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January 9, 2024

Halifax Water
450 Cowie Hill Road
Halifax, NS B3P 2V3

Re: Redevelopment of Mic Mac Mall & Adjacent Lands

– Downstream Wastewater Sewer Analysis

Our clients are planning to redevelop portions of their existing lands surrounding Mic Mac Mall in Dartmouth, Nova Scotia. The proposal for the mall property (owned by 4239474 Canada Inc) will add 2,400 residential apartment/senior units and 1,570,000 sq. ft. (14.6 ha) of new commercial space to the mall properties. Based on a unit density of 2.25 people per unit and a commercial density of 85 people per hectare, we understand that this development will add an additional 6,641 people to the area's population. The proposal for the adjacent lands (owned by Dartmouth Properties Limited) will add 2,000 residential units and 90,000 sq. ft. (0.84 ha) of commercial space to the area. Based on a unit density of 2.25 people per unit and a commercial density of 85 people per hectare, we understand that this development will add an additional 4,571 people to the area's population. Together these developments will add 11,212 people to the area's population. As per Halifax Water Design and Construction Specifications (2023) Section 4.2.1, SDMM has prepared the following capacity analysis for the wastewater systems immediately downstream of the proposed development sites.

Tributary Drainage Areas & Population

The downstream terminus of this analysis was established based on correspondence with Halifax Water Engineering staff who confirmed MH189609 within the Lake Banook trail /park to be the terminus of this analysis (See Figures 1-3). This manhole connects the analyzed sewer reaches to a 1200 mm trunk sewer that runs parallel to Lake Banook. Tributary areas for the analyzed sewers are depicted in Figure 1 of the appendix. Wastewater flows from the proposed developments have been split into four areas. Areas P1, P2 & P4 discharge to the wastewater system within Micmac Boulevard and Garden Court Terrace to the trail, while Area P3 discharges into the existing system within Brookdale Crescent as shown in Figure 4. The proposed flow split was established based on the available existing wastewater systems in front of each phase of the project. The two public wastewater systems available converge at the intersection of Brookdale Crescent and Garden Court Terrace before entering the park. This required the analysis of 22 sections of public gravity wastewater sewer directly downstream of the project site, shown in Figures 2 & 3 of the appendix.

SDMM determined equivalent populations for the existing sewer sheds based on the following resources:

- Halifax Water Design & Construction Specifications (2023)
- Zoning information from the HRM Regional Centre Secondary Municipal Planning Strategy & Regional Centre Land Use By-Law (Package B)
- Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal (2006)
- Correspondence with Halifax Water – (Population Densities & Terminus Point)

A summary of the density calculations is presented in Table 1. Existing populations were estimated by counting the number of residential properties, townhouses, and apartment units. A density of 3.35 people per unit was applied to residential homes and townhouses while a density of 2.25 people per unit was applied to apartment buildings. Tributary area and population calculations are summarized and presented in Table 2 of the appendix.

Estimated Wastewater Flow Calculations

Estimated wastewater flows were calculated for each reach of sewer based on the hydraulic design formula outlined in Section 4.2.2 of the Halifax Water Design & Construction Specifications (2023). Flows calculated include the Halifax Water safety factor of 1.25 with allowances of 0.30m³ per person per day for residential development and 24m³ per gross hectare per day for infiltration/inflow. A summary of the proposed wastewater flow calculations is presented in Table 3 of the appendix.

Existing Pipe Capacity

Existing pipe capacities were calculated using Manning's Equation for each reach of downstream sewer, utilizing pipe characteristics provided by Halifax Water GIS information. A summary of the existing pipe characteristics, flow capacities and resulting anticipated percentage of wastewater flow to pipe capacity for each reach of downstream sewer are presented in Table 4 of the appendix.

Conclusion

Comparing the estimated wastewater flows to the existing pipe capacities we see that several downstream pipe reaches are anticipated to exceed their flow capacities; these are identified in table 4 where their wastewater % of pipe capacity exceeds 100%.

