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Town of Legal

Asset Management Review of Utility and Road Infrastructure

Prepared by:

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Prepared for:

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Date: December 2021

Project #: 60658079

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Revision History

Rev #	Date	Revised By:	Revision Description
0	November 24, 2021	JC/SF/AH	Draft
1	December 15, 2021	JC/SF/AH/DC	Final

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Robert Proulx
CAO
Town of Legal
5021 50 Street
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December 15, 2021

Project #
60658079

Dear Mr. Proulx:

Subject: Asset Management Review of Utility and Road Infrastructure Error! Reference source not found.

We are pleased to submit our final report for the Asset Management Review of Water, Sanitary Sewer and Road Infrastructure for the Town of Legal. Please contact us with any questions or comments.

Sincerely,
AECOM Canada Ltd.

JCherdarchuk

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/jc
Encl.

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AECOM: 2015-04-13

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1. Introduction

The Town of Legal (Town) is located in Sturgeon County, 50 km north of Edmonton on Highway 651 and 3 km east of Highway 2. The Town has a population of 1,345 people (2016 census).

The Town has obtained funding through the federal Municipal Asset Management Program (MAMP) and has initiated this project to gain a better understanding of the condition and capacity of their underground and road assets.

The overall objectives of this review are to complete the following tasks which will contribute to the Town's overall asset management planning, allowing the Town to make decisions and prioritize spending related to their infrastructure:

1. Capacity assessment of the Town's water distribution and sanitary sewer systems.
2. Condition assessment of the Town's sanitary sewers.
3. Condition Assessment of the Town's road network.

2. Utility Capacity Assessment

2.1 Background & Purpose

AECOM completed a report for the Town of Legal in 2007 which assessed the capacity of the existing water distribution and sanitary systems, identified deficiencies, and assessed the impact of the anticipated 20-year future development on existing systems.

We understand the need to have an up to date assessment study in place to effectively respond to development inquiries, resolve issues that may occur, and invest in infrastructure with the future in mind. Our goal will be to provide the Town with comprehensive water and sanitary sewer servicing plans to support the Town in developing strategies for managing capital upgrades and handling future growth.

This assessment update will be built on the work carried out in the 2007 Assessment. As built data since 2007 was obtained to update the water and sanitary sewer models. The updated models were then utilized to determine the capacity of the existing system and the ability to support future development. Deficiencies, if any, were identified as well as upgrades to mitigate any problem areas. Cost estimates were also developed with improvements prioritized.

2.2 Data Collection

The following information was incorporated in the models to update them from 2007 to the present:

- New 375 mm sanitary trunk.
- New 50 mm sanitary forcemain along the back of lots on 50 Avenue.
- Watermain upgrades on:
  - 50 Street
    - Installation of new 400 mm diameter pipe along 50 Street from the reservoir pumphouse to 48 Avenue.
    - Upgraded the existing 100 and 150 mm line to 300 mm diameter pipe along 50 Street from 48 Avenue to 51 Avenue.
    - Upgraded the existing 100 and 150 mm line to 200 mm along 50 Street from 51 Avenue to south of 54 Avenue.
  - 49 Street
    - Upgraded the existing 100 mm line to 200 mm along 49 Street from 50 Avenue to 51 Avenue.
  - 48 Street
    - Upgraded the existing 100 mm line to 200 mm along 48 Street from 50 Avenue to 51 Avenue.
  - 51 Avenue
    - Installation of new 200 mm diameter pipe along 51 Avenue from 50 Street to 46 Street.

- Water consumption data including:
  - Reservoir inflow
  - Reservoir outflow
  - High demand user meter data
- Sanitary sewer flow data
- Rain gauge data

2.3 Population and Land Use

The Town of Legal consists of a mix of residential, commercial, institutional and industrial areas. Land Use and existing developed areas are illustrated on Figure 2.1.

The latest census data for the Town of Legal is from 2016 with a population of 1,345. The Town experienced modest growth from 2011 to 2016 with an estimated increase of 1.6% per year. Assuming the growth rate from 2016 to 2021 was also 1.6%, the estimated population for 2021 is therefore 1,437. This value is an assumption based on past growth and may not reflect the actual growth of the Town. The new census population numbers for the Town are expected to be released in 2022. There are approximately 455 occupied lots in the Town resulting in an average density of 3.16 people per lot.

Moving forward, the Town expects a moderate growth rate of between 1.6 and 2.0%. The projected populations under varying growth rates are presented in Table 2-1.

Table 2-1: Population Projections

Year	Annual Growth Rate of 1.6%	Annual Growth Rate of 1.8%	Annual Growth Rate of 2%
2011	1,225	1,225	1,225
2015	1,305	1,316	1,326
2020	1,413	1,438	1,464
2021	*1,437*	*1,466*	*1,496*
2025	1,530	1,573	1,616
2030	1,656	1,719	1,785
2035	1,793	1,880	1,970
2040	1,941	2,055	2,175
2045	**2,101**	2,247	2,402
2050	2,275	2,456	2,652

The design horizon for the proposed upgrades is 20 to 25 years. From the Table above, a target design horizon of 25 years and target population of 2,100 people is recommended with an increase of 663 people from the 2021 population (assumed annual growth rate of 1.6%). Assuming an average density of 3 people per lot, similar to the existing density, this is an increase of 221 lots.

Based on discussions with the Town, growth is expected to occur as illustrated on Figure 2.2 and summarized in Table 2-2.

Table 2-2: Future Development Description

Location	Future Development Area (ha)	Number of Residential lots	Population	Land Use
Pepins Point	2.7	36	108	Residential
47 Avenue, 51 Street	2.8	35	105	Residential
East Country Residential	3.6	18	54	Residential
South of 47 Avenue and 47 Street	9.2	112	336	Residential
Infill throughout the Town	2.7	20	153	Residential
Industrial	10.0	-	-	Non-residential
Total	31	221	663	-

The East Country Residential area is expected to be lower density estate lots while the rest of the residential development will be consistent with the existing lot sizes within the Town.

2.4 Water Distribution System Assessment

2.4.1 Existing System Description

The Town of Legal receives water from EPCOR via the Morinville Booster Station, located in St. Albert that increases the pressure in the transmission main to supply Villeneuve, Summerbrook, the Riviere Qui Barre/Cardiff Booster Station, the Legal Booster Station, and the Morinville Reservoir. The Town of Legal has a dedicated booster station to fill its reservoir. Figure 2.3 shows existing water transmission system to the Town of Legal.

The Town of Legal currently operates as water distribution system that consists of a network of distribution mains that provides water and emergency fire flows within the Town as well as provides servicing to six to eight residential acreages, and five commercial/industrial lots including the Alfalfa industrial plant located west of the Town. The water distribution system consists of a network of 50 mm diameter to 300 mm diameter watermains. The existing water distribution system is shown on Figure 2.4.

The Town of Legal is currently being serviced by one reservoir-pumphouse that is located west of 50 Street south of the Town. The storage capacity of the existing reservoir is 2,100 m^3.

The existing pumphouse was upgraded in 2011 with a gas-powered pump that is capable of providing flows during high demand periods such as an emergency fire scenario. The existing pumping capacity is as follows:

- Lead Pump 101 – 19 L/s at 50 m of hydraulic head.
- Lag Pump 102 – 19 L/s at 50 m of hydraulic head.
- Lag Pump 103 – 77 L/s at 50 m hydraulic head.
- High Capacity Pump 104 – 200 L/s at 50 m hydraulic head.

The pumping system operates to maintain a hydraulic grade line set point of approximately 747.5 m which is maintained at the header of the pumphouse. The elevation of the reservoir is approximately 703.7 m. Therefore, the operation setpoint is approximately 430 kPa (62 psi) at the reservoir-pumphouse.

Pump 101 operates as the lead pump, Pump 102 turns on when the system pressure drops 2 psi, and Pump 103 turns on when the system pressure drops 5 psi. The new high-capacity pump is activated during an emergency scenario.

2.4.2 Design Criteria

2.4.2.1 Existing and Historical Water Consumption Rates

Monthly water consumption data was provided by the Town of Legal for 2019 and 2020. Table 2-3 shows the provided monthly water consumption, including the total consumption (including truck fill) and truck fill usage.

Table 2-3: Monthly Water Consumption Data

Year	2019 Consumption		2020 Consumption	
	Total Consumption (m^3)	Truck Fill (m^3)	Total Consumption (m^3)	Truck Fill (m^3)
January	9,451	1,379	9,129	1,552
February	8,443	989	8,548	1,489
March	9,511	1,332	9,594	1,590
April	9,228	1,411	9,547	1,758
May	13,001	3,419	12,587	2,808
June	13,712	4,814	13,819	4,882
July	11,130	2,852	10,454	2,421
August	9,517	1,999	10,758	2,217
September	9,412	1,984	10,250	2,398
October	9,322	1,269	10,088	2,122
November	8,469	1,057	9,127	1,784
December	8,894	1,640	10,147	1,985
Total	120,090	24,145	124,048	27,006

Based on the data shown above, the average annual water consumption for 2019 and 2020 was 120,090 m^3/year and 124,048 m^3/year, respectively. Truck fill usage remains relatively constant throughout the year except for the months of May and June where usage spikes.

Meter data from 2014 to 2020 was provided bi-monthly for the West Pipeline which services five non-residential lots, the Alfalfa plant and six to eight residential properties located west of the Town. The meter data is summarized in in Table 2-4.

Table 2-4: West Pipeline Annual Water Consumption Data

Year	Water Consumption (m^3/year)
2014	6,665
2015	6,290
2016	7,128
2017	6,948
2018	6,823
2019	6,337
2020	5,993

Water meter data was provided for several higher demand users within the Town from 2018 to 2021. The consumption is summarized in Table 2-5. The Average Day consumption for each high demand user was determined by calculating the average daily consumption for each user from 2018-2021.

Table 2-5: High Demand Users Water Consumption Data

Location	2021 Water Consumption To-Date (m^3) *	2020 Total Water Consumption (m^3)	2019 Total Water Consumption (m^3)	2018 Total Water Consumption (m^3)	Average Day L/s
Car Wash	259	496	626	711	0.019
Ecole Citadelle	267	199	252	287	0.010
Legal School	214	1,050	1,570	1,989	0.040
Chateau Sturgeon	1,605	2,591	2,360	2,373	0.084
Nault Centre	3,235	4,171	-	-	0.085
4727 50 Ave	251	520	443	471	0.015
5015 48 St	1,799	1,311	1,299	1,857	0.064

** Note: 2021 Water Consumption includes data from January – July*

Based on the demand data provided, the existing water consumption for the Town was determined and is summarized in Table 2-.6 which was used within the model for the remainder of the assessment.

Table 2-6: Existing Water Consumption

Year	Population (persons)	Total Consumption (L/s)	West Pipeline Consumption (L/s)	Truck Fill Consumption (L/s)	High Demand User Consumption (L/s)	Residential User Consumption (L/s)
2019	1,392*	3.81	0.20	0.77	0.32	2.52
2020	1,413*	3.93	0.19	0.86	0.32	2.57

** Note: The assumed 2019 and 2020 populations are based on 1.6% growth rate from 2016*

The average day consumption of each high demand user listed in Table 2-5 was calculated and summed to determine the High Demand User Consumption value of 0.32 L/s in Table 2-6. As seen in Table 2-6, the average water usage in 2019 and 2020 was approximately 3.8 and 3.9 L/s, respectively, indicating an increase of approximately 2.6% from 2019 to 2020. For the remainder of the assessment, the 2020 values were used. The truck fill operates separately from the distribution system. For the purposes of the hydraulic analysis discussed in Section 2.4.4.2, the demand from the truck fill was removed from the overall demand to assess the system. The Residential User Consumption was calculated by subtracting the West Pipeline, Truck Fill, and High Demand User consumptions from the Total Water Consumption of the Town. The 2020 Residential User Consumption was therefore 2.57 L/s or approximately 158 L/p/day. This value falls in line with typical values for other municipalities. For example, EPCOR cites 186 L/p/d as the average residential water consumption rate in Edmonton.

Hourly meter data was provided by the Town at the reservoir-pumphouse to determine peaking factors for the existing development condition. Based on the meter data provided, a peaking factor 1.4 times the average day demand was determined for the existing max day demand (MDD). Likewise, a peaking factor of 3.7 times the average day demand was determined for the existing peak hour demand (PHD). The Town Standards specify peaking factors of 1.8 and 3.0 times the average day demand for the maximum day demand and peak hour demand, respectively.

2.4.2.2 *Future Water Consumption Rates*

For the future residential developments, 350 L/p/d was used for Average Day Demand (ADD) as per the Town of Legal Minimum Design Standards. For future non-residential land uses, 6,000 L/ha/day was used. A peaking factor of 1.8 was used for the for MDD as per the Town Standards. A peaking factor of 4.0 was used for the PHD. The future peaking factor recommended for PHD is greater than the design standards to represent the actual peaking factors experienced by the Town.

2.4.2.3 *Fire Flow*

Recommended available fire flows for the Town of Legal have been maintained since the previous 2007 Water and Sanitary Sewer Assessment. According to the Town of Legal Minimum Design Standards, 18,000 liters per minute (300 L/s) should be considered for fire flow analysis for high value properties. However, this number is relatively high compared to similar communities around Edmonton; the following fire flow rates have been adopted for this study as discussed with the Town:

- Residential: 75 L/s (single and two family)
- Residential: 120 L/s (multi-family)
- Non-Residential: 200 L/s (including high value properties such as schools, churches, and light industries)

2.4.2.4 *Pipe Design Requirements*

The minimum required pipe diameter for distribution mains is 150 mm as per the Town of Legal Minimum Design Standards. Permitted pipe materials include thermoplastic pipes (PVC and HDPE) and steel. Ductile Iron and Asbestos Cements pipes are no longer recommended for new pipes within the Town.

2.4.2.5 *Minimum Pressure Requirements*

The Town of Legal minimum Design Standards for the residual pressure for peak hour conditions specify a minimum pressure of 280 kPa (40 psi). Similarly, for the maximum day plus fire flow condition, the minimum design standards specify a residual pressure of 140 kPa (20 psi) at all locations within the distribution system.

2.4.3 Upgrades Completed From Previous Master Plan

The following upgrades to the water distribution system have been completed since the 2007 Master Plan. The new pipes completed since the previous master plan are highlighted on Figure 2.4.

- Installation of a new 200 L/s gas powered pump at the reservoir pumphouse.
- Installation of a new 400 mm diameter pipe along 50 Street from the reservoir pumphouse to 48 Avenue.
- Upgrade of the existing 100 mm and 150 mm line to 300 mm diameter pipe along 50 Street from 48 Avenue to 51 Avenue.
- Upgrade of the existing 100 mm and 150 mm line to 200 mm along 50 Street from 51 Avenue to south of 54 Avenue.
- Installation of a new 200 mm diameter pipe along 51 Avenue from 50 Street to 46 Street.
- Upgrade of the existing 100 mm line to 200 mm along 49 Street from 50 Avenue to 51 Avenue.
- Upgrade of the existing 100 mm line to 200 mm along 48 Street from 50 Avenue to 51 Avenue.

2.4.4 Existing System Assessment

2.4.4.1 Existing Storage and Pumping Capacity Assessment

The existing reservoir-pumphouse is discussed in Section 2.4.1. The existing total pumping capacity of the pumphouse meets the Town's maximum day plus fire flow demands. Future pumping capacity is further discussed in Section 2.4.6.1.

Two options were considered for determining existing storage volumes. In Option 1, the Regional Water Customers Group (RWCG) recommendation of two times Average Day Demand (Supply Interruption) plus fire storage. To account for the demands of the truck fill in the summer months, two times the daily truck fill demand was also included in the storage requirement. The supply interruption storage represents the available storage in case of disruption to the water supply. The design of two average days storage enables the RWCG to collectively manage the high 5-day draw rates off EPCOR Water such that there is minimal financial rate implication to the regional customers.

In Option 2, the storage volume requirements outlined in the April 2012 Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems were assessed. The Fire Flow storage plus 25% of Maximum Day Demand (Equalization Storage) plus 15% of Average Day Demand (Emergency Storage) were accounted. In this option the equalization storage is assigned to meet the daily demand fluctuation above the supply rates, as the water supply rate is generally lower than the peak water consumption rate. The emergency storage is allocated for the routine disruption of supply for maintenance.

Tables 2-7 and 2-8 summarize the existing storage requirements for the two options. Note that the ADD and MDD values were based on the 2020 population of 1,413 people based on the growth rate of 1.6% from 2016.

Table 2-7: Existing System Analysis – Option 1 Storage Requirement

Description	Existing Required Volume (m^3)
Fire Storage (200 L/s for 2 hours)	1,440
Two times Truck Fill (0.86 L/s)	148
Two times Average Day Demand (ADD = 3.1 L/s)	599
Total Required Storage	2,127
Total Existing Storage	2,100

Table 2-8: Existing System Analysis – Option 2 Storage Requirement

Description	Existing Required Volume (m^3)
Fire Storage (200 L/s for 2 hours)	1,440
Two times Truck Fill (0.86 L/s)	148
Equalization Storage - 25% of Maximum Day Demand (MDD = 4.4 L/s)	94
Emergency Storage - 15% of Average Day Demand (ADD = 3.1 L/s)	40
Total Required Storage	1,723
Total Existing Storage	2,100

As seen in the above Tables, both required storage options are very close to the existing Town storage volume threshold of 2,100 m^3. As noted above, the demand values used were calculated based on the estimated population of 1,413 people. This may not reflect the actual population of the Town, which will be confirmed with the

release of the 2022 census data. However, when looking at demand values with the 2016 population of 1,345 people, the Total Required Storage outlined in Option 1 is very similar, with a value of 2,099 m^3. It is therefore recommended that the Town monitor its current storage needs, and plan for expansion in the near future. Of the two storage options, Option 1 is preferable as it allows for additional required storage redundancy in case of supply interruptions. The future storage requirements are examined in Section 2.4.6.1.

2.4.4.2 Existing Hydraulic Assessment

The existing distribution system was simulated during the peak hour demand scenario as well as the maximum day demand plus fire flow scenario.

Tables 2-9 and 2-10 summarize the assessment for the existing system and are shown schematically on Figures 2.5 and 2.6.

Table 2-9: Existing System Analysis – Peak Hour Demand

Total Nodes	Minimum Pressure	Maximum Pressure	Nodes with High Pressure		Nodes with Low Pressure	
(No.)	(kPa)	(kPa)	(No.)	(%)	(No.)	(%)
82	380	655	0	0	0	0

In total there are 82 nodes in the existing system analysis conducted for the Peak Hour Demand. The existing distribution system was simulated for the peak hour demand based on the current pumping philosophy. As a result, two distribution pumps were turned on and a minimum pressure of 380 kPa was simulated at nodes J-29, J-30, and J-31. The minimum pressure is greater than the recommended minimum pressure of 280 kPa (40 psi). The system is adequate to supply the peak hour demands.

A maximum simulated residual pressure of 655 kPa occurred at the Alfalfa Plant located at the lowest elevation in the network but is outside of the Town's boundaries (684 m). The Town Standards do not specify an upper limit for the residual pressure in the network, but it is commonly recommended not to exceed 700 kPa to avoid any damage to the infrastructure. Based on the above results, the system meets the requirements for peak hour demands. The Peak Hour Demand results are illustrated in Figure 2.5.

Table 2-10: Existing System Analysis – Maximum Day Demand Plus Fire Flow

Residential Nodes	Non-Residential Nodes	Residential Nodes Failing Fire Flow Requirements		Non-Residential Nodes Failing Fire Flow Requirements		Total Nodes Failing Fire Flow Requirements	
(No.)	(No.)	(No.)	(%)	(No.)	(%)	(No.)	(%)
63	19	1	1.6	14	73.7	15	18.3

In total there are 82 nodes in the existing system analysis conducted for the Maximum Day Demand. Simulation runs were carried out to establish the available fire flow within the distribution system. The simulation results shown in Table 2-9 indicate that the existing system cannot provide the minimum fire flow requirements to the majority of non-residential areas.

Outside of the Town's boundary to the west there are 5 nodes which failed to meet the Fire Flow requirements, of which 4 nodes are non-residential, and 1 node which is residential. However, the Town does not provide fire protection for the areas outside the Town boundary.

In the southwest section of the Town, there are 7 nodes failing the fire flow along 48 Avenue and 50 Avenue (J-32, J-34, J-35, J-36, J-37, J-39, and J-73). This area in the existing system is zoned as industrial; however, along 50 Avenue in general the lots are residential and acreages, and along 48 Avenue are smaller businesses.

In the northeast portion of the Town there are 3 nodes which failed to meet the Fire Flow requirements (J-70, J-110, and J-111). The new school constructed in the Town is located at J-70 while J-110 & J-111 are located near a residential home in the northeast of the Town along 43 Street. Refer to Figure 2.6 for the Maximum Day Demand results.

2.4.5 Existing System Deficiencies and Improvements

As discussed in Section 2.4.4.2, the water distribution system is insufficient to supply fire flows in the southwest non-residential area of Town, along the 150 mm diameter water line to the Alfalfa plant and other non-residential lots located west of the Town, as well as at the new school and residential lot located in the northeast portion of the Town. The following section discusses the proposed improvements for the existing water distribution system, which are shown schematically on Figure 2.7.

The area in the southwest portion of Town is currently zoned as industrial and therefore requires 200 L/s for fire protection. However, in general, along 50 Avenue the lots are currently acreages or small businesses, and along 48 Avenue are smaller industrial lots. The fire flow in this area ranges from 36 L/s to 185 L/s and thus some areas do not currently meet residential fire flow requirements. To increase the fire flow in this area, Improvement 1 is recommended as a 200 mm diameter water loop along 50 Avenue between 53 Street and 54 Street. Hydraulic results indicate that this improvement will increase the available fire flow in this area up to a minimum of 113 L/s within the looped distribution system. In the previous master plan, it was recommended to upsize the entire watermain along 48 Avenue west of 50 Street; however, this improvement is recommended to be deferred until future industrial development is completed (as shown in the future development water distribution system schematic - Figure 2.8). If 200 L/s is required for the industrial development along 48 Avenue, upgrading this watermain would be required.

Currently, there are no hydrants located on the watermain west of the Town that provides services to the Alfalfa plant. Therefore, upgrading of this watermain is not recommended.

The new school located in the northeast section of Town currently has approximately 90 L/s available fire flow (at Node J-70) and does not meet the requirement. Therefore, Improvement 2 is recommended as a 200 mm diameter loop through the school field to the west and south connecting to the system at 48 Street and 51 Avenue.

The residential lot in the northeast corner of the Town (J-111) currently receives approximately 50 L/s of available fire flow because it is located at a long dead end of a 50 mm diameter water line. It is understood that there is a hydrant located at the dead end of this line for flushing. Upgrading of this line is not required until the Town experiences more development to the east.

The proposed improvements were analyzed during the maximum day demand plus fire flow scenario. Table 2-11 summarizes the change in available fire flow for the nodes that did not meet the fire flow requirement in the existing system analysis.

Table 2-11: Existing System with Improvements Analysis – Maximum Day Demand

Node	Improvement No.	Fire Flow Needed	Existing System Available Fire Flow	Proposed System Available Fire Flow
(-)	(-)	(L/s)	(L/s)	(L/s)
J-32	Improvement 1	200	185	194
J-34	Improvement 1	200	143	171
J-35	Improvement 1	200	81	130
J-36	Improvement 1	200	62	122
J-37	Improvement 1	200	44	162
J-38	Improvement 1	200	38	68
J-70	Improvement 2	200	152	214
J-73	Improvement 1	200	168	183

As seen in Table 2-11 and noted above, the hydraulic results indicate that with the improvements implemented, the available fire flow in the southwest of the Town will increase up to a minimum of 113 L/s. These nodes (J-32, J-34, J-35, J-36, J-37, and J-73) now meet the minimum single-family residential fire flow requirement of 75 L/s. As this area fully develops in the future, further upgrades are recommended as discussed in Section 2.4.6 to meet the 200 L/s required fire flow for the industrial development along 48 Avenue.

2.4.6 Future System Assessment

The future development scenario for 2045 was assessed based on a total population of 2,100 people and the development projection presented in Section 2.3. The future water system demand was calculated and compared to the existing system to determine the total system requirements for the ultimate development which is presented in Table 2-12.

Table 2-12: Summary of Projected Demands

Demand Type	Existing (L/s)	Future Development (2045) (L/s)
Average Day Demand	3.1	6.5
Maximum Day Demand	4.4	10.5
Peak Hour Demand	11.5	25.1
Maximum Fire Flow Demand	200	200
Maximum Day Plus Fire Flow Demand	204.4	210.5

As seen in Table 2-12, with the additional development and population planned for 2045, the average day demand increases by approximately 3.4 L/s based on the future development average day demand of 350 L/p/d. In the ultimate development, the maximum day demand plus fire flow scenario remains as the governing demand scenario at approximately 211 L/s.

The demand for future development was added to the model spatially based on land use, and watermains were added to the system. Local pipes and system looping within the new development areas were not assessed as the layout for these development areas has not been finalized. The proposed watermain diameter and system tie-in locations for each area were determined and are shown schematically on Figure 2.8.

The Pepins Point area at the northwest corner of the Town is expected to continue to be developed. This area will be serviced with a 200 mm diameter water main. The residential area west of 51 Street and south of 48 Avenue will be serviced by a 200 mm diameter water main. The residential area located south of 47 Avenue east of 50 Street will be serviced with a 200 mm diameter water main.

