TOWN OF CALMAR

Water Master Plan Update

FINAL REPORT

October 2025

ISL Engineering and Land Services Ltd. is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

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7909 51 Avenue NW, Edmonton AB T6E 5L9, T: 780.438.9000 F: 780.438.3700

October 1, 2025
Our Reference: 16898

Town of Calmar
4901 – 50 Avenue
Calmar, AB TOC 0V0

Attention: **Sylvain Losier**, M.ATDR, MCIP, RPP, Chief Administrative Officer
cc. **Graydon Nielson**, Acting Director, Infrastructure and Growth

Dear Sylvain:

Reference: Water Master Plan Update

Enclosed is the Final Report for the Town of Calmar's Water Master Plan Update. We trust that it meets your needs.

The key objective of the Water Master Plan Update is to assess the Town of Calmar's current water distribution infrastructure capacity and the future needs based on projected populations and development areas.

The Water Master Plan Update will provide the Town of Calmar with direction on infrastructure implementation and associated timelines to service future growth, while ensuring infrastructure remains fully functional in providing an appropriate level of service. This information will aid in making informed decisions on capital projects and will provide solutions for efficient, economical, and sustainable municipal services to residents and businesses.

We sincerely appreciate the opportunity to undertake this project on behalf of the Town of Calmar. Should you have any questions or require further information, please do not hesitate to contact the undersigned at 780.438.9000 or AAl-Musawi@islengineering.com, at your convenience.

Sincerely,
ISL Engineering and Land Services Ltd.

Ahmed Al-Musawi, P.Eng.
Project Engineer, Community Development

Corporate Authorization

This document entitled “Water Master Plan Update” has been prepared by ISL Engineering and Land Services Ltd. (ISL) for the use of the Town of Calmar. The information and data provided herein represent ISL’s professional judgment at the time of preparation. ISL denies any liability whatsoever to any other parties who may obtain this report and use it, or any of its contents, without prior written consent from ISL.

Sarah Barbosa, P.Eng., ENV SP Utilities Lead	Josephine Lalonde-Bester, E.I.T. Utilities Support

Ahmed Al-Musawi, P.Eng.
Project Manager

Executive Summary

Introduction

The Town of Calmar (the Town) retained ISL Engineering and Land Services Ltd. (ISL) to complete an update to its 2006 Water Master Plan (WMP). The purpose of this update is to evaluate the performance and capacity of the existing water distribution system, assess its ability to accommodate future growth, and develop a comprehensive capital improvement strategy aligned with the Town's 2045 planning horizon.

This updated Water Master Plan integrates recent development trends, updated land use planning, and detailed hydraulic modeling so that the Town's water infrastructure continues to provide reliable service and fire protection for both existing and future residents and businesses.

Report Summary

- **Purpose and scope:** The WMP provides a comprehensive review of Calmar's existing water infrastructure, assesses system performance under present and future demands, and outlines a strategic servicing concept aligned with projected growth through 2045.
- **Study area:** The Town of Calmar, located approximately 40 km southwest of Edmonton, is serviced by a single-pressure zone water distribution system. The study area includes residential, commercial, industrial, and public service developments, with land use and growth projections informed by the Town's Municipal Development Plan and Area Structure Plans.
- **Design criteria and modelling approach:** Water system performance was assessed under Average Day Demand (ADD), Maximum Day Demand (MDD), Peak Hour Demand (PHD), and MDD plus Fire Flow (MDD + FF) conditions. The hydraulic model was updated using current GIS and SCADA data and calibrated against hydrant testing results. Evaluation criteria included system pressures, fire flow availability, and compliance with the Town's Design and Construction Standards.
- **Existing water system and hydraulic model:** Calmar's water system includes approximately 18 km of watermains, with the majority made of polyvinyl chloride (PVC). The system is supplied from the Capital Region Southwest Water Services Commission (CRSWSC) via a pumphouse and below-ground reservoir, with four pumps supplying the network. A WaterCAD model was developed to simulate system conditions and validate upgrade needs.
- **Existing system assessment:** The model confirmed that system pressures under ADD, MDD, and PHD scenarios meet service standards; however, fire flow deficiencies were noted in several locations due to insufficient looping and undersized pipes. Six upgrades were proposed to improve fire flow capacity and system redundancy.
- **Future system assessment and concept:** The future servicing concept supports the Town's growth to 2045 and is based on implementing the six recommended upgrades to the existing system. No additional upgrades were found to be necessary to accommodate future demands. The updated model confirmed that the proposed network layout, which was mostly based on planned ASP servicing, will provide sufficient pressure and fire flow capacity under projected loading conditions.

WMP Conclusions

Key conclusions from this study include:

- The existing water distribution system generally meets pressure and operational standards but has localized fire flow deficiencies.
- The updated hydraulic model supports a risk-informed approach to prioritizing upgrades that improve system resiliency.
- The proposed future system aligns with land use plans and enables adequate service for projected growth areas.
- High-water users were separately modelled to better reflect system demand distribution.
- Aging infrastructure, particularly asbestos cement (AC) pipes over 50 years old, poses a long-term reliability risk and should be replaced during road reconstruction or capital upgrades.

WMP Recommendations

Recommendations arising from this WMP include:

- Advance the six priority upgrades to address fire flow deficiencies and improve system looping, with an estimated cost of $1.27 million.
- Implement the proposed future network concept to support long-term growth.
- Field-verify pipe sizes and materials prior to construction to minimize risk during detailed design.
- Coordinate water infrastructure upgrades with road and utility projects to optimize cost efficiency.
- Confirm pump station performance on an ongoing basis.
- Maintain and calibrate the hydraulic model regularly with updated SCADA and GIS data to support ongoing capital planning.
- Review and update the WMP following major development phases or every five years so that it remains current and effective.
- Maintain and update GIS records.

Class “D” cost estimates for the proposed existing system upgrades total approximately **$1.3 million**, and for future sanitary servicing, approximately **$5.1 million**, inclusive of engineering and contingencies.

Table of Contents

APPENDICES

TABLES

FIGURES

ACRONYMS

Acronym	Description
ASP	Area Structure Plan
ADD	Average Day Demand
AC	Asbestos Cement
C Value	Hazen-Williams Coefficient
CRSWSC	Capital Region Southwest Water Services Commission
FF	Fire Flow
GIS	Geographic Information System
HGL	Hydraulic Grade Line
ISL	ISL Engineering and Land Services Ltd.
LiDAR	Light Detection and Ranging
MDD	Maximum Daily Demand
MDD + FF	Maximum Daily Demand plus Fire Flow
MDP	Municipal Development Plan
PHD	Peak Hour Demand
PRV	Pressure Reducing Valve
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance / Quality Control
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
TDH	Total Dynamic Head
Town	Town of Calmar
UNKN	Unknown (Pipe Material)

UNITS

Unit	Description
mm	Millimetres
m	Metres
m^3	Cubic Metres
ha	Hectares
L	Litres
L/d	Litres per Day
L/p/d	Litres per Person per Day
L/ha/d	Litres per Hectare per Day
L/s	Litres per Second
m^3/d	Cubic Metres per Day
kPa	Kilopascals
psi	Pounds per Square Inch
igpm	Imperial Gallons per Minute
%	Percent
$	Dollars

1.0 Introduction

1.1 Authorization

The Town of Calmar (Town) retained ISL Engineering and Land Services Ltd. (ISL) to conduct a review of its existing water distribution system and assess its capacity to effectively convey current and future growth water flow volumes. A review and assessment of the water distribution system's capacity were conducted to generate an updated Water Master Plan.

1.2 Background

The original Water Master Plan was completed in 2006 (ISL, 2006). Since then, there has been continued development in the town and some capital improvements to the water infrastructure. To support growth and infrastructure performance in the Town, there is a need to update the previous master plan to reflect the current system conditions, assess the limitations of the existing system, and develop a capital improvement plan to accommodate future growth.

The updated Water Master Plan will help the Town assess the implications of servicing new developments by understanding each area's servicing approach and constraints. By completing a comprehensive review of the available background data and water distribution system hydraulic model, maintaining consistent approaches to issues, and using sound engineering principles, while all the time protecting the natural and human environment, the updated Water Master Plan will guide effective infrastructure improvement and expansion. The updated Water Master Plan will also examine the capacity of the water distribution system to determine the extent of upgrades required to maintain an appropriate level of service for existing and future residents and businesses.

1.3 Purpose of Study

The objectives of the Water Master Plan Update include the following:

- Review current land use and population.
- Review future land use and projected future population.
- Collect the Town's staff concerns and items that may be improved.
- Public engagement to receive feedback from residents and communicate the master plan update's objectives and preliminary results.
- Update existing hydraulic model with the current system configuration and hydraulic loadings.
- Calibrate the model with hydrant flow testing data.
- Assess existing water distribution system capacity and identify constraints.
- Assess the existing water distribution system's capacity to accommodate future growth.
  Review and recommendations for servicing of short-term and long-term development objectives for the Town.
- Develop a future servicing concept.
- Prepare Class "D" cost estimates for the future servicing concept.

2.0 Study Area

2.1 Location

The Town of Calmar is situated along Highway 39, approximately 40 km southwest of Edmonton. It is made up mainly of residential development with some commercial development located along Highway 39 and industrial development in the south and east ends of the Town. The Town is relatively flat with the ground gently sloping towards the northwest, draining into Conjuring Creek. The topography of the study area is shown in **Figure 2.1**.

2.2 Existing Land Use

The development type influences water consumption rates; therefore, obtaining an appropriate classification was vital in ensuring an accurate representation of the Town's water distribution system. To classify existing development, a land use shapefile provided by the Town was used.

Figure 2.2 presents a land use bylaw map that outlines existing development within the Town. The land uses were compared to aerial maps and Google Street View to confirm that parcels were properly categorized. For the purposes of the project, parcels not connected to the water system were excluded from analysis. Additionally, several land use districts were consolidated into broader categories to simplify classification. As a result, the Town's development was grouped into distinct land use types, including residential, commercial, industrial, and public service. **Figure 2.3** illustrates the parcels that are serviced by the water system, along with their corresponding generalized land use classifications.

2.3 Planned Future Land Use

The future land use concept outlined in the Town's Municipal Development Plan (MDP) (Calmar, 2019) is illustrated in **Figure 2.4**.

There are five Area Structure Plans (ASP), including:

- Highway 39 Industrial Park (2016) – approximately 46 ha in the northeast
- Enberg Estates (1994) – approximately 39 ha in the northeast
- Hawks Landing residential development (2005) – approximately 29 ha in the northwest
- Southbridge residential development (2017) – approximately 21 ha in the southwest
- Thomas Creek residential development (2017) – approximately 63 ha in the southwest

The 2045 development horizon was considered in this assessment to align with the Transportation Master Plan. A series of land use assumptions were made for the 2045 horizon with assistance from Town staff. These assumptions are illustrated in **Figure 2.5** and summarized below by land use.

Residential Development

By 2045, it is assumed that 481 new residential lots will be subdivided in Calmar, broken down as shown in **Table 2.1**.

Table 2.1: Future Population Projections

ASP	Development Type	# of Lots Developed by 2045	Population Density[1]	Population
			Pop/Unit	
Thomas Creek	Low-Density Residential	65	2.94	191
Southbridge	Low-Density Residential	82	2.8	230
	Medium-Density Residential	8	1.8	14
Hawk's Landing	Low-Density Residential	226	2.8	633
	Medium Density Residential	100	2.8	280
Total		481	-	1,348

[1] As stipulated in the corresponding ASP.

Commercial Development

By 2045, approximately 8.54 ha of commercial land is expected to be developed, including:

- 0.89 ha site on the south side of Highway 39 east of Westview Drive
- 2.95 ha strip on the south side of Highway 39 between 47 Street and 45 Street
- 4.70 ha strip on the north side of Highway 39 between 47 Street and 45 Street

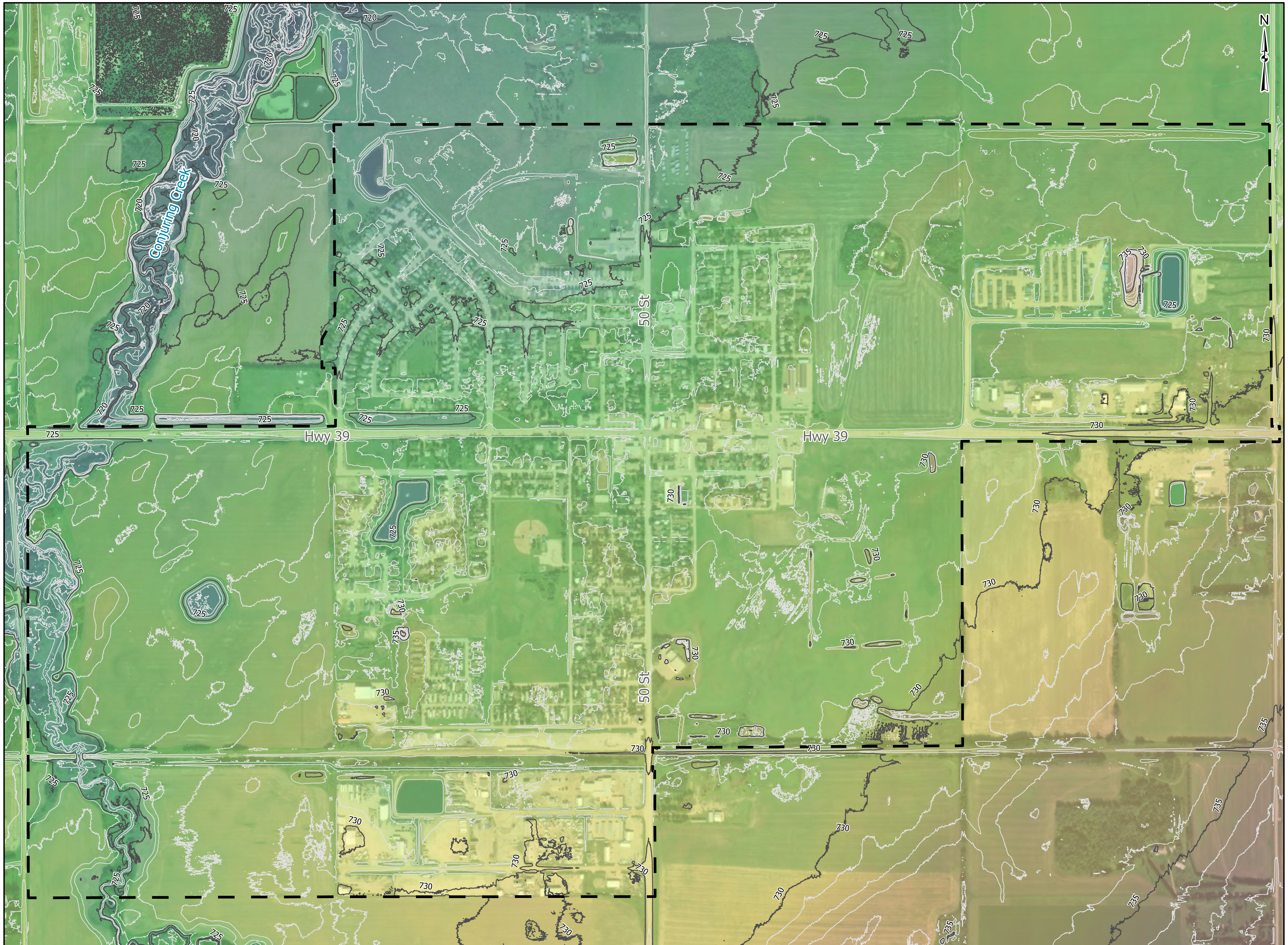
Industrial Development

By 2045, around 58.08 ha of industrial land is projected to be developed, including:

- 16.14 ha site at the western terminus of 42 Avenue in southwest Calmar
- 41.94 ha in the southeast corner of Calmar, south of Highway 39 and east of Highway 795

Beyond 2045, around 8.93 ha of industrial land is projected to be developed, including:

- A 7.65 ha strip and a 1.28 ha site, both east of 45 Street in the southern portion of the Highway 39 Industrial Park



LEGEND

Town Boundary

Minor Contour - 1m

Major Contour - 5m

Elevation (m)

747.765

682.615

TITLE

TOPOGRAPHY

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 CSRS 3TM 114

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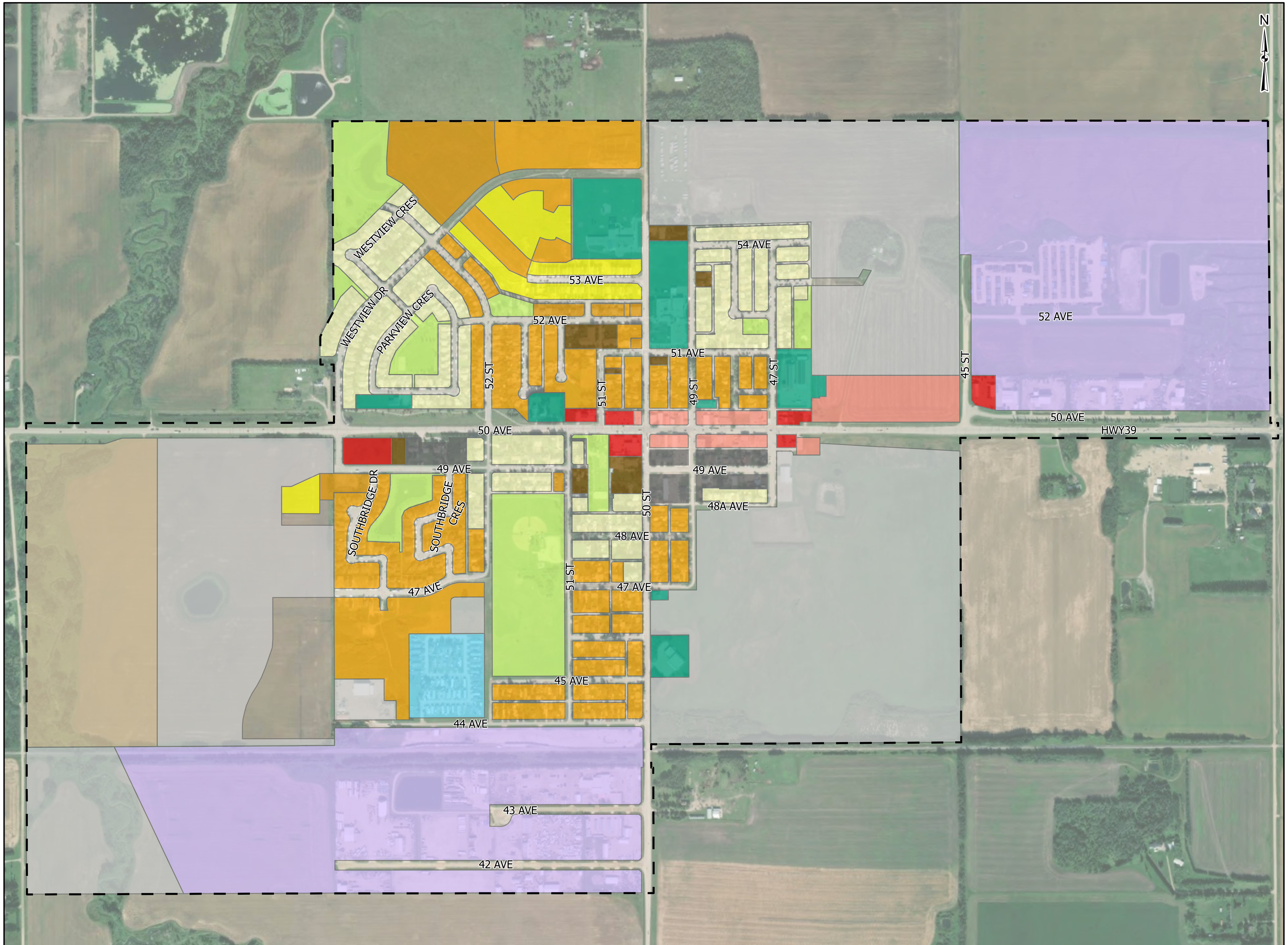
FIGURE	2.1
DATE	7/11/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates.aprx - Figure 2.1_Topography



LEGEND

Town Boundary

Land Use

- R1 Residential (Single Detached)
- R1B Residential (Small Lot, Single Detached)
- R2 Residential (Narrow Lot)
- R3 Residential (Medium Density)
- R4 Residential (Higher Density)
- RCE Residential (Country Estate)
- RMHP Residential (Manufactured Home Park)
- C1 Commercial (Central)
- C2 Commercial (Highway)
- M1 Industrial
- P Parks and Recreation
- US Urban Services
- DC Direct Control
- UR Urban Reserve

