Town of Okotoks

North Okotoks Annexation Lands Stormwater Master Drainage Plan (MDP)

Final Report

January 8, 2024

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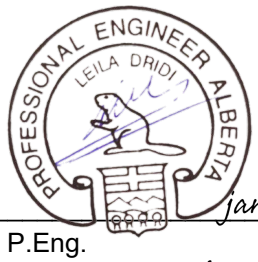

jan. 08, 2024

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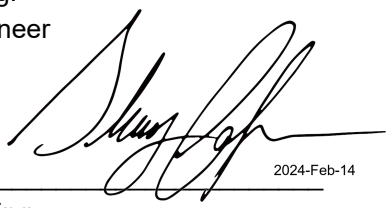

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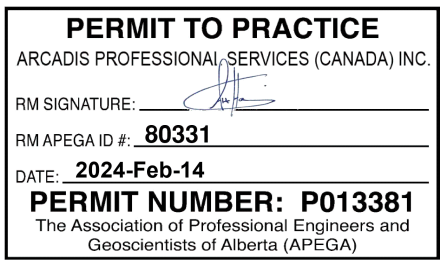

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Executive Summary

Arcadis Professional Services (Canada) Inc. was retained by the Town of Okotoks to undertake the North Okotoks Annexation Lands Stormwater Master Drainage Plan (MDP). The main objectives of this MDP are to provide guidance for the development of stormwater connectivity across 338th Avenue with the current urbanization project and support the pattern growth of the undeveloped agricultural lands located north of the 338th Avenue.

In addition to information gathering, and after reviewing the existing drainage conditions, defining the sub-catchments boundaries, examining the existing outlets at the limit of 338th Avenue, and undertaking hydrologic and hydraulic modeling with PCSWMM for the 100-year event, this assessment was considered to help quantify potential impacts of projected developments. Existing conditions were first modeled to ensure that the models reflected current conditions reasonably accurately, and then future conditions were studied considering fully developed lands as well as fully urbanized 338th Avenue. Lastly, preliminary estimates of storage requirements were evaluated for a unit area release rate (UARR) limited to 2.5 L/s/ha.

For the pre-development conditions, stormwater infrastructure in the study area has mainly consisted of rural stormwater management plans such as road ditches and culverts. For the undeveloped lands, eleven (11) separate sub-catchments were delineated based on LiDAR and nine (9) drainage outlets were identified. In general, some sub catchments bypass the downstream lands and drain through the existing roadway ditches on highways (Outlets 1, 15 and 16). Other sub catchments flow through the Wedderburn Lands to reach the east Northridge Drive ditch (Outlet 14), concrete swale in Crystal ridge (Outlet 13), or Trilogy Plains lands (Outlet 12). Whereas other sub catchments drain directly into the Trilogy Plains development to reach St. James Church and the Holy Trinity Academy ditch system (Outlet 11), the culvert on the Crystal Ridge golf course (Outlet 10) or the roadside ditch running along 48th Street (Outlet 9). The simulated 100-year event peak flows for the outlets varied between 0.13 and 0.96 m^3/s for various pre-development sub-catchment areas varying between 5.23 ha and 167.27 ha.

Two scenarios were modelled to ascertain the impact of the development at proposed outlets within each of the future, post-development sub-catchments. The two modelled scenarios are: 1) Fully Developed Upper Lands with the existing 338th Avenue. and 2) Fully Developed Upper Lands with 338 Avenue developed as the urbanized boulevard.

The first scenario showed a higher peak flow from the post-development impervious areas for the majority of the outlets except outlets 11 and 12, which were excluded from the post-development assessment. To mitigate the impacts of these higher post-development peak flows from impervious surfaces after the land development, a preliminary estimate of the stormwater management facilities was undertaken. Six (6) ponds were required at various locations, based on the assumed residential land use developments. Preliminary assessments were also undertaken to estimate the maximum allowable discharge rate and the required volume of storm ponds for each area considering the 100-year design storm event and an allowable unit area release rate of 2.5 L/s/ha. The maximum allowable discharge rate varied between 0.013 and 0.37 m3/s for various post-development sub-catchment areas ranging from 5.2 to 145.7 ha, whereas the simulated storage capacity varied between 2,300 m3 and 64,000 m3. In assuming an active storage depth of 1.5 m for each pond, the area required for the required ponds varies between 0.15 and 4.27 ha. The computed results provided in this report are based on various assumptions for future land developments (land use, impervious percentage, divided lands per quarter, various developers, etc.). Therefore, these preliminary results are to be adjusted once the future land uses and timelines are defined.

For the second scenario, modelling the future urbanized conditions considering four- and six lane urban section build-out and 100-year design storm event showed that 4.7 ha of road could drain through the Wedderburn, 7.8 ha of road drains through the Trilogy lands and the remaining area (7.0 ha) could be directed south to North Point lands and east to the new Highway interchange pond. The exact drainage areas need to be confirmed at detailed design stage.

The Stormwater Master Drainage Plan for future land development was developed at a master plan level. At this level, the designated outlets for future development are identified for all the lands within the boundary of the study area. The approximate locations and sizes of stormwater detention facilities shall serve as a guide to assist the decision-making process with the ongoing transportation project. Therefore, further individual land development studies will need to be complete for each specific development to refine the pond design and configuration of the stormwater infrastructure with consideration for LIDs (Low Impact Development) to retain more stormwater on sites and to meet the water quality criteria.

1 Introduction

In 2023, Arcadis was retained by the Town of Okotoks to prepare the North Okotoks Annexation Lands Stormwater Master Drainage Plan (NOAL MDP) to provide guidance for development of stormwater connectivity across 338th Avenue with the current developments and to support the growth pattern of the undeveloped agricultural lands situated north of 338th Avenue.

The purpose of this MDP is to examine the current drainage conditions, evaluate the pre-development and post-development flows, evaluate the impacts of projected land development and urbanization of 338th Avenue with respect to drainage, and document a preliminary drainage configuration for the future developments. This report is an addition to the North Point Stormwater Master Drainage Plan (NP MDP) prepared by Arcadis (2023) that is currently under review by the Town of Okotoks.

1.1 Project Description

North Okotoks covers an approximate area of 900 ha of land as shown in red on Figure 1. It is limited by Northridge Drive (Highway 2A) to the West, Highway 2 to the East, 322 Ave E to the North, and approximately Green Haven Drive to the South. The existing lands are predominately agricultural as shown in the existing Land Use **(Figure 10, Appendix A)**. The lands are relatively flat and drain from the north to the south towards the Sheep River through various natural drainage pathways, roadway drainage such as culverts and ditches, and existing municipal infrastructure.

The study area comprises 510 ha (referred to in this report and Figure 1 as zones 1N and 2N) of predominately agricultural lands, and their land use characteristics for future development are unknown at this time.

There are currently three active development areas adjacent to the Study Area and impacted by the upstream drainage conditions evaluated in the NOAL MDP. Two development areas are located east and west of 48th Street E as shown on Figure 1. The lands west 48th Street E are referred to as the Trilogy Plains ASP while the lands east of 48th Street E are referred to as the North Point ASP. North Point is designated industrial and commercial areas, while Trilogy Plains is a mixed-use development i.e., commercial, residential, and industrial. The third development area is located west of 32nd Street E (Figure 1) and is referred to as the Wedderburn ASP. The proposed Trilogy Plains and North Point land use, and Stormwater Management Facility locations are based on the current concept plans (ASP) provided by B&A Planning Group for Trilogy, December 2021 (Figure 11) and North Point, May 2022 (Figure 12) **(Appendix B).** The Wedderburn ASP is the most advanced and its western side is already under construction. The original concept plan is presented through Figure 13 **(Appendix B).**

1.2 Objective

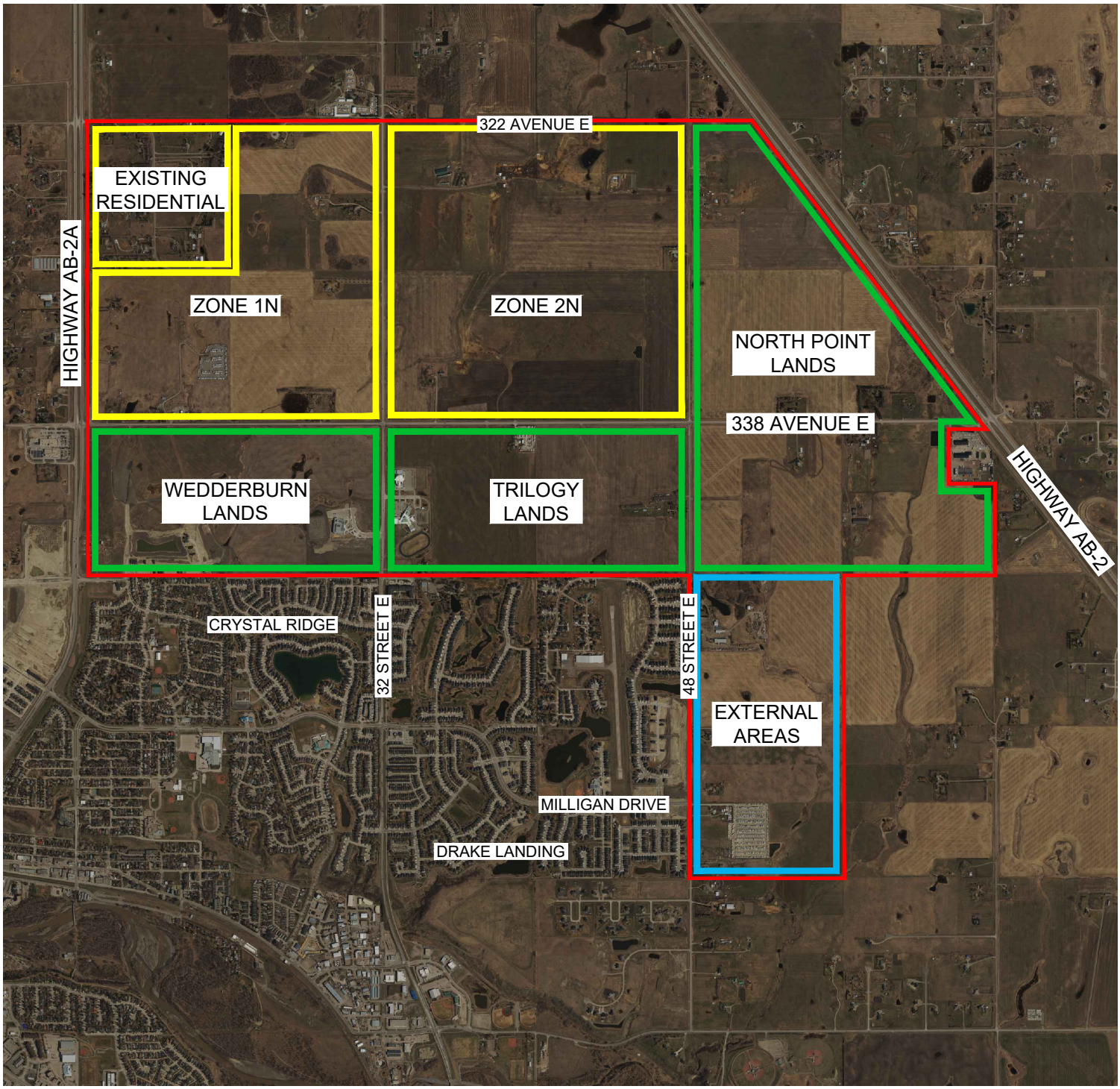
The objective of the proposed MDP is to establish a post-development stormwater management concept for the subject lands. The concept would establish post-development drainage boundaries, approximate pond locations and preliminary sizing, as well as allowable stormwater discharge rates and routes. The information contained in the MDP is intended to guide future design decisions for stormwater connectivity across 338th Avenue and inform downstream developments of any required control or conveyance through their stormwater management facilities and infrastructure.

The main activities included in this study are as follows:

- Collect and review existing Master Drainage Plans and Stormwater Management Reports for the area.
- Coordinate with third parties working on similar studies for either adjacent or overlapping study areas (i.e., North Point/ISL interchange work).
- Process LiDAR data for the subject lands and prepare a contour/surface plan to be incorporated and used as the basis for this MDP.
- Review existing geotechnical reports and biophysical assessment reports for this study area and identify any data gaps or requirements for future studies.
- Confirm pre-development catchment areas and drainage routes using the most recent topographic data.
- Undertake hydrologic analysis and associated modelling to estimate the existing runoff.
- Carry out hydrologic analysis and associated modelling to estimate post-development runoff considering future development scenarios.
- Undertake hydraulic analysis and associated modelling to estimate stormwater management facility requirements to meet development targets.
- Prepare a Conceptual Post-Development Drainage Concept for the study area.

Assumptions

The condition and capacity of downstream drainage courses, outside the study area boundary, have not been evaluated or assessed in this report. It is assumed that the final pond location, sizing, and any drainage course recommendations will be confirmed by the developer at the Staged Master Drainage Plan and/or Pond Report Stage.



LEGEND

- NORTH OKOTOKS
- EXISTING ASPs
- STUDY AREA (FUTURE DEVELOPMENTS)
- EXTERNAL AREAS

CLIENT
TOWN OF OKOTOKS

5 ELIZABETH STREET
OKOTOKS, AB

PROJECT NAME
NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN
OKOTOKS, AB

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2 Existing System Background Information

2.1 Background Information

There have been previous Master and Staged Master Drainage Plans (MDP, SMDP) in the region. Arcadis has examined the existing reports to understand the development of the study area and assess environmental assessment reports to evaluate site constraints. The list of the documents that Arcadis has reviewed and examined is as follows:

- Crystal Ridge Stage IV (Stantec, October 2000)
- Crystal Ridge Stage IV Revised Stormwater Master Drainage Plan (Stantec May 2001)
- Stormwater Management Master Plan and Flood Mitigation Plan (ISL, November 2014)
- North Okotoks Stormwater Master Drainage Plan Draft Report (Stantec, June 2015)
- D'Arcy & Wedderburn Staged Master Drainage Plan- Volume 1 (Stantec, September 2016)
- D'Arcy & Wedderburn Staged Master Drainage Plan- Volume 2 (Stantec, September 2016)
- Master Drainage Plan (McElhanney, November 2016)
- Revised D'Arcy Storm Pond 'A' Design Report (Stantec, 2017)
- Master Drainage Plan Trilogy Plains ASP (Cima, December 2021)
- Biophysical Overview for the Community Campus Concept Plan, located near the Town of Okotoks, AB (McElhanney, March 2016
- Biophysical Overview North Point Area Structure Plan Near Okotoks, Alberta (Trace Associates, 2021)
- Trilogy Plains ASP Biophysical Overview (Trace Associates, July 2021)
- Trilogy Plains ASP Phase 1 Environmental Site Assessment (Trace Associates, May 2021)
- Biophysical Assessment - 338 Ave E Okotoks, AB (Tetra Tech, 2022)
- Wedderburn Phase 1 Environmental Site Assessment (Amec, October 2014)

In addition to the above reports, the following ASP documents relating to each development, geotechnical reports for each land, and record drawing were also reviewed:

- Municipal Development Plan, Town of Okotoks (September 2019)
- North Okotoks ASP – Wedderburn (November 2016)
- Trilogy Plains Area Structure Plan (December 2021)
- North Point ASPs (2021, 2022)
- Northridge Drive Urbanization 338 Avenue to Sandstone Gate (January 2022)
- Wedderburn Lands Geotechnical Report. (June 2015)
- Trilogy Plains ASP Geotechnical (May 2021)

2.2 Biophysical Assessments

A bio-physical overview was undertaken by Tetra Tech (2022) for the Transportation Functional Study and Design for 338th Avenue East (E) to assess existing environmental constraints for the 338th Ave corridor (Figures 14 and 15, Appendix C). A Widened Study Zone of a 1,000 m search buffer area (1,000 m on either side of the centerline; Figure 14) was used to account for species occurrences and ranges that may be identified outside of the local study zone but still have the potential to impact the project.

The preliminary biophysical assessments identified several bio-physical features, which include wetlands and drainage conveyance pathways:

For the wetlands, the review reported several small marsh type and shrubby wetlands within the study zone (Figure 14, Appendix D). Most of these wetlands are within agricultural fields in low lying areas near 338th Avenue and several are adjacent to agricultural residential or developed areas.

For the watercourses, five drainage pathways were identified in the vicinity of the study site: **Table 1** summarizes the conditions of each watercourse. Culvert locations were also observed during Tetra Tech's reconnaissance survey and are shown on **Figure 15**. The two dugouts present on either side of 338th Avenue by Highway 2 over the unnamed watercourse ID 69707, are located on North Point land and are part of the North Point MDP (2023).

Table 1: Conditions of Each Watercourse (Based on Tetra Tech, 2022)

Listed Watercourse on Alberta FWIMT Database (Fish and Wildlife Internet Mapping Tool)	Location	Field Identification	Crossing
Not listed	NE 22-020-29 W4M	Drainage channel connecting wetland on the north side of 338 Ave. Culvert crossing 338 Ave	1N/Wedderburn lands
69948	NW 34-020-29 W4M	Wetlands on the north and south of 338 Ave connected by culvert.	1N/Trilogy lands
69842	34-020-029 W4M	Culverts crossing 338 Ave.	2N/Trilogy lands
69862	34-020-029 W4M	Realigned drainage ditch. Culverts crossing 338 Ave	2N/Trilogy lands/48th
69707	35-020-029 W4M	Wetland on north end, dugout both north and south with culverts crossing 338 Ave.	North point lands

The overview completed by Trace Associates for Trilogy Plains provided a more detailed review of the existing water streams and ephemeral waterbodies (Figure 16). Three mapped unnamed watercourses (A, B and D) were identified (Figure 17, Appendix C). The current bio-physical overview is shown in Figure 17 (Appendix C). Based on the review, most of Watercourse A has been lost during the construction of a church and school and only a small portion exists on the actual site. Watercourse B runs through several agricultural fields and pastures. The downstream portion of Watercourse B has been lost as result of development of the south residential communities of Crystal Green.

Watercourse D runs north to south on the eastern border of the site near 48th Street. A small portion has been realigned toward the street and flows into the 48th Street E roadway ditch **(Figure 18).** The remaining southeast portion runs through residential lots and non-native grassland and appears to be undisturbed. The downstream portion of watercourse D, outside the Study Area, should be investigated further at a later land planning phase to determine if it has the potential to be maintained as it appears that it is relatively undisturbed and is connected to the Sheep River directly through an existing drainage/coulee network.

Because these preliminary assessments are developed based on high-level desktop information, it is recommended that a Biophysical Impact Assessments be completed at a more detailed land use planning phase. The review should follow the Town's guidance and include a full field season of field inventories to update and augment the findings of this preliminary assessment.

2.3 Geotechnical Investigation

For Zones 1N & 2N, geotechnical investigations were not currently available to inform this study, however, previous geotechnical investigations were undertaken in the vicinity of the study area:

For Trilogy Plains, the geotechnical investigation of the western half of the project lands was undertaken by Watt Consulting Group in April 2021. The field investigation included 16 boreholes and found that generally, a topsoil layer of 80-300 mm overlays mostly silty clay. In some local instances, sandy silt was encountered. For Wedderburn development, McIntosh-Lalani engineering (2015-2016) undertook preliminary geotechnical analysis of the soils for the Darcy ranch lands and Wedderburn Pond B and describes the soils as "thin covers of topsoil and intermittent organic browns overlying a sequence of silt and silty clay till soils".

For the following hydrologic analysis, it is assumed that the soils in the study area have the same characteristics as in the previous lands' reports. Additional testing is required to estimate the average infiltration rate to support the development of these lands.

2.4 Existing Stormwater Infrastructure and Natural Drainage Pathway

Stormwater runoffs from the NOAL lands are generally conveyed by a system of roadway ditches and culverts to the south, where they are intercepted either by the Town's stormwater collection system or conveyed through natural channels to branches of the Sheep River. As shown on Figure 19, Appendix D), only the south part of North Okotoks is connected to an existing stormwater pipe collection system. The north part uses natural drainage pathways, roadway ditches and culverts to drain to the river. The drainage patterns and outlets for the study area are discussed in Section 3.

2.5 Design Guidelines and Standards

Based on the Town of Okotoks General Design & Construction Specifications, the design of the storm sewer system shall be in accordance with the currently adopted City of Calgary Storm Water Management & Design Manual and must follow Alberta Environment Guidelines (1999).

2.6 Release Rate

Future developments are required to provide stormwater management facilities to ensure that post development, 1:100 Year flows into the Sheep River are within the pre-development 1:100 Year runoff rates.

Based on the Stormwater Management Master Plan and Flood Mitigation Plan (ISL, 2014) adopted by the Town of Okotoks, discharges from all future developments within the Town boundary are limited to unit area release rate (UARR) of 2.5 L/s/ha for the 100-year event. Drainage from future developments lands will eventually be directed to the Sheep River

3 Drainage Analysis

The whole NOAL area consists of two zones (1N and 2N) as shown in Figure 1. Zone 1N comprises 264 ha of land between Highway 2A and 32nd Street and Zone 2N includes 216 ha of land between 32nd Street and 48th Street. These lands (1N & 2N) comprise 480 hectares in total, located north of 338 Avenue East as shown in Figure 1.

In same Figure 1, there is another future development (North Point lands) which includes 400 ha of land between 48th Street and Highway 2. The North Point MDP has been completed for this area and is under review by the Town for the proposed Area Structure Plan (ASP) shown on Figure 12 (Appendix B).

The same Figure shows the Wedderburn development portion of the D'Arcy and Wedderburn ASP lands, and Trilogy Plains development. D'Arcy and Wedderburn lands will be residential communities which feature constructed on-site storm wet ponds referred in this report as Pond A DARCY (for D'Arcy Land) and Pond B Wedderburn (for Wedderburn development, Figure 13 Appendix B). Pond A is located west of Highway 2A and well outside the study area. It was not practical to include it in the figures.

The development of Trilogy Plains consists of residential housing, commercial areas, employment/industrial areas, and municipal reserves which will require the construction of one storm (to be confirmed in the final Trilogy SMDP) pond referred in this report as Pond C Trilogy (Figure 11, Appendix B).

3.1 Sub-Catchments Delineation

For the sub-catchment's delineation, data from various sources were gathered to estimate the limit of each sub-catchment:

- The survey data provided culvert information within 32nd Street, 48th Street and 338th Avenue to be used as input data in the hydraulic model. Characteristics of the existing culverts are presented in **Table 2.**
- LiDAR data, topography and digital elevation model DEM were used as input into WDT software with an average catchment size of 10 hectares to estimate the contributing area to each sub-catchment. The study area was broken into small catchments through the WDT tool, but in this study some catchments were combined with one common outlet, and others were added to account for the entire area. The pre-development drainage catchments are shown **in Figure 2.**

Figure 3 shows the topography and flow direction generated by WDT from the LiDAR data for the entire North Okotoks area.

3.2 338th Avenue Drainage

The current 338th Avenue E corridor consists of a rural cross-section that runs from Highway 2A to Highway 2. This section is a two-lane hard-surfaced, rural roadway that connects the two highways. Currently, roadside ditches are used along the Avenue to convey runoff water between the north and the south. There are (9) existing culverts (**Figure 2)**, with details shown in **Table 2.**

A transportation project is planned to urbanize the cross-section of the roadway by adding a multi-use pathway, curb, gutter, and intersections. The upgrade would also include drainage improvements. Existing culverts along 338th Avenue will need to be incorporated into the upgrades in order to maintain existing, pre-development drainage patterns.

Table 2: Existing Culvert Conditions

Culvert ID from the Hydraulic Model	Type	Diameter (mm)	Type	US Invert (m)	DS Invert (m)	Length (m)	Slope (%)
13	Circular – Crossing	600	Corrugated Steel Culvert (CSP)	1116.75	1115.06	20.01	8.42
24	Circular – Crossing	900	CSP	1119.74	1118.82	31.13	2.95
3	Circular – Crossing	600	CSP	1117.80	1117.30	21.83	2.26
4	Circular – Crossing	600	CSP	1118.7	1118.30	20.00	2.00
5	Circular – Crossing	900	CSP	1110.91	1110.78	23.75	0.55
6	Circular – Crossing	900	CSP	1104.59	1104.38	23.91	0.87
8	Circular – Crossing	600	CSP	1105.26	1105.17	19.95	0.46
9	Circular – Crossing	400	CSP	1102.70	1102.50	22.07	0.92
10	Circular – Crossing	600	CSP	1091.34	1091.25	20.06	0.45

3.3 Existing Culverts Crossing 48th and 32nd Street

There are various existing culverts across streets that help maintain water connectivity to the existing outlets (Figure 2). **Table 3** summarizes the list of culverts crossing 32nd Street E and 48th Street E:

Table 3: Existing Culverts Crossing 32 ST E and 48 ST E

Crossing	Culvert ID from the Hydraulic Model	Type	Diameter (mm)	Type	US Invert (m)	DS Invert (m)	Length (m)	Slope (%)
32 St E	*C29-C2 twin	Circular – Crossing	600 600	CSP	1116.53	1116.34	19.14	1.01
48 St E	*C7	Circular – Crossing	600	CSP	1105.34	1105.08	17.00	1.51
	**C30 twin	Circular – Crossing	900 900	CSP	1092.79	1092.45	17.40	1.91

* Data collected during the road survey.

3.4 Existing Outlets South of 338th Avenue E and Crossing the Highways

Six outlets (9 to 14) exist south of the 338th Avenue E which convey the flow from the upper lands (Zone 1N and 2N) located north of the 338th Avenue to the south side of 338th. Two other outlets (15 and 16) convey water west across Northridge Drive to two separate locations. Another outlet (1) is on the east side of Highway 2 ditch. The outfalls are shown in Figure 2 and summarized in Table 4. The outlets crossing the Wedderburn and Trilogy Plains lands are discussed in the following section.

Table 4: Existing Outlets for the Upper Lands

Crossing Lands or Highway	Outlet Number	Direction	Ultimate Discharge Point
Trilogy	9	South	Roadside ditch running along 48th St. E
Trilogy	10	South	Culvert on the Crystal Ridge Golf Course
Trilogy	11	South	Church and high school ditch
Wedderburn	12	South	Roadside ditch running along 32nd St. E
Wedderburn	13	South	Concrete swale
Wedderburn	14	South	Highway 2A East ditch
Highway 2A	15	West	Highway 2A west ditch
Highway 2A	16	West	Highway 2A Darcy dam
Highway 2	1	East	Highway 2 East ditch

Wedderburn Lands:

- Outlet 15 to Northridge Drive West ditch: This outlet is used to drain the flow from sub-catchment 12S, Southwest via an existing roadway culvert, to the existing Northridge Drive west ditch where it is captured into an existing 900 mm storm sewer at Crescent Road W and discharges to an outfall at the Sheep River adjacent to Southridge Drive.
- Outlet 14 to Northridge Drive East ditch: This outlet is located on the east side of Northridge Drive. The flow generated by the sub-catchment 13S and 14S flows South to the east ditch where it is captured into an existing 1,200 mm storm sewer at Crescent Road W then discharging to an outfall at the Sheep River adjacent to Southridge Drive.
- Outlet 13 to Concrete Swale: The flow from the sub-catchment 15S and a small portion of Wedderburn lands exit the site along the western boundary where it is captured and conveyed through an existing concrete swale toward Bannister Dr., where it is collected into an existing 375 mm storm sewer.
- Outlet 12 to the east roadside ditch running along 32nd Street E: The flow generated by the sub-catchment 16S flows east and then runs south through the west side of 32nd Street E roadside ditch. The flow is then transferred to the east side ditch via two parallel 600 mm culverts on 32nd Street E.

Trilogy Lands:

- Outlet 11 to the St. James Church and Holy Trinity Academy Ditch: The existing church and school are located on the west side of Trilogy lands. These properties have an existing ditch and their own on-site stormwater management. Details of this system were unavailable.
- Outlet 10 to Culvert on the Crystal Ridge Golf Course: This outlet could be an outlet of the previous natural pathway of watercourse B.
- Outlet 9 to Roadside Ditch Running Along 48th Street E: This outlet is a 900 mm culvert crossing 338th Avenue. Flows generated by sub-catchments 4S and a fraction of S5 and S6 drain towards the roadside ditch running along 48th Street E. Downstream of the Trilogy development boundary, there are twin 900 mm culverts that cross 48th Street and appear to direct the majority of the flow from the ditch to the east and into an existing coulee that traverses south to discharge into the Sheep River.

Northridge Drive and Highway 2:

- Outlet 16 to Northridge Drive Crossing: This outlet located on the east side of Northridge Drive drains flow from sub-catchment 11S to the existing Darcy Dam via an existing roadway culvert.
- Outlet 1 to Highway 2 Ditch: This outlet located on the west side of Highway 2 drains upstream flow from sub-catchments 3S and S1 to Highway 2 ditch.

3.5 Sub-Catchments Properties

The study area has been divided into 11 sub-catchment areas for the hydrology analysis of pre-development scenario (Figure 2). The properties of the sub-catchments draining into the previous outlets are summarized in **Table 5**:

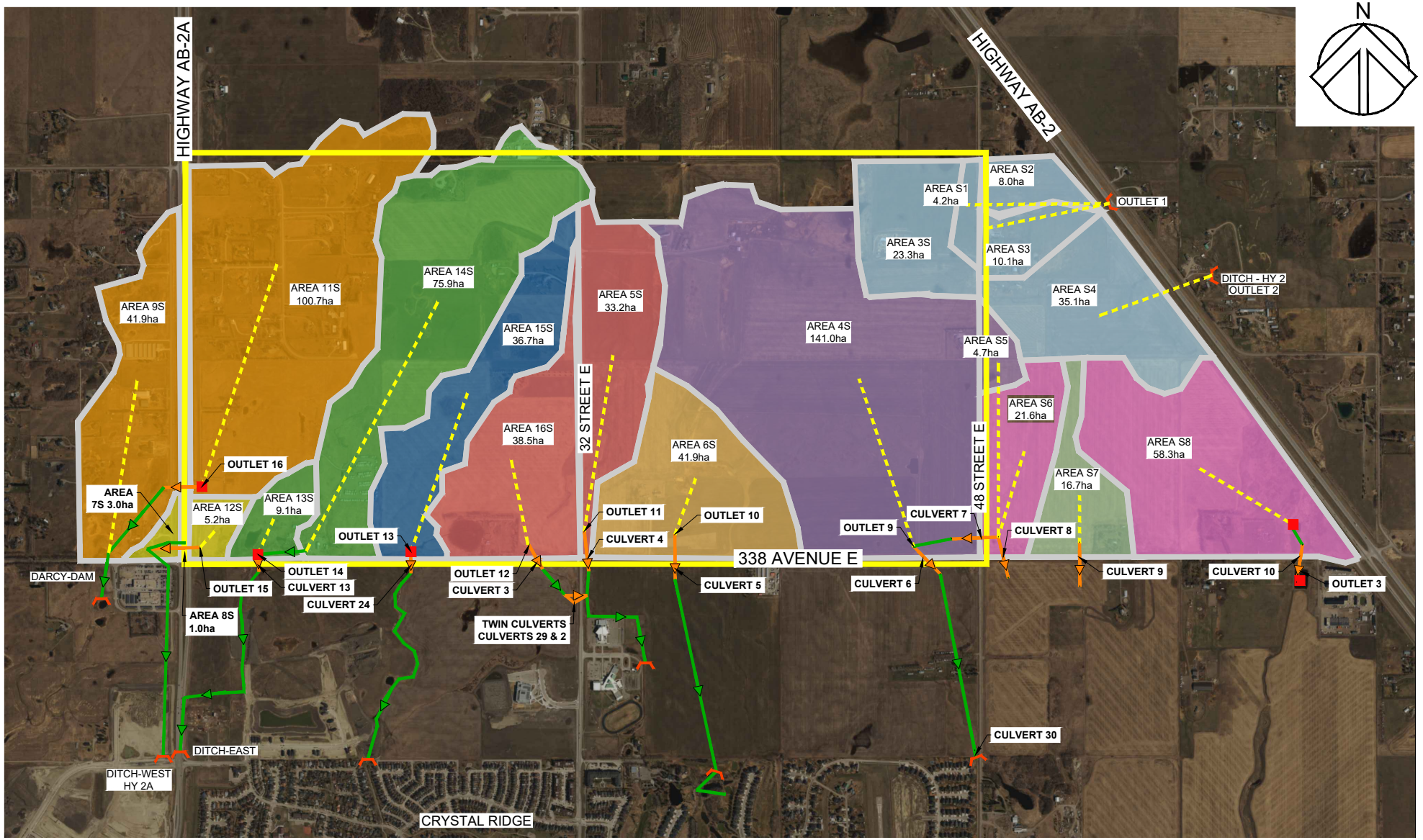
All runoff generated by Sub-catchment 11s will continue to be accommodated by the existing D'Arcy Dam.

- All runoff generated by Sub-catchment 12s is captured first by Highway 2A west ditch then diverted to the new Pond A DARCY.

- All runoff generated by Sub-catchments 13s and 14s is captured by the Northridge Drive east ditch.
- All runoff generated by Sub-catchment 15s is captured by the Crystal Ridge swale.
- All runoff generated by Sub-catchment 16s is directed to the east ditch on 32nd Steet E and is transferred to Trilogy Plains via the church and school ditch.
- All runoff generated by Sub-catchment 5s is directed to Trilogy Plains via the church and high school ditch.
- All runoff generated by Sub-catchment 6s flows directly to Trilogy Plains and through the culvert on the Crystal Ridge Golf Course.
- All runoff generated by Sub-catchment 4s flows towards the roadside ditch running along 48th Steet.
- Lastly, all runoff generated by Sub-catchments 3s and s1 is captured by Highway 2 west ditch.

Table 5: Sub-Catchment Properties

Sub-catchment	Outlet Number	Area (ha)	Width (m)	Flow Length (m)	Slope (%)	Imperv. (%)
s1	OUTLET-1-Ditch-1-HY2	4.17	416.94	100.00	4.5	2
3s	OUTLET-1-Ditch-1-HY2	23.31	525.00	444.00	3.0	2
4s	OUTLET-09-J11	141.03	746.97	1888.00	2.0	2
6s	OUTLET-10-j9	41.96	547.73	766.00	3.0	2
5s	OUTLET-11-J7	33.23	237.34	1400.00	2.8	2
16s	OUTLET-12--J5	38.52	304.24	1266.00	2.5	2
15s	OUTLET-13-J53s	36.72	236.75	1551.00	2.3	2
14s	OUTLET-14-Js29	75.92	392.76	1933.00	2.2	2
13s	OUTLET-14-Js29	9.15	226.00	404.80	2.8	2
12s	OUTLET-15-Js24	5.23	173.75	301.00	2.2	6
11s	OUTLET-16-J16s--to-DARCY-DAM	100.68	499.00	2017.62	1.5	2



LEGEND

- PRE-DEVELOPMENT SUBCATCHMENT BOUNDARIES
- STUDY AREA
- DRAINAGE ROUTE
- PRE-DEVELOPMENT PATHWAYS
- CULVERT
- FLOW DIRECTION
- OUTFALL
- EXISTING DEPRESSION

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FIGURE NAME
PRE-DEVELOPMENT
SUBCATCHMENT AREAS
AND OUTLETS

FIGURE NO.
F2.0

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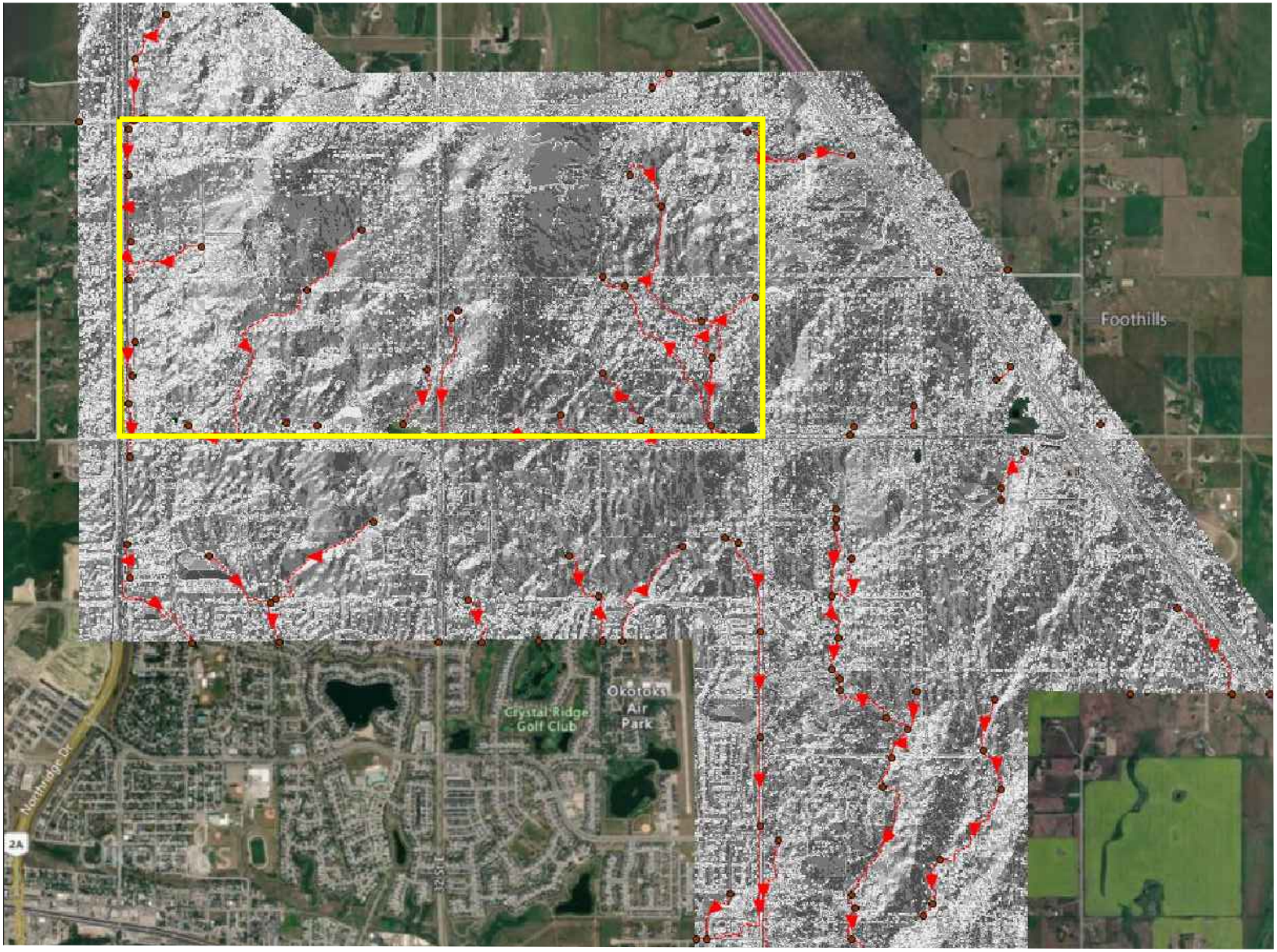

LEGEND

CHANNELS

STUDY AREA

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FIGURE NAME
TOPOGRAPHY AND
CHANNEL FLOW DIRECTIONS

FIGURE NO.
F3.0

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4 Pre-Development Configuration and Assessment

4.1 Model Development

In order to estimate the pre- and post-development runoff conditions, the PCSWMM Version 7.6.3665 (64-bit) Professional 2D with the EPA SWMM5 Version 5.0.013 - 5.2.4 engine model was used for the hydrologic analyses. This software was developed by Computational Hydraulics International (CHI) and uses the US EPA SWMM5 model as calculation protocol with a friendly GIS user interface.

