# 4.0 Consultation and Engagement

## 4.1 Overview of Consultation and Engagement Requirements, Role of the Proponent, and Proponent's Approach

Consultation and engagement are required for the Project under section 58 of the Newfoundland and Labrador (NL) *Environmental Protection Act* (NL EPA). The *Act* requires that there are opportunities for interested members of the public to meet with a proponent at a place adjacent to or in the geographical area of the undertaking, or as the Minister may determine. Consultation and engagement provide information concerning the undertaking to the people whose environment may be affected by the undertaking and records and responds to the concerns of the local community regarding the environmental effects of the undertaking. Under section 10 of the *Environmental Assessment Regulations*, a proponent will notify the Minister and the public of a meeting scheduled with the public under section 58 of the *Act* not fewer than seven days before a scheduled meeting.

This chapter outlines the consultation and engagement process undertaken by WEGH2 and describes the issues and concerns raised by interested members of the public, stakeholders, and Indigenous groups throughout the process.

The Environmental Impact Statement (EIS) guidelines set out in December 2022 outline engagement and consultation requirements for this Project. The guidelines request development of the following plans:

- Public Participation Plan (Appendix 4-A)
- Domestic Wood Cutting Consultation Plan (Appendix 4-B)
- Outfitter Environmental Effects Monitoring Plan

The guidelines also outline the requirements for consultation and engagement associated with the development and implementation of these three plans. The Public Participation Plan (Appendix 4-A) outlines World Energy GH2's (WEGH2) approach to engagement and consultation through all Project phases. The Domestic Wood Cutting Consultation Plan (Appendix 4-B) has been developed in consultation with the NL Department of Fisheries, Forestry and Agriculture. This plan will be used to engage with domestic users on the Port au Port Peninsula to identify and address concerns with the Project and develop appropriate mitigations.

The Outfitter Environmental Effects Monitoring Plan will include a description of the potential environmental effects of the Project on outfitters, measures to mitigate those effects, and monitoring plans for the life of the Project. This chapter describes engagement by WEGH2 with the Newfoundland and Labrador Outfitters Association (NLOA), and identifies concerns expressed by the NLOA and how those concerns are being addressed.

### 4.1.1 WEGH2's Role

Stakeholder engagement is a key priority for WEGH2. WEGH2 strives to be a good neighbour and corporate citizen, practice sound environment and social governance, and create positive impacts in the communities in which WEGH2 operates. As such, WEGH2 began consultation and engagement with stakeholders early in the process and will continue to engage with interested parties throughout the life of the Project.

WEGH2 initiated Project consultation and engagement with stakeholders in March 2022. Consultation and engagement activities have included: meetings with individuals and groups, drop-in sessions within communities, delivery of presentations to communities and business leaders, distribution of brochures and household mailouts, launching a website and social media accounts, sharing a monthly e-newsletter, conducting media interviews, participating in community events and sponsorships, and hosting a series of open houses in the Project areas.

WEGH2 has a dedicated stakeholder relations team, overseen by WEGH2's Managing Director and CEO. The full-time stakeholder relations team includes the following roles: Director of Public and Regulatory Affairs; Marketing Communications and Stakeholder Relations Manager; Community Liaison; and Community Engagement Manager.

WEGH2 established a Community Information Office in July 2022 to serve as a point of contact for local residents with comments and concerns during the Project construction period. The office is located in Stephenville and is managed by two local team members, the Community Liaison and the Community Engagement Manager. Throughout summer and fall 2022, and winter 2023, WEGH2's Community Office hosted a resident wind energy educator from DOB Academy (Netherlands). In May 2023, the Community Office welcomed a student intern from College of the North Atlantic's Community Studies program for a five-week work-term. To date, WEGH2's stakeholder consultation and engagement has resulted in the following:

- Comprehensive understanding of stakeholders' priorities, concerns and questions
- Input from Indigenous leaders, including letters of support and memoranda of understanding (MOUs)
- Input from the Town of Stephenville and municipalities in the area
- Strong community activity and engagement, including a committee developed to work with WEGH2 that represents the Port au Port Project area
- Growing interest in the Project, particularly in relation to employment, training, and service / supply opportunities

### 4.1.2 Approach

WEGH2 is committed to ongoing consultation and engagement, and to involving local stakeholders and Indigenous communities throughout the lifetime of the Project. WEGH2 will continue to build on the engagement that has already been undertaken as part of the Project development activities in NL. WEGH2 will improve on, and expand, previous engagement efforts to develop and operate the Project with tangible, appropriate benefits to local communities and stakeholders. WEGH2's approach to consultation and engagement is described in more detail in the Project Public Participation Plan (Appendix 4-A).

WEGH2's approach is to be open and responsive, and to build trusting relationships with key stakeholders. Key Project stakeholders include:

- Indigenous communities
- Community leaders and residents within the Project areas
- Business leaders
- Education partners
- Industry partners
- Government (municipal, provincial, and federal)

WEGH2's approach is to continue engaging with community leaders to share information about the Project, and to work with community, Indigenous, industry, and business leaders to build understanding of the opportunities this Project will bring to the area – and the province. Along with information-sharing, WEGH2 is asking questions, actively listening, and addressing concerns as WEGH2 builds trusting relationships with stakeholders.

### 4.1.3 Indigenous Group Engagement

WEGH2's engagement with Indigenous groups began in March 2022. Engagement with the Indigenous groups is ongoing and will continue throughout the life of the Project. The results of WEGH2's engagement with the Indigenous groups is described in Section 4.2.6. WEGH2's long-term engagement planning provides the opportunity for WEGH2 to continue listening and learning from the Indigenous groups with the following intended results:

- Establish trust
- Share information regarding the foundations of the Project
- Create points of contact
- Identify priorities, concerns and issues
- Identify common ground
- Establish methods of ongoing communications

Specifically, as part of its continued Indigenous engagement effort, WEGH2 will:

- Continue meetings, phone calls and emails with Indigenous community leaders
- Continue developing partnerships with Indigenous communities
- Continue to staff a Community Office in Stephenville to act as a hub for conversation and presence in the area.

## 4.2 Consultation and Engagement Activities and Outcomes

### 4.2.1 Project Stakeholders and Indigenous Groups

Community (Indigenous and non-Indigenous) engagement and consultation began in March 2022. To date, it has included a series of one-on-one and group meetings with members of the community and organizations, drop-in sessions within communities, opening a Community Information Office in Stephenville, distributing brochures and household mailouts, launching a website and social media accounts, sharing a monthly e-newsletter, conducting media interviews, delivering speeches / presentations to communities and business leaders, and participating in community events and sponsorships.

Table 4.1 lists the key stakeholders and key Indigenous groups engaged for the Project.

**Table 4.1 Key Stakeholders and Indigenous Groups**

| Stakeholder Group | Stakeholders |
|---|---|
| Community leaders and residents within the Project areas | Municipal leaders (listed below in 'Government' section)<br>Associations and Groups<br>• Bay St. George all-terrain vehicle (ATV) and Snowmobile Association<br>• Bay St. George South Historical Society<br>Local Service District Committees<br>• Bay St. George South (Fischells, Heatherton, Robinsons, Cartyville, McKay's, Jeffrey's, Maidstone, St. David's, St. Fintan's, Loch Leven, Highlands)<br>• Black Duck Brook and Winterhouse<br>• Boswarlos<br>• Campbell's Creek<br>• Fox Island River – Point au Mal<br>• Mainland<br>• Piccadilly Head<br>• Piccadilly Slant – Abraham's Cove<br>• Sheaves Cove<br>• Ship Cove – Lower Cove – Jerry's Nose<br>• Three Rock Cove<br>• West Bay<br>Residents |

### Table 4.1 Key Stakeholders and Indigenous Groups

| Stakeholder Group | Stakeholders |
|---|---|
| Industry partners | EnergyNL<br>NL Construction Association (NLCA)<br>Trades NL<br>Women in Resource Development Corporation (WRDC) |
| Business leaders | Organizations<br>• Bay St. George South Area Development Association<br>• Bay St. George Chamber of Commerce<br>• Codroy Valley Area Development Association<br>• Kruger (Corner Brook Pulp and Paper)<br>• Long Range Small Business Committee<br>• MOWI<br>• NLOA<br>• NL Organization of Women Entrepreneurs<br>• St. John's Board of Trade<br>• Stephenville Business Improvement Association<br>Individuals<br>Business owners |
| Education partners | College of the North Atlantic<br>Memorial University of Newfoundland and Labrador<br>Grenfell Campus<br>Marine Institute |
| Government | Government of Newfoundland and Labrador<br>Government of Canada<br>Municipalities<br>• Cape St. George<br>• Kippens<br>• Lourdes<br>• Port au Port East<br>• Port au Port West-Aguathuna-Felix Cove<br>• Stephenville<br>• Stephenville Crossing<br>• St. George's<br>Royal Canadian Mounted Police (Bay St. George detachment) |
| Alliances and Associations | • NARMN (NL Alliance of Rural Mi'kmaq Nations)<br>• NL Indigenous Peoples' Alliance<br>• Newfoundland Aboriginal Women's Network |

**Table 4.1 Key Stakeholders and Indigenous Groups**

| Stakeholder Group | Stakeholders |
|---|---|
| **Indigenous Groups** | |
| Indigenous groups<br>Local Band Councils | • Qalipu First Nation<br>- Benoit First Nation (Port au Port)<br>- Flat Bay Mi'kmaq Band (Flat Bay)<br>- Indian Head First Nation (Stephenville)<br>- Port au Port Mi'kmaq Band (Port au Port)<br>- St. George's Indian Band (St. George's)<br>- Three Rivers Mi'kmaq Band (Bay St. George South)<br>• Miawpukek First Nation |

## 4.2.2 Project Website and Social Media Engagement

### 4.2.2.1 Website

The Project website, https://worldenergygh2.com/, launched on August 19, 2022, contains regularly updated information that describes the Project, the expected phases for the Project, frequently asked questions and answers, a list of Project partners and consultants, the latest news articles in relation to the Project and the industry, resources to help explain various aspects of wind turbines and effects, and a contact page that includes a contact form, office locations, and contact information.

Stakeholders and Indigenous groups can contact the Project team via the contact form on the website, or call the phone number listed on the website, or email the general address for the Project: info@WorldEnergyGH2.com.

Since the website's launch in August 2022, there have been more than 20,000 visits to the site, with approximately 6,000 visits from users across NL.

### 4.2.2.2 Newsletter

Since July 2022, WEGH2 has been issuing a monthly newsletter to stakeholders and Indigenous groups via email. The content includes a Project progress update, engagement opportunities, calls for survey participation, promotion of community drop-in sessions and open houses, employment opportunities, industry news and resources. The newsletter contact list includes 676 subscribers. Tracking metrics capture the percentage of recipients who were sent the link and those that accessed the link. The July 2022 newsletter indicated 58% of recipients opened the email and 20% of recipients clicked to access the newsletter.

#### 4.2.2.3 Social Media

In October 2022, WEGH2 launched a Facebook page, LinkedIn account, and Twitter account to engage with stakeholders and Indigenous groups. The content shared on these accounts includes Project information and updates; promotion of community drop-in sessions and open houses; industry news and resources; employment opportunities; and calls for survey participation. As of June 1, 2023, account audience volumes are as follows:

- Facebook: 1,001 followers
- LinkedIn: 1,991 followers
- Twitter: 186 followers

The majority of the Project's social media audience is based in NL, and for Facebook, specifically, the audience is largely located on the west coast of the Island.

### 4.2.3 Project Office

WEGH2 has established Project offices in both St. John's and Stephenville, NL. Additionally, a number of Project offices will also be established near the work sites as the Project progresses.

#### 4.2.3.1 Corporate Office: St. John's, NL

The WEGH2 Corporate Office in St. John's opened in September 2022. The office houses the corporate team managing the Project workstreams, including management, engineering, community and Indigenous relations, environment and sustainability, and logistics.

St. John's Office
87 Water Street, St. John's, NL Canada A1C 1A5
709-757-0183

#### 4.2.3.2 Community Office: Stephenville, NL

The Stephenville Community Office opened in July 2022 and is currently staffed by a Community Liaison and a Community Engagement Manager. The office has also hosted a team member from WEGH2's partner, DOB Academy. Initially, the Community Office had approximately three to five visitors per day. As of spring 2023, the office has received approximately 20 visitors per day, with most visits and inquiries regarding employment and training opportunities, as well as small business service / supply opportunities.

Stephenville Community Office
13 Tennessee Drive, Stephenville, NL Canada A2N 2Y3
709-757-0183

### 4.2.4 Regulatory Consultation

In addition to the NL Environmental Assessment Committee (EAC), meetings with provincial and federal regulators periodically took place to provide updates on the Project, request information, and gain clarity on the EIS guidelines where required. Table 4.2 identifies lists the consultation conducted with regulators.

**Table 4.2 Consultation with Regulators**

| Government Agencies | Type | Date of Meeting |
|---|---|---|
| Wildlife Division | Meeting | October 31, 2022 |
| Environmental Assessment Division | Meeting | November 4, 2022 |
| Wildlife Division | Meeting | December 8, 2022 |
| Environmental Assessment Committee | Meeting | February 7, 2023 |
| Wildlife Division | Meeting | February 10, 2023 |
| Ecological Land Classification with Wildlife Division | Meeting | February 13, 2023 |
| Forestry Division | E-mail | February 21, 2023 |
| Tourism Product Development Division | E-mail | February 21, 2023 |
| Wildlife Division | Meeting | March 8, 2023 |
| Atmospheric and Community Health Services | Meeting | March 28, 2023 |
| Fisheries and Oceans Canada (Freshwater) | Meeting | March 30, 2023 |
| Pollution Prevention Division | Meeting | April 5, 2023 |
| Climate Change Division | Meeting | April 5, 2023 |
| Wildlife Division | Meeting | April 5, 2023 |
| Pollution Prevention Division | E-mail | April 5, 2023 |
| Transport Canada | Meeting | April 6, 2023 |
| Environment and Climate Change Canada | Meeting | April 11, 2023 |
| Fisheries and Oceans Canada (Marine) | Meeting | April 17, 2023 |
| Environmental Assessment Committee | Meeting | April 20, 2023 |
| Inland Fisheries Division | Meeting | April 20, 2023 |
| Environment and Climate Change Canada | Email | May 1, 2023 |
| Water Resources Management Division | Meeting | May 3, 2023 |
| Tourism and Human Health | Meeting | June 5, 2023 |
| Provincial Archaeology Office | Meeting | June 8, 2023 |
| NL Department of Transportation and Infrastructure | Meeting | June 21, 2023 |
| Environment and Climate Change Canada | Email | July 4, 2023 |

## 4.2.5 Online Survey

WEGH2 launched a Land and Resource Use (LRU) survey (Appendix 4-C) to engage the public and members of the Indigenous groups, solicit feedback, identify LRU activities that occur in the Project Area, and to identify community perceptions around the potential risks and/or benefits of the Project. The LRU survey was conducted online; however, paper copies were also made available to support participation of residents without computer literacy, and/ or limited / no access to the internet and /or no access to social media websites. The online LRU survey was open to the public from April 3 to 17, 2023, and from May 17 to 31, 2023 (Appendix 4-C). The printed versions of the survey were made available for pick up at WEGH2 Stephenville Community Office located at 13 Tennessee Drive, Stephenville, NL, A2N 2Y3, and were delivered to multiple locations within the Project area, including Gillis's Store (Codroy), Mountainside General Store (Doyles), Valley Pharmacy (Doyles), Small Town Grocery (Millville), Atlantic Edge Credit Union (Doyles), Port au Port East Gas Bar (Port au Port East), Port au Port West – Aguathuna – Felix Cove Town Office (Port au Port West – Aguathuna – Felix Cove), Benoit First Nation (DeGrau), Cape St. George Town Office (Cape St. George), Mainland Gas Bar (Mainland), Lourdes Town Office (Lourdes), and Parkview Variety Store (Piccadilly). Towns were also encouraged to share information about the survey on their Facebook pages." (Appendix 4-C). The LRU survey was completed by 515 participants, including 184 members of Qalipu First Nation, and two Miawpukek First Nation members (Appendix 4-C).

## 4.2.6 Indigenous Engagement

A description of WEGH2's approach to Indigenous engagement is described in Section 4.1.4. The following sections describe the results of WEGH2's engagement with Indigenous groups.

### 4.2.6.1 Initial Engagement with Qalipu First Nation

Engagement with Qalipu First Nation began in March 2022. Initial engagement consisted of meetings in the Project area and phone calls regarding Project updates. WEGH2 also provided presentations which described Project details and included maps of the proposed Project areas. Meetings with the Qalipu First Nation were held to discuss the First Nation's priorities, questions about the Project, and concerns. In-person meetings, including presentations to Qalipu First Nation's Council, video and phone calls, and email correspondence have been ongoing,

WEGH2 began meeting with local band councils in June 2022, beginning with in-person meetings that included presentations and discussions about the Project. This engagement has continued throughout 2023 with meetings, calls, and email correspondence.

In July 2022, WEGH2 invited a group of Indigenous and community leaders from the Port au Port to visit a wind farm in southern Ontario. The group toured a wind farm and its operating facility and spoke with the local mayor and local farmers.

#### 4.2.6.2 Memorandum of Understanding with Qalipu First Nation

In September 2022, WEGH2 entered into a Memorandum of Understanding (MOU) with Qalipu First Nation that highlights areas of collaboration for the Project: training and employment opportunities for Qalipu members; environmental protection; economic development; and various business opportunities. The MOU focuses on community benefits, and how the Project will advance the economy and support communities in the region for years to come. As part of the MOU, WEGH2 is helping facilitate a partnership between Qalipu First Nation and DOB Academy (Netherlands) to develop wind energy training.

In December 2022, WEGH2 signed an MOU with Three Rivers Mi'kmaq Band (a local Mi'kmaq Band).

#### 4.2.6.3 Meetings and Correspondence with Indigenous Groups

Meetings with the Indigenous groups are presented in Table 4.3.

## Table 4.3 Meetings and Correspondence with Indigenous Groups

| Date / Location | Indigenous Group or Stakeholder | Purpose and Focus |
|---|---|---|
| March 28, 2022<br>Port of Stephenville | Qalipu First Nation<br>Miawpukek First Nation | Initial meeting to introduce the Project concept. |
| May 13, 2022<br>Stephenville | Qalipu First Nation | Provided briefing on WEGH2 and the proposed Project. Provided PowerPoint presentation and engaged in a two-hour question and answer session about the Project. |
| May 30, 2022<br>Conne River | Miawpukek First Nation | Ongoing discussions to provide additional information and Project updates. |
| June 2, 2022<br>Stephenville | Qalipu First Nation<br>Benoit's Cove Indian Band<br>Three Rivers Mi'kmaq Band<br>Qalipu Development Corporation<br>Flat Bay Band<br>Benoit First Nation | Provided briefing to local First Nations band councils on WEGH2 and the proposed Project. Provided PowerPoint presentation and engaged in a two-hour question and answer session about the Project. |
| June 23, 2022<br>Flat Bay | Flat Bay Band Council | Provided briefing to Flat Bay Band Council on WEGH2 and the proposed Project. Engaged in a 1.5 hour question and answer session about the Project. |
| July 7, 2022<br>Robinsons | Three Rivers Mi'kmaq Band Council | Provided briefing to Three Rivers Band Council on WEGH2 and the proposed Project. Presented a PowerPoint slide deck and engaged in a 1.5 hour question and answer session about the Project. |
| July 8, 2022<br>Flat Bay | Flat Bay Pow Wow | Attended the opening ceremonies of the annual Flat Bay Pow Wow and engaged with community members. |
| July 13, 2022<br>Video call | Outfitters<br>Three Rivers Mi'kmaq Band Council | Hosted a video call with Chief White of the Three Rivers Band Council, a council member, and three local outfitters to share information about the Project and engaged in a one-hour question and answer session about the Project. |
| Aug. 23, 2022<br>Stephenville | Three Rivers Mi'kmaq Band Council<br>Flat Bay Band Council<br>St. George's Band Council | Discussions with Chief Peggy White, Chief Joanne Miles, and Chief Rhonda Sheppard at the Canada-Germany Atlantic Hydrogen Expo. |
| Aug. 24, 2022<br>Robinsons | Three Rivers Mi'kmaq Band Council & community members<br>Flat Bay Band Council & community members<br>Community members from Codroy Valley | Provided briefing to approximately 25 to 30 community members from Three Rivers, Flat Bay and Codroy Valley on WEGH2 and the proposed Project. Presented a PowerPoint slide deck and engaged in a 1.5 hour question and answer session about the Project. |

## Table 4.3 Meetings and Correspondence with Indigenous Groups

| Date / Location | Indigenous Group or Stakeholder | Purpose and Focus |
|---|---|---|
| Aug. 24, 2022<br>DeGrau | Benoit First Nation Band Council | Provided a Project update and answered questions. |
| Sept. 9, 2022<br>Corner Brook | Qalipu First Nation | Meeting with Chief Brendan Mitchell and Band Manager Keith Goulding regarding the Project, the training academy element and partnership. |
| Sept. 9, 2022<br>Corner Brook | Three Rivers Band<br>Flat Bay Band<br>St. George's Band | Meeting with Chief Peggy White, Three Rivers Mi'kmaq Band Council; Chief Joanne Miles, Flat Bay Band Council; and Chief Rhonda Sheppard, St. George's Band Council. Discussed the Project and the potential benefits for the communities. |
| Nov. 21, 2022<br>Phone call<br>November 30, 2022<br>November 21, 2022 | Benoit First Nation<br><br>Three Rivers Mi'kmaq Band<br>Flat Bay Band | Call with Chief Jasen Benwah to discuss Project updates and MOU development.<br><br>Meeting with Chief Peggy White in St. John's<br>Meeting with Chief Joanne Miles in St. John's |
| Feb. 1, 2023<br>St. John's | Qalipu First Nation | Meeting to discuss Project status, partnership and MOU, and next steps. |
| Feb. 15, 2023<br>Corner Brook | Qalipu First Nation | Meeting with Chief and Council to discuss Project status, partnership and MOU, and next steps. |
| Feb. 28, 2023<br>Phone call | Flat Bay Band | Call with Chief Joanne Miles to discuss Project updates, and planning community information sessions, and supplier information sessions. |
| Feb. 28, 2023<br>Video call | St. George's Band | Call with Chief Rhonda Sheppard and council regarding Project updates, and planning community information sessions. |
| March 7, 2023<br>Phone call | Benoit's Cove Ward Councillor, Qalipu First Nation | Call to discuss the proposed Project areas and the removal of the Lewis Hills from the Project areas. |
| March 16, 2023<br>Video call | Qalipu First Nation | Call regarding the development of industry training. |
| April 6, 2023<br>Video call | Three Rivers Band | Call with Chief Peggy White to discuss MOU and economic development opportunities. |
| April 17, 2023<br>Video call | NL Aboriginal Women's Network | Call with Odelle Pike to discuss priorities and concerns amongst First Nations women. |
| April 18, 2023<br>Video call | NL Indigenous People's Alliance | Call with chair and board member to discuss priorities and concerns amongst First Nations groups. |

### Table 4.3 Meetings and Correspondence with Indigenous Groups

| Date / Location | Indigenous Group or Stakeholder | Purpose and Focus |
|---|---|---|
| May 3, 2023<br>Video call | Qalipu First Nation | Call with John Davis and Charles Pender to discuss education and training partnership development. |
| May 12, 2023<br>Stephenville | NARMN<br>& First People's Group | Meeting with First People's Group to discuss the Project, First Nations engagement, and next steps. |
| May 17, 2023<br>Phone call | Benoit First Nation | Call with Chief Jasen Benwah to discuss NARMN process, Mi'kmaq workshops, and MOU development. |
| May 30, 2023<br>Phone call | NARMN | Call with Chief Jasen Benwah to discuss WEGH2 planning to hire a First Nations consultant. |
| June 27, 2023<br>Phone call | Qalipu First Nation | Call with Chief Brendan Mitchell to discuss WEGH2 planning to hire a First Nations consultant |
| July 18, 2023 | NARMN | Day-long (8-hour) meeting and cultural session with local band councils and First Peoples Group:<br>• Benoit First Nation (Port au Port)<br>• Flat Bay Indian Band (Flat Bay)<br>• Indian Head First Nation (Stephenville)<br>• Port au Port Mi'kmaq Band (Port au Port)<br>• St. Georges Indian Band (St. George's)<br>• Three Rivers Mi'kmaq Band (Bay St. George South) |
| Ongoing<br>via phone, email and in-person meetings | Qalipu First Nation | Calls, emails and meetings with Qalipu First Nation regarding Project updates, training academy planning, and potential benefits for community members. |
| Ongoing<br>via phone, email and in-person meetings | Community bands | Calls, emails and meetings with community bands regarding Project updates and the potential benefits for the communities. |
| Ongoing via phone, email and in-person meetings | NARMN | Calls, emails and meetings regarding Project updates, consultation with First Nations groups and individuals, and the potential benefits for the communities. |

#### 4.2.6.4 The Collection of Current Land Use and Aboriginal Traditional Knowledge

WEGH2's MOU with Qalipu First Nation supported the collection of Indigenous Knowledge applicable to the Project Area. For example, to gain a better understanding of current use within the Project area, Qalipu First Nation undertook a study entitled, "The Collection of Current Land Use and Aboriginal Traditional Knowledge" (ATK Study) in 2023 (Qalipu First Nation 2023). The ATK Study was funded through the benefit agreement established with WEGH2 and was guided by the MOU.

The ATK Study took the form of an online survey which was open to the public for two weeks in late April and early May 2023. The survey questionnaire was derived from the questionnaire used in a 2011 Traditional Knowledge Study conducted by the Federation of Newfoundland Indians and was adapted into an online survey. Survey topics included: hunting moose, bear, caribou, and waterfowl; trapping furbearing animals; frequency of consumption of wild game; harvesting medicinal and food plants and berries; and sacred Mi'kmaq sites. The survey also included several questions on WEGH2's proposed wind farms and how the Project may impact the lives of survey respondents.

The ATK Study provided insight and knowledge from Qalipu First Nation regarding how membership uses the land and the resources it has to offer. Individuals have deep ties to the land and provide insight into how their lives would be affected should their access to the land be impeded by the development of major projects on their traditional hunting and gathering grounds. Different perceptions were expressed by participants regarding what effects the proposed wind farm would have, and general trends from the data were developed.

The ATK Study identified activities and locations within the Project Area and Local Assessment Area, Qalipu First Nation concerns and perceived benefits of the Project, and potential mitigation and/or enhancement measures for WEGH2's consideration in Project planning.

##### Issues Identified During Engagement and Future Engagement

Perceived benefits of the Project as well as key concerns related to the Project's potential interactions with Indigenous interests have been identified through the Project's engagement activities with the Indigenous groups. A summary of the concerns shared by the Indigenous groups is provided below.

The Indigenous groups identified concerns related to the following interests:

- Cultural and traditional lifeways, practices and activities
- Cultural identity and quality of life, including the identity and lifeways of future generations
- Traditional knowledge transmission, and the ability to teach children to hunt, fish, trap, pick berries, cut wood, and worship the creator
- Food security
- Harvesting areas, activities (e.g., hunting, trapping, fishing) and harvested resources including:
  - Indigenous commercial and/or food fisheries
  - Fish, fish habitat, and fishing activities and areas

- Marine environment, fishing activities, and marine resources
- Birds and bird habitat
- Wildlife and wildlife habitat
- Culturally important species (e.g., sacred white moose)
- Forests, plant life, berries and other food plants, medicinal plants, and wood cutting
- Watersheds and water supplies

The Indigenous groups also expressed concern regarding potential Project interactions with socio-economic conditions (e.g., property and land value, travel on local roads), human health (e.g., mental, physical, and spiritual), and potential accidents and malfunctions.

In response to concerns received during the early engagement phase and with a focus on collaborating with Indigenous groups to create shared value, WEGH2 has committed to continued involvement and engagement with the Indigenous groups throughout the EIS process and the life of the Project. WEGH2 received letters of support for their Crown land bid for the Project from Qalipu First Nation, and associated Indigenous groups including Benoit First Nation, the Newfoundland Alliance of Rural Mi'kmaw Nations (NARMN), and Three Rivers Mi'kmaq Band.

Demonstrating additional support for the Project, some of the self-identified members of Qalipu First Nation who participated in the LRU survey identified the following potential benefits:

- Improvements to services, including health care and health benefits, educational resources, commercial / business operations, and recreational activities in the local area
- Improvements to infrastructure, including paved roads
- Increased economic development and growth in the region, including growth to the small business community
- Creation of long-term careers and other jobs, including for young people, and potential to bring people (including young people) back to the area
- Creation of green energy and helping with the climate crisis and global warming
- Building up the community and enabling it to prosper

Some of the Qalipu First Nation members who participated in the ATK study also expressed support for the Project and "a lack of concern for any potential effects," stating that "they felt any environmental concerns were being addressed by following provincial environmental guidelines and regulations" (Qalipu First Nation 2023:12). A few of the Qalipu First Nation members who participated in the ATK study mentioned "that the positives [i.e., Project benefits] outweighed any negatives" (Qalipu First Nation 2023:12). Examples of perceived "positives" identified by the ATK study participants include "the production of green energy and cleaner fuel, and how the Project will offset greenhouse gas emissions by reducing reliance on oil and gas;" "the economic boon to the area;" "how the Project will create jobs for the locals;" and "that the land that is cleared for the wind turbines may produce berries" and, therefore, increase berry harvesting locations within the Project Area (Qalipu First Nation 2023:13).

### 4.2.6.5 Indigenous Engagement – Miawpukek First Nation

#### Initial Engagement with Miawpukek First Nation

The Project partners have long-standing relationships with Miawpukek First Nation in marine services and fishing. While engagement related specifically to the Project started with Miawpukek First Nation in March of 2022, including a series of meetings between March and the end of May 2022, it was determined by Miawpukek First Nation that they would prefer to be involved in other planned wind to hydrogen projects that had approached Miawpukek First Nation for direct involvement, most of these being closer to Miawpukek First Nation's home in Conne River. While this outcome was agreed in 2022, opportunities for Miawpukek First Nation to participate in the project may develop as the industry matures. As an example, initial discussions between the Project and Miawpukek Horizon Maritime Services have started regarding short-seas shipping of green ammonia in an effort to realize potential logistics and shipping efficiencies, plus accelerating the inclusion of Miawpukek Indigenous seafarers in the industry. The Project partners value their relationship with the Miawpukek First Nation and will continue to be open to further discussions as the Project and the industry evolve.

Engagement with Miawpukek First Nation began in March 2022, and continued until June 2022 (Table 4.4). Initial engagement consisted of a meeting, phone calls, and emails regarding Project updates, and a presentation with Project details. In June 2022, Chief Mi'sel Joe and Miawpukek First Nation advised WEGH2 via a letter that Miawpukek First Nation intended to focus on renewable energy projects closer to their geographic area. Miawpukek First Nation also advised that, because of the Project location, the Nation would be unlikely to have interaction or concerns with the Project. The correspondence from Miawpukek First Nation also indicated that Qalipu First Nation's sizeable presence in the Project Area made Qalipu First Nation a more appropriate partner for the Project, and for deeper engagement and consultation. Since that time, WEGH2 has fully focused on Indigenous engagement efforts with Qalipu First Nation and community bands.

**Table 4.4 Meetings and Correspondence with Miawpukek First Nation**

| Date / Location | Indigenous Group or Stakeholder | Purpose and Focus |
|---|---|---|
| March 28, 2022<br>Port of Stephenville | Miawpukek First Nation | Initial meeting to introduce the project concept. |
| May 30, 2022<br>Conne River | Miawpukek First Nation | Ongoing discussions to provide additional information and project updates. |
| June 2022<br>Email | Miawpukek First Nation | Letter from Chief Mi'sel Joe and Miawpukek First Nation regarding their intention to focus on partnering with projects closer to their geographic area. |

#### Issues Identified During Engagement with Miawpukek First Nation

Miawpukek First Nation expressed that they intended to focus on renewable energy projects closer to their geographic area. Miawpukek First Nation also indicated that Qalipu First Nation's sizeable presence in the Project area made Qalipu First Nation a more appropriate partner for the Project, and for deeper engagement and consultation.

#### Land and Resource Use Survey

A description of the WEGH2 LRU survey is provided in Section 4.2.5. Two members of Miawpukek First Nation participated in the LRU Survey, providing insight regarding LRU activities that occur in the Project Area, and their perceptions around the potential risks and / or benefits of the Project (Appendix 4-C).

### 4.2.7 Community, Stakeholder and Indigenous Engagement

Community and stakeholder engagement has occurred concurrent with Indigenous engagement (including a familiarization tour of a wind farm in southern Ontario). In addition to the activities described in Section 4.2.1, WEGH2 has also participated in ongoing stakeholder and Indigenous groups consultation and engagement activities described below.

Marketing communications

- Website
- Brochures and one-pagers
- Household mailouts
- Monthly e-newsletter
- Presentations and events (community, industry, business, education)
- Information campaign: Partnership with EnergyNL on a campaign focused on building awareness of the industry; building understanding of the economic impact and climate change mitigation opportunities this industry will offer; and rallying support for the industry in NL.

Community Vibrancy Fund

- WEGH2 has committed a $10 million Community Vibrancy Fund to the three Project areas: the Town of Stephenville; Port au Port Wind Farm project area; and the Codroy Wind Farm project area.
- The fund will be paid over three years, and equally divided across the Project areas, commencing with construction.
- Community committees:
- WEGH2 is working with a committee of Port au Port residents to allocate and administer the construction phase of the Community Vibrancy Fund, and to negotiate the production phase of the fund.
- A similar committee is being developed in the Codroy Project area, and discussions have begun with community leaders, including the Bay St. George South Area Development Association and the Codroy Valley Area Development Association.

Education Partnership with College of the North Atlantic

- WEGH2 has been meeting with College of the North Atlantic (CNA) since spring 2022, and intends to develop partnerships, as appropriate, including the following commitments made to-date:
  - Scholarships for students accepted into the Wind Turbine Technician and Hydrogen Technician programs
  - Pending Project approval, commitment to pre-hire students accepted into the Wind Turbine Technician and Hydrogen Technician programs, and pay for their training

Renewable Energy Training Partnership

- WEGH2 is helping to facilitate a partnership between Qalipu First Nation and DOB Academy (The Netherlands) to develop industry training and a curriculum. The training will include micro-credential programs focused on wind energy, hydrogen, and green energy development. A location in the Town of Stephenville has been identified for a training facility and this training partnership is an important part of WEGH2's MOU with Qalipu First Nation. DOB Academy offers wind energy education for professionals working in the wind energy industry.

Memorandum of Understanding

- Town of Stephenville – signed in September 2022

#### 4.2.7.1 Outfitter Questionnaire

As part of the community and stakeholder engagement process, WEGH2 developed a questionnaire to solicit feedback from outfitters about the Project, as well as to identify issues, concerns, or inquiries related to the Project. The questionnaire included a Project map identifying the wind farm locations and respondents were asked a series of questions divided into four parts.

Part A of the questionnaire consisted of 20 questions asking respondents to provide general information about their outfitting operation. Part B of the questionnaire, consisting of three questions, asked respondents to identify the hunting activities that clients engage in through their outfitting operation. Part C of the questionnaire, consisting of six questions, asked respondents to identify what fishing activities their clients engage in through their outfitting operation. Part D of the questionnaire, with three questions, sought to ascertain the respondent's opinion on the potential effects, both positive and adverse, of resource development and industrial projects in general and the proposed Project specifically on their outfitting operation. The final part of the questionnaire recorded identifying information of the respondents and asked for other comments the respondents wished to share.

The questionnaire was administered by Newfoundland and Labrador Outfitters Association via email. WEGH2 representatives expressed their desire to continue with dialogue and discussions with the affected outfitters to better understand areas of importance to individual outfitters and to address their concerns. Information sharing with the outfitters will continue in a process that is transparent. A summary of input received from outfitters on key issues and concerns is provided in Appendix 4-D of the EIS.

### 4.2.7.2 Community Meetings and Information Sessions

In addition to a meeting that was held in Stephenville in May 2022, Mayors, Deputy Mayors, and Town Managers from the following municipalities in the Bay St. George area were invited to attend community meetings:

- Lourdes (July 2022)
- Cape St. George (July 2022)
- Robinsons (July & Aug 2022)

Community drop-in sessions were held in:

- Port au Port (Sept. 2022)
  - DeGrau: Sept. 6, 2022, 1 – 7 p.m.
  - Lourdes: Sept. 7, 2022, 1 – 7 p.m.
  - Mainland: Sept. 8, 2022, 1 – 7 p.m.
  - Piccadilly: Sept. 9, 2022, 1 – 7 p.m.
  - Port au Port East: Sept. 10, 2022, 10 a.m. – 4 p.m.
- Port au Port (2023)
  - Fox Island River – Point au Mal: May 13, 12 - 5 p.m.
- Bay St. George South – Codroy (2023)
  - McKay's: March 7, 1 – 4 p.m; March 8, 9 a.m. – 12 p.m; March 15, 10 a.m. – 4 p.m; March 22, 10 a.m. – 4 p.m; April 19, 10 a.m. – 4 p.m.
  - Flat Bay: March 29, 10 a.m. – 4 p.m.
  - St. George's: March 30, 10 a.m. – 4 p.m.
  - Upper Ferry: May 17, 10 a.m. – 4 p.m.

### 4.2.7.3 Community Open Houses

In order to further engage and consult with local community members, and to provide Project information and updates, WEGH2 hosted a series of open houses in the Project areas.

The purpose of these open house sessions was to describe the aspects of the proposed Project, to describe the activities associated with it, and to provide an opportunity for interested persons to request information or state their concerns.

The open houses included Project information and updates, including wind farm and hydrogen / ammonia plant development plans, the environmental assessment process and the studies being undertaken, as well as draft maps for discussion and input.

Through 20 hours of open house sessions, over the course of four days, WEGH2 representatives and consultants with subject matter expertise offered information and answered questions. Periodically, throughout each open house, presentations were provided, followed by question and answer sessions.

The schedule for the open houses was as follows:

- Monday, April 24: Stephenville, 2 – 7 p.m., Days Inn, 44 Queen St
- Tuesday, April 25: Stephenville Crossing, 2 – 7 p.m., Church of the Assumption, Hospital Road
- Wednesday, April 26: Port au Port, 2 – 7 p.m., Our Lady of Fatima Parish Community Centre, Piccadilly Crossroads
- Thursday, April 27: Bay St. George South – Codroy, 2 – 7 p.m., Three Rivers Lions Club, McKay's

The largest local population centre within the Project Area is the Town of Stephenville. Many of the communities in the Project Area are more than an hour away from Stephenville via vehicle. To make the sessions as accessible as possible, and to offer multiple days and times for community members to attend the sessions, WEGH2 hosted sessions in four communities within the Project Area, over four days: Stephenville; Stephenville Crossing; Piccadilly; and McKay's.

The venues chosen for the open houses were selected according to the following criteria: ability to accommodate 100+ people at one time; accessible for people with mobility concerns/aids; familiarity to the local community; ample parking; availability. Each of the venues were also recommended by local community members as suitable spaces for hosting open houses.

WEGH2 shared information about the sessions via:

- Print ad in the Saltwire weekly paper *The West Coast Wire* (April 12 & 19, 2023)
- Direct email to community leaders, Indigenous leaders, Gov NL
- WEGH2 E-newsletter
- Page on WEGH2 website
- Social media posts
- Notice posted in town halls / offices, community centres, and higher-traffic grocery / convenience stores from April 10 to 27, 2023, inclusive
- Notice posted in post offices or on community mailboxes, as allowed
- WEGH2 requested that the notice of the meeting be placed on the communities' web sites, social media pages / groups, or e-newsletters, as applicable

A summary of the community engagement offered to-date is listed in Table 4.5.

## Table 4.4 Community Engagement

<table>
<tr><th>Date / Location</th><th>Stakeholder</th><th>Purpose and Focus</th></tr>
<tr><td>May 13, 2022<br>Stephenville</td><td>Mayors, Deputy Mayors and Town Managers invited from the municipalities in the Bay St. George area<ul><li>Town of Stephenville</li><li>Town of Stephenville Crossing</li><li>Town of St. George's</li><li>Town of Lourdes</li><li>Town of Port au Port East</li><li>Town of Port au Port West-Aguathuna-Felix Cove</li><li>Town of Kippens</li></ul></td><td>Provided briefing on WEGH2 and the proposed Project. Provided PowerPoint presentation and engaged in a two-hour question and answer session about the Project.</td></tr>
<tr><td>June 2, 2022|<br>Port au Port East</td><td>Town of Port au Port East</td><td>Update meeting with the Town of Port au Port East to answer specific questions about the possible route of transmission lines near their town. Answered questions related to route, proximity to town residences and services.</td></tr>
<tr><td>June 2, 2022<br>Stephenville</td><td>ATV Association</td><td>Provided briefing to the ATV Association President on WEGH2 and the proposed Project. Provided an overview of planned development areas and answered preliminary questions.</td></tr>
<tr><td>June 2, 2022<br>Stephenville</td><td>Town of Stephenville</td><td>Continued discussions on cooperation with the town during the Project development process.</td></tr>
<tr><td>June 10, 2022<br>St. John's</td><td>Department of Education, Gov NL</td><td>Provided a Project overview and discussed potential training/post-secondary education elements.</td></tr>
<tr><td>June 29, 2022<br>Video call</td><td>College of the North Atlantic and Department of Education, Gov NL</td><td>Discussion regarding the Project, post-secondary education planning, and potential partnership opportunities.</td></tr>
<tr><td>July 2022 – ongoing<br>Stephenville</td><td>Community members in the Project areas</td><td>Opened a Community Office in Stephenville in July 2022, staffed by a Community Liaison, a Community Engagement Manager, and a team member from DOB Academy.</td></tr>
<tr><td>July 6, 2022<br>Stephenville</td><td>Town of Stephenville</td><td>Provided update presentation to council followed by a question-and-answer period.</td></tr>
<tr><td>July 6, 2022<br>Lourdes</td><td>Town of Lourdes and surrounding areas</td><td>Provided briefing on WEGH2 and the proposed Project in the Port au Port area. Provided PowerPoint presentation and engaged in a one-hour question and answer session about the Project.</td></tr>
<tr><td>July 6, 2022<br>Cape St. George</td><td>Town of Cape St. George and surrounding areas</td><td>Provided briefing on WEGH2 and the proposed Project in the Port au Port area. Provided PowerPoint presentation and engaged in a one-hour question and answer session about the Project.</td></tr>
</table>

## Table 4.4 Community Engagement

| Date / Location | Stakeholder | Purpose and Focus |
|---|---|---|
| July 7, 2022<br>Robinsons | Three Rivers Mi'kmaq Band Council and community members | Provided briefing to Three Rivers Band Council and community members on WEGH2 and the proposed Project. Presented a PowerPoint slide deck and engaged in a 1.5 hour question and answer session about the Project |
| July 7, 2022<br>Stephenville | BSG Chamber of Commerce | Meeting with the Chair, Debbie Brake-Patten, to discuss the chamber, membership, and opportunities to collaborate |
| July 8, 2022<br>Corner Brook | Corner Brook Pulp and Paper Ltd. | Shared a Project update and answered questions. |
| July 13, 2022<br>Video call | Outfitters<br>Three Rivers Mi'kmaq Band Council | Hosted a video call with Chief White of the Three Rivers Band Council, a council member, and three local outfitters to share information about the Project and engaged in a one-hour question and answer session about the Project. |
| July 25, 2022<br>Haldimand County, ON | Port au Port community leaders | Familiarization tour: A group of 10 community leaders from Port au Port visited a wind farm in southern Ontario. The group toured a wind farm and its operating facility and spoke with the local mayor and local residents. |
| Aug. 10, 2022<br>Video call | Town of Stephenville | Provided a Project update to council and discussed plans for the Canada-Germany Atlantic Hydrogen Expo and ancillary event preparation. |
| Aug. 22, 2022<br>Stephenville | Port au Port community leaders | Provided a Project update, discussed the Canada-Germany Atlantic Hydrogen Expo, discussed the development of a Community Vibrancy Fund, and answered questions. |
| Aug. 24, 2022<br>Robinsons | Three Rivers Mi'kmaq Band<br>Flat Bay Band<br>Community members from Bay St. George South (BSGS) and the Codroy Valley, including the BSGS Local Service District, BSGS Area Development Association, and the Codroy Valley Area Development Association | Provided briefing to approximately 25 to 30 community members from Three Rivers Mi'kmaq Band, BSGS, Flat Bay Band and Codroy Valley on World Energy GH2 and the proposed Project. Presented a PowerPoint slide deck and engaged in a 1.5 hour question and answer session about the Project. |
| Sept. 6, 2022<br>DeGrau | Residents of: Town of Cape St. George and surrounding areas | Six-hour community drop-in session (1 to 7 p.m.) with WEGH2 and DOB Academy representatives at Benoit First Nation Women's Centre, DeGrau. |
| Sept. 7, 2022<br>Lourdes | Residents of: Lourdes, West Bay & Black Duck Brook-Winterhouse | Six-hour community drop-in session (1 to 7 p.m.) with WEGH2 and DOB Academy representatives at Town of Lourdes Town Office. |
| Sept. 8, 2022<br>Mainland | Residents of: Mainland & Three Rock Cove | Six-hour community drop-in session (1 to 7 p.m.) with WEGH2 and DOB Academy representatives at L'Association Régionale de la Côte Ouest (ARCO). |

### Table 4.4 Community Engagement

| Date / Location | Stakeholder | Purpose and Focus |
|---|---|---|
| Sept. 8, 2022<br>Stephenville | Bay St. George Chamber of Commerce<br>Stephenville Business Improvement Association | Presentation to the Bay St. George Chamber of Commerce and the Stephenville Business Improvement Association, with approximately 20 people in attendance at the Days Inn in Stephenville. Presentation was followed by a question and answer session. |
| Sept. 9, 2022<br>Piccadilly | Residents of: Sheaves Cove, Ship Cove, Lower Cove, Campbells Creek, Piccadilly Head, Piccadilly Slant & Abrahams Cove. | Six-hour community drop-in session (1 to 7 p.m.) with WEGH2 and DOB Academy representatives at the Piccadilly Crossroads Community Centre. |
| Sept. 10, 2022<br>Port au Port East | Residents of: Port au Port East, Port au Port West-Aguathuna-Felix Cove, Fox Island River, and Point au Mal | Six-hour community drop-in session (10 a.m. to 4 p.m.) with WEGH2 and DOB Academy representatives at the Twilight 50+ Club Port au Port East. |
| Sept. 23, 2022<br>Netherlands | NLDE and DOB Academy | Meeting to discuss the education-focused elements of the Project |
| Nov. 14, 2022<br>Phone call | Local Service District of Mainland | Call with the Chair, Sherisse Benoit, and Clerk, Tanya Murchison, regarding the wind measurement campaign and related construction in Mainland |
| Dec. 8, 2022<br>Stephenville | Town of Port au Port East | Meeting with Mayor, Jim Cashin, regarding the Project, questions and concerns |
| Dec. 9, 2023<br>Phone call | NLOA | Call with the Executive Director, Cory Foster, to discuss the Project. |
| Jan. 5, 2023<br>Mainland | Local Service District of Mainland | Meeting for 1.5 hours with the Local Service District, their invited guests from surrounding communities, and a representative from Tony Wakeham's office regarding the wind measurement campaign and related construction, and water issues in Mainland. |
| Jan. 12, 2023<br>Phone call | NLOA | Call to discuss questions and suggestions for consultation and engagement with outfitters. |
| Jan. 24, 2023<br>Phone call | Codroy Valley Area Development Association | Call to discuss questions and suggestions for consultation and engagement with community leaders in the area. |
| Feb. 14, 2023<br>Stephenville | Town of Lourdes | Meeting with the Mayor to discuss questions and suggestions |
| Feb. 14, 2023<br>Video call | Town of Stephenville | Call to discuss economic development and community engagement opportunities |
| Feb. 28, 2023<br>Video call | WRDC | Call to discuss the Project, WRDC's capabilities and services, and how we may collaborate |
| Feb. 28, 2023<br>Video call | NL Organization of Women Entrepreneurs | Call to discuss the Project, NL Organization of Women Entrepreneurs' capabilities and services, and membership levels, and how we may collaborate |
| March 7, 2023<br>McKay's | Residents of BSGS and surrounding area | Three-hour community drop-in session with WEGH2 representative from 1 to 4 p.m. |
| March 8, 2023<br>McKay's | Residents of BSGS and surrounding area | Three-hour community drop-in session with WEGH2 representative from 9 a.m. to 12 p.m. |

## Table 4.4 Community Engagement

| Date / Location | Stakeholder | Purpose and Focus |
|---|---|---|
| March 15, 2023<br>McKay's | Residents of BSGS and surrounding area | Six-hour community drop-in session with WEGH2 representative from 10 a.m. to 4 p.m. |
| March 15, 2023<br>Video call | techNL | Call with techNL CEO and team members to discuss the Project and how we may collaborate |
| March 21, 2023<br>Phone call | Labour Market Development, Immigration, Population Growth and Skills, GovNL | Call with Labour Market Development Officer based in Stephenville, NL, regarding upcoming employers' sessions and potential opportunities to work together on job fairs |
| March 22, 2023<br>McKay's | Residents of BSGS and surrounding area | Six-hour community drop-in session with WEGH2 representative from 10 a.m. to 4 p.m. |
| March 29, 2023<br>Flat Bay | Residents of Flat Bay and surrounding area | Six-hour community drop-in session with WEGH2 representatives from 10 a.m. to 4 p.m. |
| March 30, 2023<br>St. George's | Residents of St. George's and surrounding area | Six-hour community drop-in session with WEGH2 representatives from 10 a.m. to 4 p.m. |
| April 1, 2023<br>Video call | WRDC | Follow-up call to continue discuss the Project, WRDC's capabilities and services, and how we may collaborate |
| April 4, 2023<br>Video call | Town of Stephenville | Presentation of a Project update, followed by question and answer session with the mayor and town council |
| April 19, 2023<br>McKay's | Residents of Bay St. George South | Six-hour community drop-in session with WEGH2 representative from 10 a.m. to 4 p.m. |
| April 20, 2023<br>Video call | NLCA | Call with the NLCA to discuss Project updates, member opportunities, and how we may collaborate |
| April 21, 2023<br>Video call | Town of Port au Port East | Call with Mayor and council regarding the latest Project maps and the transmission line planning |
| April 24, 2023<br>Stephenville | Residents of Stephenville and surrounding areas | Five-hour public open house where WEGH2 representatives and consultants with subject matter expertise offered information and answered questions. Periodically, throughout each open house, presentations were provided, followed by question and answer sessions. |
| April 25, 2023<br>Stephenville Crossing | Residents of Stephenville Crossing and surrounding areas | Five-hour public open house where WEGH2 representatives and consultants with subject matter expertise offered information and answered questions. Periodically, throughout each open house, presentations were provided, followed by question and answer sessions. |
| April 26, 2023<br>Piccadilly | Residents of Port au Port and surrounding areas | Five-hour public open house where WEGH2 representatives and consultants with subject matter expertise offered information and answered questions. Periodically, throughout each open house, presentations were provided, followed by question and answer sessions. |
| April 26, 2023<br>Piccadilly | Port au Port Regional Vibrancy Committee | Meeting with community leaders to discuss Project updates, review Project maps, and discuss the Community Vibrancy Fund |

## Table 4.4 Community Engagement

| Date / Location | Stakeholder | Purpose and Focus |
|---|---|---|
| April 27, 2023<br>McKay's | Community leaders in the Codroy Project area | Meeting with community leaders to discuss Project updates, review Project maps, and discuss the Community Vibrancy Fund |
| April 27, 2023<br>McKay's | Residents of Bay St. George South, Codroy Valley and surrounding areas | Five-hour public open house where WEGH2 representatives and consultants with subject matter expertise offered information and answered questions. Periodically, throughout each open house, presentations were provided, followed by question and answer sessions. |
| May 1, 2023<br>Phone call | Local Service District: Fox Island River – Point au Mal | Phone call with the Chair of the Local Service District regarding the Project and plans for the wind measurement campaign |
| May 13, 2023<br>Fox Island River | Residents of Fox Island River – Point au Mal | Five-hour community drop-in session with WEGH2 representatives from 12 to 5 p.m. |
| May 17, 2023<br>Upper Ferry | Residents of the Codroy Valley | Six-hour community drop-in session with WEGH2 representatives from 10 a.m. to 4 p.m. |
| May 17, 2023<br>Video call | MOWI | Call with MOWI representatives to discuss Project plans and possible coordination |
| May 25, 2023<br>Port au Port West | Town of Port au Port West – Aguathuna – Felix Cove | Presentation to Mayor and council by WEGH2 representative on Project update and maps, questions and discussion |
| May 29, 2023<br>Video call | Codroy Valley Area Development Association | Call with Codroy Valley Area Development Association Chair, Ron Laudadio, regarding the Community Vibrancy Fund |
| June 2, 2023<br>Phone call | Outfitter: Art Ryan | Call with local outfitter regarding the Project plans, mapping, outfitter business operations, location and seasonality, and discussed concerns about the Project's potential impact on outfitters |
| June 5, 2023<br>Phone call | Outfitter: Ken Ryan | Call with local outfitter regarding the Project plans, mapping, outfitter business operations, location and seasonality, and discussed concerns about the Project's potential impact on outfitters |
| June 16, 2023<br>Phone call | Outfitter: Angus Kettle | Call with local outfitter regarding the Project plans, mapping, outfitter business operations, location and seasonality, and discussed concerns about the Project's potential impact on outfitters |
| June 20, 2023<br>Phone call | Outfitter: David Gillam | Call with local outfitter regarding the Project plans, mapping, outfitter business operations, location and seasonality, and discussed concerns about the Project's potential impact on outfitters |
| June 21, 2023<br>Phone call | NLOA | Call with Executive Director, Cory Foster, regarding the wind measurement campaign and potential effects on outfitters |
| June 14, 2023<br>BSGS | BSGS Local Service District | Meeting with WEGH2 representatives and the BSGS Local Service District executive regarding Project updates, maps and questions |

**Table 4.4 Community Engagement**

| Date / Location | Stakeholder | Purpose and Focus |
|---|---|---|
| June 23, 2023<br>Stephenville | Academy Canada | Meeting with Academy Canada to discuss the Project and potential for collaboration regarding training |
| June 27, 2023<br>Stephenville | Codroy Valley Area Development Association | Meeting with Codroy Valley Area Development Association Chair, Ron Laudadio, regarding the Project, and community members' questions and concerns |
| July 18, 2023<br>Corner Brook | NLOA and local outfitters | Meeting with the NLOA and local outfitters to discuss the Project, review maps, and discuss questions, concerns and potential solutions |
| Ongoing<br>via phone, email and in-person meeting | Town of Stephenville | Ongoing discussions regarding Project updates and community engagement opportunities. |
| Ongoing via email and phone | Port au Port Regional Vibrancy Committee | Discussing questions and the development of an area committee to manage the Community Vibrancy Fund. |
| Ongoing<br>via email, phone and in-person at WEGH2's Stephenville Community Office | Community members in the Project areas | Emails from community members, mostly inquiring about opportunities to work with the company, training opportunities, and/or to provide goods and services when the Project begins construction. |
| Ongoing<br>via phone, email and in-person meetings | College of the North Atlantic | Calls, emails, and meetings with College of the North Atlantic representatives regarding the Project and the potential partnership opportunities. |

### 4.2.8 Summary of Community and Stakeholder Issues and Concerns

A list of the key issues / concerns identified to-date through consultation and engagement with stakeholders and Indigenous groups, as well as WEGH2's response and where it is incorporated into the EIS is provided in Appendix 4-D.

