



Engineering Ltd.

Report for:

CITY OF WINNIPEG

-WATER AND WASTE DEPARTMENT-

Final Report

WASTEWATER LIFT STATION CONDITION ASSESSMENT PHASE II

Document VIII: Riverbend Lift Station Assessment



Date: March 16, 2020

City File No.: S-1095

MPE Project No.: 8400-001-00

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Corporate Authorization

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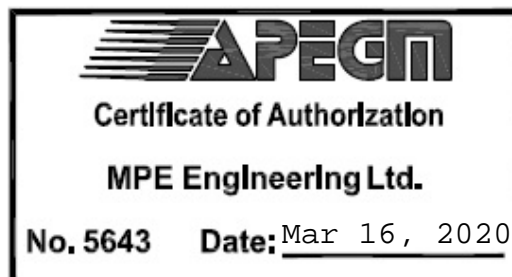


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1.0 Introduction

1.1 Background

MPE Engineering Ltd. (MPE) conducted a visual inspection of the Riverbend Lift Station on July 10, 2019. City of Winnipeg (the City) staff accompanied MPE for the duration of the inspection. The purpose of the site inspection was to assess the current condition of the facility and identify components that will require replacement or maintenance. The condition assessment will assist the City in making informed decisions on short and long-term maintenance requirements of the facilities. The scope of the condition assessment includes the following:

- Detailed assessment of the following **Asset Categories**:
 - Facility (including site, structural, and HVAC systems),
 - Pumps and motors,
 - Electrical and communications,
 - Pipe work and valves,
 - Power, and
 - Force mains.
- Review of code compliance, occupant safety, and accessibility.
- Recommendations and cost estimates for rehabilitation projects.
- Recommendations on any follow up re-inspection work.

This document provides an assessment of the current infrastructure in terms of the performance and condition of individual lift station components, review of lift station components with respect to the latest codes and standards, as well as a hydraulic and capacity review. The assessment identifies components that require replacement or maintenance along with associated estimation of cost.

The assessments were based on **Condition Assessment Forms** that were developed from our site investigations, discussions with Operation Staff, and review of available documents. These forms were used to assign ratings to each component of the lift station in order to develop the cost estimates and recommendations.

1.2 Limitations

Inspections were limited to cursory visual review of lift station components. Analysis of below grade infrastructure that was not accessible has not been included. Buried pipelines were not exposed or reviewed. Assessment of below grade infrastructure has been based on operational comments from City staff and life cycle estimations. Destructive testing methods were not conducted.

1.3 Design Standards & Guidelines

MPE prepared this assessment in accordance to the standards and guidelines listed in **Appendix G**.

1.4 Methodology

The condition assessment consisted of the following:

- Review of available documents and drawings. Documents were reviewed to determine if any previously identified issues were unresolved or remain unaddressed. Drawings were examined in order to understand intent of design, design capacity, and to review component compliance with applicable codes.
- Site inspections of each facility. Inspections were conducted by qualified personnel. Photographs of each site were taken and field assessment forms were completed. City of Winnipeg staff accompanied MPE

personnel and provided operational information, background, and the history of each facility. Additionally, City staff identified the areas of operation and maintenance concern.

- Informal interviews with Operations Staff. Interviews were conducted to collect further information about each site and to identify issues that are of importance to the maintenance staff. Staff members were also able to provide valuable historical information about deficiencies identified at each site.
- Completion of Condition Assessment Forms. The collected information was compiled and reviewed to identify deficient items. A system of rating the condition of each component was developed. Estimated costs for correcting the deficiencies were assigned to each deficiency. Recommendations were developed based on the condition of the component, importance of the component, as well as safety and code compliance. Results were compiled into the Condition Assessment Forms.

1.5 Evaluation Criteria

The Asset Categories identified in Section 1.1 were evaluated based on the following Likelihood Indicators:

- **Current Physical Condition** – Assesses the actual condition of the component.
- **Fitness for Purpose** – Assesses the component’s ability to consistently deliver the design performance required.
- **Maintenance and Operability** – Assesses whether optimal maintenance and operation practices occur.
- **Third Party and Environmental Damage** – Assesses vulnerability to external hazards.

Note: The “Demand Condition” indicator, used in previous assessments conducted by the City, was removed from this assessment and incorporated into Fitness for Purpose. The “Third Party and Environmental Damage” indicator was removed from Facility assessments but remains an indicator for force main assessments.

Table 1.1 provides a general overview of the scoring matrix that was used to assess each component. The scoring criteria was adjusted to suit each asset category, but generally utilized the following format:

Table 1.1 : CONDITION RATING LEGEND		
SCORE	5	Emergency / Critical Component is not functional or is causing an unsafe condition
	4	Poor / Unsatisfactory Component has extensive deficiencies that may affect plant operations. High level of maintenance may be required
	3	Fair Component is able to function for its intended use. Additional maintenance may be required
	2	Good Only minor deficiencies. Routine maintenance should be sufficient for foreseeable future
	1	Excellent Component is in new condition

1.6 Condition Assessment Forms

The Condition Assessment Forms are the basis of our assessment. The forms compile information gained through site visits, discussions with Operations staff, review of documents, and engineering experience. A sample form is shown in Figure 1.1. Individual assessment forms were generated for each piece of equipment assessed. The completed assessment forms have been appended to this report.

Figure 1.1 – Condition Assessment Form Sample

Project No.: 8400-001-00
 Tag: IC_101_Panel
 Facility: Metcalfe Lift Station
 Assessment Page 1 of 1

CONTROL PANEL CONDITION ASSESSMENT FORM

Assessor: Richard Ofstie
 Date: 29-Jun-19
 Populate Date
 Asset ID: 14331

SECTION	ITEM	DATA	Asset Category		Likelihood Indicator Scores			
			Current Physical Condition	Fitness for Purpose	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_101_Panel Description: IC_101_Panel	GENERAL	Location: Drywell, Main Level Description: IC_101_Panel Function: Station Monitoring PLC Processor: SCADAPack 357 UPS Protection: Yes	3	1		2013	30	24
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5
	Current Physical Condition	Equipment Visual Inspection Issues for Discussion: Likelihood Indicators New) or Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. Equipment is not rated for classified locations. Wiring methods do not follow provided raceway. Panduit cover is removed. No redundancy.			
		Canadian Electrical Code Issues Identified: Issues for Discussion: Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4	Notes & Comments			
		Control Wiring Terminations Visual Inspection: Issues for Discussion: Asset Consideration Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1	Assessor's Rating			
		Occurrences of Maintenance Issues: Issues for Discussion: Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4	Recommendations with Cost Estimates			
	Fitness for Purpose	Controls Functioning as Expected: Issues for Discussion: Rating 1 (Always) Rating 2 (More than half of time) Rating 3 (Half of the time) Rating 4 (Less often than half) Rating 5 (Never)	1	0.3	RECOMMENDATIONS: Incorporate redundant control for the lift station. Upgrade HVAC system. Install panduit cover.	COST ESTIMATE \$ 45,000.00		
		Panel is Appropriately Designed: Issues for Discussion: Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.1	Pre-Established Weighting			
		Control Logic is Appropriate for Installation: Issues for Discussion: Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3				
		Communications Equipment is Appropriate: Issues for Discussion: Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1				
	Equipment Remaining Service Life: Issues for Discussion: Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.2					
PHOTOGRAPHS								

2.0 General Overview

2.1 Location

The Riverbend Lift Station is accessed via Portage Avenue in west Winnipeg. It is south of Portage Avenue, north of the Assiniboine River, in the northeast corner of the École Assiniboine School field.

2.2 General

The lift station was originally constructed in 1958 and was renovated in 1983 and 2015. It services a large, primarily commercial and industrial area. Table 2.1 provides a brief overview of the station.

Table 2.1: Riverbend Lift Station Overview		
YEAR CONSTRUCTED	1958	Major Reno: 1983
LOCATION	1740 Portage Ave.	
CONFIGURATION	Wet Well / Dry Well	
PUMPING CAPACITY	181 L/s	
TYPE OF PUMPS	Dry Pit Solids Handling	
PUMP HORSEPOWER	P-101: 60 HP, P-102: 60 HP	
BACKUP GENERATOR	Mobile Generator - One Pump	
VENTILATION	Dry Well: Intermittent, Wet Well: N/A	



The station primary components are aging and in need of upgrading to ensure reliable usage going forward. The primary structure remains in fair condition, but the secondary structural members and principal equipment are at the end of their service life and will require upgrades in the near future.

Riverbend Site Location – Google Earth

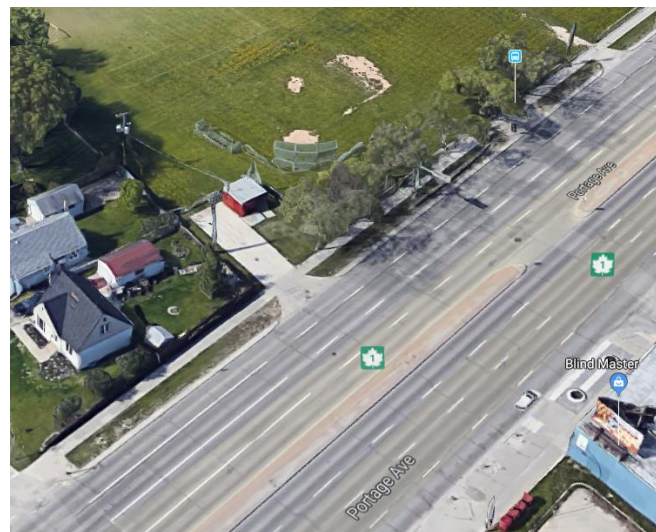
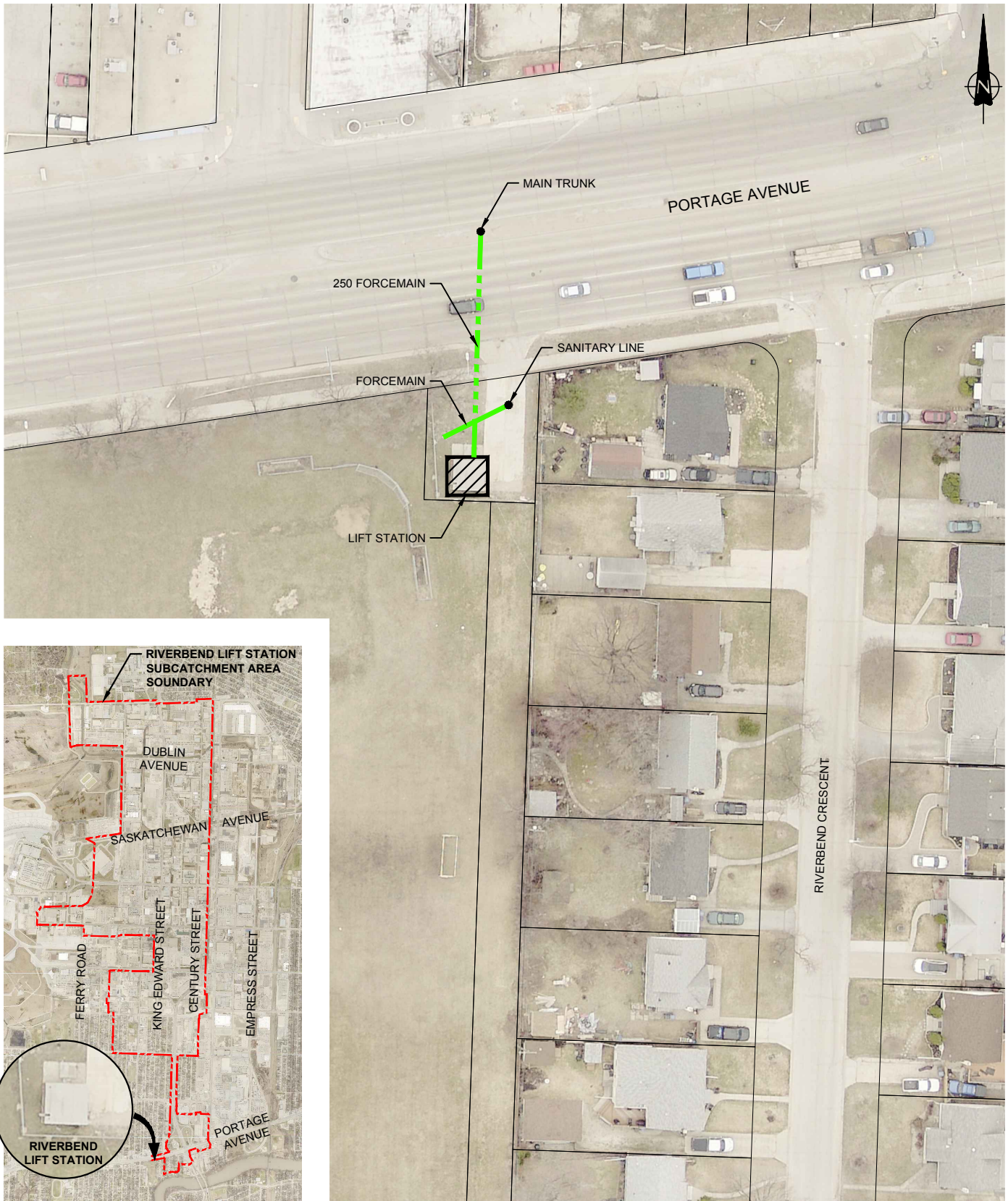


Figure 2.1 provides an overall site location plan of the lift station facility.



CITY OF WINNIPEG

LIFT STATION ASSESSMENTS 2018-2019
RIVERBEND LIFT STATION
LOCATION PLAN

SCALE: 1:750

DATE: AUGUST 2019

JOB: 8400-001-00

FIGURE: 2.1

3.0 Information and Regulatory Review

3.1 Historical Data Review

3.1.1 Data Collection

The City of Winnipeg records estimated average and peak incoming flow into the lift station wet well. Estimated flows were provided by the City of Winnipeg.

3.1.2 Record Drawings, Reports, & Manuals

The following data, plans, reports, and manuals were compiled and reviewed to complete this report:

- 2015 Comminutor Chamber Piping & Valve Upgrades, Riverbend Lift Station – City of Winnipeg; 2015
- Pump 1 & 2 Power & Control Circuit, Riverbend Lift Station – City of Winnipeg; 1983
- Installation of New Pumps & Piping, Riverbend Lift Station – City of Winnipeg; 1983
- Substructure General Layout, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- Misc. Details, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- Reinf. Steel, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- Superstructure 313, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- Superstructure 313-A, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- Site Plan & Misc. Details, Riverbend Comm. & Pumping Sta. – City of Winnipeg 1958
- LIFT_STN_SERVICE_AREAS.gws – Lift Station Service Areas

4.0 Sewage Production

4.1 General

The service area and design flows were generated based on discussion with the City of Winnipeg representatives along with the design criteria presented in the *City of Winnipeg Wastewater Flow Estimation and Servicing Guidelines; 2018*.

4.1.1 Catchment Area

The catchment area for the Riverbend Lift Station was provided by the City from the LIFT_STN_SERVICE_AREAS.gws workspace and consists of primarily Single Family Dwellings with areas of Multi Family Dwellings and Commercial areas. The catchment area is located primarily west of Century Street, east of the airport, north of Portage Avenue, and west of Century Street. Figure 4.1 illustrates the sub-catchment area for the Riverbend Lift Station.

4.1.2 Peaking Factor

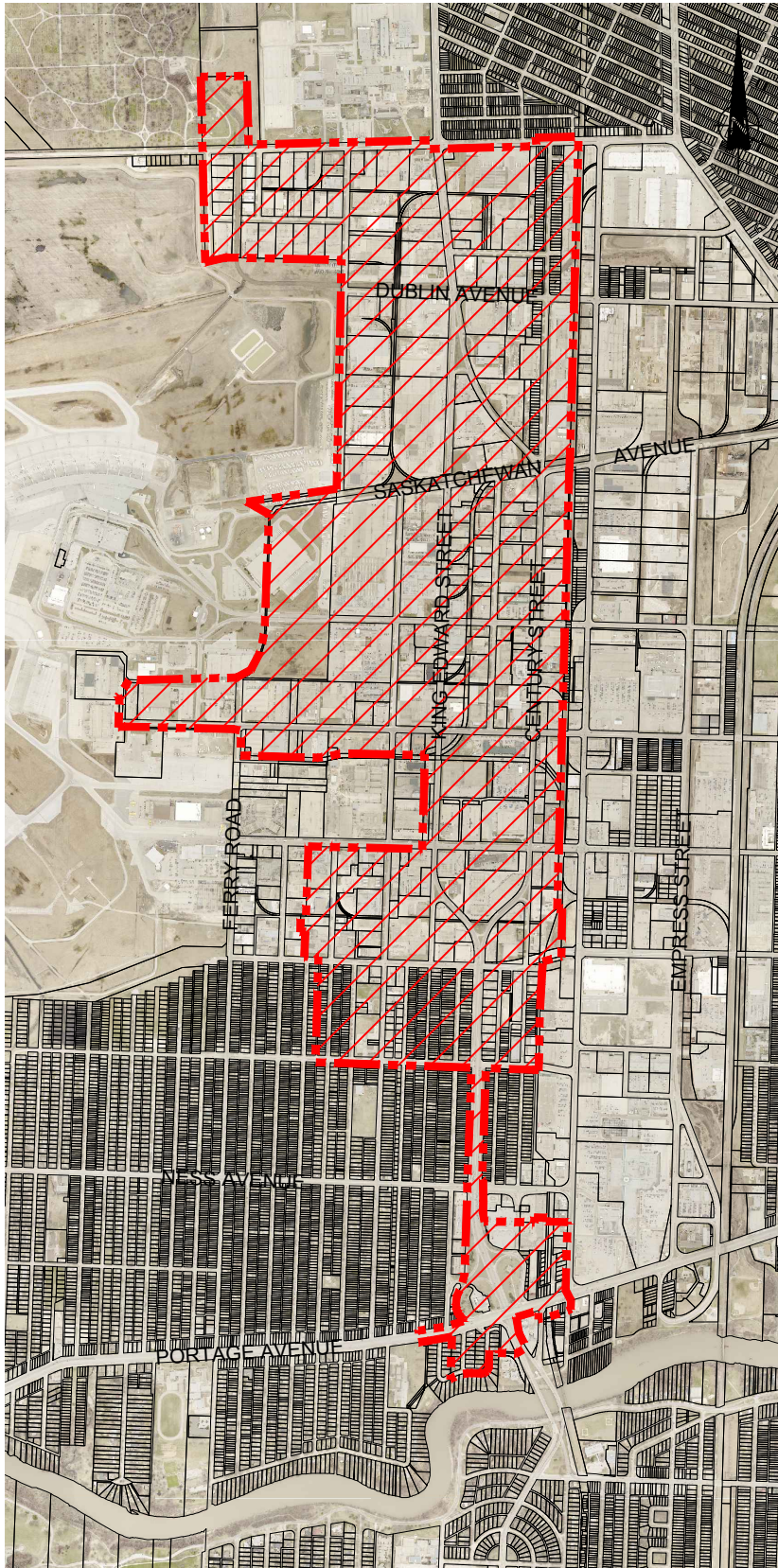
To account for the diurnal fluctuations in sewage flows, peak hourly flows are calculated based on the peaking factor derived from the Harmon equation:

$$\text{Harmon's Peaking Factor} = 1 + 14 / (4 + P^{1/2})$$

where: P = design contributing population in thousands



Riverbend Lift Station Wet Well



RIVERBEND	
ROW LABELS	COUNT
APARTMENTS	7
COMM/RETAIL WH CTRE	4
COMMUNITY CENTRE	1
COMPLETE AUTO DEALER	1
DETACHED SINGLE DWELLING	371
DUPLEX	2
HOTEL	10
HYDRO SUB-STATIONS	3
INDSTRL HEAVY MANUFC	4
INDSTRL LIGHT MANUFC	8
INDSTRL MISCELLANEOUS	2
MEDICAL OFFICE CLINIC	1
MULTI FAMILY CONVRSN	1
NGHBRHD SHOP CENTRE	3
OFFICE	12
POLICE/FIRE	2
RAILROAD	2
REFERENCE ROLL	4
RESTAURANT	5
SCHOOL	3
STORE	2
SUPER MARKET	1
VACANT COMMERCIAL	7
VACANT INDUSTRIAL	57
VACANT PARK	1
VACANT RESIDENTIAL 1	10
VACANT RESIDENTIAL 2	2
VEHICLE SERV RELATED	10
WAREHOUSE	171
GRAND TOTAL	707