For the precipitation, the model can execute a single event or continuous meteorological events over a period of time. The 1:100-year design storm event of the Chicago distribution was used for this study, with a total storm duration of 24 hours and 5-minute rainfall increments. The input and output for the single event-based model can be found in Appendix E and F for the pre-development conditions and Appendix G and H for the post-development conditions.

Parameters used in the hydrological modelling for infiltration, storage and roughness are summarized in Table 6. For the water lost by infiltration, and according to the geotechnical investigation reports undertaken in the vicinity of the study area, the subsoil conditions appear to be mostly silty clay, which is categorized under the hydrologic soil group with a low infiltration rate. Because of the limited geotechnical data around the study area, it is assumed that the subsoil conditions for the entire study area are similar to those described in the geotechnical investigation reports for neighboring terrain. The watershed is predominantly agricultural, and Green-Ampt method was used to estimate the physical nature of infiltration rates. All-natural channel conveyance routing was performed by PCSWMM to account for the conveyance routing associated with natural drainage courses and highway/roadway ditches. The conveyance pathways are represented as trapezoidal geometries with a Manning roughness of 0.035.

Table 6: Infiltration, Storage, and Roughness Modelling Parameters

Parameter	Used Values
Suction Head (mm)	270
Conductivity (mm/hr)	1.016
Initial deficit (fraction)	0.26
Manning's "n" roughness	0.035
Depression storage Pervious Areas (mm)	3.2
Depression storage Impervious Areas (mm)	1.6

Imperviousness:

The parameters for imperviousness that were used as input in the PCSWMM models are listed in **Table 7.**

Table 7: Typical Imperviousness of Urban Catchments

Land Use Description	% Imperviousness
Major Road Right-of-Way	70
Gravelled Roads, Lanes and Parking Areas	50
Paved Surfaces and Roofs	100
Commercial Malls with Large Parking Areas	95
Light Commercial and Industrial	85
Parks, Playfield	10
Green Space	15
Undeveloped Area	2-4

4.2 Pre-Development Flow Analysis

The objective of the hydrologic analysis is to estimate the pre-development stormwater runoff that discharges from the lands in Zones 1N and 2N to the outlet locations shown in Figure 2. **Table 8** presents the simulated pre-development 100 Year Event Peak Flows at the outlets **and Figure 4** shows flow hydrographs at these outlets.

Table 8: Pre-Development 100 Year Event Flows at the Outlets

Outlet-Number-Node Name	Contributing Pre-development Sub-catchment	Area (ha)	Pre-development Peak Discharge 100 Year (m3/s)
OUTLET-1-Ditch-1-HY2	S1+3S	27.4	0.71
OUTLET-13-J53s	15S	36.7	0.31
OUTLET-14-Js29	13S+14S	85.1	0.70
OUTLET-16-J16s--to-DARCY-DAM	11S	100.6	0.57
OUTLET-15-Js24	12S	5.2	0.13
OUTLET-12--J5	16S	38.5	0.38
OUTLET-11-J7	5S	33.2	0.32
OUTLET-10-j9	6S	41.9	0.61
OUTLET-09-J11	4S+ % of S5+S6	167.3	0.96

CLIENT TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB	PRIME CONSULTANT ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com	
	SCALE: NTS DATE: 2024-01-05 PROJECT ENG: LD DRAWN BY: NI CHECKED BY: LD APPROVED BY: LD PROJECT NO.: 138875	FIGURE NAME PRE-DEVELOPMENT 100 YEAR EVENT FLOWS AT THE OUTLES	FIGURE NO. F4.0

5 Post-Development Assessment

To assist the Town with design decisions for stormwater connectivity across 338th Avenue and inform downstream developments of any required control or conveyance through their SWM facilities and infrastructure, two post-developments scenarios (PDS 1 and PDS 2) were performed:

- Scenario 1 (PDS 1): Actual 338th Avenue + Fully Developed Upper Lands (Zone 1N, 2N)
- Scenario 2 (PDS 2): Future urban boulevard + Fully Developed Upper Lands (Zone 1N, 2N)

The objective of these simulations is to provide the following information:

- Post-development discharges from the upper lands and required storage volume based on Town's allowable stormwater discharge rate.
- Stormwater flowrate generated by the urbanized boulevard, eventual outlets and total area expected to be routed to the downstream lands: Wedderburn, Trilogy Plains and North Point.

5.1 Scenario 1 (PDS 1)

Upper Land Development Plan

The runoff generated by each sub-catchment is a function of the type of land surface that has impervious surface coverage. The land use plan proposed by each developer provides the characteristics of each surface. The imperviousness of each surface is used as an input in the hydraulic model.

For the purposes of developing the final full master drainage plan for this report, it is assumed that the undeveloped lands of the study area be considered as residential zoned lands. An average impervious percentage of 50% is assumed. The ultimate drainage plan was developed around natural drainage patterns as much as possible. Eleven (11) separate drainage sub-catchments were delineated based on previous natural pre-development sub-catchments limit, and quarter-sections, as shown on **Figure 5**. The post development sub-catchments are shown and labelled based on their proposed drainage concept and routes.

Since Sub-catchment 4S drains such a large area, it was divided into 3 smaller sub-catchments: 4S-1, 4S-2, and 4S-3. Outlets 11 and 12 that discharge to a ditch running along the Church and School within Trilogy Plains were not considered to convey any flow, the preference being to direct discharge to alternative outlets, which have straighter discharge pathway. Outlet 13 that drains to a swale on Crystal Ridge is not used but a new outlet, Outlet 13A at the corner of 32nd street and 338th Avenue is used to drain, ultimately, to the same swale.

For the post-development model parameters, in addition to impervious percentage change, it is assumed that the flow lengths in each sub-catchment are 350 m to reflect the future distance to catch basins. For depression storage, which represents the water stored within small depressions on the ground surface, a value of 3.2 mm is used for the pervious area and 1.6 mm for the impervious surface.

The post development flow hydrographs are shown in **Figure 6. Table 9** shows that post-development peak runoff varies with the area. As shown in **Figure 6**, there is an increase in peak flow under proposed conditions compared to the pre-development conditions (**Figure 4**), requiring extra storage for the project area.

Table 9: Post-Development 100 Year Event Flows at the Selected Outlets

Outlet-Number-Node Name	Contributing POST-development Sub-catchment	Contributing Area (ha)	Post-development Peak Discharge 100 Year (m3/s)
Outlet-9--J11	4S-2 +4S-3	145.7	10.1
Outlet-10-j9	4S-1+5S+6S	114.8	7.9
Outlet-11-J7	-	0.0	0.0
Outlet-12-J5	-	0.0	0.0
Outlet-13A-J53s	14S+15S+16S	128.3	8.9
Outlet-14-Js29	13S	29.0	2.0
Outlet-15-Js24	12S	5.2	0.3
Outlet-16--J16s--to-DARCY-DAM	11S	89.5	4.1

LEGEND

- POST-DEVELOPMENT SUBCATCHMENT BOUNDARIES
- DRAINAGE ROUTE
- PRE-DEVELOPMENT PATHWAYS
- CULVERT
- FLOW DIRECTION
- OUTFALL
- FUTURE DRAINAGE ROUTE
- FUTURE OFFSITE SWMF
- EXISTING POND
- STUDY AREA

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FIGURE NAME
POST-DEVELOPMENT SUBCATCHMENT AREAS AND OUTLETS

FIGURE NO.
F5.0

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	SCALE: NTS DATE: 2024-01-05 PROJECT ENG: LD DRAWN BY: NI CHECKED BY: LD APPROVED BY: LD PROJECT NO.: 138875	FIGURE NAME POST-DEVELOPMENT 100 YEAR EVENT FLOWS AT SELECTED OUTLETS	FIGURE NO. F6.0

5.2 Stormwater Management Facilities

The proposed drainage concepts for the zones 1N and 2 N are shown in **Figure 7**. Catchment colours represent an approximation of pre-development drainage areas. All proposed SWM Facilities are considered wet ponds with storage up to the 100-year rainfall event with outflow controlled to 2.5 L/s/ha. Six new SWM Facilities have been proposed for this area to service approximately 512 ha of future residential development as presented in **Table 10**.

Reducing the outflow from the developed sub-catchments to a maximum of 2.5 L/s/ha would equate to a maximum discharge of 0.37 m3/s. The required storage capacity of the new SWMFs varies between 2,300 m3 and 64,000 m3. By assuming an active storage depth of 1.5 m for each pond, the corresponding areas required for the ponds vary between 0.15 and 4.27 ha.

Because the land use and soil conditions are unknown, stormwater source control practices were not incorporated in the simulation to reduce runoff volumes. As an example, these volumes could be reduced by assuming that 20% to 40% of all impervious runoff would be directed through the pervious lands. Also, a few optimizations could be assessed during subsequent design phases of the project. For example, subcatchment 12S and 13 S are in very close proximity, their areas could be aggregated into a single subcatchment with only one pond.

Table 10 shows that overall, the SWMF's post development discharges at the existing outlets are reduced from that of the predevelopment condition (**Table 8**). **Table 11** summarizes the contributing areas and flowrate at each outlet for the pre-development, post-development and SWMF's post-development conditions.

Table 10: Stormwater Management Facilities

Pond Name	Contributing Area (ha)	(UARR) L/s/ha	Allowable Discharge m3/s	Volume Without Stormwater Source Control (m3)	Required Area with 1.5 m Depth (ha)
Pond-D-J11	145.7	2.5	0.364	64,013	4.27
Pond-E-J9	114.8	2.5	0.287	50,424	3.36
Pond-F-J53s	128.3	2.5	0.321	56,325	3.76
Pond-H-Js29	29.0	2.5	0.073	12,739	0.85
Pond-I-Js24	5.2	2.5	0.013	2,300	0.15
Pond-K-J16s--to-DARCY-DAM	89.5	2.5	0.224	34,683	2.31

Table 11: Comparison Pre-Development, Post-Development and SWMF's Post-Development Conditions

Outlet-Number-	Contributing Pre-development Sub-catchment	Area	Pre-development Peak Discharge 100 Year (m3/s)
OUTLET-09-J11	4S+ % of S5+S6	167.3	0.96
OUTLET-10-j9	6S	41.9	0.61
OUTLET-13-J53s	15S	36.7	0.31
OUTLET-14-Js29	13S+14S	85.1	0.70
OUTLET-15-Js24	12S	5.2	0.13
OUTLET-16-J16s--to-DARCY-DAM	11S	100.6	0.57
OUTLET-12--J5	16S	38.5	0.38
OUTLET-11-J7	5S	33.2	0.32

Outlet-Number-	Contributing POST-development Sub-catchment	Area (ha)	Post-development Peak Discharge 100 Year (m3/s)
Outlet-9--J11	4S-2 +4S-3	145.7	10.1
Outlet-10-j9	4S-1+5S+6S	114.8	7.9
Outlet-13A-J53s	14S+15S+16S	128.3	8.9
Outlet-14-Js29	13S	29.0	2.0
Outlet-15-Js24	12S	5.2	0.3
Outlet-16--J16s--to-DARCY-DAM	11S	89.5	4.1
OUTLET-12--J5	NA	0	0
OUTLET-11-J7	NA	0	0

Pond Name	(UARR) L/s/ha	Area (ha)	Allowable Discharge m3/s
Pond-D-J11	2.5	145.7	0.364
Pond-E-j9	2.5	114.8	0.287
Pond-F-J53s	2.5	128.3	0.321
Pond-H-Js29	2.5	29.0	0.073
Pond-I-Js24	2.5	5.2	0.013
Pond-K-J16s--to-DARCY-DAM	2.5	89.5	0.224
OUTLET-12--J5	0	NA	0
OUTLET-11-J7	0	NA	0

5.3 Alternative for Servicing Routes

One proposed combination of options is created in **Figure 7** to represent potential service connections points. Other possible combinations should be investigated further by future developers once the land use concept is defined.

Figure 7 shows the receiving outlet for each of the stormwater management facilities. The facilities are proposed to be routed either through natural drainage courses that currently route the pre-development flow or through new connections to future ponds located on Wedderburn and Trilogy Plains lands. Any discharge directed to Wedderburn or Trilogy Ponds would be pre-development or 2.5L/s/ha (depending on stage of upstream development) and would be considered as flow-through.

Overall, flows from the outfalls of the ponds located on sub-catchments 11s and 12s are proposed to be routed along the existing pre-development drainage as discussed in Section 3.5.

Only one route has been identified for Sub-catchment 13s flow to reach the final outlet when discharging across 338th Avenue. This option is the existing natural drainage route for the pre-development case. The flow crosses 338th Avenue to flow through the Wedderburn land, ultimately discharging into the Northridge Drive east ditch.

One path has been identified for Sub-catchments 14s, 15s and 16s when discharging across 338th Avenue. Pond F would be on the east corner of 32nd and 338th avenue, to capture and control runoff from the catchments. This option would involve routing discharge from Pond F to a new connection to allow the flow to be routed to the future Pond C on Wedderburn lands, eventually discharging into the Crystal Ridge Swale. Based on North Okotoks Stormwater Master Drainage Plan (Stantec 2015), the controlled discharges from the east half of the Wedderburn lands, will be conveyed by a new storm sewer from the future Pond C to the existing 375 mm storm sewer in the Crystal Ridge community. It is anticipated that this new storm sewer will be installed under the existing pathway and will have a full-flow capacity of 226 L/s. This rate should be confirmed, in consultation with the Town, at the detailed design stage. For sub-catchments 4S-1, 5S and 6S, two alternatives were identified:

1. Option 1 proposes that the discharge from the SWM Facilities be conveyed along the predevelopment route through Trilogy Plains; the flow is routed directly to discharge via the Culvert on Crystal Ridge Golf Course
2. Option 2 is a new route that would involve installing a new connection between the proposed Pond E and the future Pond on Trilogy Plains lands.

Two options have been identified for sub-catchments 4S-2 and 4S-3 as show on **Figure 7**:

1. Option 1 is to allow the flow to cross the 338th Avenue to reach Trilogy Plains land to be then routed through the new pond on Trilogy Plains.
2. Option 2 is a proposed route that would involve installing a new connection along 338th Avenue which would then connect to the North Point development on the south side of 338th Avenue. From here, the Pond D discharge (0.364 m3/s) would be routed through the future infrastructure of North Point development to ultimately discharge into the Sheep River.

To consider potential alternatives to the current Option 1 and ensure a potential cost-effective alternative, Option 2 connecting Pond D (NOAL MDP) to Pond A (NP MDP) and then discharge into Ponds B and C (NP MDP post development Scenario 1) was investigated with the following preliminary findings:

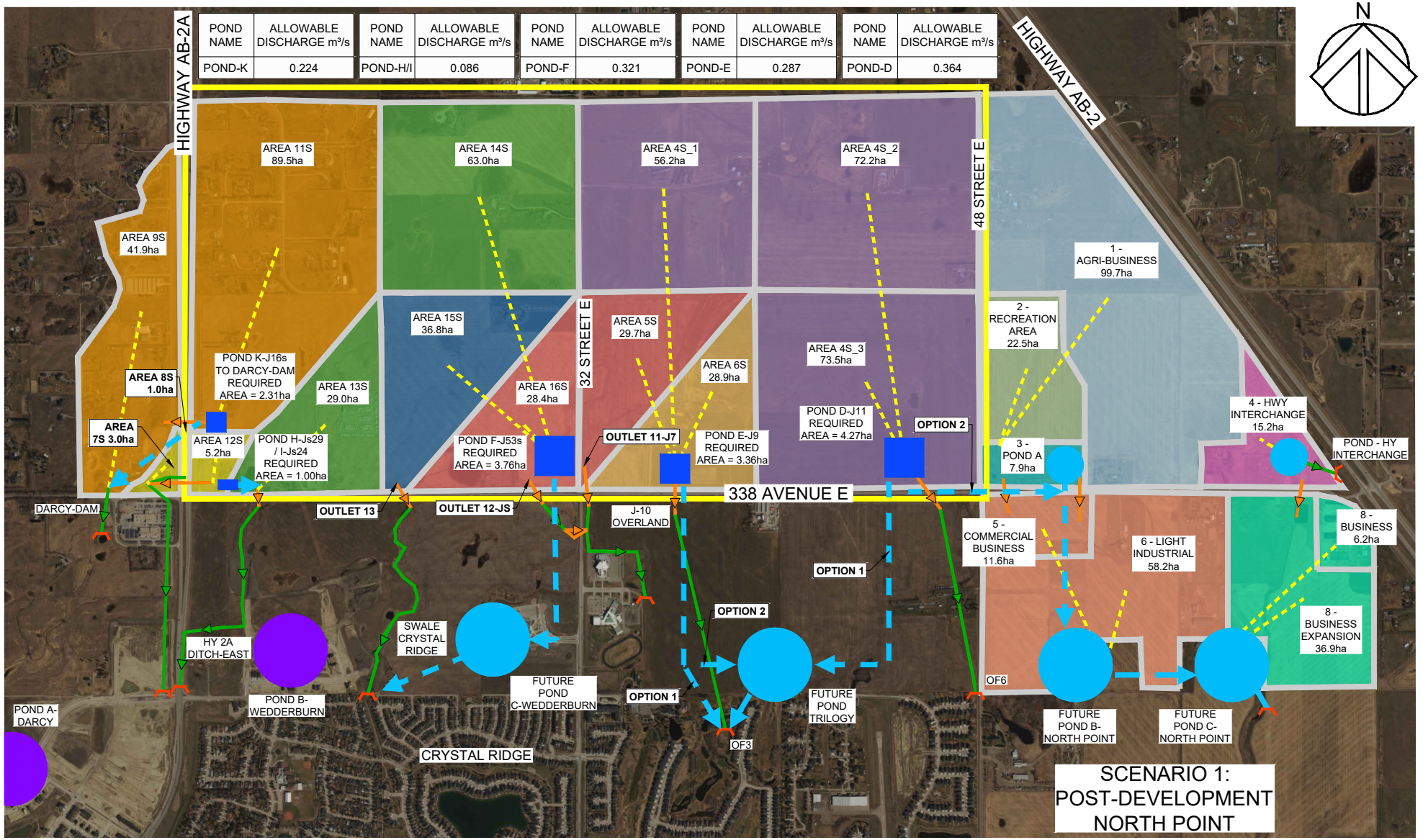
1. The post development discharge flowrate from Ponds A, B and C are 0.324 m3/s, 0.196 m3/s and 0.109 m3/s, respectively, totaling 0.629 m3/s at outlet no. 7

2. The estimated pre-development flowrate at the same outlet no. 7 is 1.38 m3/s allowing a discharge room of about 0.75 m3/s to be routed to this outlet
3. Option 2 offers less drainage pipe than the original Option 1 connecting Pond D to the Trilogy Pond, which would still require Pond A to connect to Ponds B and C
4. Option 2 offers an additional certainty in terms of not being dependent on the Trilogy Pond and uncertainties associated with its future incoming flowrates and downstream capacity through existing infrastructure.

While Option 1 is still considered a viable option, it is recommended that this Option 1 connecting to the Trilogy Pond be further evaluated during subsequent design phases to ensure that it is adequately sized for all incoming flowrates including Upper lands development's drainage through Pond D.

The choice between the two options will also depend on the timing of the development and construction of the various ponds (Trilogy Pond or Ponds on North Point).

Because Pond I requires only a small capacity, it would be practical to aggregate Pond I and H into a larger Pond, to capture and control runoff from both Sub-catchments 12S and 13S. The total flow would cross 338th Avenue to flow through the Wedderburn land, ultimately discharging into the Northridge Drive east ditch.



POND NAME	ALLOWABLE DISCHARGE m³/s	POND NAME	ALLOWABLE DISCHARGE m³/s	POND NAME	ALLOWABLE DISCHARGE m³/s	POND NAME	ALLOWABLE DISCHARGE m³/s	POND NAME	ALLOWABLE DISCHARGE m³/s
POND-K	0.224	POND-H/I	0.086	POND-F	0.321	POND-E	0.287	POND-D	0.364

LEGEND

- POST-DEVELOPMENT SUBCATCHMENT BOUNDARIES
- DRAINAGE ROUTE
- PRE-DEVELOPMENT PATHWAYS
- CULVERT
- FLOW DIRECTION
- OUTFALL
- FUTURE SWMF UPPER LANDS
- FUTURE CONNECTIONS
- FUTURE OFFSITE SWMF
- EXISTING POND
- STUDY AREA

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FIGURE NAME
POST-DEVELOPMENT DRAINAGE CONFIGURATION ROUTES AND POND LOCATIONS

FIGURE NO.
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5.4 Scenario 2 (PDS 2)

The widening of 338th Avenue E from a two-lane rural section to a four- and six lane urban section was analyzed with PCSWMM. The downstream infrastructure/ponds will need to be capable of controlling and conveying the potential, post-2046, 6-lane concept for the entire road. The selected cross-section for 338th Avenue for the first segment between Northridge Drive and 48th Street, and the second segment between 48th Street and Highway 2 are presented in **Figure 8**. The total contributing catchment area is 19.50 ha with an ultimate percentage of imperviousness of 55% and 66%, respectively.

The boulevard sub-catchments, as shown in **Figure 9**, include five (5) sub-catchments (Boulevard 1 through 5). Only Sub-catchment 1 and 2 are currently draining toward the west. All runoff from sub-catchments 3 to 5 drain west to east and discharge into different outlets. To accommodate the new configuration, a future storm sewer along the boulevard will collect drainage from the right of way and outlet south to eventually discharge into existing and future detention ponds located on Wedderburn, Trilogy Plains, North Point, or the new Highway 2 interchange pond. Exact catchments will be verified at the detailed design stage (Refer to 338th Avenue Functional Study – Stormwater Management Concept Report for future concept, Arcadis 2023).

Figure 9 shows the potential outlets locations downstream of the boulevard and **Table 12** describes the contributing areas, percent of imperviousness and peak flows for the post-development scenario (for 100-year storm event). Stormwater management guidelines for the 338th Avenue ROW, including stormwater targets and outlet locations, are described in the "338th Avenue Functional Study – Stormwater Management Concept" (Arcadis, 2023). The concept is currently under review by the Town of Okotoks and will be confirmed prior to the detailed design of the road.

Table 12: Peak Discharge, Outlets, and Sub-Catchment Summary

Boulevard Sub-catchment	Outlet Type	% Imperviousness	Contributing Area (ha)	Peak Runoff 100 Year (m^3/s)
1	**POND Wedderburn**	55	2.92	0.45
2	**Future POND C Wedderburn**	55	1.78	0.34
3	**Future POND Trilogy**	55	7.74	0.69
4	**Future Pond-B-North Point**	66	3.92	0.56
5	**Future POND-HY-Interchange**	66	3.09	0.50

ULTIMATE 46m ROW CROSS-SECTION - 6 LANES (48 STREET TO HIGHWAY 2)

INTERIM 46m ROW CROSS-SECTION - 6 LANES (NORTHRIDGE DRIVE TO 48 STREET)
OPTION 2: WIDER BOULEVARDS

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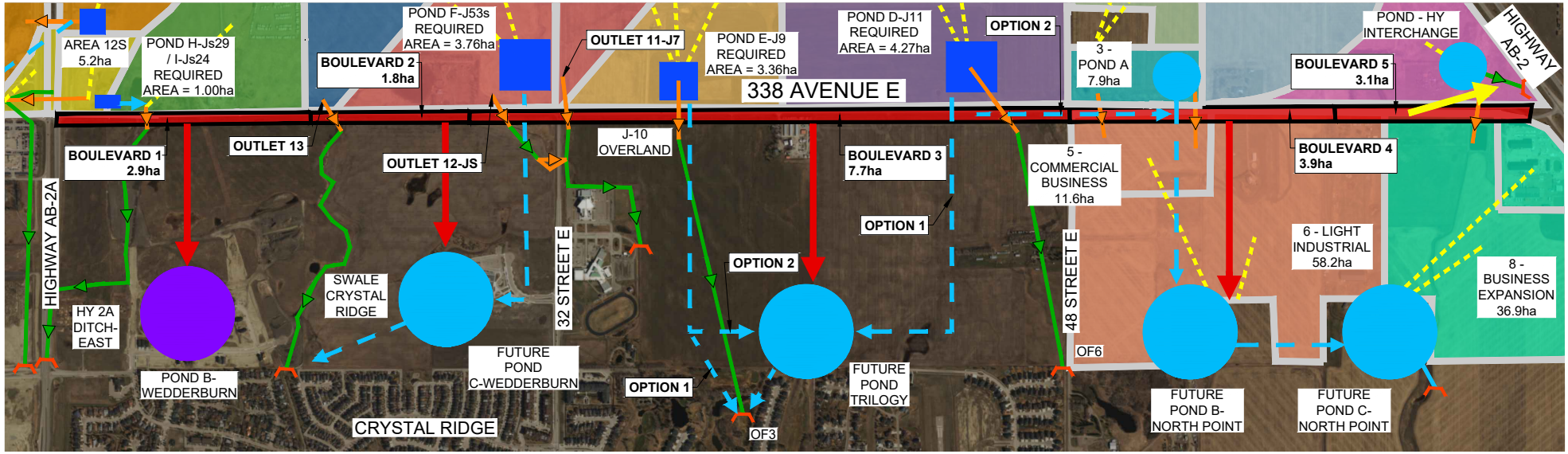
	SCALE NTS	DATE 2024-01-05	FIGURE NAME 338 AVENUE CROSS SECTIONS 48 STREET & HIGHWAY 2 NORTHRIDGE DRIVE & 48 STREET
	PROJECT ENG LD	DRAWN BY NI	FIGURE NO. F8.0
	CHECKED BY LD	APPROVED BY LD	
	PROJECT NO. 138875		



LEGEND

- POST-DEVELOPMENT SUBCATCHMENT BOUNDARIES
- DRAINAGE ROUTE
- PRE-DEVELOPMENT PATHWAYS
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- FLOW DIRECTION
- OUTFALL
- FUTURE SWMF UPPER LANDS
- BOULEVARD DRAINAGE
- INTERCHANGE DRAINAGE
- BOULEVARD SUBCATCHMENT
- FUTURE CONNECTIONS
- FUTURE OFFSITE SWMF
- EXISTING POND

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FIGURE NAME
POTENTIAL DRAINAGE CONFIGURATION FOR FUTURE BOULEVARDAND FUTURE LAND DEVELOPMENT

FIGURE NO.
F9.0

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10mm

5.5 Water Quality

Ponds are used to temporarily store stormwater runoff and help in the settlement of runoff pollutants, as well as restricting downstream discharge to predetermined rates to reduce downstream flooding and erosion potential. Wet ponds are similar to lakes in that there is always a permanent body of water. During rainfall events, additional temporary storage is provided above the permanent level. After the rainstorm, the water level gradually recedes back to its original level.

Improvement of stormwater quality will be facilitated by sediment removal in the proposed storm ponds, prior to discharging to the existing system. Water quality improvement achieved by the ponds should adhere to Town of Okotoks standards at the time of detailed design. During construction, erosion and sediment control measures should be applied in accordance with applicable guidelines such as those adopted by the City of Calgary.

5.6 Best Management Practices

City of Calgary guidelines (September 2011) describe Best Management Practice (BMP) techniques that can be implemented to control the quantity/rate and improve the quality of stormwater discharges to receiving watercourses. The following techniques are best suited for Calgary climate: 1) Better Planning Practices. 2) Vegetated swales. 3) Absorbent landscaping. 4) Bioretention areas. 5) Porous pavement. 6) Rainwater harvesting. 7) Green roofs and 8) Water reuse and stormwater use. Each of these technologies need to be evaluated in the current site development process.

The stormwater management facility numbers and sizing described above are based on traditional stormwater management approaches and assume that any/all wetlands will be removed and compensated. However, the Town of Okotoks has positioned itself to be an Environmental Leader, prioritizing the protection and enhancement of natural areas and systems.

5.7 Low Impact Development

The Town of Okotoks has positioned itself to be an Environmental Leader, prioritizing the protection and enhancement of natural areas and systems. They have created policies that require the implementation of low-impact development (LID) into any future land developments in order to progress Town Sustainability goals and move toward more resilient stormwater management systems. The intent of LIDs being to reduce the post-development runoff volume so that it more closely matches the pre-development discharge to the Sheep River, and to maintain historic hydrological water courses in the area that do not negatively affect existing wetlands and courses.

In other jurisdictions, LID requirements are often determined by an average annual runoff volume target (noted as ‘mm’ over the study area) for the watershed’s receiving water body. At the time of this study, there had been no specific runoff volume target set for the Sheep River. However, it is prudent to start designing appropriate infrastructure now as opposed to being required to retrofit if/when future targets are applied or flooding becomes more frequent.

The “Stormwater Management Master Plan and Flood Mitigation Plan” (ISL, 2014), suggested a potential average annual runoff volume target of 98mm based on pre-development conditions and reviewed a range of typical LID tools. It should be noted that this target was set based on Town boundaries at the time of publication, and did not

consider the lands recently annexed at the north and east boundaries. A repeat analysis may be required to provide a more comprehensive estimation.

While 98mm is not particularly stringent (relative to regionally relevant zones with mandatory runoff volume targets), it does pose a challenge to traditional developments and servicing. As LID technology and regulatory restrictions evolve, the ease of meeting targets is likely to improve. It is crucial that any targets applied are done so at the staged master drainage plan or pond report phase, so that the full potential of SWMFs, green spaces, or LID infrastructure can be applied to the entire development area.

While it is unlikely that the runoff volume for the annexation lands will be significantly different that the noted 98mm, until such time that the volume target can be updated based on the current Town boundary, it is recommended that the Town apply this target to all future developments at the SMDP stage.

If deemed acceptable by the Town, future developments may provide justification (in the form of a detailed pre-development analysis) for an increased runoff volume target. However, it is recommended that the Town adopt the current City of Calgary guidelines (Interim Approach) as an absolute minimum runoff volume target recommendation for all new developments within Town boundaries:

- 250mm for Industrial and Large Commercial sites
- 150mm for Small Commercial and Multi-Family residential Sites
- Single family developments require all roof leaders to be directed to absorbent/resilient landscaping.
- Minimum 300mm topsoil for all landscape applications
- SMDP and/or Pond Report should indicate whether targets are applied on a site-by-site basis or achieved through centralized infrastructure (ie. Pond water reuse to achieve equivalent runoff target for an entire development).
- Relaxations may only be explored where site challenges (ex. High water table) limit LID effectiveness and all alternatives have been exhausted.

6 Conclusion and Recommendations

6.1 Conclusion

For this MDP, a comprehensive hydraulic model was developed to better understand the drainage system of the upper lands. The existing drainage system for the study area was evaluated under the current pre-development conditions using a computer hydraulic model under the 100-year 24-hour rainfall event. The identified sub-catchments within the study Area and flow paths to the downstream lands are based on LiDAR data.

Eleven (11) separate sub-catchments were delineated and nine (9) drainage outlets were identified. The simulated 100-year event peak flows for the previous outlets varied between 0.13 and 0.96 m3/s for sub-catchment areas varying between 5.23 ha and 167.27 ha.

Under the post-development condition, the proposed urbanized 338th Avenue corridor drainage and future residential developments were examined. A stormwater management concept was analyzed at a high level, and the designated outlets for future development have been identified for all upper lands within the project's boundary. The designated outlets provide suitable points of discharge with easy access throughout the area and

easy connection to downstream developments. This allows future development to occur with relatively independent drainage boundaries.

The approximate locations and size of stormwater detention facilities are also provided as a guide for the Town. Six (6) new SWM Facilities have been proposed for the upstream lands, to control stormwater from approximately 512 ha of future developments. The ponds were assumed to be wet ponds for this study. Active pond volumes were computed to range from 2,300 m3 and 64,000 m3 for the proposed Drainage Concept with a maximum release rate of 2.5 L/s/ha. The impact of proposed road improvement on peak flow was evaluated and five outlets were identified: POND B Wedderburn, Future POND C Wedderburn, Future POND Trilogy, Future Pond-B-North Point and Future POND-HY-Interchange.

6.2 Recommendations

Based on the analysis results and information gathered during the study, the following are proposed recommendations provided to the Town that would require addressing during subsequent project stages with respect to drainage planning:

Future Development:

- For the undeveloped lands, site-specific studies would need to be done for each specific future development to refine the design and configuration of the stormwater facilities including connectivity. Any variation on the concepts proposed in the NOAL MDP, NP MDP or SWMC may require updates to the relevant reports to ensure wholistic decision-making.
- Developers are considered responsible for designing and installing appropriate stormwater management infrastructure that adheres to the Development Standards Manual set by the Town of Okotoks and City of Calgary.
- A Pond Report should be prepared for all future stormwater management storage facilities.
- Each new development should be required to provide storage for a 100-year, 24-hour rainfall event with an allowable release rate of 2.5 L/s/ha.
- Ponds within the Wedderburn, Trilogy Plains and North Point ASP areas must be able to accommodate pre and post-development flows as per this report and develop a plan for transitioning between these two scenarios.

The future land developer(s) and the Town should work together to optimize the number and the location of detention facilities for the future developed lands.

- Once the future land concepts are determined, the location of future SWMF (stormwater management facilities) needs to be refined to take advantage of the natural depression and minimize construction work, and in turn capital expenditure.
- Coordination between the future developers and Trilogy Plains and Wedderburn developers is recommended to connect various stormwater infrastructure and minimize construction work, and in turn capital expenditure.
- A potential service connection point was proposed in this report. However, other alternative connection options could be investigated by the future developers once the land use concept is defined.
- One large pond was proposed for every two quarters of land; however, other options can be analyzed with one pond per quarter.

- It is assumed that when lands are to be developed, a stormwater facility will be provided for two quarter sections. If the lands will be developed for quarter section, the number of stormwater facilities required could increase but at the same time, their volume will be reduced.

Environment:

- A complete biophysical assessment of the undeveloped lands is recommended to identify any environmentally sensitive areas or wetlands. This analysis shall meet the requirements set out by Alberta regulations.
- Incorporate stormwater source control practices to retain stormwater onsite to reduce runoff volumes and discharge to Sheep River to a target 98mm. The selection and design of suitable management practices will be decided during the detailed design phases.
- A comprehensive environmental sensitive area survey in the entire upper lands is recommended to have a better understanding on its wetland distribution and potential ways of integration or avoidance with stormwater management facilities. Additional wetland reviews may indicate water bodies that the Town will prioritize for preservation. If any other wetlands are proposed to be directly impacted and removed by the future developments, approval from Environment and Protected Areas under the Water Act is required. This approval process will require monetary compensation and could be slow to proceed and could delay the project planning. The second option could be the integration of stormwater management facilities within the site of the existing wetlands to optimize land use.

Geotechnical:

- A detailed geotechnical investigation is recommended for future developments to confirm subsoil conditions and soil hydraulic conductivity across different sites.

Hydraulic Model:

- The modelled results provided in this report are based on various assumptions for future land development concepts (residential land use, impervious percentage, quarter subdivisions, etc.). The parameters of the hydraulic model require future adjustment once land use is defined, which would require updating the results outlined in this report.