TITLE
LAND USE BYLAW

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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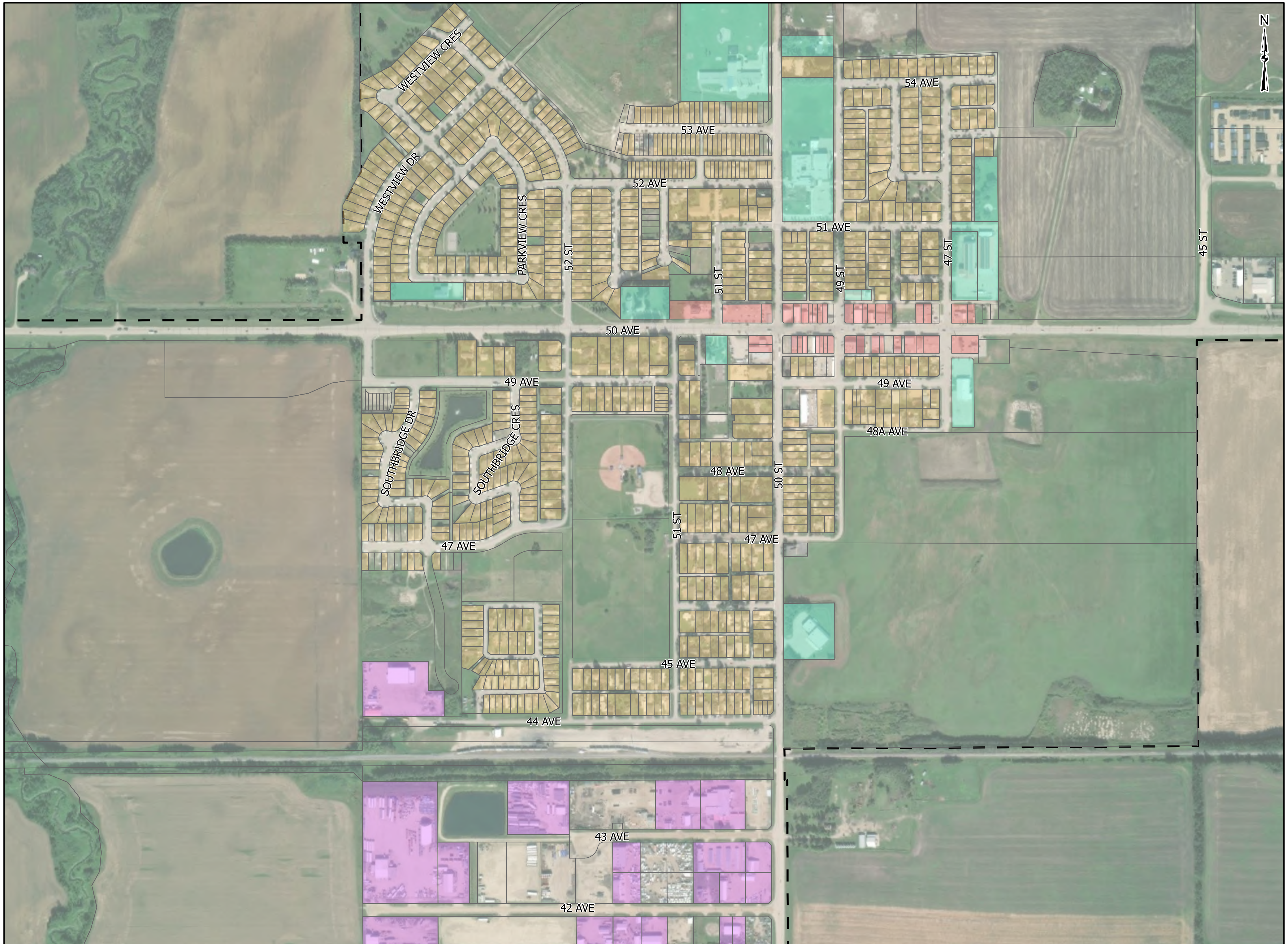
FIGURE	2.2
DATE	7/4/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND
- Parcel
- Town Boundary

Generalized Land Use
- Commercial
- Industrial
- Public Services
- Residential

TITLE
EXISTING LAND USE FOR SERVICED PARCELS

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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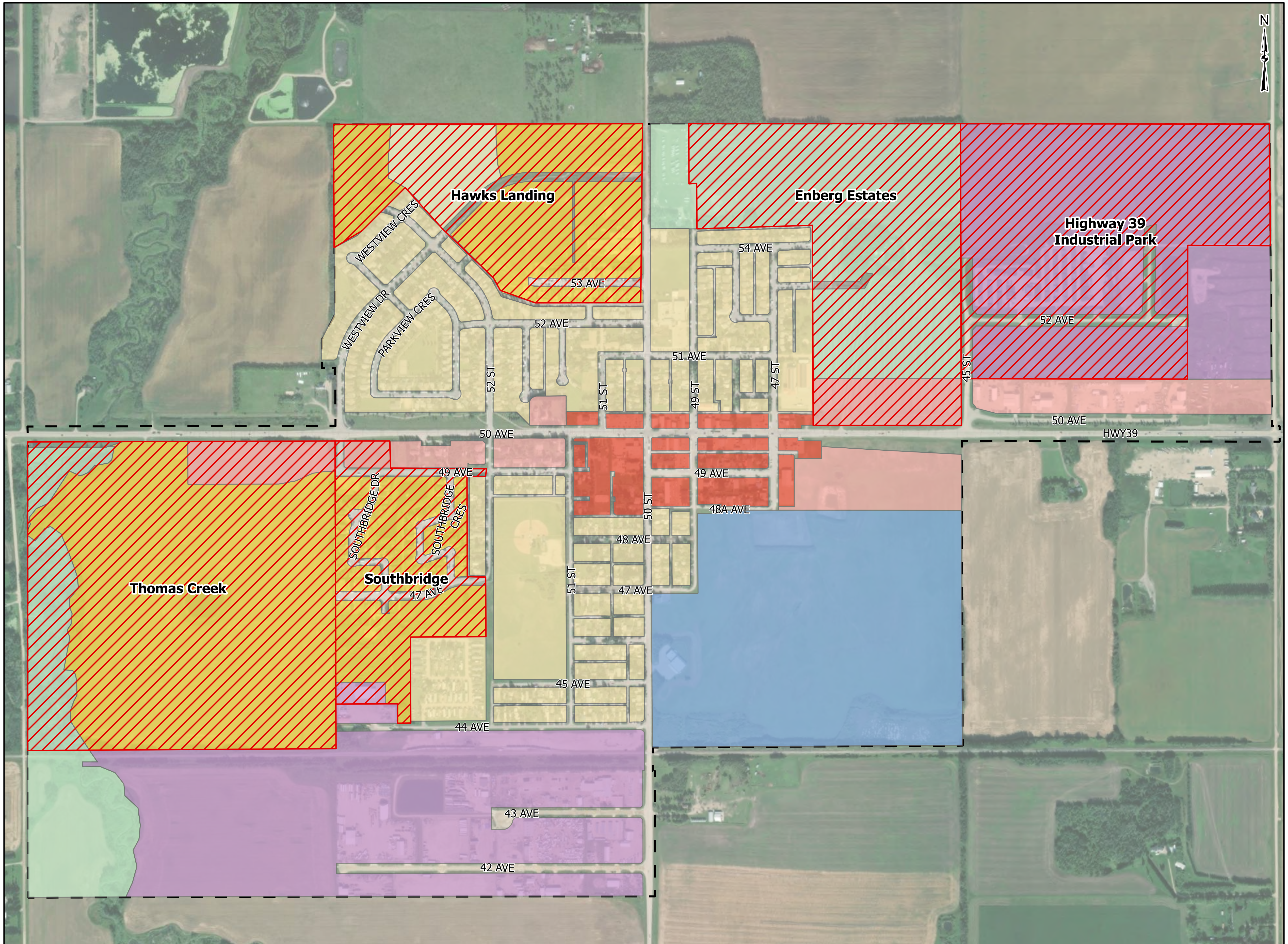
FIGURE	2.3
DATE	7/28/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

- Town Boundary
- Area Structure Plan (ASP)

Land Use

- Existing Neighbourhood
- Future Neighbourhood
- Planned Neighbourhood
- Future Park
- Commercial
- Industrial
- Special Study Area
- Downtown

TITLE

FUTURE LAND USE CONCEPT
MUNICIPAL DEVELOPMENT PLAN

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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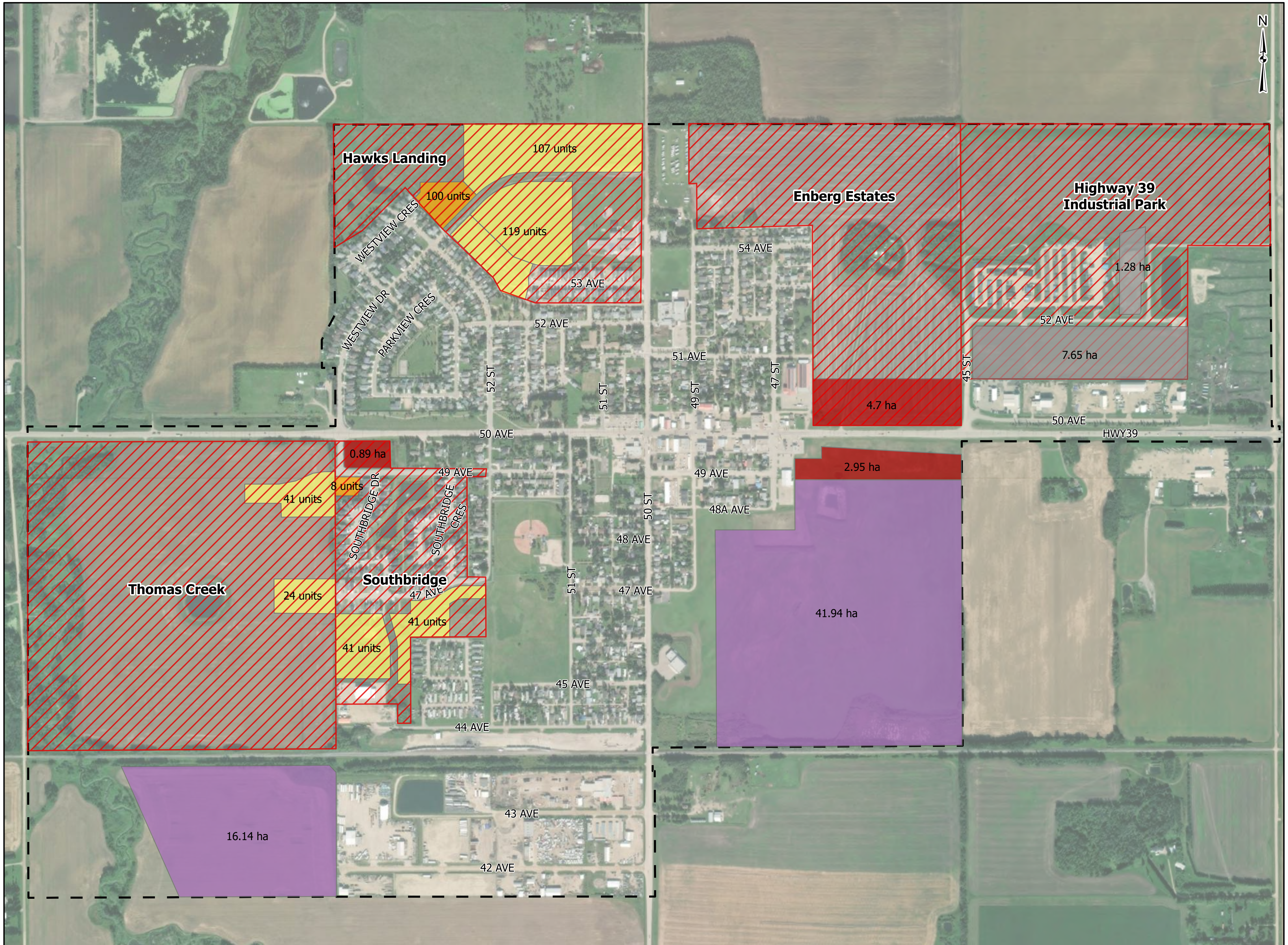
FIGURE	2.4
DATE	7/4/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_MP_Updates.aprx - Figure 2.3_Future Land Use (MDP)



LEGEND

- Town Boundary
- Area Structure Plan (ASP)

Anticipated Land Use

- Future Commercial
- Future Industrial
- Future Low Density Residential
- Future Medium Density Residential

Anticipated Land Use (Post 20-Year Horizon)

- Future Industrial

TITLE

FUTURE LAND USE ASSUMPTIONS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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FIGURE	2.5
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

2.4 Historic Rate Review

The Town provided ISL with historic production data for the sewer system and consumption data for the water system from 2020 to 2024. The production data includes total monthly flow, weekly average flow, and max/min weekly flow. The consumption data includes total monthly flow, daily average flow, and max/min daily flows. This data was used to analyze the historic trends for each system and review the water consumption and sewage generation rates that have been applied for past studies.

The following graph, **Figure 2.6**, compares the water consumed to the sewage generated. Generally, the sewage generation rate tends to be larger than the water consumption, which is uncharacteristic when considering the typical relationship between water consumption and sewage generation. This discrepancy may be attributed to several factors, such as data inconsistencies, unmetered water reuse in industrial areas, or gaps in the metering data. Additionally, both water consumption and sewage generation show a slight downward trend over the observed period.

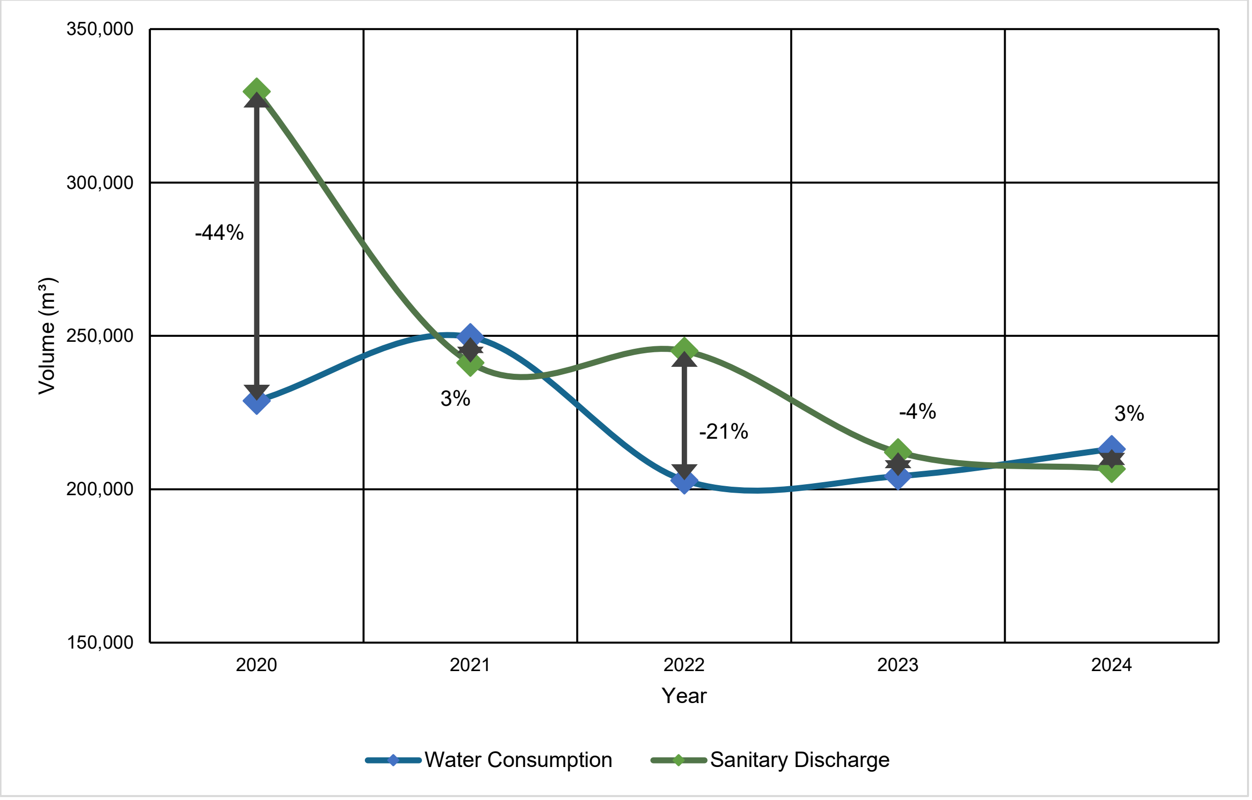


Figure 2.6: Historical Consumption and Discharge Volumes

With the historic water consumption data, an analysis of the maximum daily demand (MDD) peaking factor was undertaken by comparing the average and peak flows of each month for each year of data. It is noted that an analysis of the peak hour demand was not completed as no hourly data was available. **Table 2.2** summarizes the MDD peaking factors for each month from 2020 to 2024. The maximum MDD peaking factor of 1.65 was observed in May of 2023 and October of 2024.

Table 2.2: Summary of MDD Peaking Factors

Month	Peaking Factors				
	2020	2021	2022	2023	2024
January	1.45	1.30	1.28	1.23	1.19
February	1.22	1.14	1.26	1.25	1.29
March	1.18	1.16	1.13	1.31	1.25
April	1.24	1.29	1.16	1.32	1.35
May	1.27	1.59	1.37	1.65	1.30
June	1.46	1.47	1.56	1.51	1.62
July	1.30	1.34	1.58	1.33	1.38
August	1.33	1.58	1.50	1.52	1.27
September	1.23	1.21	1.24	1.17	1.23
October	1.57	1.21	1.53	1.37	1.65
November	1.32	1.21	1.33	1.47	1.28
December	1.23	1.20	1.26	1.32	1.42
Max	**1.57**	**1.59**	**1.58**	**1.65**	**1.65**

The water consumption and sewage generation rates were determined based on the SCADA provided and the census population data from 2020 to 2024 (Government of Alberta, 2025). These are summarized in **Table 2.3**. The maximum and minimum rates are highlighted for reference, and the average rates are also provided. To better illustrate the trends in the data, **Figure 2.7** is provided.

Table 2.3: Historic Water Consumption and Sewage Generation Rates

Year	Population	Water Consumption Rate	Sewage Generation Rate
		L/p/d	L/p/d
2020	2,319	270	389
2021	2,264	302	292
2022	2,286	243	294
2023	2,327	240	250
2024	2,335	250	242
	Average	**261**	**293**

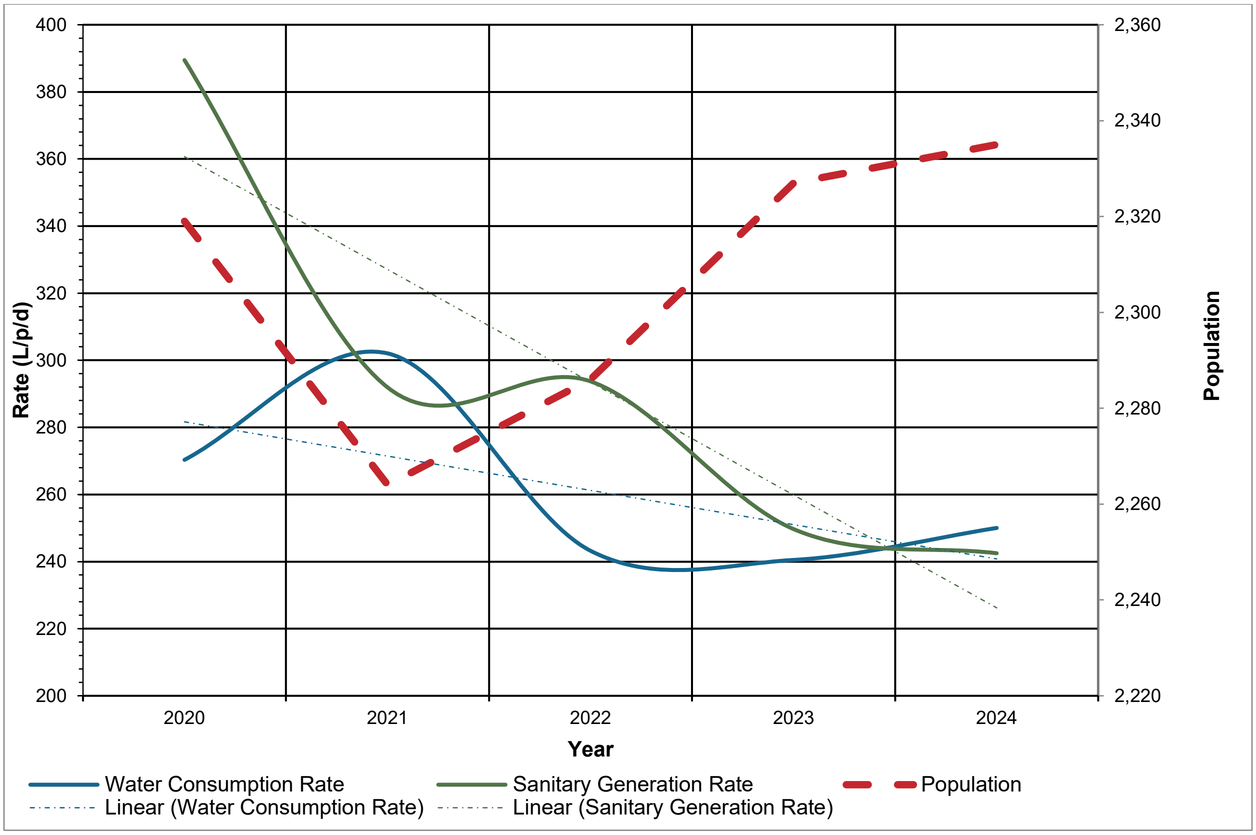


Figure 2.7: Historic Water Consumption and Sewage Generation Rate Comparison

3.0 Design Criteria

The design criteria used to assess the Town's water distribution system were derived from the existing Water Master Plan (ISL, 2006), Calmar's Design and Construction Standards (Calmar, 2020), typical municipal servicing standards in the Province of Alberta, and fire flow requirements from the Fire Underwriters Survey. In addition, water consumption rates were derived based on the Town's population rates, service areas, and historic production data.

3.1 Assessment Scenarios

Model simulations were conducted to analyze the water distribution system under both existing and future conditions. Scenarios reviewed included:

- Steady State:
  - Average day demand (ADD)
  - Maximum daily demand (MDD)
  - Peak hour demand (PHD)
- Steady State with Fire Flow Analysis:
  - Maximum day demand plus fire flow (MDD + FF)

3.2 Existing System Consumption Rates

The existing system consumption rates used in this analysis were derived through historic production data provided by the Town. Consumption rates for residential and non-residential were determined, in addition to the application of high-water users throughout the Town. The derivation of rates is based on 2020 to 2024 metering data obtained from the main meter leaving the reservoir into the distribution system. The rates were calculated by taking the average daily flow from the past five years, subtracting the top water user demand, and determining a ratio iteratively for residential versus non-residential consumption to match the historic average daily flow. These rates are summarized in **Table 3.1**. Note that the consumption rates in the model have the high-water user demand subtracted, and thus will be slightly lower than the rates listed in **Table 2.3**.

Table 3.1: Existing System Consumption Rates

Classification	Rate
Residential Consumption	150 L/p/d
Non-Residential Consumption	2,500 L/ha/d
High-Water User Demand	Varies by High-Water User (Total Demand of 3.22 L/s)

3.2.2 High-Water Users Demand

The Town provided a list of the top water meters from March 2025 to June 2025. The top eight users from this list were considered in the model, as shown in **Figure 3.1**. To better represent the high-water users in the model, their consumption was excluded from the general rate derivation. Instead, their usage was assigned individually in the model through fixed demands at the nearest nodes to each property.

