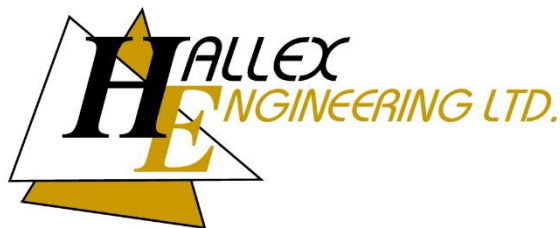

JORDAN FOUR-STOREY HOTEL
3821-3827 MAIN STREET, LINCOLN

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 0 – January 16, 2023

PREPARED BY:



HALLEX PROJECT #220603

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1. INTRODUCTION

The proposed Jordan Four-Storey Hotel development consists of the demolition of the existing residential buildings complete with driveways and grass areas at addresses 3821 Main Street, 3823 Main Street, 3827 Main Street, the redevelopment of the existing asphalt parking lot and the construction of a four-storey building, asphalt laneway and parking areas, parking structure below grade and grass areas. This development is located at 3821-3827 Main Street, which is north of the Main Street and King Street intersection in the Town of Lincoln, ON. This development also fronts Nineteenth Street which runs parallel to Main Street.

The purpose of the service assessment is to determine the functional sizing of the storm, sanitary and water services and the post-development flows to determine the impact on the existing municipal infrastructure.

2. EXISTING MUNICIPAL INFRASTRUCTURE

2.1 EXISTING SITE DRAINAGE

The existing site fronts both Nineteenth Street and Main Street. Both streets contain storm infrastructure that has been designed to drain the existing site as per the Proposed Storm Area Catchment Plan, Drawing No. C3.0, Revision 5 completed by IBI Group under reference number 117802, dated June 14, 2021. Part of the site has been allocated to the storm infrastructure at Nineteenth Street whereas most of the site has been allocated to the storm infrastructure at Main Street.

2.2 STORM SEWER

Part of the existing site is serviced at 3821 Main Street to the storm sewer at Nineteenth Street as it currently consists of an existing single-family dwelling. The existing storm sewer and laterals are currently being replaced as part of the Jordan Village reconstruction project which proposes an 825mm municipal storm sewer draining northerly towards Wismer Street complete with a 125mm storm lateral to the property as per the IBI Group Drawing C6.8 under file # 117802, dated October 20, 2021.

The remainder of the site is serviced at the existing parking lot to the storm sewer at Main Street. The existing storm sewer and laterals are currently being replaced as part of the Jordan Village reconstruction project which proposes a 600mm municipal storm sewer draining northerly towards Wismer Street complete with a 250mm storm lateral to the property as per the IBI Group Drawing C7.3 under file # 117802, dated October 20, 2021.

2.3 SANITARY SEWER

Part of the existing site is serviced at 3821 Main Street and 3823 Main Street to the sanitary sewer at Nineteenth Street as it currently consists of existing single-family dwellings. The existing sanitary sewer and laterals are currently being replaced as part of the Jordan Village reconstruction project which proposes a 250mm municipal sanitary sewer draining northerly towards Wismer Street complete with sanitary laterals to each of these properties as per the IBI Group Drawing C6.8 under file # 117802, dated October 20, 2021. The sanitary sewer at Wismer Street continues westerly and connects to the new sanitary sewer at Main Street.

The remainder of the site is serviced at 3821 Main Street, 3823 Main Street and 3827 Main Street to the sanitary sewer at Main Street as it currently consists of existing single-family dwellings. The existing sanitary sewer and laterals are currently being replaced as part of the Jordan Village reconstruction project which proposes a 200mm municipal sanitary sewer draining northerly towards Wismer Street complete with sanitary laterals to each of these properties as per the IBI Group Dwg C7.3, File# 117802, dated October 20, 2021.

2.4 WATERMAIN

Part of the existing site is serviced at 3821 Main Street and 3823 Main Street to the watermain at Nineteenth Street as it currently consists of existing single-family dwellings. The existing watermain and water services are currently being replaced as part of the Jordan Village reconstruction project which proposes a 300mm municipal watermain complete with 25mm water services to each of these properties as per the IBI Group Drawing C6.8 under file # 117802, dated October 20, 2021.

