

Memorandum

To	Le' Ann Whitehouse Seely, OALA, CSLA	Page	1
CC	Jana Joyce Associate, MBTW Group		
Subject	Gore Park Pedestrianization: Grading Review		
From	Ian Izzard, P.Eng., M.A.Sc. Project Manager		
Date	May 17, 2012	Project Number	60225470

1. Introduction

As requested by the MBTW Group, AECOM has reviewed the preliminary grading for King Street East, between James Street and Catharine Street. This memorandum details the requirements and anticipated cost estimate for the road reconstruction as proposed in the Functional Plan.

The park has been split into 3 blocks as follows:

1. Central Garden section between James Street and Hughson Street,
2. Veteran's Place section between Hughson Street and John Street,
3. MacDonald Square section between John Street and Catharine Street.

Cross section drawings showing existing cross section and two proposed cross sections for each block is described in the following sections.

2. Requirements

The Functional Plan proposes raising the roadway by approximately 150mm with a crowned or pitched section draining to catch basins. New or raised catch basins will be required to collect storm water on the new surface. By raising the road 150mm, the step typically associated with a concrete curb and gutter at the edge of a road will be eliminated. This will create a smooth uninterrupted surface from the existing buildings, across the sidewalk, across the road and up to the existing park. It will improve the appearance of the roadway but may create a storm water drainage concern.

Based on the existing road grading, two Options were evaluated:

- Option 1: Inverted crown with flush curbs and central catch basin alignment.
- Option 2: Pitched cross fall with flush curbs and southern catch basin alignment.

Roadways are typically crowned to convey surface water towards the gutter. The gutters have a longitudinal slope to convey the water towards the catch basins which are regularly spaced along both sides of the road.

In the event of heavy storms, excess surface water beyond the capacity of the catch basins will collect in the gutters along the edge of the road. With the removal of the curb and gutters, the surplus water from the storm event will no longer be confined within the road. Temporary pooling can occur and may expand onto the sidewalk and towards adjacent buildings. Therefore, efforts should be made to ensure that storm water is kept away from the buildings as much as possible.

While the pitched section promotes water flows towards the buildings, an inverted crown section can provide better protection to the adjacent building by redirecting the excess storm water surface flows to the middle of the road. This would result in a minimal impact to the existing curb elevations. The inverted crown can maintain the 2% cross fall required by City of Hamilton standards and will help keep the surface water away from the adjacent buildings.

3. Evaluation

AECOM has completed a comparison of the alternative sections. Typical drawings showing existing and proposed cross sections of each block are attached.

The goal of this project is to maintain a consistent look and feel along the entire length of the Gore; however, each block contains unique constraints with different designs and issues. The three blocks are described as follows:

Central Garden Block;

This section of the park runs from James Street to Hughson Street. The existing roadway is built with a crown of approximately 2% to the north and 4% to the south. There is a 150mm gutter on either side of the street. Two options were reviewed for the Pedestrianization of this block

	Inverted crown	Full cross slope
Pedestrianization	Proposed road surface is flush with the existing sidewalk and curb	Proposed road surface is flush with the existing sidewalk and curb
Sub drains	New sub drain will have to be installed under the low point in the road to ensure drainage of the stone base under the road.	Roadway sub drain will remain in its present location and will ensure drainage of the stone base under the road.
Cross slope	2% cross fall as per City standards	1% cross fall, does not meet City standards
Water storage	Water storage from heavy storm may back-up within the existing roadway before it approaches the building.	Water storage from heavy storm may back-up on the sidewalk and approach the existing buildings.
Catch basins	Existing catch basins will be removed and replaced with new catch basins at the low point in the roadway.	Existing catch basins can remain in their existing location and be raised to the elevation of the proposed Pedestrianized road. Additional catch basins will be required between the existing catch basins.

Veteran’s Place:

This section of the park runs from Hughson Street to John Street. The existing roadway is built with a cross slope of approximately 2% to the south. There is a 150mm gutter on either side of the street. Two options were reviewed for the Pedestrianization of this block

	Inverted crown	Full cross slope
Pedestrianization	Proposed road surface is flush with the existing sidewalk. The north side curb will have to be lowered approximately 150mm to match the proposed slope. This additional depth will be accommodated in the proposed park renovations.	Proposed road surface is flush with the existing sidewalk and curb
Sub drains	New sub drain will have to be installed under the low point in the road to ensure drainage of the stone base under the road.	Roadway sub drain will remain in its present location and will ensure drainage of the stone base under the road.
Cross slope	2% cross fall as per City standards	2.6% cross fall, exceeds City standards but is acceptable
Water storage	Water storage from heavy storm may back-up within the existing roadway before it approaches the building.	Water storage from heavy storm may back-up on the sidewalk and approach the existing buildings.
Catch basins	Existing catch basins will be removed and replaced with new catch basins at the low point in the roadway.	Existing catch basins can remain in their existing location and be raised to the elevation of the proposed Pedestrianized road. Additional catch basins will be required between the existing catch basins.

MacDonald Square:

This section of the park runs from John Street to Catharine Street. The existing roadway is built with a cross slope of approximately 2.5% to the south. There is a 150mm gutter on the south side of the street; the North side of the rolling surface is flush with king Street. Two options were reviewed for the Pedestrianization of this block:

	Inverted crown	Full cross slope
Pedestrianization	Proposed road surface is flush with the existing sidewalk and curb	Proposed road surface is flush with the existing sidewalk and curb
Sub drains	New sub drain will have to be installed under the low point in the road to ensure drainage of the stone base under the road.	Roadway sub drain will remain in its present location and will ensure drainage of the stone base under the road.
Cross slope	2% cross fall as per City standards	1.3% cross fall, does not meet City standards
Water storage	Water storage from heavy storm may back-up within the existing roadway before it approaches the building.	Water storage from heavy storm may back-up on the sidewalk and approach the existing buildings.
Catch basins	Existing catch basins will be removed and replaced with new catch basins at the low point in the roadway.	Existing catch basins can remain in their existing location and be raised to the elevation of the proposed Pedestrianized road. Additional catch basins will be required between the existing catch basins.

4. Cost Estimate

Cost estimates were generated for each of the options reviewed above. The cost estimates include the removal of the existing paving stone surface, removal of the existing curbs, new stone base, regarding of the sub-base and concrete slab. One row of catch basins will be required along the low point of the cross section at a spacing of approximately 25m. Existing manhole covers will be adjusted to the elevation of the new surface.

In general cost of the inverted crown option is approximately 9% greater that the full cross slope option. With the cross slope option, catch basins on the south side of the road can remain in their current location and have the heads raised to match the proposed surface elevation. With the inverted crown option, catch basins on both sides of the road must be removed and new catch basins installed, a new sub drain along the low point of the roadway cross section must be installed. All other costs are similar between the two options.

Section	Inverted crown	Full cross slope
Central Garden Block	\$150 000	\$137 000
Veteran's Place	\$143 000	\$131 000
MacDonald Square	\$95 000	\$89 000

5. Conclusion

The inverted crown option is recommended for the Pedestrianized roadway for each of the three blocks.

- Using the same option of all three blocks will help promote cohesion throughout the Gore Park,
- The cost of the inverted crown option is approximately 9% greater than the cross slope option,
- The inverted crown is the safer option as accumulated surface water is more likely to remain in the roadway and not approach the building entrances,
- The regular 2% cross slope will assist with water travel across the finished surface and is less likely to result in puddles forming within the roadway.

The cost of the inverted crown is slightly greater than the option of the full cross slope, however, the inverted crown will keep any accumulated surface waters further away from the adjacent buildings thereby providing a safer design.

