MARITIME
LAUNCH

ABOUT
MARITIME LAUNCH SERVICES

Maritime Launch is a Canadian-owned commercial aerospace company based in Nova Scotia.

ABOUT
THE SPACEPORT IN NOVA SCOTIA

Maritime Launch is executing a plan to develop and operate Spaceport Nova Scotia, a commercially controlled and managed site that will provide rocket launch services to clients in support of the growing commercial space transportation industry. This will be the first commercial orbital launch complex in Canada.

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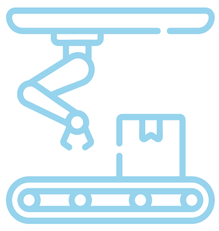
THE OPPORTUNITY

With the building of this world-class facility near Canso, Nova Scotia, Canada will join a small group of countries around the globe with launch capabilities.

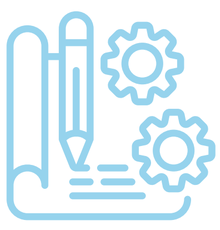
The Spaceport will employ 50 full time, year-round employees in Nova Scotia. The launch complex will require an investment in community infrastructure, and it will support economic spinoffs in the tourism and hospitality sectors, keep our highly educated youth at home, and facilitate research and development initiatives with post-secondary institutions in the region.

Career opportunities at the Spaceport will be available for skilled trades, scientists, engineers, security, and fire services. For each launch, there will be an additional 150 people working at the site.



MANUFACTURING AND PRODUCTION

Machinists
Assembly Mechanics
Electrical Technicians
Tooling Fabricators
Precision Welders
Composite Mechanics



ENGINEERING AND LAUNCH OPERATIONS

Aerospace
Mechanical
Electrical
Launch Operations Engineers
Aerospace Technicians
Protective Services
General Services

ADMINISTRATIVE

IT
Supply Chain
Finance

Indirect economic impact to the community will occur in tourism and associated outgrowth in tax revenues, hotels, stores and restaurants, seaport usage, and new business development.

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OUR COMMITMENT TO SAFETY

Safety is Maritime Launch's top priority and it is woven into everything we do, from building access roads in preparation of the site for construction to carrying commercial satellites into space.

Based on our extensive knowledge of spaceflight, we are developing a safe operational environment for all stakeholders of the project. This includes the local communities, our employees, contractors, launch service customers, our province, and our country.

Safety is a cornerstone to our operations. Here is how we will implement it in all areas:

- By leveraging the extensive experience and expertise of our professional team and project partners—utilizing vast practical knowledge and best industry practices that were accumulated since the beginning of spaceflight.
- By undertaking a thorough analysis of potential hazards and implementation of engineering controls into the design of the spaceport, its facilities, and operational planning.
- Through compliance with regulatory requirements that are instituted on all levels of government—municipal, provincial, federal, and international.
- Through partnership and collaboration with the community and the Mi'kmaq on many safety aspects including raising public awareness, education, and feedback.
- Assisting with the upgrade of local emergency response services and providing safety-related employment opportunities at the Spaceport.

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THE BUSINESS CASE FOR LAUNCHING SATELLITES

The global space industry was estimated in value at $385 billion in 2020, and satellite communications is leading the growth. The purpose of the satellite industry at large is to conduct more frequent launches of smaller satellites, many of which will go into sun-synchronous orbits.