## 4.3 Ongoing and Future Consultation and Engagement

WEGH2 is committed to ongoing consultation and engagement with stakeholders and Indigenous groups and involving local stakeholders and Indigenous communities throughout the lifetime of the Project. WEGH2 will improve and expand upon, previous engagement efforts to develop and operate the Project with tangible, demonstrable, and appropriate benefits to local stakeholders and Indigenous communities.

Further consultation and engagement are required regarding outfitters in the Codroy Wind Farm area, and an Outfitters Effects and Monitoring Plan will be an important part of the Project.

Future stakeholder and Indigenous engagement plans are outlined in a Public Participation Plan, which summarizes plans for consultation and engagement efforts during the construction, operation and maintenance, and decommissioning phases of the Project. WEGH2 has adopted a continuous improvement model for operations and stakeholder and Indigenous consultation and engagement efforts.

WEGH2 will continue to dedicate a full-time team to stakeholder and Indigenous engagement and will continue to prioritize stakeholder and Indigenous input throughout the Project.

## 4.4 References

Qalipu First Nation. 2023. The Collection of Current Land Use and Aboriginal Traditional Knowledge (ATK Study).

# 5.0 Environmental Assessment Approach, Scope, and Methods

An environmental assessment (EA) is a planning and decision-making process used to predict environmental effects of a project prior to that project being carried out. The process includes identifying important beneficial and adverse environmental effects associated with the Project, mitigation measures to reduce adverse effects, and a determination of effects significance. This chapter describes the approach, scoping considerations, and methods used to assess the effects of routine activities and components, accidental events, and cumulative effects of the Project; and the effects of the environment on the Project that could occur. The methods used to prepare this Environmental Impact Statement (EIS) have been developed in consideration of the Newfoundland and Labrador *Environmental Protection Act* (NL EPA). These methods were informed by the provincial regulatory requirements with specific consideration of the requirements set out in the Final EIS Guidelines for Project Nujio'qonik GH2, dated December 2022 ). A table of concordance is provided for these guidelines in Appendix E-1.

Throughout the EA process for the Project, opportunities have been and will continue to be provided for meaningful Indigenous and stakeholder participation, including opportunities provided to comment on the Registration Document, Draft EIS Guidelines, and the EIS. As discussed in Chapter 4, World Energy GH2 (WEGH2) will continue providing opportunities for such participation and will pursue positive and constructive relationships with Indigenous groups and stakeholders throughout the life of the Project. Information gathered during engagement activities has informed the EIS including the EA methods.

## 5.1 Overview of Environmental Assessment Approach

This EIS examines the environmental effects that could result from changes to the environment as a result of the Project being carried out. It uses a precautionary, conservative approach, with conservative assumptions generally applied to overestimate rather than underestimate potential adverse effects. An overview of the steps conducted for each Valued Environmental Component (VEC) assessment of routine Project effects is provided in Figure 5.1. Detailed methods on each of these steps is provided in Section 5.3.

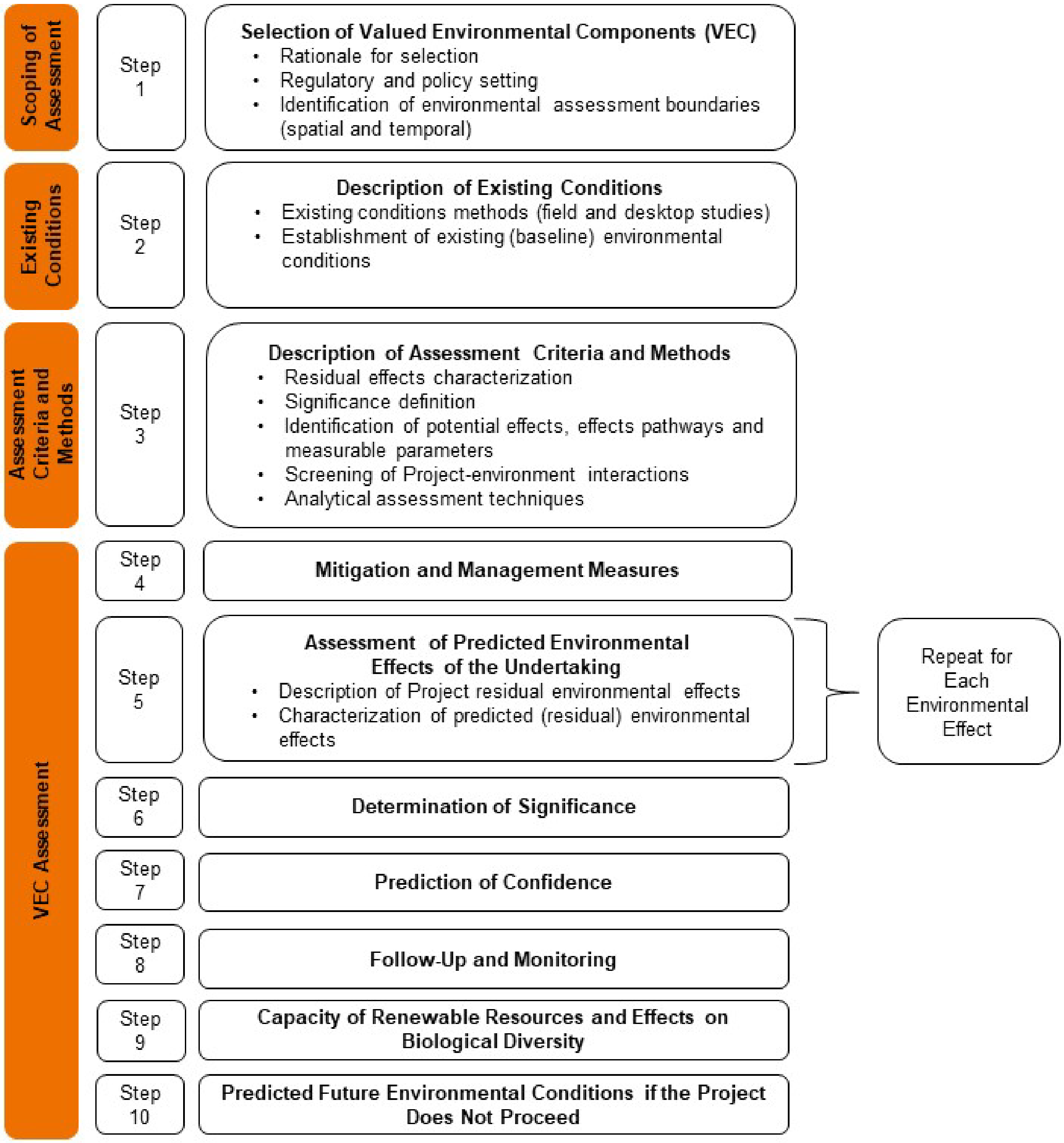


**Figure 5.1 Approach to Assessing Routine Project Effects**

## 5.2 Selection of Valued Environmental Components

The approach to identifying VECs was consistent with the requirements of the EIS Guidelines, including the considerations of components of the biophysical/ecological environment, the anthropogenic (i.e., built/developed) environment, and the social environment (including economic and cultural aspects) that have potential to be affected by the Project. Consideration was also given to components that are of value or interest because they have been identified to be of concern by regulatory agencies, the proponent, resource managers, scientists, key stakeholders, and/or the general public. VECs selected for this assessment and EIS Guidelines scoping considerations are presented in Table 5.1.

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Atmospheric Environment | Atmospheric Environment | • Comparison of the observed air quality to acceptable standards (s.4.3.1(a))<br>• The effects of the Project on provincial greenhouse gas emissions levels must be assessed for all phases of the Project and mitigation measures proposed to minimize greenhouse gas emissions during the operations phase of the Project (s.6.2(h)) | Chapter 6 |
| | Acoustic Environment | • Comparison of the observed noise levels to acceptable standards (s.4.3.1(b)) | Chapter 7 |
| Aquatic Environment | Groundwater Resources | • Changes in nearby groundwater quality and quantity resulting from water withdrawals from the Project, including potential effects on industrial and other users of nearby surface water and groundwater aquifers (s.6.2(c))<br>• Effects of wind turbines and associated infrastructure on water quality in protected public water supply areas, protected wellhead areas, unprotected public drinking water source areas, and private water sources (s.6.2(c)) | Chapter 8 |
| | Surface Water Resources | • Changes in nearby surface quality and quantity resulting from water withdrawals from the Project, including potential effects on industrial and other users of nearby surface water and groundwater aquifers (s.6.2(c))<br>• Effects of water withdrawal for the hydrogen and ammonia production facility on surface-water flow, groundwater movement and aquifer recharge zones (s.6.2(c))<br>• Effects of water withdrawal for the hydrogen and ammonia production facility on known contaminated sites (s.6.2(c))<br>• Effects of wastewater discharge from any treatment needed to produce required water quality for hydrogen/ammonia production or other desired use, on receiving environment (s.6.2(c))<br>• Capacity of the receiving environment to manage wastewater discharge from the hydrogen/ammonia production facility (s.6.2(c))<br>• Effects of wind turbines and associated infrastructure on water quality in protected public water supply areas, protected wellhead areas, unprotected public drinking water source areas, and private water sources (s.6.2(c)) | Chapter 9 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Aquatic Environment (cont'd) | Freshwater Fish and Fish Habitat | • Effects of the Project on fish and fish habitat, including critical and sensitive habitat, shall be assessed for all phases of the Project. The EIS shall describe the potential adverse environmental effects of the Project on fish habitat and fish populations by species including species of special concern, threatened and endangered species, and rare species associated with, but not limited to, the following:<br>• Work windows and sensitive times of the year (e.g., migration, feeding and spawning) which are critical for fish populations identified in the study area (s.6.2(d))<br>• The construction and operation of Project facilities or infrastructure including, but not limited to: primary and ancillary buildings and structures associated with the hydrogen/ammonia production facility and wind turbines; site preparation, blasting, access roads, transmission lines and substations; surface and groundwater management activities; water use / water withdrawal during operations; and turbidity, siltation and other contamination from surface runoff and slope movement (s.6.2(d))<br>• In-water works during construction such as: fording; removal of aquatic and/or stream side vegetation; installation of culvert, bridges and water crossings; infilling; dewatering; and changes to natural flow regime (s.6.2(d)) | Chapter 10 |
| | Marine Environment and Use | • Effects on existing and potential commercial, recreational, and Indigenous fisheries and aquaculture operations (s.6.2(c))<br>• Effects on marine navigation (e.g., commercial and recreational boat traffic) and biosecurity in the port (s.6.2(c)) | Chapter 11 |
| Terrestrial Environment | Wetlands and Vegetation, including Rare Plants | • Effects of the Project on flora and their habitat (including critical, sensitive and rare habitat), associated with, but not limited to, the following:<br>• Direct and indirect effects of Project construction, operation, decommissioning and rehabilitation (s.6.2(e))<br>• Interactions with wind turbines, including estimated mortality rates (s.6.2(e))<br>• Emissions, discharges and releases of substances (s.6.2(e))<br>• Land disturbance that has the ability to act as temporary habitat for species at risk and species of conservation concern (s.6.2(e)) | Chapter 12 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Terrestrial Environment (cont'd) | Avifauna | • Effects of the Project on fauna (including migratory birds, birds protected by the *Migratory Birds Convention Act,* species at risk and of conservation concern), and their habitat (including critical, sensitive and rare habitat), associated with, but not limited to, the following:<br>• Direct and indirect effects of Project construction, operation, decommissioning and rehabilitation (s.6.2(e))<br>• Interactions with wind turbines, including estimated mortality rates (s.6.2(e))<br>• Emissions, discharges and releases of substances (s.6.2(e))<br>• Land disturbance that has the ability to act as temporary habitat for species at risk and species of conservation concern (s.6.2(e))<br>• Noise, vibrations and light, and in particular effects on feeding, breeding, movement and migratory patterns (s.6.2(e)) | Chapter 13 |
| | Bats | • Effects of the Project on fauna (including bats, species at risk and of conservation concern), and their habitat (including critical, sensitive and rare habitat), associated with, but not limited to, the following:<br>• Direct and indirect effects of Project construction, operation, decommissioning and rehabilitation (s.6.2(e))<br>• Interactions with wind turbines, including estimated mortality rates (s.6.2(e))<br>• Emissions, discharges and releases of substances (s.6.2(e))<br>• Land disturbance that has the ability to act as temporary habitat for species at risk and species of conservation concern (s.6.2(e))<br>• Noise, vibrations and light, and in particular effects on feeding, breeding, movement and migratory patterns (s.6.2(e)) | Chapter 14 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Terrestrial Environment (cont'd) | Other Wildlife | • Effects of the Project on fauna (including moose, caribou, muskrat, species at risk and of conservation concern), and their habitat (including critical, sensitive and rare habitat), associated with, but not limited to, the following:<br>• Direct and indirect effects of Project construction, operation, decommissioning and rehabilitation (s.6.2(e))<br>• Interactions with wind turbines, including estimated mortality rates (s.6.2(e))<br>• Emissions, discharges and releases of substances (s.6.2(e))<br>• Land disturbance that has the ability to act as temporary habitat for species at risk and species of conservation concern (s.6.2(e))<br>• Noise, vibrations and light, and in particular effects on feeding, breeding, movement and migratory patterns (s.6.2(e)) | Chapter 15 |
| | Areas of Conservation Concern | • Effects of the Project on flora and fauna and their habitat (including critical, sensitive and rare habitat), associated with, but not limited to, the following:<br>• Direct and indirect effects of Project construction, operation, decommissioning and rehabilitation (s.6.2(e))<br>• Emissions, discharges and releases of substances (s.6.2(e))<br>• Land disturbance that has the ability to act as temporary habitat for species at risk and species of conservation concern (s.6.2(e)) | Chapter 16 |
| Economy, Employment and Business | Economy, Employment and Business | • Boomtown effects of the project on community health and services, including:<br>• Employment and employment equity and diversity including under-represented groups (s.6.2(b))<br>• Business capacity relative to goods and services (s.6.2(b)) | Chapter 17 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Communities | Communities | • Boomtown effects of the project on community health and services, including:<br>• Food security (s.6.2(b))<br>• Employment and employment equity and diversity including under-represented groups (s.6.2(b))<br>• Business capacity relative to goods and services (s.6.2(b))<br>• Housing, accommodations and property values (s.6.2(b))<br>• Health care and community services, including mental health and addiction services and social programs (s.6.2(b))<br>• Fire and emergency services (s.6.2(b))<br>• Education and training services and facilities (s.6.2(b))<br>• Municipal infrastructure or services to be used by the Project and the capacity of the infrastructure and services to support the Project (s.6.2(b))<br>• Green spaces (s.6.2(b))<br>• Effects of the Project on existing electrical infrastructure and the potential implications for the overall provincial and regionally interconnected transmission system, including but not limited to the following:<br>• Effects on cost and access to electricity and other goods and services for provincial residents (s.6.2.(g))<br>• Details regarding the geographical footprint and routing to assess proximity to existing infrastructure and any consequential risk of interference, including but not limited to the province's high voltage direct current infrastructure (s.6.2.(g))<br>• System impact studies to determine the reliability and operating effects of the Project on the existing electrical system, particularly the newly constructed high voltage direct current facilities of the Labrador- Island Link and Maritime Link (s.6.2.(g))<br>• Details on when the Project would require access to transmission resources, including any curtailment considerations and the effect on other customers, both during the period before the wind farm is operational and over the longer term (s.6.2.(g))<br>• Details on when the intermittent renewable energy resource will be available for supply to the energy grid when not used for production of hydrogen (s.6.2.(g)) | Chapter 18 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Communities (cont'd) | Human Health and Quality of Life | • Effects of all phases of the Project on human health and quality of life, including but not limited to:<br>• Vibrations, noise emissions and noise levels, including sustained low frequency noise (s.6.2(a))<br>• Light emissions and shadow flicker and nighttime flicker (s.6.2(a))<br>• Dust and air emissions (s.6.2(a))<br>• Ice throw from wind turbines (s.6.2(a))<br>• Weather radar (s.6.2(a))<br>• Viewscapes (s.6.2(a)) | Chapter 19 |
| Land and Resource Use | Land and Resource Use | • Effects on existing and potential commercial, recreational, and Indigenous fisheries and aquaculture operations (s.6.2(c))<br>• Effects of the Project on land use and tenure, including but not limited to:<br>• Mining, mineral exploration, and quarrying activities, and land accessibility for future mining, mineral exploration, and quarrying activities, including the accessibility of land for future exploration of limestone and dolomite resources of the St. George Group (s.6.2(f))<br>• Existing land tenure under the Petroleum and Natural Gas Act, Mineral Act, and Quarry Materials Act, including restrictions for Project development associated with existing land tenure (s.6.2(f))<br>• Effects of potential options for above ground or underground storage of carbon dioxide, hydrogen and/or ammonia and the interaction of those sites with the current disposition of mineral rights and exploration efforts (s.6.2(f))<br>• Potential effects of existing mining operations on the Project, specifically but not limited to, the effects of blasting from mining operations (s.6.2(f))<br>• Existing land tenure, including Crown land tenure and private land ownership and restrictions for Project development associated with existing land tenure (s.6.2(f))<br>• Municipal zoning, permitted/discretionary use in designated zones, and permissibility of Project features that overlap municipal zones (s.6.2(f))<br>• Tourism establishments and operations (s.6.2(f)) | Chapter 20 |

## Table 5.1 VEC Scoping Considerations

| Environmental Components Specified in the EIS Guidelines | VEC Selected for Assessment | EIS Guidelines Scoping Considerations[a] | Relevant EIS Section Reference |
|---|---|---|---|
| Land and Resource Use (cont'd) | Land and Resource Use (cont'd) | • Potential effects of vibrations from wind turbines on existing land and marine-based aquaculture facilities and operations (s.6.2(f))<br>• Domestic wood cutting areas<br>• Cultural and recreational activities<br>• Developed areas | Chapter 20 |
| Aquatic Environment | Indigenous Fisheries | • Effects on existing and potential Indigenous fisheries (s.6.2(c)) | Chapter 21 |
| Heritage and Cultural Resources | Heritage and Cultural Resources | • Historic and archaeological resources<br>• Paleontological resources<br>• Architectural resources<br>• Burial, cultural, spiritual and heritage sites<br>• Natural attractions and tourism generating resources (s. 4.2.5) | Chapter 22 |

Note:

[a] Section references provided in this column relate to the applicable sections of the EIS Guidelines where the requirement has been identified. Information in this column identifies scoping requirements set out in the EIS Guidelines and is not an exhaustive list of scoping elements for each VEC. Additional details on scoping is provided in the respective VEC chapters.

# 5.3 VEC Assessment Methods

## 5.3.1 Scope of Assessment

### 5.3.1.1 Regulatory and Policy Setting

This section provides an overview of applicable regulatory requirements, policies, and guidance for the assessment of effects on the VEC. Regulatory requirements and policies from applicable federal and provincial authorities influence the scope of the assessment, including defining significance, where applicable.

### 5.3.1.2 Rationale for VEC Selection

The description of the scope of the assessment for each VEC begins with a definition of the respective VEC (as identified in Section 5.2) and a brief overview of what it represents (e.g., species groups, abiotic resources, or major socio-economic aspects). The rationale for why the VEC was selected as a component of the environment on which to focus the assessment is provided; this may include the VEC's potential to be affected by the Project, its importance to various stakeholders, and/or its ecological and/or socio-economic importance. Potential linkages to other VECs are identified, where applicable.

### 5.3.1.3 Boundaries

The VEC-specific spatial (i.e., geographical extent of potential effects) and temporal (i.e., timing of potential effects) boundaries of the assessment are described.

#### Spatial Boundaries

The spatial boundaries for the assessment were selected based on the geographic extent of the measurable potential environmental, social, heritage and human effects of the Project. The spatial boundaries include the following:

- The Project Area encompasses the immediate area in which Project activities and components will occur and is comprised of following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen / Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the potential area of direct physical disturbance associated with the construction, operation and decommissioning and rehabilitation of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide right-of-way (RoW) for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.

Though not an official Project Boundary, the assessment references the "Project footprint", which is the anticipated area of direct physical disturbance associated with construction, operation and maintenance, and decommissioning, within the Project Area. The Project footprint is likely to change in some parts of the Project Area as a result of micro-siting, following biophysical surveys. The Project footprint represents 5.29% of the LAA and 1.12% of the RAA. The Project Area, which is not expected to be completely directly disturbed but represents the extent where clearing is possible, represents 36.56% of the LAA and 7.71% of the RAA.

- The Local Assessment Area (LAA) encompasses the area in which Project-related environmental effects (direct or indirect) can be predicted or measured for assessment. The LAA, which is specific to each VEC, encompasses the Project Area and is selected in consideration of the geographic extent of effects on the given VEC.
- The Regional Assessment Area (RAA) is the area established for context in the determination of significance of project-specific effects. It is also the area which informs the assessment of cumulative effects. The RAA is VEC specific and encompasses both the Project Area and the LAA.

### Temporal Boundaries

Temporal boundaries set the timeframe to be considered and will be defined for the assessment to address the potential effects during the Project's construction, operation and maintenance, and decommissioning and rehabilitation phases over relevant timescales. The temporal boundaries for the Project consist of the following phases:

- Construction Phase – Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q1 2026. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen and ammonia plant will be constructed in phases from Q2 2024 to Q1 2026.
- Operation and Maintenance Phase – Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port Wind Farm and Q2 2027 at the Codroy Wind Farm. The 600 MW electrolyzer expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- Decommissioning and Rehabilitation – After a 30 year operational life, the decommissioning phase is anticipated to, occur during 2057 and 2058. Decommissioning is anticipated to begin Q1 2057 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm.

### 5.3.2 Existing Conditions

Existing conditions for each VEC are established based on data collected during studies involving desktop analyses, field programs, engagement, and from traditional use studies. Potential data gaps that are important for the effects assessment are identified, where applicable. An overview of the existing environment is presented using information about current conditions, which in many cases have been and/or are being influenced by historical and present activities in the Project Area, LAA, and RAA. The current condition of the VEC is described and the influences of other past and present projects and activities on the VEC condition leading to the present time are considered in a cumulative effects assessment, where applicable. An understanding of the existing conditions for the VEC within the spatial area being assessed is a key requirement in the prediction of potential Project effects.

The existing environmental conditions are described in each of the VEC chapters (Chapter 6 to Chapter 22) as well as in the Baseline Studies. Table 5.2 identifies the baseline studies that have been completed in support of the Project. These studies have been appended to this EIS as Baseline Study Appendices (BSAs). Results from these studies are summarized in the respective VEC chapters (Chapters 6 to 22), with the detailed findings provided in the attached BSAs.

**Table 5.2 Baseline Study Appendices**

| Number | Baseline Study Appendix | Attachment Name |
|---|---|---|
| **BSA-1** | Atmospheric Environment | Atmospheric Environment Baseline Study |
| **BSA-2** | Aquatics Environment | Aquatics Environment Baseline Study |
| **BSA-3** | Terrestrial Environment | Terrestrial Environment Baseline Study |
| **BSA-4** | Socio-Economic Environment and Land and Resource Use | Socio-economic Environment and Land and Resource Use Baseline Study |

### 5.3.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on each VEC. Residual environmental effects are assessed and characterized using criteria described in Section 5.3.3.1, including nature, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant (Section 5.3.3.2). Environmental effects are then assessed for each VEC, including effect pathways and measurable parameters (Section 5.3.3.3), followed by the identification of potential Project interactions with the VEC (Section 5.3.3.4). Analytical assessment techniques used for the assessment are described in Section 5.3.3.5.

#### 5.3.3.1 Residual Effects Characterization

The predicted (residual) environmental effects of the undertaking are characterized using the following criteria: nature, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological or socio-economic context. Quantitative measures were developed, where possible, to characterize residual effects. Qualitative considerations were used where quantitative measurement was not possible.

The definitions of each of these criteria are customized as necessary, in Chapter 6 to Chapter 22, for each VEC-specific assessment. In generic terms, the residual effect characterization criteria include the following:

- **Nature** – The long-term trend of the residual effect (i.e., neutral, positive, or adverse).
- **Magnitude** – The amount of change in measurable parameter(s) for the VEC relative to existing conditions. Magnitude is defined for each VEC as negligible, low, moderate, high, or other qualifier(s) as deemed appropriate.
- **Geographic Extent** – The geographic area in which a residual effect occurs. Geographic extent is defined for each residual effect based on the Project Area, LAA, and RAA, as appropriate.
- **Timing** – Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant.
- **Frequency** – Identifies how often the residual effect occurs (e.g., single event, multiple irregular event, multiple regular event, or continuous) during the Project, during a specific phase of the Project, or during another specified time period.
- **Duration** – The period of time (e.g., short-term, medium-term, long-term, or permanent) required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived.
- **Reversibility** – Describes whether a measurable parameter(s) or the VEC can return to its existing condition or meet another target (e.g., a remediation target), if applicable, after the Project activity ceases, including through active management techniques (e.g., habitat restoration).
- **Ecological / Socio-economic Context** – Existing conditions (e.g., undisturbed or disturbed) and trends in the area where the residual effect occurs.

In each VEC assessment chapter, a focused narrative is used to provide an overview of the characteristics of the residual environmental effects of the Project on the respective VEC. Following this overview, the characterization of Project-related residual effects on the VEC is organized according to the Project effects and phase(s) of the Project that the various Project activities, and associated Project-related residual environmental effects, are linked to. As per section 6.2 of the EIS Guidelines, the EIS is required to also consider the following parameters:

- Level of knowledge
- The capacity of renewable resources that are likely to be significantly affected by the Project, to meet the needs of present and future generations
- The extent to which biological diversity is affected by the Project

These parameters are discussed further in Section 5.3.3.5, 5.3.9, and 5.3.10, respectively, below.

#### 5.3.3.2 Significance Definition

VEC-specific threshold criteria or standards are identified beyond which a residual environmental effect on the VEC would be considered significant. These significance criteria are defined in consideration of regulatory requirements, standards, objectives, and guidelines, as applicable to the VEC. Where pre-established thresholds or standards do not exist (e.g., in regulations or guidelines), significance criteria are developed using the measurable parameters established for the VEC, accepted EA practice methods, along with the professional judgement of the assessors, and justification for the criteria is provided. The significance criteria define the limits of a change in a measurable parameter or state of the VEC beyond which it would be considered significant, based on resource management objectives, community standards, scientific literature, or ecological processes (e.g., natural variability for fish or wildlife habitats or populations). Quantitative thresholds are preferred; however qualitative thresholds for significance may be used where quantitative thresholds are not known.

The VEC-specific significance criteria defined within each VEC assessment chapter are used to determine the significance of predicted Project-related residual adverse environmental effects on the VEC. Generally, the determination of significance is also made in consideration of the magnitude, duration, frequency, geographic extent, timing, and/or reversibility of predicted residual effects on the VEC. If a predicted residual adverse environmental effect is determined to be significant, the likelihood of occurrence of that significant residual effect is discussed.

#### 5.3.3.3 Potential Effects, Pathways and Measurable Parameters

For each VEC, potential effects and Project effect pathways (both direct and indirect) are identified. The measurable parameters and units of measurement used to assess potential effects are also identified. Quantitative measurable parameters are used where possible, with qualitative parameters and units of measurement identified where the nature of the effect or available data does not allow for a quantitative assessment. Potential environmental effects and measurable parameters have been selected based on review of recent EISs for large development projects in Newfoundland and Labrador and other parts of Canada, comments provided during engagement, and professional judgment.

#### 5.3.3.4 Potential Environmental Effects

For each potential effect, the physical activities that might interact with the VEC and result in the identified environmental effect are identified. These interactions are indicated by a checkmark and are discussed in the context of standard and Project-specific mitigation / enhancement, and effects pathways and residual effects. Components and activities that do not interact with the VEC are also identified and the reason for the lack of interaction is explained. Table 5.3 presents an example table used to define potential environmental effects for each VEC.

**Table 5.3 Project Interactions with [VEC Name], Environmental Effects, and Environmental Effect Pathways**

| Project Activities | Environmental Effect(s) to be Assessed | | |
|---|---|---|---|
| | Effect #1 | Effect #2 | Effect #3 |
| **Construction** | | | |
| Site Preparation and Civil Works (includes turbine foundations, road construction, quarries, clearing, grubbing, cement production and watercourse crossings) | | | |
| Transportation of Resources and Equipment (includes trucking, shipping and barging of materials) | | | |
| Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure | | | |
| Installation and Commissioning of Wind Farm Infrastructure (including wind turbines, access roads, and collector systems) | | | |
| Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing) | | | |
| Installation and Commissioning of Hydrogen / Ammonia Production and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure) | | | |
| Restoration of Existing Port Facilities (including pile driving and dredging) | | | |
| Emissions, Discharges, and Wastes[1] | | | |
| Employment and Expenditures[2] | | | |
| **Operation and Maintenance** | | | |
| Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems) | | | |
| Presence, Operation, and Maintenance of Transmission Lines and Substations | | | |
| Presence, Operation, and Maintenance of Hydrogen / Ammonia Production and Storage Facilities and Associated Infrastructure (includes marine discharge from treatment plant) | | | |
| Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering at Port) | | | |
| Emissions, Discharges, and Wastes[1] | | | |
| Employment and Expenditures[2] | | | |
| **Decommissioning and Rehabilitation** | | | |
| Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure | | | |
| Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems) | | | |
| Decommissioning and Rehabilitation of Transmission Lines and Substations | | | |

**Table 5.3 Project Interactions with [VEC Name], Environmental Effects, and Environmental Effect Pathways**

| | Environmental Effect(s) to be Assessed | | |
|---|---|---|---|
| **Project Activities** | **Effect #1** | **Effect #2** | **Effect #3** |
| Decommissioning and Rehabilitation of Hydrogen / Ammonia Production and Storage Facilities and Associated Infrastructure | | | |
| Decommissioning and Rehabilitation of Port Facilities | | | |
| Emissions, Discharges, and Wastes[1] | | | |
| Employment and Expenditures[2] | | | |

Notes:
✓ = Potential interaction
– = No interaction
[1] Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Emissions, Discharges, and Wastes" is listed as a separate item under each phase of the Project.
[2] Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, "Employment and Expenditures" is listed as a separate item under each phase of the Project.

#### 5.3.3.5 Analytical Assessment Techniques and Level of Knowledge

The effects assessment considers relevant scientific literature, baseline and monitoring results, other available information (e.g., community, stakeholder, and Indigenous knowledge), and the results of analytical assessment tools such as quantitative modelling (where needed) and employs professional judgement for the analysis of potential Project-related environmental changes to the VEC that may result through one or more mechanisms or pathways. Within each VEC chapter the analytical assessment techniques including assumptions made in the VEC assessment are described and conservative assumptions used as part of the precautionary approach are noted. For each VEC, the assessment considers the implications of data gaps and how that may influence the level of knowledge and conservative approach undertaken.

### 5.3.4 Mitigation Measures

Mitigation measures proposed to eliminate (e.g., avoid), reduce, or control potential adverse environmental effects, to address public or stakeholder concerns, and/or to enhance positive (beneficial) environmental effects are identified and described for each VEC. Technically and economically feasible mitigation measures constituting standard practice are considered in the evaluation of Project effects. Mitigation can also include VEC-specific measures, such as habitat offsetting / compensation or planned environmental management and response measures, to address VEC-specific issues.

The mitigation measures that are prescribed to address the potential effects of the Project on each VEC are identified in the VEC-specific effects assessment chapters (Chapter 6 to Chapter 22). Other types of mitigation that are proposed for the Project include:

- Measures proposed in monitoring and management plans as part of a process of adaptive management, such as those referred to in Section 2.12
- Project design mitigation measures, such as those identified in Section 2.12
- Standard environmental protection procedures and best management practices, such as those identified in Section 2.12
- Mitigation and contingency measures to address the possibility of accidents and malfunctions that could affect the environment, such as those identified in Chapter 24

Where applicable, the extent to which technological innovations may help mitigate environmental effects is also considered. Each VEC assessment also provides an explanation of the extent to which the precautionary principle applies to the prescribed mitigation measures. Steps commonly taken to demonstrate a conservative approach are to present mitigation measures that are more than adequate for reducing an effect to acceptable levels and to define effects thresholds at levels below what actually would be required to have an unacceptable effect.

### 5.3.5 Residual Environmental Effects

The effects assessment considers relevant scientific literature, baseline and monitoring results and other available information (e.g., community, stakeholder and Indigenous knowledge) in the analysis of potential Project-related environmental changes to the VEC that may result through one or more mechanisms or pathways. The focus of the effects assessment is on residual effects, which are the effects that remain after application of planned mitigation. Residual effects are discussed for each phase of Project (i.e., construction, operation and maintenance and decommissioning and rehabilitation) as well as by Project component (i.e., Port au Port Wind Farm, Codroy Wind Farm, Ammonia and Hydrogen Facility, Port Facilities, and 230 kV Transmission Lines). Following the analysis of environmental effects pathways and mitigation measures, the residual environmental effects are characterized using the following criteria: nature, magnitude, geographic extent, timing, frequency, duration, reversibility, and ecological or socio-economic context. The definitions of these criteria, which are further customized in each VEC-specific assessment, are outlined above in Section 5.3.3.1. A summary of the characterization of residual environmental effects is provided in tabular form for each VEC. An example summary table is provided in Table 5.4.

**Table 5.4 Summary of Predicted Environmental Effects of the Undertaking on [VEC Name]**

| Residual Effect | Residual Effects Characterization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Nature | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Ecological and Socio-economic Context |
| **Construction** | | | | | | | | |
| Residual Effect #1 | | | | | | | | |
| Residual Effect #2 | | | | | | | | |
| Residual Effect #3 | | | | | | | | |
| **Operation and Maintenance** | | | | | | | | |
| Residual Effect #1 | | | | | | | | |
| Residual Effect #2 | | | | | | | | |
| Residual Effect #3 | | | | | | | | |
| **Decommissioning and Rehabilitation** | | | | | | | | |
| Residual Effect #1 | | | | | | | | |
| Residual Effect #2 | | | | | | | | |
| Residual Effect #3 | | | | | | | | |

**KEY:**

***Nature:***
*P: Positive*
*A: Adverse*
*N: Neutral*

***Magnitude:***
*N: Negligible*
*L: Low*
*M: Moderate*
*H: High*

***Geographic Extent:***
*PA: Project Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Duration:***
*ST: Short-term*
*MT: Medium-term*
*LT: Long-term*

***Timing:***
*NS: No Sensitivity*
*MS: Moderate Sensitivity*
*HS: High Sensitivity*

***Frequency:***
*S: Single Event*
*IR: Irregular Event*
*R: Regular Event*
*C: Continuous*

***Reversibility:***
*R: Reversible*
*I: Irreversible*

***Ecological / Socio-Economic Context:***
*D: Disturbed*
*U: Undisturbed*

### 5.3.6 Determination of Significance

For each environmental effect, threshold criteria or standards beyond which a residual environmental effect is considered significant are identified (Section 5.3.3.2). Using the VEC-specific significance definitions stated within each VEC section, the assessment evaluates the significance of these effects and summarizes the residual environmental effects of the Project's activities and components in a concluding paragraph in each VEC section. If a significant adverse residual effect is predicted, then the likelihood of this occurrence is also discussed.

### 5.3.7 Prediction Confidence

Level of confidence is assigned to the residual effect predictions for each VEC. A lower level of confidence may be indicative of deficiencies in available information (e.g., data gaps in baseline information or limitations in the availability of existing knowledge related to potential Project-environment interactions) or other challenges. VEC-specific deficiencies or challenges associated with the EA process are identified.

### 5.3.8 Follow-Up and Monitoring

Follow-up and monitoring programs are identified for each VEC, where applicable. VEC-specific follow-up and monitoring programs include those proposed to verify the accuracy of key EA predictions and the effectiveness of prescribed mitigation measures. Monitoring may also be recommended to verify compliance with applicable regulatory requirements, including the terms and conditions of environmental permits, approvals, or authorizations that may be requirements of the Project. Follow-up and monitoring can also be used to confirm adherence to general and specific mitigation measures as well as to inform the need for adaptive management. In the event of a variance between predicted and actual effects, an adaptive management approach (e.g., revision of existing mitigation measures) will be taken, as required.

A preliminary framework and scope for follow-up and monitoring have been developed in consideration of the EIS Guidelines for the Project, as well as in consideration of pertinent legislation, regulations, industry standards, and legislative guides. Monitoring and follow-up plans are proposed, where applicable, for each VEC (Chapter 6 to Chapter 22). The follow-up and monitoring programs proposed in this EIS will be more fully developed in consultation with government agencies, Indigenous groups, and stakeholders, where relevant.

Follow-Up and Monitoring Programs are described in each respective VEC chapter (Chapter 6 to Chapter 22), and/or in Section 2.9 (Health, Safety, and Environmental Management).

### 5.3.9 Capacity of Renewable Resources and Effects on Biological Diversity

As per the EIS Guidelines, the capacity of renewable resources and effects on biological diversity are also considered, where applicable, for each VEC. In cases where the assessment of routine Project-related environmental effects on a VEC concludes that a renewable resource is likely to be significantly affected by the Project, the capacity of that renewable resource to meet the needs of present and future generations is discussed. A discussion on the extent to which biological diversity is affected by Project is included for each VEC. This includes adverse Project-related effects on biological diversity that exceed the limits of natural variability or affect the long-term viability of biological diversity in the RAA with respect to each VEC.

### 5.3.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

As per the EIS Guidelines, the predicted future condition of the environment is also considered for each VEC to help distinguish between Project-related environmental effects and environmental changes due to natural processes. The predicted future condition of the environment, if the Project were not to proceed, is described within the expected lifespan of the Project.

## 5.4 Methods for the Assessment of Other Environmental Effects

### 5.4.1 Cumulative Environmental Effects

Cumulative environmental effects can result from interactions between the residual effects of multiple past, present, and future physical activities (i.e., projects and/or activities) on a particular component of the environment. More specifically, Project-related cumulative environmental effects can result from the combination of Project-related residual effects and the residual effects of other (non-Project) past, present, and certain or reasonably foreseeable projects and activities. Chapter 23 identifies the Project-related residual environmental effects that may interact cumulatively with (i.e., overlap spatially and temporally with) the residual environmental effects of other projects and activities in the RAA and assesses the associated potential cumulative environmental effects. The contribution of the Project to potential cumulative effects is then analyzed.

The residual environmental effects of past and present physical activities in the RAA have contributed to the existing environmental (baseline) conditions that are described for each VEC in Chapter 6 to Chapter 22. Associated historical and ongoing cumulative effects are therefore inherently captured in the assessments of Project-related environmental effects that are conducted for each VEC in Chapter 6 to Chapter 22. Accordingly, the focus of the cumulative effects assessment is on the combination of residual Project effects with the residual effects of future projects and activities in the RAA that are certain or reasonably foreseeable. Future projects and activities that are considered certain or reasonably foreseeable are those that either have already obtained the necessary authorizations to proceed, those that are in the process of obtaining the required authorizations, or those for which it has been publicly announced that the proponent intends to seek the necessary authorizations to proceed.

The following two conditions must be met to initiate an assessment of cumulative environmental effects on a VEC:

- The Project is predicted to have an adverse residual environmental effect(s) on a VEC
- The adverse residual effect(s) from the Project overlaps spatially and temporally with the adverse residual effect(s) of one or more other projects or activities on the same VEC

Cumulative environmental effects are only assessed in cases where both of these conditions are met; if either of these two conditions is not met, an assessment of cumulative environmental effects is not conducted.

A project and activity inclusion list will be developed to provide known past, present, and certain or reasonably foreseeable future projects and activities that could overlap spatially and temporally with the residual environmental effects of the Project. Chapter 23 evaluates the residual environmental effects of the Project (as assessed in Chapter 6 to Chapter 22) in the context of residual effects from past, present, and certain or reasonably foreseeable future projects and activities to determine the potential for cumulative effects. The scope and methods for the assessment of cumulative environmental effects are described further in Chapter 23.

### 5.4.2 Accidents and Malfunctions

The EIS Guidelines require that the EA consider the environmental effects of potential non-routine (unplanned) accidents and malfunctions that could occur in connection with the Project. The potential for an accident or malfunction to occur over the life of the Project, and the potential consequences (i.e., adverse environmental effects) of Project-related accidents and malfunctions, are assessed in Chapter 24. The assessment provides an initial basis for development of contingency planning and what will eventually be incorporated into the Project's emergency and contingency response plans. Details on the types of accident or malfunction events considered are discussed in Chapter 24.

Potential environmental effects on VECs due to Project-related accidents and malfunctions are assessed in a similar fashion to routine (planned) Project-related environmental effects (Section 5.3). Environmental effects are identified, mitigation and safety measures are described (i.e., incident avoidance measures, design safeguards), and effects are characterized using the same terms used for Project-related environmental effects. The significance of the environmental effects is then determined using the same thresholds used for Project-related environmental effects. The approach employed for the assessment of non-routine Project-related environmental effects associated with accidents and malfunctions are described further in Chapter 24.

### 5.4.3 Effects of the Environment on the Project

The EIS Guidelines for the Project require consideration of changes to the Project that may be caused by environmental factors and hazards and assessment of the potential effects that could occur. The potential environmental changes and hazards that are considered include weather, climate, and metocean conditions (e.g., wind, ocean currents, waves, extreme precipitation, storms and storm surges, hurricanes, droughts, floods, and ice), climate change (e.g., sea level rise; increased severity and frequency of storms, storm surges, and flooding; and changes to precipitation quantity and recharge rates), geological hazards (e.g., seismic events and landslides), forest fires, and algal blooms. The influence that these environmental changes and hazards may have on the Project are predicted and described and the measures to be taken to limit or avoid potential adverse effects are identified. The scope and methods for the assessment of the effects of the environment on the Project are described further in Chapter 25.

# 6.0 Atmospheric Environment

## 6.1 Scope of Assessment

The Atmospheric Environment Valued Environmental Component (VEC) consists of air quality, greenhouse gases, and lighting. The atmospheric environment was assessed as a VEC to meet the requirements of the Provincial EIS Guidelines (Table E.1) for the Project and because the atmospheric environment may be affected by Project activities. Sound quality and vibration were also included as part of the EIS Guidelines under the atmospheric environment section. However, due to the size of these assessments and the limited linkage between them and the other components discussed in this chapter, sound quality and vibration have been assessed in a separate VEC chapter, Chapter 7 Acoustic Environment.