Existing offsite Inlet Control device (ICD) for downstream infrastructure:

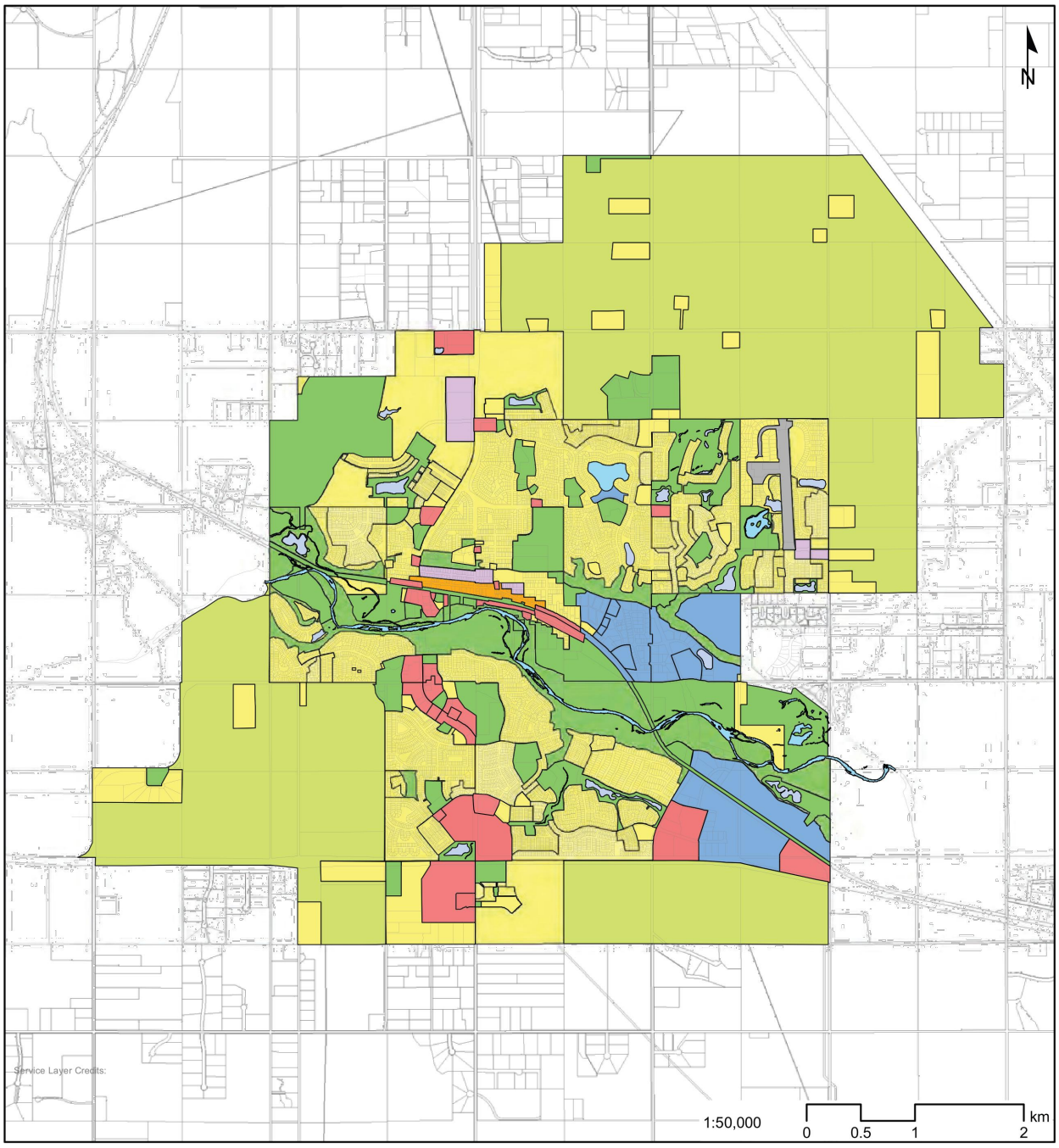
- Once the sub-catchments 13S and 14S are changed from their pre-development to post-development sizes, the ICD located downstream 13S will need to be revised in future works. Flow controls may need to be reviewed to ensure compatibility with shifts in flow from new developments. This should likely occur at SMDP or Pond report stages.

Bibliography

1. City of Calgary; Stormwater Management & Design Manual; September 2011
2. Stormwater Management Guidelines for the Province of Alberta. Alberta Environment. (1999).
3. Municipal development plan, Town of Okotoks (September 2019)
4. North Point ASP (2021, 2022)
5. Biophysical Overview North Point Area Structure Plan Near Okotoks, Alberta (Trace Associates, 2021)
6. Stormwater management master Plan and Flood Mitigation Plan (ISL, November 2014)
7. North Okotoks Stormwater Master Drainage Plan Draft Report (Stantec, June 2015)
8. Master Drainage Plan Trilogy Plains ASP (Cima, December 2021)
9. Wedderburn Lands Geotechnical Report. (June 2015)
10. Trilogy Plains ASP Geotechnical (May 2021)
11. North Point Stormwater Master Drainage Plan (Arcadis 2023)
12. 338th Avenue Functional Study – Stormwater Management Concept” (Arcadis, 2023)

Appendix A

Figure 10: Map D.4 Current Land Use (September 2019)



Legend

- Agricultural
- Residential
- Commercial
- Mixed Use
- Industrial
- Open Space/ Institutional
- Aerodrome

Okotoks
Historic Past. Sustainable Future.

Current as of September, 2019

SOURCE: MUNICIPAL DEVELOPMENT PLAN: TOWN OF OKOTOKS

CLIENT TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB		PRIME CONSULTANT ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
	SCALE NTS	DATE 2024-01-05	FIGURE NAME MAP D.4 - CURRENT LAND USE (SEPTEMBER 2019)
	PROJECT ENG LD	DRAWN BY NI	FIGURE NO. F10.0
	CHECKED BY LD	APPROVED BY LD	
	PROJECT NO. 138875		

SCALE CHECK 1 in 10mm

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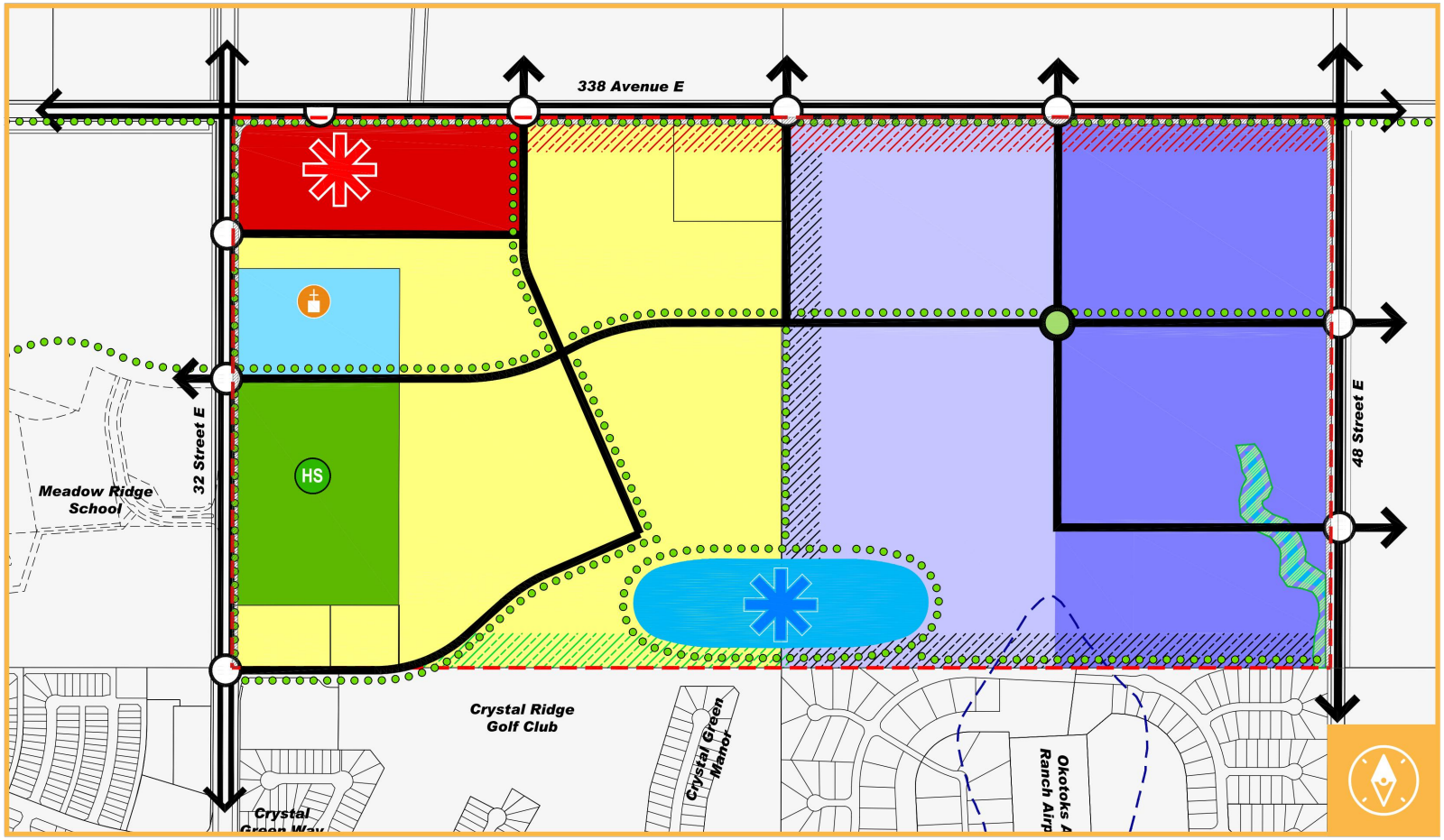
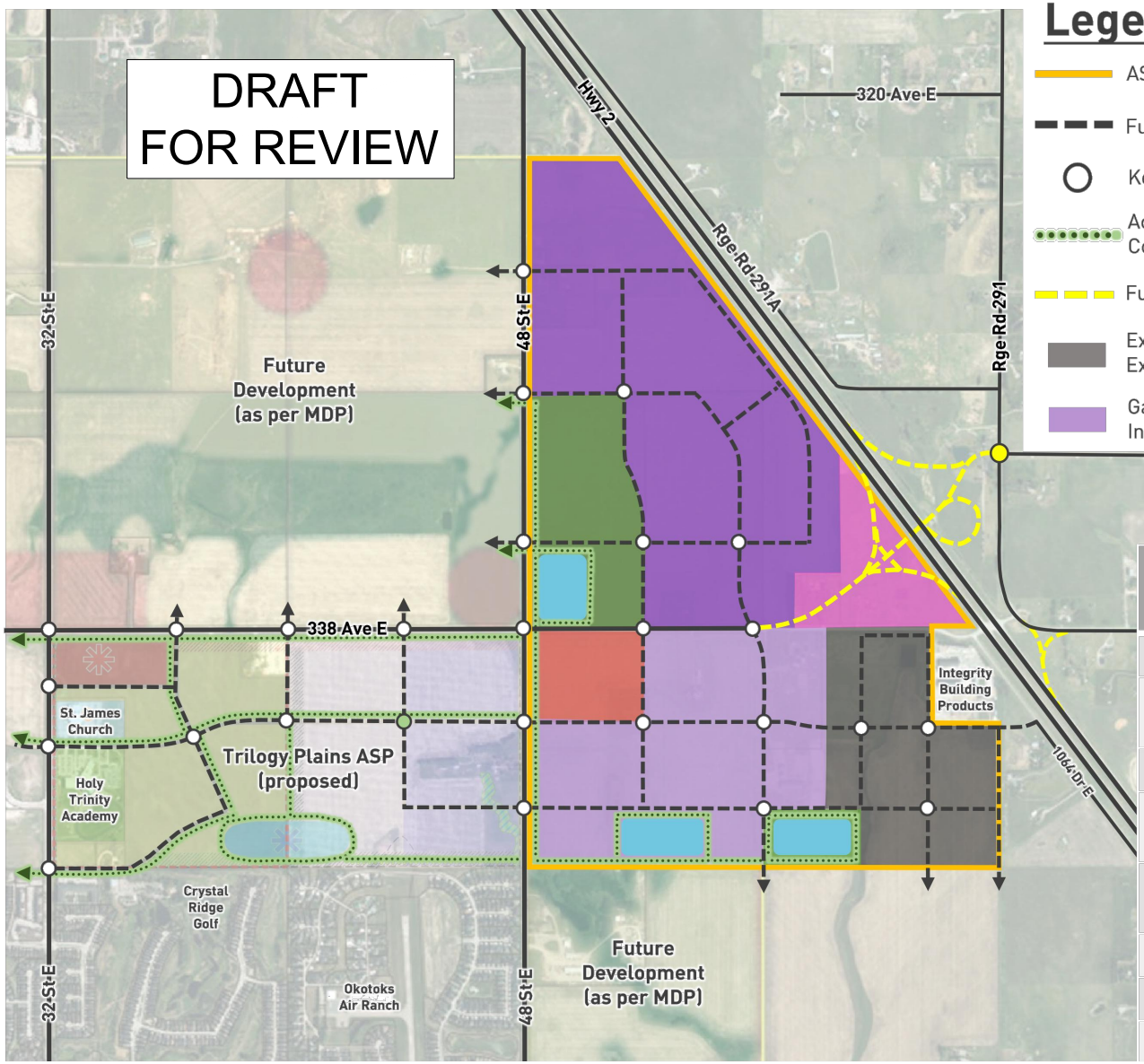
Appendix B

Figure 10 | **Land Use Concept**



- Area Structure Plan Boundary
- Proposed Pathway System
- Arterial System
- Collector System
- All-Turns Intersection
- Right-In-Right-Out Access
- Mixed-use Area
- Neighbourhood Area
- Institutional (Church)
- Existing High School Site
- Employment Flex Area
- Road Widening Area
- Employment Area (Industrial/Commercial)
- Employment- Residential Interface Area
- 338 Avenue Interface Area
- Golf Course Interface Area
- Potential Environmental Reserve
- Community Hub
- Proposed Stormwater Facility (exact size and shape to be determined at detailed design stage)
- 30 NEF Contour
- Roundabout

CLIENT: TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME: NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB	PRIME CONSULTANT: ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com	
	SCALE: NTS DATE: 2024-01-05 PROJECT ENG: LD DRAWN BY: NI CHECKED BY: LD APPROVED BY: LD PROJECT NO.: 138875	FIGURE NAME: TRILOGY PLAINS AREA STRUCTURE PLAN (B&A PLANNING GROUP, DECEMBER 2021)	FIGURE NO.: F11.0



Legend

- ASP Boundary
- Future Roads
- Key Intersections
- Active Modes Connection
- Future Interchange
- Existing Business Expansion Area
- Gateway Light Industrial 'Flex' Area
- Commercial Business Area
- North Point Recreation Area
- Stormwater Management Area
- Highway 2 / 338 Ave Interchange Area
- Agri-Business / Long Term Business Area

N

Land Use Type	± ha	± ac
Business Expansion	37	91
Gateway Light Industrial / Flex	58	143
Commercial Business	12.1	30
North Point Regional Park	20.5	50.6
Agri-Business / Long-Term Business	99	245
Stormwater	16.2	40
Interchange	15.4	38
TOTAL	**267**	**660**

Map 3: Future Development Concept

North Point Area Structure Plan
May 6, 2022

b&a PLANNING GROUP

Note: Alignment of future interchange is conceptual only and is subject to Alberta Transportation

CLIENT
TOWN OF OKOTOKS

5 ELIZABETH STREET
OKOTOKS, AB

PROJECT NAME
NORTH POINT MASTER DRAINAGE PLAN
OKOTOKS, AB

PRIME CONSULTANT
ARCADIS
227 11 Avenue SW - 3rd Floor
Calgary AB T2R 1R9 Canada
tel 403 270 5600
www.arcadis.com

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PROJECT ENG	DRAWN BY
LD	NI
CHECKED BY	APPROVED BY
LD	LD
PROJECT NO.	
138875	

FIGURE NAME
TOWN OF OKOTOKS NORTH POINT ASP (MAY 2022)

FIGURE NO.
F12.0

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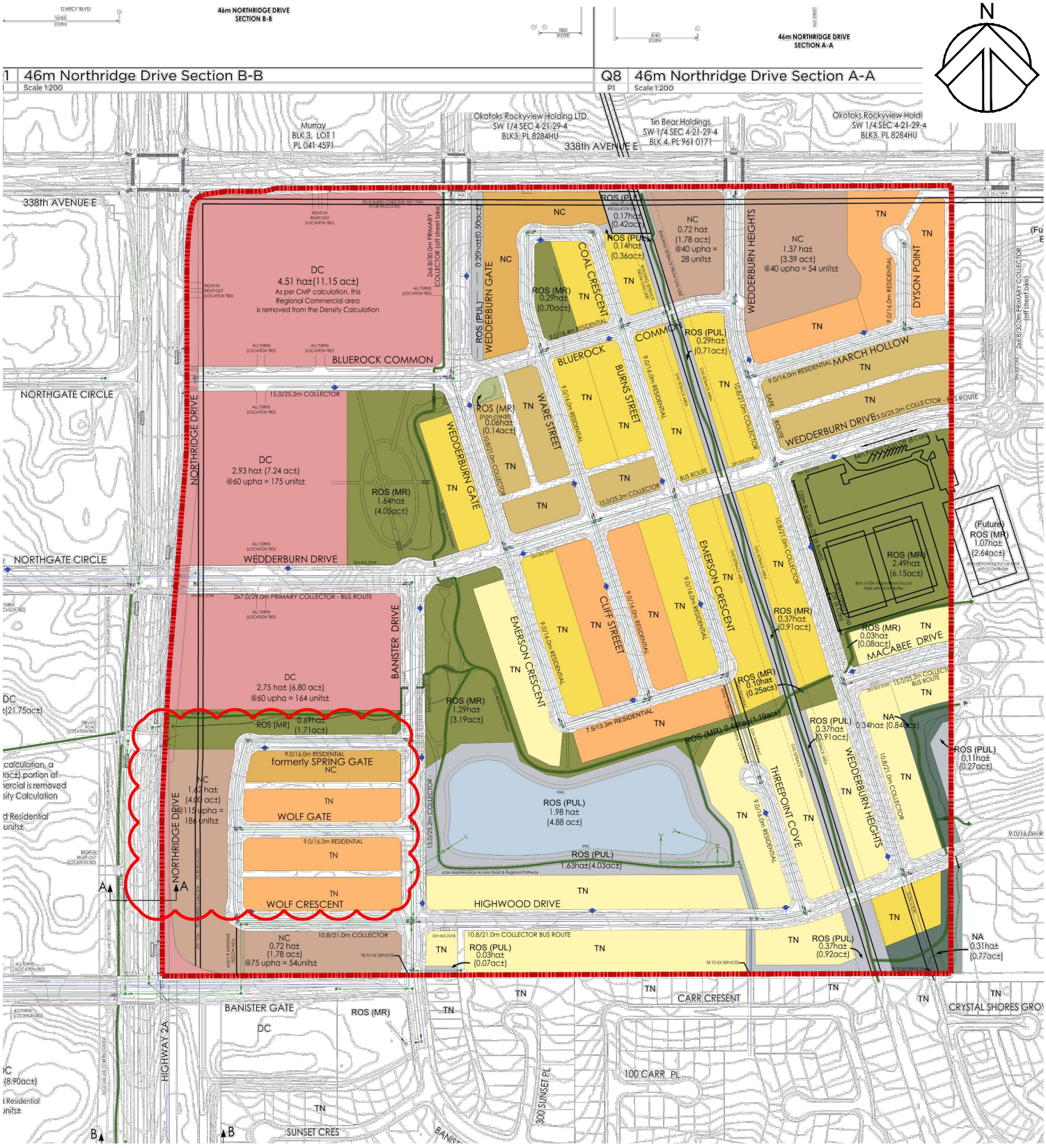

LEGEND

- COMMERCIAL/OFFICE/MULTI-FAMILY
- SINGLE FAMILY RESIDENTIAL R-1
- SINGLE FAMILY RESIDENTIAL R-1N
- SINGLE FAMILY RESIDENTIAL R-1S
- SINGLE FAMILY RESIDENTIAL R-2
- MULTIFAMILY RESIDENTIAL
- MULTIFAMILY RESIDENTIAL
- PS/MR
- PS/PUL
- PS/PUL

CLIENT
TOWN OF OKOTOKS

5 ELIZABETH STREET
OKOTOKS, AB

PROJECT NAME
NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN
OKOTOKS, AB

SCALE	DATE
NTS	2024-01-05
PROJECT ENG	DRAWN BY
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LD	LD
PROJECT NO.	
138875	

PRIME CONSULTANT
ARCADIS
227 11 Avenue SW - 3rd Floor
Calgary AB T2R 1R9 Canada
tel 403 270 5600
www.arcadis.com

FIGURE NAME
WEDDERBURN LANDS OUTLINE PLAN (GROUND CUBED PLANNING, JANUARY 2022)

FIGURE NO.
F13.0

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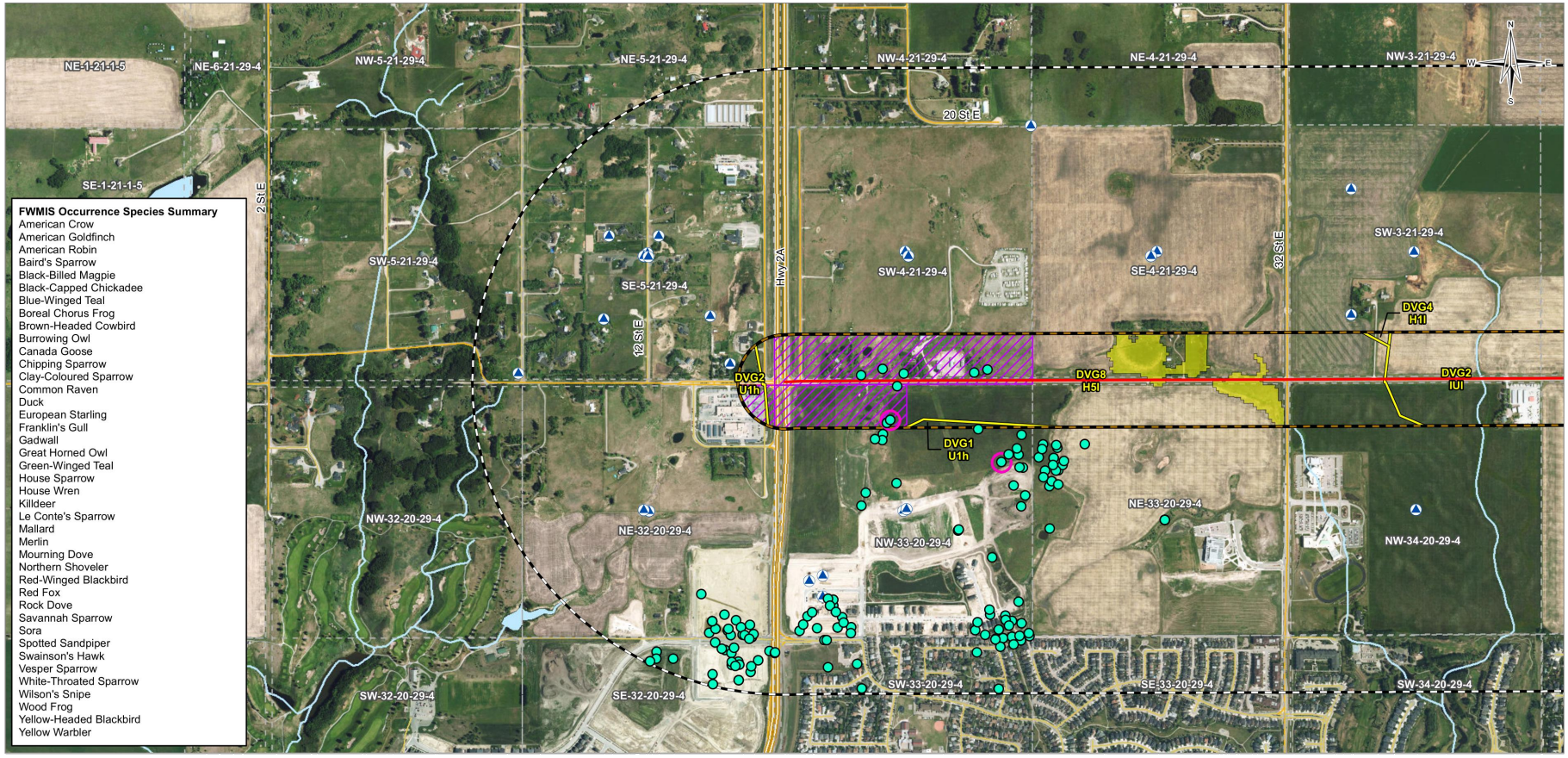
Appendix C



FWMIS Occurrence Species Summary

American Crow
American Goldfinch
American Robin
Baird's Sparrow
Black-Billed Magpie
Black-Capped Chickadee
Blue-Winged Teal
Boreal Chorus Frog
Brown-Headed Cowbird
Burrowing Owl
Canada Goose
Chipping Sparrow
Clay-Coloured Sparrow
Common Raven
Duck
European Starling
Franklin's Gull
Gadwall
Great Horned Owl
Green-Winged Teal
House Sparrow
House Wren
Killdeer
Le Conte's Sparrow
Mallard
Merlin
Mourning Dove
Northern Shoveler
Red-Winged Blackbird
Red Fox
Rock Dove
Savannah Sparrow
Sora
Spotted Sandpiper
Swainson's Hawk
Vesper Sparrow
White-Throated Sparrow
Wilson's Snipe
Wood Frog
Yellow-Headed Blackbird
Yellow Warbler

LEGEND

- Project Location
- Local Study Area (150 m)
- Widened Study Area (1 km)
- FWMIS Occurrence
- FWMIS Nest Occurrence
- Water Well
- Marsh
- Soil Delineation

Historical Resource

- HRV 5a: Believed to Contain an Archaeological Historic Resource

* Sensitive Raptor Range and Sharp-tailed Grouse Survey Cover the Entire Widened Study Area

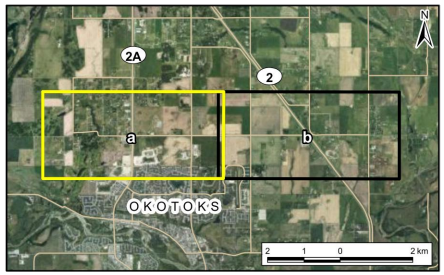
Base Data

- Highway
- Main Road
- Local Road
- Watercourse
- Waterbody

Map Unit Name

Soil Map Unit

EOR18 H1l — *Landform*



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Soils from AGRASID
Water Wells from Alberta Water Well Information Database (2021)
Wetlands from Alberta Merged Wetland Inventory (2018)
Wildlife Sensitivity Maps, AEP (2016)

STATUS
ISSUED FOR USE

TRANSPORTATION FUNCTIONAL STUDY AND DESIGN
338 AVE E, OKOTOKS, ALBERTA

Environmental Features

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Metres

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Tt-EDM	MV/DS	SL	SF	0

DATE May 19, 2022
PROJECT NO. ENG.CGEO04246-01

TETRA TECH

Figure 2a

SOURCE:
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REVISION 01
338 AVENUE EAST, OKOTOKS, AB
(TETRA TECH, NOVEMBER 2022)

CLIENT: TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME: NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB	PRIME CONSULTANT: ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
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PROJECT NO.: 138875		

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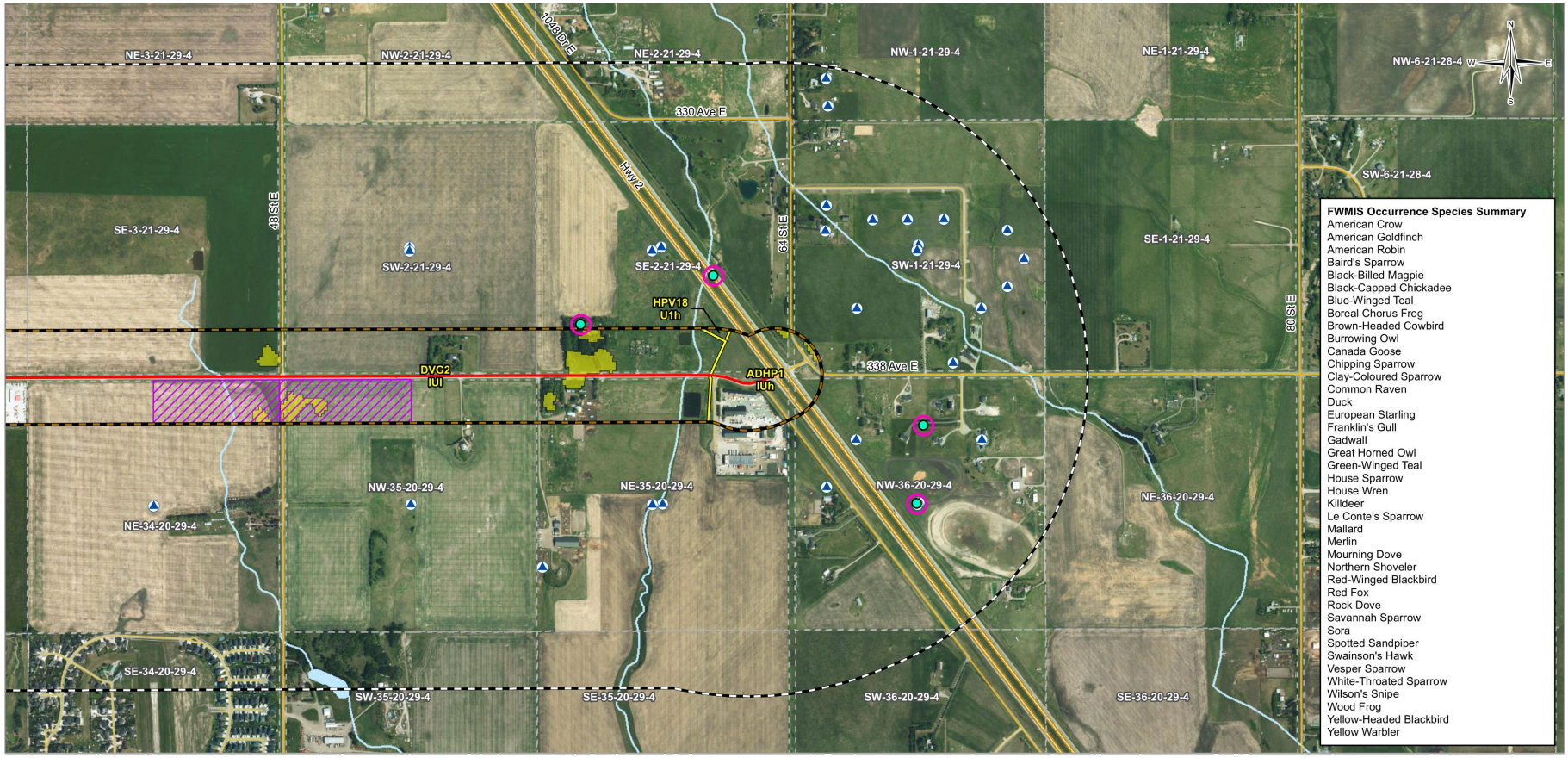


LEGEND

- Project Location
- Local Study Area (150 m)
- Widened Study Area (1 km)
- FWMIS Occurrence
- FWMIS Nest Occurrence
- Water Well
- Marsh
- Soil Delineation

Historical Resource

- HRV 5a: Believed to Contain an Archaeological Historic Resource

* Sensitive Raptor Range and Sharp-tailed Grouse Survey Cover the Entire Widened Study Area

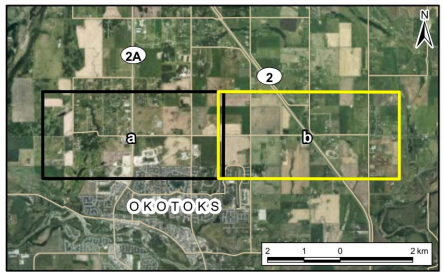
Base Data

- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Watercourse
- Waterbody

Map Unit Name

Soil Map Unit

EOR18
H1l — *Landform*



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STATUS
ISSUED FOR USE

TRANSPORTATION FUNCTIONAL STUDY AND DESIGN
338 AVE E, OKOTOKS, ALBERTA

Environmental Features

PROJECTION	DATUM	CLIENT
3TM 114	NAD83	Okotoks

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Metres

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Tt-EDM	MV/DS	SL	SF	0

DATE: May 19, 2022
PROJECT NO.: ENG.CGEO04246-01

TETRA TECH

Figure 2b

SOURCE:
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REVISION 01
338 AVENUE EAST, OKOTOKS, AB
(TETRA TECH, NOVEMBER 2022)

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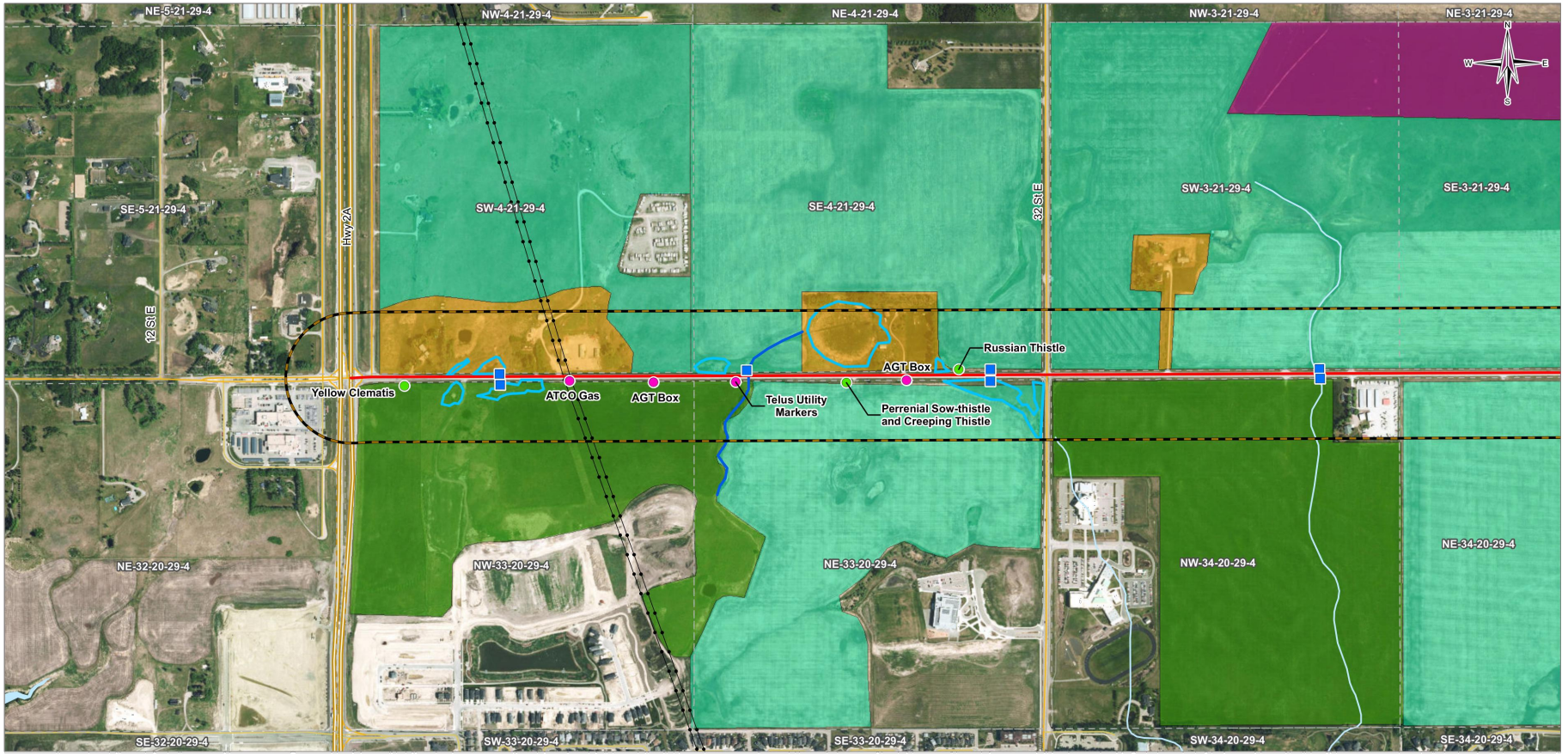


LEGEND

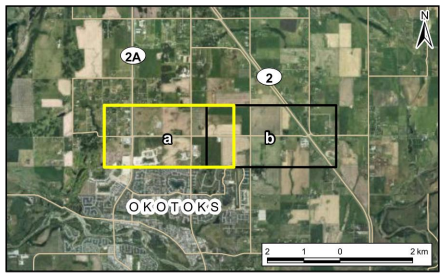
- Field Observation
- Vegetation Field Observation
- Culvert Location
- Project Location
- Drainage Ditch
- Pipeline
- Local Study Area (150 m)
- Field Observed Wetland

Land Cover

- Cultivated
- Hay
- Pasture
- Yard

Base Data

- Highway
- Main Road
- Local Road
- Watercourse
- Waterbody



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STATUS
ISSUED FOR USE

TRANSPORTATION FUNCTIONAL STUDY AND DESIGN
338 AVE E, OKOTOKS, ALBERTA

Field Observations

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DATE September 30, 2022	PROJECT NO. ENG.CGEO04246-01	

SOURCE:
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REVISION 01
338 AVENUE EAST, OKOTOKS, AB
(TETRA TECH, NOVEMBER 2022)

