

APPENDIX O  
SHADOW FLICKER

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

Assumptions for shadow calculations

Maximum distance for influence  
Calculate only when more than 20 % of sun is covered by the blade  
Please look in WTG table

Minimum sun height over horizon for influence 3 °  
Day step for calculation 1 days  
Time step for calculation 1 minutes

Sunshine probability S (Average daily sunshine hours) [KENTVILLE]  
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec  
2.53 3.50 4.28 4.96 6.33 7.24 7.51 7.27 5.85 4.44 2.81 1.86

No operational time reduction. It is assumed the WTGs are always running with worst case wind direction.

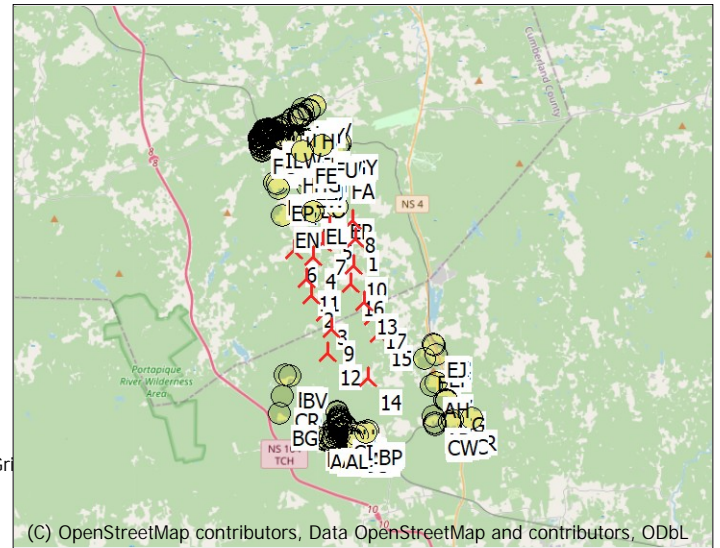
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Elevation Grid Data Object: Higgins\_Mtn\_November2021\_EMDGr  
Obstacles used in calculation  
Receptor grid resolution: 1.0 m

All coordinates are in  
UTM (north)-NAD83 (US+CA) Zone: 20

### WTGs

Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
				Valid	Manufact.					Calculation distance [m]	RPM
1	453,220	5,046,538	340.9 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
2	450,868	5,043,589	360.5 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
3	451,574	5,042,630	359.4 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
4	450,996	5,045,608	336.8 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
5	451,855	5,047,156	309.1 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
6	449,975	5,045,980	320.0 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
7	451,470	5,046,325	316.5 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
8	453,098	5,047,472	304.5 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
9	451,900	5,041,817	324.5 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
10	453,135	5,045,116	317.1 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
11	450,593	5,044,417	329.4 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
12	451,701	5,040,519	299.9 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
13	453,668	5,043,143	313.2 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
14	453,817	5,039,138	275.8 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
15	454,374	5,041,524	326.8 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
16	452,972	5,044,137	301.1 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
17	454,144	5,042,399	347.2 Siemens Gamesa SG 6.6-170 6600 170.0 IO... Yes	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8



Scale 1:400,000  
New WTG Shadow receptor

### Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
	[m]	[m]	[m]	[m]	[m]	[m]	[°]		[m]
A	451,944	5,035,868	89.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
B	451,740	5,035,869	105.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
C	451,581	5,035,873	104.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
D	452,919	5,035,878	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
E	453,047	5,035,879	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
F	452,935	5,035,880	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
G	452,803	5,035,882	82.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
H	451,963	5,035,888	88.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
I	451,741	5,035,890	106.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
J	451,713	5,035,893	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
K	453,050	5,035,902	90.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
L	452,854	5,035,903	85.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
M	452,741	5,035,909	81.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
N	452,790	5,035,911	82.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
O	452,669	5,035,917	82.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P	452,984	5,035,918	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Q	452,334	5,036,934	108.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
R	459,270	5,037,006	113.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
S	452,199	5,037,012	104.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
T	452,245	5,037,014	105.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
U	452,767	5,035,932	81.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
V	452,188	5,035,943	67.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
W	452,910	5,035,945	88.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
X	453,031	5,035,952	91.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Y	452,943	5,035,956	91.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Z	453,023	5,035,957	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AA	452,735	5,035,963	80.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AB	452,548	5,035,965	80.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AC	452,899	5,035,968	87.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AD	452,934	5,035,974	90.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AE	451,836	5,035,993	107.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AF	452,900	5,036,000	87.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AG	452,301	5,037,037	108.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AH	457,206	5,038,741	225.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AI	452,606	5,036,001	82.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJ	451,156	5,036,028	134.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AK	452,731	5,036,030	82.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AL	452,011	5,036,032	88.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AM	452,808	5,036,038	84.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AN	451,779	5,036,050	114.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AO	452,846	5,036,050	86.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AP	457,261	5,037,101	182.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQ	452,284	5,037,118	111.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AR	452,283	5,037,149	111.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AS	452,307	5,036,082	70.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AT	453,212	5,036,083	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AU	452,324	5,036,084	69.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AV	453,144	5,036,099	103.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AW	453,127	5,036,099	102.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AX	453,210	5,036,103	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AY	452,239	5,036,104	71.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZ	457,448	5,038,885	248.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BA	453,125	5,036,136	104.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BB	453,115	5,036,149	104.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BC	453,598	5,036,153	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BD	453,151	5,036,154	104.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BE	452,100	5,036,169	78.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BF	453,141	5,036,175	105.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BG	449,081	5,037,321	214.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BH	452,144	5,037,367	125.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BI	452,162	5,037,411	129.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJ	453,171	5,036,203	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BK	450,993	5,036,208	159.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BL	453,541	5,036,208	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BM	452,312	5,036,219	78.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BN	452,319	5,036,233	78.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BO	452,340	5,036,267	84.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BP	453,734	5,036,277	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQ	453,422	5,036,278	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BR	453,715	5,036,278	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BS	452,366	5,036,286	84.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BT	453,725	5,036,287	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BU	452,425	5,036,308	84.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BV	449,711	5,039,316	212.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BW	452,413	5,036,359	83.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BX	453,843	5,036,360	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BY	451,923	5,036,363	114.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZ	452,323	5,036,366	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CA	452,381	5,036,372	83.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CB	452,339	5,036,381	84.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CC	458,014	5,037,893	185.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CD	452,326	5,036,421	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CE	452,367	5,036,432	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CF	452,013	5,036,476	113.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CG	458,001	5,037,942	187.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CH	457,919	5,037,956	193.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CI	452,343	5,036,522	87.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJ	452,098	5,036,595	104.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CK	452,081	5,036,603	106.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CL	452,658	5,036,616	96.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CM	452,648	5,036,625	96.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CN	452,570	5,036,626	93.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CO	452,561	5,036,630	93.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CP	452,642	5,036,656	101.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQ	449,287	5,038,235	312.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CR	449,276	5,038,250	313.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CS	457,382	5,036,699	138.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CT	457,352	5,036,716	140.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CU	452,341	5,036,719	98.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CV	452,288	5,036,724	98.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CW	457,381	5,036,726	140.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CX	457,292	5,036,729	141.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CY	457,346	5,036,731	141.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZ	452,282	5,036,737	97.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DA	452,290	5,036,747	98.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DB	452,345	5,036,749	100.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DC	458,157	5,036,764	120.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DD	452,365	5,036,771	103.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DE	452,329	5,036,782	102.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DF	452,355	5,036,791	104.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DG	452,361	5,036,798	105.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DH	452,328	5,036,799	103.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DI	452,351	5,036,808	104.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJ	452,267	5,036,844	101.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DK	452,950	5,035,772	90.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DL	453,014	5,035,773	92.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DM	452,830	5,035,789	83.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DN	452,998	5,035,798	92.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DO	452,920	5,035,807	88.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DP	458,268	5,036,871	126.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DQ	452,203	5,036,896	93.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DR	452,194	5,036,922	93.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DS	452,973	5,035,820	92.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DT	453,127	5,035,823	89.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DU	452,991	5,035,829	93.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DV	453,157	5,035,839	91.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DW	453,121	5,035,841	90.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DX	453,137	5,035,842	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DY	451,587	5,035,845	103.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DZ	451,595	5,035,848	104.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EA	452,969	5,035,848	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EB	452,858	5,035,852	85.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EC	452,957	5,035,862	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ED	452,966	5,035,864	92.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EE	456,831	5,040,152	219.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EF	457,462	5,040,359	231.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EG	449,418	5,039,368	216.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EH	457,310	5,040,836	213.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EI	457,358	5,040,839	212.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EJ	457,330	5,040,843	213.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EK	457,293	5,040,908	208.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EL	450,987	5,048,004	286.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EM	450,792	5,048,016	262.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EN	449,348	5,047,779	275.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
EO	450,682	5,049,306	264.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EP	449,143	5,049,181	237.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EQ	449,127	5,049,193	237.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ER	452,232	5,048,215	301.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ES	448,980	5,049,526	196.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ET	448,967	5,049,530	194.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EU	450,634	5,050,224	259.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EV	450,017	5,050,608	210.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EW	450,427	5,049,938	260.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EX	450,211	5,050,601	221.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EY	450,205	5,050,621	217.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EZ	450,440	5,050,307	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FA	452,363	5,050,310	257.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FB	449,077	5,049,463	201.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FC	448,205	5,051,694	91.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FD	448,517	5,051,698	91.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FE	450,421	5,051,151	136.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FF	451,004	5,051,703	122.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FG	448,211	5,051,704	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FH	450,355	5,050,803	181.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FI	452,048	5,051,447	118.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FJ	450,726	5,051,736	118.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FK	450,704	5,051,737	118.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FL	450,376	5,050,821	177.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FM	450,445	5,051,186	135.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FN	452,310	5,051,469	119.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FO	450,249	5,051,743	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FP	450,260	5,051,749	111.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FQ	448,236	5,051,749	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FR	448,293	5,051,192	97.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FS	448,309	5,051,197	97.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FT	448,299	5,051,207	97.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FU	451,444	5,051,479	121.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FV	452,411	5,051,482	118.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FW	451,428	5,051,492	122.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FX	450,223	5,051,827	110.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FY	450,393	5,051,828	112.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FZ	451,419	5,051,503	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GA	448,276	5,051,503	93.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GB	450,237	5,051,758	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GC	448,245	5,051,764	90.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GD	450,343	5,051,796	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GE	449,970	5,051,797	109.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GF	449,794	5,051,798	107.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GG	449,757	5,051,800	105.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GH	449,997	5,051,804	108.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GI	450,090	5,051,849	110.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GJ	448,143	5,051,854	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GK	449,391	5,051,857	102.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GL	449,835	5,051,857	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GM	450,487	5,051,276	129.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GN	448,256	5,051,550	93.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GO	448,337	5,051,559	93.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GP	449,763	5,051,777	106.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GQ	450,814	5,051,778	118.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GR	451,634	5,051,293	128.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GS	448,361	5,051,309	96.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GT	450,251	5,051,813	111.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GU	450,396	5,051,814	112.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GV	450,264	5,051,816	111.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GW	448,202	5,051,823	89.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GX	450,203	5,050,645	216.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GY	452,409	5,051,597	109.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GZ	448,448	5,051,606	92.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HA	449,808	5,050,665	187.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
HB	448,407	5,051,627	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HC	451,517	5,051,383	125.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HD	450,773	5,051,640	122.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HE	448,274	5,051,642	92.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HF	448,425	5,051,646	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HG	450,383	5,050,704	195.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HH	448,231	5,051,389	95.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HI	448,432	5,051,653	91.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HJ	448,514	5,051,653	92.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HK	448,269	5,051,657	92.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HL	448,535	5,051,665	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HM	448,438	5,051,666	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HN	450,755	5,050,736	201.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HO	448,224	5,051,409	95.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HP	448,615	5,052,188	102.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HQ	448,457	5,052,190	97.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HR	448,886	5,052,194	113.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HS	448,319	5,051,986	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HT	448,432	5,051,993	94.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HU	448,697	5,052,202	106.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HV	449,241	5,052,402	142.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HW	449,139	5,052,006	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HX	449,190	5,052,007	106.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HY	449,066	5,052,007	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HZ	449,359	5,052,007	107.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IA	448,510	5,052,212	98.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IB	448,730	5,052,214	110.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IC	448,492	5,052,214	98.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ID	448,892	5,052,216	115.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IE	449,247	5,052,421	143.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IF	448,440	5,052,012	92.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IG	449,384	5,052,016	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IH	448,950	5,052,020	105.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
II	448,470	5,052,036	94.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IJ	448,444	5,052,229	96.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IK	448,429	5,052,240	95.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IL	448,917	5,052,039	106.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IM	449,381	5,052,041	108.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IN	448,998	5,052,243	122.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IO	448,801	5,052,252	115.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IP	449,018	5,052,253	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IQ	449,411	5,052,485	151.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IR	448,780	5,052,065	106.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IS	448,552	5,052,073	95.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IT	448,537	5,052,077	95.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IU	448,433	5,052,262	96.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IV	448,785	5,052,264	115.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IW	448,874	5,052,269	116.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IX	448,779	5,052,078	106.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IY	449,807	5,051,860	105.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IZ	449,793	5,051,861	105.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JA	448,212	5,051,865	88.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JB	448,589	5,051,867	91.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JC	448,554	5,052,091	97.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JD	448,603	5,052,100	98.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JE	448,667	5,052,290	107.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JF	448,781	5,052,291	115.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JG	449,414	5,051,874	101.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JH	448,199	5,051,875	88.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JI	449,948	5,051,883	108.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JJ	449,972	5,051,884	108.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JK	448,587	5,052,106	98.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JL	448,658	5,051,895	92.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JM	448,128	5,051,896	90.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JN	448,143	5,051,899	89.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
JO	448,618	5,052,121	99.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JP	448,819	5,052,123	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JQ	448,645	5,052,310	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JR	448,636	5,052,313	107.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JS	449,170	5,052,314	134.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JT	449,185	5,052,319	134.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JU	449,144	5,052,321	133.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JV	449,133	5,052,324	132.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JW	448,640	5,051,907	93.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JX	448,459	5,051,908	90.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JY	448,619	5,051,909	94.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JZ	448,836	5,052,130	107.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KA	448,737	5,052,131	106.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KB	448,494	5,052,134	98.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KC	448,662	5,052,337	109.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KD	449,587	5,052,572	151.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KE	448,471	5,051,924	91.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KF	448,786	5,052,145	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KG	449,164	5,052,345	134.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KH	449,589	5,052,587	150.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KI	448,791	5,052,166	109.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KJ	448,758	5,052,167	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KK	448,794	5,052,169	109.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KL	448,545	5,052,171	100.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KM	448,585	5,052,176	100.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KN	448,637	5,052,181	103.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KO	448,801	5,052,182	110.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KP	448,831	5,052,182	112.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KQ	448,516	5,052,183	99.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KR	448,853	5,052,184	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KS	450,396	5,053,036	129.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KT	450,372	5,053,055	130.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KU	450,001	5,052,865	136.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KV	451,166	5,053,557	130.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KW	450,311	5,053,104	129.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KX	450,489	5,053,115	125.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KY	450,838	5,053,306	123.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KZ	449,992	5,052,910	135.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LA	450,505	5,053,122	125.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LB	450,847	5,053,325	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LC	450,824	5,053,341	121.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LD	450,223	5,052,984	131.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LE	450,461	5,053,381	123.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LF	450,284	5,052,998	130.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LG	450,399	5,053,004	129.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LH	450,281	5,053,008	130.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LI	450,219	5,053,010	131.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LJ	450,286	5,053,027	129.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

### Calculation Results

Shadow receptor  
Shadow, expected values

No.	Shadow hours per year [h/year]
A	0:00
B	0:00
C	0:00
D	0:00
E	0:00
F	0:00
G	0:00
H	0:00
I	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page  
Shadow, expected values

No.	Shadow hours per year [h/year]
J	0:00
K	0:00
L	0:00
M	0:00
N	0:00
O	0:00
P	0:00
Q	0:00
R	0:00
S	0:00
T	0:00
U	0:00
V	0:00
W	0:00
X	0:00
Y	0:00
Z	0:00
AA	0:00
AB	0:00
AC	0:00
AD	0:00
AE	0:00
AF	0:00
AG	0:00
AH	0:00
AI	0:00
AJ	0:00
AK	0:00
AL	0:00
AM	0:00
AN	0:00
AO	0:00
AP	0:00
AQ	0:00
AR	0:00
AS	0:00
AT	0:00
AU	0:00
AV	0:00
AW	0:00
AX	0:00
AY	0:00
AZ	0:00
BA	0:00
BB	0:00
BC	0:00
BD	0:00
BE	0:00
BF	0:00
BG	0:00
BH	0:00
BI	0:00
BJ	0:00
BK	0:00
BL	0:00
BM	0:00
BN	0:00
BO	0:00
BP	0:00
BQ	0:00
BR	0:00
BS	0:00
BT	0:00
BU	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page

Shadow, expected values

No. Shadow hours

per year  
[h/year]

BV	0:00
BW	0:00
BX	0:00
BY	0:00
BZ	0:00
CA	0:00
CB	0:00
CC	0:00
CD	0:00
CE	0:00
CF	0:00
CG	0:00
CH	0:00
CI	0:00
CJ	0:00
CK	0:00
CL	0:00
CM	0:00
CN	0:00
CO	0:00
CP	0:00
CQ	0:00
CR	0:00
CS	0:00
CT	0:00
CU	0:00
CV	0:00
CW	0:00
CX	0:00
CY	0:00
CZ	0:00
DA	0:00
DB	0:00
DC	0:00
DD	0:00
DE	0:00
DF	0:00
DG	0:00
DH	0:00
DI	0:00
DJ	0:00
DK	0:00
DL	0:00
DM	0:00
DN	0:00
DO	0:00
DP	0:00
DQ	0:00
DR	0:00
DS	0:00
DT	0:00
DU	0:00
DV	0:00
DW	0:00
DX	0:00
DY	0:00
DZ	0:00
EA	0:00
EB	0:00
EC	0:00
ED	0:00
EE	0:00
EF	0:00
EG	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page  
Shadow, expected values

No. Shadow hours  
per year  
[h/year]

EH	0:00
EI	0:00
EJ	0:00
EK	0:00
EL	7:11
EM	8:51
EN	0:00
EO	0:00
EP	0:00
EQ	0:00
ER	10:03
ES	0:00
ET	0:00
EU	0:00
EV	0:00
EW	0:00
EX	0:00
EY	0:00
EZ	0:00
FA	0:00
FB	0:00
FC	0:00
FD	0:00
FE	0:00
FF	0:00
FG	0:00
FH	0:00
FI	0:00
FJ	0:00
FK	0:00
FL	0:00
FM	0:00
FN	0:00
FO	0:00
FP	0:00
FQ	0:00
FR	0:00
FS	0:00
FT	0:00
FU	0:00
FV	0:00
FW	0:00
FX	0:00
FY	0:00
FZ	0:00
GA	0:00
GB	0:00
GC	0:00
GD	0:00
GE	0:00
GF	0:00
GG	0:00
GH	0:00
GI	0:00
GJ	0:00
GK	0:00
GL	0:00
GM	0:00
GN	0:00
GO	0:00
GP	0:00
GQ	0:00
GR	0:00
GS	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page  
Shadow, expected values

No.	Shadow hours per year [h/year]
GT	0:00
GU	0:00
GV	0:00
GW	0:00
GX	0:00
GY	0:00
GZ	0:00
HA	0:00
HB	0:00
HC	0:00
HD	0:00
HE	0:00
HF	0:00
HG	0:00
HH	0:00
HI	0:00
HJ	0:00
HK	0:00
HL	0:00
HM	0:00
HN	0:00
HO	0:00
HP	0:00
HQ	0:00
HR	0:00
HS	0:00
HT	0:00
HU	0:00
HV	0:00
HW	0:00
HX	0:00
HY	0:00
HZ	0:00
IA	0:00
IB	0:00
IC	0:00
ID	0:00
IE	0:00
IF	0:00
IG	0:00
IH	0:00
II	0:00
IJ	0:00
IK	0:00
IL	0:00
IM	0:00
IN	0:00
IO	0:00
IP	0:00
IQ	0:00
IR	0:00
IS	0:00
IT	0:00
IU	0:00
IV	0:00
IW	0:00
IX	0:00
IY	0:00
IZ	0:00
JA	0:00
JB	0:00
JC	0:00
JD	0:00
JE	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page  
Shadow, expected values

No.	Shadow hours per year [h/year]
JF	0:00
JG	0:00
JH	0:00
JI	0:00
JJ	0:00
JK	0:00
JL	0:00
JM	0:00
JN	0:00
JO	0:00
JP	0:00
JQ	0:00
JR	0:00
JS	0:00
JT	0:00
JU	0:00
JV	0:00
JW	0:00
JX	0:00
JY	0:00
JZ	0:00
KA	0:00
KB	0:00
KC	0:00
KD	0:00
KE	0:00
KF	0:00
KG	0:00
KH	0:00
KI	0:00
KJ	0:00
KK	0:00
KL	0:00
KM	0:00
KN	0:00
KO	0:00
KP	0:00
KQ	0:00
KR	0:00
KS	0:00
KT	0:00
KU	0:00
KV	0:00
KW	0:00
KX	0:00
KY	0:00
KZ	0:00
LA	0:00
LB	0:00
LC	0:00
LD	0:00
LE	0:00
LF	0:00
LG	0:00
LH	0:00
LI	0:00
LJ	0:00

Total amount of flickering on the shadow receptors caused by each WTG  
No. Name

No.	Name	Worst case [h/year]	Expected [h/year]
1	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (375)	0:00	0:00
2	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (376)	0:00	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Real Case - Dec 2022

...continued from previous page

No.	Name	Worst case [h/year]	Expected [h/year]
3	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (377)	0:00	0:00
4	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (378)	0:00	0:00
5	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (379)	54:19	13:41
6	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (380)	0:00	0:00
7	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (381)	0:00	0:00
8	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (382)	39:51	10:03
9	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (383)	0:00	0:00
10	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (384)	0:00	0:00
11	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (385)	0:00	0:00
12	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (386)	0:00	0:00
13	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (387)	0:00	0:00
14	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (388)	0:00	0:00
15	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (389)	0:00	0:00
16	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (390)	0:00	0:00
17	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (391)	0:00	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022  
Assumptions for shadow calculations

Maximum distance for influence  
Calculate only when more than 20 % of sun is covered by the blade  
Please look in WTG table

Minimum sun height over horizon for influence 3 °  
Day step for calculation 1 days  
Time step for calculation 1 minutes

The calculated times are "worst case" given by the following assumptions:  
The sun is shining all the day, from sunrise to sunset  
The rotor plane is always perpendicular to the line from the WTG to the sun  
The WTG is always operating

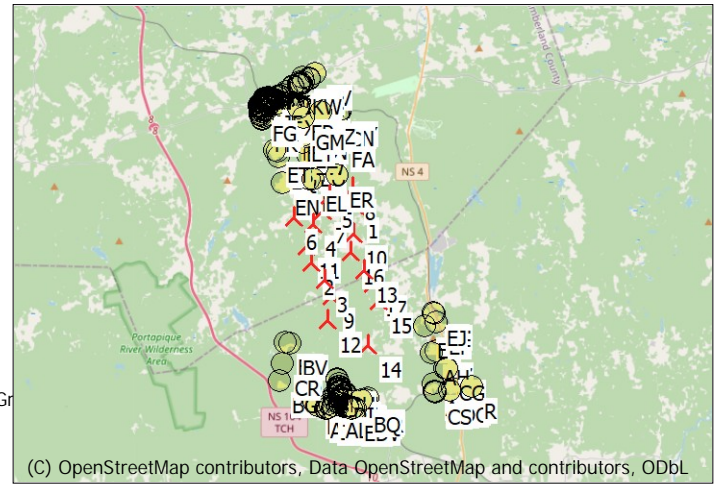
A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:

Height contours used: Elevation Grid Data Object: Higgins\_Mtn\_November2021\_EMDGr  
Obstacles used in calculation  
Receptor grid resolution: 1.0 m

All coordinates are in  
UTM (north)-NAD83 (US+CA) Zone: 20

### WTGs

No.	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data	
					Valid	Manufact.					Calculation distance [m]	RPM
1	453,220	5,046,538	340.9	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
2	450,868	5,043,589	360.5	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
3	451,574	5,042,630	359.4	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
4	450,996	5,045,608	336.8	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
5	451,855	5,047,156	309.1	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
6	449,975	5,045,980	320.0	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
7	451,470	5,046,325	316.5	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
8	453,098	5,047,472	304.5	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
9	451,900	5,041,817	324.5	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
10	453,135	5,045,116	317.1	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
11	450,593	5,044,417	329.4	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
12	451,701	5,040,519	299.9	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
13	453,668	5,043,143	313.2	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
14	453,817	5,039,138	275.8	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
15	454,374	5,041,524	326.8	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
16	452,972	5,044,137	301.1	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8
17	454,144	5,042,399	347.2	Siemens Gamesa SG 6.6-170 6600 170.0 IO...	Yes	Siemens Gamesa	SG 6.6-170-6,600	6,600	170.0	110.5	2,041	8.8



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Scale 1:400,000

▲ New WTG

● Shadow receptor

### Shadow receptor-Input

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
	[m]	[m]	[m]	[m]	[m]	[m]	[°]		[m]
A	451,944	5,035,868	89.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
B	451,740	5,035,869	105.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
C	451,581	5,035,873	104.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
D	452,919	5,035,878	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
E	453,047	5,035,879	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
F	452,935	5,035,880	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
G	452,803	5,035,882	82.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
H	451,963	5,035,888	88.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
I	451,741	5,035,890	106.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
J	451,713	5,035,893	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
K	453,050	5,035,902	90.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
L	452,854	5,035,903	85.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
M	452,741	5,035,909	81.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
N	452,790	5,035,911	82.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
O	452,669	5,035,917	82.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P	452,984	5,035,918	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Q	452,334	5,036,934	108.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
R	459,270	5,037,006	113.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
S	452,199	5,037,012	104.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
T	452,245	5,037,014	105.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
U	452,767	5,035,932	81.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
V	452,188	5,035,943	67.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
W	452,910	5,035,945	88.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
X	453,031	5,035,952	91.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Y	452,943	5,035,956	91.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
Z	453,023	5,035,957	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AA	452,735	5,035,963	80.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AB	452,548	5,035,965	80.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AC	452,899	5,035,968	87.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AD	452,934	5,035,974	90.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AE	451,836	5,035,993	107.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AF	452,900	5,036,000	87.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AG	452,301	5,037,037	108.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AH	457,206	5,038,741	225.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AI	452,606	5,036,001	82.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AJ	451,156	5,036,028	134.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AK	452,731	5,036,030	82.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AL	452,011	5,036,032	88.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AM	452,808	5,036,038	84.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AN	451,779	5,036,050	114.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AO	452,846	5,036,050	86.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AP	457,261	5,037,101	182.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AQ	452,284	5,037,118	111.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AR	452,283	5,037,149	111.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AS	452,307	5,036,082	70.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AT	453,212	5,036,083	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AU	452,324	5,036,084	69.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AV	453,144	5,036,099	103.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AW	453,127	5,036,099	102.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AX	453,210	5,036,103	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AY	452,239	5,036,104	71.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
AZ	457,448	5,038,885	248.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BA	453,125	5,036,136	104.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BB	453,115	5,036,149	104.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BC	453,598	5,036,153	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BD	453,151	5,036,154	104.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BE	452,100	5,036,169	78.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BF	453,141	5,036,175	105.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BG	449,081	5,037,321	214.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BH	452,144	5,037,367	125.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BI	452,162	5,037,411	129.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BJ	453,171	5,036,203	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BK	450,993	5,036,208	159.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BL	453,541	5,036,208	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BM	452,312	5,036,219	78.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BN	452,319	5,036,233	78.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BO	452,340	5,036,267	84.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BP	453,734	5,036,277	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BQ	453,422	5,036,278	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BR	453,715	5,036,278	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BS	452,366	5,036,286	84.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BT	453,725	5,036,287	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BU	452,425	5,036,308	84.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BV	449,711	5,039,316	212.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BW	452,413	5,036,359	83.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BX	453,843	5,036,360	0.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BY	451,923	5,036,363	114.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
BZ	452,323	5,036,366	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CA	452,381	5,036,372	83.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CB	452,339	5,036,381	84.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CC	458,014	5,037,893	185.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CD	452,326	5,036,421	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

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No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
CE	452,367	5,036,432	84.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CF	452,013	5,036,476	113.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CG	458,001	5,037,942	187.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CH	457,919	5,037,956	193.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CI	452,343	5,036,522	87.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CJ	452,098	5,036,595	104.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CK	452,081	5,036,603	106.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CL	452,658	5,036,616	96.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CM	452,648	5,036,625	96.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CN	452,570	5,036,626	93.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CO	452,561	5,036,630	93.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CP	452,642	5,036,656	101.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CQ	449,287	5,038,235	312.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CR	449,276	5,038,250	313.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CS	457,382	5,036,699	138.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CT	457,352	5,036,716	140.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CU	452,341	5,036,719	98.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CV	452,288	5,036,724	98.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CW	457,381	5,036,726	140.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CX	457,292	5,036,729	141.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CY	457,346	5,036,731	141.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
CZ	452,282	5,036,737	97.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DA	452,290	5,036,747	98.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DB	452,345	5,036,749	100.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DC	458,157	5,036,764	120.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DD	452,365	5,036,771	103.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DE	452,329	5,036,782	102.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DF	452,355	5,036,791	104.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DG	452,361	5,036,798	105.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DH	452,328	5,036,799	103.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DI	452,351	5,036,808	104.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DJ	452,267	5,036,844	101.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DK	452,950	5,035,772	90.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DL	453,014	5,035,773	92.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DM	452,830	5,035,789	83.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DN	452,998	5,035,798	92.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DO	452,920	5,035,807	88.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DP	458,268	5,036,871	126.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DQ	452,203	5,036,896	93.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DR	452,194	5,036,922	93.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DS	452,973	5,035,820	92.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DT	453,127	5,035,823	89.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DU	452,991	5,035,829	93.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DV	453,157	5,035,839	91.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DW	453,121	5,035,841	90.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DX	453,137	5,035,842	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DY	451,587	5,035,845	103.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
DZ	451,595	5,035,848	104.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EA	452,969	5,035,848	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EB	452,858	5,035,852	85.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EC	452,957	5,035,862	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ED	452,966	5,035,864	92.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EE	456,831	5,040,152	219.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EF	457,462	5,040,359	231.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EG	449,418	5,039,368	216.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EH	457,310	5,040,836	213.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EI	457,358	5,040,839	212.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EJ	457,330	5,040,843	213.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EK	457,293	5,040,908	208.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EL	450,987	5,048,004	286.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EM	450,792	5,048,016	262.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EN	449,348	5,047,779	275.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EO	450,682	5,049,306	264.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EP	449,143	5,049,181	237.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EQ	449,127	5,049,193	237.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

