

Memo to:

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Environmental Permissions Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West,
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From:

DNV GL – Energy
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Phone: +1 514 272-2175

Date:

28 April 2020

DNV GL reference:

10160644-HOU-R-02

Confidentiality Classification:

Customer's Discretion

Subject: Barlow Solar Energy Centre – Answers to MECP Questions on Acoustic Audits

This letter provides additional information for the Ministry of the Environment, Conservation and Parks (MECP) following information requests sent by the MECP on 13 March 2020 in relation to the Acoustic Audit Report [1] dated 24 January 2020 for the Barlow Solar Energy Centre (the "Project"). The text in blue refers to questions from the MECP.

1. Height of the microphone/measurements – the report indicates that the measurements were done at the height of 1.5 m. It appears that the microphone was installed at a height lower than 1.5 m.

The microphone was installed at a height of 1.5 m and the weather station is installed at 2.0 m. This was confirmed on-site via a laser distance measurer. A picture of the height (1.537 m) was documented with the windscreen off. Moreover, the windscreen can serve as a reference object. The microphone rests in the middle of the windscreen and since the windscreen is a 7" sphere, it is possible to estimate the microphone height based on a relative size from the windscreen. Based on our calculation, the windscreen is 0.21 inches on screen and the microphone height is 1.75 inches on screen. The microphone height is 8.33 times tall as the windscreen. This ratio can be used to estimate actual dimensions. Since the windscreen is 7" tall, the microphone is situated approximately 58.3" (1.8 m) above ground. Photos of the laser distance measurer and relative sizing example are shown in Figure 1-1.



Figure 1-1 Photos of laser distance measurer and relative sizing from the South location

2. Please confirm that all receptors surrounding facility are one storey houses and a height of 4.5 m does not apply, as per approval.

The pre-constructions acoustic assessment report (AAR) [2] conservatively assumed a height of 4.5 m for all receptors, without any consideration for the structures.

The two nearest buildings surrounding the facility are:

- a one-story transfer station to the northeast; and
- the one story shed near Cornwall Aeromodellers to the southwest.

As noted in the AAR:

The lands immediately south of the Project Location (and south of Cornwall Centre Road) are owned by Hydro One (Transmission line corridor) and the City of Cornwall (dump or transfer station). The current land use zoning designation does not permit noise sensitive buildings and therefore no receptors are included on these properties.

The shed to the southwest is aptly described in the AAR as:

Similarly, an abandoned commercial building is located to the southwest within lands zoned commercial. This property is not considered suitable for a noise sensitive receptor.

The land to the east where the measurement was taken is described as well:

The 40 dBA contour plot can extend over to the property located to the east of the Project Location. However, of the property over which the 40 dBA contour plot extends is currently zoned as a flood plain and is not considered suitable for a noise sensitive receptor. Therefore, a vacant lot receptor was not considered.

To address further concerns, modelled sound levels are presented in this memo (MECP question 5), at 1.5 m and 4.5 m at the nearest receptor in each direction. These receptors are outside the land areas surrounding the facility. The selected monitoring locations are much closer than the receptors to the Project. In order to have a more conservative reading and with limitations on site access, measurements were taken near the property line of the Project area based on the height of the nearest buildings.

3. ANSI/IEEE C57.12.90 Standard – provide sample calculation of sound power and the area based on info presented in Table 5-1 and Table 5-2.

The acoustic audit report [1] provided the dimensions for the entire inverter/transformer skid in Table 5-1. The inverter and transformer areas were calculated separately for assessing sound power shown in Table 5-2. The positioning of inverter and transformer are slightly offset and separated from each other which can be viewed within the report photos (Figure A-1 through A-4). Therefore, the size of the skid is larger than the sum of the components in certain directions. Table 3-1 show the dimensions of the installed equipment. The Inverter/Transformer skid dimensions are informative.

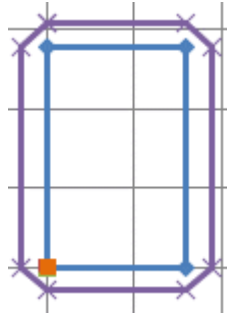
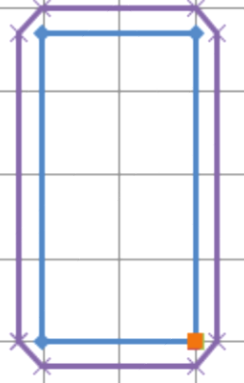
Table 3-1 Dimensions of transformer and inverter

	Transformer	Inverter	Inverter/Transformer Skid
Length (m)	2.394	3.700	8.3
Width (m)	1.711	2.022	3.2
Height (m)	2.509	2.254	2.5
Area (m ²)	31.6	40.7	Not Used

The area for the transformer was calculated using the C57.12.90 standard with a 0.3 m offset, applicable to naturally cooled surface (no fans). Measurements were taken 0.3 m from the unit.

Calculations are provided in Table 3-2. In this example, the blue box represents the perimeter of the transformer. The purple outline represents the perimeter area used for assessing the surface area. The derivation of total surface area from dimensions is shown in Table 3-2.

