Application for Amendment to Land Use Bylaw

Foothills County **www.foothillscountyab.ca**
309 Macleod Trail, Box 5605, High River, AB T1V 1M7 • Tel: 403-652-2341 Fax: 403-652-7880
Email: planning@foothillscountyab.ca

Note: An Application Fee of $ 1,600.00 shall accompany this application.

Date Received: May 9-25 Receipt No. 439484

THIS SECTION TO BE COMPLETED IN FULL BY THE APPLICANT

I, Diane Benoit-Hill - Choice Storage Solutions Inc
Name of Registered Owner (please print)

hereby certify that I am the registered owner of the land described above and authorize

Diane Benoit-Hill to act as agent in the matter.
Name of Agent (please print)

PLEASE ACCEPT THIS APPLICATION REGARDING LEGAL LAND DESCRIPTION

All/part of the NE 1/4 sec. 6 twp. 20 range 28 west of 4th meridian.

Being all parts of lot 1 block 2 Reg. Plan No. ~~1014651~~ 2310476 C.O.T. No. _____

TO: (Choose One)

☐ Redesignate from _____ to _____

☑ Amend the Land use Bylaw by Site specific amendment to allow for RV storage.

Size of existing parcel(s) 35.75 Size of proposed parcel(s) 2.7 acres

The reasons for the (redesignation) (amendment) are as follows:

Site Specific Amendment to allow for RV storage.

I certify that the information given on this form and attachment hereto are full and complete and is to the best of my knowledge a true statement of the facts concerning this application and I am the registered owner and/or the duly authorized agent.

Date May 9, 2025 Signed _____

Landowner Information

Phone No. [redacted]

Address: [redacted]

I consent to receive documents by email: ☑ Yes ☐ No

Email Address: [redacted]

Agent Information

Phone No. _____

Address: _____

I consent to receive documents by email: ☐ Yes ☐ No

Email Address: _____

Right of Entry

I, being the owner or person in possession of the above described land and any buildings thereon consent to an authorized person designated by Foothills County to enter upon the land for the purpose of inspection during the processing of this application.

May 9, 2025 [redacted]
Date Signature of Owner

Is there an access or safety concern with respect to a site inspection: ☐ Yes ☑ No

If yes, please clarify:

_____

_____

_____

***Important Note: Applications must be received with original signed signature. Photocopies, faxes and emails will not be accepted.**

DISCLAIMER: Please note that the personal information collected on this form is authorized under the Municipal Government Act and is required for the purpose of the County's Planning and Development processes. This information may also be shared with appropriate government agencies and may also be kept on file by those agencies. The application and related file contents will become available to the public and are subject to the provisions of the Freedom of Information and Protection of Privacy Act (FOIP). If you have any questions about the collection and use of this information, please contact the Municipal Planner at 403-652-2341.

08/19

Application Responses:

Land Use & Development Permit Applications must be accompanied with the following information:

1. Site Plan (see files attached)
   a. Entire Parcel
   Aerial view, see attached from Absolute Surveys

   b. Drawing
   See attached

   c. Aerial View Showing Buildings
   See attached

   d. Identify and show all existing structures and any proposed buildings with measurements from the same, in feet or metres, to all parcel lines;
   Structures on Boundary Adjustment Property include House and Barn shown on photo map 2.7 acres indicated in red south of the current yard, bordering house and barn.

   e. show all existing wells, septic tanks, disposal fields, dugouts on the parcel and storage areas;
   Existing well is on West side of house, septic field South and West of house (see attached)
   ¬

2. Full description of the business, including what it is, and how it operates.
   Expansion of Storage Yard business by 2.4 acres immediately south of current yard for RV's. The office is open 10-5 Tuesday through Saturday. Customers access from 6am to 10 pm via card pass.
   We currently have both indoor and outdoor storage. This application for the 2.4 acres expansion is for RV storage ONLY.

3. Please indicate if the business is primarily run from the parcel or off site.
   Yes run from on site

4. What buildings will be used on the parcel for this business, include storage areas.
   The house is currently being rented. All other structures are vacant and will not be used. There are no plans to use any of the other structures in the future.

5. Are there any buildings proposed and if so, for what purposes will they be used for. Please also include the building size and why it is necessary.
   No, not at this time

6. Number of people to be employed, both on site and off site.
   1 employee other than owners

7. If producing a product or goods please indicate the method of distribution or sales.
   No, Storage yard only

8. Provisions for loading and parking.
   Not applicable

9. Access locations to and from the lot including roads and highways to be used and dust control measures to be implemented.

Paved Municipal Road to front gates, maintained gravel entrance

10. Vehicle generation, break down between employees and customers on a daily basis, also please list the types of vehicles to be expected.

RV type vehicles in and out, consisting of campers, motor home and boats. I have no way of determining how often the new customers would access their trailers. This is completely dependant on the new customers.

11. Parking Plan;

Existing, no new

12. Building Designs;

None currently

13. Will there be deliveries to the site, if so, how many and how often.

No

14. Hours and days of operation.

Existing 6:00 am to 10 pm

15. Amount of water required for this business.

Office requirement only 1-2 staff

16. Garbage and storage areas and the fencing and screening proposed for same, and methods for disposing of garbage.

We dispose of the garbage by hauling it to the Foothills Landfill and Resource Recovery Centre

17. Methods of controlling noise, dust, or drainage from the lot.

Recycled asphalt placed on storage lanes

18. Descriptions of any noxious, toxic, radioactive, flammable, or explosive materials proposed (i.e. gas, oil, paint, etc.). Please also include how it is being stored and how much is being stored and why it is necessary to have in relation to this business.

None

19. Particulars of any proposed use or involvement by persons other than residents of the lot.

None

20. Are there proposed to be any events to be held, if so, please include the following:

- how many per year & months in which they will be held, including how many days and hours of operation;
- what type of events they are;
- how many people, with a break down of employees and attendees;

None

21. Will there be land contouring done to accommodate this use and if so we need to

determine that you do not fall under our Lot Grading definition, which will require additional permits.

Yes , in the future

22. If you do not fall under the definition of Lot Grading, please provide the details on how you will be contouring the land to accommodate this use, even if the contouring is minimal.

Any lot grading will be to done as development proceeds

23. What type of landscaping is proposed for this site (i.e. vegetation, fencing) and will it require any additional water. Please note that it is the preference of the municipality to have developments visually screened along highways by adding landscaping elements. Please note that the M.D. of Foothills has screening standards, adopted by Council by Resolution.

No additional landscaping planned at this time, private area, no property along highway. There are no roadways in close proximity.

¬24. What type of outdoor lighting is proposed for the site. Please note that there is a Dark Sky Bylaw in place with the M.D. of Foothills.

Future site lighting will comply, and match existing rows planned for storage. There is no existing lighting and there are no current plans to add lighting.

25. Method of advertising, if a sign is proposed to be placed on site, you must include this as part of your application, whereby there is additional information to be included, please see additional information on applying for signs, without this information it will not be considered at this time and additional applications will be required.

No additional signage required at this time.

26. Storm water management plans;

See attachment

¬27. Any other plans prepared by a Professional Engineer relevant to the project, which may be required as a condition of Council, if approved;

See attachment

28. If this parcel is not owned by the applicant, then they must receive written consent from the landowner to file an application.

Owned by applicant

Brenda Bartnik

From: Choice Storage <office@choicestorage.ca>
Sent: June 26, 2025 10:54 AM
To: Brenda Bartnik
Cc: Diane Benoit-Hill
Subject: Foothills application for Site Specific Amendment

Thank you for your assistance. I have replied to the best of my knowledge. If you need anything further, please feel free to call me.
Diane Benoit-Hill
[redacted]

From: Brenda Bartnik <Brenda.Bartnik@FoothillsCountyAB.ca>
Sent: Wednesday, June 25, 2025 2:42 PM
To: Choice Storage <office@choicestorage.ca>; Diane Benoit-Hill [redacted]
Subject: Foothills application for Site Specific Amendment

Thank you for taking the time to speak with me this afternoon.

I have attached a copy of the receipt for payment of the initial application fees.

Further to our conversation I have noted the following. If I am incorrect, please be sure to let me know:

- The existing garage/shed is being used for the business owner's personal storage That is correct
- It is anticipated that the existing barn will be removed from the property That is correct
- Access to the RV Storage facility (both new and existing) will be from the access point beside the office (and not via the easement that borders the highway) That is correct

I am expecting additional comment from you respecting how the expanded area will be fenced and as to how it is to be screened from the view of the highway.
Once this is received, the file will be sent out for comment by any internal departments and external agencies.
Currently there is chain link fence running the entire east property line. The intention is to build a berm and plant trees to screen from the highway, once we reach that portion of development.

The public hearing for your application is tentatively scheduled for 1:30 PM on September 24, 2025.
Should you wish to request of Council all three readings at once the following need to be completed prior to the hearing:

- Submission of final fees: $1,500.00
- Submission of a complete application for development permit and fees in the amount of $500.00

I will remind you of this prior to the hearing. Yes I would like all 3 readings at once if possible.
Do you need an additional credit card authorization filled out, or can you use what you have to process these payments?

So you are familiar, the application to Council will outline both the existing development and what you wish to add to it. It will also include a request to vary the setback requirements for existing shed/garage.

I will be in contact nearer to the hearing date so I can attend the property and take some pictures.

At this time, I need to confirm that all you are requesting is the additional 164 RV's on a 2.4 acre area of the property. I ask this as it is important to remember that you will be required to go through this process again (a site specific amendment and development permit application) if you wish to expand in the future. Alternately, you could ask for the ability to store enough RV's to fill the property and identify that this may occur in phases. Which would mean that for future expansions, all you would require is a development permit application. You would not first have to receive approval for a Site Specific Amendment

If you choose to do this, you will additionally need to identify the following under this application. I would need to receive this information no later than July 24, 2025 in order to ensure the information was available in time for a September public hearing:

- What the maximum overall number of RV's on the property would be, and what type of phasing you would be looking at
- What the maximum anticipated related trips for the RV's would be at build out
- A plan for addressing surfacing of the lot as a whole and stormwater management/drainage for the property
- A plan for visual screening from the highway

At this point, it is unclear as to whether we would look to fill the property with just RV's. Therefore, I am requesting the 164 RV's on the 2.4 acre property for now.

Please feel free to let me know of any questions that you have.

Brenda Bartnik
Planning & Development Officer
Foothills County
Direct line: (403) 603-6222
Brenda.bartnik@foothillscountyab.ca

Brenda Bartnik

From: Choice Storage <office@choicestorage.ca>
Sent: June 14, 2025 4:05 PM
To: Brenda Bartnik
Cc: Diane Benoit-Hill
Subject: Foothills application for Site Specific Amendment

Hi Brenda,

Thank you for the email. I have done my best to answer all the questions you have asked.

1. Please revise the application to identify our legal address as you recommended. If you are available on Wednesday to touch base, please offer and time to discuss.
2. The existing 6.39x9.14 is a shed with no foundation. The office will be used to support the expanded area; the shed will not at this time. If you feel that I should include the request to Council to acknowledge the sheds' location under this application, please do so.
3.
    1. The size of the existing RV Storage/Commercial Storage area is approximately 11.97 acres.
    2. The maximum number of RV's stored at any given time is 539 units.
    3. There are 196 units available to rent in the Commercial Storage Buildings.
    4. Yes, that is correct.
    5. Yes, the shed will be removed from the property. The well is shielded with a 24-inch culvert.
    6. Based on current averages, the maximum expected is 70 daily trips.
    7. The source of the water that supplies the office is a well and cistern.
    8. The garbage bin is stored behind the office in a small covered 3-sided shelter.
    9. The current area of expansion is chain link fence and is not visible from the highway.

The initial application fee can be taken from the credit card provided.

In order to ensure we have not missed any emails, please send to both office@choicestorage.ca and [redacted]

I really appreciate the September booking if possible. Please contact me if you have any further questions and I will respond as quickly as possible.

Kind Regards,

Diane Benoit-Hill

From: Brenda Bartnik <Brenda.Bartnik@FoothillsCountyAB.ca>
Sent: June 12, 2025 8:53 AM
To: [redacted]Choice Storage <office@choicestorage.ca>
Subject: Foothills application for Site Specific Amendment

Good morning Diane,

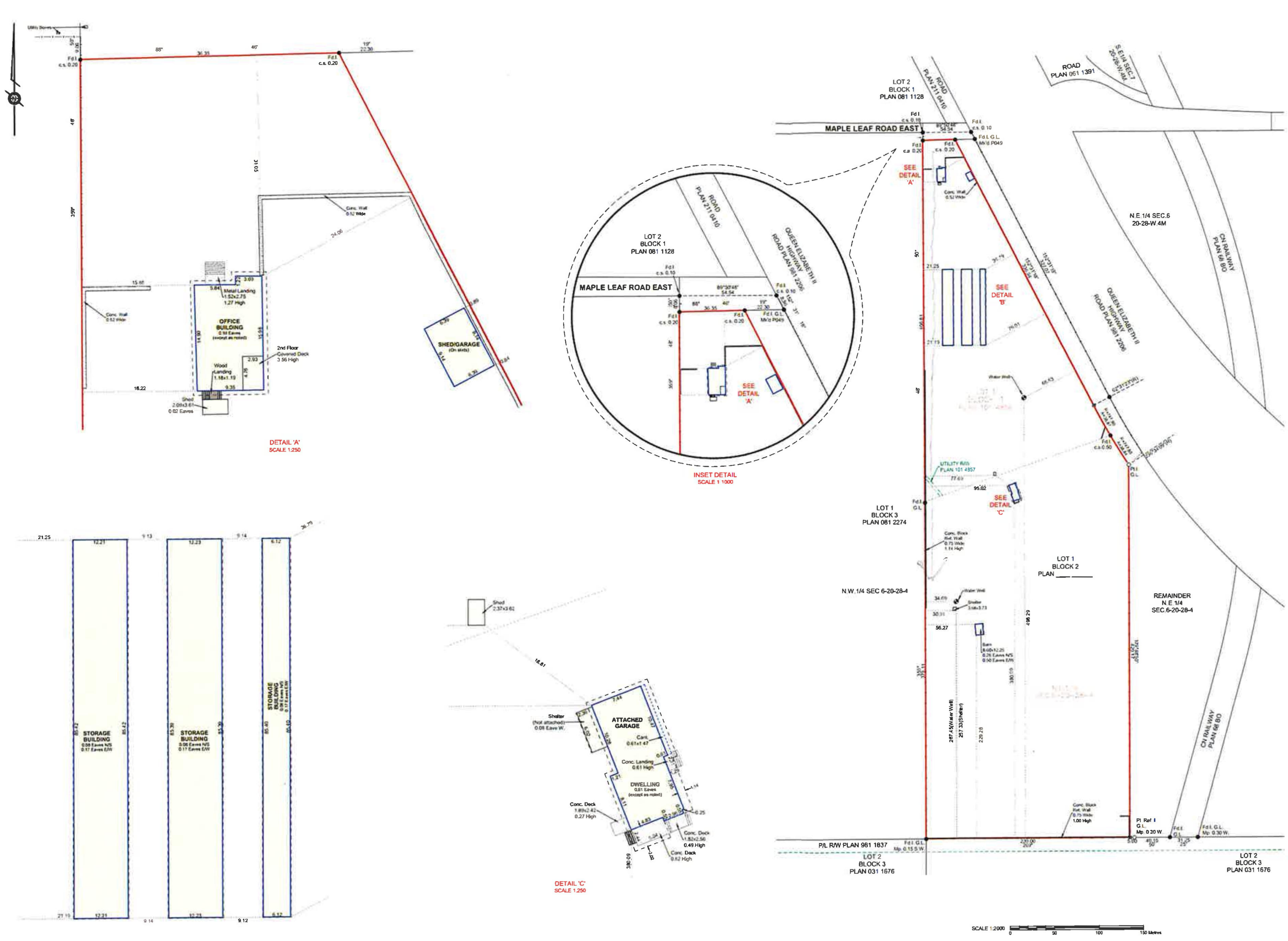
1. When changes to property boundaries are completed, a new legal land address for the lot is assigned by Alberta Land Titles and the lands become one property.
   At this time, your property is showing as a 35.75 acre parcel owned by Choice Storage Solutions Inc. under Plan 2310476, Block 2, Lot 1. Unless you have concern in this regard, I will revise your application to identify this legal land address.
   I suggest that we touch base respecting bringing the site into compliance under the current Land Use Bylaw under this application so that you have an understanding of how this may be beneficial.

