APPENDIX B – MMM GROUP LTD. CONCEPTUAL GATE CHAMBER DESIGN EXISTING CONDITION ASSESSMENTS REPORT

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March 31, 2015 Ref. No.: 5514130.000.101

Ms. Swarna Jayakody, M.Eng., P.Eng.
Land Drainage and Flood Protection Branch
City of Winnipeg
Water and Waste Department
110-1199 Pacific Avenue
Winnipeg MB R3E 3S8

Dear Ms. Jayakody:

Re: RFP No. 818-2014 - Professional Consulting Services for Developing Conceptual Concepts for Gate Chamber Designs for Storm Relief Sewer Systems

MMM Group Limited is pleased to submit our Condition Assessment and Report complete with Conceptual Drawings for the referenced project as per the Terms of Reference. The following documents are enclosed:

- Condition Assessment and Report – 5 Hard Copies, 1 Electronic Copy
- 11x17 Drawings – Included in Appendix of Report

The report includes conceptual designs we have developed that will allow the City to prioritize sites for upgrades and serve as a foundation for preliminary design. This has been a great opportunity for our MMM team to work with the City of Winnipeg's Water and Waste Department.

Please call me at (204) 943-3178 if you have any questions about this submittal.

Regards,

MMM Group Limited

Edmund Ho, P.Eng.
Project Engineer, Bridges and Structures

BB/tc

cc: Jim Lukashenko

Conceptual Chamber Design Cover Letter bb

CONCEPTUAL GATE CHAMBER DESIGN
EXISTING CONDITION ASSESSMENTS

Prepared for:

The City of Winnipeg

Submitted by:

MMM Group Limited

March 2015

5514130-000.101

EXECUTIVE SUMMARY

MMM Group Limited (MMM) was retained by the City of Winnipeg (COW), Water and Waste Department to undertake inspections and condition assessments of six SRS and one LDS gate chamber. As part of this report, the condition of each component in the chambers was assessed, along with recommended rehabilitation work, and any requirements for the addition of flap gates were determined.

A total of seven gate chambers were inspected and the condition assessment for each one is included in this report. For each site the report contains a description of the chamber and existing sluice gate, the condition of the chamber, gate, electrical and mechanical components, site conditions, and recommendations for upgrades and repairs.

Condition assessments are limited to areas of the sites that were accessible at the time of inspection. Site layouts, chamber details and concrete dimensions were designed using information from historical drawings supplied by the COW and are based on previous design experience of gate chambers for the COW. Proposed new gate widths and diameters were assumed to match the existing SRS/LDS diameters at the chambers and no hydraulic analysis was performed. Site restoration costs are based on previous contract experience. Designs are for the purpose of planning and developing Class-3 cost estimates. A concern with each of the sites is the accuracy of available information for buried structures. Utility locates were not performed during this study.

The following table is a summary of the recommend upgrades for each site location, with an estimated cost for the works, ordered from highest to lowest priority:

Priority	Lift Station	Assessment	Recommendation	Total Estimated Cost
1	**Donald (Site No. 6)**	Fair condition of chamber Older chamber	Staining observed in areas inaccessible during inspection. Areas should be sounded and any delaminated concrete removed and patched. If upgrades below are performed then this may be deferred until such time.	
			Considerable grease surrounding lift. Check to ensure it is properly sealed and lubricated. If upgrades below are performed then this may be omitted.	
			Severe corrosion to lower sections. Replace ladders and remove or replace safety cages. If upgrades below are performed then this may be deferred until such time.	

Priority	Lift Station	Assessment	Recommendation	Total Estimated Cost
			Construct two new chamber cells on the upstream side of the existing chamber, one with new flap gate and one for a pump-out location (no permanent pumps). Replace existing sluice gate at this time.	$1,052,000
2	**Fort Rouge Park (Site No. 1)**	Fair condition of concrete and pumps	Brackets supporting a timber platform are corroded and should be replaced with galvanized steel brackets.	
			Construct two new chamber cells complete with new flap gate and sluice gate downstream of existing chamber. Decommission existing sluice gate and use existing chamber as pump-out location complete with new pumps.	$1,478,000
3	**Canora (Site No. 2)**	Fair condition of chamber and pumps Older chamber	Replace corroded steel C-channel that supports pump guide.	
			Construct two new chamber cells on the upstream side of the existing chamber, one with new flap gate and one for a pump-out location complete with new pumps. Replace existing sluice gate at this time.	$1,180,000
4	**Ruby (Site No. 4)**	Good condition High volume SRS	Stem guide is poorly corroded and requires replacement. If upgrades below are performed and chamber is decommissioned then this may be omitted.	
			Spalls left from previous modifications should be patched. If upgrades below are performed and chamber is decommissioned then this may be omitted.	
			Decommission existing chamber and construct a separate new chamber with three cells downstream of the existing chamber, one with new flap gate, one with new sluice gate and one for a pump-out location complete with new pumps.	$1,889,000
5	**Aubrey (Site No. 5)**	Good condition High volume SRS	Construct two new chamber cells on the upstream side of the existing chamber, one with new flap gate and one for a pump-out location complete with new pumps. Replace existing sluice gate at this time.	$1,819,000

Priority	Lift Station	Assessment	Recommendation	Total Estimated Cost
6	**Burrows (Site No. 3)**	Good condition No pumping required	Install top steps for both ladders on chamber roof.	
			Replace damaged air vent.	
			Construct one new chamber cell on the upstream side of the existing chamber complete with a new flap gate. Replace existing sluice gate at this time.	$1,083,000
7	**Riviera (Site No. 7)**	Good condition No pumping required	Construct two new chamber cells on the upstream side of the existing chamber, one with new flap gate and one for a pump-out location.	$572,000

STANDARD LIMITATIONS

This report was prepared by MMM Group Limited (MMM) for the account of the City of Winnipeg – Water and Waste Department (the Client). The disclosure of any information contained in this report is the sole responsibility of the Client. The material in this report reflects MMM's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. MMM accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions based on this report.

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1.0 FORT ROUGE PARK

1.1 Gate Chamber Information

Gate Chamber Name:	Fort Rouge Park
Year of Construction:	1966
Location of Station:	Intersection of Cauchon Street and River Avenue
Sewer Type:	2440 mm Diameter Storm Relief Sewer (2440 SRS)
Sluice Gate:	Square 2150 x 2150 mm
Rim Elevation to Downstream Invert:	9.885 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

1.2 Observations

1.2.1 General

The Fort Rouge Park gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 250 mm slot for stop logs in the upstream chamber. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. The sluice gate is operated by a gate lift located on a concrete corbel inside the chamber with an operating shaft that extends to the surface. Submersible pumps are present in the upstream cell with piping to dewater to the downstream side. A diversion tee and discharge piping are also present which allow the chamber to be dewatered to an adjacent combined sewer. The condition and operation of the pumps was not observed. At the time of inspection there was approximately 2 m of water in the chamber and as a result some components were inaccessible.

1.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

1.2.3 Site Conditions

The site is located in Fort Rouge Park off of River Avenue. The site is also adjacent to an apartment complex so working hours may affect the construction schedule. Several trees are in the general vicinity which may conflict with construction activities. COW records show that there is a tee junction in the SRS immediately upstream of the chamber. This hinders the ease of placing a flap gate upstream of the existing chamber. MMM recommends performing any upgrades on the downstream side of the existing chamber at this location. Records also show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

1.2.4 Gate Condition

The downstream chamber cell contains a 2150 x 2150 mm steel sluice gate supported by a wall thimble and gate guides. The gate stem feeds through a steel stem guide immediately below the concrete corbel to a gate lift located inside the chamber. Drawings show an operating shaft extending from the gate lift to the surface of the chamber, however this was not present at the time of inspection. Some components were not visible during inspection. The

functionality of the gate was not checked during inspection because leaks would not be visible. It is understood from the COW collections department that the gate at this location does leak.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Fair	Rusted with scaling and some section loss, limited access during inspection.
Gate Stem	Good	
Stem Guide	Fair	Rusted with scaling and some section loss.
Gate Lift	Good	Rusted with scaling, does not appear to inhibit function of lift. Operating shaft not present during inspection.

1.2.5 Chamber Condition

The chamber is constructed of cast-in-place concrete with galvanized steel appurtenances. During the inspection, high water limited access to some components with some areas inaccessible. A platform of timbers supported on steel brackets was in place in the upstream cell approximately 3.8 m from the top for access to a valve. The brackets of this platform are corroded however the visible anchors appear to be in good condition. If this platform is to be maintained then the support brackets should be replaced with galvanized steel brackets.

Component	Condition	Notes
Structural Concrete	Good	Limited access. Some discolouration observed.
Galvanized Steel Hatches and Frames	Good	Visible rust on some hinges.
Galvanized Steel Ladders and Safety Cages	Good	Overall good with some rusting of safety cage in lower half of chamber on downstream side.
Air Vent	Good	
Existing SRS	Unknown	SRS not accessible.

1.2.6 Pumps and Electrical

The Fort Rouge Park gate chamber currently has a permanent chamber pump installed complete with activation floats and controls. The condition of the existing pump is unknown and could not be inspected due to water levels in the chambers. No information other than the 100 mm (4-in) discharge connection size could readily be provided for this pump by the COW. The floats appeared to be tied up in the off position and were not in use. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine pump sizing an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 6,000 m^3

(1,585,032 US gallons). A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is practicable and results in a required pumping capacity of approximately 0.07 m^3/s (1100 to 1200 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This will result in a probable pump discharge connection size of 200 mm (8-in) or 150 mm (6-in) dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. Due to the existing pump likely being undersized and a lack of available information it is recommended the existing pump be replaced. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

Manitoba Hydro existing electrical service is 200A/120/240V/1phase. We recommend that new 200A/600V/3phase/4wire service to be provided to the site.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1200GPM at design head conditions. Remove existing pump and controls. Estimated Cost $46,500
Discharge Piping and Valve	N/A	Remove existing pump discharge piping, rails, appurtenances, and downstream flapper gate; replace with new. Provide valve operator extensions. Estimated Cost: $20,000.
Electrical and Controls	N/A	Demolish existing control panel and provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Reuse feeder from existing control panel to connect to Manitoba Hydro. Existing control panel to be demolished. Manitoba Hydro to replace existing electrical service with new to suit new installation. Estimated Cost $35,000.

1.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in overall good condition. Steel brackets supporting a timber platform in the upstream cell should be replaced with galvanized brackets if the platform is to be maintained. The condition below the waterline at the time of inspection is unknown and it is possible that there may be maintenance repairs required.

As part of the RFP the feasibility of installing a flap gate was assessed. COW records show that the existing chamber is placed immediately downstream of a tee junction between a 2150 mm diameter SRS and a 1200 mm diameter SRS. To place a flap gate in this location, a large cell would be required to encapsulate both pipes. A preferred alternative is to construct a new cell on the downstream side of the existing chamber to accommodate a flap gate, and then a second new cell for a new positive gate. The existing chamber would be left in place with the existing gate removed and would be used as a pump-out location. Appropriately sized pumps would be installed with piping necessary to dewater the upstream side of the chamber in the event that the gates are closed. As an option to reduce the overall footprint and impact on the park the downstream cell of the existing chamber could be demolished, increasing construction costs but reducing the overall length of the chamber footprint by approximately 1.8 m. The final pump location will have to be determined in the final design, however it may be placed in either of the existing chamber cells. The COW has expressed that they will install a removable weir in the downstream cell of the existing chamber, which may affect pump placement. The

diversion tee and discharge piping is to be maintained, however the piping may need to be relocated as necessary during detailed design.

Sizing of the proposed flap and sluice gates were such that the gate's minimum cross-sectional dimension matched or exceeded the existing SRS diameter. During the detailed design a hydraulic analyses should be performed on the system to determine if smaller sized gates are feasible, which would allow for reduced cell dimensions and thus lower overall costs.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,478,000. A breakdown of the cost is included in Section 1.5 below.

1.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the existing design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components and it is understood that the existing sluice gate leaks when closed. Because of site constraints, in order to install a flap gate it is preferable to locate it in a new cell downstream of the existing positive gate. This would result in abandoning the existing positive gate and installing a new positive gate further downstream in a second new cell.

1.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	665	$399,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	110	$275,000.00
1-3	Supply and Install Flap Gate	LS	$169,600.00	1	$169,600.00
1-4	Supply and Install Sluice Gate	LS	$241,400.00	1	$241,400.00
2	Surface Restoration and Landscaping	LS	$45,000.00	1	$45,000.00
3	Mechanical/Electrical Upgrades				
3-1	Supply and Install New Submersible Pump, Automation and Controls	LS	$46,500.00	1	$46,500.00
3-2	Supply and Install Discharge Piping and Valve	LS	$20,000.00	1	$20,000.00
3-3	Power Supply and Control for the New Submersible Pump	LS	$35,000.00	1	$35,000.00
	Total Construction				**$1,231,500.00**
	Engineering Fees (10%)				**$123,000.00**
	City Fees (10%)				**$123,000.00**
			Total		**$1,477,500.00**
			Rounded =		$1,478,000.00

Additonal Price Options

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
4	Credit for Not Installing New Permanent Pumps				
4-1	Less Supply and Install New Submersible Pump, Automation and Controls	LS	-$46,500.00	1	-$46,500.00
4-2	Less Supply and Install Discharge Piping and Valve	LS	-$20,000.00	1	-$20,000.00
4-3	Less Power Supply and Control for the New Submersible Pump	LS	-$35,000.00	1	-$35,000.00
	Total Credit with No Permanent Pumps				**-$101,500.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$121,800.00**

Total with No New Permanent Pumps (Rounded) **$1,356,000.00**

1.6 Photographs

Photograph No. 1

Existing site looking south (towards upstream)

Photograph No. 2

Existing site looking north (towards outfall)

Photograph No. 3

Piping in upstream chamber to downstream chamber, float switches not in use

Photograph No. 4

Valve in upstream chamber and piping from submersible pump

Photograph No. 5

Support for platform in upstream chamber, staining on concrete walls

Photograph No. 6

Discharge flap in downstream chamber from submersible pump

Photograph No. 7

Corrosion on ladder cage, downstream chamber

Photograph No. 8

Corrosion on gate stem guide

Photograph No. 9

Positive sluice gate

2.0 CANORA

2.1 Gate Chamber Information

Gate Chamber Name:	Canora
Year of Construction:	1963
Location of Station:	Intersection of Canora Street and Palmerston Avenue
Sewer Type:	1980 mm Diameter Storm Relief Sewer (1980 SRS)
Sluice Gate:	Rectangular 1520 mm wide x 1830 mm high
Rim Elevation to Downstream Invert:	9.077 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

2.2 Observations

2.2.1 General

The Canora gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 250 mm slot for stop logs in the upstream chamber. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. The sluice gate is operated by a gate lift located on a concrete corbel inside the chamber with an operating shaft that extends to the surface. Submersible pumps are present in the upstream chamber cell with piping to dewater to the downstream side. The condition and operation of the pumps was not observed. At the time of inspection there was over 2 m of water in the chamber and as a result some components were inaccessible.

2.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

2.2.3 Site Conditions

The site is located on the river-side of Palmerston Avenue at the end of Canora Street. The existing chamber is in a treed space with park features including brick paving, concrete retaining wall and fencing. There is a hydro pole immediately north of the existing chamber which may require moving to perform upgrades. The site is also located between two homes so working hours may affect the construction schedule. Consideration will have to be made for protecting an adjacent brick garage from adverse effects of piling and excavating. Records show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

2.2.4 Gate Condition

The downstream chamber cell contains a 1520 mm wide x 1830 mm high steel gate supported by a wall thimble and gate guides. The gate stem feeds through a steel stem guide immediately below the concrete corbel to a gate lift located inside the chamber. Drawings show an operating shaft extending from the gate lift to the surface of the chamber, which was not present at the time of inspection. Some components were not visible during inspection. The functionality of the gate was not checked during inspection because leaks would not be visible. COW collections workers stated the gate had been operating correctly.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Fair	Rusted with scaling and some section loss, limited access during inspection.
Gate Stem	Good	
Stem Guide	Fair	Rusted with scaling and some section loss.
Gate Lift	Good	Rusted with scaling, does not appear to inhibit function of lift. Operating shaft not present during inspection.

2.2.5 Chamber Condition

The chamber is cast-in-place concrete with galvanized steel appurtenances. During the inspection high water limited access to some components with some areas inaccessible. Submersible pumps have been added to the chamber and concrete has spalled where openings in the chamber walls were cut for piping and conduits. These appear to have been left since the upgrades were performed and accepted by the City. The galvanized safety cage in the upstream chamber has been removed, apparently to facilitate the installation of a submersible pump. This is acceptable by current standards.

Component	Condition	Notes
Structural Concrete	Good	Limited access. Minor damage around some openings.
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Good	Safety cage in upstream chamber has been removed.
Air Vent	Good	
Existing SRS	Unknown	SRS not accessible.