The remainder of the site is serviced at 3821 Main Street, 3823 Main Street and 3827 Main Street to the watermain at Main Street as it currently consists of existing single-family dwellings. The existing watermain and water services are currently being replaced as part of the Jordan Village reconstruction project which proposes a 300mm municipal watermain complete with 25mm water services to each of these properties as per the IBI Group Drawing C7.3 under file # 117802, dated October 20, 2021.

3. STORM SEWER

3.1 ALLOWABLE SITE FLOW

The total drainage area for the subject development considering areas that drain onto and from the site is 0.564 hectares with an allowable runoff coefficient of 0.79. This is based on the catchment areas and blended runoff coefficients provided on the IBI Group Drawing No. C3.0, Revision 5, dated June 14, 2021. The catchment area plan for the pre-development site condition is provided on Hallex Sketch CSK1, attached.

Utilizing the rationale method ($Q = CiA/360$) and the minimum recommended time of concentration of 10 minutes, the allowable peak flow for the pre-development site is as follows:

<u>Storm Event</u>	<u>Allowable Flow to Main Street</u>	<u>Allowable Flow to Nineteenth Street</u>	<u>Total Pre- Development Flow</u>
5-year Storm	92.3 L/s	21.9 L/s	114.2 L/s
100-year Storm	155.4 L/s	37.0 L/s	192.4 L/s

These flows are calculated using the Town of Lincoln intensity-duration-frequency curves. The allowable flows for the subject site are provided in Exhibit #1 for the five -year storm and Exhibit #2 for the one-hundred-year storm at the end of the design brief.

3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the four-storey building, asphalt laneway and parking areas, parking structure below grade and grass areas. The grading for the site will ensure drainage through a proposed storm sewer system for storm water management. The total drainage area for the subject development considering areas that drain onto and from the site is 0.564 hectares with a calculated runoff coefficient of 0.68 based on the proposed and existing roof, asphalt and grass surfaces. The proposed storm sewer system for the site will then discharge to the 600mm municipal storm sewer at Main Street. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK2, attached.

Utilizing the rationale method ($Q = CiA/360$) and the minimum recommended time of concentration of 10 minutes, the calculated peak flow for the post-development site is as follows:

<u>Storm Event</u>	<u>Post-Dev. Flow to Main Street</u>	<u>Post-Dev. Flow to Nineteenth Street</u>	<u>Total Post- Development Flow</u>
5-year Storm	108.8 L/s	0.0 L/s	108.8 L/s
100-year Storm	183.2 L/s	0.0 L/s	183.2 L/s

These flows are calculated using the Town of Lincoln intensity-duration-frequency curves. The post-development flows for the proposed development are provided in Exhibit #3 for the five -year storm and Exhibit #4 for the one-hundred-year storm at the end of the design brief.

3.3 STORMWATER QUANTITY CONTROL

The post-development storm water runoff to Main Street will increase by 16.5 L/s for the five-year storm and 27.8 L/s for the one-hundred-year storm from the allowable flow from the site. The post-development storm water runoff to Nineteenth Street will be completely eliminated resulting in a decrease of 21.9 L/s for the five-year storm and 37.0 L/s for the one-hundred-year storm. The total post-development storm water runoff for the subject site will decrease by 5.4 L/s for the five-year storm and 9.2 L/s for the one-hundred-year storm from the total allowable flow from the site. Given the flow increases to the storm infrastructure at Main Street, storm water detention is recommended for the proposed development unless it can be confirmed by IBI Group that available capacity exists within the storm infrastructure at and downstream from the subject site.

Stormwater quantity controls for the site can be achieved by utilizing an orifice plate within a manhole prior to discharging to the existing 600mm municipal storm sewer at Main Street.

The orifice plate will ensure the combined post development runoff is controlled to the allowable pre-development runoff rate to Main Street for the five-year and one-hundred-year storm events. The resulting 39 m³ volume generated for the five-year storm event and 68 m³ volume generated for the one-hundred-year storm event can be stored within a proposed underground storage chamber system, a storm sewer system consisting of oversized storm sewers, catchbasins / manholes and/or temporary surface ponding.

3.4 STORMWATER QUALITY CONTROL

The Region of Niagara has stated “The storm water will be accommodated in the local infrastructure therefore it is subject to the Town’s satisfaction regarding water quality and quantity impacts” in the Niagara Region – Development Services Division Pre-Consultation Notes, 3821-3827 Main Street, Lincoln, dated April 14, 2022.