Where the existing wastewater systems allowed a flow split, Area P3 will be conveyed via Brookdale Crescent separate from areas P1, P2 & P4. As a result, we can review these areas separately until we reach pipe U whereby these areas converge before reaching the above noted terminus. We note areas P1, P2 & P4 are routed via Micmac Boulevard and Garden Court Terrace.

Area P3 via Brookdale Crescent (pipe reaches M through T) results in an 87% theoretical wastewater % of pipe capacity within pipe O. This accounted for estimated wastewater flows based on 530 units and 2.09ha of commercial space (1370 people). We note the Brookdale system does not exceed 100% until a population of 1595 people or 100 additional apartment units are added to P3.

Area P1, P2 & P4 via Micmac Boulevard (pipe reaches AA through I) and Garden Court Terrace (pipe reaches J through L) result in several pipe reaches that exceed 100% capacity (reaches A, B, & I) with several others exceeding the 80% threshold (reaches AA, E, F, G, H, & J).

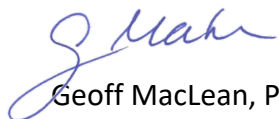
Where these areas converge the theoretical wastewater flow is calculated to be 90% of the theoretical flowing capacity.

We note flow capacity limitations are due to the existing pipe slope and pipe diameters within these streets; to increase these capacities either the pipe slope or diameter will need to be increased. We further note that increased pipe diameters must be carried downstream as downsizing of pipe diameters is not permitted. The potential to increase the various pipe's slope is dependent on the selected street profile. Alternatively, lesser populations due to the redevelopment could be reviewed.

For additional information related to this analysis please contact the undersigned.

Regards,

Servant, Dunbrack, McKenzie & MacDonald Ltd.