### 6.1.1 Air Quality

Air quality is defined as the composition of the ambient air, including the presence and quantity of contaminants which could have adverse effects on vegetation, wildlife, human health, and other biota. The concentrations of contaminants in the ambient air can be compared to air quality criteria and objectives, which are established to protect the environment and human health.

The air quality assessment was conducted to determine potential residual and cumulative changes to ambient air quality from the Project. In the air quality assessment, the quantities of air contaminants that may be released to the atmosphere were estimated from the planned Project construction and operation activities. The assessment of effects on air quality from construction was assessed in consideration of the emissions estimates, proposed activities and available best practices and mitigation for construction. Air contaminant emissions from operation activities were estimated and modelled using an atmospheric dispersion model to predict the potential changes in ambient air quality associated with Project emissions (Section 6.5.5.3). The air quality assessment considered substances that could be emitted from the Project for which there are applicable air quality objectives and standards adopted by either or both the Newfoundland and Labrador Department of Environment and Climate Change (NLDECC) and Environment and Climate Change Canada (ECCC). The predicted effects were assessed relative to these criteria.

The following air contaminants are considered in this assessment:

- Nitrogen dioxide ($NO_2$)
- Carbon monoxide (CO)
- Sulphur dioxide ($SO_2$)
- Ammonia ($NH_3$)
- Total particulate matter (TPM) matter with an aerodynamic diameter less than 30 micrometre (μm)
- Particulate matter ($PM_{10}$) with particles having an aerodynamic diameter less than 10 μm

- Particulate matter ($PM_{2.5}$) with particles having an aerodynamic diameter less than 2.5 µm
- Diesel particulate matter (DPM)
- Select speciated VOCs (benzene, toluene,  xylene, formaldehyde, acrolein)
- Total polycyclic aromatic hydrocarbons (PAHs) and select speciated PAHs (acenaphthene, acenaphthylene, anthracene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-c,d]pyrene, naphthalene, phenanthrene, pyrene)

Other air contaminants such as hydrogen sulphide, arsenic, asbestos, cadmium, copper, lead, mercury, nickel, polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (dioxins) and polychlorinated dibenzo furans, vanadium, and zinc are also regulated provincially. However, these compounds are not expected to be released in substantive quantities from Project activities and are not typically the primary air contaminants of concern from construction activities or the operation of hydrogen / ammonia plant and wind turbines.

### 6.1.2 Climate Change

Information about atmospheric climate (including temperature, precipitation, wind, storms) and climate change (including climate change projections) are provided in the Effects of the Environment on the Project VEC (Chapter 25) and the Atmospheric Environment Baseline Study (BSA-1).

When greenhouse gases (GHGs) are released into the atmosphere, they absorb and trap heat, creating a phenomenon called "the greenhouse effect". Releases of GHGs, on a global scale, increase worldwide concentrations of GHGs in the atmosphere and are associated with climate change (IPCC 2014). Project-based releases of GHGs are typically used as an indicator of the potential environmental interactions with climate change. In this assessment, the emissions of GHGs are expressed in the form of tonnes (t) of carbon dioxide equivalent ($CO_2e$). An explanation of how $CO_2e$ is calculated is provided in Appendix 6-C. The climate and GHG assessment includes the following GHGs that will be emitted by Project activities:

- Carbon dioxide ($CO_2$)
- Methane ($CH_4$)
- Nitrous oxide ($N_2O$)

Greenhouse gases also include perfluorocarbons (PFC), hydrofluorocarbons (HFC), sulfur hexafluoride ($SF_6$), and nitrogen trifluoride ($NF_3$). These gases are expected to be released in insubstantial amounts, or not at all from the Project, and are, therefore, not considered further in the GHG assessment. Monitoring and reporting of these GHGs would be completed by WEGH2 during construction and operation of the Project as required under provincial and federal regulations for GHG quantification and reporting.

The climate and GHG assessment also includes consideration of the potential for offset of global GHG emissions resulting from the downstream usage of the ammonia product that would replace the use of traditional fossil fuels, and the assessment of the o overall expected change  to global GHG levels.

### 6.1.3 Light

Light was selected as a subcomponent of the atmospheric environment because exterior Project lighting can affect nighttime sky views and migrating wildlife. It can also result in visual aesthetic changes for, and physiological changes in, humans.

## 6.2 Regulatory and Policy Setting

### 6.2.1 Air Quality

There are federal and provincial ambient air quality standards (AAQS) which help track, regulate, and reduce exposure to air contaminants. The federal and NL AAQS apply to the Project and are presented in this section.

Air quality in Newfoundland and Labrador (NL) is regulated by the Air Pollution Control Regulation under the Newfoundland and Labrador Environmental Protection Act (NL EPA). This Regulation and Act provide measures to regulate the release of air contaminants to the atmosphere from "sources", provide testing and monitoring provisions, and establish maximum permissible ground-level concentrations of specified air contaminants in ambient air, among other requirements. The NL Ambient Air Quality Standards (NLAAQS) prescribed in Schedule A of the Air Pollution Control Regulations apply to ambient air and were established under the NL EPA in 2004. These values are shown in Table 6.1.

The applicable federal air quality criteria considered in the assessment are the Canadian Ambient Air Quality Standards (CAAQS). The CAAQS were implemented to reduce emissions and ground-level concentrations of various air contaminants nationally. The CAAQS have been endorsed by the Canadian Council of Ministers of the Environment (CCME) for SO2, $PM_{2.5}$, ozone ($O_3$) and $NO_2$. The 2020 CAAQS are adopted for the 2020 to 2024 period, after 2025, the 2025 CAAQS are adopted as per the change in standards. The CAAQS (2020 and 2025) values are shown in Table 6.2.

The CCME has yet to publish a guidance document on the procedures and methodologies that should be followed to assess whether measured concentrations of $SO_2$ or $NO_2$ exceed the CAAQS. However, it is understood that model predictions should not be directly compared to the CAAQS because these are intended to be compared with measured ambient air quality data and are not considered directly applicable to industrial fence-line concentrations. Therefore, although the predicted ground-level concentrations of criteria air contaminants (CACs) (including $SO_2$, $PM_{2.5}$, and $NO_2$) are compared to both the CAAQS and the NL Air Pollution Control Regulations, only the NL regulations are considered in the residual effects assessment as the compliance standard.

Several contaminants considered in this assessment are regulated by the Newfoundland and Labrador (NL) Ambient Air Quality Standards (NL AAQS), as per Schedule A of the Air Pollution Control Regulations, 2022 (Table 6.1). Additional contaminants that have the potential to be released from the Project but that are not regulated in NL were also considered in this assessment. In absence of NL specific AAQS, criteria set by alternate Canadian jurisdictions, e.g., Ontario or Alberta were considered (Table 6.3).

### Table 6.1 NL Ambient Air Quality Standards

| Contaminant | Units | 1-hour | 3-hour | 8-hour | 24-hour | 1 year |
|---|---|---|---|---|---|---|
| Nitrogen dioxide | Parts per billion (ppb) | 213 | - | - | 106 | 53 |
| Carbon monoxide | ppb | 30,582 | - | 13,107 | - | - |
| Ozone | ppb | 82 | - | 44 | - | - |
| Sulphur dioxide | ppb | 344 | 229 | - | 115 | 23(1) |
| Ammonia | ppb | - | - | - | 144 | - |
| Particulate matter Total | micrograms per cubic metre (µg/m$^3$) | - | - | - | 120 | 60(2) |
| Particulate matter < 10 microns | µg/m$^3$ | - | - | - | 50 | - |
| Particulate matter < 2.5 microns | µg/m$^3$ | - | - | - | 25(3) | 8.8(1)(3) |
| Ammonia | µg/m$^3$ | - | - | - | 100 | - |

Notes:
(1) The arithmetic average over a single calendar year of all 1-hour average concentrations in the year.
(2) The geometric average over a single calendar year of all 1-hour average concentrations in the year.
(3) At reference conditions, a dry gas temperature of 25 °Celsius and a gas pressure of 101.325 kilopascals
Source: NL Air Pollution Control Regulations, 2022

### Table 6.2 Canadian Ambient Air Quality Standards

| Air Contaminant | Averaging Period | µg/m$^3$ | |
|---|---|---|---|
| | | 2020–2024 | 2025+ |
| Ozone ($O_3$) | 8-hour (1) | 122 | 118 |
| Nitrogen Dioxide ($NO_2$) | 1-hour (2) | 113 | 79 |
| | 1-year (3) | 32 | 23 |
| Sulphur Dioxide ($SO_2$) | 1-hour (4) | 183 | 170 |
| | 1-year (5) | 13 | 10 |
| Fine Particulate Matter ($PM_{2.5}$) | 24-hour (6) | 27 | - |
| | 1-year (7) | 8.8 | - |

Notes:
(1) The 3-year average of the annual 4th highest of the daily maximum 8-hour average ozone concentrations
(2) The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
(3) The average over a single calendar year of all 1-hour average concentrations
(4) The 3-year average of the annual 99th percentile of the SO2 daily maximum 1-hour average concentrations
(5) The average over a single calendar year of all 1-hour average SO2 concentrations
(6) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
(7) The 3-year average of the annual average of the daily 24-hour average concentrations
Source: CCME 2023

## Table 6.3 Ontario and Alberta Applicable Air Quality Standards

| Contaminant | Units | Ontario O. Reg. 419/05 | | | | Alberta AAQO | | |
|---|---|---|---|---|---|---|---|---|
| | | 10-min | 1-hour | 24-hour | 1 year | 1-hour | 24-hour | 1 year |
| Benzene | µg/m$^3$ | - | - | 100 (1) | 0.45 (2) | 30 | - | - |
| Toluene | µg/m$^3$ | - | - | 2,000 (3) | - | 1,880 | 400 | - |
| Xylene | µg/m$^3$ | 3,000 (2) | - | 730 (2) | - | 2,300 | 700 | - |
| Acrolein | µg/m$^3$ | - | 4.5 (2) | 0.4 (2) | - | 4.5 | 0.4 | - |
| Formaldehyde | µg/m$^3$ | - | - | 65 (2) | - | - | - | - |
| Benz[a]anthracene | µg/m$^3$ | - | - | - | - | - | - | - |
| Benzo[a]pyrene | µg/m$^3$ | - | - | - | 0.00001 (2) | | | 0.30 ng/m$^3$ |
| Benzo[b]fluoranthene | µg/m$^3$ | - | - | - | - | - | - | - |
| Benzo[j]fluoranthene | µg/m$^3$ | - | - | - | - | - | - | - |
| Benzo[k]fluoranthene | µg/m$^3$ | - | - | - | - | - | - | - |
| Chrysene | µg/m$^3$ | - | - | - | - | - | - | - |
| Dibenz[a,h]anthracene | µg/m$^3$ | - | - | - | - | - | - | - |
| Benzo[g,h,i]perylene | µg/m$^3$ | - | - | - | - | - | - | - |
| Indeno[1,2,3-c,d]pyrene | µg/m$^3$ | - | - | - | - | - | - | - |
| Anthracene | µg/m$^3$ | - | - | - | - | - | - | - |
| Acenaphthene | µg/m$^3$ | - | - | - | - | - | - | - |
| Acenaphthylene | µg/m$^3$ | - | - | - | - | - | - | - |
| Fluoranthene | µg/m$^3$ | - | - | - | - | - | - | - |
| Fluorene | µg/m$^3$ | - | - | - | - | - | - | - |
| Naphthalene | µg/m$^3$ | 50 (2) | - | 22.5 (2) | - | - | - | 3 |
| Phenanthrene | µg/m$^3$ | - | - | - | - | - | - | - |
| Pyrene | µg/m$^3$ | - | - | - | - | - | - | - |

Notes:
(1) Upper Risk Threshold
(2) B1 Standard
(3) B1 Guideline

### 6.2.2 Greenhouse Gases

The management of GHG emissions occurs at provincial, national, and international scales. The existing legislation is mostly related to reporting industrial emissions above specified thresholds and promoting emission reductions at industrial operations.

In the 2015 submission to the United Nations Framework Convention on Climate Change, the Government of Canada agreed to reduce GHG emissions by 30% below 2005 levels by 2030 as part of the Paris Agreement (ECCC 2019). More recently, Canada's 2030 Emissions Reduction Plan, under the *Canadian Net-Zero emissions Accountability Act,* includes the following updated targets (ECCC 2022):

- 40% reduction in national GHG emissions below 2005 levels by 2030
- Achieve net zero emissions by 2050

The Government of NL has set the following emission reduction targets in the provincial Climate Change Action Plan (Government of NL 2019):

- A 35% to 45% reduction in regional GHG emissions below 1990 levels by 2030
- A 30% reduction in provincial GHG emissions below 2005 levels by 2030

In 2020, the province of Newfoundland and Labrador established their own commitment to achieving net-zero GHGs by 2050.

To support the initiatives and facilitate achieving the GHG reduction targets, the federal government developed the Pan-Canadian Approach to Pricing Carbon Pollution. This initiative provided flexibility to provinces and territories to develop carbon pollution pricing systems of their own and outlined the required criteria for these systems. For provinces and territories that did not implement jurisdictional carbon pollution pricing systems that would meet the federal benchmark requirements, they are required to comply with the federal carbon pollution pricing system.

As part of Canada's carbon pricing mechanism under the Pan-Canadian Framework on Clean Growth and Climate Change, they implemented the Output-Based Pricing System (OBPS) to reduce GHGs from industrial facilities. The OBPS sets a benchmark standard for emission intensity based on the output production from a facility. If a facility emits greater than the benchmark level, it must purchase carbon credits to offset the emissions.

The province of Newfoundland and Labrador created the Made-in-Newfoundland and Labrador Carbon Pricing Plan, which was approved by the federal government to meet the requirements of the Pan-Canadian Approach to Pricing Carbon Pollution in October 2018. The plan consisted of a hybrid system containing performance standards for large emitting facilities and large-scale electricity generation.

In 2022, the Government of Canada decided to impose its federal carbon tax backstop on Newfoundland and Labrador as of July 1, 2023. The national carbon pollution price schedule is $65 per tonne of GHG emission calculated in carbon dioxide equivalent ($CO_2e$) in 2023 and increases by $15 per year to $170 per tonne $CO_2$e in 2030. This prompted the Newfoundland government to alter their carbon pricing system to meet the federal benchmark stringency requirements, which was successful.

The most recent emission reduction and carbon pricing requirements in Newfoundland are as follows:

- Performance standards based on sector benchmarks for industrial facilities emitting more than 25,000 tonnes $CO_2$e annually under Newfoundland's Management of GHG Act. GHG emission reduction requirements are set at 14% in 2023, and increase by 2% each year until 2030 when the required reduction target is 28% below the baseline.
- Carbon tax imposed by authority under Newfoundland's Revenue Administration Act and the Revenue Administration Regulations (Newfoundland Reg. 73/11). The Management of GHG Regulations (Newfoundland Reg. 19/23) sets the carbon price, which must follow the federal price schedule.

In addition to the GHG reduction targets and carbon pricing, there are GHG emission reporting requirements both federally and provincially. Federally, under the Canadian Environmental Protection Act, 1999, industrial facilities that emit more than 10,000 t$CO_2$e per year are required to quantify and report GHG emissions to Environment and Climate Change Canada's Greenhouse Gas Reporting Program. Provincially, under the Management of Greenhouse Gas Act (MGGA) and the Management of Greenhouse Gas Reporting Regulations, there are provincial GHG emission reporting requirements. There are three levels of GHG reporting as follows:

- Facilities emitting 15,000 t of $CO_2$e or more annually must report their emissions to the provincial government
- Facilities emitting between 15,000 and 25,000 t of $CO_2$e annually may apply to be designated as opted-in facilities, in which the facility opts to performing a third-party verification of emissions
- By opting in, facilities may apply to become exempt from the application of the federal Greenhouse Gas Pollution Pricing Act for fuels those emissions are included in their reporting
- Facilities emitting more than 25,000 t of $CO_2$e annually are subject to annual GHG reduction targets and require third-party verification of emissions

Under Section 5 of the MGGA, facilities that emit over 25,000 tonnes of $CO_2$e emissions annually are required to reduce GHG emissions annually to meet specified reduction targets set out in the Management of Greenhouse Gas Regulations. Further, under the MGGA if a facility emits 15,000 tonnes of GHG emissions per year, it is subject to best available control technology (BACT) requirements as outlined in Section 12.1 of the Management of GHG Regulations.

Depending on the annual quantity of GHG emissions released to the atmosphere, the Project may be required to report annual GHG emissions to both the provincial and federal government. In addition, the Project may be subject to meeting specified reduction targets and/or subject to the BACT requirements.

### 6.2.3 Lighting

Currently there are no regulations in NL related to obtrusive light from industrial facilities.

Various international organizations, including the International Dark Sky Association (IDA) and the Commission Internationale de L'Éclairage (CIE), also known as the International Commission on Illumination, have developed guidelines and recommendations to limit light pollution and associated effects to humans and wildlife. The CIE is currently recognized by the International Organization for Standardization (ISO) as an international standardization body relating to matters on light and lighting, color and vision, photobiology, and image technology (CIE 2017). The CIE has established guidelines for light trespass and glare for various levels of urbanization. These guidelines have been adopted in various jurisdictions in Canada and the United Kingdom and have been used in this study.

The following three attributes are used to describe the potential environmental effects of light:

- Light trespass refers to the transmission of light from fixtures within a facility to the surrounding environment and receptors outside the facility. The unit of measure for light incidence either in or outside the facility is a lux. A lux is equal to one lumen lighting up an area of 1 square metre ($m^2$), or 1 lumen/$m^2$. A 60-watt incandescent light bulb emits approximately 800 lumens. Light trespass reaches problematic levels, for example, when lights (also referred to as luminaires) located on the outside of an industrial facility shine in through the windows of nearby residential homes at levels that could disrupt sleep or cause annoyance.
- Glare refers to intense, harsh or contrasting lighting conditions associated with incoming light that reduces the ability of humans, birds and other organisms to see clearly. The most common example of glare is oncoming high-beam vehicle headlights that provide ample light for the driver in the oncoming vehicle, while at the same time, result in poor visibility, potentially reaching hazardous conditions for the driver meeting the other vehicle. The unit of measure is luminance, which is equal to lumens per steradian, and this is referred to as the candela (cd).
- Sky glow refers to the illumination of the clouds by light sources on the surface of the Earth at night, such as street lighting, and haze in the atmosphere that replaces the natural nighttime sky with a translucent to opaque lighted dome. The sky appears washed out, or brownish-purple and may be devoid of visible stars in the extreme. Sky glow is the cumulative effect of all the lights at the surface either emitting upward or being reflected upward by the surface plus the emission from photochemical activity in the atmosphere. The unit of measure for the brightness of the sky, including sky glow, is magnitudes per square arcsecond (mag/$arcsec^2$). A sky glow measurement representative of a clear sky in a rural or dark area would be approximately 21 to 22 mag/$arcsec^2$ and within a city or urban well-lit area would be approximately 18-19 mag/$arcsec^2$ (Berry 1976).

The values represented in the guidelines are based on environmental zones and time of day. Five environmental zones have been established by the CIE as a basis for outdoor lighting. The five zones are listed in Table 6.4.

### Table 6.4 Environmental Lighting Zones

| Zone | Lighting Environment | Examples |
|---|---|---|
| E0 | Intrinsically Dark | IDA Dark Sky Parks |
| E1 | Dark | Relatively uninhabited rural areas |
| E2 | Low district brightness | Sparsely inhabited rural areas |
| E3 | Medium district brightness | Well inhabited rural and urban settlements |
| E4 | High district brightness | Town and city centres and other commercial areas |
| Source: CIE 2017 | | |

The maximum values recommended by CIE for light trespass (also knowns as illuminance) by environmental lighting zone and time of day are presented in Table 6.5.

### Table 6.5 Recommended Maximum Values of Light Trespass (Illumination) per Environmental Zones

| Time of Day | Environmental Zones | | | | |
|---|---|---|---|---|---|
| | E0 | E1 | E2 | E3 | E4 |
| 19:00 – 23:00 | n/a | 2 lux | 5 lux | 10 lux | 25 lux |
| 23:00 – 6:00 | n/a | < 0.1 lux | 1 lux | 2 lux | 5 lux |
| Source: CIE 2017 | | | | | |

The maximum values recommended by CIE for glare (intensity of luminaires) in designated directions by environmental zone and time of day are presented in Table 6.6. The recommended values for glare depend not only on the brightness of the luminaire, but also the distance from the observer to the luminaire (*d*) and the size of the luminaire (Ap).

### Table 6.6 Recommended Maximum Values for Glare (Intensity of Luminaires)

| Light Technical Parameter | Application Conditions | Luminaire group (projected area Ap in m²) | | | | |
|---|---|---|---|---|---|---|
| | | **0<*Ap*≤0.002** | **0.002<*Ap*≤0.01** | **0.01<*Ap* ≤0.03** | **0.03<*Ap*≤0.13** | **0.13<*Ap* ≤0.50** |
| Maximum luminous intensity luminaire (*I* in cd) | **Environmental Zone E0** | | | | | |
| | Pre-curfew[1]: | 0 | 0 | 0 | 0 | 0 |
| | Post-curfew: | 0 | 0 | 0 | 0 | 0 |
| | **Environmental Zone E1** | | | | | |
| | Pre-curfew: | 0.29·*d* | 0.63·*d* | 1.3·*d* | 2.5·*d* | 5.1·*d* |
| | Post-curfew: | 0 | 0 | 0 | 0 | 0 |
| | **Environmental Zone E2** | | | | | |
| | Pre-curfew: | 0.57·*d* | 1.3·*d* | 2.5·*d* | 5.0·*d* | 10·*d* |
| | Post-curfew: | 0.29·*d* | 0.63 *d* | 1.3·*d* | 2.5·*d* | 5.1·*d* |
| | **Environmental Zone E3** | | | | | |
| | Pre-curfew: | 0.86·*d* | 1.9·*d* | 3.8·*d* | 7.5·*d* | 15·*d* |
| | Post-curfew: | 0.29·*d* | 0.63·*d* | 1.3·*d* | 2.5·*d* | 5.1·*d* |
| | **Environmental Zone E4** | | | | | |
| | Pre-curfew: | 1.4·d | 3.1·*d* | 6.3·*d* | 13·d | 26·*d* |
| | Post-curfew: | 0.29·*d* | 0.63·*d* | 1.3·*d* | 2.5·*d* | 5.1·*d* |

Source: CIE 2017

Note:

[1] Curfew refers to the time of day after which light requirements are more strict to control obtrusive light. Post-curfew typically refers to 11:00 PM and later. Pre-curfew is daytime hours up until post-curfew.

To limit the potential for sky glow, the CIE recommends maximum values for the upward flux ratio (UFR) for installations with four or more luminaries. The UFR takes into account the light that is reflected upwards based on the reflecting surface as well as from the luminaire. The CIE maximum values of UFR are presented in Table 6.7.

### Table 6.7 Maximum Values of Upward Flux Ratio of Installation

| Light Parameter | Type of Installation | Environmental Lighting Zones | | | | |
|---|---|---|---|---|---|---|
| | | E01 | E02 | E03 | E04 | E05 |
| Upward Flux Ratio (%) | Road | NA | 2 | 5 | 8 | 12 |
| | Amenity | NA | NA | 6 | 12 | 35 |
| | Sports | NA | NA | 2 | 6 | 15 |

Note:
NA – Not Applicable
Source: CIE (2017)

Reference levels for sky glow are shown in Table 6.8 (Berry 1976). Sky glow is typically measured in units related to astronomy, where higher numbers are associated with darker skies. Lower numbers are associated with skies influenced by anthropogenic lighting that can obscure faint astronomical objects.

### Table 6.8 Reference Levels of Sky Glow

| Sky Glow (mag/arcsec$^2$) | Corresponding Appearance of the Sky |
|---|---|
| 21.7 (Rural) | The sky is covered with stars that appear large and close. In the absence of haze, the Milky Way can be seen to the horizon. The clouds appear as black silhouettes against the sky. |
| 21.6 | Sky appearance similar to that defined for rural (above) but with a glow in the direction of one or more cities is seen on the horizon. Clouds are bright near the city glow. |
| 21.1 | The Milky Way is brilliant overhead but cannot be seen near the horizon. Clouds have a greyish glow at the zenith and appear bright in the direction of one or more prominent city glows. |
| 20.4 | The contrast to the Milky Way is reduced and detail is lost. Clouds are bright against the zenith sky. Stars no longer appear large and near. |
| 19.5 | Milky Way is marginally visible, only near the zenith. Sky is bright and discoloured near the horizon in the direction of cities. The sky looks dull grey. |
| (18.5 Urban) | Stars are weak and washed out and reduced to a few hundred. The sky is bright and discoloured everywhere. |

Source: Berry (1976)

# 6.3 Boundaries

## 6.3.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on the Atmospheric Environment in areas surrounding the Project components:

- Project Area: The Project Area encompasses the immediate area in which the Project activities and components occur and is comprised of following distinct areas: the Port au Port Wind Farm, the Codroy Wind Farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- Local Assessment Area (LAA) and Regional Assessment Area (RAA): The LAA is the maximum area where Project-specific environmental effects on the atmospheric environment can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA is inclusive of the Project Area. The RAA represents the area within which cumulative effects on the atmospheric environment are likely to occur, depending on the location of other past, present or reasonably foreseeable future projects or activities. For the atmospheric environment, the LAA and RAA are different for each component (air quality, GHGs, and lighting):
  - For the air quality component of the atmospheric environment, both the LAA and RAA are the same and are defined as a 90 km by 100 km area which encompasses the hydrogen / ammonia plant, and the Codroy and Port au Port wind farm sites (Figure 6.1). The LAA/RAA represents the modelling domain for air contaminant dispersion modelling of Project operation and includes sensitive receptors as well as other past, present or reasonably foreseeable projects/activities that could interact cumulatively with the Project. More details on the modelling domain and receptors used are provided in Appendix 6-B.
  - For the lighting component of the atmospheric environment, the LAA and RAA are the same and are defined as 1.5 kilometres (km) extending beyond the Project Development Area (PDA) as it is expected that receptors within this area may experience the greatest impacts due to Project lighting (Figure 6.2).

The environmental effects related to GHGs are global and cumulative in nature, thus the spatial boundary for purposes of assessment is the global area under the Earth's atmosphere.


Stantec

Sensitive Receptor Location

Local Assessment Area/ Regional Assessment Area

**Proposed Project Features**

Wind Turbine

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Trans-Canada Highway

Road

Watercourse

Waterbody

Wetland

Forested Area

N

0 12 Kilometres
(At original document size of 8.5x11)
1:600,000

***Notes***
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by MER on 2023-07-20
QR by AW on 2023-07-20

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_209

*Figure No.*
**6.1**

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**Local Assessment Area/Regional Assessment Area**
**Air Quality**

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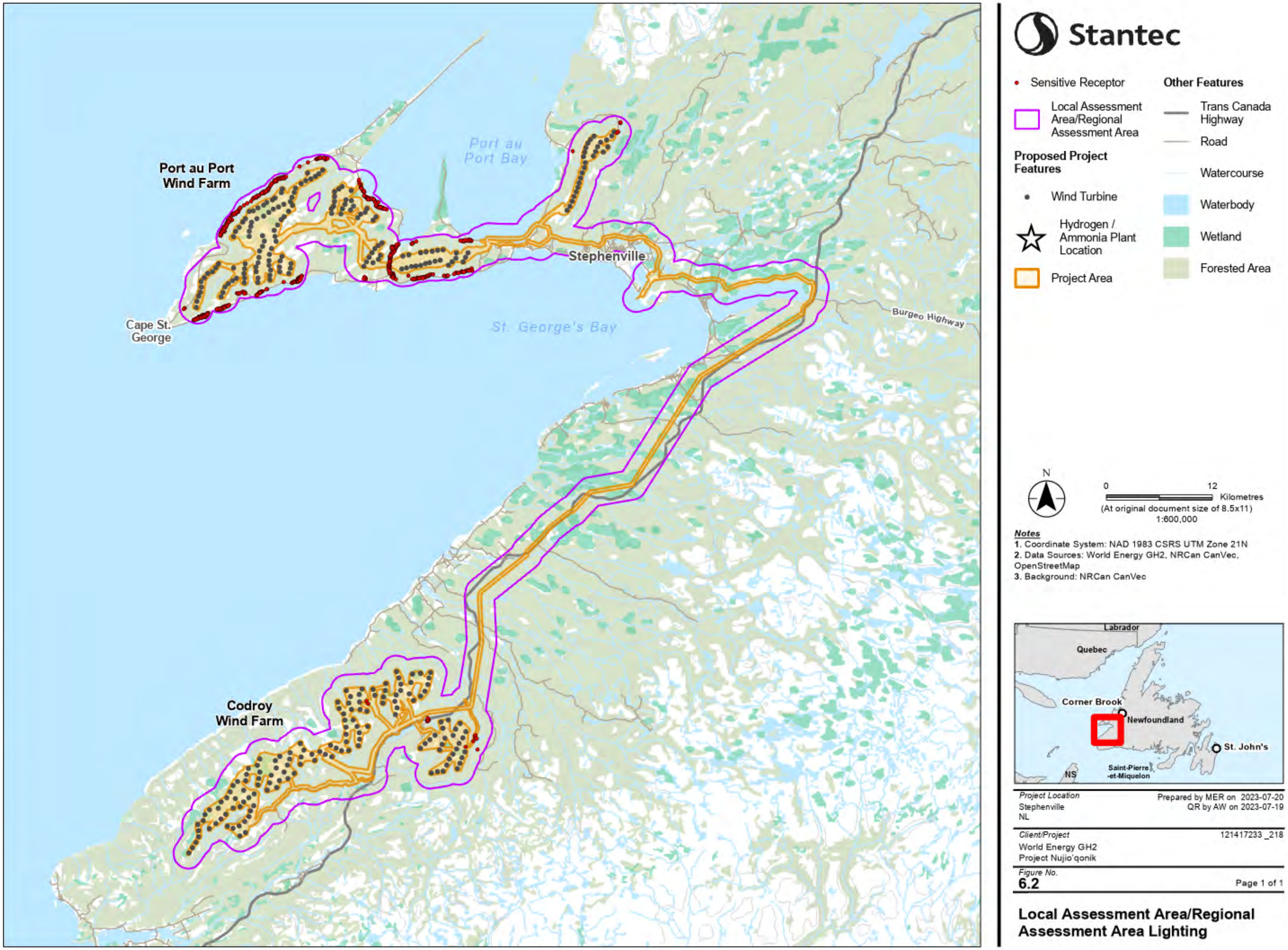


***Notes***
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec

*Project Location*
Stephenville
NL

Prepared by MER on 2023-07-20
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233 _218

*Figure No.*
**6.2**

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**Local Assessment Area/Regional Assessment Area Lighting**

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### 6.3.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the Atmospheric Environment include:

- Construction: Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port Wind Farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q4 2025. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- Operation and maintenance: Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port Wind Farm and Q3 2027 at the Codroy Wind Farm. The 600 MW electrolyzer is expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- Decommissioning and rehabilitation: The decommissioning phase is anticipated to take two years, occurring between 2056 and 2058. Decommissioning is anticipated to begin Q1 2056 at the Port au Port Wind Farm, with completion in Q3 2058 at the Codroy Wind Farm.

## 6.4 Existing Environmental Conditions

### 6.4.1 Methods

#### 6.4.1.1 Air Quality

The existing conditions for air quality are characterized using a combination of publicly available data and literature. Ambient air quality field data are also being collected at locations near sensitive receptors in the summer and fall of 2023 to supplement the desktop assessment, and will be made publicly available upon completion. For more information, see the Atmospheric Environment Baseline Report (BSA-1). The field data will supplement the other data presented herein and in the Atmospheric Environment Baseline Report to further characterize air quality near the Project.

The most recently available ambient air quality data from the Environment and Climate Change Canada (ECCC) National Air Pollutant Surveillance (NAPS) Program (2019–2021), the provincial air quality annual report (2022), and air contaminant release information from the National Pollutant Release Inventory (NPRI) were obtained and used in the assessment herein. The data was processed to the statistical metrics required by the CAAQS, which are presented in the footnotes of Table 6.2. In addition, the $90^{th}$ percentile hourly ambient monitoring data was presented as this is the metric that is often used to estimate background 1-hour background ambient concentrations for addition to dispersion modelling results for short-term averaging periods. The $90^{th}$ percentile is used as it provides a conservative estimate of ambient levels, while at the same time providing some consideration for the fact that the location and time for the occurrence of maximum ground level concentrations from background sources varies from that for the source(s) being considered in the modelling assessment. Because of this, addition of the maximum measured background concentration to the maximum model predictions would be overly conservative. Similarly, the maximum 24-hour concentrations excluding the hourly values >90$^{th}$ percentile was included as this is used to estimate the background 24-hour baseline ambient concentrations used in dispersion modelling. Establishing background concentrations to use in dispersion modelling following these methods is consistent with the approach that is recommended in Alberta and has been applied for this assessment due to the absence of province specific guidance (AEP 2021).

In addition to the above noted measured ambient data sources, review was done of available atmospheric data, generated through modelled results assimilated with observational data. The dataset, published by the European Centre for Medium-Range Weather Forecasts, is known as the Copernicus Atmosphere Monitoring Service global re-analysis (CAMS EAC4) (Inness et al. 2019). The CAMS EAC4 data allows for data with more spatial coverage compared to NAPS data, however, it also contains the inherent uncertainties that arise with any modelled data set due to assumptions in atmospheric processes. Where the NAPS data has been collected using United States Environmental Protection Agency (US EPA) Federal Reference Methods, and the data has been quality assured prior to publication, it is the data that will be used to establish background concentration for dispersion modelling. Nonetheless, review of the available modelled data provided further context into the existing conditions in the LAA/RAA for air quality. For more information on the CAMS EAC4, see the Atmospheric Environment Baseline Report (BSA-1).

#### 6.4.1.2 Greenhouse Gases

The existing conditions for GHGs are quantified using provincial and national GHG emissions inventory data from ECCC's National Inventory Report (NIR) (ECCC 2023d). Data published for the 2021, 2020 and 2019 reporting years were included, as the most recently published information.

#### 6.4.1.3 Lighting

The existing ambient light levels within the Project Area were characterized via ambient light monitoring, review of satellite observations of artificial light (World Atlas 2015), and through assumptions based on the Project location, nearby communities, nearby sources of light, and professional experience.

Ambient light monitoring was conducted at two locations on the Port au Port peninsula and one location near the Port of Stephenville. Ambient light monitoring included measurements of illuminance (lux) and sky glow (mag/arcsec$^2$). Illuminance was measured using a conventional, integrating hemispherical light meter (Extech EA33) with a resolution of 0.01 lux. Sky glow was measured using a Unihedron Sky Quality Meter (SQM-L). For more information about field methods and data analysis, see the Atmospheric Environment Baseline Report BSA-1).

## 6.4.2 Existing Conditions

### 6.4.2.1 Air Quality

There are no large industrial emissions sources in the Project Area. Based on a review of the ECCC NPRI reporting data for the Island of Newfoundland, the nearest emissions sources to the Project Area include the Atlantic Minerals Limited (AML) Lower Cove Quarry, the Corner Brook Pulp and Paper Mill, and the Newfoundland and Labrador Hydro Ramea Diesel Generating Station. Of these emission sources, only the AML quarry is located in the LAA/RAA, however, emissions from the other sources may have influence on the background concentrations due to long-range transport. The AML quarry, located approximately 45 km west of the hydrogen / ammonia plant, has reported emissions of particulate matter. The Corner Brook Pulp and Paper Mill is located approximately 60 km northeast of the Project. Emissions from the pulp and paper mill consist primarily of combustion gases ($NO_X$, CO, and $SO_2$), PM, volatile organic compounds (VOCs) and selected trace metals. The generating station is located 140 km southeast of the Project. Based on recent NPRI reporting data, air contaminants that are released in substantive quantities from these facilities include combustion gases (nitrogen oxides) and particulate matter ($PM_{10}$ and $PM_{2.5}$) (ECCC 2023a). NPRI defines "substantive quantities" as the masses of air contaminants released to the atmosphere that may impact air quality within a 5 km radius of the source.

The nearest and most representative NAPS ambient air quality monitoring (AAQM) station is Grand Falls-Windsor, approximately 220 km east-northeast from the Project. There is a NAPS station located at Corner Brook, which is closer to the Project; however, this station is adjacent to the Corner Brook Pulp and Paper Mill which would be expected to contribute to $NO_2$ and $SO_2$ levels that would not be representative to the background of the Project Area where there are no substantive sources of these contaminants. The Grand Falls-Windsor station measures the following air contaminants: $SO_2$, nitric oxide (NO), $NO_2$, $NO_X$, CO, $PM_{2.5}$, $PM_{10}$, and $O_3$.

The ambient air quality monitoring data collected at the NAPS monitoring location at Grand Falls-Windsor measured over the 2019–2021 period were below the NL AAQS and CAAQS as detailed in Table 6.9.

An overview of the 2019–2021 NAPS monitoring results for the Grand Falls-Windsor station (ECCC 2023b), for those air contaminants relevant to the Project, is presented in Table 6.9. The data for the NL 2022 Ambient Air Monitoring Report are not yet publicly available, as such, the 2022 data was not able to be analyzed in detail. For $PM_{10}$, no valid data at the Grand Falls-Windsor station was available for 2019 or 2021, with only approximately 3 months of data in 2020 (from September 17, 2020, to December 31, 2020).

## Table 6.9 NAPS Monitoring Results Summary – Grand Falls-Windsor

| Contaminant | Averaging Period | Measured Concentrations (µg/m³) | Air Quality Criteria/Objectives | | |
|---|---|---|---|---|---|
| | | | NL AAQS | CAAQS 2020–2024 | CAAQS 2025+ |
| $SO_2$ | Maximum Hourly | 12.3 | 900 | - | - |
| | 98th Percentile Hourly Concentrations | 3.41 | - | - | - |
| | 90th Percentile Hourly Concentrations | *2.36* | - | - | - |
| | 3-hour Rolling Average 90th Percentile Hourly Concentrations | 2.45 | - | - | - |
| | Maximum 24-hour Average | 4.40 | 300 µg/m³<br>24-hour averaging period | - | - |
| | Maximum 24-hour (Excluding Hourly Values >90th Percentile) | *2.10* | | | |
| | 3-Year Average of 99th Percentile of the Daily Maximum Hour | 3.93 | - | 183 (1) | 170 (1) |
| | Maximum Annual Average | *1.72* | 60 µg/m³ (7)<br>Annual averaging period | 13 (2) | 10 (2) |
| $NO_2$ | Maximum Hourly | 52.7 | 400 | - | - |
| | 98th Percentile Hourly Concentrations | 11.3 | - | - | - |
| | 90th Percentile Hourly Concentrations | *5.65* | - | - | - |
| | Maximum 24-hour Average | 14.3 | 200 µg/m³<br>24-hour averaging period | - | - |
| | Maximum 24-hour (Excluding Hourly Values >90th Percentile) | *3.76* | - | - | - |
| | 3-Year Average of 98th Percentile of the Daily Maximum Hour | 23.2 | - | 113 (3) | 79 (3) |
| | 3-Year Average of 24-hour 98th Percentile | - | - | - | - |
| | Maximum Annual Average | *3.83* | 100 µg/m³<br>Annual averaging period | 32 (4) | 23 (4) |

## Table 6.9 NAPS Monitoring Results Summary – Grand Falls-Windsor

| Contaminant | Averaging Period | Measured Concentrations (µg/m³) | Air Quality Criteria/Objectives | | |
|---|---|---|---|---|---|
| | | | NL AAQS | CAAQS 2020–2024 | CAAQS 2025+ |
| $PM_{2.5}$ | Maximum Hourly | 90.0 | - | - | - |
| | 98th Percentile Hourly Concentrations | 13.0 | - | - | - |
| | 90th Percentile Hourly Concentrations | 7.00 | - | - | - |
| | Maximum 24-hour Average | 20.5 | 25 µg/m³<br>24-hour averaging period | - | - |
| | Maximum 24-hour (Excluding Hourly Values >90th Percentile) | *6.10* | - | - | - |
| | 3-Year Average of 24-hour 98th Percentile | 9.19 | - | 27(5) | - |
| | Maximum Annual Average | *4.51* | 8.8 µg/m³ (7)(8)<br>Annual averaging period | 8.8(6) | - |
| $PM_{10}$ (9) | Maximum Hourly | 129 | - | - | - |
| | 98th Percentile Hourly Concentrations | 29 | - | - | - |
| | 90th Percentile Hourly Concentrations | 17 | - | - | - |
| | Maximum 24-hour Average | 27 | 50 µg/m³<br>24-hour averaging period | - | - |
| | Maximum 24-hour (Excluding Hourly Values >90th Percentile) | 14 | - | - | - |
| | Maximum Annual Average | 9.9 | - | - | - |

### Table 6.9 NAPS Monitoring Results Summary – Grand Falls-Windsor

| Contaminant | Averaging Period | Measured Concentrations (µg/m³) | Air Quality Criteria/Objectives | | |
|---|---|---|---|---|---|
| | | | NL AAQS | CAAQS 2020–2024 | CAAQS 2025+ |
| CO | Maximum Hourly | 1,031 | 35,000 µg/m³<br>1-hour averaging period | - | - |
| | 98th Percentile Hourly Concentrations | 298 | - | - | - |
| | 90th Percentile Hourly Concentrations | *206* | - | - | - |
| | Maximum 8-hour Rolling Average | 784 | 15,000 µg/m³<br>8-hour averaging period | - | - |
| | 8-hour Rolling Average (Excluding hourly values >90th Percentile) | *206* | - | - | - |

Notes:
(1) The 3-year average of the annual 99th percentile of the $SO_2$ daily maximum 1-hour average concentrations
(2) The average over a single calendar year of all 1-hour average $SO_2$ concentrations
(3) The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
(4) The average over a single calendar year of all 1-hour average concentrations
(5) The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
(6) The 3-year average of the annual average of the daily 24-hour average concentrations
(7) The arithmetic average over a single calendar year of all 1-hour average concentrations in the year.
(8) At reference conditions, a dry gas temperature of 25 °Celsius and a gas pressure of 101.325 kilopascals
(9) Only $PM_{10}$ data that was available from 2019-2021 were from September 17, 2020 to December 31, 2020
Source of measured concentrations: ECCC 2023b

The ambient air quality monitoring data collected at the NAPS monitoring location at Grand Falls-Windsor measured over the 2019–2021 period were below the NL AAQS and CAAQS.

The NL Annual Ambient Air Monitoring Reports include results from the industrial monitoring network across the province. The industrial monitoring network includes six facilities located across NL, including Atlantic Minerals Limited or AML. The monitoring station at the AML site collects $PM_{2.5}$ and TPM data from continuous monitors located at the western side of their Port au Port facility (NLDECC 2023). In 2022, there were no $PM_{2.5}$ exceedances of the NL AAQS or the CAAQS. The NL AAQS for TPM were exceeded five times over a six-month period, in May (1), June (1), August (2) and October (1). The exceedances were expected to be associated with stockpiling and port activities at the AML facility (NLDECC 2023).

The cumulative effects of the air quality from the AML quarry would mostly occur during the construction phase of the Project as this is when emissions of particulate matter from the Project would be expected on Port au Port. The AML quarry is close to the Project Area (< 1 km away) on the Port au Port Peninsula where the Port au Port wind farm will be located. Given that the AML facility is near the Project Area, it is possible that air contaminant releases from AML would on occasion contribute materially to reduced air quality within the Project Area near the quarry. The section of the Project Area nearest to the quarry is associated with access roads and the 239 kv transmission line, for which the construction of and/or transport on would be limited in duration. There are no turbines within 1 km of the AML fenceline, and as such, it is not likely that AML emissions will act cumulatively with construction emissions during most of the construction phase.

The Port au Port wind farm is not expected to produce substantive air contaminant emissions during operations, with slight releases from maintenance activities (fuel combustion in vehicles and heavy equipment). During the operations phase, the hydrogen / ammonia plant (located near Stephenville) will generate air contaminant emissions. However, due to the distance from the plant to AML (45 km), it is not expected that these air contaminant releases will act cumulatively in any substantive way with the Project.

Background concentrations are combined with the air quality dispersion modelling results to assess the potential cumulative effects of the Project when combined with other sources of air contaminant emissions in the LAA. As described in Section 6.2.1, the 1-hour background ambient concentrations used in dispersion modelling are the 90$^{th}$ percentile of 1-hour average concentrations. Similarly, the maximum 24-hour concentrations excluding the hourly values >90$^{th}$ percentile were used as the background concentrations in dispersion modelling for 24-hour concentrations. For CO which has an 8-hour averaging period, the 8-hour CO background concentration is the maximum 3-hour average with hourly values greater than the 90th percentile excluded from the 8-hour average calculation. For annual averaging periods, the maximum annual average was used for the background concentration. The values that were used as background concentrations in dispersion modelling have been italicized in Table 6.9.

As TPM is not monitored at the Grand Falls-Windsor station, the annual background concentration was established from the AML monitoring network, using the maximum annual average between 2020-2022 (corresponds to 2022) (NLDECC 2021, NLDECC 2022, NLDECC 2023). This value would be considered conservative as it is directly affected by emissions from the quarry activities. The background concentration for 24-hour TPM was estimated from the annual AML TPM concentration using a conversion factor for averaging periods, as outlined in Ontario's Guideline A-11 (MECP 2017).

Due to the limited amount of valid data for $PM_{10}$ at the Grand Falls-Windsor station, the 24-hour background concentration was conservatively assumed to be equal to that of TPM, which is 19.5 µg/m$^3$. This is more conservative than using the maximum 24-hour concentrations excluding the hourly values >90$^{th}$ percentile of available $PM_{10}$ data, which was found to be 14 µg/m$^3$.

There was no available monitored or CAMS EAC4 (modelled paired with observation) data for the remaining species included the assessment. Given that there are no major industrial activities within the LAA, it was assumed background concentrations of these air contaminants were negligible.

#### 6.4.2.2 Greenhouse Gases

Current provincial and national GHG emissions were characterized by summarizing provincial and national GHG emissions inventory data. Several years of data were reviewed to assess the percent contribution of emissions in NL to national GHG emissions over time. The provincial and national GHG emissions are presented in Table 6.10. The GHG emissions information was obtained from the most recently published ECCC NIR (ECCC 2023d).

