APPENDIX B
CO2 SUMMARY FROM EVREC

Equipment Type	Model:	Site	# Required	Notes:	Number of years	Operating days per year	Operating days	Runtime/Day (hrs)	Hourly Fuel Consumption (L/hr)	Total fuel consumption	Emission coefficient (kgCO2/unit)	Total CO2 emissions (kg)	Total CO2 emissions (tonnes)
Excavator:	470/349/PC 490	Twin Lakes	7	7 Crews, 1 per crew	1.5	312	468	21	35	2,407,860	2.67	6,428,986	6,429
Excavator:	336/290/PC 360	Twin Lakes	13	12 crews, 1 at crusher	1.5	312	468	21	25	3,194,100	2.67	8,528,247	8,528
Loading Unit:	Cat 390/JD 870	Twin Lakes	2	Main Quarry Ops - Loading Wiggles	1.5	312	468	21	48	943,488	2.67	2,519,113	2,519
Shovel/Loading Unit :	CAT 6015B/Hitachi EX-1200/PC 1200	Twin Lakes	1	Main Quarry Ops - Loading Rigids	1.5	312	468	21	85	835,380	2.67	2,230,465	2,230
Dozer:	D8/D155/1050K	Twin Lakes	14	7 New Road Construction Crews Running 2 Each	1.5	312	468	21	44	6,054,048	2.67	16,164,308	16,164
Dozer:	D6/P65	Twin Lakes	5	5 Upgrading Crews Running 1 Each Widening ROW and placing in new ROW	1.5	312	468	21	22	1,081,080	2.67	2,886,484	2,886
Roller:	10-Ton	Twin Lakes	12	May be split between crews, not necessarily 1 per crew?	1.5	312	468	21	15	1,769,040	2.67	4,723,337	4,723
Haul Truck:	JD 460/Cat 740	Twin Lakes	8	4 New Road Construction crews running 2 each	1.5	312	468	21	30	2,358,720	2.67	6,297,782	6,298
Haul Truck:	Live Bottom Trailers	Twin Lakes	4	4 trucks floating between 5 upgrading crews as required	1.5	312	468	21	18	707,616	2.67	1,889,335	1,889
Haul Truck:	CAT 777	Twin Lakes	6	3 New Road Construction crews running 2 777s each	1.5	312	468	21	64	3,773,952	2.67	10,076,452	10,076
Concrete Truck:		Twin Lakes	12	Once Towers reached	1.5	312	468	21	18	2,122,848	2.67	5,668,004	5,668
Other:	1/2 Ton Pickup	Twin Lakes	30	2.5 per crew (foreman, surveyor, labour crew floating), 2 for crusher, 2 for batch plant	1.5	312	468	21	10	2,948,400	2.67	7,872,228	7,872
Other:	Fuel Truck	Twin Lakes	6	Site Wide	1.5	312	468	21	15	884,520	2.67	2,361,668	2,362
Other:	Maintenance Truck	Twin Lakes	6	Site Wide	1.5	312	468	21	15	884,520	2.67	2,361,668	2,362
Grader:	12M/672GP	Twin Lakes	5	1 per upgrading crew	1.5	312	468	21	16	786,240	2.67	2,099,261	2,099
Loader:	CAT 988	Twin Lakes	4	1 at each quarry, 1 at crusher, 1 at batch plant	1.5	312	468	21	40	1,572,480	2.67	4,198,522	4,199
Loader:	CAT 980	Twin Lakes	1	1 at crusher	1.5	312	468	21	22	216,216	2.67	577,297	577
Feller Buncher:	CAT 522	Twin Lakes	6	Site Wide	1.5	312	468	10.5	36	1,061,424	2.67	2,834,002	2,834
Utility Loader:	CAT 938	Twin Lakes	2	Site Wide - Loading/Lifting, Spill Rock Cleanup	1.5	312	468	21	8	157,248	2.67	419,852	420
Batch Plant:		Twin Lakes	2		1.5	312	468	21		-	2.67	-	-
Crusher:		Twin Lakes	2		1.5	312	468	21		-	2.67	-	-
Excavator:	470/349/PC 490	Port to plant	3	1 per new road crew	1	312	312	21	35	687,960	2.67	1,836,853	1,837
Excavator:	336/290/PC 360	Port to plant	7	6 crews with 1, 1 at crusher	1	312	312	21	25	1,146,600	2.67	3,061,422	3,061
Dozer:	D8/D155/1050K	Port to plant	6	2 per new road construction, mix of spreading and stripping	1	312	312	21	44	1,729,728	2.67	4,618,374	4,618
Dozer:	D6/P65	Port to plant	3	1 per upgrading crew, stripping and spreading on ROW widening	1	312	312	21	22	432,432	2.67	1,154,593	1,155
Roller:	10-Ton	Port to plant	6	May be split between crews, not necessarily 1 per crew?	1	312	312	21	15	589,680	2.67	1,574,446	1,574
Haul Truck:	JD 460/Cat 740	Port to plant	12	3 per new construction crew, 1 per upgrading crew for widening and bad areas	1	312	312	21	30	2,358,720	2.67	6,297,782	6,298

Haul Truck:	Live Bottom Trailers	Port to plant	6	2 per upgrading crew	1	312	312	21	18	707,616	2.67	1,889,335	1,889
Other:	1/2 Ton Pickup	Port to plant	20	6 crews, each crew foreman, surveyor, labourer, 2 for crusher	1	312	312	21	10	1,310,400	2.67	3,498,768	3,499
Other:	Fuel Truck	Port to plant	2	Site Wide	1	312	312	21	15	196,560	2.67	524,815	525
Other:	Maintenance Truck	Port to plant	2	Site Wide	1	312	312	21	15	196,560	2.67	524,815	525
Grader:	12M/672GP or 14M	Port to plant	3	1 per upgrading crew, maybe one for maintenance of existing roads?	1	312	312	21	16	314,496	2.67	839,704	840
Loader:	CAT 988	Port to plant	1	1 at crusher	1	312	312	21	40	262,080	2.67	699,754	700
Loader:	CAT 980	Port to plant	1	1 at crusher	1	312	312	21	22	144,144	2.67	384,864	385
Feller Buncher:	CAT 522	Port to plant	6	Site Wide	1	312	312	10.5	36	707,616	2.67	1,889,335	1,889
Utility Loader:	CAT 938	Port to plant	1	Site Wide - Loading/Lifting, Spill Rock Cleanup	1	312	312	21	8	52,416	2.67	139,951	140
Crusher:		Port to plant	1		1	312	312	10.5		-	2.67	-	-
Excavator:	470/349/PC 490	Roadworks	9	9 Crews, 1 per crew	2	312	624	21	35	4,127,760	2.67	11,021,119	11,021
Excavator:	336/290/PC 360	Roadworks	17	16 crews, 1 at crusher	2	312	624	21	25	5,569,200	2.67	14,869,764	14,870
Loading Unit:	Cat 390/JD 870	Roadworks	5	Main Quarry Ops - Loading Wiggles, 1 between crews for long reach SG excavation	2	312	624	21	48	3,144,960	2.67	8,397,043	8,397
Shovel/Loading Unit :	CAT 6015B/Hitachi EX-1200/PC 1200	Roadworks	1	Main Quarry Ops - Loading Rigids	2	312	624	21	85	1,113,840	2.67	2,973,953	2,974
Dozer:	D8/D155/1050K	Roadworks	14	9 New Road Construction Crews Running 7 Each	2	312	624	21	44	8,072,064	2.67	21,552,411	21,552
Dozer:	D6/P65	Roadworks	11	5 Upgrading Crews Running 1 Each Widening ROW and placing in new ROW, 2 New Road Crews	2	312	624	21	22	3,171,168	2.67	8,467,019	8,467
Roller:	10-Ton	Roadworks	16	May be split between crews, not necessarily 1 per crew?	2	312	624	21	15	3,144,960	2.67	8,397,043	8,397
Haul Truck:	JD 460/Cat 740	Roadworks	10	5 New Road Construction crews running 2 each	2	312	624	21	30	3,931,200	2.67	10,496,304	10,496
Haul Truck:	Live Bottom Trailers	Roadworks	6	6 trucks floating between 7 upgrading crews as required	2	312	624	21	18	1,415,232	2.67	3,778,669	3,779
Haul Truck:	CAT 777 or 775	Roadworks	8	4 New Road Construction crews running 2 777s each	2	312	624	21	64	6,709,248	2.67	17,913,692	17,914
Concrete Truck:		Roadworks	12		2	312	624	21	18	2,830,464	2.67	7,557,339	7,557
Other:	1/2 Ton Pickup	Roadworks	45	2.5 per crew (foreman, surveyor, labour crew floating), 2 for crusher, 2 for batch plant	2	312	624	21	10	5,896,800	2.67	15,744,456	15,744
Other:	Fuel Truck	Roadworks	6	Site Wide	2	312	624	21	15	1,179,360	2.67	3,148,891	3,149
Other:	Maintenance Truck	Roadworks	6	Site Wide	2	312	624	21	15	1,179,360	2.67	3,148,891	3,149
Grader:	12M/672GP	Roadworks	7	1 per upgrading crew	2	312	624	21	16	1,467,648	2.67	3,918,620	3,919
Loader:	CAT 988	Roadworks	6	1 at each quarry, 1 at crusher, 1 at batch plant	2	312	624	21	40	3,144,960	2.67	8,397,043	8,397
Loader:	CAT 980	Roadworks	2	1 per crusher	2	312	624	21	22	576,576	2.67	1,539,458	1,539

Utility Loader:	CAT 938	Roadworks	4	Site Wide - Loading/Lifting, Spill Rock Cleanup	2	312	624	21	8	419,328	2.67	1,119,606	1,120
Feller Buncher:	CAT 522	Roadworks	4	Site Wide	2	312	624	10.5	36	943,488	2.67	2,519,113	2,519
Batch Plant:		Roadworks	2		2	312	624	22		-	2.67	-	-
Crusher:		Roadworks	2		2	312	624	22		-	2.67	-	-
Explosives		Offsites	11,721,600	Sitewide explosives in kg. Assuming we need to drill and blast 14,800,000 m3 of rock							0.19	2,215,382	2,215
Drill and blast		Offsites											
Turbine Concrete (non-buoyant)		Offsites	272,083	Per turbine. Assumed 70% of total Footing: 647 m3 Pedestal: 40 m3 Crane pad: 140 m3 TOTAL: 827 m3							400.00	108,833,200	108,833
Turbine Concrete (buyoant)		Offsites	156,510	Per turbine. Assumed 30% of total Footing: 930 m3 Pedestal: 40 m3 Crane pad: 140 m3 TOTAL: 1110 m3							400.00	62,604,000	62,604
Concrete for electricity towers		Offsites	87,638	66 kV x896 (@12 poles/km): 1.5Dx4=7.07m3 230 kV x74 (@8 poles/km) 2.5Dx4=19.63 m3							400.00	35,055,040	35,055
Concrete for collector substations		Offsites	2,400	Trafo: 2x50=200m3 Circuit breaker: 6x10=120m3 Control building: 200m3 Cable trenches: 120m3 Support structures: 100m3 TOTAL = approx. 800m3 / substation							400.00	960,000	960
Concrete for camps		Offsites	14,000	Assumed 2x500people camps and 1x1000 ppl camp. 20m2 average living quarters per person, 0.15 slab thickness, 2m frost line, Concrete for slabs: 1500m3 Concrete for footings: 20% of slab area 2000m3 TOTAL 3500m3							400.00	5,600,000	5,600
Concrete for main process facility		Production facility	532,631								400.00	213,052,240	213,052
Cement trucks		Offsites	17,000	truck rides						2,040,000	2.67	45,390	45
Diesel generators - camps		Offsites	8	Assumed 2x350kW generators per 500 people camp running 24/7, at 80% load. Assumed 2x 500 ppl camps and 1x 1000 ppl camp	2	365	730	24	65	9,110,400	2.67	24,324,768	24,325

Diesel generators - offsites general		Offsites	20	Assumed 20x 100 kW small diesel generators for powering small machinery	2	312	624	21	18	4,717,440	2.67	12,595,565	12,596
Diesel generators for batch plants		Offsites	2	Assumed a power requirement for a 100m3/h capacity batch plant of 125 kW, hence 1x 130 kW diesel generator	2	312	624	21	25	655,200	2.67	1,749,384	1,749
Heavy haul truck rides - wind turbines		Offsites	4,230							2,538,000	2.67	6,776,460	6,776
Heavy haul trucks - electricity towers		Offsites	5,656							2,262,400	2.67	6,040,608	6,041
Heavy haul trucks - electricity cables		Offsites	107							42,840	2.67	114,383	114
Total												**753,998,677**	**753,999**

Total cement (kg)	266,315,300			
Total fuel (l of diesel)	124,000,084		12,400	1,240.00
Total cubic yards of cement	242,105			
Total number of truck rides of cement truck	40,351			
kg cement per m3 of	250			
Total distance per truck ride (back and forth)	30	km		
Fuel consumption of a cement truck (diesel)	4	l/km		
Fuel consumption of 350KW diesel generator running at 80% load	65	l/h		
Fuel consumption of 100kW diesel generator running at 80% load	18	l/h		

Fuel consumption of 130kW diesel generator running at 90% load	25	l/h	
Carbon coefficient of explosives per kg (assuming ANFO)	0.189	kgCO2/kgANFO	
Carbon coefficient of diesel per l	2.67	kgCO2/l diesel	
Carbon coefficient of m3 of concrete	400	kgCO2/m3 concrete	
Hauling assumption for equipment			
Turbines	**Sections per turb**	**Total numb**	**Truck rides**
Tower section	4	1880	1880
Nacelles	1	470	470
Rotors	1	470	470
Blades	3	1410	1410
TOTAL			4230
km per truck ride (wind turbine) (back and forth)	60	km	
diesel consumption of heavy haul truck carying wind turbine sections	10	l/km	
Power lines	Sections per tower		
Number of electricity towers (MV)	10,752		
Number of electricity towers (HV)	560		
Electricity tower per	2		
Total number of truck rides	5,656		

Length of cable (MV + HV)	966		
Cable drums (assumed 10km/drum MV 20mm and 4km per drum HV 50 mm cable)	107		
Cable drum per truck	1		
Total number of truck rides		107	
Distance per truck ride (back and forth)	40		km
Diesel consumption of	10		l/km

CO2 EMISSION FACTOR CALCULATION

	TOTAL CARBON BY WEIGHT	DENSITY	SPECIFIC GRAVITY	CALORIFIC VALUE	CO2 Factor	UNITS
		lb/scf		Btu/scf		
COAL	0.786				2.882	TON CO2 / TON COAL
TAR/BTX	0.86				3.153333333	TON CO2 / TON TAR/BTX
COKE	0.918				3.366	TON CO2/ TON COKE
COG	0.3626		0.3622	550	33463.83186	TONS CO2 / BTU X 1012
BFG		0.0797	1.0402	92.0839	282184	TONS CO2 / BTU X 1012
NATURAL GAS	0.72		0.59	1000	59430.5712	TONS CO2 / BTU X 1012
OIL	0.87			183000	0.0154715	TONS CO2 / IMP GAL
DIESEL	0.873				0.013844325	TONS CO2 / IMP GAL
GASOLINE	0.855				0.011489775	TONS CO2 / IMP GAL
PROPANE	0.817				0.00763895	TONS CO2 / LBS
LIME (UNBURNT)	0.117					TON
DOLOMITE	0.124					TON
HOT METAL	0.043					TON
REG SCRAP	0.0014					TON
HECKETT SCRAP	0.001					TON
CARBON IN STEEL	0.00137					

Note: BFG Factor determined using combustion spreadsheet information.

The EVREC projects aims at producing 940,000 tpa of clean renewable ammonia produced using exclusively renewable power and resulting in 0 tCO2e/tNH3 greenhouse gas emissions (GHG).

940000	1000000

EVREC products are set to be shipped to Europe where it would replace carbon intense fossil-based conventional ammonia production process as the benchmark ammonia production emission factor in the EU is 1.57 tCO2e/tNH3 (source: Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS).

1.57	1.57

From 2030 onwards, it could represent a GHG emissions reduction potential of up to 1,476 ktCO_2e/annum and, brought to a total emissions reduction potential of 29,516 ktCO_2e assuming minimum 20 years of operation.

1476000	1570000
20	30
29520000	47100000

REDRAFT

The EVREC projects aims at producing ~940,000-1,000,000 tpa of clean renewable ammonia produced using exclusively renewable power and resulting in 0 tCO2e/tNH3 greenhouse gas emissions (GHG).

EVREC products are set to be shipped to Europe where it would replace carbon intense fossil-based conventional ammonia production process as the benchmark ammonia production emission factor in the EU is 1.57 tCO2e/tNH3 (source: Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS).

From 2030 onwards, it could represent a GHG emissions reduction potential of up to 1,570 ktCO2e/annum and, brought to a total emissions reduction potential of 47,100 ktCO2e assuming minimum 30 years of operation.

CO_2 SUMMARY TABLE

	Construction Period	Operational Period	Decomissioning Period	Total
KtCO2 Generated	754		53	807
KtCO2 Offset		47,100,000		47,100,000
		EXPECTED NET CO_2 PROJECT REDUCTION kt CO_2		**47,099,193**

Notes

The EVREC projects aimes at producing ~1,000,000 tpa of clean renewable ammonia produced using exclusively renewable power and resulting in 0 tCO2e/tNH3 greenhouse gas emissions (GHG).

EVREC products are set to be shipped to Europe where it would replace carbon intense fossil-based conventional ammonia production process as the benchmark ammonia production emission factor in the EU is 1.57 tCO2e/tNH3 (source: Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS).

Assumes a Project operating life of 30 years

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EVREC

Certification Action Plan

Actionable recommendations to prepare EVREC for certification once operational

Version 1 – Final report

September 2024

Table of Contents

1 Executive summary and general recommendations ... 4
2 Acronyms ... 8
3 Introduction ... 9
4 Project description ... 13
5 RED II RFNBO compliance assessment across the value chain ... 15
5.1 Requirements for REDII compliant RFNBO production and usage along the entire value chain ... 15
5.2 Transposition of REDII requirements to the project context ... 17
6 Hydrogen production ... 22
6.1 Responsible custodians, roles and responsibilities ... 22
6.2 Operational considerations ... 22
6.3 Monitoring and data collection requirements ... 25
6.4 Contracting ... 26
7 Ammonia production ... 28
7.1 Responsible custodians, roles and responsibilities ... 28
7.2 Operational considerations ... 28
7.3 Monitoring and data collection requirements ... 30
7.4 Contracting ... 31
8 Ammonia storage, shipping, and distribution ... 32
8.1 Responsible custodians, roles and responsibilities ... 32
8.2 Operational considerations ... 32
8.3 Monitoring and data collection requirements ... 33
8.4 Contracting ... 33
9 Downstream considerations ... 34
9.1 Responsible custodians, roles, and responsibilities ... 34
9.2 Contracting ... 34
9.3 Considerations on cracking ... 34
10 References ... 36
11 Annex ... 37
12 Definitions ... 42

1 Executive summary and general recommendations

An analysis of the relevant EU regulations to the EVREC's project context was carried out to assess the likelihood the project has of producing RED II compliant Renewable Fuel of Non-Biological Origin (RFNBO) and therefore of addressing the associated mandatory market in Europe. In order to anticipate potential compliance-related risks, a preliminary assessment has been conducted based on current technical & operational hypotheses considered by EVREC and evaluated against the CertifHy™ Voluntary Scheme requirements for RED II RFNBO compliance. However, it is important to highlight that actual compliance can only be demonstrated based on actual production of a running plant.

This assessment resulted in two main activities:

- A preparatory analysis conducted by Hinicio and aiming at reviewing EVREC hypotheses to identify suitable scenarios for the audit both on renewability and GHG emissions assessment.
- An audit exercise conducted by Bureau Veritas, certification body recognized under the CertifHy™ Voluntary Scheme.

Based on the hypotheses taken so far and assuming the project will be built and operated as per the designs and documents provided, the conclusion of this audit exercise was that the RFNBO ammonia coming from EVREC's project is on track to be RED II compliant.

Based on the audit conclusions & open remarks, and to support EVREC eventually achieving RED II RFNBO compliance when starting production, Hinicio developed a range of recommendations summarized in the Table 1 below.

For more detailed information about each of the recommendations please refer to the specific section addressing the issue in the following chapters.

The timeline for implementing these recommendations should be understood as follows:

- *During engineering phase*: refers to the incorporation of equipment into the plant design, either to allow more flexibility during the operation or to monitor and perform mass and energy balances.
- *Before Final Investment Decision (FID)*: refers to the investigation of alternatives or the negotiation with third parties of concepts that might have an important impact during the operation of the plant, and that cannot be incorporated at a later stage.
- *Before Commercial Operation Date (COD)*: refers to the implementation of administrative measures and processes that are key to the certification of the RFNBO.
- *During operation*: refers to the implementation of strategies that would allow for the optimization of the production of RFNBOs, or the certification of the product.

Importance was scored as follows:

- *Low*: the result of implementation of the recommendation is a nice to have but does not jeopardize the general business model.
- *Medium*: the recommendation needs to be addressed to successfully implement the project but can be corrected at a later stage if necessary.
- *High*: the implementation of the recommendation is paramount to the production or certification of the RFNBO.

Table 1: Actionable overall recommendations

VALUE CHAIN POSITION	ACTION	INVOLVED PARTIES	TIMELINE	IMPORTANCE
General	Choose a Voluntary Scheme and accredited certification body to prepare for the actual certification.	EVREC Voluntary Schemes	Before COD	High
General	Perform recurrent compliance checks / stress tests to ensure that the technical / commercial options retained do not jeopardize compliance.	EVREC	Before COD	High
General	Put in place a mass balancing system allowing to monitor the environmental attributes of the different products across the entire production chain.	EVREC EPC contractor	During engineering phase	High
General	Ensure relevant information (internal and from third parties) is available to perform an accurate GHG footprint calculation.	EVREC Power & other inputs suppliers	Before FID	Medium
General	Put in place a system for the transfer of PoS down the value chain to other economic operators.	EVREC and other identified custodians	Before COD	Medium
Electricity sourcing from the local grid	**If looking for marginal renewable power sourcing from the grid,** engage with the local grid operator to ensure access to the relevant information required to demonstrate the >90% claim i.e. share of renewable power in the grid consumption mix (production + imports – exports) at a yearly granularity.	EVREC The grid operator	Before COD	Medium
Electricity sourcing from the local grid	**If looking for marginal renewable power sourcing from the grid** closely monitor the local grid operator upcoming production strategy and potential impact on the 90% clause	EVREC The grid operator	During operation	Medium
Renewable electricity generation	Install a smart metering system allowing to oversee the energy balances, including any possible exchanges with the local grid and/or the back-up power generators.	EVREC EPC contractor	During engineering phase	High
Hydrogen production	Implement sub-metering such the hourly matching of the electrolyser consumption with the renewable electricity generation can be proved.	EVREC EPC contractor	During engineering phase	High
Hydrogen production	Install the necessary equipment to perform the mass balance.	EVREC EPC contractor	During the engineering phase	High
Hydrogen production	Perform mass balance and chose the balancing period that optimizes operation.	EVREC	During operation	Medium
Hydrogen production	Monitor and keep the products GHG emissions within the operational thresholds necessary to guarantee RED compliant RFNBO.	EVREC	During operation	High
Hydrogen production	Set up a forecasting and control system that allows to maximize the amount of renewable electricity fed to the electrolyser.	EVREC EPC contractor	During operation	Low
Ammonia production	Optimize the size of the H_2 buffer storage tanks according to the expected fluctuations in H_2 generation and the capabilities of the ammonia plant.	EVREC EPC contractor	During engineering phase	Low

Ammonia production	Implement a strategy for the storage of H_2 according to the production capacity of the ammonia plant.	EVREC	During operation	Medium
Ammonia production	Install the necessary equipment and metering systems for performing mass balance.	EVREC EPC contractor	During engineering phase	High
Ammonia production	Perform mass balance and choose the balancing period that optimizes operation.	EVREC	During operation	Medium
Ammonia production	Implement sub-metering such the matching of the ammonia plant electricity consumption with the renewable electricity generation can be proved (on a batch basis).	EVREC EPC Contractor	During engineering phase	High
Storage, shipping, & distribution	Define whose responsibility it is to perform the mass balance and GHG emissions calculations for the downstream transport and uses.	EVREC and other custodians	During operation	High
Storage, shipping, & distribution	Encourage the shipping of the ammonia using high-capacity ships carrying full load and travelling at eco-speeds.	Shipping operator	During operation	Low
Storage, shipping, & distribution	Promote the use carbon efficient fuels for shipping.	Shipping operator	During operation	Low
Downstream	In case new cracking options would be considered, evaluate the impact of the different cracking heat sources options on the resulting hydrogen renewability as part of the business case.	EVREC Off-taker	Before FID	High
Downstream	Ensure the correct transmission of the PoS along the entire value chain.	EVREC and other certified custodians	During operation	High

It is key to incorporate these recommendations into the project design from an early stage to minimize their cost of implementation and avoid delays during the construction and operation of the project.

2 Acronyms

ASU	Air Separation Unit
BOP	Balance of Plant
CO2e	Carbon dioxide equivalent
COD	Commercial Operation Date
DA	Delegated act
EAC	Energy Attribute Certificate
EU	European Union
FID	Final Investment Decision
GHG	Greenhouse gas
HP	High pressure
MP	Medium pressure
PoS	Proof of Sustainability
RE	Renewable Energy
RED	Renewable Energy Directive
RED II	Renewable Energy Directive II
RED III	Renewable Energy Directive III
RFNBO	Renewable fuel of non-biological origin
SMR	Steam Methane Reformer
VLSFO	Very Low Sulphur Fuel Oil

3 Introduction

Introduced in 2009, the Renewable Energy Directive (RED) is the main regulation driving the uptake for renewable energy in Europe. The current version of the Directive (REDII update or RED III) – adopted in October 2023 – sets a binding objective of 42.5% (previously 32% in REDII) renewable share in the Member States overall energy consumption. Besides this overall target, the following sector-specific ambitions are defined:

- Increase of binding targets for renewables in the transport sector by 2030: 29% of energy share or a reduction of 14.5% in the GHG intensity.
- Introduction of a binding target for Renewable Fuel of Non-Biological Origin (RFNBO) hydrogen use in the industry sector by 2030: 42% of energy share.
- Introduction of a target for renewable energy in heating and cooling in buildings by 2030: +1.1pp/year up to 2030.

These REDIII sector-specific binding targets in the industry, the transport sector and in the heating & cooling sector effectively create a demand for RFNBOs, incentivizing its production and commercialization within the European Union.

Each Member State has an 18-month period following the adoption of REDIII to transpose the directive into their local legislation. During that process each Member State will need to put in place a mechanism for incentivizing compliance (or to discourage the use of non-compliant energy sources beyond the threshold). These incentives will mainly be economical, through taxes or subsidies, making it desirable for economic operators to meet the required targets.

To demonstrate compliance, economic operators will need to evidence that the fuels claimed to be used to meet REDIII targets are compliant with the EU legislation and definitions. For the specific case of RFNBOs, the following criteria needs to be met and certified:

- Renewability: all relevant energy inputs of the RFNBOs, i.e. the electricity consumed by the electrolyser, must be of renewable origin, taking into consideration the additionality, temporal and geographical correlation requirements defined in the legislation. Using non-renewable energy to cover for non-relevant energy inputs (nitrogen production, hydrogen compression, ammonia production, …) would not affect the renewability of the final product but the impact on the GHG emissions of the product should be closely monitored (see below).
- Greenhouse gas emissions reduction: the RFNBO must achieve at least 70% of GHG emissions reductions on a well-to-grave basis, compared to its fossil fuel comparator (94 gCO_{2eq}/MJ i.e., max. GHG emissions of 28.2 gCO_2eq/MJ fuel LHV).

Fuels need to be produced and handled by certified economic operators empowered to claim they have been produced and used according to the above-mentioned requirements. To do so the economic operators will need to go through an audit & certification process with a recognized Voluntary Scheme whether the RFNBOs are produced locally or imported into the EU.

In that context, the objective of this document is to analyze the compliance of the EVREC project according to the CertifHy™'s Voluntary Scheme for RFNBOs (currently under review by the European Commission), and to assess whether the project design is on track to comply with the EU regulation and hence be eligible to be used in the EU RFNBO premium market. This document provides actionable recommendations to EVREC to work towards demonstrating compliance with the RFNBO Voluntary Scheme's requirements once the plant is operational.

This document builds on two previous deliverables from May, June, and July 2024 respectively:

- A regulatory compliance analysis delivered by Hinicio to EVREC, including:
    - REDII requirements analysis and transposition to EVREC's project.
    - Definition and critical review of the reference scenario.
    - Sensitivity analysis and identification of key parameters to monitor.
    - Definition of the scenarios to put forward for a pre-certification.
    - Preparation for the audit and guidance through the process.
- A pre-certification audit report delivered by Bureau Veritas on the selected scenarios, in collaboration with Hinicio and according to CertifHy™'s Voluntary Scheme for RFNBOs.

The CertifHy™ Voluntary Scheme[1] is based on the requirements and criteria set out in the two Delegated Acts (DA) published by the European Commission on the 20th of June 2023[2].

These Delegated Acts are associated documents to the Renewable Energy Directive (REDII) and set the definitions and conditions to be matched by hydrogen (and derivatives) to be considered Renewable Fuels of Non-Biological Origins (RFNBO) and count towards renewable fuels consumption targets in the EU as per REDIII.

On March 1st, 2023, CertifHy™ submitted its RFNBO EU Voluntary Scheme documents for approval by the European Commission[3]. Voluntary Schemes such as CertifHy™'s RFNBO EU Voluntary Scheme, set out the criteria and requirements that economic operators need to meet to ensure that RFNBO volumes comply with the relevant REDII criteria.

[1] CertifHy™ VS system documents "GHG Emissions & Renewability" from 28/02/2023 and "Traceability & Chain of Custody" from 24/01/2023 and updated in August/2023.
[2] Delegated act on renewable electricity requirements, Delegated act on GHG methodology
[3] https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/voluntary-schemes_en

Once CertifHy™'s EU Voluntary Scheme for RFNBO has been recognized by the European Commission[4], economic operators will be able to issue certificates under CertifHy™'s scheme to demonstrate that hydrogen and derivatives have been produced in compliance with EU REDII and Delegated Acts criteria. The subsequent certificates and proof of sustainability (PoS) documents will be used to demonstrate compliance with the European Member States' renewable energy in transport target and the mandate on the use of renewable hydrogen in industry (as per REDIII).

It is worth noting that going through the process of certification via a Voluntary Scheme (such as CertifHy™) is the only way of demonstrating compliance and, therefore, of benefitting from the premium value of the RFNBO in the EU (subsidy, tax reliefs, etc., depending on the Member State transposition).

In this report we will first provide an overview of the regulatory context under which the project is developed, and we will make recommendations to be considered along the entire value chain to be able to demonstrate that the RFNBO to be produced and delivered by EVREC is on track for being compliant and therefore will be a premium product. Following, more detailed recommendations will be given per item in the value chain, namely i) Hydrogen production, ii) Ammonia production, iii) Storage and shipping and iv) Downstream use. For each item we provide recommendations regarding:

1. Custodian (economic operator): roles and responsibilities.
2. Operational considerations.
3. Monitoring requirements for auditing purposes.
4. Contractual considerations.

[4] https://www.certifhy.eu/news/certifhy-rfnbo-vs-for-recognition-eu-commission/

Disclaimer: This report is based on a high-level analysis, and it should not be considered an exhaustive step-by-step action plan to guarantee compliance with the requirements of CertifHy™'s RFNBO Voluntary Scheme. In addition, a level of uncertainty remains as to the final criteria and requirements that will be set out in RFNBO Voluntary Schemes as none has been formally recognized by the European Commission at the date of writing this report.

4 Project description

Exploits Valley Renewable Energy Corporation "EVREC" is a Power-to-X (P2X) mega project located in the central region of Newfoundland, Canada that aims at developing, building, and operating a large-scale industrial value chain to produce renewable ammonia, from renewable hydrogen to address the European market for Renewable Fuels of Non-Biological Origin (RFNBO).

The renewable power for the project will be produced via a directly connected combined 3.1 GW windfarm and 250 MW solar farm, designed to feed a 2.6 GW modular water electrolyser, capable of producing up to 167 kton/year of hydrogen. This hydrogen will be fed into 3 newly-built ammonia production plants, where it will be converted into e-ammonia using nitrogen obtained from an in-house Air Separation Unit (ASU) allowing to produce around 1,000 kton/year of RFNBO ammonia, 100% of which will be liquified and shipped to the main European ports to address the industrial demand for compliant RFNBO and/or hydrogen.

To evaluate the products compliance on a full value chain – as required by the regulation – hypotheses have been taken for the downstream part:

- Shipping to Antwerp and distribution via barge on a 100 km distance to be used as ammonia.
- Shipping to Rotterdam and distribution via ammonia pipeline on a 100 km distance to be used as ammonia.
- Shipping to Hamburg, to be cracked to hydrogen using EVREC ammonia as a heat source, compressing the resulting hydrogen and delivering it via pipeline to an industrial user at a 200 km distance.