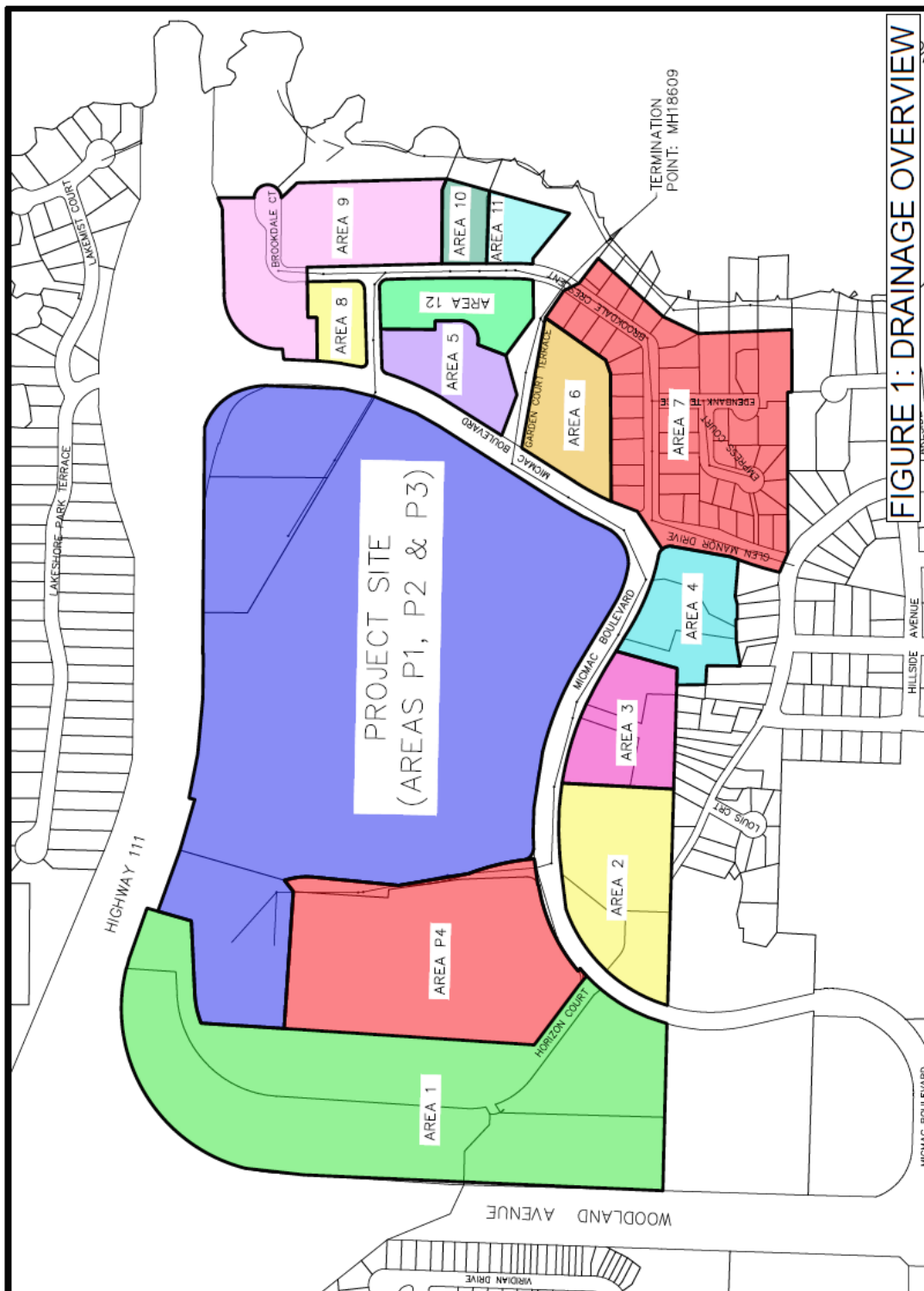


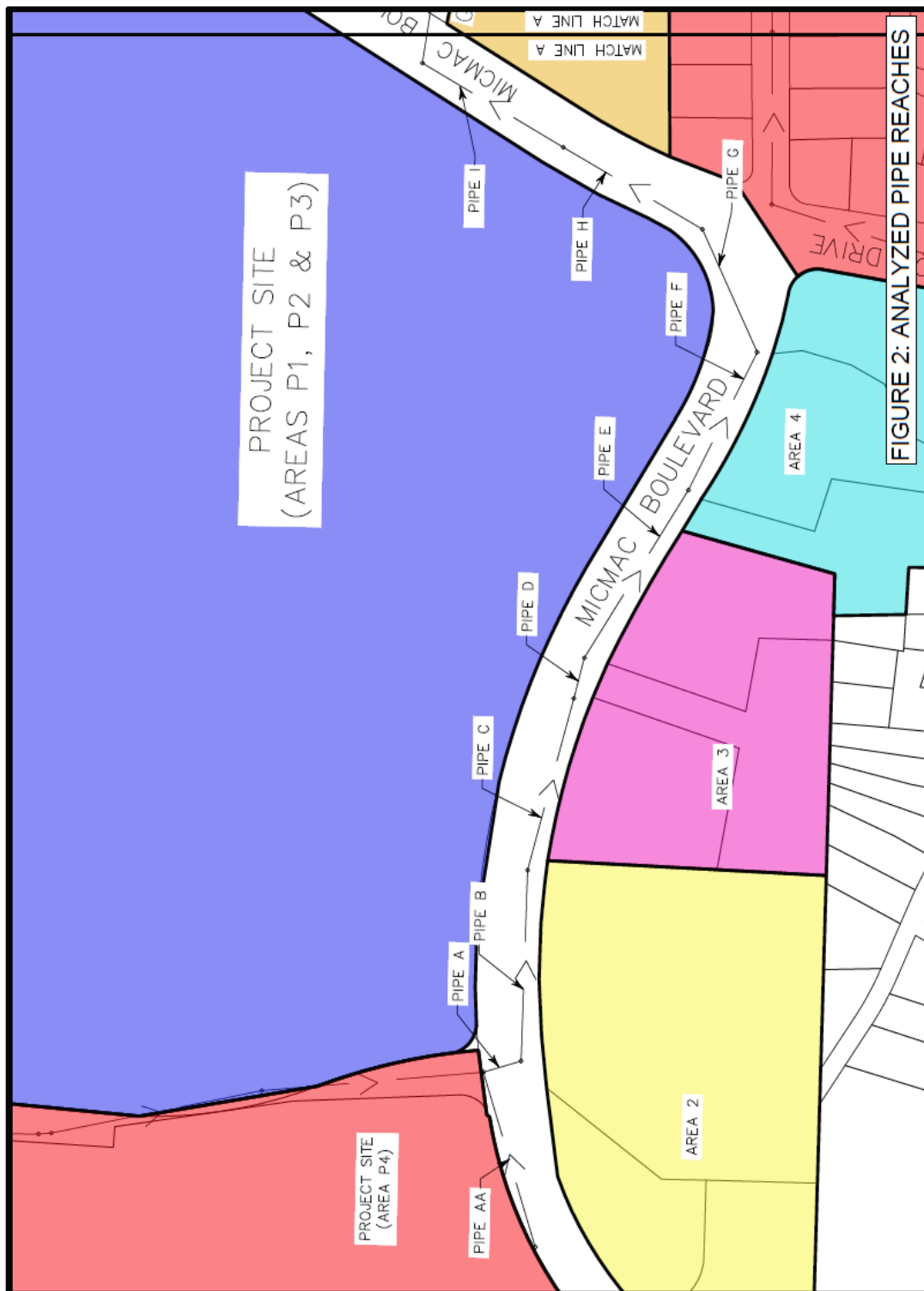
Geoff MacLean, P.Eng.

