Amherst Island Wind Project – Road Use Agreement - Pre-Construction Study, Section B.02

Culvert Treatment Plan

September 20, 2017

Culvert Inventory and Conditions – The culvert table in this Section B.02 of the Pre-Construction Study provides an inventory of the culverts on Amherst Island potentially affected by the Amherst Island Wind Project.

There are 102 existing culverts on the Project 'Heavy Haul Routes'. 66 of these were assessed to be in condition that does not warrant replacement to sustain construction traffic associated with the Work. 20 of 102 existing culverts were assessed to be in questionable condition, and may suffer damage if not reinforced or replaced based on the proposed construction traffic loading. 16 of these 20 are of comparatively small (less than 1m) span.

An additional 16 of the 102 existing culverts have not been assessed. Windlectric has decided that it will use a conservative methodology and replace or protect each of these 16 culverts as set forth below.

Culvert Replacement – Subject to permitting, Windlectric intends to replace the 16 existing small-span culverts found in questionable condition, and the 16 existing culverts whose assessment could not be completed on a like-for-like basis. In connection with such work, Windlectric will seek to obtain all applicable permits from Loyalist Township, the Cataraqui Region Conservation Authority, and other applicable entities. Windlectric will install any such replacement culverts in compliance with materials specifications on the Project drawings for similar work, such as culvert CSP minimum pipe wall thickness of 2.0 mm.

Culvert Protection – If unable to obtain required permits on a timely basis, and therefore unable to replace a culvert as outlined above, Windlectric shall protect any of the 16 existing culverts found in questionable condition, or any of the 16 existing culverts whose assessment could not be completed, with 'bridging plates'. Pre-Construction Study, v5, submitted August 29, 2017 to Loyalist Township, provides information regarding culvert protection plans, specifically typical section design drawings showing the 'bridging plate' methodology on drawing no. MR289.

Culvert Reinforcement – Windlectric intends to reinforce, with internal shoring, the 4 existing culverts assessed to be in questionable condition whose span exceeds 1m. The approved Operations Plan (Section 2.14) includes an agreed process whereby Windlectric must provide drawings of proposed culvert reinforcements to the Township for review prior to execution of such reinforcement. Typical culvert reinforcement details are shown on drawing no. MR-289, of Section D of the Study. Drawings for such culvert reinforcement work will be updated by the Project Engineer, and submitted to the Township, a minimum of 10 business days prior to the execution of any work related thereto.

Stantec Consulting Ltd.
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Waterloo ON N2L 0A4
Tel: (519) 579-4410

May 4, 2017
File:

Pennecon Heavy Civil
1309 Topsoil Road
St. John's, NL A1B 3N4

Attention: **Mr. Trevor Dwyer, P.Eng**

Dear Mr. Dwyer:

Reference: **Culvert Inspection and Summary Report**
Project ID #1421 Amherst Island Wind Farm – Culvert Inspection, Collection System on the Island

We are pleased to submit herewith the Culvert Inspection, Condition Analysis and Recommendations and Summary for the above-mentioned project.

The roadway crossing culverts within the project area have been inspected. Within the project limits there are a total of ninety-eight crossing culverts inspected. Of these ninety-eight crossing culverts, there are two box concrete culverts, three concrete/CSP split culverts and ninety-three corrugated steel pipe (CSP) culverts. The Purpose of the inspection was to field review/inspect each culvert on the island that would be used for the transportation of and the delivery of the windmill parts and equipment for the proposed Wind Farm project. The intent of the inspection was to review the existing culverts, assess their condition and provide a recommendation for the replacement of any culvert that may not withstand the proposed weight of the delivery vehicles with the Wind Farm materials or equipment.

Culvert Condition:

On March 13, 2017 and March 14, 2017, a detailed field review of existing roadway crossing culverts was carried out. For the major roadway crossing culverts, #4, 41, 66, and 82, an individual inspection sheet was completed and has been included with this report. Please see the attached.

All of the culverts inspected varied from poor to good condition, but for some culverts the access was not available due to plugged pipes or we could not locate the culvert. The attached Culvert Inspection Form details the culvert inspection condition and our recommendations.

