

# City of Meadow Lake

## Engineering Report

2017



**CITY OF MEADOW LAKE**

Rocky Chowdhury

Peter Mansuy

January, 2018

The City of Meadow Lake undertakes different engineering works throughout the year as capital projects or regular maintenances of its assets. This report summarizes the major engineering works the City performed in 2017. Other than these, the engineering department also provides technical support to other City departments, coordinate with Public Works for drainage issues and service connections, annual budgeting, capital planning for future etc.

The Engineering works completed in 2017 can be broadly divided into three categories –

1. Capital Project Related Works
2. Asset Management Works
3. Other Works

#### **( 1 ) Capital Projects**

- ✓ Street Upgrade Project – full depth rehabilitation and overlays.
- ✓ Street Maintenance Project – utility patching, milling and overlay, removal and replacement
- ✓ Valve Maintenance Project
- ✓ Sewer Replacement on Cochin Ave
- ✓ Culvert Installation
- ✓ Sidewalk installation

#### **( 2 ) Asset Management Works**

- ✓ Road condition survey and assessment
- ✓ Sidewalk condition assessment survey
- ✓ Sanitary sewer pipe inspection and evaluation
- ✓ GIS database works on water pipes, sanitary sewer pipes and storm sewer pipes.
- ✓ GPS surveying and mapping of all City hydrants
- ✓ GPS surveying of water valves
- ✓ Training on CityWide Asset Management system

### **( 3 ) Other Works**

- ✓ Road and ditch profiles on the East Side
- ✓ Drainage Issues

#### **Street Upgrade Project – full depth rehabilitation and overlays.**

The City retained Resource Management International Inc. for surveying and Engineering design for this road project and K&S Asphalt as contractor for construction in this project.

On April 2017, the City got two bids for surveying, geotechnical works, design, specifications, resident services, quality control testing and post-construction services for this street upgrade projects.

<b>Bidder</b>	<b>Bidding Price</b>
Resource Management International Inc.	\$88,000 + G.S.T. + P.S.T.
Bullee Consulting Ltd.	\$121,657 + G.S.T. + P.S.T.

The City publicly invited tender for this project on SaskTender from prospective bidders with closing date on July 18, 2017. The City received following bids for construction in this project.

<b>Bidder</b>	<b>Bidding Price</b>
G & C Asphalt	1,106,887.50 + G.S.T. + P.S.T
K & S Asphalt	889,966.00 + G.S.T. + P.S.T.

The project included the following works.

- 6<sup>th</sup> Ave W from 5<sup>th</sup> St W to 2<sup>nd</sup> St W – 140.5 m asphalt overlay and the 286.4 m of full depth rehabilitations.
- 5<sup>th</sup> Ave W (West of 4<sup>th</sup> St W) – 71 m of full depth rehabilitations.
- 4<sup>th</sup> St W from 6<sup>th</sup> Ave W to 5<sup>th</sup> Ave W – 172 m of full depth rehabilitations.
- 3<sup>rd</sup> St W from 7<sup>th</sup> Ave W to 5<sup>th</sup> Ave W – 268.8 m of full depth rehabilitations, 67.9 m of asphalt overlay, 25.0 m of patch and 65 m of new sidewalk installations.
- 2<sup>nd</sup> St W (South of 6<sup>th</sup> Ave W) – 70.2 m of full depth rehabilitations.

- Cochin Ave from 5<sup>th</sup> St W to 4<sup>th</sup> St W – 242 m of full depth rehabilitations, 478.25 m of rolled curb and gutter installations and 2 catch basin adjustments.

The construction work in this project started on August 8, 2017 and completed on September 21, 2017. Total cost in this project was \$1,104,137.51 (includes G.S.T. and P.S.T.). The cost for contractor was \$973,731.45 (includes taxes) and the cost for Engineering was \$130,406.06 (includes taxes). The following pictures show the works in this project.



Figure 1: Cochin Ave during excavation for road construction



Figure 2: Cochin Ave after construction



Figure 3: Paving on 4<sup>th</sup> St W



Figure 4: Intersection of 6<sup>th</sup> Ave W and 2<sup>nd</sup> St W before construction



Figure 5: Base preparation on 6<sup>th</sup> Ave W and 3<sup>rd</sup> St W



Figure 6: Paving on 6<sup>th</sup> Ave W

**Street Maintenance Project – utility patching, milling and overlay, removal and replacement**

The City retained K & S Asphalt as contractor for this project.

The City publicly invited tender for this project on Sasktender. The project included utility patching, milling and replacement to grade, asphalt overlay and pavement removal and replacement under this project. The City got four following bids closing on May 25, 2017.

