

January 9, 2019

Mr. Erik Marko
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Project # OTT-00248529-A0
Water Distribution Network Issues – Lower Iqaluit Loop

Dear Mr. Marko:

Introduction

The City of Iqaluit (City) has requested that exp assist the City in repairing and rehabilitating their water distribution network. A visual assessment of each AV and MH in the City has been completed and exp is now in the process of analyzing the data and determining the current state of the system. This letter addresses exp's findings of the Lower Iqaluit network. The information highlighted in this report is being utilized to provide the City with suggested corrective actions to re-instate the water distribution system back to its intended functionality.

Transmission of Key Lower Iqaluit Loop Findings

The table below (Table 1.1), illustrates the findings of the visual inspection that was completed from the top (at the hatch) of each structure within the Lower Iqaluit Loop. The sequence of each structure has been set to follow the water's designed flow pattern as it is transmitted from each structure and eventually circulated through the Building 222 Reheat Station to have heat added within the loop. It should be noted that the infrastructure within Lower Iqaluit is some of the oldest in the City. A large portion of the piping is still ductile iron and most of the structures are old concrete manholes as opposed to the new standard access vaults.

There were several structures that could not be found or were full of water/sewage and could not be visually investigated from the surface. The presence of sump pumps in many of structures indicates consistent groundwater issues in the area. However, it is suggested that these structures be pumped out and thoroughly investigated. This is to ensure that the watermain piping is not leaking and confirming that the water observed in the structures is ground water and not potable water.

General comments are made for each structure within the table 1.1. Corrective action comments about cleaning and installing the sanitary clean out lid have not been included but, as a general note, most of the structures require thorough cleaning/disinfection and the re-installation of the lid for the sanitary cleanout as well as the laterolet caps.

Missing and Inaccessible Structures

The following list of structures were inaccessible at the time of the inspection. This was due to either not being able to physically open the lid or that the structure was buried and not visible. The use of a bar finder and a backhoe is suggested to uncover and gain access to the structures that could not be found. Once found, investigate the internal components.

- MH 21
- MH 30
- MH 60
- MH 59
- MH 45
- PT A
- MH 24
- MH 26

Watermain Inspections Not Possible

The following list of structures could not be visually investigated due to debris, water, and sewage. These structures require pumping followed by inspection. It is probable that several structures have ground water infiltration issues, however it would be prudent to confirm the current state of the watermain.

- | | |
|----------|---------|
| • MH 8 | • MH 38 |
| • PT A2 | • MH 37 |
| • MH 14 | • MH 36 |
| • MH 15 | • MH 35 |
| • MH 13 | • MH 62 |
| • MH 22 | • MH 61 |
| • MH 20 | • MH 48 |
| • MH 23B | • MH 47 |
| • MH 31 | • MH 46 |
| • MH 32 | • MH 58 |
| • MH 32B | • MH 42 |
| • MH 63 | • MH 41 |
| • MH 65 | • MH 40 |
| • MH 66 | • MH 27 |

AV 400 – see image in Table 1.1 – This is a key structure/junction in Lower Iqaluit Loop. Water is transmitted from AV 9A to AV 400 and then over to the 222 Building to have heat added. However, as seen in the image, it appears the valve on the piping that is coming from AV 9A is closed. Confirmation of this closure is required. If it is closed, the Lower Iqaluit Loop is not being supplied as designed

MH 22 – see image in Table 1.1 – During the investigation, it was noted, that audible sounds were observed that seemed to be representative of a leak. Structure requires cleaning and further investigation to confirm the cause of the noise. If a leak is identified, repair.

MH 39 – see image in Table 1.1 – Major leak identified at the valve, repair the leak.

MH 24A – see image in Table 1.1 – Significant leak identified at the flanged connection of the 45° bend, repair the leak.

First Recommendations

Based on the current conditions of the Lower Iqaluit Water system, it is evident that a very extensive repair and rehabilitation program will need to be developed. There are still 36 structures which could not be visually inspected, these structures should be inspected prior to investigating corrective actions for the loop. Of the structures that were accessible and visually clear, two significant leaks were identified and should be repaired.

Upon reviewing the images, it appears possible that some of the current valve configurations are not as per the intended design. Thus, it is likely that sections of watermain are being supplied through unintended flow patterns, further information is required confirming the current configurations, these requests are identified in table 1.1. Because of these flow conditions, bleeds have been installed throughout the years to ensure flow is occurring and that piping doesn't freeze. It was noted that several bleeds did not have backflow preventers, any bleed should have backflow preventers installed. It was also noticed within several structures, the watermain was at a lower elevation than the sanitary sewer and in some cases completely submerged in sewage. This configuration significantly increases the risk of contamination, it is strongly recommended that a cleaning program be put in place and that the sanitary clean out lids be re-installed.