2.2.6 Pumps and Electrical

The Canora gate chamber currently has a permanent chamber pump installed complete with activation floats and controls. The condition of the existing pump is unknown and could not be inspected due to water levels in the chambers. No information other than the 150 mm (6-in) discharge connection size could readily be provided for this pump by the COW. The floats appeared to be tied up in the off position and were not in use. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine pump sizing an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 5,000 m^3 (1,320,860 US gallons). A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is practicable and results in a required pumping capacity of approximately 0.06 m^3/s (900 to 950 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This

will result in a probable pump discharge connection size of 150 mm (6-in) or 100 mm (4-in) dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. Due to the existing pump likely being undersized and a lack of available information it is recommended the existing pump be replaced. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites which will result in slightly a larger pump size than indicated.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

Manitoba Hydro existing electrical service is 100A/120/240V/1phase. We recommend that new 200A/600V/3phase/4wire service to be provided to the site.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1200GPM at design head conditions. Remove existing pump and controls. Estimated Cost $46,500
Discharge Piping and Valve	N/A	Remove existing pump discharge piping, rails, appurtenances, and downstream flapper gate; replace with new. Provide valve operator extensions. Estimated Cost: $20,000.
Electrical and Controls	N/A	Demolish existing control panel and provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Re-use existing feeder from to be demolished control panel to Manitoba Hydro. Manitoba Hydro to replace existing electrical service with new to suit new installation. Estimated Cost $35,000.

2.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in an overall good condition. Spalls around openings from earlier chamber upgrades should be repaired with grout in order to maintain adequate cover to reinforcing steel for long-term durability. If the pumps are to remain in service in the existing upstream chamber then the C-channel supporting the pump guide should be replaced. The condition below the waterline at the time of inspection is unknown and it is possible that there is damage that may require repairs.

As part of the RFP the feasibility of installing a flap gate was assessed. A concern with the site is minimizing adverse effects to the aesthetics of the area and maintaining the existing sidewalk in front of the chamber. For the upgrades a new concrete cell to house a flap gate would be constructed on the upstream side of the existing chamber. The exposed outer wall of the chamber would tie into the existing curb at the site. A second cell for pump-out would be constructed below grade with a man-hole cover for access. It is preferred not to have typical steel hatches in walkways due to their reduced traction in winter. An option to reduce the overall footprint of the upgraded chamber would be to demolish the existing upstream cell although this would result in increased construction costs. These upgrades would require moving a hydro pole and restoring architectural park features including stone paving, trees and a curb.

Due to the age of the existing steel positive gate it is recommended to replace the gate, frame, stem and other appurtenances. A new surface-mounted gate operator would be installed.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,180,000. A breakdown of the cost is included in Section 2.5 below.

2.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components. In order to install a flap gate a new cell should be constructed upstream of the existing chamber as well as a second new cell for a pump-out. It is recommended to replace the existing sluice gate and appurtenances at the time of these upgrades.

2.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	530	$318,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	95	$237,500.00
1-3	Supply and Install Flap Gate	LS	$131,800.00	1	$131,800.00
1-4	Supply and Install Sluice Gate	LS	$145,300.00	1	$145,300.00
2	Surface Restoration and Landscaping	LS	$50,000.00	1	$50,000.00
3	Mechanical/Electrical Upgrades				
3-1	Supply and Install New Submersible Pump, Automation and Controls	LS	$46,500.00	1	$46,500.00
3-2	Supply and Install Discharge Piping and Valve	LS	$20,000.00	1	$20,000.00
3-3	Power Supply and Control for the New Submersible Pump	LS	$35,000.00	1	$35,000.00
	Total Construction				**$984,100.00**
	Engineering Fees (10%)				**$98,000.00**
	City Fees (10%)				**$98,000.00**
			Total		$1,180,100.00
			Rounded =		**$1,180,000.00**

Additonal Price Options

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
4	Credit for Not Installing Permanent Pumps				
4-1	Less Supply and Install New Submersible Pump, Automation and Controls	LS	-$46,500.00	1	-$46,500.00
4-2	Less Supply and Install Discharge Piping and Valve	LS	-$20,000.00	1	-$20,000.00
4-3	Less Power Supply and Control for the New Submersible Pump	LS	-$35,000.00	1	-$35,000.00
	Total Credit with No Permanent Pumps				**-$101,500.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$121,800.00**
5	Credit for Not Replacing Existing Sluice				
5-1	Less Supply and Install Sluice Gate	LS	-$145,300.00	1	-$145,300.00
	Total Credit No Sluice Replacement				**-$145,300.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$174,400.00**

Total with No New Permanent Pumps (Rounded)	**$1,058,000.00**
Total with No Sluice Replacement (Rounded)	**$1,006,000.00**
Total with No New Permanent Pumps AND No New Sluice Replacement (Rounded)	**$884,000.00**

2.6 Photographs

Photograph No. 1

Existing chamber roof looking west

Photograph No. 2

Existing site looking south (towards outfall)

Photograph No. 3

Piping in upstream chamber to downstream chamber, ladder safety cage removed

Photograph No. 4

Positive gate lift, operating shaft not present

Photograph No. 5

C-shape channel support for submersible pump guide

Photograph No. 6

Discharge flap in downstream chamber from submersible pump

Photograph No. 7

Spalling around openings for conduits in existing concrete wall

Photograph No. 8

Corrosion on gate stem guide

Photograph No. 9

Positive sluice gate

3.0 BURROWS

3.1 Gate Chamber Information

Gate Chamber Name:	Burrows
Year of Construction:	1971
Location of Station:	One Block East of Intersection of Burrows Avenue and Main Street
Sewer Type:	2440 mm Diameter Storm Relief Sewer (2440 SRS)
Sluice Gate:	Square 2140 x 2140 mm
Rim Elevation to Downstream Invert:	9.043 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

3.2 Observations

3.2.1 General

The Burrows gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 250 mm slot for stop logs in the upstream chamber. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. There is an overflow pipe from an adjacent combined sewer that discharges into the upstream chamber. The sluice gate is operated by a gate lift located on a concrete mid-level floor inside the chamber with an operating shaft that extends to the surface. There are no provisions for temporary pumps at this site. At the time of inspection there was approximately 1.5 m of water in the chamber and as a result some components were inaccessible.

3.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

3.2.3 Site Conditions

The site is located on the median boulevard of Burrows Avenue east of Main Street. The chamber surface has damage that may have been from vehicles, and as a result there are red steel poles marking three of its four corners. There is a combined sewer immediately south of the chamber with manhole west of the chamber that will interfere with any new construction. The manhole will have to be removed during excavation and replaced, while maintaining service to affected homes. Any upgrades will likely result in the loss of one of the trees that are regularly spaced on the median centerline. Records also show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

3.2.4 Gate Condition

The downstream chamber contains a 2140 x 2140 mm steel gate supported by a wall thimble and gate guides. The gate stem feeds through a pipe sleeve in the intermediate concrete floor to a gate lift located inside the chamber. An operating shaft extends from the gate lift to the surface of the chamber. Some components were not visible during inspection. The functionality of the gate was not checked during inspection because leaks would not be visible. The COW has stated that the current sluice gate operator has been giving them issues.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Fair	Rusted with scaling and some section loss, limited access during inspection.
Gate Stem	Good	
Stem Guide		No stem guide.
Gate Lift	Poor	Rusted with scaling. COW has indicated lift is not working correctly.

3.2.5 Chamber Condition

The chambers are cast-in-place concrete with galvanized steel appurtenances. During the inspection high water limited access to some components with some areas inaccessible. There was originally a ladder step above the chamber roof for both ladders which have both since been removed. It is recommended the steps be replaced for ease of access to the chamber. The corrugated steel air vent has been damaged and may allow precipitation to enter the chamber. This should be repaired to restore its intended function of ventilating gases.

Component	Condition	Notes
Structural Concrete	Good	Limited access. No defects in visible areas.
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Good	Note that top manhole steps above roof have been removed. Condition of remaining ladder is good.
Air Vent	Poor	The vent has been damaged and torn such that precipitation would be able to enter it freely.
Existing SRS	Good	Limited visibility, observed areas were in good condition.

3.2.6 Pumps and Electrical

The Burrows gate chamber currently does not have a permanent chamber pump installed. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine if a pump was required and sizing an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 6,000 m^3 (1,585,032 US gallons). It is recommended that a submersible dewatering pump be provided for this site. A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is practicable and results in a required pumping capacity of approximately 0.07 m^3/s (1100 to 1200 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This will result in a probable pump discharge connection size of 200 mm (8-in) or 150 mm (6-in) dependent on pump type and manufacture.

The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

There is no existing electrical service for this site and requires a 600v/3-ph service be made available to the site by Manitoba Hydro.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1200GPM at design head conditions. Estimated Cost $46,500
Discharge Piping and Valve	N/A	Provide new pump discharge piping, rails, appurtenances, and downstream flapper gate. Provide valve operator extensions. Estimated Cost: $15,000
Electrical and Controls	N/A	Provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Manitoba Hydro to provide 600V/3Ø/4W service for the new control panel. Estimated Cost: $48,000

3.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in overall good condition. Repairs will have to be done to the air vent. It is proposed to replace the cap portion of the vent to prevent precipitation from entering. The top steps of both ladders which extend above the surface have been removed. New top steps should be placed for ease of access.

As part of the RFP the feasibility of installing a flap gate was assessed. An additional chamber cell would be required to accommodate the flap gate and it is proposed to place this cell immediately west (upstream) of the existing chamber. There is an existing combined sewer and manhole adjacent to the chamber which would have to be moved during construction and service to affected homes maintained. An overflow pipe from the adjacent combined sewer will have to be replaced at this time.

Due to the age of the existing steel positive gate it is recommended to replace the gate, frame, stem and other appurtenances. A new surface-mounted gate operator would be installed.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,083,000. A breakdown of the cost is included in Section 3.5 below.

3.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components. In order to install a flap gate a new chamber cell would be annexed upstream of the existing chamber. It is recommended to replace the existing sluice gate and appurtenances at the time of these upgrades.

3.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add One Cell to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	440	$264,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	65	$162,500.00
1-3	Supply and Install Flap Gate	LS	$169,600.00	1	$169,600.00
1-4	Supply and Install Sluice Gate	LS	$241,400.00	1	$241,400.00
1-5	Relocate Existing CS at Chamber	LS	$20,000.00	1	$20,000.00
2	Surface Restoration and Landscaping	LS	$45,000.00	1	$45,000.00
	Total Construction				**$902,500.00**
	Engineering Fees (10%)				**$90,000.00**
	City Fees (10%)				**$90,000.00**
			Total		**$1,082,500.00**
			Rounded =		$1,083,000.00

Additonal Price Options

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
3	Credit for Not Replacing Existing Sluice				
3-1	Less Supply and Install Sluice Gate	LS	-$241,400.00	1	-$241,400.00
	Total Credit No Sluice Replacement				**-$241,400.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$289,700.00**

Total with No Sluice Replacement (Rounded) **$793,000.00**

3.6 Photographs

Photograph No. 1

Existing chamber looking west (towards upstream), combined sewer MH beyond chamber

Photograph No. 2

Damaged air vent

Photograph No. 3

Galvanized ladder and safety cage

Photograph No. 4

Positive gate lift

Photograph No. 5

Upstream chamber and combined sewer outfall

Photograph No. 6

Existing SRS looking upstream

Photograph No. 7

Underside of galvanized hatch covers

Photograph No. 8

Gate stem and sleeve in mid-level concrete floor

Photograph No. 9

Positive sluice gate

4.0 RUBY

4.1 Gate Chamber Information

Gate Chamber Name:	Ruby
Year of Construction:	1969
Location of Station:	Intersection of Ruby Street and Palmerston Avenue
Sewer Type:	2440 mm Diameter Storm Relief Sewer (2440 SRS)
Sluice Gate:	Rectangular 2740 mm wide x 2130 mm high
Rim Elevation to Downstream Invert:	10.546 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

4.2 Observations

4.2.1 General

The Ruby gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 350 mm wide slot for stop logs in the upstream chamber. The top of the roof is approximately 250 mm below grade except for manhole and hatch. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. There is an outfall in the upstream chamber from a weir in an adjacent combined sewer. The sluice gate is operated by a gate lift located on a concrete mid-level floor inside the chamber with an operating shaft that extends to the surface. Piping to dewater the upstream side to the downstream side has been added to the chamber. At the time of inspection there was over 3 m of water in the chamber and as a result some components were inaccessible.

4.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

4.2.3 Site Conditions

The site is located on the boulevard of Ruby Street on the northwest corner of the intersection with Palmerston Avenue. The existing chamber is in a grassed space and is recessed 250 mm below grade except for openings. There is a large tree immediately north of the existing chamber which it is assumed the City would like to preserve. The site is also located adjacent to private houses so working hours may affect the construction schedule. Records show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

4.2.4 Gate Condition

The downstream chamber contains a 2740 mm wide x 2130 mm high steel gate supported by a wall thimble and gate guides. The gate stem feeds through a steel stem guide immediately below the intermediate concrete floor to a gate lift located inside the chamber. Drawings show an operating shaft extending from the gate lift to the surface of the chamber. However, this was not present at the time of inspection. Some components were not visible during inspection. The functionality of the gate was not checked during inspection because leaks would not be visible. COW collections workers stated the gate had been operating properly.

Severe corrosion was present on the gate stem guide, and therefore this component should be replaced.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Unknown	Not accessible during inspection.
Gate Stem	Good	
Stem Guide	Poor	Significant section loss, requires replacement.
Gate Lift	Fair	Rusted with some section loss. Operating shaft not present during inspection.

4.2.5 Chamber Condition

The chambers are cast-in-place concrete with galvanized steel appurtenances. During the inspection high water limited access to some components with some areas inaccessible. Piping for submersible pumps has been added to the chamber and concrete has spalled where openings in the chamber roof were cut for conduits. The round manhole opening of the upstream chamber has been replaced with a rectangular hatch by saw-cutting through the previous roof slab. This saw-cutting has resulted in several spalls around the bottom edge of the opening, and leaves the ends of some reinforcing exposed. The roof slab may require replacing in the long-term due to durability issues. The galvanized safety cage in the upstream chamber has been removed, apparently to facilitate the installation submersible pump piping. This is acceptable by current standards. A 4.5 m high air vent shown on drawings was not observed on site. It is assumed the chamber is adequately vented through the manhole opening however this should be confirmed.

Component	Condition	Notes
Structural Concrete	Fair	Limited access. Spalling and exposed rebar around opening in roof slab.
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Good	Safety cage in upstream chamber has been removed.
Air Vent	Missing	Air vent not present.
Existing SRS	Unknown	SRS not accessible.

4.2.6 Pumps and Electrical

The Ruby Street gate chamber currently does not have a permanent chamber pump installed. It was noted by the COW that they rent a submersible pump for this site. This particular pump was rated for 0.076 m^3/s (1200 USgpm) and does not properly dewater the chamber within a 24 hour or 48 hour period. Recorded data for COW storm flow rates on this gate chamber were

not able to be obtained. To determine if a pump was required and sizing an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 20,000 m³ (5,283,441 US gallons). It is recommended that a submersible dewatering pump be provided for this site. A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is not practicable and a 48 hour period was selected. This results in a required pumping capacity of approximately 0.116 m³/s (1800 to 1850 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This will result in a probable pump discharge connection size of 200 mm (8-in) but is dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites. Dependent upon the final pump selection and design head for this site the pumping curve for the pumps used at other sites noted within this report may still be suitable.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

Manitoba Hydro existing electrical service is 100A/120/240V/1phase. We recommend that new 200A/600V/3phase/4wire service to be provided to the site.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1800GPM at design head conditions. Remove existing pump and controls. Estimated Cost $46,500
Discharge Piping and Valve	N/A	Provide new pump discharge piping, rails, appurtenances, and downstream flapper gate. Provide valve operator extensions. Estimated Cost: $15,000
Electrical and Controls	N/A	Demolish existing control panel and provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Re-use existing feeder from to be demolished control panel to Manitoba Hydro. Manitoba Hydro to replace existing electrical service with new to suit new installation. Estimated Cost $35,000.

4.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in overall good condition. Spalls around openings from earlier chamber upgrades should be repaired with grout in order to maintain adequate cover to reinforcing steel for long-term durability. The stem guide of the existing sluice gate is severely corroded and should be replaced. The condition below the waterline at the time of inspection is unknown and it is possible that there may be maintenance repairs required.

As part of the RFP the feasibility of installing a flap gate was assessed. Placing a new chamber cell upstream of the existing chamber would disrupt the aesthetics of the boulevard. For this reason it is proposed to place a new three cell chamber towards the outfall of the SRS. MMM proposes placing the new chamber in the parking lot of the Robert A. Steen Community Club resulting in some property acquisition. The chamber would be built complete with a new flap gate, sluice gate and pump-out. The existing chamber would be abandoned with the sluice gate removed.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,889,000. A breakdown of the cost is included in Section 4.5 below.

4.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components. Because of site constraints, in order to install a flap gate it is preferable to locate it in a separate chamber several meters upstream of the existing chamber.