Bidder	Bidding Price
United Paving	424,186.59 + G.S.T.
K & S Asphalt	422,316.63 + G.S.T.
G & C Asphalt	586,799.15 + G.S.T.
HJR Asphalt	495,921.00 + G.S.T.

The project included following works:

Location	Type of work	Quantity
4 <sup>th</sup> Ave W and 8 <sup>th</sup> St W	50 mm utility patch	16 sq.m.
Centre St	75 mm utility patch	94 sq.m.
Evan St	50 mm utility patch	24 sq.m.
3 <sup>rd</sup> St W and 7 <sup>th</sup> Ave W	75 mm utility patch	11 sq.m.
3 <sup>rd</sup> St W and 5 <sup>th</sup> Ave W	50 mm utility patch	16 sq.m.

<b>Location</b>	<b>Type of work</b>	<b>Quantity</b>
2 <sup>nd</sup> St W and 7 <sup>th</sup> Ave W	Removal and replacement with 75 mm hot mix asphalt	204 sq.m.
2 <sup>nd</sup> St W and 7 <sup>th</sup> Ave W	50 mm overlay	441 sq.m.
3 <sup>rd</sup> St E and 9 <sup>th</sup> Ave E	75 mm removal and replacement with 75 mm hot mix asphalt	1285 sq.m.
3 <sup>rd</sup> St E and 2 <sup>nd</sup> Ave E	75 mm utility patch	70 sq.m.
3 <sup>rd</sup> St E and 4 <sup>th</sup> Ave E	75 mm utility patch	32 sq.m.
3 <sup>rd</sup> St E and 7 <sup>th</sup> Ave E	75 mm utility patch	12 sq.m.
3 <sup>rd</sup> St E and 8 <sup>th</sup> Ave E	75 mm utility patch	39 sq.m.
2 <sup>nd</sup> St E and 7 <sup>th</sup> Ave E	50 mm utility patch	56 sq.m.
Centre St and 7 <sup>th</sup> Ave E	50 mm utility patch	44 sq.m.
3 <sup>rd</sup> St W and 7 <sup>th</sup> Ave W	50 mm utility patch	106.5 sq.m.
2 <sup>nd</sup> St E and 4 <sup>th</sup> Ave E	50 mm utility patch	14 sq.m.
5 <sup>th</sup> St W and 4 <sup>th</sup> Ave W	50 mm utility patch	52 sq.m.
6 <sup>th</sup> St W and 4 <sup>th</sup> Ave W	50 mm utility patch	48 sq.m.
7 <sup>th</sup> St W and 4 <sup>th</sup> Ave W	50 mm utility patch	21 sq.m.
ESAU St and 4 <sup>th</sup> Ave W	50 mm utility patch	30 sq.m.
2 <sup>nd</sup> Ave W	50 mm utility patch	46 sq.m.
2 <sup>nd</sup> St E and 2 <sup>nd</sup> Ave E	Removal and replacement with 75 mm hot mix asphalt	60 sq.m.
2 <sup>nd</sup> St W and 2 <sup>nd</sup> Ave W	Removal and replacement with 75 mm hot mix asphalt	210 sq.m.
8 <sup>th</sup> St W, 7 <sup>th</sup> St W, Centre St	Removal and replacement with 50 mm hot mix asphalt	372 sq.m.
8 <sup>th</sup> St W, 7 <sup>th</sup> St W and Centre St	Milling and replacement with 50 mm hot mix asphalt	355 sq.m.
1 <sup>st</sup> St W	Milling and replacement with 50 mm hot mix asphalt	697 sq.m.
1 <sup>st</sup> St W and 7 <sup>th</sup> Ave W	Milling and replacement with 50 mm hot mix asphalt	180 sq.m.
5 <sup>th</sup> St W and 9 <sup>th</sup> Ave W	Milling and replacement with 75 mm hot mix asphalt	504 sq.m.
7 <sup>th</sup> St W and 5 <sup>th</sup> Ave W	50 mm utility patch	88 sq.m.
Esau St and 5 <sup>th</sup> Ave W	50 mm utility patch	23 sq.m.
3 <sup>rd</sup> St W and 2 <sup>nd</sup> Ave W	Milling and replacement with 50 mm hot mix asphalt	454 sq.m.
2 <sup>nd</sup> Ave W, 3 <sup>rd</sup> St W and 4 <sup>th</sup> St W	Removal and replacement with 50 mm hot mix asphalt	219 sq.m.
2 <sup>nd</sup> Ave W, 3 <sup>rd</sup> St W and 4 <sup>th</sup> St W	Milling and replacement with 50 mm hot mix asphalt	192 sq.m.