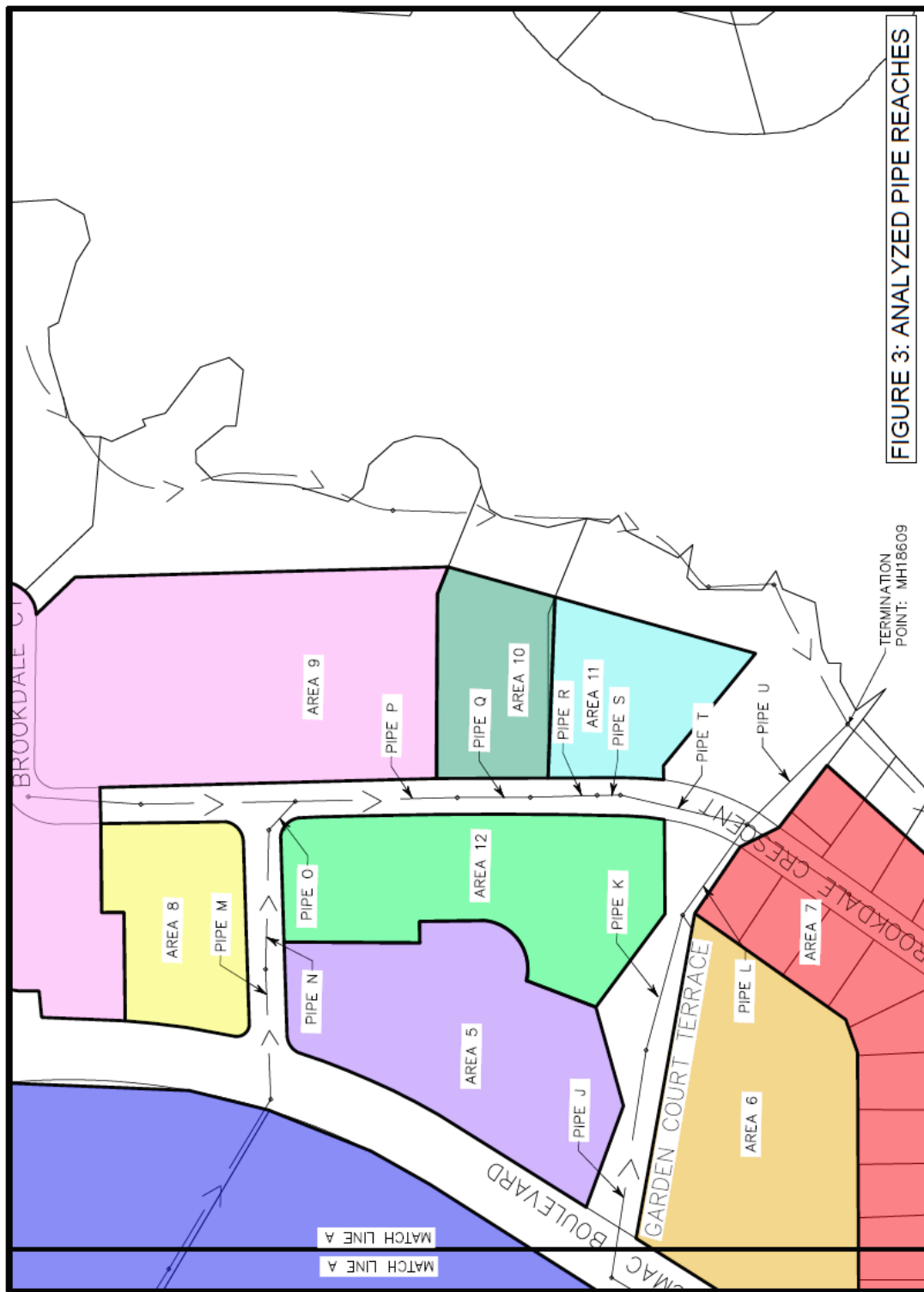
Project Engineer

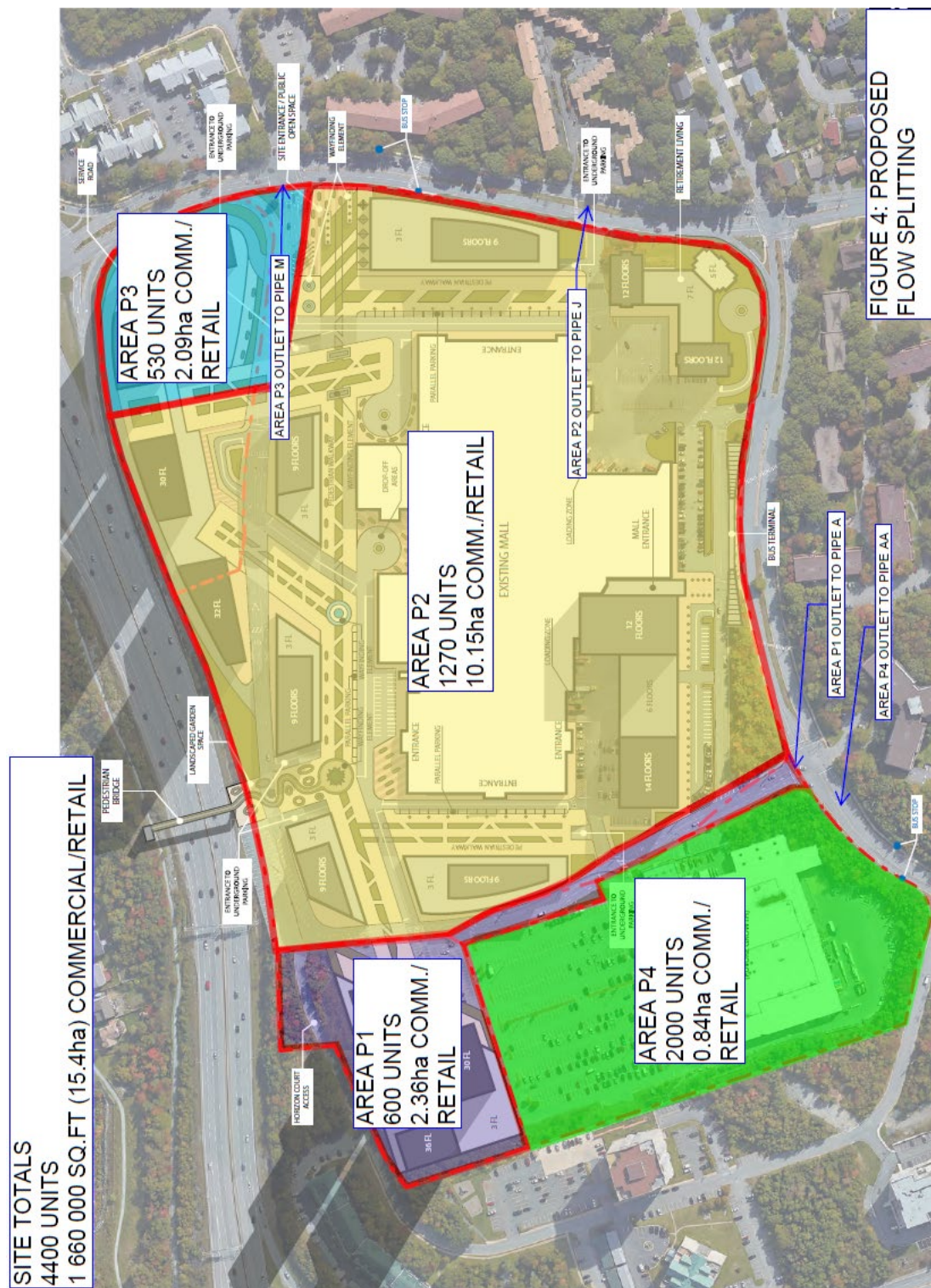
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APPENDIX