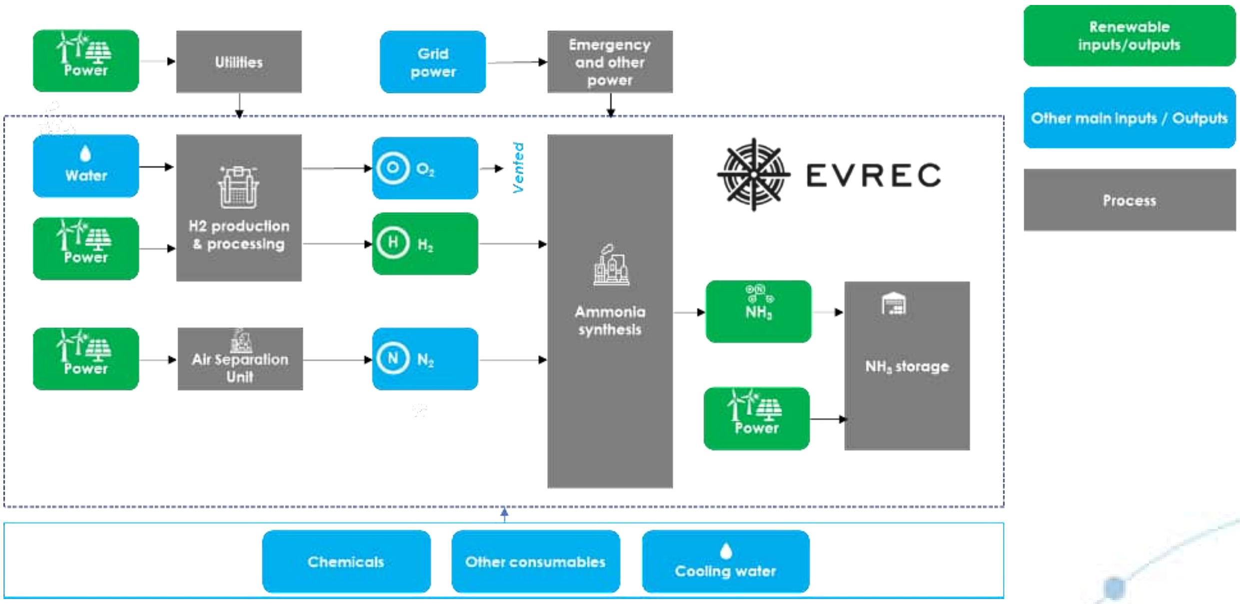


Figure 1: Schematic of EVREC's project setup.

If the intended strategy is to run exclusively on directly connected renewable power, some power could be sourced from the grid via a 50 MW connection to the local grid. Considering the high penetration of RE in the local grid consumption mix, this power will be considered renewable for the purpose of RFNBO production allowing EVREC to complement the RE coming from the direct connection (see dedicated section). This connection may also be used to distribute and sell excess renewable power to the local grid operator in case of shortage.

5 RED II RFNBO compliance assessment across the value chain

In the sections below we will address the main actions that are required across the value chain to demonstrate compliance and become certified in the future. We will also calculate the expected GHG emissions of EVREC's project according to a defined set of scenarios for analysis.

For a more detailed analysis of each step of the value chain individually, please refer to the next chapter, where the responsible custodians and their respective roles and responsibilities will be explained. Key operational considerations will be provided as well as monitoring and data collection requirements and the key elements that would need to be included in contracts.

5.1 Requirements for REDII compliant RFNBO production and usage along the entire value chain

REDII requires that the renewability of RFNBOs and their GHG emissions savings characteristics can be proven at any moment in the entire supply chain. For GHG emissions, this implies that the required scope under REDII is from "well-to-grave"[5]: all emissions, including distribution and combustion (or oxidation if used in a fuel cell) need to be accounted for. This is illustrated in the picture below.

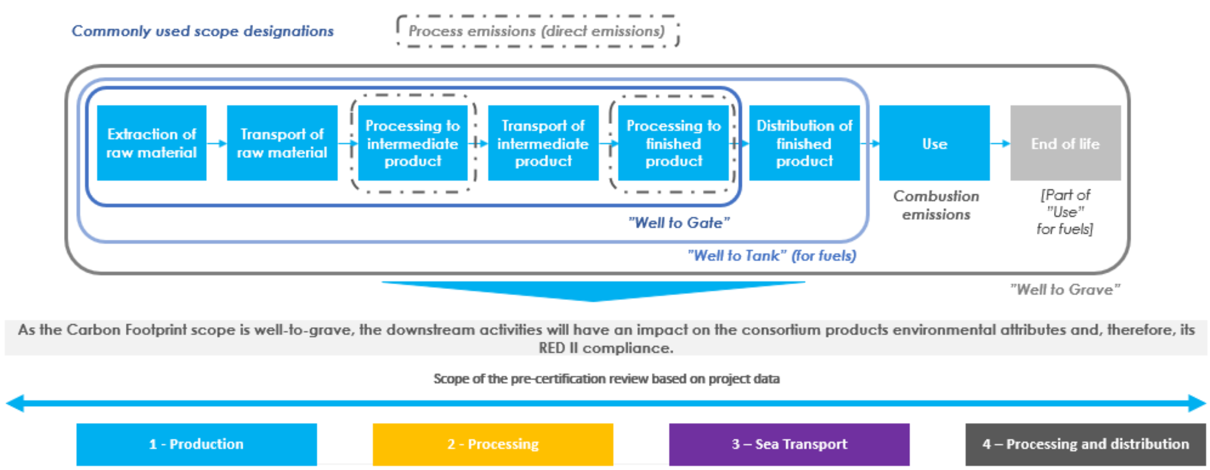


Figure 2: GHG emissions calculations scope under REDII

Hence, to produce compliant products under REDII, each step in the chain will need to be certified, including i) hydrogen production, ii) ammonia production, iii) storage and shipping and iv) downstream use.

[5] In the EU regulatory context, emissions from the construction of assets are not considered (only operational emissions).

A mechanism is needed to trace the origin of products and pass on information along the supply chain about i) their renewable energy content ('renewability') and ii) GHG emissions savings characteristics[6] [7]. Such mechanism, which all economic operators will need to use, will need to be based on a "mass balance" principle, and would need to link the physical product to a certificate, known as a "proof of sustainability" (PoS).

A PoS demonstrating REDII compliance of a share[8] of the product will need to be issued at each processing or stationary storage step. The PoS and the physical product may not be separated. Each custodian along the value chain will also be responsible for the upstream transport emissions of their fuel. For example, the ammonia producer is responsible for the transport emissions of the hydrogen to the ammonia plant. This is illustrated in Figure 3.

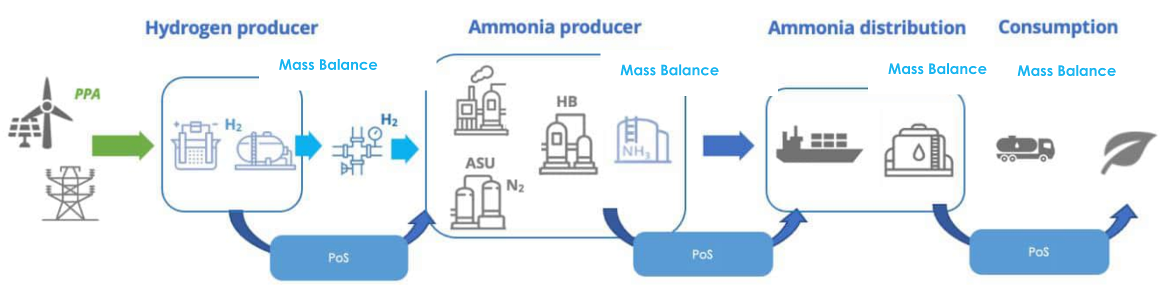


Figure 3: Typical chain of custody for RFNBO compliant ammonia.

Therefore, an end-to-end mass balance system needs to be implemented, with information added by each economic operator ('custodian') along the supply chain concerning physical production volumes. This is critical to be able to distinguish the different production batches that might find themselves together at a particular transport or storage stage but may carry different environmental attributes (mainly renewability and GHG emissions). A Voluntary Scheme for RFNBOs, such as the one proposed by CertifHy™, allows precisely to keep track of the renewability and GHG attributes of the RFNBO following the prescribed mass balance system.

Certification according to a Voluntary Scheme for RFNBOs is thus necessary to have access to the "compliance market": the market driven by the need to comply with REDIII requirements and thereby capture a premium. It is foreseeable that many producers will want to get certified to be able to issue PoS with their products in the future, and auditors

[6] Official definition: 'proof of sustainability' means a declaration by an economic operator, made on the basis of a certificate issued by a certification body within the framework of a voluntary scheme certifying the compliance of a specific quantity of feedstock or fuels with the sustainability and greenhouse gas emissions savings criteria set out in Articles 25(2) and 29 of Directive (EU) 2018/2001. Source: COMMISSION IMPLEMENTING REGULATION (EU) 2022/996 of 14 June 2022 on rules to verify sustainability and greenhouse gas emissions saving criteria and low indirect land- use change-risk criteria https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0996
[7] For an overview of data to be transmitted through the whole supply chain and transaction data (i.e. content of a PoS), see Annex 1 of https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022R0996 (same reference as previous)
[8] Mass balancing allows certified and non-certified products to be mixed along the supply chain while keeping its environmental attributes separated.

may become a bottleneck for certification. It is therefore of great importance to book an auditor in advance and make sure to have all relevant documentation ready, to ensure a smooth and efficient certification process that allows to capture market premiums early.

5.2 Transposition of REDII requirements to the project context

As explained in the previous sections, mainly 2 criteria need to be met to justify that a RFNBO is REDII compliant: i) renewability and ii) greenhouse gas emissions reduction.

(i) It is expected that the electrolyser and the ammonia production process will be exclusively supplied with renewable electricity coming from the wind plants directly connected to the production plants. However, some power may be sourced from the grid requiring specific configurations on the bidding zone concept.

As defined in the EU 2019/943, bidding zones are the largest geographical area in which bids and offers from market participants can be matched without the need to attribute cross-zonal capacity. In the European context, this concept is in most cases coincident with national borders. However, there are also cases, (e.g. Italy, Denmark, Sweden) where multiple bidding zones are present within the same country. In the latest "Q&A implementation of hydrogen delegated acts" document published by the European Commission on the 14/03/2024, the Commission has provided guidance on how to interpret the bidding zone concept outside the EU. The following approach applies:

- Certifiers should assess whether at the location of the electrolyser, market regulations requiring establishing hourly prices for electricity in a geographical area exist. If so, that geographical area should be considered as a bidding zone.
- If such rules are not in place, certifiers should assess whether the electricity network in the country of production is integrated or whether there are several separated networks. If there are several networks, each network should be considered as a bidding zone.
- If the electricity network of the country is integrated and there are no geographically differentiated electricity prices, the whole country may be considered as one bidding zone.

Where the DAs require certain conditions to be met related to the concept of a bidding zone (e.g. in the case of bidding zones with abundant renewable share in the grid mix to consider that electricity as fully renewable), the conditions can only be considered as fulfilled if compliance can be demonstrated based on reliable data from official sources.

These considerations will be helpful to assess the local grid configuration and associated impact on the EVREC GHG emissions as described in the next section.

The analysis described in Annex 1 led to the conclusion that the whole Newfoundland and Labrador province should be considered one unique bidding zone for the purpose of RFNBO production as vertically integrated and separated from the other province / networks in Canada.

(ii) To assess the GHG emission reduction characteristics of the product, its carbon footprint needs to be calculated across the entire value chain, on a "well-to-grave" scope. To calculate EVREC's RFNBO GHG emissions, a value chain set-up was defined based on the project's actual configuration and the most likely conservative scenarios that the RFNBO could face during its lifecycle. Table 2 below summarizes the general parameters used to model the RFNBO GHG emissions across the modelled scenario. For the upstream part of the value chain, 3 main scenarios have been considered:

The relevant data to evaluate the general set-up of the project are described in the Table 3 below.

Table 2: Description of the common parameters of the modelled scenarios

Component	Parameter	Value
Power sourcing strategy	Base load	Renewable from directly connected RE production plant
	Cooling water	
	Water treatment	
	EZ stack + compressor	
	EZ BOP + aux	
	Hydrogen storage	
	Air separation unit	
	Ammonia synthesis	
	Ammonia liquefaction	
	Ammonia storage	
Electricity GHG emissions	Renewable sources	0 gCO_2e/kWh
Shipping	Fuel	Shipping VLSFO
	Vessel	Middle-sized Gas Carrier (MGC)
	Payload	90%
	Port of destination	Antwerp **or** Rotterdam **or** Hamburg
Downstream POTENTIAL Uses	Cracking at port of destination	No **or** Yes
	Cracking fuel	Ammonia where relevant
	H_2 compression (grid injection)	Yes where relevant
	H_2 pressure	110

Table 3: Description of the technical hypotheses for the modelled scenario.

PARAMETER	BASE CASE SCENARIO	UNIT
Fresh water output	862	m3/h
Electrolyser capacity	1,740	MW
H_2 production	37.2	ton/h
ASU capacity	37.6	MW
Nitrogen output	171.1	ton/h
Haber-Bosch capacity	60	MW
Ammonia output	208	ton/h
Ammonia storage power consumption	2.25	MWh/day
Ammonia storage capacity	75,000	ton

The GHG EMISSIONS of the base scenario was calculated, and the calculations were submitted to be audited by Bureau Veritas. The result of such audited GHG EMISSIONS calculations is presented in the Table 4 for each major step in the value chain.

- Upstream:

I. After the storage of the ammonia at the port of export.

II. After the unloading of the ammonia at the relevant port of destination (including the emissions related to the loading and shipping of the ammonia).

- Downstream:

III. After 100-km distance distribution via barge.

IV. After 100-km distance distribution via pipeline.

V. After cracking, compression of the hydrogen and delivery at 200 km via hydrogen pipeline.

Table 4: GHG EMISSIONS along the value chain for the modelled base case scenario.

PARAMETER	Scenario 1	Scenario 2	Scenario 3	UNIT	GHG SAVINGS
After the storage of the ammonia at port of export, Canada		0[9]		gCO_{2e}/MJNH3	100%
After the unloading of the ammonia at the port of destination	3.9	4.1	4.5	gCO_{2e}/MJNH3	96% / 96% / 95%
After ammonia distribution	4.1	4.2	4.5	gCO_{2e}/MJNH3	96% / 96% / 95%
After cracking using ammonia in the port of destination[10]	NA	NA	5	gCO_{2e}/MJH2	95%
After compression to 110 bars[11]	NA	NA	9.4	gCO_{2e}/MJH2	90%
After pipeline delivery on a 200 km distance	NA	NA	9.5	gCO_{2e}/MJH2	90%

As can be seen from the results presented and audited by Bureau Veritas and shown in Table 4 , the RFNBO ammonia or hydrogen would meet the minimum emission savings threshold of 70 % in all the analyzed scenarios along different steps of the value chain and would still have a budget of around 18.7 to 24.1 gCO2e/MJ for any remaining steps downstream.

Based on these considerations, it can be concluded that the EVREC project is on track to produce REDII compliant RFNBO.

However, ensuring that the operational hypotheses described in this section will eventually be met is critical to reach the results above. In particular, the use of non-renewable power for the production steps, the shipping hypotheses, or the cracking fuel

[9] As stated by the auditor in its report, GHG emissions calculation should be updated with the detailed list of chemicals used in the plant, not available at the moment of performing this exercise. These contributions are not expected to be material though.

[10] As stated in the latest "Q&A implementation of hydrogen delegated acts" document published by the European Commission on the 14/03/2024 in question 57, in the case of cracking ammonia into hydrogen, since the energy content of the hydrogen coming out of the cracking process is higher than the energy content of the ammonia used as a feedstock, the electricity and heat used in the cracking process that results in this higher energy content must be considered as relevant energy. **Therefore, non-renewable energy and heat sources will have an impact in the renewability of the produced RFNBO hydrogen.**

Q57: "One way to transport renewable hydrogen over long distance is to ship it in the form of derivatives (e.g. ammonia, methanol or methane) and to reconvert it into renewable hydrogen at the place of consumption. Is the energy used for converting hydrogen derivatives considered as relevant energy?"

A: "As set out under point 3 of the GHG methodology, only electricity and heat that is adding to the heating value of the fuel is considered as relevant energy. Where the use of heat for reconversion of derivatives does not increase the heating value of the products, the share of RCF and RFNBO is not affected. To establish whether electricity and heat that are used in a process are adding to the heating value of the fuel, **the heating value of the derivative that enters the process and qualifies as an RFNBO should be compared to the heating value of the hydrogen the process yields. If the heating value of the hydrogen that yields from the process exceeds the heating value of the RFNBO input, the heating value is increased and accordingly the electricity and heat is adding to the heating value of the fuel and must be considered as relevant energy.**" – To be considered in case other cracking source is envisaged. See annex 2 for illustration impact.

[11] Based on standard value from the Delegated Act for grid power carbon intensity in Germany, may decrease over time and lead to a reduced compression emission contribution.

to be used at the port of destination is key, as the use of non-low-carbon fuels may have an important impact on the hydrogen GHG emissions.

6 Hydrogen production

This chapter provides recommendations related to the compliance and certification of the hydrogen production. The hydrogen production plant considered in the EVREC project is a greenfield electrolyser facility located in Newfoundland, Canada. The plant will produce RFNBO hydrogen using renewable electricity generated by EVREC's assets in the region via a direct connection.

6.1 Responsible custodians, roles and responsibilities

Table 5: Responsible custodians, roles, and responsibilities for hydrogen production

CUSTODIAN	ROLE AND RESPONSIBILITIES
Renewable energy asset operator: EVREC	• Generation assets owned by EVREC. • Generation and transmission of all the renewable energy downstream for its use for RFNBO and auxiliaries.
Grid operator (private grid): EVREC	• The private network linking the generating assets to the downstream energy consumers will be developed and owned by EVREC and will be considered a direct connection as a base case. • EVREC will oversee the energy balances, including any possible exchanges with the local grid using a smart metering system.
Grid operator: The grid operator	• The grid in Newfoundland and Labrador is overseen and managed by the company The grid operator. The company will oversee the scheduling and dispatch of the energy balances. • In particular, the company will also be responsible for monitoring and sharing relevant data for EVREC such as the share of renewables in the grid consumption mix over time. • In case such system is developed, the grid operator may also be responsible or involved in the process of producing / selling Environmental Attributes Certificates (EACs) associated with the production of renewable electricity
Hydrogen fuel producer & plant operator: EVREC	• Perform mass balance. Mass balance period can be chosen – any period up to one calendar quarter[12]. In this specific case where the hydrogen and ammonia producer are the same economic operator, it should be noted that there is: • No need to establish a hydrogen purchase agreement (HPA) with the ammonia production plant as integrated with the hydrogen production and managed by the same economic operator. • No need to provide Proof of Sustainability to the ammonia production plant as integrated with the hydrogen production and managed by the same economic operator.

6.2 Operational considerations

As the electrolyser is fed with renewable electricity from EVREC's own production assets via a direct connection, the emissions related to electrolysis should be calculated based on the Delegated Act guideline and the renewable electricity covered by the direct connection is attributed a zero-GHG emissions (0 gCO_2e/kWh) (as per REDII).

[12] While the mass balance period can be max. one calendar quarter (3 months), the maximum timeframe over which an average footprint may be calculated is up to 1 calendar month, and should take into account temporal correlation requirements when the claim of using renewable power is made resulting in even shorter time intervals production batches.

Additionally, in case EVREC would pull power from the grid to feed its electrolyser, specific considerations would apply and the grid power would be attributed a carbon intensity of:

- 0 gCO_2e/kWh if the Newfoundland and Labrador grid has a percentage of RE in the mix higher than 90%. In this case, EVREC could withdraw RE for an amount of full-load hours equivalent to the percentage of RE in the mix for the previous year. Once the 90% threshold is reached, this condition is considered matched for a period of 5 years. The analysis described in annex 1 shows that this condition was matched since 1990 and that the current grid development strategy should allow to maintain this statement over time and allowing EVREC to benefit from renewable power directly from the grid.
- In case the condition above is not matched anymore and/or power is pulled from the grid for hours exceeding the yearly cap described, the carbon intensity value of the last available year should be used and should be checked with Newfoundland Hydro, in order to use a compliant that would include also upstream emissions.

For the calculation of the GHG emissions of the produced hydrogen, the European Commission gives the following guidelines: "*The greenhouse gas emissions intensity may be calculated as an average for the entire production of fuels occurring during a period of at most one calendar month but may also be calculated for shorter time intervals. Where electricity qualifying as fully renewable according to the methodology set out in Directive (EU) 2018/2001 is used as input that enhances the heating value of the fuel or intermediate products, the time interval shall be in line with the requirements applying for temporal correlation. Where relevant, greenhouse gas emissions intensity values calculated for individual time intervals may then be used to calculate an average greenhouse gas emissions intensity for a period of up to one month, provided that the individual values calculated for each period meet the minimum savings threshold of 70 %*[13]".

This means that different time intervals could be considered for the calculation of the GHG emissions in the production of hydrogen (where the heating value of the fuel is enhanced) and of the rest of intermediary products (including ammonia). Table 6 below explains the different time intervals that could be considered.

Table 6: Time interval definition for batches, GHG calculations and mass-balance.

	Batches and GHG Calculation	Mass balance
Hydrogen	Before 2030: up to a calendar month After 2030: Up to an hour	Up to a calendar quarter
Ammonia and other intermediate products	Up to a calendar month	

[13] Commission Delegated Regulation (EU) 2023/1185 of 10 February 2023. Annex A. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023R1185

In the case of hydrogen, Figure 4 illustrates specific conditions under which the hydrogen produced would (or not) comply with the REDII requirements and be considered an RFNBO. Each of the timeframes identified in the profile can be considered individual production batches[14]. These different production batches lead to different types of hydrogen:

- When the electricity mix used for the hydrogen production is comparable to time interval 1 or 4, the renewable electricity produced covers all the electrolyser consumption. Therefore 100% REDII compliant RFNBO hydrogen is produced. This is EVREC's base case.
- When the electricity mix used for hydrogen production is comparable to time interval 2, the renewable energy produced does not cover all the electrolyser needs and additional electricity is sourced from the grid (considering it delivers non-renewable energy in this example). A mix of REDII compliant RFNBO (85%) and non-RFNBO (15%) hydrogen is produced.
- When the electricity mix used for hydrogen production is comparable to time interval 3, the renewable energy produced does not cover all the electrolyser needs and additional electricity is sourced from the grid. Renewable hydrogen is produced (as renewable electricity is used) but the level of grid electricity used is high enough to bring the overall batch carbon footprint higher than the threshold. No REDII compliant RFNBO (0%) is produced.

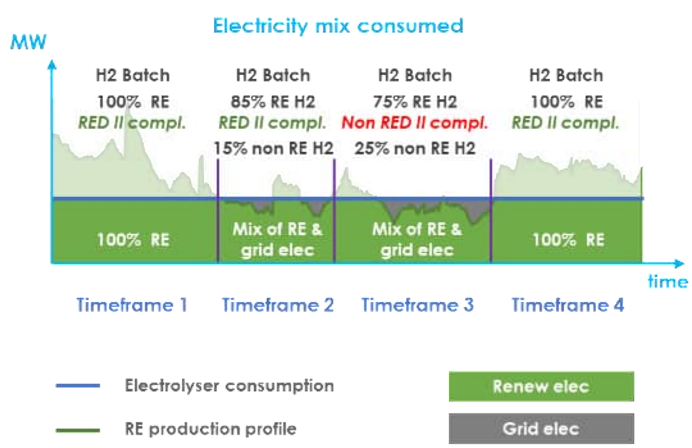


Figure 4: Example of batch production profile mixing RFNBO and non RFNBO production[15].

These results and analyses are thus closely linked to the timeframe defined. Optimal choice of timeframes (within the limits specified in Table 6) can allow to maximize the volume of REDII compliant hydrogen produced. The issuance of PoS is done ex post but there are also no specific guidelines on whether the batch timeframe needs to be set

[14] A batch is the production within a define time interval.
[15] Source: Hinicio. Hypothetical case.

ahead of production or afterwards. Thus, any batch/timeframe definition should be acceptable if it respects the conditions specified above and if the information collected is sufficient to demonstrate the products' compliance.

6.2.1 Following renewable energy profile (temporal correlation compliance)

The electrolyser stack is the part of the hydrogen production plant which contributes to the energy content of the fuel. It therefore needs to comply with the temporal correlation requirement. To comply with the temporal correlation requirement, the electrolyser stack power consumption should follow the production profile of the renewable energy asset(s) on an hourly basis (monthly until 31/12/2029). To do so the operator of the hydrogen production plant, EVREC, needs to receive information about the renewable energy production profiles and schedule its hydrogen production accordingly.

Showing exact matching of the stack consumption with the renewable assets would require sub-metering. This will be discussed in more detail in section 6.3.

6.2.2 GHG Emissions monitoring and control on the Balance of Plant

The Balance of Plant (BoP) and Auxiliary power demand does not contribute to the energy content of the fuel and therefore does not need to meet the temporal correlation requirement. However, they do have an impact on the GHG emissions of the produced hydrogen.

In the audit it was assumed that all electricity consumed by the hydrogen production plant, including the BoP and auxiliary power, is coming from REDII compliant renewable electricity sources (thus with no impact on the GHG emissions). Once the plant is operational, part of this electricity may come from non-renewable sources (either the grid or back-up power generator). For each production batch this amount of non-renewable electricity should be monitored, and the GHG emissions calculated and kept below the threshold.

6.2.3 Synchronization of hydrogen production with ammonia production

In the EVREC project setup, there is hydrogen storage/buffer in between the electrolyser and the ammonia synthesis plant. However, most of the produced hydrogen will need to be directly fed into the ammonia synthesis plant. For this reason, the ammonia plant should follow the production profile of the hydrogen production plant when possible, and the H_2 storage capacity should be used to smoothen the fluctuations in hydrogen production. The implications this has on the ammonia plant are further detailed in section 7.2.

6.3 Monitoring and data collection requirements

The production of hydrogen is the main contributor to the energy content of the RFNBO; hence it is the driver for the renewability aspect of the PoS. For this reason, special attention should be given to monitoring and data collection related to electricity sourcing for auditing and certification purposes. Hydrogen production is, to a lesser extent, also relevant for the GHG emissions of the product.

6.3.1 Electricity

Specific attention should be given to the metering of electricity. Optimizing the usage of renewable electricity from the direct connection may require being able to specifically identify the electrical consumption of different (sub-)process blocks. This would be required at least for the electrolyser, but it can be of interest to be able to identify any specific consumptions throughout the production process to adjust the renewable electricity consumption.

It is also key to monitor the energy exchange (in both ways) with the local grid, and to correlate possible energy imports from the grid with specific consumptions in the plant (ideally different than the electrolyser stack).

This comes with implications and additional costs on the overall electric design that should be integrated at early stages to facilitate its incorporation into the different production sites.

6.3.2 Water sourcing and treatment

Considering EVREC's project set-up and electricity supply and assuming that the power taken from the grid can be considered renewable, the sourcing of river water is not a contributor to the GHG Emissions of the produced hydrogen. If this statement was to evolve over time, the associated impact on EVREC products should be evaluated even if this is not expected to constitute a material contribution / risk for compliance.

6.3.3 Summary of data collection requirements

The minimum data points required to perform the GHG EMISSIONS calculation and PoS audit are given in Table 7.

Table 7: Data collection requirements for hydrogen production.

DATA POINT	MEAN OF MEASUREMENT	MIN. MEASUREMENT FREQUENCY	IMPACTS
Electricity consumption Stack	Power sub-metering	Monthly (until 31/12/29) Hourly (01/01/30 onwards)	Renewability GHG EMISSIONS
Electricity consumption electrolyser plant	Power metering (incl. BOP, auxiliary, and water treatment)	Batch total	GHG EMISSIONS
Water input	Flow metering	Batch total	GHG EMISSIONS
Hydrogen production	Flow metering	Hourly	Renewability GHG EMISSIONS
External metering required			
RES production	Power metering	Hourly	Renewability
River water pumping	Power metering	Batch total	GHG EMISSIONS

6.4 Contracting

Power Purchase Agreements, regional specificities, and bidding zones

In the reference scenario there is no need for a PPA according to the REDII requirements and the DA, as the renewable electricity assets and the hydrogen plant are directly connected and owned by the same economic operator.

In the latest “Q&A Implementation of Hydrogen Delegated Acts” document annex published by the European Commission on 14/03/2024, the Commission provided guidance on the requirements for Environmental Attribute Certificates (EACs) in cases where the Delegated Acts do not mandate the conclusion of PPAs. This applies to projects like this one, which envisions a direct connection between RE plants and an electrolyser. EACs should not be sold to the market and must be cancelled for the purpose of RFNBO production to prevent double counting.

Additionally, in case some electricity to produce RFNBO is pulled from the local grid, EVREC needs to make sure that EACs are also purchased for that amount of power. EVREC should also make sure that the EACs are not sold for the power that is directly consumed for the production of RFNBO, to avoid any double counting.

7 Ammonia production

This chapter provides recommendations related to the certification of the ammonia production. The ammonia production plant considered in EVREC project is a greenfield ammonia production facility located in Newfoundland, Canada. The plant will produce RFNBO ammonia using the hydrogen produced by EVREC and nitrogen sourced from an ASU located within the premises of the ammonia plant.

7.1 Responsible custodians, roles and responsibilities

Table 8: Responsible custodians, roles, and responsibilities for ammonia production

CUSTODIAN	ROLE AND RESPONSIBILITIES
Hydrogen plant operator: EVREC	• Provide RFNBO hydrogen to ammonia production. • No need to provide Proof of Sustainability to the ammonia producer since it is the same economic operator.
Ammonia fuel producer and plant operator: EVREC	• Perform mass balance. Mass balance period can be chosen – any period up to one calendar quarter[16]. • Provide Proof of Sustainability to the downstream economic operator.

7.2 Operational considerations

The same general criteria for RFNBO compliance regarding energy used and GHG emission threshold as listed for hydrogen in section 6.2 apply for ammonia, with a few specific additional conditions:

- Ammonia can be produced based on different hydrogen production batches (i.e., coming with different GHG emissions).
- In that case, the percentage of RFNBO ammonia would correspond to the percentage of RFNBO hydrogen consumed for its production.

The foreseen project setup has several operational implications which EVREC should manage.

7.2.1 Synchronization of ammonia production with hydrogen production

In the EVREC project setup, there is hydrogen storage/buffer between the electrolyser and the ammonia synthesis plant. The ammonia plant should follow the production profile of the hydrogen production plant when possible, and the H_2 storage capacity should be used to run the Haber-Bosch reactor when hydrogen is not being produced (at all or in sufficient quantities). The operator of the ammonia production plant should evaluate whether the storage available is enough to operate the Haber-Bosch reactor and for how long.

[16] While the mass balance period can be max. one calendar quarter (3 months), the maximum timeframe over which an average footprint may be calculated is up to 1 calendar month.

Good communication exchange needs to be in place between the scheduling of the hydrogen and ammonia plant, potentially with the implementation of production forecast models advising the supervisory controls on the overall complex how to ramp up/down the production of ammonia based on predicted H_2 production levels.

7.2.2 Nitrogen sourcing

The nitrogen used to produce RFNBO ammonia will be produced internally using an Air Separation Unit (ASU). For each batch of ammonia, the operator of the ammonia plant should ensure that enough nitrogen is produced to cover the entire batch of RFNBO ammonia.

As nitrogen does not constitute a relevant energy input, producing it using renewable or non-renewable power will not harm the ammonia renewability. However, the GHG emissions of the nitrogen will have to be considered.

For the base case scenario it was assumed that the ASU would run on the back-up power diesel generator (see Table 2), thus contributing to GHG emissions. Using renewable electricity, either via the direct connected plants or via the grid would therefore further reduce the GHG emissions of the ammonia.

7.2.3 GHG emissions monitoring & control

In the EVREC project set-up and strategy, this step is to be supplied with renewable energy. In case it is not, the ammonia conversion step would have a significant impact on the GHG emissions of the final product, leading to important compliance risks.

The operator of the ammonia synthesis plant would have to control the impact of consuming electricity from non-renewable sources on the GHG emissions of the ammonia, in such a way that the total batch GHG emission remains below the required limits.

As an illustration, Table 9 below summarizes the impact of switching part of the power consumption in the ammonia plant to non-renewable power (either back-up power generator or grid in case the >90% case is not achieved anymore). Results are expressed in qualitative evaluation of increase in the delivered H_2 footprint based on the power consumption the different steps represent.

Table 9: Impact of (partly) using non-renewable power in the ammonia production process

Scenario description	Impact on H_2 footprint when delivered
Average scenario for reference	-
Water cooling & treatment using non-renewable power	+
BOP using non-renewable power	++
Ammonia synthesis using non-renewable power	+++
Ammonia liquefaction non renewable power	+

7.3 Monitoring and data collection requirements

The significant contributors to the GHG emissions of the ammonia are the emissions linked to the hydrogen production, electricity used in the ammonia production plant, and electricity used for the production of nitrogen. Therefore, each of these inputs should be monitored and data must be collected for auditing and certification purposes.

7.3.1 RFNBO Hydrogen and syngas

The RFNBO hydrogen will come into the ammonia plant with a certain GHG emissions. For mass balancing purposes, it is crucial to know and show how much RFNBO hydrogen is being fed into the ammonia synthesis plant. This data is used to determine the amount of RFNBO ammonia which is produced in the batch and allocate the footprint accordingly. This data should be monitored on a batch total basis.

7.3.2 Nitrogen sourcing

The nitrogen used in the production of RFNBO ammonia is produced by EVREC using an ASU. As such, it will have a GHG emissions according to the inputs used for its production (non-renewable electricity). To ensure compliance and reduce the GHG emissions of Nitrogen to a minimum (ideally zero), the operator of the ammonia plant should show that they source sufficient renewable electricity to produce enough nitrogen to be fed for the synthesis of RFNBO ammonia. This should be shown for each batch.

7.3.3 Electricity consumption

The ammonia synthesis plant consumes 100% renewable electricity but could also be fed with non-renewable electricity (which comes with an associated GHG Emissions). The impact of this electricity on the GHG Emissions of the product is very large and should be limited as much as possible. In any case, the amount and source of electricity consumed during each batch should be tracked. Sub-metering should be installed to be able to track the energy sources used to produce ammonia and apply the appropriate GHG Emissions (zero in case enough renewable energy can be proved available through energy balancing). The cost of installing such sub metering equipment should be considered.