This approach was used to ensure accurate allocation of flow throughout the network, so that areas with higher water use received an appropriate share of the system capacity. The total demand of the high-water users is 3.22 L/s.

Any low-density residential parcels appearing on the list, such as A-4708 49 Avenue and 5113 49 Avenue, were disregarded. These properties typically have lower water demands compared to non-residential parcels, and their presence among the top users suggests some anomalies. Such unusually high consumption is not characteristic of standard residential use and may be indicative of issues such as system leaks, meter malfunction, or other isolated irregularities. As these anomalies do not reflect typical demands, they were not included in the modelling assumptions.

3.3 Future System Consumption Rates

The consumption rates for future developments are consistent with the rates in the Town's Design and Construction Standards. While these rates are relatively high compared to typical real-world usage, they have been used as a conservative measure. This approach ensures a built-in buffer to accommodate potential variations or refinements at the detailed design stage. The rates are as follows:

- Residential ADD – 360 L/person/d
- Commercial/Light Industrial ADD – 22,500 L/ha/day

3.4 Peaking Factors

The following peaking factors from the Town's Design and Construction Standards were used to establish MDD and PHD for both the existing and future scenarios:

- MDD = 1.8 x ADD
- PHD = 3.0 x ADD

3.5 Operating Pressure Criteria

The Town's water distribution system was assessed using the following criteria based on the Town's Design and Construction Standards:

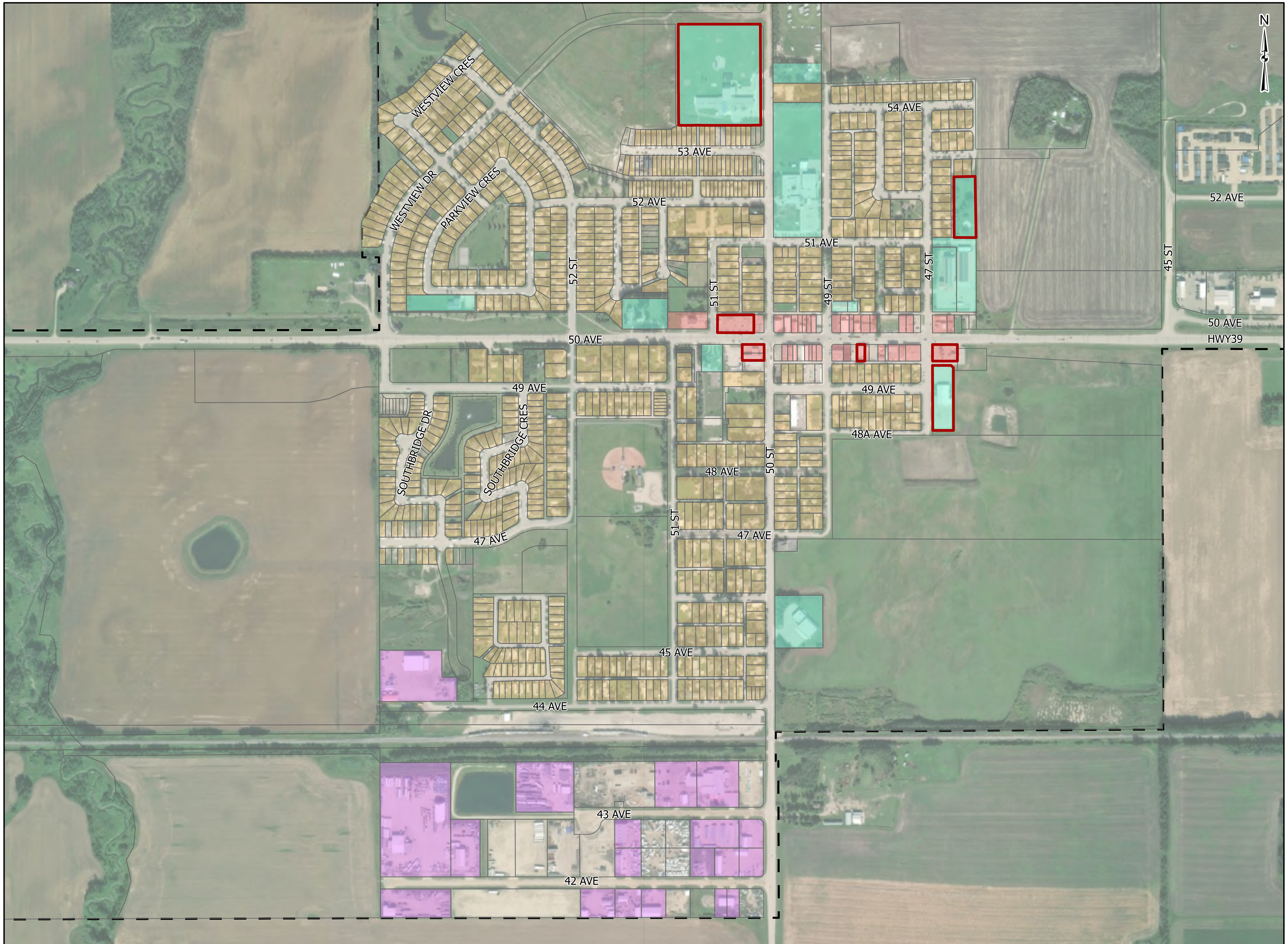
- Normal operating pressure range for residential distribution shall be between 350 kPa and 550 kPa
- Minimum residual pressure at any location in the system of 275 kPa under Peak Hour Demand
- Minimum residual pressure at any location in the system of 140 kPa under fire flow conditions

3.6 Fire Flow Criteria

The Town's Standards recommend fire flow requirements for various land use types, as shown in **Table 3.2**. The industrial land use was not included in the Town's Standards, so a value was approximated based on other municipalities.

Table 3.2: Minimum Fire Flow by Land Use

Land Use	Minimum Fire Flow
Commercial	270 L/s
Industrial	225 L/s
Public Services	180 L/s
Medium and High-Density Residential	180 L/s
Single Family and Low-Density Residential	100 L/s



LEGEND

- High-Water Users
- Parcel
- Town Boundary

Generalized Land Use

- Commercial
- Industrial
- Public Services
- Residential

TITLE
HIGH-WATER USERS

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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FIGURE	3.1
DATE	7/23/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

ISL

4.0 Existing Water System

4.1 Water Supply

The Town of Calmar receives its potable water from the Capital Region Southwest Water Services Commission (CRSWSC), which sources treated water from the City of Edmonton. This water is conveyed via a 600 mm transmission main to the City of Leduc, from which smaller lateral mains deliver water to surrounding communities, including Calmar.

The below-ground reservoir and pumphouse facility is located near 50 Avenue and 49 Avenue, just west of 50 Street. This facility was upgraded in 2015 with the addition of a new 2,600 m^3 cell (ISL, 2015). This expansion brought the total storage capacity to approximately 5,000 m^3, providing sufficient supply to meet Calmar's projected water demand through 2036. Given that the most recent reservoir study was completed in 2016, it is recommended that the study be updated to reflect current conditions, population growth, and water demand trends.

The pumphouse includes the following four pumps:

- VSP-212 – Variable speed pump with a design capacity of 49 L/s at 62 m TDH
- VSP-213 – Variable speed pump with a design capacity of 49 L/s at 62 m TDH
- CSP-214 – Constant speed pump with a design capacity of 43 L/s at 62 m TDH
- FP-211 – Fire pump with a design capacity of 190 L/s at 62 m TDH

Water is distributed from the pumphouse directly to the municipal distribution system and to a dedicated truck fill station. The water distribution system operates within a single pressure zone.

4.2 Water Distribution System

Calmar is currently serviced by approximately 18 km of watermains. The water distribution system details with regard to pipe diameter, material, and installation period are shown in **Figures 4.1**, **4.2**, and **4.3**, respectively. The watermains are predominantly made of polyvinyl chloride (PVC) in the newer developments or asbestos cement (AC) in the older parts of Town, and some steel pipes around the pumphouse. About 40% of the pipes in the system are over 50 years old. **Tables 4.1** to **4.3** below summarize the water system based on diameter, material, and installation year, respectively.

Table 4.1: Existing System Diameter Summary

Diameter	Total Length	Percentage of Total
mm	m	%
100	437	2.39
150	7,758	42.45
200	4,690	25.66
250	2,074	11.35
300	789	4.32
350	257	1.41
400	2,269	12.42
Total	**18,273**	**100.00**

Table 4.2: Existing System Material Summary

Material	Total Length	Percentage of Total
	m	%
Asbestos Cement (AC)	5,454	29.85
Polyvinyl Chloride (PVC)	11,265	61.65
Steel	243	1.33
Unknown	1,311	7.17
Total	**18,273**	**100.00**

Table 4.3: Existing System Installation Period Summary

Installation Period	Total Length	Percentage of Total
	m	%
1950-1959	5,124	28.04
1960-1969	773	4.23
1970-1979	3,619	19.81
1980-1989	3,155	17.27
1990-1999	0	0.00
2000-2009	3,584	19.61
2010-2024	838	4.59
Unknown	1,180	6.46
Total	**18,273**	**100.00**

LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

WATERMAIN DIAMETER

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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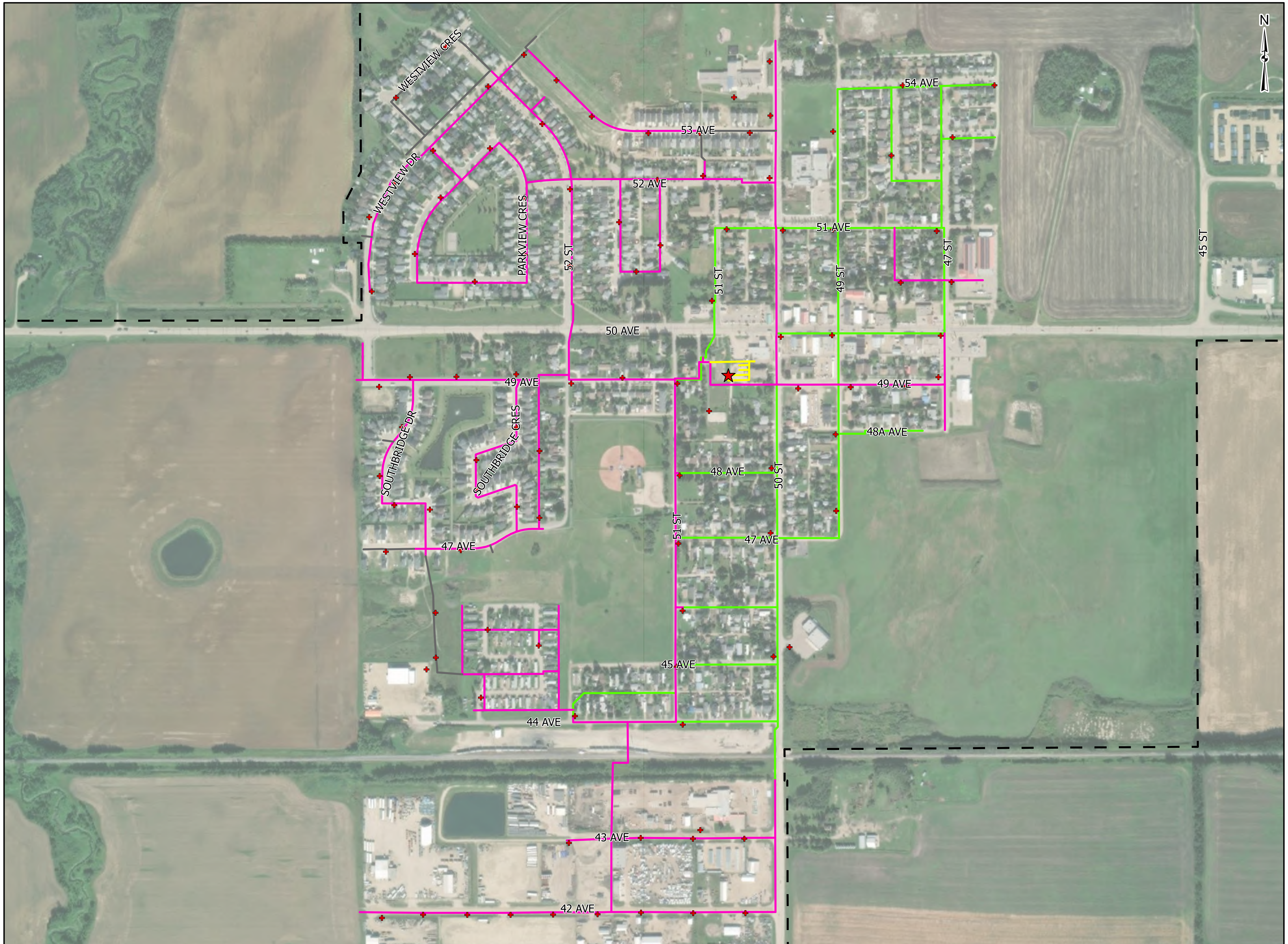
FIGURE	4.1
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Watermain Material

- Asbestos Cement
- PVC
- Steel
- Unknown

TITLE
WATERMAIN MATERIAL

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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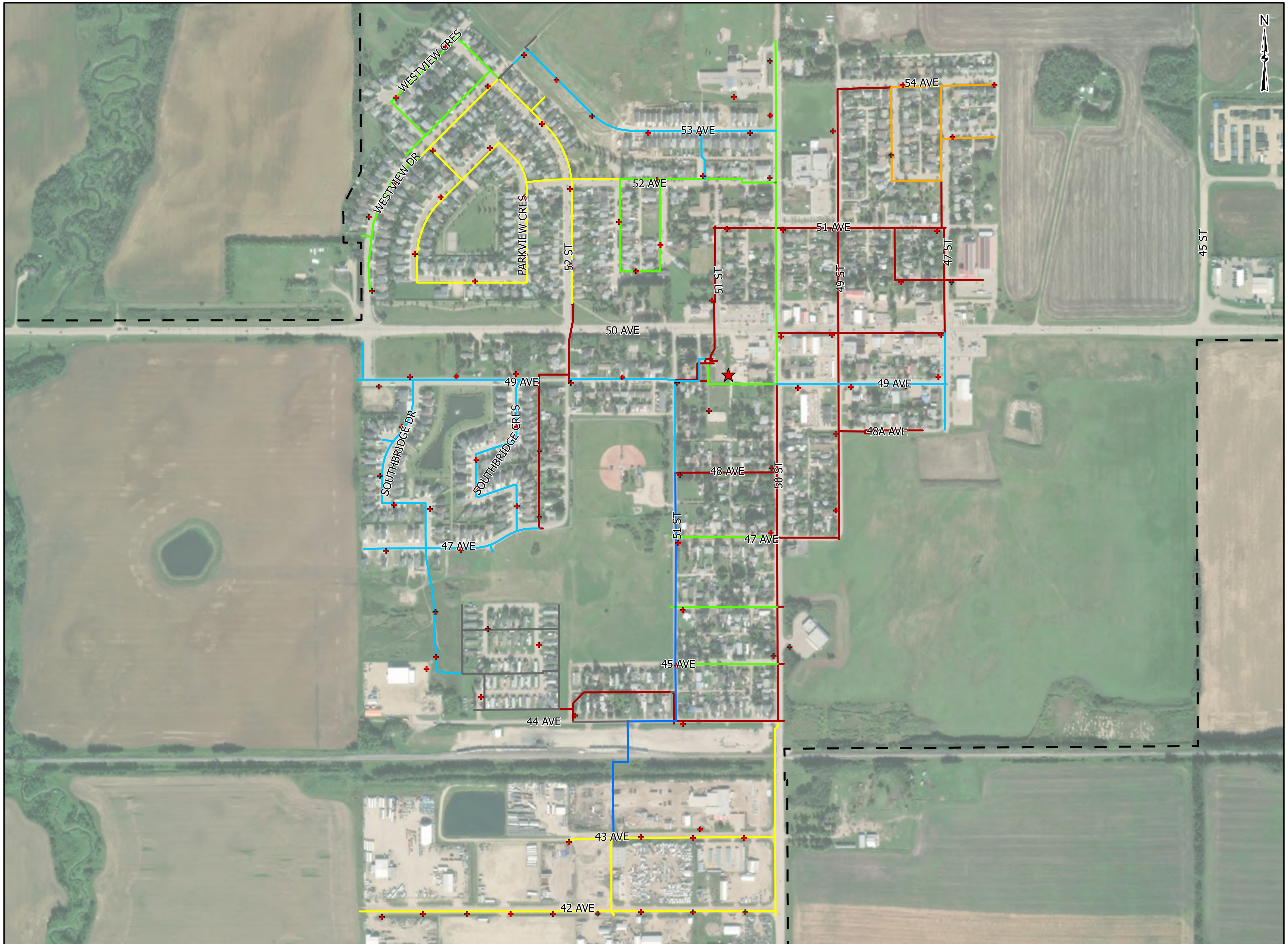
FIGURE	4.2
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Watermain Installation Period

- 1950-1959
- 1960-1969
- 1970-1979
- 1980-1989
- 2000-2009
- 2010-2024
- Unknown

TITLE
WATERMAIN INSTALLATION PERIOD

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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FIGURE	4.3
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

ISL

5.0 Hydraulic Model Development

5.1 Computer Model

The existing water distribution model was generated in 2006 by ISL and validated through hydrant testing and a calibration exercise. Bentley OpenFlows WaterCAD Connect Edition Update 3 was used to update the existing water distribution model. WaterCAD is a powerful analysis tool that utilizes pump curve data, routes flow through the physical distribution system, and estimates available fire flow at any location in the water distribution system based on minimum system pressure. Modelling files will be included as part of the final report submission.

All available updated GIS data relevant to the water system received from the Town was reviewed in detail and used to update the WaterCAD model. The model was inspected by performing a series of quality assurance/quality control (QA/QC) tasks to ensure that all data was detailed and accurate.

5.2 Model Update

The model was updated with current GIS shapefiles and reviewed with recent as-builts. Model updates are shown in **Figure 5.1** and some major changes are listed below:

- Watermain on 50 Street and 49 Avenue updated to 400 mm
- Water along 51 Street updated to 400 mm from the pumphouse to 43 Avenue
- Westview Crescent and Westview Drive watermains added to the model
- Southbridge watermains added to model
- Hawk’s Landing watermain along 53 Avenue added to the model
- Watermains in the industrial area added to the model

5.3 Service Area Delineation

Following the update to the water distribution system model, the study area was subdivided into service areas for the purpose of deriving populations and system demands. The service areas were delineated using individual lot boundaries and classified by development type as outlined in Section 2.2, which includes residential, commercial, industrial, and public service categories.

Lots associated with any of the high-water users were removed from the individual lot dataset to avoid double-counting any demands at these parcels. Populations were then spatially allocated to the individual lots. Each lot was assigned to the nearest node in ArcGIS, and lots sharing the same node were merged to formulate the final service area polygons. The populations associated with each development type on a per lot basis were summed during the merging process.

5.4 Hydrant Testing

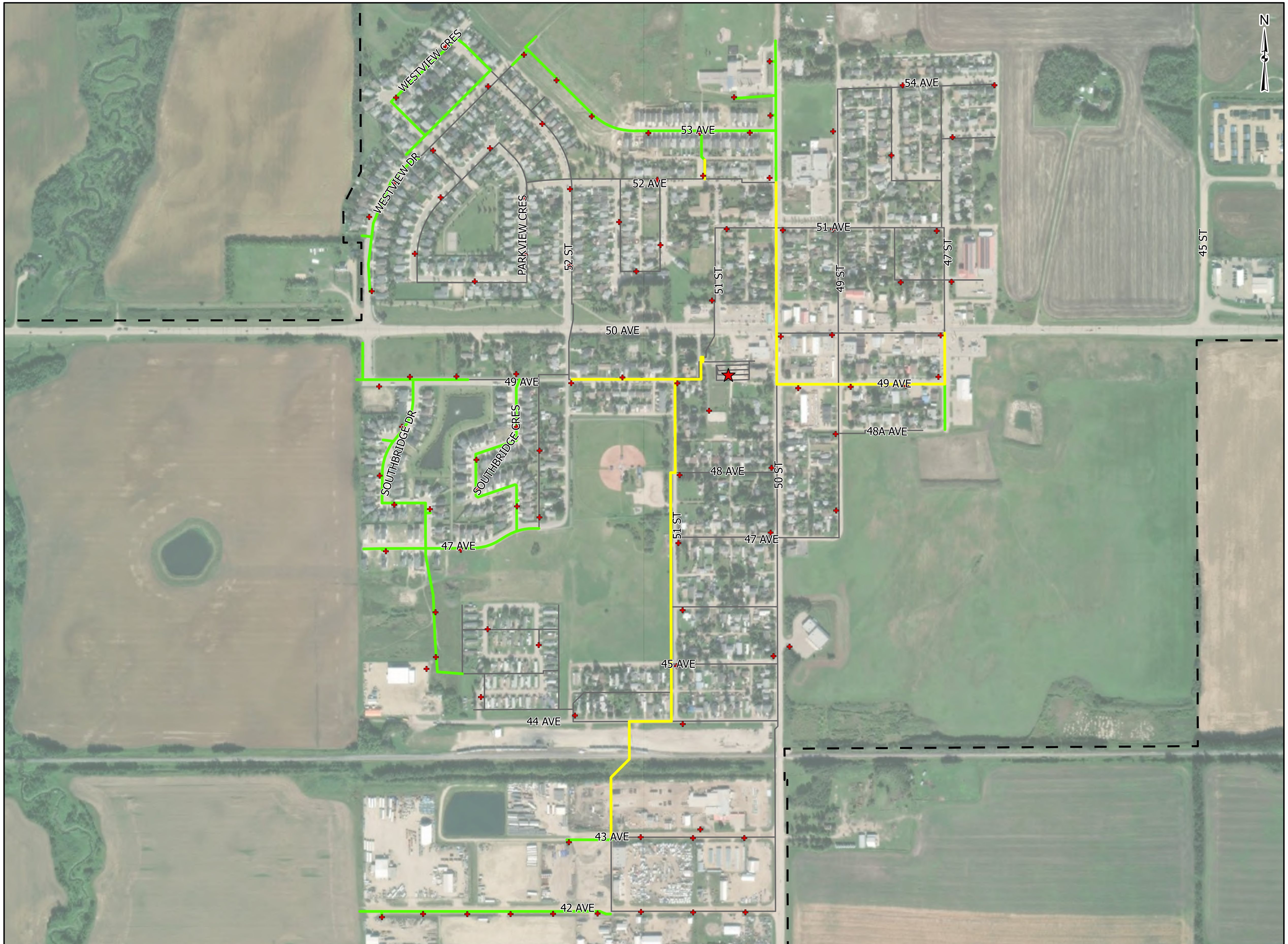
SFE Global was contracted by ISL to complete hydrant tests at three strategic locations throughout Calmar. These hydrant test locations are the same as in the 2006 Water Master Plan and represent multiple physical locations within Calmar. One residual monitoring station (logger) was installed to supplement the hydrant flow tests. A map of the flow hydrants, residual hydrants, and logger location is provided in **Figure 5.2**.