LEGEND



RIVERBEND SUBCATCHMENT
AREA=327.2 ha (808.5 acres)



CITY OF WINNIPEG

LIFT STATION ASSESSMENTS 2018-2019
RIVERBEND LIFT STATION
SUBCATCHMENT AREA

SCALE: 1:25 000

DATE: AUGUST 2019

JOB: 8400-001-00

FIGURE: 4.1

4.2 Wastewater Flows

4.2.1 Historical Flows

Historical wastewater flow data was not available for the Riverbend Lift Station. Therefore, the following assumptions have been used to estimate the current and projected ultimate capacities for the facility:

- Land use consists of Commercial Areas.
- Catchment area is approximately 327.2 ha.
- Average dry weather wastewater flow as follows:
 - Residential areas – 270 litres per capita day (Lpcd).
 - Commercial areas – 16,800 L/ha/day.
- Extraneous flow allowance as follows:
 - Groundwater infiltration – 2,200 L/ha/day.
 - Manhole infiltration – 12 L/min/manhole.
 - Residential manhole density – 1.6 manholes/ha.
 - Commercial/industrial manhole density – 1.0 manholes/ha.
 - Weeping tile flow – 4.55 L/min/service connection.
 - Only included in residential areas constructed prior to 1990.
- No anticipated future developments to be serviced by the lift station.

Table 4.1 illustrates the estimated wastewater flows.

TABLE 4.1: ESTIMATED WASTEWATER FLOWS								
SUBCATCHMENT DESIGN FLOW								
LAND USE	AREA (HA)	DWELLING DENSITY (DWELLINGS/HA)	DWELLINGS (NO.)	POPULATION DENSITY (PPL/DWELLING)	EQUIVALENT POPULATION	HARMON PEAKING FACTOR	AVERAGE DRY WEATHER FLOW	
							(LPCD)	(L/SEC)
							(L/HA/DAY)	(L/SEC)
Commercial	327.2	-	-	-	-	-	16,800	63.6
Subtotal	327.2						16,800	63.6
Total:	327.2							63.6
LAND USE	PEAK DRY WEATHER FLOW		EXTRANEEOUS FLOW CONTRIBUTIONS				PEAK WET WEATHER FLOW	
	(LPCD)	(L/SEC)	GROUNDWATER	MANHOLE		WEEPING TILE	(L/SEC)	
			(L/SEC)	(MH/HA)	(L/SEC)	(L/SEC)		
Commercial	28,100	106.4	8.3	1.0	65.4	-	-	
Subtotal	28,100	106.4	8.3	-	65.4	-	180.2	
Total:	-	106.4	8.3	-	65.4	0.0	180.2	

The estimated average dry weather flow is 63.6 L/sec, the peak dry weather flow is 106.4 L/sec, and the peak wet weather flow is estimated to be 180.2 L/sec.

4.2.2 Projected Flows

No further expansion is anticipated for the catchment area for the Riverbend Lift Station.

5.0 Lift Station Hydraulic & Capacity Review

5.1 Background

The lift station houses two (2) dry pit solids handling pumps. The primary pump cycles between the two pumps on a pump operational basis. Only one pump will operate under normal conditions and the pumping control system will allow for a second pump to be called into operation based on the level in the wet well. The primary pump starts at a level of 1379 mm and the secondary pump starts if it exceeds 1529 mm. Table 5.1 provides a summary of the pumps utilized at the Riverbend Lift Station.



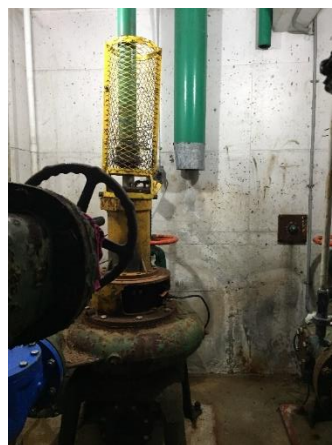
TABLE 5.1: RIVERBEND LIFT STATION PUMPING SUMMARY

PUMP	Pump Type	MANUFACTURER	MODEL	POWER (HP)	YEAR OF INSTALL	DUTY POINT		DISCHARGE SIZE (mm)
						FLOW (L/sec)	TDH (m)	
PUMP 1 - P-101	DRY PIT SOLIDS HANDLING	FAIRBANKS MORSE	B5414	60	1983	151.4	20.7	200
PUMP 2 - P-102	DRY PIT SOLIDS HANDLING	FAIRBANKS MORSE	B5414	60	1983	151.4	20.7	200

* Based on duty point in Pump Manufacturer's datasheet

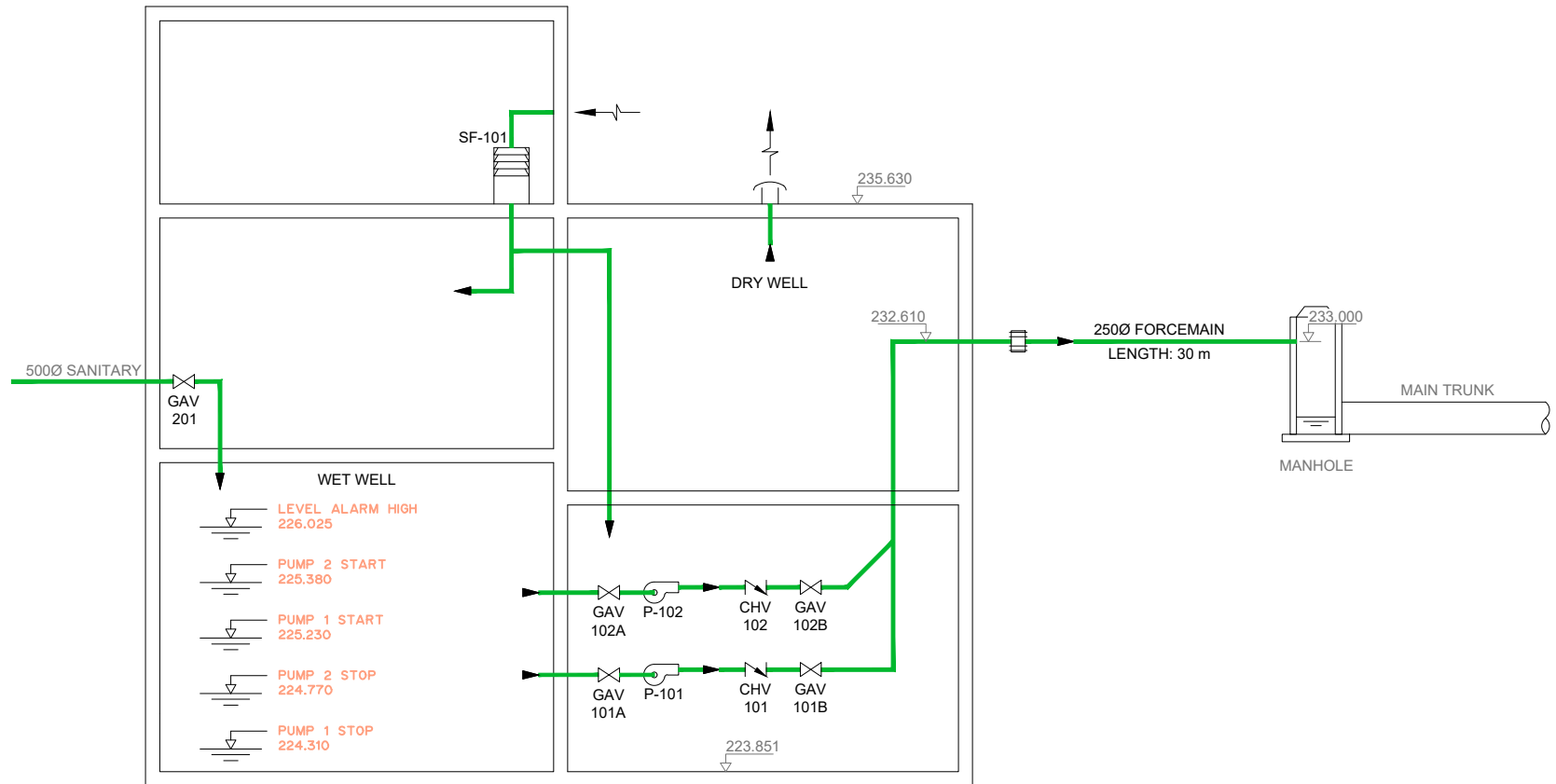
P-101 and P-102 are identical Fairbanks Morse B5414 pumps rated for 151.4 L/sec at a Total Dynamic Head (TDH) of 20.7 m and operate at a constant speed. Operational staff noted that there are concerns with solids and grease build up noted on the pumps and the pumps are small and difficult to clean.

A 250 mm diameter AC force main is used to discharge sewage from the Riverbend Lift Station. The force main connects to a manhole located in the median of Portage Avenue west of Riverbend Crescent.



5.1.1 Process Flow Diagram

Figure 5.1 provides an overall process flow diagram of the Riverbend Lift Station.



P-101
 - DUTY POINT: 151.40 L/s @ 20.7 m
 - 60 HP, 1166 RPM
 - 575 VAC/3 PH/60 Hz

P-102
 - DUTY POINT: 151.40 L/s @ 20.7 m
 - 60 HP, 1166 RPM
 - 575 VAC/3 PH/60 Hz



LIFT STATION ASSESSMENTS 2018-2019
 RIVERBEND
 PROCESS FLOW DIAGRAM

SCALE: NTS

DATE: SEPT 2019

JOB: 8400-001-00

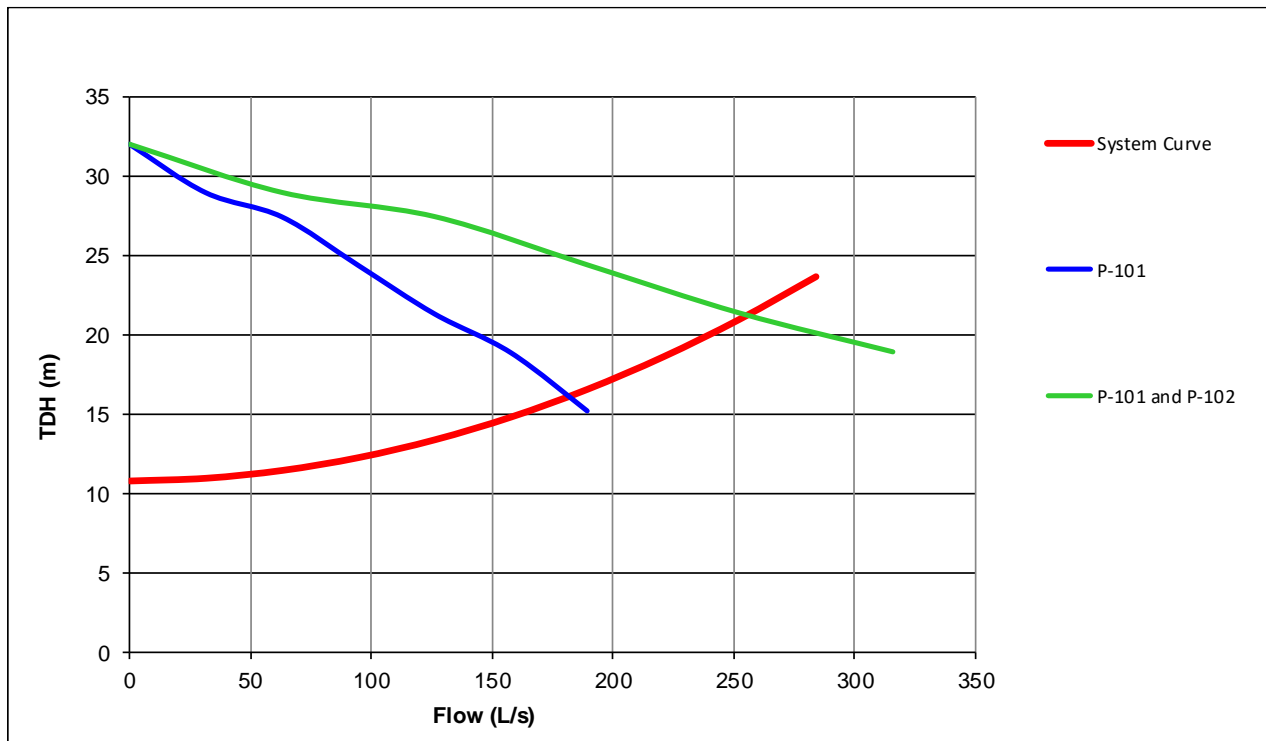
FIGURE: 5.1

5.2 Hydraulic Analysis

5.2.1 Pump Capacity Review

To develop the lift station system curve, the piping system was analyzed using the Darcy – Weisbach formula. The anticipated pump flows are determined by the intersection of the system curve with the respective pump curves. The lift station system curve versus theoretical pump performance chart is illustrated below in Figure 5.2.

Figure 5.2: Lift Station Curve vs. Pump Performance Curve



The theoretical flows that can be obtained with one pump and two pumps in operation are 181 L/s and 255 L/s, respectively.

5.2.2 Pumping Requirements Review

The design of the lift station pumping system must incorporate standby capacity such that when the largest pump is out of service the station is capable of handling the peak inflow rate. The rated capacity should be equal to or greater than the peak wet weather flow rate of 180.2 L/sec. The maximum pumping capacity of the lift station is approximately 255 L/s with both pumps in operation. The 'rated' capacity of the lift station with the largest pump being out of service is currently 181 L/sec. Based on the estimated peak wet weather flow, the pumping system is capable of meeting the peak influent flow requirements.

5.2.3 NPSHA Analysis

A Net Positive Suction Head Available (NPSHA) analysis was performed to review the lift station suction piping system. NPSHA is the maximum absolute pressure available at the suction port of the pump above vapour pressure.

Centrifugal pumps are not capable of handling large quantities of vapour, so it is critical that there is sufficient absolute pressure on the suction side of the pump to prevent vaporization or flashing in the impeller.

An NPSHA analysis was performed at various levels in the lift station wet well. The analysis indicated that there is sufficient NPSHA to prevent cavitation. The results of the analysis are summarized in Table 5.2.

TABLE 5.2: SUCTION LINE NPSHA ANALYSIS							
CONDITION	WET WELL LEVEL (mm)	PUMP SPEED (%)	FLOW (L/s)	SUCTION LINE TOTAL DYNAMIC HEAD (m)	NPSH REQUIRED (m)	NPSH AVAILABLE AT PUMP INLET (m)	NPSH EXCESS AVAILABLE (m)
PUMP 1 STOP	459	100	151.4	0.88	6.10	8.68	2.58
PUMP 2 STOP	919	100	151.4	0.88	6.10	8.68	2.58
PUMP 1 START	1379	100	151.4	0.88	6.10	9.60	3.50
PUMP 2 START	1529	100	151.4	0.88	6.10	9.75	3.65

5.2.4 Force Main Review

A 250 mm diameter AC force main is used to convey sewage from the Riverbend Lift Station. The length of the force main is 30 m. The force main was installed in 1959 and has a volume of approximately 29 m³. Based on the estimated average and peak dry weather flows of 63.6 L/s and 106.4 L/s, the average retention time in the force main ranges from 14 to 23 seconds, which is below the maximum recommended retention time of 4 hours.

An analysis of the force main was performed to confirm whether the force main piping is adequate to carry the flow rates from the lift station. Velocities were calculated for theoretical pumping rate scenarios at the Riverbend Lift Station. The results are summarized in Table 5.3.

TABLE 5.3: FORCE MAIN VELOCITY		
DESCRIPTION	ONE PUMP THEORETICAL	TWO PUMPS THEORETICAL
FLOW (L/s)	181	255
FORCE MAIN VELOCITY (m/s)	3.69	5.19

The Riverbend force main was found to be undersized for the flows from the lift station and the velocities are above the acceptable range of 0.6 m/sec to 1.6 m/sec. Due to the short length, the force main size is not currently impacting the hydraulic performance of the pumping system.

5.3 Wet Well Sump Analysis

The fill time of the wet well from the pump stop level to the pump start level is approximately 4 minutes. Best industry practices state that the filling time based on average flow should not exceed 30 minutes to avoid anaerobic conditions. The existing wet well meets the maximum fill time requirements and is adequately sized for the incoming flows.

5.3.1 Pump Cycling Review

The wet well size was modeled for tank level versus pump cycle time. Average dry day flow results in approximately eleven (11) pump cycles per hour. Peak dry day flow results in approximately twelve (12) pump cycles per hour.

Peak wet weather flow results in one (1) pump cycle for the duration of the storm event. The maximum allowable starting and stopping intervals for a 60 HP pump are 7 cycles per hour. The pump cycles exceed the allowable limits and the pump capacity exceeds the volume of the wet well. It is recommended that variable frequency drives (VFDs) be fitted to the pumps to mitigate this issue.

5.4 Wet Well Flow Path Review

Sewage enters the south east side of the wet well through a 500 mm diameter steel pipeline and is directed to the pump suction lines located on the east side at the north end of the wet well. The wet well is circular and prevents solids build up in the edges of the wet well. The 250 mm diameter pump suction lines are located at the bottom of the wet well. Operational staff noted that there are no major issues with solids buildup in the wet well and the wet well is only cleaned as required.