7.3.4 Summary of data collection requirements

The minimum data point required to perform the GHG EMISSIONS calculation and PoS audit are given in Table 10.

Table 10: Data collection requirements for ammonia production.

DATA POINT	MEAN OF MEASUREMENT	MIN. MEASUREMENT FREQUENCY	IMPACTS
Hydrogen in (RFNBO)	Flow metering	Batch total	Renewability Mass balance GHG EMISSIONS
Nitrogen in (ASU)	Flow metering	Batch total	Mass balance GHG EMISSIONS
Electricity consumption	Power metering (ammonia synthesis sub-metering)	Batch total	GHG EMISSIONS
Ammonia out of HB synthesis	Flow metering	Batch total	Mass balance GHG EMISSIONS
Ammonia out of refrigeration turbine	Flow metering	Batch total	Mass balance GHG EMISSIONS

7.4 Contracting

- Ammonia purchase agreement with an offtaker, including warranties to ensure the delivery of the RFNBO compliant ammonia in sync with the production capacity. Also, it should cover other crucial elements to demonstrate compliance, namely the GHG emissions, renewability, and data exchange agreements (PoS) between the ammonia plant operator and the offtaker.
- With the grid operator (The grid operator): in case some electricity to produce RFNBO is withdrawn from the local grid, as previously explained for hydrogen production, EVREC needs to make sure that Environmental Attributes Certificates (EACs) are also purchased for that amount of power. EVREC should also make sure that the EACs are not sold for the power that is directly consumed for the production of RFNBO, to avoid any double counting.

8 Ammonia storage, shipping, and distribution

This chapter will provide the recommendations related to the certification of the ammonia in the port of destination. The ammonia is stored cryogenically in liquid form at the production plant site before being shipped, also in liquid form, to the port of destination. In the current setup the ship is fueled using shipping VLSFO and travels between Canada and Europe.

8.1 Responsible custodians, roles and responsibilities

Table 11: Responsible custodians, roles, and responsibilities for ammonia storage, shipping, and distribution.

CUSTODIAN	ROLE AND RESPONSIBILITIES
Ammonia producer: EVREC	• Provide downstream economic operators with the PoS. • Depending on how the supply chain is organized (degree of vertical integration) it is either the ammonia producer or the downstream operator that is responsible for performing the mass balance and providing calculations and evidence on the emissions intensity of the activities downstream of ammonia production. In case third parties are contracted to perform certain activities (e.g., transport, storage, cracking), it must be ensured that the emissions related to these outsourced activities are provided to either the ammonia producer upstream, or downstream to the next economic operator (e.g., cracking and end-use), depending on the organization of supply chain in question.
Transport operator: TBD	In case the transport operator has the responsibility of performing the mass balance: • Perform mass balance and emissions calculation (a vessel is considered a mass balance unit). Transport emissions between the ammonia producer and storage/conversion unit are typically covered as upstream transport emissions by the operator of the downstream activity(ies). • Provide PoS to the next economic operator downstream.
Storage operator: tbd	In case the storage operator has the responsibility of performing the mass balance: • Perform mass balance and emissions calculation. • Provide PoS to the next economic operator downstream.
Conversion unit operator (e.g., cracking)	• Similar to storage operator.

8.2 Operational considerations

The shipping, cracking, and distribution of the ammonia represent a significant contribution to EVREC's ammonia GHG emissions. As such, these specific steps that may be out of EVREC's direct control shall be closely monitored and, in particular,:

- For shipping:
    - Use of large vessels and import payload should be preferred options.
    - Use of low-carbon & renewable fuels shall be encouraged.
    - Use of optimized routes shall be encouraged.
    - Use of eco-speed mode shall be encouraged.
- For cracking (if such):

- Use of renewable energy inputs for heat and electricity for cracking shall be encouraged to achieve 100% RFNBO hydrogenError! Bookmark not defined..
- For distribution:
  - Efficient distribution storage shall be preferred options:
    - Ammonia rather than hydrogen.
    - Trains & Barges rather than truck.
    - Pipelines rather than vehicles.

8.3 Monitoring and data collection requirements

Along with the different parameters listed above, a specific data & evidence requirements shall be added to the requirements list defined for partners across the value chain allowing for a sanity check prior to operations and smooth data collection process after the beginning of production.

Table 12: Data collection requirements for ammonia storage, shipping, and distribution

DATA POINT	MEAN OF MEASUREMENT	MIN. MEASUREMENT FREQUENCY	IMPACTS
Power consumption (storage facility)	Power metering	Batch total over storage period	GHG EMISSIONS
Power consumption (loading terminal)	Power metering	Shipload total	GHG EMISSIONS
Power consumption (offloading terminal)	Power metering	Shipload total	GHG EMISSIONS
Fuel consumption ammonia ship	Mass-flow metering	Round trip	GHG EMISSIONS
Ammonia loaded	Mass-flow metering	Shipload total	GHG EMISSIONS
Ammonia offloaded	Mass-flow metering	Shipload total	GHG EMISSIONS

8.4 Contracting

- Agreement between the ammonia producer and downstream economic operator stipulating the relevant conditions are needed, ensuring that the product received fulfills REDII requirements. This should cover the GHG emissions, renewability, and data exchange agreements (PoS) between the ammonia plant and downstream economic operator.
- Contracts with third parties (e.g., distributors) are needed to ensure that mass balance and emissions calculations related to the outsourced activities are performed correctly and provided timely.

9 Downstream considerations

The REDII specifies a well-to-grave approach, which includes the final user. This chapter details the consideration for the downstream use of the ammonia or hydrogen.

9.1 Responsible custodians, roles, and responsibilities

Table 13: Responsible custodians, roles, and responsibilities for downstream uses.

CUSTODIAN	ROLE AND RESPONSIBILITIES
Final user	The final user of the compliant product will demand the PoS containing all the necessary information of the upstream processes related to the received (batch of) product. The final user would need to report the GHG emissions of using the product to the authorities (in case of emissions) and typically surrender the PoS to the respective authorities to fulfill its regulatory obligation. Various EU Member State have or are considering mandates for the use of RFNBO in transport (REDII) and in industry (REDIII). Obligations under REDII are typically on fuel suppliers, not on end-users of the fuel. Fuel suppliers ('obligated parties') will need to surrender the PoS to the relevant authority upon delivery ('booking the volumes in a register'). REDIII introduces mandatory targets for the use of RFNBOs in industry, and the responsibility of surrendering the PoS will be directly on them.

9.2 Contracting

- Offtake agreement between the relevant upstream economic operator and final user are needed, stipulating the relevant conditions ensuring that the product received fulfills REDII requirements covering the GHG emissions, renewability, and data exchange agreements (PoS) between the ammonia plant and downstream economic operator.

9.3 Considerations on cracking

Cracking ammonia into hydrogen is crucial in RFNBO processing. However, the energy sources used in this process greatly impact the hydrogen's renewability. According to the European Commission's guidelines from 14/03/2024, the hydrogen produced must have its energy content compared to the ammonia input, and any additional energy, which is considered a relevant energy input, from non-renewable sources affects its RFNBO classification.

If natural gas (NG) is used in the cracking process, it contributes to the total energy input, and the RFNBO share of the produced hydrogen is determined by the ratio X/(X+Y), where X is the ammonia energy and Y is the NG energy. On the other hand, if ammonia (NH3) is used as fuel in cracking and is 100% RFNBO, then the resulting hydrogen will also be 100% RFNBO.

The primary risks associated with using non-renewable fuels in the cracking process include the loss of RFNBO classification, an increased GHG emissions, and potential regulatory and market risks. Non-renewable fuels reduce the RFNBO share, affecting compliance with regulations, and may lead to penalties and decreased market acceptance. Thus, using renewable energy in the cracking process is essential to maintain RFNBO status, minimize environmental impact, and comply with regulations.

10 References

Documents shared by EVREC:

1. Project Update 20240506.ppt
2. POSITION PAPER PROJECT DEFINITION DESIGN 20240303.doc
3. J-001309-PR-HMB-20003, Heat and Material Balance, Rev 01.pdf
4. EVREC - MASTER SCHEDULE - FINAL (19.05.2024).mnp
5. PFDs.pdf

Documents delivered by Hinicio:

6. 240521_EVREC_H2_NH3_Inputs.xls
7. 240611_EVREC RFNBO_Project_Concept_Evaluation_shared.pdf
8. 2400614_EVREC_HINICIO_Pre_cert_scenario_table.pdf

Documents delivered by Bureau Veritas:

1. BV_Hinicio_Pre-audit CertifHy RFNBO EVREC_ Report audit review_V2.pdf

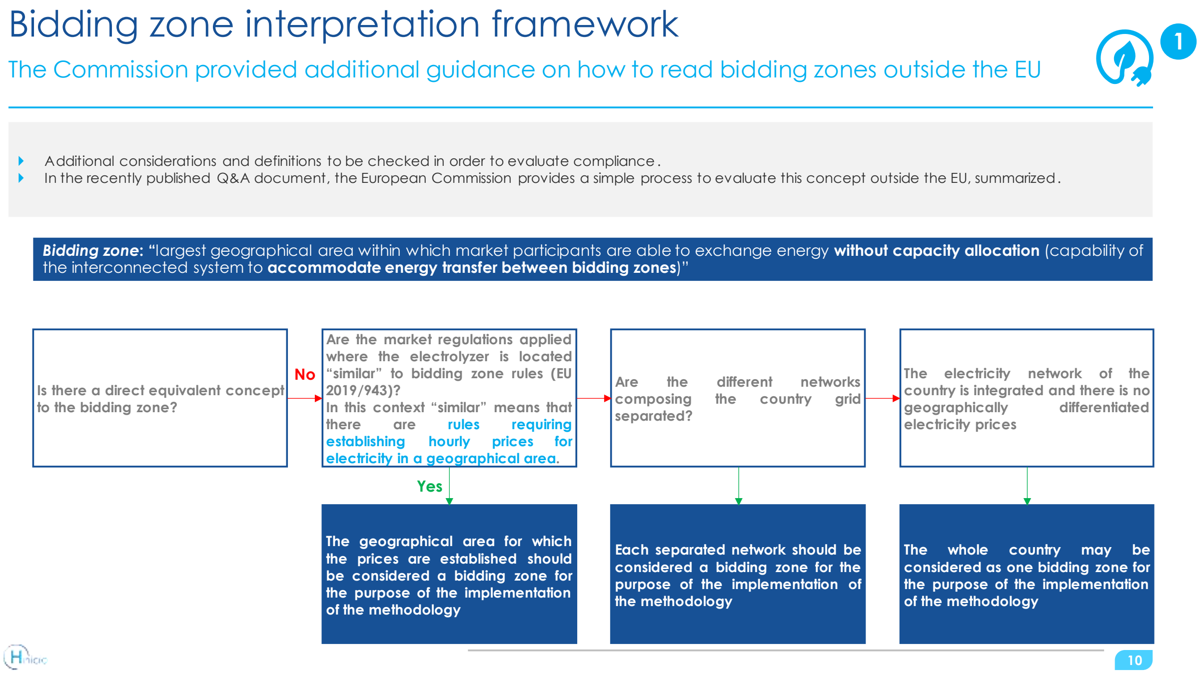
Other documents:

1. Directive (EU) 2018/2001
2. Directive (EU) 2023/2413
3. Delegated regulation - C(2023)1086
4. Delegated regulation - C(2023)1087
5. Q&A implementation of hydrogen delegated acts – version of 14/03/2024

11 Annex

1. Analysis on the bidding zone concept applied to Newfoundland
2. Illustration of the impact of latest Q&A document published by the European Commission on ammonia cracking

Annex 1 – Analysis on the bidding zone concept applied to New Foundland



Bidding zones are the largest geographical area in which bids and offers from market participants can be matched without the need to attribute cross-zonal capacity. The European Commission has provided a simple process to evaluate this concept outside of the European Union, summarized in the picture above.

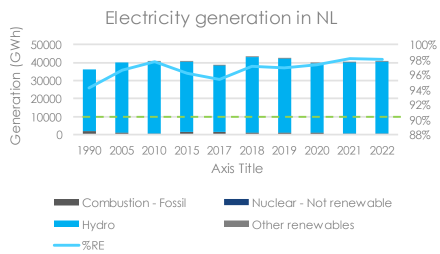
Applied to the Newfoundland, it has emerged that the grid in Newfoundland and Labrador is fully integrated and operated by the grid operator, therefore complying with the methodology outlined by the Commission, which foresees that each separated network composing a country grid can be considered a bidding zone. The specific characteristics of the considered grid can be found in the picture below.

Applied to Newfoundland

The whole Newfoundland region should be considered a single bidding zone for the purpose of RFNBO production, matching the >90% renewable condition

GRID CHARACTERISTICS

- Fully integrated network operated by Newfoundland and Labrador Hydro.
- One interconnection with Nuova Scotia via subsea cables connection (Maritime Link)
- No EACs in place in Newfoundland and Labrador
- One main thermal power production plant, Holyroad, that is set to be decommissioned after 2030.



Source: National inventory report: greenhouse gas sources and sinks in Canda

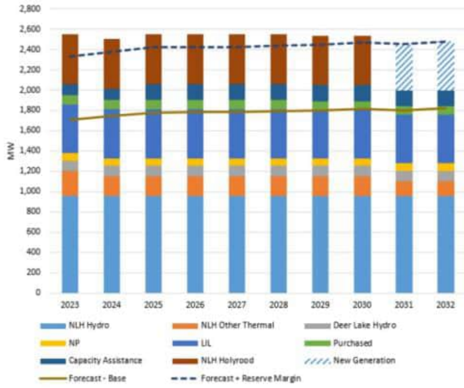
12

As can be seen from the picture above, Newfoundland and Labrador grid has had a percentage of RE in the mix higher than 90% since 1990. This allows EVREC to withdraw RE with 0 gCO_2e/kWh for an amount of full-load hours equivalent to the percentage of RE in the mix for the previous year. Once the 90% threshold is reached, this condition is considered matched for a period of 5 years. Moreover, the current grid development strategy outlined in the picture below should allow to maintain this characteristic over time, allowing EVREC to benefit from renewable power directly from the grid.

Applied to Newfoundland

Looking forward, no additional thermal electricity production capacity should be developed allowing to maintain the >90% RE condition

Firm Capacity versus Forecast Peak Demand



Source: Reliability and Resource Adequacy Study – 2022 Update, Newfoundland and Labrador Hydro

Key considerations

- Based on publicly availableinformation, the plan is to reduce the number of emitting resources generating electricity in Newfoundland and Labrador.
- According to the latest available data, the penetration of renewable energy (RE) in the mix is currently over 90%. With a decrease in the installed capacity of emitting resources, it is reasonable to expect that the percentage of RE in the mix will remain above 90% in the coming years.

Annex 2 - Illustration of the impact of latest Q&A document published by the European Commission on ammonia cracking.

As stated in the latest "Q&A implementation of hydrogen delegated acts" document published by the European Commission on the 14/03/2024 in question 57, in the case of cracking ammonia into hydrogen, since the energy content of the hydrogen coming out of the cracking process is higher than the energy content of the ammonia used as a feedstock, the electricity and heat used in the cracking process that results in this higher energy content must be considered as relevant energy. Therefore, non-renewable energy and heat sources will have an impact in the renewability of the produced RFNBO hydrogen.

Q57: "One way to transport renewable hydrogen over long distance is to ship it in the form of derivatives (e.g. ammonia, methanol or methane) and to reconvert it into renewable hydrogen at the place of consumption. Is the energy used for converting hydrogen derivatives considered as relevant energy?"

A: "As set out under point 3 of the GHG methodology, only electricity and heat that is adding to the heating value of the fuel is considered as relevant energy. Where the use of heat for reconversion of derivatives does not increase the heating value of the products, the share of RCF and RFNBO is not affected. To establish whether electricity and heat that are used in a process are adding to the heating value of the fuel, the heating value of the derivative that enters the process and qualifies as an RFNBO should be compared to the heating value of the hydrogen the process yields. If the heating value of the hydrogen that yields from the process exceeds the heating value of the RFNBO input, the heating value is increased and accordingly the electricity and heat is adding to the heating value of the fuel and must be considered as relevant energy."

Qualitative description of the impact on an actual cracker based on hypotheses shared by EVREC.

Case 1 - If NG is used as fuel in cracking

In that case, the NG would be considered part of the H_2 relevant energy inputs (see definitions below) and you would have to consider an energy balance on the cracking unit taking into account:

- The RFNBO energy input going in the cracker in the form of ammonia (X GJ).
- The external energy input provided by the natural gas (Y GJ).
- Define the RFNBO energy share going in the cracker (X/(X+Y)%)
- This will give you the share of RFNBO hydrogen share outside the cracker (X/(X+Y)%).

Case 2 - If NH3 is used as fuel in cracking

In that case, if your ammonia is 100% RFNBO, 100% of the resulting hydrogen is RFNBO.

12 Definitions

Voluntary Scheme

A voluntary scheme refers to a system or a program where organizations or individuals voluntarily choose to adhere to certain standards, guidelines or requirements related to hydrogen production, distribution or utilization. In the context of this study, we're talking about the CertifHy™ Voluntary Scheme, which is pending recognition by the European Commission as EU Voluntary Scheme for RFNBO (renewable hydrogen and derivatives used as fuel for the transport sector).

Delegated Act

In the context of European legislation, a "delegated act" refers to a legal mechanism that allows the European Commission, the executive arm of the European Union (EU), to supplement or amend certain non-essential elements of a legislative act adopted by the European Parliament and the Council of the EU. The European Parliament and the Council delegate specific powers to the Commission to adopt delegated acts within the framework of a legislative act. While primary legislation establishes the main rules and objectives, certain technical or detailed provisions may need to be specified or adjusted after the primary legislation is in force. Delegated acts are used for this purpose. They allow the Commission to fill in the gaps or make specific adjustments within the parameters set by the primary legislation. In the context of this report we mainly refer to the delegated acts titled: "Supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin" and "supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuel"

Mass balance

Mass balance is a principle used to track the flow and distribution of materials or substances within a system. It is often applied in situations where it's challenging to physically segregate or trace individual components but where the overall quantity or quality of the substances is important for compliance, sustainability, or certification purposes. In a simplified explanation, mass balance involves accounting for inputs, outputs, and internal transfers of a substance within a system. This can help ensure that the sum of inputs, outputs, and internal transfers matches the overall changes in the system. The concept can be extended to the certification of sustainable products, such as biofuels or renewable energy sources and their derived products.

Hinicio

EVREC

Project critical review against CertifHy™ EU RFNBO compliance requirements

Reference: 797257/22772360

Version	Date	Written by	Verified by
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TABLE OF CONTENT

TABLE OF CONTENT *2*
I. CONTROL DOCUMENT *3*
I.1 LEVEL OF ASSURANCE 3
II. ABBREVIATIONS *4*
III. REFERENCES *5*
IV. INTRODUCTION *6*
V. DESCRIPTION OF THE PROJECT *7*
VI. METHODOLOGY OF THE ASSESSMENT *9*
VI.1 Sustainability requirements 9
VI.1.1 Additionality 9
VI.1.2 Temporal correlation 9
VI.1.3 Geographical correlation 10
VI.1.4 Avoiding double counting 10
VI.2 GHG requirements 10
VI.3 Mass balance 11
VI.4 Traceability and chain of custody 11
VI.5 Management system 11
VII. SCOPE AND BOUNDARIES OF THE ANALYSIS *13*
VIII. DETAILED EVALUATION *16*
VIII.1 Evaluation of sustainability requirements 16
VIII.1.1 Additionality 16
VIII.1.2 No subsidies for RE producer 16
VIII.1.3 Temporal Correlation 16
VIII.1.4 Geographical correlation 16
VIII.2 GHG requirements 17
VIII.2.1 Global remarks not affecting the conformity 18
VIII.2.2 Scenario 1: Ammonia for Bunkering fuel 18
VIII.2.3 Scenario 2: Ammonia for industry 19
VIII.3 Mass balance 21
VIII.4 Traceability and chain of custody 22
VIII.5 Management system 22
IX. CONCLUSION *23*

I. CONTROL DOCUMENT

Identification		
Client	EVREC	
Description	EVREC is a green energy project development company with goals aligned to those of the Canadian Government to set the country on a path to meet climate change goals of net-zero greenhouse gas emissions by 2050 (Government of Canada 2023). The management and shareholders of EVREC have both a long track record of investing in Canadian companies that support the energy transition, and the proven capability of executing and delivering large industrial infrastructure and energy projects.	
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Configuration				
Version	**Date**	**Written by**	**Verified by**	**Modifications**
Draft	05/07/2024	O. AZZOUZI	V. ROBIN	Draft issue

I.1 LEVEL OF ASSURANCE

The level of assurance was used to determine the depth of detail that the pre-audit team placed in the validation plan to determine if there are any errors, omissions, or misrepresentations as define in ISO 14064-3.

In the context of our compliance analysis with the CertifHy EU RFNBO, regarding the provided documentation and the purpose of this pre-audit, the absence of on-site visit as the project is at design stage, we have opted for limited insurance in the present report.

II. ABBREVIATIONS

DA1 : RED II 1st Delegated Act

DA2 : RED II 2nd Delegated Act

EU : European Union

PCF : Product Carbon Footprint

PoS : Proof of Sustainability

PPA : Power Purchase Agreement

RED : Renewable Energy Directive

RFNBO : Renewable Fuel of Non-Biologic Origin

CFP : Carbon Footprint of Products

III. REFERENCES

[1] **RED II**: *DIRECTIVE (EU) 2018/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the promotion of the use of energy from renewable sources*, Official Journal of the European Union, 2018.

[2] **RED II 1st Delegated Act**: *COMMISSION DELEGATED REGULATION (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin*, Official Journal of the European Union, 2023.

[3] **RED II 2nd Delegated Act**: *COMMISSION DELEGATED REGULATION (EU) 2023/1185 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a minimum threshold for greenhouse gas emissions savings of recycled carbon fuels and by specifying a methodology for assessing greenhouse gas emissions savings from renewable liquid and gaseous transport fuels of non-biological origin and from recycled carbon fuel*s, Official Journal of the European Union, 2023.

The other references are given in section VII.

IV. INTRODUCTION

Published in December 2018, the Renewable Energy Directive II (RED II) is a framework defined by the European Commission, aiming to shape the continent's approach to sustainable energy. Enacted as part of the EU's broader commitment to combat climate change and transition towards a greener future, RED II builds upon its predecessor by setting ambitious targets for renewable energy consumption and production. This directive not only strives to increase the share of renewables in the overall energy mix but also introduces measures to enhance energy efficiency and promote the use of advanced biofuels.

While the main document primarily focuses on biofuels, two delegated acts were published in February 2023 addressing criteria for Renewable Fuels of Non-Biologic Origin (RFNBO). These fuels rely mainly on hydrogen by electrolysis. E-methanol, e-ammonia, e-methane and hydrogen are examples of RFNBO. The criteria mentioned in both DA must be met by all RFNBO producers to comply with RED II and, consequently, to avail themselves of all related benefits.

EVREC, a Canada-based green ammonia project developer, develops a project to produce RFNBO ammonia for the European markets. They chose the certification scheme CertifHy EU RFNBO which allows, prior to the audit, a pre-audit at design stage in order to have their design assessed.

This report provides the methodology, the details and the results of the pre-audit.

V. DESCRIPTION OF THE PROJECT

EVREC BV's project is a green ammonia production unit, including the H2 production by an electrolyser. The basic flow diagram is presented below:

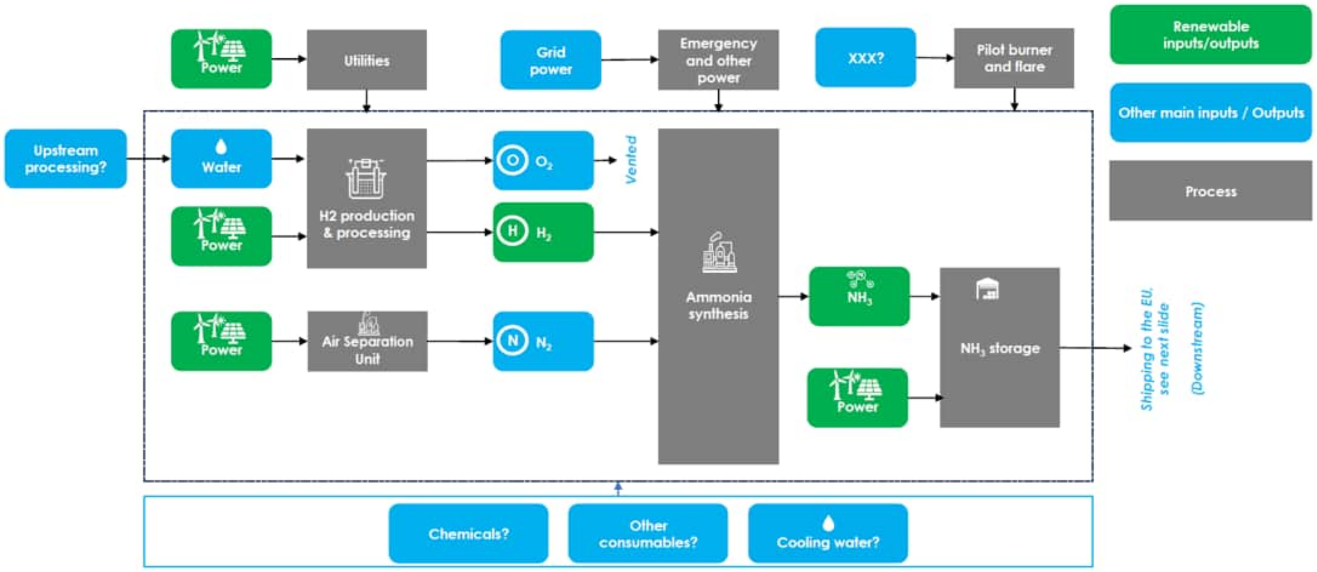


Figure 1 : Flows diagram of EVREC project

The EVREC project consist of an off-grid RFNBO production plant that plans to produce 167 kt/year of green H2 and 940 kt/year of green NH3, which will then be transported via a 3 km ammonia pipeline to the port of Botwood, where they will be exported by sea to European hubs. For the purpose of the exercise, all calculations are made to Hamburg as the farthest considered export port.
The production process will run on renewable electricity from a > 3 GW RE hybrid wind power plant, a 150 MW solar photovoltaic plant and a battery directly connected to the plant for the production of H2 (by water based-electrolysis) and NH3 (by the Haber-Bosh process). This electricity plant will be directly connected to the hydrogen production assets.

The project is located in Botwood (Canada), as shown in the figure below.

The power and RFNBO plants are located in Botwood.

As part of the EVREC project, three downstream scenarios have been delineated, contingent upon the sector to which the end-use of production in the form of ammonia or hydrogen (resulting from ammonia cracking) is directed.

1. Ammonia for bunkering fuel use in maritime;
2. Ammonia for industry;
3. Hydrogen for industry.

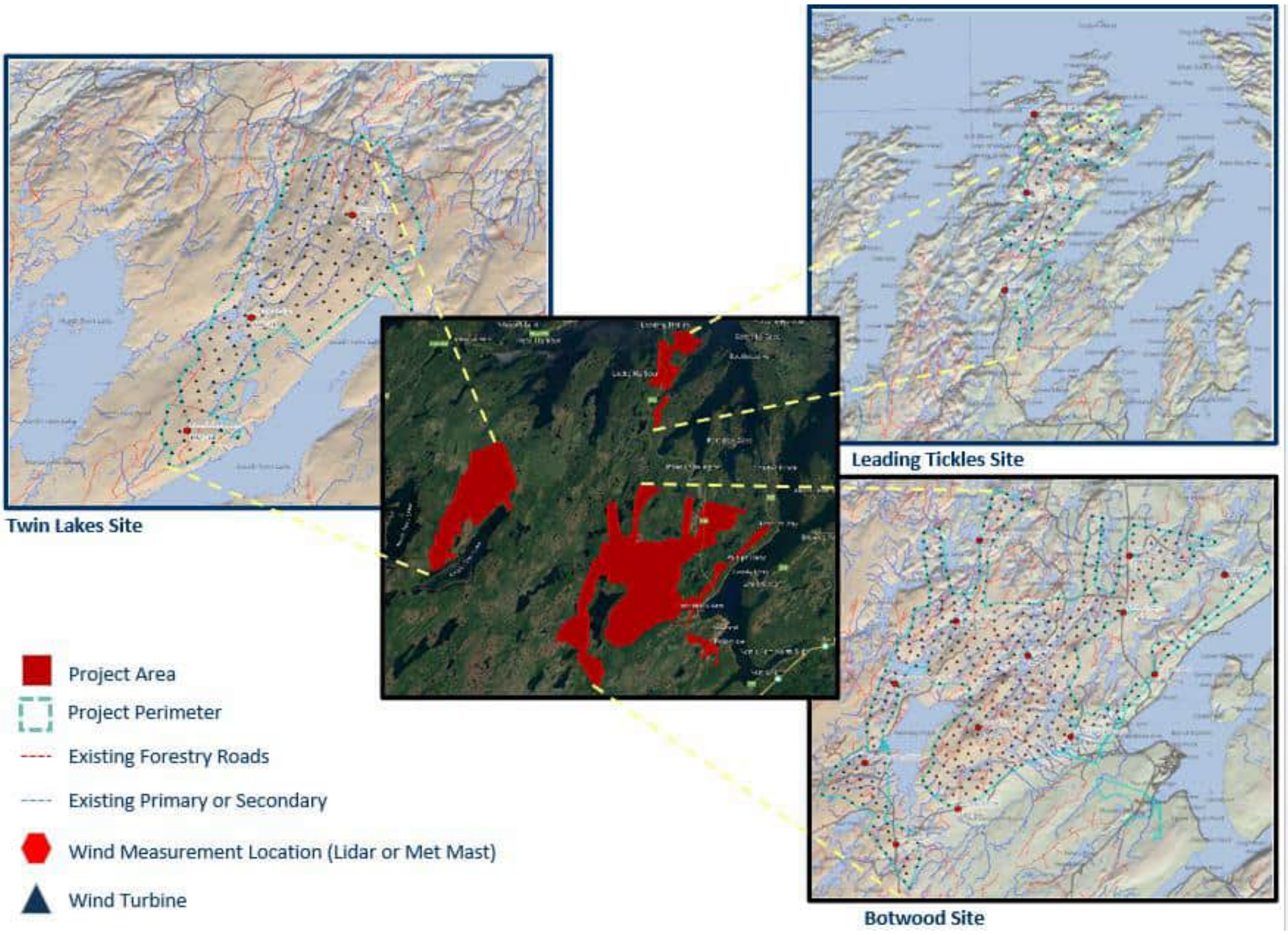


Figure 2: Location of EVREC project supply chain

This project aims to start operating by 2030.

VI. METHODOLOGY OF THE ASSESSMENT

The methodology consists of verifying whether all the requirements of the CertifHy EU RFNBO certification scheme are met. This certification scheme is currently being reviewed by the European Commission in order to become an official scheme which certifies that a production is compliant with RED II, DA1 and DA2 requirements. The used version of the scheme documentation is the version 1.0 published February 28th, 2023.

- Sustainability
- GHG emissions
- Mass balance
- Traceability and chain of custody
- Management system

Those requirements are briefly presented below. More information can be found in CertifHy EU RFNBO scheme guidelines, and in reference documents (see Chapter II. Of the current report).

VI.1 Sustainability requirements

The overarching concept of the first delegated act is that the electricity used for RFNBO production must be renewable (cf. *Article 1* [2]). Various cases of renewable electricity sourcing may be accepted such as:

- Direct connection to an installation generating renewable electricity
- Connection to the grid
- With or without a PPA

Depending on the case of the project, different sustainable requirements may apply:

VI.1.1 Additionality

The additionality criterion requires the applicant to demonstrate the renewable electricity source has started operating maximum 36 months before the RFNBO production. The aim of this requirement is to prevent RFNBO producer to use a source of renewable energy already claimed for another use. As the electrification of many activities are an important lever to reduce GHG emissions, RFNBO producers shall not be in competition with another use of this already existing renewable energy source.

In case of PPA, the contracting renewable electricity producer shall not have received any aid except for some specific cases. This requirement does not apply for projects using direct connection to the electricity plan such as EVREC's project.

VI.1.2 Temporal correlation

For grid stability purpose, electricity demand and supply should meet as much as possible. The same rule applies for the renewable electricity production and the RFNBO production, which stands are demand in that situation.

As a consequence, RED II DA1 requires a monthly correlation between electricity production and consumption until end of 2029, and hourly correlation from early 2030.

However, the electricity can also be stored in a relatively new storage asset. In that case, the storage asset shall be just after the electricity plant in the network ("behind the meter"), and the temporal correlation is to be met between the production and the storage. Moreover, detailed data are to be provided to ensure that the electricity stored in the storage asset comes from the renewable plant and not from the grid.

This requirement does not apply for projects using direct connection to the electricity plan such as EVREC's project

VI.1.3 Geographical correlation

For the same purpose of simplifying the grid management by relevant authorities, and to ensure in a way that the produced electrons could be those used, geographical correlation require electricity production and consumption to be in the same bidding zone or in bidding zones that are interconnected.

The bidding zone is the largest geographical area within which market participants are able to exchange energy without capacity allocation.

This requirement does not apply for projects using direct connection to the electricity plan such as EVREC's project.

VI.1.4 Avoiding double counting

One of the key requirements of the RED for accounting for the consumption of renewable energy is to avoid double counting. To do so, any energy unit claimed renewable for the production of RFNBO should be backed by the cancellation of a certification (Guarantee of Origin, Renewable Energy Certificate, etc.) or it can be proven that the issuance of certificate for renewable electricity is not possible in the region.