It was also observed in several structures, that access into the vault or manhole appears inadequate. This needs to be corrected to ensure that each structure is safely accessible.

Based on the first review of this network, exp suggests that a meeting be had with the City after they have reviewed this report to discuss the rehabilitation of this loop. Exp wants to ensure the City understands the magnitude of the scope and level of effort required to rehabilitate the Lower Iqaluit Loop back to intended functionality and to also discuss options on how to proceed.

We trust the above information meets your requirements. Should you have any additional questions please do not hesitate to contact the undersigned.



Yours truly,



EXP Services Inc.



Simon Plourde
Engineering Designer
Infrastructure Services



Ian Crawford, CET
Project Manager
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Table 1.1 – Lower Iqaluit Loop Structures



Structure	Comment	Photo	Action Required
AV 305	<ul style="list-style-type: none"> • Sewer Cleanout not installed • Evidence of previous backups and surcharges • Requires cleaning and pumping 		No
MH 9	<ul style="list-style-type: none"> • Water servicing removed from MH 9 in 1985 (approx.) and was replaced with AV 9A • Sewage dropping into structure at very high flow rate • Appears to have extensive corrosion, potential that mechanical components don't operate as intended 		No



AV 9A	<ul style="list-style-type: none"> • Piping under ladder is believed to be a service, no recirculation piping visible, may be outside structure. • Piping going to MH 84 (going up, vertically in the photo) is supposed to be abandoned. Cannot tell configuration of valve. • Large service connection visible, return piping installed on laterolet 		Yes – confirm valve going to MH 84 is closed
MH 8	<ul style="list-style-type: none"> • Key structure in Lower Iqaluit network as the water supply loops back and ties into the structure, thus completing the loop • Originally constructed with open sewer benching • Requires pumping and cleaning • Water level suggests possible downstream sewage issues • Access does not appear adequate • Piping from MH 8 to AV 11 is supposed to have been abandoned • Electrical equipment (heater and sump pump) still in place but probably not functional 		Yes – Modify access and determine source of water, leak or infiltration



MH 7	<ul style="list-style-type: none"> • Originally constructed with open sewer benching • Appears to have extensive corrosion, potential that mechanical components don't operate as intended • Requires pumping and cleaning • Water level suggests downstream sewage issues • Upper pipe appears to be sewer from AV 10, water line coming from AV 10 was previously abandoned 		No
PT A2	<ul style="list-style-type: none"> • Low visibility • Requires cleaning and draining 		Yes – determine source of water, leak or infiltration



AV 400	<ul style="list-style-type: none"> • Sewage backup issues present • Cleanout cover not installed • Appears to have various jumpers installed • Furthest Valve to the right appears to be closed, this valve should be open as the supply for Lower Iqaluit is supposed to come through this piping • Bleed present but not active, appears to have backflow preventer 		<p>Yes, confirm that the valve is in the closed position. If closed, discuss with Public Works why this was shut, frozen pipes? Or?</p>
MH 6	Could not locate structure, possibly buried		Locate and investigate
MH 14	<ul style="list-style-type: none"> • Open sewer benching • Little information can be gathered without entry into structure 		<p>Yes – determine source of water, leak or infiltration</p>

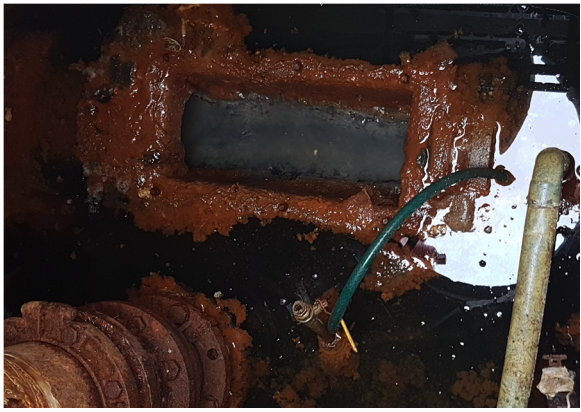

MH 15	<ul style="list-style-type: none"> • Requires pumping • Clear water inside structure, probably groundwater but possibly potable • Low visibility, further information not obtainable without pumping 		Yes – determine source of water, leak or infiltration
MH 13	<ul style="list-style-type: none"> • Contains valving to control water flow direction • Requires pumping and cleaning as none of the internals visible • Internal condition suggests sewage back-up to substantial depth 		Yes – clean and pump out then investigate
Building 222 Reheat Station			