The Town of Lincoln has stated “A stormwater management report is required to demonstrate how the proposed development will limit storm runoff conditions to pre-development levels during five- and 100-year storm events” in the Town of Lincoln Pre-Consultation Meeting Minutes, 3821-3827 Main Street, Jordan, dated April 14, 2022.

Given the Region has deferred stormwater management requirements to the Town and the Town has only indicated stormwater quantity control is required for the development, stormwater quality controls are not proposed for this development.

4. SANITARY SEWER SYSTEM

Given the site is to be completely redeveloped for the proposed Jordan Four-Storey Hotel development, the sanitary laterals to the subject property currently in construction are proposed to be removed from the scope of work. A new sanitary lateral shall be proposed from the building to the 200mm municipal sanitary sewer currently in construction at Main Street.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The four-storey hotel development is assumed to have a total of 44 two-bed space units and 5 four-bed space units resulting in an equivalent population 108 persons assuming an average of one person per bed space.
- The proposed exterior pool will be adequately treated and then discharged to the storm sewer when emptied.
- The subsequent calculations provided in Exhibit #5 are based on the recommendations provided in the Town of Lincoln Municipal Design and Quality Standards, the Niagara Region Project Design and Technical Specifications Manual and the MOE Design Guidelines for Sewage Works.

The peak dry weather design flow for the proposed Jordan Four-Storey Hotel development is determined to be 1.829 L/s. The peak wet weather design flow for the proposed Jordan Four-Storey Hotel is determined to be 1.834 L/s. These calculations are based on the Sanitary Catchment Area Plan CSK3 and the Sanitary Sewer Design Sheet provided in Exhibit #5, attached.

The Town of Lincoln has indicated in their email correspondence on October 24, 2022 “The Town’s consultant has concluded that there will be sufficient sanitary sewer capacity to handle the anticipated sanitary flows from

the hotel once the Jordan Station Sewer Pumping Station is upgraded. Until then, the building cannot connect to the sanitary sewer network as there is no available capacity". This comment was based on the preliminary sanitary flow calculations provided to the Town by Hallex Engineering on July 29, 2022.

Based on the above, Hallex recommends a minimum 200mm diameter sanitary sewer @ 1.0% to be installed to convey sanitary flows from the proposed building to the 200mm municipal sanitary sewer currently in construction at Main Street. Furthermore, this new sanitary stub is not to be used to convey sanitary flows from the proposed hotel development until such time as the Jordan Station Sewer Pumping Station is upgraded.

5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely redeveloped for the proposed Jordan Four-Storey Hotel development, the water services to the subject property currently in construction are proposed to be removed from the scope of work. A new water service shall be proposed from the building to the 300mm municipal watermain currently in construction at Main Street.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The four-storey hotel development is assumed to have a total of 44 two-bed space units and 5 four-bed space units resulting in an equivalent population 108 persons assuming an average of one person per bed space
- The subsequent calculations provided in Exhibit #6 are based on the recommendations provided in the Niagara Region Project Design and Technical Specifications Manual.
- The building is assumed to be fire resistive, of non-combustible construction and will have sprinklers and hose cabinets installed throughout the building as per applicable standards.

The domestic water demand for the proposed Jordan Four-Storey Hotel development is calculated as follows:

<u>Site</u>	<u>Average Day Water Demand</u>	<u>Maximum Day Water Demand</u>	<u>Peak Hour Water Demand</u>
Hotel	46.1 m ³ /day	72.8 m ³ /day	1.69 L/s

The resulting domestic flow head losses for the proposed development is determined to be 0.19 kPa (0.03 psi). As such, the minimum working pressure within the municipal watermain is required to be 50.03psi to ensure a minimum normal operating pressure of 50 psi within the municipal watermain. The resulting fire flow head losses for the proposed development is determined to be 102.08 kPa (14.81 psi). The minimum working pressure within the municipal watermain is required to be 34.81psi to ensure a minimum pressure of 20 psi within the municipal watermain under fire flow conditions. These calculations are based on the Water Demand Design Sheet provided in Exhibit #6, attached.

Using the calculations provided in the Fire Underwriters Survey – 1999 Water Supply for Public Fire Protection, the minimum water supply flow rate for fire protection is determined to be 8,000 L/min. The calculations are based on the above assumptions as shown in Exhibit #7, attached. There are four existing municipal fire hydrants located near the site. The first is located adjacent the west property line on the east side of Main Street. The second is located approximately 80.0m south of the property on the east side of Main Street. The third is located approximately 14.1m north of the property on the west side of Nineteenth Street. The fourth is located approximately 30.7m south of the property on the west side of Nineteenth Street.