VI.2 GHG requirements

While DA1 relied on primarily qualitative data, the criteria for DA2 are quantitative. The RFNBO, as an alternative to a reference fuel, must be less harmful to the climate, i.e., emit fewer greenhouse gases. According to DA2, "The greenhouse gas emissions savings from the use of recycled carbon fuels shall be at least 70 %" (*Article 2* [3]).

The reference value set by the DA2 is 94gCO2eq/MJ of fuel.

As a consequence, **the RFNBO carbon intensity must be below 28.2 gCO2eq/MJ of fuel.**

The methodology for calculating the equivalent CO2 emissions of RFNBO is provided in the Annex of DA2. The result is obtained using the following formula.

$$\mathrm{E} = e_i + e_p + e_{td} + e_u - e_{ccs}$$

Where:

E = total emissions from the use of the fuel (gCO2eq/MJ of fuel)

$e_i = e_{elastic} + e_{rigid} - e_{ex-use}$: emissions from supply of inputs (gCO2eq/MJ of fuel)

$e_{elastic}$ = emissions from elastic inputs (gCO2eq/MJ of fuel)

e_{rigid} = emissions from rigid inputs (gCO2eq/MJ of fuel)

e_{ex-use} = emissions from inputs' existing use or fate (gCO2eq/MJ of fuel)

e_p = emissions from processing (gCO2eq/MJ of fuel)

e_{td} = emissions from transport and distribution (gCO2eq/MJ of fuel)

e_u = emissions from combusting the fuel in its end-use (gCO2eq/MJ of fuel)

e_{ccs} = emission savings from carbon capture and geological storage (gCO2eq/MJ of fuel)

VI.3 Mass balance

In the field of RFNBO, physical segregation of products with different sustainability properties is not required. The mass balance system is accepted. This system allows the consumer to blend a certified RED II RFNBO with a non-certified RED II fuel without losing the sustainability attribute of the certified fuel. It's the certification of the molecule that matters, and it must be tracked throughout the value chain. However, this system poses risks of double counting certified fuel. That's why a verification of the mass balance throughout the entire value chain is necessary.

VI.4 Traceability and chain of custody

For the production of the RED II-compliant RFNBO to be certified by the CertifHy EU RFNBO certification scheme, the whole supply chain must also be RED II compliant.

The following elements of the supply chain are subject to certification under the CertifHy EU RFNBO: RFNBO producers, processing unit, storage units, and traders. They must get certified in order to issue a valid document to the next economic actor in the value chain: a Proof of Sustainability.

This document is always linked to a specific product consignment. It is a delivery document containing relevant information about the RFNBOs that must be issued by the supplier for each delivery of RFNBO volumes.

Where a consignment of fuel is used to comply with an obligation placed on a fuel supplier by an EU Member State, it shall be considered to be withdrawn from the mixture of the mass balance.

VI.5 Management system

The management system describes the scope of responsibilities and internal company processes and procedures for ensuring that an economic operator is able to implement and update all of the requirements for achieving the objectives of CertifHy EU RFNBO scheme.

The management system must ensure that good management practices with respect to sustainability, greenhouse gas emissions, traceability and chain of custody requirements are applied at every critical control point. All the elements of the supply chain must ensure that their management systems cover these requirements. The management team of the economic operator must commit itself in writing to complying with CertifHy EU RFNBO requirements, and this commitment has to be made available to the employees, suppliers, customers and other interested parties.

The purpose of the management system requirements is to inspire all the employees and stakeholders toward the sustainability requirements and the purpose of such a certification.

VII. SCOPE AND BOUNDARIES OF THE ANALYSIS

As EVREC project is at design stage, a pre-audit was done. Therefore, no on-site visit happened, nor analysis, actual production data and consumption. The CertifHy EU RFNBO scheme requirements have only been checked on the design stage in accordance with the received documents that are detailed below.

Nature of document	Name of file	Reception date	Reference value in this report
Project concept evaluation	240621_EVREC RFNBO_Project_Concept_Evaluation_WP1_Sensitivities.pdf	24/06/2024	[4]
Project overview	POSITION PAPER PROJECT DEFINITION DESIGN 20240303.docx	24/06/2024	[5]
Project status	Project Update 20240506.pptx	24/06/2024	[6]
Heat and Material Balance	J-001309-PR-HMB-20003, Heat and Material Balance, Rev 01.pdf	24/06/2024	[7]
Process flow diagram **Project legend**	J-001309-PR-PFD-20010-PFD Project Legend Rev 01.pdf	24/06/2024	[8]
Process flow diagram of water treatment system	J-001309-PR-PFD-20011-PFD Water Treatment System Rev 01.pdf	24/06/2024	[9]
Process flow diagram of electrolyser package	J-001309-PR-PFD-20012-PFD Electrolyzer Package Rev 01.pdf	24/06/2024	[10]
Process flow diagram of hydrogen purification package	J-001309-PR-PFD-20013-PFD Hydrogen Purification Rev 01.pdf	24/06/2024	[11]
process flow diagram of hydrogen compression train	J-001309-PR-PFD-20014-PFD Hydrogen Compression Rev 01.pdf	24/06/2024	[12]
Process flow diagram of hydrogen storage	J-001309-PR-PFD-20015-PFD Hydrogen Storage Rev 01.pdf	24/06/2024	[13]

Process flow diagram of ammonia production	J-001309-PR-PFD-20016-PFD Ammonia Production Rev 01.pdf	24/06/2024	[14]
Process flow diagram of ammonia storage and export	J-001309-PR-PFD-20017-PFD Ammonia Storage & Export Rev 01.pdf	24/06/2024	[15]
Carbon Footprint (CFP) calculation - Ammonia for Bunkering fuel scenario	240624_EVREC_H2_NH3_tool_v4.0_Scenario1.xlsx	24/06/2024	[16]
Carbon Footprint (CFP) calculation - Ammonia for industry scenario	240624_EVREC_H2_NH3_tool_v4.0_Scenario2.xlsx	24/06/2024	[17]
Carbon Footprint (CFP) calculation - Hydrogen for industry scenario	240624_EVREC_H2_NH3_tool_v4.0_Scenario3.xlsx	24/06/2024	[18]
Project commissioning schedule	EVREC - MASTER SCHEDULE - FINAL (19.05.2024).pdf	01/07/2024	[19]
Preparation of conceptual design - report	OWC-038968-001-REP001-A.pdf	08/07/2024	[20]
Draft Environmental assessment Registration Document	Draft Botwood EARD - do not copy June 13 2024.pdf	08/07/2024	[21]

Table 1: Received documentation for the preaudit

The results of this analysis do not ensure that the operational stage will also be certified, nor eligible to be certified. Any change in the design invalidates the current analysis.

The scope of EVREC encompasses the production of ammonia and its subsequent export by sea to the European port hubs. To remain conservative, the port of Hamburg is considered for all the scenarios.

Upon reaching the destination port hub (i.e. Hamburg port), EVREC considered two modes of distribution (barge and pipeline) to deliver the product to the offtake point, as developed in the documents associated with the CFP calculation [7].

VIII. DETAILED EVALUATION

VIII.1 Evaluation of sustainability requirements

As stated in RED II DA1 on the rules requirements for counting electricity as fully renewable, electricity is considered fully renewable when it is obtained from a direct connection to an installation producing renewable electricity.

In fact, the ammonia production project by EVREC is directly connected to the renewable power facility. Electricity will be generated by a hybrid power plant with a capacity of > 3 GW wind power, a 150 MW photovoltaic solar power plant, and an electric battery that is directly connected to the H2 and NH3 production plant.

As part of EVREC project, relevant evidence of direct connection to the renewable energy system has been provided by EVREC as detailed in the documents [1]. Bureau Veritas considers that the evidence provided is compliant with EU requirements.

As the electricity plant will be connected to the grid, smart metering is mandatory to ensure that the consumed electricity comes from the plant itself and not from the grid. EVREC will have to implement smart metering to fulfill the RED requirements.

VIII.1.1 Additionality

This criterion description can be found in chapter V.1.1.

The green ammonia production plant is expected to start in 2030 (p. 2, Annex [6] and [19]) and will be powered by direct renewable electricity connection. The date when the electricity plant will come into operation is expected to be in 2030.

Considering to the above-mentioned valuation, the additionality is considered complied with.

VIII.1.2 No subsidies for RE producer

This criterion is only required if the electricity used to produce the RFNBO is taken from the grid.

The EVREC project does not involve the use of electricity from the grid and, consequently, the conditions linked to underlying operating aid or investment aid that installation generating renewable electricity may receive is not applicable.

VIII.1.3 Temporal Correlation

As the EVREC project does not involve the use of electricity from the grid (i.e. only direct connection), the temporal correlation criterion is not applicable according to the RED II DA 1 descriptions.

VIII.1.4 Geographical correlation

As the EVREC project does not involve the use of electricity from the grid (i.e. only direct connection), the geographical correlation criterion is not applicable, according to the RED II DA 1 descriptions.

Considering to the above-mentioned valuation, the sustainability criteria is considered by Bureau Veritas to be in line for compliance with RED II requirements.

VIII.2 GHG requirements

This criterion is described in VI.2.

Based on the data provided by Hinicio, Bureau Veritas has verified the method and result of GHG emissions quantification on a life-cycle basis in accordance with the CertifHy EU RFNBO scheme requirements.

The GHG emissions calculations inform the validation decision and ensure alignment of the ammonia carbon footprint with the GHG emissions threshold (28,2 gCO2eq/MJ) defined by RED II.

The carbon footprint pre-audit of the EVREC project, was conducted remotely and focused on the verification of the CFP calculation file associated with the EVREC project scenarios.
The GHG emissions calculation file supplied by Hinicio are reported in the appendix [16], [17] and [18].

EVREC scope is not covering the shipping and downstream part of the supply chain. Therefore, for actual certification, EVREC scope of calculation will be limited to the production of the ammonia. However, in order to comply with the required scope of GHG emissions calculation and evaluate EVREC's products compliance on a well-to-gate scope, assumptions have been taken to cover the maritime transport and downstream processing of the fuel.

The shipping to Hamburg is assumed covered with a Middle-size Gas Carrier (MGC) running on Heavy Fuel Oil (HFO) with a 90% payload. Roundtrip emissions have been considered assuming that the vessel would return empty, hence, providing a conservative estimate of the associated emissions.

EVREC has considered different options for distribution and offtake use scenarios, as summarized in the table 2 below. As those value chain links are to be included in the calculation, the results of these different scenarios are to be checked.

Table 2: scenarios involved within EVREC project

Scenario	Downstream distribution	Molecule	Offtake end-use
1	Barge – 20 km	Ammonia	Bunkering fuel
2	Pipeline – 100 km	Ammonia	Ammonia for industry
3	Pipeline – Ammonia 100km Pipeline – Hydrogen 200 km after compression	Hydrogen (*Resulted by ammonia cracking using EVREC ammonia as a heat source*)	Hydrogen for industry

VIII.2.1 Global remarks not affecting the conformity

The following limitation regarding the GHG emissions calculation performed regarding EVREC project should be considered when interpreting the information presented in this pre-audit report:

- **Ammonia storage flare**: The document relating to the process flow diagram of ammonia storage and export [15] provided, show the use of an ammonia storage flare. This flare device is used to safely burn off excess ammonia gas that might be released from storage tanks or during processing. This is a safety measure to prevent the buildup of flammable or toxic gases that could pose a risk to workers, the facility, and the surrounding environment.

  It is important to note that atmospheric emissions of N_2O can occur if ammonia undergoes incomplete combustion in the flare system. However, EVREC did not consider these potential N_2O emissions when quantifying the GHG emissions associated with the project scenarios.

  Given the absence of specific data on the combustion efficiency of the flaring system, Bureau Veritas recommends taking a conservative approach. The GHG emissions calculations should include the estimated quantities of N_2O that could be emitted due to incomplete combustion of NH_3. If the exclusion of these N_2O emissions is considered negligible, this must be justified in a scientifically appropriate manner.

- **Negligibility of elastic inputs**: certain material inputs used in the hydrogen treatment system (e.g. De-oxo catalysts) and ammonia production (e.g. iron catalyst) have not been included in the calculation of GHG emissions because considered negligible. Although it is considered trivial, the justification for their materiality level will have to be quantitatively supported for the operational certification.

Bureau Veritas recommends that the materiality of these GHG emissions sources shall be evaluated in order to justify their exclusion, but this does not compromise the compliance with GHG emissions savings requirements for pre-certification.

VIII.2.2 Scenario 1: Ammonia for Bunkering fuel

In the first scenario:

- It is assumed that the project boundary ends at the point of with the ammonia has been delivered at the port of Hamburg, considering ammonia loading/unloading and shipping.

Furthers assumptions can found in annex [16].

The results are given below:

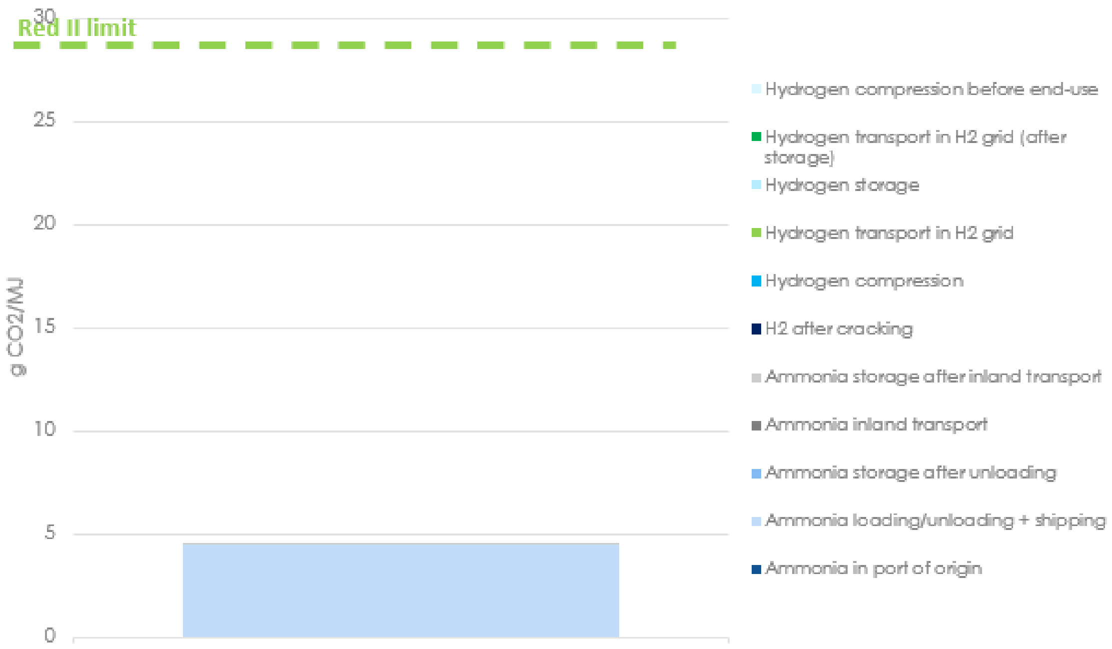


Figure 3 : Product carbon footprint of green ammonia – Scenario 1

Bureau Veritas has assessed the methodology used for this calculation and made the conclusion that the methodology is compliant with the GHG emissions criteria of RED II.

Bureau Veritas has checked the used emission factors for this analysis. RED II imposes the use of standard values given in RED II [1], DA1 [2] and DA2 [3] annexes, which have been correctly used by Hinicio in the report and made the conclusion that they were compliant with the GHG emissions criteria of RED II.

The detailed calculation and formula have been reviewed according to references [7] and [22]. No errors or double-counting errors have been identified by Bureau Veritas.

The obtained results of 4,5 gCO2e/MJ of fuel are below the RED II DA2 threshold. This result was obtained by considering a roundtrip to Europe.

For scenario 1, the GHG requirements are considered complied.

VIII.2.3 Scenario 2: Ammonia for industry

For this scenario, the main assumptions are the following:

- It is assumed that the project boundary ends at the point of with the ammonia has been delivered at the port of Hamburg, considering ammonia loading/unloading, shipping and inland transport, ammonia cracking with NH3 and grid transport of the resulting hydrogen.

Furthers assumptions can found in annex [17].

The results are given below:

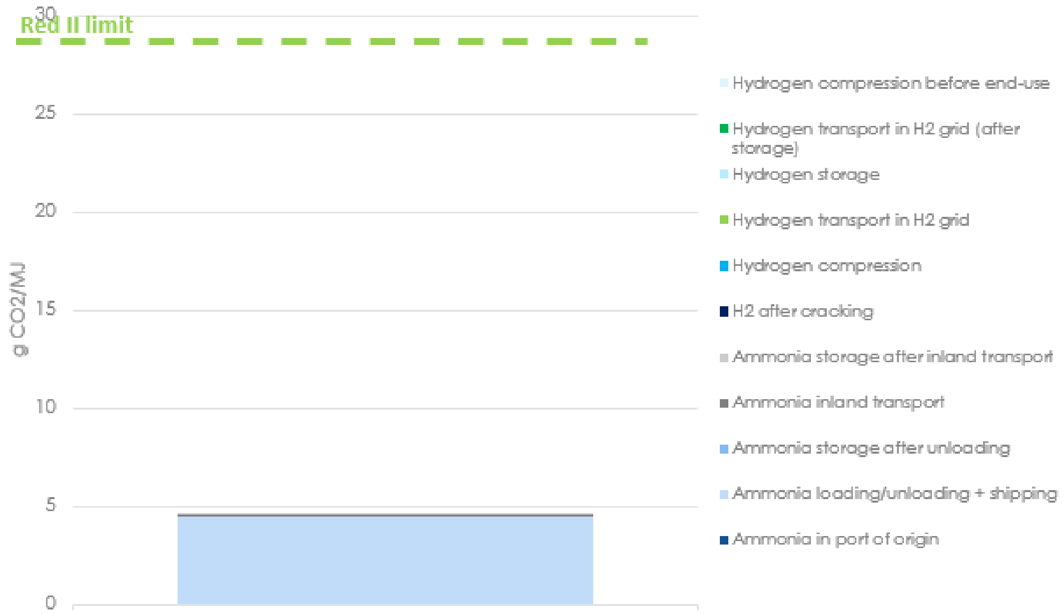


Figure 4 : Product carbon footprint of green ammonia – Scenario 2

As for the scenario 1, Bureau Veritas has assessed the methodology used for this calculation and made the conclusion that the methodology is compliant with the GHG emissions criteria of RED II.

As for the scenario 1, Bureau Veritas has assessed the emission factors used for this calculation and made the conclusion that they were compliant with the GHG emissions criteria of RED II.

As for the scenario 1, Bureau Veritas has assessed the detailed calculation and has identified no errors.

The results for scenario 2, which are maximum 4,6 gCO2eq/MJ of fuel are below the RED II DA2 threshold. This result was obtained by considering a roundtrip to Europe.

For scenario 2, the GHG requirements are considered complied with.

VIII.2.4 Scenario 3: Hydrogen for industry

For this scenario, the main assumptions are the following:

- It is assumed that the project boundary ends at the point of with the ammonia has been delivered at the port of Hamburg, considering ammonia loading/unloading, shipping and inland transport.

Furthers assumptions can found in annex [18].

The results are given below:

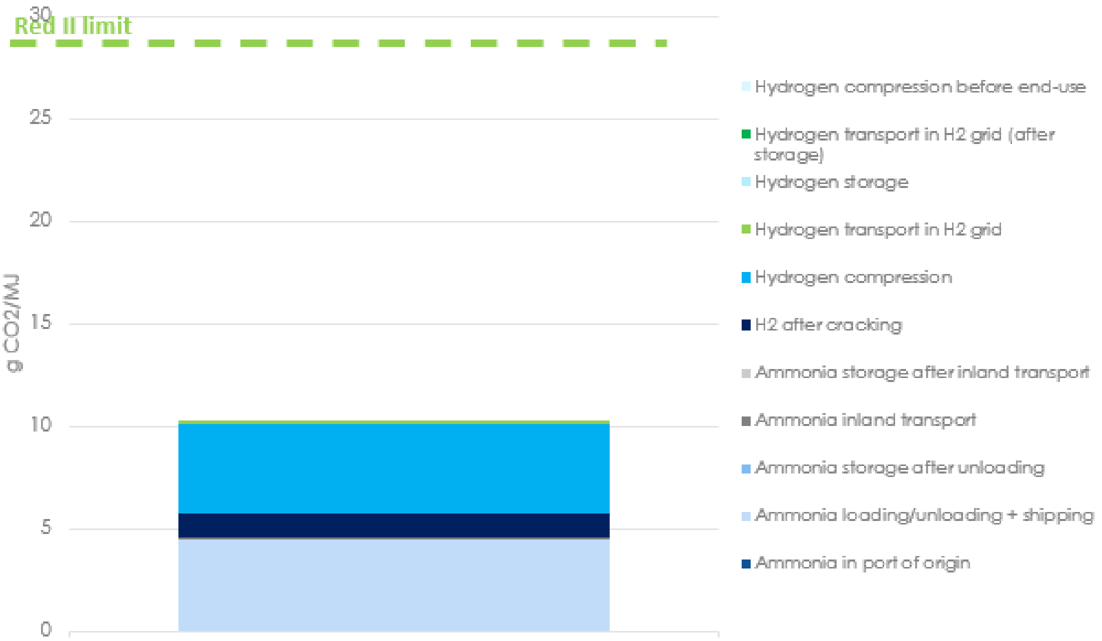


Figure 5 : Product carbon footprint of green ammonia – Scenario 3

As for the scenario 1, Bureau Veritas has assessed the methodology used for this calculation and made the conclusion that the methodology is compliant with the GHG emissions criteria of RED II.

As for the scenario 1, Bureau Veritas has assessed the emission factors used for this calculation and made the conclusion that they were compliant with the GHG emissions criteria of RED II.

As for the scenario 1, Bureau Veritas has assessed the detailed calculation and has identified no errors.

The results for scenario 3, which are maximum 10,2 gCO2eq/MJ of fuel are below the RED II DA2 threshold. This result was obtained by considering a roundtrip to Europe.

For scenario 3, the GHG requirements are not considered complied with.

VIII.3 Mass balance

The mass balance has been verified by Bureau Veritas, basing the analysis on the heat and mass balance document ([7]).

The produced hydrogen is made out of electrolysis through the following equation:

$$2\,H_2O = 2\,H_2 + O_2$$

In columns 8, 13, and 14 of page 4 of the mass balance document, Bureau Veritas noted that the calculation were valid regarding hydrogen production.

The produced ammonia is made out of Haber-Bosch through the following equation:

$$3\,H_2 + N_2\ = 2\,NH_3$$

In columns 34, 37, and 41 of page 5 of the mass balance document, Bureau Veritas noted that the calculation were valid regarding ammonia production.

Regarding blending of fuels with different sustainability properties, a part of the production can involve grid electricity which is not fully renewable. As a consequence, the related produced fuel will have different GHG emissions savings that the production part fully made with renewable electricity. As the grid electricity is not used for the electrolyser, the obtained fuel can still be certified. However, the GHG emissions savings will be different. CertifHy EU RFNBO scheme guidelines require to trace apart fuels with different GHG emissions savings. Hence, through smart metering, EVREC will have to detect when and how much electricity from grid is used, in order to determinate the relevant GHG emissions of the fuel and carry out of mass balance calculation to trace both categories of fuel.

The other solution is to always consider the worst-case scenario for GHG emission savings. With that conservative assumption, the grid electricity is always used, and if the resultant GHG emission savings are still beyond the threshold, EVREC will be allowed to consider one single produced fuel, and no blending will occur.

The mass balance requirements are considered complied with.

VIII.4 Traceability and chain of custody

This criterion is described in V.4.

As EVREC project goes from the electrolyser shipping part, no PoS is required from any supplier. Though EVREC will have to issue a PoS to its client.

- Still at early design stage, no PoS has been issued at the moment.

As transport or distribution actors do not need to be certified, only the downstream traders and processing units (e.g. for ammonia cracking) will have to be certified too and issue a PoS.

The traceability requirements remain to be complied with.

VIII.5 Management system

This criterion is described in V.5.

No management system document has been provided to assess this criterion. It is expected for a project at a very early stage not to have implemented any management system in accordance with CertifHy EU RFNBO requirements.

The management system requirements remain to be complied with.

IX. CONCLUSION

The CertifHy EU RFNBO certification scheme pre-audit results are summarized in the table below

Criterion	Result	Condition or comment
Renewable electricity	**Compliant**	Smart metering shall be used to ensure the consumed electricity is produced by the electricity plant and not taken from the grid.
GHG emissions	**Compliant**	The GHG emissions calculation will have to be done once the quantities of chemicals and the data about storage flare are known. The objective is to support the fact that these emissions are neglectable (See section VIII.2.1).
Mass balance	**Compliant**	EVREC needs to address the use of grid electricity, as different GHG emissions require different batches traceability and mass balance calculation.
Traceability	**Not assessed at design stage**	
Management system	**Not assessed at design stage**	

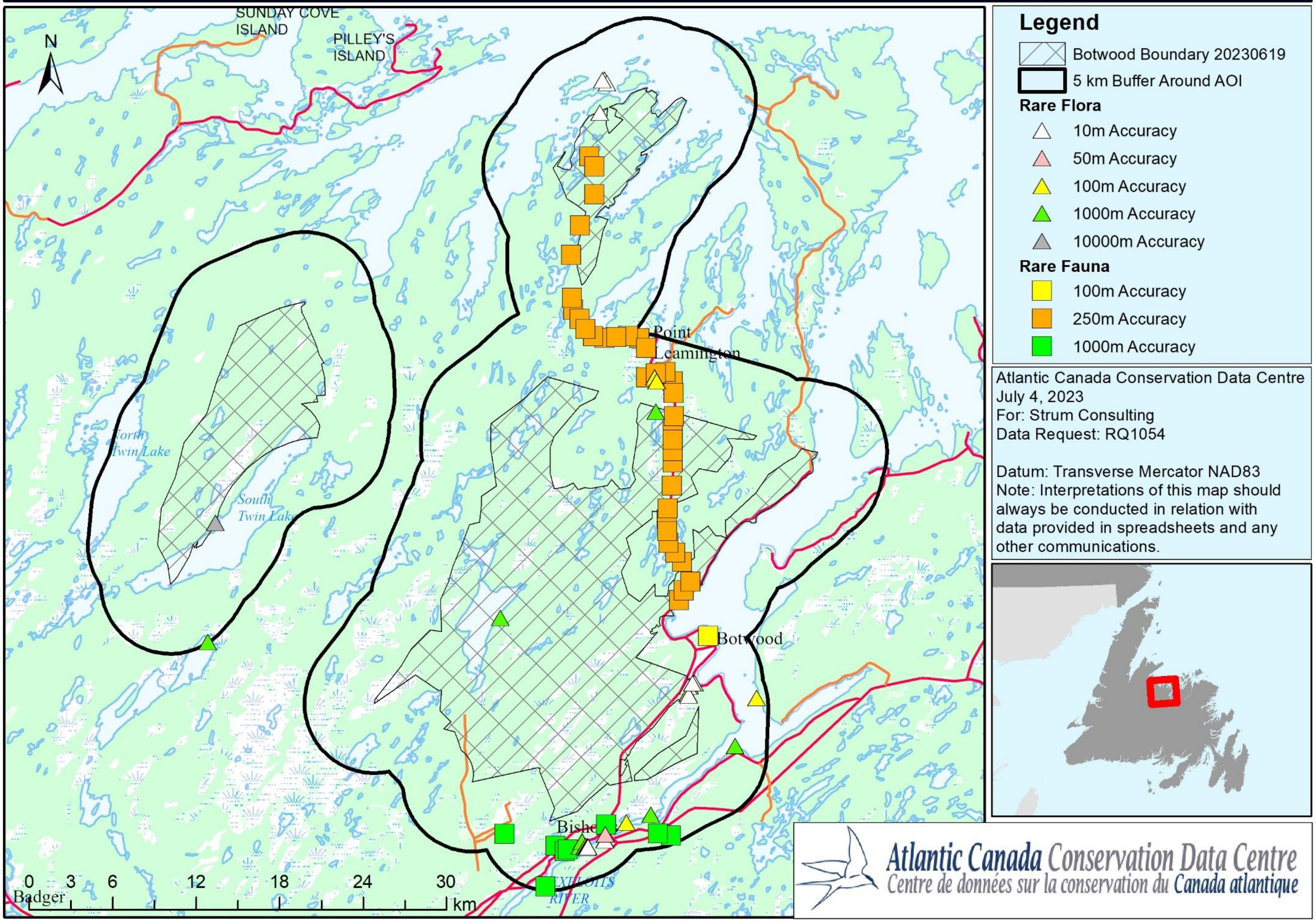
In conclusion, Bureau Veritas has performed an analysis of the current design of the EVREC ammonia project in accordance with the certification scheme CertifHy EU RFNBO requirements based on RED II DA1 and DA2 regulations.

This analysis conclusion is entirely related to the current design and current EU regulations. Any major change in this design until the operation time would require a whole new analysis. As the project is still at an early stage, some documentation required for the actual audit have not been provided (such as traceability and management system documentation).

This documents audit review considers that this project is **compliant with the scheme requirements.** Bureau Veritas points out limits detailed above regarding the GHG emission calculation. More information regarding inputs are required to have the carbon intensity of the fuel completely compliant. The other criteria are considered complied with.