Table 3-2 Summary of C57.12.90 surface area calculations

	<p>Transformer Dimensions of equipment (blue): 2.394 x 1.711 m</p> <p>Dimensions of C57 area: (purple) Top/Bottom: 1.711 m Left/Right: 2.394 m Corner Lines: 0.424 m</p> <p>Perimeter: $(1.711 \times 2) + (2.394 \times 2) + (0.424 \times 4) = 9.906$ m Side Area = Perimeter \times height = $9.906 \times 2.509 = 24.854$ m²</p> <p>Top Area: $(1.711+0.3 \times 2) \times (2.394+0.3 \times 2) - (0.3 \times 0.3) \times 2 = 6.739$ m²</p> <p>Total Area = $24.854 + 6.739 = \mathbf{31.6\ m^2}$</p>
	<p>Inverter Dimensions of equipment (blue): 3.700 x 2.022 m</p> <p>Dimensions of C57 area: (purple) Top/Bottom: 2.022 m Left/Right: 3.700 m Corner Lines: 0.424 m</p> <p>Perimeter: $(3.700 \times 2) + (2.022 \times 2) + (0.424 \times 4) = 13.140$ m Side Area = Perimeter \times height = $13.140 \times 2.509 = 29.618$ m²</p> <p>Top Area: $(3.700+0.3 \times 2) \times (2.022+0.3 \times 2) - (0.3 \times 0.3) \times 2 = 11.095$ m²</p> <p>Total Area = $29.618 + 11.095 = \mathbf{40.7\ m^2}$</p>

The reported sound power levels (PWL) in Table 5-2 of the report [1] were converted from the sound pressure level (SPL) at each measurement point using the following equation:

$$PWL = SPL + 10 \times \log_{10} (S), \text{ where } S \text{ is the measurement surface area in } m^2.$$

The values used for the PWL calculations are shown in Table 3-3.

Table 3-3 Summary of sound pressure level to sound power level calculations

Equipment	Average Sound Pressure Level [dBA]	10 × Log (S)	Sound Power Level [dBA]
Transformer	74.5	15.0	89.4 ^a
Inverter	76.6	16.1	92.7

^a - Additional precision was maintained within calculations: $74.451 + 14.996 = 89.447$

4. AADT traffic counts are not generally used to define the ambient and criteria levels. Please provide more details on traffic data used in assessment, compared with traffic counts obtained from the local municipality on an hourly basis.

DNV GL obtained daily [6] and detailed traffic counts [7] from the City of Cornwall. Traffic noise results were modelled with STAMSON. Modelled sound pressure levels using AADT traffic counts and more granular city records were similar. The surveys occurred during periods when the solar plant was active, which coincides with more active time periods. This supports the approach that averaged AADT totals are appropriate for these locations during the hours when the acoustic audit occurred. NPC-300 Section C.3.2.1 states that road traffic noise impacts may be based on AADT as well [4]. City of Cornwall traffic records were obtained for the nearest intersection to the Project (Power Dam Drive and Cornwall Centre Road) gathered on 6/5/2019 and 6/14/2017. The City traffic data is divided into 15-minute intervals. The traffic counts presented within this memo are aligned the acoustic audit time of day for each measurement period to the extent possible, and then normalized the results to one-hour periods. STAMSON modelled results and Cornwall traffic data are include at the end of this memo in Appendix A and Appendix B.

As a matter of conservatism, all vehicles were assumed to be cars. Only the City of Cornwall 2017 data contained information for commercial traffic, as the City had an issue with the 2019 commercial data. The 2017 data daily totals indicated that slightly more than 10 percent of the traffic was commercial. Assuming 10 percent of the vehicle records were medium trucks, based on STAMSON results, this would increase the modelled traffic noise by 3 dBA.

DNV GL has not received hourly data from Highway 401. Numerous attempts were made to contact Ontario Department of Transportation. Highway 401 is recognized as one of the busiest highways in the world. A continuous drone of highway noise was audible from the eastern monitoring location 1,275 meters from the highway.

Measurement location	Distance from road (m)	Annual Average Daily Traffic (AADT)		Field measurement count		City of Cornwall 15 Minute Records	
		Vehicles (averaged to 1 hour)	Modeled traffic noise [dBA]	Vehicles (averaged to 1 hour)	Modeled traffic noise [dBA]	Vehicles (averaged to 1 hour)	Modeled traffic noise [dBA]
South 17-Sep-19	39	98	48	90	48	101	48
East 10-Oct-19	168	98	37	57	35	92	37
East (Hwy 401) 10-Oct-19	1200	937	35	N/A	N/A	N/A	N/A
West 19-Oct-19	89	98	41	61	40	78	41

5. Based on measurement and assessment, indicate what is the estimated noise impact at the existing noise sensitive points of reception.

An updated acoustic model was created with DataKustik CadnaA using the ISO 9613-2 model.

Key modelling parameters included:

- Four transformer/inverter clusters based on the as-built coordinates and the measured sound power level (94.4 dBA) and measured octave band spectrum.
- The transformer clusters were modeled as point sources at a height of 2.5 m based on on-site measurements.
- Ground Factor of 0.7 based on the input parameters used in the AAR.
- Receptor height of 1.5 m for the monitoring locations.
- Receptor heights of 1.5 m and 4.5 m for the nearest receptors.

The AAR and REA simply provided general area polygons for the siting of equipment. The presented results from pre-construction models included the worst-case layout scenarios for each direction, applicable at each receptor. Additionally, there is no substation transformer at the project site even though it was included within the REA and AAR. It is worth noting that the 94.4 dBA sound power level can also be considered conservative because, as noted in the acoustic audit report [1], the measured value of each component may be influenced by the partnered pair of machinery.

The receptor testing locations are situated near the Project area boundary, and much closer than the nearest receptors. There are no real receptors immediately surrounding the facility (only commercial or industrial buildings).