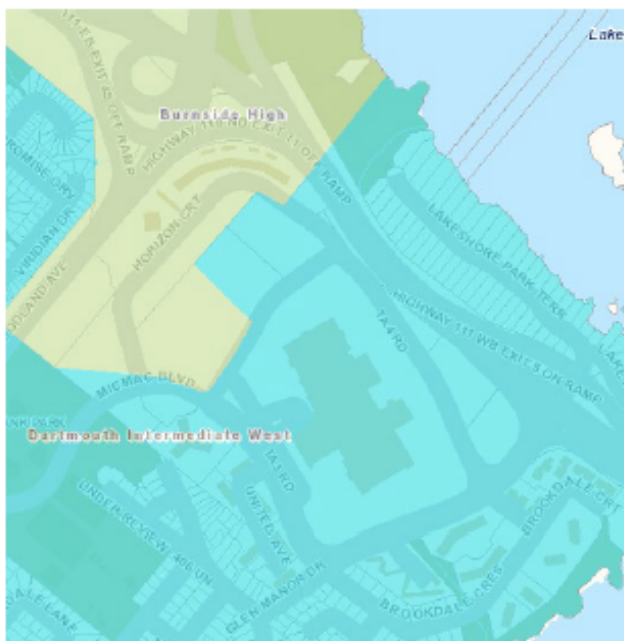
Supporting Correspondence with Halifax Water Approvals

From: [Meghan Woszczyński](#)
To: [Ray Landry](#)
Cc: [Chris Marks](#); [James Chisholm](#)
Subject: RE: Mic Mac Mall Redevelopment - Water HGL/design report and/or existing water model Request
Date: Friday, March 3, 2023 12:00:59 PM
Attachments: [image001.png](#)
[image002.png](#)
[image005.png](#)

Hi Ray,

The majority of the site is within the Dartmouth Intermediate West pressure zone (estimated HGL between 310 to 330ft). The North West portion is close to the Burnside High pressure zone (estimated HGL between 380 to 400ft) (see below). As you know, record information can be requested by contacting gisproducts@halifaxwater.ca. I will ask around to see if a water model is available or if there are any water reports around the area.

As for the wastewater, I would assume it would all flow towards Lake Banook so the analysis can end at MH189609.



I will let you know if I find any additional information,
Thanks again
Meghan

Meghan Woszczyński, M.A.Sc., P.Eng
Development Engineer, Halifax Water
450 Cowie Hill Rd, PO Box 8388 RPO CSC Halifax, NS B3K 5M1
C: 902-209-3915 E: meghanw@halifaxwater.ca

Table 1: Regional Center Plan Density Values				
Zoning	Number of Units	People per unit (HW)	Min. Lot Area (m ² Ha)	People per Hectare
Existing & Proposed Commercial & Retail				
	*Atlantic Canada Wastewater Guidelines			85