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## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
ER	452,232	5,048,215	301.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ES	448,980	5,049,526	196.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ET	448,967	5,049,530	194.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EU	450,634	5,050,224	259.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EV	450,017	5,050,608	210.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EW	450,427	5,049,938	260.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EX	450,211	5,050,601	221.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EY	450,205	5,050,621	217.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
EZ	450,440	5,050,307	254.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FA	452,363	5,050,310	257.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FB	449,077	5,049,463	201.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FC	448,205	5,051,694	91.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FD	448,517	5,051,698	91.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FE	450,421	5,051,151	136.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FF	451,004	5,051,703	122.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FG	448,211	5,051,704	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FH	450,355	5,050,803	181.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FI	452,048	5,051,447	118.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FJ	450,726	5,051,736	118.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FK	450,704	5,051,737	118.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FL	450,376	5,050,821	177.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FM	450,445	5,051,186	135.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FN	452,310	5,051,469	119.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FO	450,249	5,051,743	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FP	450,260	5,051,749	111.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FQ	448,236	5,051,749	90.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FR	448,293	5,051,192	97.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FS	448,309	5,051,197	97.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FT	448,299	5,051,207	97.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FU	451,444	5,051,479	121.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FV	452,411	5,051,482	118.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FW	451,428	5,051,492	122.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FX	450,223	5,051,827	110.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FY	450,393	5,051,828	112.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
FZ	451,419	5,051,503	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GA	448,276	5,051,503	93.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GB	450,237	5,051,758	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GC	448,245	5,051,764	90.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GD	450,343	5,051,796	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GE	449,970	5,051,797	109.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GF	449,794	5,051,798	107.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GG	449,757	5,051,800	105.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GH	449,997	5,051,804	108.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GI	450,090	5,051,849	110.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GJ	448,143	5,051,854	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GK	449,391	5,051,857	102.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GL	449,835	5,051,857	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GM	450,487	5,051,276	129.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GN	448,256	5,051,550	93.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GO	448,337	5,051,559	93.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GP	449,763	5,051,777	106.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GQ	450,814	5,051,778	118.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GR	451,634	5,051,293	128.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GS	448,361	5,051,309	96.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GT	450,251	5,051,813	111.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GU	450,396	5,051,814	112.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GV	450,264	5,051,816	111.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GW	448,202	5,051,823	89.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GX	450,203	5,050,645	216.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GY	452,409	5,051,597	109.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
GZ	448,448	5,051,606	92.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HA	449,808	5,050,665	187.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HB	448,407	5,051,627	91.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HC	451,517	5,051,383	125.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HD	450,773	5,051,640	122.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
HE	448,274	5,051,642	92.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HF	448,425	5,051,646	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HG	450,383	5,050,704	195.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HH	448,231	5,051,389	95.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HI	448,432	5,051,653	91.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HJ	448,514	5,051,653	92.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HK	448,269	5,051,657	92.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HL	448,535	5,051,665	91.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HM	448,438	5,051,666	90.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HN	450,755	5,050,736	201.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HO	448,224	5,051,409	95.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HP	448,615	5,052,188	102.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HQ	448,457	5,052,190	97.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HR	448,886	5,052,194	113.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HS	448,319	5,051,986	92.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HT	448,432	5,051,993	94.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HU	448,697	5,052,202	106.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HV	449,241	5,052,402	142.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HW	449,139	5,052,006	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HX	449,190	5,052,007	106.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HY	449,066	5,052,007	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
HZ	449,359	5,052,007	107.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IA	448,510	5,052,212	98.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IB	448,730	5,052,214	110.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IC	448,492	5,052,214	98.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
ID	448,892	5,052,216	115.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IE	449,247	5,052,421	143.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IF	448,440	5,052,012	92.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IG	449,384	5,052,016	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IH	448,950	5,052,020	105.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
II	448,470	5,052,036	94.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IJ	448,444	5,052,229	96.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IK	448,429	5,052,240	95.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IL	448,917	5,052,039	106.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IM	449,381	5,052,041	108.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IN	448,998	5,052,243	122.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IO	448,801	5,052,252	115.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IP	449,018	5,052,253	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IQ	449,411	5,052,485	151.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IR	448,780	5,052,065	106.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IS	448,552	5,052,073	95.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IT	448,537	5,052,077	95.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IU	448,433	5,052,262	96.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IV	448,785	5,052,264	115.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IW	448,874	5,052,269	116.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IX	448,779	5,052,078	106.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IY	449,807	5,051,860	105.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
IZ	449,793	5,051,861	105.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JA	448,212	5,051,865	88.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JB	448,589	5,051,867	91.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JC	448,554	5,052,091	97.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JD	448,603	5,052,100	98.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JE	448,667	5,052,290	107.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JF	448,781	5,052,291	115.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JG	449,414	5,051,874	101.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JH	448,199	5,051,875	88.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JI	449,948	5,051,883	108.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JJ	449,972	5,051,884	108.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JK	448,587	5,052,106	98.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JL	448,658	5,051,895	92.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JM	448,128	5,051,896	90.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JN	448,143	5,051,899	89.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JO	448,618	5,052,121	99.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JP	448,819	5,052,123	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JQ	448,645	5,052,310	107.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

No.	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
			[m]	[m]	[m]	[m]	[°]		[m]
JR	448,636	5,052,313	107.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JS	449,170	5,052,314	134.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JT	449,185	5,052,319	134.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JU	449,144	5,052,321	133.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JV	449,133	5,052,324	132.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JW	448,640	5,051,907	93.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JX	448,459	5,051,908	90.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JY	448,619	5,051,909	94.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
JZ	448,836	5,052,130	107.5	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KA	448,737	5,052,131	106.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KB	448,494	5,052,134	98.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KC	448,662	5,052,337	109.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KD	449,587	5,052,572	151.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KE	448,471	5,051,924	91.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KF	448,786	5,052,145	106.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KG	449,164	5,052,345	134.7	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KH	449,589	5,052,587	150.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KI	448,791	5,052,166	109.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KJ	448,758	5,052,167	108.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KK	448,794	5,052,169	109.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KL	448,545	5,052,171	100.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KM	448,585	5,052,176	100.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KN	448,637	5,052,181	103.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KO	448,801	5,052,182	110.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KP	448,831	5,052,182	112.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KQ	448,516	5,052,183	99.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KR	448,853	5,052,184	112.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KS	450,396	5,053,036	129.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KT	450,372	5,053,055	130.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KU	450,001	5,052,865	136.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KV	451,166	5,053,557	130.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KW	450,311	5,053,104	129.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KX	450,489	5,053,115	125.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KY	450,838	5,053,306	123.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
KZ	449,992	5,052,910	135.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LA	450,505	5,053,122	125.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LB	450,847	5,053,325	123.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LC	450,824	5,053,341	121.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LD	450,223	5,052,984	131.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LE	450,461	5,053,381	123.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LF	450,284	5,052,998	130.1	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LG	450,399	5,053,004	129.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LH	450,281	5,053,008	130.3	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LI	450,219	5,053,010	131.8	1.0	1.0	1.0	90.0	"Green house mode"	2.0
LJ	450,286	5,053,027	129.6	1.0	1.0	1.0	90.0	"Green house mode"	2.0

## Calculation Results

Shadow receptor

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	0:00	0	0:00
B	0:00	0	0:00
C	0:00	0	0:00
D	0:00	0	0:00
E	0:00	0	0:00
F	0:00	0	0:00
G	0:00	0	0:00
H	0:00	0	0:00
I	0:00	0	0:00
J	0:00	0	0:00
K	0:00	0	0:00
L	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	0:00	0	0:00
T	0:00	0	0:00
U	0:00	0	0:00
V	0:00	0	0:00
W	0:00	0	0:00
X	0:00	0	0:00
Y	0:00	0	0:00
Z	0:00	0	0:00
AA	0:00	0	0:00
AB	0:00	0	0:00
AC	0:00	0	0:00
AD	0:00	0	0:00
AE	0:00	0	0:00
AF	0:00	0	0:00
AG	0:00	0	0:00
AH	0:00	0	0:00
AI	0:00	0	0:00
AJ	0:00	0	0:00
AK	0:00	0	0:00
AL	0:00	0	0:00
AM	0:00	0	0:00
AN	0:00	0	0:00
AO	0:00	0	0:00
AP	0:00	0	0:00
AQ	0:00	0	0:00
AR	0:00	0	0:00
AS	0:00	0	0:00
AT	0:00	0	0:00
AU	0:00	0	0:00
AV	0:00	0	0:00
AW	0:00	0	0:00
AX	0:00	0	0:00
AY	0:00	0	0:00
AZ	0:00	0	0:00
BA	0:00	0	0:00
BB	0:00	0	0:00
BC	0:00	0	0:00
BD	0:00	0	0:00
BE	0:00	0	0:00
BF	0:00	0	0:00
BG	0:00	0	0:00
BH	0:00	0	0:00
BI	0:00	0	0:00
BJ	0:00	0	0:00
BK	0:00	0	0:00
BL	0:00	0	0:00
BM	0:00	0	0:00
BN	0:00	0	0:00
BO	0:00	0	0:00
BP	0:00	0	0:00
BQ	0:00	0	0:00
BR	0:00	0	0:00
BS	0:00	0	0:00
BT	0:00	0	0:00
BU	0:00	0	0:00
BV	0:00	0	0:00
BW	0:00	0	0:00
BX	0:00	0	0:00

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## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
BY	0:00	0	0:00
BZ	0:00	0	0:00
CA	0:00	0	0:00
CB	0:00	0	0:00
CC	0:00	0	0:00
CD	0:00	0	0:00
CE	0:00	0	0:00
CF	0:00	0	0:00
CG	0:00	0	0:00
CH	0:00	0	0:00
CI	0:00	0	0:00
CJ	0:00	0	0:00
CK	0:00	0	0:00
CL	0:00	0	0:00
CM	0:00	0	0:00
CN	0:00	0	0:00
CO	0:00	0	0:00
CP	0:00	0	0:00
CQ	0:00	0	0:00
CR	0:00	0	0:00
CS	0:00	0	0:00
CT	0:00	0	0:00
CU	0:00	0	0:00
CV	0:00	0	0:00
CW	0:00	0	0:00
CX	0:00	0	0:00
CY	0:00	0	0:00
CZ	0:00	0	0:00
DA	0:00	0	0:00
DB	0:00	0	0:00
DC	0:00	0	0:00
DD	0:00	0	0:00
DE	0:00	0	0:00
DF	0:00	0	0:00
DG	0:00	0	0:00
DH	0:00	0	0:00
DI	0:00	0	0:00
DJ	0:00	0	0:00
DK	0:00	0	0:00
DL	0:00	0	0:00
DM	0:00	0	0:00
DN	0:00	0	0:00
DO	0:00	0	0:00
DP	0:00	0	0:00
DQ	0:00	0	0:00
DR	0:00	0	0:00
DS	0:00	0	0:00
DT	0:00	0	0:00
DU	0:00	0	0:00
DV	0:00	0	0:00
DW	0:00	0	0:00
DX	0:00	0	0:00
DY	0:00	0	0:00
DZ	0:00	0	0:00
EA	0:00	0	0:00
EB	0:00	0	0:00
EC	0:00	0	0:00
ED	0:00	0	0:00
EE	0:00	0	0:00
EF	0:00	0	0:00
EG	0:00	0	0:00
EH	0:00	0	0:00
EI	0:00	0	0:00
EJ	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
EK	0:00	0	0:00
EL	29:54	60	0:35
EM	34:07	84	0:31
EN	0:00	0	0:00
EO	0:00	0	0:00
EP	0:00	0	0:00
EQ	0:00	0	0:00
ER	39:51	76	0:37
ES	0:00	0	0:00
ET	0:00	0	0:00
EU	0:00	0	0:00
EV	0:00	0	0:00
EW	0:00	0	0:00
EX	0:00	0	0:00
EY	0:00	0	0:00
EZ	0:00	0	0:00
FA	0:00	0	0:00
FB	0:00	0	0:00
FC	0:00	0	0:00
FD	0:00	0	0:00
FE	0:00	0	0:00
FF	0:00	0	0:00
FG	0:00	0	0:00
FH	0:00	0	0:00
FI	0:00	0	0:00
FJ	0:00	0	0:00
FK	0:00	0	0:00
FL	0:00	0	0:00
FM	0:00	0	0:00
FN	0:00	0	0:00
FO	0:00	0	0:00
FP	0:00	0	0:00
FQ	0:00	0	0:00
FR	0:00	0	0:00
FS	0:00	0	0:00
FT	0:00	0	0:00
FU	0:00	0	0:00
FV	0:00	0	0:00
FW	0:00	0	0:00
FX	0:00	0	0:00
FY	0:00	0	0:00
FZ	0:00	0	0:00
GA	0:00	0	0:00
GB	0:00	0	0:00
GC	0:00	0	0:00
GD	0:00	0	0:00
GE	0:00	0	0:00
GF	0:00	0	0:00
GG	0:00	0	0:00
GH	0:00	0	0:00
GI	0:00	0	0:00
GJ	0:00	0	0:00
GK	0:00	0	0:00
GL	0:00	0	0:00
GM	0:00	0	0:00
GN	0:00	0	0:00
GO	0:00	0	0:00
GP	0:00	0	0:00
GQ	0:00	0	0:00
GR	0:00	0	0:00
GS	0:00	0	0:00
GT	0:00	0	0:00
GU	0:00	0	0:00
GV	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
GW	0:00	0	0:00
GX	0:00	0	0:00
GY	0:00	0	0:00
GZ	0:00	0	0:00
HA	0:00	0	0:00
HB	0:00	0	0:00
HC	0:00	0	0:00
HD	0:00	0	0:00
HE	0:00	0	0:00
HF	0:00	0	0:00
HG	0:00	0	0:00
HH	0:00	0	0:00
HI	0:00	0	0:00
HJ	0:00	0	0:00
HK	0:00	0	0:00
HL	0:00	0	0:00
HM	0:00	0	0:00
HN	0:00	0	0:00
HO	0:00	0	0:00
HP	0:00	0	0:00
HQ	0:00	0	0:00
HR	0:00	0	0:00
HS	0:00	0	0:00
HT	0:00	0	0:00
HU	0:00	0	0:00
HV	0:00	0	0:00
HW	0:00	0	0:00
HX	0:00	0	0:00
HY	0:00	0	0:00
HZ	0:00	0	0:00
IA	0:00	0	0:00
IB	0:00	0	0:00
IC	0:00	0	0:00
ID	0:00	0	0:00
IE	0:00	0	0:00
IF	0:00	0	0:00
IG	0:00	0	0:00
IH	0:00	0	0:00
II	0:00	0	0:00
IJ	0:00	0	0:00
IK	0:00	0	0:00
IL	0:00	0	0:00
IM	0:00	0	0:00
IN	0:00	0	0:00
IO	0:00	0	0:00
IP	0:00	0	0:00
IQ	0:00	0	0:00
IR	0:00	0	0:00
IS	0:00	0	0:00
IT	0:00	0	0:00
IU	0:00	0	0:00
IV	0:00	0	0:00
IW	0:00	0	0:00
IX	0:00	0	0:00
IY	0:00	0	0:00
IZ	0:00	0	0:00
JA	0:00	0	0:00
JB	0:00	0	0:00
JC	0:00	0	0:00
JD	0:00	0	0:00
JE	0:00	0	0:00
JF	0:00	0	0:00
JG	0:00	0	0:00
JH	0:00	0	0:00

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

Shadow, worst case

No.	Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
J1	0:00	0	0:00
J2	0:00	0	0:00
J3	0:00	0	0:00
J4	0:00	0	0:00
J5	0:00	0	0:00
J6	0:00	0	0:00
J7	0:00	0	0:00
J8	0:00	0	0:00
J9	0:00	0	0:00
J0	0:00	0	0:00
JP	0:00	0	0:00
JQ	0:00	0	0:00
JR	0:00	0	0:00
JS	0:00	0	0:00
JT	0:00	0	0:00
JU	0:00	0	0:00
JV	0:00	0	0:00
JW	0:00	0	0:00
JX	0:00	0	0:00
JY	0:00	0	0:00
JZ	0:00	0	0:00
KA	0:00	0	0:00
KB	0:00	0	0:00
KC	0:00	0	0:00
KD	0:00	0	0:00
KE	0:00	0	0:00
KF	0:00	0	0:00
KG	0:00	0	0:00
KH	0:00	0	0:00
KI	0:00	0	0:00
KJ	0:00	0	0:00
KK	0:00	0	0:00
KL	0:00	0	0:00
KM	0:00	0	0:00
KN	0:00	0	0:00
KO	0:00	0	0:00
KP	0:00	0	0:00
KQ	0:00	0	0:00
KR	0:00	0	0:00
KS	0:00	0	0:00
KT	0:00	0	0:00
KU	0:00	0	0:00
KV	0:00	0	0:00
KW	0:00	0	0:00
KX	0:00	0	0:00
KY	0:00	0	0:00
KZ	0:00	0	0:00
LA	0:00	0	0:00
LB	0:00	0	0:00
LC	0:00	0	0:00
LD	0:00	0	0:00
LE	0:00	0	0:00
LF	0:00	0	0:00
LG	0:00	0	0:00
LH	0:00	0	0:00
LI	0:00	0	0:00
LJ	0:00	0	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
1	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (375)	0:00
2	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (376)	0:00
3	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (377)	0:00
4	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (378)	0:00
5	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (379)	54:19

To be continued on next page...

## SHADOW - Main Result

Calculation: Higgins - Worst Case - Dec 2022

...continued from previous page

No.	Name	Worst case [h/year]
6	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (380)	0:00
7	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (381)	0:00
8	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (382)	39:51
9	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (383)	0:00
10	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (384)	0:00
11	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (385)	0:00
12	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (386)	0:00
13	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (387)	0:00
14	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (388)	0:00
15	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (389)	0:00
16	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (390)	0:00
17	Siemens Gamesa SG 6.6-170 6600 170.0 !O! hub: 110.5 m (TOT: 195.5 m) (391)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneously.

APPENDIX P  
SOUND

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**Overview of Infrasound**

Infrasound is an inaudible range of low frequency sound between one and 10 Hz generated as a result of large masses/objects in motion. Infrasound is emitted from both natural sources (e.g., wind, oceans) and artificial sources such as road traffic, ventilation systems, and aircrafts (Keith, 2018). Levels of infrasound emitted from large-scale wind turbines attenuate over space as a function of site-specific characteristics (i.e., topography, structures, etc.) and climatic conditions (Rod & Heiger-Bernays, 2012; Schmidt & Klokker, 2014). Generally, frequencies below 100 Hz are attenuated by three dBA over a doubling of distance when downwind of turbines (between distances of 0.3 to 20 km) and six dBA over a doubling of distance when upwind of turbines (between distances of 0.4 to 3 km) (Shepherd & Hubbard, 1991). Health Canada reported that infrasound generated by wind turbines can be measured up to 10 km away, however, in many cases was below background levels (Health Canada, 2014; Keith, 2018).

When evaluating potential effects of infrasound, it is important that these frequencies be discussed in the context of the sound pressure levels, or in other words, the loudness of the sound. Studies show that the lower the frequency of the sound, the louder the sound needs to be in order to be audible/perceived. For instance, very loud sounds at very low frequencies (i.e., 165 dB at 2 Hz, reducing to 145 dB at 20 Hz) may result in pain (Leventhall, 2006) and infrasound has been shown to cause annoyance, when the sound level exceeds the threshold of hearing (i.e., the lowest sound levels that a listener can detect) (HGC, 2010). Further, research shows that to be physically felt, infrasound must exceed 100–110 dB (Ellenbogen et al., 2012). While there is some variation in the literature and between individual sensitivities, there is fairly good agreement on the level of the threshold of hearing among the various studies that have been completed (Figure P.1).

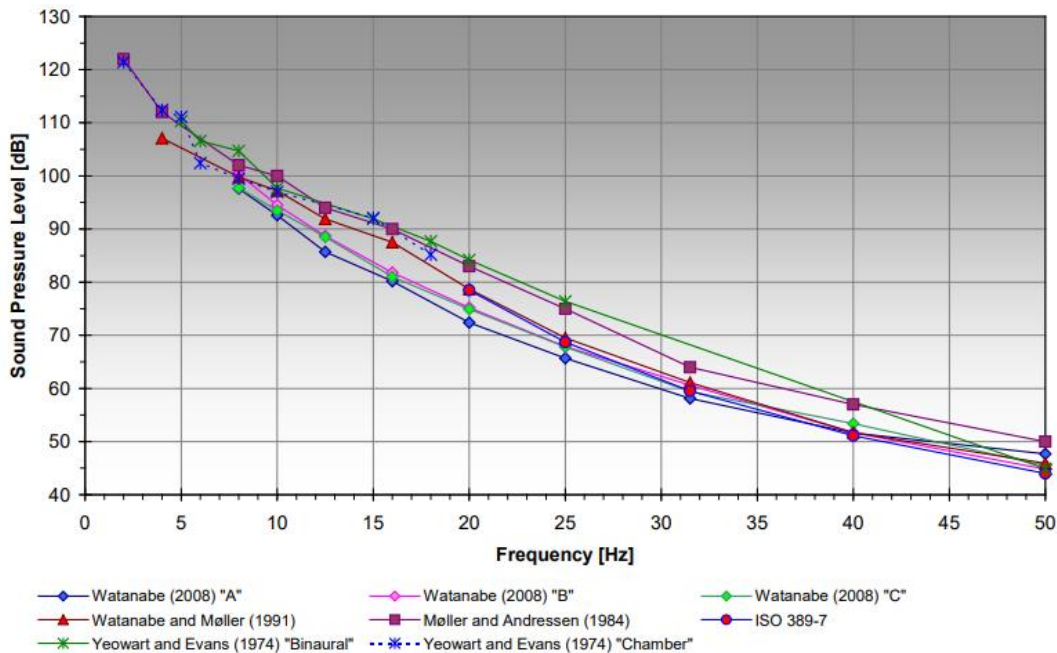


Figure P.1. Threshold of Hearing Data from Various Papers (Source: HGC, 2010)

## Measuring Infrasound

In 2010, Sonus, an acoustic consulting firm based in South Australia, completed a study to measure infrasound produced by a range of natural and manmade sources using a methodology specifically designed to measure infrasound (Table P.1). Sound levels measured using the G-weighting filters, expressed as dBG. The G-weighting network was applied to the measured infrasound pressure levels as it has been standardized to determine the human perception (i.e. threshold of hearing) and annoyance due to noise that lies within the infrasound frequency range. By comparison, when measuring audible sound levels, meters are usually equipped with weighting circuits to simulate the frequency response characteristics of the human ear.

**Table P.1: Measured Levels of Infrasound from Natural & Manmade Sources**

Source	Infrasound Level (dBG)
Threshold of Hearing	85
Ambient Infrasound (As measured 100 m from nearest wind turbine with negligible wind and no turbine operation)	62
<b>Natural Sources</b>	
Adjacent to Beach – 25 m from high water	75
Cliff Face – 250 m from coastline	69
Inland Forest – 8 km from coastline	57
<b>Anthropogenic Sources</b>	
Business District (70 m from two major road corridors)	76
Gas Fired Power Station (350 m away)	74
Wind Farm – 100 m downwind	66
Wind Farm – 200 m downwind	63
Wind Farm – 360 m downwind	61
Outside Residence – 1.2 km from nearest wind turbine	58

Source: Sonus 2010

The results of the study indicate that while turbines do produce infrasound, levels are well below established levels that can be perceived by humans and are comparable to natural and urban sources that are common in the environment.

## Infrasound and Potential Health Concerns

Concerns about infrasound from wind turbines is thought to have originated from the experience of neighbours of early wind turbine designs with downwind rotors (rotors downwind of the tower). In contrast, all modern utility scale wind turbines have upwind rotors that produce significantly lower infrasound emissions (Bastasch et al., 2006). Several studies and panels have been assembled to evaluate the perceived health effects associated with wind turbines.

A study by Evans et al. (2013) concluded that measured infrasound levels at rural locations both near to and away from wind farms were no higher than infrasound levels measured at the urban locations. Human activity and traffic were the main sources of infrasound within urban locations, while localized wind conditions were found to be the main source of infrasound in rural locations. All measurements were below the levels that can be perceived by humans, with most by a significant margin (Evans et al., 2013).

A scientific advisory panel with expertise in audiology, acoustics, occupational/environmental medicine, and public health was assembled by the wind industry in early 2009 to conduct a review of current literature available on the issue of perceived health effects of wind turbines (Colby et al., 2009). Following their review and analysis of the information, the panel reached consensus on the following conclusions:

- There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.
- The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.
- Sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.

The Chief Medical Officer of Health in Ontario also conducted a review of papers and reports (from 1970 to 2010) on wind turbines and health from scientific bibliographic databases, grey literature, and from a structured Internet search. The report concluded that "low frequency sound and infrasound from current generation upwind model turbines are well below the pressure sound levels at which known health effects occur. Further, there is no scientific evidence to date that vibration from low frequency wind turbine noise causes adverse health effects" (CMOH of Ontario, 2010).

The Massachusetts panel concluded that "measured levels of infrasound produced by modern upwind wind turbines at distances as close as 68 m are well below that required for non-auditory perception". Further, the panel concluded that "the weight of the evidence suggests no association between noise from wind turbines and measures of psychological distress or mental health problems" (Ellenbogen et al., 2012).

A new study found that infrasound (generated acoustically as part of the study to correspond to real world wind farms) had no influence on reported annoyance or on the measured response on the autonomic nervous system (Maijila et al., 2021). The study concluded that participants did not detect infrasonic ranges of simulated wind turbine noise.

Overall, potential impacts on nearby residents as a result of Project generated infrasound are anticipated to be negligible based on the scientific findings discussed above and distances to nearby receptors.

## DECIBEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

Noise calculation model:

ISO 9613-2 General

Wind speed (in 10 m height):

Loudest up to 95% rated power

Ground attenuation:

Fixed values, Agr: 0.0, Dc: 0.0

Meteorological coefficient, CO:

0.0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Fixed penalty added to source noise of WTGs with pure tones

Model: 5.0 dB(A)

Height above ground level, when no value in NSA object:

0.0 m; Don't allow override of model height with height from NSA object

Uncertainty margin:

0.0 dB; Uncertainty margin in NSA has priority

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0.0 dB(A)

All coordinates are in

UTM (north)-NAD83 (US+CA) Zone: 20

### WTGs

	Easting	Northing	Z	Row data/Description	WTG type		Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Noise data		Wind speed [m/s]	Status	Lwa,ref [dB(A)]
					Valid	Manufact.					Creator	Name			
1	453,220	5,046,538	340.9	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
2	450,868	5,043,589	360.5	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
3	451,574	5,042,630	359.4	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
4	450,996	5,045,608	336.8	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
5	451,855	5,047,156	309.1	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
6	449,975	5,045,980	320.0	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
7	451,470	5,046,325	316.5	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
8	453,098	5,047,472	304.5	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
9	451,900	5,041,817	324.5	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
10	453,135	5,045,116	317.1	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
11	450,593	5,044,417	329.4	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
12	451,701	5,040,519	299.9	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
13	453,668	5,043,143	313.2	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
14	453,817	5,039,138	275.8	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
15	454,374	5,041,524	326.8	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
16	452,972	5,044,137	301.1	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g
17	454,144	5,042,399	347.2	Siemens Gamesa SG 6.6-170-6.600	Yes	Siemens Gamesa	SG 6.6-170-6.600	6,600	170.0	110.5	EMD	(AM 0, 6.6MW) - 106dB(A)	8.0	Interpolated	106.0 g

g) Data calculated from data for other wind speed (uncertain)

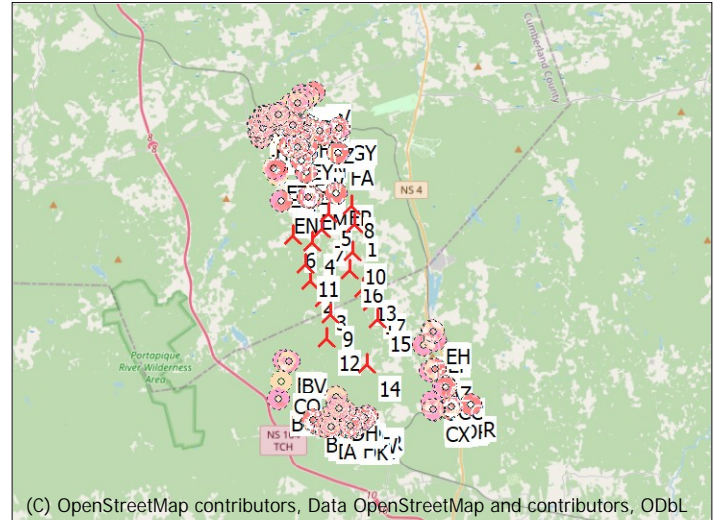
## Calculation Results

### Sound level

Noise sensitive area

No.	Name	Easting	Northing	Z [m]	Immission height [m]	Sound level From WTGs [dB(A)]
A	Noise sensitive point: User defined (323)	451,944	5,035,868	89.9	0.0	19.5
B	Noise sensitive point: User defined (324)	451,740	5,035,869	105.0	0.0	19.3
C	Noise sensitive point: User defined (325)	451,581	5,035,873	104.8	0.0	19.1
D	Noise sensitive point: User defined (326)	452,919	5,035,878	90.2	0.0	20.4
E	Noise sensitive point: User defined (327)	453,047	5,035,879	90.2	0.0	20.4
F	Noise sensitive point: User defined (328)	452,935	5,035,880	90.9	0.0	20.4
G	Noise sensitive point: User defined (329)	452,803	5,035,882	82.9	0.0	20.3
H	Noise sensitive point: User defined (330)	451,963	5,035,888	88.6	0.0	19.6
I	Noise sensitive point: User defined (331)	451,741	5,035,890	106.7	0.0	19.4
J	Noise sensitive point: User defined (332)	451,713	5,035,893	108.2	0.0	19.3
K	Noise sensitive point: User defined (333)	453,050	5,035,902	90.5	0.0	20.5
L	Noise sensitive point: User defined (334)	452,854	5,035,903	85.3	0.0	20.4
M	Noise sensitive point: User defined (335)	452,741	5,035,909	81.1	0.0	20.4
N	Noise sensitive point: User defined (336)	452,790	5,035,911	82.5	0.0	20.4
O	Noise sensitive point: User defined (337)	452,669	5,035,917	82.8	0.0	20.3
P	Noise sensitive point: User defined (338)	452,984	5,035,918	91.9	0.0	20.5
Q	Noise sensitive point: User defined (339)	452,334	5,036,934	108.8	0.0	24.0

To be continued on next page...