5.5 Pump Control Strategy Review

The following provides a brief outline of the control narrative for the lift station:

5.5.1 General

- Typically, the facility is operated in Automatic mode.
- Pumps can be operated either in Manual or Automatic mode.
- There are no local motor emergency stops in the dry well lower level.

5.5.2 Manual Mode

- The pumps can operate manually through a hand/off/auto switch that can bypass the controller and operate the pump.

5.5.3 Automatic Mode

- In the Automatic mode the station pump controller operates the pumps based on level.
- The duty pump will start when the level in the wet well rises above the "Pump 1 Start Level" of 1379 mm.
- Should the sewage level rise above the "Pump 2 Start Level" of 1529 mm, the second pump will start.
- If any pump fails to operate correctly in Automatic mode, then a pump failure alarm will be triggered, the failed pump will automatically shut down, and the alternate pump will automatically start to replace the failed pump.
- The second pump shuts down at the "Pump 2 Stop Level" of 919 mm and the duty pump shuts down at the "Pump 1 Stop Level" of 459 mm.

The control strategy used at the Riverbend Lift Station is similar to the control strategy used at other lift stations throughout the City. The control strategy is well understood by the Operators and has proven to be a successful method of operation.

5.6 Conclusions and Recommendations

The hydraulic and capacity assessment of the Riverbend Lift Station yielded the following conclusions:

- There are no issues with NPSHA.
- The pumping system is capable of meeting the peak influent flow requirements.
- The existing wet well meets the maximum fill time requirements.
- The pump cycles exceed the allowable limits and the pump capacity exceeds the volume of the wet well. It is recommended that VFDs be fitted to the pumps to mitigate this issue.
- The force main was found to be undersized for the flows from the lift station and the velocities are above the acceptable range. The force main size is not currently impacting the hydraulic performance of the pumping system.


6.0 Facility Condition Assessment

6.1 Background

The following provides a condition assessment of the building facility for the Riverbend Lift Station in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that requires replacement, maintenance, or upgrades. A condition rating has been given to the components to identify the condition and cost estimates have been developed. Recommendations have been developed in order to assist the City in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

6.2 Code Review

A review of the lift station was undertaken to verify compliance with the National Building Code. Table 6.1 provides a summary of the code review.

Table 6.1: Riverbend Lift Station Overview			
YEAR CONSTRUCTED	1958	Major Reno: 1983	
LOCATION	1740 Portage Ave.		
CONFIGURATION	Wet Well / Dry Well		
PUMPING CAPACITY	181 L/s		
TYPE OF PUMPS	Dry Pit Solids Handling		
PUMP HORSEPOWER	P-101: 60 HP, P-102: 60 HP		
BACKUP GENERATOR	Mobile Generator - One Pump		
VENTILATION	Dry Well: Intermittent, Wet Well: N/A		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
BARRIER FREE ACCESS	Not Required	n/a	NBC - 3.8- A3.8.1.1
MAIN FLOOR EXITS	1 required	YES	NBC - 3.4.2.1 (A) - Floor area < 200m2
TRAVEL DISTANCES	Less than 15 m	YES	NBC - 3.4.2.1 (A) - F-3 Occupancy
MEZZANINE EXIT	Less than 15 m	n/a	NBC - 3.4.2.2
GUARDRAILS	0.75 kN/m lateral load	YES	NBC - 4.1.5.14 -
IMPORTANCE FACTOR	Post Disaster	NO	NBC - 4.1.2
EGRESS PATHS	1100mm min. width	YES	NBC - 3.4.3.2
NOISE DECIBEL	< 85 dBA	YES	OH&S Part 8. -
MONORAIL CERTIFICATION			No inspection certification noted
SPRINKLER SYSTEM	Not Required	n/a	NBC - 3.2.2
EMERGENCY LIGHTING	Required	NO	NBC - 3.2.7.3
EXIT SIGNAGE	Illuminated over door	NO	NBC - 3.4.5.1 (2)
SMOKE ALARM	Not Required	n/a	NBC - 3.2.4.11
FIRE ALARM	Not Required	n/a	NBC - 3.2.4
HAZARDOUS SUBSTANCE	CAPACITY (Litres)	REGISTERED	CODE REFERENCE / NOTES
DEISEL (Fuel Oil) - Generator Room	None	n/a	Registration with Ministry of Environment is not required
DEISEL (Fuel Oil) - Pump Station	None	n/a	Registration with Ministry of Environment is not required
<i>-Hazardous Substances and Waste Dangerous Goods Regulations recommends registration for tank capacity > 4000 Litres-</i>			
SECURITY	SITE SECURE	BUILDING SECURE	NOTES
PUMP STATION	No - partially fenced	Not sufficiently	Building door, frame, and latch are very aged.

6.3 Site Conditions

The Riverbend Lift Station is located immediately south of Portage Avenue between Riverbend Crescent and Winston Road. The Assiniboine River is located south of the station.

6.3.1 Site Access and Parking Lot

The lift station can be accessed from Portage Avenue. This is a busy route though, and access / egress can be difficult. There is a designated driveway and sufficient parking space. However, there is little room to turn a vehicle around and egress requires backing out onto Portage Avenue.

6.3.2 Site Grading & Landscaping

The site area is well delineated and the grading provides sufficient drainage. There are no site grading or landscaping concerns.

6.3.3 Security and Signage

There is no perimeter fencing around the station. The building does not have windows and is secure. The electric meter located on the exterior of the building and is kept in a locked enclosure to prevent vandalism. There is no signage present for the facility.



Riverbend Site Location - Google Maps

6.4 Foundations

6.4.1 Foundation Slab

The Riverbend Lift Station foundation consists of a cast-in-place concrete dry well (a valve pit and a pump room). The base of the valve pit is approximately 11.6m below grade. The wet well and pump room bases are approximately 12.7m below grade. The valve pit was historically a comminutor room with open sewage. The open sewage pits have since been “piped over” and the structure no longer contains open sewage. A round, buried concrete wet well was cast against the side of the structure. The concrete base slab in the valve pit shows signs of surface deterioration from the previous H₂S environment. Some of the aggregate is loose. The sump pit is functional and the floor is sloped for drainage to the sump; however, minor ponding was noted near the sump during the inspection.



6.4.2 Foundation Walls, Columns, and Beams

The concrete foundation walls are in “Good” condition with minor surface deterioration. There is more significant deterioration in the walls of the valve pit. In some areas, paint has begun to flake off.

6.4.3 Wet Well

The wet well is located outside of the main structure. It is a circular concrete pipe structure attached to the exterior of the foundation. A weir within directs flow from the valve pit outlet to the pump inlets.

The wet well access vault is structurally sound. Concrete surfaces have started to deteriorate, exposing aggregate.

6.5 Primary Structural Systems

6.5.1 Loadbearing Walls, Columns and Beams

During the inspection, MPE was unable to properly assess the exterior walls of the superstructure due to the insulation panels installed. The drawings provided by the City suggest that the structure was built using Haydite blocks and Haydite precast roof panels. There is significant cracking on the tension face of the roof panels. The roof has deflected as a consequence and causes water on the roof to pond. Refer to section 6.8 for further detail.

6.5.2 Suspended Floors, Trusses, and Joists

The main floor slab appears to be in "Fair" condition from the top, though the finish has worn. The underside of the slab that acts as the ceiling to the valve pit is in poor condition. The concrete surface has suffered extensive corrosion from the previous H₂S atmosphere. Small pipe penetrations in the suspended slabs has damaged the concrete and exposed rebar. This rebar has corroded and will continue to damage the concrete.

6.6 Secondary Structural Systems

6.6.1 Stairs, Ladders, Catwalks, Hatches, Rails



The lower level stairs and hand rail leading to the valve pit are excessively corroded and present an immediate safety risk with further usage. The handrail is no longer attached at the top. The base is propped up by a brick. Immediate replacement is recommended.

Plywood is used for hatch lids throughout the station and are not sufficient to support Code required live loads. Square hatch lids are susceptible to falling through openings. A few hatches have holes in them. There are no fall protection guard rails in place around the openings. The hatches, stairs, and rails are not code compliant and are considered a safety risk.

6.6.2 Interior Walls, Ceilings, Support Members, Equipment Pads

The interior of the superstructure is mostly lined with insulation panels with no vapour barrier or interior liner in place. The insulation panels are deteriorating.

6.6.3 Finishes

The finishes of most floor areas and some wall areas have worn or flaked off. It is recommended that the walls and ceilings be repaired with linings.

6.6.4 Monorails and Hoists

The top level monorail anchor brackets and bolts are significantly corroded. The lower level lifting lugs are improperly labelled. No hoist or monorail certification was available.

6.7 Building Envelope

6.7.1 Exterior Siding, Roofing, Doors

The penetrations through the brick exterior walls are not all properly sealed. The paint is stripping off the brick surfaces. The door is aging and should be replaced.

6.7.2 Insulation, Vapour Barrier, Interior Liner

Insulating panels have been installed on the interior of the superstructure and on the underside of the floor. There is no vapour barrier or protective board installed. The insulation is damaged in areas. Evidence of moisture condensing behind the insulation or possible leakage through the roof was observed.

6.7.3 Flashings, Soffits, Sealants, Weather-stripping

The flashings are corroded and should be replaced with the next roof renovation. The weather stripping is in “Poor” condition and should also be replaced.

6.8 Roofing

6.8.1 Roof Membrane, Insulation, Decking

The roof structure is a haydite panel system. The 1963 drawings indicate a Barret Type A – 20 year bonded roofing system.

The roof structure is showing clear evidence of sagging. Long term deflection cracking is evident on the underside of the panel ribs. This deflection results in ponding on the roof, further adding to the loading, which in turn causes additional deflection.

The roof membrane appears to have been replaced recently and is in good condition. The sag in the roof will continue to be problematic. Sloped insulation installed below the membrane may be sufficient to eliminate ponding and extend the life of the life of the roofing structure. At this point, it is recommended that the roof panels be replaced to ensure there is capacity to support Code required snow and rain loads. A full structural assessment on the roof panels may indicate the service life of the panels can be extended if ponding is eliminated.



6.8.2 Skylights, Hatches, Penetrations

The roofing penetrations appear to be well sealed.

6.8.3 Flashings, Trim, Gutters, Downspouts

The flashing and trim about the roof are in good condition.

6.9 Building Mechanical

6.9.1 Heating

The building includes a wall mount electric unit heater located in the dry well and a portable heater on the floor in the building. It is recommended that a wall mount unit heater complete with a thermostat be installed in the building to maintain a consistent temperature.

6.9.2 Interior Plumbing

The domestic plumbing consists of steel and PVC piping and includes a water meter, double check valve assembly and pressure reducing valve. The plumbing system is used to supply hose bibs in the lift station. The plumbing system is in “Fair” condition.

Drain lines from the building are directed to a sump in the dry well lower level and a sump in the Comminutor Chamber. Sump pumps are used to discharge water from the sumps to the wet well. The drainage system is in “Fair” condition and no operational concerns were noted.

6.9.3 Fire Suppression Systems

The building has no apparent fire suppression system. It is recommended that a handheld ABC fire extinguisher be installed by the building entrance.

6.9.4 Gas Distribution

There is no gas distribution system at the lift station.

6.10 Facility Assessment Cost Summary

Table 6.2 summarizes the cost estimates and recommended Action time for each recommendation for the Facility Assessment.

TABLE 6.2: RIVERBEND FACILITY IMPROVEMENT COST ESTIMATES			
Item	Facility Section	Action	Cost
1	Site Conditions	-	\$ -
2	Foundations	Short Term	\$ 70,000.00
3	Primary Structural Systems	Short Term	\$ 80,000.00
4	Secondary Structural Systems	Short Term	\$ 76,000.00
5	Building Envelope	Mid Term	\$ 18,500.00
6	Roofing	Short Term	\$ 10,000.00
7	Building Mechanical	-	\$ -
Total:			\$ 254,500.00

The capital costs for the recommended improvements have been *estimated in 2019 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. The estimates have been provided to assist the City with budgetary planning purposes only and should not be used as actual quotes. The cost estimates are exclusive of taxes.

6.11 Conclusions & Recommendations

The major findings of the facility assessment of the Riverbend Lift Station are summarized as follows:

- The stair access to the lower valve room requires immediate replacement;
- The roof structural panels are deflecting excessively causing ponding on the roof;
- The exterior door requires replacement;
- Hoist and monorail should be inspected and certified.

A breakdown of the recommendations with associated costs can be found in Section 11. The recommendations are summarized in Table 6.3:

TABLE 6.3: RIVERBEND FACILITY RECOMMENDATIONS	
Component	Recommendation
SITE CONDITIONS	
FOUNDATION / WET WELL	Rehabilitate concrete surface in valve pit area within the next 3 years.
PRIMARY STRUCTURAL SYSTEMS	Replace roof panels.
SECONDARY STRUCTURAL MEMBERS	Replace stairs and handrail to lower valve room.
	Replace monorail and lugs
	Replace floor finishes
	Repair sections of wall finishes
	Replace floor hatches
BUILDING ENVELOPE	Replace exterior door
	Seal exterior penetrations
	Install vapour barrier and interior liner on walls and ceiling
	Repair exterior paint.
ROOFING	Replace roofing system with the replacement of the roofing structure.
BUILDING MECHANICAL	


7.0 Mechanical Equipment Condition Assessment

7.1 Background

This section provides an assessment of the process mechanical equipment in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment to identify priority of future upgrades. Recommendations and project time frames have been developed in order to assist the City in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

The Riverbend Lift Station houses sewage pumping equipment and associated piping and valves located in the dry well lower level.

TABLE 7.1: RIVERBEND LIFT STATION MECHANICAL OVERVIEW	
YEAR CONSTRUCTED	1983
PUMPING CAPACITY	181 L/sec
LOCATION	1740 Portage Avenue
NUMBER OF PUMPS	Two (2)
PUMP HORSEPOWER	P-101: 60 HP, P-102: 60 HP
TYPE OF PUMPS	Dry Pit Solids Handling
PIPING MATERIAL	Carbon Steel



A major upgrade was completed in 1983 which included replacement of all process mechanical equipment. Piping was installed in the Comminutor Chamber in 2018. The Comminutor Chamber was previously an open flume, which caused high levels of H₂S and resultant corrosion throughout the lift station. The City Operations and Maintenance Staff have performed tasks to prolong the usable life of the equipment including routine servicing, preventative maintenance, and building cleanup. In general, the equipment is in “Fair” to “Poor” physical condition.

7.2 Code Review

A review of the lift station equipment was undertaken to verify compliance with current ANSI and Hydraulic Institute design standards. Table 7.2 provides a summary of the code review.

TABLE 7.2: MECHANICAL CODE REVIEW			
YEAR CONSTRUCTED	1983		
LOCATION	1740 Portage Avenue		
PUMPS			
TYPE	Dry Pit Solids Handling		
PUMP LOCATION	Dry Well		
SUCTION SOURCE	Wet Well - Direct Piped		
PIPING			
SUCTION/DISCHARGE DIAMETER	250 mm		
MATERIAL	Carbon Steel		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
SUCTION INTAKE SUBMERGENCE	250 mm	YES	ANSI/HI 9.8-2012 Section 9.8.7
SUCTION INTAKE FLOOR CLEARANCE	100 mm	YES	ANSI/HI 9.8-2012 Section 9.8.3.2.3.2
SUCTION INTAKE WALL CLEARANCE	75 mm	YES	ANSI/HI 9.8-2012 Section 9.8.3.2.3.1
SUCTION BELL	Required	NO	ANSI/HI 9.6.6-2016 Section 9.6.6.3.6
SUCTION PIPING VELOCITY	2.4 m/s	NO	ANSI/HI 9.6.6-2016 Section 9.6.6.3.1
SUCTION STRAIGHT PIPE LENGTHS	5	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.3.3
PUMP VIBRATION	0.15 in/sec	YES	ANSI/HI 9.6.4-2016 Section 9.6.4.2.5
PUMP TEMPERATURE	160 F	YES	ANSI/HI 9.6.5-2016 Section 9.6.5.2.6
DISCHARGE PIPING VELOCITY	4.5 m/s	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.4.1
VALVES	Isolation / check	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.4.3



7.3 Pumps

The lift station houses two (2) dry pit solids handling pumps. P-101 and P-102 are identical Fairbanks Morse model B5414 pumps. Each is equipped with a 60 HP, 575 VAC, 3 phase, 60 Hz electric motor. Each pump is rated for 151.4 L/sec at a Total Dynamic Head (TDH) of 20.7 m and operate at a constant speed. P-101 and P-102 were installed in 1983 and are used regularly. There have been several repairs performed on the pumps since their original installation and the pumps are passed their expected service life. Operational staff noted that there are concerns with solids and grease build up on the pumps and the pumps are small and difficult to clean.

Overall the pumps are in “Poor” condition. Table 7.3 provides a summary of the condition of the pumps at the Riverbend Lift Station.

TABLE 7.3: RIVERBEND LIFT STATION PUMP CONDITION ASSESSMENT						
PUMP	DESCRIPTION	MAKE	MODEL	CONDITION	IMPORTANCE	ACTION
P-101	60 HP Dry Pit Solids Handling	Fairbanks Morse	B5414	Poor	Important	Short Term
P-102	60 HP Dry Pit Solids Handling	Fairbanks Morse	B5414	Poor	Important	Short Term

7.3.1 Vibration and Temperature

MPE collected onsite pump vibration and temperature measurements when the pumps were in operation. Temperature measurements were recorded on the pump motor and volute using an infrared thermometer. Vibration readings were recorded in the x, y, and z axis on the pump motor and volute using a Digital Measurement Metrology Digital Vibration Meter. Table 7.4 provides a summary of the vibration and temperature readings at the Riverbend Lift Station.

TABLE 7.4: RIVERBEND LIFT STATION PUMP VIBRATION AND TEMPERATURE					
PUMP		VIBRATION (in/s)			TEMPERATURE (F)
		x	y	z	
P-101					
	Motor	0.02	0.01	0.01	96
	Volute	0.00	0.00	0.13	60
P-102					
	Motor	0.06	0.04	0.02	128
	Volute	0.04	0.03	0.06	62

The temperature readings were found to be within the required tolerances as set out in *ANSI/HI 9.6.5-2009 Rotodynamic Pumps – Guideline for Condition Monitoring*. Vibration readings in the x, y, and z axes were found to be within the tolerances as set out in *ANSI/HI 9.6.4-2009 Rotodynamic Pumps for Vibration Measurements and Allowable Values*.

7.4 Valves

The majority of the valves were installed in 1983, with the exception of the gate valve in the Comminutor Chamber and the P-101 check valve that was recently installed. The manually actuated gate valves are used for isolation of equipment for maintenance and are not regularly exercised. The check valves are critical to the operation of the lift station and are exercised regularly through operation. In general, valves are in “Poor” condition. Table 7.5 provides a summary of the condition of the valves at the Riverbend Lift Station.