Table 2 - Proposed Tributary Areas and Population						
Area	Sub-Area	Number of Units	People per Unit	People per Hectare	Tributary Area (ha)	Equivalent Population
P (PROJECT AREAS)						
P1						
	Proposed Commercial			85	2.36	201
	Proposed Residential	600	2.25			1,350
				P1 Sub-Totals	2.36	1,551
P2						
	Existing Commercial			85	4.49	382
	Proposed Commercial			85	10.15	863
	Proposed Residential	1270	2.25			2,858
P3				P2 Sub-Totals	14.64	4,102
	Proposed Commercial			85	2.09	178
	Proposed Residential	530	2.25			1,193
P4				P3 Sub-Totals	2.09	1,370
	Road/Parking Lots			-	0.57	-
				P1-P3 Sub-Totals	19.66	7,023
P4						
	Proposed Commercial			85	0.84	71
	Proposed Residential	2000	2.25		3.81	4,500
				P4 Sub-Totals	4.65	4,571
1						
	HR-2	572	2.25		9.03	1,287
	Road			-	-	
				Sub-Totals	9.03	1,287
2						
	HR-1	132	2.25		1.40	297
	HR-2	150	2.25		0.76	338
	Road			-	0.66	-
				Sub-Totals	2.82	635
3						
	HR-1	65	2.25		1.28	146
	Road	-	-	-	0.40	-
				Sub-Totals	1.68	146
4						
	HR-1	61	2.25		1.22	137
	Road	-	-	-	0.45	-
				Sub-Totals	1.67	137
5						
	HR-1	56	2.25		0.96	126
	Road	-	-	-	0.67	-
				Sub-Totals	1.63	126

Table 2 - Proposed Tributary Areas and Population						
Area	Sub-Area	Number of Units	People per Unit	People per Hectare	Tributary Area (ha)	Equivalent Population
6						
	HR-1	42	3.25		1.17	137
	Road	-	-	-	0.19	-
				Sub-Totals	1.36	137
7						
	ER-1	45	3.35		3.92	151
	Road	-	-	-	0.79	-
				Sub-Totals	4.71	151
8						
	HR-1	34	2.25		0.46	77
	Road	-	-	-	0.35	-
				Sub-Totals	0.81	77
9						
	HR-1	180	2.25		2.41	405
	Road	-	-	-	0.44	-
				Sub-Totals	2.85	405
10						
	HR-1	49	2.25		0.39	110
	Road	-	-	-	0.07	-
				Sub-Totals	0.46	110
11						
	HR-1	48	2.25		0.43	108
	Road	-	-	-	0.08	-
				Sub-Totals	0.51	108
12						
	HR-1	55	2.25	620	0.88	124
	Road	-	-	-	0.02	-
				Sub-Totals	0.90	124
Totals					48.09	15,035