Table 5-1 Modelled sound values at measurement locations

Measurement Locations						DNV GL Modeled As-Built
ID	Microphone Height (m)	Easting (m)	Northing (m)	Distance to nearest source (m)	Nearest Source ID	Modeled sound level at 1.5 m (dBA)
East	1.5	515045	4988067	308	East	38
South	1.5	514942	4987874	187	South	36
West	1.5	514657	4987781	189	West	38

The modelled values at the nearest receptors are compared to the pre-construction studies. As shown in Table 5-2, the updated values for the model are well below the 40 dBA night-time limit set for the Project.

Table 5-2 Modelled sound values at closest receptors

AAR receptor coordinates and Model						DNV GL Modeled As-Built	
ID	Modeled height (m)	Easting (m)	Northing (m)	Distance to nearest source (m)	Modeled sound level (dBA)	Modeled sound level at 1.5 m (dBA)	Modeled sound level at 4.5 m (dBA)
VPOR29	4.5	515333	4988010	572	34	27	28
VPOR45	4.5	515152	4987511	574	33	28	30
EPOR60	4.5	514260	4987476	684	30	28	30

REFERENCES

- [1] DNV GL. Barlow Solar Energy Centre: Acoustic Audit Report. 24 January 2020.
- [2] Stantec. Barlow Solar Energy Centre Acoustic Assessment Report. 5 October 2017.
- [3] Ontario Ministry of the Environment and Climate Change. Barlow Solar Energy Centre, Renewable Energy Approval, number 0173-AW6HLN. 3 April 2018.
- [4] MOE Publication NPC-300, Environmental Noise Guideline, Stationery and Transportation Sources - Approval and Planning Publication NPC-300", August 2013,
- [5] IEEE Std C57.12.90 - Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers. 2015.
- [6] Lalonde, 2018 Daily Traffic Counts. City of Cornwall: Infrastructure and Municipal Works. December 2018.
- [7] City of Cornwall. Power Dam and Cornwall Centre Traffic Data for 2017 & 2019. Obtained 16 & 17 April 2019 via email correspondence with City of Cornwall: Department of Infrastructure & Municipal works.

APPENDIX B- CORNWALL TRAFFIC DATA

City of Cornwall

1225 Ontario St
Cornwall, ON, K6H 5T9
613-932-5354

Zone:2
Counted by:Christina
Printed by: Ben
Other: PEAKS

File Name : power dam and cornwall centre
Site Code : 00000000
Start Date : 6/5/2019
Page No : 1

Start Time	Power Dam From North			Cornwall Centre From East			Power Dam From South			Cornwall Centre From West			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
06:45 AM	2	26	4	4	8	3	3	7	0	1	4	2	64
Total	2	26	4	4	8	3	3	7	0	1	4	2	64
07:00 AM	2	17	5	0	6	8	1	14	2	2	9	2	68
07:15 AM	2	23	14	2	4	5	5	16	1	0	4	0	76
07:30 AM	5	43	10	5	6	4	4	12	2	0	7	2	100
07:45 AM	4	44	13	4	19	11	9	27	2	1	8	3	145
Total	13	127	42	11	35	28	19	69	7	3	28	7	389
08:00 AM	4	36	9	7	10	11	6	29	1	5	7	0	125
08:15 AM	2	35	10	3	4	5	6	11	2	1	1	0	80
08:30 AM	2	30	5	0	5	5	11	17	0	1	11	2	89
08:45 AM	0	35	10	0	5	5	12	15	0	0	8	1	91
Total	8	136	34	10	24	26	35	72	3	7	27	3	385
09:00 AM	1	31	11	4	4	6	7	13	2	0	1	3	83
09:15 AM	0	13	6	4	6	2	5	24	5	1	6	1	73
09:30 AM	0	20	3	1	4	4	8	18	1	3	6	3	71
*** BREAK ***													
Total	1	64	20	9	14	12	20	55	8	4	13	7	227
*** BREAK ***													
11:15 AM	5	15	2	3	14	11	9	13	2	3	8	1	86
11:30 AM	1	11	7	6	5	5	8	26	1	1	7	4	82
11:45 AM	1	12	7	7	9	8	8	19	2	3	12	2	90
Total	7	38	16	16	28	24	25	58	5	7	27	7	258
12:00 PM	1	13	6	6	9	5	4	27	4	2	8	2	87
12:15 PM	4	9	7	6	7	6	6	27	3	1	7	2	85
12:30 PM	5	20	11	5	4	3	8	15	1	1	6	2	81
12:45 PM	1	16	6	3	5	2	10	14	1	2	10	1	71
Total	11	58	30	20	25	16	28	83	9	6	31	7	324
01:00 PM	2	11	4	5	14	3	0	28	2	2	9	3	83
*** BREAK ***													
Total	2	11	4	5	14	3	0	28	2	2	9	3	83
*** BREAK ***													
02:45 PM	0	22	4	7	8	3	5	21	3	3	4	3	83
Total	0	22	4	7	8	3	5	21	3	3	4	3	83
03:00 PM	3	20	8	4	6	2	9	28	2	2	11	3	98
03:15 PM	2	29	7	1	5	8	12	36	1	5	17	4	127
03:30 PM	6	21	6	7	6	10	11	41	1	1	16	4	130
03:45 PM	0	25	7	6	11	9	16	28	0	0	8	2	112
Total	11	95	28	18	28	29	48	133	4	8	52	13	467
04:00 PM	2	27	12	9	3	11	7	44	3	2	8	5	133
04:15 PM	2	21	6	2	9	7	12	44	3	0	3	0	109
04:30 PM	1	24	10	7	8	7	11	43	2	3	9	5	130
04:45 PM	0	24	17	5	12	9	14	41	4	2	5	2	135
Total	5	96	45	23	32	34	44	172	12	7	25	12	507
05:00 PM	2	34	5	4	10	8	15	53	2	3	3	3	142
05:15 PM	1	18	6	1	8	13	9	40	3	1	4	3	107
05:30 PM	2	30	7	6	7	6	7	23	1	0	5	3	97
Grand Total	65	755	245	134	241	205	258	814	59	52	232	73	3133
Apprch %	6.1	70.9	23	23.1	41.6	35.3	22.8	72	5.2	14.6	65	20.4	
Total %	2.1	24.1	7.8	4.3	7.7	6.5	8.2	26	1.9	1.7	7.4	2.3	