4.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Construct Separate Three Cell Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	800	$480,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	165	$412,500.00
1-3	Supply and Install Flap Gate	LS	$221,400.00	1	$221,400.00
1-4	Supply and Install Sluice Gate	LS	$309,400.00	1	$309,400.00
2	Surface Restoration and Landscaping	LS	$55,000.00	1	$55,000.00
3	Mechanical/Electrical Upgrades				
3-1	Supply and Install New Submersible Pump, Automation and Controls	LS	$46,500.00	1	$46,500.00
3-2	Supply and Install Discharge Piping and Valve	LS	$15,000.00	1	$15,000.00
3-3	Power Supply and Control for the New Submersible Pump	LS	$35,000.00	1	$35,000.00
	Total Construction				**$1,574,800.00**
	Engineering Fees (10%)				**$157,000.00**
	City Fees (10%)				**$157,000.00**
			Total		**$1,888,800.00**
			Rounded =		$1,889,000.00

Additonal Price Options

Item	Description	Unit	Unit Price	Construct Separate Three Cell Chamber	
				Quantity	Price
4	Credit for Not Installing Permanent Pumps				
4-1	Less Supply and Install New Submersible Pump, Automation and	LS	-$46,500.00	1	-$46,500.00
4-2	Less Supply and Install Discharge Piping and Valve	LS	-$15,000.00	1	-$15,000.00
4-3	Less Power Supply and Control for the New Submersible Pump	LS	-$35,000.00	1	-$35,000.00
	Total Credit with No Permanent Pumps				**-$96,500.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$115,800.00**
			Total with No New Permanent Pumps (Rounded)		**$1,773,000.00**

4.6 Photographs

Photograph No. 1

Overall site looking south (towards outfall)

Photograph No. 2

Existing site looking north (towards upstream)

Photograph No. 3

Opening to upstream chamber, spalls and exposed reinforcing

Photograph No. 4

Upstream chamber, ladder safety cage removed

Photograph No. 5

450 mm combined sewer outfall

Photograph No. 6

Gate lift, operating shaft not present

Photograph No. 7

Flap outlet for pumps from upstream chamber

Photograph No. 8

Severe corrosion on gate stem guide

Photograph No. 9

Positive sluice gate

5.0 AUBREY

5.1 Gate Chamber Information

Gate Chamber Name:	Aubrey
Year of Construction:	1969
Location of Station:	Intersection of Aubrey Street and Palmerston Avenue
Sewer Type:	2900 mm Diameter Storm Relief Sewer (2900 SRS)
Sluice Gate:	Rectangular 2740 mm wide x 2130 mm high
Rim Elevation to Downstream Invert:	11.000 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

5.2 Observations

5.2.1 General

The Aubrey gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 350 mm wide slot for stop logs in the upstream chamber. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. The sluice gate is operated by a gate lift located on a mid-level concrete floor inside the chamber with an operating shaft that extends to the surface. Piping for submersible pumps to dewater the upstream cell to the downstream cell has been added to the chamber. At the time of inspection there was over 3 m of water in the chamber and as a result some components were inaccessible.

5.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

5.2.3 Site Conditions

The site is located on the river-side of the intersection of Aubrey Street and Palmerston Avenue. There are trees north of the chamber which may interfere with construction. Removing the existing upstream chamber cell would help reduce the overall footprint of the upgrades. Hydro pole guy wires are anchored immediately north of the existing chamber which will have to be relocated to allow new construction. The site is also adjacent to a private home so working hours may affect the construction schedule. Records show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

5.2.4 Gate Condition

The downstream chamber contains a 2740 mm wide x 2130 mm high steel gate supported by a wall thimble and gate guides. The gate stem feeds through a steel stem guide immediately below the intermediate concrete floor to a gate lift located inside the chamber. Drawings show an operating shaft extending from the gate lift to the surface of the chamber, however this was not present at the time of inspection. Some components were not visible during inspection. The concrete has exhibited minor differential movement along a horizontal construction joint in the lower section of the upstream cell. The functionality of the gate was not checked during

inspection because leaks would not be visible. COW collections workers stated the gate had been operating properly.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Unknown	Not accessible during inspection.
Gate Stem	Good	
Stem Guide	Fair	Rusted with some section loss.
Gate Lift	Fair	Rusted with some section loss. Operating shaft not present during inspection.

5.2.5 Chamber Condition

The chambers are cast-in-place concrete with galvanized steel appurtenances. During the inspection high water limited access to some components with some areas inaccessible. Piping for submersible pumps has been added to the chamber. The galvanized safety cage in the upstream chamber has been altered to facilitate the installation submersible pump piping which is acceptable. The cage is also damaged near the bottom of the chamber such that it interferes with the climbing circle, and therefore this should be repaired. In the upstream cell at the construction joint located approximately mid-height there is slight differential movement of the concrete made visible by some feathering of the concrete. No other cracks or visible deflections were noted.

Component	Condition	Notes
Structural Concrete	Fair	Limited access. Differential movement around mid-level construction joint in upstream cell.
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Fair	Safety cage in upstream cell has been modified to facilitate discharge piping, which is acceptable. Cage in upstream cell is damaged near bottom and interferes with climbing circle.
Air Vent	Good	
Existing SRS	Unknown	SRS not accessible.

5.2.6 Pumps and Electrical

The Aubrey Street gate chamber currently does not have a permanent chamber pump installed. It was noted by the COW that they rent a submersible pump for this site. This particular pump was rated for 0.076 m^3/s (1200 USgpm) and does not properly dewater the chamber within a 24 hour or 48 hour period. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine if a pump was required and sizing an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m

(11-ft) was calculated. Volume at this location was approximated at 15,000 m^3 (3,962,581 US gallons). It is recommended that a submersible dewatering pump be provided for this site. A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is not practicable and a 48 hour period was selected. This results in a required pumping capacity of approximately 0.087 m^3/s (1400 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This will result in a probable pump discharge connection size of 200 mm (8-in) but is dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites. Dependent upon the final pump selection and design head for this site the pumping curve for the pumps used at other sites noted within this report may still be suitable.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

Manitoba Hydro existing electrical service is 200A/347/600V/3phase, no upgrade is required for this service.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1400GPM at design head conditions. Remove existing pump and controls. Estimated Cost $46,500
Discharge Piping and Valve	N/A	Provide new pump discharge piping, rails, appurtenances, and downstream flapper gate. Provide valve operator extensions. Estimated Cost: $15,000
Electrical and Controls	N/A	Demolish existing control panel and provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Save existing Hydro service for re-use. Estimated Cost $20,000.

5.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in overall good condition. The condition below the waterline at the time of inspection is unknown and it is possible that there may be maintenance repairs required.

As part of the RFP the feasibility of installing a flap gate was assessed. It is preferred to minimize the impact on the surrounding area however excavation will likely result in the loss of at least one tree. The existing upstream cell will become redundant and may be removed to reduce the overall footprint of the upgrades at an increased construction cost. A separate chamber cell for pump-out is proposed to be placed upstream of the flap-gate chamber.

Due to the age of the existing steel positive gate it is recommended to replace the gate, frame, stem and other appurtenances. A new surface-mounted gate operator would be installed.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,819,000. A breakdown of the cost is included in Section 5.5 below.

5.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components. A flap-gate cell and pump-out could be installed on the upstream side of the existing chamber.

5.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	815	$489,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	130	$325,000.00
1-3	Supply and Install Flap Gate	LS	$260,300.00	1	$260,300.00
1-4	Supply and Install Sluice Gate	LS	$309,400.00	1	$309,400.00
2	Surface Restoration and Landscaping	LS	$50,000.00	1	$50,000.00
3	Mechanical/Electrical Upgrades				
3-1	Supply and Install New Submersible Pump, Automation and Controls	LS	$46,500.00	1	$46,500.00
3-2	Supply and Install Discharge Piping and Valve	LS	$15,000.00	1	$15,000.00
3-3	Power Supply and Control for the New Submersible Pump	LS	$20,000.00	1	$20,000.00
	Total Construction				**$1,515,200.00**
	Engineering Fees (10%)				**$152,000.00**
	City Fees (10%)				**$152,000.00**
			Total		**$1,819,200.00**
			Rounded =		$1,819,000.00

Additonal Price Options

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
4	Credit for Not Installing Permanent Pumps				
4-1	Less Supply and Install New Submersible Pump, Automation and	LS	-$46,500.00	1	-$46,500.00
4-2	Less Supply and Discharge Piping and Valve	LS	-$15,000.00	1	-$15,000.00
4-3	Less Power Supply and Control for the New Submersible Pump	LS	-$20,000.00	1	-$20,000.00
	Total Credit with No Permanent Pumps				**-$81,500.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$97,800.00**
5	Credit for Not Replacing Existing Sluice				
5-1	Less Supply and Install Sluice Gate	LS	-$309,400.00	1	-$309,400.00
	Total Credit No Sluice Replacement				**-$309,400.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$371,300.00**

Total with No New Permanent Pumps (Rounded)	**$1,721,000.00**
Total with No Sluice Replacement (Rounded)	**$1,448,000.00**
Total with No New Permanent Pumps AND No New Sluice Replacement (Rounded)	**$1,350,000.00**

5.6 Photographs

Photograph No. 1

Overall site looking northwest

Photograph No. 2

Existing site looking south (towards outfall)

Photograph No. 3

Chamber roof looking east

Photograph No. 4

Upstream chamber cell, damage to safety cage near bottom of chamber

Photograph No. 5

Underside of upstream chamber galvanized hatch covers

Photograph No. 6

Cracks in construction joint in upstream chamber cell

Photograph No. 7

Downstream chamber cell from above

Photograph No. 8

Gate lift

Photograph No. 9

Positive sluice gate

6.0 DONALD

6.1 Gate Chamber Information

Gate Chamber Name:	Donald
Year of Construction:	1964
Location of Station:	Intersection of Donald Street and Assiniboine Avenue
Sewer Type:	1980 mm Diameter Storm Relief Sewer (1980 SRS)
Sluice Gate:	Rectangular 1520 mm wide x 1830 mm high
Rim Elevation to Downstream Invert:	8.876 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	November 28, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

6.2 Observations

6.2.1 General

The Donald gate chamber is a conventional two-cell gate chamber with a positive sluice gate in the downstream chamber and a 250 mm slot for stop logs in the upstream chamber. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. The sluice gate is operated by a gate lift located on a concrete corbel inside the chamber with an operating shaft that extends to the surface. At the time of inspection there was approximately 1.5 m of water in the chamber and as a result some components were inaccessible.

6.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on November 28, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

6.2.3 Site Conditions

The site is located on the river-side of the intersection of Donald Street and Assiniboine Avenue in an existing green-space. There are trees east of the SRS which may affect construction access. There is an access road that winds around the chamber which may need to be re-aligned if a new chamber is added. The existing upstream cell could be demolished to reduce the overall footprint of the upgrades in the interest of minimizing realignment of the existing access road. The site was adjacent to new condominium construction at the time of the inspection. Records show that corrugated metal pipe sections of the SRS have slip joints packed with asbestos rope.

6.2.4 Gate Condition

The downstream cell contains a 1520 mm wide x 1830 mm high steel gate supported by a wall thimble and gate guides. The gate stem feeds through a pipe sleeve through a concrete corbel to a gate lift located inside the chamber. An operating shaft extends from the gate lift to the surface of the chamber. The gate lift and surrounding area are considerably covered in grease. MMM recommends the lift be checked to ensure it is properly sealed and lubricated. Some components were not visible during inspection. The functionality of the gate was not checked during inspection because leaks would not be visible. COW collections workers stated the gate had been operating correctly.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss, limited access during inspection.
Thimble	Unknown	Not accessible during inspection.
Gate Guides	Unknown	Not accessible during inspection.
Gate Stem	Good	
Stem Guide		No stem guide.
Gate Lift	Fair	Moderate rust only. A large amount of grease is present around lift.

6.2.5 Chamber Condition

The chambers are cast-in-place concrete with galvanized steel appurtenances. During the inspection high water limited access to some components with some areas inaccessible. The galvanized safety cages exhibit considerable rust and section loss and should be removed or replaced. Some sections of the ladders are rusting with minor section loss and should be replaced as part of the rehabilitation works. Some staining of concrete was observed in inaccessible areas and may be delaminated from underlying rebar degradation. The cause of the staining should be confirmed.

Component	Condition	Notes
Structural Concrete	Fair	Limited access. Considerable staining observed at lower elevations.
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Poor	The safety cage has significant rust and section loss in lower section. Ladders are rusty with some scaling and section loss in lower sections.
Air Vent	Poor	Air vent is cracked at the base and the anchor to chamber wall is broken.
Existing SRS	Unknown	SRS not accessible.

6.2.6 Pumps and Electrical

The COW has stated that a permanent pump is not required for this site. Pump sizing is given below in accordance with the RFP however the installation of a permanent pump is thus not recommended.

The Donald Street gate chamber currently does not have a permanent chamber pump installed. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine pump requirement and sizing, an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 5,000 m^3 (1,320,860 US gallons). A dewatering period of

24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is practicable and results in a required pumping capacity of approximately 0.06 m^3/s (900 to 950 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, and screening may be required. This will result in a probable pump discharge connection size of 150 mm (6-in) or 100 mm (4-in) dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites which will result in slightly a larger pump size than indicated.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost of remote monitoring of the panel-trouble or alarm conditions, common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

There is no existing electrical service for this site and requires a 600v/3-ph service be made available to the site by MB Hydro.

Component	Condition	Notes
Submersible Pump	N/A	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1200GPM at design head conditions. Remove existing pump and controls.
Discharge Piping and Valve	N/A	Provide new pump discharge piping, rails, appurtenances, and downstream flapper gate. Provide valve operator extensions.
Electrical and Controls	N/A	Provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Manitoba Hydro to provide 600V/3Ø/4W service for the new control panel.

6.3 Proposed Upgrades

The parts of the chamber that were visible and accessible were in overall fair condition. Several areas of concrete that were inaccessible but visible exhibited stains which suggests the reinforcing steel is corroding. The concrete should be sounded when it is accessible and any delamination repaired appropriately. Steel ladders should be replaced and safety cages should be removed (and optionally also replaced). The gate lift appears to have leaked a large amount of grease. It should be checked to ensure it is in proper working order and lubricated. The condition below the waterline at the time of inspection is unknown and it is possible that there may be maintenance repairs required.

As part of the RFP the feasibility of installing a flap gate was assessed. It is preferred to minimize the impact on the surrounding area. MMM proposes to annex a new chamber cell to house a flap gate on the upstream side of the existing chamber. A second separate cell for pump-out is proposed to be placed upstream of the flap-gate. New permanent pumps were sized as part of the requirements of the RFP however based on discussions with the COW new pumps are not proposed to be installed. Some landscaping and a minor re-alignment of the existing access road would be required.

Due to the age of the existing steel positive gate it is recommended to replace the gate, frame, stem and other appurtenances. A new surface-mounted gate operator would be installed.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $1,052,000. A breakdown of the cost is included in Section 6.5 below.

6.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The existing chamber is functional, although there is visible corrosion to several gate components and it is likely that minor concrete repairs will be required. Steel ladders and safety cages are exhibiting considerable rust and should be replaced during rehabilitation works. A flap-gate chamber and pump-out chamber without pumps could be installed immediately upstream of the existing chamber. It is recommended to replace the existing sluice gate and appurtenances at the time of these upgrades.

6.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	475	$285,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	100	$250,000.00
1-3	Supply and Install Flap Gate	LS	$145,800.00	1	$145,800.00
1-4	Supply and Install Sluice Gate	LS	$145,300.00	1	$145,300.00
2	Surface Restoration and Landscaping	LS	$50,000.00	1	$50,000.00
	Total Construction				**$876,100.00**
	Engineering Fees (10%)				**$88,000.00**
	City Fees (10%)				**$88,000.00**
			Total		**$1,052,100.00**
			Rounded =		$1,052,000.00

Additonal Price Options

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
3	Credit for Not Replacing Existing Sluice				
3-1	Less Supply and Install Sluice Gate	LS	-$145,300.00	1	-$145,300.00
	Total Credit No Sluice Replacement				**-$145,300.00**
	Total Credit incl 10% Eng + 10% City Fees				**-$174,400.00**
			Total with No Sluice Replacement (Rounded)		**$878,000.00**

6.6 Photographs

Photograph No. 1

Existing chamber looking southwest

Photograph No. 2

Overall site looking south (towards outfall)

Photograph No. 3

Damage to air vent and anchor

Photograph No. 4

Corrosion and section loss to ladder safety cage

Photograph No. 5

Rust stains in concrete in upstream chamber

Photograph No. 6

Loss of galvanizing and corrosion on ladder

Photograph No. 7

Grease staining on floor and wall around gate lift

Photograph No. 8

Gate lift

Photograph No. 9

Positive sluice gate

7.0 RIVIERA

7.1 Gate Chamber Information

Gate Chamber Name:	Riviera
Year of Construction:	1988 (Approximately)
Location of Station:	Intersection of Riviera Avenue and Riviera Crescent
Sewer Type:	1830 mm Diameter Land Drainage Sewer (1830 LDS)
Sluice Gate:	Square 1830 x 1830 mm
Rim Elevation to Downstream Invert:	8.370 m
Chamber Construction:	Cast-in-Place Concrete
Date of Inspection:	December 1, 2014
Inspected By:	Edmund Ho, P.Eng. and Bob Bowles, EIT
Inspecting Firm:	MMM Group Limited (MMM)
Client:	City of Winnipeg – Water and Waste Department

7.2 Observations

7.2.1 General

The Riviera gate chamber is a one-cell gate chamber with a positive sluice gate. The chamber is constructed of cast-in-place concrete with galvanized steel hatch covers and frames. The sluice gate is operated by a gate lift located on the surface of the chamber. Precast manhole risers upstream of the chamber connect to a hole in the roof of the LDS to provide access for pumps for dewatering. At the time of inspection the depth of water was less than 50 mm in the LDS.