CLIENT: TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME: NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB	PRIME CONSULTANT: ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
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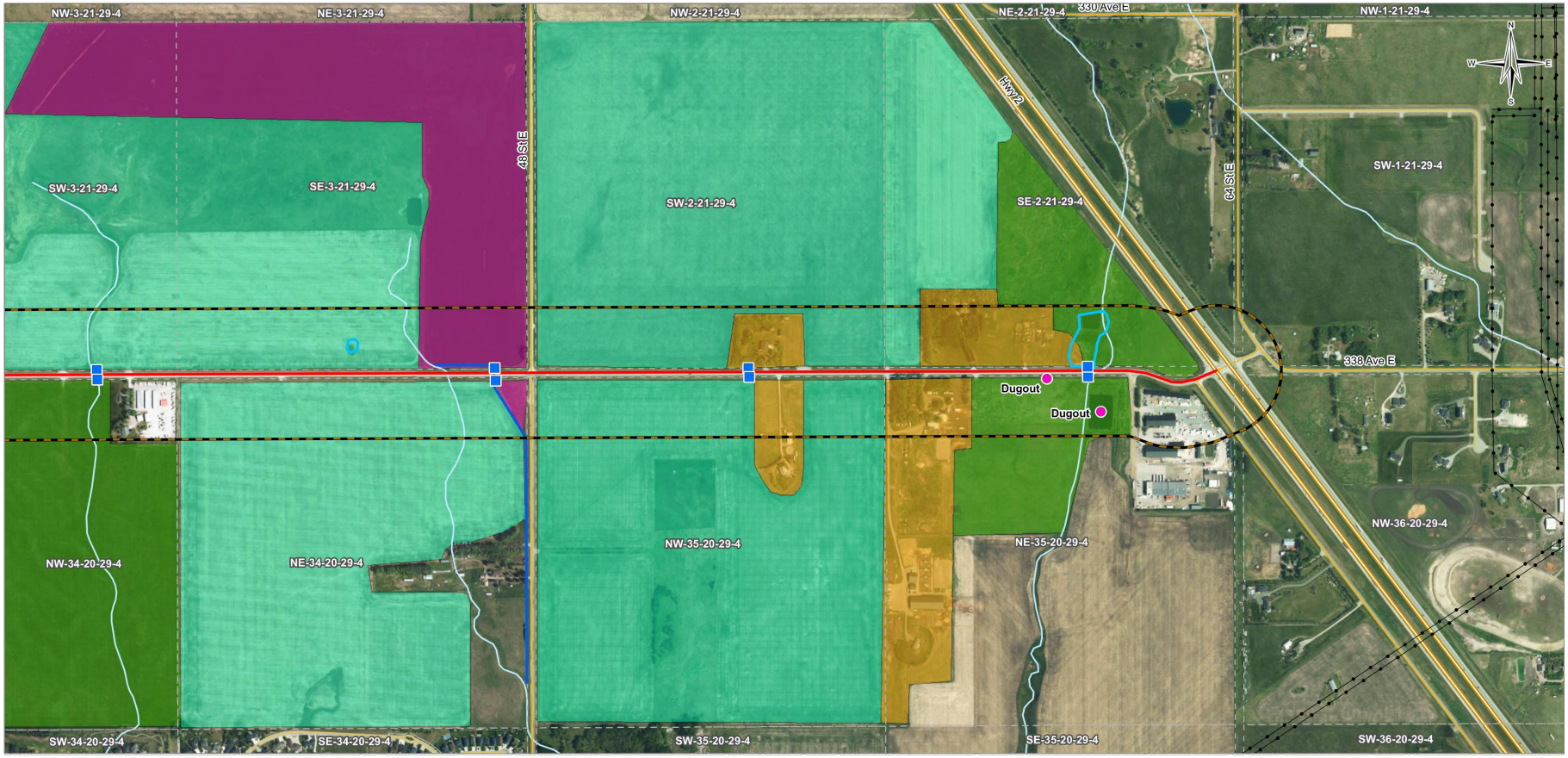
SCALE CHECK 10mm 1 in



LEGEND

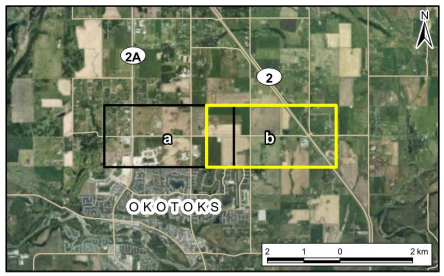
- Field Observation
- Culvert Location
- Project Location
- Drainage Ditch
- Pipeline
- Local Study Area (150 m)
- Field Observed Wetland

Land Cover

- Cultivated
- Hay
- Pasture
- Yard

Base Data

- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Watercourse



NOTES
Base data source:
CanVec 1:50,000
Hydrology from FWMIS (2018)
Imagery provided by ESRI; Foothills County (2021)
Wetlands from Alberta Merged Wetland Inventory (2018)

STATUS
ISSUED FOR USE

TRANSPORTATION FUNCTIONAL STUDY AND DESIGN
338 AVE E, OKOTOKS, ALBERTA

Field Observations

PROJECTION	DATUM	CLIENT
3TM 114	NAD83	Okotoks

Scale: 1:9,000
150 75 0 150
Metres

TETRA TECH

FILE NO.				
CGEO04246-01_Figure03_FieldObservations.mxd				
OFFICE	DWN	CKD	APVD	REV
TI-EDM	DS	SL	SF	0
DATE	PROJECT NO.			
September 30, 2022	ENG.CGEO04246-01			

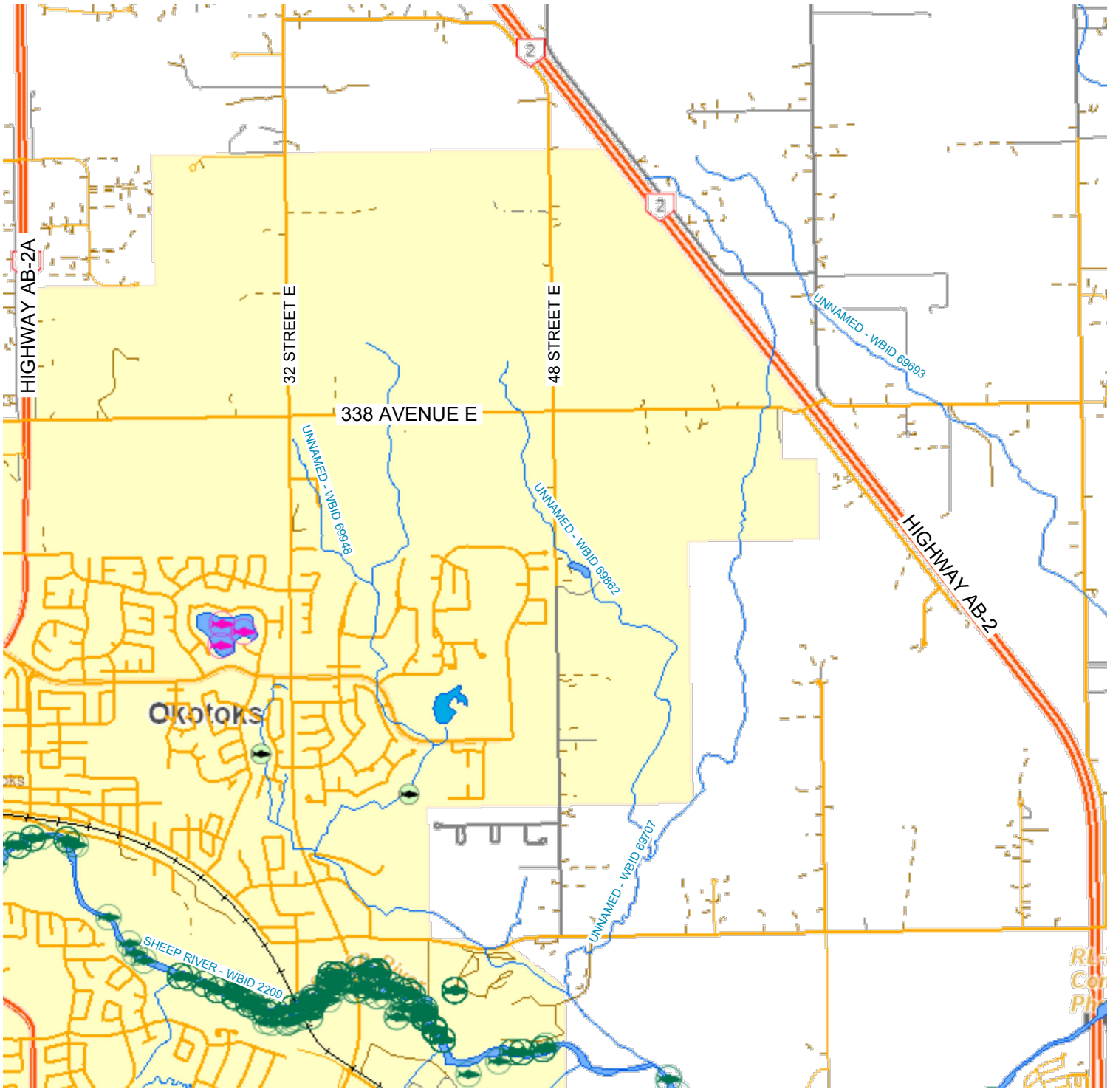
Figure 3b

SOURCE:
BIOPHYSICAL ASSESSMENT
REVISION 01
338 AVENUE EAST, OKOTOKS, AB
(TETRA TECH, NOVEMBER 2022)

CLIENT: TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME: NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB	PRIME CONSULTANT: ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
SCALE: NTS DATE: 2024-01-05 PROJECT ENG: LD DRAWN BY: NI CHECKED BY: LD APPROVED BY: LD PROJECT NO.: 138875	FIGURE NAME: BIOPHYSICAL ASSESSMENT FIELD OBSERVATIONS	FIGURE NO.: F15.1

SCALE CHECK 1 in 10mm

File Location: j:\138875_22-103_338_al7.0_production\7.03_design\04_Civil\SWMRannexation-swmdp-figures\138875_APPENDICES-2.dwg Last Saved: December 13, 2023, by nicole.isaak Plotted: Friday, January 5, 2



LEGEND

WATERCOURSE

CLIENT
TOWN OF OKOTOKS

5 ELIZABETH STREET
OKOTOKS, AB

PROJECT NAME
NORTH OKOTOKS
ANNEXATION LANDS
MASTER DRAINAGE PLAN
OKOTOKS, AB

PRIME CONSULTANT
ARCADIS
227 11 Avenue SW - 3rd Floor
Calgary AB T2R 1R9 Canada
tel 403 270 5600
www.arcadis.com

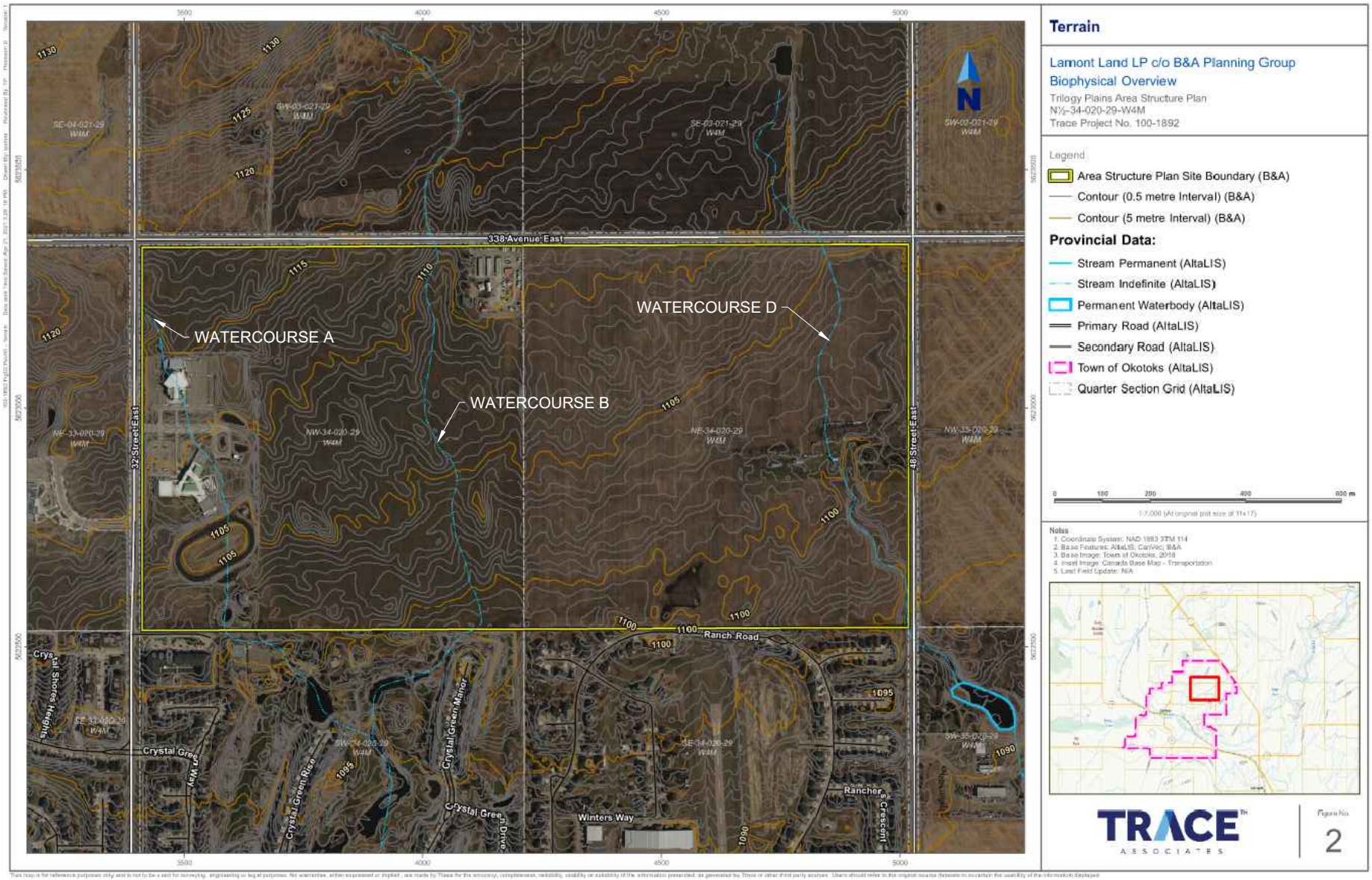
SCALE	DATE
NTS	2023-10-25
PROJECT ENG	DRAWN BY
LD	NI
CHECKED BY	APPROVED BY
LD	LD
PROJECT NO.	
138875	

FIGURE NAME
WATERCOURSES

FIGURE NO.
F16.0

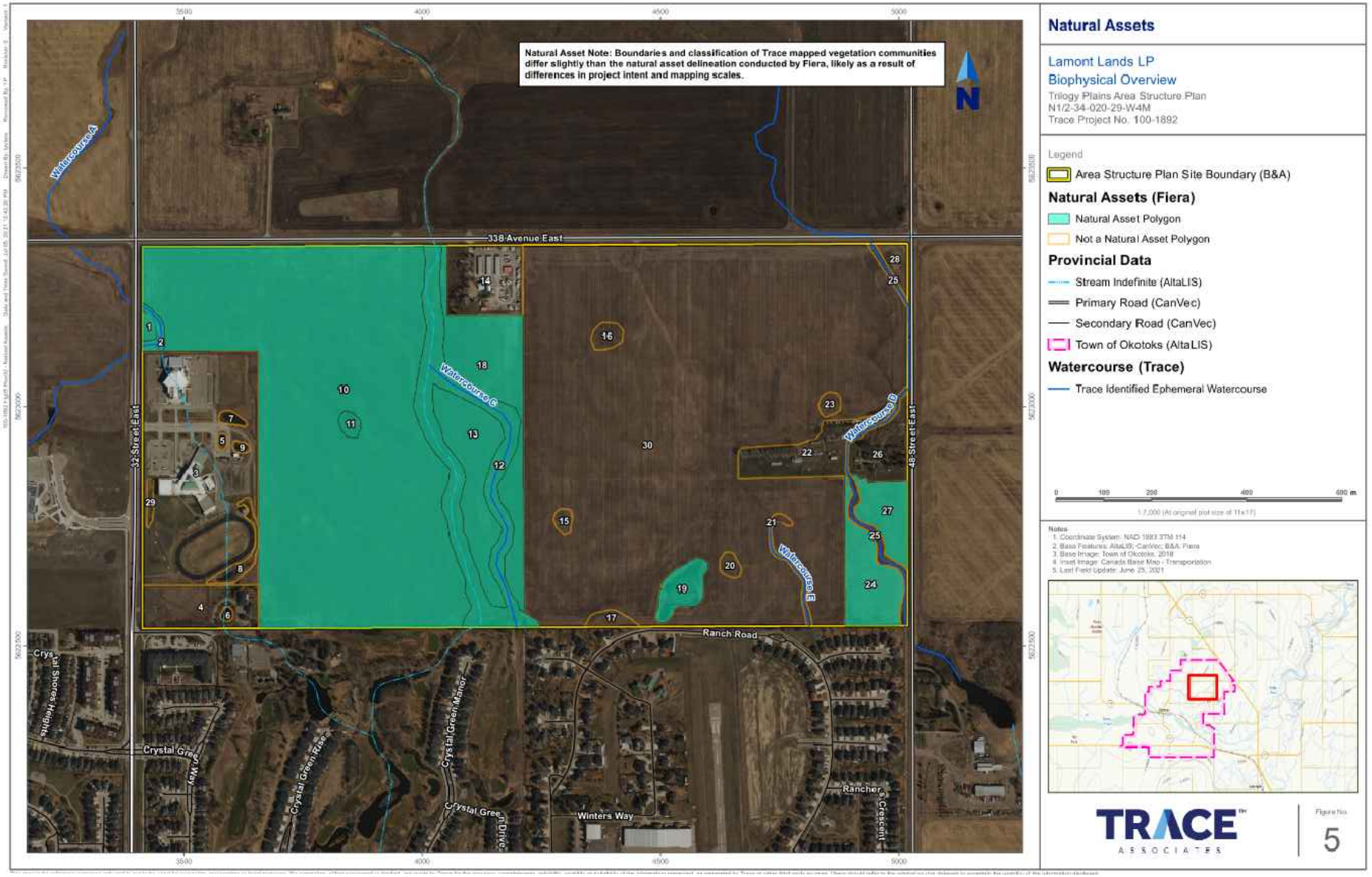
SCALE CHECK
1 in 10mm

File Location: j:\138875_22-103_338_a\7.0_production\7.03_design\04_Civil\SWMR\annexation-swmdp-figures\138875_WATERCOURSES.dwg Last Saved: October 27, 2023, by nicole.isaak Plotted: Friday, January 5, 2024 2:59:01 PM by Nicole Isaak



SOURCE:
TRACE ASSOCIATES 2021

CLIENT TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB		PRIME CONSULTANT ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
	SCALE NTS	DATE 2024-01-05	FIGURE NAME BIOPHYSICAL OVERVIEW TRILOGY PLAINS
	PROJECT ENG LD	DRAWN BY NI	FIGURE NO. F17.0
	CHECKED BY LD	APPROVED BY LD	
	PROJECT NO. 138875		

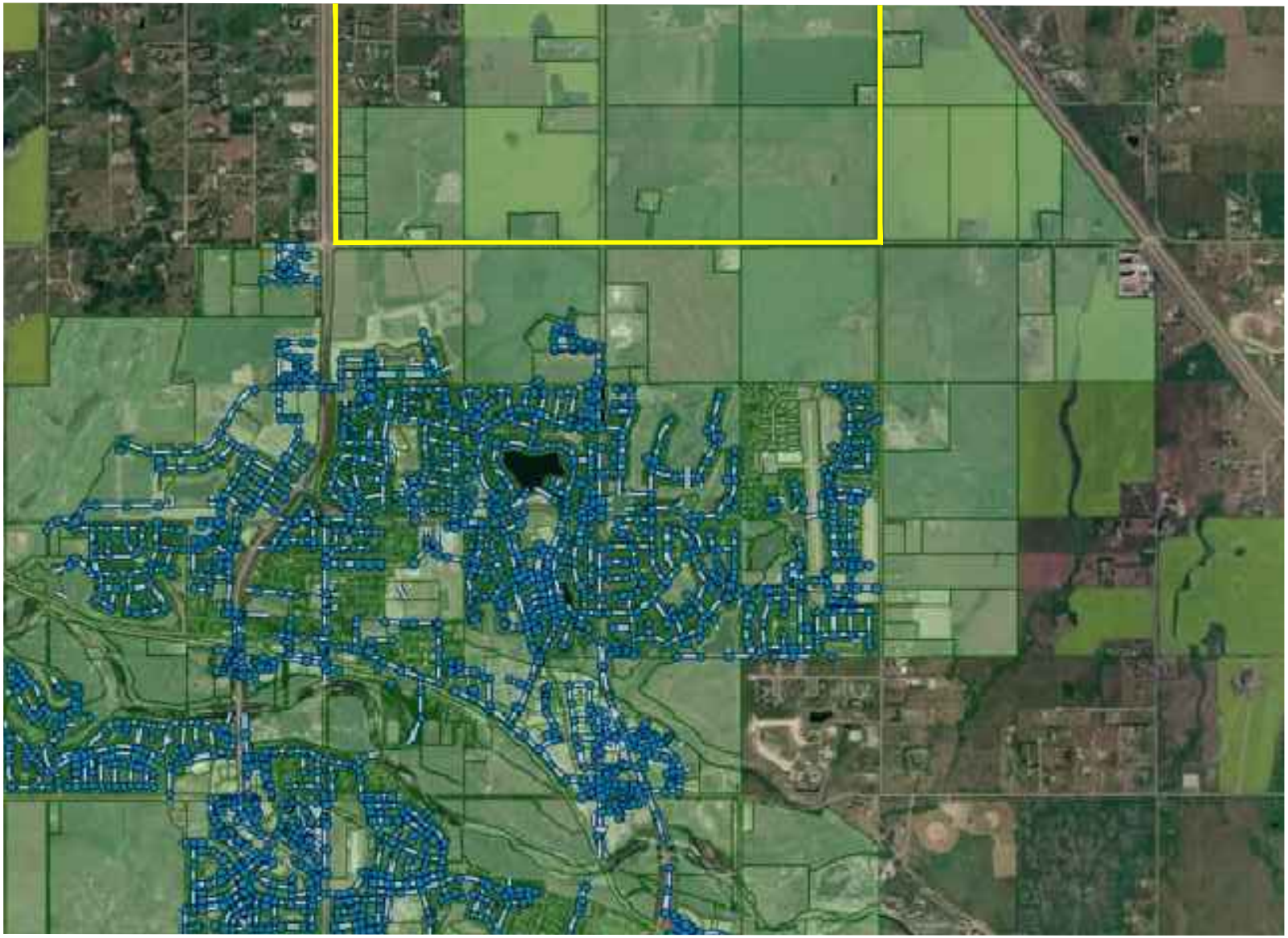


SOURCE:
TRACE ASSOCIATES 2021

CLIENT TOWN OF OKOTOKS 5 ELIZABETH STREET OKOTOKS, AB	PROJECT NAME NORTH OKOTOKS ANNEXATION LANDS MASTER DRAINAGE PLAN OKOTOKS, AB		PRIME CONSULTANT ARCADIS 227 11 Avenue SW - 3rd Floor Calgary AB T2R 1R9 Canada tel 403 270 5600 www.arcadis.com
	SCALE NTS	DATE 2024-01-05	FIGURE NAME BIOPHYSICAL OVERVIEW TRILOGY PLAINS
	PROJECT ENG LD	DRAWN BY NI	FIGURE NO. F18.0
	CHECKED BY LD	APPROVED BY LD	
	PROJECT NO. 138875		

Appendix D

Figure 19: North Okotoks Stormwater Collection System



LEGEND

STORMWATER COLLECTION SYSTEM

STUDY AREA

CLIENT
TOWN OF OKOTOKS

5 ELIZABETH STREET
OKOTOKS, AB

PROJECT NAME
NORTH OKOTOKS
ANNEXATION LANDS
MASTER DRAINAGE PLAN
OKOTOKS, AB

PRIME CONSULTANT
ARCADIS
227 11 Avenue SW - 3rd Floor
Calgary AB T2R 1R9 Canada
tel 403 270 5600
www.arcadis.com

SCALE	DATE
NTS	2024-01-05
PROJECT ENG	DRAWN BY
LD	NI
CHECKED BY	APPROVED BY
LD	LD
PROJECT NO.	
138875	

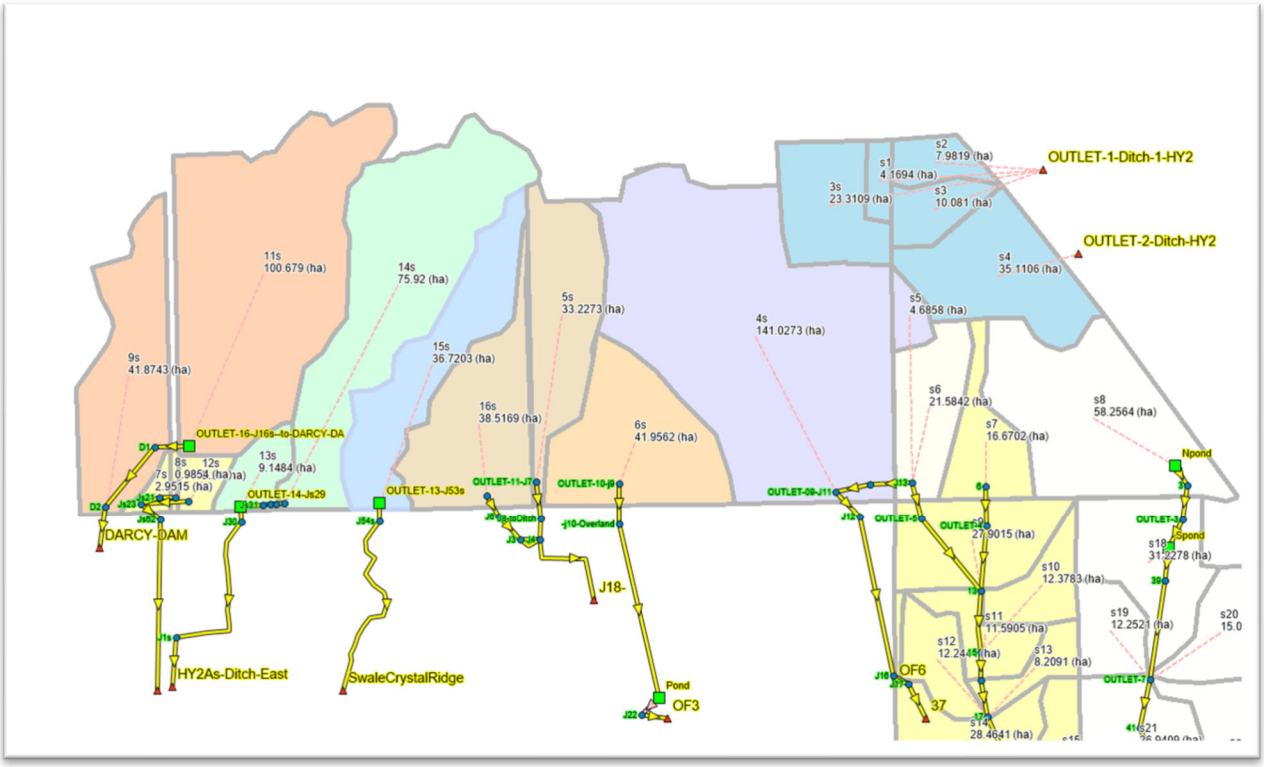
FIGURE NAME
NORTH OKOTOKS
STORMWATER COLLECTION
SYSTEM

FIGURE NO.
F19.0

SCALE CHECK
10mm
1 in

Appendix E

Pre-Development PCSWMM Model Input Data



TITLE]

;;Project Title/Notes

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

START_DATE           07/01/2023
START_TIME           23:00:00
REPORT_START_DATE    07/01/2023
REPORT_START_TIME    23:00:00
END_DATE             07/06/2023
END_TIME             23:00:00
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         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.1    0.38   1.12   2.4    3.61   4.57   4.99   4      2.24   0.99
0.27   0.07
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Calgary_24h_100y INTENSITY 0:05     1.0      TIMESERIES Calgary_24h_100y
Continuous_6014  INTENSITY 1:00     1.0      TIMESERIES Continuous

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
11s              Calgary_24h_100y OUTLET-16-J16s--to-DARCY-DAM 100.679 2 499  1.5
0
12s              Calgary_24h_100y OUTLET-15-Js24   5.23     6        173.754  2.2
0
13s              Calgary_24h_100y OUTLET-14-Js29   9.1484   2        226      2.8
0
```

14s	Calgary_24h_100y	js34	75.92	2	392.757	2.2
0						
15s	Calgary_24h_100y	OUTLET-13-J53s	36.7203	2	236.752	2.3
0						
16s	Calgary_24h_100y	OUTLET-12--J5	38.5169	2	304.241	2.5
0						
3s	Calgary_24h_100y	OUTLET-1-Ditch-1-HY2	23.3109	2	525	3
0						
4s	Calgary_24h_100y	OUTLET-09-J11	141.0273	2	746.967	2
0						
5s	Calgary_24h_100y	OUTLET-11-J7	33.2273	2	237.338	2.8
0						
6s	Calgary_24h_100y	OUTLET-10-j9	41.9562	2	547.731	3
0						
7s	Calgary_24h_100y	Js23	2.9515	17	133	0.5
0						
8s	Calgary_24h_100y	Js22	0.9854	47	40	0.5
0						
9s	Calgary_24h_100y	DARCY-DAM	41.8743	5	278	1.3
0						
s1	Calgary_24h_100y	OUTLET-1-Ditch-1-HY2	4.1694	2	416.94	4.5
0						
s10	Calgary_24h_100y	15	12.3783	2	190.435	3.9
0						
s11	Calgary_24h_100y	OUTLET-8-Scenario1	11.5905	2	298.724	4.6
0						
s12	Calgary_24h_100y	17	12.2444	2	193.434	6
0						
s13	Calgary_24h_100y	17	8.2091	2	154.889	5
0						
s14	Calgary_24h_100y	20	28.4641	10	370.626	6
0						
s15	Calgary_24h_100y	21	12.2538	4	170.428	4.7
0						
s16	Calgary_24h_100y	21	11.958	4	199.3	3.9
0						
s17	Calgary_24h_100y	26	44.6711	8	450	5.9
0						
s18	Calgary_24h_100y	Spond	31.2278	6	380.827	4
0						
s19	Calgary_24h_100y	OUTLET-7	12.2521	10	230.736	4
0						
s2	Calgary_24h_100y	OUTLET-1-Ditch-1-HY2	7.9819	2	206.251	4.5
0						
s20	Calgary_24h_100y	OUTLET-7	15.078	4	236.332	4
0						
s21	Calgary_24h_100y	43	26.9409	4	371.599	6
0						
s22	Calgary_24h_100y	43	23.5269	4	280	4.5
0						
s23	Calgary_24h_100y	44	37.6547	4	396.365	5.5
0						
s24	Calgary_24h_100y	47	28.4369	4	300	5
0						
s25	Calgary_24h_100y	47	15.6721	4	256.499	6
0						
s26	Calgary_24h_100y	26	3.0279	4	97.674	4
0						
s27	Calgary_24h_100y	33	16.2128	4	197.717	5.38
0						
s28	Calgary_24h_100y	35	9.88	12	173.333	5.7
0						

```
s29              Calgary_24h_100y 33                6.7802   4        160.668  4.14
0
s3               Calgary_24h_100y OUTLET-1-Ditch-1-HY2 10.081 19     201.218  4.5
0
s4               Calgary_24h_100y OUTLET-2-Ditch-HY2 35.1106 2       470      3.2
0
s5               Calgary_24h_100y j13               4.6858   2        142.426  4.5
0
s6               Calgary_24h_100y j13               21.5842  2        265.488  5
0
s7               Calgary_24h_100y 6                 16.6702  2        210.748  4
0
s8               Calgary_24h_100y Npond             58.2564  2        448.126  2
0
s9               Calgary_24h_100y 13                27.9015  2        516.694  7.5
0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ---
-------
11s              0.015      0.25       1.6        5          0          OUTLET
12s              0.015      0.25       1.6        5          0          PERVIOUS   100
13s              0.015      0.25       1.6        5          0          OUTLET
14s              0.015      0.25       1.6        5          0          OUTLET
15s              0.015      0.25       1.6        5          0          OUTLET
16s              0.015      0.25       1.6        5          0          OUTLET
3s               0.015      0.25       1.6        5          0          OUTLET
4s               0.015      0.25       1.6        5          0          OUTLET
5s               0.015      0.25       1.6        5          0          OUTLET
6s               0.015      0.25       1.6        5          0          OUTLET
7s               0.015      0.25       1.6        5          0          PERVIOUS   100
8s               0.015      0.25       1.6        5          0          PERVIOUS   100
9s               0.015      0.25       1.6        5          0          PERVIOUS   100
s1               0.015      0.25       1.6        5          0          OUTLET
s10              0.015      0.25       1.6        5          0          OUTLET
s11              0.015      0.25       1.6        5          0          OUTLET
s12              0.015      0.25       1.6        5          0          OUTLET
s13              0.015      0.25       1.6        5          0          OUTLET
s14              0.015      0.25       1.6        5          0          OUTLET
s15              0.015      0.25       1.6        5          0          OUTLET
s16              0.015      0.25       1.6        5          0          OUTLET
s17              0.015      0.25       1.6        5          0          OUTLET
s18              0.015      0.25       1.6        5          0          OUTLET
s19              0.015      0.25       1.6        5          0          OUTLET
s2               0.015      0.25       1.6        5          0          OUTLET
s20              0.015      0.25       1.6        5          0          OUTLET
s21              0.015      0.25       1.6        5          0          OUTLET
s22              0.015      0.25       1.6        5          0          OUTLET
s23              0.015      0.25       1.6        5          0          OUTLET
s24              0.015      0.25       1.6        5          0          OUTLET
s25              0.015      0.25       1.6        5          0          OUTLET
s26              0.015      0.25       1.6        5          0          OUTLET
s27              0.015      0.25       1.6        5          0          OUTLET
s28              0.015      0.25       1.6        5          0          OUTLET
s29              0.015      0.25       1.6        5          0          OUTLET
s3               0.015      0.25       1.6        5          0          OUTLET
s4               0.015      0.25       1.6        5          0          OUTLET
s5               0.015      0.25       1.6        5          0          OUTLET
s6               0.015      0.25       1.6        5          0          OUTLET
s7               0.015      0.25       1.6        5          0          OUTLET
s8               0.015      0.25       1.6        5          0          OUTLET
```

```
s9               0.015      0.25       1.6        5          0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
11s              270        1.016      0.26       0          0
12s              270        1.016      0.26       0          0
13s              270        1.016      0.26       0          0
14s              270        1.016      0.26       0          0
15s              270        1.016      0.26       0          0
16s              270        1.016      0.26       0          0
3s               270        1.016      0.26       0          0
4s               270        1.016      0.26       0          0
5s               270        1.016      0.26       0          0
6s               270        1.016      0.26       0          0
7s               270        1.016      0.26       0          0
8s               270        1.016      0.26       0          0
9s               270        1.016      0.26       0          0
s1               270        1.016      0.26       0          0
s10              270        1.016      0.25       0          0
s11              270        1.016      0.25       0          0
s12              270        1.016      0.25       0          0
s13              270        1.016      0.25       0          0
s14              270        1.016      0.25       0          0
s15              270        1.016      0.25       0          0
s16              270        1.016      0.25       0          0
s17              270        1.016      0.25       0          0
s18              270        1.016      0.25       0          0
s19              270        1.016      0.25       0          0
s2               270        1.016      0.26       0          0
s20              270        1.016      0.25       0          0
s21              270        1.016      0.25       0          0
s22              270        1.016      0.25       0          0
s23              270        1.016      0.25       0          0
s24              270        1.016      0.25       0          0
s25              270        1.016      0.25       0          0
s26              270        1.016      0.25       0          0
s27              270        1.016      0.25       0          0
s28              270        1.016      0.25       0          0
s29              270        1.016      0.25       0          0
s3               270        1.016      0.26       0          0
s4               270        1.016      0.26       0          0
s5               270        1.016      0.26       0          0
s6               270        1.016      0.26       0          0
s7               270        1.016      0.26       0          0
s8               270        1.016      0.26       0          0
s9               270        1.016      0.25       0          0

[JUNCTIONS]
;;Name            Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
13               1094.263   1.5        0          0          0
15               1092.487   1.5        0          0          0
17               1088.392   2          0          0          0
20               1082.451   2          0          0          0
21               1078.123   2          0          0          0
22               1076.009   2          0          0          0
23               1074.936   2          0          0          0
24               1067.875   2          0          0          0
26               1061       2          0          0          0
3                1091.942   2          0          0          0
33               1075.542   2          0          0          0
35               1069.805   2          0          0          0
```

```
39                1091.165   1.5        0          0          0
41                1083.736   2          0          0          0
42                1078.583   2          0          0          0
43                1074.924   2          0          0          0
44                1068.629   2          0          0          0
45                1065.832   2          0          0          0
46                1064.596   2          0          0          0
47                1062.992   2          0          0          0
6                 1105.29    2          0          0          0
D1                1111.5     3          0          0          0
D2                1110.544   3          0          0          0
-j10-Overland     1113.367   2.75       0          0          0
J12               1104.384   1.5        0          0          0
J13               1105.26    2          0          0          0
J16               1093.619   2          0          0          0
J17               1092       2          0          0          0
J1s               1105.461   2          0          0          0
J22               1110       2          0          0          0
J3                1118.14    2.22       0          0          0
J30               1114.472   3          0          0          0
J4                1115.666   2.457      0          0          0
J54s              1119.631   2          0          0          0
J6                1117.309   2.05       0          0          0
J8-toDitch        1118.29    1.24       0          0          0
Js21              1113.009   3          0          0          0
Js22              1113.878   3          0          0          0
Js23              1112.269   3          0          0          0
Js31              1118.275   2          0          0          0
Js32              1118.861   2          0          0          0
Js33              1119.74    2          0          0          0
Js34              1120.004   2          0          0          0
Js62              1111.921   3          0          0          0
OUTLET-09-J11     1104.593   2          0          0          0
OUTLET-10-j9      1116.135   2.605      0          0          0
OUTLET-11-J7      1118.71    0.95       0          0          0
OUTLET-12--J5     1117.803   2          0          0          0
OUTLET-15-Js24    1114.519   3          0          0          0
OUTLET-3          1091.186   2          0          0          0
OUTLET-4          1100.312   2          0          0          0
OUTLET-5          1105.171   1.522      0          0          0
OUTLET-6          1105.171   2          0          0          0
OUTLET-7          1088.346   1.5        0          0          0
OUTLET-8-Scenario1 1091.563  2          0          0          0
OUTLET-8-Scenario2 1067      2          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
37                1091.577   FREE                        NO
DARCY-DAM         1110       FREE                        NO
HY2As-Ditch-East  1100.687   FREE                        NO
HY2As-Ditch-West  1098.32    FREE                        NO
J18-              1110       FREE                        NO
OF3               1108       FREE                        NO
OF6               1093       FREE                        NO
OUTLET-1-Ditch-1-HY2 1113.655 FREE                       NO
OUTLET-2-Ditch-HY2 1109.431  FREE                        NO
SwaleCrystalRidge 1097.12    FREE                        NO
WatercourseC      1059       FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape       Curve Name/Params
SurDepth Fevap    Psi      Ksat     IMD
```