The results of the hydrant testing are summarized in **Table 5.1**. The complete fire flow test reports are provided in **Appendix A**.

Table 5.1: Hydrant Flow Test Results

Hydrant Test	Time of Test	Residual Hydrant Elevation[1]	Test Type	Flow at Hydrant	Flow at Hydrant	Residual Hydrant			Logger No. 1		
						Pressure		HGL	Pressure[2]		HGL
		m		igpm	L/s	psi	kPa	m	psi	kPa	m
1	10:14	727.28	Static	-	-	62	427	770.9	60	416	769.7
			1 Port	1009	76.48	34	234	751.2	31	255[3]	749.1
2	10:37	726.09	Static	-	-	64	441	771.1	60	416	769.7
			1 Port	1039	78.76	38	262	752.8	38	262	753.9
3	11:00	726.92	Static	-	-	62	427	770.5	60	416	769.7
			1 Port	902	68.37	34	234	750.8	38	259	753.6

[1] Elevations were obtained via LiDAR data.
[2] Static pressures at the logger were calculated by taking the average of the overall logger data.
[3] This value was manually refined to mitigate potential inaccuracies identified in the field data.



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Watermain
- Pipes Updated in Model
- Pipes Added to Model
- Town Boundary

TITLE
MODEL UPDATES

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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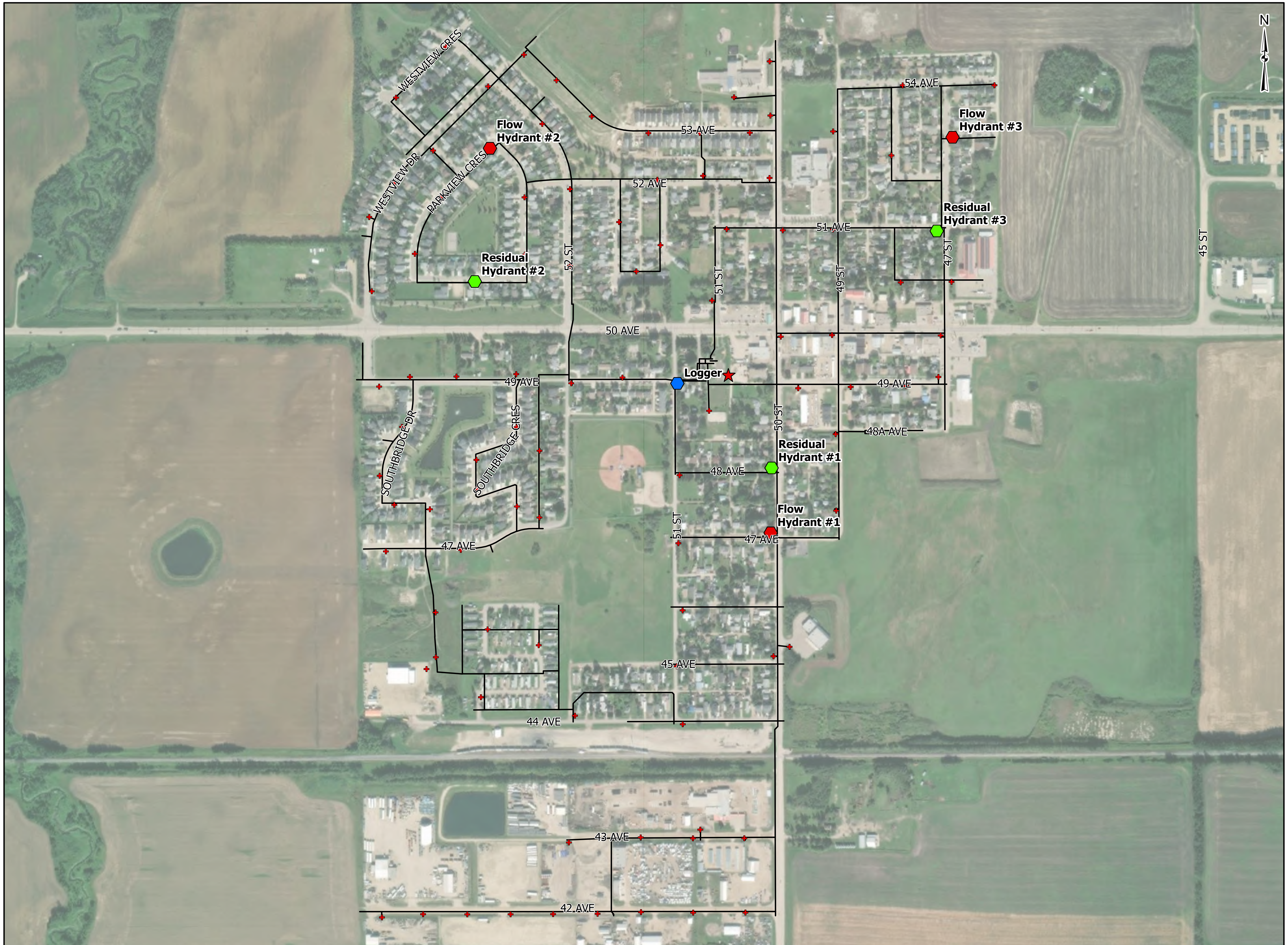
ISL

FIGURE	5.1
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure X_Model Updates



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Water Pipe

Hydrant Test Locations

- Residual
- Flow
- Logger

TITLE
HYDRANT TESTING LOCATIONS

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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ISL

FIGURE	5.2
DATE	7/28/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure X_Hydrant Testing Locations

5.5 Model Calibration

Model calibration was performed by using the resultant pressures and associated flow rates obtained from the three hydrant tests. This was done to ensure proper Hazen-Williams ‘C’ values were used in the WaterCAD model to simulate pipe roughness and aging. The final ‘C’ values determined during calibration are listed in **Table 5.3** below.

The following assumptions were made during the model calibration:

- A pressure reducing valve (PRV) for the primary distribution pump was assigned a hydraulic grade line (HGL)setting of 770.25 m to control the HGL out of the facility. This value was determined during static flow calibration and confirmed by the Town.
- A PRV was added at the constant discharge pump and set to a hydraulic grade setting of 756 m. This was necessary to match the pressures observed in the field during the flow tests.
- Additional investigation into the pumps’ performance could be warranted to verify the field performance compared to the theoretical pump curves.

The calibration results are shown in **Table 5.2** and **Figures 5.3** and **5.4.** A summary of the calibration process and key findings is as follows:

- Overall Results: The difference between field and modelled pressures falls within a range of ±30 kPa for all three tests, which was deemed acceptable for this assessment.
- Logger Readings: The field pressure recorded during hydrant test #1 appears anomalous, as it does not align with the results from tests #2 and #3 or with the modelled data, as seen in **Figure 5.5**. Unlike the other two tests, the flow during test #1 does not stabilize during the test. A slight stabilization is observed near the end of the test, at around 37 psi (255 kPa), which corresponds well with the modelled data calibrated to tests #2 and #3. Accordingly, a logger pressure of 255 kPa was adopted for test #1 in the analysis. This anomaly could potentially be attributed to the proximity of test #1 to the pumps.
- Model Calibration Parameters: The Hazen-Williams coefficient for AC pipe was set to 130, which is on the higher end and higher than used in the previous master plan. This adjustment may be compensating for potential pipe size discrepancies or possible variations of pipe alignments and connectivity in the field, helping achieve better alignment between modelled and observed results.
- Recommendation: Pipe diameters should be field-confirmed prior to proceeding with any upgrades. For full certainty, hydrovac exposure followed by measurement with an OD tape is recommended. If direct access around the entire circumference is not feasible, diameters may be estimated using a measuring tape, although this approach carries higher uncertainty.

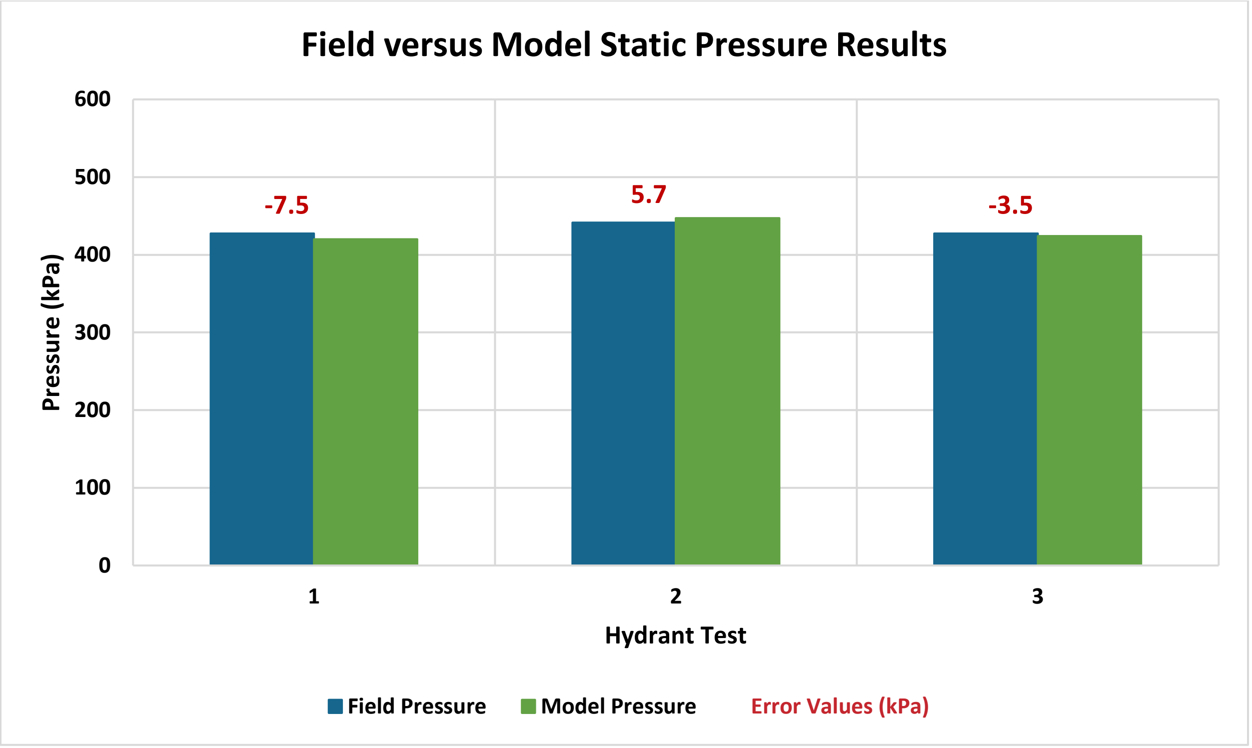


Figure 5.3: Static Calibration Results

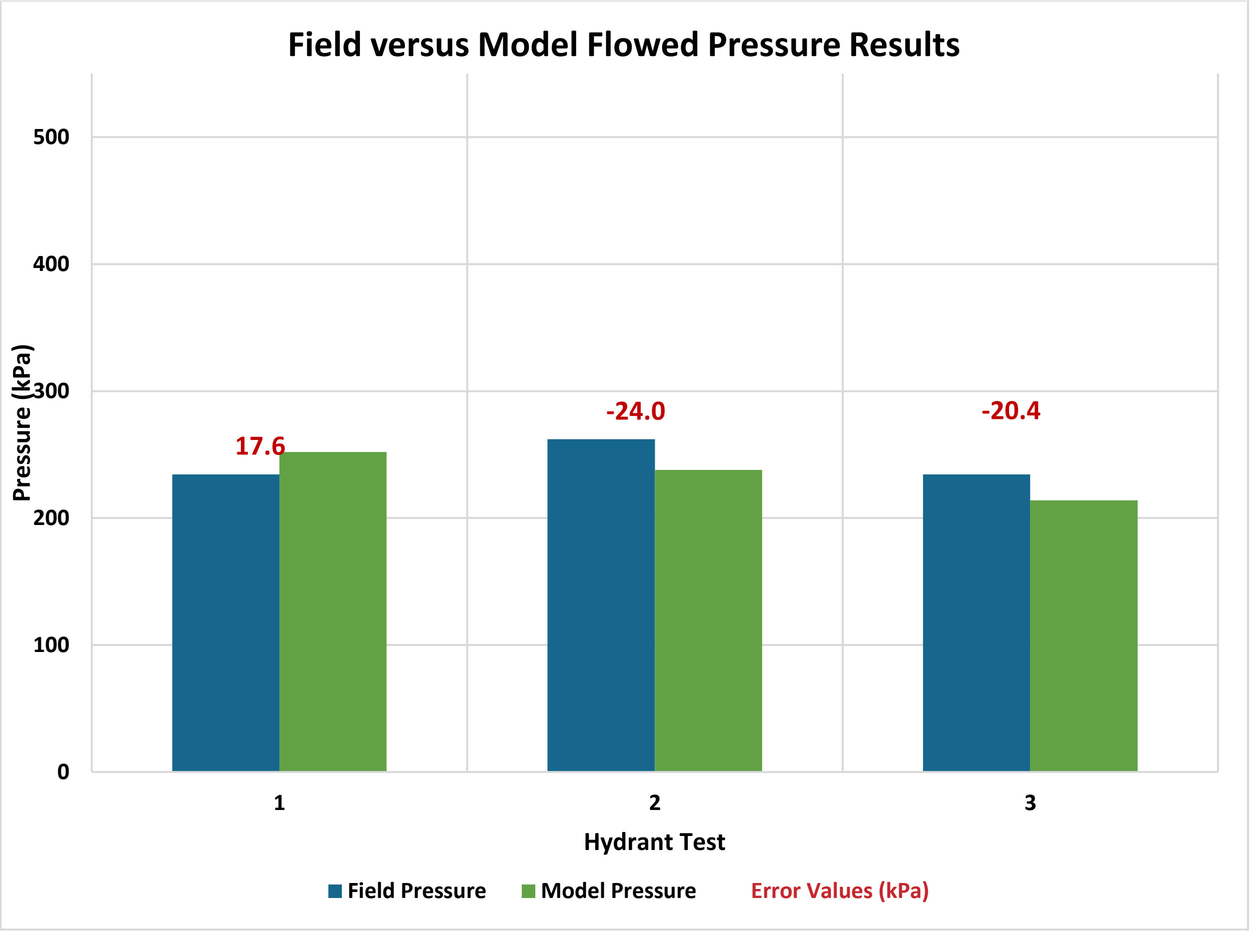


Figure 5.4: Residual Calibration Results

Table 5.2: Calibration Results

Hydrant Test	Test Type	Flow at Hydrant	Residual Hydrant			Logger 1		
			Field Pressure	Model Pressure	Model Error	Field Pressure	Model Pressure	Model Error
		L/s	kPa	kPa	kPa	kPa	kPa	kPa
1	Static		427.5	420.0	-7.5	416.3	422.0	5.7
	Flow	76.48	234.4	252.0	17.6	255.0	259.0	4.0
2	Static		441.3	447.0	5.7	416.3	422.0	5.7
	Flow	78.76	262.0	238.0	-24.0	261.8	255.0	-6.8
3	Static		427.5	424.0	-3.5	416.3	422.0	5.7
	Flow	68.37	234.4	214.0	-20.4	259.3	270.0	10.7

Figure 5.5: Logger Pressure During Hydrant Tests

Table 5.3: Hazen-Williams 'C' Factor

Material	C Value
Asbestos Cement (AC)	130
Polyvinyl Chloride (PVC)	140
Steel	100
Unknown (UNKN)	130

6.0 Existing System Assessment

The existing water distribution system was analyzed under four (4) different scenarios to determine system conditions. As mentioned in Section 3.1, these scenarios included:

- Steady State:
  - Average day demand (ADD)
  - Maximum daily demand (MDD)
  - Peak hour demand (PHD)
- Steady State with Fire Flow Analysis:
  - Maximum day demand plus fire flow (MDD + FF)

Additionally, the water distribution system was assessed for reservoir storage and pumping capacity under the existing conditions. **Table 6.1** summarizes the demands that were used in these assessments. The pump configuration shown in **Table 6.2** was used to assess the existing system.

Table 6.1: Existing System Demands

Scenario	Demand	
	L/s	m^3/d
ADD	6.94	599.62
MDD	12.49	1,079.14
PHD	20.81	1,797.98

Table 6.2: Modelled Pump Configuration

Pump Name	Pump Type	Set Point HGL	Existing System Model Scenario			
		m	ADD	MDD	MDD+FF	PHD
PMP-F1	Fire Pump	-	OFF	OFF	ON	OFF
PMP-D2	Variable Speed	770.25	ON	ON	ON	ON
PMP-D3	Variable Speed	770.25	OFF	OFF	OFF	OFF
PMP-D4	Constant Speed	756.00	OFF	OFF	OFF	OFF

Pump controls are set to the following:

- One variable speed pump operates normally as the primary distribution pump.
- The second variable speed pump is shut off to act as a 100% backup for the operating distribution pump.
- The constant speed pump turns on if the pressure at the discharge from the pumphouse falls below 360kPa at which time the operating variable speed distribution pump will slow, if necessary, to prevent the pressure leaving the pumphouse from exceeding 510kPa.
- The fire pump was only turned on for the MDD + FF scenario.

6.1 Pressure Assessment

The highest and lowest pressures including the locations at which these pressures occur are shown below in **Table 6.3** for each of the assessment scenarios. Results for the existing water distribution system assessments are shown in **Figures 6.1** to **6.3** for the ADD, MDD, and PHD scenarios, respectively. The contours in the figures represent pressure bands, which are separated into six classifications to evaluate the distribution system. Contour labels represent the pressure in kPa.

Table 6.3: Existing System Pressure Ranges

Scenario	Highest Pressure		Location	Lowest Pressure		Location
	kPa	psi		kPa	psi	
ADD	468	67.9	Westview Drive and 53 Avenue	392	56.9	50 Street and 42 Avenue
MDD	467	67.7		392	56.9	
PHD	467	67.7		392	56.9	

Overall, the highest pressure observed in the distribution system is less than 550 kPa and lowest pressure is greater than 350 kPa which indicates that the existing water distribution system is functioning optimally.

6.2 Fire Flow Assessment

The resulting available fire flow for the MDD + FF assessment under existing conditions is shown in **Figure 6.4** as contour lines and **Figure 6.5** as nodes. Available fire flow was determined at hydrants only (noting that the minimum pressure constraint requirement occurs at all nodes, not only the hydrants), with fire flows ranging from 80 L/s to 393 L/s.

Figure 6.6 compares the available fire flow under existing conditions to the required fire flow per land use type outlined in Section 3.6. The red dots show any locations that fail to meet the fire flow requirement based on the land use types within the vicinity. The percentage represents the fire flow that the system can reach compared to the required fire flow. There are a few locations where the existing fire flow is inadequate. Some of the deficiencies are due to the hydrant being situated on a long single feed, others are due to the lack of looping, and some are due to small-diameter pipes that are unable to provide the required fire flow at the minimum pressure of 140 kPa. Otherwise, the available fire flow within the existing water distribution system is generally sufficient to accommodate existing development.

6.3 Existing System Recommendations

Existing water distribution system upgrades are proposed to meet fire flow standards and increase system redundancy through upsizing and looping. A summary of the proposed upgrades to the existing water distribution system is shown in **Table 6.4** and **Figure 6.7**. The results for the upgraded existing water distribution system can be found in **Figures 6.8** to **6.13**. The upgraded system meets all fire flow requirements, and pressure levels throughout the network remain generally consistent with those under existing conditions.

Please consider the following specific notes regarding individual upgrades:

- Upgrade 1: The alignment is located outside of an existing right-of-way (ROW). As such, additional costs related to land acquisition and/or easements are anticipated and should be accounted for in project planning. If the required easement cannot be obtained, an alternative upgrade to the existing watermain along 49 Street is a possibility.
- Upgrade 5: While upgrading to a 250 mm pipe would meet current needs, future expansion of the industrial area to the west will ultimately require a 300 mm pipe. Therefore, a single upgrade to 300 mm is recommended to avoid the need for future rework.

Table 6.4: Proposed Upgrades

Upgrade No.	Location	Pipe Upgrade	Length
			m
UPG 1	Across the school field between 50 Street and 49 Street	Loop with 200 mm	121
UPG 2	Along 47 Street from 50 Avenue to 51 Avenue	Upsize from 100 mm to 200 mm	206
UPG 3	Along 53 Avenue south of 54 Avenue	Loop with 200 mm	102
UPG 4	Along 49 Street between 48A Avenue to 49 Avenue	Upgrade from 150 mm to 200 mm	96
UPG 5	South of the 350 mm watermain in the industrial area	Upsize from 200 mm to 300 mm	144
UPG 6	Dead-end pipe on 43 Avenue	Upsize from 150 mm to 200 mm	87

It is recommended that existing watermains be upsized to 200 mm throughout the system, in accordance with the Calmar Design and Construction Guidelines, during future road improvement projects. This approach will help prevent bottlenecking, enhance available fire flows, and support the long-term resiliency and performance of the water distribution system.