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL  
Scale 1:400,000  
New WTG Noise sensitive area

## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

Noise sensitive area		Sound level				
No.	Name	Easting	Northing	Z	Immission height	From WTGs
				[m]	[m]	[dB(A)]
R	Noise sensitive point: User defined (340)	459,270	5,037,006	113.2	0.0	12.8
S	Noise sensitive point: User defined (341)	452,199	5,037,012	104.8	0.0	24.1
T	Noise sensitive point: User defined (342)	452,245	5,037,014	105.5	0.0	24.1
U	Noise sensitive point: User defined (343)	452,767	5,035,932	81.6	0.0	20.5
V	Noise sensitive point: User defined (344)	452,188	5,035,943	67.7	0.0	20.0
W	Noise sensitive point: User defined (345)	452,910	5,035,945	88.5	0.0	20.6
X	Noise sensitive point: User defined (346)	453,031	5,035,952	91.1	0.0	20.7
Y	Noise sensitive point: User defined (347)	452,943	5,035,956	91.4	0.0	20.7
Z	Noise sensitive point: User defined (348)	453,023	5,035,957	90.9	0.0	20.7
AA	Noise sensitive point: User defined (349)	452,735	5,035,963	80.7	0.0	20.6
AB	Noise sensitive point: User defined (350)	452,548	5,035,965	80.7	0.0	20.4
AC	Noise sensitive point: User defined (351)	452,899	5,035,968	87.8	0.0	20.7
AD	Noise sensitive point: User defined (352)	452,934	5,035,974	90.7	0.0	20.7
AE	Noise sensitive point: User defined (353)	451,836	5,035,993	107.6	0.0	19.8
AF	Noise sensitive point: User defined (354)	452,900	5,036,000	87.0	0.0	20.8
AG	Noise sensitive point: User defined (355)	452,301	5,037,037	108.6	0.0	24.3
AH	Noise sensitive point: User defined (356)	457,206	5,038,741	225.6	0.0	21.8
AI	Noise sensitive point: User defined (357)	452,606	5,036,001	82.4	0.0	20.6
AJ	Noise sensitive point: User defined (358)	451,156	5,036,028	134.6	0.0	19.1
AK	Noise sensitive point: User defined (359)	452,731	5,036,030	82.8	0.0	20.8
AL	Noise sensitive point: User defined (360)	452,011	5,036,032	88.1	0.0	20.1
AM	Noise sensitive point: User defined (361)	452,808	5,036,038	84.0	0.0	20.9
AN	Noise sensitive point: User defined (362)	451,779	5,036,050	114.0	0.0	19.9
AO	Noise sensitive point: User defined (363)	452,846	5,036,050	86.1	0.0	21.0
AP	Noise sensitive point: User defined (364)	457,261	5,037,101	182.2	0.0	18.3
AQ	Noise sensitive point: User defined (365)	452,284	5,037,118	111.1	0.0	24.6
AR	Noise sensitive point: User defined (366)	452,283	5,037,149	111.4	0.0	24.7
AS	Noise sensitive point: User defined (367)	452,307	5,036,082	70.0	0.0	20.6
AT	Noise sensitive point: User defined (368)	453,212	5,036,083	0.0	0.0	21.3
AU	Noise sensitive point: User defined (369)	452,324	5,036,084	69.9	0.0	20.7
AV	Noise sensitive point: User defined (370)	453,144	5,036,099	103.6	0.0	21.3
AW	Noise sensitive point: User defined (371)	453,127	5,036,099	102.8	0.0	21.3
AX	Noise sensitive point: User defined (372)	453,210	5,036,103	0.0	0.0	21.3
AY	Noise sensitive point: User defined (373)	452,239	5,036,104	71.2	0.0	20.6
AZ	Noise sensitive point: User defined (374)	457,448	5,038,885	248.5	0.0	21.2
BA	Noise sensitive point: User defined (375)	453,125	5,036,136	104.1	0.0	21.5
BB	Noise sensitive point: User defined (376)	453,115	5,036,149	104.2	0.0	21.5
BC	Noise sensitive point: User defined (377)	453,598	5,036,153	0.0	0.0	21.6
BD	Noise sensitive point: User defined (378)	453,151	5,036,154	104.6	0.0	21.6
BE	Noise sensitive point: User defined (379)	452,100	5,036,169	78.3	0.0	20.7
BF	Noise sensitive point: User defined (380)	453,141	5,036,175	105.9	0.0	21.7
BG	Noise sensitive point: User defined (381)	449,081	5,037,321	214.9	0.0	19.2
BH	Noise sensitive point: User defined (382)	452,144	5,037,367	125.5	0.0	25.4
BI	Noise sensitive point: User defined (383)	452,162	5,037,411	129.5	0.0	25.6
BJ	Noise sensitive point: User defined (384)	453,171	5,036,203	108.2	0.0	21.8
BK	Noise sensitive point: User defined (385)	450,993	5,036,208	159.8	0.0	19.4
BL	Noise sensitive point: User defined (386)	453,541	5,036,208	0.0	0.0	21.9
BM	Noise sensitive point: User defined (387)	452,312	5,036,219	78.3	0.0	21.2
BN	Noise sensitive point: User defined (388)	452,319	5,036,233	78.8	0.0	21.2
BO	Noise sensitive point: User defined (389)	452,340	5,036,267	84.4	0.0	21.4
BP	Noise sensitive point: User defined (390)	453,734	5,036,277	0.0	0.0	22.1
BQ	Noise sensitive point: User defined (391)	453,422	5,036,278	0.0	0.0	22.1
BR	Noise sensitive point: User defined (392)	453,715	5,036,278	0.0	0.0	22.2
BS	Noise sensitive point: User defined (393)	452,366	5,036,286	84.8	0.0	21.5
BT	Noise sensitive point: User defined (394)	453,725	5,036,287	0.0	0.0	22.2
BU	Noise sensitive point: User defined (395)	452,425	5,036,308	84.7	0.0	21.6
BV	Noise sensitive point: User defined (396)	449,711	5,039,316	212.1	0.0	26.5
BW	Noise sensitive point: User defined (397)	452,413	5,036,359	83.1	0.0	21.8
BX	Noise sensitive point: User defined (398)	453,843	5,036,360	0.0	0.0	22.5
BY	Noise sensitive point: User defined (399)	451,923	5,036,363	114.0	0.0	21.2
BZ	Noise sensitive point: User defined (400)	452,323	5,036,366	84.6	0.0	21.7
CA	Noise sensitive point: User defined (401)	452,381	5,036,372	83.9	0.0	21.8
CB	Noise sensitive point: User defined (402)	452,339	5,036,381	84.5	0.0	21.8
CC	Noise sensitive point: User defined (403)	458,014	5,037,893	185.4	0.0	17.8
CD	Noise sensitive point: User defined (404)	452,326	5,036,421	84.6	0.0	21.9

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## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

Noise sensitive area		Sound level				
No.	Name	Easting	Northing	Z	Immission height	From WTGs
				[m]	[m]	[dB(A)]
CE	Noise sensitive point: User defined (405)	452,367	5,036,432	84.6	0.0	22.0
CF	Noise sensitive point: User defined (406)	452,013	5,036,476	113.3	0.0	21.8
CG	Noise sensitive point: User defined (407)	458,001	5,037,942	187.1	0.0	17.9
CH	Noise sensitive point: User defined (408)	457,919	5,037,956	193.8	0.0	18.2
CI	Noise sensitive point: User defined (409)	452,343	5,036,522	87.6	0.0	22.3
CJ	Noise sensitive point: User defined (410)	452,098	5,036,595	104.9	0.0	22.3
CK	Noise sensitive point: User defined (411)	452,081	5,036,603	106.0	0.0	22.3
CL	Noise sensitive point: User defined (412)	452,658	5,036,616	96.4	0.0	23.1
CM	Noise sensitive point: User defined (413)	452,648	5,036,625	96.8	0.0	23.1
CN	Noise sensitive point: User defined (414)	452,570	5,036,626	93.4	0.0	23.0
CO	Noise sensitive point: User defined (415)	452,561	5,036,630	93.7	0.0	23.0
CP	Noise sensitive point: User defined (416)	452,642	5,036,656	101.3	0.0	23.2
CQ	Noise sensitive point: User defined (417)	449,287	5,038,235	312.7	0.0	22.2
CR	Noise sensitive point: User defined (418)	449,276	5,038,250	313.0	0.0	22.2
CS	Noise sensitive point: User defined (419)	457,382	5,036,699	138.7	0.0	17.0
CT	Noise sensitive point: User defined (420)	457,352	5,036,716	140.1	0.0	17.1
CU	Noise sensitive point: User defined (421)	452,341	5,036,719	98.7	0.0	23.1
CV	Noise sensitive point: User defined (422)	452,288	5,036,724	98.3	0.0	23.1
CW	Noise sensitive point: User defined (423)	457,381	5,036,726	140.8	0.0	17.1
CX	Noise sensitive point: User defined (424)	457,292	5,036,729	141.5	0.0	17.3
CY	Noise sensitive point: User defined (425)	457,346	5,036,731	141.0	0.0	17.2
CZ	Noise sensitive point: User defined (426)	452,282	5,036,737	97.9	0.0	23.1
DA	Noise sensitive point: User defined (427)	452,290	5,036,747	98.1	0.0	23.2
DB	Noise sensitive point: User defined (428)	452,345	5,036,749	100.9	0.0	23.2
DC	Noise sensitive point: User defined (429)	458,157	5,036,764	120.3	0.0	15.2
DD	Noise sensitive point: User defined (430)	452,365	5,036,771	103.5	0.0	23.4
DE	Noise sensitive point: User defined (431)	452,329	5,036,782	102.8	0.0	23.4
DF	Noise sensitive point: User defined (432)	452,355	5,036,791	104.4	0.0	23.4
DG	Noise sensitive point: User defined (433)	452,361	5,036,798	105.3	0.0	23.5
DH	Noise sensitive point: User defined (434)	452,328	5,036,799	103.8	0.0	23.4
DI	Noise sensitive point: User defined (435)	452,351	5,036,808	104.6	0.0	23.5
DJ	Noise sensitive point: User defined (436)	452,267	5,036,844	101.8	0.0	23.5
DK	Noise sensitive point: User defined (437)	452,950	5,035,772	90.3	0.0	20.0
DL	Noise sensitive point: User defined (438)	453,014	5,035,773	92.1	0.0	20.0
DM	Noise sensitive point: User defined (439)	452,830	5,035,789	83.3	0.0	20.0
DN	Noise sensitive point: User defined (440)	452,998	5,035,798	92.7	0.0	20.1
DO	Noise sensitive point: User defined (441)	452,920	5,035,807	88.0	0.0	20.1
DP	Noise sensitive point: User defined (442)	458,268	5,036,871	126.8	0.0	15.1
DQ	Noise sensitive point: User defined (443)	452,203	5,036,896	93.9	0.0	23.6
DR	Noise sensitive point: User defined (444)	452,194	5,036,922	93.9	0.0	23.7
DS	Noise sensitive point: User defined (445)	452,973	5,035,820	92.4	0.0	20.2
DT	Noise sensitive point: User defined (446)	453,127	5,035,823	89.8	0.0	20.2
DU	Noise sensitive point: User defined (447)	452,991	5,035,829	93.1	0.0	20.2
DV	Noise sensitive point: User defined (448)	453,157	5,035,839	91.6	0.0	20.3
DW	Noise sensitive point: User defined (449)	453,121	5,035,841	90.6	0.0	20.3
DX	Noise sensitive point: User defined (450)	453,137	5,035,842	91.3	0.0	20.3
DY	Noise sensitive point: User defined (451)	451,587	5,035,845	103.7	0.0	19.0
DZ	Noise sensitive point: User defined (452)	451,595	5,035,848	104.0	0.0	19.0
EA	Noise sensitive point: User defined (453)	452,969	5,035,848	92.2	0.0	20.3
EB	Noise sensitive point: User defined (454)	452,858	5,035,852	85.8	0.0	20.2
EC	Noise sensitive point: User defined (455)	452,957	5,035,862	92.2	0.0	20.3
ED	Noise sensitive point: User defined (456)	452,966	5,035,864	92.6	0.0	20.3
EE	Noise sensitive point: User defined (457)	456,831	5,040,152	219.0	0.0	25.3
EF	Noise sensitive point: User defined (458)	457,462	5,040,359	231.3	0.0	23.2
EG	Noise sensitive point: User defined (459)	449,418	5,039,368	216.4	0.0	25.6
EH	Noise sensitive point: User defined (460)	457,310	5,040,836	213.8	0.0	24.3
EI	Noise sensitive point: User defined (461)	457,358	5,040,839	212.7	0.0	24.1
EJ	Noise sensitive point: User defined (462)	457,330	5,040,843	213.1	0.0	24.2
EK	Noise sensitive point: User defined (463)	457,293	5,040,908	208.3	0.0	24.4
EL	Noise sensitive point: User defined (464)	450,987	5,048,004	286.5	0.0	34.4
EM	Noise sensitive point: User defined (465)	450,792	5,048,016	262.3	0.0	33.6
EN	Noise sensitive point: User defined (466)	449,348	5,047,779	275.8	0.0	30.1
EO	Noise sensitive point: User defined (467)	450,682	5,049,306	264.9	0.0	27.6
EP	Noise sensitive point: User defined (468)	449,143	5,049,181	237.5	0.0	24.7
EQ	Noise sensitive point: User defined (469)	449,127	5,049,193	237.3	0.0	24.7

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## DECIBEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

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Noise sensitive area						Sound level
No.	Name	Easting	Northing	Z	Immission height	From WTGs
				[m]	[m]	[dB(A)]
ER	Noise sensitive point: User defined (470)	452,232	5,048,215	301.2	0.0	36.1
ES	Noise sensitive point: User defined (471)	448,980	5,049,526	196.3	0.0	23.3
ET	Noise sensitive point: User defined (472)	448,967	5,049,530	194.1	0.0	23.2
EU	Noise sensitive point: User defined (473)	450,634	5,050,224	259.0	0.0	24.0
EV	Noise sensitive point: User defined (474)	450,017	5,050,608	210.4	0.0	21.7
EW	Noise sensitive point: User defined (475)	450,427	5,049,938	260.8	0.0	24.7
EX	Noise sensitive point: User defined (476)	450,211	5,050,601	221.1	0.0	22.0
EY	Noise sensitive point: User defined (477)	450,205	5,050,621	217.8	0.0	22.0
EZ	Noise sensitive point: User defined (478)	450,440	5,050,307	254.0	0.0	23.4
FA	Noise sensitive point: User defined (479)	452,363	5,050,310	257.4	0.0	25.0
FB	Noise sensitive point: User defined (480)	449,077	5,049,463	201.0	0.0	23.7
FC	Noise sensitive point: User defined (481)	448,205	5,051,694	91.4	0.0	15.6
FD	Noise sensitive point: User defined (482)	448,517	5,051,698	91.8	0.0	16.1
FE	Noise sensitive point: User defined (483)	450,421	5,051,151	136.5	0.0	20.4
FF	Noise sensitive point: User defined (484)	451,004	5,051,703	122.1	0.0	19.1
FG	Noise sensitive point: User defined (485)	448,211	5,051,704	91.3	0.0	15.6
FH	Noise sensitive point: User defined (486)	450,355	5,050,803	181.6	0.0	21.5
FI	Noise sensitive point: User defined (487)	452,048	5,051,447	118.8	0.0	20.5
FJ	Noise sensitive point: User defined (488)	450,726	5,051,736	118.7	0.0	18.8
FK	Noise sensitive point: User defined (489)	450,704	5,051,737	118.7	0.0	18.7
FL	Noise sensitive point: User defined (490)	450,376	5,050,821	177.6	0.0	21.5
FM	Noise sensitive point: User defined (491)	450,445	5,051,186	135.4	0.0	20.3
FN	Noise sensitive point: User defined (492)	452,310	5,051,469	119.7	0.0	20.4
FO	Noise sensitive point: User defined (493)	450,249	5,051,743	112.4	0.0	18.3
FP	Noise sensitive point: User defined (494)	450,260	5,051,749	111.8	0.0	18.3
FQ	Noise sensitive point: User defined (495)	448,236	5,051,749	90.2	0.0	15.5
FR	Noise sensitive point: User defined (496)	448,293	5,051,192	97.4	0.0	17.1
FS	Noise sensitive point: User defined (497)	448,309	5,051,197	97.0	0.0	17.1
FT	Noise sensitive point: User defined (498)	448,299	5,051,207	97.4	0.0	17.1
FU	Noise sensitive point: User defined (499)	451,444	5,051,479	121.9	0.0	20.1
FV	Noise sensitive point: User defined (500)	452,411	5,051,482	118.6	0.0	20.4
FW	Noise sensitive point: User defined (501)	451,428	5,051,492	122.7	0.0	20.1
FX	Noise sensitive point: User defined (502)	450,223	5,051,827	110.5	0.0	18.0
FY	Noise sensitive point: User defined (503)	450,393	5,051,828	112.6	0.0	18.2
FZ	Noise sensitive point: User defined (504)	451,419	5,051,503	123.1	0.0	20.1
GA	Noise sensitive point: User defined (505)	448,276	5,051,503	93.3	0.0	16.3
GB	Noise sensitive point: User defined (506)	450,237	5,051,758	112.4	0.0	18.2
GC	Noise sensitive point: User defined (507)	448,245	5,051,764	90.4	0.0	15.5
GD	Noise sensitive point: User defined (508)	450,343	5,051,796	112.4	0.0	18.2
GE	Noise sensitive point: User defined (509)	449,970	5,051,797	109.0	0.0	17.8
GF	Noise sensitive point: User defined (510)	449,794	5,051,798	107.2	0.0	17.6
GG	Noise sensitive point: User defined (511)	449,757	5,051,800	105.8	0.0	17.6
GH	Noise sensitive point: User defined (512)	449,997	5,051,804	108.9	0.0	17.8
GI	Noise sensitive point: User defined (513)	450,090	5,051,849	110.2	0.0	17.8
GJ	Noise sensitive point: User defined (514)	448,143	5,051,854	91.9	0.0	15.1
GK	Noise sensitive point: User defined (515)	449,391	5,051,857	102.7	0.0	16.9
GL	Noise sensitive point: User defined (516)	449,835	5,051,857	106.8	0.0	17.5
GM	Noise sensitive point: User defined (517)	450,487	5,051,276	129.6	0.0	20.1
GN	Noise sensitive point: User defined (518)	448,256	5,051,550	93.0	0.0	16.1
GO	Noise sensitive point: User defined (519)	448,337	5,051,559	93.5	0.0	16.2
GP	Noise sensitive point: User defined (520)	449,763	5,051,777	106.3	0.0	17.6
GQ	Noise sensitive point: User defined (521)	450,814	5,051,778	118.9	0.0	18.7
GR	Noise sensitive point: User defined (522)	451,634	5,051,293	128.7	0.0	20.9
GS	Noise sensitive point: User defined (523)	448,361	5,051,309	96.2	0.0	16.9
GT	Noise sensitive point: User defined (524)	450,251	5,051,813	111.8	0.0	18.1
GU	Noise sensitive point: User defined (525)	450,396	5,051,814	112.6	0.0	18.2
GV	Noise sensitive point: User defined (526)	450,264	5,051,816	111.2	0.0	18.1
GW	Noise sensitive point: User defined (527)	448,202	5,051,823	89.2	0.0	15.3
GX	Noise sensitive point: User defined (528)	450,203	5,050,645	216.3	0.0	21.9
GY	Noise sensitive point: User defined (529)	452,409	5,051,597	109.2	0.0	20.0
GZ	Noise sensitive point: User defined (530)	448,448	5,051,606	92.0	0.0	16.3
HA	Noise sensitive point: User defined (531)	449,808	5,050,665	187.4	0.0	21.2
HB	Noise sensitive point: User defined (532)	448,407	5,051,627	91.9	0.0	16.1
HC	Noise sensitive point: User defined (533)	451,517	5,051,383	125.5	0.0	20.5
HD	Noise sensitive point: User defined (534)	450,773	5,051,640	122.3	0.0	19.1

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## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

Noise sensitive area						Sound level
No.	Name	Eastings	Northing	Z	Immission height	From WTGs
				[m]	[m]	[dB(A)]
HE	Noise sensitive point: User defined (535)	448,274	5,051,642	92.7	0.0	15.9
HF	Noise sensitive point: User defined (536)	448,425	5,051,646	91.3	0.0	16.1
HG	Noise sensitive point: User defined (537)	450,383	5,050,704	195.6	0.0	21.9
HH	Noise sensitive point: User defined (538)	448,231	5,051,389	95.4	0.0	16.5
HI	Noise sensitive point: User defined (539)	448,432	5,051,653	91.2	0.0	16.1
HJ	Noise sensitive point: User defined (540)	448,514	5,051,653	92.0	0.0	16.2
HK	Noise sensitive point: User defined (541)	448,269	5,051,657	92.8	0.0	15.8
HL	Noise sensitive point: User defined (542)	448,535	5,051,665	91.3	0.0	16.2
HM	Noise sensitive point: User defined (543)	448,438	5,051,666	90.9	0.0	16.1
HN	Noise sensitive point: User defined (544)	450,755	5,050,736	201.0	0.0	22.2
HO	Noise sensitive point: User defined (545)	448,224	5,051,409	95.4	0.0	16.4
HP	Noise sensitive point: User defined (546)	448,615	5,052,188	102.4	0.0	14.9
HQ	Noise sensitive point: User defined (547)	448,457	5,052,190	97.2	0.0	14.7
HR	Noise sensitive point: User defined (548)	448,886	5,052,194	113.6	0.0	15.3
HS	Noise sensitive point: User defined (549)	448,319	5,051,986	92.2	0.0	15.0
HT	Noise sensitive point: User defined (550)	448,432	5,051,993	94.6	0.0	15.2
HU	Noise sensitive point: User defined (551)	448,697	5,052,202	106.7	0.0	15.0
HV	Noise sensitive point: User defined (552)	449,241	5,052,402	142.1	0.0	15.1
HW	Noise sensitive point: User defined (553)	449,139	5,052,006	107.0	0.0	16.2
HX	Noise sensitive point: User defined (554)	449,190	5,052,007	106.6	0.0	16.2
HY	Noise sensitive point: User defined (555)	449,066	5,052,007	107.0	0.0	16.1
HZ	Noise sensitive point: User defined (556)	449,359	5,052,007	107.4	0.0	16.4
IA	Noise sensitive point: User defined (557)	448,510	5,052,212	98.7	0.0	14.7
IB	Noise sensitive point: User defined (558)	448,730	5,052,214	110.0	0.0	15.0
IC	Noise sensitive point: User defined (559)	448,492	5,052,214	98.5	0.0	14.7
ID	Noise sensitive point: User defined (560)	448,892	5,052,216	115.6	0.0	15.2
IE	Noise sensitive point: User defined (561)	449,247	5,052,421	143.0	0.0	15.1
IF	Noise sensitive point: User defined (562)	448,440	5,052,012	92.8	0.0	15.1
IG	Noise sensitive point: User defined (563)	449,384	5,052,016	107.0	0.0	16.4
IH	Noise sensitive point: User defined (564)	448,950	5,052,020	105.0	0.0	15.9
II	Noise sensitive point: User defined (565)	448,470	5,052,036	94.7	0.0	15.1
IJ	Noise sensitive point: User defined (566)	448,444	5,052,229	96.7	0.0	14.5
IK	Noise sensitive point: User defined (567)	448,429	5,052,240	95.8	0.0	14.5
IL	Noise sensitive point: User defined (568)	448,917	5,052,039	106.3	0.0	15.8
IM	Noise sensitive point: User defined (569)	449,381	5,052,041	108.0	0.0	16.4
IN	Noise sensitive point: User defined (570)	448,998	5,052,243	122.3	0.0	15.3
IO	Noise sensitive point: User defined (571)	448,801	5,052,252	115.2	0.0	15.0
IP	Noise sensitive point: User defined (572)	449,018	5,052,253	123.1	0.0	15.3
IQ	Noise sensitive point: User defined (573)	449,411	5,052,485	151.5	0.0	15.1
IR	Noise sensitive point: User defined (574)	448,780	5,052,065	106.1	0.0	15.5
IS	Noise sensitive point: User defined (575)	448,552	5,052,073	95.5	0.0	15.1
IT	Noise sensitive point: User defined (576)	448,537	5,052,077	95.0	0.0	15.1
IU	Noise sensitive point: User defined (577)	448,433	5,052,262	96.6	0.0	14.4
IV	Noise sensitive point: User defined (578)	448,785	5,052,264	115.4	0.0	14.9
IW	Noise sensitive point: User defined (579)	448,874	5,052,269	116.9	0.0	15.0
IX	Noise sensitive point: User defined (580)	448,779	5,052,078	106.5	0.0	15.4
IY	Noise sensitive point: User defined (581)	449,807	5,051,860	105.5	0.0	17.4
IZ	Noise sensitive point: User defined (582)	449,793	5,051,861	105.3	0.0	17.4
JA	Noise sensitive point: User defined (583)	448,212	5,051,865	88.1	0.0	15.2
JB	Noise sensitive point: User defined (584)	448,589	5,051,867	91.2	0.0	15.8
JC	Noise sensitive point: User defined (585)	448,554	5,052,091	97.5	0.0	15.1
JD	Noise sensitive point: User defined (586)	448,603	5,052,100	98.2	0.0	15.1
JE	Noise sensitive point: User defined (587)	448,667	5,052,290	107.6	0.0	14.7
JF	Noise sensitive point: User defined (588)	448,781	5,052,291	115.7	0.0	14.9
JG	Noise sensitive point: User defined (589)	449,414	5,051,874	101.9	0.0	16.9
JH	Noise sensitive point: User defined (590)	448,199	5,051,875	88.4	0.0	15.1
JI	Noise sensitive point: User defined (591)	449,948	5,051,883	108.8	0.0	17.5
JJ	Noise sensitive point: User defined (592)	449,972	5,051,884	108.7	0.0	17.5
JK	Noise sensitive point: User defined (593)	448,587	5,052,106	98.4	0.0	15.1
JL	Noise sensitive point: User defined (594)	448,658	5,051,895	92.9	0.0	15.8
JM	Noise sensitive point: User defined (595)	448,128	5,051,896	90.3	0.0	14.9
JN	Noise sensitive point: User defined (596)	448,143	5,051,899	89.6	0.0	15.0
JO	Noise sensitive point: User defined (597)	448,618	5,052,121	99.7	0.0	15.1
JP	Noise sensitive point: User defined (598)	448,819	5,052,123	106.8	0.0	15.4
JO	Noise sensitive point: User defined (599)	448,645	5,052,310	107.0	0.0	14.6

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## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

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Noise sensitive area							Sound level
No.	Name	Eastings	Northing	Z	Immission height	From WTGs	
				[m]	[m]	[dB(A)]	
JR	Noise sensitive point: User defined (600)	448,636	5,052,313	107.4	0.0	14.6	
JS	Noise sensitive point: User defined (601)	449,170	5,052,314	134.1	0.0	15.3	
JT	Noise sensitive point: User defined (602)	449,185	5,052,319	134.9	0.0	15.3	
JU	Noise sensitive point: User defined (603)	449,144	5,052,321	133.2	0.0	15.3	
JV	Noise sensitive point: User defined (604)	449,133	5,052,324	132.7	0.0	15.2	
JW	Noise sensitive point: User defined (605)	448,640	5,051,907	93.4	0.0	15.7	
JX	Noise sensitive point: User defined (606)	448,459	5,051,908	90.7	0.0	15.4	
JY	Noise sensitive point: User defined (607)	448,619	5,051,909	94.6	0.0	15.7	
JZ	Noise sensitive point: User defined (608)	448,836	5,052,130	107.5	0.0	15.4	
KA	Noise sensitive point: User defined (609)	448,737	5,052,131	106.0	0.0	15.2	
KB	Noise sensitive point: User defined (610)	448,494	5,052,134	98.0	0.0	14.9	
KC	Noise sensitive point: User defined (611)	448,662	5,052,337	109.3	0.0	14.6	
KD	Noise sensitive point: User defined (612)	449,587	5,052,572	151.1	0.0	15.1	
KE	Noise sensitive point: User defined (613)	448,471	5,051,924	91.7	0.0	15.4	
KF	Noise sensitive point: User defined (614)	448,786	5,052,145	106.8	0.0	15.3	
KG	Noise sensitive point: User defined (615)	449,164	5,052,345	134.7	0.0	15.2	
KH	Noise sensitive point: User defined (616)	449,589	5,052,587	150.8	0.0	15.0	
KI	Noise sensitive point: User defined (617)	448,791	5,052,166	109.4	0.0	15.2	
KJ	Noise sensitive point: User defined (618)	448,758	5,052,167	108.2	0.0	15.2	
KK	Noise sensitive point: User defined (619)	448,794	5,052,169	109.8	0.0	15.2	
KL	Noise sensitive point: User defined (620)	448,545	5,052,171	100.8	0.0	14.9	
KM	Noise sensitive point: User defined (621)	448,585	5,052,176	100.8	0.0	14.9	
KN	Noise sensitive point: User defined (622)	448,637	5,052,181	103.6	0.0	15.0	
KO	Noise sensitive point: User defined (623)	448,801	5,052,182	110.6	0.0	15.2	
KP	Noise sensitive point: User defined (624)	448,831	5,052,182	112.2	0.0	15.2	
KQ	Noise sensitive point: User defined (625)	448,516	5,052,183	99.9	0.0	14.8	
KR	Noise sensitive point: User defined (626)	448,853	5,052,184	112.4	0.0	15.3	
KS	Noise sensitive point: User defined (627)	450,396	5,053,036	129.8	0.0	14.4	
KT	Noise sensitive point: User defined (628)	450,372	5,053,055	130.0	0.0	14.3	
KU	Noise sensitive point: User defined (629)	450,001	5,052,865	136.8	0.0	14.6	
KV	Noise sensitive point: User defined (630)	451,166	5,053,557	130.9	0.0	13.3	
KW	Noise sensitive point: User defined (631)	450,311	5,053,104	129.0	0.0	14.1	
KX	Noise sensitive point: User defined (632)	450,489	5,053,115	125.9	0.0	14.2	
KY	Noise sensitive point: User defined (633)	450,838	5,053,306	123.2	0.0	13.9	
KZ	Noise sensitive point: User defined (634)	449,992	5,052,910	135.6	0.0	14.5	
LA	Noise sensitive point: User defined (635)	450,505	5,053,122	125.9	0.0	14.2	
LB	Noise sensitive point: User defined (636)	450,847	5,053,325	123.1	0.0	13.8	
LC	Noise sensitive point: User defined (637)	450,824	5,053,341	121.2	0.0	13.8	
LD	Noise sensitive point: User defined (638)	450,223	5,052,984	131.9	0.0	14.4	
LE	Noise sensitive point: User defined (639)	450,461	5,053,381	123.6	0.0	13.4	
LF	Noise sensitive point: User defined (640)	450,284	5,052,998	130.1	0.0	14.4	
LG	Noise sensitive point: User defined (641)	450,399	5,053,004	129.9	0.0	14.5	
LH	Noise sensitive point: User defined (642)	450,281	5,053,008	130.3	0.0	14.4	
LI	Noise sensitive point: User defined (643)	450,219	5,053,010	131.8	0.0	14.3	
LJ	Noise sensitive point: User defined (644)	450,286	5,053,027	129.6	0.0	14.4	

## Distances (m)

NSA	WTG																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	10745	7795	6771	9786	11288	10302	10468	11661	5949	9324	8655	4657	7476	3768	6155	8332	6891
B	10771	7769	6762	9767	11287	10264	10459	11682	5950	9351	8624	4650	7525	3872	6238	8359	6958
C	10790	7749	6756	9753	11286	10234	10453	11698	5952	9372	8601	4648	7563	3957	6303	8380	7012
D	10664	7979	6884	9918	11328	10522	10547	11595	6026	9240	8850	4798	7303	3381	5830	8259	6635
E	10660	8012	6909	9943	11339	10558	10564	11593	6048	9237	8884	4831	7290	3348	5798	8258	6612
F	10662	7982	6886	9920	11328	10525	10548	11593	6027	9238	8853	4801	7300	3375	5824	8257	6631
G	10664	7946	6858	9892	11313	10486	10528	11593	6003	9239	8816	4766	7312	3410	5856	8256	6654
H	10724	7778	6753	9768	11268	10286	10449	11640	5929	9302	8639	4639	7452	3741	6130	8310	6867
I	10750	7748	6741	9747	11266	10243	10439	11661	5929	9330	8604	4629	7504	3854	6219	8338	6939
J	10751	7743	6738	9742	11264	10236	10435	11662	5927	9332	8598	4627	7509	3867	6228	8340	6946
K	10637	7990	6887	9921	11317	10536	10542	11570	6025	9214	8862	4810	7266	3325	5775	8235	6588
L	10641	7938	6847	9881	11297	10480	10513	11571	5990	9217	8809	4758	7285	3375	5822	8234	6623
M	10640	7905	6821	9855	11282	10444	10493	11568	5968	9215	8775	4726	7293	3403	5847	8231	6640
N	10635	7914	6827	9861	11283	10455	10497	11565	5972	9211	8785	4735	7284	3386	5831	8227	6628
O	10635	7881	6802	9835	11269	10418	10477	11563	5950	9211	8750	4703	7295	3419	5860	8226	6648

To be continued on next page...

## DECIBEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	10622	7958	6858	9892	11295	10503	10517	11555	5998	9199	8829	4777	7257	3326	5776	8219	6584
Q	9644	6814	5746	8776	10233	9348	9431	10565	4902	8221	7683	3640	6350	2656	5022	7231	5757
R	11290	10674	9532	11936	12570	12920	12153	12150	8801	10169	11411	8344	8309	5855	6662	9514	7441
S	9581	6711	5652	8680	10150	9240	9342	10499	4815	8158	7577	3543	6304	2672	5009	7167	5728
T	9574	6718	5656	8685	10150	9249	9344	10493	4816	8151	7586	3548	6292	2642	4987	7160	5711
U	10615	7889	6803	9837	11261	10429	10474	11545	5949	9191	8759	4710	7267	3373	5818	8207	6612
V	10645	7759	6715	9739	11218	10278	10407	11565	5881	9222	8623	4602	7351	3586	5994	8231	6746
W	10597	7912	6817	9851	11260	10455	10479	11528	5958	9173	8783	4731	7237	3319	5767	8192	6571
X	10587	7937	6834	9868	11265	10483	10490	11520	5973	9164	8809	4757	7218	3281	5731	8185	6542
Y	10585	7910	6812	9846	11253	10454	10473	11517	5953	9162	8781	4729	7223	3300	5749	8181	6554
Z	10583	7931	6828	9862	11260	10477	10484	11515	5967	9160	8802	4750	7215	3278	5728	8180	6539
AA	10585	7851	6766	9800	11227	10390	10439	11514	5913	9161	8721	4672	7240	3353	5797	8177	6588
AB	10594	7807	6735	9767	11212	10340	10416	11520	5888	9169	8675	4632	7264	3417	5851	8183	6629
AC	10574	7887	6792	9826	11236	10430	10455	11505	5933	9150	8758	4706	7215	3299	5748	8169	6550
AD	10568	7891	6793	9827	11234	10435	10454	11499	5934	9144	8762	4710	7206	3285	5734	8163	6538
AE	10635	7657	6642	9652	11163	10159	10338	11548	5824	9215	8515	4528	7380	3716	6085	8222	6809
AF	10542	7856	6760	9795	11204	10399	10423	11473	5902	9118	8727	4675	7183	3269	5717	8137	6519
AG	9545	6706	5639	8670	10128	9240	9325	10465	4796	8121	7575	3533	6256	2590	4942	7131	5670
AH	8757	7980	6845	9259	9973	10232	9510	9650	6134	7564	8715	5785	5648	3413	3971	6859	4771
AI	10555	7785	6708	9741	11180	10320	10387	11482	5859	9130	8654	4608	7220	3362	5799	8144	6581
AJ	10710	7566	6615	9581	11150	10022	10302	11607	5836	9300	8408	4524	7545	4092	6368	8309	7037
AK	10519	7786	6701	9734	11161	10325	10373	11448	5847	9095	8656	4606	7174	3292	5734	8111	6524
AL	10575	7643	6612	9630	11125	10154	10307	11491	5786	9153	8504	4498	7301	3592	5978	8161	6715
AM	10508	7796	6706	9740	11159	10338	10374	11438	5850	9084	8667	4616	7156	3260	5705	8100	6500
AN	10586	7594	6582	9590	11106	10092	10280	11498	5768	9166	8450	4470	7340	3699	6057	8174	6775
AO	10494	7794	6701	9735	11150	10336	10366	11424	5844	9070	8665	4613	7140	3236	5683	8087	6480
AP	10265	9108	7931	10565	11416	11485	10891	11175	7140	9014	9898	6526	7029	4001	5282	8240	6147
AQ	9466	6624	5557	8588	10047	9158	9243	10386	4715	8043	7493	3451	6182	2536	4877	7053	5600
AR	9436	6594	5527	8557	10016	9128	9212	10355	4684	8012	7462	3420	6152	2511	4849	7022	5571
AS	10495	7643	6588	9615	11083	10169	10277	11417	5749	9071	8509	4478	7190	3408	5820	8082	6578
AT	10455	7863	6748	9780	11156	10413	10389	11390	5882	9033	8736	4687	7074	3114	5563	8057	6385
AU	10492	7645	6588	9616	11082	10171	10277	11414	5749	9068	8511	4479	7185	3399	5813	8079	6572
AV	10439	7828	6717	9749	11132	10377	10362	11373	5852	9017	8700	4650	7063	3112	5563	8040	6379
AW	10439	7823	6712	9745	11130	10371	10359	11373	5848	9017	8695	4644	7064	3116	5566	8039	6382
AX	10435	7844	6729	9760	11136	10394	10369	11370	5862	9013	8716	4667	7055	3095	5544	8037	6365
AY	10480	7610	6560	9585	11059	10133	10250	11401	5723	9056	8475	4448	7183	3420	5825	8066	6578
AZ	8743	8088	6966	9318	9984	10304	9544	9626	6275	7578	8808	5975	5694	3640	4052	6900	4823
BA	10402	7787	6676	9708	11093	10336	10323	11336	5811	8980	8659	4609	7027	3080	5530	8002	6345
BB	10389	7771	6661	9693	11078	10320	10308	11323	5796	8966	8644	4593	7015	3070	5520	7989	6334
BC	10391	7921	6785	9806	11140	10473	10392	11330	5913	8974	8793	4760	6990	2992	5426	8008	6270
BD	10384	7778	6665	9697	11078	10327	10309	11318	5800	8962	8650	4600	7008	3057	5508	7985	6324
BE	10429	7521	6481	9503	10989	10038	10175	11347	5651	9006	8384	4368	7147	3429	5817	8015	6557
BF	10363	7755	6642	9674	11056	10304	10287	11297	5777	8941	8627	4577	6988	3039	5489	7964	6305
BG	10103	6517	5864	8505	10218	8705	9315	10916	5306	8785	7255	4134	7411	5072	6758	7848	7171
BH	9234	6351	5293	8321	9793	8882	8984	10150	4457	7812	7219	3183	5973	2436	4717	6820	5415
BI	9188	6312	5251	8279	9749	8843	8941	10104	4413	7766	7179	3142	5926	2392	4670	6774	5368
BJ	10335	7737	6622	9654	11032	10286	10264	11270	5756	8913	8609	4560	6958	3005	5455	7937	6273
BK	10567	7382	6448	9400	10982	9825	10128	11459	5682	9162	8219	4369	7433	4069	6300	8172	6947
BL	10334	7850	6716	9738	11076	10402	10327	11272	5844	8917	8722	4687	6935	2942	5380	7949	6220
BM	10358	7510	6452	9481	10946	10037	10141	11280	5613	8934	8376	4343	7055	3283	5691	7945	6446
BN	10344	7498	6440	9468	10933	10025	10128	11266	5600	8920	8364	4331	7040	3268	5676	7931	6431
BO	10309	7469	6409	9438	10900	9997	10096	11231	5568	8885	8335	4300	7003	3228	5637	7895	6392
BP	10274	7854	6710	9725	11040	10406	10300	11213	5836	8859	8725	4704	6866	2862	5286	7897	6136
BQ	10262	7745	6615	9641	10991	10297	10235	11199	5745	8843	8617	4577	6869	2887	5332	7872	6164
BR	10272	7846	6703	9718	11036	10398	10295	11211	5829	8857	8717	4695	6865	2862	5287	7894	6136
BS	10288	7455	6393	9423	10882	9985	10079	11210	5551	8863	8322	4285	6980	3200	5610	7874	6367
BT	10263	7841	6697	9712	11028	10393	10288	11202	5823	8848	8712	4691	6855	2852	5276	7885	6126
BU	10260	7445	6378	9409	10862	9977	10062	11184	5534	8836	8313	4273	6946	3153	5568	7847	6329
BV	8029	4427	3802	6422	8128	6670	7227	8832	3324	6735	5177	2326	5505	4110	5159	5820	5400
BW	10211	7393	6326	9357	10811	9925	10011	11134	5482	8786	8261	4221	6899	3113	5524	7798	6283
BX	10197	7817	6668	9677	10978	10369	10244	11137	5793	8785	8688	4678	6785	2778	5191	7826	6047
BY	10258	7303	6277	9292	10793	9813	9973	11171	5454	8837	8164	4163	7001	3360	5714	7845	6432
BZ	10211	7368	6308	9337	10800	9897	9996	11133	5467	8787	8235	4199	6909	3149	5551	7798	6302
CA	10200	7374	6309	9339	10797	9905	9995	11123	5466	8776	8241	4203	6892	3116	5524	7787	6280
CB	10195	7357	6295	9325	10786	9886	9982	11117	5454	8771	8224	4187	6891	3128	5531	7782	6283
CC	9885	9139	7995	10430	11124	11403	10674	10767	7265	8717	9881	6837	6816	4378	5142	8026	5940

To be continued on next page...

## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

	WTG																
NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
CD	10156	7315	6254	9283	10745	9844	9941	11078	5413	8732	8182	4145	6854	3099	5498	7743	6249
CE	10141	7312	6248	9278	10736	9843	9933	11064	5405	8717	8179	4141	6835	3069	5473	7728	6226
CF	10134	7204	6169	9188	10681	9720	9864	11049	5342	8712	8067	4055	6869	3215	5572	7720	6295
CG	9836	9098	7956	10385	11076	11359	10628	10718	7228	8669	9839	6807	6770	4352	5098	7980	5895
CH	9784	9024	7880	10319	11018	11291	10565	10667	7151	8611	9768	6725	6706	4269	5030	7916	5830
CI	10054	7219	6156	9186	10645	9750	9842	10976	5314	8630	8087	4049	6752	3003	5399	7641	6147
CJ	10006	7102	6058	9081	10564	9623	9751	10923	5226	8584	7966	3945	6733	3069	5429	7593	6155
CK	10000	7091	6048	9071	10556	9611	9742	10917	5218	8578	7955	3935	6730	3072	5429	7587	6153
CL	9938	7199	6111	9145	10571	9741	9782	10865	5256	8513	8070	4019	6604	2775	5199	7527	5971
CM	9929	7188	6100	9134	10561	9730	9772	10856	5246	8505	8059	4008	6597	2771	5194	7519	5965
CN	9933	7168	6086	9119	10554	9707	9761	10859	5234	8509	8038	3989	6609	2804	5219	7522	5984
CO	9930	7162	6081	9114	10550	9702	9757	10856	5229	8505	8032	3984	6606	2805	5219	7518	5983
CP	9899	7156	6068	9102	10529	9698	9740	10825	5214	8474	8027	3976	6567	2746	5167	7488	5936
CQ	9188	5583	4954	7569	9284	7776	8380	9993	4434	7884	6319	3324	6579	4619	6058	6958	6398
CR	9179	5572	4946	7557	9272	7762	8368	9983	4428	7876	6307	3321	6575	4626	6058	6951	6397
CS	10683	9482	8301	10962	11828	11875	11297	11594	7500	9428	10279	6846	7438	4320	5686	8647	6556
CT	10655	9449	8268	10930	11799	11842	11267	11567	7466	9399	10246	6812	7408	4285	5656	8617	6526
CU	9858	7026	5960	8990	10448	9559	9646	10780	5117	8434	7894	3854	6559	2833	5217	7445	5960
CV	9858	7010	5948	8977	10441	9540	9636	10778	5108	8434	7877	3840	6565	2857	5233	7444	5971
CW	10658	9461	8281	10939	11803	11853	11273	11568	7481	9403	10258	6830	7414	4303	5663	8623	6532
CX	10620	9398	8217	10885	11759	11795	11224	11533	7413	9360	10197	6754	7367	4228	5613	8575	6485
CY	10639	9433	8253	10914	11782	11826	11250	11550	7451	9382	10231	6798	7391	4271	5639	8601	6510
CZ	9846	6997	5935	8964	10428	9527	9623	10766	5095	8423	7864	3827	6554	2850	5224	7432	5961
DA	9835	6988	5926	8955	10418	9519	9614	10756	5085	8412	7856	3818	6543	2837	5212	7421	5949
DB	9828	6998	5931	8962	10419	9531	9616	10750	5088	8404	7866	3825	6529	2806	5188	7415	5930
DC	10950	9986	8817	11380	12154	12324	11668	11843	8043	9745	10760	7469	7800	4947	6081	9014	6918
DD	9805	6981	5912	8943	10398	9515	9596	10726	5068	8381	7849	3807	6504	2777	5160	7391	5903
DE	9796	6962	5896	8926	10385	9495	9582	10718	5053	8373	7830	3790	6500	2786	5164	7383	5903
DF	9785	6958	5890	8921	10377	9492	9575	10707	5046	8361	7827	3785	6486	2765	5145	7371	5887
DG	9777	6953	5884	8915	10370	9487	9569	10699	5040	8354	7821	3779	6478	2756	5136	7364	5878
DH	9780	6945	5879	8909	10368	9478	9565	10701	5036	8356	7813	3773	6484	2772	5149	7366	5887
DI	9769	6941	5873	8904	10360	9475	9558	10690	5029	8345	7810	3768	6470	2753	5131	7355	5872
DJ	9740	6888	5827	8856	10320	9419	9515	10660	4986	8317	7756	3718	6453	2768	5132	7327	5864
DK	10769	8089	6994	10028	11436	10632	10656	11700	6135	9345	8960	4908	7405	3475	5925	8364	6733
DL	10767	8106	7006	10040	11442	10650	10665	11700	6146	9344	8977	4925	7399	3460	5910	8364	6722
DM	10756	8043	6955	9989	11409	10584	10624	11686	6099	9332	8914	4863	7401	3491	5939	8349	6740
DN	10742	8077	6979	10013	11416	10622	10638	11675	6119	9319	8949	4897	7376	3439	5889	8339	6700
DO	10735	8048	6954	9988	11398	10591	10617	11666	6096	9311	8919	4867	7373	3449	5898	8330	6705
DP	10905	9994	8830	11367	12120	12318	11644	11794	8063	9712	10763	7512	7778	4995	6067	8991	6897
DQ	9696	6825	5768	8796	10266	9354	9458	10614	4931	8273	7692	3658	6416	2762	5112	7282	5836
DR	9670	6797	5741	8768	10239	9326	9431	10589	4904	8248	7664	3631	6393	2746	5092	7257	5814
DS	10720	8049	6952	9986	11391	10593	10612	11653	6092	9297	8920	4868	7355	3423	5873	8317	6683
DT	10715	8087	6981	10014	11404	10634	10632	11649	6118	9292	8959	4907	7339	3385	5835	8315	6654
DU	10711	8045	6947	9981	11384	10590	10606	11644	6087	9288	8917	4864	7345	3410	5861	8308	6671
DV	10698	8080	6972	10005	11391	10628	10620	11633	6108	9276	8952	4901	7321	3364	5813	8299	6634
DW	10697	8069	6962	9995	11385	10616	10613	11631	6099	9274	8941	4889	7322	3369	5819	8297	6637
DX	10696	8072	6965	9998	11386	10620	10615	11630	6102	9274	8944	4893	7320	3365	5815	8296	6634
DY	10817	7777	6785	9781	11314	10263	10481	11725	5980	9399	8630	4676	7589	3977	6326	8407	7035
DZ	10813	7775	6782	9779	11311	10261	10478	11721	5977	9395	8628	4673	7584	3970	6320	8403	7030
EA	10692	8021	6923	9957	11362	10565	10584	11624	6064	9269	8892	4840	7328	3397	5847	8289	6656
EB	10692	7989	6898	9932	11348	10530	10565	11622	6041	9268	8859	4808	7335	3423	5871	8285	6672
EC	10679	8004	6907	9941	11347	10548	10568	11610	6048	9255	8875	4823	7315	3386	5836	8274	6644
ED	10677	8005	6907	9941	11346	10549	10567	11609	6048	9253	8876	4824	7312	3382	5832	8273	6640
EE	7336	6882	5812	7989	8592	8998	8176	8217	5204	6189	7556	5143	4353	3180	2814	5547	3503
EF	7495	7343	6311	8329	8812	9362	8456	8345	5750	6431	7978	5763	4706	3845	3301	5868	3895
EG	8116	4463	3910	6437	8160	6636	7254	8900	3487	6845	5184	2557	5684	4404	5404	5947	5615
EH	7017	7006	6010	7915	8349	8959	8015	7860	5498	5979	7612	5618	4311	3884	3016	5451	3531
EI	7042	7049	6055	7951	8378	8996	8048	7883	5545	6010	7653	5666	4350	3929	3062	5488	3573
EJ	7023	7021	6027	7926	8356	8971	8024	7865	5516	5988	7626	5638	4324	3905	3033	5462	3545
EK	6949	6962	5973	7858	8283	8904	7953	7790	5469	5916	7563	5605	4259	3901	2984	5394	3484
EL	2672	4417	5407	2396	1214	2262	1747	2177	6254	3600	3609	7519	5552	9307	7312	4347	6433
EM	2842	4428	5443	2417	1367	2194	1822	2369	6297	3728	3604	7552	5658	9379	7414	4450	6541
EN	4066	4457	5610	2726	2583	1905	2572	3762	6485	4630	3585	7632	6337	9728	8024	5138	7207
EO	3756	5720	6736	3711	2449	3400	3083	3033	7587	4855	4889	8845	6848	10640	8613	5654	7726
EP	4859	5852	6988	4025	3385	3307	3684	4308	7863	5698	4980	9032	7546	11078	9273	6333	8426
EQ	4879	5868	7005	4043	3405	3323	3704	4328	7880	5718	4996	9048	7565	11095	9292	6352	8446

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## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WTG																	
ER	1947	4823	5624	2885	1125	3176	2038	1141	6407	3229	4136	7714	5272	9215	7026	4145	6122
ES	5187	6230	7368	4406	3726	3683	4055	4602	8244	6059	5358	9409	7920	11459	9650	6707	8801
ET	5200	6238	7376	4415	3738	3690	4066	4615	8252	6071	5365	9416	7931	11468	9660	6717	8812
EU	4503	6639	7652	4630	3302	4294	3988	3694	8502	5688	5807	9763	7704	11534	9470	6521	8576
EV	5179	7070	8129	5095	3911	4628	4522	4396	8990	6315	6217	10228	8310	12083	10075	7114	9188
EW	4400	6364	7398	4367	3127	3983	3760	3635	8253	5530	5523	9504	7528	11319	9293	6335	8405
EX	5056	7043	8087	5055	3818	4627	4458	4258	8945	6216	6196	10192	8221	12017	9986	7030	9096
EY	5076	7064	8108	5075	3838	4647	4479	4276	8966	6237	6216	10212	8241	12038	10007	7050	9117
EZ	4683	6732	7761	4732	3454	4352	4113	3886	8615	5849	5892	9869	7858	11668	9624	6669	8732
FA	3869	6886	7721	4897	3195	4945	4084	2932	8506	5252	6153	9813	7286	11267	9014	6204	8109
FB	5072	6141	7275	4306	3611	3597	3946	4487	8151	5947	5269	9321	7812	11361	9544	6598	8693
FC	7193	8532	9671	6696	5824	5982	6284	6463	10546	8221	7659	11709	10148	13754	11895	8935	11030
FD	6982	8443	9570	6575	5637	5901	6131	6232	10444	8041	7571	11623	9986	13633	11739	8776	10869
FE	5396	7576	8599	5573	4245	5190	4939	4550	9451	6618	6736	10709	8642	12484	10407	7464	9511
FF	5621	8115	9091	6095	4626	5814	5398	4721	9926	6923	7297	11205	8965	12876	10722	7818	9819
FG	7196	8539	9677	6702	5827	5989	6289	6464	10552	8225	7666	11716	10152	13760	11900	8940	11035
FH	5138	7232	8264	5234	3943	4837	4614	4315	9118	6330	6390	10371	8346	12168	10112	7161	9218
FI	5047	7946	8830	5933	4296	5846	5154	4111	9631	6424	7179	10933	8461	12436	10192	7368	9287
FJ	5765	8148	9145	6133	4717	5804	5461	4879	9988	7044	7320	11259	9082	12971	10844	7924	9942
FK	5776	8150	9149	6136	4723	5803	5466	4891	9992	7053	7321	11262	9091	12978	10852	7931	9951
FL	5142	7249	8279	5250	3952	4857	4627	4316	9132	6337	6408	10387	8354	12180	10120	7171	9226
FM	5414	7609	8631	5605	4270	5227	4968	4564	9481	6640	6770	10740	8665	12511	10430	7488	9534
FN	5014	8011	8870	6006	4337	5964	5212	4074	9661	6407	7258	10967	8436	12423	10157	7362	9253
FO	5994	8178	9210	6181	4860	5770	5554	5134	10063	7229	7334	11318	9255	13101	11020	8079	10123
FP	5993	8182	9213	6184	4862	5775	5557	5132	10066	7229	7339	11321	9256	13103	11021	8080	10124
FQ	7211	8574	9711	6733	5848	6026	6315	6476	10587	8246	7702	11752	10177	13791	11926	8965	11060
FR	6778	8027	9169	6204	5383	5477	5812	6076	10045	7769	7155	11204	9679	13260	11421	8466	10562
FS	6770	8027	9168	6201	5376	5476	5808	6067	10044	7764	7154	11204	9674	13258	11417	8461	10557
FT	6784	8040	9182	6215	5391	5489	5821	6081	10057	7778	7167	11216	9688	13271	11431	8475	10571
FU	5251	7911	8851	5888	4343	5692	5154	4335	9673	6584	7113	10963	8628	12567	10377	7500	9473
FV	5010	8042	8892	6042	4361	6016	5242	4068	9678	6407	7294	10985	8433	12424	10149	7366	9246
FW	5269	7923	8864	5900	4358	5700	5167	4354	9687	6601	7124	10977	8645	12584	10395	7516	9490
FX	6079	8263	9296	6267	4948	5852	5641	5218	10150	7316	7419	11404	9343	13188	11108	8167	10211
FY	5998	8253	9274	6249	4896	5863	5608	5128	10124	7251	7414	11385	9283	13144	11047	8112	10148
FZ	5282	7933	8875	5910	4369	5708	5178	4366	9698	6614	7133	10987	8657	12595	10407	7528	9503
GA	7007	8328	9467	6492	5631	5778	6084	6285	10342	8025	7455	11506	9948	13550	11695	8736	10831
GB	6012	8193	9226	6196	4878	5783	5571	5153	10079	7247	7349	11334	9273	13118	11038	8097	10141
GC	7215	8585	9722	6742	5854	6037	6323	6478	10597	8253	7713	11764	10185	13801	11934	8973	11068
GD	5993	8224	9248	6222	4880	5827	5585	5127	10099	7240	7383	11358	9270	13126	11034	8098	10136
GE	6182	8257	9307	6273	5009	5817	5674	5337	10165	7393	7406	11410	9411	13231	11177	8227	10283
GF	6278	8279	9340	6306	5079	5821	5724	5444	10201	7471	7424	11439	9483	13284	11249	8294	10357
GG	6300	8286	9349	6314	5096	5824	5736	5467	10210	7489	7430	11447	9500	13297	11265	8310	10374
GH	6174	8261	9309	6276	5005	5824	5673	5327	10166	7387	7411	11412	9407	13229	11173	8224	10278
GI	6165	8297	9339	6307	5014	5870	5694	5311	10194	7390	7449	11444	9413	13247	11179	8233	10283
GJ	7351	8703	9842	6867	5987	6153	6453	6615	10717	8386	7830	11880	10316	13925	12064	9104	11198
GK	6554	8399	9482	6452	5308	5906	5910	5742	10349	7711	7536	11571	9707	13467	11472	8510	10585
GL	6305	8333	9390	6356	5117	5879	5769	5466	10251	7506	7479	11491	9520	13328	11286	8334	10394
GM	5470	7697	8715	5691	4342	5321	5048	4614	9564	6706	6860	10825	8734	12587	10498	7560	9601
GN	7054	8378	9517	6543	5680	5829	6134	6330	10393	8075	7506	11556	9998	13601	11745	8786	10881
GO	7004	8362	9498	6518	5636	5815	6100	6274	10373	8033	7490	11541	9963	13576	11711	8751	10846
GP	6277	8262	9325	6290	5072	5800	5712	5445	10186	7466	7406	11423	9476	13273	11242	8286	10350
GQ	5766	8189	9180	6173	4738	5858	5492	4874	10020	7055	7364	11294	9095	12992	10854	7940	9952
GR	5013	7742	8664	5721	4144	5566	4971	4092	9480	6358	6955	10774	8401	12350	10147	7281	9242
GS	6810	8117	9255	6280	5427	5568	5874	6096	10130	7819	7244	11295	9739	13338	11485	8526	10622
GT	6054	8248	9279	6250	4926	5840	5622	5192	10132	7292	7404	11387	9320	13168	11085	8145	10188
GU	5984	8239	9260	6235	4881	5849	5593	5114	10110	7237	7400	11370	9268	13130	11032	8098	10133
GV	6050	8249	9280	6251	4925	5843	5622	5187	10132	7290	7406	11388	9318	13167	11083	8143	10185
GW	7288	8655	9792	6814	5926	6106	6395	6549	10667	8326	7782	11833	10258	13872	12006	9046	11140
GX	5096	7087	8132	5099	3860	4670	4502	4295	8990	6259	6240	10236	8264	12061	10029	7073	9139
GY	5124	8155	9007	6154	4476	6122	5355	4182	9793	6522	7406	11101	8548	12539	10263	7482	9360
GZ	6961	8375	9505	6517	5605	5830	6084	6222	10380	8006	7502	11554	9944	13575	11695	8733	10827
HA	5355	7155	8227	5194	4062	4687	4647	4584	9092	6470	6297	10321	8455	12204	10218	7254	9334
HB	7005	8406	9539	6552	5646	5861	6123	6267	10413	8047	7534	11586	9983	13611	11734	8772	10866
HC	5136	7821	8754	5798	4241	5618	5058	4218	9574	6473	7027	10865	8516	12459	10265	7391	9360
HD	5658	8051	9046	6036	4612	5716	5360	4772	9887	6938	7225	11159	8977	12867	10737	7819	9836
HE	7108	8461	9598	6620	5740	5912	6204	6377	10473	8138	7588	11639	10067	13678	11815	8855	10950

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## DECI BEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

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NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HF	7006	8419	9550	6562	5650	5874	6130	6265	10425	8051	7547	11599	9989	13621	11740	8778	10872
HG	5041	7132	8162	5133	3842	4742	4512	4221	9016	6229	6291	10270	8244	12066	10010	7059	9117
HH	6959	8234	9376	6408	5573	5683	6011	6247	10251	7963	7361	11411	9878	13465	11621	8665	10760
HI	7006	8424	9554	6566	5651	5879	6133	6265	10429	8053	7551	11603	9992	13624	11743	8781	10874
HJ	6951	8401	9528	6534	5602	5858	6093	6204	10402	8006	7529	11581	9949	13592	11702	8739	10832
HK	7121	8476	9613	6635	5754	5927	6218	6390	10488	8152	7603	11654	10081	13693	11829	8869	10964
HL	6945	8406	9532	6537	5599	5864	6093	6196	10407	8003	7534	11586	9948	13595	11701	8738	10831
HM	7012	8435	9565	6576	5658	5890	6142	6269	10440	8060	7563	11615	10000	13634	11752	8789	10883
HN	4868	7148	8148	5133	3745	4819	4468	4018	8992	6103	6321	10260	8133	11995	9897	6962	8999
HO	6978	8256	9397	6430	5593	5705	6032	6266	10273	7983	7383	11432	9899	13486	11642	8686	10781
HP	7289	8889	10006	6997	5985	6355	6521	6507	10879	8393	8019	12070	10361	14049	12120	9155	11242
HQ	7391	8933	10056	7055	6073	6393	6593	6618	10929	8481	8061	12113	10441	14110	12197	9232	11323
HR	7126	8830	9935	6916	5848	6308	6412	6327	10806	8256	7962	12009	10237	13956	11998	9034	11117
HS	7328	8775	9906	6916	5985	6230	6478	6573	10781	8390	7903	11955	10335	13975	12087	9124	11217
HT	7259	8750	9877	6881	5926	6208	6431	6497	10751	8332	7878	11931	10283	13938	12038	9074	11166
HU	7249	8883	9996	6983	5953	6352	6498	6461	10868	8362	8013	12063	10334	14032	12094	9128	11215
HV	7087	8962	10047	7017	5862	6464	6473	6260	10914	8262	8099	12135	10263	14032	12028	9069	11140
HW	6824	8593	9688	6662	5559	6084	6141	6020	10557	7966	7727	11769	9954	13693	11717	8754	10833
HX	6793	8583	9675	6648	5535	6077	6122	5986	10544	7940	7718	11759	9931	13675	11694	8731	10809
HY	6868	8609	9707	6683	5596	6095	6169	6068	10577	8003	7742	11786	9988	13718	11750	8786	10867
HZ	6695	8552	9636	6605	5456	6058	6062	5878	10502	7858	7690	11724	9856	13620	11621	8660	10734
IA	7375	8940	10061	7057	6063	6402	6589	6597	10934	8471	8069	12121	10434	14111	12191	9226	11316
IB	7238	8886	9997	6984	5946	6357	6495	6447	10870	8354	8016	12066	10328	14031	12088	9123	11209
IC	7388	8947	10068	7065	6075	6408	6599	6611	10942	8482	8076	12128	10445	14119	12202	9237	11326
ID	7140	8850	9955	6935	5864	6329	6430	6340	10825	8272	7982	12029	10254	13975	12015	9051	11134
IE	7099	8980	10064	7034	5876	6482	6489	6271	10931	8275	8116	12152	10278	14047	12043	9083	11154
IF	7268	8766	9892	6896	5937	6225	6444	6505	10767	8343	7895	11947	10296	13952	12051	9087	11178
IG	6688	8556	9638	6607	5452	6064	6061	5869	10505	7854	7694	11728	9853	13620	11618	8658	10730
IH	6949	8646	9750	6730	5665	6126	6227	6155	10621	8073	7778	11825	10053	13771	11814	8850	10933
II	7266	8781	9905	6906	5939	6240	6450	6499	10779	8345	7909	11961	10301	13962	12056	9092	11183
IJ	7429	8973	10096	7095	6113	6433	6633	6654	10970	8520	8102	12154	10480	14150	12237	9272	11362
IK	7448	8989	10112	7112	6131	6448	6651	6674	10986	8539	8117	12169	10498	14167	12255	9290	11380
IL	6984	8673	9778	6759	5699	6151	6258	6192	10649	8107	7804	11852	10086	13801	11847	8882	10966
IM	6710	8582	9663	6632	5475	6090	6085	5890	10529	7877	7719	11753	9877	13644	11642	8681	10754
IN	7097	8854	9952	6929	5834	6338	6413	6290	10822	8241	7987	12031	10228	13963	11991	9028	11108
IO	7223	8906	10014	6997	5941	6380	6500	6427	10885	8349	8037	12085	10327	14040	12089	9124	11208
IP	7094	8860	9957	6933	5834	6346	6415	6285	10827	8240	7993	12037	10229	13966	11992	9028	11108
IQ	7063	9015	10090	7057	5863	6530	6495	6223	10955	8257	8154	12183	10267	14056	12033	9076	11141
IR	7090	8729	9840	6827	5793	6201	6339	6304	10712	8201	7860	11910	10173	13874	11933	8968	11054
IS	7241	8795	9915	6912	5924	6257	6446	6468	10789	8331	7924	11976	10292	13966	12049	9084	11174
IT	7254	8803	9924	6921	5936	6265	6457	6482	10798	8343	7932	11984	10303	13975	12060	9095	11185
IU	7462	9009	10132	7131	6147	6469	6669	6686	11006	8554	8137	12189	10515	14186	12272	9307	11397
IV	7243	8921	10030	7013	5959	6395	6517	6447	10901	8367	8052	12101	10346	14057	12107	9142	11226
IW	7193	8906	10011	6991	5919	6385	6486	6392	10882	8327	8038	12085	10309	14031	12071	9107	11189
IX	7101	8742	9853	6839	5804	6214	6351	6314	10725	8213	7873	11922	10185	13886	11945	8980	11066
IY	6323	8339	9398	6364	5130	5882	5779	5485	10259	7521	7484	11498	9534	13339	11300	8346	10407
IZ	6331	8342	9402	6368	5137	5884	5784	5494	10263	7528	7487	11501	9541	13345	11307	8353	10414
JA	7312	8692	9828	6848	5954	6143	6427	6570	10703	8354	7819	11870	10288	13907	12038	9076	11171
JB	7060	8586	9707	6705	5732	6047	6246	6296	10581	8139	7714	11766	10095	13761	11850	8886	10977
JC	7253	8811	9932	6928	5937	6274	6461	6479	10805	8345	7940	11992	10307	13982	12064	9099	11188
JD	7229	8807	9926	6919	5918	6272	6448	6452	10799	8326	7937	11988	10290	13972	12048	9083	11172
JE	7336	8976	10089	7076	6044	6444	6591	6546	10961	8452	8105	12156	10425	14125	12185	9220	11306
JF	7267	8949	10057	7040	5985	6423	6544	6470	10928	8393	8080	12128	10372	14084	12133	9168	11252
JG	6555	8412	9494	6463	5313	5921	5918	5741	10360	7716	7550	11583	9713	13476	11478	8517	10590
JH	7328	8705	9842	6863	5970	6157	6442	6587	10717	8370	7833	11883	10303	13921	12053	9092	11186
JI	6267	8345	9395	6362	5097	5903	5763	5420	10254	7480	7494	11498	9499	13320	11265	8316	10371
JJ	6255	8343	9392	6359	5089	5903	5757	5407	10250	7471	7492	11495	9490	13313	11256	8307	10361
JK	7243	8817	9935	6929	5931	6281	6459	6466	10809	8339	7946	11997	10303	13983	12060	9095	11184
JL	7036	8595	9713	6707	5716	6060	6239	6267	10587	8124	7724	11776	10085	13761	11842	8877	10967
JM	7392	8748	9887	6911	6030	6198	6497	6654	10762	8429	7875	11925	10359	13969	12108	9147	11242
JN	7384	8745	9884	6908	6023	6196	6491	6645	10759	8422	7873	11923	10354	13966	12102	9142	11237
JO	7236	8824	9941	6933	5927	6289	6460	6456	10814	8335	7953	12004	10301	13985	12059	9094	11183
JP	7111	8777	9885	6869	5822	6251	6375	6320	10757	8230	7908	11957	10206	13914	11967	9002	11087
JQ	7366	9000	10114	7103	6072	6468	6618	6575	10987	8481	8130	12181	10453	14151	12213	9248	11334
JR	7373	9005	10119	7108	6079	6472	6624	6583	10991	8487	8134	12185	10460	14157	12219	9254	11341
JS	7054	8888	9978	6950	5815	6384	6415	6234	10846	8218	8024	12063	10214	13971	11979	9017	11092

To be continued on next page...