Satellite clients represent the following industries:

EARTH IMAGING

Agriculture
Change Detection
Disaster Mitigation
Meteorology

TELECOMMUNICATIONS

Television
Telephones
Broadband
Aviation
Road and Rail

SCIENCE

Earth Science
Space Science

NATIONAL SECURITY

TOURISM

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ROCKET NOISE STUDY

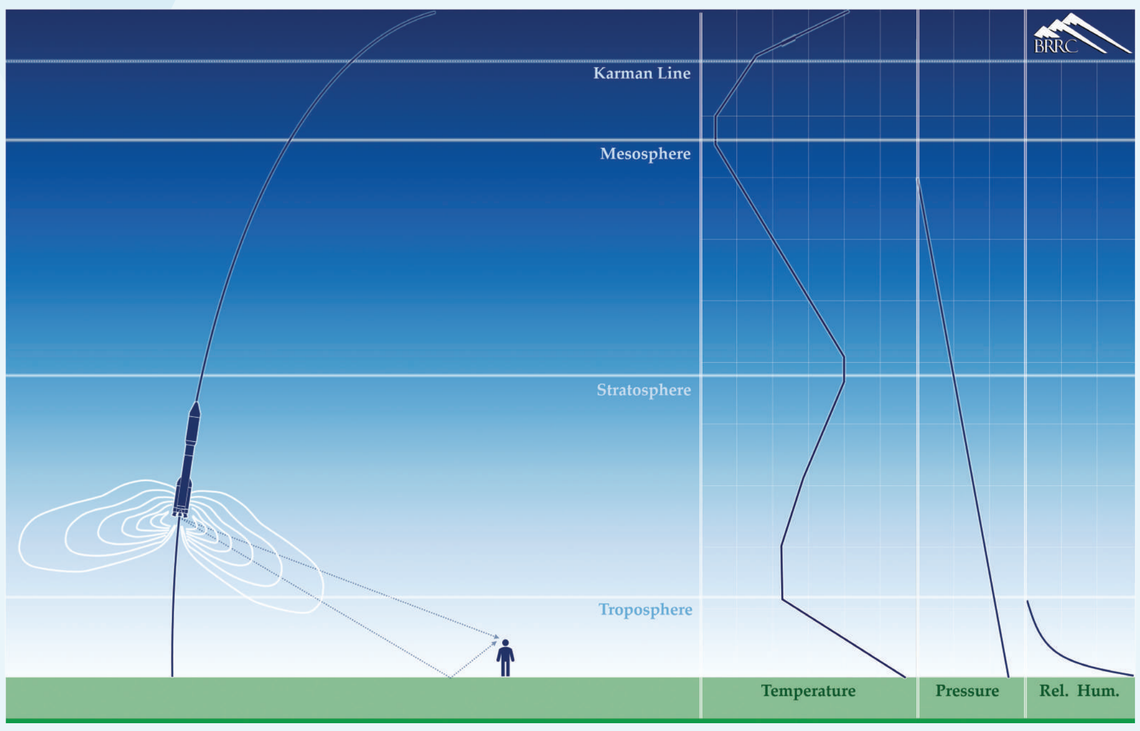
OVERVIEW

Maritime Launch Services employed the acoustical engineering firm, Blue Ridge Research and Consulting, LLC (BRRC), to evaluate the potential impacts of noise from Canso Spaceport operations.

PROPULSION NOISE AND SONIC BOOM MODELLING

BRRC has provided rocket noise analyses for over 30 environmental studies in the US, UK, and Canada. BRRC utilizes modelling software that reflects the best available science.

- Propulsion noise modelling was performed with RUMBLE.
- Sonic boom modelling was performed with PCBoom.



ENVIRONMENTAL NOISE MONITORING

BRRC is measuring ambient sound levels in 2021 using high-fidelity acoustical monitoring equipment located at the Canso Spaceport and in the surrounding community.