Location	Type of work	Quantity
2 <sup>nd</sup> Ave W, 5 <sup>th</sup> St W and 6 <sup>th</sup> St W	Milling and replacement with 50 mm hot mix asphalt	539 sq.m.
2 <sup>nd</sup> Ave W and 6 <sup>th</sup> St W	Removal and replacement with 50 mm hot mix asphalt	278 sq.m.
2 <sup>nd</sup> Ave W, 6 <sup>th</sup> St W and 7 <sup>th</sup> St W	Removal and replacement with 50 mm hot mix asphalt	188 sq.m.
4 <sup>th</sup> Ave W, 3 <sup>rd</sup> St W and 4 <sup>th</sup> St W	Milling and replacement with 50 mm hot mix asphalt	346 sq.m.
4 <sup>th</sup> Ave W, 5 <sup>th</sup> St W and 6 <sup>th</sup> St W	Milling and replacement with 50 mm hot mix asphalt	728 sq.m.
4 <sup>th</sup> Ave W, 5 <sup>th</sup> St W and 6 <sup>th</sup> St W	Removal and replacement with 50 mm hot mix asphalt	652 sq.m.

Total cost of the project was \$476,545.89 including G.S.T. and P.S.T. Some of the pictures in this project are given below.



Figure 7: Pavement works on Centre St



Figure 8: Pavement works on 2<sup>nd</sup> Ave W and 1<sup>st</sup> St W intersection

### **Valve Maintenance Project**

The work on the valve maintenance project started in 2015. The City contracted Rusway Construction and JRT Excavating to repair and replace water valves and hydrants. The original contract was to excavate up to 100 water valve locations and replacement of the complete valve or replacement of the steel bolts with new stainless steel bolts. The quote from the Rusway Construction for this project was \$694,550 + Taxes. The following table gives a summary of the works completed under this project.

Contractor	Number of repaired or replaced valves (includes hydrant isolation valves)	Hydrant installations
Rusway Construction	99	12
J.R.T. Excavating	19	4
<b>Total</b>	<b>118</b>	<b>16</b>

The financial summary for this project and any works related to this project at the end of 2017 are given below:

Contractor	Invoice year	Total (include PST)	Valve (910-2058)	Hydrant (910-2042)	W&S contracted service (910-2060)	Drainage contract (600-3080)
Rusway Construction	2015	81,975.5	26,189.2	26,517.4	29,268.9	0.00
Rusway Construction	2016	243,302.8	177,598.7	35,254.5	30,449.8	0.00
Rusway Construction	2017	211,117.5	124,048.3	26,179.9	39,769.2	21,119.7
JRT Excavating	2017	56,461.0	43,827.6	12,130.0	0.00	503.5
	<b>Total</b>	<b>592,857</b>	<b>371,664</b>	<b>100,082</b>	<b>99,488</b>	<b>21,623</b>





Figure 11: Valve maintenance works

### **Culvert Installation**

The City installed 9 culverts in 2017. Their size and locations are given below.

<b>Culvert locations</b>	<b>Sizes</b>
3 culverts near intersection of 7 <sup>th</sup> St E and 3 <sup>rd</sup> Ave E	400 mm
1 culvert near 617 3 <sup>rd</sup> Ave E	300 mm
1 culvert near the intersection of 6 <sup>th</sup> St E and 5 <sup>th</sup> Ave E	300 mm
1 culverts near 503 9 <sup>th</sup> Ave E	600 mm
1 culvert between 9 <sup>th</sup> St W and Highway # 4, by the Fas Gas	600 mm
1 culvert near Cemetery by Petro-Canada	600 mm
1 culvert near the South-west corner of the reservoir (near the East end of 4 <sup>th</sup> Ave E)	600 mm



Figure 9: Newly installed culvert between 9<sup>th</sup> St W and Highway # 4



Figure 10: Newly installed culvert near 503 9<sup>th</sup> Ave E

### **Sanitary Sewer Replacement on Cochin Ave**

The City replaced the clay tile sanitary sewer main in 2017. There had been few collapses in this pipe in previous years and there were some concerns of the ability of the pipe for long term performances. Therefore, prior to any pavement

upgradation works on Cochin Ave, the City proceeded with camera inspection of the clay tile sewer pipe. The inspection showed broken spots, cracking and tree root growing into the pipe. Therefore, the council decided to replace the sewer pipes before starting the paving work on Cochin Ave.

The City retained Rusway Construction to complete this sewer main replacement work. The total project cost was \$251,270 (including taxes). Under this project, the City replaced 251 m of sewer main, replaced 2-1200 mm manholes and replaced 23 service connections.