The existing and future light industrial area in the west of the Town located west of 54 Street and south of 50 Avenue will be serviced by 250 mm diameter water mains looping within the industrial area connecting 50 Avenue to 48 Avenue.

The required improvements to the existing water distribution system were determined to meet peak hour pressure requirements and available fire flow requirements. For the ultimate development scenario, three additional system improvements are proposed as follows:

- Improvement 3: Installation of a new 150 mm diameter watermain through the field in the northeast of the Town along the sanitary service ROW to service the future East Country residential developments. Upgrading the existing 50 mm diameter watermain to 150 mm diameter from J-109 to J-111 is also recommended.
- Improvement 4: Upgrading the existing 150 mm diameter watermain to 250 mm diameter along 48 Avenue between 50 Street and 54 Street.
- Improvement 5: Upgrading the existing 150 mm diameter watermain to 200 mm diameter along 50 Avenue between 54 Street and the west edge of the Town of Legal Boundary.

These improvements, in general, are proposed to increase the available fire flow within the residential area in the northeast areas of the Town, and industrial areas in the southwest portions of the Town.

The future development scenario for 2045 was analyzed assuming all recommended existing system improvements have been implemented. The hydraulic assessment is further discussed in Section 2.4.6.2. A schematic of the proposed water distribution system for the future development condition is shown on Figure 2.8.

2.4.6.1 Future Storage and Pumping Capacity Assessment

As shown in Table 2-12 in Section 2.4.6, the future development Maximum Day Plus Fire Flow Demand is approximately 217 L/s while the existing fire pump (High Capacity Pump 104) has a capacity of 200 L/s. The existing Max Day Plus Fire Flow demand is therefore slightly above the 200 L/s capacity of the fire pump. Therefore, it recommended to consider adding an additional gas-powered high capacity pump to supplement the existing High Capacity Pump 104 in the event that all three distribution pumps are out of service during high demand periods such as an emergency fire scenario.

The future system storage requirements were determined similarly to the existing system analyzing two options for the future storage requirement. Tables 2-13 and 2-14 summarize the existing storage requirements for the two options.

Table 2-13: Future System Analysis – Option 1 Storage Requirement

Description	Future Required Volume (m^3)
Fire Storage (200 L/s for 2 hours)	1,440
Two times Truck Fill (2.9 L/s)	493
Two times Average Day Demand (ADD = 6.5 L/s)	1,123
Total Required Storage	3,056
Total Existing Storage	2,100
Deficient Volume	956

Table 2-14: Future System Analysis – Option 2 Storage Requirement

Description	Future Required Volume (m^3)
Fire Storage (200 L/s for 2 hours)	1,440
Two times Truck Fill (2.9 L/s)	493
Equalization Storage - 25% of Maximum Day Demand (MDD = 10.5 L/s)	226
Emergency Storage - 15% of Average Day Demand (ADD = 6.5 L/s)	84
Total Required Storage	2,243
Total Existing Storage	2,100
Deficient Volume	143

As seen in the above Tables, the existing storage capacity of 2,100 m^3 is insufficient, Option 1 has a deficient volume of approximately 956 m^3. Based on the data provided by the Town, truck fill demand was projected to the design horizon year of 2045, and was calculated to be 2.9 L/s based on the average growth of 5% from 2011. Of the two storage options, Option 1 is preferable as it allows for additional required storage redundancy in case of supply interruptions and enables the RWCG to collectively manage the high 5-day draw rates off EPCOR Water such that there is minimal financial rate implication to the regional customers.

Based on the recommended storage capacity requirement Option 1, in the ultimate development an additional 956 m^3 will be required. It should be noted that the existing storage capacity will become insufficient once the storage requirement exceeds the existing storage capacity (2,100 m^3). Therefore, additional storage will be required prior to the fully developed ultimate demand scenario (2045). AECOM recommends building an additional 1,000 m^3 of storage, bringing the total storage within The Town to approximately 3,100 m^3.

The turnover of the reservoir was assessed to determine the most appropriate time frame for expansion of the storage. It is recommended that there should be a maximum retention time of seven days within the reservoir to maintain residual chlorine levels. Delaying the upgrade of the reservoir storage until a turnover of seven days is recommended. A turnover of seven days is achieved when the total demand for the Town (including truck fill) reaches 5.1 L/s, which is projected to occur when the Town reaches a population of approximately 1,655 people in 2029 based on the assumed growth rate of 1.6% from 2016. At this time, based on the storage requirement Option 2, the required storage would be 1,867 m^3, and thus the existing storage capacity would still meet AEP's requirement for storage. It is recommended to monitor the ADD of both the distribution system and the truck fill as development and water demand increases.

Planning for additional storage is recommended at tis time. For the purposes of this study, it was assumed that the existing reservoir could be expanded by the proposed 1,000 m^3 without significant upgrades to the existing reservoir. However, it is recommended to conduct an assessment of the existing reservoir to determine the feasibility of expansion.

2.4.6.2 Future Development Hydraulic Assessment

The water distribution system was assessed during the future development condition assuming that all improvements to the existing system have been completed. Similar to the existing development condition, the model was simulated during peak hour demand and maximum day demand plus fire flow scenarios. Tables 2-13 and 2-14 summarize the assessment for the future system. Figures 2.9 and 2.10 hydraulic results for the peak hour demand plus fire flow demand, respectively.

Table 2-15: Future System Analysis – Peak Hour Demand

Total Nodes	Minimum Pressure	Maximum Pressure	Nodes with High Pressure		Nodes with Low Pressure	
(No.)	(kPa)	(kPa)	(No.)	(%)	(No.)	(%)
92	301	577	0	0	0	0

In total there are 92 nodes in the future system analysis conducted for the Peak Hour Demand. The future distribution system was simulated for the peak hour demand based on the current pumping philosophy. As a result, two distribution pumps were turned on and a residual minimum pressure of 301 kPa was simulated at nodes J-29, J-30, and J-31. The minimum residual pressure is above the recommended minimum pressure of 280 kPa (40 psi). The system is adequate to supply the peak hour demands.

A maximum simulated residual pressure of 577 kPa occurred at the Alfalfa plant located at the lowest elevation in the network but is outside of the Town's boundaries (684 m). The Town Standards do not specify an upper limit for the residual pressure in the network, but it is commonly recommended not to exceed 700 kPa to avoid any damage to the infrastructure.

Based on the above results, the future system meets the requirements for peak hour demands.

Table 2-16: Future System Analysis – Maximum Day Demand Plus Fire Flow

Residential Nodes	Non-Residential Nodes	Residential Nodes Failing Fire Flow Requirements		Non-Residential Nodes Failing Fire Flow Requirements		Total Nodes Failing Fire Flow Requirements	
(No.)	(No.)	(No.)	(%)	(No.)	(%)	(No.)	(%)
72	20	1	1.4	4	20	5	5.4

In total there are 92 nodes in the future system analysis conducted for the Maximum Day Plus Fire Flow Demand. Simulation runs were carried out to establish the available fire flow within the distribution system. The simulation results shown in Table 2-12 and in Figure 2.9 indicate that the future system can provide the minimum fire flow requirements to all areas within the Town's boundaries assuming all Improvements outlined in Section 2.4.6 are implemented.

Outside of the Town's boundary there are 5 nodes which failed to meet the Fire Flow requirements, of which 4 nodes are non-residential, and 1 node which is residential. It should be noted however, that the Town does not provide fire protection for the residential and non-residential areas located outside the Town boundary. Therefore, no additional improvements are recommended for the serviced areas west of the Town boundary.

Based on the above results, the future system meets the requirements for maximum day plus fire flow demand.

2.4.7 Cost Estimates

Cost estimates for the water distribution system improvements have been developed at a conceptual level. The cost estimates provided include supply and installation costs in CAD (2021 dollars) based on previous tenders and recent experience on similar projects. The estimated costs include 40% for engineering and contingency. Each improvement upgrade was assigned a priority ranking and is shown in the tables.

Table 2-17: Cost Estimate – Existing System Improvements

Item	Description	Priority	Unit	Unit Rate	Quantity	Cost
Improvement 1	New 200 mm Diameter Watermain - 50 Avenue	1	L.m	$1,450	120	$174,000
Improvement 2	New 200 mm Diameter Watermain - School	2	L.m	$800	350	$262,500
					Subtotal	$436,500
					Engineering and Contingency (40%)	$174,600
					Total	$611.100

Table 2-18: Cost Estimate – Ultimate Development

Item	Description	Priority	Unit	Unit Rate	Quantity	Cost
Improvement 3	New 150 mm Diameter Watermain & Replace Existing 50 mm with 150 mm - NE Residential	3	L.m	$750	750	$692,000
Improvement 4	Replace Existing 150 mm with 200 mm diameter Watermain - 50 Avenue	2	L.m	$1,150	490	$563,500
Improvement 5	Replace Existing 150 mm with 250 mm diameter Watermain - 48 Avenue	2	L.m	$1,375	250	$343,800
Storage Upgrade	Expand Existing Reservoir by 1500 m^3 *	1	m^3	$950	1,000	$950,000
Pumping Upgrade	100 L/s High Capacity Pump	3	HP	$9,000	100	$900,000
					Subtotal	$3,449,300
					Engineering and Contingency (40%)	$1,379,700
					Total	$4,829,000

**Pending population growth of the Town reaches 1,700 people as outline in Section 2.4.6.*

Based on Tables 2-17 and 2-18, the total cost based on priority including 40% for engineering and contingency is as follows:

- Priority 1: $1,573,600
- Priority 2: $1,637,700
- Priority 3: $2,228,800

2.5 Wastewater System Assessment

2.5.1 Existing System Description

The Town of Legal sanitary sewer system consists of approximately 9.3 km of gravity sewer and 0.8 km of forcemain. The existing sanitary sewer conveys flow from the south and west areas towards the lagoon located northeast of the Town. Also, there is a low-pressure sewer main (50 mm) on the east side of the Town which collects the sanitary sewage of 50 Avenue between 43 and 46 Street. There is also a low-pressure sewer main (50 mm) on the west side of the Town installed in 2020 located along the back of lots on 50 Avenue. Although

functional, there are no properties currently serviced to this line yet. Figure 2.11 shows the Town's existing sanitary system.

Flow monitoring was undertaken by BOTCorp and consisted of one flow meter and one rain gauge. The flow meter was installed just upstream of the lagoon. The rain gauge was installed next to the Municipal Shop on 5310 48 Avenue. The data was collected from approximately June 1, 2021 to September 30, 2021.

The sanitary sewer system model was first developed by UMA/AECOM in 2007 in XPSWMM. The 2007 model was not calibrated and flows were based on design standards. For this model update, model catchments and populations were updated based on the current development. Inflow was distributed to manholes along main sewer lines in each basin, connected to pipes and dry and wet weather flow parameters were calibrated to match the monitoring data as described below.

2.6 Model Calibration

2.6.1 Dry Weather Flow

Several periods of dry weather flow were selected from the monitoring data. The data were reviewed, and the average sewage generation rates were calculated based on the population/area and monitored volume. Diurnal patterns were selected for residential and non-residential catchments and adjusted so that the modelled data displayed peaks of similar magnitude and at similar times as the monitoring data.

Table 2-19: Calibrated Dry Weather Flow Rates

Area	Average Flow
Average Residential Flow Per Capita (L/person/day)	157
Average Non-Residential Flow (L/ha/s)	0.043 (3,715 L/ha/d)

As shown in Table 2-19, the residential average sewage generation was calculated at 157 L/p/d. This value falls in line with typical values for other municipalities. For example, EPCOR cites 160 L/p/d as an average sewage generation value. It is below the Town's standard of 320 L/p/d but in line with the water consumption of 158 L/p/d.

Non-residential sewage generation was estimated at 0.043 L/ha/s (3715 L/ha/d) based on gross area. These rates are consistent with generation rates throughout the Alberta Capital Region Wastewater Commission (ACRWC) service area, for example, the average industrial rate for ACRWC is 4,300 L/ha/d while the ACRWC level of service standard is 6,170 L/ha/d. These rates are also consistent with the types of development located in the service areas. Water meter data was provided for several higher demand non-residential users within the Town from 2018 to 2021, as shown in Table 2-5 in Section 2.4.1.1. In the analysis, the actual water consumption of each high-water user in the Town was individually inputted and used for sewage generation.

Residential and non-residential diurnal flow patterns were developed to best match the actual flow data. The non-residential diurnal generally has a minimum early in the morning, and peak during the afternoon when most people are at work. The residential diurnal flow patterns have a morning and an afternoon peak. Peaking factors and times were adjusted to best match the data. The average residential and non-residential peaking factors and times are shown in Table 2-20 as well as Figure 2.12.

Table 2-20: Diurnal Flow Patterns

Diurnal Pattern	Average Morning Peaking Factor	Morning Peak Time	Average Afternoon/Evening Peaking Factor	Afternoon/Evening Peak Time
Non-Residential	-	-	1.3	12PM - 2PM
Residential	1.0	6AM - 8AM	1.5	6PM - 8PM

The results of the dry weather calibration comparing the modelled to monitored data is shown in Table 2-21.

Table 2-21: Dry Weather Flow Calibration Results

Monitored Peak Flow (L/s)	Model Peak Flow (L/s)	Model/Monitored Flow Ratio (%)	Monitored Volume (m^3)	Model Volume (m^3)	Model/Monitor Volume Ratio (%)	Comparison Flow/Volume
6.41	6.30	98	294.0	294.1	100	Good/Good

The model results are compared to the monitored values as a percentage. Results within 10% are considered good, from 10 to 20% are considered fair, and results differing by greater than 20% were considered high or low. We were able to achieve modelled volumes compared very well to the monitored data. Peak flows are also consistent with the monitored data.

Figure 2.13 shows the dry weather flow calibration results. As seen on the figure, the modelled flow matches the monitored data very well.

2.6.2 Wet Weather Flow

Wet weather flow was calibrated using recent rainfall events. A summary of the events used is provided in Table 2-22. The rain events were selected as they were the largest that occurred during the 2021 monitoring period. The rainfall data for the storms were checked against rainfall data for the Environment Canada Legal rain gauge (located approximately 8.3 km northeast of the Town) to verify consistency and indicate how widespread the events were.

Table 2-22: Rainfall Events

Date	Rainfall Depth (mm)	Duration (hours)	Average Intensity (mm/hr)	Estimated Return Period	Environment Canada RG (mm)
July 10, 2021	17.3	1	17.3	2 year	12.1
July 27, 2021	17.8	9.7	1.8	<1:2 year	19.2
August 23, 2021	34.8	11.3	3.1	<1:2 year	25.9
September 1, 2021	20.6	7.4	2.8	<1:2 year	18.5

The region experienced lower than average total rainfall in the summer of 2021, however, there were still some heavy rainfall events. The July 10th event had a return period greater than a 1 and 2 year. The largest event occurred on August 23, 2021 with 34.8 mm of rain. The total rainfall for each of the events compares well with the Environment Canada data.

The RTK method was used to calibrate the model. This method involves an R value, which is the total fraction of rainfall that becomes infiltration and inflow (I&I) entering the sanitary sewer, a T value, which is the time it takes for the flow to peak, and a K value, which is the ratio of the falling limb duration to the rising limb duration indicated the time for the peak to subside. For example, as shown in Table 2-23, the area was assigned an R value of 0.0075, T

value of 0.25 and K value of 8, which means that 0.75% of the rainfall becomes I&I, the time to peak is 15 minutes and the time to recede is 120 minutes.

Table 2-23: RTK Calibration Parameters

R	T (hours)	K (ratio of falling limb to T)
0.0075	0.25	8

Table 2-24: Wet Weather Flow Calibration Results:

Date	Monitored Peak (L/s)	Model Peak Flow (L/s)	Flow Ratio (%)	Monitored Volume (m^3)	Model Volume (m^3)	Volume Ratio (%)	Comparison Flow/Volume
July 10, 2021	17.8	17.1	96	460	566	123	Good/High
July 27, 2021	9.8	14.6	148	313	416	133	High/High
August 23, 2021	13.9	12.6	91	575	456	79	Good/Fair
September 1, 2021	17.2	11.7	68	560	488	87	Low/Fair
Average			101			105	

Four rain events were used for the wet weather flow calibration. A summary of the calibration events is provided above in Table 2-24. The model results are compared to the monitored values as a percentage. Results within 10% were considered good, from 10 to 20% were considered fair, and results differing by greater than 20% were considered high or low. The peak flows are relatively consistent with the monitored data, apart from the July 27th event being high and the September 1st event being low. The modelled volumes also compared well to the monitored volumes, apart from the July 10th and July 27th modelled events resulting in higher comparative volumes. Results are illustrated on Figure 2.14. As seen in the figure, the modelled flows match up relatively well with the monitor data. The August 23rd monitored data has three peak flows during the rain event while the modelled flows undergo only two peaks in flow. On September 1st, both the modelled and monitored flows have two peaks, but the first monitor flow peak is considerably higher than the model. On average, the date compares well with the average peak only 1% higher and the average volume 5% higher than the monitored data.

2.6.3 Existing System Performance

The system performance was assessed under the 1:25 Year 24 Hour and the 1:5 Year 4 Hour design rainfall events to identify capacity constraints in the existing system, as well as to compare to the typical Infiltration and Inflow (I/I) allowance of 0.28 L/s/ha. Infiltration and inflow (I/I) is excess water that flows into sewer pipes from groundwater and stormwater.

The design storms were selected as the 1:5 Year 4 Hour and 1:25 Year 24 Hour distribution rainfall event as this is consistent with the event that nearby municipalities used to assess their systems including the Alberta Capital Region Wastewater Commission which services many municipalities surrounding Edmonton. The Chicago distribution was used for the shorter duration event as it has a sharp peak consistent with shorter duration storms. The Huff distribution was used for the 24 hour event which results in a lower peak more typical of longer duration events. Environment Canada's 2019 Intensity-Duration-Frequency (IDF) rainfall data for Edmonton Namao was used.

Pipe capacity utilization and hydraulic grade line (HGL) results at manhole locations within the Town of Legal sanitary system for the two events are illustrated on Figures 2.15 and 2.16. As seen in both figures, the freeboard, or difference between the HGL and the ground surface, are split into intervals that are greater than 2.5 m or less than 2.5 m. The use of 2.5 m as a threshold was used to assess possible basement flooding risk in the Town. As shown in the figures, the vast majority of the manholes and pipes are light green, meaning that there is sufficient

distance from the HGL to the ground. There are also several dark green manholes, denoting that the HGL is less than 2.5 m from the ground elevations; however, this is caused by a shallow manhole, and the risk of basement flooding has not been identified as the HGL remains within the diameter of the pipe.

The system has adequate capacity to convey both the 1:5 Year 4 Hour and 1:25 Year 24 Hour event. There is no surcharging within 2.5 m of ground level and there are no blue or red pipes, meaning that there are no pipes which are over-utilized (the max flow : pipe capacity flow ratio of all pipes is less than 1.2).

Infiltration and Inflow on a per hectare basis was estimated to compare to the Town's standard of 0.28 L/s/ha. The results are summarized in Table 2-25.

Table 2-25: Estimated Infiltration and Inflow Rates

Event	Rainfall (mm)	Peak Flow (L/s)	Peak I/I (L/s/ha)	Average I/I over Rain Event (L/s/ha)
5 Year 4 Hour Chicago	37	25.7	0.33	0.13
25 Year 24 Hour Huff	96	20.9	0.26	0.08

Overall, the system produces a peak I&I slightly higher than the standard of 0.28 L/s/ha for the short duration event and slightly lower for the long duration event. The I&I rate is consistent with the standard.

2.6.4 Existing System Improvements

The system has adequate capacity for the existing development and no pipe size upgrades are currently recommended. Although I&I does not cause the system to surcharge during the design events, there may be opportunities to reduce the I&I in the system as there are still impacts to the lagoon system. The Town is aware of at least one extraneous connection to the sanitary sewer. The Ecole Citadel has a drain that connects directly to the sanitary sewer on 46 Street. Options to disconnect and allow the stormwater to flow overland should be investigated. Manholes located in sags can also be fitted with an inflow dish to prevent stormwater flow from entering in large volumes from the manhole lid. Further opportunities will be discussed in the following section as the condition of the sanitary sewer was assessed in detail.

2.6.5 Future System Assessment

The future development scenario for 2045 was analyzed for the sanitary system. Sewage generation rates of 320 L/c/d for future residential areas and 6,000 L/ha/day for future non-residential areas were used in the analysis, along with a population density of 3.5 people per lot. These assumptions are based on the Town of Legal Minimum Design Standards. Figure 2.16 shows the future development sanitary system schematic.

The future system performance was assessed under the 1:25 Year 24 Hour and the 1:5 Year 4 Hour design rainfall events to identify capacity constraints in the existing system.

Pipe capacity utilization and hydraulic grade line (HGL) results at manhole locations within the Town of Legal sanitary system for the two events are illustrated on Figures 2.18 and 2.19. Like the existing system performance, the vast majority of the manholes and pipes in the future model schematic are light green, meaning there is sufficient distance from the HGL to the ground. There are also several dark green manholes, denoting that the HGL is less than 2.5 m from the ground elevations; however, this is caused by a shallow manhole, and the risk of basement flooding has not been identified as the HGL remains within the diameter of the pipe.

The future system has adequate capacity to convey both the 1:5 Year 4 Hour and 1:25 Year 24 Hour event. There are no nodes surcharging within 2.5 m of ground level and there are no blue or red pipes, meaning that there are no pipes which are over-utilized (the max flow: pipe capacity flow ratio of all pipes is less than 1.2).

Infiltration and Inflow on a per hectare basis was estimated to compare to the Town's standard of 0.28 L/s/ha. The results are summarized in Table 2-26.

Table 2-26: Estimated Future Infiltration and Inflow Rates

Event	Rainfall (mm)	Peak Flow (L/s)	Peak I/I (L/s/ha)	Average I/I over Rain Event (L/s/ha)
5 Year 4 Hour Chicago	37	38.8	0.32	0.19
25 Year 24 Hour Huff	96	33.9	0.27	0.13

Overall, the future system produces a peak I&I slightly higher than the standard of 0.28 L/s/ha for the short duration event and slightly lower for the long duration event. The I&I rate is consistent with the standard.

2.6.6 Future System Improvements

As the system performs well under future conditions and pipe capacities are not restricting flow, there are no upgrades currently recommended.

Based on the ratio between available capacity to peak flows in the trunks, the population of Legal can increase by a magnitude of 2.2 (population of approximately 3,000) and still be serviced by the main trunk comfortably.

2.7 Conclusions and Recommendations

The existing sanitary sewer system has adequate capacity for the next 20-25 years. No improvements are recommended to increase the capacity of the sanitary sewer system for existing or future development.