Gore Park Pedestrianization Initiative
The Central Garden
Cost Estimate



Central Garden Option 1										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$13,500.00	\$13,500.00	
1.02	110.60					m	110.6	\$20.00	\$2,212.00	
1.03	110.60	9.11				m ²	1007.6	\$80.00	\$80,605.28	
1.04	110.60	9.11	0.20		2.200	t	443.3	\$18.00	\$7,979.92	
1.05				5.00		Ea.	5.0	\$2,000.00	\$10,000.00	
1.08				7.00		Ea.	7.0	\$500.00	\$3,500.00	
1.09				5.00		Ea.	5.0	\$1,000.00	\$5,000.00	
Section 'B' - Removals										
2.01	110.60	9.11				m ²	1007.6	\$5.00	\$5,037.83	
2.02	221.20					m	221.2	\$10.00	\$2,212.00	
2.03				8		Ea.	8.0	\$500.00	\$4,000.00	
2.05	110.60				1.310	m ³	144.9	\$20.00	\$2,897.72	
Sub-Total Option 1									136,945	
30% Contingency									13,694	
TOTAL									150,639	

Central Garden Option 2										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$12,500.00	\$12,500.00	
1.02	110.60	9.11				m ²	1007.6	\$80.00	\$80,605.28	
1.03	110.60	9.11	0.20		2.200	t	443.3	\$18.00	\$7,979.92	
1.04				3.00		Ea.	3.0	\$500.00	\$1,500.00	
1.05				2.00		Ea.	2.0	\$2,000.00	\$4,000.00	
1.06				7.00		Ea.	7.0	\$500.00	\$3,500.00	
1.07				2.00		Ea.	2.0	\$1,000.00	\$2,000.00	
Section 'B' - Removals										
2.01	110.60	9.11				m ²	1007.6	\$5.00	\$5,037.83	
2.02	221.20					m	221.2	\$10.00	\$2,212.00	
2.04				5		Ea.	5.0	\$500.00	\$2,500.00	
2.06	110.60				1.063	m ³	117.5	\$20.00	\$2,350.25	
Sub-Total Option 2									124,185	
30% Contingency									12,419	
TOTAL									136,604	

Gore Park Pedestrianization Initiative
 Veteran's Place
 Cost Estimate



Veteran's Place Option 1										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$13,000.00	\$13,000.00	
1.02	113.00					m	113.0	\$20.00	\$2,260.00	
1.03	113.00	9.11				m ²	1029.4	\$80.00	\$82,354.40	
1.04	113.00	9.11	0.20		2.200	t	452.9	\$18.00	\$8,153.09	
1.05				4.00		Ea.	4.0	\$2,000.00	\$8,000.00	
1.06				2.00		Ea.	2.0	\$500.00	\$1,000.00	
1.07				4.00		Ea.	4.0	\$1,000.00	\$4,000.00	
Section 'B' - Removals										
2.01	113.00	9.11				m ²	1029.4	\$5.00	\$5,147.15	
2.02	226.00					m	226.0	\$10.00	\$2,260.00	
2.03				2		Ea.	2.0	\$500.00	\$1,000.00	
2.04	113.00				1.458	m ³	164.7	\$20.00	\$3,293.95	
Sub-Total Option 1									130,469	
30% Contingency									13,047	
TOTAL									143,515	

Veteran's Place Option 2										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$12,000.00	\$12,000.00	
1.02	113.00	9.11				m ²	1029.4	\$80.00	\$82,354.40	
1.03	113.00	9.11	0.20		2.200	t	452.9	\$18.00	\$8,153.09	
1.04				2.00		Ea.	2.0	\$500.00	\$1,000.00	
1.05				2.00		Ea.	2.0	\$2,000.00	\$4,000.00	
1.06				2.00		Ea.	2.0	\$500.00	\$1,000.00	
1.07				2.00		Ea.	2.0	\$1,000.00	\$2,000.00	
2										
2.01	113.00	9.11				m ²	1029.4	\$5.00	\$5,147.15	
2.02	226.00					m	226.0	\$10.00	\$2,260.00	
2.03	113.00				0.558	m ³	63.0	\$20.00	\$1,259.95	
Sub-Total Option 2									119,175	
30% Contingency									11,917	
TOTAL									131,092	

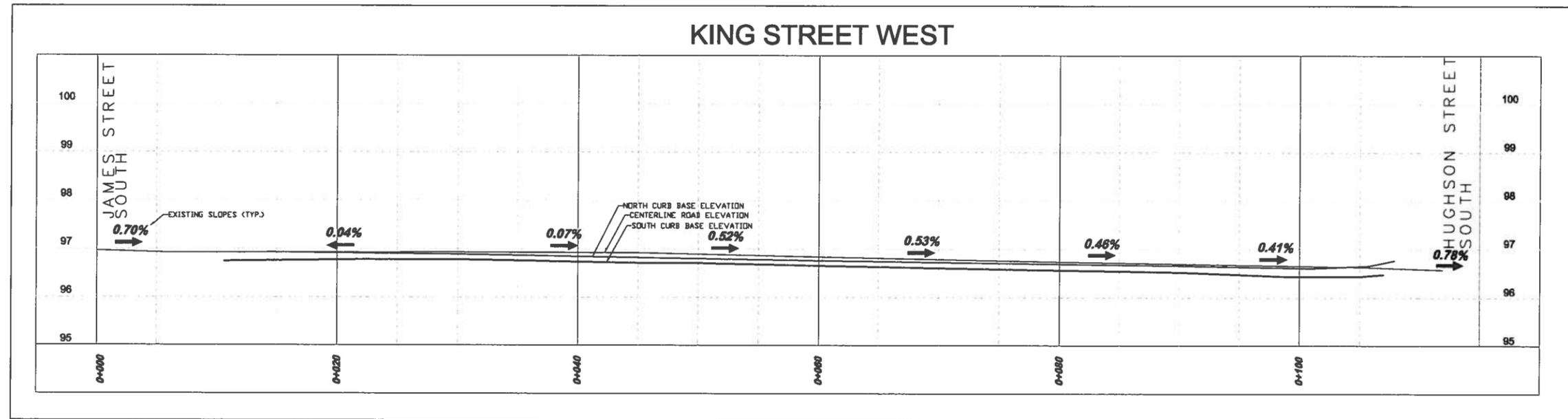
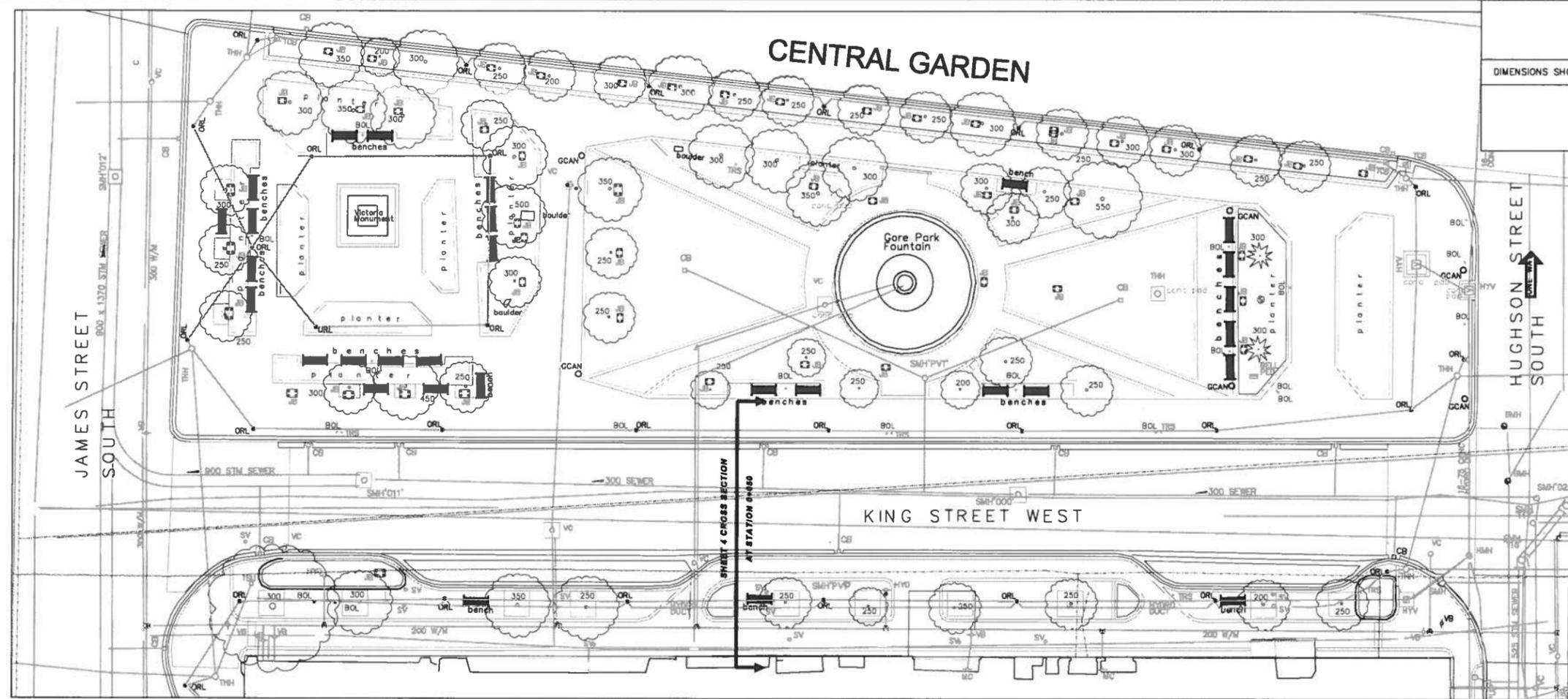
Gore Park Pedestrianization Initiative
MacDonald Square
Cost Estimate



