



**Engineering Ltd.**

*Report for:*

## **CITY OF WINNIPEG**

**-WATER AND WASTE DEPARTMENT-**

*--- Final Copy ---*

**WASTEWATER LIFT STATION CONDITION ASSESSMENT PHASE II**

**Document III: Conway Lift Station Assessment**



Date: March 16, 2020

City File No.: S-1095

MPE Project No.: 8400-001-00

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**MPE ENGINEERING LTD.**

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*Mar 16, 2020*

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*March 16, 2020*

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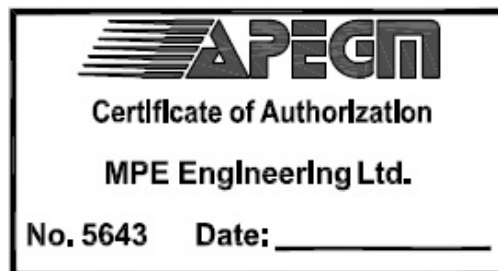
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## 1.0 Introduction

### 1.1 Background

MPE Engineering Ltd. (MPE) conducted a visual inspection of the Conway Lift Station on January 31, 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.

### 1.2 Limitations

Inspections were limited to cursory visual review of lift station components. Analysis of below grade infrastructure not able to be accessed was not included and buried pipelines were not exposed. Assessment of below grade infrastructure has been based on operational comments from City Staff. 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 methodology 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	Assessment Scores		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 Conway Lift Station is located at 2200 Portage Avenue, just south of the intersection of Portage Avenue and Conway Street. It is situated in a narrow, graded, treed lot bordering the Assiniboine River.

### 2.2 General

The lift station was originally constructed in 1963 and had electrical and controls upgrades in 1999. The station services an approximately 150-hectare area that is mostly residential.

Table 2.1: Conway Lift Station	
YEAR CONSTRUCTED	1963
LOCATION	2200 Portage Avenue
CONFIGURATION	Wet well / Dry well
PUMPING CAPACITY	63 L/s
TYPE OF PUMPS	Dry Pit Solids Handling
PUMP HORSEPOWER	P1: 15 HP, P2: 15 HP
BACKUP GENERATOR	Mobile Generator - Full Station
VENTILATION	Dry Well: Intermittent, Wet Well: N/A



The lift station includes a transfer switch that can connect to the City’s mobile generator which can power the full station. The station is aging and in need of renovation and upgrades in order to ensure reliable usage in the future. The newer electrical and control components are generally in “Fair” to “Good” condition. The components with the greatest need for upgrades are the facility and pumps.

*Conway Site Location – Google Earth*

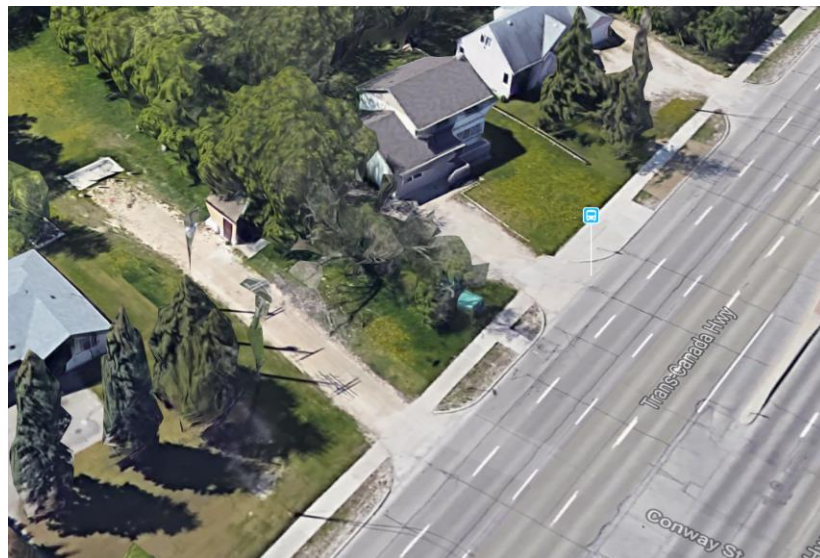
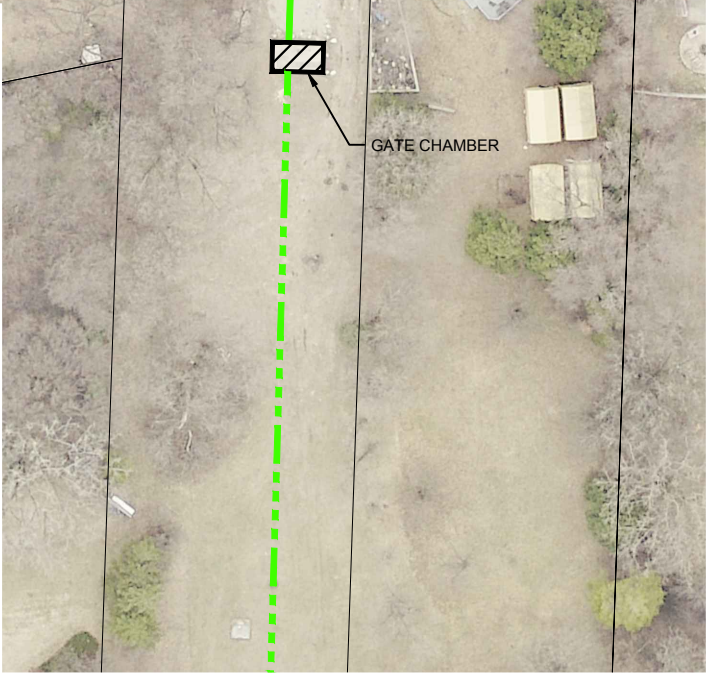
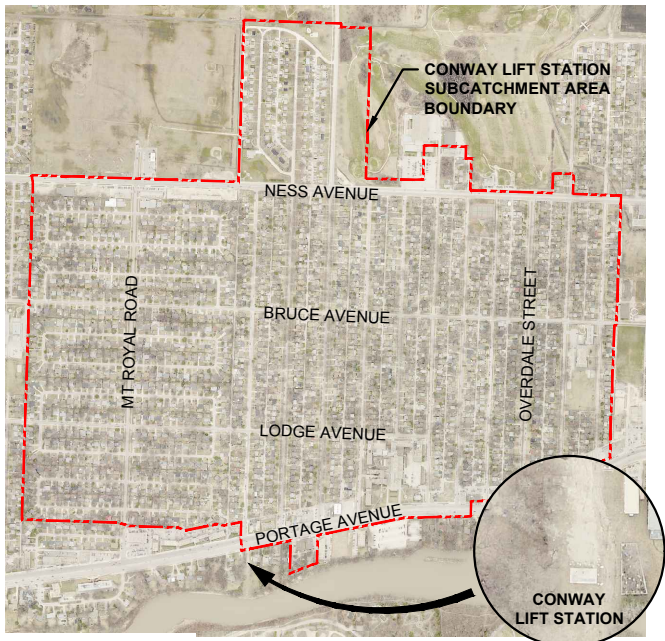
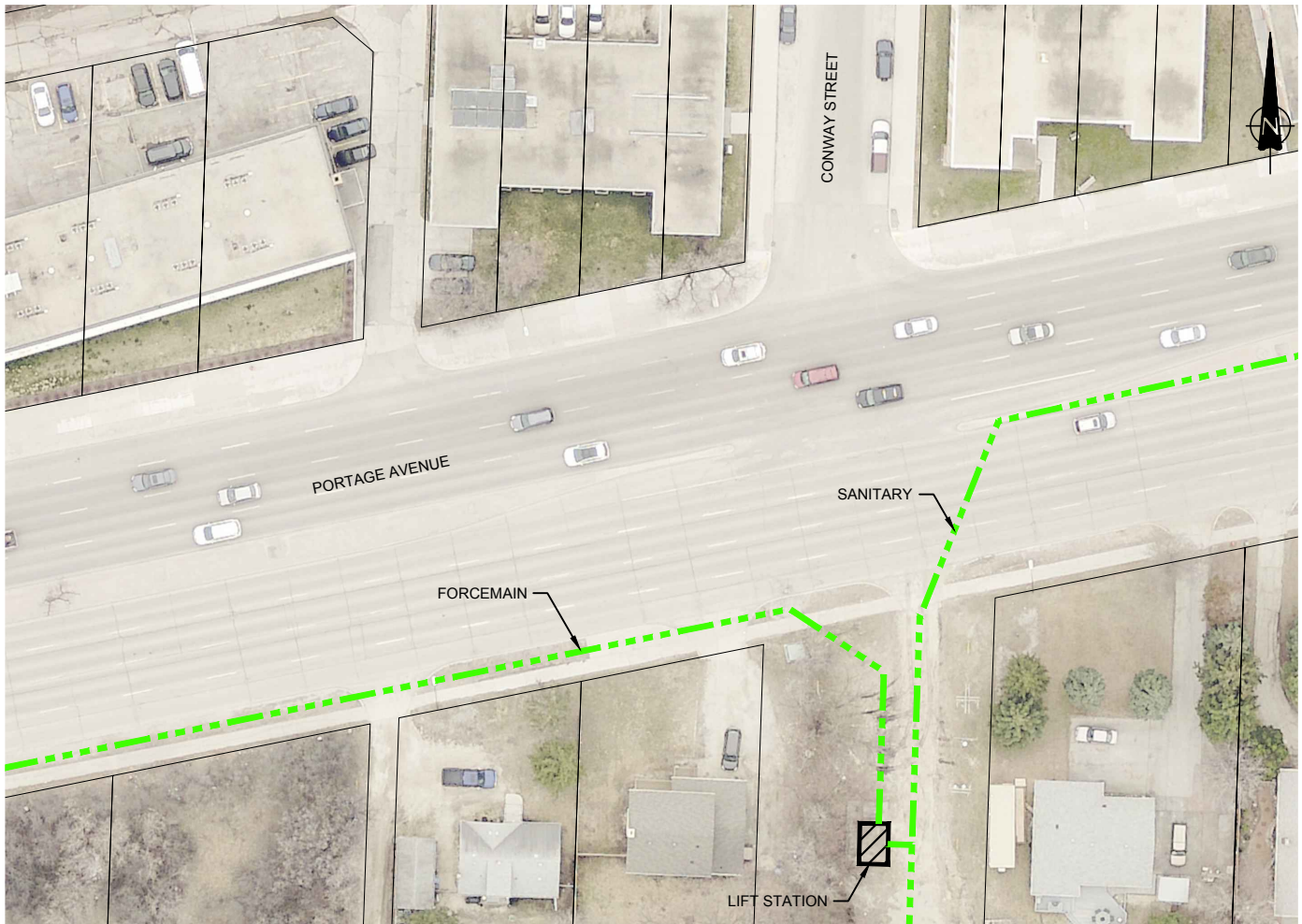


Figure 2.1 provides an overall site location plan of the lift station facility.



CITY OF WINNIPEG

LIFT STATION ASSESSMENTS 2018-2019  
 CONWAY / MOORGATE 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:

- St. James Interceptor Site Plan – Conway Pumping Station; Waterworks & Waste Disposal Division; 1963
- St. James Interceptor – Conway Pumping Station Reinforcement Details; Waterworks & Waste Disposal Division; 1963
- St. James Interceptor – Conway Pumping Station Cross Section Drawing 404; Waterworks & Waste Disposal Division; 1963
- St. James Interceptor – Conway Pumping Station Superstructure Details; Waterworks & Waste Disposal Division; 1963
- Conway Lift Station Electrical & Control; City of Winnipeg Water & Waste Department; 1999
- LIFT\_STN\_SERVICE\_AREAS.gws – Lift Station Catchment 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 Conway Lift Station was provided by the City from the LIFT\_STN\_SERVICE\_AREAS.gws workspace and consists of primarily Single Family Dwellings with a small area of Commercial. The catchment area is located primarily south of Ness Avenue, east of Mt. Royal Road, west of Overdale Street, and north of Portage Avenue. Figure 4.1 illustrates the sub-catchment area for the Conway Lift Station.