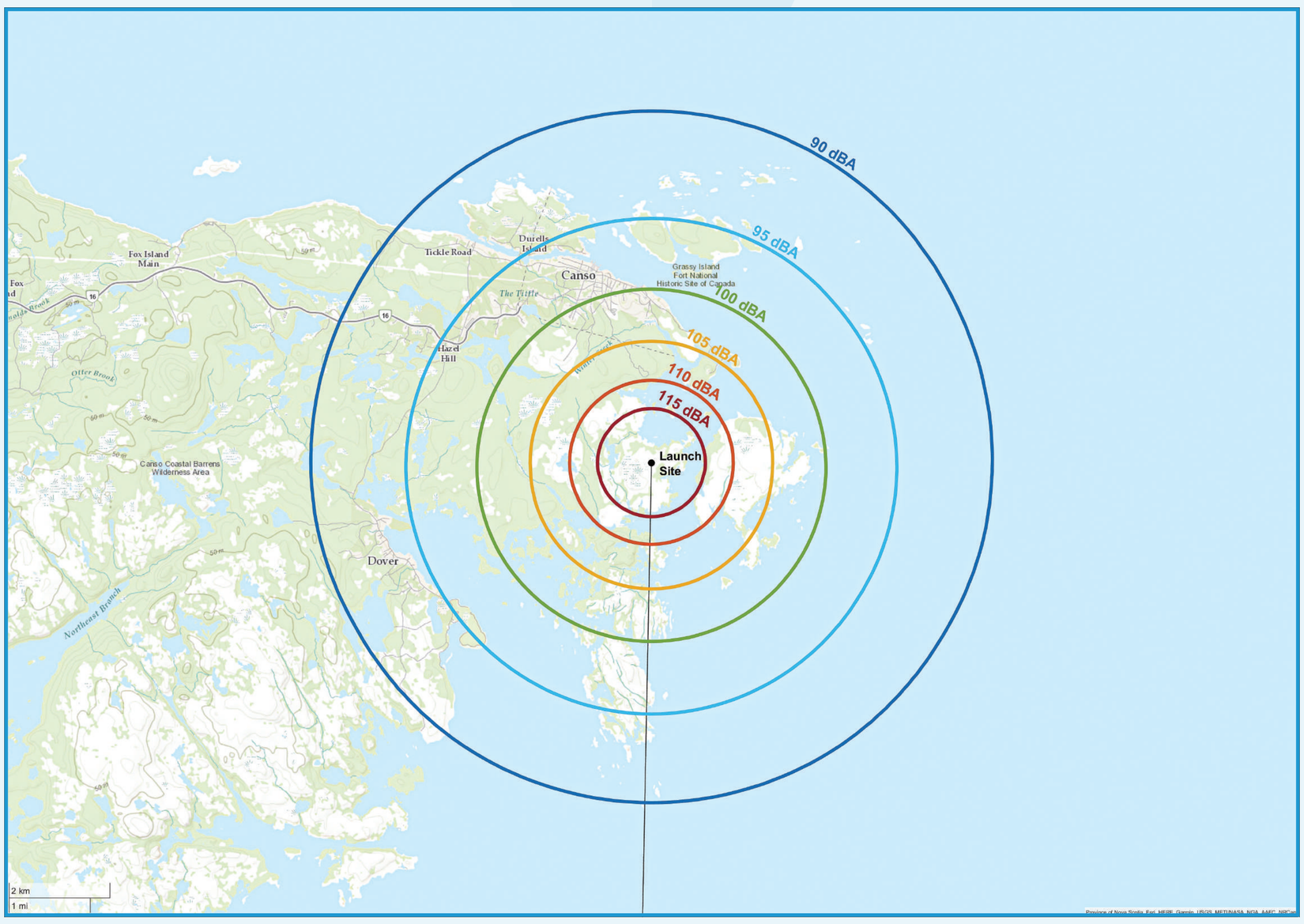
BRRC

MARITIME LAUNCH

ROCKET NOISE STUDY

PROPULSION NOISE MODELLING

Rocket engines generate high-amplitude broadband noise. The primary sources of noise are generated by combustion of the rocket propellants, and mixing between the rocket plume and the atmosphere.



MAXIMUM A-WEIGHTED SOUND LEVELS

- A-weighted decibel levels (dBA) are commonly used to assess community noise.
- The maximum sound level outside the evacuation area is not expected to exceed 105 dBA (comparable to an ambulance siren).
- The maximum sound level in Canso may briefly reach approximately 100 dBA (comparable to a motorcycle).
- The maximum sound level in Little Dover may briefly reach approximately 90 dBA (comparable to a lawnmower).