### **Road and Ditch Profiles on the East Side**

We got road and drainage ditch profiles on the 2<sup>nd</sup> Ave E, 3<sup>rd</sup> Ave E, Sergent Ave, 4<sup>th</sup> Ave E, 5<sup>th</sup> St E, 6<sup>th</sup> St E and 7<sup>th</sup> St E. This was done to find out the grades in the drainage ditch to see the flow direction. There are some areas where the road and the ditch are at the same elevation. When we compared the road profiles with the ditch profile, it showed whether it needs ditching or elevating road surfaces for proper drainages in those areas. Due to the low road surface elevation, a lot of culverts in that area do not get sufficient cover depths and get damaged shortly after their installations. Considering these, the road surface elevation of the 3<sup>rd</sup> Ave E was elevated so that the already installed culverts and future culverts along 3<sup>rd</sup> Ave E get sufficient cover depths and the ditch beside the road has enough cross-sectional area to carry the drainage water. This should also solve the flooding issue near the 7<sup>th</sup> St E and 3<sup>rd</sup> Ave E.

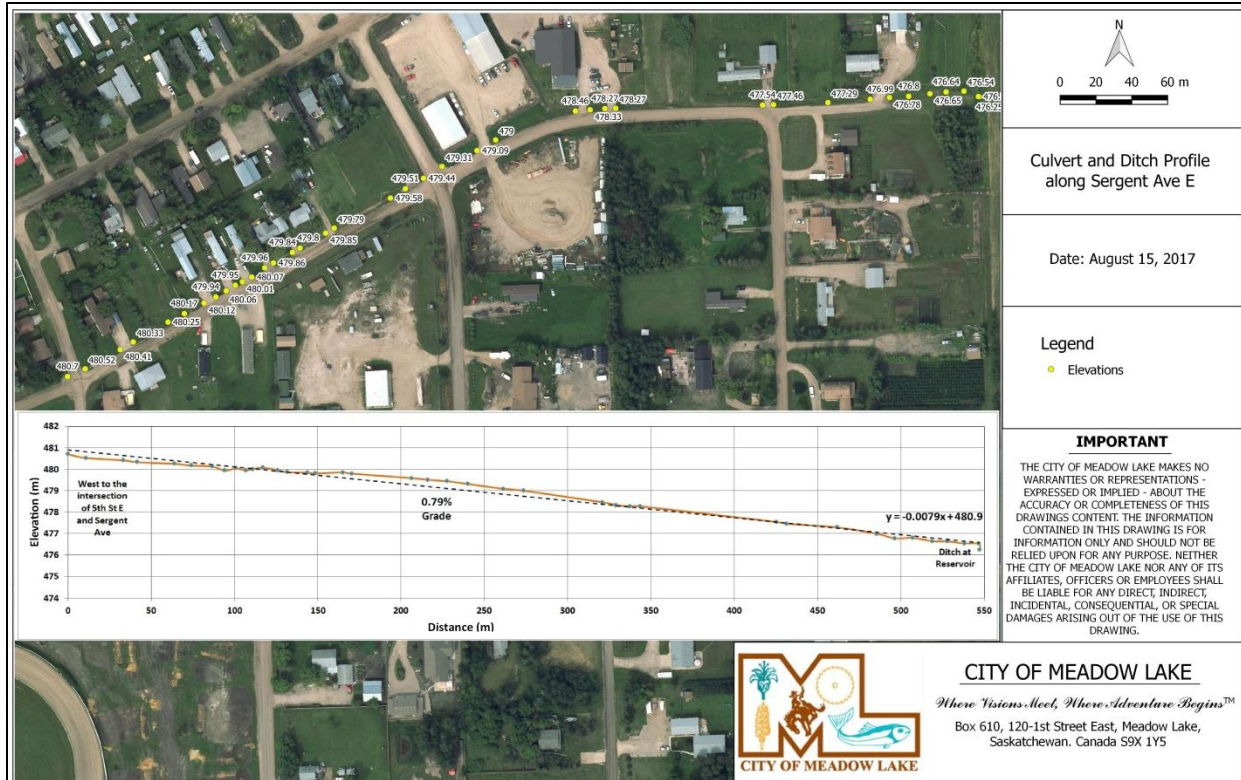


Figure 11: Ditch profile along Sergeant Ave E

## Asset Management Works

The City received an asset management grant from the Federation of Canadian Municipalities in order to advance its asset management works. The duration for this project is 27 June 2017 – 27 May 2018. The City is required to complete the following asset management works under this program.