#### 4.1.2 Peaking Factor

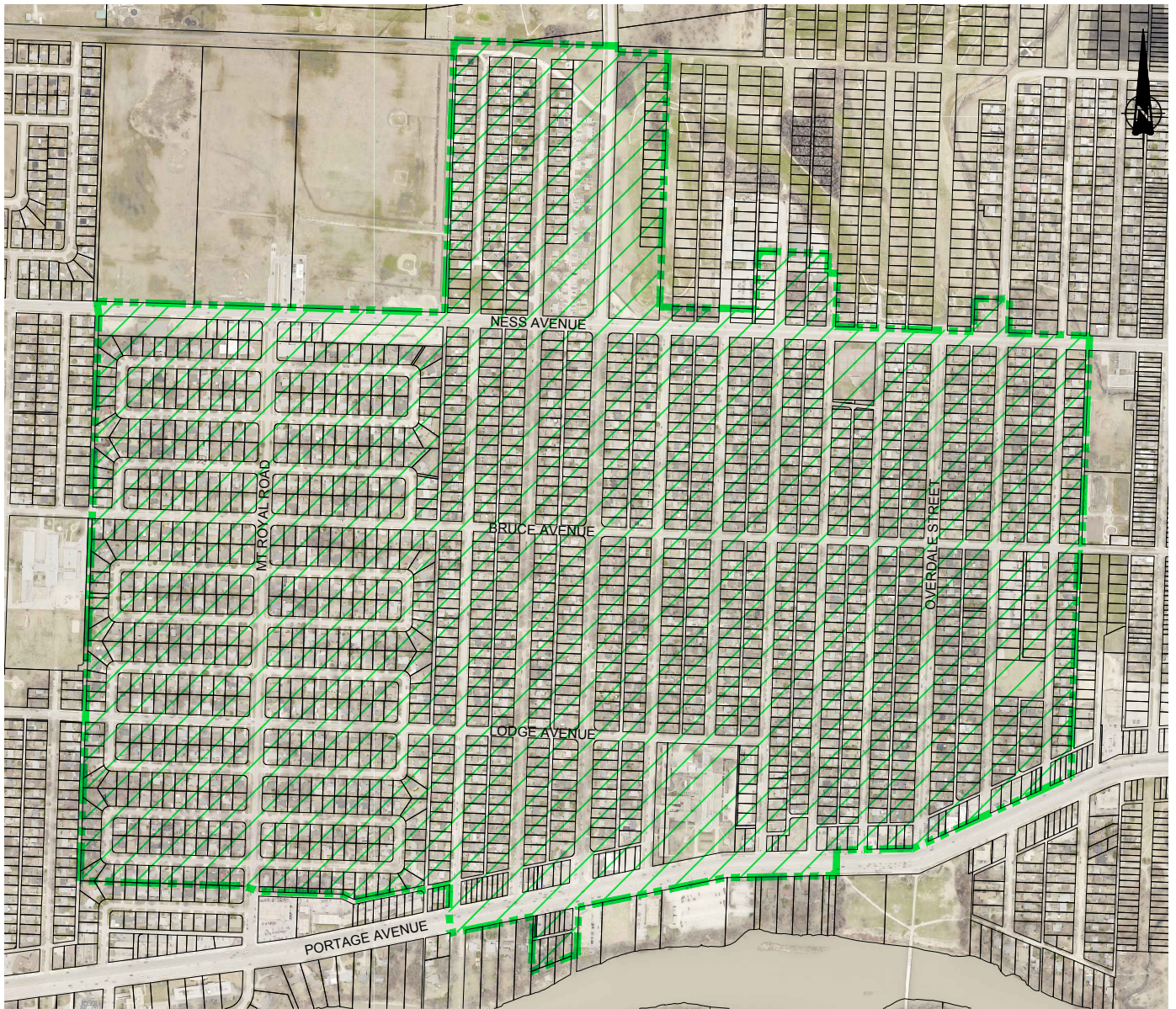
To account for the diurnal fluctuations in sewage flows, peak hourly flows are calculated based on the peaking factor derived from the Harmon equation:

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

where: P = design contributing population in thousands



*Conway Wet Well*



CONWAY / MOORGATE	
ROW LABELS	COUNT
APARTMENTS	9
CHURCH	3
COMMERCIAL MULTI USE	3
CURLING RINK	1
DETACHED SINGLE DWELLING	1585
FUNERAL HOME	1
GOLF COURSE	2
GOVERNMENT OFFICE	1
HOSPITAL	1
HYDRO SUB-STATIONS	1
MEDICL OFFICE CLINIC	1
MULTI FAMILY CONVRSN	3
MULTI RES BLDGS	1
NGHBRHD SHOP CENTRE	4

CONWAY / MOORGATE	
ROW LABELS	COUNT
OFFICE	9
PARK WITH BUILDING	1
RECREATONL MULTI USE	1
RES GROUP CARE	1
RESTAURANT	2
SCHOOL	1
STORE	6
VACANT COMMERCIAL	3
VACANT PARK	3
VACANT RESIDENTIAL 1	4
VACANT RESIDENTIAL 2	3
VEHICLE SERV RELATED	2
<b>GRAND TOTAL</b>	<b>1652</b>

**LEGEND**



CONWAY / MOORGATE  
SUBCATCHMENT  
AREA=153.4ha (379.03 acres)



CITY OF WINNIPEG

LIFT STATION ASSESSMENTS 2018-2019  
CONWAY / MOORGATE LIFT STATION  
SUBCATCHMENT AREA

SCALE: 1:10 000

DATE: APRIL 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 Conway Lift Station. Therefore, the following assumptions have been used to estimate the current and projected ultimate capacities for the facility:

- Land use consists of Single Family Dwellings and Commercial Areas.
- Catchment area is approximately 153.4 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)
Single Family Dwelling	145.7	12.29	1,790.7	3.05	5,461	-	270	17.1
<b>Subtotal</b>	<b>145.7</b>				<b>5,461</b>	<b>3.209</b>	<b>270</b>	<b>17.1</b>
							<b>(L/HA/DAY)</b>	<b>(L/SEC)</b>
Commercial	7.7	-	-	-	-	-	16,800	1.5
<b>Subtotal</b>	<b>7.7</b>						<b>16,800</b>	<b>1.5</b>
<b>Total:</b>	<b>153.4</b>							<b>18.6</b>
LAND USE	PEAK DRY WEATHER FLOW		EXTRANEAN FLOW CONTRIBUTIONS				PEAK WET WEATHER FLOW	
	(LPCD)	(L/SEC)	GROUNDWATER (L/SEC)	MANHOLE		WEEPING TILE (L/SEC)	(L/SEC)	
				(MH/HA)	(L/SEC)			
Single Family Dwelling	-	-	3.7	1.6	46.6	135.8	-	
Multi-Family Dwelling	-	-	0.0	1.6	0.0	-	-	
<b>Subtotal</b>	<b>866</b>	<b>54.8</b>	<b>3.7</b>	<b>-</b>	<b>46.6</b>	<b>135.8</b>	<b>240.9</b>	
	<b>(L/HA/DAY)</b>	<b>(L/SEC)</b>	<b>(L/SEC)</b>	<b>(MH/HA)</b>	<b>(L/SEC)</b>	<b>(L/SEC)</b>	<b>(L/SEC)</b>	
Commercial	28,100	2.5	0.2	1.0	1.5	-	-	
<b>Subtotal</b>	<b>28,100</b>	<b>2.5</b>	<b>0.2</b>	<b>-</b>	<b>1.5</b>	<b>-</b>	<b>2.5</b>	
<b>Total:</b>	<b>-</b>	<b>57.3</b>	<b>3.9</b>	<b>-</b>	<b>48.2</b>	<b>135.8</b>	<b>243.4</b>	

The estimated average dry weather flow is 18.6 L/sec, the peak dry weather flow is 57.3 L/sec, and the peak wet weather flow is estimated to be 243.4 L/sec.

### 4.2.2 Projected Flows

No further expansion is anticipated for the catchment area for the Conway 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 if required based on the level in the wet well. The primary pump starts at a level of 1219 mm and the secondary pump starts if it exceeds 1372 mm. Table 5.1 provides a summary of the pumps utilized at the Conway Lift Station.

**TABLE 5.1: CONWAY 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	AURORA	KU-5CX5	15	1968	56.78	11.6	150
PUMP 2 - P-102	DRY PIT SOLIDS HANDLING	AURORA	KU-5CX5	15	1968	56.78	11.6	150

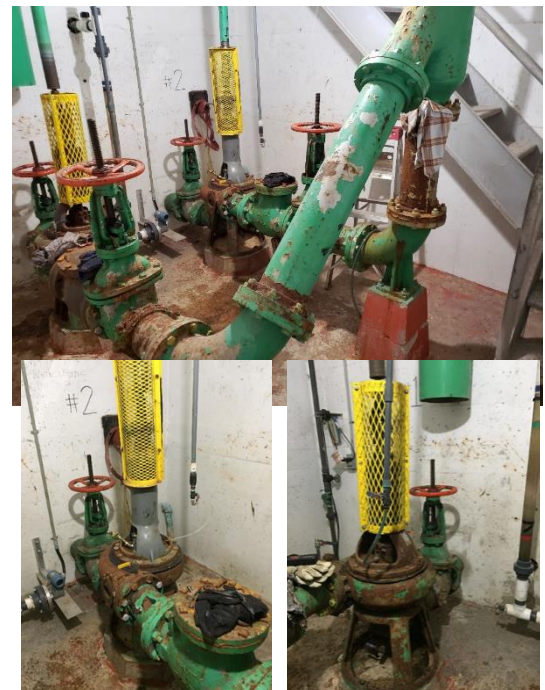
\* Based on duty point in Pump Manufacturer's datasheet

P-101 and P-102 are identical Aurora KU-5CX5 pumps. Each pump is rated for 56.78 L/sec at a Total Dynamic Head (TDH) of 11.6 m and operate at a constant speed. Operational staff noted that there are concerns with the pumps plugging constantly with rags, rocks and debris. The pumps run continuously for long periods after rainfall events.