**Table 6.10 Provincial and National GHG Emissions (2019, 2020 and 2021)**

| Parameter | Units | $CO_2$ | $CH_4$ | $N_2O$ | Other GHGs [a] ($CO_2e$) | Total ($CO_{2e}$) |
|---|---|---|---|---|---|---|
| **2019** | | | | | | |
| NL GHG Emissions | kty | 9,936 | 770 | 124 | 197 | 11,027 |
| National GHG Emissions | kty | 578,588 | 101,368 | 30,550 | 13,174 | **723,679** |
| NL contribution to National GHG Emissions | % | 1.7% | 0.8% | 0.4% | 1.5% | 1.5% |
| **2020** | | | | | | |
| NL GHG Emissions | kty | 7,767 | 747 | 107 | 200 | **8,820** |
| National GHG Emissions | kty | 522,845 | 91,380 | 31,523 | 13,040 | **658,788** |
| NL contribution to National GHG Emissions | % | 1.5% | 0.8% | 0.3% | 1.5% | 1.3% |
| **2021** | | | | | | |
| NL GHG Emissions | kty | 7,314 | 727 | 105 | 190 | **8,336** |
| National GHG Emissions | kty | 537,174 | 90,510 | 30,231 | 12,513 | **670,428** |
| NL contribution to National GHG Emissions | % | 1.4 | 0.8 | 0.3 | 1.5 | **1.2** |

Notes:
kt $CO_2e$ /y = kilotonnes of carbon dioxide ($CO_2$) equivalent per year
[a] Other GHGs include sulphur hexafluoride, hydrofluorocarbons, perfluorocarbons, and nitrogen trifluoride
Source: ECCC 2023d

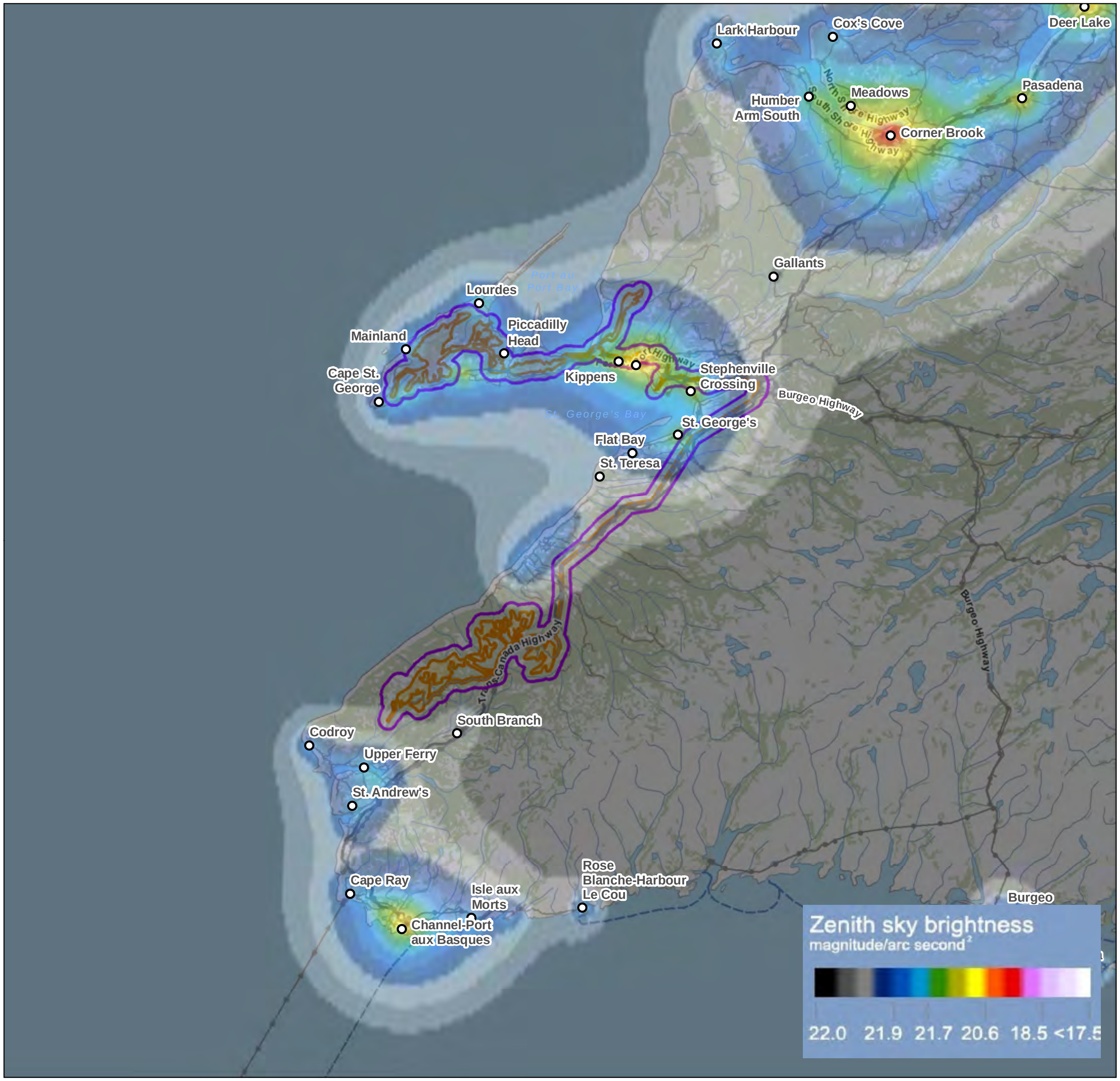
The provincial NL GHG emissions accounted for a small fraction of Canada's national GHG emissions in 2021 (1.2%), 2020 (1.3%) and 2019 (1.5%). Additionally, the provincial NL GHG emissions accounted for approximately 1.5% of Canada's national GHG emissions each year from 2015 to 2018 (ECCC 2023d).

#### 6.4.2.3 Lighting

As shown in Figure 6.3, there are existing sources of artificial light contributing to the existing ambient light environment within the Project Area. The main source of artificial light in the Project Area is from the Town of Stephenville where the sky glow values of 20.3 $mag/arcsec^2$ were measured by satellite. As presented in Table 6.4, sky glow levels in this range are representative of a semi-polluted sky, as the contrast to the Milky Way is reduced and detail is lost. Other areas in the Project Area experience darker skies with satellite measurements of between 21.2 $mag/arcsec^2$ near Lower Cove in Port au Port, to 21.5 $mag/arcsec^2$ at St. Georges. The Milky Way would still be clearly visible overhead at these levels, but not be seen near the horizon. Elsewhere in the Project Area, the sky glow levels are representative of unpolluted starry sky, where, on clear nights with no haze, many thousands of stars would be visible and the Milky Way would be clearly visible (Berry 1976; US DOE 2017).

Light monitoring was conducted in May 2023 at three locations near the Project. Details pertaining to the baseline light monitoring survey are presented in the Atmospheric Environment Baseline Study (BSA-1). Measurements of incident light were <0.01 lux at each location and sky glow measurements were consistent with satellite observations and ranged from 21.9 to 23.2 $mag/arcsec^2$ which is characterized as a dark, rural environmental zone, or CIE Category E1 (see Table 6.4).

The existing light environment surrounding the Project Area was mainly characterized as CIE Category E1 (dark, relatively uninhabited areas) for areas near Port au Port and Codroy, and E3 (medium district brightness, well inhabited rural and urban settlements) near the Town of Stephenville that experienced nighttime lighting similar to more urbanized settlements.




# Stantec

**Proposed Project Features**

- Project Area
- Local Assessment Area

**Other Features**

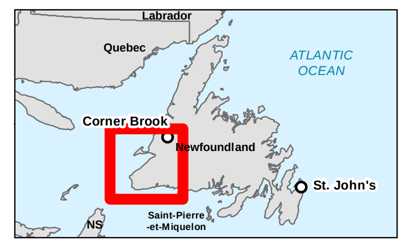
- Transmission Line, Existing
- Trans-Canada Highway
- Road
- Ferry Route
- Watercourse
- Waterbody
- Forested Area

N

0 10 20 Kilometres
(At original document size of 8.5x11)
1:1,150,000

***Notes***

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, Openstreetma, The New World Atlas of Artificial Night Sky Brightness
3. Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MB on 2023-07-28
QR by AW on 2023-07-28

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_069a

*Figure No.*
**6.3**

**Distribution of Artificial Lighting Within and Surrounding the Project Area**

## 6.5 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on the Atmospheric Environment. Residual environmental effects (Section 6.7) are assessed and characterized using criteria defined in Section 6.2, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for the Atmospheric Environment is provided in Section 6.5.2. Section 6.5.3 identifies the environmental effects to be assessed for the Atmospheric Environment, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 6.5.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on the Atmospheric Environment are provided in Section 6.5.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on the Atmospheric Environment are described in Section 6.5.5.2.

### 6.5.1 Residual Effects Characterization

Table 6.11 presents definitions for the predicted environmental effects characterization for Atmospheric Environment. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are also used to support quantitative measures.

**Table 6.11 Characterization of Predicted Environmental Effects on the Atmospheric Environment**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Nature** | The long-term trend of the residual effect | • **Neutral –** No net change in the measurable parameter(s) for the Atmospheric Environment relative to baseline<br>• **Positive –** A residual effect that moves the measurable parameter(s) in a direction beneficial to the Atmospheric Environment relative to baseline<br>• **Adverse –** A residual effect that moves the measurable parameter(s) in a direction detrimental to the Atmospheric Environment relative to baseline |

## Table 6.11 Characterization of Predicted Environmental Effects on the Atmospheric Environment

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Magnitude** | The amount of change in measurable parameter(s) or the VEC relative to existing conditions | **Air Quality:**<br>• **Negligible** – model predicted air contaminant concentrations due to Project-related emissions are less than 10% of baseline conditions and do not result in exceedances of the ambient air quality criteria<br>• **Low** – model predicted air contaminant concentrations due to Project-related emissions are greater than 10% of baseline conditions, but less than 50% of the ambient air quality criteria<br>• **Moderate** – model predicted air contaminant concentrations due to Project-related emissions are greater than 50% of the ambient air quality criteria, but the maximum air contaminant concentrations are less than the ambient air quality criteria<br>• **High** – the predicted air contaminant concentrations due to Project-related emissions combined with background frequently exceed the ambient air quality criteria<br>**GHGs:**<br>• **Negligible** – no notable change in GHG emissions, no notable effect on attainment of provincial or national emission reduction targets<br>• **Low** – although a change is measurable, it will not have a notable impact on attainment of provincial or national emission reduction targets in 2030 or 2050<br>• **Moderate** – notable changes are expected in provincial and national GHG emissions which may affect achievement of 2030 targets, however, a net-zero plan should be able to be feasibly implemented to avoid affecting the attainment of provincial or national emission reduction targets for 2050<br>• **High** – material changes are expected in provincial and national GHG emissions, whereby the project emissions cannot feasibly be brought to net-zero by 2050, causing an adverse effect on the ability of NL or ECCC to achieve the national emission reduction targets<br>**Light:**<br>• **Negligible** – no measurable change<br>• **Low** – effect is detectable but is limited through design mitigation<br>• **Moderate** –lighting is effectively controlled, but navigation, security and other required lighting have a measurable adverse effect<br>• **High** – the design is uncontrolled by Project design criteria and has a pronounced adverse effect |

### Table 6.11 Characterization of Predicted Environmental Effects on the Atmospheric Environment

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Geographic Extent** | The geographic area in which a residual effect of a defined magnitude occurs | • **Project Area –** Residual effect is restricted to the Project Area<br>• **LAA –** Residual effect extends into the LAA<br>• **RAA –** Residual effect extends into the RAA |
| **Timing** | Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC. | • **No Sensitivity –** Residual effect does not occur during a sensitive period or does not affect the Atmospheric Environment<br>• **Moderate Sensitivity –** Residual effect may occur during a lower sensitive period<br>• **High Sensitivity –** Residual effect occurs during a high-sensitivity period (e.g., light during nighttime) |
| **Duration** | The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived | • **Short term** – residual effect restricted to construction or decommissioning, rehabilitation and closure phases.<br>• **Medium term** – residual effect extends through project operations but is expected to subside when operations cease.<br>• **Long term** – residual effect extends beyond the life of the project.<br>• **Permanent** – recovery to baseline conditions unlikely. |
| **Frequency** | Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period | • **Single event**<br>• **Multiple irregular event –** Occurs at no set schedule<br>• **Multiple regular event –** Occurs at regular intervals<br>• **Continuous –** Occurs continuously |
| **Reversibility** | Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques | • **Reversible –** Residual effect is likely to be reversed after activity completion and rehabilitation<br>• **Irreversible –** Residual effect is unlikely to be reversed |
| **Ecological / Socio-economic Context** | Existing conditions and trends in the area where the residual effect occurs | • **Undisturbed –** Area is relatively undisturbed or not adversely affected by human activity<br>• **Disturbed –** Area has been substantially previously disturbed by human development or human development is still present |

### 6.5.2 Significance Definition

A significant residual adverse effect on the Atmospheric Environment is defined as a residual Project-related change to the environment that results in any of the following:

- A significant residual adverse effect for air quality is one where the Project's releases of air contaminants to the atmosphere degrade the quality of ambient air such that the model predicted concentrations (combined with background data) are likely to exceed applicable regulatory criteria for ambient air quality, and are of concern relative to the geographical extent of predicted exceedances, their frequency of occurrence and the presence of potentially susceptible receptors.
- The contribution of the Project GHG emissions (i.e., the magnitude of the Project release), will be compared to provincial and federal GHG emission totals and the ability to attain current reduction targets in 2030 and 2050. This will also include assessment of the Project's ability to achieve net-zero by 2050. The Project's contribution to global GHG emissions will also be considered, including the reduction of downstream (Scope 3) GHG emissions by the replacement of fossil fuel usage with project-produced hydrogen.
- A significant residual adverse effect on ambient light is defined as an increase in Project related light emissions such that the CIE guidelines for light trespass and glare in a suburban environment are exceeded and sky glow levels would be altered toward those of an urban environment.

### 6.5.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 6.12 lists the potential Project effects on the Atmospheric Environment and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

Potential environmental effects on the atmospheric environment are anticipated to occur primarily within the construction, operation and decommissioning phases. Potential environmental impacts during construction and decommissioning phases will be primarily due to the use of earthmoving equipment and construction activities to construct or decommission the Project.

**Table 6.12 Environmental Effects, Effect Pathways, and Measurable Parameters for the Atmospheric Environment**

| Environmental Effect(s) | Effect Pathway(s) | Measurable Parameter(s) and Units of Measurement |
|---|---|---|
| Change in air quality | • Atmospheric dispersion of air emissions from Project construction, operation and decommissioning, rehabilitation and closure | • Ambient concentrations of particulate matter (TPM, $PM_{10}$, $PM_{2.5}$), combustion gases (CO, $NO_2$, $SO_2$), $NH_3$, select speciated VOCs and PAHs in µg/$m^3$ |
| Change in GHGs | • GHGs released to the atmosphere from Project equipment and activities, during Project construction, operation and decommissioning, rehabilitation and closure<br>• Loss of carbon sinks due to deforestation during land clearing | • GHG emissions ($CO_2$, $CH_4$, $N_2O$) in tonnes of $CO_2$ equivalent per year ($tCO_2e$) |
| Change in lighting | • Light levels from the Project equipment and activities during Project construction, operation and decommissioning, rehabilitation and closure | • Levels of light trespass as measured in Lux; levels of glare as measured in cd; levels of sky glow as measured in mag/$arcsec^2$ |

### 6.5.4 Project Interactions with the Atmospheric Environment

Table 6.13 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following, environmental effects pathways are briefly described and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.

**Table 6.13 Project Interactions with the Atmospheric Environment, Environmental Effects, and Environmental Effect Pathways**

| Project Activities | Environmental Effect(s) to be Assessed | | |
|---|---|---|---|
| | Change in Air Quality | Change in GHGs | Change in Light |
| **Construction** | | | |
| Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossings) | - | ✓ | - |
| Transportation of Resources and Equipment (includes trucking, shipping and barging of materials) | - | - | - |
| Construction / Installation, Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure | - | - | - |
| Installation and Commissioning of Wind Turbines | - | - | - |
| Installation and Commissioning of Collector Systems | - | - | - |
| Installation and Commissioning of Transmission Lines and Substations (including marine cable crossing) | - | - | - |
| Installation and Commissioning of Hydrogen / Ammonia Production, and Storage Facilities and Associated Infrastructure (including Industrial water supply infrastructure) | - | - | - |
| Restoration of Existing Port Facilities (including pile driving and dredging) | - | - | - |
| Emissions, Discharges, and Wastes[1] | ✓ | ✓ | ✓ |
| Employment and Expenditures[2] | - | - | - |
| **Operation and Maintenance** | | | |
| Presence, Operation, and Maintenance of Wind Farms (including wind turbines, access roads, and collector systems) | - | - | - |
| Presence, Operation, and Maintenance of Transmission Lines and Substations | - | - | - |
| Presence, Operation, and Maintenance of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure (includes marine discharge from treatment plant) | - | - | - |
| Presence, Operation, and Maintenance of Port Facilities (includes loading of ammonia and vessel maneuvering within Port) | - | - | - |
| Emissions, Discharges, and Wastes[1] | ✓ | ✓ | ✓ |
| Employment and Expenditures[2] | - | - | - |

### Table 6.13 Project Interactions with the Atmospheric Environment, Environmental Effects, and Environmental Effect Pathways

| Project Activities | Environmental Effect(s) to be Assessed | | |
|---|---|---|---|
| | Change in Air Quality | Change in GHGs | Change in Light |
| **Decommissioning and Rehabilitation** | | | |
| Presence, Operation, and Maintenance of Temporary Workforce Accommodations and Associated Infrastructure | - | - | - |
| Decommissioning and Rehabilitation of Wind Farms (including wind turbines, access roads, and collector systems) | - | - | - |
| Decommissioning and Rehabilitation of Transmission Lines and Substations | - | - | - |
| Decommissioning and Rehabilitation of Hydrogen / Ammonia Production, and Storage, Facilities and Associated Infrastructure | - | - | - |
| Decommissioning and Rehabilitation of Port Facilities | - | - | - |
| Emissions, Discharges, and Wastes[1] | ✓ | ✓ | ✓ |
| Employment and Expenditures[2] | - | - | - |

Notes:

✓ = Potential interaction

– = No interaction

[1] Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Emissions, Discharges, and Wastes" is listed as a separate item under each phase of the Project.

[2] Project employment and expenditures are generated by most Project activities and are the main drivers of many potential socio-economic effects. Rather than acknowledging this by placing a checkmark against each of these activities, "Employment and Expenditures" is listed as a separate item under each phase of the Project.

Emissions of air contaminants, GHGs, and light levels are generated by Project activities, and may result in a change in air quality, a change in atmospheric greenhouse gases, and/or a change in ambient light levels. Rather than acknowledging this by placing a "checkmark" by each of these activities in the table above, Emissions, Discharges and Wastes has been introduced as an additional component under each Project phase for efficiency of discussion. Emissions, Discharges and Wastes includes air contaminant releases, GHG emissions, lighting, and noise. Noise is assessed in the Acoustic Environment VEC (Chapter 7).

A "checkmark" was added to Site Preparation and Civil Works (including turbine foundations, road construction, quarries, clearing, grubbing, blasting, cement production, and watercourse crossing") for change in GHGs to represent the change in carbon sinks due to land clearing. GHG emissions associated with these activities are still captured under Emissions, Discharges, and Wastes.

The emissions of air contaminants, GHGs, and light during decommissioning, rehabilitation and closure activities are not anticipated to be substantial in comparison to the emissions from construction and operation. Therefore, the decommissioning, rehabilitation and closure phase of the Project has been assessed qualitatively. The potential environmental effects from this phase of the Project will be less than, or similar to, those quantitatively assessed in Section 6.7 for construction and operation.

In the absence of mitigation, the Project may interact with the Atmospheric Environment in the following ways:

- Air contaminants and GHG emissions will be generated from the combustion of fossil fuels in mobile and stationary equipment and from blasting during construction. Fugitive dust may be generated from movement of equipment and materials during construction. During operation emissions of air contaminants and GHGs will occur from standby power generation (periodic) as well as from flaring (periodic with continuous flare pilot), and from the cooling tower. Indirect sources of GHG emissions during construction and operation include electricity consumption, the transportation of supplies, marine vessel shipping, and waste transportation.
- GHG emissions will be released from deforestation/the loss of carbon sinks during land clearing for construction.
- Light will be generated from the use of mobile lighting units during construction, navigation lights on the wind turbines, and by the use of nighttime safety lighting for Project buildings, surrounding vehicle parking lots, and along roads within the Project area during operation

The following activities will not interact in a substantive way with the Atmospheric Environment, and effects from these activities are not considered further in the EIS:

- Employment and expenditures will not directly result in changes to the atmospheric environment.

## 6.5.5 Analytical Assessment Techniques and Level of Knowledge

### 6.5.5.1 VEC Components

#### Air Quality

The following tasks were conducted for the air quality assessment for the Project:

- Identification of air contaminant emission sources from Project construction and operation activities (Section 6.7.1)
- Development of an air contaminant emission inventory for Project construction and operation activities and air quality modelling for Project operation activities (Section 6.7.1)
- Assessment of environmental effects on air quality from construction of the Project by consideration of estimated Project emissions, existing conditions and proposed construction planning and mitigation
- Assessment of environmental effects on air quality from the operation of the Project by comparing the air quality modelling results plus conservative background concentrations to the applicable air quality standards (Section 6.7.1)

Emissions of air contaminants during decommissioning and rehabilitation are expected to be less than during construction, and so were assessed qualitatively based on the outcomes of assessment of construction effects.

#### Greenhouse Gases

The following tasks were conducted as part of the GHG assessment for the Project:

- Identification of GHG emission sources from Project construction and operation activities (Section 6.7.2)
- Development of a GHG emission inventory for Project construction and operation activities (Section 6.7.2)
- Assessment of environmental effects of the construction and operation of the Project by comparing the GHG emission inventory to provincial and national GHG totals and reduction targets (Section 6.7.2)
- Estimate the offset of GHG emissions resulting from the downstream usage of the ammonia produced by the operation of the Project in replacement of the usage of traditional fossil fuels (Section 6.7.2).

Emissions of GHGs during decommissioning and rehabilitation are expected to be less than during construction, and so were assessed qualitatively in consideration of construction effects.

#### Lighting

The following tasks were conducted as part of the lighting assessment for the Project:

- Qualitative assessment of environmental effects of the construction and operation of the Project by comparing expected light sources to applicable lighting recommendations and guidance (Section 6.7.3)

Light emissions during decommissioning and rehabilitation are expected to be less than during construction, and so were assessed qualitatively in consideration of construction predicted environmental effects.

### 6.5.5.2 Assumptions and Conservative Approach

A conservative approach was used to address uncertainty in the environmental effects assessment. Specifically, the following assumptions were made:

- Conservative estimates were incorporated into the development of the air quality and GHG emission inventories.
- Conservative conditions were incorporated into the air quality dispersion modelling. For example, the air contaminant emissions used in the assessment were estimated based on the year(s) with the highest production rates to establish the potential maximum emissions.
- Three years of hourly meteorological data were used in the model, including a wide range of weather conditions, so that conditions leading to poor dispersion (i.e., resulting in the maximum ground-level concentrations) were considered in the model.
- The air quality assessment approach used a screening type analysis, where maximum air contaminant emissions were modelled continuously over the complete three-year period of the meteorological data, to establish the potential maximum ground-level concentrations that might occur for contaminants with short-term averaging periods. These maximum concentrations were used as the basis for the assessment of potential residual effects.
- CIE criteria would be followed during the design of the Light Plan.
- The GHG emissions intensities of the Newfoundland electrical grid for estimation of Scope 2 emissions were taken from the 2023 National Inventory Report (NIR) (ECCC 2023d) which is based on current electricity production. The Project is expected to operate until beyond 2050, when electricity generation is expected to be net-zero GHG emissions based on current targets. A reduction in emission intensity is expected between now and 2050, and as such, applying a static value based on current conditions is conservative.
- When estimating GHG emissions from land clearing during construction, the area used includes the upgraded access roads and the transmission line.
- When design parameters were unavailable, conservative estimates were used.

Other assumptions that were made to estimate changes to air quality and GHGs are detailed in Appendix 6-A and Appendix 6-C, respectively.

#### 6.5.5.3 Change in Air Quality

This air quality assessment considers substances that may be released from Project-related sources in substantive quantities for which there are ambient air quality criteria (i.e., objectives, guidelines, or standards) adopted by provincial (NL and Ontario) and/or national regulatory agencies.

Air contaminant releases during the construction and operation phases of the Project were estimated using standard methods for this type of assessment. During construction, activities result in releases of air contaminants from fuel combustion in heavy equipment and stationary equipment (e.g., generators), and fugitive dust due to earth moving and site preparation activities. During operation, air contaminants are released from the plant flare (pilot and flaring events), the cooling towers, the biodiesel fueled back-up emergency generator, and marine vessels. The release estimates were prepared and summarized in an emissions inventory for both construction and operation. The inventories were prepared using operational and design information and published emission factors. Additional details on air contaminant release estimates for construction and operation are provided below in Section 6.7.1. During the decommissioning, rehabilitation and closure phase of the Project, air contaminant releases will be similar to, or less than, those during construction and were assessed qualitatively.

The potential air contaminant releases during construction were estimated for this assessment and were not modelled as these releases are expected to be short-term and intermittent. Construction activities occur over a large area overall, but at any one time are carried out over a small area as construction occurs in a modular manner. As such, construction occurring at a specific location is relatively short resulting in potential impacts that are only expected to occur over a short period at that location. The focus will be on mitigation and ambient monitoring during construction. The main concern during construction would be related to dust (particulate matter) releases from equipment and material movements during preparation of the turbine pads. A dust management best practice plan will be developed in advance of construction activities that will outline the controls to be implemented. Dust monitoring will be conducted during construction to monitor the effectiveness of mitigation and to assess against the ambient air quality criteria for particulates. If ambient monitoring results indicate exceedances to applicable air quality criteria, the construction activities will be assessed, and actions to reduce the exceedance will be taken, in an adaptive management manner. These actions could range from applying dust suppression and/or watering, to adjusting the construction activity that is generating the dust. Several of the mitigations that will be in the dust management best practice plan are outlined in Section 6.6.

An air quality transport and dispersion model provides the link between these air contaminant releases and changes to ambient concentrations in the LAA/RAA.

For this assessment, the CALMET / California Puff (CALPUFF) modelling system (Scire et al. 2000) was used to determine the potential effects of the air contaminant releases during operation of the Project on ambient air quality, which applies to the hydrogen / ammonia plant. The application of the modelling system is generally conducted in accordance with the NL Guideline for Plume Dispersion Modelling

(GPDM) (NLDMAE 2002). The CALMET model is used to provide hourly meteorological data required for the CALPUFF transport and dispersion model. The predicted ambient concentrations due to Project operation emissions are combined with ambient background concentrations and the totals are compared to the regulatory criteria. Ambient concentrations are expressed in units of $\mu g/m^3$.

The CALPUFF model is a non-steady-state Gaussian puff dispersion model that incorporates simple chemical transformation mechanisms, complex terrain algorithms and building downwash. It is suitable for estimating ground-level concentrations on local and regional scales, from tens of metres to hundreds of kilometres. The core of this modelling system consists of a meteorological model, CALMET, a transport and dispersion model, CALPUFF, and a post-processor model, CALPOST, which is designed to report the concentrations of the air contaminants of interest.

The CALPUFF model was chosen over AERMOD as it has algorithms to handle complex terrain and it is the NLDECC's preferred model for studies in NL.

Information on the dispersion modelling strategy, such as meteorological data, dispersion model set-up parameters, and source and emission inputs are provided in Appendix 6-B.

The CALMET and CALPUFF model domain consists of a 30 km by 30 km gridded receptor grid, centred around the hydrogen / ammonia plant, with sensitive receptors modelled beyond to an area consistent with the LAA/RAA.

Maximum predicted ground-level concentrations along and outside the Project Area (combined with the background contribution) are compared to the ambient air quality standards provided in Table 6.20 and Table 6.21 (Section 6.5.1).

#### 6.5.5.4 Change in GHGs

The federal and provincial governments have set targets to reduce emissions of GHGs. The federal 2030 Emissions Reduction Plan aims to reduce GHG emissions by 40 to 45% below 2005 levels by 2030 and to achieve net zero GHG emissions by 2050 (ECCC 2022). The provincial targets aim to reduce GHG emissions by 35%-45% below 1980 levels by 2030, to reduce by 30% below 2005 levels by 2030 down to 3.9 MT $CO_2e$ annually, and to achieve net-zero by 2050 (Government of NL 2019). As part of the analysis, the assessment considers whether the designated project will hinder or contribute to Canada's and Newfoundland and Labrador's ability to meet the established reduction targets.

As part of the initiative to achieve net-zero, projects that extend beyond 2050 shall include a plan by which net-zero GHG emissions may be realized. The net-zero plan is provided in Section 6.6.1.

For those activities with more substantial fuel consumption (e.g., the use of heavy mobile equipment during construction), the releases of air contaminants and GHGs can cause local effects on sensitive receptors and contribute to climate change. These are carried forward for more detailed assessment after consideration of mitigation. Mitigation measures for GHG emissions are most-often related to lower fuel consumption, which is directly proportional to lower GHG emissions. Mitigation measures that reduce GHG emissions are presented in Section 6.6.

The GHG emissions associated with construction and operation activities were estimated and compared to provincial and national totals. During the decommissioning, rehabilitation and closure phase of the Project, releases of GHGs will be similar to, or less than, those during construction and operation and were assessed qualitatively.

The methods used to estimate GHG emissions from the construction and operation of the Project were guided by the principles of the GHG Protocol (WRI 2013). The GHG Protocol is an internationally accepted accounting standard and provides guidance on preparing a GHG emissions inventory. Relevance, completeness, consistency, transparency and accuracy are the five principles that should build the base of GHG accounting and, therefore, guided this assessment. The GHG emission inventories are an estimate based on best available information at the time of the environmental assessment.

#### 6.5.5.5 Change in Lighting Levels

Light associated with an industrial development is critical to the safe and efficient operation of the enterprise. Good lighting meets the required levels on the designated property with low capital, maintenance and energy costs. Badly designed lighting or excessive lighting can result in obtrusive lighting, contributing to light trespass, glare and sky glow.

The analysis of a change in ambient light focuses on the potential effects that the Project infrastructure and activities could have on light trespass, glare and sky glow. Lighting can become obtrusive if the light criteria in Table 6-5, Table 6-6, Table 6-7 and Table 6-8 are exceeded.

The effects of the Project lighting on nearby receptors are assessed by comparing predicted light levels to the specified light criteria. As the exterior lighting plan for the Project has not been designed, light levels related to the Project cannot be quantified. Therefore, the lighting assessment method is qualitative. While the predictions are qualitative, they are based on the professional judgment of the study team and incorporate design mitigation to manage potential light effects to acceptable levels, as published in the CIE guidelines (CIE 2017).

The final design of the Project will incorporate the lighting design recommendations presented in this EIS. These recommendations will represent a conservative approach to the reduction of Project-related light pollution.

## 6.6 Mitigation Measures

Environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. Key measures to mitigate the potential effects of the Project on the Atmospheric Environment are listed in Table 6-14, by category and Project phase.

## Table 6.14 Mitigation Measures: Atmospheric Environment

| ID #* | Mitigation Type | Mitigation Measure | Project Phase* | | |
|---|---|---|---|---|---|
| | | | C | O | D |
| 20 | Mitigation | Project footprint and disturbed areas will be limited to the extent practicable. | X | X | X |
| 21 | Mitigation | The limits for approved clearing, grubbing and topsoil overburden removal will be clearly identified (flagging/survey stakes) in the field prior to the commencement of work. | X | - | - |
| 22 | Mitigation | Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations. | X | - | - |
| 23 | Mitigation | Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical. | X | - | - |
| 24 | Mitigation | Dust from Project activities will be controlled where required by using applications of water or other approved agents. Waste oil will not be used for dust controls. | X | - | - |
| 25 | Mitigation | Project-related fugitive road dust will be controlled through measures such as:<br>• Establishing appropriate speed limits on Project-controlled gravel roads<br>• Conducting road watering on an as-needed basis<br>• Requiring trucks hauling material that can generate dust to have tarps to cover the load" | X | - | - |
| 26 | Mitigation | Re-seeding of areas will follow standard methods in compliance with permit conditions. These methods will be included the Project EPP. | - | - | X |
| 27 | Mitigation | Specific stockpiles of topsoil, overburden, and other potentially dust-generating materials will be kept covered, where practical, and used as soon as practical, or will be appropriately temporarily vegetated. | X | - | - |
| 28 | Mitigation | Nearby residents will be notified prior to blasting. | X | - | - |
| 29 | Mitigation | Project vehicles will drive within the speed limit to reduce engine noises as vehicles travel on roadways within adjacent communities, and horns will be used only as necessary for safety purposes. | X | - | - |
| 32 | Mitigation | An Explosives and Blasting Management Plan will be developed by the blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment and Project components. | X | - | - |

**Table 6.14 Mitigation Measures: Atmospheric Environment**

| ID #* | Mitigation Type | Mitigation Measure | Project Phase* | | |
|---|---|---|---|---|---|
| | | | C | O | D |
| 236 | Mitigation | Lighting will be designed using recommended minimum lighting levels provided by the Illuminating Engineering Society (IES) of North America’s IES Lighting Handbook for outdoor worksite lighting, and in consideration of the CIE criteria, or other standards acceptable to the minister, as required by the NL Occupational Health and Safety Regulations. | X | X | X |
| 314 | Mitigation | Biodiesel will be used instead of diesel fuel, where possible. | X | X | X |
| 333 | Mitigation | Where nighttime construction work is conducted, lighting used will be in compliance with regulations and permit conditions issued for the Project. | | | |
| 357 | Mitigation | Grid power will be used instead of onsite power generation where possible. | X | X | X |

* Note:
“ID #” denotes the mitigation master identification number, Appendix 26-A.
“C” denotes the construction phase of the Project.
“O” denotes the operation and maintenance phase of the Project.
“D” denotes the decommissioning and rehabilitation phase of the Project.
“X” denotes the relevant Project phase to mitigation measure

### 6.6.1 Net Zero Plan

As required by the guidelines, the EIS shall include a long-term capital plan through which WEGH2 demonstrates how the facility will reduce its emissions over time with the objective of achieving net zero by 2050 or otherwise maximizing annual GHG reductions between start-up and 2050.

One of the key Project objectives is to be a world leading low GHG emitting project. Because of this, net zero GHG emissions by 2050 has been integrated as criteria of the design and achieving net zero GHG emissions by 2050 is expected to be relatively straightforward. WEGH2 will track, report on and manage Scope 1, Scope 2 and Scope 3 GHG emissions throughout the lifetime of the Project.

Scope 1 sources to be mitigated include back up power (currently biodiesel), the flare pilot fuel (currently butane) and onsite vehicle use. The biodiesel generator planned to be used initially as a back up power source when grid power is unavailable can be feasibly replaced by additional power storage, with charging of the batteries supplied by renewable wind energy. The best technologies to replace emergency power with net zero energy will continue to be reviewed during the Project lifetime.

The flare pilot is a safety system that will emit very low levels of GHGs throughout the lifetime of the Project until such time that a renewable gas or alternative technology is available to maintain flare pilot. As the pilot is estimated to emit less than 1,000 tonnes $CO_2e$ annually, it is not expected to impede achievement of net zero on prior to 2050.

It is expected that the limited onsite vehicle use required to operate the facility could be replaced with electric or hydrogen or ammonia vehicles at some point prior to 2050. As the Project evolves, WEGH2 will continue to monitor vehicle and mobile equipment technology development and look to mitigate GHG emissions from fossil fuel combustion of onsite and maintenance vehicles.

Scope 2 GHG emissions from electricity are primarily the responsibility of NL Hydro to mitigate although WEGH2 will also continue to review options to reduce grid electricity requirements and optimize use of wind energy.

Mitigation of Scope 3 GHG emissions will also be a focus of WEGH2 during operation although other companies have ownership over those emissions. WEGH2 will track and estimate Scope 3 emissions during operation and include consideration of these emissions in net zero planning. Mitigation of these emissions can be encouraged through a variety of actions by WEGH2 including setting targets and incentives for its supply chain partners to reduce GHG emissions in their operations.

### 6.6.2 Application of the Precautionary Principle to Project Mitigation Measures

The assessment of effects of the Project on air quality, GHGs and lighting for all phases of the Project was completed in consideration of the emission estimates, proposed activities, available best practices, and mitigation. The mitigation measures in Section 6.6 have been selected in consideration of the environmental effects pathways and include standard proven mitigation measures that are known to be effective to reduce the release of air contaminants, the release of GHGs, and lighting.

## 6.7 Residual Environmental Effects

For each potential effect identified in Section 6.5.3, specific Project activities that may interact with the VEC and result in an environmental effect (i.e., a measurable change that may affect the VEC) are identified and described. The following sections first describe the pathways by which a potential Project effect could result from Project activities in the absence of mitigation during each Project phase (i.e., construction, operation and decommissioning and rehabilitation). Mitigation and management measures (Section 6.6) are applied to avoid or reduce these potential pathways and resulting environmental effects. Residual effects are those remaining following implementation of mitigation, which are then characterized using the criteria defined in Section 6.5.1. A summary of predicted residual effects is provided in Section 6.7.4.

### 6.7.1 Change in Air Quality

Air contaminant releases can generally be characterized as either point or fugitive sources. Point sources are typically stacks or vents (such as exhaust from fuel combustion in stationary heavy equipment or stacks / vents at the processing plant). Fugitive sources include dust generated from material handling or wind erosion from stockpiles. The most substantive air contaminant releases are expected during construction and operation of the Project. Although some intermittent releases may occur during decommissioning, the emissions are expected to be lower in magnitude than during construction. Releases expected during construction and operation are described further in the following sections.

Air emission inventories were prepared for the construction and operation phases of the Project using operational and design information, and emission factors published by regulatory agencies such as the US EPA or ECCC. Dispersion modelling was conducted using CALPUFF for the operational phase of the Project, and concentration results were compared against applicable regulatory ambient air quality standards.

#### 6.7.1.1 Construction

Construction activities will include site preparation and earthworks, including the clearing and cutting of vegetation and removal of organic materials, development of roads, excavation and preparation of areas within the turbine sites and access roads, and grading for infrastructure construction. Air contaminants may be released during construction activities in the form of combustion gases ($SO_2$, $NO_x$ and CO) and particulate matter (TPM, $PM_{10}$ and $PM_{2.5}$) from the operation of diesel and gas powered equipment and fugitive dust (particulate matter including TPM, $PM_{10}$ and $PM_{2.5}$) from earth and material moving and handling activities, blasting and equipment movements. Trace amounts of VOCs and PAHs may be released from the operation of diesel and gas powered equipment. Marine vessels and assist tugboats may also generate air contaminant emissions during maneuvering and hoteling during unloading. However, the air contaminant emissions from the marine activities (maneuvering/hoteling of vessels and tugboats) during construction would be less than those from operations as less trips are required for the construction phase. The impacts would be localized to the port and barge areas.

Air contaminant releases resulting from activities during construction that may result in substantive emissions were estimated. Releases were estimated for blasting activities, fugitives from wind erosion of stockpile surfaces, laydown areas, material transfer (loading and unloading) at stockpiles, emissions from material crushing and screening, fugitives from travel on unpaved access roads, fuel combustion in mobile heavy equipment and fuel combustion in stationary equipment. The releases were estimated using published emission factors, such as those from ECCC and the US EPA AP-42 Emission Factors. The air contaminant release estimates from construction activities are provided in Table 6-15. Sample calculations and supporting data used to develop the emissions inventory is provided in Appendix 6-A.

The potential air contaminant releases during construction were estimated for this assessment and were not modelled as these releases are expected to be short-term and intermittent, as construction of the turbines moves around the Project Area in a staggered approach. The focus to mitigate any potential significant effects to air quality during construction will be on implementation of a detailed dust management plan including ambient monitoring during construction. The main concern during construction would be related to dust (particulate matter) releases from equipment and material movements during preparation of the turbine pads. A dust management best practice plan will be developed in advance of construction activities that will outline the controls to be implemented and how effectiveness will be monitored. Several of the mitigations that will be in the dust management best practice plan are outlined in Section 6.6. If ambient dust monitoring results indicate exceedances to applicable air quality criteria, construction activities will be adjusted, and additional controls will be applied.

## Table 6.15 Air Contaminant Releases – Construction

| Air Contaminant | CAS # | Emission Rate (tonnes/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Blasting | Stockpile Fugitives | Transfer Points at Stockpiles | Crushing and Screening | Laydown Areas Fugitives | Unpaved Roads Fugitives | Mobile Combustion Sources – Heavy Equipment | Stationary Combustion | Total |
| NOx | 10102-44-0 | 32 | - | - | - | - | - | 36 | 65.6 | 133 |
| CO | 630-08-0 | 136 | - | - | - | - | - | 310 | 14.1 | 461 |
| $SO_2$ | 7446-09-5 | 4.0 | - | - | - | - | - | 41 | 4.3 | 50 |
| TPM | N/A-1 | 92 | 3.2 | 12.6 | 19.9 | 31.0 | 0.067 | 1.2 | 4.6 | 165 |
| $PM_{10}$ | N/A-2 | 2.1 | 1.6 | 5.9 | 7.3 | 15.5 | 0.002 | 1.2 | 4.6 | 38 |
| $PM_{2.5}$ | N/A-3 | 1.2 | 0.6 | 0.9 | 1.1 | 6.2 | 2.14E-04 | 1.2 | 4.6 | 15.8 |

The mitigation proposed for construction has been proven in various instances to be effective at controlling construction dust. For example, the Western Regional Air Partnership's (WRAP) Fugitive Dust Handbook (WRAP 2006) presents control efficiencies of several dust control activities, such as a reduction of 84% of dust from unpaved roads with the application of dust suppressants, or a reduction of 98% of dust formed during construction if activities are prohibited during high-winds. The application of controls (e.g., watering, dust suppressant), implementation of best practices (e.g., reducing material transfer heights , implementing speed limits), design specifications (e.g., location, height, and slope of stockpiles) and the adjustment of dust-generating activities due to meteorological conditions will aid in reducing construction related dust.

### Summary

The residual environmental effects on air quality during construction are adverse, as the Project construction results in an increase of ambient concentrations compared to baseline conditions. The magnitude of residual effects on air quality are conservatively predicted to be moderate as construction planning will include a detailed dust management plan with ambient monitoring and adaptive management plan for increased mitigation as needed to avoid frequent exceedances of ambient air quality criteria (e.g., avoid high-magnitude effects). The geographic extent for change in air quality is limited to the LAA/RAA, and the residual effects will be short-term (i.e., limited to the 30 month construction period) and continuous as construction activities were assumed to occur throughout the construction phase. The residual effects are predicted to be reversible as the predicted increase in ambient concentrations would return to baseline conditions after the end of construction. The LAA/RAA in which the changes in air quality are assessed is considered undisturbed; there has been little anthropogenic sources of emissions within the LAA/RAA prior to the Project.

Based on the information above, a summary of residual effects on air quality during the construction phase is provided in Table 6-16.

**Table 6.16 Summary of Effects by Project Component During Construction**

| Project Site | Summary of Effect during Construction |
|---|---|
| Temporary Workforce Accommodations | Residual effects to changes in air quality are anticipated to be limited from the temporary workforce accommodation. Limited direct air contaminant emissions during construction of the temporary workforce accommodations are expected. It is assumed that the workforce accommodations will have electrical heating which will not contribute to direct air quality emissions. |
| Port au Port Wind Farm and Associated Infrastructure | Residual effects to changes in air quality during construction of the Port au Port wind farm and associated infrastructure will be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. |
| Codroy Wind Farm and Associated Infrastructure | Residual effects to changes in air quality during construction of the Codroy wind farm and associated infrastructure will be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. |

### Table 6.16 Summary of Effects by Project Component During Construction

| Project Site | Summary of Effect during Construction |
|---|---|
| 230 kV Transmission Lines and Substations | Residual effects to changes in air quality during construction of the transmission lines and substations will be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. |
| Hydrogen / Ammonia Production and Storage Facilities | Residual effects to changes in air quality during construction of the hydrogen / ammonia production and storage facilities will be caused by emissions of air contaminants from combustion of fuel in vehicles, heavy equipment, and stationary combustion, blasting, material moving/handling activities, and equipment movement. |
| Port Facilities | Residual effects to changes in air quality during construction from the Port Facilities will be caused by emissions of air contaminants from marine vessels and tug boats. |

#### 6.7.1.2 Operation and Maintenance

Changes to air quality as a result of the Project-related releases of air contaminants to the atmosphere during operation of the hydrogen / ammonia plant are assessed using an atmospheric dispersion model in combination with ambient background air contaminant concentrations. It is not expected that the operation and maintenance of the wind farms and transmission lines would result in routine releases of air contaminants. Details of the emissions estimates and dispersion modelling for the operation phase of the Project are provided below.

*Air Contaminant Emissions*

Air contaminant emissions from the hydrogen / ammonia plant were estimated using design information, with conservative assumptions made where final design details were not available, and using emission factors published by regulatory agencies such as the US EPA or ECCC. The design information includes stack gas properties, engine capacities, and usage rates. This information was used in conjunction with published emissions factors to estimate air contaminant emissions of particulate matter, combustion gases, $NH_3$, speciated VOCs and PAHs.

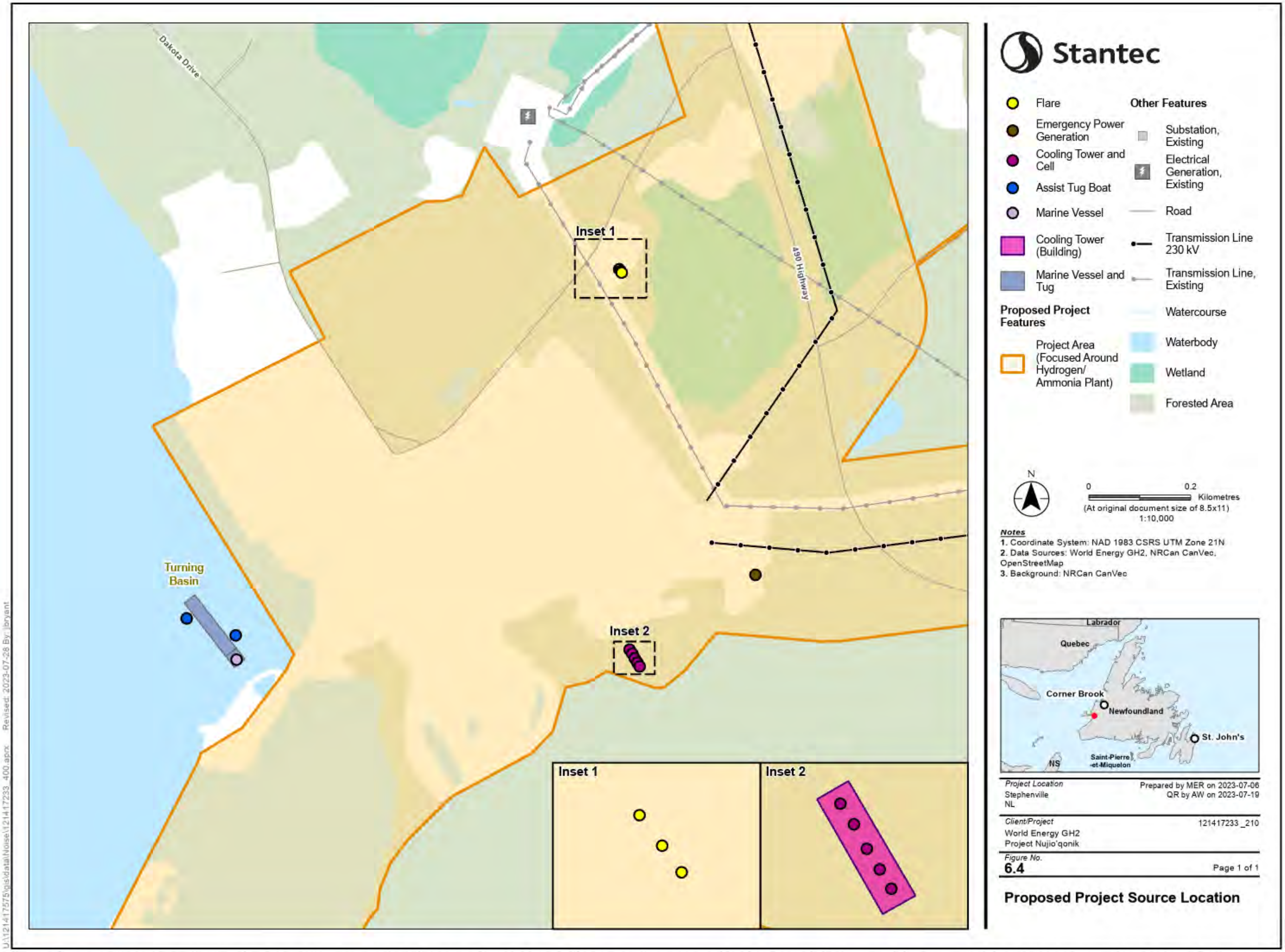
The Project sources of air contaminants during operation and the emissions estimation methodologies for each activity are provided in Table 6.17. The Project source locations are shown in Figure 6.4.

### Table 6.17 Sources of Air Contaminants and Release Estimation Methodologies – Operation

| Source | Operating Condition and Schedule | Estimation Approach / Emission Factor Reference | Expected Contaminants |
|---|---|---|---|
| Flares – Pilot (three flare heads total) | The flare pilot will be continuously (24 hours per day, 365 days per year) fueled by a small flow of butane gas. | Emissions are estimated using the pilot butane flowrate, the higher heating value of butane, and emission factors sourced from AP-42 Chapter 13.5 Industrial Flares (US EPA 1995) (for $NO_X$) and the Texas Commission on Environmental Quality (TCEQ) 2021 Emissions Inventory Guidelines (RG-360/21) (for CO) | $NO_X$, CO |
| Flares – $NH_3$ Release (three flare heads total) | Approximately once per year, full flaring event expected to occur over 1-hour | Emissions are estimated using the mass of ammonia released, destruction efficiency (for $NH_3$) and emission factors sourced from AP-42 Chapter 13.5 Industrial Flares (US EPA 1995) (for thermal Nox), and TCEQ (2021) (fuel Nox) | $NO_X$, $NH_3$ |
| Backup Power Generation (50 MW biodiesel combustion turbine) | The backup generator would only be used during emergencies, for approximately 13 hours per event. It was assumed this may occur 4 events per year (52 hours/year). | Emissions are estimated using the power demand and emission factors sourced from US EPA AP-42 Chapter 3.1 – Stationary Gas Turbines (US EPA 2000). It was assumed the sulfur content of the fuel will be 15 ppmw (0.0015%). It was assumed that bio-diesel air contaminant emissions would be similar to those of regular diesel. | $NO_X$, CO, $SO_2$, TPM, $PM_{10}$, $PM_{2.5}$, DPM, VOCs, PAHs |
| Cooling Tower | Continuous (24 hours per day, 365 days per year) | Emissions are estimated from the cooling tower following the approach in AP-42 Chapter 13.: Wet Cooling Towers (US EPA 1995). It was conservatively assumed that TPM = PM10 = PM2.5. | TPM, $PM_{10}$, $PM_{2.5}$ |
| Marine Vessel – hoteling at port | 4 vessels per month at maximum production, loading was estimated (from loading pipe rate and ship volume capacity) to take 43 hours. | Emissions of criteria air contaminants ($NO_X$, CO, $PM_{10}$, $PM_{2.5}$, and $SO_2$) are estimated using emission factors sourced from "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories" (US EPA 2009), engine power rating (KW), and the load factor. Emissions of speciated organic compounds and metals are estimated from emission factors source from AP-42 Chapter 1.3 – Fuel Oil Combustion (US EPA 2010) and the fuel usage rates. It was conservatively assumed the fuel sulphur content was 0.1%, the maximum content allowed within Canadian jurisdictions as per the Vessel Pollution and Dangerous Chemicals Regulations. | $NO_X$, CO, $SO_2$, TPM, $PM_{10}$, $PM_{2.5}$, DPM, VOCs, PAHs |

## Table 6.17 Sources of Air Contaminants and Release Estimation Methodologies – Operation

| Source | Operating Condition and Schedule | Estimation Approach / Emission Factor Reference | Expected Contaminants |
|---|---|---|---|
| Assist Tug Boats (2 tugs) | Present when vessels are in port | Emissions of criteria air contaminants ($NO_X$, CO, $PM_{10}$, $PM_{2.5}$, and $SO_2$) are estimated using emission factors sourced from "Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories" (US EPA 2009), the tug engine power rating (KW), and the load factor. Emissions of speciated organic compounds and metals are estimated from emission factors source from AP-42 Chapter 1.3 – Fuel Oil Combustion (US EPA 2010) and the fuel usage rates. It was conservatively assumed the fuel sulphur content was 0.1%, the maximum content allowed within Canadian jurisdictions as per the Vessel Pollution and Dangerous Chemicals Regulations. | $NO_X$, CO, $SO_2$, TPM, $PM_{10}$, $PM_{2.5}$, DPM, VOCs, PAHs |

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A summary of the provided activity data for operation used for the emissions estimates is provided in Table 6-18.