N

54 AVE
53 A AVE
GRASSHOPPER HILL PARK
52 AVE
CITADEL PARK
CITADEL CENTRE
LEGAL ARENA
LEGAL SCHOOL
ECOLE CITADEL
ST. EMILE CHURCH
51 AVE
50 AVE
MUNICIPAL SHOP
CENTENNIAL PARK
R.V. PARK
49 AVE
48 AVE
K.C. PARK
47 AVE
WATER RESERVOIR

53 ST
52 ST
51 ST
56 ST
55 ST
54 ST
50 ST
49 ST
48 ST
47 ST
46 ST
49A ST

90 0 90 180 m

1:9,000

LEGEND:

- TOWN OF LEGAL BOUNDARY
- COMMERCIAL DISTRICT (HIGHWAY)
- COMMERCIAL DISTRICT (CENTRAL BUSINESS AREA)
- INDUSTRIAL DISTRICT
- PUBLIC PARKS
- RESIDENTIAL DISTRICT (TWO FAMILY)
- RESIDENTIAL DISTRICT (MEDIUM DENSITY)
- RESIDENTIAL DISTRICT (SINGLE FAMILY)
- URBAN RESERVE DISTRICT
- URBAN SERVICES DISTRICT

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AECOM

Figure: 2.1

EXISTING SYSTEM ASSESSMENT
EXISTING LAND USE PLAN

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

AECOM

Figure: 2.2

EXISTING SYSTEM ASSESSMENT
FUTURE DEVELOPMENT PLAN

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

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LEGEND:

- TOWN OF LEGAL BOUNDARY
- COMMERCIAL DISTRICT (HIGHWAY)
- COMMERCIAL DISTRICT (CENTRAL BUSINESS AREA)
- INDUSTRIAL DISTRICT
- PUBLIC PARKS
- RESIDENTIAL DISTRICT (TWO FAMILY)
- RESIDENTIAL DISTRICT (MEDIUM DENSITY)
- RESIDENTIAL DISTRICT (SINGLE FAMILY)
- URBAN RESERVE DISTRICT
- URBAN SERVICES DISTRICT
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

PEPINS POINT
2.7 ha

54 AVE
53 A AVE
GRASSHOPPER HILL PARK
52 AVE
51 AVE
53 ST
52 ST
51 ST
CITADEL PARK
CITADEL CENTRE
LEGAL ARENA
LEGAL SCHOOL
ECOLE CITADEL
ST. EMILE CHURCH
46 ST
47 ST
48 ST
49 ST
50 ST
3.6 ha
EAST COUNTRY RESIDENTIAL
56 ST
55 ST
54 ST
50 AVE
10.0 Ha
MUNICIPAL SHOP
52 ST
49 AVE
48 AVE
47 AVE
49A ST
CENTENNIAL PARK
R.V. PARK
K.C. PARK
2.8 ha
9.2 ha
WATER RESERVOIR

80 0 80 160 m

1:8,000

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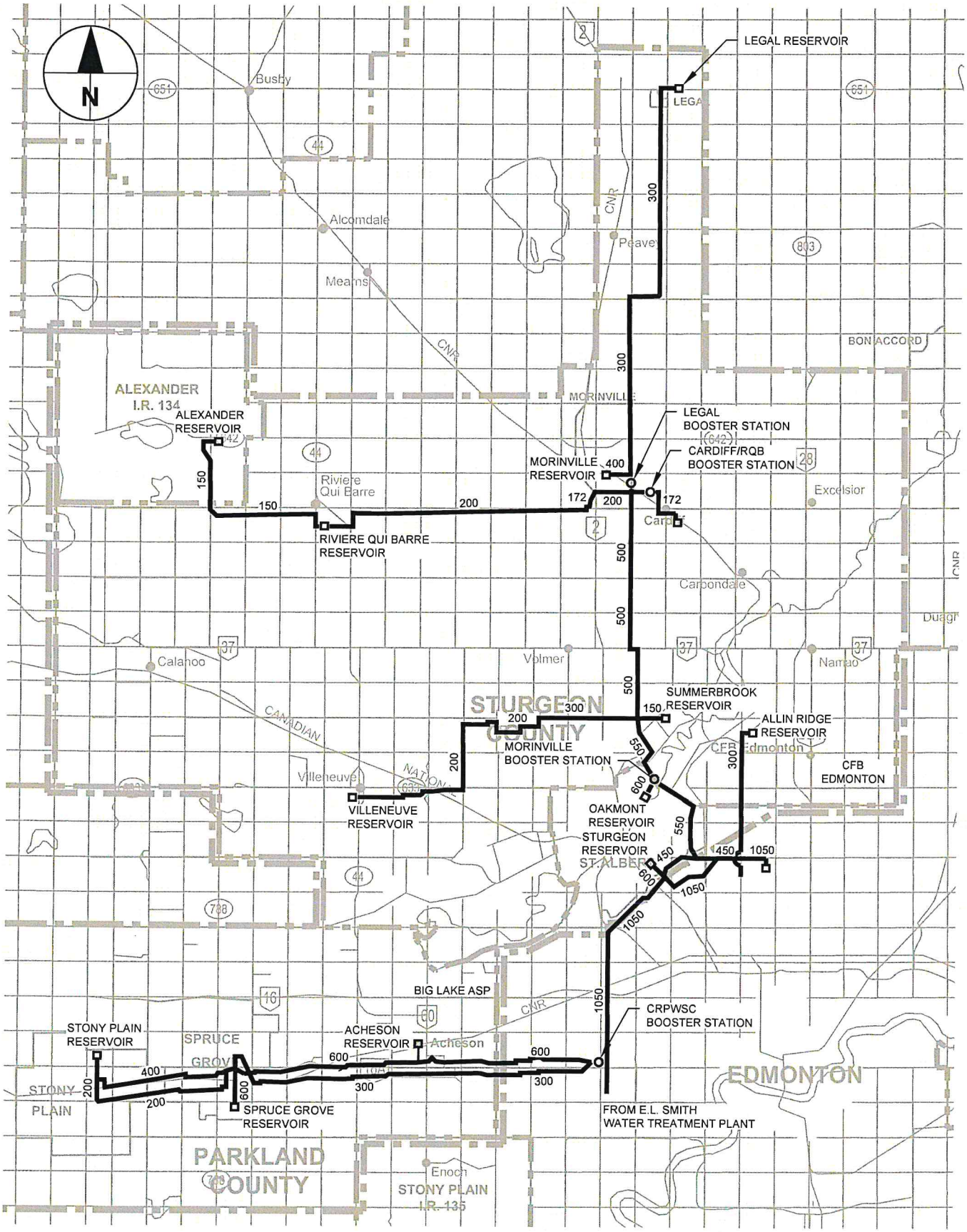

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ASSET MANAGEMENT REVIEW

EXISTING SYSTEM ASSESSMENT
EXISTING WATER TRANSMISSION SYSTEM

TOWN OF LEGAL
Project No.: 60658079 Date: 2021-11-23

AECOM

Figure: 2.3

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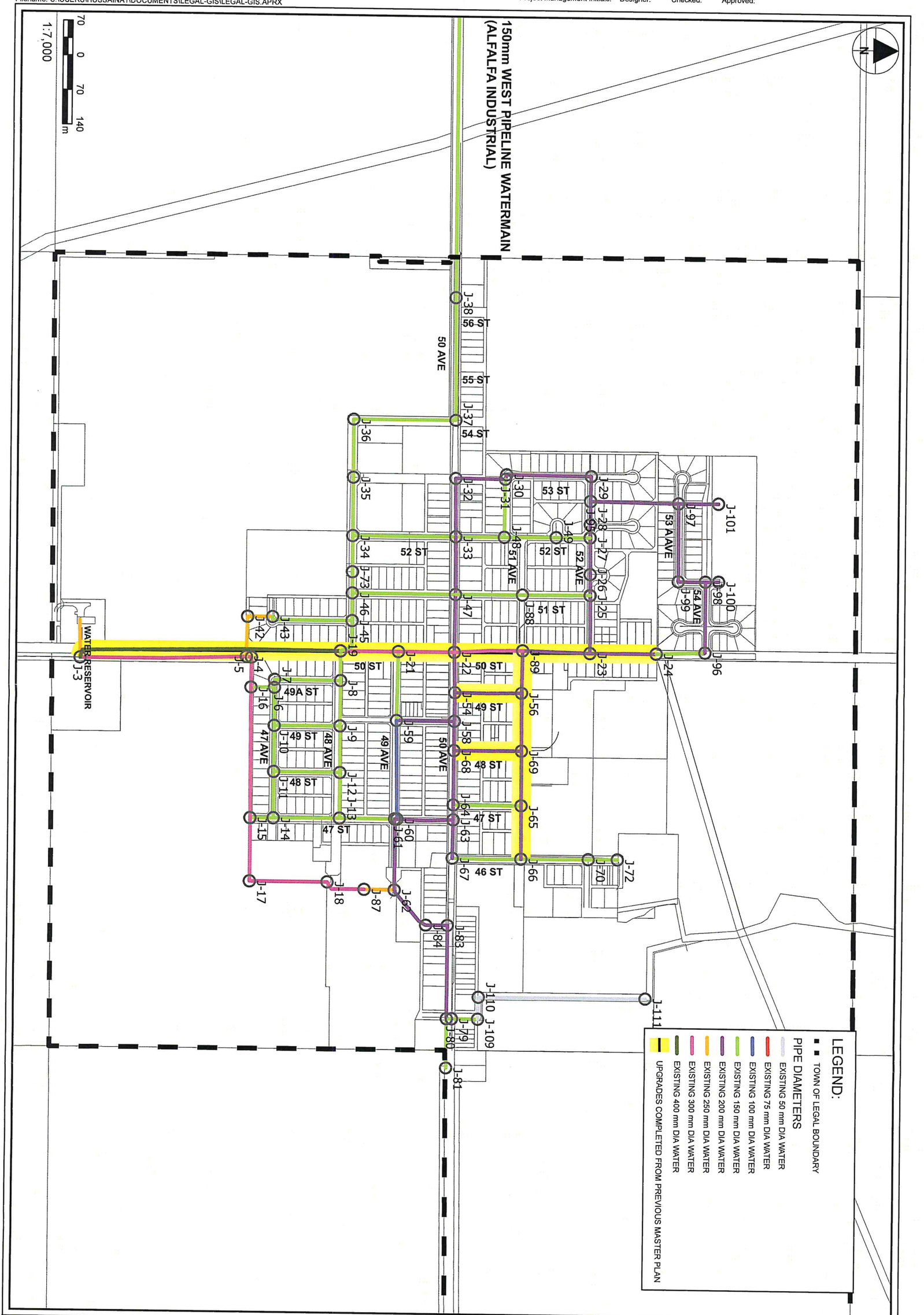

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

EXISTING SYSTEM ASSESSMENT
EXISTING WATER DISTRIBUTION SYSTEM

AECOM

Figure: 2.4

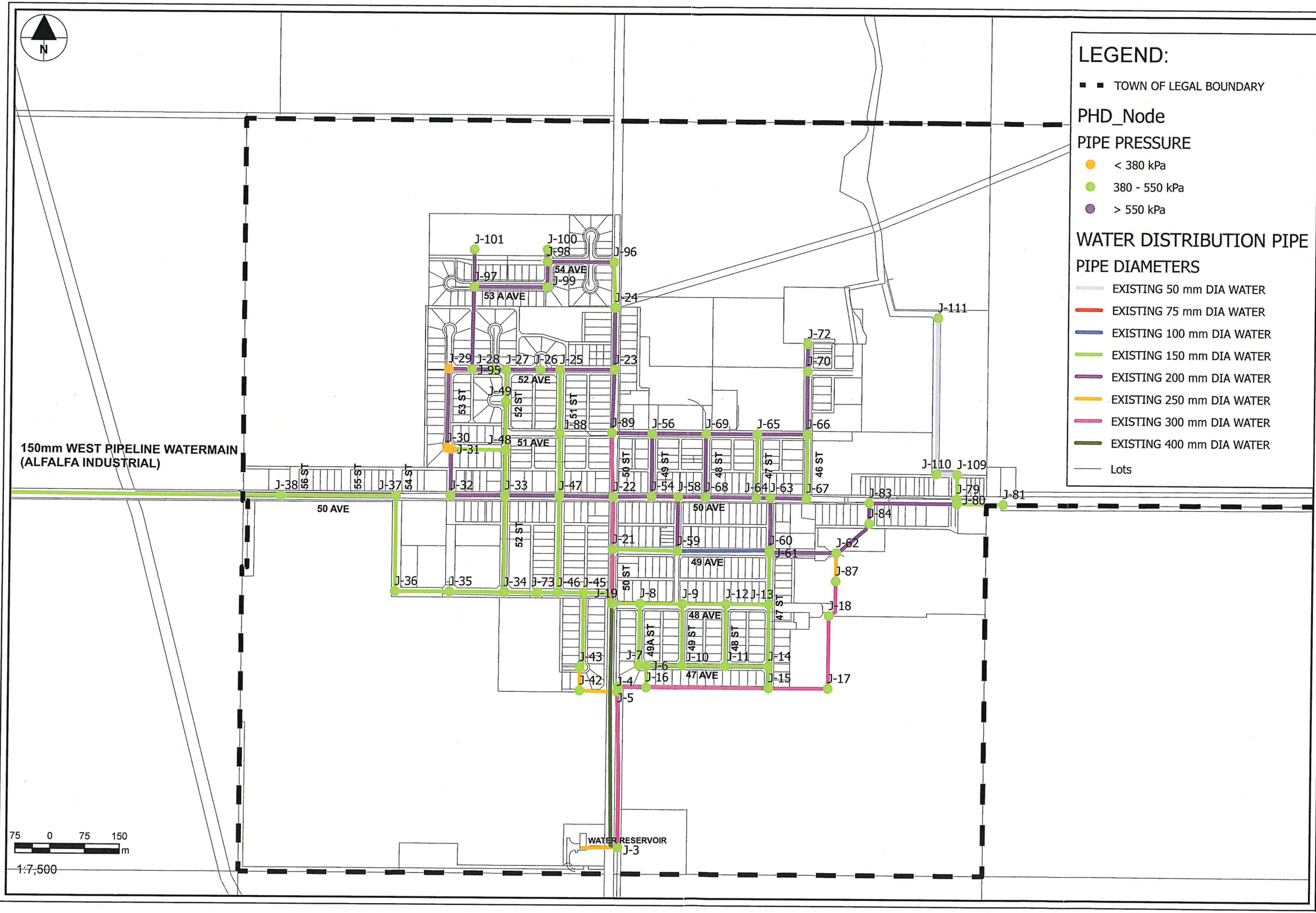

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Figure: 2.5

EXISTING SYSTEM ASSESSMENT
PEAK HOUR DEMAND

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

AECOM

Figure: 2.6

EXISTING SYSTEM ASSESSMENT
MAXIMUM DAY PLUS FIRE FLOW

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

N

LEGEND:

- TOWN OF LEGAL BOUNDARY
- DOES NOT SATISFY FIRE FLOW REQUIREMENTS
- SATISFIES FIRE FLOW REQUIREMENTS

PIPE DIAMETERS

- EXISTING 50 mm DIA WATER
- EXISTING 75 mm DIA WATER
- EXISTING 100 mm DIA WATER
- EXISTING 150 mm DIA WATER
- EXISTING 200 mm DIA WATER
- EXISTING 250 mm DIA WATER
- EXISTING 300 mm DIA WATER
- EXISTING 400 mm DIA WATER

J-92
J-91
J-93
J-90
J-94
J-101
J-100
J-98
J-96
J-97
J-99
J-24
J-111
J-72
J-70
J-29
J-95
J-27
J-25
J-23
J-26
J-28
J-49
J-89
J-56
J-69
J-65
J-66
J-30
J-88
J-31
J-48
J-110
J-109
J-38
J-32
J-33
J-47
J-22
J-58
J-68
J-63
J-67
J-83
J-79
J-81
J-37
J-54
J-64
J-84
J-21
J-59
J-60
J-62
J-61
J-87
J-36
J-35
J-34
J-46
J-45
J-8
J-9
J-12
J-13
J-18
J-78
J-39
J-43
J-7
J-14
J-42
J-4
J-6
J-10
J-11
J-15
J-17
J-16
J-5
J-3

150mm WEST PIPELINE WATERMAIN
(ALFALFA INDUSTRIAL)

WATER RESERVOIR

54 AVE
53 A AVE
52 AVE
51 AVE
50 AVE
49 AVE
48 AVE
47 AVE
56 ST
55 ST
54 ST
53 ST
52 ST
51 ST
50 ST
49 ST
48 ST
47 ST
46 ST
49A ST

110 0 110 220 m

1:12,000

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Figure: 2.7

EXISTING SYSTEM ASSESSMENT
MAXIMUM DAY PLUS FIRE FLOW
SYSTEM IMPROVEMENTS

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

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N

LEGEND:

- TOWN OF LEGAL BOUNDARY
- DOES NOT SATISFY FIRE FLOW REQUIREMENTS
- SATISFIES FIRE FLOW REQUIREMENTS

PIPE DIAMETERS

- EXISTING 50 mm DIA WATER
- EXISTING 75 mm DIA WATER
- EXISTING 100 mm DIA WATER
- EXISTING 150 mm DIA WATER
- EXISTING 200 mm DIA WATER
- EXISTING 250 mm DIA WATER
- EXISTING 300 mm DIA WATER
- EXISTING 400 mm DIA WATER
- PROPOSED 200 mm DIA WATER

150mm WEST PIPELINE WATERMAIN
(ALFALFA INDUSTRIAL)

IMPROVEMENT 1

IMPROVEMENT 2

WATER RESERVOIR

J-101 J-100 J-98 J-96 J-97 J-99 J-24 J-111 J-72 J-29 J-28 J-27 J-26 J-25 J-23 J-95 J-49 J-88 J-89 J-56 J-69 J-65 J-66 J-70 J-30 J-48 J-31 J-38 J-37 J-32 J-33 J-47 J-22 J-54 J-58 J-68 J-64 J-63 J-67 J-110 J-109 J-79 J-80 J-81 J-83 J-84 J-21 J-59 J-60 J-61 J-62 J-87 J-36 J-35 J-34 J-73 J-46 J-45 J-19 J-8 J-9 J-12 J-13 J-18 J-43 J-7 J-6 J-10 J-11 J-14 J-42 J-4 J-16 J-15 J-17 J-5 J-3

53 A AVE 54 AVE 52 AVE 51 AVE 50 AVE 49 AVE 48 AVE 47 AVE

53 ST 52 ST 51 ST 50 ST 49 ST 48 ST 47 ST 46 ST 56 ST 55 ST 54 ST 49A ST

75 0 75 150 m

1:7,500

AECOM

Figure: 2.8

FUTURE SYSTEM ASSESSMENT
FUTURE DEVELOPMENT
WATER DISTRIBUTION MODEL SCHEMATIC

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

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N

LEGEND:

- TOWN OF LEGAL BOUNDARY
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

PIPE DIAMETERS

- 75 mm DIA WATER
- 100 mm DIA WATER
- 150 mm DIA WATER
- 200 mm DIA WATER
- 250 mm DIA WATER
- 300 mm DIA WATER
- 400 mm DIA WATER
- PROPOSED 150 mm DIA WATER
- PROPOSED 200 mm DIA WATER
- PROPOSED 250 mm DIA WATER
- FUTURE SYSTEM IMPROVEMENTS TO EXISTING SYSTEM

150mm WEST PIPELINE WATERMAIN (ALFALFA INDUSTRIAL)

IMPROVEMENTS 1 & 5

IMPROVEMENT 2

IMPROVEMENT 3

IMPROVEMENT 4

2.7 ha

10.0 Ha

2.8 ha

9.2 ha

3.6 ha

MUNICIPAL SHOP

GRASSHOPPER HILL PARK

CITADEL PARK

CITADEL CENTRE

LEGAL ARENA

LEGAL SCHOOL

ECOLE CITADEL

ST. EMILE CHURCH

CENTENNIAL PARK

R.V. PARK

K.C. PARK

WATER RESERVOIR

53 A AVE
54 AVE
52 AVE
51 AVE
50 AVE
49 AVE
48 AVE
47 AVE

53 ST
52 ST
51 ST
50 ST
49 ST
48 ST
47 ST
46 ST
56 ST
55 ST
54 ST
49A ST

J-101 J-100 J-98 J-96 J-97 J-99 J-24 J-29 J-28 J-27 J-26 J-25 J-23 J-95 J-49 J-88 J-89 J-56 J-69 J-65 J-66 J-72 J-70 J-111 J-110 J-109 J-30 J-48 J-31 J-38 J-37 J-32 J-33 J-47 J-22 J-54 J-58 J-68 J-64 J-63 J-67 J-83 J-84 J-79 J-80 J-81 J-112 J-36 J-35 J-34 J-73 J-46 J-45 J-19 J-8 J-9 J-12 J-13 J-18 J-21 J-59 J-60 J-61 J-62 J-87 J-43 J-7 J-6 J-10 J-11 J-14 J-102 J-42 J-4 J-16 J-15 J-17 J-5 J-103 J-104 J-113 J-114 J-3

75 0 75 150 m

1:7,500

N

LEGEND:

PIPE PRESSURE
- < 380 kPa
- 380 - 550 kPa
- > 550 kPa

PIPE DIAMETERS
- 75 mm DIA WATER
- 100 mm DIA WATER
- 150 mm DIA WATER
- 200 mm DIA WATER
- 250 mm DIA WATER
- 300 mm DIA WATER
- 400 mm DIA WATER
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT
- TOWN OF LEGAL BOUNDARY

J-101 2.7 ha J-100 J-98 J-96 J-97 J-99 54 AVE 53 A AVE J-24 GRASSHOPPER HILL PARK J-29 J-28 J-26 J-25 J-23 J-95 J-27 52 AVE J-49 53 ST 52 ST 51 ST J-88 J-89 J-56 CITADEL CENTRE LEGAL ARENA J-69 LEGAL SCHOOL J-65 J-66 ECOLE CITADEL ST. EMILE CHURCH J-30 J-48 51 AVE J-31 50 ST 49 ST 48 ST 47 ST 46 ST

IMPROVEMENT 3 J-111 J-72 IMPROVEMENT 2 J-70 CITADEL PARK 3.6 ha

150mm WEST PIPELINE WATERMAIN (ALFALFA INDUSTRIAL)

IMPROVEMENTS 1 & 5

J-38 56 ST 55 ST J-37 54 ST J-32 J-33 J-47 J-22 J-54 J-58 J-68 J-64 J-63 J-67 J-83 J-84 J-110 J-109 J-79 J-80 J-81 50 AVE

10.0 Ha J-112 MUNICIPAL SHOP J-36 J-35 J-34 J-73 J-45 J-46 J-19 J-8 J-9 J-12 J-13 J-21 J-59 J-60 J-61 49 AVE CENTENNIAL PARK J-62 J-87 R.V. PARK J-18 48 AVE 47 ST 49A ST 49 ST 48 ST K.C. PARK J-10 J-11 J-14 J-6 J-7 J-16 47 AVE J-15 J-17 J-4 J-5

IMPROVEMENT 4

2.8 ha J-102 J-43 J-42

J-103 J-104 9.2 ha J-113 J-114

WATER RESERVOIR J-3

75 0 75 150 m

1:7,500

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Figure: 2.9

FUTURE SYSTEM ASSESSMENT
PEAK HOUR DEMAND
WATER DISTRIBUTION MODEL SCHEMATIC

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

N

LEGEND:

- TOWN OF LEGAL BOUNDARY
- DOES NOT SATISFY FIRE FLOW REQUIREMENTS
- SATISFIES FIRE FLOW REQUIREMENTS

PIPE DIAMETERS

- 75 mm DIA WATER
- 100 mm DIA WATER
- 150 mm DIA WATER
- 200 mm DIA WATER
- 250 mm DIA WATER
- 300 mm DIA WATER
- 400 mm DIA WATER
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

J-101 2.7 ha J-100 J-98 J-96 J-97 J-99 54 AVE 53 A AVE GRASSHOPPER HILL PARK J-24 J-29 J-28 J-27 J-26 J-25 J-23 J-95 52 AVE J-49 53 ST 52 ST 51 ST J-88 J-89 J-56 CITADEL CENTRE J-69 LEGAL ARENA J-65 LEGAL SCHOOL J-66 ECOLE CITADEL ST. EMILE CHURCH J-30 J-31 J-48 51 AVE 150mm WEST PIPELINE WATERMAIN (ALFALFA INDUSTRIAL) IMPROVEMENTS 1 & 5 J-38 56 ST 55 ST J-37 54 ST J-32 J-33 J-47 J-22 50 ST J-54 J-58 49 ST J-68 48 ST J-64 J-63 47 ST J-67 46 ST J-83 J-84 50 AVE J-21 J-59 J-60 J-61 CENTENNIAL PARK J-62 J-87 R.V. PARK 49 AVE J-112 J-36 J-35 J-34 J-73 J-46 J-45 J-19 J-8 J-9 J-12 J-13 J-18 48 AVE MUNICIPAL SHOP 10.0 Ha IMPROVEMENT 4 2.8 ha J-43 J-7 49A ST J-6 J-10 J-11 J-14 K.C. PARK J-102 J-42 J-4 J-16 47 AVE J-15 J-17 J-5 J-103 J-104 9.2 ha J-113 J-114 WATER RESERVOIR J-3 IMPROVEMENT 2 J-72 J-70 IMPROVEMENT 3 J-111 3.6 ha J-110 J-109 J-79 J-80 J-81

75 0 75 150 m

1:7,500

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ASSET MANAGEMENT REVIEW

FUTURE SYSTEM ASSESSMENT
MAXIMUM DAY PLUS FIRE FLOW
WATER DISTRIBUTION MODEL SCHEMATIC

TOWN OF LEGAL
Project No.: 60658079

AECOM

Figure: 2.10

N

SEWAGE LAGOON

LEGEND:

TOWN OF LEGAL BOUNDARY

SANITARY PIPE DIAMETERS

- 50mm SANITARY FORCE MAIN
- 200mm SANITARY PIPE
- 250mm SANITARY PIPE
- 375mm SANITARY PIPE
- 400mm SANITARY PIPE

50 AVE
51 AVE
52 AVE
53 A AVE
54 AVE
49 AVE
48 AVE
47 AVE
56 ST
55 ST
54 ST
53 ST
52 ST
51 ST
50 ST
49 ST
49A ST
48 ST
47 ST
46 ST