City of Cornwall

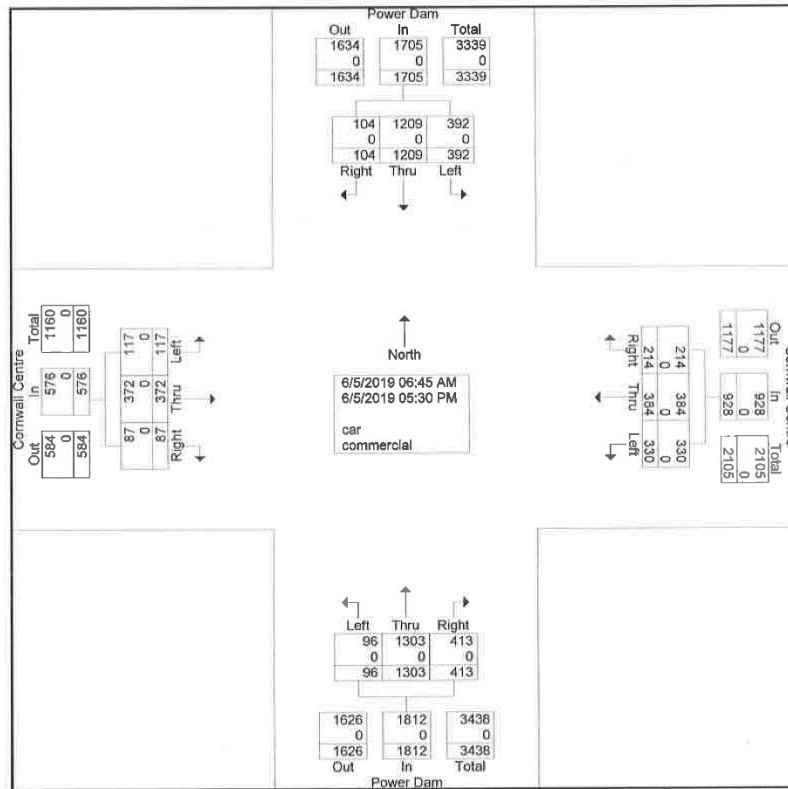
1225 Ontario St
Cornwall, ON, K6H 5T9
613-932-5354

Zone:2
Counted by:Christina
Printed by: Ben
Other: AADT

File Name : Power Dam and Cornwall Centre
Site Code : 00000000
Start Date : 6/5/2019
Page No : 2

Groups Printed- car - commercial

	Power Dam From North			Cornwall Centre From East			Power Dam From South			Cornwall Centre From West			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
car	104	1209	392	214	384	330	413	1303	96	87	372	117	5021
% car	100	100	100	100	100	100	100	100	100	100	100	100	100
commercial	0	0	0	0	0	0	0	0	0	0	0	0	0
% commercial	0	0	0	0	0	0	0	0	0	0	0	0	0



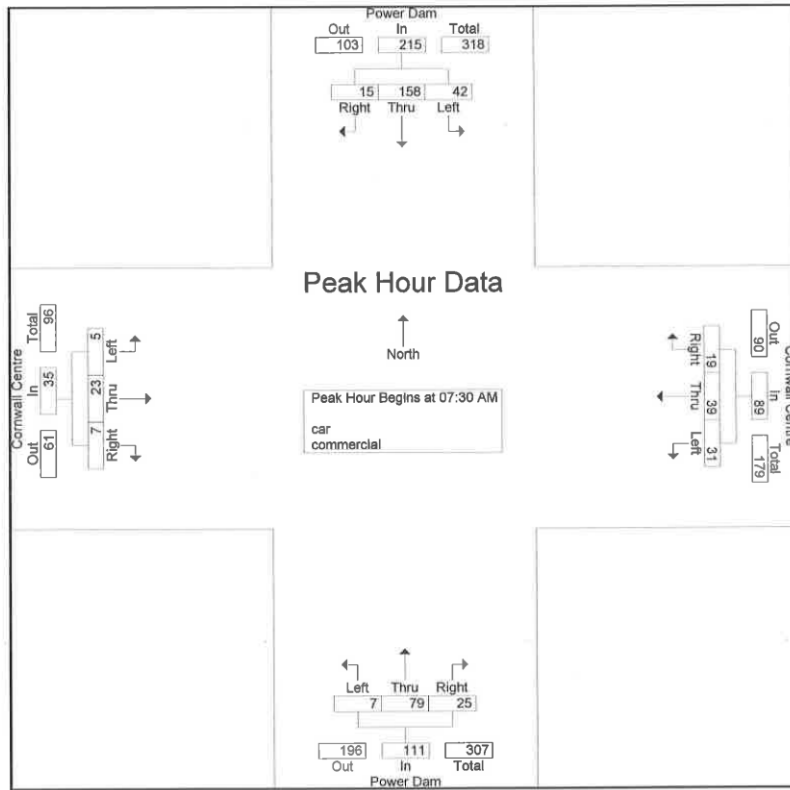
City of Cornwall

1225 Ontario St
 Cornwall, ON, K6H 5T9
 613-932-5354

Zone:2
 Counted by:Christina
 Printed by: Ben
 Other: PEAKS

File Name : power dam and cornwall centre
 Site Code : 00000000
 Start Date : 6/5/2019
 Page No : 3

