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GLOBAL PERSPECTIVE.
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REPORT

Town of Claresholm

Conceptual Servicing Plan



APRIL 2024



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1 INTRODUCTION

The Town of Claresholm (the Town) retained Associated Engineering (Associated) to provide a preliminary servicing report for the water, sanitary and storm systems of a new subdivision and development in support of an Area Structural Plan (ASP) to develop approximately 15.20 ha (38 acres).

2 BACKGROUND

The Town is developing an ASP for the North Point Development located West of Highway 2 and Alberta Road and East of 8th Street West. The site area includes 14.22 Ha of Block 7 (Plan 7410624) and 0.97 Ha of Block 8 (Lot 5, Plan 0715848). This report represents a conceptual servicing plan that identifies the deep utility servicing requirements for the development.

The proposed development is currently in a vacant undeveloped area zoned as Multiple Land Use (Block 7), and C2 – Highway Commercial (Lot 5, Block 8), as per the 2021 Infrastructure Master Plan (IMP). The Municipal Development Plan (MDP) designates a commercial corridor area adjacent to Alberta Road and the rest of the site for residential development.

The natural topography of the site slopes gently from Northwest to Southeast toward ditches and eventually into Willow Creek, located approximately 7.6 km West; the site elevations range between 1038m and 1045m.

3 REFERENCES

The following information was reviewed for this study:

- Town of Claresholm Infrastructure Master Plan (IMP), Associated Engineering, 2021.
- Water Supply for Public Fire Protection, Fire Underwriters Survey, 2020.
- Town of Claresholm Municipal Development Plan Bylaw 1644, Oldman River Regional Services Commission, 2018.
- Town of Claresholm Servicing Standards for Municipal Improvements (SSMI), 2017.
- Standards and guidelines for municipal waterworks, wastewater and storm drainage systems, Alberta Environment and Parks Standards and Guidelines, 2012
- Town of Claresholm Land Use Bylaw No. 1525, Oldman River Regional Services Commission, 2009.

4 DEEP UTILITY SERVICING

The proposed development will consist of a Medium and High-Density Residential development area and a Highway Commercial section refer to **Table 4-1**. Based on the proposed land use, there will be an estimated 291 Residential units, with an assumed occupancy of 1.8 persons per unit in the High-Density Area, and 2.7 persons per unit in the Medium-Density Area. The forecasted population of the residential development is 535 people. The area for the commercial sector consists of 8.42 ha with approximately 9 lots.

Table 4-1 Land Use Statistics

Land Use	Area (Ha)	Units ¹	Population
Medium Density Residential	0.32	9	24
High Density Residential	3.24	282	508
Highway Commercial	8.42	-	-
Recreation, Parks, and Open Space	2.14	-	-
Roadways	0.67	-	-
Stormwater Pond	0.41	-	-
Total	15.20	291	532

Note 1: Estimated development units from North Point ASP Land Use concept.

5 POTABLE WATER SERVICING

5.1 Water Demands

The development water demands were estimated based on the proposed land uses, and the assumed design population described in previous sections. A residential design demand of 550 l/d per capita and a commercial design demand of 20,000 l/ha per day was used for planning purposes according to the Infrastructure Master Plan (IMP). Peaking factors were applied to calculate maximum day and peak hour flow rates, summarised in [Table 5-1](#).

Table 5-1 Water Demand

	Medium Density Residential	High Density Residential	Highway Commercial	Total
Design Population / Area	24	508	8.42 Ha	
Average Water Demand Per Capita	550 l/c/d	550 l/c/d	20,000 l/ha/d	
Average Day Demand (l/s)	0.15	3.23	1.99	5.38
Max Day Peaking Factor	2.60	2.60	2.60	
Maximum Day Demand (l/s)	0.40	8.40	5.18	13.98
Peak Hour Factor	5.20	5.20	5.20	
Peak Hour Demand (l/s)	0.80	16.80	10.35	27.96

5.2 Fire Protection Requirements

As per the Town of Claresholm SSMI Water Distribution System Master Plan, the fire flow requirement for a Medium Density Residential is 67 l/s, for a High-Density Residential is 151 l/s, and for a Highway, Commercial is 189 l/s. Following the IMP design criteria, the design fire storage for the proposed development will be based on the commercial fire flow requirement, 189 l/s for 2.5 hours. The number of hydrants and their location will be determined during the detailed design stage. The SSMI states a maximum spacing of hydrants in multi-family and commercial areas of 90 m.