TABLE 7.5: RIVERBEND LIFT STATION VALVE CONDITION ASSESSMENT					
VALVE	DESCRIPTION	SIZE	CONDITION	IMPORTANCE	ACTION
GAV-101A	Gate Valve	250 mm	Poor	Intermediate	Short Term
GAV-101B	Gate Valve	250 mm	Poor	Intermediate	Short Term
GAV-102A	Gate Valve	250 mm	Poor	Intermediate	Short Term
GAV-102B	Gate Valve	250 mm	Poor	Intermediate	Short Term
GAV-201	Gate Valve	500 mm	Excellent	Intermediate	None
CHV-101	Swing Check Valve	250 mm	Excellent	Important	None
CHV-102	Swing Check Valve	250 mm	Poor	Important	Short Term

7.5 Piping & Fittings

The lift station includes carbon steel piping for conveyance with one section of recently installed stainless steel piping. The pipe flanges are constructed of carbon steel and a mixture of carbon steel and stainless steel bolts and nuts have been used. In general, the piping is in “Fair” condition. Table 7.6 provides a summary of the condition of the piping at the Riverbend Lift Station.

TABLE 7.6: RIVERBEND LIFT STATION PIPING CONDITION ASSESSMENT				
PIPING	MATERIAL	CONDITION	IMPORTANCE	ACTION
Influent Line	Carbon Steel	Excellent	Important	None
P-101 Suction Line	Carbon Steel	Fair	Important	Mid Term
P-102 Suction Line	Carbon Steel	Fair	Important	Mid Term
P-101 Discharge Line	Carbon Steel	Fair	Important	Mid Term
P-102 Discharge Line	Carbon Steel	Fair	Important	Mid Term
Discharge Header	Carbon Steel	Fair	Important	Mid Term

7.5.1 Non-Destructive Testing

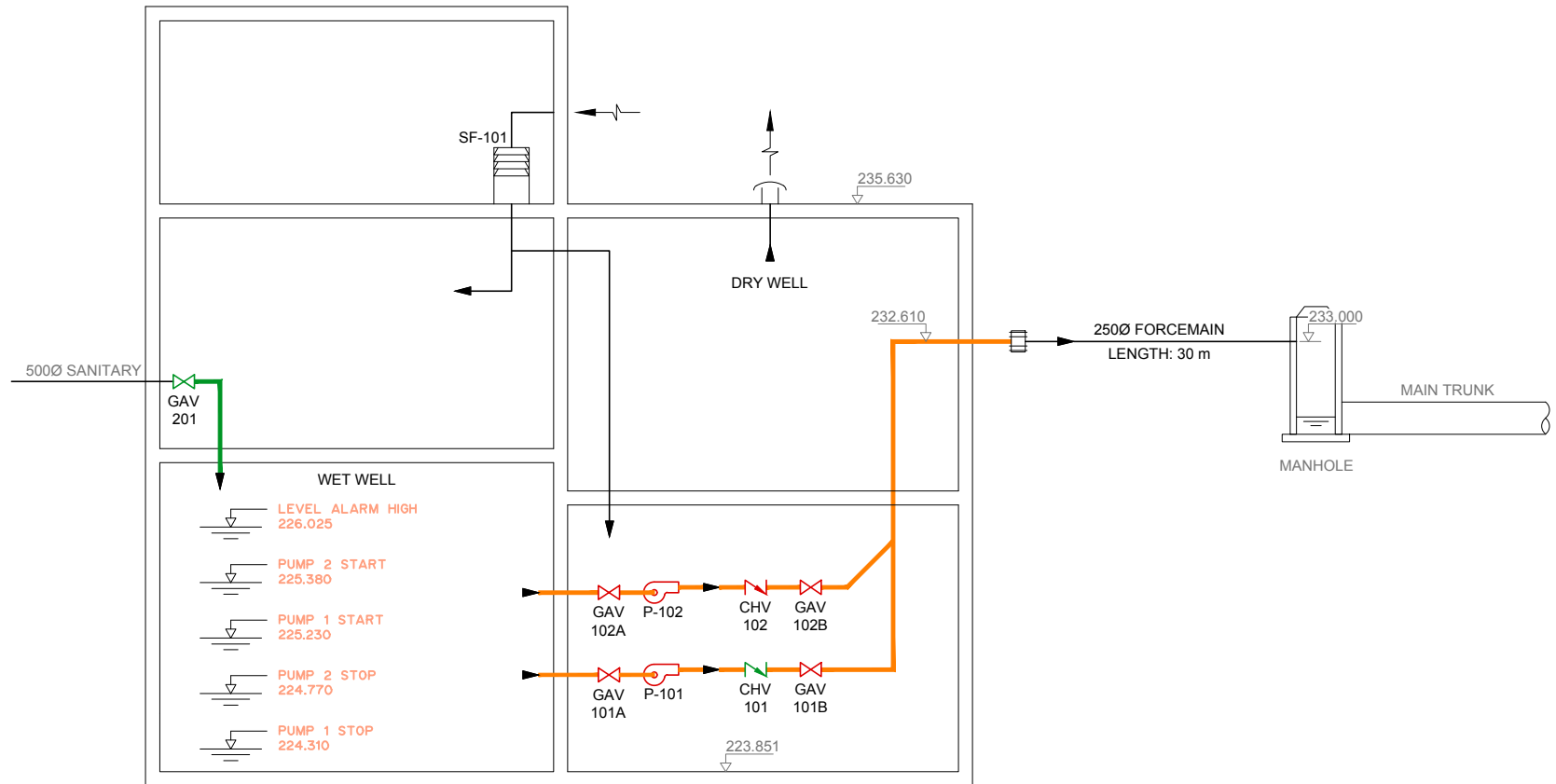
Non-destructive testing was not performed on the piping in the lift station.

7.5.2 Cathodic Protection

The lift station does not include cathodic protection and cathodic protection is not recommended for this station.

7.6 Summary of Condition Assessment

Figure 7.1 provides a graphical summary of the condition assessment of the mechanical components of the Riverbend Lift Station.



P-101
 - DUTY POINT: 18.93 L/s @ 9.6 m
 - 10 HP, 1200 RPM
 - 575 VAC/3 PH/60 Hz

P-102
 - DUTY POINT: 18.93 L/s @ 9.6 m
 - 10 HP, 1200 RPM
 - 575 VAC/3 PH/60 Hz

LEGEND	
—	POOR
—	FAIR
—	GOOD
—	EXCELENT



LIFT STATION ASSESSMENTS 2018-2019
 RIVERBEND
 CONDITION ASSESSMENT SUMMARY

SCALE: NTS

DATE: SEPT 2019

JOB: 8400-001-00

FIGURE: 7.1

7.7 Conclusions

The major findings for the Process Mechanical Assessment are summarized as follows:

- The mechanical equipment is generally in “Fair” to “Poor” physical condition.
- There are issues with the lift station pumps handling solids.
- The pumping system should be upgraded with new equipment.

7.8 Recommendations

7.8.1 Pump and Piping Replacement (5-10 years)

Due to the age of the pumping system, it is recommended that the replacement of the pumps, piping, and valves be completed within the next 10 years.

7.9 Improvement Cost Estimates

The capital costs for the recommended improvements are summarized in Table 7.7. These upgrades will provide long term benefits to the sewage works system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 7.7: MECHANICAL EQUIPMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Mid Term	Pump and Piping Replacement	\$242,000
TOTAL			\$242,000

The capital costs for the recommended improvements have been **estimated in 2019 dollars**. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes.


8.0 Electrical Equipment Condition Assessment

8.1 Background

This section provides an assessment of the electrical equipment in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment to identify priority of future upgrades. Recommendations and project time frames have been developed in order to assist the City in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

The Riverbend Lift Station houses electrical equipment such as pump motors, and full voltage starters.

TABLE 8.1: RIVERBEND LIFT STATION ELECTRICAL OVERVIEW	
YEAR CONSTRUCTED	1983
LOCATION	1740 Portage Ave
SERVICE	200 AMP
VOLTAGE	600 VAC
STANDBY GENERATOR SIZE	N/A
NUMBER OF PUMPS	Two (2)
PUMP HORSEPOWER	P-101: 60HP, P-102: 60HP




8.2 Code Review

As part of the condition assessment of the equipment and installation methods, MPE reviews equipment and installations to assess whether standards set forth in applicable codes and regulations are met. The Canadian Electrical Codes CSA C22.1-15 and NFPA 820 are of particular relevance for wastewater lift station electrical systems. According to the NFPA 820 Table 4.2 Row 17, a below grade or partially below grade wastewater pumping station dry well that is ventilated with fewer than 6 air changes per hour is to be classified as a Zone 2 (or Class 1 Division 2) space. The dry well and above grade building are connected through the dry well access and are therefore considered a single air space. This air space is not ventilated continuously to the minimum standards to achieve an unclassified rating. Currently, the electrical equipment within the station is not rated for use in a Zone 2 space, therefore it is recommended that the ventilation system be upgraded to provide the necessary air changes to achieve an unclassified rating. Row 1 of Table 9.1.1.4 in the NFPA 820 requires a minimum of 12 air changes per hour to classify a wet well as a Zone 2 (or Class 1 Division 2) space. This lift station is unable to meet the required number of air changes per hour and is therefore classified as a Zone 1 space.

CSA C282 provides the standard for emergency electrical power supplies for buildings where emergency electrical supplies are required by the National Building Code of Canada, or for essential electrical systems such as health care facilities. Emergency power generation is not required at this facility under this definition and, therefore, it is not required that this installation adhere to the requirements of the CSA 282 standard. Table 8.2 provides a summary of the code review.

One meter clearance has not been maintained in front of the Motor Control Centre.

TABLE 8.2: ELECTRICAL CODE REVIEW			
YEAR CONSTRUCTED	1983		
LOCATION	1740 Portage Ave		
WET WELL			
HAZARDOUS LOCATION CLASSIFICATION	Zone 1		
CORROSIVE ENVIRONMENT CATEGORY	Category 1		
DRY WELL			
HAZARDOUS LOCATION CLASSIFICATION	Zone 2		
CORROSIVE ENVIRONMENT CATEGORY	Category 2		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
EXPLOSION PROOF INSTALLATION	Required	NO	CSA 22.1-15 CEC Section 18, NFPA 820
AIR CHANGES FOR UNCLASSIFIED RATING	6 air changes in dry well	NO	NFPA 820
AIR CHANGES FOR ZONE 2 RATING	12 air changes in wet well	NO	NFPA 820
CORROSIVE ENVIRONMENT WIRING	Required	NO	CSA 22.1-15 CEC Section 22
MINIMUM CLEARANCE	1 m Required	NO	CSA 22.1-15 CEC Section 2-308
MOTOR OVERCURRENT PROTECTION	Motor Breakers Adequate	YES	CSA 22.1-15 CEC Section 28-200
FEEDER OVERCURRENT PROTECTION	Service Breaker Adequate	YES	CSA 22.1-15 CEC Section 28-204
EMERGENCY POWER SUPPLY	Sufficient Capacity	N/A	CSA 22.1-15 CEC Section 46-202
EMERGENCY POWER SUPPLY	Onsite Fuel Storage	N/A	CSA C282 (Not Required)



8.3 Electrical Service Entrance Equipment

The electrical service is 600 VAC, 3 Phase, 200 Amp, 60 Hz service. The service is fed overhead via a pole mount transformer. The main service and associated equipment is mounted on the main level of the lift station. Riverbend lift station's main service utilizes a Klockner Moeller Motor Control Centre (MCC). City staff noted the MCC is original to the building with corrosion taking place on the buss bars due to past H₂S levels. Metering cabinet is located on the exterior of the building and does not have proper sealing around penetrations entering the structure. Currently there are no provisions at the Riverbend Lift Station for a temporary generator connection in the event of power outages. Table 8.3 provides a summary of the condition of the service equipment at the Riverbend Lift Station.

TABLE 8.3: RIVERBEND LIFT STATION SERVICE ENTRANCE EQUIPMENT CONDITION ASSESSMENT				
DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Motor Control Centre	600 VAC	Poor	Important	Short Term
Meter	600 VAC	Fair	Important	N/A

8.4 Cable and Conduit

The wiring style in Riverbend Lift Station is a mixture of threaded rigid conduit, Teck cable, and RPVC. RPVC does not meet Zone 2 requirements. Threaded rigid conduit is showing signs of corrosion on sub grade levels. Some fitting covers are missing allowing moisture and gasses to enter the conduit.



8.5 Motors

The lift station is equipped with two (2) pumps. Each pump is equipped with a 575 VAC 3 phase electric motor. Both P-101 and P-102 are equipped with a 60HP Westinghouse Electric motor. The Vent motor is a 115 VAC single phase electric motor. The pump motors for P-101 and P-102 appear to have been previously painted, likely to reduce corrosion affecting the motors. The motors were subject to high levels of H₂S gas prior to 2018. At that time, a piping upgrade was completed to eliminate the comminutor room. For that reason, the life expectancy of these motors has been substantially reduced. The two motors are in “Fair” condition. The vent motor appears to be in “Fair” condition. Taking into account the age of the motors and the harmful atmosphere they have endured throughout the years, it is recommended that motors for P-101 and P-102 be replaced once ventilation concerns have been addressed. Table 8.4 provides a summary of the condition of the motors at the Riverbend Lift Station.

TABLE 8.4: RIVERBEND LIFT STATION MOTOR CONDITION ASSESSMENT

DESCRIPTION	HORSEPOWER	CONDITION	IMPORTANCE	ACTION
P-101 Motor	60HP	Fair	Important	Short Term
P-102 Motor	60HP	Fair	Important	Short Term
Vent Motor	1/3HP	Fair	Important	Short Term

8.5.1 Motor Circuit Analysis/ HIPOT Testing

A motor circuit analysis was not conducted.

8.6 Full Voltage Starters

Each pump is equipped with a Full Voltage Non Reversing (FVNR) starter. The FVNRs appear to have had components replaced. The starters’ components appear to be in “Fair” condition. Due to the overall condition of the MCC and corrosion concerns with buss bars and at termination points the overall state of the FVNRs is “Poor”. Table 8.5 provides a summary of the condition of the starters at the Riverbend Lift Station.

TABLE 8.5: RIVERBEND LIFT STATION MOTOR STARTER CONDITION ASSESSMENT

DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
P-101 FVNR	600 VAC	Poor	Important	Short Term
P-102 FVNR	600 VAC	Poor	Important	Short Term

8.7 Transformers, Panelboards, and Distribution Equipment

Distribution Equipment is internal to the MCC. Distribution equipment has been replaced and appears to be in “Good” condition. The main lighting panel is fed from a 600VAC:120/208VAC step down transformer. The transformer has been replaced and appears to be in “Good” condition. The lighting panel is in “Good” condition. Corrosion is evident on wiring at the termination points for both the transformer and lighting panel. Table 8.6 provides a summary of the condition of the transformers, panelboard, and distribution equipment at Riverbend Lift Station.

8.7.1 Lighting

Lighting at the Riverbend lift station is outdated and does not comply with the recommended fixtures of LED or F32T8 set forth in the City of Winnipeg Design Guide. Exterior lighting above man doors would be recommended. The main floor fixture is tie wired in place rather than properly fastened. Currently, the fixture is mounted to the hoist rail, meaning that in order to use the rail the fixture would need to be lowered. The fixture directly below the stairs going down to the second level is no longer fastened to the wall and is held in place by the conduit it is affixed to.

8.7.2 Emergency Lighting

No emergency lighting was present in the Riverbend Lift Station. The Winnipeg Design Guide calls for emergency lighting in all facilities. Addition of adequate emergency lighting to each level of the lift station as required is recommended.

TABLE 8.6: RIVERBEND LIFT STATION TRANSFORMERS, PANELBOARDS, AND DISTRIBUTION EQUIPMENT CONDITION ASSESSMENT				
DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Main Lighting Panel	120/208VAC	Good	Intermediate	Short Term
Dry Type Transformer	600:120/208VAC	Good	Intermediate	Short Term
Building Envelope Lighting	120VAC	Poor	Intermediate	Short Term
Emergency Lighting	N/A	N/A	Intermediate	Short Term

8.8 Standby Power Generators and Engines

There is currently no connection means for standby power. It would be recommended to install a manual transfer switch for City Staff to connect their temporary generator to in the event of a power outage.

8.9 Conclusions

The major findings for the electrical equipment at the Riverbend Lift Station are summarized as follows:

- Although the components within the electrical system have been replaced, the equipment is in “Poor” condition due to deterioration taking place with the MCC and at all termination points.
- The dry well requires a ventilation upgrade in order for the existing electrical equipment to meet the Canadian Electrical Code.

8.10 Recommendations

8.10.1 Project 1: Electrical Upgrade (0-5 years)

The electrical system and equipment have endured substantial corrosion and are in “Poor” condition. A full electrical upgrade is recommended. Any upgrades should take into consideration the lack of redundancy at the Riverbend Lift Station by planning to maintain operation during upgrades and construction. Prior to and electrical upgrades, it is recommended to solve all heating and ventilation concerns so any new electrical equipment will not have a shortened life expectancy due to moisture and corrosive atmospheres.

8.11 Improvement Cost Estimates

The capital costs for the recommended improvements have been estimated and are summarized in Table 8.7. These upgrades will provide long-term benefits to waterworks system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 8.7: ELECTRICAL EQUIPMENT IMPROVEMENT COST ESTIMATES			
Item	Action	Description	Capital Cost
1	Short-Term	Electrical Upgrade	\$117,000
Total:			\$117,000

The capital costs for the recommended improvements have been *estimated in 2019 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. Refer to **Appendix E** for the complete details of the capital cost estimate.

9.0 Controls & Instrumentation Conditions Assessment

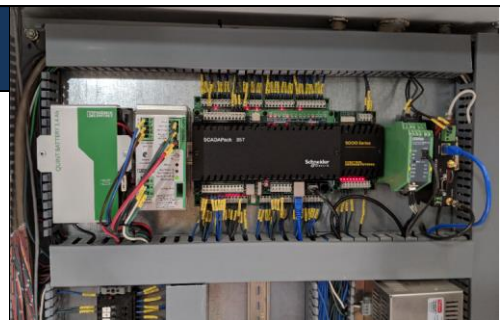
9.1 Background

This section provides an assessment of the controls and instrumentation equipment in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment, identifying future upgrades. Recommendations and project time frames are presented to assist the City in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

The Riverbend Lift Station control system consists of Schneider SCADAPack 357, and a Pressure Based Level Transmitter with a Float Level Switch.