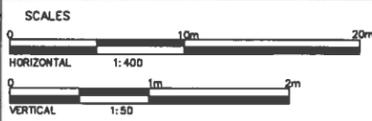
MacDonald Square Option 1										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$8,500.00	\$8,500.00	
1.02	88.39					m	88.4	\$20.00	\$1,767.84	
1.03	73.66	9.11				m ²	671.0	\$80.00	\$53,683.41	
1.04	73.66	9.11	0.20		2.200	t	295.3	\$18.00	\$5,314.66	
1.05				3.00		Ea.	3.0	\$2,000.00	\$6,000.00	
1.06				1.00		Ea.	1.0	\$500.00	\$500.00	
1.07				3.00		Ea.	3.0	\$1,000.00	\$3,000.00	
Section 'B' - Removals										
2.01	73.66	9.11				m ²	671.0	\$5.00	\$3,355.21	
2.02	88.39					m	88.4	\$10.00	\$883.92	
2.03				1		Ea.	1.0	\$500.00	\$500.00	
2.04	73.66				2.054	m ³	151.3	\$20.00	\$3,025.22	
Sub-Total Option 1									86,530	
30% Contingency									8,653	
TOTAL									95,183	

MacDonald Square Option 2										
Item	L	W	H	No.	Other	Units	Q	Unit Cost	Cost	
Section 'A' - General Items										
1.01						L.S.	1.0	\$8,000.00	\$8,000.00	
1.02	73.66	9.11				m ²	671.0	\$80.00	\$53,683.41	
1.03	73.66	9.11	0.20		2.200	t	295.3	\$18.00	\$5,314.66	
1.04				1.00		Ea.	1.0	\$500.00	\$500.00	
1.05				2.00		Ea.	2.0	\$2,000.00	\$4,000.00	
1.06				1.00		Ea.	1.0	\$500.00	\$500.00	
1.07				2.00		Ea.	2.0	\$1,000.00	\$2,000.00	
Section 'B' - Removals										
2.01	73.66	9.11				m ²	671.0	\$5.00	\$3,355.21	
2.02	88.39					m	88.4	\$10.00	\$883.92	
2.03				0		Ea.	0.0	\$500.00	\$0.00	
2.04	73.66				1.585	m ³	116.8	\$20.00	\$2,335.02	
Sub-Total Option 2									80,572	
30% Contingency									8,057	
TOTAL									88,629	

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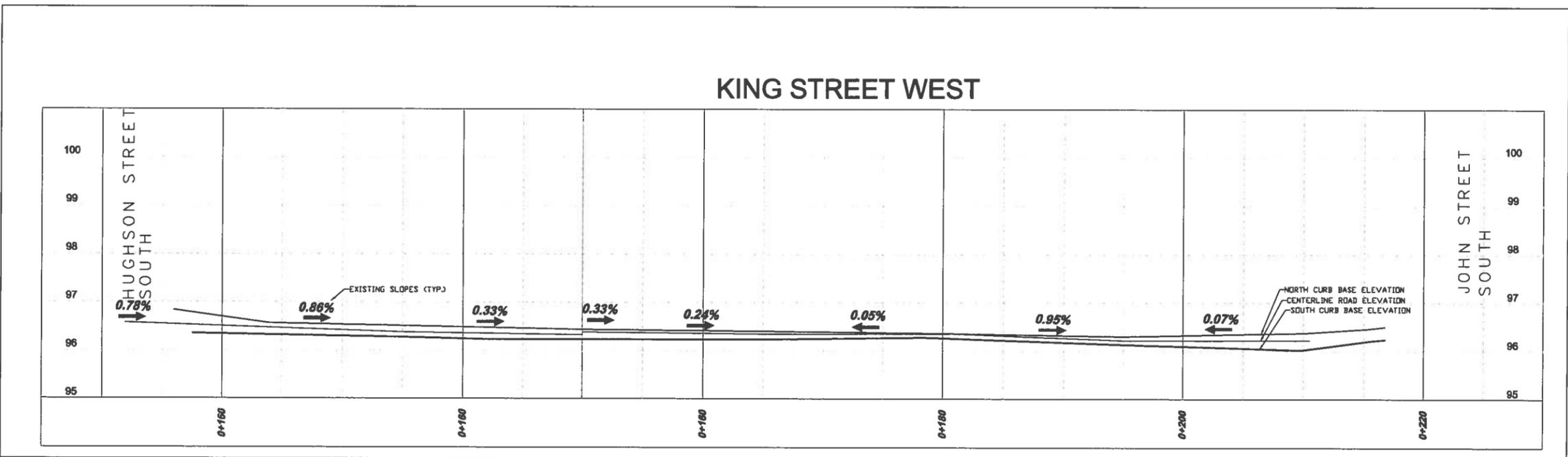
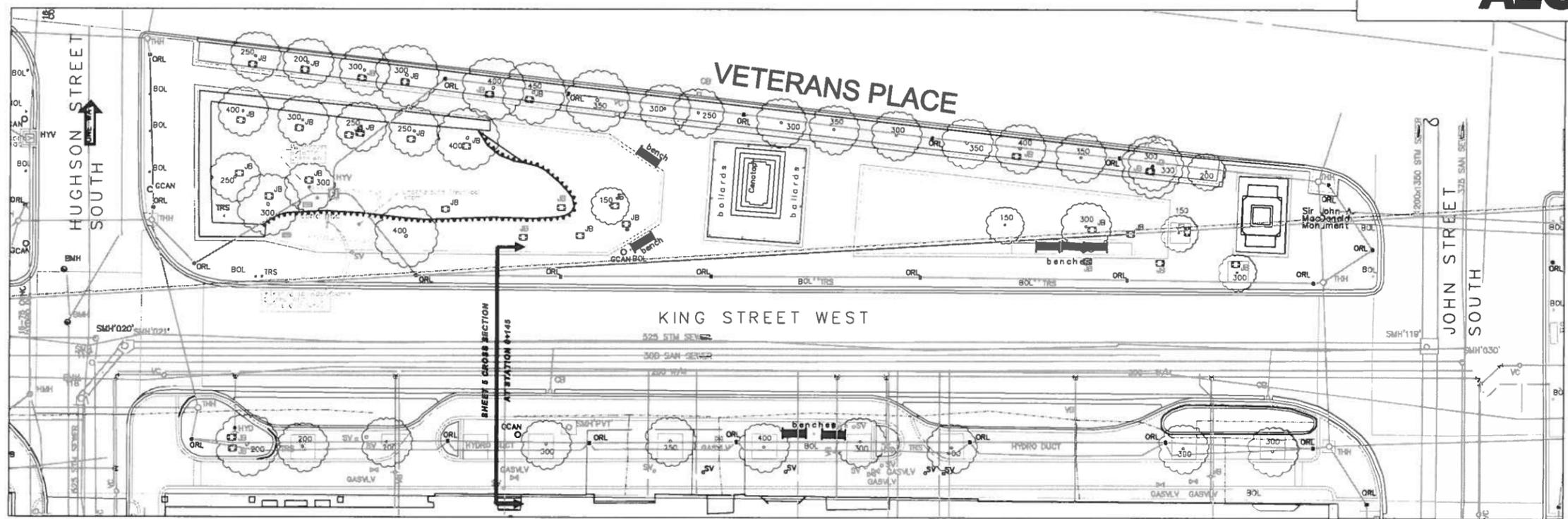