5.3 Storage Requirements

Storage requirements related to the proposed development were calculated based on the design flows in **Table 5-2**. The calculations follow the requirements laid out in the Alberta Environment and Parks Standards and Guidelines (AEP), Part 2:

$$S = A + B + (\text{the greater of C or D})$$

where S = Total storage requirement, m³

A = Fire storage, m³

B = Equalization storage (approximately 25% of projected maximum daily design flow), m³

C = Emergency storage (minimum of 15% of projected average daily design flow), m³

D = Disinfection contact time (T10) storage to meet the CT requirements, m³ (not applicable for this report)

Table 5-2 Water Storage Requirements

Storage Requirements	Volume (m ³)
Fire Storage (189 l/s for 2.5 hours)	1,701 ²
Equalization Storage (0.25 x Max Day Demand)	204
Emergency Storage (0.15 x Average Day Demand)	48
Total¹	2,083

Note¹: Does not include disinfection contact time storage requirements.

Note²: Fire storage requirement already accounted within existing storages.

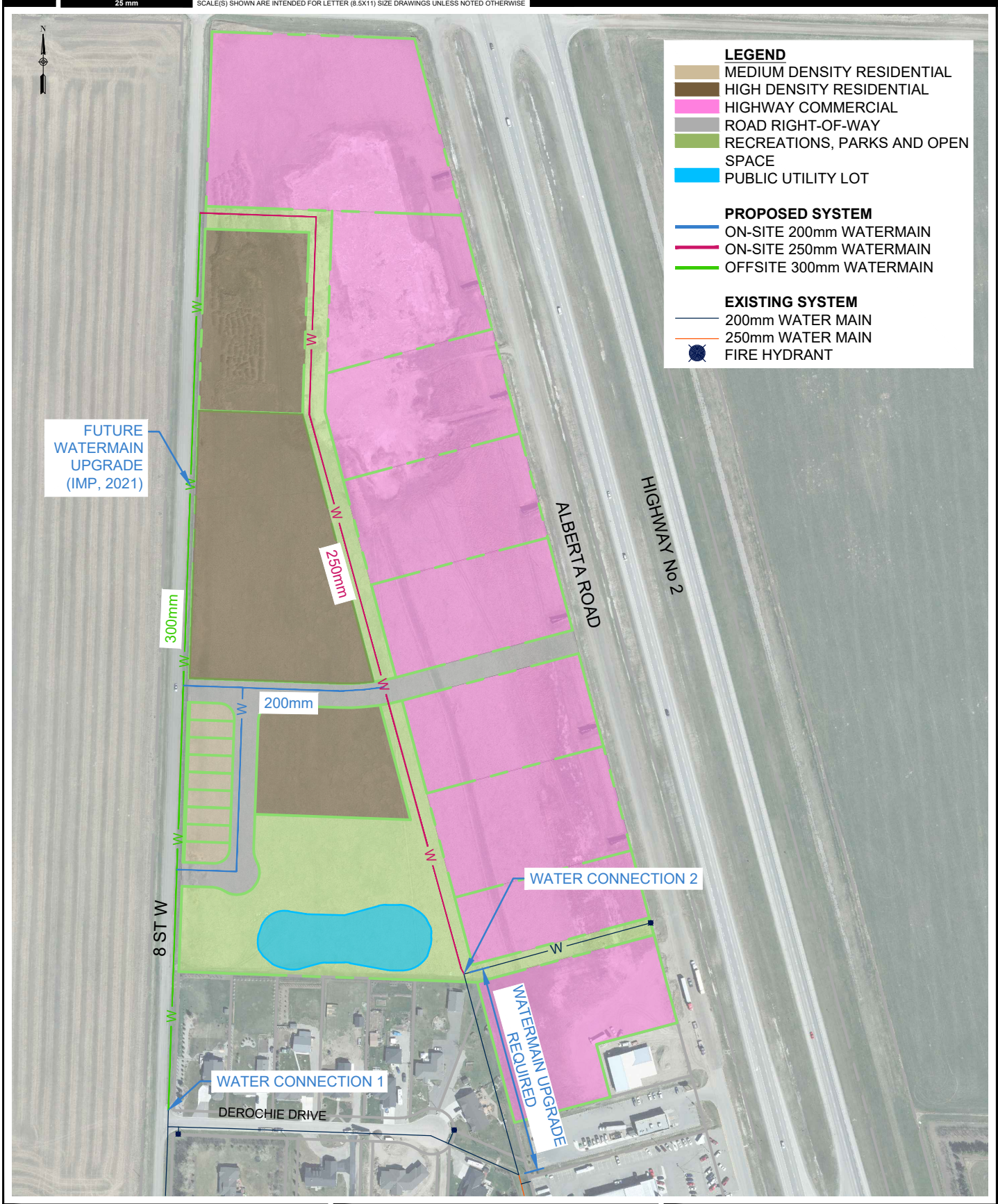
5.4 Proposed Potable Water System

Providing water service to the development will require the installation of new water mains within the proposed roadways and open space areas of the development.

An offsite watermain extension will be required to connect to the existing 8 Street W water system. The offsite watermain will create a looped watermain that will provide capacity to meet the normal operating needs of the system as well as the fire protection requirements for both commercial and residential zones. Two connections to the existing system have been proposed:

- **Connection 1** is required at the intersection of 8 St. W, and Derochie Dr. Construction of the new watermain will be completed along the existing right-of-way of 8 Street W.
- **Connection 2** is required at the existing waterline located south of the proposed site.

The above connections to the existing water system and the proposed water system are shown in **Figure 5-1-Proposed Water System**.



LEGEND

- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- HIGHWAY COMMERCIAL
- ROAD RIGHT-OF-WAY
- RECREATIONS, PARKS AND OPEN SPACE
- PUBLIC UTILITY LOT

PROPOSED SYSTEM

- ON-SITE 200mm WATERMAIN
- ON-SITE 250mm WATERMAIN
- OFFSITE 300mm WATERMAIN

EXISTING SYSTEM

- 200mm WATER MAIN
- 250mm WATER MAIN
- FIRE HYDRANT

FUTURE
WATERMAIN
UPGRADE
(IMP, 2021)

300mm

250mm

200mm