Culvert Size:

The CSP culvert sizes vary from 300mm to 1000mm, including some elliptical CSP's. Stantec's recommendations and condition assessment is captured in the attached Culvert Inspection Form.

For the concrete box culverts, Culvert #41 size is a 2500mm x 1250mm that was in poor condition with sever cracking and wall separation. Culvert #82 size is a 2500mm x 1500mm that was in good condition with the roof slab observed to be dry and free of moisture and the retaining walls are plumb, free of any sag or bowness.

Reference: Culvert Inspection and Summary Report
Project ID #1421 Amherst Island Wind Farm – Culvert Inspection, Collection System on the Island

Summary:

Based on the existing condition and size of the CSP and box concrete crossing culverts, it is our recommendation that 11 of the CSP, and 1 of the 2 box concrete crossing culverts are recommended to be replaced. Another 10 of the CSP's require an owner decision for replacement based on type of weight/loading that will be placed on them. The remaining concrete culverts are recommended to remain.

Should you have any questions, or require additional information, please do not hesitate to contact me.

Sincerely,

STANTEC CONSULTING LTD.

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Attachment:

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AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	(mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
SOUTH SHORE ROAD										
1	Gravel	0+145	South Shore Road	400		CSP	NO	Generally in good condition, no signs of corrosion	Culvert is in good condition.	NO
2	Gravel	0+490	South Shore Road	400 / 500 CONC	450 Conc.	CONCRETE JOINT PIPE	NO	Pipe is in poor condition due to pipe collapse	Remove and replace culvert	NO
3	Gravel	0+535	South Shore Road	300 / 400	400	CSP	NO	Pipe is in fair - poor condition. Inlet and outlet ends are slightly damaged.	Corrosion occuring on bottom 20% of culvert. Outlet end is plugged. Replace prior to heavy traffic loading	NO
4	Gravel	0+685	South Shore Road	1200 CSP, JOINED TO 1000 X 1200 CONC. CULVERT		CSP	YES	Concrete culvert is in poor condition. CSP Inlet has sluice gate and minor headwalls. Outlet has failing headwalls and concrete is unsound and wide cracking and separation. Inlet CSP was added to rectangular 1.2m x 1.0m existing concrete culvert.	Replace with box culvert or larger than original sectional area pipe to accommodate upstream private spring fed pond.	YES
5	Gravel	0+880	South Shore Road	450 / 400	450	CSP	NO	Culvert in good - fair condition. Minor rusting in small area at inlet end.	Leave culvert in place	NO
6	Gravel	1+035	South Shore Road	450 / 400	450	CSP	NO	Fair - poor condition. Corrosion throughout pipe. Less than 300mm cover on pipe.	Replace culvert prior to heavy traffic loads.	NO
7	Gravel	1+085	South Shore Road	350 / 450	550	CSP	NO	Fair condition. Light to medium rusting throughout pipe. Outlet plugged	Replace culvert prior to heavy traffic loads.	NO
8	Gravel	1+148	South Shore Road	350 / 400	400	CSP	NO	Fair condition. Light to medium rusting throughout pipe. Inlet and Outlet damaged.	Leave culvert in place, but note damage to inlet and outlet, prior to heavy traffic loading.	NO
9	Gravel	1+295	South Shore Road	400		CSP	NO	Fair - poor condition. Corrosion throughout pipe. Less than 300mm cover on pipe.	Replace culvert prior to heavy traffic loads.	NO
10	Gravel	1+465	South Shore Road	600		CSP	NO	Fair - good condition. Rust forming on bottom of pipe.	Leave in place.	NO
11	Gravel	1+645	South Shore Road	450		CSP	NO	Good condition.	Leave in place.	NO
12	Gravel	1+690	South Shore Road	450		CSP	NO	Fair condition due to medium rusting on pipe. Pipe damage at inlet end of pipe.	Leave in place.	NO
13	Gravel	1+885	South Shore Road	400		CSP	NO	Good condition. Less than 300mm cover on pipe.	Leave in place.	NO
14	Gravel	2+010	South Shore Road	450		CSP	NO	Good - fair condition. Light rusting on bottom of pipe.	Leave in place.	NO
15	Gravel	2+115	South Shore Road	400	400	CSP	NO	Fair condition. Light corrosion on 20% of pipe.	Replace culvert prior to heavy traffic loads.	NO
16	Gravel	2+180	South Shore Road	300		CSP	NO	Good condition, requires 300mm cover on pipe.	Leave in place.	NO
17	Gravel	2+200	South Shore Road	300		CSP	NO	Good condition, cracking in gravel noted. Less than 300mm cover provided.	Leave in place.	NO
18	Gravel	2+305	South Shore Road	400		CSP	NO	Good condition, cracking in gravel noted. Less than 300mm cover provided.	Leave in place.	NO
19	Gravel	2+505	South Shore Road	400		CSP	NO	Fair condition, rusting on the bottom 10% of pipe	Leave in place.	NO
20	Gravel	2+805	South Shore Road	400		CSP	NO	Good condition	Leave in place.	NO
21	Gravel	2+858	South Shore Road	400	400	CSP	NO	Fair condition, light corrosion on the 50% of pipe	Leave in place, but monitor since pipe may buckle under constant heavy loads	NO
22	Gravel	2+940	South Shore Road	400		CSP	NO	Fair condition, light rust staining on 10% of pipe	Leave in place.	NO

AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	(mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
23	Gravel	3+085	South Shore Road	400		CSP	NO	Fair condition, damage on outlet end of pipe, 10% rust staining on bottom of pipe	Leave in place.	NO
24	Gravel	3+165	South Shore Road	400		CSP	NO	Fair condition, moderate rusting on 20% of pipe. Less than 300mm of cover on pipe.	Leave in place	NO
25	Gravel	3+245	South Shore Road	400		CSP	NO	Good condition. Less than 300mm cover	Leave in place	NO
26	Gravel	3+418	South Shore Road	400		CSP	NO	Good condtion. Approximately 300mm cover on pipe	Leave in place	NO
27	Gravel	3+555	South Shore Road	400		CSP	NO	Good condtion. Approximately 300mm cover on pipe	Leave in place	NO
28	Gravel	3+810	South Shore Road	400		CSP	NO	Good condtion. Minor rust staining.	Leave in place	NO
29	Gravel	4+010	South Shore Road	400 /350 CSP & 300 Conc	300 Conc & 400 CSP	CSP / CONCRETE	NO	Good condition. Inlet end is CSP, Outlet end has concrete pipe. Appears to be 50/50 split with Concrete Pipe and CSP. Concrete pipe is disjointed and undulating.	Replace concrete pipe portion of culvert with CSP.	NO
30	Gravel	4+160	South Shore Road	400		CSP	NO	Fair condition - light rusting inside pipe. Less than 300mm cover on pipe.	Leave in place.	NO
31	Gravel	4+195	South Shore Road	400		CSP	NO	Culvert was not inpsected. Replace if permits allow, protect otherwise or protect in accorance with culvert plan.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with culvert plan.	NO
LOWER FORTY FOOT ROAD										
32	Gravel	4+545	Lower Forty Foot Road	300		Concrete / CSP	NO	Area saturated and overgrowth - could not access. Less than 300mm cover	No comment	NO
33	Gravel	5+318	Lower Forty Foot Road	600		CSP	NO	Good condition	Leave in place	NO
34	Gravel	5+320	Lower Forty Foot Road	600, bolted connection		CSP	NO	Fair condtion, 40% rusting present throughout pipe	Leave in place. Increase cover during heavy traffic loads	NO
35	Gravel	5+455	Lower Forty Foot Road	450 / 500	400	CSP	NO	Fair condtion, 30% corrosion present inside of pipe. Damage / failure of approx. 2m in from west end and 3m from east end.	Replace prior to heavy traffic loading.	NO
36	Gravel	5+780	Lower Forty Foot Road	800		CSP	NO	Fair condition. Moderate rusting on 30% of pipe. Frozen water through pipe, unable to fully assess.	Replace prior to heavy traffic loading.	NO
37	Gravel	5+785	Lower Forty Foot Road	500 / 600 on survey	500	CSP	NO	Good condition. Lime staining on obverts of pipe.	Leave in place	NO
38	Gravel	6+090	Lower Forty Foot Road	600		CSP	NO	Good condition. Moderate corrosion on 30% of pipe. Less than 300mm of cover provided.	Leave in place, but monitor since pipe may buckle under constant heavy loads	NO
FRONT ROAD										
39A	Gravel	6+260 16+577	Lower Forty Front Road	450 / 400	400	CSP	NO	Good condition. Damage at Inlet and Oultlet ends, but pipe is generally in good condition	Leave in place	NO
39B	Gravel	6+264 16+573	Lower Forty Front Road	400	350	CSP	NO	Fair condition. Moderate rusting at outlet end of pipe. Damage at Inlet and Outlet ends of pipe. Leaking at springline of pipe.	Replace pipe.	NO
A	Gravel	16+112	Front Road	600		CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	
40	Gravel	15+480	Front Road	600		CSP	NO	Good condition at outlet end. Could not access inlet end due to tree obstruction and skew angle of driveway.	Leave in place	NO

AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	(mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
41	Gravel	15+945	Front Road	2500 x 1250		CONCRETE BOX CULVERT	NO	Poor condition. Severe diagonal cracking, full height, east wall, 1.35m from north end and 3.0m from south end of culvert. Wall to slab separation east wall for 5.2m from east wall. Gap separation is 25mm. Severe cracking for 1 meter on West wall. Broken slab on North east corner.	Replace.	YES
42	Gravel	15+478	Front Road	600		CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
43	Gravel	15+095	Front Road	400		CSP	NO	Good condition. Slight damage at Inlet end of pipe.	Leave in place.	NO
44	Gravel	14+280	Front Road	300 / 350	400	CSP	NO	Good condition. - no photo, visual only.	Leave in place.	NO
45	Gravel	15+182	Front Road	400		CSP	NO	Pipe plugged - could not access	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
46	Gravel	13+980	Front Road	2000 Elliptical	1400 wide x 750 height	CSP	NO	Poor condition. Bottom of culvert disintegrated, bolts rusted and disintegrated. Stone Retaining walls on Inlet end non - standard and unable to sustain loading.	Replace	NO
~~47~~	~~Gravel~~		~~Front Road~~			~~CSP~~	~~NO~~	~~Culvert was not inspected.~~	Eroneous entry in original table. No culvert existent between #46 and #48A.	NO
48A	Gravel	13+855	Front Road	500		CSP	NO	Good Condition	Leave in place	NO
48B	Gravel	13+740	Front Road	400 / 500	500	CSP	NO	Good Condition	Leave in place	NO
49	Gravel	13+558	Front Road	400 / 500	450	CSP	NO	Good Condition - Note, stone retaining walls nearby	Leave in place	NO
50	Gravel	13+315	Front Road	600		CSP	NO	Good - fair condition - rust staining on 20% of pipe	Leave in place	NO
51	Gravel	13+190	Front Road	750 / 800	800	CSP	NO	Good - fair condition - rust staining on 20% of pipe. Greater than 2.0 meters of cover.	Leave in place	NO
52	Gravel	13+115	Front Road	ENDS WERE COMPLETELY PLUGGED. COULD NOT EVALUATE INSIDE OF PIPE.		CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
53	Asphalt	11+890	Front Road	600		CSP	NO	Good condition. Less than 300mm cover on roadway	Leave in place	NO
54	Asphalt	11+665	Front Road	400		CSP	NO	Good condition.	Leave in place	NO
55	Asphalt	11+540	Front Road	400		CSP	NO	Unable to see inside pipe. Ends are crushed. Less than 300mm cover provided.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
56	Asphalt	11+170	Front Road	1600 x 1000 Elliptical		CSP	NO	Fair condition. Moderate corrosion on 40% of pipe. Greater than 600mm cover.	Replace	NO
57	Asphalt	10+935	Front Road	400		CSP	NO	Good condition. Less than 300mm cover provided.	Leave in place	NO
58	Asphalt	10+720	Front Road	400		CSP	NO	Blocked. Assume the pipe defect is due to depression in asphalt, parallel to plane of culvert. Less than 300 cover provided.	Replace	NO

AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	(mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
59	Asphalt	10+430	Front Road	600		CSP	NO	Good condition. Less than 300mm cover provided. Crack in pavement parallel to culvert plane. Slight damage on inlet end of pipe.	Leave in place	NO
60	Asphalt	10+190	Front Road	1000		CSP	NO	Good condtion. Light rust staining, 20%, below springline of pipe. Could not see below springline of pipe due to frozen water in pipe.	Leave in place	NO
61	Asphalt	10+192	Front Road	1000		CSP	NO	Good - fair condition. Light to moderate rusting on 20% of pipe. Could not see below springline of pipe due to frozen water in pipe.	Leave in place	NO
CONCESSION ROAD 3										
B	Gravel	30+435	Third Concession Road		400	CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	
62	Gravel	30+610	Third Concession Road	400		CSP	NO	Blocked. Unable to access.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
63	Gravel	30+658	Third Concession Road	400		CSP	NO	Inlet appeared to be in Fair condition. Unable to access Outlet end. CSP requires extensions to meet R.O.W. guidelines.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
64	Gravel	30+845	Third Concession Road	400 / 350	400	CSP	NO	Fair Condition. Partially blocked with overburden.	Leave in place.	NO
65	Gravel	31+670	Third Concession Road	450		CSP	NO	Fair condition. 20% rust staining	Leave in place.	NO
66	Gravel	31+860	Third Concession Road	5200 x 2400 Elliptical Bolted pipe	4500 Semi-circle bolted	CSP	NO	Good Condition. Concrete footings in good condition, no signs of any defects at this time. Roof portion of pipe is dry, no moisture present. Bolts tight with no moiture or rust present. No cracking or deformation of pipe shape present. Greater than 1200mm of cover.	Leave in place	NO
67	Gravel	32+150	Third Concession Road	400 / 600	500	CSP	NO	Good condition	Leave in place	NO
68	Gravel	32+280	Third Concession Road	500		CSP	NO	Good condition. Slight damage at Inlet end of pipe. Slight rusting at outlet end of pipe.	Leave in place	NO
69	Gravel	32+490	Third Concession Road	600		CSP	NO	Good condition. Debris in oultet end of pipe. "Hickenbottom" at west end.	Leave in place	NO
70	Gravel	32+740	Third Concession Road	400		CSP	NO	Good condtion. Rust staining along 10% of pipe	Leave in place	NO
71	Gravel	33+095	Third Concession Road	400		CSP	NO	Good condition	Leave in place	NO
72	Gravel	33+285	Third Concession Road	400		CSP	NO	Good condition	Leave in place	NO

AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	(mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
73	Gravel	33+618	Third Concession Road	500		CSP	NO	Fair condition. Slight damage / obstruction at east end of pipe. Less than 300mm cover on pipe provided.	Leave in place, monitor flows during peak flow periods.	NO
74	Gravel	33+810	Third Concession Road	400		CSP	NO	Good conditon. Pipe has been extended using larger than 400mm pipe.	Leave in place	NO
75	Gravel	34+065	Third Concession Road	PLUGGED / END DAMAGED		CSP	NO	Ends were plugged, could not access. East end appears damaged	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
76	Gravel	34+170	Third Concession Road	400		CSP	NO	Good condition. Less than 300mm cover provided.	Leave in place	NO
77	Gravel	34+245	Third Concession Road	400		CSP	NO	Good condition.	Leave in place	NO
78	Gravel	34+595	Third Concession Road	300		CSP	NO	Good condition	Leave in place	NO
79	Gravel	34+790	Third Concession Road	400		CSP	NO	Fair condition. Debris throughout culvert.	Leave in place	NO
80	Gravel	34+900	Third Concession Road	400		CSP	NO	Good condition - fair. Rust staining on 25% of pipe	Leave in place	NO
81	Gravel	35+020	Third Concession Road	400 / 450	450	CSP	NO	Good - poor condition. 3/4 of pipe is good. Remainder is full of corrosion	Leave in place, but monitor since pipe may buckle under constant heavy loads	NO
C	Gravel (at time of Project work)	35+260	Third Concession Road		350	CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	
STELLA 40 FOOT ROAD										
82	Gravel	40+560	Stella Forty Foot Road	2500 x 1500 Pre-cast Concrete Box Culvert		PRE CAST CONCRETE		Good condition. Pre-cast segment joints at west end are different in horizontal plane, but this appears to be a product of poor intallation. Roof slab is dry and free of moisture. Retaining walls are plumb and free of sag or bowness.	Leave in place	NO
~~83~~	~~Gravel~~	~~40+125~~	~~Stella Forty Foot Road~~	~~400~~		~~CSP~~	~~RETAIN.~~	~~Fair - poor condition. Corrosion on 50% of pipe.~~	Outside of Project Heavy Load boundaries	NO
84	Gravel (at time of Project work)	40+845	Stella Forty Foot Road	500		CSP	NO	Fair condition. Moderate corrosion on 30% of pipe. Cracking and depression in asphalt, parallel to CSP.	Replace	NO
85	Gravel (at time of Project work)	41+340	Stella Forty Foot Road	550 / 600	600	CSP	NO	Fair condition. Moderate corrosion on 40% of pipe at east end.	Leave in place but monitor while heavy traffic loads cross culvert.	NO
CONCESSION ROAD 2										