TABLE 9.1: RIVERBEND LIFT STATION CONTROLS & INSTRUMENTATION OVERVIEW

YEAR CONSTRUCTED	1983
LOCATION	1740 Portage Ave
LAST AUTOMATION UPDATE	2014
CONTROLLER	SCADAPack 357
PROGRAMMING SOFTWARE	Telepace
COMMUNICATION TYPE	4G Cellular Communication with PSTN backup
SCADA SOFTWARE	N/A



9.2 Control Systems

The Riverbend Lift Station monitoring is handled by SCADAPack 357. The Remote Telemetry Unit (RTU) is used for monitoring and reporting only. Monitoring is done through the use of MTS 4G cellular communication with a Public Switched Telephone Network (PSTN) as backup. Pump control is achieved through the use of a Precision Digital. Currently, the station does not have control redundancy. This has been added to prior lift station upgrades and is a recommended upgrade at the Riverbend Lift Station. Field devices include one Pressure Based Level Transmitter and three Float Level Switch.

9.2.1 Manual Control

Manual controls are located on the main level of the lift station. Hand-Off-Auto switches are located on the front panel of each motor starter cubicle. Manual control is achieved by turning the local switch to the Hand position, the motor becomes locally controlled by operations. Manual controls are functional and in “Good” condition.

9.2.2 Programmable Logic Controllers (PLC) and Remote Telemetry Units (RTU)

The RTU controller in use at this lift station is a SCADAPack 357. While this RTU is capable of controlling the equipment at this lift station, it is only used to monitor the lift station. As a result, the station control is isolated from internet-connected devices. A PLC or RTU controller allows for custom lift station operation that can be programmed by any local integrator as well as the ability to adjust set points and operate pumps remotely if used for pump control. Future upgrades should evaluate if these functions are desired and options for securing communications should be explored at that time. The condition of the RTU controller is in “Good” condition. No physical degradation of the controller was noted.

9.2.3 Human Machine Interface (HMI)

Riverbend Lift Station is not equipped with an HMI.

9.2.4 Control Panel

The control panel is located on the main level of the lift station and contains the SCADA PACK 375 as well as all of the equipment required for reporting back to the SCADA system at McPhillips Control Centre. The general condition of this panel and the equipment it contains is “Good”. While wiring is run with cable management devices such as Panduit, it has not been maintained within the control panel. Terminations are secure and cabling appears to be in “Good” condition. Wire labelling is applied to both ends of the wire and device tagging has been used. It is recommended to separate signal cabling and unlike voltage sources to separate Panduit raceways.

9.2.5 SCADA

The RTU controller is integrated into the central SCADA application at the McPhillips Control Centre. Data collected by the RTU is transmitted via cellular communication to the SCADA application.

9.2.6 Communication Hardware

Communications to the Riverbend Lift Station are accomplished using MTS 4G cellular communication. A PTSN connection is still utilized as a backup communication method. The station reports alarms to the McPhillips Control Centre SCADA application via the communication link. A Sixnet cellular modem acts as the primary communication device enabling this link. The router is in “Good” condition.

Table 9.2 provides a summary of the condition of the control equipment at Riverbend Lift Station.

TABLE 9.2: RIVERBEND LIFT STATION CONTROL PANEL CONDITION ASSESSMENT				
CONTROL PANEL	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
Control Panel	Pump Controls and Monitoring	Good	Important	Short Term
Termination Panel	Weir and Flap Gate Monitoring	Good	Important	N/A
Communications Equipment	Sixnet Cellular Modem	Good	Important	N/A

9.3 Instrumentation

Instrumentation at the Riverbend Lift Station includes a Pressure Based Level Transmitter and float level switches located within the dry well and wet well. In general, the instrumentation is in “Fair” condition. Table 9.3 provides a summary of the condition of the instrumentation at the Riverbend Lift Station.

TABLE 9.3: RIVERBEND LIFT STATION INSTRUMENTATION CONDITION ASSESSMENT				
INSTRUMENTATION	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
LT-101	Level Transmitter	Fair	Important	Mid Term
LSHH-101	Building Flood Detector	Fair	Low	Mid Term
LSH-102	Wetwell High	Fair	Low	Mid Term
LSHH-102	Wetwell High High	Fair	Low	Mid Term

9.3.1 Process Control

9.3.1.1 Pumping

The primary process control device used at the Riverbend Lift Station is a pressure based level sensor. The condition of the level transmitter appears to be in “Fair” condition. There is currently no redundancy in case of instrument failure. Pumps start and stop based on the wet well level determined by these devices. It is recommended that a redundant ultrasonic level transmitter is installed to mitigate the risk of environmental damage and damage to property resulting from a flood situation.

9.3.2 Gas Monitoring

Riverbend Lift Station does not have continuous gas monitoring. Personal gas detection monitors are used by City staff within the Lift Station.

9.3.3 Process Monitoring

The wet well level is monitored continuously using the pressure based level transmitter. The wet well level is transmitted back to the central SCADA application where they are monitored by operations staff. Issues arising from out of normal values are highlighted with alarms and operations staff are notified to take action. The lift station does not include any devices for flow monitoring. It is recommended that a flowmeter complete with a totalizer is installed downstream of the pumping system to allow for continuous flow monitoring.

9.3.4 Building Monitoring

Building alarms, including flood detection are transmitted back to the central SCADA application. Operators are notified if an alarm condition exists and are able to take action to correct the alarm. No heat detector or low building temperature sensor is installed at this station; it is recommended that both of these devices be installed.

9.4 Pump Control Strategy & Reliability Review

9.4.1 Sanitary

The pump control strategy employed at this station is a basic level based pump control system. Each pump has a start level and a shut down level that are offset such that the additional pump is enabled as the level becomes higher. Multiple pumps increase system reliability; however, this system operates with only two pumps and does not have complete redundancy.

9.5 Conclusions

The major findings for the controls and instrumentation at Riverbend Lift Station are summarized as follows:

- The automation platform in use at this lift station is adequate for the needs of the station; however, it does not provide remote set point or remote pump control capability.
- No redundant level detector presents an environmental risk if the primary level detector fails.
- No continuous flow monitoring capabilities.
- No heat detectors or low building temperature sensors are installed. A Heat detector would provide advanced warning of fire at this lift station, along with low building temperature sensors alleviating the risk of freezing throughout the winter months.

9.6 Recommendations

9.6.1 Project 1: Install Building Alarm Instruments (0-5 years)

A heat detector and low building alarm should be installed to alert operators of fire or freezing conditions at the lift station. The alarms would be transmitted back to central SCADA system allowing operators to be notified and take corrective actions.

9.6.2 Project 2: Install a Redundant Level Transmitter (0-5 years)

There is no redundant level sensor. Lift stations pose an environmental risk if left to overflow and a redundant level sensor would provide some protection from this possibility in the case of a primary level sensor failure. It is recommended that an ultrasonic level transmitter be installed in case of the event the lift station experiences an instrument failure.

9.6.3 Project 3: Install Flow Transmitter (0-5 years)

Install a flow transmitter for continuous flow monitoring of the station allowing the City to assess pump performance along with providing the City with more data on flow outputs from the lift station for future planning.

9.7 Improvement Cost Estimates

The capital costs for the recommended improvements have been estimated and are summarized in Table 9.4. These upgrades will provide long term benefits to waterworks system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 9.4: CONTROLS & INSTRUMENTATION IMPROVEMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short-Term	Install Building Alarm Instruments	\$1,400
2	Short-Term	Install a Redundant Level Transmitter	\$16,800
3	Short-Term	Install Flowmeter at Force Main	\$16,800
Total:			\$35,000


The capital costs for the recommended improvements have been *estimated in 2019 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. Refer to **Appendix C** for the complete details of the capital cost estimate.

10.0 Dry & Wet Well Ventilation Review

10.1 Background

The Riverbend Lift Station ventilation system includes a supply fan located inside the building. The supply fan forces fresh air into the dry well lower level to create a positive pressure in the space. Air is then exhausted out by gravity through an exhaust stack located outside of the building. The dry well ventilation system is used intermittently when the building is occupied. There is no permanent wet well ventilation system in place. It was noted that there have been odour issues and corrosion is evident throughout the station. However, the recent installation of piping in the Comminutor Chamber has reduced odour and condensation. No major ventilation upgrades have been carried out at the lift station since its original construction. In general, the equipment is showing signs of aging and is in “Poor” condition. The Condition Assessment Forms have been appended to this report.

TABLE 10.1: RIVERBEND LIFT STATION VENTILATION OVERVIEW	
YEAR CONSTRUCTED	1958
ODOUR CONTROL	No
DRY WELL	
VENTILATION TYPE	Intermittent
VENTILATION RATE	1104 m ³ /hr
WET WELL	
VENTILATION TYPE	N/A
VENTILATION RATE	N/A



10.2 Ventilation Requirement Review

Table 10.2 provides a summary of the ventilation system at the Riverbend Lift Station.

TABLE 10.2: RIVERBEND LIFT STATION VENTILATION REQUIREMENTS						
VENTILATED AREA	VOLUME (m ³)	VENTILATION FREQUENCY	REQUIRED AIR CHANGES PER HOUR	REQUIRED VENTILATION RATE (m ³ /hr)	CURRENT VENTILATION RATE (m ³ /hr)	VENTILATION TYPE
Dry Well	251	Intermittent	30	7,540	1,104	Supply Fan
Wet Well	9	Intermittent	30	271	N/A	N/A

As illustrated in Table 10.2, the current dry well ventilation system is undersized to meet NFPA 820 and Ten States ventilation requirements of 30 air changes per hour when used intermittently. There is no wet well ventilation system in place.

10.3 Ventilation Equipment

10.3.1 Fans, Blowers, & Blower Heaters

The supply fan is original to the building and is in “Poor” condition. MPE tested the airflow from the supply fan intake louver using a portable anemometer to confirm building airflows. Table 10.3 provides a summary of the condition of the supply fan at the Riverbend Lift Station.

TABLE 10.3: RIVERBEND LIFT STATION FAN CONDITION ASSESSMENT				
EQUIPMENT	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
SF-101	1/6 HP Centrifugal Supply Fan	Poor	Important	Short Term

10.3.2 Intake and Exhaust Louvres and Dampers

The lift station includes a supply louver in the main level of the building and an exhaust stack outside the building. The louver and exhaust stack are in “Fair” operating condition.

10.3.3 Ventilation System Balancing

The ventilation system includes ducting for supply and exhaust in the dry well. No concerns were noted with pressurization in the dry well.



10.4 Odour Control System

The lift station is not fitted with an odour control system.

10.5 Conclusion

The major findings for the Ventilation System Assessment are summarized as follows:

- The dry well continuous ventilation system is undersized for the dry well fresh air requirements.
- There is no wet well ventilation system in place. Due to the small size of the wet well, it is recommended that a portable air supply system continue to be used for the wet well ventilation system.

10.6 Recommendations

10.6.1 Upgrade Dry Well Ventilation System (0-5 years)

In order to achieve the required ventilation rates, it is recommended that the existing ventilation system be upgraded. A continuous ventilation system will provide an unclassified NFPA 820 rating. The upgrades would include the installation of a blower heater that would connect to the existing ducting entering the dry vault to provide heated fresh air to the space to meet code requirements.

10.7 Improvement Cost Estimates

The capital costs for the recommended improvements are summarized in Table 10.4. These upgrades will provide long term benefits to the sewage works system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 10.4: RIVERBEND STATION VENTILATION SYSTEM IMPROVEMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short Term	Replace Ventilation System	\$40,000
TOTAL:			\$40,000

The capital costs for the recommended improvements have been *estimated in 2019 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes.

11.0 Recommendations

11.1 Recommended Projects

A list of recommended improvements has been prepared. For each recommended item, an “Action” was assigned based on an established methodology indicating the time period when the improvement should be completed.

Through the development of recommendations relative to system improvements or upgrades, projects were identified as either “Maintenance”, “Capital”, or “Study” projects. The differentiation between “Maintenance” and “Capital” projects was established based on our understanding of the scope of the project, project cost, and the assumed ability of the City to perform the work required utilizing in-house resources. Recommended improvements for the sewage lift station are presented in Table 11.1.

TABLE 11.1: SUMMARY OF RECOMMENDED IMPROVEMENTS - RIVERBEND LIFT STATION			
Item	Project Type	Action	Cost
Facility Condition Assessment			
Site Conditions			\$0
Foundations	Capital	Short Term	\$70,000
Primary Structural Systems	Capital	Short Term	\$80,000
Secondary Structural Systems	Capital	Short Term	\$76,000
Building Envelope	Capital	Mid Term	\$18,500
Roofing	Capital	Short Term	\$10,000
Building Mechanical			\$0
Subtotal:			\$254,500
Mechanical Equipment Condition Assessment			
Pump Replacements	Capital	Short Term	\$180,000
Valve Replacements	Capital	Short Term	\$30,000
Pipe Replacements	Capital	Short Term	\$32,000
Subtotal:			\$242,000
Electrical Equipment Condition Assessment			
Main Service	Capital	Short Term	\$45,000
Starters for P-101 & 102	Capital	Short Term	\$20,000
Motor Upgrades	Capital	Short Term	\$38,000
Distribution Panel	Capital	Short Term	\$4,000
Transformer	Capital	Short Term	\$10,000
Subtotal:			\$117,000
Controls & Instrumentation Condition Assessment			
Control Panel	Capital	Mid Term	\$33,600
Subtotal:			\$33,600
Dry & Wet Well Ventilation Review			
Dry Well Ventilation System Replacement	Capital	Short Term	\$40,000
Subtotal:			\$40,000
Total			
Total Estimated Cost - All Recommended Improvements:			\$687,100

All recommendations were given an associated cost to implement. Cost estimates provided were based on

engineering judgment for the component replacement value, and do not include ancillary costs associated with replacing a component. The cost estimates are intended to be used as a measure of comparing the lift stations, and are not intended to be used for budgetary numbers. Actual replacement costs will require further investigation.

11.2 Code Compliance & Safety Concerns

A prioritized list of the recommended improvements for the sewage lift station are presented in Table 11.2.

TABLE 11.2: CODE COMPLIANCE & SAFETY CONCERNS - RIVERBEND LIFT STATION	
Item Description	Type
Site Conditions	
Foundations	
Primary Structural Systems	
Roof panels are cracked	Safety
Secondary Structural Systems	
Stairs and rail to lower valve room should be replaced	Safety
Floor hatches have no hold open device, fall protection. Some hatches are covered only with plywood	Code Compliance
Building Envelope	
Roofing	
Building Mechanical	
There are no fire extinguishers	Code Compliance
Building Ventilation	

Appendix A

Facility Condition Assessment Forms



FACILITY CONDITION ASSESSMENT FORM
 FOUNDATION



SECTION	ITEM	DATA		ASSESSMENT SCORES			AGE		
		Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life		
Tag: STR_Foundations	GENERAL	CODE COMPLIANCE ISSUES:		3.6	3.3	4.0	1958	70	9
		SAFETY ISSUES: Access to lower level stairwell - Refer to Secondary Str Systems		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			3
	Current Physical Condition	Base Slab: <i>Issues for Discussion:</i> - Cracking, spalling, moisture infiltration - Evidence of settlements - Sump and Pump - Groundwater seepage deterioration - Effluorescence, salts from groundwater	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.3	NOTES & COMMENTS: Overall concrete was aged but in relatively sound condition other than the valve pit (confined space area) Lower level old wet chamber concrete has deteriorated from previous H ₂ S environment. Some aggregate in the valve pit is loose. Cracking in the walls was observed in the drywell. Concrete otherwise appeared sound in the drywell. Valve pit was retrofitted from an open pit to a valved area, functions adequate, but impractical to access. The concrete paste in the wet well is deteriorating and aggregate is exposed. No significant structural concerns.			
		Below Grade Exterior Walls, Columns and Beams: <i>Issues for Discussion:</i> - Cracking, spalling, moisture infiltration - Evidence of movement - Seepage through wet well wall	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.3				
		Wet Wells: <i>Issues for Discussion:</i> - Cracking, spalling, corrosion - Degredation at base of columns - Damage from equipment operation / removal	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.4				
	Fitness for Purpose	Base Slab: <i>Issues for Discussion:</i> - Sufficient space for equipment - Floor sloped sufficient to drain	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	4	0.3	RECOMMENDATIONS: Rehabilitate concrete surface in valve pit area within the next 3 years.		COST ESTIMATE \$ 70,000.00	
		Below Grade Exterior Walls, Columns and Beams: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4				
		Wet Wells: <i>Issues for Discussion:</i> - Interference with function or equipment removal	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3				
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davit, gear, hatch locations)	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	4	1				
	PHOTOGRAPHS								



FACILITY CONDITION ASSESSMENT FORM
 PRIMARY STRUCTURAL SYSTEMS



SECTION	ITEM	DATA		ASSESSMENT SCORES			AGE		
		Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life		
Tag: STR_Primary_Str_Systems	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:		3.0	3.3	3.0	1958	50	0
	Current Physical Condition	Loadbearing walls, columns, beams: <i>Issues for Discussion:</i> - Deterioration of concrete - Corrosion of steel (beams, column base, anchors...)		3	0.4	NOTES & COMMENTS: Exposed corroded rebar in suspended slabs. Mid level floors were in fair condition. Structurally sound. Holes through the floor minimally reduce the design load capacity. Concrete roof panels have excessive deflection possibly due to long term loading (snow). Notable cracking along the tension face (bottom side) was observed. Deflection has resulted in ponding water on the roof, subsequently increasing the loading. Potential for failure if not mitigated. Exterior walls were lined with insulation panels. Above grade wall structure was not assessed.			
		Trusses and Joists: <i>Issues for Discussion:</i> - Corrosion		3	0.3				
		Suspended Floors: <i>Issues for Discussion:</i>		3	0.3				
		Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)							
	Fitness for Purpose	Loadbearing walls, columns, beams: <i>Issues for Discussion:</i> - Suitable access to equipment, levels - Compliance with Codes and Standards		3	0.4	RECOMMENDATIONS: Replace roof panels	COST ESTIMATE \$ 80,000.00		
		Trusses and Joists: <i>Issues for Discussion:</i> - Clearance		4	0.3				
		Suspended Floors: <i>Issues for Discussion:</i> - Sufficient Space for layout		3	0.3				
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davit, gear, hatch locations)		3	1				
	PHOTOGRAPHS								

SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE				
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life		
Tag: STR_Secondary_Str_Systems	GENERAL	<p>CODE COMPLIANCE ISSUES: Plywood is used to cover an opening rather than a hatch. Other hatches have holes. Hatches are not Code compliant.</p> <p>SAFETY ISSUES: The lower level stairs and rails are in danger of collapse.</p>	4.4	3.2	5.0	1958	35	0		
	Current Physical Condition	<p>Stairs, Ladders, Catwalks, Rails, Hatches: <i>Issues for Discussion:</i> - Corrosion of material, anchors - Hatch seals, operability, locks</p> <p>Interior walls, Ceiling, Supports, Equipment Base: <i>Issues for Discussion:</i></p> <p>Finishes: <i>Issues for Discussion:</i> - Floor, wall, ceiling paint. Finishes on doors, etc</p> <p>Monorails and Hoists: <i>Issues for Discussion:</i> - Corrosion, anchor bolts, labels - Corrosive atmosphere</p>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	5	0.5	<p>NOTES & COMMENTS: Lower stairwell to valve pit is critically corroded and in danger of collapse. Handrail is not attached to any support structure. Floor finishes are completely worn off. Wall finishes are generally still intact. Sections of the wall lining require repair work in the lower levels. Monorail anchor brackets / bolts are significantly corroded. Lifting lug in lower valve room is corroded. Plywood hatch to lower level is not Code compliant. Plywood is not suitable to support Live Load requirements. Steel floor hatches require hold open device, fall prevention, and ability to prevent lid from falling through. Holes in large hatch are not Code compliant as they would not support live loading requirements.</p>				
	Fitness for Purpose	<p>Stairs, Ladders, Catwalks, Rails, Hatches: <i>Issues for Discussion:</i> - Corrosion resistance of material - Suitable access to equipment, levels - Compliance with Codes and Standards</p> <p>Interior walls, Ceiling, Supports, Equipment Base: <i>Issues for Discussion:</i></p> <p>Finishes: <i>Issues for Discussion:</i> - Floor and wall protection.</p> <p>Monorails and Hoists: <i>Issues for Discussion:</i> - Transport of equipment to accessible area - Certificated by others</p>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.5					
	Safety	<p>Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davit, gear, hatch locations)</p>	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	5	1					
							<p>RECOMMENDATIONS: Replace stairs and handrail to lower valve room.</p> <p>Replace monorail and lugs</p> <p>Replace floor finishes</p> <p>Repair sections of wall finishes</p> <p>Replace floor hatches</p>	<p>COST ESTIMATE</p> <p>\$ 10,000.00</p> <p>\$ 4,000.00</p> <p>\$ 35,000.00</p> <p>\$ 12,000.00</p> <p>\$ 15,000.00</p>		
	PHOTOGRAPHS									

SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life
Tag: STR_Building_Envelope	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.6	3.4	3.0	1958	N/A	N/A
	Current Physical Condition	Exterior Siding, Windows, Doors: <i>Issues for Discussion:</i> - Weathering, deterioration - Door swing, seals, locks - Graffiti, vandalism - UV breakdown	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.4	NOTES & COMMENTS: Rigid insulation added to interior with no vapour barrier or protection board. Potential condensation behind the insulation. No interior liner. Building exterior paint is delaminating from the brick. Penetrations through the exterior wall are not all sealed. Door is at the end of its useful life. Weatherstripping is worn. Water staining around rigid insulation panels indicates water leakage through the roof, or buildup of condensation behind the insulation.		
		Insulation, Vapour Barrier, Interior Liner: <i>Issues for Discussion:</i> - Interior frost, condensation	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.4			
		Flashings, Soffits, Sealants, Weatherstripping: <i>Issues for Discussion:</i> - UV breakdown	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	2	0.2			
	Fitness for Purpose	Exterior Siding, Windows, Doors: <i>Issues for Discussion:</i> - Door size, durability of siding	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4	RECOMMENDATIONS: Replace exterior door \$ 3,500.00 Seal exterior penetrations \$ 500.00 Install vapour barrier and interior liner on walls and ceiling \$ 12,000.00 Repair exterior paint. \$ 2,500.00		
		Insulation, Vapour Barrier, Interior Liner: <i>Issues for Discussion:</i> - Adequate insulation, durability of liner	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	4	0.4			
		Flashings, Soffits, Sealants, Weatherstripping: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.2			
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1			
	PHOTOGRAPHS							

SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE					
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life			
Tag: STR_Roofing	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.5	2.8	3.0	1958	N/A	N/A			
	Current Physical Condition	Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.5	NOTES & COMMENTS: The roofing membrane appears to be in good condition. Due to the flexure of the support structure, the water on the roof is not able to drain to the corner drain. Ponding is considerable, and will result in leakage.					
		Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.3						
		Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.2						
	Fitness for Purpose	Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.5	RECOMMENDATIONS: Replace roofing system with the replacement of the roofing structure.					
		Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3				COST ESTIMATE \$ 10,000.00		
		Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	2	0.2						
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Roof Tie-off	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1						
	PHOTOGRAPHS										



FACILITY CONDITION ASSESSMENT FORM
 BUILDING MECHANICAL



SECTION	ITEM	DATA	ASSESSMENT SCORES				AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life	
Tag: STR_Building_Mechanical	GENERAL	CODE COMPLIANCE ISSUES: There is no apparent Fire Suppression System	3.6	3.6	3	1959	25	0	
		SAFETY ISSUES:	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			3	
	Current Physical Condition	Heating and Ventilation Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.3	NOTES & COMMENTS: No apparent Fire Suppression System. Wall mount unit heater in lower level. Portable heater on floor in building main level.			
		Interior Plumbing: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.4				
		Fire Suppression Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	5	0.3				
	Fitness for Purpose	Heating and Ventilation Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3	RECOMMENDATIONS:		COST ESTIMATE	
		Interior Plumbing: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4	Install handheld fire extinguisher	\$	500.00	
		Fire Suppression Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	5	0.3	Install wall mount unit heater c/w thermostat in building main level.	\$	1,500.00	
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Monitors, Alarms	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1				
	PHOTOGRAPHS								



VENTILATION CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE		
			Current Physical Condition	Fitness For Purpose	Safety	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Tag: VENTILATION SYSTEM	GENERAL	<p>VENTILATION SYSTEMS: - Wet Well, Dry Well</p> <p><u>CODE COMPLIANCE ISSUES:</u> Dry well ventilation system is undersized to meet NFPA 820 ventilation requirements</p> <p><u>SAFETY ISSUES:</u></p>	4	4	3	1959		0
	Current Physical Condition	<p>Wet Well Ventilation <i>Issues for Discussion:</i></p> <p>Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)</p> <p>Dry Well Ventilation <i>Issues for Discussion:</i></p> <p>Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)</p>	0	0	<p><u>NOTES & COMMENTS:</u> - No wet well ventilation system. - Dry well ventilation system has exceeded its expected service life. - Dry well ventilation system is undersized to meet NFPA 820 ventilation requirements of 30 air changes per hour when used intermittently.</p>			
	Fitness for Purpose	<p>Wet Well Ventilation <i>Issues for Discussion:</i></p> <p>Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)</p> <p>Dry Well Ventilation <i>Issues for Discussion:</i></p> <p>Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)</p>	0	0	<p><u>RECOMMENDATIONS:</u> - Replace Dry Well Ventilation System</p>		<p><u>COST ESTIMATE</u> \$ 40,000.00</p>	
	Safety	<p>Operator Safety <i>Issues for Discussion:</i> - Monitors, Alarms</p> <p>Rating 1: No safety hazard conditions Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks</p>	3	1				
	PHOTOGRAPHS							

Appendix B

Pumps Condition Assessment Forms



PUMP CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
GENERAL	Location: Dry Well Lower Level Type: 60 HP Dry Pit Solids Handling Pump Description: Dry Pit Solids Handling Manufacturer: Fairbanks Morse Model: B5414 RPM: 1160 Rated Voltage: 575 Rated Current: 57.7		4.0	1.8	2.9		1983	25	0	
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
			VIBRATION (in/s)			X	Y	Z		
			Motor			0.02	0.01	0.01		
			Volute			0	0	0.13		
			NOTES & COMMENTS:							
			Pump is at the end of its service life.							
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.2					
		Equipment Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	Severe corrosion noted on pump.				
		Condition of Pump Accessories: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.1	Pump frequently plugs.				
		Rebuild Potential of Pump: Issues for Discussion:	Rating 1 (N/A - Pump is New) Rating 2 (Pump Re-Build Feasible) Rating 3 (Pump Rebuild / Replace Equally Feasible) Rating 4 (Approaching End of Useful Life) Rating 5 (At or Surpassed Useful Life)	5	0.2	The pumping system is capable of meeting the peak wet weather influent flow requirements.				
		Occurrence of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	4	0.3	Pump models are dated and spare parts are not readily available.				
	Fitness for Purpose	Design Flow Rate: Issues for Discussion:	Rating 1 (Pump consistently provides design flow rate) Rating 2 (Pump consistently provides +/- 10% of design flow rate) Rating 3 (Pump consistently provides +/- 25% of design flow rate) Rating 4 (Pump performance a potential issue during high flow events) Rating 5 (Pump performance a critical issue)	3	0.2					
		Pump Redundancy: Issues for Discussion:	Rating 1 (100% Redundancy) Rating 3 (50% Redundancy) Rating 5 (No Redundancy. Risk of Critical Failure)	1	0.2					
		Appropriate Pump Type for Application: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper pump selection for application. Risk of Critical Failure)	1	0.2					
Available Water Supply for Pumps (If Required): Issues for Discussion:		Rating 1 (Yes) Rating 2 (No - Not required for installed pumping equipment) Rating 3 (Yes - Flow / pressure inadequate for installed pumping equipment) Rating 4 (No - Available source on site but not connected) Rating 5 (No - No available source)	2	0.1						
Pump Capacity: Issues for Discussion:		Rating 1 (Pump has sufficient capacity for current and projected demand conditions) Rating 2 (Pump has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Pump has sufficient capacity) Rating 4 (Pump does not meet current demand condition) Rating 5 (Pump is critically undersized and likelihood of station backup is high)	2	0.3						
Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:		Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	3	0.25						
Maintainability and Operability	Piping/Equipment Interference with Pump Removal: Issues for Discussion:	Rating 1 (No interference) Rating 2 (Yes - Some minor piping/equipment interference with pump removal) Rating 3 (Yes - Piping/equipment interference causes minor alteration of work method) Rating 4 (Yes - Piping/equipment interference causes major alteration of work method) Rating 5 (Yes - Piping/equipment interference prevents safe removal of pumps)	3	0.2						
	Provision of Direct Lift Spot for Pump Removal: Issues for Discussion:	Rating 1 (Yes - Accessible unobstructed direct lift spot for pump removal) Rating 2 (Yes - Accessible direct lift spot for pump removal, with minor obstructions) Rating 3 (Yes - Direct lift spot with limited access and minor obstructions) Rating 4 (Yes - Direct lift spot with difficult access and major obstructions) Rating 5 (No provision for direct pump removal)	3	0.1						
	Pumping Equipment Uniformity: Issues for Discussion:	Rating 1 (Yes - All installed pumps are identical model and duty point) Rating 2 (Yes - All installed pumps are identical model with varying duty points) Rating 3 (No - All installed pumps are different models, but same manufacturer) Rating 4 (No - All installed pumps are different models and different manufacturers) Rating 5 (No - Pump record information (design duty point) is not known)	1	0.2						
	Availability of Spare Parts: Issues for Discussion:	Rating 1 (Yes - Spare parts readily available with < 6 week lead time) Rating 2 (Yes - Spare parts readily available with 6-8 week lead time) Rating 3 (Yes - Spare parts readily available with > 8 week lead time) Rating 4 (Yes - Select spare parts available with varying lead times) Rating 5 (No - Spare parts no longer available for this equipment)	4	0.25						
PHOTOGRAPHS										
	RECOMMENDATIONS									
	Replace Pump									
	COST ESTIMATE \$ 90,000.00									



PUMP CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
GENERAL	Location: Dry Well Lower Level Type: 60 HP Dry Pit Solids Handling Pump Description: Dry Pit Solids Handling Manufacturer: Fairbanks Morse Model: B5414 RPM: 1160 Rated Voltage: 575 Rated Current: 57.7		4.0	1.8	2.9		1983	25	0	
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
			VIBRATION (in/s)			X	Y	Z		
			Motor			0.06	0.04	0.02		
			Volute			0.04	0.03	0.06		
			NOTES & COMMENTS:							
			Pump is at the end of its service life.							
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.2					
		Equipment Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	Severe corrosion noted on pump.				
		Condition of Pump Accessories: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.1	Pump frequently plugs.				
		Rebuild Potential of Pump: <i>Issues for Discussion:</i>	Rating 1 (N/A - Pump is New) Rating 2 (Pump Re-Build Feasible) Rating 3 (Pump Rebuild / Replace Equally Feasible) Rating 4 (Approaching End of Useful Life) Rating 5 (At or Surpassed Useful Life)	5	0.2	The pumping system is capable of meeting the peak wet weather influent flow requirements.				
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	4	0.3	Pump models are dated and spare parts are not readily available.				
	Fitness for Purpose	Design Flow Rate: <i>Issues for Discussion:</i>	Rating 1 (Pump consistently provides design flow rate) Rating 2 (Pump consistently provides +/- 10% of design flow rate) Rating 3 (Pump consistently provides +/- 25% of design flow rate) Rating 4 (Pump performance a potential issue during high flow events) Rating 5 (Pump performance a critical issue)	3	0.2					
		Pump Redundancy: <i>Issues for Discussion:</i>	Rating 1 (100% Redundancy) Rating 3 (50% Redundancy) Rating 5 (No Redundancy. Risk of Critical Failure)	1	0.2					
		Appropriate Pump Type for Application: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper pump selection for application. Risk of Critical Failure)	1	0.2					
Available Water Supply for Pumps (If Required): <i>Issues for Discussion:</i>		Rating 1 (Yes) Rating 2 (No - Not required for installed pumping equipment) Rating 3 (Yes - Flow / pressure inadequate for installed pumping equipment) Rating 4 (No - Available source on site but not connected) Rating 5 (No - No available source)	2	0.1						
Pump Capacity: <i>Issues for Discussion:</i>		Rating 1 (Pump has sufficient capacity for current and projected demand conditions) Rating 2 (Pump has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Pump has sufficient capacity) Rating 4 (Pump does not meet current demand condition) Rating 5 (Pump is critically undersized and likelihood of station backup is high)	2	0.3						
Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>		Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	3	0.25						
Maintainability and Operability	Piping/Equipment Interference with Pump Removal: <i>Issues for Discussion:</i>	Rating 1 (No interference) Rating 2 (Yes - Some minor piping/equipment interference with pump removal) Rating 3 (Yes - Piping/equipment interference causes minor alteration of work method) Rating 4 (Yes - Piping/equipment interference causes major alteration of work method) Rating 5 (Yes - Piping/equipment interference prevents safe removal of pumps)	3	0.2						
	Provision of Direct Lift Spot for Pump Removal: <i>Issues for Discussion:</i>	Rating 1 (Yes - Accessible unobstructed direct lift spot for pump removal) Rating 2 (Yes - Accessible direct lift spot for pump removal, with minor obstructions) Rating 3 (Yes - Direct lift spot with limited access and minor obstructions) Rating 4 (Yes - Direct lift spot with difficult access and major obstructions) Rating 5 (No provision for direct pump removal)	3	0.1						
	Pumping Equipment Uniformity: <i>Issues for Discussion:</i>	Rating 1 (Yes - All installed pumps are identical model and duty point) Rating 2 (Yes - All installed pumps are identical model with varying duty points) Rating 3 (No - All installed pumps are different models, but same manufacturer) Rating 4 (No - All installed pumps are different models and different manufacturers) Rating 5 (No - Pump record information (design duty point) is not known)	1	0.2						
	Availability of Spare Parts: <i>Issues for Discussion:</i>	Rating 1 (Yes - Spare parts readily available with < 6 week lead time) Rating 2 (Yes - Spare parts readily available with 6-8 week lead time) Rating 3 (Yes - Spare parts readily available with > 8 week lead time) Rating 4 (Yes - Select spare parts available with varying lead times) Rating 5 (No - Spare parts no longer available for this equipment)	4	0.25						
PHOTOGRAPHS										
	RECOMMENDATIONS									
	Replace Pump									
	COST ESTIMATE \$ 90,000.00									

Appendix C

Electrical & Communication Condition Assessment Forms

Project No.: 8400-001-00
 Tag: IC_101_Panel
 Facility: Riverbend Lift Station
 Assessment Page 1 of 1



CONTROL PANEL CONDITION ASSESSMENT FORM



Assessor: Richard Ofstie/Doug Grant
 Date: 23-Aug-19

Asset ID:

SECTION	ITEM	DATA	Assessment Scores				Component Age			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_101_Panel Description: IC_101_Panel	GENERAL	Location: Dry Well, Main Level	3.2	1.4			2014	30	25	
		Description: IC_101_Panel								
		Function: Station Monitoring								
		PLC Processor: SCADAPack 357								
	UPS Protection: Yes	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. Equipment is not rated for classified locations. Wiring methods do not follow provided raceway. Panduit cover has been removed. No level redundancy or flow measure capabilities. RECOMMENDATIONS: Incorporate redundant level control for the lift station. Install a flow transmitter for continuous flow monitoring. Install building alarms (heat, ambient temperature, intrusion, etc.) COST ESTIMATE \$ 35,000.00				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Controls Functioning as Expected: Issues for Discussion:	Rating 1 (Always) Rating 2 (More than half of time) Rating 3 (Half of the time) Rating 4 (Less often than half) Rating 5 (Never)	1	0.3					
Fitness for Purpose	Panel is Appropriately Designed: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.1						
	Control Logic is Appropriate for Installation: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3						
	Communications Equipment is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1						
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.2						
PHOTOGRAPHS										


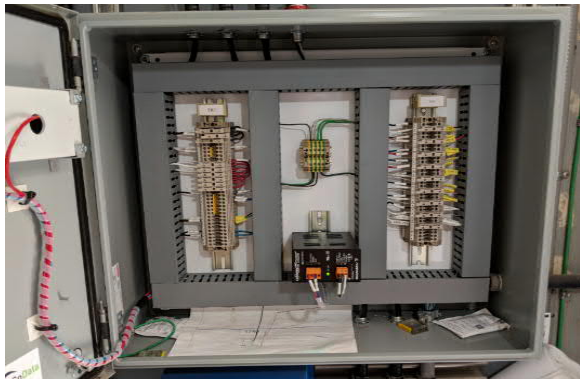
Project No.: 8400-001-00
 Tag: IC_102_Panel
 Facility: Riverbend Lift Station
 Assessment Page 1 of 1



CONTROL PANEL CONDITION ASSESSMENT FORM



Assessor: Richard Ofstie/Doug Grant
 Date: 23-Aug-19
 Asset ID:

SECTION	ITEM	DATA	Assessment Scores				Component Age							
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE					
Equipment Tag: IC_102_Panel Description: IC_102_Panel	GENERAL	Location: Dry Well, Main Level	1.4	1.2			2014	30	25					
		Description: IC_102_Panel												
		Function: Weir and Flap Gate Monitoring												
		PLC Processor: N/A												
		UPS Protection: No												
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4							
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. RECOMMENDATIONS: COST ESTIMATE								
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4									
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1									
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4									
		Controls Functioning as Expected: Issues for Discussion:	Rating 1 (Always) Rating 2 (More than half of time) Rating 3 (Half of the time) Rating 4 (Less often than half) Rating 5 (Never)	1	0.3									
	Fitness for Purpose	Panel is Appropriately Designed: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1									
		Control Logic is Appropriate for Installation: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3									
		Communications Equipment is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1									
		Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.2									
PHOTOGRAPHS														