APPENDIX C
ACCDC REPORT

GIS Scan of Rare and Provincially/Federally Listed Species for Area East and Northeast of Botwood, Newfoundland and Labrador



GNAME	GCOMNAME	FAMILY	Observer	TotalNumber	Month	Day	Year	SRANK_2015	SRANK_2	NRANK
Scolopax minor	American Woodcock	Scolopacida	BBS observer: 10		7	5	2015	S1B,SUM	S1B	N5B,N5M
Dendroica castanea	Bay-breasted Warbler	Parulidae	BBS observer: 10		7	2	2018	S2B,SUM	S3B	N5B,N5M
Dendroica castanea	Bay-breasted Warbler	Parulidae	BBS observer: 10		7	3	2017	S2B,SUM	S3B	N5B,N5M
Ophiogomphus colubrinus	Boreal Snake Tail/ Club	Gomphidae	unknown		8	15	1997	S3	S3?	N5
Dendroica tigrina	Cape May Warbler	Parulidae	BBS observer: 10		7	7	2014	S2B,SUM	S2B	N5B,N5M
Dendroica tigrina	Cape May Warbler	Parulidae	BBS observer: 10		7	2	2018	S2B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		6	17	2019	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2012	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2012	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2014	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		6	17	2019	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	3	2016	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2014	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2014	S2S3B,SUM	S2B	N5B,N5M
Spizella passerina	Chipping Sparrow	Passerellida	BBS observer: 10		7	7	2014	S2S3B,SUM	S2B	N5B,N5M
Leucorrhinia glacialis	Crimson-ringed Whitefa	Libellulidae	Larson D.J.		6	19	1979	S3S4	S3	N5
Catharus minimus	Gray-cheeked Thrush	Turdidae	BBS observer: 10		7	3	2017	S2B,SUM	S2S3B	N5B,N5M
Catharus minimus	Gray-cheeked Thrush	Turdidae	BBS observer: 10		7	7	2013	S2B,SUM	S2S3B	N5B,N5M
Tringa melanoleuca	Greater Yellowlegs	Scolopacida	BBS observer: 10		6	17	2019	S3B, S4M	S4B,S5M	I5B,N4N,N
Tringa melanoleuca	Greater Yellowlegs	Scolopacida	BBS observer: 10		7	7	2011	S3B, S4M	S4B,S5M	I5B,N4N,N
Tringa melanoleuca	Greater Yellowlegs	Scolopacida	BBS observer: 10		7	2	2018	S3B, S4M	S4B,S5M	I5B,N4N,N
Anas platyrhynchos	Mallard	Anatidae	BBS observer: 10		7	7	2013	S3B,SUM	S3B	I5B,N5N,N
Martes americana	Newfoundland Marten	Mustelidae	Mac Andrews	1	12	10	1987	S3	S1	N5
Martes americana	Newfoundland Marten	Mustelidae	Roland Wayne Pa	1	4	26	2014	S3	S1	N5
Accipiter gentilis	Northern Goshawk	Accipitridae	Todd Boland	1	12	28	1999	S3	S3B	I4B,N4N5N
Accipiter gentilis	Northern Goshawk	Accipitridae	Craig Purchase	1	12	28	1998	S3	S3B	I4B,N4N5N
Parula americana	Northern Parula	Parulidae	BBS observer: 10		7	5	2015	S1B?,SUM	S1?B	N5B,N5M
Contopus cooperi	Olive-sided Flycatcher	Tyrannidae	Alison Mews		6	11	2017	S3B,SUM	S3S4B	N4B,N3M
Contopus cooperi	Olive-sided Flycatcher	Tyrannidae	BBS observer: 10		7	7	2014	S3B,SUM	S3S4B	N4B,N3M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2014	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2017	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	2	2018	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2013	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2014	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	5	2015	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	5	2015	S3B,SUM	S5B	N5B,N5M

GNAME	GCOMNAME	FAMILY	Observer	TotalNumber	Month	Day	Year	SRANK_2015	SRANK_2	NRANK
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2016	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	2	2018	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	2	2018	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	2	2018	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		6	17	2019	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2013	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2014	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2016	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2011	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	7	2014	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	5	2015	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2016	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2016	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2017	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		6	17	2019	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	3	2016	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		7	2	2018	S3B,SUM	S5B	N5B,N5M
Seiurus aurocapilla	Ovenbird	Parulidae	BBS observer: 10		6	17	2019	S3B,SUM	S5B	N5B,N5M
Vireo philadelphicus	Philadelphia Vireo	Vireonidae	BBS observer: 10		7	7	2013	S3B,SUM	S2B	N5B,N5M
Vireo philadelphicus	Philadelphia Vireo	Vireonidae	BBS observer: 10		7	7	2012	S3B,SUM	S2B	N5B,N5M
Vireo philadelphicus	Philadelphia Vireo	Vireonidae	BBS observer: 10		7	7	2012	S3B,SUM	S2B	N5B,N5M
Vireo philadelphicus	Philadelphia Vireo	Vireonidae	BBS observer: 10		7	7	2012	S3B,SUM	S2B	N5B,N5M
Vireo philadelphicus	Philadelphia Vireo	Vireonidae	BBS observer: 10		7	3	2016	S3B,SUM	S2B	N5B,N5M
Loxia curvirostra	Red Crossbill	Fringillidae	Barry Linehan		10		2020	S1S2	S2S3	‌J5B,N5N,N
Agelaius phoeniceus	Red-winged Blackbird	Icteridae	BBS observer: 10		7	7	2013	S1B,SUM	S1S2B	‌J5B,N5N,N
Calopteryx aequabilis	River Jewelwing/ Apicall	Calopterygi	Larson D.J.		6	26	1979	S3	S2S3	N5
Euphagus carolinus	Rusty Blackbird	Icteridae	BBS observer: 10		7	7	2013	S2S3B,SUM	S3B	I4B,NUN,N
Euphagus carolinus	Rusty Blackbird	Icteridae	BBS observer: 10		7	3	2017	S2S3B,SUM	S3B	I4B,NUN,N
Euphagus carolinus	Rusty Blackbird	Icteridae	BBS observer: 10		7	3	2016	S2S3B,SUM	S3B	I4B,NUN,N
Euphagus carolinus	Rusty Blackbird	Icteridae	BBS observer: 10		7	3	2016	S2S3B,SUM	S3B	I4B,NUN,N
Glaucopsyche lygdamus	Silvery Blue	Lycaenidae	Ross					S3		N5
Catharus fuscescens	Veery	Turdidae	BBS observer: 10		7	7	2011	S2B,SUM	S3B	N5B,N5M
Catharus fuscescens	Veery	Turdidae	BBS observer: 10		7	7	2011	S2B,SUM	S3B	N5B,N5M
Catharus fuscescens	Veery	Turdidae	BBS observer: 10		7	5	2015	S2B,SUM	S3B	N5B,N5M
Catharus fuscescens	Veery	Turdidae	BBS observer: 10		7	5	2015	S2B,SUM	S3B	N5B,N5M
Troglodytes hiemalis	Winter Wren	Troglodytida	BBS observer: 10		7	7	2011	S3B,SUM	S3S4B	N5B

GRANK	GeneralStatı	COSEWIC_ST	PROVINCIAL	SARA	DESCR_HABIT	SITE_NAME	Accuracy	SYNAME
G5	Sensitive					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Jndetermine(					ExploitsRiver	1000	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Jndetermine(					Bishops Falls	1000	
G5	Secure	ındidate (Mid Priori	Threatened			Northern Arm BBS route (ID:19)	250	
G5	Secure	ındidate (Mid Priori	Threatened			Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	At Risk	Threatened	Threatened	Endangered		SE of Bishops Falls, approx 10 km	1000	
G5	At Risk	Threatened	Threatened	Endangered	. Marten eventu	Confederation Place, Botwood	100	
G5	Secure						1000	
G5	Secure					Jumper's Brook Road	1000	
G5	Jndetermine(					Northern Arm BBS route (ID:19)	250	
G4	At risk	Special Concern	Threatened	Threatened			1000	
G4	At risk	Special Concern	Threatened	Threatened		Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	

GRANK	GeneralStatı	COSEWIC_ST	PROVINCIAL	SARA	DESCR_HABIT	SITE_NAME	Accuracy	SYNAME
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	At Risk	Threatened	Threatened	Threatened			1000	
G5	Sensitive					Northern Arm BBS route (ID:19)	250	
G5	Jndetermined					Bishops Falls	1000	
G4	Secure	Special Concern	Vulnerable	Special Concern		Northern Arm BBS route (ID:19)	250	
G4	Secure	Special Concern	Vulnerable	Special Concern		Northern Arm BBS route (ID:19)	250	
G4	Secure	Special Concern	Vulnerable	Special Concern		Northern Arm BBS route (ID:19)	250	
G4	Secure	Special Concern	Vulnerable	Special Concern		Northern Arm BBS route (ID:19)	250	
G5	Secure					Bishop's Falls	1000	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	
G5	Secure					Northern Arm BBS route (ID:19)	250	

CITATION	IDNUM	5km GRII	Y CENTROID OF	X CENTROID OF GRID CELL
Pardieck, K.L., Ziolkowski J	mstr1136111	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136987	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136771	Grid Cell	49.32398958	-55.44143202
2DDragonflydata.xls	mstr1034732	Grid Cell	49.01016537	-55.51963033
Pardieck, K.L., Ziolkowski J	mstr1135954	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136966	Grid Cell	49.36894828	-55.44001091
Pardieck, K.L., Ziolkowski J	mstr1137190	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135342	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1135343	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1135913	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1137191	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136454	Grid Cell	49.36985699	-55.50885691
Pardieck, K.L., Ziolkowski J	mstr1135914	Grid Cell	49.41390659	-55.43858624
Pardieck, K.L., Ziolkowski J	mstr1135915	Grid Cell	49.45886452	-55.43715802
Pardieck, K.L., Ziolkowski J	mstr1135916	Grid Cell	49.45886452	-55.43715802
2DDragonflydata.xls	mstr1034726	Grid Cell	49.00926804	-55.45128125
Pardieck, K.L., Ziolkowski J	mstr1136848	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135780	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1137127	Grid Cell	49.32398958	-55.44143202
Pardieck, K.L., Ziolkowski J	mstr1134996	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136893	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1135554	Grid Cell	49.32304138	-55.37265221
John Neville. Accidental Ca	AC0153	Grid Cell	49.00833024	-55.38293564
Accidental Capture Marten	ST0246	Grid Cell	49.14320875	-55.37855038
Nf.Birds, Data Entry by WD	mstr1029831	Grid Cell	49.01016537	-55.51963033
Nf.Birds, Data Entry by WD	mstr1029841	Grid Cell	49.00833024	-55.38293564
Pardieck, K.L., Ziolkowski J	mstr1136222	Grid Cell	49.18816748	-55.37708134
nf.birds, june 11, 2017	mstr1055595	Grid Cell	49.01016537	-55.51963033
Pardieck, K.L., Ziolkowski J	mstr1135851	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135994	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1136795	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1137013	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135714	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1135995	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1136265	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1136266	Grid Cell	49.2780838	-55.37413227

CITATION	IDNUM	5km GRII	Y CENTROID OF	X CENTROID OF GRID CELL
Pardieck, K.L., Ziolkowski J	mstr1136544	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1137014	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1137015	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1137016	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1137282	Grid Cell	49.2780838	-55.37413227
Pardieck, K.L., Ziolkowski J	mstr1135715	Grid Cell	49.32398958	-55.44143202
Pardieck, K.L., Ziolkowski J	mstr1135997	Grid Cell	49.32398958	-55.44143202
Pardieck, K.L., Ziolkowski J	mstr1136547	Grid Cell	49.32398958	-55.44143202
Pardieck, K.L., Ziolkowski J	mstr1135119	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1135996	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136267	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136545	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136546	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136796	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1137283	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1136548	Grid Cell	49.36985699	-55.50885691
Pardieck, K.L., Ziolkowski J	mstr1137017	Grid Cell	49.36894828	-55.44001091
Pardieck, K.L., Ziolkowski J	mstr1137284	Grid Cell	49.36894828	-55.44001091
Pardieck, K.L., Ziolkowski J	mstr1135651	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135366	Grid Cell	49.32304138	-55.37265221
Pardieck, K.L., Ziolkowski J	mstr1135367	Grid Cell	49.41481674	-55.50749507
Pardieck, K.L., Ziolkowski J	mstr1135368	Grid Cell	49.45886452	-55.43715802
Pardieck, K.L., Ziolkowski J	mstr1136483	Grid Cell	49.45886452	-55.43715802
email communication, via C	mstr1061422	Grid Cell	49.01016537	-55.51963033
Pardieck, K.L., Ziolkowski J	mstr1135580	Grid Cell	49.18816748	-55.37708134
2DDragonflydata.xls	mstr1034722	Grid Cell	49.00926804	-55.45128125
Pardieck, K.L., Ziolkowski J	mstr1135581	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136686	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136419	Grid Cell	49.32398958	-55.44143202
Pardieck, K.L., Ziolkowski J	mstr1136420	Grid Cell	49.32398958	-55.44143202
Ross Newfoundland Data.x	mstr1041138	Grid Cell	49.01016537	-55.51963033
Pardieck, K.L., Ziolkowski J	mstr1135189	Grid Cell	49.18816748	-55.37708134
Pardieck, K.L., Ziolkowski J	mstr1135190	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136323	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1136324	Grid Cell	49.23312583	-55.37560864
Pardieck, K.L., Ziolkowski J	mstr1135156	Grid Cell	49.2780838	-55.37413227

GNAME	GCOMNAME	OBSERVER	MONTH	DAY	YEAR	Verification
Pinus resinosa	Red Pine	Bruce Roberts; digitized by			0	
Carex foenea	Dry-Spike Sedge	Fernald; Wiegand; Darling			0	
Persicaria amphibia	water smartweed	Fernald; Wiegand; Darling	8		1911	
Astragalus alpinus var. brunetianus	Alpine Milk-Vetch	Fernald, M.L., K.M. Wiega	7	28	1911	v
Eleocharis quinqueflora	Few-Flower Spikerush	Fernald, M.L., K.M. Wiega	7	28	1911	v
Crataegus macrosperma	Big-Fruit Hawthorn	Fernald, M.L., K.M. Wiega	7	28	1911	v
Astragalus eucosmus	Pretty Milk-Vetch	Fernald, M.L., K.M. Wiega	7	28	1911	v
Cornus alternifolia	Alternate-Leaf Dogwood	Fernald, M.L., K.M. Wiega	7		1911	v
Carex houghtoniana	A Sedge	Fernald, M.L., K.M. Wiega	7		1911	v
Ranunculus macounii	Macoun Buttercup	Fernald, M.L., K.M. Wiega	7	28	1911	v
Crataegus chrysocarpa var. chrysocarpa	Fineberry Hawthorne	Fernald, M.L., K.M. Wiega	7	28	1911	v
Carex pseudocyperus	Cyperus-Like Sedge	Fernald, M.L., K.M. Wiega	7		1911	v
Ranunculus pensylvanicus	Bristly Crowfoot	Fernald, M.L., K.M. Wiega	7	28	1911	v
Graphephorum melicoides	Purple False Oats	Fernald, M.L., K.M. Wiega	7	28	1911	v
Spartina pectinata	Fresh Water Cordgrass	Fernald; Wiegand; Darling	7	28	1911	
Carex conoidea	Field Sedge	Fernald, M.L., K.M. Wiega	7	28	1911	v
Carex adusta	Crowded Sedge	Fernald; Wiegand; Darling	7		1911	
Carex cryptolepis	Northeastern Sedge	Fernald, M.L., K.M. Wiega	7		1911	v
Carex houghtoniana	A Sedge	Bouchard, A., S. Hay, L. B	7	21	1988	v
Carex adusta	Crowded Sedge	Bouchard, A., S. Hay, L. B	7	21	1988	v
Spartina pectinata	Fresh Water Cordgrass	Bouchard, A., S. Hay, L. B	7	21	1988	v
Carex conoidea	Field Sedge	Bouchard, A., S. Hay, L. B	7	21	1988	v
Najas flexilis	Bushy Naiad	Bouchard, A., S. Hay, L. B	7	23	1988	v
Potamogeton spirillus	Spiral Pondweed	Bouchard, A., S. Hay, L. B	7	23	1988	v
Juncus militaris	Bayonet Rush	Hanel, C. and Hancock, J.	8	27	2001	
Eleocharis acicularis	Least Spike-Rush	Hanel, C. and Hancock, J.	8	27	2001	v
Potamogeton alpinus	Northern Pondweed	Hanel, C. and Hancock, J.	8	27	2001	v
Sagittaria graminea	Grassleaf Arrowhead	Hanel, C. and Hancock, J.	8	27	2001	
Astragalus eucosmus	Pretty Milk-Vetch	Hanel, C. and Hancock, J.	8	27	2001	v
Apocynum cannabinum	Clasping-Leaf Dogbane	Hanel, C. and Hancock, J.	8	27	2001	v
Prunella vulgaris	Self-Heal	Hanel, C. and Hancock, J.	8	27	2001	
Dichanthelium boreale	Northern Witchgrass	Hanel, C. and Hancock, J.	8	27	2001	
Apocynum androsaemifolium	Spreading Dogbane	Hanel, C. and Hancock, J.	8	27	2001	
Muhlenbergia glomerata	Marsh Muhly	Hanel, C. and Hancock, J.	8	27	2001	v
Hedysarum americanum	Apline Sweet-Vetch	Hanel, C. and Hancock, J.	8	27	2001	
Cicuta bulbifera	Bulb-Bearing Water-Heml	Hanel, C. and Hancock, J.	8	27	2001	

GNAME	GCOMNAME	OBSERVER	MONTH	DAY	YEAR	Verification
Dichanthelium boreale	Northern Witchgrass	Hanel, C. and Hancock, J.	8	27	2001	
Juncus militaris	Bayonet Rush	Hanel, C. and Hancock, J.	8	27	2001	
Dulichium arundinaceum	Three-Way Sedge	Hanel, C. and Hancock, J.	8	27	2001	
Eleocharis elliptica	Slender Spike-Rush	Hanel, C. and Hancock, J.	8	27	2001	v
Apocynum cannabinum	Clasping-Leaf Dogbane	Hanel, C. and Hancock, J.	8	27	2001	v
Crataegus chrysocarpa var. chrysocarpa	Fineberry Hawthorne	Maunder, John E.	6	15	1987	v
Amelanchier spicata	Running Serviceberry	Maunder, John E.	6	15	1987	v
Astragalus eucosmus	Pretty Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Astragalus eucosmus	Pretty Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Astragalus alpinus var. brunetianus	Alpine Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Diervilla lonicera	Northern Bush-honeysuck	C. Hanel and P. Sokoloff	7	10	2008	
Astragalus eucosmus	Pretty Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Astragalus eucosmus	Pretty Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Astragalus alpinus var. brunetianus	Alpine Milk-Vetch	C. Hanel and P. Sokoloff	7	10	2008	
Diervilla lonicera	Northern Bush-honeysuck	C. Hanel and P. Sokoloff	7	10	2008	
Pinus resinosa	Red Pine	Roberts, B.			1985	v
Alisma triviale	Northern Water-Plantain	Hanel, C. and Pardy, S.	7	25	2001	v
Eleocharis acicularis	Least Spike-Rush	Hanel, C. and Pardy, S.	7	25	2001	v
Cicuta bulbifera	Bulb-Bearing Water-Heml	Hanel, C. and Pardy, S.	7	25	2001	v
Eleocharis elliptica	Slender Spike-Rush	Hanel, C. and Pardy, S.	7	25	2001	v
Prunella vulgaris	Self-Heal	Hanel, C. and Pardy, S.	7	25	2001	v
Scirpus cyperinus	Cottongrass Bulrush	Hanel, C. and Pardy, S.	7	25	2001	
Prunella vulgaris	Self-Heal	Hanel, C. and Pardy, S.	7	25	2001	
Equisetum pratense	Meadow Horsetail	Hanel, C. and Pardy, S.	7	27	2001	v
Matteuccia struthiopteris var. pensylvani	Ostrich Fern	Hanel, C. and Pardy, S.	7	27	2001	
Scirpus cyperinus	Cottongrass Bulrush	Hanel, C. and Pardy, S.	7	27	2001	v
Carex projecta	Necklace Sedge	Hanel, C. and Pardy, S.	7	27	2001	v
Carex pedunculata	Longstalk Sedge	Damman, A.W.H.	7	30	1957	v
Carex houghtoniana	A Sedge	Damman, A.W.H.	7	1	1957	v
Eriophorum gracile	Slender Cotton-Grass	Fernald, M.L., K.M. Wiega	7	14	1911	v
Chimaphila umbellata	Common Wintergreen	van Nostrand, R.	8		1958	v
Zannichellia palustris	Horned Pondweed	Hanel, C. and Pardy, S.	7	27	2001	v
Juncus gerardii	Black Grass	Hanel, C. and Pardy, S.	7	27	2001	v
Spartina pectinata	Fresh Water Cordgrass	Hanel, C. and Pardy, S.	7	27	2001	v
Triglochin gaspensis	GaspT Peninsula Arrow-G	Hanel, C. and Pardy, S.	7	27	2001	
Juncus gerardii	Black Grass	Hanel, C. and Pardy, S.	7	27	2001	

GNAME	GCOMNAME	OBSERVER	MONTH	DAY	YEAR	Verification
Buxbaumia minakatae	Hump-Backed Elves	G. Freake			0	v
Dryopteris fragrans	Fragrant Cliff Wood-Fern	Rouleau, E.	6	25	1958	v
Diervilla lonicera	Northern Bush-honeysuck	Hanel, C. and Pardy, S.	7	26	2001	
Apocynum androsaemifolium	Spreading Dogbane	Hanel, C. and Pardy, S.	7	26	2001	v
Brachyelytrum aristosum	Northern Shorthusk	Hanel, C. and Pardy, S.	7	26	2001	v
Brachyelytrum aristosum	Northern Shorthusk	Hanel, C. and Pardy, S.	7	26	2001	v
Pyrola elliptica	Shinleaf	Hanel, C. and Pardy, S.	7	26	2001	
Dryopteris cristata	Crested Wood Fern	Hanel, C. and Pardy, S.	7	26	2001	v
Packera aurea	Golden Groundsel	Hanel, C. and Pardy, S.	7	26	2001	v
Dichanthelium boreale	Northern Witchgrass	Hanel, C. and Pardy, S.	7	26	2001	v
Brachyelytrum aristosum	Northern Shorthusk	Hanel, C. and Pardy, S.	7	26	2001	
Diervilla lonicera	Northern Bush-honeysuck	Hanel, C. and Pardy, S.	7	26	2001	
Carex deweyana var. deweyana	Short-Scale Sedge	Hanel, C. and Pardy, S.	7	26	2001	v
Botrychium matricariifolium	Chamomile Grape-Fern	Hanel, C. and Pardy, S.	7	26	2001	v
Gentianella amarella subsp. acuta	Northern Gentian	Hanel, C. and Pardy, S.	7	26	2001	v
Rhinanthus minor	Little Yellow-Rattle	Hanel, C. and Pardy, S.	7	26	2001	
Festuca rubra	Red Fescue	Hanel, C. and Pardy, S.	7	26	2001	
Woodsia ilvensis	Rusty Woodsia	Hanel, C. and Pardy, S.	7	26	2001	v
Festuca rubra	Red Fescue	Hanel, C. and Pardy, S.	7	26	2001	

GNAME	SRANK_2010	SRANK_2015	NRANK	GRANK	FAMILY	PROV_END_A
Pinus resinosa	S2	S2	N5	G5	Pinaceae	Threatened
Carex foenea	S2S3	S3	N5	G5	Cyperaceae	
Persicaria amphibia	S2	S2	N5	G5	Polygonaceae	
Astragalus alpinus var. brunetianus	S1	S2S3	N3N4	G5T3	Fabaceae	
Eleocharis quinqueflora	S3	S3S4	N5	G5	Cyperaceae	
Crataegus macrosperma	S1	S1	N5	G5	Rosaceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Cornus alternifolia	S3	S3S4	N5	G5	Cornaceae	
Carex houghtoniana	S1	S1	N5	G5	Cyperaceae	
Ranunculus macounii	S2	S2S3	N5	G5	Ranunculaceae	
Crataegus chrysocarpa var. chrysocarpa	S2	S2	N5	G5T5	Rosaceae	
Carex pseudocyperus	S2	S2	N5	G5	Cyperaceae	
Ranunculus pensylvanicus	S2	S2S3	N5	G5	Ranunculaceae	
Graphephorum melicoides	S2	S2S3	N4N5	G4G5	Poaceae	
Spartina pectinata	S3	S3S4	N5	G5	Poaceae	
Carex conoidea	S2	S2	N4N5	G5	Cyperaceae	
Carex adusta	S2S3	S3	N5	G5	Cyperaceae	
Carex cryptolepis	S1	S1	N4N5	G4G5	Cyperaceae	
Carex houghtoniana	S1	S1	N5	G5	Cyperaceae	
Carex adusta	S2S3	S3	N5	G5	Cyperaceae	
Spartina pectinata	S3	S3S4	N5	G5	Poaceae	
Carex conoidea	S2	S2	N4N5	G5	Cyperaceae	
Najas flexilis	S2	S2	N5	G5	Hydrocharitaceae	
Potamogeton spirillus	S2	S2	N5	G5	Potamogetonace	
Juncus militaris	S3	S3	N5	G5	Juncaceae	
Eleocharis acicularis	S3S5	S3S4	N5	G5	Cyperaceae	
Potamogeton alpinus	S3S4	S3S4	N5	G5	Potamogetonace	
Sagittaria graminea		S3S4	N4N5	G5	Alismataceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Apocynum cannabinum	S2S3	S3	N5	G5	Apocynaceae	
Prunella vulgaris	S3S4	S3S5	N5	G5	Lamiaceae	
Dichanthelium boreale	S3S5	S3S4	N5	G5	Poaceae	
Apocynum androsaemifolium	S2S3	S3	N5	G5	Apocynaceae	
Muhlenbergia glomerata	S3S5	S3S4	N5	G5	Poaceae	
Hedysarum americanum	S3	S3	N5	G5	Fabaceae	
Cicuta bulbifera	S3	S3	N5	G5	Apiaceae	

GNAME	SRANK_2010	SRANK_2015	NRANK	GRANK	FAMILY	PROV_END_A
Dichanthelium boreale	S3S5	S3S4	N5	G5	Poaceae	
Juncus militaris	S3	S3	N5	G5	Juncaceae	
Dulichium arundinaceum	S3S5	S3S4	N5	G5	Cyperaceae	
Eleocharis elliptica	S3S5	S3S4	N5	G5	Cyperaceae	
Apocynum cannabinum	S2S3	S3	N5	G5	Apocynaceae	
Crataegus chrysocarpa var. chrysocarpa	S2	S2	N5	G5T5	Rosaceae	
Amelanchier spicata	SNR	S3S4	N5	G5	Rosaceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Astragalus alpinus var. brunetianus	S1	S2S3	N3N4	G5T3	Fabaceae	
Diervilla lonicera	S3S4	S3S4	N5	G5	Caprifoliaceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Astragalus eucosmus	S3	S3	N5	G5	Fabaceae	
Astragalus alpinus var. brunetianus	S1	S2S3	N3N4	G5T3	Fabaceae	
Diervilla lonicera	S3S4	S3S4	N5	G5	Caprifoliaceae	
Pinus resinosa	S2	S2	N5	G5	Pinaceae	Threatened
Alisma triviale	S1	S2	N5	G5	Alismataceae	
Eleocharis acicularis	S3S5	S3S4	N5	G5	Cyperaceae	
Cicuta bulbifera	S3	S3	N5	G5	Apiaceae	
Eleocharis elliptica	S3S5	S3S4	N5	G5	Cyperaceae	
Prunella vulgaris	S3S4	S3S5	N5	G5	Lamiaceae	
Scirpus cyperinus	S2S3	S3S4	N5	G5	Cyperaceae	
Prunella vulgaris	S3S4	S3S5	N5	G5	Lamiaceae	
Equisetum pratense	S3	S3	N5	G5	Equisetaceae	
Matteuccia struthiopteris var. pensylvani	S3S4	S3S4	N5	G5T5	Dryopteridaceae	
Scirpus cyperinus	S2S3	S3S4	N5	G5	Cyperaceae	
Carex projecta	S3	S3	N5	G5	Cyperaceae	
Carex pedunculata	S3	S3	N5	G5	Cyperaceae	
Carex houghtoniana	S1	S1	N5	G5	Cyperaceae	
Eriophorum gracile	S1S2	S1S2	N5	G5	Cyperaceae	
Chimaphila umbellata	S2	S2	N5	G5	Ericaceae	
Zannichellia palustris	S2	S2S3	N5	G5	Potamogetonace	
Juncus gerardii	S2S3	S2S3	N5	G5	Juncaceae	
Spartina pectinata	S3	S3S4	N5	G5	Poaceae	
Triglochin gaspensis	S2S3	S3	N4N5	G4G5	Juncaginaceae	
Juncus gerardii	S2S3	S2S3	N5	G5	Juncaceae	

GNAME	SRANK_2010	SRANK_2015	NRANK	GRANK	FAMILY	PROV_END_A
Buxbaumia minakatae	S1	S2?	N1N3	G2G4	Buxbaumiaceae	
Dryopteris fragrans	S2	S2S3	N5	G5	Dryopteridaceae	
Diervilla lonicera	S3S4	S3S4	N5	G5	Caprifoliaceae	
Apocynum androsaemifolium	S2S3	S3	N5	G5	Apocynaceae	
Brachyelytrum aristosum		S3S4	N5	G5	Poaceae	
Brachyelytrum aristosum		S3S4	N5	G5	Poaceae	
Pyrola elliptica	S2S3	S2S3	N5	G5	Ericaceae	
Dryopteris cristata	S3S4	S3S4	N5	G5	Dryopteridaceae	
Packera aurea	S4S5	S3S4	N5	G5	Asteraceae	
Dichanthelium boreale	S3S5	S3S4	N5	G5	Poaceae	
Brachyelytrum aristosum		S3S4	N5	G5	Poaceae	
Diervilla lonicera	S3S4	S3S4	N5	G5	Caprifoliaceae	
Carex deweyana var. deweyana	S1S2	S2	N5	G5T5	Cyperaceae	
Botrychium matricariifolium	S2	S2S3	N5	G5	Ophioglossaceae	
Gentianella amarella subsp. acuta	S2S3	S3	N5	G5T5	Gentianaceae	
Rhinanthus minor	S3	S3	N5	G5	Scrophulariaceae	
Festuca rubra	S5	S2S3	N5	G5	Poaceae	
Woodsia ilvensis	S3	S3S4	N5	G5	Dryopteridaceae	
Festuca rubra	S5	S2S3	N5	G5	Poaceae	

GNAME	COSEWIC	DESCR_HABITA	ACCURACY_ME	SYNAME	SITE_NAME	SURVEYSITE
Pinus resinosa			100		ER, Exploits Rive	
Carex foenea		Ditch in bog	1000	Carex aenea; C.		Bishop Falls
Persicaria amphibia		Shallow pool nea	1000	Polygonum ampl		Bishop Falls
Astragalus alpinus var. brunetianus		Ledges, talus, ar	1000	Astragalus bruer	Bishop Falls	Bishop Falls, north ba
Eleocharis quinqueflora		Springy spots in	1000	Scirpus quinquef	Bishop Falls	Bishop Falls; north ba
Crataegus macrosperma		Ledges, gravel, c	1000	Crataegus acutil	Bishop Falls	Bishop Falls, south ba
Astragalus eucosmus		Ledges, talus, ar	1000	Astragalus eucos	Bishop Falls	Bishop Falls, north ba
Cornus alternifolia		Woods.	1000	Swida alternifolia	Bishop Falls	Bishop Falls.
Carex houghtoniana		Sandy terraces.	1000	Carex houghtoni	Bishop Falls	Bishop Falls; north ba
Ranunculus macounii		Springy spots in	1000	Ranunculus mac	Bishop Falls	Bishop Falls; n. bank
Crataegus chrysocarpa var. chrysocarpa		Ledges, gravel, c	1000	Cratagus bruneti	Bishop Falls	Bishop Falls, south ba
Carex pseudocyperus		Boggy thickets.	1000		Bishop Falls	Bishop Falls.
Ranunculus pensylvanicus		Alluvial bushy fla	1000		Bishop Falls	Bishop Falls; n. bank
Graphephorum melicoides		Ledges, talus, ar	1000	Graphephorum r	Bishop Falls	Bishop Falls, north ba
Spartina pectinata		Springy spots in	1000	Spartina michau:		Bishop Falls, north ba
Carex conoidea		Ledges, gravel, c	1000	Carex katahdine	Bishop Falls	Bishop Falls; south ba
Carex adusta		Sandy terraces, r	1000			Bishop Falls, north ba
Carex cryptolepis		Bogs.	1000	Carex flava var. t	Bishop Falls	Bishop Falls.
Carex houghtoniana		Sandy flood plair	100	Carex houghtoni	Bishop's Falls	Bishop's Falls, south s
Carex adusta		Sandy flood plair	100		Bishop's Falls	Bishop's Falls, south s
Spartina pectinata		boulder and grav	100	Spartina michau:		Bishop's Falls, south s
Carex conoidea		Ledges and crev	100	Carex katahdine	Bishop's Falls	Bishop's Falls, south s
Najas flexilis		Flood pond on al	100		Exploits River	Exploits River, Bishop
Potamogeton spirillus		Flood pond on al	100	Potamogeton dir	Exploits River	Exploits River, Bishop
Juncus militaris		Backwater of rive	100		Bishop's Falls (T	Exploits Valley, Bisho
Eleocharis acicularis		Backwater of rive	100	Scirpus aciculari:	Bishop's Falls (T	Exploits Valley, Bisho
Potamogeton alpinus		Backwater of rive	100	Potamogeton alp	Bishop's Falls (T	Exploits Valley, Bisho
Sagittaria graminea		Backwater of rive	100		Bishop's Falls (T	Exploits Valley, Bisho
Astragalus eucosmus		Cobblely and bou	10	Astragalus eucos	Bishop's Falls (b	Exploits Valley, Bisho
Apocynum cannabinum		Cobblely and bou	10	Apocynum canna	Bishop's Falls (b	Exploits Valley, Bisho
Prunella vulgaris		Bouldery river sh	10		Bishop's Falls (T	Exploits Valley, Bisho
Dichanthelium boreale		Bouldery riverba	10	Panicum boreale	Bishop's Falls (b	Exploits Valley, Bisho
Apocynum androsaemifolium		Bouldery riverba	10	Apocynum ambig	Bishop's Falls (b	Exploits Valley, Bisho
Muhlenbergia glomerata		Bouldery riverba	10	Polypogon glome	Bishop's Falls (b	Exploits Valley, Bisho
Hedysarum americanum		Bouldery riverba	10	Hedysarum alpin	Bishop's Falls (b	Exploits Valley, Bisho
Cicuta bulbifera		Bouldery river sh	10		Bishop's Falls (T	Exploits Valley, Bisho

GNAME	COSEWIC	DESCR_HABITA	ACCURACY_ME	SYNAME	SITE_NAME	SURVEYSITE
Dichanthelium boreale		Bouldery river sh	10	Panicum boreale	Bishop's Falls (T	Exploits Valley, Bisho
Juncus militaris		Bouldery river sh	10		Bishop's Falls (T	Exploits Valley, Bisho
Dulichium arundinaceum		Bouldery river sh	10	Cyperus arundin	Bishop's Falls (T	Exploits Valley, Bisho
Eleocharis elliptica		Bouldery river sh	10	Eleocharis capita	Bishop's Falls (T	Exploits Valley, Bisho
Apocynum cannabinum		Bouldery river sh	10	Apocynum canna	Bishop's Falls (T	Exploits Valley, Bisho
Crataegus chrysocarpa var. chrysocarpa			50	Cratagus bruneti		Bishops Falls, at bridg
Amelanchier spicata			50			Bishops Falls, at bridg
Astragalus eucosmus		Open gravelly an	10	Astragalus eucos	Bishops Falls, E	Central Newfoundland
Astragalus eucosmus		Open gravelly an	10	Astragalus eucos	Bishops Falls, E	Central Newfoundland
Astragalus alpinus var. brunetianus		Rocky river shore	10	Astragalus bruer	Bishops Falls, E	Central Newfoundland
Diervilla lonicera		Open gravelly an	10	Diervilla diervilla;	Bishops Falls, E	Central Newfoundland
Astragalus eucosmus		Open gravelly an	10	Astragalus eucos	Bishops Falls, E	Central Newfoundland
Astragalus eucosmus		Open gravelly an	10	Astragalus eucos	Bishops Falls, E	Central Newfoundland
Astragalus alpinus var. brunetianus		Rocky river shore	10	Astragalus bruer	Bishops Falls, E	Central Newfoundland
Diervilla lonicera		Open gravelly an	10	Diervilla diervilla;	Bishops Falls, E	Central Newfoundland
Pinus resinosa			1000		Exploits River	Exploits River, below
Alisma triviale		Small backwater	100	Alisma plantago-	Peters River (nea	Northeast Coast, Bay
Eleocharis acicularis		Small backwater	100	Scirpus aciculari	Peters River (nea	Northeast Coast, Bay
Cicuta bulbifera		Small backwater	100		Peters River (nea	Northeast Coast, Bay
Eleocharis elliptica		Small backwater	100	Eleocharis capita	Peters River (nea	Northeast Coast, Bay
Prunella vulgaris		Small backwater	100		Peters River (nea	Northeast Coast, Bay
Scirpus cyperinus		Small backwater	100	Eriophorum cype	Peters River (nea	Northeast Coast, Bay
Prunella vulgaris		Gravelly shore of	10		Peters River (nea	Northeast Coast, Bay
Equisetum pratense		Alluvial Alnus inc	100	Equisetum prater	Peterview	Northeast Coast, Botv
Matteuccia struthiopteris var. pensylvani		Alluvial Alnus inc	100	Struthiopteris pe	Peterview	Northeast Coast, Botv
Scirpus cyperinus		Slight depression	10	Eriophorum cype	Peterview	Northeast Coast, Botv
Carex projecta		Slight depression	10		Peterview	Northeast Coast, Botv
Carex pedunculata		Black spruce fore	1000		Exploits River	Exploits River.
Carex houghtoniana		On sandy, wet ba	100	Carex houghtoni	Rattling Brook	Rattling Brook, a few
Eriophorum gracile		Shallow pool in tu	1000	Eriophorum grac	Mary Ann Lake	Mary Ann Lake, head
Chimaphila umbellata		Dry mossy Black	1000	Chimaphila umb	New Bay Lake	New Bay Lake (near),
Zannichellia palustris		Pool in intertidal	10	Zannichellia maj	Peters River (mo	Northeast Coast, Botv
Juncus gerardii		Marsh at rivermo	10	Juncus bulbosus	Peters River (mo	Northeast Coast, Botv
Spartina pectinata		Marsh at rivermo	10	Spartina michau	Peters River (mo	Northeast Coast, Botv
Triglochin gaspensis		Shallow pool in s	10		Peters River (mo	Northeast Coast, Botv
Juncus gerardii		Shallow pool in s	10	Juncus bulbosus	Peters River (mo	Northeast Coast, Botv

