, comment la cibler pour l'échantillonnage et l'efficacité de deux instruments potentiels de détection de vie.

Inuktitut: ᐊᑐᕈᒪᔨᒍᑦ ᐆᒪᖅᑯᑎᑭᑦᑐᒥᒃ, ᐃᑎᔪᒥᒃ (<1m ᐃᑎᓂᖃᖅᑐᒥᒃ) ᐃᑰᑕᕐᒥᒃ ᖁᕕᐊᓇᖅᓯᑎᑦᑎᓇᓱᐊᖅᑐᑕ ᓄᓇᐅᑉ ᖄᖓᓂᒃ, ᖁᐊᖅᓵᕐᓇᕐᓂᖏᑦ ᖃᐅᔨᔮᐅᕚᕐᐳᑦ ᓄᓇᐅᑉ ᓂᐱᓕᐅᕈᑎᖏᓐᓄᑦ ᓴᖅᑭᑦᑎᖁᓪᓗᒋᑦ ᐃᑎᔪᒥᒃ ᓄᓇᐅᑉ ᖄᖓᓂᒃ ᓄᓇᙳᐊᒥᒃ. ᑕᒪᓐᓇ ᐱᔪᓐᓇᖅᑎᑦᑎᔨᖅ ᓯᕗᓂᒃᓴᒥ ᓯᓚᕐᔪᐊᑉ ᖄᖓᓄᑦ ᐊᒻᒪ ᑕᖅᑭᕐᒧᑦ ᑎᑭᑕᐅᓂᐊᖅᑐᓄᑦ ᓴᖅᑭᑦᑎᔪᓐᓇᖁᓪᓗᒋᑦ ᑐᕌᒐᒃᓴᐅᔪᓂᒃ ᓄᓇᙳᐊᓂᒃ ᐃᑰᑕᓚᐅᙱᓐᓂᖏᓐᓂ ᐊᒻᒪ ᐆᒃᑐᕋᐃᓚᐅᙱᓐᓂᖏᓐᓂ. MEAD-ᑯᑦ ᐃᑰᑕᕐᓂᖏᑦ ᓴᖅᑭᑦᑎᓂᐊᕐᒥᔪᑦ ᒥᑭᔪᓂᒃ ~50gm-ᓂᒃ ᖃᐅᔨᓴᕈᑎᓂᒃ ᑐᓂᔭᐅᓂᐊᖅᑐᓂᒃ ᒪᕐᕉᓐᓄᑦ ᐆᒃᑑᑎᓄᑦ ᓯᓚᕐᔪᐊᑉ ᖄᖓᓂ ᐃᓅᓯᕐᒥᒃ ᖃᐅᔨᓴᕈᑎᓄᑦ ᐊᒻᒪᓗ ᐃᑲᔪᕐᓂᖃᕐᓂᐊᖅᑐᑦ ᖃᐅᔨᓴᕐᓂᕐᒧᑦ ᒥᑭᑦᑑᑎᓂᒃ ᐆᒪᔪᓂᒃ ᐊᓯᔾᔨᖅᐸᓪᓕᐊᓂᖏᓐᓂᒃ ᓯᓚᕐᔪᐊᑉ ᖄᖓᓂ ᓯᑯᖃᙱᑦᑐᒥ (Haughton impact crater) ᐊᐅᔭᒃᑯᑦ, ᖁᑦᑎᓂ ᐊᒻᒪᓗ ᐊᑖᓂ ᖁᐊᖑᔪᖅ ᑭᒡᓕᖓᑕ (ᐊᒃᑐᐃᓂᖃᖅᑐᖅ 0.6m). MEAD-ᑯᑦ ᖃᐅᔨᔭᐅᔪᑦ ᐱᐅᓯᕚᓪᓕᖅᑎᑦᑎᓂᐊᖅᑐᑦ ᖃᐅᔨᒪᓂᑦᑎᓐᓂᒃ ᓇᑭᑦ ᕿᓂᕈᓐᓇᕐᒪᖔᑦᑕ ᓯᓚᕐᔪᐊᑉ ᖄᖓᓂ ᐆᒪᔪᓂᒃ, ᖃᓄᖅ ᑐᕌᒐᖃᕈᓐᓇᕐᒪᖔᑦᑕ ᖃᐅᔨᓴᕈᑎᒃᓴᓂᒃ, ᐊᒻᒪᓗ ᐊᑑᑎᖃᕐᓂᖏᓐᓂᒃ ᒪᕐᕉᒃ ᐆᒪᔪᓂᒃ ᖃᐅᔨᓴᕈᑎᐅᔪᓐᓇᖅᑑᒃ.