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 06:45 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	5	43	10	58	5	6	4	15	4	12	2	18	0	7	2	9	100
07:45 AM	4	44	13	61	4	19	11	34	9	27	2	38	1	8	3	12	145
08:00 AM	4	36	9	49	7	10	11	28	6	29	1	36	5	7	0	12	125
08:15 AM	2	35	10	47	3	4	5	12	6	11	2	19	1	1	0	2	80
Total Volume	15	158	42	215	19	39	31	89	25	79	7	111	7	23	5	35	450
% App. Total	7	73.5	19.5		21.3	43.8	34.8		22.5	71.2	6.3		20	65.7	14.3		
PHF	.750	.898	.808	.881	.679	.513	.705	.654	.694	.681	.875	.730	.350	.719	.417	.729	.776



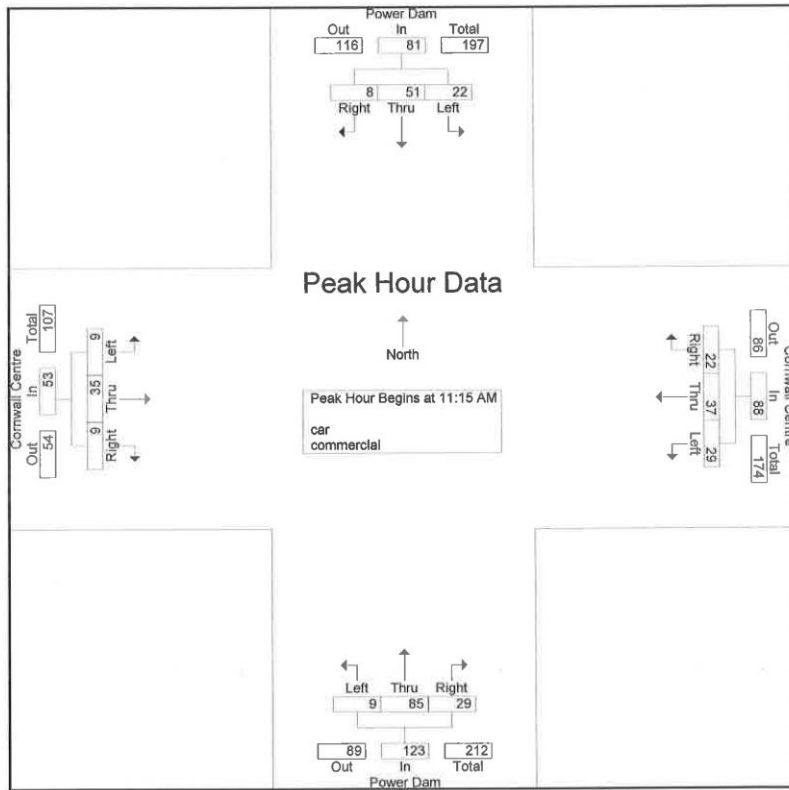
City of Cornwall

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Zone:2
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 Printed by: Ben
 Other: PEAKS

File Name : power dam and cornwall centre
 Site Code : 00000000
 Start Date : 6/5/2019
 Page No : 4

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 11:15 AM																	
11:15 AM	5	16	2	22	3	14	11	28	9	13	2	24	3	8	1	12	86
11:30 AM	1	11	7	19	6	5	5	16	8	26	1	35	1	7	4	12	82
11:45 AM	1	12	7	20	7	9	8	24	8	19	2	29	3	12	2	17	90
12:00 PM	1	13	6	20	6	9	5	20	4	27	4	35	2	8	2	12	87
Total Volume	8	51	22	81	22	37	29	88	29	85	9	123	9	35	9	53	345
% App. Total	9.9	63	27.2		25	42	33		23.6	69.1	7.3		17	66	17		
PHF	.400	.850	.786	.920	.786	.661	.659	.786	.806	.787	.563	.879	.750	.729	.563	.779	.958