Based on the above, Hallex recommends a minimum 150mm diameter water service to be installed to provide water supply to the proposed building from the 300mm diameter municipal watermain at Main Street. The water service is to be separated at the property line with a 100mm diameter domestic water service and a 150mm fire protection service and shall extend to the mechanical room of the proposed building.

6. CONCLUSION

The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

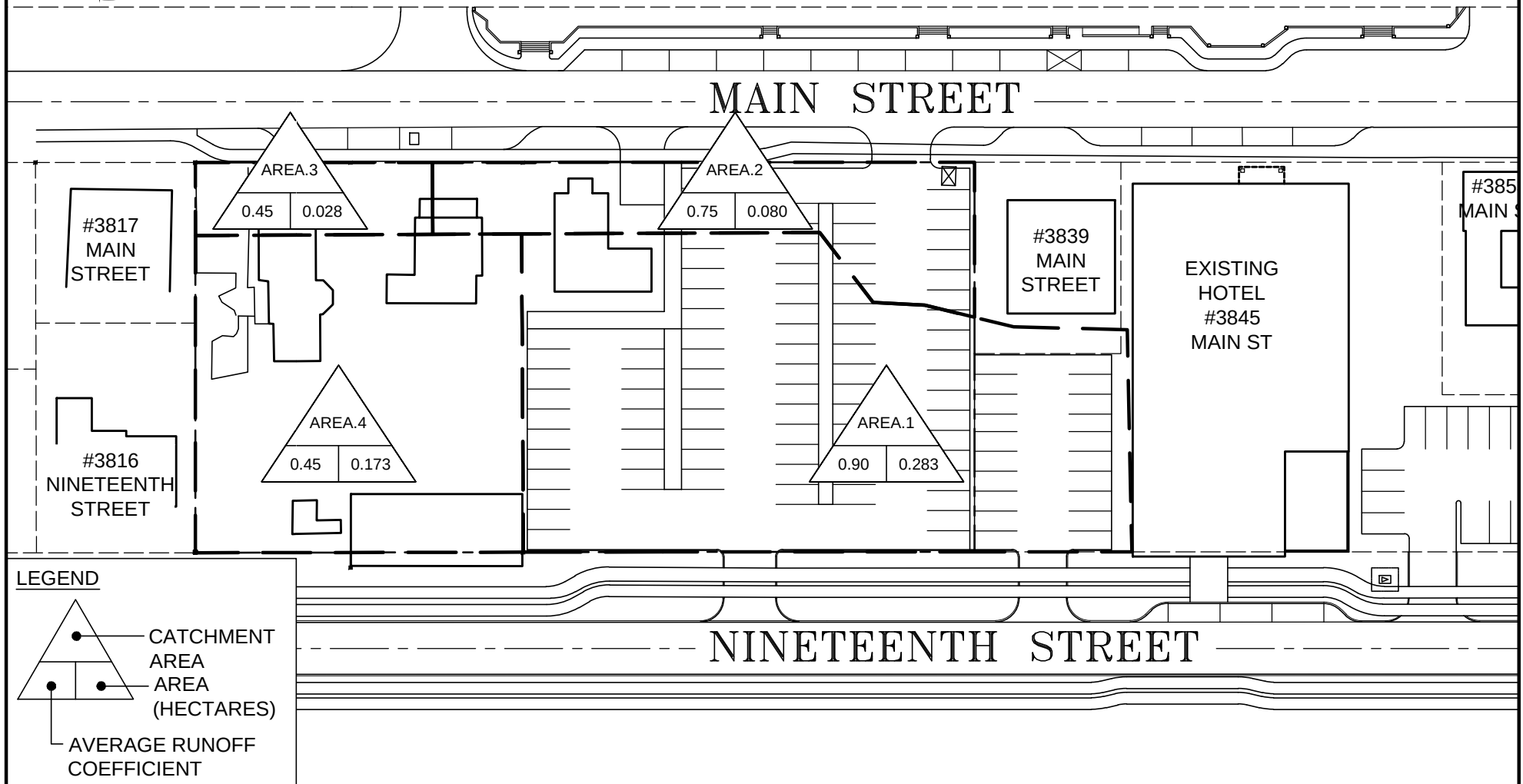
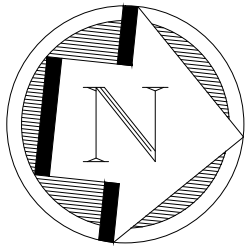
We trust this report meets your approval. Please contact the undersigned should you have any questions or comments.