6.4 Risk Assessment

To better aid the Town in prioritizing the proposed upgrades, ISL developed a point scoring system that considers various risk criteria to determine the scoring and weight of importance of each criterion. The risk assessment scoring system allowed for a quantitative approach to prioritize required existing system upgrades. The risk assessment criteria and scoring matrix are presented in **Table 6.5**.

Table 6.5: Proposed Upgrade Risk Assessment – Risk Criteria and Scoring

Criteria			Scoring	
ID	**Name**	**Definition**	**Scale**	**Description**
C.1	Fire Flow Improvement	Difference between the percentage of available fire flow versus the required fire flow before and after upgrades.	5	> 40%
			4	30% - 40%
			3	20% - 30%
			2	10% - 20%
			1	< 10%
C.2	Impacted Land Use	Land use type of parcels affected by the upgrade.	5	High priority institutional (e.g. school, daycare)
			4	Medium/high density residential or commercial
			3	Other institutional or industrial
			2	Low-density residential
			1	Single residential parcel only
C.3	Generalized Pipe Condition	General condition of existing pipe based on condition assessment.	5	AC pipes with a service age greater than 60 years
			4	AC pipes with a service age of 50 to 60 years
			3	AC pipes with a service age of 40 to 50 years or PVC pipes with a service age of 50 to 60 years
			2	PVC pipes with a service age of less than 50 years
			1	No existing pipe
C.4	Road Condition Upgrade Potential	Potential for upgrades to improve the existing road condition during construction.	5	High
			4	Good
			3	Moderate
			2	Low
			1	Negligible

Based on the above criteria, a pairwise comparison was conducted to allocate a weighting to each criterion as the baseline multiplier for calculating the risk score. The pairwise comparison and weighting of each criterion is shown in **Table 6.6**.

Table 6.6: Proposed Upgrade Risk Assessment – Criteria Ranking

Risk Criteria – Pairwise Comparison					Count	Weighting	Criteria Ranking		
	C.1	**C.2**	**C.3**	**C.4**			**Rank**	**ID**	**Description**
C.1	C.1	C.1	C.1	C.1	4	40.0%	1	C.1	Available Fire Flow Improvement
C.2		C.2	C.2	C.2	3	30.0%	2	C.2	Affected Land Use
C.3			C.3	C.3	2	20.0%	3	C.3	Generalized Pipe Condition
C.4				C.4	1	10.0%	4	C.4	Road Condition Upgrade Potential
				Total	**10**	**100.0%**			

Each proposed upgrade was then assigned a score based on model results, GIS information, and street imagery. The prioritization results of the risk assessment are summarized in **Table 6.7** and illustrated in **Figure 6.14**, with detailed assessment and scoring calculations provided in **Appendix B**.

Upgrades were assessed on an individual basis (independent of any other upgrades). Note that many of the upgrades need to be combined to achieve the required fire flows.

Table 6.7: Proposed Upgrade Priority Summary

Priority	Upgrade No.	Name	Length	Combined Weighted Score
1	6	Dead-end pipe on 43 Avenue	87	3.60
2	2	Along 47 Street from 50 Avenue to 51 Avenue	206	3.50
3	1	Across the school field between 50 Street and 49 Street	121	3.40
	4	Along 49 Street between 48A Avenue to 49 Avenue	96	3.40
4	3	Along 53 Avenue south of 54 Avenue	102	2.10
5	5	South of the 350 mm watermain in the industrial area	144	2.00

6.5 Cost Estimates

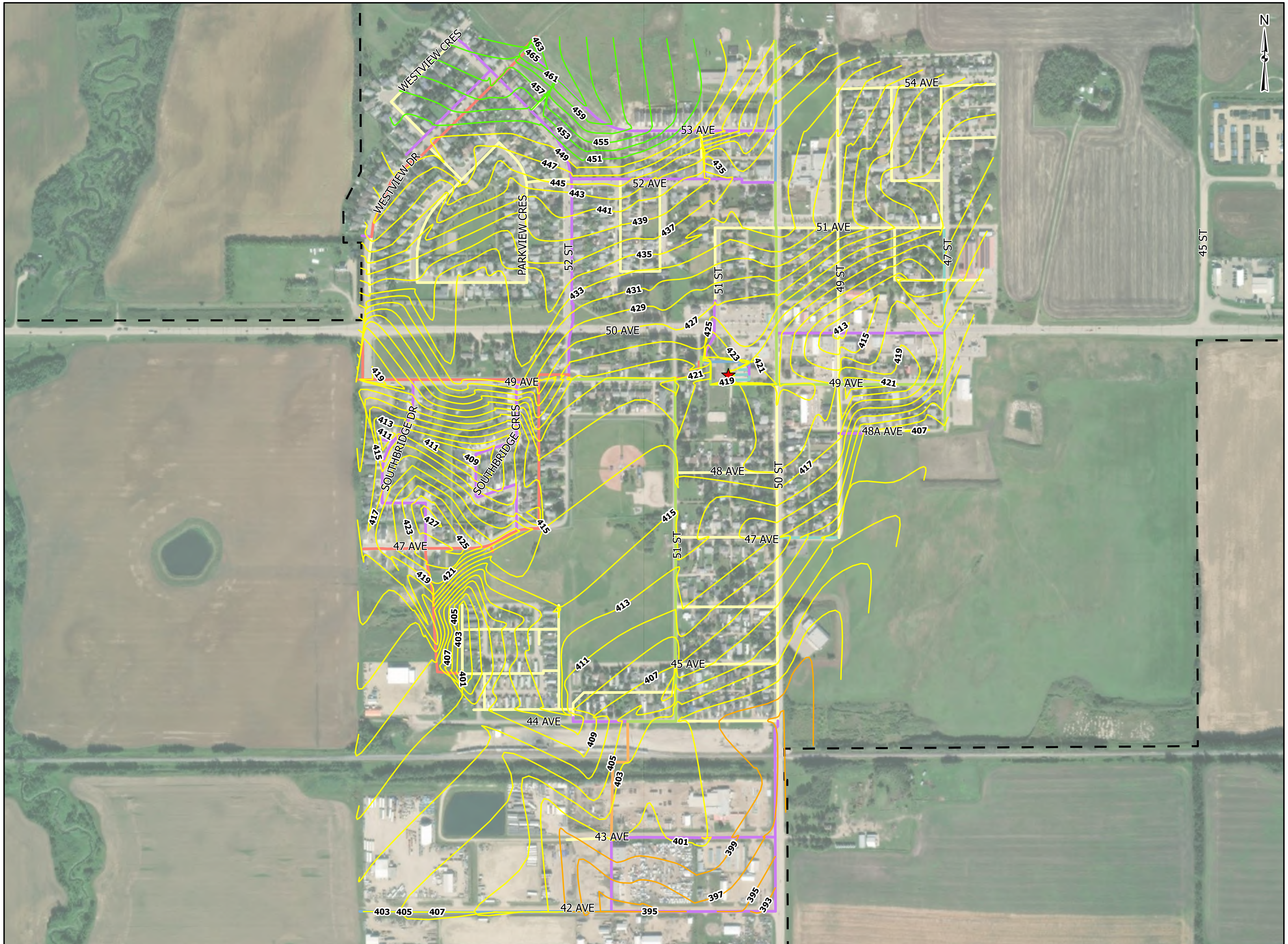
Class 'D' cost estimates of the proposed existing system upgrades were developed based on typical representative unit costs from ISL's past project experience in similar municipalities in Alberta, escalated for 2025 dollars. An additional 15% engineering allowance and a 30% contingency are also included in the estimates. It should be noted that there are a number of factors affecting the cost estimates which ISL cannot readily forecast, including the volume of work in hand or in prospect for contractors and suppliers at the time of tender calls, labour and material availability, and escalation rates.

A summary of the Class 'D' cost estimates for the proposed upgrades is presented in **Table 6.8**, with the full breakdown available in **Appendix C**.

Table 6.8: Cost Estimates for Recommended

Priority	Upgrade ID	Cost	Contingency (30%)	Engineering (15%)	Total[1,2]
		($)	($)	($)	($)
3	UPG 1[3]	$49,610	$14,883	$7,442	$80,000
2	UPG 2	$321,360	$96,408	$48,204	$470,000
4	UPG 3	$93,840	$28,152	$14,076	$140,000
3	UPG 4	$149,760	$44,928	$22,464	$220,000
5	UPG 5	$172,080	$51,624	$25,812	$250,000
1	UPG 6	$88,740	$26,622	$13,311	$130,000
	Total	**$875,390**	**$262,617**	**$131,309**	**$1,270,000**

[1] Costs herein are comparable to other municipalities. Costs are representative of 2025 dollars.
[2] The total cost has been rounded to the nearest $10,000.
[3] Land acquisition costs not included.



LEGEND

- Distribution Pumphouse and Reservoir
- Town Boundary

Average Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM AVERAGE DAY DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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FIGURE	6.1
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Maximum Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM MAXIMUM DAY DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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FIGURE	6.2
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.2_Existing System_MDD Contours

LEGEND

- Distribution Pumphouse and Reservoir
- Town Boundary

Peak Hour Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM PEAK HOUR DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

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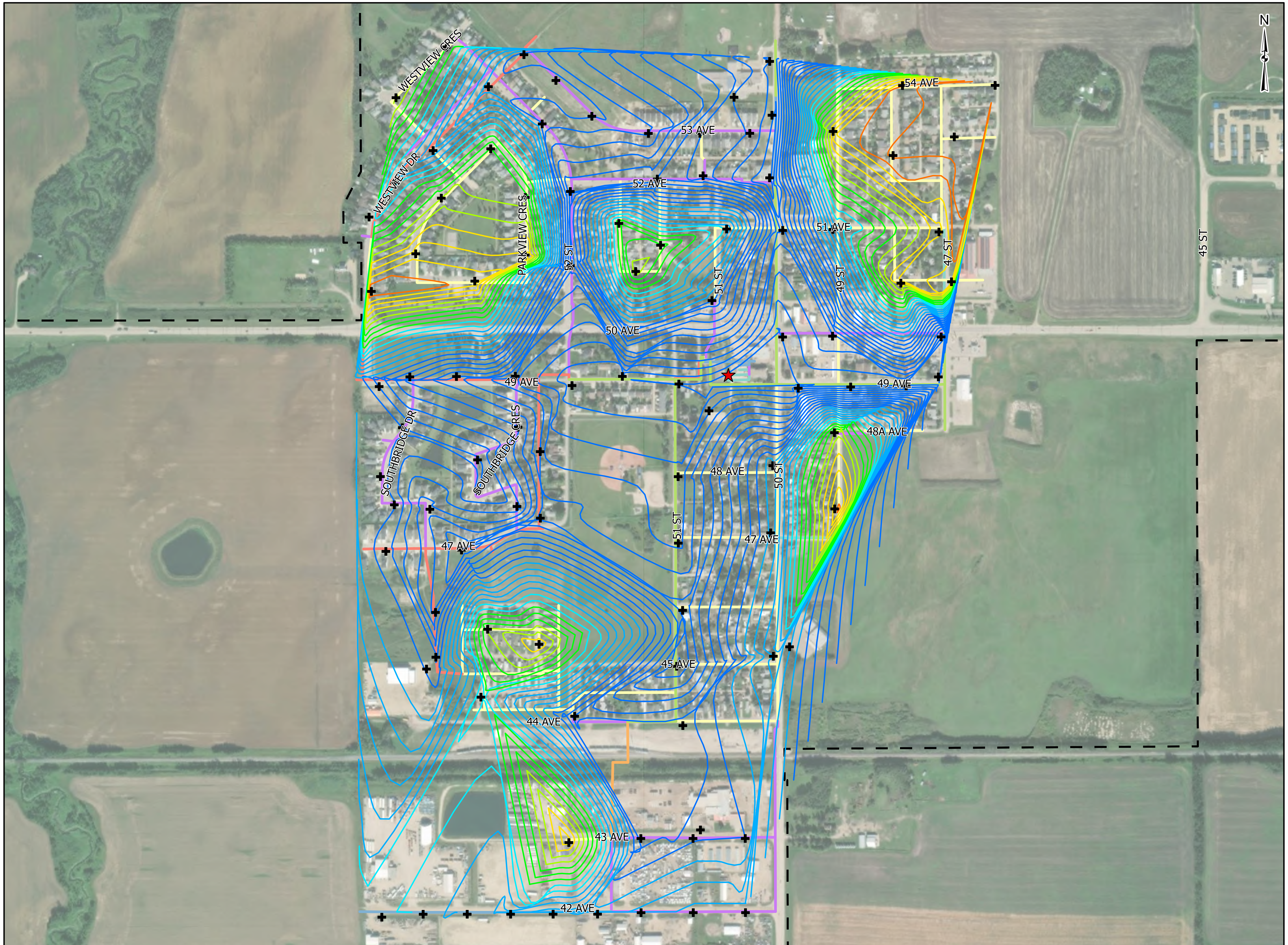
1:7,500 KM

FIGURE	6.3
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

ISL

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.3_Existing System_PHD Contours



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.4
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.4_Existing System_MDD+FF_Contours

LEGEND

★ Distribution Pumphouse and Reservoir

Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2 KM
1:7,500

FIGURE	6.5
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Fire Flow Requirement

Fails Requirement

Meets Requirement

Watermain Diameter

100 mm

150 mm

200 mm

250 mm

300 mm

350 mm

400 mm

Fire Flow Required by Land Use

100 L/s (Single Family and Low Density Residential)

180 L/s (Medium/High Density Residential and Urban Services)

225 L/s (Industrial)

270 L/s (Commercial)

TITLE

EXISTING SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW VS REQUIRED

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.6
DATE	7/25/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE
PROPOSED UPGRADES

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

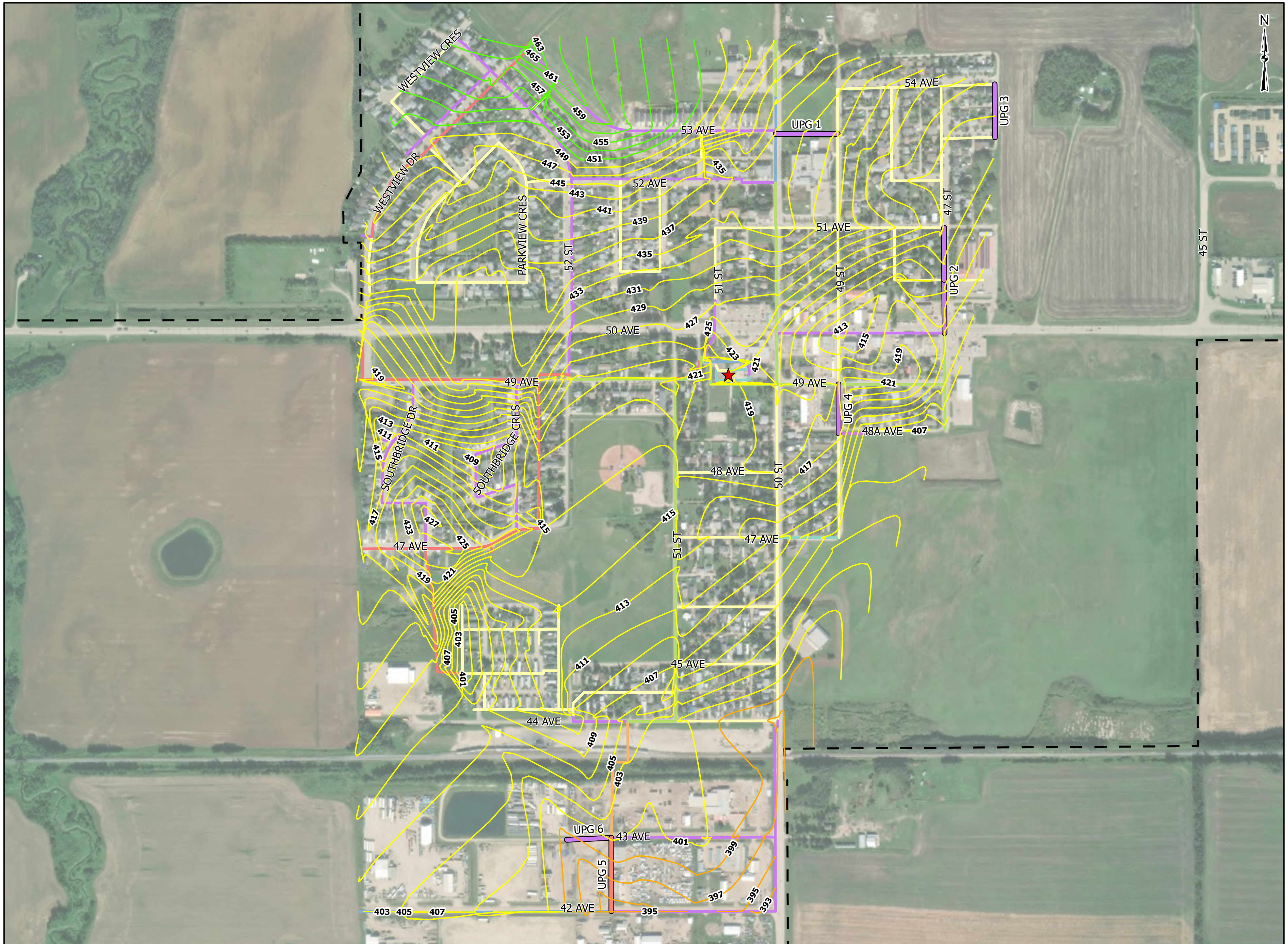
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

ISL

FIGURE	6.7
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Average Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM WITH UPGRADES
AVERAGE DAY DEMAND
PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

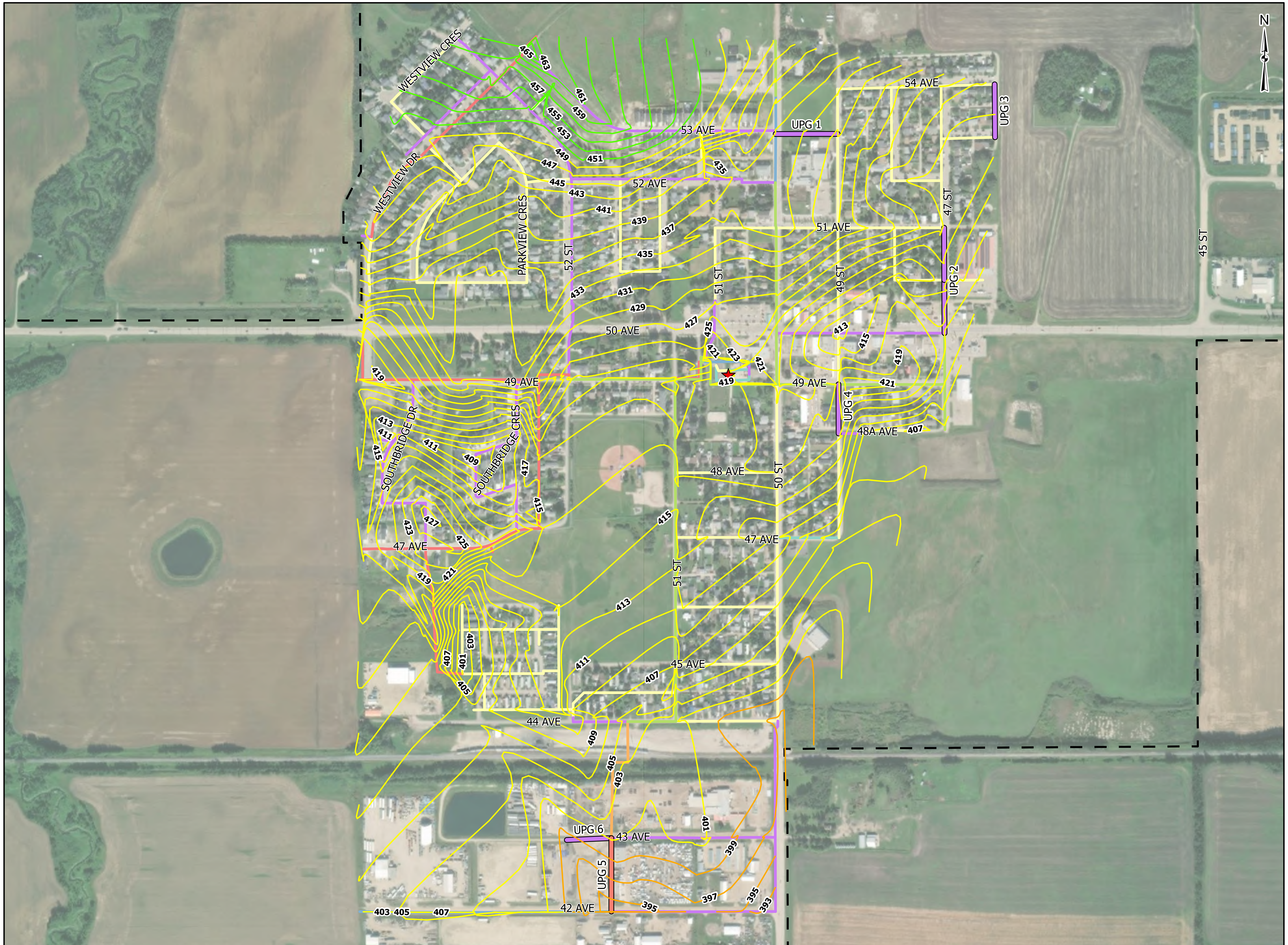
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.8
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Maximum Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM WITH UPGRADES MAXIMUM DAY DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