### Table 6.18 Activity Data – Operation

| Activity | Value |
|---|---|
| **Flares** | |
| Butane pilot flowrate – per flare, 3 in total ($Sm^3$/hr) | 0.8 (30 SCFH) |
| Release during $NH_3$ Flaring Event (kg $NH_3$ flared) | 11,685 |
| Duration of flaring event (hours) | 1 |
| **Backup Power Generation** | |
| Power Demand (kW) | 50,000 |
| **Cooling Towers** | |
| Total water supply (L/hour) | 11,515,187 (50,700 GPM) |
| Total dissolved solids in water supply (mg/L) | 649 |
| Drift | 0.02% |
| **Marine Vessels** | |
| Number of vessels per year (peak production) | 48 |
| Loading time per vessel, per event (hours) | 43 |
| Total Auxiliary Engine Power Rating (for all three engines) (kW) | 3,600 |
| Auxiliary Boiler Power Rating (kW) | 1,446 |
| Fuel Type | Marine Gas Oil (MGO) |
| Fuel Sulphur Content (%) | 0.1 [1] |
| **Assist Tug Boats** | |
| Main Engine Power Rating (kW) | 1,540 |
| Fuel Type | Marine Gas Oil (MGO) |
| Fuel Sulphur Content (%) | 0.1 [1] |
| Number of tugs | 2 |
| Note:<br>[1] Conservatively assumed sulphur fuel content as the maximum limit in Canadian waters, as per the Vessel Pollution and Dangerous Chemicals Regulation | |

More detailed emissions estimates and information used to prepare the estimates, including operating schedules of each source, are provided in Appendix 6-A.

A summary of the estimated annual air contaminant releases during operation is provided in Table 6.19. Due to the low quantity of butane being combusted in the flare pilot, and that most hydrocarbons will be destroyed during combustion, speciated VOCs from the pilot were assumed negligible. VOCs are not expected from flaring events of $NH_3$ as $NH_3$ does not contain hydrocarbons.

## Table 6.19 Air Contaminant Releases – Operation

| Air Contaminant | CAS # | Emission Rate (tonnes/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Flare 1 [1] | Flare 2 [1] | Flare 3 [1] | Cooling Towers | Combustion Turbine | Marine Vessel | Tug 1 | Tug 2 | Total |
| $NO_X$ | 10102-44-0 | 0.03 [1]/ 0.066 [2] | 0.03 [1]/ 0.066 [2] | 0.03 [1]/ 0.066 [2] | - | 13.11 | 23.11 | 18.15 | 18.15 | 72.60 |
| CO | 630-08-0 | 0.21 | 0.21 | 0.21 | - | 0.049 | 2.20 | 1.51 | 1.51 | 5.92 |
| $SO_2$ | 7446-09-5 | - | - | - | - | 0.023 | 1.23 | 0.01 | 0.01 | 1.27 |
| TPM | N/A-1 | 1.77E-07 | 1.77E-07 | 1.77E-07 | 13.09 | 0.179 | 0.37 | 0.99 | 0.99 | 15.62 |
| $PM_{10}$ | N/A-2 | 1.77E-07 | 1.77E-07 | 1.77E-07 | 13.09 | 0.179 | 0.37 | 0.99 | 0.99 | 15.62 |
| $PM_{2.5}$ | N/A-3 | 1.77E-07 | 1.77E-07 | 1.77E-07 | 13.09 | 0.179 | 0.32 | 0.79 | 0.79 | 15.18 |
| DPM | N/A-4 | - | - | - | - | 0.179 | 0.32 | 0.79 | 0.79 | 2.09 |
| $NH_3$ | 7664-41-7 | 0.23 [2] | 0.23 [2] | 0.23 [2] | - | - | - | - | - | 0.70 |
| Benzene | 71-43-2 | - | - | - | - | 0.0008 | 4.31E-03 | 9.61E-04 | 9.61E-04 | 7.05E-03 |
| Formaldehyde | 50-00-0 | - | - | - | - | 0.0042 | 4.38E-04 | 9.77E-05 | 9.77E-05 | 4.81E-03 |
| Naphthalene | 91-20-3 | - | - | - | - | 0.0005 | 7.22E-04 | 1.61E-04 | 1.61E-04 | 1.57E-03 |
| Benzene | 71-43-2 | - | - | - | - | 0.0008 | 4.31E-03 | 9.61E-04 | 9.61E-04 | 7.05E-03 |
| Toluene | 108-88-3 | - | - | - | - | - | 1.56E-03 | 3.48E-04 | 3.48E-04 | 2.26E-03 |
| Xylenes | 1330-20-7 | - | - | - | - | - | 1.07E-03 | 2.39E-04 | 2.39E-04 | 1.55E-03 |
| Propylene | 115-07-1 | - | - | - | - | - | 1.55E-02 | 3.45E-03 | 3.45E-03 | 2.24E-02 |
| Formaldehyde | 50-00-0 | - | - | - | - | 0.0042 | 4.38E-04 | 9.77E-05 | 9.77E-05 | 4.81E-03 |
| Acrolein | 107-02-8 | - | - | - | - | - | 4.37E-05 | 9.76E-06 | 9.76E-06 | 6.33E-05 |
| Naphthalene | 91-20-3 | - | - | - | - | 0.0005 | 7.22E-04 | 1.61E-04 | 1.61E-04 | 1.57E-03 |
| Acenaphthylene | 208-96-8 | - | - | - | - | - | 5.12E-05 | 1.14E-05 | 1.14E-05 | 7.41E-05 |
| Acenaphthene | 83-32-9 | - | - | - | - | - | 2.60E-05 | 5.80E-06 | 5.80E-06 | 3.76E-05 |
| Fluorene | 86-73-7 | - | - | - | - | - | 7.10E-05 | 1.58E-05 | 1.58E-05 | 1.03E-04 |

## Table 6.19 Air Contaminant Releases – Operation

| Air Contaminant | CAS # | Emission Rate (tonnes/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Flare 1 [1] | Flare 2 [1] | Flare 3 [1] | Cooling Towers | Combustion Turbine | Marine Vessel | Tug 1 | Tug 2 | Total |
| Phenanthrene | 85-01-8 | - | - | - | - | - | 2.26E-04 | 5.05E-05 | 5.05E-05 | 3.27E-04 |
| Anthracene | 120-12-7 | - | - | - | - | - | 6.83E-06 | 1.52E-06 | 1.52E-06 | 9.87E-06 |
| Fluoranthene | 206-44-0 | - | - | - | - | - | 2.24E-05 | 4.99E-06 | 4.99E-06 | 3.23E-05 |
| Pyrene | 129-00-0 | - | - | - | - | - | 2.06E-05 | 4.59E-06 | 4.59E-06 | 2.98E-05 |
| Benz(a)anthracene | 56-55-3 | - | - | - | - | - | 3.45E-06 | 7.70E-07 | 7.70E-07 | 4.99E-06 |
| Chrysene | 218-01-9 | - | - | - | - | - | 8.49E-06 | 1.89E-06 | 1.89E-06 | 1.23E-05 |
| Benzo(b)fluoranthene | 205-99-2 | - | - | - | - | - | 6.16E-06 | 1.37E-06 | 1.37E-06 | 8.91E-06 |
| Benzo(k)fluoranthene | 207-08-9 | - | - | - | - | - | 1.21E-06 | 2.70E-07 | 2.70E-07 | 1.75E-06 |
| Benzo(a)pyrene | 50-32-8 | - | - | - | - | - | 1.43E-06 | 3.18E-07 | 3.18E-07 | 2.06E-06 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | - | - | - | - | - | 2.30E-06 | 5.13E-07 | 5.13E-07 | 3.32E-06 |
| Dibenz(a,h)anthracene | 53-70-3 | - | - | - | - | - | 1.92E-06 | 4.28E-07 | 4.28E-07 | 2.78E-06 |
| Benzo(g,h,l)perylene | 191-24-2 | - | - | - | - | - | 3.09E-06 | 6.88E-07 | 6.88E-07 | 4.46E-06 |
| Total PAHs | N/A-5 | - | - | - | - | 0.0006 | 1.18E-03 | 2.63E-04 | 2.63E-04 | 2.30E-03 |

Note:

[1] Emissions from the continuous flare pilot (continuous)

[2] Emissions from ammonia flaring event (assumed one flaring event per year)

*Dispersion Modelling Results*

The CALPUFF dispersion modelling system was used to predict the maximum ground level concentrations of the substances of interest in the LAA/RAA during the normal operation of the Project. Further information on CALPUFF is included in Section 6.5.5.3 and Appendix 6-B.

The maximum predicted concentrations of the air contaminants of concern released during normal operation of the Project combined with measured background concentrations (to account for existing conditions) are provided in Table 6-20. The modelled maximums were predicted for areas outside the hydrogen / ammonia plant property boundary (fenceline). The results are presented for the averaging periods of each respective air criteria. For species that did not have applicable criteria, 1-hour, 24-hour, and annual results are presented.

The maximum predicted concentrations, combined with measured background, at a location of human residence (located at Little Port Harmon area) are provided in Table 6-21. Results were generated at other residential areas; however, these represent the locations in which the maximum concentration (combined with background) were predicted; concentrations at other residential areas would be equal or less than these values.  This shows the maximum concentrations predicted at residential areas in the LAA/RAA. The locations vary depending on the air contaminant as not all sources emitted all modelled contaminants. The maximum concentration does not necessarily occur at the nearest receptor; rather, this depends on the sources contributing to the maximum concentration of each contaminant.

The predicted concentrations are also presented graphically in the form of isopleth plots (concentration contour plots). Plots were generated for species where the concentration (predicted plus background) was equal to 50% or more of the applicable air quality criteria. Plots were prepared for $PM_{2.5}$ (24-hour, annual), $PM_{10}$ (24-hour), $NO_2$ (hourly, 24-hour, annual) and diesel particulate matter (2-hour, annual). The generated contour plots are shown in Figure 6.5 through Figure 6.12. The highest predicted concentrations generally occur at or near the fence line of the hydrogen / ammonia plant boundary, mainly occurring to the south (near the proposed emergency generator) or the south-west side of the property (near the port).

Maximum predicted concentrations of the air contaminants modelled (due to Project related air contaminant releases combined with measured ambient background concentrations) are below the provincial ambient air quality standards and the adopted ambient air quality standards at all receptors. The maximum predicted concentrations (including background) of $PM_{2.5}$ are also below the 24-hour CAAQs.

As discussed in Section 6.5.5 there were several conservative assumptions made in the development of the emission inventory and during the modelling, as such, these results are considered conservative. Flaring events and the use of the back-up generator are infrequent releases, while the marine vessel shipping is periodic and not continuous. The results presented are not expected to occur routinely, but instead, on an infrequent basis.  Emergency events (e.g., $NH_3$ flaring and the operation of the back-up generator) would typically not be assessed as part of the air quality assessment in an EIS. They were included in this assessment as these sources may be operated during periods of routine maintenance. Their inclusion is conservative.

Generally, the predicted concentrations reach 10% of background levels within 6 to 8 km of the hydrogen / ammonia plant boundary with $NO_2$ extending out to approximately 30 km to reach 10% of the background levels, at which point the contribution from the Project is considered negligible.

**Table 6.20 Maximum Predicted Ground-level Concentrations – Operation**

| Contaminant | Average Period | Background Concentrations (µg/m³) | Predicted Concentrations (µg/m³) | Predicted plus Background (µg/m³) | NL AQ Standard (µg/m³) | 2020 CAAQS (µg/m³) | 2025 CAAQS (µg/m³) | Ontario ACB (µg/m³) | Alberta AAQO (µg/m³) | Percent of NL/Adopted Standard |
|---|---|---|---|---|---|---|---|---|---|---|
| TPM | 24-hour | 19.5 | 13.7 | 33.2 | 120 | - | - | - | - | 27.69% |
| | Annual | 9.1 | 0.85 | 9.95 | 60 | - | - | - | - | 16.58% |
| $PM_{10}$ | 24-hour | 19.5 | 13.7 | 33.2 | 50 | - | - | - | - | 66.46% |
| $PM_{2.5}$ | 24-hour | 6.1 | 12.0 | 18.1 | 25 | 27.0 | NA | - | - | 72.25% |
| | Annual | 4.5 | 0.84 | 5.34 | 8.8 | 8.8 | NA | - | - | 59.29% |
| DPM | 2-hour | NA | 46.6 | 46.6 | - | - | - | - | - | NA |
| | Annual | NA | 0.65 | 0.65 | - | - | - | - | - | NA |
| $NO_2$ | 1-hour | 5.6 | 109 | 115 | 400 | 112.9 | 79 | - | - | 28.60% |
| | 24-hour | 3.8 | 92.5 | 96.3 | 200 | - | - | - | - | 48.40% |
| | Annual | 3.8 | 9.82 | 13.62 | 100 | 32.0 | 28.2 | - | - | 13.62% |
| $SO_2$ | 1-hour | 2.4 | 1.22 | 3.62 | 900 | 183.4 | 170 | - | - | 0.40% |
| | 3-hour | 2.4 | 1.10 | 3.50 | 600 | - | - | - | - | 0.58% |
| | 24-hour | 2.1 | 0.50 | 2.60 | 300 | - | - | - | - | 0.86% |
| | Annual | 1.72 | 0.01 | 1.73 | 60 | 13.1 | 10.5 | - | - | 2.88% |
| CO | 1-hour | 206 | 34.8 | 240.8 | 35,000 | - | - | - | - | 0.69% |
| | 8-hour | 206 | 28.5 | 234.5 | 15,000 | - | - | - | - | 1.56% |
| $NH_3$ | 24-hour | NA | 48.7 | 48.7 | 100 | - | - | - | - | 48.71% |
| Benzene | 1-hour | NA | 3.81E-02 | 3.81E-02 | - | - | - | - | 30 | 0.13% |
| | 24-hour | NA | 2.29E-02 | 2.29E-02 | - | - | - | 100 | - | 0.02% |
| | Annual | NA | 5.35E-04 | 5.35E-04 | - | - | - | 0.45 | - | 0.12% |
| Toluene | 1-hour | NA | 1.38E-02 | 1.38E-02 | - | - | - | - | 1,880 | 0.00% |
| | 24-hour | NA | 8.29E-03 | 8.29E-03 | - | - | - | 2,000 | 400 | 0.00% |
| Xylene | 10-min | NA | 1.56E-02 | 1.56E-02 | - | - | - | 3,000 | - | 0.00% |
| | 1-hour | NA | 9.45E-03 | 9.45E-03 | - | - | - | - | 2,300 | 0.00% |
| | 24-hour | NA | 5.69E-03 | 5.69E-03 | - | - | - | 730 | 700 | 0.00% |
| Acrolein | 1-hour | NA | 3.86E-04 | 3.86E-04 | - | - | - | 4.5 | 4.5 | 0.01% |
| | 24-hour | NA | 2.32E-04 | 2.32E-04 | - | - | - | 0.4 | 0.4 | 0.06% |
| Formaldehyde | 24-hour | NA | 2.23E-02 | 2.23E-02 | - | - | - | 65 | - | 0.03% |
| Benz[a]anthracene | 1-hour | NA | 3.05E-05 | 3.05E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.84E-05 | 1.84E-05 | - | - | - | - | - | NA |
| | Annual | NA | 4.28E-07 | 4.28E-07 | - | - | - | - | - | NA |
| Benzo[a]pyrene | Annual | NA | 1.77E-07 | 1.77E-07 | - | - | - | 0.00001 | - | 1.77% |
| Benzo[b]fluoranthene | 1-hour | NA | 5.43E-05 | 5.43E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 3.27E-05 | 3.27E-05 | - | - | - | - | - | NA |
| | Annual | NA | 7.65E-07 | 7.65E-07 | - | - | - | - | - | NA |
| Benzo[k]fluoranthene | 1-hour | NA | 1.07E-05 | 1.07E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 6.43E-06 | 6.43E-06 | - | - | - | - | - | NA |
| | Annual | NA | 1.50E-07 | 1.50E-07 | - | - | - | - | - | NA |

**Table 6.20 Maximum Predicted Ground-level Concentrations – Operation**

| Contaminant | Average Period | Background Concentrations (μg/m³) | Predicted Concentrations (μg/m³) | Predicted plus Background (μg/m³) | NL AQ Standard (μg/m³) | 2020 CAAQS (μg/m³) | 2025 CAAQS (μg/m³) | Ontario ACB (μg/m³) | Alberta AAQO (μg/m³) | Percent of NL/Adopted Standard |
|---|---|---|---|---|---|---|---|---|---|---|
| Chrysene | 1-hour | NA | 7.50E-05 | 7.50E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 4.51E-05 | 4.51E-05 | - | - | - | - | - | NA |
| | Annual | NA | 1.06E-06 | 1.06E-06 | - | - | - | - | - | NA |
| Dibenz[a,h]anthracene | 1-hour | NA | 1.69E-05 | 1.69E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.02E-05 | 1.02E-05 | - | - | - | - | - | NA |
| | Annual | NA | 2.39E-07 | 2.39E-07 | - | - | - | - | - | NA |
| Benzo[g,h,i]perylene | 1-hour | NA | 2.72E-05 | 2.72E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.64E-05 | 1.64E-05 | - | - | - | - | - | NA |
| | Annual | NA | 3.83E-07 | 3.83E-07 | - | - | - | - | - | NA |
| Indeno[1,2,3-c,d]pyrene | 1-hour | NA | 2.03E-05 | 2.03E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.22E-05 | 1.22E-05 | - | - | - | - | - | NA |
| | Annual | NA | 2.86E-07 | 2.86E-07 | - | - | - | - | - | NA |
| Anthracene | 1-hour | NA | 6.02E-05 | 6.02E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 3.63E-05 | 3.63E-05 | - | - | - | - | - | NA |
| | Annual | NA | 8.48E-07 | 8.48E-07 | - | - | - | - | - | NA |
| Acenaphthene | 1-hour | NA | 2.30E-04 | 2.30E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.38E-04 | 1.38E-04 | - | - | - | - | - | NA |
| | Annual | NA | 3.23E-06 | 3.23E-06 | - | - | - | - | - | NA |
| Acenaphthylene | 1-hour | NA | 4.53E-04 | 4.53E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.73E-04 | 2.73E-04 | - | - | - | - | - | NA |
| | Annual | NA | 6.35E-06 | 6.35E-06 | - | - | - | - | - | NA |
| Fluoranthene | 1-hour | NA | 1.97E-04 | 1.97E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.19E-04 | 1.19E-04 | - | - | - | - | - | NA |
| | Annual | NA | 2.77E-06 | 2.77E-06 | - | - | - | - | - | NA |
| Fluorene | 1-hour | NA | 6.27E-04 | 6.27E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 3.77E-04 | 3.77E-04 | - | - | - | - | - | NA |
| | Annual | NA | 8.83E-06 | 8.83E-06 | - | - | - | - | - | NA |
| Naphthalene | 10-min | NA | 2.13E-02 | 2.13E-02 | - | - | - | 50 | - | 0.04% |
| | 24-hour | NA | 3.83E-03 | 3.83E-03 | - | - | - | 22.5 | - | 0.02% |
| | Annual | NA | 8.95E-05 | 8.95E-05 | - | - | - | - | 3 | 0.00% |
| Phenanthrene | 1-hour | NA | 2.00E-03 | 2.00E-03 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.21E-03 | 1.21E-03 | - | - | - | - | - | NA |
| | Annual | NA | 2.81E-05 | 2.81E-05 | - | - | - | - | - | NA |
| Pyrene | 1-hour | NA | 1.82E-04 | 1.82E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.10E-04 | 1.10E-04 | - | - | - | - | - | NA |
| | Annual | NA | 2.56E-06 | 2.56E-06 | - | - | - | - | - | NA |

**Table 6.21 Maximum Predicted Ground-level Concentrations at a Residential Area – Operation**

| Contaminant | Average Period | Background Concentrations (µg/m³) | Predicted Concentrations (µg/m³) | Predicted plus Background (µg/m³) | NL AQ Standard (µg/m³) | 2020 CAAQS (µg/m³) | 2025 CAAQS (µg/m³) | Ontario ACB (µg/m³) | Alberta AAQO (µg/m³) | Percent of NL/Adopted Standard |
|---|---|---|---|---|---|---|---|---|---|---|
| TPM | 24-hour | 19.5 | 2.84 | 22.3 | 120 | - | - | - | | 18.62% |
| | Annual | 9.1 | 0.12 | 9.22 | 60 | - | - | - | | 15.37% |
| $PM_{10}$ | 24-hour | 19.5 | 2.84 | 22.3 | 50 | - | - | - | | 44.69% |
| $PM_{2.5}$ | 24-hour | 6.1 | 2.27 | 8.37 | 25 | 27.0 | NA | - | | 33.49% |
| | Annual | 4.5 | 0.10 | 4.60 | 8.8 | 8.8 | NA | - | | 51.12% |
| DPM | 2-hour | NA | 5.73 | 5.73 | - | - | - | - | - | NA |
| | Annual | NA | 0.11 | 0.11 | - | - | - | - | - | NA |
| $NO_2$ | 1-hour | 5.6 | 81.6 | 87.2 | 400 | 112.9 | 79 | - | | 21.74% |
| | 24-hour | 3.8 | 48.3 | 52.1 | 200 | - | - | - | | 26.20% |
| | Annual | 3.8 | 1.69 | 5.49 | 100 | 32.0 | 28.2 | - | | 5.49% |
| $SO_2$ | 1-hour | 2.4 | 0.36 | 2.76 | 900 | 183.4 | 170 | - | | 0.31% |
| | 3-hour | 2.4 | 0.36 | 2.76 | 600 | - | - | - | | 0.46% |
| | 24-hour | 2.1 | 0.11 | 2.21 | 300 | - | - | - | | 0.74% |
| | Annual | 1.7 | 0.00 | 1.72 | 60 | 13.1 | 10.5 | - | | 2.87% |
| CO | 1-hour | 206.0 | 8.84 | 214.84 | 35,000 | - | - | - | | 0.61% |
| | 8-hour | 206.0 | 7.23 | 213.23 | 15,000 | - | - | - | | 1.42% |
| $NH_3$ | 24-hour | NA | 8.55 | 8.55 | 100 | - | - | - | | 8.55% |
| Benzene | 1-hour | NA | 9.67E-03 | 9.67E-03 | - | - | - | - | 30 | 0.03% |
| | 24-hour | NA | 4.74E-03 | 4.74E-03 | - | - | - | 100 | - | 0.00% |
| | Annual | NA | 8.96E-05 | 8.96E-05 | - | - | - | 0.45 | - | 0.02% |
| Toluene | 1-hour | NA | 3.50E-03 | 3.50E-03 | - | - | - | - | 1,880 | 0.00% |
| | 24-hour | NA | 1.71E-03 | 1.71E-03 | - | - | - | 2,000 | 400 | 0.00% |
| Xylene | 10-min | NA | 3.97E-03 | 3.97E-03 | - | - | - | 3,000 | - | 0.00% |
| | 1-hour | NA | 2.40E-03 | 2.40E-03 | - | - | - | - | 2,300 | 0.00% |
| | 24-hour | NA | 1.18E-03 | 1.18E-03 | - | - | - | 730 | 700 | 0.00% |
| Acrolein | 1-hour | NA | 9.80E-05 | 9.80E-05 | - | - | - | 4.5 | 4.5 | 0.00% |
| | 24-hour | NA | 4.80E-05 | 4.80E-05 | - | - | - | 0.4 | 0.4 | 0.01% |
| Formaldehyde | 24-hour | NA | 5.35E-04 | 5.35E-04 | - | - | - | 65 | - | 0.00% |
| Benz[a]anthracene | 1-hour | NA | 7.75E-06 | 7.75E-06 | - | - | - | - | - | NA |
| | 24-hour | NA | 3.80E-06 | 3.80E-06 | - | - | - | - | - | NA |
| | Annual | NA | 7.16E-08 | 7.16E-08 | - | - | - | - | - | NA |
| Benzo[a]pyrene | Annual | NA | 2.97E-08 | 2.97E-08 | - | - | - | 0.00001 | - | 0.30% |
| Benzo[b]fluoranthene | 1-hour | NA | 1.38E-05 | 1.38E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 6.76E-06 | 6.76E-06 | - | - | - | - | - | NA |
| | Annual | NA | 1.28E-07 | 1.28E-07 | - | - | - | - | - | NA |
| Benzo[k]fluoranthene | 1-hour | NA | 2.71E-06 | 2.71E-06 | - | - | - | - | - | NA |
| | 24-hour | NA | 1.33E-06 | 1.33E-06 | - | - | - | - | - | NA |
| | Annual | NA | 2.51E-08 | 2.51E-08 | - | - | - | - | - | NA |

**Table 6.21 Maximum Predicted Ground-level Concentrations at a Residential Area – Operation**

| Contaminant | Average Period | Background Concentrations (µg/m³) | Predicted Concentrations (µg/m³) | Predicted plus Background (µg/m³) | NL AQ Standard (µg/m³) | 2020 CAAQS (µg/m³) | 2025 CAAQS (µg/m³) | Ontario ACB (µg/m³) | Alberta AAQO (µg/m³) | Percent of NL/Adopted Standard |
|---|---|---|---|---|---|---|---|---|---|---|
| Chrysene | 1-hour | NA | 1.90E-05 | 1.90E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 9.33E-06 | 9.33E-06 | - | - | - | - | - | NA |
| | Annual | NA | 1.76E-07 | 1.76E-07 | - | - | - | - | - | NA |
| Dibenz[a,h]anthracene | 1-hour | NA | 4.29E-06 | 4.29E-06 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.10E-06 | 2.10E-06 | - | - | - | - | - | NA |
| | Annual | NA | 3.99E-08 | 3.99E-08 | - | - | - | - | - | NA |
| Benzo[g,h,i]perylene | 1-hour | NA | 6.92E-06 | 6.92E-06 | - | - | - | - | - | NA |
| | 24-hour | NA | 3.39E-06 | 3.39E-06 | - | - | - | - | - | NA |
| | Annual | NA | 6.40E-08 | 6.40E-08 | - | - | - | - | - | NA |
| Indeno[1,2,3-c,d]pyrene | 1-hour | NA | 5.17E-06 | 5.17E-06 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.53E-06 | 2.53E-06 | - | - | - | - | - | NA |
| | Annual | NA | 4.79E-08 | 4.79E-08 | - | - | - | - | - | NA |
| Anthracene | 1-hour | NA | 1.53E-05 | 1.53E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 7.49E-06 | 7.49E-06 | - | - | - | - | - | NA |
| | Annual | NA | 1.42E-07 | 1.42E-07 | - | - | - | - | - | NA |
| Acenaphthene | 1-hour | NA | 5.84E-05 | 5.84E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.86E-05 | 2.86E-05 | - | - | - | - | - | NA |
| | Annual | NA | 5.40E-07 | 5.40E-07 | - | - | - | - | - | NA |
| Acenaphthylene | 1-hour | NA | 1.15E-04 | 1.15E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 5.64E-05 | 5.64E-05 | - | - | - | - | - | NA |
| | Annual | NA | 1.06E-06 | 1.06E-06 | - | - | - | - | - | NA |
| Fluoranthene | 1-hour | NA | 5.00E-05 | 5.00E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.45E-05 | 2.45E-05 | - | - | - | - | - | NA |
| | Annual | NA | 4.64E-07 | 4.64E-07 | - | - | - | - | - | NA |
| Fluorene | 1-hour | NA | 1.59E-04 | 1.59E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 7.80E-05 | 7.80E-05 | - | - | - | - | - | NA |
| | Annual | NA | 1.48E-06 | 1.48E-06 | - | - | - | - | - | NA |
| Naphthalene | 10-min | NA | 2.67E-03 | 2.67E-03 | - | - | - | 50 | - | 0.01% |
| | 24-hour | NA | 7.94E-04 | 7.94E-04 | - | - | - | 22.5 | - | 0.00% |
| | Annual | NA | 1.50E-05 | 1.50E-05 | - | - | - | - | 3 | 0.00% |
| Phenanthrene | 1-hour | NA | 5.09E-04 | 5.09E-04 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.49E-04 | 2.49E-04 | - | - | - | - | - | NA |
| | Annual | NA | 4.70E-06 | 4.70E-06 | - | - | - | - | - | NA |
| Pyrene | 1-hour | NA | 4.63E-05 | 4.63E-05 | - | - | - | - | - | NA |
| | 24-hour | NA | 2.27E-05 | 2.27E-05 | - | - | - | - | - | NA |
| | Annual | NA | 4.29E-07 | 4.29E-07 | - | - | - | - | - | NA |


Stantec

Maximum Concentration: 33.2 µg/m³

Particulate Matter (with a diameter less than 10 microns), maximum predicted 24-hour concentration, with the background concentration (19.5 µg/m³) included. (Regulatory Limit 50 µg/m³)

Modelled Site Boundary

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Substation, Existing

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 1.2 Kilometres

(At original document size of 8.5x11) 1:60,000

*Notes*

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by MER on 2023-07-06
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2 Inc.,
Project Nujio'qonik

121417233_216

*Figure No.*
**6.5**

Page 1 of 1

**Maximum Concentration**

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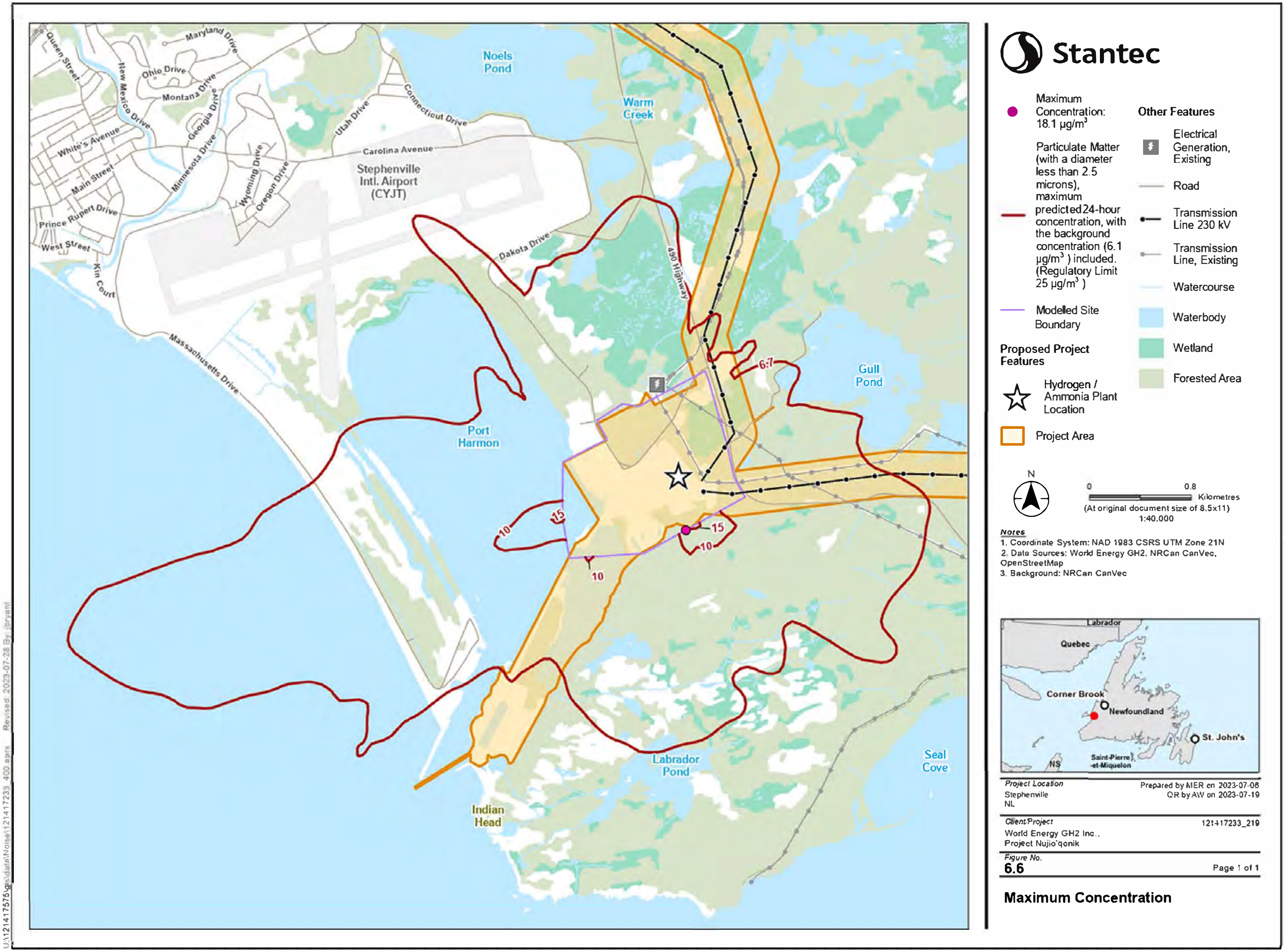


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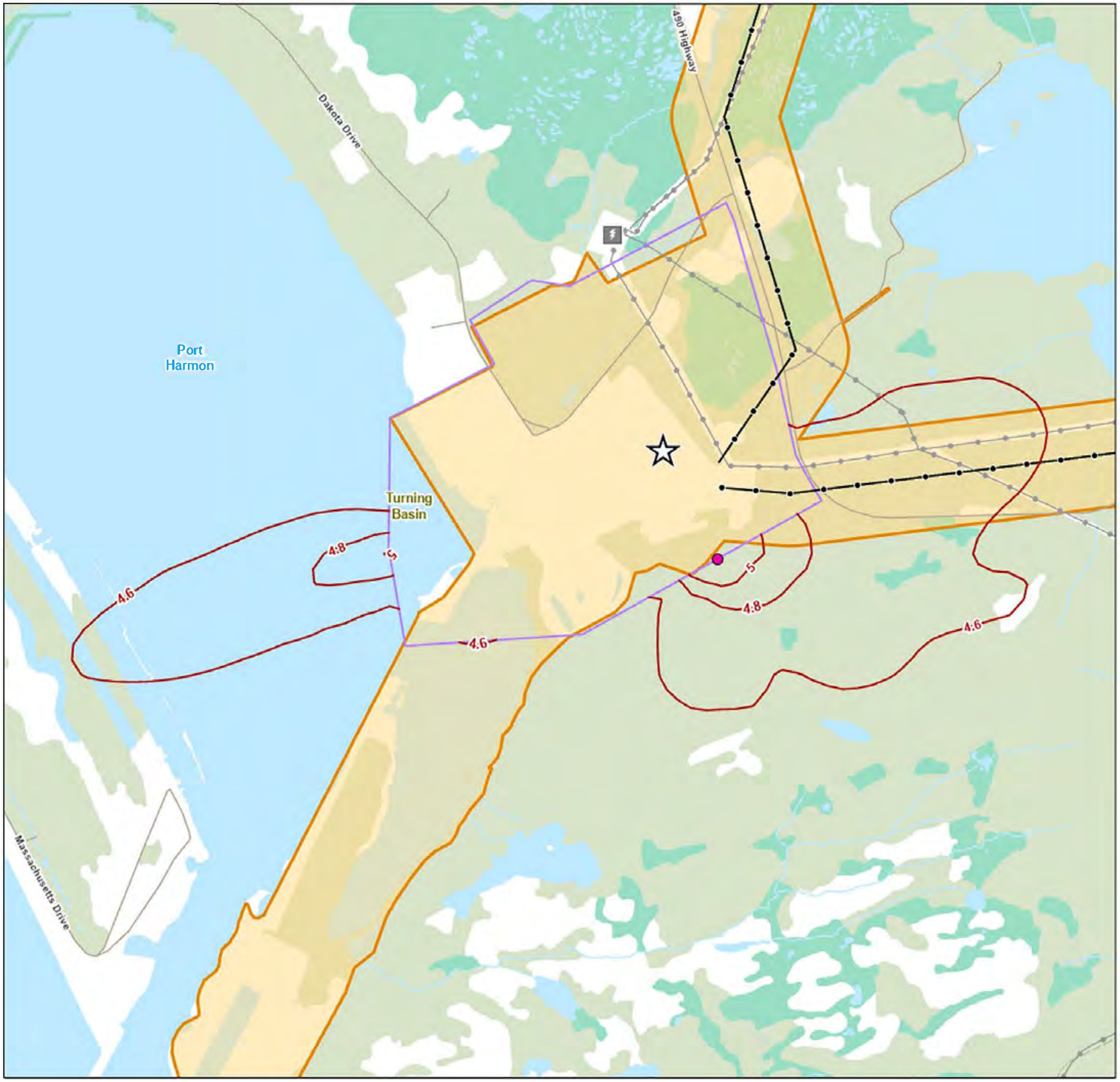



Stantec

Maximum Concentration: 5.3 µg/m³

Particulate Matter (with a diameter less than 2.5 microns), maximum predicted annual concentration, with the background concentration (4.5 µg/m³ ) included. (Regulatory Limit 9 µg/m³ )

Modelled Site Boundary

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 0.4 Kilometres

(At original document size of 8.5x11) 1:20,000

*Notes*

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by MER on 2023-07-06
QR by AW on 2023-07-21

*Client/Project*
World Energy GH2 Inc.,
Project Nujio'qonik

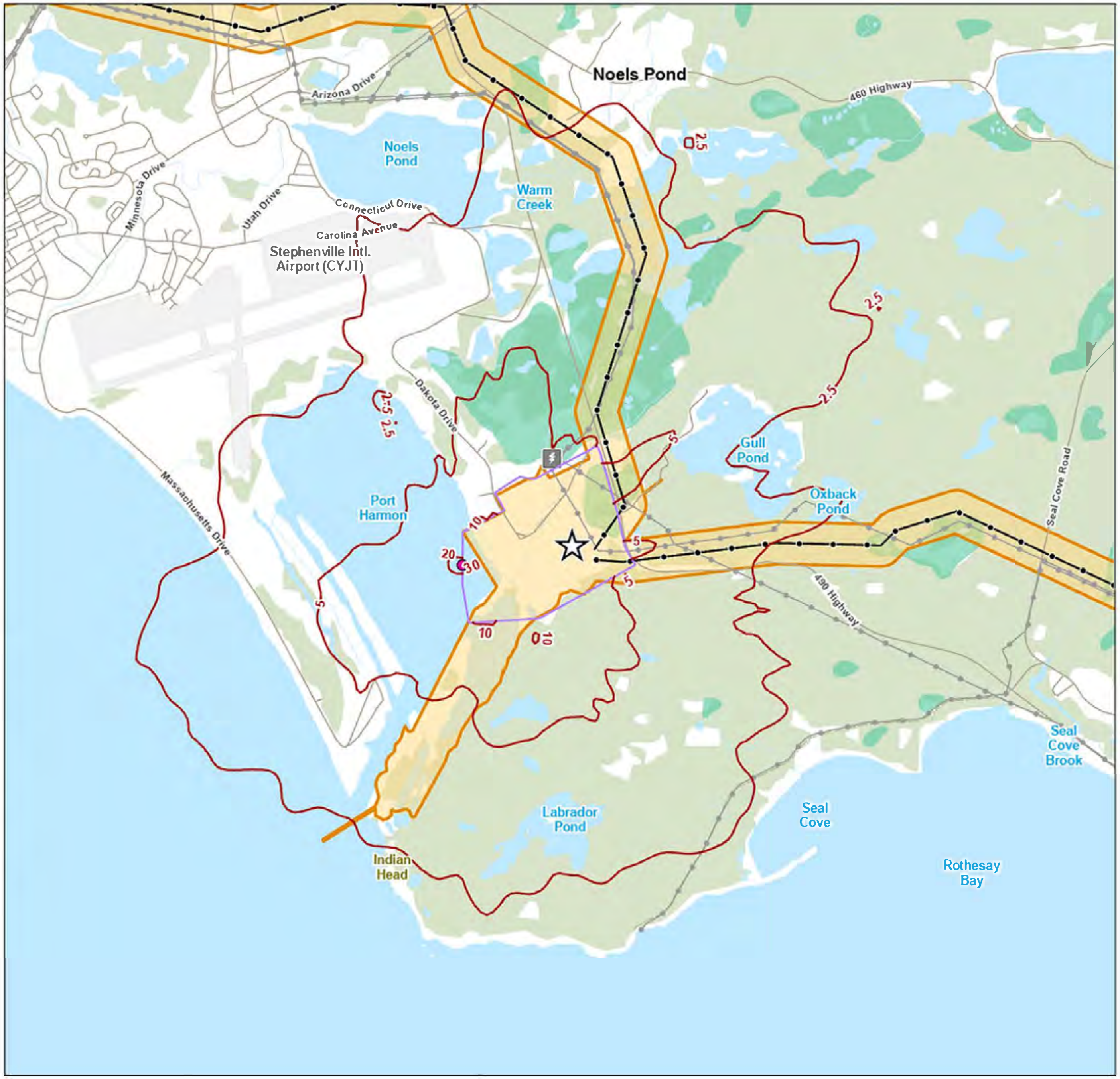
121417233_217

*Figure No.*
**6.7**

Page 1 of 1

**Maximum Concentration**

Revised: 2023-07-28 By: jbryant




Stantec

Maximum Concentration: 46.6 µg/m³ Diesel Particulate Matter, maximum predicted 24-hour concentration without background concentration (Regulatory Limit Not Available)

Modelled Site Boundary

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 1 Kilometres

(At original document size of 8.5x11) 1:50,000

*Notes*

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by JSC on 2023-07-14
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

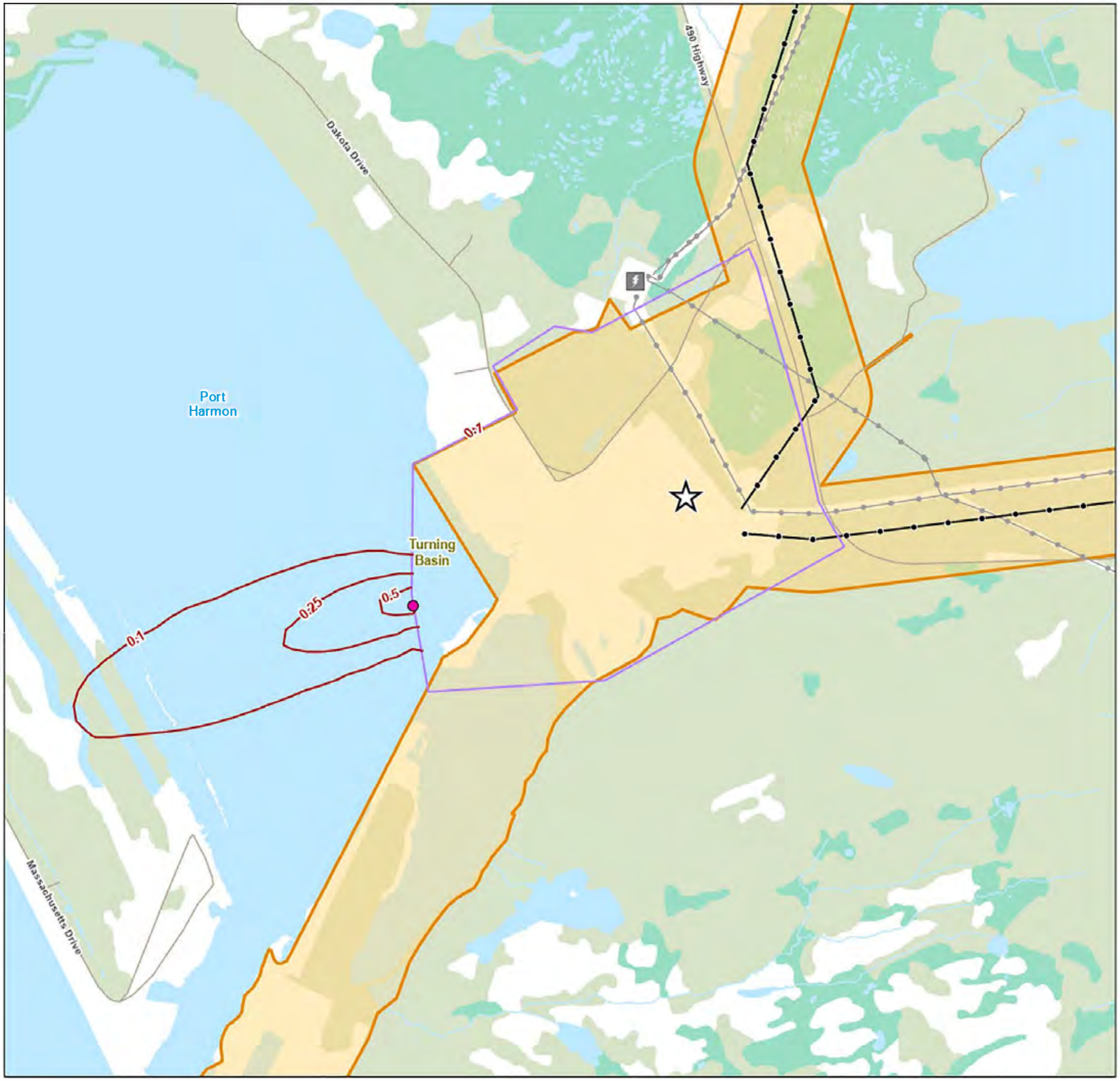
121417233_212

*Figure No.*
**6.8**

Page 1 of 1

**Maximum Concentration**

Revised: 2023-07-28 By: ibryant




Stantec

Maximum Concentration: 0.65 µg/m³

Diesel Particulate Matter, maximum predicted annual concentration without background concentration (Regulatory Limit Not Available)

Modelled Site Boundary

Proposed Project Features

Hydrogen / Ammonia Plant Location

Project Area

Other Features

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 0.4 Kilometres

(At original document size of 8.5x11)
1:20,000

*Notes*
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by JSC on 2023-07-14
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233 _211