AMHERST ISLAND WIND FARM CULVERT INSPECTION FORM

Updated 11 Sep '17, with concurrence by Todd Hutton of Stantec.

Contract Culvert Number	Top Surface type	Station	Location	In-Field Culvert Measurement Culvert (mm)	In-Field Culvert Measurement (mm)	Culvert Type	Existing Headwall	Culvert Condition	Culvert Inspection and Evaluation Recommendations	Structural Repair Work Required
D	Gravel (at time of Project work)	25+595	Second Concession Road		350	CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	
86	Gravel	25+510	Second Concession Road	400		CSP	NO	Both ends of culvert covered or crushed. Could not evaluate	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
87	Gravel	25+265	Second Concession Road	400		CSP	NO	Pipe full of frozen water and damage on west end of culvert. Could not evaluate.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	NO
88	Gravel	24+390	Second Concession Road	600		CSP	NO	Fair - poor condition. Corrosion on 30% of pipe. Less than 300mm cover	Replace	NO
89	Gravel	24+388	Second Concession Road	600		CSP	NO	Fair - poor condition. Corrosion on 30% of pipe. Less than 300mm cover	Replace	NO
90	Gravel	24+105	Second Concession Road	450		CSP	NO	Poor condition. Corrosion throughout pipe.	Replace	NO
91	Gravel	23+790	Second Concession Road	300		CSP	NO	Good condition.	Leave in place	NO
92	Gravel	23+218	Second Concession Road	400		CSP	NO	Good condition. Corrosion on 10% of pipe	Leave in place	NO
E	Gravel	22+845	Second Concession Road		1030x740	CSPA	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	N/A
F	Gravel	22+850	Second Concession Road		1030x740	CSPA	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	N/A
93	Gravel	22+425	Second Concession Road	900		CSP	NO	Fair condition - 75% Rust condition at springline of pipe	Replace	NO
G	Gravel	21+420	Second Concession Road		400	CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	N/A
H	Gravel	20+575	Second Concession Road		800	CSP	NO	Culvert was not inspected.	Culvert was not inspected. Replace if permits allow, protect otherwise in accordance with detail on drawing sheet MR289.	N/A

CONCRETE CULVERT INSPECTION

Project ID # 1421 Amherst Island Wind Farm –
Culvert Inspection Collection System on the Island.

Culvert No.:	4	Inspected by:	Kevin Culligan
Culvert Location:	0+685, 3850 SOUTH SHORE RD	Date:	March 13, 2017
Skew:	N/A	Reviewed by:	
Type:	1000 CSP Joined to 1000 x 1200 Concrete Culvert	Date:	
Diameter / Width:	1200		
Height:	1200		
Wall / Slab Thickness:	300		
Length:	9700mm	Inlet Elevation:	N/A
Flow Direction:	West to East.	Outlet Elevation:	N/A

OBSERVATIONS:

Inlet:

- Spring fed pond empties into sluice gate opening at 1000mm CSP location
- 1200 diameter CSP pipe extends 3.0 meters into 1200 x 1200 deteriorated box culvert which empties into Lake Ontario.