Project Manager (Design)
 WILLIAM VAN RUYVEN
 Manager of Design
 IAN IZZARD, P. Eng.

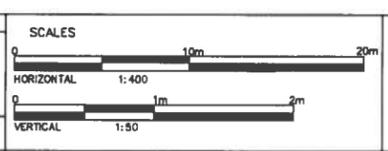
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 Public Works Department

KING STREET EAST
 GORE PARK PEDESTRIANIZATION
 GRADING REVIEW
 CENTRAL GARDEN
 From : James Street South
 To : Hughson Street South

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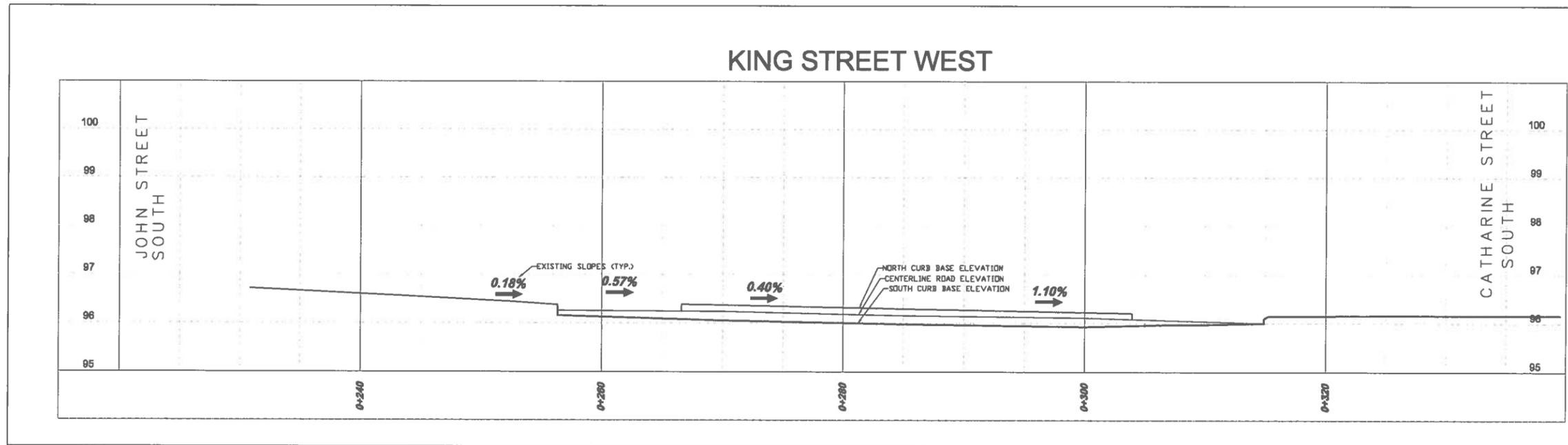
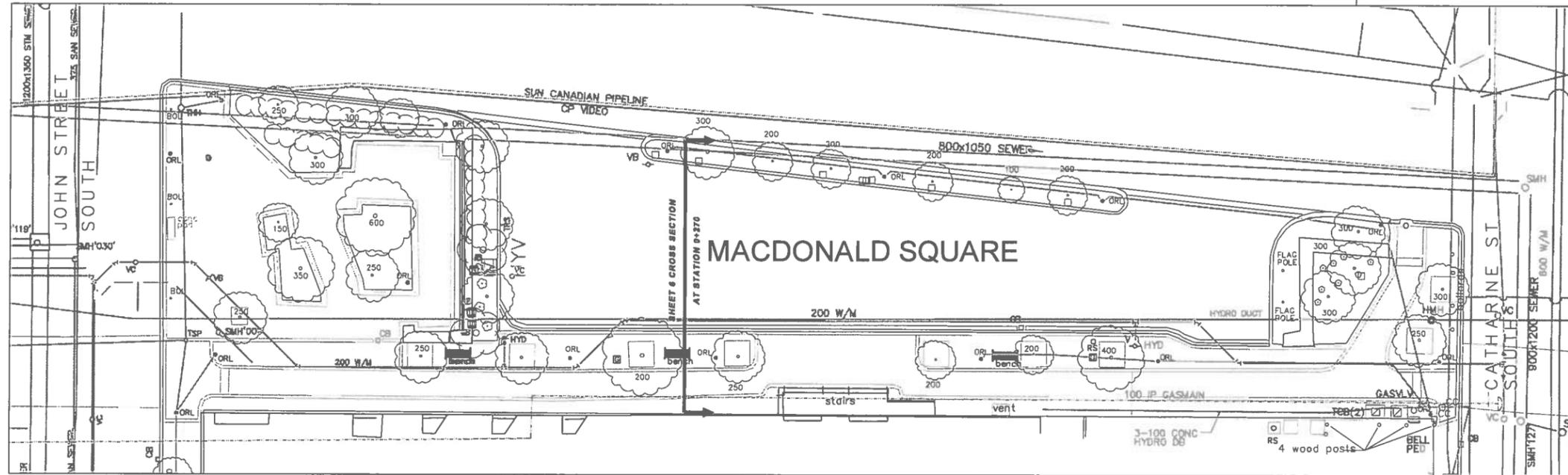
Project Manager (Design)
WILLIAM VAN RUYVEN
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 IAN IZZARD, P. Eng.

CITY OF HAMILTON
 Public Works Department

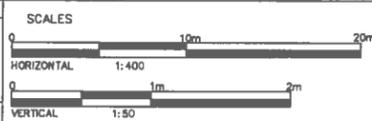
KING STREET EAST
 GORE PARK PEDESTRIANIZATION
 GRADING REVIEW
 VETERANS PLACE
 From : Hughson Street South
 To : John Street South