MH 13	Previously reviewed, see above		
MH 22	<ul style="list-style-type: none"> Requires pumping and cleaning Audible sounds suggest water flow present Further internal observations required 		Yes – access to determine causes of noise and repair
MH 21	Could not open, frame and cover seized together.		Yes – Fix access issue and gather information
MH 20	<ul style="list-style-type: none"> Requires pumping and cleaning Open sewer benching Structure access damaged Internal conditions could not be observed Requires internal access and re-inspection 		Yes – Fix structure access, investigate structure after cleaning and pumping



AV 19A	<ul style="list-style-type: none"> • No exceptions noted 		No
MH 23B	<ul style="list-style-type: none"> • Requires pumping and cleaning • Internal conditions could not be evaluated due to internal water 		Yes –Investigate structure after cleaning and pumping, determine source of water

AV 23A	<ul style="list-style-type: none"> • Requires pumping • Installed to separate water from sewer • High humidity due to standing water is damaging coatings • Piping going to MH 33 is to have been abandoned. 		No
MH 30	Could not locate; probably buried		Locate and investigate
MH 31	<ul style="list-style-type: none"> • Requires cleaning and disinfection • Open sewer benching • Indications of sewage back-up to near surface elevation • Watermain is not visible, supposed to be a 150mm ductile iron pipe 		Yes – investigate water piping after cleaning



MH 32	<ul style="list-style-type: none"> • Requires cleaning and disinfection • Open benching • Indications of sewage back-up to near surface elevation • Watermain is not visible, supposed to be a 150mm ductile iron pipe 		Yes – investigate water piping after cleaning
MH 32A	<ul style="list-style-type: none"> • Requires pumping and cleaning • Clean-out cover missing • Copper piping probably for sump pump that is no longer in service 		No

MH 32B	<ul style="list-style-type: none"> • Requires pumping and cleaning • Clean-out cover missing • Appears to previously have used garden hose for bleed; currently broken from nozzle. • Does not appear to have back flow prevention • Copper piping for sump pump; not in service 		<p>Yes – if bleed is utilized, backflow preventer required. After pump out investigate watermain</p>
MH 63A	<ul style="list-style-type: none"> • Clean-out cover missing • Water and Sewer both drop vertically • Insulation added for additional freeze protection • Water present at bottom of structure, probably groundwater but could be potable • Bleed installed with missing backflow preventer • Minor leak from end of bleed, structure has water in it upto top of clean out 		<p>Yes – if bleed is utilized, backflow preventer required</p>



<p>MH 63</p>	<ul style="list-style-type: none"> • Requires pumping water at bottom • Frame and cover raised using a combination of CSP and concrete collar. • Inadequate structure access • This is an important junction/structure within Lower Iqaluit loop. • Structure has quite a bit of water that appears transparent, possible leak or groundwater. 		<p>Yes – repair access, investigate source of water in structure.</p>
<p>MH 65</p>	<ul style="list-style-type: none"> • Structure access appears inadequate • Structure has water that appears transparent, possible leak or groundwater • Cleanout cover not installed 		<p>Yes – repair access, investigate source of water in structure.</p>



MH 66	<ul style="list-style-type: none"> • Transparent water within structure, appears to be ground water infiltration but could possibly be a leak • Pumping and cleaning required • Appears to be top of sewer run 		Yes – investigate source of water in structure.
MH 39	<ul style="list-style-type: none"> • Large structure with 2 access points • Significant leak at valve • Water pipe going to MH 48 should be out of service • Electrical equipment still present but probably not functional 		Yes – repair major leak



			
MH 38	<ul style="list-style-type: none"> • Requires pumping • Frame and cover raised using a combination of CSP and concrete collar. • Clean-out cover missing • Appears to contain groundwater 		Yes – investigate water source within structure



MH 37	<ul style="list-style-type: none">• Requires pumping and cleaning• Structure appears to have relatively clear water, possible leak or groundwater		Yes – investigate water source within structure
MH 36	<ul style="list-style-type: none">• Requires pumping, removal of debris and cleaning• Clean-out cover missing• Sewer appears to have previous backups• Sump pump and heater present but probably not functional		Yes – investigate water source within structure