Yours truly,
HALLEX ENGINEERING LTD

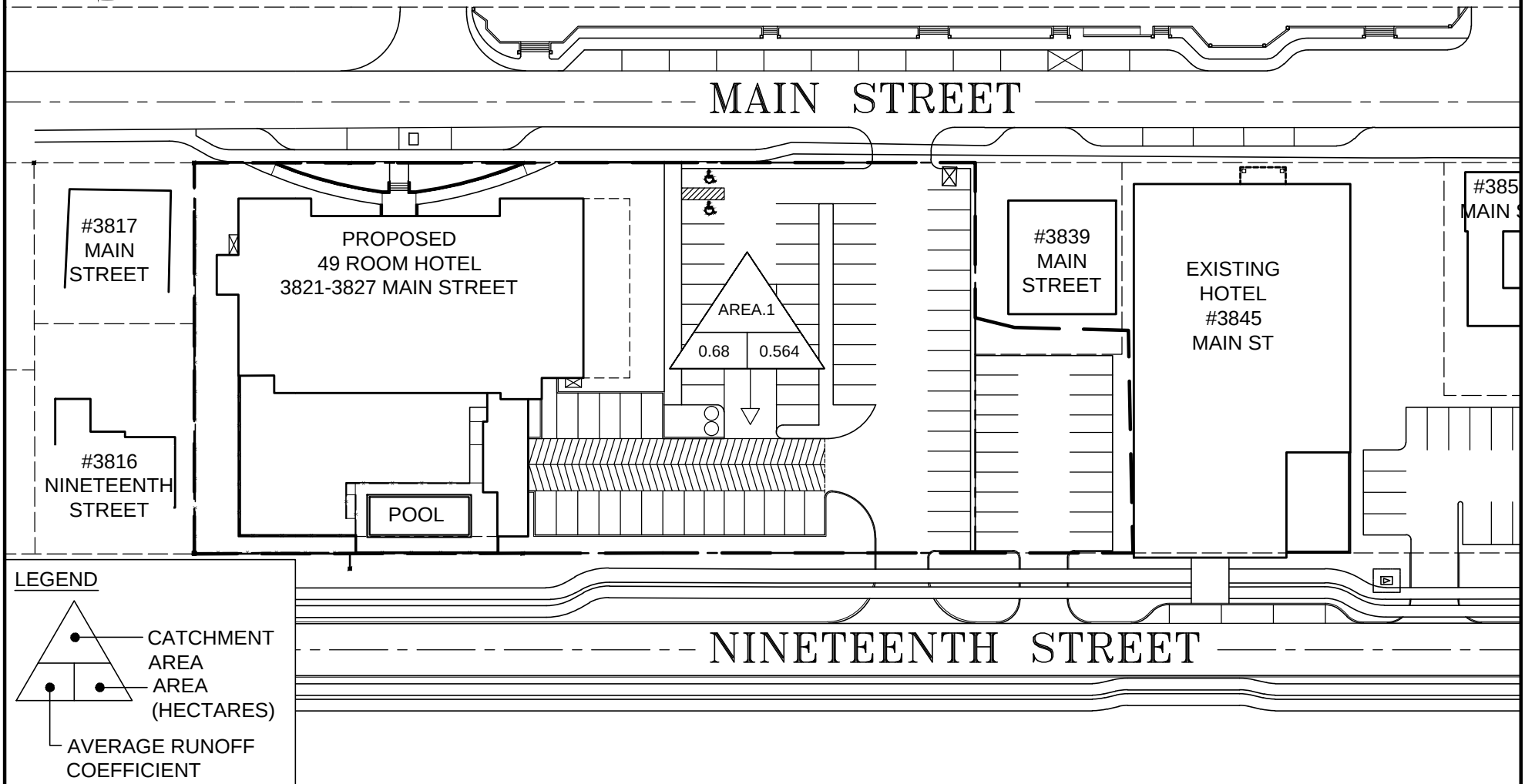
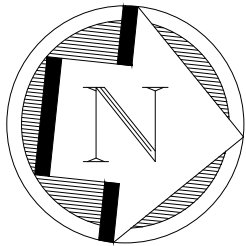