7.2.2 Site Safety

The inspection was carried out by Bob Bowles, EIT, and Edmund Ho, P.Eng., on December 1, 2014 with assistance from the COW collections crew. MMM's inspectors have been trained in confined space entry, fall protection, first aid and were fitted and trained in the use of respirators. All work was carried out in accordance with the Safe Work Plan submitted under separate cover. No incidents, near misses or hazard IDs were recorded at the site.

7.2.3 Site Conditions

The site is located on the river-side of the intersection of Riviera Avenue and Riviera Crescent. The existing chamber is in the gore between two residential driveways. It is assumed that the driveway access and existing landscaping will be disrupted during construction. The close proximity to existing homes will affect the available working hours and construction schedule.

7.2.4 Gate Condition

The chamber contains a 1830 mm wide x 1830 mm high steel gate with a round seating supported by a wall thimble and gate guides. The gate stem feeds through a stem guide and through a sleeve in the chamber roof to a gate lift located above the chamber. The functionality of the gate was not checked during inspection however the City stated the gate is still operating properly.

Component	Condition	Notes
Gate	Fair	Rusted with scaling and some section loss.
Thimble	Good	Surface rust, steel is good in seating area.
Gate Guides	Good	
Gate Stem	Good	
Stem Guide	Fair	Two Stem guides, surface rust with some section loss.
Gate Lift	Good	Visual inspection only.

7.2.5 Chamber Condition

The chamber is cast-in-place concrete with galvanized steel appurtenances. The overall condition of the chamber and appurtenances was good. The concrete at the invert of the outlet of the chamber has eroded away and should be repaired to prevent further damage.

Component	Condition	Notes
Structural Concrete	Good	
Galvanized Steel Hatches and Frames	Good	
Galvanized Steel Ladders and Safety Cages	Good	There is no safety cage.
Air Vent		There is no air vent present on this chamber.
Existing LDS	Fair	Bottom of LDS at outlet is eroded away.

7.2.6 Pumps and Electrical

The COW has stated that a permanent pump is not required for this site. Pump sizing is given below in accordance with the RFP however the installation of a permanent pump is not recommended.

The Riviera gate chamber currently does not have a permanent chamber pump installed. Recorded data for COW storm flow rates on this gate chamber were not able to be obtained. To determine pump requirement and sizing, an estimated volume of water in the upstream piping while the James Avenue gauge reads 3.35 m (11-ft) was calculated. Volume at this location was approximated at 5,000 m^3 (1,320,860 US gallons). A dewatering period of 24 hour and 48 hour were prescribed by the COW. For this site a 24 hour period is practicable and results in a required pumping capacity of approximately 0.06 m^3/s (900 to 950 USgpm). The pump during operation may be required to pass solids and it is recommended that a solids handling pump be selected, screening may be required. This will result in a probable pump discharge connection size of 150 mm (6-in) or 100 mm (4-in) dependent on pump type and manufacture. The final physical characteristics of pump selection during detailed design should be based off probable solids sizes which can enter into the piping system in discussion with COW operations. The new pump for economics and availability should be run from a 600v/3-ph power source. It is recommended that where practicable a common pump type and size be selected for all gate chamber sites which will result in slightly a larger pump size than indicated.

A suitable control system is necessary for the pump; a typical float type system is recommended with an above grade mounted control panel having hand/off/auto feature. The control panel should facilitate automation of the pump and provide minimal monitoring of pump operation, control circuit, and high water level. Due to the very minor incremental cost remote monitoring of the panel trouble or alarm conditions in the form of a common trouble alarm should be provided even if it is not connected at this time. Monitoring and manual operation of the pump from above grade will aid in maintenance and avoid unnecessary entry into the gate chamber to determine operating condition of the pump.

Replacement of the discharge piping and components should also be performed. Valve extensions brought to grade elevation are recommended for any diversion valve. This will allow operation from outside of the chambers avoiding unnecessary entry into the chamber. During the detailed design process this should be reviewed to ensure the feasibility.

Electrical service for the site would have to be determined if pumps were to be installed at a future date.

Component	Condition	Notes
Submersible Pump	Existing - Unknown	Provide new simplex submersible pump c/w control panel, floats, and guide rail assembly. Pump to provide 1200GPM at design head conditions.
Discharge Piping and Valve	N/A	Provide new pump discharge piping, rails, appurtenances, and downstream flapper gate. Provide valve operator extensions.
Electrical and Controls	N/A	Provide new weatherproof, vandal-resistant outdoor enclosure c/w service entrance rated breaker, starter, controls and metering. Manitoba Hydro to provide 600V/3Ø/4W service for the new control panel.

7.3 Proposed Upgrades

The chamber was in an overall good condition. The existing concrete LDS exhibits erosion at the downstream invert which should be repaired to prevent further damage. Because the existing gate has minimal corrosion MMM proposes not to replace the entire gate.

As part of the RFP the feasibility of installing a flap gate was assessed. A new chamber cell would be annexed upstream of the existing chamber and would encroach slightly under the driveway of 1006 Riviera Crescent. The portion of the chamber outside of the hatch opening could be recessed and paved over in order to limit any realignment of the driveway. A second new cell would also be constructed upstream to replace the existing pump-out. New permanent pumps were sized as part of the requirements of the RFP however based on discussions with the COW new pumps are not proposed to be installed.

The sluice gate at this site is relatively new and does not require replacement. It should be checked for leaks at the time of the upgrades and may require adjustments.

A site plan and conceptual drawing is included in Appendix B of this report.

The total estimated cost of these works including expected engineering fees and taxes is: $572,000. A breakdown of the cost is included in Section 7.5 below.

7.4 Conclusions and Recommendations

MMM, through this inspection, does not warrant that the design complies with current codes or standards.

The functionality of the existing sluice gate should be confirmed in the preliminary design stage. A new chamber cell to house a flap gate and a second cell for pump-out should be constructed without any permanent pumps. The chambers may have to be at least partially recessed and paved in order to accommodate adjacent driveways.

7.5 Class-3 Cost Estimate

Item	Description	Unit	Unit Price	Add Two Cells to Existing Chamber	
				Quantity	Price
1	Construction of New Chamber				
1-1	Excavation, Shoring and Backfill	m^3	$600.00	325	$195,000.00
1-2	Cast-In-Place Concrete	m^3	$2,500.00	55	$137,500.00
1-3	Supply and Install Flap Gate	LS	$83,200.00	1	$83,200.00
2	Surface Restoration and Landscaping	LS	$60,000.00	1	$60,000.00
	Total Construction				**$475,700.00**
	Engineering Fees (10%)				**$48,000.00**
	City Fees (10%)				**$48,000.00**
			Total		**$571,700.00**
			Rounded =		$572,000.00

7.6 Photographs

Photograph No. 1

Existing chamber looking southeast

Photograph No. 2

Hatch and gate lift of existing chamber

Photograph No. 3

Existing pump-out

Photograph No. 4

Erosion at invert of LDS outlet

Photograph No. 5

Thimble for 1830 mm diameter sluice gate

Photograph No. 6

Bottom of sluice gate at gate guide

Photograph No. 7

Ladder and intermediate landing

Photograph No. 8

Existing sluice and gate guide

Photograph No. 9

Positive sluice gate

SUMMARY

MMM has completed condition assessments and developed conceptual designs for upgrades at each of the seven sites listed in the RFP. Conditions of some components and areas were not accessible at the time of inspection. Components that were in a poor condition are recommended to be repaired or replaced, and it is assumed that other defects such as localized concrete degradation may be found when chambers are in a dry condition. At each site we have included recommendations to expand the chamber and install a flap gate, as well as install or replace pumps where necessary. New sluice gates are recommended at each site, some in a newly constructed cell and some in place of existing gates.

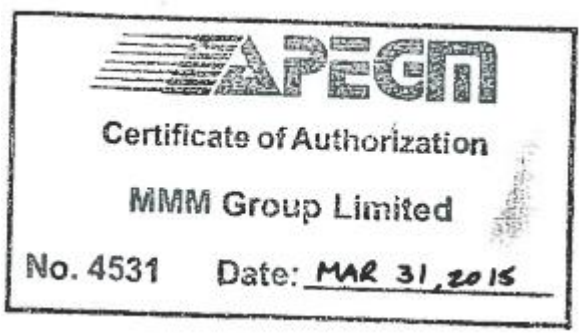
Prepared by:

MMM Group Limited

Bob Bowles, EIT
Inspector
Bridges and Structures

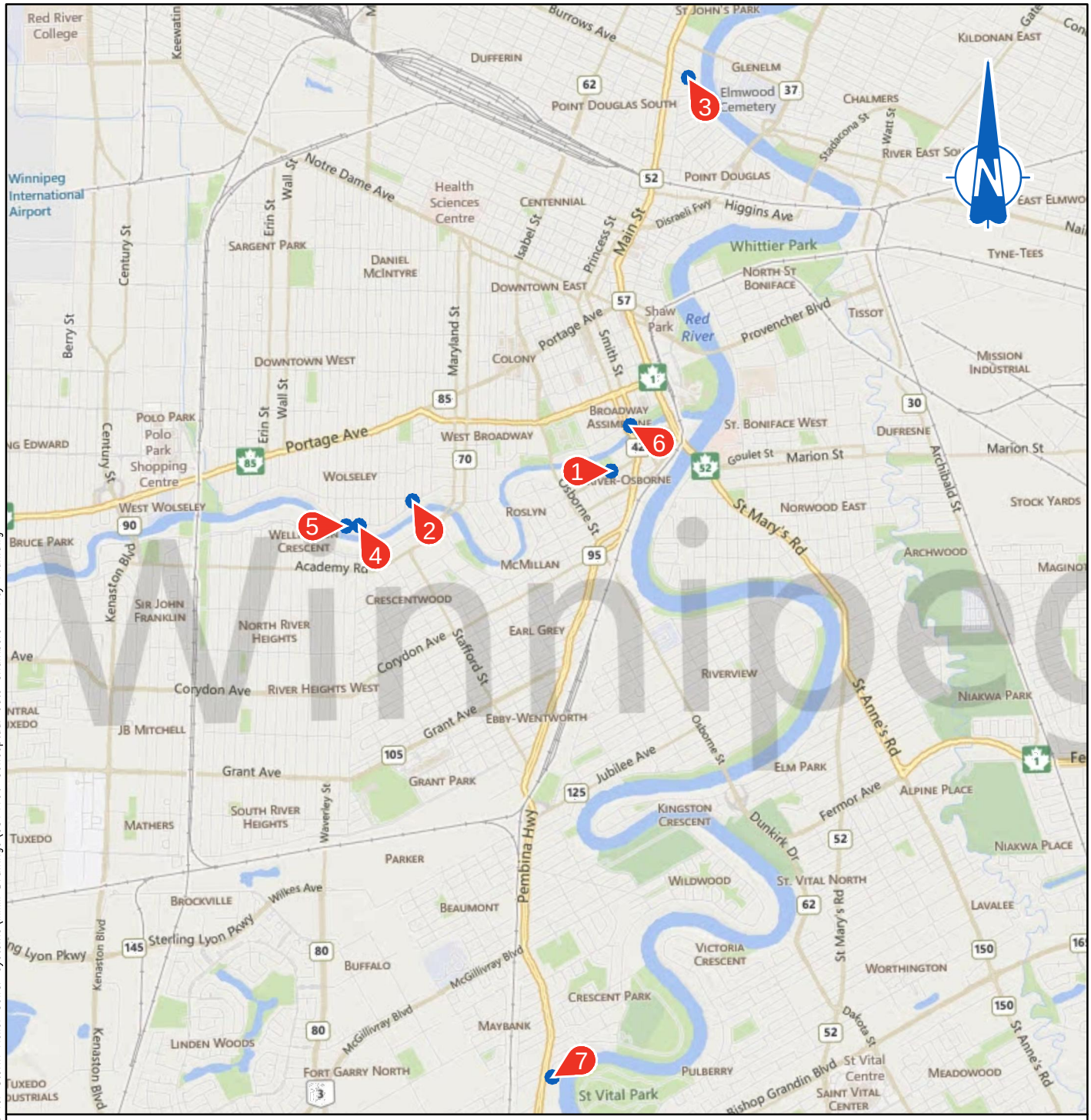
Reviewed by:

MMM Group Limited



Edmund Ho, P.Eng.
Project Manager
Bridges and Structures

APPENDIX A – Key Plan of Chamber Sites



KEY PLAN
NOT TO SCALE

1. FORT ROUGE PARK STORM RELIEF GATE CHAMBER
2. CANORA STREET OUTFALL GATE CHAMBER
3. BURROWS AVENUE STORM RELIEF GATE CHAMBER
4. RUBY STREET STORM RELIEF GATE CHAMBER
5. AUBREY STREET STORM RELIEF GATE CHAMBER
6. DONALD STREET OUTFALL GATE CHAMBER
7. RIVIERA CRESCENT OUTFALL GATE CHAMBER

THE CITY OF WINNIPEG
WASTE AND WATER DEPARTMENT

Winnipeg

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CONCEPTUAL GATE CHAMBER DESIGNS
FOR STORM RELIEF SEWER SYSTEMS

KEY PLAN

AS NOTED	15 03 30	FIGURE 0.01

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P:\5514100-5514199\5514130 - Conceptual Gate Chamber Designs for Storm Relief Sewer Systems\MMM Drawings\5514130 Conceptual Gate Chambers - Key Plan.dwg

APPENDIX B – Site Plans and Concrete Drawings

LOCATION PLAN

1:300

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

THE CITY OF WINNIPEG
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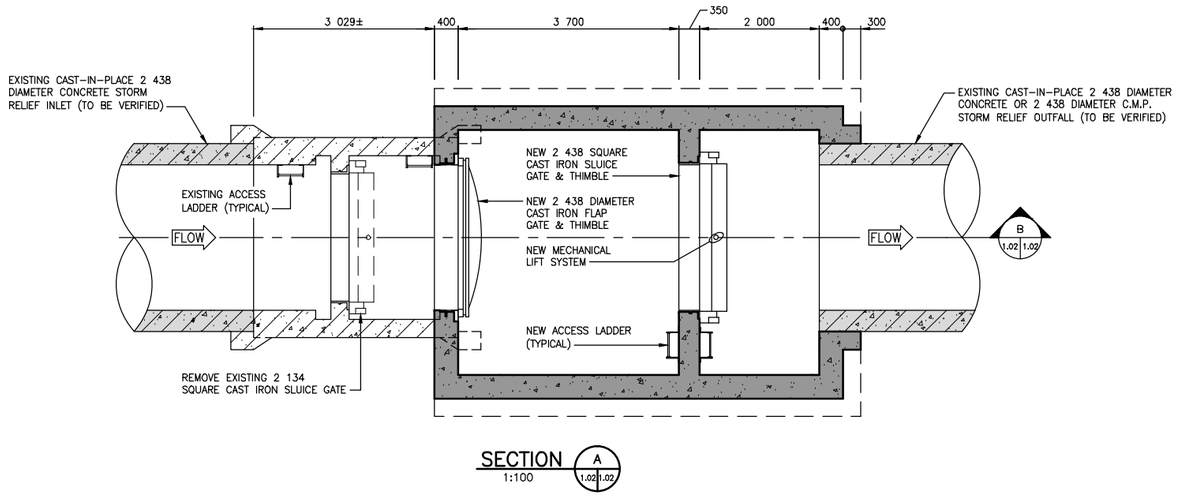
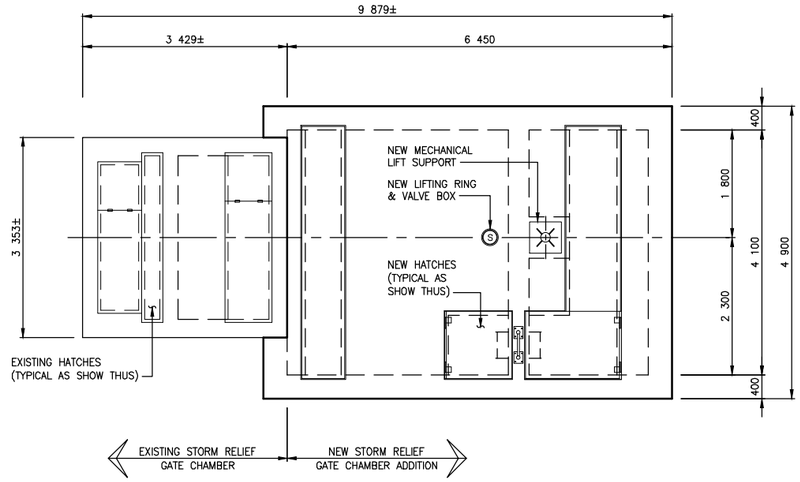
CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