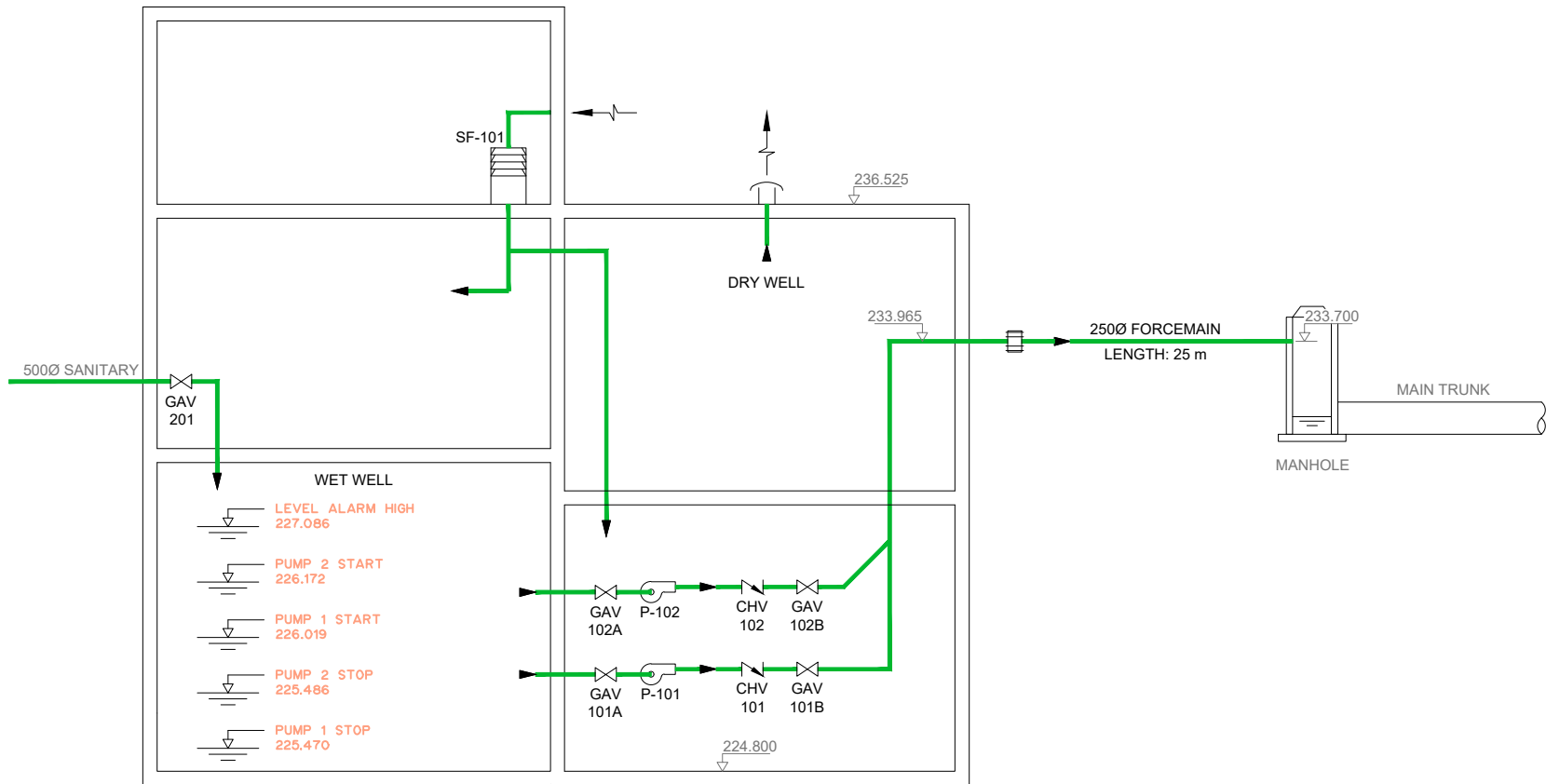
A 250 mm diameter AC force main is used to discharge sewage from the Conway Lift Station. The force main connects to a manhole north of the station located at the intersection of Conway Street and Portage Avenue.

#### 5.1.1 Process Flow Diagram

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







P-101  
 - DUTY POINT: 56.78 L/s @ 11.6 m  
 - 15 HP, 1200 RPM  
 - 575 VAC/3 PH/60 Hz

P-102  
 - DUTY POINT: 56.78 L/s @ 11.6 m  
 - 15 HP, 1200 RPM  
 - 575 VAC/3 PH/60 Hz



LIFT STATION ASSESSMENTS 2018-2019

CONWAY  
 PROCESS FLOW DIAGRAM

SCALE: NTS

DATE: SEPT 2019

JOB: 8400-001-00

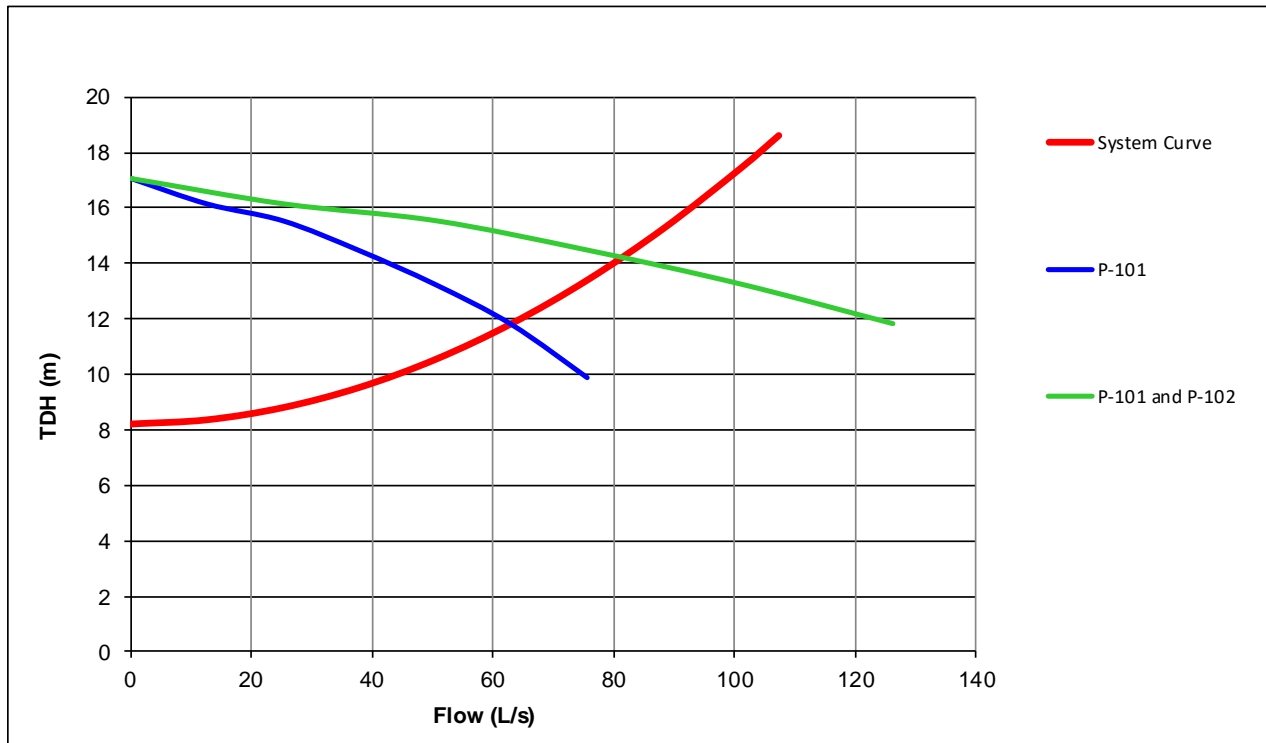
FIGURE: 5.1

## 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 63 L/s and 81 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 243.4 L/sec. The maximum pumping capacity of the lift station is approximately 81 L/s with both pumps in operation. The 'rated' capacity of the lift station with the largest pump being out of service is currently 63 L/sec. Based on the estimated peak wet weather flow, the pumping system is not currently 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	670	100	56.78	1.32	6.10	8.24	2.14
PUMP 2 STOP	686	100	56.78	1.32	6.10	8.24	2.14
PUMP 1 START	1219	100	56.78	1.32	6.10	8.78	2.69
PUMP 2 START	1372	100	56.78	1.32	6.10	8.94	2.84

#### 5.2.4 Force Main Review

A 250 mm diameter Asbestos Cement (AC) force main is used to convey sewage from the Conway Lift Station. The length of the force main is 25 m. The force main was installed in 1971. The force main has a volume of approximately 1.2 m<sup>3</sup>. Based on the estimated average and peak dry weather flows of 18.6 L/s and 57.3 L/s, the average retention time in the force main ranges from 21 to 66 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 Conway 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)	63.0	81.0
FORCE MAIN VELOCITY (m/s)	1.28	1.65

The Conway force main was found to be adequately sized for the majority of flows from the lift station and the velocities are within the acceptable range of 0.6 m/sec to 1.6 m/sec. When two pumps are operating, the force main is slightly above the acceptable range for velocity.

### 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 6 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 six (6) pump cycles per hour. Peak dry day flow results in approximately three (3) pump cycles per hour. Peak wet weather flow will result in both pumps operating continuously for the duration of the storm event. The maximum allowable starting and stopping intervals for a 15 HP pump are 12 cycles per hour. The pump cycles are within the allowable limits and the pump capacity is acceptable for the volume of the wet well. If it were determined that pump cycles were more than the allowable motor starts per hour, variable frequency drives (VFDs) can 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 150 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 it 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 1219 mm.
- Should the sewage level rise above the "Pump 2 Start Level" of 1372 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 686 mm and the duty pump shuts down at the "Pump 1 Stop Level" of 670 mm.

The control strategy used at the Conway 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 Conway Lift Station yielded the following conclusions:

- There are no issues with NPSHA or excessive pump cycling in the pumping system.
- The pumping system is capable of meeting the peak dry weather influent flow requirements, however the pumping system is not currently capable of meeting the peak wet weather influent flow requirements.
- The existing wet well meets the maximum fill time requirements and is adequately sized for the incoming flows.
- The force main was found to be adequately sized for the majority of flows from the lift station and the velocities are within the acceptable range.


## 6.0 Facility Condition Assessment

### 6.1 Background

The following provides a condition assessment of the building facility for the Conway 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: CONWAY LIFT STATION - CODE REVIEW			
YEAR CONSTRUCTED	1963		
BUILDING FOOTPRINT AREA (m2)	<25m2		
LOCATION	2200 Portage Avenue at Conway Street		
BUILDING CLASSIFICATION	Combustible / Non Combustible		
ROOFING MATERIAL	Haydite Roof Panels & Barrett Bonded Roof		
MAJOR OCCUPANCY CLASSIFICATION	F-3 - Low Hazard Industrial		
OCCUPANT LOADING	5 max.		
			
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. -
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
CHLORINE	None	n/a	-Hazardous Substances and Waste Dangerous Goods Regulations recommends registration for tank capacity > 4000 Litres-
SECURITY	SITE SECURE	BUILDING SECURE	NOTES
PUMP STATION	NO	YES	

### 6.3 Site Conditions

The Conway Lift Station is located immediately south of the intersection of Portage Avenue and Conway Street. An outlet structure and the Assiniboine River are 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 across traffic. There is a designated driveway and sufficient parking space. The quality of the parking space was not thoroughly assessed due to snow cover but appears to be in good condition.

### 6.3.2 Site Grading & Landscaping

Due to snow cover during the inspection, the site grading conditions were not observable. A Google Maps – Street View image reveals ponding against the side of the structure. The City suggested that the ponding might have been corrected during force main upgrading in the same area. Landscaping consists of a grass area kept mowed and trees overhanging the building that interfere with exhaust, roof drain, and the electrical service.



### 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 could be subject to vandalism. Signage identifies the building as a City of Winnipeg facility, but does not provide emergency contact information.

## **6.4 Foundations**

### 6.4.1 Foundation Slab

The Conway Lift Station foundation consists of a cast-in-place concrete dry well (a comminutor room and a pump room). A round, buried wet well exists outside of the lift station. The base of the comminutor room is approximately 9.0m below grade. The wet well and pump room bases are approximately 11.6m below grade. The concrete base slab is aged and shows signs of surface deterioration. 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 very “Good” condition. No structural concerns were noted. 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 Comminutor outlet to the pump inlets.

The wet well access vault is in “Poor” condition. Ground movement has sheared the manhole joints such that the vault segments as well as the access ladder out significantly misaligned. Access to the well is not recommended until corrective measures have been taken.

## 6.5 Primary Structural Systems

### 6.5.1 Loadbearing Walls, Columns and Beams

During the inspection, MPE was unable to assess the superstructure components due to the cladding installed. The drawings provided by the City suggest that the structure was built using Haydite blocks and Haydite precast roof panels. The superstructure as well as the subgrade concrete walls and base slab are structurally sound. The cast-in-place concrete beams supporting the main floor slab are in “Good” condition.

### 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 lower level suspended slabs show signs of surface deterioration. A pipe penetration has been saw-cut through the slab. Therefore, a structural analysis should be performed to determine whether the floor is still capable of supporting the required Live Load.

## 6.6 Secondary Structural Systems

### 6.6.1 Stairs, Ladders, Catwalks, Hatches, Rails

The lower level stairs and rails are corroded and no longer suitable for use. Future renovations should include the replacement of these stairs and rails. Some of the carbon steel bolts used as anchors in various places are also corroding.