75 0 75 150 m

1:7,500

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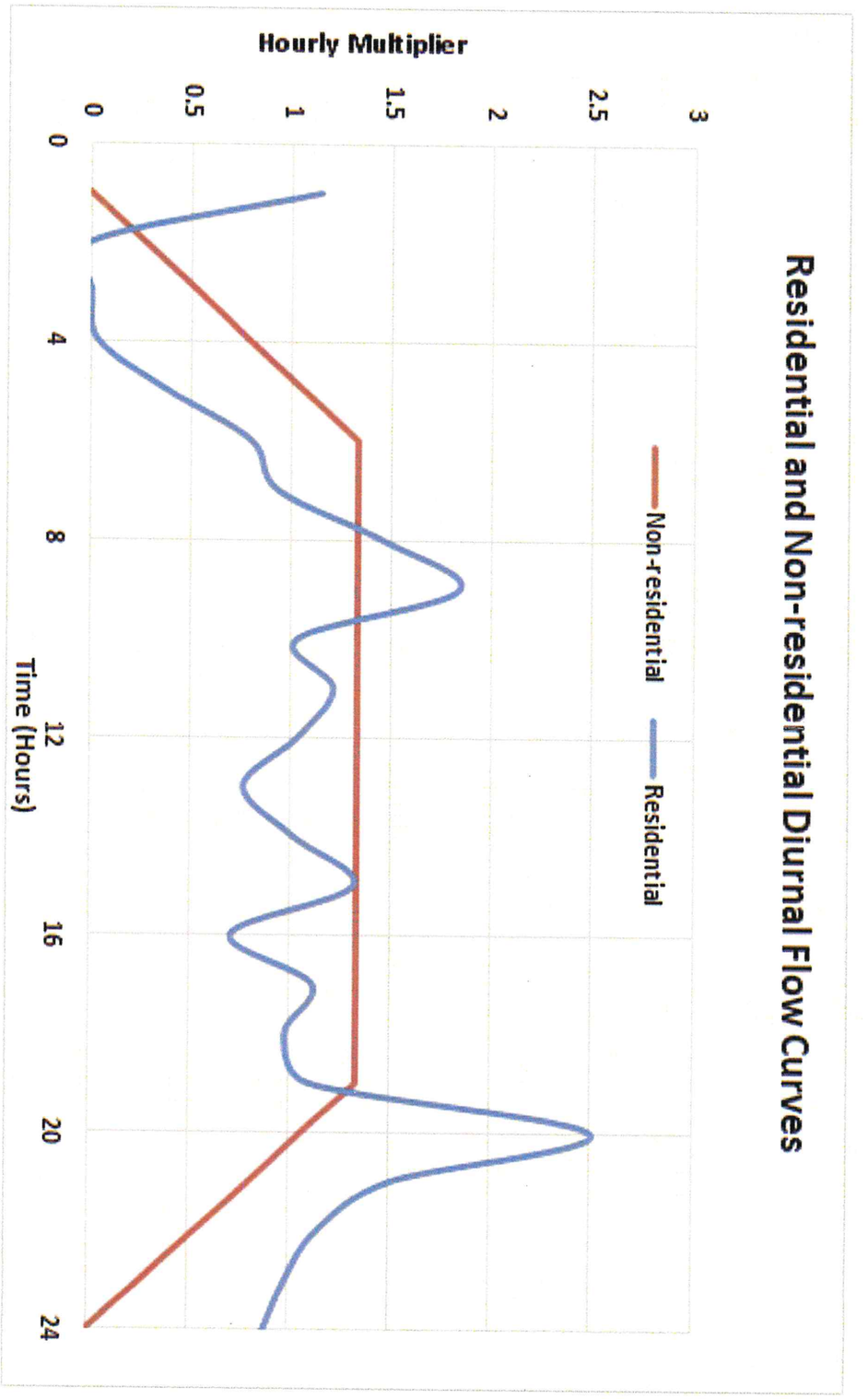
Figure: 2.11

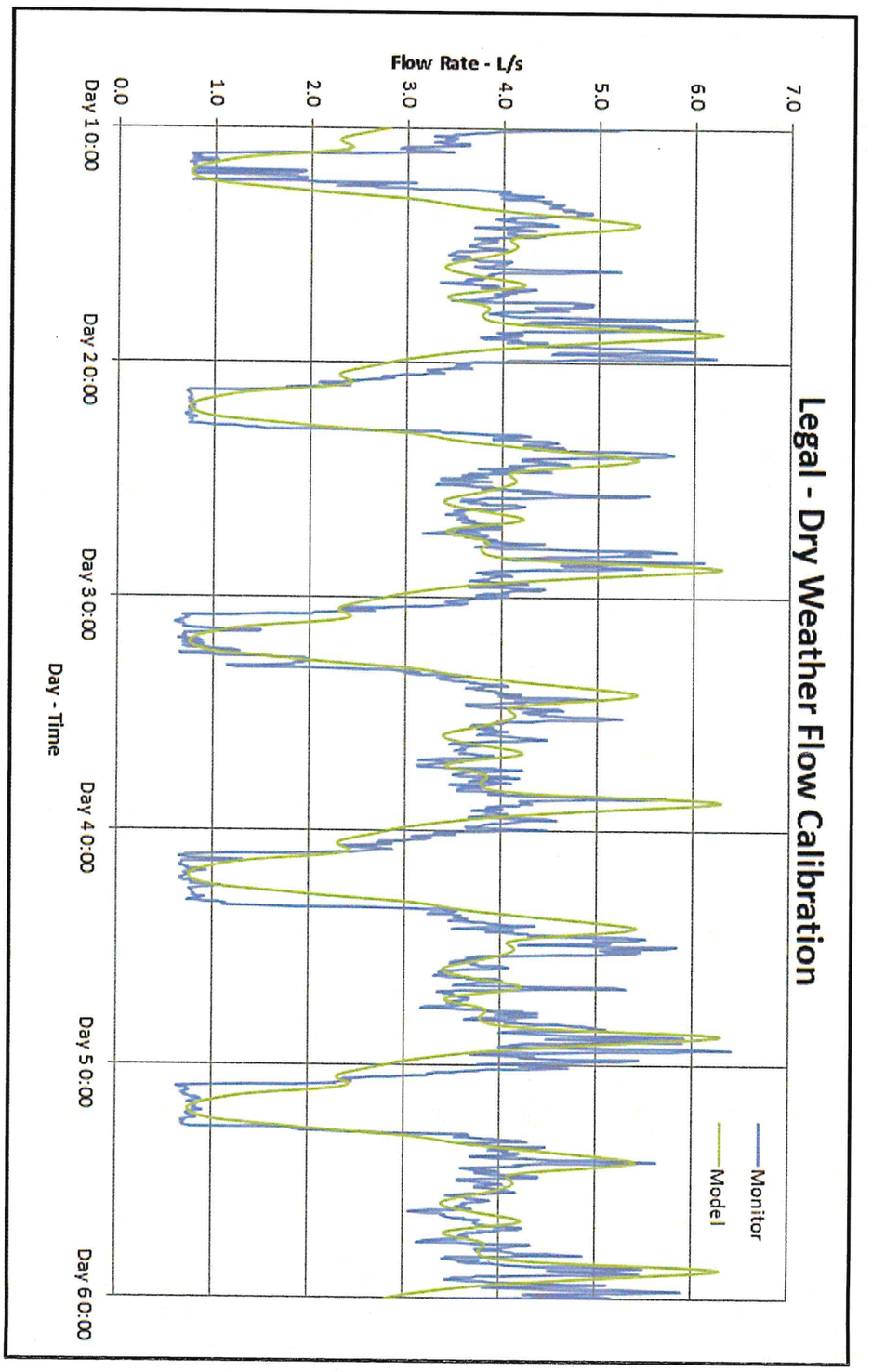
EXISTING SYSTEM ASSESSMENT
EXISTING SANITARY MODEL SCHEMATIC

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079



LEGEND:
NON-RESIDENTIAL
RESIDENTIAL



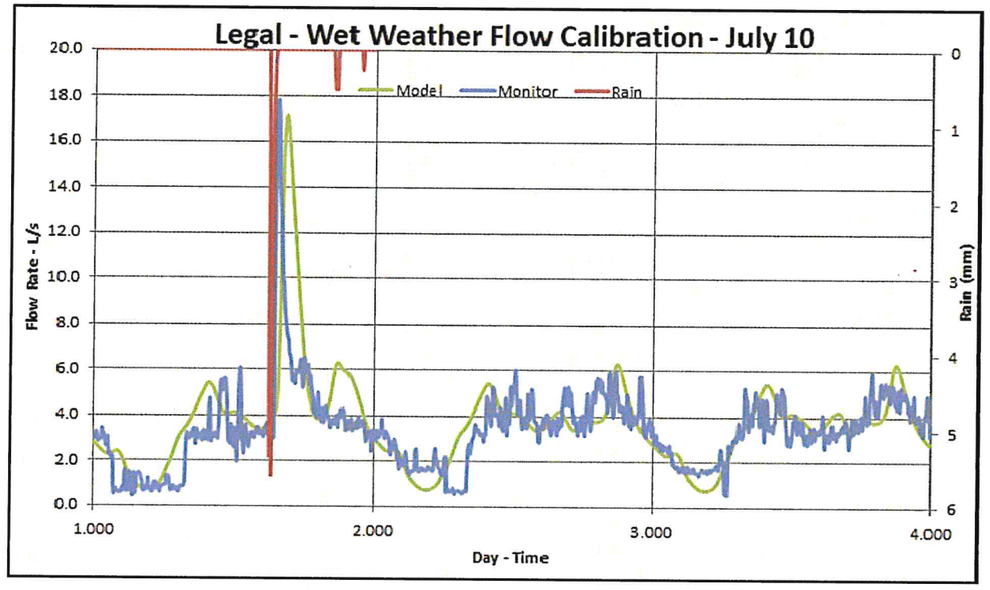
LEGEND:

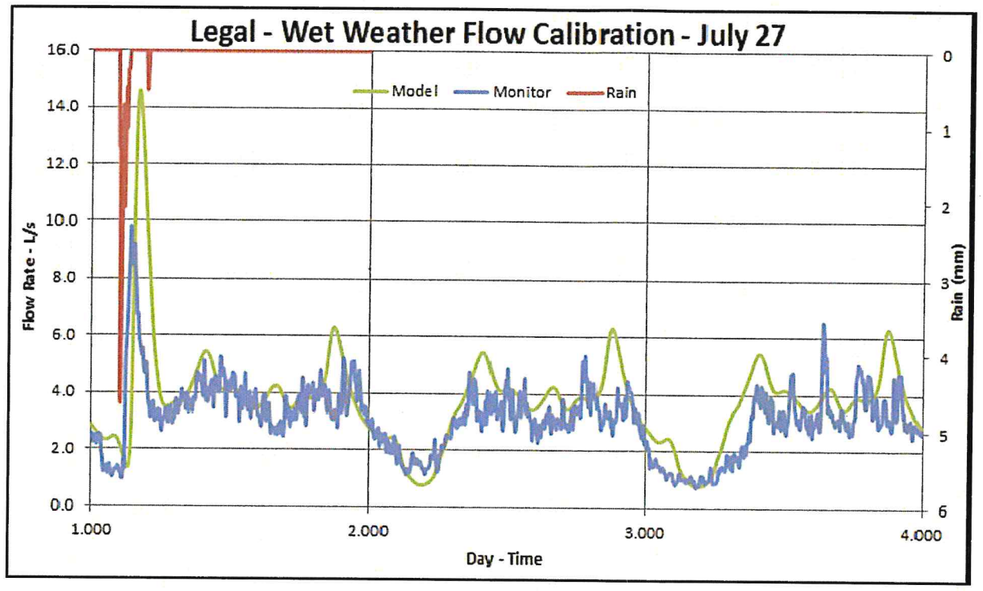
MODELED FLOW (L/S)

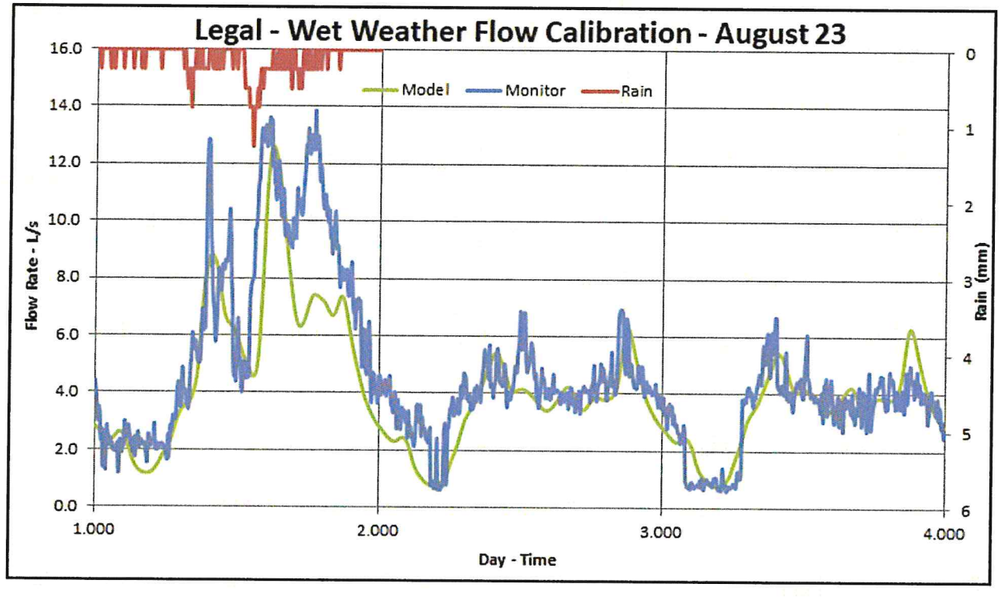
MONITORED FLOW (L/S)

LEGEND:

- RAINFALL DEPTH (mm)
- MODELED FLOW (L/S)
- MONITORED FLOW (L/S)







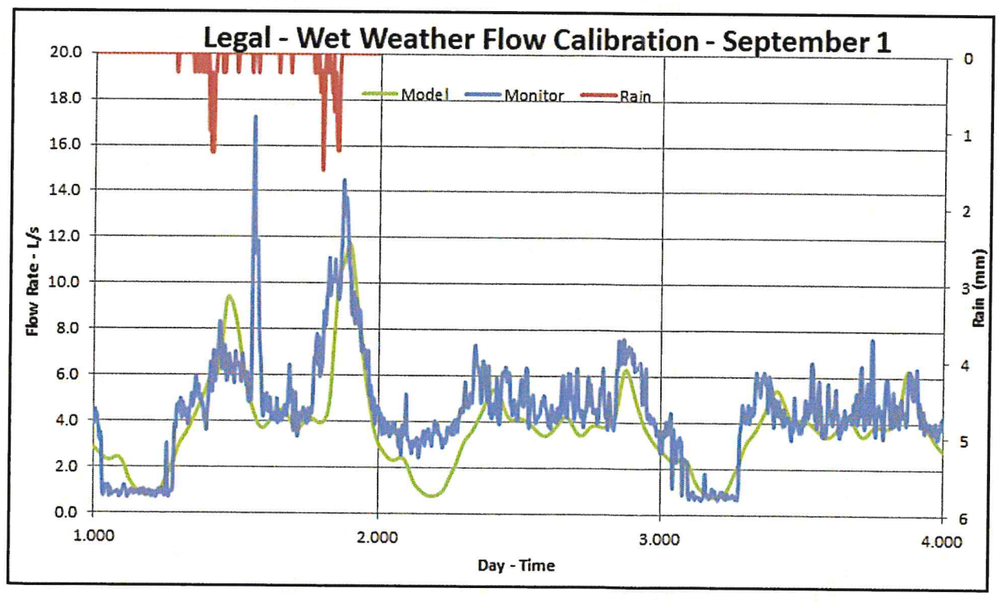


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Figure: 2.14

EXISTING SYSTEM ASSESSMENT
WET WEATHER FLOW CALIBRATION

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

AECOM

Figure: 2.15

EXISTING SYSTEM ASSESSMENT
5 YEAR 4 HOUR CHICAGO DESIGN STORM

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

SEWAGE LAGOON

LEGEND:

- TOWN OF LEGAL BOUNDARY

FREEBOARD

- < 1.00 m
- 1.00 - 2.50 m (HGL WITHIN MAIN, SHALLOW SEWER)
- 2.51 - 8.20 m

MAX FLOW/DESIGN FLOW

- < 1.20
- 1.20 - 2.00
- > 2.00

N

75 0 75 150 m

1:7,500

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SEWAGE LAGOON

LEGEND:

TOWN OF LEGAL BOUNDARY

FREEBOARD

< 2.50 m (HGL WITHIN MAIN, SHALLOW SEWER)

> 2.50 m

MAX FLOW/DESIGN FLOW

< 1.20

1.20 - 2.00

> 2.00

Arena

Citadel

school

ecole

church

carwash

50 AVE

49 AVE

48 AVE

47 AVE

54 AVE

53 A AVE

53 ST

52 ST

51 ST

50 ST

49 ST

48 ST

47 ST

46 ST

49A ST

56 ST

55 ST

54 ST

75 0 75 150 m

1:7,500

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Figure: 2.16

EXISTING SYSTEM ASSESSMENT
25 YEAR 24 HOUR HUFF DISTRIBUTION DESIGN STORM

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

N

SEWAGE LAGOON

LEGEND:

- TOWN OF LEGAL BOUNDARY

SANITARY PIPE DIAMETERS

- 50mm SANITARY FORCE MAIN
- 100mm SANITARY FORCE MAIN
- 200mm SANITARY PIPE
- 250mm SANITARY PIPE
- 375mm SANITARY PIPE
- 400mm SANITARY PIPE
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

2.7 ha
54 AVE
53 A AVE
GRASSHOPPER HILL PARK
52 AVE
53 ST
52 ST
51 ST
51 AVE
CITADEL PARK
CITADEL CENTRE
LEGAL ARENA
LEGAL SCHOOL
ECOLE CITADEL
ST. EMILE CHURCH
3.6 ha
56 ST
55 ST
54 ST
50 ST
49 ST
48 ST
47 ST
46 ST
50 AVE
10.0 Ha
MUNICIPAL SHOP
CENTENNIAL PARK
R.V. PARK
49 AVE
48 AVE
49A ST
47 AVE
2.8 ha
K.C. PARK
9.2 ha

90 0 90 180 m

1:9,000

Project Management Initials: Designer: Checked: Approved:

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Figure: 2.17

FUTURE SYSTEM ASSESSMENT
FUTURE SANITARY MODEL SCHEMATIC

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

AECOM

Figure: 2.18

FUTURE SYSTEM ASSESSMENT
5 YEAR 4 HOUR CHICAGO DESIGN STORM

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

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N

LEGEND:

- TOWN OF LEGAL BOUNDARY

FREEBOARD

- < 1.00 m
- 1.00 - 2.50 m (HGL WITHIN MAIN, SHALLOW SEWER)
- > 2.50 m

MAX FLOW/DESIGN FLOW

- < 1.20
- 1.20 - 2.00
- > 2.00
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

SEWAGE LAGOON

2.7 ha

54 AVE

53 A AVE

GRASSHOPPER HILL PARK

52 AVE

53 ST

52 ST

51 ST

51 AVE

CITADEL PARK

CITADEL CENTRE

LEGAL ARENA

LEGAL SCHOOL

ECOLE CITADEL

ST. EMILE CHURCH

3.6 ha

56 ST

55 ST

54 ST

50 ST

49 ST

48 ST

47 ST

46 ST

50 AVE

10.0 Ha

MUNICIPAL SHOP

52 ST

CENTENNIAL PARK

R.V. PARK

49 AVE

50 ST

48 AVE

47 ST

2.8 ha

49A ST

49 ST

48 ST

K.C. PARK

47 AVE

9.2 ha

90 0 90 180 m

1:9,000

N

SEWAGE LAGOON

LEGEND:

- TOWN OF LEGAL BOUNDARY

MAX FLOW/DESIGN FLOW

- < 1.20
- 1.20 - 2.00
- > 2.00

FREEBOARD

- < 1.00
- 1.00 - 2.50m (HGL WITHIN MAIN, SHALLOW SEWER)
- > 2.50 m
- FUTURE NONRESIDENTIAL DISTRICT
- FUTURE RESIDENTIAL DISTRICT

2.7 ha
54 AVE
53 A AVE
GRASSHOPPER HILL PARK
52 AVE
53 ST
52 ST
51 ST
51 AVE
CITADEL PARK
CITADEL CENTRE
LEGAL ARENA
LEGAL SCHOOL
ECOLE CITADEL
ST. EMILE CHURCH
3.6 ha
56 ST
55 ST
54 ST
50 ST
49 ST
48 ST
47 ST
46 ST
50 AVE
10.0 Ha
MUNICIPAL SHOP
CENTENNIAL PARK
49 AVE
R.V. PARK
48 AVE
2.8 ha
49A ST
K.C. PARK
47 AVE
9.2 ha

90 0 90 180 m

1:9,000

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AECOM

Figure: 2.19

FUTURE SYSTEM ASSESSMENT
25 YEAR 24 HOUR HUFF DESIGN STORM

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

3. Sanitary Sewer System Condition Assessment

3.1 Background & Purpose

The Town of Legal retained AECOM to perform a condition assessment of the sanitary sewer assets within the Town. The purpose of this assessment was to review each asset's condition and recommend repairs to rehabilitate any deteriorated infrastructure. This section summarizes the findings.

A field investigation program was performed to gather information, with the goal of confirming the condition and rehabilitation requirements for approximately 7 km of 200 mm sanitary sewer within the Town of Legal. This was accomplished primarily through Closed-Circuit Television (CCTV) inspections performed and coded in accordance with National Association of Sewer Service Company's (NASSCO) Pipeline Assessment Certification Program (PACP) standards. NASSCO PACP is the current North American standard for pipeline defect identification and assessment and provides a standardized and consistent method that can be applied to future investigations.

The CCTV and PACP condition grading were completed by Cam-trac Inspection Services Ltd. between May 11 and 26, 2021. The inspection scope is illustrated on Figure 3.1. Note that the main trunk to the lagoons was excluded from the scope as it was installed and inspected within the last 5 years.

3.2 Condition Assessment

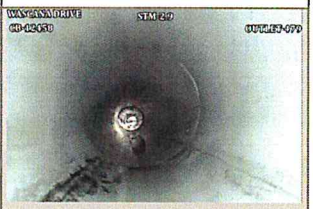
A total of 86 sanitary sewer assets were reviewed, amounting to 6,453 m of 200 mm sanitary pipe inspected. Of the 83 assets, 10 inspections (732 m) were not fully completed due to an inability for the camera to pass an obstruction such as encrustation or high water depth.

The CCTV inspections and PACP code data were reviewed by AECOM and notable findings summarized in **Appendix A**. The NASSCO PACP Code data and Quick Scores were then used as a baseline to estimate the severity of observed defects and conditions. The review concentrated on structural defects and factors impacting rehabilitation methods.

The CCTV videos were examined in conjunction with Quick Scores, and each manhole-to-manhole segment was manually assigned a Structural Performance Grade (SPG). This grade reflects the segment's relative structural condition on a 1 to 5 scale. Table 3-1 summarizes the SPG classification system employed in the assessment.

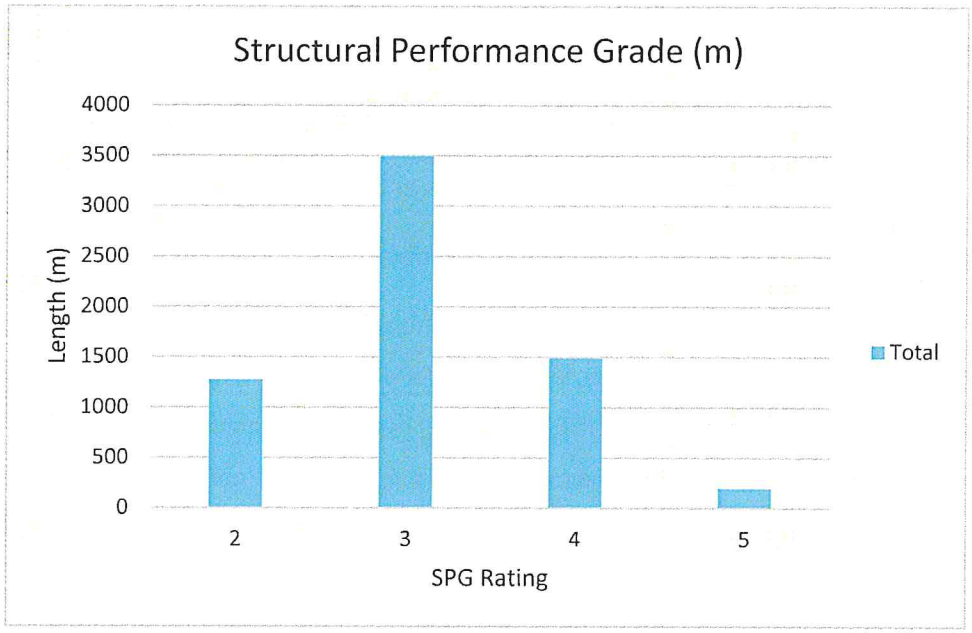
An SPG of 1 indicates good structural condition with no structural defects and low probability of collapse, whereas an SPG of 5 indicates poor structural condition with severe structural defects and high probability of collapse. Sewers with an SPG of 1 or 2 are in acceptable structural condition, but further long-term monitoring is recommended to watch for deterioration. Sewers with an SPG of 3, 4 and 5 have significant structural defects that require attention to prevent further deterioration, therefore these assets are recommended for rehabilitation.

Table 3-1: Structural Performance Grade Classification System

Structural Performance Grade	Implication	Typical Description	Example Photo
5	Collapsed, or Collapse Imminent	Collapsed; or Deformation > 15%	
4	Collapse likely in near future	Deformation 5-15%; Broken or fractured Serious loss of level	
3	Collapse unlikely in near future, but further deterioration likely	Deformation 0-5%; Fractured; Longitudinal/multiple cracking; Minor loss of level; Poor connections	
2	Minimum collapse risk in short term, but potential for further deterioration	Circumferential cracking; Moderate joint defects	
1	Acceptable structural condition	No structural defects	

It should be noted that since the assessments are based on visual observations, it is not possible to determine pipe condition when the camera is underwater or obstructed. The structural condition ratings and rehabilitation recommendations are therefore based only on the length inspected.

Chart 3-1 summarizes the SPG's for the sanitary assets as a percentage of the total inspected length surveyed. This gives a general indication of the state of the system, as well as where the system is in its service life cycle.