FORT ROUGE PARK STORM RELIEF GATE CHAMBER LOCATION PLAN

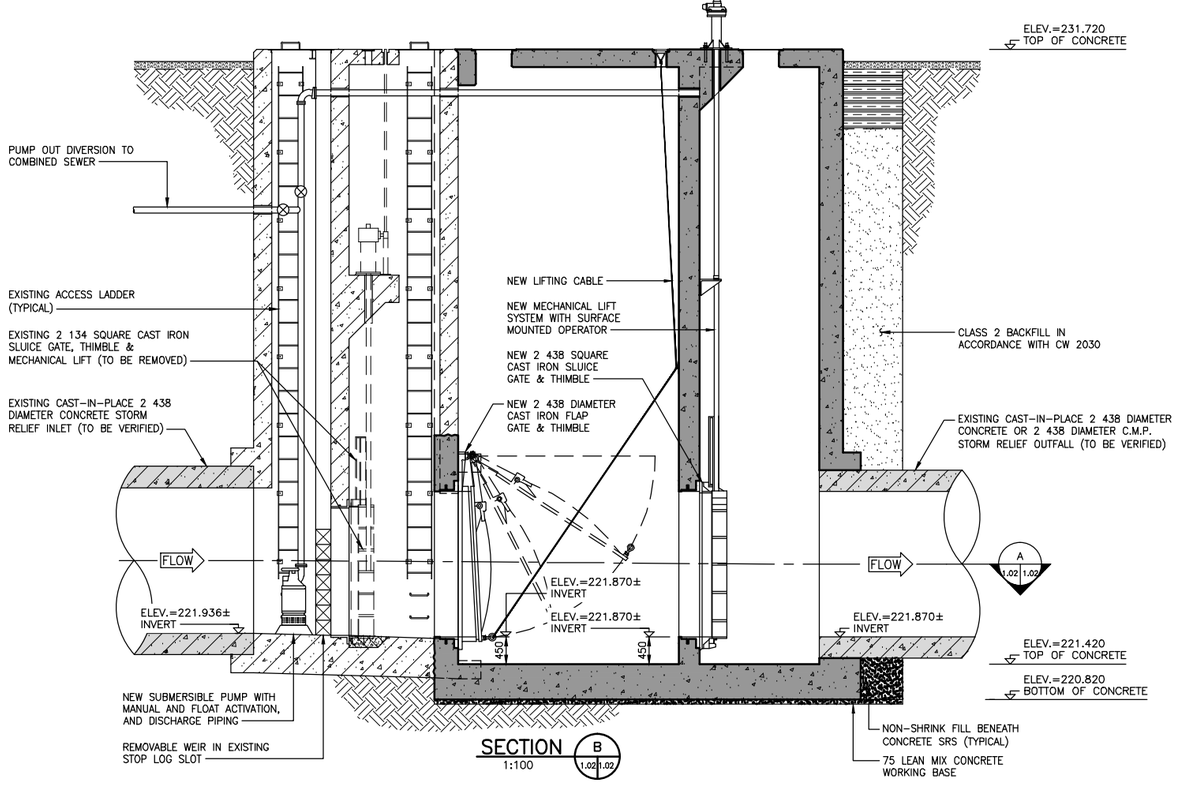
SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 1.01



SECTION A
1:100



PLAN
1:100



SECTION B
1:100

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 1.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING STORM RELIEF GATE CHAMBER WERE DERIVED FROM THE ORIGINAL c.1966 DRAWINGS.
4. ELEVATION DATUM (0.00') ASSUMED TO EQUAL 727.57' A.M.S.L. (JAMES AVE. PUMPING STATION). ALL ELEVATIONS FROM ORIGINAL c.1966 DRAWINGS WERE THEN HARD CONVERTED TO METRES (MULTIPLIED BY 0.3048).
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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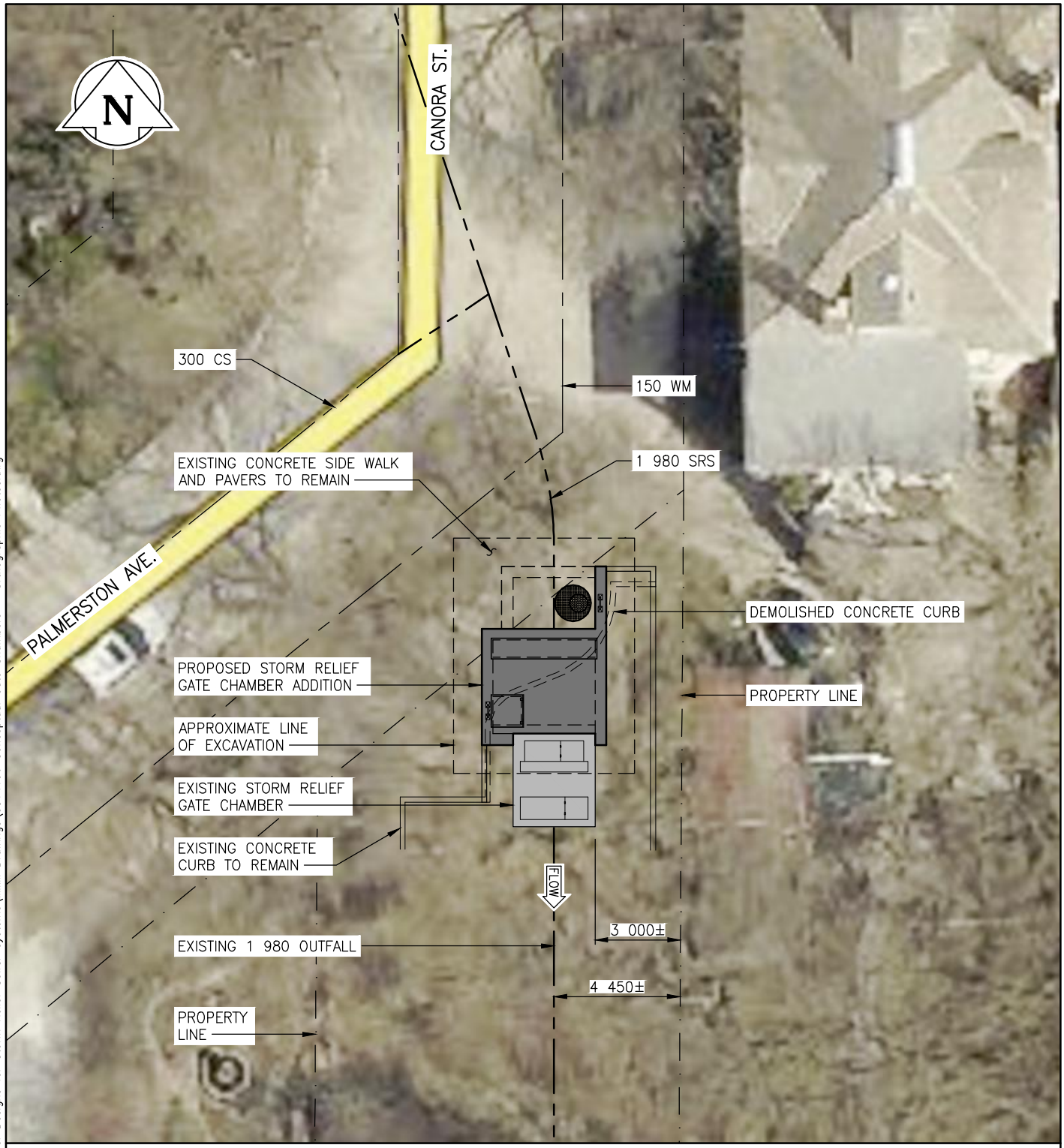
CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

FORT ROUGE PARK STORM RELIEF GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 1.02

Mar. 30, 15 - 3:28:53 PM (last saved by: patersonc)
P:\5514100-5514199\5514130 - Conceptual Gate Chamber Designs for Storm Relief Sewer Systems\MMM Drawings\5514130 Conceptual Gate Chambers - Concrete Details.dwg



LOCATION PLAN
1:200

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

CANORA STREET OUTFALL GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 2.01

Mar. 27, 15 - 4:38:44 PM (last saved by: patersonc)
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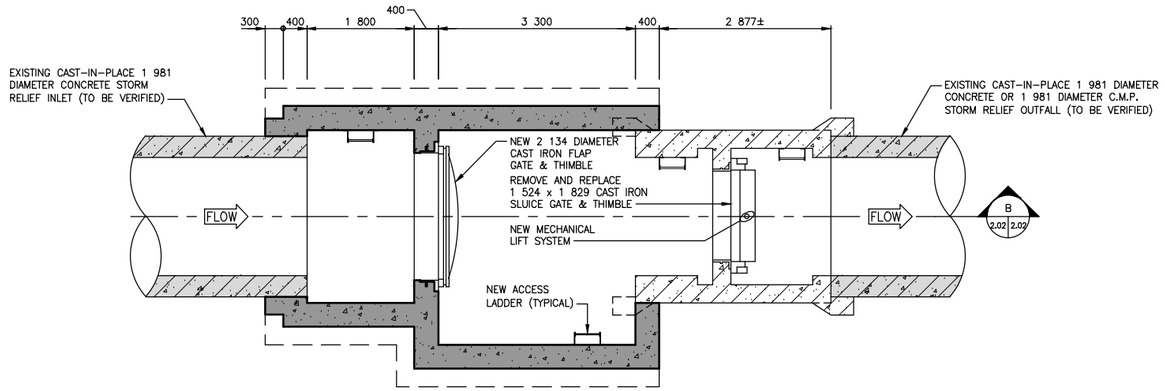
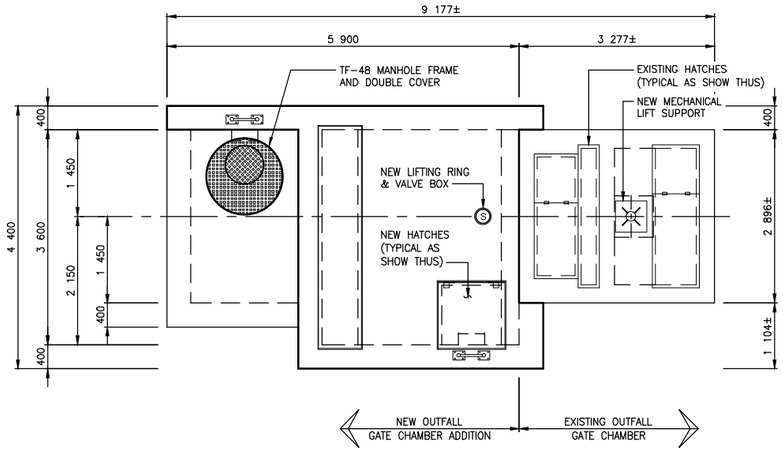
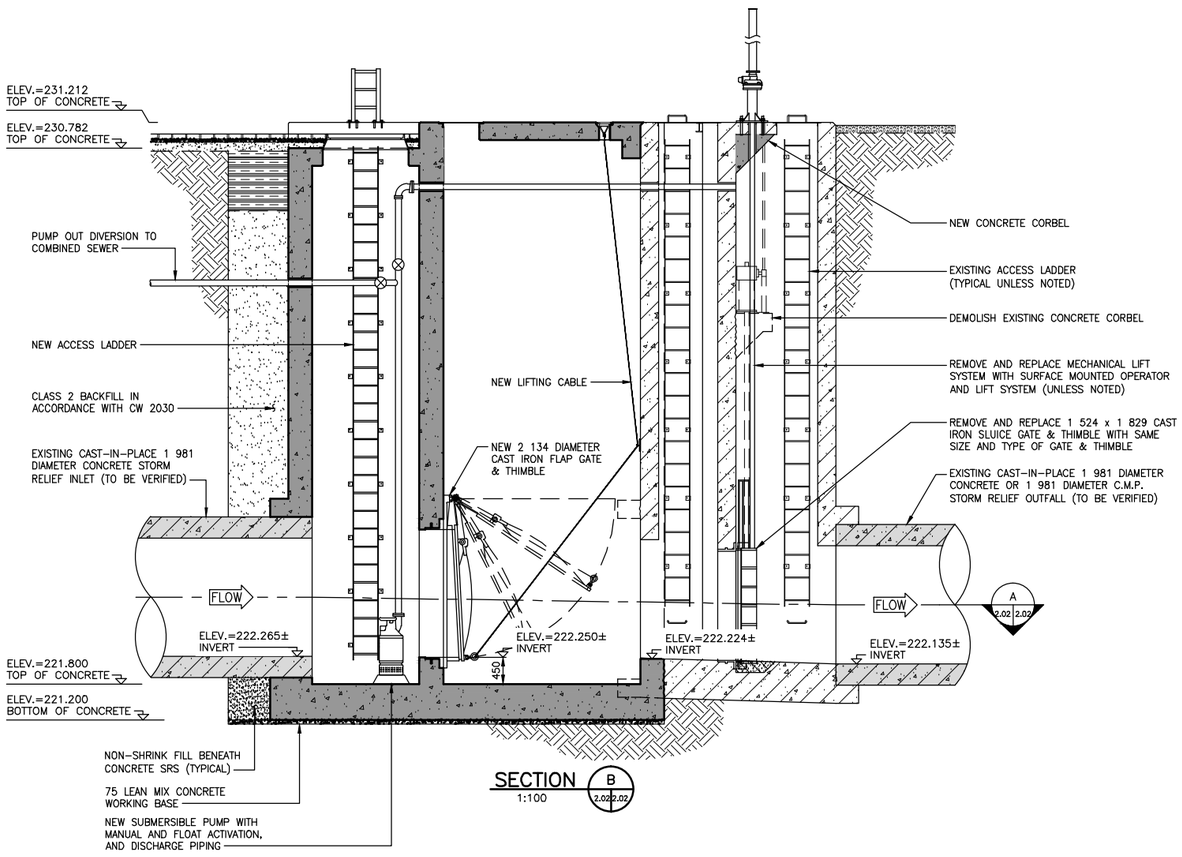


SECTION A
1:100



PLAN
1:100



SECTION B
1:100

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 2.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING STORM RELIEF GATE CHAMBER WERE DERIVED FROM THE ORIGINAL c.1963 DRAWINGS.
4. ELEVATION DATUM (0.00') ASSUMED TO EQUAL 727.57' A.M.S.L. (JAMES AVE. PUMPING STATION). ALL ELEVATIONS FROM ORIGINAL c.1963 DRAWINGS WERE THEN HARD CONVERTED TO METRES (MULTIPLIED BY 0.3048).
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

CANORA STREET OUTFALL GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 2.02

Mar. 30, 15 - 3:28:53 PM (last saved by: patersonc)
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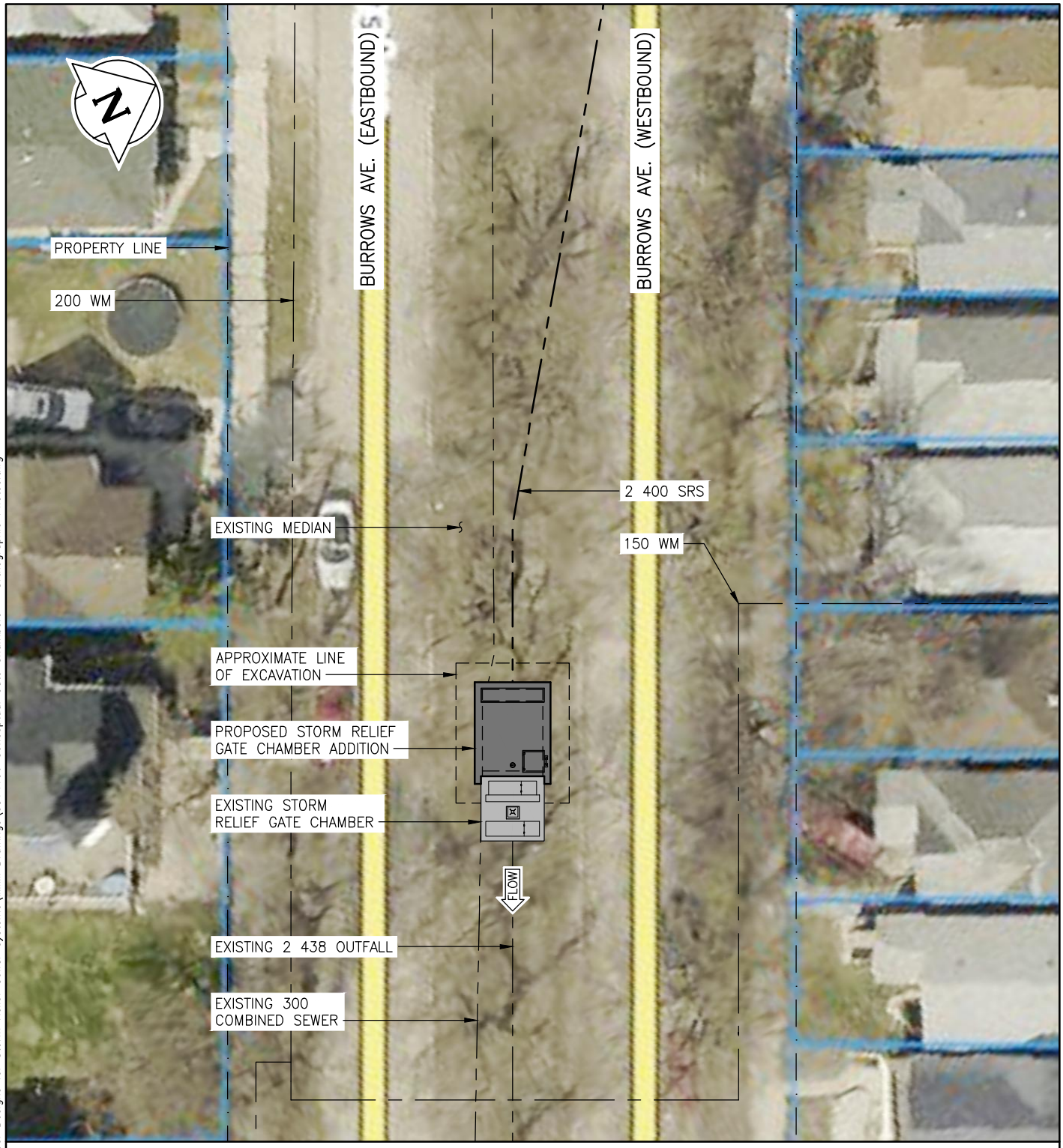