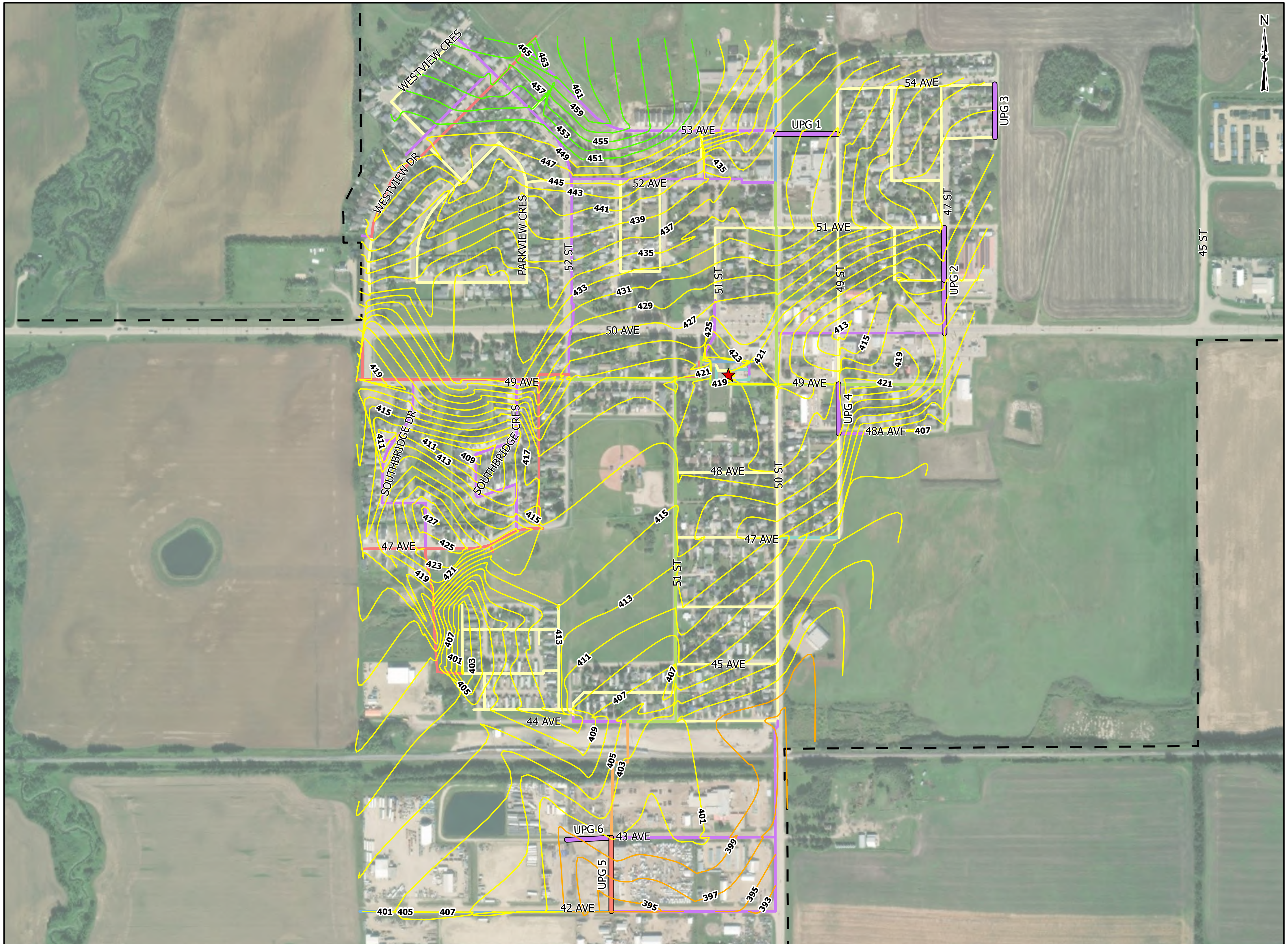
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.9
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_WAT_MP_Update.aprx - Figure 6.9_Upgrades_MDD Contours



LEGEND

- Distribution Pumphouse and Reservoir
- Town Boundary

Peak Hour Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM WITH UPGRADES PEAK HOUR DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

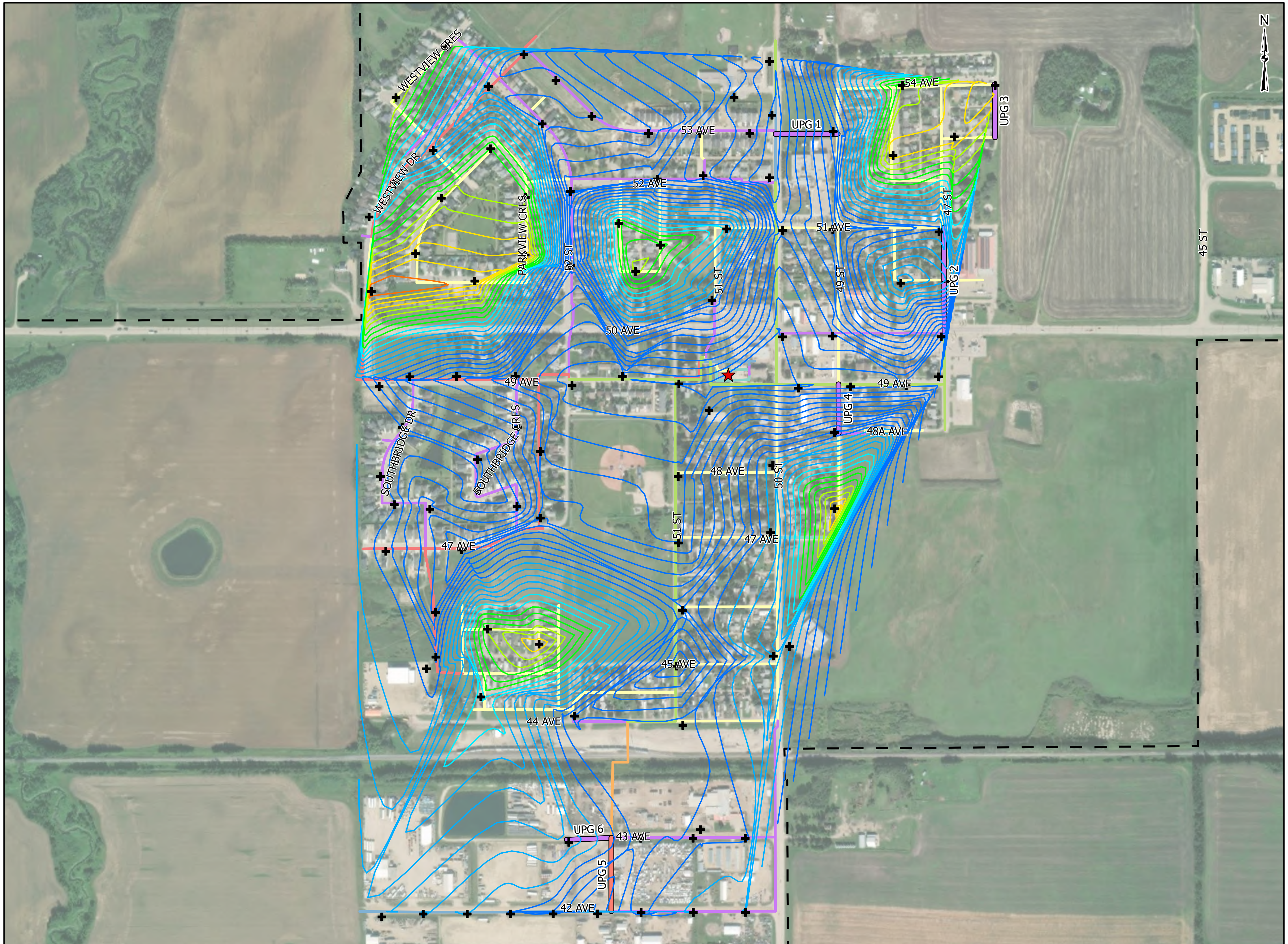
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.10
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.10_Upgrades_PHD Contours



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM WITH UPGRADES MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES

- Topographic Map:Maxar

PROJECTION

NAD 1983 CSRS 3TM 114

0 0.1 0.2 KM

1:7,500

ISL

FIGURE	6.11
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.11_Upgrades_MDD+FF_Contours

LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

EXISTING SYSTEM WITH UPGRADES
MAXIMUM DAY DEMAND
AVAILABLE FIRE FLOW

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.12
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_WAT_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.12_Upgrades_MDD+FF_Nodes

LEGEND

- Distribution Pumphouse and Reservoir
- Town Boundary

Fire Flow Requirement

- Meets Requirement

Proposed Diameter

- 200 mm
- 250 mm

Watermain Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

Fire Flow Required by Land Use

- 100 L/s (Single Family and Low Density Residential)
- 180 L/s (Medium/High Density Residential and Urban Services)
- 225 L/s (Industrial)
- 270 L/s (Commercial)

TITLE

EXISTING SYSTEM WITH UPGRADES MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW VS REQUIRED

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

ISL

FIGURE	6.13
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 6.13_Upgrades_MDD+FF_Land Use

LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Existing Watermain
- Town Boundary

Upgrade Priority

- 1
- 2
- 3
- 4
- 5

TITLE

PROPOSED UPGRADE PRIORITY RANKING

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:7,500 KM

FIGURE	6.14
DATE	7/29/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

7.0 Future Water System

7.1 Future System Concept Development

The proposed water distribution system is shown in **Figure 7.1**. Most of the proposed network was based on the utility alignments in the various ASP documents, except for the commercial/industrial area south of Highway 39 and east of 50 Street, and the westward extension of the industrial area, which is not part of an ASP. For these service areas, a standard 300 mm grid network was assumed along the quarter-section boundary.

In the Hawk's Landing ASP, the proposed loops branching off the main line were initially specified as 150 mm. However, to ensure consistency with the Calmar Design and Construction Standards, these were revised to 200 mm. Additionally, some of the larger future service areas were divided into smaller service areas to improve the spatial distribution of demands within the model. This allowed for a more even allocation of water demand along the proposed watermains. Each service area was connected to the nearest junctions in the model to reflect realistic system behaviour.

The servicing concept assumes that all existing water distribution system upgrades are implemented. Thus, it is recommended that these upgrades be completed prior to any substantial future development.

Note that the infrastructure required to connect the future industrial area east of 45th Street to the Town's existing system represents potential future servicing requirements beyond the 20-year growth horizon. These alignments are not included in the current servicing concept but are identified for planning purposes and may be required if growth accelerates or development patterns change. Should these areas develop sooner than anticipated, the master plan will be updated to reflect the necessary infrastructure.

7.2 Future System Assessment

The future water distribution system was analyzed under four different scenarios to determine system conditions. These scenarios included:

- Steady State:
  - Average day demand (ADD)
  - Maximum daily demand (MDD)
  - Peak hour demand (PHD)
- Steady State with Fire Flow Analysis:
  - Maximum day demand plus fire flow (MDD + FF)

Note that the infrastructure needed to service the future industrial area east of 45th Street was not included in this assessment.

Table 7.1 summarizes the demands that were used for input in the future water distribution system assessments. These values are substantially higher than the existing system demands because of the conservative consumption rate assumed in the future system analysis as discussed in Section 3.3, particularly for non-residential development.

Table 7.1: Future System Demands

Scenario	Demand	
	L/s	m^3/d
ADD	32.35	2,795.04
MDD	58.23	5,031.07
PHD	97.06	8,385.98

7.2.2 Pressure Assessment

The highest and lowest pressures and locations at which these pressures occur are shown below in **Table 7.2** for each of the assessment scenarios. Results for the ultimate future water distribution system assessments are shown in **Figures 7.2** to **7.4** for the ADD, MDD, and PHD scenarios, respectively.

Table 7.2: Future System Pressure Ranges

Scenario	Highest Pressure		Location	Lowest Pressure		Location
	kPa	psi		kPa	psi	
ADD	468	67.9	Westview Drive and 53 Avenue	392	56.9	50 Street and 42 Avenue
MDD	463	67.2		387	56.1	
PHD	461	66.9		386	56.0	

7.2.3 Fire Flow Assessment

The fire flow assessment results are shown in **Figures 7.5** to **7.7** for the future system. Fire flow contours are generally consistent in comparison to the existing system upgrades results. The introduction of additional pipes leads to minor reductions in fire flow availability in some localized areas. However, improvements are seen in other areas, such as Southbridge, where enhanced system looping contributes to increased fire flow capacity. No additional upgrades are needed to meet the required fire flow standards.

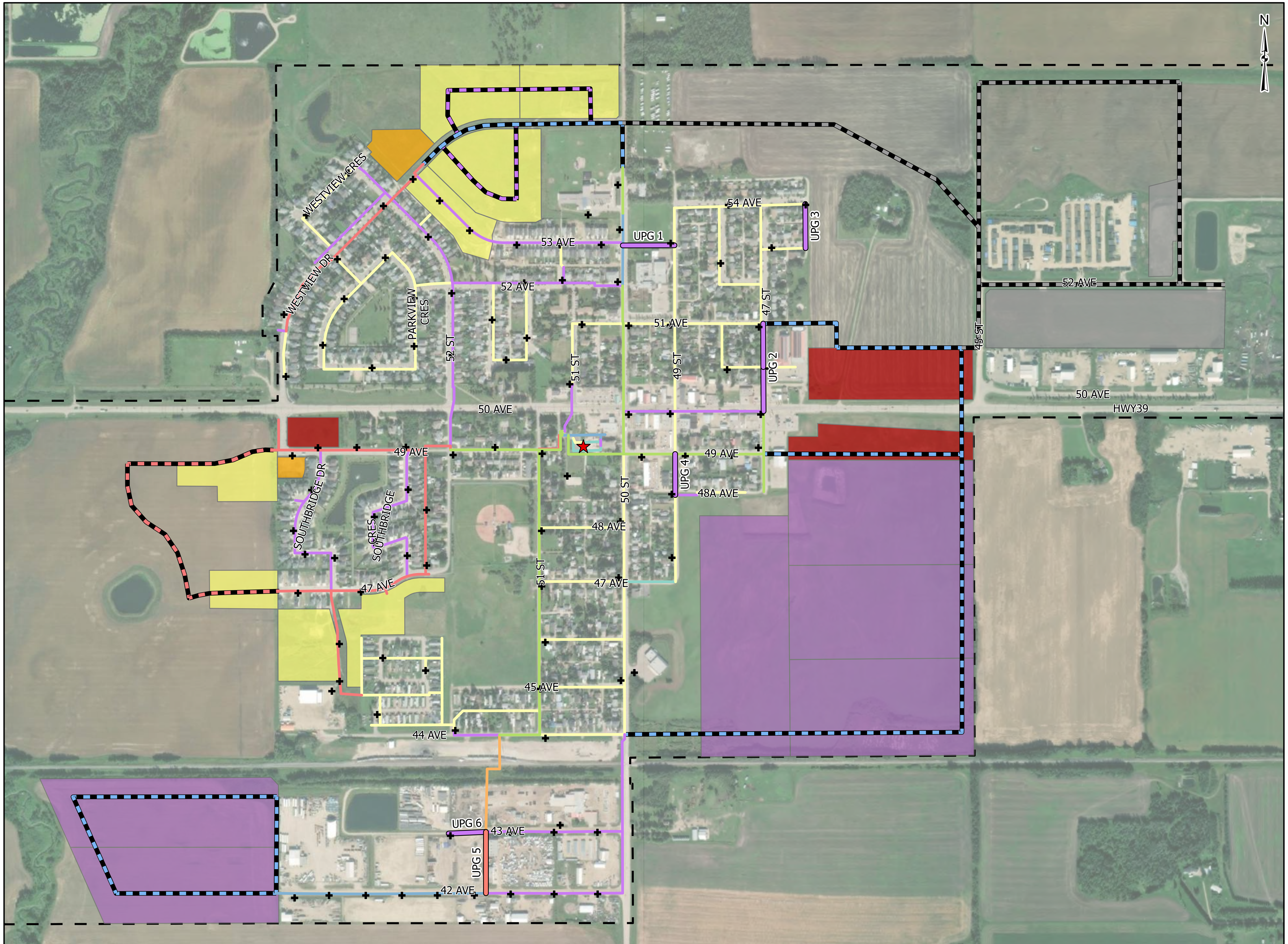
7.3 Future System Cost Estimates

The cost estimate summary for the servicing concept is summarized below in **Table 7.3**. For a detailed cost breakdown, please refer to **Appendix C**.

Table 7.3: Cost Estimates for Future Servicing

Item	Total Cost[1, 2]
200mm Watermain	$550,000
250mm Watermain	$620,000
300mm Watermain	$3,920,000
Total	**$5,090,000**

[1] Costs herein are comparable to other municipalities. Costs are representative of 2025 dollars.
[2] The total cost has been rounded to the nearest $10,000.



LEGEND

- Hydrants
- Distribution Pumphouse and Reservoir
- Future Watermain (Post 20-Year Horizon)
- Town Boundary

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Anticipated Land Use

- Future Commercial
- Future Industrial
- Future Low Density Residential
- Future Medium Density Residential

Anticipated Land Use (Post 20-Year Horizon)

- Future Industrial

TITLE
FUTURE SERVICING CONCEPT

PROJECT
WATER MASTER PLAN UPDATE

CLIENT
TOWN OF CALMAR

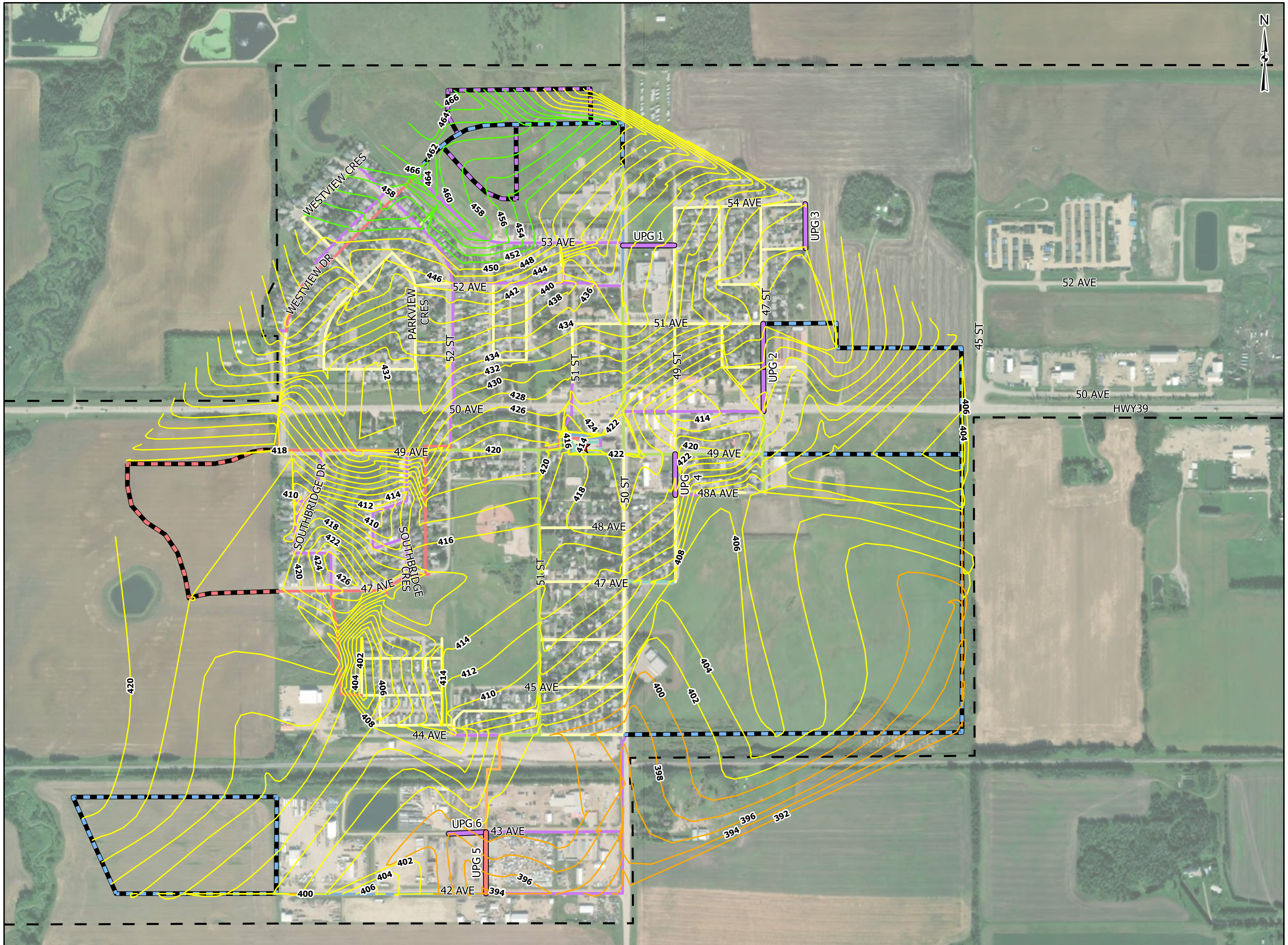
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

FIGURE	7.1
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

ISL



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Average Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

FUTURE SYSTEM AVERAGE DAY DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

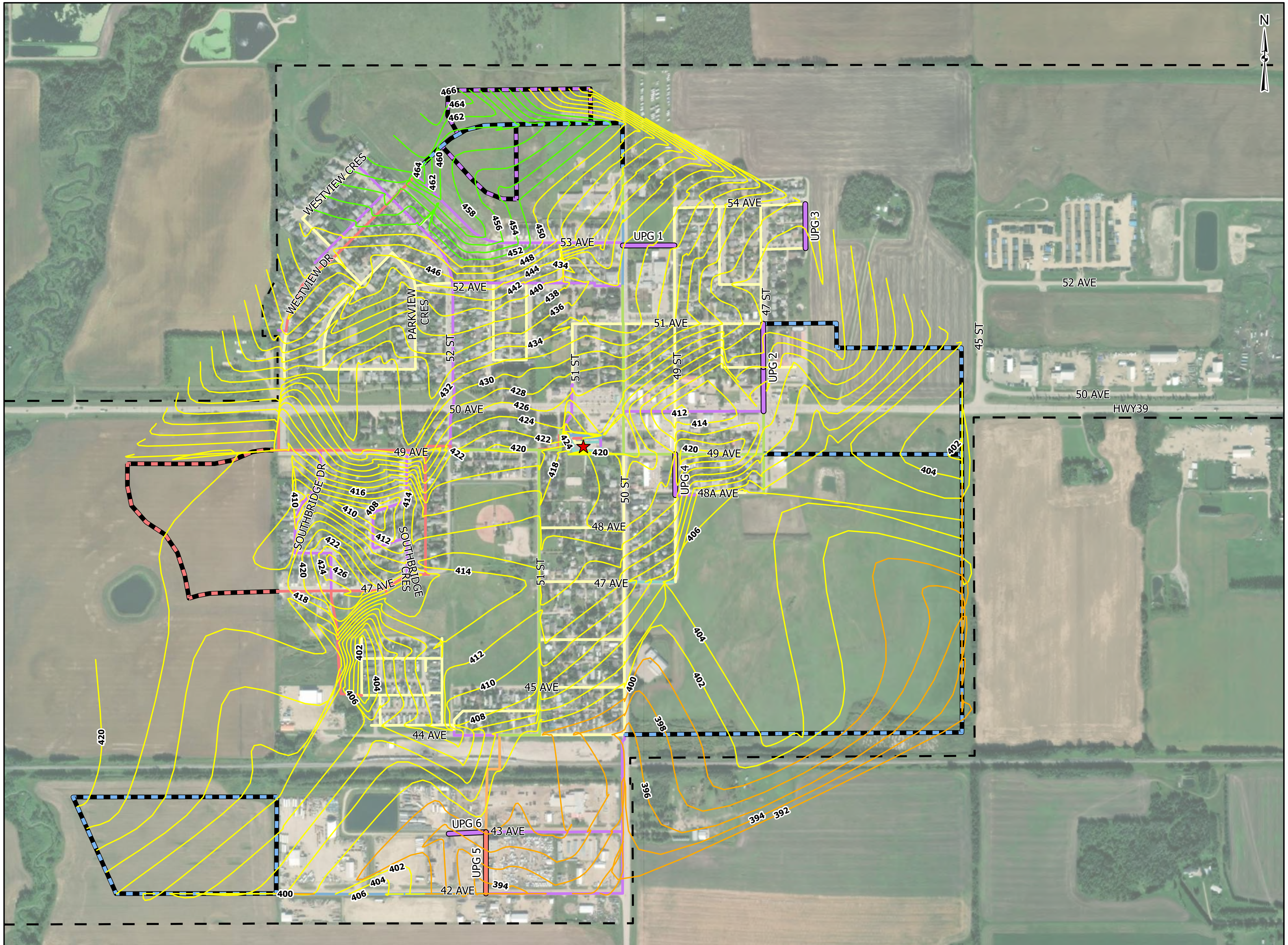
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

FIGURE	7.2
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

ISL



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Maximum Day Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

FUTURE SYSTEM MAXIMUM DAY DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

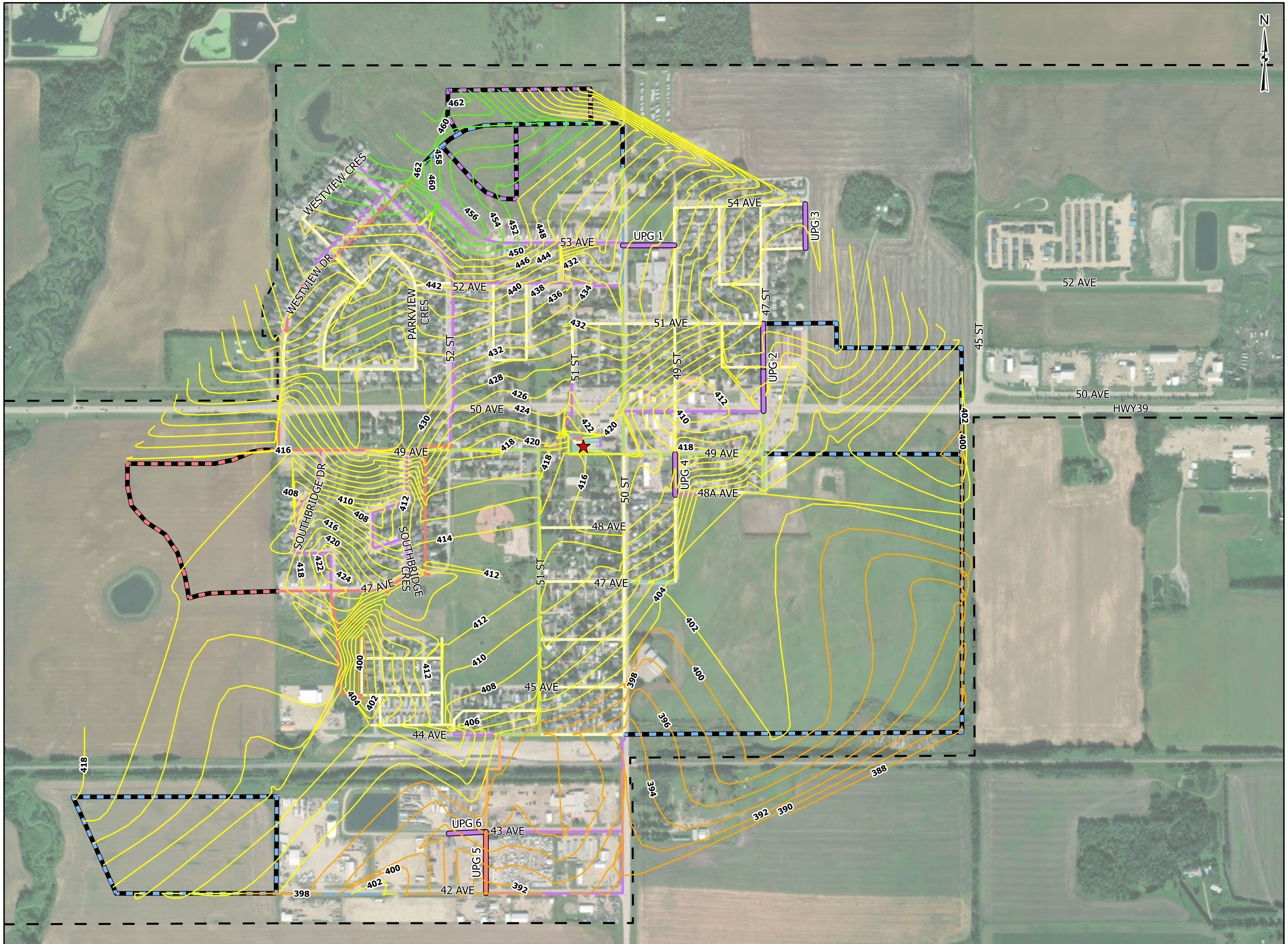
TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

FIGURE	7.3
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Peak Hour Demand Pressure Contours

- Less than 275 kPa
- 275 kPa to 350 kPa
- 350 kPa to 400 kPa
- 400 kPa to 450 kPa
- 450 kPa to 500 kPa
- 500 kPa to 550 kPa

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

FUTURE SYSTEM PEAK HOUR DEMAND PRESSURE CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

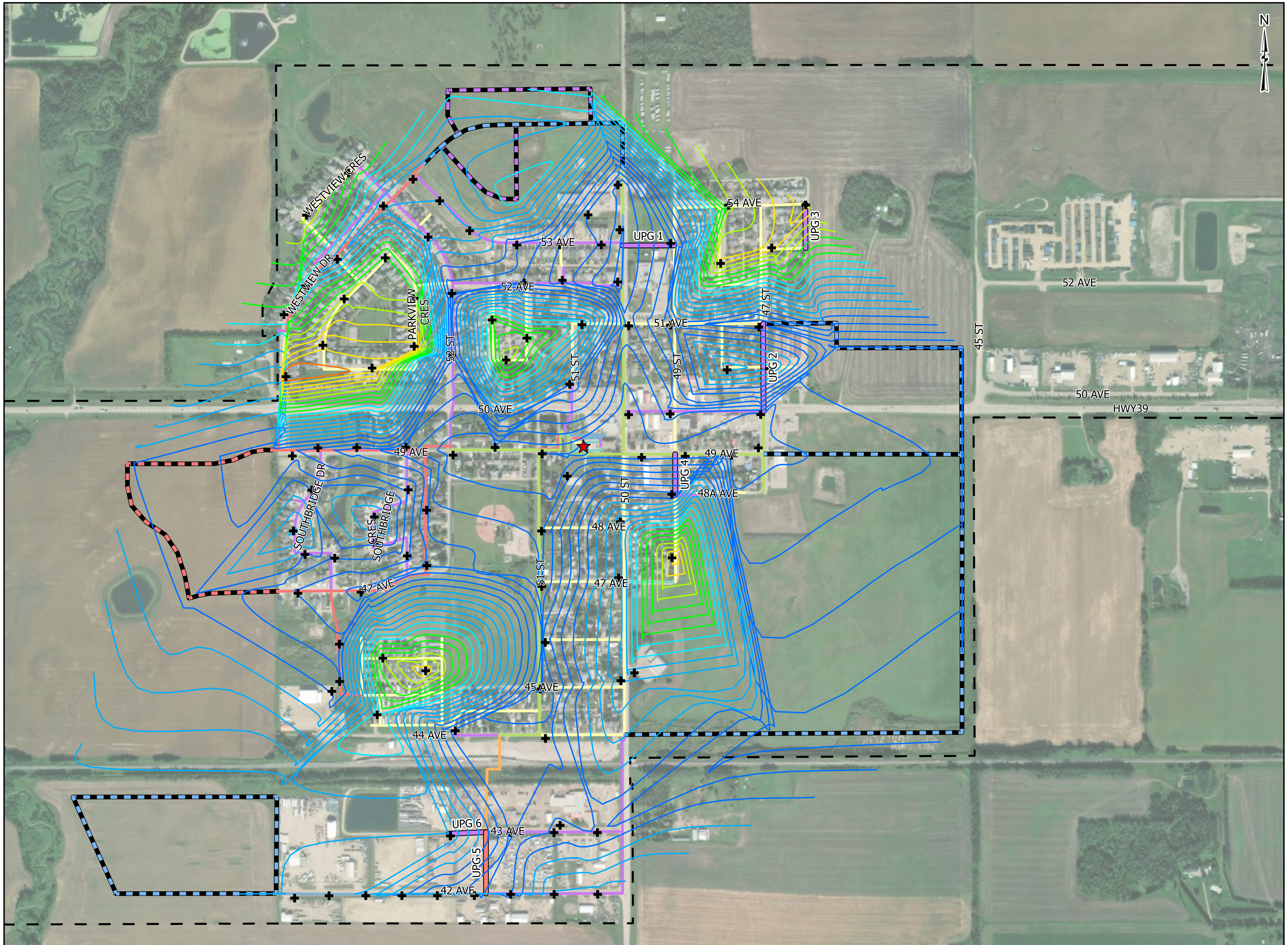
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

ISL

FIGURE	7.4
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester



LEGEND

Hydrants

Distribution Pumphouse and Reservoir

Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

FUTURE SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW CONTOURS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

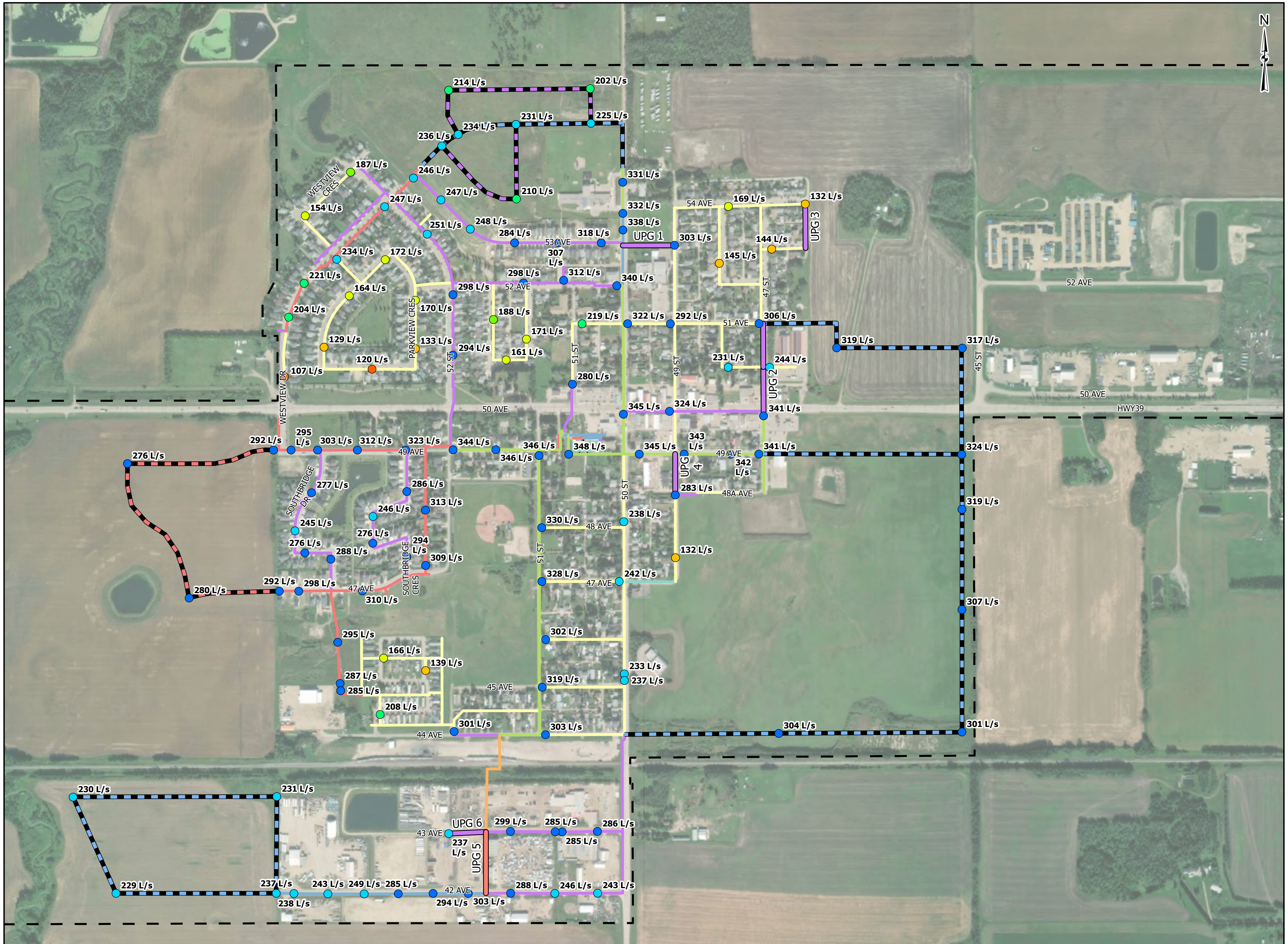
PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

ISL

FIGURE	7.5
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_MP_Updates\16898_Calmar_WAT_MP_Update.aprx - Figure 7.5 _Future System_MDD+FF_Contours



LEGEND

★ Distribution Pumphouse and Reservoir

Town Boundary

Available Fire Flow

- Less than 100 L/s
- 100 L/s to 125 L/s
- 125 L/s to 150 L/s
- 150 L/s to 175 L/s
- 175 L/s to 200 L/s
- 200 L/s to 225 L/s
- 225 L/s to 270 L/s
- Greater than 270 L/s

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

TITLE

FUTURE SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

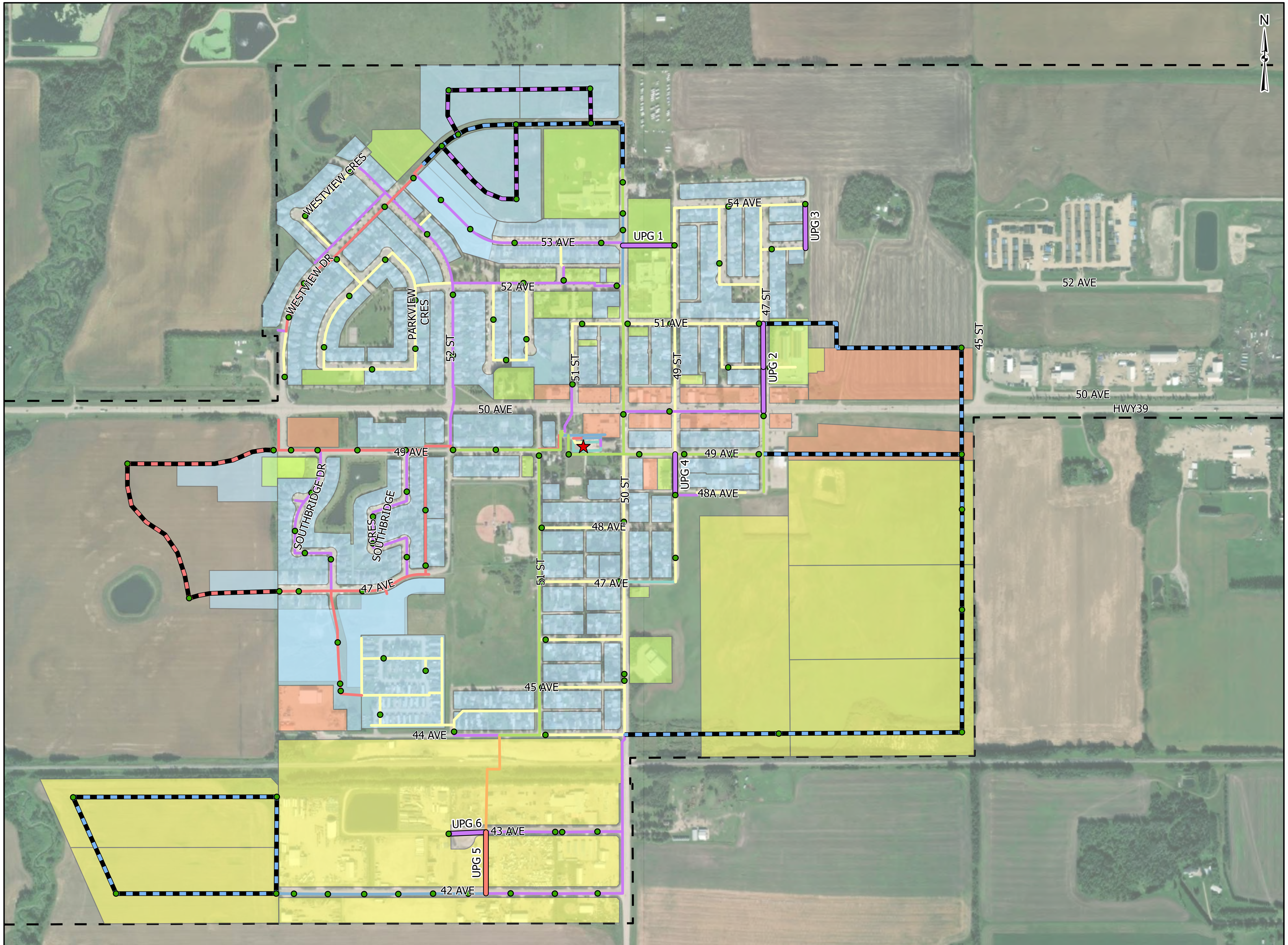
DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

FIGURE	7.6
DATE	9/12/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_WAT_MP_Update.aprx - Figure 7.6_Future System_MDD+FF_Nodes



LEGEND

Distribution Pumphouse and Reservoir

Town Boundary

Fire Flow Requirement

Meets Requirement

Existing Pipe Diameter

- 100 mm
- 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 400 mm

Existing Proposed Upgrade Diameter

- 200 mm
- 250 mm

Future Pipe Diameter

- 200 mm
- 250 mm
- 300 mm

Fire Flow Required by Land Use

- 100 L/s (Single Family and Low Density Residential)
- 180 L/s (Medium/High Density Residential and Urban Services
- 225 L/s (Industrial)
- 270 L/s (Commercial)

TITLE

FUTURE SYSTEM MAXIMUM DAY DEMAND AVAILABLE FIRE FLOW VS REQUIRED

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2 KM
1:9,000

ISL

FIGURE	7.7
DATE	9/17/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester

Document: Y:\Projects\16898_Calmar_Master_Plans_Updates\251_Figures\16898_Calmar_WAT_MP_Update.aprx - Figure 7.7 Future System MDD+FF Land Use

8.0 Conclusion and Recommendations

8.1 Conclusion

This updated Water Master Plan for the Town of Calmar provides a comprehensive assessment of the Town's existing and future water distribution systems, evaluates system capacity under multiple demand scenarios, and outlines a strategic servicing concept aligned with the 2045 planning horizon. The existing system was found to be generally adequate under current average day, maximum day, and peak hour demand conditions, with localized deficiencies primarily related to fire flow availability.

The future water distribution system concept incorporates alignment with existing ASPs, standardized pipe sizing, and enhanced network looping to ensure long-term servicing flexibility and resilience. Strategic discretization of service areas and updated pipe sizing align with the Town's Design and Construction Standards. The hydraulic analysis confirms that with implementation of the proposed upgrades to the existing system, the future network will be capable of providing the necessary level of service to accommodate projected residential, commercial, and industrial development throughout the Town.

8.2 Recommendations

- **Complete Upgrades to the Existing Water Distribution System.** Prioritize construction of the six identified system upgrades to address current fire flow deficiencies and improve system redundancy. It is recommended that these be completed prior to major new development or densification to ensure baseline system reliability.
- **Adopt the Proposed Future System Configuration.** Implement the future water distribution system as detailed in Section 7.1, in accordance with the Town's Design and Construction Standards.
- **Stage Infrastructure Investments According to Growth.** Phase future water system expansions and investments to align with actual development timelines.
- **Verify Pipe Dimensions Prior to Construction.** Field verification (e.g., hydrovac or equivalent methods) should be undertaken during preliminary design to confirm existing pipe sizes. This will help ensure accurate project scoping and reduce the risk of unforeseen construction issues.
- **Maintain and Update the Hydraulic Model.** Continue to update and calibrate the hydraulic model as new developments are serviced and infrastructure changes occur. Incorporate updated GIS data and SCADA monitoring results to maintain model accuracy over time.
- **Coordinate Water Infrastructure Upgrades with Other Capital Projects.** Where feasible, align water system upgrades with roadwork or utility renewal projects to maximize cost efficiency and minimize construction impacts.
- **Confirm Pump Station Performance on an Ongoing Basis.** Regularly review and validate pump performance against design assumptions and system demand conditions to ensure reliable service delivery and adequate fire flow throughout the network.
- **Monitor Growth and Update the Water Master Plan.** The Water Master Plan should be reviewed and updated at regular intervals, or when substantial growth or infrastructure changes occur, to ensure servicing concepts remain relevant and effective.
- **Maintain and Update GIS Records.** Continuously update the Town's GIS records to reflect field-verified data and any new infrastructure, ensuring the accuracy of the stormwater asset inventory for future modelling and planning.

9.0 References

Government of Alberta, Alberta Regional Dashboard – Calmar Population, 2025.

Town of Calmar Design and Construction Standards, 2020.

Town of Calmar Land Use Bylaw, 2024.

Town of Calmar Municipal Development Plan (MDP), 2019.

Highway 39 Industrial Park ASP, ISL Engineering and Land Services Ltd., 2016.

Enberg Estates ASP, W.J. Francl Consulting Ltd., 1994.

Hawk's Landing ASP, Challenger Engineering, 2005.

Southbridge ASP, Select Engineering Consultants Ltd., 2017.

Thomas Creek ASP, ISL Engineering and Land Services Ltd., 2017.

Calmar Water Master Plan, ISL Engineering and Land Services Ltd., 2006.

Fire Underwriters Survey, Water Supply for Public Fire Protection, National Fire Protection Association.

SFE Global, Hydrant Flow Test Reports, 2025.

SCADA Production and Consumption Data (2020–2024), Town of Calmar.

Town of Calmar Water Reservoir Expansion, ISL Engineering and Land Services Ltd., 2015.

APPENDIX
Hydrant Testing Results

A

Final Report for
ISL Engineering

Attn: **Sarah Barbosa, P.Eng., ENV. SP**

Calmar, Alberta
Fire Hydrant Flow Testing
May 2025

Prepared and submitted by:

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May 12, 2025

Sarah Barbosa, P. Eng., ENV. SP
Project Engineer

ISL Engineering
4015 – 7 St SE
Calgary, Alberta
T2G 2Y9

FINAL REPORT: A25-128 – CALMAR FIRE FLOW TESTING REPORT

Dear Sarah Barbosa,

Please find enclosed SFE's Final Report for the above-mentioned project. If you have any questions, comments, or concerns, please do not hesitate to contact us at your earliest convenience.

Thank you for having SFE conduct this work on your behalf. We appreciate the opportunity to work with you and your team on this project. We look forward to working together again soon.

Sincerely,
SFE Global

Nick Schellenberg
Director of Operations
(780) 461-0171
Nick.Schellenberg@sfeglobal.com
www.sfeglobal.com

1. Executive Summary

This report provides details of the hydrant fire flow testing conducted in Calmar, Alberta. SFE Global was retained by ISL under the direction of Sarah Barbosa, P.Eng., ENV SP. Nick Schellenberg represented SFE Global as Project Manager during this project.

As requested, SFE conducted three (3) fire hydrant flow tests on May 08, 2025. The flow hydrants and test hydrants were indicated to SFE by maps supplied by the client. The fire flow tests were conducted according to the National Fire Protection Association (NFPA) 291 standards.

2. Summary of Testing

SFE Technicians met representatives of Calmar on-site to perform testing. The testing plan was discussed, and location maps reviewed by all participants.

Testing Equipment

Testing was performed on flow hydrants utilizing a Hydro Flow Product Hose Monster system with integral de-chlorinator. These are fixed pitot devices to measure flow, de-chlorinate and diffuse in one process. The benefit of this system is the ability to provide repeatable results and manage discharge water conditions.

The configuration for the Hose Monster System consisted of a 4 inch hose monster device. To digitally log system pressure SFE Technicians installed one (1) Telog HPR hydrant pressure logger. The device was set to ten second logging intervals and one second sampling intervals. Each interval logs the minimum, maximum and average pressure for that time stamp.

Testing Procedure

The client selected all flow and residual hydrants for each test. SFE Technicians installed flow testing equipment on each flow hydrant and residual pressure measurement equipment on the residual hydrant.

The tests were performed by recording static pressure then flowing the hydrant until flow and pressure stabilized. Residual and pitot(flow) pressures were then obtained. Upon closure of the flow hydrant, static pressure was obtained. Total flow and extrapolated flow to 20 psi residual pressure are calculated with system under normal conditions and using system static pressure.

Flow testing summary sheets are included in Appendix I.

3. Data

The testing reports included in Appendix I contain all test results and photos. All pressure readings are in psi and all flow values are reported in IGPM. All hydrants were returned to as found condition upon completion of testing.

4. Safety

A pre-job safety inspection and meeting was conducted by SFE personnel, and the following potential hazards were identified:

- Need for Personal Protective Equipment
- Working with water under pressure
- Pedestrian and vehicular traffic conditions
- Safe operation and shut down of fire hydrants
- COVID-19 Precautions

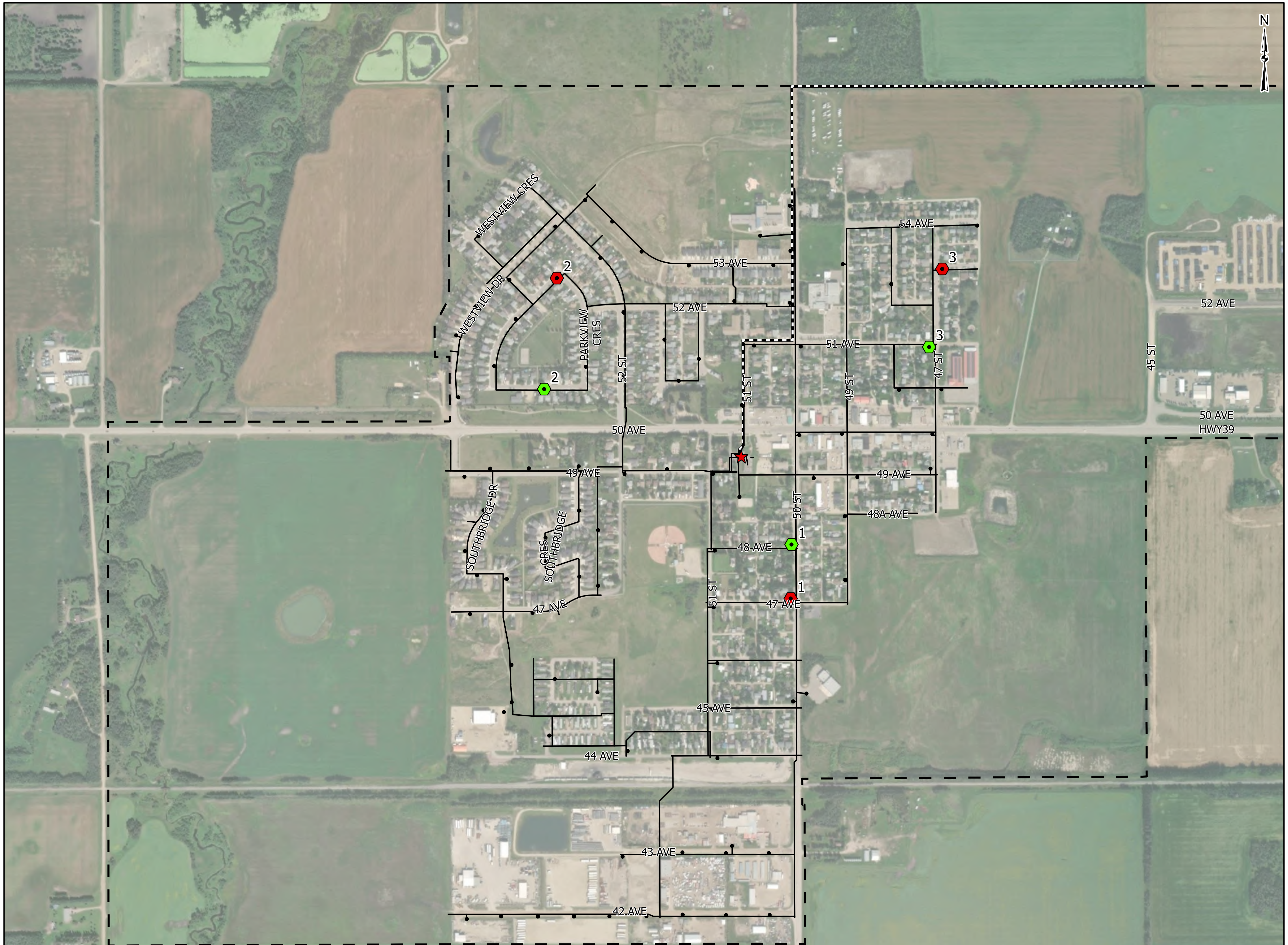
This project was conducted in accordance with the WCB and OSHA safety standards as documented in SFE’s Safety Procedures Manual. The SFE crew reviewed the work to be completed and safety requirements at a tail-gate safety meeting held prior to commencing work.

Report End
May 2025

SFE Global
Project A25-128

Appendix I

Overall Site Map, System Pressure and Test Results



LEGEND

- Hydrants
- Distribution Pump House
- Water Pipe
- Supply Line
- Town Boundary

Hydrant Test Locations

- Residual
- Flow

TITLE

WATER SYSTEM
HYDRANT TESTING LOCATIONS

PROJECT

WATER MASTER PLAN UPDATE

CLIENT

TOWN OF CALMAR

DATA SOURCES
- Topographic Map:Maxar

PROJECTION
NAD 1983 CSRS 3TM 114

0 0.1 0.2
1:9,000 KM

FIGURE	A.1
DATE	3/18/2025
PROJECT NO.	16898
AUTHOR	jlalonde-bester


SYS-1 Logger
65
60
55
50
45
40
35
30
25
09:36:50
09:41:50
09:46:50
09:51:50
09:56:50
10:01:50
10:06:50
10:11:50
10:16:50
10:21:50
10:26:50
10:31:50
10:36:50
10:41:50
10:46:50
10:51:50
10:56:50
11:01:50
11:06:50
11:11:50
11:16:50
Pressure.Max (psi)
Pressure (psi)
Pressure.Min (psi)

Final Report

Fire Flow Test Report

Client Name:	ISL	Hyd 1 - #/Port Size	2.5"	Log Hyd Addr	51 St & 49 Ave
Project Location:	Calmar, Alberta	Hyd 2 - #/Port Size	N/A	Flow Hyd 2 Addr.	N/A
SFE Project #:	A25-128	Hyd 1 - Pito Types	2.5"	Resid Hyd Addr.	N/A
SFE Technicians:	JS, JB	Hyd 2 - Pito Types	N/A	Fire Pump Status	Auto
		Test Procedure	NFPA 291	(circle one)	Force On

Test ID: Pressure Logger   Test : N/A   of   N/A   Date: 08-May-25

		Flow Hyd 1		Flow Hyd 2		Residual Hydrant		
Start Time	End Time	Port 1-1 psi	Port 1-2 psi	Port 2-1 psi	Port 2-2 psi	Static psi	Residual psi	Static psi
9:40	11:10	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Flow Summary (igpm)	
Flow 1-1	0
Flow 1-2	0
Flow 2-1	0
Flow 2-2	0
Total Flow	0
Flow @ 20 psi	N/A

Notes:

Pressure Logger

GPS N53.2640490 W-113.8083977

Final Report

Fire Flow Test Report

Client Name:	ISL	Hyd 1 - #/Port Size	4.5"	Flow Hyd 1 Addr.	50 St & 47 Ave
Project Location:	Calmar, Alberta	Hyd 2 - #/Port Size	N/A	Flow Hyd 2 Addr.	N/A
SFE Project #:	A25-128	Hyd 1 - Pito Types	4" HM	Resid Hyd Addr.	50 St & 48 Ave
SFE Technicians:	JS, JB	Hyd 2 - Pito Types	N/A	Fire Pump Status	Auto
		Test Procedure	NFPA 291	(circle one)	Force On

Test ID: T1 Test : 1 of 3 Date: 08-May-25

		Flow Hyd 1		Flow Hyd 2		Residual Hydrant		
Start Time	End Time	Port 1-1 psi	Port 1-2 psi	Port 2-1 psi	Port 2-2 psi	Static psi	Residual psi	Static psi
10:14	10:18	10	N/A	N/A	N/A	62	34	62

Flow Summary (igpm)	
Flow 1-1	1009
Flow 1-2	0
Flow 2-1	0
Flow 2-2	0
Total Flow	1009
Flow @ 20 psi	1256

Notes: Flow Hyd: Initial test failed at 9:59 - 10:04. Upsize pito

Flow Hydrant

GPS N53.261460 W-113.805608

Residual Hydrant

GPS N53.262647 W-113.805575

Fire Flow Test Report

Client Name:	ISL	Hyd 1 - #/Port Size	4.5"	Flow Hyd 1 Addr.	58 Parkview Cres
Project Location:	Calmar, Alberta	Hyd 2 - #/Port Size	N/A	Flow Hyd 2 Addr.	N/A
SFE Project #:	A25-128	Hyd 1 - Pito Types	4" HM	Resid Hyd Addr.	35 Parkview Cres
SFE Technicians:	JS, JB	Hyd 2 - Pito Types	N/A	Fire Pump Status	Auto
		Test Procedure	NFPA 291	(circle one)	Force On

Test ID: T2 Test : 2 of 3 Date: 08-May-25

		Flow Hyd 1		Flow Hyd 2		Residual Hydrant		
Start Time	End Time	Port 1-1 psi	Port 1-2 psi	Port 2-1 psi	Port 2-2 psi	Static psi	Residual psi	Static psi
10:37	10:41	11	N/A	N/A	N/A	64	38	64

Flow Summary (igpm)	
Flow 1-1	1039
Flow 1-2	0
Flow 2-1	0
Flow 2-2	0
Total Flow	1039
Flow @ 20 psi	1380

Notes:

Flow Hydrant

GPS N53.268214 W-113.813839

Residual Hydrant

GPS N53.265881 W-113.814316

Final Report

Fire Flow Test Report

Client Name:	ISL	Hyd 1 - #/Port Size	4.5"	Flow Hyd 1 Addr.	Off 47 St
Project Location:	Calmar, Alberta	Hyd 2 - #/Port Size	N/A	Flow Hyd 2 Addr.	N/A
SFE Project #:	A25-128	Hyd 1 - Pito Types	4" HM	Resid Hyd Addr.	47 St & 51 Ave
SFE Technicians:	JS, JB	Hyd 2 - Pito Types	N/A	Fire Pump Status	Auto
		Test Procedure	NFPA 291	(circle one)	Force On

Test ID: T3 Test : 3 of 3 Date: 08-May-25

		Flow Hyd 1		Flow Hyd 2		Residual Hydrant		
Start Time	End Time	Port 1-1 psi	Port 1-2 psi	Port 2-1 psi	Port 2-2 psi	Static psi	Residual psi	Static psi
11:00	11:06	8	N/A	N/A	N/A	62	34	62

Flow Summary (igpm)	
Flow 1-1	902
Flow 1-2	0
Flow 2-1	0
Flow 2-2	0
Total Flow	902
Flow @ 20 psi	1123

Notes:

Flow Hydrant

GPS N53.268890 W-113.800230

Residual Hydrant

GPS N53.266759 W-113.800707

APPENDIX
Risk Assessment

B

Appendix B Risk Assessment

Table B.1: Existing System Upgrades Risk Assessment Parameter Summary

Upgrade No.	Name	Parameter			
		Available Fire Flow Improvement	Affected Land Use	Generalized Pipe Condition	Road Condition Upgrade Potential
		%			
1	Across school field between 50 Street and 49 Street	30%	Institutional	N/A	Negligible
2	Along 47 Street from 50 Avenue to 51 Avenue	27%	Residential / Institutional	Poor	Good
3	Along 53 Avenue south of 54 Avenue	20%	Residential	N/A	Negligible
4	Along 49 Street between 48A Avenue to 49 Avenue	11%	Medium Density Residential	Poor	Good
5	South of the 350 mm watermain in the industrial area	4%	Industrial	Poor	Negligible
6	Dead end pipe on 43 Avenue	42%	Industrial	Poor	Negligible

Table B.2: Existing System Upgrades Risk Assessment Scores

Upgrade No.	Name	Length	Parameter				Combined Weighted Score
			Available Fire Flow Improvement	Affected Land Use	Generalized Pipe Condition	Road Condition Upgrade Potential	
1	Across school field between 50 Street and 49 Street	121	1.60	1.50	0.20	0.10	3.40
2	Along 47 Street from 50 Avenue to 51 Avenue	206	1.20	0.90	1.00	0.40	3.50
3	Along 53 Avenue south of 54 Avenue	102	1.20	0.60	0.20	0.10	2.10
4	Along 49 Street between 48A Avenue to 49 Avenue	96	0.80	1.20	1.00	0.40	3.40
5	South of the 350 mm watermain in the industrial area	144	0.40	0.90	0.60	0.10	2.00
6	Dead end pipe on 43 Avenue	87	2.00	0.90	0.60	0.10	3.60

Table B.3: Existing System Upgrades Risk Assessment – Fire Flow Improvement

Upgrade No.	Existing Available Fire Flow[1]	Upgraded Available Fire Flow[1]	Increase in Fire Flow	Raw Score	Weighted Score
	%	%	%		
1	70%	100%	30%	4	1.60
2	73%	100%	27%	3	1.20
3	80%	100%	20%	3	1.20
4	89%	100%	11%	2	0.80
5	96%	100%	4%	1	0.40
6	58%	100%	42%	5	2.00

[1] Fire flow presented in units of percentage of required fire flow by land use.

Table B.4: Existing System Upgrades Risk Assessment – Impacted Land Use

Upgrade No.	Land Use	Raw Score	Weighted Score
1	Institutional	5	1.50
2	Residential / Institutional	3	0.90
3	Residential	2	0.60
4	Medium Density Residential	4	1.20
5	Industrial	3	0.90
6	Industrial	3	0.90

Table B.5: Existing System Upgrades Risk Assessment – Generalized Pipe Condition

Upgrade No.	Length (m)	Generalized Pipe Condition	Raw Score	Weighted Score
1	121	N/A	1	0.20
2	206	Failing	5	1.00
3	102	N/A	1	0.20
4	96	Failing	5	1.00
5	144	Poor	3	0.60
6	87	Poor	3	0.60

Table B.6: Existing System Upgrades Risk Assessment – Road Condition Upgrade Potential

Upgrade No.	Length	Imagery Year	Road Condition	Road Condition Upgrade Potential	Raw Score	Weighted Score
1	121	-	N/A	Negligible	1	0.10
2	206	2023	Fair	Good	4	0.40
3	102	2023	Dirt road/unpaved	Negligible	1	0.10
4	96	2023	Fair	Good	4	0.40
5	144	2023	Dirt road/unpaved	Negligible	1	0.10
6	87	2023	Dirt road/unpaved	Negligible	1	0.10

APPENDIX C
Cost Estimates

Appendix C Cost Estimates

Table C.1: Existing System Capacity Upgrades Cost Estimates

ID	Items	Material	Quantity	Units	Unit Cost	Sub-Total	Contingency (30%)	Engineering (15%)	Total Cost[1,2]
EX Upgrade 1	200mm Watermain	PVC	121	Metres	$410	$49,610	$14,883	$7,442	$80,000
					EX Upgrade 1 Sub-Total:	$49,610	$14,883	$7,442	$80,000
EX Upgrade 2	200mm Watermain	PVC	206	Metres	$410	$84,460	$25,338	$12,669	$130,000
	100mm Watermain Removal	AC	206	Metres	$100	$20,600	$6,180	$3,090	$30,000
	Pavement Rehabilitation	N/A	206	Metres	$1,048	$215,888	$64,766	$32,383	$320,000
					EX Upgrade 2 Sub-Total:	$321,360	$96,408	$48,204	$470,000
EX Upgrade 3	200mm Watermain	PVC	102	Metres	$410	$41,820	$12,546	$6,273	$70,000
	Gravel Road Rehabilitation	N/A	102	Metres	$510	$52,020	$15,606	$7,803	$80,000
					EX Upgrade 3 Sub-Total:	$93,840	$28,152	$14,076	$140,000
EX Upgrade 4	200mm Watermain	PVC	96	Metres	$410	$39,360	$11,808	$5,904	$60,000
	150mm Watermain Removal	AC	96	Metres	$100	$9,600	$2,880	$1,440	$20,000
	Pavement Rehabilitation	N/A	96	Metres	$1,048	$100,608	$30,182	$15,091	$150,000
					EX Upgrade 4 Sub-Total:	$149,760	$44,928	$22,464	$220,000
EX Upgrade 5	300mm Watermain	PVC	144	Metres	$585	$84,240	$25,272	$12,636	$130,000
	200mm Watermain Removal	PVC	144	Metres	$100	$14,400	$4,320	$2,160	$30,000
	Gravel Road Rehabilitation	N/A	144	Metres	$510	$73,440	$22,032	$11,016	$110,000
					EX Upgrade 5 Sub-Total:	$172,080	$51,624	$25,812	$250,000
EX Upgrade 6	200mm Watermain	PVC	87	Metres	$410	$35,670	$10,701	$5,351	$60,000
	150mm Watermain Removal	PVC	87	Metres	$100	$8,700	$2,610	$1,305	$20,000
	Gravel Road Rehabilitation	N/A	87	Metres	$510	$44,370	$13,311	$6,656	$70,000
					EX Upgrade 6 Sub-Total:	$88,740	$26,622	$13,311	$130,000
					Existing System Upgrade Total:	$875,390	$262,617	$131,309	$1,270,000

[1]Costs herein are comparable to other municipalities. Costs are representative of 2025 dollars.
[2]The total cost has been rounded up to the nearest $10,000.

Table C.2: Future Servicing Cost Estimates

Item	Material	Quantity	Units	Unit Cost[1]	Sub-Total	Contingency (30%)	Engineering (15%)	Total Cost[1,2]
200mm Watermain	PVC	925	Metres	$410	$379,250	$113,775	$56,888	$550,000
250mm Watermain	PVC	927	Metres	$460	$426,420	$127,926	$63,963	$620,000
300mm Watermain	PVC	4,611	Metres	$585	$2,697,435	$809,231	$404,615	$3,920,000
				Total	$3,503,105	$1,050,932	$525,466	$5,090,000

[1]Costs herein are comparable to other municipalities. Costs are representative of 2025 dollars.
[2]The total cost has been rounded up to the nearest $10,000.