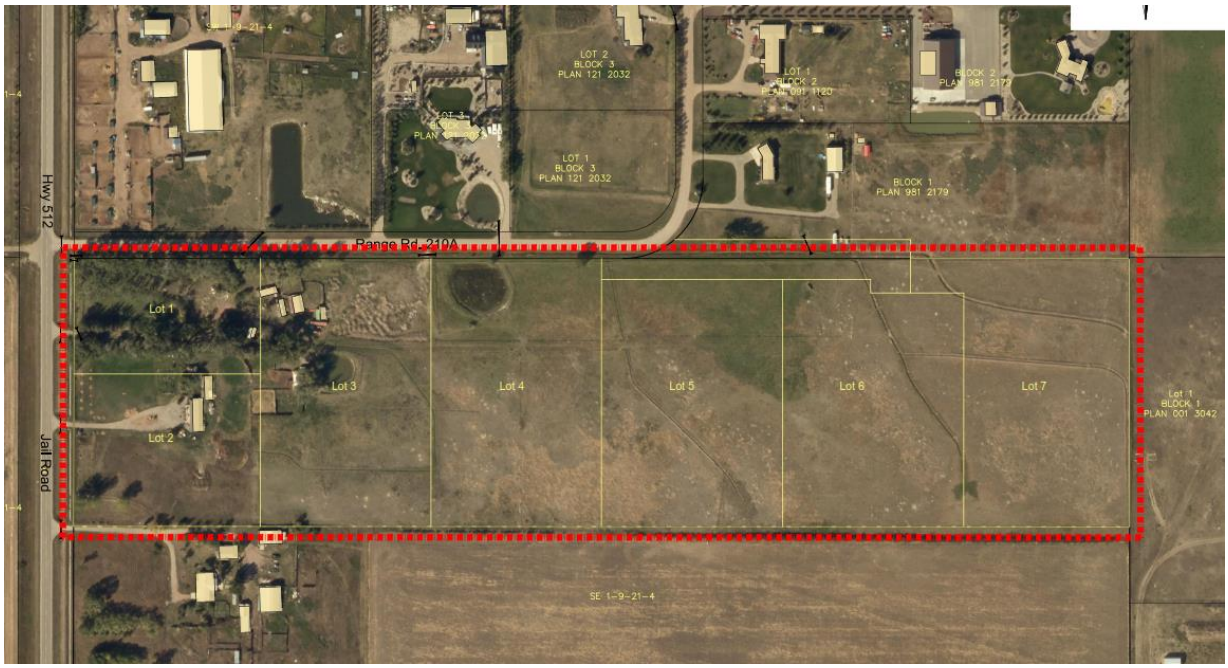
Country Side

AREA STRUCTURE PLAN

SE ¼ Sec. 1 – 9 – 21 -W4M



MARTIN GEOMATIC CONSULTANTS LTD.

229729CE

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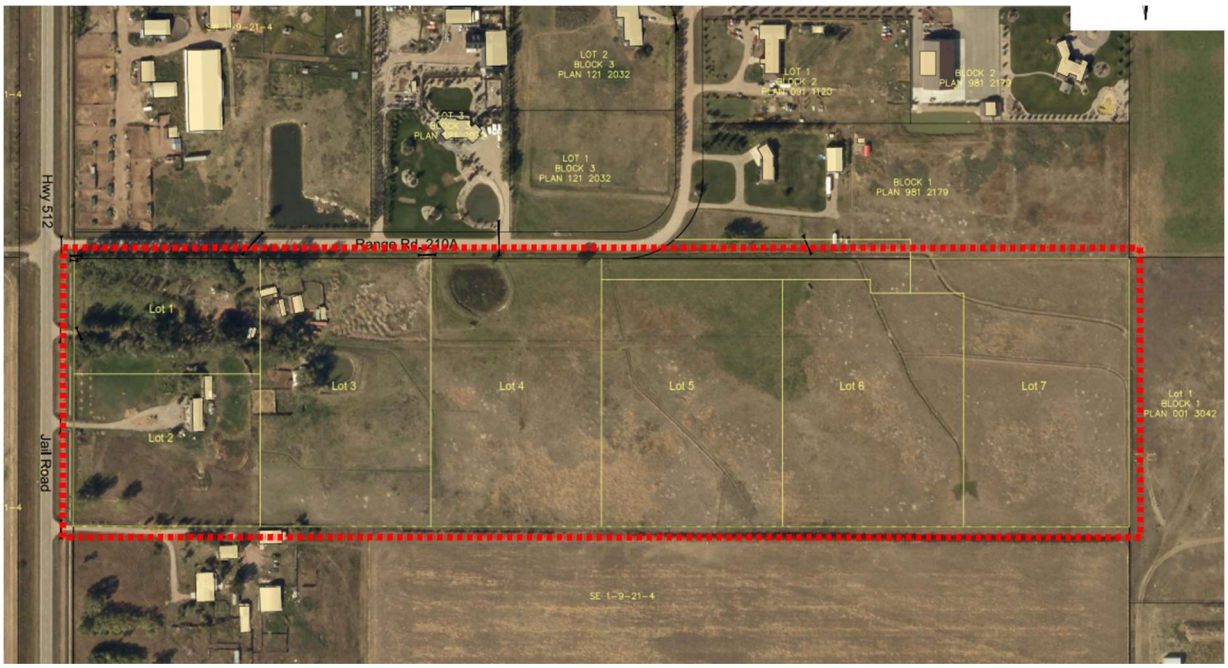
SE ¼ Sec. 1 – 9 – 21 -W4M



Bylaw 23-021- Approved July 18, 2024

MARTIN GEOMATIC CONSULTANTS LTD

229729CE

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APPENDICES

1.0 Introduction

The purpose of the Country Side Area Structure Plan is to provide a comprehensive planning framework for development of the land within a portion of the SE ¼ Sec 1, Twp 9, Rge 21, W4M. The plan area containing 40.06 acres (16.21 ha), is within Lethbridge County and is shown in **Figure 1 –Location and Figure 2 – Existing Site Plan and Figure 3 - Aerial Photo**.

This ASP is intended to provide pertinent planning and development information to the County and its advisors that will aid in determining the future use and servicing of this development.

The overall concept for this development is to prepare a suitable site that will allow for mixed residential and light industrial uses. It is also intended that this development serve as a buffer between an existing grouped country residential development (Pater Subdivision) and proposed light industrial subdivisions. The plan is submitted for approval in accordance with provincial statutory requirement and requirements of Lethbridge Country. This plan will also be used to support a land use classification pursuant to Lethbridge Country Land Use Bylaw No. 24-007.

2.0 Site Description

2.1 EXISTING LAND USES

2.1.1 *COUNTRY SIDE LAND USE*

The Country Side ASP site is located on the north side of Highway No 512 (Jail Road) about 4.2 km east of the Lethbridge City Limits.

The property is in the west half of the SE ¼ Sec. 1, Twp 9, Rge 21, W4M and contains about 40.05 acres. **Refer to Appendix A – Property Title.**

The subject site is currently used as irrigated farmland with the south side being heavily treed and having a residential house and numerous small accessory buildings.

This site falls within the Urban Fringe (UF) district of the County's Land Use Bylaw. The property is also included in the City/ County Intermunicipal Development Plan in Policy Area 5.

2.1.2 *SURROUNDING LAND USES*

a) West Boundary

Range Road 210A runs about halfway along the west property boundary. This road is gravelled and is used to provide access to the lots adjacent to the NW corner of the site, (Pater Subdivision). The Pater Subdivision contains 15 lots and is zoned Grouped Country Residential (GCR). Two large residential lots front onto the south half of Range Road 210A (Access Road). These sites are zoned UF.

b) North Boundary

The adjacent land to the north contains a large communications tower and a communal septic field. These are zoned UF. The Broxburn Industrial Park is located on the northeast side of these sites.

c) East Boundary

The land adjacent to the east boundary of the ASP site is irrigated farmland that is zoned UF.

d) South Boundary

Highway No. 512 (Jail Road) runs east/west along the south boundary of the ASP site. The land adjacent to and on the south side of the highway is used as irrigated farmland and is zoned UF.

2.1.3 *REFERENCE*

Refer to **Figure 3 - (Aerial Photo)** and **Figure 4 - (Land Use)**

2.2 SITE CHARACTERISTICS

- Access to the site is from a north/ south gravel road (Rge. Road 210A) along the west property boundary leading from Highway 512.
- There is a buried Telus line along the east boundary. As well, there are buried lines adjacent to the property line on the east and north side.
- SMRID has a buried irrigation line along the south boundary of the ASP site and adjacent to the west property boundary of the ASP site. Turnouts are located in both the SW and SE corners of the site.
- Over 20 existing residential dwellings are within 800m of the subject site.
- The south westerly corner of the site is heavily covered with larger trees.
- The County of Lethbridge Water Co-op currently has 2 water services to the property.
- One residential dwelling is located in the south easterly portion of the site. The current intention is to leave this house in place.
- Numerous small accessory buildings are located along the south side of the site.

2.3 TOPOGRAPHY

The site is relatively flat with an average slope of 0.35% dropping from the southwest to the northeast. The high point elevation in the southwest corner of the existing north/south access road is 900.0. The low point in the northeast corner of the site has an elevation of 897.4 Along the east property line there is a caragana hedge running north/south. This hedge has resulted in a natural berm of blow dirt between 0.3 m and 0.7 m high. This has resulted in existing surface drainage being accommodated mainly by infiltration and evaporation. Refer to **Figure 2 – Existing Site Plan and Figure 3- Aerial Photo.**

2.4 HABITAT AND VEGETATION

The plan area consists mainly of irrigated farmland with large trees in the SW corner.

3.0 Planning Framework

3.1 South Saskatchewan Regional Plan

This ASP aims to follow the Alberta Government South Saskatchewan Regional Plan (SSRP) 2014 – 2024, Amended February 2017.

Strategic Outcomes of the SSRP aligned with this ASP include: sustainable development wherein economic development takes into account environmental sustainability and social outcomes, conserving and maintaining the benefits of biodiversity, advancing watershed management, promoting efficient use of land, and strengthening communities.

3.2 Municipal Government Act

Country Side Area Structure Plan has been produced in accordance with **Section 633** of the Municipal Government Act. It is the intention of this plan to create a framework for the development of a portion of SW. ¼ Sec. 1, Twp 9, Rge 21, W4M into country residential uses with the ability to allow for limited light industrial uses.

3.3 Lethbridge County, Grouped Country Residential (GCR) Land Use Strategy

The main purpose of the above strategy is the identification of suitable sites for GCR developments.

Although we are seeking a combination of Direct Control and GCR zoning, the site is basically going to be used to provide modified country residential lots that will have the ability for increased light industrial uses.

The development meets the following criteria for GCR uses:

- The site consists of a fragmented parcel
- The site is immediately adjacent to the Pater subdivision (15 lots) and may be considered as the continuation of this development
- There are about 30 existing residential dwelling in the SW ¼ of Sec. 1 Twp 9, Rge 21.
- The site has a low capability for agricultural production
- The site has direct access to highway 512
- The site will have the ability to provide potable water, irrigation water, sanitary sewage, treatment capabilities, electric and gas.
- This site is situated on fragmented, poorer agricultural land.

3.4 CITY/ COUNTY INTERMUNICIPAL DEVELOPMENT PLAN (IMDP)

This plan is located in Policy Area 4, Sub-Area 3b and generally follows the policies for Sub-Area 3b which recognizes a shift from strictly agricultural uses.

The IMDP states “This area is somewhat fragmented and consists of some historical subdivisions. This area is recognized as an important development node for the county. The fragmented areas off of Highway 3 may be suitable for re-subdivision and infill development with appropriate planning.”

This ASP helps accommodate the IMDP policy by enabling light industrial growth that is separated from residential growth through proper planning.

3.5 LETHBRIDGE COUNTY MUNICIPAL DEVELOPMENT PLAN

The Country Side ASP aims to follow the Lethbridge County Municipal Development Plan (MDP) Bylaw No. 22-001.

The MDP outlines specific requirements necessary for residential development in Lethbridge County. Based on these requirements this ASP sets the stage for the proposed development.

Part 4, Sec. 4 - Land Use and Development Requirements of the MDP, outlines specific requirements in order that land in the County is properly planned and serviced based on the proposed use. This ASP and Land Use request is compatible with these detailed prerequisites for ASP’s, land use re-designation, geotechnical and soil reports.

This ASP has been designed such that the requirements of the MDP that are outlined in **Part 4 Sec. 4 - Plan Policies**; **Sec. 5 - Subdivision and Sec. 6 - General Residential Land Use**, can be met when the development is ready for subdivision. The detailed design will be required to confirm as closely as possible to the policies in **Sec. 11 - Infrastructure and Servicing** and with the County’s requirements in “Engineering Guidelines and Minimum Servicing Standards”.

This ASP has endeavored to meet the requirements as detailed in **Part 4, Sec. 8 - Grouped Country Residential** and the appropriate polices in **Section 10 – Industrial & Commercial Land Use.** Particularly the criteria for siting, servicing, roadways and fire suppression have generally been met. Notwithstanding these requirements, the source of potable water has not yet been finalized. The ASP presents three alternatives for the potable water supply. The developer currently has two water units from the Water Co-op and is endeavoring to obtain additional water units through the co-op. The water source must be finalized and approved by Lethbridge County.

The Grouped Country Residential Land Use District (GCR) is intended to provide for a high quality clustered residential development in areas where no conflict to agriculture can be anticipated pursuant to the municipal development plan.

The minimum lot size is 2 acres (0.8 ha) to facilitate on-site sewage disposal systems.

The Grouped Country Residential (GCR) and the Direct Control land uses will be designed to provide for a high quality, clustered residential development in conjunction with compatible light industrial uses that will provide a buffer between future industrial and current residential uses.

3.6 COUNTY LAND USE BYLAW

The requirements of Land Use By- Law No. 24-007 for residential and industrial uses will be selectively combined to provide a Direct Control land use that enhances and buffers the residential development through proper building siting, intensive landscaping and permitted light industrial uses.

The current land use districts do not provide for mixed residential and light industrial uses To allow for this combination of uses, a Direct Control Bylaw is being proposed. This Direct Control Bylaw allows for this and provides specific requirements that are specifically focused on these mixed uses. These will help ensure successful developments that will benefit the future residents and existing neighboring properties.

The two sites on the south end of the development will not have an industrial use and will be designated as Grouped Country Residential.

3.7 LETHBRIDGE COUNTY'S INDUSTRIAL- COMMERCIAL LAND USE STRATEGY

The Lethbridge County's Industrial – Commercial Land Use Strategy 2023 Update, identifies the Country Side ASP site as a "Prospective – Future Mixed-Use Residential and/ or Light Industrial growth site. The land immediately adjacent to the east boundary, is identified as a "Prospective – Future Light Industrial or Commercial" growth area.

This ASP proposes a transitional use for the Country Side development; providing a mixed use residential and light industrial site in accordance with the County's Industrial- Commercial Land Use Strategy. Its use has the potential to help maximize the opportunities for industrial/ commercial growth on the lands to the east, with minimum concerns being raised by the neighbors, particularly from the adjacent Pater subdivision. The provision of opportunities for light industrial in conjunction with residential and increased home occupation use will serve to enhance the goals of the Country's Industrial – Commercial strategy.

These land uses will also serve as a catalyst for increased industrial growth.

4.0 Plan Goals, Objectives and Land Use

4.1 Plan Goals

The Country Side Area Structure Plan will respond to the needs, issues and requirements identified by the owners, Lethbridge County as well as those agencies and organizations having an interest in the planning of this area.

The goals of this Area Structure Plan follow the planning policies outlined through the legislative framework.

When adopted by the Lethbridge County Council, this Area Structure Plan will create the framework for subdividing and developing the subject property.

This document will function as the required plan and as such will outline:

- conceptual land use,
- conceptual lot layout,
- the road access and circulation,
- the location of public utilities,
- supply of irrigation water,
- supply of potable water,
- sanitary sewage disposal,
- drainage and stormwater management,
- landscaping
- other related matters.

4.2 Plan Objectives

This ASP will adhere to the following objectives:

- Create two residential lots, having a minimum area of 2 acres along the south boundary.
- Create additional lots for residential use and the ability to also use each of these lots for light industrial purposes.
- Develop a Direct Control zoning to ensure the compatibility of the residential and industrial land uses through proper siting of buildings and landscaping.
- Consider alternatives for road access and traffic compatibility with the adjacent Pater Subdivision lots.
- Design drainage and storm water management system for the planned development.
- Investigate the sustainability of on-site septic systems for wastewater treatment and disposal
- Plan for a communal irrigation system
- Identify electrical and gas requirements.

4.3 PROPOSED LAND USES AND ZONING

4.3.1 *GROUPED COUNTRY RESIDENTIAL (GCR)*

The southerly portion of the ASP site is heavily treed and has an existing house on it. This makes the site ideal for residential use. As such, the ASP proposes to zone this for a Grouped Country Residential (GCR) use with the area divided into 2 lots. The westerly lot is planned with 3.0 acres and the easterly lot will be 3.9 acres. **Figure 4 –Land Use.**

4.3.2 *DIRECT CONTROL*

The balance of the site will be divided into 5 lots with about 6 acres each these lots will be zoned Direct Control (DC).

In conjunction with DC zoning a Direct Control Bylaw is being adopted. This DC Bylaw will have standards and rules applicable to land use and development. These standards will address items such as Permitted and Discretionary uses, lot size access, site drainage & grading, building size & siting requirements and landscaping.

The purpose of these lots and the DC zoning is to provide a buffer between the Grouped Country Residential uses on the Pater Subdivision and the proposed future land uses on the east side of the ASP site. The front portion of each lot will provide for residential uses, while the balance of the lot will allow for specified light industrial uses. This provides on opportunity for the residents to live and work on the same lot. The DC zoning will also provide an increase in Home Occupations that can be carried out on each lot. Landscaping, consisting of two rows of trees will provide screening between the two land uses. **Figure 4 –Land Use.**

4.4 ACCESSORY BUILDINGS

With the DC zoning, accessory buildings under 3000 sq ft will be allowed for residential uses in the front portion of the lots. Accessory buildings up to 12,000 sq ft will be permitted at the back of the lots. These shall be behind any residential development with extensive landscaping separating the residential and light industrial portion of the lots. There will be set back requirements in the DC land use for the residential dwellings and for accessory building. Intensive landscaping will be required for each lot. The maximum size of all accessory buildings, located in the industrial portion of the lot, shall be no more than 12,000 sq. ft.

The building siting and landscape requirements will help provide a buffer between the Pater subdivision and the future industrial uses east of the ASP site. These requirements will also provide adequate screening between the residential and light industrial uses on each lot. Refer to **Figure 5 – Conceptual Lot Layout and Setbacks.**

4.5 DENSITY AND POPULATION

The housing density within the proposed development is comprised of 7 lots or 5.65 lots per acre (2.28 lots/ ha).

Based on an average of 3.5 persons per household, the population within the plan area is estimated to be approximately 25 people.

4.6 MUNICIPAL RESERVE REQUIREMENTS

Cash-in-lieu of 10% of the land value will be paid to the County for Municipal Reserve purposes.

5.0 Services

5.1 Potable Water Supply And Distribution

It is envisioned that the domestic potable water requirements for the subdivision will be met by one of the following alternatives or by a combination of these alternatives.

5.1.1 *Potable Water Supply, Alternative 1*

The first alternative is to have the water supplied by the County of Lethbridge Rural Water Association via extensions from an existing potable water pipe running through the site. Each lot will be supplied with a trickle system to fill individual cisterns. The Water Co-op is in the process of finalizing their water supply plans for this area. The ASP site currently has water rights from the Co-op for two lots, which will be used to service the two Country Residential lots. Two additional units will most likely be available but the ASP must be approved first. It is anticipated that the three remaining lots will get Co-op water, but this has not yet been finalized. Easements will be provided on all lots to allow for future Co-op supplied water.

5.1.2 *Potable Water Supply, Alternative 2*

The second alternative is to use SMRID supplied irrigation water that will be treated as required by each individual lot owner. The feasibility of this alternative will be determined as required and must be approved by Lethbridge County. SMRID approval for the supply of water is also required.

5.1.3 *Potable Water Supply, Alternative 3*

At the discretion of Lethbridge County, potable water will be hauled to individual cisterns on each lot.

5.1.4 *Determination Of Final Potable Water Sources*

The final method of water supply will be dependent on the Water Co-op's final plans and the costs associated with each of the alternatives. The ultimate method of supply could be by a combination of these alternatives which would be subject to Lethbridge County administrative approval.

5.1.5 *Government Requirements*

The water supply and cisterns will be installed in accordance with requirements of the Chinook Health Region, the Safety Codes Council of Alberta and Lethbridge County.

5.1.6 *Home Owner Association*

The potable water and irrigation systems will not be taken over by Lethbridge County. A separate entity will be created to manage these facilities. The entity and management requirements shall be approved by Lethbridge County.

5.2 SEWAGE TREATMENT AND DISPOSAL

5.2.1 *SOILS*

Two test pits were excavated by “Southland Contractors Inc.” with “Down to Earth Labs” providing tests on soil samples from the pits. The soil was determined to contain mainly clay at one location and clay loam with sand lenses at the other pit.

5.2.2 *INDIVIDUAL LOT REQUIREMENTS*

- Southland Contractors evaluated the soil from the test pits and have determined that the site will support private sewage disposal pressurized mound type systems. In some areas it may be required to increase the sand layer depth. Refer to **Appendix B- Southland Report**.
- The owner or builder for each lot must use a qualified septic system designer and contractor to determine the type of septic system necessary for each lot. The type of system will be based on house design and soil conditions which vary throughout the lots.
- A treatment mound or secondary effluent treatment may be required instead of a conventional treatment field if unacceptable soil conditions exist.
- Connection of accessory buildings to the sewage treatment system is permitted, provided a qualified septic system designer has designed the system, accounting for sewage from the accessory building.

5.2.3 *POSSIBLE CONFLICT WITH STORM WATER DRAINAGE*

No on-site septic system components shall be installed in areas designated for stormwater conveyance or detention of runoff.

5.2.4 *ALBERTA SEWAGE SYSTEM REQUIREMENTS*

The *Alberta Private Sewage Systems Standard of Practice 2021* describes the requirements for the design of on-site wastewater treatment and disposal systems. All on- site wastewater treatment and disposal systems must adhere to these regulations.

5.3 STORM WATER MANAGEMENT

5.3.1 *EXISTING CONDITION*

A detailed description of the site and existing surface drainage is described in the stormwater management plan which is appended to this document.

5.3.2 *DRAINAGE CONCEPT*

The proposed development outlined in this report will follow the Stormwater Management Plan (SWMP) which covers for the entire ASP area.

The on-site storage ponds will be designed to store runoff up to a post-development 1 in 100 year-24-hour event. Based on PCSWMM modelling using a Chicago design storm[1], it is proposed that the developer provide a combined total of approximately **7,200 cu. m.** of active stormwater storage on-site through the use of individual ponds and natural depression (trapped lows) with zero release. The evaporative ponds will be located at the back of each lot with approximate sizes ranging from 300 cu.m. to 1,700 cu.m. The storm pond water will be drained through evaporation, infiltration and irrigation. Excess storm water due to back to back storms will overflow in the northeast corner of the development. This being where excess stormwater currently exits the property. The final size and design of each pond will be determined at the time of subdivision.

The two lots zoned CR Country Residential along the south boundary of the ASP, will drain storm water into smaller onsite storage ponds with excess flows directed via swales to the adjacent lots to the north for combined storage.

All water storage areas and swales will be protected with an easement or right-of-way. These easements or right of ways shall be registered on title at the time of subdivision.

Additional drainage swales will be required between the new lots and along the east boundary of the lots to direct the runoff into the ponds (see **Figure 6- Stormwater Management Plan**).

5.3.3 *Site Grading*

The subdivision will be graded to be consistent with the overall stormwater management plan. Individual lots will be graded such that all surface runoff will be directed to perimeter swales designed to carry the stormwater runoff into the stormwater detention facilities on each lot. The required size and cross section of these conveyance facilities and storage/evaporative ponds will be determined during Detailed Design stage.

5.4 Roads & Access

A TIA was completed by Watt Consulting Group and a Type 111B intersection was recommended for the intersection of Highway 512 and Range Road 210A. Alberta Transportation and Economic Corridors have reviewed this and advised that a south bound to west bound taper (acceleration lane) at this intersection was satisfactory at this time. They also advised that the existing most westerly direct highway access to this property will need to be removed. (See **Figure 5 – Conceptual Lot Layout & Setbacks, Figure 7 – Intersection Upgrade and Appendix 4 – Correspondence from Alberta Transportation.**)

It is proposed to provide access to Lot 2 using the existing access off of Highway #512. The existing Lot 1 access will be abandoned and will now be accessed off the existing gravelled entrance road to the Pater Subdivision (Range Road 210A). The lots 3 & 4 access will be adjacent to each other at the junction of their property lines and the Pater access road.

Lots 5,6, and 7 will have their access off of a new county road coming northerly off the Pater access road (Range Road 210A). A 30 m diameter cul-de-sac will be constructed at the north end of this road. This new road will be partially on the Country Side ASP site and partially along the east boundary of Block 1, Plan 981279. This new access road will be owned by the County and will be paved to meet County standards.

[1] Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, 1:100 year-24hr.(city of Lethbridge – Design standards, section 3.3.3

5.5 IRRIGATION

5.5.1 *COMMUNITY IRRIGATION*

A community irrigation system will provide SMRID supplied non-potable water to each lot for watering lawns and gardens or possibly as a source of grey water for each lot. This irrigation water will be supplied by SMRID through a communal pipeline system with lateral connections supplying each lot. Each lot will have an irrigation water storage pond to be used when SMRID water is not available. The irrigation system will require approval from SMRID.

5.5.2 *OPERATION OF SYSTEM*

A homeowner's association or other legal entity will be formed to own and operate the irrigation system within the development. The irrigation piping will be installed in an easement through the lots in favor of this association. The type of entity proposed to manage the irrigation system must be approved by the Lethbridge County. This irrigation system must be approved by SMRID.

5.6 SHALLOW UTILITIES

5.6.1 *NATURAL GAS*

Natural gas is available through ATCO Gas.

5.6.2 *ELECTRICITY*

Fortis Alberta is the current distribution of electricity in the County. It is planned that electrical services to the lots will be distributed overhead as are the existing residential lots to the west. All necessary application for the detailed design and installation of electrical utilities will be submitted to Fortis for approval.

5.6.3 *SOLID WASTE*

Lot purchasers will be responsible for disposing of their own solid waste or by contracting out this service to a private solid waste hauler.

6.0 Protective Services

6.1 Fire Services

The Coaldale Fire Department is the responding fire station and is located approximately 10 km east of the plan area.

6.2 Police Services

Policing in the development area is provided by the R.C.M.P. which has a detachment located in the Town of Coaldale.

7.0 Development Agreement

The Developer will enter into a Development Agreement with Lethbridge County regarding the following matters:

- Runoff conveyance and detention as per the Stormwater Management Plan,
- Roadway construction,
- Potable water installation,
- Irrigation system,
- Shallow utilities,
- Roadway signage including culvert markers.
- Other services or matters considered necessary by Lethbridge County.

8.0 Architectural Controls

8.1 Purpose Of Controls

The developer of Country Side will establish a set of architectural controls in order to achieve standards and development limitations throughout the area.

Architectural Controls shall be submitted to Lethbridge County for pre-approval and will be registered on title at the time of subdivision.

These architectural controls will be administered by the Developer.

8.2 Typical Items Included In Controls

Typically, the controls that will be in effect within Country Side will include the following:

- Minimum dwelling unit area and site coverage (building footprint),
- Siting of all buildings,
- Diversity in home design,
- Design Compatibility between house and accessory buildings,
- Incorporation of energy efficiency features,
- Roof pitch & materials,
- Exterior finishing materials,
- Fencing materials,
- Minimum landscaping requirements,

- Accessory building.
- Building and lot drainage requirements
- Sanitary Sewage Disposal

8.3 SPECIFIC ARCHITECTURAL CONTROL REQUIREMENTS

The Architectural Consultant will be responsible for approving the setbacks, landscaping and lot grading plan for each lot prior to Lethbridge County issuing a development or building permit.

Upon completion of the development on each lot, the Consultant will check the landscaping and lot grade elevations in the field. He will either issue a certificate of compliance or require the home owner to re-grade the lot to meet the design. A copy of the grading compliance will be provided to the County if so desired.

9.0 LETTER TO NEIGHBORS

A letter and drawings (refer to Appendix 5) were hand delivered to about 25 neighbors for their information and comments.

9.1 SUMMARY OF NEIGHBORHOOD QUESTIONS AND CONCERNS

- An email was received from Lisa Lutz questioning light industrial building sizes and inquiring who was responsible for paved road into the subdivision.
- A form from the Neighborhood Letter was received from John Ockerman advising that he had no concern with the proposed development.
- An email was received from Chris Kadijk requesting information about Architectural Controls.
- An email was received from Christian Hamel expressing strong opposition to the light industrial/ commercial uses as shown in the County Side ASP. He was very concerned about introducing light industrial uses in a predominantly agricultural area and suggested environmental risks. Some other concerns were: noise pollution, air quality, traffic congestion, light pollution, water contamination, order & dust, physiological stress, access to nature and community cohesion.

10.0 IMPLEMENTATION AND DEVELOPMENT CONTROL

- This Area Structure Plan will become a Bylaw of Lethbridge County.
- The Land Use Bylaw must be amended to include the Direct Control zoning and the Grouped Country Residential (GCR) zoning.
- All subsequent subdivision applications must adhere to provisions of this A.S.P. Bylaw and the Land Use Bylaw.
- The Direct Control By-law shall include a clause stating that re-subdivision is not permitted.
- Development applications, within the boundaries of the plan area, must comply with the requirements of the respective land use districts for which they are proposed.
- Building permits must be reviewed through a safety codes process approved by Lethbridge County.
- The developer of The Country Side subdivision will establish a level of architectural standards and development limitations in order to achieve the desired results within the proposed subdivision. These standards and limitations are beyond the normal statutory requirements of Lethbridge County and will thus be administered by either the Developers or agents acting on their behalf and within their legal authority.
- Lethbridge County may utilize other bylaws and policies that will regulate aspects of activity within the boundaries of the Area Structure Plan.

11.0 PHASING

This development will be constructed in one phase.

12.0 MARKET DEMAND

The County's Group Residential strategy requires that a market demand study be included with the ASP. Consultation with land appraisers and realtors has determined that a market demand study in a rural residential development setting is difficult to undertake. The developer is best to determine market demand because it's the developer who must finance the servicing of the lots.

The two country residential lots have been tentatively sold but formal agreements must wait for final subdivision registration. It is anticipated that the remaining five lots will be developed and sold within two years. The developer has definite interest in three of these with ongoing discussions for the balance.

The developer has met with three or four real estate agents who have indicated that country residential lots are in high demand but potential purchases are sensitive to lot prices. Additionally, they reported that it is difficult to measure market demand for the lots zoned as Direct Control because there are no comparative lots available.

CLOSURE

We are pleased to present to you the Country Side Area Structure Plan.

We trust this meets your requirements. Please contact the undersigned if you have any questions or comments.

Respectfully submitted, May 24th, 2024.

PROFESSIONAL ENGINEER ED MARTIN MAY 24 2024

Prepared by
Ed Martin, P.Eng.

PROFESSIONAL ENGINEER RAY E. MARTIN ALBERTA

2024-05-24

Reviewed by
Ray Martin, P.Eng.

PERMIT TO PRACTICE
Martin Geomatic Consultants Ltd.
Signature:
Date: 2024-05-24
PERMIT NUMBER: P 5852
The Association of Professional Engineers and Geoscientists of Alberta

FIGURES

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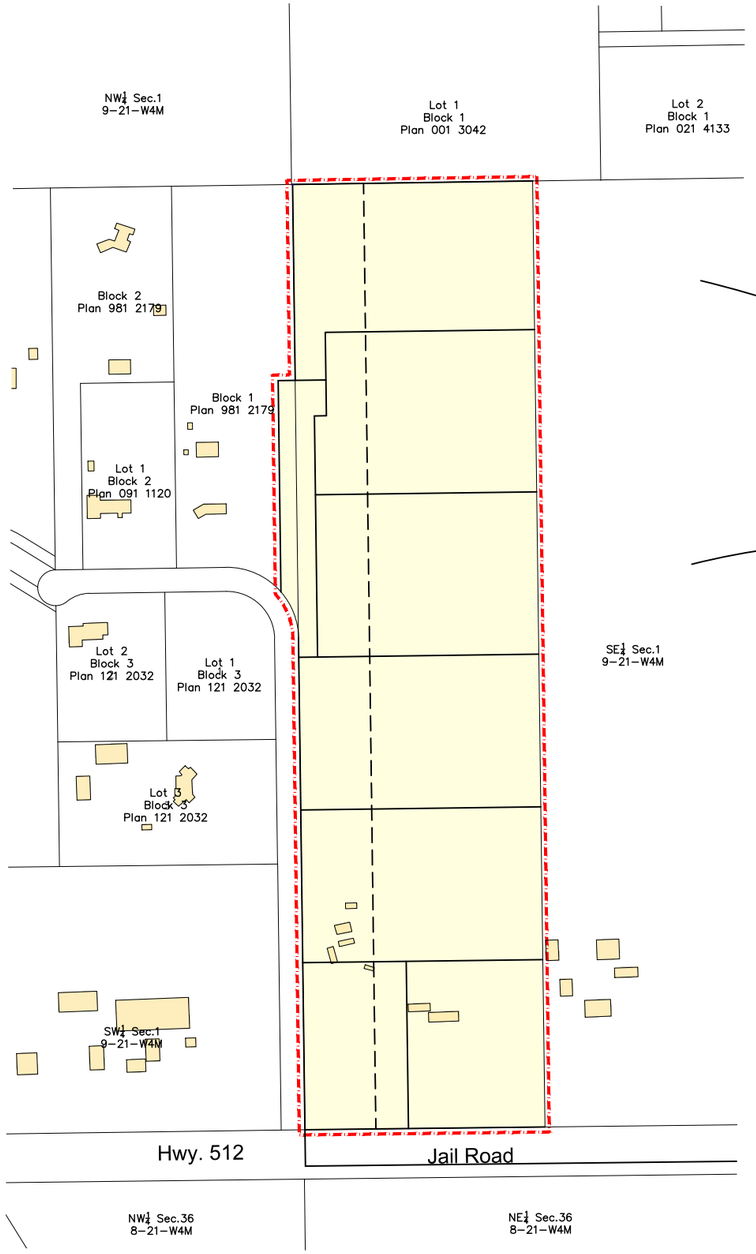
3. Aerial Photo
4. Land Use
5. Layout & Setbacks
6. Stormwater Management Plan
7. Intersection Upgrade

Country Side Subdivision
AREA STRUCTURE PLAN
Lethbridge County



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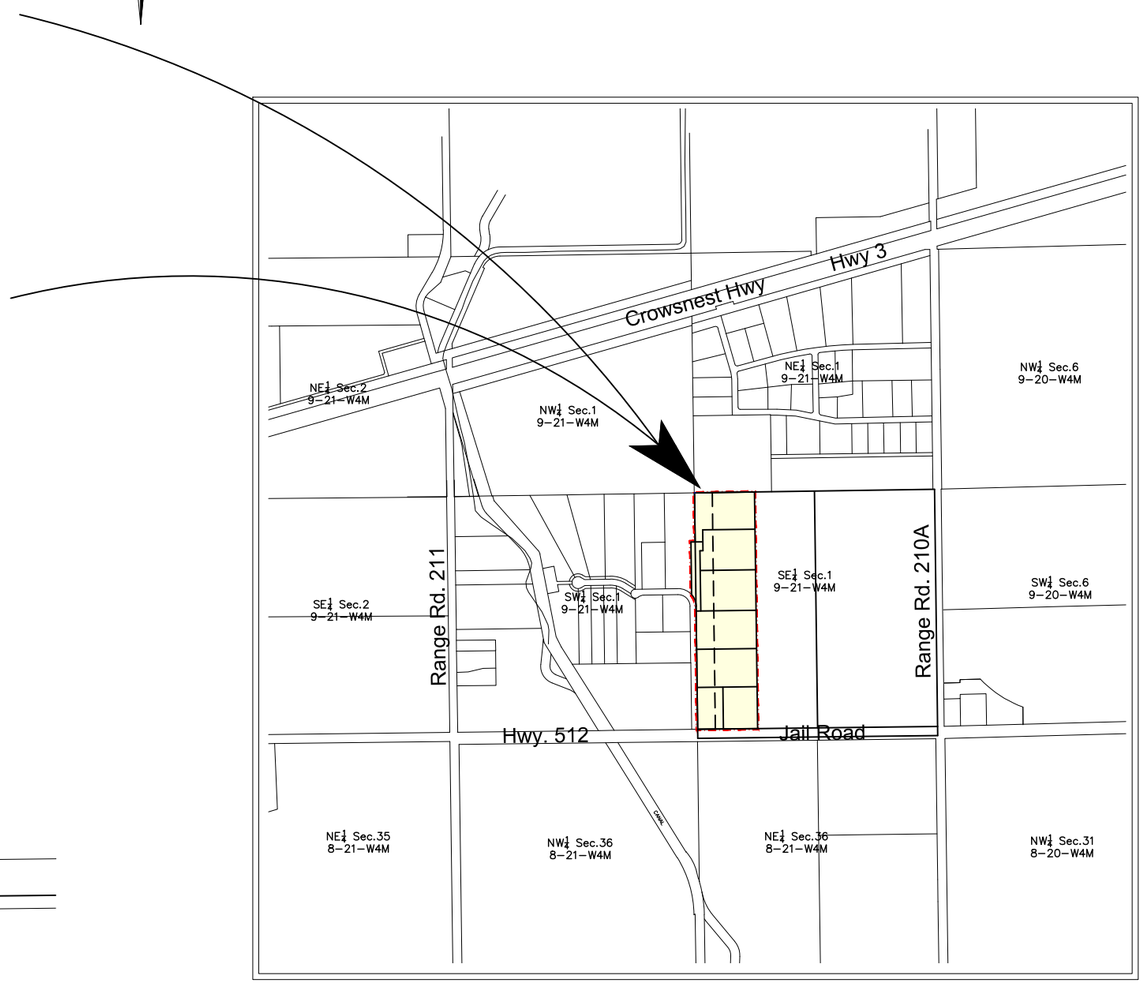

LOCATION MAP
SCALE 1:20000

DRAWING LIST

DWG. No.	Description
Fig 1	LOCATION
Fig 2	EXISTING SITE PALN
Fig 3	AERIAL PHOTO
Fig 4	LAND USE
Fig 5	CONCEPTUAL LOT LAYOUT & SETBACKS
Fig 6	STORM WATER MANAGEMENT PLAN
Fig 7	INTERSECTION UPGRADE

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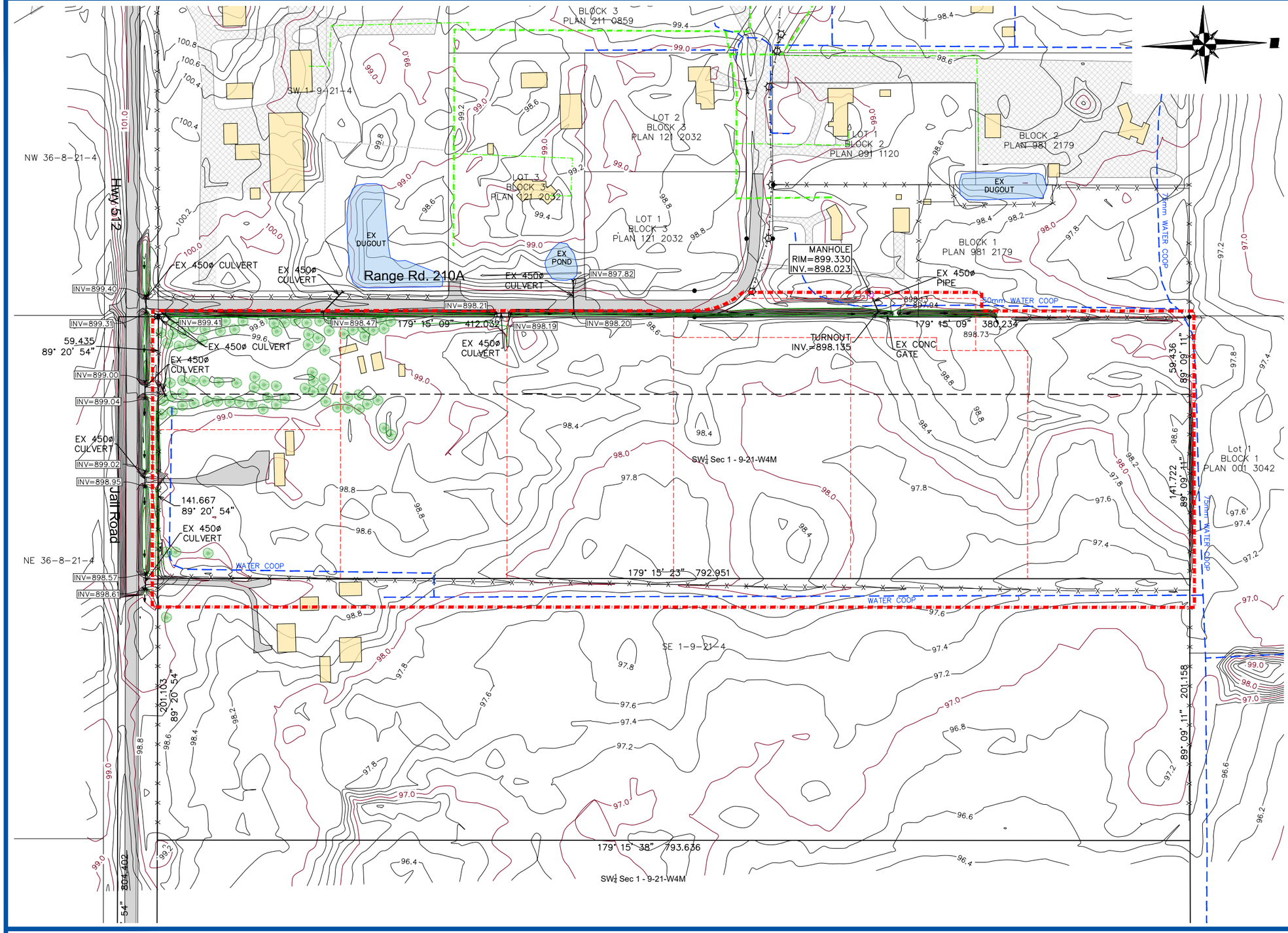
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)

1: 3000

Country Side Subdivision

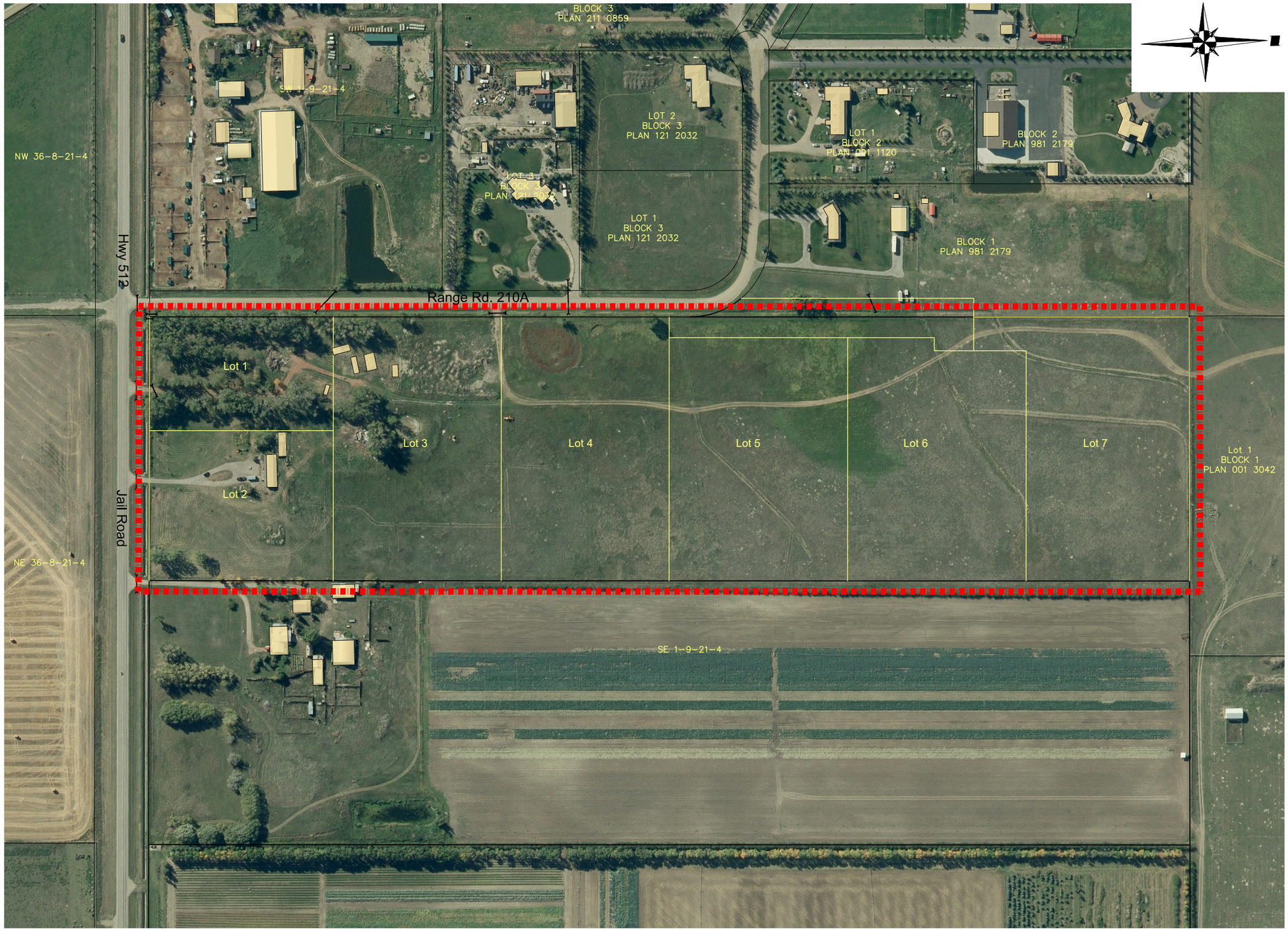
AREA STRUCTURE PLAN

June 07, 2024

EXISTING SITE PLAN
FIGURE 2

229729LS

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)

1: 3000

Country Side Subdivision

AREA STRUCTURE PLAN

June 07, 2024

AERIAL PHOTO
FIGURE 3

229729LS

MARTIN
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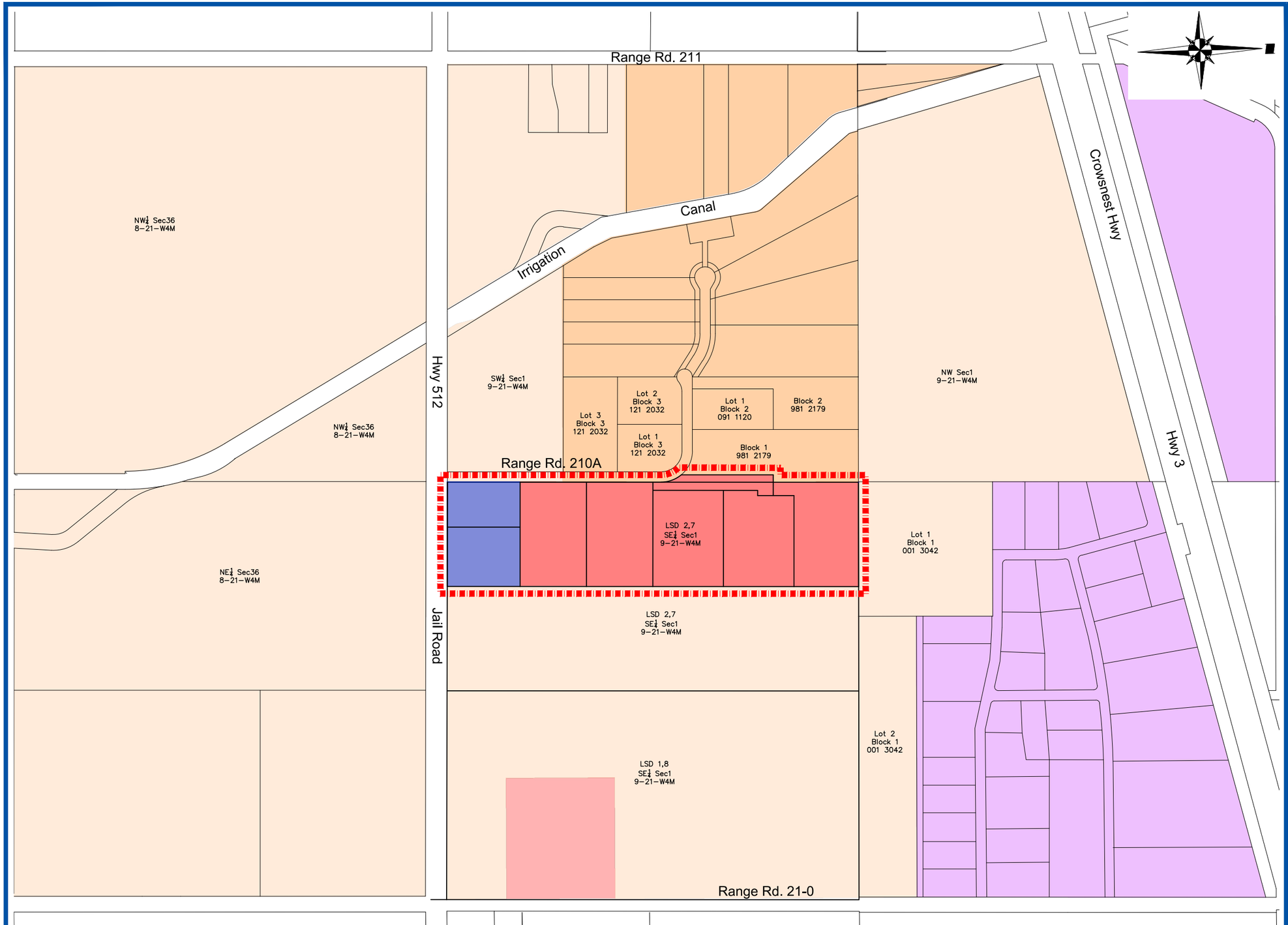
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)

EXISTING:

- EXISTING: URBAN FRINGE (UF)
- EXISTING: GROUPED COUNTRY RESIDENTIAL (GCR)
- EXISTING: RURAL GENERAL INDUSTRIAL (RGI)
- EXISTING: RURAL COMMERCIAL (RC)

PROPOSED:

- FROM: URBAN FRINGE (UF) TO: DIRECT CONTROL (DC)
- FROM: URBAN FRINGE (UF) TO: GROUPED COUNTRY RESIDENTIAL (GCR)

1: 7500

Country Side Subdivision

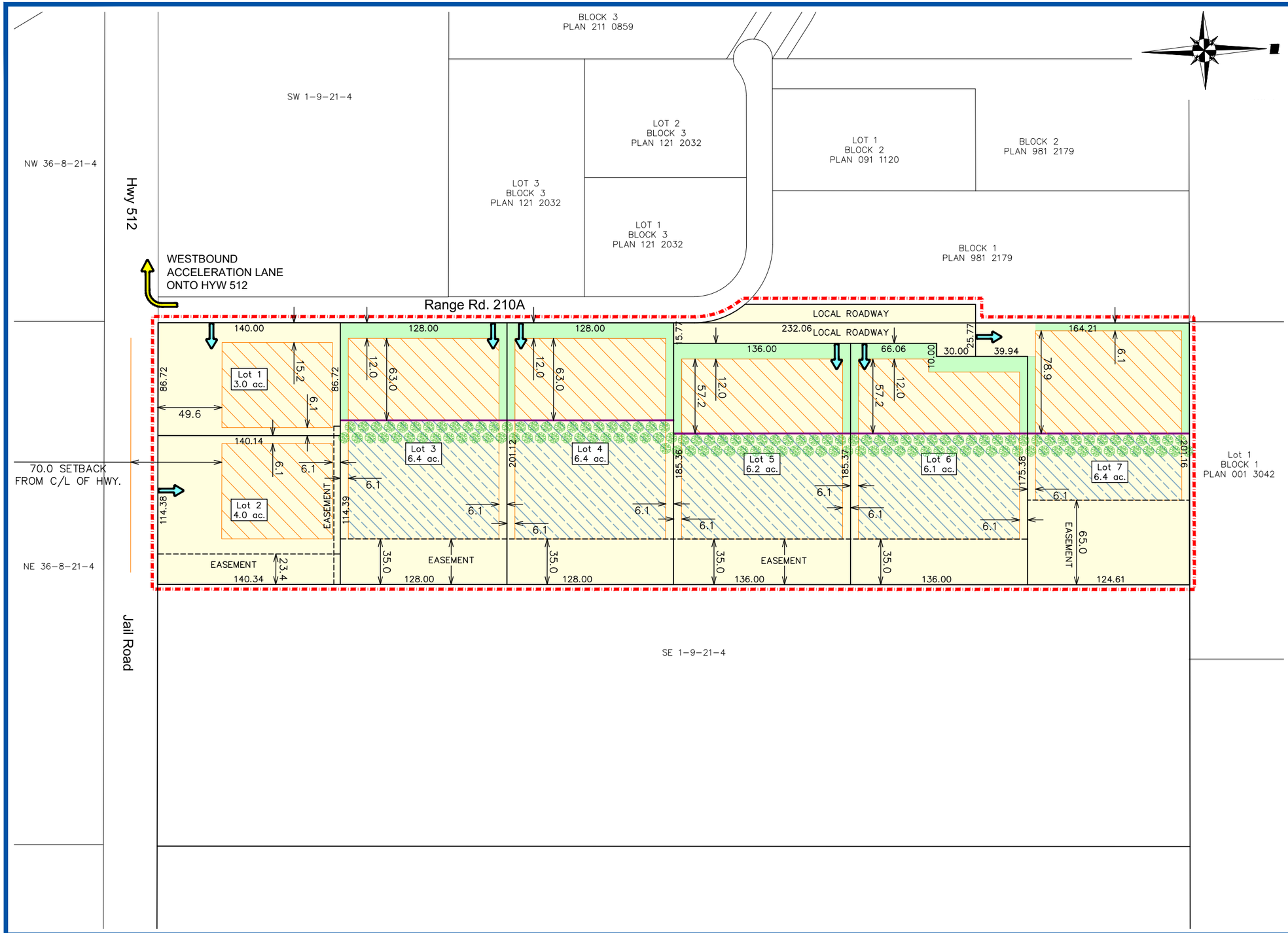
AREA STRUCTURE PLAN

June 07, 2024

LAND USE
FIGURE 4

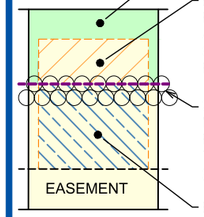
229729LS

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)



LANDSCAPED AREA
C/W IRRIGATED GRASS

BUILDABLE AREA FOR THE RESIDENTIAL DWELLINGS AND ACCESSORY BUILDING USED AS A GARAGE OR OTHER SIMILAR RESIDENTIAL PURPOSE.

2 ROWS OF TREES
MAX SPACING EQUAL TO THE RECOMMENDED SPACING FOR THAT SPECIES
(TO BE DETERMINED)

BUILDABLE AREA FOR RESIDENTIAL DWELLINGS AND LIGHT INDUSTRIAL

LOT DIMENSIONS AND EASEMENT LOCATION ARE CONCEPTUAL AND MAY BE CHANGED DURING THE SUBDIVISION PROCESS.

PROPOSED ACCESS

DRAINAGE EASEMENT

1: 3000

Country Side Subdivision

AREA STRUCTURE PLAN

June 07, 2024

CONCEPTUAL LOT LAYOUT & SETBACKS

FIGURE 5

229729LS

MARTIN
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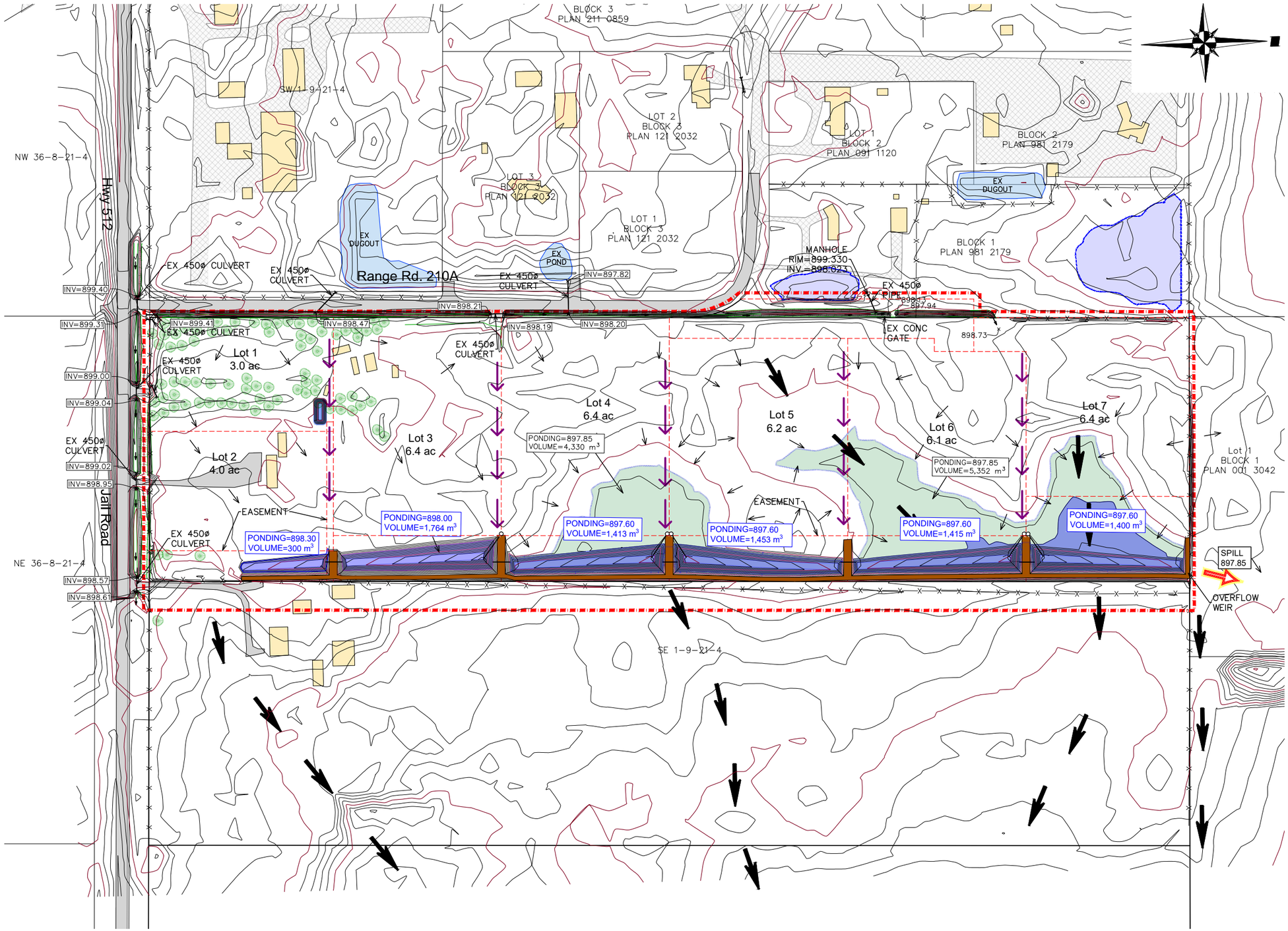
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
  Area = 40.06 acres (16.21 ha)
- EXISTING STURCTURE/HOUSE
- EXISTING GRAVEL ROAD
- SURFACE DRAINAGE ROUT
- OVERLAND DRAINAGE SYSTEM ROUTE
- EMERGENCY DRAINAGE SYSTEM ROUTE
- PROPOSED MAJOR CONTOUR (1.0m)
- PROPOSED MINOR CONTOUR (0.2m)
- EX TREE
- 1:100 yr. PONDING AREA
- PONDING AREA OVER 1:100 yr. EVENT
  (TOP OF BERM - SPILL ELEV=897.85)
- OVERFLOW WEIR
- GRASS SWALE BETWEEN LOTS
- PROPOSED DUGOUT / POND
- DRAINAGE EASEMENT

LOT DIMENSIONS AND EASEMENT LOCATION ARE CONCEPTUAL AND MAY BE CHANGED DURING THE SUBDIVISION PROCESS.

1: 3000

Country Side Subdivision

AREA STRUCTURE PLAN

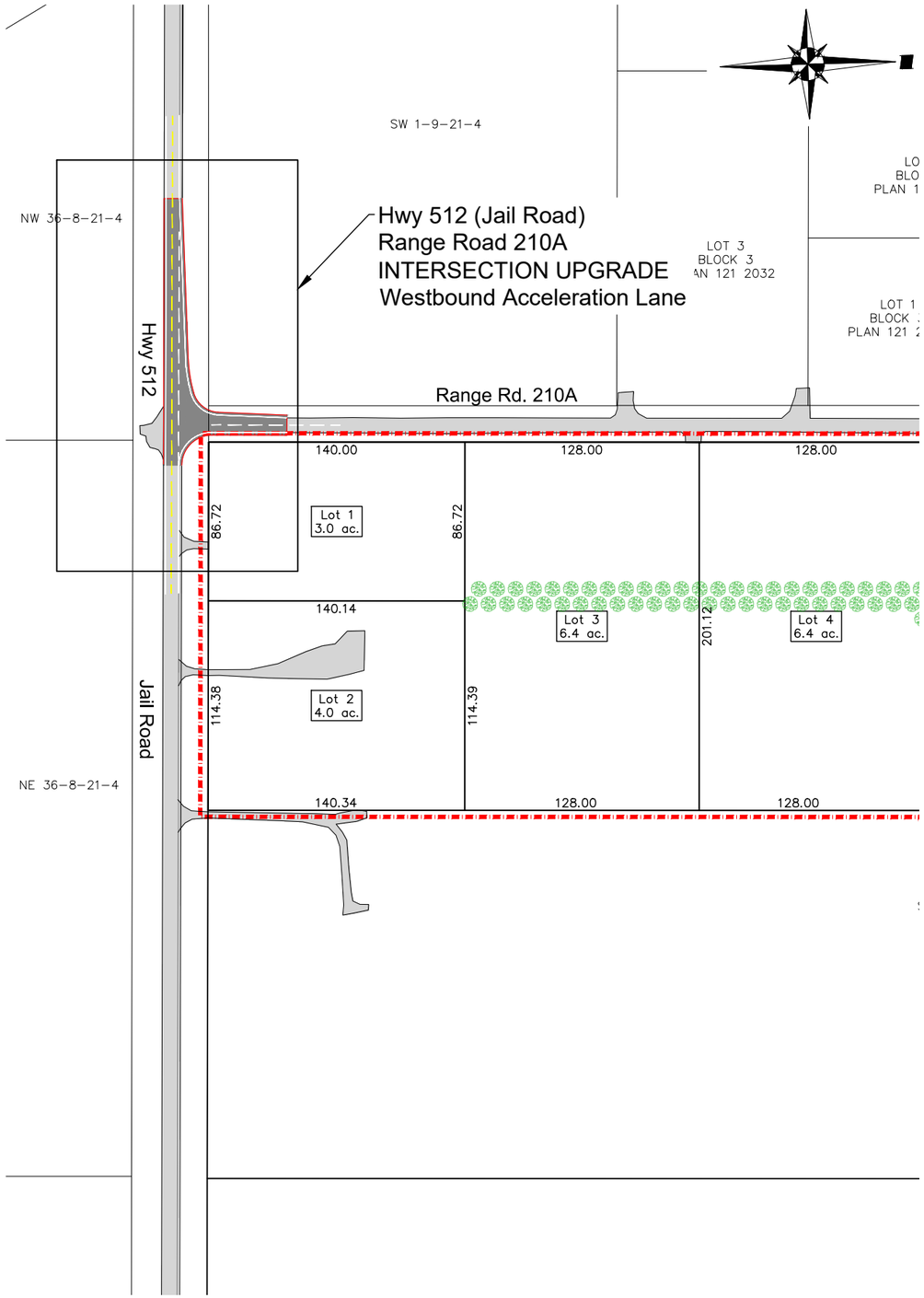
June 07, 2024

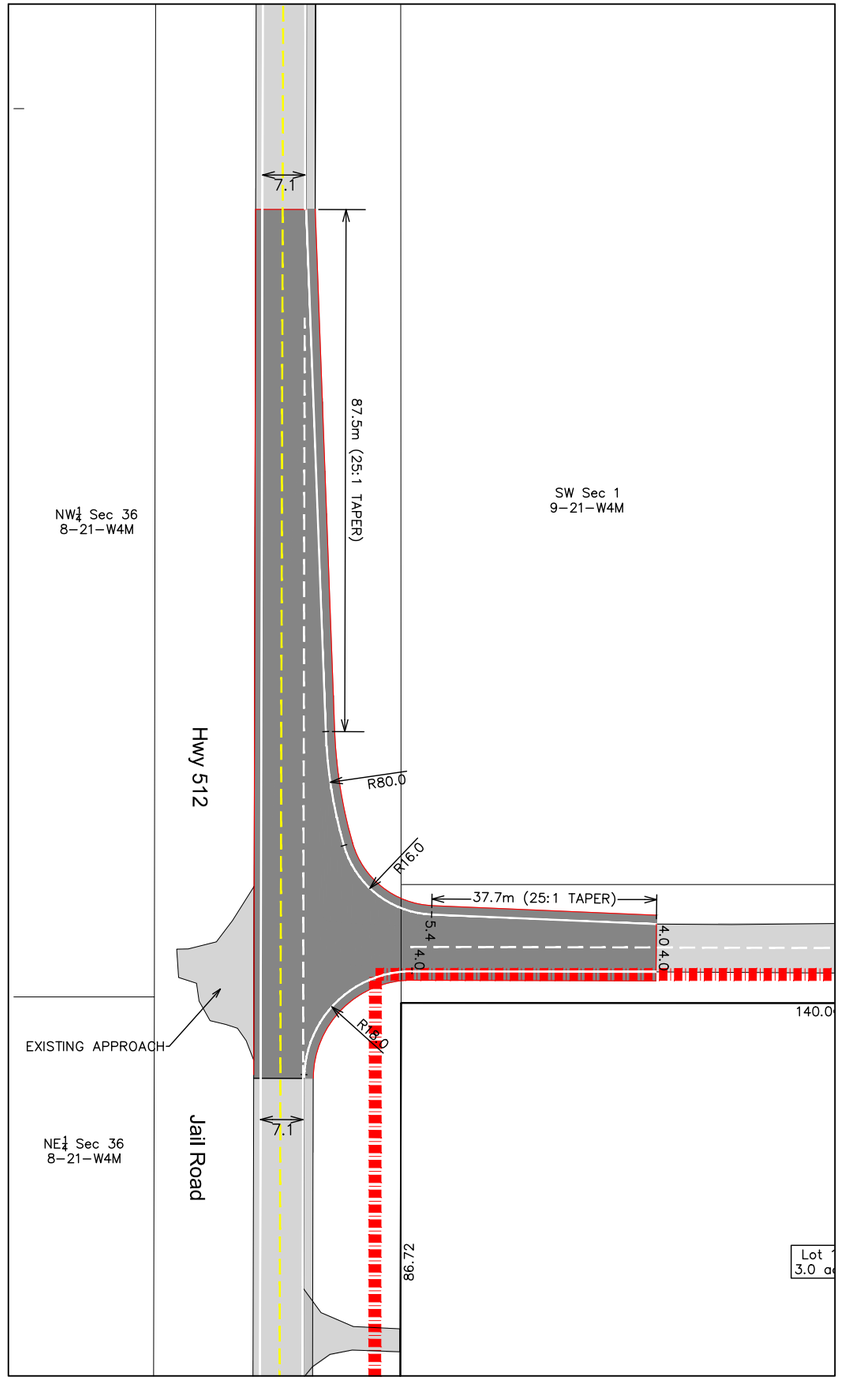
STORM WATER MANAGEMENT PLAN

FIGURE 6

229729LS

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594





LEGEND:

1: 3000

Country Side Subdivision

AREA STRUCTURE PLAN

March 2023

INTERSECTION UPGRADE

FIGURE 7

229729LS

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594

APPENDICES

1. Property Titles
2. Southland Report
3. Stormwater Management Plan
4. Correspondence From Alberta Transportation
5. Letter And Drawings To Neighbors

APPENDIX 1

PROPERTY OWNERSHIP TITLES

Certificate of Title		**Landowner**
C of T #211 110 525 +1	-	Blair Frache
C of T #211 110 525	-	Blair Frache

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0017 551 673	4;21;9;1;;2,7	211 110 525 +1

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 21 TOWNSHIP 9
SECTION 1
THE MOST WESTERLY 195 FEET THROUGHOUT THE WEST HALF OF
LEGAL SUBDIVISIONS 2 AND 7 IN THE SOUTH EAST QUARTER
CONTAINING 4.77 HECTARES (11.8 ACRES) MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES (MORE OR LESS)	ACRES	
ROAD WIDENING	7711751	0.061	0.15	(LSD 2)

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 111 284 768 +1

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
211 110 525	07/06/2021	TRANSFER OF LAND		SEE INSTRUMENT

OWNERS

BLAIR FRACHE
OF PO BOX 426
COALDALE
ALBERTA T1M 1M4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
2506ET .		RESTRICTIVE COVENANT "REGISTRATION NUMBER CORRECTED SEPT 5/12 BY 121228486"
891 257 641	06/12/1989	IRRIGATION DISTRICT RESOLUTION PART OF AN IRRIGABLE UNIT
001 245 087	30/08/2000	CAVEAT RE : UTILITY RIGHT OF WAY CAVEATOR - ATCO GAS AND PIPELINES LTD. 909 ELEVENTH AVENUE SW CALGARY ALBERTA
221 141 380	07/07/2022	CAVEAT RE : UTILITY RIGHT OF WAY CAVEATOR - ST MARY RIVER IRRIGATION DISTRICT. 525-40 ST SOUTH LETHBRIDGE ALBERTA T1J4M1

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF JUNE, 2023 AT 04:22 P.M.

ORDER NUMBER: 47601058

CUSTOMER FILE NUMBER: 229729LS

END OF CERTIFICATE

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0017 553 265	4;21;9;1;;2,7	211 110 525

LEGAL DESCRIPTION

MERIDIAN 4 RANGE 21 TOWNSHIP 9
SECTION 1
THOSE PORTIONS OF THE WEST HALVES OF LEGAL SUBDIVISIONS
2 AND 7 IN THE SOUTH EAST QUARTER WHICH LIES TO THE EAST OF
THE WEST 195 FEET THEREOF, CONTAINING 11.3 HECTARES (28.2 ACRES)
MORE OR LESS
EXCEPTING THEREOUT:

PLAN	NUMBER	HECTARES (MORE OR LESS)	ACRES
ROAD WIDENING	7711751	0.146	0.36 (LSD 2)

EXCEPTING THEREOUT ALL MINES AND MINERALS
AND THE RIGHT TO WORK THE SAME

ESTATE: FEE SIMPLE

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 111 284 768

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
211 110 525	07/06/2021	TRANSFER OF LAND		SEE INSTRUMENT

OWNERS

BLAIR FRACHE
OF PO BOX 426
COALDALE
ALBERTA T1M 1M4

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
1485KX .	21/06/1971	IRRIGATION ORDER/NOTICE THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		IRRIGATION DISTRICT
741 059 286	18/06/1974	UTILITY RIGHT OF WAY GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. "PORTION DESCRIBED IN 4;21;9;1;;2"
891 257 641	06/12/1989	IRRIGATION DISTRICT RESOLUTION PART OF AN IRRIGABLE UNIT
221 141 380	07/07/2022	CAVEAT RE : UTILITY RIGHT OF WAY CAVEATOR - ST MARY RIVER IRRIGATION DISTRICT. 525-40 ST SOUTH LETHBRIDGE ALBERTA T1J4M1

TOTAL INSTRUMENTS: 004

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 22 DAY OF JUNE, 2023 AT 04:22 P.M.

ORDER NUMBER: 47601058

CUSTOMER FILE NUMBER: 229729LS

END OF CERTIFICATE

APPENDIX 2

SOUTHLAND REPORT

Southland Report Dated: April 6, 2023

SouthLand Contractors, Inc.

SLCI

Quotation

P. O. Box 505
Coaldale, AB T1M 1M5

Phone # 403-635-4910

Fax # 403-345-3969

GST # 830864450

General Excavating Contractor
Commercial Foundation Excavation & Backfill
Site Services/ Site Grading, Compaction & Gravel Base

PSDS Qualified for Septic System Design/Installation

Pivot Mainlines/Acreage Development
Dugouts/Roadbuilding/Trenching
Water & Sewer Services/Cisterns/Pumps
Gravel Truck/Bobcat/Hi-Hoe/Dozer/Grader Service

Name/Address

Blair Frache

E-mail	Estimate #	4265
nh-slci@live.ca	Date	2023-04-06
	Expiry Date	**2025-06-01**

Description	Qty	Rate	Total
To Whom it may concern-- We have completed a site evaluation with test pits on the property as shown on the map included with this report and have found that the property will support private sewage disposal pressurized mound type systems. A restrictive horizon was identified in one location indicating that the pressurized mound type system may require increasing the sand layer depth in some areas of the development to ensure depth to restrictive layers required by the Standard is met. This increased sand layer depth meets all the design requirements of the Standard of Practice. Designers and installers should ensure that all installations are completed in accordance with the current Standard of Practice in force at the time of installation. By- Nelson Hooley Private Sewage Design/Install Ticket #10156			

TERMS & CONDITIONS--
THIS QUOTE IS VALID ONLY UNTIL EXPIRY DATE SHOWN. Because of our scope of work we require 30% initial deposit to schedule job, 2nd draw of 45% at start of job, remaining balance due at substantial completion. No work will proceed until these payment terms are fulfilled.
Customer responsible to provide accurate drawings and\or specifications.
Sewage disposal system quotes are conditional upon a site evaluation and lab reports. Conditions requiring changes from quoted system will involve additional charges.
Customer responsible to provide correct address/legal land description for utility line locate purposes.
All work schedules subject to recieving initial deposit, progress payments, weather, other trades, material availability, permitting processes, and/or our particular needs.
Changes, additions, frost conditions, or items not listed on this quote will be extra.

Subtotal	$0.00
GST	$0.00
Total	$0.00

Down To Earth Labs Inc.

The Science of Higher Yields

Southland Contractors Inc.
Box 505
Coaldale, AB T1M 1M5

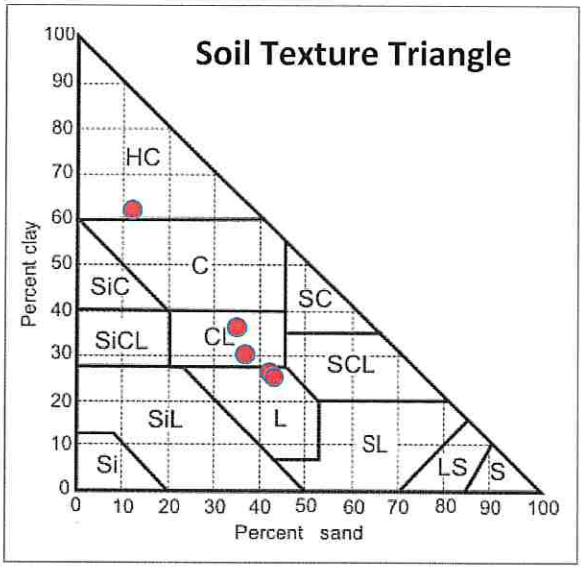
Report #: 148085
Report Date: 2023-04-03
Received: 2023-03-30
Completed: 2023-04-03
Test Done: ST

Project : Frache

PO:

3510 6th Ave North
Lethbridge, AB T1H 5C3
403-328-1133
www.downtoearthlabs.com
info@downtoearthlabs.com

		Sample ID:	230330P001	230330P002	230330P003	230330P004	230330P005
		Cust. Sample ID:	1	1	1	1	2
Analyte	Units		8-22	22-44	44-62	62-108	13-25
Sand	%		37.0	12.2	35.2	42.2	43.2
Silt	%		33.0	25.8	28.8	31.8	31.8
Clay	%		30.0	62.0	36.0	26.0	25.0
Soil Texture	-		Clay Loam	Heavy Clay	Clay Loam	Loam	Loam



Down To Earth Labs Inc.

The Science of Higher Yields

Southland Contractors Inc.
Box 505
Coaldale, AB T1M 1M5

Report #: 148085
Report Date: 2023-04-03
Received: 2023-03-30
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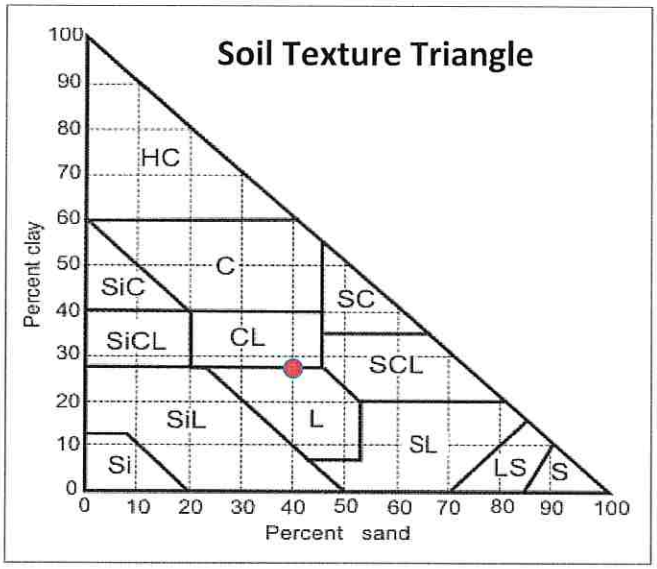
Test Done: ST

Project : Frache

PO:

3510 6th Ave North
Lethbridge, AB T1H 5C3
403-328-1133
www.downtoearthlabs.com
info@downtoearthlabs.com

		Sample ID:	230330P006
		Cust. Sample ID:	2
Analyte	Units		25-108
Sand	%		40.2
Silt	%		32.8
Clay	%		27.0
Soil Texture	-		Clay Loam



Raygan Boyce - Chemist

Test Pit 2
Test Pit 1
RANGE ROAD 210A
RANGE ROAD 210A

APPENDIX 3

Stormwater Management Plan

Stormwater Management Plan

STORMWATER MANAGEMENT PLAN

COUNTRY SIDE SUBDIVISION
SE-1-9-21-W4M
LETHBRIDGE COUNTY
ALBERTA

Prepared for: **324700 Alberta Ltd.**

File Number: **229729CE**

Dated: **April 2024**

Prepared By: **Martin Geomatic Consultants Ltd.**
255 – 31st Street No.
Lethbridge, AB T1H 3Z4
403-329-0050
geomart@mgcl.ca

April 16, 2024

File: 229729CE

324700 Alberta Ltd.

Re: Stormwater Management Plan
Proposed Subdivision in SE ¼ Sec 1-9-21-W4M

We are pleased to submit the Stormwater Management Plan for the Proposed Subdivision in SE ¼ Sec 1-9-21-W4M. This report examines the stormwater management requirements to subdivide the subject property.

We trust that this report meets with your needs.

Yours truly,

PROFESSIONAL ENGINEERS ALBERTA
RAY E. MARTIN
2024-04-17

PERMIT TO PRACTICE
Martin Geomatic Consultants Ltd.
Signature:
Date: 2024-04-17
PERMIT NUMBER: P 5852
The Association of Professional Engineers and Geoscientists of Alberta

MARTIN GEOMATIC CONSULTANTS LTD.

Ray Martin, P.Eng.

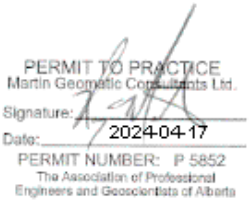
Enclosure

CORPORATE AUTHORIZATION

This report has been prepared by Martin Geomatic Consultants Ltd. (MGCL) under the authorization of 324700 Alberta Ltd. The material in this report represents the best Judgement of MGCL given the available information. Any use that a third party makes of this report, or reliance on or decisions made base upon it is the responsibility of the third party. MGCL accepts no responsibility for damages, if any, suffered by a third party, as a result of decisions made, or actions taken based upon this report.

Should any questions arise regarding the content of this report, please contact the undersigned.

MARTIN GEOMATIC CONSULTANTS LTD.



Ray Martin, P.Eng.
Senior Project Manager

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDIX

I. PROJECT BACKGROUND AND DRAINAGE FEATURES

The Country Side Subdivision is a proposed grouped country residential and light industrial subdivision located 4.2 km east of Highway#4 (43rd St. S) and just north of Highway #512 (Jail Rd.) in Lethbridge County. The legal property description is Southeast Quarter of Section 1, Township 9, Range 21 West of the 4th Meridian. The property is bound by Range road 210A to the west, and the Broxburn Business Park to the north, and farmland to the east. The subdivision west of the subject property is known as the "Pater Subdivision" which contains 15 lots and is zoned Grouped Country Residential (GCR). ***Drawing 1 – Project Location*** shows the project location. This drainage report is being submitted in support of the Country Side Area Structure Plan (ASP) and rezoning application, for consideration by Lethbridge County. The plan area is 39.5 acres and the proposed lots will range in size from approx. 3.0 to 6.0 acres.

The southerly two lots are proposed to be Grouped Country Residential (GCR). The balance of the site containing five – 6 acre lots will be zoned Direct Control (DC). The Direct Control zoning will allow for residential dwellings and light industrial uses on each lot. The purpose of this report is to provide storm water management strategies to guide future development of the County Side subdivision.

The proposed lot layout is shown in Appendix A - ***Drawing 2 – Proposed Subdivision.***

A. Existing Features

The land is generally flat with the majority of the site draining to the east and northeast at ground slopes of 0.4% - 1.0%. This water then flows into two natural depressions (trapped lows) and overflow east and north into cultivated land.

The land splits into two main catchment areas which define the overland drainage boundaries. The south catchment (9.17 ha) Zone "1" (see Drawing-3) drains via overland sheet flow to a natural depression situated in the middle of the site along the east property line. The north catchment (6.96 ha) Zone "2" drains via sheet flow to another natural depression located along the north end of the east property line.

Existing soil descriptions for the area include loam (L) and silt loam Orthic Dark Brown Chernozem on medium textured (L, SiL) sediments deposited by wind and water (LET), as defined in soil polygon 5861 which encompasses an area of 936 ha[a].

The impact of offsite runoff is negligible due to the existing perimeter features which generally minimizes the overland drainage from entering or exiting the site. The north-south Range Road 210-A defines the west boundary. The east boundary slopes away from the site and includes a raised berm along the fence line and row of bushes running the length of the property. The two natural depressions pond to the height of the hedge berm and spill over to the east and north where it flows overland through cultivated fields ending up in a roadside ditch and/or to the Broxburn Business park. The natural depressions do not retain much water as it is lost to either infiltration or evaporation.

A topographical site survey was completed by Martin Geomatic Consultants Ltd. and compiled with lidar survey information. An existing surface model was created to define drainage boundaries, storage facilities and flow conveyance routes as shown in ***Drawing 3 – Pre-development ponding*.**

[a] *Alberta Soil Information Viewer*, Alberta Agriculture and Forestry, http://www4.agric.gov.ab.ca/agrasidviewer

B. Proposed Development

The impervious areas for the ASP will increase with the addition of hard surfaces such as driveways, principal and auxiliary building roofs for the residential and the light industrial buildings. We have used 25,000 sq. ft. per lot or 10.05% total impervious area for the lots that are zoned Direct Control. The two lots that are zoned Grouped Country Residential will have about 12,000 sq. ft. of impervious area.

Post development storm run-off will be directed to individual onsite ponds. The emergency overflow from each pond will drain through individual control structures/weirs into swales/ditches running between ponds connecting them in the event of a storm in excess of a 1:100 year storm event. The storm drainage will ultimately overflow to the north east corner of development into cultivated farmland. The storage areas will be drained by infiltration, evaporation, and irrigation. However, irrigation and evaporation will be the primary mechanisms for draining the ponds. Easements will be provided for the swales, ditches, and the areas affected by the storm water storage.

The on-site storage ponds will be designed to store runoff up to a post-development 1 in 100 year-24 hour event. Based on the modelling using a PCSWMM and a Chicago design storm[b], it is recommended that the developer provide a combined total of approximately **7,200 cu. m.** of active stormwater storage on-site through the use of individual ponds and natural depression (trapped lows). It is proposed that the developer construct a berm along the east boundary to contain the required trapped low storage **(see Drawing-4).** An overflow pipe will be installed between each pond to control the discharge in flood conditions and allow for shared storage. As there is no designated outfall route downstream of the development, all stormwater runoff in excess of the required storage will be directed through the constructed weirs and swales, and discharged into the fields to the existing pre-development runoff routes in the northeast corner of the development.

Swales are required throughout the site to direct runoff to the designated storage areas, which must be maintained to preserve conveyance capacities. Overflow from each pond will be directed to the storage areas via interconnected grass swales. The final size, shape, and design of each pond will be determined at the time of subdivision.

Drawing 4 – Post-development ponding shows the location of proposed detention ponds.

II. METHODOLOGY

Drainage analysis of the proposed development has been completed to determine runoff, storage, and discharge rates for pre and post-development conditions. Existing site analysis (pre-development) has been analyzed to determine a benchmark for allowable release rates at

[b] Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, 1:100 year-24hr.(city of Lethbridge – Design standards, section 3.3.3

the post development conditions if allowed. A stormwater management model[c] has been built to assist with the analysis. The following parameters are included in the modeling:

1. Synthetic Design Storm – Chicago Method: 24-hour duration, 100-year return period, (IDF Parameters A = 1019.20, B = 0, C = 0.731)[d]
2. Rainfall time step = 5 minutes
3. Simulation duration = 24 hrs
4. Routing Method: Dynamic Wave
5. No effect of Evaporation and Groundwater
6. Total Catchment area = 15.91ha
7. Infiltration Method: Green Ampt
8. Manning's N Impervious = 0.015
9. Manning's N Pervious = 0.15 (undeveloped), 0.1 (developed)
10. Depression Storage Pervious = 5mm (undeveloped), 3.8mm (developed)
11. Depression Storage Impervious = $0.77*(S\%)^{-0.49}$

A. Sub-Catchments

The existing (pre-development) and proposed site (post-development) models have been developed to simulate drainage patterns in response to a single event 100yr synthetic design storm. The following tables show the sub catchment parameters assumed in the pre and post-development models:

Table 1 – Pre Development Sub-Catchment Parameters

Sub-Catchment ID	Area (ha)	Flow Path (m)	Slope (%)	Soil	H.Con (mm/hr)	S.Head (mm)	IMD
Zone-1	8.96	100	0.6	L, SiL	5.0	127.9	0.36
Zone-2	6.98	220	0.5	L, SiL	5.0	127.9	0.36

Table 2 – Post Development Sub-Catchment Parameters

Sub-Catchment ID	Area (ha)	Flow Path (m)	Slope (%)	Soil	H.Con (mm/hr)	S.Head (mm)	IMD
Lot 1	1.17	84	0.4	L, SiL	5.0	127.9	0.36
Lot 2	1.56	111	0.6	L, SiL	5.0	127.9	0.36
Lot 3	2.59	198	0.8	L, SiL	5.0	127.9	0.36
Lot 4	2.62	204	0.7	L, SiL	5.0	127.9	0.36
Lot 5	2.66	195	0.3	L, SiL	5.0	127.9	0.36
Lot 6	2.68	205	1.0	L, SiL	5.0	127.9	0.36
Lot 7	2.63	211	0.5	L, SiL	5.0	127.9	0.36

[c] EPA Storm Water Management Model – Version 5.0 (Build 5.0.22)
[d] *2021 Design Standards*, City of Lethbridge.

The source information for the above tables includes:

Area (ha) & Flow Path (m): measured

Slope (%): calculated from field survey

Soil Texture: Alberta Soil Viewer & boreholes

Hydraulic Conductivity (mm/hr) & Suction Head (mm): Soil properties[e]

Initial Moisture Deficit: Typical soil characteristics[f]

Pre-development impervious area: 1%[g]

Post-development impervious area: 10%

III. RESULTS

The model results are presented in the following tables. Details of the rainfall runoff modeling are included in ***Appendix C – SWMM Model Results***.

A. Pre and Post Development Runoff

Table 3 presents the pre-development model results for the sub-catchment runoff generated from a 24 hour duration 100 year storm. Existing subcatchment areas are shown in the attached **Appendix 3.**

Table 3 – Pre-Development Runoff

Sub Catchment ID	Zone-1	Zone-2	TOTAL
Desc.	**South**	**North**	**-**
Area (ha)	8.96	6.98	15.94
Precipitation (mm)	120.15	120.15	120.15
Infiltration (mm)	86.69	83.67	
Runoff Depth (mm)	33.47	36.49	
Runoff Volume (m^3)	3,070	2,570	5,640
Peak Runoff (m^3/s)	0.55	0.73	-

[e] Rawls, W.J. et al., (1983). J. Hyd. Engr., 109:1316
[f] *XP SWMM Solutions*, http://help.xpsolutions.com/display/xps2015/Infiltration
[g] *2016 Design Standards*, City of Lethbridge.

Table 4 presents the sub-catchment model results for the post-development runoff generated from a 24 hour duration 100 year storm. Proposed subcatchment areas are shown in the attached Appendix **(Drawing-4, Post Development Ponding).**

Table 4 – Post-Development Runoff

Sub-Catchment ID	Area (ha)	Precipitation (mm)	Infiltration (mm)	Runoff Depth (mm)	Runoff Volume (m^3)	Peak Runoff (m^3/s)
Lot 1	1.17	120.15	72.75	47.39	560	0.28
Lot 2	1.56	120.15	72.92	47.22	740	0.36
Lot 3	2.59	120.15	74.02	46.10	1,190	0.47
Lot 4	2.62	120.15	74.32	45.80	1,200	0.46
Lot 5	2.66	120.15	75.69	44.41	1,180	0.39
Lot 6	2.68	120.15	73.79	46.33	1,240	0.51
Lot 7	2.63	120.15	78.20	41.91	1,100	0.27
Total:	15.91	120.15			7,210	

B. Proposed Onsite Storage Units

Table 5 displays the proposed detention ponds in response to the 100 year event as shown on **Drawing-4, Post Development Ponding** .

Table 5 – Proposed Storage Units

Storage Unit	Overflow Pipe (dia.)	Max. Depth (m)	HWL (m)	Max. HGL El. (m)	Area bottom (m^2)	Area HWL (m^2)	Max. Volume (m^3)	Min. FF El. (m)
Lot 1	200mm	2.0	899.0	897.0	96	336	400	899.6
Lot 2	200mm	0.9	898.3	897.6	312	665	400	898.9
Lot 3	200mm	1.9	898.0	896.1	519	1506	1,764	898.6
Lot 4	200mm	1.7	897.6	895.3	532	1772	1,400	898.2
Lot 5	200mm	1.7	897.6	895.3	582	1873	1,400	898.2
Lot 6	200mm	1.7	897.6	895.3	595	2006	1,400	898.2
Lot 7	200mm	1.7	897.6	895.3	523	3744	1,400	898.2
TOTAL	-	-	-	-	-	-	8,164	-

HWL = High water level

HGL = Hydraulic grade line

Min. FF El. = Minimum finished floor or openings of buildings adjacent to ponds

FF = Finished floor

IV. RECOMMENDATIONS

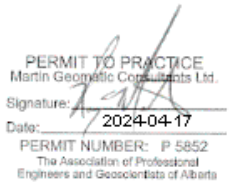
It is recommended that the developer(s) provide a combined total of approximately **7,200 m³** of active stormwater storage on-site to retain the runoff (with zero discharge) generated from a 1 in 100 year 24 hour storm event as outlined in this report. Detailed designs including detention ponds, weirs, swales and grading plans are required prior to construction, which should follow the preliminary concepts outlined in this report. The high-water (HWL) level of such detention ponds shall be a minimum of 0.6 m below finished floor (FF) elevations of adjacent buildings. Emergency escape routes shall be provided for a suitable outlet from each pond in the event of flooding. The storage areas will be drained by infiltration, evaporation, and irrigation controlled by the individual lot owners. Easements will be provided for the swales, ditches, and the areas affected by the storm water storage.

Based on varying soil conditions, irrigation and evaporation will be the primary mechanisms for draining the ponds. If another event were to occur prior to the ponds being drained, excess storm water will ultimately overflow in the northeast corner of the development. This being where excess storm water is currently exiting the property.

V. CLOSING

We trust that this report meets the requirements of the Area Structure Plan. Should you require any further information, please contact the undersigned.

Per:



Ray Martin, P.Eng.
Project Manager

MARTIN GEOMATIC CONSULTANTS LTD.
Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice P05852

APPENDIX "A"
LIST OF DRAWINGS:

Drawing 1 – Project Location

Drawing 2 – Proposed Subdivision/Land Use

Drawing 3 – Pre-Development Features

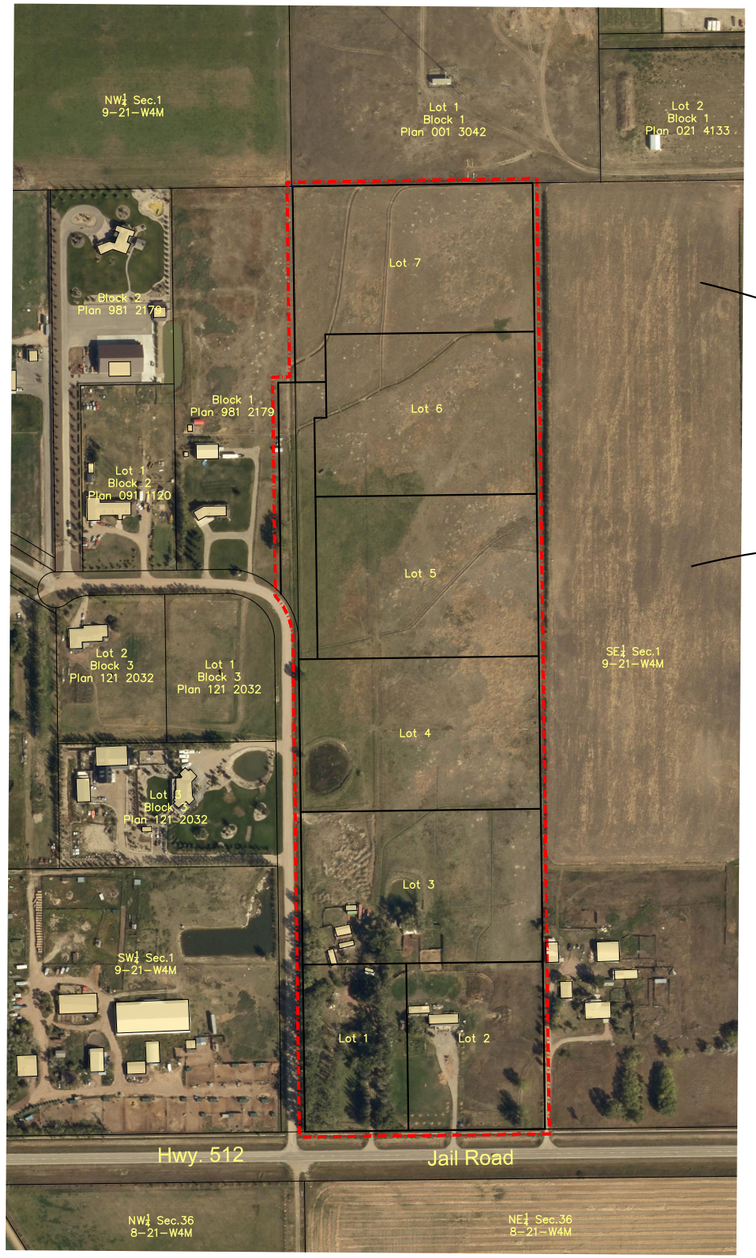
Drawing 4 – Post-Development Ponding

STORMWATER MANAGEMENT PLAN
COUNTRY SIDE SUBDIVISON
SE ¼ SEC 1-9-21-W4M
Lethbridge County, Alberta

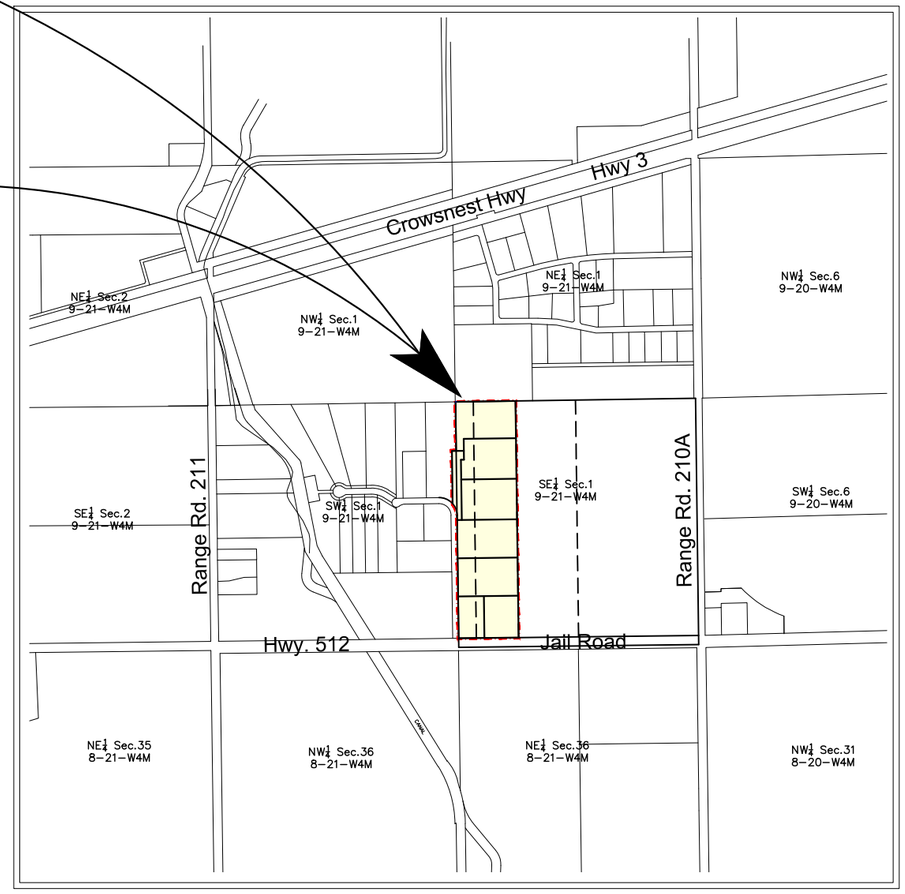
Country Side Subdivision

STORMWATER MANAGEMENT PLAN

Lethbridge County



SUBDIVISION DETAIL
SCALE 1:5000



LOCATION MAP
SCALE 1:20000

DRAWING LIST

DWG. No.	Description
1	PROJECT LOCATION
2	LAND USE
3	PRE-DEVELOPMENT PONDING
4	POST-DEVELOPMENT PONDING

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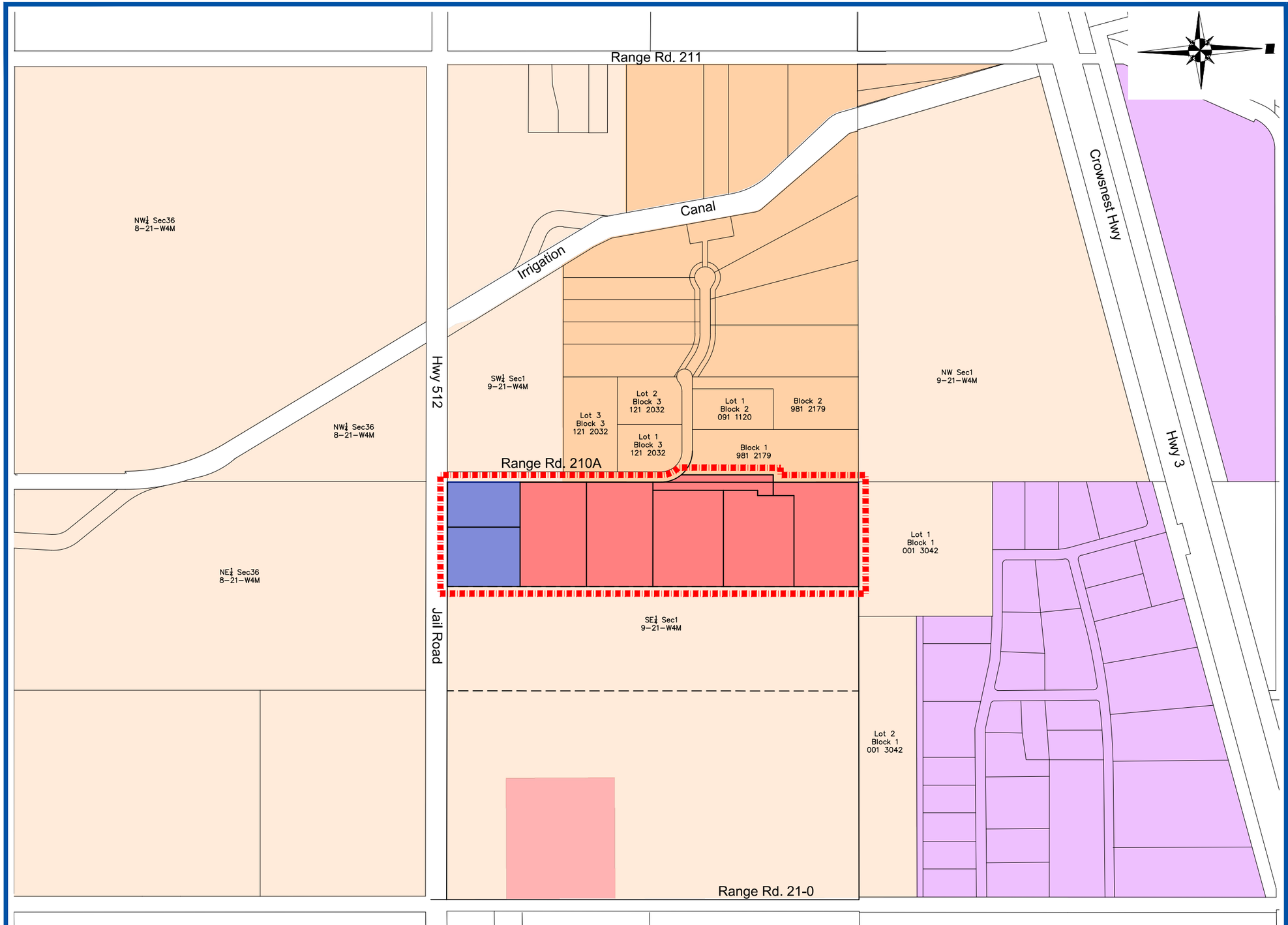
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)

EXISTING:

- EXISTING: LETHBRIDGE URBAN FRINGE (LUF)
- EXISTING: GROUPED COUNTRY RESIDENTIAL (GCR)
- EXISTING: RURAL GENERAL INDUSTRIAL (RGI)
- EXISTING: RURAL COMMERCIAL (RC)

PROPOSED:

- FROM: LETHBRIDGE URBAN FRINGE (RA) TO: DIRECT CONTROL (DC)
- FROM: LETHBRIDGE URBAN FRINGE (RA) TO: GROUPED COUNTRY RESIDENTIAL (GCR)

1: 7500

Country Side Subdivision

STORMWATER MANAGEMENT PLAN

July 2023

LAND USE
DRAWING - 2

229729LS

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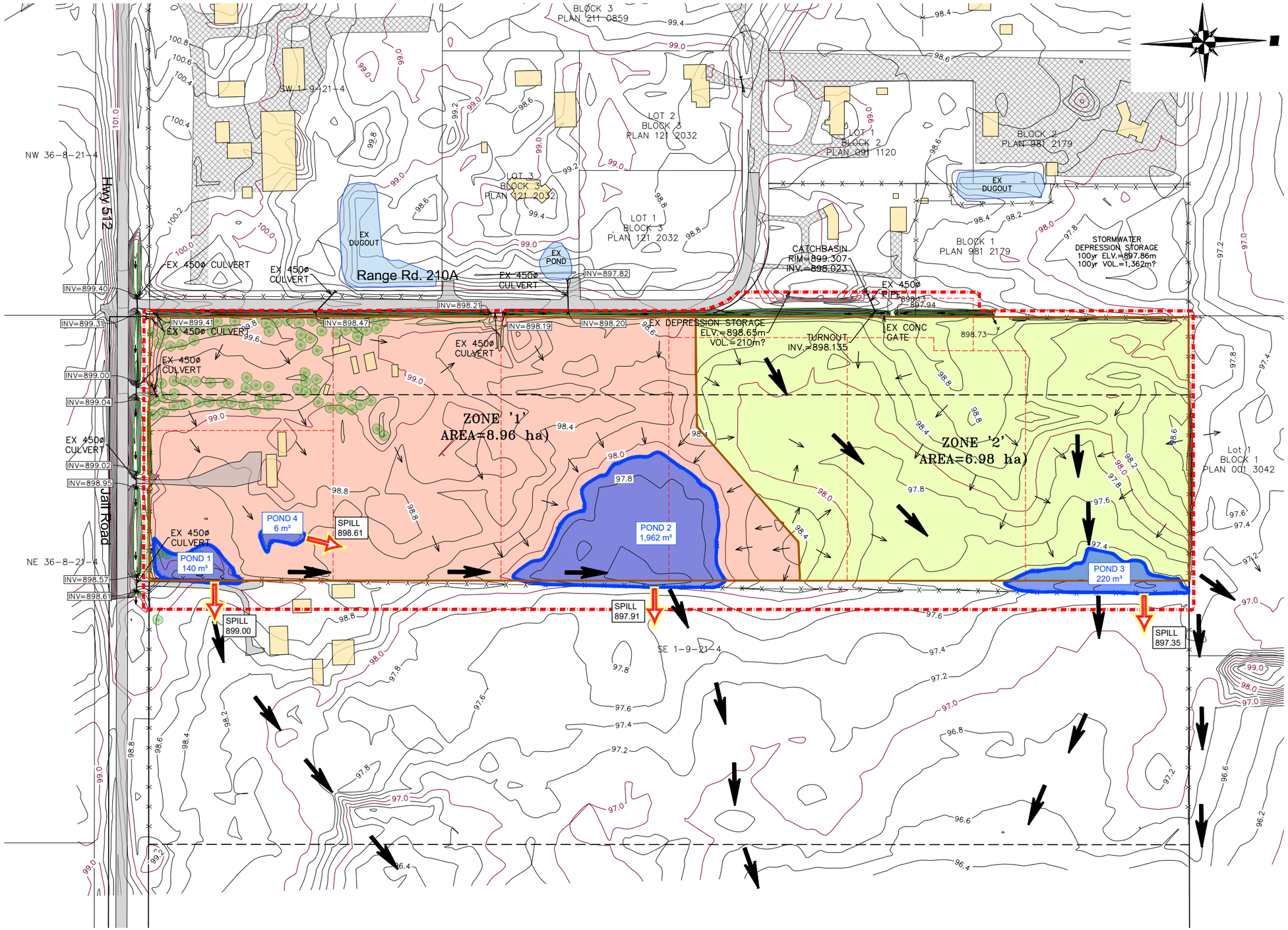

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
  Area = 40.06 acres (16.21 ha)
- STM ZONE '1' (8.96 ha.)
- STM ZONE '2' (6.98 ha.)
- EXISTING STURCTURE/HOUSE
- EXISTING GRAVEL ROAD
- SURFACE DRAINAGE ROUT
- OVERLAND DRAINAGE SYSTEM ROUTE
- EMERGENCY DRAINAGE SYSTEM ROUTE
- EX MAJOR CONTOUR (1.0m)
- EX MINOR CONTOUR (0.2m)
- EX TREE
- EXISTING PONDING

1: 3000

Country Side Subdivision

STORMWATER MANAGEMENT PLAN

July 2023

PRE-DEVELOPMENT PONDING
DRAWING - 3

229729LS

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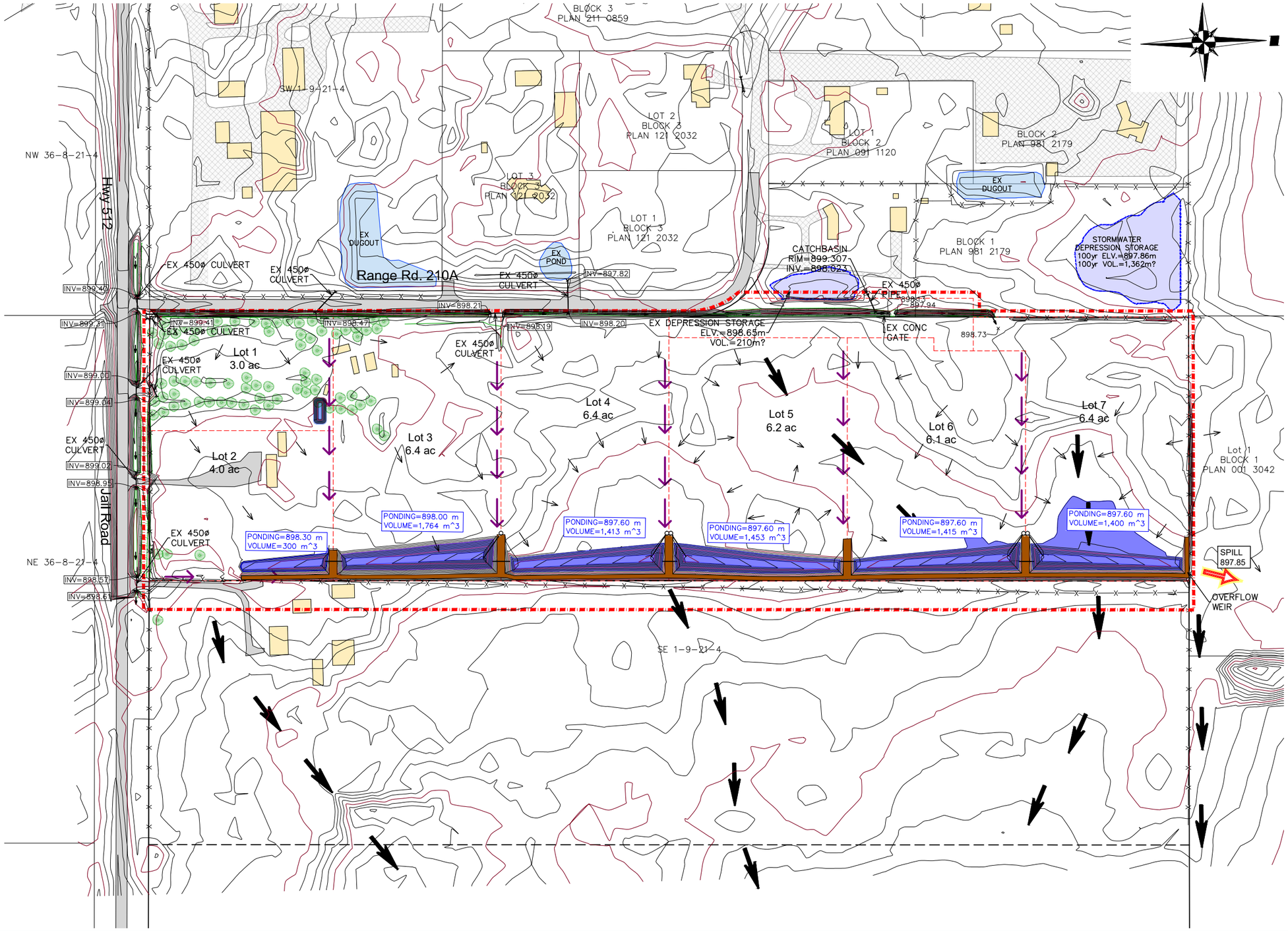

LEGEND:

- AREA STRUCTURE PLAN BOUNDARY
  Area = 40.06 acres (16.21 ha)
- EXISTING STURCTURE/HOUSE
- EXISTING GRAVEL ROAD
- SURFACE DRAINAGE ROUT
- OVERLAND DRAINAGE SYSTEM ROUTE
- EMERGENCY DRAINAGE SYSTEM ROUTE
- PROPOSED MAJOR CONTOUR (1.0m)
- PROPOSED MINOR CONTOUR (0.2m)
- EX TREE
- PROPOSED PONDING
- OVERFLOW WEIR
- GRASS SWALE BETWEEN LOTS
- PROPOSED DUGOUT / POND

1: 3000

Country Side Subdivision

STORMWATER MANAGEMENT PLAN

July 2023

POST-DEVELOPMENT PONDING
DRAWING - 4

229729LS

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Appendix B – Soil Information

STORMWATER MANAGEMENT PLAN
COUNTRY SIDE SUBDIVISON
SE ¼ SEC 1-9-21-W4M
Lethbridge County, Alberta

Alberta Agriculture and Forestry

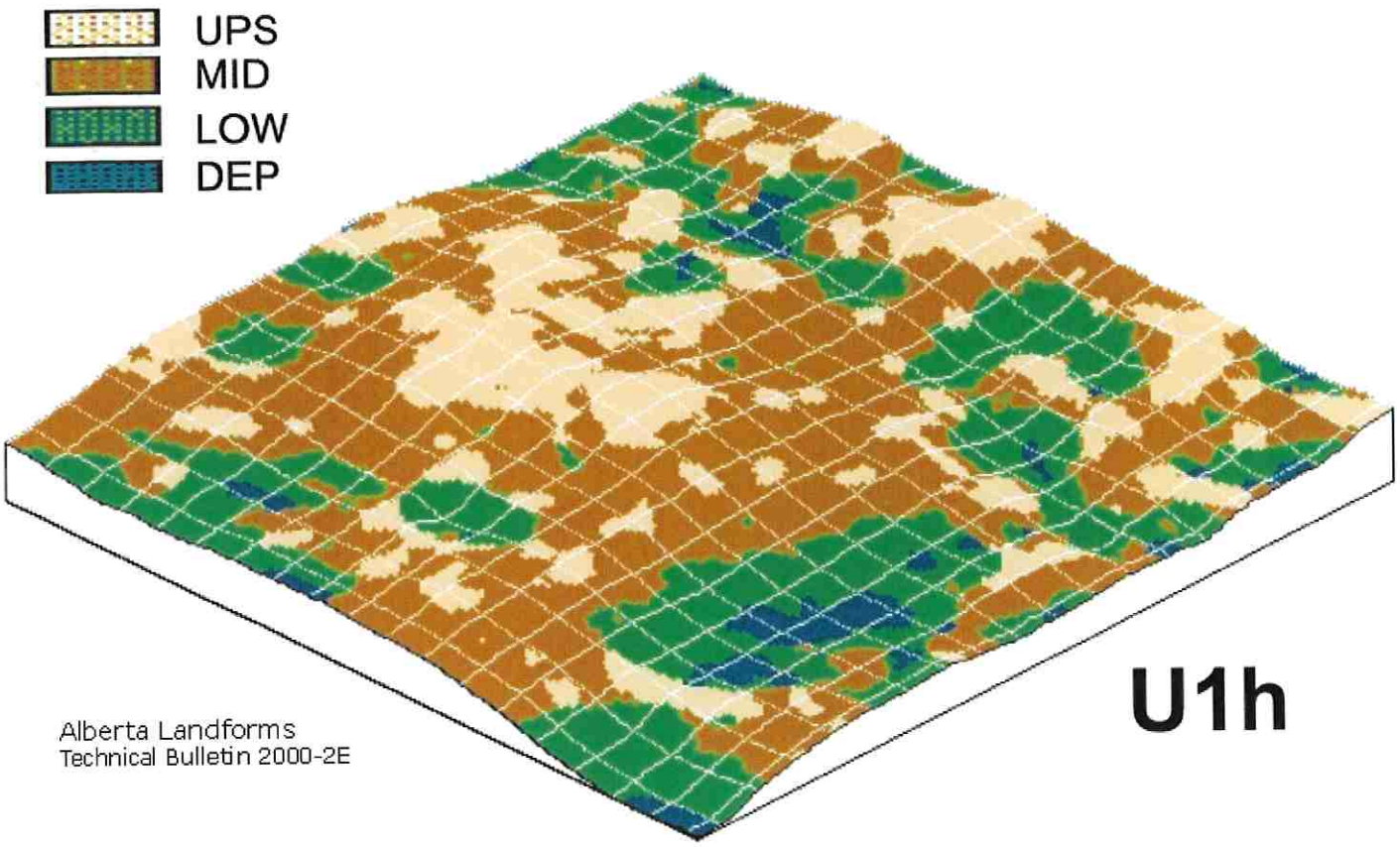
Report on Soil Polygon: 5861

Variable	Value
POLY_ID	5861
Map Unit Name	LET4/U1h
Landform	U1h - undulating - high relief
LSRS Rating (Spring Grains)	3M(10)

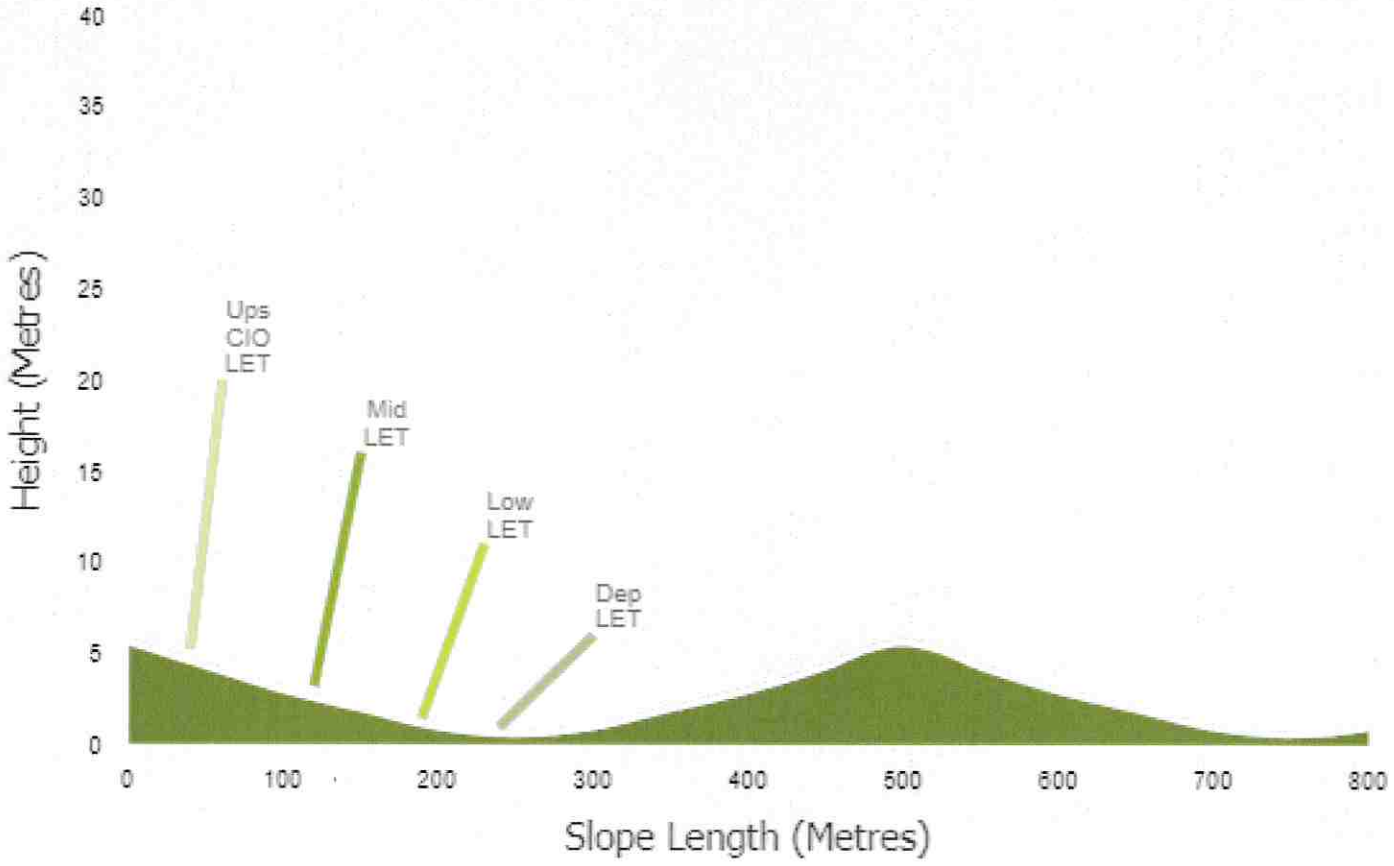
Landscape Model Descriptions:
Orthic Dark Brown Chernozem on medium textured (L, SiL) sediments deposited by wind and water (LET).
The polygon includes soils with Rego profiles (4).
Undulating, high relief landform with a limiting slope of 4% (U1h).

Image:

Landform Model:

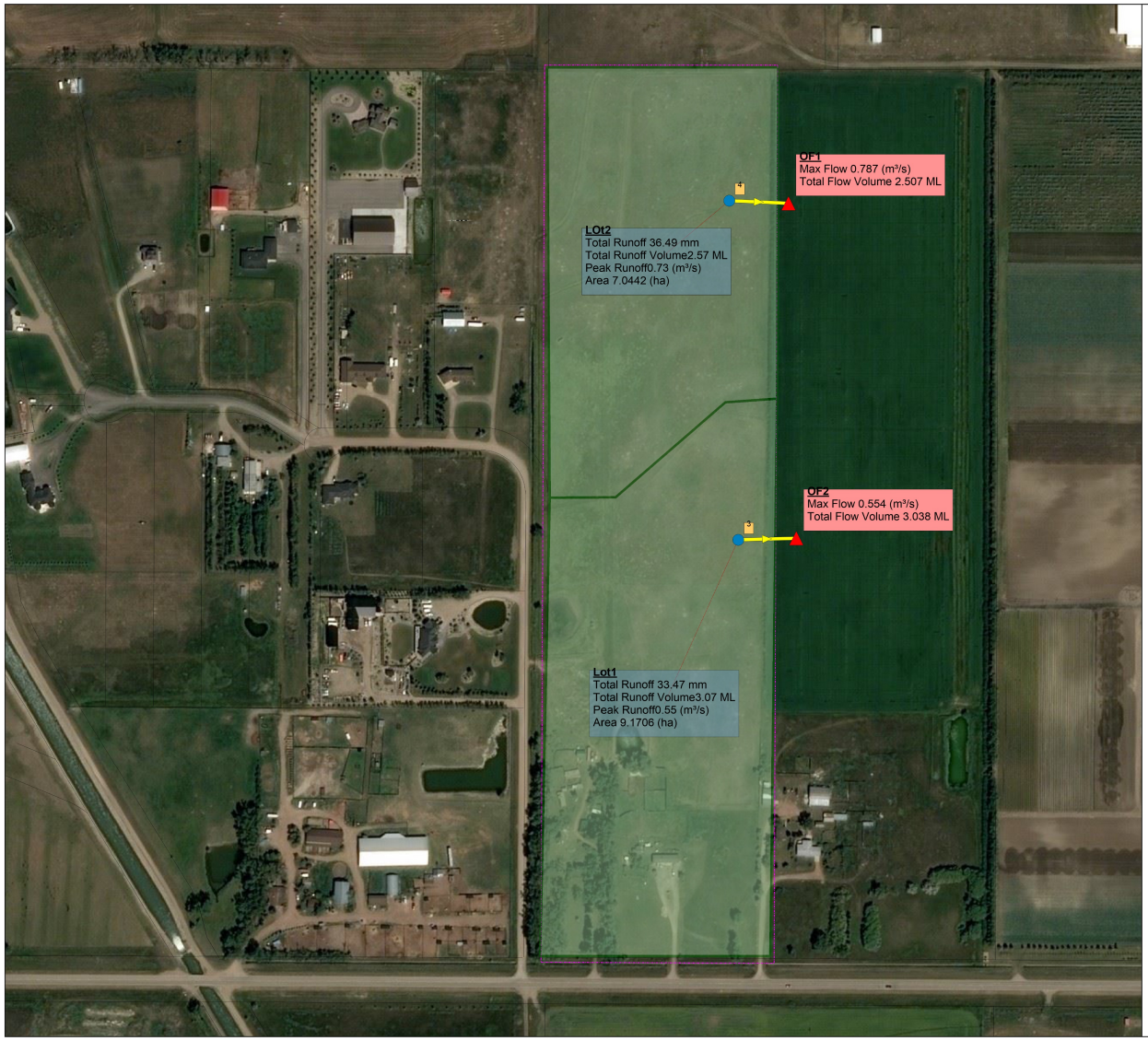


Landform Profile:



Appendix C – SWMM Model Results

STORMWATER MANAGEMENT PLAN
COUNTRY SIDE SUBDIVISON
SE ¼ SEC 1-9-21-W4M
Lethbridge County, Alberta



LEGEND:

- Junctions
- Outfalls
- Conduits
- Subcatchments
- Boundary
- AutoCad lot lines
- post development

Stormwater Management Plan

Country Side Subdivision

PCSWMM Model
Pre-development

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

N

200 m

MARTIN GEOMATIC CONSULTANTS

File Number:229729CE Figure 1

Country Side Subdivision
Pre Developmetn 1:100yr 24hr

```
[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           03/28/2022
START_TIME           00:00:00
REPORT_START_DATE    03/28/2022
REPORT_START_TIME    00:00:00
END_DATE             03/29/2022
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4
```

```
[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Lethbridge_1:100year_Chicago_24h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_1:100year_Chicago_24h
Lethbridge_100year_Chicago_4h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_100year_Chicago_4h
Lethbridge_5year_Chicago_4h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_5year_Chicago_4h

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
Lot1             Lethbridge_1:100year_Chicago_24h 3 9.1706  0        416.845  0.6      0
LOt2             Lethbridge_1:100year_Chicago_24h 4 7.0442  0        704.42   0.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
Lot1             0.013      0.15       0.45       5          25         OUTLET
LOt2             0.013      0.15       0.45       5          25         OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
Lot1             127.9      5          0.36       0          0
LOt2             127.9      5          0.36       0          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
3                897.6      1.2        0          0          0
4                897.2      1.3        0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              897.8      FREE                        NO
OF2              897.9      FREE                        NO
```

```
[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ---------
-
1                4                OF1              53.323     0.01       0          0          0          0
2                3                OF2              52.149     0.013      0          0          0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
1                RECT_OPEN    1                4          0          0          1
2                RECT_OPEN    1                4          0          0          1

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;lot 3 pond
pondnorth        Storage    0          0.6
pondnorth                   0.1        89
pondnorth                   0.2        307
pondnorth                   0.3        568
pondnorth                   0.4        848
pondnorth                   0.5        1149
pondnorth                   0.6        1448
pondnorth                   0.7        1718
pondnorth                   0.8        1959
pondnorth                   0.9        2175
pondnorth                   1          2370
pondnorth                   1.33       23685

pondsouth2       Storage    0          0.6
pondsouth2                  0.1        12
pondsouth2                  0.2        49.4
pondsouth2                  0.3        107
pondsouth2                  0.4        185
pondsouth2                  0.5        287
pondsouth2                  0.6        425
```

```
pondsouth2                  0.7        636
pondsouth2                  0.8        917
pondsouth2                  0.9        1267
pondsouth2                  1          1721
pondsouth2                  1.4        7263

Road_Default_Trapped_Low Storage    0          0.636
Road_Default_Trapped_Low            1.2        0.636
Road_Default_Trapped_Low            1.6        1000

Road_Default_Trapped_Low2 Storage    0          0.6
Road_Default_Trapped_Low2            1.2        0.6
Road_Default_Trapped_Low2            1.3        3000
Road_Default_Trapped_Low2            1.6        4500

Waterfront_Dry_Pond Storage    0          156.7
Waterfront_Dry_Pond            0.2        236.1
Waterfront_Dry_Pond            0.4        335.5
Waterfront_Dry_Pond            0.6        458.4
Waterfront_Dry_Pond            0.8        601.2
Waterfront_Dry_Pond            1          763.6
Waterfront_Dry_Pond            1.2        945.4
Waterfront_Dry_Pond            1.4        1147.1
Waterfront_Dry_Pond            1.6        1370.2
Waterfront_Dry_Pond            1.8        1628.2
Waterfront_Dry_Pond            2          2002.8
Waterfront_Dry_Pond            2.2        2597.1

Waterfront_Pond  Storage    0          6533
Waterfront_Pond             0.2        6750
Waterfront_Pond             0.4        6957
Waterfront_Pond             0.6        7167
Waterfront_Pond             0.8        7381
Waterfront_Pond             1          7597
Waterfront_Pond             1.2        7811
Waterfront_Pond             1.4        8027
Waterfront_Pond             1.6        8146
Waterfront_Pond             1.8        8470
Waterfront_Pond             2          8696
Waterfront_Pond             2.2        9041
Waterfront_Pond             2.4        9392
```

```
Waterfront_Pond             2.6         9751
Waterfront_Pond             2.8         10117
Waterfront_Pond             3           10490
Waterfront_Pond             3.2         10870
Waterfront_Pond             3.4         11257
Waterfront_Pond             3.6         11651
Waterfront_Pond             3.8         12053
Waterfront_Pond             4           12461
Waterfront_Pond             4.2         12877
Waterfront_Pond             4.4         13300
Waterfront_Pond             4.6         13731
Waterfront_Pond             4.8         14165

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, r = 0.3, rain units = mm/hr.
Lethbridge_1:100year_Chicago_24h            0:00       1.352
Lethbridge_1:100year_Chicago_24h            0:05       1.364
Lethbridge_1:100year_Chicago_24h            0:10       1.376
Lethbridge_1:100year_Chicago_24h            0:15       1.388
Lethbridge_1:100year_Chicago_24h            0:20       1.4
Lethbridge_1:100year_Chicago_24h            0:25       1.413
Lethbridge_1:100year_Chicago_24h            0:30       1.426
Lethbridge_1:100year_Chicago_24h            0:35       1.439
Lethbridge_1:100year_Chicago_24h            0:40       1.453
Lethbridge_1:100year_Chicago_24h            0:45       1.466
Lethbridge_1:100year_Chicago_24h            0:50       1.48
Lethbridge_1:100year_Chicago_24h            0:55       1.495
Lethbridge_1:100year_Chicago_24h            1:00       1.51
Lethbridge_1:100year_Chicago_24h            1:05       1.525
Lethbridge_1:100year_Chicago_24h            1:10       1.54
Lethbridge_1:100year_Chicago_24h            1:15       1.556
Lethbridge_1:100year_Chicago_24h            1:20       1.572
Lethbridge_1:100year_Chicago_24h            1:25       1.589
Lethbridge_1:100year_Chicago_24h            1:30       1.606
Lethbridge_1:100year_Chicago_24h            1:35       1.624
Lethbridge_1:100year_Chicago_24h            1:40       1.641
Lethbridge_1:100year_Chicago_24h            1:45       1.66
Lethbridge_1:100year_Chicago_24h            1:50       1.679
Lethbridge_1:100year_Chicago_24h            1:55       1.698
```

Lethbridge_1:100year_Chicago_24h	2:00	1.718
Lethbridge_1:100year_Chicago_24h	2:05	1.739
Lethbridge_1:100year_Chicago_24h	2:10	1.76
Lethbridge_1:100year_Chicago_24h	2:15	1.782
Lethbridge_1:100year_Chicago_24h	2:20	1.804
Lethbridge_1:100year_Chicago_24h	2:25	1.828
Lethbridge_1:100year_Chicago_24h	2:30	1.851
Lethbridge_1:100year_Chicago_24h	2:35	1.876
Lethbridge_1:100year_Chicago_24h	2:40	1.901
Lethbridge_1:100year_Chicago_24h	2:45	1.928
Lethbridge_1:100year_Chicago_24h	2:50	1.955
Lethbridge_1:100year_Chicago_24h	2:55	1.983
Lethbridge_1:100year_Chicago_24h	3:00	2.012
Lethbridge_1:100year_Chicago_24h	3:05	2.042
Lethbridge_1:100year_Chicago_24h	3:10	2.073
Lethbridge_1:100year_Chicago_24h	3:15	2.105
Lethbridge_1:100year_Chicago_24h	3:20	2.138
Lethbridge_1:100year_Chicago_24h	3:25	2.173
Lethbridge_1:100year_Chicago_24h	3:30	2.209
Lethbridge_1:100year_Chicago_24h	3:35	2.247
Lethbridge_1:100year_Chicago_24h	3:40	2.286
Lethbridge_1:100year_Chicago_24h	3:45	2.326
Lethbridge_1:100year_Chicago_24h	3:50	2.369
Lethbridge_1:100year_Chicago_24h	3:55	2.413
Lethbridge_1:100year_Chicago_24h	4:00	2.46
Lethbridge_1:100year_Chicago_24h	4:05	2.508
Lethbridge_1:100year_Chicago_24h	4:10	2.559
Lethbridge_1:100year_Chicago_24h	4:15	2.612
Lethbridge_1:100year_Chicago_24h	4:20	2.669
Lethbridge_1:100year_Chicago_24h	4:25	2.728
Lethbridge_1:100year_Chicago_24h	4:30	2.79
Lethbridge_1:100year_Chicago_24h	4:35	2.856
Lethbridge_1:100year_Chicago_24h	4:40	2.925
Lethbridge_1:100year_Chicago_24h	4:45	2.999
Lethbridge_1:100year_Chicago_24h	4:50	3.077
Lethbridge_1:100year_Chicago_24h	4:55	3.16
Lethbridge_1:100year_Chicago_24h	5:00	3.249
Lethbridge_1:100year_Chicago_24h	5:05	3.344
Lethbridge_1:100year_Chicago_24h	5:10	3.446
Lethbridge_1:100year_Chicago_24h	5:15	3.555
Lethbridge_1:100year_Chicago_24h	5:20	3.673

Lethbridge_1:100year_Chicago_24h	5:25	3.801
Lethbridge_1:100year_Chicago_24h	5:30	3.939
Lethbridge_1:100year_Chicago_24h	5:35	4.091
Lethbridge_1:100year_Chicago_24h	5:40	4.257
Lethbridge_1:100year_Chicago_24h	5:45	4.44
Lethbridge_1:100year_Chicago_24h	5:50	4.642
Lethbridge_1:100year_Chicago_24h	5:55	4.868
Lethbridge_1:100year_Chicago_24h	6:00	5.122
Lethbridge_1:100year_Chicago_24h	6:05	5.409
Lethbridge_1:100year_Chicago_24h	6:10	5.738
Lethbridge_1:100year_Chicago_24h	6:15	6.119
Lethbridge_1:100year_Chicago_24h	6:20	6.565
Lethbridge_1:100year_Chicago_24h	6:25	7.098
Lethbridge_1:100year_Chicago_24h	6:30	7.745
Lethbridge_1:100year_Chicago_24h	6:35	8.553
Lethbridge_1:100year_Chicago_24h	6:40	9.594
Lethbridge_1:100year_Chicago_24h	6:45	10.997
Lethbridge_1:100year_Chicago_24h	6:50	13.01
Lethbridge_1:100year_Chicago_24h	6:55	16.203
Lethbridge_1:100year_Chicago_24h	7:00	22.264
Lethbridge_1:100year_Chicago_24h	7:05	40.822
Lethbridge_1:100year_Chicago_24h	7:10	314.277
Lethbridge_1:100year_Chicago_24h	7:15	62.374
Lethbridge_1:100year_Chicago_24h	7:20	38.336
Lethbridge_1:100year_Chicago_24h	7:25	28.645
Lethbridge_1:100year_Chicago_24h	7:30	23.295
Lethbridge_1:100year_Chicago_24h	7:35	19.837
Lethbridge_1:100year_Chicago_24h	7:40	17.393
Lethbridge_1:100year_Chicago_24h	7:45	15.56
Lethbridge_1:100year_Chicago_24h	7:50	14.128
Lethbridge_1:100year_Chicago_24h	7:55	12.973
Lethbridge_1:100year_Chicago_24h	8:00	12.02
Lethbridge_1:100year_Chicago_24h	8:05	11.217
Lethbridge_1:100year_Chicago_24h	8:10	10.531
Lethbridge_1:100year_Chicago_24h	8:15	9.937
Lethbridge_1:100year_Chicago_24h	8:20	9.416
Lethbridge_1:100year_Chicago_24h	8:25	8.956
Lethbridge_1:100year_Chicago_24h	8:30	8.545
Lethbridge_1:100year_Chicago_24h	8:35	8.177
Lethbridge_1:100year_Chicago_24h	8:40	7.844
Lethbridge_1:100year_Chicago_24h	8:45	7.542

Lethbridge_1:100year_Chicago_24h	8:50	7.265
Lethbridge_1:100year_Chicago_24h	8:55	7.012
Lethbridge_1:100year_Chicago_24h	9:00	6.778
Lethbridge_1:100year_Chicago_24h	9:05	6.563
Lethbridge_1:100year_Chicago_24h	9:10	6.362
Lethbridge_1:100year_Chicago_24h	9:15	6.176
Lethbridge_1:100year_Chicago_24h	9:20	6.002
Lethbridge_1:100year_Chicago_24h	9:25	5.839
Lethbridge_1:100year_Chicago_24h	9:30	5.687
Lethbridge_1:100year_Chicago_24h	9:35	5.543
Lethbridge_1:100year_Chicago_24h	9:40	5.408
Lethbridge_1:100year_Chicago_24h	9:45	5.28
Lethbridge_1:100year_Chicago_24h	9:50	5.159
Lethbridge_1:100year_Chicago_24h	9:55	5.045
Lethbridge_1:100year_Chicago_24h	10:00	4.936
Lethbridge_1:100year_Chicago_24h	10:05	4.833
Lethbridge_1:100year_Chicago_24h	10:10	4.735
Lethbridge_1:100year_Chicago_24h	10:15	4.641
Lethbridge_1:100year_Chicago_24h	10:20	4.552
Lethbridge_1:100year_Chicago_24h	10:25	4.466
Lethbridge_1:100year_Chicago_24h	10:30	4.385
Lethbridge_1:100year_Chicago_24h	10:35	4.307
Lethbridge_1:100year_Chicago_24h	10:40	4.231
Lethbridge_1:100year_Chicago_24h	10:45	4.159
Lethbridge_1:100year_Chicago_24h	10:50	4.09
Lethbridge_1:100year_Chicago_24h	10:55	4.024
Lethbridge_1:100year_Chicago_24h	11:00	3.96
Lethbridge_1:100year_Chicago_24h	11:05	3.898
Lethbridge_1:100year_Chicago_24h	11:10	3.839
Lethbridge_1:100year_Chicago_24h	11:15	3.781
Lethbridge_1:100year_Chicago_24h	11:20	3.726
Lethbridge_1:100year_Chicago_24h	11:25	3.673
Lethbridge_1:100year_Chicago_24h	11:30	3.621
Lethbridge_1:100year_Chicago_24h	11:35	3.571
Lethbridge_1:100year_Chicago_24h	11:40	3.523
Lethbridge_1:100year_Chicago_24h	11:45	3.476
Lethbridge_1:100year_Chicago_24h	11:50	3.43
Lethbridge_1:100year_Chicago_24h	11:55	3.386
Lethbridge_1:100year_Chicago_24h	12:00	3.344
Lethbridge_1:100year_Chicago_24h	12:05	3.302
Lethbridge_1:100year_Chicago_24h	12:10	3.262

Lethbridge_1:100year_Chicago_24h	12:15	3.223
Lethbridge_1:100year_Chicago_24h	12:20	3.185
Lethbridge_1:100year_Chicago_24h	12:25	3.148
Lethbridge_1:100year_Chicago_24h	12:30	3.112
Lethbridge_1:100year_Chicago_24h	12:35	3.077
Lethbridge_1:100year_Chicago_24h	12:40	3.043
Lethbridge_1:100year_Chicago_24h	12:45	3.01
Lethbridge_1:100year_Chicago_24h	12:50	2.977
Lethbridge_1:100year_Chicago_24h	12:55	2.946
Lethbridge_1:100year_Chicago_24h	13:00	2.915
Lethbridge_1:100year_Chicago_24h	13:05	2.885
Lethbridge_1:100year_Chicago_24h	13:10	2.856
Lethbridge_1:100year_Chicago_24h	13:15	2.827
Lethbridge_1:100year_Chicago_24h	13:20	2.799
Lethbridge_1:100year_Chicago_24h	13:25	2.772
Lethbridge_1:100year_Chicago_24h	13:30	2.745
Lethbridge_1:100year_Chicago_24h	13:35	2.719
Lethbridge_1:100year_Chicago_24h	13:40	2.693
Lethbridge_1:100year_Chicago_24h	13:45	2.669
Lethbridge_1:100year_Chicago_24h	13:50	2.644
Lethbridge_1:100year_Chicago_24h	13:55	2.62
Lethbridge_1:100year_Chicago_24h	14:00	2.597
Lethbridge_1:100year_Chicago_24h	14:05	2.574
Lethbridge_1:100year_Chicago_24h	14:10	2.552
Lethbridge_1:100year_Chicago_24h	14:15	2.53
Lethbridge_1:100year_Chicago_24h	14:20	2.508
Lethbridge_1:100year_Chicago_24h	14:25	2.487
Lethbridge_1:100year_Chicago_24h	14:30	2.466
Lethbridge_1:100year_Chicago_24h	14:35	2.446
Lethbridge_1:100year_Chicago_24h	14:40	2.426
Lethbridge_1:100year_Chicago_24h	14:45	2.407
Lethbridge_1:100year_Chicago_24h	14:50	2.388
Lethbridge_1:100year_Chicago_24h	14:55	2.369
Lethbridge_1:100year_Chicago_24h	15:00	2.35
Lethbridge_1:100year_Chicago_24h	15:05	2.332
Lethbridge_1:100year_Chicago_24h	15:10	2.315
Lethbridge_1:100year_Chicago_24h	15:15	2.297
Lethbridge_1:100year_Chicago_24h	15:20	2.28
Lethbridge_1:100year_Chicago_24h	15:25	2.263
Lethbridge_1:100year_Chicago_24h	15:30	2.247
Lethbridge_1:100year_Chicago_24h	15:35	2.23

Lethbridge_1:100year_Chicago_24h	15:40	2.214
Lethbridge_1:100year_Chicago_24h	15:45	2.199
Lethbridge_1:100year_Chicago_24h	15:50	2.183
Lethbridge_1:100year_Chicago_24h	15:55	2.168
Lethbridge_1:100year_Chicago_24h	16:00	2.153
Lethbridge_1:100year_Chicago_24h	16:05	2.138
Lethbridge_1:100year_Chicago_24h	16:10	2.124
Lethbridge_1:100year_Chicago_24h	16:15	2.11
Lethbridge_1:100year_Chicago_24h	16:20	2.095
Lethbridge_1:100year_Chicago_24h	16:25	2.082
Lethbridge_1:100year_Chicago_24h	16:30	2.068
Lethbridge_1:100year_Chicago_24h	16:35	2.055
Lethbridge_1:100year_Chicago_24h	16:40	2.042
Lethbridge_1:100year_Chicago_24h	16:45	2.029
Lethbridge_1:100year_Chicago_24h	16:50	2.016
Lethbridge_1:100year_Chicago_24h	16:55	2.003
Lethbridge_1:100year_Chicago_24h	17:00	1.991
Lethbridge_1:100year_Chicago_24h	17:05	1.979
Lethbridge_1:100year_Chicago_24h	17:10	1.966
Lethbridge_1:100year_Chicago_24h	17:15	1.955
Lethbridge_1:100year_Chicago_24h	17:20	1.943
Lethbridge_1:100year_Chicago_24h	17:25	1.931
Lethbridge_1:100year_Chicago_24h	17:30	1.92
Lethbridge_1:100year_Chicago_24h	17:35	1.909
Lethbridge_1:100year_Chicago_24h	17:40	1.898
Lethbridge_1:100year_Chicago_24h	17:45	1.887
Lethbridge_1:100year_Chicago_24h	17:50	1.876
Lethbridge_1:100year_Chicago_24h	17:55	1.865
Lethbridge_1:100year_Chicago_24h	18:00	1.855
Lethbridge_1:100year_Chicago_24h	18:05	1.844
Lethbridge_1:100year_Chicago_24h	18:10	1.834
Lethbridge_1:100year_Chicago_24h	18:15	1.824
Lethbridge_1:100year_Chicago_24h	18:20	1.814
Lethbridge_1:100year_Chicago_24h	18:25	1.804
Lethbridge_1:100year_Chicago_24h	18:30	1.795
Lethbridge_1:100year_Chicago_24h	18:35	1.785
Lethbridge_1:100year_Chicago_24h	18:40	1.776
Lethbridge_1:100year_Chicago_24h	18:45	1.766
Lethbridge_1:100year_Chicago_24h	18:50	1.757
Lethbridge_1:100year_Chicago_24h	18:55	1.748
Lethbridge_1:100year_Chicago_24h	19:00	1.739

Lethbridge_1:100year_Chicago_24h	19:05	1.73
Lethbridge_1:100year_Chicago_24h	19:10	1.721
Lethbridge_1:100year_Chicago_24h	19:15	1.713
Lethbridge_1:100year_Chicago_24h	19:20	1.704
Lethbridge_1:100year_Chicago_24h	19:25	1.696
Lethbridge_1:100year_Chicago_24h	19:30	1.687
Lethbridge_1:100year_Chicago_24h	19:35	1.679
Lethbridge_1:100year_Chicago_24h	19:40	1.671
Lethbridge_1:100year_Chicago_24h	19:45	1.663
Lethbridge_1:100year_Chicago_24h	19:50	1.655
Lethbridge_1:100year_Chicago_24h	19:55	1.647
Lethbridge_1:100year_Chicago_24h	20:00	1.639
Lethbridge_1:100year_Chicago_24h	20:05	1.631
Lethbridge_1:100year_Chicago_24h	20:10	1.624
Lethbridge_1:100year_Chicago_24h	20:15	1.616
Lethbridge_1:100year_Chicago_24h	20:20	1.608
Lethbridge_1:100year_Chicago_24h	20:25	1.601
Lethbridge_1:100year_Chicago_24h	20:30	1.594
Lethbridge_1:100year_Chicago_24h	20:35	1.587
Lethbridge_1:100year_Chicago_24h	20:40	1.579
Lethbridge_1:100year_Chicago_24h	20:45	1.572
Lethbridge_1:100year_Chicago_24h	20:50	1.565
Lethbridge_1:100year_Chicago_24h	20:55	1.558
Lethbridge_1:100year_Chicago_24h	21:00	1.551
Lethbridge_1:100year_Chicago_24h	21:05	1.545
Lethbridge_1:100year_Chicago_24h	21:10	1.538
Lethbridge_1:100year_Chicago_24h	21:15	1.531
Lethbridge_1:100year_Chicago_24h	21:20	1.525
Lethbridge_1:100year_Chicago_24h	21:25	1.518
Lethbridge_1:100year_Chicago_24h	21:30	1.512
Lethbridge_1:100year_Chicago_24h	21:35	1.505
Lethbridge_1:100year_Chicago_24h	21:40	1.499
Lethbridge_1:100year_Chicago_24h	21:45	1.493
Lethbridge_1:100year_Chicago_24h	21:50	1.487
Lethbridge_1:100year_Chicago_24h	21:55	1.48
Lethbridge_1:100year_Chicago_24h	22:00	1.474
Lethbridge_1:100year_Chicago_24h	22:05	1.468
Lethbridge_1:100year_Chicago_24h	22:10	1.462
Lethbridge_1:100year_Chicago_24h	22:15	1.456
Lethbridge_1:100year_Chicago_24h	22:20	1.451
Lethbridge_1:100year_Chicago_24h	22:25	1.445

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Lethbridge_1:100year_Chicago_24h            22:30      1.439
Lethbridge_1:100year_Chicago_24h            22:35      1.433
Lethbridge_1:100year_Chicago_24h            22:40      1.428
Lethbridge_1:100year_Chicago_24h            22:45      1.422
Lethbridge_1:100year_Chicago_24h            22:50      1.417
Lethbridge_1:100year_Chicago_24h            22:55      1.411
Lethbridge_1:100year_Chicago_24h            23:00      1.406
Lethbridge_1:100year_Chicago_24h            23:05      1.4
Lethbridge_1:100year_Chicago_24h            23:10      1.395
Lethbridge_1:100year_Chicago_24h            23:15      1.39
Lethbridge_1:100year_Chicago_24h            23:20      1.384
Lethbridge_1:100year_Chicago_24h            23:25      1.379
Lethbridge_1:100year_Chicago_24h            23:30      1.374
Lethbridge_1:100year_Chicago_24h            23:35      1.369
Lethbridge_1:100year_Chicago_24h            23:40      1.364
Lethbridge_1:100year_Chicago_24h            23:45      1.359
Lethbridge_1:100year_Chicago_24h            23:50      1.354
Lethbridge_1:100year_Chicago_24h            23:55      1.349
Lethbridge_1:100year_Chicago_24h            24:00      0

;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 240 minutes, r = 0.3, rain units = mm/hr.
Lethbridge_100year_Chicago_4h              0:00       5.122
Lethbridge_100year_Chicago_4h              0:05       5.409
Lethbridge_100year_Chicago_4h              0:10       5.738
Lethbridge_100year_Chicago_4h              0:15       6.119
Lethbridge_100year_Chicago_4h              0:20       6.565
Lethbridge_100year_Chicago_4h              0:25       7.098
Lethbridge_100year_Chicago_4h              0:30       7.745
Lethbridge_100year_Chicago_4h              0:35       8.553
Lethbridge_100year_Chicago_4h              0:40       9.594
Lethbridge_100year_Chicago_4h              0:45       10.997
Lethbridge_100year_Chicago_4h              0:50       13.01
Lethbridge_100year_Chicago_4h              0:55       16.203
Lethbridge_100year_Chicago_4h              1:00       22.264
Lethbridge_100year_Chicago_4h              1:05       40.822
Lethbridge_100year_Chicago_4h              1:10       314.277
Lethbridge_100year_Chicago_4h              1:15       62.374
Lethbridge_100year_Chicago_4h              1:20       38.336
Lethbridge_100year_Chicago_4h              1:25       28.645
Lethbridge_100year_Chicago_4h              1:30       23.295
Lethbridge_100year_Chicago_4h              1:35       19.837
```

Lethbridge_100year_Chicago_4h	1:40	17.393
Lethbridge_100year_Chicago_4h	1:45	15.56
Lethbridge_100year_Chicago_4h	1:50	14.128
Lethbridge_100year_Chicago_4h	1:55	12.973
Lethbridge_100year_Chicago_4h	2:00	12.02
Lethbridge_100year_Chicago_4h	2:05	11.217
Lethbridge_100year_Chicago_4h	2:10	10.531
Lethbridge_100year_Chicago_4h	2:15	9.937
Lethbridge_100year_Chicago_4h	2:20	9.416
Lethbridge_100year_Chicago_4h	2:25	8.956
Lethbridge_100year_Chicago_4h	2:30	8.545
Lethbridge_100year_Chicago_4h	2:35	8.177
Lethbridge_100year_Chicago_4h	2:40	7.844
Lethbridge_100year_Chicago_4h	2:45	7.542
Lethbridge_100year_Chicago_4h	2:50	7.265
Lethbridge_100year_Chicago_4h	2:55	7.012
Lethbridge_100year_Chicago_4h	3:00	6.778
Lethbridge_100year_Chicago_4h	3:05	6.563
Lethbridge_100year_Chicago_4h	3:10	6.362
Lethbridge_100year_Chicago_4h	3:15	6.176
Lethbridge_100year_Chicago_4h	3:20	6.002
Lethbridge_100year_Chicago_4h	3:25	5.839
Lethbridge_100year_Chicago_4h	3:30	5.687
Lethbridge_100year_Chicago_4h	3:35	5.543
Lethbridge_100year_Chicago_4h	3:40	5.408
Lethbridge_100year_Chicago_4h	3:45	5.28
Lethbridge_100year_Chicago_4h	3:50	5.159
Lethbridge_100year_Chicago_4h	3:55	5.045
Lethbridge_100year_Chicago_4h	4:00	0

Lethbridge_5year_Chicago_4h	0:00	3.028
Lethbridge_5year_Chicago_4h	0:05	3.19
Lethbridge_5year_Chicago_4h	0:10	3.374
Lethbridge_5year_Chicago_4h	0:15	3.587
Lethbridge_5year_Chicago_4h	0:20	3.836
Lethbridge_5year_Chicago_4h	0:25	4.131
Lethbridge_5year_Chicago_4h	0:30	4.489
Lethbridge_5year_Chicago_4h	0:35	4.934
Lethbridge_5year_Chicago_4h	0:40	5.504
Lethbridge_5year_Chicago_4h	0:45	6.268
Lethbridge_5year_Chicago_4h	0:50	7.356

```
Lethbridge_5year_Chicago_4h            0:55       9.064
Lethbridge_5year_Chicago_4h            1:00       12.265
Lethbridge_5year_Chicago_4h            1:05       21.818
Lethbridge_5year_Chicago_4h            1:10       143.764
Lethbridge_5year_Chicago_4h            1:15       32.694
Lethbridge_5year_Chicago_4h            1:20       20.578
Lethbridge_5year_Chicago_4h            1:25       15.594
Lethbridge_5year_Chicago_4h            1:30       12.808
Lethbridge_5year_Chicago_4h            1:35       10.992
Lethbridge_5year_Chicago_4h            1:40       9.698
Lethbridge_5year_Chicago_4h            1:45       8.723
Lethbridge_5year_Chicago_4h            1:50       7.957
Lethbridge_5year_Chicago_4h            1:55       7.336
Lethbridge_5year_Chicago_4h            2:00       6.822
Lethbridge_5year_Chicago_4h            2:05       6.388
Lethbridge_5year_Chicago_4h            2:10       6.015
Lethbridge_5year_Chicago_4h            2:15       5.691
Lethbridge_5year_Chicago_4h            2:20       5.407
Lethbridge_5year_Chicago_4h            2:25       5.155
Lethbridge_5year_Chicago_4h            2:30       4.93
Lethbridge_5year_Chicago_4h            2:35       4.727
Lethbridge_5year_Chicago_4h            2:40       4.544
Lethbridge_5year_Chicago_4h            2:45       4.377
Lethbridge_5year_Chicago_4h            2:50       4.224
Lethbridge_5year_Chicago_4h            2:55       4.084
Lethbridge_5year_Chicago_4h            3:00       3.954
Lethbridge_5year_Chicago_4h            3:05       3.834
Lethbridge_5year_Chicago_4h            3:10       3.723
Lethbridge_5year_Chicago_4h            3:15       3.619
Lethbridge_5year_Chicago_4h            3:20       3.522
Lethbridge_5year_Chicago_4h            3:25       3.431
Lethbridge_5year_Chicago_4h            3:30       3.345
Lethbridge_5year_Chicago_4h            3:35       3.265
Lethbridge_5year_Chicago_4h            3:40       3.189
Lethbridge_5year_Chicago_4h            3:45       3.117
Lethbridge_5year_Chicago_4h            3:50       3.049
Lethbridge_5year_Chicago_4h            3:55       2.985
Lethbridge_5year_Chicago_4h            4:00       0

[REPORT]
;;Reporting Options
```

```
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       375766.3004      5506454.28215    376027.9376      5507330.58285
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
3                375963.908         5506865.853
4                375962.802         5507168.233
OF1              376015.992         5507164.647
OF2              376016.045         5506866.076

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Lot1             375984.255         5506494.114
Lot1             375778.193         5506498.837
Lot1             375796.133         5506907.178
Lot1             375855.017         5506906.222
Lot1             375955.345         5506988.681
Lot1             376001.644         5506990.845
Lot1             375984.255         5506494.114
LOt2             375802.774         5507290.751
LOt2             376009.397         5507286.016
LOt2             376001.644         5506990.836
LOt2             375955.344         5506988.672
LOt2             375855.016         5506906.213
LOt2             375796.133         5506907.169
LOt2             375802.774         5507290.751
```

```
[SYMBOLS]
;;Gage            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
```

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)

****
Element Count
****
Number of rain gages 3
Number of subcatchments ... 2
Number of nodes 4
Number of links 2
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Lethbridge_1:100year_Chicago_24h	Lethbridge_1:100year_Chicago_24h	INTENSITY	5 min.
Lethbridge_100year_Chicago_4h	Lethbridge_100year_Chicago_4h	INTENSITY	5 min.
Lethbridge_5year_Chicago_4h	Lethbridge_5year_Chicago_4h	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Lot1	9.17	416.84	0.00	0.6000	Lethbridge_1:100year_Chicago_24h	3
LOt2	7.04	704.42	0.00	0.5000	Lethbridge_1:100year_Chicago_24h	4

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow

3	JUNCTION	897.60	1.20	0.0
4	JUNCTION	897.20	1.30	0.0
OF1	OUTFALL	897.80	1.00	0.0
OF2	OUTFALL	897.90	1.00	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	4	OF1	CONDUIT	53.3	-1.1253	0.0100
2	3	OF2	CONDUIT	52.1	-0.5753	0.0130

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	RECT_OPEN	1.00	4.00	0.67	4.00	1	32.39
2	RECT_OPEN	1.00	4.00	0.67	4.00	1	17.81

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO

```
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date ..... 03/28/2022 00:00:00
Ending Date ..... 03/29/2022 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.948	120.146
Evaporation Loss	0.000	0.000
Infiltration Loss	1.384	85.376
Surface Runoff	0.564	34.782
Final Storage	0.000	0.000
Continuity Error (%)	-0.010	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.564	5.640
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.554	5.545
Flooding Loss	0.000	0.000

```
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.010         0.095
Continuity Error (%) .....         0.001


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     4.50 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
Percent Not Converging      :     0.00
Time Step Frequencies       :
    5.000 -  3.155 sec      :   100.00 %
    3.155 -  1.991 sec      :     0.00 %
    1.991 -  1.256 sec      :     0.00 %
    1.256 -  0.792 sec      :     0.00 %
    0.792 -  0.500 sec      :     0.00 %


**************************
Subcatchment Runoff Summary
**************************

-------------------------------------------------------------------------------------------------------------
-------------
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
Lot1	120.15	0.00	0.00	86.69	0.00	33.47	33.47	3.07	0.55	0.279
LOt2	120.15	0.00	0.00	83.67	0.00	36.49	36.49	2.57	0.73	0.304

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
3	JUNCTION	0.22	0.45	898.05	0 07:25	0.45
4	JUNCTION	0.43	0.75	897.95	0 07:15	0.73
OF1	OUTFALL	0.01	0.09	897.89	0 07:15	0.09
OF2	OUTFALL	0.01	0.11	898.01	0 07:25	0.11

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
3	JUNCTION	0.554	0.554	0 07:25	3.07	3.07	1.029
4	JUNCTION	0.728	0.728	0 07:20	2.57	2.57	2.557
OF1	OUTFALL	0.000	0.787	0 07:15	0	2.51	0.000

OF2	OUTFALL	0.000	0.554	0	07:25	0	3.04	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	22.32	0.130	0.787	2.507
OF2	26.60	0.132	0.554	3.038
System	24.46	0.262	1.268	5.545

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth

1	CONDUIT	0.787	0	07:15	0.47	0.02	0.42	
2	CONDUIT	0.554	0	07:25	0.49	0.03	0.28	

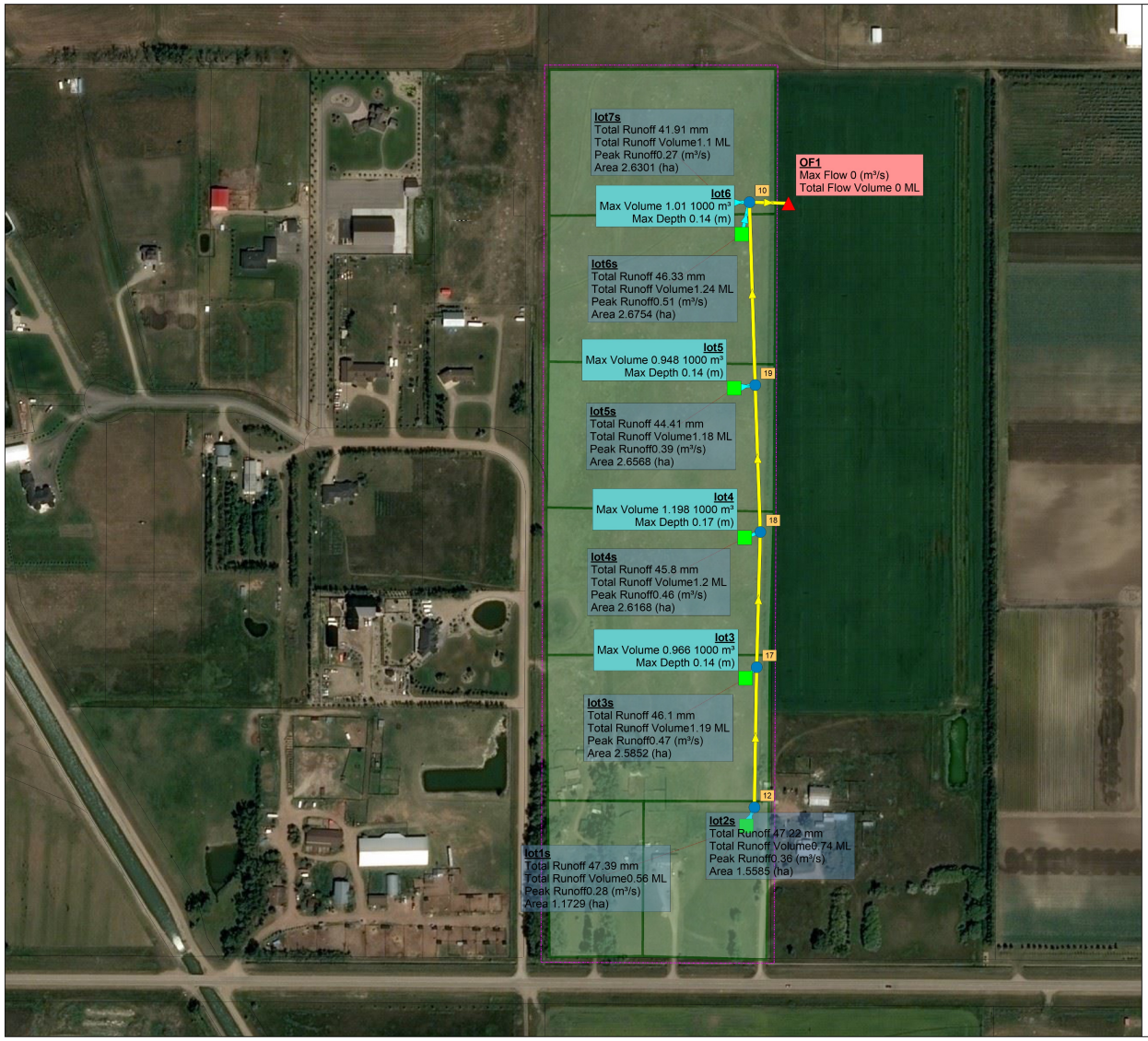
****
Flow Classification Summary
****

	Adjusted	Fraction of Time in Flow Class								
Conduit	/Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
1	1.00	0.30	0.00	0.00	0.70	0.00	0.00	0.00	0.46	0.00
2	1.00	0.30	0.00	0.00	0.70	0.00	0.00	0.00	0.38	0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Fri Jul 7 17:18:45 2023
Analysis ended on: Fri Jul 7 17:18:45 2023
Total elapsed time: < 1 sec



LEGEND:

- Junctions
- Outfalls
- Storages
- Conduits
- Weirs
- Subcatchments
- Boundary
- AutoCad lot lines
- post development

Stormwater Management Plan

Country Side Subdivision

PCSWMM Model Post-development

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

N

200 m

MARTIN GEOMATIC CONSULTANTS

File Number:229729CE Figure 2

Country Side Subdivision
Post Development
1:100yr 24hr

```
[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           03/28/2022
START_TIME           00:00:00
REPORT_START_DATE    03/28/2022
REPORT_START_TIME    00:00:00
END_DATE             03/29/2022
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:05:00
ROUTING_STEP         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              4
```

```
[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Lethbridge_1:100year_Chicago_24h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_1:100year_Chicago_24h
Lethbridge_100year_Chicago_4h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_100year_Chicago_4h
Lethbridge_5year_Chicago_4h INTENSITY 0:05     1.0      TIMESERIES Lethbridge_5year_Chicago_4h

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
lot1s            Lethbridge_1:100year_Chicago_24h Lot2 1.1729 10     140      0.4      0
lot2s            Lethbridge_1:100year_Chicago_24h Lot2 1.5585 10     140      0.6      0
lot3s            Lethbridge_1:100year_Chicago_24h lot3 2.5852 10     130.5    0.8      0
lot4s            Lethbridge_1:100year_Chicago_24h lot4 2.6168 10     128      0.7      0
lot5s            Lethbridge_1:100year_Chicago_24h lot5 2.6568 10     136      0.3      0
lot6s            Lethbridge_1:100year_Chicago_24h lot6 2.6754 10     130.5    1        0
lot7s            Lethbridge_1:100year_Chicago_24h lot7 2.6301 10     124.5    0.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
lot1s            0.015      0.1        0.45       3.8        25         OUTLET
lot2s            0.015      0.1        0.45       3.8        25         OUTLET
lot3s            0.015      0.1        0.45       3.8        25         OUTLET
lot4s            0.015      0.1        0.45       3.8        25         OUTLET
lot5s            0.015      0.1        0.45       3.8        25         OUTLET
lot6s            0.015      0.1        0.45       3.8        25         OUTLET
lot7s            0.015      0.1        0.45       3.8        25         PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
lot1s            127.9      5          0.36       0          0
lot2s            127.9      5          0.36       0          0
lot3s            127.9      5          0.36       0          0
```

```
lot4s            127.9      5          0.36       0          0
lot5s            127.9      5          0.36       0          0
lot6s            127.9      5          0.36       0          0
lot7s            127.9      5          0.36       0          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
10               897.9      0.7        0          0          0
12               898.2      0.7        0          0          0
17               897.6      1.2        0          0          0
18               897        1.8        0          0          0
19               898.06     0.74       0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF1              897.8      FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape       Curve Name/Params            SurDepth Fevap    Psi
Ksat     IMD
;;-------------- -------- ---------- ---------- ----------- ---------------------------- -------- -------- --------
-------- --------
Lot2             898      1          0          FUNCTIONAL  1000      2         7000     0        0        292.2
0.5      0.25
lot3             896.8    1.4        0          FUNCTIONAL  1000      2         7000     0        0        292.2
0.5      0.25
lot4             896.8    1.4        0          FUNCTIONAL  1000      2         7000     0        0
lot5             897.8    0.6        0          FUNCTIONAL  1000      2         7000     0        0        292.2
0.5      0.25
lot6             897.5    0.9        0          FUNCTIONAL  1000      2         7000     0        0        292.2
0.5      0.25
lot7             897.8    0.6        0          FUNCTIONAL  1000      2         7000     0        0        292.5
0.5      0.25

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ---------
-
2                10               OF1              35.166     0.01       0          0          0          0
6                18               19               131.18     0.01       0.6        0          0          0
```

```
7               19              10              163.133    0.01       0          0          0          0
conduit3        12              17              124.967    0.01       0.4        0.4        0          0
conduit4        17              18              120.498    0.01       0          0.6        0          0

[WEIRS]
;;Name           From Node       To Node         Type         CrestHt    Qcoeff     Gated    EndCon   EndCoeff
Surcharge  RoadWidth  RoadSurf   Coeff. Curve
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- -------- ----------
---------- ---------- ---------- ----------------
1               lot7            10              TRANSVERSE   0.5        3.33       NO       0        0
YES
11              lot4            18              TRANSVERSE   1          3.33       NO       0        0
YES
8               lot5            19              TRANSVERSE   0          3.33       NO       0        0
YES
9               lot6            10              TRANSVERSE   0          3.33       NO       0        0
YES
bioswale4       Lot2            12              TRANSVERSE   0.5        3.33       NO       0        0
YES
W3              lot3            17              TRANSVERSE   1          3.33       NO       0        0
YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
2               TRAPEZOIDAL  1                2          2          2          1
6               TRAPEZOIDAL  0.4              1          5          5          1
7               TRAPEZOIDAL  0.4              1          5          5          1
conduit3        TRAPEZOIDAL  0.4              1          5          5          1
conduit4        TRAPEZOIDAL  0.4              1          5          5          1
1               RECT_OPEN    1                1          0          0
11              RECT_OPEN    0.6              1          1          1
8               RECT_OPEN    1                1          0          0
9               RECT_OPEN    1                1          0          0
bioswale4       RECT_OPEN    1                1          1          1
W3              RECT_OPEN    0.6              1          1          1

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------

[CURVES]
```

```
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;lot 3 pond
pondnorth        Storage    0          0.6
pondnorth                   0.1        89
pondnorth                   0.2        307
pondnorth                   0.3        568
pondnorth                   0.4        848
pondnorth                   0.5        1149
pondnorth                   0.6        1448
pondnorth                   0.7        1718
pondnorth                   0.8        1959
pondnorth                   0.9        2175
pondnorth                   1          2370
pondnorth                   1.33       23685

pondsouth2       Storage    0          0.6
pondsouth2                  0.1        12
pondsouth2                  0.2        49.4
pondsouth2                  0.3        107
pondsouth2                  0.4        185
pondsouth2                  0.5        287
pondsouth2                  0.6        425
pondsouth2                  0.7        636
pondsouth2                  0.8        917
pondsouth2                  0.9        1267
pondsouth2                  1          1721
pondsouth2                  1.4        7263

Road_Default_Trapped_Low Storage    0          0.636
Road_Default_Trapped_Low            1.2        0.636
Road_Default_Trapped_Low            1.6        1000

Road_Default_Trapped_Low2 Storage    0          0.6
Road_Default_Trapped_Low2            1.2        0.6
Road_Default_Trapped_Low2            1.3        3000
Road_Default_Trapped_Low2            1.6        4500

Waterfront_Dry_Pond Storage    0          156.7
Waterfront_Dry_Pond            0.2        236.1
Waterfront_Dry_Pond            0.4        335.5
```

```
Waterfront_Dry_Pond            0.6        458.4
Waterfront_Dry_Pond            0.8        601.2
Waterfront_Dry_Pond            1          763.6
Waterfront_Dry_Pond            1.2        945.4
Waterfront_Dry_Pond            1.4        1147.1
Waterfront_Dry_Pond            1.6        1370.2
Waterfront_Dry_Pond            1.8        1628.2
Waterfront_Dry_Pond            2          2002.8
Waterfront_Dry_Pond            2.2        2597.1

Waterfront_Pond  Storage    0          6533
Waterfront_Pond             0.2        6750
Waterfront_Pond             0.4        6957
Waterfront_Pond             0.6        7167
Waterfront_Pond             0.8        7381
Waterfront_Pond             1          7597
Waterfront_Pond             1.2        7811
Waterfront_Pond             1.4        8027
Waterfront_Pond             1.6        8146
Waterfront_Pond             1.8        8470
Waterfront_Pond             2          8696
Waterfront_Pond             2.2        9041
Waterfront_Pond             2.4        9392
Waterfront_Pond             2.6        9751
Waterfront_Pond             2.8        10117
Waterfront_Pond             3          10490
Waterfront_Pond             3.2        10870
Waterfront_Pond             3.4        11257
Waterfront_Pond             3.6        11651
Waterfront_Pond             3.8        12053
Waterfront_Pond             4          12461
Waterfront_Pond             4.2        12877
Waterfront_Pond             4.4        13300
Waterfront_Pond             4.6        13731
Waterfront_Pond             4.8        14165

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 1440 minutes, r = 0.3, rain units = mm/hr.
Lethbridge_1:100year_Chicago_24h            0:00       1.352
```

Lethbridge_1:100year_Chicago_24h	0:05	1.364
Lethbridge_1:100year_Chicago_24h	0:10	1.376
Lethbridge_1:100year_Chicago_24h	0:15	1.388
Lethbridge_1:100year_Chicago_24h	0:20	1.4
Lethbridge_1:100year_Chicago_24h	0:25	1.413
Lethbridge_1:100year_Chicago_24h	0:30	1.426
Lethbridge_1:100year_Chicago_24h	0:35	1.439
Lethbridge_1:100year_Chicago_24h	0:40	1.453
Lethbridge_1:100year_Chicago_24h	0:45	1.466
Lethbridge_1:100year_Chicago_24h	0:50	1.48
Lethbridge_1:100year_Chicago_24h	0:55	1.495
Lethbridge_1:100year_Chicago_24h	1:00	1.51
Lethbridge_1:100year_Chicago_24h	1:05	1.525
Lethbridge_1:100year_Chicago_24h	1:10	1.54
Lethbridge_1:100year_Chicago_24h	1:15	1.556
Lethbridge_1:100year_Chicago_24h	1:20	1.572
Lethbridge_1:100year_Chicago_24h	1:25	1.589
Lethbridge_1:100year_Chicago_24h	1:30	1.606
Lethbridge_1:100year_Chicago_24h	1:35	1.624
Lethbridge_1:100year_Chicago_24h	1:40	1.641
Lethbridge_1:100year_Chicago_24h	1:45	1.66
Lethbridge_1:100year_Chicago_24h	1:50	1.679
Lethbridge_1:100year_Chicago_24h	1:55	1.698
Lethbridge_1:100year_Chicago_24h	2:00	1.718
Lethbridge_1:100year_Chicago_24h	2:05	1.739
Lethbridge_1:100year_Chicago_24h	2:10	1.76
Lethbridge_1:100year_Chicago_24h	2:15	1.782
Lethbridge_1:100year_Chicago_24h	2:20	1.804
Lethbridge_1:100year_Chicago_24h	2:25	1.828
Lethbridge_1:100year_Chicago_24h	2:30	1.851
Lethbridge_1:100year_Chicago_24h	2:35	1.876
Lethbridge_1:100year_Chicago_24h	2:40	1.901
Lethbridge_1:100year_Chicago_24h	2:45	1.928
Lethbridge_1:100year_Chicago_24h	2:50	1.955
Lethbridge_1:100year_Chicago_24h	2:55	1.983
Lethbridge_1:100year_Chicago_24h	3:00	2.012
Lethbridge_1:100year_Chicago_24h	3:05	2.042
Lethbridge_1:100year_Chicago_24h	3:10	2.073
Lethbridge_1:100year_Chicago_24h	3:15	2.105
Lethbridge_1:100year_Chicago_24h	3:20	2.138
Lethbridge_1:100year_Chicago_24h	3:25	2.173

Lethbridge_1:100year_Chicago_24h	3:30	2.209
Lethbridge_1:100year_Chicago_24h	3:35	2.247
Lethbridge_1:100year_Chicago_24h	3:40	2.286
Lethbridge_1:100year_Chicago_24h	3:45	2.326
Lethbridge_1:100year_Chicago_24h	3:50	2.369
Lethbridge_1:100year_Chicago_24h	3:55	2.413
Lethbridge_1:100year_Chicago_24h	4:00	2.46
Lethbridge_1:100year_Chicago_24h	4:05	2.508
Lethbridge_1:100year_Chicago_24h	4:10	2.559
Lethbridge_1:100year_Chicago_24h	4:15	2.612
Lethbridge_1:100year_Chicago_24h	4:20	2.669
Lethbridge_1:100year_Chicago_24h	4:25	2.728
Lethbridge_1:100year_Chicago_24h	4:30	2.79
Lethbridge_1:100year_Chicago_24h	4:35	2.856
Lethbridge_1:100year_Chicago_24h	4:40	2.925
Lethbridge_1:100year_Chicago_24h	4:45	2.999
Lethbridge_1:100year_Chicago_24h	4:50	3.077
Lethbridge_1:100year_Chicago_24h	4:55	3.16
Lethbridge_1:100year_Chicago_24h	5:00	3.249
Lethbridge_1:100year_Chicago_24h	5:05	3.344
Lethbridge_1:100year_Chicago_24h	5:10	3.446
Lethbridge_1:100year_Chicago_24h	5:15	3.555
Lethbridge_1:100year_Chicago_24h	5:20	3.673
Lethbridge_1:100year_Chicago_24h	5:25	3.801
Lethbridge_1:100year_Chicago_24h	5:30	3.939
Lethbridge_1:100year_Chicago_24h	5:35	4.091
Lethbridge_1:100year_Chicago_24h	5:40	4.257
Lethbridge_1:100year_Chicago_24h	5:45	4.44
Lethbridge_1:100year_Chicago_24h	5:50	4.642
Lethbridge_1:100year_Chicago_24h	5:55	4.868
Lethbridge_1:100year_Chicago_24h	6:00	5.122
Lethbridge_1:100year_Chicago_24h	6:05	5.409
Lethbridge_1:100year_Chicago_24h	6:10	5.738
Lethbridge_1:100year_Chicago_24h	6:15	6.119
Lethbridge_1:100year_Chicago_24h	6:20	6.565
Lethbridge_1:100year_Chicago_24h	6:25	7.098
Lethbridge_1:100year_Chicago_24h	6:30	7.745
Lethbridge_1:100year_Chicago_24h	6:35	8.553
Lethbridge_1:100year_Chicago_24h	6:40	9.594
Lethbridge_1:100year_Chicago_24h	6:45	10.997
Lethbridge_1:100year_Chicago_24h	6:50	13.01

Lethbridge_1:100year_Chicago_24h	6:55	16.203
Lethbridge_1:100year_Chicago_24h	7:00	22.264
Lethbridge_1:100year_Chicago_24h	7:05	40.822
Lethbridge_1:100year_Chicago_24h	7:10	314.277
Lethbridge_1:100year_Chicago_24h	7:15	62.374
Lethbridge_1:100year_Chicago_24h	7:20	38.336
Lethbridge_1:100year_Chicago_24h	7:25	28.645
Lethbridge_1:100year_Chicago_24h	7:30	23.295
Lethbridge_1:100year_Chicago_24h	7:35	19.837
Lethbridge_1:100year_Chicago_24h	7:40	17.393
Lethbridge_1:100year_Chicago_24h	7:45	15.56
Lethbridge_1:100year_Chicago_24h	7:50	14.128
Lethbridge_1:100year_Chicago_24h	7:55	12.973
Lethbridge_1:100year_Chicago_24h	8:00	12.02
Lethbridge_1:100year_Chicago_24h	8:05	11.217
Lethbridge_1:100year_Chicago_24h	8:10	10.531
Lethbridge_1:100year_Chicago_24h	8:15	9.937
Lethbridge_1:100year_Chicago_24h	8:20	9.416
Lethbridge_1:100year_Chicago_24h	8:25	8.956
Lethbridge_1:100year_Chicago_24h	8:30	8.545
Lethbridge_1:100year_Chicago_24h	8:35	8.177
Lethbridge_1:100year_Chicago_24h	8:40	7.844
Lethbridge_1:100year_Chicago_24h	8:45	7.542
Lethbridge_1:100year_Chicago_24h	8:50	7.265
Lethbridge_1:100year_Chicago_24h	8:55	7.012
Lethbridge_1:100year_Chicago_24h	9:00	6.778
Lethbridge_1:100year_Chicago_24h	9:05	6.563
Lethbridge_1:100year_Chicago_24h	9:10	6.362
Lethbridge_1:100year_Chicago_24h	9:15	6.176
Lethbridge_1:100year_Chicago_24h	9:20	6.002
Lethbridge_1:100year_Chicago_24h	9:25	5.839
Lethbridge_1:100year_Chicago_24h	9:30	5.687
Lethbridge_1:100year_Chicago_24h	9:35	5.543
Lethbridge_1:100year_Chicago_24h	9:40	5.408
Lethbridge_1:100year_Chicago_24h	9:45	5.28
Lethbridge_1:100year_Chicago_24h	9:50	5.159
Lethbridge_1:100year_Chicago_24h	9:55	5.045
Lethbridge_1:100year_Chicago_24h	10:00	4.936
Lethbridge_1:100year_Chicago_24h	10:05	4.833
Lethbridge_1:100year_Chicago_24h	10:10	4.735
Lethbridge_1:100year_Chicago_24h	10:15	4.641

Lethbridge_1:100year_Chicago_24h	10:20	4.552
Lethbridge_1:100year_Chicago_24h	10:25	4.466
Lethbridge_1:100year_Chicago_24h	10:30	4.385
Lethbridge_1:100year_Chicago_24h	10:35	4.307
Lethbridge_1:100year_Chicago_24h	10:40	4.231
Lethbridge_1:100year_Chicago_24h	10:45	4.159
Lethbridge_1:100year_Chicago_24h	10:50	4.09
Lethbridge_1:100year_Chicago_24h	10:55	4.024
Lethbridge_1:100year_Chicago_24h	11:00	3.96
Lethbridge_1:100year_Chicago_24h	11:05	3.898
Lethbridge_1:100year_Chicago_24h	11:10	3.839
Lethbridge_1:100year_Chicago_24h	11:15	3.781
Lethbridge_1:100year_Chicago_24h	11:20	3.726
Lethbridge_1:100year_Chicago_24h	11:25	3.673
Lethbridge_1:100year_Chicago_24h	11:30	3.621
Lethbridge_1:100year_Chicago_24h	11:35	3.571
Lethbridge_1:100year_Chicago_24h	11:40	3.523
Lethbridge_1:100year_Chicago_24h	11:45	3.476
Lethbridge_1:100year_Chicago_24h	11:50	3.43
Lethbridge_1:100year_Chicago_24h	11:55	3.386
Lethbridge_1:100year_Chicago_24h	12:00	3.344
Lethbridge_1:100year_Chicago_24h	12:05	3.302
Lethbridge_1:100year_Chicago_24h	12:10	3.262
Lethbridge_1:100year_Chicago_24h	12:15	3.223
Lethbridge_1:100year_Chicago_24h	12:20	3.185
Lethbridge_1:100year_Chicago_24h	12:25	3.148
Lethbridge_1:100year_Chicago_24h	12:30	3.112
Lethbridge_1:100year_Chicago_24h	12:35	3.077
Lethbridge_1:100year_Chicago_24h	12:40	3.043
Lethbridge_1:100year_Chicago_24h	12:45	3.01
Lethbridge_1:100year_Chicago_24h	12:50	2.977
Lethbridge_1:100year_Chicago_24h	12:55	2.946
Lethbridge_1:100year_Chicago_24h	13:00	2.915
Lethbridge_1:100year_Chicago_24h	13:05	2.885
Lethbridge_1:100year_Chicago_24h	13:10	2.856
Lethbridge_1:100year_Chicago_24h	13:15	2.827
Lethbridge_1:100year_Chicago_24h	13:20	2.799
Lethbridge_1:100year_Chicago_24h	13:25	2.772
Lethbridge_1:100year_Chicago_24h	13:30	2.745
Lethbridge_1:100year_Chicago_24h	13:35	2.719
Lethbridge_1:100year_Chicago_24h	13:40	2.693

Lethbridge_1:100year_Chicago_24h	13:45	2.669
Lethbridge_1:100year_Chicago_24h	13:50	2.644
Lethbridge_1:100year_Chicago_24h	13:55	2.62
Lethbridge_1:100year_Chicago_24h	14:00	2.597
Lethbridge_1:100year_Chicago_24h	14:05	2.574
Lethbridge_1:100year_Chicago_24h	14:10	2.552
Lethbridge_1:100year_Chicago_24h	14:15	2.53
Lethbridge_1:100year_Chicago_24h	14:20	2.508
Lethbridge_1:100year_Chicago_24h	14:25	2.487
Lethbridge_1:100year_Chicago_24h	14:30	2.466
Lethbridge_1:100year_Chicago_24h	14:35	2.446
Lethbridge_1:100year_Chicago_24h	14:40	2.426
Lethbridge_1:100year_Chicago_24h	14:45	2.407
Lethbridge_1:100year_Chicago_24h	14:50	2.388
Lethbridge_1:100year_Chicago_24h	14:55	2.369
Lethbridge_1:100year_Chicago_24h	15:00	2.35
Lethbridge_1:100year_Chicago_24h	15:05	2.332
Lethbridge_1:100year_Chicago_24h	15:10	2.315
Lethbridge_1:100year_Chicago_24h	15:15	2.297
Lethbridge_1:100year_Chicago_24h	15:20	2.28
Lethbridge_1:100year_Chicago_24h	15:25	2.263
Lethbridge_1:100year_Chicago_24h	15:30	2.247
Lethbridge_1:100year_Chicago_24h	15:35	2.23
Lethbridge_1:100year_Chicago_24h	15:40	2.214
Lethbridge_1:100year_Chicago_24h	15:45	2.199
Lethbridge_1:100year_Chicago_24h	15:50	2.183
Lethbridge_1:100year_Chicago_24h	15:55	2.168
Lethbridge_1:100year_Chicago_24h	16:00	2.153
Lethbridge_1:100year_Chicago_24h	16:05	2.138
Lethbridge_1:100year_Chicago_24h	16:10	2.124
Lethbridge_1:100year_Chicago_24h	16:15	2.11
Lethbridge_1:100year_Chicago_24h	16:20	2.095
Lethbridge_1:100year_Chicago_24h	16:25	2.082
Lethbridge_1:100year_Chicago_24h	16:30	2.068
Lethbridge_1:100year_Chicago_24h	16:35	2.055
Lethbridge_1:100year_Chicago_24h	16:40	2.042
Lethbridge_1:100year_Chicago_24h	16:45	2.029
Lethbridge_1:100year_Chicago_24h	16:50	2.016
Lethbridge_1:100year_Chicago_24h	16:55	2.003
Lethbridge_1:100year_Chicago_24h	17:00	1.991
Lethbridge_1:100year_Chicago_24h	17:05	1.979

Lethbridge_1:100year_Chicago_24h	17:10	1.966
Lethbridge_1:100year_Chicago_24h	17:15	1.955
Lethbridge_1:100year_Chicago_24h	17:20	1.943
Lethbridge_1:100year_Chicago_24h	17:25	1.931
Lethbridge_1:100year_Chicago_24h	17:30	1.92
Lethbridge_1:100year_Chicago_24h	17:35	1.909
Lethbridge_1:100year_Chicago_24h	17:40	1.898
Lethbridge_1:100year_Chicago_24h	17:45	1.887
Lethbridge_1:100year_Chicago_24h	17:50	1.876
Lethbridge_1:100year_Chicago_24h	17:55	1.865
Lethbridge_1:100year_Chicago_24h	18:00	1.855
Lethbridge_1:100year_Chicago_24h	18:05	1.844
Lethbridge_1:100year_Chicago_24h	18:10	1.834
Lethbridge_1:100year_Chicago_24h	18:15	1.824
Lethbridge_1:100year_Chicago_24h	18:20	1.814
Lethbridge_1:100year_Chicago_24h	18:25	1.804
Lethbridge_1:100year_Chicago_24h	18:30	1.795
Lethbridge_1:100year_Chicago_24h	18:35	1.785
Lethbridge_1:100year_Chicago_24h	18:40	1.776
Lethbridge_1:100year_Chicago_24h	18:45	1.766
Lethbridge_1:100year_Chicago_24h	18:50	1.757
Lethbridge_1:100year_Chicago_24h	18:55	1.748
Lethbridge_1:100year_Chicago_24h	19:00	1.739
Lethbridge_1:100year_Chicago_24h	19:05	1.73
Lethbridge_1:100year_Chicago_24h	19:10	1.721
Lethbridge_1:100year_Chicago_24h	19:15	1.713
Lethbridge_1:100year_Chicago_24h	19:20	1.704
Lethbridge_1:100year_Chicago_24h	19:25	1.696
Lethbridge_1:100year_Chicago_24h	19:30	1.687
Lethbridge_1:100year_Chicago_24h	19:35	1.679
Lethbridge_1:100year_Chicago_24h	19:40	1.671
Lethbridge_1:100year_Chicago_24h	19:45	1.663
Lethbridge_1:100year_Chicago_24h	19:50	1.655
Lethbridge_1:100year_Chicago_24h	19:55	1.647
Lethbridge_1:100year_Chicago_24h	20:00	1.639
Lethbridge_1:100year_Chicago_24h	20:05	1.631
Lethbridge_1:100year_Chicago_24h	20:10	1.624
Lethbridge_1:100year_Chicago_24h	20:15	1.616
Lethbridge_1:100year_Chicago_24h	20:20	1.608
Lethbridge_1:100year_Chicago_24h	20:25	1.601
Lethbridge_1:100year_Chicago_24h	20:30	1.594

Lethbridge_1:100year_Chicago_24h	20:35	1.587
Lethbridge_1:100year_Chicago_24h	20:40	1.579
Lethbridge_1:100year_Chicago_24h	20:45	1.572
Lethbridge_1:100year_Chicago_24h	20:50	1.565
Lethbridge_1:100year_Chicago_24h	20:55	1.558
Lethbridge_1:100year_Chicago_24h	21:00	1.551
Lethbridge_1:100year_Chicago_24h	21:05	1.545
Lethbridge_1:100year_Chicago_24h	21:10	1.538
Lethbridge_1:100year_Chicago_24h	21:15	1.531
Lethbridge_1:100year_Chicago_24h	21:20	1.525
Lethbridge_1:100year_Chicago_24h	21:25	1.518
Lethbridge_1:100year_Chicago_24h	21:30	1.512
Lethbridge_1:100year_Chicago_24h	21:35	1.505
Lethbridge_1:100year_Chicago_24h	21:40	1.499
Lethbridge_1:100year_Chicago_24h	21:45	1.493
Lethbridge_1:100year_Chicago_24h	21:50	1.487
Lethbridge_1:100year_Chicago_24h	21:55	1.48
Lethbridge_1:100year_Chicago_24h	22:00	1.474
Lethbridge_1:100year_Chicago_24h	22:05	1.468
Lethbridge_1:100year_Chicago_24h	22:10	1.462
Lethbridge_1:100year_Chicago_24h	22:15	1.456
Lethbridge_1:100year_Chicago_24h	22:20	1.451
Lethbridge_1:100year_Chicago_24h	22:25	1.445
Lethbridge_1:100year_Chicago_24h	22:30	1.439
Lethbridge_1:100year_Chicago_24h	22:35	1.433
Lethbridge_1:100year_Chicago_24h	22:40	1.428
Lethbridge_1:100year_Chicago_24h	22:45	1.422
Lethbridge_1:100year_Chicago_24h	22:50	1.417
Lethbridge_1:100year_Chicago_24h	22:55	1.411
Lethbridge_1:100year_Chicago_24h	23:00	1.406
Lethbridge_1:100year_Chicago_24h	23:05	1.4
Lethbridge_1:100year_Chicago_24h	23:10	1.395
Lethbridge_1:100year_Chicago_24h	23:15	1.39
Lethbridge_1:100year_Chicago_24h	23:20	1.384
Lethbridge_1:100year_Chicago_24h	23:25	1.379
Lethbridge_1:100year_Chicago_24h	23:30	1.374
Lethbridge_1:100year_Chicago_24h	23:35	1.369
Lethbridge_1:100year_Chicago_24h	23:40	1.364
Lethbridge_1:100year_Chicago_24h	23:45	1.359
Lethbridge_1:100year_Chicago_24h	23:50	1.354
Lethbridge_1:100year_Chicago_24h	23:55	1.349

```
Lethbridge_1:100year_Chicago_24h            24:00      0

;Chicago design storm, a = 1019.2, b = 0, c = 0.731, Duration = 240 minutes, r = 0.3, rain units = mm/hr.
Lethbridge_100year_Chicago_4h             0:00       5.122
Lethbridge_100year_Chicago_4h             0:05       5.409
Lethbridge_100year_Chicago_4h             0:10       5.738
Lethbridge_100year_Chicago_4h             0:15       6.119
Lethbridge_100year_Chicago_4h             0:20       6.565
Lethbridge_100year_Chicago_4h             0:25       7.098
Lethbridge_100year_Chicago_4h             0:30       7.745
Lethbridge_100year_Chicago_4h             0:35       8.553
Lethbridge_100year_Chicago_4h             0:40       9.594
Lethbridge_100year_Chicago_4h             0:45       10.997
Lethbridge_100year_Chicago_4h             0:50       13.01
Lethbridge_100year_Chicago_4h             0:55       16.203
Lethbridge_100year_Chicago_4h             1:00       22.264
Lethbridge_100year_Chicago_4h             1:05       40.822
Lethbridge_100year_Chicago_4h             1:10       314.277
Lethbridge_100year_Chicago_4h             1:15       62.374
Lethbridge_100year_Chicago_4h             1:20       38.336
Lethbridge_100year_Chicago_4h             1:25       28.645
Lethbridge_100year_Chicago_4h             1:30       23.295
Lethbridge_100year_Chicago_4h             1:35       19.837
Lethbridge_100year_Chicago_4h             1:40       17.393
Lethbridge_100year_Chicago_4h             1:45       15.56
Lethbridge_100year_Chicago_4h             1:50       14.128
Lethbridge_100year_Chicago_4h             1:55       12.973
Lethbridge_100year_Chicago_4h             2:00       12.02
Lethbridge_100year_Chicago_4h             2:05       11.217
Lethbridge_100year_Chicago_4h             2:10       10.531
Lethbridge_100year_Chicago_4h             2:15       9.937
Lethbridge_100year_Chicago_4h             2:20       9.416
Lethbridge_100year_Chicago_4h             2:25       8.956
Lethbridge_100year_Chicago_4h             2:30       8.545
Lethbridge_100year_Chicago_4h             2:35       8.177
Lethbridge_100year_Chicago_4h             2:40       7.844
Lethbridge_100year_Chicago_4h             2:45       7.542
Lethbridge_100year_Chicago_4h             2:50       7.265
Lethbridge_100year_Chicago_4h             2:55       7.012
Lethbridge_100year_Chicago_4h             3:00       6.778
Lethbridge_100year_Chicago_4h             3:05       6.563
```

Lethbridge_100year_Chicago_4h	3:10	6.362
Lethbridge_100year_Chicago_4h	3:15	6.176
Lethbridge_100year_Chicago_4h	3:20	6.002
Lethbridge_100year_Chicago_4h	3:25	5.839
Lethbridge_100year_Chicago_4h	3:30	5.687
Lethbridge_100year_Chicago_4h	3:35	5.543
Lethbridge_100year_Chicago_4h	3:40	5.408
Lethbridge_100year_Chicago_4h	3:45	5.28
Lethbridge_100year_Chicago_4h	3:50	5.159
Lethbridge_100year_Chicago_4h	3:55	5.045
Lethbridge_100year_Chicago_4h	4:00	0

Lethbridge_5year_Chicago_4h	0:00	3.028
Lethbridge_5year_Chicago_4h	0:05	3.19
Lethbridge_5year_Chicago_4h	0:10	3.374
Lethbridge_5year_Chicago_4h	0:15	3.587
Lethbridge_5year_Chicago_4h	0:20	3.836
Lethbridge_5year_Chicago_4h	0:25	4.131
Lethbridge_5year_Chicago_4h	0:30	4.489
Lethbridge_5year_Chicago_4h	0:35	4.934
Lethbridge_5year_Chicago_4h	0:40	5.504
Lethbridge_5year_Chicago_4h	0:45	6.268
Lethbridge_5year_Chicago_4h	0:50	7.356
Lethbridge_5year_Chicago_4h	0:55	9.064
Lethbridge_5year_Chicago_4h	1:00	12.265
Lethbridge_5year_Chicago_4h	1:05	21.818
Lethbridge_5year_Chicago_4h	1:10	143.764
Lethbridge_5year_Chicago_4h	1:15	32.694
Lethbridge_5year_Chicago_4h	1:20	20.578
Lethbridge_5year_Chicago_4h	1:25	15.594
Lethbridge_5year_Chicago_4h	1:30	12.808
Lethbridge_5year_Chicago_4h	1:35	10.992
Lethbridge_5year_Chicago_4h	1:40	9.698
Lethbridge_5year_Chicago_4h	1:45	8.723
Lethbridge_5year_Chicago_4h	1:50	7.957
Lethbridge_5year_Chicago_4h	1:55	7.336
Lethbridge_5year_Chicago_4h	2:00	6.822
Lethbridge_5year_Chicago_4h	2:05	6.388
Lethbridge_5year_Chicago_4h	2:10	6.015
Lethbridge_5year_Chicago_4h	2:15	5.691
Lethbridge_5year_Chicago_4h	2:20	5.407

```
Lethbridge_5year_Chicago_4h            2:25       5.155
Lethbridge_5year_Chicago_4h            2:30       4.93
Lethbridge_5year_Chicago_4h            2:35       4.727
Lethbridge_5year_Chicago_4h            2:40       4.544
Lethbridge_5year_Chicago_4h            2:45       4.377
Lethbridge_5year_Chicago_4h            2:50       4.224
Lethbridge_5year_Chicago_4h            2:55       4.084
Lethbridge_5year_Chicago_4h            3:00       3.954
Lethbridge_5year_Chicago_4h            3:05       3.834
Lethbridge_5year_Chicago_4h            3:10       3.723
Lethbridge_5year_Chicago_4h            3:15       3.619
Lethbridge_5year_Chicago_4h            3:20       3.522
Lethbridge_5year_Chicago_4h            3:25       3.431
Lethbridge_5year_Chicago_4h            3:30       3.345
Lethbridge_5year_Chicago_4h            3:35       3.265
Lethbridge_5year_Chicago_4h            3:40       3.189
Lethbridge_5year_Chicago_4h            3:45       3.117
Lethbridge_5year_Chicago_4h            3:50       3.049
Lethbridge_5year_Chicago_4h            3:55       2.985
Lethbridge_5year_Chicago_4h            4:00       0

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       375774.57055     5506451.2216     376037.96445     5507328.5024
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
10               375980.886         5507166.561
12               375972.969         5506627.128
17               375977.95          5506751.979
```

```
18               375983.844         5506872.316
19               375982.372         5507003.46
OF1              376015.992         5507164.647
Lot2             375965.485         5506610.59
lot3             375967.696         5506742.312
lot4             375969.76          5506867.607
lot5             375963.486         5507001.059
lot6             375973.45          5507138.056
lot7             375960.432         5507166.447

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
lot1s            375869.882         5506496.686
lot1s            375786.543         5506497.834
lot1s            375788.213         5506637.364
lot1s            375873.809         5506634.638
lot1s            375869.882         5506496.686
lot2s            375869.883         5506496.695
lot2s            375873.809         5506634.647
lot2s            375986.176         5506632.064
lot2s            375980.654         5506491.098
lot2s            375869.883         5506496.695
lot3s            375788.214         5506637.372
lot3s            375790.421         5506766.962
lot3s            375989.925         5506762.39
lot3s            375986.176         5506632.073
lot3s            375788.214         5506637.372
lot4s            375790.421         5506766.971
lot4s            375792.922         5506898.491
lot4s            375996.603         5506890.086
lot4s            375989.925         5506762.399
lot4s            375790.421         5506766.971
lot5s            375797.873         5507028.339
lot5s            376000.286         5507021.481
lot5s            375996.603         5506890.077
lot5s            375792.922         5506898.482
```

```
lot5s             375797.873          5507028.339
lot6s             375797.873          5507028.33
lot6s             375801.6            5507158.48
lot6s             376004.093          5507155.319
lot6s             376000.286          5507021.472
lot6s             375797.873          5507028.33
lot7s             375804.585          5507288.626
lot7s             376007.056          5507284.725
lot7s             376004.093          5507155.31
lot7s             375801.6            5507158.471
lot7s             375804.585          5507288.626

;;Storage Node   X-Coord             Y-Coord
;;--------------- ------------------- -------------------

[SYMBOLS]
;;Gage            X-Coord             Y-Coord
;;--------------- ------------------- -------------------
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.015)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit conduit4
WARNING 10: crest elevation raised to downstream invert for regulator Link 8
WARNING 10: crest elevation raised to downstream invert for regulator Link 9
WARNING 02: maximum depth increased for Node 10
WARNING 02: maximum depth increased for Node 12

*************
Element Count
*************
Number of rain gages ...... 6
Number of subcatchments ... 7
Number of nodes ........... 12
Number of links ........... 11
Number of pollutants ...... 0
Number of land uses ....... 0


****************
Raingage Summary
****************
                                                  Data       Recording
Name                 Data Source                  Type       Interval
----------------------------------------------------------------------
Chicago_24h          Chicago_24h                  INTENSITY    5 min.
Chicago_3h           Chicago_3h                   INTENSITY    5 min.
Chicago_4h           Chicago_4h                   INTENSITY    5 min.
Lethbridge_1:100year_Chicago_24h Lethbridge_1:100year_Chicago_24h INTENSITY    5 min.
Lethbridge_100year_Chicago_4h Lethbridge_100year_Chicago_4h  INTENSITY    5 min.
Lethbridge_5year_Chicago_4h Lethbridge_5year_Chicago_4h    INTENSITY    5 min.


*******************
Subcatchment Summary
*******************
Name                        Area     Width    %Imperv    %Slope Rain Gage            Outlet
------------------------------------------------------------------------------------------------
lot1s                       1.17    140.00     10.00    0.4000 Lethbridge_1:100year_Chicago_24h Lot2
```

lot2s	1.56	140.00	10.00	0.6000	Lethbridge_1:100year_Chicago_24h	Lot2
lot3s	2.59	130.50	10.00	0.8000	Lethbridge_1:100year_Chicago_24h	lot3
lot4s	2.62	128.00	10.00	0.7000	Lethbridge_1:100year_Chicago_24h	lot4
lot5s	2.66	136.00	10.00	0.3000	Lethbridge_1:100year_Chicago_24h	lot5
lot6s	2.68	130.50	10.00	1.0000	Lethbridge_1:100year_Chicago_24h	lot6
lot7s	2.63	124.50	10.00	0.5000	Lethbridge_1:100year_Chicago_24h	lot7

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
10	JUNCTION	897.90	1.00	0.0	
12	JUNCTION	898.20	0.80	0.0	
17	JUNCTION	897.60	1.20	0.0	
18	JUNCTION	897.00	1.80	0.0	
19	JUNCTION	898.06	0.74	0.0	
OF1	OUTFALL	897.80	1.00	0.0	
Lot2	STORAGE	898.00	1.00	0.0	
lot3	STORAGE	896.80	1.40	0.0	
lot4	STORAGE	896.80	1.40	0.0	
lot5	STORAGE	897.80	0.60	0.0	
lot6	STORAGE	897.50	0.90	0.0	
lot7	STORAGE	897.80	0.60	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
2	10	OF1	CONDUIT	35.2	0.2844	0.0100
6	18	19	CONDUIT	131.2	-0.3507	0.0100
7	19	10	CONDUIT	163.1	0.0981	0.0100
conduit3	12	17	CONDUIT	125.0	0.4801	0.0100
conduit4	17	18	CONDUIT	120.5	0.0003	0.0100
1	lot7	10	WEIR			
11	lot4	18	WEIR			
8	lot5	19	WEIR			

9	lot6	10	WEIR
bioswale4	Lot2	12	WEIR
W3	lot3	17	WEIR

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
2	TRAPEZOIDAL	1.00	4.00	0.62	6.00	1	15.48
6	TRAPEZOIDAL	0.40	1.20	0.24	5.00	1	2.72
7	TRAPEZOIDAL	0.40	1.20	0.24	5.00	1	1.44
conduit3	TRAPEZOIDAL	0.40	1.20	0.24	5.00	1	3.18
conduit4	TRAPEZOIDAL	0.40	1.20	0.24	5.00	1	0.07

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 03/28/2022 00:00:00

```
Ending Date ..... 03/29/2022 00:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:05:00
Routing Time Step ..... 5.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001500 m
```

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	1.910	120.146
Evaporation Loss	0.000	0.000
Infiltration Loss	1.189	74.799
Surface Runoff	0.720	45.319
Final Storage	0.001	0.064
Continuity Error (%)	-0.030	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.720	7.204
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.000	0.000
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.160	1.605
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.560	5.598
Continuity Error (%)	0.009	

****

Time-Step Critical Elements
****
None

****
Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 4.50 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 2.00
Percent Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff

lot1s	120.15	0.00	0.00	72.75	11.99	35.40	47.39	0.56
0.28 0.394								
lot2s	120.15	0.00	0.00	72.92	11.98	35.23	47.22	0.74
0.36 0.393								
lot3s	120.15	0.00	0.00	74.02	11.97	34.13	46.10	1.19
0.47 0.384								
lot4s	120.15	0.00	0.00	74.32	11.97	33.83	45.80	1.20
0.46 0.381								
lot5s	120.15	0.00	0.00	75.69	11.96	32.45	44.41	1.18
0.39 0.370								
lot6s	120.15	0.00	0.00	73.79	11.98	34.35	46.33	1.24
0.51 0.386								
lot7s	120.15	0.00	0.00	78.20	11.97	41.91	41.91	1.10
0.27 0.349								

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
10	JUNCTION	0.00	0.00	897.90	0 00:00	0.00
12	JUNCTION	0.00	0.00	898.20	0 00:00	0.00
17	JUNCTION	0.00	0.00	897.60	0 00:00	0.00
18	JUNCTION	0.00	0.00	897.00	0 00:00	0.00
19	JUNCTION	0.00	0.00	898.06	0 00:00	0.00
OF1	OUTFALL	0.00	0.00	897.80	0 00:00	0.00
Lot2	STORAGE	0.10	0.15	898.15	0 10:30	0.15
lot3	STORAGE	0.09	0.14	896.94	0 10:55	0.14
lot4	STORAGE	0.11	0.17	896.97	1 00:00	0.17
lot5	STORAGE	0.09	0.14	897.94	0 11:31	0.14
lot6	STORAGE	0.09	0.14	897.64	0 10:52	0.14
lot7	STORAGE	0.08	0.14	897.94	0 11:16	0.14

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
10	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
12	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
17	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
18	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
19	JUNCTION	0.000	0.000	0	00:00	0	0	0.000	ltr
OF1	OUTFALL	0.000	0.000	0	00:00	0	0	0.000	ltr
Lot2	STORAGE	0.637	0.637	0	07:15	1.29	1.29	0.008	
lot3	STORAGE	0.472	0.472	0	07:15	1.19	1.19	0.008	
lot4	STORAGE	0.456	0.456	0	07:15	1.2	1.2	0.011	
lot5	STORAGE	0.390	0.390	0	07:15	1.18	1.18	0.008	
lot6	STORAGE	0.508	0.508	0	07:15	1.24	1.24	0.008	
lot7	STORAGE	0.272	0.272	0	07:20	1.1	1.1	0.008	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

	Average	Avg	Evap	Exfil	Maximum	Max	Time of Max	Maximum

APPENDIX 4

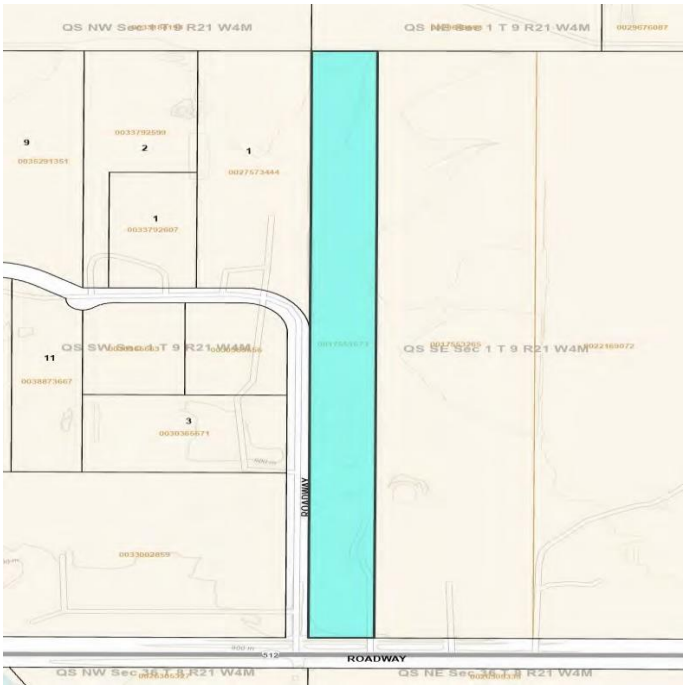
Alberta Transportation

Correspondence from Alberta Transportation

Transportation and Economic Corridors Notice of Referral Decision

Statutory Plan in Proximity of a Provincial Highway

Municipality File Number:	Bylaw 23-021 and Bylaw 23-022	**Highway(s):**	3, 4X, 512
Legal Land Location:	QS-SE SEC-01 TWP-009 RGE-21 MER-4	**Municipality:**	Lethbridge County
Decision By:	Leah Olsen	**Issuing Office:**	Southern Region / Lethbridge
Issued Date:	March 6, 2024	**AT Reference #:**	RPATH0036927
Description of Development:	Area Structure Plan and Rezoning Bylaw Applications.		



Transportation and Economic Corridors met with Developer Mr. Blair Frache and representatives of Lethbridge County on Wednesday, February 14, 2024, to discuss the outcome of the Traffic Impact Assessment Memorandum prepared by WATT Consulting Group dated December 6, 2023, File No. 4157.T01 (attached).

Section 7.0 Conclusions & Recommendations indicates a Type IIIb intersection treatment would be required, however during discussions on February 14, 2024, Transportation and Economic Corridors advised a south bound to west bound right taper at Range Road 201A and Highway 512 would be satisfactory at this time.

Please submit detailed drawings and an application through RPATH for the proposed intersection upgrades.

It should also be noted that the most westerly direct highway access to this property will need to be removed which will be a condition of subdivision.

Please contact Transportation and Economic Corridors through the RPATH Portal if you have any questions, or require additional information.

Issued by Leah Olsen**,** on March 6, 2024 on behalf of the Minister of Transportation and Economic Corridors pursuant to *Ministerial Order 52/20 – Department of Transportation and Economic Corridors Delegation of Authority*

WATT CALGARY
1300 – 736 6th Ave SW
Calgary, AB T2P 3T7
403-273-9001

MEMORANDUM

Date: December 6, 2023
To: Leah Olsen, ATEC
Cc: Blair Frache
From: Brendan Stevenson, WATT
William Minchin, WATT
Our File No: 4157.T01
Subject: Transportation Review of SE-1-9-21-W4

1.0 INTRODUCTION & PROPOSED DEVELOPMENT

WATT Consulting Group (WATT) was retained by Mr. Blair Frache to prepare a memo according to the guidelines from Alberta Transportation and Economic Corridors (ATEC), to support the proposed development and to outline any improvements needed to the highway network. The proposed development includes subdividing the western portion of approximately 40 acres of SE-1-9-W4 into 7 lots. As illustrated in **Figure 1**, this development is located immediately north of Highway 512 between Range Road 210 and Range Road 211, to the east of Lethbridge.

Two of these lots along the south edge are anticipated to be residential only, while the remaining five are expected to support combination residential / light industrial ("work/live") applications. The subject property currently has one house but is otherwise used for agricultural purposes. The existing house has direct access onto Highway 512, which runs along the south side of the property; it is proposed that this house and access will remain. There is a public road, Range Road 210A, that runs along the west side of the property, and it is proposed that the remaining lots will have access via this road.

The study area is limited to the development outlined above and the intersection of Highway 512 and Range Road 210A.

The existing Highway 512 (also known as Jail Road) has a service classification of *Level 4* (within a small metropolitan area) and a functional classification of *Rural Collector Undivided* (RCU). The development is within Control Section 2.

Figure 1: Site Situation

2.0 EXISTING CONDITIONS

The existing Highway 512 is a two-lane undivided highway with minimal shoulders and a posted limit through the study area of 100 km/h, with an assumed design speed of 110 km/h (i.e. 10 km/h higher than the posted speed limit). The road is effectively flat

and level within the study area. Highway 512 is free flow at the intersection of Range Road 210A, while Range Road 210A operates under a stop condition.

The intersection of Highway 512 and Range Road 210A, located on the southwest corner of the property, is currently a Type I intersection, with no additional acceleration or deceleration lanes.

It is noted that the study intersection includes a driveway on the south approach that services an agricultural property. During the data collection, no traffic volumes were recorded for this approach and have therefore been left out of the traffic volume figures below.

3.0 2043 HORIZON BACKGROUND TRAFFIC

Background traffic volumes for the intersection of Highway 512 and Range Road 210A were established using an AM (7:00-9:00) and PM (16:00-18:00) peak hour count completed on Tuesday, October 17, 2023[1]. Resulting turning movement volumes, as counted, are presented in **Figure 2**. Using a k-factor of 0.116[2], an AADT of 2,850 was calculated along Highway 512 and 200 on Range Road 210A.

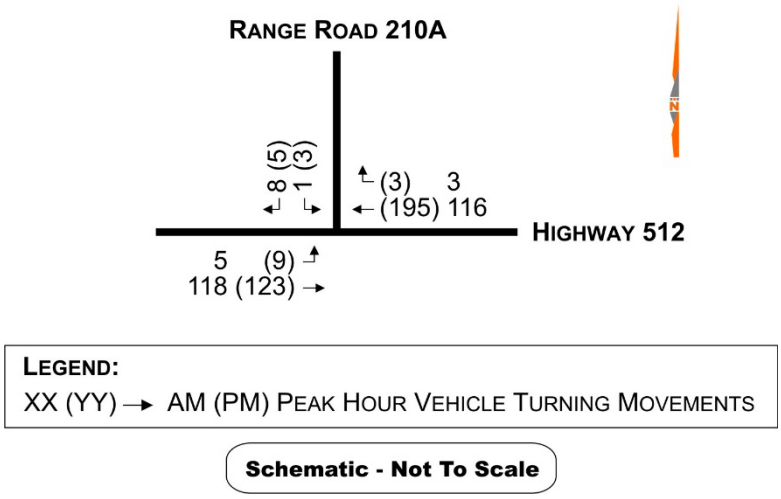


Figure 2: Existing Traffic Volumes, As Counted, AM & PM Peak Hours

[1] Data provided by Client. Although there is a driveway forming a de-facto south leg to the intersection, no volume to or from this leg was recorded, and it has been excluded from volume figures for clarity.
[2] Calculated from the Alberta Transportation traffic count of Highway 4 / Highway 512 (2022).

The PM Peak Hour volumes were found to be higher than the AM Peak Hour volumes, and so the PM Peak Hour was used for design purposes.

Existing volumes along Highway 512 were grown to a 20-year horizon using an annual linear growth rate of 2%, resulting in a future AADT of 4,000 along Highway 512. No growth rate was applied to Range Road 210A, given the limited growth potential volumes[3]. This background traffic, including the 20 years of growth, is shown in **Figure 3** for the PM peak hour.

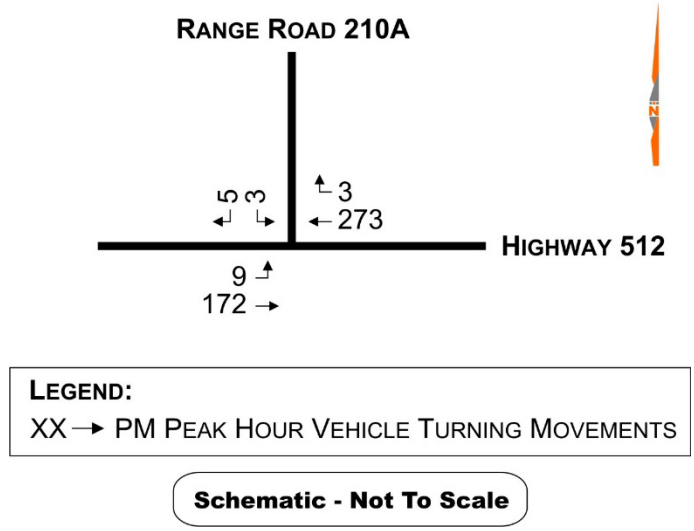


Figure 3: Background Traffic, 20 Year Projection, PM Peak Hour

4.0 TRIP GENERATION

Trip generation rates associated with the proposed development reflect local rates developed from a traffic count[4] at an existing development with comparable land use. Resulting trip generation for the live / work units include:

- AM Peak Hour 4 vehicles / unit (50% inbound / 50% outbound)

[3] With the completion of this development, the catchment area of Range Road 210A will be saturated.
[4] Traffic Count provided by Client, Tuesday, October 24, 2023.

- PM Peak Hour 4 vehicles / unit (50% inbound / 50% outbound)

The existing farmhouse accessed via Highway 512 is not considered in this generated traffic and is reflected in the background volumes. **Table 2** summarized the anticipated generated traffic.

Table 1: Trip Generation

Land Use	Units	Trips Generated, AM Peak Hour			Trips Generated, PM Peak Hour		
		Total	IB	OB	Total	IB	OB
Live/Work	6	24	12	12	24	12	12

Traffic generated by the development is assumed to follow the same directional split as the existing traffic to and from Range Road 210A, as noted in **Table 3** and **Table 4**. Assigned Development Traffic generated is shown in **Figure 4**.

Table 2: Directional Split for Inbound Trips

	Existing Trips Entering from...		Direction Split		Assigned Inbound Tirps	
	East	West	East	West	East	West
AM Peak	4	5	44%	56%	5	7
PM Peak	5	14	26%	74%	3	9

Table 3: Directional Split for Outbound Trips

	Existing Trips Leaving to...		Direction Split		Assigned Outbound Tirps	
	East	West	East	West	East	West
AM Peak	3	10	23%	77%	3	9
PM Peak	4	7	36%	64%	4	8

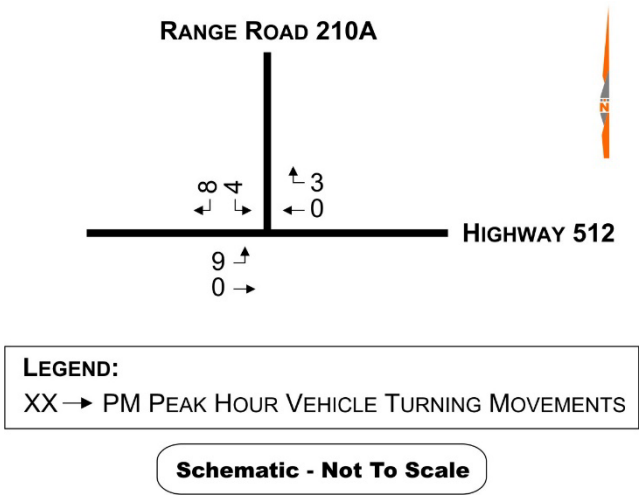


Figure 4: Site Generated Traffic, Full Build Out, PM Peak Hour

5.0 2043 HORIZON POST-DEVELOPMENT TRAFFIC

Post development traffic volumes were determined by adding the background (**Figure 3**) and site generated traffic (**Figure 4**), with the resulting 2043 traffic volumes illustrated in **Figure 5**.

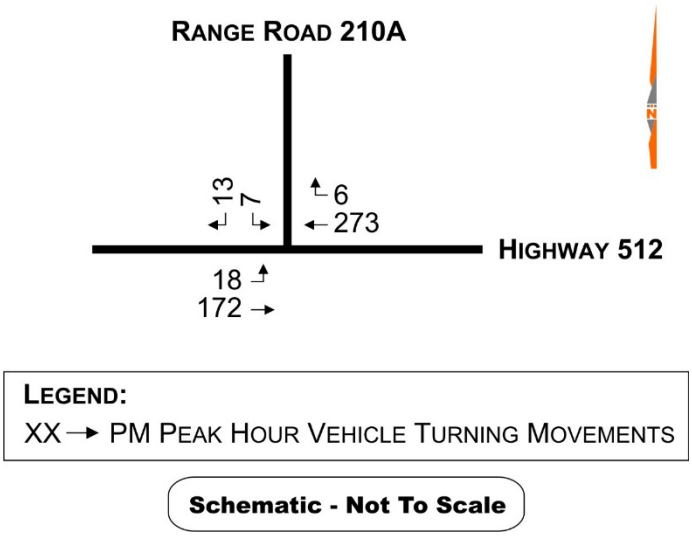


Figure 5: Combined Traffic, 20 Year Projection, PM Peak Hour

6.0 INTERSECTION TREATEMENT WARRANT FOR HIGHWAY 512 AND RANGE ROAD 210A

ATEC has a published warrant procedure for determining intersection treatments along provincial highways[5]. The warrant was applied, using the PM Peak Hour as the design hour, as it was found to have higher traffic volumes than the AM Peak Hour. The volumes used for the intersection treatment warrants are detailed in **Table 4**.

Table 4: Traffic Volumes for Intersection Treatment Warrant

	Background	Post-Development	Notes
VI	9	18	Left turning volume
V_A	181	190	Advancing volume
L	5.0%	9.5%	% of left turns
V_O	276	279	Opposing volume

For the intersection treatment warrants, a design speed of 110 km/h was assumed (i.e. 10 km/h above the posted speed limit).

Based on the projected background traffic volumes, the intersection warrant treatment was completed (see **Figure 6**), and the appropriate treatment is right on the border between a Type II and a Type III treatment.

Based on the projected development traffic volumes, a second intersection warrant treatment was also completed (see **Figure 7**), and appropriate the treatment is a Type III treatment. Because there is a farmhouse access to the south at the intersection of Highway 512 and Range Road 210A, the appropriate Type III intersection design is the Type IIIb design, as shown in **Figure 8**.

[5] *Highway Geometric Design Guide*, by Alberta Transportation. See Chapter D: At-Grade Intersections, last updated March 2023.

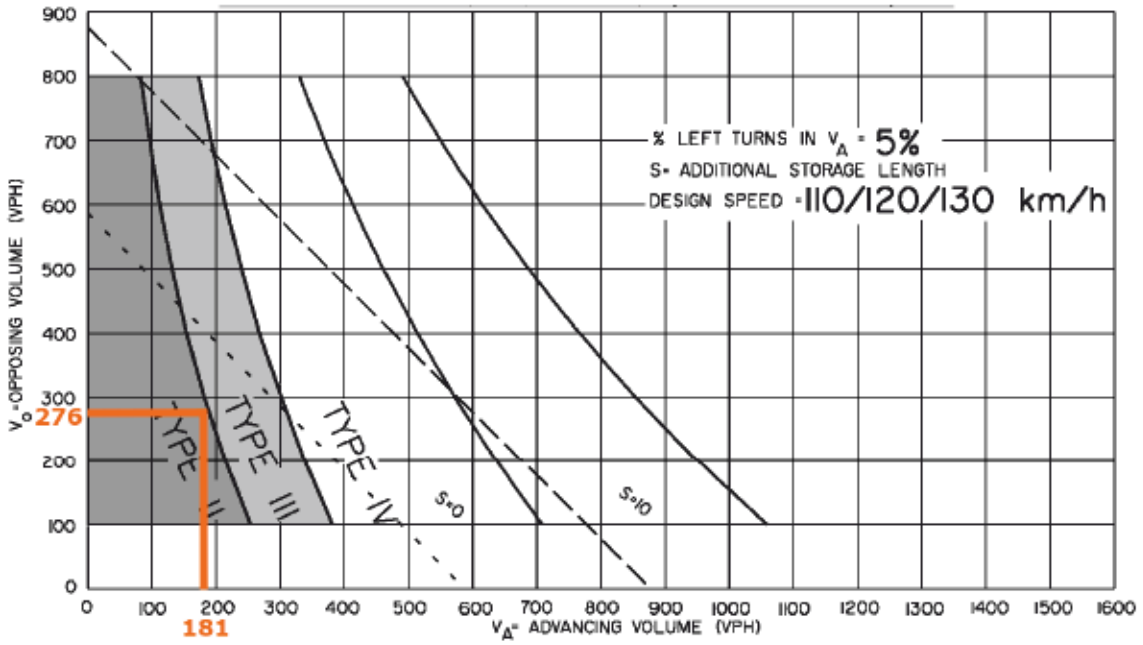


Figure 6: Warrant for Left Turn Lanes for Two-Lane Highways, Design Speed 110 km/h, Left Turn 5%[6]

It is remarked that intersection treatments (beyond Type I, i.e. those adding acceleration, deceleration, and left turn storage lanes) are currently rare along the 27 km length Highway 512, only occurring at the two termini of Highway 512 (at Highway 4, 4 km to the west, and Highway 3 to the northeast), at the intersection with Highway 845 (immediately south of Coaldale, 7.2 km to the east of the project) and the intersection with Township Road 92 (immediately east of Coaldale).

It is noted that the existing farmhouse access within the proposed development will fall within the functional area of the intersection. This access located on the north side of the highway, approximately 135m east of the intersection.

There is a second existing farmhouse access immediately south of the proposed development, whose access forms a de-facto south leg to the intersection. However, no volume from this leg was recorded, and so no intersection treatment is warranted based on movements to or from this let.

[6] Figure D-7.6.7a in Alberta Transportation's Highway Geometric Design Guide

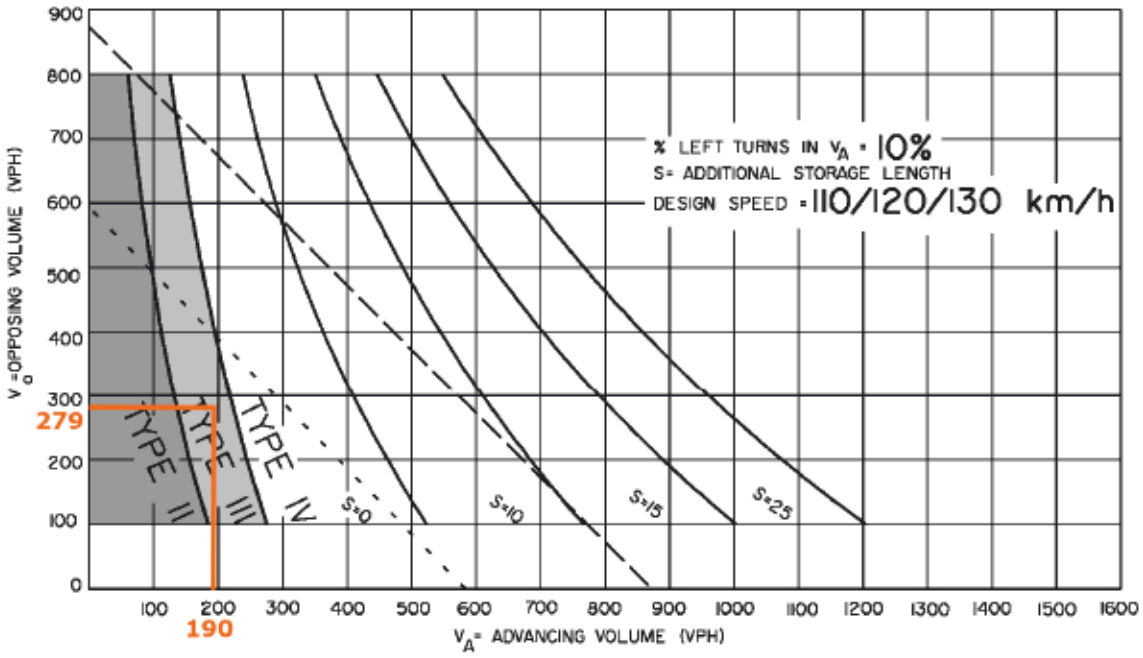


Figure 7: Warrant for Left Turn Lanes for Two-Lane Highways, Design Speed 110 km/h, Left Turn 10%[6]

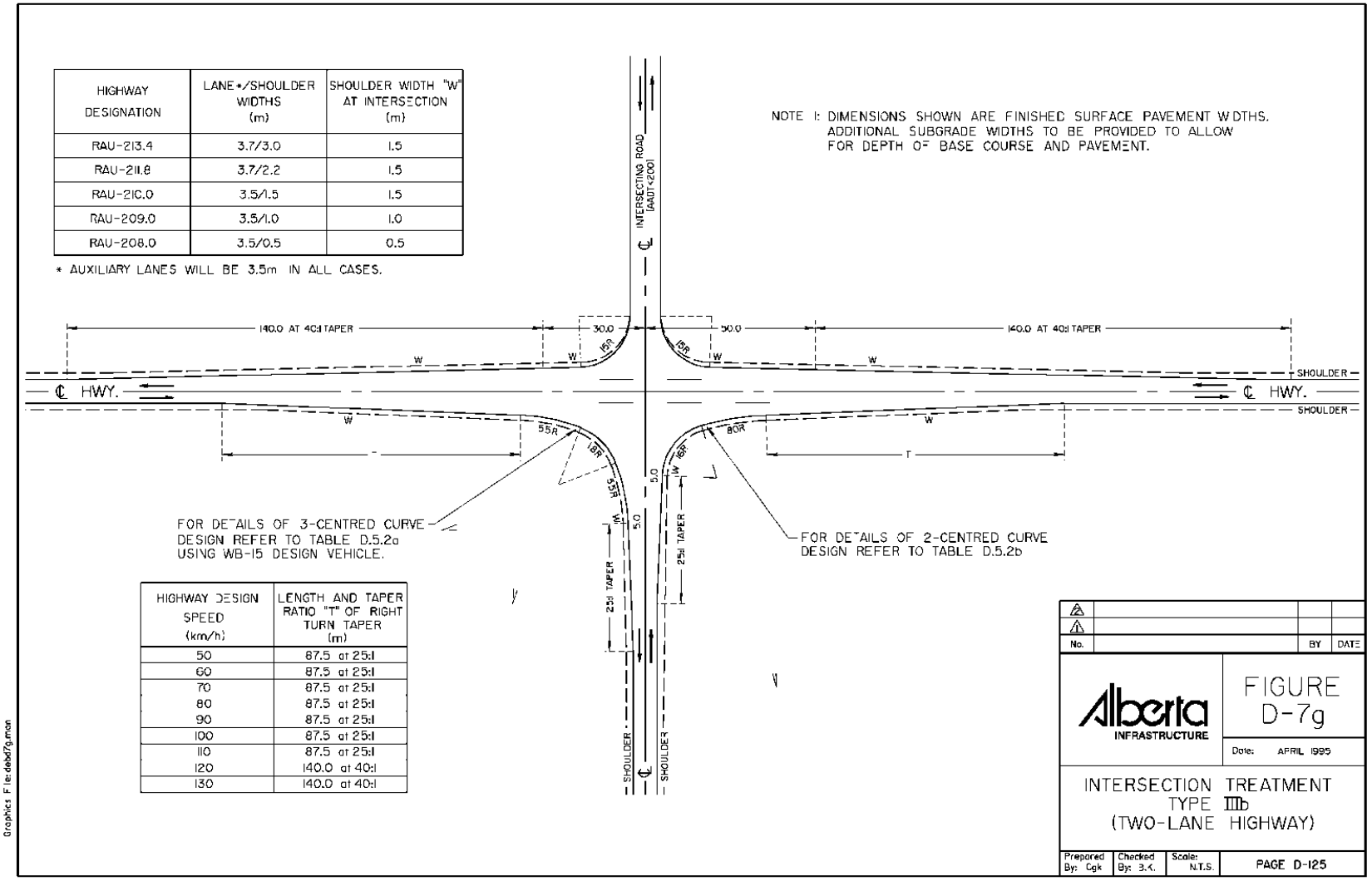


Figure 8: Intersection Treatment Type IIIb (Two Lane Highway)

7.0 CONCLUSIONS & RECOMMENDATIONS

The proposed development is located to the north of Highway 512 and east of Range Road 210A and is anticipated to include both residential and industrial land use on a 40 acre parcel.

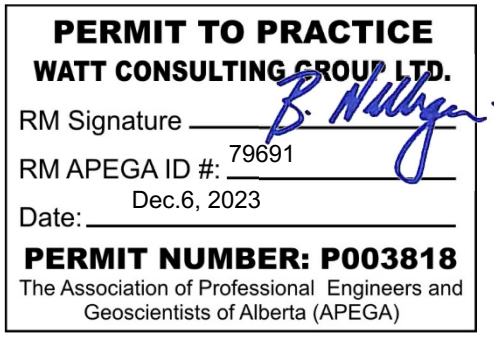
As indicated in the body of the report, existing and future traffic volumes in the 2043 horizon are not anticipated to cause any intersection operation concerns. According to an intersection treatment review, a Type IIIb intersection treatment will be required to support traffic in the 2043 horizon year, with or without the development going forward.

Sincerely,
WATT Consulting Group

Brendan Stevenson, *PEng, PTOE, PMP*
Regional Lead Transportation

T 403-273-9001 ext. 728
C 587-432-3282
E bstevenson@wattconsultinggroup.com

#WEAREWATT



APPENDIX 5

LETTER TO NEIGHBORS

Letter and Drawings to Neighbors

CONSULTING ENGINEERS, PLANNERS & LAND SURVEYORS
255 – 31st Street North, Lethbridge, Alberta, T1H 3Z4
PH: (403) 329-0050 FAX: (403) 329-6594
Email: geomart@mgcl.ca

March 25, 2024 File: 229729CE

Dear Neighbor:

Re: Proposed Land Development – Country Side - Area Structure Plan
Lethbridge County, Alberta

We are pleased to provide this notification and to seek your feedback regarding a new residential development called Country Side, being planned in your community. We are preparing an Area Structure Plan and County Land Use Bylaw Amendment in support of this seven-lot development at the northeast corner of the intersection of Highway 512 (Jail Road) and Range Road 210A. The southerly 140 meters (459 feet) will be rezoned to Country Residential (CR), with a 3.0 acre and 4.0 acre lot that would face south onto Highway 512.

We are proposing Direct Control (DC) zoning for the balance of the property, which would have five, 6 acre lots along the east side of Range Road 210A. This zone would provide a Country Residential use on the west side of each lot with provisions made to allow light industrial uses at the rear of these lots. The light industrial use would be required to have a setback of at least 75 meters from the front property line with at least two rows of trees providing screening along the setback line. Attached is a concept plan that shows the lot boundaries and setbacks.

The County of Lethbridge's Industrial Commercial Land Use Strategy recommends that this site be used for a mixed use of residential and/ or light industrial. The balance of the quarter section is envisioned as Light industrial or commercial uses. The residential portion of the Countryside ASP provides a buffer for existing residential properties to the west, from this light industrial land use.

It is anticipated that potable water will be provided from the County of Lethbridge Rural water coop or County approved alternative; septic systems will be used to provide for wastewater and gas, electrical, telephone and irrigation water will be available to all lots. To assist in accessing the highway, an acceleration lane will be added to the west bound lane of Highway 512 at the intersection with Range Road 210A.

In order to manage storm water, each lot will be required to store water from the in 100-year storm event in ponds at the back of their lot.

Architectural Controls will be registered on title and are intended to help ensure a high-quality development that would fit into the current community.

If you have any comments or questions with regard to the Countryside Area Structure Plan or the proposed new zoning, please email your concerns to Ed Martin, P. Eng., at edm@mgcl.ca or telephone at 403-329-0050 and we will be happy to address your concerns.

Please provide any comments by **April 12th, 2024** and we will work to address any comments received.

If you do not have any concerns with the proposed development, please read and sign the box below:

I, _____ (print names),

of _____(address),

have received the letter and concept drawings from MGCL, dated March 25, 2024 outlining the planned 7 lot development at the northeast corner of the intersection of Highway 512 (Jail Road) and Range Road 210A.

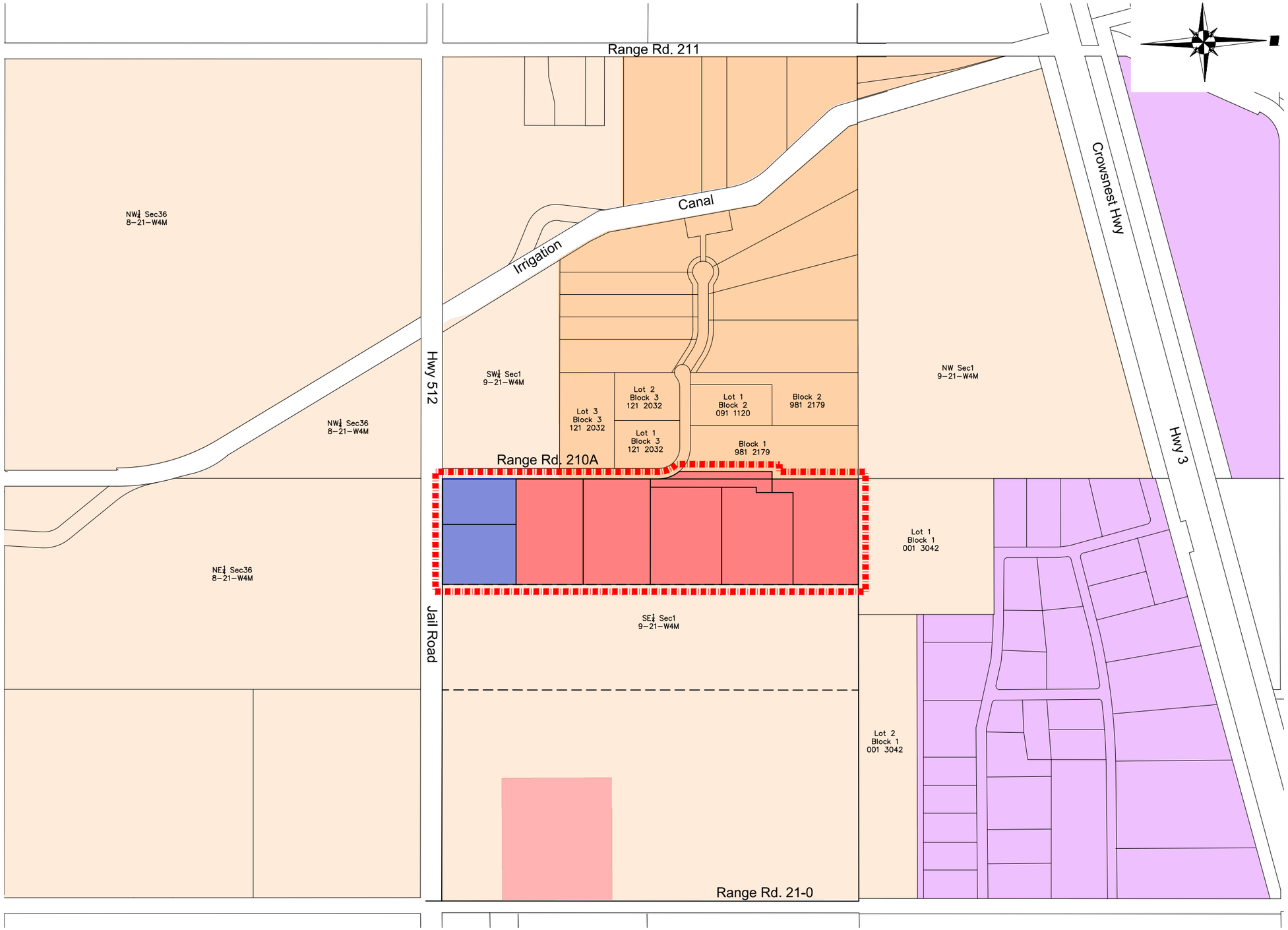
I have reviewed the letter and concept plans and have no concerns with the proposed development at this time, based on the information received.

Regards,

_____(sign names)

_____(date)

Thank you.



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
Area = 40.06 acres (16.21 ha)

EXISTING:

- EXISTING: LETHBRIDGE URBAN FRINGE (LUF)
- EXISTING: GROUPED COUNTRY RESIDENTIAL (GCR)
- EXISTING: RURAL GENERAL INDUSTRIAL (RGI)
- EXISTING: RURAL COMMERCIAL (RC)

PROPOSED:

- FROM: LETHBRIDGE URBAN FRINGE (RA)
  TO: DIRECT CONTROL (DC)
- FROM: LETHBRIDGE URBAN FRINGE (RA)
  TO: GROUPED COUNTRY RESIDENTIAL (GCR)

1: 7500

Country Side Subdivision

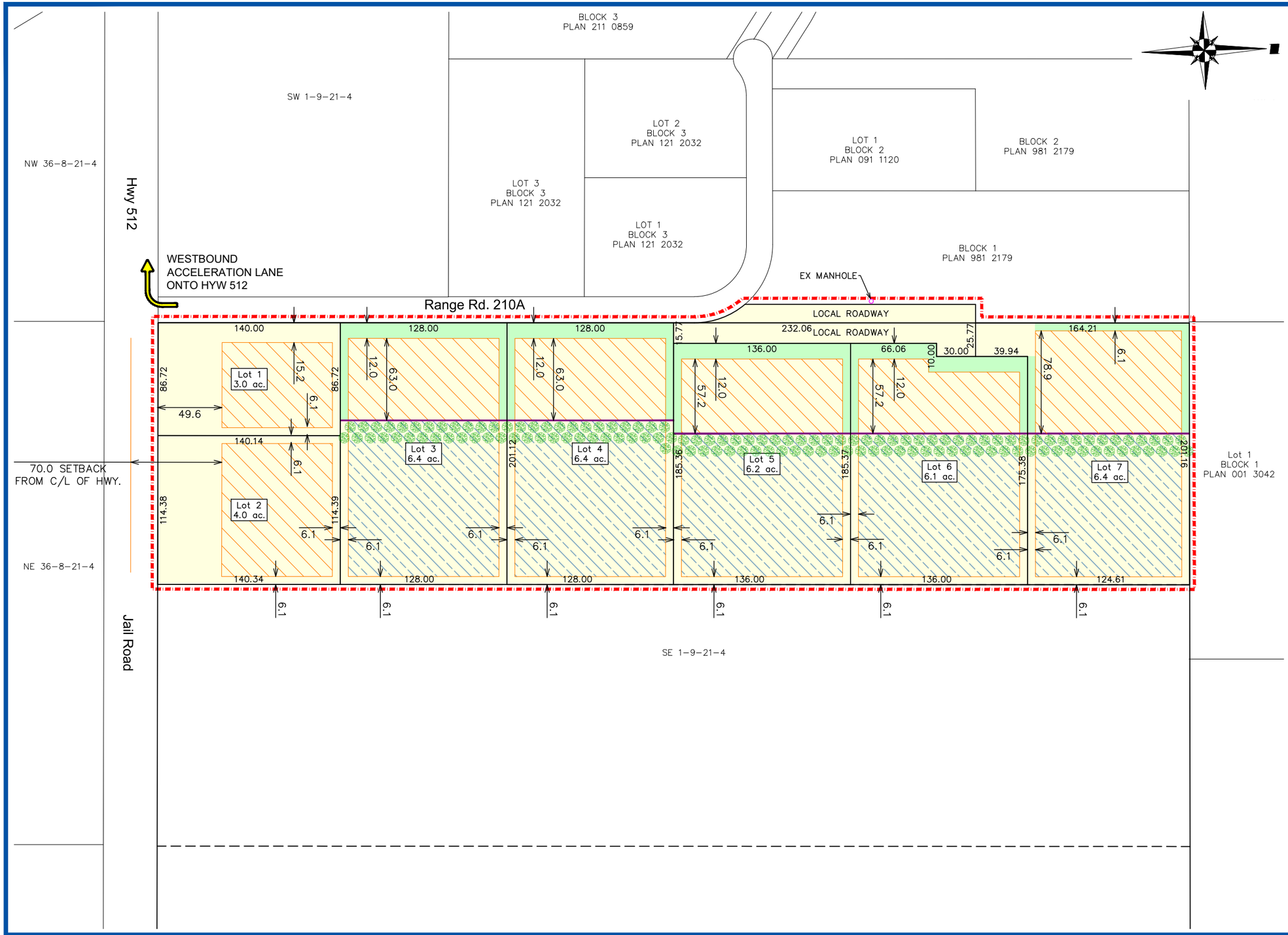
AREA STRUCTURE PLAN

Mar 25, 2024

LAND USE
FIGURE 1

229729LS

MARTIN
GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594



LEGEND:

AREA STRUCTURE PLAN BOUNDARY
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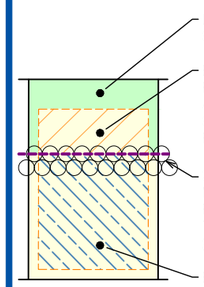

LOT DIMENSIONS ARE CONCEPTUAL AND MAY BE CHANGED DURING THE SUBDIVISION PROCESS.

1: 3000

Country Side Subdivision

AREA STRUCTURE PLAN

Mar 25, 2024

CONCEPTUAL LOT LAYOUT & SETBACKS

FIGURE 2

229729LS

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