*Figure No.*
**6.9**

Page 1 of 1

**Maximum Concentration**

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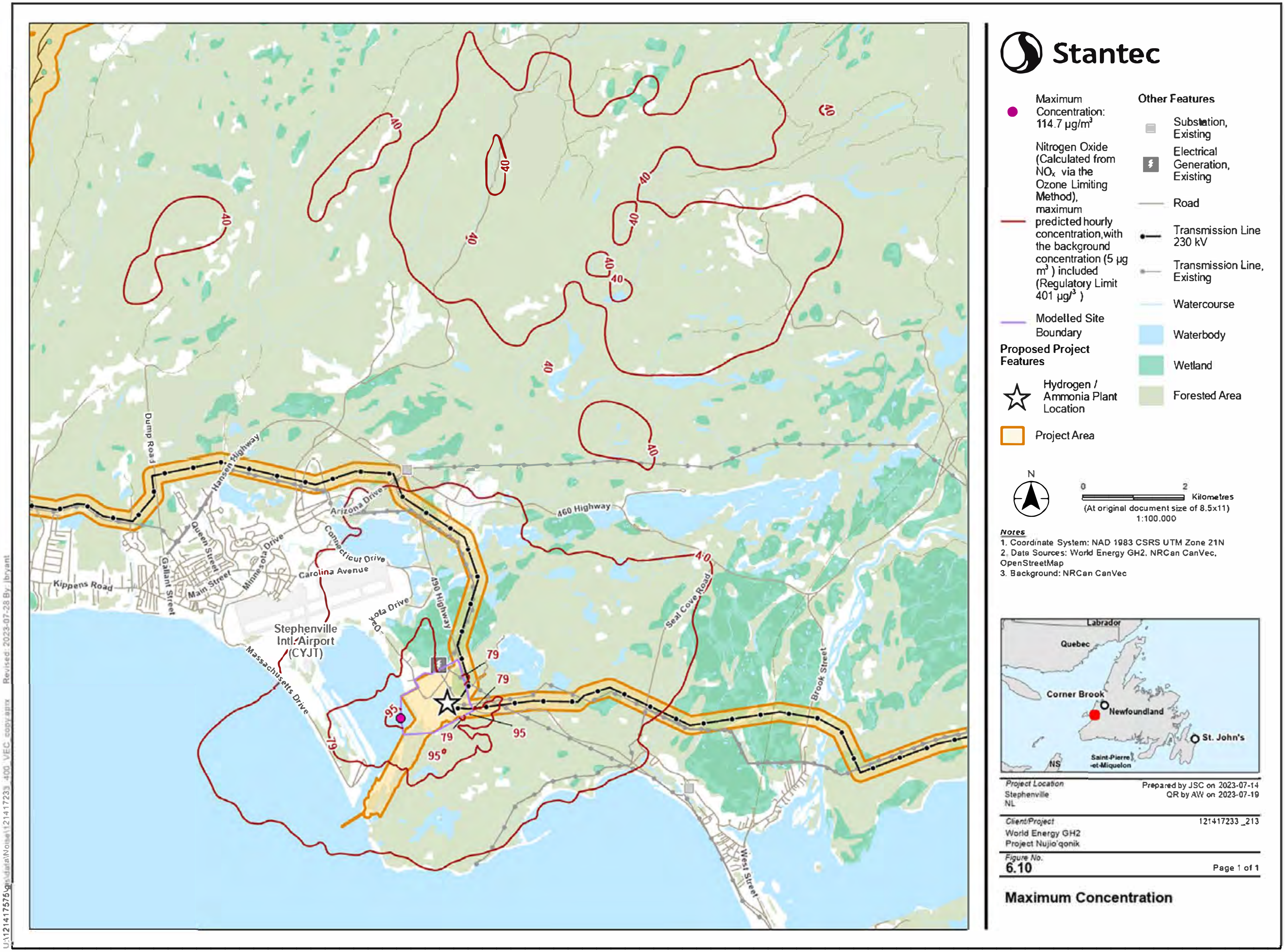


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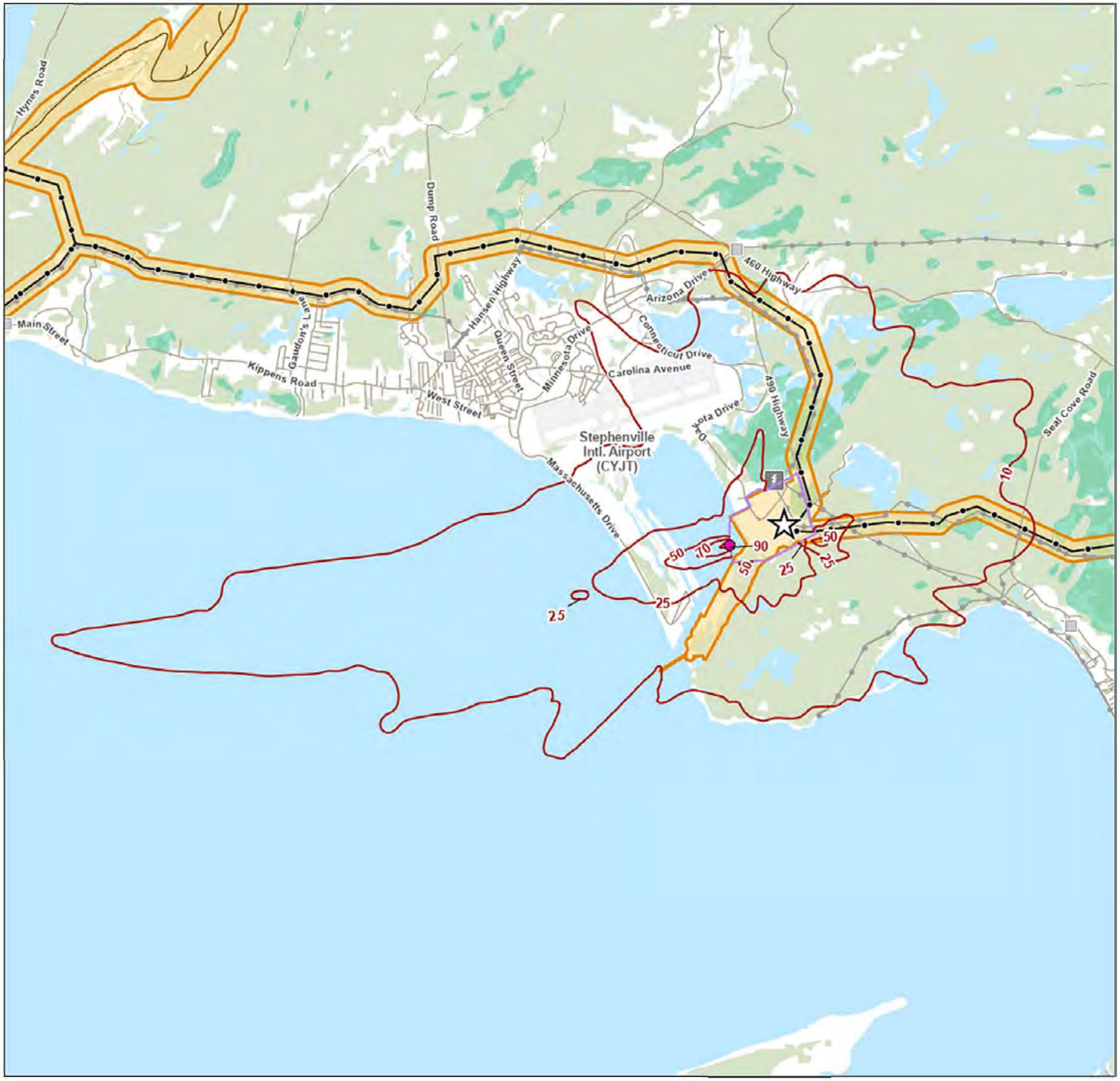



Stantec

Maximum Concentration: 96.3 µg/m³

Nitrogen Oxide (Calculated from $NO_x$ via the Ozone Limiting Method), maximum predicted hourly concentration, with the background concentration (3.8 µg/m³) included (Regulatory Limit 199 µg/m³)

Modelled Site Boundary

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Substation, Existing

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 2 Kilometres
(At original document size of 8.5x11)
1:100,000

*Notes*
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by JSC on 2023-07-14
QR by AW on 2023-07-19

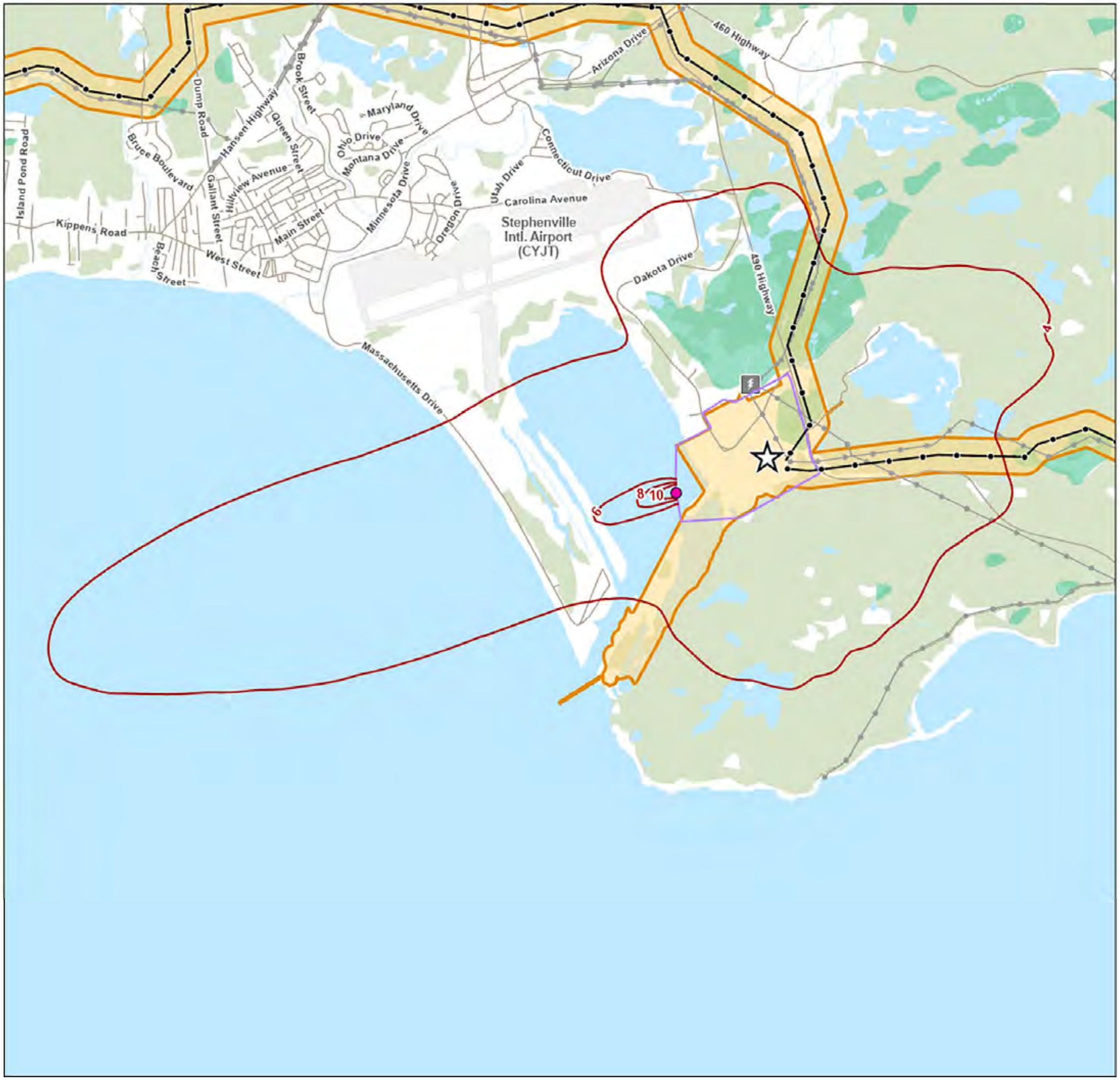
*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_215

*Figure No.*
**6.11**

Page 1 of 1

**Maximum Concentration**




Stantec

Maximum Concentration: 13.6 ug/m³

Nitrogen Oxide (Calculated from $NO_x$ via the Ozone Limiting Method), maximum predicted annual concentration, with the background concentration (3.8 $\mu g/m^3$) included. (Regulatory Limit 100 $\mu g/m^3$)

Modelled Site Boundary

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Electrical Generation, Existing

Road

Transmission Line 230 kV

Transmission Line, Existing

Watercourse

Waterbody

Wetland

Forested Area

N

0 1.2 Kilometres

(At original document size of 8.5x11)
1:60,000

*Notes*
1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec


*Project Location*
Stephenville
NL

Prepared by MER on 2023-07-06
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2 Inc.,
Project Nujio'qonik

121417233_214

*Figure No.*
**6.12**

Page 1 of 1

**Maximum Concentration**

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## Summary

With the implementation of mitigation measures, residual effects from the Project during operation and maintenance on change in air quality are anticipated to be adverse as the Project operation results in a predicted increase of ambient concentrations compared to baseline conditions. The magnitude of residual adverse effects on change in air quality during operation is predicted to be moderate; the Project operation results in predicted ambient concentrations for the various substances of interest and averaging periods that are greater than 10% of baseline concentrations, less than 50% of the AAQC (i.e., low in magnitude), and greater than 50% of the AAQC (i.e., moderate in magnitude). No substances were predicted to exceed their AAQC (i.e., high in magnitude). Residual effects will be limited to the LAA/RAA. The duration for change in air quality during operation is long-term, with the predicted operation-related increase in ambient concentrations continuing through the operation phase (30 years). Residual effects will be continuous, however, some of the emission sources are infrequent, such as the back-up emergency generator and the $NH_3$ flaring events. Ambient concentrations may change with meteorological conditions. The predicted increase in air contaminant concentrations would return to baseline conditions after the end of the operation phase; therefore, effects will be reversible. The ecological / socio-economic context of the LAA/RAA is considered undisturbed; there are relatively minor anthropogenic sources of emissions within the LAA/RAA prior to the Project.

Based on the information above, a summary of residual effects on air quality during the operation and maintenance phase is provided in Table 6-22.

**Table 6.22 Summary of Effects by Project Component During Operation and Maintenance**

| Project Site | Summary of Effect during Operation and Maintenance |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | There are no anticipated residual effects to air quality as a result of the Port au Port wind farm and associated infrastructure as they will not result in direct emissions to atmosphere. |
| Codroy Wind Farm and Associated Infrastructure | There are no anticipated residual effects to air quality as a result of the Codroy wind farm and associated infrastructure as they will not result in direct emissions to atmosphere. |
| 230 kV Transmission Lines and Substations | There are no anticipated residual effects to air quality as a result of the transmission lines and substations as they will have not direct emissions to atmosphere. |
| Hydrogen / Ammonia Production and Storage Facilities | There are moderate adverse effects to air quality as a result of the operation of the hydrogen / ammonia production and storage facilities due to emissions of air contaminants, however, concentrations are predicted to remain below applicable air quality criteria. Some sources of emissions are infrequent (e.g., flare and back-up generator), and as such, their effects will be periodic. |
| Port Facilities | There are moderate adverse effects to air quality as a result of the marine traffic (vessels and tugboats) associated with the operation of the port facilities due to emissions of air contaminants, however, concentrations are predicted to remain below applicable air quality criteria. |

#### 6.7.1.3 Decommissioning and Rehabilitation

The residual environmental effects on air quality during decommissioning and rehabilitation are adverse, as the related activities result in a predicted increase of air contaminant releases compared to baseline conditions. The magnitude is predicted to be low and limited to the LAA/RAA since the release of air contaminants during decommissioning and rehabilitation are typically less than during construction and can be effectively managed through the application of standard operating procedures (SOPs) and best management practices (BMPs). The duration is short term, the frequency is multiple regular events, and the residual effect on change in air quality during decommissioning and rehabilitation is predicted to be reversible as the predicted increase in air contaminant releases would end once rehabilitation is complete. The LAA/RAA in which the changes in air quality are assessed is considered undisturbed, given the limited anthropogenic sources of emissions within the LAA/RAA prior to the Project.

### 6.7.2 Change in GHGs

The main sources of direct GHGs during Project construction include blasting, deforestation/the loss of carbon sinks during land clearing, and off-road mobile and stationary equipment exhaust gases from fossil fuel combustion. During Project operation and maintenance, the direct sources of GHGs include the flare pilot, some fossil fuelled mobile equipment and the limited use of a bio-diesel generator for back-up power when required. These GHG emissions consist primarily of $CO_2$, and smaller amounts of $CH_4$ and $N_2O$. Releases of PFC, HFC, $SF_6$, and $NF_3$ are expected in insubstantial amounts, or not at all, and are therefore not considered further in the assessment.

As per the Provincial EIS Guidelines (Table E.1), the GHG emissions inventory is to also include indirect emissions associated with the consumption of purchased electricity, and GHG emissions by source for activities occurring outside of the Project boundary including purchased services from providers outside the Project boundary (e.g., on-road transportation of the wind turbines and construction equipment, marine transportation of supplies and products, and the transportation of waste). Indirect emissions associated with waste at the landfill were not calculated because they would be small in comparison to other emissions sources. The Project will implement a waste management plan to reduce waste to landfill waste where feasible.

Other indirect GHG emissions associated with upstream sources, such as production of purchased materials and associated upstream transportation and distribution, have not been evaluated for this assessment. No $CO_2$ emissions will be sequestered on-site, exported to a separate site for sequestration, or purchased off-site and sequestered on-site. The Project will also not include substantive GHG emissions from air transportation, or non-combustion and industrial process sources.

The GHG emissions from explosives detonation during construction were estimated using an emission factor (0.189 t $CO_2$ / t explosives) recommended by the Mining Association of Canada (MAC 2014) and based on predicted explosive quantities.

The GHG emissions estimated for deforestation/the loss of carbon sinks during land clearing included two portions: emissions from the carbon stock changes (i.e., the fate/release of the carbon stored in the tree), and the loss of carbon sinks (i.e., the loss of carbon sequestration due to the removal of trees and vegetation). Emissions resulting from deforestation/the loss of carbon sinks will occur during the construction phase. The total area that would be disturbed is estimated to be 4,078 ha, of this approximately 1,584 ha are softwood, 442 ha are hardwood, 2,360 ha are mixed wood, 1,190 ha are unknown forest, and 2,560 ha are wetlands. The area to be cleared includes access road upgrades, the footprint of the transmission line, wind turbine areas, and the hydrogen / ammonia plant area.

The change in greenhouse gases arising from deforestation/the loss of carbon sinks during land clearing are quantified separately from other Project-related GHG emissions. Changes to carbon sinks interrupt the natural process of land that result in the net absorption of carbon from the atmosphere (ECCC 2021). Details and sample calculations of the GHG emissions estimated for land clearing are provided in Appendix 6-C.

Emissions from off-road mobile and stationary equipment were estimated using diesel combustion emission factors from the ECCC NIR (ECCC 2023d) (see Appendix 6-C). The estimated fuel usages were provided by the design team and include fuel consumed in heavy mobile equipment, vehicles, and stationary equipment for land clearing, earth moving activities, and material handling. Emissions from the transportation of the wind turbines (from the port of Stephenville to their final locations for assembly), transportation of waste from the hydrogen / ammonia plant to the landfill, and on-road transportation during operation were also estimated using emission factors from the ECCC NIR (ECCC 2023d) (see Appendix 6-C).

The indirect GHG emissions from electricity consumption during construction and operation were estimated using the 2021 (most recently available) electricity consumption emission factor for NL (0.017 t $CO_2e$/MWh) from the ECCC NIR (ECCC 2023d) and the estimated annual electricity usage at the site (52,000 MWh during the construction period, and 630,000 MWh per year during operations).

Indirect GHG emissions from marine shipping during construction (delivery of turbine and plant components) and operations (shipping of ammonia product to market) were estimated using shipping distances, the tonnage shipped, and emission factors obtained from the International Maritime Organization (IMO) document Fourth Greenhouse Gas Study 2020" (IMO 2020). The emission factors applied were 17.1 $gCO_2e$/tonne-nm shipped (general cargo with size category 10,000-19,999 dwt) and 19.4 $gCO_2e$/tonne-nm shipped (general cargo with size category 5,000-9,999 dwt) during construction and 9.5 $gCO_2e$/tonne-nm (liquified gas tanker with size category 50,000-99,999 $m^3$) during operation. The shipping distance, 2,857 NM, was assumed to be from Hamburg, Germany to the Port of Stephenville for construction deliveries, and the opposite route for product shipping, as noted in Section 2.62 of the Project Description.

GHG Emissions from tugboats for both the construction and operation phases were estimated using mean emission factor (0.8 tonne $CO_2e$/h) sourced from the Fourth IMO GHG Study 2020 (IMO 2020) and the total annual usage time. The number of vessels are as 88 vessels per year during construction and 54 vessels per year during operations. It was assumed that 2 tugs were needed per vessel, and conservatively assumed that they were required during both maneuvering and unloading.

During construction and operation, the emissions generated when marine vessels are in the port loading and unloading (vessel hoteling) were estimated. The activity data includes the number of trips per year per type of vessel, and fuel consumption ratings (L/hour). It is assumed each vessel will be docked at the port for 30 hours during construction and 24 hours during operation. The emission factors for marine diesel from the ECCC NIR (ECCC 2023d) were used in the calculations (see Appendix 6-C).

During operation, one 50 MW biodiesel generator will be used during unplanned grid electrical outages. It is assumed the generator could typically run for 52 hours per year for a total annual power usage of 2,600 MWh. The direct GHG emissions from use of the biodiesel generator were estimated using an emission factor provided by the design team for the biodiesel fuel to be sourced for the Project (27 grams $CO_2$e/MJ).

The facility will have up to 3 flare stacks to combust hydrogen and ammonia in upset conditions. Flaring ammonia would not produce any substantive GHGs as there is no carbon in the fuel. The flares would also combust small amounts of butane to maintain a pilot flame during normal operation. Each pilot would require 0.8 standard $m^3$/hr (30 standard cubic feet per hour [SCFH]) of butane, for a maximum of 90 SCFH for all three flare stacks. The GHG emissions from the flare pilot were calculated using flaring methodology from the ECCC Canada's Greenhouse Gas Quantification Requirements (ECCC 2023c).

Releases of GHG emissions may occur during decommissioning and rehabilitation activities from the combustion of fossil fuels in mobile and stationary equipment. These releases are expected to be lower than those released during construction and operation as additional low GHG emitting and net zero technologies will be available by the time of decommissioning and rehabilitation. As the exact technologies to be used during decommissioning and rehabilitation are not yet defined, GHG emissions during this phase were not quantified.

Emissions of GHGs are expected to be generated throughout the life of the Project at relatively low levels with a goal of net zero by 2050 of sooner. Limited releases of GHGs are expected from the operation of the Project; these releases create a relatively small change in the total GHG releases from NL and Canada. Downstream usages of ammonia will offset the usage of traditional fossil fuels, resulting in a positive impact to global GHG levels (e.g., an overall reduction in global GHG emissions).

#### 6.7.2.1 Construction

The estimated annual GHG emissions (direct and indirect) from Project construction activities are presented in Table 6-23. Sample calculations of the estimated GHG emissions are provided in Appendix 6-C. The direct emissions associated with construction of the Project includes emissions from blasting, and off-road mobile and stationary equipment exhausts. Indirect GHG emissions from construction include the consumption of purchased electricity, on-road transportation of the wind turbines and construction equipment, marine transportation of supplies and products, and the transportation of waste. Approximately 116,181 t $CO_2$e (direct and indirect emissions) are estimated to be released per year during construction, and 290,453 t $CO_2$e (direct and indirect emissions) are estimated to be released during the entire construction period (30 months).

### Table 6.23 Summary of Estimated Annual Construction GHG Emissions

| Activity | Units | $CO_2$ | $CH_4$ | $N_2O$ | Total ($CO_2e$) |
|---|---|---|---|---|---|
| **Direct Scope 1 GHG Emissions** | | | | | |
| Mobile Combustion | t $CO_2e$/y | 40,744 | 31 | 501 | 41,276 |
| Stationary Combustion | t $CO_2e$/y | 2,145 | 1.75 | 4.66 | 2,151 |
| Blasting | t $CO_2e$/y | 756 | - | - | 756 |
| **Indirect Scope 2 GHG Emissions** | | | | | |
| Electricity | t/y | 357 | - | - | 357 |
| **Indirect Scope 3 GHG Emissions** | | | | | |
| Supply Deliveries – Road Transportation of Wind Turbine Components and Construction Equipment/Supplies | t $CO_2e$/y | 48 | 0.05 | 0.71 | 48 |
| Supply Deliveries – Marine Shipping | t $CO_2e$/y | 65,430 | - | - | 65,430 |
| Supply Deliveries – Tug Boats | t $CO_2e$/y | 4,080 | - | - | 4,080 |
| Marine Vessel Unloading and Loading (Hoteling at Port) | t $CO_2e$/y | 2,059 | 5.42 | 14.65 | 2,079 |
| Transportation of Waste | t $CO_2e$/y | 2.70 | 0.00 | 0.04 | 2.75 |
| **Total Annual GHG Emissions** | | | | | |
| **Total Direct GHG Emissions** | t $CO_2e$/y | **43,644** | **33** | **506** | **44,183** |
| **Total Indirect GHG Emissions** | t $CO_2e$/y | **71,977** | 5 | 15 | **71,998** |
| **Total GHG Emissions (Direct + Indirect)** | t $CO_2e$/y | **115,621** | 38 | 522 | **116,181** |

The change in carbon sequestration from land clearing and deforestation were also assessed, considering two different components: the carbon sinks impact (CSI), and the change in carbon stock. The estimated CSI values are presented in Table 6-24.

### Table 6.24 Caron Sink Impact Results

| Ecological Landscape | Carbon Sink Impact | |
|---|---|---|
| | T C | T $CO_2$ [1] |
| Forrest Land (Hardwood and Softwood) | -5,135 | -18,826 |
| Wetlands | -8,448 | -30,958 |
| Total | -13,583 | -49,784 |

Note:
[1] If the carbon sequestered was only $CO_2$, this is the amount of $CO_2e$ that the CSI would have

The CSI for the Project from disturbance of Forest Land and Wetlands is negative 13,583 t C. That is, because of the Project, approximately 13,583 tonnes of carbon may not be removed from the atmosphere once the forested and wetlands land is removed. The estimation of CSI uses the assumption that the forested and wetland land will be completely disrupted during the Project's lifetime. When this is compared to a $CO_2$ equivalency, it is approximately -49,784 $CO_2$ unable to be sequestered (over the next 100-years). Sample calculations of the estimated CSI are provided in Appendix 6-C.

The change in carbon stock from converting forest land, grass land, and wetlands to settlements is presented in Table 6-25, split by the portion assumed to be burned versus not-burned. The total amount of $CO_2$ emissions from land-use conversions related to carbon-stock changes are estimated to be 157,904 tonnes $CO_2e$ annually, in which 102,397 tonnes $CO_2e$ are related to burning of the trees/biomass, and 55,507 tonnes $CO_2e$ are related to the unburned portion. Sample calculations of the estimated GHG emissions are provided in Appendix 6-C.

### Table 6.25 Summary of Estimated Annual Construction GHG Emissions from Land-Use Changes

| Activity | Units | Carbon | $CO_2$ | $N_2O$ | $CH_4$ | $CO_2e$ |
|---|---|---|---|---|---|---|
| Carbon Stock Change – Unburned | tonnes | - | -55,507 | - | - | -55,507 |
| Carbon Stock Change – Burned Trees/Biomass | tonnes | - | -88,389 | -358 | -15 | -102,397 |
| **Total** | tonnes | - | -143,895 | -358 | -15 | -157,904 |

The contribution of the annual Project construction GHG emissions (direct and indirect) to provincial and federal totals are presented in Table 6-26. These GHG emissions used in these comparisons do not include emissions from land clearing as the provincial and federal reported emissions do not include emissions from land use change (ECCC 2021). The construction of the Project (direct and indirect emissions) contributes approximately 1.4% and 0.02% to annual provincial and national GHG emissions, respectively. Direct emissions from the construction of the Project contribute approximately 0.5 and 0.01% to annual provincial and national GHG emissions, respectively.

**Table 6.26 Estimated Contribution of Annual Construction GHG Emissions to Provincial and National Totals**

| Parameter | Units | $CO_2$ | $CH_4$ | $N_2O$ | Total ($CO_{2e}$) |
|---|---|---|---|---|---|
| Annual Construction GHG Emissions (Direct) | kt $CO_2$e/y | 44 | 0.03 | 0.51 | 44 |
| Annual Construction GHG Emissions (Indirect) | kt $CO_2$e/y | 72 | - | 0.001 | 72 |
| Annual Construction GHG Emissions (Direct + Indirect) | kt $CO_2$e/y | 116 | 0.03 | 0.51 | 116 |
| NL GHG Emissions [(1)(2)] | kt $CO_2$e/y | 7,314 | 727 | 105 | 8,336 |
| National GHG Emissions [(1)(2)] | kt $CO_2$e/y | 537,174 | 90,510 | 30,231 | 670,428 |
| Annual Project Construction Contribution (Direct) to NL GHG Emissions | % | 0.6% | 0.005% | 0.5% | **0.5%** |
| Annual Project Construction Contribution (Direct) to National GHG Emissions | % | 0.01% | <0.001% | 0.002% | **0.01%** |
| Annual Project Construction Contribution (Direct + Indirect) to NL GHG Emissions | % | 1.6% | 0.005% | 0.5% | **1.4%** |
| Annual Project Construction Contribution (Direct + Indirect) to National GHG Emissions | % | 0.02% | <0.001% | 0.002% | **0.02%** |

Notes:
(1) Provincial and national GHG emission totals include emissions from the following sectors: energy, industrial processes and product use, agriculture, and waste. The GHG emissions totals include other fluorinated GHGs
(2) Provincial and national GHG emission totals are from ECCC 2023d

### Summary

With the implementation of mitigation measures, residual effects from the Project during construction on change in GHGs are anticipated to be adverse and low in magnitude (i.e., direct and indirect emissions are less than 1.4% of provincial and national GHG totals during the construction period). Note that some of the indirect emissions would occur beyond NL and Canadian borders so it is conservative to compare them to the NL and Canadian totals. The geographic extent for change in GHGs during construction is not applicable as the effects are expected to occur within the global area under the Earth's atmosphere. During construction, residual effects are expected to be short-term (i.e., the 30 months of construction) and regular event as GHG emissions will occur regularly during the construction phase. The residual effect is considered irreversible as effects related to the release of GHG emissions from project construction would not be reversible for decades. Based on the information above, a summary of residual effects on GHGs during the construction phase is provided in Table 6-27.

### Table 6.27 Summary of Effects by Project Component During Construction

| Project Site | Summary of Effect during Construction |
|---|---|
| Temporary Workforce Accommodations | Residual effects anticipated to be limited; GHG emissions will result from the use of electricity at the temporary workforce accommodations. Small amounts of GHGs during construction of the temporary workforce accommodations are expected. |
| Port au Port Wind Farm and Associated Infrastructure | Residual effects to changes in GHGs during construction of the Port au Port wind farm and associated infrastructure will be caused by the release of GHGs from combustion of fuel in vehicles (transportation of turbine components and construction supplies), the combustion of fuel in heavy equipment, and blasting. These effects will be adverse, low in magnitude, and create a relatively small change in the total GHG releases from NL and Canada. |
| Codroy Wind Farm and Associated Infrastructure | Residual effects to changes in GHGs during construction of the Port au Port wind farm and associated infrastructure will be caused by the release of GHGs from combustion of fuel in vehicles (transportation of turbine components and construction supplies), the combustion of fuel in heavy equipment, and blasting. These effects will be adverse, low in magnitude, and create a relatively small change in the total GHG releases from NL and Canada. |
| 230 kV Transmission Lines and Substations | Residual effects to changes in GHGs during construction of the transmission lines and substations will be caused by the release of GHGs from combustion of fuel in heavy equipment, and blasting. These effects will be adverse, low in magnitude, and create a relatively small change in the total GHG releases from NL and Canada. |
| Hydrogen / Ammonia Production and Storage Facilities | Residual effects to changes in GHGs during construction of the hydrogen / ammonia production and storage facilities will be caused by the release of GHGs from combustion of fuel in heavy equipment. These effects will be adverse, low in magnitude, and create a relatively small change in the total GHG releases from NL and Canada. |
| Port Facilities | Residual effects to changes in GHGs during construction of the port facilities will be caused by the release of GHGs from combustion of fuel in heavy equipment. These effects will be adverse, low in magnitude, and create a relatively small change in the total GHG releases from NL and Canada. |

#### 6.7.2.2 Operation and Maintenance

The estimated annual GHG emissions (direct and indirect) from Project operation activities are presented in Table 6-28. Sample calculations of the estimated GHG emissions are provided in Appendix 6-C. The GHG emissions for operation and maintenance were conservatively estimated to last for the entire Project life of 30 years. However, GHG emissions are likely to decline over time due to advancements in technology including those discussed in the Net Zero Plan (Section 6.6.1).

The direct emissions associated with operation of the facility include the flare pilot, mobile equipment and the infrequent use of bio-diesel generator for back-up power. These result in 930 t $CO_2e$ per year, which is below the MGGA threshold of 15,000 t $CO_2e$ per year for BACT requirements (see). Indirect GHG emissions from construction include the consumption of purchased electricity, and emissions associated with marine transportation. Approximately 103,407 t $CO_2e$ (direct and indirect emissions) are estimated to be released per year during operation, and 3,069,288 t $CO_2e$ (direct and indirect) are estimated to be released during the life of the Project (30 years) if emission intensities from activities remain consistent. These emissions are mainly from marine shipping.

## Table 6.28 Summary of Estimated Annual Operation GHG Emissions

| Activity | Units | $CO_2$ | $CH_4$ | $N_2O$ | Total ($CO_2e$) |
|---|---|---|---|---|---|
| **Direct Scope 1 GHG Emissions** | | | | | |
| Biodiesel Generator | t $CO_2e$/y | 253 | - | - | 253 |
| Flare Pilot | t $CO_2e$/y | 162 | - | 0.39 | 162 |
| Mobile Combustion | t $CO_2e$/y | 504 | 0.36 | 11 | 515 |
| **Indirect Scope 2 GHG Emissions** | | | | | |
| Electricity | t $CO_2e$/y | 10,710 | - | - | 10,710 |
| **Indirect Scope 3 GHG Emissions** | | | | | |
| Marine Shipping | t $CO_2e$/y | 88,321 | - | - | 88,321 |
| Tug Boats | t $CO_2e$/y | 2,246 | - | - | 2,246 |
| Marine Vessel Unloading and Loading (Hoteling at Port) | t $CO_2e$/y | 1,192 | 2.1 | 5.7 | 1,200 |
| **Total** | | | | | |
| **Total Direct GHG Emissions** | **t $CO_2e$/y** | **919** | **0.36** | **11** | **930** |
| **Total Indirect GHG Emissions** | **t $CO_2e$/y** | **102,469** | **2.1** | **5.7** | **102,477** |
| **Total GHG Emissions (Direct + Indirect)** | **t $CO_2e$/y** | **103,388** | **2.5** | **17.0** | **103,407** |

Although marine shipping emissions are not directly controlled by WEGH2 (Scope 3 emissions), it is expected that these will decline over time as new lower GHG emitting vessels become standard and will potentially be fueled by hydrogen or ammonia. The IMO has emission reduction targets set to reduce marine shipping emissions overtime, with the goal of reaching net-zero by 2050 (IMO 2023). These targets include reducing GHG carbon intensities from international shipping by at least 40% by 2030, compared to 2008, and to reduce the total annual GHG emissions from international shipping by at least 70% by 2040, compared to 2008. When these reductions are considered, the annual marine shipping GHG releases are estimated to decline from 88,321 t $CO_2e$/year to 49,869 t $CO_2e$ by 2030, down to 22,164 t $CO_2e$/year in 2040, and eventually down to 0 t $CO_2e$ as international marine shipping approaches net-zero (target for 2050).

Downstream use of the ammonia produced by the operation of the Project would also be considered to influence global GHG emissions as it is expected to offset the use of fossil fuels and combustion of hydrogen or ammonia does not directly produce any greenhouse gases. The emissions offset estimated is not presented in the table above for conservatism however an estimate has been completed assuming all the Project's production will offset the usage of traditional fossil fuels, resulting in a positive change to global GHG levels. The Project is expected to produce 360,000 tonnes of ammonia per year; and in consideration of the energy content of ammonia and natural gas, the equivalent volume of natural gas is approximately 213,160,000 $m^3$. The GHG emissions resulting from the combustion of this volume of natural gas would be approximately 411,135 t $CO_2e$ per year. In consideration of this, the Project is estimated to result in a net-reduction in global GHG emissions of 307,728 $tCO_2e$ per year (considering the estimated offset from natural gas and total direct and indirect Project annual emissions). The net reduction would be larger if the Project product were to offset a more carbon intensive fuel such as fuel oil or coal.

The net-reduction in global GHG emissions would increase over time as marine shipping and other Project sources of GHG emissions become less carbon-intensive, with the goal of reaching a net-reduction in global GHG emissions of 411,135 t $CO_2e$ by 2050. In consideration of the direct and indirect GHG emissions quantified, an overall reduction in global GHG emissions is expected.

The contribution of the annual Project operation GHG emissions (direct and indirect) to provincial and federal totals are presented in Table 6-29. The operation of the Project (direct and indirect emissions) contributes approximately 1.2% and 0.02% to annual provincial and national GHG emissions, respectively. The majority of these emissions are related to marine shipping of product. Direct emissions from the operation of the Project are considered negligible, with contributions of approximately 0.01% and <0.001% to annual provincial and national GHG emissions, respectively.

**Table 6.29 Estimated Contribution of Annual Operation GHG Emissions to Provincial and National Totals**

| Parameter | Units | $CO_2$ | $CH_4$ | $N_2O$ | Total ($CO_{2e}$) |
|---|---|---|---|---|---|
| Annual Operation GHG Emissions (Direct) | kt $CO_2e$/y | 1 | 0.0004 | 0.011 | 0.9 |
| Annual Operation GHG Emissions (Indirect) | kt $CO_2e$/y | 102 | 0.0021 | 0.0057 | 102 |
| Annual Operation GHG Emissions (Direct + Indirect) | kt $CO_2e$/y | 103 | 0.0025 | 0.017 | 103 |
| NL GHG Emissions [(1)(2)] | kt $CO_2e$/y | 7,314 | 727 | 105 | 8,336 |
| National GHG Emissions [(1)(2)] | kt $CO_2e$/y | 537,174 | 90,510 | 30,231 | 670,428 |
| Annual Project Operation Contribution (Direct) to NL GHG Emissions | % | 0.01% | <0.001% | 0.01% | 0.01% |
| Annual Project Operation Contribution (Direct) to National GHG Emissions | % | <0.001% | <0.001% | <0.001% | <0.001% |
| Annual Project Operation Contribution (Direct + Indirect) to NL GHG Emissions | % | 1.4% | <0.001% | 0.02% | 1.2% |
| Annual Project Operation Contribution (Direct + Indirect) to National GHG Emissions | % | 0.02% | <0.001% | <0.001% | **0.02%** |

Notes:
(1) Provincial and national GHG emission totals include emissions from the following sectors: energy, industrial processes and product use, agriculture, and waste. The GHG emissions totals include other fluorinated GHGs
(2) Provincial and national GHG emission totals are from ECCC 2023d

### Summary

With the implementation of mitigation measures, residual effects from the Project during operation and maintenance on change in GHGs are anticipated to be adverse and low in magnitude (i.e., direct and indirect emissions are less than 1.2% of provincial and national GHG emissions). The geographic extent for change in GHGs during construction is not applicable as the effects are expected to occur within the global area under the Earth's atmosphere. During operation and maintenance, residual effects are expected to be medium-term and continuous as GHG emissions will occur continuously during the operations phase. The residual effect is considered irreversible as effects related to the release of GHG emissions from Project operation would not be reversible for decades. Based on the information above, a summary of residual effects on GHGs during the operation and maintenance phase is provided in Table 6-30.

**Table 6.30 Summary of Effects by Project Component During Operation and Maintenance**

| Project Component | Summary of Effect during Operation and Maintenance |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | There are no anticipated residual effects to the change in GHGs as a result of operating the Port au Port wind farm and associated infrastructure as no releases to atmosphere are expected. Maintenance of the Port au Port wind farm and associated infrastructure may have limited releases from vehicle and/or equipment exhaust. |
| Codroy Wind Farm and Associated Infrastructure | There are no anticipated residual effects to the change in GHGs as a result of operating the Codroy wind farm and associated infrastructure as no releases to atmosphere are expected. Maintenance of the Codroy wind farm and associated infrastructure may have limited releases from vehicle and/or equipment exhaust. |
| 230 kV Transmission Lines and Substations | There are no anticipated residual effects to the change in GHGs as a result of operating the transmission lines and substations as no releases to atmosphere are expected. Maintenance of the transmission lines and substations may have limited releases from vehicle and/or equipment exhaust. |
| Hydrogen / Ammonia Production and Storage Facilities | Small releases to atmosphere are expected from the flare pilot and generator, which will be used in upset or emergency conditions. |
| Port Facilities | The GHG emissions associated with the port, including marine vessel shipping and associated tug boats, and vessel loading and unloading at the port (hoteling) are considered other indirect emissions. No direct emissions are expected from operation or the port facilities. |

#### 6.7.2.3 Decommissioning and Rehabilitation

The residual environmental effects on GHGs during decommissioning and rehabilitation are adverse, as the related activities result in a predicted increase of air contaminant releases compared to baseline conditions. The magnitude is predicted to be low and limited to the LAA/RAA since the release of GHGs during decommissioning and rehabilitation are typically less than during construction and operation and can be effectively managed through the application of standard operating procedures (SOPs) and best management practices (BMPs). The duration is short-term, the frequency is multiple regular event, and the residual effect on change in GHGs during decommissioning and rehabilitation is predicted to be irreversible as effects related to the release of GHG emissions from Project activities would not be reversible for decades.

### 6.7.3 Change in Light

Details from the light guidelines are presented in Section 6.2.3 because Project lighting will be designed using the recommended minimum lighting levels provided by the Illuminating Engineering Society (IES) of North America's IES Lighting Handbook for outdoor worksite lighting, in consideration of the CIE criteria, or other standards acceptable to the minister, as required by the NL Occupational Health and Safety Regulations (Section 6.6).

#### 6.7.3.1 Construction

Construction activities will mostly occur during daytime hours, therefore Project-related lighting during nighttime will be limited. The use of mobile artificial lighting may occur for short periods of time (i.e., in the fall and winter) when there is less daylight during the workday. Since the design of the Project is not complete, the number of mobile artificial lighting units and their locations, are currently unknown. However, it is probable that such equipment will be used throughout the Project Area, where construction and infrastructure installation activities will occur. The use of nighttime lighting will be limited and mitigated by using directional lighting.

By implementing mitigation, the levels of light trespass and glare from mobile artificial lighting units are not expected to exceed CIE guidelines for receptor locations within a kilometre of the light source. Mitigation measures would also control light emissions that may contribute to sky glow, and so it is expected that sky glow levels would be similar to baseline conditions during project construction.

##### Summary

With the implementation of mitigation measures, residual effects from the Project during construction on change in light are anticipated to be low in magnitude. Project effects on light are expected to occur within the Project Area. During construction, residual effects are expected to be short-term and regular in frequency. Based on the information above, a summary of residual effects on light during the construction phase is provided in Table 6-31.

### Table 6.31 Summary of Effects by Project Component During Construction

| Project Site | Summary of Effect during Construction |
|---|---|
| Temporary Workforce Accommodations | The effects on light during construction of the temporary workforce accommodations during nighttime will be limited, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |
| Port au Port Wind Farm and Associated Infrastructure | The effects on light during construction of the Port au Port wind farm and associated infrastructure during nighttime will be limited, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |
| Codroy Wind Farm and Associated Infrastructure | The effects on light during construction of the Codroy wind farm and associated infrastructure during nighttime will be limited, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |
| 230 kV Transmission Lines and Substations | The effects on light during construction of the transmission lines and substations during nighttime will be limited, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |
| Hydrogen / Ammonia Production and Storage Facilities | The effects on light during construction of the hydrogen / ammonia production and storage facilities during nighttime will be limited, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |
| Port Facilities | The effects on light during construction of the Port Facilities during nighttime will be limited. The use of mobile artificial lighting, and is not expected to increase beyond the CIE guidelines for dark, rural environmental zone. |

### 6.7.3.2 Operation and Maintenance

During operation, there will be nighttime safety lighting for the Project buildings, navigation lighting for the wind turbines, and lighting for vehicle parking lots and access roads within the Project Area. Since the design of the Project is not complete, the number, type and locations of lights, are currently unknown. However, the final lighting design will be developed using the minimum lighting levels recommended by the Illuminating Engineering Society (IES) of North America's IES Lighting Handbook for outdoor worksite lighting, and in consideration of the CIE guidelines. Light trespass and glare will be reduced where practicable using full cut-off luminaires to focus light on work areas. Navigation light fixtures will likely follow design standards issued by Transport Canada that balance safety needs for aviation with obtrusive impacts from facility lighting (Transport Canada 2021).

By implementing mitigation, the levels of light trespass and glare are expected to be maintained below the CIE guidelines within a kilometre of project lighting sources. Adherence to mitigation measures related to full cut-off fixtures and other design approaches are expected to limit sky glow contributions. It is therefore expected that sky glow levels will remain close to baseline levels during project operation.

#### Summary

With the implementation of mitigation measures, residual effects from the Project during operation and maintenance on change in light are anticipated to be low. Project effects on light are expected to occur within the Project Area. During operation and maintenance, residual effects are expected to be short-term and regular in frequency. Based on the information above, a summary of residual effects on light during the operation and maintenance phase is provided in Table 6-32.

**Table 6.32 Summary of Effects by Project Component During Operation and Maintenance**

| Project Site | Summary of Effect during Operation and Maintenance |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | Nighttime safety lighting will be used for Port au Port wind farm and associated infrastructure including buildings, parking lots and roads. The final lighting design is not expected to increase lighting beyond the CIE guidelines for low, sparsely inhabited rural areas. |
| Codroy Wind Farm and Associated Infrastructure | Nighttime safety lighting will be used for Codroy wind farm and associated infrastructure including buildings, parking lots and roads. The final lighting design is not expected to increase lighting beyond the CIE guidelines for low, sparsely inhabited rural areas. |
| 230 kV Transmission Lines and Substations | Nighttime safety lighting will be used for buildings, parking lots and roads associated with the transmission lines and substations. The final lighting design is not expected to increase lighting beyond the CIE guidelines for low, sparsely inhabited rural areas. |
| Hydrogen / Ammonia Production and Storage Facilities | Nighttime safety lighting will be used for buildings, parking lots and roads at the hydrogen / ammonia production and storage facilities. The final lighting design is not expected to increase lighting beyond the CIE guidelines for low, sparsely inhabited rural areas. |
| Port Facilities | Nighttime safety lighting will be used for buildings, parking lots and roads associated with the port facilities. The final lighting design is not expected to increase lighting beyond the CIE guidelines for low, sparsely inhabited rural areas. |

### 6.7.3.3 Decommissioning and Rehabilitation

The residual environmental effects on light during decommissioning and rehabilitation are adverse, as the related activities result in a predicted increase of light compared to baseline conditions. The magnitude is predicted to be low and limited to the Project Area since the use of light during decommissioning and rehabilitation are typically less than during construction and operation and can be effectively managed through the application of standard operating procedures (SOPs) and best management practices (BMPs). The duration is short term, the frequency is multiple regular event, and the residual effect on change in light during decommissioning and rehabilitation is predicted to be reversible as the predicted increase in light would end once rehabilitation is complete. The LAA/RAA in which the changes in light are assessed is considered undisturbed, given the limited development (anthropogenic sources of light) within the LAA/RAA prior to the Project.

## 6.7.4 Residual Environmental Effects Summary

### 6.7.4.1 Residual Environmental Effects Characterization

Table 6.33 summarizes the predicted environmental effects (residual effects) of the Project on the Atmospheric Environment.

### Table 6.33 Summary of Predicted Environmental Effects of the Undertaking on the Atmospheric Environment

| Residual Effect | Residual Effects Characterization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Nature | Magnitude | Geographic Extent | Timing | Duration | Frequency | Reversibility | Ecological and Socio-economic Context |
| **Construction** | | | | | | | | |
| Change in Air Quality | A | M | LAA/RAA | NS | ST | R | R | U |
| Change in GHGs | A | L | Global | NS | ST | R | I | U |
| Change in Light | A | L | LAA/RAA | NS | ST | R | R | U |
| **Operation and Maintenance** | | | | | | | | |
| Change in Air Quality | A | M | LAA/RAA | NS | MT | C | R | U |
| Change in GHGs | A | L | Global | NS | MT | C | I | U |
| Change in Light | A | L | LAA/RAA | NS | ST | R | R | U |
| **Decommissioning and Rehabilitation** | | | | | | | | |
| Change in Air Quality | A | L | LAA/RAA | NS | ST | R | R | U |
| Change in GHGs | A | L | Global | NS | ST | R | I | U |
| Change in Light | A | L | LAA/RAA | NS | ST | R | R | U |

**KEY:**

***Nature:***
*P: Positive*
*A: Adverse*
*N: Neutral*

***Magnitude:***
*N: Negligible*
*L: Low*
*M: Moderate*
*H: High*

***Geographic Extent:***
*PA: Project Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Duration:***
*ST: Short-term*
*MT: Medium-term*
*LT: Long-term*

***Timing:***
*NS: No Sensitivity*
*MS: Moderate Sensitivity*
*HS: High Sensitivity*

***Frequency:***
*S: Single Event*
*IR: Irregular Event*
*R: Regular Event*
*C: Continuous*

***Reversibility:***
*R: Reversible*
*I: Irreversible*

***Ecological / Socio-Economic Context:***
*D: Disturbed*
*U: Undisturbed*

#### 6.7.4.2 Summary of Predicted Environmental Effects

Air contaminant emissions are expected to be generated throughout the lifetime of the Project, creating an adverse environmental effect on air quality. During construction and decommission and rehabilitation, the emissions are generated mainly from fuel combustion in mobile equipment and stationary equipment, blasting, and fugitive dust generated from material transfers, stockpiles and unpaved roads. Best management practices will be taken to control emissions of dust during construction and decommissioning to avoid significant environmental effects. On-going monitoring during construction, and adaptive management if needed, will be applied to reduce and manage the magnitude of effects.