Project No.: 8400-001-00
 Tag: IC_101_UPS
 Facility: Riverbend Lift Station
 Assessment Page 1 of 1



UPS CONDITION ASSESSMENT FORM



Assessor: Richard Ofstie/Doug Grant
 Date: 23-Aug-19



Asset ID:

SECTION	ITEM	DATA	Assessment Scores				Component Age			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_101_UPS Description: IC_101_UPS	GENERAL	Location: Dry Well, Main Level	1.4	1.8			2014	15	10	
		Description: IC_101_UPS								
		Make: Phoenix								
		Model: Quint-BAT/24DC/3.4AH								
		Rated VA:								
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. RECOMMENDATIONS: Maintain routine maintenance checks and replace battery as required. COST ESTIMATE				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
UPS system is Present & Designed Appropriately: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.2						
Fitness for Purpose	UPS External Maintenance Bypass is Installed: Issues for Discussion:	Rating 1 (Yes) Rating 5 (No)	5	0.1						
	UPS Redundancy is Required / Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1						
	UPS is Sized Appropriately: Issues for Discussion:	Rating 1 (Yes) Rating 3 (Load > 80% or Runtime below design guidelines) Rating 5 (Load and Runtime outside guidelines)	1	0.2						
	UPS Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.4						
PHOTOGRAPHS										



INSTRUMENTATION CONDITION ASSESSMENT FORM





SECTION	ITEM	DATA	Assessment Scores				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_101_Level_Unit Description: IC_101_Level_Unit	GENERAL	Location: Dry Well, Main Level	1.4	1.5			2014	20	15	
		Description: IC_101_Level_Unit								
		Make: Precision Digital								
		Model: PD6000-7R4								
		Device Span:								
		Input/Output: Output								
		Signal Type: 4-20mA								
	Rated Voltage: 24 VDC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Instrument/Measurement is Designed Appropriately: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3	RECOMMENDATIONS: COST ESTIMATE				
		Instrument Redundancy is Required/Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1					
		Instrument Range is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
Instrument Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.5						
PHOTOGRAPHS										



INSTRUMENTATION CONDITION ASSESSMENT FORM


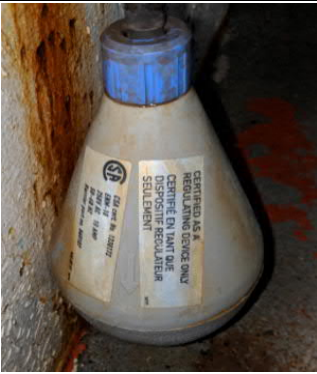


SECTION	ITEM	DATA	Assessment Scores				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: IC_101_Level_Transmitter Description: IC_101_Level_Transmitter	GENERAL	Location: Dry Well, Sub Grade	1.5	2.4			2010	20	11
		Description: IC_101_Level_Transmitter							
		Make: Rosemount							
		Model: 1151 Pressure based level transmitter							
		Device Span: 0-150 in H2O							
		Input/Output: Input							
		Signal Type: 4-20mA							
	Rated Voltage: 24VDC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipment is starting to show signs of surface corrosion and is in "Fair" Condition. Currently no level redundancy in the case of equipment failure.			
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4				
Control Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
Fitness for Purpose	Instrument/Measurement is Designed Appropriately: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3	RECOMMENDATIONS: Have a redundant Ultrasonic Level Transmitter installed.				
	Instrument Redundancy is Required/Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	5	0.1					
	Instrument Range is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
	Instrument Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5					
PHOTOGRAPHS									



INSTRUMENTATION CONDITION ASSESSMENT FORM






SECTION	ITEM	DATA	Assessment Scores			AGE			
			Current Physical Condition	Fitness For Purpose		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_101_FLYGT Description: IC_101_FLYGT	GENERAL	Location: Dry Well, Sub Grade	1.5	2.0			2010	20	11
		Description: IC_101_FLYGT							
		Make: Xylem							
		Model: ENM-10							
		Device Span: 0.95-1.10g/cm3							
		Input/Output: Input							
		Signal Type: Discrete							
	Rated Voltage: 250VAC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipments appears to be in "Fair" condition. Associated fastening hardware is severely corroded RECOMMENDATIONS: Maintain routine maintenance checks to ensure device is operational. Replace Flygt Ball as required. COST ESTIMATE			
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4				
Control Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
Instrument/Measurement is Designed Appropriately: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3					
Fitness for Purpose	Instrument Redundancy is Required/Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1					
	Instrument Range is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
	Instrument Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5					
PHOTOGRAPHS									



INSTRUMENTATION CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	Assessment Scores				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_102_FLYGT Description: IC_102_FLYGT	GENERAL	Location: Comm Room	1.5	2.0			2010	20	11	
		Description: IC_102_FLYGT								
		Make: Xylem								
		Model: ENM-10								
		Device Span: 0.95-1.10g/cm3								
		Input/Output: Input								
		Signal Type: Discrete								
	Rated Voltage: 250VAC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipments appears to be in "Fair" condition. RECOMMENDATIONS: Maintain routine maintenance checks to ensure device is operational. Replace Flygt Ball as required. COST ESTIMATE				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Instrument/Measurement is Designed Appropriately: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3					
	Fitness for Purpose	Instrument Redundancy is Required/Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1					
		Instrument Range is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
Instrument Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5						
PHOTOGRAPHS	  									



INSTRUMENTATION CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	Assessment Scores				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_103_FLYGT Description: IC_102_FLYGT	GENERAL	Location: Comm Room	1.5	2.0			2010	20	11	
		Description: IC_102_FLYGT								
		Make: Xylem								
		Model: ENM-10								
		Device Span: 0.95-1.10g/cm3								
		Input/Output: Input								
		Signal Type: Discrete								
	Rated Voltage: 250VAC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipments appears to be in "Fair" condition.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Control Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Instrument/Measurement is Designed Appropriately: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3					
	Fitness for Purpose	Instrument Redundancy is Required/Installed: Issues for Discussion:	Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1	RECOMMENDATIONS: Maintain routine maintenance checks to ensure device is operational. Replace Flygt Ball as required.				
		Instrument Range is Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
Instrument Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5						
PHOTOGRAPHS										

Appendix D

Pipe Work & Valves Condition Assessment Forms



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: GAV_101A Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	2.0		1983	25	0
		Description: Gate Valve							
		Size: 250 mm							
		Valve Make: Jenkins							
		Valve Model: 454							
		Actuation: Manual - Handwheel							
		Actuator Make: N/A							
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i> Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)		4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		3	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 6,000.00			
	Valve Capacity: <i>Issues for Discussion:</i> Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
PHOTOGRAPHS									



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_101B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	2.0		1983	25	0	
		Description: Gate Valve								
		Size: 250 mm								
		Valve Make: Jenkins								
		Valve Model: 454								
		Actuation: Manual - Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	3	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 6,000.00			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
PHOTOGRAPHS										



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_102A Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	2.0		1983	25	0	
		Description: Gate Valve								
		Size: 250 mm								
		Valve Make: Jenkins								
		Valve Model: 454								
		Actuation: Manual - Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	3	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 6,000.00			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
PHOTOGRAPHS										



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_102B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	2.0		1983	25	0	
		Description: Gate Valve								
		Size: 250 mm								
		Valve Make: Jenkins								
		Valve Model: 454								
		Actuation: Manual - Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	3	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 6,000.00			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
PHOTOGRAPHS										



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_201 Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	1.00	1.0	1.0		2018	25	24	
		Description: Gate Valve								
		Size: 500 mm								
		Valve Make: Clow								
		Valve Model: Series 50								
		Actuation: Manual - Handwheel c/w Valve Extension								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	1	0.2	NOTES & COMMENTS: Valve is in excellent condition				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	1	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)	1	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	1	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										



VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: CHV_101 Description: Check Valve	GENERAL	Location: Dry Well Lower Level	1.0	1.0	2.0		2018	25	24
		Description: Check Valve							
		Size: 250 mm							
		Valve Make: GA Industries							
		Valve Model: 8-FIG200							
		Actuation: N/A							
		Actuator Make: N/A							
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	1	0.2	NOTES & COMMENTS: Valve is in excellent condition				
		Valve Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	1	0.2					
Valve Operation: <i>Issues for Discussion:</i> Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)		1	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		1	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE			
	Valve Capacity: <i>Issues for Discussion:</i> Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
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VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: CHV_102 Description: Check Valve	GENERAL	Location: Dry Well Lower Level	4.2	1.0	2.0		1983	25	0	
		Description: Check Valve								
		Size: 250 mm								
		Valve Make: Check Rite								
		Valve Model: DBY								
		Actuation: N/A								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (New) Rating 2 (Good condition, functions well) Rating 3 (Fair condition) Rating 4 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Extensive corrosion) Rating 5 (Corrosion affects operability)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (New) Rating 2 (Valve functions well) Rating 3 (Functions but with difficulty) Rating 4 (Valve operable but exceeds service life) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	4	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7	Replace Valve	\$	6,000.00			
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
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PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE												
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE										
Equipment Tag: P_Influent Description: Influent Line	GENERAL	Location: Dry Well	1.00	1.8	1.00		2018	50	49										
		Description: Influent Line																	
		Size: 500 mm																	
		Material: Carbon Steel																	
		Service: Sewage																	
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5													
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.3	NOTES & COMMENTS: No flow meter installed.														
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.4															
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0															
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3															
	Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3						RECOMMENDATIONS: COST ESTIMATE									
		Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2															
		Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1															
	Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4															
		Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	1	0.6															
Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)		1	0.4																
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PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: P_P101_Suction Description: P-101 Suction Line	GENERAL	Location: Dry Well Lower Level	3.1	1.8	1.6		1983	50	14		
		Description: P-101 Suction Line									
		Size: 250 mm									
		Material: Cast Iron									
		Service: Sewage									
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5					
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.3	NOTES & COMMENTS: Piping is nearing the end of its service life. Severe corrosion noted on piping. No flowmeter installed.						
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4							
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0							
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3							
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 4,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4								
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4								
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PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: P_P102_Suction Description: P-102 Suction Line	GENERAL	Location: Dry Well Lower Level	3.1	1.8	1.6		1983	50	14	
		Description: P-102 Suction Line								
		Size: 250 mm								
		Material: Cast Iron								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.3	NOTES & COMMENTS: Piping is nearing the end of its service life. Severe corrosion noted on piping. No flowmeter installed.					
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4						
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0						
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2	RECOMMENDATIONS: Replace Piping						COST ESTIMATE \$ 4,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1							
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4							
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6							
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4							
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PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: P_P101_Discharge Description: P_101_Discharge Line	GENERAL	Location: Dry Well Lower Level	3.1	1.8	1.6	1983	50	14	
		Description: P-101 Discharge Line							
		Size: 250 mm							
		Material: Carbon Steel / Stainless Steel							
		Service: Sewage							
	Coating: Epoxy / Uncoated Stainless Steel	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.3	NOTES & COMMENTS: Piping is nearing the end of its service life. A section of the piping was recently replaced with stainless steel piping. Severe corrosion noted on carbon steel sections of piping. No flowmeter installed.				
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4					
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0					
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3					
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping				COST ESTIMATE \$ 7,000.00	
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1						
	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4						
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PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: P_P102_Discharge Description: P_102 Discharge Line	GENERAL	Location: Dry Well Lower Level	3.1	1.8	1.6		1983	50	14		
		Description: P-102 Discharge Line									
		Size: 250 mm									
		Material: Carbon Steel									
		Service: Sewage									
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5					
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.3	NOTES & COMMENTS: Piping is nearing the end of its service life. Severe corrosion noted on piping. No flowmeter installed.						
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4							
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0							
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3							
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 7,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4								
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4								
PHOTOGRAPHS											



PIPING CONDITION ASSESSMENT FORM




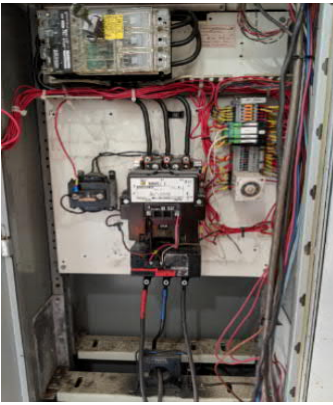

Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: P_Discharge_HDR Description: Discharge Header	GENERAL	Location: Dry Well Lower/Mid Level	3.1	1.8	1.6		1983	50	14	
		Description: Discharge Header								
		Size: 250 mm								
		Material: Carbon Steel								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	3	0.3	NOTES & COMMENTS: Piping is nearing the end of its service life. Severe corrosion noted on piping. No flowmeter installed.					
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4						
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0						
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2	RECOMMENDATIONS: Replace Piping						COST ESTIMATE \$ 10,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1							
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4							
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6							
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4							
PHOTOGRAPHS										

Appendix E

Power Condition Assessment Forms

SECTION	ITEM	DATA	CONDITION RATING				AGE											
			Current Physical Condition	Fitness for Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE									
Equipment Tag: E_E101_Service Description: E_E101_Service	GENERAL	Location: Dry Well, Main Level	3.3	2.4			1983	40	4									
		Description: E_E101_Service																
		Phase: 3 Phase																
		Rated Voltage: 600 VAC																
		Rated Current: 200 A																
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4											
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	4	0.1	NOTES & COMMENTS: Service equipment is original to the building and has experienced severe corrosion through out the Motor Control Centre (MCC). Main ground is also being affected by the corrosion. Equipment is not rated for Zone 1 locations. The MCC does not have one meter clearance as per the Canadian Electrical Code.												
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4													
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1													
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4													
	Fitness for Purpose	Meets City Electrical Design Guide: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.2						RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended to complete a full service upgrade.							
		Standby Generator Needed & Present: Issues for Discussion:	Rating 1 (Yes / Not needed) Rating 3 (Needed / Portable Generator) Rating 5 (Needed / Not Available)	3	0.2											COST ESTIMATE \$ 45,000.00		
		Is Main Breaker Present & Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)	1	0.05													
		Is Grounding System Present & Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)	3	0.1													
		Is Utility Service appropriate: (600V/3PH) Issues for Discussion:	Rating 1 (Yes) Rating 5 (No)	1	0.1													
Has the Service Capacity Been Reached? Issues for Discussion:		Requires review of service calculation. Rating 1 (Service < 85% capacity) Rating 3 (Service 85% - 99% capacity) Rating 5 (Service > 99% capacity)	1	0.1														
Equipment Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.25														
PHOTOGRAPHS																		

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E101_Starter Description: E_E101_Starter	GENERAL	Location: Dry Well, Main Level	3.3	2.5			1983	40	4	
		Description: E_E101_Starter								
		Manufacturer: Square D								
		Model: 8536SE01H20S								
		Phase: 3 Phase								
		Rated Voltage: 600 VAC								
	Rated Horsepower: 50 HP	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	4	0.1	NOTES & COMMENTS: Although the starter it self seems to have been replaced the overall condition would be "Poor" due to the severe corrosion taking place within the Motor Control Centre. Equipment is not rated for a Zone 2 locations. Motor horsepower exceeds the starters rated horsepower RECOMMENDATIONS: Once ventilation requirements have been asessed and upgraded, it would be recommended to complete a full electrical upgrade incorporating a new starter into a new MCC.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4						
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	COST ESTIMATE \$ 10,000.00					
	Has the Breaker Capactiy been Reached? Issues for Discussion:	Review starts per hour vs. recommendation Rating 1 (< 80% rec. starts / hour) Rating 3 (80% - 95% rec. starts / hour) Rating 5 (>95% rec. starts / hour)	1	0.25						
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.5						
PHOTOGRAPHS	  									

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E102_Starter Description: E_E102_Starter	GENERAL	Location: Dry Well, Main Level	3.2	3.0			1983	40	4	
		Description: E_E102_Starter								
		Manufacturer: Square D								
		Model: 8536SE01S								
		Phase: 3 Phase								
		Rated Voltage: 600 VAC								
	Rated Horsepower: 50 HP	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	5	0.1	NOTES & COMMENTS: Although the starter it self seems to have been replaced the overall condition would be "Poor" due to the severe corrosion taking place within the Motor Control Centre. Equipment is not rated for a Zone 2 locations. Motor horsepower exceeds the starters rated horsepower RECOMMENDATIONS: Once ventilation requirements have been assesed and upgraded, it would be recommended to complete a full electrical upgrade incorporating a new starter into a new MCC.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	3	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	3	0.4						
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	COST ESTIMATE \$ 10,000.00					
	Has the Breaker Capactiy been Reached? Issues for Discussion:	Review starts per hour vs. recommendation Rating 1 (< 80% rec. starts / hour) Rating 3 (80% - 95% rec. starts / hour) Rating 5 (>95% rec. starts / hour)	3	0.25						
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.5						
PHOTOGRAPHS										



MOTOR CONDITION ASSESSMENT FORM





SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_E101_Motor Description: E_E101_Motor	GENERAL	Location: Dry Well, Sub Grade	2.7	2.8			1983	40	4
		Description: E_E101_Motor							
		Manufacturer: Westinghouse							
		Model: HSB-404TD							
		Horsepower: 60 HP							
		Rated Voltage: 575 VAC							
		Phase: 3 Phase							
		Rated Current: 57.7 A							
	RPM: 1177	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Motor has been painted making a accurate visual inspection difficult. As is the motor appears to be in "Fair" condition. Equipment is not rated for Zone 2 locations. Pecker heads were not open during inspections. Equipment is nearing the end of its expected service life. Support for cabling is inadequate.			
Canadian Electrical Code Issues Identified: Issues for Discussion:		Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.4					
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.25	RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended to incorporate a new motor into the electrical upgrade.				
	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	2	0.5					
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.25					
PHOTOGRAPHS	  								
	COST ESTIMATE \$ 19,000.00								

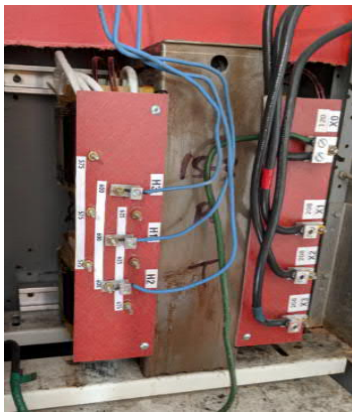


SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_E102_Motor Description: E_E102_Motor	GENERAL	Location: Dry Well, Sub Grade	2.7	2.8			1983	40	4
		Description: E_E102_Motor							
		Manufacturer: Westinghouse							
		Model: HSB-404TD							
		Horsepower: 60 HP							
		Rated Voltage: 575 VAC							
		Phase: 3 Phase							
		Rated Current: 57.7 A							
	RPM: 1177	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Motor has been painted making a accurate visual inspection difficult. As is the motor appears to be in "Fair" condition. Equipment is not rated for Zone 2 locations. Pecker heads were not open during inspections. Equipment is nearing the end of its expected service life. Support for cabling is inadequate.			
Canadian Electrical Code Issues Identified: Issues for Discussion:		Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.4					
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.25	RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended to incorporate a new motor into the electrical upgrade.				
	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	2	0.5					
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.25					
PHOTOGRAPHS									
			COST ESTIMATE \$ 19,000.00						