```
;;-------------- -------- ---------- ---------- ---------- --------------------------
-- -------- -------- -------- -------- --------
Npond            1092.214 2          0          FUNCTIONAL  1200      0         0
0        1
OUTLET-13-J53s   1120.103 2          0          FUNCTIONAL  6000      0         0
0        1
OUTLET-14-Js29   1116.451 3          0          FUNCTIONAL  10000     0         0
0        1
OUTLET-16-J16s--to-DARCY-DAM 1115.407 2 0       TABULAR     ST6
0        1
Pond             1110     5          0          FUNCTIONAL  1000      0         0
0        1
Spond            1091.163 2          0          FUNCTIONAL  4500      0         0
0        1

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- --
-------- ---------- ----------
1                OUTLET-4         13               294.739    0.035      0          0
0          0
10               24               OUTLET-8-Scenario2 102.703  0.035      0          0
0          0
11               OUTLET-8-Scenario2 26             244.632    0.035      0          0
0          0
12               26               WatercourseC     244.077    0.035      0          0
0          0
13               Spond            39               149.204    0.035      0          0
0          0
14               J17              37               174.11     0.01       0          0
0          0
15               39               OUTLET-7         451.015    0.035      0          0
0          0
16               OUTLET-7         41               223.108    0.035      0          0
0          0
17               41               42               321.064    0.035      0          0
0          0
18               42               43               237.332    0.035      0          0
0          0
19               43               44               482.765    0.035      0          0
0          0
2                13               15               278.668    0.035      0          0
0          0
20               44               45               263.987    0.035      0          0
0          0
21               45               46               158.789    0.035      0          0
0          0
22               46               47               206.607    0.035      0          0
0          0
23               47               26               262.087    0.035      0          0
0          0
24               OUTLET-3         Spond            142.572    0.035      0          0
0          0
25               Npond            3                106.777    0.01       0          0
0          0
3                15               OUTLET-8-Scenario1 124.524  0.035      0          0
0          0
4                OUTLET-8-Scenario1 17             169.341    0.035      0          0
0          0
5                17               20               407.709    0.035      0          0
0          0
```

6	20	21	235.151	0.035	0	0	0
7	21	22	237.887	0.035	0	0	0
8	23	24	598.272	0.035	0	0	0
9	22	23	98.431	0.035	0	0	0
C11-Overland	J6	J3	143.61	0.05	0	0	0
C18	J22	OF3	8.437	0.01	0	0	0
C1s-to-Crystal-Ridge-Swalele	J54s	SwaleCrystalRidge	1019.7	0.035	0	0	0
C5s-to-WESTDITCH-HW2A	J30	J1s	687	0.035	0	0	0
Cs13	OUTLET-14-Js29	J30	20.015	0.025	0	0	0
cs14	Js22	Js21	38	0.025	0	0	0
Cs15	OUTLET-15-Js24	Js23	72.18	0.025	0	0	0
Cs22	Js32	Js31	10.754	0.025	0	0	0
Cs23	Js34	Js33	15.75	0.025	0	0	0
Cs35	Js23	Js62	61	0.025	0	0	0
Cs4_1_EAST-ditch	Js62	HY2As-Ditch-West	767	0.035	0	0	0
Cs52	Js33	Js32	38	0.035	0	0	0
Cs53	Js31	OUTLET-14-Js29	100.505	0.035	0	0	0
Cs64	Js21	Js23	26	0.025	0	0	0
Cs7	J1s	HY2As-Ditch-East	316	0.035	0	0	0
Culvert-10	3	OUTLET-3	20.06	0.01	0	0	0
Culvert5	OUTLET-10-j9	-j10-Overland	23.752	0.024	0	0	0
Culvert7	J13	OUTLET-6	19.956	0.024	0.112	0	0
Culvert8	J13	OUTLET-5	19.96	0.024	0	0	0
Culvert-9	6	OUTLET-4	22.07	0.01	0	0	0
Culvert-C24s-900	OUTLET-13-J53s	J54s	31.13	0.025	0	0	0
CulvertC3	OUTLET-12--J5	J6	21.8	0.024	0	0	0
CulvertC4	OUTLET-11-J7	J8-toDitch	20	0.024	0	0	0
CulvertC6	OUTLET-09-J11	J12	23.92	0.024	0	0	0
Ditch-C12	J8-toDitch	J4	122.6	0.03	0	0	0
Ditch-C13	J4	J18-	471.806	0.035	0	0	0
Ditch-C23	OUTLET-5	13	420.006	0.035	0	0	0

```
DitchC24          OUTLET-6          OUTLET-09-J11     97          0.035       0           0
0           0
DitchC25          J12               J16               797.262     0.035       0           0
0           0
DitchC31          J16               OF6               102         0.03        0.318       0
0           0
Dummy-Culvert1    OUTLET-16-J16s--to-DARCY-DAM D1     155.186     0.01        0           0
0           0
Dummy-pipe2       D1                D2                348.25      0.035       0           0
0           0
Dummy-pipe3       D2                DARCY-DAM         191.319     0.01        0           0
0           0
FirstCulvertC29   J3                J4                19.6        0.024       0           0
0           0
OverlandDitchC27 -j10-Overland      Pond              25          0.011       0           0
0           0
SecondCulvertC2   J3                J4                21          0.024       0           0
0           0
TWCulvertC30      J16               J17               17          0.024       0.005       0
0           0
TWCulvertC9       J16               J17               17          0.024       0           0
0           0
```

[ORIFICES]

```
;;Name           From Node        To Node          Type         Offset     Qcoeff
Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ----------
-------- ----------
OR1              Pond             J22              SIDE         0          0.65
NO       0
```

[XSECTIONS]

```
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ------
---- ----------
1                TRAPEZOIDAL  1                2          10         10         1
10               TRAPEZOIDAL  1                2          10         10         1
11               TRAPEZOIDAL  1                2          10         10         1
12               TRAPEZOIDAL  1                2          10         10         1
13               TRAPEZOIDAL  1                2          10         10         1
14               CIRCULAR     1                0          0          0          1
15               TRAPEZOIDAL  1                2          10         10         1
16               TRAPEZOIDAL  1                2          10         10         1
17               TRAPEZOIDAL  1                2          10         10         1
18               TRAPEZOIDAL  1                2          10         10         1
19               TRAPEZOIDAL  1                2          10         10         1
2                TRAPEZOIDAL  1                2          10         10         1
20               TRAPEZOIDAL  1                2          10         10         1
21               TRAPEZOIDAL  1                2          10         10         1
22               TRAPEZOIDAL  1                2          10         10         1
23               TRAPEZOIDAL  1                2          10         10         1
24               TRAPEZOIDAL  1                2          10         10         1
25               CIRCULAR     1                0          0          0          1
3                TRAPEZOIDAL  1                2          10         10         1
4                TRAPEZOIDAL  1                2          10         10         1
5                TRAPEZOIDAL  1                2          10         10         1
6                TRAPEZOIDAL  1                2          10         10         1
7                TRAPEZOIDAL  1                2          10         10         1
8                TRAPEZOIDAL  1                2          10         10         1
9                TRAPEZOIDAL  1                2          10         10         1
C11-Overland     CIRCULAR     1                0          0          0          1
C18              TRAPEZOIDAL  1                3          3          3          1
```

```
C1s-to-Crystal-Ridge-Swalele TRAPEZOIDAL 1     2          10         10         1
C5s-to-WESTDITCH-HW2A TRAPEZOIDAL 1           1          15         15         1
Cs13              CIRCULAR     0.6           0          0          0          1
cs14              CIRCULAR     1             0          0          0          1
Cs15              CIRCULAR     0.9           0          0          0          1
Cs22              CIRCULAR     0.6           0          0          0          1
Cs23              CIRCULAR     0.6           0          0          0          1
Cs35              CIRCULAR     0.9           0          0          0          1
Cs4_1_EAST-ditch TRAPEZOIDAL  1.5           3.5        6          3          1
Cs52              TRAPEZOIDAL  1.5           3.5        20         3          1
Cs53              TRAPEZOIDAL  1.5           3.5        20         3          1
Cs64              TRAPEZOIDAL  1.5           3.5        6          3          1
Cs7               TRAPEZOIDAL  1.5           3.5        6          3          1
Culvert-10        CIRCULAR     0.6           0          0          0          1
Culvert5          CIRCULAR     0.9           0          0          0          1
6
Culvert7          CIRCULAR     0.6           0          0          0          1
6
Culvert8          CIRCULAR     0.6           0          0          0          1
6
Culvert-9         CIRCULAR     0.4           0          0          0          1
Culvert-C24s-900 CIRCULAR     0.9           0          0          0          1
CulvertC3         CIRCULAR     0.6           0          0          0          1
CulvertC4         CIRCULAR     0.6           0          0          0          1
6
CulvertC6         CIRCULAR     0.9           0          0          0          1
Ditch-C12         CIRCULAR     1             0          0          0          1
Ditch-C13         CIRCULAR     1             0          0          0          1
Ditch-C23         TRAPEZOIDAL  1             2          10         10         1
DitchC24          CIRCULAR     1             0          0          0          1
DitchC25          CIRCULAR     1             0          0          0          1
DitchC31          CIRCULAR     1             0          0          0          1
Dummy-Culvert1    CIRCULAR     0.9           0          0          0          1
Dummy-pipe2       CIRCULAR     1             0          0          0          1
Dummy-pipe3       CIRCULAR     1             0          0          0          1
FirstCulvertC29   CIRCULAR     0.6           0          0          0          1
6
OverlandDitchC27 CIRCULAR     1             0          0          0          1
SecondCulvertC2   CIRCULAR     0.6           0          0          0          1
6
TWCulvertC30      CIRCULAR     0.9           0          0          0          1
TWCulvertC9       CIRCULAR     0.9           0          0          0          1
OR1               CIRCULAR     1             0          0          0

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

[CURVES]
;;Name            Type       X-Value    Y-Value
;;--------------- ---------- ---------- ----------
;Storage
ST6               Storage    0          0
ST6                          0.94       10314.56
ST6                          1.88       25783.34
ST6                          2.82       49692.69

[TIMESERIES]
;;Name            Date       Time       Value
;;--------------- ---------- ---------- ----------
;Calgary_24h_100y design storm, rain interval = 5 minutes, rain units = mm/hr.
Calgary_24h_100y             0:00       0
Calgary_24h_100y             0:05       1.094
```

Calgary_24h_100y	0:10	1.103
Calgary_24h_100y	0:15	1.113
Calgary_24h_100y	0:20	1.122
Calgary_24h_100y	0:25	1.132
Calgary_24h_100y	0:30	1.143
Calgary_24h_100y	0:35	1.153
Calgary_24h_100y	0:40	1.163
Calgary_24h_100y	0:45	1.174
Calgary_24h_100y	0:50	1.185
Calgary_24h_100y	0:55	1.197
Calgary_24h_100y	1:00	1.208
Calgary_24h_100y	1:05	1.22
Calgary_24h_100y	1:10	1.232
Calgary_24h_100y	1:15	1.245
Calgary_24h_100y	1:20	1.257
Calgary_24h_100y	1:25	1.27
Calgary_24h_100y	1:30	1.284
Calgary_24h_100y	1:35	1.297
Calgary_24h_100y	1:40	1.311
Calgary_24h_100y	1:45	1.326
Calgary_24h_100y	1:50	1.341
Calgary_24h_100y	1:55	1.356
Calgary_24h_100y	2:00	1.372
Calgary_24h_100y	2:05	1.388
Calgary_24h_100y	2:10	1.404
Calgary_24h_100y	2:15	1.421
Calgary_24h_100y	2:20	1.439
Calgary_24h_100y	2:25	1.457
Calgary_24h_100y	2:30	1.476
Calgary_24h_100y	2:35	1.495
Calgary_24h_100y	2:40	1.515
Calgary_24h_100y	2:45	1.535
Calgary_24h_100y	2:50	1.556
Calgary_24h_100y	2:55	1.578
Calgary_24h_100y	3:00	1.601
Calgary_24h_100y	3:05	1.624
Calgary_24h_100y	3:10	1.648
Calgary_24h_100y	3:15	1.674
Calgary_24h_100y	3:20	1.7
Calgary_24h_100y	3:25	1.727
Calgary_24h_100y	3:30	1.755
Calgary_24h_100y	3:35	1.784
Calgary_24h_100y	3:40	1.815
Calgary_24h_100y	3:45	1.846
Calgary_24h_100y	3:50	1.88
Calgary_24h_100y	3:55	1.914
Calgary_24h_100y	4:00	1.95
Calgary_24h_100y	4:05	1.988
Calgary_24h_100y	4:10	2.028
Calgary_24h_100y	4:15	2.07
Calgary_24h_100y	4:20	2.113
Calgary_24h_100y	4:25	2.159
Calgary_24h_100y	4:30	2.208
Calgary_24h_100y	4:35	2.259
Calgary_24h_100y	4:40	2.313
Calgary_24h_100y	4:45	2.371
Calgary_24h_100y	4:50	2.432
Calgary_24h_100y	4:55	2.497
Calgary_24h_100y	5:00	2.566
Calgary_24h_100y	5:05	2.64
Calgary_24h_100y	5:10	2.719
Calgary_24h_100y	5:15	2.805
Calgary_24h_100y	5:20	2.897

Calgary_24h_100y	5:25	2.997
Calgary_24h_100y	5:30	3.105
Calgary_24h_100y	5:35	3.224
Calgary_24h_100y	5:40	3.354
Calgary_24h_100y	5:45	3.497
Calgary_24h_100y	5:50	3.656
Calgary_24h_100y	5:55	3.833
Calgary_24h_100y	6:00	4.033
Calgary_24h_100y	6:05	4.259
Calgary_24h_100y	6:10	4.519
Calgary_24h_100y	6:15	4.821
Calgary_24h_100y	6:20	5.176
Calgary_24h_100y	6:25	5.601
Calgary_24h_100y	6:30	6.12
Calgary_24h_100y	6:35	6.773
Calgary_24h_100y	6:40	7.624
Calgary_24h_100y	6:45	8.785
Calgary_24h_100y	6:50	10.488
Calgary_24h_100y	6:55	13.283
Calgary_24h_100y	7:00	18.961
Calgary_24h_100y	7:05	40.516
Calgary_24h_100y	7:10	168.138
Calgary_24h_100y	7:15	54.372
Calgary_24h_100y	7:20	31.748
Calgary_24h_100y	7:25	23.236
Calgary_24h_100y	7:30	18.66
Calgary_24h_100y	7:35	15.763
Calgary_24h_100y	7:40	13.746
Calgary_24h_100y	7:45	12.251
Calgary_24h_100y	7:50	11.093
Calgary_24h_100y	7:55	10.166
Calgary_24h_100y	8:00	9.405
Calgary_24h_100y	8:05	8.768
Calgary_24h_100y	8:10	8.225
Calgary_24h_100y	8:15	7.756
Calgary_24h_100y	8:20	7.346
Calgary_24h_100y	8:25	6.985
Calgary_24h_100y	8:30	6.664
Calgary_24h_100y	8:35	6.376
Calgary_24h_100y	8:40	6.116
Calgary_24h_100y	8:45	5.88
Calgary_24h_100y	8:50	5.665
Calgary_24h_100y	8:55	5.468
Calgary_24h_100y	9:00	5.287
Calgary_24h_100y	9:05	5.119
Calgary_24h_100y	9:10	4.964
Calgary_24h_100y	9:15	4.819
Calgary_24h_100y	9:20	4.684
Calgary_24h_100y	9:25	4.558
Calgary_24h_100y	9:30	4.44
Calgary_24h_100y	9:35	4.329
Calgary_24h_100y	9:40	4.224
Calgary_24h_100y	9:45	4.125
Calgary_24h_100y	9:50	4.032
Calgary_24h_100y	9:55	3.943
Calgary_24h_100y	10:00	3.859
Calgary_24h_100y	10:05	3.78
Calgary_24h_100y	10:10	3.704
Calgary_24h_100y	10:15	3.631
Calgary_24h_100y	10:20	3.562
Calgary_24h_100y	10:25	3.496
Calgary_24h_100y	10:30	3.433
Calgary_24h_100y	10:35	3.373

Calgary_24h_100y	10:40	3.315
Calgary_24h_100y	10:45	3.259
Calgary_24h_100y	10:50	3.206
Calgary_24h_100y	10:55	3.154
Calgary_24h_100y	11:00	3.105
Calgary_24h_100y	11:05	3.057
Calgary_24h_100y	11:10	3.011
Calgary_24h_100y	11:15	2.967
Calgary_24h_100y	11:20	2.924
Calgary_24h_100y	11:25	2.883
Calgary_24h_100y	11:30	2.843
Calgary_24h_100y	11:35	2.805
Calgary_24h_100y	11:40	2.767
Calgary_24h_100y	11:45	2.731
Calgary_24h_100y	11:50	2.696
Calgary_24h_100y	11:55	2.662
Calgary_24h_100y	12:00	2.629
Calgary_24h_100y	12:05	2.597
Calgary_24h_100y	12:10	2.566
Calgary_24h_100y	12:15	2.536
Calgary_24h_100y	12:20	2.506
Calgary_24h_100y	12:25	2.478
Calgary_24h_100y	12:30	2.45
Calgary_24h_100y	12:35	2.423
Calgary_24h_100y	12:40	2.396
Calgary_24h_100y	12:45	2.371
Calgary_24h_100y	12:50	2.346
Calgary_24h_100y	12:55	2.321
Calgary_24h_100y	13:00	2.297
Calgary_24h_100y	13:05	2.274
Calgary_24h_100y	13:10	2.252
Calgary_24h_100y	13:15	2.229
Calgary_24h_100y	13:20	2.208
Calgary_24h_100y	13:25	2.187
Calgary_24h_100y	13:30	2.166
Calgary_24h_100y	13:35	2.146
Calgary_24h_100y	13:40	2.126
Calgary_24h_100y	13:45	2.107
Calgary_24h_100y	13:50	2.088
Calgary_24h_100y	13:55	2.069
Calgary_24h_100y	14:00	2.051
Calgary_24h_100y	14:05	2.034
Calgary_24h_100y	14:10	2.016
Calgary_24h_100y	14:15	1.999
Calgary_24h_100y	14:20	1.983
Calgary_24h_100y	14:25	1.966
Calgary_24h_100y	14:30	1.95
Calgary_24h_100y	14:35	1.935
Calgary_24h_100y	14:40	1.919
Calgary_24h_100y	14:45	1.904
Calgary_24h_100y	14:50	1.889
Calgary_24h_100y	14:55	1.875
Calgary_24h_100y	15:00	1.86
Calgary_24h_100y	15:05	1.846
Calgary_24h_100y	15:10	1.833
Calgary_24h_100y	15:15	1.819
Calgary_24h_100y	15:20	1.806
Calgary_24h_100y	15:25	1.793
Calgary_24h_100y	15:30	1.78
Calgary_24h_100y	15:35	1.767
Calgary_24h_100y	15:40	1.755
Calgary_24h_100y	15:45	1.743
Calgary_24h_100y	15:50	1.731

Calgary_24h_100y	15:55	1.719
Calgary_24h_100y	16:00	1.707
Calgary_24h_100y	16:05	1.696
Calgary_24h_100y	16:10	1.685
Calgary_24h_100y	16:15	1.673
Calgary_24h_100y	16:20	1.663
Calgary_24h_100y	16:25	1.652
Calgary_24h_100y	16:30	1.641
Calgary_24h_100y	16:35	1.631
Calgary_24h_100y	16:40	1.621
Calgary_24h_100y	16:45	1.611
Calgary_24h_100y	16:50	1.601
Calgary_24h_100y	16:55	1.591
Calgary_24h_100y	17:00	1.581
Calgary_24h_100y	17:05	1.572
Calgary_24h_100y	17:10	1.562
Calgary_24h_100y	17:15	1.553
Calgary_24h_100y	17:20	1.544
Calgary_24h_100y	17:25	1.535
Calgary_24h_100y	17:30	1.526
Calgary_24h_100y	17:35	1.517
Calgary_24h_100y	17:40	1.509
Calgary_24h_100y	17:45	1.5
Calgary_24h_100y	17:50	1.492
Calgary_24h_100y	17:55	1.484
Calgary_24h_100y	18:00	1.476
Calgary_24h_100y	18:05	1.467
Calgary_24h_100y	18:10	1.46
Calgary_24h_100y	18:15	1.452
Calgary_24h_100y	18:20	1.444
Calgary_24h_100y	18:25	1.436
Calgary_24h_100y	18:30	1.429
Calgary_24h_100y	18:35	1.421
Calgary_24h_100y	18:40	1.414
Calgary_24h_100y	18:45	1.407
Calgary_24h_100y	18:50	1.399
Calgary_24h_100y	18:55	1.392
Calgary_24h_100y	19:00	1.385
Calgary_24h_100y	19:05	1.378
Calgary_24h_100y	19:10	1.372
Calgary_24h_100y	19:15	1.365
Calgary_24h_100y	19:20	1.358
Calgary_24h_100y	19:25	1.352
Calgary_24h_100y	19:30	1.345
Calgary_24h_100y	19:35	1.339
Calgary_24h_100y	19:40	1.332
Calgary_24h_100y	19:45	1.326
Calgary_24h_100y	19:50	1.32
Calgary_24h_100y	19:55	1.313
Calgary_24h_100y	20:00	1.307
Calgary_24h_100y	20:05	1.301
Calgary_24h_100y	20:10	1.295
Calgary_24h_100y	20:15	1.289
Calgary_24h_100y	20:20	1.284
Calgary_24h_100y	20:25	1.278
Calgary_24h_100y	20:30	1.272
Calgary_24h_100y	20:35	1.266
Calgary_24h_100y	20:40	1.261
Calgary_24h_100y	20:45	1.255
Calgary_24h_100y	20:50	1.25
Calgary_24h_100y	20:55	1.244
Calgary_24h_100y	21:00	1.239
Calgary_24h_100y	21:05	1.234

```
Calgary_24h_100y           21:10      1.229
Calgary_24h_100y           21:15      1.223
Calgary_24h_100y           21:20      1.218
Calgary_24h_100y           21:25      1.213
Calgary_24h_100y           21:30      1.208
Calgary_24h_100y           21:35      1.203
Calgary_24h_100y           21:40      1.198
Calgary_24h_100y           21:45      1.193
Calgary_24h_100y           21:50      1.188
Calgary_24h_100y           21:55      1.184
Calgary_24h_100y           22:00      1.179
Calgary_24h_100y           22:05      1.174
Calgary_24h_100y           22:10      1.17
Calgary_24h_100y           22:15      1.165
Calgary_24h_100y           22:20      1.16
Calgary_24h_100y           22:25      1.156
Calgary_24h_100y           22:30      1.151
Calgary_24h_100y           22:35      1.147
Calgary_24h_100y           22:40      1.143
Calgary_24h_100y           22:45      1.138
Calgary_24h_100y           22:50      1.134
Calgary_24h_100y           22:55      1.13
Calgary_24h_100y           23:00      1.125
Calgary_24h_100y           23:05      1.121
Calgary_24h_100y           23:10      1.117
Calgary_24h_100y           23:15      1.113
Calgary_24h_100y           23:20      1.109
Calgary_24h_100y           23:25      1.105
Calgary_24h_100y           23:30      1.101
Calgary_24h_100y           23:35      1.097
Calgary_24h_100y           23:40      1.093
Calgary_24h_100y           23:45      1.089
Calgary_24h_100y           23:50      1.085
Calgary_24h_100y           23:55      1.081
Calgary_24h_100y           24:00      1.077

Continuous       FILE "C:\Users\OneDrive -
ARCADIS\Desktop\Remote_Desktop_SWMM_A_S_O_N\NORTH-OKOTOKS-PREDEV\PrecipitationData-
Calgary19602014.dat"

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
AVERAGES   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   11s             OutletDArcyDam
Subcatch   12s             OutletHWY2AWestDitch
Subcatch   13s             OutletHWY2AEastDitch
Subcatch   14s             OutletHWY2AEastDitch
Subcatch   15s             OutletSwaleCrystalRidge
Subcatch   16s             OutletDitchCHS
Subcatch   3s              Ditch-1-HY2
Subcatch   4s              OutletDitch48ST
Subcatch   5s              OutletDitchCHS
Subcatch   6s              OutletCulvertGolfCourse
Subcatch   7s              OutletHWY2AWestDitch
Subcatch   8s              OutletHWY2AWestDitch
Subcatch   9s              OutletDArcyDam
```

```
Subcatch   s1               Ditch-1-HY2
Subcatch   s10              OutletOverland
Subcatch   s11              OutletOverland
Subcatch   s12              OutletOverland
Subcatch   s13              OutletOverland
Subcatch   s14              OutletOverland
Subcatch   s15              OutletOverland
Subcatch   s16              OutletOverland
Subcatch   s17              OutletOverland
Subcatch   s18              18
Subcatch   s19              19
Subcatch   s2               Ditch-1-HY2
Subcatch   s20              20
Subcatch   s21              21
Subcatch   s22              22
Subcatch   s23              23
Subcatch   s24              24
Subcatch   s25              25
Subcatch   s26              OutletOverland
Subcatch   s27              27
Subcatch   s28              28
Subcatch   s29              29
Subcatch   s3               Ditch-1-HY2
Subcatch   s4               Ditch-1-HY2
Subcatch   s5               OutletDitch48ST
Subcatch   s6               OutletOverland48ST
Subcatch   s7               OutletOverland
Subcatch   s8               08
Subcatch   s9               OutletOverland

[MAP]
DIMENSIONS       571590.55535     5616853.3082     577470.90565     5621972.2638
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
13               575928.77          5619554.547
15               575928.01          5619276.955
17               575956.248         5618985.412
20               576124.83          5618614.525
21               576276.242         5618434.84
22               576202.746         5618208.783
23               576275.708         5618142.83
24               576014.702         5617607.634
26               576164.409         5617311.575
3                576860.428         5620029.409
33               575690.409         5617919.538
35               575611.835         5617432.681
39               576758.887         5619599.342
41               576646.073         5618935.547
42               576762.832         5618636.727
43               576653.552         5618426.272
44               576667.945         5618010.666
45               576473.254         5617832.661
46               576460.244         5617674.531
47               576333.506         5617511.555
6                575950.837         5620027.212
D1               572212.426         5620201.883
D2               571991.339         5619933.148
-j10-Overland    574302.64          5619854.375
J12              575384.697         5619890.342
J13              575619.309         5620044.88
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J16              575534.599         5619171.858
J17              575602.14          5619133.507
J1s              572307.078         5619344.822
J22              574401.808         5618995.771
J3               573855.161         5619783.43
J30              572604.3           5619863.467
J4               573944.149         5619784.446
J54s             573224.759         5619865.984
J6               573761.264         5619889.726
J8-toDitch       573950.249         5619881.531
Js21             572234.841         5619976.622
Js22             572303.224         5619976.622
Js23             572147.936         5619949.553
Js31             572699.502         5619943.517
Js32             572733.066         5619946.106
Js33             572756.447         5619946.856
Js34             572797.373         5619951.403
Js62             572236.433         5619877.818
OUTLET-09-J11    575273.203         5620003.132
OUTLET-10-j9     574300.002         5620039.59
OUTLET-11-J7     573929.738         5620047.281
OUTLET-12--J5    573705.703         5619985.061
OUTLET-15-Js24   572363.06          5619958.101
OUTLET-3         576837.95          5619876.126
OUTLET-4         575954.351         5619847.949
OUTLET-5         575662.105         5619878.64
OUTLET-6         575428.743         5620035.123
OUTLET-7         576692.995         5619153.516
OUTLET-8-Scenario1 575929.82          5619152.544
OUTLET-8-Scenario2 576097.199         5617546.598
37               575683.024         5618979.478
DARCY-DAM        571962.789         5619744.114
HY2As-Ditch-East 572293.215         5619123.241
HY2As-Ditch-West 572224.214         5619103.886
J18-             574186.307         5619512.004
OF3              574520.12          5618979.342
OF6              575539.361         5619139.953
OUTLET-1-Ditch-1-HY2 576209.306         5621448.766
OUTLET-2-Ditch-HY2 576368.451         5621071.39
SwaleCrystalRidge 573058.77          5619103.194
WatercourseC     576071.668         5617085.988
Npond            576804.978         5620120.559
OUTLET-13-J53s   573223.281         5619953.396
OUTLET-14-Js29   572599.596         5619933.266
OUTLET-16-J16s--to-DARCY-DAM 572367.409         5620207.106
Pond             574481.248         5619072.721
Spond            576777.137         5619747.307
```

[VERTICES]

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;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
19               576782.484         5618180.455
2                575917.669         5619382.659
8                576161.464         5617847.934
C1s-to-Crystal-Ridge-Swalele 573188.158         5619823.758
C1s-to-Crystal-Ridge-Swalele 573160.886         5619779.327
C1s-to-Crystal-Ridge-Swalele 573163.925         5619728.366
C1s-to-Crystal-Ridge-Swalele 573201.502         5619701.072
C1s-to-Crystal-Ridge-Swalele 573176.554         5619656.673
C1s-to-Crystal-Ridge-Swalele 573160.674         5619628.629
C1s-to-Crystal-Ridge-Swalele 573198.545         5619580.473
C1s-to-Crystal-Ridge-Swalele 573243.194         5619546.323
C1s-to-Crystal-Ridge-Swalele 573257.855         5619495.522
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C1s-to-Crystal-Ridge-Swalele 573240.009         5619441.946
C1s-to-Crystal-Ridge-Swalele 573205.21          5619436.821
C1s-to-Crystal-Ridge-Swalele 573182.031         5619431.859
C1s-to-Crystal-Ridge-Swalele 573152.368         5619392.028
C1s-to-Crystal-Ridge-Swalele 573127.352         5619352.262
C1s-to-Crystal-Ridge-Swalele 573109.472         5619301.003
C1s-to-Crystal-Ridge-Swalele 573091.332         5619268.289
C1s-to-Crystal-Ridge-Swalele 573096.37          5619240.537
C5s-to-WESTDITCH-HW2A 572565.674         5619814.822
C5s-to-WESTDITCH-HW2A 572534.995         5619770.329
C5s-to-WESTDITCH-HW2A 572530.289         5619711.509
C5s-to-WESTDITCH-HW2A 572538.443         5619654.702
C5s-to-WESTDITCH-HW2A 572547.286         5619548.328
C5s-to-WESTDITCH-HW2A 572541.097         5619463.778
C5s-to-WESTDITCH-HW2A 572549.379         5619397.79
C5s-to-WESTDITCH-HW2A 572549.737         5619372.087
C5s-to-WESTDITCH-HW2A 572446.727         5619365.148
Ditch-C13        573951.978         5619699.921
Ditch-C13        574149.48          5619697.437
SecondCulvertC2  573892.835         5619753.187
TWCulvertC9      575552.917         5619150.096

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
11s              573153.176         5621471.936
11s              573137.978         5621424.183
11s              573084.372         5621371.42
11s              573063.793         5621219.501
11s              573087.34          5621151.92
11s              573079.36          5620905.094
11s              573076.516         5620780.592
11s              573018.599         5620711.91
11s              572967.715         5620625.199
11s              572884.875         5620558.461
11s              572831.576         5620315.567
11s              572788.402         5620307.69
11s              572718.067         5620266.503
11s              572672.376         5620244.81
11s              572598.65          5620171.005
11s              572583.377         5620166.967
11s              572320.908         5620165.335
11s              572320.471         5620190.469
11s              572303.585         5621163.352
11s              572296.509         5621513.981
11s              572604.098         5621523.945
11s              572645.256         5621485.794
11s              572702.809         5621523.344
11s              572753.041         5621529.829
11s              572827.173         5621629.535
11s              572913.228         5621706.178
11s              572979.228         5621691.587
11s              573008.802         5621651.344
11s              573129.819         5621718.783
11s              573167.251         5621739.584
11s              573268.247         5621738.361
11s              573292.42          5621673.957
11s              573293.33          5621606.65
11s              573216.323         5621488.633
11s              573153.176         5621471.936
12s              572583.377         5620166.984
12s              572529.299         5620057.042
12s              572480.813         5619958.671
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12s	572473.823	5619908.76
12s	572315.987	5619908.371
12s	572320.907	5620165.353
12s	572583.377	5620166.984
13s	572473.823	5619908.743
13s	572480.813	5619958.653
13s	572529.299	5620057.024
13s	572583.377	5620166.967
13s	572598.65	5620171.005
13s	572672.376	5620244.81
13s	572718.067	5620266.503
13s	572788.402	5620307.69
13s	572831.576	5620315.567
13s	572838.977	5620102.916
13s	572807.847	5620061.756
13s	572765.127	5620040.809
13s	572756.657	5619997.692
13s	572789.377	5619921.182
13s	572473.823	5619908.743
14s	573946.176	5621442.076
14s	573941.29	5621395.079
14s	573886.348	5621375.011
14s	573795.133	5621317.231
14s	573779.157	5621240.452
14s	573726.573	5621197.206
14s	573658.932	5621166.517
14s	573659.967	5621089.969
14s	573446.212	5620697.885
14s	573340.211	5620673.058
14s	573290.041	5620608.577
14s	573282.944	5620504.271
14s	573192.114	5620458.382
14s	573094.359	5620452.807
14s	573112.382	5620312.283
14s	573057.064	5620194.88
14s	573055.988	5620063.985
14s	573097.736	5619922.288
14s	572789.377	5619921.164
14s	572756.657	5619997.674
14s	572765.127	5620040.791
14s	572807.847	5620061.738
14s	572838.977	5620102.899
14s	572831.576	5620315.549
14s	572884.875	5620558.443
14s	572967.715	5620625.199
14s	573018.599	5620711.892
14s	573076.517	5620780.574
14s	573079.36	5620905.094
14s	573087.34	5621151.902
14s	573063.793	5621219.483
14s	573084.373	5621371.403
14s	573137.978	5621424.183
14s	573153.176	5621471.918
14s	573216.323	5621488.615
14s	573284.601	5621490.466
14s	573321.989	5621521.579
14s	573388.543	5621526.079
14s	573483.532	5621557.97
14s	573533.983	5621555.051
14s	573577.792	5621643.863
14s	573609.682	5621682.102
14s	573649.113	5621695.238
14s	573720.338	5621620.584

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14s             573774.51         5621608.714
14s             573892.585        5621531.093
14s             573946.176        5621442.076
15s             573097.737        5619922.27
15s             573055.988        5620063.968
15s             573057.064        5620194.863
15s             573112.382        5620312.265
15s             573094.36         5620452.789
15s             573192.114        5620458.364
15s             573282.944        5620504.253
15s             573290.041        5620608.56
15s             573340.211        5620673.04
15s             573446.213        5620697.867
15s             573659.967        5621089.951
15s             573658.932        5621166.5
15s             573726.573        5621197.189
15s             573779.157        5621240.434
15s             573795.133        5621317.213
15s             573886.348        5621375.011
15s             573887.798        5621308.848
15s             573887.824        5621307.642
15s             573887.798        5621308.828
15s             573889.189        5621245.402
15s             573869.071        5621201.994
15s             573869.071        5621201.994
15s             573867.046        5621181.684
15s             573837.912        5620889.905
15s             573826.662        5620777.242
15s             573826.662        5620777.224
15s             573770.148        5620714.558
15s             573640.109        5620674.933
15s             573624.76         5620651.222
15s             573617.474        5620610.646
15s             573554.069        5620568.005
15s             573447.865        5620407.268
15s             573439.979        5620314.453
15s             573346.424        5620280.545
15s             573348.876        5620195.705
15s             573283.531        5620103.419
15s             573331.182        5620055.751
15s             573326.383        5620024.348
15s             573341.026        5620003.654
15s             573370.418        5619954.433
15s             573370.824        5619924.406
15s             573097.737        5619922.27
;Part2: 15s
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15s             573867.812        5621189.367
15s             573869.057        5621201.834
15s             573868.736        5621198.615
15s             573867.844        5621189.683
16s             573914.414        5619936.534
16s             573370.824        5619924.389
16s             573370.418        5619954.415
16s             573341.026        5620003.636
16s             573326.384        5620024.33
16s             573331.182        5620055.733
16s             573283.531        5620103.402
16s             573348.877        5620195.687
16s             573346.424        5620280.528
16s             573439.979        5620314.436
16s             573447.865        5620407.25
16s             573554.069        5620567.987
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16s             573617.474        5620610.628
16s             573624.76         5620651.205
16s             573640.109        5620674.916
16s             573770.148        5620714.54
16s             573826.662        5620777.215
16s             573869.071        5621201.985
16s             573869.071        5621201.986
16s             573889.189        5621245.4
16s             573889.189        5621245.393
16s             573891.868        5621123.189
16s             573882.083        5620926.342
16s             573914.414        5619936.534
;Part2: 16s
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16s             573834.263        5620853.358
16s             573826.662        5620777.233
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3s              575407.941        5621231.416
3s              575524.872        5621209.247
3s              575525.001        5621135.414
3s              575527.381        5621022.307
3s              575333.281        5621027.177
3s              575278.301        5621031.86
3s              575068.486        5621016.531
3s              575068.486        5621016.514
3s              575032.046        5621177.016
3s              575011.913        5621570.173
3s              575418.702        5621578.849
4s              574820.797        5619946.273
4s              574800.493        5620071.179
4s              574739.323        5620257.609
4s              574570.643        5620427.142
4s              574464.235        5620548.438
4s              574341.331        5620644.996
4s              574201.705        5620717.329
4s              574235.183        5620900.538
4s              574246.08         5621050.945
4s              574211.285        5621249.774
4s              574142.313        5621312.763
4s              574302.247        5621313.191
4s              574306.532        5621309.524
4s              574325.656        5621412.471
4s              574454.222        5621461.803
4s              574489.581        5621468.201
4s              574592.569        5621465.566
4s              574616.332        5621401.03
4s              574714.168        5621370.054
4s              575021.723        5621378.605
4s              575033.599        5621168.232
4s              575068.486        5621016.522
4s              575068.485        5621016.54
4s              575278.301        5621031.851
4s              575319.437        5621035.183
4s              575330.536        5621027.129
4s              575333.281        5621027.169
4s              575527.381        5621022.307
4s              575544.421        5619961.906
4s              574820.797        5619946.273
;Part2: 4s
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4s              574481.288        5621472.189
4s              574454.222        5621461.803
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5s                573914.414          5619936.517
5s                573911.808          5620213.474
5s                573886.348          5621374.994
5s                573941.29           5621395.061
5s                573941.291          5621395.067
5s                573969.948          5621307.651
5s                574142.313          5621312.754
5s                574211.285          5621249.765
5s                574215.69           5621180.462
5s                574246.08           5621050.936
5s                574228.513          5620808.471
5s                574180.913          5620646.606
5s                574185.717          5620595.611
5s                574129.75           5620332.394
5s                574038.495          5620279.657
5s                573981.598          5620246.778
5s                573960.196          5619940.235
5s                573929.421          5619940.068
;Part2: 5s
5s                573941.29           5621395.07
5s                573941.291          5621395.069
5s                573941.291          5621395.067
5s                573941.29           5621395.07
;Part3: 5s
5s                573941.29           5621395.07
5s                573946.176          5621442.085
5s                573941.291          5621395.069
5s                573941.29           5621395.07
6s                574820.798          5619946.265
6s                574740.484          5619944.516
6s                573960.196          5619940.243
6s                573967.484          5620044.63
6s                573981.597          5620246.769
6s                574129.75           5620332.385
6s                574185.717          5620595.62
6s                574201.705          5620717.32
6s                574341.331          5620644.987
6s                574464.235          5620548.429
6s                574523.726          5620478.66
6s                574570.643          5620427.133
6s                574739.323          5620257.6
6s                574800.493          5620071.171
6s                574820.798          5619946.265
7s                572282.207          5620187.892
7s                572284.954          5619908.762
7s                572054.137          5619900.492
7s                572055.024          5619910.768
7s                572085.365          5619944.021
7s                572126.121          5619966.126
7s                572165.545          5620010.792
7s                572231.025          5620101.996
7s                572246.819          5620148.395
7s                572257.732          5620176.254
7s                572282.207          5620187.892
8s                572320.907          5620165.353
8s                572315.987          5619908.388
8s                572284.954          5619908.744
8s                572282.208          5620187.875
8s                572320.471          5620190.469
8s                572320.907          5620165.353
9s                572282.207          5620187.892
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9s	572231.024	5620102.013
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;;Storage Node   X-Coord            Y-Coord
;;-------------- ------------------ ------------------

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

[PROFILES]
;;Name           Links
;;-------------- ----------
"1N--Node Js34 to Node HY2As-Ditch-East" Cs23 Cs52 Cs22 Cs53 Cs13
"1N--Node Js34 to Node HY2As-Ditch-East" C5s-to-WESTDITCH-HW2A Cs7
"1N--Node J53s to Node OF6s" Culvert-C24s-900 C1s-to-Crystal-Ridge-Swalele
"1N---Node Js24 to Node HY2As-Ditch-West" Cs15 Cs35 Cs4_1_EAST-ditch
"1N--Node Js22 to Node HY2As-Ditch-West" cs14 Cs64 Cs35 Cs4_1_EAST-ditch
"2N----Node J7 to Node J18" CulvertC4 Ditch-C12 Ditch-C13
"1N--Node J16s--to-DARCY-DAM to Node DARCY-DAM" Dummy-Culvert1 Dummy-pipe2 Dummy-pipe3
"2N----Node j9 to Node OF3" Culvert5 OverlandDitchC27 OR1 C18
```