An adverse change in air quality is predicted from the operation of the Project, however, it is not predicted that air quality criteria will be exceeded due to the Project operations, even with conservative assumptions. Based on annual predicted concentrations, air quality surrounding the Project is expected to remain well below ambient air quality criteria most of the time, and below the criteria at all times.

Emissions of GHGs are expected to be generated throughout the life of the Project at relatively low levels with a goal of net zero by 2050 or sooner. During construction, and decommissioning, direct GHG emissions are generated mainly from fuel combustion in vehicles, heavy equipment, and blasting. While these effects will be adverse, they are low in magnitude and create a relatively small change in the total GHG releases from NL and Canada. Indirect GHG emissions are expected from marine shipping and transportation, along with electricity usage. Although marine shipping emissions are not directly controlled by WEGH2, it is expected that these will decline over time as new lower GHG emitting vessels become standard, potentially fuelled by hydrogen or ammonia. The revised IMO GHG Strategy includes an ambition to reach net-zero GHG emissions from international shipping close to 2050, a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030 (IMO 2023).

Limited releases of GHGs are expected from the operation of the Project, associated with the flare pilot and the back-up generator, along with indirect emissions from marine vessel shipping and other transportation methods. These releases are low in magnitude and create a relatively small change in the total GHG releases from NL and Canada. Downstream usages of the ammonia will offset usage of traditional fossil fuels, resulting in a positive impact to global GHG levels.

Changes in light levels are expected throughout the lifetime of the Project. International lighting criteria will be followed such that the final change in lighting during any phase of the Project will not result in an increase in lighting beyond the CIE guidelines for low, sparsely inhabited rural areas.

# 6.8 Determination of Significance

## Air Quality

The construction, operation, and decommissioning phases of the Project will result in air contaminant emissions; however, the magnitudes of the releases will be limited and well managed.

Construction related emissions (primarily dust from site preparation and material handling as well as combustion gases from equipment) can temporarily decrease air quality; however, with the implementation of mitigation, on-going monitoring during construction, and adaptive management if needed, the change in air quality is not expected to be substantive.

The potential change to air quality in the LAA/RAA during operation was assessed by predicting ground-level concentrations from the modelling of Project-related releases combined with measured background concentrations and compared against ambient air quality criteria.

The combined concentrations for the air contaminants modelled (due to Project related air contaminant releases combined with measured ambient background concentrations) were below the adopted ambient air quality standards outside the hydrogen / ammonia plant boundary, including at the sensitive receptors that were assessed.

With the implementation of mitigation and environmental protection measures as described in this assessment and based on the results of the dispersion modelling (for operation) and characterization of residual effects in Section 6.7.1, residual environmental effects on air quality during the construction, operation, and decommissioning phases of the Project are predicted to be not significant.

The level of confidence in this prediction is Discussed in Section 6.9.

## Greenhouse Gases

Provincial and federal policies and regulations do not identify specific thresholds or standards for determining significance when assessing the residual effects of a single Project's GHG emissions. The primary criterion used to assess significant effects of Project-related changes in GHG emissions is magnitude. The GHG emissions from the Project are compared to provincial and national GHG inventories to establish a context for the magnitude of emissions following the Strategic Assessment of Climate Change (ECCC 2021) guidance.

As described in Section 6.5.3, the Project GHG emission contributions will be ranked as low, moderate or high as presented in the magnitude definition of Table 6-11.

The Project GHG emissions during construction and operation represent a small contribution to provincial and national GHG emissions. On the maximum annual basis, the direct construction emissions contribute approximately 0.5% and 0.01% to provincial and national emission totals, respectively. The direct operation emissions contribute approximately 0.01% and <0.01% to provincial and national emission totals, respectively. This is without consideration of downstream emissions reductions which are estimated at 411,135 t $CO_2e$ per year, assuming the product offsets natural gas combustion.

The Project emissions are ranked as low in magnitude during construction and operation. Based on these results and the characterization of residual effects in Section 6.7.2, the residual environmental effects from the Project on GHG emissions are predicted to be not significant.

The level of confidence in this prediction is Discussed in Section 6.9.

### Lighting

As defined in Section 6.5.2, a significant environmental effect on lighting is defined as an increase in Project related light emissions such that the CIE guidelines for light trespass and glare in a suburban environment are exceeded and sky glow levels would be altered toward those of an urban environment.

With the proposed mitigation (Section 6.6), an increase in Project-related light emissions (light trespass and glare) is not likely to exceed the criteria in Section 6.2.3 for a suburban environment. Based on this light assessment, the levels of light trespass and glare will be maintained at levels representative of a rural environment provided the Light Design for the Project incorporates guidance from IES and CIE. With proper design, existing levels of sky glow will also be maintained at levels representative of rural areas beyond the Project Area. Therefore, residual effects are predicted to be not significant.

The level of confidence in this prediction is Discussed in Section 6.9.

## 6.9 Prediction Confidence

### Air Quality

The air quality assessment depends on evaluation of the effects of proposed mitigation as well as on air quality dispersion models to link emissions (the releases of air contaminants to the atmosphere) to changes in ambient air quality. The model predictions depend on the representativeness of the sources and the associated emissions inventory, the meteorological conditions used in the model, and the algorithms used to represent atmospheric physics and chemistry processes in the models.

The overall approach for the air quality assessment is considered conservative as the inputs used in the assessment are expected to result in higher and more frequent emissions and predicted ambient concentrations than what will actually occur. The conditions are considered in the assessment to predict a conservatively higher change in air quality as a result of the Project. Generally, dispersion model inputs are based on maximum quantities of air contaminants potentially released to the atmosphere from the Project. These are assumed to occur continuously over the period of the model run to identify / establish the potential maximum short-term concentrations that might occur. Therefore, the results of the assessment are considered to be conservative. There are uncertainties associated with the emissions estimates, the meteorological data, and the algorithms used to model plume dispersion. A description of these uncertainties is provided below.

### *Uncertainty in Emissions*

Release estimates of air contaminant emissions from the hydrogen / ammonia plant sources are based on source characteristics and processing rates, as well as published emission factors and/or published engineering estimates. The final designs were not available at the time of developing the emission inventory, and as such, conservative assumptions had to be applied where data was not finalized.

The exact specifications for the cooling tower were unavailable, and as such, a conservative drift loss was assumed which would result in high particulate emissions. It was also conservatively assumed that The amount of steam that comes off the top of a cooling tower, known as drift emissions of TPM, $PM_{10}$, and $PM_{2.5}$ from the cooling tower will be equal as only total suspended solid concentrations in the make-up water were known, which would likely overestimate emissions of both $PM_{10}$ and $PM_{2.5}$. The emission estimation method followed the approach by the US EPA.

The flare emissions and emergency power generator emissions were based on usage data directly provided by the design team, and published emission factors/engineering estimates developed by the US EPA and the TCEQ. The specifications of the emergency power supply were not yet finalized upon development of the emission inventory, however, the emission factor used relied on the power demand which was available. The fuel used in the emergency diesel power unit is a biodiesel, in which there are not readily available emission factors for, as such, it was assumed that they would have similar emissions to a regular diesel.

As the final marine shipping company / vessels are unknown, the marine vessel emissions assumed conservative vessel models and that the fuel during hoteling would be marine gas oil (MGO), which may be conservative if the vessels use a liquid natural gas or even hydrogen during hoteling. Similarly, the assist tugboats assumed the conservative usage of MGO. This may overestimate the emissions from marine shipping.

### *Uncertainty in Meteorology*

The application of three years of hourly meteorological data includes a wide range of weather conditions in the modelling. This helps to reduce the uncertainty related to meteorology. The use of three years of meteorological data in the modelling is consistent with the recommendations provided in the Plume Dispersion Modelling Guideline (NLDMAE 2002). The level of confidence related to the meteorological data is rated as moderate to high.

### *Uncertainty on the Dispersion Model*

The dispersion modelling is a screening analysis used to identify the highest concentrations of air contaminants caused by the Project on its own and cumulatively (i.e., when combined with other nearby sources and background). In terms of the air quality model algorithms, the US EPA (2005) states:

> *Models are reasonably reliable in estimating the magnitude of highest concentrations occurring sometime, somewhere within an area. For example, errors in highest estimated concentrations of ±10 to ±40% are found to be typical, i.e., certainly well within the often quoted factor-of-two accuracy that has long been recognized for these models.*

In addition, they also state, "*it is desirable to quantify the accuracy or uncertainty associated with concentration estimates used in decision-making. Communications between modelers and decision-makers must be fostered and further developed*." This communication is being done as part of this assessment.

The US EPA (2005) indicates that the application of regulatory dispersion models is viewed as a best estimate approach and that this approach should be viewed as acceptable to the decision maker. The NLDMAE (2002) has issued the plume dispersion modelling guideline recognizing that the modelling is a best estimate approach and to provide consistency with respect to the application of models to assess projects in NL. The approach to the dispersion modelling that was used for this assessment is viewed as a best-practice approach. The level of confidence related to the air dispersion model is rated as moderate to high.

#### *Overall Air Quality*

The level of confidence is high for the representativeness of the meteorological data, the selected model approach, and the overall effectiveness of the proposed mitigation measures. There is some uncertainty and a lower confidence associated with the emission estimates as the design has not be finalized, several assumptions had to be made. However, given the screening type analysis conducted for the dispersion modelling (as described above), the overall assessment of air quality is still considered to be conservative, meaning the modelling results are likely to be higher than those that would be measured when the Project is in operation.

#### GHG Emissions

The estimation of GHG emissions associated with construction, operation and decommissioning depends on the engineering design, the estimated fuel consumption, and other estimated usages such as explosives and electricity (indirect). The prediction confidence for GHG emissions is rated as medium to high. The confidence in the effectiveness of the GHG mitigation measures is also high because most of the mitigation measures are known to effectively reduce the source of GHG emissions (e.g., lower fuel consumption is directly proportional to lower GHG emissions).

#### Lighting

Future levels of light trespass, glare and sky glow related to the construction, operation and decommissioning of the Project are directly related to the lighting plan for the Project which has yet to be designed. This lighting assessment was therefore qualitative and based on other similar projects, the Project components and their location, results of a viewshed analysis, and professional opinion. However, as the lighting plan will be designed to incorporate guidance and criteria published by the IES and CIE to limit offsite light trespass and glare and contributions to sky glow, the predictions and conclusions made in this assessment are based on a medium to high level of confidence.

## 6.10 Follow-Up and Monitoring

### Air Quality

An Air Quality Management Plan (AQMP) will be created for Project construction and operation, as part of the EPP. The AQMP will specify the mitigation measures for the management and reduction of air emissions during Project construction, operation and decommissioning, and the proposed ambient air quality monitoring program.

Ambient air and meteorology monitoring will be implemented in conjunction with emissions mitigation to provide an understanding of the meteorological conditions and offsite concentrations and evaluate the need for more rigorous mitigation. Monitoring during construction is expected to include monitoring of ambient TPM, $PM_{10}$ and $PM_{2.5}$ concentrations, while monitoring during operation is expected to include measurement of $NO_2$ and $NH_3$ concentrations, the exact monitoring details will be confirmed during permitting. Meteorological data (wind speed and direction) will be obtained from monitoring from the wind mast(s) and meteorological tower(s) that will be installed for the operation of the wind farms. The final ambient air quality monitoring plan would be developed and reviewed with regulatory agencies during the permitting process.

The results of the ambient PM monitoring will be used to assess the effectiveness of the dust mitigation and to evaluate the potential need for more rigorous dust mitigation during construction. If the monitoring program indicates that ground-level TPM, $PM_{10}$ or $PM_{2.5}$ concentrations are greater than the NL AAQS, additional mitigation measures to reduce PM emissions will be implemented. Similarly, the results of ambient $NO_2$ and $NH_3$ monitoring during operation will be used to assess whether controls are required to reduce these emissions during operations.

### Greenhouse Gases (GHGs)

The purpose of the Greenhouse Gas (GHG) Management Plan will be to manage Project GHG emissions in accordance with relevant GHG emissions management legislation and WEGH2 GHG reduction targets. The Plan will also include policy updates, emission source descriptions, data management framework, and GHG emission intensity reduction strategies review. The GHG Management Plan will be reviewed and updated at least annually and consider the effectiveness of mitigation employed, follow-up, monitoring and requirements for regulatory reporting of GHGs based on provincial and federal reporting requirements. This plan would have a key objective of net zero GHG emissions for Scope 1, Scope 2 and Scope 3 emissions by 2050 and would drive annual review of this target and associated prioritization of planned actions and initiatives to achieve net zero.

### Lighting

There is no follow-up monitoring recommended with respect to ambient lighting.

## 6.11 Capacity of Renewable Resources and Effects on Biological Diversity

The potential environmental effects of the Project on the atmospheric environment were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on the atmospheric environment, and for global GHG-emissions, actually result in a positive effect on the atmospheric environment. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to the atmospheric environment.

## 6.12 Predicted Future Environmental Conditions if the Project Does Not Proceed

If the project is not allowed to proceed, the existing conditions as described in the baseline section will continue to prevail, including current land use and natural conditions. It is possible that future development may occur in the area, including wind energy (given those Project areas are designated for wind farm development), but neither the likelihood nor extent of such development can be reasonably predicted at this time based on currently known information. Future projects are anticipated to have similar effects on the atmospheric environment. Should the Project Area remain undeveloped, the predicted future condition of the acoustic environment would be relatively unchanged from what was documented during the existing environment assessment presented in Section 6.4.

There are no large industrial emissions sources in the area surrounding the hydrogen / ammonia plant, with the largest industrial facility, the AML quarry, being 45 km west of the plant. The AML quarry is within the LAA, and near the Project Area (<1 km away) on the Port au Port Peninsula where the Port au Port wind farm is proposed. The air contaminant concentrations in the LAA are not likely to change substantially from the baseline concentrations presented in Section 6.4.2.1. If the Project were not to proceed, air quality in the LAA would remain at the existing low background levels unless other developments with substantive emissions were brought into the area.

The federal and provincial governments have set targets to reduce emissions of GHGs. If the Project were not to proceed, federal and provincial GHG emissions would continue the current trend of decreasing GHG emissions due to efforts by the governments to meet specified targets and reduce the effects of climate change. This trend would continue regardless of Project implementation as the Project contributions to overall GHG emissions would not be substantial to the extent that Canada and NL would be unable to meet GHG reduction targets. The Project-generated green hydrogen will be used to displace the use of fossil (i.e., carbon) fuels, which results in downstream GHG mitigations however at the present time these downstream reductions are not expected to occur in Canada. If the Project were not to proceed, it could have a negative impact on global emissions of GHGs as the fossil fuels it would have displaced may continue to be used.

The predicted future condition of lighting if the Project does not proceed is anticipated to be consistent with the current existing condition within the LAA/RAA.

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# 7.0 Acoustic Environment

## 7.1 Scope of Assessment

The Acoustic Environment Valued Environmental Component (VEC) consists of sound quality (noise) and vibration. The acoustic environment was assessed as a VEC to meet the requirements of the Provincial EIS Guidelines for the Project given that the acoustic environment may be affected by Project activities. Sound quality (noise) and vibration from the Project could affect human health and wellbeing, and wildlife and wildlife habitat.

The sound quality assessment includes baseline sound pressure level monitoring near the Project, and predicted noise levels associated with construction and operation activities using acoustic modelling. The baseline and predicted noise levels were used to estimate the potential effects of Project activities on sound quality. The sound quality assessment was based on equivalent sound pressure levels ($L_{eq}$) for the daytime ($L_d$) and nighttime ($L_n$) periods, and the day-night average sound level ($L_{dn}$). The predicted and baseline noise levels were assessed using criteria recommended by Health Canada (2017), which includes a threshold associated with an estimate of the change in percentage of people highly annoyed (%HA) by noise emissions from Project activities, and a threshold related to sleep disturbance.

The vibration assessment includes baseline vibration monitoring near the Project, and an assessment of Project activities causing vibration emissions. The locations of sensitive receptors were compared to the locations where vibration emissions are likely to occur to estimate the potential effects of Project activities due to vibration. The vibration assessment was based on nuisance guidelines related to the root-mean-square (RMS) of vibration levels established by the Acoustical Society of America (ASA).

### 7.1.1 Regulatory and Policy Setting

#### 7.1.1.1 Sound Quality

There are no regulations regarding noise emissions in the province. Health Canada provides guidance for assessing noise impacts in their "Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise" document (Health Canada 2017), as well as Guidelines for Wind Turbine Noise (Health Canada 2012). Heath Canada's approach to acoustic assessments is based on internationally recognized standards for acoustics, including the World Health Organization's (WHO) Guidelines for Community Noise (1999) and Night Noise Guidelines for Europe (2009).

Health Canada recommends using a guideline level related to annoyance called percent highly annoyed or %HA. The %HA is an estimate of the percentage of people who are potentially annoyed by noise emissions and is based on research conducted by the United States Environmental Protection Agency (US EPA). To calculate the %HA, the daytime equivalent sound levels (or $L_d$, a 15-hour time average of sound levels over the daytime period from 7:00 AM to 10:00 PM) and nighttime equivalent sound levels (or $L_n$, a 9-hour time average over the nighttime period from 10:00 PM to 7:00 AM) are combined to calculate an adjusted day-night average sound level (or $L_{dn}$). In the $L_{dn}$ calculation, the $L_n$ value is increased by 10 dB to account for higher sensitivity to noise emissions at night. The $L_{dn}$ value is used to calculate the %HA value due to Project-related noise emissions.

A %HA value is calculated for the existing environmental sound emissions (i.e., the baseline conditions). A second %HA is calculated for the total sound levels from baseline conditions and Project-related sound emissions. The difference between the values of %HA is then compared with guideline criteria. Health Canada recommends that the maximum change in %HA due to Project activities be no more than 6.5%. If the change in %HA threshold is exceeded, the effects are considered to be of concern and may require mitigation.

The noise guidance from Health Canada (2017) references the WHO guidelines and recommendations for community noise and night noise (WHO 1999 and 2009). The WHO guideline recommends a target for sleep disturbance as being an indoor sound level of no more than 30 dBA $L_{eq}$ for continuous noise during the sleep period (WHO 1999). Health Canada recommends that an outdoor-to-indoor transmission loss with windows at least partially open is 15 dBA and fully closed windows are assumed to reduce outdoor sound levels by approximately 27 dBA (Health Canada 2017). The corresponding outdoor sound level targets for sleep disturbance at the receptor location are 45 dBA and 57 dBA for partially open windows and fully closed windows, respectively.

A summary of sound level criteria developed by Health Canada (2017) used for this assessment is provided in Table 7.1.

**Table 7.1 Summary of Guideline Criteria Developed by Health Canada used for Sound Quality**

| Criteria | Threshold |
|---|---|
| Change in Percent Highly Annoyed (Δ %HA) | 6.5% |
| Sleep Disturbance | 45 dBA |
| Source: Health Canada 2017 | |

#### 7.1.1.2 Vibration

Ground-borne vibration is the measure of ground oscillations, usually due to industrial activities such as construction, earthworks, pile driving, or even highway traffic. The most common approach to vibration measurement is by measuring velocity measurements at ground level, where higher velocities correspond to higher levels of vibration. One way to measure and report vibration is to record the maximum vibration level at any given time, also known as the peak particle velocity (PPV). Human exposure is more sensitive to vibrations that occur over a certain period of time more so than a more sudden exposure to vibrations for a short amount of time (Caltran 2020). Therefore, a more common measure of vibration for human exposure is the root-mean-square (RMS) of the vibrations. The RMS approach calculates an average vibration value for a given time period (usually one second). Since the RMS value is an average of the instantaneous vibration velocity measurements, it is always a lower value than the PPV value. The PPV and RMS can be related by a crest factor. The crest factor can be as low as 1.4, but can be as high as 8 depending on the nature of the vibration source (US FTA 2018).

There are no regulations or guideline exposure limits for vibration in Newfoundland and Labrador. Guidelines related to public nuisance from vibration have been developed by the American National Standards Institute (ANSI) and the ASA through ANSI/ASA S.39-1983. These guidelines have been adopted by regulatory agencies such as the United States Federal Transit Administration (US FTA) and are often used in jurisdictions across Canada for assessing vibration. The ANSI guidance gives threshold values for different types of land use. For land uses associated with residential areas or in areas where sleeping occurs, the recommended ANSI threshold is 0.1 mm/s RMS, while daytime thresholds are recommended to be 0.14 mm/s RMS. The guidelines levels used for the vibration assessment are summarized in Table 7.2.

**Table 7.2 Summary of Guideline Criteria used for Vibration**

| Criteria | Threshold (mm/s RMS) |
|---|---|
| Daytime Nuisance | 0.14 |
| Sleep Disturbance | 0.1 |
| Source: ANSI/ASA S.39-1983 | |

## 7.1.2 Boundaries

### 7.1.2.1 Spatial Boundaries

The following spatial boundaries were used to assess Project effects, including residual environmental effects, on the Acoustic Environment in areas surrounding the Project components (Figure 7.1):

- Project Area: The Project Area encompasses the immediate area in which Project activities and components occur and is comprised of following distinct areas: the Port au Port wind farm, the Codroy wind farm, the Hydrogen/Ammonia Production and Storage Facility (hydrogen / ammonia plant), Port Facilities, and the 230 kV Transmission Lines, as well as associated infrastructure including roads, substations, and water supply infrastructure. The Project Area is the anticipated area of direct physical disturbance associated with the construction, operation and decommissioning, rehabilitation and closure of the Project. In addition to encompassing the immediate area in which Project components and activities will occur, the Project Area also includes a buffer of up to 300 m for access roads and turbines and a 350 m corridor to accommodate the 70 to 75 m wide RoW for the transmission line. These buffers allow flexibility for the micro-siting of Project components during detailed design, based on technical considerations as well as the avoidance of environmentally sensitive areas, where practicable.
- Local Assessment Area (LAA) and Regional Assessment Area (RAA): The LAA is the maximum area where Project-specific environmental effects on the acoustic environment can be predicted or measured with a reasonable degree of accuracy and confidence. The LAA is inclusive of the Project Area. The RAA represents the area within which cumulative effects on the acoustic environment are likely to occur, depending on the location of other past, present or reasonably foreseeable future projects or activities. For the acoustic environment, both the LAA and RAA are the same and are defined as 1.5 kilometres (km) extending beyond the Project Area, beyond which Project generated noise and/or vibration would be indistinguishable from background levels.


Stantec

Local Assessment Area/ Regional Assessment Area

**Proposed Project Features**

Wind Turbine

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Trans Canada Highway

Road

Watercourse

Waterbody

Wetland

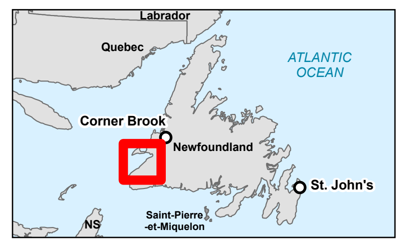
Forested Area

N

0 12 Kilometres
(At original document size of 8.5x11)
1:600,000

***Notes***

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 7/31/2023
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

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**Local Assessment Area and Regional Assessment Area**

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#### 7.1.2.2 Temporal Boundaries

The temporal boundaries for the assessment of potential effects on the Acoustic Environment include:

- Construction: Overall the construction phase of the Project will be from Q4 2023 through Q2 2027, pending EA approval and receipt of other required permits and approvals. Early civil works are planned to start Q4 2023 through Q3 2024. Construction of the Port au Port wind farm and associated infrastructure is expected to start in Q3 2024 with completion of the construction in Q1 2025. Construction of the Codroy Wind Farm and associated infrastructure is expected to start Q4 2025 with completion in Q1 2027. The hydrogen / ammonia plant will be constructed in phases from Q2 2024 to Q1 2026. Grid power sources are planned for hydrogen production in 2025 until March 2026, when the electrolyzer is commissioned.
- Operation and maintenance: Wind farm commissioning is anticipated to start Q1 2026 at the Port au Port wind farm and Q3 2027 at the Codroy wind farm. The 600 MW electrolyzer expected to be commissioned in Q1 2026. The operational life of the Project is 30 years at each site.
- Decommissioning and rehabilitation: The decommissioning phase is anticipated to take two years, occurring between 2056 and 2058. Decommissioning is anticipated to begin Q1 2056 at the Port au Port wind farm, with completion in Q3 2058 at the Codroy wind farm.

## 7.2 Existing Environmental Conditions

A characterization of the existing conditions within the spatial boundaries defined in Section 7.1.2 is provided in the following sections. An understanding of the existing conditions for the VEC within the spatial area being assessed is a key requirement in the prediction of potential Project effects provided in Section 7.3.

For a more in-depth description of the existing environmental conditions, refer to the Acoustic Section in the Atmospheric Environment Baseline Study (BSA-1).

### 7.2.1 Methods

#### 7.2.1.1 Sound Quality

Health Canada recommends that baseline sound measurements used in an acoustic assessment, as part of an EIS, be characterized either through direct measurement or estimation (Health Canada 2017). The baseline ambient sound levels within the Project Area were characterized by conducting a baseline sound quality monitoring survey. The baseline sound quality monitoring survey was conducted between May 16 and 26, 2023 at 16 locations (Figure 7.2) and are representative of the nearest receptor locations.


Stantec

Vibration Monitoring Location

Noise Monitoring Location

**Proposed Project Features**

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Quarry

Trans Canada Highway

Road

Watercourse

Waterbody

Wetland

Forested Area

N

0 10 Kilometres

(At original document size of 8.5x11)

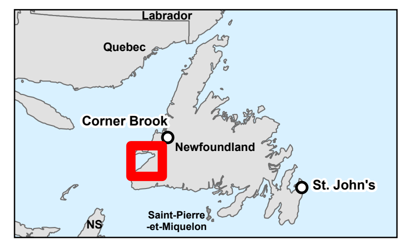
1:500,000

***Notes***

**1.** Coordinate System: NAD 1983 CSRS UTM Zone 21N

**2.** Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap

**3.** Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 2023-07-19
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

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*Figure No.*
**7.2**

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**Baseline Monitoring Locations for Sound and Vibration**

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The baseline sound quality monitoring survey was conducted in accordance with ISO 1996-2:2007 ("Acoustics –Description, measurement and assessment of environmental noise – Part 2L Determination of environmental noise levels"), as recommended by Health Canada (Health Canada 2017). Ambient sound levels were measured using Type 1 Sound Pressure Level Meters. Measurements were taken continuously over a period of between 2 to 4 days at each location. Daily calibration checks were undertaken throughout the monitoring survey.

Upon completion of the sound monitoring, the baseline measurements were analyzed in relation to meteorological conditions during the time of monitoring, potential nearby sources of sound (both natural and anthropogenic) and the audio recordings. Further calculations were performed on the raw data to obtain the daytime sound pressure level ($L_d$), the nighttime sound pressure level ($L_n$), and the day-night average sound pressure level ($L_{dn}$) (Health Canada 2017).

Details pertaining to the baseline sound quality monitoring survey are provided in BSA-1.

#### 7.2.1.2 Vibration

The baseline vibration levels within the Project Area were measured at 7 locations during a field survey campaign between May 16 and 26, 2023. The baseline vibration measurement locations are shown in Figure 7.2. These locations were chosen to capture potential existing vibration emissions from nearby roadways and an active aggregate quarry on Port au Port Peninsula that are near the Project location. These locations are also near populated areas closest to the Project and so are most likely to experience changes in vibration due to Project activities. Seismographs were used to measure peak particle velocity (PPV) at each monitoring location.

Additional details on the baseline measurement methods are provided in BSA-1.

### 7.2.2 Existing Conditions

#### 7.2.2.1 Sound Quality

The sound pressure levels measured during the baseline sound quality survey are presented in Table 7.3, including daytime sound level ($L_d$), nighttime sound level ($L_n$), the day-night average sound level ($L_{dn}$) values.

Noise levels were found to be highest for locations close to major roadways or nearer to Stephenville, such as 1E, 1W, 1S, and 4N. Rural areas experienced less noise, including 4W, 2N, 3N, 6W, and the campground across from the Port of Stephenville. The major contributor to sound levels during the daytime were related to vehicle traffic. The major contributor to sound levels during nighttime were related to the natural environment, including wind and wave noise and wildlife calls, as well as occasional noise emissions from vehicle traffic.

### Table 7.3 Measured Sound Pressure Levels within the Project Area, May 2023

| Monitoring Location | UTM Coordinates | | 7:00 to 22:00 $L_d$ (dBA) | 22:00 to 07:00 $L_n$ (dBA) | Day-Night Average Sound Level ($L_{dn}$) (dBA) |
|---|---|---|---|---|---|
| | Latitude | Longitude | | | |
| 1N | 378611 | 5390284 | 43 | 36 | 44 |
| 2N | 376211 | 5384199 | 41 | 41 | 48 |
| 3N | 376130 | 5379651 | 40 | 38 | 45 |
| 4N | 382717 | 5379268 | 53 | 49 | 56 |
| 1E | 393057 | 5374322 | 48 | 43 | 51 |
| Campground | 386413 | 5375265 | 41 | 39 | 45 |
| 1S | 361324 | 5325755 | 47 | 41 | 49 |
| 3S | 355443 | 5335205 | 42 | 41 | 48 |
| 1W | 338315 | 5372291 | 49 | 43 | 51 |
| 2W | 347891 | 5375812 | 45 | 41 | 48 |
| 3W | 358157 | 5376412 | 44 | 38 | 46 |
| 4W | 354948 | 5386770 | 39 | 40 | 47 |
| 5W | 338648 | 5380467 | 45 | 42 | 49 |
| 6W | 345901 | 5387190 | 40 | 37 | 44 |
| 7W | 370228 | 5379901 | 43 | 43 | 50 |
| 8W | 367078 | 5376977 | 46 | 43 | 50 |

#### 7.2.2.2 Vibration

A summary of the RMS vibration levels for the 7 monitoring locations is provided in Table 7.4. Baseline vibration levels were found to be low at most locations. Location 5 was closest to the existing quarry, and had one occurrence of vibration levels above 0.1 mm/s RMS. Location 7 also experienced one event with an RMS level above 0.1 mm/s. In both cases, the elevated vibration levels were likely due to a vehicle pass-by. The remaining measurements at each location were well below 0.1 mm/s.

### Table 7.4 Results of the Baseline Vibration Monitoring Study

| Monitoring Location | Location Coordinates (UTM 21) | | RMS Value (mm/s) [1] |
|---|---|---|---|
| | Easting (m) | Northing (m) | |
| 1 | 361780 | 5326284 | 0.056 |
| 2 | 355814 | 5335463 | 0.056 |
| 3 | 370197 | 5379930 | 0.045 |
| 4 | 338620 | 5380439 | 0.062 |
| 5 | 349109 | 5376753 | 0.209 |
| 6 | 338496 | 5372380 | 0.090 |
| 7 | 393062 | 5374298 | 0.101 |

Note:
[1] RMS values are based on PPV measurements combined with a crest factor of 1.4

## 7.3 Assessment Criteria and Methods

This section describes the criteria and methods used to assess environmental effects on the Acoustic Environment. Residual environmental effects (Section 7.5) are assessed and characterized using criteria defined in Section 7.3.1, including direction, magnitude, geographic extent, timing, duration, frequency, reversibility, and ecological or socio-economic context. The assessment also evaluates the significance of residual effects using threshold criteria or standards beyond which a residual environmental effect is considered significant. The definition of a significant effect for the Acoustic Environment is provided in Section 7.3.2. Section 7.3.3 identifies the environmental effects to be assessed for the Acoustic Environment, including effect pathways and measurable parameters. This is followed by the identification of potential Project interactions with this VEC (Section 7.3.4). Analytical assessment techniques employed for the assessment of potential Project-related environmental effects on the Acoustic Environment are provided in Section 7.3.5. The assumptions that were made to support a conservative approach to the assessment of residual effects on the Acoustic Environment are described in Section 7.3.5.2.

### 7.3.1 Residual Effects Characterization

Table 7.5 presents definitions for the predicted environmental effects characterization of the Project on the Acoustic Environment. The criteria are used to describe the potential residual effects that remain after mitigation measures have been implemented. Quantitative measures have been developed, where possible, to characterize residual effects. Qualitative considerations are used where quantitative measurement is not possible.

**Table 7.5 Characterization of Predicted Environmental Effects of the Undertaking on the Acoustic Environment**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Nature** | The long-term trend of the residual effect | • **Neutral –** No net change in the measurable parameter(s) for the Acoustic Environment relative to baseline<br>• **Positive –** A residual effect that moves the measurable parameter(s) in a direction beneficial to the Acoustic Environment relative to baseline<br>• **Adverse –** A residual effect that moves the measurable parameter(s) in a direction detrimental to the Acoustic Environment relative to baseline |

## Table 7.5 Characterization of Predicted Environmental Effects of the Undertaking on the Acoustic Environment

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Magnitude** | The amount of change in measurable parameter(s) or the VEC relative to existing conditions | Sound Quality:<br>• **Negligible** – No measurable change<br>• **Low** – Sound Pressure Levels predicted to increase by up to 3 dB above baseline, but do not exceed relevant acoustic criteria<br>• **Moderate** – Sound Pressure Levels predicted to increase by more than 3 dB above baseline, but do not exceed relevant acoustic criteria<br>• **High** – Sound Pressure Levels predicted to exceed relevant acoustic criteria<br><br>Vibration:<br>• **Negligible** – No noticeable change beyond Project footprint<br>• **Low** – Measurable change at one receptor, but vibration levels still well below applicable criteria<br>• **Moderate** – Measurable change for many receptors, but vibration levels still below applicable criteria<br>• **High** – Vibration levels exceed applicable criteria |
| **Geographic Extent** | The geographic area in which a residual effect of a defined magnitude occurs | • **Project Area –** Residual effect is restricted to the Project Area<br>• **LAA –** Residual effect extends into the LAA<br>• **RAA –** Residual effect extends into the RAA |
| **Timing** | Considers when the residual environmental effect is expected to occur, where applicable or relevant to the VEC. | • **No Sensitivity –** Residual effect does not occur during critical life stage or timing does not affect the Acoustic Environment<br>• **Moderate Sensitivity –** Residual effect may occur during a lower sensitive period<br>• **High Sensitivity –** Residual effect occurs during a high-sensitivity period (e.g., nighttime) |
| **Duration** | The period of time required until the measurable parameter(s) or the VEC returns to its existing (baseline) condition, or the residual effect can no longer be measured or otherwise perceived | • **Short term** – residual effect restricted to construction or decommissioning, rehabilitation and closure phases.<br>• **Medium term** – residual effect extends through Project operation but is expected to subside when operations cease.<br>• **Long term** – residual effect extends beyond the life of the Project.<br>• **Permanent** – recovery to baseline conditions unlikely. |
| **Frequency** | Identifies how often the residual effect occurs during the Project, during a specific phase of the Project, or during another specified time period | • **Single event**<br>• **Multiple irregular event –** Occurs at no set schedule<br>• **Multiple regular event –** Occurs at regular intervals<br>• **Continuous –** Occurs continuously |

**Table 7.5 Characterization of Predicted Environmental Effects of the Undertaking on the Acoustic Environment**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories |
|---|---|---|
| **Reversibility** | Describes whether a measurable parameter(s) or the VEC can return to its existing condition after the Project activity ceases, including through active management techniques | • **Reversible –** Residual effect is likely to be reversed after activity completion and rehabilitation<br>• **Irreversible –** Residual effect is unlikely to be reversed |
| **Ecological / Socio-economic Context** | Existing conditions and trends in the area where the residual effect occurs | • **Undisturbed –** Area is relatively undisturbed or not adversely affected by human activity<br>• **Disturbed –** Area has been substantially previously disturbed by human development or human development is still present |

## 7.3.2 Significance Definition

A significant residual adverse effect on the Acoustic Environment is defined as a residual Project-related change to the environment that results in any of the following:

- A significant residual adverse effect for sound quality is one where Project-related noise levels are likely to exceed the annoyance or sleep disturbance guideline criteria recommended by Health Canada.
- A significant residual adverse effect for vibration is one where Project-related vibration levels are likely to exceed nuisance criteria established by ANSI/ASA.

## 7.3.3 Potential Environmental Effects, Project Pathways, and Measurable Parameters

Table 7.6 lists the potential Project effects on the Acoustic Environment and provides a summary of the Project effect pathways and measurable parameters and units of measurement to assess potential effects. Potential environmental effects and measurable parameters were selected based on review of recent environmental assessments for large development projects in NL, renewable energy projects in other parts of Canada, comments provided during engagement, and professional judgment.

Potential environmental effects on the acoustic environment are anticipated to occur primarily within the construction, operation, and decommissioning phases. Potential environmental effects during construction and decommissioning activities will be primarily due to the use of earthmoving equipment and construction activities to construct or decommission the Project. The potential effects to the acoustic environment during operation are mainly from noise emissions from wind power generation and from industrial equipment operation at the ammonia production facility.

**Table 7.6 Environmental Effects, Effect Pathways, and Measurable Parameters for the Acoustic Environment**

| Environmental Effect(s) | Effect Pathway(s) | Measurable Parameter(s) and Units of Measurement |
|---|---|---|
| Change in Sound Quality | • Noise emissions from Project equipment and activities during Project construction, operation and decommissioning, rehabilitation and closure | • Propagation of sound from Project construction, operation and decommissioning, rehabilitation and closure, measured in A-weighted decibels (dBA). Annoyance criteria for noise is based on the change in percent highly annoyed (%HA). |
| Change in Vibration | • Vibration emissions from Project equipment and activities during Project construction, operation and decommissioning, rehabilitation and closure | • Propagation of ground-borne vibrations from Project construction, operation and decommissioning, rehabilitation and closure, quantified as the root-mean-square (RMS) of vibration velocity measurements in mm/s. |

### 7.3.4 Project Interactions with the Acoustic Environment

Table 7.7 uses checkmarks to indicate the routine Project activities that could interact with the VEC and result in the identified environmental effect(s) to be assessed. Immediately following Table 7.7, environmental effects pathways are briefly described for potential routine Project-related environmental effects and justification is provided in cases where no Project interaction with the VEC (and therefore no potential environmental effect on the VEC) is predicted.

Emissions of noise and vibration are generated by most Project activities, and may result in a change in sound quality or a change in vibration. Therefore, Emissions, Discharges and Wastes has been introduced as additional components under each Project phase for efficiency of discussion. Emissions, Discharges and Wastes includes light, noise, vibration, air contaminants and greenhouse gas (GHG) emissions. Light, air contaminants and GHG emissions are assessed in the Atmospheric Environment VEC (Chapter 6).

**Table 7.7 Project Interactions with Acoustic Environment Environmental Effects, and Environmental Effect Pathways**

| Project Activities | Environmental Effect(s) to be Assessed | |
|---|---|---|
| | Change in Sound Quality | Change in Vibration |
| **Construction** | | |
| Emissions, Discharges, and Wastes[1] | ✓ | ✓ |
| **Operation and Maintenance** | | |
| Emissions, Discharges, and Wastes[1] | ✓ | – |
| **Decommissioning and Rehabilitation** | | |
| Emissions, Discharges, and Wastes[1] | ✓ | ✓ |

Notes:
✓ = Potential interaction
– = No interaction
[1] Emissions (e.g., light, noise, vibration, air contaminants and GHGs), discharges (e.g., wastewater and other liquid effluents), and hazardous and non-hazardous wastes are generated by many Project activities. Rather than acknowledging this by placing a checkmark against each of these activities, "Emissions, Discharges, and Wastes" is listed as a separate item under each phase of the Project.

The emissions of noise and vibration during decommissioning, rehabilitation and closure activities are not anticipated to be substantial in comparison to the emissions from construction and operation. Therefore, the decommissioning, rehabilitation and closure phase of the Project has been assessed qualitatively. The potential environmental effects from this phase of the Project will be less than, or similar to, those quantitatively assessed in Section 7.5 for construction and operation.

The Project may cause effects in the Acoustic Environment from:

- Construction / installation of infrastructure and equipment, including buildings, access roads, power transmission lines and substations, wind turbines, and port facilities.
- Construction-related transportation of infrastructure components such as wind turbine components and prefabricated ammonia processing infrastructure.
- Blasting associated with foundation construction of the wind turbines
- Pile driving associated with refurbishment of the facilities in the Port of Stephenville
- Operation of the Project components, including wind turbines, substations, and ammonia production facility, will result in noise emissions.

Project operations, including operating and maintaining the wind turbines, transmission lines, ammonia generation facility, and port facilities, are not expected to generate substantial vibration emissions, and so vibration effects from these activities are not considered further in the EIS:

### 7.3.5 Analytical Assessment Techniques and Level of Knowledge

#### Sound Quality

The following tasks were conducted as part of the sound quality assessment for the construction and operation of the Project:

- Identification of noise sensitive receptors within the Project Area (Section 7.2.1.1)
- Determination of baseline sound levels at noise sensitive receptor locations (Section 7.2.1.1)
- Identification of modelling scenarios that conservatively assume all equipment operate simultaneously and at full load (Section 7.5.1)
- Identification of noise emission sources from Project construction and operation activities (Section 7.5.1)
- Characterization of the sound power levels (PWLs) for each noise emission source using manufacturer's data, acceptable theoretical calculation methods, or similar equipment noise data from an archived database of measurements (Section 7.5.1)
- Development of an acoustic model for construction and operation of the Project (Section 7.5.1)
- Prediction of sound levels within the LAA and RAA, and at the noise sensitive receptors (Section 7.5.1)
- Assessment of compliance of the construction and operation of the Project by comparing the modelled results plus baseline to the applicable noise targets (i.e., Health Canada noise and sleep disturbance targets) (Section 7.5.1)

Noise emissions during decommissioning and rehabilitation were considered to be less than noise emissions during construction and operation, and so were assessed qualitatively.

#### Vibration

The following tasks were conducted as part of the vibration assessment for the construction of the Project:

- Identification of baseline vibration levels within the Project Area (Section 7.2.1.1)
- Identifying location of vibration receptors based on those listed in the EIS Guidelines
- Identification of vibration emission sources related to Project construction (Section 7.5.2)
- Characterization of vibration emissions relative to vibration receptors (Section 7.5.2)

Vibration emissions during operation, decommissioning, and rehabilitation were considered to be less than vibration emissions during construction and so were assessed qualitatively.

#### 7.3.5.2 Assumptions and Conservative Approach

A conservative approach was used to address uncertainty in the environmental effects assessment. Specifically, the following assumptions were made:

- Worst-case conditions were considered for Project activities, where all equipment was running simultaneously at full capacity, and the facility was assumed to operate continuously, 24 hours a day, 7 days a week.
- Noise propagation from Project activities assumed environmental conditions conducive to sound propagation, such as the level of ground absorption and the wind direction.

## 7.4 Mitigation Measures

A series of environmental management plans will be developed by WEGH2 to mitigate the effects of Project development on the environment. A full list of mitigation measures to be applied throughout Project construction, operation and maintenance, and decommissioning and rehabilitation is provided in Section 26.2. Key measures to mitigate the potential effects of the Project on the acoustic environment are listed in Table 7.8, by category and Project phase.

**Table 7.8 Mitigation Measures: Acoustic Environment**

| ID # | Mitigation Type | Mitigation Measure | Project Phase* | | |
|---|---|---|---|---|---|
| | | | C | O | D |
| 20 | Mitigation | Project footprint and disturbed areas will be limited to the extent practicable. | X | X | X |
| 21 | Mitigation | The limits for approved clearing, grubbing and topsoil overburden removal will be clearly identified (flagging/survey stakes) in the field prior to the commencement of work. | X | - | - |
| 22 | Mitigation | Project vehicles, heavy equipment, machinery, and associated exhaust systems and mufflers (and/or other appropriate sound attenuation devices) will be regularly inspected and maintained so that they remain operating in accordance with manufacturer's recommendations. | X | - | - |
| 23 | Mitigation | Project vehicles, heavy equipment, and machinery will be shut down when stationary for long periods of time. The idling of vehicles and equipment will be avoided whenever practical. | X | - | - |
| 26 | Mitigation | Re-seeding of areas will follow standard methods in compliance with permit conditions. These methods will be included the Project EPP. | - | - | X |
| 28 | Mitigation | Nearby residents will be notified prior to blasting. | X | - | - |
| 29 | Mitigation | Project vehicles will drive within the speed limit to reduce engine noises as vehicles travel on roadways within adjacent communities, and horns will be used only as necessary for safety purposes. | X | - | - |

## Table 7.8 Mitigation Measures: Acoustic Environment

| ID # | Mitigation Type | Mitigation Measure | Project Phase* | | |
|---|---|---|---|---|---|
| | | | C | O | D |
| 31 | Mitigation | Blasting activities (if required) will be included under a contract service agreement with the explosives supplier and who will have a valid blasters certificate issued by the NLDECC. | X | - | - |
| 32 | Mitigation | An Explosives and Blasting Management Plan will be developed by the blasting contractor to provide direction for the safe storage, handling and use of explosives and explosive components at the Project site, to address the safety of the public and Project personnel, and protection of both the environment and Project components. | X | - | - |
| 149 | Mitigation | Blasting patterns and procedures will be used to reduce shock or instantaneous peak noise levels, in accordance with a Blast Management Plan that will be developed for the Project. | X | - | - |
| 238 | Mitigation | Noise mitigation measures, such as enclosures, louvvres, and insulation, will be used in the hydrogen / ammonia plant in order to meet regulated sound levels at receptors. | - | X | - |
| 239 | Mitigation | Outdoor process piping will be wrapped in insulation to reduce piping noise. | - | X | - |
| 320 | Mitigation | WEGH2 will establish sufficient setback of wind turbines to mitigate risk to surrounding residences. | X | X | - |

* Note:
"ID #" denotes the mitigation master identification number, Appendix 26-A.
"C" denotes the construction phase of the Project.
"O" denotes the operation and maintenance phase of the Project.
"D" denotes the decommissioning and rehabilitation phase of the Project.
"X" denotes the relevant Project phase to mitigation measure

### 7.4.1 Application of the Precautionary Principle to Project Mitigation Measures

The mitigation measures outlined for the acoustic environment are expected to reduce noise levels below applicable annoyance criteria. This is combined with the assumption that noise and vibration emitting activities will be occurring continuously throughout the Project lifetime. The mitigation measures included as part of the Project are well-understood and are known to be effective for the Project activities.

The review of potential receptors included consideration of satellite imagery, government land use databases, and aerial surveys. Structures were conservatively assumed to be sensitive receptors even if they could not be confirmed to be permanently or temporarily occupied.

## 7.5 Residual Environmental Effects

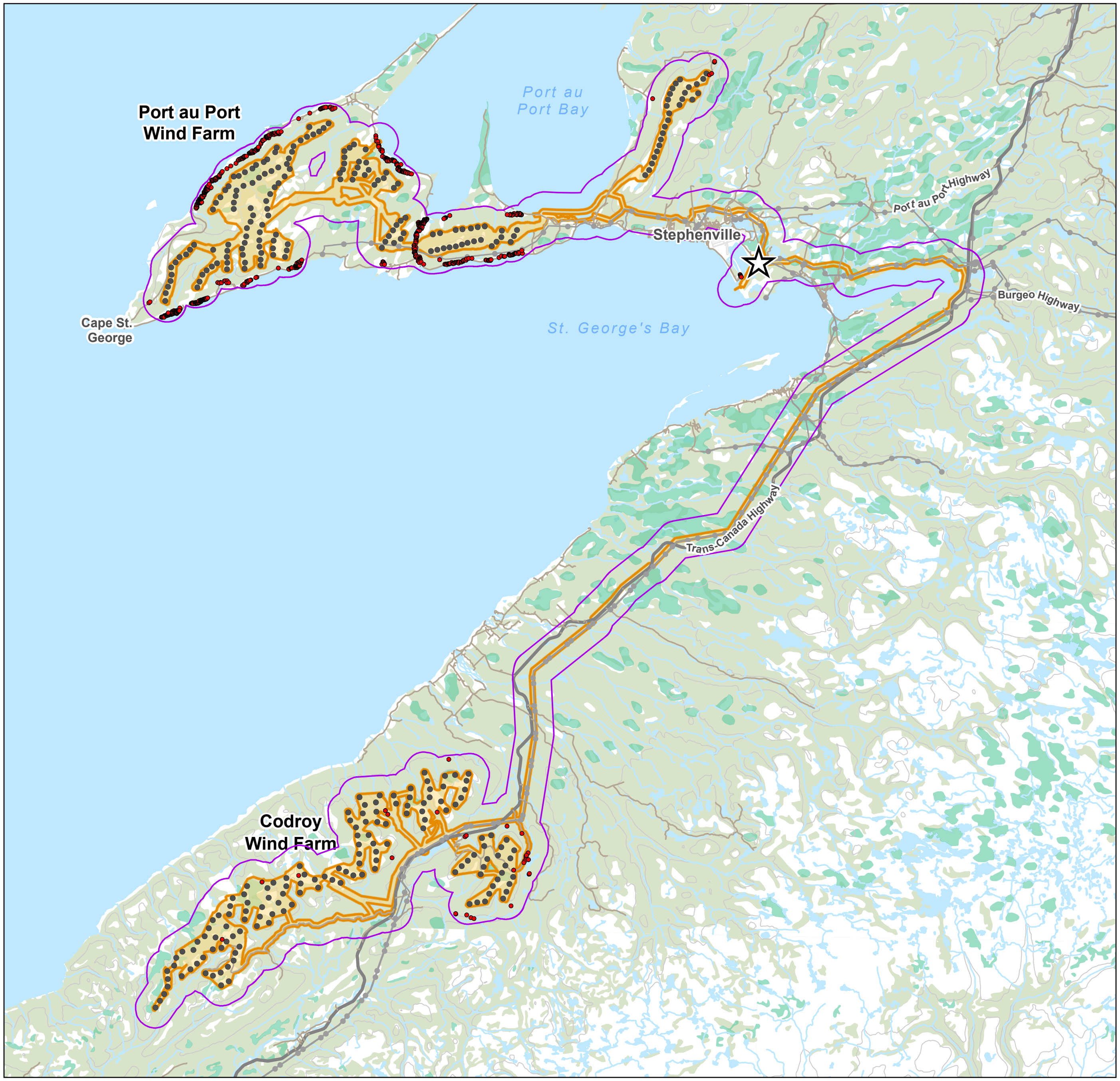
For each potential effect identified in Section 7.3.3, specific Project activities that may interact with the VEC and result in an environmental effect (i.e., a measurable change that may affect the VEC) are identified and described. The following sections first describe the pathways by which a potential Project effect could result from Project activities in the absence of mitigation during each Project phase (i.e., construction, operation and decommissioning and rehabilitation). Mitigation and management measures (Section 7.4) are applied to avoid or reduce these potential pathways and resulting environmental effects. Residual effects are those remaining following implementation of mitigation, which are then characterized using the criteria defined in Section 7.3.1. A summary of predicted residual effects is provided in Section 7.5.3.