FILE No.	CONTRACT No. 60225470	SHEET No.
	DRAWING No. 60225470-03	3 OF 6

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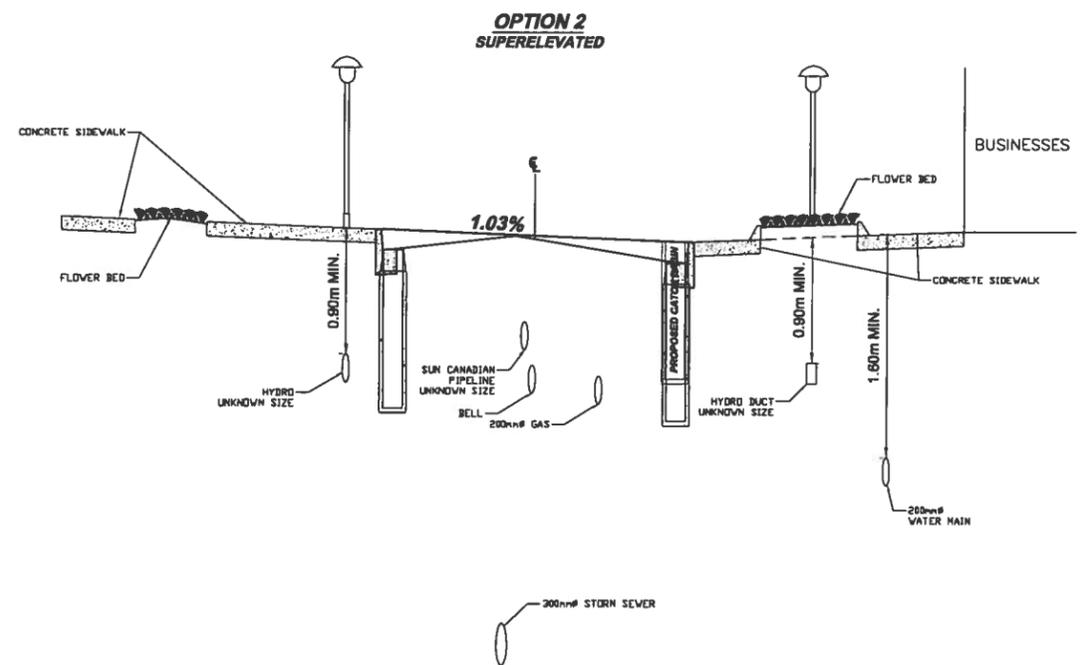
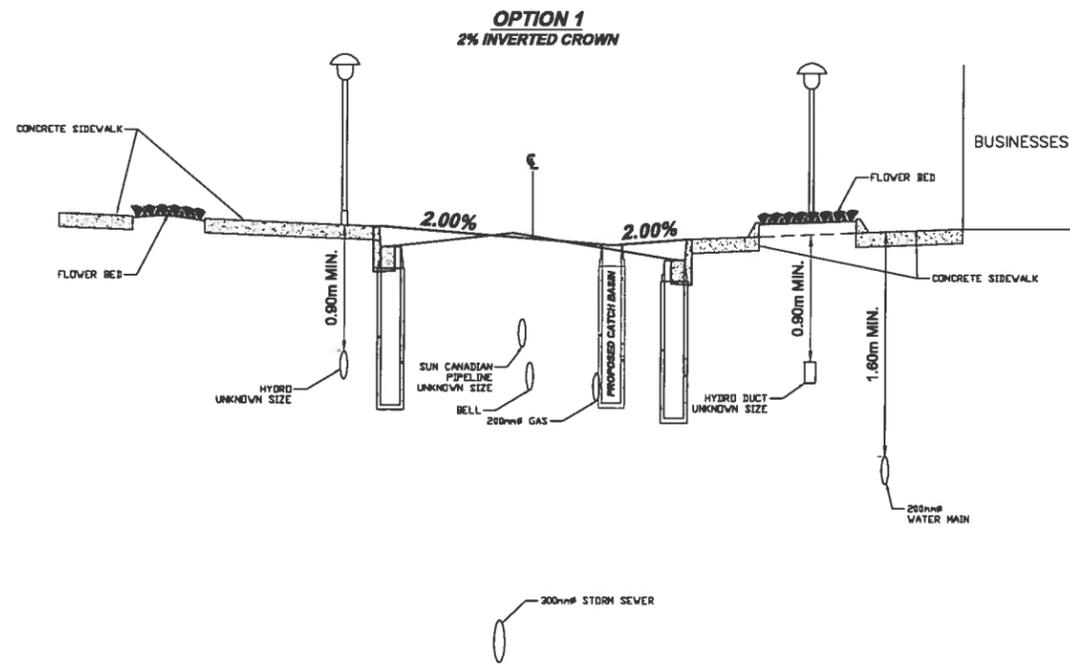
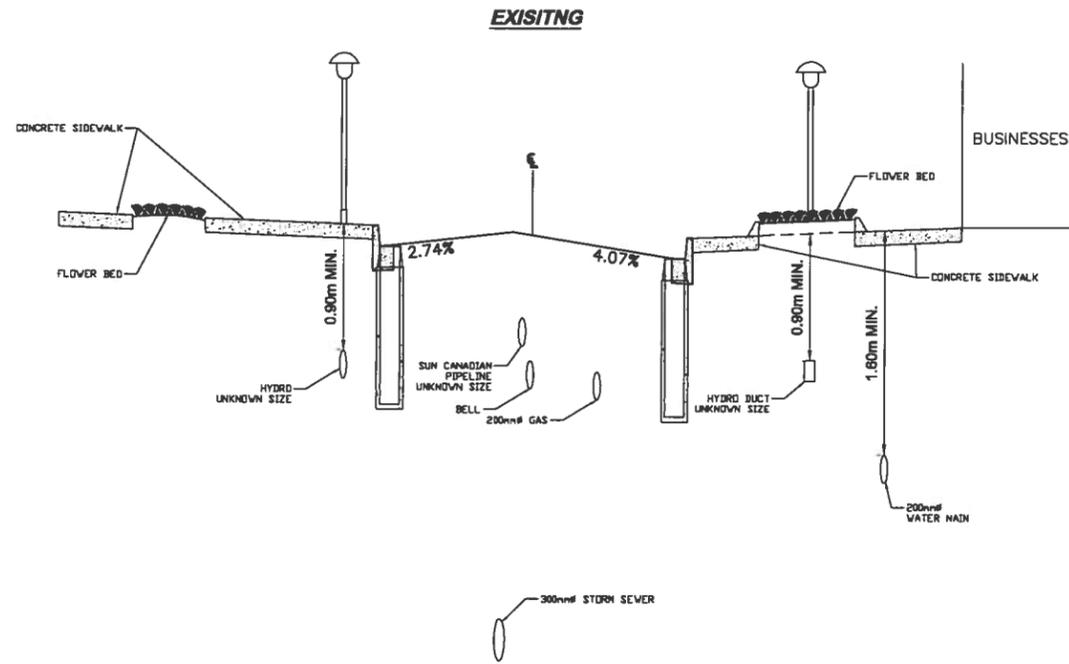


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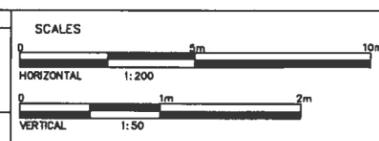
KING STREET EAST
 CORE PARK PEDESTRIANIZATION
 GRADING REVIEW
 MACDONALD SQUARE
 From : John Street South
 To : Catharine Street South

FILE No.	CONTRACT No. 60225470 DRAWING No. 60225470-01	SHEET No. 4 OF 6
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AECOM		