## DECIBEL - Main Result

Calculation: Higgins - Noise Model - Jan 2023

...continued from previous page

	WTG																
NSA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JT	7050	8891	9980	6951	5813	6388	6415	6229	10848	8215	8027	12065	10213	13972	11977	9016	11090
JU	7075	8901	9991	6964	5833	6395	6431	6256	10860	8237	8036	12076	10233	13987	11997	9035	11110
JV	7085	8906	9997	6970	5842	6400	6438	6266	10866	8245	8041	12081	10241	13994	12005	9043	11119
JW	7057	8611	9730	6725	5736	6075	6258	6288	10603	8144	7740	11792	10104	13778	11861	8896	10986
JX	7176	8660	9787	6791	5840	6118	6343	6418	10661	8246	7789	11841	10196	13848	11950	8986	11078
JY	7073	8619	9739	6734	5750	6082	6270	6305	10612	8157	7748	11799	10116	13789	11873	8908	10998
JZ	7106	8779	9887	6870	5818	6254	6374	6313	10758	8227	7910	11959	10204	13914	11965	9000	11084
KA	7168	8804	9916	6903	5871	6274	6417	6381	10788	8280	7934	11984	10252	13951	12012	9047	11133
KB	7325	8869	9991	6989	6007	6330	6527	6552	10865	8414	7998	12050	10374	14044	12131	9166	11256
KC	7376	9022	10135	7122	6086	6491	6635	6584	11007	8494	8152	12202	10469	14170	12229	9264	11350
KD	7043	9074	10139	7105	5872	6603	6524	6191	11001	8257	8216	12237	10274	14084	12040	9089	11147
KE	7181	8673	9798	6802	5847	6131	6351	6421	10673	8252	7801	11853	10204	13859	11958	8994	11086
KF	7148	8806	9915	6900	5857	6278	6409	6358	10787	8266	7936	11985	10241	13946	12001	9036	11121
KG	7083	8920	10010	6981	5845	6416	6446	6263	10878	8248	8055	12095	10245	14003	12010	9048	11123
KH	7055	9088	10153	7119	5884	6618	6538	6202	11015	8270	8231	12251	10287	14098	12053	9102	11159
KI	7162	8825	9934	6919	5873	6298	6426	6371	10806	8281	7956	12005	10257	13964	12017	9053	11138
KJ	7184	8834	9945	6931	5891	6306	6441	6394	10817	8300	7965	12014	10274	13977	12034	9069	11155
KK	7163	8827	9936	6921	5874	6301	6428	6371	10808	8282	7958	12007	10258	13966	12019	9054	11139
KL	7321	8891	10011	7006	6009	6354	6537	6543	10884	8417	8020	12072	10381	14060	12139	9174	11263
KM	7299	8885	10003	6996	5991	6349	6523	6518	10876	8399	8014	12066	10365	14048	12123	9158	11246
KN	7270	8877	9992	6983	5967	6343	6505	6486	10865	8375	8006	12057	10344	14034	12103	9138	11225
KO	7168	8838	9946	6930	5881	6312	6436	6375	10818	8289	7969	12018	10266	13975	12027	9062	11147
KP	7150	8831	9938	6921	5866	6306	6424	6355	10810	8274	7962	12011	10252	13965	12013	9048	11133
KQ	7348	8910	10031	7027	6035	6372	6560	6572	10904	8443	8039	12091	10405	14081	12162	9198	11287
KR	7138	8828	9934	6916	5856	6304	6416	6342	10805	8264	7959	12007	10243	13958	12004	9040	11123
KS	7085	9459	10473	7452	6058	7068	6796	6185	11319	8381	8621	12585	10420	14313	12180	9265	11278
KT	7112	9479	10495	7473	6083	7086	6819	6213	11342	8406	8641	12606	10446	14337	12206	9290	11304
KU	7099	9316	10356	7325	6003	6885	6703	6219	11210	8359	8469	12462	10391	14248	12155	9220	11256
KV	7314	9973	10935	7951	6438	7670	7238	6384	11763	8668	9158	13049	10711	14661	12453	9592	11548
KW	7182	9532	10551	7527	6145	7132	6877	6284	11399	8473	8692	12661	10512	14400	12272	9354	11371
KX	7122	9533	10541	7524	6113	7153	6860	6217	11386	8425	8698	12654	10467	14368	12225	9315	11322
KY	7176	9717	10702	7700	6234	7377	7010	6257	11538	8507	8892	12816	10550	14478	12302	9415	11397
KZ	7143	9362	10402	7371	6048	6930	6749	6263	11256	8404	8514	12508	10436	14294	12200	9266	11301
LA	7122	9540	10546	7529	6116	7161	6865	6216	11390	8427	8705	12659	10468	14371	12226	9317	11323
LB	7190	9736	10720	7718	6251	7396	7028	6271	11556	8522	8912	12834	10566	14495	12317	9431	11413
LC	7213	9753	10738	7735	6271	7410	7046	6294	11575	8544	8927	12852	10588	14516	12339	9452	11435
LD	7109	9417	10442	7416	6052	7008	6774	6216	11292	8390	8574	12552	10426	14305	12188	9264	11287
LE	7379	9801	10809	7792	6380	7417	7128	6471	11654	8688	8965	12922	10729	14634	12486	9580	11583
LF	7096	9427	10448	7424	6049	7024	6777	6201	11297	8382	8586	12559	10420	14303	12181	9260	11279
LG	7055	9427	10441	7420	6027	7037	6764	6155	11287	8349	8589	12553	10389	14281	12149	9233	11247
LH	7106	9437	10458	7434	6060	7034	6788	6211	11307	8392	8596	12569	10430	14314	12191	9270	11290
LI	7134	9443	10468	7442	6078	7034	6801	6241	11318	8415	8601	12578	10453	14331	12214	9290	11313
LJ	7121	9456	10477	7452	6077	7053	6805	6226	11325	8408	8615	12587	10446	14331	12207	9287	11306

APPENDIX Q  
PROJECT TEAM CURRICULUM VITAE

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## PROFESSIONAL ASSOCIATIONS

- Environmental Services Association of Nova Scotia (ESANS)
- Canadian Land Reclamation Association (former Board Member)
- Halifax Chamber of Commerce
- OTANS member

## AREAS OF SPECIALIZATION

- Project Management
- Environmental Impact Assessment
- Public and Regulatory Consultation
- Permitting
- Infrastructure Planning and Construction
- Environmental Management System
- Natural Resource Inventories

## EDUCATION

- BSc., McGill University, Montreal (1990)

## TRAINING

- M.Eng. (pending), University of New Brunswick, Fredericton
- CEAA Screening Training
- Contaminated Sites Assessment and Clean-up
- EMS and Project Planning
- Conflict Management and Dispute Resolution
- Project Management Bootcamp, 2007
- ISO 14001 Orientation

## RELEVANT EXPERIENCE

Mr. Duncan is the President of Strum Consulting based in Bedford Nova Scotia. Shawn has also worked for both provincial and federal government departments, as well as having senior environmental experience in the private sector for the oil and gas industry. He has worked professionally in the environmental field throughout Canada and internationally for over 30 years. His areas of specialization include project planning and management, environmental impact assessment, infrastructure planning and construction, public consultation and regulatory support.

## REPRESENTATIVE PROJECTS AND ROLES

### NATURAL RESOURCE INVENTORIES AND SURVEYS:

**Environmental Effects Monitoring Programs, Paper Mills, NB – Project Manager:** Involved in the development, design, and implementation of EEM programs for five pulp mills that were required under federal regulations. These programs were multi-year in scope and involved both freshwater and marine systems.

**Assessment of Downstream Fish Migration, NB – Field Coordinator:** Involved in the study of the downstream migration patterns of juvenile blue-backed herring and alewife on the St. John River.

**Fish Habitat Assessments, NS, NB – Program Manager:** Coordinated a fish habitat assessment program that assessed over 500 watercourses that intersected a proposed pipeline corridor, in support of the EIA and provincial and federal permitting.

**Aerial Moose Survey, NB – Program Manager:** Managed and conducted a provincial aerial winter survey for moose, using helicopter.

**Development of Watershed Management Plan, Keswick River, NB – Program Manager:** Developed a watershed management plan for the Keswick River System in conjunction with the federal Department of Fisheries and Oceans.

**Numerous Fisheries and Aquatic Habitat Surveys, NS, NB – Project Manager:** Coordinated a number of freshwater fisheries and aquatic habitat surveys throughout the Atlantic provinces to provide baseline and monitoring data for a number of projects and developments.

**Identification of Fish Habitat Improvement Opportunities, NB – Project Manager:** Identified particularly beneficial opportunities for fish habitat improvement in New Brunswick, and determined strategies for project implementation.

**Development of Fisheries Management Plans, Recreational Fisheries Developments, NB – Technical Support:** Involved in the preparation of fisheries management plans to provide improved recreational salmonid fishing on private landholdings.

**Tropical Ecology, Bellairs Institute, Barbados – Field Assistant:** Attended a field course on tropical ecology and participated in research surveys of mangrove environments, reef ecosystems, and marine fisheries.

**Fish Behavioural Study, St. Andrews, NB – Field Assistant:** Conducted a two-month study underwater survey to observe the behaviour of juvenile Pollock under induced threat from predation.

**Marine Benthic Habitat Surveys, NS, NB – Field Assistant:** Conducted a number of marine benthic habitat and sampling surveys for the federal government to support dredging or wharf construction activities.

#### **ENVIRONMENTAL ASSESSMENTS:**

**Sydney Tar Ponds Environmental Impact Statement, Sydney, NS – Manager:** Mr. Duncan managed the EIS for the cleanup, which involved managing a large team of professionals, working closely with the proponent and their engineering consultant to prepare the 7-volume EIS for submission to federal and provincial regulators. Components included public and regulatory consultation, environmental baseline field work and human and ecological risk assessments. He also provided testimony during the three week public hearing process as part of a joint review panel.

**Environmental Impact Assessment, Keltic Petrochemical and LNG Facilities, NS – Project Manager:** Mr. Duncan acted as Project Manager for the preparation of a provincial EIA and a federal CSR for this combined petrochemical and LNG project. Managed a large consulting team and coordinated consultation with the public, stakeholders, and the regulatory agencies. Shawn also acted as panel lead at the 8-day provincial hearings that were part of the NS review process.

**Fundy Tidal Energy Project, NB – Senior Technical Reviewer:** Mr. Duncan provided senior technical input and senior review for the combined federal and provincial EA that was required as part of the Fundy Tidal Energy Project.

**Environmental Assessment, NB DoT, Route #11, NB – Senior Reviewer:** Mr. Duncan acted as the senior reviewer for a provincial EA for a new 4 lane highway in northern NB. This Project also included compliance with the federal CEA Act and required a number of natural resource surveys.

**Federal Comprehensive Study Report, Hamilton Harbour Clean-up, ON – Project Manager:** Mr. Duncan was the Project Manager and Senior Technical Reviewer for the federal CSR that was required as part of the Randle Reef Project in Hamilton Harbour.

**Environmental Impact Assessment, 25 MW Windfarm, Canso, NS – Project Manager:** Mr. Duncan conducted the environmental impact assessment for a windfarm and associated infrastructure. Components included public and regulatory consultation, environmental baseline field work, turbine site selection, and environmental impact assessment.

**Joint Federal-Provincial Environmental Assessment (Comprehensive Study) for the Black Point Quarry Project, Erdene Resource Development Corp, NS – Project Director:** Mr. Duncan was the Project Director responsible for senior review and client management for the environmental assessment project and EA scoping; scoping and coordination of field studies; regulatory and public consultation plans; and report preparation.

**Environmental Impact Assessment, Power Generating Facilities, Barbados – Project Manager:** Mr. Duncan was the Project Manager for the environmental impact assessment for a 250 MW power production facility and associated transmission line. Options that were considered for the facility fuel design included low-speed diesel engines and natural gas engines. Components included public and regulatory consultation, environmental baseline field work, and environmental impact assessment.

**Environmental Assessment, Maritimes & Northeast Pipeline, Mainline Expansion, NS, NB – Project Manager:** Mr. Duncan provided project management and development of the federal CEEA screenings for four compressor stations. This involved detailed site selection, field surveys and public, regulatory, and First Nations consultation programs.

**Environmental Impact Assessment, Terminal and Pipeline Facilities, Barbados – Project Manager:** Mr. Duncan prepared the EIA for a petroleum terminal facility and associated transmission pipelines. The existing bulk storage facilities were relocated from a coastal location in Oistins to a location near the airport. Components included public and regulatory consultation, environmental baseline field work, and pipeline route selection.

**Environmental Impact Assessment, Windfarm, Barbados – Project Manager:** Mr. Duncan conducted the Environmental Impact Assessment for a windfarm near Lamberts, Barbados. The project consisted of eleven 900 kW wind turbines. The EIA included public and regulatory consultation, environmental baseline field work, and environmental impact assessment.

**Environmental Impact Assessment, Prison Facility, Barbados – Project Manager:** Mr. Duncan prepared the Environmental Assessment for a new prison facility in Dodds, St. Philip. The previous prison was destroyed by fire and therefore there was an accelerated timeline to build a new facility to house the inmates. The EIA was completed ahead of schedule.

**Environmental Impact Assessment, Natural Gas Pipeline Route, Country Harbour, Nova Scotia to St. Stephen, New Brunswick – Assessor:** Mr. Duncan participated in the technical aspects of the corridor selection and environmental impact assessment of a 558 km pipeline, which included providing input on the definition of VECs, prediction of environmental effects, identification and analysis of design and route alternatives, socioeconomic impacts, contingency planning and compensation.

#### **ENERGY RELATED EXPERIENCE:**

**Regulatory Support and Joint Public Review, Sable Offshore Energy and Maritimes & Northeast Pipeline – Technical Support:** Mr. Duncan participated in, and provided environmental support to expert witness panel members testifying before a Joint Public Review Panel which included representatives of the National Energy Board.

**Detailed Route Assessment and Hearings Maritimes & Northeast Pipeline – Technical Support:** Mr. Duncan conducted a detailed analysis for the routing of the detailed 25 m easement for the mainline 30-inch pipeline. He also provided technical support for a detailed regulatory review of this easement through a NEB panel review process.

**Environmental Protection Plan, Maritimes & Northeast Pipeline – Management/Technical Support:** Mr. Duncan provided management and technical support for the development of an environmental protection plan for construction of 550 km of 30 inch natural gas transmission pipeline. Construction practices and protection measures were outlined in the EPP which would minimize potential impacts to the receiving environment.

**Maritimes & Northeast Pipeline – Construction Supervisor:** For the construction of the M&NP mainline and the Halifax lateral, Mr. Duncan fulfilled the role of construction supervisor. He provided supervision of a team of 20 environmental inspectors to oversee the implementation of environmental commitments and regulatory requirements during construction activities.

**Duke Energy, Environment, Health and Safety Audit, Natural Gas Distribution and Processing Facilities, Fort Nelson, British Columbia, and Northwestern Ontario – Lead Assessor:** Mr. Duncan conducted an EH&S compliance audit of distribution pipeline facilities in Ontario, and a gas processing facility in Fort Nelson. He verified compliance with applicable provincial and federal legislation and/or permits related to environmental and health and safety requirements for these types of facilities.

**Comprehensive Study, Halifax Lateral, Maritimes & Northeast Pipeline – Management/Technical Reviewer:** Mr. Duncan provided management support and technical review of a comprehensive EIA for the construction and operation of 120 km of 12 inch natural gas pipeline into Halifax. Shawn also acted as the construction supervisor to oversee the implementation of required environmental measures.

**Pipeline Evaluation and Coastal Mapping, Orimulsion Pipeline, NB – Project Manager:** Mr. Duncan was involved in the evaluation of an Orimulsion pipeline and the development of a coastal mapping for use in contingency and spill response planning for the transportation of Orimulsion. The Orimulsion was being transported to the NB Power generating station in Dalhousie New Brunswick.

## **ENVIRONMENTAL MANAGEMENT:**

**Sydney Tar Ponds Remediation – Project Director and Regulatory Manager:** Mr. Duncan fulfilled these senior roles during the Detailed Design of the Sydney Tar Ponds Clean-up and for the ongoing Construction Administration and Oversight for this Project.

**Inventory of Fish Processing Facilities, Environment Canada, Atlantic Provinces – Project Manager:** Managed a project that compiled and evaluated data and information of fish processing facilities in the Maritimes with the intent to evaluate waste treatment procedures for these operations.

**Acid Rock Mitigation and Construction Response Plan, Maritimes & Northeast Pipeline – Technical Support:** Participated in the development and implementation of a unique approach to the handling of acid rock during the planning and construction of the pipeline. A construction response plan (CRP) was developed in conjunction with regulators that addressed the identification, handling, and disposal of acid rock encountered during construction. In addition, the CRP outlined mitigation and risk analysis procedures that were developed for treatment of acid rock to be left on-site.

**Environmental Evaluation and Management, Canadian International Development Agency, India – Technical Support:** Assisted CIDA and the government of India in identifying hazardous waste streams and developing treatment strategies.

**Environmental Sensitivity Atlas, Baie de Chaleur, NB – Assessor:** Collected environmental information for the Baie de Chaleur region and used it to produce environmental sensitivity mapping for the region to support spill response planning.

**Inland Waters and Coastal Oceanographic Information Network, NB – Technical Support:** Provided technical support for a project to develop and apply an environmental information system for the Bay of Fundy and Chaleur Bay regions. The system combines metafiles, a knowledge-based system and a geographical information system. It is used both for EIAs of proposed projects and contingency planning and to identify development opportunities.

**Corporate EMS, Industrial Client – Project Manager:** Developed and provided implementation guidance for a corporate environmental management system that closely followed the requirements as set out in the ISO 14001 CSA standard.

**Environmental Performance Evaluation Training, India – Technical Support:** Provided technical input and conducted training to environmental professionals in India to provide an overview of EPE and the requirements under the ISO 14031 CSA standard.

**Wilderness Recreation Potential Assessment, Halifax, NS – Project Manager:** Prepared an assessment of the potential for wilderness recreational use of a forest area that will be bisected by the proposed Highway #113.

## AREAS OF SPECIALIZATION

- Project Management
- Environmental Assessment
- Ecological Assessment
- Habitat Assessment
- Regulatory Permitting, Monitoring, and Compliance Assessments
- Environmental Protection Plans
- Wetland/Watercourse Alterations
- Wetland and Fish Habitat Compensation

## RELEVANT EXPERIENCE

Ms. Smith is the Vice President of Environmental Assessments and Approvals. She has a strong background in a variety of environmental program and policy areas. Ms. Smith has extensive experience leading teams, as well as building relationships and communicating with the public, regulators, the Mi'kmaq of Nova Scotia, clients, experts, and other stakeholders.

Prior to her appointment as Vice President of Environmental Assessments and Approvals at Strum, Ms. Smith held a Team Lead position with the Impact Assessment Agency of Canada. That role included the following:

- Led a team of professionals in completing federal environmental and impact assessments to support the Minister in decision making.
- Managed all aspects of assembling project teams, executing priorities, performance, deliverables, and overall quality.
- Supported the team in conducting Indigenous consultation, coordinating with federal and provincial departments, communicating with proponents, and engaging with stakeholders.
- Supported the team in the technical review of regulatory submissions under the *Canadian Environmental Assessment Act, 2022* and the *Impact Assessment Act*.
- Advised senior Agency officials on complex regulatory considerations.

Ms. Smith also held multiple roles with Nova Scotia Environment which included the following responsibilities:

- Led the development, management, and implementation of the Risk-Based Audit Project. The purpose of this corporate priority project was to modernize inspection services by using risk to maximize the allocation of limited resources while fulfilling the Department's mandate.
- Conducted extensive cross-sector collaboration within the Department, including all regions, inspectorates, divisions, and staff levels to ensure the project met the needs of working level staff and the goals of senior management.
- Provided strategic policy support and analysis for departmental programs and policies using the Regulatory Management Process.
- Conducted focus group sessions, coordinated stakeholder consultation, and provided recommendations to senior management.
- Completed inspections, responded to complaints, reviewed applications, and generated approvals related to the protection and sustainable use of air, land, and water resources in NS.

## EDUCATION

- MES, Dalhousie University, Halifax, NS (2004)
- BSc. (Honours), Environmental Science, Acadia University, Wolfville, NS (2001)

## TRAINING

- GBA+ Micro-learning Series (2022)
- Cultural Safety (2021)
- Unconscious Bias (2021)
- Emergency First Aid (2021)
- Management Development Program (2019)
- Advanced Training, *Impact Assessment Act* (2019)
- Introduction to CEAA 2012 (November 2012)
- Water Management & Wetland Restoration Training Course, University of Guelph (2010)
- Screenings Under CEAA (2010)
- Aboriginal Relations Training (Ontario Ministry of the Environment) (2008)
- Negotiation and Mediation Training (Ontario Public Service) (2008)
- Orientation to CEAA (2007)
- Atlantic RBCA Applications (Dalhousie University) (2004)
- Management of Environmental Site Assessment (Dalhousie University) (2004)

At Strum, Ms. Smith previously held progressive management roles including acting as the Team Lead during a long-term secondment of a senior manager and managed all aspects of a variety of projects within the Environment Group, including environmental assessments, watercourse alteration applications, wetland alteration applications, wetland compensation, environmental protection plans, environmental monitoring, and ecological assessments. This also included successfully and simultaneously managing multiple provincial Environmental Assessments. Ms. Smith also has extensive experience creating budgets, schedules, staff resourcing and supervision, deliverables, and client communication. She has presented at public open houses, community liaison committee meetings, public hearings, and testified at a UARB hearing.

## REPRESENTATIVE PROJECTS AND ROLES

### Strum Consulting (current)

**Wind Power Environmental Assessments, 2022-2023 – Project Manager/Team Lead:** Providing senior review and management on several 100 MW+ wind farms in Nova Scotia.

### Impact Assessment Agency

**Boat Harbour Remediation Project, 2018-2022 – Team Lead:** Team Lead for the Agency's technical review of this project, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement. This project conducted the Agency's first external technical review as part of the process.

**Beaver Dam Mine Project, Fifteen Mile Stream Project, 2017-2022– Team Lead:** Team Lead for the Agency's technical review of these gold mining projects, as well as associated consultation with the Mi'kmaq of Nova Scotia and public engagement.

**Canso Space Port, Northern Pulp Replacement Effluent Treatment System, Touquoy Mine Expansion, Goldboro Gold Mine, 2017-2021 – Team Lead:** Team Lead for requests to the Minister for these projects to be subject to the *Impact Assessment Act*. Review and analysis involved input from federal departments and a decision package to the Minister.

**Howse Property Iron Mine Project, 2018– Team Lead:** Team Lead for the Minister's decision package for the Howse Property Iron Mine.

### Strum Consulting (past)

**Wind Power Environmental Assessments, 2011-2014 – Project Manager/Team Lead:** Project managed and coordinated all aspects of the provincial EA process for seven wind power projects ranging in size from 4 MW to 10 MW. Project components included wetlands, watercourses, wildlife, avifauna, bats, sound, shadow flicker, visual aesthetics, socio-economic conditions, and effects assessment. Also highly involved in public engagement activities including participation at several municipal planning meetings and project open houses, as well as the preparation of presentation materials (e.g. posters, handouts, etc.).

**South Canoe Wind Project, 2011-2013 – Project Manager/Team Lead:** Project managed and coordinated the completion of numerous desktop and field studies in support of a 100 MW wind power project. Studies included exclusion mapping; a desktop review of site habitat, species at risk (including flora, fauna, and avian species), and archaeological resources; a sound and shadow flicker assessment; a visual impact assessment; and field assessment for wetlands, watercourses, wildlife, and avian species. Managed the launch of the project website and completed the effects assessment for the biophysical components of the provincial environmental assessment registration document. Also developed presentation materials for and attended three public open houses and delivered multiple technical presentations to the Community Liaison Committee and as part of the Development Agreement Public Hearing process.

**CEAA Screening, Hansen Bridge Replacement, 2012 – Project Manager:** Project managed field assessments (stream assessment, archaeological surveys, and habitat characterization), desktop review, and effects assessments for a bridge replacement project under CEAA. Consulted with Nova Scotia Environment, Transport Canada (TC), and DFO to ensure all regulatory requirements were met.

## AREAS OF SPECIALIZATION

- Project Management
- Environmental Assessment
- Technical Program Development
- Wetland and Watercourse Alteration Permitting
- HADD Projects and DFO Authorizations

## RELEVANT EXPERIENCE

Mr. Dickey is the Manager of Environmental Sciences at Strum where he oversees the company's Environmental Science Group in conducting environmental assessments, research, and field assessment programs, as well as wetland and watercourse permitting projects.

Mr. Dickey joined the Strum team in 2012. He received his Masters of Resource and Environmental Management degree from Dalhousie University that same year. While studying at Dalhousie, Scott specialized in environmental assessment, project management, regulatory compliance management, and natural resource management. Scott also obtained a Bachelor of Science degree with Honours from Mount Saint Vincent University in 2009.

Scott is active in managing consulting projects, conducting environmental assessments, overseeing wetland and watercourse alteration applications, and Fisheries and Oceans Canada (DFO) authorizations. He is knowledgeable with provincial and federal approvals processes, as well as best industry practices for assessment and data collecting protocols. Scott is also a technical specialist in a number of specialized areas such as acoustic assessments and compliance consulting, avian radar assessments, environmental ecology, and environmental geomatics systems.

## REPRESENTATIVE PROJECTS AND ROLES

**Various Wind Power Projects, NS, 2020-Present, Environmental Scientist** – Coordinated and led the environmental assessment of several large (> 50 MW) wind power projects. This included the development of new services such as avian radar assessments, the coordination of several environmental research and assessment programs, regulatory consultation, and the coordination of the data analysis and technical reporting programs.

**L8005 Transmission Line Project, NS, 2020-2022, Environmental Scientist** – Managed and conducted several component studies as part of this transmission line project's environmental assessment, including an avifauna interaction study, wetland, watercourse and rare plant studies, and a Mainland Moose study.

**Chaswood Wetland Compensation Project, NS, 2020-2022, Environmental Scientist** – Identified, conceptualized, and developed a wetland expansion and enhancement project located near Chaswood, NS.

**Melford Atlantic Gateway Terminal Project, NS, 2016-2022, Environmental Scientist** – Managed and conducted several component studies, permitting programs, and prepared environmental management plans for this marine terminal project. This included conducting a wetland and watercourse assessment and obtaining alteration approvals for several dozen hydraulic features; preparing environmental management plans for the Project's construction and operation; and consulting with regulators and other stakeholders on the Project's regulatory requirements.

**Boat Harbor Remediation Project, NS, 2021, Environmental Scientist** – Researched, designed, and installed mitigations to improve water quality and reduce fish mortalities at the Boat Harbor remediation site.