LOCATION PLAN

1:300

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

BURROWS AVENUE STORM RELIEF GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 3.01

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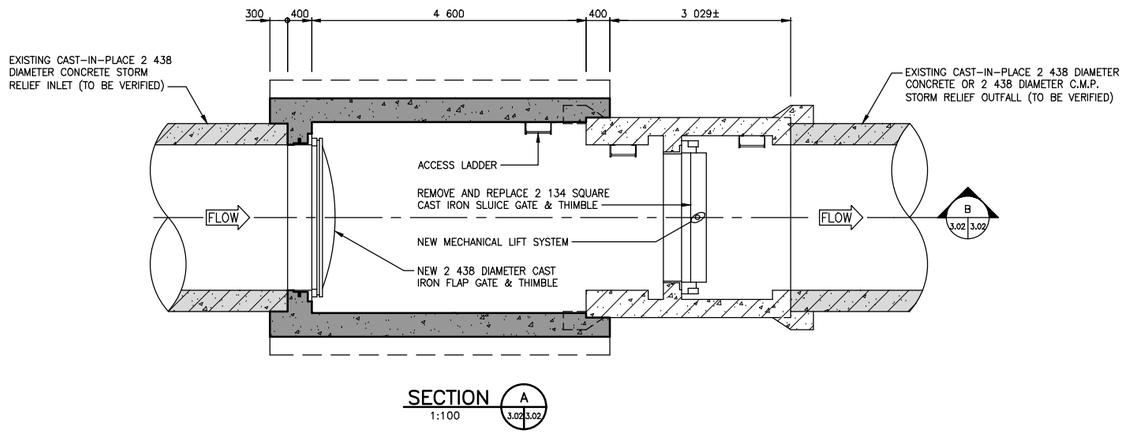
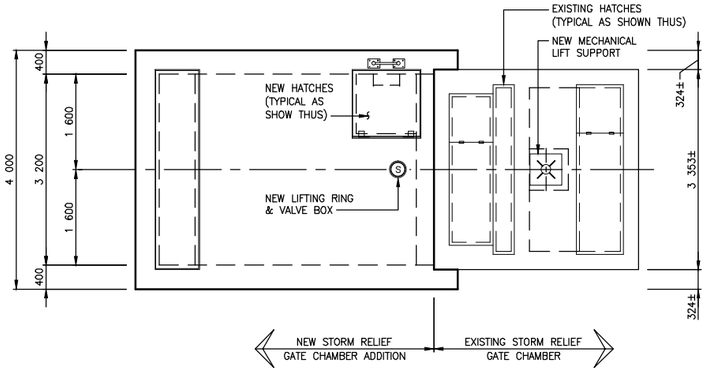
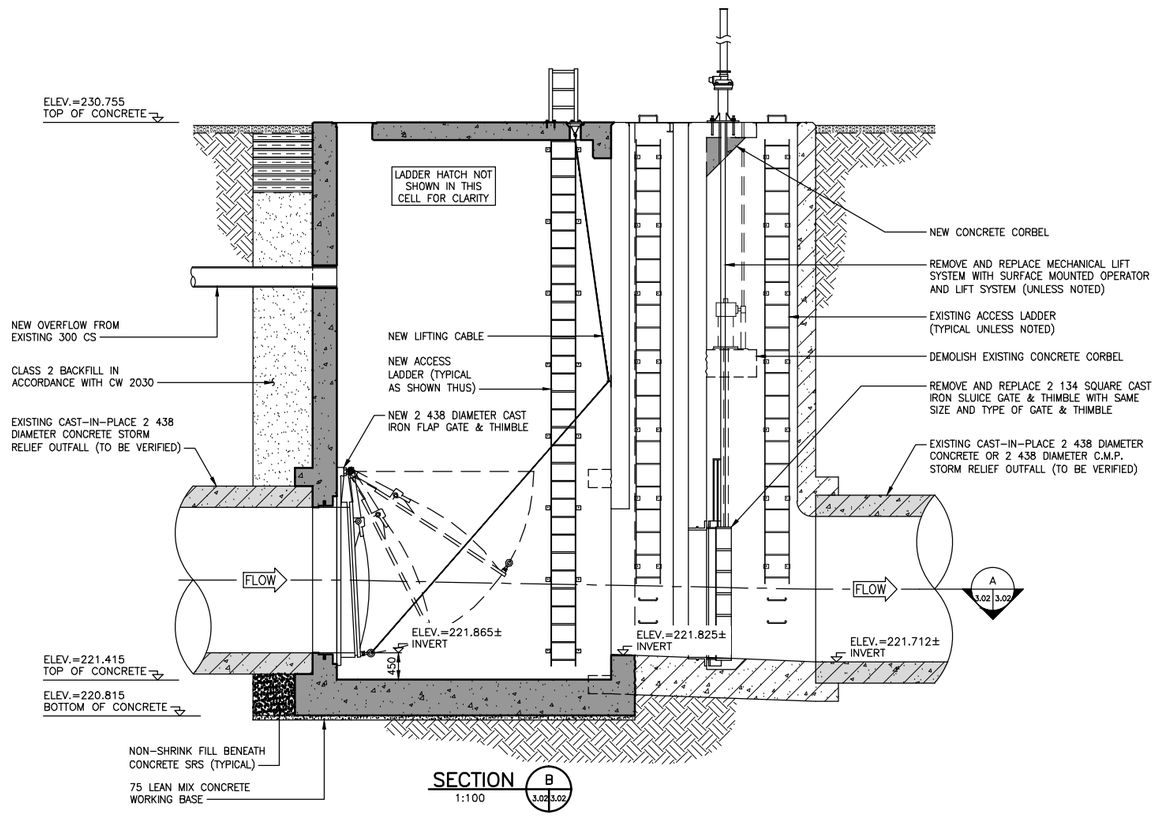


SECTION A
1:100 (3.02 | 3.02)



PLAN
1:100



SECTION B
1:100 (3.02 | 3.02)

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 3.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING STORM RELIEF GATE CHAMBER WERE DERIVED FROM THE ORIGINAL c1971 DRAWINGS.
4. ELEVATION DATUM (0.00') ASSUMED TO EQUAL 727.57' A.M.S.L. (JAMES AVE. PUMPING STATION). ALL ELEVATIONS FROM ORIGINAL c.1971 DRAWINGS WERE THEN HARD CONVERTED TO METRES (MULTIPLIED BY 0.3048).
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

BURROWS AVENUE STORM RELIEF GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 3.02

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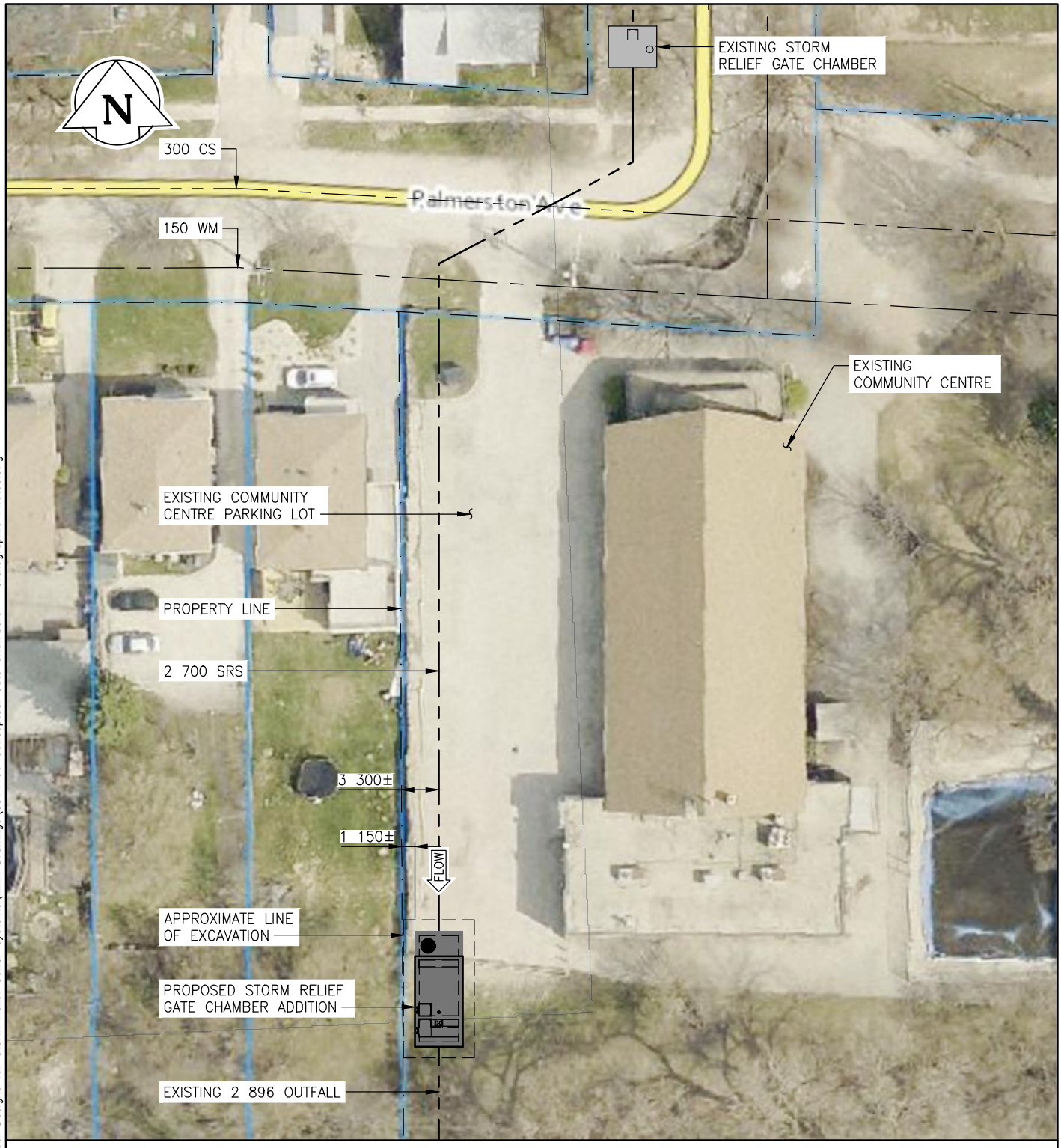

LOCATION PLAN

1:500

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

RUBY STREET STORM RELIEF GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 4.01

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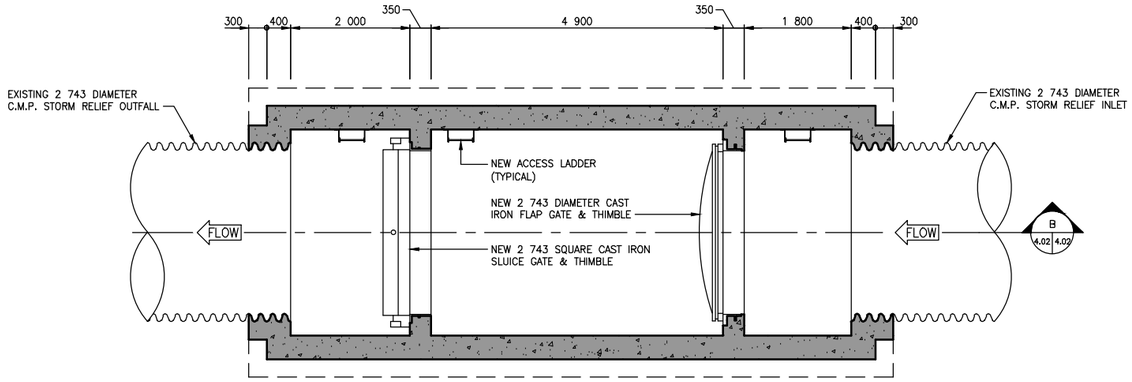
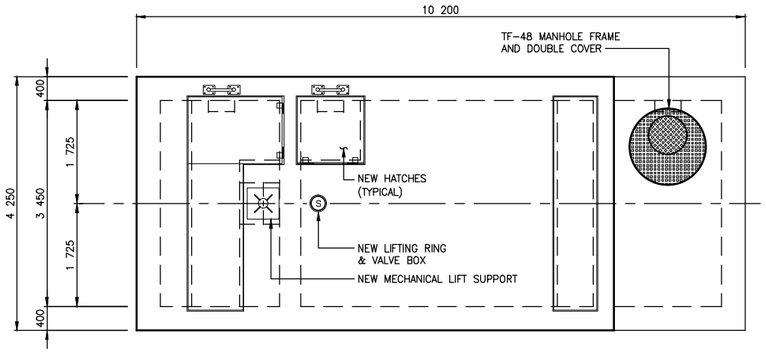
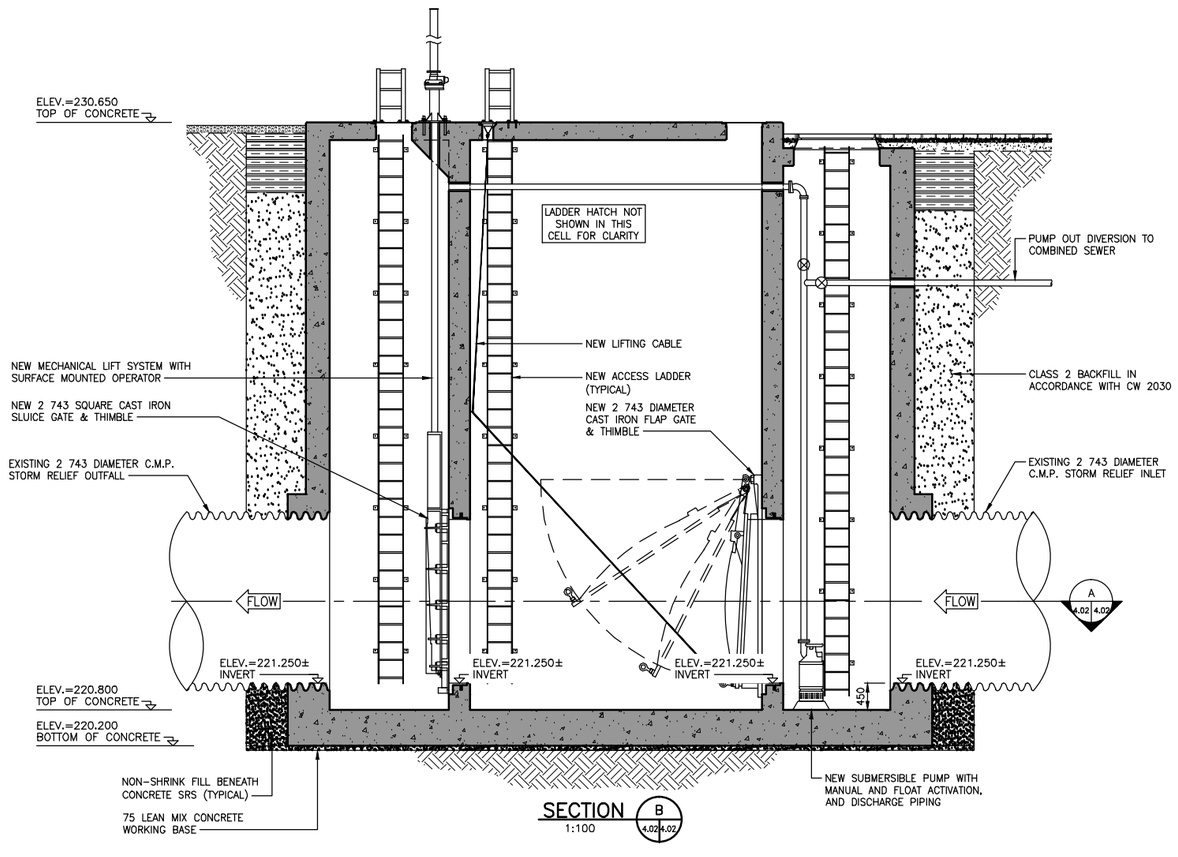