8 ST W

WATER CONNECTION 1

DEROCHIE DRIVE

WATER CONNECTION 2

WATERMAIN UPGRADE
REQUIRED

ALBERTA ROAD

HIGHWAY No 2



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FIGURE 5-1 - WATER SYSTEM

TOWN OF CLARESHOLM
 CONCEPTUAL SERVICING PLAN
 PROPOSED WATER SYSTEM

5.5 Conclusions and Recommendations

The predicted increase in flows for the potable water system is not expected to exceed the existing operation capacity of the Town's Water Treatment Plant.

The Town has an available water storage of 5,644 m³ in two facility locations: the Water Treatment Plant and the Highway Pump Station Storage, which already account 3,402m³ for fire storage. No additional fire storage is needed for the proposed development and the additional required equalization and emergency storage can be overtaken within the available storage.



Future Water System Upgrades, IMP

However, the distribution system in the northwest area of the Town is currently not able to meet the level of service requirements for existing developments or the addition of the proposed development.

The IMP proposed improvements to the existing system to address the lack of sufficient fire flow and to facilitate growth in the north developable areas. One of the proposed improvements that will impact the proposed development (both Prairie Shores and North Point) is the installation of a new reservoir and pumphouse in the Town's north end with a storage volume of 3,200m³, which is required due to the increasing water consumption and the additional pumping and distribution capacity; the reservoir will also provide redundancy in the water distribution system.

It is recommended that the Town follows the capital planning recommendations stated in the IMP to improve the level of service and provide capacity for development at the north end of the Town.

Additional infrastructure upgrades have been recommended to support the proposed development, including:

1. An extension of the existing water system for Connection 1. The water main along 8 Street is considered within the Future Growth Improvement Projects of the IMP and includes the installation of new 300mm mains to increase the ultimate servicing capacity of the developable lands on the north side of the Town.
2. An upgrade of the existing 200mm water main with a new 250mm main for Connection 2 along the southeast end of Derochie Dr., to comply with the Town's design requirements for commercial areas.