2. The existing 6.39 x 9.14 Shed/Garage does not meet the required setback distance from the property line. With your confirmation, I will include the request to Council to acknowledge it's location under this application.
   Are this shed/garage and the office building used in support of the business, and will they additionally be used in support of the expanded storage area?
   If the barn is not proposed to be used for any purpose, is it anticipated that it will be removed from the lot?

3. Please confirm the following:

    1. The size (approximate acres) of the existing RV Storage/Commercial storage area
    2. The maximum number of RV's that are stored in the existing area at any given time
    3. The number of units that are rented in the Commercial Storage buildings
    4. You are proposing to add the use of a 2.4 acre area of the property to store an additional 164 RV's. Is this correct?
    5. There are a water well and a shelter identified in the area of the proposed expansion. Will this shed be removed from the property? Please provide comment as to protection/capping of the water well.
    6. While it is understood that the number of vehicle trips may be difficult to determine, based upon your experience, what is the approximate cumulative (all units combined – existing and additional development) maximum daily vehicle trips by clients that are anticipated to occur?
    7. What is the source of the water that supplies the office?
    8. Prior to taking garbage to the Landfill, where is it temporarily stored on site?
    9. How is this area of expansion the property fenced and how will the new/expanded storage area be screened from the view of the highway?

Please confirm that you would like this application put through and that the initial application fee can be taken off the credit card information provided.



ALBERTA LAND SURVEYOR'S REAL PROPERTY REPORT

SUBJECT PROPERTY:

LOT 1, BLOCK 1, PLAN 101 4856
80135 MAPLE LEAF ROAD EAST, FOOTHILLS COUNTY

ALBERTA LAND SURVEYOR'S CERTIFICATION:

I hereby certify that this Report and related survey, was prepared and performed under my personal supervision and in accordance with the Alberta Land Surveyors' Association's Manual of Standard Practice and supplements thereto. Accordingly, within those standards and as of the date of this Report, I am of the opinion that:

1. the plan illustrates the boundaries of the Property, the improvements as defined Part D, Section 8.5 of the Alberta Land Surveyors' Association's Manual of Standard Practice and registered easements and right-of-ways affecting the extent of the title of the Property;
2. the improvements are entirely within the boundaries of the Property;
3. no visible encroachments exist on the property from any improvements situated on an adjoining property;
4. no visible encroachments exist on registered easements or right-of-ways affecting the extent of the Property.

PURPOSE OF REPORT:

This report has been prepared for the benefit of the Property owner, subsequent owners and any of their agents for the purpose of (a land conveyance, support of a subdivision application, a mortgage application, a submittal to the municipality for a compliance certificate, etc). Copying is permitted only for the benefit of those parties.

Where applicable, registered easements and utility right-of-ways affecting the extent of the Property have been shown on the plan.

Unless shown otherwise, property corner markers have not been placed during the survey for this report. The plan should not be used to establish boundaries because of the risk of misinterpretation or measurement error by the user.

The information shown on this report reflects the status of this property as of the date of the survey only. Users are encouraged to have the Real Property Report updated for future requirements.

NOTES :

- Title Information is based on a title search dated June 28, 2022, C. of T. No. 111 014 676 & 211 212 569
- The survey was performed on: June 20 and June 21, 2022
- Ties to the property lines are at right angles or radial to the curve and are from the exterior walls unless otherwise shown.
- Perimeter Fences exist as shown
- Interior fences exist and are not shown
- Eaves are dimensioned to the line of fascia.
- All measurements are in metres.
- Property is subject to the following instruments:

- 2756 IG	- Restrictive Covenant
- 751 025 374	- Utility R/W
- 101 365 784	- Utility R/W - Plan 101 4857
- 101 365 786	- Development Agreement
- 101 365 785	- Caveat Re: Deferred Reserve

LEGEND:

SYMBOLS AND ABBREVIATIONS THAT MAY APPEAR ON THIS PLAN

- Iron Post found
- Iron Bar found
- Drill Hole found
- Calculated Position
- Boundary of Subject Property
- Right-of-Way
- Exterior Wall
- Eave
- Fence

A	Arc	I	Iron Post
A/C	Air Conditioner	m	metre
A.G.	Above Ground	Mk.	Mark
AR/W	Access Right-of-Way	OD	Overland Drainage
Calc.	Calculated	PL	Property Line
Cant.	Cantilever	R	Radius
Conc.	Concrete	(R)	Radial
c.s.	Countersunk	Reg.	Registered
FCP	Fence Corner Post	Ret.	Retaining
Fd	Found	R/W	Right-of-Way
fdn	Foundation	URW	Utility Right-of-Way
FL	Floor	WW	Window Well
G.L.	Ground Level		

Dated at Okotoks, Alberta,
June 30, 2022

M. Kent Croucher, A.L.S.

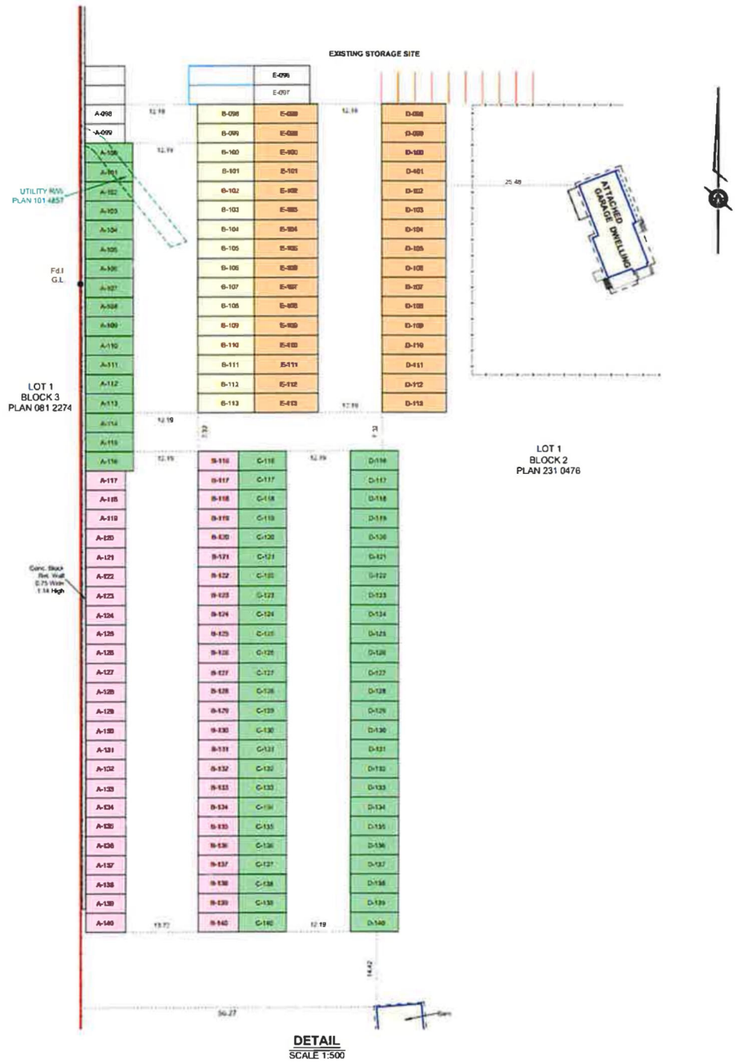
This document is not valid unless it bears a signature (in blue ink) and an Absolute Surveys Inc. permit stamp (in red ink).

ALBERTA LAND SURVEYORS' ASSOCIATION PERMIT NUMBER P 300 ABSOLUTE SURVEYS INC.

REV.	COMMENT	DATE	INITIALS
0	Issued	Jun. 30, 2022	ES/MDUR

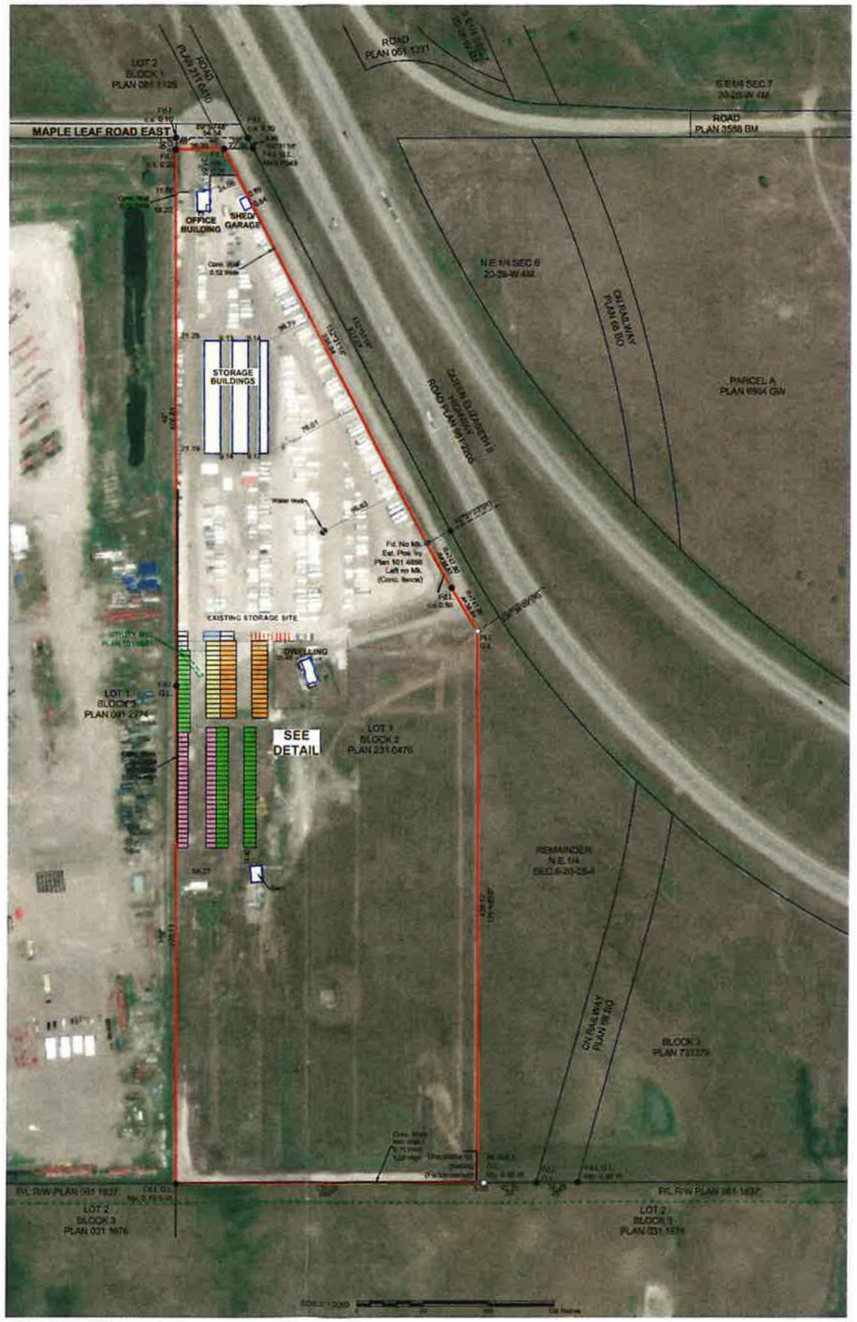
ABSOLUTE SURVEYS
69 Elma Street West
Okotoks, Alberta T1S 1J8
Office: 587-757-0634

CAD File: 22-0587RPR
Job No.: 22-0587



DETAIL
SCALE 1:500

PROPOSED STALL COUNT	
SIZE	COUNT
7.62x3.66m (25'x12')	46
9.14x3.66m (30'x12')	70
10.67x3.66m (35'x12')	18
12.19x3.66m (40'x12')	32



SKETCH PLAN
SHOWING
PROPOSED DEVELOPMENT

SUBJECT PROPERTY:

LOT 1, BLOCK 1, PLAN 101 4856
80135 MAPLE LEAF ROAD EAST, FOOTHILLS COUNTY, ALBERTA

NOTES:

1 DISTANCES ARE IN METRES AND DECIMALS THEREOF.
2 BEARINGS ARE 3TM 114° GRID AND ARE DERIVED FROM GNSS OBSERVATION
COMBINED SCALE FACTOR: 0.999741

LEGEND:

SYMBOLS AND ABBREVIATIONS THAT MAY APPEAR ON THIS PLAN SHOWN BELOW

ALBERTA SURVEY CONTROL MARKER
CALCULATED POSITION
FOUND STATUTORY IRON POST
IRON BAR FOUND
SURVEY CONTROL POINT
ESTABLISHED BENCHMARK
PROPOSED 25' STALL:
PROPOSED 30' STALL:
PROPOSED 35' STALL:
PROPOSED 40' STALL:
SPOT ELEVATIONS
BOLLARD
CATCH BASIN
FIRE HYDRANT
LIGHT STANDARD
MANHOLE
POLE ANCHOR
POWER POLE
WATER VALVE
BUSH
FENCE LINE
EXTERIOR WALL
PROPERTY LINE
OVERHEAD POWER LINE
BURIED POWER LINE
OVERHEAD TELECOM LINE
BURIED TELECOM LINE
BURIED GAS LINE
SANITARY LINE
STORM LINE
WATER LINE
C/L DRAINAGE
TOP OF SLOPE
TOE OF SLOPE
CONTOUR MAJOR(5m)
CONTOUR MINOR(1m)

A	Arc	M	Meridian
ac.	Acre	M.D	Municipal District
A.G.	Above Ground	MH	Manholes
ARW	Access Right-of-Way	Mk.	Mark
ASCM	Alberta Survey Control Marker	Mk'd	Marked
B.G.	Below Grade	Mon.	Monument
Blk.	Block	Mp	Marker Post
BOC	Back of Curb	MR	Municipal Reserve
BOW	Back of Walk	N.	North
C. of T.	Certificate of Title	NAD	North American Datum
Calc	Calculated	P	Brass Cap
CB	Catch Basin	Pl.	Placed
CL	Center Line	Pos	Position
CSRS	Canadian Spatial Reference System	PPP	Precise Point Positioning
c.s.	Countersunk	PUL	Public Utility Lot
Δ	Central Angle of Curve	R	Radius
D.H.	Drill Hole	(R)	Radial
E.	East	Re-est	Re-established
EO	Electrical Outlet	Ref.	Reference
EOA	Edge of Asphalt	Res.	Restored
Est.	Established	RGE.	Range
FCP	Fence Corner Post	R/W	Right-of-Way
Fd.	Found	RP	Roof Peak
FL	Fence Line	S	South
FOC	Face of Curb	SEC	Section
G.L.	Ground Level	Sck.	Spike
GNSS	Global Navigation Satellite System	TH	Test Hole
ha	Hectare	TWP.	Township
I.	Statutory Iron Post	(typ.)	Typical
I.Bar	Iron Bar	UR/W	Utility Right-of-Way
Int.	Intersection	UTM	Universal Transverse Mercator
Inv.	Invert	W.	West
LOC	Lip of Gutter	WV	Water Valve
LS	Light Standard		

DISCLAIMER:

This plan represents the best information available at the time of the survey. Absolute Surveys takes no responsibility for the location of any underground pipes, conduits or facilities, whether shown on or omitted from this plan. Owner/contractor must confirm the location of buried facilities prior to construction.