NOTE:
1. ϵ REFERS TO THE MIDPOINT BETWEEN CURBS

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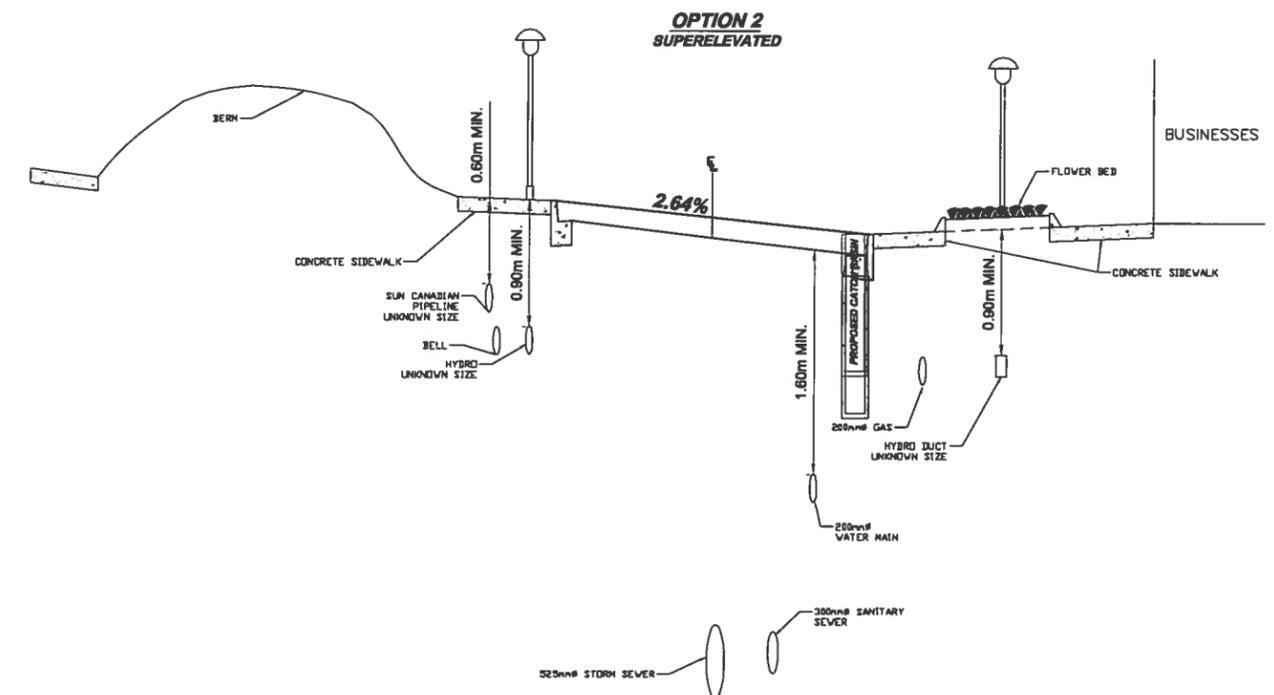
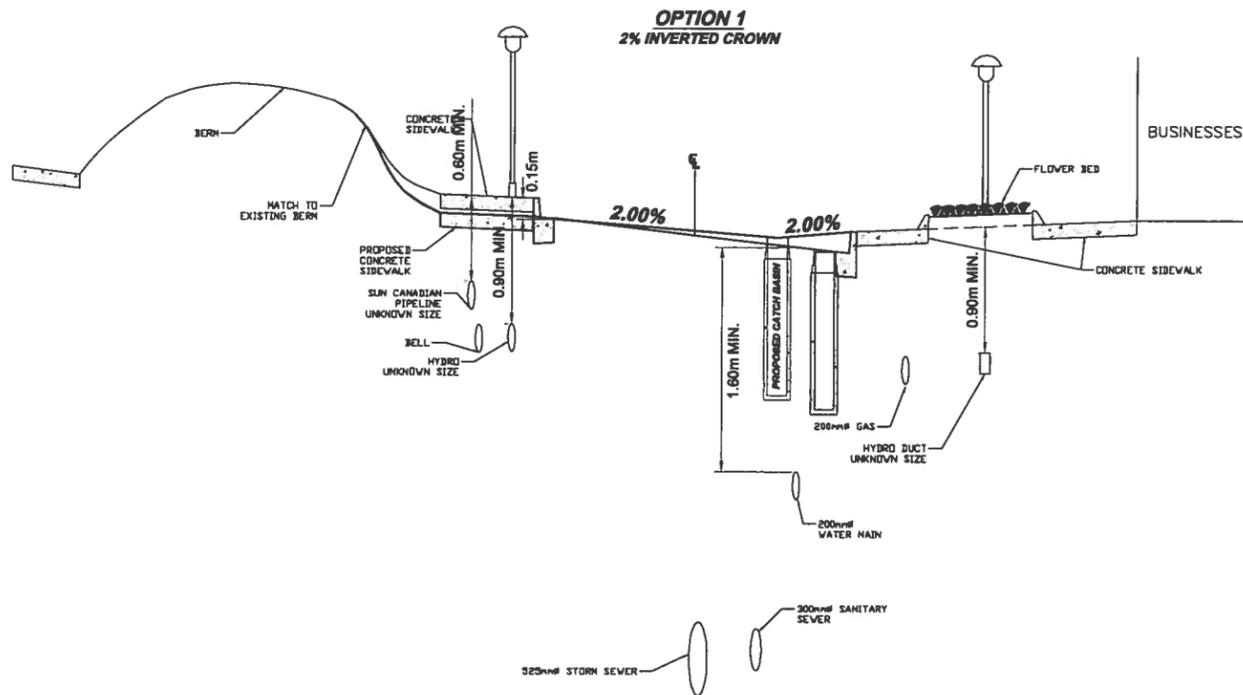
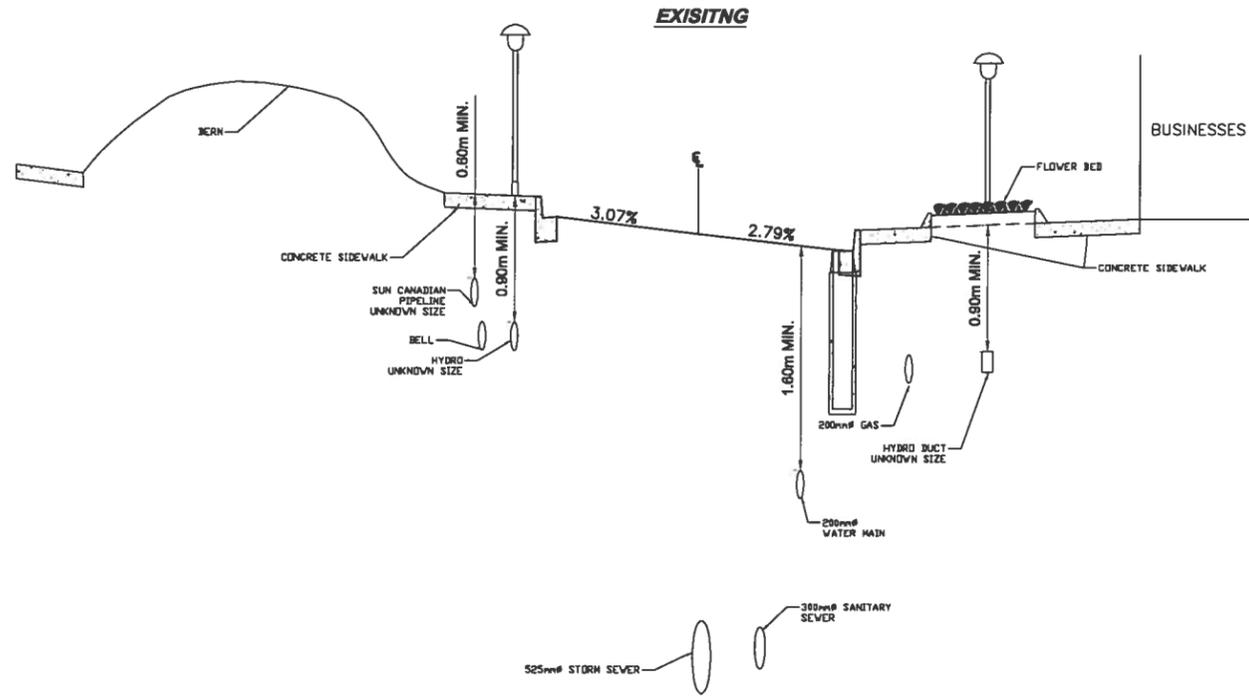
Project Manager (Design)
WILLIAM VAN RUYVEN
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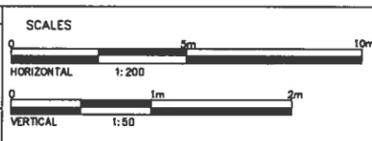
KING STREET EAST
GORE PARK PEDESTRIANIZATION
GRADING REVIEW
CENTRAL GARDEN CROSS SECTION
From : James Street South
To : Hughson Street South