SECTION A
1:100



PLAN
1:100



SECTION B
1:100

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 4.01 FOR LOCATION PLAN.
3. THE TOP OF CONCRETE ELEVATION SHOWN IS BASED ON 1997 FLOOD WATER ELEVATION PLUS 1.22 METRES. THE TOP OF CONCRETE ELEVATION SHALL BE THE GREATER OF 1997 FLOOD WATER ELEVATION PLUS 1.22 METRES OR THE EXISTING GROUND ELEVATION. A TOPOGRAPHIC SURVEY IS REQUIRED TO VERIFY THE EXISTING GROUND ELEVATION.
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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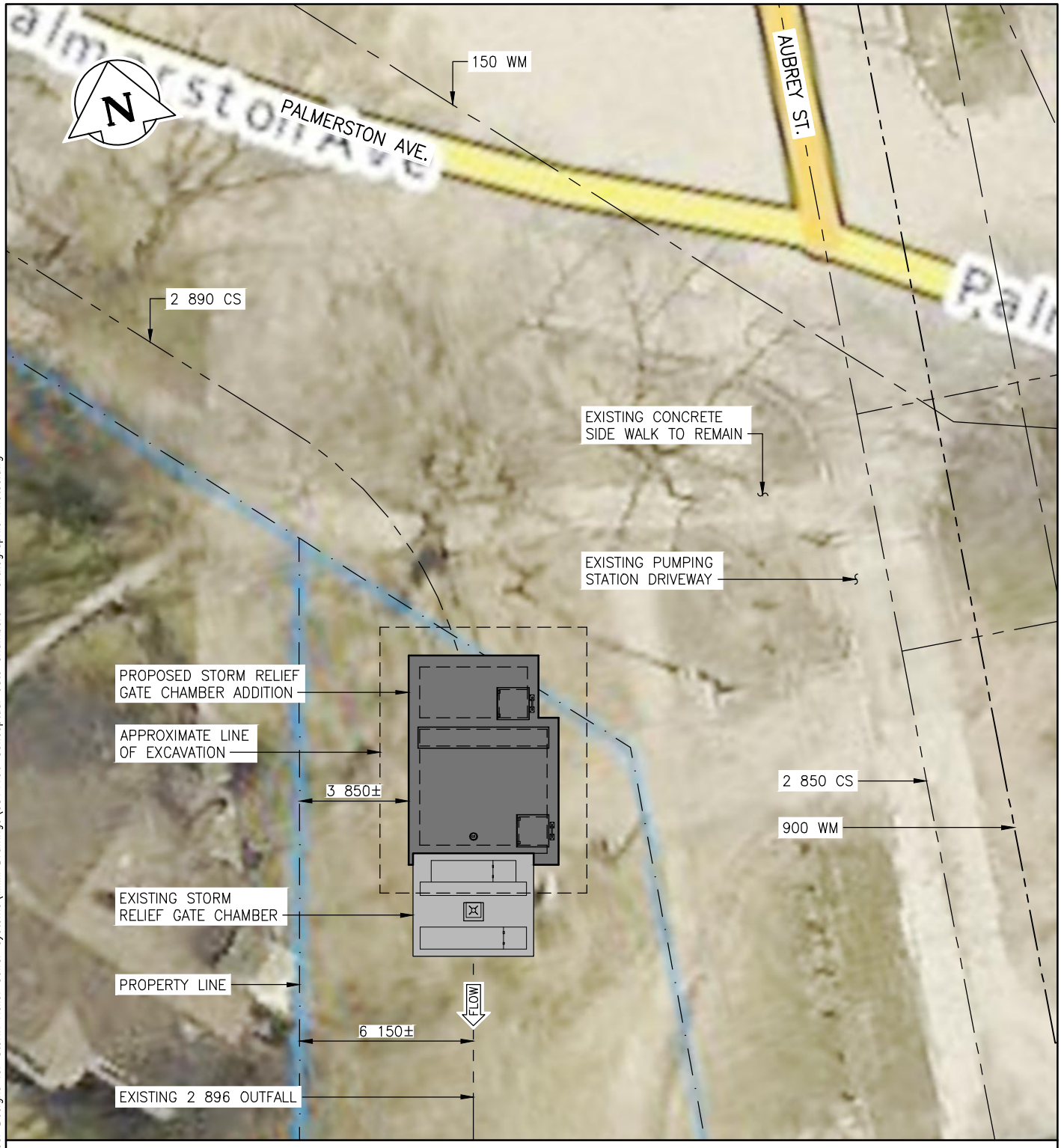
CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

RUBY STREET STORM RELIEF GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 4.02



LOCATION PLAN

1:200

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

AUBREY STREET STORM RELIEF GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 5.01

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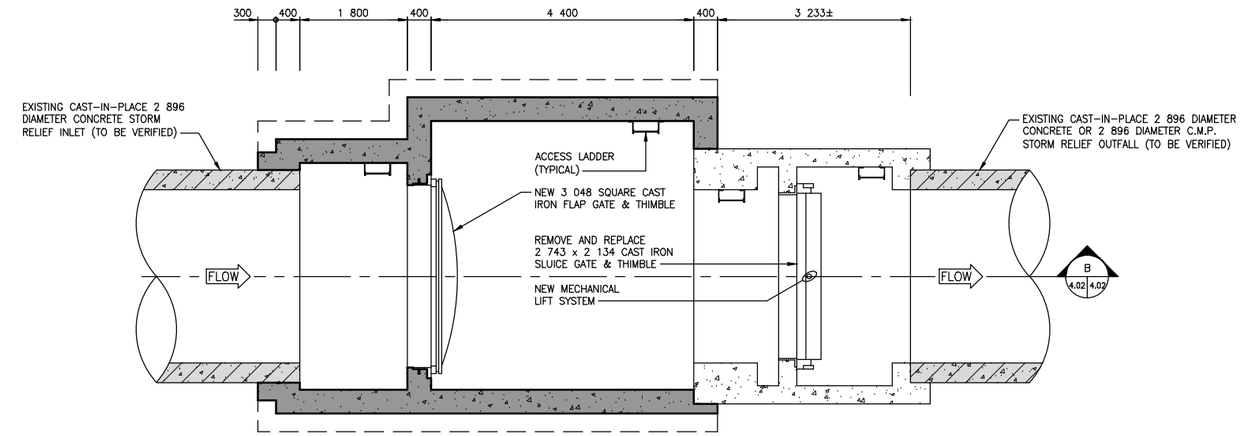
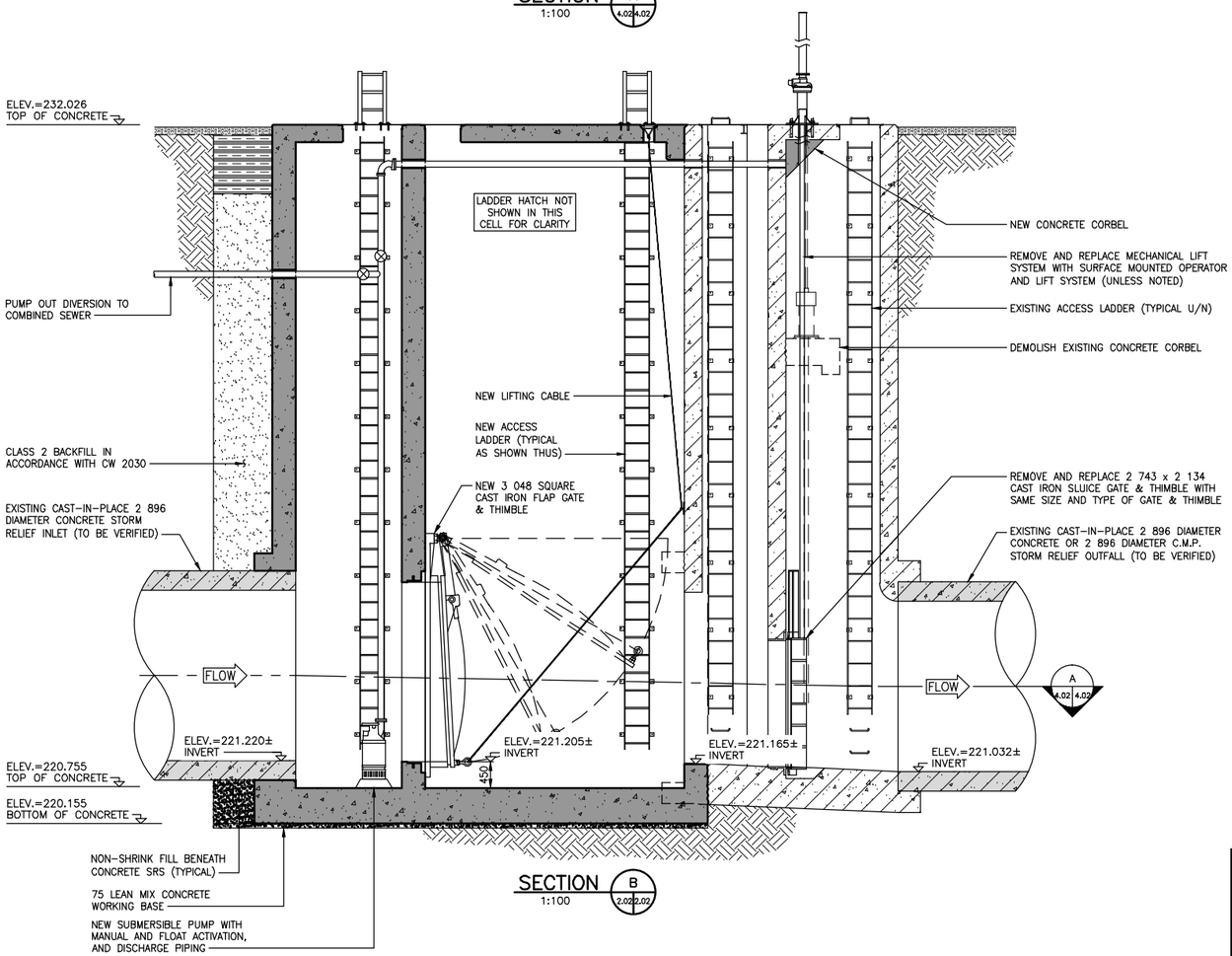
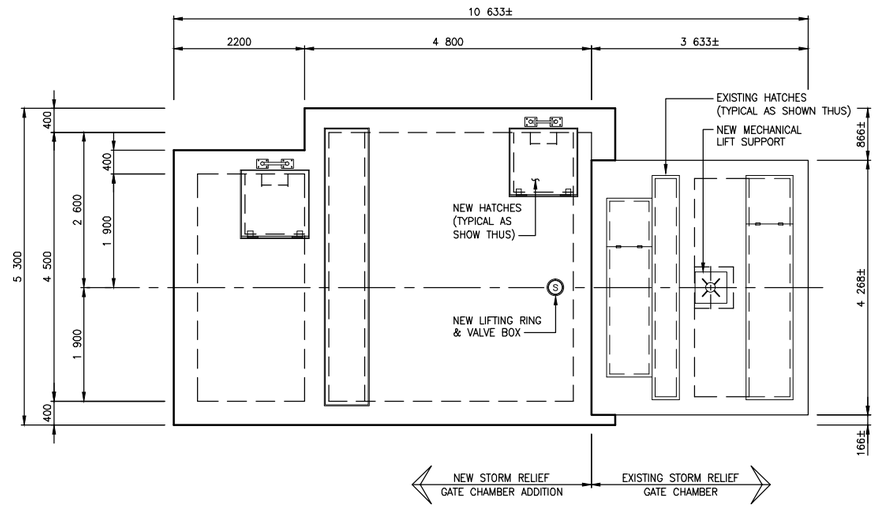


SECTION A
1:100



SECTION B
1:100



PLAN
1:100

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 5.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING STORM RELIEF GATE CHAMBER WERE DERIVED FROM THE ORIGINAL c1969 DRAWINGS.
4. ELEVATION DATUM (0.00') ASSUMED TO EQUAL 727.57' A.M.S.L. (JAMES AVE. PUMPING STATION). ALL ELEVATIONS FROM ORIGINAL c.1969 DRAWINGS WERE THEN HARD CONVERTED TO METRES (MULTIPLIED BY 0.3048).
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

AUBREY STREET STORM RELIEF GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 5.02

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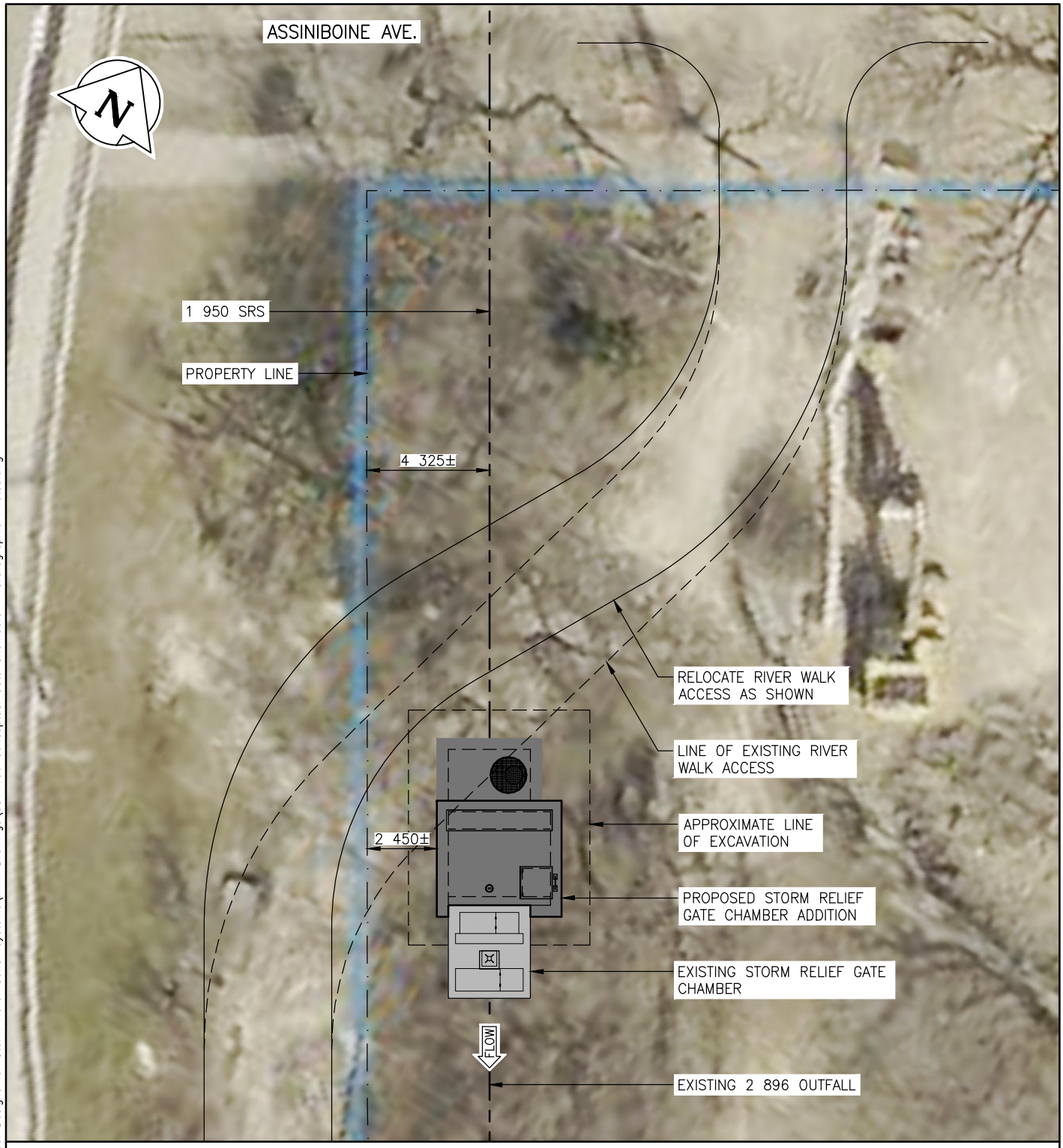

LOCATION PLAN
1:200

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

DONALD STREET OUTFALL GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 6.01