Appendix F

Pre-Development PCSWMM Model Output Results

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 2
Number of subcatchments ... 42
Number of nodes 73
Number of links 64
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
Calgary_24h_100y	Calgary_24h_100y	INTENSITY	5 min.
Continuous_6014	Continuous	INTENSITY	60 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
11s	100.68	499.00	2.00	1.5000	Calgary_24h_100y	OUTLET-16-J16s--to-DARCY-DAM
12s	5.23	173.75	6.00	2.2000	Calgary_24h_100y	OUTLET-15-Js24
13s	9.15	226.00	2.00	2.8000	Calgary_24h_100y	OUTLET-14-Js29
14s	75.92	392.76	2.00	2.2000	Calgary_24h_100y	Js34
15s	36.72	236.75	2.00	2.3000	Calgary_24h_100y	OUTLET-13-J53s
16s	38.52	304.24	2.00	2.5000	Calgary_24h_100y	OUTLET-12--J5
3s	23.31	525.00	2.00	3.0000	Calgary_24h_100y	OUTLET-1-Ditch-1-HY2
4s	141.03	746.97	2.00	2.0000	Calgary_24h_100y	OUTLET-09-J11
5s	33.23	237.34	2.00	2.8000	Calgary_24h_100y	OUTLET-11-J7
6s	41.96	547.73	2.00	3.0000	Calgary_24h_100y	OUTLET-10-j9
7s	2.95	133.00	17.00	0.5000	Calgary_24h_100y	Js23
8s	0.99	40.00	47.00	0.5000	Calgary_24h_100y	Js22
9s	41.87	278.00	5.00	1.3000	Calgary_24h_100y	DARCY-DAM
s1	4.17	416.94	2.00	4.5000	Calgary_24h_100y	OUTLET-1-Ditch-1-HY2
s10	12.38	190.44	2.00	3.9000	Calgary_24h_100y	15

s11	11.59	298.72	2.00	4.6000	Calgary_24h_100y	
OUTLET-8-Scenario1						
s12	12.24	193.43	2.00	6.0000	Calgary_24h_100y	
17						
s13	8.21	154.89	2.00	5.0000	Calgary_24h_100y	
17						
s14	28.46	370.63	10.00	6.0000	Calgary_24h_100y	
20						
s15	12.25	170.43	4.00	4.7000	Calgary_24h_100y	
21						
s16	11.96	199.30	4.00	3.9000	Calgary_24h_100y	
21						
s17	44.67	450.00	8.00	5.9000	Calgary_24h_100y	
26						
s18	31.23	380.83	6.00	4.0000	Calgary_24h_100y	
Spond						
s19	12.25	230.74	10.00	4.0000	Calgary_24h_100y	
OUTLET-7						
s2	7.98	206.25	2.00	4.5000	Calgary_24h_100y	
OUTLET-1-Ditch-1-HY2						
s20	15.08	236.33	4.00	4.0000	Calgary_24h_100y	
OUTLET-7						
s21	26.94	371.60	4.00	6.0000	Calgary_24h_100y	
43						
s22	23.53	280.00	4.00	4.5000	Calgary_24h_100y	
43						
s23	37.65	396.37	4.00	5.5000	Calgary_24h_100y	
44						
s24	28.44	300.00	4.00	5.0000	Calgary_24h_100y	
47						
s25	15.67	256.50	4.00	6.0000	Calgary_24h_100y	
47						
s26	3.03	97.67	4.00	4.0000	Calgary_24h_100y	
26						
s27	16.21	197.72	4.00	5.3800	Calgary_24h_100y	
33						
s28	9.88	173.33	12.00	5.7000	Calgary_24h_100y	
35						
s29	6.78	160.67	4.00	4.1400	Calgary_24h_100y	
33						
s3	10.08	201.22	19.00	4.5000	Calgary_24h_100y	
OUTLET-1-Ditch-1-HY2						
s4	35.11	470.00	2.00	3.2000	Calgary_24h_100y	
OUTLET-2-Ditch-HY2						
s5	4.69	142.43	2.00	4.5000	Calgary_24h_100y	
J13						
s6	21.58	265.49	2.00	5.0000	Calgary_24h_100y	
J13						
s7	16.67	210.75	2.00	4.0000	Calgary_24h_100y	6
s8	58.26	448.13	2.00	2.0000	Calgary_24h_100y	
Npond						
s9	27.90	516.69	2.00	7.5000	Calgary_24h_100y	
13						

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
13	JUNCTION	1094.26	1.50	0.0	
15	JUNCTION	1092.49	1.50	0.0	

17	JUNCTION	1088.39	2.00	0.0
20	JUNCTION	1082.45	2.00	0.0
21	JUNCTION	1078.12	2.00	0.0
22	JUNCTION	1076.01	2.00	0.0
23	JUNCTION	1074.94	2.00	0.0
24	JUNCTION	1067.88	2.00	0.0
26	JUNCTION	1061.00	2.00	0.0
3	JUNCTION	1091.94	2.00	0.0
33	JUNCTION	1075.54	2.00	0.0
35	JUNCTION	1069.81	2.00	0.0
39	JUNCTION	1091.16	1.50	0.0
41	JUNCTION	1083.74	2.00	0.0
42	JUNCTION	1078.58	2.00	0.0
43	JUNCTION	1074.92	2.00	0.0
44	JUNCTION	1068.63	2.00	0.0
45	JUNCTION	1065.83	2.00	0.0
46	JUNCTION	1064.60	2.00	0.0
47	JUNCTION	1062.99	2.00	0.0
6	JUNCTION	1105.29	2.00	0.0
D1	JUNCTION	1111.50	3.00	0.0
D2	JUNCTION	1110.54	3.00	0.0
-j10-Overland	JUNCTION	1113.37	2.75	0.0
J12	JUNCTION	1104.38	1.50	0.0
J13	JUNCTION	1105.26	2.00	0.0
J16	JUNCTION	1093.62	2.00	0.0
J17	JUNCTION	1092.00	2.00	0.0
J1s	JUNCTION	1105.46	2.00	0.0
J22	JUNCTION	1110.00	2.00	0.0
J3	JUNCTION	1118.14	2.22	0.0
J30	JUNCTION	1114.47	3.00	0.0
J4	JUNCTION	1115.67	2.46	0.0
J54s	JUNCTION	1119.63	2.00	0.0
J6	JUNCTION	1117.31	2.05	0.0
J8-toDitch	JUNCTION	1118.29	1.24	0.0
Js21	JUNCTION	1113.01	3.00	0.0
Js22	JUNCTION	1113.88	3.00	0.0
Js23	JUNCTION	1112.27	3.00	0.0
Js31	JUNCTION	1118.28	2.00	0.0
Js32	JUNCTION	1118.86	2.00	0.0
Js33	JUNCTION	1119.74	2.00	0.0
Js34	JUNCTION	1120.00	2.00	0.0
Js62	JUNCTION	1111.92	3.00	0.0
OUTLET-09-J11	JUNCTION	1104.59	2.00	0.0
OUTLET-10-j9	JUNCTION	1116.13	2.60	0.0
OUTLET-11-J7	JUNCTION	1118.71	0.95	0.0
OUTLET-12--J5	JUNCTION	1117.80	2.00	0.0
OUTLET-15-Js24	JUNCTION	1114.52	3.00	0.0
OUTLET-3	JUNCTION	1091.19	2.00	0.0
OUTLET-4	JUNCTION	1100.31	2.00	0.0
OUTLET-5	JUNCTION	1105.17	1.52	0.0
OUTLET-6	JUNCTION	1105.17	2.00	0.0
OUTLET-7	JUNCTION	1088.35	1.50	0.0
OUTLET-8-Scenario1	JUNCTION	1091.56	2.00	0.0
OUTLET-8-Scenario2	JUNCTION	1067.00	2.00	0.0
37	OUTFALL	1091.58	1.00	0.0
DARCY-DAM	OUTFALL	1110.00	1.00	0.0
HY2As-Ditch-East	OUTFALL	1100.69	1.50	0.0
HY2As-Ditch-West	OUTFALL	1098.32	1.50	0.0
J18-	OUTFALL	1110.00	1.00	0.0
OF3	OUTFALL	1108.00	1.00	0.0
OF6	OUTFALL	1093.00	1.00	0.0
OUTLET-1-Ditch-1-HY2	OUTFALL	1113.65	0.00	0.0
OUTLET-2-Ditch-HY2	OUTFALL	1109.43	0.00	0.0

SwaleCrystalRidge	OUTFALL	1097.12	1.00	0.0	
WatercourseC	OUTFALL	1059.00	1.00	0.0	
Npond	STORAGE	1092.21	2.00	0.0	
OUTLET-13-J53s	STORAGE	1120.10	2.00	0.0	
OUTLET-14-Js29	STORAGE	1116.45	3.00	0.0	
OUTLET-16-J16s--to-DARCY-DAM	STORAGE	1115.41	2.00	0.0	
Pond	STORAGE	1110.00	5.00	0.0	
Spond	STORAGE	1091.16	2.00	0.0	

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
1	OUTLET-4	13	CONDUIT	294.7	2.0528	0.0350
10	24	OUTLET-8-Scenario2	CONDUIT	102.7	0.8520	0.0350
11	OUTLET-8-Scenario2	26	CONDUIT	244.6	2.4534	0.0350
12	26	WatercourseC	CONDUIT	244.1	0.8194	0.0350
13	Spond	39	CONDUIT	149.2	-0.0013	0.0350
14	J17	37	CONDUIT	174.1	0.2430	0.0100
15	39	OUTLET-7	CONDUIT	451.0	0.6250	0.0350
16	OUTLET-7	41	CONDUIT	223.1	2.0667	0.0350
17	41	42	CONDUIT	321.1	1.6052	0.0350
18	42	43	CONDUIT	237.3	1.5419	0.0350
19	43	44	CONDUIT	482.8	1.3041	0.0350
2	13	15	CONDUIT	278.7	0.6373	0.0350
20	44	45	CONDUIT	264.0	1.0596	0.0350
21	45	46	CONDUIT	158.8	0.7784	0.0350
22	46	47	CONDUIT	206.6	0.7764	0.0350
23	47	26	CONDUIT	262.1	0.7601	0.0350
24	OUTLET-3	Spond	CONDUIT	142.6	0.0161	0.0350
25	Npond	3	CONDUIT	106.8	0.2547	0.0100
3	15	OUTLET-8-Scenario1	CONDUIT	124.5	0.7420	0.0350
4	OUTLET-8-Scenario1	17	CONDUIT	169.3	1.8729	0.0350
5	17	20	CONDUIT	407.7	1.4573	0.0350
6	20	21	CONDUIT	235.2	1.8408	0.0350
7	21	22	CONDUIT	237.9	0.8887	0.0350

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  8                 23                24                CONDUIT          598.3    1.1803
0.0350
  9                 22                23                CONDUIT           98.4    1.0902
0.0350
  C11-Overland      J6                J3                CONDUIT          143.6   -0.5787
0.0500
  C18               J22               OF3               CONDUIT            8.4   24.4006
0.0100
  C1s-to-Crystal-Ridge-Swalele J54s             SwaleCrystalRidge CONDUIT
1019.7    2.2081    0.0350
  C5s-to-WESTDITCH-HW2A J30             J1s               CONDUIT          687.0
1.3118    0.0350
  Cs13              OUTLET-14-Js29    J30               CONDUIT           20.0    9.9363
0.0250
  cs14              Js22              Js21              CONDUIT           38.0    2.2874
0.0250
  Cs15              OUTLET-15-Js24    Js23              CONDUIT           72.2    3.1187
0.0250
  Cs22              Js32              Js31              CONDUIT           10.8    5.4572
0.0250
  Cs23              Js34              Js33              CONDUIT           15.8    1.6764
0.0250
  Cs35              Js23              Js62              CONDUIT           61.0    0.5705
0.0250
  Cs4_1_EAST-ditch Js62               HY2As-Ditch-West CONDUIT          767.0    1.7736
0.0350
  Cs52              Js33              Js32              CONDUIT           38.0    2.3138
0.0350
  Cs53              Js31              OUTLET-14-Js29    CONDUIT          100.5    1.8151
0.0350
  Cs64              Js21              Js23              CONDUIT           26.0    2.8473
0.0250
  Cs7               J1s               HY2As-Ditch-East CONDUIT          316.0    1.5109
0.0350
  Culvert-10        3                 OUTLET-3          CONDUIT           20.1    3.7714
0.0100
  Culvert5          OUTLET-10-j9      -j10-Overland     CONDUIT           23.8   11.7337
0.0240
  Culvert7          J13               OUTLET-6          CONDUIT           20.0    1.0073
0.0240
  Culvert8          J13               OUTLET-5          CONDUIT           20.0    0.4459
0.0240
  Culvert-9         6                 OUTLET-4          CONDUIT           22.1   23.1521
0.0100
  Culvert-C24s-900 OUTLET-13-J53s     J54s              CONDUIT           31.1    1.5164
0.0250
  CulvertC3         OUTLET-12--J5     J6                CONDUIT           21.8    2.2666
0.0240
  CulvertC4         OUTLET-11-J7      J8-toDitch        CONDUIT           20.0    2.1005
0.0240
  CulvertC6         OUTLET-09-J11     J12               CONDUIT           23.9    0.8738
0.0240
  Ditch-C12         J8-toDitch        J4                CONDUIT          122.6    2.1408
0.0300
  Ditch-C13         J4                J18-              CONDUIT          471.8    1.2010
0.0350
  Ditch-C23         OUTLET-5          13                CONDUIT          420.0    2.5980
0.0350
  DitchC24          OUTLET-6          OUTLET-09-J11     CONDUIT           97.0    0.5959
0.0350
  DitchC25          J12               J16               CONDUIT          797.3    1.3504
0.0350
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DitchC31	J16	OF6	CONDUIT	102.0	0.9187	0.0300
Dummy-Culvert1	OUTLET-16-J16s--to-DARCY-DAM	D1	CONDUIT			
155.2	2.5184	0.0100				
Dummy-pipe2	D1	D2	CONDUIT	348.2	0.2745	0.0350
Dummy-pipe3	D2	DARCY-DAM	CONDUIT	191.3	0.2843	0.0100
FirstCulvertC29	J3	J4	CONDUIT	19.6	12.7242	0.0240
OverlandDitchC27	-j10-Overland	Pond	CONDUIT	25.0	13.5918	0.0110
SecondCulvertC2	J3	J4	CONDUIT	21.0	11.8636	0.0240
TWCulvertC30	J16	J17	CONDUIT	17.0	9.5968	0.0240
TWCulvertC9	J16	J17	CONDUIT	17.0	9.5670	0.0240
OR1	Pond	J22	ORIFICE			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
1	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	32.70
10	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	21.07
11	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	35.75
12	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	20.66
13	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	0.84
14	CIRCULAR	1.00	0.79	0.25	1.00	1	1.54
15	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	18.04
16	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	32.81
17	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	28.92
18	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	28.34
19	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	26.06
2	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	18.22
20	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	23.49
21	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	20.14
22	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	20.11
23	TRAPEZOIDAL	1.00	12.00	0.54	22.00	1	19.90

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  24                TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
2.90
  25                CIRCULAR             1.00     0.79     0.25     1.00         1
1.57
  3                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
19.66
  4                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
31.23
  5                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
27.55
  6                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
30.97
  7                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
21.52
  8                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
24.80
  9                 TRAPEZOIDAL          1.00    12.00     0.54    22.00         1
23.83
  C11-Overland      CIRCULAR             1.00     0.79     0.25     1.00         1
0.47
  C18               TRAPEZOIDAL          1.00     6.00     0.64     9.00         1
220.94
  C1s-to-Crystal-Ridge-Swalele TRAPEZOIDAL          1.00    12.00     0.54    22.00
1    33.92
  C5s-to-WESTDITCH-HW2A TRAPEZOIDAL          1.00    16.00     0.52    31.00         1
33.65
  Cs13              CIRCULAR             0.60     0.28     0.15     0.60         1
1.01
  cs14              CIRCULAR             1.00     0.79     0.25     1.00         1
1.89
  Cs15              CIRCULAR             0.90     0.64     0.23     0.90         1
1.66
  Cs22              CIRCULAR             0.60     0.28     0.15     0.60         1
0.75
  Cs23              CIRCULAR             0.60     0.28     0.15     0.60         1
0.41
  Cs35              CIRCULAR             0.90     0.64     0.23     0.90         1
0.71
  Cs4_1_EAST-ditch TRAPEZOIDAL           1.50    15.38     0.89    17.00         1
53.95
  Cs52              TRAPEZOIDAL          1.50    31.13     0.81    38.00         1
117.86
  Cs53              TRAPEZOIDAL          1.50    31.13     0.81    38.00         1
104.39
  Cs64              TRAPEZOIDAL          1.50    15.38     0.89    17.00         1
95.69
  Cs7               TRAPEZOIDAL          1.50    15.38     0.89    17.00         1
49.79
  Culvert-10        CIRCULAR             0.60     0.28     0.15     0.60         1
1.55
  Culvert5          CIRCULAR             0.90     0.64     0.23     0.90         1
3.36
  Culvert7          CIRCULAR             0.60     0.28     0.15     0.60         1
0.33
  Culvert8          CIRCULAR             0.60     0.28     0.15     0.60         1
0.22
  Culvert-9         CIRCULAR             0.40     0.13     0.10     0.40         1
1.30
  Culvert-C24s-900 CIRCULAR              0.90     0.64     0.23     0.90         1
1.16
  CulvertC3         CIRCULAR             0.60     0.28     0.15     0.60         1
0.50
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  CulvertC4        CIRCULAR             0.60     0.28     0.15     0.60        1
0.48
  CulvertC6        CIRCULAR             0.90     0.64     0.23     0.90        1
0.92
  Ditch-C12        CIRCULAR             1.00     0.79     0.25     1.00        1
1.52
  Ditch-C13        CIRCULAR             1.00     0.79     0.25     1.00        1
0.98
  Ditch-C23        TRAPEZOIDAL          1.00    12.00     0.54    22.00        1
36.79
  DitchC24         CIRCULAR             1.00     0.79     0.25     1.00        1
0.69
  DitchC25         CIRCULAR             1.00     0.79     0.25     1.00        1
1.04
  DitchC31         CIRCULAR             1.00     0.79     0.25     1.00        1
1.00
  Dummy-Culvert1   CIRCULAR             0.90     0.64     0.23     0.90        1
3.74
  Dummy-pipe2      CIRCULAR             1.00     0.79     0.25     1.00        1
0.47
  Dummy-pipe3      CIRCULAR             1.00     0.79     0.25     1.00        1
1.66
  FirstCulvertC29  CIRCULAR             0.60     0.28     0.15     0.60        1
1.19
  OverlandDitchC27 CIRCULAR             1.00     0.79     0.25     1.00        1
10.45
  SecondCulvertC2  CIRCULAR             0.60     0.28     0.15     0.60        1
1.15
  TWCulvertC30     CIRCULAR             0.90     0.64     0.23     0.90        1
3.04
  TWCulvertC9      CIRCULAR             0.90     0.64     0.23     0.90        1
3.03


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... NO
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... GREEN_AMPT
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 07/01/2023 23:00:00
  Ending Date .............. 07/06/2023 23:00:00
  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 ........ 5.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 2
  Head Tolerance ........... 0.001500 m


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Control Actions Taken
****

Runoff Quantity Continuity	Volume hectare-m	Depth mm
Total Precipitation	99.212	89.667
Evaporation Loss	4.101	3.706
Infiltration Loss	71.195	64.346
Surface Runoff	23.973	21.667
Final Storage	0.000	0.000
Continuity Error (%)	-0.057	

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	23.972	239.719
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	22.861	228.615
Flooding Loss	1.019	10.192
Evaporation Loss	0.086	0.858
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.001
Final Stored Volume	0.008	0.078
Continuity Error (%)	-0.010	

****
Time-Step Critical Elements
****
Link Cs22 (17.09%)
Link C18 (13.52%)

****
Highest Flow Instability Indexes
****
Link FirstCulvertC29 (6)
Link Culvert5 (5)
Link OverlandDitchC27 (5)
Link SecondCulvertC2 (5)
Link Cs7 (4)

****
Most Frequent Nonconverging Nodes
****
Node 37 (0.05%)
Node DARCY-DAM (0.05%)
Node HY2As-Ditch-East (0.05%)
Node HY2As-Ditch-West (0.05%)
Node J18- (0.05%)

****
Routing Time Step Summary
****
Minimum Time Step : 0.50 sec

```
  Average Time Step           :     4.08 sec
  Maximum Time Step           :     5.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.01
  % of Steps Not Converging   :     0.05
  Time Step Frequencies       :
      5.000 -  3.155 sec      :    73.60 %
      3.155 -  1.991 sec      :     7.52 %
      1.991 -  1.256 sec      :    10.65 %
      1.256 -  0.792 sec      :     8.17 %
      0.792 -  0.500 sec      :     0.06 %


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

  ------------------------------------------------------------------------------------------
-----------------------------------------
                             Total      Total      Total      Total     Imperv
Perv      Total       Total     Peak  Runoff
                          Precip      Runon       Evap      Infil     Runoff
Runoff     Runoff      Runoff   Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm
mm         mm    10^6 ltr      CMS
  ------------------------------------------------------------------------------------------
-----------------------------------------
  11s                        89.67       0.00       4.23      70.51       1.67
13.29      14.96       15.06     1.11   0.167
  12s                        89.67       0.00       3.27      59.47       4.99
27.01      27.01        1.41     0.17   0.301
  13s                        89.67       0.00       3.05      61.37       1.66
23.65      25.31        2.32     0.24   0.282
  14s                        89.67       0.00       4.09      69.18       1.67
14.76      16.43       12.47     0.88   0.183
  15s                        89.67       0.00       3.97      67.80       1.67
16.26      17.93        6.58     0.46   0.200
  16s                        89.67       0.00       3.83      66.46       1.66
17.74      19.40        7.47     0.51   0.216
  3s                         89.67       0.00       3.09      61.56       1.66
23.42      25.08        5.85     0.58   0.280
  4s                         89.67       0.00       4.11      69.31       1.67
14.61      16.28       22.96     1.63   0.182
  5s                         89.67       0.00       3.87      66.69       1.67
17.48      19.14        6.36     0.44   0.214
  6s                         89.67       0.00       3.48      63.59       1.66
20.98      22.64        9.50     0.70   0.253
  7s                         89.67       0.00       4.20      55.40      14.19
30.22      30.22        0.89     0.09   0.337
  8s                         89.67       0.00       5.58      39.16      39.09
45.20      45.20        0.45     0.05   0.504
  9s                         89.67       0.00       4.31      68.38       4.17
17.03      17.03        7.13     0.31   0.190
  s1                         89.67       0.00       2.42      58.10       1.66
27.73      29.39        1.23     0.34   0.328
  s10                        89.67       0.00       3.31      61.88       1.66
22.85      24.51        3.03     0.26   0.273
  s11                        89.67       0.00       2.95      59.99       1.66
25.15      26.81        3.11     0.37   0.299
  s12                        89.67       0.00       3.15      61.05       1.66
23.86      25.52        3.13     0.30   0.285
  s13                        89.67       0.00       3.10      60.77       1.66
24.20      25.86        2.12     0.22   0.288
```

s14			89.67	0.00	3.51	56.40	8.34
21.51	29.85	8.50	1.58	0.333			
s15			89.67	0.00	3.38	60.58	3.33
22.44	25.77	3.16	0.35	0.287			
s16			89.67	0.00	3.31	60.27	3.33
22.81	26.14	3.13	0.35	0.292			
s17			89.67	0.00	3.63	58.65	6.67
20.80	27.47	12.27	1.97	0.306			
s18			89.67	0.00	3.58	60.02	5.00
21.14	26.14	8.16	1.11	0.292			
s19			89.67	0.00	3.41	55.89	8.34
22.12	30.46	3.73	0.71	0.340			
s2			89.67	0.00	2.90	60.53	1.66
24.66	26.32	2.10	0.25	0.294			
s20			89.67	0.00	3.34	60.44	3.33
22.61	25.94	3.91	0.43	0.289			
s21			89.67	0.00	3.29	60.18	3.33
22.92	26.25	7.07	0.80	0.293			
s22			89.67	0.00	3.50	61.23	3.33
21.65	24.98	5.88	0.63	0.279			
s23			89.67	0.00	3.52	61.32	3.33
21.55	24.88	9.37	1.00	0.277			
s24			89.67	0.00	3.55	61.50	3.33
21.33	24.66	7.01	0.75	0.275			
s25			89.67	0.00	3.19	59.63	3.33
23.59	26.91	4.22	0.50	0.300			
s26			89.67	0.00	2.94	58.33	3.32
25.17	28.49	0.86	0.12	0.318			
s27			89.67	0.00	3.43	60.81	3.33
22.16	25.49	4.13	0.45	0.284			
s28			89.67	0.00	3.41	54.30	10.00
22.06	32.06	3.17	0.67	0.358			
s29			89.67	0.00	3.09	59.08	3.32
24.25	27.57	1.87	0.23	0.308			
s3			89.67	0.00	3.60	50.19	15.85
20.19	36.05	3.63	0.97	0.402			
s4			89.67	0.00	3.43	63.36	1.66
21.26	22.93	8.05	0.60	0.256			
s5			89.67	0.00	2.81	60.11	1.66
25.18	26.84	1.26	0.17	0.299			
s6			89.67	0.00	3.32	62.81	1.66
21.92	23.58	5.09	0.41	0.263			
s7			89.67	0.00	3.39	63.14	1.66
21.53	23.19	3.87	0.30	0.259			
s8			89.67	0.00	3.90	67.20	1.67
16.91	18.58	10.82	0.75	0.207			
s9			89.67	0.00	3.00	60.22	1.66
24.86	26.52	7.40	0.84	0.296			

****
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
13	JUNCTION	0.05	0.35	1094.62	0 07:50	0.35
15	JUNCTION	0.05	0.39	1092.88	0 07:53	0.39
17	JUNCTION	0.05	0.37	1088.76	0 07:53	0.37
20	JUNCTION	0.05	0.39	1082.84	0 07:54	0.39

21	JUNCTION	0.07	0.49	1078.62	0	07:56	0.49
22	JUNCTION	0.06	0.47	1076.48	0	07:55	0.47
23	JUNCTION	0.06	0.46	1075.39	0	08:02	0.46
24	JUNCTION	0.07	0.52	1068.39	0	08:06	0.51
26	JUNCTION	0.13	0.72	1061.72	0	08:13	0.71
3	JUNCTION	0.05	0.24	1092.19	0	08:17	0.24
33	JUNCTION	1.97	2.00	1077.54	0	02:04	2.00
35	JUNCTION	1.97	2.00	1071.81	0	02:06	2.00
39	JUNCTION	0.06	0.31	1091.47	0	08:59	0.31
41	JUNCTION	0.05	0.27	1084.01	0	08:45	0.27
42	JUNCTION	0.05	0.27	1078.86	0	08:48	0.27
43	JUNCTION	0.06	0.35	1075.28	0	08:37	0.35
44	JUNCTION	0.07	0.41	1069.04	0	08:34	0.40
45	JUNCTION	0.08	0.44	1066.27	0	08:35	0.43
46	JUNCTION	0.08	0.44	1065.03	0	08:38	0.43
47	JUNCTION	0.09	0.49	1063.48	0	08:33	0.48
6	JUNCTION	0.02	0.14	1105.43	0	07:15	0.13
D1	JUNCTION	0.27	3.00	1114.50	0	07:23	1.54
D2	JUNCTION	0.09	0.41	1110.95	0	08:30	0.40
-j10-Overland	JUNCTION	0.03	0.18	1113.55	0	07:15	0.17
J12	JUNCTION	0.23	1.50	1105.88	0	07:17	1.50
J13	JUNCTION	0.10	1.52	1106.78	0	07:17	0.88
J16	JUNCTION	0.05	0.22	1093.84	0	09:01	0.22
J17	JUNCTION	0.11	0.52	1092.52	0	07:17	0.52
J1s	JUNCTION	0.03	0.16	1105.62	0	10:05	0.16
J22	JUNCTION	0.01	0.04	1110.04	0	08:04	0.04
J3	JUNCTION	0.06	0.35	1118.49	0	07:37	0.35
J30	JUNCTION	0.05	0.21	1114.68	0	09:55	0.21
J4	JUNCTION	0.13	0.74	1116.40	0	08:10	0.73
J54s	JUNCTION	0.02	0.10	1119.74	0	10:19	0.10
J6	JUNCTION	0.97	2.05	1119.36	0	07:13	2.05
J8-toDitch	JUNCTION	0.06	0.36	1118.65	0	07:15	0.32
Js21	JUNCTION	0.00	0.03	1113.04	0	07:35	0.02
Js22	JUNCTION	0.02	0.14	1114.01	0	07:35	0.13
Js23	JUNCTION	0.05	0.42	1112.68	0	07:37	0.40
Js31	JUNCTION	0.03	0.18	1118.45	0	07:17	0.13
Js32	JUNCTION	0.08	0.49	1119.36	0	07:17	0.39
Js33	JUNCTION	0.02	0.16	1119.90	0	07:15	0.12
Js34	JUNCTION	0.10	1.73	1121.73	0	07:15	0.52
Js62	JUNCTION	0.01	0.10	1112.03	0	07:48	0.10
OUTLET-09-J11	JUNCTION	0.22	1.87	1106.47	0	07:17	1.54
OUTLET-10-j9	JUNCTION	0.09	0.73	1116.86	0	07:15	0.72
OUTLET-11-J7	JUNCTION	0.10	0.78	1119.49	0	07:15	0.63
OUTLET-12--J5	JUNCTION	0.51	2.00	1119.80	0	07:14	1.87
OUTLET-15-Js24	JUNCTION	0.02	0.19	1114.71	0	07:35	0.18
OUTLET-3	JUNCTION	0.11	0.51	1091.69	0	08:41	0.50
OUTLET-4	JUNCTION	0.02	0.12	1100.43	0	07:51	0.12
OUTLET-5	JUNCTION	0.02	0.14	1105.32	0	07:50	0.14
OUTLET-6	JUNCTION	0.10	2.00	1107.17	0	07:17	0.97
OUTLET-7	JUNCTION	0.05	0.26	1088.60	0	08:42	0.25
OUTLET-8-Scenario1	JUNCTION	0.04	0.32	1091.88	0	07:51	0.32
OUTLET-8-Scenario2	JUNCTION	0.05	0.39	1067.39	0	08:08	0.38
37	OUTFALL	0.11	0.51	1092.09	0	07:18	0.51
DARCY-DAM	OUTFALL	0.09	0.41	1110.41	0	08:31	0.40
HY2As-Ditch-East	OUTFALL	0.02	0.13	1100.81	0	10:05	0.13
HY2As-Ditch-West	OUTFALL	0.01	0.09	1098.41	0	07:48	0.09
J18-	OUTFALL	0.09	0.48	1110.48	0	08:10	0.48
OF3	OUTFALL	0.01	0.04	1108.04	0	08:04	0.04
OF6	OUTFALL	0.00	0.00	1093.00	0	00:00	0.00
OUTLET-1-Ditch-1-HY2	OUTFALL	0.00	0.00	1113.65	0	00:00	0.00
OUTLET-2-Ditch-HY2	OUTFALL	0.00	0.00	1109.43	0	00:00	0.00
SwaleCrystalRidge	OUTFALL	0.02	0.10	1097.22	0	10:19	0.10
WatercourseC	OUTFALL	0.09	0.58	1059.58	0	08:13	0.57

```
  Npond                STORAGE      0.08     0.40  1092.62     0  08:17        0.40
  OUTLET-13-J53s       STORAGE      0.07     0.29  1120.40     0  10:10        0.29
  OUTLET-14-Js29       STORAGE      0.07     0.34  1116.79     0  09:51        0.34
  OUTLET-16-J16s--to-DARCY-DAM STORAGE      0.05     0.24  1115.65     0  08:29
0.24
  Pond                 STORAGE      0.07     0.57  1110.57     0  08:04        0.56
  Spond                STORAGE      0.12     0.51  1091.68     0  08:42        0.51


  ********************
  Node Inflow Summary
  ********************

  ------------------------------------------------------------------------------------
-------------
                                   Maximum  Maximum                   Lateral
Total        Flow
                                   Lateral    Total  Time of Max      Inflow
Inflow     Balance
                                    Inflow   Inflow   Occurrence      Volume
Volume       Error
  Node                 Type           CMS      CMS  days hr:min    10^6 ltr    10^6
ltr     Percent
  ------------------------------------------------------------------------------------
-------------
  13                   JUNCTION     0.844    1.626     0  07:40         7.4
17.3       0.015
  15                   JUNCTION     0.257    1.853     0  07:50        3.03
20.4       0.060
  17                   JUNCTION     0.521    2.702     0  07:50        5.25
28.7       0.054
  20                   JUNCTION     1.581    3.362     0  07:51         8.5
37.2      -0.045
  21                   JUNCTION     0.700    3.874     0  07:53        6.28
43.5      -0.013
  22                   JUNCTION     0.000    3.866     0  07:56           0
43.5       0.005
  23                   JUNCTION     0.000    3.869     0  07:57           0
43.5      -0.098
  24                   JUNCTION     0.000    3.854     0  08:02           0
43.5       0.106
  26                   JUNCTION     2.085    8.174     0  08:09        13.1
116       -0.007
  3                    JUNCTION     0.000    0.537     0  08:17           0
10.8       0.000
  33                   JUNCTION     0.684    0.684     0  07:15           6
6        0.000
  35                   JUNCTION     0.673    0.673     0  07:15        3.17
3.17       0.000
  39                   JUNCTION     0.000    0.996     0  08:44           0
18.8       0.242
  41                   JUNCTION     0.000    1.442     0  08:42           0
26.4      -0.013
  42                   JUNCTION     0.000    1.441     0  08:45           0
26.4       0.072
  43                   JUNCTION     1.430    2.261     0  08:33        12.9
39.3      -0.030
  44                   JUNCTION     1.003    2.848     0  08:30        9.37
48.7      -0.019
  45                   JUNCTION     0.000    2.845     0  08:34           0
48.7      -0.001
  46                   JUNCTION     0.000    2.844     0  08:35           0
48.7       0.042
```

47	JUNCTION	1.243	3.575	0	08:30	11.2	
59.9	-0.020						
6	JUNCTION	0.298	0.298	0	07:50	3.87	
3.87	-0.000						
D1	JUNCTION	0.000	0.580	0	08:29	0	
15.1	-0.017						
D2	JUNCTION	0.000	0.580	0	08:29	0	
15.1	0.004						
-j10-Overland	JUNCTION	0.000	0.693	0	07:15	0	
9.5	0.047						
J12	JUNCTION	0.000	1.645	0	07:16	0	
23.2	-0.038						
J13	JUNCTION	0.572	0.612	0	07:17	6.35	
6.66	-0.002						
J16	JUNCTION	0.000	0.823	0	07:16	0	
22.3	0.006						
J17	JUNCTION	0.000	0.812	0	07:40	0	
22.3	-0.000						
J1s	JUNCTION	0.000	0.547	0	09:57	0	
14.6	0.057						
J22	JUNCTION	0.000	0.676	0	08:04	0	
9.49	0.056						
J3	JUNCTION	0.000	0.378	0	07:14	0	
7.34	0.013						
J30	JUNCTION	0.000	0.548	0	09:52	0	
14.6	-0.061						
J4	JUNCTION	0.000	0.802	0	07:15	0	
13.7	-0.002						
J54s	JUNCTION	0.000	0.239	0	10:10	0	
6.44	-0.189						
J6	JUNCTION	0.000	0.475	0	07:16	0	
7.47	0.674						
J8-toDitch	JUNCTION	0.000	0.437	0	07:15	0	
6.36	0.008						
Js21	JUNCTION	0.000	0.055	0	07:35	0	
0.445	-0.008						
Js22	JUNCTION	0.055	0.055	0	07:35	0.445	
0.445	-0.000						
Js23	JUNCTION	0.088	0.310	0	07:36	0.892	
2.75	0.010						
Js31	JUNCTION	0.000	0.749	0	07:17	0	
12.5	-0.058						
Js32	JUNCTION	0.000	0.863	0	07:15	0	
12.5	0.008						
Js33	JUNCTION	0.000	0.883	0	07:15	0	
12.5	-0.006						
Js34	JUNCTION	0.883	0.883	0	07:15	12.5	
12.5	-0.001						
Js62	JUNCTION	0.000	0.311	0	07:40	0	
2.75	-0.234						
OUTLET-09-J11	JUNCTION	1.631	1.645	0	07:16	23	
23.5	-0.000						
OUTLET-10-j9	JUNCTION	0.698	0.698	0	07:15	9.5	
9.5	-0.046						
OUTLET-11-J7	JUNCTION	0.437	0.437	0	07:15	6.36	
6.36	-0.020						
OUTLET-12--J5	JUNCTION	0.514	0.514	0	07:15	7.47	
7.48	0.022						
OUTLET-15-Js24	JUNCTION	0.169	0.169	0	07:35	1.41	
1.41	-0.030						
OUTLET-3	JUNCTION	0.000	0.537	0	08:17	0	
10.8	-0.076						

```
  OUTLET-4             JUNCTION     0.000    0.298     0  07:50           0
3.87      -0.130
  OUTLET-5             JUNCTION     0.000    0.615     0  07:17           0
6.07      -0.119
  OUTLET-6             JUNCTION     0.000    0.341     0  07:15           0
0.902      -0.110
  OUTLET-7             JUNCTION     1.144    1.444     0  08:38        7.64
26.4      -0.148
  OUTLET-8-Scenario1   JUNCTION     0.373    2.195     0  07:50        3.11
23.5      -0.015
  OUTLET-8-Scenario2   JUNCTION     0.000    3.838     0  08:06           0
43.4       0.030
  37                   OUTFALL      0.000    0.815     0  07:18           0
22.3       0.000
  DARCY-DAM            OUTFALL      0.308    0.888     0  08:30        7.13
22.2       0.000
  HY2As-Ditch-East     OUTFALL      0.000    0.546     0  10:05           0
14.5       0.000
  HY2As-Ditch-West     OUTFALL      0.000    0.303     0  07:48           0
2.74       0.000
  J18-                 OUTFALL      0.000    0.709     0  08:10           0
13.7       0.000
  OF3                  OUTFALL      0.000    0.676     0  08:04           0
9.49       0.000
  OF6                  OUTFALL      0.000    0.000     0  00:00           0
0       0.000 ltr
  OUTLET-1-Ditch-1-HY2 OUTFALL      1.996    1.996     0  07:15        12.8
12.8       0.000
  OUTLET-2-Ditch-HY2   OUTFALL      0.602    0.602     0  07:50        8.05
8.05       0.000
  SwaleCrystalRidge    OUTFALL      0.000    0.238     0  10:19           0
6.4        0.000
  WatercourseC         OUTFALL      0.000    8.164     0  08:13           0
116        0.000
  Npond                STORAGE      0.745    0.745     0  07:15        10.8
10.8       -0.000
  OUTLET-13-J53s       STORAGE      0.456    0.456     0  07:15        6.58
6.58       -0.000
  OUTLET-14-Js29       STORAGE      0.236    0.953     0  07:18        2.32
14.8       0.049
  OUTLET-16-J16s--to-DARCY-DAM STORAGE      1.105    1.105     0  07:15        15.1
15.1       -0.001
  Pond                 STORAGE      0.000    0.697     0  07:15           0
9.5      -0.001
  Spond                STORAGE      1.108    1.137     0  07:15        8.16
19      -0.009


  **********************
  Node Surcharge Summary
  **********************

  Surcharging occurs when water rises above the top of the highest conduit.
  -------------------------------------------------------------------------
                                          Max. Height   Min. Depth
                                Hours     Above Crown    Below Rim
  Node                 Type   Surcharged      Meters       Meters
  -------------------------------------------------------------------------
  33                   JUNCTION    120.00        2.000        0.000
  35                   JUNCTION    120.00        2.000        0.000
  D1                   JUNCTION      3.27        2.000        0.000
  J12                  JUNCTION      3.56        0.500        0.000
  J13                  JUNCTION      2.13        0.808        0.480
```

J6	JUNCTION	8.33	1.050	0.000
Js34	JUNCTION	0.11	1.127	0.273
OUTLET-09-J11	JUNCTION	3.42	0.874	0.126
OUTLET-11-J7	JUNCTION	1.35	0.182	0.168
OUTLET-12--J5	JUNCTION	7.02	1.400	0.000
OUTLET-6	JUNCTION	0.03	1.000	0.000

****
Node Flooding Summary
****

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Hours Flooded	Maximum Rate CMS	Time of Max Occurrence days hr:min	Total Flood Volume 10^6 ltr	Maximum Ponded Depth Meters
33	22.42	0.683	0 07:15	6.000	0.000
35	22.62	0.672	0 07:15	3.165	0.000
D1	0.01	0.086	0 07:23	0.000	0.000
J12	1.97	0.640	0 07:17	0.950	0.000
J6	1.17	0.097	0 07:15	0.075	0.000
OUTLET-12--J5	0.03	0.039	0 07:15	0.002	0.000
OUTLET-6	0.01	0.229	0 07:17	0.000	0.000

****
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
Npond	0.092	3.8	0.1	0.0	0.483	20.1	0 08:17	0.537
OUTLET-13-J53s	0.419	3.5	2.2	0.0	1.756	14.6	0 10:10	0.239
OUTLET-14-Js29	0.732	2.4	1.4	0.0	3.371	11.2	0 09:51	0.548
OUTLET-16-J16s--to-DARCY-DAM	0.053	0.2	0.0	0.0	0.315	1.3	0 08:29	0.580
Pond	0.074	1.5	0.1	0.0	0.566	11.3	0 08:04	0.676
Spond	0.525	5.8	0.6	0.0	2.308	25.6	0 08:42	0.996

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CMS	CMS	10^6 ltr
37	36.31	0.400	0.815	22.293
DARCY-DAM	36.70	0.393	0.888	22.191
HY2As-Ditch-East	69.55	0.121	0.546	14.534
HY2As-Ditch-West	32.37	0.067	0.303	2.738
J18-	36.73	0.262	0.709	13.705
OF3	36.47	0.194	0.676	9.488
OF6	0.00	0.000	0.000	0.000
OUTLET-1-Ditch-1-HY2	34.10	0.288	1.996	12.807
OUTLET-2-Ditch-HY2	33.76	0.179	0.602	8.049
SwaleCrystalRidge	67.37	0.054	0.238	6.400
WatercourseC	71.43	1.189	8.164	116.409
System	41.34	3.146	13.393	228.614

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
1	CONDUIT	0.297	0	07:51	0.50	0.01	0.24
10	CONDUIT	3.838	0	08:06	1.30	0.18	0.45
11	CONDUIT	3.835	0	08:08	0.92	0.11	0.55
12	CONDUIT	8.164	0	08:13	1.48	0.40	0.65
13	CONDUIT	0.996	0	08:44	0.40	1.19	0.41
14	CONDUIT	0.815	0	07:18	2.00	0.53	0.52
15	CONDUIT	0.984	0	08:52	0.73	0.05	0.28
16	CONDUIT	1.442	0	08:42	1.18	0.04	0.26
17	CONDUIT	1.441	0	08:45	1.11	0.05	0.27
18	CONDUIT	1.439	0	08:48	0.90	0.05	0.31
19	CONDUIT	2.258	0	08:37	1.03	0.09	0.38
2	CONDUIT	1.598	0	07:50	0.77	0.09	0.37
20	CONDUIT	2.845	0	08:34	1.08	0.12	0.42
21	CONDUIT	2.844	0	08:35	1.02	0.14	0.44
22	CONDUIT	2.843	0	08:38	0.93	0.14	0.46
23	CONDUIT	3.573	0	08:33	0.80	0.18	0.60
24	CONDUIT	0.527	0	08:33	0.25	0.18	0.51
25	CONDUIT	0.537	0	08:17	2.44	0.34	0.32
3	CONDUIT	1.848	0	07:53	0.94	0.09	0.35
4	CONDUIT	2.194	0	07:52	1.17	0.07	0.35
5	CONDUIT	2.695	0	07:53	1.22	0.10	0.38
6	CONDUIT	3.354	0	07:54	1.19	0.11	0.44
7	CONDUIT	3.866	0	07:56	1.18	0.18	0.48
8	CONDUIT	3.854	0	08:02	1.16	0.16	0.49
9	CONDUIT	3.869	0	07:57	1.27	0.16	0.46
C11-Overland	CONDUIT	0.378	0	07:14	0.68	0.80	0.68
C18	CONDUIT	0.676	0	08:04	5.51	0.00	0.04
C1s-to-Crystal-Ridge-Swalele	CONDUIT	0.238	0	10:19	0.79	0.01	0.10
C5s-to-WESTDITCH-HW2A	CONDUIT	0.547	0	09:57	0.82	0.02	0.18
Cs13	CONDUIT	0.548	0	09:52	4.41	0.54	0.45
cs14	CONDUIT	0.055	0	07:35	1.82	0.03	0.08
Cs15	CONDUIT	0.169	0	07:35	1.26	0.10	0.34
Cs22	CONDUIT	0.749	0	07:17	4.64	1.00	0.56
Cs23	CONDUIT	0.883	0	07:15	4.71	2.14	0.63
Cs35	CONDUIT	0.311	0	07:40	2.13	0.44	0.29
Cs4_1_EAST-ditch	CONDUIT	0.303	0	07:48	0.80	0.01	0.06

Cs52	CONDUIT	0.863	0	07:15	0.42	0.01	0.21
Cs53	CONDUIT	0.747	0	07:18	1.38	0.01	0.15
Cs64	CONDUIT	0.055	0	07:35	0.09	0.00	0.15
Cs7	CONDUIT	0.546	0	10:05	0.93	0.01	0.09
Culvert-10	CONDUIT	0.537	0	08:17	3.51	0.35	0.62
Culvert5	CONDUIT	0.693	0	07:15	2.44	0.21	0.50
Culvert7	CONDUIT	0.224	0	07:15	1.29	0.67	1.00
Culvert8	CONDUIT	0.615	0	07:17	3.56	2.77	0.62
Culvert-9	CONDUIT	0.298	0	07:50	10.07	0.23	0.31
Culvert-C24s-900	CONDUIT	0.239	0	10:10	2.29	0.21	0.22
CulvertC3	CONDUIT	0.475	0	07:16	1.68	0.95	1.00
CulvertC4	CONDUIT	0.437	0	07:15	1.82	0.91	0.80
CulvertC6	CONDUIT	1.645	0	07:16	2.61	1.79	1.00
Ditch-C12	CONDUIT	0.420	0	07:15	1.31	0.28	0.53
Ditch-C13	CONDUIT	0.709	0	08:10	1.42	0.73	0.61
Ditch-C23	CONDUIT	0.499	0	07:50	0.60	0.01	0.25
DitchC24	CONDUIT	0.229	0	07:17	0.29	0.33	1.00
DitchC25	CONDUIT	0.823	0	07:16	2.00	0.80	0.61
DitchC31	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
Dummy-Culvert1	CONDUIT	0.580	0	08:29	1.66	0.16	0.63
Dummy-pipe2	CONDUIT	0.580	0	08:29	1.02	1.24	0.70
Dummy-pipe3	CONDUIT	0.580	0	08:31	1.93	0.35	0.41
FirstCulvertC29	CONDUIT	0.192	0	07:37	1.03	0.16	0.79
OverlandDitchC27	CONDUIT	0.697	0	07:15	7.97	0.07	0.37
SecondCulvertC2	CONDUIT	0.191	0	07:37	1.01	0.17	0.79
TWCulvertC30	CONDUIT	0.397	0	07:40	1.62	0.13	0.41
TWCulvertC9	CONDUIT	0.415	0	07:40	1.68	0.14	0.41
OR1	ORIFICE	0.676	0	08:04			0.57

****
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
1	1.00	0.67	0.11	0.00	0.21	0.00	0.00	0.00	0.98	0.00
10	1.00	0.60	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00
11	1.00	0.30	0.40	0.00	0.31	0.00	0.00	0.00	0.97	0.00
12	1.00	0.30	0.00	0.00	0.70	0.00	0.00	0.00	0.29	0.00
13	1.00	0.02	0.01	0.00	0.98	0.00	0.00	0.00	0.00	0.00
14	1.00	0.01	0.00	0.00	0.89	0.10	0.00	0.00	0.05	0.00
15	1.00	0.03	0.02	0.00	0.95	0.00	0.00	0.00	0.05	0.00
16	1.00	0.12	0.01	0.00	0.86	0.00	0.00	0.00	0.71	0.00
17	1.00	0.19	0.00	0.00	0.81	0.00	0.00	0.00	0.42	0.00
18	1.00	0.23	0.01	0.00	0.76	0.00	0.00	0.00	0.56	0.00
19	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.58	0.00
2	1.00	0.67	0.00	0.00	0.33	0.00	0.00	0.00	0.27	0.00
20	1.00	0.29	0.00	0.00	0.71	0.00	0.00	0.00	0.63	0.00
21	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.49	0.00
22	1.00	0.31	0.01	0.00	0.69	0.00	0.00	0.00	0.50	0.00
23	1.00	0.30	0.02	0.00	0.68	0.00	0.00	0.00	0.98	0.00
24	1.00	0.02	0.47	0.00	0.51	0.00	0.00	0.00	0.53	0.00
25	1.00	0.50	0.00	0.00	0.30	0.20	0.00	0.00	0.05	0.00
3	1.00	0.70	0.00	0.00	0.30	0.00	0.00	0.00	0.01	0.00
4	1.00	0.72	0.00	0.00	0.28	0.00	0.00	0.00	0.28	0.00
5	1.00	0.71	0.00	0.00	0.28	0.00	0.00	0.00	0.99	0.00
6	1.00	0.70	0.01	0.00	0.29	0.00	0.00	0.00	0.98	0.00

7	1.00	0.70	0.00	0.00	0.30	0.00	0.00	0.00	0.11	0.00
8	1.00	0.60	0.10	0.00	0.30	0.00	0.00	0.00	0.97	0.00
9	1.00	0.70	0.01	0.00	0.29	0.00	0.00	0.00	0.86	0.00
C11-Overland	1.00	0.01	0.03	0.00	0.95	0.00	0.00	0.00	0.73	0.00
C18	1.00	0.75	0.02	0.00	0.01	0.23	0.00	0.00	0.03	0.00
C1s-to-Crystal-Ridge-Swalele	1.00	0.05	0.01	0.00	0.94	0.00	0.00	0.00	0.30	0.00
C5s-to-WESTDITCH-HW2A	1.00	0.18	0.00	0.00	0.82	0.00	0.00	0.00	0.00	0.00
Cs13	1.00	0.17	0.00	0.00	0.03	0.79	0.00	0.00	0.19	0.00
cs14	1.00	0.06	0.00	0.00	0.80	0.14	0.00	0.00	0.80	0.00
Cs15	1.00	0.06	0.86	0.00	0.08	0.00	0.00	0.00	0.94	0.00
Cs22	1.00	0.01	0.00	0.00	0.75	0.24	0.00	0.00	0.00	0.00
Cs23	1.00	0.01	0.00	0.00	0.80	0.19	0.00	0.00	0.79	0.00
Cs35	1.00	0.06	0.00	0.00	0.85	0.09	0.00	0.00	0.00	0.00
Cs4_1_EAST-ditch	1.00	0.70	0.02	0.00	0.27	0.00	0.00	0.00	0.10	0.00
Cs52	1.00	0.01	0.79	0.00	0.20	0.00	0.00	0.00	0.98	0.00
Cs53	1.00	0.17	0.59	0.00	0.23	0.01	0.00	0.00	0.94	0.00
Cs64	1.00	0.06	0.79	0.00	0.15	0.00	0.00	0.00	0.94	0.00
Cs7	1.00	0.31	0.01	0.00	0.69	0.00	0.00	0.00	0.04	0.00
Culvert-10	1.00	0.48	0.02	0.00	0.35	0.14	0.00	0.00	0.97	0.00
Culvert5	1.00	0.01	0.00	0.00	0.80	0.19	0.00	0.00	0.00	0.19
Culvert7	1.00	0.88	0.04	0.00	0.07	0.00	0.00	0.00	0.00	0.91
Culvert8	1.00	0.78	0.03	0.00	0.00	0.19	0.00	0.00	0.00	0.88
Culvert-9	1.00	0.79	0.02	0.00	0.00	0.19	0.00	0.00	0.80	0.00
Culvert-C24s-900	1.00	0.04	0.00	0.00	0.40	0.56	0.00	0.00	0.00	0.00
CulvertC3	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.02	0.00
CulvertC4	1.00	0.80	0.01	0.00	0.18	0.01	0.00	0.00	0.00	0.98
CulvertC6	1.00	0.01	0.79	0.00	0.19	0.00	0.00	0.00	0.92	0.00
Ditch-C12	1.00	0.01	0.79	0.00	0.20	0.00	0.00	0.00	0.98	0.00
Ditch-C13	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
Ditch-C23	1.00	0.67	0.11	0.00	0.22	0.00	0.00	0.00	0.98	0.00
DitchC24	1.00	0.80	0.08	0.00	0.12	0.00	0.00	0.00	0.91	0.00
DitchC25	1.00	0.01	0.00	0.00	0.85	0.14	0.00	0.00	0.00	0.00
DitchC31	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dummy-Culvert1	1.00	0.01	0.78	0.00	0.20	0.01	0.00	0.00	0.98	0.00
Dummy-pipe2	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.76	0.00
Dummy-pipe3	1.00	0.01	0.00	0.00	0.79	0.19	0.00	0.00	0.06	0.00
FirstCulvertC29	1.00	0.01	0.27	0.00	0.71	0.00	0.00	0.00	0.00	0.95
OverlandDitchC27	1.00	0.73	0.08	0.00	0.00	0.19	0.00	0.00	0.96	0.00
SecondCulvertC2	1.00	0.01	0.27	0.00	0.71	0.00	0.00	0.00	0.00	0.95
TWCulvertC30	1.00	0.01	0.78	0.00	0.18	0.02	0.00	0.00	0.98	0.00
TWCulvertC9	1.00	0.01	0.75	0.00	0.10	0.13	0.00	0.00	0.99	0.00

****
Conduit Surcharge Summary
****

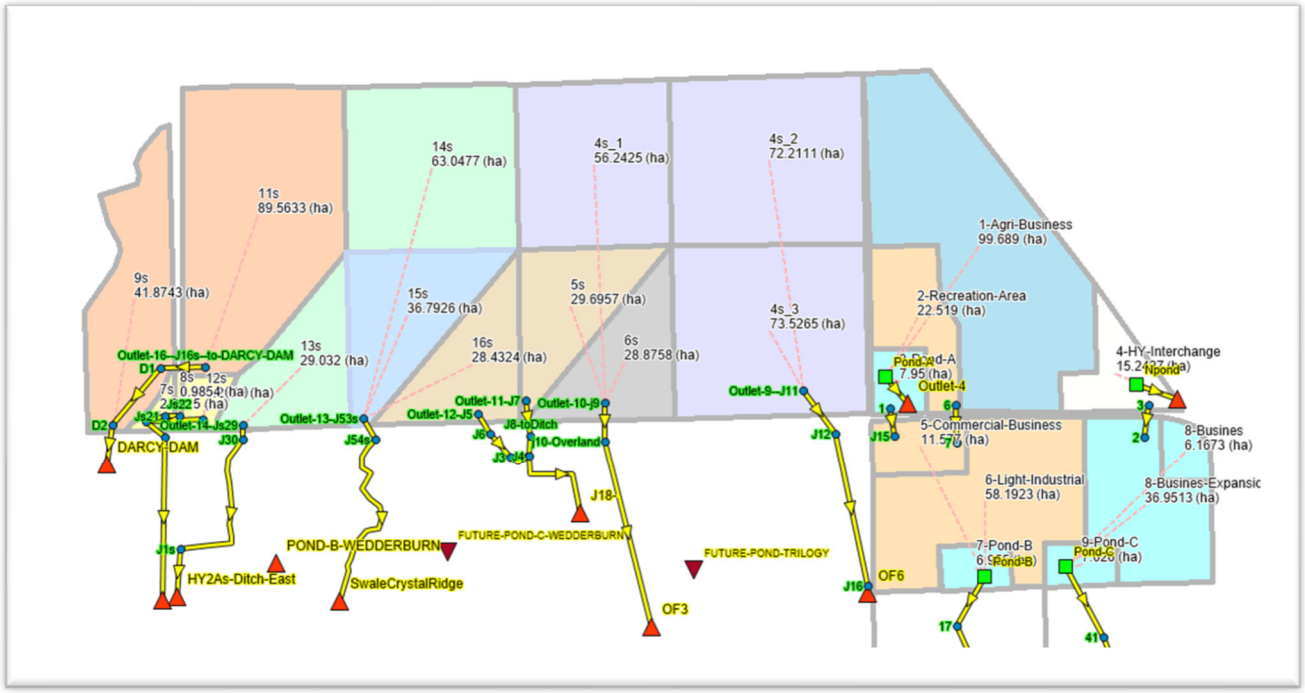
	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
13	0.01	0.01	0.01	1.67	0.01
C11-Overland	0.01	0.01	8.33	0.01	0.01
Cs22	0.01	0.01	0.01	0.02	0.01
Cs23	0.01	0.11	0.01	3.24	0.01
Culvert7	2.13	2.13	2.81	0.01	0.01
Culvert8	0.01	2.50	0.01	2.96	0.01
CulvertC3	7.02	7.02	115.10	0.01	0.01
CulvertC4	0.01	1.35	0.01	0.01	0.01
CulvertC6	3.66	3.69	3.78	1.44	1.38
DitchC24	0.03	0.03	3.42	0.01	0.01

DitchC25	0.01	3.56	0.01	0.01	0.01
Dummy-Culvert1	0.01	0.01	4.37	0.01	0.01
Dummy-pipe2	0.01	3.27	0.01	3.41	0.01
FirstCulvertC29	0.01	0.01	2.81	0.01	0.01
SecondCulvertC2	0.01	0.01	2.81	0.01	0.01

Analysis begun on: Sun Jan 7 16:27:56 2024
Analysis ended on: Sun Jan 7 16:28:00 2024
Total elapsed time: 00:00:04

Appendix G

Post-Development PCSWMM Model Input Data



[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option Value

```
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           07/01/2023
START_TIME           23:00:00
REPORT_START_DATE    07/01/2023
REPORT_START_TIME    23:00:00
END_DATE             07/06/2023
END_TIME             23:00:00
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         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[EVAPORATION]
;;Data Source    Parameters
;;--------------- ----------------
MONTHLY          0.1    0.38   1.12   2.4    3.61   4.57   4.99   4      2.24   0.99
0.27   0.07
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Calgary_24h_100y INTENSITY 0:05     1.0      TIMESERIES Calgary_24h_100y
Continuous_6014  INTENSITY 1:00     1.0      TIMESERIES Continuous

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
10-Light-Industrial Calgary_24h_100y Pond-D        121.5303 85       766.903  2
0
11-Pond-D        Calgary_24h_100y Pond-D           8.9528   65       435.6    2
0
11s              Calgary_24h_100y Outlet-16--J16s--to-DARCY-DAM 89.5633 50 350 2
0
12s              Calgary_24h_100y Outlet-15-Js24   5.2329   50       149.512  2
0
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13s              Calgary_24h_100y Outlet-14-Js29   29.032   50       829.486  2
0
14s              Calgary_24h_100y Outlet-13-J53s   63.0477  50       1801.363 2
0
15s              Calgary_24h_100y Outlet-13-J53s   36.7926  50       1051.231 2
0
16s              Calgary_24h_100y Outlet-13-J53s   28.4324  50       812.354  2
0
1-Agri-Business  Calgary_24h_100y Pond-A           99.689   85       700      2
0
2-Recreation-Area Calgary_24h_100y Pond-A         22.519   10       350      2
0
3-Pond-A         Calgary_24h_100y Pond-A           7.95     65       249.856  2
0
4-HY-Interchange Calgary_24h_100y POND-HY-Interchange 15.2427 90     482.364  2
0
4s_1             Calgary_24h_100y Outlet-10-j9     56.2425  50       1606.929 2
0
4s_2             Calgary_24h_100y Outlet-9--J11    72.2111  50       2063.174 2
0
4s_3             Calgary_24h_100y Outlet-9--J11    73.5265  50       2100.757 2
0
5-Commercial-Business Calgary_24h_100y pond-B     11.577   95       470.61   2
0
5s               Calgary_24h_100y Outlet-10-j9     29.6957  50       848.449  2
0
6-Light-Industrial Calgary_24h_100y Pond-B        58.1923  85       766.903  2
0
6s               Calgary_24h_100y Outlet-10-j9     28.8758  50       825.023  2
0
7-Pond-B         Calgary_24h_100y Pond-B           6.955    65       435.6    2
0
7-Pond-B_3       Calgary_24h_100y Pond-B           0        65       435.6    2
0
7s               Calgary_24h_100y Js23             2.9515   50       84.329   2
0
8-Busines        Calgary_24h_100y Pond-C           6.1673   95       544.83   2
0
8-Busines-Expansion Calgary_24h_100y Pond-C       36.9513  95       544.83   2
0
8s               Calgary_24h_100y Js22             0.9854   50       28.154   2
0
9-Pond-C         Calgary_24h_100y Pond-C           7.026    65       406.127  2
0
9s               Calgary_24h_100y DARCY-DAM        41.8743  50       1196.409 2
0
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[SUBAREAS]

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;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ---
-------
10-Light-Industrial 0.015   0.25       1.6        3.2        0          OUTLET
11-Pond-D        0.015      0.25       1.6        3.2        0          OUTLET
11s              0.015      0.25       1.6        3.2        0          OUTLET
12s              0.015      0.25       1.6        3.2        0          OUTLET
13s              0.015      0.25       1.6        3.2        0          OUTLET
14s              0.015      0.25       1.6        3.2        0          OUTLET
15s              0.015      0.25       1.6        3.2        0          OUTLET
16s              0.015      0.25       1.6        3.2        0          OUTLET
1-Agri-Business  0.015      0.25       1.6        3.2        0          OUTLET
2-Recreation-Area 0.015     0.25       1.6        3.2        0          OUTLET
3-Pond-A         0.015      0.25       1.6        3.2        0          OUTLET
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4-HY-Interchange 0.015      0.25       1.6        3.2        0          OUTLET
4s_1             0.015      0.25       1.6        3.2        0          OUTLET
4s_2             0.015      0.25       1.6        3.2        0          OUTLET
4s_3             0.015      0.25       1.6        3.2        0          OUTLET
5-Commercial-Business 0.015 0.25       1.6        3.2        0          OUTLET
5s               0.015      0.25       1.6        3.2        0          OUTLET
6-Light-Industrial 0.015    0.25       1.6        3.2        0          OUTLET
6s               0.015      0.25       1.6        3.2        0          OUTLET
7-Pond-B         0.015      0.25       1.6        3.2        0          OUTLET
7-Pond-B_3       0.015      0.25       1.6        3.2        0          OUTLET
7s               0.015      0.25       1.6        3.2        0          OUTLET
8-Busines        0.015      0.25       1.6        3.2        0          OUTLET
8-Busines-Expansion 0.015   0.25       1.6        3.2        0          OUTLET
8s               0.015      0.25       1.6        3.2        0          OUTLET
9-Pond-C         0.015      0.25       1.6        3.2        0          OUTLET
9s               0.015      0.25       1.6        3.2        0          OUTLET
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[INFILTRATION]

```
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
10-Light-Industrial 270     1.016      0.26       0          0
11-Pond-D        270        1.016      0.26       0          0
11s              270        1.016      0.26       0          0
12s              270        1.016      0.26       0          0
13s              270        1.016      0.26       0          0
14s              270        1.016      0.26       0          0
15s              270        1.016      0.26       0          0
16s              270        1.016      0.26       0          0
1-Agri-Business  270        1.016      0.26       0          0
2-Recreation-Area 270       1.016      0.26       0          0
3-Pond-A         270        1.016      0.26       0          0
4-HY-Interchange 270        1.016      0.26       0          0
4s_1             270        1.016      0.26       0          0
4s_2             270        1.016      0.26       0          0
4s_3             270        1.016      0.26       0          0
5-Commercial-Business 270   1.016      0.26       0          0
5s               270        1.016      0.26       0          0
6-Light-Industrial 270      1.016      0.26       0          0
6s               270        1.016      0.26       0          0
7-Pond-B         270        1.016      0.26       0          0
7-Pond-B_3       270        1.016      0.26       0          0
7s               270        1.016      0.26       0          0
8-Busines        270        1.016      0.26       0          0
8-Busines-Expansion 270     1.016      0.26       0          0
8s               270        1.016      0.26       0          0
9-Pond-C         270        1.016      0.26       0          0
9s               270        1.016      0.26       0          0
```

[JUNCTIONS]

```
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
1                1107.415   0          0          0          0
17               1088.392   2          0          0          0
2                1091.186   2          0          0          0
20               1082.451   2          0          0          0
21               1078.123   2          0          0          0
22               1076.009   2          0          0          0
23               1074.936   2          0          0          0
24               1067.875   2          0          0          0
25               1067       2          0          0          0
26               1061       2          0          0          0
3                1091.942   2          0          0          0
41               1083.736   2          0          0          0
```

```
42                1078.583   2          0          0          0
43                1074.924   2          0          0          0
44                1068.629   2          0          0          0
45                1065.832   2          0          0          0
46                1064.596   2          0          0          0
47                1062.992   2          0          0          0
6                 1105.29    2          0          0          0
7                 1100.312   2          0          0          0
D1                1111.5     3          0          0          0
D2                1110.544   3          0          0          0
j10-Overland      1113.367   2.75       0          0          0
J12               1104.384   1.5        0          0          0
J15               1105.138   1.522      0          0          0
J16               1093.619   2          0          0          0
J1s               1105.461   2          0          0          0
J3                1115       2.22       0          0          0
J30               1114.472   2          0          0          0
J4                1115       2.457      0          0          0
J54s              1119.631   2          0          0          0
J6                1117.309   2.05       0          0          0
J8-toDitch        1118.29    1.24       0          0          0
Js21              1113.009   3          0          0          0
Js22              1113.878   3          0          0          0
Js23              1112.269   3          0          0          0
Js62              1111.921   3          0          0          0
Outlet-10-j9      1116.135   5          0          0          0
Outlet-11-J7      1118.71    0.95       0          0          0
Outlet-12-J5      1117.803   2          0          0          0
Outlet-13-J53s    1120.103   5          0          0          0
Outlet-14-Js29    1116.451   5          0          0          0
Outlet-15-Js24    1114.519   5          0          0          0
Outlet-16--J16s--to-DARCY-DAM 1115.407 5 0         0          0
Outlet-9--J11     1104.593   5          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
DARCY-DAM         1110       FREE                        NO
FUTURE-POND-C-WEDDERBURN 0   FREE                        NO
FUTURE-POND-TRILOGY 1113     FREE                        NO
HY2As-Ditch-East 1100.687    FREE                        NO
HY2As-Ditch-West 1098.32     FREE                        NO
J18-              1110       FREE                        NO
OF3               1108       FREE                        NO
OF6               1093       FREE                        NO
Outlet-4          1104.194   FREE                        NO
POND-B-WEDDERBURN 0          FREE                        NO
POND-HY-Interchange 0        FREE                        NO
SwaleCrystalRidge 1097.12    FREE                        NO
WatercourseC      1059       FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape       Curve Name/Params
SurDepth Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ----------- --------------------------
-- -------- -------- -------- -------- --------
Npond             1092.214 2          0          FUNCTIONAL  1200      0         0
0        1
Pond-A            1106.85  5          0          FUNCTIONAL  10000     0         0
0        0
Pond-B            1091.563 5          0          FUNCTIONAL  1000      0         0
0        0
```

```
Pond-C           1088.346 5          0          FUNCTIONAL  1000      0         0
0        0
Pond-D           1068.955 5          0          FUNCTIONAL  1000      0         0
0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- --
-------- ---------- ----------
1                Pond-A           Outlet-4         162.07     0.01       0          0
0          0
10               24               25               102.703    0.035      0          0
0          0
11               25               26               244.632    0.035      0          0
0          0
12               26               WatercourseC     244.077    0.035      0          0
0          0
16               Pond-C           41               374.604    0.035      0          0
0          0
17               41               42               321.064    0.035      0          0
0          0
18               42               43               237.332    0.035      0          0
0          0
19               43               44               482.765    0.035      0          0
0          0
20               44               45               263.987    0.035      0          0
0          0
21               45               46               158.789    0.035      0          0
0          0
22               46               47               206.607    0.035      0          0
0          0
23               47               26               262.087    0.035      0          0
0          0
25               Npond            POND-HY-Interchange 203.177 0.01       0          0
0          0
26               j10-Overland     OF3              902.317    0.01       0          0
0          0
4                Pond-B           17               265.013    0.035      0          0
0          0
5                17               20               407.709    0.035      0          0
0          0
6                20               21               235.151    0.035      0          0
0          0
7                21               22               237.887    0.035      0          0
0          0
8                23               24               598.272    0.035      0          0
0          0
9                22               23               98.431     0.035      0          0
0          0
C11-Overland     J6               J3               143.61     0.05       0          0
0          0
C1s-to-Crystal-Ridge-Swalele J54s SwaleCrystalRidge 1019.7    0.035      0          0
0          0
C5s-to-WESTDITCH-HW2A J30         J1s              687        0.035      0          0
0          0
Cs13             Outlet-14-Js29   J30              20.015     0.025      0          0
0          0
cs14             Js22             Js21             38         0.025      0          0
0          0
Cs15             Outlet-15-Js24   Js23             267.363    0.025      0          0
0          0
```

```
Cs35             Js23             Js62             61         0.025      0          0
0          0
Cs4_1_EAST-ditch Js62             HY2As-Ditch-West 767        0.035      0          0
0          0
Cs64             Js21             Js23             26         0.025      0          0
0          0
Cs7              J1s              HY2As-Ditch-East 316        0.035      0          0
0          0
Culvert-10       3                2                20.06      0.01       0          0
0          0
Culvert5         Outlet-10-j9     j10-Overland     23.752     0.024      0          0
0          0
Culvert8         1                J15              137.132    0.024      0          0
0          0
Culvert-9        6                7                22.07      0.01       0          0
0          0
Culvert-C24s-900 Outlet-13-J53s   J54s             115.314    0.025      0          0
0          0
CulvertC3        Outlet-12-J5     J6               21.8       0.024      0          0
0          0
CulvertC4        Outlet-11-J7     J8-toDitch       15         0.024      0          0
0          0
CulvertC6        Outlet-9--J11    J12              255.436    0.024      0          0
0          0
Ditch-C12        J8-toDitch       J4               122.6      0.03       0          0
0          0
Ditch-C13        J4               J18-             471.806    0.03       0          0
0          0
DitchC25         J12              J16              797.262    0.035      0          0
0          0
DitchC31         J16              OF6              102        0.03       0.318      0
0          0
Dummy-Culvert1   Outlet-16--J16s--to-DARCY-DAM D1  213.543    0.01       0          0
0          0
Dummy-pipe2      D1               D2               348.25     0.035      0          0
0          0
Dummy-pipe3      D2               DARCY-DAM        191.319    0.01       0          0
0          0
FirstCulvertC29  J3               J4               19.6       0.024      0          0
0          0
SecondCulvertC2  J3               J4               21         0.024      0          0
0          0
```

[XSECTIONS]

```
;;Link            Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;--------------- ------------ ---------------- ---------- ---------- ---------- ------
---- ----------
1                CIRCULAR     1                0          0          0          1
10               TRAPEZOIDAL  1                2          10         10         1
11               TRAPEZOIDAL  1                2          10         10         1
12               TRAPEZOIDAL  1                2          10         10         1
16               TRAPEZOIDAL  1                2          10         10         1
17               TRAPEZOIDAL  1                2          10         10         1
18               TRAPEZOIDAL  1                2          10         10         1
19               TRAPEZOIDAL  1                2          10         10         1
20               TRAPEZOIDAL  1                2          10         10         1
21               TRAPEZOIDAL  1                2          10         10         1
22               TRAPEZOIDAL  1                2          10         10         1
23               TRAPEZOIDAL  1                2          10         10         1
25               CIRCULAR     1                0          0          0          1
26               CIRCULAR     1                0          0          0          1
4                TRAPEZOIDAL  1                2          10         10         1
```