## EDUCATION

- Masters of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2012)
- Bachelor of Science (Honours in Biology) - Mount Saint Vincent University, Halifax, NS (2009)

## TRAINING

- First Aid & CPR Level A - St. John's Ambulance (2021)
- WHMIS Certification - Construction Safety Association of Nova Scotia (2018)
- Project Management for Environmental Professionals - Eco Canada (2013)
- Risk Communication and Conflict Resolution Training - Eco Canada (2013)
- Over 80 Hours of Project Management Coursework - Dalhousie University's Faculty of Management (2010 -2011)

**Aulds Cove Avian Assessment, NS, 2015 to 2019, Environmental Scientist** – Completed pre- and post-construction avian studies and developed a risk model for the transmission line project which is located in a migratory bird flyway.

**Canso Spaceport Environmental Assessment, NS, 2018, Environmental Scientist** – Completed ecological assessments including avian assessments, bat assessment, flora and fauna assessments, and wetland and freshwater habitat assessments as part of the Project's Environmental Assessment.

**Windsor Forks Wetland Compensation Project, NS, 2014-2018, Environmental Scientist** – Contributed to the design and construction of a wetland creation project in which a wetland was created in the site of a quarry near Windsor, NS.

**Various Wind Power Project, NS, 2012-2018, Environmental Scientist** – Completed environmental assessments, wetland assessments, flora and fauna surveys, avian assessments, and post-construction bird and bat monitoring programs. Projects include, the CBU Wind Power Project, the North Beaverbank Community Wind Project, the Nine Mile River Community Wind Project, the Pockwock Community Wind Project, the Truro Heights / Millbrook Community Wind Project, and the Whynotts Community Wind Project.

**South Canoe Wind Project, NS, 2012-2018, Environmental Scientist** – Completed wetland assessments, flora and fauna surveys, ambient sound assessments, wind turbine sound warranty test, and assisted in geotechnical assessments.

**Canso Causeway Avian Study, NS, 2014-2016, Environmental Scientist** – Completed avian studies over several years and developed risk analysis framework and mortality prediction model.

**South Canoe Wetland Compensation Research Project, NS, 2014-2016, Environmental Scientist** – Completed a comprehensive research project as partial fulfillment of the wetland compensation requirement for the South Canoe Wind Project's wetland alteration. This included a comprehensive assessment and monitoring program of a number of reference wetland sites in Nova Scotia, as well as GIS analysis, vegetation, soil and hydrology data analysis, and reporting for the Project.

**Maritime Link Transmission Line Watercourse Assessment, NS, 2013- 2014, Environmental Scientist** – The scope of this project included the design and coordination of desktop and field programs to assess watercourse crossings and fish habitat along the footprint of transmission and grounding lines for the purpose of construction planning and permitting. This involved the identification and assessment of watercourses within the 90 km (combined) transmission and grounding line corridors in Cape Breton, as well as all associated site facilities and access roads. Responsible for completing field assessments including fish habitat and fish population assessment, preparation and maintenance of field data, and general communications.

**Trenton Generating Station, Benthic and Mixing Zone Studies, NS, 2013, Environmental Scientist** – An ecological assessment was completed to evaluate ecosystems in three water bodies, which receive effluents from the Trenton Generating Station's ash management facilities. The assessment incorporated an evaluation of benthic community composition (*i.e.*, benthic macro-invertebrates and macrophytes), as well as a characterization of habitat in the receiving waters. The ecological assessment was completed simultaneously with a mixing zone study, which was designed to provide guidance on determining effluent discharge limits outlined in the Operating Approval for the Trenton Generating Station, by determining concentrations of compliance parameters in the mixing zones of receiving effluent waters. Involved in all aspects of the Project including study design, the coordination and completion of the field programs, water quality sampling and sample management, data management, and reporting.

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## AREAS OF SPECIALIZATION

- Water Quality Assessments and Monitoring
- Marine Ecology and Biology
- Fish and Fish Habitat Assessments
- Wetland/Watercourse Assessments and Permitting
- Vegetation Surveys
- Environmental Assessment
- Wildlife Assessments

## RELEVANT EXPERIENCE

Ms. Mosher is an Environmental Scientist with Strum working in our Environmental Science Group. She has experience working in many aspects of technical projects and environmental assessments, including field surveys, interpretation of analytical results and data, conducting background research, reporting and regulatory permitting.

Ms. Mosher is an experienced field biologist and has conducted water quality sampling, sediment sampling, habitat assessment, and flora and fauna surveys. As a qualified wetland delineator in Nova Scotia, she has delineated numerous wetlands of a variety of habitat types and conducted multiple functional assessments for permitting and constraints assessments. She is knowledgeable of freshwater and marine fish species of the Maritimes and is proficient in fish sampling methodology. She has been active in fish habitat characterization and watercourse assessments and has performed water quality sampling at contaminated and remote sites. She has conducted an intensive study exploring the effect of anthropogenic pollution on terrestrial biogeochemical cycles.

Ms. Mosher has more than 12 years of experience conducting research and assessments in marine ecology. Her experience involves marine fish sampling, water quality assessments, benthic habitat surveys, and investigations into salt marsh communities. Her marine experience comprises projects in both academia and industry, as well as coordinating a stewardship program with coastal ecology community groups.

## REPRESENTATIVE PROJECTS AND ROLES

**Transmission Line Upgrade Environmental Assessment, NL (2020 - 2021) – Environmental Scientist:** Completed a desktop review, assessment of environmental impacts, with special consideration of nearby salmon rivers, and reporting to fulfill the permitting requirements for an environmental assessment release for the upgrade and rebuilding of 60 km of transmission line in Central Newfoundland. Developed an Environmental Protection Plan to mitigate potential environmental impacts during construction as a condition of the EA release.

**Substation Upgrades and Transmission Line Construction Environmental Assessment, NL (2020 - 2021) – Environmental Assessment – Environmental Scientist:** Completed a desktop review, assessment of environmental impacts, with special consideration of a nearby salmon river, and reporting to fulfill the permitting requirements for an environmental assessment release for the upgrade of a substation, including 2 km of new transmission line, in Central Newfoundland. Developed an Environmental Protection Plan to mitigate potential environmental impacts during construction as a condition of the EA release.

**Melford Atlantic Gateway Project, NS (2017 - 2021):** Participated in the collection and reporting of supplemental information in support of provincial and federal permitting for the construction of a marine terminal and associate rail line. Field assessments included wetland delineation, rare plant surveys, fish sampling and watercourse assessments.

## EDUCATION

- Master of Science (Earth and Atmospheric Sciences) - University of Alberta, Edmonton, AB (2013)
- Bachelor of Science (Hons.) – St. Francis Xavier University, Antigonish, NS (2010)

## TRAINING

- Backpack Electrofishing – Canadian Rivers Institute (2017)
- WESP-AC Training Course (2016)
- Pleasure Craft Operator License (2016)
- NSCSA WHMIS (2015)
- Wetland Delineation and Wetland Plant Identification – Fernhill Institute (2013)
- Canada Safety Council Defensive Driving Course (2012)

Prepared applications and supporting documentation for submissions for wetland alteration, watercourse alterations and Fisheries Act applications, including the preparation of compensation and offsetting plans.

**Windsor Forks Wetland Compensation Project, NS (2015 – ongoing) – Environmental Scientist:** Contributed in the design and construction for the restoration of 10 ha former quarry into wetland habitat.

**Wetland Delineation and Permitting, NS (2013 – ongoing) – Environmental Scientist:** Completed wetland delineation, functional assessments, and permitting submissions at numerous sites around Nova Scotia. Project included post-construction and pre-construction monitoring, compensation planning, and erosion and sedimentation control plans.

**Transmission Line Wetlands, Watercourses and Rare Plants Assessments, NS (2020) – Environmental Scientist:** Conducted wetland, watercourse and rare plant surveys along 60 km of transmission line, including data compilation and reporting.

**Marine Platform Installation Fisheries Act Application, NS (2020):** Prepared an application under Section 35 of the federal *Fisheries Act* related to the harmful alteration, disruption and destruction of fish habitat (HADD) for an infilling project within an active harbour. Work involved a desktop review of the marine environment, interpretation of benthic video footage, and the evaluation of environmental impacts on the marine habitat.

**Marine Aquaculture Facility Environmental Assessments, NS (2019 - 2020) – Environmental Scientist:** Completed reporting and research for environmental assessment registration documents for 6 marine based aquaculture facilities located throughout coastal Nova Scotia.

**Highway Interchange and Connector Road Environmental Screening and Permitting, NS (2018- 2020):** Completed wetland delineation, watercourse assessments and fish sampling in support of design and environmental permitting for a new highway interchange and connector road. Prepared an environmental assessment report and supporting documents, and associated wetland permitting.

**Lantz Development Wetland Assessments and Permitting, NS (2018 - 2020) – Environmental Scientist:** Completed wetland delineation, functional assessments and reporting to fulfill the requirements for a wetland alteration permit in support of two mixed-used residential and commercial developments.

**Drinking Water Supply Water Withdrawal Permit Renewal, NS (2018) – Environmental Scientist:** Prepared a water withdrawal permit for a drinking water supply, including assessment of environmental impacts and review of water quality data.

**Tidal Energy Environmental Assessment, NS (2017 - 2019) – Environmental Scientist:** Completed field surveys and report writing for an environmental assessment for a marine tidal energy development. Work completed included benthic invertebrate assessment, marine mammal surveys, interpretation of benthic habitat surveys, wetland delineation and rare plant surveys.

**Susie Lake Water Quality Monitoring Program, NS (2016-2018) – Environmental Scientist:** Conducted a monthly water quality sampling program at watercourses and lakes adjacent to a busy commercial area and highway. Work included water sampling, interpretation of laboratory results and reporting.

**Spaceport Environmental Assessment, NS (2017) – Environmental Scientist:** Completed wetland assessments, rare plant surveys, and terrestrial mammal surveys at a remote coastal barren and bog site in Nova Scotia. Involved in the writing and assessment of environmental impacts to the surrounding environment from the development and operation of a rocket launch facility.

**Drinking Water Reservoir Dam Replacement Environmental Assessment, NS (2016) – Environmental Scientist:** Completed field assessments for vegetation, wetlands, and freshwater mussels. Contributed to the analysis of environmental effects on the surrounding aquatic and terrestrial environment for the replacement of a dam at a drinking water supply reservoir.

**Hardwood Lands Community Wind Project Environmental Assessment, NS (2015) – Environmental Scientist:** Involved in the completion of desktop research, wetland assessments, rare plant surveys, avian surveys, habitat mapping and moose surveys for a 6 MW wind power project environmental assessment.

**Marine Surveys for Wastewater Treatment System Upgrade at a Salmon Hatchery, NB (2015) – Environmental Scientist:** Completed desktop and field-based studies into environmental effects of effluent into a coastal bay off the Bay of Fundy. Studies include fish habitat assessment, dispersion modeling, water quality assessment and benthic habitat surveys.

**Dam Decommissioning Wetland and Rare Plant Assessments, NS (2015) – Environmental Scientist:** Completed wetland delineation, wetland functional assessments, and rare plant surveys at hydroelectric dam sites around Nova Scotia. Assessed the potential impact of dam decommissioning and changing water levels within reservoirs on sensitive environmental features.

**Belmont Wetland Compensation, NS (2015 - ongoing) – Environmental Scientist:** Concept design, pre-construction ecological monitoring and construction monitoring for the remediation of a former wetland at the Belmont Quarry in Belmont, NS, as part of wetland compensation.

**Auld's Cove Transmission Project Avian Assessment, NS (2016) – Environmental Scientist:** Conducted nocturnal bird surveys, audio surveys, desktop research and statistical analysis for an extensive avian assessment at the Auld's Cove transmission lines and the Canso Causeway.

**Susie Lake Developments Environmental Assessment, NS (2015) – Environmental Scientist:** Conducted desktop and field studies, including a mainland moose monitoring program, water quality sampling and socio-economic analysis for a large residential and commercial subdivision.

**Safe, Clean Drinking Water Project Environmental Constraints Assessment, NB (2014) – Environmental Scientist:** Participated in desktop analysis and field studies identifying environmental constraints for the construction and upgrade of a city-wide drinking water distribution system. Components included wetland delineation, fish sampling, rare plant surveys, fish habitat assessments, reporting and permitting consultation.

**Safe, Clean Drinking Water Project Groundwater Site Environmental Assessment, NB (2014) – Environmental Scientist:** Participated in the desktop analysis and field studies to determine the environmental baseline condition at the site of three proposed groundwater wells. Field studies included wetland delineation and functional assessment, fish sampling, and fish habitat assessment.

**Marine Terminal Expansion Environmental Assessment, NB (2014) – Environmental Scientist:** Completed desktop studies, background research and analysis of environmental impacts on marine environmental components including fish habitat, benthic habitat, navigation and marine mammals.

**Maritime Link Transmission Line Wetland and Rare Plant Assessment, NL and NS (2013 - 2014) – Environmental Scientist:** Conducted field surveys to assess rare plants and wetlands along the footprint of the transmission and grounding lines for the purpose of construction planning and permitting. This involved the identification and functional assessment of wetlands and areas of rare plants along a combined total of 500 km of transmission and grounding line corridor as well as all associated site facilities.

**Marine Training Mitigation Measures (2014) – Environmental Scientist:** Participated in a desktop analysis to identify environmental impacts of naval at-sea training exercises throughout North America and Europe. This involved the identification of environmental components and potential adverse impacts, and the development of appropriate mitigating measures.

**Chebucto Terence Bay Wind Farm Project Environmental Assessment, NS (2014) – Environmental Scientist:** Completed desktop studies, background research and analysis of environmental and socio-economic impacts for a 7.2 MW wind farm.

**Aboiteau Replacement Fisheries Application, NS (2014) – Field Biologist:** Conducted fish sampling and fish habitat assessments and compiled a fisheries application to assess the impact of replacing an existing aboiteau on the local fish population.

**Sediment Erosion Control Program, NB (2014) – Environmental Scientist:** Conducted statistical analysis to determine the effectiveness of erosion control measures around watercourses at an active military base.

**Fish Monitoring Program, NL (2013) – Environmental Scientist:** Fish sampling, watercourse assessments and water quality analysis as part of an ongoing fish and fish habitat monitoring program at a highly contaminated military site. Fish tissue was analyzed for contaminant concentration and the resulting trends were analyzed.

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## AREAS OF SPECIALIZATION

- Field Program Design and Logistics Coordination
- Environmental Assessment
- Wetland Delineation and Functional Assessment
- Watercourse and Wetland Alteration Permitting
- Marine near-shore and Water Quality Monitoring
- Avian Studies
- Regulatory and Public Consultation

## RELEVANT EXPERIENCE

Mr. Doane joined the Strum team in 2020 as an Environmental Intern, while working towards his Master of Resource and Environmental Management degree at Dalhousie. While studying at Dalhousie, Angus specialized in natural resource management in Nova Scotia, especially in the coastal zone. Angus obtained his Bachelor of Science degree in 2019 from Mount Allison University, where he specialized in Environmental Chemistry and Microbiology. He completed his honours thesis in organic and inorganic synthesis of maltol-derived thiopyridinone ligands for various environmental and anti-bacterial applications. To complement the lab-based skills associated with research, Angus has experience in field-based collection and preparation of environmental samples from his academic studies.

Mr. Doane is active in conducting environmental assessments, wetland functional assessments, delineations, and compensation projects, completing radar, avian, wetland, watercourse, flora, lichen, and wildlife surveys, and other ecological studies. He has planned and coordinated multi-team fieldwork across large projects in remote locations throughout Nova Scotia. Away from the field, he is knowledgeable with Provincial and Federal approvals and permitting processes and works closely with senior staff to prepare reports and regulatory submissions, as well as prepare materials for, and participate in, public and regulator consultation components for Environmental Assessments. He complements freshwater and marine survey work with deckhand and operator experience in near-shore marine survey projects. Mr. Doane also serves on the Joint Occupational Health and Safety committee as an environmental science team representative. Also, Angus is experienced in working with multi-disciplinary teams through the Dalhousie Faculty of Management, in the Management Without Borders and Tri-Course class-structures, beyond his time with Strum.

Mr. Doane held a previous position with Environment and Climate Change Canada (ECCC) as a water quality technician. He conducted water sampling in many bays, harbours, and estuaries around Nova Scotia from Pubnico to Cape North, dealing with all matters of leading a field crew on a day-to-day basis. This included trailering, launch and recover practices, regular boat, motor, trailer and vehicle maintenance, as well as training and aiding new staff in acclimating to the work. Processing of samples was also completed on a daily basis using the modified A1 method in a level 3 CALA certified microbiology lab.

## EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2021)
- Bachelor of Science (Honours in Chemistry) - Mount Allison University, Sackville, NB (2019)

## TRAINING

- Wetland Ecosystem Service Protocol – Atlantic Canada (WESP-AC) – Maritime College of Forest Technology (2021)
- Wetland Delineation Training – Maritime College of Forest Technology (2020)
- Small Vessel Operator Proficiency “SVOP” and Marine Emergency Duties “MED A3” - Survival Systems Training Limited (2017)
- Wilderness First Aid - St. John’s Ambulance (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2021)
- VHF Radio Restricted Operators Certificate – Industry Canada (2017)

## REPRESENTATIVE PROJECTS AND ROLES

### **Various Wind Farm Project Environmental Assessments, NS – Environmental Scientist/Field Coordinator:**

- **Goose Harbour Lake Wind Farm Project, NS, (2021 – Present)**
- **Mersey River Wind Farm Project, NS, (2021 – Present)**
- **Weavers Mountain Wind Farm Project, NS, (2021 – Present)**
- **Ellershouse Wind Farm Project, NS, (2021 – Present)**
- **Apitamkiejit Windfarm, NS, (2021 – 2022)**
- **Blueberry Acres Windfarm, NS, (2021 – 2022)**
- **Panuke Lake Wind Farm, NS, (2021 – 2022)**
- **Melvin Lake Wind Farm Project, NS (2021 – Present)**
- **Sandy Point Wind Farm Project, NS (2021 – 2022)**
- **Higgins Mountain Wind Farm Project, NS, (2020 – Present)**

Coordinated and completed all aspects of field surveys for Environmental Assessments, including wetland, watercourse, fish & fish habitat, avian, avian radar, bat, wildlife, flora, and lichen surveys. Prepared, reviewed, and organized field data using several methods of collection. Prepared materials for and participated in public consultation meetings, as well as aiding in the preparation of materials for public outreach. Led regulatory meetings to brief provincial and federal agencies on project activities. Prepared EA related documents, including methodologies, effects assessments, and desktop reviews.

**Avian Radar Studies for Wind Development, NL, 2022 – Present - Environmental Scientist** – Aided in the design and construction of avian radar monitoring systems for 4-season deployment in harsh coastal and inland environments in Newfoundland, including siting and remote monitoring.

### **Ruth Falls Hydroelectric Monitoring, NS, 2021-Present - Project Coordinator/Environmental Scientist:**

Completed Swallow nesting/monitoring surveys during the fall 2021 migration period. Designed, coordinated, and conducted a wetland and wetland fish & fish habitat monitoring program considering wetland fish habitat functions.

**Melford Atlantic Gateway Terminal Project, NS, 2020-Present – Environmental Scientist:** Completed comprehensive research as partial fulfillment of the wetland compensation requirement for the Melford Terminal's wetland alteration. This has included a comprehensive search of potential sites across Antigonish and Guysborough counties based on the precedence of other wetland compensation projects, as well as aiding in the design and implementation of the engineered wetlands to be created. Supported regulatory consultation for watercourse alteration applications and impacts to fish and fish habitat, especially salmonid species.

### **L8001 and L8005 Transmission Line Project, NS, 2020-2022 – Environmental Scientist/Field Coordinator:**

Planned, coordinated and completed Wetland and watercourse assessments, wildlife surveys, and rare plant and lichen surveys, along the linear corridor spanning 100 km from the NS/NB border to Onslow, NS. These surveys involved preparing desktop and safety tools for field staff, as well as preparing reports respective to each of the surveys.

**Boat Harbor Remediation Project, NS, 2021, Environmental Scientist** – Monitored water quality through seasonal tide cycles, before aiding in the research and installation of mitigations to improve water quality and reduce fish mortalities at the Boat Harbor remediation site.

**GWRR Watercourse Alteration Approval and Fish Surveys, NS, 2021 – Environmental Scientist:** Conducted electrofishing / fish salvage for an emergency watercourse alteration along a section of railway. This involved the capture, identification, documentation, and release of fish from the impacted section of the watercourse. Conducted further watercourse assessments to aid in the alteration approval process.

**Canadian Shellfish Sanitation Plan – Shellfish Water Classification Program, NS, 2017-2019 – Water Quality Technician:** Completed three summers of fecal coliform testing of coastal waters around the province of Nova Scotia to aid in the classification of areas for shellfish harvesting. This involved extensive travel, sample collection, processing and overall upkeep of field equipment across a fleet of boats, vehicles, and associated gear. Lab and sample processing work included QA and QC procedures, sample reading, media production, waste management, and sample inoculation.

## AREAS OF SPECIALIZATION

- Environmental Reporting and Permitting
- Wetland and Watercourse Assessment
- Wildlife Surveying and Assessment
- Remediation and Reclamation
- Environmental Emergency Response
- Dangerous Goods Assessment

## RELEVANT EXPERIENCE

Miss Eichinger first joined the Strum team in 2020 as an Environmental Intern, while working towards her Masters of Resource and Environmental Management degree at Dalhousie. While studying at Dalhousie, Lyndsay specialized in remediation, environmental assessment, and natural resource management in Nova Scotia. Lyndsay also obtained her Bachelor of Science degree in 2019 from the University of British Columbia where she specialized in Earth and Environmental Science with a minor in Economics.

During her graduate studies, Lyndsay conducted a desktop study on the Boat Harbor Remediation Project, producing a technical review paper evaluating the cost-effectiveness of the different remedial components and technologies considered by the project. This paper has since been published in the journal Remediation titled: Review of remedial options for the Boat Harbour remediation project in Nova Scotia, Canada.

Lyndsay is active in conducting environmental assessments, wetland delineations, watercourse assessments, bat surveys, and other ecological studies. She has conducted significant fieldwork across large projects in remote locations. She is knowledgeable with provincial and federal regulations, working closely with senior staff preparing reports and regulatory submissions. Lyndsay is experienced working with multi-disciplinary teams through the Dalhousie Faculty of Management, in the Management Without Borders and Tri-Course class-structures, beyond her time with Strum.

Lyndsay held a previous position with RAM Environmental Response as a HAZMAT Responder based in the BC interior. Her role was fast-paced and multidisciplinary, working in tandem with senior management on emergency response planning and remediation teams on site. Lyndsay has responded to an array of emergency situations involving dangerous goods, such as train derailments and fuel spills, all requiring coordination between clients, contractors, first responders, and government parties. She has a strong background in safety protocols, erosion control implementation, response tactics, and emergency remediation measures for a variety of contaminants. Lyndsay is well practiced in remote travel along with ATV, snowmobile, and 4x4 use.

## REPRESENTATIVE PROJECTS AND ROLES

**Environmental Assessment Registration and Environmental Protection Plan, NL, 2022 – Junior Environmental Professional:** Completed reporting requirements for the submission of an EA Registration Document and associated Environmental Protection Plan for a transmission line decommissioning project located in Newfoundland and Labrador.

**Ellershouse Wind Farm Environmental Risk Assessment, NS, 2022 – Junior Environmental Professional:** Conducted a desktop study to characterize environmental risk, mitigation, and management measures for a wind farm located in Ellershouse, NS. This report was then used to inform constraints analysis and Project design features.

**Windsor Forks Wetland Compensation Project, NS, 2021-2022 – Junior Environmental Professional:** Completed reporting requirements for the final year of wetland monitoring and assessment for a constructed wetland.

## EDUCATION

- Masters of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2021)
- Bachelor of Science - University of British Columbia (2019)

## TRAINING

- ATV Certification (2022)
- RPAS Pilot Certification (2022)
- BICO – Search and Rescue Program (2022)
- Electrofishing Certification (2021)
- Standard First Aid and WHMIS (2021)
- Stream Gauging Training from UBC (2019).
- Environmental Impact Assessment Certificate received from the Centre for Environmental Assessment Research at UBC (2019).
- Derailment Response - CP Railway (2018)
- Railway Safety Training (2018)  
Transportation of Dangerous Goods (2018)

**Weavers Mountain Wind Farm Moose Tracking Surveys, NS, 2022 – Junior Environmental Professional:**

Participated in field assessments for winter wildlife, with a focus on mainland moose and other species at risk. This involved walking predetermined transects through various habitats to identify and document evidence of wildlife such as tracks, scat, and browsing.

**GWRR Watercourse Alteration Approval and Fish Surveys, NS, 2021 – Junior Environmental Professional:**

Conducted electrofishing / fish salvage for an emergency watercourse alteration along a section of railway. This involved the capture, identification, documentation, and release of fish from the impacted section of the watercourse.

**Mahone Bay Well Installation and Monitoring, NS, 2021 – Junior Environmental Professional:** Groundwater well installs were completed at a construction site in Mahone Bay, NS along with vegetation transects to characterize the sites environmental features.

**Pirate Harbour Wind Farm Project, NS) 2021-Present – Junior Environmental Professional:** Participated in field assessments and Environmental Assessment report writing for a wind farm located in NS. Field surveys were conducted for wildlife, birds, wetlands, and watercourses. Environmental Assessment related documents such as field survey assessments, consultation, and background research were also completed.

**Mersey Wind Farm Project, NS, 2021 – Junior Environmental Professional:** Participated in field assessments and Environmental Assessment report writing for a wind farm located in NS. Field surveys were conducted for wildlife, birds, wetlands, and watercourses. Environmental Assessment related documents such as field survey assessments, consultation, and background research were also completed.

**Melford Atlantic Gateway Project, NS, 2020-Present – Junior Environmental Professional:** Completed various reporting and background research requirements such as consultation documents, engagement record keeping, and the development of a wetland compensation plan.

**Higgins Mountain Wind Farm Project, NS, 2020-Present – Environmental Technician:** Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments all contributing to the environmental assessment for the establishment of a windfarm. Involved in Environmental Assessment development, planning, and finalization.

**L8001 and L8005 Transmission Line, NS, 2020 – Environmental Technician:** Participated in wetland and watercourse assessments, Wildlife surveys, and rare plant and lichen surveys, along the linear corridor spanning 100kms from the NS/NB border to Onslow, NS.

**Shellfish Harvesting and the Persistent Threat of Sewage Pollution, NS, 2020 – MREM Tri-course project:** Working in a multi-disciplinary team to assess the threat of sewage pollution on the shellfish industry of Nova Scotia, including the biophysical, socio-political, law and policy aspects of the greater issue of pollution in the near shore environment. This involved research into government programs, policies and regulations, as well as different stakeholders in the industry.

## AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wetland Delineation & Functional Assessment
- Wildlife Surveying and Assessment
- Environmental Reporting and Permitting
- Baseline Study Data Collection & Interpretation

## RELEVANT EXPERIENCE

Mr. Kavanagh joined Strum in 2022, having just completed a master's degree in Resource and Environmental Management at Dalhousie University. While studying at Dalhousie University, Mr. Kavanagh specialized in freshwater resource management, wetland alteration/compensation, and stormwater management. He also obtained his diploma of engineering in 2016 and Bachelor of Science degree in 2018, from Saint Mary's University. While there, he completed an honours thesis focused on enhancing the effectiveness of wind power source assessment, responding to the need of having a measure of the relationship of wind speed and its consistency.

Throughout his academic career, Mr. Kavanagh has had the opportunity to partake in a number of research initiatives, including collecting and processing water chemistry data, the remediation of trampled pollinator habitat, an assessment of the carbon sequestration capabilities of species mixes within the boreal forest, and an evaluation of the acid rock drainage potential within the watersheds of Nova Scotia. Further, for the final project of his graduate studies, Darcy assessed the climate resiliency of wetland compensation projects within the province of Nova Scotia, providing a series of research-backed recommendations to continue working towards the provincial goal of no net loss of wetland structure and function, while also ensuring a net gain of climate resiliency.

Mr. Kavanagh has proven critical thinking and problem-solving skills through collaboration with multiple real-world organizations. This includes a partnership with the Atlantic First Nations Water Authority to analyze the biophysical, socio-political, and law & policy related dimensions associated with the self-determination of water resources in First Nations communities, as well as aiding the District of Argyle in their efforts to mitigate their localized mosquito problem through a series of research tactics including a literature review, policy review, jurisdictional scan, and feasibility analysis. For the internship portion of his graduate degree, Mr. Kavanagh worked with a consulting company where he was involved with various tasks including soil, sediment, and surface water sampling, wetland delineation, electrofishing, watercourse assessment, and air quality monitoring.

Mr. Kavanagh is active in conducting numerous field surveys to fulfill baseline studies, environmental permits, and conditions of approval, as well as any relative complementary desktop research. Further, Mr. Kavanagh is well practiced in working in remote areas, along with ATV, snowmobile, and 4x4 use.

## REPRESENTATIVE PROJECTS AND ROLES

### Various Wind Farm Project Environmental Assessments, NS – Environmental Scientist:

- **Goose Harbour Lake Wind Farm Project, NS, (2022 – Present)**
- **Mersey River Wind Farm Project, NS, (2022 – Present)**
- **Weavers Mountain Wind Farm Project, NS, (2022 – Present)**
- **Higgins Mountain Wind Farm Project, NS, (2022 – Present)**
- **Ellershouse Wind Farm Project, NS, (2022 – Present)**

## EDUCATION

- Master of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2022)
- Bachelor of Science (Honours in Environmental Science) - Saint Mary's University, Halifax, NS (2018)
- Diploma of Engineering - Saint Mary's University, Halifax, NS (2016)

## TRAINING

- Wetland Ecosystem Services Protocol - Atlantic Canada (WESP-AC) Training – Maritime College of Forest Technology (2022)
- Wetland Delineation Training – Maritime College of Forest Technology (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2022)
- Wilderness First Aid – Saint John Ambulance (2022)

Responsible for conducting field assessments and Environmental Assessment report writing for multiple prospective wind farm locations in NS. Field surveys were conducted for terrestrial flora & fauna, herpetofauna, avifauna, fish & fish habitat, wetlands, and watercourses. Other methods of data collection included snowshoe expeditions, ATV driving, and trail camera, acoustic monitor, and ultrasonic monitor deployment. Environmental Assessment documentation included field data compilation and interpretation to inform effects assessments, mitigation measures, and monitoring strategies.

**Ruth Falls Wetland Monitoring, NS (2022 – Present) – Environmental Scientist:** Responsible for conducting field assessments and report writing for a wetland and wetland fish & fish habitat monitoring program to be completed 2022 – 2027 to facilitate the dewatering of the reservoir necessary for capital upgrades. Field assessments included wetland delineation & functional assessment, monitor well installation, vegetation plot monitoring, and in-situ water chemistry sampling.

**Nesting Bird Searches, NS (2022 – Present) – Environmental Scientist:** Surveyed prospective project areas for the presence of nesting birds. Collected field data related to any observed species and reported on the findings. Flagged buffer areas for any identified species.