CLICK BEFORE YOU DIG
UTILITY SAFETY PARTNERS
www.utilitysafety.ca
1-800-242-3447

Dated at Okotoks, Alberta,
May 27, 2025.

M. Kent Croucher, A.L.S.

P 300
ABSOLUTE SURVEYS INC.

REV.	ISSUED / COMMENT	DATE	INITIALS
0	Issued	May. 27, 2025	MDKC

SHEET 1 OF 1

ABSOLUTE SURVEYS
69 Elma Street West
Okotoks, Alberta T1S 1J8
Office: 587-757-0634

CAD File: 25-0315SK
Job No.: 25-0315

Choice Storage (Lot 2) Stormwater Management Plan

Site details:

Legal Description:	Lot 2, Blk. 1, Plan 221____, NE6-20-28-4
Municipal Address:	80135 Maple Leaf Rd (418 Av) E.
Municipality:	Foothills County, AB
Development Permit:	[__]

Client:	Choice Storage
Project:	220740
Date:	31 May 2022

OSPREY ENGINEERING INC.
BOX 1367 · BLACK DIAMOND, ALBERTA · T0L 0H0 CANADA
TEL.: 403.933.2226 · EMAIL: ospreyeng@gmail.com

PROFESSIONAL AUTHENTICATION

This professional work product was produced by or under the direct supervision of the persons noted in compliance with Osprey Engineering Inc.'s professional practice management plan. If errors or omissions are suspected or found, please contact the author or authenticating professional forthwith.
This report is to be used by the client/s noted and the authority having jurisdiction for the purpose/s noted.
Osprey Engineering Inc. accepts no responsibility for the work of others.
Osprey Engineering Inc. accepts no responsibility for others' conclusions derived from this report.

Authenticating professional:

Responsible member for
OSPREY ENGINEERING INC.
Association of Professional Engineers and Geoscientists of Alberta Permit to Practice No. P10743

Michael A. Kitchen, P.Eng.
President

EXECUTIVE SUMMARY

The Choice Storage (Lot 2) Expansion is located on a parcel immediately south of the existing Choice Storage site at the east end of Maple Leaf Road (418 Avenue) E.—adjacent to the former intersection with Highway 2. The proposed parcel is 8.72 ha [21.53 acres] more or less. The owner proposes to develop this site as a gravel storage yard. An existing dwelling on the parcel will be retained.

To manage runoff due to the development of the site, a bioretention area will be constructed along the east property line with discharge to adjacent via a 250-mm PVC culvert. Due to the existing property grades, this bioretention area will consist of 4 cells at varying elevations. Each cell will be connected by a check dam to ensure runoff is retained and infiltrated as much as is practical. The bioretention system ensure that runoff is retained and controlled to a rate less than 8.8 L/s/ha for events up to the 100-year return period. This is consistent with offsite runoff from the existing Choice Storage lot.

The design of the bioretention area is such that the volume of runoff is reduced by 95% over uncontrolled. As such, the required water quality enhancement target of removal of 85% or total suspended solids larger than 75 µm is met.

Due to the existing grades, an area in the west portion of the parcel cannot be conveyed eastward. The proposed grading ensure that this area is as small (0.64 ha) as practical and is significantly less than was previously draining west to adjacent land (3.6 ha).

TABLE OF CONTENTS

TABLE OF FIGURES

I. BACKGROUND

Choice Storage is a storage yard located south Maple Leaf Road (418 Avenue) in Aldersyde, Foothills County. Its general location is shown on Figure 1.

A. General Information

Table 1 provides details specific to this site.

Table 1 – General Details

Legal Description	**Lot 2, Blk. 1, Plan 221____**
ATS Reference	**NE6-20-28-4**
Development Permit	**[__]**
Drainage Area	**8.71 ha**
Discharges to	**Highwood River**

B. Study Area and Surrounding Development

The subject parcel is a 8.71 ha portion of an existing acreage located south of Maple Leaf Road (418 Avenue) E., in Aldersyde. To the north, the existing Choice Storage yard operates. The proponent intends to subdivide a new parcel (Lot 2) from the surrounding acreage and construct an expansion of Choice Storage's gravel yard.

Surrounding development (see Figure 2) is similar commercial and industrial uses to the west and north. To the east is Highway 2. Land to the south is pasture and a Canadian Pacific Railway junction.

Runoff from the site is split by a ridge as follows:

The easterly portion of the site (approximately 5.12 ha) drains eastward toward a large depression located on an adjacent parcel.

The westerly portion (approximately 3.6 ha) of the site drains to a large depression/pond located on land to the west.

The parcel is nominally tributary to the Highwood River. However, given the presence of active and former gravel pits in the area, it is most likely the runoff trapped in the adjacent depressions infiltrates with little to no surface runoff reaching the river bank.

C. Previous Reports and Designs

The are no master drainage plans, staged master drainage plans, watershed management plans or similar larger-scale plans affecting storm drainage from the subject parcel.

Table 2 lists plans known govern the design of the storm drainage system serving the subject parcel.

Table 2 – Storm Drainage Plans Governing Design

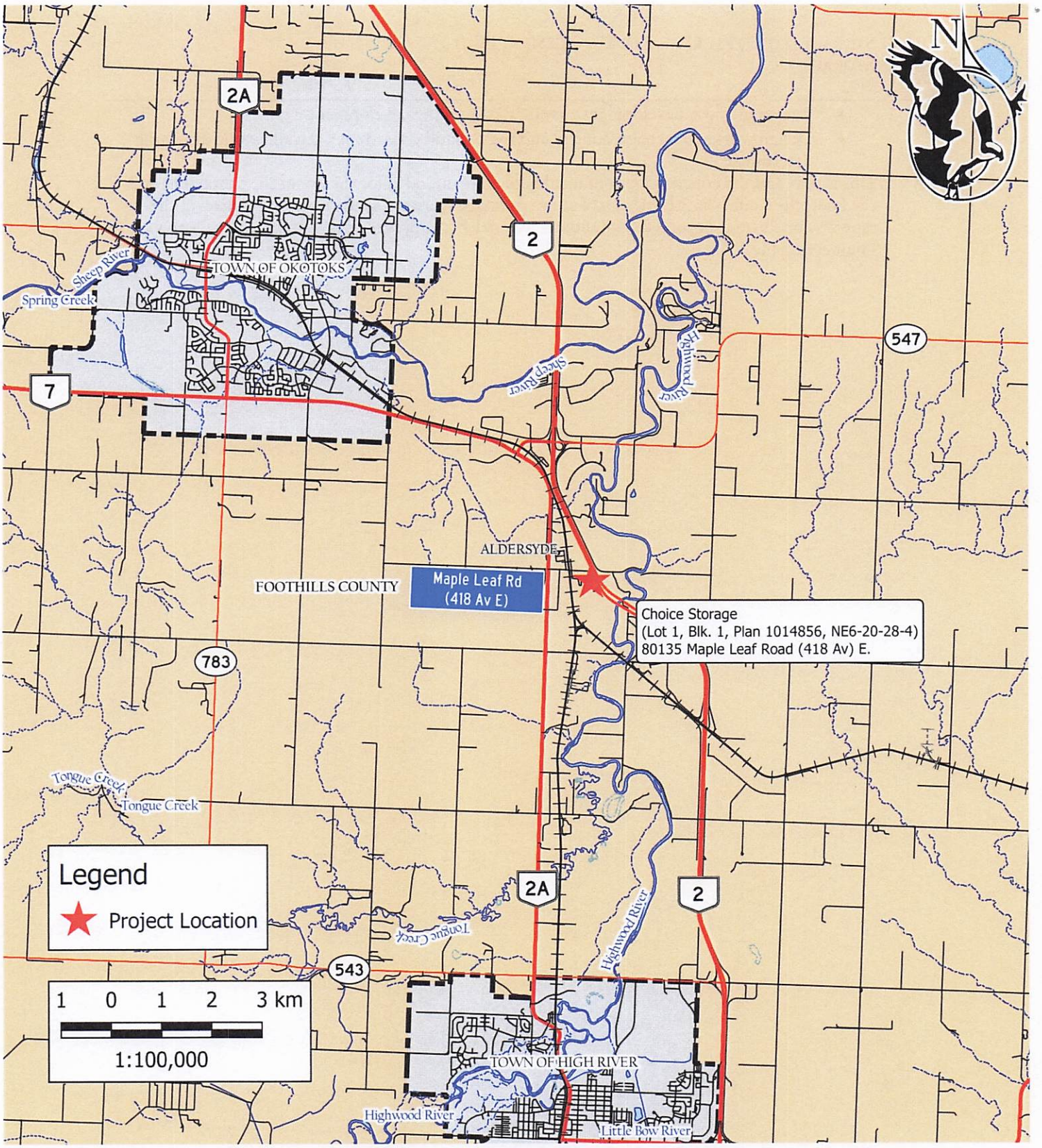
Plan	Citation	Detail
Laroque Investments – Hamlet of Aldersyde Subdivision, Stormwater Management Analysis - Revision	**(Steffler & Prozniak, 2010)**	**Storm drainage design for the existing Choice Storage property (Lot 1, Blk. 1, Plan 1014856) Prescribed allowable unit release rate (AURR) of 8.8 L/s/ha**

D. Report Purpose and Limitation

Osprey Engineering Inc. was engaged by the proponent to provide a stormwater management plan for the proposed development. Specifically, the following details were required:

- Determine post-development runoff rates from the development
- Design works to manage, control and treat runoff consistent with allowable discharge determined

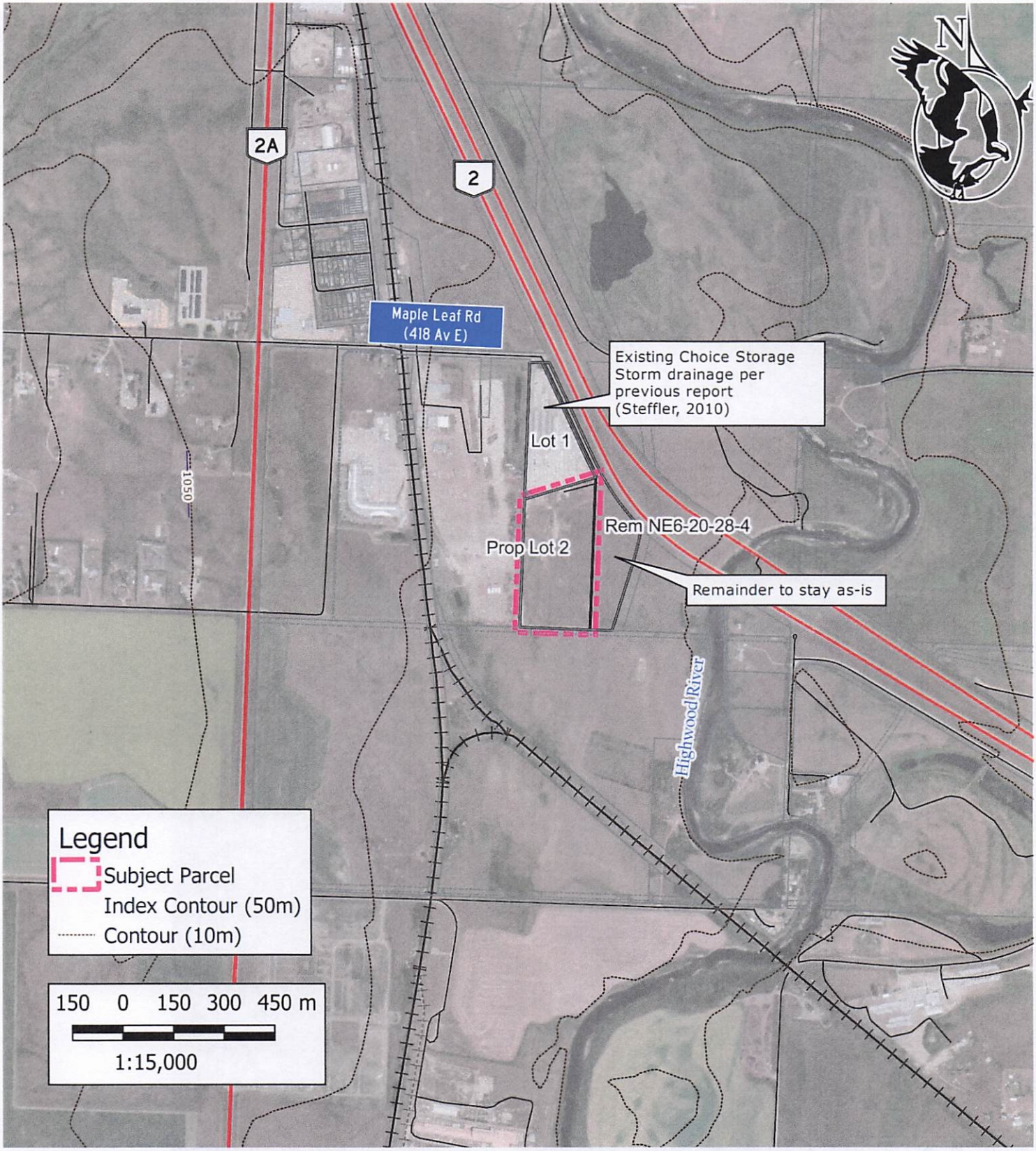
This report and the conclusions contained herein are intended for the use of the proponent and the Foothills County for the design of storm drainage works. Any use or extrapolation of the report's conclusions beyond the intent stated is neither supported nor warranted by Osprey Engineering Inc.



SPREY
ENGINEERING INC.