1. Condition assessment and state of infrastructure reports for roads and sidewalks.
2. Condition assessment and state of infrastructure reports for clay tile sewer pipes.

## Road Condition Assessment

The City purchased a GoPro camera to collect video data of roads and sidewalk condition for these assessments. We collected condition data of all the City streets and assigned ratings based on their distress conditions. We took into account the distress type, density, severity and traffic volume to calculate the

total ratings in different streets. In order to present these information on geographically referenced map, we made a GIS shape file with centerlines along all streets. These shape files allows us accurately and automatically calculate length along different streets and will be a better decision support tool for future works.

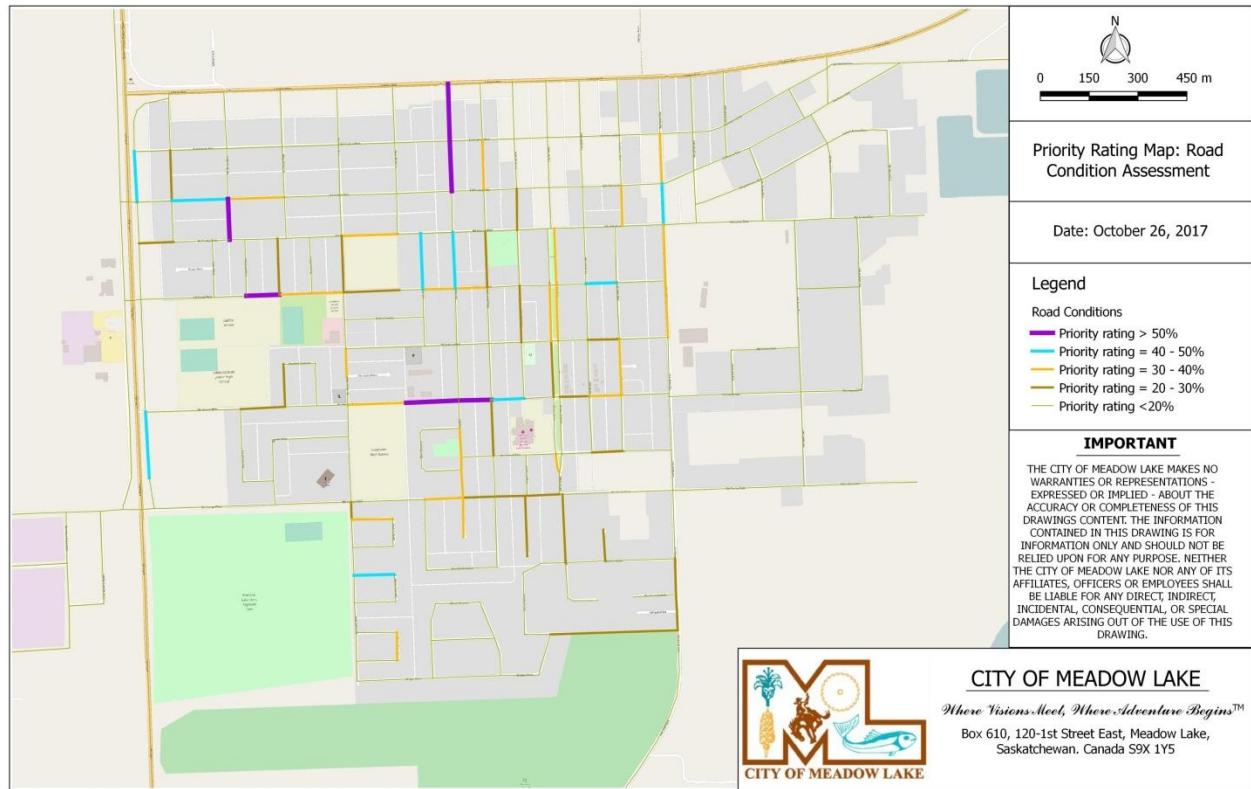


Figure 12: Priority rating map for city streets

### Sidewalk Condition Assessment

We also collected 14 km of sidewalk condition data. Total length of existing sidewalk in our record is 20 km. We identified the following distress in this 14 km of sidewalks.

Distress type	Approximate length (m)
Tripping hazards	243 m
Multiple cracks	251 m
Horizontal fault > 0.5"	726 m
Missing sidewalk	6 m
Cleanliness issue	541 m

Distress type	Approximate length (m)
Ponding	7 m
Spalling	245 m

We will finish the data collection and the similar distress identifications for the remaining 6 km of sidewalks. We also intend to identify the sidewalks with no ramp and the streets requiring sidewalks.