Three (3) of the hatch lids are plywood and all unhinged. Square hatch lids are susceptible to falling through openings. There are also no rails or a gate around the opening. 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

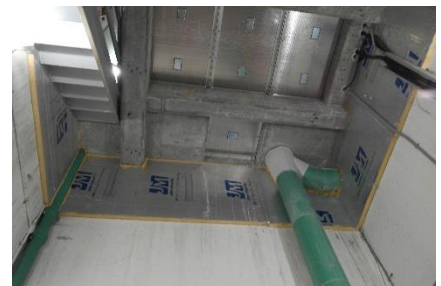
The interior of the superstructure has been covered with aluminum-faced polyisocyanurate. Protective board covers some sections and holes have been cut in the insulation in others. It is recommended that the walls and ceiling be covered with interior liner panels and painted during the next renovation.



The equipment pads in the lower levels are at the end of their service life and should be replaced during the next renovation.

### 6.6.3 Finishes

The paint on the floor surfaces has worn off on all levels. An epoxy coating on the floor would be ideal for durability, but will require additional prep work in the lower pump room due to the age of the concrete and the surface deterioration. Walls can be surfaced with a latex or suitable acrylic-latex paint to improve aesthetics and protect the surfaces.

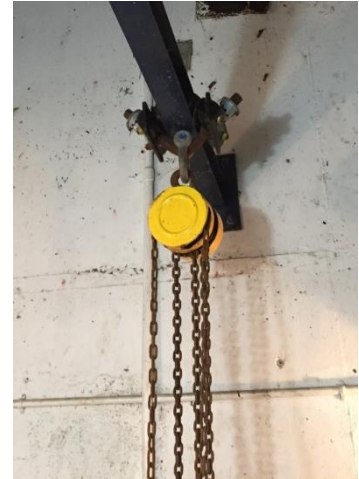




#### 6.6.4 Monorails and Hoists

The monorail capacity is written on the protective board wall-covering nearby. The capacity should be written on the monorail. If future renovations include refinishing the walls, they should also include labeling the monorail and lifting lugs properly.

MPE was unable to obtain a copy of the third party monorail and hoist certification.



### **6.7 Building Envelope**

#### 6.7.1 Exterior Siding, Roofing, Doors

The exterior of the building is in good condition, though the door is weathered. MPE was not able to assess the roof at this time due to snow cover. Operations staff noted that there has been no record of roof leakage.

#### 6.7.2 Insulation, Vapour Barrier, Interior Liner

The insulation installed in the superstructure and below is polyisocyanurate. There is no vapour barrier installed. The insulation is damaged in some areas.

#### 6.7.3 Flashings, Soffits, Sealants, Weather-stripping

The flashings are corroded and should be replaced with the next renovation. The weather stripping is cut at the latch and door frame does not seal properly.

### **6.8 Roofing**

#### 6.8.1 Roof Membrane, Insulation, Decking

The roof is a haydite panel system, and was not able to be reviewed due to the snow cover. The 1963 drawings indicate a Barret Type A – 20 year bonded roofing system. The roof should have reached the end of its service life in 1983. It is unknown whether the roof has been replaced as required.

#### 6.8.2 Skylights, Hatches, Penetrations

The roofing penetrations were not able to be reviewed at the time of the site visit.

#### 6.8.3 Flashings, Trim, Gutters, Downspouts

The flashing and trim about the roof are corroded and in need of replacement.

### **6.9 Building Mechanical**

#### 6.9.1 Heating

The building includes wall mount electric heaters located in the building lower levels that are in “Fair” operational condition.

### 6.9.2 Interior Plumbing

The domestic plumbing consists of steel and PVC piping and includes a water meter, a double check valve assembly, and a 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: CONWAY FACILITY IMPROVEMENT COST ESTIMATES			
Item	Facility Section	Action	Cost
1	Site Conditions	Mid Term	\$ 1,150.00
2	Foundations	Short Term	\$ 70,000.00
3	Primary Structural Systems	-	\$ -
4	Secondary Structural Systems	Mid Term	\$ 118,500.00
5	Building Envelope	-	\$ -
6	Roofing	Long Term	\$ 5,000.00
7	Building Mechanical	Short Term	\$ 500.00
<b>Total:</b>			<b>\$ 195,150.00</b>

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 Conway Lift Station are summarized as follows:

- The wet well access vault is in “Poor” condition.
- The suspended slabs have been modified and may no longer support the required factored loads.
- The hatches are not Code compliant and the stairs and rails are corroded.

A detailed breakdown of the recommendations with associated costs can be found in **Appendix A**. The recommendations are summarized in Table 6.3.

TABLE 6.3: CONWAY FACILITY RECOMMENDATIONS	
Component	Recommendation
SITE CONDITIONS	Trim overhanging tree.
	Install contact info signage.
FOUNDATION / WET WELL	Remove and install new wet well access vaults.
PRIMARY STRUCTURAL SYSTEMS	Review mid level floor capacity.
SECONDARY STRUCTURAL MEMBERS	Replace lower level stairs and anchors
	Epoxy floors, paint walls
	Replace concrete equipment base
	Install interior liner panel on walls / ceiling
	Replace plated bolts with SS anchors
	Replace plywood hatch lids (3), stairs, hatches
BUILDING ENVELOPE	
ROOFING	Replace flashings when roof is replaced
BUILDING MECHANICAL	Install handheld fire extinguisher by building entrance

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

**TABLE 7.1 : CONWAY LIFT STATION MECHANICAL OVERVIEW**

YEAR CONSTRUCTED	1963
PUMPING CAPACITY	63 L/sec
LOCATION	2200 Portage Avenue
NUMBER OF PUMPS	Two (2)
PUMP HORSEPOWER	P-101: 15 HP, P-102: 15 HP
TYPE OF PUMPS	Dry Pit Solids Handling
PIPING MATERIAL	Carbon Steel



Piping was installed in the Comminutor Chamber in 2015. The Comminutor Chamber was previously an open flume, which caused high levels of H<sub>2</sub>S and resultant corrosion throughout the lift station. No other major process mechanical upgrades have been carried out at the lift station since its original construction. 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 “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	1963			
LOCATION	2200 Portage Avenue			
<b>PUMPS</b>				
TYPE	Dry Pit Solids Handling			
PUMP LOCATION	Dry Well			
SUCTION SOURCE	Wet Well - Direct Piped			
<b>PIPING</b>				
SUCTION/DISCHARGE DIAMETER	150 mm			
MATERIAL	Carbon Steel			
<b>ITEM</b>	<b>REQUIREMENT</b>	<b>CODE COMPLIANCE</b>	<b>CODE REFERENCE / NOTES</b>	
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 Aurora KU-5CX5 pumps. Each is equipped with a 20 HP, 575 VAC, 3 phase, 60 Hz electric motor. Each pump is rated for 56.78 L/sec at a Total Dynamic Head (TDH) of 11.6 m and operate at a constant speed. P-101 and P-102 were installed in 1968 and are used regularly. There has been several rebuilds and repairs performed on the pumps since their original installation and the pumps are past their expected service life. Operational staff noted that there are concerns with the pumps plugging constantly with rags, rocks, and debris. The pumps run continuously for long periods after rainfall events.

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

TABLE 7.3: CONWAY LIFT STATION PUMP CONDITION ASSESSMENT						
PUMP	DESCRIPTION	MAKE	MODEL	CONDITION	IMPORTANCE	ACTION
P-101	15 HP Dry Pit Solids Handling	Aurora	KU - 5CX5	Poor	Important	Short Term
P-102	15 HP Dry Pit Solids Handling	Aurora	KU - 5CX5	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 Conway Lift Station.

TABLE 7.4: CONWAY LIFT STATION PUMP VIBRATION AND TEMPERATURE					
PUMP		VIBRATION (in/s)			TEMPERATURE (F)
		x	y	z	
<b>P-101</b>					
	Motor	0.02	0.02	0.01	72
	Volute	0.04	0.03	0.04	50
<b>P-102</b>					
	Motor	0.02	0.03	0.02	71
	Volute	0.04	0.05	0.05	48

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 are original to the building, with the exception of the gate valve in the Comminutor Chamber that was recently installed. The manually actuated gate valves that 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 Conway Lift Station.



TABLE 7.5: CONWAY LIFT STATION VALVE CONDITION ASSESSMENT					
VALVE	DESCRIPTION	SIZE	CONDITION	IMPORTANCE	ACTION
GAV-101A	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-101B	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-102A	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-102B	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-201	Gate Valve	500 mm	Excellent	Intermediate	None
CHV-101	Swing Check Valve	150 mm	Poor	Important	Short Term
CHV-102	Swing Check Valve	150 mm	Poor	Important	Short Term

## 7.5 Piping & Fittings

The lift station includes carbon steel piping for conveyance. The pipe flanges are constructed of carbon steel and use a mixture of carbon steel and stainless steel bolts and nuts. In general, the piping is in “Poor” condition. Table 7.6 provides a summary of the condition of the piping at the Conway Lift Station.

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

### 7.5.1 Non-Destructive Testing

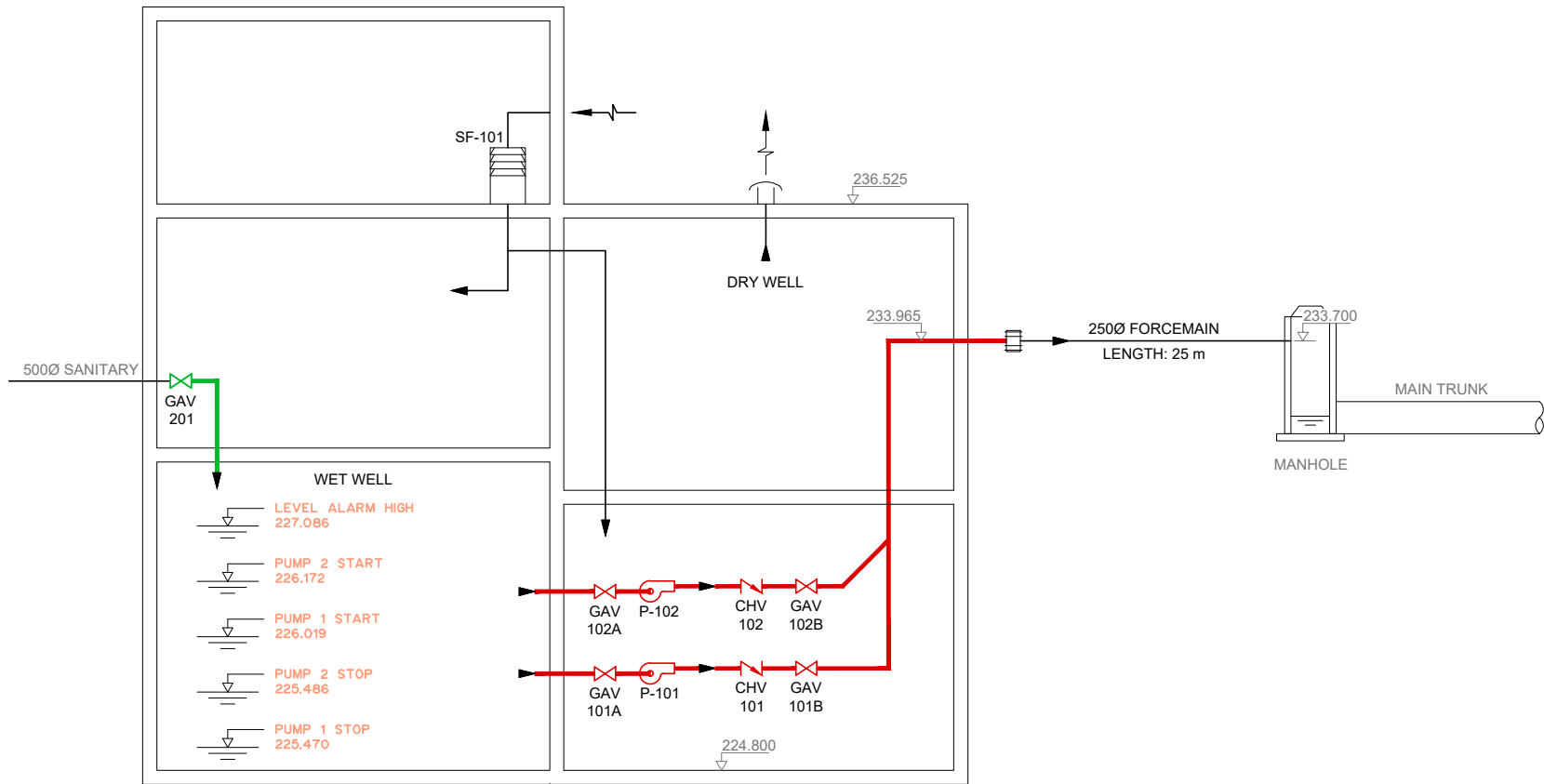
Non-destructing testing was not performed on the piping in the lift station.