Choice Storage
Comprehensive Drainage & Grading

Figure 1 - Location



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Comprehensive Drainage & Grading

Figure 2 - Area Context

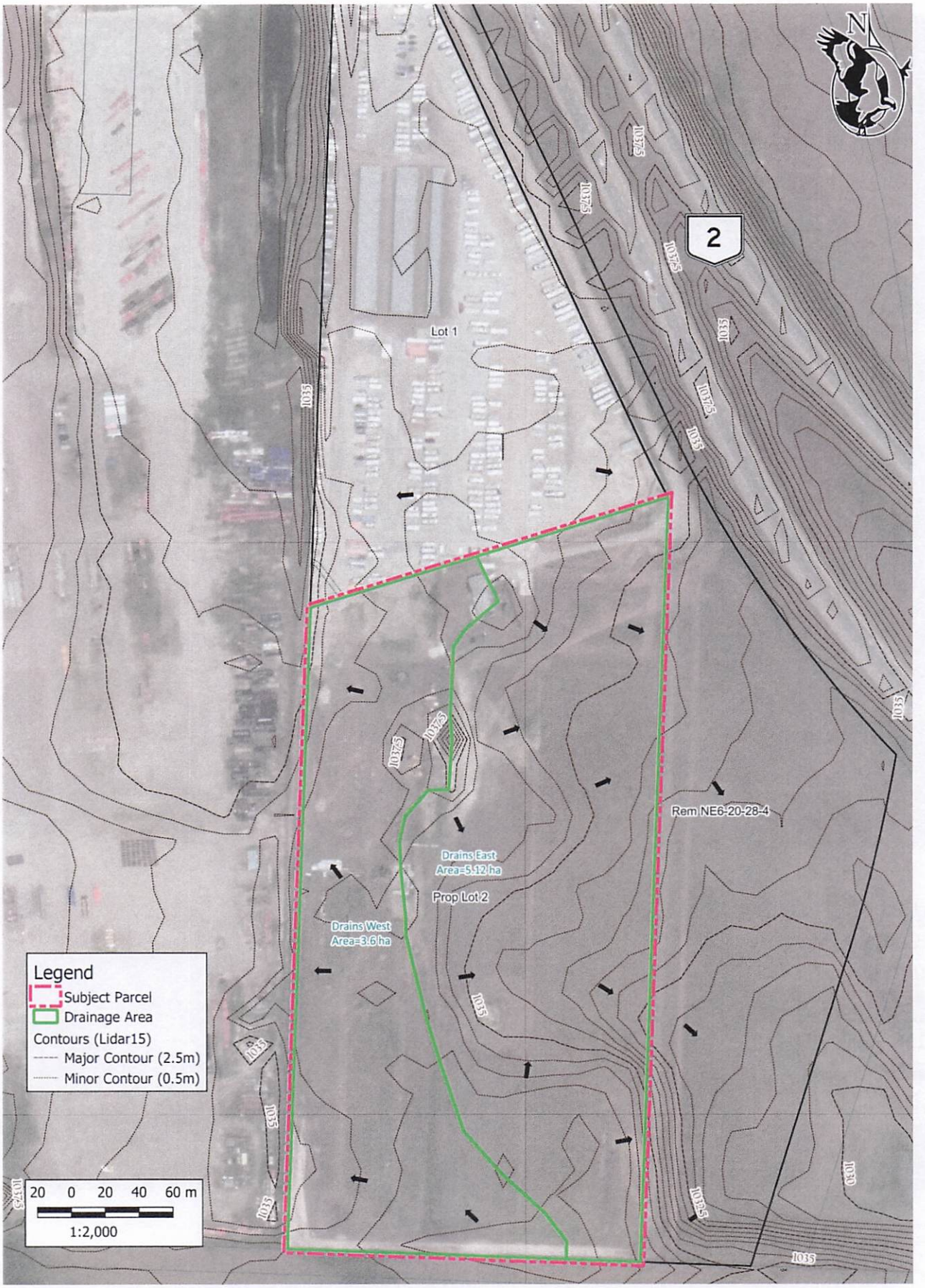


Figure 3 - Existing Surface Features

II. METHODOLOGY AND ASSUMPTIONS

This stormwater management plan and its associated analyses were consistent with the following documents:

- *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* (Alberta Environment and Parks, 2013)
- *Municipal Policies and Procedures Manual* (Alberta Environment and Parks, 2001)
- *Stormwater Management Guidelines for the Province of Alberta* (Alberta Enviroment and Parks, 1999)

Reference is made to Stormwater Management and Design Guidelines (Calgary (City of), 2011).

A. Models Used

Analysis of the proposed storm drainage system was performed using EPA-SWMM5 (version 5.1.015) (United States Environmental Protection Agency, 2020). EPA-SWMM allows seasonal variation of hydraulic conductivity parameters using a multiplier in its climate module (Rossman & Huber, 2016).

B. Precipitation and Scenarios

Both continuous and single-event models were used in simulating the operation of the storm drainage system. The following describes the precipitation simulated:

- Continuous Simulation: A continuous model using the City of Calgary's approved climate data for the years 1960-2009 (50 years)
- Single-event: the single-event storm is that recommended by the City of Calgary as detailed in Table 3.

Table 3 – Single Event Design Storm (Calgary (City of), 2011)

Return period (T)	**100 years**
Time to peak (r)	0.3
Duration	**24 hr**
IDF Parameters	**a=663.1**
$(i_T = \frac{a}{(b+t)^c})$	**b=1.870**
	c=0.712
Rainfall (mm)	**89 mm**

C. Allowable Discharge from Development

Allowable discharge is assumed as follows:

- Allowable unit release rate (Steffler & Prozniak, 2010): 8.8 L/s/ha
- No runoff volume control targets are specified.
- Water quality enhancement is assumed to require removal of 85% of total suspended solids of the 75 µm size fraction.

D. Hydrology

Storm drainage area (subcatchment) boundaries are shown on Figure 4. Table 4 details the specific hydrologic assumptions made for each subcatchment in EPA-SWMM. Assumptions common to all subcatchments are detailed in Table 5.

Table 4 – Subcatchment Parameters

Subcatchment	Runoff	Area (ha)	Width (m)	Flowpath	Slope (%)	Imperviousness

ID	Drains to (ID)			Length (m)		(%)
S0001	OF000	0.64	254	25	2	50.0
S1010	SU101	0.19	19	100	2	65.6
S1011	S1010	2.18	218	100	2	50.0
S1020	SU102	0.08	8	100	2	73.9
S1021	SU102	0.51	51	100	2	50.0
S1030	SU103	0.07	7	100	2	80.5
S1031	S1030	2.09	209	100	2	49.8
S1040	SU104	0.19	19	100	2	79.1
S1041	S1040	1.95	195	100	2	50.0
S1042	S1040	0.82	82	100	2	10.2

Table 5 – General Hydrologic Assumptions

Parameter	Value	Source
Surface roughness (Manning's n)	Impervious = 0.015 Pervious = 0.25 Impervious for ponds = 0	Pervious assumes lawn or pasture (American Society of Civil Engineers, 1992) For areas containing ponds, n=0. In EPA-SWMM, this allows runoff to be routed directly to outlet with no evaporation (evaporation is counted by storage units).
Depression storage	Imperv.: 1.6 mm Pervious: 3.2 mm (gravel yard) 7.5 mm (absorbent landscaping)	Impervious is as per developed areas, on-site pervious assumes absorbent landscaping: 0.3 m loamy topsoil, minimum.
Sub-area routing	Upland: impervious to pervious Ponds: Outlet	Impervious to pervious: assumes no storm sewers. Outlet: Routes both pervious and impervious surfaces directly inlet nodes or downstream catchment
Soil characteristics (Green-Ampt)	Silt Loam K = 6.6 mm/hr ψ = 170 mm IMD = 0.32	(Rossman & Huber, 2016)

1. Imperviousness

Assumed imperviousness for different cover types are as prescribed by the City of Calgary (Calgary (City of), 2011). Overall imperviousness for each subcatchment was

derived using an area-weighted average based on the proposed sited development plan provided by the owner.

2. Evaporation

Evaporation in EPA-SWMM is calculated internally (Rossman & Huber, 2016) based on approved climate data (daily maximum and minimum temperatures) for Calgary. No evaporation is assumed in single-event modelling.

3. Seasonal Variation of Parameters

Seasonal variation of parameters (hydraulic conductivity) was assumed per the following:

- May to October: 1×value noted in Table 5.
- November to April: 0.05×value noted in Table 5.

This is not applicable to single-event models.

4. Snowmelt

Snowmelt is considered as noted in Table 6. This is not applicable to single-event models.

Table 6 – Snowmelt Parameters

Parameter	Value
Dividing temperature between rain and snow	2°C
Antecedent temperature index	0.5
Negative melt ratio	0.6
Elevation above MSL	1080 m
Latitude	51°N
Longitude correction	36 min (Mtn. Std. Time [105°W] to 114°W)
Minimum melt coefficient	0.05 mm/hr/°C
Maximum melt coefficient	0.3 mm/hr/°C
Base temperature for melt	0°C
Free water fraction to produce liquid	0.1

The monthly average windspeeds shown in Table 7 were used in the snowmelt model.

Table 7 – Average Windspeeds (km/h) for Calgary Airport

January	February	March	April	May	June
14.8	14.6	15	16.5	16.6	15.6
July	August	September	October	November	December
14	13.2	14.1	14.6	13.7	14.9

E. Water Quality Modeling

As the BMP provided reduces runoff volume by 95%, required TSS removal (85% or 75 µm particles) is met. No further modeling of pollutant removal is necessary.

F. BMP Design

The primary BMPs used on this site are bioretention areas located along the east boundary of the site. Due to site topography, these features are split into 4 cells at different elevations. Overflow from upstream cells to downstream is via check dams whose inverts are 1.0 m above the cell bottom. Stage storage for each cell is assumed as follows.

Table 8 – Stage Storage Assumed [for Main Cell (SWMM Node SU101)]

Elevation (m AGD)	Depth (m)	Surface Area (m^2)	Volume Detained (m^3)	
1031.6	0	466		Bottom
1032.8	1.2	1161	976	Inv outlet pipe
1033.4	1.8	1508	1777	Freeboard

Table 9 – Stage Storage Assumed [for Cell 2 (SWMM Node SU102)]

Elevation (m AGD)	Depth (m)	Surface Area (m^2)	Volume Detained (m^3)	
1032.1	0	116		Bottom
1033.1	1	363	239	Top of checkdam
1033.4	1.8	560	608	Freeboard

Table 10 – Stage Storage Assumed [for South Cell (SWMM Node S103)]

Elevation (m AGD)	Depth (m)	Surface Area (m^2)	Volume Detained (m^3)	
1032.1	0	118		Bottom
1033.1	1	370	244	Top of checkdam
1033.4	1.8	572	621	Freeboard

Table 11 – Stage Storage Assumed [for North Cell (SWMM Node SU104)]

Elevation (m AGD)	Depth (m)	Surface Area (m^2)	Volume Detained (m^3)	
1032.1	0	262		Bottom
1033.1	1	596	429	Top of checkdam
1033.4	1.8	863	1013	Freeboard

1. Seepage and Infiltration

Infiltration to the soil from the bioretention units is assumed. Soil parameters were assumed to be similar to those assumed for the subcatchments.

2. Offsite Flow Control

Offiste flow control is by means of a 250-mm PVC culvert from the main bioswale cell (Node SU101) to the east.

G. Overland Flows

Alberta Environment and Parks (Alberta Environment and Parks, 2013) specifies the following depth-velocity guidelines for overland flows in public roads, as shown on Table 8.

Table 12 – AEP Depth-Velocity Guidelines for 1:100-year Return Period Overland Flows

Velocity, v (m/s)	Depth, d (m)
0.5	0.8
1	0.32
2	0.21

3	0.09

H. Model Topology

A schematic representation of the SWMM5 model is provided as Figure 5.

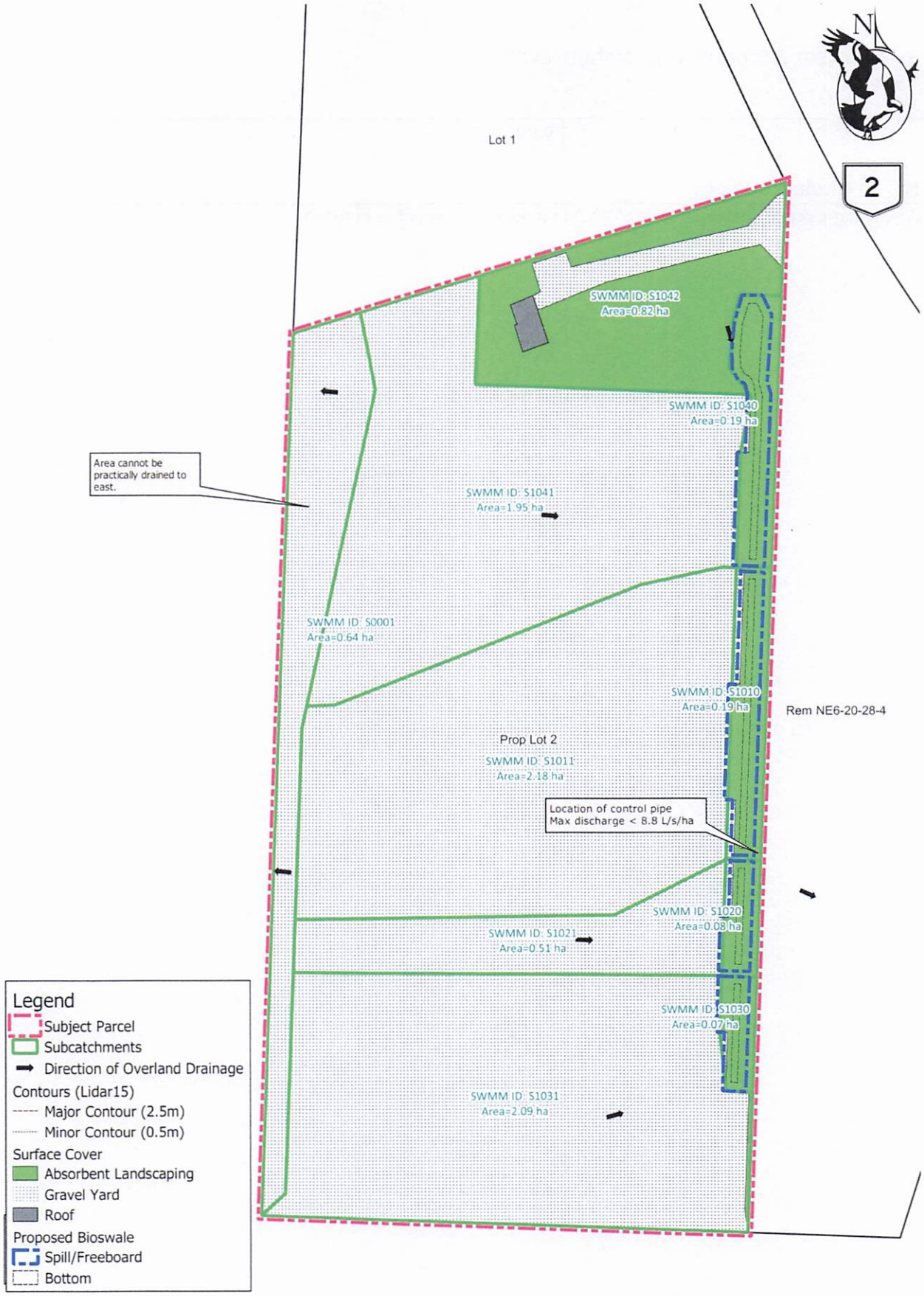


Figure 4 - Drainage Areas

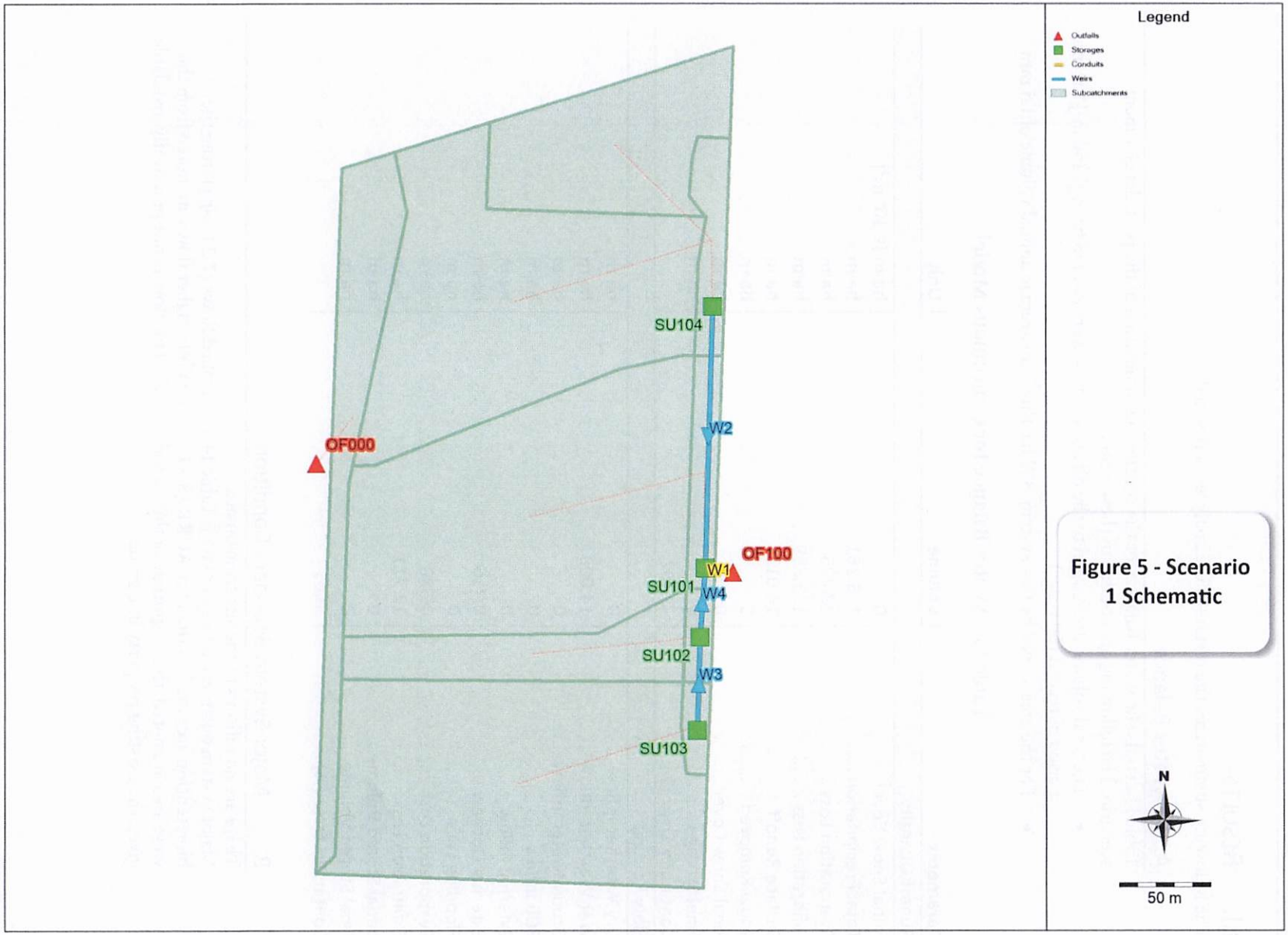


Figure 5 - Scenario 1 Schematic

III. RESULTS

The following summarizes the results of the analyses performed.

A. Water Balance

Table 13 details the water balance for the continuous simulation of the post-development scenario. The following are notable in these results:

- The total volume discharged to the offsite storm sewers is 0.716 ha·m [7,160 m^3] for the period of record (50 years).
- For the area served by this system, 8.71 ha, this is an average annual volume of 1.6 mm.

Table 13 – Water Balance for Continuous Model

Parameter	Volume	Unit
Runoff Quantity:		
Initial Snow Cover	0	ha·m [≡ 10^4 m^3]
Total Precipitation	178.261	ha·m
Evaporation Loss	28.425	ha·m
Infiltration Loss	135.869	ha·m
Surface Runoff	14.013	ha·m
Snow Removed	0	ha·m
Final Snow Cover	0.146	ha·m
Final Storage	0	ha·m
Continuity Error (%)	-0.107	
Flow Routing:		
Dry Weather Inflow	0	ha·m
Wet Weather Inflow	14.008	ha·m
Groundwater Inflow	0	ha·m
RDII Inflow	0	ha·m
External Inflow	0	ha·m
External Outflow	0.716	ha·m
Flooding Loss	0	ha·m
Evaporation Loss	0.588	ha·m
Exfiltration Loss	12.711	ha·m
Initial Stored Volume	0	ha·m
Final Stored Volume	0	ha·m
Continuity Error (%)	-0.05	

B. Major System Boundary Conditions

There are no inflows to the site from offsite.

Major system outflows are as shown on Table 14. Controlled flows (7.2 L/s/ha) from the bioretention area are less than the AURR (8.8 L/s/ha). While higher flows are noted from the west area are noted, the magnitude of this runoff is small. This flow is not practically avoidable given the existing property line grades.

Table 14 – Major System Outflows

Location	Area (ha)	Flow rate (m^3/s)	URR (L/s/ha)	Depth (mm)	Annual Volume (mm)	Volume (ML=1000 m^3)	Storm
To East (OF100)	8.08	0.058	7.2	12.1	0.2	0.978	Continuous
To West (OF000)	0.64	0.080	125.8	973.6	19.5	6.19	Continuous
To East (OF100)	8.08	0	0.0	0.0	n/a	0	100yr, 24 hr
To West (OF000)	0.64	0.166	261.1	23.7	n/a	0.151	100yr, 24 hr

C. Pond Performance

The performance of the bioretention area is as noted in Table 15. Not that the upper cells are controlled by weirs with no specific and discharge to the main cell.

Table 15 – Pond Characteristics (Main Cell)

	Parameter	Value	Unit
General	Contributing Drainage Area	8.08	ha
	Side slopes (max)	2:1	
Elevations	Bottom	1031.6	m AGD
	Outflow	1032.8	m AGD
	100-year (per CDF)	1033.36	m AGD
	100-year (design storm)	1032.46	m AGD
	Peak attained (1960-2009)	1033.19	m AGD
	Spill	1033.40	m AGD
Depths	Operational (to outflow/spill)	1.8	m
	100-year (per CDF)	1.76	m
	100-year (design storm)	0.86	m
	Peak attained (1960-2009)	1.59	m
Areas	Bottom	466	m^2
	Outflow	1,161	m^2
	Spill	1,777	m^2
Volumes	100-year (per CDF)	1,720	m^3
	100-year (design storm)	501	m^3
	Peak attained (1960-2009)	1,469	m^3
Discharge	Post-dev 100 year Design Discharge	0	m^3/s
	Post-dev Maximum (1960-2009)	0.058	m^3/s

D. Water Quality Results

As runoff volume is reduced by more than 75%, the target removal of 85% of total suspended solids greater than 75 µm is met.

E. Overland Flows

The site drainage does not feature any significant gutter, swales or ditches. Runoff is primarily sheet or shallow concentrated flow. Depths and velocities will not exceed AEP guidelines.

APPENDIX A

Figure 6 shows the annual maximum volumes detained in the main bioretention cell. Subsequent pages show the results of extreme value analysis for the maximum volumes. This analysis is consistent with the City of Calgary's approved methods (McMechan, van der Gugten, Wojcik, Beckstead, & Wagner, 2014).

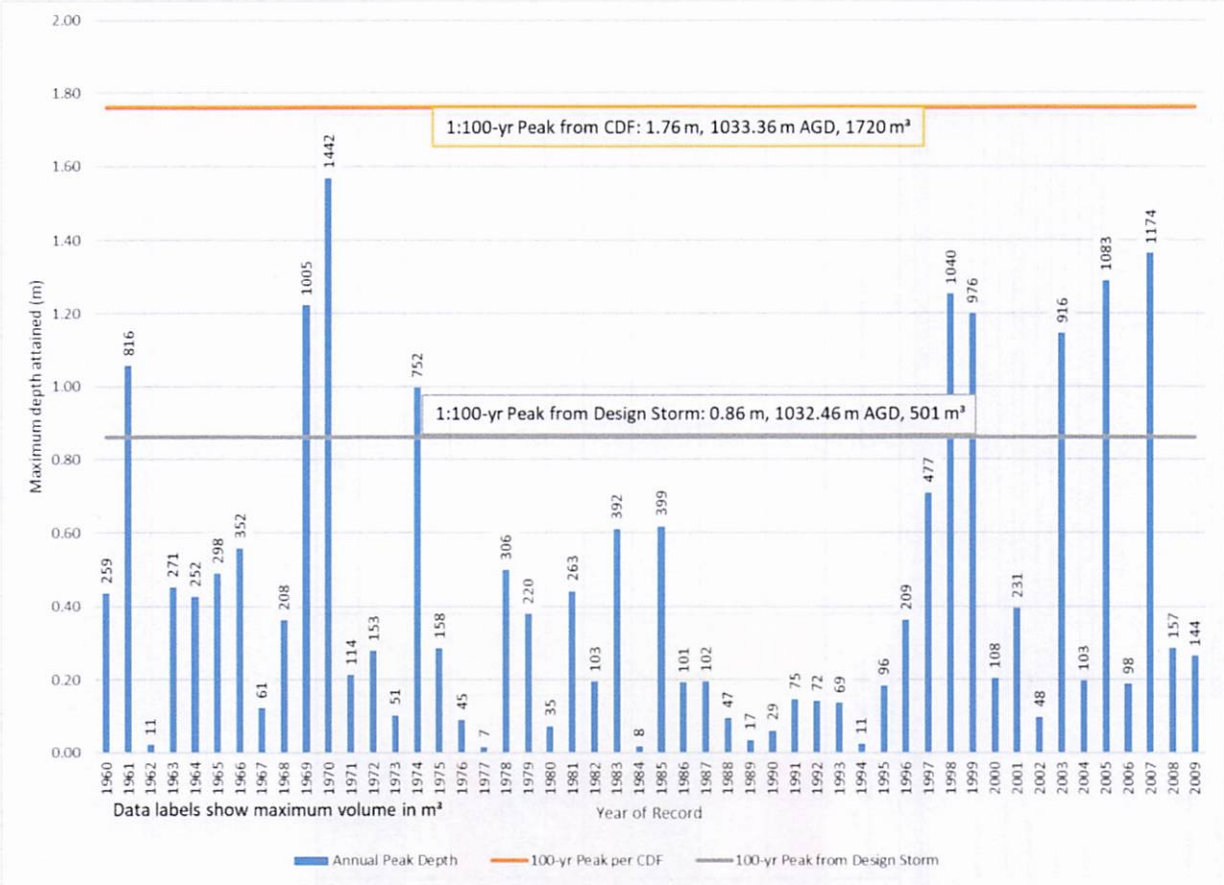


Figure 6 – Annual Depths and Volumes for Main Cell

Summary Sheet

Initial Statistical Tests:

Tests for Stationarity

Test	Result
Spearman Rank Order Correlation Coefficient	No Significant Trend at 0.05 Significance Level
Mann-Whitney Test for jump (a.k.a. Mann-Whitney U test)	No Jump at 0.05 Significance Level
Wald-Wolfowitz Test (The runs test)	No Jump at 0.05 Significance Level

Tests for Homogeneity

Test	Result
Mann-Whitney Test for jump (a.k.a. Mann-Whitney U test)	Sample is Homogeneous at 0.05 Significance Level
Terry Test	Sample is Homogeneous at 0.05 Significance Level

Tests for Independence

Test	Result
Spearman Rank Order Correlation Coefficient	Data is independent at 0.05 Significance Level
Wald-Wolfowitz Test for Independence	Data is independent at 0.05 Significance Level
Anderson Test	Data is independent at 0.05 Significance Level

Test for Outliers

Test	Result
Grubbs and Beck Test for Outliers	
Are any high outliers present?	No High Outliers Present
Are and low outliers present?	No Low Outliers Present

Project Information

Project Name:	Choice Storage (Lot 2)
Project Description:	
Location:	Aldersyde
Date:	2022-05-31
Designed by:	MAK
Company Name:	Osprey Engineering Inc.
Reviewed by:	

Numerical Goodness-of-Fit Tests Results

Distribution Type	Numerical Goodness-of-fit Tests from Spreadsheet			Average of Ranks	Ranking from Numerical Tests	Numerical Goodness-of-fit Tests from Hyfran (Input by user)		Notes from Visual Goodness-of-fit Test
	A-D Test	K-S Test	Least Squares Ranking			BIC	AIC	
Normal	10	10	7	9.00	10			
Lognormal	4	4	9	5.67	6			
Lognormal III	3	1	8	4.00	3			
Exponential	7	7	4	6.00	7			
Pearson III	8	9	3	6.67	8			
Log Pearson III	1	2	5	2.67	1			
Gumbel	9	8	6	7.67	9			
GEV	2	3	10	5.00	5			
Weibull	5	5	1	3.67	2			
Gamma	6	6	2	4.67	4			

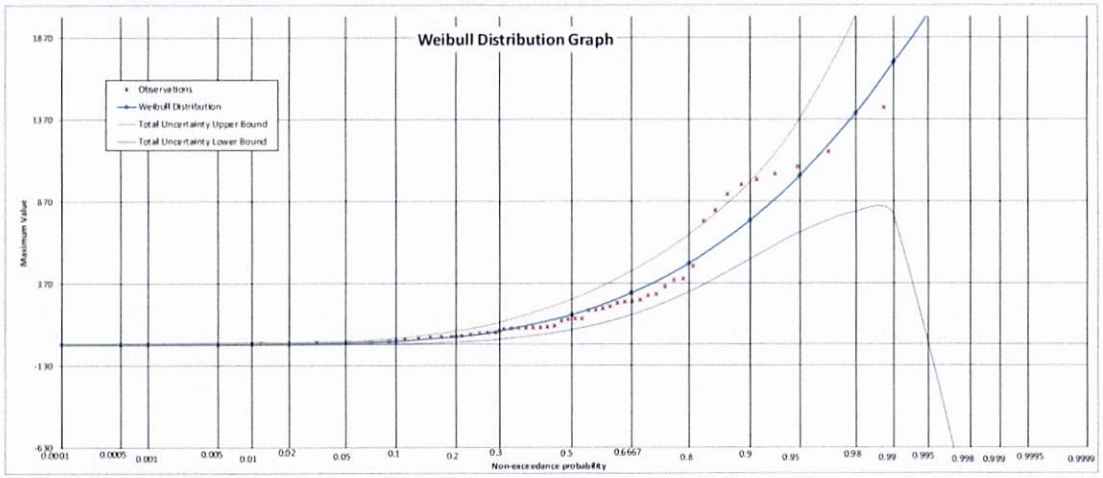
Selected Distribution and Results

Instructions:

Distribution type chosen based on visual and numerical goodness-of-fit tests:	Weibull	- Based on the results of the numerical and visual goodness-of-fit tests presented above, choose the preferred distribution in the cell on the left

Return Period	Probability	Magnitude	Total Uncertainty (Upper Bound)	Total Uncertainty (Lower Bound)
10000	0.9999	3900	12800	-25000
2000	0.9995	3300	11300	-5140
1000	0.9990	2770	7640	-2300
500	0.9980	2450	5940	-1020
200	0.9950	2020	3520	518
100	0.9900	1720	2660	785
50	0.9800	1410	2010	809
20	0.9500	1030	1380	683
10	0.9000	755	991	519
5	0.8000	494	669	320
3	0.6667	314	447	181
2	0.5000	182	274	90
1.4286	0.3000	83	135	31.1
1.25	0.2000	47.6	81.5	13.7
1.1111	0.1000	19.6	36.8	2.41
1.0526	0.0500	8.36	17.2	-0.431
1.0204	0.0200	2.77	#N/A	#N/A
1.0101	0.0100	1.21	#N/A	#N/A
1.005	0.0050	0.533	#N/A	#N/A
1.001	0.0010	0.0791	#N/A	#N/A
1.0005	0.0005	0.0348	#N/A	#N/A
1.0001	0.0001	0.00518	2.97	-2.96

*Total uncertainty is based on sampling uncertainty at (95%) Confidence Interval) plus distribution uncertainty of Top 4 distributions (based on numerical goodness of fit tests)



Errors and Warnings

Cumulative distribution function warning
No warning
No warning
No warning
No warning
CDF based on parameters does not match Pearson III distribution
No warning
No warning
No warning
No warning
No warning

If a warning is present, please check if hytran output results were pasted correctly. If hytran results were pasted correctly the warning signifies that the Continuous Distribution Function (CDF) used in this workbook does not produce same output values as the input frequency analysis results, which in turn indicates that the numerical goodness-of-fit tests calculated by this spreadsheet for this distribution may be based on inaccurate numbers. Another possible solution would be to use a different method of estimating the CDF parameters for example: method of weighted moments.

APPENDIX B

The following pages contain the report files for the SWMM5 models of each scenario considered. Input files were truncated to remove data tables (e.g. object vertices) not pertinent to the design. Text files and ESRI shapefiles can be provided if requested by the City of Calgary.

Table 16 – SWMM Model Input and Output

Model Name	Scenario	Pages
220740-1 - 100	100-year, 24-hour design storm	Input: 5 pp Report: 3 pp
220740-1	Continuous model (1960-2009)	Input: 3 pp Report: 3 pp

```
[TITLE]
;;Project Title/Notes
Choice Storage (Lot 2) - 100-yr 24-hr

[OPTIONS]
;;Option             Value
FLOW_UNITS           CMS
INFILTRATION         MODIFIED_GREEN_AMPT
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           06/01/2022
START_TIME           00:00:00
REPORT_START_DATE    06/01/2022
REPORT_START_TIME    00:00:00
END_DATE             06/03/2022
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:01:00
DRY_STEP             00:01:00
ROUTING_STEP         15
RULE_STEP            00:00:00

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

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

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Raingage1        INTENSITY 0:05     1.0      TIMESERIES 100y24h

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
S0001            Raingage1        OF000            0.6358   50       254.32   2        0        Snowpack1
S1010            Raingage1        SU101            0.1883   65.598   18.83    2        0        Snowpack1
S1011            Raingage1        S1010            2.1849   49.998   218.49   2        0        Snowpack1
S1020            Raingage1        SU102            0.0758   73.86    7.58     2        0        Snowpack1
S1021            Raingage1        SU102            0.5129   49.999   51.29    2        0        Snowpack1
S1030            Raingage1        SU103            0.0696   80.47    6.96     2        0        Snowpack1
S1031            Raingage1        S1030            2.0867   49.799   208.67   2        0        Snowpack1
S1040            Raingage1        SU104            0.189577 79.119   18.958   2        0        Snowpack1
S1041            Raingage1        S1040            1.95     50       195      2        0        Snowpack1
S1042            Raingage1        S1040            0.820923 10.224   82.092   2        0        Snowpack1

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S0001            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1010            0          0.25       1.6        7.5        100        OUTLET
S1011            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1020            0          0.25       1.6        7.5        100        OUTLET
S1021            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1030            0          0.25       1.6        7.5        100        OUTLET
S1031            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1040            0          0.25       1.6        7.5        100        OUTLET
S1041            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1042            0.015      0.25       1.6        7.5        0          PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S0001            170        6.6        0.32       0          0
S1010            170        6.6        0.32       0          0
S1011            170        6.6        0.32       0          0
S1020            170        6.6        0.32       0          0
S1021            170        6.6        0.32       0          0
S1030            170        6.6        0.32       0          0
S1031            170        6.6        0.32       0          0
S1040            170        6.6        0.32       0          0
S1041            170        6.6        0.32       0          0
S1042            170        6.6        0.32       0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF000            1035.885   FREE                        NO
OF100            1032.65    FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- -------- -------- -------- --------
SU101            1031.6   2          0          TABULAR    SC101                        0        1        170      6.6      0.32
SU102            1032.1   5          0          TABULAR    SC102                        0        1        170      6.6      0.32
SU103            1032.6   5          0          TABULAR    SC103                        0        1        170      6.6      0.32
SU104            1032.1   5          0          TABULAR    SC101                        0        1        170      6.6      0.32

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
W1               SU101            OF100            5          0.013      1.2        0          0          0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff     Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff.
Curve
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- -------- ---------- ---------- ---------- ----------
----------------
W2               SU104            SU101            TRANSVERSE   1          1.3        NO       0        0          YES
W3               SU103            SU102            TRANSVERSE   1          1.3        NO       0        0          YES
W4               SU102            SU101            TRANSVERSE   1          1.3        NO       0        0          YES
```

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
W1	CIRCULAR	0.25	0	0	0	1	6
W2	RECT_OPEN	1	3	0	0		
W3	RECT_OPEN	1	3	0	0		
W4	RECT_OPEN	1	3	0	0		

[LOSSES]

;;Link	Kentry	Kexit	Kavg	Flap Gate	Seepage
W1	0.5	0	0	NO	0

[CURVES]

;;Name	Type	X-Value	Y-Value
SC101	Storage	0	466
SC101		1.8	1508
SC102	Storage	0	116
SC102		1.8	560
SC103	Storage	0	118
SC103		1.8	572
SC104	Storage	0	262
SC104		1.8	863

[TIMESERIES]

;;Name	Date	Time	Value
100y24h		0:00	0
100y24h		0:05	1.094
100y24h		0:10	1.103
100y24h		0:15	1.113
100y24h		0:20	1.122
100y24h		0:25	1.132
100y24h		0:30	1.143
100y24h		0:35	1.153
100y24h		0:40	1.163
100y24h		0:45	1.174
100y24h		0:50	1.185
100y24h		0:55	1.197
100y24h		1:00	1.208
100y24h		1:05	1.22
100y24h		1:10	1.232
100y24h		1:15	1.245
100y24h		1:20	1.257
100y24h		1:25	1.27
100y24h		1:30	1.284
100y24h		1:35	1.297
100y24h		1:40	1.311
100y24h		1:45	1.326
100y24h		1:50	1.341
100y24h		1:55	1.356
100y24h		2:00	1.372
100y24h		2:05	1.388
100y24h		2:10	1.404
100y24h		2:15	1.421
100y24h		2:20	1.439
100y24h		2:25	1.457
100y24h		2:30	1.476
100y24h		2:35	1.495
100y24h		2:40	1.515
100y24h		2:45	1.535
100y24h		2:50	1.556
100y24h		2:55	1.578
100y24h		3:00	1.601
100y24h		3:05	1.624
100y24h		3:10	1.648
100y24h		3:15	1.674
100y24h		3:20	1.7
100y24h		3:25	1.727
100y24h		3:30	1.755
100y24h		3:35	1.784
100y24h		3:40	1.815
100y24h		3:45	1.846
100y24h		3:50	1.88
100y24h		3:55	1.914
100y24h		4:00	1.95
100y24h		4:05	1.988
100y24h		4:10	2.028
100y24h		4:15	2.07
100y24h		4:20	2.113
100y24h		4:25	2.159
100y24h		4:30	2.208
100y24h		4:35	2.259
100y24h		4:40	2.313
100y24h		4:45	2.371
100y24h		4:50	2.432
100y24h		4:55	2.497
100y24h		5:00	2.566
100y24h		5:05	2.64
100y24h		5:10	2.719
100y24h		5:15	2.805
100y24h		5:20	2.897
100y24h		5:25	2.997
100y24h		5:30	3.105
100y24h		5:35	3.224
100y24h		5:40	3.354
100y24h		5:45	3.497
100y24h		5:50	3.656
100y24h		5:55	3.833
100y24h		6:00	4.033
100y24h		6:05	4.259
100y24h		6:10	4.519
100y24h		6:15	4.821
100y24h		6:20	5.176
100y24h		6:25	5.601
100y24h		6:30	6.12
100y24h		6:35	6.773
100y24h		6:40	7.624
100y24h		6:45	8.785
100y24h		6:50	10.488
100y24h		6:55	13.283
100y24h		7:00	18.961
100y24h		7:05	40.516
100y24h		7:10	168.138
100y24h		7:15	54.372
100y24h		7:20	31.748
100y24h		7:25	23.236

100y24h	7:30	18.66
100y24h	7:35	15.763
100y24h	7:40	13.746
100y24h	7:45	12.251
100y24h	7:50	11.093
100y24h	7:55	10.166
100y24h	8:00	9.405
100y24h	8:05	8.768
100y24h	8:10	8.225
100y24h	8:15	7.756
100y24h	8:20	7.346
100y24h	8:25	6.985
100y24h	8:30	6.664
100y24h	8:35	6.376
100y24h	8:40	6.116
100y24h	8:45	5.88
100y24h	8:50	5.665
100y24h	8:55	5.468
100y24h	9:00	5.287
100y24h	9:05	5.119
100y24h	9:10	4.964
100y24h	9:15	4.819
100y24h	9:20	4.684
100y24h	9:25	4.558
100y24h	9:30	4.44
100y24h	9:35	4.329
100y24h	9:40	4.224
100y24h	9:45	4.125
100y24h	9:50	4.032
100y24h	9:55	3.943
100y24h	10:00	3.859
100y24h	10:05	3.78
100y24h	10:10	3.704
100y24h	10:15	3.631
100y24h	10:20	3.562
100y24h	10:25	3.496
100y24h	10:30	3.433
100y24h	10:35	3.373
100y24h	10:40	3.315
100y24h	10:45	3.259
100y24h	10:50	3.206
100y24h	10:55	3.154
100y24h	11:00	3.105
100y24h	11:05	3.057
100y24h	11:10	3.011
100y24h	11:15	2.967
100y24h	11:20	2.924
100y24h	11:25	2.883
100y24h	11:30	2.843
100y24h	11:35	2.805
100y24h	11:40	2.767
100y24h	11:45	2.731
100y24h	11:50	2.696
100y24h	11:55	2.662
100y24h	12:00	2.629
100y24h	12:05	2.597
100y24h	12:10	2.566
100y24h	12:15	2.536
100y24h	12:20	2.506
100y24h	12:25	2.478
100y24h	12:30	2.45
100y24h	12:35	2.423
100y24h	12:40	2.396
100y24h	12:45	2.371
100y24h	12:50	2.346
100y24h	12:55	2.321
100y24h	13:00	2.297
100y24h	13:05	2.274
100y24h	13:10	2.252
100y24h	13:15	2.229
100y24h	13:20	2.208
100y24h	13:25	2.187
100y24h	13:30	2.166
100y24h	13:35	2.146
100y24h	13:40	2.126
100y24h	13:45	2.107
100y24h	13:50	2.088
100y24h	13:55	2.069
100y24h	14:00	2.051
100y24h	14:05	2.034
100y24h	14:10	2.016
100y24h	14:15	1.999
100y24h	14:20	1.983
100y24h	14:25	1.966
100y24h	14:30	1.95
100y24h	14:35	1.935
100y24h	14:40	1.919
100y24h	14:45	1.904
100y24h	14:50	1.889
100y24h	14:55	1.875
100y24h	15:00	1.86
100y24h	15:05	1.846
100y24h	15:10	1.833
100y24h	15:15	1.819
100y24h	15:20	1.806
100y24h	15:25	1.793
100y24h	15:30	1.78
100y24h	15:35	1.767
100y24h	15:40	1.755
100y24h	15:45	1.743
100y24h	15:50	1.731
100y24h	15:55	1.719
100y24h	16:00	1.707
100y24h	16:05	1.696
100y24h	16:10	1.685
100y24h	16:15	1.673
100y24h	16:20	1.663
100y24h	16:25	1.652
100y24h	16:30	1.641
100y24h	16:35	1.631
100y24h	16:40	1.621
100y24h	16:45	1.611
100y24h	16:50	1.601
100y24h	16:55	1.591
100y24h	17:00	1.581
100y24h	17:05	1.572
100y24h	17:10	1.562
100y24h	17:15	1.553
100y24h	17:20	1.544
100y24h	17:25	1.535
100y24h	17:30	1.526
100y24h	17:35	1.517

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100y24h                 17:40      1.509
100y24h                 17:45      1.5
100y24h                 17:50      1.492
100y24h                 17:55      1.484
100y24h                 18:00      1.476
100y24h                 18:05      1.467
100y24h                 18:10      1.46
100y24h                 18:15      1.452
100y24h                 18:20      1.444
100y24h                 18:25      1.436
100y24h                 18:30      1.429
100y24h                 18:35      1.421
100y24h                 18:40      1.414
100y24h                 18:45      1.407
100y24h                 18:50      1.399
100y24h                 18:55      1.392
100y24h                 19:00      1.385
100y24h                 19:05      1.378
100y24h                 19:10      1.372
100y24h                 19:15      1.365
100y24h                 19:20      1.358
100y24h                 19:25      1.352
100y24h                 19:30      1.345
100y24h                 19:35      1.339
100y24h                 19:40      1.332
100y24h                 19:45      1.326
100y24h                 19:50      1.32
100y24h                 19:55      1.313
100y24h                 20:00      1.307
100y24h                 20:05      1.301
100y24h                 20:10      1.295
100y24h                 20:15      1.289
100y24h                 20:20      1.284
100y24h                 20:25      1.278
100y24h                 20:30      1.272
100y24h                 20:35      1.266
100y24h                 20:40      1.261
100y24h                 20:45      1.255
100y24h                 20:50      1.25
100y24h                 20:55      1.244
100y24h                 21:00      1.239
100y24h                 21:05      1.234
100y24h                 21:10      1.229
100y24h                 21:15      1.223
100y24h                 21:20      1.218
100y24h                 21:25      1.213
100y24h                 21:30      1.208
100y24h                 21:35      1.203
100y24h                 21:40      1.198
100y24h                 21:45      1.193
100y24h                 21:50      1.188
100y24h                 21:55      1.184
100y24h                 22:00      1.179
100y24h                 22:05      1.174
100y24h                 22:10      1.17
100y24h                 22:15      1.165
100y24h                 22:20      1.16
100y24h                 22:25      1.156
100y24h                 22:30      1.151
100y24h                 22:35      1.147
100y24h                 22:40      1.143
100y24h                 22:45      1.138
100y24h                 22:50      1.134
100y24h                 22:55      1.13
100y24h                 23:00      1.125
100y24h                 23:05      1.121
100y24h                 23:10      1.117
100y24h                 23:15      1.113
100y24h                 23:20      1.109
100y24h                 23:25      1.105
100y24h                 23:30      1.101
100y24h                 23:35      1.097
100y24h                 23:40      1.093
100y24h                 23:45      1.089
100y24h                 23:50      1.085
100y24h                 23:55      1.081
100y24h                 24:00      1.077