As the development progresses, the developer and designer will need to continue to work with the Town as changes and improvements in the existing distribution system and storage are implemented. It is recommended that the development servicing proceed based on the design criteria defined in this document and follow the Town's Servicing Standards.

The viability of any proposed water main alignments will require a further assessment at the design stage in terms of constructability (e.g., site investigation, geotechnical conditions, trenchless methods, etc.), infrastructure costs, and possible negotiations and agreements with utility providers and approvals by the Town.

6 SANITARY SEWER SERVICING

6.1 Sanitary Sewage Generation

Sewage generation rates were estimated based on the proposed land uses and the assumed design population described in previous sections. A design average dry weather flow rate of 400 l/d per capita was used for residential planning purposes and 20,000 l/ha per day for commercial planning purposes, as stated in the Town of Claresholm Servicing Standards for Municipal Improvements. Peaking factors were applied to calculate peak dry weather flow rates. Inflow and infiltration allowances were included based on 650 l/d per capita for residential and 9.75m³/ha per day for commercial areas. These are summarized in **Table 6-1**.

Table 6-1 Design Sewage Generation

	Residential	Commercial
Number of lots	291	9
Estimate Residential Population	535	-
Design Flow	400 l/c/d	20,000 l/ha/d
Harmon's Peaking Factor	3.96	5.95
Peak Dry Weather Flow	9.75 l/s	11.60 l/s
Contributing Area	4.23 ha ¹	8.42 ha
I&I Contribution	650 l/c/d	9.75 m ³ /ha/d
I&I Contribution	4.09 l/s	0.95 l/s
Peak Wet Weather Flow	13.84 l/s	12.55 l/s

Note ¹: Residential contributing area includes high and medium density areas and road right-of-ways.