### 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 Conway Lift Station.



P-101  
 - DUTY POINT: 56.78 L/s @ 11.6 m  
 - 15 HP, 1200 RPM  
 - 575 VAC/3 PH/60 Hz

P-102  
 - DUTY POINT: 56.78 L/s @ 11.6 m  
 - 15 HP, 1200 RPM  
 - 575 VAC/3 PH/60 Hz

LEGEND	
<span style="color: red;">—</span>	POOR
<span style="color: orange;">—</span>	FAIR
<span style="color: yellow;">—</span>	GOOD
<span style="color: green;">—</span>	EXCELENT



LIFT STATION ASSESSMENTS 2018-2019

CONWAY  
 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 “Poor” physical condition.
- The pumping system is currently undersized to meet the peak wet weather flows.
- 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 (0-5 years)

Due to the age and capacity of the pumping system, it is recommended that the replacement of the pumps, piping, and valves be completed within the next 5 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 IMPROVEMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short Term	Pump and Piping Replacement	\$138,000
<b>TOTAL</b>			<b>\$138,000</b>

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

TABLE 8.1: CONWAY LIFT STATION ELECTRICAL OVERVIEW	
YEAR CONSTRUCTED	1968
LOCATION	2200 Portage Avenue
SERVICE	100 AMP
VOLTAGE	600 VAC
STANDBY GENERATOR SIZE	N/A
NUMBER OF PUMPS	Two (2)
PUMP HORSEPOWER	P-101: 15HP, P-102: 15HP




### 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 the wet well 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.

**TABLE 8.2: ELECTRICAL CODE REVIEW**

YEAR CONSTRUCTED	1968		
LOCATION	2200 Portage Avenue		
<b>WET WELL</b>			
HAZARDOUS LOCATION CLASSIFICATION	Zone 1		
CORROSIVE ENVIRONMENT CATEGORY	Category 1		
<b>DRY WELL</b>			
HAZARDOUS LOCATION CLASSIFICATION	Zone 2		
CORROSIVE ENVIRONMENT CATEGORY	Category 2		
<b>ITEM</b>	<b>REQUIREMENT</b>	<b>CODE COMPLIANCE</b>	<b>CODE REFERENCE / NOTES</b>
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	YES	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, 100 Amp, 60 Hz service. Overall condition of electrical service equipment appears to be in “Poor” condition. 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. Conway Lift Station’s main service is constructed as a “stick build” through the use of disconnects, splitters, and separate starters. Conway Lift Station experienced high levels of H<sub>2</sub>S gases for prolonged periods, resulting in the replacement of electrical components by City staff. Currently there are no provisions at the Conway 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 lift station.

**TABLE 8.3: CONWAY LIFT STATION SERVICE ENTRANCE EQUIPMENT CONDITION ASSESSMENT**

DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Main Disconnect	600 VAC	Poor	Important	Short Term
Splitter and Meter	600 VAC	Fair	Important	Short Term

### 8.4 Cable and Conduit

The wiring style in Conway Lift Station is a mixture of threaded rigid conduit, Teck cable, and RPVC. RPVC does not meet Zone 2 requirements.

### 8.5 Motors

The lift station is equipped with two (2) pumps. Both P-101 and P-102 are equipped with a 15HP, 575 VAC 3 phase



Brook Electric motor. The Vent motor was not visible at time of the inspection, the vent motor was noted to have been replaced December 22, 2008. The pump motors for P-101 and P-102 appear to have been previously painted, likely to reduce corrosion effecting the motors. The motors were subject to H<sub>2</sub>S gasses for prolonged periods. For that reason, the life expectancy of these motors has been substantially reduced. The two motors appear in “Fair” condition on a visual inspection due to the painting of the motor. Taking into account the age of the motors and the harmful atmosphere they have endured, 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 Conway Lift Station.

TABLE 8.4: CONWAY LIFT STATION MOTOR CONDITION ASSESSMENT				
DESCRIPTION	HORSEPOWER	CONDITION	IMPORTANCE	ACTION
P-101 Motor	15HP	Fair	Important	Short Term
P-102 Motor	15HP	Fair	Important	Short Term
Vent Motor	N/A	N/A	Important	Mid 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 FVNR’s appear to have been replaced in 1999. Internal components are showing signs of deterioration caused by the harmful environment it is located within. Overall the starters are in “Poor” condition. Table 8.5 provides a summary of the condition of the starters at the Conway Lift Station.

TABLE 8.5: CONWAY 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 fed via a wall mounted splitter and appears to be in “Fair” condition. The main lighting panel is fed from a 600VAC:120/240VAC step down transformer. City staff noted the transformer has been replaced on multiple occasions due to equipment failure. The current transformer appears to be in “Good” condition. The lighting panel is in “Fair” condition. Internal corrosion is evident both on termination points throughout the distribution equipment. Table 8.6 provides a summary of the condition of the transformers, panel board, and distribution equipment at Conway Lift Station.

#### 8.7.1 Lighting

Lighting at the Conway 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. Overall, the condition of the lighting appears to be “Fair”. The fixture

located within the valve chamber and its associated hardware is showing corrosion, along with missing its protective cover. Exterior lighting above man doors would be recommended.

### 8.7.2 Emergency Lighting

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

**TABLE 8.6: CONWAY LIFT STATION TRANSFORMERS, PANELBOARDS, & DISTRIBUTION EQUIPMENT  
CONDITION ASSESSMENT**

DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Main Lighting Panel	120/208VAC	Fair	Intermediate	Short Term
Dry Type Transformer	600:120/208 VAC	Good	Intermediate	Short Term
Building Envelope Lighting	120VAC	Fair	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 Cornish Lift Station are summarized as follows:

- Although components within the electrical system have been replaced, the equipment at this site is in “Poor” condition due to the deterioration taking place on and within the electrical system.
- 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 Conway Lift Station by planning to maintain operation during upgrades and construction. Prior to any 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	\$86,500
<b>Total:</b>			<b>\$86,500</b>

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

**TABLE 9.1: CONWAY LIFT STATION CONTROLS & INSTRUMENTATION OVERVIEW**

YEAR CONSTRUCTED	1968
LOCATION	2200 Portage Ave
LAST AUTOMATION UPDATE	2013
CONTROLLER	SCADAPack 357
PROGRAMMING SOFTWARE	Telepace
COMMUNICATION TYPE	4G Cellular Communication with PSTN Backup
SCADA SOFTWARE	N/A



### 9.2 Control Systems

The Conway 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 Conway Lift Station. Field devices include one Pressure Based Level Transmitter and a 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. 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 used to monitor the lift station only, such that 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)

Conway 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”. Wiring is run with cable management devices, such as Panduit, and has remained contained within the Panduit. 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.

### 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 Conway 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 Conway Lift Station.

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

## 9.3 Instrumentation

Instrumentation at the Conway Lift Station includes a Pressure Based Level Transmitter and float level switches. In general, the instrumentation is in “Good” condition. Table 9.3 provides a summary of the condition of the instrumentation at the Conway Lift Station.

TABLE 9.3: CONWAY LIFT STATION INSTRUMENTATION CONDITION ASSESSMENT				
INSTRUMENTATION	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
LIT-101	Level Transmitter	Good	Important	Mid Term
LSHH-101	Building Flood Detector	Fair	Low	Mid Term
LSH-101	Valve Chamber Level	Good	Low	Mid-Term



### 9.3.1 Process Control

#### *9.3.1.1 Pumping*

The primary process control device used at the Conway Lift Station is a pressure based level sensor. The level transmitter appears to be in “Good” 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 be installed to mitigate the risk of environmental damage and damage to property resulting from a flood situation.

### 9.3.2 Gas Monitoring

Conway 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 be 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 off set 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 Conway 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, along with low building temperature sensors, would provide advanced warning of fire at this lift station, 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 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)

The City should 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	\$14,700
<b>Total:</b>			<b>\$32,900</b>


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 Conway 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 are minor odour issues at times and corrosion is evident throughout the station. However, the recent installation of piping in the Comminutor Chamber has reduced odour and condensation issues in the lift station. 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: CONWAY LIFT STATION VENTILATION OVERVIEW	
YEAR CONSTRUCTED	1963
ODOUR CONTROL	No
<b>DRY WELL</b>	
VENTILATION TYPE	Intermittent
VENTILATION RATE	780 m <sup>3</sup> /hr
<b>WET WELL</b>	
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 Lift Station.

TABLE 10.2: CONWAY LIFT STATION VENTILATION REQUIREMENTS						
VENTILATED AREA	VOLUME (m <sup>3</sup> )	VENTILATION FREQUENCY	REQUIRED AIR CHANGES PER HOUR	REQUIRED VENTILATION RATE (m <sup>3</sup> /hr)	CURRENT VENTILATION RATE (m <sup>3</sup> /hr)	VENTILATION TYPE
Dry Well	251	Intermittent	30	7,540	780	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 louvre using a portable anemometer to confirm building airflows. Table 10.3 provides a summary of the condition of the supply fan at the Conway Lift Station.

TABLE 10.3: CONWAY LIFT STATION FAN CONDITION ASSESSMENT				
EQUIPMENT	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
SF-101	Centrifugal Supply Fan	Poor	Important	Short Term

#### 10.3.2 Intake and Exhaust Louvres and Dampers

The lift station includes a supply louvre in the main level of the building and an exhaust stack outside the building. The louvre 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 intermittent 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 installation of blower heater that would connect to the existing ducting entering the dry vault to provide heated fresh air to the space to 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: VENTILATION SYSTEM IMPROVEMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short Term	Dry Well Ventilation System Upgrades	\$40,000
<b>TOTAL:</b>			<b>\$40,000</b>

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.

<b>TABLE 11.1: SUMMARY OF RECOMMENDED IMPROVEMENTS - CONWAY LIFT STATION</b>			
<b>Item</b>	<b>Project Type</b>	<b>Action</b>	<b>Cost</b>
<b>Facility Condition Assessment</b>			
Site Conditions	Maintenance	Mid Term	\$1,150
Foundations	Capital	Short Term	\$70,000
Primary Structural Systems			\$0
Secondary Structural Systems	Capital	Mid Term	\$118,500
Building Envelope			\$0
Roofing	Maintenance	Long Term	\$5,000
Building Mechanical	Capital	Short Term	\$500
<b>Subtotal:</b>			<b>\$195,150</b>
<b>Mechanical Equipment Condition Assessment</b>			
Pump Replacements	Capital	Short Term	\$84,000
Valve Replacements	Capital	Short Term	\$26,000
Pipe Replacements	Capital	Short Term	\$28,000
<b>Subtotal:</b>			<b>\$138,000</b>
<b>Electrical Equipment Condition Assessment</b>			
Main Service	Capital	Short Term	\$40,000
Starters for P-101 & 102	Capital	Short Term	\$10,000
Motor Studies	Study	Short Term	\$30,000
Motor Upgrades	Capital	Short Term	\$1,500
Transformer	Capital	Short Term	\$5,000
<b>Subtotal:</b>			<b>\$86,500</b>
<b>Controls &amp; Instrumentation Condition Assessment</b>			
Control Panel	Capital	Mid Term	\$40,000
Level Sensor	Capital	Mid Term	\$30,000
<b>Subtotal:</b>			<b>\$70,000</b>
<b>Dry &amp; Wet Well Ventilation Review</b>			
Dry Well Ventilation System Upgrades	Capital	Short Term	\$40,000
<b>Subtotal:</b>			<b>\$40,000</b>
<b>Total</b>			
<b>Total Estimated Cost - All Recommended Improvements:</b>			<b>\$529,650</b>

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 and Safety Concerns

A summary of the Code compliance and safety concerns for the sewage lift station are presented in Table 11.2.