Outlet:

- Outlet has deteriorating, separated culvert walls and headwall. Flow of water is emptied into Lake Ontario. Walls are founded on bedrock.

Culvert Condition:

- Concrete is unsound, cracked and deteriorating beyond any heavy vehicular traffic load.
- Severe cracking in walls and disintegration and lack of foundation supporting culvert walls.
- Leaking though WIDE cracks along pour lines of culvert barrel walls

Drainage/Flow Condition:

- Culvert is substantially blocked with rip rap rock to prevent further erosion of the culvert wall bond.
- At time of inspection there was no flow through culvert. Due to the intentional blockage inside of culvert and sluice gates at the inlet end of the culvert, it would appear that neighboring interests prefer the amount of water capacity in the private pond. With this, the culvert appears to have been sized correctly for the nominal capacities.

Recommendations:

- This culvert has experienced several structural defects and failures, especially if subject to future traffic overloading more consequential effects will be realized. Remove and replace existing concrete culvert with similar or larger sectional area structure or CSP.

FACING NORTH

FACING SOUTH

INLET LOOKING WEST

OUTLET LOOKING EAST, CRACKING AND EROSION AT HEADWALL

EAST HEADWALL / SOUTH WALL, WEST ELEVATION,
CRACKING AND SEPARATION OF HEADWALL

EAST HEADWALL / NORTH WALL, WEST ELEVATION
CRACKING AND SEPARATION OF HEADWALL

NORTH WALL BASE, WEST ELEVATION
EROSION AND LACK OF FOUNDATION BOND

WEST ELEVATION, CULVERT BARREL
LEAKING OF WIDE CRACKS

SOUTHWEST ELEVATION
SEPARATION OF HEADWALL AND DETERIORATED CONCRETE WALLS

CONCRETE CULVERT INSPECTION

Project ID # 1421 Amherst Island Wind Farm –
Culvert Inspection, Collection System on the Island.

To be field verified;

Culvert No.:	41,	Inspected by:	Kevin Culligan
Culvert Location:	15+945, 780 FRONT ROAD	Date:	March 13, 2017
Skew:	N/A	Reviewed by:	
Type:	Concrete Box Culvert	Date:	
Diameter / Width:	2500mm		
Height:	1250mm		
Wall / Slab Thickness:	600mm		
Length:	6900mm	Inlet Elevation:	N/A
Flow Direction:	North to South	Outlet Elevation:	N/A

OBSERVATIONS:

Inlet:

- Inlet is open and free of obstructions at time of inspection.
- Culvert Inlet walls are severely cracked and separation between wall and deck slab.

Outlet:

- Outlet walls have major overgrowth and flow obstructions.
- Walls are separating from deck slab.

Culvert Condition:

- Culvert is in poor condition. Severe diagonal cracking, full height along east wall, at 1.35m from North end of culvert.
- Wall to slab 25mm gap separation along east wall for 5.2 meters from east end of culvert.
- Severe cracking for 2.0 meters on West wall, around to Northwest wingwall.
- Broken slab on North East corner.
- Footings, if any were inaccessible at time of inspection

Drainage/Flow Condition:

- At time of inspection flow was stagnant.

Recommendations:

- This culvert has experienced several structural defects and failures, especially if subject to future traffic overloading more consequential effects will be realized. Remove and replace existing concrete culvert with similar or larger sectional area structure or CSP.

LOOKING WEST ON FRONT ROAD

LOOKING EAST ON FRONT ROAD

SOUTH WEST ELEVATION, WEST WALL
SEVERE CRACKING AND SEPARATION

EAST ELEVATION, EAST WALL
SEVERE DIAGONAL CRACKING, NORTH CRACK

EAST ELEVATION, CULVERT BARREL

EAST WALL,
SOUTH CRACK, AND WALL TO SLAB SEPARATION

EAST WALL, 25mm ROOF SLAB TO WALL SEPARATION

EAST ELEVATION, SOUTHEAST WALL
DISINTEGRATION OF SMALL HEADWALL

WEST ELEVATION, SOUTHEAST WALL
ROOF SLAB TO WALL SEPARTION,

ELLIPTICAL ARCH STEEL CULVERT INSPECTION

Project ID # 1421 Amherst Island Wind Farm –
Culvert Inspection Collection System on the Island.