Personnel

Personnel on site: 7

Days on site: 10

Total Person days: 70

Operations Phase: from 2025-07-27 to 2025-08-06

Closure Phase: from 2025-08-06 to 2025-08-10

Activities

Location	Activity Type	Land Status	Site history	Site archaeological or paleontological value	Proximity to the nearest communities and any protected areas
Base Camp Location	Camp	Inuit Owned Surface Lands	Site previously used by Western University and others	N/A	N/A
Existing Airstrip Location	Airstrip use or construction	Inuit Owned Surface Lands	Previously used strip by Twin Otters near camp	N/A	N/A
Proposed Study Range	Sampling sites	Inuit Owned Surface Lands	Impact melt breccia deposits inside the crater	N/A	N/A

Community Involvement & Regional Benefits

Community	Name	Organization	Date Contacted
Information is not available			

Authorizations

Indicate the areas in which the project is located:

Authorizations

Regulatory Authority	Authorization Description	Current Status	Date Issued / Applied	Expiry Date
Government of Nunavut, Nunavut Research Institute	Research Permit	Applied, Decision Pending		
Nunavut Water Board	Application for Approval without Licence	Applied, Decision Pending		
Qikiqtani Inuit Association	Land Use #320546	Applied, Decision Pending		

Project transportation types

Transportation Type	Proposed Use	Length of Use
Air	DHC-6 Twin Otter from Resolute	
Land	4 ATVs on Devon	

Project accomodation types

Temporary Camp

Material Use

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

Equipment Type	Quantity	Size - Dimensions	Proposed Use
Kawasaki Bayou ATVs	4	1m x1m	Visit sites of scientific interest in the study area; logistics to/from airstrip.
Kawasaki Bayou ATVs	4	1m x1m	Visit sites of scientific interest in the study area; logistics to/from airstrip.
Shallow 1m TRIDENT drill	1	1.5m x 0.4m	Mars prototype drill (Honeybee Robotics), max 1m depth, 3cm diameter, for sampling and local seismic vibration.
2kW generator	1	1.5m x 0.4m	(a) Base camp instruments and communications (b) field site of interest (drill, instruments); located in spill kit catchments.
2kW generator	2	0.3m x 0.5m	(a) Base camp instruments and communications (b) field site of interest (drill, instruments); located in spill kit catchments.

Detail Fuel and Hazardous Material Use

Detail fuel material use:	Fuel Type	Number of containers	Container Capacity	Total Amount	Units	Proposed Use
Gasoline	fuel	2	205	410	Liters	ATVs, 2kW generators
Propane	fuel	2	20	40	Liters	Cooking
Other	fuel	1	1	1	Liters	motor oil for ATVs

Water Consumption

Daily amount (m3)	Proposed water retrieval methods	Proposed water retrieval location
0	Water pulled by bucket and used for cooking, drinking and camping.	Haughton River bank

Waste

Waste Management

Project Activity	Type of Waste	Projected Amount Generated	Method of Disposal	Additional treatment procedures
Waste disposal	Greywater	300L total	disposed in a sump dug out far from the river	filled in upon departure
Waste disposal	Non-Combustible wastes	3-4 large 100L trash bags	Backhaul to Resolute	coordinate disposal with Polar Shelf
Drilling	Overburden (organic soil, waste material, tailings)	100-200 gm per 1m sample hole	backfilled into hole after sampling	N/A
Waste disposal	Sewage (human waste)	50L total	disposed in a sump dug out far from the river	filled in upon departure

Environmental Impacts:

2cm x 1m depth boreholes at sampling sites: will be filled in ATV tracks: will stay on existing trails Wastes: gray/blackwater in sump away from river, will be filled in Trash: backhauled to Polar Shelf

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 I1: Municipal Development

Description of Existing Environment: Physical Environment

22 million year old meteor impact crater with well-preserved gray impact rocks and no overburden.

Description of Existing Environment: Biological Environment

Polar desert with almost no plant life and very rare inland sightings of seagulls or foxes. Bears occasionally traverse Devon Island and their tracks or scat are sometimes found (away from camp).

Description of Existing Environment: Socio-economic Environment

Haughton Crater has no settlements or lodges. 7km northwest of the proposed campsite is both the Mars Society habitat camp and Pascal Lee's HMP camp area, but neither is expected to be in use this year.

Miscellaneous Project Information

Re-use of campsite previously used by Western University and others

Identification of Impacts and Proposed Mitigation Measures

This project is primarily observational except for small drilled soil samples (< 200g each, no deeper than 1m, using a low-power electric drill with no lubricants or fluids). Traverses to study sites may leave minor ATV tracks.