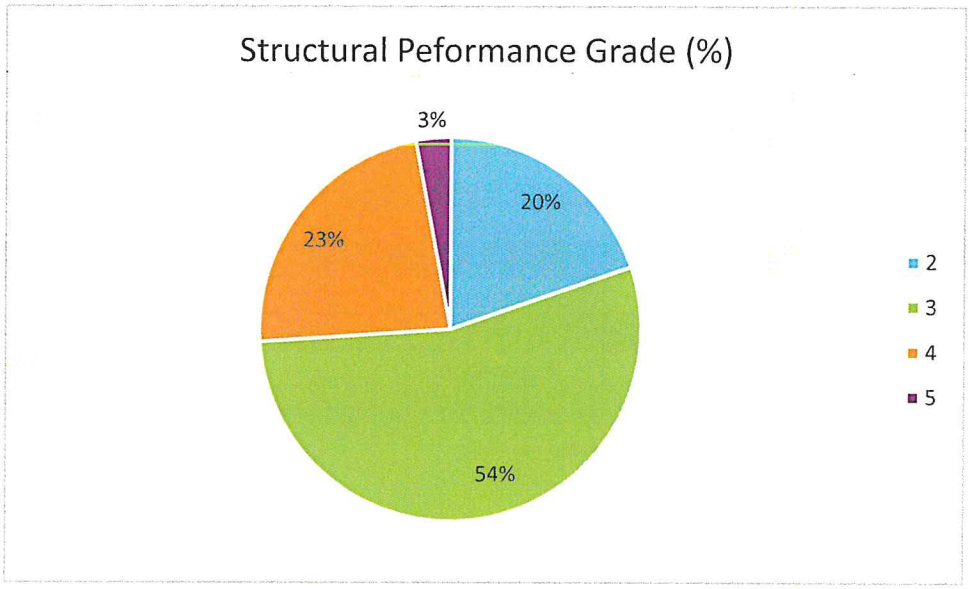


Chart 3-1 Structural Performance Grade Summary

Structural Performance Grade is also illustrated on Figure 3-1.

Results of the condition assessment for the sanitary system can be summarized as follows:

- Action is required on 3% of the system (194 m) to address severe defects (SPG 5).
- Approximately 21% of the system (1,488 m) is showing signs of more advanced deterioration (SPG 4).
- Approximately 58% of the system (4,147 m) is showing signs of moderate stages of deterioration (SPG 3).
- Approximately 18% of the system (1,321 m) is showing limited or no signs of deterioration (SPG 1&2).

It is recommended that the severe defects (SPG 5) are addressed very soon while the SPG 4 and 5 rated pipes are added to a repair program.

3.3 Repair Requirements

Findings from the condition assessment were used to recommend repair types and extents based on the defects observed for each asset. Trenchless repair methods are generally recommended over traditional open-cut as they tend to be a less invasive and disruptive alternative; however open-cut repairs may still be employed for these cases where feasible. Open-cut repairs are recommended where defects are too severe to be repaired using trenchless methods or where other repairs such as road repairs or watermain repairs are being done concurrently.

Repair recommendations for each asset are included in **Appendix A**, and have been categorized as follows:

- Replace Full Segment: open-cut replacement of the full manhole-to-manhole segment.
- Excavation Point Repair: open-cut point repair to correct a localized, severe defect.
- Full Segment Lining: trenchless lining (e.g. CIPP) for the full manhole-to-manhole segment.
- Trenchless Point Repair: trenchless point repair (e.g. CIPP point repair) to correct a localized defect.

Repairs are highly recommended for assets with an SPG of 4 or 5, as these assets are exhibiting defects that indicate that the asset is at risk of collapse in the near future. Repairs are also recommended for assets with an SPG of 3, as these assets will experience continued and accelerated deterioration in the near future, and the application of a repair treatment at this point in the asset's life cycle will likely help slow the rate of deterioration, renew the asset and extend its service life. Table 3-2 summarizes the repair type and length required.

Table 3-2: Summary of Repair Requirements

Repair Required	Repair Type	No. of Assets /Segments	Open-Cut Repair Length	Trenchless Repair Length
Trenchless Point Repair	Trenchless	11	0	845
Full Segment Lining	Trenchless	48	0	3,945
External Point Repair, and Trenchless Repair*	Combination	1	1	5
External Point Repair, and Full Segment Lining*	Combination	3	7	235
Replace Full Segment	Excavation	1	55.8	0
Total (excluding No Repair)		**64**	**64**	**5030**

**note external repairs at two locations may be accessible from the manhole.*

Table 3-3 summarizes estimated repair costs.

Table 3-3: Summary of Total Repair Costs

Repair Type	No. of Segments	Length (m)	Unit Cost	Estimated Cost
Replace Full Segment	1	55.8	2500	$139,500
Excavation Point Repair	4	7.3	2500/10000	$37,500
Full Segment Lining	51	4180	350	$1,463,100
Trenchless Point Repair	12	157	12000	$144,000
Subtotal	68	4400		$1,784,100
Engineering & Contingency (40%)				$713,600
Total				$2,497,700

Repair costs by performance grade are summarized in Tables 3-4 to 3-6.

Table 3-4: Summary of SPG 5 Repair Costs

Repair Type	No. of Segments	Length (m)	Unit Cost	Estimated Cost
Replace Full Segment	55.8	55.8	2500	$139,500
Excavation Point Repair	2	2.8	2500/10000	$17,000
Full Segment Lining	2	138	350	$48,400
Trenchless Point Repair	0	0	12000	$0
Subtotal	60	197		$204,900
Engineering & Contingency (40%)				$81,900
Total				$286,800

Table 3-5: Summary of SPG 4 Repair Costs

Repair Type	No. of Segments	Length (m)	Unit Cost	Estimated Cost
Replace Full Segment	0	0	2500	$0
Excavation Point Repair	1	4.5	2500/10000	$11,300
Full Segment Lining	18	1427	350	$499,500
Trenchless Point Repair	0	0	12000	$0
Subtotal	19	1432		$510,800
Engineering & Contingency (40%)				$204,300
Total				$715,100

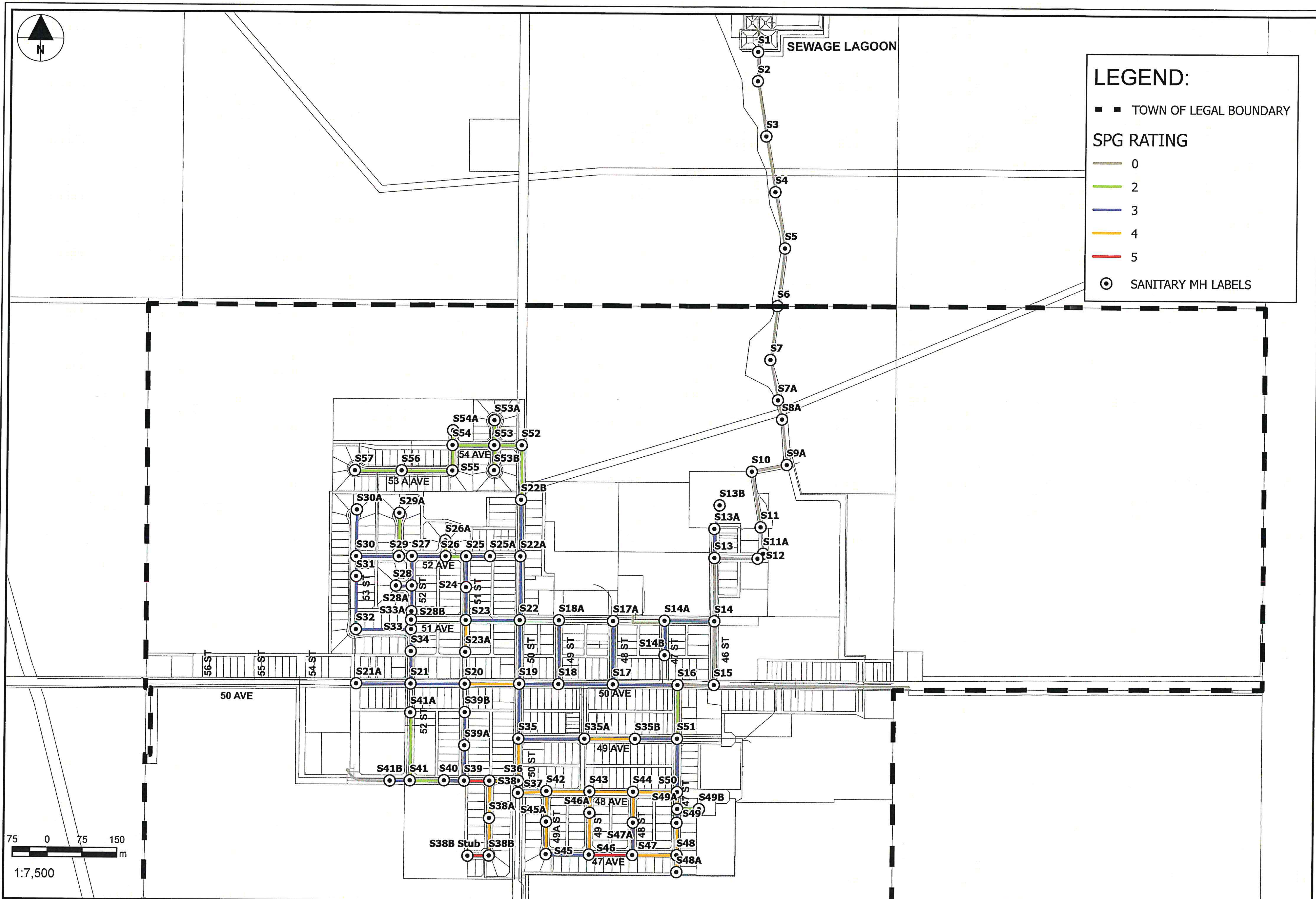
Table 3-6: Summary of SPG 3 Repair Costs

Repair Type	No. of Segments	Length (m)	Unit Cost	Estimated Cost
Replace Full Segment	0	0	2500	$0
Excavation Point Repair	1	-	2500/10000	$10,000
Full Segment Lining	30	2615	350	$915,200
Trenchless Point Repair	12	157	12000	$144,000
Subtotal	43	2772		$1,069,200
Engineering & Contingency (40%)				$427,700
Total				$1,496,900

A summary of the repair costs is provided in Table 3-7.

Table 3-7: Repair Costs by Priority

Repair Type	Repair as soon as practical (SPG 5)	Repair in the near future (SPG 4)	Lining Program (SPG 3)
Repair Cost	$204,900	$510,800	$1,069,200
Engineering & Contingency (40%)	$81,900	$204,300	$427,700
Total	$286,800	$715,100	$1,496,900



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Project Management Initials: Designer: Checked: Approved:

AECOM

Figure: 3.1

SANITARY SEWER CONDITION ASSESSMENT
STRUCTURAL PERFORMANCE GRADE

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

3.4 Sanitary Sewer Condition Assessment Summary

Overall the condition of the sanitary sewers is as expected given the age of the infrastructure is over 60 years. Only 3% of assets are at very high risk of failure while 23% should be address in the near future. The majority of the system received a performance grade of 3 which is the optimal time for rehabilitation as further deterioration can be prevented by lining the existing pipes.

4. Road Network Condition Assessment

4.1 Background & Purpose

The Town of Legal, Alberta is requesting for a road condition assessment and recommendation for prioritized rehabilitation of their street network. AECOM previously conducted a road assessment in 2006 assigning a visual condition rating for each road section, identifying pavement distresses and recommending repair methods.

The roadway network assessment and the following report examined approximately 8.2 km of paved roadway, including inventoried, visually inspected, and assigned an initial condition rating on a block by block basis. Each roadway is inventoried by section number, consistent with the 2006 street listing and described in detail in Figure 4.1.

4.2 Methodology

This assessment identified pavement distresses and recommended prioritized rehabilitation efforts for the road network within the Town of Legal. AECOM followed similar methodologies conducted during the 2006 road assessment as well as the strategies described in this section of the report.

Assumptions:

- Assumptions made to account for traffic & pedestrian volume impacts due to COVID-19 restrictions through historical data and available information. Traffic counts from the previous network assignment were used to establish priority roads and were validated with the 2020 Alberta Transportation Hwy 651 and 50th Street counts.
- Assessment of rehabilitation recommendations of municipal utilities will influence the road rehabilitation recommendations and prioritization.
- Anticipated traffic behavior and circulation within the road network will influence the road rehabilitation recommendations and prioritization, as well as engineering judgement.
- Unit prices are based on 2021 weighted unit price averages for Central and North Central Region provided by Alberta Transportation.

A review of the project scope and the previously conducted road assessment of the paved roads in Legal in 2006 by AECOM (UMA Engineering Ltd) was conducted to provide continuity with previous traffic volumes and patterns and the existing roadway inventory naming system will be utilized for this assessment. A similar naming convention of the street network as used in the 2006 road assessment to allow for the Town of Legal to compare findings. The road inventory, street listings, and section numbers from the 2006 road assessment was utilized, and the previously recorded length and width of each road section were validated.

A secondary assessment was undertaken combining field observations and photo/video records of the existing concrete sidewalks following the same roadway inventory numbering system.

4.3 Road Network Data Collection

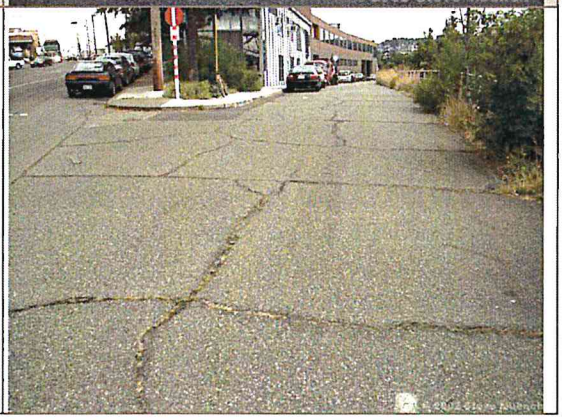
The roadway assessment was completed by an engineer who walked each road segment and took notes and photographs. This information was supplemented by video information taken with a high resolution GoPro mounted onto the front of the vehicle to provide visual detail of the roadway surface. The photographs collected are geotagged with location data that can be used for the assessment. An approximate condition was estimated and compared to the values from the 2006 road assessment where available.

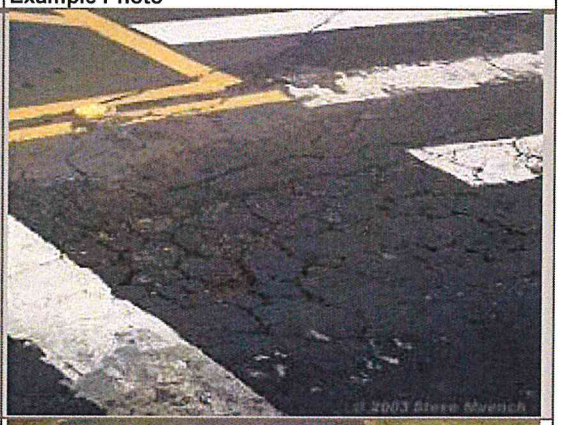
4.4 Analysis and Recommendations

The data collected from the site assessments were compiled into tables that describe the roadway details, locations, types of failures identified, recommendations, and estimated costs. The recommended work is summarized by roadway segments with detailed breakdowns for each roadway utilizing the establish naming and inventory system.

The pavement distresses identified are the following:

Table 4-1: Pavement Distress Types

Pavement Distresses	Description	Potential Causes	Example Photo
Longitudinal Cracking	Cracks parallel to the pavement's centerline.	Structural fatigue, subsurface failure	
Transverse Cracking	Cracks perpendicular to the pavement's centerline.	Thermal distortion due to frost heaving and low temperatures.	

Pavement Distresses	Description	Potential Causes	Example Photo
Alligator Cracking	Series of interconnected cracks caused by fatigue failure.	Structural failure due to increased loading, moisture infiltration into subgrade, and pavement disintegration.	
Ravelling	Surface disintegration of aggregate particles, causing loose debris, roughness, and hydroplaning conditions.	Loss of bond between aggregate particles and asphalt binders potentially due to aging and dust coating.	
Distortion	Pavement surface caused by corrugation or shoving.	Active traffic action where starts and stops are common, in addition to subgrade instability.	
Maintenance Patching	An area of pavement that has been replaced with new material to repair existing pavement.	Localized pavement repair.	

Pavement Distresses	Description	Potential Causes	Example Photo
Potholes	Depressions in the pavement surface that penetrates down to the base course causing roughness.	End result of severe fatigue cracking and frost heaving.	
Rutting	Surface depression under the wheel path, causing water ponding and hydroplaning conditions.	Consolidation under traffic loading.	
Bleed / Flushing	A film of asphalt binder accumulating on the surface, creating a sticky surface when dry and a slippery surface when wet.	Hot weather and traffic compaction expanding the binder onto the pavement surface.	

Photo Sources: https://pavementinteractive.org

The road assessment condition ratings are categorized as the following: good requiring no work or crack repair, fair requiring mill and inlay, poor requiring full overlay, and very poor requiring full reconstruction. Other work may be recommended independent of the roadway surface itself.

Specific sidewalk assessments followed a similar categorization of 'good, fair, poor, and very poor'. There are fewer options for sidewalk repairs as there are no 'crack repair' or patching options. Sidewalk repairs generally include surface patching where possible, "mudjacking" – raising and leveling settled concrete via injection of hydraulic grout, or full removal and replacement. Sidewalk cracking can be addressed by flushing the crack with pressurized water and filling with epoxy, polyurethane, or cement grout, although limited industry proactive and the lifecycle cost-benefit is not decisive on if sidewalk concrete crack filling is a cost effective solution.

The recommendations assigned to the roadways are the following:

Table 4-2: Roadway Work Categories

Category of Work	Description
No Work	Roadway surface is in acceptable condition and no work is required.
Crack Repair	Longitudinal and/or transverse cracks are repaired with the appropriate repair method.
Mill and Inlay	Top surface of the existing ACP surface is milled off and replaced with a new layer of ACP. This work can be used in for localized spot repair or Maintenance Patching.
Full Overlay	The full depth of the existing ACP surface is removed and replaced with a new ACP structure.
Full Reconstruction	The complete pavement structure (ACP and GBC) is removed, subgrade repairs are undertaken if required, and the surfacing is replaced with a new pavement structure.
Other Work - Concrete	In addition to curb and gutter replacement, sidewalk repairs include crack repair, surface patching, leveling and milling, or removal and replacement.

4.5 Key Findings

The overall road network was in good condition, with the primary road segments requiring rehabilitation efforts are along high traffic routes. The road network with their ratings are illustrated in Figure 4.2.

The majority of the road network exhibited longitudinal and transverse cracking in some form to various degrees of severities. There was minimal rutting and flushing throughout the network, with moderate amounts of ravelling, potholes, surface distortion, alligator cracking, and maintenance patching.

The percentage of the network exhibiting for each type of pavement distress and compared to the 2006 assessment is summarized in Table 4-3 below.

Table 4-3: Distress Type Summary for Road Network

Distress Type	% of Network by Length of Road (2006)	% of Network by Length of Road (2021)
Ravelling	81%	20%
Bleeding/Flushing	7%	0%
Potholes	34%	17%
Wheel Tracking Rutting	16%	8%
Distortion	72%	15%
Alligator Cracking	12%	14%
Longitudinal Cracking	94%	92%
Transverse Cracking	86%	92%
Maintenance Patching	46%	15%

The majority of the road network requires crack repair to varying degrees of severity where spray patching would be sufficient. More severe cases of crack repair would require routing and crack filling, or a shallow mill & inlay. A moderate number of roads require mill & inlay and/or partial reconstruction with no roads requiring full overlay or reconstruction. It is noted that earlier interventions present a high-value expenditure from a roadway lifecycle analysis – minor repairs in the short term are notable less intensive and less expensive than major repairs that will be required with further roadway deterioration. It is best practice to complete curb and gutter or driveway approach repairs where needed prior to completing roadway repairs.

The percentage of the road network exhibiting each type maintenance recommendation is summarized in Table 4-4 below.

Table 4-4: Maintenance Recommendation Summary for Road Network

Maintenance Recommendation	% of Network by Road (2021)
No Work	0%
Crack Repair – Spray Patch	78%
Crack Repair – Shallow Mill & Fill	15%
Mill & Inlay	13%
Full Overlay	0%
Partial Reconstruction	18%
Full Reconstruction	0%
Curb & Gutter Repair	15%

4.6 Recommendations

The road maintenance recommendations are compartmentalized and staged out into Priority Level 1, Priority Level 2, and Priority Level 3 depending on their condition rating, traffic usage, and any related underground utility maintenance that would impact the road. The road network with their ratings are illustrated in Figure 4.2.

Table 4-5: Priority Level 1

Region ID	Section ID	Road Name	Condition Rating	Repair	Estimated Cost	Comments
G3-NE	180.04	46 St	Fair	Mill & Inlay Curb & Gutter	$62,400	Cracks along West lane. Light rutting and ravelling. Damage on swale at 51 Ave crossing.
G2-NW	190.04	51 Ave	Fair	Mill & Inlay	$46,800	Significant amounts of surface cracking along major traffic route.
G3-NE	190.03	51 Ave	Fair	Mill & Inlay Partial Recon	$37,500	Curb and gutter repair. Severe isolated distortion at 49 St and 51 Ave intersection (Approx.: 2 x 25 m).
G5-SE	120.03	49 Ave	Fair	Mill & Inlay Partial Recon	$33,500	Significant isolated cracking & distortion W of 49 St (Approx.: 10 x 25 m).
G3-NE	190.01	51 Ave	Fair	Mill & Inlay	$24,100	Ravelling and surface cracking along major traffic route.
G3-NE	190.02	51 Ave	Fair	Mill & Inlay	$21,900	Ravelling and surface cracking along major traffic route. Damage at school access.
G3-NE	180.02	48 St	Fair	Crack Repair Partial Recon	$2,100	Major existing gravel patches (Approx.: 3 x 3 m and 3 x 10 m) causing severe roughness. Existing patch (Approx.: 4 x 10 m).

Table 4-6: Priority Level 2

Region ID	Section ID	Road Name	Condition Rating	Repair	Estimated Cost	Comments
G5-SE	120.01	49 Ave	Fair	Mill & Inlay	$10,000	Severe surface cracking.
G2-NW	150.04	50 St	Fair	Crack Repair Partial Recon	$6,900	Major alligator cracking and rutting 10 m N of 51 Ave. Major cracks between 51 Ave and 52 Ave.
G2-NW	170.05	54 Ave	Fair	Crack Repair Partial Recon	$3,600	Light ravelling with major alligator cracking at alley crossing for 54 Ave (Approx.: 10 x 10 m).
G5-SE	130.01	48 Ave	Good	Crack Repair	$4,300	Major surface cracks and distortion.
G5-SE	110.04	47 St	Fair	Crack Repair Partial recon	$3,200	Area with major cracks & potholes along W shoulder S of 49 Ave. (Approx.: 5 x 10 m).
G4-SW	130.02	48 Ave	Good	Crack Repair Curb & Gutter	$4,000	Curb and gutter work. Major cracking.
G1-MS	100.01	50 Ave	Fair	Crack Repair Partial Recon	$2,200	Alligator cracking and potholes at Legal pull-off area. (Approx.: 5 x 10 m).
G1-MS	100.07	50 Ave	Fair	Crack Repair Partial Recon	$2,100	Severe potholes and distortion at bridge tie-in. (Approx.: 5 x 10 m).
G2-NW	150.03	50 St	Fair	Crack Repair Partial Recon Curb & Gutter	$2,300	Curb & gutter repair. Major gravel patch (Approx.: 2 x 6 m) & rutting (Approx.: 1 x 4 m). Ravelling & potholes at the 50 Ave crosswalk.
G3-NE	180.03	47 St	Fair	Crack Partial Recon Curb & Gutter	$2,200	Curb & gutter repair. Damaged swale at 51 Ave. Alligator cracking, potholes, ravelling, and major cracks.
G4-SW	150.01	50 St	Good	Crack Repair	$2,000	Major surface cracks. Opportunity for mill & inlay based on traffic use.
G3-NE	180.01	49 St	Good	Crack Repair Swale Repair	$1,600	Major cracks. Existing patch (Approx.: 20 x 5 m). Damage around swale at 50 Ave crossing.
G5-SE	110.09	49 St	Good	Crack Repair	$1,300	Light ravelling, potential for mill & inlay. Various surface cracking.
G2-NW	150.05	50 St	Good	Crack Repair	$1,000	Longitudinal cracks. Minor rutting.

