BYLAW 856-P-07-22
TOWN OF COALDALE
PROVINCE OF ALBERTA

BEING A BYLAW OF THE TOWN OF COALDALE
TO AMEND BYLAW 512-P-04-03,
BEING THE WEST COALDALE AREA STRUCTURE PLAN

WHEREAS the municipal council is in receipt of an application to amend the West Coaldale Area Structure Plan (Bylaw 512-P-04-03) within the municipality.

AND WHEREAS the purpose of the proposed amendment is to execute a number of text amendments intended to propose a change in the neighbourhood design and dwelling types within lands located within the NW10-09-20-W4M in the Town of Coaldale as shown in Schedule A.

AND WHEREAS all changes to the ASP as generally described are identified specifically in "Schedule A" attached hereto.

AND WHEREAS the municipality must prepare an amending bylaw and provide for its consideration at a public hearing.

NOW THEREFORE, under the authority and subject to the provisions of the *Municipal Government Act*, Revised Statutes of Alberta 2000, Chapter M-26, the Council of the Town of Coaldale, in the Province of Alberta, duly assembled does hereby enact the following:

1. The West Coaldale Area Structure Plan amendments referenced above and identified specifically in "Schedule A" shall make up the amended West Coaldale Area Structure Plan.

2. Bylaw 512-P-04-03, being the West Coaldale Area Structure Plan, is hereby amended.

3. This bylaw comes into effect upon third and final reading hereof.

READ a FIRST time this 25th day of July, 2022 for West Coaldale Area Structure Plan Bylaw 856-P-07-22.

Mayor – Jack Van Rijn

CAO – Kalen Hastings

Motion #: 295-2022

Public Hearing for West Area Structure Plan Rezoning Bylaw 856-P-07-22 was scheduled to be held at 5:15 p.m. at the Regular Council Meeting on March 27th, 2023.

READ a SECOND time this 27th day of March, 2023 for West Coaldale Area Structure Plan Bylaw 856-P-07-22.

Mayor – Jack Van Rijn	CAO – Kalen Hastings

Motion #: 90-2023

READ a THIRD and FINAL time this 27th day of March, 2023 for West Coaldale Area Structure Plan Bylaw 856-P-07-22.

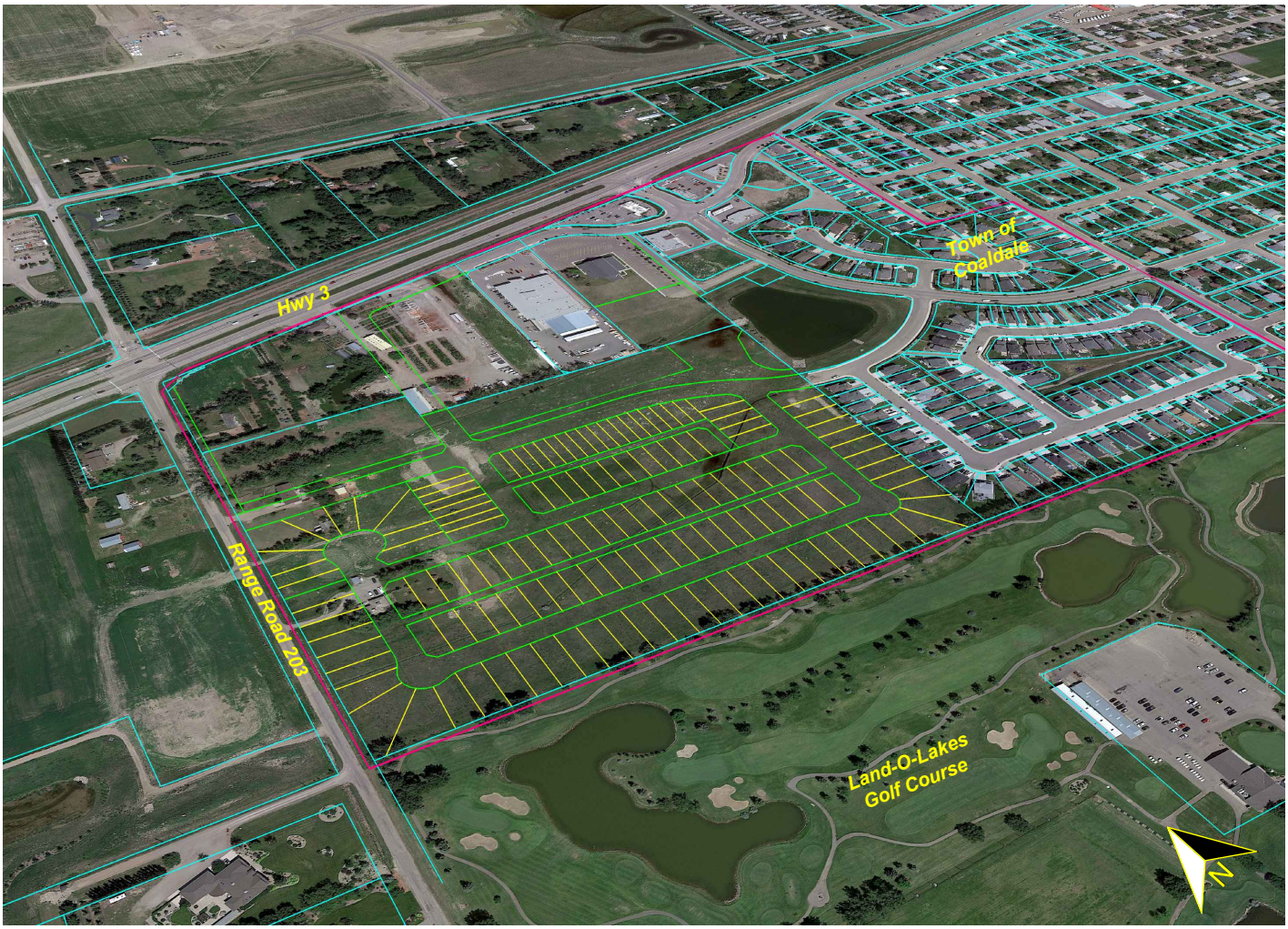
Mayor – Jack Van Rijn	CAO – Kalen Hastings

Motion #: 91-2023

West Coaldale Amended 2023

AREA STRUCTURE PLAN

NW$\frac{1}{4}$ Sec.10 - 9 - 20 - W4M



Prepared for: Domenic Land Development
Prepared by: Martin Geomatic Consultants Ltd.

MARTIN GEOMATIC CONSULTANTS

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West Coaldale Area Structure Plan, Amended 2023

Introduction

To prepare the West Coaldale Area Structure Plan version of the plan, we are proposing major changes in Section 4.0, minor changes to all other sections and eliminating. Appendices 1, 2, 3, and 4.

The 2023 ASP has included Figure 1.0- Existing Land Use, Figure 2.0 – Proposed Land Use, Figure 3.0 –Conceptual Road Network, Figure 4.0 - Underground Utilities, Figure 5.0 - Stormwater Management Pre-development, and Figure 6.0 - Stormwater Management Post-development. Appendix A - Table Showing the Existing and Proposed Densities. The results of the Town of Coaldale public engagement are included as Appendix B.

Section 1.0 from the 2003 version of the ASP is an introduction, focusing on background information and processes for the ASP approval.

Section 2.0 from the 2003 version reviews ASP versions from 1996 and 1998.

Section 3.0 outlines issues that should be addressed in the ASP. These issues will be addressed in Section 4.0 of the 2023 ASP.

In reviewing Sections 1.0, 2.0, and 3.0 of the 2003 ASP there are no major changes required. These sections mainly address process and basic information regarding ASPs in general. Therefore, we are not proposing any major changes to these sections.

Section 5.0 and 6.0 tend to outline basic and general development processes and polices that are common for the most ASP's and most developments and are not really site specific. Therefore, we are not proposing major changes to the text in Section 5.0 and 6.0.

Section 4.0 Design Scheme has been rewritten to reflect the changed elements of planning, land uses, conceptual layout, roadways, and utility servicing. Additionally, the changes reflect developments that have occurred between 2003 and 2023 with no amendments to the conceptual. Also shown in Section 4.0 are changes because of current concerns, landowner plans, and solutions to items in storm water management.

Figure 1.0 represents the existing Land Uses and Figure 2.0 shows the proposed land uses. This new concept includes changes that have been made in the layout from previous updated Maps. The primary change is a revised concept in the southwest portion of the ASP area. Changes to the concept have been crafted in conjunction with the administration of the Town of Coaldale.

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West Coaldale Area Structure Plan

Amended 2023

1.0 INTRODUCTION

1.1 Background

There have been ongoing discussions between the Town of Coaldale and individual landowners since 1996 regarding the preparation an Area Structure Plan to provide guidelines for further and future development of an underdeveloped area located in west Coaldale. UMA Engineering, on behalf of a landowner, in 1996 proposed a plan based primarily on single-family residential parcels (R-1 A) with a small centrally located commercial hub. At that time, the proposed design scheme was not adopted.

Another attempt was made in 1998 when Plains West Planning Services Ltd. reviewed the original preliminary design on behalf of the Town and recommended changes to the proposal. The amended proposal attempted to address many of the basic goals the Town identified in its General Municipal Plan as well as other engineering and planning documents. As well, that design concept was not adopted.

Again in late 2001, a number of landowners indicated to the Town that they were interested in developing the area and asked Council to resume the process to develop an Area Structure Plan. As a result, Council requested their planning advisors, the Oldman River Intermunicipal Service Agency (ORISA), in consultation with MPE Engineering, to proceed with preparing a plan for the area. The resulting Area Structure Plan will provide the framework for future development of this area.

Since 2003 ASP, approximately half of the site has been developed without an ASP amendment. Thus providing a comprehensive planning framework to complete the development.

This ASP is being prepared to update the planning and technical information required to develop the ASP site.

1.2 Location

The West Coaldale Area Structure Plan 2003 refers to lands contained within the NW 10-9-20-W4, which lies west of 25 Street, south of Highway 3, north of the golf course, and east of 30 Street (see Figure 1.0, Existing Land Use). Within the plan boundary, the area is approximately 98.80 acres (39.98 ha).

The boundaries of this 2023 amendment ASP remain the same as the 2003 ASP. The underdeveloped land as well as the existing developed land is shown together within the ASP boundaries in Figure 2.0, Proposed Land Uses.

1.3 Purpose and Intent of the Plan

An Area Structure Plan is a planning document used to regulate future subdivision and development in a specified area. More specifically, this Area Structure Plan is a means to set the stage and outline the guidelines for the guidelines residential, commercial and institutional growth and development. Development in the western portion of Coaldale presents the Town with many opportunities to change and improve the community as well as encourage economic growth within the Town.

This Area Structure Plan will address a number of issues including:

- land uses and area designations,
- provision of a wide range of housing types,
- storm water drainage management,
- utility corridors and municipal servicing,
- future lot sizes and design layout,
- roads and transportation patterns,
- as well as a sequence of development implementation process.

The purpose of the plan is not to force or require subdivision and development, but rather to set out guidelines for landowners and developers to follow if and when they decide to develop their lands. The plan also provides some reasonable certainty to interested parties as to what type of future development will be allowed in specified areas. Therefore, new lots should be designed in order to serve the needs of a range of residential housing and a variety of highway commercial uses.

1.4 Legislative Requirements

An Area Structure Plan is a planning tool adopted by municipalities pursuant to section 633 of the Municipal Government Act Revised Statutes of Alberta 2000, Chapter M-26 (MGA). An Area Structure Plan is used in conjunction with both the Municipal Development Plan and Land Use Bylaw to facilitate subdivision and development in a specific area. In conforming to the legislation, an Area Structure Plan must:

- describe the sequence of development proposed for the area,
- the land uses proposed for the area,
- the density of the proposed area,
- and the general location of transportation routes and public utilities.

It may also address any other matters Council deems necessary. An Area Structure Plan must also be consistent with other statutory documents, such as the Municipal Development Plan.

The Municipal Government Act also authorizes a notification and circulation process pursuant to section 636, which states that while preparing a statutory plan, a municipality must provide a means for any person who may be affected by the plan to make suggestions.

1.5 Process

The 2003 ASP was prepared by the Oldman River Intermunicipal Agency (ORISA), the Town of Coaldale and the Town engineers (MPE) together with consultation with effected land owners.

This 2023 amended ASP will update the 2003 version incorporating public feedback from a public consultation held by the Town in March of 2023. Since 2003 the Town has developed new policies and has updated the Land Use Bylaw.

1.6 Goals

This Area Structure Plan will seek to accomplish the following:

(a) to accomplish orderly and contiguous land development;

(b) to provide land owners with a comprehensive plan that will set the guidelines for appropriate land use and facilitate the orderly, economic and practical development and subdivision of the subject lands;

(c) to enhance storm water drainage control through efficient and economical storm water management and containment practices;

(d) to provide for a comprehensive range of residential, institutional and highway commercial land uses;

(e) to provide Council, the Subdivision Authority and the development authority with sufficient information to make planning decisions which will lead to the orderly, economic and aesthetic subdivision and development of the subject lands;

(f) to inform land owners and interested parties of the process involved and the commitments expected of them when endeavoring to subdivide and/or develop;

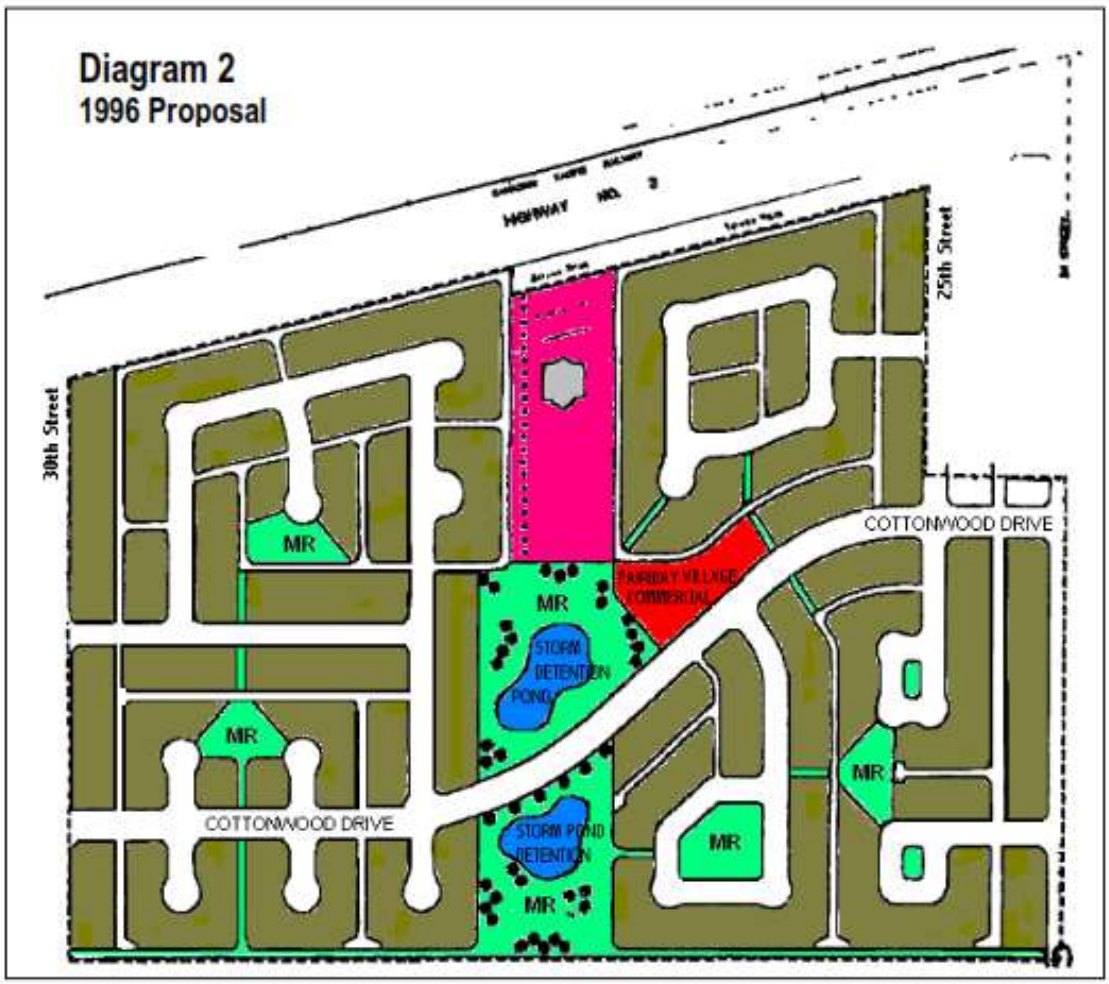
(g) to provide a design which integrates land uses with the requirements for transportation patterns and other utilities across the entire plan area;

(h) to address many of the basic goals of the Town identified in its community growth objectives, Municipal Development Plan and other engineering and planning documents.

2.0 PREVIOUS DESIGN PROPOSALS – REVIEW

2.1 1996 Design Proposal

In 1996, UMA on behalf of one of the landowners proposed a design concept that was primarily single-family residential (R-1 A) parcels with a small centrally-located commercial hub (see Diagram 2). At that time, the Town did not proceed with the formal preparation and adoption of an Area Structure Plan.



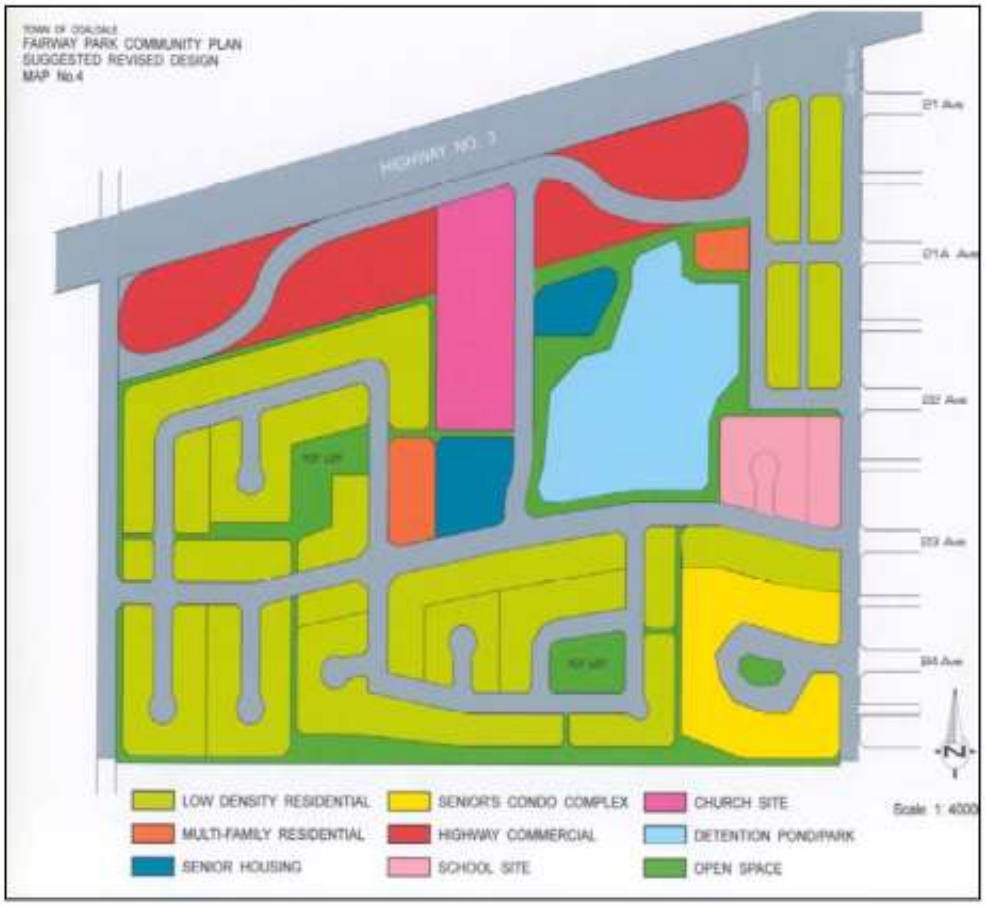
2.2 1998 Design Proposal

In 1998, Plains West Planning Services Ltd., MPE Engineering Ltd. and Town of Coaldale Planner/ Development Officer reviewed the initial design at the request of Town Council. Although comprehensive in many ways, the review found the proposed 1996 concept design fell short of municipal expectations and failed to address many of the basic goals identified by the Town in its General Municipal Plan.

Overall, the recommendation by Plains West Planning Services was to develop a new design concept (see Diagram 3) that included:

- a mixture of residential types (single family, multi family, seniors housing),
- a strip of highway commercial use located on the northern portion of the area adjacent to Highway 3,
- the addition of a school site, and
- a plan that will provide adequate on-site storm water storage to conform to the recommendations of the 1994 Town of Coaldale Storm Water Flood Control Project for the proposed ''West Detention Pond".

Diagram 3
1998 Proposal



2.3 2003 West Coaldale Area Structure Plan

In 2003 the ASP for this site was amended based on new Town Policies, new land owner requirements and new infrastructure upgrades.

2.4 2023 West Coaldale Area Structure Plan

This new West Coaldale ASP 2023 Amendments will update and amend the 2003 ASP addressing new Town policies, new infrastructures since 2003 and new landowner requirements. Additionally about one half of the site is now developed and this development will be incorporated into the ASP.

3.0 DESIGN CONSIDERATIONS

The following polices have been incorporated into this revised ASP. The policies that the Town has instituted and that have been addressed in this new ASP include:

- Town of Coaldale Strategic Plan
- The City of Lethbridge and Town of Coaldale Intermunicipal Development Plan (Bylaw No. 785-P-07-20)
- The amended Municipal Development Plan of 2020 (Bylaw No. 786-P-09-20)
- Parks and Trails Master Plan (2008)
- Gateways and Corridors Strategic Plan
- Transportation Master Plan (2021)
- Malloy Master Drainage Plan (2019)
- Recreation Master Plan (2010)
- Infrastructure Master Plan (2019)
- Land Use Bylaw No. 677-P-04-13

This amended ASP has been reviewed by the Town administration and will be presented to Council for First Reading. Before this ASP is adopted, a mandatory public hearing must be advertised and then held. Once adopted, this plan will be used to guide development of this ASP area.

3.1 Existing Land Use

The lands proposed to be included in the plan area are situated in West Coaldale – west of 25th Street, east of 30th Street, north of the golf course and south of Highway 3. The Coaldale tree nursery is located in the NW corner of the site with the church being immediately east of this. The land between the nursery and the golf course is currently underdeveloped. The land east of these properties have been developed for highway commercial and single family residential use. The current land uses are presented in Figure 1.0, Existing Land Use.

3.2 Potential Land Uses

As the plan area is over 98 acres and is largely undeveloped, this presents the opportunity to create a comprehensive land use plan that caters to a wide variety of community needs. The area is also uniquely located between the golf course property and the highway. This will allow for a wide range of land uses to be encouraged and also ''fit" with the existing layout, including the considerations of mixed residential use south and in proximity of the golf course, commercial adjacent to the highway and various public and institutional uses.

This type of plan will give the Town of Coaldale an opportunity to create an interesting and desirable neighborhood for the community. It will also enable the Town to achieve a number of economic, community and long range planning goals. Proposed land uses are depicted in Figure 2.0, Existing Land Use.

3.3 Landowner Input

The Town and Developer have undertaken the task of getting opinions and recommendations from adjacent land owners and other members of the community. This process is addressed in more detail in Section 4.5 Neighborhood Comments and Appendix C.

3.4 Road Network

The area is currently somewhat constrained, as it has limited through roads granting access. Presently the landowners of the area are limited to gain access by either 24 or 25 Streets to the east and 30 Street to the west. The north portion of the lots front onto Highway 3, with a service road partially built from 25 Street, west to the church property. The parcels are land locked from the south as they are directly north of the boundary of Land-0-Lakes Golf Course. The transportation issues with respect to the residential and highway commercial sites in addition to Highway 3 access needs to be assessed.

Proper consideration needs to been given to addressing transportation concerns and facilitating efficient traffic flow. When this area is developed, it would be logical to extend 23 Avenue from the east to the west, to meet 30 Street. When future development occurs, this would upgrade 23 Avenue to become a major east/west collector road south of Highway 3. It would help improve the overall flow of traffic for the area while taking the pressure off of 25 Street and 24 Street leading to the golf course. A local road should also be developed on the east side of the church property, to circulate traffic from the north highway commercial area, south to the 23 Avenue main collector. See Figure 3.0, Conceptual Road Network.

3.5 Stormwater Management

Storm water drainage has been identified as a problem in this area in various storm water management studies. Presently the NW 10-9-20-W4 is drained over land and flows from west to east. Storm water run-off also enters the area from land in the County of Lethbridge, situated to the west, which also must be dealt with. Storm water management is a major design consideration as historic flood events affecting Coaldale have been costly for the Town and its citizens. Increased development activity on the site will have a corresponding impact on surface runoff. Developed building sites including roof areas, driveways and paved roadways will all speed up the rate at which storm water will leave individual sites and combine with runoff from adjacent sites.

This Area Structure Plan will increase the density of the development considerably from the present, largely undeveloped scenario, and methods must be in place to deal effectively with the drainage situation. The Stormwater Management Plan is included under separate cover as Appendix D with a summary in Section 4.2 Storm Water Management.

3.6 Utilities

A water line off of 30 Street provides water to two existing dwellings, but they have no sanitary sewer service. The provision and cost of providing municipal services has been a large obstacle in the development of land in the area in the past. The provision of treated water service and water lines will also have to be addressed as well as the provision of sanitary sewers. The town has prepared the Infrastructure Master Plan to provide overall requirements and context to these deep utilities. The deep utilities are further discussed in Section 4.4 Utility Servicing and shown in Figure 4.0, Underground Utilities.

The shallow utility services will all have to undergo major expansions and upgrades to provide sufficient services to the higher density development. Usually utility companies require the developers to pay for line relocation, expansion and additional hookups.

4.0 DESIGN SCHEME (AMENDED 2023)

The following were design criteria that were used in the development of the new design scheme.

- The 2023 Amendment concept shows one storm water detention pond in the location where the Waterfront Pond is currently constructed. Additionally the operator of the existing Westgate Dry Pond will be examined. Changes will be made to the existing Waterfront Pond as required to meet storage requirements and Town of Coaldale operational objectives and may include changes to the storage volume, outlet controls, lining, and or erosion control measures.
- The Town of Coaldale has indicated that there is not a requirement for a school in this area.
- Based on the regional pathway requirements as outlined in the Town's MDP, the Parks and Trails Master Plan, as well as the Recreational Master Plan, a regional pathway should be provided along 23rd Avenue and adjacent to the storm water pond. Additional land has been planned for a park on the west side of the storm pond. The total area for this park and pathway is 0.82 ha (2.03 acres). Any shortfall in the MR required will be made up with a combination of land and cash-in-lieu to the Town.
- The 2003 ASP included a buffer strip adjacent to the east side of 30th St. to help handle overland flow from the County. The construction of storm water management facilities and ditch improvements on the west side of 30th Street has practically eliminated runoff from the county flowing into the ASP area. The Town has indicated that a buffer strip is not required adjacent to 30th Street for drainage purposes.
- A strip of land adjacent to 30th Street may be required for road right of way. This will be determined based on the TIA.
- No single family lots will front onto 30th Street. No lots will be provided with vehicular access to 30th Street.
- Low density lots in the undeveloped area have been consolidated from the previous concept plan, into the southern portion of the ASP area. Existing single family is developed in the southeast corner of the ASP area.
- The land uses along the south side of Highway No. 3 have been changed from the 2003 ASP to reflect the current developments.
- A multi-family land use is proposed along the south side of 23 Avenue with the development of semi-detached housing being planned.
- A multi-family area has been consolidated along the north side of 23 Avenue to provide for apartments, row housing and town houses.

- Since 2003 three TIAs have been prepared, with the last one being for the Southwest Coaldale ASP in 2022 which has yet to be approved by the Town of Coaldale and Alberta Transportation. The TIAs have made recommendations for the intersections of:
    - Highway No. 3 and 30th Street,
    - Highway No. 3 and Land O' Lakes Drive,
    - Land O' Lakes Drive and 23rd Avenue.
    - 30th Street and 23rd Avenue.

  In the past few years, improvements and signals were installed at the 30th St. and the Land O' Lakes Drive intersections with Hwy. No. 3. These improvements appear inadequate and it is recommended that consideration be given to include this intersection in a new TIA prior to subdivision. See Figure 3.0, Conceptual Road Network.

4.1 Type Of Development

The predominant land uses for the plan area will be a mix of residential (low density, multi- family), highway commercial and public/institutional use. Green space will be provided in conjunction with the Waterfront SWMF, a dedicated park area and proposed pathways. A PUL site will be designated to accommodate stormwater management expansion. The land use districts will stipulate and regulate the minimum parcel sizes, development setbacks, permitted and discretionary uses and other design standards, which will be applied to this area. See Figure 1.0, Conceptual Land Use.

4.1.1 Housing Types

The conceptual design illustrates a layout capable of providing for a wide variety of housing types to cater to all residents. Land ownership patterns, existing land use, population growth, household composition, service connection availability, interest rates, employment opportunities and housing trends all influence the type and pace of residential development. A mixture of residential uses including single family, semi-detached and multi-family housing will be provided for in this plan. Details of the proposed land uses and densities are shown in Appendix B Table 1 – Unit Density and Population Projections for Developed and Undeveloped ASP Sites and Table 2 – Dwelling Unit Density & Population Projection for Undeveloped Residential Sites.

a) Multi–family

- Multi-family housing will be located along both sides of 23rd Avenue, providing good access and egress to facilities in Town and to Hwy. 3.

- The multifamily north of 2[3rd] Avenue is shown as three large lots which will be subdivided based on market demand at the time of development. If market demand indicates the need for seniors housing the R2 land use district will allow for this type of residential housing.
- Three multifamily sites containing a combined total of 2.53 ha are shown on the north side of 23[rd] Avenue. The zoning is proposed as R-2 with a maximum density of 44 units per ha. This results in about 111 units for these sites. Town houses, duplexes and four plexes will be developed on these sites.
- Two multifamily sites containing a combined total of 0.90 ha will be zoned as R-2L with a maximum density of 33 units per ha. Semi-detached units are proposed for these sites.

b) Single Family

- Single family development is proposed south of 23[rd] Avenue. To provide a range of housing types the 2023 ASP Amendment proposes a mixture of larger, medium, and smaller houses.
  - R1A (Area 1, Block 8) density is proposed adjacent to the golf course, and Westgate Landing as well as along 30[th] Street. The zoning for these is R-1A with minimum lot width of 50 feet.
  - Area 1 and 2 in Block 9 are proposed to have a zoning of R-1A*. The requirements of the R1A zoning will be the same for the R-1A* zoning, except the minimum allowable width of each lot will be 46 feet.
  - R-1B zoning is proposed for Area 2, Block 8 and Area 1, Block 10. The minimum width of each lot is 40 feet.

4.1.2 Highway Commercial Development

The Town's Municipal Development Plan and various other municipal documents identify the importance of providing more commercial land within the Town, especially highway commercial.

This dedicated area of highway commercial use helps accomplish a number of overlapping municipal objectives including:

- preventing the creation of further residential properties backing on Highway 3, and helping to buffer residential areas proposed for the south,
- creating additionally needed commercial areas adjacent to the highway,
- help strengthening the Town's visual image along the highway.

Between 2003 and 2023 approximately 3.5 ha (8.6 acres) of Highway Commercial land have been developed in the ASP area. This includes Home Hardware, McDonalds, Tim Hortons, and other commercial buildings.

Additionally, the Church site comprises 1.8 ha (4.5 acres) with approximately the southern one third being undeveloped.

The remaining land in the ASP area designated for highway commercial that is underdeveloped is approximately 4.25 ha (10.5 acres) which is the Coaldale nursery property at the corner of Highway No 3 and 30th Street. With its proposed Highway Commercial land use, the Coaldale Nurseries can continue to operate at this location until they decide to relocate. At that time this parcel would be available for future commercial development.

In regard to development standards for highway commercial development:

- The development authority may permit more than one commercial building on a parcel if it is part of a planned multi-use commercial hub site. The developer will be responsible for servicing and costs, in conjunction with the Town of Coaldale and any of the shallow utility companies' requirements, in regard to servicing such a site.
- The Town of Coaldale's Land Use Bylaw setbacks and minimum lot sizes shall apply as the standards of development. Although an approval and permit from Alberta Transportation is required for development adjacent to a highway, Alberta Transportation has indicated that they will normally let the Town's regular setbacks apply, as stipulated in the Highway Commercial - HC district of the Land Use Bylaw.

4.1.3 School Site

The 2003 ASP indicates that the public-school authority would like a site set aside for a new facility for children in kindergarten through grade 4. The town has now indicated that there is not a need for reserving a site for a school facility. Accordingly, the 2023 ASP Amendment has not provided a site for a school.

4.1.4 Parks and Open Space

- A walkway/ pedestrian pathway is proposed along the North side of 23rd Avenue. This pathway will extend from 30th Street easterly to the storm pond and then proceed to the north side of the pond and then easterly to connect with the sidewalk on Land O Lakes Drive. Landscaping will be installed along the pathway which will be 3.0m in width.
- A park area about 0.6 ha in size, will be developed on the west end if the storm pond. The pathway will link through the park where it is planned to have a play area, park benches and landscaping.
- Detailed landscape design of the pathway and park will be completed during the subdivision process.

- The pathway and proposed park have a combined area of 0.78 ha. Any shortfall from the 10% municipal reserve requirement will be met through cash-in-lieu to the Town reserve fund.

4.2 Storm Water Management

MGCL has completed a Stormwater Management Plan (SWMP) see Appendix D – Storm Water Management Plan in support of the ASP Amendment. Several options and opportunities were explored in collaboration with the Town for the stormwater management system.

For the ASP Lands, the primary storm water management facilities are the:

- Waterfront SWMF,
- Westgate Dry Pond
- Town of Coaldale storm trunk that parallels Highway #3 and drains east into the Parkside Acres SWMF, and
- Highway #3 ditch.

The following are the proposed stormwater management improvements for the West Coaldale ASP:

a. New development will be provided with a minor (piped) system to be designed and constructed to accommodate the runoff from development area for a 1:5-year 4-hour rainfall event.

b. All commercial and large multifamily development will be required to provide onsite detention to reduce major event peak flows to the capacity of the minor system,

c. All streets and lower density residential development will be required to provide on-street (trapped lows) detention and overland flow on the streets to manage major event peak flows,

d. 23rd Avenue will be designed as an emergency overland flow route for flows adjacent to 23rd Avenue, 30th Street and west of 30th Street including emergency overflow from the Malloy 2 pond.

e. The southwest undeveloped block of land (SWMP Area '4') minor system will be designed to accommodate 1:5-year 4-hour rainfall event runoff from 30th Street and the area of Evergreen estates that currently drains through the southwest undeveloped block of land.

f. The southwest undeveloped block of land will drain to the Waterfront SWMF.

g. It is technically feasible to redirect most of the Coaldale Nurseries site (SWMP Area '7') to the Waterfront SWMF to reduce flows to the Highway #3 ditch. The costs and funding arrangements of providing stormwater servicing of the current Coaldale Nurseries site through the southwest undeveloped block of land will be examined during the detailed design.

h. The Waterfront SWMF will be modified:

- With a new outlet control structure or modification of the existing control structure:
  - To control the Normal Water Level at 865.66, changed from 866.00 to reduce the amount of backup into the Watergate Landing storm system and increase the Waterfront SWMF storage volume.
  - To an adjustable flow control structure allowing for zero release, gradual release and up to a full open release of up to 600 lps for rapid pond draw down when operationally required by the Town. This will dramatically reduce the downstream peak flows from the ASP Lands and eliminate any chance that development will make the downstream situation worse.

i. With signage be installed at the high-water level to warn and educate the public on the elevation of expected flooding.

j. To increase the active volume to 28,387 below a water surface elevation of 868.00 by expanding the pond in the southwest corner.

k. By completing the lining in the Waterfront SWMF, it is noted that the north, east and south sides are lined.

l. To have appropriate shoreline erosion protection installed.

4.3 Road Network

4.3.1 Existing Transportation Impact Assessments (TIA)

- Since 2003 three TIAs have been prepared, with the last one being for the Southwest Coaldale ASP in 2023 which has yet to be approved by the Town of Coaldale and Alberta Transportation. The TIAs have made recommendations for the intersections of:
  - Highway No. 3 and 30th Street,
  - Highway No. 3 and Land O' Lakes Drive,
  - 30th Street and 23rd Avenue.
  - Land O' Lakes Drive and 21st Avenue.

In the past few years, improvements and signals were installed at the 30th Street and the Land O' Lakes Drive intersections with Hwy. No. 3. These improvements appear inadequate, and a new TIA maybe required to re-visit these intersections and roadways.

4.3.2 Roadways

The roadway network and classifications are shown conceptually in Figure 3.0, Conceptual Road Network.

The conceptual roadway network drawing includes the following:

- It is proposed to extend 23rd Avenue as a Collector road connecting with 30th Street.
- A regional trail/ pathway is proposed along the north side of 23rd Avenue extending from 30th Street to a proposed park on the west side of the Waterfront storm pond and then to Land- O- Lakes Blvd.
- The multifamily on the southerly third of the church site will access to Land- O- Lakes Blvd from existing road right of way along the north boundary of the Waterfront storm pond.
- 21st Avenue will extend as a Collector road, westward and then southerly to connect with 23rd Avenue.

4.3.3 New TIA

- The Town of Coaldale is undertaking the preparation of a new TIA for the ASP site. The new TIA will address roadways and intersections that are affected by existing and proposed development within the ASP site.
- Changes to the conceptual design and layout for the lots, roadways and intersections in the ASP shall be made and approved by the Town, upon completion of the new TIA and prior to subdivision.
- The traffic and roadway design shall be consistent with existing Town plans, policies, bylaws and studies including the Town Infrastructure Master Plan, the Transportation Master Plan and the Parks and Trails Master Plan.

4.4 Utility Servicing

Water and sanitary services to the undeveloped areas within the ASP boundary will be extended from the existing utilities. The existing water and sanitary services within the ASP area and the conceptual utility extensions are shown in Figure 4.0, Underground Utilities.

A site servicing study will be undertaken at the tentative planning stage. This study will verify utilities requirements in the ASP area. As well offsite requirements to service the development area will be assessed. The Town of Coaldale will provide existing network modeling and offsite requirements for these utilities.

4.4.1 Water Distribution System

The municipal water system has been installed in Land-O-Lakes Boulevard, 21st Avenue (in front of Tim Horton's, McDonalds, the Church, and Home Hardware), the east part of 23rd Avenue, the Waterfront and Westgate Landing developments.

Municipal water will be extended along 23rd Avenue to 30th Street to connect with an existing 350 mm water pipe. Water mains will be looped southerly off of 23rd Avenue to service the residential area on the south side of 23rd Avenue.

The Coaldale IMP recommends the extension of a 300mm water line along 21st Avenue, connecting to a 300 mm water line along 21st Avenue, connecting the 300 mm pipe adjacent to the church site with the existing 350 mm water line along 30th Street. This requirement shall be verified in the Town's modeling of the water system.

4.4.2 Sanitary Sewer System

The municipal sanitary sewer system has been installed in Land-O-Lakes Boulevard, 21st Avenue (in front of Tim Horton's, McDonalds, the Church, and Home Hardware), the east part of 23rd Avenue, the Waterfront and Westgate Landing developments.

The current Town of Coaldale sanitary model appears to show that there is adequate capacity in the existing sanitary system to allow further development in the ASP area to proceed. This shall be verified by the Town at the tentative planning stage.

Municipal sanitary sewer will be extended from the existing stubbed services in 23rd Avenue, through the new roads in the development.

4.4.3 Street Lighting

Street lighting will be provided by the developers along the new road network to current road lighting standards at the time of development.

4.4.4 Shallow Utilities

All shallow utilities (electrical, telephone, gas, cable, etc.) shall be underground. It is preferred that shallow utilities will be in road rights-of-way, or in utility rights-of-way adjacent to roads.

The actual shallow utility distribution network and facilities will be determined in conjunction with the shallow utility service providers at the time of development.

The developer will contact all shallow utility providers sufficiently in advance of development to facilitate a coordinated design and installation of all improvements required by the development. It is expected that shallow utility providers at a minimum will have provided their preliminary designs and layouts at the time of submission of detailed design drawings to the Town.

4.4.5 Phasing

The phasing of the development is going to be largely based on market demand.

Currently the first phase of the residential development will be the lots and streets parallel with and adjacent to the golf course and the easterly north/ south road connecting with 23 Avenue. The second residential stage will be the lots and roadways on the north side of Phase 1. The last residential phase will be 23rd Avenue and the lots abutting 23rd Avenue.

The highway commercial will be developed in accordance with the wishes of the Coaldale Nurseries. There is not a known time frame for this.

4.5 Neighborhood Comments

4.5.1 Open House, March 2, 2022

The Town conducted an open house that was held on March 21, 2022; an online survey between March 7, 2022, and March 24, 2022; and in-person meeting held on March 15 and 16, 2022.

There appeared to be general support in having the ASP approved and to have this area developed.

The following summarizes concerns and suggestions made during the process of engaging the public.

Included are the responses as to how these will be handles in the ASP and during the detailed design.

What We Heard:

Walking paths, playgrounds, additional green space, and landscape enhancements around the storm pond were requested by numerous respondents.

How We Responded:

- The Town of Coaldale Strategic Plan encourages pathways in strategic locations especially the eastward expansion of a pathway from 30th Street
- The ASP includes a pathway that will be developed along 23rd Avenue from 30th Street to the storm pond. The path will then extend along the west and north side of the pond up to Land O' Lakes Drive.

- A park containing about 0.55ha will be developed on the west side of the storm pond.
- Landscaping in the form of irrigated grass, additional trees, and shrubs will be provided along the pathway, in the park and around the storm pond. A playground will be incorporated into the park.
- Green space is currently provided within the ASP boundary in the Westgate Landing development. The Land O' Lakes golf course along the south boundary of the ASP site provides a very large and visual green space as well as a recreational facility that benefits not only the neighborhood but also community of Coaldale.

What We Heard:

It was suggested that there be a green strip or pathway along the west side of the Westgate subdivision.

How We Responded:

A pathway/ green strip is not planned on the West side of the Westgate Landing development. This is due to the fact that the pathway would extend to the golf course boundary where it would have to terminate. This could result in pedestrian traffic onto the golf course raising a safety concern and interference with the operation of the golf course. The minimum size of lots along the boundary with Westgate Landing will be 50 feet thereby reducing the adjacent lot density.

What We Heard:

Concerns were raised with respect to the inclusion of multifamily development in the ASP.

How We Responded:

The ASP makes provisions for a variety of housing types such as single family, duplexes, row housing, town houses, and smaller apartments. This is in keeping with the Town of Coaldale Municipal Development Plan. The Residential Policies section of the plan speaks to having multifamily development throughout the community and not segregated to an individual area. Additionally a diversity of dwelling sizes and dwelling types are encouraged. This variety will enhance the visual aspects of multifamily housing and will provide housing for a broader range of residents including, seniors, younger families, professional people and lower income families.

What We Heard:

It was suggested that provisions be made for seniors housing.

How We Responded

The ASP has planned for multifamily housing along the north side of 23rd Avenue and on the south side of the church property. Additionally semi-detached dwelling are planned for the south side of 23rd Avenue. If the market conditions indicate a need for senior's housing, the Town's land use bylaw permits senior's housing on multifamily sites.

What We Heard:

There were safety concerns expressed with respect to increased traffic on 23rd Avenue and Land O' Lakes Drive.

How We Responded:

The Town of Coaldale Strategic Plan encourages the use of crosswalks and pedestrian lights to increase pedestrian safety and minimize conflict with motorized vehicles. The recommendations and the concerns raised in the Open House will be addressed during the detailed design of 23rd Avenue. Traffic calming strategies and other roadway design features such as traffic circles could be incorporated to increase pedestrian and vehicular safety.

What We Heard:

Numerous concerns were raised with respect to increased noise, dust, and garbage that could be created by the development.

How We Responded:

Total control of noise, dust & garbage in a construction area is very difficult to achieve, however steps will be taken to help minimize the impact on the neighborhood. The town requires that an erosion control plan be submitted for approval together with the detailed underground & roadway plans.

This plan will detail the mitigation to be provided to help control dust and soil erosion throughout construction. This would include snow fencing, to reduce the effect of blowing dust and silt fencing for erosion that may be caused by rainfall. The developer will also be required to have water trucks used to reduce dust levels. Additionally the lot surfaces will be graded into small windrows, again to reduce dust. House builders will be required to have dumpsters available and to keep their lot clean from garbage during construction.

Conclusion:

There were numerous individual comments and suggestions received during the neighborhood engagement process. At the ASP stage of planning it isn't possible to address all of these. Where practical to do so, measures to address these concerns will be considered during the detailed design stage.

4.5.2 Open House, February 2023

The Developer conducted an Open House that was held on Wednesday, February 22, 2023. Approximately 150 invite letters were sent to neighbouring property owners. Additionally an ad was placed om the Sunny South News and a sign advertising the open house was placed near the storm pond. Approximately 45 people attended the open house. It appeared that there was fairly strong support for the ASP.

The following summarizes concerns and suggestions received from the public.

What We Heard:

There were five written comments received at the open house. All were in favour of the ASP and the majority felt that there should be front driveway for the duplexes along 23rd Avenue and they also felt the lanes were a good idea.

How We Responded:

These comments reflected support for the Developers plan to have front driveways and a lane for the duplexes along 23 Avenue. No further action is required.

What We Heard:

Several people living in Westgate Landing and backing onto the ASP site felt that there should be a green strip separating their lots from the ASP site. Additionally concern was expressed about the poor condition of the fence separating their lots and the ASP site.

How We Responded:

A pathway/ green strip is not planned on the West side of the Westgate Landing development. This is due to the fact that the pathway would extend to the golf course boundary where it would have to terminate. This could result in pedestrian traffic onto the golf course raising a safety concern and interference with the operation of the golf course. The minimum size of lots along the boundary with Westgate Landing will be 50 feet thereby reducing the adjacent lot density.

The replacement of any fence should be the responsibility of the current Westgate lot owner and/or any future lot owners backing onto their lots. This issue has not been responded to in the ASP.

What We Heard:

Almost all the attendees were generally in favor of the land being developed and were in favor of the Area Structure Plan. The following are a reification of some of the verbal comments received during the Open House. Where possible these will be addressed during the design phase of the development.

- Concern with raised respect to traffic at the intersection of 23 Avenue and Land O Lakes Drive and with the intersection of Highway 3 and Land O Lakes Drive.

- Concern was expressed about truck traffic along 23 Avenue during subdivision and house construction.
- Concern was expressed about the lack of landscaping around the storm pond.
- Strong support was received for having front driveways and rear lanes as shown in the ASP Concept Plan. This applied to lots fronting on 23 Avenue and the lane in the R1A zoned lots.

5.0 OTHER SUBDIVISION AND DEVELOPMENT ISSUES

5.1 Off-site Levies and Development Fees

In order for an orderly, well designed, and adequately serviced subdivision to be developed, off-site levies will have to be applied to development area over and above individual on-site servicing and development costs. These levies usually will include the combined estimate costs of:

- sanitary trunk lines,
- improvements to the sewage treatment facilities,
- water main extensions,
- storm water dentition ponds costs,
- storm water sewer lines,
- collector and service road costs,
- design and engineering fees.

In addition, if other services are supplied to develop a subdivision, development agreements with the municipality should include those other direct costs as well.

The Town of Coaldale has an Off-Site Levy and Development Fees Bylaw that will apply at the time of subdivision and development.

5.2 Municipal and School Reserve

Municipal and/or school reserve will be provided in accordance with section 666 of the Municipal Government Act at the time of subdivision.

- If a landowner's parcel is not designated for land dedication for a green space, park or school, municipal and/or school reserve, the landowner will be required to provide as money in lieu of land.
- A compensation plan approved by the Town of Coaldale will compensate any landowner who is requested to provide for more than 10 percent of their total land area for parks or schools, for the acreage portion that exceeds their 10 percent dedication.
- It is assumed that municipal reserve will be provided as cash in lieu of land where Highway Commercial subdivisions occur, and the reserve has not been previously satisfied.

5.3 Architectural Control

Many successful development projects use architectural control, which is a "layer" of development control that is normally imposed on builders, within a described area, in order to achieve a uniform standard of development. It is encouraged that the residential builders, especially on development adjacent to the golf course, and the existing Westgate development; implement architectural control to create a high quality, aesthetically pleasing development. However, as this is private land that will be privately developed, the implementation of the controls will reside with the developers of the area. If architectural controls are implemented, two important points to note are:

- The desired development standards should be set forth in a document which is caveated against the land title and remains in effect for a prescribed period of time.
- A level of co-ordination between the developer's architect or design reviewer and the municipality is also necessary to ensure development and building permits are not issued if architectural approval has not been given.
- Grading elevation for individual lots will be addressed in the Architectural Controls.

6.0 SEQUENCE OF DEVELOPMENT OF LAND

Once an Area Structure Plan is in place detailing the density and types of development allowed, there is a three-stage process to begin developing a parcel of land.

6.1 Reclassification of Land

6.1.1 Process

Land eligible to be subdivided within the plan area is mainly designated as Urban Reserve within the Town of Coaldale's Land Use Bylaw No. 677-P-04-13. It will need to be reclassified to Residential, Residential Multi-family, Highway Commercial or Institutional/Recreational before subdivision and development can commence.

The process for reclassification as outlined in the Municipal Government Act Revised Statutes of Alberta 2000 (MGA) provides for advertising of the proposal and holding a public hearing where affected landowners may comment on the proposal. Council will make the final decision to redesignate a parcel and there is no appeal of this decision.

Slight deviations in the proposal in terms of the lot layout may be allowed, provided they are acceptable to Council. In particular, designs layouts may be altered for the residential area south of 23 Avenue adjacent to the golf course boundary and for the seniors housing area designated in the southeast corner, adjacent to 25 Street. If market or demographic changes occur in the future this area may be designated for low density residential. However, the overall design scheme including the density, proposed uses, storm water management areas, road network and utility corridors should be strictly adhered to.

6.1.2 Policies

1. Proposals for reclassification of lands from Urban Reserve to Residential, Residential Multi-family, Highway Commercial or Institutional/Recreational shall follow the process outlined in the Municipal Government Act, Revised Statutes of Alberta 2000.
2. Only the parcels fronting onto Highway 3 or as indicated in this plan shall be considered for reclassification to the highway commercial land use district.
3. The desires of one landowner to subdivide their lands shall not force an adjacent landowner to do the same if the adjacent landowner is not interested in development.

6.2 Subdivision and Development of Land

6.2.1 Process

After a parcel of land is redesignated to the appropriate district as outlined in this plan, the landowner may apply for subdivision of the parcel into separate titles. The landowner or developer will have certain costs to consider associated with the subdivision process. These include:

1. Subdivision application fees, survey costs and registration costs.
2. Provision of municipal reserve by way of land or cash in lieu of land in an amount not exceeding 10 percent of the acreage of the parcel being subdivided or 10 percent of the per acre value of the parcel being subdivided. It is assumed that municipal reserve will be provided as either in land, where it is warranted, or as cash in lieu of land where no park space is to occur.
3. Developers will be required to enter into a Development Agreement with the Town of Coaldale in regard to providing infrastructure to service the plan area.
4. Developers will be required to provide the following infrastructure to the Town's specifications to adequately service the area:
    - water mains and service connections,
    - sanitary sewer mains and service connections,
    - storm sewer mains and service connections,
    - overland drainage system,
    - paved roadways complete with curb and gutter,
    - sidewalks and lanes where required,
    - natural gas (ATCO Gas),
    - electrical and street lighting (Aquila Networks Canada),
    - telephone (Telus),
    - cable television (Shaw Cable).
5. Town off-site levies and development fees (that also helps cover costs for Town engineering and planning costs associated with the preparation of this Area Structure Plan) will be applied to developers of the area at the time of development.

6.2.2 Policies

1. This Area Structure Plan is to be used as a guideline for subdivision when the landowners decide that they want to subdivide their existing titles.
2. As a condition of subdivision approval, the developer must provide a plan of survey from a certified Alberta Land Surveyor that certifies the location and dimensions of any existing buildings and the exact dimensions of the lot to be subdivided.

3. Subdivision proposals will be reviewed in terms of conformity to the Area Structure Plan design scheme. Prior to the application or survey of the subdivision proposal, developers are encouraged to consult with the Town of Coaldale and their planning advisor to determine if the proposal is in compliance with the plan.
4. As a condition of subdivision approval, the landowner or developer shall enter into a development agreement within the Town of Coaldale.
5. At the time of subdivision, the subdivision authority shall require a landowner to provide the 10 percent reserve requirement by providing land, paying money in lieu, or a combination of both.
6. Costs of infrastructure construction shall be borne by the persons owning and developing land in the plan area.
7. The design of utility infrastructure shall be to the Town of Coaldale and utility company standards and the Town will provide detailed engineering standards for the roadways and servicing to the developer at the time of development.
8. Any costs associated with topographic survey or engineering work that may be required for the subdivision shall be at the expense of the developer.
9. Any utility easement(s) as required by utility companies or the Town of Coaldale shall be established prior to finalization of the subdivision application.
10. Lot sizes and layouts shall conform to the standards as described in this plan, however, in all instances the minimum lot size of the corresponding land use district in the Town of Coaldale's Land Use Bylaw shall be adhered to when subdividing a lot.
11. Any proposed deviations in the lot layout, road or designated land uses if minor in nature may not require an amendment to the ASP provided; they are acceptable to the Town’s administration. However, the overall lot and road layout, design pattern and density shall be strictly adhered to the satisfaction of the Town.
12. In respect of market demands and future growth, subdivision may occur in phases, having regard to the overall design and road layout and servicing requirements. Any phasing of development shall be reflected by a proposal or plan that must be approved by the Town of Coaldale.
13. The Town of Coaldale will agree to a formula for the distribution of the costs associated with the development of the storm water management system for the area. A landowner, whose parcel of land is not specifically designated to accommodate the storm water detention as per the design of this plan, will likely be required to provide money in lieu based on the formula, to pay for their land parcel share.

6.3 Development of Individual Lots

6.3.1 Process

Once the plan area has been subdivided, the necessary infrastructure in place, conditions met and separate titles issued, the landowner can apply to the Town of Coaldale for a development permit to develop a permitted or discretionary use as listed in the appropriate district (residential, highway commercial, public and institutional, etc.) allowed for in this plan area and contained in the Town of Coaldale's Land Use Bylaw.

The landowner will be required to submit an application form, a fee, a site plan showing the location of the building on the lot, building plans and a grading plan in keeping with the overall conceptual grading plan for the plan area as contained in Appendix 2. In addition, the landowner should be aware of the location of any underground services present before any excavation work is commenced.

The development approval process will include the following:

1. The landowner will be required to submit an application form approval as required under any architectural control, a fee, a site plan showing the location of the building on the lot, building plans and a grading plan in keeping with the overall conceptual grading plan for the plan area as contained in Appendix 2.
2. Once the application, applicable fee and any required information have been submitted, the designated officer or the development authority will review and make a decision on the application. If a proposed development conforms to this plan and the Land Use By law, the designated officer shall issue a development permit with or without conditions. If the application is for a development permit for a discretionary use the designated officer shall send the application to the development authority for a decision. In this instance, the development authority shall notify persons likely to be affected by the issuing of the development permit.
3. The development authority may require that as a condition of issuing a development permit, the applicant enter into a development agreement with the Town of Coaldale in regard to the provision of infrastructure services or pay for an off-site levy.
4. The landowner should be aware of the location of any underground services present before any excavation work is commenced. In addition, the person to whom a development permit has been issued shall notify the designated officer following the stake out of the site but prior to the commencement of construction.

5. The applicant must commence the development within 12 months from the date of issuance of the permit, unless the development permit is suspended or cancelled; otherwise, the permit is no longer valid.

6.3.2 Policies

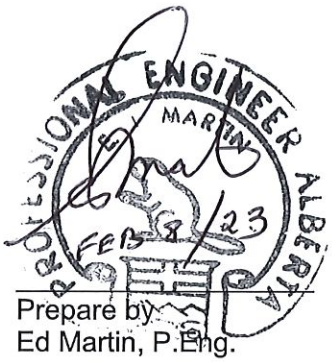
1. This Area Structure Plan is to be used as a guideline for development in conjunction with the Land Use Bylaw when considering a development permit application.
2. All residential, institutional or commercial buildings shall be required to connect to both the municipal water supply and sewage systems.
3. The landowner/developer will be required to submit an application form, a fee, a site plan showing the location of the building on the lot, building plans and a grading plan.
4. Any costs associated with topographic survey or engineering work that may be required shall be at the expense of the developer.
5. Landowners will be required to provide for adequate storm water drainage management as created by their land parcel and proposed development.
6. Legal access and egress from a lot shall be indicated on a site plan and shall be at a location to the satisfaction of the designated officer or the development authority.
7. On highway commercial designated lands, the development authority may permit more than one commercial building on a parcel if it is part of a planned multi-use commercial hub site.
8. In highway commercial areas, sites for outdoor storage of goods, at the discretion of the development authority, may be permitted if kept in a neat and orderly manner and/or suitably enclosed by a fence, wall, or screened with landscaping to the satisfaction of the development authority.
9. In highway commercial areas, the developer will be required to provide to the satisfaction of the designated officer or the development authority, landscaping and screening for buffering to adjacent residential streets.
10. Landscaping shall be provided on all street frontages and shall be to the satisfaction of the designated officer or the development authority.
11. The development authority may require the developer to provide additional standards of development (parking, landscaping, screening of storage/goods, etc) in conjunction with Schedules 4, 5, 11 and 12 of the Land Use Bylaw.

CLOSURE

We are pleased to present to you the West Coaldale Amended 2023 Area Structure Plan.

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

Respectfully submitted February 8, 2023.



Prepare by
Ed Martin, P.Eng.

Reviewed by
Ray Martin, P.Eng.

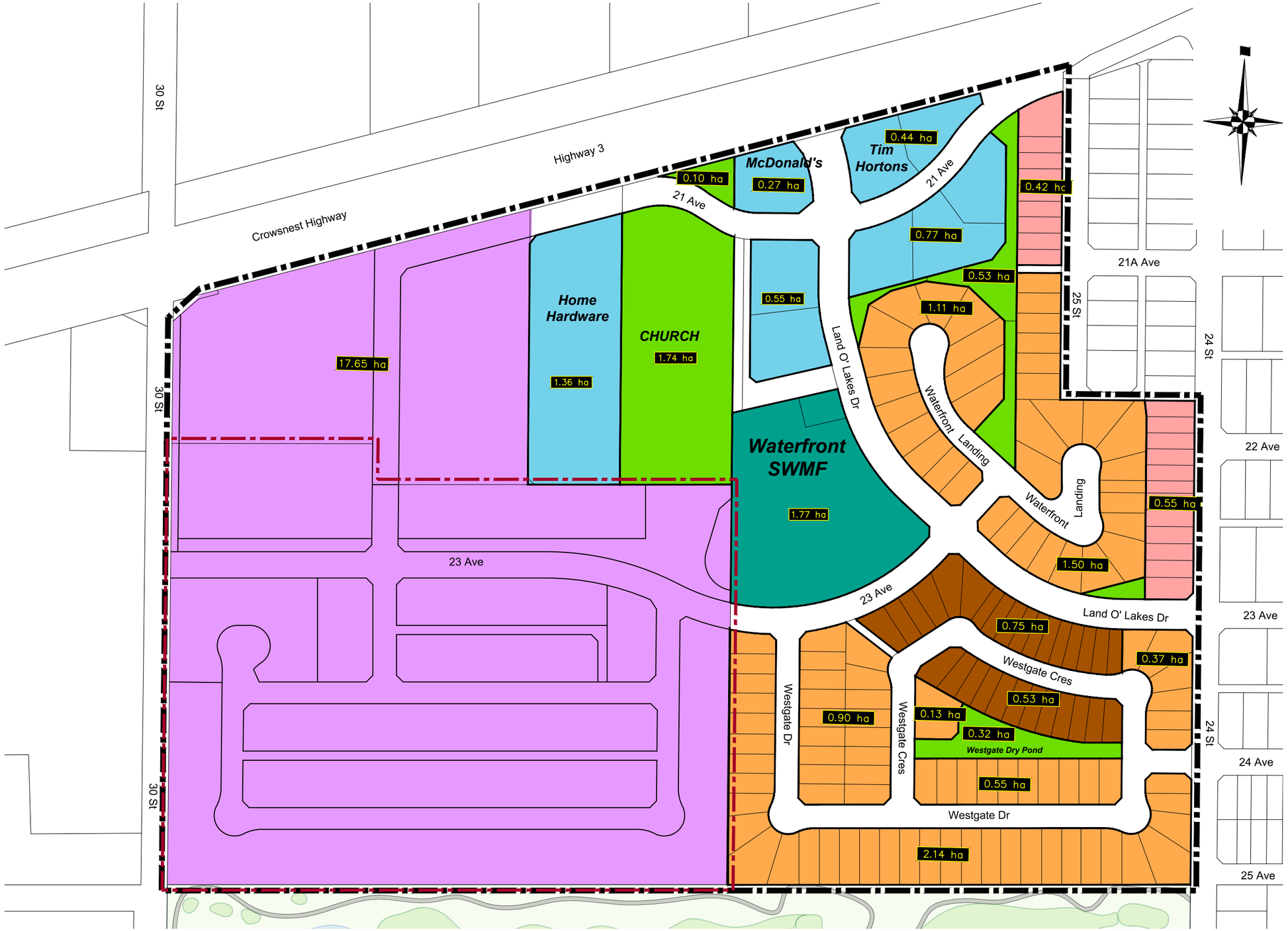
Appendix A- FIGURES

FIGURE 1 – EXISTING LAND USE

FIGURE 2 – PROPOSED LAND USE

FIGURE 3 – CONCEPTUAL ROAD NETWORK

FIGURE 4 - UNDERGROUND UTILITIES



LEGEND

ASP BOUNDARY (Area=39.52 ha)

CURRENT DEVELOPMENT BOUNDARY

EXISTING LAND USE

	AREA (ha) ha	ac
URBAN RESERVE (UR)	17.65	43.60
INSTITUTIONAL / RECREATIONAL (I/R)	2.69	6.64
UTILITY (U)	1.77	4.37
RESIDENTIAL (R-1A)	6.69	16.54
SMALL LOT RESIDENTIAL (R-1B)	0.98	2.42
RESIDENTIAL STARTER LOTS (R-1C)	1.28	3.17
HIGHWAY COMMERCIAL (C-2)	3.41	8.43
ROADWAYS & LANES	22.71	56.10
TOTAL ASP AREA:	39.53	97.67

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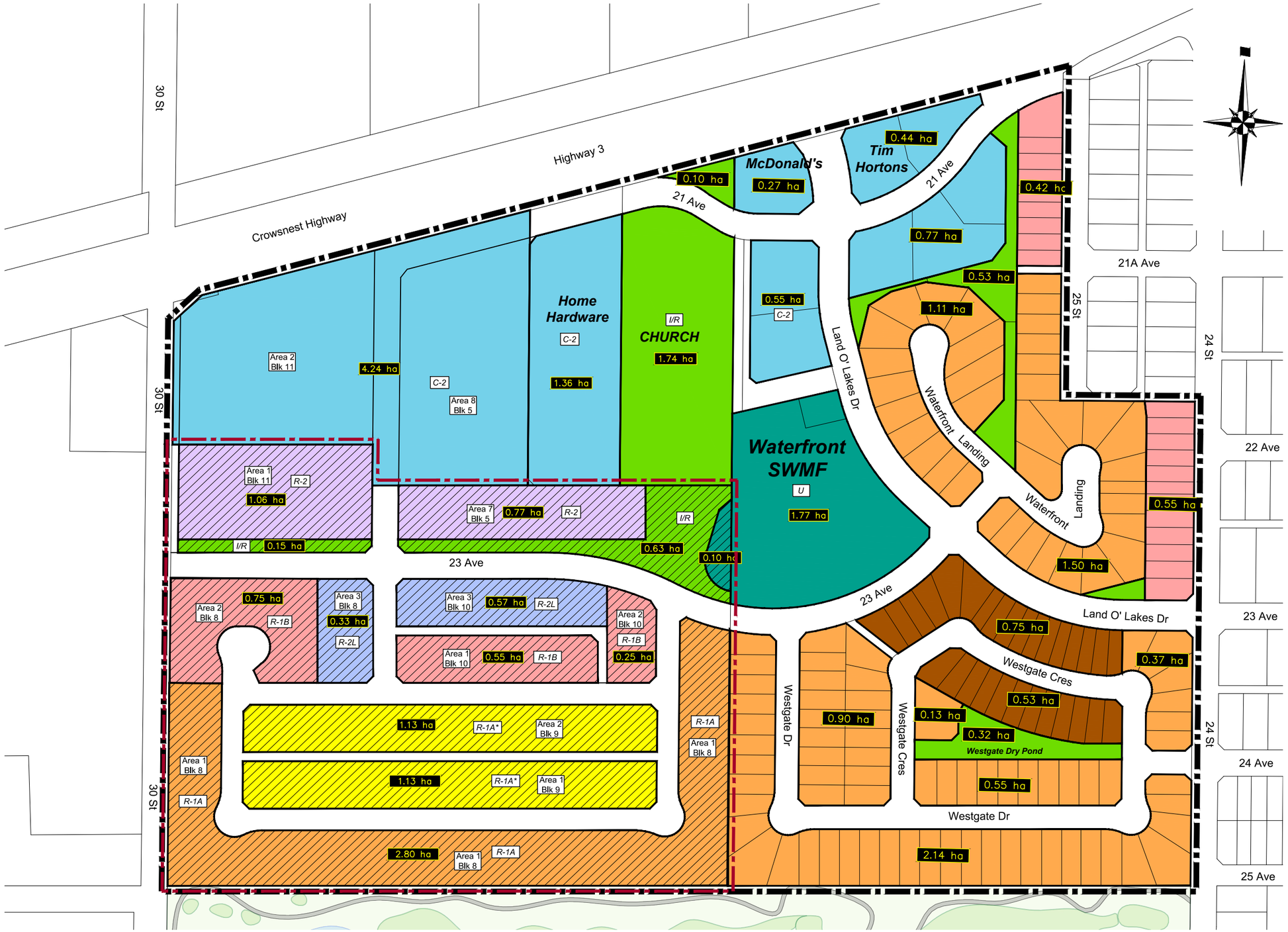
West Coaldale

AREA STRUCTURE PLAN

EXISTING LAND USE
FIGURE 1.0

Jan 16, 2023

229648CE



LEGEND

ASP BOUNDARY (Area=39.53 ha)

CURRENT DEVELOPMENT BOUNDARY

PROPOSED LAND USE

	AREA ha	AREA ac
INSTITUTIONAL / RECREATIONAL (I/R)	3.46	8.55
UTILITY (U)	1.86	4.61
RESIDENTIAL (R-1A)	9.50	23.47
RESIDENTIAL (R-1A*)	2.26	5.58
SMALL LOT RESIDENTIAL (R-1B)	2.53	6.25
RESIDENTIAL STARTER LOTS (R-1C)	1.28	3.17
HIGHWAY COMMERCIAL (C-2)	7.63	18.85
RESIDENTIAL MULTI-UNIT (R-2)	1.83	4.52
RESIDENTIAL MULTI-UNIT LIMITED (R-2L)	0.90	2.22
ROADWAYS & LANES	8.28	20.45
TOTAL ASP AREA:	39.53	97.67

INDICATES AREAS THAT WILL REQUIRE A CHANGE IN LAND USE

NOTE:

R-1A* INDICATES LOTS WITH A MINIMUM WIDTH OF 14.02m (46ft)

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AREA STRUCTURE PLAN

PROPOSED LAND USE
FIGURE 2.0

Jan 16, 2023

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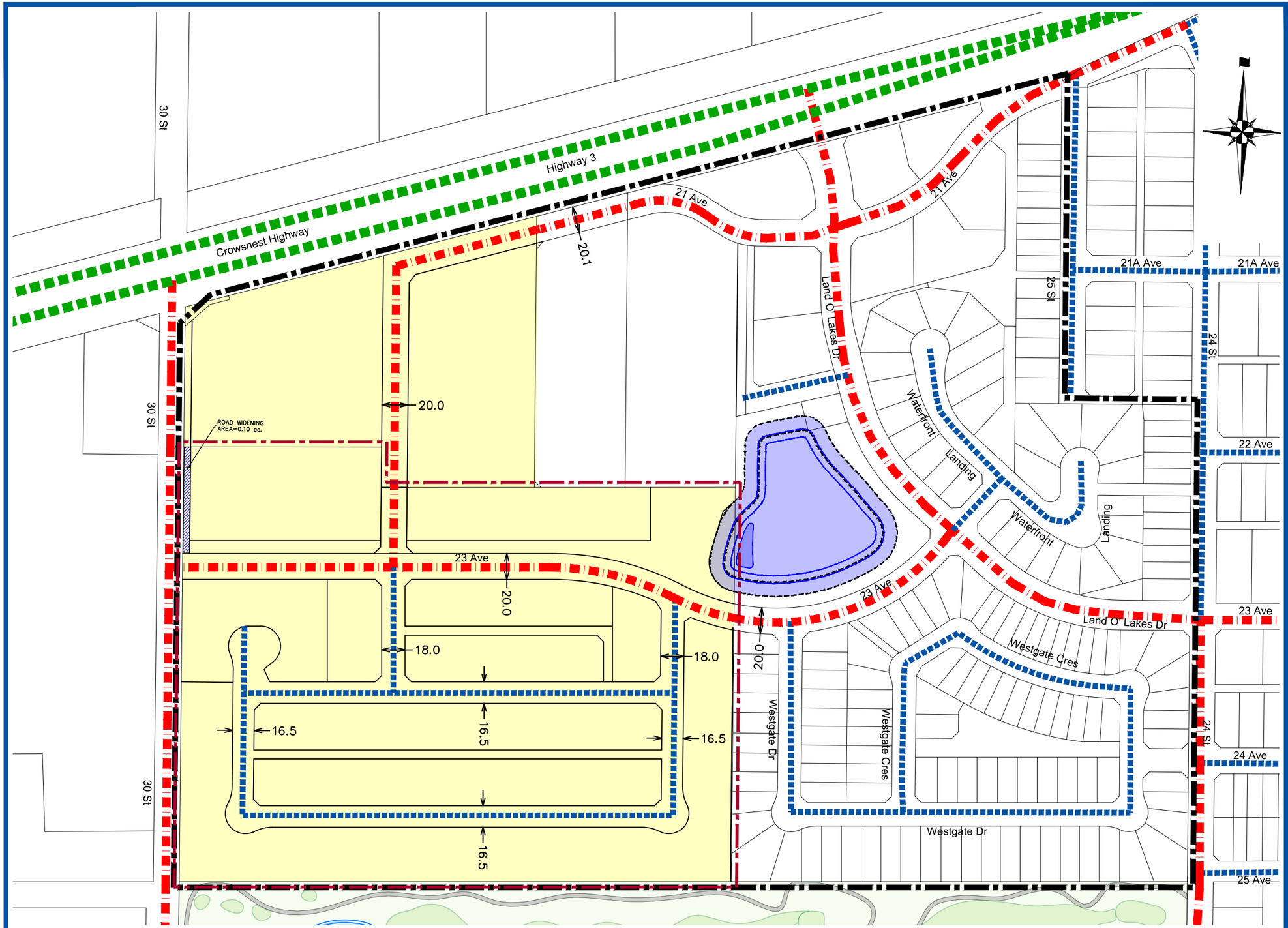

LEGEND

- ASP BOUNDARY
- NEW DEVELOPMENT
- DIVIDED HIGHWAY
- COLLECTOR ROAD
- LOCAL ROAD

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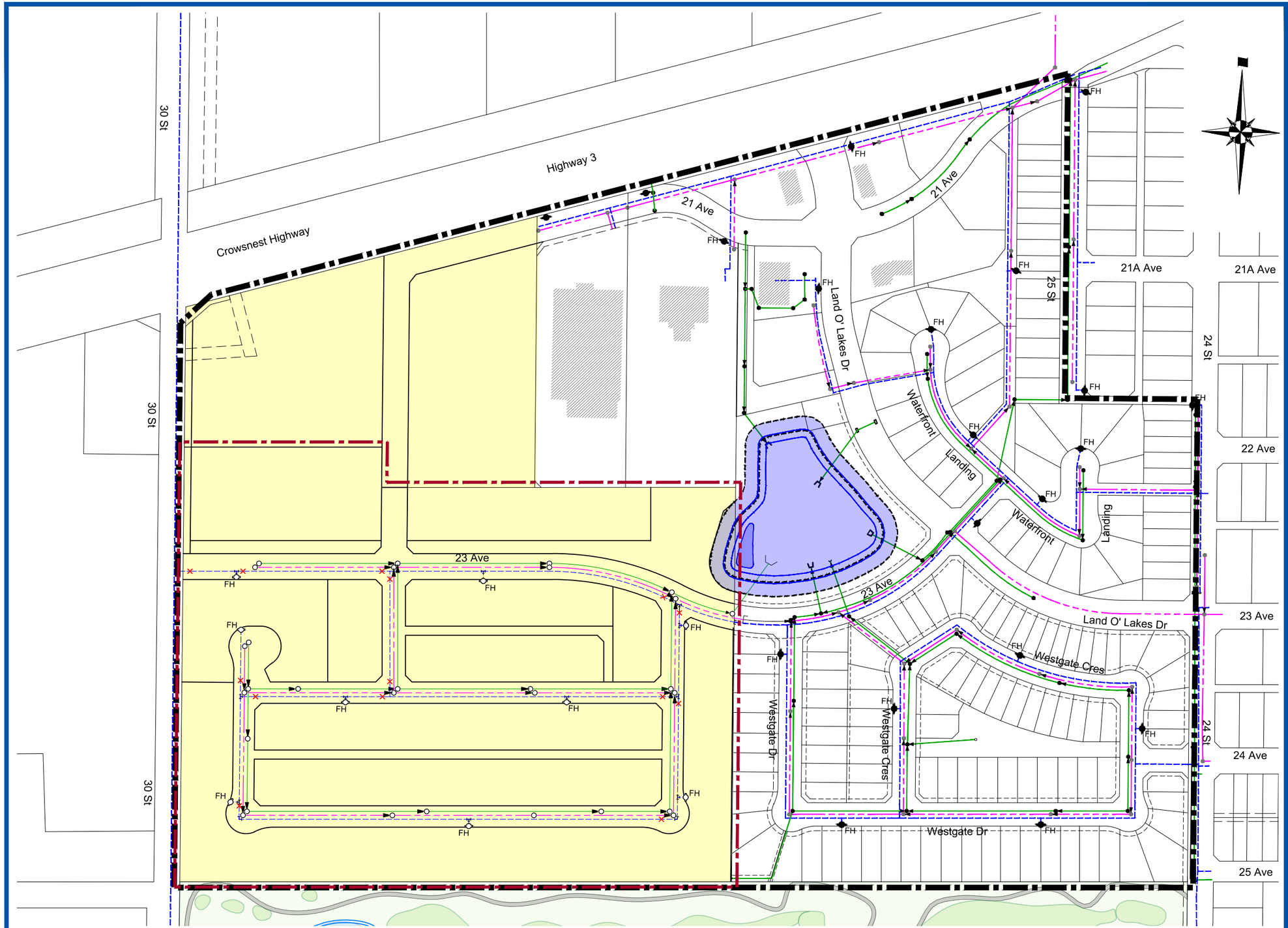
West Coaldale

AREA STRUCTURE PLAN

CONCEPTUAL ROAD NETWORK
FIGURE 3.0

Jan 16, 2023

229648CE



LEGEND

- ASP BOUNDARY
- NEW DEVELOPMENT

EXISTING UTILITIES

- STORM MANHOLE AND PIPE
- SANITARY MANHOLE AND PIPE
- WATER PIPE
- FIRE HYDRANT

FUTURE UTILITIES

- STORM MANHOLE AND PIPE
- SANITARY MANHOLE AND PIPE
- WATER PIPE
- FIRE HYDRANT
- WATER VALVE

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West Coaldale

AREA STRUCTURE PLAN

UNDERGROUND UTILITIES
FIGURE 4.0

Jan 16, 2023

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Appendix B –Tables

TABLE SHOWING EXISTING AND PROPOSED DENSITIES

TABLE 1 Unit Density & Population Projections
For Developed and Undeveloped ASP Sites

Land Use	Area ha	Units/ha	Number of Units	People per unit	Population
R1A/ R1A*	11.76	12.2	143	3.0	429
R1B	2.53	19.0	48	3.0	144
R1C	1.28	23.4	30	2.6	78
R2	1.83	44	80	2.6	208
R2L	0.90	33	30	2.6	78
Roads & Lanes	8.28	----	----	----	----
Highway Commercial	7.63	----	----	----	----
Institutional / Recreation	3.46	----	----	----	----
Utility	1.77	----	----	----	----
TOTAL:	**39.53 ha**	**8.37**	**331 units**	**2.83**	**937 people**

TABLE 2 Dwelling Unit Density & Population Projection
For Undeveloped Residential Sites

Block	Zoning	Area ha	Units per ha	Number of Units	People per unit	Population
Area 1, Block 8,	R-1A	2.80	15	42	3.0	126
Area 2, Block 8,	R-1B	0.75	13.3	10	3.0	30
Area 3, Block 8,	R-2L	0.33	24.2	8	2.6	21
Area 1, Block 9,	R-1A	1.13	19.5	22	3.0	66
Area 2, Block 9,	R-1A	1.13	19.5	22	3.0	66
Area 1, Block 10,	R-1B	0.55	23.6	13	3.0	39
Area 2, Block 10,	R-1B	0.25	20.0	5	3.0	15
Area 3, Block 10,	R-2L	0.57	31.6	18	2.6	47
Area 1, Block 11,	R2	1.06	44	46	2.6	120
Area 7, Block 5,	R2	0.77	44	34	2.6	88
	TOTAL:	**9.34 ha**	**23.55 units/ ha**	**220 units**	**2. 18**	**618 people**

STORMWATER MANAGEMENT PLAN

Stormwater Management Plan

for

West Coaldale Area Structure Plan

2022 Amendment

NW ¼ Sec 10-9-20-W4M

Prepared for: **Domenic Land Development Corp.**

File Number: **229648CE**

Dated: **February 16 , 2023**

CONSULTING ENGINEERS, PLANNERS & LAND SURVEYORS
255 – 31st Street North, Lethbridge, Alberta, T1H 3Z4
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February 16, 2023, File: 229648CE

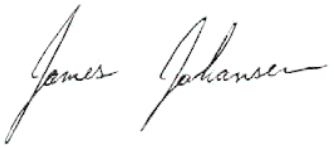
Domenic Land Development Corp.

Re: Stormwater Management Plan
West Coaldale ASP Amendment

We are pleased to submit the Stormwater Management Plan for the West Coaldale ASP Amendment, final report. This report examines the stormwater management requirements to develop the Subject Property from its current undeveloped state to residential property.

We trust that this report meets with your needs.

Yours truly,



MARTIN GEOMATIC CONSULTANTS LTD.

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Enclosure

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CORPORATE AUTHORIZATION

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

Revision	Date	Notes
1	July 7, 2022	Initial Report
2	August 19, 2022	Incorporating Towns Comments on the July 7, 2022 report.
3	December 6, 2022	Report changed to reflect a selected set of options and incorporate Town's comments on the August 19, 2022 report
4	December 9, 2022	Incorporating Town's Comments on the December 6, 2022 report.
5	December 19, 2022	Correcting errors in numbers in the report and making some changes to improve clarity.
6	February 16, 2023	Changes made to reflect Town comments and make some clarifications.

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Professional Stamp

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1. BACKGROUND

Martin Geomatic Consultants Ltd. (MGCL) was retained by **Domenic Construction Ltd** to prepare a Stormwater Management Plan (SWMP) for the West Coaldale ASP 2022 Amendment.

The purpose of the SWMP is to:

- Layout a plan of how the runoff from the ASP lands and upstream will be managed and disposed of,
- Propose a general plan for infrastructure improvements required to support further development of the ASP lands.
- Determine the storage requirements for the Waterfront SWMF to meet the requirement of zero release during a storm event.

The SWMP has been prepared following the guidance of:

- Town of Coaldale Storm Bylaw 764-R-07-19
- Water Act Approval / 00383892-00-00 and the corresponding Malloy Drain Master Drainage Plan (MPE 2010)
- Town of Coaldale Design Standards, which are currently understood to be:
  - City of Lethbridge Design Standards,
  - Alberta Environment and Parks, Standards and Guidelines for Municipal Water Works, Wastewater and Storm Drainage Systems,
- Coaldale Infrastructure Master Plan, Dec 2019 MPE Eng. Ltd.
- West Coaldale ASP, 2022 Amendment (not approved by the Town at the time of writing this report).

1.1. The ASP Area

Approximately half of the ASP lands have been developed as highway commercial, a church and single-family residential. The boundaries of the ASP lands are shown on Figure 1 and are generally described as:

- North Boundary – Highway #3,
- West boundary – 30th Street,
- South boundary - Land-O-Lakes Golf course, and
- East Boundary 24th / 25th Street.

Figure 1 also shows the proposed land uses for the West Coaldale ASP 2022 Amendment.

1.2. Previous Studies and Documents

Stormwater planning for the Town of Coaldale is guided by:

- Malloy Drain Master Drainage Plan, MPE, March 2010 (MDMDP),
- Town of Coaldale, Infrastructure Master Plan, December 15, 2019 (TCIMP),
- Malloy Drain Phase 2 Preliminary Engineering Report, September 30, 2015,
- Previous reports relevant to the existing Waterfront Storm Pond that have been examined are:
- Coaldale Stormwater Investigation, UMA, February 22, 2005,
- Waterfront Development, Record Drawings, UMA, April 23, 2008
- Westgate Landing Residential Subdivision-Stormwater Management Plan, MGCL, October 24, 2011

- Westgate Landing, Record Drawings, MGCL, December 15, 2013

The existing Waterfront SWMF has gone through several incarnations which are briefly summarized below:

1.2.1 Coaldale Stormwater Investigation, UMA, February 22, 2005

This report identified the need for a storm pond at the current location of the Waterfront SWMF. The report stated the Coaldale, Master Stormwater Management Plan, identified the maximum release rate from the 940-ha catchment area as 1.0 m^3/s which calculates to an allowable release rate of 1.064 lps/ha. The 40-ha proposed development share of the 1.0 m^3/s would be 42.6 lps. A total of 158,00 m^3 of storage would be required to attenuate the peak flow from the 940-ha to 1.0 m^3/s. It further identifies that 85,000 m3 of storage would be stored in the 40-ha proposed for development. It does not identify where the remainder of the storage would be provided however it is assumed that it was intended to be provided upstream of the 40-ha proposed development.

The report identifies that an interim pond is proposed for Phase 1 with:

- A permanent water level of 866.0 metres
- A high-water level of 868.0 metres
- Top of berm of 868.6 metres giving a freeboard of 0.6 metres, and
- An active volume of 24,400 m^3.

The remaining 60,600 m3 of active storage would be provided in subsequent phases. It is noted that the 1.0 m^3/s release rate was for the whole 940-ha catchment area and that plans have change over time and reduced the catchment area of the Waterfront SWMF to under 39.0 ha.

1.2.2 Malloy Drain Master Drainage Plan and Subsequent Implementation Plans and Studies.

The Malloy Drain Master Drainage Plan identifies the offsite sub-catchment as COAL-2 with a catchment area of 522 ha. vs. the UMA reports 900 ha. The Malloy Drain Master Drainage Plan makes the following recommendation with respect to new development greater than three residences:

- Interim Policies:
  - Zero discharge allowed during storm event. Release to be allowed only after a storm event and upon approval by Drainage authority.
  - Maximum allowable post-event discharge rate equivalent to 0.4 lps/ha
  - Inclusion of the upstream contributing areas in stormwater management plans.

After the Malloy Drain Master Drainage Plan, the Malloy 2A Project was undertaken as recommended in the Malloy Drain Master Drainage Plan and diverted bulk of the offsite sub-catchment COAL-2 north across Highway #3 with a small area of 30th Street that drains through the Subject Property.

1.2.3 Infrastructure Master Plan (IMP)

Figure 2 presents the IMP catchment areas for the ASP Lands. Catchment F drains to the Waterfront SWMF and catchment M (approximately 60 metres of the commercial land on the north edge of the ASP Lands) draining north to the Highway #3 ditch.

The IMP Catchment F is not consistent with currently constructed infrastructure. Of the 35.0-ha shown draining to the Waterfront SWMF 2.9-ha drains directly east to the Parkside Trunk and 3.3 ha of developed area and 4.2 ha of developed area drains north to the Highway #3 ditch. 0.31-ha north of and including parts of 21st Avenue drains by pipe to the Waterfront SWMF and not to the Highway #3 ditch as shown in the IMP. There are several areas that drain through a pipe system to the Waterfront SWMF, but overland flow is away from the Waterfront SWMF.

The IMP indicates the Waterfront SWMF is a Dry Pond with a current volume of 32,500 m^3. Review of the IMP input and output files shows that the Waterfront SWMF was modeled as a cylindrical structure with a constant area of 6914.9 m^2 from pond bottom elevation of 864.00 to a maximum water elevation of 867.67, which calculates as 32,500 m^3 of storage volume. The Waterfront SWMF is a Wet Pond and does not have a uniform cross-section, see Table 4. With a pond bottom elevation of 864.00, NWL of 866.00 the initial depth should have been 2.0m. If the IMP model had set the Waterfront SWMF up as a wet pond with the same cross-sectional area it would have only provided 18,670 m^3 of active storage. The IMP estimates the total 1:100-year run off volume from Catchment F at 27,000 m^3.

1.2.4 Waterfront Development, Record Drawings

The Waterfront Record Drawings show the commercial property east of Land-O-Lakes Drive and the majority of Land-O-Lakes Drive north of the Waterfront SWMF draining north to the catchbasins located in 21st Avenue immediately east of Land-O-Lakes Drive.

1.2.5 Westgate Landing Residential Subdivision, MGCL, October 24, 2011

Table 1 lays out what the Westgate Landing Residential Subdivision stormwater management report identified as the storage requirements for the Westgate development.

Table 1 - Westgate Landing Storage Requirements

	Required Storage
Phase 1 Pond Active storage volume to HWL (868.00)	8,500 m^3
Town's excess storage requirements (Phase 2)	12,000 m^3
Town's MR land Exchange (Phase 2)	5,000 m^3
Phase 2 required stormwater storage	6,800 m^3
Total Active Storage Required	**32,240 m^3**

The report does not provide an explanation for the Town's storage requirements. The report states that an expansion of the Waterfront Pond was required to meet the Town's storage requirement of 32,240 m^3.

Table 2 lays out the storage to be provided in the proposed plan. The storage requirement would be meet by the volume available below an elevation of 868.67 metres, made up of

storage in the Waterfront SWMF, Westgate SWMF (dry pond), pipe storage and trapped lows in the streets and was estimated to be 32,847 m^3.

Table 2 - Storage Provided for Westgate Development

	Phase 1 Pond	Phase 2 Pond (Westgate Expansion)	
Permanent Storage (NWL 866.00)	13,000		15,200
Active Storage (HWL 868.00)	18,300		21,042
Storage Available Above HWL to 868.67			
Waterfront SWMF		8,818	
Westgate Dry Pond		1,911	
Trapped Low Storage on 23rd Avenue and in Westgate		920	
Pipe Storage (Volume stored in stormwater collection system)		156	
Total Active Storage from HWL to 868.67			11,805
Total Active Storage Available to 868.67	**18,300**		**32,847**
Total Storage to 868.67	32,300		48,047

1.3. Current Status of the Stormwater Management System

Figure 3 presents the current drainage situation for the ASP lands. Currently there are three discharge points for the ASP lands:

- An existing storm trunk that roughly parallels Highway #3 and drains east into the Parkside SWMF and is identified in this SWMP as the "Parkside Trunk".
- The south ditch of Highway #3 which drains north across Highway #3 to the Birds of Prey wetland,
- An emergency overflow on Land-O-Lakes Drive that drains east to 24th Street and from there east on 23rd Avenue.

The central feature of stormwater management in the ASP lands is a stormwater management facility constructed as a wet pond in the approximate center of the ASP area and known as the Waterfront SWMF. The Waterfront SWMF drains east and then north to the Parkside Trunk.

The undeveloped Area4 currently drains into the Waterfront SWMF. The Waterfront SWMF drains through a storm trunk that goes east from the Waterfront SWMF in 23rd Avenue and continues in Waterfront Landing (entrance road extension of 23rd Avenue) from which it goes north to the Parkside Trunk, which is located immediately south of, and parallels Highway #3, draining to the east.

The undeveloped Area7 currently drains into the Highway #3 ditch.

1.4. Stormwater Management Issues

There are several points of concern in the Waterfront SWMF catchment area. These are described in more detail below.

1.4.1 Waterfront SWMF

The existing Waterfront SWMF was originally constructed without a liner. The 2012 expansion lined the north, east and south sides of the pond. The west side of the pond was not lined as it was expected that the pond would need to be expanded to the west.

The orifice plate installed in the outlet manhole has diameter of approximately 0.6 metres and does not provide any meaningful flow control from the Waterfront SWMF. This means that the Waterfront SWMF is not serving its intended function of reducing the peak flow into the downstream stormwater management system. Because of this, water level fluctuations from runoff in the Waterfront SWMF likely have been minimal.

1.4.2 Waterfront SWMF Spill Elevation

The Waterfront SWMF spills to 23rd Avenue at a spill elevation of 868.67. 23rd Avenue drains east (once the trapped lows on 23rd Avenue fill) to Land-O-Lakes Drive. From the intersection with 23rd Avenue Land-O-Lakes Drive spills to the southeast with a spill elevation of 868.70. This functionally means that the spill elevation of the Waterfront SWMF is 868.70 not 868.67.

1.4.3 Land-O-Lakes Drive, Catchbasins and Overland Flow

Southeast of the 23rd Avenue on Land-O-Lakes Drive are two catchbasins with a rim elevation of 868.08 which drain through the pipe network to the Waterfront SWMF. Southeast of these catchbasins the high point in the Land-O-Lakes drive gutter is 868.36. The points of concern are:

- there will be ponding, maximum depth of 0.28 metres, in Land-O-Lakes Drive if the Waterfront SWMF is filled at or above 868.08.
- the Waterfront SWMF will drain out through the pipe system at the catchbasins in Land-O-Lakes Drive. This has largely been mitigated by installing an elastomeric check valve in the pipe at the first manhole the catchbasins drain to.

1.4.4 21st Avenue, Catchbasins and Overland Flow

There are two catchbasins on 21st Avenue located northeast of the existing church that drain to the Waterfront SWMF. The rims of these catchbasins are set at 867.49 and 867.48 according to the record drawings. There is not a concern of flooding as the high point in the 21st Avenue gutter is to the west with a spill elevation is 867.719. The points of concern are:

- there will be ponding, maximum depth of 0.24 metres, in 21st Avenue if the Waterfront SWMF is filled at or above 867.48.
- the Waterfront SWMF will drain out through the pipe system at the catchbasins in 21st Avenue. This has largely been mitigated by installing an elastomeric check valve in the pipe at the first manhole north of the Waterfront SWMF.

1.4.5 Home Hardware, Onsite Stormwater Management

The Home Hardware onsite stormwater management system is connected to the Waterfront SWMF through the piped system north of the Waterfront SWMF which is the same piped system that the 21st Avenue catchbasins tie into. It also is protected by the elastomeric check

valve that prevents the Waterfront SWMF spilling to 21st Avenue. The Home Hardware onsite stormwater management system has the following critical rim elevations and inverts:

- Bottom of loading dock ramp 868.00,
- Catchbasin at the southeast corner of the building 868.50,
- Catchbasins at the northeast corner of the building 868.50,
- Catchbasin west of the building 868.61,
- Catchbasin at the northwest corner of the building 868.35,

Primary concern is that these will not drain when the Waterfront SWMF is filled above these elevations.

1.4.6 23rd Avenue Spill Elevation and Low Point

The overland spill elevation on 23rd Avenue is 868.67 which matches the Waterfront SWMF spill elevation. The low spot on 23rd Avenue adjacent to the Waterfront SWMF with catchbasins located on each side of the road has an elevation of 868.384.

Under zero release conditions, for a runoff event that fills the Waterfront SWMF to an elevation above 868.384 there will be standing water on 23rd Avenue until permission could be received to release the water stored.

1.4.7 Westgate Drive, Catchbasins

There are two catchbasins located on Westgate Drive approximately 40 metres south of 23rd Avenue. The rim elevation of these catchbasins is 868.341 which is 0.329 metres below the Waterfront SWMF spill elevation.

Under zero release conditions, for a runoff event that fills the Waterfront SWMF to an elevation above 868.341 there will be standing water on Westgate Drive until permission could be received to release the water stored.

1.5. Goals of the Stormwater Management System

The goals of the stormwater management system are to:

1. Protect the public,
2. Minimizing property and infrastructure damage from runoff events,
3. Protect the Environment,
4. Allow for development of the Subject Property,
5. Minimize inconvenience to the public,

2. SITE ANALYLSIS

2.1. Existing Storm Improvements

The existing stormwater infrastructure consists of:

- Parkside Trunk and its downstream facilities,
- Piped storm sewer in 21st Avenue,
- South ditch along Highway #3 and its downstream facilities,
- Waterfront SWMF,
- Waterfront development piped storm sewer,
- Westgate dry pond,
- Westgate development piped storm sewer,
- North piped storm sewer from McDonalds to the Waterfront SWMF,
- Trapped lows and overland drainage in the Waterfront and Westgate developments,
- Onsite detention on developed commercial lands.

2.1.1 Existing Westgate SWMF

Information on the existing Westgate SWMF was taken from the contours on the Westgate Landing, Record Drawings, December 15, 2013, and is presented in Table 3 respectively.

Table 3 - Existing Westgate SWMF Stage Storage

Description	Elevation (m)	Depth from Bottom (m)	Area (m^2)	Active Volume (m^3)
Pond Bottom	866.6	0	168	0
	866.8	0.2	249	41
	867	0.4	353	101
	867.2	0.6	479	184
	867.4	0.8	626	294
	867.6	1	792	436
	867.8	1.2	978	613
	868	1.4	1,183	828
	868.2	1.6	1,412	1088
	868.4	1.8	1,680	1396
	868.6	2	2,085	1772
Spill Elevation	868.67	2.07	2,139	1920
Top of Bank	868.8	2.2	2,355	2212

2.1.2 Existing Waterfront SWMF

Information on the existing Waterfront SWMF was taken from the contours on the Westgate Landing, Record Drawings, December 15, 2013, and is presented in Table 4.

Table 4 - Existing Waterfront SWMF Stage Storage

Description	Elevation (m)	Depth from Bottom (m)	Area (m^2)	Volume (m^3)	Active Volume (m^3)
Pond Bottom	864.0	0	6,533	0	0
	864.2	0.2	6,750	1,328	0
	864.4	0.4	6,957	2,699	0
	864.6	0.6	7,167	4,111	0
	864.8	0.8	7,381	5,566	0
	865.0	1	7,597	7,064	0
	865.2	1.2	7,811	8,604	0
	865.4	1.4	8,027	10,188	0
	865.6	1.6	8,146	11,806	0
	865.67	1.67	8358	12,383	
	865.8	1.8	8,470	13,467	0
Normal Water Level	866.0	2	8,696	15,184	0
	866.2	2.2	9,041	16,957	1,774
	866.4	2.4	9,392	18,800	3,617
	866.6	2.6	9,751	20,715	5,531
	866.8	2.8	10,117	22,701	7,518
	867.0	3	10,490	24,762	9,578
	867.2	3.2	10,870	26,898	11,714
	867.4	3.4	11,257	29,110	13,927
	867.6	3.6	11,651	31,401	16,217
	867.8	3.8	12,053	33,771	18,588
	868.0	4	12,461	36,223	21,039
	868.2	4.2	12,877	38,756	23,573
	868.4	4.4	13,300	41,374	26,190
	868.6	4.6	13,731	44,077	28,893
Spill Elevation	868.67	4.67	13,934	45,045	29,861
Top of Bank	868.8	4.8	14,165	46,871	31,688

The IMP indicates current storage of 32,500 m^3 in the Waterfront Pond at the approximate spill elevation of 868.7. How the IMP calculated storage is covered in Section 1.2.3. As the volumes presented in Table 4 are calculated form the record drawings instead of a simplified approximation used in the IMP, they are more accurate and relevant. The active storage volume of 29,861 at an elevation of 868.67 presented in Table 4 is comparable to the stated design goal of 29,860 present in Table 2.

2.1.1 Existing Highway #3 South Ditch

Information on existing Highway #3 south ditch was taken from contours from available LIDAR information and is presented in Table 5. The outlet from this ditch is a 600mm diameter culvert under Land-O-Lakes Drive draining to the Highway #3 ditch east of Land-O-Lakes Drive. The Highway #3 ditch east of Land-O-Lakes Drive drains north across Highway #3 through a 600mm diameter culvert. Field reconnaissance of these culverts conducted by MGCL in November 2022 showed that the culvert crossing Land-O-Lakes drive is approximately 50% sedimented in and the culvert crossing Highway #3 is approximately 25% sedimented in. Both culvert's inlets also have tall vegetation that during a major runoff event could block a substantial amount of flow into these culverts.

The existing Highway #3 ditch receives flows from west of 30th Street and from Highway #3 lanes in addition to the runoff from the ASP lands.

Table 5 - Existing Highway #3 South Ditch Stage Storage

Description	Elevation (m)	Depth from Bottom (m)	Area (m^2)	Active Volume (m^3)
Pond Bottom	866.8	0	122	0
	867	0.2	459	54
	867.2	0.4	966	194
	867.4	0.6	1,594	447
	867.6	0.8	2,324	837
	867.8	1	2,461	1315
Spill Elevation	868	1.2	3,959	1951

3. MODELING

3.1. Design Storms

The design of the different components of a stormwater management system are to meet the flows and volumes from the storms laid out in Table 6.

Table 6 - Design Storms

Stormwater Infrastructure	Designed For	Design Event
Minor System Conveyances	Peak Flow	1:5-year 4-hour Chicago Storm[1]
Major System Conveyances	Peak Flow	1:100-year 4-hour Chicago Storm[2]
Stormwater Management Storage Facilities	Total Runoff Volume with release only after the end of the Storm Event or as approved by the Town of Coaldale	1:100-year Chicago Storm (120.14 mm in 24 hours)[3] [4]

[1] City of Lethbridge Design Standards 2021 Edition, 3.3.2.1
[2] City of Lethbridge Design Standards 2021 Edition, 3.3.2.1
[3] City of Lethbridge Design Standards 2021 Edition, 3.3.2.1
[4] Malloy Drain Master Drainage Plan, 2010, MPE Engineering Ltd. Table 3.2

3.2. Sub-catchments

The catchment area of the ASP Area was divided into sub-catchment areas based on existing and proposed topography and stormwater management features. Where possible sub-catchment from existing plans were used. Parameters used in modelling were taken from the City of Lethbridge, Design Standards, where applicable. General parameters used in the modelling of sub-catchments are presented below:

- Slope 0.5%
- N Impervious 0.013
- N Pervious 0.15
- Depression Storage Impervious 0.45mm
- Depression Storage Pervious 1.0mm
- Infiltration Method ..... Green Ampt
    - Undeveloped:
        - Suction Head (mm).....292.2
        - Hydraulic Conductivity (mm/hr.) 0.5
        - Initial Deficit 0.25
    - Developed:
        - Suction Head (mm).....88.9
        - Hydraulic Conductivity (mm/hr.) 3.4
        - Initial Deficit 0.25

3.3. Model Setup

The PCSWWM model set up is presented in Figure 4.

The current Lethbridge 1:100-year Chicago 24-hour storm was modeled, and the duration of the model run was 144 hours. The explanation for use of only one storm is, the largest volume event is the most critical event for the major SWMF sizing which is the focus of this SWMP modeling. The reason for using such a long duration was to ensure that all the runoff volume made it into the storage ponds.

The Waterfront SWMF, Westgate SWMF and Highway #3 south ditch were modeled using the stage storage curves presented in Table 3, Table 4, Table 5 and respectively. The 30ST_W-Ditch was modeled using a functional curve to represent current ditch storage.

The outlet control on the Highway #3 ditch was modeled as the 600mm diameter culvert. It is recognized that there are additional areas flowing into the Highway #3 ditch such as the runoff from highway lanes and the Highway #3 ditch west of 30th Street however these have not been included in the model as the purpose of including the Highway #3 ditch in the model was to demonstrate the value in removing some areas that currently flow to this ditch. The purpose was not to comment on whether the ditch and culverts have adequate capacity.

Models were run with the Waterfront SWMF outlet orifice deleted to simulate a zero-release condition.

3.3.1 Changes Made from Predevelopment to Post-development Interim Model

Figure 5 presents the PCSWWM model setup for the Post-development Interim model. The following changes were made to the Predevelopment Model to the Post development Model:

- To account for Area8 sub-catchment not being able to drain overland across Area4 once it is developed:
  - The ditch from 30th Street to the Waterfront SWMF was deleted,
  - A storage was added to represent the 30th Street east ditch to provide peak flow attenuation of the 1:100-year runoff to the 1:5-year runoff. Modeling estimated 154 lps peak runoff from Area8 for a 1:5-year, post-development, runoff event and that 270 m3 of storage would be required to attenuate the peak runoff from a 1:100-year runoff event.
  - A 300mm diameter pipe was added from 30th Street to the Waterfront SWMF.
- The Area8 sub-catchment impervious percentage was increased from 25% to 35% mostly to account for improvements to 30th Street. It is noted that most of Area8 is existing country residential and the 25% impervious area was calculated from measuring the impervious area from air photos.

Table 7 - Proposed Preliminary Design of Waterfront SWMF

Description	Elevation (m)	Depth from Bottom (m)	Area (m^2)	Volume (m^3)	Active Volume (m^3)
Forebay Bottom	862.67	0	313	0	
	863.00	0.33	408	119	
	863.50	0.83	555	358	
	863.99	1.32	727	672	
Existing Pond Bottom	864.00	1.33	7988	709	
	864.50	1.83	8471	4,823	
	865.00	2.33	9056	9,203	
	865.50	2.83	9744	13,902	
Normal Water Level (NWL)	865.67	3	10002	15,581	0
	866.00	3.33	10535	18,969	3,388
	866.50	3.83	11429	24,459	8,878
	867.00	4.33	12426	30,421	14,840
	867.50	4.83	13526	36,907	21,326
Design High Water Level (DHWL)	868.00	5.33	14728	43,968	28,387
	868.30	5.63	15499	48,502	32,921
	868.50	5.83	16033	51,655	36,074
Spill Elevation	868.67	6	16501	54,420	38,839
Top of Bank	869.00	6.33	17441	60,020	44,439

- The Waterfront Pond:
    - NWL was lowered from 866.00 to 865.67 to increase the storage available by 2,800 m^3 in the existing footprint by and improve the backwater conditions in the pipe network in the Westgate development.
    - increased in size to be able to accommodate the existing and proposed development flows being stored below a HWL of 868.00. The proposed design that was used in the modeling is shown in Table 7.
- The Area4 sub-catchment impervious percentage was change from 0% in the Pre-development model to 60.0% and represents full development of the property.
- The Area7 sub-catchment impervious percentage was change from 15% in the Pre-development model to 85.0% which represents full development of the property.
- The 30ST_E-Ditch and 30ST_W-Ditch were modeled using a functional curve to represent future ditch storage.
- The NWL is the Waterfront SWMF was lowered to 865.67.

3.3.2 Post-development Model Full Build Out

Figure 6 presents the PCSWWM model setup for the Post-development Full Build Out model with a developed Area7 draining to Waterfront SWMF. This model was set up to demonstrate what the HWL would be in the Waterfront SWMF that was designed for a HWL 0f 868.00 without Area7 added. The reasoning behind this is that by the time Area7 goes for development the Town will likely have completed sufficient works in the Malloy Drain to allow a release rate during a storm event from the Waterfront SWMF which would reduce the storage required in the Waterfront SWMF. However, the Waterfront SWMF is designed to accept drainage form Area7 to a HWL of 868.30 with a zero-release rate.

To provide a point of information this model was also run with an outlet to the Waterfront SWMF with the flow being restricted to 2.0 lps/ha (75.6 lps)

3.4. Model Results

3.4.1 Predevelopment Sub-catchments

The parameters that vary from sub-catchment area to sub-catchment area and the modeled runoff from the predevelopment model is presented in Table 8.

Table 8 – Pre-Development – Model Results Sub-catchments

Name	Area (ha)	Width (m)	Flow Length (m)	Impervious (%)	Runoff Volume (ML)	Peak Runoff (L/s)	Runoff Coefficient
Draining to Parkside Trunk							
Area1	4.20	150	280	72	4.33	1,842	0.86
Sub Total	4.20				4.33		0.86
Weighted Average =				72			0.86
Draining to Highway #3 Ditch							
Area7	4.22	160	264	15	3.31	800	0.65
Area9	1.37	130	105	85	1.52	951	0.92
Sub Total	5.59				4.83		
Weighted Average =				32.1			0.72
Draining to Waterfront SWMF							
Area2	3.69	150	246	60	3.13	1,057	0.71
Area3	7.58	200	379	60	6.41	1,661	0.70
Area4	13.43	300	448	0	9.26	688	0.57
Area5	1.77	70	252	85	1.96	868	0..92
Area6	1.47	110	134	85	1.63	946	0.92
Area8	3.90	70	557	25	2.62	448	0.56
Area10	1.78	176	102	75	1.88	1,193	0.88
Subtotal	33.62				26.89		
Weighted Average =				35.2			0.67
Total =	**43.41**				**36.05**		
Weighted Average =				**38.4**			**0.70**

3.4.2 Post-Development Sub-catchments

Parameters that vary from sub-catchment area and the modeled runoff for the post - development models are presented in for the post-development without Area7 draining to the Waterfront SWMF and Table 10 for the post-development full buildout with Area7 draining to the Waterfront SWMF.

Table 9 - Post-Development - Model Results - Sub-catchments

Name	Area (ha)	Width (m)	Flow Length (m)	Impervious (%)	Runoff Volume (ML)	Peak Runoff (L/s)	Runoff Coefficient
Draining to Parkside Trunk							
Area1	4.20	150	280	72	4.33	1,842	0.86
Sub Total	4.20				4.33		0.86
Weighted Average =				72			0.86
Draining to Highway #3 Ditch							
Area7	4.22	160	264	85	4.68	2,029	0.92
Area9	1.37	130	105	85	1.52	951	0.92
Sub Total	5.59				6.20		
Weighted Average =				85			0.92
Draining to Waterfront SWMF							
Area2	3.69	150	246	60	3.13	1,057	0.71
Area3	7.58	200	379	60	6.41	1,661	0.70
Area4	13.43	300	448	60	11.31	2,636	0.70
Area5	1.77	70	252	85	1.96	868	0.92
Area6	1.47	110	134	85	1.63	946	0.92
Area8	3.90	70	557	35	2.85	524	0.61
Area10	1.78	176	102	75	1.88	1,193	0.88
Subtotal	33.62				29.17		
Weighted Average =				60.3			0.72
Total =	**43.41**				**39.7**		
Weighted Average =				**64.64**			**0.80**

Table 10 - Post Development - Model Results - Sub-catchments with Area7 Draining to the Waterfront SWMF

Name	Area (ha)	Width (m)	Flow Length (m)	Impervious (%)	Runoff Volume (ML)	Peak Runoff (L/s)	Runoff Coefficient
Draining to Parkside Trunk							
Area1	4.20	150	280	72	4.33	1,842	0.86
Sub Total	4.20				4.33		0.86
Weighted Average =				72			0.86
Draining to Highway #3 Ditch							
Area9	1.37	130	105	85	1.52	951	0.92
Sub Total	1.37				1.52		
Weighted Average =				85			0.92
Draining to Waterfront SWMF							
Area2	3.69	150	246	60	3.13	1057	0.71
Area3	7.58	200	379	60	6.41	1,661	0.70
Area4	13.43	300	448	60	11.31	2,636	0.70
Area5	1.77	70	252	85	1.96	868	0.92
Area6	1.47	110	134	85	1.63	946	0.92
Area7	4.22	160	264	85	4.68	2,029	0.92
Area8	3.90	70	557	35	2.85	524	0.61
Area10	1.78	176	102	75	1.88	1,193	0.88
Subtotal	37.84				33.85		0.74
Weighted Average =				63.1			0.74
Total =	**43.41**				**39.7**		
Weighted Average =				**64.6**			**0.80**

3.4.1 Models Results – Outlets

Table 11 present the model results at the system outlets and the Waterfront SWMF for catchment area, peak flows, and runoff volume. Note the assumption is that the Waterfront SWMF has been converted to a zero-release facility during a storm event for the Pre-development scenario. The peak flows at the outlets will be much lower than summing the peak runoff from the sub-catchment areas that contribute to the outlets flow. The reasons for this are:

- The PCSWMM model calculates runoff hydrographs and the peak runoff from a sub-catchment area is reported in Table 8, Table 9 & Table 10.
- The hydrographs are routed through downstream sub-catchment areas, conveyances, weirs and orifices which introduces the time of flow which flattens the hydrograph (the peak is reduced).
- The PCSWMM model adds hydrographs. A primary feature of hydrographs is the time component. Only when the peak flow occurs at the same time will the peak flow of each

hydrograph add to result in an output peak flow that is the sum of the inlet peaks. This is a rare occurrence and the hydrograph resulting from the addition of two or more hydrographs will have multiple localized peaks but the model will only publish the maximum peak observed in the hydrograph which will be the summation of all the input flows at the same time and is typically much lower than if the peak flows are summed.

Figure 8 presents three Hydrographs at the Outlet of STM71 located at the intersection of 21st Avenue and 25 Street into the Parkside Trunk. The hydrographs clearly show the benefit of converting the Waterfront SWMF to a 2 lps/ha and zero-release rates.

Figure 9 shows the hydrograph at the Highway #3 ditch outlet for the current drainage area pre-development and proposed development and clearly shows the benefit of draining as much of Area 7 as practical to the Waterfront SWMF.

Table 12 presents the Waterfront SWMF in its current pre-development conditions against the proposed design of the Waterfront SWMF.

Table 11 –Model Results – Outlets

			Parkside Trunk	Highway #3 Ditch	Waterfront SWMF	Total
Predevelopment Current Outfall	Catchment Area		37.821 ha	5.59 ha	33.617 ha	43.41 ha *
	Peak Flow Discharging	1:5 Year	326 lps	358 lps	243 lps	4.204
		1:100 Year	930 lps	789 lps	737 lps	
	Discharge Volume	1:5 Year	7,529 m^3	1,229 m^3	6,230 m^3	8,758 m^3*
		1:100 Year	31,021 m^3	5,006 m^3	26,600 m^3	36,027 m^3
Predevelopment Zero Release for Waterfront SWMF	Catchment Area (ha)		4.204 ha	5.59 ha	33.617ha	43.41 ha
	Peak Flow Discharging	1:5 Year	159 lps	358 lps	0 lps	
		1:100 Year	204 lps	789 lps	0 lps	
	Discharge Volume	1:5 Year	1,275 m^3	1,226 m^3	0 m^3	2,499 m^3
		1:100 Year	4,330 m^3	4,997 m^3	0 m^3	9,327 m^3
Proposed Post Development	Catchment Area		4.204 ha	5.59 ha	33.617ha	43.41 ha
	Peak Flow Discharging	1:5 Year	159 lps	635lps	0 lps	
		1:100 Year	204 lps	953 lps	0 lps	
	Discharge Volume	1:5 Year	1,275 m^3	1,924 m^3	0 m^3	3,199 m^3
		1:100 Year	4,330 m^3	6,350 m^3	0 m^3	10,680 m^3
Proposed Post-Development with Area 7 added to Waterfront SWMF	Catchment Area		4.204 ha	1.367 ha	37.84 ha	43.41 ha
	Peak Flow Discharging	1:5 Year	159 lps	216 lps	0 lps	
		1:100 Year	204 lps	596 lps	0 lps	
	Discharge Volume	1:5 Year	1,275 m^3	473 m^3	0 m^3	1,749 m^3
		1:100 Year	4,330 m^3	1,677 m^3	0 m^3	6,007 m^3

* Waterfront SWMF discharges flows through the Parkside Trunk and is therefore not included in the totals for the area.

It is noted that the Active Depth for the Proposed Waterfront SWMF is slightly above the guidelines recommended depth of 2.0 m. This is often done in the Lethbridge region and has not shown problems when handling large infrequent storm events.

Table 13 presents the modeled performance of the Waterfront SWMF for predevelopment and post-development model runs. It is noted that the modeled response shown in Table 13 shows the proposed Waterfront SWMF filling 867.90 and not to the DHWL of 868.00. This is due to continuity error for the flow routing in the model where approximately 949 m^3 of runoff has been lost. Industry practice is that continuity errors less than 2% are not relevant. However due to the Towns concerns the design of the Waterfront SWMF will accommodate the calculated runoff volume at the DHWL and not what the modeling shows for stored volume during the design runoff event and the resultant HWL.

Figure 8 - Parkside Trunk Outlet

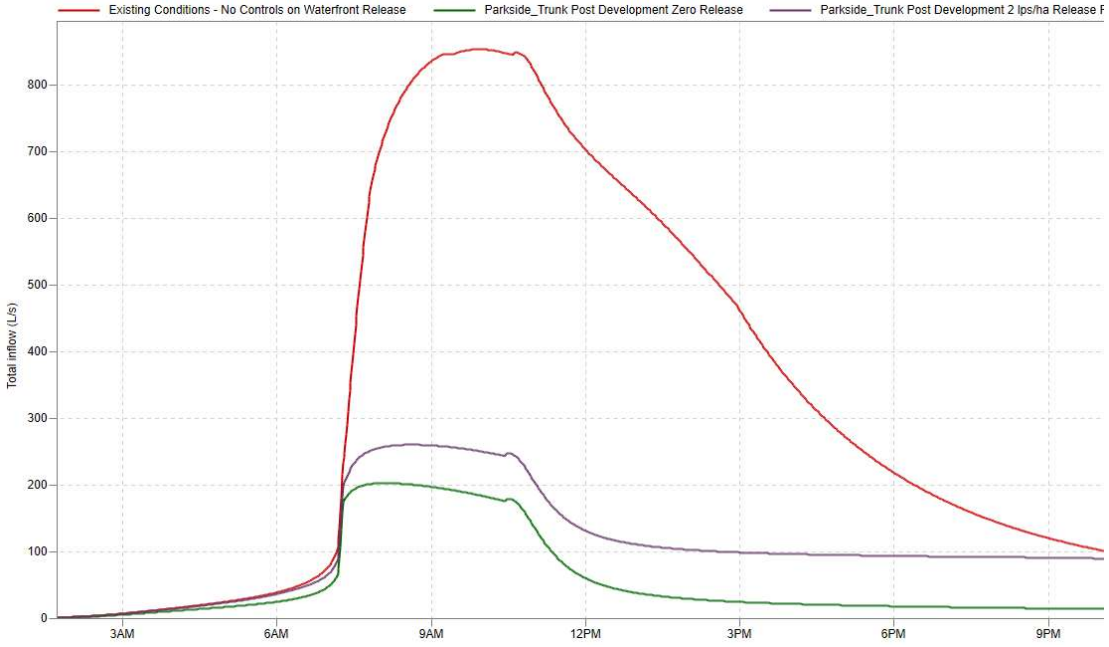


Figure 9 - Highway 3 Outlet

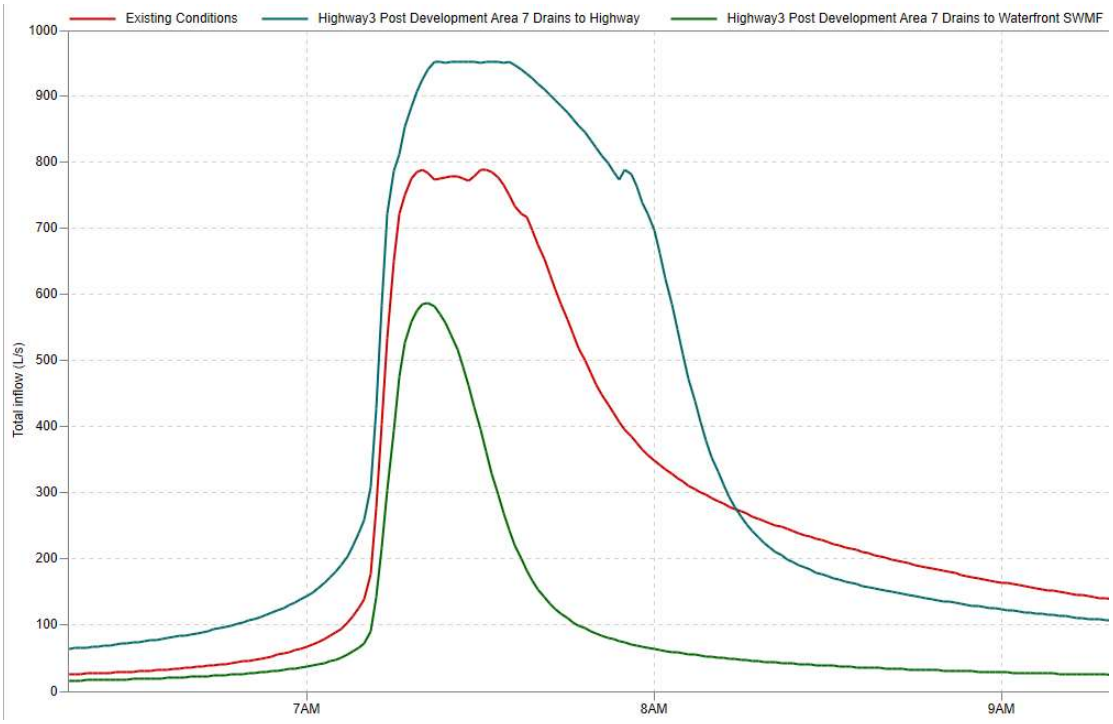


Table 12 - Waterfront SWMF Design

Design	Current Waterfront SWMF	Proposed Waterfront SWMF
Pond Bottom	864.00 m	864.00 m (Forebay 862.67 m)
NWL	866.00 m	865.67 m
Design High Water Level (DHWL)	868.00 m	868.00 m
Spill Elevation	868.67 m	868.67 m
Permanent Depth	2.00 m	1.67 m (Forebay 3.00 m)
Active Depth (DHWL-NWL)	2.00 m	2.33 m
Height to Spill Elevation (freeboard)	0.67 m	0.67 m
Permanent Volume (below NWL)	15,184 m^3	15,581 m^3
Total Volume at DHWL	36,223 m^3	43,968 m^3
Total Volume to Spill Elevation	45,045 m^3	54,420 m^3
Active (Stored) Volume	21,039 m^3	28,387 m^3 *
Volume from (Spill Elevation – DHWL)	8,822 m^3	10,452 m^3
Extra Capacity above DHWL	42.8%	37.0%

* From Table 3 the Westgate SWMF has an active volume of 866 m^3 at the DHWL making the total active volume of the Waterfront SWMF system 29,215 m^3 which is greater than the required storage volume of 29,170 listed in Table 9.

Table 13 - Waterfront SWMF Modeled Performance

	Current Waterfront SWMF Predevelopment		Proposed Waterfront SWMF Post Development							
Waterfront SWMF NWL	866.00		865.67							
Permanent Pool Volume	15604		15557							
Westgate Dry Pond Bottom	866.6		866.6							
Waterfront SWMF Spill Elevation	868.67		868.67							
Waterfront SWMF Total Volume @ Spill Elevation	45045		54334							
Westgate Dry Pond Spill Elevation	868.67		868.67							
Westgate Dry Pond Total Volume @ Spill Elevation	1920		1920							
Modeled Response	Current Condition (0.6m Orifice)		Zero – Release During Storm		without Area 7		with Area 7		with Area 7 and a 2.0 lps/ ha Release Rate	
	Waterfront SWMF	Westgate Dry Pond	Waterfront SWMF	Westgate Dry Pond	Waterfront SWMF	Westgate Dry Pond	Waterfront SWMF	Westgate Dry Pond	Waterfront SWMF	Westgate Dry Pond
1:100-year HWL	867.12	867.68	868.30	868.30	867.91	867.91	868.18	868.18	867.87	867.86
1:100-year Active Depth (m)	1.12	1.08	2.30	1.70	2.24	1.31	2.51	1.58	2.20	1.26
1:100-year Height to Spill (m) (freeboard)	1.55	0.99	0.37	0.37	0.76	0.76	0.49	0.49	0.80	0.81
1:100-year Total Volume (m^3)	26,025	500	40,048	1,236	42,271	724	46,397	1,068	42,887	679
1:100-year Active (Stored) Volume (m^3)	10,421	500	24,444	1,236	26,714	724	30,840	1,068	27,330	679
Volume from Spill Elevation – 1:100-year HWL (m^3)	19,020	1,420	4,997	684	12,063	1,196	7,937	852	11,447	1,241
Total 1:100-year Active (m^3) (Stored) Volume	10,921		25,680		27,438		31,908		28,009	
Total Volume from Spill Elevation – 1:100-year HWL (m^3)	20,440		5,681		13,259		8,789		12,688	
Additional Capacity to Spill Elevation (m^3)	187%		22%		48%		28%		45%	
Continuity Error Runoff	0.0%		0.0%		0.0%		0.0%		0.0%	
Continuity Error Routing	0.0%		0.8%		1.1%		1.3%		0.0%	

Figure 10 presents the peak flows and volumes for the Post-development model with Area 7 developed and draining into the Waterfront SWMF.

4. PROPOSED STORMWATER MANAGEMENT SYSTEM

Following the guidance of applicable standards and the results of modelling the stormwater management system in the ASP area the following improvements are proposed

4.1. Offsite Stormwater Management System Improvements

Except for the improvements required to the Waterfront SWMF discussed below, further development of the ASP lands will require no downstream infrastructure improvements. When the proposed infrastructure improvements are made, storm infrastructure downstream of the ASP lands will see a reduction peak flows from the ASP lands.

Runoff from Area8 which is upstream of the ASP Lands will be accommodated by:

- The storm main in 23rd Avenue will be designed to accommodate peak flows from the 1:5-year post development runoff, estimated at 154 lps (predevelopment estimated at 133)
- 23rd Avenue will be designed to accommodate peak flows greater than the from the
- 1:5-year event runoff on the road, curb and gutters,
- The runoff volume from Area8 has been included in all SWMF calculations.

4.2. Area 4

The stormwater management system in Area4 planned as a dual drainage (major / minor) system which is typical of urban developments in Alberta.

The minor system is planned to be designed to accommodate the Lethbridge 1:5-year runoff event without surcharging, including surcharge from the Waterfront SWMF. The major system will be designed to accommodate the Lethbridge 1:100-year, Chicago-4-hour storm and the Lethbridge 1:100-year, Chicago 24-hour storm.

Overland flow on streets, trapped lows on the roads will be designed and used as necessary to convey and attenuate the 1:100 year, Chicago 4-hr Storm as may be required. Onsite detention will be required for commercial and multi-family sites except where it can be demonstrated to the Town's satisfaction, by modeling that the site can discharge at a higher rate and not cause surcharge in the minor system or discharge directly to the SWMF without causing icing on pedestrian trails or erosion issues.. This typically only works for sites immediately adjacent to a SWMF where overland flow directly to the SWMF is practical.

The stormwater management plans for the Malloy Pond 2 show the emergency overflow directed to 30th Street, see Figure 14, and draining through Area4. To address this 23rd Avenue will be designed to safely convey overland flows of at least 2.0 m^3/s to the Waterfront SWMF. The Malloy 2 Pond is designed to drain to the Birds of Prey Wetland and only during extreme runoff exceeding the current design standards will the emergency spill way be used.

4.3. Waterfront SWMF

It is proposed that the Waterfront SWMF be converted to a zero-release during a storm event facility to reduce the pressure on the Town's stormwater system downstream. This change should be done whether development proceeds or not and therefore development is not a trigger. Development will worsen any issues caused by the current Waterfront SWMF outlet configuration.

The layout, design and equipment of the control structure will be determined during the detailed design for the expansion of the Waterfront SWMF unless the Town undertakes this work on their own. The cost of converting the Waterfront SWMF to a zero-release facility is estimated at $40,000 and includes installing a new vault structure in the grass on the berm, a control gate operatable from the surface and a weir set at the HWL. This control gate should be designed so that in the future it can be set for a controlled release during a storm event.

It is proposed that the Waterfront SWMF NWL be reduced to 865.66 which matches the maximum invert in the downstream piped stormwater system. The reason for this change is to reduce the amount of surcharging in the Westgate stormwater collection system at the NWL. It also adds some active storage volume to the Waterfront SWMF. This can easily be achieved by cutting a slot in the existing orifice plate to the invert of the manhole or with more work the plate can be cutup and removed through the manhole lid.

To accommodate the post development runoff from Area4 below an elevation of 868.00 the Waterfront SWMF will need to be expanded a minimum of 7,745 m^3. It is proposed that this be done by:

- lowering the NWL of the Waterfront SWMF from 868.00 to 865.57, as this also improves some of the other issues in the area.
- expanding the pond in the southwest corner. A concept of the expansion to provide the required storage is shown in Figure 11.

With the new pond levels there are three concerns to be addressed:

1. The pond currently does not appear to be armored at the NWL against erosion. Shoreline erosion control will be addressed during the detailed design.
2. The minimum depth of the permanent pool will no longer be in the recommended range of 2.0 to 3.0 m. To address this a small forebay pool will be excavated as part of the pond expansion in the southwest corner to a depth of approximately 3.0m.
3. The active depth of the Waterfront SWMF will be 2.33 metres which is greater than the 2.0 metres recommended in the Alberta Environment and Parks, Standards and Guidelines for Municipal Water Works, Wastewater and Storm Drainage Systems. Considering:
    - the design event that would fill the Waterfront SWMF has a 1.0% probability of occurrence (1:100-year event) it will be very rare that the pond will be filled to capacity,
    - human safety due to a slightly higher water level rise is not a concern, however posting warning signs at HWL level stating that the water is designed to rise to this level provides both information for the public to stay out of the potential flooding area and provides public education on the operation of the pond,

4.4. Area 7

The stormwater management system in Area7 is projected to be a dual drainage (major / minor) system which is typical of urban developments in Alberta when it is developed. Currently Area7 drains to the Highway 3 ditch and there is no requirement on Area 4 to accommodate drainage from Area7.

There is sufficient grade for a large portion of Area 7 to be drained into the Waterfront SWMF and away from the Highway #3 ditch. There is adequate capacity in the Waterfront SWMF to accommodate runoff from Area7 if the HWL is allowed to increase to 868.3 metres or an allowable release rate of no less than 2 lps/ha is provided. How best to accommodate the drainage from Area 7 to the Waterfront SWMF has not been determined.

4.5. General Layout of the Proposed Stormwater Management System

4.5.1 Minor System & Waterfront SWMF

Figure 11 - Waterfront SWMF Conceptual Design

Figure 12 presents the general minor system proposed for the development of Area4 (the Subject Site). It is noted:

- The minor system is a conventional piped system designed not to surcharge during a 1:5-year return period rainfall event.
- A new outlet to the Waterfront SWMF is proposed.
- The piped system in 23rd Avenue has been extended to 30th Street to convey flows from Area 8.
- No connection to Area7 is proposed. Provisions for future connections to the Waterfront SWMF to be examined during detailed design.

4.5.2 Major System

Figure 13 presents the general major system proposed for the development of Area 4. It is noted:

- for the commercial and multi-family sites onsite detention is required,
- for single family residential and the roads trapped low storage on the roads is proposed,
- ditch or trapped low storage is required for Area8 as the piped system in Area4 will be designed to convey the minor event peak flow in the pipe.
- 23rd Avenue will be designed as an overland flow route to accommodate flows from Area8 greater than the capacity of the minor system to accommodate and the potential of 2.0 m^3/s flows from the Malloy 2 pond.

4.5.3 Emergency System

Figure 14 presents the general emergency storage and overland flow. It is to be noted:

- There is a potential from an emergency overflow from the Malloy 2 Pond,
- The emergency spill elevation on Land O' Lakes Drive has not changed,
- The emergency spill from Area7 is to Highway #3.

4.5.4 Wet Pond Make-up Water

The Waterfront SWMF currently receives make-up-water from an SMRID turnout shown on Figure 3. This turnout and its piped supply line will be removed during development.

The makeup water supply lost through development will be replaced by a new SMRID turnout will be provided on 30th Street, as shown on Figure 12. This turnout will discharge to the storm sewer in 23rd Avenue which flows to the Waterfront SWMF.

Removal of the SMRID line and turnouts on the ASP Area and installing a new turnout require approval and coordination with SMRID.

4.6. How the Proposed Stormwater Management System Addresses Issues

In section 1.4 Stormwater Management Issues several points of concern in the Waterfront SWMF catchment area were raised. How the proposed system is addressing these issues is described below.

4.6.1 Waterfront SWMF

The recommendation is being made to line the west side of the Waterfront SWMF.

A new control structure is being recommended that will allow release rates to be set including the option of zero-release during a storm event.

4.6.2 Waterfront SWMF Spill Elevation

This report acknowledges that the overland spill from the Waterfront SWMF is 868.67. Whether the 30mm in difference in spill elevation will make a noticeable difference during an emergency event has not been examined. However, returning the Waterfront SWMF to a design HWL of 868.00 will help to make an event that will spill overland from the Waterfront SWMF a truly rare event. It is beyond the scope of this report to estimate what that event may look like.

4.6.3 Land-O-Lakes Drive, Catchbasins and Overland Flow

Returning the Waterfront SWMF to a design HWL of 868.00 will reduce the frequency of ponding at these catchbasins. Spill from the Waterfront Pond through these catchbasins will only occur if the water surface elevation in the Waterfront Pond has exceeded the HWL which has been calculated to accommodate the 1:100-year 24-hr rainfall event and the backflow prevention valve fails.

4.6.4 21st Avenue, Catchbasins and Overland Flow

Without excessive expenditures to lower the storm system downstream of the Waterfront SWMF which would allow a lowering of the Waterfront SWMF there is little that can be done to eliminate the issues identified here. Returning the HWL of the Waterfront SWMF to 868.00 will reduce the frequency of the outlined issues.

4.6.5 Home Hardware, Onsite Stormwater Management

Returning the HWL of the Waterfront SWMF to 868.00 will eliminate the issues up to and including the 1:100-year 24-hr rainfall event.

4.6.6 23rd Avenue Spill Elevation and Low Point

Returning the HWL of the Waterfront SWMF to 868.00 will eliminate the issues up to and including the 1:100-year 24-hr rainfall event.

4.6.7 Westgate Drive, Catchbasins

Returning the HWL of the Waterfront SWMF to 868.00 will eliminate the issues up to and including the 1:100-year 24-hr rainfall event.

5. PHASING AND TRIGGERS FOR NEW STORMWATER INFRASTRUCTURE

5.1. Area4 (Subject Property)

Development of Area4 will trigger the requirement for the following improvements to stormwater infrastructure:

1. Increasing the size of the Waterfront SWMF. If the Waterfront SWMF outlet control has not been upgraded, it should be done in conjunction with the pond expansion. Lining the west bank of the Waterfront pond and installing any shoreline armoring should also be done at the time of the pond expansion.
2. Installation of a new piped inlet into the Waterfront SWMF as the current inlets are not sized to accommodate Area4.
3. Installation of a new piped stormwater collection system in Area4 as the property is developed,
4. Extension of the storm collection system to 30th Street by:
    a. Extending the piped stormwater collection system in 23rd Avenue as each phase of development, and or
    b. Creating an interim drainage ditch from 30th Street to the furthest extent of the piped stormwater collection system in 23rd Avenue built during each phase of development.
5. Grading the ditch in 30th Street to provide 270 m^3 of storage and conveyance of runoff to the stormwater collection system located in 23rd Avenue.

5.2. Future Commercial (Area 7)

Development of Area 7 will trigger the requirement for stormwater management infrastructure being installed in Area 7.

6. RECOMENDATIONS

1. With respect to the Waterfront SWMF:
    a. The outlet should be modified to provide for a controlled release rate with the controls designed so that no release from the Waterfront pond is possible.
    b. The NWL is reduce to 865.67 by cutting a slot in the orifice plate in the outlet control manhole to the invert of the manhole,
    c. The active storage volume is increased to 28,387 m^3 below a water surface elevation of 868.00,

d. Appropriate shoreline erosion protection be installed,

e. Signage be installed at the high-water level to warn and educate the public on the elevation of expected flooding.

2. With respect to the development of Area 4:

a. Area 4 be developed with a major / minor stormwater management system,

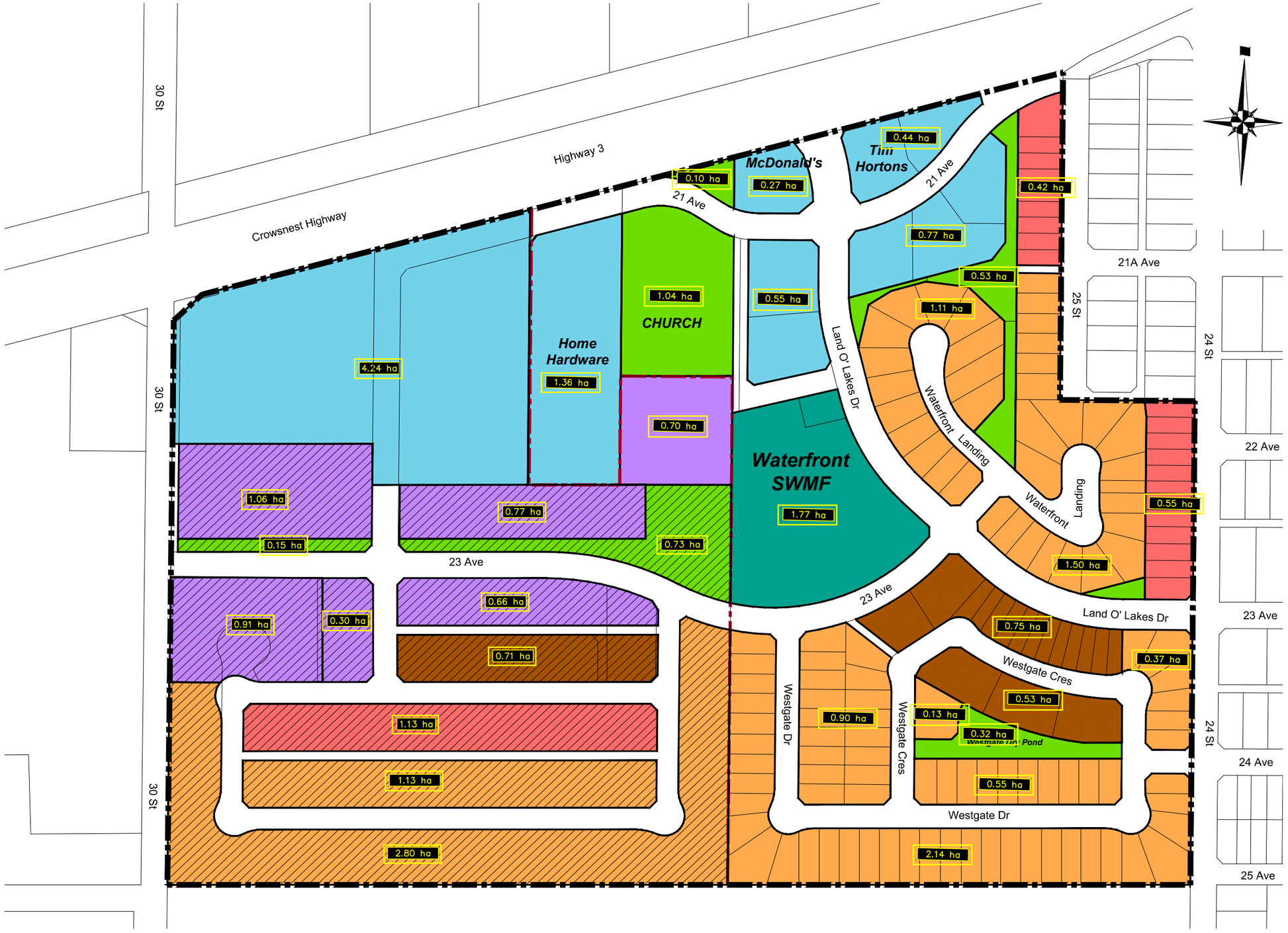
b. 1:5-year runoff from Area 8 west of Area 4 be accommodated in the Area 4 minor storm system,

c. Flows greater than the 1:5-year runoff from Area 8 west of Area 4 be accommodated in storage constructed in Area 8.

d. 23rd Avenue be designed to accommodate emergency overland flows from Area 8 and the Malloy 2 Pond.

e. Consideration of servicing Area7 through Area4 will be examined with detailed design.

APPENDIX A Figures



LEGEND

ASP BOUNDARY (Area=39.52 ha)

CURRENT DEVELOPMENT BOUNDARY

PROPOSED LAND USE

	AREA (ha) ha	ac
INSTITUTIONAL / RECREATIONAL (I/R)	2.86	7.06
UTILITY (U)	1.77	4.37
RESIDENTIAL (R-1A)	10.62	26.24
SMALL LOT RESIDENTIAL (R-1B)	2.11	5.21
RESIDENTIAL STARTER LOTS (R-1C)	0.71	1.75
HIGHWAY COMMERCIAL (C-2)	7.63	18.85
RESIDENTIAL MULTI-UNIT (R-2)	4.40	10.86
ROADWAYS & LANES	9.43	23.29
TOTAL ASP AREA:	39.51	97.64

INDICATES AREAS THAT WILL REQUIRE A CHANGE IN LAND USE

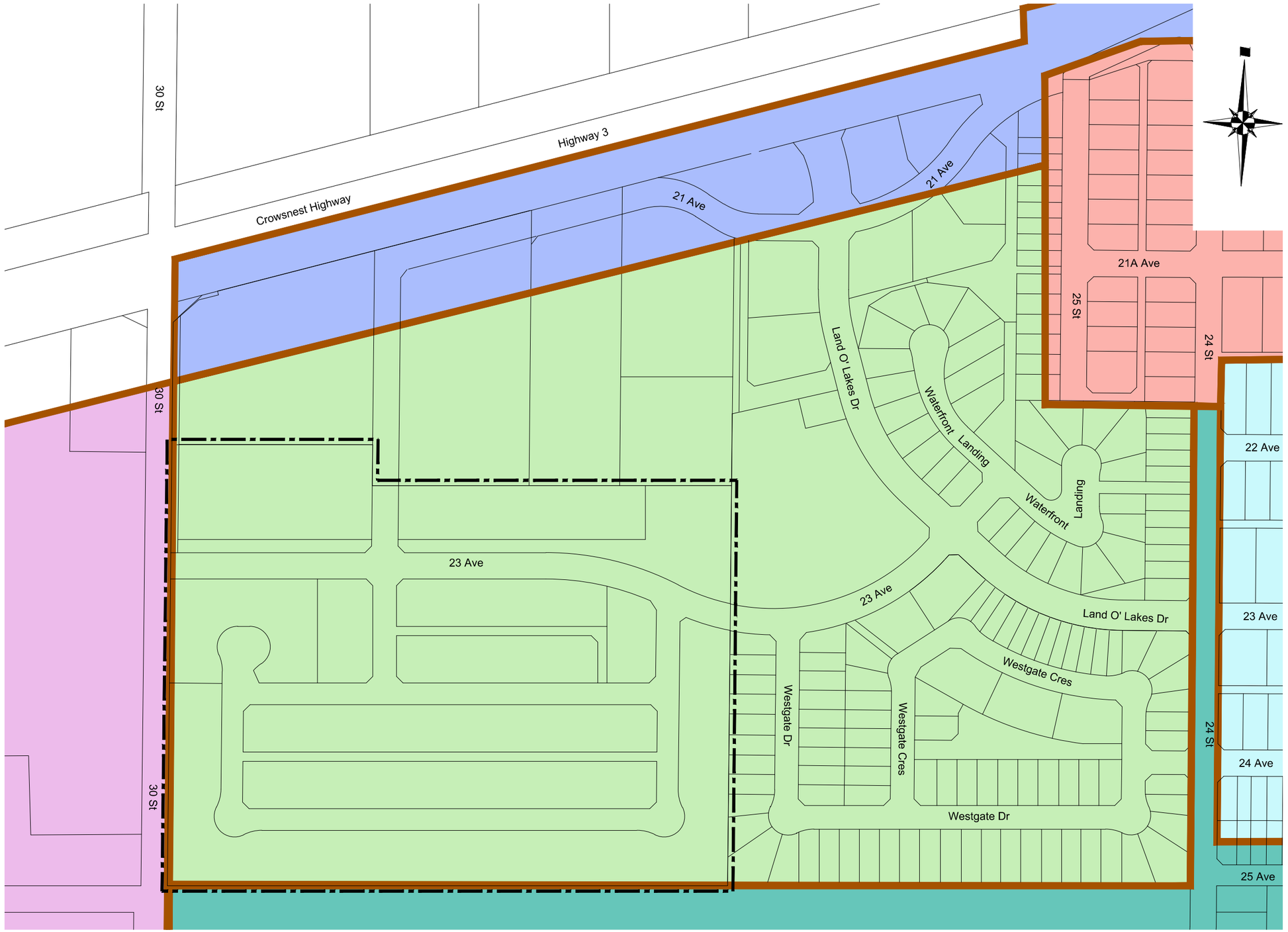
MARTIN GEOMATIC CONSULTANTS
Consulting Engineers, Planners, and Land Surveyors
255-31st Street North Lethbridge, Alberta T1H 3Z4
Ph: (403) 329-0050 E-mail: geomart@mgcl.ca Fax: (403) 329-6594

Stormwater Management Plan
West Coaldale ASP Ammendment 2022

2022 ASP AMENDMENT PROPOSED LAND USE MAP

229648CE
Dec 01, 2022

FIGURE 1.0



LEGEND

ASP BOUNDARY (Area=39.52 ha)

	IMP CATCHMENT AREAS
	M
	I
	F
	Q
	A
	G

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Stormwater Management Plan
West Coaldale ASP Ammendment 2022

229648CE
Dec 01, 2022

IMP CATCHMENT AREAS

FIGURE 2.0

To Birds of Prey Wetlands Facility

To Birds of Prey Wetlands Facility

To Parkside Acres Stormwater Facility

Crowsnest Highway

Highway 3

30 St

21 Ave

Area '9'
1.37 ha

Area '5'
1.77 ha

Area '1'
4.21 ha

Land O' Lakes Dr

21A Ave

25 St

24 St

22 Ave

23 Ave

24 Ave

25 Ave

FUTURE
COMMERCIAL
Area '7'
4.22 ha

Area '6'
1.47 ha

Area'10'
SWMF
1.81 ha

Area '2'
3.67 ha

Waterfront

Landing

Area '3'
7.48 ha

Westgate Cres

Westgate Dr

PRE-DEVELOPMENT

Area '4'
13.38 ha

EXISTING CHANNEL

Area '8'
3.90 ha

EX SMRID TURNOUT FOR
WATERFRONT SWMF
MAKEUP WATER

LEGEND

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

- STORM MANHOLE AND PIPE

FUTURE UTILITIES

- STORM MANHOLE AND PIPE

- EXISTING SMRID PIPE AND TURNOUT

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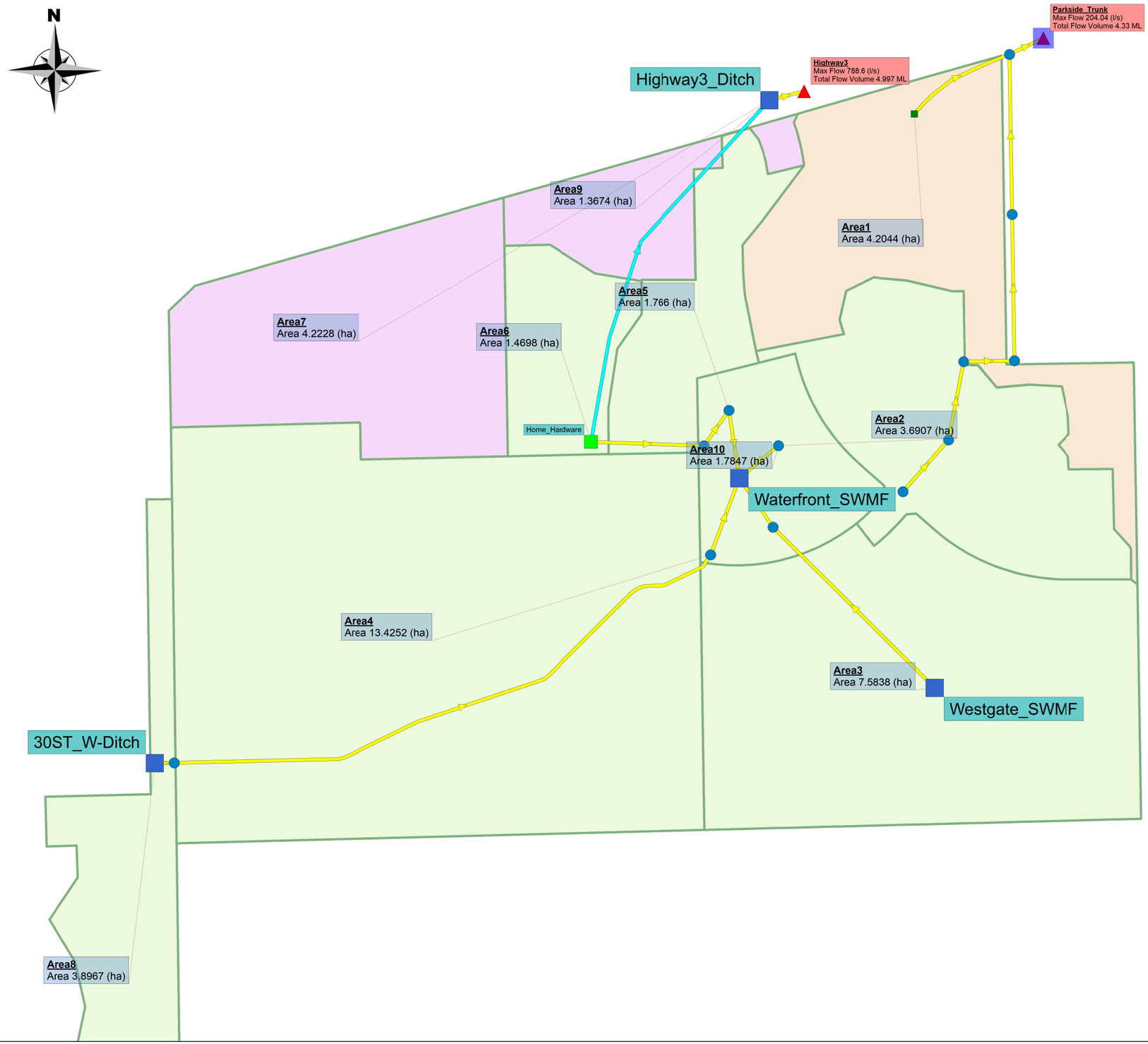
West Coaldale ASP Ammendment 2022

EXISTING STORMWATER DRAINAGE CONDITIONS

229648CE
Dec 01, 2022

FIGURE 3.0



Legend

- Junctions
- Outfalls

Storages

- Other
- Trapped_Low
- Pond

- Conduits
- Weirs

Subcatchments

- Parkside Storm Trunk
- Waterfront SWMF
- Highway #3 Ditch

Stormwater Management Plan

West Coaldale ASP Amendment
Coaldale, Alberta

PCSWMM Model Setup
Pre-development
Waterfront SWMF
Converted to
Zero-Release

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

150 m

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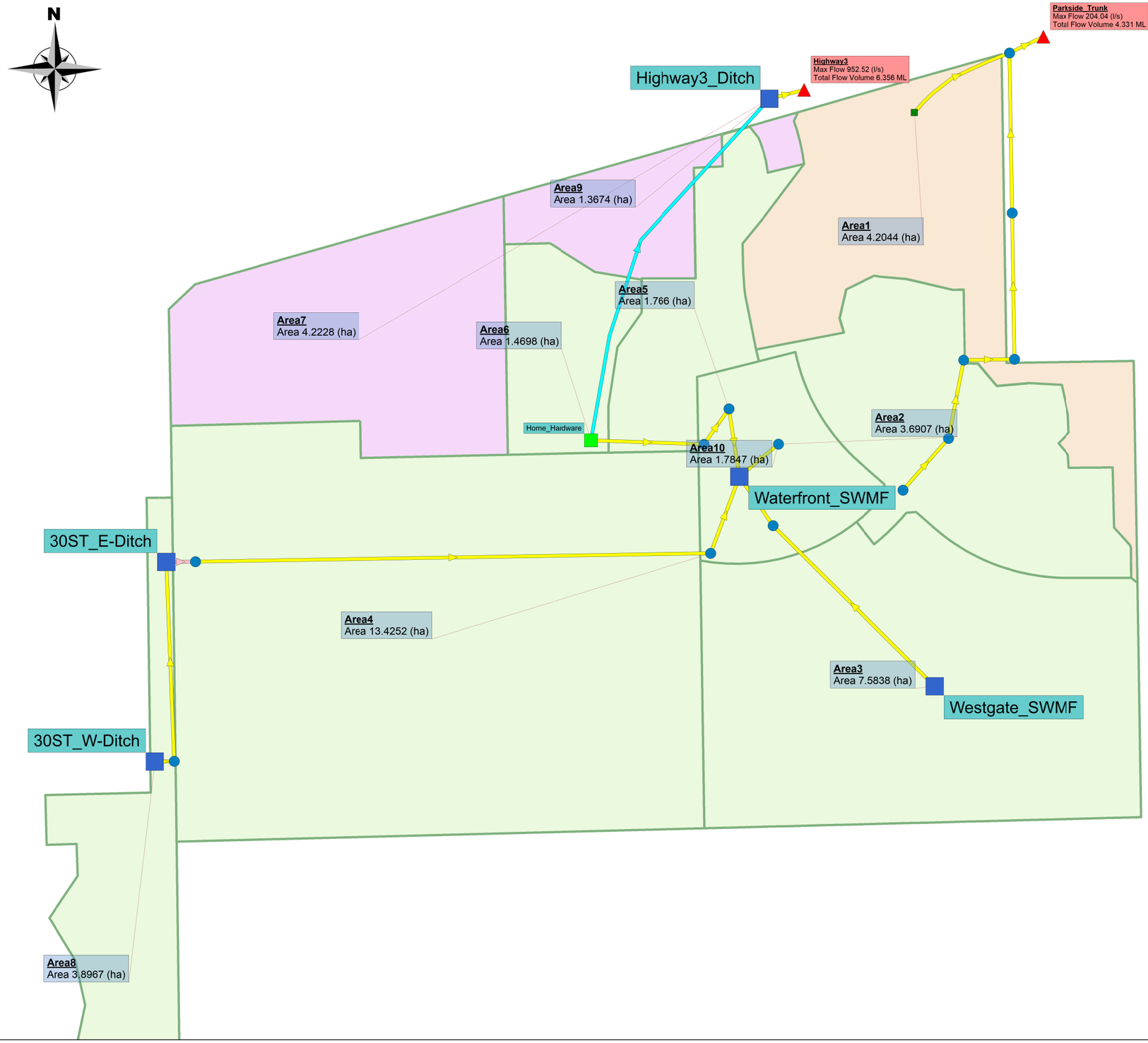
Figure 4



Legend

- Junctions
- Outfalls

Storages

- Other
- Trapped_Low
- Pond

- Conduits
- Orifices
- Weirs

Subcatchments

- Parkside Storm Trunk
- Waterfront SWMF
- Highway #3 Ditch

Stormwater Management Plan

West Coaldale ASP Amendment
Coaldale, Alberta

PCSWMM Model Setup
Post-development
Full Build Out

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

150 m

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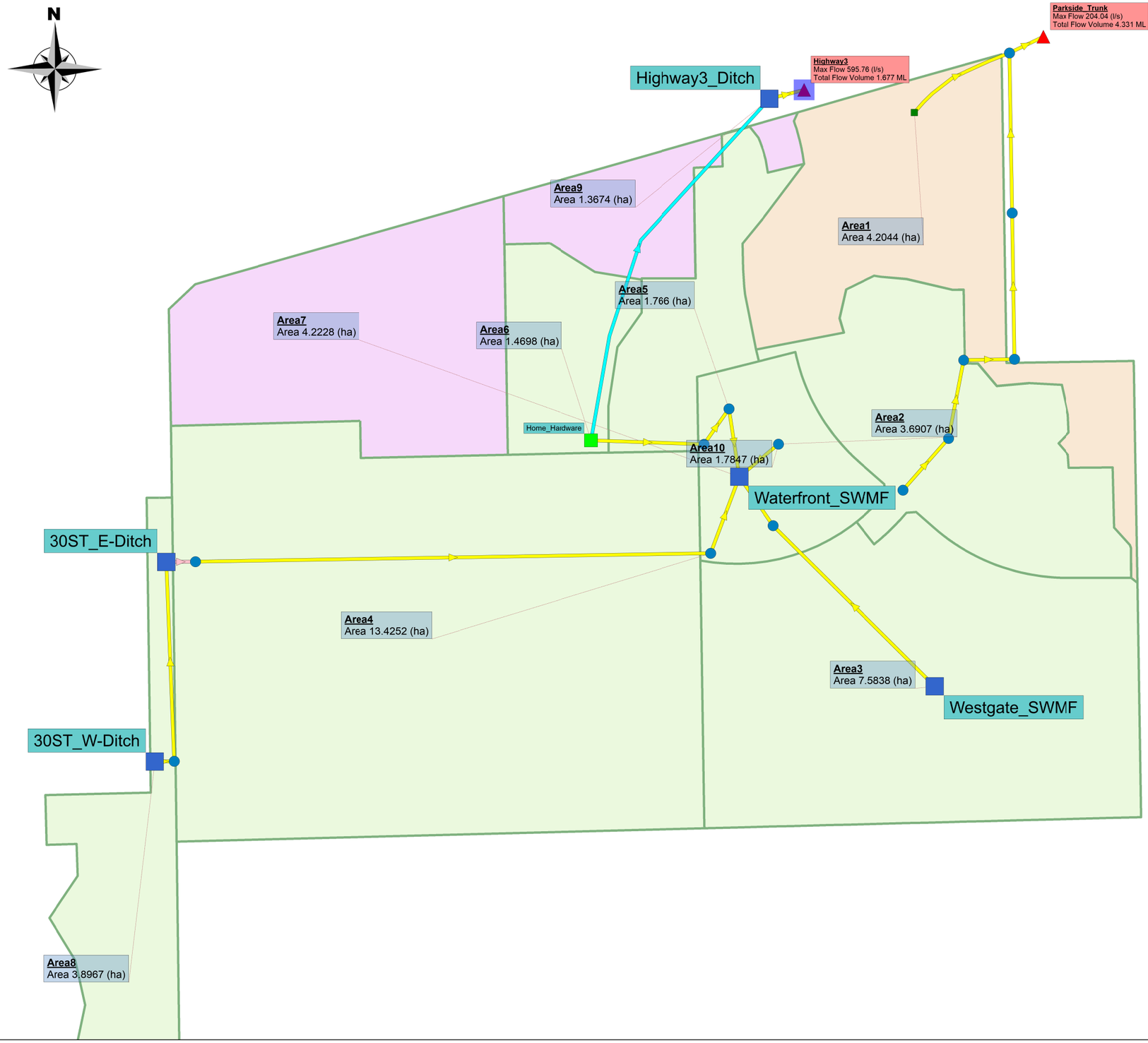
Figure 5



Legend

- Junctions
- Outfalls

Storages

- Other
- Trapped_Low
- Pond

- Conduits
- Orifices
- Weirs

Subcatchments

- Parkside Storm Trunk
- Waterfront SWMF
- Highway #3 Ditch

Stormwater Management Plan

West Coaldale ASP Amendment
Coaldale, Alberta

PCSWMM Model Setup
Post-development
Full Build Out
Area 7 Added to Waterfront SWMF

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

150 m

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Figure 6

To Birds of Prey Wetlands Facility

30 St

Crowsnest Highway

Highway 3

Hwy #3 Discharge

1:5 YEAR
Peak Flow=359 lps
Volume=1,229 m³

1:100 YEAR
Peak Flow=789 lps
Volume=5,006 m³

To Birds of Prey Wetlands Facility

Parkside Trunk Discharge

1:5 YEAR
Peak Flow=326 lps
Volume=7,529 m³

1:100 YEAR
Peak Flow=929 lps
Volume=31,021 m³

To Parkside Acres Stormwater Facility

Area '9'
1.37 ha

21 Ave

Area '5'
1.77 ha

Area '1'
4.21 ha

Land O' Lakes Dr

FUTURE COMMERCIAL
Area '7'
4.22 ha

Area '6'
1.47 ha

Area'10'
SWMF
1.81 ha

Waterfront Landing

Area '2'
3.67 ha

21A Ave

25 St

24 St

22 Ave

23 Ave

Land O' Lakes Dr

Westgate Cres

Area '3'
7.48 ha

Westgate Dr

24 Ave

25 Ave

PRE-DEVELOPMENT

Area '4'
13.38 ha

EXISTING CHANNEL

From Area (Offsite)

1:5 YEAR
Peak Flow=133 lps
Volume=401 m³

1:100 YEAR
Peak Flow=448 lps
Volume=2630 m³

Area '8'
3.90 ha

30 St

LEGEND

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

- STORM MANHOLE AND PIPE

FUTURE UTILITIES

- STORM MANHOLE AND PIPE

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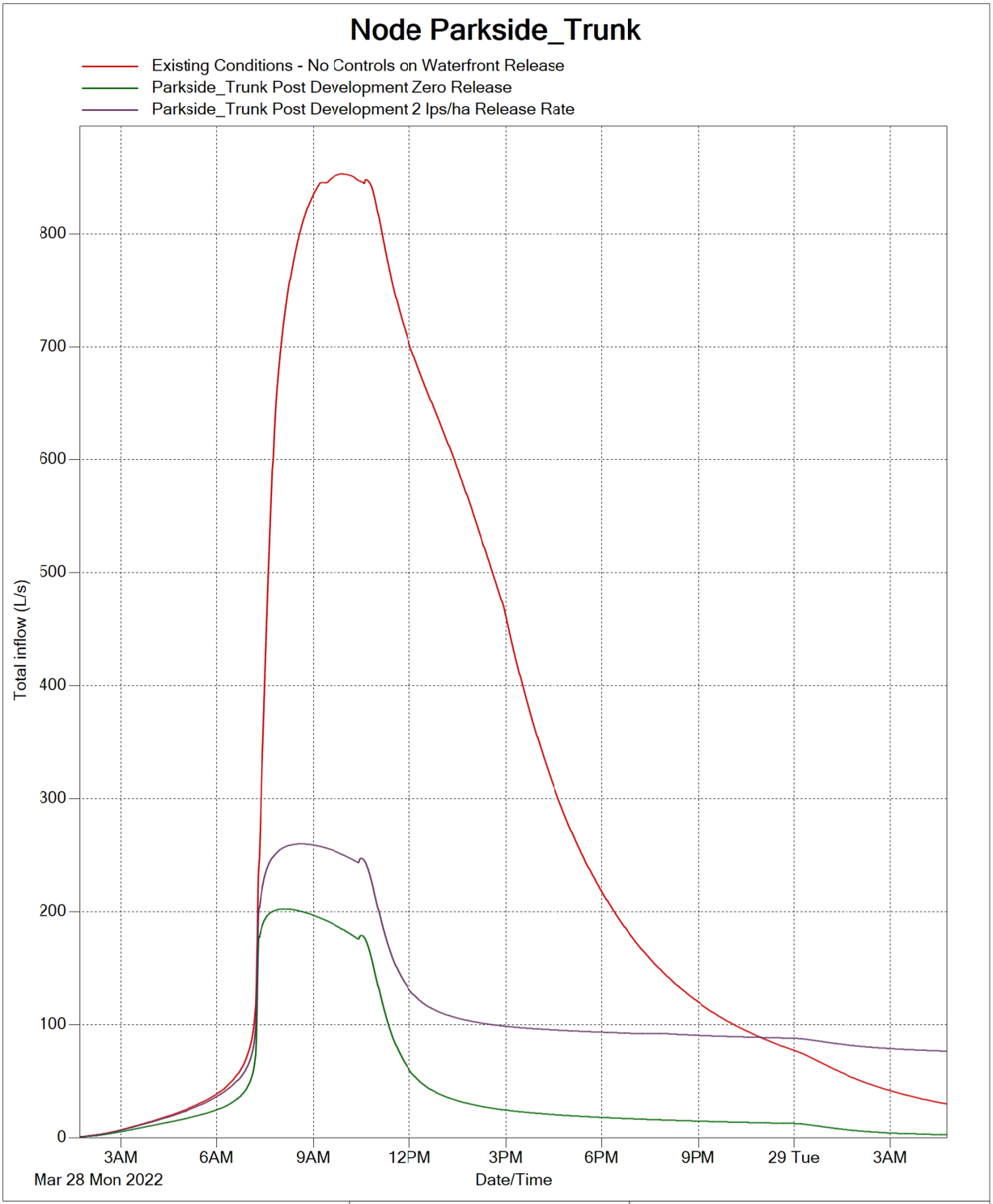
Dec 01, 2022

PRE-DEVELOPMENT
OFFSITE INFLOW AND OUTFLOWS
FIGURE 7.0



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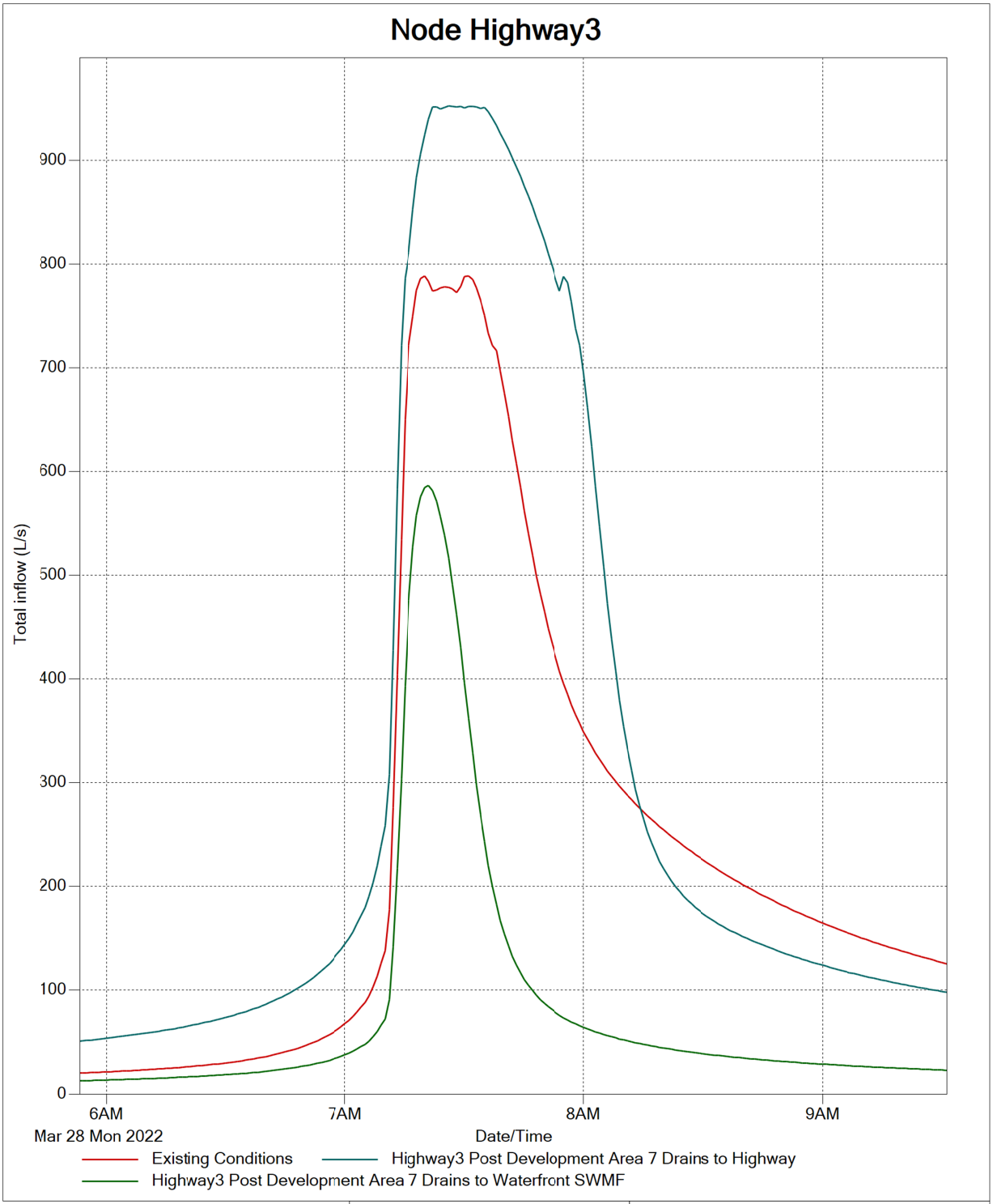
Outlet to Parkside Trunk STM71 Lethbridge 1:100 year Chicago 24 hour Rainfall Event	**Stormwater Management Plan West Coaldale ASP Amendment Coaldale, Alberta**	
	File Number: 229648CE	**Figure 8**



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Highway #3 Ditch Outlet

Lethbridge 1:100 year Chicago 24 hour Rainfall Event

Stormwater Management Plan West Coaldale ASP Amendment Coaldale, Alberta

File Number: 229648CE

Figure 9

To Birds of Prey Wetlands Facility

30 St

Crowsnest Highway

Highway 3

Hwy #3 Discharge

1:5 YEAR
Peak Flow=635 lps
Volume=1,924 m³

1:100 YEAR
Peak Flow=953 lps
Volume=6,350 m³

To Birds of Prey Wetlands Facility

Parkside Trunk Discharge

1:5 YEAR
Peak Flow=159 lps
Volume=1,275 m³

1:100 YEAR
Peak Flow=204 lps
Volume=4,330 m³

To Parkside Acres Stormwater Facility

Area '9'
1.37 ha

21 Ave

Area '5'
1.77 ha

Area '1'
4.21 ha

Land O' Lakes Dr

FUTURE COMMERCIAL
Area '7
4.22 ha

Area '6'
1.47 ha

AREA '10'
SWMF
1.81 ha

Area '2'
3.67 ha

Waterfront

Landing

21A Ave

25 St

24 St

22 Ave

23 Ave

PROPOSED DEVELOPMENT

Area '4'
13.38 ha

Area '3'
7.48 ha

Westgate Cres

Westgate Dr

24 Ave

25 Ave

From Area (Offsite)

1:5 YEAR
Peak Flow=154 lps
Volume=517 m³

1:100 YEAR
Peak Flow=524 lps
Volume=2,840 m³

Area '8'
3.90 ha

FLOW ALONG THE GOLF COURSE CONCEPTUAL

LEGEND

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

- STORM MANHOLE AND PIPE

FUTURE UTILITIES

- STORM MANHOLE AND PIPE

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Stormwater Management Plan
West Coaldale ASP Ammendment 2022

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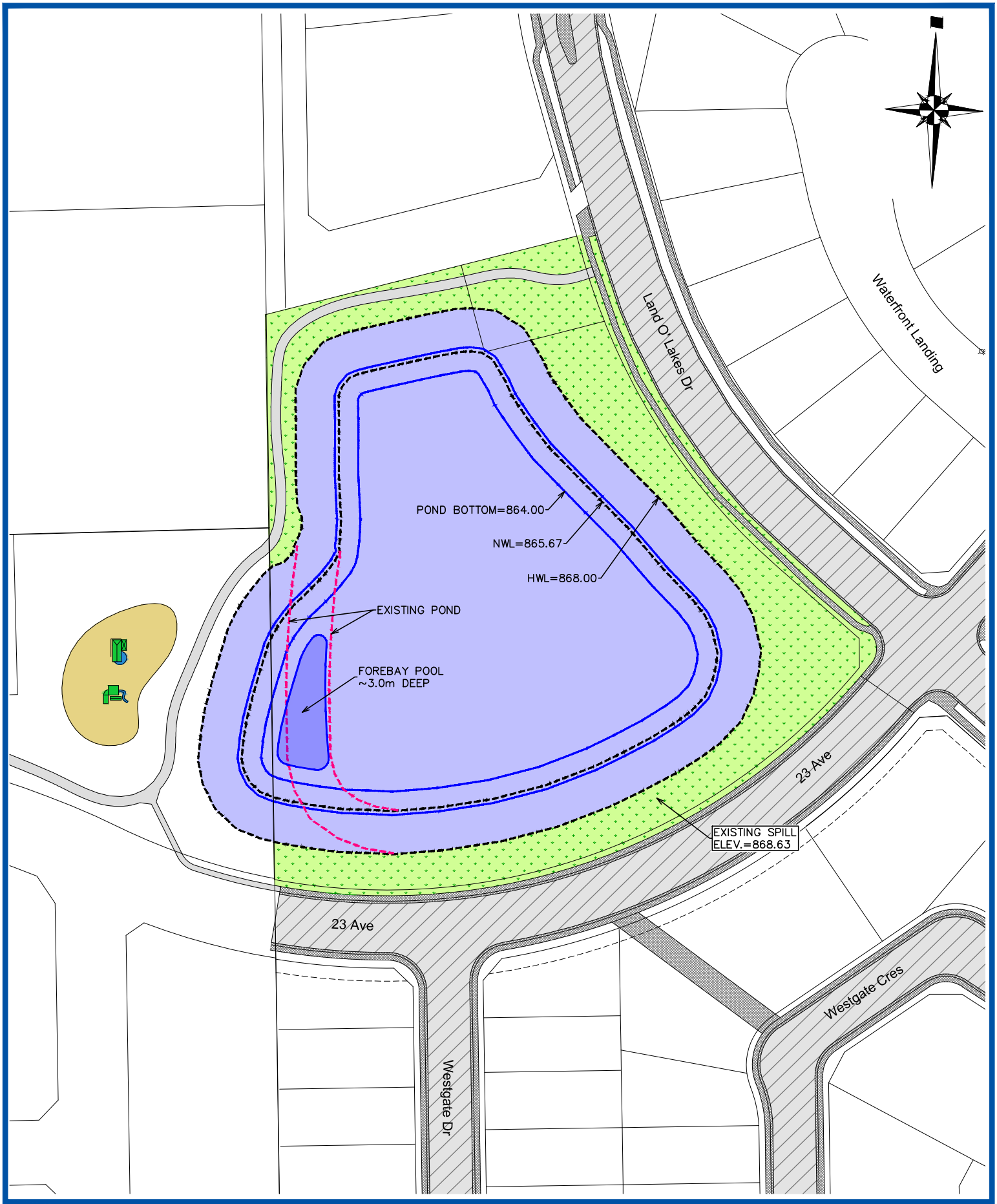
PROPOSED STORMWATER MANAGEMENT PLAN
OFFSITE INFLOWS AND OUTFLOWS
FIGURE 10.0



WATERFRONT SWMF CONCEPT

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FIGURE 11.0

To Birds of Prey
Wetlands Facility

30 St

Crowsnest Highway

Highway 3

Area '9'
1.37 ha

21 Ave

Area '5'
1.77 ha

Area '1'
4.21 ha

21A Ave

25 St

24 St

Land O' Lakes Dr

FUTURE
COMMERCIAL
Area '7'
4.22 ha

Area '6'
1.47 ha

Waterfront

Landing

Area '2'
3.67 ha

22 Ave

AREA '10'
SWMF
1.81 ha

NEW SMRID TURN OUT
FOR WATERFRONT SWMF
MAKEUP WATER

NEW OUTFALL

23 Ave

300 Ø STM
525 Ø STM
525 Ø STM
600 Ø STM
675 Ø STM
750 Ø STM

PROPOSED
DEVELOPMENT

300 Ø STM
375 Ø STM
675 Ø STM
450 Ø STM

Area '4'
13.38 ha

Westgate Cres

Westgate Dr

FH

Area '3'
7.48 ha

23 Ave

24 Ave

25 Ave

Area '8'
3.90 ha

EX. CULVERT TO REMAIN

FLOW ALONG THE GOLF
COURSE CONCEPTUAL

LEGEND

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

- STORM MANHOLE AND PIPE

FUTURE UTILITIES

- STORM MANHOLE AND PIPE
- EXISTING SMRID PIPE AND TURNOUT

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Stormwater Management Plan
West Coaldale ASP Ammendment 2022

STORMWATER - MINOR SYSTEM

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FIGURE 12.0

Area '9'
1.37 ha

Area '5'
1.77 ha

Area '1'
4.21 ha

Area '6'
1.47 ha

FUTURE
COMMERCIAL
Area '7'
4.22 ha

1:5 YEAR PRE-DEVELOPMENT
FLOW 104 LPS

ONSITE
DETENTION
REQUIRED

ONSITE
DETENTION
REQUIRED

ONSITE
DETENTION
REQUIRED

AREA '10'
SWMF
1.81 ha

Area '2'
3.67 ha

PROPOSED
DEVELOPMENT

Area '4'
13.38 ha

Area '3'
7.48 ha

Area '8'
3.90 ha

DITCH
TRAPPED
LOW

FLOW ALONG THE GOLF
COURSE CONCEPTUAL

Highway 3
Crowsnest Highway
30 St
21 Ave
Land O' Lakes Dr
21A Ave
25 St
24 St
22 Ave
Waterfront
Landing
23 Ave
Westgate Cres
Westgate Dr
24 Ave
25 Ave

LEGEND

CATCHMENT AREAS

OVERLAND FLOW ROUTE

TRAPPED LOW

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

STORM MANHOLE AND PIPE

FUTURE UTILITIES

STORM MANHOLE AND PIPE

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STORMWATER - MAJOR SYSTEM

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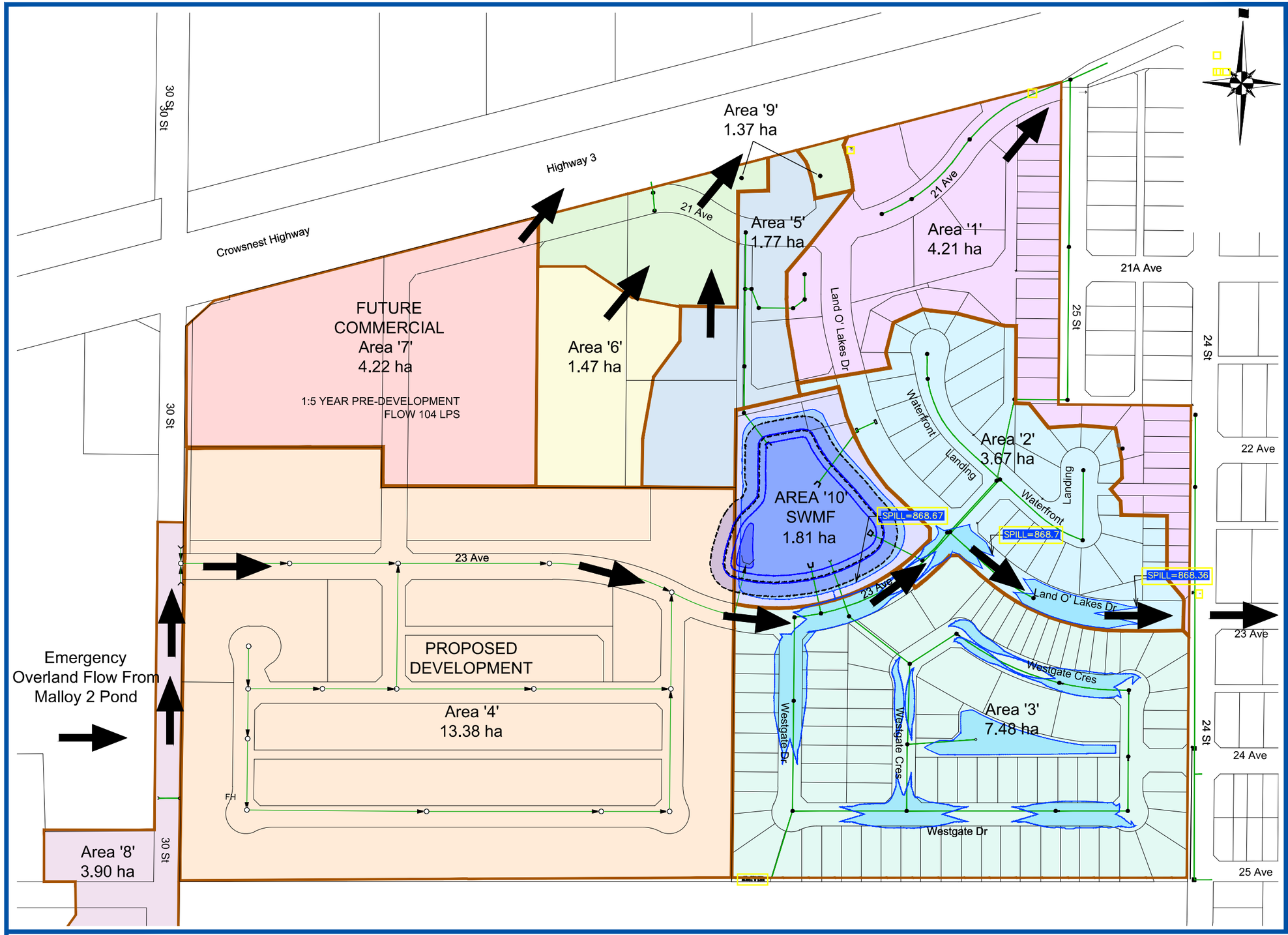
FIGURE 13.0



LEGEND

- CATCHMENT AREAS
- EMERGENCY OVERLAND FLOW ROUTE
- AREA PONDING AT SPILL ELEVATIONS

SUB-CATCHMENTS

- AREA '1'
- AREA '2'
- AREA '3'
- AREA '4'
- AREA '5'
- AREA '6'
- AREA '7'
- AREA '8'
- AREA '9'
- SWMF

EXISTING UTILITIES

- STORM MANHOLE AND PIPE

FUTURE UTILITIES

- STORM MANHOLE AND PIPE

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STORMWATER EMERGENCY STORAGE

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FIGURE 14.0