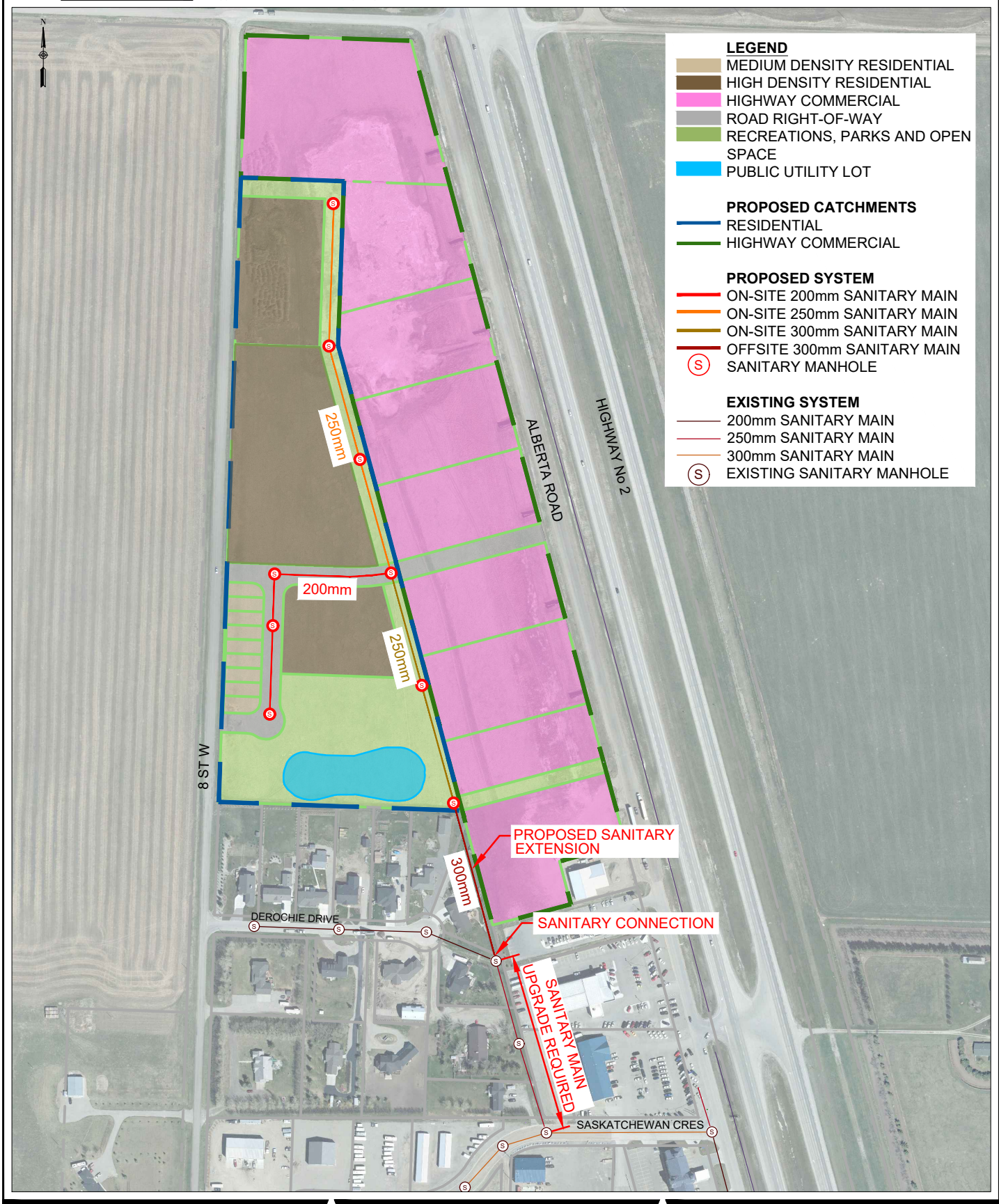
6.2 Proposed Sanitary System

Sanitary sewer servicing will require the installation of new sanitary sewers within the proposed roadways and open space. This servicing concept includes sewage collected in gravity mains to the existing wastewater system of the Town.

The development has been divided into two sewerage catchments; they are illustrated in **Figure 6-1 -Proposed Sanitary System**.

- 1) **Commercial Catchment** will flow by gravity from North to South to an existing manhole located between the existing residential and commercial areas.
- 2) **Residential Catchment** will flow by gravity to the East and tie into the proposed commercial gravity system.

The sanitary connection to the existing system and the proposed sanitary system are shown in **Figure 6-1-Proposed Sanitary System**.



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FIGURE 6-1- SANITARY SYSTEM

TOWN OF CLARESHOLM

CONCEPTUAL SERVICING PLAN
 PROPOSED SANITARY SYSTEM

6.3 Conclusions and Recommendations

The predicted design flows for the sanitary water system are not expected to exceed the existing operation capacity of the Town’s Wastewater Treatment Plant or the lagoons.



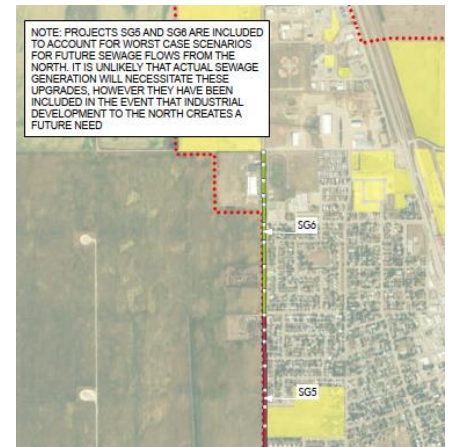
Existing Sanitary System Upgrades, IMP

However, the existing downstream sanitary system from the Saskatchewan Crescent and Columbia Drive intersection is predicted to surcharge during rainfall events, including a section of the sanitary system along 8 Street.

The IMP proposed improvements to the existing systems to address the pipes that are currently over capacity. One of the proposed improvements to the existing system that will directly impact the proposed development is the upgrade of the sanitary main that connects 59 Ave W to the Columbia Drive trunk (North Industrial Upgrade S1). The upgrade of the existing system along 8 Street S (S2) is also needed to provide additional capacity during wet weather flow.

Moreover, the IMP proposed improvements along 8 Street W to account for future sewage flows from the development of the industrial area on the north, which includes the development of Prairie shores as well.