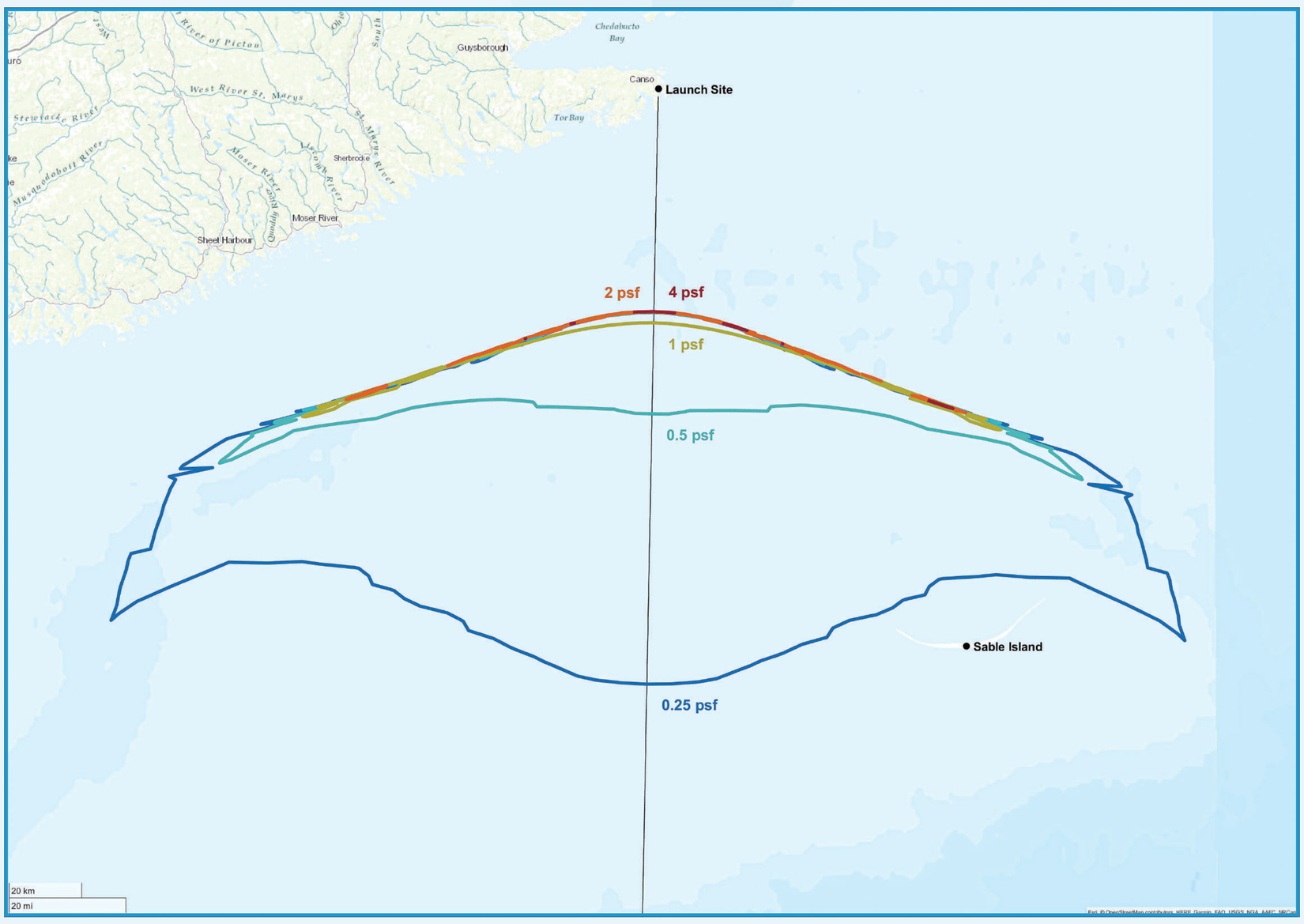
BRRC

MARITIME LAUNCH

ROCKET NOISE STUDY

SONIC BOOM MODELLING

A sonic boom is a thunder-like noise heard when a vehicle flies overhead faster than the speed of sound. A vehicle travelling faster than the speed of sound creates shock waves, much like a boat creates a wake in water. The shock waves are heard as a sonic boom.