**Wetland Delineation and Permitting, NS (2021 – Present) – Environmental Scientist:** Completed wetland delineation, functional assessments, and permitting submissions at numerous sites around Nova Scotia. Projects include pre-construction and post-construction monitoring, compensation planning, contingency planning, and erosion and sedimentation control planning.

**L8001 and L8005 Transmission Line, NS (2022) – Environmental Scientist:** Participated in wetland and watercourse assessments, wildlife surveys, and rare plant and lichen surveys along the linear corridor spanning 100 km from the NS/NB border to Onslow, NS.

**Goldboro Liquefied Natural Gas (LNG) Project, NS (2021) – Environmental Scientist:** Undertook soil and water sampling, stream flow monitoring, and avian surveys to satisfy conditions for environmental permits and approvals for the construction of an LNG facility. Soil samples were taken along the perimeter of the study area in order to delineate the presence of contaminants associated with historic gold mining. Water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. Surveys included MBBA-style early morning passerine surveys, nighttime nocturnal surveys following the *Nova Scotia Nocturnal Owl Survey* sampling methodology, as well as circumnavigating multiple waterbodies and conducting waterfowl nest surveys. Other tasks included the periodic maintenance and data extraction of both acoustic avian monitors and ultrasonic bat monitors.

**Highway 102 Aerotech Connector Road Project, NS (2021) – Environmental Scientist:** Responsible for conducting field surveys and aiding in the reporting for birds and bats to inform science-based decision making within the project laydown area. Surveys included acoustic monitoring, point-count surveys, and nighttime nocturnal surveys. Other tasks included the periodic maintenance and data extraction of ultrasonic bat monitors, as well as aiding in the development of a wildlife crossing plan to mitigate wildlife-vehicle collisions.

**Goldenville Historic Mine Remediation Project, NS (2021) – Environmental Scientist:** Flow monitoring was conducted at eight locations within and around the Goldenville Gold Mine site in tandem with a surface water sampling program. A total of eight transducers were submerged (one per sample site), along with an additional datalogger nearby to measure air pressure. A discharge transect was also completed for each sample site using a handheld flow meter. Surface water samples were analyzed in a lab for parameters including total & dissolved metals, dissolved organic carbon, and total suspended solids. This program was conducted as part of an ecological risk assessment for the remediation of the contaminated tailings area.

**Touquoy Gold Mine DustTrak Air Monitoring Program, NS (2021) – Environmental Scientist:** Responsible for conducting direct-read real time sampling in response to periodic elevated dust levels at the Touquoy Gold Mine Site, in order to better understand the reasons for the elevated dust levels. TSI DustTrak instruments were used to strategically perform monitoring upwind and downwind of known areas of concern. During the monitoring, record was taken of any mining activities occurring, localized weather conditions, and any other potential dust sources in the area. This program was useful for providing a relative comparison of on-site dust levels, offering a good indication of whether compliance with the IA could be achieved.

## AREAS OF SPECIALIZATION

- Wetland and Watercourse Assessment
- Wildlife Surveying and Assessment
- Ecological Forestry and Agriculture
- Benthic Invertebrate Analysis

## RELEVANT EXPERIENCE

Ms. Schultz joined the Strum team in 2022 as an Environmental Scientist upon completing her coursework for her Masters of Resource and Environmental Management degree at Dalhousie. While studying at Dalhousie, Ms. Schultz specialized in a number of different areas of natural resource management in Nova Scotia, such as forestry, agriculture, and wetlands. She obtained her Bachelor of Science degree in 2019 from the University of Manitoba in the department of biological sciences where she specialized in ecology and environmental sciences. Her honours thesis focused on the ecological application of double-stranded RNA-based pesticides to control flea beetles in canola cropping systems in Manitoba. This project incorporated both field-based sample collection and lab-based sample preparation using techniques in molecular biology.

During her graduate studies, Ms. Schultz worked on a number of large projects, collaborating with multidisciplinary teams to contribute to local issues. As her final MREM Research Project, she produced GIS and statistics-based recommendations for Nova Scotia Natural Resources and Renewables regarding identification of old-growth forest locations in the province. Through the Dalhousie Faculty of Management's 'Management Without Borders' course, Ms. Schultz helped develop recommendations for pest control in the Municipality of the District of Argyle. She also developed an understory vegetation sampling protocol to be used in the Acadia Research Forest by the Canadian Forestry Service.

Ms. Schultz's most recent work experience includes contributing to a research project on bat activity hosted by a global non-profit organization by conducting statistical analysis on acoustic data. Ms. Schultz held a previous position with Nova Scotia Department of Lands and Forestry as a summer intern while completing her graduate studies. This role required remote field work to carry out the provincial old-growth scoring protocol, and desktop GIS-based work to plan and navigate to study locations. Prior to this internship, Ms. Schultz held a position with Agriculture and Agri-Foods Canada as a Junior Policy Analyst. In this role, she focused on the development of the Clean Fuel Standard, which included significant correspondence with agricultural stakeholders and a major deliverable of a jurisdictional scan of clean fuel regulations across the world.

Ms. Schultz is active in conducting ecological studies to contribute to a variety of environmental assessments. She has conducted significant fieldwork across large projects in remote locations, in both Nova Scotia and Manitoba. She is knowledgeable with provincial and federal regulations, working closely with senior staff preparing reports and regulatory submissions.

## REPRESENTATIVE PROJECTS AND ROLES

**Environmental Effects Monitoring Program, Halifax International Airport Authority, NS, 2022-Present – Environmental Scientist:** Conducting preliminary research, planning, field work, data composition, and reporting for benthic macroinvertebrate monitoring plan following CABIN protocol.

## EDUCATION

- Masters of Resource and Environmental Management (MREM) - Dalhousie University, Halifax, NS (2022)
- Bachelor of Science (Hons.) - University of Manitoba, Winnipeg, MB (2019)

## TRAINING

- Wetland Ecosystem Services Protocol for Atlantic Canada Training – Maritime College of Forest Technology (2022)
- Wetland Delineation Training – Maritime College of Forest Technology (2022)
- Backpack Electrofishing – Canadian Rivers Institute (2022)
- Pilot Certificate for Small Remotely Piloted Aircraft System (RPAS), Visual line-of-sight (VLOS) – Transport Canada (2022)
- Wilderness First Aid and CPR "C" – St. John's Ambulance (2022)

**Environmental Assessment, Higgins Mountain Wind Farm, NS, 2022-Present – Environmental Scientist:**

Reporting on terrestrial habitat and flora at the Project site in support of an in-progress Environmental Assessment.

**Environmental Assessment, Weavers Mountain Wind Farm, NS, 2022-Present – Environmental Scientist:**

Collecting winter and spring wildlife data and wetland and watercourse data, and reporting on various field programs for an Environmental Screening Report and in-progress Environment Assessment.

**Environmental Assessment, Mersey River Wind Farm, NS, 2022-Present – Environmental Scientist:**

Collecting winter and spring wildlife data and wetland and watercourse data, and reporting on various field programs for an in-progress Environment Assessment.

**Environmental Assessment, Goose Harbour Lake Wind Farm, NS, 2022-Present – Environmental Scientist:**

Collecting winter and spring wildlife data and wetland and watercourse data, and reporting on various field programs for an in-progress Environment Assessment.

**Environmental Assessment, Melvin Lake, NS, 2022-Present – Environmental Scientist:**

Collecting winter and spring wildlife data.

**Environmental Study, Apitamkiejit Wind Farm, NS, 2022 – Environmental Scientist:**

Reporting on winter wildlife tracking and winter avian surveys for an Environmental Screening Report.

**Environmental Assessment, Blueberry Acres Wind Farm, NS, 2022 – Environmental Scientist:**

Reporting on winter wildlife tracking and fall and winter avian surveys for an Environmental Screening Report.

**Environmental Assessment, Red Spruce Wind Farm, NS, 2022 – Environmental Scientist:**

Reporting on fall migration avian surveys for an Environmental Screening Report.

**Environmental Study, L8005 Transmission Line, NS, 2022 – Environmental Scientist:**

Collecting winter wildlife data, reviewing a summary report of winter field work, and preparing a proposal for an old-growth forest assessment within the transmission line right-of-way.

**Environmental Assessment, Ross Bay Junction, NF, 2022 – Environmental Scientist:**

Identifying previously collected benthic macroinvertebrate samples and preparing a report and data summary on the diversity and abundance of species present on the Project site.

## PROFESSIONAL ASSOCIATIONS

- Association of Professional Engineers of Nova Scotia (Engineer-in-Training)

## AREAS OF SPECIALIZATION

- Industrial Approvals
- Environmental Approvals
- Computer-Aided Design
- Hydrogeology
- Water Treatment
- Climate Change

## RELEVANT EXPERIENCE

Frank Gascon is an Engineer-in-Training with a Bachelor's Degree in Environmental Engineering from Dalhousie University in Halifax, NS. Since his employment with Strum, he has been involved in project management, engineering design, environmental monitoring, groundwater assessments, hazard assessments, environmental assessments, project reporting, and regulatory compliance.

Frank has worked directly with the Mechanical Engineering group to design solid waste transfer stations, waste audits, long-term monitoring and regulatory permitting for large Solid Waste and Waste to Energy Facilities. Similarly, he has worked with the Industrial Approvals and Permitting group on various Industrial Approval applications across multiple industries; and is well-versed in the development of Environmental Management Plans. Additionally, he has gained valuable experience from Strum's Senior Hydrogeologist, concerning groundwater assessments for potable groundwater supply development, evaluation and treatment of water quality issues, and review of factors that contribute to the degradation of groundwater resources at residential sites.

Before working with Strum, Frank researched the management and disposal of municipal drinking water treatment plant waste residuals in the Northwest Territories.

## REPRESENTATIVE PROJECTS AND ROLES

- **Dartmouth Municipal Compost Facility Environmental Monitoring Program, Dartmouth, NS, 2021 - Present – Intermediate Engineer:** Monitoring groundwater and surface water sampling, data compilation, data analysis, and regulatory reporting. Frank has prepared various approval amendment applications for submission to NSECC, direct correspondence with NSECC and streamlined the monitoring and reporting program.
- **Wind Turbine Environmental Assessments, Multiple Locations, NS, 2021 – Present – Intermediate Engineer:** Conducted watercourse, wetland, fish/fish habitat, wildlife and avian assessments required, and environmental assessment reporting. Developing greenhouse gas and climate change assessment criteria for quantifying effects or impacts from these and other Projects.
- **Groundwater Geothermal Heating and Cooling System Review and Permitting, Wolfville, NS, 2021 - Present – Intermediate Engineer:** Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.
- **Municipal Compost Facility Leachate Handling System, Dartmouth, NS, 2021 - Present – Intermediate Engineer:** Design, specification, and industrial approval amendment.

## EDUCATION

- Bachelor of Engineering (Environmental), Dalhousie University, Halifax, NS (2020)
- Civil/Mining Technician, Collège Boréal, Sudbury, ON (2010)

## TRAINING

- Standard First Aid & CPR
- Excavation and Trenching
- Confined Spaces

- **Level I and II Groundwater Assessments, Multiple Locations, NS, 2021 - Present – Intermediate Engineer:** Supervise well installation, pump testing (i.e., step and constant), sampling, analysis of aquifer characteristics, groundwater modelling, and regulatory reporting.
- **Groundwater Geothermal Cooling Systems, Wolfville, NS, 2021 - Present – Intermediate Engineer:** Withdrawal flow monitoring, water level monitoring, equipment inspection, water quality sampling, data compilation, data analysis, and regulatory reporting.
- **Production Field Centre Hazardous Materials Assessment, Sheet Harbour, NS, 2021 – Junior Engineer:** Hazardous Materials inventory, coordinate sampling, data analysis, and reporting.
- **Green House Gas Inventory Audit, Parrsboro, NS, 2021 – Junior Engineer:** Green House Gas auditing for Fisheries and Oceans Canada (DFO) application.
- **Air Quality Improvement Design, Labrador, NL, 2021 – Junior Engineer:** Design, specification, stack testing, data analysis, and construction of ventilation improvements.
- **Drinking and Wastewater Treatment Plant System Assessments, Baddeck, NS, 2021 – Junior Engineer:** Assess water and wastewater infrastructure, establish an asset inventory, and reporting.
- **Municipal Groundwater Withdrawal Compliance, Pictou, NS, 2021 – Junior Engineer:** Review pumping rates and withdrawal volumes, spatial interferences, sustainability concerns, data analysis, and regulatory compliance.
- **Registered Potable Groundwater Supply Assessment, Cape Breton, NS, 2021 – Junior Engineer:** Review design specifications, well logs, water quality, data compilation, data analysis, and regulatory compliance.

## AREAS OF SPECIALIZATION

- Marine Hydrographic Surveys
- Bathymetric Surveys
- Single Beam Sonar Surveys
- Multibeam Sonar Surveys
- Marine Benthic and Water Sampling
- Underwater Video
- Geographic Information Systems (GIS)

## COMPUTER EXPERIENCE

- Operating Systems: Windows, OSX, Linux
- Survey Software: HYPACK
- Seismic Software: SonarWiz, Coda
- GPS Software: Trimble Office, Waypoint GPS Processing, GravNav and GravNet
- GIS Software: ArcGIS, GRASS GIS
- CAD Software: AutoCAD Civil 3D
- Image Processing: Surfer, CARIS HIPS and SIPS
- Misc. Software: Grapher, Microsoft Office, Global Mapper, SonarPro

## EQUIPMENT EXPERIENCE

- GPS Equipment: Assorted Trimble and equipment for autonomous, differential, static, and RTK surveying (Pro XR, 4600, 4800, 5700/5800), Leica RTK, differential static and total stations
- Surveying Equipment: Knudsen BP320 echosounder, SSS Klein 595 and 3000, Teledyne Reson T20P multibeam, Teledyne Reson 7125 multibeam, Odom MB1 and MB2, Integrated Marine Acoustic Profiling System, Magnetometer, and various GPR equipment.
- Misc. Equipment: RBR XR620 CTD Probe and Tide Gauge, Eckman and Van Veen Grab Samplers, Underwater Camera, CNAV 0183 NMEA GPS receivers

## RELEVANT EXPERIENCE

Mr. Savelle is a Marine Surveyor and a GIS Specialist with Strum working in our Environmental Science Group. His area of speciality is in Marine Geomatics and conducting bathymetric and topographic surveys. He has extensive experience in surveying marine benthic surfaces and shorelines, obtaining overlapping hydrographic (multibeam, single beam and side scan sonar) data, data collection positioning and navigation, data processing and compilation, plotting and reporting of results. Matt also has experience collecting conventional total station data, RTK and static GPS data, and has been responsible for project set up, establishing GPS control points, and boat mobilization.

## REPRESENTATIVE PROJECTS AND ROLES

**EverWind Fuels Green Hydrogen Project, NS, 2022 - Present - Geomatics Specialist:** Project work includes geospatial analysis, supporting external inquiries, and integrating environmental and socioeconomic factors into the assessments.

**Wind Farm Projects, NS, 2022 - Present - Geomatics Specialist:** Project work includes streamlining field data collection, developing in house habitat modelling, tracking applications, and performing geospatial data analysis.

**Marine Survey for Offshore Oil & Gas Support Facilities, Sheet Harbour, NS, 2020 –** Detailed marine surveys were conducted as part of the planning and permitting process for a marine facility used to support the offshore oil and

## EDUCATION

- Centre of Geographic Sciences (COGS), Lawrencetown, Nova Scotia Advanced Diploma in Marine Geomatics (2010)
- Saint Mary's University, Halifax, Nova Scotia Bachelor of Science Degree (BSc) (2009), major in Biology and Minor in Geography

## TRAINING

- Marine Basic First Aid
- St. John Ambulance, Level A CPR
- St. John Ambulance, Canadian East Coast Offshore Fitness Certificate
- Med A1 Offshore Survival Systems,
- WHMIS

gas industry. Bathymetric and multibeam sonar surveys were completed to provide a detailed bottom profile and water depths in areas of Sheet Harbour that will be used for large vessel movements. This information will be used to determine proper clearances for vessels and to determine if additional dredging is required. In addition to collecting this survey information, digital video was captured to document the types of marine habitat in the area to support applications for federal approvals.

**Chedabucto Bay Marine Surveys for Aquaculture Facilities, NS, 2020** – As part of the detailed siting of marine aquaculture facilities, bathymetric and single beam sonar surveys were completed to provide a detailed bottom profile and water depths in multiple areas of St. Marys Bay. In addition to collecting this survey information, digital video was captured along predetermined transects to document marine habitats, and benthic sediment samples were collected with a Van Veen grab for analysis. Marine survey data was processed to generate detailed digital bottom profiles.

**St. Marys Bay Marine Surveys for Aquaculture Facilities, NS, 2019-2020** – As part of the detailed siting of marine aquaculture facilities, bathymetric and single beam sonar surveys were completed to provide a detailed bottom profile and water depths in multiple areas of St. Marys Bay. In addition to collecting this survey information, digital video was captured along predetermined transects to document marine habitats, and benthic sediment samples were collected with a Van Veen grab for analysis. Marine survey data was processed to generate detailed digital bottom profiles.

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## AREAS OF SPECIALIZATION

- Remote Sensing
- Geographic Information Systems (GIS)
- LiDAR
- Photogrammetry
- Location, spatial, and data analytics
- Geoprocessing, Model Building, and automation
- Database management
- Geomorphology

## COMPUTER EXPERIENCE

- Operating Systems: Windows, macOS
- GPS Software: Garmin BaseCamp, Trimble Geospatial
- GIS Software: ArcGIS Suite, QGIS, Global Mapper
- Remote Sensing Data Processing: Trimble Inpho, POSPac MMS, LAStools
- Other Software: CoreDRAW X7
- Scripting: Python 2 & 3, SQL

## EDUCATION

- Master of Science in Applied Geomatics, Acadia University, Wolfville, NS (2021)
- Advanced Diploma in Geographic Information Systems (GIS), Centre of Geographic Sciences (COGS), Lawrencetown, NS (2020)
- Bachelor of Science, Major in Geology Saint Mary's University, Halifax, NS (2019)

## TRAINING

- Standard First Aid (2022)
- WHMIS (2022)
- RPAS Pilot Certification (2021)
- Over 200 hours ESRI Academy Training (2019 – Present)

## RELEVANT EXPERIENCE

Mr. Opra is a GIS Specialist with Strum working in our Environmental Science Group. Mr. Opra specializes in Geomatics analysis and automation. He has extensive experience in implementing workflows for data analysis and processing. This experience includes trajectory processing, processing single and dual channel LiDAR data, photogrammetry, and automation of geospatial data analysis with both vector and raster data. In addition, Mr. Opra is experienced in operating a RPAS for data collection.

During his graduate studies, Mr. Opra focused on the application of remote sensing technologies in exploration geology. He investigated LiDAR as an effective means to visualize topography and in further detail, geomorphological features such as folds and glacial structures. He explored the advantages of both RPAS and airplane-acquired LiDAR while reviewing various software for processing and analysis. Mr. Opra helped support the project's RPAS surveys in Trafalgar, Nova Scotia and processed the data to produce high resolution terrain models.

Prior to and following his research contribution, Mr. Opra worked in academia as an advisor, then in the industry as a Geospatial Data Analyst and as a Remote Sensing Analyst. In academia, he assisted with an Honours thesis in developing a geospatial model to automatically detect sinkholes based on LiDAR data. He also assisted in a Master's thesis by mapping legacy gold mine tailings, and developing a survey grid for sampling. As a geospatial data analyst, he helped create new data products using multispectral imagery for precision agriculture. Through working on various LiDAR and Photogrammetry projects based throughout the Caribbean, USA, and Canada, Mr. Opra was able to apply automation to photogrammetry procedures and LiDAR processing. His commitment to data quality assurance and control, allowed him to develop a deeper understanding of how data is affected by environmental and human factors. His experience in both geology and environmental science allows him to have a strategic approach for geospatial analysis in environmental consulting.

Due to the multidisciplinary nature of Geomatics, Mr. Opra developed the ability to anticipate, identify, and solve diverse geospatial problems. Mr. Opra continues to research advancements in technology to build on and develop efficient procedures for data analysis and collection.

## REPRESENTATIVE PROJECTS AND ROLES

**EverWind Fuels Green Hydrogen Project, NS, 2022 - Present - Geomatics Specialist:** Spearheaded geospatial analysis, supported external inquiries, and integrated environmental and socioeconomic factors in the assessments.

**Wind Farm Projects, NS, 2022 - Present - Geomatics Specialist:** Streamlining field data collection, developed in house habitat modelling, tracking applications, and performing geospatial data analysis.

**Sinkhole Delineation Automation, NS, 2021 - 2022 - Advisor:** Assisted in the development of a model within ArcGIS Pro for automating detection and delineation of sinkholes in the Karst prone areas.

**LiDAR and Orthoimagery Data Production, Caribbean, USA, and Canada, 2021 - 2022 - Remote Sensing Analyst:** Trajectory processing, LiDAR processing, automation, and creation of data products from inception to delivery.

**Epiphytic Lichens as Spatial Biomonitors of Airbourne Mercury and Arsenic, 2019 - Research Intern:** Used GPS to map historical mining sites and designed survey grids for Lichen collection.

**Multispectral Vineyard Imagery Data Production, California, USA, 2020 - Geospatial Data Analyst:** Assisted with the development of new proprietary geospatial products for precision agriculture.

**Provenance and Diagenesis of Sandstones in the Deep Wells Annapolis G-24, Balvenie B-79, Crimson F-81, Weymouth A-45, and Newburn H-23, Scotian Basin, offshore NS, 2017 - 2018 - Research Assistant:** Creation of graphic models and diagrams using data captured by a scanning electron microscope (SEM) to further research efforts in understanding the geology of the Scotian Basin.

**Petrography of Bedrock and Ice-rafted Granules, Flemish Cap, Offshore Newfoundland and Labrador, 2017-2018, Research Assistant:** Determining petrographic information of the samples using a scanning electron microscope (SEM). Energy dispersive spectroscopy (EDS) was used to determine mineral composition and backscattered electron images (BSE) were used to identify textures. Graphic design software was used to aggregate the images captured from the SEM.

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## AREAS OF SPECIALIZATION

- Geographic Information Systems (GIS)
- Field Studies
- Avian Radar Analysis
- Wind Turbine Risk Assessment (Shadow Flicker, Noise Modelling & Visual Simulations)

## RELEVANT EXPERIENCE

Mr. Johnson first joined Strum in 2021 as an Environmental Field Technician working in our Environmental Science Group. His area of speciality is in Geographic Information Systems and Remote Sensing. He has extensive experience in data collection in the field, installation of monitoring equipment such as groundwater wells, bird and bat monitoring systems, and working with avian radar datasets and wind turbine analysis software. He is responsible for producing concise and accurate mapping products and incorporating them into the environmental assessment.

More recently, Mr. Johnson has been responsible for the predictive modelling of multiple wind farm projects around the province. This includes the shadow flicker and noise assessment impact on receptors in nearby communities, and photo-simulations visualizing turbines in each study area.

## REPRESENTATIVE PROJECTS AND ROLES

**Higgins Mountain Wind Farm, NS, 2021-2022 – Junior Environmental Technician/GIS Technician:** Environmental constraints were calculated and visualized using GIS software, producing mapping products to be used in the official environmental assessment. Avian radar systems were installed and used in various locations of the study area for the purpose of tracking bird activity. Detailed wind turbine risk assessment was conducted for the study area, including noise level and shadow flicker assessments, and photo-simulations visualizing turbines in each potential location.

**Pirate Harbour Wind Farm Project, NS) 2021-Present – Junior Environmental Technician / GIS Technician:** Responsible for the collection of field data, analysis, and production of accurate GIS mapping products to be used in the reporting process. Avian radar systems were installed and used in various locations of the study area for the purpose of tracking bird activity. Detailed wind turbine risk assessment was conducted for the study area, including noise level and shadow flicker assessments, and photo-simulations visualizing turbines in each potential location.

**Ellershuse Wind Farm, NS, 2022-Present – Junior Environmental Technician/GIS Technician:** Responsible for the collection of field data, analysis, and production of accurate GIS mapping products to be used in the reporting process. Detailed wind turbine risk assessment was conducted for the study area, including noise level and shadow flicker assessments, and photo-simulations visualizing turbines in each potential location.

**Weavers Mountain Wind Farm, NS, 2022 – Present - Junior Environmental Technician / GIS Technician:** Responsible for the collection of field data, analysis, and production of accurate GIS mapping products to be used in the reporting process. Detailed wind turbine risk assessment was conducted for the study area, including noise level and shadow flicker assessments, and photo-simulations visualizing turbines in each potential location.

**Mersey Wind Farm, NS, 2021 – Present - Junior Environmental Technician / GIS Technician:** Responsible for the collection of field data, analysis, and production of accurate GIS mapping products to be used in the reporting process. Avian radar systems were installed and used in various locations of the study area for the purpose of tracking bird activity. Detailed wind turbine risk assessment was conducted for the study area, including noise level and shadow flicker assessments, and photo-simulations visualizing turbines in each potential location.

## EDUCATION

- Centre of Geographic Sciences (COGS), Lawrencetown, Nova Scotia Advanced Diploma in Geographic Information Systems (2020)
- Saint Mary's University, Halifax, Nova Scotia Bachelor of Science Degree (BSc) (2017), major in Geography

## TRAINING

- Canadian Drone Pilot Certificate (Basic)
- WHMIS
- ATV Training Course

**L8005 Transmission Line Moose Tracking Surveys, NS, 2022 – Junior Environmental Technician/GIS**

**Technician:** Participated in field assessments for winter wildlife, with a focus on mainland moose and other species at risk. This involved walking predetermined transects through various habitats to identify and document evidence of wildlife such as tracks, scat, and browsing. Additionally, responsible for the post-processing of field data and production of accurate GIS mapping products to be used in the reporting process.

**Various Wetland and Watercourse Delineation Projects, NS, 2021 – Present - Junior Environmental**

**Technician/GIS Technician:** Responsible for the post-processing of field data and production of accurate GIS mapping products to be used in the reporting process.

## AREAS OF SPECIALIZATION

- Stakeholder Management & Engagement
- Community Development
- Intercultural Communication
- Data Management and Analysis
- Digital Communications
- Qualitative Research
- Political Affairs

## RELEVANT EXPERIENCE

Ms. Morrison joined the Strum team in 2022. She is an experienced facilitator and community organizer with an interdisciplinary academic background. She has lived and worked in six provinces and brings this regional perspective to her work. Her diverse professional experience has fostered strong interpersonal and teamwork skills; she excels in communication, collaboration, and research.

During graduate studies, Ms. Morrison focused on environmental health, environmental racism, and First Nation consultation. She worked as a Qualitative Research Intern with the *Atlantic Policy Congress of First Nation Chiefs Secretariat*. In this role, she participated in the Atlantic consultation session for *Indigenous Circle of Experts Pathway to Canada Target 1* (protecting 17% of terrestrial areas and inland waters by 2020). She also prepared a summary and index of all First Nations' submissions to the federal review of the *Canadian Environmental Assessment Act* and *National Energy Board*. These findings were compiled into a formal report to inform member decision-making.

Prior to joining Strum, Courtney worked various political roles in Alberta, Nova Scotia, and Newfoundland & Labrador. In Alberta, she worked in both government and opposition, and represented the Minister of Health at stakeholder consultation sessions for the *Mental Health Services Protection Act*. In Nova Scotia, she managed a federal campaign (South Shore–St. Margarets). In Newfoundland & Labrador, she worked as a regional organizer and supported Indigenous and Inuk candidates running in Fortune Bay - Cape La Hune, Happy Valley-Goose Bay, and Torngat Mountains. In these roles, Courtney has gained experience developing outreach strategies and managing stakeholder, public, and Indigenous relations.

## REPRESENTATIVE PROJECTS AND ROLES

**Elmsdale (ELCO) Biochar Plant, NS, 2022-Present – Community Engagement Coordinator:** Supported client with presentation to town council.

**Ellershouse III Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Electromagnetic Interference and Engagement (Mi'kmaq, Government, Public, and Stakeholder) sections of the EA.

**EverWind Fuels Green Hydrogen Project, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Mi'kmaq, Government, Public, and Stakeholder Engagement, as well as these sections of the Class 1 Environmental Assessment (EA).

**Goose Harbour Lake Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Mi'kmaq, Government, Public, and Stakeholder Engagement, as well as these sections of the Class 1 Environmental Assessment (EA).

## EDUCATION

- Continuing and Professional Education, Change Leadership, University of Alberta, Edmonton, AB (2020)
- Master of Resource and Environmental Management, Dalhousie University, Halifax, NS (2018)
- Bachelor of Arts (Sustainability and Sociology), Dalhousie University, Halifax, NS (2013)

## TRAINING

- Standard First Aid, CPR, and AED (2022)
- WHMIS Certificate (2022)
- RBC Sustainability Leadership Certificate (2013)

**Higgins Mountain Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Engagement (Mi'kmaq, Government, Public and Stakeholder) sections of the EA.

**Laconia Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Mi'kmaq, Government, Public, and Stakeholder Engagement, as well as tracking public/stakeholder engagement efforts.

**Mersey River Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with public open houses, including ad design for local newspaper, and tracking public engagement. Also supported with Electromagnetic Interference, Engagement (Mi'kmaq, Government, Public, and Stakeholder) and Socioeconomic sections of the EA.

**Tusket Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Mi'kmaq, Government, Public, and Stakeholder Engagement, as well as tracking public/stakeholder engagement efforts.

**Weavers Mountain Wind Farm, NS, 2022-Present – Community Engagement Coordinator:** Supporting client with Electromagnetic Interference, Engagement (Mi'kmaq, Government, Public, and Stakeholder) and Socioeconomic sections of the EA.

## AREAS OF SPECIALIZATION

- Avifauna Surveys
- Wetland Delineation
- Plant Identification
- Rare Lichen Assessment

## RELEVANT EXPERIENCE

Mr. Pepper has been an active member of the Nova Scotia birding community for the past 14 years, and has participated in such projects as the Maritime Breeding Bird Atlas, the Maritime Nocturnal Owl Survey and the Christmas Bird Count. Chris served as the Field Trip Coordinator for the Nova Scotia Bird Society from 2010-12 and currently sits on the Executive Committee as a Director. Other current roles include acting as the Provincial Coordinator for the Nova Scotia Spring Migration Count.

Mr. Pepper has completed over 4000 hours of avian assessment surveys in Nova Scotia, Newfoundland, and Alberta, working for various companies including Strum Consulting, McCallum Environmental, WSP Ltd, CBCL Ltd., Nature Conservancy of Canada, and Canadian Wildlife Service.

Chris completed multiple avifauna surveys on a series of offshore coastal islands. The study was completed to ascertain the use of the islands by shorebirds during the breeding season, and to identify relationships between habitat and species utilization for nesting and feeding. The importance of the habitat for bird migration periods was also evaluated.

Chris has also been heavily involved in the implementation of comprehensive avifauna surveys in support of multiple wind energy developments in Nova Scotia.

In 2014 Chris completed an extensive bird interaction study at the site of a coastal vehicular causeway crossing in eastern Nova Scotia. The study was conducted to gauge bird behavioural responses to, and interaction with, electrical power line infrastructure. Situated in a marine environment, the study consisted of marine and shorebird species identification, and relationship to migratory pathways, impacts to coastal colony nesting, and access to feeding areas.