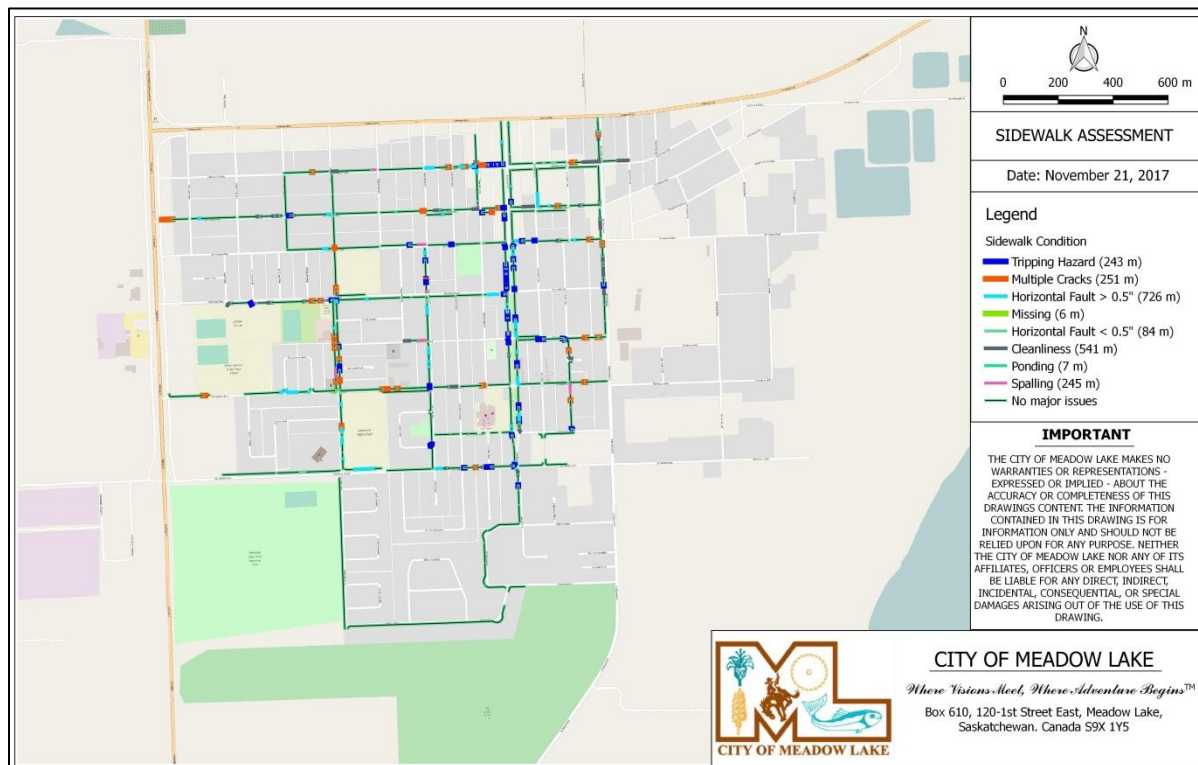


Figure 13: Sidewalk condition assessment map (incomplete)

### Sanitary Sewer Pipe Assessment

The City retained McGills Industrial services to inspect the 2.9 km clay tile sanitary sewer pipe. This would give a realistic picture of the state of the 10 km clay tile sanitary sewer pipes in the City. 5 contractors initially showed willingness to bid for this project; but at the end we got 2 bids. The price of McGills Industrial Service was \$4.50 per meter and ACME Environmental Inc. was \$7.00 per meter if the City provides Hydrovac truck and carries out necessary flushing before

beginning the camera inspection of the pipes. Considering this, the City hired McGills Industrial Services for this work.