It is recommended that the Town follows the capital planning recommendations stated in the IMP to improve the level of service and provide capacity for development at the north end of the Town.



Future Sanitary System Upgrades, IMP

Providing sanitary sewer servicing to the proposed development is constrained by the grades of the existing site and the depth of adjacent sanitary sewers that will ultimately convey sewage generated by the site to the Town’s treatment facility. It is recommended that the servicing of the development proceed based on the design criteria defined in this document and follow the Town’s Servicing Standards.

The development will require:

1. The extension of 300mm sanitary main from the existing manhole located at the southeast end of Derochie Dr. towards the proposed connection.
2. An upgrade of the existing 250mm sanitary main with a new 300mm main from the proposed sanitary connection to the existing sanitary manhole located in Saskatchewan Crescent.

As the development progresses, the developer and designer will need to continue to work with the Town as improvements in the existing sanitary system are implemented and the maximum capacity of the wastewater treatment plant and its lagoons is reached due to the expected development.

The viability of any proposed sanitary sewer mains alignments will require further assessment at the design stage in terms of constructability (e.g., site investigation, geotechnical conditions, trenchless methods, etc.), infrastructure costs, agreements with utility providers and approvals by the Town.

7 STORM SEWER SERVICING

7.1 Design Criteria

Following the Town's Infrastructure Master Plan, Associated analyzed the generated site runoff under a rainfall event that considers the impacts of climate change, as it presents the highest rainfall per event and has a peak and total rainfall ~5-8% higher than the historical data.

To comply with the Town's bylaw 1644, the minor system is to be designed for a 5-year return flow, and the major system is to be designed for a 100-year design storm. The intensity-duration-frequency (IDF) constants for the 5 and 100-year return frequency events are presented in **Table 7-1**, where:

$$i = \frac{a}{(t_D + b)^c}$$

i_{avg} = average rainfall intensity (mm/hr)

t_D = duration of rainfall (hr)

a, b, c = IDF constants for each period in years

Table 7-1 Design Rainfall Event Under Climate Change

Rainfall Event	A	B	C
5 Year	27.7	0.091	0.764
100 Year	84.3	0.415	0.898

7.2 Residential Catchment

The residential catchment includes two land use zones: Medium and High Density Residential. The stormwater runoff boundary along the residential area of the development will include the west portion of the site. An area of 6.78 ha will drain to a dry pond through the major and minor systems before release to the existing ditch located between Alberta Road and Highway 2.

The design criteria that will be used for the stormwater management system includes:

- High-density residential areas to retain and manage runoff volumes on-site. Allowable peak post-development release rates to not exceed flows resulting from a 1 in a 5-year storm event.
- Dry pond to store peak runoff volume for a 100-year event.
- Offsite discharge is to be at a controlled release rate based on a unit release rate of 2.5 l/s/ha.
- Stormwater management techniques to improve water quality. An oil grit separator should be considered upstream of the pond.

Table 7-2 summarizes the flows and volumes for the 5 and 100-year design rainfall of the post-development scenario.

Table 7-2 Residential Runoff Results

	Area	5-year, 4-hour Runoff		100-year, 24-hour Runoff	
		Peak Flow	Volume	Peak Flow	Volume
Medium-Density Residential	3.56 ha	636 l/s	998 m ³	1,365 l/s	3,510 m ³
High-Density Residential	3.24 ha	564 l/s	912 m ³	1,232 l/s	3,212 m ³

The medium-density residential area includes roads right-of-way, park space and the public utility lot.

The high-density residential area requires storage on-site at approximately 660 m³ (204 m³/ha) with an allowable release rate to the proposed minor system of 564 l/s.

7.3 Commercial Catchment

The stormwater runoff boundary along the commercial area of the development will include the east portion of the site. An area of 8.42 ha will retain runoff volumes on-site and drain to the existing ditch located between Alberta Road and Highway 2 under a controlled release rate.

The design criteria that will be used for the stormwater management system includes:

- Commercial areas to retain and manage runoff volumes on-site.
- Allowable post-development release rates set to 2.5 l/s/ha.

Table 7-3 summarizes the flows and volumes for the 5 and 100-year design rainfall of the post-development scenarios.