FILE No.	CONTRACT No. 60225470	SHEET No. 5 OF 6
DRAWING No. 60225470-D2		
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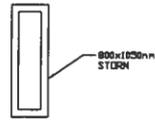
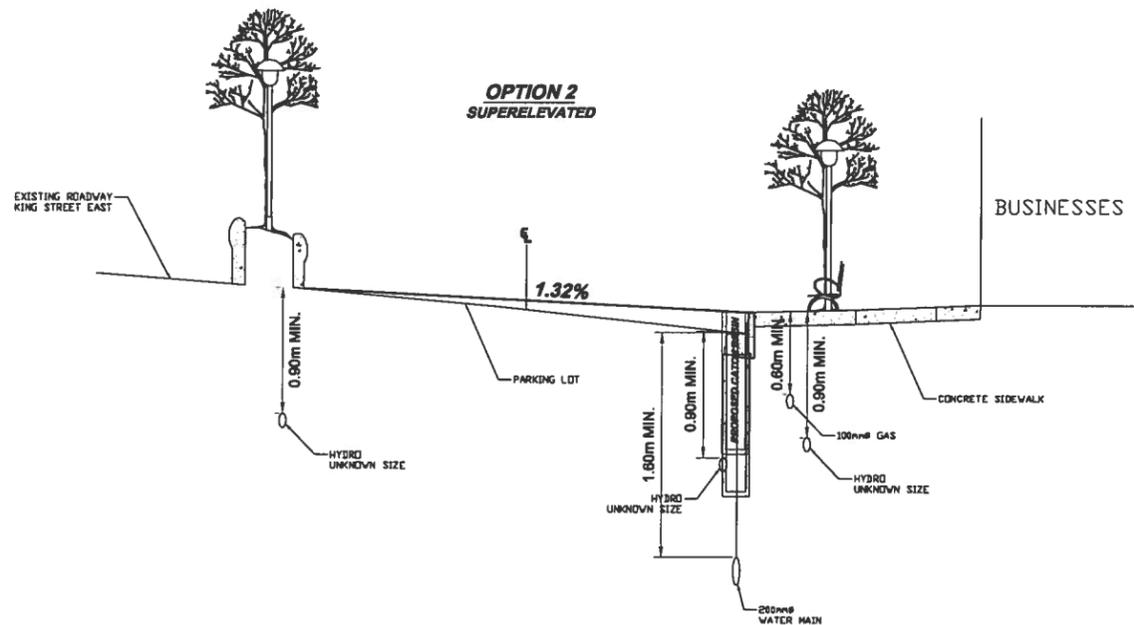
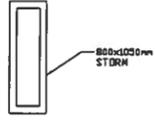
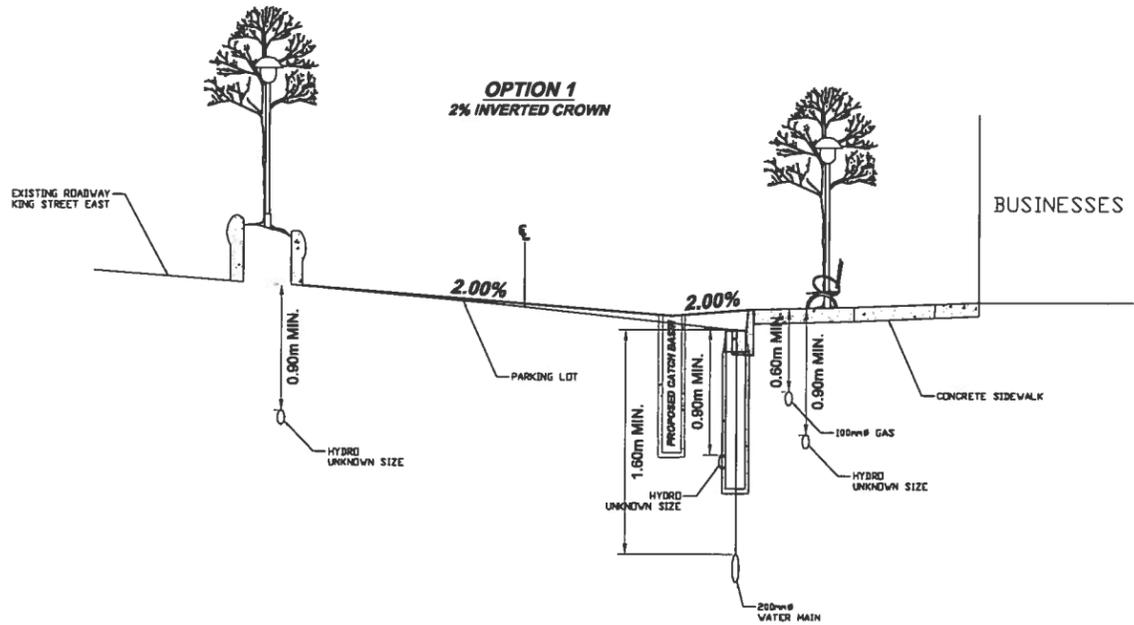
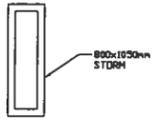
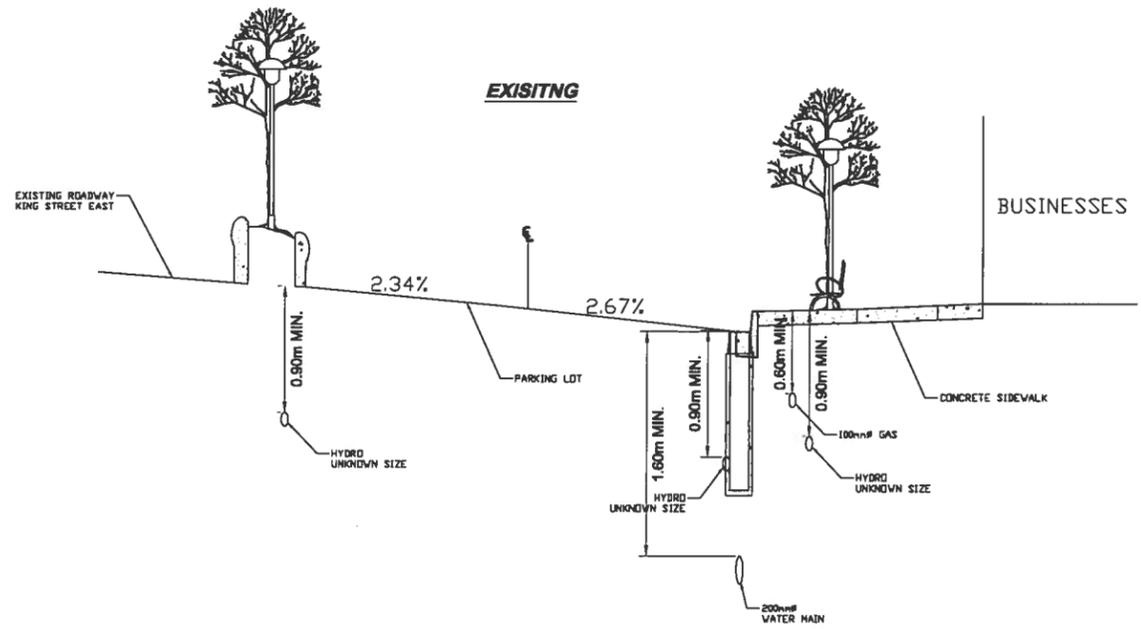


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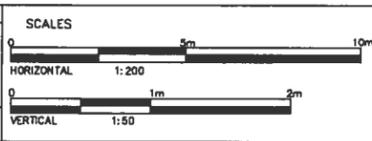
KING STREET EAST
CORE PARK PEDESTRIANIZATION
GRADING REVIEW
VETERANS PLACE CROSS SECTION
From : Hughson Street South
To : John Street South

FILE No.	CONTRACT No. 6022547D	SHEET No. 6 OF 6
DRAWING No. 60225470-03		
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Public Works Department

KING STREET EAST
GORE PARK PEDESTRIANIZATION
GRADING REVIEW
MACDONALD SQUARE CROSS SECTION
From : John Street South
To : Catharine Street South

Memorandum

To	Jana Joyce, MBTW-Watchhorn	Page	1 of 4
CC			
Subject	Gore Park Utility review		
From	Ian Izzard		
Date	September 06, 2012	Project Number	60225470

Recommendations for proposed functional design:

AECOM was retained by the City of Hamilton to review the underground implications to the proposed landscaping work as part of the preparation of the Functional Plan for the renovation of Gore Park.