TABLE 11.2: CODE COMPLIANCE & SAFETY CONCERNS - CONWAY LIFT STATION	
Item Description	Type
<b>Site Conditions</b>	
<b>Foundations</b>	
Wet well access vault is badly damaged.	Safety
<b>Primary Structural Systems</b>	
<b>Secondary Structural Systems</b>	
Stairs, rails, and anchors are corroded.	Safety
Hatch lids are subject to falling through openings.	Code Compliance
Hatch openings do not include guard rails and gates.	Code Compliance
<b>Building Envelope</b>	
<b>Roofing</b>	
<b>Building Mechanical</b>	
There is no current fire suppression system.	Code Compliance
<b>Building Ventilation</b>	

## **Appendix A**

### **Facility Condition Assessment Forms**





FACILITY CONDITION ASSESSMENT  
 SITE CONDITIONS



SECTION	ITEM	DATA		ASSESSMENT SCORES			AGE		
				Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life
Tag: STR_Site_Conditions	GENERAL	CODE COMPLIANCE ISSUES:		Assign Ratings	Assign Ratings	Assign Ratings	1963	30	0
	GENERAL	SAFETY ISSUES:		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			10
	Current Physical Condition	<b>Site Access Road &amp; Parking Lot:</b> <i>Issues for Discussion:</i> - Condition of surface -potholes, mud, etc - Proper bollards in place to protect infrastructure	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)		0.4	<b>NOTES &amp; COMMENTS:</b> - Site drainage was not able to be assessed at time of visit - Parking area and surrounding was frozen but appeared in good condition - No perimeter fence - No identification or emergency contact info - Difficult to access site west bound. Exit and entry off busy road. Sight lines are ok - Overhanging tree interferes with exhaust, roof drain, etc			
	Current Physical Condition	<b>Site Grading &amp; Landscaping:</b> <i>Issues for Discussion:</i> - Ponding water on site - Ground sloped away from the building - Condition of vegetation on site - Trees overhanging powerlines or building - Trees blocking sight lines for access / exit	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)		0.3				
	Current Physical Condition	<b>Fencing &amp; Signage:</b> <i>Issues for Discussion:</i> - Signage in place / visible - Fence and gate condition - Warning signage appropriate	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)		0.3				
	Current Physical Condition	<b>Site Access Road &amp; Parking Lot:</b> <i>Issues for Discussion:</i> - Sight lines entering and exiting the site - Sufficient parking space - Emergency vehicle accessibility	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)		0.4				
	Fitness for Purpose	<b>Site Grading &amp; Landscaping:</b> <i>Issues for Discussion:</i> - Suitability of landscaping for the community - Grading sufficient to drain site	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)		0.2	<b>RECOMMENDATIONS:</b> - trim overhanging tree - Install contact info signage - Caution entering / exiting		<b>COST ESTIMATE</b> \$ 1,000.00 \$ 150.00	
	Fitness for Purpose	<b>Fencing &amp; Signage:</b> <i>Issues for Discussion:</i> - Signage reflect important information, emergency # - Fencing and gate appropriate or needed for security	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)		0.4				
	Safety	<b>Public and Operator Safety:</b> <i>Issues for Discussion:</i> - Historical safety incidents, or potential conditions - 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		1				
	PHOTOGRAPHS								



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:	3.3	3.0	5.0	1963	50	0	
		SAFETY ISSUES: - The condition of the wet well access vault makes wet well entry unsafe.							
	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)	3	0.3	NOTES & COMMENTS: - Concrete base slab in dry well is aging with surface deterioration. - foundation walls in very good condition - Wet well vault in very poor condition. Ground shifting has sheared vault joints. Not able to access wet well - Unsafe to enter wet well  RECOMMENDATIONS: Remove and install new wet well access vaults  COST ESTIMATE \$ 70,000.00			
		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				
		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)	3	0.3				
		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	5	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:	3.0	3.0	3.0	1963	50	0
		SAFETY ISSUES:						
	Current Physical Condition	<b>Loadbearing walls, columns, beams:</b> <i>Issues for Discussion:</i> - Deterioration of concrete - Corrosion of steel (beams, column base, anchors...)	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)	3	0.4	<b>NOTES &amp; COMMENTS:</b> - Aging building, Haydite pre-cast walls, brick veneer, structurally sound - Haydite pre-cast roof panels - CIP concrete beams supporting concrete floors in good condition - mid level floor was sawcut to allow for pipe penetration. Floor may not be able to support required Live Loads.		
		<b>Trusses and Joists:</b> <i>Issues for Discussion:</i> - Corrosion	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)	3	0.3			
		<b>Suspended Floors:</b> <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			
	Fitness for Purpose	<b>Loadbearing walls, columns, beams:</b> <i>Issues for Discussion:</i> - Suitable access to equipment, levels - Compliance with Codes and Standards	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	<b>RECOMMENDATIONS:</b> Review of mid level floor capacity	<b>COST ESTIMATE</b>	
		<b>Trusses and Joists:</b> <i>Issues for Discussion:</i> - Clearance	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			
		<b>Suspended Floors:</b> <i>Issues for Discussion:</i> - Sufficient Space for layout	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	<b>Public and Operator Safety:</b> <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	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	<b>CODE COMPLIANCE ISSUES:</b> - The hatches are not Code compliant.	4.1	3.5	5.0	1963	50	0
	GENERAL	<b>SAFETY ISSUES:</b> - The stairs and rails are corroded.						
	Current Physical Condition	<b>Stairs, Ladders, Catwalks, Rails, Hatches:</b> <i>Issues for Discussion:</i> - Corrosion of material, anchors - Hatch seals, operability, locks	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)	4	0.5	<b>NOTES &amp; COMMENTS:</b> - Lower level stairs / handrail no longer suitable for usage - Concrete equipment base at end of service life - Walls, ceiling covered with aluminum faced polyiso insulation. protective board over sections of the wall. - Floor and wall finishes are worn off - Monorail load capacity should be on the monorail. - Carbon steel bolts used for anchors in places and are corroding - Plywood hatch not suitable - Hatches not to code, stair rails corroded		
	Current Physical Condition	<b>Interior walls, Ceiling, Supports, Equipment Base:</b> <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	0.2			
	Current Physical Condition	<b>Finishes:</b> <i>Issues for Discussion:</i> - Floor, wall, ceiling paint. Finishes on doors, etc	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)	5	0.1			
	Current Physical Condition	<b>Monorails and Hoists:</b> <i>Issues for Discussion:</i> - Corrosion, anchor bolts, labels - Corrosive atmosphere	Rating 1 (Excellent condition) Rating 2 (Good condition) Rating 3 (Functional condition) Rating 4 (Poor condition) Rating 5 (Not functional)	4	0.2			
	Fitness for Purpose	<b>Stairs, Ladders, Catwalks, Rails, Hatches:</b> <i>Issues for Discussion:</i> - Corrosion resistance of material - Suitable access to equipment, levels - Compliance with Codes and Standards	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	0.5		<b>RECOMMENDATIONS:</b> - Replace lower level stairs and anchors - Epoxy floors, paint walls - Replace concrete equipment base - Install interior liner panel on walls / ceiling - Replace plated bolts with SS anchors - Replace plywood hatch lids (3), stairs, hatches	<b>COST ESTIMATE</b> \$ 35,000.00 \$ 55,000.00 \$ 1,500.00 \$ 12,000.00 \$ 7,500.00 \$ 7,500.00
	Fitness for Purpose	<b>Interior walls, Ceiling, Supports, Equipment Base:</b> <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			
	Fitness for Purpose	<b>Finishes:</b> <i>Issues for Discussion:</i> - Floor and wall protection.	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	0.1			
	Fitness for Purpose	<b>Monorails and Hoists:</b> <i>Issues for Discussion:</i> - Transport of equipment to accessible area - Certificated by others	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	<b>Public and Operator Safety:</b> <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	5	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_Building_Envelope	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.4	2.6	1.0	1963	25	0
	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)	3	0.4	NOTES & COMMENTS: - Exterior door is old, weathered - Exterior veneer is in good condition - Insulation added to interior can be problematic in heated spaces with no vapour barrier.		
		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)	3	0.2			
		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)	2	0.4			
	Fitness for Purpose	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)	3	0.4	RECOMMENDATIONS:  COST ESTIMATE		
		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			
		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	1	1			
	Safety							
	PHOTOGRAPHS							



FACILITY CONDITION ASSESSMENT FORM  
 ROOFING



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:	3.2	2.5	1.0	1963	25	0
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			3
	Current Physical Condition	Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i>	3	0.5	NOTES & COMMENTS: - Hadite Pre-cast concrete roof panels - Unable to access and view roof due to snow load - Flashings are corroded  RECOMMENDATIONS: Replace flashings when roof is replaced  COST ESTIMATE \$ 5,000.00			
		Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i>	3	0.3				
		Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i>	4	0.2				
		Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i>	2	0.5				
		Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i>	3	0.3				
		Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i>	3	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	1	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	3.0	1963	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  RECOMMENDATIONS: - Install handheld fire extinguisher by building entrance  COST ESTIMATE \$ 500.00						
		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							
		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							
		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							
	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	<b>Ventilation Systems:</b> - Wet Well, Dry Well  <b>CODE COMPLIANCE ISSUES:</b> Dry well ventilation system is undersized to meet NFPA 820 ventilation requirements  <b>SAFETY ISSUES:</b>	4.0	4.0	3.0	1963	25	0
	Current Physical Condition	<b>Wet Well Ventilation</b> <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)  <b>Dry Well Ventilation</b> <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)	0	0	<b>NOTES &amp; COMMENTS:</b> - 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.	<b>RECOMMENDATIONS:</b> Replace Dry Well Ventilation System		
	Fitness for Purpose	<b>Wet Well Ventilation</b> <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)  <b>Dry Well Ventilation</b> <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)	4	1				
	Safety	<b>Operator Safety</b> <i>Issues for Discussion:</i> - Monitors, Alarms  Rating 1: No safety hazard conditions Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1				
	PHOTOGRAPHS							
				Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		



## **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	
Equipment Tag: P_101 Description: Dry Pit Solids Handling	GENERAL	Location: Dry Well Lower Level	4.4	3.0	2.3		1963	25	0	
		Type: 15 HP Vertical End Suction								
		Description: Dry Pit Solids Handling								
		Manufacturer: Aurora								
		Model: KU - 5CX5								
		RPM: 1150								
		Rated Voltage: 575 V								
	Rated Current: 15.3 A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			3			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	VIBRATION (in/s) Motor 0.02 0.02 0.01 Volute 0.04 0.03 0.04				
		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	NOTES & COMMENTS: Pump is at the end of its service life. Severe corrosion noted on pump. Pump frequently plugs.				
		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	The pumping system is capable of meeting the peak dry weather influent flow requirements, however the pumping system is not currently capable of meeting the peak wet weather influent flow requirements.				
		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	Pump models are dated and spare parts are not readily available.				
		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					
	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)	4	0.2					
		Pump Redundancy: Issues for Discussion:	Rating 1 (100% redundancy) Rating 3 (50% redundancy) Rating 5 (No redundancy. Risk of critical failure)	3	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	RECOMMENDATIONS Replace Pump					
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	COST ESTIMATE \$ 42,000.00					
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)	4	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)	2	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)	2	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)	2	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										



**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	4.4	3.0	2.3		1963	25	0																	
	Type:	15 HP Vertical End Suction																								
	Description:	Dry Pit Solids Handling																								
	Manufacturer:	Aurora																								
	Model:	KU - 5CX5																								
	RPM:	1150																								
	Rated Voltage:	575 V																								
	Rated Current:	15.3 A																								
				Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			3																	
	Current Physical Condition	<b>Equipment Visual Inspection:</b> <i>Issues for Discussion:</i>	Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	5	0.2	<table border="1"> <thead> <tr> <th colspan="4">VIBRATION (in/s)</th> </tr> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Motor</td> <td>0.02</td> <td>0.03</td> <td>0.02</td> </tr> <tr> <td>Volute</td> <td>0.04</td> <td>0.05</td> <td>0.05</td> </tr> </tbody> </table>					VIBRATION (in/s)					X	Y	Z	Motor	0.02	0.03	0.02	Volute	0.04	0.05	0.05
		VIBRATION (in/s)																								
			X	Y	Z																					
		Motor	0.02	0.03	0.02																					
		Volute	0.04	0.05	0.05																					
		<b>Equipment Corrosion Noted:</b> <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	<b>NOTES &amp; COMMENTS:</b> Pump is at the end of its service life. Severe corrosion noted on pump. Pump frequently plugs.																				
		<b>Condition of Pump Accessories:</b> <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	The pumping system is capable of meeting the peak dry weather influent flow requirements, however the pumping system is not currently capable of meeting the peak wet weather influent flow requirements.																				
		<b>Rebuild Potential of Pump:</b> <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	Pump models are dated and spare parts are not readily available.																				
		<b>Occurrence of Maintenance Issues:</b> <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																					
		<b>Design Flow Rate:</b> <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)	4	0.2																					
	<b>Pump Redundancy:</b> <i>Issues for Discussion:</i>	Rating 1 (100% redundancy) Rating 3 (50% redundancy) Rating 5 (No redundancy. Risk of critical failure)	3	0.2																						
<b>Appropriate Pump Type for Application:</b> <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																							
<b>Available Water Supply for Pumps (If Required):</b> <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																							
<b>Pump Capacity:</b> <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)	4	0.3																							
Fitness for Purpose	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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	0.25																						
	<b>Piping/Equipment Interference with Pump Removal:</b> <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)	2	0.2																						
	<b>Provision of Direct Lift Spot for Pump Removal:</b> <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)	2	0.1																						
	<b>Pumping Equipment Uniformity:</b> <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																						
	<b>Availability of Spare Parts:</b> <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																						
					RECOMMENDATIONS		COST ESTIMATE																			
					Replace Pump		\$ 42,000.00																			
PHOTOGRAPHS																										

## **Appendix C**

### **Electrical & Communication Condition Assessment Forms**



Project No.: 8400-001-00  
 Tag: IC\_Panel  
 Facility: Conway Lift Station  
 Assessment Page 1 of 1



CONTROL PANEL CONDITION ASSESSMENT FORM



Assessor: Richard Ofstie  
 Date: 15-May-19  
 Asset ID: 13456

SECTION	ITEM	DATA	Assessment Scores				Component Age			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: IC_Panel Description: Conway Control Panel	GENERAL	Location: Dry Well, Main Level	3.0	1.0				25	0	
		Description: Conway Control 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: Replaced in 2013. No gas detection. Equipment is not rated for Classified locations.  RECOMMENDATIONS: Install Building Alarms (smoke, heat and ambient temperature) Install Flow Meter  COST ESTIMATE \$ 33,100.00				
		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)	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					
Panel is Appropriately Designed: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1						
Fitness for Purpose	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)	1	0.2						
PHOTOGRAPHS	 									

Project No.: 8400-001-00  
 Tag: IC\_Termination\_Panel  
 Facility: Conway Lift Station  
 Assessment Page 1 of 1



CONTROL PANEL CONDITION ASSESSMENT FORM



Assessor: Richard Ofstie  
 Date: 31-Jan-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_Termination_Panel Description: Conway Termination Panel	GENERAL	Location: Dry Well, Main Level	3.0	1.0				25	0					
		Description: Conway Termination Panel												
		Function: Level Monitor Displays												
		PLC Processor: N/A												
		UPS Protection: 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: Termination Panel is 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)	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)	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	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									
		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)	1	0.2									
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_Instrument_1 Description: Level Sensor	GENERAL	Location: Dry Well, Lower Level	1.4	1.0				20	0	
		Description: Level Sensor								
		Make: Rosemount								
		Model: 2051L1AAOFD21AAK6M5D4								
		Device Span: 0-250in								
		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)	1	0.1	<b>NOTES &amp; COMMENTS:</b> Instrument is in "GOOD" condition. No control 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)	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						
		<b>RECOMMENDATIONS:</b>			<b>COST ESTIMATE</b>					
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	Add Redundant wet well level sensor			\$	30,000.00	
	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)	1	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_Instrument_2 Description:	GENERAL	Location: Dry Well Valve Chamber	1.0	1.5				20	0	
		Description:								
		Make:								
		Model:								
		Device Span: N/A								
		Input/Output: Input								
		Signal Type: Discrete								
		Rated Voltage: 24VDC/120VAC								
		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	<b>NOTES &amp; COMMENTS:</b> FLYGT ball 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)	1	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	<b>RECOMMENDATIONS:</b>  <b>COST ESTIMATE</b>				
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										



## **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	1.6		1963	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: McAvity								
		Valve Model: 125S - 200W								
		Actuation: Manual - Hand Wheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	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	<b>NOTES &amp; COMMENTS:</b> 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 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of critical failure)	1	0.3	<b>RECOMMENDATIONS:</b> Replace Valve		<b>COST ESTIMATE</b> \$ 5,000.00			
	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)	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: GAV_101B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	1.6		1963	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: McAvity								
		Valve Model: 125S - 200W								
		Actuation: Manual - Hand Wheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	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: Issues for Discussion:	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: Issues for Discussion:		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: Issues for Discussion:		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: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of critical failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 5,000.00			
	Valve Capacity: Issues for Discussion:	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: 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)	2	0.6						
	Sufficient Access to Exercise Valve: 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 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: GAV_102A Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	1.6		1963	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: McAvity								
		Valve Model: 125S - 200W								
		Actuation: Manual - Hand Wheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	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	<b>NOTES &amp; COMMENTS:</b> Valve is at the end of its service life. Severe corrosion noted on valve.				
		Valve Corrosion Noted: Issues for Discussion:	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: Issues for Discussion:		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: Issues for Discussion:		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: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of critical failure)	1	0.3	<b>RECOMMENDATIONS:</b> Replace Valve		<b>COST ESTIMATE</b> \$ 5,000.00			
	Valve Capacity: Issues for Discussion:	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: 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)	2	0.6						
	Sufficient Access to Exercise Valve: 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 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: GAV_102B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.9	1.0	1.6		1963	25	0
		Description: Gate Valve							
		Size: 150 mm							
		Valve Make: McAvity							
		Valve Model: 125S - 200W							
		Actuation: Manual - Hand Wheel							
		Actuator Make: N/A							
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3			
	Current Physical Condition	<b>Valve Visual Inspection:</b> <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	<b>NOTES &amp; COMMENTS:</b> Valve is at the end of its service life. Severe corrosion noted on valve.				
		<b>Valve Corrosion Noted:</b> <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					
<b>Valve Operation:</b> <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						
<b>Occurrence of Maintenance Issues:</b> <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	<b>Appropriate Valve Configuration:</b> <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	<b>RECOMMENDATIONS:</b> Replace Valve		<b>COST ESTIMATE</b> \$ 5,000.00			
	<b>Valve Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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						
	<b>Sufficient Access to Exercise Valve:</b> <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: GAV_201 Description: Gate Valve	GENERAL	Location: Dry Well	1.0	1.0	1.0		2015	25	21	
		Description: Gate Valve								
		Size: 500 mm								
		Valve Make: Clow								
		Valve Model: Series 50								
		Actuation: Manual - Hand Wheel c/w Valve Extension								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	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	<b>NOTES &amp; COMMENTS:</b> 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 3 (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	3.9	1.0	1.6		1963	25	0
		Description: Check Valve							
		Size: 150 mm							
		Valve Make: McAvity							
		Valve Model: 125 SWP							
		Actuation: N/A							
		Actuator Make: N/A							
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3			
	Current Physical Condition	<b>Valve Visual Inspection:</b> <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	<b>NOTES &amp; COMMENTS:</b> Valve is at the end of its service life.  Severe corrosion noted on valve.				
		<b>Valve Corrosion Noted:</b> <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					
<b>Valve Operation:</b> <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						
<b>Occurrence of Maintenance Issues:</b> <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	<b>Appropriate Valve Configuration:</b> <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	<b>RECOMMENDATIONS:</b> Replace Valve		<b>COST ESTIMATE</b> \$ 3,000.00			
	<b>Valve Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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						
	<b>Sufficient Access to Exercise Valve:</b> <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						
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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	3.9	1.0	1.6		1963	25	0	
		Description: Check Valve								
		Size: 150 mm								
		Valve Make: McAvity								
		Valve Model: 125 SWP								
		Actuation: N/A								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	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	<b>NOTES &amp; COMMENTS:</b> Valve is at the end of its service life.  Severe corrosion noted on valve.				
		Valve Corrosion Noted: Issues for Discussion:	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: Issues for Discussion:		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: Issues for Discussion:		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: Issues for Discussion:	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 3 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	<b>RECOMMENDATIONS:</b> Replace Valve		<b>COST ESTIMATE</b> \$ 3,000.00			
	Valve Capacity: Issues for Discussion:	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: 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)	2	0.6						
	Sufficient Access to Exercise Valve: 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 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						
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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	1.0	1.8	1.0		2015	50	46			
		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)		3						
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	1	0.3	<b>NOTES &amp; COMMENTS:</b> Piping in excellent condition.							
		<b>Piping Corrosion Noted:</b> <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								
		<b>Condition of Potable Water Piping and Backflow</b> <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								
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3									
	<b>Flow Meter Installed:</b> <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	<b>RECOMMENDATIONS:</b>						<b>COST ESTIMATE</b>		
	<b>Appropriate Piping Configuration:</b> <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	<b>Piping Capacity:</b> <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									
	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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									
	<b>Isolation Valves Installed:</b> <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	3.4	1.8	1.6		1963	50	0	
		Description: P-101 Suction Line								
		Size: 150 mm								
		Material: Carbon Steel								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	3	0.3	<b>NOTES &amp; COMMENTS:</b> Piping is at the end of its service life.  Severe corrosion noted on piping.  No flowmeter installed.					
		<b>Piping Corrosion Noted:</b> <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						
		<b>Condition of Potable Water Piping and Backflow</b> <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						
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	<b>Flow Meter Installed:</b> <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	<b>RECOMMENDATIONS:</b> Replace Piping						<b>COST ESTIMATE</b> \$ 3,000.00
	<b>Appropriate Piping Configuration:</b> <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							
<b>Piping Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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							
	<b>Isolation Valves Installed:</b> <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-101 Suction Line	GENERAL	Location: Dry Well Lower Level	3.4	1.8	1.6		1963	50	0	
		Description: P-101 Suction Line								
		Size: 150 mm								
		Material: Carbon Steel								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	3	0.3	<b>NOTES &amp; COMMENTS:</b> <i>Piping is at the end of its service life.</i>  <i>Severe corrosion noted on piping.</i>  <i>No flowmeter installed.</i>					
		<b>Piping Corrosion Noted:</b> <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						
		<b>Condition of Potable Water Piping and Backflow</b> <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						
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	<b>Flow Meter Installed:</b> <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	<b>RECOMMENDATIONS:</b> Replace Piping						<b>COST ESTIMATE</b> \$ 3,000.00
	<b>Appropriate Piping Configuration:</b> <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							
<b>Piping Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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							
	<b>Isolation Valves Installed:</b> <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_P101_Discharge Description: P_101_Discharge Line	GENERAL	Location: Dry Well Lower Level	3.4	1.8	1.6		1963	50	0	
		Description: P-101 Discharge Line								
		Size: 150 mm								
		Material: Carbon Steel								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3				
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	3	0.3	<b>NOTES &amp; COMMENTS:</b> Piping is at the end of its service life. Severe corrosion noted on piping. No flowmeter installed.					
		<b>Piping Corrosion Noted:</b> <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						
		<b>Condition of Potable Water Piping and Backflow</b> <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						
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	<b>Flow Meter Installed:</b> <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	<b>RECOMMENDATIONS:</b> Replace Piping						<b>COST ESTIMATE</b> \$ 6,000.00
	<b>Appropriate Piping Configuration:</b> <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							
<b>Piping Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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							
	<b>Isolation Valves Installed:</b> <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	3.4	1.8	1.6	1963	50	0	
		Description: P-102 Discharge Line							
		Size: 150 mm							
		Material: Carbon Steel							
		Service: Sewage							
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		3			
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	3	0.3	<b>NOTES &amp; COMMENTS:</b> Piping is at the end of its service life. Severe corrosion noted on piping. No flowmeter installed.				
		<b>Piping Corrosion Noted:</b> <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					
		<b>Condition of Potable Water Piping and Backflow</b> <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					
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3						
	<b>Flow Meter Installed:</b> <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	<b>RECOMMENDATIONS:</b> Replace Piping					<b>COST ESTIMATE</b> \$ 6,000.00
	<b>Appropriate Piping Configuration:</b> <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						
<b>Piping Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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						
	<b>Isolation Valves Installed:</b> <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: P-102 Discharge Line	GENERAL	Location: Dry Well Lower Level	3.4	1.8	1.6		1963	50	0			
		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)		3						
	Current Physical Condition	<b>Piping Visual Inspection:</b> <i>Issues for Discussion:</i> Rating 1 (Like new) Rating 3 (Minor leaks) Rating 5 (Risk of critical failure)	3	0.3	<b>NOTES &amp; COMMENTS:</b> Piping is at the end of its service life. Severe corrosion noted on piping. No flowmeter installed.							
		<b>Piping Corrosion Noted:</b> <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								
		<b>Condition of Potable Water Piping and Backflow</b> <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								
		<b>Occurrence of Maintenance Issues:</b> <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	<b>Force Main Shut Off Valve:</b> <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	<b>RECOMMENDATIONS:</b> Replace Piping							
		<b>Flow Meter Installed:</b> <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						<b>COST ESTIMATE</b>		\$ 10,000.00
		<b>Appropriate Piping Configuration:</b> <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								
		<b>Piping Capacity:</b> <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	<b>Sufficient Access to Perform O&amp;M Activities Safely:</b> <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								
<b>Isolation Valves Installed:</b> <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_Service Description: Conway Service Equipment	GENERAL	Location: Dry Well, Main Level	3.7	2.9			1999	40	20						
		Description: Conway Service Equipment													
		Phase: 3													
		Rated Voltage: 600 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)	4	0.1	<b>NOTES &amp; COMMENTS:</b> Service enters the lift station over head from two pole mount transformers. It then enters into a 100A disconnect which then supplies power to a wall mount splitter. Main service equipment is highly corroded. Equipment is not rated for a classified location. City staff noted service is Delta configuration. No transfer switch is at the location for hooking up Portable Generator during power failure. Height restrictions would limit the station to remain with individual service components rather than an MCC. Same philosophy could be used as Configuration C in the Electrical Design Guide.  Service does not meet current Design Guide. City noted during wet conditions both pumps are needed to run for extended periods to keep up with demand.									
		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)	3	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)	3	0.2						<b>RECOMMENDATIONS:</b> Complete a service upgrade once HVAC and H2S concerns have been mitigated. Service upgrade to mimic City Design Guide Configuration C of 3.3.3.  <b>Access capacity demand and pump sizing</b>				
		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										
		Is Main Breaker Present & Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)	3	0.05										
		Is Grounding System Present & Appropriate: Issues for Discussion:	Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)	1	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)	3	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	  														
											<b>COST ESTIMATE</b> \$ 40,000.00				



SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Starter_1 Description: Pump 1 Motor Starter	GENERAL	Location: Dry Well, Main Level (MCC)	3.3	2.5			1999	40	20	
		Description: Pump 1 Motor Starter								
		Manufacturer: Square D								
		Model: 8538 SDG-14								
		Phase: 3								
		Rated Voltage: 600								
	Rated Horsepower: 25HP	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	<b>NOTES &amp; COMMENTS:</b> Corrosion has started to develop on relatively new equipment due to H2S gasses. Equipment is not rated for classified locations.				
		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)	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						
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	<b>RECOMMENDATIONS:</b> Replace Starter as part of the service upgrade, following the HVAC improvements and H2S concerns have been mitigated.					
	Has the Breaker Capacity 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)	3	0.5						
PHOTOGRAPHS										
							<b>COST ESTIMATE</b> \$ 5,000.00			

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Starter_2 Description: Pump 2 Motor Starter	GENERAL	Location: Dry Well, Main Level (MCC)	3.3	2.5			1999	40	20	
		Description: Pump 2 Motor Starter								
		Manufacturer: Square D								
		Model: 8538 SDG-14								
		Phase: 3								
		Rated Voltage: 600								
	Rated Horsepower: 25HP	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	<b>NOTES &amp; COMMENTS:</b> Corrosion has started to develop on relatively new equipment due to H2S gasses. Equipment is not rated for classified locations.  <b>RECOMMENDATIONS:</b> Replace Starter as part of the service upgrade, following the HVAC improvements and H2S concerns have been mitigated.				
		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)	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						
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	<b>COST ESTIMATE</b> \$ 5,000.00					
	Has the Breaker Capacity 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)	3	0.5						
PHOTOGRAPHS										



PANELBOARD 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_Dist_Panel Description: Conway Panelboard	GENERAL	Location: Dry Well, Main Level	3.1	1.5			1999	40	20	
		Description: Conway Panelboard								
		Manufacturer: Square D								
		Model: OO Load Center								
		Phase: Single Phase								
		Rated Voltage: 120/240V								
	Rated Current: 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	<b>NOTES &amp; COMMENTS:</b> Panelboard appears to be in "GOOD" condition. Assuming corrosive atmosphere concerns are dealt with in the near future there will be no need to replace the Panelboard.				
		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)	2	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	<b>RECOMMENDATIONS:</b> Ensure corrosive atmosphere is corrected. Use anti Corrosion pucks to limit the amount of corrosion to take place in the mean-time					
	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)	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)	2	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_Motor_1 Description: Pump 1 Motor	GENERAL	Location: Dry Well, Lower Level	2.5	2.3				25	0
		Description: Pump 1 Motor							
		Manufacturer: Brooks Electric Motors							
		Model:							
		Horsepower: 15HP							
		Rated Voltage:							
		Phase: Three Phase							
		Rated Current:							
	RPM: 1160	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	<b>NOTES &amp; COMMENTS:</b> It appears the motor has recently been painted. Presumably to prevent further corrosion. With that noted a accurate visual inspection for condition of the motor can not be complete. Motor is not rated for classified locations. Pecker heads were not opened for visual inspections. Tray system used for motor feeds is not supported appropriately. substantial cable length is left "FREE AIR" from point of exiting the tray to its termination point.  Motor is nearing its end of service life. Both motors are required to run for long durations during wet weather.			
		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)	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	Bring raceway up to code and manufacture recommendation standards.	\$	500.00	
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)	4	0.25	Assess lift station demands. Replace Motor at the same time the Motor starter is replaced.	\$	15,000.00		
PHOTOGRAPHS									

SECTION	ITEM	DATA	CONDITION RATING			AGE			
			Current Physical Condition	Fitness For Purpose		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Motor_2 Description: Pump 2 Motor	GENERAL	Location: Dry Well, Lower Level	2.5	2.3				25	0
		Description: Pump 2 Motor							
		Manufacturer: Brook Electric Motors							
		Model: DP-F-324UC							
		Horsepower:							
		Rated Voltage: 575							
		Phase:							
	Rated Current:								
	RPM: 1160	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	<b>NOTES &amp; COMMENTS:</b> It appears the motor has recently been painted. Presumably to prevent further corrosion. With that noted a accurate visual inspection for condition of the motor can not be complete. Motor is not rated for classified locations. Pecker heads were not opened for visual inspections. Tray system used for motor feeds is not supported appropriately. Tray system is not grounded. Substantial cable length is left "FREE AIR" from point of exiting the tray to its termination point.  Motor is nearing its end of service life. Both motors are required to run for long durations during wet weather.			
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)	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	<b>RECOMMENDATIONS:</b> Bring raceway up to code and manufacture recommendation standards.  Assess lift station demands. Replace Motor at the same time the Motor starter is replaced.		<b>COST ESTIMATE</b>  \$ 15,000.00		
	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									

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: E_Motor_3 Description:	GENERAL	Location:	N/A		2.0	3.0			2008	25	14
		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)	N/A	0	<b>NOTES &amp; COMMENTS:</b> It Appears motor was last replaced at the end of 2008. Unit was not opened for visual inspection.					
		Canadian Electrical Code Issues Identified: Issues for Discussion:	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	N/A	0						
		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						
		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	1						
	Fitness for Purpose	Meets City Electrical Design Standards: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	N/A	0	<b>RECOMMENDATIONS:</b> Install new motor along with the new HVAC system.					
		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)	N/A	0						
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	1							
PHOTOGRAPHS											
									<b>COST ESTIMATE</b>		
									\$ 1,000.00		

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Transformer Description:	GENERAL	Location:	3.2	1.8				40	0	
		Description:								
		Manufacturer:								
		Model:								
		Phase:								
		Rated Voltage:								
		Rated kVA:								
		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)	3	0.1	<b>NOTES &amp; COMMENTS:</b> City noted internal components of the transformer has been replaced two times due to corrosion. Equipment is not rated for classified areas.				
		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	<b>RECOMMENDATIONS:</b> Based on the exposure to H2S gasses it is recommended to replace the Transformer well upgrading the service equipment.			<b>COST ESTIMATE</b> \$ 5,000.00		
	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)	3	0.4						
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_Piping Description: Sanitary Force Main	GENERAL	Location: Intersection of Conway Street and Portage Avenue	3.4	1.0	2.2	1963	70	14
		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)		10		
	Current Physical Condition	<b>Force Main Breaks or Leaks in the Past:</b> <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	<b>NOTES &amp; COMMENTS:</b> Force main is nearing the end of its service life. Force main has sufficient capacity for the majority of flows from the station. Force main located under Portage Avenue which would make repairs difficult.			
		<b>Force Main Age:</b> <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				
	<b>Compatibility with Pumps and Motors:</b> <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)	1	1					
3rd Party & Environmental Damage	<b>Force Main Attached to a Bridge:</b> <i>Issues for Discussion:</i> Rating 1 (No) Rating 5 (Yes)	1	0.2	<b>RECOMMENDATIONS:</b> <b>COST</b>				
	<b>Force Main Near Other Underground Utilities:</b> <i>Issues for Discussion:</i> Rating 1 (No) Rating 3 (Yes - Minor nearby utilities) Rating 5 (Yes - Major nearby utilities)	5	0.3					
	<b>Force Main Under a River Crossing:</b> <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								

**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