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

[TAGS]

[MAP]
DIMENSIONS       297118.1088      5616674.6947     297366.4052      5617173.1553
UNITS            Meters

[COORDINATES]
;;Node            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
OF000             297129.59          5616926.129
OF100             297354.658         5616867.381
SU101             297339.354         5616869.492
SU102             297336.715         5616832.55
SU103             297335.132         5616782.414
SU104             297343.576         5617010.398

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

[POLYGONS]
;;Subcatchment    X-Coord            Y-Coord
;;--------------- ------------------ ------------------
S0001             297147.169         5616915.144
S0001             297139.758         5616714.837
S0001             297129.395         5616705.22
S0001             297143.452         5617085.162
S0001             297172.117         5617094.01
S0001             297178.737         5617061.088
S0001             297147.169         5616915.144
S1010             297348.953         5616983.825
S1010             297344.299         5616858.009
S1010             297330.134         5616858.88
S1010             297329.299         5616858.466
S1010             297333.96          5616984.022
S1010             297348.953         5616983.825
```

s1011	297333.96	5616984.022
s1011	297329.299	5616858.466
s1011	297281.212	5616834.595
s1011	297144.126	5616832.92
s1011	297147.169	5616915.144
s1011	297149.263	5616924.827
s1011	297161.132	5616925.19
s1011	297293.031	5616976.787
s1011	297327.741	5616984.104
s1011	297333.96	5616984.022
s1020	297344.299	5616858.009
s1020	297342.432	5616807.552
s1020	297327.802	5616808.365
s1020	297327.439	5616808.368
s1020	297329.299	5616858.466
s1020	297330.134	5616858.88
s1020	297344.299	5616858.009
s1021	297329.299	5616858.466
s1021	297327.439	5616808.368
s1021	297143.278	5616809.998
s1021	297144.126	5616832.92
s1021	297281.212	5616834.595
s1021	297329.299	5616858.466
s1030	297342.432	5616807.552
s1030	297340.61	5616758.296
s1030	297329.126	5616758.957
s1030	297326.537	5616784.073
s1030	297327.439	5616808.368
s1030	297327.802	5616808.365
s1030	297342.432	5616807.552
s1031	297326.537	5616784.073
s1031	297329.126	5616758.957
s1031	297340.61	5616758.296
s1031	297338.355	5616697.352
s1031	297129.395	5616705.22
s1031	297139.758	5616714.837
s1031	297143.278	5616809.998
s1031	297327.439	5616808.368
s1031	297326.537	5616784.073
s1040	297351.709	5617058.32
s1040	297348.953	5616983.825
s1040	297333.96	5616984.022
s1040	297335.812	5617033.9
s1040	297340.217	5617058.752
s1040	297339.79	5617058.768
s1040	297336.265	5617063.242
s1040	297331.011	5617070.186
s1040	297332.7	5617091.205
s1040	297335.702	5617101.714
s1040	297353.291	5617101.086
s1040	297351.709	5617058.32
s1041	297335.812	5617033.9
s1041	297333.96	5616984.022
s1041	297327.741	5616984.104
s1041	297293.031	5616976.787
s1041	297161.132	5616925.19
s1041	297149.263	5616924.827
s1041	297178.737	5617061.088
s1041	297172.117	5617094.01
s1041	297223.528	5617109.879
s1041	297221.801	5617063.211
s1041	297340.217	5617058.752
s1041	297335.812	5617033.9
s1042	297336.265	5617063.242
s1042	297339.79	5617058.768
s1042	297221.801	5617063.211
s1042	297223.528	5617109.879
s1042	297355.119	5617150.498
s1042	297353.291	5617101.086
s1042	297335.702	5617101.714
s1042	297332.7	5617091.205
s1042	297331.011	5617070.186
s1042	297336.265	5617063.242

[SYMBOLS]

;;Gage	X-Coord	Y-Coord
;;---------------	------------------	------------------

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

Choice Storage (Lot 2) - 100-yr 24-hr

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 10
Number of nodes 6
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	100y24h	INTENSITY	5 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S0001	0.64	254.32	50.00	2.0000	Raingage1	OF000
S1010	0.19	18.83	65.60	2.0000	Raingage1	SU101
S1011	2.18	218.49	50.00	2.0000	Raingage1	S1010
S1020	0.08	7.58	73.86	2.0000	Raingage1	SU102
S1021	0.51	51.29	50.00	2.0000	Raingage1	SU102
S1030	0.07	6.96	80.47	2.0000	Raingage1	SU103
S1031	2.09	208.67	49.80	2.0000	Raingage1	S1030
S1040	0.11	10.76	82.89	2.0000	Raingage1	SU104
S1041	1.95	195.00	50.00	2.0000	Raingage1	S1040
S1042	0.90	90.29	10.22	2.0000	Raingage1	S1040

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF000	OUTFALL	1035.88	0.00	0.0	
OF100	OUTFALL	1032.65	0.25	0.0	
SU101	STORAGE	1031.60	2.00	0.0	
SU102	STORAGE	1032.10	5.00	0.0	
SU103	STORAGE	1032.60	5.00	0.0	
SU104	STORAGE	1032.10	5.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
W1	SU101	OF100	CONDUIT	10.0	1.5002	0.0130
W2	SU104	SU101	WEIR			
W3	SU103	SU102	WEIR			
W4	SU102	SU101	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
W1	CIRCULAR	0.25	0.05	0.06	0.25	1	0.07

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... MODIFIED_GREEN_AMPT
Flow Routing Method ..... KINWAVE
Starting Date 06/01/2022 00:00:00
Ending Date 06/03/2022 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:01:00
Dry Time Step 00:01:00
Routing Time Step ..... 15.00 sec

********** Runoff Quantity Continuity **********	Volume hectare-m	Depth mm
Total Precipitation	0.781	89.667
Evaporation Loss	0.000	0.000
Infiltration Loss	0.575	65.978
Surface Runoff	0.201	23.038
Final Storage	0.006	0.693
Continuity Error (%)	-0.047	

********** Flow Routing Continuity **********	Volume hectare-m	Volume 10^6 ltr

Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.201	2.008
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.015	0.151
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.108	1.078
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.078	0.778
Continuity Error (%)	0.007	

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

****
Routing Time Step Summary
****

Minimum Time Step	:	15.00 sec
Average Time Step	:	15.00 sec
Maximum Time Step	:	15.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00
Percent Not Converging	:	0.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S0001	89.67	0.00	0.00	65.17	44.08	23.79	23.79	0.15	0.17	0.265
S1010	89.67	261.31	0.00	34.00	230.24	86.77	317.01	0.60	0.23	0.903
S1011	89.67	0.00	0.00	66.39	44.06	22.52	22.52	0.49	0.25	0.251
S1020	89.67	0.00	0.00	21.69	66.23	1.75	67.98	0.05	0.03	0.758
S1021	89.67	0.00	0.00	66.39	44.06	22.52	22.52	0.12	0.06	0.251
S1030	89.67	672.14	0.00	19.50	613.02	129.34	742.37	0.52	0.23	0.974
S1031	89.67	0.00	0.00	66.49	43.88	22.42	22.42	0.47	0.23	0.250
S1040	89.67	462.16	0.00	16.79	457.42	77.66	535.08	0.58	0.25	0.970
S1041	89.67	0.00	0.00	66.39	44.06	22.52	22.52	0.44	0.22	0.251
S1042	89.67	0.00	0.00	83.08	9.01	6.44	6.44	0.06	0.03	0.072

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF000	OUTFALL	0.00	0.00	1035.88	0 00:00	0.00
OF100	OUTFALL	0.00	0.00	1032.65	0 00:00	0.00
SU101	STORAGE	0.56	0.86	1032.46	0 09:17	0.86
SU102	STORAGE	0.73	1.08	1033.18	0 09:30	1.08
SU103	STORAGE	0.84	1.26	1033.86	0 07:57	1.26
SU104	STORAGE	0.75	1.11	1033.21	0 09:15	1.11

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF000	OUTFALL	0.166	0.166	0 07:16	0.151	0.151	0.000
OF100	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
SU101	STORAGE	0.231	0.231	0 07:24	0.597	0.597	0.000
SU102	STORAGE	0.067	0.076	0 07:56	0.167	0.309	0.000
SU103	STORAGE	0.234	0.234	0 07:22	0.517	0.517	0.028
SU104	STORAGE	0.249	0.249	0 07:22	0.576	0.576	0.000

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU101	0.294	16	0	64	0.501	27	0 09:16	0.006
SU102	0.163	4	0	57	0.267	7	0 09:30	0.003
SU103	0.205	5	0	40	0.350	9	0 07:57	0.063
SU104	0.311	6	0	55	0.499	9	0 09:15	0.005

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF000	4.04	0.022	0.166	0.151
OF100	0.00	0.000	0.000	0.000
System	2.02	0.022	0.166	0.151

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
W1	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
W2	WEIR	0.000	0	00:00			0.00
W3	WEIR	0.059	0	07:57			0.00
W4	WEIR	0.000	0	00:00			0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon May 30 15:02:19 2022
Analysis ended on: Mon May 30 15:02:19 2022
Total elapsed time: < 1 sec

```
[TITLE]
;;Project Title/Notes

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

START_DATE          01/01/1960
START_TIME          00:00:00
REPORT_START_DATE   01/01/1960
REPORT_START_TIME   00:00:00
END_DATE            01/01/2010
END_TIME            00:00:00
SWEEP_START         01/01
SWEEP_END           12/31
DRY_DAYS            0
REPORT_STEP         01:00:00
WET_STEP            00:05:00
DRY_STEP            00:05:00
ROUTING_STEP        60
RULE_STEP           00:00:00

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

[EVAPORATION]
;;Data Source    Parameters
;;--------------- ----------------
TEMPERATURE
DRY_ONLY          NO

[TEMPERATURE]
FILE        "D:\Data\SWMM\Climate Data\Calgary Approved Data\Final_Hour_Temperature_Data SWMM Daily MinMax.txt"
WINDSPEED   MONTHLY    14.8 14.6 15 16.5 16.6 15.6 14 13.2 14.1 14.6 13.7 14.9
SNOWMELT               2 0.5 0.6 0.0 51 36
ADC         IMPERVIOUS 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
ADC         PERVIOUS   0.10 0.35 0.53 0.66 0.75 0.82 0.87 0.92 0.95 0.98

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Raingage1        INTENSITY 1:00     1.0      FILE       "D:\Data\SWMM\Climate Data\Calgary Approved Data\Final_Hour_Precip_Data HLY03.txt" 3031093    MM


[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope   CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- ----------------
S0001            Raingage1        OF000            0.6358   50       254.32   2        0        Snowpack1
S1010            Raingage1        SU101            0.1883   65.598   18.83    2        0        Snowpack1
S1011            Raingage1        S1010            2.1849   49.998   218.49   2        0        Snowpack1
S1020            Raingage1        SU102            0.0758   73.86    7.58     2        0        Snowpack1
S1021            Raingage1        SU102            0.5129   49.999   51.29    2        0        Snowpack1
S1030            Raingage1        SU103            0.0696   80.47    6.96     2        0        Snowpack1
S1031            Raingage1        S1030            2.0867   49.799   208.67   2        0        Snowpack1
S1040            Raingage1        SU104            0.189577 79.119   18.958   2        0        Snowpack1
S1041            Raingage1        S1040            1.95     50       195      2        0        Snowpack1
S1042            Raingage1        S1040            0.820923 10.224   82.092   2        0        Snowpack1

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S0001            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1010            0          0.25       1.6        7.5        100        OUTLET
S1011            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1020            0          0.25       1.6        7.5        100        OUTLET
S1021            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1030            0          0.25       1.6        7.5        100        OUTLET
S1031            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1040            0          0.25       1.6        7.5        100        OUTLET
S1041            0.015      0.25       1.6        3.2        0          PERVIOUS   100
S1042            0.015      0.25       1.6        7.5        0          PERVIOUS   100

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
S0001            170        6.6        0.32       0          0
S1010            170        6.6        0.32       0          0
S1011            170        6.6        0.32       0          0
S1020            170        6.6        0.32       0          0
S1021            170        6.6        0.32       0          0
S1030            170        6.6        0.32       0          0
S1031            170        6.6        0.32       0          0
S1040            170        6.6        0.32       0          0
S1041            170        6.6        0.32       0          0
S1042            170        6.6        0.32       0          0