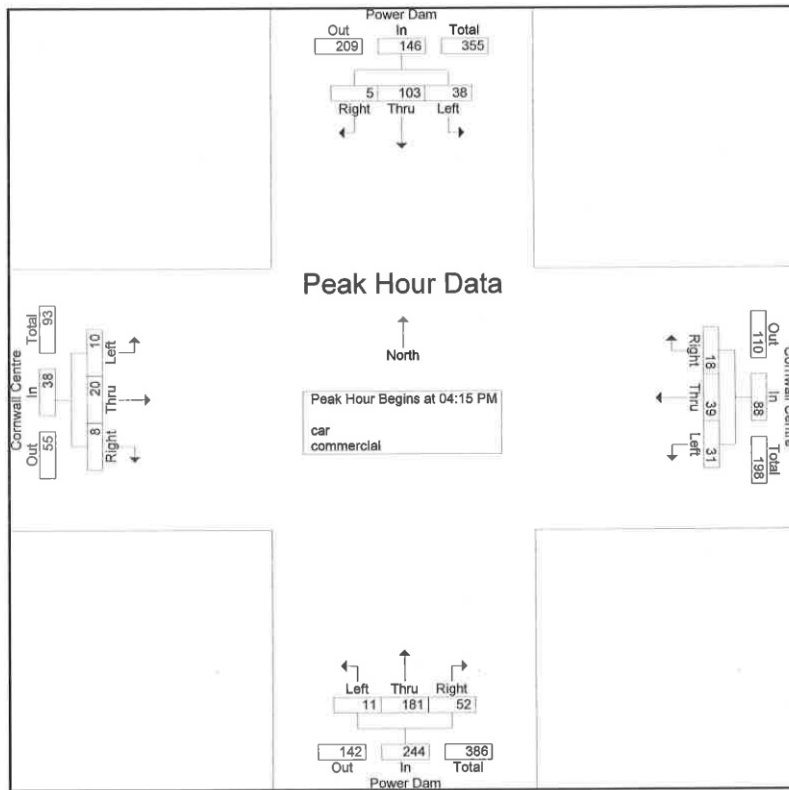
City of Cornwall

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Zone:2
 Counted by:Christina
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File Name : power dam and cornwall centre
 Site Code : 00000000
 Start Date : 6/5/2019
 Page No : 5

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 02:00 PM to 05:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	2	21	6	29	2	9	7	18	12	44	3	59	0	3	0	3	109
04:30 PM	1	24	10	35	7	8	7	22	11	43	2	56	3	9	5	17	130
04:45 PM	0	24	17	41	5	12	9	26	14	41	4	59	2	5	2	9	135
05:00 PM	2	34	5	41	4	10	8	22	15	63	2	70	3	3	3	9	142
Total Volume	5	103	38	146	18	39	31	88	52	181	11	244	8	20	10	38	516
% App. Total	3.4	70.5	26		20.5	44.3	35.2		21.3	74.2	4.5		21.1	52.6	26.3		
PHF	.625	.757	.559	.890	.643	.813	.861	.846	.867	.854	.688	.871	.667	.556	.500	.559	.908



City of Cornwall

1225 Ontario St
Cornwall, ON, K6H 5T9
613-932-5354

Zone: 2
Counted by:
Printed by: Ben
Other: PEAKS

File Name : Cornwall Centre and Power Dam
Site Code : 00000000
Start Date : 6/14/2017
Page No : 1

Groups Printed- car - commercial

Start Time	Power Dam From North			Cornwall Centre From East			Power Dam From South			Cornwall Centre From West			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
07:00 AM	0	21	7	6	1	4	1	14	1	0	7	0	62
07:15 AM	0	17	11	10	3	7	6	12	1	0	5	0	72
07:30 AM	2	24	13	6	5	4	5	12	2	0	5	1	79
07:45 AM	2	36	9	8	5	9	4	14	2	0	2	1	92
Total	4	98	40	30	14	24	16	52	6	0	19	2	305
08:00 AM	2	26	15	4	10	8	7	16	0	0	6	0	94
08:15 AM	3	20	7	5	7	5	4	8	0	0	6	3	68
08:30 AM	0	24	8	8	4	6	0	12	0	0	3	0	65
08:45 AM	0	19	7	8	6	3	7	8	0	0	7	2	67
Total	5	89	37	25	27	22	18	44	0	0	22	5	294
09:00 AM	3	17	8	8	6	2	3	10	1	1	2	1	62
09:15 AM	0	11	5	3	6	3	5	11	2	0	10	0	56
09:30 AM	1	12	3	5	7	0	3	10	3	0	3	0	47
09:45 AM	0	10	2	7	10	7	2	12	2	1	2	2	57
Total	4	50	18	23	29	12	13	43	8	2	17	3	222
*** BREAK ***													
11:30 AM	1	13	6	4	5	6	6	13	1	3	6	2	66
11:45 AM	3	14	6	7	6	2	4	11	0	0	9	0	62
Total	4	27	12	11	11	8	10	24	1	3	15	2	128
12:00 PM	1	7	10	5	9	2	4	16	2	0	7	2	65
12:15 PM	1	11	5	6	4	5	3	9	0	1	5	0	50
12:30 PM	1	15	8	6	7	3	5	11	0	0	6	0	62
12:45 PM	0	17	10	6	9	1	5	14	1	0	6	1	70
Total	3	50	33	23	29	11	17	50	3	1	24	3	247
01:00 PM	1	12	4	5	5	2	5	42	1	0	4	2	83
01:15 PM	3	13	5	7	4	0	3	13	2	0	2	1	53
*** BREAK ***													
Total	4	25	9	12	9	2	8	55	3	0	6	3	136
*** BREAK ***													
03:00 PM	1	13	6	4	8	4	9	24	0	0	7	2	78
03:15 PM	0	13	9	5	13	4	4	16	1	1	6	0	72
03:30 PM	4	6	6	7	6	3	7	27	2	1	12	2	83
03:45 PM	1	17	7	11	8	4	9	19	2	0	5	0	83
Total	6	49	28	27	35	15	29	86	5	2	30	4	316
04:00 PM	1	20	7	6	4	4	12	29	0	2	5	2	92
04:15 PM	4	21	7	5	8	6	9	24	0	3	7	0	94
04:30 PM	1	23	14	15	8	3	6	39	0	1	10	1	121
04:45 PM	1	18	12	8	8	7	11	37	1	0	12	0	115
Total	7	82	40	34	28	20	38	129	1	6	34	3	422
05:00 PM	2	28	9	8	13	7	8	36	0	0	13	0	124
05:15 PM	0	27	10	10	6	4	4	27	1	0	2	0	91
05:30 PM	0	15	11	10	3	4	6	25	0	0	7	1	82
05:45 PM	0	22	7	11	4	6	5	18	0	1	4	1	79
Total	2	92	37	39	26	21	23	106	1	1	26	2	376
Grand Total	39	562	254	224	208	135	172	589	28	15	193	27	2446
Apprch %	4.6	65.7	29.7	39.5	36.7	23.8	21.8	74.7	3.5	6.4	82.1	11.5	
Total %	1.6	23	10.4	9.2	8.5	5.5	7	24.1	1.1	0.6	7.9	1.1	
car	31	537	221	201	187	120	156	565	25	13	167	21	2244
% car	79.5	95.6	87	89.7	89.9	88.9	90.7	95.9	89.3	86.7	86.5	77.8	91.7