MH 35	<ul style="list-style-type: none">• Requires pumping and cleaning• Clean-out cover missing		Yes – investigate water source within structure
MH 62	<ul style="list-style-type: none">• Requires pumping and cleaning• Further comments require pump out		Yes – investigate water source within structure



MH 61	<ul style="list-style-type: none"> • Requires pumping and cleaning • Significant corrosion, indicative of long standing water issues • Appears to have experienced sewage back-up and surcharge • Further comment requires cleaning and re-inspection 		Yes – investigate water source within structure
MH 60	<ul style="list-style-type: none"> • Access appears to be buried • Internal inspection not possible • Important junction in water network 		Yes – Uncover access and investigate



MH 59	<ul style="list-style-type: none"> • Structure appears to be buried • Internal inspection not possible 		Yes – Uncover access and investigate
MH 48	<ul style="list-style-type: none"> • Large structure with 2 access points • Sump pump installed but probably not functional • Piping to MH 39 should have a valve that is in the closed position • Cleanout cover not installed • Relatively clear water present, possible leak or infiltration 		Yes – investigate water in structure and ensure valve to MH 39 is closed



MH 47	<ul style="list-style-type: none"> • Requires pumping • Clean-out cover in place 		Yes – investigate water source within structure
MH 46	<ul style="list-style-type: none"> • Requires pumping • Clean-out open • Piping in place for a bleed, not operating during inspection • Structure needs to be accessed to see other piping which connects to watermain 		Yes – investigate water source within structure



MH 58	<ul style="list-style-type: none"> • Requires pumping • CSP riser installed over concrete structure • Clean-out open, water inside structure is filled to rim of clean-out; draining into sewer • Watermain not visible 		Yes – Investigate water source, groundwater or leak
MH 46B	<ul style="list-style-type: none"> • Unused electrical equipment remains in place <ul style="list-style-type: none"> • Sump pump, electric heater, connection to thaw tube • Clean-out cover missing, start of sanitary run • Requires cleaning • Structure generally dry • Newer ball valve installed, assuming it was used as a bleed. 		Yes – if using ball valve as a bleed, install backflow preventers


MH 46A	<ul style="list-style-type: none"> • Clean-out cover appears to be in place <ul style="list-style-type: none"> • Appears to be a retro-fitted cover • Thaw tube still in place • Requires pumping 		No
MH 45	Structure not visible; probably buried		Yes – Locate and uncover
MH 43	<ul style="list-style-type: none"> • Requires pumping and cleaning • Clean out cover removed • Watermain crosses over sewer main • Evidence of previous backup and surcharges 		No

MH 42	<ul style="list-style-type: none"> • Requires pumping and cleaning • Important junction in watermain network • No internal observations possible 		Yes – clean and investigate
PT A	<ul style="list-style-type: none"> • Could not open wooden box; inspection not possible 		Yes – access and investigate
MH 42	Previously reviewed, see above		

MH 41	<ul style="list-style-type: none"> • Requires pumping and removal of debris • Clean-out cover missing • Appears filled with groundwater to clean-out rim • Top end of sewer system • No evidence of sewage back-up 		Yes – investigate water source
MH 40	<ul style="list-style-type: none"> • Requires pumping • Lower sewer piping not visible • Upper piping appears more recent (thaw laterolets) • Valve on lower piping between newer piping is supposed to be in closed position 		Yes – investigate water source, confirm valve is closed

AV 40A	<ul style="list-style-type: none"> • Requires pumping • Cleanout not installed • Original configuration had water entering and returning within the structure, appears to have been extended. • Where (structure) the water returns, unknown • Piping for a bleed present, doesn't appear active • Corrosion around laterolet indicates minor leak 		Yes – investigate water source, repair laterolet
MH 40	Previously reviewed, see above		
MH 24A	<ul style="list-style-type: none"> • Leak at 45° bends flanged connection • Requires pumping and cleaning, contamination risk is high with leak present • Electrical components are present but probably not functioning 		Yes – Repair leak
MH 24	Could not locate; probably buried		Yes – Locate and investigate

AV 25A	<ul style="list-style-type: none"> • Appears to have been provided to separate water from sewage (MH 25) • Requires pumping • Corrosion around laterolet indicates a minor leak 		No
MH 26	<ul style="list-style-type: none"> • Wooden box has been constructed above the structure • Limited visibility • Appears to have ½ piping either acting as a service or as a bleed into the structure 		Yes – Correct odd configuration and investigate internal componentns

MH 27	<ul style="list-style-type: none"> Filled with debris, cleaning required 		Yes – clean and insepct
MH 8	Previously reviewed, see above		