### 7.5.1 Change in Sound Quality

Noise emission inventories were prepared for the construction and operation phases of the Project using operational and design information provided by ARUP and acoustic technical literature corresponding to appropriate equipment specifications (Bies and Hansen 2003). Acoustic modelling was conducted using CADNA/A, a commercially available environmental acoustic model that complies with the algorithms described in the ISO 9613-1 and 9613-2 standards for acoustic modelling. The CADNA/A model considers geometrical divergence (distance attenuation), barrier effects due to intervening structures, ground effects, atmospheric absorption, and topography. Wind direction can change noise attenuation through the air, and therefore wind direction is always assumed to be blowing from each source location to each point of reception.

Noise emissions during the decommissioning and rehabilitation phase of the Project will be similar to, or less than, those during construction and operation and were assessed qualitatively.

A total of 812 receptors within the LAA and RAA were considered in the acoustic model; these are shown in Figure 7.3. The receptors represent noise-sensitive locations such as homes, cabins, hospitals or schools located outside of the facility fence line. Where a receptor location was identified by satellite imagery or government databases but could not be confirmed through surveys, those receptors were included in the assessment.




Stantec

Sensitive Receptor

Local Assessment Area/ Regional Assessment Area

**Proposed Project Features**

Wind Turbine

Hydrogen / Ammonia Plant Location

Project Area

**Other Features**

Trans Canada Highway

Other Highway

Arterial / Collector

Watercourse

Waterbody

Wetland

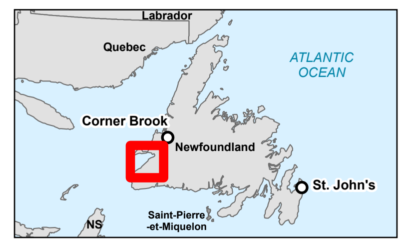
Forested Area

N

0 12 Kilometres
(At original document size of 8.5x11)
1:527,089

***Notes***

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 7/31/2023
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_208

*Figure No.*
**7.3**

Page 1 of 1

**Sensitive Receptors within 1.5 km of Project Area**

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#### 7.5.1.1 Construction

The construction of the Project is anticipated to occur over a period of 30 months. For construction activities lasting longer than one year, Health Canada recommends a quantitative assessment of noise emissions (Health Canada 2017).

The Project construction phase noise emissions were established using the following information sources:

- Equipment lists and design data provided as part of the Project Description in Chapter 3
- Measurement data of similar equipment
- Publications that provide reference sound power levels and sound pressure levels for construction equipment (DEFRA 2005; DEFRA 2006)

A list of equipment and quantities that are planned to be used for the construction of each wind farm is provided in Table 7.9 along with estimates of the sound power levels that could be emitted from the operation of the construction equipment. The main construction noise is expected to be related to the construction of the wind turbines. While additional earthmoving and construction activities are also planned for the ammonia production facility, the main source of noise emissions during construction of the ammonia production facility and port is related to piledriving activities that may be required for the refurbishment of the Port of Stephenville. The sound power levels assumed for piledriving activities are shown in Table 7.10 and include a 12 dB penalty for highly impulsive noise as recommended by Health Canada.

Sound emissions will also result from blasting during construction. Blast energy that liberates into the atmosphere can generate air overpressure and noise. Blasting is expected to be limited to daytime hours and will follow best management practices (BMPs) outlined in guidance documents such as the Blasters Handbook (ISEE 2016) and the Environmental Code of Practice for Metal Mines (ECCC 2009). These guidance documents provide detailed information on designing and carrying out blasting to reduce sound emissions, and these will be consulted during blasting design.

The equipment sources related to Project construction of the wind turbines were modelled as area sources covering the Codroy and Port au Port wind farm locations. The vehicle traffic between the port of Stephenville and traffic to/from the wind farms were modelled as line sources. Point sources were used to represent piledriving activities at the Port of Stephenville.

The predicted construction-related daytime sound levels are shown in Table 7.11 for the nearest receptor locations in Port au Port, Codroy, and the Campground located near the Port of Stephenville. As construction activities will be limited to daytime hours, existing nighttime sound levels will not be affected by the proposed construction activities. The full set of results are presented in Appendix 7-A, Table 7-A.1.

### Table 7.9 Sound Power Levels – Construction Equipment for Wind Farm

| Type of Source | Model / Description | Number of Units | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | | Total Sound Power Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | dB | dBA |
| Excavators | C390 | 1 | 119 | 120 | 111 | 112 | 108 | 106 | 105 | 98 | 123 | 114 | 119 |
| | C349 | 8 | 119 | 120 | 111 | 112 | 108 | 106 | 105 | 98 | 123 | 114 | 119 |
| | C336 | 2 | 119 | 120 | 111 | 112 | 108 | 106 | 105 | 98 | 123 | 114 | 119 |
| | C324 | 3 | 105 | 108 | 107 | 104 | 104 | 103 | 98 | 91 | 113 | 109 | 105 |
| | C305 | 2 | 105 | 108 | 107 | 104 | 104 | 103 | 98 | 91 | 113 | 109 | 105 |
| Haul Trucks | HM400 | 14 | 124 | 110 | 102 | 101 | 105 | 100 | 99 | 92 | 124 | 109 | 124 |
| | Live Bottom | 5 | 124 | 107 | 103 | 107 | 110 | 108 | 100 | 95 | 124 | 114 | 124 |
| | Tandem | 5 | 124 | 107 | 103 | 107 | 110 | 108 | 100 | 95 | 124 | 114 | 124 |
| Bulldozers | D8 | 2 | 108 | 112 | 104 | 105 | 107 | 109 | 97 | 87 | 116 | 113 | 108 |
| | D6 | 3 | 117 | 118 | 109 | 101 | 102 | 98 | 96 | 92 | 121 | 108 | 117 |
| | D4 | 1 | 117 | 118 | 109 | 101 | 102 | 98 | 96 | 92 | 121 | 108 | 117 |
| Roller | CS56 | 5 | 115 | 113 | 103 | 101 | 103 | 101 | 97 | 91 | 118 | 108 | 115 |
| Loaders | 988 | 2 | 116 | 121 | 112 | 112 | 111 | 109 | 107 | 97 | 123 | 116 | 116 |
| | 980 | 2 | 115 | 115 | 113 | 103 | 104 | 102 | 97 | 90 | 120 | 110 | 115 |
| | IT38 | 2 | 115 | 115 | 113 | 103 | 104 | 102 | 97 | 90 | 120 | 110 | 115 |
| Cranes | LG 1750 | 4 | 108 | 107 | 101 | 102 | 101 | 101 | 92 | 83 | 112 | 106 | 108 |
| | JLG Lift | 8 | 109 | 105 | 94 | 90 | 87 | 85 | 79 | 74 | 111 | 95 | 109 |
| Concrete | Concrete Plant | 2 | 100 | 101 | 107 | 100 | 97 | 95 | 91 | 88 | 110 | 104 | 100 |
| | Cement Transport | 4 | 124 | 107 | 103 | 107 | 110 | 108 | 100 | 95 | 124 | 114 | 124 |
| | Concrete Truck | 14 | 111 | 102 | 94 | 97 | 98 | 106 | 88 | 83 | 113 | 108 | 111 |
| | Concrete Pump Truck | 2 | 111 | 105 | 103 | 103 | 102 | 103 | 95 | 91 | 114 | 108 | 111 |
| | Crushing Spread | 2 | 109 | 108 | 108 | 111 | 110 | 107 | 104 | 101 | 117 | 114 | 109 |

## Table 7.9 Sound Power Levels – Construction Equipment for Wind Farm

| Type of Source | Model / Description | Number of Units | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | | Total Sound Power Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | **31.5** | **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | **dB** | **dBA** |
| Blasting equipment | Copco L8 | 2 | 122 | 123 | 118 | 119 | 115 | 113 | 108 | 101 | 127 | 121 | 122 |
| | Copco D9 | 3 | 122 | 123 | 118 | 119 | 115 | 113 | 108 | 101 | 127 | 121 | 122 |
| | Explosives Truck | 2 | 124 | 107 | 103 | 107 | 110 | 108 | 100 | 95 | 124 | 114 | 124 |
| Grader | G140 | 2 | 116 | 115 | 111 | 107 | 112 | 106 | 102 | 93 | 120 | 115 | 116 |
| Support | Flat Deck | 4 | 109 | 106 | 104 | 102 | 100 | 97 | 92 | 84 | 112 | 105 | 109 |
| | Water Truck | 2 | 106 | 114 | 112 | 106 | 106 | 105 | 98 | 97 | 118 | 111 | 106 |
| | Fuel Truck | 3 | 106 | 114 | 112 | 106 | 106 | 105 | 98 | 97 | 118 | 111 | 106 |
| | Telehandler | 2 | 109 | 106 | 104 | 102 | 100 | 97 | 92 | 84 | 112 | 105 | 109 |
| | Support Cranes | 10 | 109 | 106 | 104 | 102 | 100 | 97 | 92 | 84 | 112 | 105 | 109 |
| | Boom Truck | 4 | 109 | 106 | 104 | 102 | 100 | 97 | 92 | 84 | 112 | 105 | 109 |
| | Pickups | 30 | 109 | 106 | 104 | 102 | 100 | 97 | 92 | 84 | 112 | 105 | 109 |
| | Mobile Lights | 50 | 106 | 99 | 94 | 90 | 87 | 83 | 84 | 77 | 107 | 93 | 106 |
| | Pumps | 50 | 111 | 104 | 98 | 101 | 102 | 100 | 93 | 86 | 113 | 106 | 111 |
| | Generators | 1 | 119 | 129 | 123 | 115 | 115 | 116 | 116 | 112 | 131 | 123 | 119 |
| Other Activities | Material Handling | 2 | 110 | 106 | 110 | 109 | 109 | 106 | 100 | 92 | 117 | 113 | 110 |
| **Total Construction Per Wind Farm** | | | **141** | **137** | **131** | **130** | **129** | **127** | **123** | **117** | **143** | **134** | **141** |

**Table 7.10 Sound Power Levels – Piledriving related to Construction at the Port of Stephenvillen**

| Type of Source | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | | Total Sound Power Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | dB | dBA |
| Piledriving (Including 12 dB Penalty for Highly Impulsive Noise) | 122 | 122 | 122 | 122 | 129 | 123 | 118 | 115 | 110 | 132 | 129 |

### Table 7.11 Predicted Sound Pressure Levels from Construction Activities at Nearby Receptors

| Receptor Region | Receptor with Maximum Predicted Day-Night Sound Pressure Levels | Maximum Predicted Daytime Sound Pressure Levels ($L_d$) (dBA) | Maximum Predicted Nighttime Sound Pressure Levels ($L_n$) (dBA) | Maximum Predicted Day-Night Sound Pressure Level ($L_{dn}$) (dBA) |
|---|---|---|---|---|
| Codroy | Codroy-19 | 59 | - | 57 |
| Port au Port | Port au Port-510 | 54 | - | 52 |
| Campground | Campground-1 | 48 | - | 46 |

The predicted change in the %HA in the community is shown in Table 7.12. The predicted change in %HA was lower than the Health Canada criterion of a change of 6.5 %HA at each receptor.

### Table 7.12 Calculation of % Highly Annoyed at Nearby Receptors during Construction

| Receptor | Baseline | | Project Predicted $L_{dn}$ (dBA) | Total (Baseline plus Project) | | Change in %HA (Between Total and Baseline) |
|---|---|---|---|---|---|---|
| | $L_{dn}$ (dBA) | %HA | | $L_{dn}$ (dBA)* | %HA | |
| Codroy-19 | 49 | 1.92 | 57 | 58 | 5.72 | 3.79 |
| Port au Port-510 | 46 | 1.30 | 52 | 53 | 3.08 | 1.78 |
| Campground-1 | 45 | 1.14 | 46 | 48 | 1.80 | 0.66 |

Note:
* The total Ldn represents the expected noise level at the receptors during the construction period; it is the modelled Ldn result at the receptor plus the baseline Ldn at the nearest receptor.

#### Summary

With the implementation of mitigation measures, residual effects from the Project during construction on change in sound quality are anticipated to be moderate in magnitude (i.e., the predicted change in sound pressure level may increase by more than 3 dB however the change in %HA was less than the Health Canada criterion of 6.5 %HA). Project effects on sound quality are expected to occur within the LAA and RAA. During construction, residual effects are expected to be short-term and regular in frequency. Based on the information above, a summary of residual effects on change in sound quality during the construction phase is provided in Table 7.13.

### Table 7.13 Summary of Effects by Project Component During Construction

| Project Site | Summary of Effect during Construction |
|---|---|
| Temporary Workforce Accommodations | No residual effects anticipated |
| Port au Port Wind Farm and Associated Infrastructure | Sound levels are predicted to increase due to construction activities, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Codroy Wind Farm and Associated Infrastructure | Sound levels are predicted to increase due to construction activities, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |

**Table 7.13 Summary of Effects by Project Component During Construction**

| Project Site | Summary of Effect during Construction |
|---|---|
| 230 kV Transmission Lines and Substations | Sound levels are predicted to increase due to construction activities, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Hydrogen / Ammonia Production and Storage Facilities | Sound levels are predicted to increase due to construction activities, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Port Facilities | Sound levels are predicted to increase due to construction activities, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |

#### 7.5.1.2 Operation and Maintenance

For operation activities, Health Canada recommends a quantitative assessment of noise emissions (Health Canada 2017). Based on the review of the Project infrastructure and equipment list, the operation scenario that was considered representative of the maximum case for noise emissions (and thus modelled in the acoustic assessment) was that all equipment was operating simultaneously.

The Project operation phase noise emissions were established using the following information sources:

- Equipment lists and design data provided by ARUP and the wind turbine manufacturer (Siemens 2023)
- Measurement data of similar equipment
- Equipment specifications and referenced formula from acoustic literature (Bies and Hansen 2003).

Noise emissions are anticipated to occur from the operation of the wind turbines. While noise emissions can increase with increasing wind speeds, the background noise due to rustling vegetation and gusting winds tends to increase baseline noise levels (Health Canada 2012). The worst-case conditions for wind turbine noise are often when winds are moderate (i.e., approximately 6 m/s) but are still low enough that background noise levels are low. Therefore, the sound power levels for the wind turbines operating in winds of 6 m/s were used.

The other noise generating activities include operation of the substations and the ammonia generation facility. Some of the equipment, such as the large compressor units, are planned to be operated inside an enclosure, while other equipment are planned to be operated outdoors. Outdoor noise sources include the cooling water tower, transformers, and process piping.

The sound power levels for the outdoor noise sources are shown in Table 7.14. Sound emissions within the compressor buildings include the compressor operation and piping noise within each building. The total sound power level from the compressor buildings are shown in Table 7.15.

The estimated sound attenuation for pipe wrapping for outdoor piping used in this assessment is shown in Table 7.16.

## Table 7.14 Sound Power Levels for Facility Outdoor Equipment

| Source | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | | Total Sound Power Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **31.5** | **63** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | **dB** | **dBA** |
| Wind Turbine (Siemens 6.6 MW 6 m/s wind) | 103 | 100 | 97 | 95 | 91 | 88 | 88 | 80 | 65 | 111 | 99 |
| Cooling Water Tower | 78 | 78 | 76 | 86 | 75 | 77 | 78 | 78 | 76 | 89 | 85 |
| Cooling Water Tower Vent | 74 | 71 | 72 | 81 | 67 | 69 | 69 | 67 | 62 | 83 | 77 |
| Transformers | 109 | 115 | 117 | 112 | 112 | 106 | 101 | 96 | 89 | 121 | 112 |
| **Compressor Piping*** | | | | | | | | | | | |
| Instrument Air Compressors Piping | 83 | 80 | 91 | 92 | 98 | 110 | 116 | 109 | 104 | 95 | 94 |
| $N_2$ Separation Compressors Piping | 82 | 80 | 90 | 92 | 98 | 110 | 115 | 109 | 104 | 119 | 118 |
| $H_2$ Storage Compressor Piping | 83 | 81 | 91 | 93 | 99 | 111 | 116 | 110 | 105 | 104 | 103 |
| Boil Off Gas (BOG) Compressors Piping | 64 | 62 | 72 | 73 | 79 | 92 | 97 | 90 | 85 | 100 | 99 |
| Syngas Compressors Piping | 68 | 66 | 76 | 77 | 83 | 96 | 101 | 94 | 89 | 118 | 117 |
| Refrigeration Compressors Piping | 59 | 57 | 67 | 68 | 75 | 87 | 92 | 86 | 80 | 94 | 93 |
| Recycle Compressors Piping | 58 | 56 | 66 | 68 | 74 | 86 | 91 | 85 | 80 | 119 | 118 |
| $H_2$ Compressor at Solid Oxide Electrolyser Cell (SOEC) Phase 1 Piping | 56 | 53 | 64 | 65 | 71 | 83 | 89 | 82 | 77 | 92 | 91 |
| $H_2$ Compressors at SOEC Phase 2 and 3 Piping | 67 | 64 | 75 | 76 | 82 | 94 | 100 | 93 | 88 | 103 | 102 |

Note:
* Sound power levels for piping are shown on a per-metre basis

### Table 7.15 Sound Power Levels for Facility Indoor Equipment

| Facility | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | | Total Sound Power Level | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | dB | dBA |
| Instrument Air Compressors | 81 | 81 | 85 | 86 | 90 | 99 | 104 | 97 | 92 | 106 | 107 |
| $N_2$ Separation Compressors | 104 | 105 | 108 | 110 | 113 | 123 | 128 | 121 | 115 | 130 | 131 |
| $H_2$ Storage Compressor | 89 | 90 | 93 | 95 | 99 | 108 | 113 | 106 | 101 | 115 | 116 |
| Boil Off Gas (BOG) Compressors | 85 | 86 | 89 | 91 | 95 | 104 | 109 | 102 | 96 | 111 | 112 |
| Syngas Compressors | 104 | 104 | 108 | 109 | 113 | 123 | 127 | 121 | 115 | 130 | 130 |
| Refrigeration Compressors | 80 | 80 | 84 | 85 | 89 | 99 | 103 | 96 | 91 | 105 | 106 |
| Recycle Compressors | 105 | 105 | 109 | 110 | 114 | 124 | 128 | 122 | 116 | 131 | 131 |
| $H_2$ Compressor at Solid Oxide Electrolyser Cell (SOEC) Phase 1 | 77 | 78 | 81 | 83 | 86 | 96 | 101 | 94 | 90 | 103 | 104 |
| $H_2$ Compressors at SOEC Phase 2 and 3 | 88 | 89 | 92 | 94 | 97 | 107 | 112 | 105 | 99 | 114 | 115 |

### Table 7.16 Sound Attenuation Applied to Wrapping for Outdoor Process Piping

| Source | Sound Power Level (dB) by Octave Band (Hz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 31.5 | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |
| Pipe wrapping | - | - | 5 | 9 | 18 | 37 | 37 | 37 | - |

The predicted operation-related daytime and nighttime sound levels are shown in Table 7.17 for the nearest receptor locations in Port au Port, Codroy, and the Campground located near the Port of Stephenville. The full set of results are presented in Appendix 7-A, Table 7-A.2.

### Table 7.17 Predicted Sound Pressure Levels from Operations at Nearby Receptors

| Receptor Region | Receptor with Maximum Predicted Day-Night Sound Pressure Levels | Maximum Predicted Daytime Sound Pressure Levels ($L_d$) (dBA) | Maximum Predicted Nighttime Sound Pressure Levels ($L_n$) (dBA) | Maximum Predicted Day-Night Sound Pressure Level ($L_{dn}$) (dBA) |
|---|---|---|---|---|
| Codroy | Codroy-16 | 34 | 34 | 40 |
| Port au Port | Port au Port-791 | 28 | 28 | 34 |
| Campground | Campground-1 | 36 | 36 | 43 |

The predicted daytime ($L_d$), nighttime ($L_n$) and day-night average sound levels ($L_{dn}$) at the receptors do not exceed the Health Canada sleep disturbance criteria ($L_n$ of 45 dBA). The largest predicted change in the %HA for reach region is shown in Table 7.18. The predicted change in %HA was less than the Health Canada criterion of 6.5 %HA.

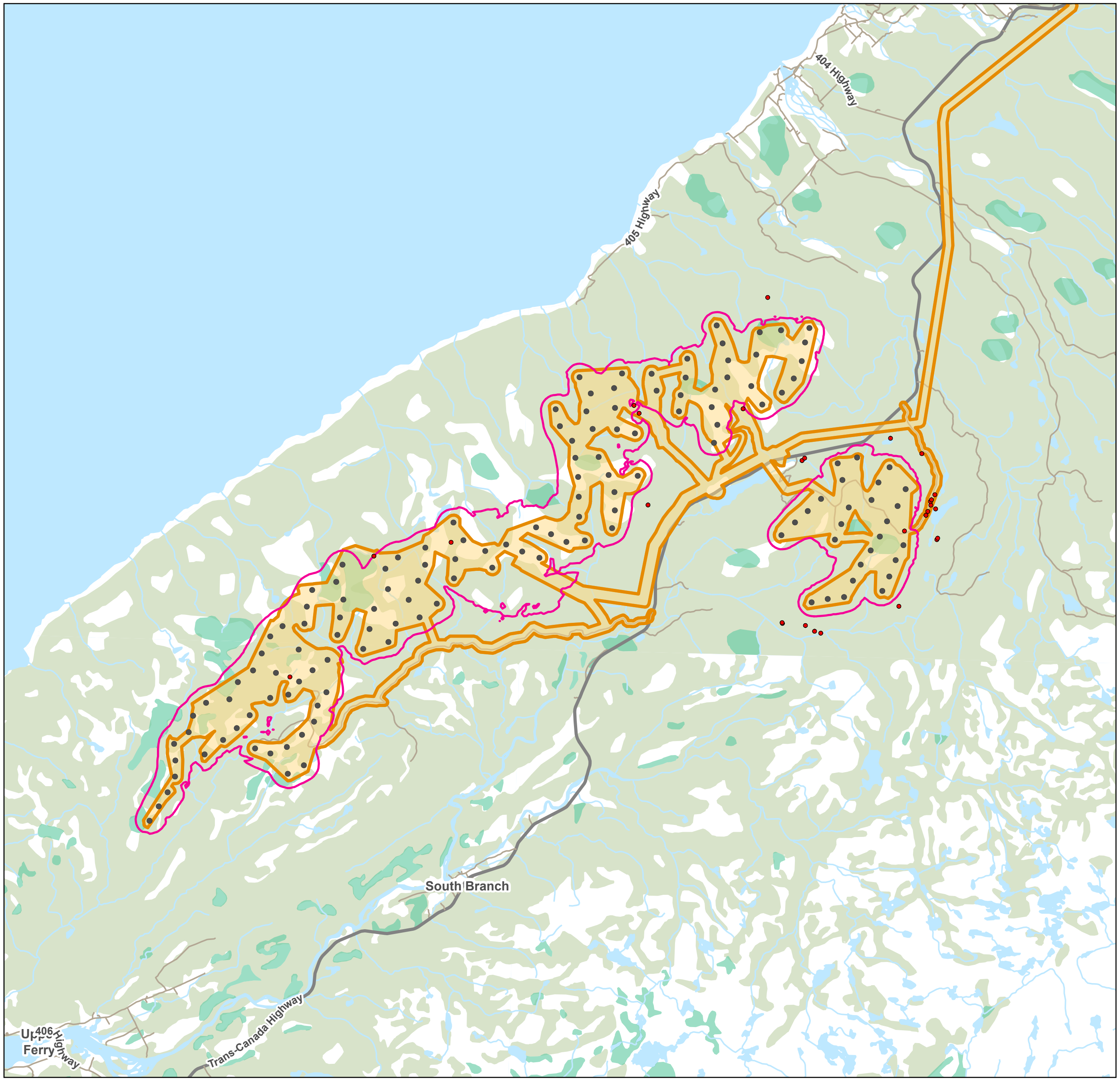
Contours of the Day-Night sound pressure levels from Project operation are shown in Figure 7.4 through to Figure 7.7.

### Table 7.18 Predicted Change in % Highly Annoyed at Nearby Receptors due to Project Operations

| Receptor | Baseline | | Project Predicted $L_{dn}$ (dBA) | Total (Baseline plus Project) | | Change in %HA (Between Total and Baseline) |
|---|---|---|---|---|---|---|
| | $L_{dn}$ (dBA) | %HA | | $L_{dn}$ (dBA)* | %HA | |
| Codroy-16 | 48 | 1.69 | 40 | 49 | 1.85 | 0.16 |
| Port au Port-791 | 44 | 1.00 | 34 | 44 | 1.06 | 0.06 |
| Campground-1 | 45 | 1.14 | 43 | 47 | 1.47 | 0.33 |

Notes:

* The total $L_{dn}$ represents the expected noise level at the receptors during the operation period; it is the modelled $L_{dn}$ result at the receptor plus the baseline $L_{dn}$ at the nearest receptor.




Stantec

Sensitive Receptor

Day-Night (Ldn) Sound Pressure Level (dBA)

35

**Proposed Project Features**

Turbine Location

Hydrogen / Ammonia Plant Location

Project Area

Proposed Route

Alternate Route

**Other Features**

Trans-Canada Highway

Road

Watercourse

Waterbody

Wetland

Forested Area

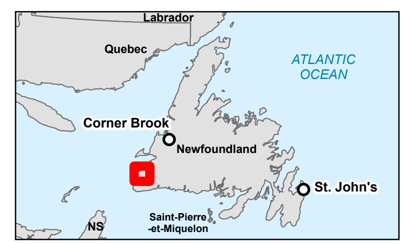
N

0 5 Kilometres

(At original document size of 8.5x11)
1:250,000

***Notes***

**1.** Coordinate System: NAD 1983 CSRS UTM Zone 21N
**2.** Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
**3.** Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 7/31/2023
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_205

*Figure No.*
**7.4**

Page 1 of 1

**Predicted Day-Night Sound Pressure Levels (dBA) from Project Operations-Codroy**

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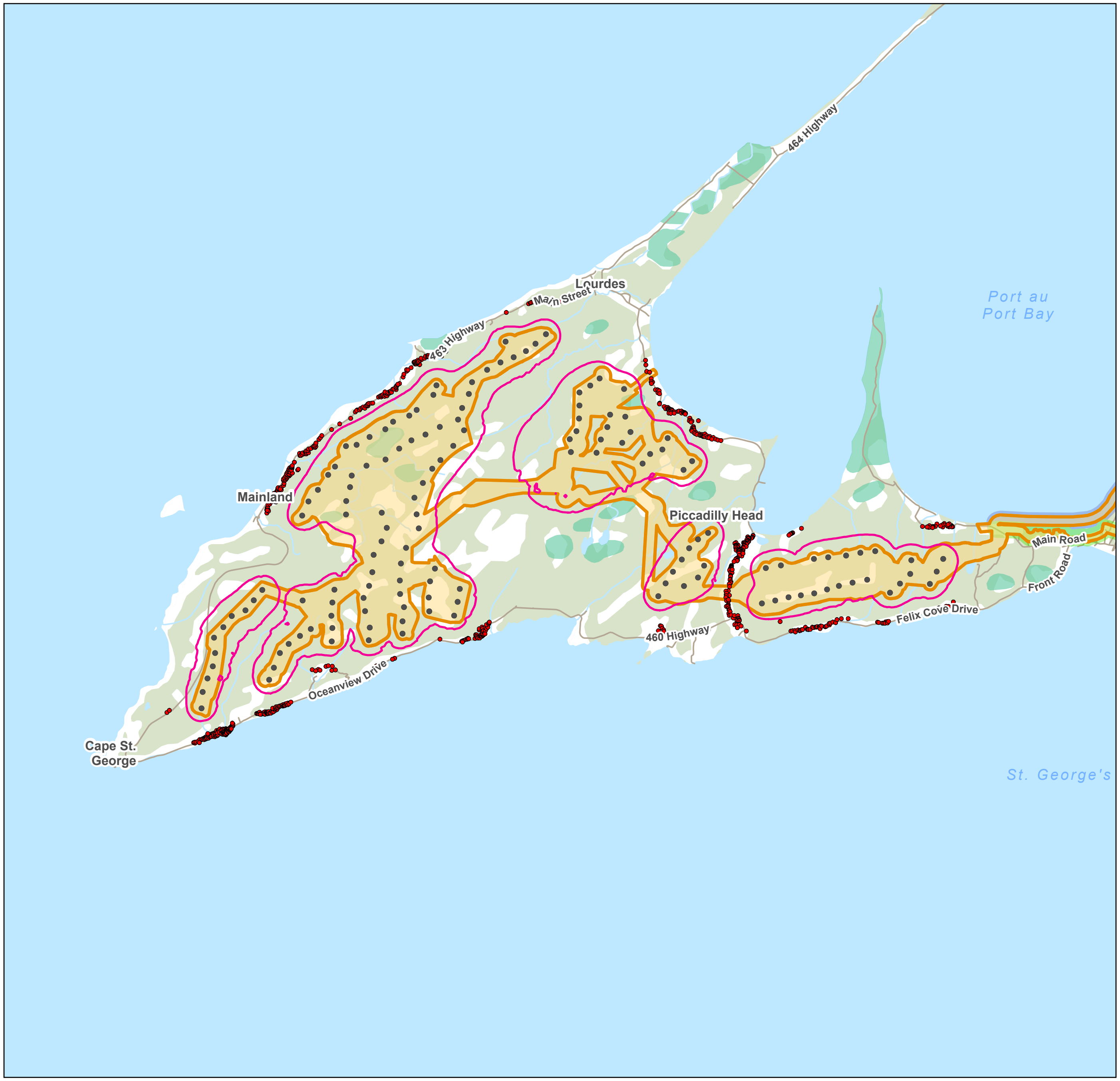



Stantec

- Sensitive Receptor

Day-Night (Ldn) Sound Pressure Level (dBA) selection

- 35

**Proposed Project Features**

- Turbine Location
- Hydrogen / Ammonia Plant Location
- Project Area
- Proposed Route
- Alternate Route

**Other Features**

- Trans-Canada Highway
- Road
- Watercourse
- Waterbody
- Wetland
- Forested Area

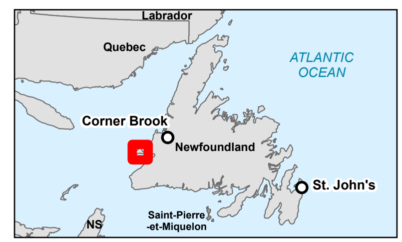
N

0 5 Kilometres

(At original document size of 8.5x11)
1:250,000

***Notes***

1. Coordinate System: NAD 1983 CSRS UTM Zone 21N
2. Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
3. Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 7/31/2023
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_205

*Figure No.*
**7.5**

Page 1 of 1

**Predicted Day-Night Sound Pressure Levels (dBA) from Project Operations-Port au Port**

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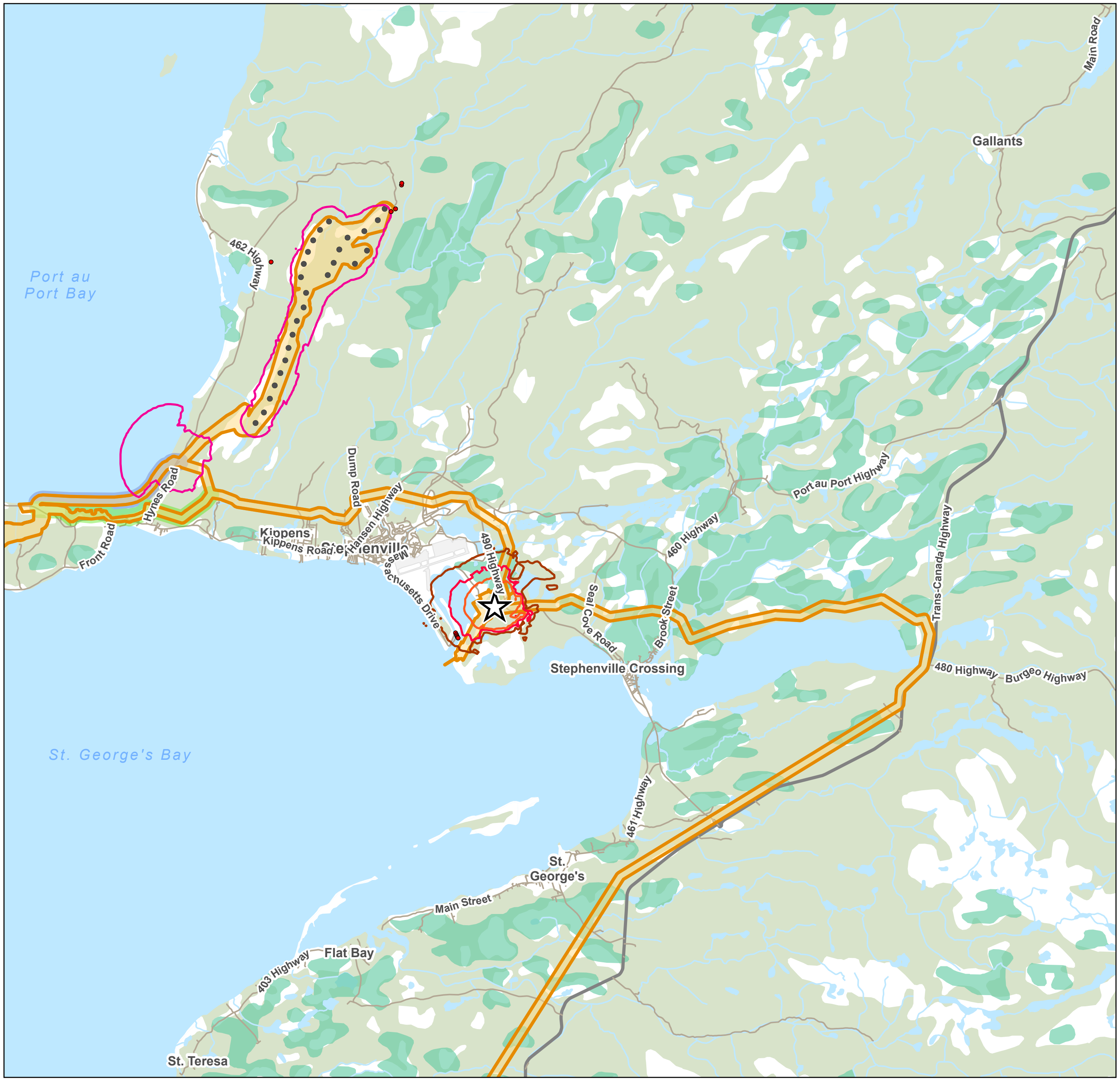



Stantec

- Sensitive Receptor

Day-Night (Ldn) Sound Pressure Level (dBA)
- 35
- 40
- 45
- 50

**Proposed Project Features**
- Turbine Location
- Hydrogen / Ammonia Plant Location
- Project Area
- Proposed Route
- Alternate Route

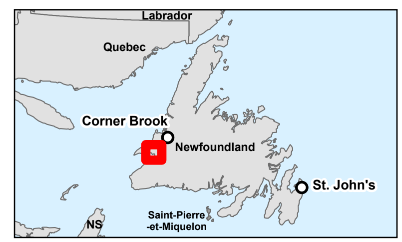
**Other Features**
- Trans Canada Highway
- Other Highway
- Arterial /
- Watercourse
- Waterbody
- Wetland
- Forested Area

N

0 5 Kilometres

(At original document size of 8.5x11)
1:250,000

***Notes***
**1.** Coordinate System: NAD 1983 CSRS UTM Zone 21N
**2.** Data Sources: World Energy GH2, NRCan CanVec, OpenStreetMap
**3.** Background: NRCan CanVec




*Project Location*
Stephenville
NL

Prepared by MGS on 7/31/2023
QR by AW on 2023-07-19

*Client/Project*
World Energy GH2
Project Nujio'qonik

121417233_205

*Figure No.*
**7.6**

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**Predicted Day-Night Sound Pressure Levels (dBA) from Project Operations-East Port au Port and Ammonia Production Facility**

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### Summary

With the implementation of mitigation measures, residual effects from the Project during operation and maintenance on change in sound quality are anticipated to be moderate in magnitude (i.e., the predicted change in sound levels may increase by more than 3 dB, however the change in %HA was less than 6.5% and noise levels were predicted to not exceed sleep disturbance criteria). Project effects on sound quality are expected to occur within the LAA and RAA. During operation and maintenance, residual effects are expected to be short-term and regular in frequency. Based on the information above, a summary of residual effects on change in sound quality during the operation and maintenance phase is provided in Table 7.19.

**Table 7.19 Summary of Effects by Project Component During Operation and Maintenance**

| Project Site | Summary of Effect during Operation and Maintenance |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | Sound levels are predicted to increase, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Codroy Wind Farm and Associated Infrastructure | Sound levels are predicted to increase, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| 230 kV Transmission Lines and Substations | Sound levels are predicted to increase, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Hydrogen / Ammonia Production and Storage Facilities | Sound levels are predicted to increase, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |
| Port Facilities | Sound levels are predicted to increase, however sound levels are not predicted to increase beyond guideline criteria for nuisance of sleep disturbance |

#### 7.5.1.3 Decommissioning and Rehabilitation

The residual environmental effects on sound quality during decommissioning and rehabilitation are adverse, as the related activities result in a predicted increase of sound levels compared to baseline conditions. The magnitude is predicted to be low and limited to the LAA/RAA since noise emissions during decommissioning and rehabilitation are typically much less than during construction and operation and can be effectively managed through the application of standard operating procedures (SOPs) and BMPs. The duration is short-term, the frequency is multiple regular event, and the residual effect on change in sound quality during decommissioning and rehabilitation is predicted to be reversible as the predicted increase in sound levels would end once rehabilitation is complete. The LAA/RAA in which the changes in sound quality are assessed is considered undisturbed, given the limited development within the LAA/RAA prior to the Project.

A summary of residual effects on change in sound quality during the operation and maintenance phase is provided in Table 7.20.

**Table 7.20 Summary of Effects by Project Component During Decommissioning and Rehabilitation**

| Project Site | Summary of Effect during Decommissioning and Rehabilitation |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | Sound levels are predicted to increase but will be lower in magnitude than those identified for construction and operation. |
| Codroy Wind Farm and Associated Infrastructure | Sound levels are predicted to increase but will be lower in magnitude than those identified for construction and operation. |
| 230 kV Transmission Lines and Substations | Sound levels are predicted to increase but will be lower in magnitude than those identified for construction and operation. |
| Hydrogen / Ammonia Production and Storage Facilities | Sound levels are predicted to increase but will be lower in magnitude than those identified for construction and operation. |
| Port Facilities | Sound levels are predicted to increase but will be lower in magnitude than those identified for construction and operation. |

## 7.5.2 Change in Vibration

### 7.5.2.1 Construction

The construction of the Project is anticipated to occur over a period of 30 months. The main construction vibration emissions from the wind turbines are from heavy vehicle traffic along access roads and blasting. The main source of vibration during construction of the ammonia production facility and port is from piledriving that may be required for the refurbishment of the Port of Stephenville.

Vibration emissions will also result from blasting during construction. Blasting is expected to be limited to daytime hours and will follow BMPs outlined in guidance documents such as the Blasters Handbook (ISEE 2016) and the Environmental Code of Practice for Metal Mines (ECCC 2009). These guidance documents provide detailed information on designing and carrying out blasting to reduce vibration emissions, and these will be consulted during blasting design.

Vibration emissions from construction activities were based on guidance from California Department of Transportation (Caltrans 2020). For the purposes of this assessment, piledriving was assumed to occur from a vibratory pile driver. In reviewing the equipment list for construction (e.g., Table 7.8 in Section 7.5.1.1), a large bulldozer is likely to generate the most vibration emissions during other construction activities, and was also assessed for construction vibration emissions (Caltrans 2020).

The estimated distance where vibrations may be barely perceptible, using the vibration screening approach recommended by Caltrans, is summarized for pile driving and a large bulldozer in Table 7.21. Vibration levels are expected to be below nuisance levels within the Project Area. Therefore, vibration levels at nearby receptor locations are not expected to exceed nuisance levels.

### Table 7.21 Predicted Vibration Levels During Construction Activities

| Source | Distance to nuisance vibration level of 0.14 mm/s RMS (m) |
|---|---|
| Vibratory Pile Driver | 430 |
| Large Bulldozer | 70 |

#### Summary

Residual effects from the Project during construction on change in vibration are anticipated to be low in magnitude (i.e., the predicted change in vibration is not expected to be perceptible). Project effects on vibration are expected to occur within the LAA and RAA. During construction, residual effects are expected to be short-term and regular in frequency. Based on the information above, a summary of residual effects on change in vibration during the construction phase is provided in Table 7.22.

### Table 7.22 Summary of Effects by Project Component During Construction

| Project Site | Summary of Effect during Construction |
|---|---|
| Temporary Workforce Accommodations | No residual effects anticipated |
| Port au Port Wind Farm and Associated Infrastructure | No residual effects anticipated |
| Codroy Wind Farm and Associated Infrastructure | No residual effects anticipated |
| 230 kV Transmission Lines and Substations | No residual effects anticipated |
| Hydrogen / Ammonia Production and Storage Facilities | No residual effects anticipated |
| Port Facilities | No residual effects anticipated |

### 7.5.2.2 Operation, Decommissioning and Rehabilitation

The residual environmental effects on vibration during Project operation and decommissioning and rehabilitation are adverse, as the related activities result in a predicted increase of vibration compared to baseline conditions. The magnitude is predicted to be low and limited to the Project Area since vibration during Project operation, decommissioning and rehabilitation are typically much less than during construction and can be effectively managed through the application of SOPs and BMPs. The duration is short-term, the frequency is multiple regular event, and the residual effect on change in vibration during operation, decommissioning and rehabilitation is predicted to be reversible as the predicted increase in vibration would end once activities are complete. The LAA/RAA in which the changes in vibration are assessed is considered undisturbed, given the limited development within the LAA/RAA prior to the Project.

A summary of residual effects on change in vibration during the construction phase is provided in Table 7.23.

**Table 7.23 Summary of Effects by Project Component During Operation, Decommissioning and Rehabilitation**

| Project Component | Summary of Effect |
|---|---|
| Port au Port Wind Farm and Associated Infrastructure | No residual effects anticipated |
| Codroy Wind Farm and Associated Infrastructure | No residual effects anticipated |
| 230 kV Transmission Lines and Substations | No residual effects anticipated |
| Hydrogen / Ammonia Production and Storage Facilities | No residual effects anticipated |
| Port Facilities | No residual effects anticipated |

## 7.5.3 Residual Environmental Effects Summary

### 7.5.3.1 Residual Environmental Effects Characterization

Table 7.24 summarizes the predicted environmental effects (residual effects) of the Project on the Acoustic Environment.

**Table 7.24 Summary of Predicted Environmental Effects of the Undertaking on the Acoustic Environment**

| Residual Effect | Residual Effects Characterization | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Nature** | **Magnitude** | **Geographic Extent** | **Timing** | **Duration** | **Frequency** | **Reversibility** | **Ecological and Socio-economic Context** |
| **Construction** | | | | | | | | |
| Change in Sound Quality | A | M | LAA and RAA | NS | ST | C | R | U/D |
| Change in Vibration | A | L | PA | NS | ST | C | R | U/D |
| **Operation and Maintenance** | | | | | | | | |
| Change in Sound Quality | A | M | LAA and RAA | NS | LT | C | R | U/D |
| Change in Vibration | A | L | PA | NS | LT | C | R | U/D |
| **Decommissioning and Rehabilitation** | | | | | | | | |
| Change in Sound Quality | A | M | LAA and RAA | NS | ST | C | R | U/D |
| Change in Vibration | A | L | PA | NS | ST | C | R | U/D |

**KEY:**

***Nature:***
*P: Positive*
*A: Adverse*
*N: Neutral*

***Magnitude:***
*N: Negligible*
*L: Low*
*M: Moderate*
*H: High*

***Geographic Extent:***
*PA: Project Area*
*LAA: Local Assessment Area*
*RAA: Regional Assessment Area*

***Duration:***
*ST: Short-term*
*MT: Medium-term*
*LT: Long-term*

***Timing:***
*NS: No Sensitivity*
*MS: Moderate Sensitivity*
*HS: High Sensitivity*

***Frequency:***
*S: Single Event*
*IR: Irregular Event*
*R: Regular Event*
*C: Continuous*

***Reversibility:***
*R: Reversible*
*I: Irreversible*

***Ecological / Socio-Economic Context:***
*D: Disturbed*
*U: Undisturbed*

#### 7.5.3.2 Summary of Predicted Environmental Effects

Noise and vibration emissions are expected to occur throughout the lifetime of the Project. Construction-related emissions are mostly related to heavy equipment operations for earthworks and for constructing the Project facilities. Emissions during operation are mostly related to the production of wind power and the ammonia generation facility.

Noise levels are predicted to increase from baseline conditions. The increase in sound levels are not predicted to exceed criteria related to nuisance or sleep disturbance.

Vibration levels are not expected to increase from baseline conditions beyond the Project Area.

## 7.6 Determination of Significance

In consideration of the VEC-specific significance criteria defined above, the residual effect(s) of routine Project activities on the Acoustic Environment (i.e., sound quality and vibration) are predicted to be not significant since Project emissions of noise and vibration do not exceed criteria for nuisance or sleep disturbance. The level of confidence in this prediction is discussed in Section 7.7.

## 7.7 Prediction Confidence

The determination of significance is made with a high level of confidence. The equipment deployed for the Project are well understood and the prediction techniques that are used are well-established to provide accurate results. As the design of the Project is not finalized, conservative assumptions were used that are related to the operation, sizing, and emission levels. Therefore it is likely that the change in the Acoustic Environment has been overstated.

## 7.8 Follow-Up and Monitoring

Follow-up and monitoring are intended to verify the accuracy of predictions made during the EA, to assess the implementation and effectiveness of mitigation, and to manage adaptively, if required. Compliance monitoring, where required by permitting or regulations, will be conducted to confirm that mitigation measures are properly implemented. Should an unexpected deterioration of the environment be observed as part of follow-up and/or monitoring, intervention mechanisms may include the application of mitigation measures to address it.

Based on the results of the residual environmental effects, follow-up and monitoring are not planned at this time.

## 7.9 Capacity of Renewable Resources and Effects on Acoustic Environment

The potential environmental effects of the Project on the acoustic environment were thoroughly assessed. The assessment concluded that routine Project activities are not likely to result in significant residual adverse effects on sound quality or vibration. Therefore, adverse Project-related effects on the capacity of renewable resources to meet the needs of the present and those of the future are not anticipated with respect to the acoustic environment.

## 7.10 Predicted Future Environmental Conditions if the Project Does Not Proceed

The Project is located in an area that has been designated for wind farm development, and it is possible that other wind farm projects would occur in this area if this Project were not to proceed. Future projects are anticipated to have similar effects on the acoustic environment. Should the Project Area remain undeveloped, the predicted future condition of the acoustic environment would be relatively unchanged from what was documented during the existing environment assessment presented in Section 7.2.

## 7.11 References

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