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E103_Motor Description: E_E103_Motor	GENERAL	Location: Dry Well, Main Level	3.1	2.0			2010	20	11	
		Description: E_E103_Motor								
		Manufacturer: Emerson								
		Model: SA55NXFGS-4786								
		Horsepower: 1/3 HP								
		Rated Voltage: 115 VAC								
		Phase: Single Phase								
		Rated Current: 6.4/4.0 A								
	RPM: 1725/1140	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipment appears to be in "Fair" condition. Equipment is not rated for Zone 2 locations. RECOMMENDATIONS: Replace motor as part of the ventilation upgrade.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
		Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	2	0.5					
Equipment Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.25						
PHOTOGRAPHS										

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_E101_Sump_Pump Description:	GENERAL	Location:		1.5	2				0
		Description:							
		Manufacturer:							
		Model:							
		Horsepower:							
		Rated Voltage:							
		Phase:							
		Rated Current:							
	RPM:								
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4	
Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS:				
	Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
	Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
	Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	RECOMMENDATIONS: COST ESTIMATE				
	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	2	0.5					
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.25					
PHOTOGRAPHS									

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E102_Sump_Pump Description: E_E102_Sump_Pump	GENERAL	Location: Dry Well, Sub Grade	1.4	1.8			2015	15	11	
		Description: E_E102_Sump_Pump								
		Manufacturer: Myers								
		Model: MS50PT1								
		Horsepower: 1/2 HP								
		Rated Voltage: 115 VAC								
		Phase: Single Phase								
		Rated Current: 4.1 A								
	RPM: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. RECOMMENDATIONS: Maintain regular maintenance checks to ensure pump is operational. Replace pump as needed. COST ESTIMATE				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
		Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	2	0.5					
Equipment Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.25						
PHOTOGRAPHS	 									

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E101_Dist_Panel Description: E_E101_Dist_Panel	GENERAL	Location: Dry Well, Main Level	1.7	2.8			2010	40	31	
		Description: E_E101_Dist_Panel								
		Manufacturer: Federal								
		Model:								
		Phase: Single Phase								
		Rated Voltage: 120/208 VAC								
		Rated Current: 100 A								
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	2	0.1	NOTES & COMMENTS: Equipment appears to be in "Fair" condition. Equipment is not rated for Zone 2 locations. Conductors at their termination points are showing signs of corrosion. Panel directory appears out of date. The panel has no available circuits for future additions. RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended as part of the electrical upgrade to install a new distribution panel.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	1	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
	Fitness for Purpose	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Panel < 70% Full) Rating 2 (Panel < 90% Full) Rating 3 (Panel > 90 Full or Loaded) Rating 4 (Panel Full but not Loaded) Rating 5 (Panel 100% Full or Loaded)	4	0.25	COST ESTIMATE \$ 4,000.00				
		Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5					
PHOTOGRAPHS										

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E101_Transformer Description: E_E101_Transformer	GENERAL	Location: Dry Well, Main Level	3.0	1.4			2010	40	31	
		Description: E_E101_Transformer								
		Manufacturer: N/A								
		Model: N/A								
		Phase: N/A								
		Rated Voltage: N/A								
		Rated kVA: N/A								
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	1	0.1	NOTES & COMMENTS: City Staff noted the transformer has been replaced multiple times due to equipment failure. Equipment appears to be in "Good" condition. Equipment is not rated for Zone 2 locations. Conductors at their termination points are showing signs of corrosion, along with the ground connection. Name plate was not visible at time of inspection. kVA sizing conflict between City Lift Station Arc Data Recording Sheet which states 15kVA and the provided Arc Flash study single line at 7.5kVA. The Arc Flash study single line also shows a 600:120/240VAC transformer when associated picture attached is 600:120/208 VAC.				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1						
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4						
Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.2	RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended as part of the electrical upgrade to install a new transformer.					
	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (<75%) Rating 2 (<85%) Rating 3 (<95%) Rating 4 (At capacity) Rating 5 (Above capacity)	1	0.4						
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.4						
PHOTOGRAPHS	  									
	COST ESTIMATE \$ 10,000.00									



BREAKER CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_E101_Main_BKR Description: E_E101_Main_BKR	GENERAL	Location: Dry Well, Main Level	3.3	2.5			1983	40	4	
		Description: E_E101_Main_BKR								
		Phase: 3 Phase								
		Rated Voltage: 600 VAC								
		Rated Current: 200 A								
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			4			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 2 (Minor surface corrosion) Rating 3 (Surface & internal corrosion) Rating 4 (Severe corrosion) Rating 5 (Safety concern)	4	0.1	NOTES & COMMENTS: Equipment appears to be in "Poor" condition due to the overall corrosion taking place within the equipment. Equipment is not rated for Zone 2 locations. RECOMMENDATIONS: Once ventilation requirements have been assessed and upgraded, it would be recommended as part of the electrical upgrade to install a new Main Breaker. COST ESTIMATE \$ 5,000.00				
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: Issues for Discussion:	Rating 1 (Connections tight, labelled) Rating 2 (Missing labels) Rating 3 (Loose / disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
		Has breaker capacity been Reached? Issues for Discussion:	Rating 1 (Appropriately sized) Rating 5 (Undersized)	1	0.25					
		Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.5					
	PHOTOGRAPHS									

Appendix F

Force Main Condition Assessment Forms



FORCEMAIN PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	3rd Party & Environmental Damage	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: FM_Pipe Description: Sanitary Force Main	GENERAL	Location: Along Wellington Crescent	3.4	3.0	1.6	1959	75	15	
		Description: Sanitary Force Main							
		Size: 250 mm							
		Material: AC							
		Service: Sewage							
		Coating: N/A							
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Force Main Breaks or Leaks in the Past: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Repairs) Rating 4 (Major Repairs) Rating 5 (Risk of Critical Failure)	3	0.6	NOTES & COMMENTS: Force main is nearing the end of its service life. The force main was found to be undersized for the flows from the lift station and the velocities are above the acceptable range. However, the force main size is not currently impacting the hydraulic performance of the pumping system.				
		Force Main Age: <i>Issues for Discussion:</i> Rating 1 (Less than 10 years old) Rating 2 (Less than 25 years old) Rating 3 (Greater than 25 years old) Rating 4 (Greater than 50 years old) Rating 5 (Greater than 75 years old)	4	0.4					
		Compatibility with Pumps and Motors: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper force main selection for application. Risk of Critical Failure)	3	1					
3rd Party & Environmental Damage	Force Main Attached to a Bridge: <i>Issues for Discussion:</i> Rating 1 (No) Rating 5 (Yes)	1	0.2	RECOMMENDATIONS: COST					
	Force Main Near Other Underground Utilities: <i>Issues for Discussion:</i> Rating 1 (No) Rating 3 (Yes - Minor nearby utilities) Rating 5 (Yes - Major nearby utilities)	3	0.3						
	Force Main Under a River Crossing: <i>Issues for Discussion:</i> Rating 1 (No) Rating 3 (Yes - location of pipe not an issue) Rating 5 (Yes - location of pipe is an issue)	1	0.5						
PHOTOGRAPHS									



FORCEMAIN PIPING CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING			AGE		
			Current Physical Condition	Fitness For Purpose	3rd Party & Environmental Damage	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: FM_Piping Description:	GENERAL	Location:						
		Description:						
		Size:						
		Material:						
		Service:						
		Coating:						
				Assign Ratings	Assign Ratings	Assign Ratings		0
				Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		
						NOTES & COMMENTS:		
						RECOMMENDATIONS: COST		
3rd Party & Environmental Damage	Current Physical Condition	Forcemain Breaks or Leaks in the Past: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Repairs) Rating 4 (Major Repairs) Rating 5 (Risk of Critical Failure)		0.6			
		Forcemain Age: <i>Issues for Discussion:</i>	Rating 1 (Less than 10 years old) Rating 2 (Less than 25 years old) Rating 3 (Greater than 25 years old) Rating 4 (Greater than 50 years old) Rating 5 (Greater than 75 years old)		0.4			
	Fitness for Purpose	Compatibility with Pumps and Motors: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper forcemain selection for application. Risk of Critical Failure)		1			
		Forcemain Attached to a Bridge: <i>Issues for Discussion:</i>	Rating 1 (No) Rating 5 (Yes)		0.2			
3rd Party & Environmental Damage	Forcemain Near Other Underground Utilities: <i>Issues for Discussion:</i>	Rating 1 (No) Rating 3 (Yes - Minor nearby utilities) Rating 5 (Yes - Major nearby utilities)		0.3				
	Forcemain Under a River Crossing: <i>Issues for Discussion:</i>	Rating 1 (No) Rating 3 (Yes - location of pipe not an issue) Rating 5 (Yes - location of pipe is an issue)		0.5				
PHOTOGRAPHS								

Appendix G
Design Standards & Guidelines

Appendix G – Design Standards and Guidelines

The Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers and Ontario Ministry of the Environment, as stipulated in *Recommended Standards for Wastewater Facilities – 2014 and Design Guidelines for Sewage Works – 2008*, have established standards and guidelines for public sewage works such as gravity sewers, force mains, and sewage pumping stations. The following information summarizes the guidelines and best industry practices as they relate to the components of the sewage pumping facility.

Structures – Regulatory Requirements

Lift station structures should be designed to facilitate removing pumps, monitors, and other mechanical and electrical equipment. In areas where high groundwater conditions are expected, adequate provisions should be made for protection against buoyancy of the lift station structures. Lift station structures should be water tight, protected from physical damage from a 100-year flood, and should remain fully operational and accessible during a 25-year flood. Lift stations are to be designed as “Post-Disaster” buildings under the Manitoba Building Code.

Pumps – Regulatory Requirements

Lift stations shall be designed with multiple pump units, with provision for the peak wastewater design flows to be handled by the remaining pumps in the event of the largest pump being out of service. Pumps handling raw wastewater should be capable of passing particles of a minimum 75 mm in diameter. Minimum pump suction and discharge openings should be 100 mm in diameter. Each pump should have an individual intake with wet well and intake designed to avoid turbulence near the intake and prevent vortexing. In order to minimize hydraulic surges, lift stations should be designed to deliver as uniform a flow as practicable.

Valves – Regulatory Requirements

Suitable shut-off valves should be placed on the discharge lines of pumps. Check valves should be placed between the shut-off valve and the pump on the discharge line of each pump. Check valves should be suitable for the material being handled and shall be placed on the horizontal portion of the discharge piping with the exception of ball check valves, which may be placed in the vertical. Valves should be capable of withstanding normal operating pressure and water hammer. All valves should be operable from floor level and accessible for maintenance.

Wet Wells – Regulatory Requirements

Wet well sizing should take into consideration the design fill time and minimum pump cycle time. The effective volume of the wet well should be based on design average flow and is not to exceed a fill time of 30 minutes unless the facility is designed to provide flow equalization/storage. When selecting the minimum cycle time, the motor manufacturer’s duty cycle recommendations should be utilized. Provisions should be made so that the fill time indicated is not exceeded for initial flows when the anticipated initial flow to the pumping station is less than the design average flow. Pump configurations within the wet well should be designed to avoid settling of solids. The wet well floor should have a minimum slope of 1:1 to the hopper bottom.

Flow Measurement – Regulatory Requirements

All lift stations should be provided with suitable devices for measuring wastewater flow. Large lift stations with peak design flow greater than 50 L/s should be provided with indicating, totalizing, and recording flow measurement devices. Elapsed time meters may be used for lift stations with peak design flow less than 50 L/s.

Electrical Equipment – Regulatory Requirements

Electrical systems and associated components (motors, lights, cable, switchboxes, control circuits, etc.) in lift station wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapours are likely to occur in normal operation, should comply with the Canadian Electrical Code requirements for Zone 1 hazardous locations. Equipment located in wet wells should be suitable for use in corrosive conditions and meet the requirements under the Canadian Electrical Code for Category 2 corrosive environments. Electrical systems installed in lift station dry wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapours are not likely to occur in normal operation, should comply with the Canadian Electrical Code requirements for Zone 2 hazardous locations. Equipment located in dry wells should be suitable for use in corrosive conditions and meet the requirements under the Canadian Electrical Code for Category 1 corrosive environments. If a lift station dry well complies with the ventilation requirements set forth in the NFPA standard 820 to be an unclassified space, the electrical systems installed in dry wells may not be considered a Zone 2 hazardous location.

Alarm Systems – Regulatory Requirements

Alarm systems should be provided for lift stations. Alarms should be in place for cases of high and low liquid levels, power failure, sump pump failure, pump failure, unauthorized entry, or any cause of lift station fault. Lift station alarms should be telemetered to the personnel in charge of operating the lift station. In some cases, audio-visual alarm systems with a self-contained power supply may be installed in lieu of a telemetering system depending on location, station holding capacity, and inspection frequency.

Emergency Operation – Regulatory Requirements

Lift stations should be designed to operate in such a way that equipment failure may not result in the discharge of raw wastewater to any waters and to protect public health by preventing backup of wastewater and subsequent discharge to basements, streets, and other public and private property.

Ventilation – Regulatory Requirements

Ventilation systems shall be designed to function year round, including fresh air intake louvers and openings. To prevent subsequent blockages, screen openings should be sized to avoid build-up of frost during winter months. Ventilation of the wet well may be either continuous or intermittent. If continuous, a minimum of 12 complete air changes per hour is required. If intermittent, a minimum of 30 complete air changes per hour during the period of occupancy is required. Fresh air should be forced into wet wells by mechanical means at a point about 30 cm above the expected high liquid level, with provision for emergency automatic blow-by to elsewhere in the wet well, should the fresh air outlet become submerged. Provision should be made in the lift station system design to verify that the ventilation fan is operational and the air change capacity is achieved.

Ventilation of the dry well may be either continuous or intermittent. If continuous, a minimum of 6 complete air changes per hour are required. If intermittent, a minimum of 30 complete air changes per hour during the period of occupancy are required. Positive pressure ventilation is recommended and the system is to avoid dispensing contaminants throughout other areas of the lift station.

Provision for heating of intake air is recommended. Switches for the operation of ventilation equipment are to be plainly identified and located within arm's reach of the lift station entry way. All intermittently operated ventilation equipment should be interconnected with the lighting system.

Force main – Regulatory Requirements

The minimum pipe diameter for a force main should not be less than 100 mm. Velocities less than 0.6 m/sec (2 ft/sec) and greater than 1.6 m/sec (5.2 ft/sec) are not recommended. Above 3.0 m/sec pipe scouring can damage the walls of the pipe. Below 0.6 m/sec solid particles can separate from the wastewater and settle to the bottom of the pipe, which can obstruct the pipe flow over time. Total retention time in a force main should be kept under 4 hours to avoid anaerobic fermentation and the resultant production of odorous, hazardous, and corrosive gases.

Sewer – Regulatory Requirements

It is recommended that no gravity sewer conveying raw sewage should be less than 200 mm in diameter. Sanitary sewers should be designed and constructed with such slopes to give a mean velocity of not less than 0.6 m/s (2 fps) during average flow conditions with due consideration given to actual depth of sewage flowing in the pipe. Slopes slightly less than those required for 0.6 m/s (2 fps) may be considered if the depth of flow will be 0.3 of the diameter or greater for design average flow, and provisions can be made for frequent cleaning. Manholes should be installed at the end of each line and at all changes in grade, size, or alignment. Manhole spacing should not exceed 120 m for sewers 380 mm (15 inches) in diameter or less. The sewer shall be installed at no less than 600 mm below a water line if installed in the same trench and the horizontal separation distance is a minimum of 300 mm. Best industry practices are to maintain a minimum of 3 meters separation distance between water and sewer lines and a separation distance of 300 mm when crossing with the water line above.

Design Standards & Guidelines

- MPE prepared this assessment in accordance to the following standards and guidelines as a minimum:
- City of Winnipeg Design and Development Standards Manual, 2017
- City of Winnipeg Sewage Works Control Bylaw (Bylaw No. 5115)
- City of Winnipeg Standard Construction Specifications and Drawings, Roadways, Water, and Sewer
- The Waterworks and Sewage Works Regulations, 2015
- The Environmental Management and Protection Act, 2002
- Water Security Agency, Sewage Works Design Standard (EPB 503), Nov. 15, 2012
- AWWA M11 – Steel Pipe – A Guide for Design and Installation
- AWWA M23 – PVC Pipe: Design and Installation
- AWWA M55 – PE Pipe: Design and Installation
- ANSI/HI – 1.3, 1.4, 1.6, 9.1-9.5 Standards for Centrifugal Pumps
- ANSI/HI – 9.6.4 Rotodynamic Pumps for Vibration Measurements & Allowable Values
- ANSI/HI – 9.6.5 Rotodynamic Pumps – Guideline for Condition Monitoring

- ANSI/HI – 9.6.6 Rotodynamic Pumps for Pump Piping
- ANSI/HI – 9.8 Pump Intake Design
- ANSI/HI – 11.6-2012 Rotodynamic Submersible Pumps: for Hydraulic Performance
- ASME/ANSI B16.5 – 2013
- ANSI – Applicable Standards
- ASTM – Applicable Standards
- AMSE – Applicable Standards
- AWWA – Applicable Standards
- Saskatchewan Plumbing and Drainage Regulations
- Canadian Standards Association (CSA)
- National Sanitation Foundation (NSF)
- Canadian Electrical Code (CEC)
- Institute of Electrical and Electronic Engineers (IEEE)
- Electrical and Electronic Equipment Manufacturers Association of Canada (EEMAC)
- National Building Code of Canada
- National Plumbing Code of Canada
- Canadian Standards Association (CSA) Natural Gas and Propane Installation Code CSA B149.1
- American Society of Heating, Refrigeration & Air Conditioning Engineers (ASHRAE)
- ACI, Requirements for Assessment, Repair, and Rehab of Existing Concrete Structures (ACI 562M-16)
- ACI, Metric Building Code Requirements for Structural Concrete and Commentary (ACI 318M-14)
- ACI, Code Requirements for Environmental Engineering Concrete Structures (ACI 350-06)
- Process Industry Practices, Fixed Ladders and Cages (PIP STF05501)
- National Fire Code of Canada
- NFPA 820
- The Uniform Building & Accessibility Standards Regulations of Saskatchewan
- The Occupational Health and Safety Act