City of Cornwall

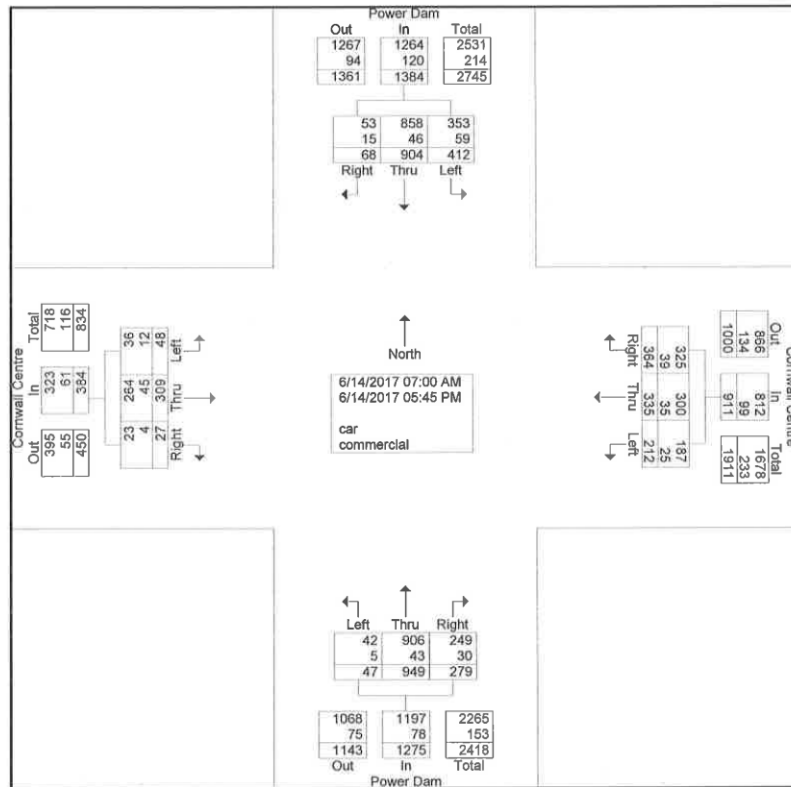
1225 Ontario St
 Cornwall, ON, K6H 5T9
 613-932-5354

Zone: 2
 Counted by:
 Printed by: Ben
 Other: AADT

File Name : Cornwall Centre and Power Dam
 Site Code : 00000000
 Start Date : 6/14/2017
 Page No : 2

Groups Printed- car - commercial

	Power Dam From North			Cornwall Centre From East			Power Dam From South			Cornwall Centre From West			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
commercial	15	46	59	39	35	25	30	43	5	4	45	12	358
% commercial	22.1	5.1	14.3	10.7	10.4	11.8	10.8	4.5	10.6	14.8	14.6	25	9.1



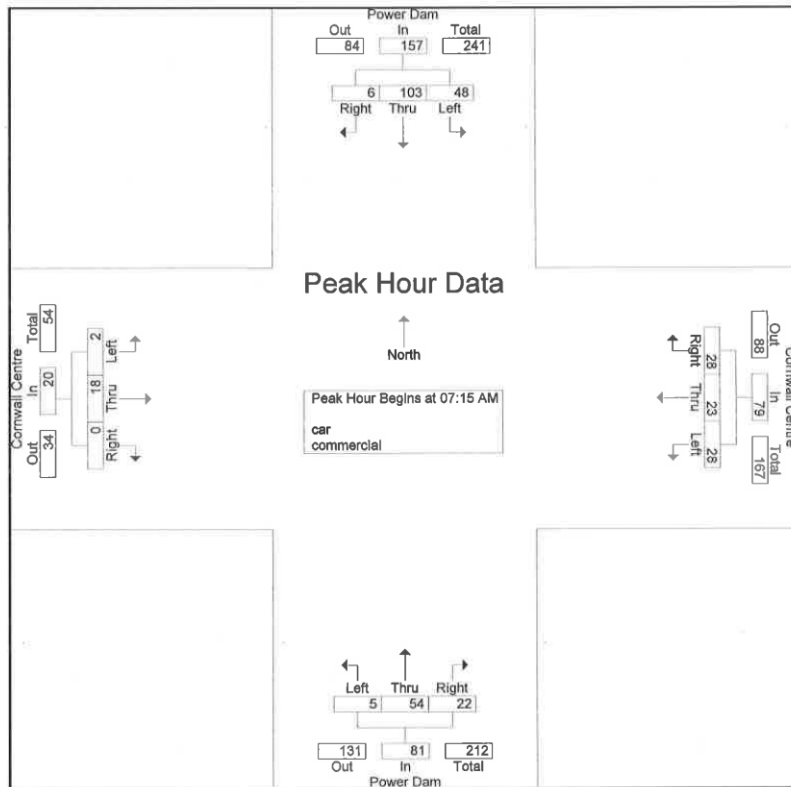
City of Cornwall

1225 Ontario St
 Cornwall, ON, K6H 5T9
 613-932-5354

Zone: 2
 Counted by:
 Printed by: Ben
 Other: PEAKS

File Name : Cornwall Centre and Power Dam
 Site Code : 00000000
 Start Date : 6/14/2017
 Page No : 3