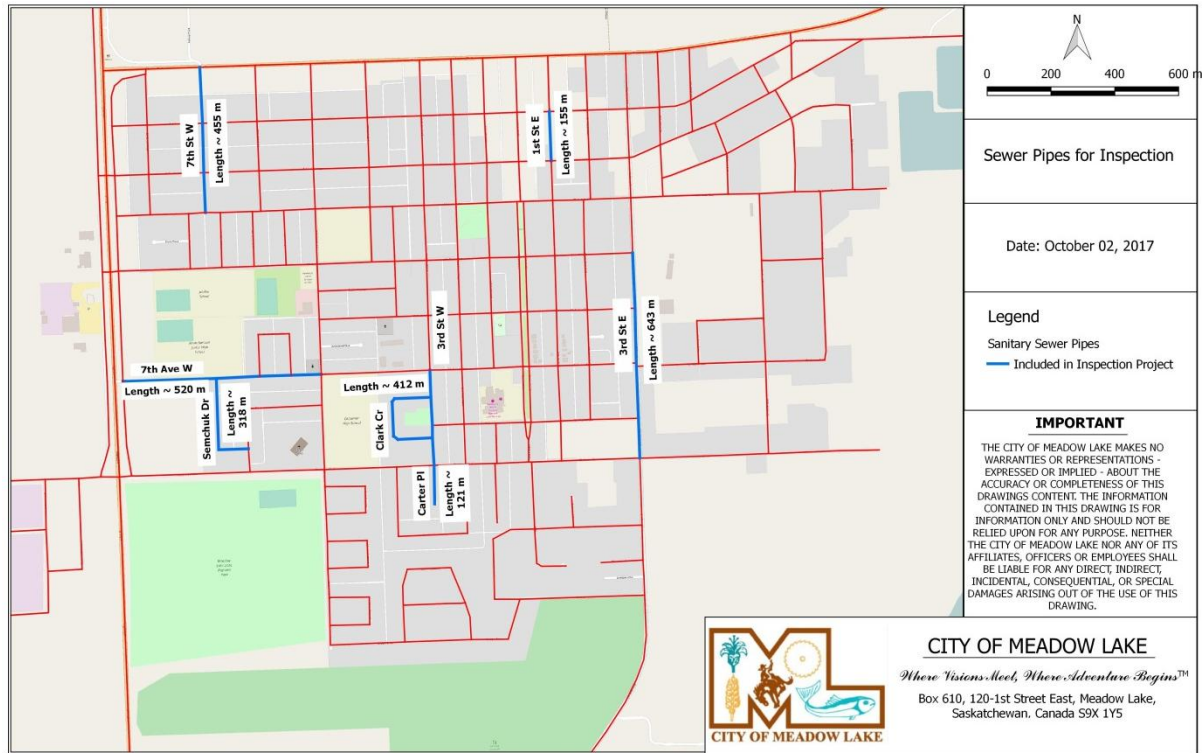


Figure 14: Sanitary sewer pipes planned for inspection

During the camera inspection, McGills encountered very high flow on 7<sup>th</sup> St W and 1<sup>st</sup> St E and could not carry out camera inspection. On other streets, the camera got stuck in the encrustations several times. At the end, McGills could perform camera inspection of about 1500 m of the pipes. In the camera inspection, we found few locations where cracks in the clay tile pipes were visible and they may need spot repairs in future. The following two pictures shows the pipe cracks found during camera inspection.

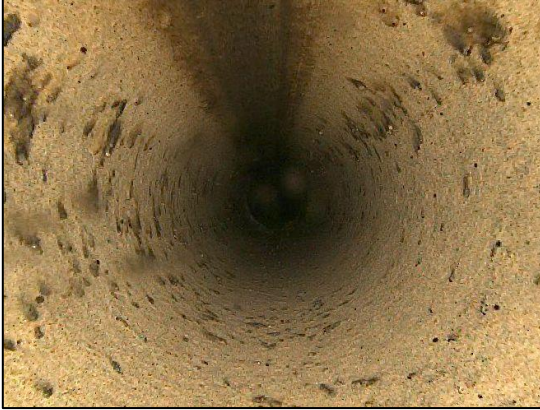


Figure 15: 3<sup>rd</sup> St E



Figure 16: 3<sup>rd</sup> St E – 24 m north to the intersection of 6<sup>th</sup> Ave E and 3<sup>rd</sup> St E

The City contracted Associated Engineering for the evaluation of the sewer pipe videos and to provide an expert opinion on the pipe structural condition and the repair strategies. They rated most of the pipes as being in good conditions. There are few cracks in some offset joints near the manholes and they recommended rehabilitating those locations with either open cut or trenchless spot repairs methods. We will program these spot repairs before the pavement maintenance works begins in 2018.

### **GIS Database work on Water Pipe, Sanitary and Storm Sewer Pipe**

We updated water pipe information in the GIS. The water pipe data were collected from the past as-built drawings, AutoCAD records etc. We recorded water pipe size, material, and pipe ID. We could calculate the pipe length automatically since the water pipes were drawn on georeferenced satellite images. The pipe alignment was finalized using the water valve location coordinates got from GPS survey. We also assigned unique ID to every pipe. We used the following ID format for water pipe –

WP1000718

“WP” indicates that this is a water pipe ID. The following statistics of water pipe was obtained from the GIS.