In addition to Chris's Avian Assessment experience, he has completed over 3000 hours of Boreal Felt Lichen surveys for various organizations including Stantec, McCallum Environmental, Consulting, Mersey Tobeatic Research Institute, Northern Pulp, Port Hawkesbury Paper, Nature Conservancy of Canada, Nova Scotia Nature Trust, and others.

Chris is also an experienced Wetland Delineator, completing wetland surveys for various companies including McCallum Environmental, Strum Consulting and others.

## REPRESENTATIVE PROJECTS AND ROLES

**Nova Scotia Wind Farm Developments, NS, Ongoing – Expert Birder:** Responsible for completing seasonal avifauna surveys as part of Environmental Assessments in support of multiple proposed wind power projects.

**Offshore Island Bird Surveys, NS, Ongoing – Expert Birder:** Responsible for completing avifauna surveys on a series of offshore islands along the Eastern Shore of Nova Scotia.

**Canso Causeway Bird Study, NS, 2014 – Expert Birder:** Completion of avian abundance and species composition surveys at a marine causeway, and evaluation of potential migration pattern disturbance as a result of power line infrastructure.

## TRAINING

- Wetland Plant Adaption and Identification and Wetland Delineation (2012)
- First Aid (2015)

## MEMBERSHIPS AND ROLES

- Provincial Coordinator for the Nova Scotia Bird Migration Count
- Director for the Nova Scotia Birds Society

**Canada Warbler Study, NS, Ongoing – Expert Birder:** Completion of surveys to evaluate the potential shift in presence/absence and behavioural changes of Canada Warbler, as a result of local wind farm development.

**Abraham’s Lake Bird Surveys, NS, 2011 – Expert Birder:** Responsible for completing avifauna surveys in support of the acquisition of a parcel of land on behalf of the Nature Conservancy of Canada.

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**Education:** Master of Arts – History, Saint Mary’s University, 2011  
Bachelor of Arts – History and Social Anthropology, Dalhousie University, 1998

**Permits:** Nova Scotia Heritage Research Permits held since 2008  
Newfoundland and Labrador Historic Resources Impact Assessment Permits held since 2011  
Parks Canada Agency - Research and Collection Permits held since 2017

**Affiliations:** Saint Mary’s University, Adjunct Professor, Department of Anthropology (2014-Present)  
Acadia University, Part-time Professor, Department of History and Classics (2017)

Archaeological Land Trust of Nova Scotia (Director: 2006-Present; Secretary/Treasurer: 2011-2017)  
Association of Professional Archaeologists of New Brunswick (2013-Present; Secretary: 2018-2021)  
Canadian Archaeology Association (Vice President: 2020-Present)  
Gorsebrook Research Institute, Saint Mary’s University (External Director: 2020-Present)  
Nova Scotia Archaeology Society (Director: 2004-2008; 2015-2016; President: 2005-2007; 2016-2018)  
Royal Nova Scotia Historical Society (Director: 2010-2013; Vice President: 2013-2017; President: 2017-2020)

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## EMPLOYMENT HISTORY

### *Saint Mary’s University, Halifax, Nova Scotia*

2020 Adjunct Professor, Department of Anthropology

### *Parks Canada, Indigenous Affairs & Cultural Heritage Directorate, Halifax, Nova Scotia*

2019-2020 Collections Specialist (SI-2) – responsible for the creation of an archaeological inventory/database of all Indigenous material cultural from Nova Scotia National Historic Sites/Parks held in the Parks Canada collection, report writing, and photography.

2018 Collections Specialist (SI-2) – responsible for the creation of an archaeological inventory/database of all Indigenous material cultural from Prince Edward Island National Historic Sites/Parks held in the Parks Canada collection, report writing, and photography.

### *Acadia University, Wolfville, Nova Scotia*

2017 Part-time Professor, Department of History and Classics

### *Boreas Heritage Consulting Inc., Halifax, Nova Scotia*

2013-Present Principal and Senior Archaeologist/Historian providing archaeological, historical and heritage consulting services to public and private sector clients.

### *Parks Canada, Indigenous Affairs & Cultural Heritage Directorate, Halifax, Nova Scotia*

2017 Archaeological Assistant (GT-1) – responsible for the creation of an archaeological inventory/database of all Indigenous material cultural from New Brunswick National Historic Sites/Parks held in the Parks Canada collection, report writing, photography, and conservation.

***Stantec Consulting, Churchill River, Newfoundland & Labrador***

2015-2017 Senior Archaeologist/Field Team Lead for Stage 3 Mitigation of Muskrat Falls Hydroelectric Project, Labrador, involved in all aspects of archaeological assessment and mitigation, including: research, implementation of field and lab work, artifact analysis, and report writing. This project required working in remote areas of Labrador, directing large field crews, and working closely with Innu and other Indigenous peoples.

***Cultural Resource Management Group Limited, Halifax, Nova Scotia***

2006-2013 Staff Archaeologist and Historian involved in all aspects of archaeological assessment and mitigation, including project management, research, implementation of field and lab work, and report writing.

***Parks Canada, Halifax, Nova Scotia***

2004 Archaeological Site and Laboratory Assistant, Beaubassin & Fort Lawrence National Historic Sites.

***Private Consultant***

2003-2006 Provided archaeological and historical research services to private sector consulting firms in Nova Scotia.

***Jacques Whitford Environment Limited, Dartmouth, Nova Scotia***

1993 Field Technician and Archaeological Assistant involved in various aspects of environmental assessment.

***Parks Canada, Halifax, Nova Scotia***

1992 Field Archaeologist and Laboratory Assistant, Fort Anne National Historic Site.

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**REPRESENTATIVE PROFESSIONAL EXPERIENCE**

- 2021 Project Manager for Gaspereau Lake Reservoir Archaeological Mitigation, for Nova Scotia Power Inc.  
Principal Investigator for Archaeological Impact Assessment of Acadia Wharf Extension, for Develop Nova Scotia  
Principal Investigator for Archaeological Impact Assessment of Blandford to Tancook Ferry Terminals, for NS Department of Transportation  
Principal Investigator for Archaeological Impact Assessment of Peggy's Cove Revitalization, for Develop Nova Scotia
- 2020 Project Manager for Archaeological Impact Assessment of installation of electric charging stations at Ardgowan National Historic Site, Prince Edward Island, for Parks Canada  
Project Manager for Archaeological Impact Assessment of George's Island National Historic Site, for Parks Canada  
Project Manager for Geophysical Survey of Shubenacadie Residential School, for Confederacy of Mainland Mi'kmaq  
Principal Investigator for Archaeological Assessment of Deep Panuke Jackup Gas Production Field Centre (PFC) Platform, for RJMI Ltd.
- 2019 Project Manager and Lead Researcher for Chignecto Isthmus Indigenous Knowledge Study (Archaeology), for Mi'gmawe'l Tplu'taqnn Incorporated
- 2018 Project Manager for Archaeological Impact Assessment of PEI National Park – Morrison Cottage Infrastructure Removal, for Parks Canada  
Principal Investigator for Geophysical Investigation of the Garrison Graveyard at Fort Anne National Historic Site, for Parks Canada  
Project Manager/Senior Archaeologist for Geophysical Investigation of Chapel Island at Potlotek First Nation;

for Potlotek First Nation

Project Manager/Senior Archaeologist for Archaeological Impact Assessment of Kejimikujik Multi Use Trail in Kejimikujik National Park/National Historic Site, for Parks Canada

Project Manager for Hydro Asset Study, for Nova Scotia Power Incorporated

Project Manager/Senior Archaeologist for Archaeological Resource Impact Assessment PID 15308448, in Cape Breton Regional Municipality, for Eskasoni First Nation

Project Manager/Senior Archaeologist for Archaeological Impact Assessment of Halifax Citadel National Historic Site in Halifax Regional Municipality, for Parks Canada

Archaeological Assistant for 2018 Archaeological Survey & Geophysical Investigation of Sable Island National Park Reserve, for Parks Canada

2017 Project Manager for Archaeological Impact Assessment of PEI National Park Project FII 1427, for Parks Canada

Principal Investigator for Geophysical Investigation of Elsdale Anomaly at Halifax Citadel National Historic Site, in Halifax Regional Municipality, for Parks Canada

Principal Investigator for Archaeological Salvage Operation at Canso Islands National Historic Site in Canso, in Guysborough County, for Parks Canada

Project Manager/Historian/Archaeologist for Archaeological Impact Assessment of Halifax Citadel National Historic Site in Halifax Regional Municipality, for Parks Canada

Archaeological Assistant for 2017 Archaeological Survey of Sable Island National Park Reserve, for Parks Canada

Project Manager/Senior Archaeologist for Archaeological Resource Impact Assessment of Ellershouse Windfarm, in Hants County, for Strum Consulting

Project Manager for Archaeological Impact Assessment of Kouchibouguac Force Main Realignment, in Kouchibouguac National Park, New Brunswick, for Parks Canada

Principal Investigator for Archaeological Resource Impact Assessment of Big Moon Tidal Demonstration Site, in Cape Split, Kings County, for Strum Consulting

2016 Field Team Lead for Stage 3 Mitigation of Muskrat Falls Hydroelectric Project, Labrador, for Stantec

Senior Archaeologist/Historian for Archaeological Overview Assessment of Halifax Citadel National Historic Site in Halifax Regional Municipality, for Parks Canada

Project Manager/Senior Archaeologist for Archaeological Screening and Reconnaissance of Cow Bay Road-Grand Lake Road in Cape Breton Regional Municipality, for Nova Scotia Department of Natural Resources

2015 Field Team Lead for Stage 3 Mitigation of Muskrat Falls Hydroelectric Project, Labrador, for Stantec

Principal Investigator for Archaeological Monitoring of geotechnical drilling at Upper Lake Falls, Mersey River Hydro System in the Region of Queens Municipality, for Nova Scotia Power Incorporated

Project Manager/Historian for Archaeological Monitoring of site preparation for Horizontal Directional Drilling Pad location at Cape Ray, Newfoundland and Labrador, for NSP Maritime Link Inc. / Emera Newfoundland and Labrador

Project Manager/Historian for Archaeological Screening and Reconnaissance of the Mersey Hydro System Redevelopment in the Region of Queens Municipality, for Nova Scotia Power Incorporated

Project Manager/Historian for Archaeological Screening and Reconnaissance of Eon Wind – Ketch Harbour Wind Farm in Halifax Regional Municipality, for Strum Environmental

Project Manager for Archaeological Monitoring of tree clearing for Maritime Link - Onslow to Springhill Transmission Line near Debert, for Nova Scotia Power Incorporated

2014 Principal Investigator for Archaeological Shovel Testing of Maritime Link – Onslow to Springhill Transmission Line – Debert Area in Colchester County, for Nova Scotia Power Incorporated

Project Manager for Archaeological Screening, Reconnaissance and Shovel testing of Haddock Harbour in Richmond County, for Glenn Group

Project Manager for Archaeological Screening, Reconnaissance and Shovel Testing of Lower Lake Falls Reservoir in Queen’s County, for Nova Scotia Power Incorporated

Project Manager for Archaeological Screening and Reconnaissance of Van Dyke Blueberry (PID 70036504) in Queens County

Project Manager for Archaeological Shovel Testing of Town Point (PID 01302165) in Antigonish County

Project Manager for Archaeological Screening and Reconnaissance of Eon Wind Farms in Queen’s County and Halifax Regional Municipality, for Strum Consulting

Project Manager for Archaeological Screening and Reconnaissance of Maritime Link - Onslow to Springhill Transmission Line, for Nova Scotia Power Incorporated

Project Manager for Archaeological Screening and Reconnaissance of Northumberland Rock Quarry Expansion in Antigonish County, for Alva Construction

Principal Investigator for Archaeological Screening and Reconnaissance of Hardwood Lands Community Wind Project in Hants County, for Strum Environmental

Principal Investigator for Archaeological Monitoring of Upper Broad River Bridge Replacement in Queens County, for Nova Scotia Department of Internal Services

Project Manager for Archaeological Monitoring of Sandy Lake drawdown in Halifax Regional Municipality, for Nova Scotia Power Incorporated

Principal Investigator for Archaeological Testing of Castor’s River, Newfoundland

Project Manager for Archaeological Screening and Reconnaissance of Chedabucto Aggregates Quarry Expansion in Guysborough County, for Strum Environmental

Project Manager for Archaeological Screening, Reconnaissance and Testing of Mink Lake Dam Refurbishment in Yarmouth County, for Nova Scotia Power Incorporated

Project Manager for Archaeological Screening, Reconnaissance and Testing of PID 25223686 in Cumberland County

Project Manager for Archaeological Screening, Reconnaissance and Testing of PID 50001007 in Inverness County

Principal Investigator for Archaeological Screening and Reconnaissance of Crowdis Bridge Replacement in Inverness County, for Nova Scotia Department of Transportation and Infrastructure Renewal

2013 Principal Researcher/Historian for Historical Research Report on the “Formation of the Jewish Legion at Fort Edward during WWI”, for Parks Canada

Project Manager for Archaeological Screening and Reconnaissance of proposed Dufferin Mine Expansion in Halifax Regional Municipality, for Ressources Applaches

Project Manager for Archaeological Testing of proposed Neives Dam Replacement in Annapolis County, for Nova Scotia Power Incorporated

Project Manager for Stage 2 Archaeological Assessment of proposed subdivision in Happy Valley-Goose Bay, Labrador, for Goose Bay Capital Corp. Inc.

Principal Investigator for Archaeological Testing of the Thibodeau Village/Shawbrook Farm site in Hants County;

2012 Principal Investigator for Archaeological Testing of the Shawbrook Farm site in Hants County

Principal Investigator for Archaeological Testing of the Donahue Dam Refurbishment project in Guysborough County, for Nova Scotia Power Incorporated

Principal Investigator for Archaeological Testing of the Cooks Brook Pit Expansion project in Halifax Regional Municipality, for Gallant Aggregates Limited

Principal Investigator for the Archaeological Testing of Highway 103 Connector Road in Halifax Regional Municipality, for Nova Scotia Department of Transportation and Infrastructure Renewal

2011 Principal Investigator for Archaeological Screening, Reconnaissance and Strategic Testing of the Cape Ray, Newfoundland component of the *Maritime Link* project, for Emera Newfoundland and Labrador

Field Supervisor for Archaeological Survey of Lawlors Island Quarantine Facility in Halifax, Nova Scotia

Principal Investigator for Archaeological Screening and Reconnaissance of the Cape Breton Grounding Site components of the *Maritime Link* project, for Emera Newfoundland and Labrador

Field Supervisor and Principal Researcher for Archaeological Screening and Reconnaissance of the Newfoundland component of the *Maritime Link* project, for Emera Newfoundland and Labrador

Field Supervisor and Principal Researcher for Archaeological Screening and Reconnaissance of the Cape Breton component of the *Maritime Link* project, for Emera Newfoundland and Labrador

Principal Investigator for Archaeological Monitoring of the Provincial Law Courts Parking Lot Replacement in Halifax Regional Municipality, for Department of Transportation and Infrastructure Renewal

Principal Investigator for Comparative Evaluation of archaeological potential assessment of the Greater Sydney Area Wastewater Collection Project in Cape Breton Regional Municipality, for Cape Breton Regional Municipality

Principal Investigator for Archaeological Screening, Reconnaissance and Testing of the proposed Ingramport Cellular Tower Site in Halifax Regional Municipality, for GENIVAR

Principal Investigator for Archaeological Reconnaissance of the Falls Lake Refurbishment in Hants County, for Nova Scotia Power Incorporated

Principal Investigator for Archaeological Screening and Reconnaissance of McNab's Bridge, Hay Cove Bridge, Soldiers Bridge, Sutherlands Culvert and Thorn Culvert, in Richmond County, for Nova Scotia Department of Transportation and Infrastructure Renewal

Principal Investigator for Archaeological Screening and Reconnaissance of the Aberdeen Transmission Line and Substation Expansion in Inverness County, for Nova Scotia Power Incorporated

Principal Investigator for Archaeological Monitoring of the Shoreline Stabilization Project at Malagawatch, Inverness County, for Dillon Consulting Limited and the Assembly of Nova Scotia Mi'kmaq Chiefs

Principal Investigator for Archaeological Assessment of the Northeast Nova Scotia Correctional Facility in Pictou County, for Nova Scotia Department of Transportation and Infrastructure Renewal

Principal Investigator for Archaeological Screening and Reconnaissance of the Raynardton and Alders Bridge

Replacement projects in Yarmouth County, for Nova Scotia Department of Transportation and Infrastructure Renewal

Principal Investigator for Archaeological Screening and Reconnaissance of the Antigonish Wind Project in Antigonish County, for Nova Scotia Power Incorporated

- 2010 Principal Investigator for Archaeological Screening and Reconnaissance of the Donahue Dam Refurbishment project in Guysborough County, for Nova Scotia Power Incorporated
- Principal Investigator for Archaeological Screening and Reconnaissance of the Baddeck Landfill Expansion project in Victoria County, for the Municipality of the County of Victoria
- Principal Investigator for Archaeological Screening and Reconnaissance of the Ten Mile Lake Dam project in Halifax Regional Municipality, for Nova Scotia Power Incorporated
- Principal Investigator for Archaeological Screening and Reconnaissance of the Marshall Falls Dam project in Halifax Regional Municipality, for Nova Scotia Power Incorporated
- Principal Investigator for the Archaeological Monitoring of soil sampling at the Halifax Armoury in Halifax, for Defence Construction Canada
- Principal Investigator for the Archaeological Assessment of proposed Highway 103 Connector Road alignments in Halifax Regional Municipality, for Nova Scotia Department of Transportation and Infrastructure Renewal
- Principal Investigator for the Archaeological Screening and Reconnaissance of the Stillwater Later Bridge Replacement project, for Halifax Regional Municipality
- Principal Investigator for Archaeological Screening and Reconnaissance of the Lower Cove Wind Project in Cumberland County, for Nova Scotia Power Incorporated
- Principal Investigator for Archaeological Screening and Reconnaissance of the Loganville Wind Project in Colchester County, for Nova Scotia Power Incorporated
- Principal Investigator for Archaeological Screening and Reconnaissance of the Nuttby I & II Wind Projects in Colchester County, for Nova Scotia Power Incorporated
- 2009 Principal Researcher for Archaeological Assessment of proposed Highway 113 alignment in Halifax Regional Municipality, for Nova Scotia Department of Transportation and Infrastructure Renewal
- Field Archaeologist and Principal Researcher for Archaeological Assessment of the Ferrona Bridge Replacement Project in Pictou County, for Nova Scotia Department of Transportation and Infrastructure Renewal
- Principal Researcher for Archaeological Assessment of the Hawthorne Farm Site within a proposed mine expansion area in Gays River, Nova Scotia, for Acadian Mining
- Principal Investigator for the Archaeological Monitoring of subterranean electrical duct installation at CFB Stadacona in Halifax, for Department of National Defence
- Field Director for Stage 2 and Stage 3 Archaeological Assessments of Talbot Wind Farm, in Chatham-Kent, Ontario, for Renewable Energy Systems - *Reports on file with Ontario Ministry of Tourism, Culture and Sport*
- 2008 Principal Investigator for Archaeological Screening and Reconnaissance of the Fifteen Mile Stream Development in Halifax Regional Municipality, for Nova Scotia Power Incorporated
- Principal Researcher for Archaeological Assessment of Highway 101 Twinning in Kings County, for Nova Scotia Department of Transportation and Infrastructure Renewal
- Field Supervisor and Principal Researcher for Archaeological Screening, Reconnaissance and Testing of Great Barren Dam Safety Remedial Works in Yarmouth County, for Nova Scotia Power Incorporated

Field Archaeologist and Principal Researcher for Archaeological Screening and Reconnaissance of the Ardoise Development Property in Hants County, for Environmental Design and Management Limited

Field Archaeologist and Principal Researcher for Archaeological Screening and Reconnaissance of the Sandy Lake Development Property in Halifax Regional Municipality, for Armco Capital Incorporated

Field Supervisor and Principal Researcher for Archaeological Screening and Reconnaissance of the Beaver Dam, Getty, Northeast Expansion, Smithfield, and Cape Breton Barite development properties, all proposed mine expansion areas in Nova Scotia, for Acadian Mining Corporation

Field Archaeologist and Principal Researcher for Archaeological Screening and Reconnaissance of proposed harbour improvements at Margaree Harbour, Inverness County, for Public Works and Government Services Canada

Principal Researcher for Assessment of the Touquoy Gold Project – Moose River Heritage Preservation in Halifax Regional Municipality, for Atlantic Gold

2007 Field Supervisor and Principal Researcher for Archaeological Investigations of the Dartmouth Turbine Chamber, part of the Shubenacadie Canal System and Starr Manufacturing complex in Dartmouth, for Halifax Regional Municipality & the Shubenacadie Canal Commission

Field Director and Principal Researcher for the Monitoring and Mitigation of features identified during construction of Founders Corner Condominiums in Halifax Regional Municipality, for Nova New England Group

Field Archaeologist for the Archaeological Mitigation of the Sinkhole Site, a Precontact habitation site within a proposed mine expansion area in Colchester County, for ScoZinc Limited

Principal Researcher and Field Archaeologist for Archaeological Reconnaissance and Testing of proposed Highway 104 corridor and interchange areas between Port Hawkesbury and Port Hastings, Cape Breton, for Department of Transportation and Infrastructure Renewal

Principal Researcher for Archaeological Assessment of Lot 209, Palaeo Subdivision in Debert, Colchester County, for Department of Transportation and Public Works

2006 Field Archaeologist during search for the Portobello Turbine Chamber, part of the Shubenacadie Canal System in Waverly, for Halifax Regional Municipality & the Shubenacadie Canal Commission

Field Archaeologist for Archaeological Screening, Reconnaissance and Testing of proposed Miller's Creek gypsum quarry expansion in Hants County, for Fundy Gypsum Company

Field Archaeologist for the Archaeological Reconnaissance of Wrights Lake and Coon Pond in Halifax Regional Municipality, for Nova Scotia Power Incorporated

Field Archaeologist for the Archaeological Assessment of construction related activities at McGowan Headpond Main Dam on the Medway River in Queens County, for Nova Scotia Power Incorporated

2005 Field Archaeologist for Archaeological Testing of proposed Lingan Wind Turbine #2 site in Cape Breton County, with CRM Group

Field Archaeologist and Archaeological Monitor of proposed Port Hawkesbury/Port Hastings Sewage Treatment Plant site in Inverness County, with CRM Group

Archaeological Monitor during construction of Balmoral Pump Station and connecting pipe system at Point Pleasant Park in Halifax Regional Municipality, with CRM Group

Field Archaeologist for partial excavation and documentation of a 19<sup>th</sup> century shipwreck (BdCv-51) in Woodside, Nova Scotia, with CRM Group

Archival Research for "Crafting an Identity: Occupational Therapy in Nova Scotia, 1950-1972", in Halifax, Nova Scotia, for Saint Mary's University and Associated Medical Services Inc.

- 2004 Archaeological Site and Laboratory Assistant for Archaeological Testing of Beaubassin and Fort Lawrence National Historic Sites in Cumberland County, for Parks Canada
- Field Archaeologist and Artifact Processor for Archaeological Mitigation of the Maritime Museum Combined Sewage Overflow Chamber in Halifax Regional Municipality, with CRM Group
- 2003 Field Archaeologist for Archaeological Assessment of Highway 101 structure construction areas in Yarmouth County, with CRM Group
- Field Archaeologist for Archaeological Assessment of a proposed quarry expansion area in Colchester County, with CRM Group
- 1993 Field Technician and Archaeological Assistant for Jacques Whitford Environment Limited, Dartmouth, Nova Scotia
- 1992 Field Archaeologist and Laboratory Assistant for Archaeological Excavation of Charlesfort site at Fort Anne National Historic Site in Annapolis County, for Parks Canada

### PUBLICATIONS AND PRESENTATIONS

- Beanlands, Sara 2018 "The Training of the Jewish Legion in Windsor, Nova Scotia, During the First World War," *Journal of the Royal Nova Scotia Historical Society*, Vol. XXI (2018).
- Beanlands, Sara 2012 "The Reverend Professor Andrew Brown: An Academic Reassessment," *The University of Edinburgh Journal*, Vol. XLV, No.4 (2012).
- Erickson, Paul & Jonathan Fowler, eds. 2010 "Neighbours in Time," in *Underground Nova Scotia: Stories of Archaeology*. Halifax: Nimbus Publishing.
- Reid, John G et. al. 2009 "Is There a Canadian Atlantic World?" *International Journal of Maritime History*, Vol. XXI, No. 1 (2009).
- MacIntyre, April & Sara Beanlands 2008 "History of Sale: The Treasure Trove Act in Nova Scotia," In *Preprints of the 15th Triennial Meeting, New Delhi, 22-26 September 2008*.
- Beanlands, Sara 2006 "The Rev. Dr. Andrew Brown: Nova Scotia's Elusive Historian," *Journal of the Royal Nova Scotia Historical Society*, Vol. IX (2006).
- 2019 "Merging UAV Data with Subsurface Ground Penetrating Radar for Archaeological Investigations", Nova Scotia Community College AGRG-COGS *Sensors High and Low: Measuring the Reality of Our World Conference*, Middleton, Nova Scotia
- "Archaeology and Species at Risk Research in Kespukwitk", with Jeff Purdy, *Kespukwitk Two-Eyed Seeing Gathering*, Bear River First Nation, Nova Scotia
- "What Lies Beneath: An Acadian Ancestry Project", Kings Theatre, Annapolis Royal, Nova Scotia
- 2018 "Sandy Banks (FgCg-01): The Archaeology of a Hudson's Bay Company Fur Trade Post in Central Labrador", with Fred Schwarz et al., *Council for Northeastern Archaeology Conference*, Halifax, Nova Scotia
- "A Typological analysis of the Stone Pipes of the Isthmus of Chignecto, Eastern Canada", with Eric Tremblay et al., *Council for Northeastern Archaeology Conference*, Halifax, Nova Scotia
- "The Elsdale Anomaly: Geophysics and the Search for Fort Luttrell", *Council for Northeastern Archaeology Conference*, Halifax, Nova Scotia
- "The Training of the Jewish Legion at Fort Edward", *Royal United Services Institute of Nova Scotia*, Royal Artillery Park, Halifax, Nova Scotia
- "The Jewish Legion in Windsor", *Atlantic Mayors Congress*, Windsor, Nova Scotia

- “Voices of the Landscape”, *Landscape of Cultures Festival*, Grand Pré National Historic Site, Nova Scotia
- 2017 “Landscape in Memory: What Time is it in Fort Lawrence?”, *Nova Scotia Archaeology Society*, Halifax, Nova Scotia
- “The Training of the Jewish Legion at Fort Edward during the First World War”, *Royal Nova Scotia Historical Society*, Halifax, Nova Scotia
- 2016 “Unearthing our History”, *West Hants Historical Society Heritage Banquet*, Windsor, Nova Scotia
- “Thibodeau Village: Community Engagement, Archaeology, and the Discovery of an Acadian Past in a Nova Scotia Planter Landscape”, *Genealogical Association of Nova Scotia*, Dartmouth, Nova Scotia
- “John Reid’s Influence on Historical Archaeology in Nova Scotia”, *Practicing History in the 21<sup>st</sup> Century Symposium*, Saint Mary’s University, Halifax, Nova Scotia
- 2015 “An Early African-Nova Scotian Burial Ground in Hammonds Plains”, *Black Canadian Studies Conference*, Dalhousie University, Halifax, Nova Scotia
- “Preserving the Memory of Historical Public Space in Halifax Regional Municipality”, *Public Space, History and Memory Symposium*, Saint Mary’s University, Halifax, Nova Scotia
- “Thibodeau Village: Community Engagement, Archaeology, and the Discovery of an Acadian Past in a Nova Scotia Planter Landscape”, *Evenings at Government House Lecture Series*, for the Lieutenant Governor of Nova Scotia, Government House, Halifax, Nova Scotia
- 2013 “Re-layering the Cultural Landscape”, *Nova Scotia Heritage Conference*, Liverpool, Nova Scotia
- “Unravelling the 3D Cultural Landscape within a Tablet Interface”, *European Archaeology Association*, Pilsen, Czech Republic
- 2012 “Rev. Dr. Andrew Brown and the Removal of the French Inhabitants of Nova Scotia”, *Monument-Lefebvre National Historic Site*, Memramcook, New Brunswick
- 2011 “The Brown Manuscripts: An 18<sup>th</sup> Century Approach to Understanding Acadia”, *Histoire de l’Acadie: New Approaches*, Saint Mary’s University, Halifax, Nova Scotia
- “Bayonets, Bottles and Beads: An Overview of Archaeological Sites in the Chignecto”, *Tantramar Heritage Trust*, Sackville, New Brunswick
- 2010 “Finding Acadia in Planter Oral Tradition”, *Colchester Historical Society*, Truro, Nova Scotia
- “An Introduction to Industrial Archaeology”, *Industrial Heritage Nova Scotia*, Halifax, Nova Scotia
- “The Brown Manuscript: An 18<sup>th</sup> Century Account of the Acadian Deportation”, *Causerie: Grand-Pré*, Place des Arts Père Anselm Chaisson, Cheticamp, Nova Scotia
- “Removal of the French Inhabitants of Nova Scotia by Lieut. Governor Lawrence & His Majesty’s Council in October 1755”, *Tantramar Heritage Trust*, Sackville, New Brunswick
- 2009 “The Brown Manuscript and the Scottish Enlightenment”, *Atlantic Canada Studies Conference*, University of Prince Edward Island, Charlottetown, Prince Edward Island
- 2008 “New Perspectives on the Idea of a ‘Canadian’ Atlantic World”, *International Workshop on Material Culture Dimensions of the Asia-Atlantic Comparison and on the ‘Canadian’ Atlantic World*, Halifax, Nova Scotia
- 2006 “Thibodeau Village”, *Confederation of Association of Acadian Families*, Lafayette, Louisiana
- “Thibodeau Village”, *Acadian Memorial*, St. Martinville, Louisiana
- “If the Land Could Speak”, *Grand-Pré National Historic Site*, Wolfville, Nova Scotia

- “Andrew Brown and the Acadians”, *Société Historique Acadienne*, Université de Moncton, Moncton, New Brunswick
- 2005 “An Enlightened Mind in Nova Scotia: The University of Edinburgh’s Andrew Brown - Nova Scotia’s First Historian”, *University of Edinburgh*, Centre of Canadian Studies, Edinburgh, Scotland
- “The Rev. Dr. Andrew Brown: Nova Scotia’s Elusive Historian”, *Royal Nova Scotia Historical Society*, Halifax, Nova Scotia

#### **SCHOLARSHIPS AND AWARDS**

- 2017 Volunteer Service Award (Municipality of the District of West Hants & the Town of Windsor)
- 2013 Nova Scotia Museum Research Grant (Cultural History)
- 2006/2007 Mary Jackson-Hinch and Joseph Hinch Research Award (St. Mary’s University)
- 2006 Honorary Citizenship to the City of Lafayette, Louisiana for contributions to Acadian Society
- 2005/2006 St. Mary’s University Graduate Award Scholarship
- St. Mary’s University Faculty of Graduate Studies and Research Fellowship
- 2005 Associated Medical Services Hannah Studentship
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#### **TRAINING AND CERTIFICATES**

Certified Emergency First Aid CPR Level A.  
Wilderness First Aid  
WHMIS

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