Table 7-3 Commercial Runoff Results

	Area	5-year, 4-hour Runoff		100-year, 24-hour Runoff	
		Peak Flow	Volume	Peak Flow	Volume
Commercial Area	8.42 ha	1,352 l/s	2,942 m ³	2,823 l/s	9,402 m ³

The commercial area requires storage and management on-site of approximately 8,091 m³ (~961 m³/ha), with a total allowable release rate of 21.05 l/s to the existing ditch.

7.4 Proposed Storm System

The proposed stormwater system follows a traditional dual drainage system with a pipe system and a designed overland drainage system that incorporates the roads, curbs, and other designed overland flow paths, as well as stormwater management facilities. The proposed minor system is shown in **Figure 7-1-Proposed Storm System**.

The proposed dry pond facility will generally be designed to meet the following criteria:

- Upstream Drainage Area: 6.1 ha
- Pond Area: 7,225 m²
- Active Storage Volume (HWL): 5,650 m³
- High water level (HWL) depth: 1.0 m

- Freeboard depth (0.5m above HWL): 1.5 m
- Design detention release rate 17 l/s

Construction of the pond outlet will require a control structure that will limit the offsite discharge to the defined design release rate. The pond outlet will discharge to the existing ditch between the site and Alberta Road, which drains to the Highway 2 ditch through an existing culvert, and eventually drains south through the ditch system and discharges into a watershed located in the northeast corner of the Town.

An emergency overland spill route is provided to control the discharge of runoff in extreme events; it will be directed to the existing ditch adjacent to the site. Both the pond outlet and the emergency overland spill route are proposed along the established public green space between the commercial lots.



LEGEND

- MEDIUM DENSITY RESIDENTIAL
- HIGH DENSITY RESIDENTIAL
- HIGHWAY COMMERCIAL
- ROAD RIGHT-OF-WAY
- RECREATIONS, PARKS AND OPEN SPACE
- PUBLIC UTILITY LOT

PROPOSED CATCHMENTS

- RESIDENTIAL
- HIGHWAY COMMERCIAL

PROPOSED SYSTEM

- PROPOSED STORM SYSTEM
- S PROPOSED STORM MANHOLE
- PROPOSED EMERGENCY OVERLAND SPILL ROUTE

EXISTING SYSTEM

- EXISTING DITCH
- EXISTING CULVERT



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FIGURE 7-1 - STORM MINOR SYSTEM
 TOWN OF CLARESHOLM
 CONCEPTUAL SERVICING PLAN
 PROPOSED STORM SYSTEM

7.5 Conclusion and Recommendations

In order to contain drainage within the boundary of the development and to control the release of stormwater, area grading will be required to alter the direction and nature of overland flows in the area.

The residential storm minor system shall be re-evaluated during detailed design to consider the high-density residential storm system layout.

The developer and designer will need to assess the condition of the existing culvert under Alberta Road to confirm it meets the flow capacity through the ditch.

It is recommended that the development servicing proceed based on the design criteria defined in this document and follow the Town's Servicing Standards.

The viability of any proposed storm sewer main alignment will require further assessment at the design stage in terms of constructability (e.g., site investigation, geotechnical conditions, trenchless methods, etc.), infrastructure costs, agreements with utility providers and approvals by the Town. The final arrangement for the discharge will be subject to Municipal, Environmental Protection and Enhancement Act, and Water Act approvals.

8 CONCLUSIONS

The development will require offsite connections and upgrades of existing infrastructure to service the proposed development adequately. The offsite connections will be completed in cooperation with the Town and may be subject to an additional review of downstream capacities.

As the development commences, the preliminary and detailed designs should be completed in general accordance with this report. The design criteria and considerations contained in this report should form the basis of these designs. All work will be subject to the review of the relevant authorities and further assessment at the design stage in terms of constructability (e.g. site investigation, geotechnical conditions, trenchless methods, etc.), infrastructure costs, possible negotiations and agreements with affected private landowners, utility providers and approvals.

CLOSURE

This report was prepared for the Town of Claresholm as a guideline that provides the Client with a conceptual design and future design criteria for the development located Northeast of the Town.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,

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