Jim Halucha P.Eng
Civil/Structural Engineer

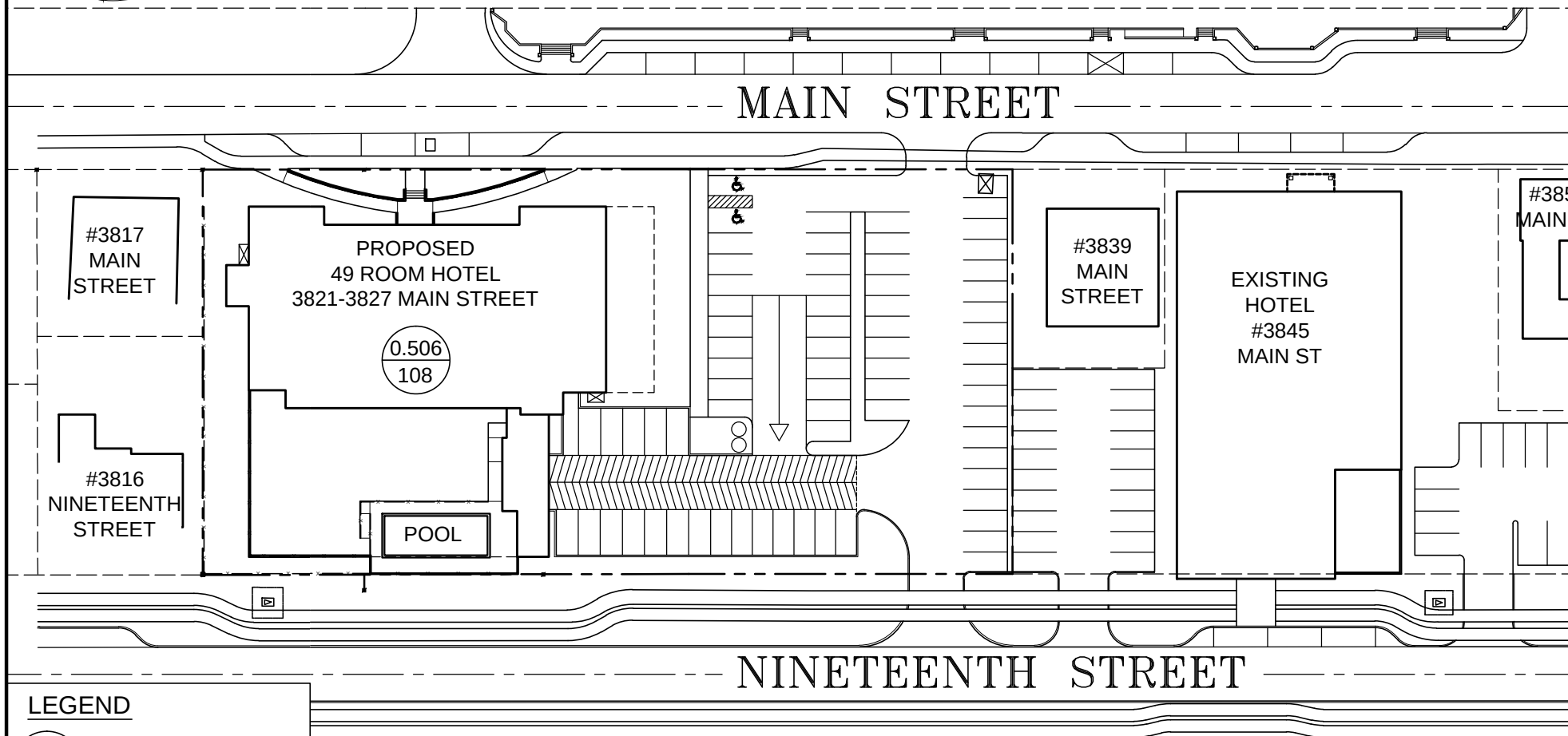
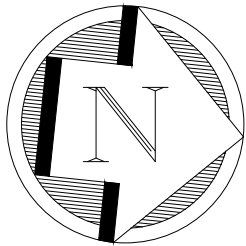
Jonathan Skinner, C.E.T., B.Tech
Civil Technologist