Table 4-7: Priority Level 3

Region ID	Section ID	Road Name	Condition Rating	Repair	Estimated Cost	Comments
G5-SE	140.01	47 Ave	Good	Crack repair	$730.00	Significant cracking at 48 St intersection. Patch around water valve (Approx.: 3 x 4 m). Light surface ravelling.
G5-SE	110.05	47 St	Good	Crack repair	$500.00	Minor crack repair, generally in good condition.
G2-NW	170.07	53a Ave	Good	Crack repair	$490.00	Minor cracking.
G2-NW	170.01	51a Ave	Good	Crack repair	$430.00	Cracks to seal at bend.
G1-MS	100.03	50 Ave	Good	Crack repair	$330.00	Minor cracking.
G2-NW	160.07	52 St	Good	Crack repair	$320.00	Cracking at cul-de-sac.
G5-SE	110.06	48 St	Good	Crack repair	$320.00	Patch around water valve.
G1-MS	100.05	50 Ave	Good	Crack repair	$320.00	Minor cracking.
G2-NW	160.05	53 St	Good	Crack repair	$290.00	Minor cracking.
G1-MS	100.04	50 Ave	Good	Crack repair	$290.00	Minor cracking.
G5-SE	120.02	49 Ave	Good	Crack repair	$280.00	Minor crack repair, generally in good condition.
G4-SW	160.01	51 St	Good	Crack repair	$270.00	Minor cracking.
G4-SW	160.02	51 St	Good	Crack repair	$260.00	Minor cracking.
G2-NW	170.02	52 Ave	Good	Crack repair	$200.00	Minor cracking.
G2-NW	160.04	52 St	Good	Crack repair	$200.00	Minor cracking.
G2-NW	170.03	52 Ave	Good	Crack repair	$190.00	Minor cracking.
G1-MS	100.02	50 Ave	Good	Crack repair	$190.00	Significant longitudinal crack along centre line.
G2-NW	160.11	51 St	Good	Crack repair	$170.00	Minor cracking.
G4-SW	150.06	50 St	Good	Crack repair	$160.00	Minor crack repair, generally in good condition.
G4-SW	150.02	50 St	Good	Crack repair	$160.00	Intersection at 48 Ave with potholes and cracks. Existing patch around driveway (Approx.: 10 x 5 m).
G5-SE	110.08	49a St	Good	Crack repair	$160.00	Minor crack repair, generally in good condition.
G5-SE	110.07	49 St	Good	Crack repair	$160.00	Minor crack repair, generally in good condition.
G2-NW	170.06	50a St	Good	Crack repair	$150.00	Minor curb & gutter repair.
G2-NW	170.04	52 Ave	Good	Crack repair	$140.00	Minor cracking.
G1-MS	100.06	50 Ave	Good	Crack repair	$140.00	Minor crack repair, generally in good condition.
G2-NW	160.06	52a St	Good	Crack repair	$130.00	Minor cracking.
G3-NE	180.06	52 Ave	Good	Crack repair	$120.00	Minor cracking.
G3-NE	180.05	46 St	Good	Crack repair	$110.00	Minor cracking.
G1-MS	110.02	45 St	Good	Crack repair	$70.00	75 m² area with light distortion to be monitored.
G1-MS	110.01	43 St	Good	Crack repair	$70.00	Minor crack repair, generally in good condition.
G2-NW	160.10	51 St	0	N/A	$-	Undergoing paving.
G4-SW	160.03	52 St	0	N/A	$-	Undergoing paving.
G5-SE	110.10	49 St	0	N/A	$-	Undergoing paving.
G5-SE	110.03	47 St	0	N/A	$-	Undergoing paving.

The total cost of the maintenance for the road network is summarized in Table 4-8 below:

Table 4-8: Total Cost of Maintenance

Section ID	Repair	Cost Estimate ($)
	Priority Level 1	
180.04	Mill & Inlay, Curb & Gutter Repair	$71,000
190.04	Mill & Inlay	$46,800
190.03	Mill & Inlay, Partial Recon	$43,900
120.03	Mill & Inlay, Partial Recon	$33,500
190.01	Mill & Inlay	$24,100
190.02	Mill & Inlay	$25,700
180.02	Crack Repair, Partial Recon	$2,100
	Subtotal:	$247,100
	Engineering and Contingency	$98,800
	Total	$345,900
	Priority Level 2	
120.01	Mill & Inlay	$10,000
150.04	Crack Repair, Partial Recon	$6,800
170.05	Crack Repair, Partial Recon	$3,600
130.01	Crack Repair	$4,300
110.04	Crack Repair, Partial recon	$3,200
130.02	Crack Repair, Curb & Gutter Repair	$12,000
100.01	Crack Repair, Partial Recon	$2,200
100.07	Crack Repair, Partial Recon	$2,100
150.03	Crack Repair, Partial Recon, Curb & Gutter Repair	$6,300
180.03	Crack Repair, Partial Recon, Curb & Gutter Repair	$6,200
150.01	Crack Repair	$2,000
180.01	Crack Repair, Swale Repair	$3,200
170.06	Crack repair, Curb & Gutter Repair	$3,900
110.09	Crack Repair	$1,300
150.05	Crack Repair	$1,000
	Subtotal:	$68,100
	Engineering and Contingency	$27,200
	Total	$95,300
	Priority Level 3	
140.01	Crack repair	$730.00
110.05	Crack repair	$500.00
170.07	Crack repair	$490.00
170.01	Crack repair	$430.00
100.03	Crack repair	$330.00
160.07	Crack repair	$320.00
110.06	Crack repair	$320.00
100.05	Crack repair	$320.00
160.05	Crack repair	$290.00
100.04	Crack repair	$290.00
120.02	Crack repair	$280.00
160.01	Crack repair	$270.00
160.02	Crack repair	$260.00
170.02	Crack repair	$200.00
160.04	Crack repair	$200.00
170.03	Crack repair	$190.00
100.02	Crack repair	$190.00
160.11	Crack repair	$170.00
150.06	Crack repair	$160.00
150.02	Crack repair	$160.00
110.08	Crack repair	$160.00
110.07	Crack repair	$160.00
170.04	Crack repair	$140.00
100.06	Crack repair	$140.00

Section ID	Repair	Cost Estimate ($)
160.06	Crack repair	$130.00
180.06	Crack repair	$120.00
180.05	Crack repair	$110.00
110.02	Crack repair	$70.00
110.01	Crack repair	$70.00
160.10	N/A	N/A
160.03	N/A	N/A
110.10	N/A	N/A
110.03	N/A	N/A
	Subtotal:	$7,200
	Engineering and Contingency	$2,900
	Total	$10,100
	Summary	
	Priority Level 1:	$345,900
	Priority Level 2:	$95,300
	Priority Level 3:	$10,100
	Total Cost Estimate:	**$451,300**

Table 4-9: Weighted Unit Price Averages (Central & North Central Region)

2021 Weighted Unit Price Averages (Central & North Central Region)	Unit	Unit Cost	AT No.
Crack Repair			
Crack Repair - Spray Patch	m	$7.00	M102
Adjusted Severity 3 - (Approx. 20 m of cracks per 25 m of road)	*m*	*$5.60*	
Adjusted Severity 2 - (Approx. 10 m of cracks per 25 m of road)	*m*	*$2.80*	
Adjusted Severity 1 - (Approx. 5 m of cracks per 25 m of road)	*m*	*$1.40*	
Crack Repair - Shallow Mill & Fill	m	$49.52	M104
Adjusted - (Approx. 5 m of cracks per 25 m of road)	*m*	*$9.90*	
Crack Repair - Spray Patch	m	$7.00	M102
Adjusted Severity 3 - (Approx. 20 m of cracks per 25 m of road)	*m*	*$5.60*	
Adjusted Severity 2 - (Approx. 10 m of cracks per 25 m of road)	*m*	*$2.80*	
Adjusted Severity 1 - (Approx. 5 m of cracks per 25 m of road)	*m*	*$1.40*	
Crack Repair - Shallow Mill & Fill	m	$49.52	M104
Mill & Inlay			
Cold Milling Asphalt (50 mm Assumed)	m^2	$3.79	Q565
Asphalt Concrete Pavement - EPS Mix Type H1 (50 mm Assumed)	t	$114.41	Q990
	m^2	$14.30	
Mill & Inlay	m^2	$18.09	
Full Overlay			
Asphalt Concrete Pavement - EPS Mix Type H1 (50 mm Assumed)	t	$114.41	Q990
	m^2	$14.30	
Full Reconstruction			
Asphalt Surface - Remove & Dispose (50 mm Assumed)	m^3	$54.80	X205
	m^2	$2.74	
Subgrade Excavation (200 mm Assumed)	m^3	$8.79	B100
	m^2	$1.76	
Granular Base Course - Des. 2 Cl.25 (300 mm Assumed)	t	$22.40	B282
	m^2	$15.79	
Prepare Subgrade Surface	m^2	$1.63	B180
Asphalt Concrete Pavement - EPS Mix Type H1 (50 mm Assumed)	t	$114.41	Q990
	m^2	$14.30	
Full Reconstruction	m^2	$34.59	
Other Work			
Curb & Gutter	m	$137.37	
Concrete Curb & Gutter – Remove & Dispose	m	$35.67	X215
Concrete Curb & Gutter - Install	m	$101.70	X325

4.6.1

4.6.2 Sidewalk Recommendations

In general, the sidewalk condition throughout the assessed area are in good or fair shape. While there are many areas with cracking, there are only a few sections that are recommended for replacement at this time. The sidewalk assessment was completed as an accompanying exercise and a recommended to be undertaken concurrently with the priority roadway repairs, generally along 51 Avenue and within the GE-NE mapping section. A summary photo-log of the sidewalk condition is included in **Appendix B**, which also includes the detailed Sidewalk Assessment.

The recommended sidewalk repairs include crack filling, some patching if practical, and sections of replacement. Unit prices were derived from recent unit price averages in St. Albert and the City of Edmonton with comparable types of work.

Table 4-10: Sidewalk Repair and Estimate

Sidewalk Work Cost Estimation								
Map Grouping	Section ID	Crack Repair - fill	Crack Repair - flush and fill	Surface Patch or Repair	Leveling or Milling Flush	Remove and Replace	Total Est. Cost	Condition Rating
G1-MS	100.01	$ -	$ -	$ -	$ -	$16,020.00	$16,020.00	Fair
G1-MS	100.02	$ -	$ -	$ -	$ -	$ 7,048.80	$ 7,048.80	Poor
G1-MS	100.03	$118.40	$ -	$ 904.32	$ -	$ 5,126.40	$ 6,149.12	Fair
G1-MS	100.04	$177.60	$ -	$1,356.48	$1,742.40	$ -	$ 3,276.48	Fair
G1-MS	100.05	$ -	$ -	$ 452.16	$ -	$ -	$ 452.16	Good
G1-MS	100.06	$ -	$ -	$1,017.36	$ -	$ -	$ 1,017.36	Fair
G1-MS	100.07	$ -	$ -	$ -	$ -	$17,942.40	$17,942.40	Poor
G1-MS	110.01	$ -	$ -	$ -	$ -	$ -	$ -	
G1-MS	110.02	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	110.03	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	110.04	$ -	$2,359.80	$ -	$ -	$ -	$ 2,359.80	Good
G5-SE	110.05	$ -	$ 492.48	$ -	$ -	$ -	$ 492.48	Fair
G5-SE	110.06	$ -	$ -	$ -	$ -	$ -	$ -	Good
G5-SE	110.07	$ -	$ -	$ -	$ -	$ -	$ -	Good
G5-SE	110.08	$ -	$ -	$ -	$ -	$ -	$ -	Good
G5-SE	110.09	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	110.10	$ 44.40	$ -	$ -	$ -	$ -	$ 44.40	Good
G5-SE	120.01	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	120.02	$ -	$ -	$ -	$ -	$ -	$ -	Good
G5-SE	120.03	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	130.01	$ -	$ -	$ -	$ -	$ -	$ -	
G4-SW	130.02	$ -	$ -	$ -	$ -	$ -	$ -	
G5-SE	140.01	$ -	$ -	$ -	$ -	$ -	$ -	Good
G4-SW	150.01	$ -	$ -	$ -	$ -	$ -	$ -	
G4-SW	150.02	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	150.03	$ -	$ 677.16	$1,865.16	$ -	$ -	$ 2,542.32	Fair
G2-NW	150.04	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	150.05	$ -	$ -	$ -	$ -	$ -	$ -	Good
G4-SW	150.06	$ -	$ -	$ -	$ -	$ -	$ -	Good
G4-SW	160.01	$ -	$ -	$ -	$ -	$ -	$ -	
G4-SW	160.02	$ -	$ -	$ -	$ -	$ -	$ -	
G4-SW	160.03	$ -	$ -	$ -	$ -	$ -	$ -	
G2-NW	160.04	$ -	$ -	$ -	$ -	$ -	$ -	
G2-NW	160.05	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	160.06	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	160.07	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	160.10	$162.80	$ -	$1,243.44	$ -	$ -	$ 1,406.24	Fair
G2-NW	160.11	$ -	$ -	$ -	$ -	$ -	$ -	
G2-NW	170.01	$ -	$ -	$ -	$ -	$ -	$ -	

Sidewalk Work Cost Estimation								
Map Grouping	Section ID	Crack Repair - fill	Crack Repair - flush and fill	Surface Patch or Repair	Leveling or Milling Flush	Remove and Replace	Total Est. Cost	Condition Rating
G2-NW	170.02	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	170.03	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	170.04	$251.60	$ -	$ -	$ -	$ -	$ 251.60	Good
G2-NW	170.05	$ -	$ -	$ -	$ -	$ -	$ -	Good
G2-NW	170.06	$ -	$ -	$ -	$ -	$ -	$ -	
G2-NW	170.07	$ -	$ -	$ -	$ -	$ -	$ -	Good
G3-NE	180.01	$ -	$ -	$ -	$ -	$ -	$ -	Fair
G3-NE	180.02	$ 37.00	$ -	$ 282.60	$ -	$ -	$ 319.60	Fair
G3-NE	180.03	$ -	$ -	$ -	$ -	$ -	$ -	Fair
G3-NE	180.04	$ -	$ -	$ -	$ -	$ -	$ -	Fair
G3-NE	180.05	$ -	$ -	$ -	$ -	$ -	$ -	Good
G3-NE	180.06	$ -	$ -	$ -	$ -	$ -	$ -	
G3-NE	190.01	$ -	$ -	$ -	$ -	$ -	$ -	Fair
G3-NE	190.02	$ -	$ -	$ 226.08	$ -	$ -	$ 226.08	Fair
G3-NE	190.03	$325.60	$ -	$ -	$ -	$ -	$ 325.60	Fair
G2-NW	190.04	$ -	$ -	$ -	$ -	$ -	$ -	

4.7 Overall Road Condition Summary

Overall, the road network in the Town of Legal is currently in good condition. The majority of the distresses can be corrected using cracking sealing and spot repairs on any failed areas.

As pavement crack is the most common distress type, which is likely the result of cold temperatures during the winter months, an effective crack sealing program should be maintained to ensure moisture entering the road base is minimized.

The program provided is based on a road network analysis to determine which pavements should receive what type of rehabilitative treatment and when it should occur. At a project level design, each section would undergo a more detailed scope of work on pavement design and other street upgrades at the time of rehabilitation.

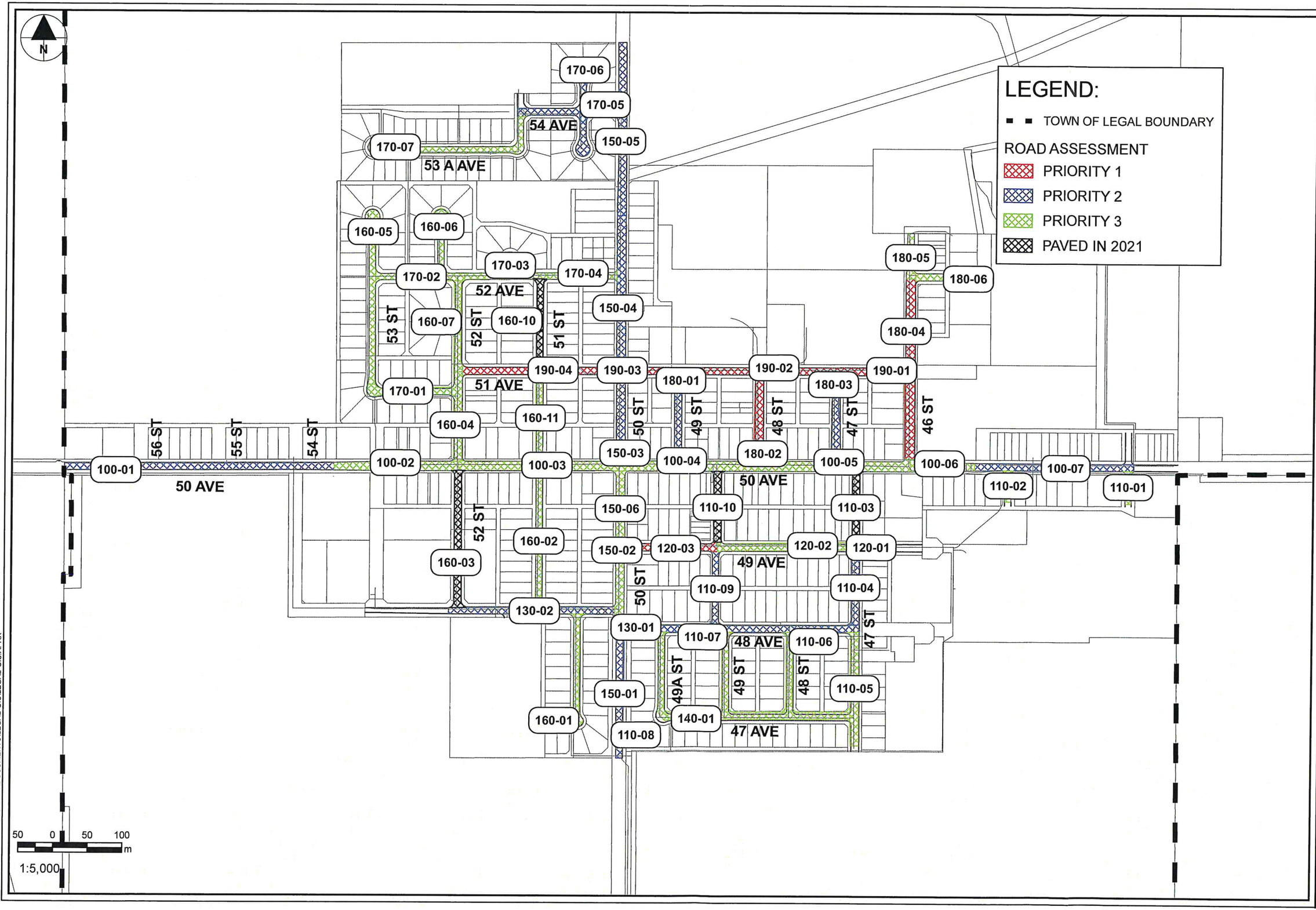


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Figure: 4.1

ROAD NETWORK CONDITION ASSESSMENT

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

5. Conclusions and Recommendations

Water
Under Max Day plus Fire Flow conditions, the existing water distribution provides adequate fire flows to the majority of town with the exception of three areas. Improvements are recommended for these areas. The timing of the improvements in the southwest industrial area may depend on the timing and type of development.

The future water distribution system performs well under the demand scenarios. While the Town of Legal has available storage that is sufficient to meet the existing demand conditions, it is expected that the total required storage of the Town will be equal to the existing storage by the end of 2022. It is therefore recommended that the Town increase its reservoir storage by 1,000 m^3 for it to meet the additional 956 m^3 of storage required by the end of 2045.

In the ultimate development, the system has sufficient pumping capacity with the existing high capacity 200 L/s pump and the distribution pumps activated. However, in an emergency scenario if the distribution pumps cannot be activated, the gas powered high capacity pump is slightly under capacity. Therefore, an additional high capacity gas powered pump could be considered for additional safety. However, this upgrade has been delegated to Priority 3.

Sanitary Sewer
The existing sanitary sewer system has adequate capacity for the next 20-25 years. No improvements are recommended to increase the capacity of the sanitary sewer system for existing or future development.

The condition of the sanitary sewers is as expected given the age of the infrastructure. 26% of assets should be addressed in the near future through excavations, or trenchless repairs. The majority of the system received a performance grade of 3 which is the optimal time for rehabilitation as further deterioration can be prevented by lining the existing pipes.

Roads
Overall, the road network in the Town of Legal is currently in good condition. The majority of the distresses can be corrected using cracking sealing and spot repairs on any failed areas.

A summary of estimate costs for Improvements is included in Table 5-1.

Table 5-1: Cost Summary

Asset	Priority 1	Priority 2	Priority 3
Water	$1,573,600	$1,637,700	$2,228,800
Sanitary Sewer	$286,800	$715,100	$1,496,900
Road Network	$345,900	$95,300	$10,100
Total	$2,206,300	$2,448,100	$3,735,800