GNAME	COSEWIC	DESCR_HABITA	ACCURACY_ME	SYNAME	SITE_NAME	SURVEYSITE
Buxbaumia minakatae	Candidate (Group 1, Hi		10000			South Twin Lake, 35k
Dryopteris fragrans		Dry cliffs.	1000	Polypodium fragr	Point Leamingtor	Point Leamingon, Mill
Diervilla lonicera		Clearing around	100	Diervilla diervilla;	Point Leamingtor	Northeast Coast, Poir
Apocynum androsaemifolium		Clearing around	100	Apocynum ambig	Point Leamingtor	Northeast Coast, Poir
Brachyelytrum aristosum		Small ledges on	10		Point Leamingtor	Northeast Coast, Poir
Brachyelytrum aristosum		Edge of trail in A	100		Point Leamingtor	Northeast Coast, Poir
Pyrola elliptica		Edge of trail in A	100	Pyrola compacta	Point Leamingtor	Northeast Coast, Poir
Dryopteris cristata		Edge of trail in A	100	Polypodium crista	Point Leamingtor	Northeast Coast, Poir
Packera aurea		Moist clearing in	100	Senecio aureus;	Point Leamingtor	Northeast Coast, Poir
Dichanthelium boreale		Open area on bo	100	Panicum boreale	Point Leamingtor	Northeast Coast, Poir
Brachyelytrum aristosum		Open area on bo	100		Point Leamingtor	Northeast Coast, Poir
Diervilla lonicera		Open area on bo	100	Diervilla diervilla;	Point Leamingtor	Northeast Coast, Poir
Carex deweyana var. deweyana		Landward rocky s	100		Leading Tickles	Northeast Coast, Lea
Botrychium matricariifolium		Open slope on la	10	Botrychium lunar	Leading Tickles	Northeast Coast, Lea
Gentianella amarella subsp. acuta		Open slope on la	10	Gentiana acuta; .	Leading Tickles	Northeast Coast, Lea
Rhinanthus minor		Open slope on la	10		Leading Tickles	Northeast Coast, Lea
Festuca rubra		Rocky tip of sma	10	Festuca rubra su	Leading Tickles	Northeast Coast, Lea
Woodsia ilvensis		Dry crack in rock	10	Acrostichum ilver	Leading Tickles	Northeast Coast, Lea
Festuca rubra		Crest of headlan	10	Festuca rubra su	Leading Tickles	Northeast Coast, Lea

GNAME	ACRONYMS_O	COLLECTION	SOURCES	IDNUM	EST_NF_ID	5KM GRID CELL
Pinus resinosa			Natural and man	SP103541	560867	Grid Cell 19 - Bis
Carex foenea	GH	4821		SP027115	881663	Grid Cell 19 - Bis
Persicaria amphibia	GH	5348		SP026981	414337	Grid Cell 19 - Bis
Astragalus alpinus var. brunetianus	GH	5794	Bouchard, A. Da	SP024177	515713	Grid Cell 19 - Bis
Eleocharis quinqueflora	GH	4756	Bouchard, A. Da	SP025525	602077	Grid Cell 19 - Bis
Crataegus macrosperma	GH	5640	Bouchard, A. Da	SP024703	613627	Grid Cell 19 - Bis
Astragalus eucosmus	GH; CAN	5797	Bouchard, A. Da	SP024198	456721	Grid Cell 19 - Bis
Cornus alternifolia	GH	5973	Bouchard, A. Da	SP024081	513156	Grid Cell 19 - Bis
Carex houghtoniana	GH	5009	Bouchard, A. Da	SP025360	537502	Grid Cell 19 - Bis
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Apocynum cannabinum	NFM, MT	CH 010827-52	Herbarium Data	SP019959	560775	Grid Cell 19 - Bis
Prunella vulgaris			Herbarium Data	SP019968	544712	Grid Cell 19 - Bis
Dichanthelium boreale			Herbarium Data	SP020072	596871	Grid Cell 19 - Bis
Apocynum androsaemifolium			Herbarium Data	SP020083	284625	Grid Cell 19 - Bis
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Astragalus eucosmus				SP066663	456721	Grid Cell 19 - Bis
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Scirpus cyperinus			Herbarium Data	SP018979	525578	Grid Cell 16 - SW
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Juncus gerardii				SP019143	458105	Grid Cell 14 - Bo

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Astragalus eucosmus	49.00926804	-55.45128125
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Carex houghtoniana	49.00926804	-55.45128125
Ranunculus macounii	49.00926804	-55.45128125
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Ranunculus pensylvanicus	49.00926804	-55.45128125
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Eleocharis acicularis	49.00926804	-55.45128125
Potamogeton alpinus	49.00926804	-55.45128125
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Astragalus eucosmus	49.00926804	-55.45128125
Apocynum cannabinum	49.00926804	-55.45128125
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Muhlenbergia glomerata	49.00926804	-55.45128125
Hedysarum americanum	49.00926804	-55.45128125
Cicuta bulbifera	49.00926804	-55.45128125

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Apocynum cannabinum	49.00926804	-55.45128125
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Amelanchier spicata	49.00926804	-55.45128125
Astragalus eucosmus	49.00926804	-55.45128125
Astragalus eucosmus	49.00926804	-55.45128125
Astragalus alpinus var. brunetianus	49.00926804	-55.45128125
Diervilla lonicera	49.00926804	-55.45128125
Astragalus eucosmus	49.00926804	-55.45128125
Astragalus eucosmus	49.00926804	-55.45128125
Astragalus alpinus var. brunetianus	49.00926804	-55.45128125
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Scirpus cyperinus	49.09824963	-55.38001577
Prunella vulgaris	49.09824963	-55.38001577
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Carex houghtoniana	49.09726827	-55.31155051
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Zannichellia palustris	49.14320875	-55.37855038
Juncus gerardii	49.14320875	-55.37855038
Spartina pectinata	49.14320875	-55.37855038
Triglochin gaspensis	49.14320875	-55.37855038
Juncus gerardii	49.14320875	-55.37855038

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Brachyelytrum aristosum	49.32304138	-55.37265221
Brachyelytrum aristosum	49.32304138	-55.37265221
Pyrola elliptica	49.32304138	-55.37265221
Dryopteris cristata	49.32304138	-55.37265221
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Dichanthelium boreale	49.32304138	-55.37265221
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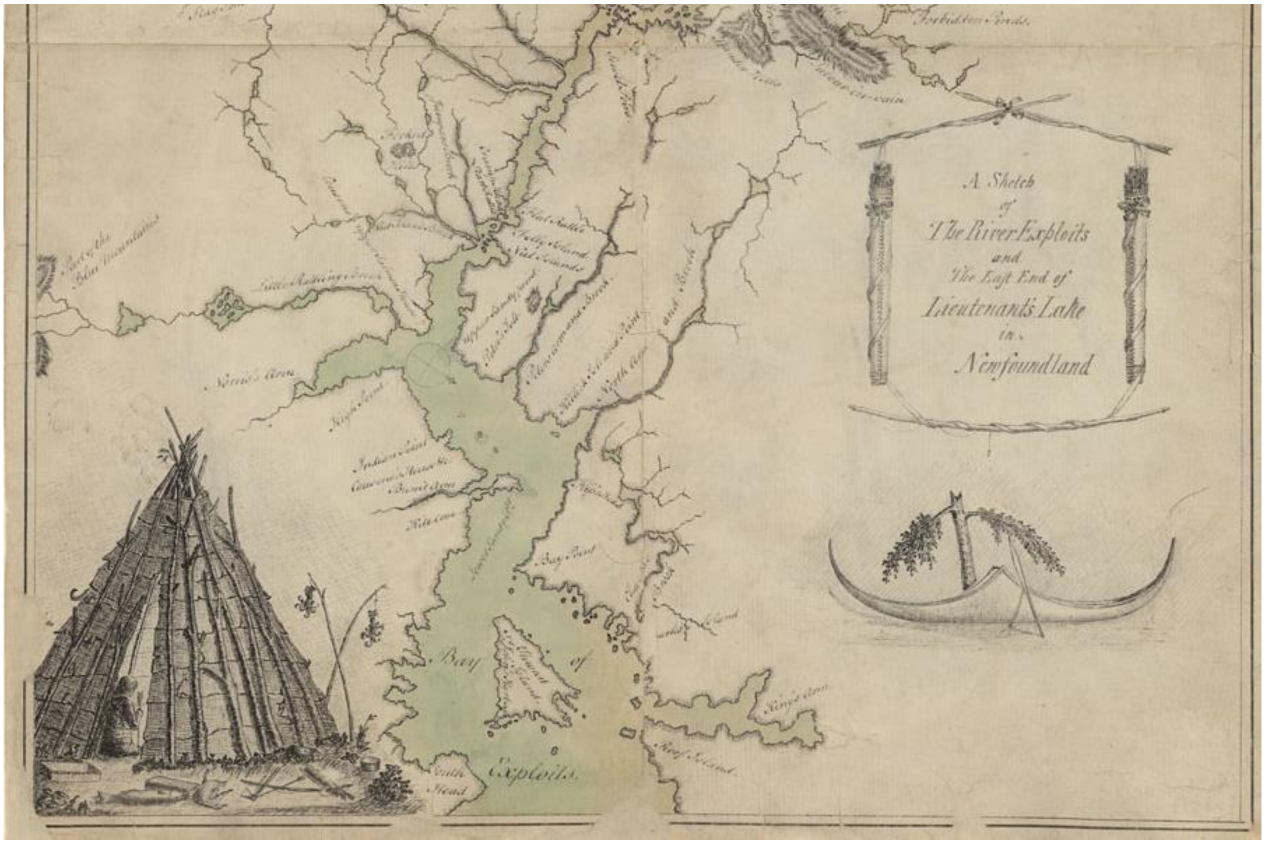
Gentianella amarella subsp. acuta	49.50382207	-55.43572621
Rhinanthus minor	49.50382207	-55.43572621
Festuca rubra	49.50382207	-55.43572621
Woodsia ilvensis	49.50382207	-55.43572621
Festuca rubra	49.50382207	-55.43572621

Appendix D
Archaeology Report



Desktop Survey of Cultural Resources
in the
Botwood, Twin Lakes and Leading Tickles Area
Newfoundland and Labrador

By: Stephen Mills
Heritage Consultant
Prepared for: Strum Consulting
June, 2023

Executive Summary

In June, 2023 Strum Consulting hired the author to assist with an environmental assessment for a project proposed for central Newfoundland, between Botwood, Leading Tickles, North Twin Lake and South Twin Lake (Figure 1). The focus of this report is to determine the potential of heritage and paleontological resources in the areas proposed for the project. A review of the database in the Provincial Archaeology Office (PAO) and a literature view of publications, reports and library sources (historic maps etc.) indicate the region near the towns of Botwood and Leading Tickle, North Twin Lake and South Twin Lake, including the watershed west of the Exploits River, was inhabited by various Indigenous populations for close to five millennia. In the early eighteenth century, Europeans began moving into the Exploits River Basin and adjoining bays to harvest cod, salmon and fur-bearing animals. Archaeological and ethnographic sites associated with Europeans are also found in the area.

The PAO Archaeological Sites Database list over 200 archaeological sites in the Exploits Bay region. More than one cultural group utilized some of these sites over time. Archaeological sites can be classed as having a single component, meaning just one group lived there, or when there is evidence for more than one group on site (over time), they are referred to as "multicomponent sites". Together, these 200+ sites include Indigenous components from: the Maritime Archaic, (23 sites, 3,000-5000 years old), Pre-Inuit (38 sites, 1000-2800 years old), Recent First Nations (Beothuk ancestors and possibly other groups) (95 sites, 500-1600 years old), Beothuk (57 sites, 500-200 years old) and Mi'kmaq (6 sites, 300 years old to modern times). Included in the database are over 80 sites associated with European activities from the eighteenth century to twentieth-century lumber camps and WW II-era plane wrecks.

Historical documents, including testimonies from Beothuk themselves, indicate that these people traversed the interior waterways in this region. Historic maps from the early nineteenth century show the locations of some of the pathways and other Beothuk features, including wigwams (Indigenous houses), storehouses, caribou fences and camping sites, in the area.

There are no paleontological resources recorded in this area.[1]

It is recommended that the three parcels of land identified for this project be subjected to an archaeological survey to search for potential sites, particularly any associated with the Beothuk people, whose last known homeland was along the watershed of the Exploits River.

[1] The Historic Resources Act lists all the known paleontological resources in the province. None are listed for the Botwood area. See: https://www.assembly.nl.ca/legislation/sr/statutes/h04.htm#2_

Introduction

Strum Consulting contracted the author to assist with an environmental assessment for a project proposed for central Newfoundland, between the towns of Botwood and Leading Tickles, including an area between North Twin Lake and South Twin Lake (Figure 1). The focus of this report is twofold: 1) identify archaeological and ethnographic sites and paleontological resources in the areas proposed for development; 2) determine the potential of additional heritage and paleontological resources in the areas proposed for development. Heritage resources include archaeological and/or historic sites including human burials. The province of Newfoundland and Labrador define paleontological resources as "… a construct, structure or work of nature consisting of or being evidence of prehistoric multicellular organisms …" (NL Provincial Historic Resources Act https://www.assembly.nl.ca/legislation/sr/statutes/h04.htm#2_. All of the recorded heritage or paleontological sites within or near the project areas will be identified within this report.

The proposed zones for development are divided into three irregular-shaped parcels, totaling just over 562 square kilometres. These zones have been designated as Parcels A, B & C. Parcel A is nearly 110 square kilometres in size and is located between South Twin Lake and North Twin Lake. It extends from the south end of South Twin Lake continuing some 20 kilometres northwards to a point about 4 kilometres south of Wild Bight (Badger Bay). Parcel B, at about 410 square kilometres in size, is the largest of the three parcels. It covers the area along the southwest side of the Bay of Exploits, near to, but excluding, the town of Botwood, and extending about 15 kilometres in land. The north-to-south length of Parcel B is approximately 30 kilometres. Parcel C, at about 49 square kilometres in size, is the third and smallest parcel of land. It covers much of the peninsula between Osmonton Arm and the north end of Seal Arm. As with the east side of Parcel B, Parcel C runs along most of the coastline of that peninsula. Each parcel is depicted separately showing the locations of nearby archaeological sites (Figures 7-10). All of the archaeological sites recorded in the area are listed in Table 1.

Historical Significance

The Beothuk people, the Indigenous inhabitants of Newfoundland and Labrador at the time of contact with Europeans, and earlier Indigenous populations (Maritime Archaic, Pre-Inuit, Ancestral Beothuk) utilized the coast, islands and "near interior"[2] in north central Newfoundland for nearly 5000 years. These Indigenous populations, in particular the Beothuk and their ancestors, traditionally followed a cyclical transhumance economy, spending springs and summers on the coast and in the fall moving along rivers and lesser waterways, to the near interior where they could harvest terrestrial resources, mainly caribou, to sustain themselves during the winter (Holly 2013: 140-146). This part of Norte Dame Bay, and specifically the area around the Exploits River Basin, was, at various times home to all the Indigenous populations in Newfoundland. Western European fishers began taking cod and other marine species (whales,

[2] The "near interior" is defined as being within 30 km of the coast (Schwarz 1994b: 63) or about a one-two day's walk from the coast.

salmon etc.) in Newfoundland in the early sixteenth century. Within a century of discovering these rich resources, fishing ships were in the waters off the north-central part of the island.

This was the last area of Newfoundland known to have been inhabited by the Beothuk (Pastore 1989:67). South Twin Lake was included in this area and it is known that the Beothuk used this area even after they abandoned the Exploits River as an access route from the coast to the interior (Marshall 1996: 138). Beginning in the 1730s, English settlers began to push farther into Norte Dame Bay, into the traditional homeland of the Beothuk (Marshall 1996: 65). Such incursions had a profound impact on the Beothuk, particularly as Europeans began to establish salmon-catching stations on the rivers and fur trappers ventured further up the waterways to lakes/ponds in the near-interior. These activities sometimes brought Europeans face-to-face with Beothuk, often to the detriment of the latter. Conflicts, including the taking of captives and killings by both sides, were deemed untenable to the colonial government, eventually resulting in Governor Hugh Palliser offering incentives to settlers to interact peacefully with the Beothuk (Marshall 1996: 85-92). Considering the numerous reports of violence upon the Beothuk by some Europeans, it is no surprize they chose locations deep in the interior for their fall/winter camps in an effort to protect themselves from Europeans.

Hand-drawn maps, from the late eighteenth century and a collection of sketches by Shanawdithit, the last know Beothuk, indicate the locations of a number of Beothuk campsites and their travel routes in this region. These maps and sketches were of the areas along the Exploits River including the region between Badger Bay and South Twin Lake.

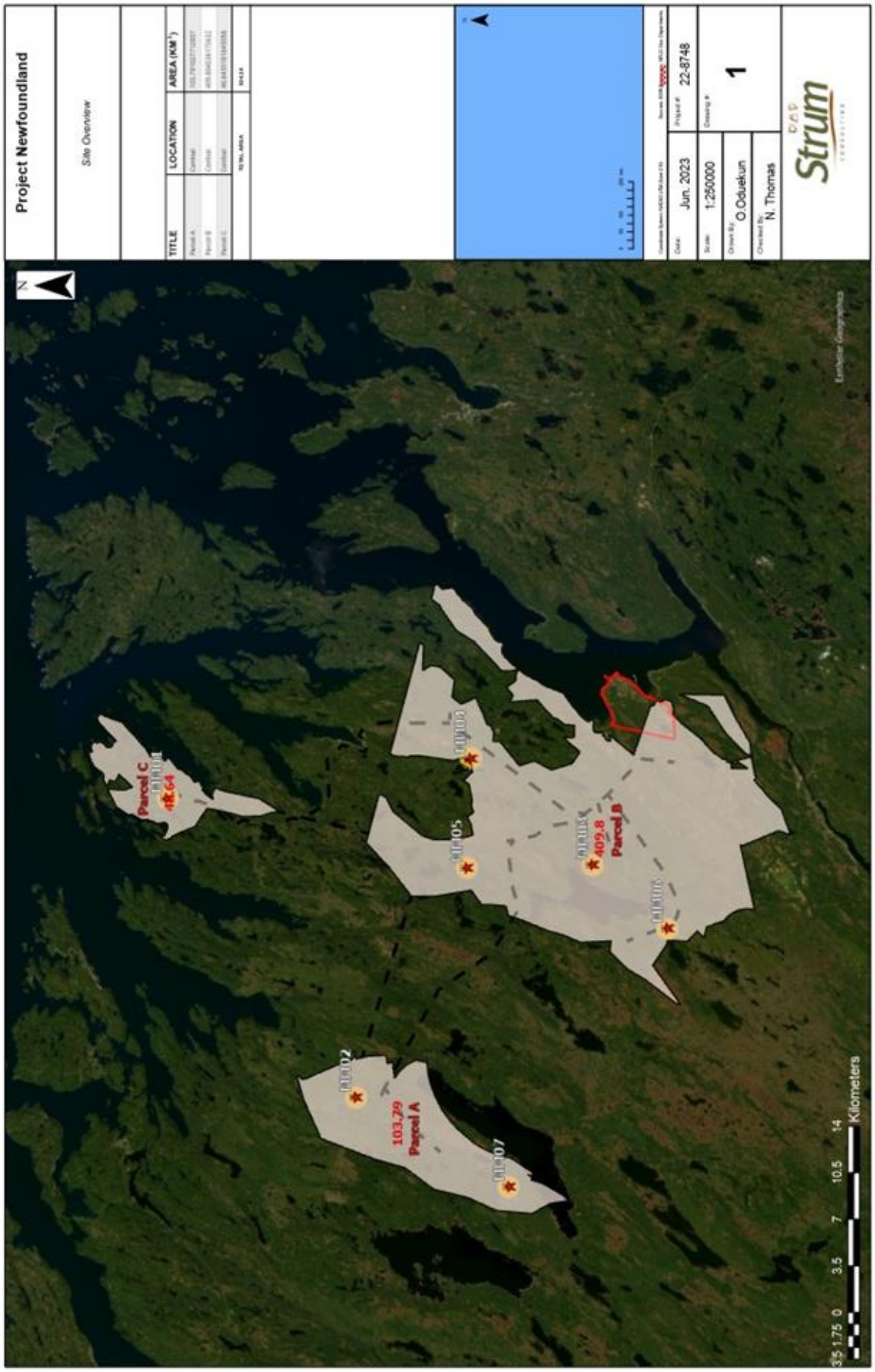


Figure 1 *Plan of the project area showing the three parcels of land proposed for development.*

Documentary References

Fortunately, there are a small number of maps depicting parts of the area proposed for this project. These maps, by British Naval officers, and several sketches made by Shanawdithit, believed to be the last of her people, provide clues to potential Beothuk sites, trails and other features in the area. Documentary references to the region increase in the 1760s as government officials began to show concern for the Beothuk, the Indigenous population of the island of Newfoundland.

Lieutenant John Cartwright

The first to undertake such a reconnaissance mission was Lieutenant John Cartwright (Royal Navy) who was commissioned by Governor Palliser to assemble an expedition in 1768 to traverse the Exploits River to Beothuk Lake (formerly Red Indian Lake) and locate any Beothuk (Cartwright, F.D.1826). Cartwright's mission failed to make contact with any Beothuk on the river but he did record considerable evidence of Beothuk activity in the region, including numerous campsites and caribou fences used to channel herds of caribou to places along rivers when they could be dispatched (Marshall 1996: 85).

Cartwright's guide on the expedition was John Cousens, a local trapper, who owned a salmon station on the Exploits River. Cousins told Cartwright that he usually went trapping in the fall and on one occasion, he had planned to trap beaver on Middleton Lake and Mary Anne Lakes, south of South Twin Lake, but when he arrived there he found a Beothuk camp there so he abandoned his plan and returned to the Exploits River (Marshall 1996: 76). Cartwright drew a map showing some of the Exploits River system from the coast to Beothuk Lake (Figure 2)

Figure 2 A sketch of the River Exploits and the east end of Lieutenant's Lake in Newfoundland. John Cartwright, 1768. (Library and Archives Canada, reference # H3/110/Exploits River/[ca.1773], G3437 .E82 1768 .C37 H3, Box number: 2000206202. Note, the blue star indicates the location of the town of Botwood.

Captain David Buchan

The next attempt to reach the Beothuk was by Captain David Buchan and his men in 1811 (Marshall 1996: 137-153). Like Cartwright before him, Buchan failed to make contact with any Beothuk although, like Cartwright before him, also recorded seeing numerous campsites and associated features. Buchan prepared several maps showing where he had been and identifies several of the Beothuk camps and other features, including hearths and storehouses. (Figures 3-5). Importantly, he places South Twin Lake (known at the time as Badger Bay Pond) on his maps.

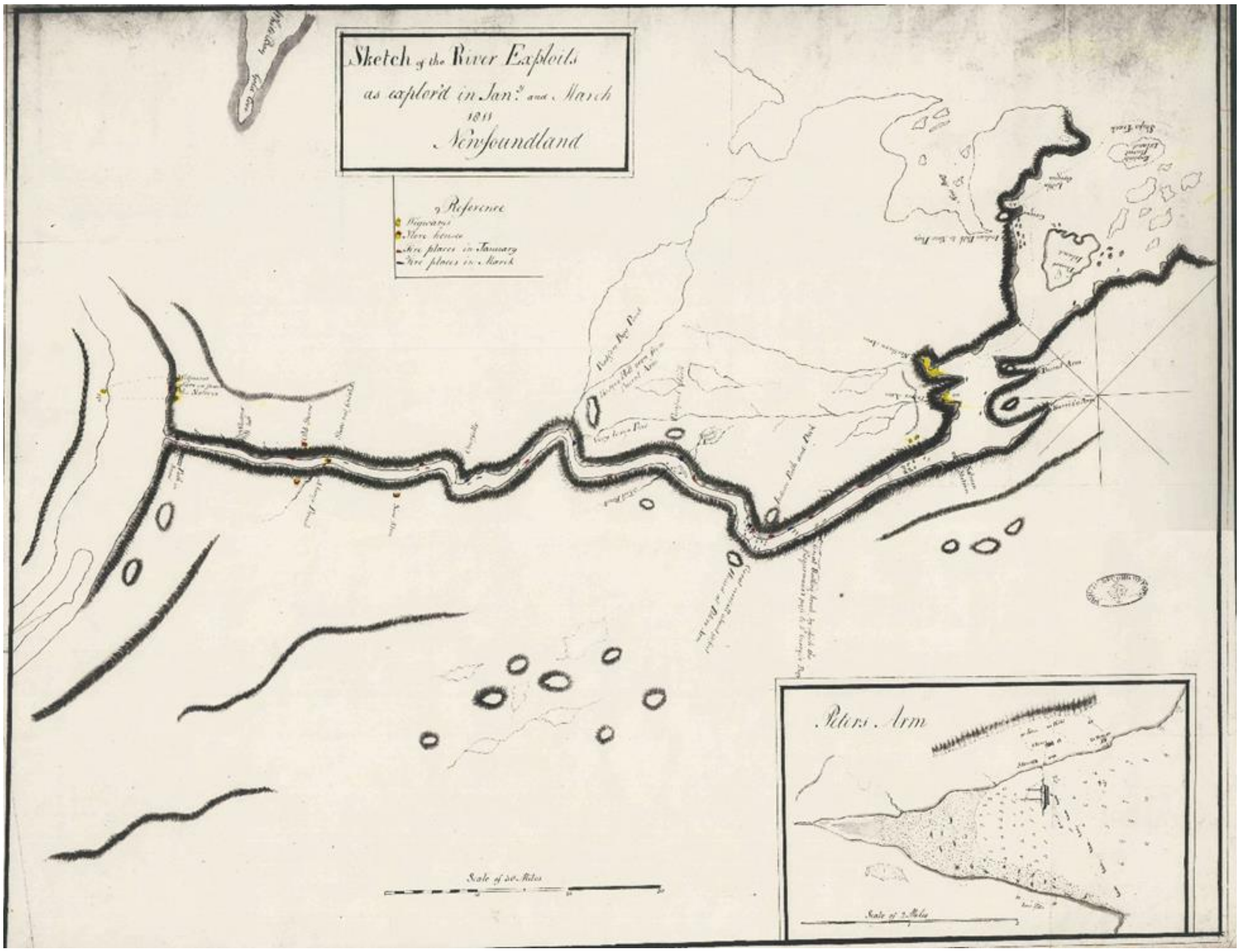


Figure 3 Sketch of the River Exploits as Explored in January and March 1811. By David Buchan. Courtesy of the Centre for Newfoundland Studies, catalogue # Nfld. Map G 3435 1811 BB. Note: Badger Bay Pond is South Twin Lake. The coloured markings indicate Beothuk features as observed in 1811.

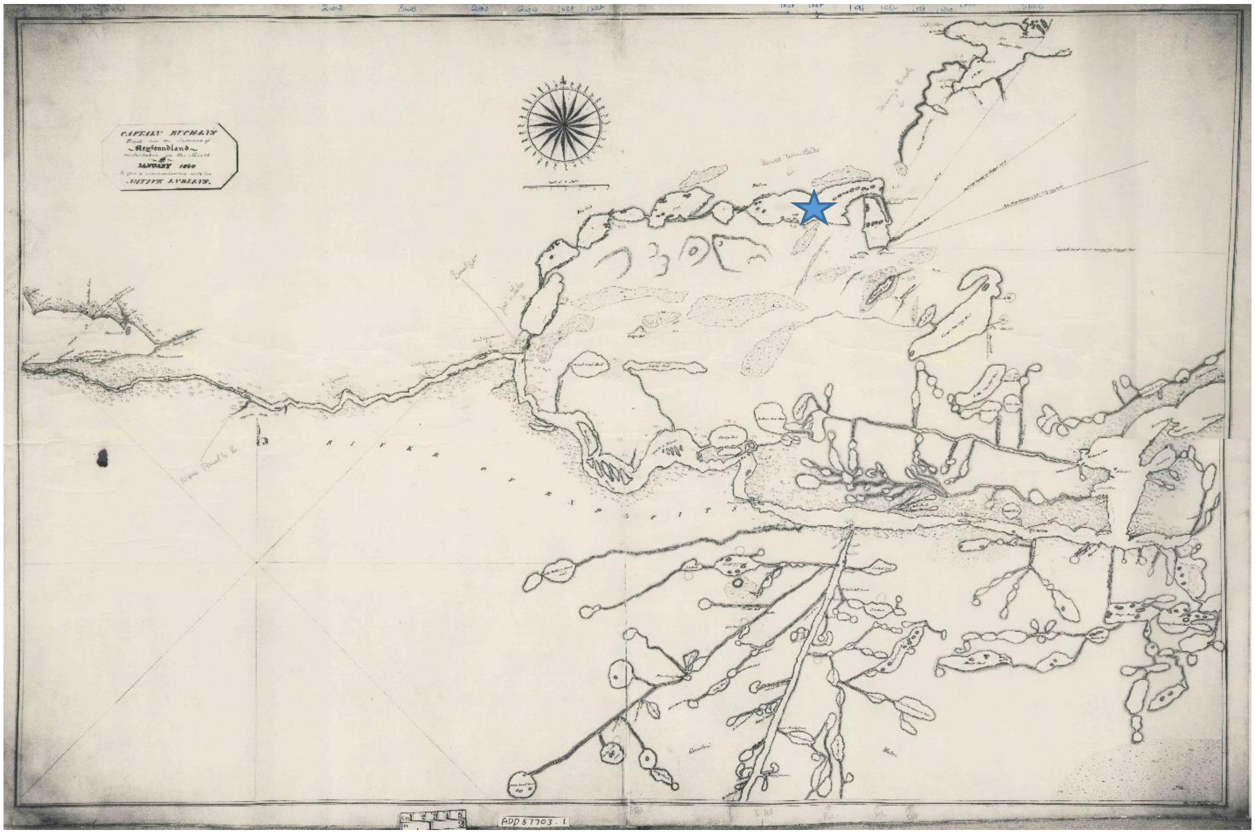


Figure 4 Captain Buchan's Track into the Interior of Newfoundland January 1820 to Open Communication with the Native Indians Sht. 1. Courtesy of the Centre for Newfoundland Studies, Memorial University, Catalogue # Nfld. Map G 3435 1820 C3. Note: South Twin Lake is identified with a blue star.

William Epps Cormack

When William Epps Cormack travelled this part of Newfoundland in 1827 in search of Beothuk, he recorded seeing one of their "encampments" at the east end of South Twin Lake, which he referred to as "Badger Bay Great Lake" (Howley 1915: 190-191). He wrote in his journal "The settlement consisted of the remains of eight or ten winter mamateeks, each large enough for up to eighteen or twenty people, and each with a small square or oblong storage pit next to it." Cormack also recorded canoe rests and the remains of a "vapour bath" (sweat lodge) as well as trails travelling north to Badger Bay, and to the westward. Additional trails led to the southeast, in the direction of the Exploits River (Cormack 1822).