 4999 Victoria Avenue, Niagara Falls, ON L2E 4C9 Tel: 905-357-4015 Fax: 905-353-1105 745 South Service Rd. Unit 205, Stoney Creek, ON L8E 5Z2 Tel: 905-561-4016 Fax: 905-561-1105	PROJECT: JORDAN FOUR STOREY HOTEL 3821-3827 MAIN STREET, LINCOLN, ON		DATE: 2023/01/16		JOB No.: 220603	
	SHEET TITLE: PRE-DEVELOPMENT CATCHMENT AREA PLAN		SCALE: 1:750		DWG. CSK1	REV. O
			DR. BY: JS			
			CH. BY: JH			



 4999 Victoria Avenue, Niagara Falls, ON L2E 4C9 Tel: 905-357-4015 Fax: 905-353-1105 745 South Service Rd. Unit 205, Stoney Creek, ON L8E 4Z2 Tel: 905-561-4016 Fax: 905-561-1105	PROJECT: JORDAN FOUR STOREY HOTEL 3821-3827 MAIN STREET, LINCOLN, ON	DATE: 2023/01/16		JOB No.: 220603	
	SHEET TITLE: POST-DEVELOPMENT CATCHMENT AREA PLAN	SCALE: 1:750		DWG. CSK2	REV. O
		DR. BY: JS			
		CH. BY: JH			





MUNICIPALITY: Lincoln

Jordan Four-Storey Hotel Exhibit #3 - 5 Year Post - Development Calculations

1/16/2023
Job: 220603

Rainfall Intensity Values =
A= 1039.000
B= 7.000
C= 0.821

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre- ment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow
				(m)	(ha)	(min)	(min)			(m ³ /d)	(m ³ /s)
1	Area 1	Street 1	N/A	0.564	0.564	10.00	N/A	101	48714	9397.0	0.1088
Roof	-	-	-	0.115	-	-	-	-	21921.5	2521.0	-
Paved	-	-	-	0.275	-	-	-	-	21921.5	6028.4	-
Grass	-	-	-	0.174	-	-	-	-	4871.4	847.6	-

Run-off Coefficients Used:

Roof Structure C = 0.90
Paved Surface C = 0.90
Grass Surface C = 0.20

Velocity Range:

Minimum Velocity = 0.75 m/s
Maximum Velocity = 4.50 m/s

Time of Concentration: 10 min



MUNICIPALITY: **Lincoln**

Jordan Four-Storey Hotel Exhibit #4 - 100 Year Post - Development Calculations

1/16/2023
Job: 220603

Rainfall Intensity Values =
 A= 2138.000
 B= 9.000
 C= 0.858

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre- ment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow
				(m)	(ha)	(min)	(min)			(m ³ /d)	(m ³ /s)
1	Area 1	Street 1	N/A	0.564	0.564	10.00	N/A	171	82050	15827.4	0.1832
Roof	-	-	-	0.115	-	-	-	-	36922.5	4246.1	-
Paved	-	-	-	0.275	-	-	-	-	36922.5	10153.7	-
Grass	-	-	-	0.174	-	-	-	-	8205.0	1427.7	-

Run-off Coefficients Used:

Roof Structure C = 0.90
 Paved Surface C = 0.90
 Grass Surface C = 0.20

Velocity Range:

Minimum Velocity = 0.75 m/s
 Maximum Velocity = 4.50 m/s

Time of Concentration: 10 min



Jordan Four-Storey Hotel Exhibit #5 - Sanitary Sewer Design Sheet

1/16/2023
Job: 220603

Lincoln ▼

mannings n = 0.013 PVC Pipe

Location			Length (m)	INDIVIDUAL			CUMULATIVE			M	Q (p)	Q (i)	Q (l ₁)	Q (l ₂)	Q (l ₃)	Q (l _m)	Q (d)	Q (w)	Sewer Design			
Pipe	From Node	To Node		Pop.	Bed Space	Area (ha)	Pop.	Bed Space	Area (ha)		(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	Slope (m/m)	Capacity Full (L/s)	Velocity Full (m/s)	Dia- meter (m)
1	MH. A	MH. B	22.0	0	108	0.506	0	108	0.506	4.50	1.688	0.142	0.0051	0.0000	0.0009	0.005	1.829	1.834	0.0100	32.798	1.044	0.200

Calculations:

BS = hotel bed spaces

q = avg daily flow 338 L/cap.d

H = avg daily hotel flow 225 L/BS.d

I = infiltration allowance 0.280 L/ha.s

M= peaking factor

Q (p) = peak population flow (L/s)

Q (i) = peak extraneous flow (L/s)

L₁ = unit of allowable leakage 0.01 L/s/ha

L₂ = unit of allowable leakage 22 L/cap/d

L₃ = unit of allowable leakage 0.075 L/mm/100m/hr

Q (l_m) = peak allowable leakage (L/s)

Q (d) = peak dry weather design flow (L/s)

Q (w) = peak wet weather design flow (L/s)

$$M = 1 + \frac{14}{4 + \sqrt{P}} \text{ where } P = \text{population in 1000's}$$

$$Q(p) = \frac{PqM}{86.4} + \frac{(H \cdot BS)}{4 \cdot 60 \cdot 60} \text{ (L/s)}$$

$$Q(i) = I \cdot A \text{ (L/s) where } A = \text{area in hectares}$$

$$Q(l_1) = L_1 \cdot A \text{ (L/s) where } A = \text{area in hectares}$$

$$Q(l_2) = \frac{L_2 \cdot P}{86.4} \text{ (L/s) where } P = \text{population in 1000's}$$

$$Q(l_3) = \frac{L_3 \cdot \text{dia} \cdot \text{Len}}{360,000} \text{ (L/s) where dia = pipe diameter in mm and Len = pipe length in m}$$

$$Q(d) = Q(p) + Q(i) \text{ (L/s)}$$

$$Q(w) = Q(p) + Q(i) + Q(l_m) \text{ (L/s)}$$

Velocity Range:

Minimum Velocity = 0.60 m/s

Maximum Velocity = 3.00 m/s



Jordan Four-Storey Hotel Exhibit #6 - Water Demand

1/16/2023
Job: 220603

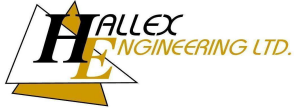
Roughness Coefficient =

100 for 150mm pipe
110 for 200-250mm pipe

Location			Length	Pop.	Water Demand by Population			Water Demand by Area			Max. Peak Hour Demand	Fire Flow	Watermain Design								
Pipe	From Node	To Node			Area	Average Day	Maximum Day	Peak Hour	Average Day	Maximum Day			Peak Hour	Dia- meter	Dom. Head Loss	Domestic Pressure Loss		Dia- meter	Fire Head Loss	Fire Pressure Loss	
					(ha)	m³/day	m³/day	L/s	m³/day	m³/day			L/s	(L/s)	(L/s)	(m)	(m)	(kPa)	(psi)	(m)	(m)
1	Area. 1	Street	20.0	108	0.506	46.1	72.8	1.69	12.5	19.8	0.46	1.69	133.33	0.100	0.019	0.19	0.03	0.150	10.417	102.08	14.81

Calculations:

Commercial Avg Day Service Demand	<u>24.75</u> m ³ /ha/day	Max Day Factor (DeCew Falls)	<u>1.58</u>
Avg Daily Water Demand (DeCew Falls)	<u>0.427</u> m ³ /day/person	Max Hourly Demand Peaking Factor (Com	<u>2.00</u>
		Fluid Specific Weight	9.8 kN/m ³



Jordan Four-Storey Hotel
Exhibit #7 - Fire Water Demand

1/16/2023
Job: 220603

FIRE WATER SUPPLY

Building Type: Fire Resistive

<u>Floor Area</u>		<u>Reduct.</u>	
First Floor	1338 m ²	1.00	1338 m ²
Second Floor	1057 m ²	1.00	1057 m ²
Third Floor	1057 m ²	0.50	528.5 m ²
Fourth Floor	298 m ²	0.50	149 m ²
			<u>3072.5 m²</u>

Construction Type: Non-Combustible Const.

Construction Coefficient:

1st Preliminary Fire Flow = 10000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor:
Net Decrease = -1500 L/min

2nd Preliminary Fire Flow = 8500 L/min

Sprinkler System: Sprinkler & Hose Lines

Sprinkler System Factor:
Net Decrease = -3400 L/min

Separation Factor

North	45+ m	0.00
South	6.0 m	0.20
West	22.6 m	0.10
East	36.7 m	<u>0.05</u>
		<u>0.35</u>

Net Increase = 2975 L/min

FINAL FIRE FLOW = 8000.0 L/min

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey