TOWN OF COCHRANE

2023 WATER AND WASTEWATER MASTER PLAN UPDATE (FINAL)

MAY 2026

URBAN SYSTEMS

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DATE: MAY 2026

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1728.0456.01/02

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1.0 INTRODUCTION

The Town of Cochrane ('the Town') is currently the fastest growing municipality in Alberta, with a population of approximately 35,000 people[1] (a municipal census is being conducted in 2024). In the last 6 years, Cochrane grew at a robust annual average rate of 5.1% [1], indicative of Cochrane's desirability as a community for people to live and work in, being near the City of Calgary, and on the doorstep of the Rocky Mountains. With this pace of growth comes an increased requirement for water and wastewater infrastructure planning that considers the long-term sustainability of level of service and manages resources in a fiscally and environmentally responsible way.

This Master Plan is an update from the previous 2012 Town of Cochrane Water and Wastewater (W3) Master Plan ("2012 W3 Report") [2] and is intended to provide a clear picture of the existing system's technical performance and constraints. It also provides a plan for future upgrades that will support growth to the current Municipal Boundary and assist the Town in prioritizing investment decisions for the future, including:

- Capital needs and their timing for infrastructure throughout the system to accommodate growth to the boundary.
- Opportunities for densification and redevelopment within areas of the downtown.
- Strategic alignment opportunities for investments where different projects may correlate or overlap, such as passive replacement projects to reduce system deficiencies.
- A reduction in risk of service interruptions by adding resiliency to the system.

This project began in 2023. The existing water and sanitary system analysis is based on the Town's water meter data from January to December 2022, and the existing water and sanitary network information reflects the Town's GIS records as of May 2023.

The analysis presented in this report was initiated in 2023 and completed in 2024. After the Master Plan was finished, the report remained in draft form while additional studies of the Town's water and sanitary systems were carried out. The findings from those studies, along with feedback from the Town, have been incorporated into the Final (2026) version of this report.

[1] This population estimate is based on 4% annual growth from the 2021 Federal Census

1.1 BACKGROUND & PREVIOUS STUDIES

Over the past 4 years, many important studies have laid the groundwork for this Master Plan update, which are referenced throughout the document and are summarized as follows:

2012 WATER AND WASTEWATER (W3) MASTER PLAN [2]

In October 2010, Urban Systems developed a steady-state model of Cochrane's Water Distribution System to support the 2012 W3 Report, using GIS data and available as-built records from the Town. The 2012 W3 Report established Cochrane's utility service delivery goals (levels of service) for both water and wastewater and analyzed the existing water and wastewater systems performance under those service delivery goals. The 2012 W3 Report recommended passive and capital upgrades required to meet the 20-year growth needs (an estimated population of 35,000-40,000 people). The report also analyzed the existing infrastructure for system failure using a risk-based approach (likelihood and consequence of failure), to recommend upgrades to improve system resiliency.

Many of the upgrades cited in the 2012 W3 Report have been completed over the past 12 years, apart from a few which are explored again in this 2023 Master Plan.

2020-2022 SEWER MODEL UPDATE AND CALIBRATION [3]

The Town's sanitary model developed in 2011 for the W3 Master Plan underwent an extensive update from 2020 to 2022. The model had not been updated since its development and as a result, a substantial amount of information was missing and/or out of date, including new mains from recent developments and pipe upgrades on existing areas that had taken place over a period of 9 years. To calibrate the updated model, evaluate the system's performance and response to rainfall, and determine potential issues with inflow and infiltration (I&I), flow monitoring was conducted for a period that included both winter and summer months.

The update consisted of three phases: (1) update the model geometry based on record information and plan the flow monitoring program, (2) monitor flows at key locations to get a representative sample of dry and wet weather flows, and (3) calibrate the model based on collected monitoring information.

Phase 1 was completed in August 2020 using PCSWMM, the flow monitoring program was conducted in the winter and summer of 2021, and the calibration of the model was completed in 2022. By normalizing and averaging the collected flow and rain gauge data, diurnal patterns for each land use type (residential and non-residential) were created and applied to each node in the model based on the node's location. To represent I&I more accurately based on specific characteristics of the Town's sanitary system, the RTK method was employed to predict rainfall-derived inflow and infiltration (RDII) responses. The calculated RTK parameters were entered into each node to model the response of the sanitary system to rainfall for each node's sewershed. The calibrated model resulting from this update was used as the basis for the sanitary system analysis within this Master Plan.

2019 WATER MODEL UPDATE AND CALIBRATION [4]

The WaterCAD model, built in 2010, underwent a review and update in August 2015, which also introduced an extended period simulation (EPS) model aimed at evaluating reservoir fill times and daily water level fluctuations, though it wasn't calibrated due to data availability limitations. By 2019, after years of new developments and upgrades within the Town, there was a need to update and calibrate both steady-state and EPS models to address future challenges, especially concerning the 2 Million Gallon (2MG) reservoir's filling operations. This 2019 update used Bentley WaterCAD V8i for incorporating system expansions and relied on the Town's GIS for accurate model enhancements, focusing on the addition of pipes, pumps, PRVs, and hydrants to reflect recent developments in Town.

The 2019 update aimed to refine demand allocations within the model, leveraging SCADA data and metering records from 2017 (the most recent full data set available at the time) to establish water consumption patterns and demand peaking factors. These refinements allowed for a more accurate representation of water usage across different Town areas. The EPS model, calibrated with 2017 SCADA records, was designed to offer insight into reservoir level management and identify potential future upgrades that could support improvements.

Despite certain limitations, such as uncalibrated diurnal patterns and unknown operational details at reservoirs, the model's calibration showed a good correlation with actual water usage and distribution flows, setting a foundation for future analyses. Urban Systems recommended periodic updates to the model, including improved monitoring of pump operations, reservoir control set points, and inflow/outflow data to support further analyses to optimize reservoir fill times and accommodate growth, ensuring Cochrane's water distribution system remains efficient and responsive to the Town's needs. The steady state model resulting from this update was used as the basis of the water system analysis within this Master Plan.

2022 EXTENDED PERIOD SIMULATION MODEL CALIBRATION AND 2MG FILLING ANALYSIS [5]

This technical memo addressed the recurring issues with filling the Town's 2MG reservoir during periods of high water demands. In this EPS model update, the model was calibrated with water demand and reservoir level records during a two-week period in June and July 2021 where record temperatures were experienced across Alberta resulting in record water demands in Cochrane. This allowed for analysis of reservoir filling under a stressed distribution system.

The memo evaluated and compared the effects of potential solutions to improve 2MG reservoir filling, including infrastructure upgrades and changes in the operational philosophy at the Water Treatment Plant (WTP) high lift pump (HLP) station. Installation of a 600 mm main between the WTP and Westside Drive (as identified in the 2012 W3 Report, shown in Figure 1 below) showed improvements in maintaining reservoir water levels during high-demand periods as did altering WTP high lift pump operations. However, while changes in pump operation at the WTP indicated improved reservoir levels at the

2MG Reservoir, further discussions with the Town were recommended, to assess wider implications like high pressures at the outlet of the WTP and increased power consumption. It was concluded that the 600 mm main showed the most promising results that would require no change to the operational philosophy of the WTP, but operators could explore implementing the recommended operational changes (*i.e.,* using the second 150HP pump instead of the second 100HP pump during times where significant depletion is seen at the 2MG reservoir).

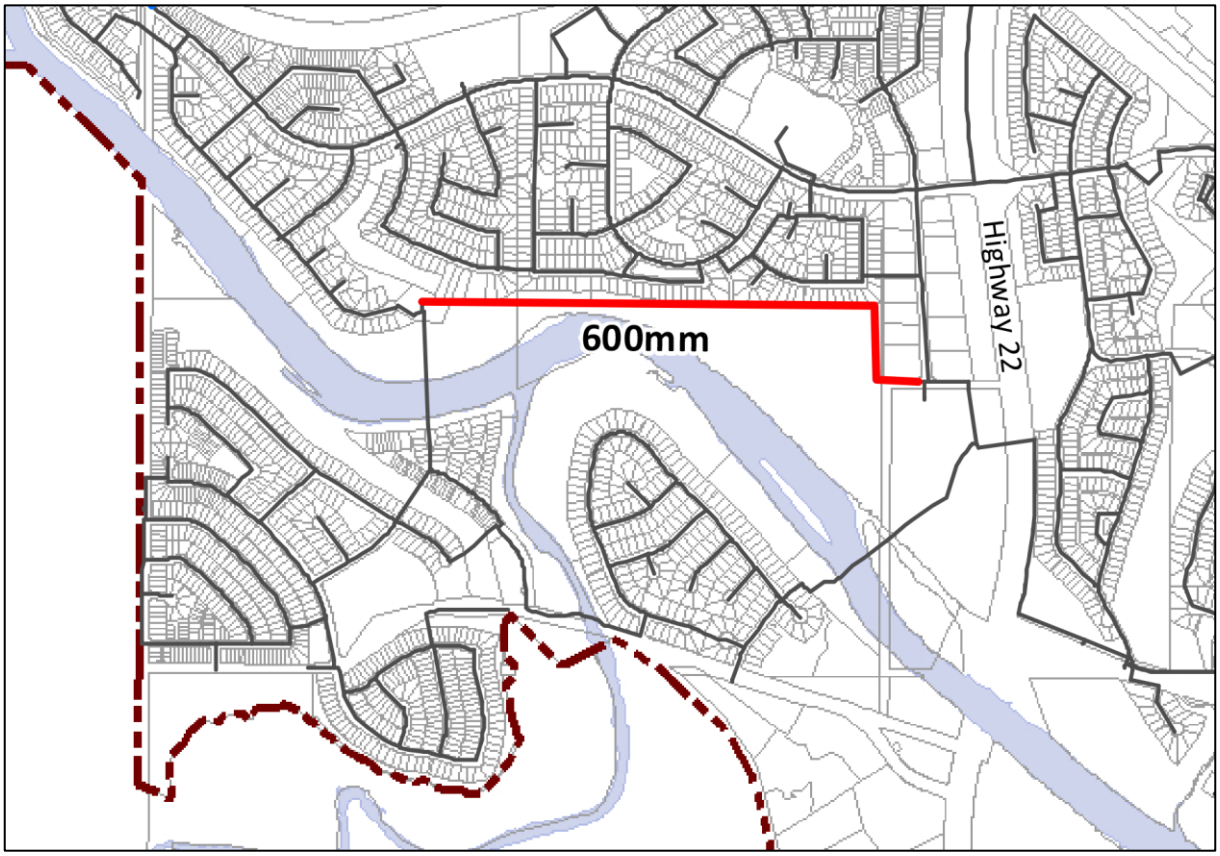


Figure 1: 600mm Feedermain proposed in 2012 W3 Report.

WATER SUPPLY STRATEGY [6]

In 2023, Urban Systems completed a report summarizing a multi-year strategy for securing Cochrane's long-term raw water supply needs. The work included developing guiding principles with the Town, compiling and interpreting data, and working with Alberta Environment and other regional partners to develop a strategy in the following four areas:

- Raw and Potable Water Demands and Growth Needs: The historical water demands were comprehensively reviewed to identify an appropriate design basis for long-range planning purposes. This included establishing parameters like per capita raw water and potable water demands and the maximum day demand: average day demand (MDD:ADD) peaking factor based on historical data, and allowing for potential hot and

dry safety factor scenarios. A range of population projections were used to develop the target planning volumes and timeframes for annual licence needs and future treatment capacities for 25 years of growth in Cochrane. The per capita demands and peaking factors established in this strategy are used in this 2023 Master Plan.

- Water Supply Infrastructure Needs: Three options for supply and treatment were developed at a high level, and capital costs and net present value costs over 25 years of operation were estimated. The options that were rated highest included a new WTP located elsewhere in Town (beyond the ultimate capacity of the existing WTP), with exploration of it being regional to provide maximum financial benefit. Recommendations for next steps were to explore locations for a future WTP and begin work to evaluate the existing WTP upgrade needs for the interim – both projects beginning in 2024.

1.2 2023 MASTER PLAN STUDY OBJECTIVES

The goal of any utility master plan is to recommend methods of achieving reliable levels of service for current and future growth.

In January 2023, a scoping workshop was conducted to review the opportunities and objectives of this Master Plan update and to identify synergies or interdependencies of other concurrent work. The workshop attendees included Town representatives from engineering, planning, operations, and parks. The core principles and key outcomes that were desired included:

- Level of Service: The plan should identify critical infrastructure and required upgrades to meet the Town's current level of service. It was agreed that this work would not review or change established levels of service.
- Risk: The plan should identify areas of risk to critical infrastructure, but a framework for decision-making so that the Town can properly prioritize upgrades and replacements would be conducted under an asset management program (not within this Master Plan scope).
- Future Capacity: The plan should provide clarity surrounding the Town's growth, by confirming the growth assumptions and identifying infrastructure upgrades required to service this growth.
- Prioritization: The plan should be a tool to identify priority projects (and their timing) for annual budget planning and for future Off-site Levy (OSL) bylaw updates. A framework for prioritization is not included in this scope, as this is included in the Town's capital planning process.
- Integration with Capital Planning: The plan should be a tool and reference used by Capital Planning to help identify priorities and efficiencies relative to other project scopes and departments.
- Connection to Broader Planning Practices: This plan should connect or build off key Town planning work such as:
    - 2024 Cochrane Growth Study
    - OSL Bylaw Updates

- Future WTP Location Feasibility Study (2024)
- Municipal Emergency Management Plan (2023)
- Cochrane Open Space Master Plan (November 2012)

Understanding the core principles and outcomes desired by the Town, the scope of this Master Plan update was refined and included:

- Inventory and analysis of infrastructure under existing conditions.
- Identifying upgrades required to the existing system to meet current level of service objectives.
- Identifying system upgrades required to support growth within the Town Boundary, including considerations for re-development within downtown.
- Creating short (3 years), medium (5-10 years) and long-term (10+ years) plans for the upgrades required to support growth within the Town Boundary.
- Provide opinion of probable costs (OPC) for the system upgrades required to support growth within the Town Boundary.
- Provide inputs for the 2024 OSL Update and the 2024 Cochrane Growth Study

As per the Town's request, risk assessments, fire flow testing, and asset management prioritization of system infrastructure are not included within the scope of this study. The Town plans to embark on an asset management program to address condition, risk, and renewal of their system infrastructure.

1.3 LEVELS OF SERVICE AND RISK ASSESSMENT

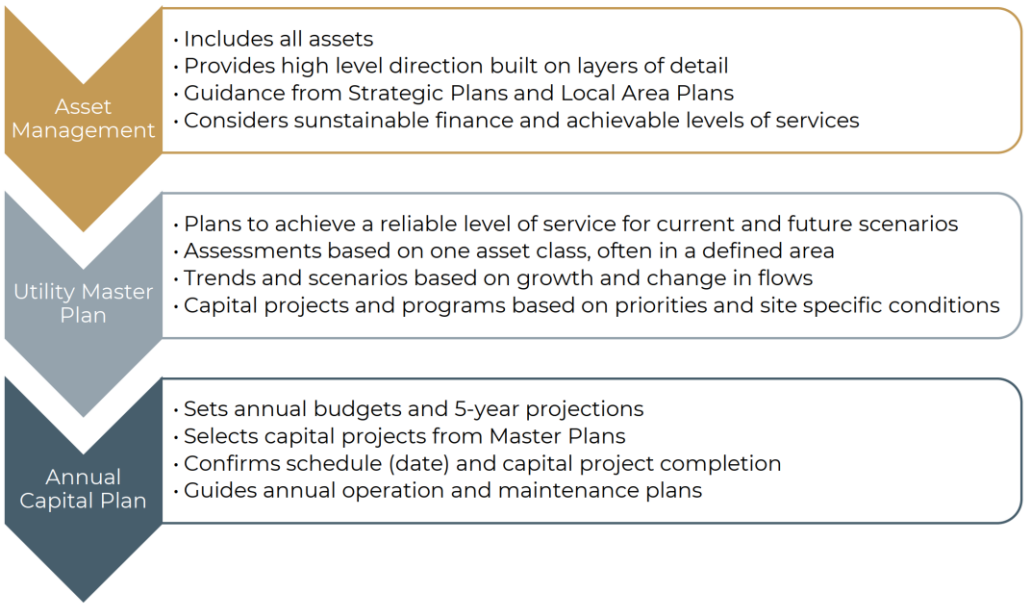
Levels of service are benchmarks commonly used by local governments to communicate to customers what they can expect in terms of overall system performance. Levels of service are important components of master planning and service delivery as they help guide priorities and inform decisions. They often include various categories such as risk (likelihood and consequence of failure), customer satisfaction, finance, engagement, system capacity and reliability, and in the context of infrastructure, these categories help to prioritize upgrades by assessing infrastructure performance and consequence if no upgrades occur.

This analysis excludes risk-based assessments related to condition and asset renewal and plan primarily focuses on the technical needs related to system capacity and reliability.

A risk assessment based on performance, condition, and consequence of failure ranking was conducted for both the sanitary and water systems in the 2012 Master Plan. This analysis identified pipes in the water and sanitary systems that should be replaced within the next 20-years at the time (2032). In this Master Plan update, passive replacement projects were reassessed solely based on pipe material and age. A more comprehensive review of passive replacement projects should be conducted as part of the asset management program to prioritize upgrades.

1.4 HIERARCHY AND GOVERNANCE

Levels of service, utility policy, asset management, master planning, and capital planning are integral components of infrastructure planning that must work together and inform one another. The following infrastructure hierarchy illustrates the role and decision-making process within each component and highlights the connection between each.



This hierarchy highlights asset management as a key overarching framework that needs to inform how this plan is considered and how to prioritize the recommended upgrades. The Town can then take this Master Plan to accurately inform 3–10-year capital plans and OSL Bylaw updates.

2.0 STUDY AREA

2.1 COCHRANE LOCATION CONTEXT

The Town of Cochrane is located within Rocky View County, with neighboring communities being the City of Calgary to the east and Stoney Nakoda First Nation to the west. The Town is situated in the foothills of the Rockies and boasts mountain views, distinctive rolling hills, and the Bow River winding through its borders.

The Town municipal limits are defined by HWY 22 in the north of Town, the borders of Fireside and Southbow Landing on the south, Horse Creek Road on the west, and the Bow River on the east. The Town is intersected by Highway 1A and Highway 22. The total area of land within the Town boundary as of December 31, 2022, is 752.1 hectares [7]. The elevations throughout the Town range from 1,100m to 1,352m.

Figure 2 provides a visual of the Town's limits within the region Cochrane Lake, a community within Rocky View County is shown for context as the Town of Cochrane provides them with sanitary servicing.

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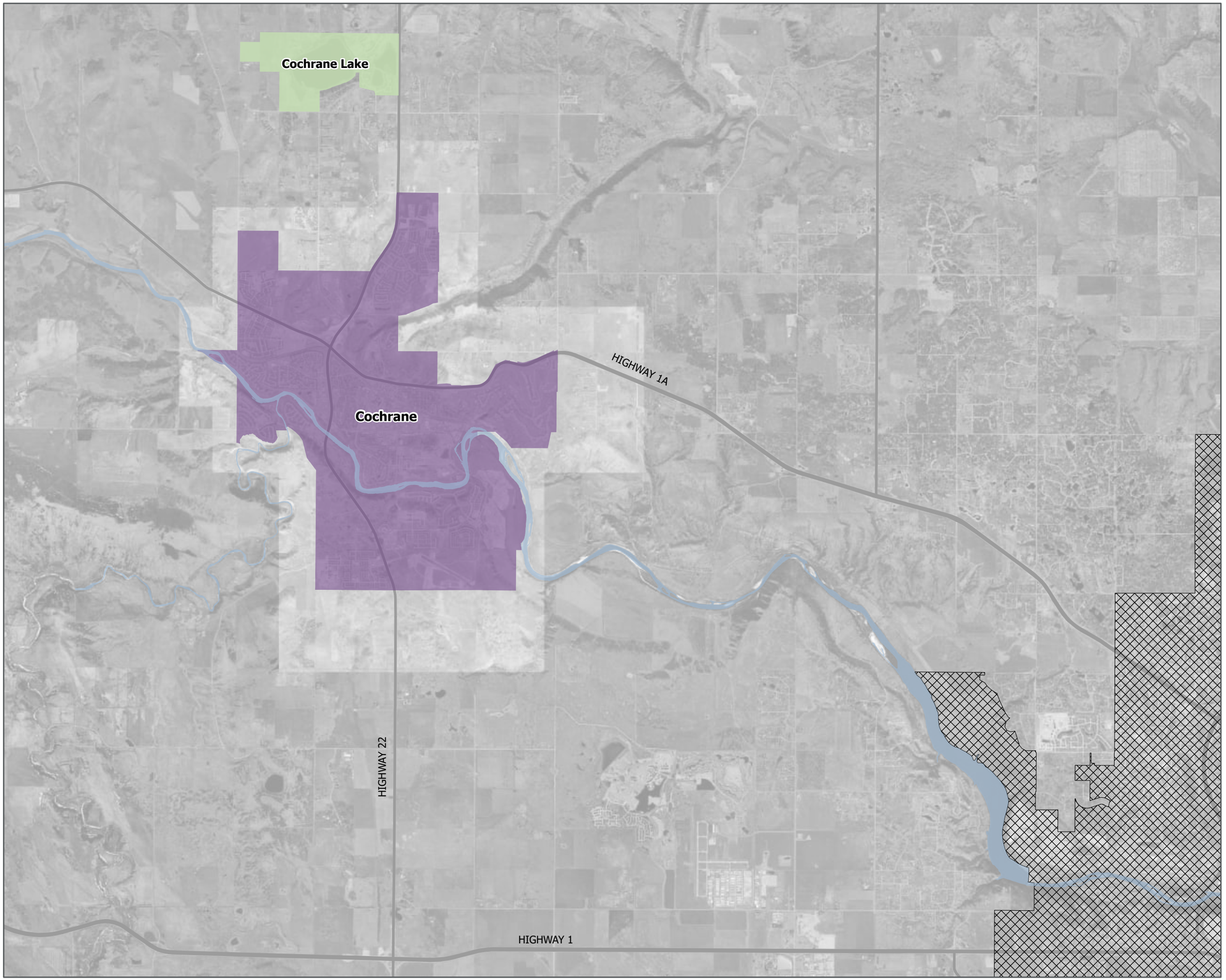

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Cochrane Overview

Legend

- Cochrane Lake (Rocky View County)
- Town of Cochrane
- City of Calgary

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Kilometers

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Data Sources:

- Data provided by the Town of Cochrane

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

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FIGURE 2

2.2 STUDY AREA EXTENT

The area extent of this study is the current Municipal Town boundary. Within the Town boundary, three growth scenarios were discussed at the scoping workshop in January 2023:

1. Existing system analysis (current state of the system)
2. Growth to the Town boundary
3. Potential growth areas beyond the Town boundary (technical support for the 2024 Growth Study)
4. Infill/Redevelopment within the Downtown.

Recognizing that this plan is in development concurrently with other key studies and policy documents not yet adopted, two of the three growth scenarios mentioned above are encompassed within this Master Plan: Growth to the Town boundary and infill/redevelopment. A high-level water and wastewater comparative analysis for potential growth beyond the Town boundary is provided under a separate cover and presented for internal Town use only to support the 2024 Growth Study.

3.0 GROWTH PROJECTIONS WITHIN TOWN BOUNDARY

3.1 POPULATION PROJECTIONS

In 2022, the Town of Cochrane developed a 25-Year Water Supply Strategy (the Water Strategy) [6]. Population projections within the Town boundary were developed based on the most recent available data provided by the Town up to the end of year 2022 (*i.e.,* updated development plans and census data), and were used to project the water licensing and treatment capacity needs for the Town for 25 years.

A constant 4% growth rate was used for long-range planning purposes in the Water Strategy to plan adequately for the supply needs of the Town and to allow for broader decision making regarding future treatment expansions.

This culminated in a 25-year projection of 86,645 people. These projections have been carried forward in this Master Plan to the Town boundary, which is estimated to be between 68,000 – 77,000) [7]. This Master Plan uses the population projections in Table 1 to estimate the timeframe for upgrades, but the Town should confirm upgrade timing annually based on actual growth within each community.

Table 1: Cochrane 25 Year Water Strategy Population Projections [8]

Projection Year	Year	Population (at growth rate of 4%)	Projection Year (cont'd)	Year (cont'd)	Population (at growth rate of 4%) (cont'd)
	2019	30,050	12	2033	52,037
	2020	31,252	13	2034	54,118
0	2021	32,502	14	2035	56,283
1	2022	33,802	15	2036	58,534
2	2023	35,154	16	2037	60,876
3	2024	36,560	17	2038	63,311
4	2025	38,023	18	2039	65,843
5	2026	39,544	19	2040	68,477
6	2027	41,125	*20*	*2041*	*71,216*
7	2028	42,770	*21*	*2042*	*74,064*
8	2029	44,481	*22*	*2043*	*77,027*
9	2030	46,260	23	2044	80,108
10	2031	48,111	24	2045	83,312
11	2032	50,035	25	2046	86,645

3.2 DEVELOPABLE LANDS

The Town completed land suitability assessments to identify which remaining lands within the Town boundary are most suited to support future community growth [7]. Water and wastewater infrastructure required to achieve growth within these developable lands is provided within this plan.

Figure 3 shows all the developable lands within the Town boundary that can support future growth.

Areas shown in green indicate future growth areas within the Town boundary, as identified by the Cochrane Growth Study. Areas hatched in blue in Figure 3 indicate lots that are subdivided, but not yet occupied. These correspond to areas within Town that were excluded from the future growth areas identified in the Growth Study but that did not have meter data available. To ensure these demands were captured, they are shown separately and were included as part of the Growth to Town boundary analysis.

3.2.1 SPECIAL CONSIDERATION AREAS

A few notable consideration areas are starred and shaded in purple on Figure 3 and include the following:

- Franciscan Lands
- Cochrane & District Agricultural Society Lands
- Baptist Seminary Lands

These areas have no current plans for growth or redevelopment. Therefore, no growth projections or water / sanitary demands for these areas have been included as part of the analyses. However, at the request of the Town, a high-level review of how these areas could be serviced if growth or redevelopment were to occur is provided in the water and wastewater analyses sections (no opinions of probable costs or capital projects are provided as a result of this analysis.)

3.2.2 REDEVELOPMENT / INFILL

The Town has identified target areas for infill or redevelopment planning. These areas include the Historic Downtown, New Downtown, East Industrial, East End, and Glenbow neighborhoods, shown in Figure 4. These established areas where development has already been concentrated are likely to densify with multi-family residential and commercial development.

These areas have been contemplated within this plan to inform the Town on the water and wastewater infrastructure constraints for targeted areas redevelopment plans/studies. Since no area redevelopment plans exist and it is difficult to make assumptions on demands and flows for redevelopment, this plan provides capacities of existing water and wastewater infrastructure after all future demands (to the Town boundary) have been allocated.

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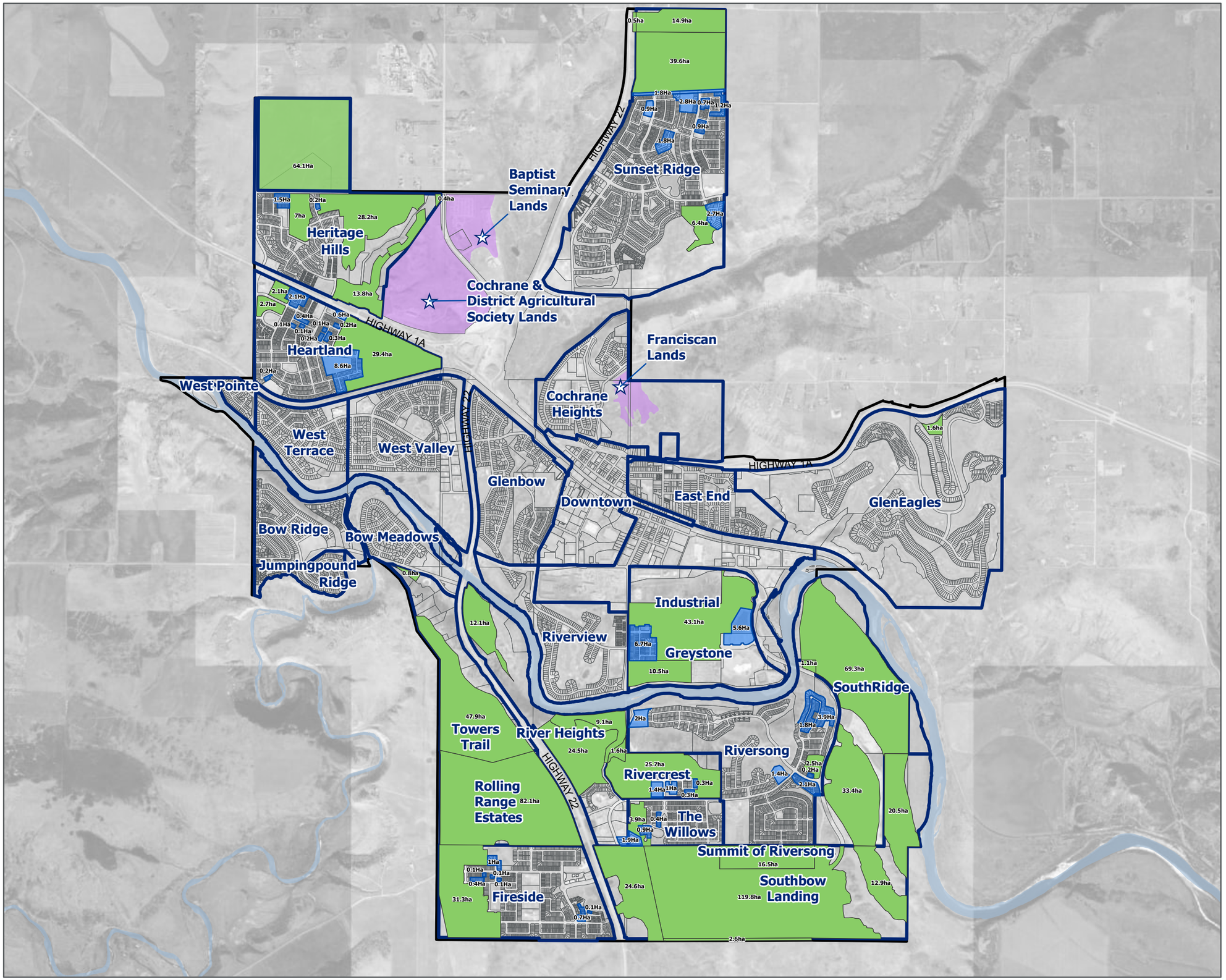

Town of Cochrane

Water & Wastewater Master Plan

Growth Areas

Legend

- Areas for Consideration, No Planned Servicing
- Developable Area
- Infill Area - Subdivided, no meter data available
- Cochrane Neighbourhoods
- Cochrane Boundary

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Kilometers

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Data Sources:

- Data provided by the Town of Cochrane, ESRI
- Growth Study

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

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FIGURE 3

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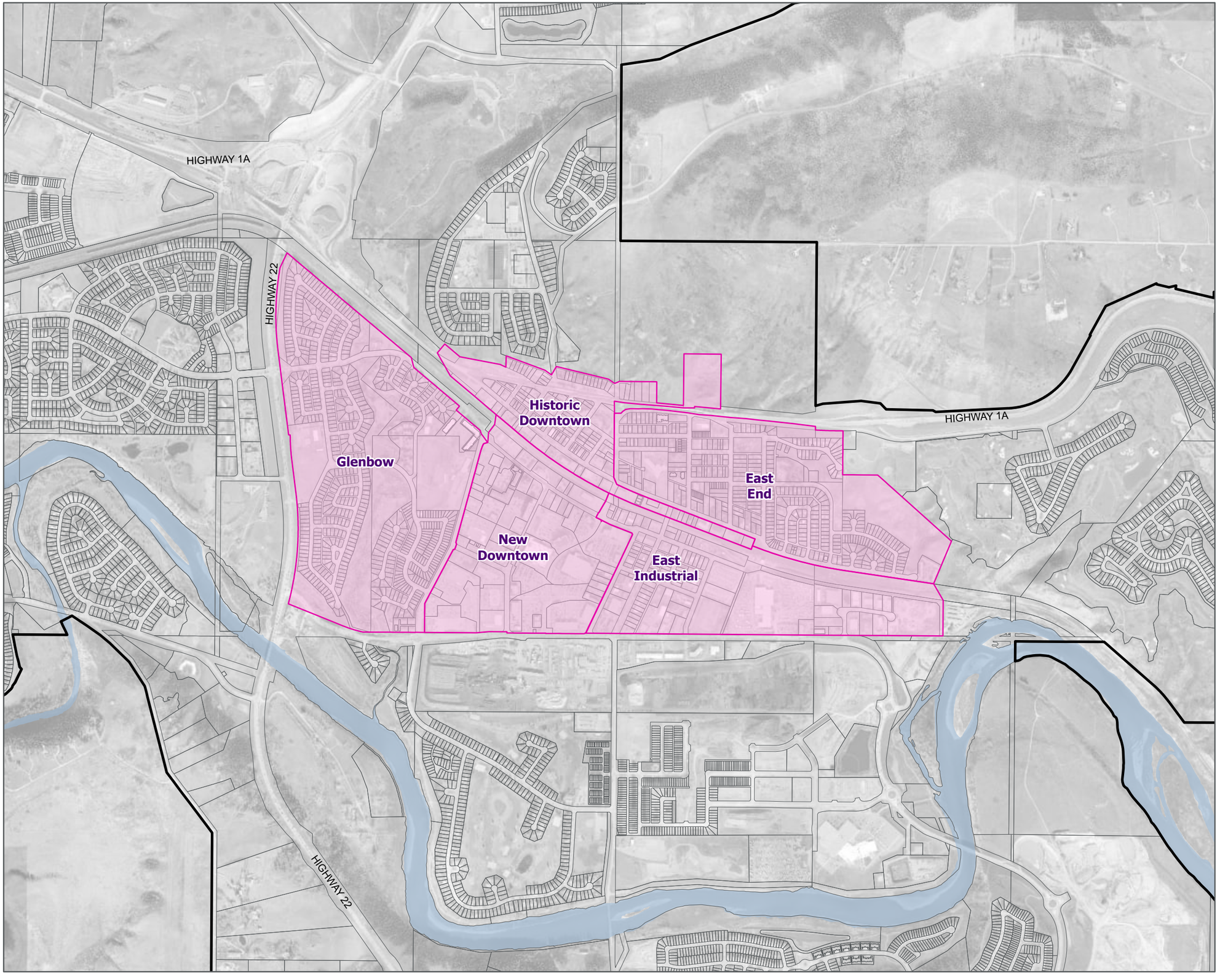

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Redevelopment / Infill Opportunities

Legend

- Target Area for Redevelopment / Infill
- Cochrane Boundary

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Kilometers

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Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

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FIGURE 4

4.0 DESIGN CRITERIA

Design basis workshops were conducted with Town representatives to confirm design criteria and assumptions used within this plan. The workshops highlighted design criteria guidelines used in the Town and in the City of Calgary, along with Provincial standards. Key inputs and decisions were tracked and documented in a design basis memorandum, included in Appendix A.

Some design criteria were constrained by existing guidelines, while others presented opportunities to improve on with proactive operational and maintenance, education, and asset management practices.

Table 2: Design Criteria Opportunities and Constraints

Opportunities	Constraints
• Water Consumption Rates • Sanitary Generation Rates • Sanitary Peaking Factors • Inflow and Infiltration Rates	• System pressures • Fire Protection Standards • Reservoir Storage Volumes • Wastewater Design Flow Levels • Syphon Design Levels

A summary of the design criteria for both the water and wastewater systems are included in the following sections with details regarding the development of these provided in Appendix A.

4.1 WATER SYSTEM DESIGN CRITERIA

4.1.1 POTABLE WATER DEMANDS

Existing demands were determined using meter records, and WTP distribution records. The Town provided monthly meter data from January 2022 to December 2022 for all homes within the Town boundary. From this data, an average daily use for each address was generated, and the total average potable water demand was compared to the 2022 WTP output records. The metered demands were scaled to match the total average 2022 WTP output average to account for unmetered demands, fire testing, hydrant flushing, and leakage and losses within the system. This resulted in meter demands being increased by a factor of 10% to match the WTP output records and thus reflected total Town demands.

Future demands: A blended rate for future residential and non-residential demands was established because the extents of residential and non-residential growth are not known for all growth areas and may change as development advances. The blended rate utilizes the per-capita demands established in the Water Supply Strategy (270 L/c/d) and the Town's population density targets as of 2023. As these demands are 'Total Town Demands,' they account for residential, commercial, and industrial demand, in addition to leakages and losses within the system. To establish a demand that is spatially based, the following

calculation was completed, and the blended rate was increased by a factor of 10% to allow for higher density development in the future:

$$\frac{270\ L^{1}}{capita\ day} \times \frac{2.6\ capita^{2}}{household} \times \frac{20\ households^{3}}{hectare} \times \frac{1\ day}{86400\ s} = \frac{0.16\ L}{s\ ha} \times 1.1 = \mathbf{\frac{0.18\ L}{s\ ha}}$$

1. 270 L/c/d is the average per capita potable water demand as identified in the Water Strategy [6].
2. 2.6 is the average household size as identified in the 2021 Federal Census [9].
3. 20 households per hectare is based on the Town's current density [10].

This proposed rate was reviewed against the existing Town demands in both commercial and residential areas to ensure that it was reasonable.

Peaking Factors: The peaking factors established apply to both existing and future system demands. The maximum day demand to average day demand peaking factor (MDD:ADD) was determined using historical WTP output records over the last seven years, as shown in Table 3. This factor is consistent with the MDD:ADD established in the Water Strategy.

AEPA Standards for Municipal Waterworks indicate that the maximum hourly design flow, or Peak Hour Demand (PHD), for water systems should be 2.0 to 5.0 times the MDD [11]. To confirm the peak hour demand, the WTP hourly SCADA records for the MDD (July 28th, 2022) were reviewed[2]. From these records, the maximum volume of water delivered to the system in a single hour on this day was 15.097 ML. This volume is only 1.2 times the MDD for the year 2022. Based on the resolution of the SCADA data (hourly), it is possible that larger peaks may have been missed. Therefore, it is proposed to use a peak hour demand factor that is 2.6 times greater than the MDD (and 4.0 times greater than ADD). This remains consistent with the 2012 W3 Report, and exceeds the minimum standards outlined by AEPA.

[2] A higher peak hour demand (19.87 ML) occurred on February 6th, 2022; however, this flow was due to a large fire within the Town and did not result in a max day output for the plant. The peak hour demand factor for this event is 1.6, which lies within the proposed factor of 2.6.

Table 3: Historical Potable Water Demand Patterns

	Maximum Day Demand (MLD)	Average Day Demand (MLD)	Potable MDD:ADD	Population (people)	Potable Per Capita Demand (L/c/d)
2016	13.87	7.07	1.96	25,122	282
2017	13.03	7.49	1.74	26,320	285
2018	12.74	7.53	1.69	27,960	269
2019	11.56	7.22	1.60	29,277	247
2020	12.59	7.87	1.60	30,655[1]	257
2021	12.87	8.31	1.55	30,884[2]	269
2022	12.54	8.07	1.55	31,838[3]	254
7 Yr Avg.			1.67		266
Master Plan Demands Basis[4]			1.7		270

1. Provided by the Town of Cochrane, based on completed premises for 2020.
2. Provided by the Town of Cochrane, based on completed premises as of April 2021 .
3. Provided by the Town of Cochrane, based on completed premises as of April 2022.
4. Consistent with the Cochrane Water Supply Strategy [6]

4.1.2 WATER SYSTEM PLANNING & ASSESSMENT CRITERIA

The following water system assessment criteria are discussed in detail in Appendix A, but have been summarized in the following sections for reference:

Water Pressure

The current Level of Service for the Town's maximum and minimum operating pressures is summarized in Table 4. There is a desire to reduce the maximum allowable operating pressure to match the Alberta Environment and Protected Areas (AEPA) standard. However, this requires changes to the existing Level of Service guidelines and would result in significant infrastructure improvements within existing developments.

The large variation in elevation throughout the Town also poses significant challenges with respect to pressure and constrains the existing system to the current level of service guidelines. However, there is an opportunity to identify new/future areas where community PRVs could improve overall system performance.

Table 4: Minimum and Maximum Operating Pressure Standards

Town of Cochrane Operating Pressure Guidelines	
Maximum	125 psi[1]
Minimum	50 psi
AEPA Operating Pressure Guidelines [11]	
Maximum	80 psi
Minimum	50 psi
City of Calgary Operating Pressure Guidelines [12]	
Maximum	100 psi
Minimum	40 psi

1. Town of Cochrane has implemented a bylaw requiring all premises connected to the waterworks system by a service connection be installed with a pressure reducing valve (PRV) set to 65psi [13].

Fire Protection (Available Flow, Pressure, and Hydrant Coverage)

The Fire Underwriters Survey (FUS) is the benchmark used by local governments in Canada for determining fire flow and hydrant coverage requirements, as it informs how insurance grades are set. Specific structures or grouping of structures have required flow rates and durations that are necessary for controlling major fires utilizing manual firefighting methods, in conjunction with built in safety features of the building (e.g., sprinkler systems). Available fire flows are determined by calculating the flow at each hydrant at a residual pressure of 20 psi [14].

The following recommended fire flows for land use types were adopted by the Town prior to the 2012 W3 Report. The fire flow rates and duration ranges are similar to those used elsewhere in the region for similar land uses. Should the Town wish to review or revisit these flows, a new Fire Underwriters Survey would be required. Detailed FUS analyses on specific buildings may determine that fire flow requirements are higher or lower than shown in the Table 5 and is dependent on individual building construction materials, exposures, proximity to other structures, etc. The Town should keep records of the detailed FUS analyses that deviate from the general approach summarized in Table 5.

Table 5: Town-Wide Adopted Fire Flow Requirements (FUS)

Building Type	Flow Rate (L/s)	Duration (hours)
Residential, Single Detached	75	1.75
Residential, Multi Family	125-180[1]	2
Schools, Institutional Buildings, Neighborhood Commercial	180[2]	2
Downtown Commercial	230[3]	3
Industrial Park	230	3
Warehouse Commercial/ Industrial	330	4

1. Certain types of multifamily buildings require higher fire flows, depending on the building design and construction. For example, the Multifamily building in Fireside requires 200 L/s for 2.5 hrs.

2. A detailed analysis of the Sunset Ridge Catholic School indicated a Fire Flow requirement of 120 L/s, lower than the general Town standard.

3. Downtown Commercial refers generally to commercial land use. Commercial developments being proposed in other development areas should follow this fire flow requirement. In some cases, the Town may elect to set a higher fire flow requirement if prudent. For example, fire flow availability of 260 L/s for 3 hours was used (set to match the Walmart's building requirement Downtown) for commercial land uses in the River Heights Reservoir service area to ensure future potential commercial developments would not be limited by the reservoir and pump station.

The model updated for the Master Plan was calibrated for fire flow using the Town's Land Use Bylaw, which was updated in 2022 [15]. From this Bylaw's Land Use District Map, shown in **Figure 5**, a "Land Use and Associated Fire Flow Target" map for the Town was developed **(Figure 6).** To create **Figure 6,** the bylaw land uses were assessed and appropriately grouped with the required fire flow for land use types, as identified in **Table 5**. For example, "Residential Medium Density" and "Residential High Density" were grouped together to form "Residential, Multi-Family" as both land uses have the same associated fire flow range[3]. This figure was used to determine fire flow requirements in areas where specific Fire Underwriters Surveys are not completed. In addition, the Town provided information regarding specific building types in existing areas to help determine fire flow requirements based on associated land use.

Where a range of fire flows is provided (Residential, Multi-Family), the higher end of this range (180 L/s) is used to remain conservative. For areas for which the Town has commissioned an FUS on specific buildings, these requirements are set in the model for the hydrants located in proximity to those buildings.

[3] Parks and Recreation, Urban Holdings, Direct Control, and Water Features are noted in the figure but do not have an associated fire flow.

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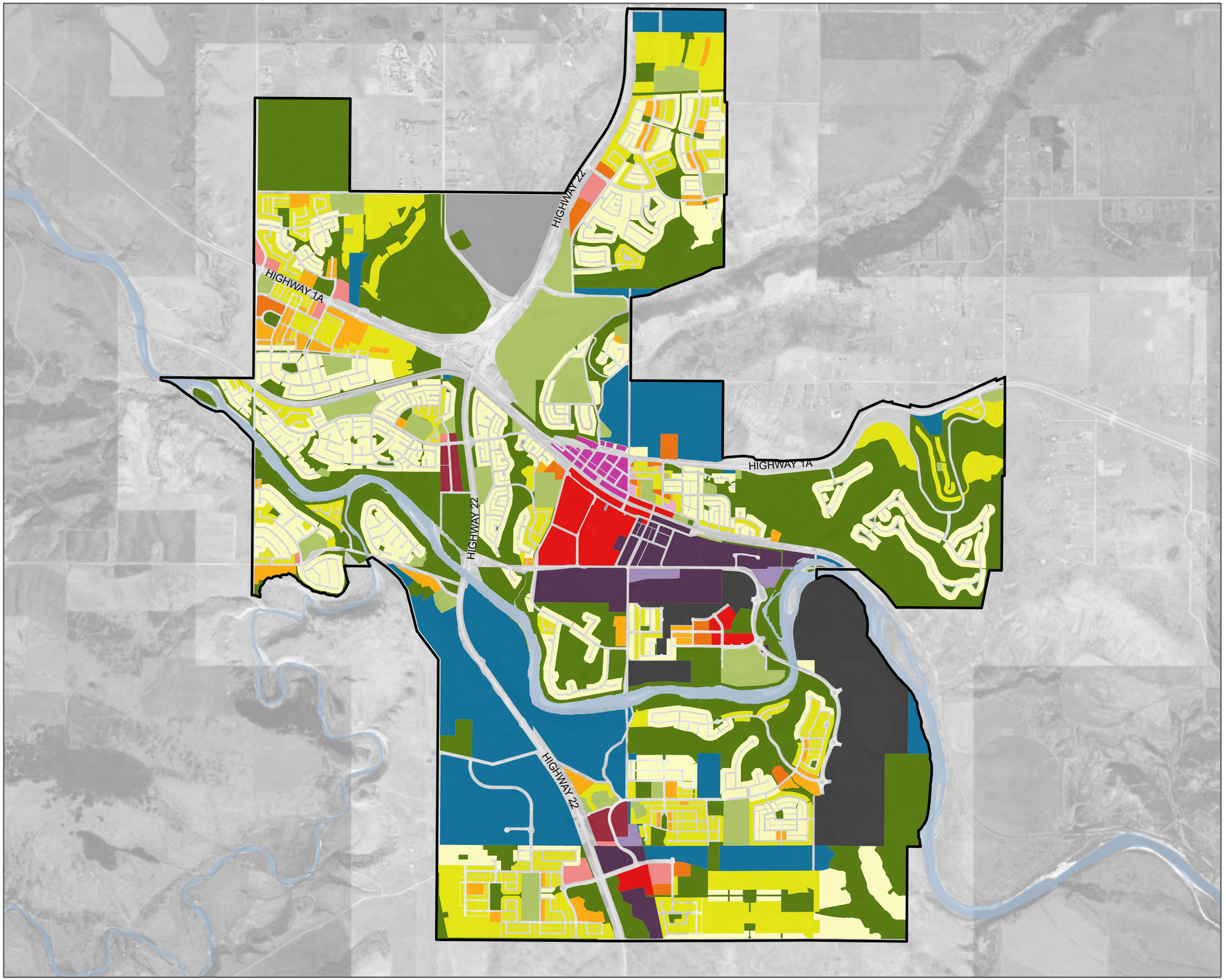

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Land Use

Legend

- Municpal Boundary

Land Use

- R-LD - Residential Low Density
- R-MD - Residential Medium Density
- R-HD - Residential High Density
- R-MX - Residential Mix
- CS - Community Service
- PR - Parks and Recreation
- UH - Urban Holdings
- C-T - Commercial Transition
- C-HD - Historic Downtown
- C-N - Neighbourhood Commercial
- C-G - General Commercial
- C-H - Highway Commercial
- I-B - Business Industrial
- I-G - General Industrial
- I-S - Special Industrial
- DC - Direct Control

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

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Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:32,000
(When plotted at 11"x17")

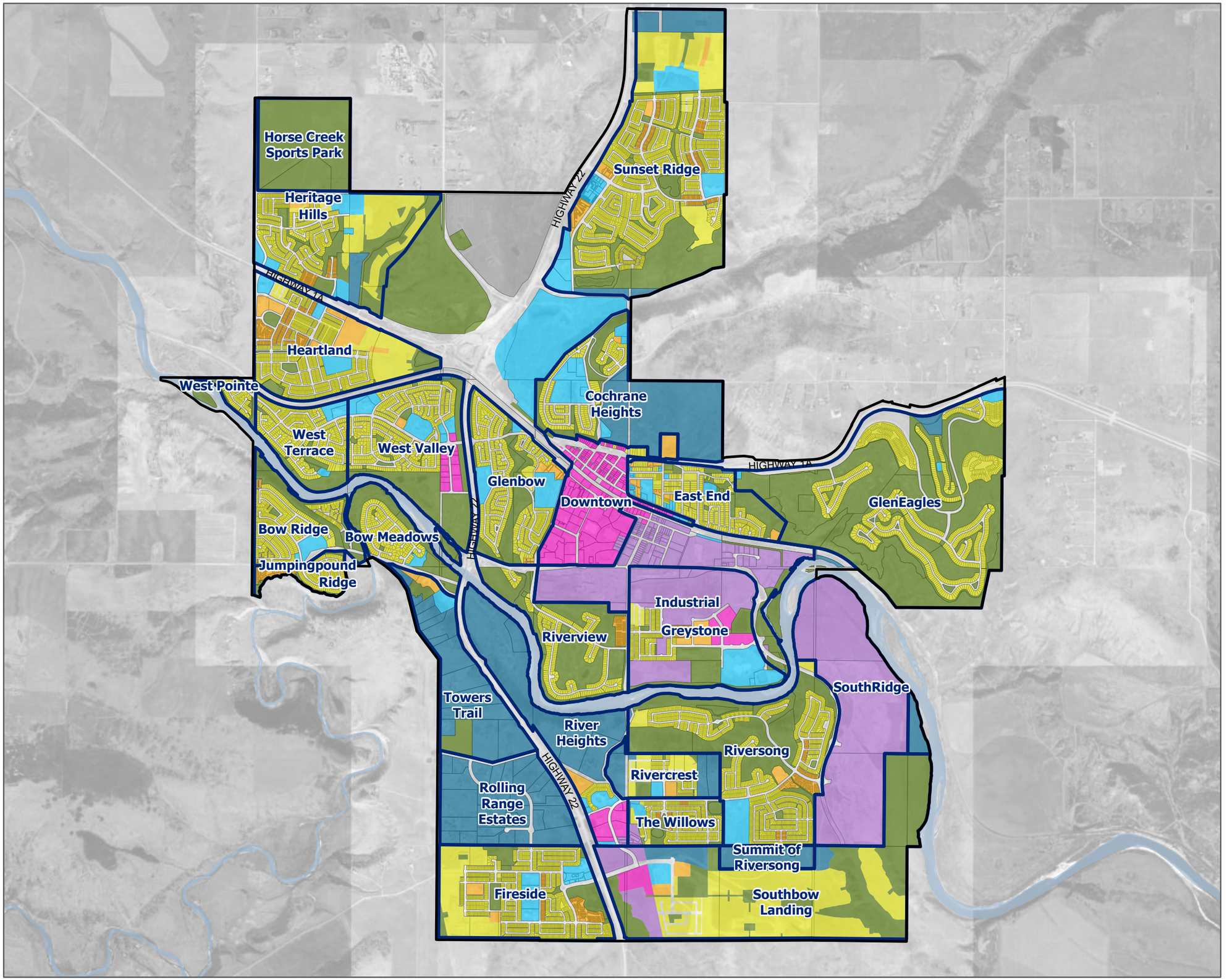
Data Sources:

- Data provided by the Town of Cochrane, ESRI
- Land Use provided by the Town of Cochrane (2022 Land Use Bylaw)

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 5



Town of Cochrane

Water & Wastewater Master Plan

Land Use &
Current Fire Flow Target

Legend

- Municpal Boundary
- Cochrane Neighbourhoods

Land Use & Associated Fire Flow

- 75 - 124 L/s - Residential, Single Detached
- 125 – 179L/s - Residential, Multi Family
- 180 – 229L/s - Schools, Institutional Buildings, Neighborhood Commercial
- 230 – 329 L/s - Downtown Commercial, Industrial Park
- Greater than 330L/s - Warehouse Commercial / Industrial
- Parks and Recreation
- Urban Holdings
- Direct Control

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 0.5 1 1.5
Kilometers

Coordinate System:
NAD 1983 3TM 114

Scale: 1:32,000
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI.

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	Final
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 6

Last updated by SdeBoerFuller on Wednesday, December 18, 2024 at 8:32 AM
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The Town utilizes the 2020 City of Calgary Subdivision Servicing Standards (Section III: D) for maximum spacing between hydrants [16]:

- **Residential:** 300 m
- **Non-residential:** 150 m

For reference, Fire Underwriters Survey recommends the following maximum spacing between hydrants [14]:

- **Residential:** 180 m
- **Non-residential:** 90 m

Hydrant spacing deficiencies were determined based on the City of Calgary Standard. However, spacing against the FUS standard was also evaluated and provided for reference. The Town expressed a desire to improve the location and number of hydrants in new developments to improve fire protection services. Additional discussions would be required to achieve this as this would be a change to the Town's existing level of service standard.

It is recommended that new community developments within Town obtain FUS building calculations as part of the development process, on all buildings with land use above Residential-Single Detached, to ensure buildings meet fire flow limitations within areas of Town. In addition, developers should submit a Hydraulic Network Analysis that identifies available fire flows within the new development, proposed hydrant locations, and the associated spacing requirements used for the Town to evaluate.

Reservoir Storage Requirements and Storage Management

The fire, equalization, and emergency storage requirements are determined in accordance with AEPA Guidelines for Municipal Waterworks [11]:

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

where:

S = Total Treated Storage Required (m^3)

A = Fire Storage (m^3)

B = Equalization Storage (25% of MDD) (m^3)

C = Emergency Storage (minimum 15% of ADD) (m^3)

D = Disinfection Contact Time Requirement. This volume does not need to be considered for the Town's reservoirs as they are not used as treated clear wells, and contact times are met at the Water Treatment Plant.

Emergency and equalization storage volumes are calculated based on present and projected service areas and the blended rate for potable water demands (0.18 L/s/ha). Fire

storage needs are determined by the land use with the highest fire flow demand within each reservoir's service area.

To assess design capacity of each reservoir, the available volume was evaluated using record drawings, assuming water accessibility to either the bottom of the reservoir outlet or the minimum submergence level of the pump, depending on reservoir configuration. The design volumes are based on regulatory requirements and engineering best practices, and may differ from operational active storage volumes which may consider system resilience and balancing. Operational volumes are controlled by the Town's SCADA system and control when the Town's pumps turn on and off to fill the reservoirs.

Reservoir fill lines are analyzed for future system redundancy and resiliency opportunities where possible, as reservoir supply lines are critical to ensure reliable service and fire protection to the community. In general, the best practice is that a reservoir should be able to fill at the MDD demand rate for the reservoir service area to allow for efficient storage recovery. Therefore, filling of the reservoirs will be assessed under the Growth to the Town Boundary scenario to ensure adequate water supply to these reservoirs.

System Resiliency, Redundancy, and Service Reliability

The Town's water distribution system should be reliable, meaning that the service should be available when desired, and that customers have uninterrupted service that meets the Town's service delivery standards on pressure and flow availability.

Therefore, existing and future improvements will be designed to ensure the aforementioned standards are either met or exceeded.

4.2 WASTEWATER SYSTEM DESIGN CRITERIA

4.2.1 WASTEWATER DEMANDS

Existing Demands: Existing wastewater demands were calculated by applying a water to sanitary ratio to the 2022 water meter data provided by the Town. The ratio refers to how much sanitary flow is discharged back to the system for a given amount of water drawn from the meter. To calculate this ratio, 2022 wastewater flows discharged from the Transfer Station (total wastewater flow leaving the system) and distribution volumes from the WTP (total potable water entering the system) were compared for the winter months where irrigation does not occur and where infiltration is expected to be minimal. The average sanitary flow to water demand ratio during the winter months was determined to be 87% (Table 6). This value was rounded up to 90% to include a safety factor for sanitary infrastructure sizing, ensuring that base flows are not underestimated.

Table 6: 2022 Sanitary to Water Ratio

Month	Discharged Flows from Sanitary Transfer Station (m^3)	Distribution Volumes from WTP (m^3)	Sanitary Flow: Water Demand
January	194,128	222,360	0.87
February	172,056	206,580	0.83
March	188,702	221,830	0.85
November	187,519	210,380	0.89
December	197,755	222,690	0.89

Since the metering records do not capture unmetered or unaccounted demands between the WTP and the meters (i.e., leakage, fire fighting, hydrant flushing, connections without meters), the ratio cannot be applied to the water meter records directly. These demands need to be added back to distinguish how much unaccounted water ends back into the sanitary system. This value was determined using the sum of the 2022 water meter data (excluding irrigation) divided by the 2022 WTP distribution data during the winter months. A value of 20% was calculated as the water that is unaccounted for in the distribution system during winter months.

Future Demands: A blended rate for future residential and non-residential wastewater demands was determined using the calculated blended rate for future water demands (0.18 L/s/ha) and applying the sanitary to water ratio of 90%. This resulted in a wastewater blended rate of 0.16 L/s/ha.

Since most of the future growth is projected to be residential, non-residential (commercial/industrial/institutional) and residential were not split, and any currently projected growth is anticipated to have a similar ratio of residential to non-residential development. Furthermore, the per capita demand estimated for growth include both residential and non-residential and will represent a similar ratio in growth areas.

4.2.2 WASTEWATER SYSTEM PLANNING & ASSESSMENT CRITERIA

The following wastewater system assessment criteria are discussed in detail in Appendix A and are summarized below for reference:

Sanitary Main Capacity Criteria

The AEPA Guidelines state that sanitary sewers shall be designed such that the Peak Wet Weather Flow (PWWF) does not exceed 85% of the sewer capacity [17] This is a standard design practice and is maintained when assessing sanitary sewer performance in this Master Plan.

Syphon Design Levels

The AEPA Guidelines recommend a minimum cleansing velocity of 1.0 m/s for inverted syphons to ensure solids remain in suspension and do not settle, creating reduced capacity over time [17]. However, it is understood that this velocity criteria may not be met in some syphons and depends on the buildout of the syphon's catchment area. Therefore, it is recommended to flush syphons annually (at minimum) for preventative maintenance, and supplemented by Town operations to cleanse and ensure solids remain in suspension in early stages of a syphon's catchment buildout.

Sanitary Diurnal Patterns (Peaking Factor)

To peak dry weather flows, a variety of approaches were reviewed with the Town. The 2012 Master Plan used peaking factors based on field flow monitoring conducted in 2005. However, the diurnal pattern developed did not distinguish between residential and non-residential uses and was applied to every node in the model regardless of land use. The AEPA Guidelines and City of Calgary recommend that the peaking factor should be the larger of 2.5 or Harmon's Peaking factor.

Based on the monitoring conducted in 2021, diurnal patterns across the Town for residential and non-residential areas were established [18]. Through this exercise it was found that the Town's peak dry weather flows were considerably lower than what Harmon's Peaking Factor would predict. As a result, the developed residential and non-residential diurnal patterns based on the 2021 flow monitoring were used in this Master Plan, and appropriately applied to residential and non-residential areas.

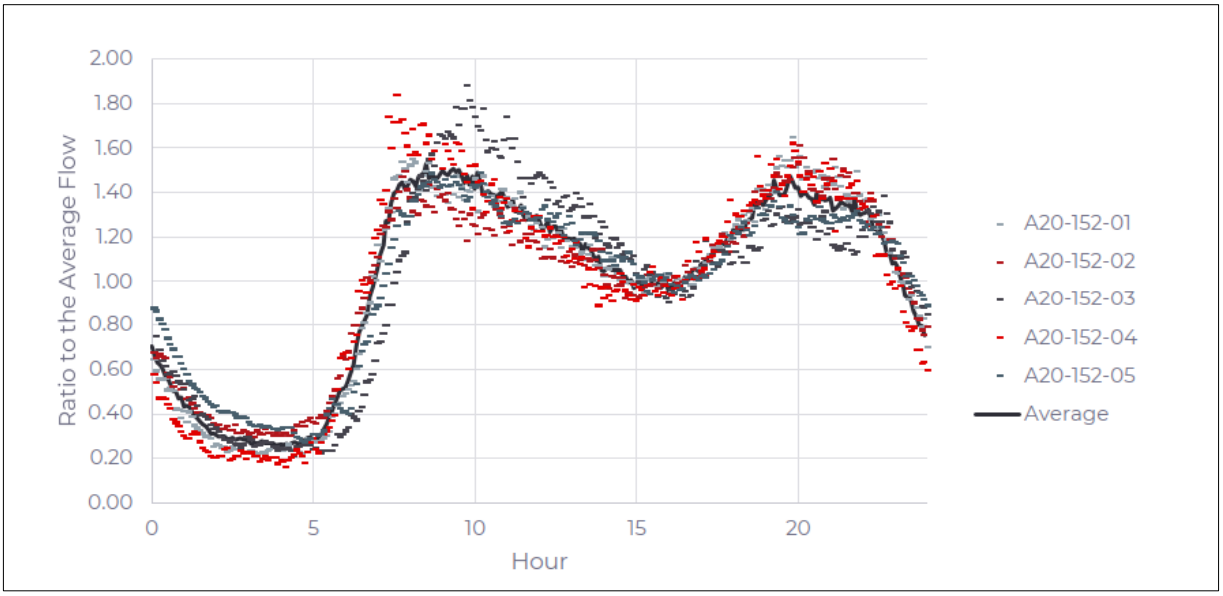

Figure 7: Residential Diurnal Pattern

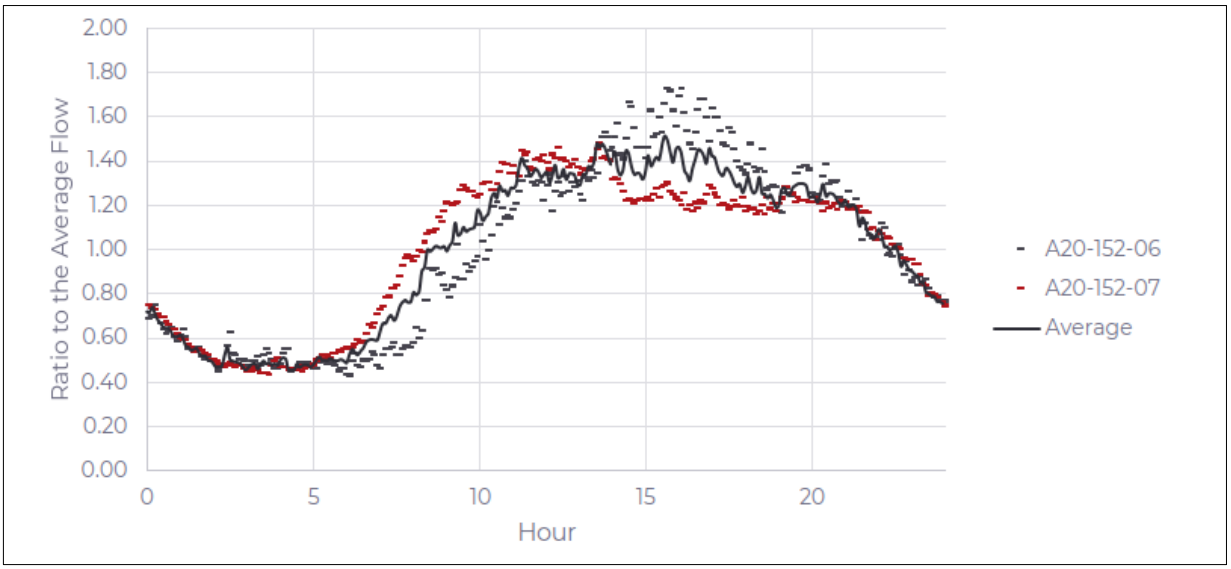

Figure 8: Non-Residential Diurnal Pattern

I&I Allocations

Two I&I allocation standards were reviewed for this Master Plan update. Both the AEPA Guidelines and the City of Calgary recommend using 0.28 L/s/ha as a constant base flow to represent I&I in the system. However, this method does not capture the nuances of the existing system. To achieve a more accurate representation of I&I based on the specific characteristics of the Town's sanitary system, flow monitoring data and the RTK method were employed to create rainfall derived I&I (RDII) curves for the Town. The RTK method uses three triangular unit hydrographs to represent short, intermediate, and long-term responses to rainfall. The shape of each of the three triangles is quantified by three parameters:

- R: The fraction of the rainfall over the sewershed that enters the sanitary system.
- T: The time to peak in hours.
- K: The ratio of the time to recession to the time to peak.

Each flow monitoring location, selected based on land use, age, and material of pipes, was assigned its own set of R, T, K parameters [18].

The I&I rates, on average, were found to be comparable to 0.28 L/s/ha, with some variation across the system depending on age and material of pipes. In some cases, the I&I rate was higher and in some it was lower than the 0.28 L/s/ha standard rate [18]. The calculated RDII curves were applied to existing developments. In terms of future developments, the RTK parameters that most closely resembled the 0.28 L/s/ha standard rate was applied.

It is recommended the Town implements permanent sanitary flow monitoring stations at strategic areas throughout the Town to validate and confirm peak flows through critical mains. This will aid in confirming predicted data in the model, and assist the Town with timing of future upgrades.

5.0 WATER SYSTEM ANALYSIS

The Town's water system is comprised of two intakes at the Bow River which supply raw water to the water treatment plant (complete with a clearwell and high lift pump station) located on the west end of Town. Treated water is then provided to the community via a distribution system and to bulk water stations. The Town's distribution system includes approximately 163 km of water mains, 8 storage reservoirs, and 10 pump stations. Every building connected to the Town's water has a water meter to measure water usage. Due to the local topography the distribution system is dynamic and has multiple pressure zones supplying water to various subdivisions.

5.1 MODEL DEVELOPMENT AND INPUTS

An update to the Town of Cochrane's water system model was performed in WaterCAD (Connect Edition V10.04.00.108). The software simulates flow and pressure in a pipe network using information such as:

- Pipe material, length, nominal size.
- Pump performance data.
- Reservoir dimensions and elevations.
- Contour data.
- Demand information.
- Fire flow requirements.
- Spatial coordinates.

The information was obtained from a variety of sources including the Town's GIS database, as-constructed drawings, operational data, metering records, discussions with the Town's operations & engineering team, and the previous modelling conducted for:

- 2012 Water Wastewater Master Plan
- 2019 Water Model Update and Calibration
- 2022 Extended Period Simulation Model Calibration and 2MG Filling Analysis.

The model requires accurate information to provide a reliable estimate of the performance, thus, data collection was a critical part of the modelling process.

Typically, the simulated network does not match the complexity of the real-world situation. Models are simplified simulations of real-world conditions, and therefore the results are approximations of actual system pressures and flows. The real-world condition is reduced to a smaller subset of pipes that still represent the major system elements and produce reliable, albeit approximate, results. Any discrepancies seen between the model and reality may result from operational nuances that are not captured (such as closed valves). The model assumes that all valves are normally open, unless otherwise indicated. Individual user demands are combined to produce a larger aggregate total which is included in the model, as described in Section 4.1.1. Only distribution mains need to be represented at this level of analysis.

The model was used to analyze the performance of the existing distribution network, in the context of the design criteria established in Section 4.0.

System Demands (Existing):

Existing system demands were determined from the 2022 metering records from each home and the 2016-2022 Water Treatment Distribution Records for potable water outlined in Table 3. These metered demands and WTP output records are the annual demands and include irrigation. The annual average for each address was determined from the meter records, and the total annual average potable water demand was compared to the 2022 WTP output records. It was found that the metered demands were approximately 10% less than that of the WTP output, indicating that there were 10% losses within the system. These losses can be attributed to the approximation in the datasets, unmetered demands, fire testing, and leakage and losses within the system.

Once the annual average for each address in the Town is generated, and then scaled to account for losses, these demands are spatially assigned in the Town's water model. Demands are grouped into 'catchments' of approximately 15-20 homes to simulate the spatially allocated demands. These demands represent the Town's existing average day demands (ADD). From here, the maximum day demands (MDD), and peak hour demands (PHD) are scaled in their respective scenarios by the factors established in Section 4.0.

Irrigation contributes to increased peaking during the summer months as the Town's irrigation windows are 5:00 a.m. to 10:00 a.m. and 7:00 p.m. to 1:00 a.m.[4] These irrigation windows fall within typical peak hour demands, which generally take place when customers are using water in their homes (*i.e.*, showering, laundry, dishes, etc.). Metering records for high irrigation uses within the Town were reviewed to determine if this added demand in the summer months could be captured. From this review, it was concluded that discreet irrigation demands cannot be included in the model as they have already been captured in individual average day demands, and cannot be peaked individually, as this would reflect larger outputs than those recorded at the WTP. This limitation does not significantly affect the model results or recommendations, as pipe sizing is governed by the largest flow, which in this case corresponds to the maximum day demand plus fire flow (MDD+FF) scenario.

Fire Flow Requirements (Existing System Analysis):

The model created for the Master Plan was developed using the land use types outlined in Figure 6, and the fire flows corresponding to these land uses, as summarized in Table 5.

For existing development areas, current fire flow availability at hydrants was established and compared to the required fire flow to identify system deficiencies and propose upgrades or recommend operational practices to achieve required fire flow, if possible. It is important to

[4] As of March 2024, the Town updated the irrigation window to 7:00 p.m. to 10:00 a.m. This change will not be captured in the peaking factors for this Master Plan as the data from this change is not yet available.

note that fire flow results are approximate, and hydrant testing would be required to confirm actual fire flow availability. For already developed areas, where distribution system upgrades are not always feasible, infill and redevelopment proposals should account for provisions to include fire protection measures given the existing system availability (*e.g.*, installing monitored sprinkler systems or proposing fire-resistant materials within the proposed building, which may reduce fire flow requirements depending on the building type).

It is recommended that hydrant testing in areas of concern and all new developments take place to ensure that what the model is predicting for available fire flow matches adequately with what is available on site.

Future System Demands and Fire Flow Requirements:

This Master Plan provides information on servicing to the Town's current municipal boundary. Remaining lands to be developed within the Town boundary that are not captured within the existing system demands have been identified as part of the Cochrane Growth Study [7].

For the Growth to Town Boundary scenario, the criteria for fire flow requirements within future development areas was assumed to be the same as that adopted for the existing system analysis (Table 5). Future systems may have limited fire flows from existing fire storage available in reservoirs, existing pump system capacity, and topography. The ultimate system is sized to optimize the amount of fire flow available given these constraints. In addition, the system is reviewed to ensure that growth is not significantly reducing flows in existing areas.

Additional Model Updates:

Updates to the existing system model included:

- Import of Town's GIS data for network additions since 2019.
- Reviewing as-built drawings from 2019 to 2022 to ensure changes were captured in the distribution network.
- Updated PRV settings with data provided by the Town's operations team.
- Reservoir elevations and pump curve data reviewed and updated from the 2022 EPS model calibration data.

Wherever preliminary model results appeared to diverge from expectations, these areas were reviewed in finer detail with the Town's operations team to ensure that the model reflected the real-world situation as accurately as possible.

Cochrane's water network is complex and growing quickly. While this exercise seeks to provide a model that is as accurate as possible, further refinement can always take place. The model should be considered a 'living tool' that is continuously updated and improved as system understanding grows and operational processes change.

It is recommended that model calibration and SCADA data review take place at least every five years. The Town's existing water model has not been calibrated (C-factor testing) since

prior to the 2012 W3 Master Plan. In addition, it is recommended that upon completion of capital upgrades projects, the model be updated and reviewed to ensure it is as accurate as possible for future designs and reviews.

5.2 EXISTING WATER SYSTEM OVERVIEW AND PERFORMANCE

This section describes performance analyses results for Cochrane's existing water distribution system under current system demands, utilizing GIS records as of May 2023 and water meter data obtained between January 2022 and December 2022. This includes a description of each infrastructure components' capacity to meet the design criteria outlined in Section 4.0.

Figure 9 illustrates the location and size of the distribution mains, and the location of all reservoirs and pump stations. Figure 10 is a schematic of this system, illustrating the approximate elevations and design volumes of all reservoirs, and the hydraulic grade conditions of the various pressure zones within the distribution network.

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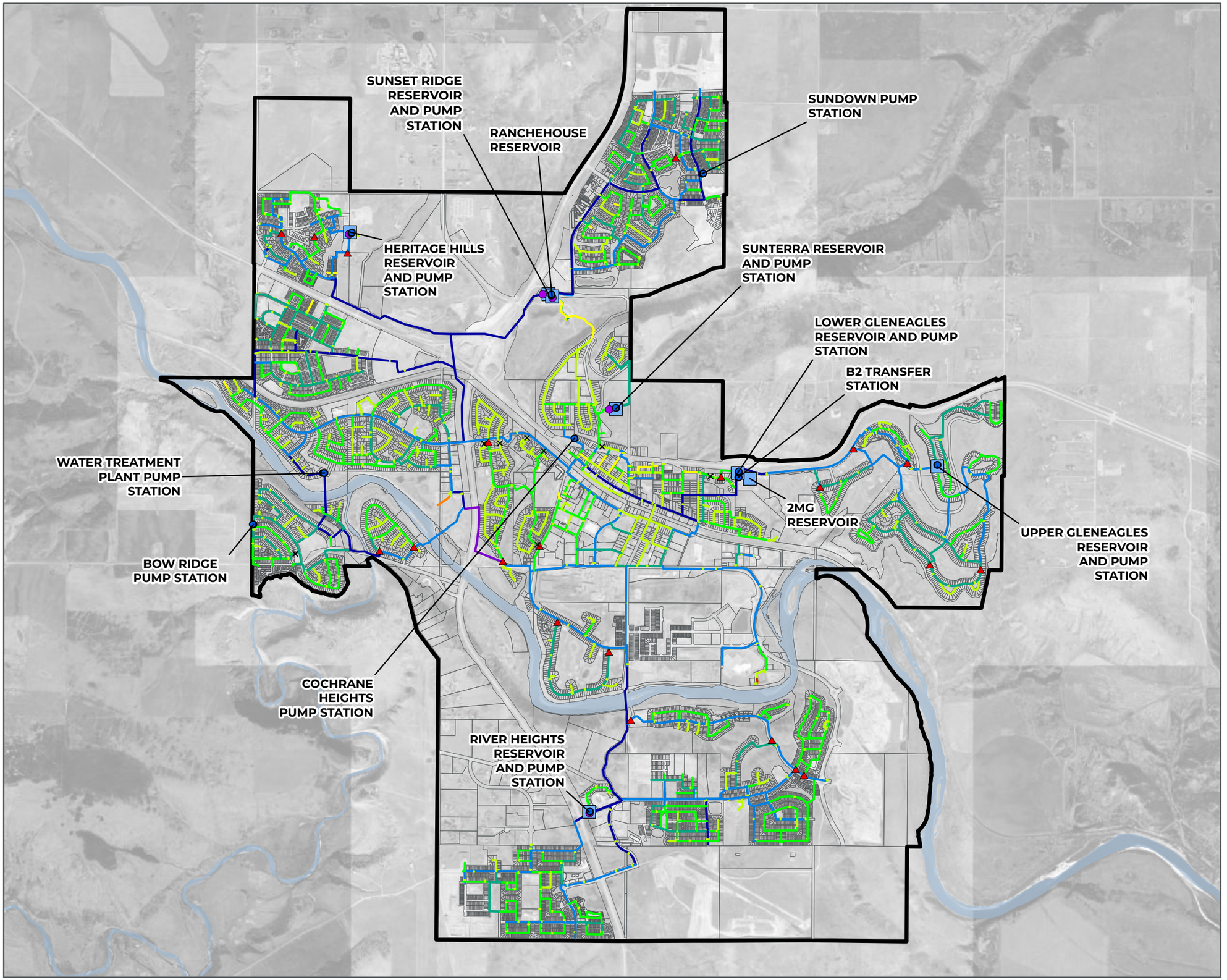

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Water System

Legend

- Valve, Normal Position: Closed
- Pump Station
- Flow control Valve
- Pressure Reducing Valve
- Potable Water Reservoir
- Municipal Boundary Area

Water Pipe Sizes (mm)

- 50
- 75
- 100
- 150
- 200
- 250
- 300
- 400
- 450
- 600

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0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:32,000
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 9

ELEV. (M)

1325
1305
1285
1265
1245
1225
1205
1185
1165
1145
1125

UPPER GLENEAGLES
HGL 1371M Distribution Network
2,900 M³

LOWER GLENEAGLES
HGL 1310M Gleneagles Drive Distribution Network
HGL 1301M Gleneagles Close/View Distribution Network

SUNSET RIDGE
HGL 1314M Distribution Network
HGL 1307M Distribution Network
4,200 M³

HERITAGE HILLS
HGL 1256M Distribution Network
3,130 M³
HGL 1237M Distribution Network

SUNTERRA
HGL 1288M Distribution Network
1,050 M³

RANCHEHOUSE
270 M³

8,150 M³
(2MG)

HGL 1230M Headlands Distribution Network

2,010 M³

B2 VAULT/ TRANSFER STATION

B1 VAULT

C1

RIVER HEIGHTS
HGL 1250M Distribution Network
7,714 M³
3,637 M³

HGL 1229M Bow Ridge Distribution Network

BOW RIDGE BOOSTER STATION

COCHRANE HEIGHTS BOOSTER STATION

HGL 1211M Cochrane Heights Distribution Network

HGL 1205M Main Pressure Zone Distribution Network

HGL 1196M Glenbow Distribution Network

WATER TREATMENT PLANT
CLEARWELL

HGL 1174M Riverview Greens Distribution Network

HGL 1185M Bow Meadows Distribution Network

MAIN PRESSURE ZONE (2MG)

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Water System Schematic

SYMBOL LEGEND

Normally Closed	Normally Open
	Valve
	Actuated Valve
	Check Valve

- Centrifugal Pump
- Pressure Regulator Valve
- Magnetic Flow Meter
- Pressure Transmitter
- Vertical Turbine Pump
- Reservoir
- Building
- Reservoir Service Area
- Vault

Notes:
1. Elevations and Hydraulic Grade Lines (HGL) Are approximate only.
2. Reservoir Design capacity shown.
3. Not all Existing Equipment is Shown.

Project #: 1728.0456.01
Author: MRC
Checked: NA
Status: Final
Revision: 02
Date: 2024/12/20

URBAN SYSTEMS

FIGURE 10

5.2.1 WATER LICENCE

The Town of Cochrane's only source of raw water supply is the Bow River. This is a regulated water body under the Water Act, which addresses Albertan's rights to divert water and describes the priority of water rights among users. Once the Town's current water licence capacity is reached, no more raw water may be drawn for treatment until a new licence is acquired or transferred. Water licence is one of the key drivers of growth within a community, as the Town needs to have enough licence to meet the needs of its customers.

The Town's current licence capacity is shown in Table 7 below. The current licence capacity held by the Town is enough to meet the existing system demands.

The Town's water licence holding is a combination of consumptive and non-consumptive licences. Certain consumptive licences within the Town's licence holding must be paired with the Town's large non-consumptive licence.

Table 7: Town of Cochrane Existing Licence Capacity

	Annual Licence Capacity (Acre-feet)
Consumptive Licence	4,005
Consumptive Licence – paired	802
Non-Consumptive Licence	3,240
Annual Volume Available for Diversion[1]	7,245

1. Includes the Town's 4,005 Acre-feet in unrestricted licence, plus 802 acre-feet of licence that has been paired for use with the 3,250 non-consumptive licence (condition of the licence). 8 Acre-feet of consumptive licence remain to be paired with the Town's non-consumptive licence.

5.2.2 WATER TREATMENT PLANT

Overview

The WTP was originally designed to produce an MDD of 8 MLD. In 2016, Urban Systems completed a report titled "Town of Cochrane Water Treatment Upgrade Study", which reviewed at a cursory level the requirements to achieve 29.7 MLD, with estimated phasing and timelines for implementation [19].

A separate Water Treatment Plant Capacity Assessment and Future Upgrades Study was completed concurrently with this Master Plan (Urban Systems Ltd.) Findings and recommendations from this study are captured within this Master Plan's Capital Upgrades Plan. However, because the Water Treatment Plant Capacity Assessment and Future Upgrades Study was not complete at the initiation of this Master Plan, an assumption was needed to be made regarding the distribution capacity of the Water Treatment Plant under the Existing Conditions Scenario. This Master Plan analyzes the existing system based on a distribution capacity of 19.4 MLD, as this is the current capacity of the water treatment plant's high lift pumps.

Performance:

Under the existing system scenario, there are no concerns with the distribution capacity of the WTP to deliver ADD, PHD, or MDD+FF.

5.2.3 TREATED WATER RESERVOIRS

The Town manages eight (8) treated water reservoirs, with their locations and service areas shown in Figure 11.

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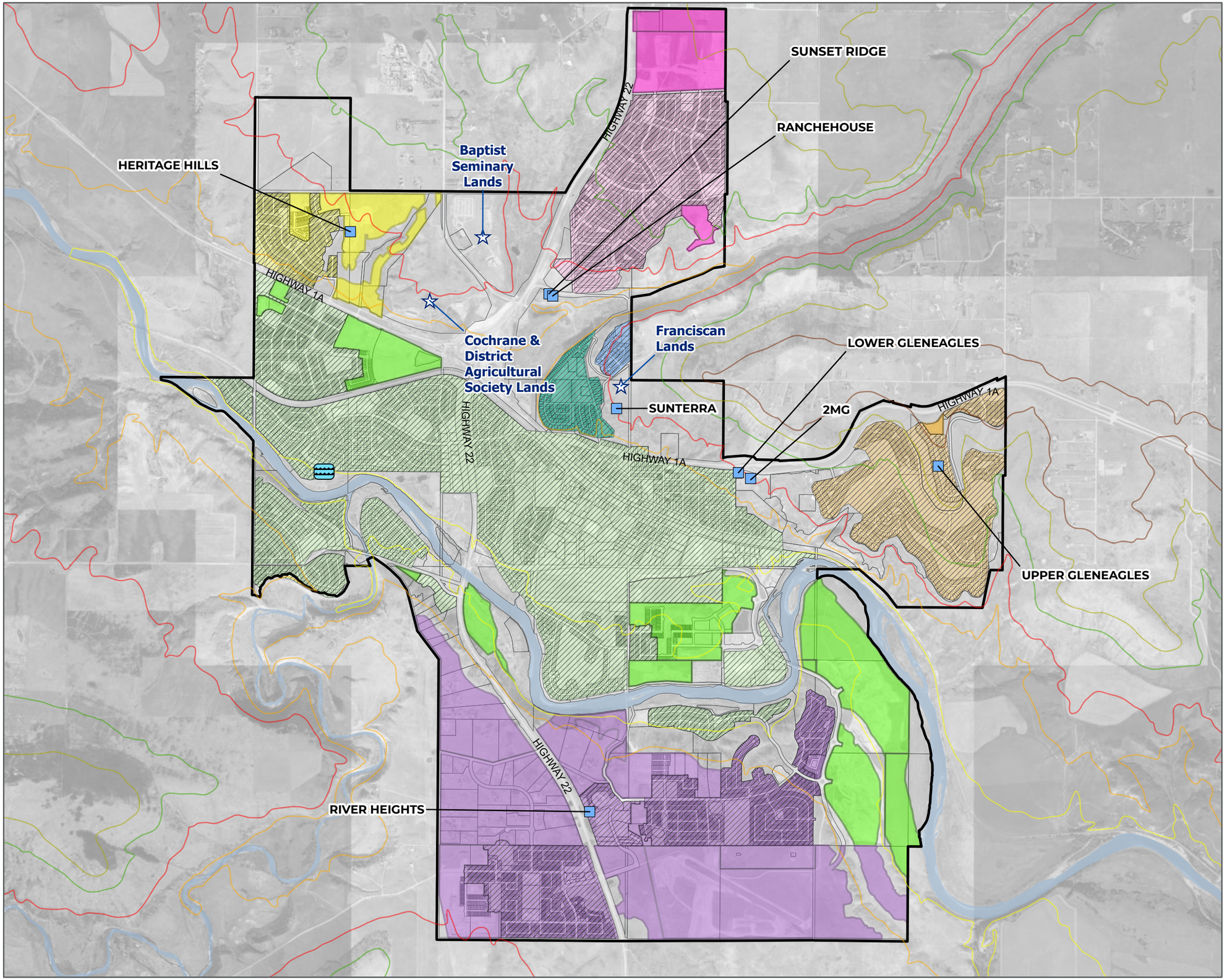

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Existing and Projected Reservoir Service Areas

Legend

- Areas for Consideration, No Planned Servicing
- WTP
- Reservoir
- Municpal Boundary

Pressure Zones
- 1130m
- 1170m
- 1210m
- 1250m
- 1290m
- 1330m

Existing Storage Service Area Coverage
- Sunset Ridge Reservoir
- 2MG Reservoir
- Cochrance Heights (2MG & Sunterra)
- Upper and Lower Gleneagles Reservoir
- Heritage Hills Reservoir
- River Heights Reservoir
- 4th Avenue/ Sunterra Reservoir

Future Storage Service Area Coverage
- Sunset Ridge Reservoir
- 2MG Reservoir
- Upper Gleneagles Reservoir
- Heritage Hills Reservoir
- River Heights Reservoir

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URBAN SYSTEMS

FIGURE 11

East (Gleneagles)

Overview

East Cochrane's potable water storage is provided by the Upper Gleneagles Reservoir, but it operates in conjunction with the Lower Gleneagles Reservoir. A summary of their operation to service the Gleneagles Neighborhoods (both Upper and Lower) is summarized below:

- Water is pumped from the existing WTP through the distribution system within the main pressure zone to the B2 Transfer Station, east of downtown. This transfer station boosts the hydraulic grade of the main pressure zone to fill the Lower Gleneagles Reservoir. Depending on hydraulic grade conditions of the main pressure zone, Lower Gleneagles can fill from the main pressure zone directly or from the 2MG Reservoir, as the 2MG reservoir services the main pressure zone.
- The Lower Gleneagles Reservoir's distribution pumps are controlled by a SCADA system (on/off based on operational setpoint). This pump station only delivers water when the Upper Gleneagles reservoir depletes to a specified elevation. Except during the summer months, when one pump is always running, with the other remaining pumps operating based on this setpoint. The Lower Gleneagles pump station does not have a dedicated fill line to the Upper Gleneagles Reservoir, so when water is pumped to the Upper Gleneagles reservoir, water is delivered to both customers downstream of this pumping system and to the reservoir.
- When the Lower Gleneagles pumps are not running, water is distributed to the Lower Gleneagles neighborhood by gravity from the Upper Gleneagles reservoir. Except in the summer months when the supply is blended from both stations.
- The Upper Gleneagles neighborhood receives water from the pump station at the Upper Gleneagles Reservoir.

The configuration of the Lower Gleneagles reservoir does not have pumping capacity to deliver fire flow and can only supplement Lower Gleneagles demands when filling the Upper Gleneagles reservoir. Therefore, the equalization, emergency, and neighborhood commercial fire storage (180 L/s for 2 hours) for the Upper and Lower Gleneagles Neighborhoods is contained in the Upper Gleneagles Reservoir.

Performance Under Existing Conditions

The Upper Gleneagles Reservoir has sufficient storage capacity under the existing scenario.

North-West (Heritage Hills):

Overview:

The Heritage Hills reservoir is fed from the existing distribution system and WTP. This is not a direct feed; water travels through the distribution network to reach this reservoir and it relies on the hydraulic grade of the main pressure zone for its fill rate. The existing reservoir services the entire Heritage Hills neighborhood and provides neighborhood commercial fire flow (180 L/s for 2 hours).

Performance Under Existing Conditions:

The Heritage Hills Reservoir has sufficient storage capacity under the existing system scenario.

North-East (Sunset Ridge):

Overview:

North-east Cochrane's potable water storage is provided by the Sunset Ridge reservoir, which is fed from the existing distribution system and WTP. This is not a direct feed, as water travels through the distribution network to reach this reservoir and it relies on the hydraulic grade of the main pressure zone for its fill rate. The existing reservoir services the entire Sunset Ridge neighborhood and provides neighborhood commercial fire flow (180 L/s for 2 hours).

Performance Under Existing Conditions:

The Sunset Ridge reservoir has sufficient storage capacity under the existing scenario. The Town does not have specific FUS calculations for the large multi-family developments within the Sunset Ridge service area. To confirm that there is sufficient fire storage in Sunset Ridge, a building specific FUS calculation is being undertaken by the Town on some of these buildings, including 207 Sunset Drive, as it is the largest of the three buildings in this multi-family complex. Any potential changes in recommendations because of this work will follow in an addendum.

South (River Heights):

Overview:

The River Heights reservoir is fed by one supply main from the distribution system in the main pressure zone. The water travels east through the main pressure zone, crosses the Bow River underneath the Riverview Bridge (above grade) to reach the reservoir, and relies on the hydraulic grade line of the main pressure zone for its fill rate. Construction of the River Heights pump station upgrade and detailed design of the ultimate River Heights reservoir expansion was underway at the time of writing of this report, with construction completion expected in Spring 2026. The volumes reported for this reservoir correspond to the facility size following these planned upgrades.

Performance Under Existing Conditions:

The expanded River Heights reservoir has sufficient storage capacity under the existing scenario.

Ranchehouse:

Overview:

The Ranchehouse reservoir services only the Cochrane Ranchehouse (101 Ranchehouse Rd). The reservoir relies on the hydraulic grade of the main pressure zone, and the Cochrane Heights pump station for its fill rate. This reservoir services a fire hydrant at the Ranchehouse off a dedicated line from the reservoir.

The Town has indicated that the Ranchehouse Reservoir can be fed by the Sunset Ridge reservoir, but this could not be verified based on the records made available to USL as they were incomplete. Therefore, it is recommended that an in-depth review of the interconnection between these two reservoirs take place prior to recommending any upgrades to the Ranchehouse Reservoir to confirm pipe inlet and outlet elevations and water level design and operating elevations.

Performance Under Existing Conditions:

The Ranchehouse reservoir does not have adequate storage capacity to suppress a fire at the Ranchehouse, which is assumed to require 180 L/s for 2 hours.

There is no building specific FUS calculation for the Ranchehouse, therefore it is recommended that this calculation be completed in addition to the review of the connection between the Sunset Ridge and Ranchehouse reservoirs to determine what specific upgrades are required.

4th Avenue (Sunterra):

Overview

The Sunterra reservoir is fed by the existing distribution system and WTP. This is not a direct feed, as water travels through the distribution network to reach this reservoir and relies on the hydraulic grade of the main pressure zone for its fill rate. During periods of high demand, where the hydraulic grade of the main pressure zone is low, the Sunterra reservoir can supply demands to the Cochrane Heights neighborhood by gravity (a valve will open if there is a low-pressure condition in Cochrane Heights.) There is also a check valve in place preventing the Sunterra reservoir from back feeding the main pressure zone, so supply is contained to the Cochrane Heights neighborhood only.

Performance Under Existing Conditions

A fire underwriters' analysis of the 'Sunterra Multifamily Site' was completed during the Fire Pumps Replacement Preliminary Design to ensure that the pumps had adequate capacity to service the MDD+FF for the largest possible fire demand in this neighborhood [6].

The existing reservoir has adequate fire storage (83 L/s for 2 hours) in addition to the equalization and emergency storage for the Sunterra neighborhood but does not contain fire storage for Cochrane Heights (180 L/s for 2 hours). Fire storage for Cochrane Heights is contained in the 2MG reservoir, however the fire flows cannot currently be achieved by the Cochrane Heights Booster Station (discussed further in Section 5.2.4). Flows may be supplemented by the Sunterra reservoir depending on the hydraulic grade conditions of the overall system at the time of a fire, but there are limitations in pumping capacity.

Main Pressure Zone Storage (2MG Reservoir)

Overview

The main pressure zone storage is provided by the 2 Million Gallon (2MG) Reservoir, which is filled from the WTP through the distribution network; there is no direct feed to this

reservoir. The reservoir is filled and depleted based on the hydraulic grade of the main pressure zone. The reservoir was designed with altitude valves, but their functionality is unable to be confirmed. The Town has had difficulty controlling the fill of this reservoir during periods of high demand in the past, as the flow from the WTP are directly demanded by the system before reaching the reservoir under those conditions. In 2022, a study was conducted to review how to improve the filling at this reservoir.

Performance Under Existing Conditions:

Filling

The 2012 W3 Report and 2022 EPS Model Calibration and 2MG Filling Analysis analyzed the options to improve fill to this reservoir. It was concluded that to improve the recovery of the 2MG Reservoir following sequential maximum demand days, the Town may:

1. Explore operational changes to the WTP pumps during periods of high demand to improve system filling (i.e., using the second 150HP pump instead of the second 100HP pump during times where significant depletion is seen at the 2MG reservoir) which requires WTP discharge pressure to be increased; or
2. Install a 600mm feeder main from the WTP to Westside Drive which provides an alternate route for the water, thereby increasing the hydraulic grade conditions through side of the main pressure zone east of HWY 22, as recommended in the 2012 W3 Report.

The above recommendations are explored in more detail in Section 5.2.5 under the growth scenario.

Storage

The main pressure zone requires fire storage capacity for Warehouse Industrial fire flow (330 L/s for 4 hours). Presently, the storage in the main pressure zone is deficient by approximately 3,170m^3. This deficiency is overcome in the interim as the existing WTP has pumping capacity greater than the demands in the main pressure zone, so during maximum day demands, flow is provided by both the WTP and the 2MG reservoir. However, once the maximum day demands in the main pressure zone exceed the installed capacity of the WTP, it will no longer be able to supplement the demands adequately and the reservoir will require expansion to ensure adequate storage is available.

Currently, the Lower Gleneagles reservoir *can* supplement the 2MG reservoir through manual operation of a valve which allows backfilling if it is full itself. Manual operation of a valve during an emergency increases the risk that this storage is not available. Therefore, it is recommended that the Town:

1. Investigate how best to automate this connection to allow for automated access to the potable storage within the Lower Gleneagles reservoir during times of emergency, and

2. Work with fire services to ensure that operational testing takes place to ensure that backfilling of the main pressure zone is successful, and that there is an operational philosophy in place in the event of an emergency.

A budgetary-level estimate has been provided for this retrofit to allow for the LGE to supplement the 2MG when required.

Summary:

Based on the above discussion, the design capacity of each reservoir and existing storage requirements are summarized in Table 8.

Table 8: Reservoir Storage Requirements, Existing System Demands

Reservoir (Pressure Zone)	Fire Flow Storage Allocation	Design Volume (m^3)	Current Capacity Required (m^3)	Additional Storage Required (m^3)
Ranchehouse	0	270	0	0
Upper Gleneagles (E)	180L/s, 2hrs Neighborhood Commercial	2,890	2,700	0
Lower Gleneagles (E)		2,010		
4th Avenue (Sunterra)	180 L/s, 2hrs Neighborhood Commercial (Cochrane Heights)	1,050	1,400[1]	350
Heritage Hills (NW)	180L/s, 2hrs Neighborhood Commercial	3,130	1,680	0
Sunset Ridge (NE)	180 L/s, 2hrs Neighborhood Commercial	4,200	2,710	0
River Heights (S)	260 L/s, 3hrs Warehouse Commercial	7,710	4,360	0
2 Million Gallon (2MG) (Main Pressure Zone)	330 L/s, 4hrs Warehouse Industrial	8,150	11,320	3,170

1. Capacity requirement of Sunterra reservoir is based on tri-school site storage, and as such a storage deficiency has been noted at the Sunterra Reservoir. The Town is undertaking a process to revisit the fire flow requirements and recommendations on infrastructure to follow based on the results at a later date.

Should it be determined that there is sufficient hydraulic grade to provide fire flows to Cochrane Heights via the 2MG reservoir, the current capacity required for the Sunterra Reservoir will be 680m^3.

5.2.4 PUMP STATIONS

Overview

The Town operates eleven (11) pump stations, including the WTP high lift pump station, shown in Figure 9. Pump station design guidelines require that a station's capacity is rated as that with the largest pump out of service ("firm"). Ensuring redundancy of critical infrastructure at pump stations allows for reliability and continuity of service, risk mitigation, and operational and maintenance flexibility.

To determine the firm capacity for each station, the design specifications of the pumps, including their flow and total dynamic head (TDH) were examined. The reported firm capacities are theoretical because they do not account for the inefficiencies inherent in operating multiple pumps in parallel. Achieving precise calculation requires more thorough analysis that is outside of the scope of this Master Plan.

Performance:

The following table outlines the existing firm capacity of each station, rounded to the nearest whole number:

Table 9: Pump Station Firm Capacity, Existing System

Pump Station	Existing Firm Capacity	
	Flow L/s	TDH (m)
Sunterra	4	64
Sunterra – Fire Pump	76	55
Bow Ridge	25	26
Bow Ridge – Fire	125	19
Upper Gleneagles	19	56
Upper Gleneagles – Fire Pump	76	56
Lower Gleneagles	22	116
Lower Gleneagles – Fire Pump	76	119
Water Treatment Plant	225	98
Sunset Ridge	265	103
River Heights	324	61
Sundown Pump Station	240	50
Heritage Hills	244	73
Cochrane Heights	15	14
B2 Transfer Station	28	6

Performance:

Several studies have been conducted since the 2012 W3 Report reviewing pump stations. These include (but are not limited to):

- 2013 Sunset Ridge Pump Station Assessment [20]
- 2018 Sunset Ridge Pump Station Final Upgrade – Detailed Design Brief [21]
- 2016 Water Treatment Upgrade Study [19]
- 2023 Fire Pumps Replacement for Sunterra, Lower Gleneagles, and Upper Gleneagles Pump Stations Preliminary Design Report [22]
- 2021 River Heights Reservoir and Pump Station Expansion Preliminary Design Report [23]

Because these studies have taken place in advance of the completion of the 2023 Water and Wastewater Master Plan Update, they are considered *planned* upgrades and can be classified into two categories: (1) Asset renewal/replacement upgrades, and (2) growth-

related upgrades. This section reviews the asset renewal/replacement upgrades, which include those projects that do not add pumping capacity to the system and are for pumps that have reached the end of their service life. Growth-related upgrades will be discussed under the Growth to the Town Boundary scenario.

Asset Renewal/ Replacement Upgrades (Existing System Deficiencies):

1. The Sunterra pump station has a planned upgrade for the replacement of the existing engine driven fire pump with an electric motor driven pump and backup generator. The existing firm and fire flow capacities of the station will not change [24].
2. The Upper Gleneagles pump station has a planned upgrade for replacement of the existing engine driven fire pump with an electric motor driven pump and backup generator [24]. The existing firm and fire flow capacities of the station will not change.
3. The current configuration of the Lower Gleneagles pump station consists of two pumps in a duty/standby configuration, one fire pump, and one jockey pump. The planned pump configuration at this station is to remove the fire and jockey pump and replace with two small distribution pumps (one duty and one standby) [24].

Through the existing system analysis, further deficiencies have been identified:

1. Bow Ridge pump station: Jumpingpound common has deficient fire flow availability for its land use. There is no network solution available to improve fire flow, and review of the existing pump station indicates that there is no feasible solution to improving pumping capacity given the space and electrical limitations at the station. Therefore, the only feasible resolution to this fire flow gap is reducing fire flow requirements on the buildings, which is thought to have been completed, but has not been validated by Urban Systems. A FUS building calculation should be completed in lieu of available records.
2. Cochrane Heights pump/Sunterra pump stations: Potable water is stored for Cochrane Heights in the 2MG and the Sunterra reservoirs. Under normal operating conditions, the main pressure zone (2MG Reservoir and WTP) supplies water to Cochrane Heights and the Sunterra Reservoir, and the Cochrane Heights pump station helps maintain the pressure in this community. During higher demand periods, such as when fighting a fire, the Sunterra Reservoir can drain by gravity to aid in the delivery of water to this community, and the Cochrane Heights pump station helps maintain system pressures.

   The Cochrane Heights pump station is an in-line pump station that was installed in 2005. The station was not designed to meet fire flow demands as the pumps are not adequately sized for this purpose nor do they have standby power. The Sunterra reservoir can only provide water to this neighborhood when the hydraulic grade of the reservoir is higher than that of the community, as the Sunterra pump station does not service Cochrane Heights.

Fire flow deficiencies were identified in this area in the 2012 W3 Report, where it was recommended that dual hydrants be used in the event of a fire. Through the development of this Master Plan, the Town requested review of what infrastructure improvements would be required to improve fire flows in these areas without relying on dual hydrant use. The following pump improvements are therefore recommended to improve the fire flow in Cochrane Heights. It is important to note that pump improvements alone cannot improve the fire flows in Cochrane Heights, and the following recommended improvements must be completed in conjunction with the proposed network improvements, discussed later:

A. Expansion of the Cochrane Heights pump station is unlikely given space and power limitations. Therefore, fire pumps could be added at the Sunterra pump station, and these pumps could be connected to the Cochrane Heights water network. The Sunterra pump station does not have adequate space for additional pumps; therefore, it is assumed an additional pump house is required.
B. Expansion of the Sunterra reservoir would be required as the reservoir does not have storage for the largest fire flows in Cochrane Heights based on land use assumptions.

The above improvements have been costed and are shown in the Capital Upgrades Plan. They are recommended for the medium term to allow the Town to complete calculations, design, hydrant testing, and prioritize amongst existing capital projects.

5.2.5 DISTRIBUTION SYSTEM PERFORMANCE

The existing water distribution system was modeled under three scenarios:

- Average Day Demand (ADD)
- Peak Hour Demand (PHD)
- Maximum Day Demand + Fire Flow (MDD+FF)

Average Day Demand:

This scenario was modeled to establish a system baseline for network pressure and note locations where pressures may be high in existing areas. As seen on Figure 12. a wide range of pressures are found throughout Town. This can largely be attributed to the significant change in elevation throughout the Town. Many of the high pressures seen (>100psi) are immediately downstream of large pump stations that are delivering flows to higher elevations. In cases where there are high pressures on direct service to homes, these homes must rely on the individual PRVs to reduce pressure into the home as there are no feasible solutions to reducing pressure while still maintaining the minimum pressure standard within the pump station service area. These valves should be properly maintained by homeowners to avoid damage to appliances and pipe fittings due to high pressures.

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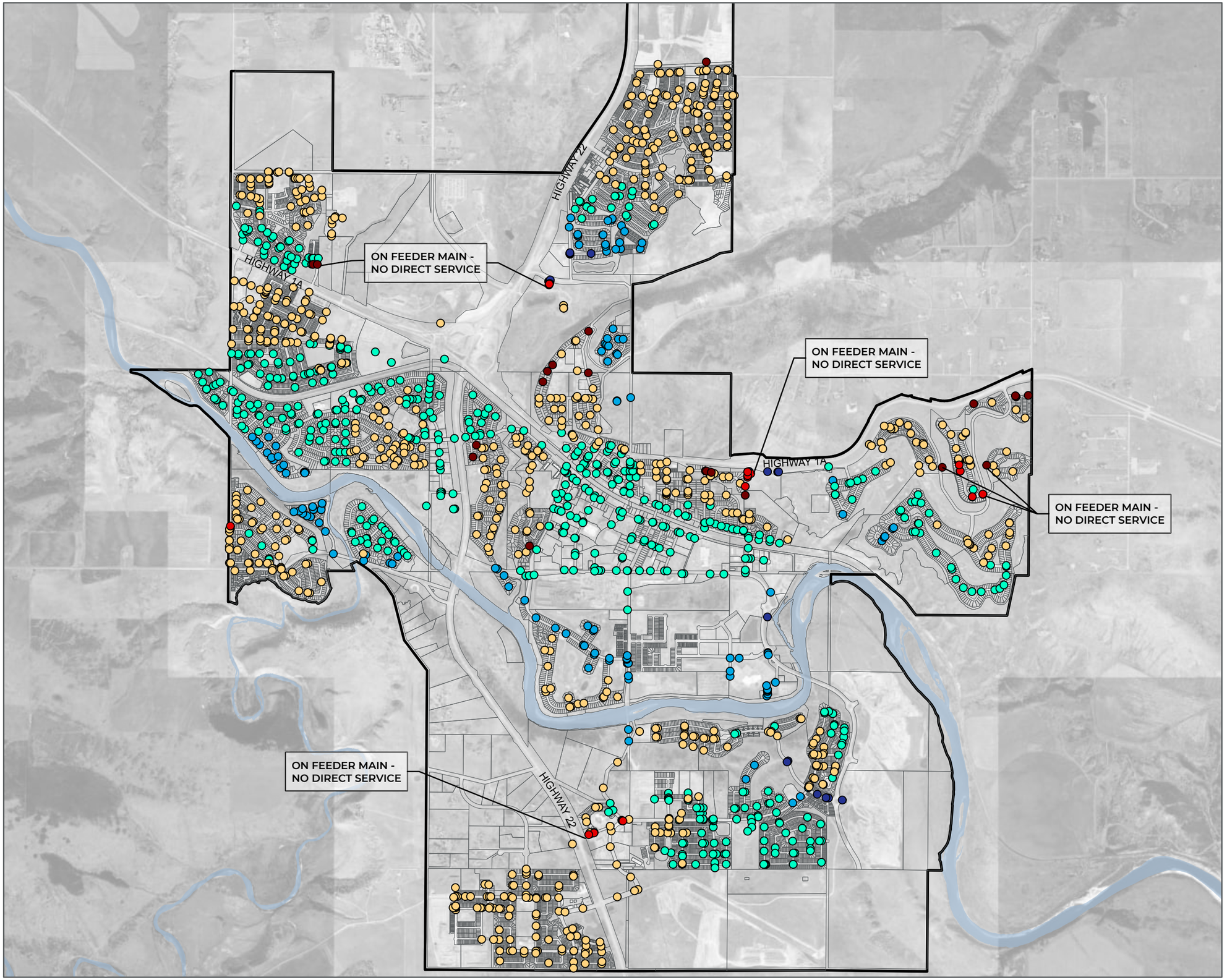

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HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Pressure During Average Day Demand

Legend

- Municipal Boundary

Average Day Demand Pressure (psi)

- < = 40 (Below City of Calgary Standards)
- 41-50 (Below EPA Standards)
- 51 - 80 (Within EPA Standards)
- 81 - 100 (Above EPA Standards)
- 101 - 125 (Above City of Calgary Standards)
- Greater than 125 (Above Town Standard)

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Kilometers

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Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

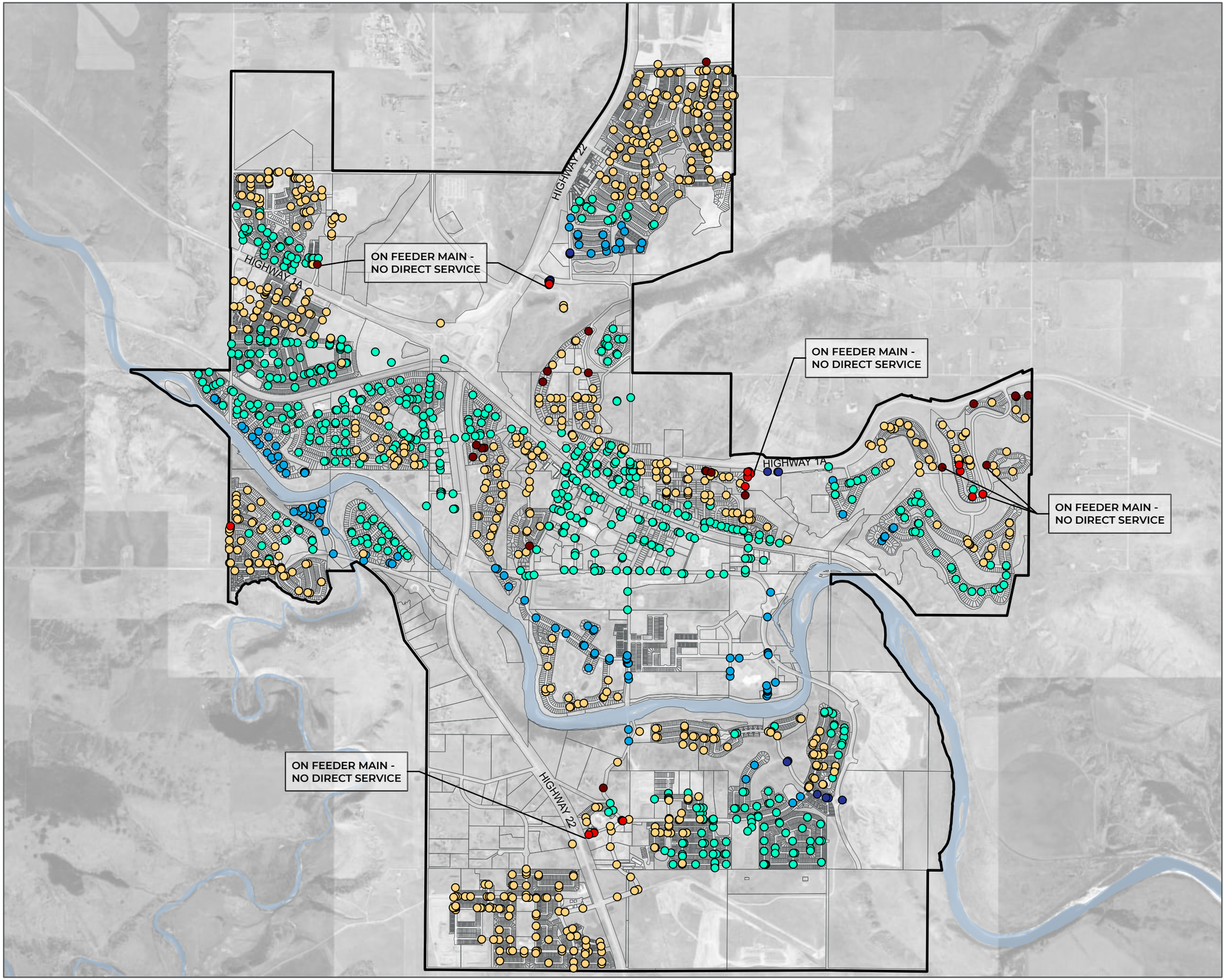
FIGURE 12

Peak Hour Demand:

Existing system pressures during peak hour demand are shown on

Figure 13. This scenario was modeled to determine where low pressures might exist during periods of high demand. There are pressures below the AEPA standard (<50 psi) in Sunset Ridge, Cochrane Heights, Headlands, and Gleneagles. However, all pressures still fall within the City of Calgary minimum requirement (40 – 50 psi). Therefore, no improvements are recommended.

Some areas experience pressures below the City of Calgary Standard, but these are on reservoir feed lines that do not deliver service directly to homes, therefore are not of concern and no improvements are recommended.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Pressure During Peak Hour Demand

Legend

Municipal Boundary

Peak Hour Demand Pressure (psi)

- < = 40 (Below City of Calgary Standards)
- 41-50 (Below EPA Standards)
- 51 - 80 (Within EPA Standards)
- 81 - 100 (Above EPA Standards)
- 101 - 125 (Above City of Calgary Standards)
- Greater than 125 (Above Town Standard)

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0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:30,000
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI.

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	Final
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 13

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Maximum Day Demand + Fire Flow (MDD+FF):

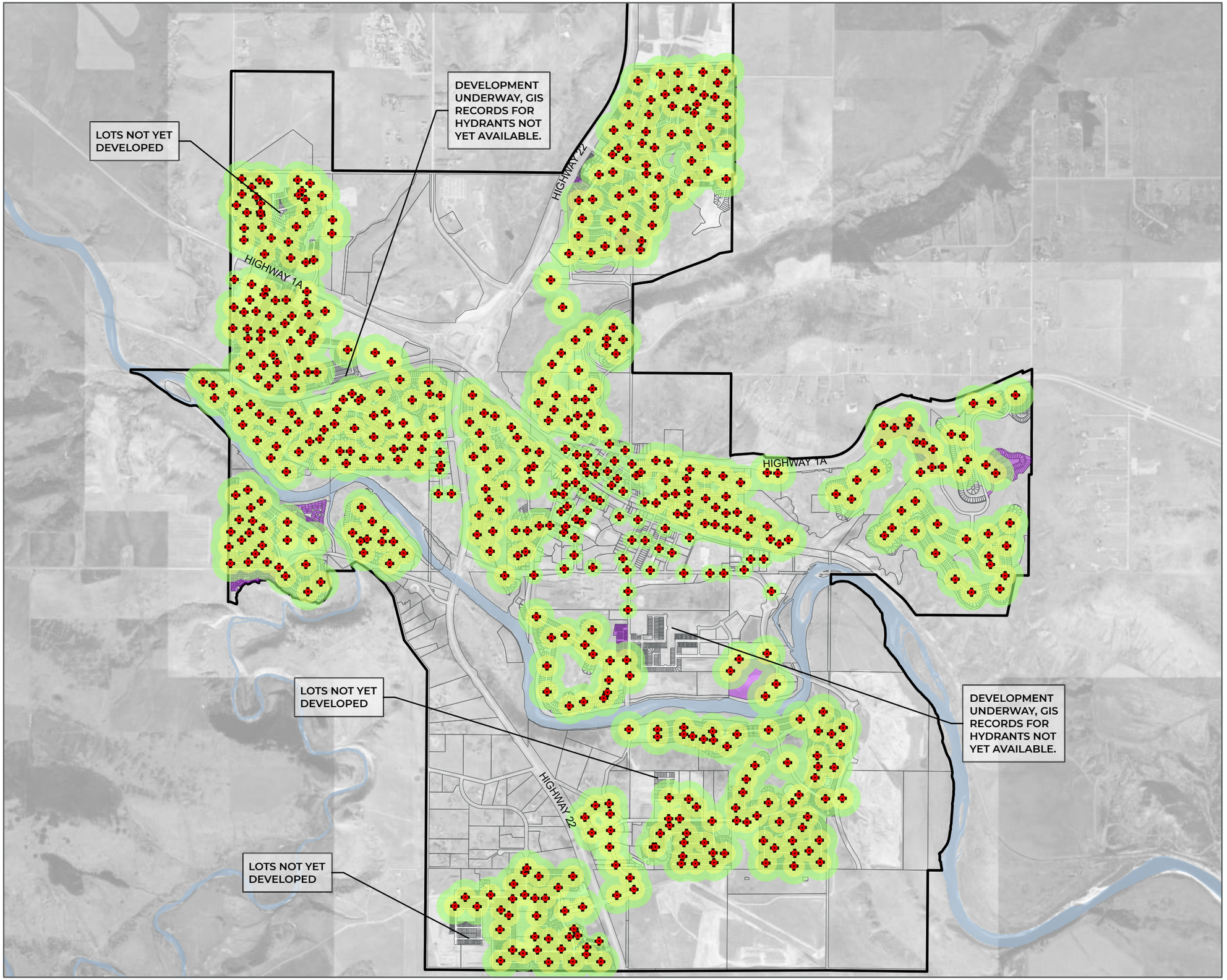
The distribution system was analyzed to determine if there is adequate hydrant coverage in existing areas, and if it is capable of delivering maximum day demand plus the required fire flow from a single hydrant at a minimum residual pressure of 20psi.

Figure 14 illustrates the existing hydrant coverage. As seen in the figure, there are areas with inadequate coverage under City of Calgary standards. The Town has expressed interest in moving towards FUS standards for coverage, so both are shown to assist in decision making to add coverage if desired.

Where deficiencies exist, additional hydrants should be installed as part of the Town's infrastructure renewal program.

The network was evaluated for available fire flow at each hydrant during a day of maximum demand. Flow is considered acceptable if a hydrant can deliver 90% of the recommended FUS flow as outlined by the guidelines in Table 5. Figure 15 shows the available fire flow range from individual hydrants.

Please note the Town is undertaking a process to revisit the target fire flows, and infrastructure recommendations will be revisited at a later date.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Hydrant Coverage

Legend

- Fire Hydrant
- FUS Hydrant Coverage
- City of Calgary Hydrant Coverage
- Private Hydrant Coverage
- Municpal Boundary

Notes:
Hydrant Spacing

Fire Underwriters Survey
Residential = 180m; Non-Residential = 90m

City of Calgary
Residential = 300m; Non-Residential = 150m

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0 0.5 1 1.5
Kilometers

Coordinate System:
NAD 1983 3TM 114

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Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	Final
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 14

Last updated by SdeBoerFuller on Thursday, December 19, 2024 at 10:19 AM
Last exported by SdeBoerFuller on Thursday, December 19, 2024 10:19 AM
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Last updated by SdeBoerFuller on Thursday, December 19, 2024 at 10:01 AM
Last exported by SdeBoerFuller on Thursday, December 19, 2024 10:01 AM
\\WWW MP- ReportFig -v8 -20241218.aprx\Cochrane - WWW Master Plan Update 2024\03 - September 25, 2017 11:46 AM

REQUIRED: 180 L/S
AVAILABLE: 159 L/S

REQUIRED: 180 L/S
AVAILABLE: 150 L/S

REQUIRED: 180 L/S
AVAILABLE: 111 L/S

REQUIRED: 180 L/S
AVAILABLE: 108-126 L/S

GRIFFIN RD AND RIVER AVE
REQUIRED: 330 L/S
AVAILABLE: 206-256 L/S

REQUIRED: 180 L/S
AVAILABLE: 68-130 L/S

REQUIRED: 180 L/S
AVAILABLE: 152 L/S

REQUIRED: 75 L/S
AVAILABLE: 45 L/S

REQUIRED: 230 L/S
AVAILABLE: 128-227 L/S

REQUIRED: 180 L/S
AVAILABLE: 19 L/S

HIGHWAY 1A

HIGHWAY 22

HIGHWAY 1A

HIGHWAY 22

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing System
Fire Flow Availability

Legend

- Municipal Boundary
- Insufficient Fire Flow Based on Land Use

Existing Available Fire Flow (L/s)

- Less than 75 (Insufficient Residential Fire Flow)
- 75 - 124 (Residential, Single Detached)
- 125 - 180 (Residential, Multi Family)
- 181 - 230 (Schools, Institutional Buildings, Neighborhood Commercial)
- 231 - 330 (Downtown Commercial, Industrial Park)
- Greater than 331 (Warehouse Commercial / Industrial)

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0 0.5 1 1.5
Kilometers

N

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Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
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URBAN SYSTEMS

FIGURE 15

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The following summarizes the areas that appear deficient in fire flow protection and the potential means for addressing these deficiencies:

Heritage Hills: As indicated in Table 5, fire flow requirements for multi-family developments can range from 125-180 L/s. The Town is undertaking a FUS building calculation for the buildings adjacent to the hydrant on Heritage Heights take place prior to completion of any upgrades, as the current fire flows in this area meet the low end of the standard.

Bethany Cochrane: A hydrant located on the private site adjacent to this nursing facility is reporting deficient fire flow as it is serviced off a 90m long 150mm diameter lead. The losses within this main are too high to provide the fire flow required. Therefore, it is recommended that the hydrants located on Quigley Drive be used in the event of a fire as they can provide sufficient fire flow and are within the coverage area.

Jumpingpound Common: As discussed in Section 5.2.4, it is believed that buildings in this development were spaced to meet the existing fire flow constraints, but this could not be validated. The Town is undertaking a building specific FUS calculations to confirm fire flow requirements.

Cochrane Heights: Recommendations to improve fire flows in Cochrane Heights are as follows. It is important to note that network improvements alone cannot improve the fire flows, and these improvements must be completed with the recommended pump upgrades (provided in Section 5.2.4).

1. The Town will obtain FUS building calculations in all areas where fire flows are noted as 'deficient,' as the fire flow requirements for specific buildings constructed in this neighborhood may be less than the requirements based on land use as identified in Table 5. In lieu of FUS building calculations, upgrades are recommended within this Master Plan to meet the fire flows based on land use requirements. Recommendations will be revisited at a later date.
2. Many of the pipes in Cochrane Heights are 150mm in diameter. To reach fire flow requirements based on land use, significant improvements to the network would be required as well, to upsize the pipes to a minimum of 200mm in diameter. This includes:
    a. 370 l.m. watermain replacement along Chinook Dr.
    b. 620 l.m. of new watermain through Tri-School site.
    c. 210 l.m. of new watermain from Sunterra pump station to 4th Avenue Intersection.

Ranchehouse: As discussed in Section 5.2.3, there is deficient fire flow at the Ranchehouse hydrant. The recommendations made in Section 5.2.3 apply to the water network as well, and the Town will be completing a building specific FUS prior to any upgrades taking place.

Historic Downtown & East End: Hydrants in this area have inadequate flow when considering fire flow available from a single hydrant. To increase fire protection, mains that are currently 150mm in diameter or less should be upgraded to a minimum 200mm diameter. These upgrades can be passive and can be phased when roadworks occur, or when replacements of pipes at the end of their service life are required. The Town will be assessing the required fire flows in this areas, and recommendations will follow at a later date.

New Downtown: Hydrants along 5th Avenue N, Railway St., and Grande Avenue do not provide adequate fire flows to commercial developments in this area. The 5th Avenue improvements project has been designed to improve fire flows in these areas as well as provide water and sanitary servicing to a future redeveloped lot adjacent to 5th Avenue. A 300mm main and new hydrants will be added along 5th Avenue to improve fire flows in the area. This project is captured in the Town's 3-year budget (as of 2024) and has been included in the capital upgrades plan for the short term.

In addition, some hydrants reporting deficient flows are centrally located within the commercial development area off long leads. Therefore, it is recommended that these hydrants be used to supplement flows, but primary fire protection be prioritized off the hydrants located on larger mains.

East Industrial: While the land use of this area indicates Industrial usage, as shown on Figure 6, much of the area contains commercial development requiring Downtown Commercial fire flow (230 L/s). Most of the water mains in this area are 150mm in diameter, and as such, the supply of 330 L/s is not possible. Therefore, the following recommended upgrades assume that Downtown Commercial Fire Flow (230 L/s) is required. The Town will be completing a building specific FUS calculations for the highest-risk buildings in this area so that the largest fire flow requirement may be confirmed and recommendations will follow at a later date.

To increase fire protection in the East Industrial area, mains that are currently 150mm in diameter or less should be upgraded to a minimum 200mm diameter. These upgrades can be passive and phased when road works occur, or when replacements of pipes at the end of their service life are required. A few additional key upgrades have been identified to improve system looping:

1. There are four hydrants along Griffin Industrial Point that are currently unable to deliver the required fire flow for commercial land use. Installing a 250mm diameter main across the railroad to tie into the existing 200mm diameter line on 1st Street and Bentley Place would improve fire flows in this area. The resulting flows would then meet the requirements for 90% of Downtown Commercial land use. It is recommended that this project be completed at the same time as the East End

Storm Project, planned for 2028 to allow for cost savings associated with construction efficiencies.

2. There is additional looping that can be completed along Bow Street. The first connection is between Charlesworth and River Avenue, and the second is Fisher Avenue to the alley 30m west of Fisher Avenue. This will not show immediate improvement in the fire flows, but once the 150mm mains in this area have been replaced with a minimum of 200mm mains (recommended for passive improvement) all hydrants will be within 90% of the fire flow for Downtown Commercial land use. The urgency of this project depends on the Town's asset management strategy findings, as this work will likely be coupled with asset renewal/replacement projects. Therefore, it is in the 10+ year window until prioritized otherwise.
3. The Town owns a parcel of land between All Span Building Systems and Bluebird Self Storage. A looped connection through this parcel between Griffin Rd and Railway Street East is recommended to improve fire flows along Griffin Road (by approximately 20-40 L/s at three hydrants, when paired with the Griffin Industrial Looping). If this area were to redevelop, the need for this looping would be triggered, therefore this project is listed in the 10+ year window.

Griffin Rd and River Avenue: All hydrants adjacent to Spray Lakes Sawmill are deficient for Industrial land use when hydrants are used individually. It was found that use of multiple hydrants in this area allows for these flows to be realized. It is recommended that fire testing be conducted to validate the results and establish a plan for fighting a fire adjacent to the sawmill and for the Town to have discussions with the Sawmill to determine what specific fire protection measures are included within their facility to evaluate the required fire flow from these hydrants.

Glenbow: There are five hydrant deficiencies within the Glenbow neighborhood. The mains in this neighborhood range from 150mm to 200mm, and most are ductile iron and at the end of their service life. PRVs have been installed at the entrance to this neighborhood as the existing pipes cannot handle the high pressures entering the neighborhood. To improve the fire flows in Glenbow, the existing pipes must be replaced with mains that have a high enough pressure rating. Once all the mains in the neighborhood are upgraded, the pressure reduction settings on the PRV settings can be modified to allow for higher pressure flow throughout the neighborhood and as a result, higher fire flow availability.

It is recommended that the pipes be upsized to a minimum of 200mm, and that the main along Glenpatrick Road be upsized to 300mm. The main in Glenpatrick Road is intended to be replaced in 2025; therefore, it is recommended that this project be completed in the short term, with the remaining replacements taking place passively and as part of the Town's asset management strategy.

Sanitary Transfer Station: This hydrant is only capable of delivering 19 L/s as the mains that provide service range from 50mm to 150mm. There is a hydrant on Griffin Rd east, within the coverage area that can deliver 150 L/s. It is recommended that this hydrant be used for

the Transfer Station. Once capital upgrades to the Town boundary are complete, this hydrant will be capable of delivering 200 L/s. Therefore, no specific upgrades are recommended.

5.2.6 RISK ASSESSMENT AND LEVELS OF SERVICE

Risk and Consequence of Failure

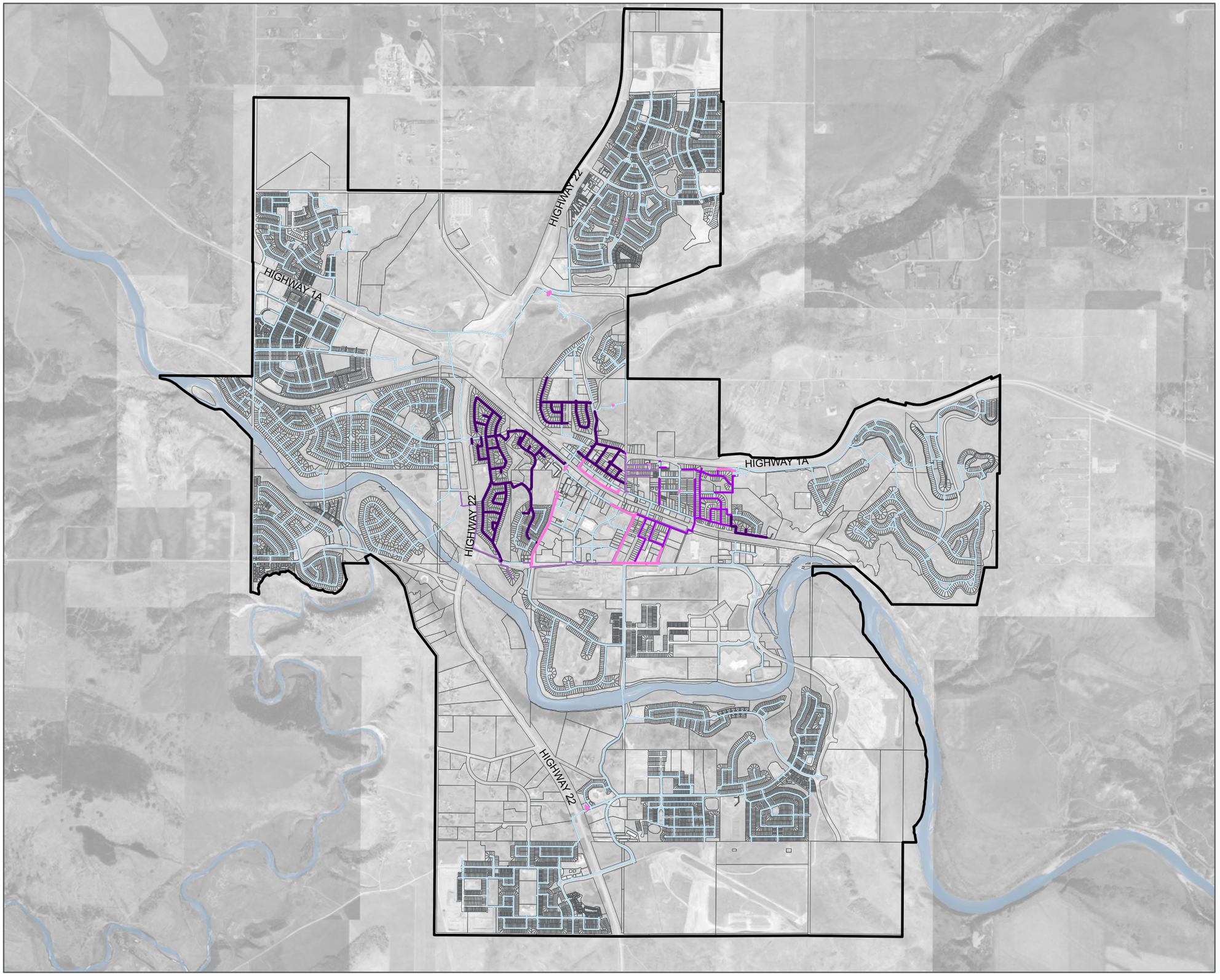
The 2012 W3 Report provided a detailed assessment of system failure risks for the distribution pipes in the system [2]. Each of the pipe elements within the system were ranked based on their material life expectancy, and the consequence of failure. This information was not updated as part of the scope of this study but remains a relevant concern. Therefore, it is provided in Appendix B [2].

Asset Age

Asset age information for the existing system was updated based on the available data from the Town's GIS. The life expectancy of the assets was based on the specific material of each pipe. These are:

1. Minimum 45 years for materials which include cast iron, concrete (PCCP), vitrified clay tile (VCT), asbestos cement, steel, ductile iron, and copper.
2. Minimum 75 years for all other materials including PVC, HDPE, PE, and PEX.

An updated map of pipes with their serviceable life can be found in Figure 16.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Water System Serviceable Life

Legend

- Municipal Boundary Area

Water Pipes

- Unknown serviceable life remaining

Material with Minimum 45 Year Service Life

- Greater than 10 years of serviceable life remaining
- 5-10 years of serviceable life remaining
- 5 years or less of serviceable life remaining
- Service life consumed

Material with Minimum 75 Year Service Life

- Greater than 10 years of serviceable life remaining

Notes:

- Material with minimum 75 year serviceable life includes; HDPE, PE, PEX, PVC
- Material with minimum 45 year serviceable life includes; AC,BB, CI, CU, DI, STL, HPC, PCCP
- Pipe material and age shown for the Downtown Area are based on anecdotal information from the Town of Cochrane and may differ from the Town's GIS records

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0 0.5 1 1.5

Kilometers

N

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Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2026 / 4 / 20

URBAN SYSTEMS

FIGURE 16

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Based on the serviceable life of the assets, the distribution performance provided in Section 5.2.5, and the known asset renewal/replacement projects for pump stations (Section 5.2.4), a summary of the recommended passive replacement projects is provided in Figure 17. These include:

1. Sunterra pump station upgrades
2. Lower Gleneagles pump station upgrades
3. Upper Gleneagles pump station upgrades
4. Cochrane Heights main replacements (where asset age has reached minimum serviceable life)
5. Glenbow main replacements (where asset age has reached minimum serviceable life)
6. Downtown and East end main replacements (where asset age has reached minimum serviceable life)

The Downtown main replacements discussed in Section 5.2.5 have been included in the above list even though some of the watermains have not yet reached their serviceable life, as passive improvements have been recommended in these areas to improve fire flows. It is recommended that these pipes, along with the pipes that have been identified as reaching the end of their serviceable life, be reviewed as part of the Town's asset management strategy. Upsizing existing mains once they have reached their serviceable life will improve fire flows throughout the Downtown area.

Pipes in the East End have not yet reached their serviceable life, nor are there existing fire flow deficiencies in this area. As these assets begin to reach their serviceable life, the Town will need to ensure that redevelopment is built to meet the existing fire flow constraints in the area, or if upgrades take place to supply larger fire flows.

Passive replacement projects are not included in the capital plan for this Water Wastewater Master Plan, as further conditions analysis and prioritization strategies are required for these projects.

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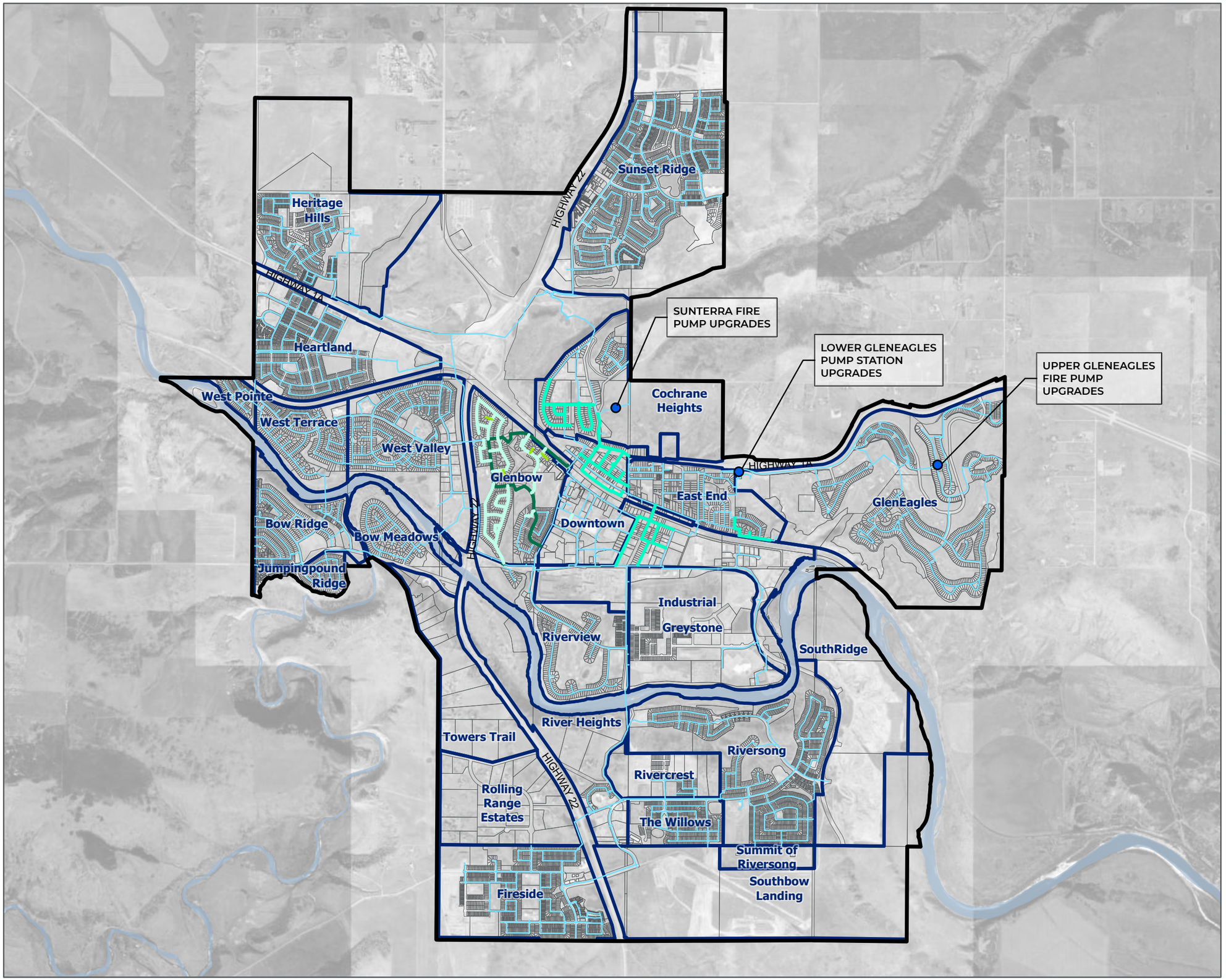

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Water System
Passive Replacement Projects

Legend

- Pump Station
- Municipal Boundary Area
- Cochrane Neighbourhoods

Water Pipes

Passive Upgrades / Replacements

- 300mm
- 200mm - 250mm
- 200mm
- 150mm
- Existing Pipes

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0 0.5 1 1.5
Kilometers

N

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Scale: 1:32,000
(When plotted at 11"x17")

Data Sources:

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- Growth Study

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 17

5.3 GROWTH RELATED INFRASTRUCTURE

The following section outlines the performance analysis results for Cochrane's water distribution system under the growth to Town boundary demand scenario (all developable lands within the Town boundary, as indicated in Figure 3 have been developed). System performance is compared against the design criteria outlined in Section 4.0.

Where the existing system is unable to meet the design criteria because of the expanding water network and added demands, capital upgrades will be recommended. Associated timing estimates for these capital upgrades will be prioritized based on short (0-4 years), medium (5-10 years), and long term (10+ years) estimates. In addition, network servicing recommendations are made for future growth areas.

5.3.1 WATER LICENCE

The Water Supply Strategy, completed in 2022, assessed the Town's 25-year water licence needs and developed a long-term strategy for securing the water supply for the future. Since the completion of the Water Supply Strategy, the Town has successfully acquired enough consumptive and non-consumptive water licence for 25 years of growth. The Town is currently able to divert 7,245-acre feet annually.

5.3.2 WATER TREATMENT PLANT

A separate Water Treatment Plant Capacity Assessment and Future Upgrades Study was recently completed following this Master Plan (Urban Systems Ltd.). Findings and recommendations from this study are summarized below and are captured within this Master Plan's Capital Upgrades Plan. However, because the Water Treatment Plant Capacity Assessment and Future Upgrades Study was not complete until after the completion of this Master Plan, the Master Plan utilizes the previously planned ultimate distribution capacity of 29.7 MLD of output in the Growth to Town Boundary scenario.

Summary of findings, recommendations, and decisions from 2025 Water Treatment Plant Capacity Assessment and Future Upgrades Study:

- The current (2025) capacity of the Town's existing water treatment system is 14.6 MLD.
- Three possible upgrade scenarios were reviewed, with varying increases to the existing water treatment plant's capacity.
- The Town is proceeding with upgrades to the existing Water Treatment plant to a treated output capacity of 21.8 MLD.

The recommended capital upgrades to achieve this capacity include:

1. West intake replacement and piping upgrade
2. Pretreatment upgrades including new flocculation chambers, clarifier modifications, and chemical storage.
3. Clearwell diffuser replacement

4. Upgrade two of the high lift pumps
5. Add residuals management system
6. Upgrade electrical system and generator

The total estimated cost (Class D) to achieve the above-noted upgrades was $29.9M.

Based on study, the existing water treatment plant will be operating above several individual process capacities by 2028. These upgrades will be captured within the near-term of the Town's capital upgrades plan.

Following completion of the upgrades to the Town's existing Water Treatment Plant, a new Water Treatment Plant will be required to continue to service growth. It is anticipated that the new Water Treatment Plant construction will be required to start in 2030 (to achieve operation by 2032). Costs can vary significantly depending on the size, location, and treatment processes within the new water treatment plant. Therefore, it is recommended that the Town:

1. Complete a future WTP Location due diligence and concept design (underway in 2026) and begin land acquisition.
2. Complete a conceptual design and phasing plan for the future WTP, explore grant opportunities and incorporate the funding plan into the OSL program.

The future Water Treatment Plant will provide additional distribution pumping capacity to service the surrounding area, which will allow for improved reservoir filling near the new plant. The location of a new plant has not yet been determined, so pumping capacity, reservoir filling, and distribution considerations for all growth areas have been evaluated independent of a new treatment plant. It is recommended that once a location for a new WTP has been established, the recommendations herein are reviewed and updated to capture the new information.

5.3.3 TREATED WATER RESERVOIRS

As discussed in Section 4.1.1, reservoir capacity was assigned to growth areas within the Town boundary based on the established design criteria (0.18 L/s/ha) and the existing fire flow requirement of the reservoir service area.

Storage Capacity Assessment – Performance under Growth to Town Boundary:

A summary of the reservoir storage requirements for the Growth to the Town boundary scenario can be found in Table 10. The growth to Town boundary scenario does not change the operational philosophies of the reservoirs, discussed in Section 5.2.3, so they are not restated here.

East (Gleneagles):
The Upper Gleneagles reservoir has sufficient storage capacity under the Growth to the Town boundary scenario.

North-West (Heritage Hills):

There are three special areas for consideration when reviewing the Heritage Hills reservoir storage capacity under the Growth to the Town boundary scenario:

1. **Horse Creek Sports Park:** A site servicing report for Horse Creek Sports Park was completed in 2024. The site servicing report contemplates servicing a school, a clubhouse, and a sports dome on this site. It was concluded through this study that 424m3 would be required to service the school, clubhouse, and sports dome on this site from Heritage Hills Reservoir, provided that the fire demand on this site does not exceed 180 L/s for 2 hours. The water demand for these uses have been accounted for in the growth scenario and there is capacity within the reservoir. Capacity for irrigation of the sports fields was not included.
2. **Cochrane & District Agricultural (AG) Society Lands:** The AG Society Lands were included in the original endeavor to assist during the planning and construction of this reservoir. Although this area has no Policy in place, allocation of treated storage for this land has been included if the Town wishes to provide servicing.
3. **Baptist Seminary Lands:** This parcel is a future area for consideration. There is no policy or planning in place, and allocation for this land has not been included in the growth scenario for reservoir storage.

Based on the above considerations, the Heritage Hills reservoir has sufficient storage capacity under the Growth to the Town boundary scenario.

North-East (Sunset Ridge):

The Sunset Ridge reservoir has sufficient storage capacity under the Growth to the Town boundary scenario.

South (River Heights):

The River Heights reservoir has sufficient storage capacity under the Growth to the Town boundary scenario.

Ranchehouse:

The Growth to Town boundary scenario does not add any additional demands to this reservoir service area. Deficiencies related to this reservoir are discussed in Section 5.2.3.

4th Avenue (Sunterra):

The Franciscan Lands is a future area for consideration. However, there is no policy or planning in place, and allocation for this land has not been included in the growth scenario for reservoir storage.

Based on the above consideration, and the discussion provided in Section 5.2.3, the following work needs to take place to confirm the expansion requirements of the Sunterra Reservoir:

1. Confirm fire flow requirements in Cochrane Heights (through a building-specific FUS analysis), and

2. Confirm how the 2MG and Sunterra reservoirs will respond to a fire in the Cochrane Heights neighborhood.

Should it be determined that there is sufficient hydraulic grade to provide fire flows to Cochrane Heights via the 2MG reservoir, there will be sufficient storage in the Sunterra Reservoir under the Growth to Town Boundary scenario.

Main Pressure Zone Storage (2MG):

Main pressure zone storage will require expansion as the population and demands increase over time. As discussed in Section 5.2.3, the main pressure zone storage is currently deficient. To meet demands of the developable area within the Town boundary, the main pressure zone requires storage expansion of approximately 5,110 m^3 if the Lower Gleneagles Reservoir is not used by the Town to supplement demands. With supplementation from Lower Gleneagles, the required expansion volume is 3,100 m^3.

It is recommended that expansion of this storage take place in the short-term[5], and a main pressure zone expansion feasibility study be conducted to determine whether expansion of the 2MG reservoir at its current location is appropriate for the main pressure zone storage.

[5] Should water treatment plant capacity increases be prioritized over storage expansion, the plant will be able to supplement additional demands, and this project could be deferred.

Table 10: Reservoir Storage Requirements, Growth to Town Boundary

Reservoir (Pressure Zone)	Fire Flow Storage Allocation	Design Volume (m^3)	Ultimate Capacity Required (m^3)	Additional Storage Required (Existing) (m^3)
Ranchehouse	0	270	270	0
Upper Gleneagles (E)	180L/s, 2hrs Neighborhood Commercial	2890	2,715	0
Lower Gleneagles (E)				
4th Avenue (Sunterra)	83 L/s, 2hrs Sunterra Multifamily	1050	1,400	350
Heritage Hills (NW)	180L/s, 2hrs Neighborhood Commercial	3130	2,860	0
Sunset Ridge (NE)	180 L/s, 2hrs Neighborhood Commercial	4200	3,260	0
River Heights (S)	260 L/s, 3hrs Warehouse Commercial	7710	7710	0
2 Million Gallon (2MG) (Main Pressure Zone)	330 L/s, 4hrs Warehouse Industrial	8150	13,260	5,110

Reservoir Filling – Steady State Performance under Growth to Town Boundary Conditions:

Filling for reservoirs that service growth was reviewed under the MDD scenario, as reservoirs within Town should be capable of filling at MDD for their service area, and the water treatment system within Town should be capable of delivering MDD for the Town demands. A steady state analysis under the MDD scenario was conducted to determine if there is sufficient hydraulic grade to provide the reservoirs with MDD demands. This analysis does not account for timing to fill the reservoirs, nor does it account for the filling and depletion of the reservoirs based on their size and elevation and diurnal patterns within their service areas. Significant extended period simulation (EPS) modeling is required to do so.

To provide an initial review of the filling under MDD conditions. the flow control valve (FCV) settings into the Heritage Hills, Sunset Ridge, Sunterra, and River Heights reservoirs were adjusted to the MDD of their respective service area, as shown in Table 11[6].

Table 11: FCV Settings for MDD of Reservoir Service Area - Growth

Reservoir	FCV Setting (L/s)
Heritage Hills	22
Sunset Ridge	48
Sunterra	4
River Heights	165 [23]

From this analysis, it was found that the only reservoir unable to fill at the MDD rate for its service area was the River Heights reservoir. Therefore, as this area grows, the River Heights reservoir will require either:

1. A second supply line capable of supplementing demands to the service area MDD.
2. An in-line pump station on the existing supply line capable of providing additional pressure to increase the fill of this reservoir.

When developing a solution to supplement the fill to this reservoir, the redundancy and resiliency of this system should be considered. There is only one large diameter main crossing the Bow River to service South Cochrane (River Heights service area and beyond), and only one storage reservoir. Further, the existing single supply main to this reservoir is installed in a structure which hangs from the River Avenue bridge. Should there ever be an issue with this installation, or the bridge itself, replacement and/or repair of the main could be time-consuming. In addition, this water main is at higher risk of damage in the event of a flood or ice jam as it is exposed. For these reasons, a 400mm second supply line from the George Fox Trail and Bow Meadows drive intersection to the River Heights reservoir is recommended. Installation of this main will provide redundancy to the reservoir supply,

[6] Filling of the 2MG reservoir requires EPS analysis as this reservoir is controlled by the hydraulic grade of the system and supplements the system in high demand scenarios.

allows for the required filling rates to the ultimate reservoir for a maximum day event, thus providing resiliency to service to the communities of south Cochrane.

The timing for the installation of this main will depend on the speed of development in South Cochrane. Presently, the Town's MDD demands for south Cochrane are approximately 27 L/s, and the existing supply line can provide 90-100 L/s, depending on the HGL conditions of the main pressure zone at the time of filling. Based on the approximate growth rates provided by the Town at the time of analysis, this supply line is needed within the long-term growth timeframe (10+ years).

Reservoir Filling - Extended Period Simulation (EPS) Performance under Growth to Town Boundary Conditions:

EPS modelling was completed to review the previously proposed filling solutions for the 2MG reservoir, and review how the RHR and 2MG reservoirs recover during periods of high demand. The EPS model used utilities the system updated discussed in Section 5.0, and the diurnal patterns established from the 2022 EPS Model Update and Calibration.

As the system grows and undergoes upgrades, it is recommended that EPS model be updated periodically to minimize the effort in future modelling endeavors.

RHR Second Supply Line Timing

The EPS model was run under three different demand conditions to confirm the timing for the requirement of a second supply line to the River Heights Reservoir. These timing scenarios were established by developing estimates for the buildout of all growth areas within the Town boundary with the Town's engineering team. The demands were then applied to the model as short (0-4 years), medium (5-10 years) and long (10+ years) term growth scenarios.

From this analysis, it was found that the River Heights reservoir was able to recover during periods of low system demand (overnight) within the short and medium term, but a second supply line or in-line pump station would be required in the long term.

2MG Filling Analysis

To confirm the need for the 600 mm feeder main, eight scenarios were run using the EPS model. Instead of adjusting the demands within these eight scenarios, the demands remained consistent (long-term, 10+ years of demands), and the flow output of the water treatment plant was adjusted. This was to review how increased pressures out of the WTP aid in filling the reservoirs during periods of high demands, and what measures could be taken to reduce the pressures out of the WTP while still allowing for recovery of the 2MG reservoir.

As shown in Figure 18 below, the 2022 EPS model results indicated that to improve the filling and recovery of the 2MG reservoir during periods of high demand, the Town can increase the speed of the high lift pumps to deliver more flow (at higher pressures), and the

Town can deliver similar flows at lower pressures with the installation of the 600mm feeder main.

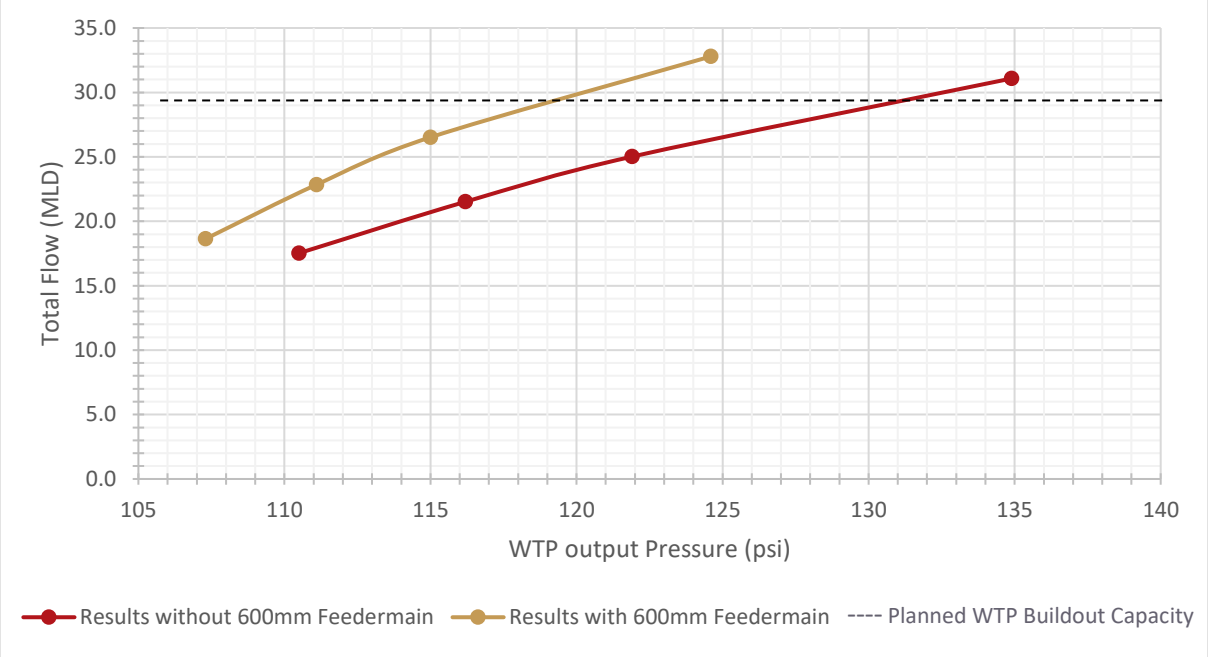


Figure 18: EPS Model Results for 600mm feedermain

The timing needed for this improvement depends on the extents and timing for the WTP capacity upgrades. If the Town does not want to operate the plant at an output pressure above 130psi, the feeder main will need to be in place prior to expansion of the plant. Therefore, the feeder main is estimated to be required in the 5-10 year window.

It is important to note that the 600mm feeder main proposed to improve filling of the 2MG reservoir marginally improves flows to the River Heights reservoir as well. However, it does not improve them enough to eliminate the need for additional improvements to the system as stated above.

Further EPS analysis was undertaken to determine how best to improve filling to the 2MG reservoir. It was observed that the main pressure zone is adequately keeping all other reservoirs full (above ~80%) over a 48-hour period, likely at the expense of filling or maintaining level in the 2MG. In this analysis, the FCVs for the other reservoirs were manipulated in the model, under a scenario with the existing WTP output at 29.7 MLD and no 600mm feedermain in place. The results indicated that the Town could adjust FCV settings at the reservoirs that fill preferentially and see very little cycling to improve flow to both the RHR and the 2MG. Adjustments at Heritage Hills and Sunset Ridge has an immediate impact given their proximity to the WTP [25].

The following recommendations are made to meet the main pressure zone storage requirements and improve filling of the 2MG reservoir:

1. Complete operational testing as recommended in the 2022 EPS model analysis to determine whether changing pumping operations in periods of high demand can aid in the recovery of this reservoir in the interim.
    a. Develop a standard operational philosophy for the WTP to ensure proper management of this distribution system.
2. Complete operational changes of the recommended flow control valves to aid in allowing more flow to travel east through the main pressure zone. If operational changes are unable to aid in the nightly recovery of this reservoir, or if the discharge pressures are deemed too high risk for longevity of infrastructure, install the 600mm feeder main from the WTP to Westside Dr.

Note: Since this analysis was completed and the report finalized, the Town discovered the presence of a closed left-turn valve. Since the Town opened this valve, they have observed minimal challenges in filling and recovery of the 2MG reservoir. As such, the calibration of the EPS model is based on this valve being closed and needs to be updated and recalibrated in the future to capture actual revised system performance.

5.3.4 PUMP STATIONS

As discussed in Section 5.2.4, there are upgrades required to the Town's pump stations to service future growth. These are summarized in Table 12.

Table 12: Pump Station Firm Capacity, Existing and Ultimate

Pump Station	Existing Firm Capacity		Town Boundary (Ultimate, Planned) Firm Capacity	
	Flow L/s	TDH (m)	Flow L/s	TDH (m)
Sunterra	4	64	4	64
Sunterra – Fire	76	55	75	55
Bow Ridge	25	26	25	26
Bow Ridge – Fire	125	19	125	19
Upper Gleneagles	19	56	19	56
Upper Gleneagles – Fire	76	56	76	57
Lower Gleneagles	22	116	18	118
Water Treatment Plant	225	98	347	105
Sunset Ridge	265	103	265	103
River Heights	324	61	447	61
Sundown Pump Station	240	50	240	50
Heritage Hills	244	73	244	73
Cochrane Heights	15	14	15	14
B2 Transfer Station	28	6	28	6

The River Heights Phase 1A expansion was recently completed. The final pump upgrade will not be required until a population in the service area of approximately 18,000 people (or 350 ha of developed land), which is anticipated to take place in the 5-10 year range.

Growth Related Upgrades (Planned):

1. The current configuration of the WTP consists of 2 x 100 HP, and 2 x 150 HP distribution pumps, and 1 x 75HP jockey pump. The planned configuration to meet 29.7 MLD is 5 x 150 HP distribution pumps (four duty, one standby) [19].
2. The River Heights pump station Phase 1A expansion was recently completed and the firm capacity is reported assuming project completion. The Phase 2 expansion will see the addition of the final 200 HP pump [23].

5.3.5 DISTRIBUTION SYSTEM

Servicing Growth:

The following is a discussion regarding future buildout areas within the Town boundary, how they should be serviced, and the remaining fire flows available. Location and sizing for the water network within these areas can be found in Figure 19. The proposed sizing is high-level and intended to establish the minimum sizing for the largest mains within the future development areas. Hydraulic Network Analyses for each development will need to be submitted to the Town. These reports will have the correct alignments of larger mains and laterals to service these areas. In some instances, these reports have been submitted and incorporated into the Master Plan (Southbow and West Hawk.)

Heritage Hills:
Development of growth areas within Heritage Hills should provide 250mm-300mm looped watermains to maintain existing fire flow availability. Development of the West-Hawk neighborhood will require PRVs to keep system pressures within AEPA standards. Note that the network shown is the major component of the Developer-proposed water network for servicing this development (received December 2023).

Horse Creek Sports Park:
A site servicing report for Horse Creek Sports Park was completed in 2024. The site servicing report contemplates servicing a school, a clubhouse, and a sports dome on this site. A water network analysis was completed for this development, and the Town's preferred servicing method (main sizing and PRV) has been captured in Figure 19.

It is important to note that irrigation using potable water for this site was not included as part of the ultimate demands, as irrigation demands for a high-level sports playfield area are quite large. The Town will need to review irrigation options and determine whether it is necessary to allocate remaining storage and available flows for this purpose as the concept gets refined.

Heartland:
Development of remaining growth areas within Heartland should provide minimum 250mm looped watermains to maintain existing system fire flows.

Greystone:
A 300mm watermain main should be provided as a looped connection between River Avenue and Griffin Rd.

Sunset Ridge:
The proposed network for the large undeveloped northern parcel in Sunset Ridge consists of looped 300mm mains, which form an extension of the existing 400mm mains. 300mm mains are sized to provide fire flows to this northern parcel. Fire flows in this area are limited by the storage capacity of Sunset Ridge reservoir (180 L/s). These mains have been sized such that this fire flow is achieved.

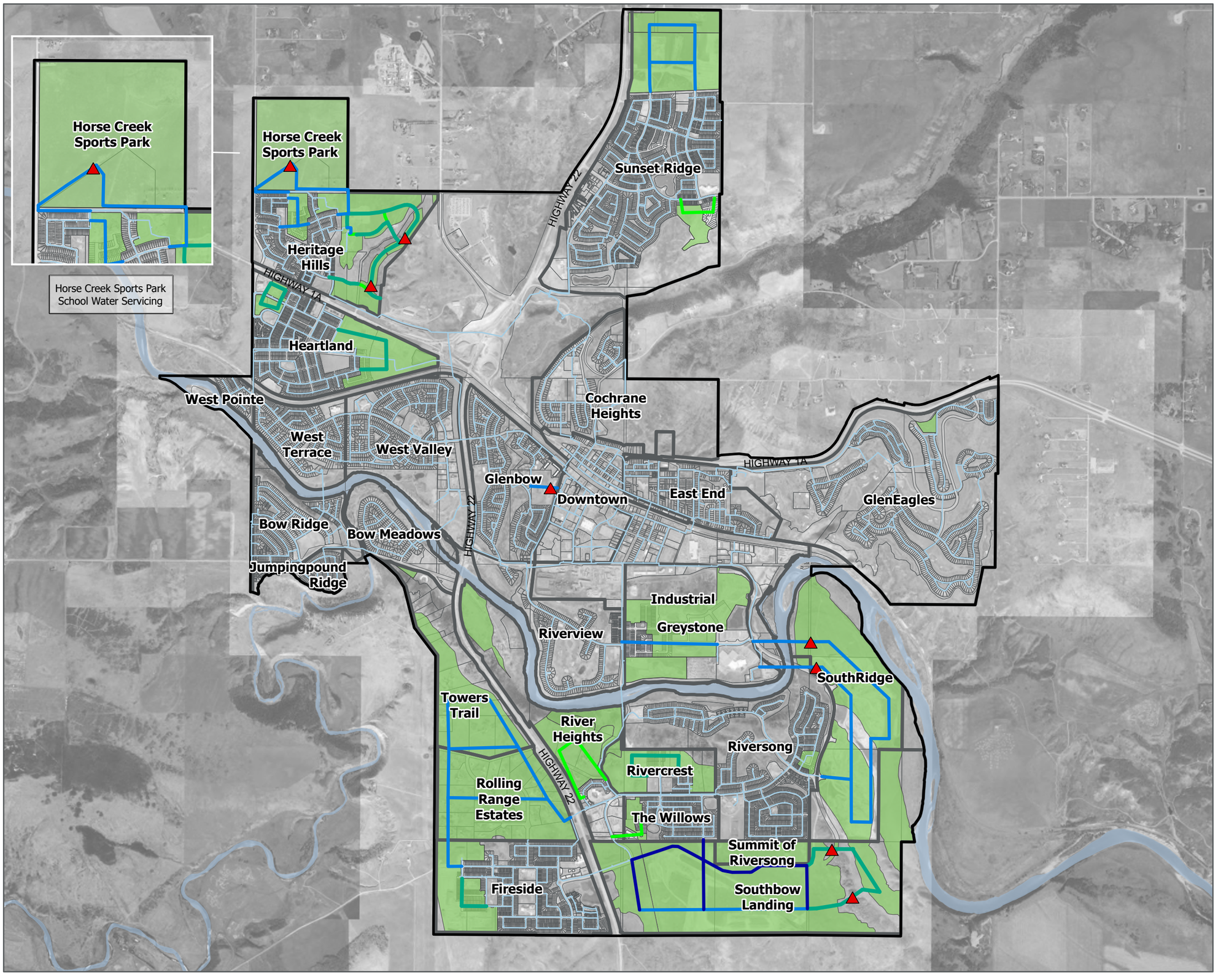
South Ridge Lands:
Servicing of these lands will require looped water connections across the Bow River (a dual river crossing) with mains sized to a minimum of 300mm in diameter. Pressure reducing valves on the looped connections may be required to keep pressures within APEA standards, but the final grades of this site following mining and development are not known. A 300mm normally closed connection should be provided from Riversong Boulevard to provide water service from the River Heights network to this area in the event of an emergency but would not be the normal connection as the River Heights reservoir and pump station were not sized to accommodate these lands. Fire flows in this development range from 150 L/s to 180 L/s (calculated from 300mm mains), depending on topography.

Southbow Landing:
The proposed water network in Southbow landing reflects the Hydraulic Network Analysis submitted by the Developer in April 2024. Mains range from 250mm to 400mm, and PRVs will be required to keep pressures on the lower bench within AEPA standards. Fire flows in this development can reach 300 L/s off large mains, depending on location and topography. The expanded River Heights reservoir holds 260 L/s of fire flow and therefore all development in this neighborhood must be below this threshold.

River Heights:
Remaining developable area within the River Heights service area should provide looped connections to a minimum diameter of 200mm.

A 200mm loop should be provided between River Heights Drive and Willow Park Point.

Rolling Range/Tower's Trail:
These developments should be serviced with a minimum of 300mm mains with looping. Fire flows can reach as high as 260 L/s (off 300mm mains) depending on location and topography.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Water System
Growth to Town Boundary
Proposed Water Network

Legend

- Pressure Reducing Valve
- Existing Pipes
- Cochrane Boundary
- Developable Area

Water Pipe Sizes (mm)

- 150
- 200
- 250
- 300
- 400

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Kilometers

N

Coordinate System: NAD 1983 3TM 114

Scale: 1:32,000 (When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI
- Growth Study

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	Final
Revision:	A
Date:	2026 / 4 / 20

URBAN SYSTEMS

FIGURE 19

Last updated by sdeboerfuller on Monday, April 13, 2026 at 11:43 AM
Last exported by sdeboerfuller on Monday, April 13, 2026 11:43 AM
Last printed by sdeboerfuller on Monday, September 25, 2017 11:46 AM
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5.4 WATER SYSTEM CAPITAL UPGRADES

In summary, the Water System Capital Upgrades are as follows. These capital upgrades, coupled with the recommended servicing of growth areas is found in Figure 20:

Table 13: Water System Capital Upgrades Summary

Project	Timing (yrs)	Rationale
Griffin Industrial Looping	0-4	Improved fire flows to meet system design criteria and distribution system capacity.
Glenpatrick 300mm main upsizing	0-4	Improved fire flows, resiliency to downtown water supply.
Automation of valve system between Lower Gleneagles Reservoir and the Main Pressure Zone	0-4	Additional water storage capacity can be allocated to the Main Pressure Zone.
Main Pressure Zone (2MG) Storage Expansion	0-4	Additional capacity to meet existing and future demands.
5th Avenue Improvements	0 - 4	Improved fire flow and hydrant coverage downtown and "pre work" associated with servicing the future development site adjacent to 5th Avenue.
WTP Upgrades (Expansion of Town's Existing Treatment System)	0-4	To meet future demands as population grows.
New WTP	5-10	To meet future demands as population grows.
River Heights Phase 2 Pump Station Expansion	5-10	To meet future demands as population grows.
600mm Feedermain	5-10	Improved Town distribution capacity and resiliency at lower WTP output pressures.
Cochrane Heights Fire Flow Improvements	5-10	Improved fire flows to meet system design criteria.
River Heights Second Supply Line	10+	To provide adequate fill to River Heights reservoir to accommodate growth and to offer redundancy and resiliency to south Cochrane's water supply.
Bow Street Looping	10+	Improved fire flows to meet system design criteria, provide capacity for redevelopment.
All Span Building Systems Loop	10+	Improved fire flows to meet system design criteria, provide capacity for redevelopment.

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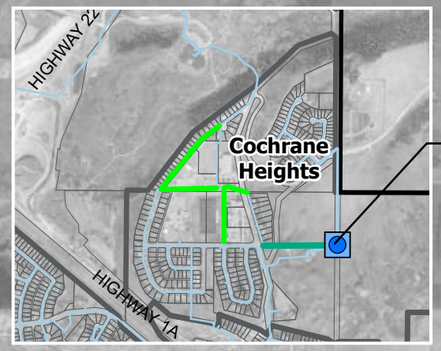
Horse Creek Sports Park
Heritage Hills
Sunset Ridge
HIGHWAY 22
HIGHWAY 1A
Heartland
West Pointe
Cochrane Heights
MAIN PRESSURE ZONE 2MG STORAGE EXPANSION
West Terrace
West Valley
Glenbow
Downtown
East End
GlenEagles
Bow Ridge
Bow Meadows
Jumpingpound Ridge
Industrial
Greystone
Riverview
SouthRidge
Towers Trail
River Heights
Riversong
Rivercrest
Rolling Range Estates
The Willows
Summit of Riversong
Fireside
Southbow Landing

Cochrane Heights Fire Flow Improvements



SUNTERRA PUMP STATION AND RESERVOIR EXPANSION

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Water System
Recommended Capital Projects

Legend

- Main pressure Zone Storage Expansion
- Reservoir
- Pump Station
- Existing Pipes
- Cochrane Boundary
- Developable Area

Water Pipe Sizes (mm)

- 200
- 250
- 300
- 400
- 600

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Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:32,000
(When plotted at 11"x17")

Data Sources:

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- Growth Study

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 20

5.5 SPECIAL AREAS FOR CONSIDERATION

The following areas are discussed to allow the Town to understand how they could be serviced if desired in the future. There is no current Policy in place for these lands, nor plans for servicing.

5.5.1 COCHRANE & DISTRICT AGRICULTURAL (AG) SOCIETY LANDS

The Ag Society Lands were included in the original endeavor to assist during the planning and construction of the Heritage Hills reservoir. Therefore, allocation for these lands has been included in the ultimate scenario for this reservoir (provided land use does not exceed neighborhood commercial fire flow). In addition, these lands are within the service area of the Heritage Hills pump station, as they are at a lower elevation than the highest elevation the station is designed to service. Servicing the AG Society Lands from this reservoir would only require the mains to be adequately sized and looped to deliver fire flows for the specified land use within this development.

5.5.2 BAPTIST SEMINARY

The Baptist Seminary Lands are currently serviced from the Main Pressure Zone with a private booster station and distribution system. If expansion in this area was desired, there are several possible ways to achieve service:

- Service from the Main Pressure Zone would require expansion of Main Pressure Zone storage, and expansion of the existing private booster station and distribution system.
- There is some capacity available within the Sunset Ridge reservoir, however this would require a booster station, a significant provincial highway (Highway 22) crossing, and a large coulee crossing.
- Service from Heritage Hills would require a booster station and potential expansion of the reservoir.

In all cases, infrastructure expansion is required to service these lands. It is recommended that further study take place to determine the size and scale of development before servicing design is completed.

5.5.3 FRANCISCAN LANDS

Given the proximity to the system, the most feasible way to service the Franciscan Lands is through the Sunterra Reservoir and pump station. This reservoir is limited in what can be supplied for fire flow (83 L/s for 2 hours) and therefore development of these lands would also be limited (unless expansion of the reservoir was completed.) The Sunterra pump station is not adequately sized to provide water to these lands, and therefore a new pumping system would be required. The water network would need to be sized and installed to meet the fire flow demands for the proposed development.

5.6 INFILL/REDEVELOPMENT AREAS

In future years, the Town expects to increase density in the downtown core, increasing demands and requiring higher fire flow availability in areas of Downtown. This includes Glenbow, Historic Downtown, East End, East Industrial and New Downtown neighborhoods outlined in Figure 4. Accurate assumptions regarding the location and type of infill and redevelopment that will occur in the future are not possible. Therefore, the growth to Town boundary model was reviewed under the MDD + Fire Flow scenario to check available fire flow for redevelopment. Fire flow is expected to be the limiting factor for this area, given there are currently very large requirements (Downtown Commercial - (230 L/s) and Warehouse Industrial – 330 L/s). Knowing the available fire flows, the Town can assess redevelopment projects to determine what offsite improvements may be required. An alternative approach is that new construction could be required to conform to available fire flows in the vicinity with fire-reducing design and construction practices (e.g., spacing, materials and sprinkler systems).

Redevelopment and/or densification creates more system demands and all the areas highlighted for redevelopment exist within the main pressure zone, supplied only by the 2MG reservoir which currently does not have adequate storage. Therefore, redevelopment on a large scale will require expansion of storage needs in the main pressure zone.

Given the planned timing for expanding the 2MG reservoir at its current location (or elsewhere within the main pressure zone), it is recommended that the Town complete redevelopment plans for specific areas (especially the Downtown), which would include more targeted analysis and recommendations for offsite upgrades. This would also help inform how funding of these upgrades may occur. This Master Plan would therefore form a basis for the available system conditions to inform detailed analysis for redevelopment opportunities.

6.0 WASTEWATER SYSTEM ANALYSIS

The Town's current sanitary collection system is maintained and operated by the Town and is comprised of 9 lift stations and approximately 163km of sewer mains. The sanitary sewage is collected at the Town's Main Transfer Station located on the east end of Town and pumped to the City of Calgary for treatment.

6.1 MODEL DEVELOPMENT AND INPUTS

An update to the Town's wastewater system model was completed using the PCSWMM version 5.1 modelling software. The software simulates flows in the pipe network using information such as:

- Pipe material, length, slope, and nominal size.
- Lift station pumping capacity rates.
- Demand information.
- Spatial coordinates.

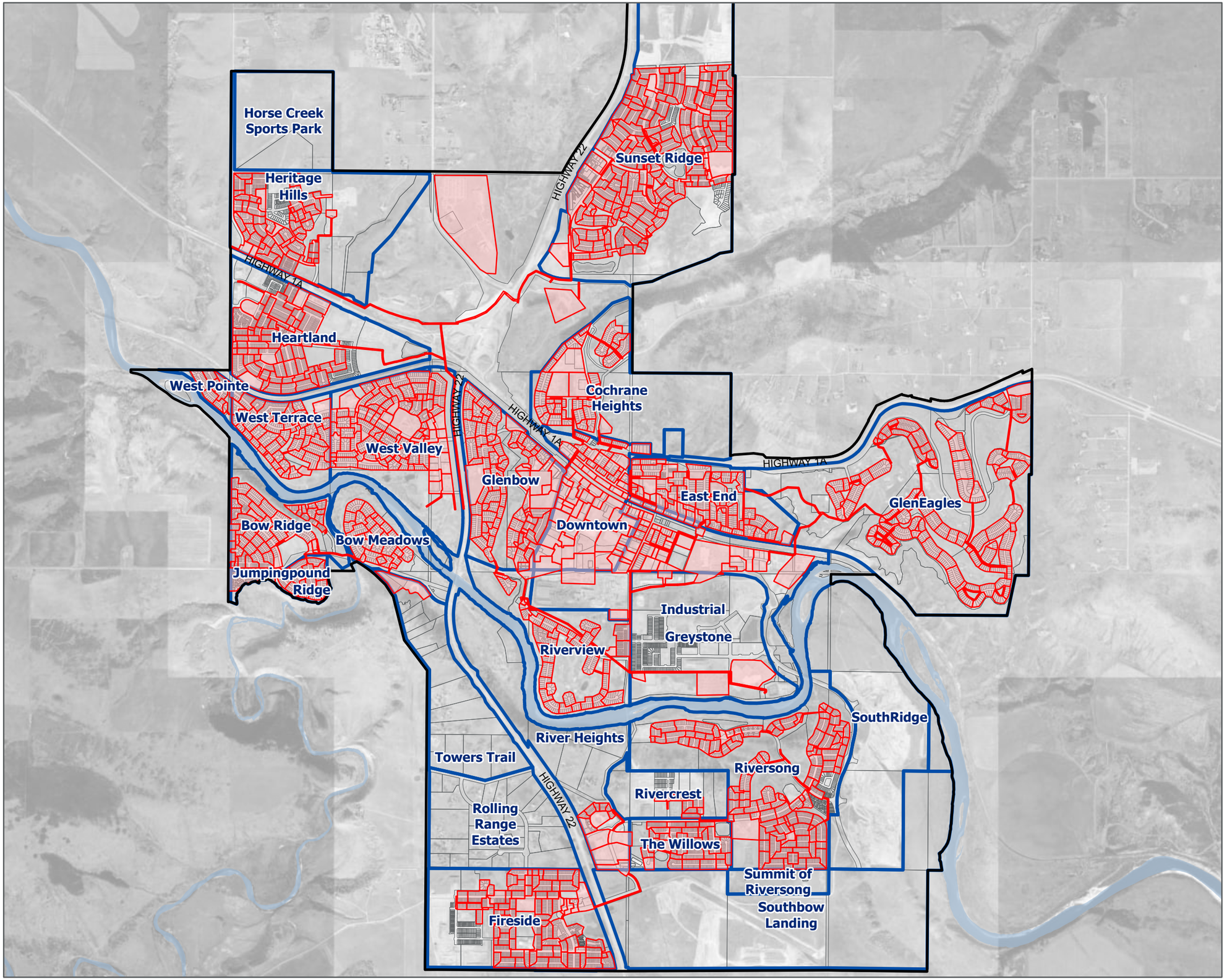
The information was obtained from a variety of sources including the Town's GIS database, as-constructed drawings, operation data, discussions with the Town's operations & engineering team, and the previous modelling conducted for:

- 2012 W3 Report
- 2020-2022 Sewer Model Update and Calibration

The model requires accurate information to provide a reliable estimate of the performance, thus, data collection is a critical part of the modelling process. The model is used to analyze the performance of the existing system under both existing and growth scenarios.

System Demands (Existing)

Existing wastewater system demands were determined by applying the sanitary to water ratio (90%) to the 2022 water metering records from each home. Lots were grouped into sewersheds defined between manholes (see Figure 21) and the average demand of the lots were allocated to the most upstream manhole. These demands represent the Town's existing Average Dry Weather Flows (ADWF). The diurnal patterns shown in Section 4.2.2 were applied to each manhole based on land use, in order to establish Peak Dry Weather Flows (PDWF). Inflow and infiltration was determined by assigning RTK parameters to each node, which model the response of the sanitary system to rainfall for each sewershed.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Sanitary Sewersheds

Legend

- Sewershed
- Cochrane Boundary
- Cochrane Neighbourhoods

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Kilometers

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Coordinate System:
NAD 1983 3TM 114

Scale: 1:30,000
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Data Sources:

- Data provided by the Town of Cochrane, ESRI.

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 21

Last updated by SdeBoerFuller on Wednesday, December 18, 2024 at 8:39 AM
Last exported by SdeBoerFuller on Wednesday, December 18, 2024 at 8:39 AM
Last printed by SdeBoerFuller on Wednesday, September 25, 2024 11:46 AM
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System Demands (Growth)

For all growth areas within the Town, demands were assigned using the 0.16 L/s/ha growth demands.

The same diurnal patterns were carried forward to determine the PDWFs in the growth scenario. It should be noted that even though there will be some commercial/ industrial/ institutional development within growth areas, most future growth is projected to be residential and as such, the residential diurnal pattern was used for all growth areas. The RTK parameters that most closely resembled the standard 0.28 L/s/ha rate recommended by AEPA was used for inflow and infiltration within all growth areas.

Lift Stations & Forcemains

For all lift stations, the pumping rate capacities were based on data provided by the Town. Lift stations were modelled using storage nodes at their respective locations. Forcemains were not modelled due to a lack of available as-built information. Instead, the entire length of the forcemains was idealized as single pump links set to the capacity of the specific pump station. Therefore, forcemain capacities at each lift station are not included in this analysis. It is recommended that the Town conducts a separate analysis to ensure all forcemain capacities are adequate under existing and growth scenarios.

Additional Model Updates

Additional updates to the existing system model included:

- Import of Town's GIS data for network additions since 2021.
- Reviewing as-built drawings from 2021 to 2023 to ensure changes were captured in the collection network.
- Applying existing demands from Cochrane Lake entering the Town's wastewater collection system.

Like the water system, Cochrane's wastewater network is complex. While the wastewater model was built to be as accurate as possible, further refinement can always take place. The model should be considered a 'living tool' that is continuously updated and improved as system understanding grows and operational processes change.

Therefore, it is recommended that upon completion of capital upgrades projects, the model be updated and reviewed to ensure it is as accurate as possible for future designs and reviews.

Growth Model Updates

Key updates to the growth model included:

- Capturing sanitary pipe upgrades at the 5th Avenue Site and Glenpatrick Drive as per design drawings available at the time of this report.

- Applying ultimate demands from Cochrane Lake that can enter the Town's wastewater system as per the existing Master Servicing Agreement between Cochrane and Rocky View County (maximum agreement for 48 L/s).

6.2 EXISTING WASTEWATER SYSTEM OVERVIEW AND PERFORMANCE

This section describes the performance analyses results for Cochrane's wastewater collection system under existing demands. This includes a description of each infrastructure component's capacity to meet the design criteria outlined in Section 4.0.

The Town's wastewater system consists of gravity mains ranging from 150mm to 650mm in diameter, 10 lift stations and forcemains, 6 syphons (3 of which cross bodies of water), and 1 Main Transfer Station and pipeline to Calgary. The existing wastewater system infrastructure is shown on Figure 22, while the performance of each piece of infrastructure (i.e., capacities) is depicted on Figure 23.

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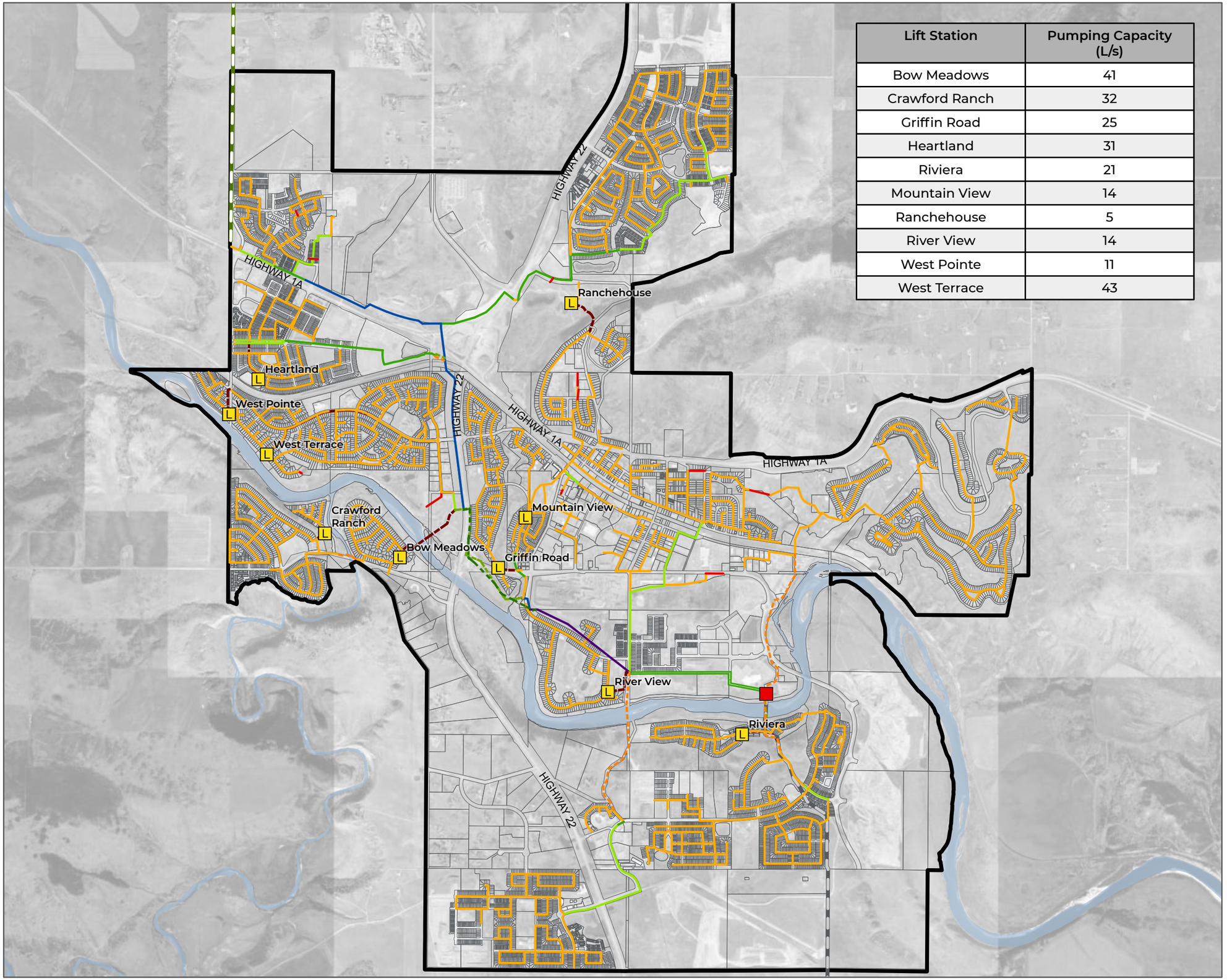

Lift Station	Pumping Capacity (L/s)
Bow Meadows	41
Crawford Ranch	32
Griffin Road	25
Heartland	31
Riviera	21
Mountain View	14
Ranchehouse	5
River View	14
West Pointe	11
West Terrace	43

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Existing Sanitary System

Legend

- L — Lift Station
- Transfer Station
- Cochrane Boundary

Existing Sanitary Syphon

Diameter (mm)

- 200 - 300
- 350 - 400
- Greater than 400

Existing Sanitary Pipe

Diameter (mm)

- 75 - 150
- 200 - 300
- 350 - 400
- 450 - 500
- 525 - 600
- Greater than 600
- Existing Sanitary Forcemain
- Wastewater Pipeline to Calgary
- Wastewater Pipeline to Cochrane Lake

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0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:30,000
(When plotted at 11"x17")

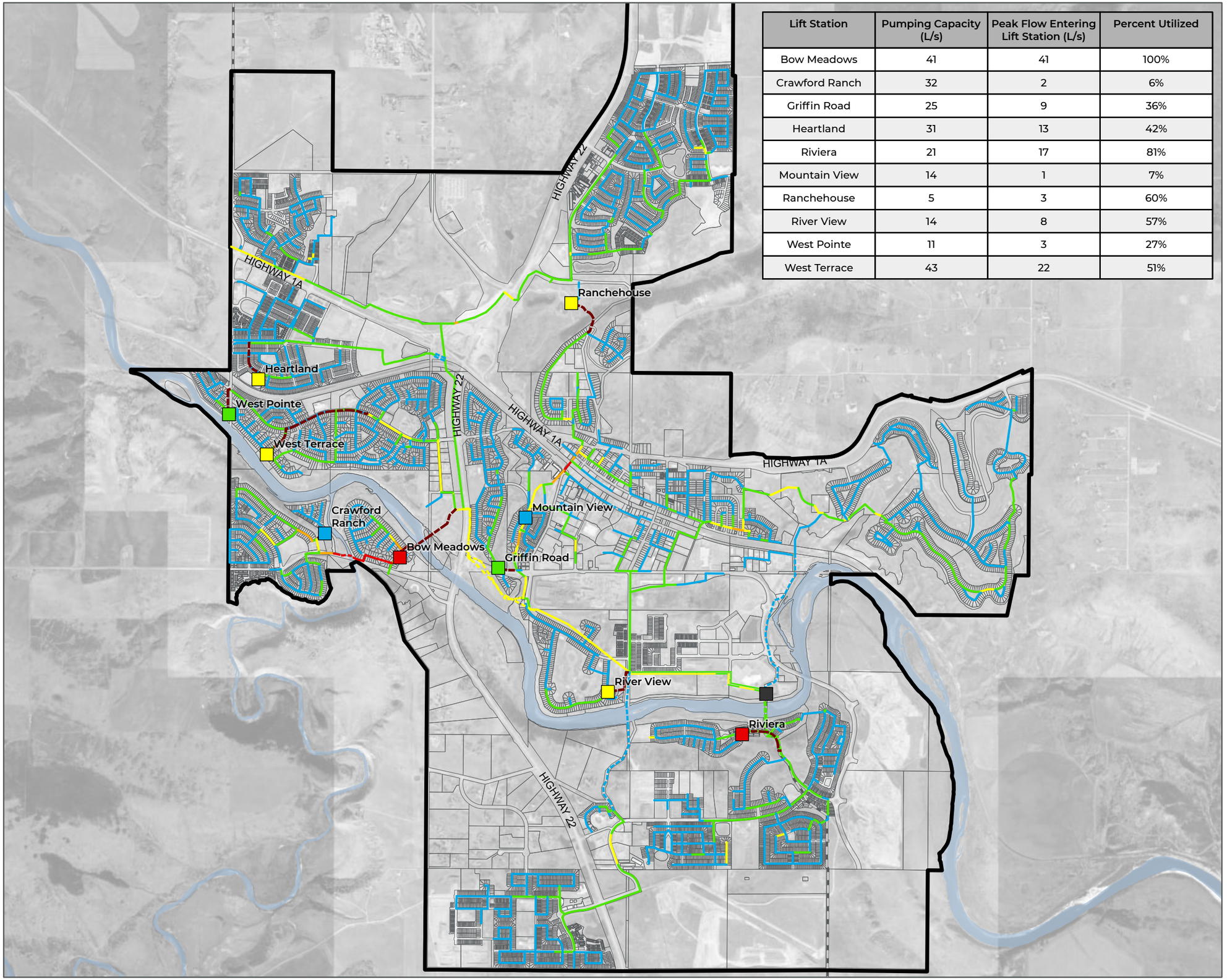
Data Sources:

- Data provided by the Town of Cochrane

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 22



Lift Station	Pumping Capacity (L/s)	Peak Flow Entering Lift Station (L/s)	Percent Utilized
Bow Meadows	41	41	100%
Crawford Ranch	32	2	6%
Griffin Road	25	9	36%
Heartland	31	13	42%
Riviera	21	17	81%
Mountain View	14	1	7%
Ranchehouse	5	3	60%
River View	14	8	57%
West Pointe	11	3	27%
West Terrace	43	22	51%

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Existing Sanitary System Deficiencies

Legend

- Transfer Station
- Municipal Boundary Area

Lift Stations

Percent Utilization

- 0 - 20%
- 20% - 40%
- 40% - 60%
- 60% - 80%
- 80% - 100%

Existing Sanitary Syphon

Percent Utilization

- 0 - 20%
- 20% - 40%
- 40% - 60%
- 85% - 100%

Existing Sanitary Pipe

Percent Utilization

- 0 - 20%
- 20% - 40%
- 40% - 60%
- 60% - 85%
- 85% - 100%
- Existing Sanitary Forcemain
- Wastewater Pipeline to Calgary

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 0.5 1 1.5
Kilometers

N

Coordinate System: NAD 1983 3TM 114

Scale: 1:30,000 (When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane

Project #: 1728.0456.01
Author: SDF
Checked: SG
Status: Final
Revision: A
Date: 2024 / 12 / 20

URBAN SYSTEMS

FIGURE 23

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6.2.1 COLLECTION SYSTEM INFRASTRUCTURE

Overview

The existing linear system consists of gravity mains and 6 syphons. The 6 syphons, include two Bow River crossings in the south, a Jumpingpound Creek crossing, a twinned Highway 22 to Riverview syphon, a crossing at Heartland and Highway 22, and a syphon that runs parallel to Griffin Road E.

Performance

The analysis of the existing capacity of the wastewater collection system shows that the system is adequately sized to handle the demands from the existing users. As seen in Figure 23, most of the gravity mains and syphons are currently operating below 85% of their full flow capacity under PWWF conditions, apart from a few exceptions. Three areas were found to be operating above 85% capacity as described below and highlighted red in Figure 23:

- 5th Avenue and Railway Street: Although these pipes are operating above 85% capacity, they are not operating under surcharged conditions nor are they flooding to the surface. Under existing conditions, the pipes are approximately 90% full and do not warrant upgrades at this time.
- Upstream of Bow Meadows Lift Station: Due to small pipe sizes and mild slopes, the pipes directly upstream of the Bow Meadows lift station are currently operating at approximately 97% capacity, but not surcharging to surface. Note that the flow conditions in these mains are not due to the limitations of the lift station. Given that there are no future developments planned upstream of these mains, upgrades are not considered necessary at this time. That said, the Town should continue to monitor the performance of these mains to determine whether the frequency of surcharging would warrant upsizing.
- Downstream of Jumpingpound Creek Syphon: Due to small main sizes, the pipes directly downstream of the Jumpingpound Creek syphon are operating at 100% capacity but are not surcharging to surface. In 2023, the Town experienced blockages in the Jumpingpound Creek syphon leading to wastewater spillage through the gravity pipes and manholes occurred across the road. It is recommended to upsize the downstream pipes from 200mm to 300mm in diameter to alleviate surcharging and increase velocities in the syphon, thereby reducing the risk of future blockages. Improvements to the downstream pipes of Jumpingpound Creek syphon are recommended as passive replacement projects. It is recognized that these improvements may be challenging as the pipes run through the yards of a few homes and will disrupt homeowners.

The capacity constraints in the existing collection system mentioned above are highlighted for the Town's awareness and monitoring as the Town continues to grow. Capital upgrades to these segments are not warranted at this time.

6.2.2 LIFT STATIONS & FORCEMAINS

Overview

The existing wastewater system includes 10 lift stations throughout the Town (see Figure 22 for locations of each lift station). Pumping capacity of a single pump at each lift station was provided by the Town. It is worth noting that the pumping capacities of two lift stations (Ranchehouse and Crawford Ranch) may not be accurate due to a lack of available records at the Town. The Town inherited the Ranchehouse lift station and Crawford Ranch lift station is privately owned, resulting in limited records and data.

Performance

A summary of the operating conditions, the peak flow entering, and the percent utilized at each lift station under existing conditions can be found in Table 14.

Table 14: Lift Station Capacities – Existing Demands

Lift Station	Firm Pumping Capacity (L/s)	Peak Flow Entering Lift Station (L/s)	Percent Utilized
Bow Meadows	41	41	100%
Crawford Ranch	32	2	6%
Griffin Road	25	9	36%
Heartland	31	13	42%
Riviera	21	17	81%
Mountain View	14	1	7%
Ranchehouse	5	3	60%
River View	14	8	57%
West Pointe	11	3	27%
West Terrace	43	22	51%

All the Town's lift stations have sufficient capacity to accommodate existing demands. The Bow Meadows lift station is operating at 100% capacity under existing conditions, however because this lift station is not intended to handle any additional flow from what it current conveys (i.e., no more growth is expected in this area), upgrades are not being recommended at this time.

6.2.3 TRANSFER STATION & PIPELINE

The Town currently collects all its sanitary sewage through a gravity and pumped collection system to the Main Transfer Station where it is pumped through a dedicated forcemain that transitions to gravity before discharging to a receiving structure inside the City of Calgary municipal boundary. The Town also operates a septage receiving station at the Main Transfer Station. The Main Transfer Station and pipeline to Calgary is owned and operated by the Town.

In 2016, a Sanitary Sewer Strategy was completed which evaluated and compared various infrastructure options to meet Cochrane's long-term wastewater needs. The result of this study, which was completed with inputs from Town Council, determined that twinning the pipeline and pump station to Calgary is the best option to meet the growing sanitary demands from the Town. In 2017, preliminary design was completed for the full pipeline and transfer station twinning, which included analysis of population projections, historical sanitary flow data and detailed modelling to develop a phased approach to gradually increase the pipeline capacity over a period of 10-15 years [26]. The first phase (Phase 0) was constructed in 2019, providing increased peak wastewater storage capacity at the Town's existing Transfer Station site. This provides sufficient capacity under existing conditions.

6.2.4 RISK ASSESSMENT AND LEVELS OF SERVICE

Risk and Consequence of Failure

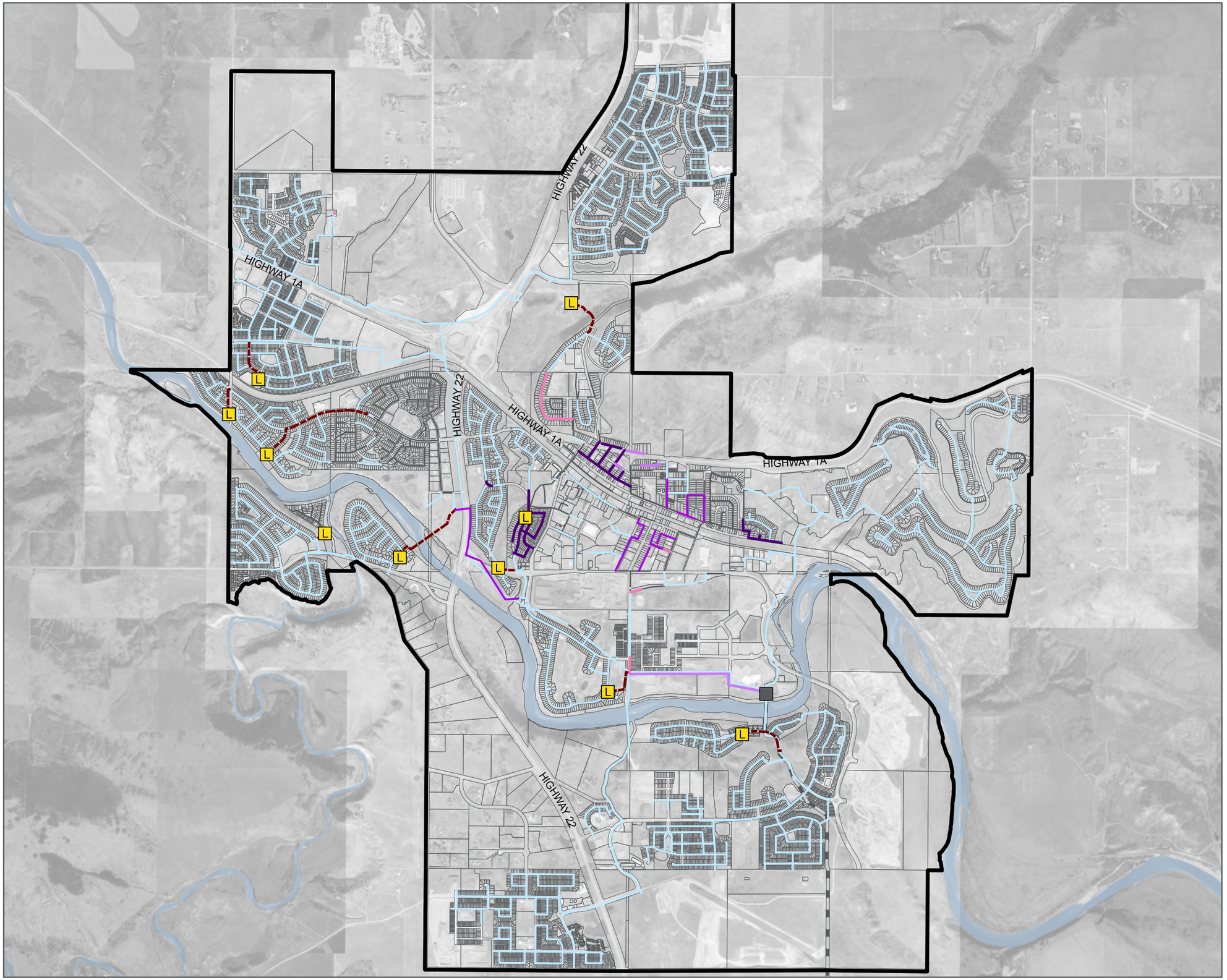
The 2012 W3 Report provided a detailed assessment of system failure risks for the wastewater collection system. Each of the pipe elements within the system were ranked based on their life expectancy, and the consequence of failure. This information was not updated as part of this Master Plan but remains a relevant concern. Therefore, it has been provided in Appendix C [2].

Asset Age

Asset age information for the existing system was updated based on the available data from the Town's GIS database. The minimum life expectancies of the wastewater gravity pipes and syphons were based on the specific material of each pipe, as outlined in the 2012 W3 Report. These are:

1. Minimum 45 years for materials which include cast iron, concrete (PCCP), vitrified clay tiles (VCT), asbestos cement, steel, ductile iron, and copper.
2. Minimum 75 years for PE, PVC and HDPE.

Figure 24 shows wastewater pipes that are currently past their serviceable life.



Town of Cochrane

Water & Wastewater Master Plan
Sanitary System
Serviceable Life Remaining

Legend

- Transfer Station
- L — Lift Station
- Cochrane Boundary

Sanitary Pipe

- Unknown serviceable life remaining

Material with Minimum 75 Year Service Life

- Greater than 10 years of serviceable life remaining

Material with Minimum 45 Year Service Life

- Greater than 10 years of serviceable life remaining
- 5-10 years of serviceable life remaining
- 5 years of serviceable life remaining
- Service life consumed
- Existing Sanitary Forcemain
- Wastewater Pipeline to Calgary

Notes:

- Material with minimum 75 year serviceable life includes; HDPE, PVC and PE
- Material with minimum 45 year serviceable life includes; Cast Iron, CON, VCT, AC, STL, DI, Copper, PCCP
- Pipe material and age shown for the Downtown Area are based on anecdotal information from the Town of Cochrane and may differ from the Town's GIS records

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0 0.5 1 1.5 Kilometers

N

Coordinate System: NAD 1983 3TM 114

Scale: 1:30,000 (When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2026 / 4 / 20

URBAN SYSTEMS

FIGURE 24

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Last printed by sdeboerfuller on Monday, September 25, 2017 11:46 AM
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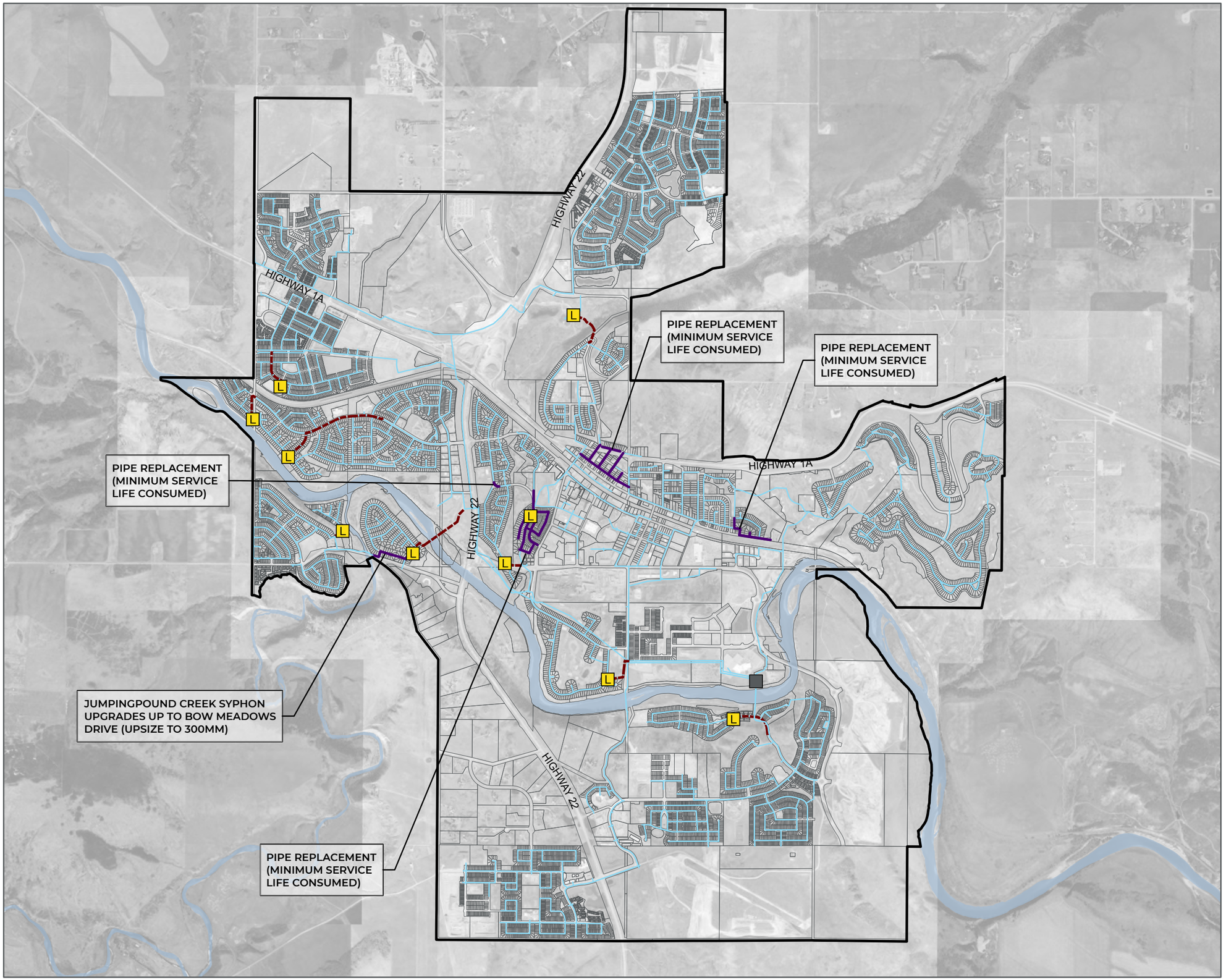
Based on the serviceable life of the assets and the collection system performance provided in Section 6.2.1, a summary of the recommended passive replacement projects is provided in Figure 24. Passive projects were identified based on infrastructure nearing the end of its serviceable life and existing deficiencies that are impacting operation of the overall system. These include:

1. Pipe upgrades 200mm to 300mm pipe diameter from Jumpingpound Creek syphon to Bow Meadows Drive to alleviate surcharging and increase velocities in the Jumpingpound Creek Syphon.
2. Glenbow main replacements (where asset age has reached minimum serviceable life)
3. East End main replacements (where asset age has reached minimum serviceable life)

It is recommended that the pipes that have been identified as reaching the end of their serviceable life be reviewed as part of the Town's asset management strategy.

Recommended passive replacement projects are not included in the capital plan for the 2024 Water Wastewater Master Plan, as further conditions analysis and prioritization strategies are required for these projects.



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Sanitary System
Passive Replacement Projects

Legend

- Transfer Station
- Lift Station
- Cochrane Boundary

Sanitary Pipes

- Passive Upgrades / Replacements
- Existing Sanitary Forcemain
- Existing Pipes

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0 0.5 1 1.5
Kilometers

Coordinate System: NAD 1983 3TM 114

Scale: 1:32,000 (When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI

Project #:	1728.0456.01
Author:	SDF
Checked:	MC
Status:	Final
Revision:	A
Date:	2026 / 4 / 20

URBAN SYSTEMS

FIGURE 25

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6.3 GROWTH PERFORMANCE

This section describes the performance analyses results for Cochrane's wastewater system under future growth demands. This section includes a description of each infrastructure component's capacity to meet the design criteria outlined in Section 4.0 when growth to Town boundary occurs.

Based on discussions with the Town, tie-in points within the existing wastewater system were identified for allocating demands for each growth area in the model. Key decisions made from discussions with the Town include:

- Southbow Landing: Tie-in points to follow Servicing Plan provided to the Town in May 2024.
- Rivercrest: As per the Rivercrest Phase 2 Offsites Sanitary Review [28], the growth areas within Riverview plan to connect directly to the River Heights syphon, apart from 1.3 ha for a proposed school site which will connect to the existing gravity pipes within the community.
- Towers Trail and Rolling Range: Tie-in point to reflect developer plans to route wastewater demands from Towers Trail and Rolling Range to the River Heights syphon.
- Southridge: Tie-in point to reflect developer plans to route all Southridge wastewater demands through the Riviera syphon.

The tie-in points for each growth area are shown in Figure 26.

The performance of the Town's wastewater system under growth to Town boundary demands is shown in Figure 27.

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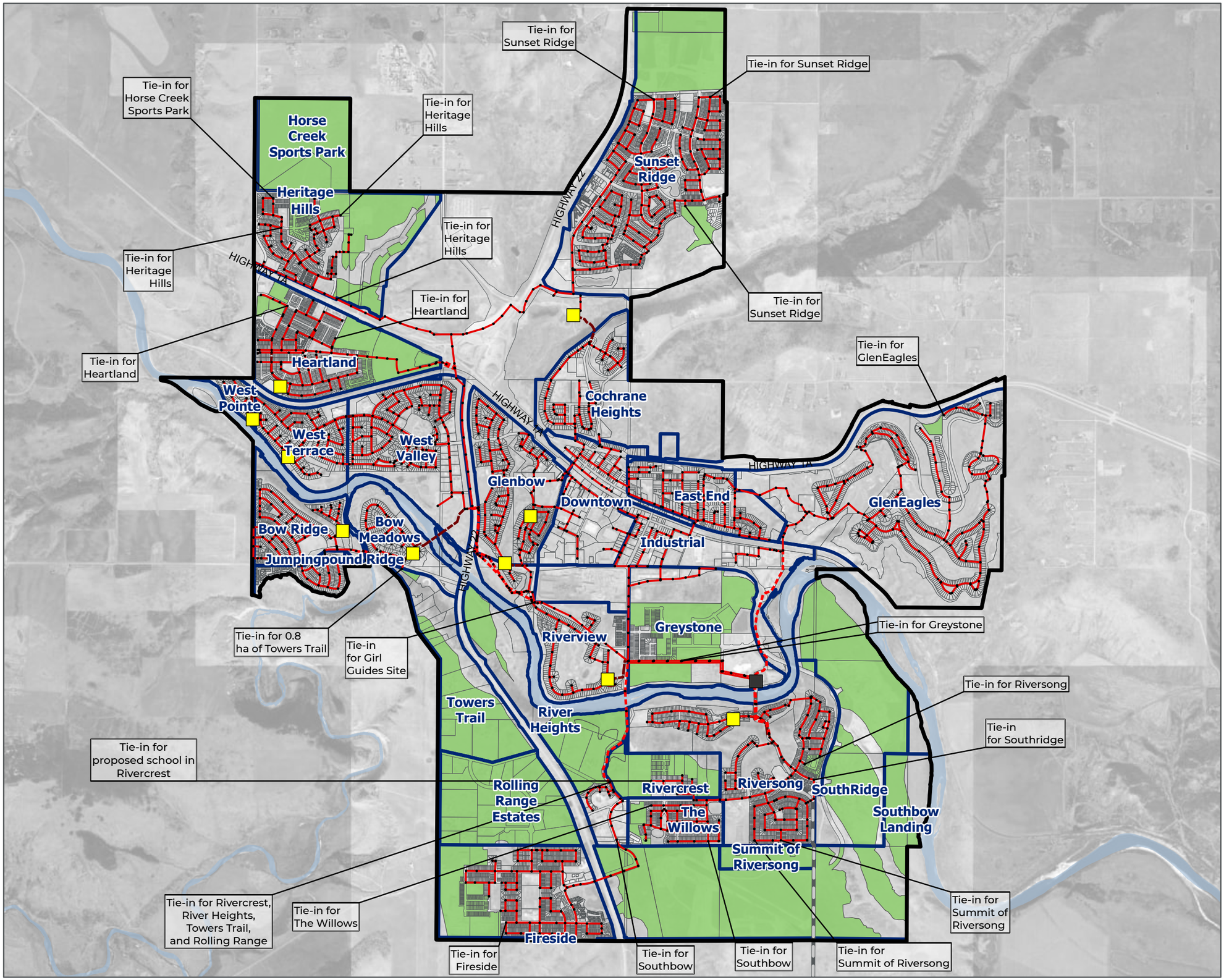

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan

Growth Demand Tie-In Points

Legend

- Developable Area
- Cochrane Neighbourhoods
- Municipal Boundary Area
- Transfer Station
- Lift Station
- Sanitary Junction
- Sanitary Syphon
- Sanitary Pipe
- Sanitary Forcemain
- Wastewater Pipeline to Calgary

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0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:32,000
(When plotted at 11"x17")

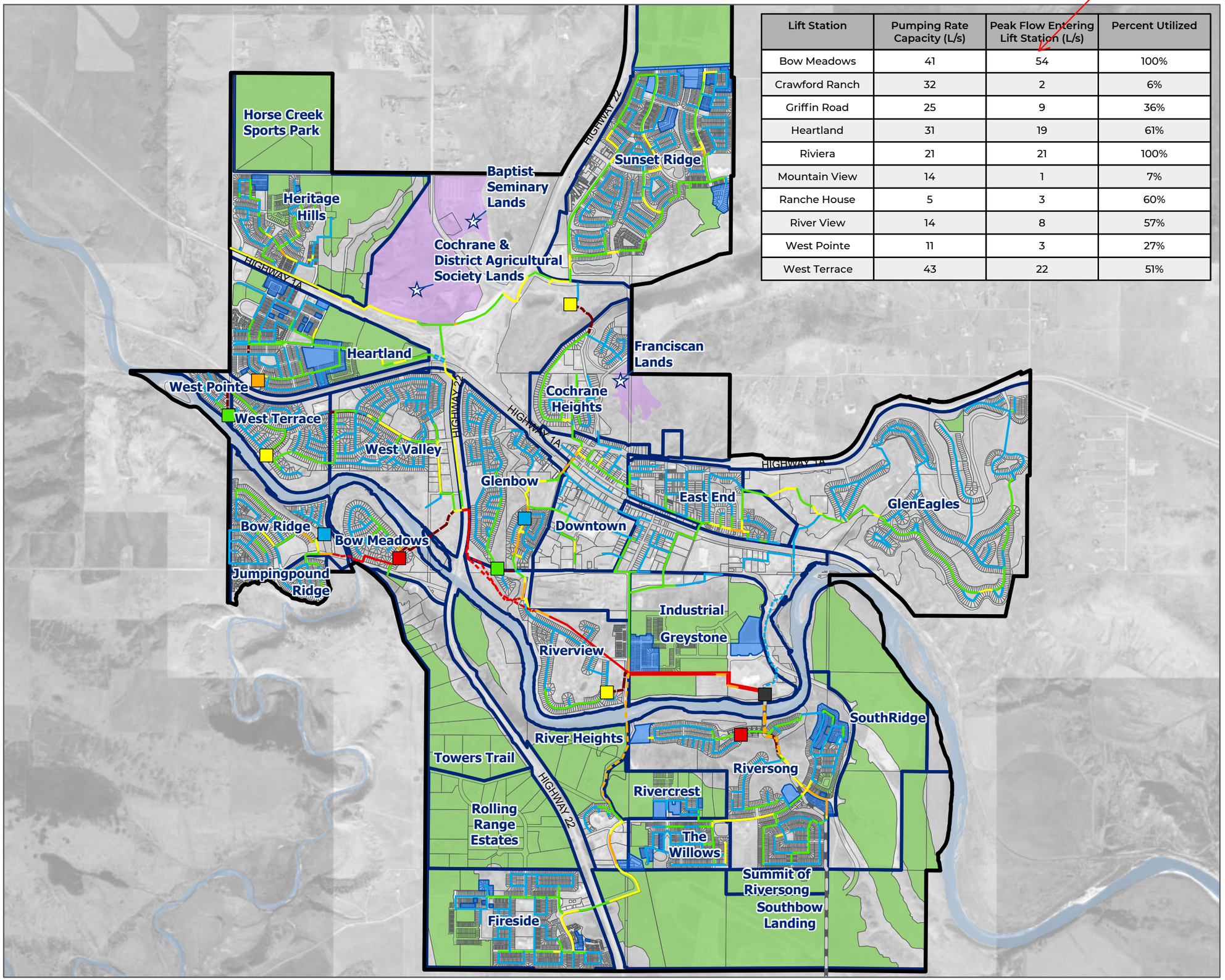
Data Sources:

- Data provided by the Town of Cochrane

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 26



41

Lift Station	Pumping Rate Capacity (L/s)	Peak Flow Entering Lift Station (L/s)	Percent Utilized
Bow Meadows	41	54	100%
Crawford Ranch	32	2	6%
Griffin Road	25	9	36%
Heartland	31	19	61%
Riviera	21	21	100%
Mountain View	14	1	7%
Ranche House	5	3	60%
River View	14	8	57%
West Pointe	11	3	27%
West Terrace	43	22	51%

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Sanitary
Growth Performance Analysis

Legend

- Areas for Consideration, No Planned Servicing
- Infill Area - Subdivided, no meter data available
- Developable Area
- Cochrane Neighbourhoods
- Municipal Boundary Area
- Transfer Station

Lift Stations

Percent Utilization

- 5% - 20%
- 21% - 40%
- 41% - 60%
- 61% - 80%
- 81% - 100%

Sanitary Syphon

Percent Utilization

- 0 - 20%
- 60% - 85%
- 85% - 100%

Sanitary Pipe

Percent Utilization

- 0 - 20%
- 20% - 40%
- 40% - 60%
- 60% - 85%
- 85% - 100%
- Sanitary Forcemain
- Wastewater Pipeline to Calgary

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0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:30,000
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Data Sources:

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Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	Final
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 27

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6.3.1 COLLECTION SYSTEM

An analysis of the wastewater system under the projected growth demands showed that for the most part, the system has enough capacity to handle this growth. As seen on Figure 27, most gravity pipes and syphons will continue to operate below 85% capacity under PWWF conditions, apart from a few exceptions. Prior to planning significant upgrades, flow monitoring during peak wet weather seasons should be conducted to validate the peak flow estimates and refine timing needs for upgrades.

- Highway 22 to Riverview Twinned Syphon: The twinned syphon is shown to be operating at 90% capacity under growth demands. Although this exceeds 85%, the twinned syphon can accommodate the projected growth to the Town boundary and no capital upgrades are being recommended at this time.
- 5th Avenue and Railway Street: Planned upgrades at the 5th Avenue site and along Glenpatrick Drive alleviate existing surcharging on the pipes along 5th Avenue and Railway Street, as identified in Section 6.2. It is recommended that the planned upgrades proceed to alleviate surcharged pipes in this area.
- Burnco Trunks: The Burnco trunk mains are responsible for carrying flows from the north and west areas of Town to the Transfer Station. With significant growth projected in the north and west of Town, the two 450mm mains cannot handle the additional demands. The growth scenario results in the trunk mains being surcharged, some manholes flooding to the surface, and backups on upstream pipes. To accommodate growth demands, it is recommended to replace the older of the twin 450mm pipes (south line) with a 900mm diameter pipe. This is a proposed capital upgrade.

For the overall collection system, as the Town grows, it is recommended that all syphons be flushed annually (at minimum) for preventative maintenance. This should be supported by Town operations to cleanse and ensure solids remain in suspension in early stages of a syphon's catchment buildout.

6.3.2 LIFT STATIONS

A summary of the pumping rate capacity, the peak flow entering, and the percentage utilized at each lift station under growth to Town boundary conditions can be found in Table 15.

Table 15: Lift Station Capacities – Growth Demands

Lift Station	Firm Pumping Capacity (L/s)	Peak Flow Entering Lift Station (L/s)	Percent Utilized
Bow Meadows	41	41	100%
Crawford Ranch	32	2	6%
Griffin Road	25	9	36%
Heartland	31	19	61%
Riviera	21	21	100%
Mountain View	14	1	7%
Ranchehouse	5	3	60%
River View	14	8	57%
West Pointe	11	3	27%
West Terrace	43	22	51%

All the Town's lift stations have sufficient capacity to accommodate growth demands. Demands from a growth area of 0.8 hectares along George Fox Trail (Phase 2 Lofts on the Bow) are directed through the Bow Meadows lift station; however, the station's utilization is maintained at 100% and no upgrades are required.

The Town is assessing wastewater service options for St. Peters Lutheran Church and the Girl Guides Canada Jubilee Lands, all with plans to connect to the Bow Meadows lift station. Although these additional connections were not included in the original Master Plan analysis, a February 28, 2025 feasibility review by Urban Systems indicates that upgrades to the forcemain and lift station will be necessary. It is recommended the Town considers the upgrade options presented in the feasibility review if these connections move forward.

The only other lift station to reach full capacity is the Riviera lift station due to full development of its service area. It is recommended that the Town monitors the capacity and condition of both lift stations as growth occurs, particularly during heavy rainfall events, to determine if pump upgrades are necessary.

6.3.3 TRANSFER STATION & PIPELINE

An analysis of population projections, sanitary flow data, and modelling for the Town led to the development of a five-phased approach for upgrades to the Transfer Station and pipeline system in 2016. The proposed phases intend to gradually increase the capacity of the system with continued growth.

Cochrane is currently working on a regional agreement with Rocky View County and EPCOR (owner and operator of the Harmony Advanced Water System (HAWSCo)), to provide wastewater service to the Harmony Franchise Area (HFA) in the future through the twinning wastewater pipeline to Calgary. The HFA includes the community of Harmony, Bingham Crossing, the Springbank Airport, and Edge School. As of the writing of this

Report, several possible scenarios are under review to refine the pipeline twinning phasing plan, and as such, the pipeline twinning phases, their capacities, and triggers are subject to change.

The following table presents the current (April 2026) phasing under review by the Town, Rocky View County, and EPCOR. Because there are many possible scenarios, the timing is presented as a range. For inclusion in the capital plan, each phase is scheduled for the worst-case scenario (earliest year capacity is reached). It is recommended that the Town review and update their capital plan as more information on this infrastructure becomes available, and that infrastructure is in place before capacity is reached.

Table 16: Current Transfer Station and Pipeline Phasing Plan

Phase	Estimated Year Capacity is Reached
0	2028-2031
1	2033-2034
2	2037-2038
3	2042-2043
4	2048-2049
5	2054-2055

6.4 CAPITAL UPGRADES

Under existing conditions, no capital projects have been identified. As described in Section 6.2.1, there are a few areas within the linear system where pipes are operating at or slightly above the 85% capacity. However, because no additional growth is expected in these areas, capital upgrades are not warranted.

To meet the projected demands of growth within Town boundary, the following table summarizes the capital projects identified for the wastewater system. One of the identified capital projects in the 5-10 timeline is the Burnco Trunk Upgrades due to significant growth in the North and West pushing the existing 450mm trunk mains to full capacity. While upgrades are triggered when the Town's population reaches approximately 45,000 (projected within the 5-10 year window), it is recommended that the Town implement a flow monitoring program at the Burnco Trunks. Monitoring actual flows will allow calibration of the system model using real data and may refine the timing of upgrades. Accurate, real time flow data could potentially defer upgrades beyond the 5–10-year horizon. The locations of the capital upgrades are illustrated in Figure 28.

Table 17: Wastewater System Capital Upgrades Summary

Project	Timing (yrs)	Rationale
Burnco Trunk Upgrades	5-10	With significant growth projected in the North and West, the two 450mm trunk mains cannot handle the additional demands. In the growth to Town boundary scenario, the existing trunk mains reach full capacity, some manholes flood to the surface, and pipes upstream of the Burnco trunks back up.
Transfer Station and Pipeline System (Phase 1)	5-10	Phase 1 upgrades are driven by Town growth rates and by the needs of the Harmony Franchise Area, a future regional customer.
Transfer Station and Pipeline System (Phase 2)	10+[1]	As the Town grows and experiences increased demands, Phases 2-5 upgrades to the Transfer Station and pipeline system will be required to increase capacity.
Transfer Station and Pipeline System (Phase 3)	10+	
Transfer Station and Pipeline System (Phase 4)	10+	
Transfer Station and Pipeline System (Phase 5)	10+	

1. It is recommended the Town implements permanent inflow monitoring at the upstream manholes of the Transfer Station to continuously evaluate peak wet weather flows entering the station. Real-time monitoring at these locations will help establish a more accurate timeline for future upgrades.

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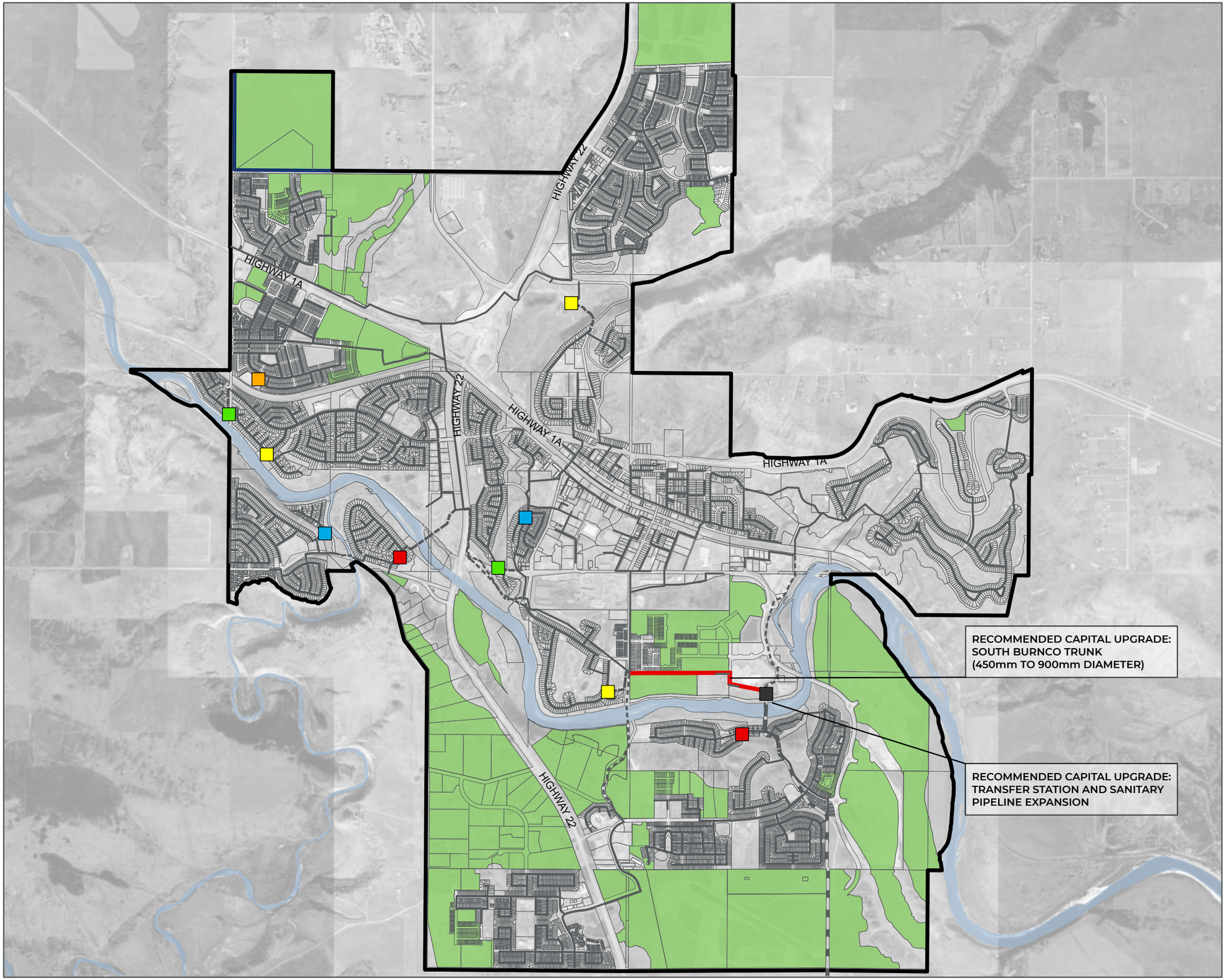

cochrane
HOW THE WEST IS NOW

Town of Cochrane

Water & Wastewater Master Plan
Sanitary System
Recommended Capital Upgrades

Legend

- Developable Area
- Municipal Boundary Area
- Transfer Station

Lift Stations

Percent Utilization

- 5% - 20%
- 21% - 40%
- 41% - 60%
- 61% - 80%
- 81% - 100%

Sanitary Pipe

Percent Utilization

- 85% - 100%
- Existing Syphon
- Existing Sanitary Pipe
- Existing Sanitary Forcemain
- Wastewater Pipeline to Calgary

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 0.5 1 1.5
Kilometers

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:30,000
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2024 / 12 / 20

URBAN SYSTEMS

FIGURE 28

6.5 SPECIAL AREAS FOR CONSIDERATION

As noted in Section 3.2.1, three areas currently have no plans in place for growth or redevelopment, and therefore were not included in the growth analysis. However, a high-level analysis has been conducted to determine wastewater servicing if growth or redevelopment in these areas is to be proposed in the future.

6.5.1 COCHRANE & DISTRICT AGRICULTURAL (AG) SOCIETY LANDS

To service the Ag Society Lands, the most practical tie-in point to the system would be to the south. The pipes south of the Ag Society are 525mm diameter trunk mains that connect to the mains running south along Highway 22 to the twinned syphon. According to the capacities depicted in Figure 27, the wastewater mains along Highway 22 are operating at 40-60% full under growth demands, so they can accommodate additional demands from the Ag Society. The remaining capacity at the twinned Highway 22 syphon and Burnco trunk main would need to be confirmed at the time of development. As confirmed in Section 6.3 , the twinned syphon is 90% full and the Burnco trunk mains will surcharge under growth to Town boundary demands.

6.5.2 BAPTIST SEMINARY

To service the Baptist Seminary, the most practical tie-in point to the system would be to the south. The pipes directly south of Baptist Seminary consist of 450mm diameter trunk mains that connect to the mains running south along Highway 22 to the twinned syphon. According to the capacities depicted in Figure 27, the 450mm main is operating at 20-40% full and the mains along Highway 22 at 40-60% full under growth to Town boundary demands. These mains can accommodate additional demands from Baptist Seminary. Like the Ag Society lands, remaining capacity at the twinned Highway 22 syphon and Burnco trunk main would need to be confirmed at the time of development, since the twinned syphon and Burnco trunk mains are at capacity under the growth to Town boundary scenario.

6.5.3 FRANCISCAN LANDS

To service the Franciscan Lands, the most practical tie-in point to the system would be to the south on 4th Avenue. As seen in Figure 27, the pipes from this tie-in point to the twinned Highway 22 syphon are at most 60-80% full under growth conditions. Therefore, the mains can accommodate some additional demands from Franciscan. Like Ag Society and Baptist Seminary, before any development or growth occurs in this area, the Town should complete a check of the remaining capacities at the twinned Highway 22 syphon and Burnco trunk main to ensure both infrastructure pieces can handle additional demands.

6.6 INFILL/REDEVELOPMENT AREAS

As mentioned in Section 3.2.2, the Town has identified target areas for infill or redevelopment planning: Historic Downtown, New Downtown, East Industrial, East End, and Glenbow neighborhoods. After future demands to the Town boundary were allocated, a separate analysis was conducted to understand downstream wastewater infrastructure constraints if these areas were to densify.

The biggest constraint in the sanitary collection system in this area is at the Burnco trunk mains. To accommodate the full buildout to the Town boundary and future infill/redevelopment, an upgrade to the Burnco trunk main is required.

The upgrades could be triggered from growth either in the north or west cochrane, or from downtown redevelopment, depending on development timing. Therefore, as growth occurs in any of these areas, it is recommended montioring of the Burnco trunk mains is conducted to understand actual flows entering the trunk mains and remaining capacity.

As indicated in Figure 29, there are also several pipe segments on the west side that cannot handle any additional demands. Depending on the type of infill or redevelopment proposed, these pipes may need to be upgraded. For development on the east side of Industrial, the syphon along Griffin Road has approximately 86 L/s of capacity remaining.

Remaining capacities of pipes downstream of the Glenbow, Downtown, East End, and Industrial areas are provided in Figure 29. It is recommended that the Town considers flow monitoring at the Burnco trunk mains (see Section 6.4) and an Area Redevelopment Plan which would assist in determining the types of development that could occur and planning of required upgrades.

Last updated by sdeboerfuller on Wednesday, September 10, 2025 at 12:36 PM
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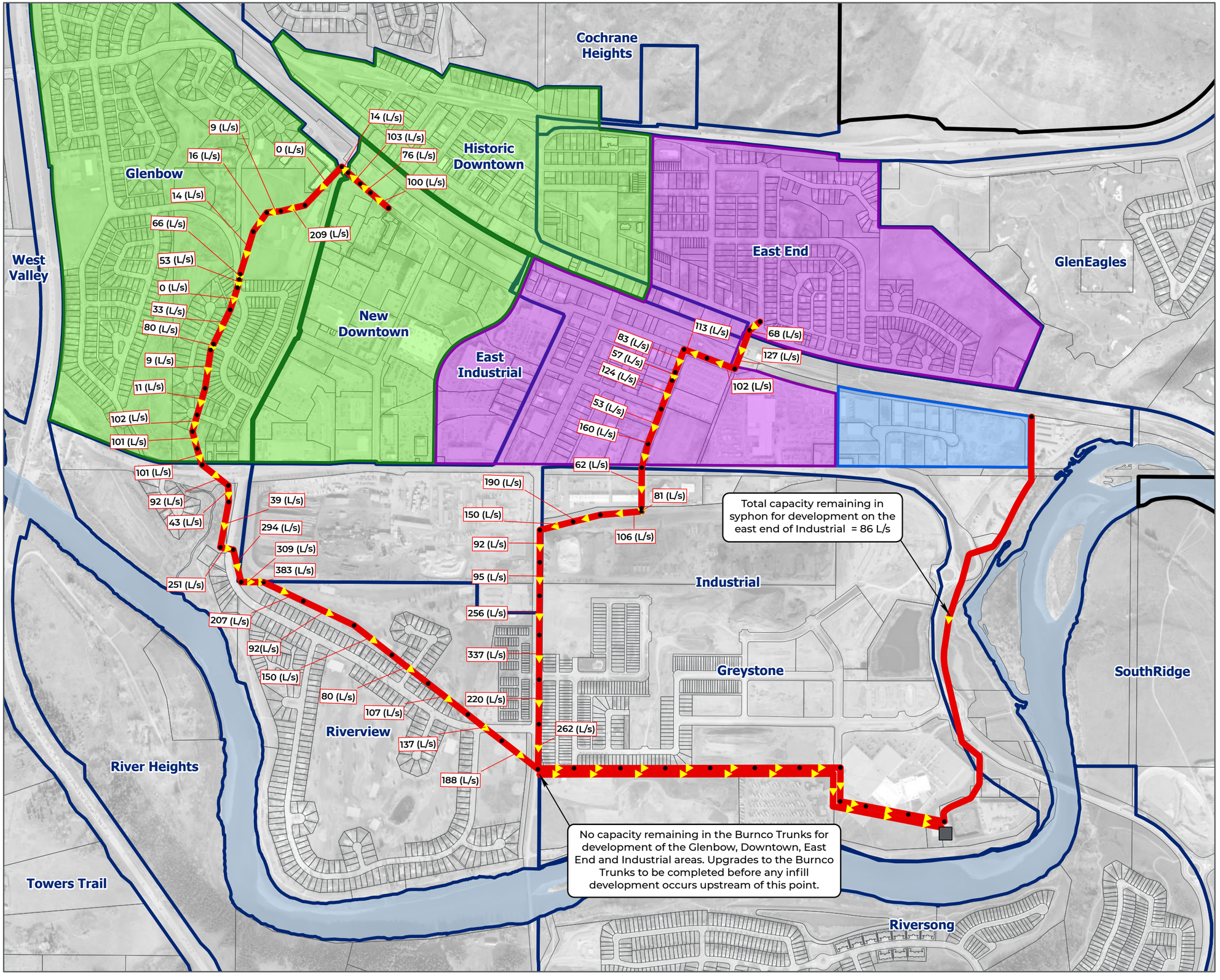

Town of Cochrane

Water & Wastewater Master Plan

Wastewater Infill / Redevelopment Analysis

Legend

- X L/s – Remaining Pipe Capacity
- Sanitary Manhole
- Transfer Station
- Flow Direction
- Cochrane Neighbourhoods
- Municipal Boundary Area

Servicing Areas

- Sanitary Trunk through Downtown/ Glenbow
- Sanitary Trunk through East End/ Industrial
- Syphon to Transfer Station

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 100 200 300
Meters

Coordinate System:
NAD 1983 3TM 114

Scale: 1:10,000
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane, ESRI.

Project #:	1728.0456.01
Author:	SDF
Checked:	SG
Status:	**Final**
Revision:	A
Date:	2025 / 9 / 20

URBAN SYSTEMS

FIGURE 29

7.0 SUMMARY OF PLANNED UPGRADES

The following is a list of upgrades that have been discussed and the Town has already identified as a project to be completed. These projects were not recommendations resulting from this analysis, but have been summarized below for completeness:

1. The Sunterra pump station has a planned upgrade for the replacement of the existing engine driven fire pump with an electric motor driven pump and backup generator. The existing firm and fire flow capacities of the station will not change [24].
2. The Upper Gleneagles pump station has a planned upgrade for replacement of the existing engine driven fire pump with an electric motor driven pump and backup generator [24]. The existing firm and fire flow capacities of the station will not change.
3. The current configuration of the Lower Gleneagles pump station consists of two pumps in a duty/standby configuration, one fire pump, and one jockey pump. The planned pump configuration at this station is to remove the fire and jockey pump and replace with two small distribution pumps (one duty and one standby) [24].

8.0 SUMMARY RECOMMENDATIONS AND CAPITAL UPGRADE PLAN

8.1.1 WATER SYSTEM

General Recommendations

1. The Town should undertake a zone balancing analysis by implementing pressure monitoring at key areas of the distribution system to better understand unaccounted for water and to confirm model assumptions and demands.
2. Town to allocate budget to allow for regular water and wastewater model updates (every 2-3 years) to keep up with development or redevelopment, asset renewals and capital projects.
3. It is recommended that hydrant testing in areas of concern and all new developments take place to ensure that what the model is predicting for available fire flow is what is available on site.
4. It is recommended that model calibration and SCADA data review take place approximately every five years. The Town's existing water model has not been calibrated (C-factor testing) since prior to the 2012 W3 Master Plan.

Fire Flow Improvements

1. New community developments within Town should obtain FUS building calculations as part of the development process, on all buildings with land use above Residential - Single Detached, to ensure buildings meet the fire flow limitations of the Town.
2. Developers should submit a Hydraulic Network Analysis that identifies available fire flows within new developments, proposed hydrant locations, and the associated spacing requirements used.
3. Where hydrant spacing deficiencies exist in Town, additional hydrants should be installed as part of the Town's infrastructure renewal program.
4. Building specific FUS calculations should be completed at the following locations:
    a. Ranchehouse
    b. Multi-Family buildings adjacent to deficient hydrant in Heritage Hills (on Heritage Heights).
    c. Jumping pound common multi-family site
    d. Cochrane Heights tri-school site
    e. High risk buildings in Old Downtown, New Downtown, and East Industrial Areas
    f. Sunset Drive Multifamily Units, including 207 Sunset Drive.
5. Hydrants located on Quigley Drive should be used in the event of a fire at Bethany Cochrane as they can provide sufficient fire flow and are within the coverage area.
6. Hydrant testing can be conducted to:
    a. Confirm fire flow availability throughout Town, and
    b. Establish a plan for fighting a fire adjacent to Spray Lakes Sawmill. The Town should discuss the fire protection measures in place at the spray lakes sawmill to better understand the required fire flows adjacent to the hydrants.
    c. Validate model C-factors.
7. As pipes in East End begin to reach their serviceable life, Town should consider redevelopment planning for this area to ensure that asset replacement allows for larger fire flows in the future if required.
8. Fire testing is recommended to validate model results and establish a plan for fighting a fire adjacent to the Spray Lakes Sawmill, and for the Town to have discussions with the Sawmill to determine what specific fire protection measures are included within their facility to evaluate the required fire flow from these hydrants.
9. Passive replacement of mains in Glenbow should be upsized to a minimum of 200mm, and the main along Glenpatrick road be upsized to 300mm.

Water Treatment Plant Expansion

The recommended capital upgrades to achieve a treatment capacity of 21.8 MLD includes:

1. West intake replacement and piping upgrade
2. Pretreatment upgrades including new flocculation chambers, clarifier modifications, and chemical storage.
3. Clearwell diffuser replacement
4. Upgrade two of the high lift pumps
5. Add residuals management system
6. Upgrade electrical system and generator

In addition, it is recommended that the Town:

1. Complete a future WTP Location due diligence and concept design (underway in 2026) and begin land acquisition.
2. Complete a conceptual design and phasing plan for the future WTP, explore grant opportunities and incorporate the funding plan into the OSL program.

Storage

1. A main pressure zone expansion concept design should be conducted to determine whether expansion of the 2MG reservoir at its current location is appropriate for the main pressure zone storage.
    a. As part of this concept design, the Town should investigate how best to automate the connection between the Lower Gleneagles Reservoir and the main pressure zone to allow for supplementation of this storage, which may reduce the storage expansion requirements of the 2MG reservoir. A budgetary cost estimate has been included in the capital plan for this work.
    b. Please note that this project is awaiting the confirmed planned WTP upgrades and the future location feasibility study, as it may be possible to combine treated storage at the future WTP site depending on its location.
2. Complete operational testing as recommended in the 2022 EPS model analysis and the 2024 Hydraulic Modelling memorandum to determine whether changing high lift pumping operations at the WTP in periods of high demand can aid in the recovery of this reservoir in the interim.
    a. Develop a standard operational philosophy for the WTP to ensure proper management of this distribution system.
3. Complete operational changes of the recommended flow control valves to aid in allowing more flow to travel east through the main pressure zone. If operational changes are unable to aid in the nightly recovery of this reservoir, or if the discharge pressures are deemed too high risk for longevity of infrastructure, install the 600mm feeder main from the WTP to Westside Dr.

4. Determine the acceptable/allowable WTP discharge pressure. If it is undesirable to operate the WTP above ~130 psi, then install the 600mm feeder main from the WTP to Westside Dr to allow for lower pressure discharge.
5. To confirm the expansion requirements of the Sunterra reservoir:
    a. Confirm fire flow requirements in Cochrane Heights (through a building-specific FUS analysis), and
6. Confirm how the 2MG and Sunterra reservoirs will respond to a fire in the Cochrane Heights neighborhood via hydrant testing and reservoir level monitoring.
7. It is recommended that an in-depth review of the interconnection between the Sunset Ridge and Rancehouse reservoirs take place, prior to recommending any upgrades to the Ranchehouse Reservoir, to confirm whether the Sunset Ridge reservoir can provide fire storage for the Ranchehouse Reservoir.

8.1.2 SANITARY SYSTEM

General Recommendations

1. The Town should implement a sanitary flow monitoring program to obtain a better understanding of the peak wet weather flows in key areas of Town.
2. Upgrades to the Burnco Trunks are triggered by increased flows when the Town's population reaches approximately 45,000 (projected within the 5-10 year window). Start a flow monitoring program at the Burnco trunks and upstream manholes of the Transfer Station to confirm actual flows entering the trunks in subsequent years and use this information to calibrate parameters specific to this trunk and to confirm timing of upgrades.
3. Monitor the capacities and condition of the Bow Meadows and Riviera Lift Stations as growth occurs, particularly during heavy rainfall events, to determine if pump upgrades are necessary. Review upgrade options to the Bow Meadows Lift Station if proposed connections from St. Lutheran Church, Lofts on the Bow, and Girl Guides Canada Jubilee Lands are desired.
4. Monitor discharge flow and pressure at all Lift Stations to monitor operational efficacy.
5. Conduct a separate analysis on forcemains throughout the Town to ensure all forcemain capacities are adequate under existing and growth scenarios.
6. An asset renewal/replacement strategy for sanitary infrastructure should be undertaken to include further condition analyses and prioritization strategies. This strategy should coordinate wastewater passive replacement projects with other replacement programs such as roads, water, and storm.
7. Undertake a flushing maintenance program based on historical blockage information and regular video inspections.
8. Flush syphons annually (at minimum) for preventative maintenance to cleanse and ensure solids remain in suspension, especially in the early stages of a syphon's catchment buildout.

9. Implement an education program to inform customers on the causes of sewer backups and minimize the occurrence of service line blockages.

Redevelopment

1. Town complete an Area Redevelopment Plan for specific areas of the Downtown, which would include more targeted analysis and recommendation for upgrades.

8.1.3 SHORT TERM UPGRADES (0-4 YEARS)

Project	System	Cost ($2024)	Rationale
Griffin Industrial Looping	Water	$1,600,000	Improved fire flows to meet system design criteria and distribution system capacity.
Glenpatrick 300mm main upsizing	Water	$230,000	Improved fire flows, resiliency to downtown water supply.
Automation of valve system between Lower Gleneagles Reservoir and the Main Pressure Zone	Water	$350,000	Additional water storage capacity can be allocated to the main pressure zone.
Main Pressure Zone Storage Expansion	Water	$16,350,000	Additional capacity to meet existing and future demands.
5th Avenue Watermain Improvements	Water	$6,700,000[7]	Improved fire flow and hydrant coverage downtown and "pre work" associated with servicing the future development site adjacent to 5th Avenue. Costs provided are for 5th Avenue only and do not include on-site servicing costs identified in the "Servicing Growth" plan.
Water Treatment Plant Upgrades (Expansion of Town's Existing Treatment System)	Water	$29,900,000	To meet future demands as population grows.

[7] Cost estimate is based on Option 2 from the 5th Avenue (Phase 1) Servicing Improvement Project – Utility Installation Option Analysis Memorandum [36].

8.1.4 MEDIUM TERM UPGRADES (5-10 YEARS)

Project	System	Cost ($2024)	Rationale
River Heights Phase 2 Pump Station Expansion	Water	$580,000	To meet future demands as population grows.
600mm Feedermain	Water	$6,100,000	Improved fill of 2MG reservoir at lower WTP pressures. Improved Town distribution capacity and resiliency.
Cochrane Heights Fire Flow Improvements	Water	$15,200,000	Improved fire flows to meet system design criteria.
New Water Treatment Plant	Water	TBD	To meet future demand as population grows
Burnco Trunk Upgrades	Sewer	$10,000,000	With significant growth projected in the North and West, the two 450mm trunk mains cannot handle the additional demands. In the growth to Town boundary scenario, the existing trunk mains reach full capacity, some manholes flood to the surface, and pipes upstream of the Burnco trunks back up.
Transfer Station and Pipeline System Upgrades (Phase 1)	Sewer	$46,020,00[8] ($2024)	Phase 1 upgrades are driven by Town growth rates and by the needs of Harmony, a future regional customer. The Town is working through the phasing approach for this infrastructure and capital costs are subject to change based on preferred strategy.

[8] Cost-estimate is based on estimates provided in "Cochrane & Subregional Wastewater Pipeline Twinning Phase Optimization – FINAL, Urban Systems, 2024 [27]"

8.1.5 LONG TERM UPGRADES (10+ YEARS)

Project	System	Cost ($2024)	Rationale
River Heights Second Supply Line	Water	$11,750,000	To provide adequate fill to River Heights reservoir to accommodate growth and to offer redundancy and resiliency to south Cochrane's water supply.
Bow Street Looping	Water	$1,320,000	Improved fire flows to meet system design criteria, provide capacity for redevelopment.
All Span Buildings Loop	Water	$1,760,000	Improved fire flows to meet system design criteria, provide capacity for redevelopment.
Transfer Station and Pipeline System Upgrades (Phase 2)	Sewer	$16,750,000[8] ($2024)	As the Town grows and experiences increased demands, Phases 2-5 upgrades to the Transfer Station and pipeline system will be required to increase capacity.
Transfer Station and Pipeline System Upgrades (Phase 3)	Sewer	$33,660,000[8] ($2024)	
Transfer Station and Pipeline System Upgrades (Phase 4/5)	Sewer	$20,700,00[8] ($2024)	

9.0 CLOSING AND AUTHORIZATION

This report, entitled “Town of Cochrane 2023 Water & Wastewater Master Plan Update”, was prepared for the Town of Cochrane by Urban Systems Ltd. The material in this report reflects the best judgment of Urban Systems Ltd. based on the information available at the time of preparation. Any use that a third party makes of this report, and any reliance on or decisions made based on its contents, is the sole responsibility of the third party. Urban Systems Ltd. shall bear no responsibility or duty in law for loss or damages, if any, suffered by a third party arising from reliance, decisions made, or actions taken based on this report without the express written authority of Urban Systems Ltd.

Sincerely,

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Permit to Practice

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APPENDIX A

DESIGN BASIS MEMORANDUM

URBAN SYSTEMS MEMORANDUM

DATE: December 13, 2023
TO: Pinky De La Cruz, Director of Engineering and Asset Management, Town of Cochrane
CC: Shawn Tooth, Manager of Water & Wastewater, Shane Hubl, Director of Operations, Ryan Stewart, Manager of Civil Lande Development Services & GIS, Rebecca Carrol, Water Systems Technologist, Town of Cochrane
FROM: Malaya Coppola, EIT, Selina Gandha, EIT, Leigh Chmilar, P.Eng., Nicolas Abarca, P.Eng., Urban Systems LTD.
FILE: 1728.0456.01
SUBJECT: Town of Cochrane 2023 Water & Wastewater Master Plan - Design Basis Summary

1.0 INTRODUCTION & PURPOSE

With substantial growth since the last Water/Wastewater Master Plan update in December 2012, the Town of Cochrane (Town) has engaged Urban Systems to complete a Master Plan update to support strategic growth plans and ensure that water and wastewater infrastructure is adequate to meet the current and future needs of the community and support concepts of livability.

Workshops with Town representatives were held on May 15th (growth assumptions), May 30th and June 15th 2023 (water and wastewater assumptions), to review and confirm design basis assumptions and criteria, and discuss Levels of Service that would be carried forward in this 2023 Master Plan update. These focused workshops allowed for discussion and input from various departments within the Town to ensure alignment on key decisions and rationale prior to starting the analysis. The following sections within this memorandum summarize the design basis assumptions, the evaluation criteria, and Levels of Service that will be used moving forward in the 2023 Master Plan analysis.

1.1 DESIGN BASIS VS. SERVICE DELIVERY GOALS (LEVEL OF SERVICE)

The design basis is a set of criteria and assumptions that are developed and used to complete technical analysis of system capacities and provide sizing of infrastructure.

Level of Service refers to the quality of a given service, and is generally defined by both the:

1. Customer's expectations of a particular service and their level of satisfaction.
2. Organization/administration's goals for service.

This Master Plan will primarily focus on the technical level of service, meaning the expectations and targets set by administration for designing and operating the infrastructure to deliver their service. Changing a level of service is a Council-level decision, as it has broad implications on customer experience and long-term financials. Therefore, the 2023 Master Plan update does not make changes to level of service but instead documents observations and opportunities provided by administration so that it can be used as a tool to guide future conversations for improving level of service, if desired.

2.0 LIST OF DEFINITIONS & ACRONYMS

Average Day Demand (ADD): The total volume of water demanded in a given service area over a year divided by 365 days. These demands are used to complete Water Treatment Plant capacity evaluations, distribution system capacity analyses and project future water demands.

Average Dry Weather Flow (ADWF): The minimum sanitary flow expected through the sanitary system resulting from everyday use (i.e., flows that do not include extraneous flows due to groundwater, snowmelt or rainfall).

Diurnal Pattern: Normalized daily flow patterns based on different land use types (i.e., residential, non-residential).

I&I: Inflow and infiltration in the sanitary the system due to rainfall, snowmelt, or groundwater.

Maximum Day Demand (MDD): The maximum water consumption occurring in a service area during any one day of the year. It is determined from the Water Treatment Plant distribution data and aids in the evaluation of the Water Treatment Plant and distribution system capacities.

MDD:ADD Ratio (Peaking Factor): The maximum day demand (MDD) divided by the average day demand (ADD). This ratio allows for planning of peak daily balancing storage in the system and is used to size treatment and distribution systems to ensure they can handle the day in the year with the most demand.

Per Capita Demand: The daily water consumption per person. Calculated by dividing the ADD by the total estimated population of a given service area.

Peak Hour Demand (PHD): The maximum volume of water delivered to the system in a single hour. Distribution systems should be designed to adequately handle the peak hourly demand or maximum day demand plus fire flow, whichever is greater.

Peak Dry Weather Flow (PDWF): Peaks of sanitary flow throughout the day based on the time of day and type of development.

Peak Wet Weather Flow (PWWF): Maximum design flow for a sanitary collection system, characterized by adding inflow and infiltration (I&I) to the PDWF.

R.T.K Method: A method to predict short, medium, and long-acting rainfall-derived infiltration and inflow (RDII) responses.

3.0 WATER SYSTEM DESIGN BASIS & ASSUMPTIONS

The design basis and assumptions summarized in the following sections were used to update the Town of Cochrane's water distribution system model (WaterCAD Connect Edition V10.04.00.108), which is then used to analyze the performance of the existing water distribution network, predict the future impacts of growth on the system, and develop recommendations for upgrades or new infrastructure.

3.1 POTABLE WATER DEMANDS

System demands are determined in two ways:

1. For existing demands, the metering records from each home and Water Treatment Plant distribution records are used. The metering records are compared to the Water Treatment Plant distribution records and are adjusted to ensure that the flows are consistent. This adjustment ensures that any leakage within the distribution system is captured within the model.
2. For future demands, the Town's annual water production records from the Water Treatment Plant and corresponding population are used to provide the average usage per capita. This average is projected against the assumed population growth to determine future consumption patterns. This is discussed in further detail in **Section 5.2**.

In 2022, the Town of Cochrane developed a 25-Year Water Supply Strategy (Urban Systems, 2023). Through this work, significant analysis took place to establish key design criteria related to the Town's water system. This analysis is summarized in the table below for the years 2016-2021 and has been appended to this memorandum for reference. In addition, the Water Strategy analysis was reviewed against the most recent available data provided by the Town (up to end of year 2022) to confirm that the assumptions used in the Water Strategy align with the assumptions carried forward in the Master Plan.

The data used to determine the ADD and MDD was obtained directly from the Town's Water Treatment Plant discharge flow meters (outflow from the distribution pumps), and therefore include all the residential, commercial, and industrial demands within the system, in addition to any leakage and un-metered demands.

The following table summarizes the most recent 7 years of the potable water parameters of interest:

Table 1: Historical Potable Water Demand Patterns

Design Parameter	2016	2017	2018	2019	2020	2021	2022	7-Yr Avg.	Proposed
Maximum Day Demand (ML)	13.87	13.03	12.74	11.56	12.59	12.87	12.54		
Average Day Demand (ML)	7.07	7.49	7.53	7.22	7.87	8.31	8.07		
Potable MDD:ADD	1.96	1.74	1.69	1.60	1.60	1.55	1.55	1.67	1.7
Population (people)	25,122	26,320	27,960	29,277	*30,655*[1]	30,884[2]	31,838[3]		
Potable per capita demand (L/c/d)	282	285	269	247	257	269	254	266	270

1. Provided by the Town of Cochrane, based on completed premises for 2020.
2. Provided by the Town of Cochrane, based on completed premises as of April 2021.
3. Provided by the Town of Cochrane, based on completed premises for as of April 2022.

Alberta Environment and Protected Area's (EPA) Standards for Municipal Waterworks indicate that the maximum hourly design flow, or Peak Hour Demand (PHD), for water systems should be 2.0 to 5.0 times the MDD (Alberta Environment and Protected Areas, 2021). To confirm the peak hour demand, the Water Treatment Plant hourly SCADA records for the MDD (July 28th, 2022) were reviewed[1]. From these records, the maximum volume of water delivered to the system in a single hour on this day was 15.097 ML. This volume is only 1.2 times the MDD

[1] *A higher peak hour demand (19.87 ML) occurred on February 6th, 2022; however, this flow was due to a large fire within the Town and did not result in a max day output for the plant. The peak hour demand factor for this event is 1.6, which lies within the proposed factor of 2.6.*

for the year 2022. Based on the resolution of the SCADA data (hourly), it is possible that larger peaks may have been missed. Therefore, it is proposed to use a peak hour demand factor that is 2.6 times greater than the MDD (and 4.0 times greater than ADD). This remains consistent with the 2011 Water Wastewater Master Plan, and exceeds the minimum standards outlined by EPA.

3.2 TREATED WATER STORAGE

The Town currently operates eight (8) reservoirs. Storage requirements for each reservoir are determined based on EPA Guidelines for Municipal Waterworks, which state that potable water storage is to be calculated based on the following formula for the service area of each reservoir (Alberta Environment and Protected Areas, 2016):

S = A + B + Largest of (C or D)

where:

S = Total Treated Storage Required (m^3)

A = Fire Storage (m^3)

B = Equalization Storage (25% of MDD) (m^3)

C = Emergency Storage (minimum 15% of ADD) (m^3)

D = Disinfection Contact Time Requirement. This volume does not need to be considered for the Town's reservoirs as they are not used as treated clear wells, and contact times are met at the Water Treatment Plant.

The Master Plan will review if the Town requires more storage based on projected growth. In addition, it will evaluate:

- Vulnerable supply lines to reservoirs, especially ones that are isolated or having complex filling requirements (Sunterra and Sunset Ridge).
- Long-term resiliency (network expansion to growth areas may show up as opportunities to create resiliency).
- Town's ability to fill reservoirs in times of need (e.g., 2023 River Heights supply main break).

3.3 FIRE FLOW

The Fire Underwriters Survey (FUS) is the benchmark used by local governments in Canada for determining fire flow and hydrant coverage requirements, as it informs how insurance grades are set. The current adopted guidance for FUS in Canada was developed in 2020 (Fire Underwriters, 2020).

Determining required fire flows for specific structures requires information on the building construction materials, building utilization, layout, size, and details such exposure areas/proximities to adjacent buildings, the structure's fire suppression systems, etc. In most cases this information is not inventoried by the Town. That said, the Town requires building specific FUS calculations for proposed developments as part of the development approval process to review adequate fire supply is available for the proposed building. There are also situations historically where the Town commissioned a Fire Underwriters Survey to be completed for buildings within Town that were deemed higher risk.

The following recommended fire flows for land use types were adopted by the Town prior to the 2012 Water Wastewater Master Plan. The specific Fire Underwriters Survey (1991) from which these flows were developed is

not on record with Urban Systems, the Town, or with the Fire Underwriters currently, and therefore could not be reviewed as part of this Master Plan. Should the Town wish to review or revisit these flows, a new Fire Underwriters Survey would be required. Detailed FUS analyses may determine that fire flow requirements are higher or lower than shown in the Table below. The Town should keep records of the detailed FUS analyses that deviate from the general approach in Table 2.

Table 2: Town-Wide Adopted Fire Flow Requirements (FUS)

Building Type	Flow Rate (L/s)	Duration (hours)
Residential, Single Detached	75	1.75
Residential, Multi Family	125-180[1]	2
Schools, Institutional Buildings, Neighborhood Commercial	180[2]	2
Downtown Commercial	230[3]	3
Industrial Park	230	3
Warehouse Commercial/ Industrial	330	4

1. Certain types of multifamily buildings require higher fire flows, depending on the building design and construction. For example, the Multifamily building in Fireside requires 200 L/s for 2.5 hrs.

2. A detailed analysis of the Sunset Ridge Catholic School indicated a Fire Flow requirement of 120 L/s, lower than the general Town standard.

3. Downtown Commercial refers generally to commercial land use. Commercial developments being proposed in other development areas should follow this fire flow requirement for proposed commercial buildings. In some cases, the Town may elect to set a higher fire flow requirement if prudent. For example, fire flow availability of 260 L/s for 3 hours was used (set to match the Walmart's building requirement Downtown) for commercial land uses in the River Heights Reservoir service area to ensure the reservoir and pump stations would not be limited by future potential commercial developments.

For areas that the Town has commissioned an FUS on specific buildings throughout Town, the requirements are set in the model for the hydrants in proximity to those buildings. Otherwise, the fire flow analysis in the Master Plan will follow the requirements shown in Table 2.

For existing development areas, the Master plan will indicate current fire flow availability at hydrants and compare it to the required fire flow above to identify system deficiencies and propose upgrades to improve fire flow or recommend operational practices to achieve required fire flow. For already developed areas where distribution system upgrades are not always feasible, infill and redevelopment proposals should include provisions to include fire protection measures given the existing system availability (e.g., installing monitored sprinkler systems or proposing fire-resistant materials within the proposed building may reduce fire flow requirements depending on the building type).

3.4 HYDRANT COVERAGE

The Town currently adopts the 2020 City of Calgary Subdivision Servicing Standards (Section III: D) for maximum spacing between hydrants (City of Calgary, 2020):

- **Residential:** 300 mm
- **Non-residential:** 150 mm

Fire Underwriters Survey recommends the following maximum spacing between hydrants (Fire Underwriters, 2020):

- **Residential:** 180 mm
- **Non-residential:** 90 mm

Hydrant spacing deficiencies outlined in the 2023 Master Plan will be determined based on the City of Calgary Standard; however, the Plan will also evaluate spacing deficiencies against the FUS standard for reference as was done in the 2011 Master Plan. The Town expressed a desire to improve the location and number of hydrants in new developments to improve fire protection services.

3.5 WATER PRESSURE (MINIMUM AND MAXIMUM OPERATING)

Due to the topography of the Town, water pressures are variable and challenging to control in certain areas. The current Level of Service outlines that the maximum and minimum operating pressures for watermains are 125psi and 50psi, respectively.

High system pressures can result in reduced life of linear infrastructure, larger leakages and losses throughout the system and more frequent main breaks. There is a desire from the Town to reduce the maximum allowable operating pressure from 125psi to 80psi, matching the EPA Guidelines, however this requires a change to the existing Level of Service guidelines, could result in the need for many more Pressure Reducing Valves (PRVs) throughout the system, and in many areas may not be feasible. Since changing Level of Service requires Council input, the Master Plan report will outline future opportunities to improve system pressures:

- Identifying existing areas where community PRVs could improve overall system pressure.
- Identify new/future areas where community PRVs could improve system pressure.
- Note areas where the desired level of service is not currently being met (pressure exceeds EPA Guidelines).

The water distribution system analysis will outline areas where the current minimum (50psi) and maximum (125psi) operating pressures are not met, in addition to the areas where the desired level of service (EPA Guidelines) is not met for reference and future consideration.

4.0 SANITARY SYSTEM DESIGN BASIS & ASSUMPTIONS

4.1 AVERAGE DRY WEATHER FLOWS

For existing developments, ADWF (base sanitary demands) are calculated by applying a sanitary to water ratio to 2022 water meter data. For growth areas, ADWF will be calculated using the same ratio, but applied to water demand projections.

The sanitary to water ratio refers to how much sanitary flow is discharged back to the system for a given amount of water drawn from the meter. ADD (potable water demands) were translated into ADWF by comparing the total sanitary flow transferred to Calgary (excluding septage and Cochrane Lakes flows) to the total WTP

distribution flow in 2022, for the winter months where irrigation does not occur and where infiltration is expected to be minimal (January, February, March, November, and December). This resulted in an average sanitary flow to water demand ratio of 90%.

The 90% sanitary to water ratio resulting from 2022 data and this analysis is higher than what was found in 2011 during the development of the Town's Water/Wastewater Master Plan (75%). That said, the ratio shows a close representation of the current sanitary behaviour of the Town when compared to measured results, indicating that the Town may be seeing a decrease in its water consumption for non-essential purposes.

It is important to note that the metering records do not capture unmetered or unaccounted demands between the WTP and the meters, therefore this ratio is not applicable to the water meter records directly. The "Unaccounted Demands" value in the equation below accounts for all unaccounted water, including leakage, unmetered demands from fire fighting/flushing, connections without meters, etc. These demands need to be added back because we cannot distinguish how much of the unaccounted water returns to the sanitary system. Therefore, we distribute the unaccounted water across the whole model to ensure it is represented understanding that some of it is ending up in the sanitary system. This value is determined using the sum of the 2022 water meter data (excluding irrigation) divided by the 2022 WTP distribution data during the winter months (January, February, March, November and December). Irrigation is excluded because it does not return to the sanitary system. It is calculated that approximately 20% of the water is unaccounted for in the distribution system.

Based on the above, the estimation of ADWF for each node in the sanitary system model uses the following equation with a 90% sanitary to water ratio and 20% unaccounted water demand:

$$ADWF\ at\ Node\ X = (Water\ Meter\ Data\ at\ Node\ X + Unaccounted\ Demands) * \frac{Sanitary\ Transfer\ Station\ Total}{WTP\ Distribution\ Flow\ Total}$$

It is recommended that residential and non-residential (commercial/industrial/institutional) are not split when calculating ADWF for growth areas because the majority of future growth is residential, and any currently projected commercial is anticipated to have a similar ratio of residential to non-residential development. Furthermore, the per capita demand estimated for growth include both residential and non-residential and will represent a similar ratio in growth areas.

4.2 PEAK DRY WEATHER FLOWS

PDWF recognizes that there are peaks of usage throughout the day based on time of day and the type of development. Applying the diurnal patterns to the ADWF will provide the peak flows in the system prior to a rainfall event. The EPA Guidelines recommend using Harmon's Peaking Factor to calculate peak flow and consider a minimum peaking factor or 2.5 when no existing data is available. However, diurnal patterns across the Town for residential and non-residential areas were established based on flow monitoring data from 2021 (*Sanitary Model Update Memo, Urban Systems, 2022*). Though this exercise, it was established that the Town's PDWF was considerably lower than Harmon's Peaking Factor. Therefore, the diurnal patterns previously established from Town's data will be used in this Master Plan update.

4.3 PEAK WET WEATHER FLOWS

PWWF is characterized by adding inflow and infiltration (I&I) to the PDWF. Using flow monitoring data from 2021 and specific characteristics of the Town's sanitary system, the RTK Method was used to create Rainfall Derived Inflow and Infiltration (RDII) curves for the Town (*Sanitary Model Update Memo, Urban Systems, 2022*). This approach contrasts with applying a blanket I&I rate (0.28 L/s/ha), per EPA Guidelines (Alberta Environment and

Protected Areas, 2016) to the entire study area, which can sometimes overestimate I&I resulting in an overly conservative analysis. The RTK Method presents a reliable and tailored estimation of I&I.

The methodology of the RTK Method versus the EPA Guidelines I&I rate will be reviewed and compared, and a recommendation of which methodology should be used will be provided in the Master Plan. In recent design work (the Highway 22 to Riverview Syphon Design), the RTK method was deemed most appropriate.

4.4 SYSTEM PERFORMANCE / CAPACITY CRITERIA

4.4.1 Sewer Design Flow Levels

The EPA Guidelines state sanitary sewers shall be designed such that the PWWF does not exceed 85% of the sewer capacity (equivalent to approximately 80% of the sewer depth) (Alberta Environment and Protected Areas, 2016). This is a standard design practice and shall be maintained when assessing sanitary sewer performance.

4.4.2 Syphon Design Levels

Successful design and operation of an inverted sanitary syphon relies on a reasonable understanding of the velocity at different flowrates of the wastewater in the syphon. The EPA Guidelines recommend a minimum cleansing velocity of 1 m/s for inverted syphons to ensure solids remain in suspension and do not settle, creating reduced capacity overtime (Alberta Environment and Protected Areas, 2016).

The velocity design criteria recommended is a flushing velocity of 1 m/s (EPA Guidelines) achieved at least once per day, under the PDWF condition. However, it is understood that this velocity criteria may not be met in some syphons, and depends on the developed buildout of the catchment area. In general, its recommended to flush syphons annually (at minimum) for preventative maintenance, but this would be supplemented by Town operations to cleanse and ensure solids remain in suspension in early stages of a syphon's catchment buildout.

Additionally, it is recommended that surcharge elevations are assessed upstream and downstream of each syphon to ensure the hydraulic grade line is at least 2.5m below ground surface.

5.0 EXISTING AND FUTURE ANALYSIS – GROWTH ASSUMPTIONS

The above water and sanitary design basis assumptions are established as the criteria by which the performance under all development scenarios is analysed. These development timeframes include:

- **Scenario 1:** Existing system deficiencies based on current population.
- **Scenario 2:** Buildout to Town Boundary including redevelopment and densification.
- **Scenario 3:** Growth beyond the Town Boundary.

The data, assumptions, and methods used to analyze these scenarios are summarized in the following sections.

5.1 SCENARIO 1: EXISTING SYSTEM ANALYSIS

Scenario 1 analyses the existing system deficiencies based on the current population. This is done by modeling the existing water and sanitary demands and evaluating them on the performance criteria previously established.

Existing system demands were obtained from the Town of Cochrane 2022 metering records. These records are provided as monthly consumption volumes for each meter. Monthly volumes are converted into an average demand (in L/s) for the year before being imported into the model. In addition, consumption volumes were reviewed against the Water Treatment Plant output records and are adjusted to account for leakage in the system.

Each record is provided with a corresponding address and therefore the demand patterns identified are spatially based. For both water and sanitary system analysis, individual demands are grouped into catchments that are a sum of the individual demands within the catchment. These records are used to identify existing system deficiencies for the following scenarios:

- Average Day Demand
- Max Day Demand + Fire Flow (ADD x 1.7)
- Peak Hour Demand (ADD x 4.0)

5.2 SCENARIO #2: FUTURE SYSTEM ANALYSIS: PROJECTED DEMANDS

Scenario 2 builds on the established existing system analysis by applying assumptions for growth within all areas of the current Town Boundary. These growth assumptions were established through discussions with the Town to ensure that the Master Plan accurately reflects how the Town intends to develop in the future.

Remaining lands to be developed within the Town boundary have been identified as part of the Cochrane Growth Study. These areas are shown in Figure 1. There are some lands within the Town Boundary that do not have local area planning policy in place. In general, for most of these lands, the goal is to model growth in these areas and provide the Town with recommendations for how the land *should* be serviced if redevelopment takes place. These areas and details regarding the growth assumptions for each area are shown in Figure 1.

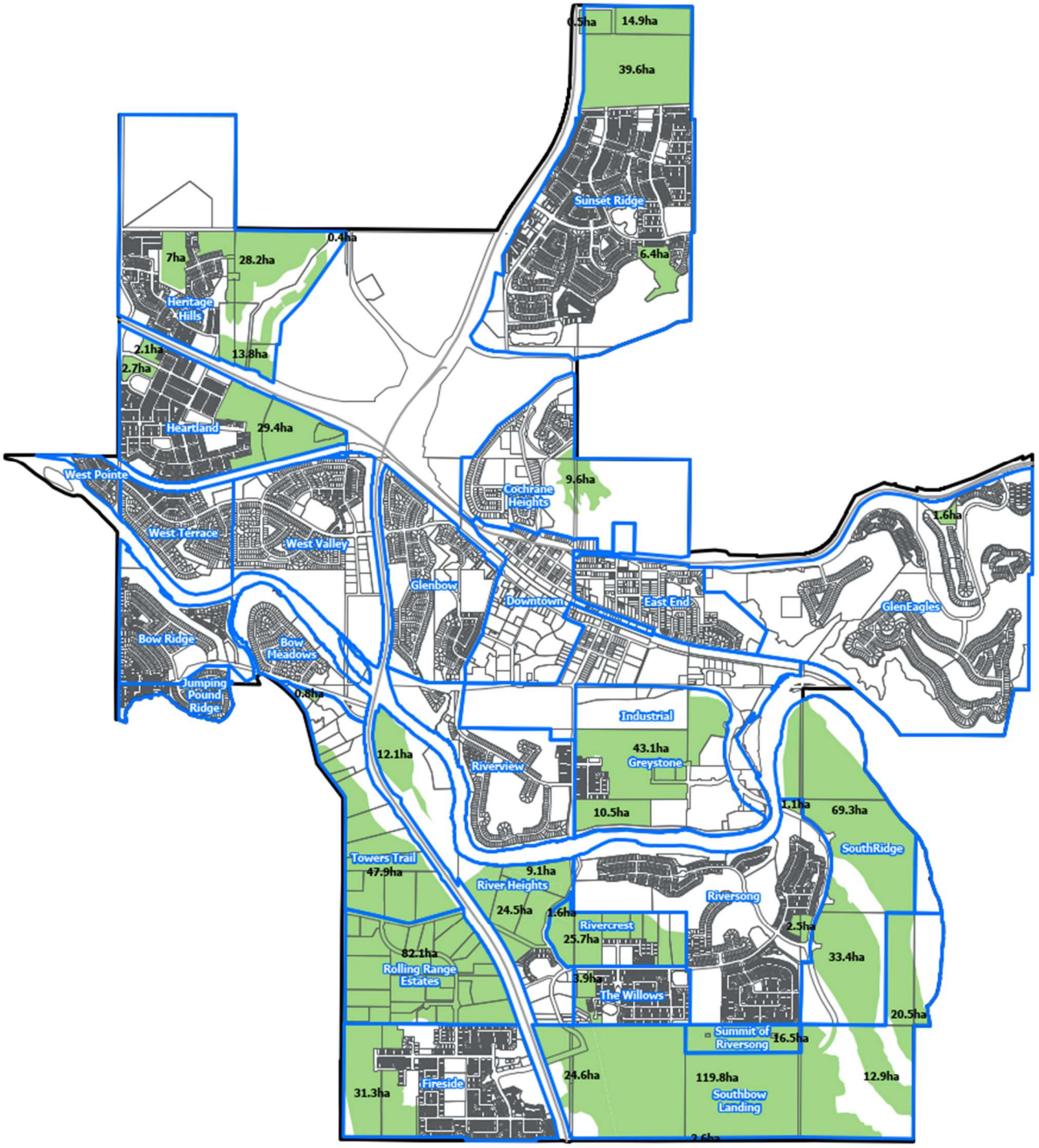


Figure 1: Growth Areas

For the future system analysis (buildout to the Town boundary), the model requires demands to be spatially based. Once these future demands are determined and assigned to growth nodes, upgrades to the existing system required to support growth in those areas can be identified.

For this level of analysis, the extents of residential and non-residential growth areas are typically not known or may change as development advances. Therefore, to facilitate this analysis, a blended rate for residential and non-residential demands is established. This blended rate is determined using the per capita demands identified in Section 3.1 (270 L/c/d). As these demands are 'Total Town Demands,' they account for residential, commercial, and industrial demand, in addition to leakages and losses within the system. To establish a demand that is spatially based, the following calculation was completed:

$$\frac{270\ L^{1}}{capita\ day} \times \frac{2.6\ capita^{2}}{household} \times \frac{20\ households^{3}}{hectare} \times \frac{1\ day}{86400\ s} = \frac{0.16\ L}{s\ ha}$$

1. 270 L/c/d is the average per capita potable water demand as identified in Table 1.
2. 2.6 is the average household size as identified in the 2021 Federal Census (Statistics Canada, 2023).
3. 20 households per hectare is based on the Town's current density (Town of Cochrane, 2023).

To ensure that the estimate is conservative, the blended rate for potable and sanitary average day demands in growth areas will be 0.18 L/s/ha and 0.16 L/s/ha, respectively. These proposed rates were reviewed against the existing Town demands in both commercial and residential areas to ensure that they were conservative enough to account for higher density development in the future.

The only lands shown in the figure above that these flow rates do not apply to are as follows:

- Horse Creek Sports Park: The current concept (July 2023) for this sports park requires water supply for a school site, a clubhouse, and irrigation of sports fields. The Master Plan will review the water and sanitary infrastructure required to provide this volume of water and detail how supply volumes were determined.

5.2.1 INFILL AND REDEVELOPMENT

As the Town grows, it is likely that existing areas within the Town core will intensify. Therefore, Scenario #2 also includes analysis of this intensification. The assumptions regarding this intensification can be found in Figure 3.

It is difficult to make accurate assumptions regarding the location and type of infill and redevelopment that will occur within the Town. Therefore, once future demands (to the Town Boundary) have been allocated, the water system will be reviewed to ensure that operating pressures are still within the minimum and maximum required. Fire flow will be the limiting factor for the water system demands, and therefore the infill analysis will confirm that there is still sufficient fire flow to service existing developments once growth demands to the Town Boundary have been allocated. In addition, the Master Plan will identify the fire flow availability in key areas identified for intensification to confirm what level of intensification can be accommodated without major offsite improvements.

The main capacity constraint to municipalities for redevelopment is typically within the sanitary sewer system. Therefore, once future demands (to the Town Boundary) have been allocated, the sanitary trunk mains within the infill/redevelopment areas will be reviewed to confirm what, if any, capacity is available for development.

The following general redevelopment assumptions are being included to provide the Town with a baseline understanding of the needs if redevelopment should occur in the future:

- 5th Avenue Site: the current improvements and development plans for the 5th Avenue site will be incorporated into the Master Plan, which include a senior's residence, mixed-market housing, and a community event center.
- The downtown East End to include multi-family land use.
- Adding a commercial corridor along 1st Street E in the East End.

As infill and redevelopment occurs, it is recommended that developers and the Town work collaboratively to undertake site specific analyses for redevelopment to ensure that the water and sanitary systems can accommodate the type of infill or redevelopment proposed.

5.3 SCENARIO #3: FUTURE SYSTEM ANALYSIS: GROWTH BEYOND THE TOWN BOUNDARY

For Scenario #3, growth beyond the Town boundary will be evaluated at a comparative level only in the four possible growth directions (N, E, S, W,) as shown in Figure 4. This analysis will be completed to speak to the relative difficulty of servicing lands in each direction from both a water and sanitary perspective. In each direction, 500 hectares of land will be evaluated, using the blended demand rates noted in **Section 5.2**. It is not intended that 500 ha of growth will occur in all areas, but a comparative analysis of relative water and wastewater servicing complexity requires that the areas are equal in all directions. This analysis will be included under separate cover from the Master Plan, as the Town has not yet acquired any land beyond the Town Boundary.

6.0 SUMMARY DESIGN BASIS

In summary, the following parameters will be used to develop the water and sanitary models for the Master Plan:

Table 3: Summary Design Basis

Parameter	2023 Water/Wastewater Master Plan Design Basis
Per Capita Demand (ADD)	270 L/c/d
Peaking Factor MDD:ADD	1.7
Peaking Factor PHD:ADD	4.0
Per Capita Demand Residential and Non-Residential (ADWF)	90% of Water Demand
Sanitary:Water Consumption Ratio	90%
Diurnal Patterns	Developed residential and non-residential patterns based on Town flow monitoring data from 2021
I&I Allocations	RDII curves based on Town flow monitoring data from 2021 and using the RTK method
Sanitary Main Capacity Criteria	PWWF shall not exceed 85% of sewer capacity
Syphon Capacity Criteria	Minimum flushing velocity of 1 m/s once per day, under the PDWF conditions
Blended Rate for Future Water Demands (ADD)	0.18 L/s/ha
Blended Rate for Future Sanitary Demands (ADWF)	0.16 L/s/ha

7.0 CLOSING AND AUTHORIZATION

This report, entitled “Town of Cochrane 2023 Water & Wastewater Master Plan Design Basis Summary”, was prepared for the Town of Cochrane by Urban Systems Ltd. The material in this report reflects the best judgment of Urban Systems Ltd. based on the information available at the time of preparation. Any use that a third party makes of this report, and any reliance on or decisions made based on its contents, is the sole responsibility of the third party. Urban Systems Ltd. shall bear no responsibility or duty in law for loss or damages, if any, suffered by a third party arising from reliance, decisions made, or actions taken based on this report without the express written authority of Urban Systems Ltd.

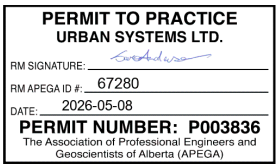
Sincerely,

URBAN SYSTEMS LTD.

Malaya Coppola, E.I.T.

Selina Gandha, E.I.T.

Nicolas Abarca, P.Eng.



cc: Lynda Cooke, Kyle Colburn, Kris Nelson

/mc
Enclosure

\\usl.urban-systems.com\projects\Projects_CAL\1728\0456\01\R-Reports-Studies-Documents\Design Basis Memorandum\2024-06-04 Design Basis Memorandum-FINAL.docx

8.0 REFERENCES

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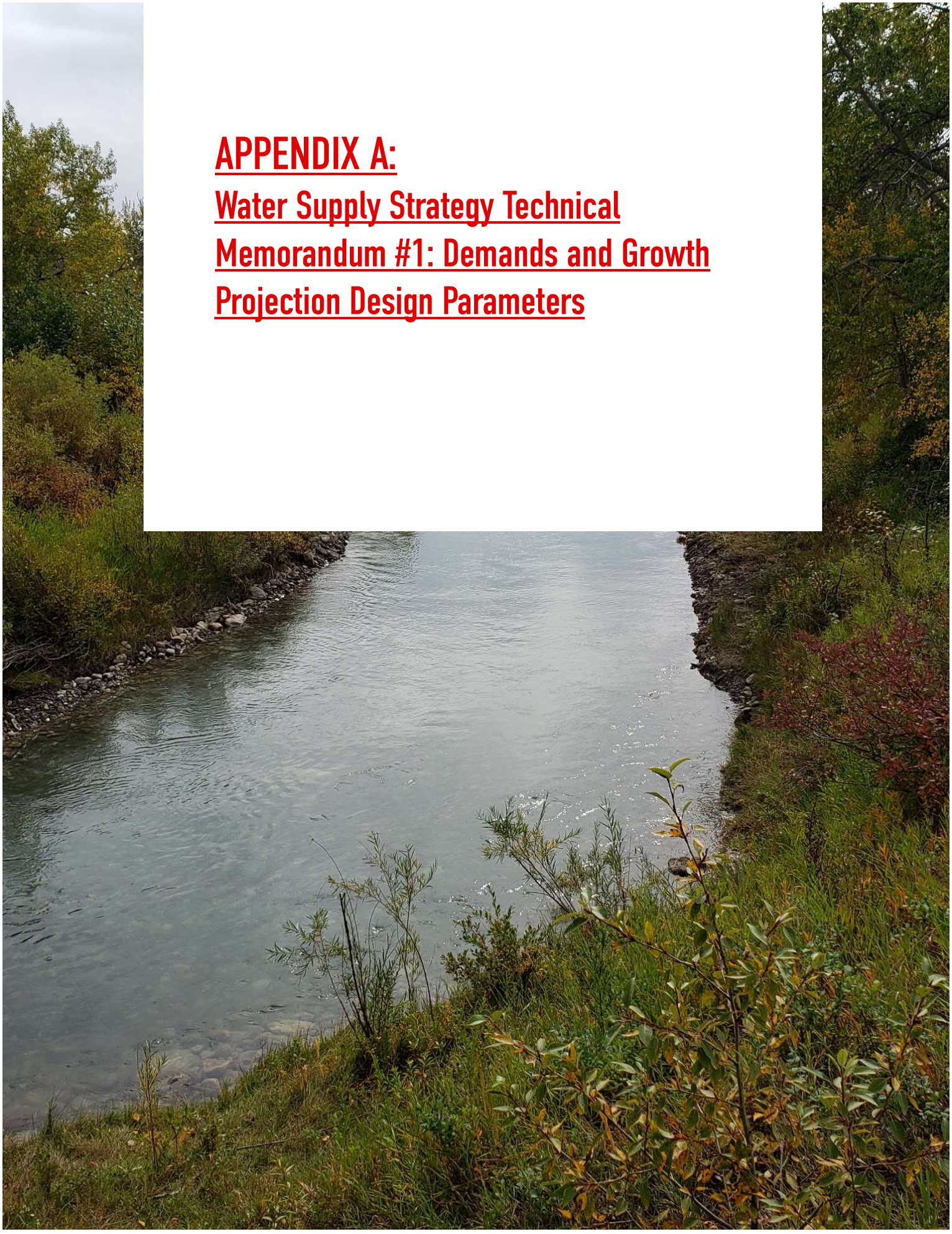
APPENDIX A:

Water Supply Strategy Technical Memorandum #1: Demands and Growth Projection Design Parameters



MEMORANDUM

Date:	March 22, 2022
To:	Drew Hyndman, Pinky De La Cruz – Town of Cochrane
cc:	Shawn Tooth – Town of Cochrane, Lynda Cooke - USL
From:	Leigh Chmilar, USL
File:	1728.0297.01
Subject:	Cochrane Water Supply Strategy Technical Memorandum #1 –Demands and Growth Projection Design Parameters- FINAL

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GLOSSARY

Average Day Demand (ADD): The total volume of water demanded over a year divided by 365 days.

Maximum Day Demand (MDD): The maximum water consumption during any one day of the year.

MDD:ADD Factor (Peaking Factor): The maximum day demand (MDD) divided by the average day demand (ADD).

Per Capita Demand: The daily demand per person. Calculated by dividing the total average day demand by the total estimated population.

1.0 BACKGROUND AND PURPOSE

Urban Systems Ltd. (Urban) is developing a water supply strategy to identify and evaluate factors in securing a long-term water supply for the Town of Cochrane (the Town). There are four major components of the Water Supply Strategy Work:

1. Water Licencing
2. Raw Water Storage Requirements
3. Long-term Water Demand Management
4. Water Supply Options Review and Infrastructure Planning

This memorandum summarizes the rationale for using specific design parameters, including the strategy service area, time frame, overall per capita demands, and peaking factors that will be used in developing options for strategy.

2.0 SERVICE AREA AND POPULATION

2.1. GROWTH MANAGEMENT STRATEGY PROJECTIONS

According to the Town of Cochrane Growth Management Strategy from 2013 (GMS), the population was expected to reach 65,812 by 2062, with growth rates slowing over time as shown in the table below (Town of Cochrane, 2013). The GMS also assumes that the Town boundary can supply land for up to approximately 68,030 people.

Table 1 - Growth Management Plan Population Projections

Year	Projected Annual Growth Rate	GMP Projected Population (Year)
2011 – 2015	5%	21,369 (2015)
2016 – 2020	4%	26,248 (2020)
2021 – 2030	3%	35,618 (2030)
2031 – 2055	2%	59,008 (2055)
2056 – 2062	1.5%	65,812 (2062)

2.2. UPDATED POPULATION PROJECTIONS

Given the GMS is over 8 years old, and is planned to be updated soon, the assumptions were reviewed against recent updated development plans and census data to confirm the current Town boundary land supply assumptions and project the population for the next 25-year period.

Table 2 shows the actual population growth over the last 7 years for comparison to the GMS.

Table 2 - Historical Population Growth

Year	Population	Growth Rate
2013	18,750	--
2014	20,708	10.4%
2015	23,084	11.5%
2016	25,122	8.8%
2017	26,320	4.8%
2018	27,960	6.2%
2019	29,277	4.7%

As shown above, the actual growth rates between 2013 and 2019 were higher than projected in the 2013 GMS, indicating the Town could reach the current boundary much sooner. It is important to note that the population growth rates impact **only the timing** of infrastructure, not whether the infrastructure is required to support growth.

Part of the water supply strategy involves acquiring water licences to ensure the Town can allow development to continue. Licence acquisition and transfers take significant time and expense, and therefore need to be in place well before development occurs. Alberta Environment and Parks (AEP) allows for municipalities to acquire licences for up to 25-years of growth. Therefore, this is the recommended timeframe for projecting the population and associated raw water needs for the Town in this strategy.

Although the actual growth rates outlined in Table 2 are higher than the projected growth rates from the 2013 GMS, as population increases annually, the percentage of growth each year generally decreases due to base being larger every year. It is reasonable to assume an average annual growth rate of 4% could be used over the next 25 years to project the water supply infrastructure needs, shown below in Table 3.

Table 3 – Cochrane 25-Year Projected Population

Projection Year	Year	Population (at growth rate of 4%)	Projection Year (cont'd)	Year (cont'd)	Population (at growth rate of 4%) (cont'd)
	2019	30,050	12	2033	52,037
	2020	31,252	13	2034	54,118
0	2021	32,502	14	2035	56,283
1	2022	33,802	15	2036	58,534
2	2023	35,154	16	2037	60,876
3	2024	36,560	17	2038	63,311
4	2025	38,023	18	2039	65,843
5	2026	39,544	19	2040	68,477
6	2027	41,125	20	2041	71,216
7	2028	42,770	21	2042	74,064
8	2029	44,481	22	2043	77,027
9	2030	46,260	23	2044	80,108
10	2031	48,111	24	2045	83,312
11	2032	50,035	**25**	**2046**	**86,645**

The actual growth rates should be reviewed annually by the Town to assess the timing requirements for implementing the required infrastructure identified in the strategy.

2.3. TOWN BOUNDARY UPDATED POPULATION PROJECTIONS

For this supply strategy, it is assumed that the Town will plan for 25 years of growth to ensure infrastructure such as water licence volume, treatment, storage, and distribution capacity is in place before it is required.

The service area for the Town's water supply strategy is within the Municipal Town boundary, shown in Figure 1. As discussed in Section 2.1, the population projection for this area was 68,030 in the 2013 GMS.

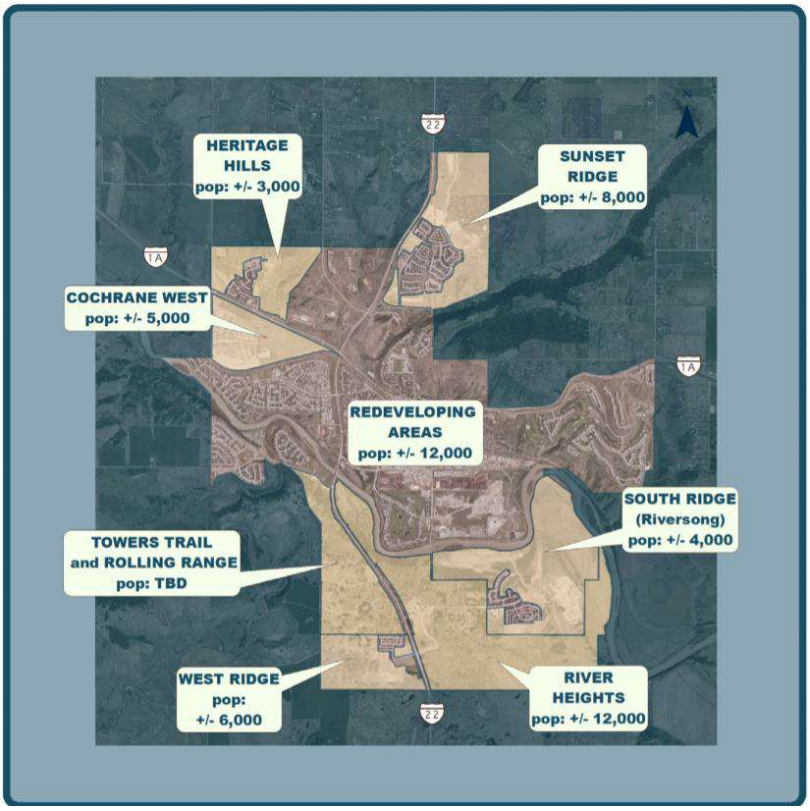

Figure 1- Cochrane Buildout Population (Town of Cochrane, 2013)

Since the 2013 GMS, there have been changes to the planning, development, and growth of the Town of Cochrane, and redevelopment and densification have become more prioritized. Therefore, it is important to analyse recent information to confirm the projected population that the current Town boundary can support. Urban reviewed available Area Structure Plans (ASP's), the Town's most recent census data (2019), and recent updated population projections provided by developers. These sources resulted in an updated population projection of 77,100 for the current municipal boundary[1]. This indicates that the 25-year projected population of 86,645 exceeds the existing municipal boundary. However, water supply security is a Town priority, and therefore it is recommended to plan for 25 years to ensure that water is available for the future growth of the Town. A summary of the updated population projections and a map of the neighbourhoods and their populations can be found in Appendix A.

2.4. ADDITIONAL POTABLE WATER CUSTOMERS

While there are options for the Town to provide servicing to other customers outside of Cochrane, such as Stoney Nakoda, developments in Rocky View County (such as Glenbow Ranch), the Strategy will focus on the Town's needs, while providing flexibility for future customers if this is desired in the future. As part the evaluation of the servicing strategy options,

[1] This projection does not include the Franciscans neighbourhood

the flexibility to include customers outside of the Town of Cochrane boundary will be considered as one aspect of the multiple-bottom line review.

3.0 WATER UNIT DEMANDS

Key parameters required to estimate the ultimate needs of the Town to complete the Strategy are the per-capita raw water demands, and the peaking factor. These parameters allow for estimation of the future total raw water needs of the community at buildout, to size future infrastructure.

3.1. PER CAPITA DEMANDS

3.1.1. Raw Water Demands

The per capita water demands summarized below are data directly from the raw water intake and are therefore "all-community raw water demands" that include WTP losses, residential, commercial, industrial demands as well as any unaccounted-for water (such as leakage or un-metered demands). Table 4 shows the last 6 years of the raw water parameters of interest.

Table 4 – Historical Raw Water Demand Parameters

Design Parameter	2016	2017	2018	2019	2020	2021	6-Yr Avg.
Maximum Day Demand (MLD)	14.88	13.35	13.02	11.56	12.97	13.41	
Average Day Demand (MLD)	7.48	7.78	7.82	7.36	8.20	8.61[3]	
Raw MDD:ADD	1.99	1.72	1.67	1.57	1.58	1.56	1.68
Population (ca)	25,122	26,320	27,960	29,277	30,655[1]	31,500[2]	
Raw Per capita demand (L/c/d)	298	296	280	251	268	273	278

1. Provided by the Town of Cochrane, based on completed premises for 2020.
2. Provided by the Town of Cochrane, based on completed premises up to November 2021.
3. Average Day Demand up to and including September 30, 2021.

The last 6-year per capita raw water demand average is 278 L/c/d. 2019 was noted to be "wetter" year, which reduced the irrigation demands in that year, and 2020/2021 were years where less watering occurred in playfields and parks as a result of the COVID-19 pandemic. In both 2016 and 2021, there were significant heat waves where demands were high, increasing the maximum day demand. Given this context, there is still an overall downward trend, especially in the MDD:ADD peaking factor and average day per capita demands, which influence projected sizing and timing of large-scale infrastructure.

3.1.2. Potable Water Demands

The per capita water demands summarized below are data directly from the water treatment plant distribution pumps, and are therefore "all-community potable water demands" that include residential, commercial, industrial demands as well as any unaccounted-for water (such as leakage or un-metered demands). Table 5 shows the last 6 years of the potable demand parameters of interest when estimating future water demands and sizing potable water infrastructure.

Table 5 - Historical Potable Water Demands

Design Parameter	2016	2017	2018	2019	2020	2021	6-Yr Avg.
Maximum Day Demand (MLD)	13.87	13.03	12.74	11.56	12.59	12.87	
Average Day Demand (MLD)	7.07	7.49	7.53	7.22	7.87	8.31	
Potable MDD:ADD	1.96	1.74	1.69	1.60	1.60	1.55	1.72
Population (ca)	25,122	26,320	27,960	29,277	*30,065*[1]	31,500[2]	
Potable Per capita demand (L/c/d)	282	285	269	247	262	264	267

1. Provided by the Town of Cochrane, based on completed premises for 2020.
2. Provided by the Town of Cochrane, based on completed premises up to November 2021.
3. Average Day Demand up to and including September 30, 2021.

3.2. HOT-DRY SCENARIO

It is important to consider years that are hotter and drier when planning for long-term raw water usage as it is estimated that the future will see increased frequency of multi-year drought and/or heat waves. Historical water demands during hot and dry months were evaluated to project a full dry summer (drought) scenario. This scenario assumes there could be little to no rain between May and September. The following method was used in calculating an adjusted per capita demand for hot/dry years:

- The monthly raw water average demands for the historically highest three months in a year were projected over a period of five months (May through September).
- A weighted average for the year was re-calculated using the above and the average monthly raw demands from the remaining seven months (Jan – Apr and Oct – Dec).

This results in an adjusted overall per capita raw water demand of approximately 290 L/c/d (270 L/c/d potable). It is proposed to use the “hot and dry” per capita raw water demands of 290 L/c/d (270 L/c/d potable) moving forward for this study.

The Town should revisit this calculation annually, to ensure the assumption is appropriate based on current climate patterns as they change. This will help to ensure infrastructure is not being significantly oversized, and to allow for the timing needs to be adjusted when upgrades are required.

3.3. PEAKING FACTOR

The peaking factor MDD:ADD is the ratio of the maximum day demand to the average day demand. This ratio allows for planning of peak daily balancing storage in the system and is used to size the treatment systems to ensure the system can handle the day of the year with the largest demands.

Prior to 2016, the peaking factor had been close to 2.0, but has since decreased, and continued over the last six years. Table 4 shows that over the last 6 years, the peaking factor has been on average 1.68, rounded to 1.7. Peaking factor is directly related to weather, as more water is used in the summer months for irrigation and recreation. Given that the Town intends to further emphasize water conservation and demand reductions, this will lessen water consumption

during the peak months (summer), which will reduce the peaking factor, which in turn helps reduce infrastructure sizing. Given this rationale, it is proposed to use an MDD:ADD peaking factor of 1.7 moving forward, as this is well supported by the data.

4.0 SUMMARY OF DESIGN BASIS

In summary, the following design parameters will be used as a basis for the water strategy:

Table 6 - Summary Design Basis

Parameter/ Assumption	Value	Units
Existing Licence Capacity	4,000 (13.5)	Acre-ft (MLD)
Existing Rated WTP Capacity	29.7	MLD
Town Boundary Updated Population Projection	77,100	Capita
25-Year Population Projection (4% Growth)	86,645	Capita
All Town - Per Capita Raw Water Demand	290	L/c/d
All Town – Per Capita Potable Water Demand	270	L/c/d
Peaking Factor	1.7	--

5.0 CLOSING AND AUTHORIZATION

This report, entitled "Cochrane Water Supply Strategy Technical Memorandum #1 –Demands and Growth Projection Design Parameters- FINAL", was prepared for the Town of Cochrane by Urban Systems Ltd. The material in this report reflects the best judgment of Urban Systems Ltd. based on the information available at the time of preparation. Any use that a third party makes of this report, and any reliance on or decisions made based on its contents, is the sole responsibility of the third party. Urban Systems Ltd. shall bear no responsibility or duty in law for loss or damages, if any, suffered by a third party arising from reliance, decisions made, or actions taken based on this report without the express written authority of Urban Systems Ltd.

URBAN SYSTEMS LTD.

PERMIT TO PRACTICE
URBAN SYSTEMS LTD.
Signature
Date Mar. 22 2022
ID 58661
PERMIT NUMBER: P 3836
The Association of Professional Engineers and Geoscientists of Alberta

Malaya Coppola, EIT
Project Engineer (EIT)

REVIEWED BY:

PROFESSIONAL ENGINEER ALBERTA
LEIGH CHMILAR
ID 82542
2022-03-22

Leigh Chmilar, P.Eng.
Water and Wastewater Engineer

cc: Lynda Cooke, Anika Joshi, Urban Systems

/lnc

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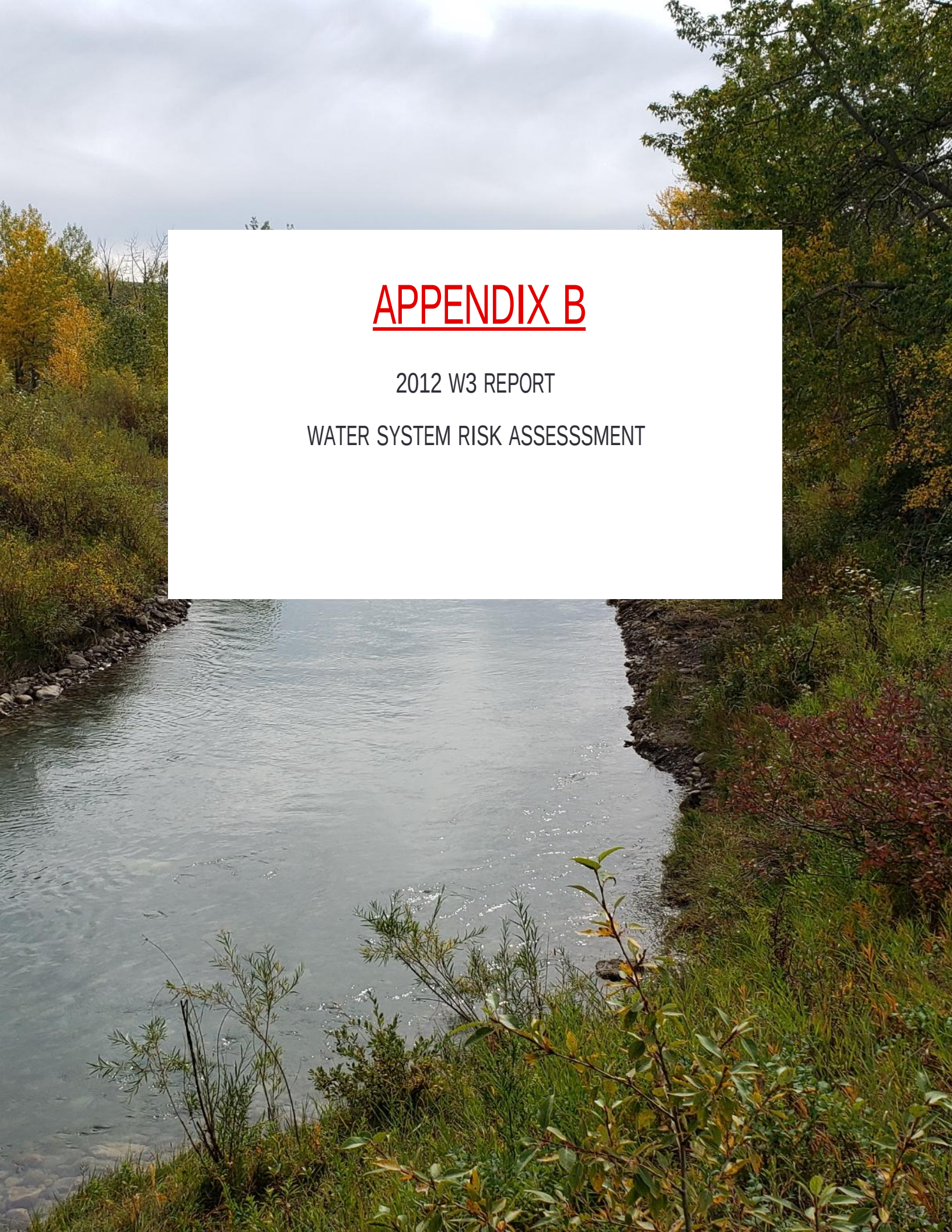
6.0 REFERENCES

Town of Cochrane. (2013, May). *Growth Management Strategy.* Retrieved from https://www.cochrane.ca/DocumentCenter/View/262/Growth-Management-Strategy?bidId=

URBAN SYSTEMS

APPENDIX A – 25-YEAR POPULATION ESTIMATE AND ASSUMPTIONS

Population Projection Summary	
Cochrane 2019 Census:	**# Persons**
West Pointe	280
West Terrace	1283
West Valley	1924
Bow Ridge	1370
Crawford Ranch	170
Jumping Pound Ridge	796
Bow Meadows	600
Glenbow	2031
Cochrane Heights	453
Riverview	1033
Glen Eagles (estates, summit, villas, and vistas incl.)	2257
Downtown	382
Industrial Park	18
Glenhaven	122
Headlands	56
Sunterra Ridge Estates	257
ASP:	
Heritage Hills	4726
Sunset Ridge (Stage 1 and Stage 2)	11448
Heartland (Stage 1 and Stage 2)	5404
South Ridge	8481
River Heights	29731
Greystone	2837
Total Population	**77,100**



APPENDIX B

2012 W3 REPORT

WATER SYSTEM RISK ASSESSSMENT

3.1.7 System Failure Risk

A system pipe failure risk analysis that allows the Town to identify and plan for capital works is provided based on the risk and consequence of failure of the distribution pipes within the system. Each of the pipe elements within the existing system is ranked based on the following criteria:

LIKELIHOOD OF FAILURE

The probability of asset failure is based on both the age and the material of the asset. A scale of 1 to 5 was applied whereby a condition rank of 5 would indicate that the likelihood of failure is very high, while a ranking of 1 would indicate that the probability of failure is very low. The following table defines how the age of the pipe is related to the likelihood of failure:

Table 3-5: Condition Ranking

Criteria	*Failure Rank*
End of asset life expectancy within 10 years	5
End of asset life expectancy within 20 years	4
End of asset life expectancy within 30 years	3
End of asset life expectancy within 40 years	2
End of asset life expectancy over 40 years	1

The life expectancy of the assets was based on the specific material of each pipe. A number of sources were consulted to determine this life expectancy. These include manufacturers, publications and professional experience. Based on this research, two life expectancy categories were established:

(1) 45 years for materials which include cast iron, concrete, vitrified clay tile (VCT), asbestos cement, steel, ductile iron and copper, and

(2) 75 years for all other materials, including PVC and HDPE.

CONSEQUENCE OF FAILURE

The consequence of failure is based on the actual location of the pipe and the ramifications from this particular pipe failing. A scale of 1 to 5 is also used to classify the consequence of failure. Higher numbers indicate more severe consequences based on the scale of service interruption and difficulty of repair. Lower numbers are assigned to pipes that are easier to repair and from which failure does not result in service interruption to large areas. The following table summarizes the criteria used for consequence of failure ranking:

Table 3-6: Consequence of Failure Ranking for Water Mains

Criteria	*Failure Rank*
River crossing or single feed out of a reservoir	5
Single feed to a reservoir	4
Railway or Highway crossing or easement between houses	3
Located along collector road standard road or higher	2
Other non-impactful location	1

Due to their larger size, some mains present an increased level of consequence should they fail. For the present analysis we considered mains of greater than or equal to 300 mm to present greater failure consequences. To take this into account, the modified consequence ranking for these pipes are as indicated in the following table:

Table 3-7: Modified Consequence of Failure Ranking for Water Mains

Original Failure Ranking	1	2	3	4	5
Modified Failure Ranking	3	3	4	5	5

In order to provide an overall risk assessment and to assist in prioritizing capital projects, a final ranking is developed as a weighted average of the likelihood and the consequence of failure, combining both criteria into a single 1 to 5 ranking. To avoid an unnecessary high ranking of an asset simply because of its location, a 60% weight was assigned to the likelihood of an asset failing, while 40% was assigned to the possible consequence of its failure. Figure 8 shows the failure ranking of network assets based on the above risk analysis.

Based on the above criteria, only one pipe was identified as a high risk of failure. This corresponds to a ductile iron 150 mm lateral located in a right-of-way between residences east of Highway 22 just south of Glenbow Drive. Most of the pipes in the system have a lower risk of failure, with more elevated risks occurring within the downtown core and neighbouring residential areas. Towards the outer areas of town, the majority of the system is relatively new and made of PVC pipe, and is not expected to fail in the near future.

A 400 mm diameter main that parallels Highway 22 on the east side, from Griffin Road to the Glenbow Elementary School. This element is High Pressure Concrete and was constructed in 1985. Because of its material, age and size the risk analysis identifies this pipe as a higher risk of failure. Replacement of this pipe is not expected to be required until 2030. Further condition analysis if this pipe should be undertaken and options for rehabilitation considered prior to replacement.

Disclaimer: This map is prepared for the sole use of the Town of Cochrane. No representations of any kind are made by Urban Systems Ltd. or its employees to any party with whom Urban Systems Ltd. does not have a contract.

N

Highway 1A

Highway 22

Highway 22

Highway 1A

Highway 22

0 0.25 0.5 1 1.5 2 km

Town of Cochrane W3 Master Plan

cochrane
HOW THE WEST IS NOW

URBAN systems

Legend

Water Pipes Current Risk

- Low Risk
- Diminished Risk
- Moderate Risk
- Elevated Risk
- High Risk
- Municipal Boundary

Coordinate System: NAD 1983 3TM 114

Figure 8: Water Existing System Failure Risk Assessment

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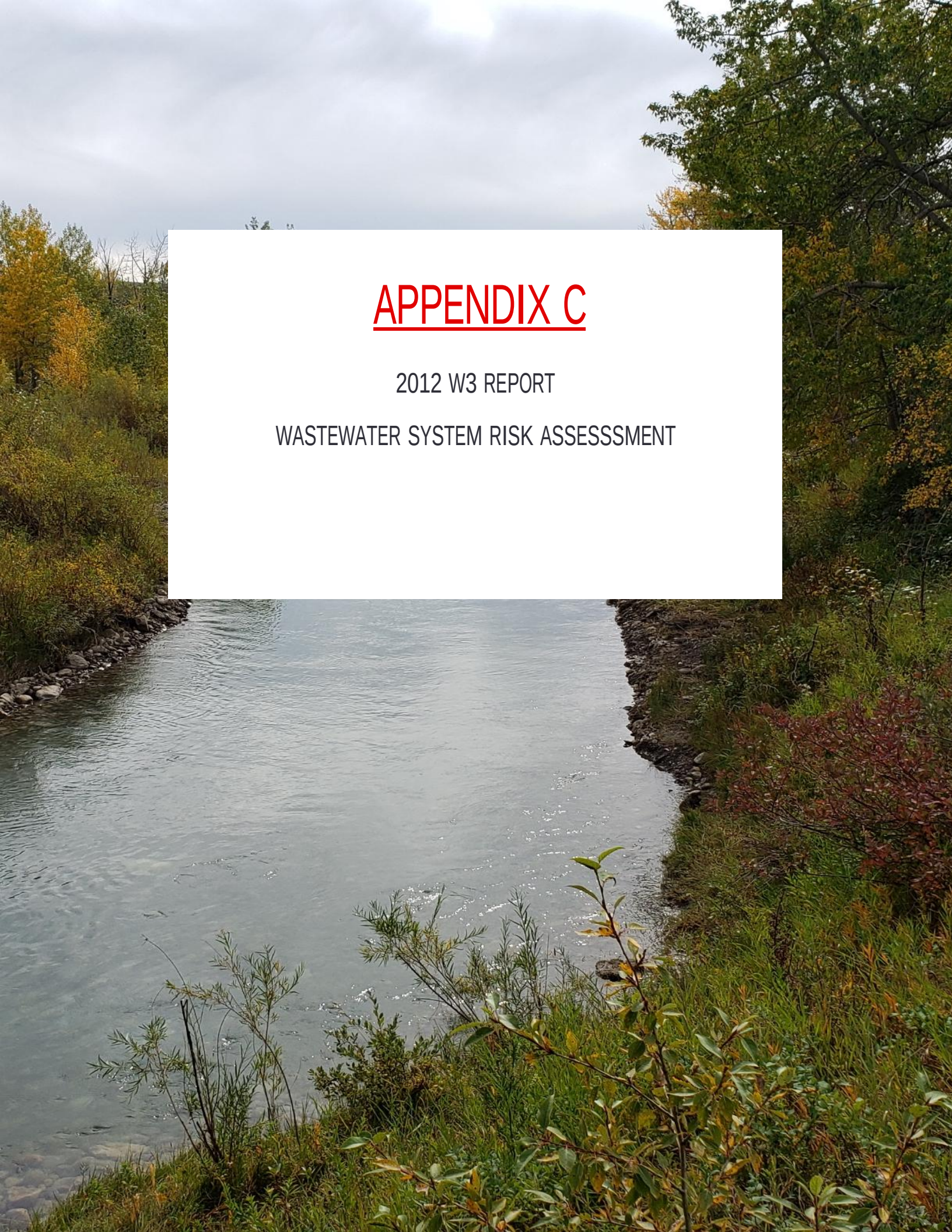


APPENDIX C

2012 W3 REPORT

WASTEWATER SYSTEM RISK ASSESSSMENT

4.1.3 Collection System Analysis

The analysis of the existing capacity of the sanitary collection system shows that the collection system is adequately sized to handle the demands from the existing users. Only a small segment of gravity main in West Valley is currently operating at capacity. This segment is a 200 mm diameter line located along Quigley Drive between W. McDougal Road and W. McManus Road, which receives outflow from the West Terrace forcemain. All other pipes in the system are currently operating below 80% capacity.

There are currently no capacity issues in regards to existing lift stations and forcemains. The lift station capacities contained in the 2005 Sanitary Master Plan were carried forward for use in this study. The following table summarizes lift station pump rates and percent capacity utilized under existing demand conditions:

Table 4-1: Lift Station Capacities - Existing System Demands

Lift Station	*Pumping Rate (L/s)*	*Percent Utilized*
River View	14	33.1%
Griffin Road	19	33.1%
Western Heritage	5	3.3%
Bow Meadows	45	24.1%
West Terrace 1	23	48.1%
Mountainview	35	5.3%
West Pointe	14	3.8%

4.1.4 System Failure Risk

As with the water distribution system, a pipe failure risk analysis based on the risk and consequence of failure of the mains within the system is undertaken for the collection system mains. This risk analysis allows the Town to identify and prioritize capital works and prepare an asset renewal plan. Each of the pipe elements within the existing system is ranked based on the following criteria:

LIKELIHOOD OF FAILURE

The criterion to define the likelihood of failure of a pipe is the same as is used for the water distribution system, where the probability of asset failure is based on both the age and the material of the asset. A scale of 1 to 5 is applied where a condition rank of 5 would indicate that the likelihood of failure is very high, while a ranking of 1 indicates that the probability of failure is very low. Table 3-5 defines how the

age of the pipe is related to the likelihood of failure. Section 3.1.7 describes how the pipe material relates to the probability of the asset failing.

CAPACITY CONCERNS

A ranking of 1 to 5 was used to identify pipes that are operating at or close to capacity. Capacity concerns were identified from the modeling and are discussed in Section 4.1.3. The following table summarizes the ranking criteria used to define the capacity of the trunks:

Table 4-2: Capacity Ranking for Gravity Mains

Criteria	*Failure Rank*
Pipe Capacity equal or greater than 90%	5
Pipe Capacity between 70% and 90%	4
Pipe Capacity between 50% and 70%	3
Pipe Capacity between 30% and 50%	2
Pipe Capacity less than 30%	1

CONSEQUENCE OF FAILURE

The consequence of failure is based on the actual location of the pipe and the ramifications of each pipe failing. A scale of 1 to 5 is also used to classify the consequence of failure. Higher numbers indicate more severe consequences based on the proximity to environmentally sensitive areas and the difficulty of repair. Lower numbers were assigned to pipes that are easier to repair and are not located in proximity of environmentally sensitive areas. The following table summarizes the criteria used for consequence of failure ranking:

Table 4-3: Consequence of Failure Ranking

Criteria	*Failure Rank*
River / Creek Crossing	5
Within 100 m of a water course	4
Main access difficult (between houses, no encasement, siphon/forcemain without access points)	3
Located in arterial or collector road	2
Other	1

Due to their larger size, some gravity pipes present an increased level of consequence should they fail. For the present analysis we considered pipes larger than 300 mm to present greater failure

consequences. To take this into account, the consequence ranking adjustments for these pipes are as per the following table:

Table 4-4: Modified Consequence of Failure Ranking Based on Main Size

Original Failure Ranking	1	2	3	4	5
Modified Failure Ranking	2	3	4	5	5

Prioritization of capital projects was established based on both the physical risk and the performance risk for each element within the sanitary system. The physical risk was defined as a weighted average of the likelihood of failure due to age and material, and the consequence of this failure. As with the water distribution system risk analysis, a 60% weight was assigned to the likelihood of the asset failing, and 40% was assigned to the possible consequence of this failure. A lesser weight was assigned to the latter to avoid high ranking of elements that are located within or near environmentally sensitive areas but that are otherwise new and not likely to fail in the near future.

In a similar manner, the performance risk was defined as a weighted average of the likelihood of failure due to capacity, and the consequence of this failure. As with the physical risk, a 60% weight was assigned to the capacity concerns and 40% to the consequence of the element failing due to capacity. This avoids high ranking of pipes simply because of their location, and gives an appropriately high ranking to pipes that are (or close to) operating at capacity and should be replaced in the near term. Figures 14 and 15 show the results of the above analysis.

The sanitary system in Cochrane is relatively young and as such, very few concerns related to the age and material of the system presently exist (Figure 14). It is important to note that pipes with unknown material were assumed to have a life expectancy of 45 years. Pipes identified as having an elevated risk of failure correspond to those that were installed in the late 1970's and are located either close to a water course, along an arterial or collector road, or are crossing the railway or the highway.

There are currently very few capacity concerns in the sanitary system (Figure 15). The majority of pipes are currently operating below 80% of the full flow capacity, with the exception of the 200 mm diameter segment located along Quigley Drive between W. McDougal Road and W. McManus Road, which receives outflow from the West Terrace forcemain.

The following assets were identified as having the highest risk:

1. The 200 mm diameter 55 m long segment located along Quigley Drive between W. McDougal Road and W. McManus Road. This pipe segment was identified as being the most critical. However, because the pipe is not intended to handle any additional flow from what it currently conveys, it is not considered a priority, nor is it recommended for upgrades at this time.

2. A 200 mm diameter, 320 m long segment flowing south along Charlesworth Avenue and east on Griffin Road E is currently flowing at about 76% capacity and is located within an

industrial/commercial area. As such, the pipe was identified as a risk; however because it has some capacity for growth and it is in good condition, upgrading is not being recommended at this time.

3. Small segments within the downtown core and the Glenbow neighborhood were identified as flowing close to 80% capacity and because they are located within right-of-ways or commercial areas, they present an elevated risk.

This risk assessment only identifies the River Avenue trunk main river crossing as a moderate risk. However, as the analysis only accounts for the main's age and available capacity, a site specific risk assessment is warranted. This major trunk main is currently installed in a structure which hangs from the River Avenue Bridge. Should there ever be an issue with this installation, or the bridge itself, replacement and/or repair of the main could prove time consuming, prolonging the restoration of service to an unacceptable timeframe. Anecdotal evidence points to local weather patterns becoming more severe. As a result, the risk of damage to the water and sewer mains due to flooding and ice jams appears to be increasing. It is recommended that, at a minimum, service redundancy for the river crossing sections of both the water and sanitary trunk mains be provided.

Disclaimer: This map is prepared for the sole use of the Town of Cochrane. No representations of any kind are made by Urban Systems Ltd. or its employees to any party with whom Urban Systems Ltd. does not have a contract.

N

Highway 1A
Highway 22
Highway 22
Highway 1A
Highway 22

0 0.25 0.5 1 1.5 2 km

Town of Cochrane W3 Master Plan

cochrane
HOW THE WEST IS NOW

URBAN systems

Legend

Risk of Physical Failure

- Low Risk
- Diminished Risk
- Moderate Risk
- Elevated Risk
- High Risk
- Municipal Boundary

Coordinate System: NAD 1983 3TM 114

Figure 14:
Existing Sanitary System
Risk of Physical Failure

Disclaimer: This map is prepared for the sole use of the Town of Cochrane. No representations of any kind are made by Urban Systems Ltd. or its employees to any party with whom Urban Systems Ltd. does not have a contract.

N

Highway 1A

Highway 22

Highway 22

Highway 1A

Highway 22

0 0.25 0.5 1 1.5 2 km

Town of Cochrane W3 Master Plan

cochrane
HOW THE WEST IS NOW

URBAN systems

Legend

Existing Sanitary Pipes

Risk of Performance Failure

- Low Risk
- Diminished Risk
- Moderate Risk
- Elevated Risk
- High Risk
- Municipal Boundary

Coordinate System: NAD 1983 3TM 114

Figure 15:

Existing Sanitary System
Risk of Performance Failure

APPENDIX D

CAPITAL UPGRADES COST ESTIMATES (0-4 YEARS)

CLASS E OPINION OF PROBABLE COST

Griffin Industrial Watermain Loop -CPR Crossing

Town of Cochrane

May 21, 2024

	DESCRIPTION			Probable Cost (MAY 2024)
A.	SITE WORKS		$	160,000
B	WATERMAINS		$	580,000
C	SURFACE WORKS		$	150,000
D	LANDSCAPE RESTORATION WORKS		$	40,000
		SUB TOTAL	$	930,000
		Contingency 50%	$	460,000
		Professional Services 15%	$	210,000
		Project Total (Rounded)	$	1,600,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	3,200,000
	-50%	$	800,000

Estimate Assumptions:

-Cost estimate completed March 2024

-Cost estimate is Class E (50% Contingency, 15% Engineering)

-Estimate is based on infrastructure shown in Town's GIS as for February 2024

-Costs shown are $2024 based on assumed inflation from 2023 pricing

-No cost assumed for coorindation with CPR

-No cost considered for any land acquistion

-Geotechnical analysis not available at time of estimate

-No relocation of existing utilites considered

Project: Griffin Industrial Watermain Loop -CPR Crossing
Location- 1st St E., Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: May 21, 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" SITE WORKS						
A.1	Mobilization	ls	1	$ 45,000.00	$	45,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 15,000.00	$	15,000.00
A.3	Erosion and Sediment Control	ls	1	$ 10,000.00	$	10,000.00
A.4	Locating, Exposing and Protecting Existing Utilities	hr	20	$ 500.00	$	10,000.00
A.5	Asphalt and Base Removal and Disposal	m^2	350	$ 17.00	$	5,948.25
A.6	Curb and Gutter Removal and Disposal	lm	40	$ 57.50	$	2,300.00
A.7	Saw Cutting - Asphalt	lm	75	$ 17.00	$	1,275.00
A.8	Remove and Dispose Top Soil	m^2	125	$ 20.00	$	2,500.00
A.9	Unsuitable Fill Export (Optional)	m^3	200	$ 28.75	$	5,750.00
A.10	Pipe Swell Export	m^3	250	$ 28.75	$	7,187.50
A.11	Suitable Fill Import (Optional)	m^3	200	$ 26.45	$	5,290.00
A.12	Type A - Rock Excavation(Optional)	m^3	100	$ 85.00	$	8,500.00
A.13	Type B - Rock Excavation(Optional)	m^3	100	$ 150.00	$	15,000.00
A.14	Dewatering	Allowance	1	$ 25,000.00	$	25,000.00
				SUBTOTAL SCHEDULE "A"	$	160,000.00
SCHEDULE "B" WATERMAINS						
B.1	250mm PVC -c/w carbon steel encasement pipe (Augured)	lm	100	$ 5,500.00	$	550,000.00
B.2	Watermain Tie Ins					
	a) First Street East	ea.	1	$ 10,000.00	$	10,000.00
	b) Griffin Industrial Point	ea.	1	$ 10,000.00	$	10,000.00
B.3	Supply and Install Valve- 250 mm	ea.	1	$ 8,244.50	$	8,244.50
				SUBTOTAL SCHEDULE "B"	$	580,000.00
SCHEDULE "C" SURFACE WORKS						
C.1	Standard Curb with 250mm Gutter on Gravel	lm	40	$ 240.00	$	9,600.00
C.2	Subgrade Prep.	m^2	350	$ 7.00	$	2,450.00
C.3	300 mm - 80 mm Granular Sub-Base Gravel	m^2	350	$ 85.00	$	29,750.00
C.4	100 mm - 25 mm Granular Base Course	m^2	350	$ 85.00	$	29,750.00
C.5	120 mm - City Mix 'A' ACP	m^2	350	$ 120.00	$	42,000.00
C.6	40mm - City Mix 'B' ACP	m^2	350	$ 100.00	$	35,000.00
C.7	Prime Coat	m^2	350	$ 4.00	$	1,400.00
C.8	Tack Coat	m^2	350	$ 2.00	$	700.00
				SUBTOTAL SCHEDULE "C"	$	150,000.00
SCHEDULE "D" LANDSCAPE RESTORATION WORKS						
D.1	Topsoil Import -150 mm and placement	m^2	250	$ 25.75	$	6,437.50
D.2	Seeding	m^2	250	$ 15.00	$	3,750.00
D.3	Sod (Optional)	m^2	250	$ 32.00	$	8,000.00
D.4	Asphalt Trail Restoration	Allowance	1	$ 10,000.00	$	10,000.00
D.5	Remove and Reinstall Fence	Allowance	1	$ 10,000.00	$	10,000.00
				SUBTOTAL SCHEDULE "D"	$	40,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" SITE WORKS			$ 160,000.00
SCHEDULE "B" WATERMAINS			$ 580,000.00
SCHEDULE "C" SURFACE WORKS			$ 150,000.00
SCHEDULE "D" LANDSCAPE RESTORATION WORKS			$ 40,000.00
	SUB TOTAL		$ 930,000.00
	CONTINGENCY	50%	$ 460,000.00
	SUB TOTAL		$ 1,390,000.00
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 210,000.00
	TOTAL PROJECT COST		$ 1,600,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%	$ 3,200,000.00
		-50%	$ 800,000.00

CLASS E OPINION OF PROBABLE COST

Glenpatrick Watermain Upsizing (from 200mm to 300mm) Incremental Cost Estimate

Town of Cochrane

May 1, 2024

	DESCRIPTION		Probable Cost (May 2024)
A.	Watermain (200mm to 300mm)	$	142,500
B.	Horizontal Directional Drill (200mm to 300mm)	$	81,250
	SUB TOTAL	**$**	**223,750**
	Project Total (Rounded)	**$**	**230,000**

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	**$**	**460,000**
	-50%	**$**	**115,000**

Estimate Assumptions

-Estimate Completed February 2024.

-No contingency or engineering carried as incremental cost increase shown only.

-It is assumed that contingency and engineering are carried through the Glenpatrick Project Estimate

-Costs shown are in $2024

-Anticipated 2024 construction

-Cost for watermain upsizing shown only. Additional costs will be incurred for fittings and valves

Glenpatrick Drive - Incremental Increase - Upsizing Watermain 200 to 300 mm

Item	*Description*	*Unit of Measure*	*Estimated Quantity*	*Unit Rate Increase*	*Extension*
1	**Watermain**				
a)	200mm PVC to 300mm PVC	m	950	$ 150.00	$ 142,500
b)	200 mm HDPE to 300 HDPE (HDD through the William Camden Park)	m	250	$ 325.00	$ 81,250
	Incremental Cost Increase				**$ 230,000**

-Cost estimate includes increase for watermain only.

-Valves and Fittings will have incremental cost increases as well, not captured here.

CLASS E OPINION OF PROBABLE COST

Cochrane 2MG Valve Chamber Automation

Town of Cochrane

September 2, 2025

	DESCRIPTION			Probable Cost (SEPTEMBER 2025)
1.0	General Requirements		$	15,000
2.0	Control Chamber Sump Pump, New Control Valve and Actuators		$	54,000
3.0	Electrical, Instrumentation & Controls		$	63,000
4.0	HVAC		$	23,000
5.0	Structural		$	19,000
	SUB TOTAL		**$**	**174,000**
	Contingency	50%	$	90,000
	Professional Services	35%	$	90,000
	Project Total (Rounded)		**$**	**354,000**

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	**$**	**708,000**
	-50%	**$**	**177,000**

Estimate Assumptions

Estimate completed September 2025.
Cost Estimate is Class E (50% Contingency, 35% Engineering).
Engineering doesn't include preliminary design.
Costs are shown based on $2025, or recently received $2024 pricing.
It is assumed that a new power supply from LGE will be trenched.
It is assumed that a sump pump will be installed in the chamber.
It is assumed that two additional 300mm actuators will be added as the existing one is not functional.
Assumed that communications/wiring will be added.
An allowance was added to replace the altitude valve due to age.
Assumed that a Dexon Blower Heater will be added to the chamber to keep it dry and ventilated.

Client:	**Foothills County & Town of Okotoks**
Project No:	**1306.0120.07**
Project Name:	**Cochrane 2MG Valve Chamber Upgades**
Date:	**September 12, 2025**

URBAN systems

Budgetary - Class E Estimate ***Phase 1:***

Item No.	Description	Unit	Material or Component Costs QTY	Unit Price	Total Price	Labour & Overhead (%)	Labour & Overhead ($)	PHASE 1 Calculated Costs
1.0	**General Requirements**		**Enter value**	**Enter value**	**(F x G)**	**Enter value**	**(H x I)**	**(H + J)**
	General Requirements							
1.1	Insurance, Safety, Bonding, Mob/Demob, Field Supervision, Temp Provisions	LS	1	$ 4,800.00	$ 4,800	0%	$ -	$ 4,800
1.2	Dewatering Allowance - during sump install	LS	1	$ 5,000.00	$ 5,000	0%	$ -	$ 5,000
1.3	Disinfection and Cleaning	LS	1	$ 5,000.00	$ 5,000	0%	$ -	$ 5,000
							Sub Total - Section 1.0	**$ 15,000**
2.0	**Control Chamber Sump Pump, New Control Valve and Actuators**		**Enter value**	**Enter value**	**(F x G)**	**Enter value**	**(H x I)**	**(H + J)**
	Valve Chamber Sump Pump							
2.1	Allowance for Pump Assembly, Float/Sensor, Electrical	EA	1	$ 15,000.00	$ 15,000		$ -	$ 15,000
	Valves							
2.2	300mm Altitude Control Valve - If Replacement Required	EA	1	$ 16,000.00	$ 16,000	50%	$ 8,000	$ 24,000
2.3	2X300mm Valve Actuators	EA	2	$ 5,000.00	$ 10,000	50%	$ 5,000	$ 15,000
							Sub Total - Section 2.0	**$ 54,000**
3.0	**Electrical, Instrumentation & Controls**		**Enter value**	**Enter value**	**(E x F)**	**Enter value**	**(G x H)**	**(G + I)**
	Power Service							
3.1	Trenching	LM	50	$ 200.00	$ 10,000	50%	$ 5,000	$ 15,000
3.2	Conduit, 1x100	LM	50	$ 50.00	$ 2,500	50%	$ 1,250	$ 3,750
3.3	Cable	LM	50	$ 155.00	$ 7,750	50%	$ 3,875	$ 11,625
3.4	Ground Grid	EA	1	$ 3,000.00	$ 3,000	50%	$ 1,500	$ 4,500
	Control Panel							
3.5	Panel	EA	1	$ 2,500.00	$ 2,500	50%	$ 1,250	$ 3,750
3.6	PLC	EA	1	$ 5,000.00	$ 5,000	50%	$ 2,500	$ 7,500
3.7	UPS	EA	1	$ 2,000.00	$ 2,000	50%	$ 1,000	$ 3,000
3.10	Misc.	LS	1	$ 1,000.00	$ 1,000	50%	$ 500	$ 1,500
	Field Instruments							
3.11	Flood Sensor	EA	1	$ 500.00	$ 500	50%	$ 250	$ 750
	Cabling							
3.12	Cable	LM	10	$ 15.00	$ 150	50%	$ 75	$ 225
	Communications							
3.13	Cell Modem	EA	1	$ 500.00	$ 500	50%	$ 250	$ 750
3.14	Antenna/Coax.	EA	1	$ 1,000.00	$ 1,000	50%	$ 500	$ 1,500
3.15	Router	EA	1	$ 1,500.00	$ 1,500	50%	$ 750	$ 2,250
3.16	Access Point	EA	1	$ 1,000.00	$ 1,000	50%	$ 500	$ 1,500
	Commissioning							
3.17	Controls Programming & Commissioning	LS	1	$ 5,000.00	$ 5,000		$ -	$ 5,000
							Sub Total - Section 4.0	**$ 63,000**
4.0	**HVAC**		**Enter value**	**Enter value**	**(E x F)**	**Enter value**	**(G x H)**	**(G + I)**
	HVAC							
4.1	Dexon Blower Heater	EA	1	$ 15,000.00	$ 15,000	50%	$ 7,500	22500
							Sub Total - Section 5.0	**$ 23,000**
5.0	**Structural**		**Enter value**	**Enter value**	**(E x F)**	**Enter value**	**(G x H)**	**(G + I)**
	Concrete - Wet Well							
6.1	Core hole for Dexon	LS	1	$ 2,500.00	$ 2,500	50%	$ 1,250	3750
6.2	Core Opening for Sump (500xxX500mm)	LS	1	$ 5,000.00	$ 5,000	50%	$ 2,500	7500
6.3	Form and Pour Sump	LS	1	$ 5,000.00	$ 5,000	50%	$ 2,500	7500
							Sub Total - Section 6.0	**$ 19,000**

Grand Sub Total [1]	**$ 174,000**
Contingency (50%)	**$ 90,000**
Professional Services (Design & Construction)	**$ 90,000**
Phase 1 Grand Total [1]	**$ 354,000**

[1] Sub and Grand Totals Rounded Up To Nearest $1000.

CLASS E OPINION OF PROBABLE COST

2 Million Gallon Reservior Expansion Estimate

Town of Cochrane

February 27, 2024

	DESCRIPTION			Probable Cost (February 2024)
A.	RESERVIOR EXPANSION		$	9,400,000
B.	REINSTATE PLAYFIELD		$	100,000
	SUB TOTAL		$	9,500,000
	Contingency	50%	$	4,750,000
	Professional Services	15%	$	2,100,000
	Project Total (Rounded)		$	16,350,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	32,700,000
	-50%	$	8,175,000

Estimate Assumptions

-Estimate Completed February 2024.

-Cost Estimate is Class E (50% Contingency, 15% Engineering)

-Costs shown are in $2024

-No geotechnical information available at time of estimate

-Site investigation, site feasibility not yet completed

-Project costs based on a $/m3 of River Heights Reservoir

-Estimate does not include additional pumping capacity. Reseroir assumed to drain by gravity

-No additional reservior feed considered as part of this estimate

-Capacity required for expansion based on 2024 Water Wastewater Master Plan

-It is assumed playfields will be reinstated back to existing conditions

-It is assumed 1:1 sloping is possible for reservior construction

Project: 2MG Expansion
Location- Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: February 27 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" - RESERVOIR EXPANSION						
A.1	Mobilization and De-mobilization	m3	5,106	$ 1,840.00	$	9,395,040.00
				SUBTOTAL SCHEDULE "A"	$	9,400,000.00
SCHEDULE "B" - REINSTATE PLAYFIELD						
B.1	Sewer Main Removal and Replacement	s.m.	2100	$ 47.50	$	99,750.00
				SUBTOTAL SCHEDULE "B"	$	100,000.00
SUMMARY OF SCHEDULES						
	SCHEDULE "A" - RESERVOIR EXPANSION				$	9,400,000.00
	SCHEDULE "B" - REINSTATE PLAYFIELD				$	100,000.00
		SUB TOTAL			$	9,500,000.00
		CONTINGENCY	50%		$	4,750,000.00
		SUB TOTAL			$	14,250,000.00
		ENGINEERING, TESTING, AND CONTRACT ADMIN	15%		$	2,100,000.00
		TOTAL PROJECT COST			$	16,350,000.00
	Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%		$	32,700,000.00
			-50%		$	8,175,000.00

CLASS C OPINION OF PROBABLE COST
5th Avenue Site Servicing (Phase 1): Option 2 - ROAD UTILITY ALIGNMENT
Town of Cochrane
June 02, 2025

DESCRIPTION			Class C
Schedule "1A" - Site Work		$	1,307,000
Schedule "1B" - Earth Work		$	55,000
Schedule "1C" - Utilities - Storm and Sanitary Sewer		$	953,000
Schedule "1D" - Utilities - Water		$	1,017,000
Schedule "1E" - Utilities - Miscellaneous		$	80,000
Schedule "1F" - Surface Work - Removal		$	74,000
Schedule "1G" - Surface Work - Road		$	472,000
Schedule "1H" - Surface Work - Asphalt Pavement		$	610,000
Schedule "1I" - Surface Work - Concrete		$	170,000
Schedule "1J" - Surface Work - Miscellaneous		$	51,000
Schedule "1K" - Landscaping		$	87,000
Schedule "1L" - Shallow Utilities		$	98,000
SUB TOTAL		**$**	**4,974,000**
Uncertainty Factor	20%	$	994,800
Total		**$**	**5,968,800**
Professional Services	10%	$	596,880.00
Internal Town Allowance (communications, legal, PM, etc.)	1%	$	59,688
Total Estimated Cost		**$**	**6,700,000**
Additional Project Cost Risk Variance	-40%	$	4,020,000
	75%	$	11,725,000

Notes

1. USL has developed the Opinion of Probable Cost (OPC) in accordance with the Town of Cochrane's Capital Project Cost Estimate Development Policy.

2. Pricing was primarily based on the recent Town of Cochrane projects. In case where this was not feasible, prices were sourced from similar projects tendered in Calgary or nearby municipalities between 2022 and 2023 with an adjustment factor applied based on the project's nature, size, and age.

3. Option 2 is currently in the conceptual design stage, with a portion of the design in the Preliminary Design stage. To reflect uncertainties and changes to the design as it is refined, a “Class C” OPC was prepared, which includes a 20% contingency factor.

Exclusions:

4. Shallow utility replacement, new duct crossings, and shallow utility capital infrastructure improvements are excluded from the project scope.

5. The construction timelines are currently uncertain. The cost will need to be reassessed at the time of design and construction.

6. All on-site Improvements on 5th Avenue Site and PRV Design.

7. Any Functional Study upgrades along 5th Avenue, including changes to road cross section and road structure.

URBAN SYSTEMS

Project: 5th Avenue Site Servicing (Phase 1)
Location - 5th Avenue, Town of Cochrane
Option 2 - Road Utility Alignment

	Description	Unit of Measure	Estimated Quantity	Unit Price	Total
SCHEDULE 1 - 5TH AVENUE					
Schedule "1A" - Site Work					
1A.1	Traffic Accommodation	LS	1	$325,000.00	$325,000.00
1A.2	Mobilization and De-mobilization	LS	1	$650,000.00	$650,000.00
1A.3	Temporary Site Fencing	LS	1	$66,000.00	$66,000.00
1A.4	Erosion and Sediment Control	LS	1	$66,000.00	$66,000.00
1A.5	Hydrovac to expose the utilities (Optional)	CA	1	$100,000.00	$100,000.00
1A.6	Dewatering (Optional)	LS	1	$100,000.00	$100,000.00
	Total Schedule "1A"				**$1,307,000.00**
Schedule "1B" - Earth Work					
1B.1	Topsoil Stripping to disposal (Optional)	m^2	500	$18.00	$9,000.00
1B.2	Unsuitable Fill Export (Optional)	m^3	200	$52.00	$10,400.00
1B.3	Suitable Fill Import (Optional)	m^3	200	$40.00	$8,000.00
1.B.4	Excess Material Export	m^3	1,000	$27.00	$27,000.00
	Total Schedule "1B"				**$54,400.00**
Schedule "1C" - Utilities - Storm and Sanitary Sewer					
1C.1	Sewer Main				
a)	Storm Sewer - 600mm PVC	l.m.	220	$1,720.00	$378,400.00
b)	Storm Sewer - 675mm PVC	l.m.	80	$2,150.00	$172,000.00
c)	Sanitary Sewer - 300mm PVC	l.m.	100	$1,500.00	$150,000.00
1C.2	Manhole (Type 5-A)				
a)	1200mm dia	ea.	4	$6,500.00	$26,000.00
b)	1200mm dia Overbuild	ea.	1	$23,500.00	$23,500.00
1C.3	Large Diameter Manhole				
a)	1500mm dia Overbuild	ea.	2	$28,000.00	$56,000.00
1C.4	Manhole Barrel	v.m.	24	$1,600.00	$38,400.00
1C.5	Sewer Fitting - 300mm Cap	ea.	1	$3,500.00	$3,500.00
1C.6	Sewer Main Tie-in				
a)	Storm main Tie in - Railway Street	ea.	1	$30,000.00	$30,000.00
1.C.7	Sanitary Sewer Bypass Pumping (Optional)	CA	1	$75,000.00	$75,000.00
	Total Schedule "1C"				**$952,800.00**
Schedule "1D" - Utilities - Water					
1D.1	Water Main Installation				
a)	300mm DR18	l.m.	380	$1,780.00	$676,400.00
1D.2	Water Valve				
a)	300mm Cut-in-valve	ea.	2	$16,500.00	$33,000.00
b)	300mm valve	ea.	8	$8,245.00	$65,960.00
1D.3	Water Fitting				
a)	100mm Cap on Ex Main	ea.	4	$971.00	$3,884.00
b)	300mm - 5° Bend (Optional)	ea.	5	$4,274.00	$21,370.00
c)	300mm - 11.25° Bend (Optional)	ea.	2	$4,274.00	$8,548.00

d)	300mm - 22.5° Bend	ea.	4	$3,175.00	$12,700.00
e)	300mm - 45° Bend	ea.	2	$5,225.00	$10,450.00
f)	300mm x 300mm Cross	ea.	1	$7,500.00	$7,500.00
1D.4	Water Hydrant Assembly Removal	ea.	1	$4,901.00	$4,901.00
1D.5	Water Hydrant Assembly	ea.	3	$25,099.00	$75,297.00
1D.6	Flushing Hydrant Assembly	ea.	1	$11,695.00	$11,695.00
1D.7	Water Main Tie-in				
a)	Railway Street	ea.	1	$15,500.00	$15,500.00
b)	Scotia Bank	ea.	1	$15,500.00	$15,500.00
1D.8	Temporary Water Service Installation	ea.	2	$10,000.00	$20,000.00
1D.9	Water Service (Abandoned In Place)	LS	1	$15,000.00	$15,000.00
1D.10	Pipe Insulation	m^2	70	$128.00	$8,960.00
1D.11	Service Connections (Optional)	ea.	2	$5,000.00	$10,000.00
	Total Schedule "1D"				**$1,016,665.00**
Schedule "1E" - Utilities - Miscellaneous					
1E.1	Initial Flushing, Mandrel Testing and Video Inspectic	LS	1	$10,000.00	$10,000.00
1E.2	Final Flushing, Mandrel Testing and Video Inspectio	LS	1	$10,000.00	$10,000.00
1E.3	Type A Rock Excavation (Optional)	m^3	250	$96.00	$24,000.00
1E.4	Type B Rock Excavation (Optional)	m^3	250	$80.00	$20,000.00
1E.5	Additional Bedding Placement (Optional)	m^3	200	$78.00	$15,600.00
	Total Schedule "1E"				**$79,600.00**
Schedule "1F" - Surface Work - Removal					
1F.1	Saw Cutting				
a)	Concrete	l.m.	100	$26.00	$2,600.00
b)	Asphalt	l.m.	100	$17.00	$1,700.00
1F.2	Asphalt Removal	m^2	4,100	$17.00	$69,700.00
	Total Schedule "1F"				**$74,000.00**
Schedule "1G" - Surface Work - Road					
1G.1	Sub-grade Preparation	m^2	4,100	$8.00	$32,800.00
1G.2	Granular Sub-base and Base				
a)	300mm Depth of Granular Sub-base (80mm)	m^2	4,100	$47.00	$192,700.00
b)	100mm Depth of Granular Base (20mm)	m^2	4,100	$60.00	$246,000.00
	Total Schedule "1G"				**$471,500.00**
Schedule "1H" - Surface Work - Asphalt Pavement					
1H.1	Prime Coat	m^2	4,100	$3.00	$12,300.00
1H.2	Tack Coat	m^2	4,100	$2.00	$8,200.00
1H.3	Asphalt Pavement				
a)	Base lift - 120mm Mix A	m^2	4,100	$86.00	$352,600.00
b)	Top Lift - 40mm Mix C	m^2	4,100	$55.00	$225,500.00
1H.4	Appurtenance Adjustments				
a)	Manhole	ea.	3	$650.00	$1,950.00
b)	Water Valve	ea.	3	$484.00	$1,452.00
	Total Schedule "1H"				**$602,002.00**

Schedule "1I" - Surface Work - Concrete

1I.1	Monolithic Sidewalk Replacement (Optional)	l.m.	300	$525.00	$157,500.00
1I.2	Concrete Island Replacement	m^2	50	$220.00	$11,000.00
	Total Schedule "1I"				**$168,500.00**

Schedule "1J" - Surface Work - Miscellaneous

1J.1	Paint Marking				
a)	Paint Marking - 100mm Yellow Solid Line	l.m.	400	$20.00	$8,000.00
b)	Paint Marking - 100mm White Solid Line	lm	700	$20.00	$14,000.00
c)	Vehicle Left Turn Arrow	ea.	6	$700.00	$4,200.00
1J.2	Inlaid Thermoplastic				
a)	Inlaid Thermoplastic Stop Bar 400 mm	l.m.	40	$110.00	$4,400.00
b)	Inlaid Thermoplastic 100 mm white solid line	l.m.	75	$15.00	$1,125.00
c)	Inlaid Thermoplastic 200 mm Crosswalk	l.m.	100	$70.00	$7,000.00
d)	Inlaid Thermoplastic Zebra Crosswalk	ea.	1	$3,500.00	$3,500.00
1J.3	Remove, Salvage, and Reinstall Traffic Signage	ea.	15	$550.00	$8,250.00
	Total Schedule "1J"				**$50,475.00**

Schedule "1K" - Landscaping

1K.1	Topsoil Placement (Optional)	m^2	500	$20.00	$10,000.00
1K.2	Topsoil Import (Optional)	m^3	100	$30.00	$3,000.00
1K.3	Seeding (Optional)	m^2	500	$12.00	$6,000.00
1K.4	Commercial Concrete Driveway Apron (Optional)	m^2	300	$225.00	$67,500.00
	Total Schedule "1K"				**$86,500.00**

Schedule "1L" - Shallow Utilities

1.L.1	Fortis Line Relocation	LS	1	$20,000.00	$20,000.00
1.L.2	TELUS Relocation	LS	1	$28,000.00	$28,000.00
1.L.3	Cash Allowance	CA	1	$50,000.00	$50,000.00
	Total Schedule "1L"				**$98,000.00**

Summary Schedule 1

	Total Schedule "1A"			**$1,307,000.00**
	Total Schedule "1B"			**$55,000.00**
	Total Schedule "1C"			**$953,000.00**
	Total Schedule "1D"			**$1,017,000.00**
	Total Schedule "1E"			**$80,000.00**
	Total Schedule "1F"			**$74,000.00**
	Total Schedule "1G"			**$472,000.00**
	Total Schedule "1H"			**$610,000.00**
	Total Schedule "1I"			**$170,000.00**
	Total Schedule "1J"			**$51,000.00**
	Total Schedule "1K"			**$87,000.00**
	Total Schedule "1L"			**$98,000.00**
			Total	**4,974,000.00**
	Class C Uncertainty Factor	20%		**$994,800.00**
			SUB TOTAL	$5,968,800.00
	Professional Services	10%		$596,880.00
	Internal Town Allowance (communications, legal, PM,	1%		$59,688.00
		Project Total (Rounded)		**$ 6,700,000.00**

APPENDIX E

CAPITAL UPGRADES COST ESTIMATES (5-10 YEARS)

CLASS C OPINION OF PROBABLE COST

River Heights Reservoir Pump Station Expansion

Town of Cochrane

June 25, 2024

	DESCRIPTION			Probable Cost (JUNE 2024)
1	GENREAL REQUIREMENTS		$	39,000
2	SITE WORKS		$	-
3	STRUCTURAL		$	7,000
4	PROCESS MECHANICAL		$	250,000
5	ELECTRICAL		$	124,000
6	BUILDING MECHANICAL		$	-
	SUB TOTAL		$	420,000
	Contingency	20%	$	80,000
	Professional Services	15%	$	80,000
	Project Total (Rounded)		$	580,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	50%	$	870,000
	-25%	$	435,000

Client:	Town of Cochrane	
Project No:	1728.0206.05	Phased Costs
Project Name:	River Heights Reservoir	
Date:	July 3, 2024	

		Build Phase 2 Only		
Item No.	Description	Phase 2 (1 pump)		
		QTY	Unit Price	Including Overhead
1.0 - General Requirements + Demolition + Temporary Measures				
1.1	General Requirements (Insurance, Safety, Bonding, etc, mob/demob, fencing, temp p	1.0	$ 39,000	$ 39,000
1.2	Excavation Groundwater Dewatering	0.0	$ 30,000	$ -
	Sub Total - Section 1.0			**$ 39,000**
2.0 -Site Works				
2.1	Common Excavation Surplus Material From Reservoir - Export Off Site as no fill is exp	0	$ 25	$ -
2.2	Backfill replacement from off-site	0	$ 35	$ -
2.3	Granular base for drainage below new cells	0	$ 35	$ -
2.4	Compacted Clay Tank Cover Fill	0	$ 6	$ -
2.5	Topsoil Remove (150mm Deep) and Stockpile	0	$ 17	$ -
2.6	Topsoil Replace 150mm Deep and Compact	0	$ 23	$ -
2.7	Permanent Fencing	0	$ 206	$ -
2.8	Install 400mm Water Main	0	$ 1,050	$ -
2.9	Install Water AWWA Valve 400mm	0	$ 23,000	$ -
3.0	Water Main Tie-ins	0	$ 6,869	$ -
3.1	New overflow Manhole (1200mm Diameter x 7m)	0	$ 14,884	$ -
3.2	Precast Headwall for Overflow Outlet	0	$ 5,725	$ -
3.3	Seeding and Landscaping	0.0	$ 138,418	$ -
3.4	Removal and replacement of road east side of the existing structure	0	$ 114	$ -
3.5	Removal of road south of proposed cell during excavation and replace paving and roa	0	$ 17	$ -
	Sub Total - Section 2.0			**$ -**
3.0 - Structural				
3.1	Concrete	0.0	$ 980,000	$ -
3.2	Connection joint between new and existing	0.0	$ 114,000	$ -
3.3	Waterproofing	0.0	$ 203,000	$ -
3.4	New Generator Pad / Foundation	0.0	$ -	$ -
3.5	New pump pedestals (demo and replace)	1.0	$ 6,563	$ 6,563
3.6	Generator room modification			
	Sub Total - Section 3.0			**$ 7,000**
4.0 - Process Mechanical				
4.1	Duty Pumps VT Type (1 additional pump)	1.0	$ 161,209	$ 241,813
4.2	Pump discharge header reducer (12" to 10")	1.0	$ 4,815	$ 7,223
4.3	Recirculation Line (See "Process Mechanical" tab)	0.0	$ 31,469	$ -
4.4	Overflow piping, does not include manhole (see "Process Mechanical" tab)	0.0	$ 89,142	$ -
4.5	Flow Testing Line (See "Process Mechanical' Tab	0.0	$ 6,340	$ -
4.6	Reservoir internal piping (see "Process Mechanical" tab)	0.0	$ 354,726	$ -
4.7	Groundwater drainage piping (see "Process Mechanical" tab)	0.0	$ 24,300	$ -
4.8	Vent and piping	0.0	$ 6,750	$ -
4.9	Combo Air Valve and Well Service Valve Allowance (Includes Spools Mods)	0.0	$ 1,766	$ -
4.10	New dewatering pump & controls	0.0	$ 20,000	$ -
4.11	1250L Totes Chlorine Storage, 2 Single Dosing Skids, Filling Piping, Dischrage Piping	0.0	$ 60,750	$ -
4.12	New sampling system	0.0	$ 1,350	$ -
4.13	Meter chamber upgrades (Add Actuators and Related Mods)	0.0	$ 10,000	$ -
4.14	Eyewash Station+ Thermostatic Mixing valve	0.0	$ 3,000	$ -
4.15	Mixing valves (duckbill)	0.0	$ 135,000	$ -
4.16	Second metering chamber - Complete	0.0	$ 200,000	$ -
4.17	Miscellaneous (remove and relocated existing drain and manhole, piping and equipment supports,new manhole drain piping)		$ -	$ -
	Sub Total - Section 4.0			**$ 250,000**
5.0 - Electrical and Instrumentation				
5.1	Instrumentation (see "Process Mechanical" tab)	0.5	$ 10,000	$ 6,250
5.2	Pump Breakers in MCC	1.0	$ 8,500	$ 9,350
5.3	Pump 200HP VFD	1.0	$ 42,000	$ 46,200
5.4	Pump Connections	1.0	$ 22,000	$ 24,200
5.5	Instrumentation Installation	0.5	$ 16,050	$ 8,025
5.6	Chlorine Analyzer	0.0	$ 13,910	$ -
5.7	Sump Pump Installation	0.0	$ 12,594	$ -
5.8	PLC Programming	1.0	$ 12,000	$ 14,400
5.9	Meter Vault Installation	0.0	$ 68,694	$ -
5.10	Temporary Generator Rental	0.0		$ -
5.11	Control Panel Additions	0.5	$ 25,000	$ 15,000
	Sub Total - Section 5.0			**$ 124,000**
6.0 - Building Mechanical				
6.1	Building HVAC Allowance (Assumed 60HP Heat Loads)	0.0	$ 32,100	$ -
	Sub Total - Section 6.0			**$ -**
Grand Sub Total				**$ 420,000**
Contingency:				**$ 80,000**
Engineering (15%)				**$ 80,000**
Project Grand Total[1]				**$ 580,000**
Grand Totals Rounded Up To Nearest $1000.				

CLASS E OPINION OF PROBABLE COST

600mm Feedermain

Town of Cochrane

May 9, 2024

	DESCRIPTION			Probable Cost (MAY 2024)
A.	SITE WORKS		$	320,000
B	WATERMAINS		$	2,590,000
C	SURFACE WORKS		$	600,000
	SUB TOTAL		$	3,510,000
	Contingency	50%	$	1,755,000
	Professional Services (Environmental Monitoring Incl.)	16%	$	840,000
	Project Total (Rounded)		$	6,105,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	12,210,000
	-50%	$	3,052,500

Estimate Assumptions

-Estimate Completed May 2024.

-Cost Estimate is Class E (50% Contingency, 15% Engineering, 1% Allowance Carried for Environmental Monitoring)

-Costs shown are in $2024 based on an assumed inflation from 2023 pricing, or recently received 2024 pricing

-Estimate does not allow for full road reconstruction, saw cut and asphalt patching assumed

-No allowance for curb and gutter installation

-Estimate is based on infrastructure shown in Town's GIS as of February 2024.

-Geotechnical Work has not yet been completed. Slope stability analysis required to confirm the feasibility of this project

-In absence of geotechnical reporting, allowances have been made for dewatering, but no costs have been carried for unsuitable fill export/suitable fill import

-It is assumed watermain is approximately 3.5m deep

-It has been assumed that trench box installation is required for area where directional drilling does not take place. An allowance has been made for this in pipe pricing, but surface pricing assumes full disturbance due to equipment working requirements

-Cost estimate does not allow for removal and replacement of existing infrastructure (valves, piping). Allowances have been made for tie in only should it be found that replacement is required due to age and material of pipe

-No relocation of existing utilities considered

-Assume no internal works at the Water Treatment Plant. It is assumed that tie in near the water treatment plant will not require crossing of the existing pond and will travel north of the WTP and tie in on the west side.

Project: 600mm Feeder main from WTP to Main pressure zone
Location- Bow Street, Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: May 9, 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" SITE WORKS						
A.1	Mobilization	ls	1	$ 110,000.00	$	110,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 20,000.00	$	20,000.00
A.3	Erosion and Sediment Control	ls	1	$ 90,000.00	$	90,000.00
A.4	Locating, Exposing and Protecting Existing Utilities	hr	15	$ 500.00	$	7,500.00
A.5	Saw Cutting - Asphalt	lm	140	$ 17.00	$	2,380.00
A.6	Asphalt and Base Removal and Disposal (Road and Pathway)	m^2	2140	$ 17.00	$	36,369.30
A.7	Dewatering	Allowance	1	$ 50,000.00	$	50,000.00
				SUBTOTAL SCHEDULE "A"	$	320,000.00
SCHEDULE "B" WATERMAINS						
B.1	Supply and Install 600mm PVC DR 18	lm	970	$ 1,300.00	$	1,261,000.00
B.2	Supply and Install 600mm HDPE (Trenchless Installation)	l.m.	340	$ 3,052.00	$	1,037,680.00
B.3	Watermain Tie Ins					
	a) Water Treatment Plant	ea.	1	$ 95,000.00	$	95,000.00
	b) West Rock Road	ea.	1	$ 40,000.00	$	40,000.00
B.4	Storm System Crossing	ea.	1	$ 5,000.00	$	5,000.00
B.5	Supply and Install Cross/Tee - 600mm	ea.	2	$ 7,000.00	$	14,000.00
B.6	Supply and Install Valve- 600mm	ea.	4	$ 35,000.00	$	140,000.00
				SUBTOTAL SCHEDULE "B"	$	2,590,000.00
SCHEDULE "C" SURFACE WORKS						
C.1	Subgrade Prep. - Road and Pathway	m^2	2140	$ 7.00	$	14,980.00
C.2	300 mm - 80 mm Granular Sub-Base Gravel - Road repairs only	m^2	700	$ 38.00	$	26,600.00
C.3	100 mm - 25 mm Granular Base Course - Road repairs only	m^2	700	$ 31.00	$	21,700.00
C.4	120 mm - City Mix 'A' ACP - Road repairs only	m^2	700	$ 70.00	$	49,000.00
C.5	40mm - City Mix 'B' ACP - Road repairs only	m^2	700	$ 28.00	$	19,600.00
C.6	3.0m Multi-Use Pathway (CoC Specifications)	m^2	1440	$ 52.50	$	75,600.00
C.7	Prime Coat- Road repairs only	m^2	700	$ 3.00	$	2,100.00
C.8	Tack Coat- Road repairs only	m^2	700	$ 2.00	$	1,400.00
C.9	Park Area Reinstatement	m^2	12960	$ 20.00	$	259,200.00
C.10	Fencing - Removal and Replacement Allowance	m	610	$ 215.00	$	131,150.00
				SUBTOTAL SCHEDULE "C"	$	600,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" SITE WORKS			$ 320,000.00
SCHEDULE "B" WATERMAINS			$ 2,590,000.00
SCHEDULE "C" SURFACE WORKS			$ 600,000.00
	SUB TOTAL		$ 3,510,000.00
	CONTINGENCY	50%	$ 1,755,000.00
	SUB TOTAL		$ 5,265,000.00
	3RD PARTY ENVIRONMENTAL MONITORING COSTS	1%	$ 50,000.00
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 790,000.00
	TOTAL PROJECT COST		$ 6,105,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%	$ 12,210,000.00
		-50%	$ 3,052,500.00

CLASS E OPINION OF PROBABLE COST

Cochrane Heights Fire Flow Improvements

Town of Cochrane

June 25, 2024

	DESCRIPTION			Probable Cost (SEPTEMBER 2023)
A.	Watermain Installation		$	2,870,000
B	Reservior		$	2,650,000
C	Pump Station		$	3,290,000
	SUB TOTAL		**$**	**8,810,000**
	Contingency	50%	$	4,410,000
	Professional Services	15%	$	1,980,000
	Project Total (Rounded)		**$**	**15,200,000**

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	**$**	**30,400,000**
	-50%	**$**	**7,600,000**

Project: Cochrane Heights Linear Infrastructure Improvements

Location- Cochrane Heights, Cochrane (Chinook Dr, Tri-School Site)

Owner: Town of Cochrane

Estimate- Class E OPC

Date: June 26, 2024

USL Job No - TBD

-Estimate Completed February 2024, Revised June 2024.
-Estimate does not allow for full road reconstruction, saw cut and asphalt patching assumed
-No allowance for curb and gutter removal and replacement
-Estimate based on infrastructure shown in Town's GIS February 2024
-It is assumed that all work takes place under the same mobilizatior
-It is assumed that trench box installation will be required. A premium is provided for this. (5m width assumed
-Assume watermain through school sites will also require Trench Box due to asphalt parking lot (5m width
-Assume watermain through school sites will be restored to asphalt parking lot only.
-Assumed open trench installation from pump house to 4th avenue
-All watermains assumed to be approximately 3m deep.
-Assume replacement of existing valves only. No allowance has been made for additional valves
-Assume hydrants are replaced where watermain is being replaced
-Water service removal and replacement only allows for replacement at the main. Replacement does not go all the way to PL as this would increase surface costs significantly (more asphalt & curb and gutter replacement required)
-No relocation of existing utilities considered
-No geotechnical information available at time of estimate

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate	Extension
SCHEDULE "A" GENERAL SITE WORKS					
A.1	Mobilization	ls	1	$ 190,000.00	$ 190,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 80,000.00	$ 80,000.00
A.3	Erosion and Sediment Control	ls	1	$ 40,000.00	$ 40,000.00
A.4	Locating, Exposing, and Protecting Existing Utilities	hr	60	$ 500.00	$ 30,000.00
A.5	Dewatering	Allowance	1	$ 15,000.00	$ 15,000.00
				SUBTOTAL SCHEDULE "A"	**$ 360,000.00**
SCHEDULE "B" WATERMAIN - CHINOOK DR					
	Site Works				
B.1	Sawcutting - Asphalt	l.m.	700	$ 17.00	$ 11,900.00
B.2	Asphalt Base Removal and Disposal	s.m.	1800	$ 17.00	$ 30,600.00
	Watermains				
B.3	Supply and Install 200mm PVC DR 18 (Trench Box Assumed)	l.m.	350	$ 1,150.00	$ 402,500.00
B.4	Watermain Tie Ins				
a)	North Tie In	ea.	1	$ 10,000.00	$ 10,000.00
b)	South Tie In	ea.	1	$ 10,000.00	$ 10,000.00
B.5	Supply and Install Water Hydrant Assembly	ea.	3	$ 20,000.00	$ 60,000.00
B.6	Supply and Install Tee/Cross	ea.	2	$ 3,600.00	$ 7,200.00
B.7	Supply and Install Valve- 200 mm	ea.	3	$ 4,500.00	$ 13,500.00
B.8	Remove Existing Water Service	ea.	20	$ 2,000.00	$ 40,000.00
B.9	Water Service Installation	ea.	20	$ 4,000.00	$ 80,000.00
B.10	Temporary Water Service	ea.	20	$ 3,680.00	$ 73,600.00
	Surface Improvements				
B.11	Subgrade Prep	s.m.	1800	$ 7.00	$ 12,600.00
B.12	300mm - 80mm Granular Sub Base Gravel	s.m.	1800	$ 29.00	$ 52,200.00
B.13	100mm - 25mm Granular Base Course	s.m.	1800	$ 10.00	$ 18,000.00
B.14	120mm - City Mix 'A' ACP	s.m.	1800	$ 40.00	$ 72,000.00
B.15	40mm - City Mix 'B' ACP	s.m.	1800	$ 20.00	$ 36,000.00
B.16	Prime Coat	s.m.	1800	$ 3.00	$ 5,400.00
B.17	Tack Coat	s.m.	1800	$ 1.00	$ 1,800.00
				SUBTOTAL SCHEDULE "B"	**$ 940,000.00**
SCHEDULE "C" WATERMAIN - THROUGH SCHOOL SITES					
	Site Works				
C.1	Sawcutting - Asphalt	l.m.	1300	$ 17.00	$ 22,100.00
C.2	Asphalt Base Removal and Disposal	s.m.	3100	$ 17.00	$ 52,700.00
	Watermains				
C.3	Supply and Install 200mm PVC DR 18 (Trench Box Assumed)	lm	620	$ 1,150.00	$ 713,000.00
C.4	Watermain Tie Ins				
a)	North Tie In	ea.	1	$ 20,000.00	$ 20,000.00
b)	South Tie In	ea.	1	$ 20,000.00	$ 20,000.00
c)	East Tie In	ea.	1	$ 10,000.00	$ 10,000.00
d)	West Tie In	ea.	1	$ 10,000.00	$ 10,000.00
C.5	Supply and Install Water Hydrant Assembly	ea.	2	$ 20,000.00	$ 40,000.00
C.6	Supply and Install Tee/Cross	ea.	4	$ 3,600.00	$ 14,400.00
C.7	Supply and Install Valve- 200 mm	ea.	5	$ 4,500.00	$ 22,500.00
C.8	Remove Existing Water Service	ea.	3	$ 2,000.00	$ 6,000.00
C.9	Water Service Installation	ea.	3	$ 4,000.00	$ 12,000.00
C.10	Temporary Water Service	ea.	3	$ 3,680.00	$ 11,040.00
	Surface Improvements				
C.11	Subgrade Prep	s.m.	3100	$ 7.00	$ 21,700.00
C.12	300mm - 80mm Granular Sub Base Gravel	s.m.	3100	$ 29.00	$ 89,900.00
C.13	100mm - 25mm Granular Base Course	s.m.	3100	$ 10.00	$ 31,000.00
C.14	60mm - City Mix 'A' ACP	s.m.	3100	$ 25.00	$ 77,500.00
C.15	Prime Coat	s.m.	3100	$ 3.00	$ 9,300.00
				SUBTOTAL SCHEDULE "C"	**$ 1,180,000.00**
SCHEDULE "D" WATERMAIN - PUMP STATION TO 4TH AVE INTERSECTION					
	Site Works				
D.1	Sawcutting - Asphalt	l.m.	45	$ 17.00	$ 765.00
D.2	Asphalt Base Removal and Disposal	s.m.	100	$ 17.00	$ 1,700.00
D.3	Topsoil Stripping to Export (0.30m depth Assumed)	c.m.	600	$ 25.00	$ 15,000.00
D.4	Topsoil Stripping to Windrow (& Placement)	c.m.	900	$ 6.00	$ 5,400.00
	Watermains				
D.5	Supply and Install 250mm PVC DR 18 (Open Trench Assumed)	l.m.	210	$ 1,350.00	$ 283,500.00
D.6	Watermain Tie Ins				$ -
a)	Tie in at Pump Station/Reservoir	ea	1	$ 30,000.00	$ 30,000.00
b)	4th Avenue Tie In	ea	1	$ 10,000.00	$ 10,000.00
D.7	Supply and Install Water Hydrant Assembly	ea	0	$ 20,000.00	$ -
D.8	Supply and Install Tee/Cross	ea	1	$ 3,600.00	$ 3,600.00
D.9	Supply and Install Valve- 250 mm	ea	3	$ 6,500.00	$ 19,500.00
	Surface Improvements				
D.10	Subgrade Prep	s.m.	100	$ 7.00	$ 700.00
D.11	300mm - 80mm Granular Sub Base Gravel	s.m.	100	$ 29.00	$ 2,900.00
D.12	100mm - 25mm Granular Base Course	s.m.	100	$ 10.00	$ 1,000.00
D.13	120mm - City Mix 'A' ACP	s.m.	100	$ 40.00	$ 4,000.00
D.14	40mm - City Mix 'B' ACP	s.m.	100	$ 20.00	$ 2,000.00
D.15	Prime Coat	s.m.	100	$ 3.00	$ 300.00
D.16	Tack Coat	s.m.	100	$ 1.00	$ 100.00
D.17	Seed	s.m.	1900	$ 3.00	$ 5,700.00
				SUBTOTAL SCHEDULE "D"	**$ 390,000.00**

SUMMARY OF SCHEDULES

SCHEDULE "A" GENERAL SITE WORKS			$ 360,000.00
SCHEDULE "B" WATERMAIN - CHINOOK DR			$ 940,000.00
SCHEDULE "C" WATERMAIN - THROUGH SCHOOL SITES			$ 1,180,000.00
SCHEDULE "D" WATERMAIN - PUMP STATION TO 4TH AVE INTERSECTION			$ 390,000.00
SUB TOTAL			**$ 2,870,000.00**
CONTINGENCY	50%		$ 1,440,000.00
SUB TOTAL			**$ 4,310,000.00**
ENGINEERING, TESTING, AND CONTRACT ADMIN	15%		$ 650,000.00
TOTAL PROJECT COST			**$ 4,960,000.00**
Variance as per Town's Capital Project Cost Estimate Policy and Procedure	**100%**		**$ 9,920,000.00**
	-50%		**$ 2,480,000.00**

Project: Sunterra Booster Station Reservoir Expansion
Location- Cochrane Heights, Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: February 12, 2024
USL Job No - TBD

Assumptions/Notes
-Costs presented will be in $2024
-Site Investigation, feasibility, and conceptual estimate have not been completed
-Project costs based on a $/m3 based on recently obtained pricing for River Heights Reservoir
-RHR Cost estimate is based on an assumed reservoir expansion to build both cells (Phase 1B and Phase 2) at the same time.
-Estimate does not include any additional pumping capacity or above-ground building. Refer to separate estimate
-Capacity required for expansion is based on 2024 Water Wastewater Master Plan.
-It is assumed that tie into existing reservoir will not be possible. Therefore, expansion volume is based on recommended volume for fire suppression of a school
-Calculation is based on assuming that Fire flow ONLY will be supplied to service CH. All remaining flows are to be provided from Main PZ. Should additional flows be required, additional pumps and storage capacity would be required. These costs do not reflect this level of service
-No site investigation has been completed to confirm the feasibility of this work. Geotechnical investigation proposed at time of conceptual design.

Item	*Description*	*Unit of Measure*	*Estimated Quantity*	*Unit Rate*		*Extension*
SCHEDULE "A" RESERVIOR CONSTRUCTION						
A.1	Reservoir Construction Sub Total	m3	1,440	$ 1,840.00	$	2,649,600.00
			SUBTOTAL SCHEDULE "A"		**$**	**2,650,000.00**

SUMMARY OF SCHEDULES

SCHEDULE "A" RESERVIOR			$	2,650,000.00
	SUB TOTAL		**$**	**2,650,000.00**
	CONTINGENCY	50%	$	1,330,000.00
	SUB TOTAL		**$**	**3,980,000.00**
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$	597,000.00
	TOTAL PROJECT COST		**$**	**4,580,000.00**
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		**100%**	**$**	**9,160,000.00**
		-50%	**$**	**2,290,000.00**

Project: Sunterra Booster Station Expansion
Location- Cochrane Heights, Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: February 12, 2024
USL Job No - TBD

Assumptions/Notes
-Costs presented will be in $2024
-No geotechnical investigation completed at time of estimate
-Costs are based off lift station pricing from 2023 and have been scaled for assumed size of this lift station

Item	*Description*	*Unit of Measure*	*Estimated Quantity*	*Unit Rate*		*Extension*
SCHEDULE "A" BOOSTER STATION						
A.1	Fire Pump (Vertical Turbine Pump) - 190HP 210L/s, 50m head	l.s.	2	$ 242,000.00	$	484,000.00
A.2	HVAC / Process Piping	l.s.	1	$ 568,000.00	$	568,000.00
A.3	Generator	l.s.	1	$ 400,000.00	$	400,000.00
A.4	Electrical - MCC, PLC, Programming VFD	l.s.	1	$ 527,000.00	$	527,000.00
A.5	Building & Civil Site Works	l.s.	1	$ 612,000.00	$	612,000.00
A.6	Contractor General Requirements	l.s.	1	$ 700,000.00	$	700,000.00
				SUBTOTAL SCHEDULE "A"	**$**	**3,290,000.00**

SUMMARY OF SCHEDULES

SCHEDULE "B" BOOSTER STATION			$ 3,290,000.00
	SUB TOTAL		**$ 3,290,000.00**
	CONTINGENCY	50%	$ 1,645,000.00
	SUB TOTAL		**$ 4,935,000.00**
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 740,000.00
	TOTAL PROJECT COST		**$ 5,675,000.00**
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		**100%**	**$ 11,350,000.00**
		-50%	**$ 2,837,500.00**

CLASS E OPINION OF PROBABLE COST

Sanitary Burnco Trunk Upgrades

Town of Cochrane

May 21, 2024

	DESCRIPTION			Probable Cost (MAY 2024, $2024)
A.	SITE WORKS		$	670,000
B	SANITARY SEWER		$	3,620,000
C	SURFACE WORKS		$	600,000
D	LANDSCAPING		$	740,000
	SUB TOTAL		$	5,630,000
	Contingency	50%	$	2,820,000
	Professional Services	15%	$	1,270,000
	Project Total		$	9,720,000
	Project Total (Rounded)		$	10,000,000
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%	$	19,440,000
		-50%	$	4,860,000

Estimate Assumptions

- South Burnco Trunk (built in 1989, CONC 450) would be replaced and upgraded to a 900 PVC.
North Burnco Trunk (built in 2004) would remain the same.
- The alignment of the new 900 PVC trunk would follow the same alignment as the existing CONC 450.
- The existing manholes would be replaced and upgraded to 1S manholes.
- Length of pipe to replace and upgrade - 1220m
- Number of manholes to replace - 12
- Assumes sanitary bypass pumping required
- Access space on the south side would be required during construction
- Assumes asphalt and concrete median restoration at the arena/parking lot
- Assumes traffic accomodation at River Avenue
- Assumes some fence restoration
- It is assumed that sanitary main will be approximately 3-4m deep
- No geotechnical information available at this time of estimate
- No relocation of existing utilities considered.

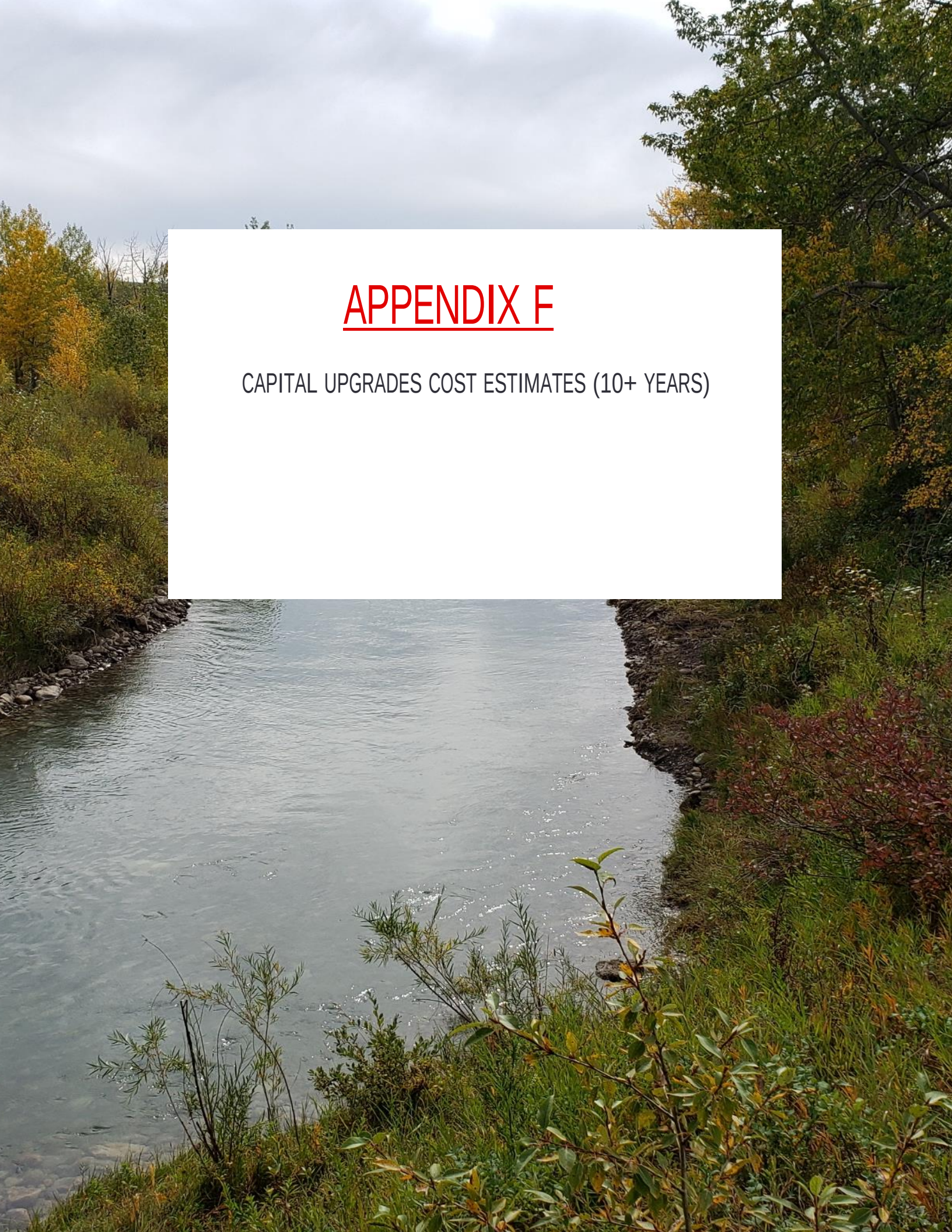
Project: Sanitary Burnco Trunk Upgrades
Location- Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: May 21, 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" - SITE WORK						
A.1	Mobilization and De-mobilization	ls	1	$ 90,000.00	$	90,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 60,000.00	$	60,000.00
A.3	Erosion and Sediment Control	ls	1	$ 70,000.00	$	70,000.00
A.4	Locating, Exposing and Protecting Existing Utilities	hr	40	$ 500.00	$	20,000.00
A.5	Temporary Site Fencing	ls	1	$ 60,000.00	$	60,000.00
A.6	Removal and Reinstallation of Fencing	ls	1	$ 5,000.00	$	5,000.00
A.7	Temporary Structures Along Alignment	ls	1	$ 5,000.00	$	5,000.00
A.8	Unsuitable Fill Export	m^3	500	$ 200.00	$	100,000.00
A.9	Excess Material Export	m^3	500	$ 100.00	$	50,000.00
A.10	Suitable Fill Import	m^3	500	$ 100.00	$	50,000.00
A.11	Saw Cutting - Asphalt	lm	250	$ 100.00	$	25,000.00
A.12	Asphalt and Road Structure Removal	m^2	3500	$ 40.00	$	140,000.00
				SUBTOTAL SCHEDULE "A"	$	670,000.00
SCHEDULE "B" - SANITARY SEWER						
B.1	Sewer Main Removal and Replacement					
a)	450mm Con Removal	lm	1330	$ 40.00	$	53,200.00
b)	900mm PVC	lm	1330	$ 2,130.00	$	2,832,900.00
B.2	Manhole (Type 5A) Removal and Replacement (Type 1S)					
a)	5A MH Removal	ea.	12	$ 2,500.00	$	30,000.00
b)	1S MH	ea.	12	$ 17,500.00	$	210,000.00
B.3	Sanitary Sewer Bypass Pumping	ls	1	$ 400,000.00	$	400,000.00
B.4	Sewer Main Tie -In					
a)	River Avenue	ea.	1	$ 20,000.00	$	20,000.00
b)	Bow Bend Way	ea.	1	$ 20,000.00	$	20,000.00
B.5	Sewer Service Replacement (Volker Stevin service and Rec Centre service)	ea.	2	$ 10,000.00	$	20,000.00
B.6	Initial Flushing, Mandrel Testing and Video Inspection	lm	1330	$ 13.00	$	17,290.00
B.7	Final Flushing, Mandrel Testing and Video Inspection	lm	1330	$ 15.00	$	19,950.00
				SUBTOTAL SCHEDULE "B"	$	3,620,000.00
SCHEDULE "C" - SURFACE WORK						
C.1	Granular Sub-base and Base					
a)	300mm Depth of Granular Sub- base (80mm)	m^2	3500	$ 40.00	$	140,000.00
b)	100mm Depth of Granular Base (25mm)	m^2	3500	$ 20.00	$	70,000.00
C.2	Prime Coat	m^2	3500	$ 6.00	$	21,000.00
C.3	Tack Coat	m^2	3500	$ 4.00	$	14,000.00
C.4	Asphalt Pavement					
a)	Base Lift - 120 mm Mix 'A'	m^2	3500	$ 70.00	$	245,000.00
b)	Top Lift - 40 mm Mix 'B'	m^2	3500	$ 30.00	$	105,000.00
				SUBTOTAL SCHEDULE "C"	$	600,000.00
SCHEDULE "D" - LANDSCAPING						
D.1	Topsoil Removal and Import	m^2	10000	$ 30.00	$	300,000.00
D.2	Landscape Rehab (Sodding/Seeding including topsoil spreading)	m^2	10000	$ 40.00	$	400,000.00
D.3	Concrete Surface Restoration - Medians in Parking Lot	m^2	200	$ 200.00	$	40,000.00
				SUBTOTAL SCHEDULE "D"	$	740,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" - SITE WORK			$ 670,000.00
SCHEDULE "B" - SANITARY SEWER			$ 3,620,000.00
SCHEDULE "C" - SURFACE WORK			$ 600,000.00
SCHEDULE "D" - LANDSCAPING			$ 740,000.00
SUB TOTAL			$ 5,630,000.00
CONTINGENCY	50%		$ 2,820,000.00
SUB TOTAL			$ 8,450,000.00
ENGINEERING, TESTING, AND CONTRACT ADMIN	15%		$ 1,270,000.00
TOTAL PROJECT COST			$ 9,720,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%		$ 19,440,000.00
	-50%		$ 4,860,000.00



APPENDIX F

CAPITAL UPGRADES COST ESTIMATES (10+ YEARS)

CLASS E OPINION OF PROBABLE COST

RHR Second Supply Line - Phase 1

Town of Cochrane

March 28, 2024

	DESCRIPTION			Probable Cost (MARCH 2024)
A.	SITE WORKS		$	540,000
B	EARTH WORKS		$	200,000
C	WATER		$	2,850,000
D	SURFACE WORKS		$	-
E	LANDSCAPING		$	230,000
	SUB TOTAL		$	3,820,000
	Contingency	25%	$	960,000
	Professional Services	15%	$	720,000
	Project Total (Rounded)		$	5,500,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	11,000,000
	-50%	$	2,750,000

Estimate Assumptions

•OPC was developed consistent with the Town of Cochrane Capital Project Cost Estimate Development Policy. For Conceptual Design "Class D" OPC is considered with 25% contingency.

•OPC is based on GIS figures dated March 6, 2024.

•No land acquisition or allowance for landowner engagement is included.

•Pricing was sourced from recent Town of Cochrane projects. Where this was not possible, pricing was sourced from other projects of similar scope tendered between 2022 and 2023 in Calgary or surrounding municipalities and an adjustment factor was applied based on the nature, size, and age of the project.

•Dewatering and Exposing, Locating, and Protecting Existing Utilities are considered as Cash Allowance for the contractor to bill hourly basis.

•It is assumed that watermain will be installed in the boulevard space along George Fox Trail.

•No service connections, fire hydrants, or meter chambers are included.

•Site works, earth works, and landscaping accounts for 1600 m2 areas at the start and end of trenchless installations.

•The assumed depth for open trench watermain installation is 3 m. No pipe insulation is included.

•It is assumed that geotechnical conditions are favorable for the proposed alignment and there are no prohibitive slope stability issues. The erosion pattern along the Bow River has not been evaluated to comment on any erosion based impacts to slope stability along this alignment.

•No geotechnical investigation has been performed. Some cash allowances are carried for rock excavation and contaminated soil export. This will be revised once more information is available.

•Open trench pipeline crossing allowance assumes an initial physical investigation to mitigate installation risks and costs. Hydrovac investigations to meet crossing agreements are incidental to pipeline crossing cost.

•Any shallow utilities removal, replacement, or installation is excluded from the scope.

•Future Highway 22 realignments will coincide with the encased pipe length included in this OPC.

•It is assumed that watermain will be installed as per the agreement alignment. Road restoration within Girl Guides will not be required.

•Seeding assumes "AT Zone 4 Agronomic Mix"

CLASS E OPINION OF PROBABLE COST

RHR Second Supply Line - Phase 2

Town of Cochrane

March 28, 2024

	DESCRIPTION			Probable Cost (MARCH 2024)
A.	SITE WORKS		$	370,000
B	EARTH WORKS		$	130,000
C	WATER		$	3,620,000
D	SURFACE WORKS		$	30,000
E	LANDSCAPING		$	200,000
	SUB TOTAL		$	4,350,000
	Contingency	25%	$	1,090,000
	Professional Services	15%	$	820,000
	Project Total (Rounded)		$	6,260,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	12,520,000
	-50%	$	3,130,000

Estimate Assumptions

•OPC was developed consistent with the Town of Cochrane Capital Project Cost Estimate Development Policy. For Conceptual Design "Class D" OPC is considered with 25% contingency.

•OPC is based on GIS figures dated March 6, 2024.

•No land acquisition or allowance for landowner engagement is included.

•Pricing was sourced from recent Town of Cochrane projects. Where this was not possible, pricing was sourced from other projects of similar scope tendered between 2022 and 2023 in Calgary or surrounding municipalities and an adjustment factor was applied based on the nature, size, and age of the project.

•Dewatering and Exposing, Locating, and Protecting Existing Utilities are considered as Cash Allowance for the contractor to bill hourly basis.

•It is assumed that watermain will be installed in the boulevard space along George Fox Trail.

•No service connections, fire hydrants, or meter chambers are included.

•Site works, earth works, and landscaping accounts for 1600 m2 areas at the start and end of trenchless installations.

•The assumed depth for open trench watermain installation is 3 m. No pipe insulation is included.

•It is assumed that geotechnical conditions are favorable for the proposed alignment and there are no prohibitive slope stability issues. The erosion pattern along the Bow River has not been evaluated to comment on any erosion based impacts to slope stability along this alignment.

•No geotechnical investigation has been performed. Some cash allowances are carried for rock excavation and contaminated soil export. This will be revised once more information is available.

•Open trench pipeline crossing allowance assumes an initial physical investigation to mitigate installation risks and costs. Hydrovac investigations to meet crossing agreements are incidental to pipeline crossing cost.

•Any shallow utilities removal, replacement, or installation is excluded from the scope.

•Future Highway 22 realignments will coincide with the encased pipe length included in this OPC.

•It is assumed that watermain will be installed as per the agreement alignment. Road restoration within Girl Guides will not be required.

•Seeding assumes "AT Zone 4 Agronomic Mix"

Project: RHR Second Supply Line
Location - Cochrane, Alberta
Owner: Town of Cochrane

Estimate- Class E OPC
Date: March 28, 2024
USL Job No - 1728.0456.01

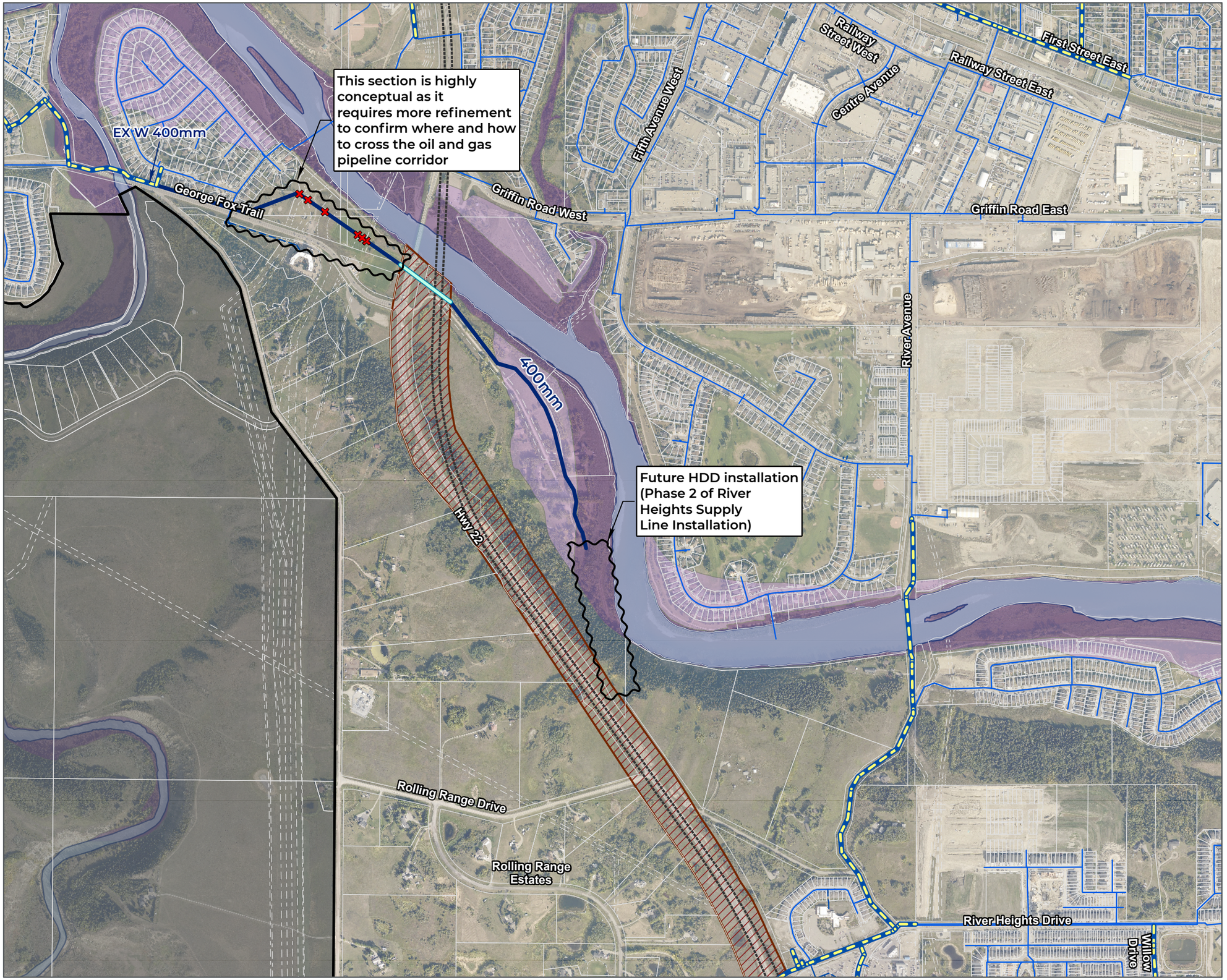
Item	Description	Unit of Measure	Estimated Quantity Phase 1	Estimated Quantity Phase 2	Unit Rate	Phase 1	Phase 2
SCHEDULE "A" SITE WORKS							
A.1	Mobilization and Demobilization	ls	1	1		$ 250,000.00	$ 175,000.00
A.2	Erosion and Sediment Control	ls	1	1		$ 75,000.00	$ 35,000.00
A.3	Traffic Accommodation	ls	1	1		$ 50,000.00	$ 50,000.00
A.4	Temporary Site Fencing	ls	1	1		$ 50,000.00	$ 35,000.00
A.5	Dewatering	ca	1	1		$ 50,000.00	$ 30,000.00
A.6	Additional Hydrovac Allowance for Unknown Conditions (optional)	ca	1	1		$ 60,000.00	$ 40,000.00
					SUBTOTAL SCHEDULE "A"	$ 540,000.00	$ 370,000.00
SCHEDULE "B" EARTH WORKS							
B.1	Clearing and Grubbing	m^2	730	6210	$ 10.00	$ 7,300.00	$ 62,100.00
B.2	Topsoil Stripping to Windrow	m^2	20550	13050	$ 2.00	$ 41,100.00	$ 26,100.00
B.3	Unsuitable Fill Export (Optional)	c.m.	2000	500	$ 20.00	$ 40,000.00	$ 10,000.00
B.4	Suitable Fill Import (Optional)	c.m.	2000	500	$ 45.00	$ 90,000.00	$ 22,500.00
B.5	Excess Material Export	cm	750	250	$ 20.00	$ 15,000.00	$ 5,000.00
					SUBTOTAL SCHEDULE "B"	$ 200,000.00	$ 130,000.00
SCHEDULE "C" WATER							
C.1	Water Main - 400mm						
	a) Open Trench Installation - PVC	lm	1600	990	$ 750.00	$ 1,200,000.00	$ 742,500.00
	b) Open Trench Installation - HDPE	lm	110	0	$ 1,300.00	$ 143,000.00	$ -
	c) HWY 22 AT ROW Auger Crossing with Encasement	lm	50	0	$ 6,300.00	$ 315,000.00	$ -
	d) HWY 22 AT ROW Open Trench Steel Encasement ONLY Installation	lm	110	0	$ 2,500.00	$ 275,000.00	$ -
	e) Girl Guide Site South Slope HDD	lm	0	400	$ 7,100.00	$ -	$ 2,840,000.00
C.2	Open Trench Pipeline Crossings	ea.	7	0	$ 125,000.00	$ 875,000.00	$ -
C.3	Water Valve	ea.	3	2	$ 12,200.00	$ 36,600.00	$ 24,400.00
C.4	Water Main Tie-in	ea.	1	2	$ 10,000.00	$ 10,000.00	$ 20,000.00
					SUBTOTAL SCHEDULE "C"	$ 2,850,000.00	$ 3,620,000.00
SCHEDULE "D" SURFACE WORKS							
D.1	Roadway Restoration	m^2	0	270	$ 125.00	$ -	$ 33,750.00
					SUBTOTAL SCHEDULE "D"	$ -	$ 30,000.00
SCHEDULE "E" LANDSCAPING							
E.1	Topsoil placement	m^2	20550	13050	$ 3.50	$ 71,925.00	$ 45,675.00
E.2	Topsoil Import (Optional)	c.m.	600	400	$ 20.00	$ 12,000.00	$ 8,000.00
E.2	Seeding	m^2	20550	13050	$ 6.50	$ 133,575.00	$ 84,825.00
E.3	Landscape Restoration (Trees and Shrubs)	ca	1	1		$ 5,000.00	$ 40,000.00
E.4	Tree Removal Allowance	ca	1	1		$ 5,000.00	$ 20,000.00
					SUBTOTAL SCHEDULE "E"	$ 230,000.00	$ 200,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" SITE WORKS		$ 540,000.00	$ 370,000.00
SCHEDULE "B" EARTH WORKS		$ 200,000.00	$ 130,000.00
SCHEDULE "C" WATER		$ 2,850,000.00	$ 3,620,000.00
SCHEDULE "D" SURFACE WORKS		$ -	$ 30,000.00
SCHEDULE "E" LANDSCAPING		$ 230,000.00	$ 200,000.00
SUB TOTAL		$ 3,820,000.00	$ 4,350,000.00
CONTINGENCY	25%	$ 960,000.00	$ 1,090,000.00
SUB TOTAL		$ 4,780,000.00	$ 5,440,000.00
ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 720,000.00	$ 820,000.00
TOTAL PROJECT COST		$ 5,500,000.00	$ 6,260,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$ 11,000,000.00	$ 6,260,000.00
	-50%	$ 2,750,000.00	$ 6,260,000.00

Last updated by sdeboerfuller on March 26, 2024 at 12:05 PM
Last exported by sdeboerfuller on March 26, 2024 12:05 PM
Last printed by sdeboerfuller on September 25, 2017 11:46 AM

U:\Projects_CAL\1728\0297\02\D-Design\GIS\Projects\Pro_Projects\1728029702_GirlGuide_revC_20240326.aprx\Cochrane - GG - Proposed Water Servicing - Option 2 - 20240326



cochrane
HOW THE WEST IS NOW

Town of Cochrane

Girl Guides' Camp Jubilee Offsite Servicing Concept Refinement

Proposed Water Servicing Option 2 - Through Girl Guides' Site

Legend

- Potential Crossing
- Existing 400m Water Main
- Existing Water Main
- Existing Private Water Main
- Encased Jointless Pipe
- Open Trench
- Current Assumed Highway 22 Realignment
- Possible Realignment and Expansion of Highway 22 ROW
- Waterbody
- Flood Fringe - 100yr
- Floodway - 100yr
- Municipal Boundary
- Rocky View County

The accuracy & completeness of information shown on this drawing is not guaranteed. It will be the responsibility of the user of the information shown on this drawing to locate & establish the precise location of all existing information whether shown or not.

0 100 200 300
Meters

N

Coordinate System:
NAD 1983 3TM 114

Scale: 1:10,500
(When plotted at 11"x17")

Data Sources:

- Data provided by the Town of Cochrane
- Flood Mapping provided by the Government of Alberta last assembled as of 2020

Project #:	1728.0297.02
Author:	SDF
Checked:	DR
Status:	**Review**
Revision:	A
Date:	2024 / 3 / 26

URBAN SYSTEMS

FIGURE 6

CLASS E OPINION OF PROBABLE COST

Bow Street Watermain Looping

Town of Cochrane

May 21, 2024

	DESCRIPTION			Probable Cost (MAY 2024)
A.	SITE WORKS		$	130,000
B	WATERMAINS		$	390,000
C	SURFACE WORKS		$	250,000
		SUB TOTAL	$	770,000
		Contingency 50%	$	380,000
		Professional Services 15%	$	170,000
		Project Total (Rounded)	$	1,320,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	2,640,000
	-50%	$	660,000

Estimate Assumptions

-Estimate Completed February 2024.

-Cost Estimate is Class E (50% Contingency, 15% Engineering)

-Costs shown are in $2024 based on an assumed inflation from 2023 pricing

-Estimate does not allow for full road reconstruction, saw cut and asphalt patching assumed

-No allowance for curb and gutter installation

-Estimate is based on infrastructure shown in Town's GIS as of February 2024.

-Assumed that both watermains are installed at the same time so mobilization/locates cost is shared.

-It is assumed both watermains are approximately 3m deep

-It is assumed that trench box installation will be required. A premium has been provided for this.

-Cost estimate assumes that watermain is located in road (GIS shows this off center).

Costs subject to change if watermain is located elsewhwere.

-Cost estiamte does not allow for removal and replacement of exsiting infraustructure (valves, piping) should it be found that replacement is required due to age and material of pipe

-No geotechnical information available at time of estimate

-No relocation of existing utilites considered

Project: 250mm Watermain loops along Bow Street
Location- Bow Street, Cochrane
Owner: Town of Cochrane

Estimate- Class E OPC
Date: May 21, 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" SITE WORKS						
A.1	Mobilization	ls	1	$ 30,000.00	$	30,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 30,000.00	$	30,000.00
A.3	Erosion and Sediment Control	ls	1	$ 10,000.00	$	10,000.00
A.4	Locating, Exposing and Protecting Existing Utilities	hr	30	$ 500.00	$	15,000.00
A.5	Saw Cutting - Asphalt	lm	530	$ 17.00	$	9,010.00
A.6	Asphalt and Base Removal and Disposal	m^2	1400	$ 17.00	$	23,793.00
A.7	Dewatering	Allowance	1	$ 10,000.00	$	10,000.00
				SUBTOTAL SCHEDULE "A"	$	130,000.00
SCHEDULE "B" WATERMAINS						
B.1	Supply and Install 250mm PVC DR 18 (Trenchbox Assumed)	lm	150	$ 1,730.00	$	259,500.00
B.2	Watermain Tie Ins					
	a) Charlesworth Ave.	ea.	1	$ 10,000.00	$	10,000.00
	b) River Ave.	ea.	1	$ 10,000.00	$	10,000.00
	c) Alley	ea.	1	$ 10,000.00	$	10,000.00
	d) Fisher Ave.	ea.	1	$ 10,000.00	$	10,000.00
B.3	Storm System Crossing	ea.	2	$ 5,000.00	$	10,000.00
B.4	Supply and Install Cross/Tee - 250mm	ea.	4	$ 3,600.00	$	14,400.00
B.5	Supply and Install Hydrant	ea.	1	$ 23,100.00	$	23,100.00
B.6	Supply and Install Valve- 250 mm	ea.	5	$ 7,710.00	$	38,550.00
				SUBTOTAL SCHEDULE "B"	$	390,000.00
SCHEDULE "C" SURFACE WORKS						
C.1	Subgrade Prep.	m^2	1400	$ 7.00	$	9,800.00
C.2	300 mm - 80 mm Granular Sub-Base Gravel	m^2	1400	$ 38.00	$	53,200.00
C.3	100 mm - 25 mm Granular Base Course	m^2	1400	$ 31.00	$	43,400.00
C.4	120 mm - City Mix 'A' ACP	m^2	1400	$ 70.00	$	98,000.00
C.5	40mm - City Mix 'B' ACP	m^2	1400	$ 28.00	$	39,200.00
C.6	Prime Coat	m^2	1400	$ 3.00	$	4,200.00
C.7	Tack Coat	m^2	1400	$ 2.00	$	2,800.00
				SUBTOTAL SCHEDULE "C"	$	250,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" SITE WORKS			$ 130,000.00
SCHEDULE "B" WATERMAINS			$ 390,000.00
SCHEDULE "C" SURFACE WORKS			$ 250,000.00
	SUB TOTAL		$ 770,000.00
	CONTINGENCY	50%	$ 380,000.00
	SUB TOTAL		$ 1,150,000.00
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 170,000.00
	TOTAL PROJECT COST		$ 1,320,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%	$ 2,640,000.00
		-50%	$ 660,000.00

CLASS E OPINION OF PROBABLE COST

Railway Street E to Griffin Rd E Watermain Loop

Town of Cochrane

May 21, 2024

	DESCRIPTION			Probable Cost (MAY 2024)
A.	SITE WORKS		$	170,000
B	WATERMAINS		$	560,000
C	SURFACE WORKS		$	110,000
D	LANDSCAPE RESTORATION WORKS		$	180,000
	SUB TOTAL		$	1,020,000
	Contingency	50%	$	510,000
	Professional Services	15%	$	230,000
	Project Total (Rounded)		$	1,760,000

Variance as per Town's Capital Project Cost Estimate Policy and Procedure	100%	$	3,520,000
	-50%	$	880,000

Estimate Assumptions

-Estimate Completed February 2024

-Cost Estimate is Class E (50% Contingency, 15% Engineering)

-Costs shown are in $2024 based on assumed inflation from 2023 pricing

-Estimate is based on infrastructure shown in Town's GIS as of February 2024

-It is assumed watermain will be approximately 3m deep

-Estimate is based on open trench installation

-Cost estimate does not allow for remoal and replacement of existing infrastructure

-No geotechnical information available at time of estimate

-No relocation of existing utilities considered

-No land acquisiton has been allowed for in this estimate. It is assumed Town easement is wide enough to install watermain with open trench

-No rock excavation or export has been allowed for

-It is assumed that surfaces disturbed will be restored back to existing condition

Project: 250mm Watermain from Railway St. E to Griffin Rd E.
Location- Railway St E to Griffin Rd E
Owner: Town of Cochrane

Estimate- Class E OPC
Date: May 21, 2024
USL Job No - 1728.0456.01

Item	Description	Unit of Measure	Estimated Quantity	Unit Rate		Extension
SCHEDULE "A" SITE WORKS						
A.1	Mobilization	ls	1	$ 50,000.00	$	50,000.00
A.2	Traffic Accommodation Strategy	ls	1	$ 20,000.00	$	20,000.00
A.3	Erosion and Sediment Control	ls	1	$ 10,000.00	$	10,000.00
A.4	Locating, Exposing and Protecting Existing Utilities	hr	30	$ 500.00	$	15,000.00
A.5	Asphalt and Base Removal and Disposal	m^2	570	$ 17.00	$	9,687.15
A.6	Curb and Gutter Removal and Disposal	lm	40	$ 57.50	$	2,300.00
A.7	Saw Cutting - Asphalt	lm	50	$ 17.00	$	850.00
A.8	Remove and Dispose Top Soil/Gravels	m^2	2030	$ 20.00	$	40,600.00
A.9	Dewatering	Allowance	1	$ 20,000.00	$	20,000.00
				SUBTOTAL SCHEDULE "A"	$	170,000.00
SCHEDULE "B" WATERMAINS						
B.1	Supply and Install 250mm PVC DR 18 (Open Trench Assumed)	lm	320	$ 1,430.00	$	457,600.00
B.2	Watermain Tie Ins					
	a) Railway Street E	ea.	1	$ 10,000.00	$	10,000.00
	b) Griffin Rd E	ea.	1	$ 10,000.00	$	10,000.00
	Water Hydrant Assembly	ea.	1	$ 18,140.00	$	18,140.00
B.3	Supply and Install 250x250mm Tee	ea.	3	$ 4,960.00	$	14,880.00
B.4	Supply and Install Valve- 250 mm	ea.	6	$ 7,710.00	$	46,260.00
				SUBTOTAL SCHEDULE "B"	$	560,000.00
SCHEDULE "C" SURFACE WORKS						
C.1	Standard Curb with 250mm Gutter on Gravel	lm	40	$ 240.00	$	9,600.00
C.2	Subgrade Prep.	m^2	570	$ 6.88	$	3,921.89
C.3	300 mm - 80 mm Granular Sub-Base Gravel	m^2	570	$ 37.87	$	21,584.48
C.4	100 mm - 25 mm Granular Base Course	m^2	570	$ 37.95	$	21,631.50
C.5	120 mm - City Mix 'A' ACP	m^2	570	$ 69.09	$	39,378.74
C.6	40mm - City Mix 'B' ACP	m^2	570	$ 31.50	$	17,955.00
C.7	Prime Coat	m^2	570	$ 3.00	$	1,710.00
C.8	Tack Coat	m^2	570	$ 1.50	$	855.00
				SUBTOTAL SCHEDULE "C"	$	110,000.00
SCHEDULE "D" LANDSCAPE RESTORATION WORKS						
D.1	Gravel Import - 150mm depth 25mm supply and placement	m^2	2030	$ 56.93	$	115,557.75
D.2	Removal and Disposal of on-site debris	Allowance	1	$ 10,000.00	$	10,000.00
D.3	Remove and Replace Fence & Gate	Allowance	1	$ 50,000.00	$	50,000.00
				SUBTOTAL SCHEDULE "D"	$	180,000.00

SUMMARY OF SCHEDULES

SCHEDULE "A" SITE WORKS			$ 170,000.00
SCHEDULE "B" WATERMAINS			$ 560,000.00
SCHEDULE "C" SURFACE WORKS			$ 110,000.00
SCHEDULE "D" LANDSCAPE RESTORATION WORKS			$ 180,000.00
	SUB TOTAL		$ 1,020,000.00
	CONTINGENCY	50%	$ 510,000.00
	SUB TOTAL		$ 1,530,000.00
	ENGINEERING, TESTING, AND CONTRACT ADMIN	15%	$ 230,000.00
	TOTAL PROJECT COST		$ 1,760,000.00
Variance as per Town's Capital Project Cost Estimate Policy and Procedure		100%	$ 3,520,000.00
		-50%	$ 880,000.00

APPENDIX G

COMMENT LOG

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LEGEND
Figure comments
A Report Wording
A Actual Comment

ITEM	PAGE		COMMENT			RESPONSE	NEXT STEPS
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1	11	1.3 Level of Service and Risk assessment	2024-09-10	Shawn Tooth	It was requested by the Town to exclude risk-based assessments related to condition and asset renewal; therefore, this plan primarily focuses on the technical needs related to risk: system capacity and reliability This does not need to be worded this way. Please adjust this paragraph so that it simply points out that risk based assessments were not completed.	Text revised to read: "This analysis excludes risk-based assessments related to condition and asset renewal; therefore, this plan primarily focuses on the technical needs related to risk: system capacity and reliability."	None.
2	13	Figure 2 - W&WW master plan overview	2024-08-08	Shawn Tooth	If we are going to include Cochrane Lakes Community, please include Springbank schools.	Cochrane Lakes Community was included in the figure because demands directly feed into the Town's sanitary system network, and these flows were part of the existing and growth analyses. Areas that contribute to the pipeline to Calgary (Springbank schools, Harmony, etc.) are not included in this figure because that is part of the CHRC work and these flows were not analyzed as part of the Master Plan.	None.
3	20	4.1.1 Design criteria - potable water demands	2024-09-05	Rebecca Carroll	20 households per hectare is based on the Town's current density [10] Should this calc be looked at closer going forward? Ave lot size = 432m2, current lot sizes = ~300m2. How will 28+ households per hectare impact this calculation? Is it the demand of 20 homes at 270 lpd or the demand of 28 homes at 235 lpd?	Response to comments #3 and #4: Updating the data to the current year's census would result in a change to the design basis of both the water and sanitary models. Typically, the results of these studies lag behind the most current information due to the amount of time it takes to complete the study. In addition, these changes will not change the outcomes of the long-range plan. As discussed in the final master plan meeting, we will update the text of the report to indicate the date of this information so that the reader knows it was from before the census was complete.	None.
4	20	4.1.1 Design criteria - potable water demands	2024-08-08	Shawn Tooth	2. 2.6 is the average household size as identified in the 2021 Federal Census [9] Should we update this to this year's census?		None.
5	22	Table 4. Min/Max operating pressure standard	2024-09-04	Rebecca Carroll	In 2013 the Town of Cochrane implemented a bylaw requiring all premises connected to the waterworks system by a service connection be installed with a pressure reducing valve (PRV) set to 65psi [13]. The PRV requirement predates 2013. most likely ~1994.	Text adjusted to remove reference to date, but bylaw reference remains in text.	None.
6	27	4.1.2 water system planning and assessment	2024-09-04	Rebecca Carroll	In general, the best practice is that a reservoir should be able to fill at MDD for the reservoir service area to allow for efficient storage recovery meaning the fill rate should equal the MDD of the supply area? define "efficient storage recovery" fills in # of hours	Assigning a number of hours is difficult to do as the draw on the reservoir in any given scenario will be different. For example, recovery of a fire vs recovery of a normal day demands. Reservoirs should be designed to fill at an MDD flow rate (i.e., L/s) for the service area, similar to how a WTP should be designed to deliver MDD demands for the whole Town (provided that there is sufficient fire storage elsewhere). Text of report revised to clarify "MDD flow rate" in this section.	None.

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7	33	5.1 model developments (fire flow requirements)	2024-09-04	Rebecca Carroll	Is hydrant testing a formal recommendation? Should it be added to the summary?	Hydrant Testing can be conducted for two purposes: 1)Model Calibration – This hasn't been done since before 2011 (confirmed by Nic Abarca) and should be done every ~5 years (along with a SCADA data review). This will be done to test the C factor used in the model. 2)Model Results Verification: Hydrant testing should be conducted for every major development to verify that what the model is predicting in a development is actually what is available on site. For flows >100 L/s, this would mean testing multiple hydrants at the same time, as the theoretical limit on individual hydrants is 80-120 L/s each. (for Example, if 300 L/s is needed 3-4 hydrants within 90m of the development should be tested to ensure this flow is provided) AWWA has recommendations for how many hydrants per pressure zone should be tested, this should be consulted prior to developing the testing program. Recommendations/language throughout will be adjusted to indicate this. (Section 5.1 and 8.1.1)	None.
8	33	5.1 model developments (fire flow requirements)	2024-09-04	Rebecca Carroll	Future systems may have limited fire flows from existing fire storage available in reservoirs, existing pump system capacity, and topography. Is this addressed by requiring FUS calculations and HA?	This means that if a reservoir was designed for a certain fire storage availability/pumping capacity, growth in those areas will be limited to that availability. Yes, the idea is that with FUS/Hydraulic Analysis calculations on buildings/areas of concern, we can ensure that buildings that do not meet the fire storage limitations will not be built in these areas. For those buildings that have already been built, other mitigation measures may need to be implemented, which may need to be strategized with Fire Services. No change to text of report in this section.	None.
9	35	Figure 9 - existing water system	2024-09-04	Rebecca Carroll	This is a check valve (location is west), flow direction west to east.	Figure to be updated. Check valves are not shown on existing water system map (only PRVs and isolation valves), therefore valve will be removed.	None.
10	36	Figure 10 - water system schematic	2024-08-09	Shawn Tooth	Just wanted to say that I love this figure!	Thank you!	None.
11	36	Figure 10 - water system schematic	2024-08-09	Shawn Tooth	Plz label this [reservoir]	Label added here for clarity since "Main Pressure Zone (2MG)" is further away from the reservoir icon than others.	None.
12	37	5.2.1 water license	2024-09-10	Shawn Tooth	I see that you have included the irrigation license in our consumptive total, should it not be represented as 260 (52 x 5) consumptive rather than 52?	No , this table represents the total licence volumes, so the total available to draw on that licence is 52 only. A column has been added to represent how much licence can be used of the non-consumptive licence given the current (Fall 2024) consumptive licence pairings with the non-consumptive licence.	None.
13	37	5.2.2 WTP	2024-09-10	Shawn Tooth	The WTP was originally designed to produce an MDD of 8 MLD. In 2016, Urban Systems completed a report titled "Town of Cochrane Water Treatment Upgrade Study", which identified how the plant could be upgraded to achieve 29.7 MLD, with estimated phasing and timelines for implementation [19] I would prefer to have this section reference the 2024 WTP Capacity Assessment instead. At the very least, let's ear mark this section for update in 2025!	Text of Section will not change. Letter at front of this report will indicate that this section is meant to be updated once the 2024 WTP Capacity Assessment is complete.	Letter to be completed.

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14	40	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	Lower Gleneagles can fill from the main pressure zone directly or from the 2MG Reservoir, as the 2MG reservoir services the main pressure zone. likely fill source	No change to text, as noted, it is possible to fill both ways.	None.
15	40	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	This pump station only delivers water when the Upper Gleneagles reservoir depletes to a specified elevation. Summer operation: P-1 running in hand. P-2 and P-3 operate based on the specified elevation.	Response to comments #15 and #16: Text of the report updated to indicate the summer operation. It is assumed that this process will change through the execution of the projects/recommendations within the fire pumps memo (which has now been added to the report as discussed in the Master Plan final meeting).	None.
16	40	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	When the Lower Gleneagles pumps are not running, water is distributed to the Lower Gleneagles neighborhood by gravity from the Upper Gleneagles reservoir. blended supply during summer months due to p-1 running in hand.		None.
17	41	5.2.3 existing system - treated water reservoirs	2024-08-09	Shawn Tooth	The Ranchehouse reservoir does not have adequate storage capacity to suppress a fire at the Ranchehouse, which is assumed to require 180 L/s for 2 hours. The Ranchehouse (Saint Timothy) reservoir is connected to the Sunset Ridge reservoir. Does that not solve our problem?	We have reviewed the as builts for this reservoir, but without the as-builts for the WHC reservoir, we are unable to say for certain whether these reservoirs are interconnected. A recommendation has been added to conduct a more detailed review.	None .
18	41	5.2.3 existing system - treated water reservoirs	2024-09-05	Rebecca Carroll	is 180L/s for 2 hours sufficient for the 98 unit building at 207 Sunset Drive? Is this a property that may need a FUS completed?	The model results do not indicate that there is insufficient storage or fire supply based on land use, but during the final meeting with the Town, this was noted as a building of concern. Therefore, text has been added to section 5.2.3 to recommend a building specific FUS calculation. In addition, this recommendation has been added to Section 7.1.1, which summarizes where FUS calculations should be completed.	None.
19	42	5.2.3 existing system - treated water reservoirs	2024-08-09	Shawn Tooth	Let's not combine Sunterra with Cochrane Heights, please break Cochrane Heights out. We should discuss the limitations in Cochrane Heights here, at the very least, identify the risks we are facing.	Response to comments #19, #20, and #21: As discussed in the Final Master Plan meeting: -The Cochrane Heights Booster station is always running, increasing the HGL to Cochrane Heights at all times (as confirmed by the Town), however, the CH booster station was designed only for PHD flows of the Cochrane Heights area, and is not capable of supplying fire flows to CH. Therefore, daily demands are typically supplied to CH by the main pressure zone. -It was concluded that the Town wanted USL to assign the fire storage demand of the tri-school site to the Sunterra Reservoir (which will result in an existing system deficiency for this reservoir), with the first step being to confirm the fire demand in CH prior to proposing a reservoir and fire pump expansion. **-To validate this concept:** Another option, not discussed in the meeting, would be to complete hydrant testing with close monitoring of the 2MG and Sunterra Reservoir levels to confirm how the reservoirs supply fire flows prior to completing a reservoir upgrade, assuming accurate SCADA data is available. Therefore: the text of the report will be updated to indicate the operation (existing system conditions, growth to Town Boundary recommendations, and final summary of recommendations), but the figure will remain the same as the supply to this neighborhood is still shared between the reservoirs (this figure is not only for fire flows, but also for emergency and balancing storage).	None.
20	42	5.2.3 existing system - treated water reservoirs	2024-09-10	Shawn Tooth	The Sunterra reservoir is fed from the existing distribution system and WTP. This is not a direct feed, as water travels through the distribution network to reach this reservoir and relies on the hydraulic grade of the main pressure zone for its fill rate. During periods of high demand, where the hydraulic grade of the main pressure zone is low, the Sunterra reservoir can supply demands to the Cochrane Heights neighborhood by gravity, but there is a check valve in place preventing the Sunterra reservoir from back feeding the main pressure zone. Isn't the Sunterra fill line HGL elevated from the main pressure zone by the Cochrane Heights Booster?		
21	42	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	The Sunterra reservoir is fed from the existing distribution system and WTP. supplied from Cochrane heights booster station.		

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22	42	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	Fire storage for Cochrane Heights is contained in the 2MG reservoir, but fire flows cannot currently be achieved by the Cochrane Heights Booster Station (discussed further in Section 5.2.4). Flows may be supplemented by the Sunterra reservoir 4th avenue vault check valve will open of there is low pressure condition in Cochrane heights.	Text updated in Section 5.2.3 to add clarity to this.	None.
23	42	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	I don't believe that the altitude valves (2MG Res.) are functional - level responds to HGL	Minor revisions to text: Reservoir is filled and depleted based on the HGL of the system. There are altitude valves, but their functionality is yet to be determined.	Letter to be completed - 2MG reservoir expansion feasibility design should take this into consideration
24	42	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	The Town has difficulty controlling the fill of [the 2MG] reservoir during periods of high demand as the flow from the WTP are directly demanded by the system before reaching the reservoir under those conditions reduced system losses, identification of YYC valves has drastically improved the ability to fill the 2M. Further data needed. 2024 High Demand period 07.08 to 07.31 showed daily recovery of 2M volume.	As discussed in the final review meeting, we will provide the Town with a list of all of the data we would like to see for an EPS model update/ recalibration following the discovery of this valve. A lot of the recommendations made previously (such as a the 600mm feeder main) may no longer be required as a result of this discovery. This needs to be confirmed.	List of SCADA data required to be provided, Letter to indicate EPS recalibration is a likely next step.
25	43	5.2.3 existing system - treated water reservoirs	2024-09-04	Rebecca Carroll	Should the age of reservoirs be included (in the summary)? Thinking of Sunterra (built ~1960) and 500 (1974)	Per comment #1: We were asked to exclude scope to speak to age and condition of asset renewal. We did this for the pipes because the data and maps were readily available to be updated. We can do this in the final iteration of the master plan, if desired by the Town (reservoirs, pump stations, lift stations).	Letter to be completed.
26	46	5.2.4 existing system - Pump stations	2024-09-10	Shawn Tooth	Under normal operating conditions, the main pressure zone (2MG Reservoir and WTP) supplies water to Cochrane Heights and the Sunterra Reservoir, and the Cochrane Heights pump station helps maintain the pressure in this community when demands are high. During higher demand periods, such as when fighting a fire, the Sunterra Reservoir I don't believe this is accurate. What can we do to confirm? I believe the booster is running most of the time raising the HGL in Cochrane heights.	Refer to comment response #19, #20, and #21. The operational description of how this pump station functions is still correct. We removed the reference to "when demands are high" as Shawn T confirmed that the CH booster is operational at all times.	None
27	46	5.2.4 existing system - Pump stations	2024-08-09	Shawn Tooth	River Heights pump station: Under the existing system conditions, the River Heights pump station is unable to deliver adequate flows to the Fireside View Multi-Family development and the school on Fireside Drive. The upgrades planned for this station will resolve these deficiencies and are anticipated to be completed in 2024. The previous section stated that because construction is underway at RH we are considering the completed status not in the current. This does not align with that.	All figures will need to be updated to reflect this change.	None
28	46	5.2.4 existing system - Pump stations	2024-09-04	Rebecca Carroll	Lower Gleneagles pump station consists of 4 pumps, not 2	Text of report updated. Intent was to indicate 4 pumps but there was a missing comma.	None.
29	48	5.2.5 existing system - Dist. System performance	2024-09-04	Rebecca Carroll	these homes must rely on the individual PRVs ... These valves should be properly maintained to avoid damages Not TOC assets, responsibility of homeowner	Clarifying text added "Should be maintained by homeowners"	None.

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30	49	Figure 12 - Existing pressure during ADD	2024-08-09	Shawn Tooth	Have these been compared to our most recent static hydrant pressures?	The only scenario in recent memory where hydrant pressures were checked was in 2023 when there was an issue with the water pressure at the top of Precedence hill was low. The pressure reported at the houses was very close to what was shown in the model. If there is an ongoing program where static pressures are checked, the can be compared to model results, should the Town desire this. No change to text of report.	Town to confirm.
31	49	Figure 12 - Existing pressure during ADD	2024-09-04	Rebecca Carroll	What is this pressure based on? Current elevation?	This pressure is based on elevation of the nodes (which is approximate) and demand under the ADD scenario. No change to text of report.	None.
32	55	5.2.5 existing system - Dist. System performance	2024-09-10	Shawn Tooth	Fireside View Development: Under current conditions, the fire flows in this area are deficient. Following upgrade of the River Heights pump station, fire flows in this area will be adequate (planned completion in 2024) Please remove this recommendation, the upgrade is complete.	Recommendation removed. Figures updated to reflect that the RHR pump station upgrades are complete.	None.
33	55	5.2.5 existing system - Dist. System performance	2024-09-04	Rebecca Carroll	Does Heritage Hills relate to the secondary pressure supply potential at the station?	The deficiencies identified in Heritage Hills are off of the low pressure connection to the HH pump station. This area is serviced off the lower pressure connection. West Hawk will be serviced off the higher pressure connection. No change to text of report.	None.
34	57	5.2.5 existing system - Dist. System performance (fire flow protection deficiency)	2024-09-04	Rebecca Carroll	Should the private hydrants in SLS yard be considered in Griffin Road and River Ave?	The water network for the SLS yard was not provided during the initial request, and is not present on the Town's GIS. This can be noted as a gap to be filled for the next master plan update. Town to secure as builts.	Letter to be completed.
35	62	5.3.1 Growth infrastructure water license	2024-09-10	Shawn Tooth	The 2023 Water Strategy reviewed the timing and population triggers for treatment expansion beyond the existing plant's capacity and estimated that the 29.7 ML/day WTP can service a population of approximately 65,000 people. Being that we are aware that 29.7 is unlikely, planning around the number seems irresponsible. Please add this to our list of items that need to be updated in 2025.	A letter will be provided at the beginning of this document indicating that this recommendation will need to be reviewed and revised once these decisions are made. This recommendation will remain until a final decision has been made, at which time the Master Plan will be updated.	Letter to be completed
36	62	Table 10: Summary of licence acquisition required to meet 25-year demands [6]	2024-08-09	Shawn Tooth	Consumptive Portion (25%) of Licence (ac-ft) This should be 20%, please adjust the numbers accordingly	The consumptive licence numbers have been updated accordingly. By the time this report is updated for final, the Town may have acquired all consumptive licence, if this is true, this section should be updated for what the Town has for licence rather than what they need.	Letter to be completed
37	64	5.3.3 Treated water reservoirs	2024-08-09	Shawn Tooth	To meet demands of the developable area within the Town boundary, the main pressure zone requires storage expansion of approximately 5,110 m3 if the Lower Gleneagles Reservoir is not used by the Town to supplement demands. With supplementation from Lower Gleneagles, the required expansion volume is 3,100 m3. This is currently a manual process and therefore not a reliable solution to supplement fire storage. Is it possible to include a recommendation to automate the connection of the Lower Gleneagles facility?	As discussed in the final review meeting, we have included a recommendation to investigate automating this connection between LGE and the Main Pressure Zone. The recommendation for expansion will still stand, but the expansion requirement may be reduced by automating this connection. This will also be mentioned in the cover letter as decisions surrounding this study will impact these final results.	Letter to be completed.

ITEM	PAGE		COMMENT			RESPONSE	NEXT STEPS
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38	64	5.3.3 Treated water reservoirs	2024-09-05	Rebecca Carroll	To meet demands of the developable area within the Town boundary, the main pressure zone requires storage expansion of approximately 5,110 m3 if the Lower Gleneagles Reservoir is not used by the Town to supplement demands. With supplementation from Lower Gleneagles, the required expansion volume is 3,100 m3 Supplementing primary with LGE does not address the storage deficit completely. The flow "through" the station to UGE needs to be account for in this scenario.	Total storage deficit is noted in the Growth to Town Boundary scenario summary table. If the LGE is utilized to supplement storage in the Main PZ, the UGE reservoir will provide the balancing while storage systems recover. No change to text, but text adjusted per previous comment to automate this connection.	None.
39	67	5.3.3 Treated water reservoirs	2024-08-09	Shawn Tooth	There is only one large diameter main crossing the Bow River to service South Cochrane (River Heights service area and beyond), and only one storage reservoir. Further, the existing single supply main to this reservoir is installed in a structure which hangs from the River Avenue bridge. Should there ever be an issue with this installation, or the bridge itself, replacement and/or repair of the main could be time-consuming. In addition, this water main is at higher risk of damage in the event of a flood or ice jam as it is exposed. For these reasons, a 400mm second supply line from the George Fox Trail and Bow Meadows drive intersection to the River Heights reservoir is recommended. ... I don't agree with this recommendation as stated.	A letter will be provided at the beginning of this document indicating that this recommendation will need to be reviewed and revised once these decisions are made. This recommendation will remain until a final decision has been made, at which time the Master Plan will be updated.	Letter to be completed
40	68	5.3.3 Treated water reservoirs (2MG)	2024-09-05	Rebecca Carroll	As shown in Figure 18 below, the 2022 EPS model results indicated that to improve the filling and recovery of the 2MG reservoir during periods of high demand, the Town can increase the speed of the high lift pumps to deliver more flow (at higher pressures) 2024 data in previous comment applies here.	Previous response applies here as well. As discussed in the final master plan meeting, we will provide the Town with a list of the data required to re-calibrate the EPS model once new data is obtained following the discovery of the closed valve.	Letter to be completed, recalibration of EPS model to be scheduled for 2026?
41	69	5.3.3 Treated water reservoirs (2MG)	2024-08-09	Shawn Tooth	The timing needs for this improvement depends on the extents and timing for the WTP capacity upgrades. If the Town does not want to operate the plant at an output pressure above 130psi, the feeder main will need to be in place prior to expansion of the plant. Therefore, the feeder main is estimated to be required in the 5-10 year window. It is important to note that the 600mm feeder main proposed to improve filling of the 2MG reservoir marginally improves flows to the River Heights reservoir as well. However, it does not improve them enough to eliminate the need for additional improvements to the system as stated above If we were to consider the WTP Capacity Assessment, Main Zone Storage Expansion and WTP Location Study, this recommendation would change. Should it be here?	A letter will be provided at the beginning of this document indicating that this recommendation will need to be reviewed and revised once these decisions are made. This recommendation will remain until a final decision has been made, at which time the Master Plan will be updated.	Letter to be completed.
42	71	5.3.5 Dist. System	2024-09-05	Rebecca Carroll	A 300mm watermain main should be provided as a looped connection between River Avenue and Griffin Rd. Was this included in Greystone servicing?	The water network design for Greystone was not provided to USL for review/confirmation. Town's GIS also does not reflect any servicing through this site. This 300mm watermain was recommended in the 2012 W/WW Master Plan. It appears that there is a 300mm main at the roundabout on Griffin Rd. extending into the Greystone site, but not looped (yet, perhaps). If as-builts are obtained in 2025, this can be updated and reflected in the final version.	Town to review records and confirm. Master plan recommendations to remain as shown for now.
43	72	5.3.5 Dist. System	2024-09-05	Rebecca Carroll	Riversong Boulevard instead of Rivera Way?	Text updated to Riversong Boulevard.	None.
44	72	5.3.5 Dist. System	2024-09-05	Rebecca Carroll	Willow Park Point instead of Willow Park Rd.?	Text updated to Willow Park Point.	None.

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45	84	6.2.1 Collection system	2024-09-05	Rebecca Carroll	Additional Syphon missing from text (noted as 5 but should be 6) Syphon located at heartland & HWY 22 SANMAIN_1539 and 1540	Noted and revised in the model, final report and shown in the figures.	None
46	84	6.2.1 Collection system	2024-09-05	Rebecca Carroll	Upstream of Bow meadows LS and Downstream of Jumpingpound Creek Syphon - both mention having small pipe sizes Is this two separate issues? or one holistic issue?	Separate - the two areas have small main sizes for the demands flowing through them. However, upgrading the pipes from 200mm to 300mm in diameter downstream of Jumpingpound creek syphon to the Bow Meadows Lift station alleviates both issues.	None
47	85	6.2.2 Lift Stations and Forcemains	2024-09-05	Rebecca Carroll	the town...does not own the Crawford Ranch lift station, but is providing a maintenance service for the community association. No longer as of July 1	Noted and will revise in the final report.	None
48	87	Figure 24 - Sanitary serviceable life remaining	2024-09-05	Rebecca Carroll	forcemain missing?	Noted and will revise in the final report.	None
49	87	Figure 24 - Sanitary serviceable life remaining	2024-09-05	Rebecca Carroll	Cochrane Heights Asset data is not current. Chinook Drive south of Chiniki Road and Crocus Crescent ~50+ years old.	Asset age information was based on the available data from the Town's GIS.	None
50	87	Figure 24 - Sanitary serviceable life remaining	2024-09-05	Rebecca Carroll	need to verify pipe material for these sections of Glenbow - classified as PVC install 1975, 76, 77	Asset age information was based on the available data from the Town's GIS.	None
51	88	6.2.4 Risk assessment and levels of service	2024-09-05	Rebecca Carroll	Is passive replacement projects clearly defined?	Clarified in the report: Passive replacement projects were identified based on infrastructure nearing the end of its serviceable life and existing deficiencies where no growth projected in that area.	None
52	88	6.2.4 Risk assessment and levels of service	2024-09-05	Rebecca Carroll	Downstream of Jumpingpound Creek syphon pipe upgrades from 200mm to 300mm in diameter Up to the LS?	Discussed at meeting with Town on September 13 and clarified in report: the recommendation is to upgrade pipes downstream of Jumpingpound Creek up to Bow Meadows Drive. This would alleviate surcharging and increase velocities in the syphon reducing the risk of future blockages in the syphon.	None
53	93	6.3.1 Growth performance of collection system	2024-09-05	Rebecca Carroll	recommended to upgrade the two downstream pipes on Sunset Drive from 250mm to 450mm in diameter. would this not be an OSL project due to growth impact rather than passive replacement? is this build out of Stage 3?	UPDATE: Those pipes are already 450mm diameter pipes. Therefore, this upgrade is no longer required and is reflected in model, figures, and final report.	None
54	96	Table 19. Wastewater system Capital Upgrades Summary	2024-09-05	Rebecca Carroll	Upgrades are required when the Town's population reaches ~45,000 people, which is projected within the 5-10 year window. However, it is recommended that the Town starts a flow monitoring program at the Burnco trunks to confirm actual flows entering the trunks in subsequent years and use this information to calibrate parameters specific to this trunk. Real-time, accurate flow monitoring at the trunks may push upgrades beyond the 10-year window I get the impression that flow monitoring is necessary to confirm the timing for this project. 5 or 10+ is significant.	Yes. The 5-10 year upgrade timing is based on growth and population projections and conservative I&I assumptions within the model. Flow monitoring will provide us with actual flow data entering the trunks and we can use this information to calibrate parameters specific to this trunk to better understand timing for upgrades.	None.
55	98	6.5.1 Special areas for consideration - AG Society land	2024-09-05	Rebecca Carroll	Truck main (singular, not plural)	Noted and revised in the final report.	None
56	98	6.5.2 Special areas for consideration - Baptist Seminary	2024-09-05	Rebecca Carroll	Truck main (singular, not plural)	Noted and revised in the final report.	None

ITEM	PAGE		COMMENT			RESPONSE	NEXT STEPS
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57	98	6.5.2 Special areas for consideration - Baptist Seminary	2024-09-05	Rebecca Carroll	450mm main (singular, not plural)	Noted and revised in the final report.	None
58	102	7.1.1 Recommendations Water system	2024-09-05	Rebecca Carroll	2. Complete operational testing as recommended in the 2022 EPS model analysis to determine whether changing high lift pumping operations at the WTP in periods of high demand can aid in the recovery of this reservoir in the interim. a. Develop a standard operational philosophy for the WTP to ensure proper management of this distribution system. 3. If operational changes are not possible, or unable to aid in the nightly recovery of this reservoir, install the 600mm feeder main from the WTP to Westside Dr. Could be impacted by 2024 data	Previous response applies here as well. As discussed in the final master plan meeting, we will provide the Town with a list of the data required to re-calibrate the EPS model.	Letter to be completed
59				Final Master Plan Meeting	5th Avenue Improvements and Site: At the final meeting it was indicated that the project would move forward in 2025, but it has since been removed from the budget. We will need to revise the results of the Master Plan (water system specifically) to capture this change.	The existing system conditions and recommendations will be updated to show that this project is not completed, and it will be moved to the 5-10 year window. Costs shown will be for 5th Avenue Improvements only (based on design cost estimate), and on site servicing costs will not be shown.	None
60				Final Master Plan Meeting	Pumps – Fire Pumps Memo, (LGE, UGE, Sunterra): It was requested that the outcomes of the fire pumps memo be captured as projects in the final master plan meeting.	A section has been added for projects that are not identified as part of the capital plan, are not required to service growth. The fire pumps recommendations have been re-captured here, at the end of the report, to remind the reader they need to take place.	None

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1	N/A		2026-01-05	Town	Add note/comment - introduction to include clear indication of when the data was collected.	Master Plan indicates that model utilizes meter data from January 2022 to December 2022 on Page 14 (Section 4.1.1). Added to Page 29 (Section 5.2) as well, and we have added a paragraph to the introduction to emphasize this.	N/A
2	14	4.1.1	2026-01-05	Town	Are the growth numbers being used accurate? Or do they need to be updated based on current growth?	We utilized growth rates and population projections that aligned with the Cochrane Growth Study (which was underway at the time of the Master Plan development) to ensure as accurate as possible at the time of development. As time passes, development fluctuates, but in general within the span of a few years, the numbers will not make a difference to the recommendations, only the timing of those recommended upgrades. For this reason, it is recommended that the Town update this plan every 3-5 years depending on the rates of growth to ensure that the timing of upgrades and other ongoing initiatives are reflected and the plan is representative of the current context.	N/A
3	21		2026-01-05	Town	Hydrant spacing is 150m, to a primary and 300m to a secondary - does that change anything?	Town to confirm spacing standard to use (City of Calgary vs FUS). At the time this Master Plan was written, the Town indicated they utilize City of Calgary Standards but also wanted FUS as a comparison.	Secondary hydrants would not change any fire flow availability results of the main. Town to confirm spacing standard to use (City of Calgary vs FUS). Figure and language can be adjusted once decision is made (Section 4.1.2). Following meeting, Town confirmed that CoC standard is to be used. Adjustment to language to highlight that FUS standard is offered as
4	33-40		2026-01-05	Town	What is considered 'existing' if there is a lot more buildout then shown?	The 'existing' system is as shown on Figure 9. There is a lot more built out because the data was obtained early 2023, and significant growth has occurred in Cochrane since then. The plan will always be lagging slightly, as we require a full year's worth of data, and it takes 1-2 years to complete the plan.	N/A
5	53, 57, Figure 17		2026-01-05	Town	Downtown main replacements does not specifically note end of serviceable life of 100mm west to east from 5th Avenue alley to 4th Avenue and the 150mm main west to east from 4th Avenue to Centre Avenue. There are four fire hydrants off these 100mm or 150mm mains. Draft states that there are no downtown mains at the end of serviceable life, this likely related to the existing GIS data for pipe material and install year that states material as PVC (not likely) or AC and install year as 1980 or 1987 (not likely) based on historical records available. The mains were likely installed mid/late 1950's (Cochrane had 1 mile of watermain in 1956).	The figures are representative of the GIS data that the Town provided. Map can be adjusted, and we will add an "*" to the figure legend to indicate that this information was provided anecdotally by the Town and is not reflective of their GIS.	N/A
6	61		2026-01-05	Town	Heritage Hills - reflect the most up to date storage allocation for Heritage Hills including HCSP, West Hawk and AG allocation. Baptist seminary is currently serviced by main zone and there is no capacity to service the lands with Heritage Hills	We will update the horse creek sports park servicing section to explain the demands allocated for this site (excluding irrigating the park and fields).	Town would like the Master Plan to address servicing for the school on the HCSP site. Update storage allocation to include demands from the school, clubhouse, and facility to the north.
7	68		2026-01-05	Town	HCSP - update to reflect irrigation as part of the ultimate demand.	No change. As discussed with Town previously, the decision to use potable water to irrigate has not yet been made and has a large impact to the water system. When analysis is complete and a decision is made on how parks will be irrigated, the model and report can be updated.	Town would not like to add irrigation at this time.
8	72		2026-01-05	Town	WTP Upgrades timing - concerned that 5 to 10 years is too far out. Alignment with capacity study?	We will update all references to the WTP capacity and timing and align with the recently completed capacity study.	Align timing with capacity study and not population projections.
9	72		2026-01-05	Town	Timing for new WTP (5-10years)	We will update all references to the WTP capacity and timing and align with the recently completed capacity study.	N/A
10	74	5.2.2	2026-01-05	Town	Baptist Seminary - as there is no capacity to service these lands from Heritage Hills this section needs to be updated. The lands are currently serviced from main zone, through booster pump service (private).	Town and Urban to connect to discuss this in more detail to understand what the Town wants conveyed in this section.	Town has confirmed that in absence of confirmed servicing, all servicing possibilities for these lands is to be noted, at a high level. Future servicing study will confirm exactly how these lands are to be serviced if they develop.

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11	N/A		2026-01-05	Town	References to Water Treatment Plant capacity as 29.7 ML/day. Suggest this be modified to a capacity in alignment with the Water Treatment Plant capacity study initial findings. Something similar to the comment on page 67 that references the improved 2MG performance since 2023	We will update all references to the WTP capacity and timing and align with the recently completed capacity study.	N/A
12	77		2026-01-05	Town	Growth was projected to be mainly residential however, there have been large commercial developments in Greystone, and Southbow (to be finished in 2026) will that change there numbers?	A blended rate of residential and non-residential demands was established and used for all growth areas (same ratio of residential/non-residential). This was used because generally, the areas that will be building out are expected to be mostly residential, with some commercial, so the ratio of residential to commercial will largely not change. Given that this cannot be predicted until plans are approved, the assumption is reasonable for base demands. Sizing of infrastructure is based on the larger of PHD or MDD+FF (Water) and PWWF (sanitary), and these are not expected to have impacts on the sizing of major infrastructure. That said, site specific analyses needs to be completed to verify that offsite sizing is still appropriate when plans are in place to verify the assumptions of a master plan as more detail is known.	Since a blended rate was established for the growth areas, fire flows and sanitary capacities for PWWF will not change the results of the master plan at this level. As areas with specific plans are proposed, water and sanitary servicing studies are important to review to verify that they will not trigger upgrades if they are materially different than what was expected.
13	83	6.2.2	2026-01-05	Town	Bow meadows lift station capacity - what is the impact of development at 97 George Fox Trail	A technical memo was completed by Urban in Feb 2025. This memo outlines upgrade options to accommodate development along George Fox Trail. Urban to add language to the MP to match the recommendations in this report.	Language in report to be revised to match recommendations in the technical memo (February 2025).
14	83 & 84	6.2.3	2026-01-05	Town	Transfer Station & Pipeline - should this include Attenuation?	The phasing numbers in the Master Plan already consider attenuation from the two wet wells (Existing STS and Phase 0). This was how the phasing was established and how the system is being utilized. Urban to update phasing table with current numbers as they are currently being revised with more current flow data. What attenuation is the Town referring to - if it's the Lagoon, we do not recommend including this in the master plan as the decision has not yet been made to utilize it in this way (regular operation) and there are other considerations for that usage.	Attenuation in the existing pump station wet wells are considered in the phasing timing. Lagoon attenuation is not considered in the phasing and timing. Phasing timing is presented as a range.
15	84, 86 & Figure 24		2026-01-05	Town	Asset age/Pipe material: there are several areas noted with unknown pipe material that can now be identified with data collected from the main condition assessment program. Much of this pipe is likely end of life (Downtown); because it is unknown material, it's not included in Figure 25. Based on a quick scan of the main condition assessment data, the sanitary main west to east from Fifth Avenue to Centre (alley north of First Street West) is VCT. As with the watermains, likely to be installed mid/late 1950's (Cochrane had 1.5 miles of sanitary pipe in 1956).	The figures are representative of the GIS data that the Town provided. Map will be adjusted. We will add an "*" to the figure legend to indicate that this information was provided anecdotally by the Town and is not reflective of their GIS.	N/A
16	Figure 27		2026-01-05	Town	Bow Meadows Peak Flow Entering Lift Station is stated as 54 L/sec. Table 16 has it at 41 L/sec.	Should be 41 L/s. Figure 27 will be updated.	N/A
17	93	6.3.3	2026-01-05	Town	Transfer Station and Pipeline - should this include Attenuation?	The phasing numbers in the Master Plan already consider attenuation from the two wet wells (Existing STS and Phase 0). This was how the phasing was established and how the system is being utilized. Urban to update phasing table with current numbers as they are currently being revised with more current flow data. What attenuation is the Town referring to - if it's the Lagoon, we do not recommend including this in the master plan as the decision has not yet been made to utilize it in this way (regular operation) and there are other considerations for that usage.	Attenuation in the existing pump station wet wells are considered in the phasing timing. Lagoon attenuation is not considered in the phasing and timing.

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18	94	6.4	2026-01-05	Town	Capital Upgrades - Table 18 Burnco Trunk Upgrades (Timing 5 to 10 years). The footnote indicates that upgrades are required at ~45,000. I don't think this should be a footnote, rather a clearly stated recommendation to complete the tasks detailed to confirm the capacity of the Burnco Trunk	We will remove from footnote and add as a clear recommendation.	N/A
19	97	6.6	2026-01-05	Town	concerned with the statement about infill and redevelopment capacity of Burnco Trunk and the upstream mains as this relates to the footnote statement on page 94.	Reword to mention the 45,000 limit. Confirm language with Town.	The Town's main concern is the wording in this section. Urban to reword this section
20	102		2026-01-05	Town	The General Recommendation for Burnco Trunk (#2, page 102) aligns with the footnote on actions, but does not mention the population limit of ~45,000.	Reword and mention the 45,000 limit in Recommendation #2.	N/A