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:15 AM																	
07:15 AM	0	17	11	28	10	3	7	20	6	12	1	19	0	5	0	5	72
07:30 AM	2	24	13	39	6	5	4	15	5	12	2	19	0	5	1	6	79
07:45 AM	2	36	9	47	8	5	9	22	4	14	2	20	0	2	1	3	92
08:00 AM	2	26	15	43	4	10	8	22	7	16	0	23	0	6	0	6	94
Total Volume	6	103	48	157	28	23	28	79	22	54	5	81	0	18	2	20	337
% App. Total	3.8	65.6	30.6		35.4	29.1	35.4		27.2	66.7	6.2		0	90	10		
PHF	.750	.715	.800	.835	.700	.575	.778	.898	.786	.844	.625	.880	.000	.750	.500	.833	.896



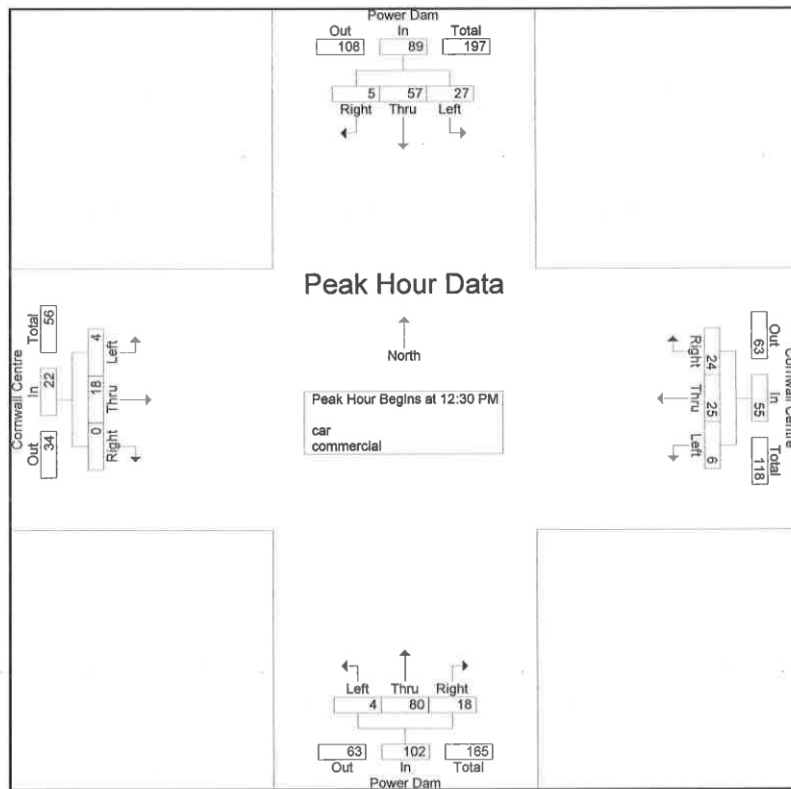
City of Cornwall

1225 Ontario St
Cornwall, ON, K6H 5T9
613-932-5354

Zone: 2
Counted by:
Printed by: Ben
Other: PEAKS

File Name : Cornwall Centre and Power Dam
Site Code : 00000000
Start Date : 6/14/2017
Page No : 4

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:30 PM																	
12:30 PM	1	15	8	24	6	7	3	16	5	11	0	16	0	6	0	6	
12:45 PM	0	17	10	27	6	9	1	16	5	14	1	20	0	6	1	7	
01:00 PM	1	12	4	17	5	5	2	12	5	42	1	48	0	4	2	6	
01:15 PM	3	13	5	21	7	4	0	11	3	13	2	18	0	2	1	3	
Total Volume	5	57	27	89	24	25	6	55	18	80	4	102	0	18	4	22	
% App. Total	5.6	64	30.3		43.6	45.5	10.9		17.6	78.4	3.9		0	81.8	18.2		
PHF	.417	.838	.675	.824	.857	.694	.500	.859	.900	.476	.500	.531	.000	.750	.500	.786	



City of Cornwall

1225 Ontario St
Cornwall, ON, K6H 5T9
613-932-5354

Zone: 2
Counted by:
Printed by: Ben
Other: PEAKS

File Name : Cornwall Centre and Power Dam
Site Code : 00000000
Start Date : 6/14/2017
Page No : 5

Start Time	Power Dam From North				Cornwall Centre From East				Power Dam From South				Cornwall Centre From West				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	4	21	7	32	5	8	6	19	9	24	0	33	3	7	0	10	94
04:30 PM	1	23	14	38	15	8	3	26	6	39	0	45	1	10	1	12	121
04:45 PM	1	18	12	31	8	8	7	23	11	37	1	49	0	12	0	12	115
05:00 PM	2	28	9	39	8	13	7	28	8	36	0	44	0	13	0	13	124
Total Volume	8	90	42	140	36	37	23	96	34	136	1	171	4	42	1	47	454
% App. Total	5.7	64.3	30		37.5	38.5	24		19.9	79.5	0.6		8.5	89.4	2.1		
PHF	.500	.804	.750	.897	.600	.712	.821	.857	.773	.872	.250	.872	.333	.808	.250	.904	.915