Table 3: Estimated Wastewater Flow Calculations

Pipe	Area Number(s)	Tributary Area (ha)	Equivalent Population	Average Dry Weather Flow, a (m ³ /d)	Harmon Peaking Factor, M	Infiltration/Inflow Allowance, b*area (m ³ /d)	Peak Dry Weather Flow, a x M (m ³ /d)	Peak Design Flow, (a x M) + b, (m ³ /d)	Safety Factor	*Estimated Flow, Q (m ³ /d)
AA	P4+1	13.68	5858	1,757.4	3.18	328.3	5,589.6	5,917.9	1.25	7,315
A	P1+P4+1	16.04	7409	2,222.6	3.08	385.0	6,851.7	7,236.7	1.25	8,950
B	P1+P4+1+2	18.86	8043	2,413.0	3.05	452.6	7,354.6	7,807.2	1.25	9,646
C	P1+P4+1+2	18.86	8043	2,413.0	3.05	452.6	7,354.6	7,807.2	1.25	9,646
D	P1+P4+1+2+3	20.54	8189	2,456.8	3.04	493.0	7,469.5	7,962.5	1.25	9,830
E	P1+P4+1+2+3	20.54	8189	2,456.8	3.04	493.0	7,469.5	7,962.5	1.25	9,830
F	P1+P4+1+2+3	20.54	8189	2,456.8	3.04	493.0	7,469.5	7,962.5	1.25	9,830
G	P1+P4+1+2+3+4	22.21	8327	2,498.0	3.03	533.0	7,577.0	8,110.1	1.25	10,004
H	P1+P4+1+2+3+4	22.21	8327	2,498.0	3.03	533.0	7,577.0	8,110.1	1.25	10,004
I	P1+P4+1+2+3+4	22.21	8327	2,498.0	3.03	533.0	7,577.0	8,110.1	1.25	10,004
J	P1+P2+P4+1+2+3+4	36.85	12429	3,728.6	2.86	884.4	10,665.1	11,549.5	1.25	14,216
K	P1+P2+P4+1+2+3+4+5	38.48	12555	3,766.4	2.86	923.5	10,756.6	11,680.1	1.25	14,369
L	P1+P2+P4+1+2+3+4+5+6	39.84	12691	3,807.3	2.85	956.2	10,855.6	11,811.8	1.25	14,526
M	P3	2.09	1370	411.0	3.71	50.2	1,524.0	1,574.2	1.25	1,955
N	P3+8	2.90	1447	434.0	3.69	69.6	1,601.8	1,671.4	1.25	2,072
O	P3+8	2.90	1447	434.0	3.69	69.6	1,601.8	1,671.4	1.25	2,072
P	P3+8+9	5.75	1852	555.5	3.61	138.0	2,006.2	2,144.2	1.25	2,646
Q	P3+8+9	5.75	1852	555.5	3.61	138.0	2,006.2	2,144.2	1.25	2,646
R	P3+8+9+10	6.21	1962	588.6	3.59	149.0	2,114.3	2,263.3	1.25	2,792
S	P3+8+9+10+11	6.72	2070	621.0	3.57	161.3	2,219.4	2,380.7	1.25	2,936
T	P3+8+9+10+11+12	7.62	2194	658.1	3.55	182.9	2,339.0	2,521.9	1.25	3,107
U	P(1-4)+1-12	52.17	15035	4,510.6	2.78	1,252.1	12,527.0	13,779.0	1.25	16,911

Table 4: Pipe Capacity Calculations

Pipe	Sewer Type	Pipe Shape	Pipe Diameter (mm)	Material	Slope (%)	Mannings Coefficient, n	Manning's Capacity, Qc (m ³ /d)	Wastewater % of Pipe Capacity
AA	Sanitary	Round	250	PVC	1.73	0.01	8,785	83%
A	Sanitary	Round	250	CONC	1.23	0.013	5,698	157%
B	Sanitary	Round	300	CONC	1.30	0.013	9,526	101%
C	Sanitary	Round	300	CONC	2.42	0.013	12,997	74%
D	Sanitary	Round	300	CONC	2.60	0.013	13,472	73%
E	Sanitary	Round	300	CONC	1.59	0.013	10,535	93%
F	Sanitary	Round	300	CONC	1.38	0.013	9,815	100%
G	Sanitary	Round	300	CONC	1.65	0.013	10,732	93%
H	Sanitary	Round	300	CONC	1.48	0.013	10,164	98%
I	Sanitary	Round	300	CONC	1.38	0.013	9,815	102%
J	Sanitary	Round	300	CONC	3.33	0.013	15,246	93%
K	Sanitary	Round	300	CONC	6.84	0.013	21,851	66%
L	Sanitary	Round	300	CONC	8.26	0.013	24,012	60%
M	Sanitary	Round	200	CONC	1.99	0.013	3,998	49%
N	Sanitary	Round	200	CONC	0.99	0.013	2,820	73%
O	Sanitary	Round	200	CONC	0.70	0.013	2,371	87%
P	Sanitary	Round	200	CONC	3.49	0.013	5,294	50%
Q	Sanitary	Round	200	CONC	4.07	0.013	5,717	46%
R	Sanitary	Round	200	CONC	3.96	0.013	5,639	50%
S	Sanitary	Round	200	CONC	3.31	0.013	5,156	57%
T	Sanitary	Round	200	CONC	2.08	0.013	4,087	76%
U	Sanitary	Round	300	CONC	5.09	0.013	18,850	90%