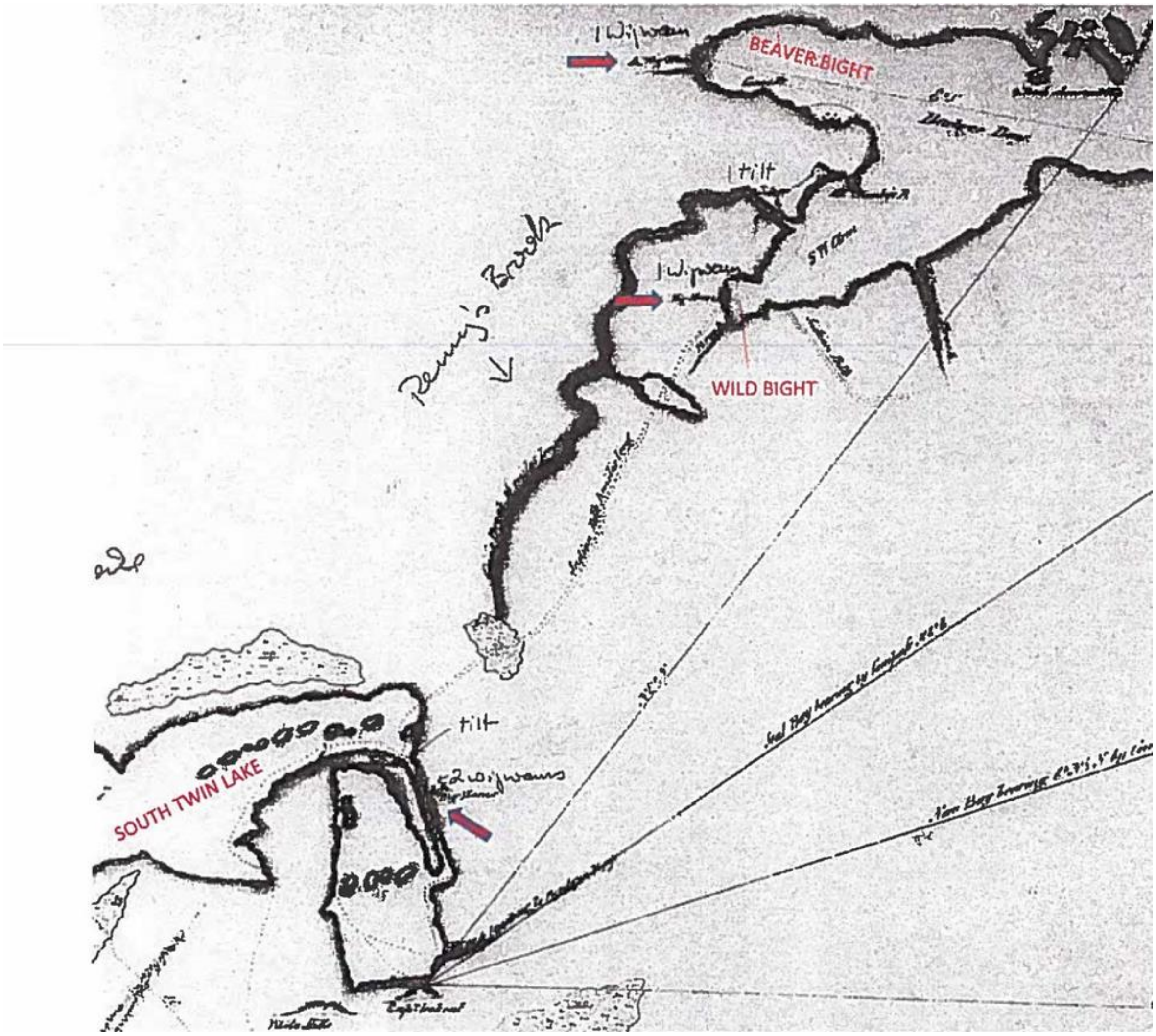


Figure 5 Detail from Figure 3. Note: Red arrows point to locations of Beothuk wigwams and the dotted lines are trails used by Beothuk, as recorded in 1811. (Source: McLean 2023. Centre for Newfoundland Studies, catalogue # Nfld. Map G 3435 1820 C3).

Shanawdithit

Shanawdithit, believed to be the last of the Beothuk, lived in the Exploits River area. In April 1823, suffering from sickness and starvation, Shawnadithit, her mother and her sister travelled along the west side of what is now South Twin Lake to the coast at the bottom of Badger Bay. There English furriers captured them. They were eventually taken to St. John's by the Twillingate merchant and magistrate John Peyton Jr. While in St. John's Shanawdithit stayed, at least for a while, at the home of Governor Hamilton and his wife, Lady Hamilton. She also spent time in the home of William Epps Cormack, where Shanawdithit executed a number of sketches detailing the area around Exploits Bay, Badger Bay and Beothuk Lake (Cormack 1822: XI).

In the spring of 1823, Shanawdithit, along with her mother and sister, were captured by furriers near the bottom of Wild Bight (Badger Bay) (Marshall 1996). While living in St. John's, Shanawdithit made a series of sketches. On some of her sketches, Shanawdithit depicted, among other things, Beothuk trails in and around the Twin Lakes, west of the Exploits River and locations of several camps. Sketch IV is of particular importance to this project as it covers some of the area now contained in Parcel B. (Figure 6)

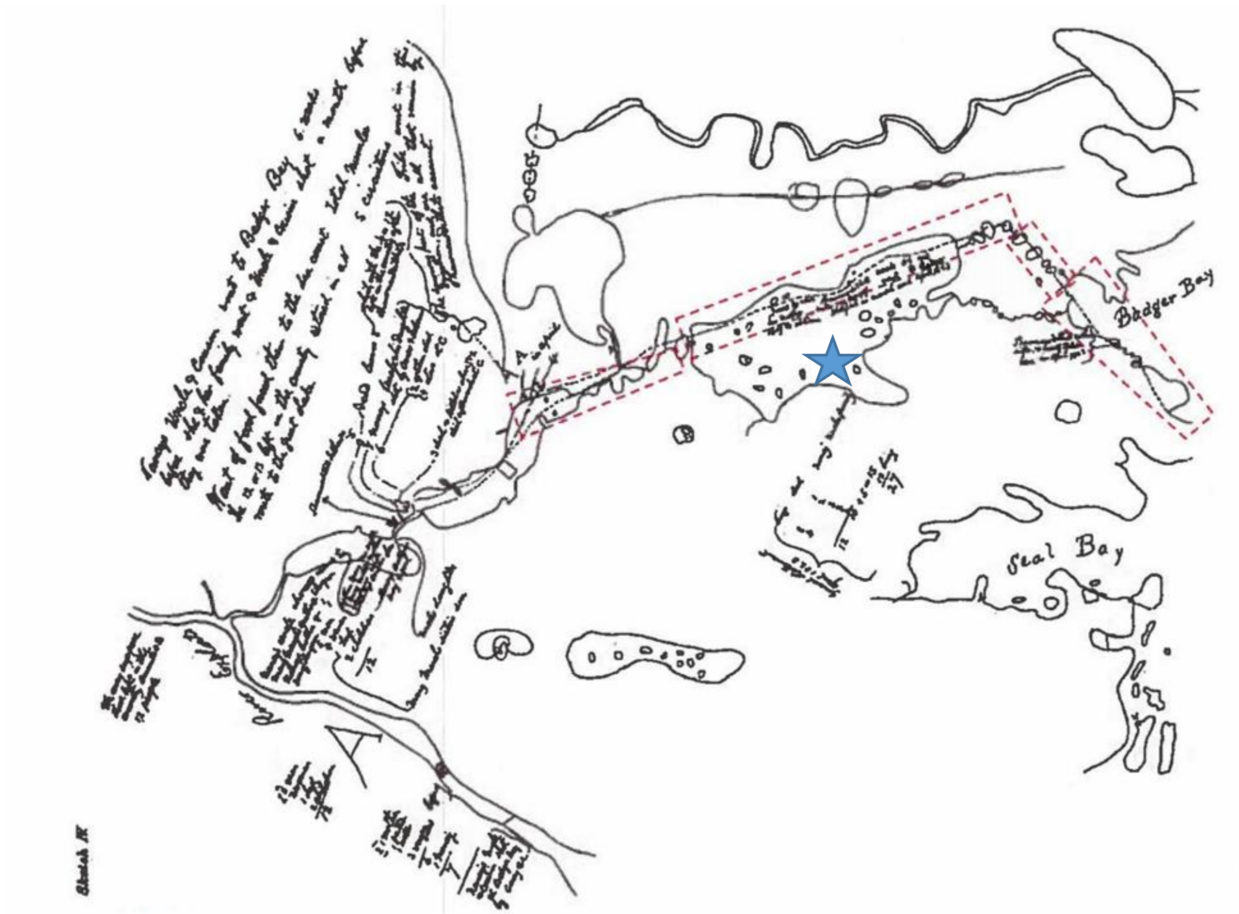


Figure 6 Shanawdithit's Sketch IV, showing the area south of Badger Bay and Seal Bay, depicting the route (dotted lines outlined in red dashes) that she and others took in March and April 1823 from the interior to Badger Day. Note: South Twin Lake indicated by a blue star. (Source: McLean 2023; sketch from Howley 1915)

Previous Archaeological Research

Notre Dame Bay was, at various times over the past 5000 years or so, home to all the Indigenous populations that once lived in Newfoundland. The region near the Exploits River basin and watershed has been the focus of archaeological investigations since the mid-1960s. Mostly, these investigations have been limited to coastal areas; however, several surveys were carried out along the Exploits River, from Botwood to Beothuk Lake. See for example: Aardvark Archaeology 2007; Claesson, Stefan and Richard K. Wells 2011; Devereux 1966; Locke 1984; McLean 2022, 2023, 2016, 2017; Reynolds 1996,1997; Schwarz 1992a, 1992b.

These surveys have identified more than 200 archaeological sites along the coast between the Bay of Exploits and Halls Bay and on the Exploits River as far south as Beothuk Lake (Figure 7). Most of these sites were made by Indigenous groups, dating back thousands of years. Sites range in type from small hunting/procurement camps to villages featuring numerous house pits and associated features. Human burials have also be recorded in the area. Evidence of multiple habitations were found at numerous sites indicating these were important procurement locations utilized at different times in the past. For example, sites near the mouths of rivers, which were typically rich salmon-gathering locations, show use by various Indigenous and Non-Indigenous groups over the span of thousands of years.

The Indigenous groups living in this region in the Pre-contact period (pre-1500 AD) are: Maritime Archaic, Pre-Inuit, Beothuk ancestors (Beaches and Little Passage populations) and Middle Woodland Cow Head people. In the historic period, Beothuk, Mi'kmaq and Europeans also lived in this region. The PAO database also shows a number of twentieth-century non-Indigenous sites in the area. Sites associated with European/ Newfoundlander/ American activities in the region include logging camps, trappers' tilts, cemeteries and WW II-era gun placements and even airplane crash sites. Included in these European sites are two early twentieth-century logging camps near the south end of South Twin Lake. Table 1 is a list of all the recorded archaeological sites in the region.

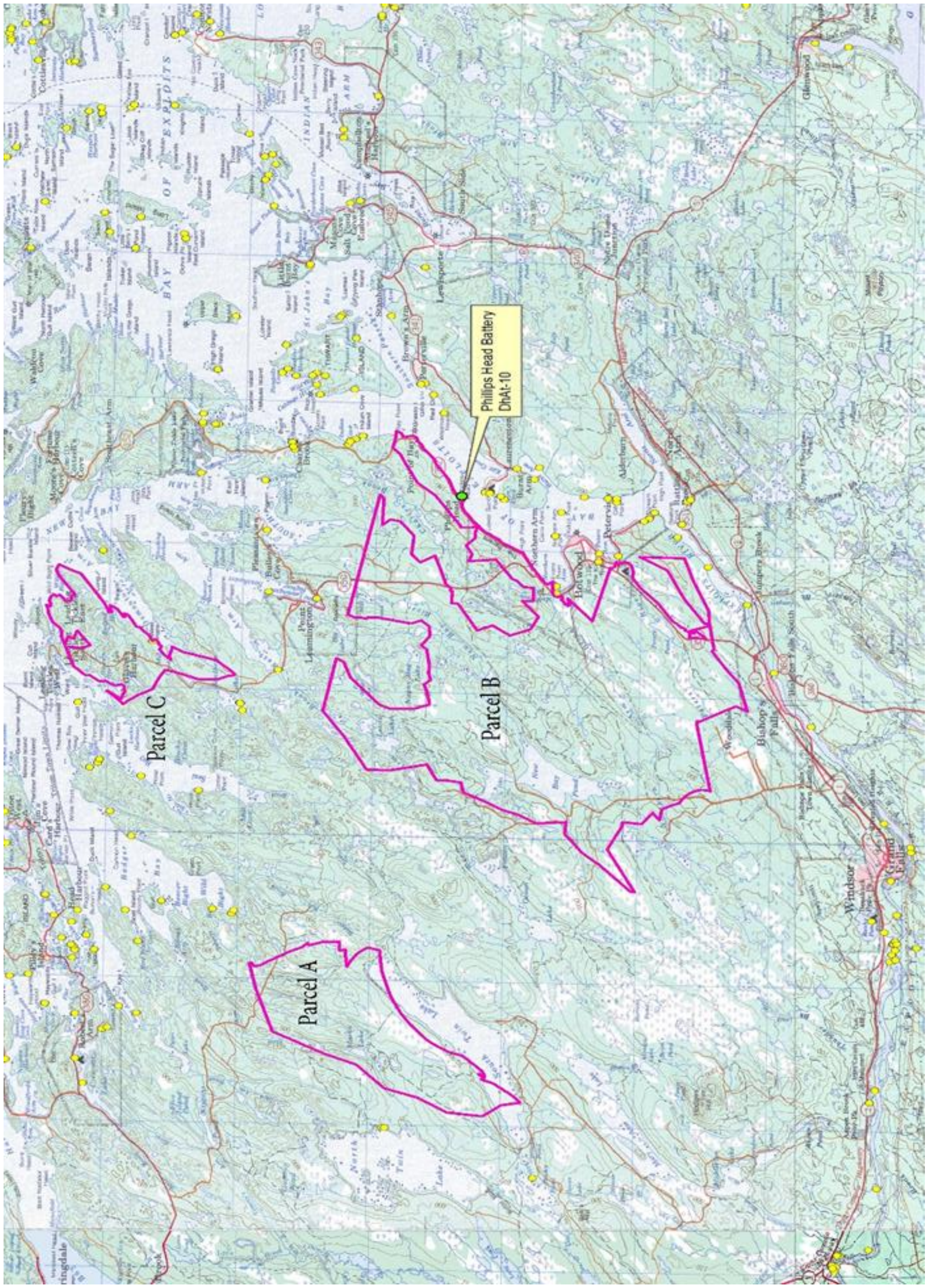


Figure 7 Detail of a map of Newfoundland showing the project parcels (outlined in pink) and the recorded archaeological sites (yellow dots). Courtesy of the Provincial Archaeology Office, Government of Newfoundland and Labrador.

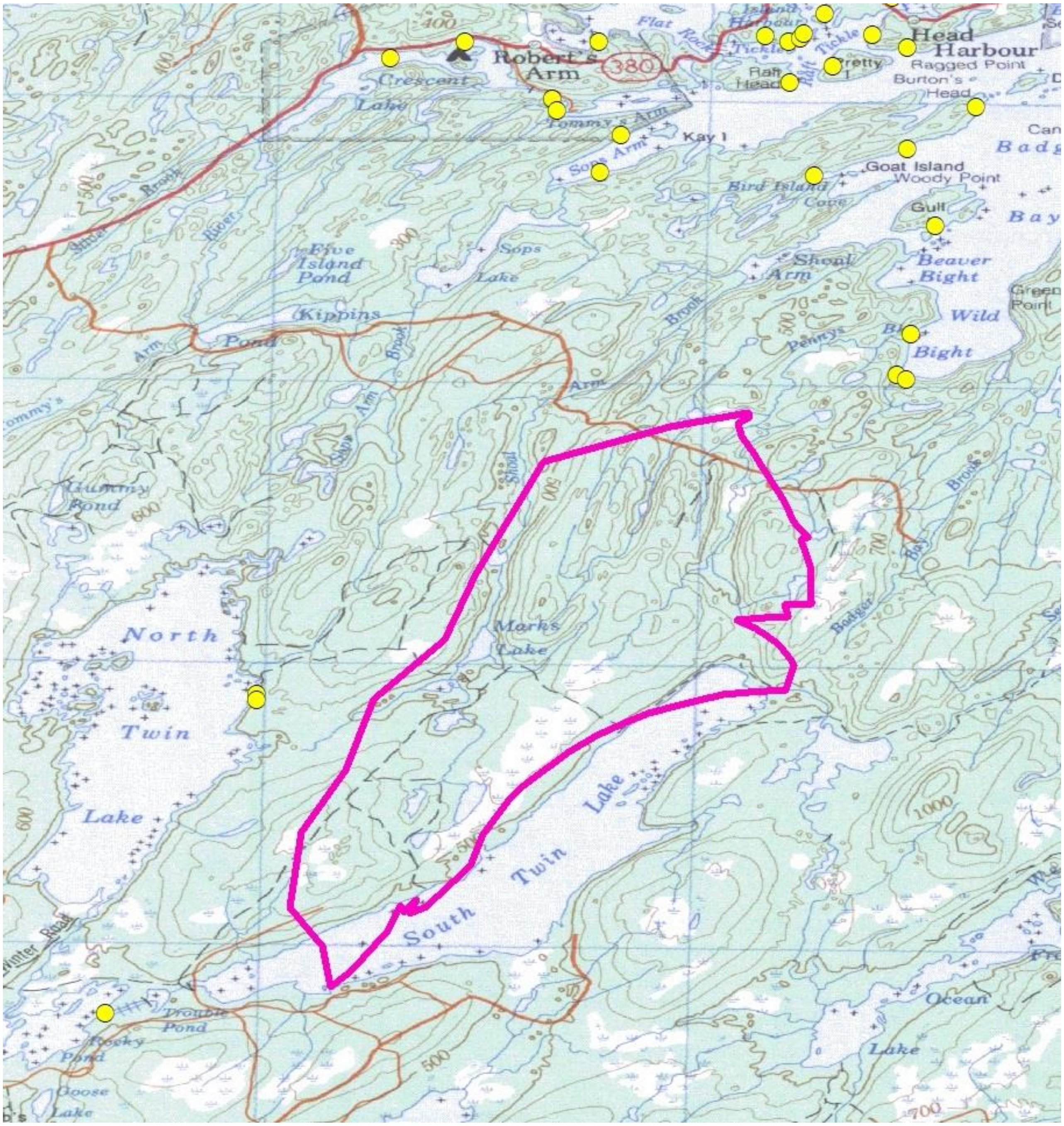


Figure 8 Detail of Parcel A with the archaeological sites identified by yellow dots. Courtesy of the Provincial Archaeology Office, Government of Newfoundland and Labrador.

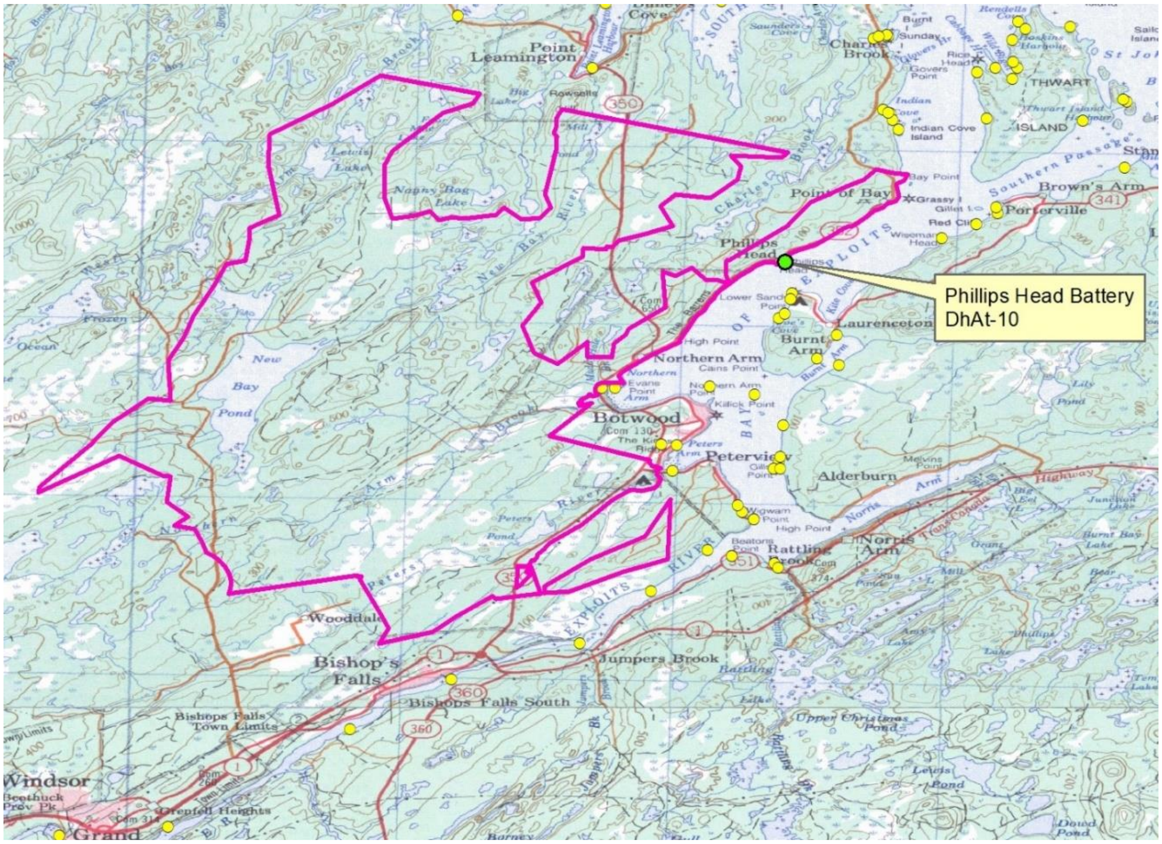


Figure 9 *Detail of Parcel B with the archaeological sites identified by yellow dots. Courtesy of the Provincial Archaeology Office, Government of Newfoundland and Labrador.*

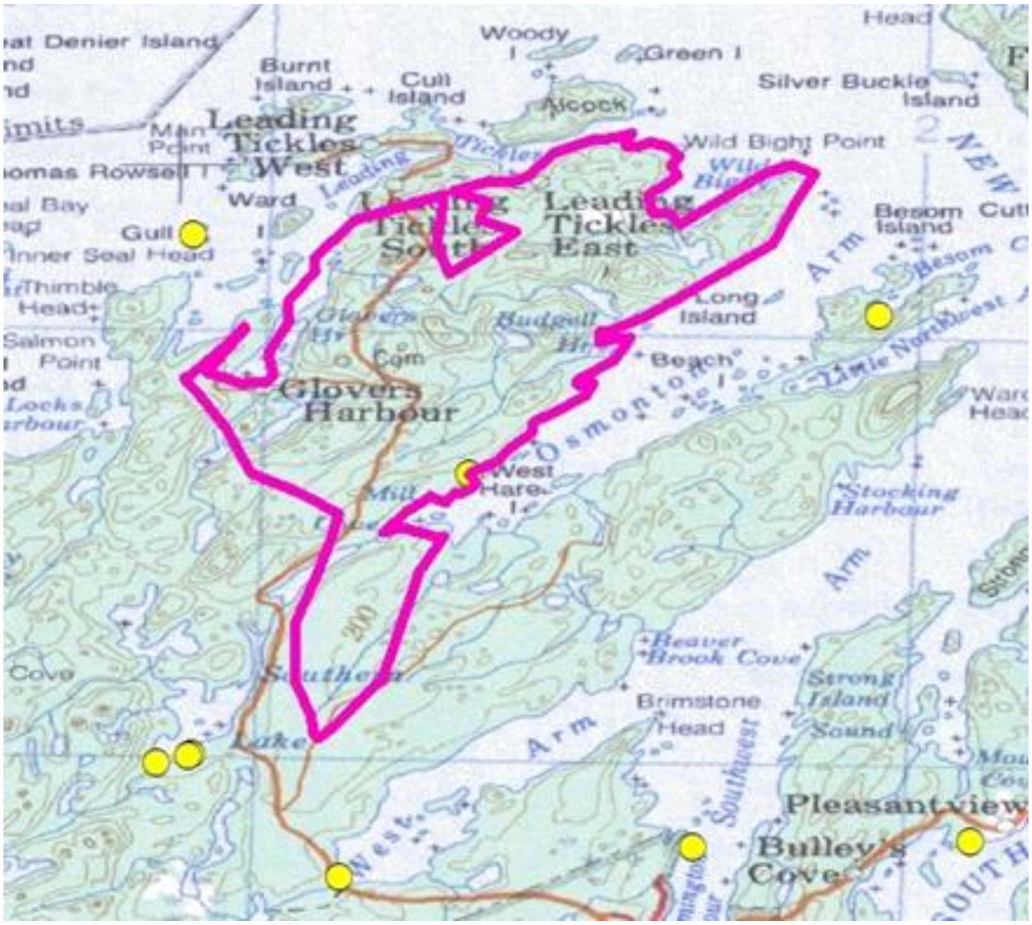


Figure 10 Detail of Parcel C with the archaeological sites identified by yellow dots. Courtesy of the Provincial Archaeology Office, Government of Newfoundland and Labrador.

Paleontological Resources

According to Newfoundland and Labrador Regulation 67/11 of the Historic Resources Act, (www.assembly.nl.ca/legislation/sr/regulations/rc110067.htm#5_), there are no paleontological resources recorded in any of the impact zones for this project. Should paleontological specimens be discovered during the project, the authorities within the Provincial Archaeology Office should be notified immediately.

Discussion

The three parcels of land proposed for development are located in an area where over 200 archaeological sites have been recorded. Evidence of land use and habitation date back nearly 5000 years, making this one of the earliest inhabited regions of the island of Newfoundland. Archaeological sites have been found along the coast, in places along the Exploits River, and also in the near interior (within 30 km of the coast). Perhaps the most culturally significant aspect of the area proposed for this project is its association with the unfortunate demise of the Indigenous Beothuk population in the late 1820s.

Beothuk have traditionally inhabited the areas along the Exploits River basin, southwards to Beothuk Lake (formerly Red Indian Lake). By the second quarter of the eighteenth century, English settlers began trapping fur-bearing animals and taking salmon near the mouths of larger rivers in the bay, where they sometimes encountered Beothuks. Beothuks had customarily taken salmon from the same rivers and bird's eggs from nearby islands. These encounters were often violent, and most often the Beothuks were shot at and sometimes captured or even killed by settlers. It is understood that Beothuk intentionally moved their fall/winter camps away from the coast and river banks to avoid being seen by Europeans. Eyewitness accounts of abandoned Beothuk encampments along the Exploits River and on the numerous lesser waterways and lakes in the area, attest to their presence there during the late eighteenth century and early nineteenth century.

Archaeological investigations in this region were mainly along the Atlantic coast or along the Exploits River. Until recently, little attention has been paid to the interior, although historic documents indicate the Beothuk also inhabited locations within a few kilometres of the coast and the banks of the Exploits River. It should be noted that there is a good chance that Indigenous groups, who predate the Beothuk, also lived in the Exploits River basin and region, and they too may have utilized the near interior resources during their cyclical rounds.

Dr. Fred Schwarz, an archaeologist with decades of experience working in the province, surveyed the Exploits River in 1992. One of the recommendations in his report was for additional archaeological surveys of the lakes north and west of that river (Schwarz 1992a: 44). Schwarz had previously surveyed the area around Gambo Pond, another large lake in Newfoundland's near interior where he located Indigenous archaeological sites dating back some 2000 years (Schwarz 1992b). The interior regions of Newfoundland have not seen the same level of archaeological attention as the coastal areas. This is not the result of negligence on behalf of researchers. Anyone who has travelled on foot in the interior of Newfoundland can attest to the dense forest cover and difficult terrain, making it a challenging place to search for evidence of past human activity. When projects such as this one near Botwood, are proposed for the interior of the province, care should be taken to mitigate negative impact to any potential Beothuk winter villages and/or associated features. History tells us that these locations were preferred by Beothuk in the latter eighteenth century and early nineteenth century when they were most fearful of Europeans.

Since the early twentieth century, logging activities, including access roads, in the region may have disturbed any evidence of early Indigenous habitation in this area. Cabins and related recreational features, built in recent decades on a number of the lakes and ponds in the region likely also negatively affected potential archaeological resources. Until an archaeological survey is carried out in the three parcels of land proposed for this project, there is no way of determining whether there are cultural resources within these areas.

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Table 1 Archaeological Site between Halls Bay and the Bay of Exploits

BORDEN #	SITE NAME	CULTURE
DfAr-02	Glenwood cemetery	Euro-American
DfAv-01	Four Mile Rapids	Beothuk; precontact
DfAv-02	Bulldozer Cut Site	Precontact
DfAv-03	Pelley	Mi'kmaq?; Euro-American?
DfAv-04	Wooden Eagle	Beothuk?
DfAw-01	North Angle	Maritime Archaic; Pre-Inuit (Late?); Beothuk
DfAw-02	Beaver Island	Beothuk
DfAw-03	Boom Island	Recent First Nation; Beothuk; Euro-American
DfAw-04	Aspen Island I	Beothuk
DfAw-05	Aspen Island II	Maritime Archaic?; Pre-Inuit (Early); Pre-Inuit (Late); Recent First Nation; Beothuk
DfAw-06	Aspen Island III	Beothuk
DfAw-07	South Exploits	Pre-Inuit (Early); Pre-Inuit (Late?); Recent First Nation; Beothuk
DfAw-08	Grand Falls 1	Maritime Archaic
DfAw-09	Rushy Brook 1	Precontact
DfAw-10	Rushy Pond 1	Recent First Nation
DfAw-11	Goodyear's Dam 1	Precontact?; European?
DfAw-12	Nimrod's Pool	Euro-American
DfAx-01	Studio Site	Precontact
DfAx-02	Pynn's Brook	Precontact
DfAx-03	Terrace Site	Precontact
DfAx-04	Old House	Beothuk
DfBa-01	Pope's Point	Maritime Archaic; Pre-Inuit (Late); Recent First Nation; Beothuk; Mi'kmaq
DfBa-05	Slaughter Island 1	Beothuk
DfBa-06	Little Red Indian Brook 1	Beothuk; Mi'kmaq; Undetermined; Precontact; Euro-American
DfBa-07	South Badger 1	Precontact
DfBa-11	Badger Chute	Beothuk
DfBa-12	Badger Beothuk;	Mi'kmaq
DfBa-17	Junction Brook 2	Beothuk; Euro-American
DgAq-03	Hurricane 5653	Euro-American
DgAt-01	Rattling Brook	Maritime Archaic; Pre-Inuit (Late); Recent First Nation
DgAt-02	Gill's Point 1	Precontact; European
DgAt-03	Gill's Point 2	European
DgAt-04	Gill's Point 3	Precontact; European
DgAt-05	Gill's Point 4	European
DgAt-06	Gill's Point 5	European
DgAt-07	Peterview 1	Precontact
DgAt-08	Peterview 2	Maritime Archaic
DgAt-09	Wigwam Point	Pre-Inuit; European; Mi'kmaq

BORDEN #	SITE NAME	CULTURE
DgAt-10	Upper Sandy Point 1	Precontact; European
DgAt-11	Wigwam Point Cemetery	Mi'kmaq?
DgAt-12	Upper Sandy Point 2	European
DgAt-13	Rattling Brook 2	European
DgAt-14	Sikorsky VS.44 - Excalibur	Euro-American
DgAt-15	Consolidated Canso 9834	Euro-American
DgAu-01	Evans Point 1	Pre-Inuit (Late); European
DgAu-02	Muddy Hole Point 1	Pre-Inuit
DgAu-03	King's Ridge 1	Precontact
DgAu-04	Peterview 3	European
DgAu-05	Silver Cove South 1	Precontact; European
DgAu-06	High Point	Pre-Inuit (Late)
DgAu-07	Flat Rattle 1	Pre-Inuit
DgAu-08	King's Ridge 2	European
DgAu-09	Botwoodville Biface	Recent First Nation
DhAr-01	Campbellton	Maritime Archaic; Pre-Inuit (Late)
DhAr-02	Thornley Site	Maritime Archaic
DhAr-03	Campbellton 2	Recent First Nation
DhAr-04	Loon Bay 1	Maritime Archaic; Undetermined
DhAr-05	Loon Bay 2	Pre-Inuit (Early); Pre-Inuit (Late)?
DhAr-06	Loon Bay 3	Pre-Inuit (Early)?
DhAr-07	Loon Bay 4	Precontact
DhAr-08	Loon Bay 5	Maritime Archaic; Recent First Nation?; Euro-American
DhAs-01	HMS Calypso	European
DhAs-02	Alfred's Cove Site	Maritime Archaic
DhAs-03	Ventura AE 793	European
DhAs-04	Thwart Island Mound	Aboriginal?; Undetermined
DhAs-05	Thwart Island-East	Precontact
DhAs-06	Thwart Island-South	Pre-Inuit; Euro-American
DhAs-07	Embree 1	Euro-American
DhAs-08	Foulke Cove 1	European
DhAs-09	Foulke Cove Tilt	Euro-American
DhAt-01	Cabbage Cove	Beothuk?
DhAt-02	Lower Sandy Point	Pre-Inuit (Late); Precontact; Beothuk; European
DhAt-03	Winter House Cove 1	Maritime Archaic
DhAt-04	Winter House Cove 3	Precontact
DhAt-05	Apple Blossom	European
DhAt-06	Ledrew's Garden	Precontact; European
DhAt-07	Burnt Arm 1	European
DhAt-08	Burnt Arm 2	European
DhAt-09	Porterville 1	Maritime Archaic
DhAt-10	Phillips Head Battery	European
DhAt-11	Porterville 2	Precontact
DhAt-12	Indian Cove, Bay of Exploits	Beothuk?; European
DhAt-13	Red Cliff 1	European