[SNOWPACKS]
;;Name           Surface    Parameters
;;-------------- ---------- ----------
Snowpack1        PLOWABLE   0.05       0.3        0.0        0.10       0.00       0.00       0.0
Snowpack1        IMPERVIOUS 0.05       0.3        0.0        0.10       0.00       0.00       25.4
Snowpack1        PERVIOUS   0.05       0.3        0.0        0.10       0.00       0.00       25.4
Snowpack1        REMOVAL    25.4       0.0        0.0        0.0        0.0        0.0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF000            1035.885   FREE                        NO
OF100            1032.65    FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- -------- -------- -------- --------
SU101            1031.6   2          0          TABULAR    SC101                        0        1        170      6.6      0.32
SU102            1032.1   5          0          TABULAR    SC102                        0        1        170      6.6      0.32
SU103            1032.6   5          0          TABULAR    SC103                        0        1        170      6.6      0.32
```

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SU104            1032.1   5          0          TABULAR    SC101                      0        1        170      6.6      0.32

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
W1               SU101            OF100            5          0.013      1.2        0          0          0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff     Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf   Coeff.
Curve
;;-------------- ---------------- ---------------- ------------ ---------- ---------- -------- -------- ---------- ---------- ---------- ----------
----------
W2               SU104            SU101            TRANSVERSE   1          1.3        NO       0        0          YES
W3               SU103            SU102            TRANSVERSE   1          1.3        NO       0        0          YES
W4               SU102            SU101            TRANSVERSE   1          1.3        NO       0        0          YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ---------- ----------
W1               CIRCULAR     0.25             0          0          0          1          6
W2               RECT_OPEN    1                3          0          0
W3               RECT_OPEN    1                3          0          0
W4               RECT_OPEN    1                3          0          0

[LOSSES]
;;Link           Kentry     Kexit      Kavg       Flap Gate  Seepage
;;-------------- ---------- ---------- ---------- ---------- ----------
W1               0.5        0          0          NO         0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
SC101            Storage    0          466
SC101                       1.8        1508

SC102            Storage    0          116
SC102                       1.8        560

SC103            Storage    0          118
SC103                       1.8        572

SC104            Storage    0          262
SC104                       1.8        863

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

[ADJUSTMENTS]
;;Parameter    Subcatchment     Monthly Adjustments
CONDUCTIVITY                    0.05   0.05   0.05   0.05   1.0    1.0    1.0    1.0    1.0    1.0    0.05   0.05

[TAGS]

[MAP]
DIMENSIONS       297118.1088      5616674.6947      297366.4052      5617173.1553
UNITS            Meters

[COORDINATES]
;;Node            X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OF000            297129.59          5616926.129
OF100            297354.658         5616867.381
SU101            297339.354         5616869.492
SU102            297336.715         5616832.55
SU103            297335.132         5616782.414
SU104            297343.576         5617010.398

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

[POLYGONS]
;;Subcatchment    X-Coord            Y-Coord
;;-------------- ------------------ ------------------
S0001            297147.169         5616915.144
S0001            297139.758         5616714.837
S0001            297129.395         5616705.22
S0001            297143.452         5617085.162
S0001            297172.117         5617094.01
S0001            297178.737         5617061.088
S0001            297147.169         5616915.144
S1010            297348.953         5616983.825
S1010            297344.299         5616858.009
S1010            297330.134         5616858.88
S1010            297329.299         5616858.466
S1010            297333.96          5616984.022
S1010            297348.953         5616983.825
S1011            297333.96          5616984.022
S1011            297329.299         5616858.466
S1011            297281.212         5616834.595
S1011            297144.126         5616832.92
S1011            297147.169         5616915.144
S1011            297149.263         5616924.827
S1011            297161.132         5616925.19
S1011            297293.031         5616976.787
S1011            297327.741         5616984.104
S1011            297333.96          5616984.022
S1020            297344.299         5616858.009
S1020            297342.432         5616807.552
S1020            297327.802         5616808.365
S1020            297327.439         5616808.368
S1020            297329.299         5616858.466
S1020            297330.134         5616858.88
S1020            297344.299         5616858.009
S1021            297329.299         5616858.466
S1021            297327.439         5616808.368
S1021            297143.278         5616809.998
S1021            297144.126         5616832.92
S1021            297281.212         5616834.595
S1021            297329.299         5616858.466
S1030            297342.432         5616807.552
S1030            297340.61          5616758.296
S1030            297329.126         5616758.957
S1030            297326.537         5616784.073
S1030            297327.439         5616808.368
S1030            297327.802         5616808.365
S1030            297342.432         5616807.552
```

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S1031             297326.537          5616784.073
S1031             297329.126          5616758.957
S1031             297340.61           5616758.296
S1031             297338.355          5616697.352
S1031             297129.395          5616705.22
S1031             297139.758          5616714.837
S1031             297143.278          5616809.998
S1031             297327.439          5616808.368
S1031             297326.537          5616784.073
S1040             297351.709          5617058.32
S1040             297348.953          5616983.825
S1040             297333.96           5616984.022
S1040             297335.812          5617033.9
S1040             297340.217          5617058.752
S1040             297339.79           5617058.768
S1040             297336.265          5617063.242
S1040             297331.011          5617070.186
S1040             297332.7            5617091.205
S1040             297335.702          5617101.714
S1040             297353.291          5617101.086
S1040             297351.709          5617058.32
S1041             297335.812          5617033.9
S1041             297333.96           5616984.022
S1041             297327.741          5616984.104
S1041             297293.031          5616976.787
S1041             297161.132          5616925.19
S1041             297149.263          5616924.827
S1041             297178.737          5617061.088
S1041             297172.117          5617094.01
S1041             297223.528          5617109.879
S1041             297221.801          5617063.211
S1041             297340.217          5617058.752
S1041             297335.812          5617033.9
S1042             297336.265          5617063.242
S1042             297339.79           5617058.768
S1042             297221.801          5617063.211
S1042             297223.528          5617109.879
S1042             297355.119          5617150.498
S1042             297353.291          5617101.086
S1042             297335.702          5617101.714
S1042             297332.7            5617091.205
S1042             297331.011          5617070.186
S1042             297336.265          5617063.242

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

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

****
Element Count
****
Number of rain gages 1
Number of subcatchments ... 10
Number of nodes 6
Number of links 4
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Raingage1	D:\Data\SWMM\Climate Data\Calgary Approved Data\Final_Hour_Precip_Data·HLY03.txt		

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S0001	0.64	254.32	50.00	2.0000	Raingage1	OF000
S1010	0.19	18.83	65.60	2.0000	Raingage1	SU101
S1011	2.18	218.49	50.00	2.0000	Raingage1	S1010
S1020	0.08	7.58	73.86	2.0000	Raingage1	SU102
S1021	0.51	51.29	50.00	2.0000	Raingage1	SU102
S1030	0.07	6.96	80.47	2.0000	Raingage1	SU103
S1031	2.09	208.67	49.80	2.0000	Raingage1	S1030
S1040	0.19	18.96	79.12	2.0000	Raingage1	SU104
S1041	1.95	195.00	50.00	2.0000	Raingage1	S1040
S1042	0.82	82.09	10.22	2.0000	Raingage1	S1040

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
OF000	OUTFALL	1035.88	0.00	0.0	
OF100	OUTFALL	1032.65	0.25	0.0	
SU101	STORAGE	1031.60	2.00	0.0	
SU102	STORAGE	1032.10	5.00	0.0	
SU103	STORAGE	1032.60	5.00	0.0	
SU104	STORAGE	1032.10	5.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
W1	SU101	OF100	CONDUIT	5.0	3.0014	0.0130
W2	SU104	SU101	WEIR			
W3	SU103	SU102	WEIR			
W4	SU102	SU101	WEIR			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
W1	CIRCULAR	0.25	0.05	0.06	0.25	1	0.10

****
Rainfall File Summary
****

Station ID	First Date	Last Date	Recording Frequency	Periods w/Precip	Periods Missing	Periods Malfunc.
3031093	01/02/1960	12/31/2009	60 min	27424	0	0

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

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... YES
  RDII ..... NO
  Snowmelt ..... YES
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Infiltration Method ..... MODIFIED_GREEN_AMPT
Flow Routing Method ..... DYNWAVE
Surcharge Method ..... EXTRAN
Starting Date 01/01/1960 00:00:00
Ending Date 01/01/2010 00:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step ..... 60.00 sec
Variable Time Step ..... YES
Maximum Trials 8
Number of Threads 1
Head Tolerance ..... 0.001500 m

********** Volume Depth
Runoff Quantity Continuity hectare-m mm

Initial Snow Cover	0.000	0.000
Total Precipitation	178.261	20455.700
Evaporation Loss	28.425	3261.824
Infiltration Loss	135.869	15591.133
Surface Runoff	14.013	1607.953
Snow Removed	0.000	0.000
Final Snow Cover	0.146	16.701
Final Storage	0.000	0.000
Continuity Error (%)	-0.107	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	14.008	140.085
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.716	7.164
Flooding Loss	0.000	0.000
Evaporation Loss	0.588	5.882
Exfiltration Loss	12.711	127.110
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.050	

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step	:	1.25 sec
Average Time Step	:	59.87 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	-0.00
Average Iterations per Step	:	2.00
Percent Not Converging	:	0.00
Time Step Frequencies	:	
60.000 - 23.031 sec	:	99.76 %
23.031 - 8.841 sec	:	0.03 %
8.841 - 3.393 sec	:	0.13 %
3.393 - 1.303 sec	:	0.08 %
1.303 - 0.500 sec	:	0.01 %

Subcatchment Runoff Summary

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
S0001	20455.70	0.00	3717.27	15793.96	6639.01	973.15	973.15	6.19	0.08	0.048
S1010	20455.70	9671.18	58.04	7566.88	19752.50	2738.58	22491.08	42.35	0.27	0.747
S1011	20455.70	0.00	3768.89	15859.15	6570.68	833.49	833.49	18.21	0.25	0.041
S1020	20455.70	0.00	25.13	5285.73	15097.17	32.10	15129.27	11.47	0.01	0.740
S1021	20455.70	0.00	3768.96	15859.05	6570.81	833.52	833.52	4.28	0.06	0.041
S1030	20455.70	24793.46	34.84	4354.71	36399.56	4453.18	40852.74	28.43	0.24	0.903
S1031	20455.70	0.00	3753.66	15880.82	6544.77	826.96	826.96	17.26	0.24	0.040
S1040	20455.70	9162.46	34.22	4562.98	23421.36	1587.19	25008.56	47.41	0.28	0.844
S1041	20455.70	0.00	3769.04	15858.94	6570.94	833.55	833.55	16.25	0.22	0.041
S1042	20455.70	0.00	840.34	19472.33	1359.17	135.90	135.90	1.12	0.04	0.007

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
OF000	OUTFALL	0.00	0.00	1035.88	0 00:00	0.00
OF100	OUTFALL	0.00	0.13	1032.78	3816 14:35	0.13
SU101	STORAGE	0.02	1.59	1033.19	3816 14:35	1.57
SU102	STORAGE	0.02	1.16	1033.26	17322 19:10	1.12
SU103	STORAGE	0.05	1.15	1033.75	17322 19:05	1.15
SU104	STORAGE	0.02	1.09	1033.19	3816 14:35	1.07

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF000	OUTFALL	0.077	0.077	17322 19:00	6.19	6.19	0.000
OF100	OUTFALL	0.000	0.058	3816 14:35	0	0.978	0.000
SU101	STORAGE	0.266	0.469	17322 19:09	42.3	46	-0.043
SU102	STORAGE	0.069	0.296	17322 19:02	15.7	20.6	-0.053
SU103	STORAGE	0.242	0.242	17322 19:00	28.4	28.4	-0.042
SU104	STORAGE	0.280	0.280	17322 19:00	47.4	47.4	-0.059

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
SU101	0.012	1	5	93	1.469	70	3816 14:35	0.062
SU102	0.004	0	3	80	0.301	8	17322 19:10	0.257
SU103	0.010	0	4	79	0.304	8	17322 19:05	0.239
SU104	0.009	0	4	95	0.850	9	3816 14:35	0.081

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF000	0.23	0.002	0.077	6.185
OF100	0.23	0.009	0.058	0.978
System	0.23	0.011	0.077	7.164

Link Flow Summary

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
W1	CONDUIT	0.058	3816 14:35	1.44	0.57	0.77
W2	WEIR	0.078	3816 14:12			0.09
W3	WEIR	0.237	17322 19:06			0.15
W4	WEIR	0.255	17322 19:11			0.16

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
W1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Conduit Surcharge Summary

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
W1	0.01	2.17	0.01	0.01	0.01

Analysis begun on: Mon May 30 16:32:14 2022
Analysis ended on: Mon May 30 16:32:55 2022
Total elapsed time: 00:00:41

REFERENCES

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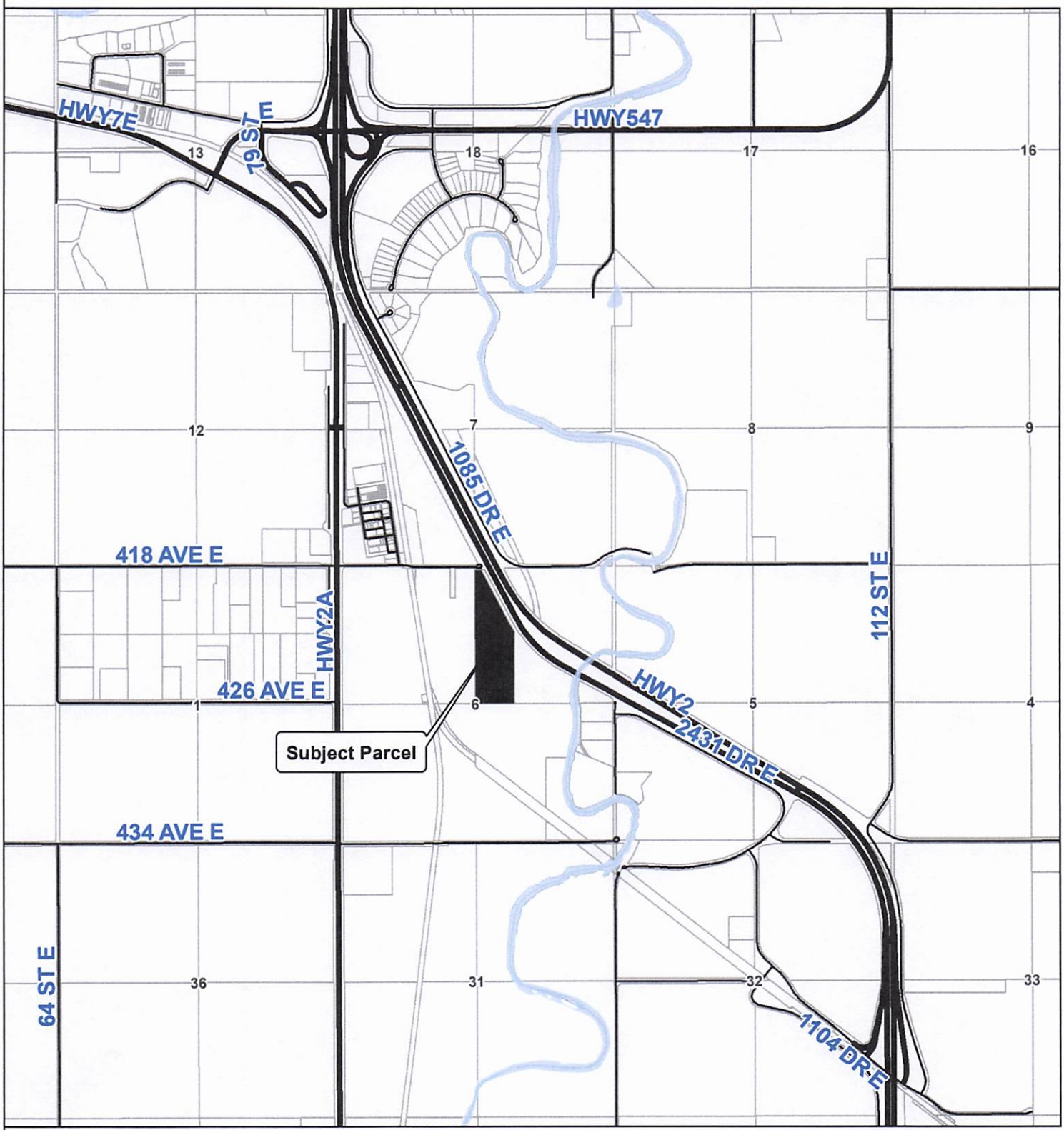
Location Map
NE 6-20-28 W4M; Plan 2310476, Blk 2, Lot 1



Legend

Roads
Highway
Parcels
Subject Parcel

Date: 2025-06-26

0 0.25 0.5 1 Miles

Document Path: C:\prj\PlanningData\MDF_Planning_HalfMileCirc.mxd