Culvert No.:	66	Inspected by:	Kevin Culligan
Culvert Location:	31+860, 3475 Concession Rd 3	Date:	March 14, 2017
Skew:	N/A	Reviewed by:	
Type:	CSP / CONCRETE FOOTING	Date:	
Diameter / Width:	5200mm		
Height:	2400mm		
Wall / Slab Thickness:	Concrete Footing – 760mm x 1200deep (assumed)		
Length:	23.8	Inlet Elevation:	N/A
Flow Direction:	West to East	Outlet Elevation:	N/A

OBSERVATIONS:

Inlet:

- Clear of obstructions, frozen at the time, but appears free flowing when thawed.

Outlet:

- Clear of obstructions, frozen at the time, but appears free flowing when thawed.

Pipe Condition:

- Pipe is in good condition. No defects observed. Culvert bolts are dry and free of rust. There are no signs of cracking or leaking of steel structure. There is minor vegetative staining along bottom 400mm of the culvert arch. The connecting arch plate to the concrete footing appears to be non-galvanized / welded steel plate. As such, there is a light rust staining along this steel plate connection. The culvert still appears to maintain its original arch shape which indicates that no deformation has occurred to date.

- Concrete footing free of defects. Two (2) Very narrow cracks < 0.2mm in width observed along south footing. These appear to be shrinkage cracks resulting from lack of concrete curing procedures at time of footing pour.

Drainage/Flow Condition:

- Drainage flow is from West to East. There are no obstructions and water staining on pipe would indicate that water flows at less than one quarter of pipe capacity.

Recommendations:

- There were no defects found during time of inspection and structure is in good condition. No repairs are required.

LOOKING SOUTH

LOOKING NORTH

LOOKING WEST

LOOKING EAST

EAST ELEVATION

CULVERT BARREL SECTION

CONCRETE FOOTING AND CONNECTION POINTS

BOLTED CONNECTIONS

PRE-CAST CONCRETE CULVERT INSPECTION

Project ID # 1421 Amherst Island Wind Farm –
Culvert Inspection Collection System on the Island.

Culvert No.:	82	Inspected by:	Kevin Culligan
Culvert Location:	40+560,	Date:	March 14, 2017
Skew:	N/A	Reviewed by:	
Type:	Pre – cast concrete	Date:	
Diameter / Width:	2500mm		
Height:	1500mm		
Wall / Slab Thickness:	250mm Slab, 200 Wall		
Length:	15.0 meters	Inlet Elevation:	N/A
Flow Direction:	East to West (assumed)	Outlet Elevation:	N/A

OBSERVATIONS:

Inlet:

- Some overgrowth and fence line appears to be impeding water flow.

Outlet:

- Some overgrowth, flow appears to be ok.

Culvert Condition:

- No defects present.
- Pre-cast roof slab sections at west end are differential in horizontal plane, but this appears to be a product of either improper orientation during installation or a manufacturing defect.
- There are no signs of settlement, cracking or deflection during inspection. Culvert faces were dry and no
- signs of leaking or moisture at joint locations.

Drainage/Flow Condition:

- At time of inspection, culvert barrel was almost completely frozen. Water marks on pre-cast sections indicate water flow through culvert during high peak flow is approximately 40% of capacity.

Recommendations:

- There were no defects found during time of inspection and structure is in good condition. No repairs are required.

LOOKING SOUTH

LOOKING WEST

LOOKING EAST

EAST ELEVATION

WEST ELEVATION

SOUTH WEST END SECTION OF PRE-CAST CULVERT BARREL

SOUTHEAST END SECTION OF PRE-CAST CULVERT BARREL

SECTION THROUGH PRE-CAST CULVERT BARREL