BORDEN #	SITE NAME	CULTURE
DhAt-14	Wiseman Head Battery	European
DhAt-15	Indian Cove-South	Recent First Nation; Beothuk
DhAt-16	Old Cabin	Precontact?; Euro-American
DhAt-17	Rimmer	Precontact
DhAt-18	Thwart Island-Outcrop	Precontact
DhAt-19	Wells	Pre-Inuit
DhAt-20	Wild Bight Loggers Camp	Euro-American
DhAt-21	Wild Bight Loggers Camp 2	Euro-American
DhAt-22	Wild Bight Sawmill	Euro-American
DhAt-23	Indian Cove 2, Bay of Exploits	Precontact; Beothuk?
DhAu-01	Point Leamington	Pre-Inuit (Late)
DhAx-01	North Twin Lake 1	Euro-American
DhAx-02	North Twin Lake 2	Euro-American
DhAx-03	Rocky Pond	Precontact
DiAr-01	Comfort Island Burial	Beothuk
DiAr-02	Knights Island	Undetermined
DiAr-03	Spirit Cove Burial	Beothuk
DiAr-04	Newstead 1	Pre-Inuit (Late)
DiAr-05	Newstead 2	Maritime Archaic
DiAr-06	Comfort Cove	Precontact
DiAr-07	Birchy Island Tickle	Pre-Inuit (Late); Recent First Nation?; European
DiAr-08	Cranberry Island	Beothuk
DiAr-09	Yellow Fox Island	Beothuk
DiAr-10	Western Harbour 1	Precontact
DiAr-11	Western Harbour 2	Euro-American
DiAr-12	Camel Island 1	Precontact
DiAr-13	Eastern Harbour 1	Euro-American
DiAr-14	Eastern Harbour 2	Precontact; Euro-American
DiAr-15	Browns Room	Beothuk?; Euro-American
DiAr-16	South Samson Island 1	Pre-Inuit (Late)
DiAr-17	South Samson Island 2	Precontact
DiAr-18	South Samson Island 3	Precontact
DiAr-19	Yellow Fox Island 2	Undetermined
DiAr-20	Spirit Cove Pits	Undetermined
DiAs-01	Ochre Pit Island	Maritime Archaic
DiAs-02	South West Harbour	Pre-Inuit (Early); Pre-Inuit (Late); Recent First Nation; Beothuk?
DiAs-06	Long Island 6	Beothuk
DiAs-07	Ochre Pit Island Cobble Pits	Beothuk; Undetermined
DiAs-09	Swan Island Burial	Pre-Inuit (Early); Beothuk
DiAs-10	Swan Island	Maritime Archaic?; Pre-Inuit (Late); Recent First Nation
DiAs-11	Pond Island Cobble Pits	Undetermined
DiAs-12	Shoal Tickle 1	Pre-Inuit (Early)
DiAs-13	Thwart Island-Northeast	Precontact
DiAt-01	Rendell's Cove Cobble Pit	Undetermined

BORDEN #	SITE NAME	CULTURE
DiAt-02	Charles Arm Rockshelter Burial	Recent First Nation; Beothuk
DiAt-03	High Grego Burial Site	Beothuk?
DiAt-04	Charles Brook 1	Pre-Inuit (Late)
DiAt-05	Winter Tickle 1	Maritime Archaic; Pre-Inuit (Early); Pre-Inuit (Late); Recent First Nation
DiAt-06	Charles Brook 3	Recent First Nation; Euro-American
DiAt-07	Winter Tickle 2	Precontact?; Beothuk?; European?
DiAt-08	Pleasantview	European; Beothuk?
DiAt-09	South Arm	Pre-Inuit; Recent First Nation?
DiAt-10	Charles Brook Lookout	Beothuk?
DiAt-11	Charles Brook 2 - Schwarz	Beothuk; Precontact?
DiAt-12	Winter Tickle 3	Maritime Archaic
DiAt-13	Winter Tickle Burial	Beothuk
DiAt-14	Winter Tickle Intertidal	Precontact
DiAt-15	Hoskins Harbour	Precontact
DiAt-16	Rendells Cove-East	Precontact
DiAt-17	Charles Brook Cemetery	Euro-American
DiAu-01	Thomas Rowsell Island	Pre-Inuit (Late)
DiAu-02	Berry Island Site	Precontact; European
DiAu-03	Woodward's Cabin	Maritime Archaic; Pre-Inuit (Late); Beothuk?
DiAu-05	Besom Cove	Precontact
DiAu-06	Southern Lake treefall	Precontact
DiAu-07	Southern Lake surface find	Precontact
DiAu-08	Southern Lake southwest	Precontact
DiAu-09	Mussel Bed Cove	Precontact
DiAv-01	Seal Bay Burial Cave	Beothuk
DiAv-03	Indian Cove	Pre-Inuit (Late?)
DiAv-04	Wild Bight 2	Precontact; European
DiAv-05	Wild Bight 3	Undetermined
DiAv-06	Badger Bay 5	Recent First Nation; Beothuk
DiAv-07	Badger Bay 6	Maritime Archaic; Pre-Inuit; Precontact; European
DiAv-08	Wild Bight 1	Precontact; European
DiAw-01	Robert's Arm 1	Pre-Inuit (Early)
DiAw-02	Robert's Arm 2	Precontact; European
DiAw-03	Robert's Arm 3	Precontact
DiAw-04	Robert's Arm 4	Maritime Archaic; European
DiAw-05	Badger Bay 1	Pre-Inuit (Late); Recent First Nation?
DiAw-06	Badger Bay 2	Precontact; European
DiAw-07	Badger Bay 7	European
DiAw-08	Badger Bay 3	Beothuk?; European
DiAw-09	Badger Bay 4	Pre-Inuit (Late); Euro-American
DiAw-10	Sop's Arm, Green Bay	European
DiAw-11	Picnic Island	Precontact; European
DiAw-12	Pretty Island	Pre-Inuit
DiAw-13	Pilley's Tickle	Precontact

BORDEN #	SITE NAME	CULTURE
DiAw-14	Crescent Lake 2	Precontact
DiAw-15	Pretty Tickle	Precontact
DiAw-16	Tommy's Arm Brook	Euro-American
DiAw-17	Tommy's Arm 1	Euro-American
DiAw-18	Badger Bay Bottom	Beothuk; Euro-American
DiAw-19	Badger Bay Bottom 2	Beothuk; Euro-American
DiAw-20	Sops Arm South	Pre-Inuit; Euro-American
DiAw-21	Raft Tickle	Beothuk?; Precontact
DiAw-22	Pine Lake barge shipwreck	Euro-American
DiAx-01	Crescent Lake 1	Maritime Archaic
DjAr-02	Black Island	Beothuk
DjAr-03	Little Black Island	Beothuk
DjAr-07	Cottles Island-East	Precontct?; Beothuk?
DjAr-08	Cottles Island-West	Pre-Inuit
DjAr-09	Herring Cove	Euro-American?; Beothuk?
DjAr-11	Puzzle Harbour East	Precontact?; Beothuk?
DjAr-12	Puzzle Harbour North	Precontact?; Beothuk?
DjAr-13	Puzzle Harbour Northwest	Euro-American; Precontact?; Beothuk?
DjAr-14	Puzzle Harbour Workshop	Precontact?; Beothuk?
DjAr-15	Puzzle Harbour Head	Precontact?; Beothuk?
DjAr-18	Charlies Park	Euro-American
DjAs-01	Exploits Island	Recent First Nation
DjAs-02	Matthew Lane Island	Pre-Inuit (Early?); Pre-Inuit (Late?)
DjAv-05	Robert's Cove 1	Recent First Nation; European
DjAv-09	Triton Island 1	Beothuk
DjAw-04	Pilley's Island 1	Pre-Inuit (Late); European
DjAw-16	Devils Cove	Recent First Nation; Beothuk
DjAw-17	Big Island Burial 1	Beothuk; Recent First Nation?
DjAw-18	Big Island Burial 2	Beothuk; Recent First Nation?
DjAw-23	Moulton	Euro-American
DjAw-24	Norman O schooner shipwreck	Euro-American
DjAx-01	Port Anson 1	Precontact
DjAx-02	Port Anson 2	Maritime Archaic (Southern Branch); Euro-American

APPENDIX E
PUBLIC MEETINGS/INFORMATION SESSIONS

Summary Table of EVREC Engagement with Stakeholders

Organization	Frequency	Concerns/Topics
Transport Canada	Monthly	Project Updates, Regulatory and Framing Discussions
Environment Canada	As required	Project Updates, Regulatory and Framing Discussions
NL Hydro	As required	Project Updates, Request for Power, Connection Agreement submitted
NLPower	Quarterly	Project Updates, Request for Power, Connection Agreement submitted
NL Department of Environment and Climate Change (Water, Lands Divisions)	As required	Project Updates, Regulatory and Framing Discussions
NL Department of Culture (Provincial Archeology Office)	As required	Project Updates, Regulatory and Framing Discussions
NL Department of Fisheries, Forestry & Agriculture	As required	Project Updates, Regulatory and Framing Discussions
Department of Industry, Energy & Technology	Monthly	Project Updates
Grand Falls (Water Treatment Plant)		No impact envisioned at this time.
MHA Exploits	Bi Monthly	Project Updates, Economic Benefits Provided , Support Letter Provided
Shalloway Family Practice Network	As required	Project Updates, No concerns
Qalipu First Nation	Monthly	Project Updates, Introduction to Benefit Agreements, Investment opportunities, Support Letter Provided
Energy NL	Bi Monthly	Project Updates, Member of Energy NL, Attend conferences, Industry supporter, Participate in work groups
Econext	Quarterly	Project Updates, Industry supporter, Participate in work groups
Professional Engineers and Geoscientists Newfoundland and Labrador	As required	Project Updates
Botwood Fire & Rescue	As required	Project Updates, no concerns, Support Letter Provided
Exploits Valley Port Corporation (EVPC)	Weekly	Project Updates, no concerns, Support Letter Provided
New Bay Pond cabin owners	As required	Project Updates, concerns raised, discussions ongoing
Exploits Regional Chamber of Commerce	Quarterly	Project Updates, no concerns, Support Letter Provided
oceanside country lodge	Monthly	Project Updates, concern raised, discussions ongoing

Organization	Frequency	Concerns/Topics
Newfoundland and Labrador Outfitters Association	As required	Project Updates, no concerns, Support Letter Provided
Newfoundland Association of Hunters and Anglers	As required	Project Updates
Newfoundland and Labrador Snowmobile Federation (Central)	As required	Project Updates, no concerns, Support Letter Provided
Hideaway Lodge	Monthly	Project Updates, discussions ongoing
A1 Hunts Twin Lakes	Monthly	Project Updates, discussions ongoing
Leading Tickles	Bi weekly	Project Updates, no concerns, Support Letter Provided
Botwood	Bi weekly	Project Updates, no concerns, Support Letter Provided
Point Leamington	Bi weekly	Project Updates, no concerns,Support Letter Provided
Bishop Falls	Bi weekly	Project Updates, no concerns,Support Letter Provided
Northern Arm	Bi weekly	Project Updates, no concerns,Support Letter Provided
Grand Falls-Windsor	Bi weekly	Project Updates, no concerns,Support Letter Provided
Peterview	Bi weekly	Project Updates, no concerns,Support Letter Provided
LSD Phillips Head	Bi weekly	Project Updates, no concerns
Point of Bay	Bi weekly	Project Updates, no concerns
LSD Pleasantview	Bi weekly	Project Updates, no concerns
LSD Glovers Harbour	Bi weekly	Project Updates, no concerns
Snowmobile and ATV Association	Twice Yearly	Project Updates, no concerns,Support Letter Provided
Trades NL	As required	Project Updates, no concerns,Support Letter Provided
ACOA	Bi-monthly	Project Updates, Industry Supporter
Nav Canada	As required	Project Updates, applications submitted, no concerns
Environment and Climate Change Canada	As required	Project Updates
NRCAN	Monthly	Project Updates, Industry Supporter
Corner Brook Pulp and Paper	Monthly	Project Updates, no concerns,Support Letter Provided
Canadian Military	As required	Project Updates
Canadian Coast Guard	As required	Project Updates
Royal Canadian Mounted Police	As required	Project Updates, no concerns

Common Questions & Answers:

Who is EVREC?	EVREC is a green energy project development company with goals aligned to those of the Canadian Government to set the country on a path to meet climate change goals of net-zero greenhouse gas emissions by 2050 (Government of Canada 2023). The management and shareholders of EVREC have both a long track record of investing in Canadian companies that support the energy transition, and the proven capability of executing and delivering large industrial infrastructure and energy projects. We are proud Canadians and excited to have the opportunity to realize such an important project for our future generations.
What is the EVREC Project?	The EVREC Project is a large-scale power to X (P2X) project in the Central Newfoundland region that will generate clean electricity for its own use from an onshore wind farm to produce zero-carbon hydrogen and ammonia at scale. The Project will contribute to positioning Canada as a global leader in clean hydrogen production, use, and export. As renewable hydrogen and ammonia are critical solutions for hard to abate industries (difficult-to-decarbonize), the Project has the potential to transform the path to global net-zero across a number of key emitting sectors and industries in Canada and beyond. The project components include: an onshore wind farm with a targeted capacity of +3GW and associated infrastructure; molecular and energy storage; a hydrogen and ammonia production facility and an integrated port infrastructure. The EVREC project will produce ammonia by utilizing green hydrogen as feedstock for an electrified Haber-Bosch process, powered by renewable electricity, instead of natural gas, resulting in no CO_2 emissions. In the development of the Project and the associated model, the proponents have taken a realistic view in all assumptions and have attempted to mitigate any risks by implementing proven technology and conservative approaches in assumptions and risk mitigation practices.

EVREC is a "Power to X" or "P2X" project, what does that mean?	P2X or "Power to X" refers to processes that involve the conversion of power (P) into another form, typically a fuel or gas (X). The production of hydrogen (H2) through electrolysis or the synthesis of synthetic fuels such as ammonia are Power to X processes. The concept is part of the broader transition towards more sustainable and flexible energy systems as it can lessen CO2 in hard to abate industrial sectors. EVREC is taking the historically intense CO2 production of both hydrogen and ammonia and turning those processes 100% green.
The EVREC project was awarded through a competitive government process, what does this mean?	The Department of Industry, Energy and Technology (IET) is the ministry in Newfoundland and Labrador that oversees the development of new industries and projects such as EVREC. As part of the process, there was a call for crown lands and 3.8 million hectares of land were nominated. These lands went through an interdepartmental review and land constraint analysis, and IET presented for a bid of 1.66 million hectares. For more information, please visit the link Virtual Engagement Sessions on Land Areas of Interest for Wind Energy Projects Launching Next Week - News Releases (gov.nl.ca). IET then launched a Crown Land Call for Bids for Wind Energy Projects (Call for Bids) for specific Crown Lands on December 14, 2022, which closed on March 23, 2023. IET received 24 bids from 19 companies (including EVREC), which underwent a stage one review, including criteria such as the bidder's experience and financial capacity to plan, construct, and operate the proposed project. Nine bids from nine companies were approved to proceed to stage two. The stage two review included a deeper examination of the bidder's experience, the proposed projects, and the project financing plan, as well as an examination of additional information on the electricity grid connection requirements, community and Indigenous engagement, and benefits to the province. IET announced that four bids from four companies (including EVREC) received wind application recommendation letters and have been granted the exclusive right to pursue the development of their projects through the Government of Newfoundland and Labrador crown land application and approval process, which includes a referral to Environmental Assessment (EA).

	The Crown Lands and EA processes will provide final project details, such as wind turbine locations. For more information on the process, please visit the link Crown Land Call for Bids for Wind Energy Projects - Industry, Energy and Technology (gov.nl.ca).
What will projects like EVREC mean for the province of Newfoundland and Labrador?	These projects will produce green hydrogen and ammonia for use in Canada and for export globally. Estimates show project lifespans can be as long as 50 years from construction completion through decommissioning. Monetarily, an estimate is that the EVREC project alone will increase the annual GDP of the province of Newfoundland and Labrador by over 5%[1], offset over 1.5 million tonnes of C02 every year[2], and contribute over CAD$5 billion[3] to Newfoundlanders through remittances to the provincial budget as well as various stakeholder benefit agreements. All projects will also pay provincial corporate tax and water royalties to the province. Peak full-time employment in the area is expected to exceed 11,500 jobs. The projects aim to ensure the development and use of the province's Crown Lands for wind energy projects is done in a manner that ensures the greatest long-term benefit for residents of the province. For more information on the process, visit the link Crown Land Call for Bids for Wind Energy Projects /Industry, Energy and Technology (gov.nl.ca).
Why is there such positive interest in Newfoundland and Labrador, when it comes to P2X and renewable energy projects like EVREC?	The Province of Newfoundland and Labrador is ideally positioned with qualities, which when combined, give it a unique competitive edge globally for hosting projects such as EVREC. It has one of the world's most accessible onshore wind resources and an abundance of fresh water - the main components for large scale P2X projects like EVREC. The province is strategically located on the main Atlantic shipping route, giving access to global markets for its product, with the primary market being western Europe and its

[1] Assuming the estimated project revenue upon full project COD and the Provincial GDP of 29 billion CAD.
[2] Based on most up to date hydrogen production numbers and a 100% offset of hydrogen produced via steam methane reforming with a carbon coefficient of 10 $kgCO_2/kgH_2$
[3] Includes the estimated economic impacts associated with operations and the spending of provincial tax/royalty revenues on public services. Values shown in 2024 dollars

	gateway ports. Additionally, Canada's stable economy and transparent regulatory regime support the energy transition, instill long-term confidence for investors, and gives developers the ability to unlock the low-cost, long-term, large-scale capital required to support these types of projects.
Will the project use energy from the grid?	EVREC will develop, construct, and operate a wind to green ammonia project on the brownfield site of the former Abitibi logging lands near Botwood, in Central Newfoundland. We are structuring its design to use 100% renewable wind energy. The Project is planning to utilize a grid connection to draw power (if available) for critical loads or to provide power to support the local and provincial grid in times of need.
What are the risks in the manufacture of green ammonia?	Green ammonia is considered environmentally friendly but can still pose certain risks. Accidental release during production, transportation, or storage could pose risks. EVREC will be implementing the latest available technologically to ensure that proper safety measures and emergency response plans are always in place.
Does the green hydrogen process require water?	This project requires water for electrolysis and cooling. It is currently believed that the project will require similar levels of water consumption to those used historically on the project site and will be drawn from Peters Pond. Studies will remain ongoing through the development phase of the project and will be reported as part of the Environmental Impact Assessment.
What development is planned for the port?	The port will be restored to its historical working condition to allow for inbound and outbound shipments. During the construction phase, a section of the port previously used by Abitibi will be upgraded to receive wind turbines and other materials required for the

	initial build. Botwood will have a fully operating international deep-water port as a result of the Project.
Will you be hiring local talent?	While it is not possible at this early stage in project development to firm up the exact job opportunities, they will be developed throughout the different project stages and will result in opportunities for various levels and skill sets. At this time, we expect the project construction and operation will require: • Project and construction managers • Engineers (electrical, mechanical, civil, design, HVAC, chemical, process, laboratory) • Control room operators • Environmental specialists • Crane and heavy machinery operators • Wind techs (The College of the North Atlantic is offering this certification) • Welders • Electricians • General Labour If you are planning any type of training or future education, please consider these areas. Check on our website regularly as jobs will be posted as the project develops. We also anticipate a growth in the local economy indirectly created by EVREC in the hospitality industry, housing construction, retail development and professional services to the area.

What effect will the building and operation of a wind farm have on local ecosystems?	EVREC is required by the Newfoundland Government to gather data and monitor all environmental effects of the wind farm build and maintenance on local species and their ecosystems- (avifauna, terrestrial reptiles, mammals, and fish). All information is gathered from existing professional sources, government and academic studies, local knowledge, field surveys and our own environmental monitoring. The final design will be influenced by the data. We share with the community the concern for every piece of the ecological puzzle.
How was the EVREC site selected?	The Exploits Valley area boasts a world class wind resource; proximity to an existing deep-water port; water availability; the topographical characteristics to enable a cost-effective build; a stable government; a favorable fiscal framework; a defined regulatory pathway and local support from community stakeholders who have known the area in more prosperous times.
How can our community be involved in the development of the EVREC project?	Community involvement in the development of any wind farm is crucial for addressing local concerns, promoting transparency, and building trust and support for renewable energy projects. This project is engaging the community through: • Public consultations and meetings • Stakeholder engagement • Educational initiatives • Land lease agreements • A community benefit agreement • Environmental impact assessments that will be openly shared • Developing job creation and training programs. Community involvement in this wind farm development will require ongoing engagement from project planning through construction, operation, and decommissioning. The project is committed to effective engagement that will foster collaboration, build trust, and ensure that the project aligns with the values and needs of the local community.

How is green ammonia produced?	Green ammonia is produced using renewable energy sources- in EVREC's case, wind turbines and solar will fuel the process. This electricity powers an electrolyzer, which splits water (H_2O) into hydrogen (H_2) and oxygen (O_2). This process is known as electrolysis and results in the production of green hydrogen. This green hydrogen is then combined with nitrogen (extracted from the air) in a process known as air separation. The hydrogen and nitrogen are then combined to create green ammonia by a process (Haber-Bosch) which has been used for over 100 years and now has been adapted to be powered by sustainable energy.
What are the environmental benefits of green ammonia?	Green ammonia offers several environmental benefits compared to conventional ammonia production methods because it has reduced greenhouse gas emissions. The key environmental benefits of green ammonia are to reduce carbon emissions, mitigate the impact of climate change, provide Canada with energy independence, improve air and water quality, have non-polluting sustainable agriculture, conserve resources, and promote a circular economy with the adoption of innovative technology.
What happens at the end of the useful life of a wind turbine?	As turbines are dismantled, the components are repurposed, recycled, or disposed of in an environmentally responsible manner.
How does green ammonia contribute to the decarbonization of the ammonia industry?	Ammonia is a key component in fertilizers and chemicals and can now be used as a clean energy carrier. Ammonia production is highly energy intensive and has traditionally been produced using fossil fuels. In 2020, global ammonia production created approx. 450 million metric tons of carbon dioxide into the air- all of which can be eliminated by producing it using green renewable energy.

How is maintenance handled on a wind turbine?	Wind turbines undergo regular routine maintenance (visual inspections, lubrication of moving parts, monitoring of key performance indicators). Routine maintenance is essential to identify and address minor issues before they escalate. Predicative monitoring systems are often installed in turbines to continuously assess the condition of critical components. This includes vibration monitoring, oil analysis, and other sensors that provide real-time data on the health of the turbine. During the life of the turbine, periodic inspections, both internal and external, are scheduled to assess the condition of components that may not be easily visible during routine maintenance. These inspections help identify wear and tear and potential issues that may require corrective action.
What applications does green ammonia have?	Green ammonia has diverse applications across various industries, leveraging its role as a clean and sustainable form of ammonia produced using renewable energy sources. The key applications of green ammonia are for fertilizer production, agriculture, chemical industry, a hydrogen carrier, fuel for power generation, fuel for the maritime and shipping industry, energy storage, hydrogen production, emission control and water treatment.
What are the economic considerations of green ammonia production?	The economic considerations in the production of green ammonia are: initial capital costs, operating and maintenance costs, cost of renewable energy, hydrogen production costs, feedstock costs, market prices for ammonia, government incentives and policies, carbon pricing and emission costs, market acceptance, access to funding, and lifecycle analysis and environmental externalities.
What happens if there is an emergency on a Turbine?	In the event of an unexpected failure or emergency, wind farms have response plans in place to address and repair issues promptly. This can involve specialized teams trained for turbine rescues and repairs.
What is green ammonia?	Green ammonia is ammonia produced using renewable and sustainable energy sources. The traditional process for producing ammonia involves the Haber-Bosch process, which uses natural gas (methane) as a feedstock and a source of hydrogen. EVREC will be powering this process using renewable wind energy.

How is wildlife considered during the construction of a wind farm?	The impact of wind farms on wildlife is a topic that has been studied extensively, and it is essential to consider both the positive and negative aspects. While wind energy is a clean and renewable source of power, the installation and operation of wind farms can have various effects on local ecosystems and wildlife. The positive impacts of wind farms are that they vary from habitat preservation, reduced greenhouse gas emissions, limited air and water pollution. It is also important to note that the impact of wind farms on wildlife can vary depending on factors such as the location of the wind turbines, the species present, and the specific design and operation of the turbines. Site mitigation, proper environmental impact assessments, and ongoing monitoring are essential in minimizing negative effects on wildlife and optimizing the coexistence of wind energy and biodiversity. The Project and environmental agencies are working together to implement mitigation measures, such as proper siting, avian monitoring, and adaptive management practices, to address and minimize any potentially negative impacts of wind farms on wildlife
What is the lifespan of a wind turbine?	The lifespan of a turbine (anywhere from 20 to 30 years or more) is influenced by the quality of the equipment, its operating environment and advancements in technology. The major components of a wind turbine are a tower, nacelle, blades, hub, gearbox, generator, and control systems. Each of these components has a specific lifespan, with some components potentially requiring replacement or major overhaul during the turbine's operational life.
What role does renewable energy play in green ammonia projects?	Renewable energy plays a central and critical role in green ammonia production as it is this use of renewable energy that distinguishes green ammonia from traditional ammonia production, made with fossil fuels. The use of renewable energy sources contributes to the environmental sustainability and lower carbon footprint of the entire ammonia production process.

When the turbines enter the decommissioning stage which will take place many years down the road, who is responsible for the decommissioning and associated costs?	Under the Crown Land Application, EVREC has the obligation of decommissioning all assets. The types of work activities typically include removing or dismantling the asset. For the EVREC Project, the various aspects of the implementation of the Asset Retirement Obligation standard have been reviewed, and in doing so the underlying requirements and issues that must be complied with have been fully addressed in the planning stage. The Project has taken a very realistic approach in developing the plan, which can be implemented to meet the future legislative requirements, and as such it will be reviewed by the regulators through the permitting and approval process.
How does EVREC manage risk?	EVREC has implemented a culture of risk management. The Executive Team is responsible for protocols to protect both the on-ground organization (community, employees, the environment and assets), its shareholders' investment and the reputation of the EVREC project. Risk is evaluated by the probability of an occurrence providing a risk level ranging from low to extreme. Mitigation strategies will then determine a residual risk rating. Identified risks that are outside the organization's risk appetite will require implementation of a risk transfer, reduction, elimination, or exploitation strategy to reduce the residual risk level to as low as reasonably practicable. Risks identified as high with an impact above a specified threshold will be reported to Project Sponsors/Steering Committee. As the organization continues to grow, it is committed to building increased awareness and a shared responsibility for risk management at all levels of the organization. Creating a culture of careful monitoring and observation by everyone is crucial to working in a truly safe environment.

What risks are associated with an ammonia plant and the transportation of ammonia?	Green ammonia, that will be produced through our process is considered environmentally friendly, however it can still pose certain risks. Accidental releases during production, transportation, or storage could pose risks. The project will be implementing best available technologically to mitigate these releases and will ensure that proper safety measures and emergency response plans will be implemented to mitigate these risks. It should be noted that ammonia production units and the transportation of ammonia is very common, with accidental releases causing harm being very rare. Industry, regulators, and the Project will work collaboratively to ensure that robust safety measures, emergency response plans, and sustainable practices are implemented and maintained.

Have the First Nations in the area been consulted through the initial development of the project?	To date, the project has demonstrated strong CSR support throughout the initial development and continues to have an active CSR campaign and community outreach. Key highlights to date: 1. Signed exclusive agreements with the Town of Botwood and Exploits Valley Port Corporation, 2. Successfully engaged the community through several meetings before the submission, which have garnered a noteworthy attendance of over 500 individuals. Most of the feedback received from attendees has been positive, indicating that the Project has an impactful and effective CSR Plan. We have also attended several co-sponsored information sessions with the Town of Botwood and have done several info sessions and get-togethers with the regional mayors from Exploits Valley and the staff. The active participation of community members and stakeholders in these meetings is a testament to the collaborative efforts being made towards executing the Project with support of the community, 3. Executed a Social License/MOU with the Qalipu Nation, which was signed and submitted with the proposal, and participated in numerous EVREC events and joint press releases, 4. The Project received an open letter of support signed by eight Mayors of the surrounding communities (Exploits Valley Region), addressed to Andrew Fury and the Minister of IET (Industry Energy and Technology). This was submitted before the final decision was released on the bid, 5. A key differentiator that sets us apart from other awarded projects is that it is targeting an area in Central Newfoundland that has been the industrial heartland for many years. Over the past century, the region has seen several large industrial and employment bases shut down. Most of the land and infrastructure targeted by the Project are repurposed forestry sites that were once a significant driver of Newfoundland's economic engine, thanks to the Abitibi Consolidated Pulp and Paper Company. The communities in the region were historical "Company Towns", communities formed to support these industries, and they are excited to see a project that aims to revitalize such an important area and bring new opportunities back to the region. Many other projects are in small communities primarily based on fishing or other outdoor and touristic pursuits (not historically heavy industry) and have a different connotation to the lands being targeted for development. Central Newfoundland, through the Project's engagements, is focused on bringing back jobs to the region, and this is the main driver behind the local government and population support of the Project.

Have the Qalipu First Nations been consulted on the project?	EVREC consulted with members and representatives of Qalipu First Nation and Qalipu Holdings, including the Ward Councilor and Exploits region Qalipu members. These discussions were expansive, leading to a Memorandum of Understanding which sets out how EVREC and Qalipu intend to work together to explore procurement, construction, employment, and economic opportunities. Furthermore, the discussions included planning for monitoring, mitigating, caring for, and avoiding areas of cultural spiritual significance, rare plants, waterways, wildlife habitat and other areas of interest. All concerns will be identified and addressed though a comprehensive environmental impact assessment, which includes environmental and socio-economic impacts. This process aligns with the Government of Newfoundland and Labrador consultation requirements with Qalipu First Nation, in which EVREC intends to comply with all guidelines and conditions for consultation and engagement, and any resulting development agreements. EVREC also recognizes there are people in the Exploits region who are not Qalipu members, but who have deep rooted, significant, and cultural, recreational, commercial, and natural connections with the land to be considered for the wind energy project. EVREC's ongoing consultation will continue to understand all interests, issues, concerns, and opportunities with all people in the Exploits area, and beyond. EVREC's intentions are to create a development that provides economic and social opportunities to support communities and future generations, with minimal impact on the environment.

How much is this project costing the Province of Newfoundland & Labrador	The company is funding the construction and operation using its own funds, as well as funds raised from investors and lenders. The product being produced is Green Ammonia which will be sold to an international customer, not the province of Newfoundland & Labrador.

APPENDIX F
EPP TABLE OF CONTENTS

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1
2.0 ENVIRONMENTAL PROTECTION PLAN OVERVIEW 1
2.1 Scope of the Environmental Protection Plan 1
2.1.1 Timing and Constraints 1
2.1.2 Unforeseen Circumstances 1
2.2 Organization and Use of the Environmental Protection Plan 1
2.3 Maintenance of the Environmental Protection Plan 1
3.0 RESPONSIBILITIES & Training 1
3.1 Roles & Responsibilities 1
3.1.1 Project Manager 1
3.1.2 Construction Manager 1
3.1.3 Environmental Monitor 1
3.1.4 Other Personnel 1
3.2 Training & Orientation Requirements 1
3.2.1 Records 1
3.3 Complaint Response Protocol 1
4.0 PROTECTIVE MEASURES 1
4.1 AIR QUALITY & DUST 1
4.2 Greenhouse Gas Emissions 1
4.3 Blasting 1
4.4 Geohazards 1
4.5 Groundwater Wells 1
4.6 Erosion & Sediment Control 1
4.7 Surface Water, Wetlands, Fish & Habitat 1
4.8 Terrestrial Plants & Lichen 1
4.9 Terrestrial Wildlife & Habitat 1
4.10 Avifauna & Bats 1
4.11 Noise Management 1
4.12 Traffic Control 1
4.13 Non-Hazardous Solid Waste Disposal 1
4.14 Contaminant Prevention Plan 1
4.14.1 Hazardous Materials & Waste Materials Management 1
4.14.2 Wastewater Management 1
5.0 CONTINGENCY PLANS 1
5.1 Spill Control Plan 2
5.1.1 Prevention 2
5.1.2 Response Procedures 2
5.1.3 Clean-up Procedures 2
5.2 Failure of Erosion & Sedimentation Controls 2
5.2.1 Prevention 2
5.2.2 Response Procedures 2

5.3 Discovery of Archaeological, Culture, or Heritage Resources 2
5.3.1 Response Procedures 2
5.4 Fires 2
5.4.1 Prevention 2
5.4.2 Response Procedures 2
6.0 COMMUNICATIONS 2
6.1 Contact List 2
6.2 Incident Reporting 2
7.0 NOTIFICATION 2
8.0 SITE VISITORS 2
9.0 CLOSURE 2
10.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS 2
11.0 REFERENCES 2

LIST OF TABLES

To be Determined

LIST OF FIGURES

To be Determined

LIST OF APPENDICES

To be Determined

1.0 INTRODUCTION

2.0 ENVIRONMENTAL PROTECTION PLAN OVERVIEW

2.1 Scope of the Environmental Protection Plan

2.1.1 Timing and Constraints

2.1.2 Unforeseen Circumstances

2.2 Organization and Use of the Environmental Protection Plan

2.3 Maintenance of the Environmental Protection Plan

3.0 RESPONSIBILITIES & TRAINING

3.1 Roles & Responsibilities

3.1.1 Project Manager

3.1.2 Construction Manager

3.1.3 Environmental Monitor

3.1.4 Other Personnel

3.2 Training & Orientation Requirements

3.2.1 Records

3.3 Complaint Response Protocol

4.0 PROTECTIVE MEASURES

4.1 Air Quality & Dust

4.2 Greenhouse Gas Emissions

4.3 Blasting

4.4 Geohazards

4.5 Groundwater Wells

4.6 Erosion & Sediment Control

4.7 Surface Water, Wetlands, Fish & Habitat

4.8 Terrestrial Plants & Lichen

4.9 Terrestrial Wildlife & Habitat

4.10 Avifauna & Bats

4.11 Noise Management

4.12 Traffic Control

4.13 Non-Hazardous Solid Waste Disposal

4.14 Contaminant Prevention Plan

4.14.1 Hazardous Materials & Waste Materials Management

4.14.2 Wastewater Management

5.0 CONTINGENCY PLANS

5.1 Spill Control Plan
5.1.1 Prevention
5.1.2 Response Procedures
5.1.3 Clean-up Procedures
5.2 Failure of Erosion & Sedimentation Controls
5.2.1 Prevention
5.2.2 Response Procedures
5.3 Discovery of Archaeological, Culture, or Heritage Resources
5.3.1 Response Procedures
5.4 Fires
5.4.1 Prevention
5.4.2 Response Procedures

6.0 COMMUNICATIONS

6.1 Contact List
6.2 Incident Reporting

7.0 NOTIFICATION

8.0 SITE VISITORS

9.0 CLOSURE

10.0 STATEMENT OF QUALIFICATIONS AND LIMITATIONS

11.0 REFERENCES