<b>Pipe Diameter (mm)</b>	<b>Material</b>	<b>Length (m)</b>
100	PVC	195.03
	AC	1050.18
	<b>Subtotal (m)</b>	<b>1245.2</b>
150	PVC	10838.00
	AC	10712.91
	N/A	1460.58
	<b>Subtotal</b>	<b>23011.8</b>
200	PVC	10202.1
	AC	1777.28
	N/A	1273.2
	<b>Subtotal</b>	<b>13252.6</b>
250	PVC	2198.71
	<b>Subtotal</b>	<b>2198.7</b>
N/A	N/A	<b>667.8</b>
<b>Total Pipe Length (m)</b>		<b>40,376</b>

We also update the sanitary sewer pipe information in the GIS. The sewer pipe sizes, materials, slope and flow directions were recorded. In 2018, we will get the GPS coordinates of the sanitary manholes and then we can update the alignment of the sewer pipes.

We have also started updating the storm sewer pipe information. Once we finish updating this information, we can send these to CityWide to upload it in their system.

### **Training on CityWide Asset Management System**

City staffs attended few training sessions on CityWide Asset Management system, owned by the Public Sector Digest (PSD). The trainings were mainly focused on creating work orders, service requests, creating reports in different formats etc. City staffs started practicing this system and may still need few more training sessions to become efficient in using this system.



Figure 17: Training Sessions on CityWide Asset Management System

### **Sidewalk and Curb Installation**

The City retained Meadow Lake Properties to construct a sidewalk on the south side of the Gateway Elementary School from the school gate to the intersection of 5<sup>th</sup> St W and 5<sup>th</sup> Ave W. The total cost of the sidewalk was \$10,378.50 (including taxes).



Figure 18: Sidewalk installation work near Gateway Elementary School

The City also worked on removing and replacing defected sidewalks, curbs and gutters.

### **GPS Surveying and Mapping**

We got the GPS coordinates of about 147 hydrants and 230 water valves. Using these GPS data, we imported the georeferenced locations of these hydrants and water valves in the GIS system. Public work staffs helped us locate some of the water valves buried under ground. There are still about 150 valves need to be located in 2018. Once all the valves are located, we can use this information for mapping and different planning works such as valve exercising etc in future. If the water valve information is uploaded in the CityWide GIS system and accessible to all staffs, it will be a great help during water breaks or similar events.

We are also assigning unique asset IDs for each valve so that those IDs can be used for storing all the information regarding each valve. An example of the water valve ID is –

3SW-5AW-N

This represents the North valve at the intersection of the 3<sup>rd</sup> St W and 5<sup>th</sup> Ave W.

The Fire department already has a unique ID format for hydrants; so we have used those IDs to enter hydrant information in the GIS.

### **Flooding / Drainage Issues**

We had few storm pipe collapses in 2017. The following table shows the major drainage repair works we did in 2017.

<b>Work location</b>	<b>Work type</b>	<b>Contractor</b>
9 <sup>th</sup> Ave E near the ditch	Replaced a collapsed storm pipe	Rusway Construction
6 <sup>th</sup> St W and 3 <sup>rd</sup> Ave W intersection	Replaced catch-basins, storm pipes and a manhole	Rusway Construction
5 <sup>th</sup> Ave W and Bauman St	Replaced a collapsed storm pipe	JRT Excavating

2 <sup>nd</sup> Ave W near Co-op grocery	Replaced a collapsed storm pipe	Shkopich Environmental
3 <sup>rd</sup> Ave E near Court-house	Replaced a collapsed storm pipe	Shkopich Environmental
3 <sup>rd</sup> St E and 4 <sup>th</sup> Ave E intersection	Replaced a collapsed storm pipe	Shkopich Environmental
5 <sup>th</sup> St W and 5 <sup>th</sup> Ave W intersection	Replaced a collapsed storm pipe	JRT Excavating
3 <sup>rd</sup> St E from 9 <sup>th</sup> Ave E to Centre Ave intersection	Installed new storm pipes	Tupper Construction



Figure : Storm pipe installation by Tupper Construction

We investigated and provided solutions for few spring flooding issues in 2017. Some examples are given below.

1. We replaced a storm pipe along 5<sup>th</sup> St W on the approach road to the Alliance Church. This should significantly mitigate the flooding on the 7<sup>th</sup> Ave W and 5<sup>th</sup> St W intersection.



Figure 19: Removal of the existing storm pipe and installation of a new pipe on the approach road to the Alliance Church

2. We investigated several flooding issues in the back alleys and provided Public Works with grades to slope the alley or cut swales etc.



Figure 20: Alley between Cochin Ave and 6<sup>th</sup> Ave W



Figure 21: Alley between Cochin Ave and 6<sup>th</sup> Ave W