Cumulative Effects

Reinforcement of existing ATV trails

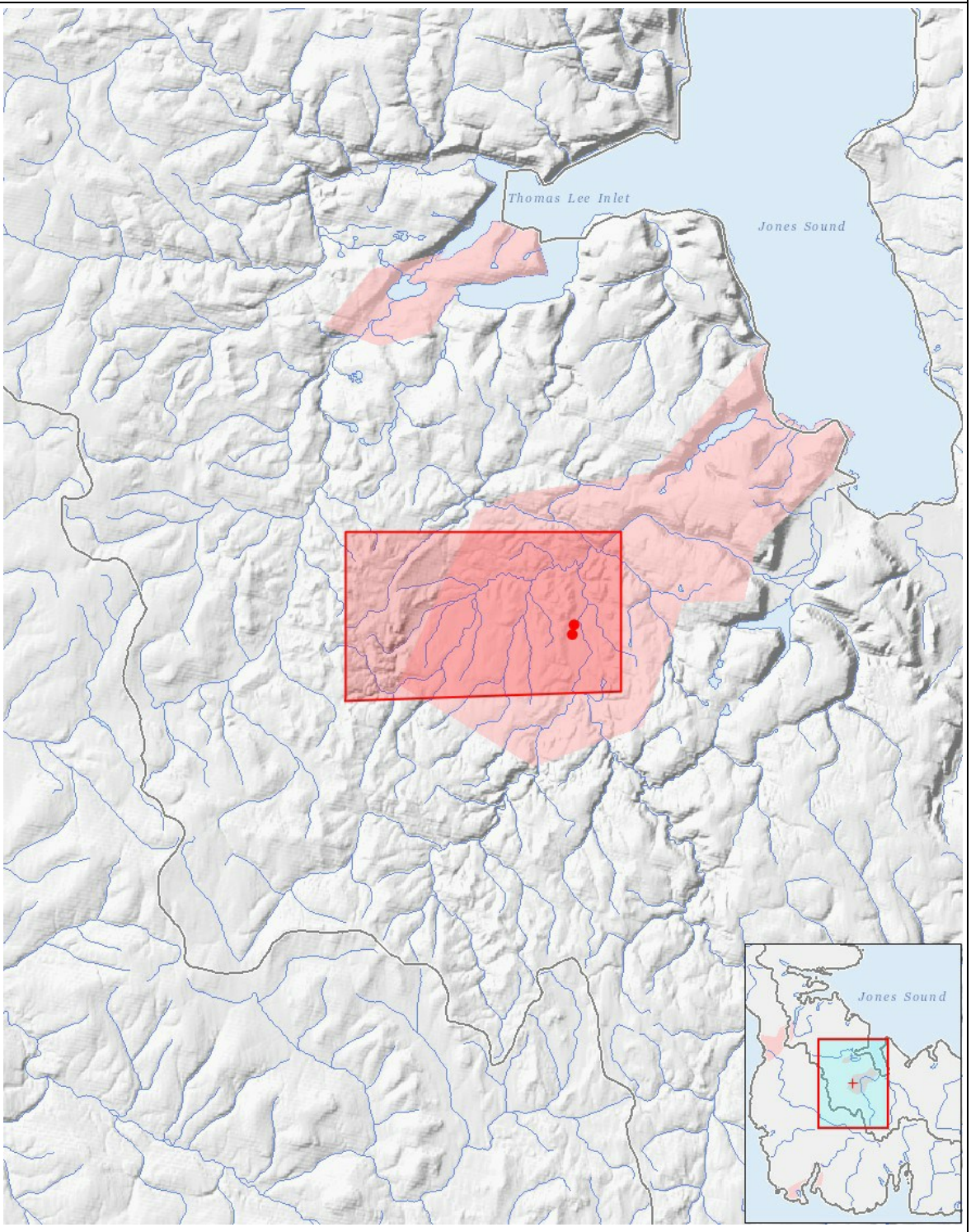
Impacts

Identification of Environmental Impacts

	PHYSICAL	Designated environmental areas	Ground stability	Permafrost	Hydrology / Limnology	Water quality	Climate conditions	Eskers and other unique or fragile landscapes	Surface and bedrock geology	Sediment and soil quality	Tidal processes and bathymetry	Air quality	Noise levels	BIOLOGICAL	Vegetation	Wildlife, including habitat and migration patterns	Birds, including habitat and migration patterns	Aquatic species, incl. habitat and migration/spawning	Wildlife protected areas	SOCIO-ECONOMIC	Archaeological and cultural historic sites	Employment	Community wellness	Community infrastructure	Human health
Construction																									
-		-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-		-	-	-	-	-
Operation																									
Airstrip use or construction		-	-	-	-	-	-	-	-	-	-	-	N		-	-	-	-	-		-	-	-	-	-
Camp		-	-	-	-	-	-	-	-	N	-	-	-		-	-	-	-	-		-	-	-	-	-
Sampling sites		-	-	M	-	-	-	-	-	M	-	-	-		-	-	-	-	-		-	-	-	-	-
Decommissioning																									
Airstrip use or construction		-	-	-	-	-	-	-	-	-	-	-	N		-	-	-	-	-		-	-	-	-	-

(P = Positive, N = Negative and non-mitigatable, M = Negative and mitigatable, U = Unknown)

Project Location



List of Project Geometries

1	polygon	Proposed Study Range
2	point	Base Camp Location
3	point	Existing Airstrip Location