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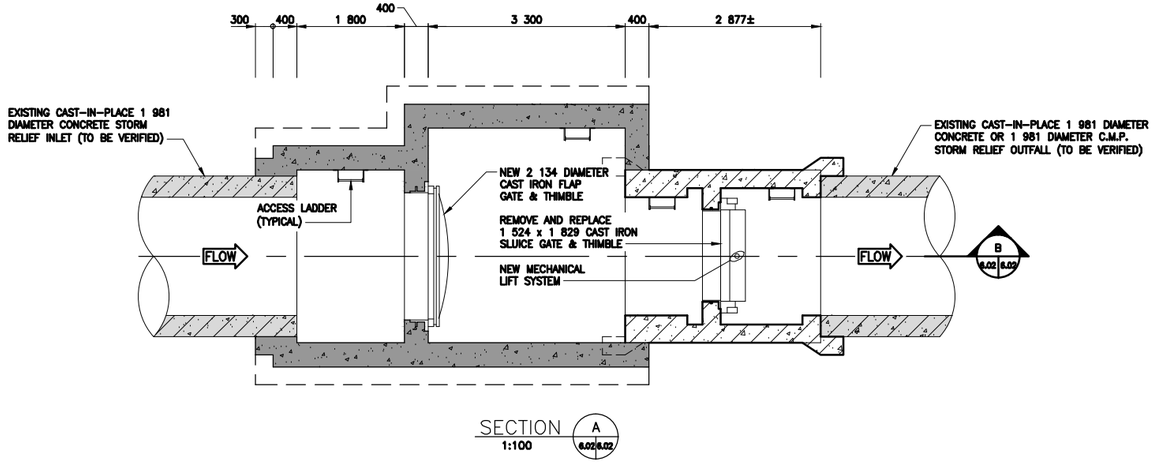
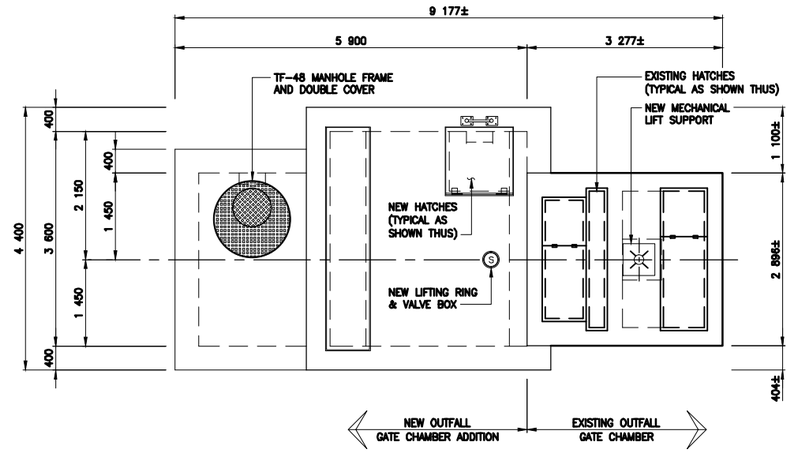
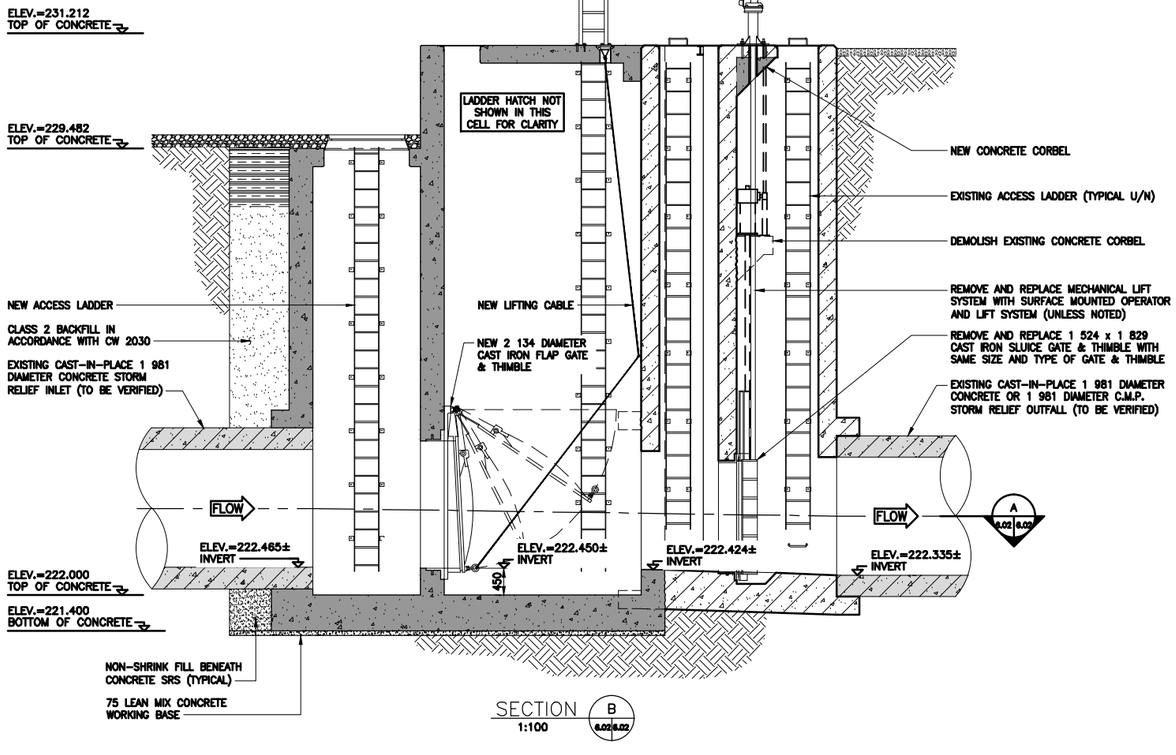


SECTION A
1:100



PLAN
1:100



SECTION B
1:100

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 6.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING STORM RELIEF GATE CHAMBER WERE DERIVED FROM THE ORIGINAL c.1964 DRAWINGS.
4. ELEVATION DATUM (0.00') ASSUMED TO EQUAL 727.57' A.M.S.L. (JAMES AVE. PUMPING STATION). ALL ELEVATIONS FROM ORIGINAL c.1964 DRAWINGS WERE THEN HARD CONVERTED TO METRES (MULTIPLIED BY 0.3048).
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

DONALD STREET OUTFALL GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 6.02

Mar. 30, 15 - 3:28:53 PM (last saved by: patersonc)
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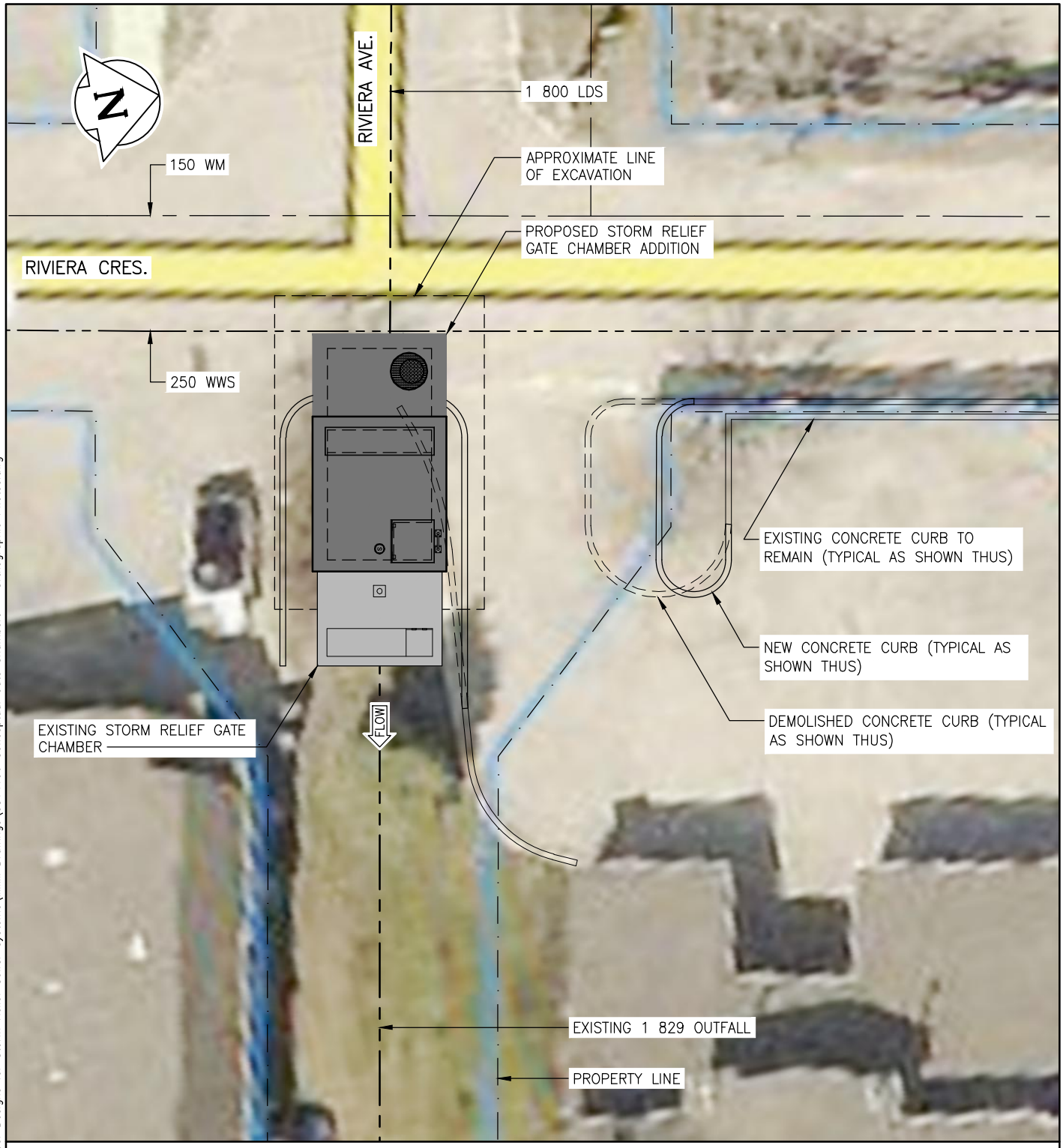

LOCATION PLAN
1:150

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. DIMENSIONS TO EXISTING UTILITIES, SERVICES AND PROPERTY LINES ARE ASSUMED AND MUST BE VERIFIED.
3. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

RIVIERA CRESCENT OUTFALL GATE CHAMBER LOCATION PLAN

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 7.01

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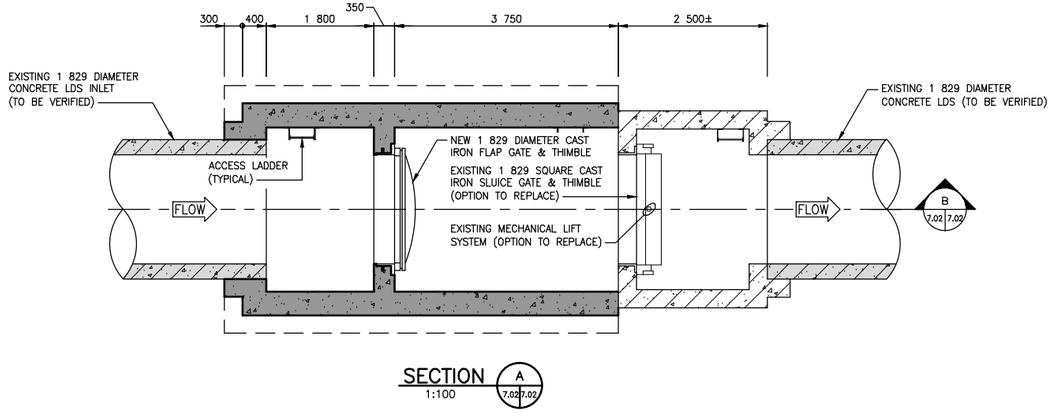
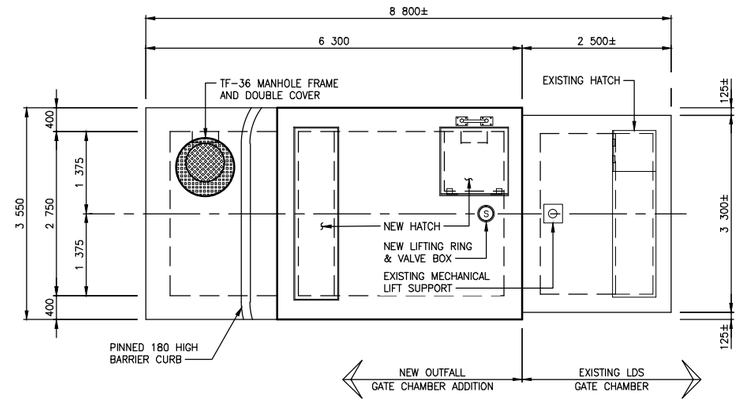
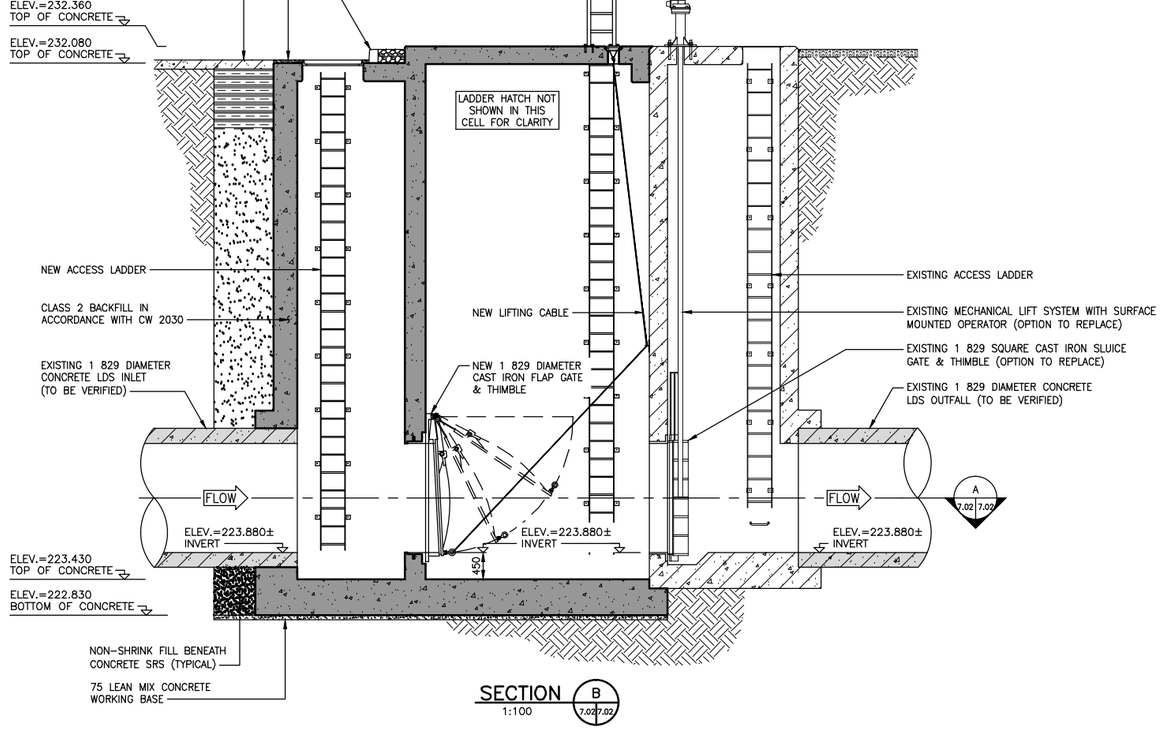


SECTION A
1:100 (7.02/7.02)



PLAN
1:100



SECTION B
1:100 (7.02/7.02)

NOTES

1. METRIC DRAWING. WHOLE NUMBERS INDICATE MILLIMETRES. DECIMALIZED NUMBERS INDICATE METRES. DO NOT SCALE DRAWING.
2. SEE FIGURE 7.01 FOR LOCATION PLAN.
3. DIMENSIONS AND GEOMETRY OF EXISTING LDS GATE CHAMBER WERE RECORDED DURING MMM GROUP'S DECEMBER 1, 2014 SITE VISIT.
4. TOP OF CONCRETE ELEVATION IS ASSUMED AND MUST BE VERIFIED.
5. CONCRETE BENCHING (NOT SHOWN), MUST BE PROVIDED IN ALL NEW CELLS AFTER INSTALLATION OF NEW GATES.
6. OTHER UTILITIES AND UNDERGROUND STRUCTURES NOT SHOWN.

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WASTE AND WATER DEPARTMENT

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CONCEPTUAL GATE CHAMBER DESIGNS FOR STORM RELIEF SEWER SYSTEMS

RIVIERA CRESCENT OUTFALL GATE CHAMBER CONCRETE DETAILS

SCALE:	DATE:	DWG. No.
AS NOTED	15 03 30	FIGURE 7.02

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P:\5514100-5514199\5514130 - Conceptual Gate Chamber Designs for Storm Relief Sewer Systems\MMM Drawings\5514130 Conceptual Gate