A subsurface investigation was prepared by SUE services in February 2012 in order to provide accurate horizontal location of the underground utilities within the project area. This information will assist in preventing costly redesign and rework if underground utilities are discovered during the construction process. With accurate advanced knowledge, the designers will be able to account for the utility during the design stage. The designers can then decide to relocate the proposed work around the utility or have the utility relocated prior to construction. This will reduce surprises and changes during construction.

As the depth of the utilities is unknown, further investigation may be required during the preliminary design stage to determine if any proposed grade changes may affect a shallow utility.

Landscaping features such as trees and monuments should not be located above underground utilities. Should the utility fail and require an excavated repair, the tree or monument may be removed or destroyed during the repair. The plans for the proposed redevelopment of Gore Park were reviewed to determine areas of potential conflict between the proposed work and existing underground utilities. Where proposed work is located above existing utilities, it is recommended to relocate the proposed work around the existing utility. The exception to this rule was with the local electrical lighting circuit. This circuit supplies power to outlets in the trees to provide seasonal lighting and will have to be relocated to provide power to each of the proposed trees.

Geotechnical investigation was carried out by Soil-Mat Engineers & Consultants Ltd with report prepared on May 17, 2012 and revised on July 27, 2012. A summary of the geotechnical report is provided below. The geotechnical report should be consulted for further information.

The following recommendations are prepared and presented as a general summary of requirements regarding the proposed work. During the preliminary and detailed design stages, care should be taken to design the proposed work so as not to interfere with the existing utilities.

Any required utility relocations should be planned in advance of the proposed construction.

Utility description:

UTILITY	DESCRIPTION	WORK IN PROXIMITY
Local Power Distribution	<ul style="list-style-type: none"> Buried local lighting cable. 	<ul style="list-style-type: none"> Cable may be relocated to accommodate plantings and landscaping.
Hydro	<ul style="list-style-type: none"> Buried duct bank (possibly concrete encased). 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Underground Bell	<ul style="list-style-type: none"> Direct bury cable. Buried duct bank (possibly concrete encased). Buried Fibre optic line in duct 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Underground Gas	<ul style="list-style-type: none"> 100mm to 200mm diameter buried pipe 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Sun Canadian Pipeline (CP Video)	<ul style="list-style-type: none"> Buried cable 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Watermain	<ul style="list-style-type: none"> 200mm buried pipe typically 1.5 to 1.7m deep 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Storm Sewer	<ul style="list-style-type: none"> 300mm to 900mm diameter sewer and 1200 x 1350mm concrete box sewer. 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.
Sanitary Sewer	<ul style="list-style-type: none"> 300mm to 375mm diameter sanitary and combined sewer 	<ul style="list-style-type: none"> Avoid trees or monuments in this area.

The attached drawings show the location of the existing utilities and the location of the proposed work. Based on the information provided, the following comments are made regarding the utilities in proximity with the proposed work.

Central Garden Block:

This section of the park runs from James Street to Hughson Street.

- Sidewalk
 - The proposed tree and shrub area near the existing buildings on the south side may interfere with buried local lighting cables. These local cables should be rerouted to accommodate the trees and shrubs.
 - Plantings should be avoided above the gas and water lines.
- Roadway
 - Water and sewer mains under the roadway should have sufficient bury depth to not be affected by the proposed works.
 - Catch basins, manhole covers and water valves must be readjusted to suit the proposed road elevation.
- Park
 - Work within the park area may interfere with buried local lighting and hydro cables. These local cables should be rerouted to accommodate the trees and shrubs.

- Work within the park area may interfere with existing water lines, valves and catch basins. These fixtures should be adjusted to suit the proposed final elevation within the park.
- The proposed relocation of the water feature brings it over several water and sewer lines and structures. These will have to be relocated as part of the water feature relocation.
- South east quadrant of the park area, care should be taken so as not to disturb the CP Video (Sun Canadian) communications line.

Veteran's Place:

This section of the park runs from Hughson Street to John Street.

- Sidewalk
 - The proposed tree and shrub area near the existing buildings on the south side may interfere with buried local lighting cables. These local cables should be rerouted to accommodate the trees and shrubs.
 - The proposed tree and shrub area near the existing buildings on the south side may interfere with water and gas services. Trees and shrubs over water and gas services should be avoided.
- Roadway
 - Water and sewer mains under the roadway should have sufficient bury depth to not be affected by the proposed works.
 - Catch basins, manhole covers and water valves must be readjusted to suit the proposed road elevation.
- Park
 - Work within the park area may interfere with buried local lighting and hydro cables. These local cables should be rerouted to accommodate the trees and shrubs.
 - Work within the park area may interfere with existing water lines, valves and catch basins. These fixtures should be adjusted to suit the proposed final elevation within the park.
 - In the southern half of the park area, care should be taken so as not to disturb the CP Video (Sun Canadian) communications line.
 - Former underground washrooms (electrical equipment vault) in located in the north-west quadrant of the park. Until this structure is demolished, care should be taken to avoid construction above this existing structure.

MacDonald Square:

This section of the park runs from John Street to Catharine Street.

- Sidewalk
 - The proposed tree and shrub area near the existing buildings on the south side may interfere with water and gas lines. Trees and shrubs over water and gas lines must be avoided.
- Roadway
 - Water mains under the roadway/ sidewalk should have sufficient bury depth to not be affected by the proposed works.
 - Catch basin and water valves must be readjusted to suit the proposed road elevation.

- Park & Parking Area
 - Work within the park area may interfere with existing water lines, valves and catch basins. These fixtures should be adjusted to suit the proposed final elevation within the park.
 - Care should be taken so as not to disturb the CP Video (Sun Canadian) communications line and storm sewer in the northern portion of MacDonald Square.

Geotechnical Considerations:

The geotechnical report was prepared by Soil-Mat Engineers & Consultants Ltd on May 17, 2012 and revised on July 27, 2012. The report indicates that the existing roadway includes interlocking brick over a granular base ranging from 400 to 530mm thick. Fill material was found below the crushed stone layer to a depth of 3.5m below the surface consisting of gravel, sand, silt, clay and occasional brick and concrete rubble. Brown sand was found below the fill layer.

The proposed pavement structure for the proposed roadway is for 200mm concrete wearing surface with 125mm crushed granular "A" stone compacted to 100% Standard Proctor Maximum Dry Density. The concrete should be 32MPa with a maximum water/cement ration of 0.45 and placed with a maximum slump of 100mm.

Proposed structures in the park should be placed on a crushed stone bedding of 400mm crushed granular "A" stone compacted to 100% Standard Proctor Maximum Dry Density. The crushed stone fill must extend laterally beyond the limits of the footings a minimum of 500mm plus an allowance for a slope of compacted fill at 1:1 slope to allow for a 'load spread' through the granular fill. The allowable bearing stress at Serviceability Limit State (SLS) should be limited to 125kPa (based on the total and differential settlements not exceeding 25mm) provided that the footings are a minimum of 800mm in width and provided with a minimum 1.2m of earth cover or equivalent to protect against frost damage.

Two samples from each borehole were submitted for laboratory analysis. The results identify Sodium Absorption Ratio (SAR) and Electrical Conductivity (EC) in all samples. This is generally a result of the use of de-icing salt for winter de-icing operations. Soil with EC and SAR may be reused within the site as backfill where engineering and geotechnical requirements can be met. Therefore, savings can be realized by providing a balance of fill requirements versus excavated materials.

Borehole #4 shows an exceedence of lead in the laboratory analysis which is beyond the limits of MOE table 3 (ICC). Excavated material from this area must be disposed of in a licensed facility.

The geotechnical report from Soil-Mat Engineers & Consultants Ltd should be consulted for further information.