SONIC BOOM PEAK LEVELS

- Sonic boom levels are measured in pounds per square foot (psf). For context, 0.25 psf sounds like distant thunder, while 2 psf sounds like thunder at 1 km.
- Sonic booms generated by the Canso Spaceport launch along a southward trajectory, and **will not impact mainland Nova Scotia**.
- Sable Island may experience low level sonic booms less than 0.25 psf (outside of the contours shown).

BRRC

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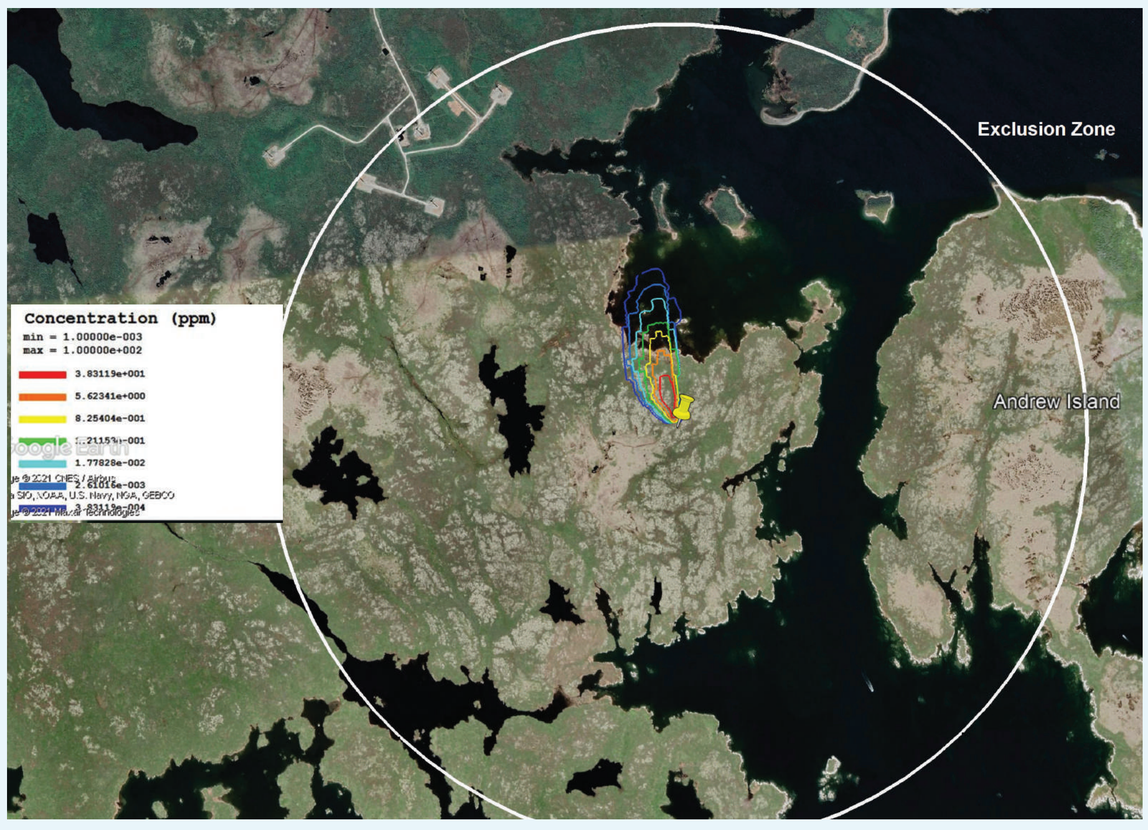
AIR EMISSIONS MODELLING

Lloyd's Register's Applied Technology Group (LR ATG) uses industry standard dispersion software to simulate chemical releases and determine their impact on local air quality. LR ATG has experience performing dispersion simulations for a range of facility types in rural, urban, and coastal environments.

When evaluation scenarios involve gas cloud dispersion analysis, LR ATG first uses simplified modelling tools. These tools allow fast assessments of a wide range of chemical release and atmospheric conditions to bound the extent of the gas cloud. When increased accuracy is needed, the high-fidelity, full-physics capabilities in ATG's Rapid City Planner platform is used. This tool provides the capability to perform geolocated scenario simulations. This capability enables LR ATG to include local terrain features and building locations in the model, and examine their effect on gas cloud dispersion. Once calculations are complete, RCP also enables the dispersion results to be overlaid on satellite imagery allowing for easy visualization by a wide audience of stakeholders.

The following image shows the predicted ground level plume concentrations sixty seconds following a launch under the worst-case weather scenario. The hot plume rises rapidly, limiting the air quality impacts to an isolated area near the pad. The affected area is well within the launch exclusion zone.



Lloyd's Register

MARITIME LAUNCH

AIR MONITORING

Relying on its expertise in emissions measurement, the St. Francis Xavier University Department of Earth Sciences will build, install and maintain an air monitoring system consisting of 4 "Ring" monitoring stations surrounding the launch pad, and 1 "Urban High Fidelity" monitoring station near Canso. The placement of the air monitors was informed by plume modeling that simulated the movement of combustion gases during the launch under a variety of wind conditions.

Four Ring stations surround the launch pad, with a setback of 600 m. These stations are designed to monitor the spread of rocket emissions, to ensure that emissions conforrm to model expectations. Combustion gases that will be measured include carbon dioxide (CO_2), carbon monoxide (CO), and nitrogen dioxide (NO_2). The Ring stations will be solar powered and will report measurements by telemetry to the St. Francis Xavier University Campus.

An Urban High Fidelity Station will be located on the edge of Canso. This station will comprise more sensitive instrumentation since it is much farther (~7 km) from the launch site where emissions are expected to be highly disperse and much harder to detect. This station will measure a wider range of gases including also methane (CH_4), nitric oxide (NO), total nitrogen (NOx), and particulate matter (PM sizes 1, 2.5, 4, 10 micrometres). This station will be grid-powered, and will display measurements continuously through a website. A simplified version of the station will be located onsite with programmable sensors for use by school-aged youth under the tutelage of St. Francis Xavier University students and staff.

The air monitoring system will conform to Nova Scotia Environment expectations, and will be maintained in a manner consistent with protocols established by the National Air Pollution Surveillance Program.

Above: Air monitoring locations, including the 4 Ring stations around the launchpad, and the Canso Urban High Fidelity station.
At Right: A St. Francis Xavier University air monitoring station in Alaska.

QUAECUMQUE·SUNT·VERA

ST. FRANCIS XAVIER UNIVERSITY

2021 BIRD SURVEYS

N

Crow Island

Grassy Island Fort National Historic Site of Canada

"Bridge" Shoreline/Shorebird Transect

Cranberry Islands

Canso Coastal Barrens Wilderness Area

Black Duck Cove Shoreline/Shorebird Transect

"Hook" Shoreline/Shorebird Transect

Launch Control Centre

Spinney Gully

Canso Coastal Barrens Wilderness Area

"Trail" Shoreline/Shorebird Transect

Andrews Island Provincial Park

Gull Island

Black Duck Cove Provincial Park

Canso Coastal Barrens Wilderness Area

Canso Coastal Barrens Wilderness Area

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0 1 2
Kilometers

Field Bird Survey Data
- Field Transect Location
- Field Bird Observation
- Autonomous Recording Unit (ARU) Deployment
- Leach's Storm Petrel (LESP) Detection
- Wildlife and Wildlife Habitat Study Area

Project Infrastructure
- Fence
- Building
- Road

Significant Ecological Area
- National Historic Site of Canada

Provincial Portected Areas
- Wilderness Area

Proposed or Pending Protection
- Provincial Park

• Conditions of the Environmental Assessment Approval required MLS to developed a Wildlife Management Plan which include studies on the diversity, behavior, and potential impacts to birds using the site during spring and fall migrations and during the shorebird/seabird/waterfowl breeding season.

• These studies have involved a desktop review and a field reconnaissance to collect data on the occurrence and breeding status of resident and migratory birds within the study area.

• The first of the studies were completed in the spring/summer of 2021 with additional studies planned for late summer and winter of 2021 which will be followed by post launch monitoring studies in 2023.

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2021 BIRD SURVEY PHOTOS

Black Duck Cove Shoreline Transect

Harlequin Ducks flying over water

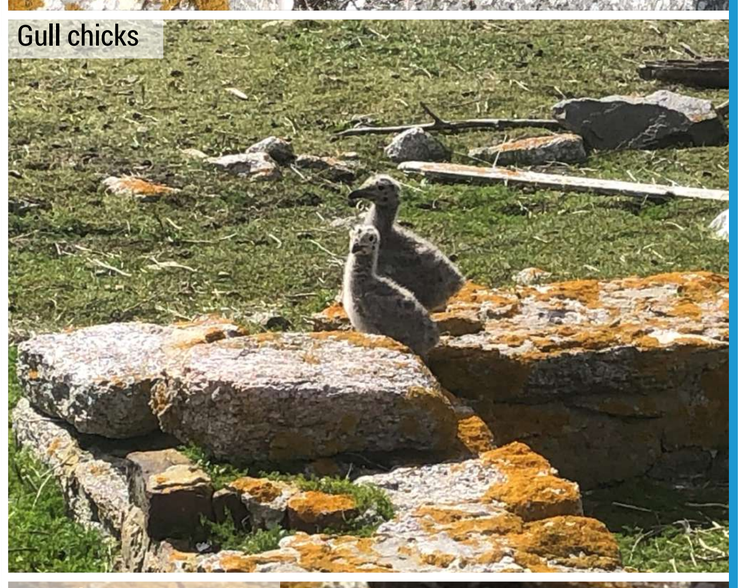
Double-Creasted Cormorant Colony Crow Island

Gull eggs in nest with chick hatching Cranberry Island

Autonomous Recording Unit (ARU) deployed in the field

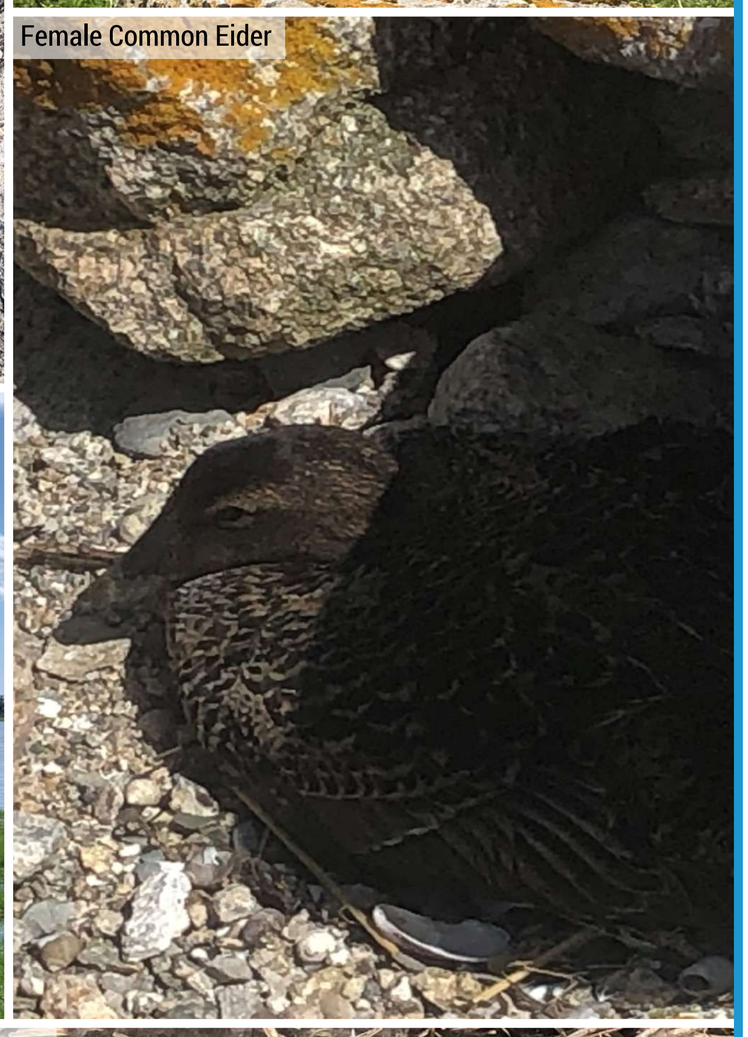
Tuna Skeleton

Gull chicks



Bald Eagle

Female Common Eider



“Bridge” Shoreline/Shorebird Transect

Whimbrel

American Oystercatcher

Common Eider nest

MARITIME LAUNCH

SPACEPORT NOVA SCOTIA

THE INFRASTRUCTURE

The spaceport consists of three parts:

1

THE HORIZONTAL INTEGRATION FACILITY (HIF)

The launch vehicle is transported to the HIF in parts. The payload, or satellites, are also transported to the HIF. The second stage of the vehicle, as well as the payload, are fueled with propellants and then integrated with the empty first stage into a fully assembled launch vehicle. During this process, the launch vehicle and its parts undergo a number of tests and checks to ensure it is safe for launch. Following successful tests, the launch vehicle, or rocket, is transported to the Launch Pad Area in a horizontal position.

2

THE LAUNCH PAD AREA (LPA)

The LPA receives the launch vehicle from the HIF. The launch vehicle is then positioned vertically and the first stage propellants are loaded onto the vehicle. At this time, additional safety and readiness checks take place. Once the safety checks are successfully completed, the launch vehicle is fully fueled and ready to launch into low earth orbit.

3

THE LAUNCH CONTROL CENTRE (LCC)

The top floor of the LCC is a facility used to direct, control, and coordinate the active launches and test operations. The launch control team works from the LCC to complete final readiness checks and eventually, issue the launch command.

The ground floor of the LCC will be open year round to welcome the community and international visitors alike to experience Canada's first commercial spaceport.

MARITIME LAUNCH

ENVIRONMENT PROTECTION

Maritime Launch is committed to being stewards of the environment and proactive in our efforts to be sustainable and minimize our footprint. We are committed to designing, constructing, and operating the Spaceport in a manner that reduces environmental effects, and will consider environmental management in all of its activities.

The Spaceport has been through an extensive environmental assessment process, which received Environmental Assessment Approval from Nova Scotia Environment and Climate Change on June 4, 2019.

The Approval is subject to conditions which include management plans, monitoring programs, and environmental permits.

Conditions of the
Environmental Assessment Approval
include developing the following plans:

Environmental Protection
Wildlife Management
Air Quality Monitoring
Lighting Management
Dust Monitoring
Noise Management
Erosion and Sediment Control
Stormwater Management
Complaint Resolution
Emergency Response
Rehabilitation

Additionally, the following permits are required:

Division IV Dangerous Goods Approval
Division I Watercourse Alteration Approval

Engaging with the local community and the Mi'kmaq are priorities for Maritime Launch, and we are engaging regularly with the Community Liaison Committee as the project progresses.