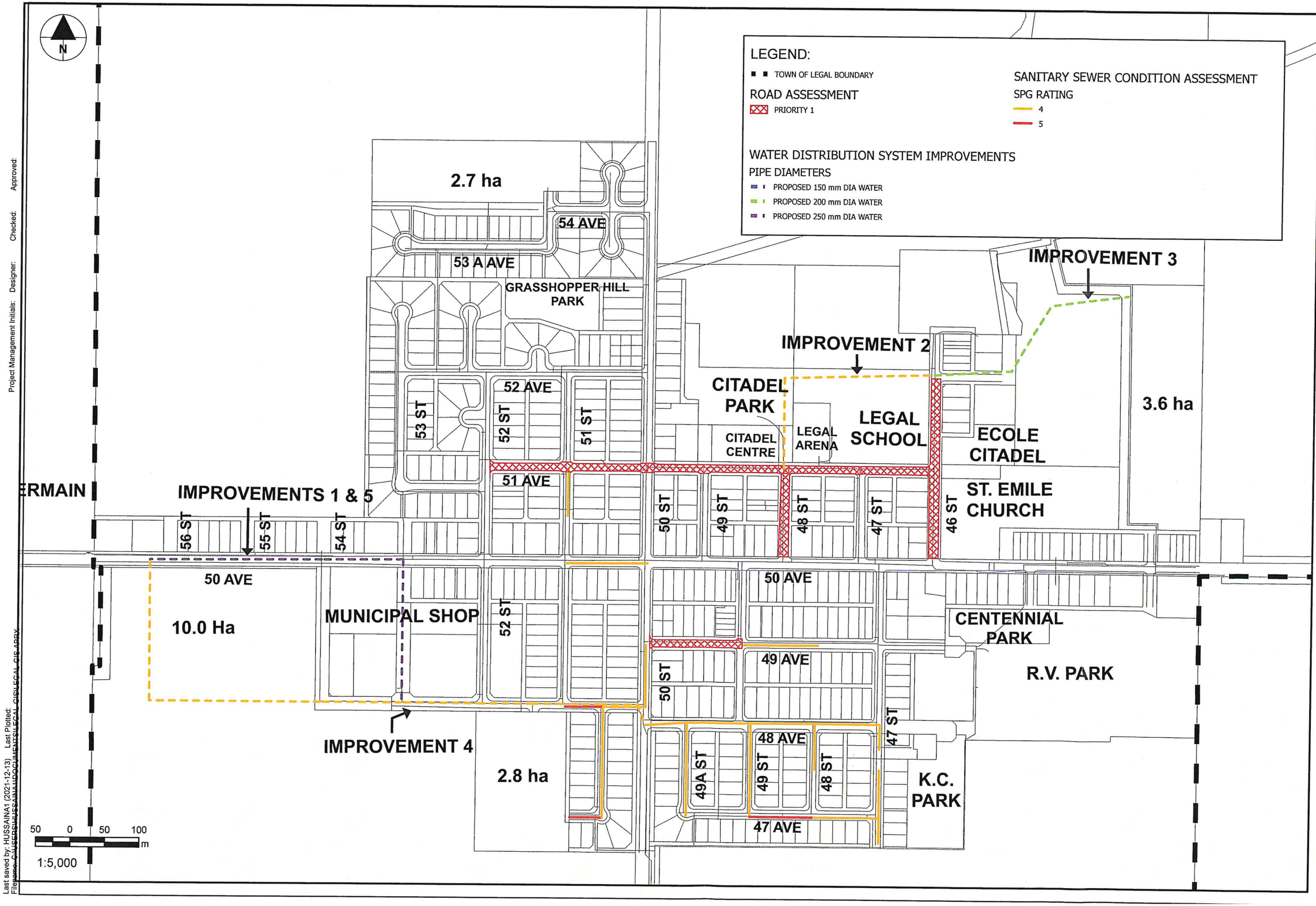

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Figure: 5.1

CONCLUSIONS AND RECOMMENDATIONS

ASSET MANAGEMENT REVIEW

TOWN OF LEGAL
Project No.: 60658079

AECOM Delivering a better world

Appendix A

Sanitary Sewer Condition Assessment Details

MARS: PACP Inspection (21-069)
System Customer
Sanitary Legal

CCTV Inspection

Status	Upstream Manhole	Downstream Manhole	Line Id	Setup Manhole	Surveyed Length (m)	Not Inspected (m)	Total Length (m)	Work Type	Add On	Immediate Attention	Requires Additional Cleaning	Reverse Run	Reverse Run Required	Survey Abandoned	Saved Date	Structural Quick	OM Quick	Overall Quick	Structural Index	OM Index	Overall Index	Comments	SPG	Rehabilitation Assigned	Sewer Cleaning	Lateral Repair
Complete	S13B	S13A	S13B:S13A	UP	52.5	0	52.5	PACP		No	No	No	No	No	2021-05-26	5142	2112	5142	3	1.3	2.8		3	Full Segment Lining		
Complete	S13A	S13	S13A:S13	UP	62.2	0	62.2	PACP		No	No	No	No	No	2021-05-26	5143	3221	5143	3.1	2.2	3		3	Full Segment Lining		
Incomplete	S14A	S14	S14A:S14	DOWN	37.8	71.7	109.5	PACP		No	No	Yes	No	Yes	2021-05-19	4131	3211	4133	3.5	2.3	2.8	Camera cannot pass encrustation	3	Trenchless Point Repair from 0.0 - 3.4 m US	Solid Debris cutting	
Incomplete	S14A	S14	S14A:S14	UP	0	109.5	109.5	PACP		No	No	No	Yes	Yes	2021-05-19	0	4100	4100	0	4	4	Camera can't get past encrustations	3			
Incomplete	S14B	S14A	S14B:S14A	DOWN	16	44.4	74.8	PACP		No	No	Yes	No	Yes	2021-05-19	0	3223	3223	0	2.4	2.4	Camera cannot get past encrustation	3			
Incomplete	S14B	S14A	S14B:S14A	UP	14.4	60.4	74.8	PACP		No	No	No	Yes	Yes	2021-05-19	4138	3327	413A	3.1	1.6	2	Camera cannot get past encrustation	3	Trenchless Point Repair from 0.0 - 14.4 m DS (based on incomplete inspection)	Solid Debris cutting	
Incomplete	S17	S16	S17:S16	UP	95.2	46.1	141.3	PACP		No	No	No	Yes	Yes	2021-05-26	4135	4135	423A	2.2	2.2	2.4		3	Full Segment Lining		
Incomplete	S17	S16	S17:S16	DOWN	37.6	103.7	141.3	PACP		No	No	Yes	N/A	Yes	2021-05-26	3228	4132	4134	2.2	2.8	2.4		3	Full Segment Lining		
Complete	S17A	S17	S17A:S17	UP	136.6	0	136.6	PACP		No	No	No	No	No	2021-05-11	3A22	4437	443C	2.8	2.5	2.6	Camera underwater at some pipe sections.	3	Full Segment Lining		
Complete	S18	S17	S18:S17	UP	118.3	0	118.3	PACP		No	No	No	No	No	2021-05-25	4131	4232	4333	1.6	3.2	1.9	Broken pipe at 19.3 m	3	Full Segment Lining		
Complete	S18A	S18	S18A:S18	UP	131.5	7.2	138.7	PACP		No	No	No	Yes	Yes	5/11/2021	3827	4C34	4C34	2.5	3.5	3.2	Camera underwater at various pipe sections; cannot go further due to unknown obstacle. Reverse Run on hold until 50 Ave is flushed and Traffic Control measures are determined	3	Full Segment Lining		
Complete	S18A	S18	S18A:S18	DOWN	7.2	131.5	138.7	PACP		No	No	Yes	N/A	N/A	2021-05-26	3400	0000	3400	3	0	3		3			
Complete	S19	S18	S19:S18	UP	84.2	0	84.2	PACP		No	No	No	No	No	2021-05-25	4121	4133	04233	2.3	2.4	2.4	Broken pipe at downstream manhole	3	grout/similar rehab of hole (gasket visible) at DS MH - S18; Trenchless Point Repair from 45.17 - 49.8 m DS		
Complete	S20	S19	S20:S19	DOWN	18.6	0	117.4	PACP		No	No	Yes	No	Yes	2021-05-25	3100	2400	3124	3	2	2.2	Reached point of downstream survey. CCTV complete	4	Full Segment Lining		
Complete	S20	S19	S20:S19	UP	106.8	0	117.4	PACP		No	No	No	Yes	Yes	2021-05-25	4132	3123	4133	1.9	2.2	1.9	Poor traction	4			
Complete	S21	S20	S21:S20	DOWN	6.6	0	117	PACP		No	No	Yes	No	Yes	2021-05-25	2200	3100	3122	2	3	2.3	Reached point of downstream survey	3	Full Segment Lining		
Complete	S21	S20	S21:S20	UP	110.8	0	117	PACP		No	No	No	Yes	Yes	2021-05-25	3226	4232	4234	1.7	2.6	2	Unable to complete due to lack of traction	3			
Complete	S21A	S21	S21A:S21	UP	117.4	0	117.4	PACP		No	No	No	No	No	2021-05-25	2419	5141	5141	1.3	3	1.8	Protruding service at upstream manhole	3	Full Segment Lining		Repair TBI at 0.6m @ 10 o clock DS and 22.7m @ 10 o clock DS
Complete	S22	S19	S22:S19	DOWN	118.4	18.6	137.9	PACP		No	No	Yes	N/A	N/A	2021-05-25	2100	5145	5145	2	4.2	3.9	Large sags. Reached point of downstream survey. CCTV complete	3			
Complete	S22	S19	S22:S19	UP	18.6	118.4	137.9	PACP		No	No	No	Yes	Yes	2021-05-11	5134	5121	5234	3.4	3.5	3.4	Camera cannot pass intruding service Reverse Run on hold until 50 Ave is flushed and Traffic Control measures are determined	3	Trenchless Point Repair from 0.0 - 29.6 m DS		
Complete	S22A	S22	S22A:S22	UP	138	0	138	PACP		No	No	No	No	No	2021-05-11	5249	4438	524A	3.1	2.8	3	Possible multiple sag, camera under water at a pipe section	3	Full Segment Lining		
Complete	S22B	S22A	S22B:S22A	UP	122.2	0	122.2	PACP		No	No	No	No	No	2021-05-10	4124	3427	4134	2.2	1.7	1.8	Some intrusive services and possible fractures	3	Full Segment Lining		
Complete	S23	S22	S23:S22	UP	117.1	0	117.1	PACP		No	No	No	No	No	2021-05-13	3800	322D	3A2D	3	2	2.2	Light encrustations at joints	3	Full Segment Lining	Encrustation cleaning	
Complete	S23A	S23	S23A:S23	UP	68.4	0	68.4	PACP		No	No	No	No	No	2021-05-13	443C	3523	443D	3.2	2.6	3	Angular Joints present	4	Full Segment Lining		
Complete	S24	S23	S24:S23	UP	70.6	0	70.6	PACP		No	No	No	No	No	2021-05-13	4131	312E	413E	2.4	2	2.1	Light grease through pipe	3	Full Segment Lining		
Complete	S25	S24	S25:S24	UP	66.7	0	66.7	PACP		No	No	No	No	No	2021-05-13	3322	332D	362D	2.3	2	2.1	Light grease stain	3	Full Segment Lining		
Complete	S25A	S25	S25A:S25	UP	52.5	0	52.5	PACP		No	No	No	No	No	2021-05-13	3222	322C	342D	2.5	2.1	2.1	Frozen sewage at first few sections of pipe.	3	Full Segment Lining		
Complete	S26	S25	S26:S25	UP	43.5	0	43.5	PACP		No	No	No	No	No	2021-05-11	0	2200	2200	0	2	2	Light grease	2			
Complete	S26A	S26	S26A:S26	DOWN	33.7	0	33.7	PACP		No	No	No	No	No	2021-05-11	0	2100	2100	0	2	2	Line in good condition	2			
Complete	S27	S26	S27:S26	DOWN	73	0	73	PACP		No	No	No	No	No	2021-05-11	1100	2200	2211	1	2	1.7	Light grease	3	Trenchless Point Repair from 0.0-2.49 m US		
Complete	S28	S27	S28:S27	UP	63.4	0	63.4	PACP		No	No	No	No	No	2021-05-11	2111	2300	2411	1.5	2	1.8	Light grease	3	Trenchless Point Repairs from 0.0-2.66m DS and 62.24-63.4m DS		
Complete	S28A	S28	S28A:S28	UP	33.4	0	33.4	PACP		No	No	No	No	No	2021-05-11	3121	0	3121	1.6	0	1.6	Light cracking	3	Trenchless Point Repairs from 0.0-0.5m DS and 30.22-33.4m DS		
Complete	S28B	S28	S28B:S28	UP	55.1	0	55.1	PACP		No	No	No	No	No	2021-05-11	1100	2300	2311	1	2	1.8	Light grease and cracking	3	Trenchless Point Repair from 52.0-55.1m DS		
Complete	S29	S27	S29:S27	UP	28.5	0	28.5	PACP		No	No	No	No	No	2021-05-10	0	2100	2100	0	2	2	Line in good condition	2			
Complete	S29A	S29	S29A:S29	UP	35.9	0	92.5	PACP		No	No	Yes	No	Yes	2021-05-10	0	4131	4131	0	3.5	3.5	TBI 50mm at 35.9m Reached point of U/S survey CCTV complete	2			
Complete	S29A	S29	S29A:S29	DOWN	56.6	0	92.5	PACP		No	No	No	Yes	Yes	2021-05-10	0	4132	4132	0	2.8	2.8	TBI 50mm at 56.6m	2			Repair TBI at 35.7m @ 10 o clock DS
Complete	S30	S29	S30:S29	UP	92	0	92	PACP		No	No	No	No	No	2021-05-10	3100	2C00	312C	3	2	2	Line in good condition light grease	3	Trenchless Point Repair from 84.77-87.54m DS	flush grease	
Complete	S30A	S30	S30A:S30	DOWN	100.1	0	100.1	PACP		No	No	No	No	No	2021-05-10	2111	342C	342D	1.5	2.1	2.1	Light grease and cracking	3	Full Segment Lining		
Complete	S31	S30	S31:S30	DOWN	42.5	0	42.5	PACP		No	No	No	No	No	2021-05-10	0	3122	3122	0	2	2	Light roots at service in line	3	Full Segment Lining		
Complete	S31	S32	S31:S32	UP	114.1	0	114.1	PACP		No	No	No	No	No	2021-05-10	3121	3112	3221	2	1.7	1.8	Light cracking. Line a good condition	3	Full Segment Lining		
Complete	S32	S33	S32:S33	UP	119	0	119	PACP		No	No	No	No	No	2021-05-11	3224	362B	382C	2.1	1.4	1.4	Roots throughout line	3	Trenchless Point Repair from 0.0-84.2m DS		
Complete	S33A	S33	S33:S33A	UP	20	0	20	PACP		No	No	No	No	No	2021-05-11	2116	0	2116	1.1	0	1.1	Light cracking	3	Full Segment Lining		
Complete	S33	S34	S33:S34	DOWN	26.3	0	47	PACP		No	No	Yes	No	Yes	2021-05-11	1B00	3100	311B	1	3	1.1	Reach point of downstream survey. CCTV completed	3			
Complete	S33	S34	S33:S34	UP	20.7	0	47	PACP		No	No	Yes	Yes	Yes	2021-05-11	1A00	3100	311A	1	3	1.1	TBI 40mm at 19.8m	3	Full Segment Lining		Repair TBI at 19.8m @ 10 o clock DS
Complete	S34	S21	S34:S21	UP	69	0	69	PACP		No	No	No	No	No	2021-05-11	1H00	0	1H00	1	0	1	Light surface damage	3	Full Segment Lining		
Complete	S35	S19	S35:S19	UP	118.3	0	118.3	PACP		No	No	No	No	No	2021-05-19	423B	4132	433C	2.5	2.4	2.5	Multiple sag sections	3	Full Segment Lining		
Complete	S35	S35A	S35:S35A	UP	71.6	0	71.6	PACP		No	No	No	No	No	2021-05-17	2100	3524	3525	2	2.4	2.4	Infiltration and encrustations present	3	Full Segment Lining		
Complete	S35A	S35B	S35A:S35B	UP	72	0	72	PACP		No	No	No	No	No	2021-05-17	5131	312A	5132	4	1.8	2	Infiltration and encrustations present. Deposit settled gravel at end of pipe	4	Full Segment Lining		
Complete	S35B	S51	S35B:S51	DOWN	91.4	1.1	92.5	PACP		No	No	Yes	No	Yes	2021-05-20	3222	413A	413A	2.2	2.3	2.3	Lots of encrustations in pipe	3	Full Segment Lining	Solid debris cutting	
Complete	S35B	S51	S35B:S51	UP	0	0	92.5	PACP		No	No	No	Yes	Yes	2021-05-19	0	4100	4100	0	4	4	Camera cannot go past Encrustation at manhole access to pipe	3			
Complete	S36	S35	S36:S35	UP	91	0	91	PACP		No	No	No	No	No	2021-05-17	4231	3224	4233	3	1.6	2	Settled gravel in line; possible break in pipe wall	4	Full Segment Lining		
Complete	S37	S36	S37:S36	UP	26.2	0	26.2	PACP		No	No	No	No	No	2021-05-17	3200	3221	3421	3	2.7	2.8	Most joints appear slightly offset	3	Full Segment Lining		
Complete	S37	S42	S37:S42	UP	61.7	0	61.7	PACP		No	No	No	No	No	2021-05-17	4435	312C	4436	3.2	2	2.3	Infiltration and encrustations at joints	4	Full Segment Lining		
Complete	S38	S36	S38:S36	UP	61	0	61	PACP		No	No	No	No	No	2021-05-17	4132	221B	4132	3.3	1.1	1.4	Possible sag and angular joints	4			
Complete	S38A	S38	S38A:S38	UP	79.9	0	79.9	PACP		No	No	No	No	No	2021-05-14	4332	3123	4333	3.6	1.7	2.5	Possible sag in line	4	Full Segment Lining		
Complete	S38B Stub	S38B	S38B Stub:S38B	DOWN	45.4	0	45.4	PACP		No	No	No	No	Yes	2021-05-14	5145	3121	5145	3.6	2	3.3	Cannot go further due to reduced pipe diameter just before Stub; multiple breaks in pipe	5	External Point Repair from 36.4-39.2 m and Full Segment Lining		
Complete	S38B	S38A	S38B:S38A	UP	80.8	0	80.8	PACP		No	No	No	No	No	2021-05-14	4333	3123	4334	2.5	2.2	2.5	Possible sag in pipe	4	Full Segment Lining		
Incomplete	S39	S38	S39:S38	DOWN	11.5	18.3	55.8	PACP		No	No	Yes	No	Yes	2021-05-17	5221	2116	5222	4	1.1	2	Possible broken pipe on the bottom.	5			
Incomplete	S39	S38	S39:S38	UP	26	0	55.8	PACP		No	No	No	Yes	Yes	2021-05-14	523B	2116	523B	3.2	1.1	2.6	Pipe broken	5	replace pipe (based on incomplete inspection)		
Complete	S39A	S39	S39A:S39	DOWN	17.6	0	76.2	PACP		No	No	Yes	No	Yes	2021-05-14	0	4121	4121	0	1.8	1.8	Match-point	3			
Complete	S39A	S39	S39A:S39	UP	58.6	0	76.2	PACP		No	No	No	Yes	Yes	2021-05-14	2915	352B	352D	1.6	1.7	1.7	Camera cannot go past encrustation.	3	Full Segment Lining	Solid Debris cutting	
Complete	S39B	S39A	S39B:S39A	UP	71.5	0	71.5	PACP		No	No	No	No	No	2021-05-14	4137	4135	423A	2.5	1.7	1.9	Sags present in pipe	3	Full Segment Lining		
Complete	S40	S39	S40:S39	UP	43.9	0	43.9	PACP		No	No	No	No	No	2021-05-14	3100	2A00	312A	3	2	2.1	Light grease in pipe	3	Trenchless Point Repair from 41-43.9m DS		
Complete	S41	S40	S41:S40	UP	74.4	0	74.4	PACP		No	No	No	No	No	2021-05-14	0	2416	2416	0	1.4	1.4	Light infiltration at joints Manhole S40 has stub line at 9 o clock not shown on map, did not see a cap	2			
Complete	S41A	S41	S41A:S41	UP	141.2	0	141.2	PACP		No	No	No	No	No	2021-05-13	3127	3224	332A	2.1	2.3	2.2	Possible sag in sections of pipe	2			
Complete	S41B	S41	S41B:S41	UP	43.2	0	43.2	PACP		No	No	No	No	No	2021-05-14	3122	2400	3126	2	2	2	Possible sag in line	3	Trenchless Point Repairs at 29.2-31.6m DS and 41.3-43.2m DS		
Complete	S42	S43	S42:S43	UP	93.7	0	93.7	PACP		No	No	No	No	No	2021-05-17	4436	332C	4439	3	1.5	1.8	Infiltration and roots at most joints	4	Full Segment Lining		
Complete	S43	S44	S43:S44	DOWN	6.1	0	94.7	PACP		No	No	Yes	No	Yes	2021-05-20	0	2311	2311	0	1.8	1.8	Encrustations present ; match point reached	4			
Complete	S43	S44	S43:S44	UP	88.6	0	94.7	PACP		No	No	No	Yes	Yes	2021-05-20	443B	362E	443C	3	1.6	1.9	Cannot go past encrustation	4	Full Segment Lining		
Complete	S44	S50	S44:S50	UP	95.7	0	95.7	PACP		No	No	No	No	No	2021-05-20	453B	342F	453C	3.1	1.9	2.4	Encrustations at joints; possible sag in line	4	Full Segment Lining		
Complete	S45	S45A	S45:S45A	UP	70.5	0	70.5	PACP		No	No	No	No	No	2021-05-21	4335	362A	433A	2.9	1.6	1.9	Fine roots at joints; possible sag in line	4	Full Segment Lining		
Complete	S45	S46	S45:S46	UP	94.5	0	94.5	PACP		No	No	No	No	No	2021-05-21	3923	362E	3B2E	2.8	2	2.1	Encrustation at service	3	Full Segment Lining		
Complete	S45A	S42	S45A:S42	UP	65.2	0	65.2	PACP		No	No	No	No	No	2021-05-21	4439	3546	443A	2.8	1.6	2.1	Possible sag in line; infiltration at joints.	4	Full Segment Lining		
Complete	S46A	S46	S46:S46A	UP	90.6	0	90.6	PACP		No	No	No	No	No	2021-05-20	4333	382A	433A	3.3	2.2	2.5	Encrustation at most service tap-in	4	Full Segment Lining		

Complete	S46	S47	S46:S47	UP	92.8	0	92.8	PACP		No	No	No	No	No	2021-05-21	5142	3523	5142	2.8	2	2.5	Hole in pipe; MH visible	5	External Point Repair (or potentially man entry repair) at DS manhole-end and Full Segment Lining		
Complete	S46A	S43	S46A:S43	UP	45.5	0	45.5	PACP		No	No	No	No	No	2021-05-20	4435	3426	4439	3.3	1.8	2.4	Infiltration with encrustation at most joints and fractures	4	Full Segment Lining		
Complete	S47A	S47	S47:S47A	UP	69.5	0	69.5	PACP		No	No	No	No	No	2021-05-21	4132	372A	4139	2.8	1.9	2.1	Infiltration and encrustations present	3	Full Segment Lining		
Complete	S47A	S44	S47A:S44	UP	65.5	0	65.5	PACP		No	No	No	No	No	2021-05-17	4128	352A	04135	2	2.2	2.1	Light cracking and encrustations	4	Full Segment Lining		
Complete	S47	S48	S48:S47	DOWN	17.1	1.4	96.8	PACP		No	No	Yes	No	Yes	2021-05-21	3100	2111	3121	3	1.5	2	MatchPoint visible	4			
Complete	S47	S48	S48:S47	UP	78.3	0	96.8	PACP		No	Yes	No	Yes	Yes	2021-05-21	4222	352I	4235	3	2	2.1	Camera cannot pass large offset joint, broken at bottom	4	External Point Repair from 77.5-82.0m DS and Full segment lining		
Complete	S48	S49	S48:S49	UP	69.5	0	69.5	PACP		No	No	No	No	No	2021-05-25	4235	382A	423A	2.8	2.3	2.5	Encrustation at most service break-in	4	Stabilize (man entry) pipe at DS manhole and Full segment lining	Solid Debris cutting	
Complete	S48A	S48	S48A:S48	UP	36.8	0	36.8	PACP		No	No	No	No	No	2021-05-25	4632	3221	4632	3.6	2.2	3.2	Cracks & fractures found	4	Full Segment Lining		
Complete	S49	49A	S49:49A	DOWN	8.1	0	35.2	PACP		No	No	Yes	No	Yes	2021-05-25	4231	3525	4236	3.2	2.5	2.7	Match point	3			
Complete	S49	49A	S49:49A	UP	27.1	0	35.2	PACP		No	No	No	Yes	Yes	2021-05-25	4231	3525	4236	3.2	2.5	2.7	Camera cannot pass Encrustation	3	Full Segment Lining	Solid Debris cutting	
Complete	S49A	S50	S49A:S50	DOWN	31.5	0	31.5	PACP		No	No	No	No	No	2021-05-25	4332	4134	4436	3.1	2.3	2.5	Encrustations at joints and service	4	Full Segment Lining	Solid Debris cutting	
Incomplete	S49B	S49A	S49B:S49A	DOWN	1.1	0	48	PACP		No	No	Yes	No	Yes	2021-05-25	0	0	0	0	0	0	Matchpoint	2			
Incomplete	S49B	S49A	S49B:S49A	UP	46.9	0	48	PACP		No	No	No	Yes	Yes	2021-05-25	2100	4100	4100	2	4	3	Possible sag in line; camera cannot go past unknown object	2		Flush line and reinspect	
Complete	S50	S51	S50:S51	UP	115.4	0	115.4	PACP		No	No	No	No	No	2021-05-25	413A	4137	423B	2.3	2.1	2.2	Sags in various pipe sections; encrustations present	3	Full Segment Lining		
Complete	S51	S16	S51:S16	UP	115.9	0	115.9	PACP		No	No	No	No	No	2021-05-20	2A00	2100	2B00	2	2	2	Possible sag in line	2			
Complete	S52	S22B	S52:S22B	UP	115	0	115	PACP		No	No	No	No	No	2021-05-10	2500	0	2500	2	0	2	Possible sag present	2			
Complete	S53	S52	S53:S52	UP	59.5	0	59.5	PACP		No	No	No	No	No	2021-05-10	2A00	0	2A00	2	0	2	Possible sag in various sections	2			
Complete	S53A	S53	S53A:S53	UP	53.8	0	53.8	PACP		No	No	No	No	No	2021-05-10	0	0	0	0	0	0	Line in good condition	2			
Complete	S53B	S53	S53B:S53	UP	54.7	0	54.7	PACP		No	No	No	No	No	2021-05-10	2100	2100	2200	2	2	2	Possible sag in line	2			
Complete	S54	S53	S54:S53	UP	89.8	0	89.8	PACP		No	No	No	No	No	2021-05-10	0	0	0	0	0	0	Line in good condition	2			
Complete	S54A	S54	S54A:S54	DOWN	56.3	0	56.3	PACP		No	No	No	No	No	2021-05-10	0	3122	3122	0	2.3	2.3	Possible blocked service, deposit settled gravel in pipe and some service.	2			clean lateral at 26.2m @ 3 o clock US
Complete	S55	S54	S55:S54	UP	54.7	0	54.7	PACP		No	No	No	No	No	2021-05-10	2A00	0000	2A00	2	0	2	Possible sag in sections of pipe	2			
Complete	S56	S55	S56:S55	UP	110	0	110	PACP		No	No	No	No	No	2021-05-07	0	3300	3300	0	3	3	Possible defective services	2			
Complete	S57	S56	S57:S56	UP	101.6	0	101.6	PACP		No	No	No	No	No	2021-05-07	4122	3211	4132	2.7	2.3	2.5	Possible sags and defective services	2			

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Appendix B

Road Assessment Details

Town of Legal - Road Assessments (Evaluation)

3 - High Severity
2 - Intermediate Severity
1 - Low Severity

Map Grouping	Section ID	Road Name	AADT (2006)	From	To	Length (m)	Width (m)	Distress & Severity										Maintenance Recommendation							Maintenance Cost Estimation										Total Est. Cost	Condition Rating	Priority	Comments
								Longitudinal Cracking	Transverse Cracking	Alligator Cracking	Ravelling	Distortion	Patching	Potholes	Rutting	Bleed/ Flushing	No Work	Crack Repair Mill & Fill	Crack Repair Mill & Fill	Mill & Inlay	Full Overlay	Part Recon	Full Recon	Other Work	CR -Spray	CR-Seal	Mill & Inlay	Full Overlay	Partial Reconstruction		Full Reconstruction	Concrete Work					
G1-MS	100.01	50 Ave	20000	W Boundary	54 St	335	10	1	1	3				3			✓				✓				$ 469.00	$ -	$ -	$ -	50	$ 1,729.56	$ -		$ 2,198.56	Fair	2	Alligator cracking and potholes at Legal pull-off area 5x10m area.
G1-MS	100.02	50 Ave	20000	53 St	52 St	135	13.7	1	1			1					✓								$ 189.00	$ -	$ -	$ -		$ -	$ -		$ 189.00	Good	3	Significant longitudinal crack along centre line.
G1-MS	100.03	50 Ave	20000	52 St	50 St	235	13.7	1	1			1					✓								$ 329.00	$ -	$ -	$ -		$ -	$ -		$ 329.00	Good	3	Minor cracking
G1-MS	100.04	50 Ave	20000	50 St	48 St	205	13.7	1	1								✓								$ 287.00	$ -	$ -	$ -		$ -	$ -		$ 287.00	Good	3	Minor cracking
G1-MS	100.05	50 Ave	20000	48 St	46 St	225	13.7	1	1			1					✓								$ 315.00	$ -	$ -	$ -		$ -	$ -		$ 315.00	Good	3	Minor cracking
G1-MS	100.06	50 Ave	20000	46 St	Bridge	100	14.2	1	1								✓								$ 140.00	$ -	$ -	$ -		$ -	$ -		$ 140.00	Good	3	Minor cracking
G1-MS	100.07	50 Ave	20000	Bridge	E Boundary	235	10	1	1		3		3				✓				✓				$ 329.00	$ -	$ -	$ -	50	$ 1,729.56	$ -		$ 2,058.56	Fair	2	Minor crack repair, generally in good condition.
G1-MS	110.01	43 St	1000	50 Ave	South Park	50	9.3	1	1								✓								$ 70.00	$ -	$ -	$ -		$ -	$ -		$ 70.00	Good	3	Severe potholes and distortion at bridge tie-in. 5x10m gravel pit.
G1-MS	110.02	45 St	1000	50 Ave	South Park	50	9.5	1	1		1						✓								$ 70.00	$ -	$ -	$ -		$ -	$ -		$ 70.00	Good	3	Minor crack repair, generally in good condition.
G5-SE	110.03	47 St	1000	50 Ave	49 Ave	115	11																		$ -	$ -	$ -	$ -		$ -	$ -		$ -		3	75m² area with light distortion to be monitored.
G5-SE	110.04	47 St	1000	49 Ave	48 Ave	115	11.5	2	2			1	1				✓	✓			✓				$ 322.00	$ 1,138.96	$ -	$ -	50	$ 1,729.56	$ -		$ 3,190.52	Fair	2	To be paved.
G5-SE	110.05	47 St	1000	48 Ave	South End	180	12	2	2								✓								$ 504.00	$ -	$ -	$ -		$ -	$ -		$ 504.00	Good	3	Major cracks & potholes along W shoulder S of 49 Ave. 5x10m area.
G5-SE	110.06	48 St	1000	48 Ave	49 Ave	115	9.7	2	2			2					✓							✓	$ 322.00	$ -	$ -	$ -		$ -	$ -		$ 322.00	Good	3	Minor crack repair, generally in good condition.
G5-SE	110.07	49 St	1000	49 Ave	48 Ave	115	10	1	1				1				✓								$ 161.00	$ -	$ -	$ -		$ -	$ -		$ 322.00	Good	3	Patch around water valve.
G5-SE	110.08	49a St	1000	47 Ave	48 Ave	115	9.5	1	1				1				✓								$ 161.00	$ -	$ -	$ -		$ -	$ -		$ 161.00	Good	3	Minor crack repair, generally in good condition.
G5-SE	110.09	49 St	1000	48 Ave	49 Ave	100	9.7	2	2		1						✓	✓							$ 280.00	$ 990.40	$ -	$ -		$ -	$ -		$ 1,270.40	Good	2	Minor crack repair, generally in good condition.
G5-SE	110.10	49 St	1000	49 Ave	50 Ave	100	10.8																		$ -	$ -	$ -	$ -		$ -	$ -		$ -		3	Light ravelling, potential for mill & inlay. Various cracking.
G5-SE	120.01	49 Ave	1000	47 St	Park	50	11	3	3											✓					$ -	$ -	$ 9,950.19	$ -		$ -	$ -		$ 9,950.19	Fair	2	To be paved.
G5-SE	120.02	49 Ave	1000	47 St	49 St	200	11	1	1								✓								$ 280.00	$ -	$ -	$ -		$ -	$ -		$ 280.00	Good	3	Severe surface cracking.
G5-SE	120.03	49 Ave	1000	50 St	49 St	125	11			3		3								✓					$ -	$ -	$24,875.47	$ -	250	$ 8,647.81	$ -		$33,523.28	Fair	1	Minor crack repair, generally in good condition.
G5-SE	130.01	48 Ave	1000	50 St	47 St	340	11	2	2			1					✓	✓			✓				$ 952.00	$ 3,367.36	$ -	$ -		$ -	$ -		$ 4,319.36	Good	2	Significant cracking & distortion 10x25m W of 49 St.
G4-SW	130.02	48 Ave	1000	50 St	52 St	240	10.8	3	3	2							✓	✓						✓	$ 1,344.00	$ 2,376.96	$ -	$ -		$ -	$ -	$ 8,242.20	$11,963.16	Good	1	Major surface cracks and distortion.
G5-SE	140.01	47 Ave	1000	47 St	49a St	260	10	2	2		1						✓								$ 728.00	$ -	$ -	$ -		$ -	$ -		$ 728.00	Good	3	Curb and gutter work. Major cracking.
G4-SW	150.01	50 St	20000	48 Ave	South	160	10	2	2		1		1				✓	✓							$ 448.00	$ 1,584.64	$ -	$ -		$ -	$ -		$ 2,032.64	Good	2	Significant cracking at 48 St intersection. 3x4m patch around water valve. Light ravelling.
G4-SW	150.02	50 St	20000	49 Ave	48 Ave	115	13.2	1	1			1		1			✓							✓	$ 161.00	$ -	$ -	$ -		$ -	$ -		$ 161.00	Good	3	Major surface cracks. Opportunity for mill & inlay based on traffic use.
G2-NW	150.03	50 St	20000	51 Ave	50 Ave	120	13.4	1	1		3	3	3	3			✓	✓			✓				$ 168.00	$ 1,188.48	$ -	$ -	25	$ 864.78	$ -	$ 4,121.10	$ 6,342.36	Fair	2	Intersection at 48 Ave with pot holes and cracks. 10x5m patch around driveway.
G2-NW	150.04	50 St	20000	51 Ave	Alley	265	13.3	2	2	3	1						✓	✓			✓				$ 742.00	$ 2,624.56	$ -	$ -	100	$ 3,459.13	$ -		$ 6,825.69	Fair	2	Major 2x6m gravel patch & 1x4m rutting. Ravelling & potholes at 50 Ave crosswalk. Curb & gutter repair
G2-NW	150.05	50 St	20000	Alley	N Boundary	180	10.5	3	1					1			✓								$ 1,008.00	$ -	$ -	$ -		$ -	$ -		$ 1,008.00	Good	2	Major alligator cracking and rutting 10m N of 51 Ave. Major cracks between 51 Ave and 52 Ave.
G4-SW	150.06	50 St	1000	50 Ave	49 Ave	115	13.2	1	1								✓								$ 161.00	$ -	$ -	$ -		$ -	$ -		$ 161.00	Good	3	Longitudinal crack . Minor rutting.
G4-SW	160.01	51 St	1000	48 Ave	South End	190	9.9	1	1								✓								$ 266.00	$ -	$ -	$ -		$ -	$ -		$ 266.00	Good	3	Minor crack repair, generally in good condition.
G4-SW	160.02	51 St	1000	48 Ave	50 Ave	185	9.7	1	1								✓								$ 259.00	$ -	$ -	$ -		$ -	$ -		$ 259.00	Good	3	Minor cracking
G4-SW	160.03	52 St	1000	48 Ave	50 Ave	185	10.7																		$ -	$ -	$ -	$ -		$ -	$ -		$ -		3	To be paved.
G2-NW	160.04	52 St	1000	50 Ave	51 Ave	140	12.2	1	1								✓								$ 196.00	$ -	$ -	$ -		$ -	$ -		$ 196.00	Good	3	Minor cracking.
G2-NW	160.05	53 St	1000	51a Ave	N Cul De Sac	210	9.8	1	1								✓								$ 294.00	$ -	$ -	$ -		$ -	$ -		$ 294.00	Good	3	Minor cracking.
G2-NW	160.06	52a St	1000	52 Ave	N Cul De Sac	90	9.7	1	1								✓								$ 126.00	$ -	$ -	$ -		$ -	$ -		$ 126.00	Good	3	Minor cracking.
G2-NW	160.07	52 St	1000	52 Ave	51 Ave	115	10.7	2	2								✓								$ 322.00	$ -	$ -	$ -		$ -	$ -		$ 322.00	Good	3	Minor cracking.
G2-NW	160.10	51 St	1000	51 Ave	52 Ave	120	9.7																		$ -	$ -	$ -	$ -		$ -	$ -		$ -		3	Significant cracking at cul-de-sac.
G2-NW	160.11	51 St	1000	51 Ave	50 Ave	120	9.7	1	1								✓								$ 168.00	$ -	$ -	$ -		$ -	$ -		$ 168.00	Good	3	To be paved.
G2-NW	170.01	51a Ave	1000	52 St	53 St	155	10	2	2								✓								$ 434.00	$ -	$ -	$ -		$ -	$ -		$ 434.00	Good	3	Minor cracking.
G2-NW	170.02	52 Ave	1000	53 St	52 St	140	9.7	1	1								✓								$ 196.00	$ -	$ -	$ -		$ -	$ -		$ 196.00	Good	3	Minor cracking.
G2-NW	170.03	52 Ave	1000	51 St	51 St	135	9.8	1	1								✓								$ 189.00	$ -	$ -	$ -		$ -	$ -		$ 189.00	Good	3	Minor cracking.
G2-NW	170.04	52 Ave	1000	51 St	50 St	100	10	1	1								✓								$ 140.00	$ -	$ -	$ -		$ -	$ -		$ 140.00	Good	3	Minor cracking.
G2-NW	170.05	54 Ave	1000	50 St	Dead End	100	10	1	1	3	1			3			✓				✓				$ 140.00	$ -	$ -	$ -	100	$ 3,459.13	$ -		$ 3,599.13	Fair	2	Light ravelling. Major alligator cracking 10x10m at alley crossing for 54 Ave.
G2-NW	170.06	50a St	1000	S Cul De Sac	N Cul De Sac	110	9	1	1								✓						✓		$ 154.00	$ -	$ -	$ -		$ -	$ -	$ 3,777.68	$ 3,931.68	Good	2	Minor curb & gutter repair.
G2-NW	170.07	53A Ave	1000	54 Ave Int	W Cul de Sac	350	9	1	1								✓								$ 490.00	$ -	$ -	$ -		$ -	$ -		$ 490.00	Good	3	Minor cracking.
G3-NE	180.01	49 St	1000	50 Ave	51 Ave	120	12.1	2	2								✓	✓					✓		$ 336.00	$ 1,188.48	$ -	$ -		$ -	$ -	$ 1,662.18	$ 3,186.66	Good	2	20x5m existing patch. Major cracks. Damage around swale at 50 Ave crossing.
G3-NE	180.02	48 St	1000	51 Ave	50 Ave	120	12.4	2	2				3				✓				✓				$ 336.00	$ -	$ -	$ -	50	$ 1,729.56	$ -		$ 2,065.56	Fair	2	3x3m and 3x10m gravel patch. Existing 4x10m patch.
G3-NE	180.03	47 St	1000	50 Ave	51 Ave	120	13.6	2	2	2	2	1	2	2			✓				✓				$ 336.00	$ -	$ -	$ -	50	$ 1,729.56	$ -	$ 4,121.10	$ 6,186.66	Fair	2	Damaged swale at 51 Ave. Alligator cracking. Potholes, ravelling, major cracks, damage to curb & gutter.
G3-NE	180.04	46 St	20000	50 Ave	52 Ave	250	13.8	1	1		1			1	1			✓					✓		$ -	$ -	$62,414.81	$ -		$ -	$ -	$ 8,585.63	$71,000.44	Fair	1	Cracks along west lane. Light rutting and ravelling. Damage on swale at 51 Ave crossing.
G3-NE	180.05	46 St	1000	52 Ave	Nursing	75	9.6	1	1		1						✓								$ 105.00	$ -	$ -	$ -		$ -	$ -		$ 105.00	Good	3	Minor cracking.
G3-NE	180.06	52 Ave	1000	46 St	East End	85	9.7	1	1								✓								$ 119.00	$ -	$ -	$ -		$ -	$ -		$ 119.00	Good	3	Minor cracking.
G3-NE	190.01	51 Ave	20000	46 St	47 St	110	12.1	1	1		2							✓							$ -	$ -	$24,079.45	$ -		$ -	$ -		$24,079.45	Fair	1	Ravelling and cracks.
G3-NE	190.02	51 Ave	1000	47 St	48 St	110	11	1	1		2							✓							$ -	$ -	$21,890.41	$ -		$ -	$ -	$ 3,777.68	$25,668.09	Fair	1	Damage at school access.
G3-NE	190.03	51 Ave	1000	48 St	50 St	185	10.7	1	1			3						✓			✓				$ -	$ -	$35,811.63	$ -	50	$ 1,729.56	$ -	$ 6,353.36	$43,894.55	Fair	1	Curb and gutter repair. Sever distortion at 49 St and 51 Ave intersection approx 2x25m.
G2-NW	190.04	51 Ave	1000	50 St	52 St	235	11	2	2									✓							$ -	$ -	$46,765.88	$ -		$ -	$ -		$46,765.88	Fair	1	Significant amounts of cracking, webbing.

Town of Legal - Sidewalk Assessments (Evaluation)

3 - High Severity
2 - Intermediate Severity
1 - Low Severity

Notes:
Length indicates area of work required, assuming a 6' 1.8m average width. These are high level estimates and were not measured in the field. Extents of repairs or replacement should be site verified.
Curb and Gutter work has been included with the roadway assessment, notes are supplementary.

Map Grouping	Section ID	Road Name	From	To	Length	Width	Distress						Maintenance Recommendation				Sidewalk Work Cost Estimation					Total Est. Cost	Condition Rating	Roadway Priority	Sidewalk Assessment
					(m)	(m)		Cracks	Large Cracks, Vegetation Growth	Settlement or Heave	Chipping, Spalling, Damage	No Work	Crack Repair	Surface Patch	Hydraulic Leveling	Remove and Replace	Crack Repair - fill	Crack Repair - flush and fill	Surface Patch or Repair	Leveling or Milling Flush	Remove and Replace				
G1-MS	100.01	50 Ave	W Boundary	54 St	50	1.8	3	✓		✓					✓		$ -	$ -	$ -	$ -	$ 16,020.00	$16,020.00	Fair	2	Sidewalk in front of unit 5306 has several longitundal cracks and has weeds growing in the cracks. Likely requires Replacement
G1-MS	100.02	50 Ave	53 St	52 St	22	1.8	1	✓	✓	✓					✓		$ -	$ -	$ -	$ -	$ 7,048.80	$ 7,048.80	Poor	3	N sidewalk in good condition, slight settlement of sand and gravel from private driveways. S sidewalk has weeds growing in the gaps and lip&gutter is worn out and missing concrete was observed at curbs 52 St. 50 Ave.
G1-MS	100.03	50 Ave	52 St	50 St	16	1.8	1	✓		✓		✓	✓		✓		$ 118.40		$ 904.32	$ -	$ 5,126.40	$ 6,149.12	Fair	3	N sidewalk in acceptable condition, minor settlement from driveway and some weeds growing in gaps. S sidewalk curb slightly worn out at 51st and 50 Ave corner, curb replacement in front of unit 5105, discoloration of curbs - repaint or replace
G1-MS	100.04	50 Ave	50 St	48 St	24	1.8	1			✓		✓	✓	✓			$ 177.60		$ 1,356.48	$ 1,742.40	$ -	$ 3,276.48	Fair	3	Minor crack on N sidewalk at 51st and 50 Ave NE corner, minor crack in front of unit 5012, crack on sidewalk and curbs at the 50 St. 50Ave NW corner needs repair. Settlement at 50Ave & 49 St. NW corner
G1-MS	100.05	50 Ave	48 St	46 St	8	1.8	1		✓				✓				$ -	$ -	$ 452.16	$ -	$ -	$ 452.16	Good	3	Chipping at curb at SW corner of 47 St. 50 Ave. Curb slightly worn out on N sidewalk. Overall in acceptable condition
G1-MS	100.06	50 Ave	46 St	Bridge	18	1.8	2	✓					✓				$ -	$ -	$ 1,017.36	$ -	$ -	$ 1,017.36	Fair	3	S curbs are worn out, N sidewalk has elongated crack with weeds growing at 50/46 NE corner. In good condition. No curb in front of unit 4501 forward, erosion and settlement in landscape
G1-MS	100.07	50 Ave	Bridge	E Boundary	56	1.8	3	✓		✓					✓		$ -	$ -	$ -	$ -	$ 17,942.40	$17,942.40	Poor	2	N sidewalk require replacement
G1-MS	110.01	43 St	50 Ave	South Park													$ -	$ -	$ -	$ -	$ -	$ -			
G1-MS	110.02	45 St	50 Ave	South Park													$ -	$ -	$ -	$ -	$ -	$ -			
G5-SE	110.03	47 St	50 Ave	49 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -		3	Sidewalk in good condition
G5-SE	110.04	47 St	49 Ave	48 Ave	115	1.8	1	✓				✓						$ 2,359.80	$ -	$ -	$ -	$ 2,359.80	Good	2	Sidewalk in acceptable condition but has separation with curb and weeds growing
G5-SE	110.05	47 St	48 Ave	South End	24	1.8		✓		✓		✓			✓			$ 492.48	$ -	$ -	$ -	$ 492.48	Fair	3	Sidewalk in good condition, one concrete pad in front of 4617 has weeds grown, and deteriorate, can be replaced.
G5-SE	110.06	48 St	48 Ave	49 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition
G5-SE	110.07	49 St	49 Ave	48 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G5-SE	110.08	49a St	47 Ave	48 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G5-SE	110.09	49 St	48 Ave	49 Ave													$ -	$ -	$ -	$ -	$ -	$ -			
G5-SE	110.10	49 St	49 Ave	50 Ave	6	1.8	1					✓					$ 44.40		$ -	$ -	$ -	$ 44.40	Good	3	Sidewalk on both side of the road, both are in acceptable condition but west side sidewalk has slight crack on curb
G5-SE	120.01	49 Ave	47 St	Park													$ -	$ -	$ -	$ -	$ -	$ -			
G5-SE	120.02	49 Ave	47 St	49 St							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition, front driveway to unit 4745 unpaved
G5-SE	120.03	49 Ave	50 St	49 St													$ -	$ -	$ -	$ -	$ -	$ -			
G5-SE	130.01	48 Ave	50 St	47 St													$ -	$ -	$ -	$ -	$ -	$ -			
G4-SW	130.02	48 Ave	50 St	52 St													$ -	$ -	$ -	$ -	$ -	$ -			
G5-SE	140.01	47 Ave	47 St	49a St							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition
G4-SW	150.01	50 St	48 Ave	South													$ -	$ -	$ -	$ -	$ -	$ -			
G4-SW	150.02	50 St	49 Ave	48 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition
G2-NW	150.03	50 St	51 Ave	50 Ave	33	1.8	1	✓		✓		✓	✓					$ 677.16	$ 1,865.16	$ -	$ -	$ 2,542.32	Fair	2	Extended crack on sidewalk at the 50st NE corner, concrete chipping on sidewalk in front of restaurant
G2-NW	150.04	50 St	51 Ave	Alley							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	2	Sidewalk in acceptable condition, no sidewalk N 52 Ave
G2-NW	150.05	50 St	Alley	N Boundary							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	2	about 50m sidewalk then no sidewalk, in acceptable condition
G4-SW	150.06	50 St	50 Ave	49 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition
G4-SW	160.01	51 St	48 Ave	South End													$ -	$ -	$ -	$ -	$ -	$ -			
G4-SW	160.02	51 St	48 Ave	50 Ave													$ -	$ -	$ -	$ -	$ -	$ -			
G4-SW	160.03	52 St	48 Ave	50 Ave													$ -	$ -	$ -	$ -	$ -	$ -			
G2-NW	160.04	52 St	50 Ave	51 Ave													$ -	$ -	$ -	$ -	$ -	$ -			
G2-NW	160.05	53 St	51a Ave	N Cul De Sac							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk on both sides in good condition
G2-NW	160.06	52a St	52 Ave	N Cul De Sac							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G2-NW	160.07	52 St	52 Ave	51 Ave	40	1.8	1										$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in acceptable condition, minor cracks
G2-NW	160.10	51 St	51 Ave	52 Ave	22	1.8	1			✓		✓	✓				$ 162.80		$ 1,243.44	$ -	$ -	$ 1,406.24	Fair	3	Sidewalk in acceptable condition, small cracks and chipping on concrete
G2-NW	160.11	51 St	51 Ave	50 Ave													$ -	$ -	$ -	$ -	$ -	$ -			
G2-NW	170.01	51a Ave	52 St	53 St													$ -	$ -	$ -	$ -	$ -	$ -			
G2-NW	170.02	52 Ave	53 St	52 St							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G2-NW	170.03	52 Ave	52 St	51 St							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G2-NW	170.04	52 Ave	51 St	50 St	34	1.8	1					✓					$ 251.60		$ -	$ -	$ -	$ 251.60	Good	3	sediment and small cracks on sidewalk
G2-NW	170.05	54 Ave	50 St	Dead End							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	2	sidewalk in acceptable condition along 54 Ave
G2-NW	170.06	50a St	S Cul De Sac	N Cul De Sac													$ -	$ -	$ -	$ -	$ -	$ -			
G2-NW	170.07	53A Ave	54 Ave Int	W Cul de Sac							✓						$ -	$ -	$ -	$ -	$ -	$ -			
G3-NE	180.01	49 St	50 Ave	51 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Good	3	Sidewalk in good condition
G3-NE	180.02	48 St	51 Ave	50 Ave	5	1.8	1			✓		✓	✓				$ 37.00		$ 282.60	$ -	$ -	$ 319.60	Fair	2	chipping on curb, sidewalk in acceptable condition
G3-NE	180.03	47 St	50 Ave	51 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Fair	2	small cracks and chipping on sidewalk, in acceptable condition
G3-NE	180.04	46 St	50 Ave	52 Ave							✓						$ -	$ -	$ -	$ -	$ -	$ -	Fair	2	sidewalk in good condition, small damage on curb near intersection 47/51
G3-NE	180.05	46 St	52 Ave	Nursing						✓	✓						$ -	$ -	$ -	$ -	$ -	$ -	Fair	1	curbs on east side require repair, sidewalk in acceptable condition
G3-NE	180.06	52 Ave	46 St	East End													$ -	$ -	$ -	$ -	$ -	$ -	Good	3	sidewalk is new, small chip on edge
G3-NE	190.01	51 Ave	46 St	47 St							✓						$ -	$ -	$ -	$ -	$ -	$ -			
G3-NE	190.02	51 Ave	47 St	48 St	4	1.8							✓				$ -	$ -	$ 226.08	$ -	$ -	$ 226.08	Fair	1	chipping and cracks on curb, sidewalk in acceptable condition
G3-NE	190.03	51 Ave	48 St	50 St	44	1.8	1			✓		✓					$ 325.60		$ -	$ -	$ -	$ 325.60	Fair	1	sidewalk on both side are in acceptable condition, minor chipping and cracks on concrete, curb requires repair in front of school
G2-NW	190.04	51 Ave	50 St	52 St													$ -	$ -	$ -	$ -	$ -	$ -			curb requires repair, S sidewalk in acceptable condition, N sidewalk has chipping and cracks

Appendix B3 – Legal Sidewalk Photo Log, 2021

100.01

100.02

100.03

100.04

100.05

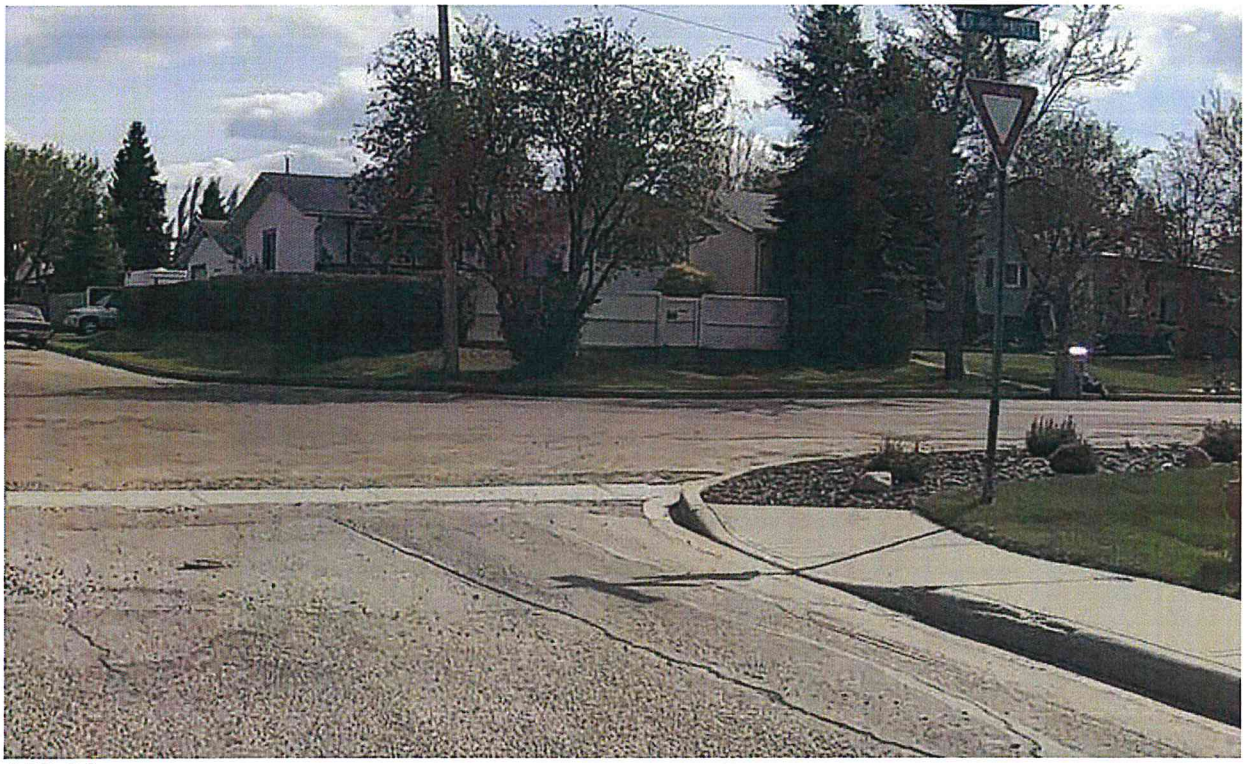
100.06

100.07

110.05

110.04

110.10



150.03

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