```
5                TRAPEZOIDAL  1               2          10         10         1
6                TRAPEZOIDAL  1               2          10         10         1
7                TRAPEZOIDAL  1               2          10         10         1
8                TRAPEZOIDAL  1               2          10         10         1
9                TRAPEZOIDAL  1               2          10         10         1
C11-Overland     CIRCULAR     1               0          0          0          1
C1s-to-Crystal-Ridge-Swalele TRAPEZOIDAL 1    2          10         10         1
C5s-to-WESTDITCH-HW2A TRAPEZOIDAL 1           1          15         15         1
Cs13             CIRCULAR     0.6             0          0          0          1
cs14             CIRCULAR     1               0          0          0          1
Cs15             CIRCULAR     0.9             0          0          0          1
Cs35             CIRCULAR     0.9             0          0          0          1
Cs4_1_EAST-ditch TRAPEZOIDAL  1.5             3.5        6          3          1
Cs64             TRAPEZOIDAL  1.5             3.5        6          3          1
Cs7              TRAPEZOIDAL  1.5             3.5        6          3          1
Culvert-10       CIRCULAR     0.6             0          0          0          1
Culvert5         CIRCULAR     2               0          0          0          1
6
Culvert8         CIRCULAR     0.6             0          0          0          1
6
Culvert-9        CIRCULAR     0.4             0          0          0          1
Culvert-C24s-900 CIRCULAR     0.9             0          0          0          1
CulvertC3        CIRCULAR     0.6             0          0          0          1
CulvertC4        CIRCULAR     0.6             0          0          0          1
6
CulvertC6        CIRCULAR     0.9             0          0          0          1
Ditch-C12        CIRCULAR     1               0          0          0          1
Ditch-C13        CIRCULAR     1               0          0          0          1
DitchC25         CIRCULAR     1               0          0          0          1
DitchC31         CIRCULAR     1               0          0          0          1
Dummy-Culvert1   CIRCULAR     0.9             0          0          0          1
Dummy-pipe2      CIRCULAR     1               0          0          0          1
Dummy-pipe3      CIRCULAR     1               0          0          0          1
FirstCulvertC29  CIRCULAR     0.6             0          0          0          1
6
SecondCulvertC2  CIRCULAR     0.6             0          0          0          1
6

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

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Storage
ST6              Storage    0          0
ST6                         0.94       10314.56
ST6                         1.88       25783.34
ST6                         2.82       49692.69

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Calgary_24h_100y design storm, rain interval = 5 minutes, rain units = mm/hr.
Calgary_24h_100y            0:00       0
Calgary_24h_100y            0:05       1.094
Calgary_24h_100y            0:10       1.103
Calgary_24h_100y            0:15       1.113
Calgary_24h_100y            0:20       1.122
Calgary_24h_100y            0:25       1.132
Calgary_24h_100y            0:30       1.143
Calgary_24h_100y            0:35       1.153
```

Calgary_24h_100y	0:40	1.163
Calgary_24h_100y	0:45	1.174
Calgary_24h_100y	0:50	1.185
Calgary_24h_100y	0:55	1.197
Calgary_24h_100y	1:00	1.208
Calgary_24h_100y	1:05	1.22
Calgary_24h_100y	1:10	1.232
Calgary_24h_100y	1:15	1.245
Calgary_24h_100y	1:20	1.257
Calgary_24h_100y	1:25	1.27
Calgary_24h_100y	1:30	1.284
Calgary_24h_100y	1:35	1.297
Calgary_24h_100y	1:40	1.311
Calgary_24h_100y	1:45	1.326
Calgary_24h_100y	1:50	1.341
Calgary_24h_100y	1:55	1.356
Calgary_24h_100y	2:00	1.372
Calgary_24h_100y	2:05	1.388
Calgary_24h_100y	2:10	1.404
Calgary_24h_100y	2:15	1.421
Calgary_24h_100y	2:20	1.439
Calgary_24h_100y	2:25	1.457
Calgary_24h_100y	2:30	1.476
Calgary_24h_100y	2:35	1.495
Calgary_24h_100y	2:40	1.515
Calgary_24h_100y	2:45	1.535
Calgary_24h_100y	2:50	1.556
Calgary_24h_100y	2:55	1.578
Calgary_24h_100y	3:00	1.601
Calgary_24h_100y	3:05	1.624
Calgary_24h_100y	3:10	1.648
Calgary_24h_100y	3:15	1.674
Calgary_24h_100y	3:20	1.7
Calgary_24h_100y	3:25	1.727
Calgary_24h_100y	3:30	1.755
Calgary_24h_100y	3:35	1.784
Calgary_24h_100y	3:40	1.815
Calgary_24h_100y	3:45	1.846
Calgary_24h_100y	3:50	1.88
Calgary_24h_100y	3:55	1.914
Calgary_24h_100y	4:00	1.95
Calgary_24h_100y	4:05	1.988
Calgary_24h_100y	4:10	2.028
Calgary_24h_100y	4:15	2.07
Calgary_24h_100y	4:20	2.113
Calgary_24h_100y	4:25	2.159
Calgary_24h_100y	4:30	2.208
Calgary_24h_100y	4:35	2.259
Calgary_24h_100y	4:40	2.313
Calgary_24h_100y	4:45	2.371
Calgary_24h_100y	4:50	2.432
Calgary_24h_100y	4:55	2.497
Calgary_24h_100y	5:00	2.566
Calgary_24h_100y	5:05	2.64
Calgary_24h_100y	5:10	2.719
Calgary_24h_100y	5:15	2.805
Calgary_24h_100y	5:20	2.897
Calgary_24h_100y	5:25	2.997
Calgary_24h_100y	5:30	3.105
Calgary_24h_100y	5:35	3.224
Calgary_24h_100y	5:40	3.354
Calgary_24h_100y	5:45	3.497
Calgary_24h_100y	5:50	3.656

Calgary_24h_100y	5:55	3.833
Calgary_24h_100y	6:00	4.033
Calgary_24h_100y	6:05	4.259
Calgary_24h_100y	6:10	4.519
Calgary_24h_100y	6:15	4.821
Calgary_24h_100y	6:20	5.176
Calgary_24h_100y	6:25	5.601
Calgary_24h_100y	6:30	6.12
Calgary_24h_100y	6:35	6.773
Calgary_24h_100y	6:40	7.624
Calgary_24h_100y	6:45	8.785
Calgary_24h_100y	6:50	10.488
Calgary_24h_100y	6:55	13.283
Calgary_24h_100y	7:00	18.961
Calgary_24h_100y	7:05	40.516
Calgary_24h_100y	7:10	168.138
Calgary_24h_100y	7:15	54.372
Calgary_24h_100y	7:20	31.748
Calgary_24h_100y	7:25	23.236
Calgary_24h_100y	7:30	18.66
Calgary_24h_100y	7:35	15.763
Calgary_24h_100y	7:40	13.746
Calgary_24h_100y	7:45	12.251
Calgary_24h_100y	7:50	11.093
Calgary_24h_100y	7:55	10.166
Calgary_24h_100y	8:00	9.405
Calgary_24h_100y	8:05	8.768
Calgary_24h_100y	8:10	8.225
Calgary_24h_100y	8:15	7.756
Calgary_24h_100y	8:20	7.346
Calgary_24h_100y	8:25	6.985
Calgary_24h_100y	8:30	6.664
Calgary_24h_100y	8:35	6.376
Calgary_24h_100y	8:40	6.116
Calgary_24h_100y	8:45	5.88
Calgary_24h_100y	8:50	5.665
Calgary_24h_100y	8:55	5.468
Calgary_24h_100y	9:00	5.287
Calgary_24h_100y	9:05	5.119
Calgary_24h_100y	9:10	4.964
Calgary_24h_100y	9:15	4.819
Calgary_24h_100y	9:20	4.684
Calgary_24h_100y	9:25	4.558
Calgary_24h_100y	9:30	4.44
Calgary_24h_100y	9:35	4.329
Calgary_24h_100y	9:40	4.224
Calgary_24h_100y	9:45	4.125
Calgary_24h_100y	9:50	4.032
Calgary_24h_100y	9:55	3.943
Calgary_24h_100y	10:00	3.859
Calgary_24h_100y	10:05	3.78
Calgary_24h_100y	10:10	3.704
Calgary_24h_100y	10:15	3.631
Calgary_24h_100y	10:20	3.562
Calgary_24h_100y	10:25	3.496
Calgary_24h_100y	10:30	3.433
Calgary_24h_100y	10:35	3.373
Calgary_24h_100y	10:40	3.315
Calgary_24h_100y	10:45	3.259
Calgary_24h_100y	10:50	3.206
Calgary_24h_100y	10:55	3.154
Calgary_24h_100y	11:00	3.105
Calgary_24h_100y	11:05	3.057

Calgary_24h_100y	11:10	3.011
Calgary_24h_100y	11:15	2.967
Calgary_24h_100y	11:20	2.924
Calgary_24h_100y	11:25	2.883
Calgary_24h_100y	11:30	2.843
Calgary_24h_100y	11:35	2.805
Calgary_24h_100y	11:40	2.767
Calgary_24h_100y	11:45	2.731
Calgary_24h_100y	11:50	2.696
Calgary_24h_100y	11:55	2.662
Calgary_24h_100y	12:00	2.629
Calgary_24h_100y	12:05	2.597
Calgary_24h_100y	12:10	2.566
Calgary_24h_100y	12:15	2.536
Calgary_24h_100y	12:20	2.506
Calgary_24h_100y	12:25	2.478
Calgary_24h_100y	12:30	2.45
Calgary_24h_100y	12:35	2.423
Calgary_24h_100y	12:40	2.396
Calgary_24h_100y	12:45	2.371
Calgary_24h_100y	12:50	2.346
Calgary_24h_100y	12:55	2.321
Calgary_24h_100y	13:00	2.297
Calgary_24h_100y	13:05	2.274
Calgary_24h_100y	13:10	2.252
Calgary_24h_100y	13:15	2.229
Calgary_24h_100y	13:20	2.208
Calgary_24h_100y	13:25	2.187
Calgary_24h_100y	13:30	2.166
Calgary_24h_100y	13:35	2.146
Calgary_24h_100y	13:40	2.126
Calgary_24h_100y	13:45	2.107
Calgary_24h_100y	13:50	2.088
Calgary_24h_100y	13:55	2.069
Calgary_24h_100y	14:00	2.051
Calgary_24h_100y	14:05	2.034
Calgary_24h_100y	14:10	2.016
Calgary_24h_100y	14:15	1.999
Calgary_24h_100y	14:20	1.983
Calgary_24h_100y	14:25	1.966
Calgary_24h_100y	14:30	1.95
Calgary_24h_100y	14:35	1.935
Calgary_24h_100y	14:40	1.919
Calgary_24h_100y	14:45	1.904
Calgary_24h_100y	14:50	1.889
Calgary_24h_100y	14:55	1.875
Calgary_24h_100y	15:00	1.86
Calgary_24h_100y	15:05	1.846
Calgary_24h_100y	15:10	1.833
Calgary_24h_100y	15:15	1.819
Calgary_24h_100y	15:20	1.806
Calgary_24h_100y	15:25	1.793
Calgary_24h_100y	15:30	1.78
Calgary_24h_100y	15:35	1.767
Calgary_24h_100y	15:40	1.755
Calgary_24h_100y	15:45	1.743
Calgary_24h_100y	15:50	1.731
Calgary_24h_100y	15:55	1.719
Calgary_24h_100y	16:00	1.707
Calgary_24h_100y	16:05	1.696
Calgary_24h_100y	16:10	1.685
Calgary_24h_100y	16:15	1.673
Calgary_24h_100y	16:20	1.663

Calgary_24h_100y	16:25	1.652
Calgary_24h_100y	16:30	1.641
Calgary_24h_100y	16:35	1.631
Calgary_24h_100y	16:40	1.621
Calgary_24h_100y	16:45	1.611
Calgary_24h_100y	16:50	1.601
Calgary_24h_100y	16:55	1.591
Calgary_24h_100y	17:00	1.581
Calgary_24h_100y	17:05	1.572
Calgary_24h_100y	17:10	1.562
Calgary_24h_100y	17:15	1.553
Calgary_24h_100y	17:20	1.544
Calgary_24h_100y	17:25	1.535
Calgary_24h_100y	17:30	1.526
Calgary_24h_100y	17:35	1.517
Calgary_24h_100y	17:40	1.509
Calgary_24h_100y	17:45	1.5
Calgary_24h_100y	17:50	1.492
Calgary_24h_100y	17:55	1.484
Calgary_24h_100y	18:00	1.476
Calgary_24h_100y	18:05	1.467
Calgary_24h_100y	18:10	1.46
Calgary_24h_100y	18:15	1.452
Calgary_24h_100y	18:20	1.444
Calgary_24h_100y	18:25	1.436
Calgary_24h_100y	18:30	1.429
Calgary_24h_100y	18:35	1.421
Calgary_24h_100y	18:40	1.414
Calgary_24h_100y	18:45	1.407
Calgary_24h_100y	18:50	1.399
Calgary_24h_100y	18:55	1.392
Calgary_24h_100y	19:00	1.385
Calgary_24h_100y	19:05	1.378
Calgary_24h_100y	19:10	1.372
Calgary_24h_100y	19:15	1.365
Calgary_24h_100y	19:20	1.358
Calgary_24h_100y	19:25	1.352
Calgary_24h_100y	19:30	1.345
Calgary_24h_100y	19:35	1.339
Calgary_24h_100y	19:40	1.332
Calgary_24h_100y	19:45	1.326
Calgary_24h_100y	19:50	1.32
Calgary_24h_100y	19:55	1.313
Calgary_24h_100y	20:00	1.307
Calgary_24h_100y	20:05	1.301
Calgary_24h_100y	20:10	1.295
Calgary_24h_100y	20:15	1.289
Calgary_24h_100y	20:20	1.284
Calgary_24h_100y	20:25	1.278
Calgary_24h_100y	20:30	1.272
Calgary_24h_100y	20:35	1.266
Calgary_24h_100y	20:40	1.261
Calgary_24h_100y	20:45	1.255
Calgary_24h_100y	20:50	1.25
Calgary_24h_100y	20:55	1.244
Calgary_24h_100y	21:00	1.239
Calgary_24h_100y	21:05	1.234
Calgary_24h_100y	21:10	1.229
Calgary_24h_100y	21:15	1.223
Calgary_24h_100y	21:20	1.218
Calgary_24h_100y	21:25	1.213
Calgary_24h_100y	21:30	1.208
Calgary_24h_100y	21:35	1.203

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Calgary_24h_100y            21:40      1.198
Calgary_24h_100y            21:45      1.193
Calgary_24h_100y            21:50      1.188
Calgary_24h_100y            21:55      1.184
Calgary_24h_100y            22:00      1.179
Calgary_24h_100y            22:05      1.174
Calgary_24h_100y            22:10      1.17
Calgary_24h_100y            22:15      1.165
Calgary_24h_100y            22:20      1.16
Calgary_24h_100y            22:25      1.156
Calgary_24h_100y            22:30      1.151
Calgary_24h_100y            22:35      1.147
Calgary_24h_100y            22:40      1.143
Calgary_24h_100y            22:45      1.138
Calgary_24h_100y            22:50      1.134
Calgary_24h_100y            22:55      1.13
Calgary_24h_100y            23:00      1.125
Calgary_24h_100y            23:05      1.121
Calgary_24h_100y            23:10      1.117
Calgary_24h_100y            23:15      1.113
Calgary_24h_100y            23:20      1.109
Calgary_24h_100y            23:25      1.105
Calgary_24h_100y            23:30      1.101
Calgary_24h_100y            23:35      1.097
Calgary_24h_100y            23:40      1.093
Calgary_24h_100y            23:45      1.089
Calgary_24h_100y            23:50      1.085
Calgary_24h_100y            23:55      1.081
Calgary_24h_100y            24:00      1.077

Continuous       FILE "C:\Users\OneDrive - ARCADIS\Desktop\Final_NOAL\Model-
Postdev\PrecipitationData-Calgary19602014.dat"

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
AVERAGES   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   10-Light-Industrial OutletOverland1
Subcatch   11-Pond-D        pond
Subcatch   11s              OutletDArcyDam
Subcatch   12s              OutletHWY2AWestDitch
Subcatch   13s              OutletHWY2AEastDitch
Subcatch   14s              OutletHWY2AEastDitch
Subcatch   15s              OutletSwaleCrystalRidge
Subcatch   16s              OutletDitchCHS
Subcatch   1-Agri-Business  Ditch-1-HY2
Subcatch   2-Recreation-Area OutletOverland
Subcatch   3-Pond-A         pond
Subcatch   4s_1             OutletDitch48ST
Subcatch   4s_2             OutletDitch48ST
Subcatch   4s_3             OutletDitch48ST
Subcatch   5-Commercial-Business OutletOverland
Subcatch   5s               OutletDitchCHS
Subcatch   6-Light-Industrial OutletOverland
Subcatch   6s               OutletCulvertGolfCourse
Subcatch   7-Pond-B         pond
Subcatch   7-Pond-B_3       OutletOverland
```

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Subcatch   7s                OutletHWY2AWestDitch
Subcatch   8-Busines         18
Subcatch   8-Busines-Expansion 18
Subcatch   8s                OutletHWY2AWestDitch
Subcatch   9-Pond-C          pond
Subcatch   9s                OutletDArcyDam
Node       FUTURE-POND-C-WEDDERBURN FUTUREPOND
Node       FUTURE-POND-TRILOGY FUTUREPOND

[MAP]
DIMENSIONS       571592.5349      5616860.48885    577429.3351      5621821.47015
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1                575639.478         5620013.809
17               575956.248         5618985.412
2                576837.95          5619876.126
20               576124.83          5618614.525
21               576276.242         5618434.84
22               576202.746         5618208.783
23               576275.708         5618142.83
24               576014.702         5617607.634
25               576097.199         5617546.598
26               576164.409         5617311.575
3                576860.428         5620029.409
41               576646.073         5618935.547
42               576762.832         5618636.727
43               576653.552         5618426.272
44               576667.945         5618010.666
45               576473.254         5617832.661
46               576460.244         5617674.531
47               576333.506         5617511.555
6                575950.837         5620027.212
7                575954.351         5619847.949
D1               572212.426         5620201.883
D2               571991.339         5619933.148
j10-Overland     574302.64          5619854.375
J12              575384.697         5619890.342
J15              575662.105         5619878.64
J16              575534.599         5619171.858
J1s              572307.078         5619344.822
J3               573855.161         5619783.43
J30              572604.3           5619863.467
J4               573944.149         5619784.446
J54s             573224.759         5619865.984
J6               573761.264         5619889.726
J8-toDitch       573950.249         5619881.531
Js21             572234.841         5619976.622
Js22             572303.224         5619976.622
Js23             572147.936         5619949.553
Js62             572236.433         5619877.818
Outlet-10-j9     574300.002         5620039.608
Outlet-11-J7     573929.738         5620047.281
Outlet-12-J5     573705.703         5619985.061
Outlet-13-J53s   573164.722         5619964.345
Outlet-14-Js29   572599.596         5619933.284
Outlet-15-Js24   572415             5619956.896
Outlet-16--J16s--to-DARCY-DAM 572425.799         5620204.096
Outlet-9--J11    575231.231         5620094.311
DARCY-DAM        571962.789         5619744.114
FUTURE-POND-C-WEDDERBURN 573566.271         5619332.223
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FUTURE-POND-TRILOGY 574718.858         5619245.362
HY2As-Ditch-East 572293.215         5619123.241
HY2As-Ditch-West 572224.214         5619103.886
J18-             574186.307         5619512.004
OF3              574520.12          5618979.342
OF6              575539.361         5619139.953
Outlet-4         575727.101         5620034.979
POND-B-WEDDERBURN 572757.615         5619276.427
POND-HY-Interchange 576997.459         5620055.973
SwaleCrystalRidge 573058.77          5619103.194
WatercourseC     576071.668         5617085.988
Npond            576804.978         5620120.559
Pond-A           575621.895         5620158.105
Pond-B           576084.401         5619217.174
Pond-C           576466.758         5619264.152
Pond-D           576107.897         5617575.902

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
19               576782.484         5618180.455
8                576161.464         5617847.934
C1s-to-Crystal-Ridge-Swalele 573188.158         5619823.758
C1s-to-Crystal-Ridge-Swalele 573160.886         5619779.327
C1s-to-Crystal-Ridge-Swalele 573163.925         5619728.366
C1s-to-Crystal-Ridge-Swalele 573201.502         5619701.072
C1s-to-Crystal-Ridge-Swalele 573176.554         5619656.673
C1s-to-Crystal-Ridge-Swalele 573160.674         5619628.629
C1s-to-Crystal-Ridge-Swalele 573198.545         5619580.473
C1s-to-Crystal-Ridge-Swalele 573243.194         5619546.323
C1s-to-Crystal-Ridge-Swalele 573257.855         5619495.522
C1s-to-Crystal-Ridge-Swalele 573240.009         5619441.946
C1s-to-Crystal-Ridge-Swalele 573205.21          5619436.821
C1s-to-Crystal-Ridge-Swalele 573182.031         5619431.859
C1s-to-Crystal-Ridge-Swalele 573152.368         5619392.028
C1s-to-Crystal-Ridge-Swalele 573127.352         5619352.262
C1s-to-Crystal-Ridge-Swalele 573109.472         5619301.003
C1s-to-Crystal-Ridge-Swalele 573091.332         5619268.289
C1s-to-Crystal-Ridge-Swalele 573096.37          5619240.537
C5s-to-WESTDITCH-HW2A 572565.674         5619814.822
C5s-to-WESTDITCH-HW2A 572534.995         5619770.329
C5s-to-WESTDITCH-HW2A 572530.289         5619711.509
C5s-to-WESTDITCH-HW2A 572538.443         5619654.702
C5s-to-WESTDITCH-HW2A 572547.286         5619548.328
C5s-to-WESTDITCH-HW2A 572541.097         5619463.778
C5s-to-WESTDITCH-HW2A 572549.379         5619397.79
C5s-to-WESTDITCH-HW2A 572549.737         5619372.087
C5s-to-WESTDITCH-HW2A 572446.727         5619365.148
Ditch-C13        573951.978         5619699.921
Ditch-C13        574149.48          5619697.437
SecondCulvertC2  573892.835         5619753.187

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
10-Light-Industrial 575562.428         5619142.232
10-Light-Industrial 576371.267         5619170.884
10-Light-Industrial 576394.682         5617779.556
10-Light-Industrial 576003.519         5617777.074
10-Light-Industrial 576009.195         5617550.076
10-Light-Industrial 576006.126         5617543.726
10-Light-Industrial 575592.125         5617534.563
10-Light-Industrial 575562.428         5619142.232
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11-Pond-D       576003.519      5617777.065
11-Pond-D       576394.682      5617779.547
11-Pond-D       576394.888      5617549.399
11-Pond-D       576009.195      5617550.085
11-Pond-D       576001.771      5617630.379
11-Pond-D       576003.519      5617777.065
11s             573077.063      5621517.895
11s             573086.017      5620742.585
11s             572672.376      5620244.828
11s             572672.376      5620244.81
11s             572583.377      5620166.967
11s             572320.907      5620165.362
11s             572320.471      5620190.478
11s             572319.429      5621513.172
11s             572615.103      5621523.181
11s             573077.063      5621517.895
12s             572583.377      5620166.984
12s             572529.299      5620057.042
12s             572480.813      5619958.671
12s             572473.823      5619908.76
12s             572315.987      5619908.371
12s             572320.907      5620165.353
12s             572583.377      5620166.984
13s             572473.823      5619908.76
13s             572480.813      5619958.68
13s             572529.299      5620057.051
13s             572583.377      5620166.993
13s             572672.376      5620244.819
13s             573086.017      5620742.576
13s             573093.996      5620597.828
13s             573108.104      5619930.047
13s             573205.54       5619932.405
13s             572897.511      5619920.952
13s             572544.389      5619909.403
13s             572639.323      5619908.564
13s             572473.823      5619908.76
;Part2: 13s
13s             573105.035      5620153.807
13s             573105.019      5620153.823
13s             573105          5620155.234
13s             573105.035      5620153.807
;Part3: 13s
13s             573114.821      5620293.571
13s             573114.781      5620293.571
13s             573114.805      5620293.577
13s             573114.821      5620293.571
14s             573077.063      5621517.886
14s             573805.291      5621532.027
14s             573883.666      5621531.197
14s             573897.575      5620753.598
14s             573180.43       5620743.013
14s             573180.43       5620743.013
14s             573180.43       5620743.013
14s             573086.017      5620742.576
14s             573077.063      5621517.886
;Part2: 14s
14s             573180.43       5620743.022
14s             573180.43       5620743.013
14s             573180.43       5620743.004
14s             573180.43       5620743.013
14s             573180.43       5620743.022
14s             573180.43       5620743.022
15s             573108.104      5619930.056
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15s               573086.017         5620742.576
15s               573897.575         5620753.58
15s               573225.898         5619956.576
15s               573205.54          5619932.414
15s               573108.104         5619930.056
16s               573205.54          5619932.405
16s               573205.54          5619932.414
16s               573897.575         5620753.589
16s               573907.61          5620405.054
16s               573906.854         5619951.033
16s               573205.54          5619932.405
;Part2: 16s
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16s               573540.932         5619938.498
16s               573549.711         5619938.491
16s               573549.647         5619936.61
1-Agri-Business   576602.007         5620600.056
1-Agri-Business   576617.295         5620181.141
1-Agri-Business   576443.836         5620171.754
1-Agri-Business   576445.647         5619992.633
1-Agri-Business   575973.305         5619995.074
1-Agri-Business   575967.402         5620400.443
1-Agri-Business   575878.722         5620542.054
1-Agri-Business   575868.932         5620775.321
1-Agri-Business   575547.277         5620769.653
1-Agri-Business   575525.771         5621341.775
1-Agri-Business   575524.099         5621412.511
1-Agri-Business   575517.17          5621583.828
1-Agri-Business   575830.411         5621595.971
1-Agri-Business   576602.007         5620600.056
2-Recreation-Area 575816.244          5619983.121
2-Recreation-Area 575810.179          5620288.046
2-Recreation-Area 575553.389          5620290.167
2-Recreation-Area 575545.28           5620747.226
2-Recreation-Area 575547.278          5620769.645
2-Recreation-Area 575868.932          5620775.33
2-Recreation-Area 575878.723          5620542.045
2-Recreation-Area 575967.402          5620400.435
2-Recreation-Area 575973.305          5619995.065
2-Recreation-Area 575972.721          5619984.456
2-Recreation-Area 575816.244          5619983.121
3-Pond-A          575816.42          5619992.976
3-Pond-A          575816.244         5619983.112
3-Pond-A          575786.585         5619983.357
3-Pond-A          575555.87          5619982.171
3-Pond-A          575553.389         5620290.158
3-Pond-A          575810.179         5620288.037
3-Pond-A          575816.42          5619992.976
4-HY-Interchange  577026.896         5619999.448
4-HY-Interchange  576445.647         5619992.624
4-HY-Interchange  576443.836         5620171.745
4-HY-Interchange  576617.295         5620181.132
4-HY-Interchange  576602.007         5620600.047
4-HY-Interchange  576602.49          5620590.241
4-HY-Interchange  577026.896         5619999.448
4s_1              573897.575         5620753.615
4s_1              573883.666         5621531.206
4s_1              574607.697         5621553.672
4s_1              574616.135         5620774.735
4s_1              573897.575         5620753.615
4s_2              574616.134         5620774.761
4s_2              574607.697         5621553.663
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4s_2                575517.17          5621583.837
4s_2                575527.338         5620778.94
4s_2                574616.134         5620774.761
4s_3                574616.134         5620774.752
4s_3                575527.338         5620778.931
4s_3                575544.07          5619983.769
4s_3                574633.174         5619958.709
4s_3                574633.174         5619958.727
4s_3                574616.134         5620774.752
5-Commercial-Business 576002.925         5619968.892
5-Commercial-Business 576001.283         5619704.884
5-Commercial-Business 575562.209         5619693.629
5-Commercial-Business 575555.192         5619925.955
5-Commercial-Business 575559.013         5619950.845
5-Commercial-Business 576002.925         5619968.892
5s                  573906.854         5619951.033
5s                  573897.575         5620753.607
5s                  574616.127         5620774.726
5s                  573926.593         5619951.239
5s                  573926.593         5619951.221
5s                  573906.854         5619951.033
;Part2: 5s
5s                  574616.135         5620774.735
5s                  574616.135         5620774.726
5s                  574616.127         5620774.726
5s                  574616.135         5620774.735
6-Light-Industrial 576371.267         5619170.884
6-Light-Industrial 576218.588         5619171.758
6-Light-Industrial 576207.847         5619368.151
6-Light-Industrial 575871.288         5619358.315
6-Light-Industrial 575874.811         5619151.985
6-Light-Industrial 575562.428         5619142.223
6-Light-Industrial 575562.209         5619693.62
6-Light-Industrial 576001.282         5619704.892
6-Light-Industrial 576002.925         5619968.901
6-Light-Industrial 576556.867         5619968.767
6-Light-Industrial 576564.12          5619374.861
6-Light-Industrial 576368.171         5619372.904
6-Light-Industrial 576371.267         5619170.884
6s                  574633.174         5619958.718
6s                  573926.593         5619951.23
6s                  574616.134         5620774.744
6s                  574633.174         5619958.718
7-Pond-B            576216.857         5619160.52
7-Pond-B            575887.032         5619149.837
7-Pond-B            575871.288         5619358.324
7-Pond-B            576207.847         5619368.142
7-Pond-B            576216.857         5619160.52
7-Pond-B_3          575875.873         5619151.465
7-Pond-B_3          575874.811         5619151.976
7-Pond-B_3          575875.861         5619152.019
7-Pond-B_3          575875.873         5619151.465
7s                  572282.207         5620187.892
7s                  572284.954         5619908.762
7s                  572054.137         5619900.492
7s                  572055.024         5619910.768
7s                  572085.365         5619944.021
7s                  572126.121         5619966.126
7s                  572165.545         5620010.792
7s                  572231.025         5620101.996
7s                  572246.819         5620148.395
7s                  572257.732         5620176.254
7s                  572282.207         5620187.892
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8-Busines        576924.867         5619664.221
8-Busines        576916.525         5619970.674
8-Busines        576918.588         5619970.685
8-Busines        576949.273         5619964.856
8-Busines        576996.532         5619956.357
8-Busines        577019.07          5619948.484
8-Busines        577075.595         5619925.305
8-Busines        577154.21          5619835.58
8-Busines        577156.761         5619667.701
8-Busines        577133.9           5619667.669
8-Busines        577156.762         5619667.661
8-Busines        577156.785         5619666.129
8-Busines        576924.867         5619664.221
8-Busines-Expansion 576924.867         5619664.221
8-Busines-Expansion 577156.785         5619666.129
8-Busines-Expansion 577164.026         5619189.647
8-Busines-Expansion 576713.35          5619177.726
8-Busines-Expansion 576716.055         5619376.368
8-Busines-Expansion 576564.12          5619374.852
8-Busines-Expansion 576556.867         5619968.758
8-Busines-Expansion 576916.525         5619970.674
8-Busines-Expansion 576924.867         5619664.221
8s               572320.907         5620165.353
8s               572315.987         5619908.388
8s               572284.954         5619908.744
8s               572282.208         5620187.875
8s               572320.471         5620190.469
8s               572320.907         5620165.353
9-Pond-C         576713.35          5619177.735
9-Pond-C         576371.458         5619164.689
9-Pond-C         576368.171         5619372.895
9-Pond-C         576716.055         5619376.359
9-Pond-C         576713.35          5619177.735
9s               572282.207         5620187.892
9s               572257.732         5620176.271
9s               572231.024         5620102.013
9s               572165.544         5620010.809
9s               572126.12          5619966.143
9s               572085.365         5619944.039
9s               572055.024         5619910.786
9s               572054.137         5619900.51
9s               571874.772         5619897.784
9s               571857.844         5620466.728
9s               572001.456         5620668.978
9s               572026.615         5620742.549
9s               572019.077         5620784.293
9s               571967.226         5620879.489
9s               571931.432         5621010.901
9s               572103.432         5621061.077
9s               572117.374         5621107.035
9s               572097.866         5621165.024
9s               572125.816         5621218.552
9s               572213.758         5621324.002
9s               572258.209         5621341.153
9s               572282.207         5620187.892

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

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

```
[PROFILES]
;;Name           Links
;;-------------- ----------
"1N--Node Js34 to Node HY2As-Ditch-East" Cs13 C5s-to-WESTDITCH-HW2A Cs7
"1N--Node J53s to Node OF6s" Culvert-C24s-900 C1s-to-Crystal-Ridge-Swalele
"1N---Node Js24 to Node HY2As-Ditch-West" Cs15 Cs35 Cs4_1_EAST-ditch
"1N--Node Js22 to Node HY2As-Ditch-West" cs14 Cs64 Cs35 Cs4_1_EAST-ditch
"!N-Node J5 to Node J18" CulvertC3 C11-Overland FirstCulvertC29 Ditch-C13
"2N----Node J7 to Node J18" CulvertC4 Ditch-C12 Ditch-C13
"1N--Node J16s--to-DARCY-DAM to Node DARCY-DAM" Dummy-Culvert1 Dummy-pipe2 Dummy-pipe3
"2N----Node j9 to Node OF3" Culvert5
```

Appendix H

Post-Development PCSWMM Model Output Results

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

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

START_DATE           07/01/2023
START_TIME           23:00:00
REPORT_START_DATE    07/01/2023
REPORT_START_TIME    23:00:00
END_DATE             07/06/2023
END_TIME             23:00:00
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         5
RULE_STEP            00:00:00

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
MAX_TRIALS           8
HEAD_TOLERANCE       0.0015
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              2

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.1    0.38   1.12   2.4    3.61   4.57   4.99   4      2.24   0.99
0.27   0.07
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Calgary_24h_100y INTENSITY 0:05     1.0      TIMESERIES Calgary_24h_100y
Continuous_6014  INTENSITY 1:00     1.0      TIMESERIES Continuous

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- --------
-------- ----------------
10-Light-Industrial Calgary_24h_100y Pond-D        121.5303 85       766.903  2
0
11-Pond-D        Calgary_24h_100y Pond-D           8.9528   65       435.6    2
0
```

```
11s              Calgary_24h_100y Outlet-16--J16s--to-DARCY-DAM 89.5633 50 350 2
0
12s              Calgary_24h_100y Outlet-15-Js24   5.2329   50       149.512  2
0
13s              Calgary_24h_100y Outlet-14-Js29   29.032   50       829.486  2
0
14s              Calgary_24h_100y Outlet-13-J53s   63.0477  50       1801.363 2
0
15s              Calgary_24h_100y Outlet-13-J53s   36.7926  50       1051.231 2
0
16s              Calgary_24h_100y Outlet-13-J53s   28.4324  50       812.354  2
0
1-Agri-Business  Calgary_24h_100y Pond-A           99.689   85       700      2
0
2-Recreation-Area Calgary_24h_100y Pond-A         22.519   10       350      2
0
3-Pond-A         Calgary_24h_100y Pond-A           7.95     65       249.856  2
0
4-HY-Interchange Calgary_24h_100y POND-HY-Interchange 15.2427 90     482.364  2
0
4s_1             Calgary_24h_100y Outlet-10-j9     56.2425  50       1606.929 2
0
4s_2             Calgary_24h_100y Outlet-9--J11    72.2111  50       2063.174 2
0
4s_3             Calgary_24h_100y Outlet-9--J11    73.5265  50       2100.757 2
0
5-Commercial-Business Calgary_24h_100y pond-B     11.577   95       470.61   2
0
5s               Calgary_24h_100y Outlet-10-j9     29.6957  50       848.449  2
0
6-Light-Industrial Calgary_24h_100y Pond-B        58.1923  85       766.903  2
0
6s               Calgary_24h_100y Outlet-10-j9     28.8758  50       825.023  2
0
7-Pond-B         Calgary_24h_100y Pond-B           6.955    65       435.6    2
0
7-Pond-B_3       Calgary_24h_100y Pond-B           0        65       435.6    2
0
7s               Calgary_24h_100y Js23             2.9515   50       84.329   2
0
8-Busines        Calgary_24h_100y Pond-C           6.1673   95       544.83   2
0
8-Busines-Expansion Calgary_24h_100y Pond-C       36.9513  95       544.83   2
0
8s               Calgary_24h_100y Js22             0.9854   50       28.154   2
0
9-Pond-C         Calgary_24h_100y Pond-C           7.026    65       406.127  2
0
9s               Calgary_24h_100y DARCY-DAM        41.8743  50       1196.409 2
0
```

[SUBAREAS]

```
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ---
-------
10-Light-Industrial 0.015   0.25       1.6        3.2        0          OUTLET
11-Pond-D        0.015      0.25       1.6        3.2        0          OUTLET
11s              0.015      0.25       1.6        3.2        0          OUTLET
12s              0.015      0.25       1.6        3.2        0          OUTLET
13s              0.015      0.25       1.6        3.2        0          OUTLET
14s              0.015      0.25       1.6        3.2        0          OUTLET
15s              0.015      0.25       1.6        3.2        0          OUTLET
```

```
16s                0.015      0.25       1.6        3.2        0          OUTLET
1-Agri-Business    0.015      0.25       1.6        3.2        0          OUTLET
2-Recreation-Area  0.015      0.25       1.6        3.2        0          OUTLET
3-Pond-A           0.015      0.25       1.6        3.2        0          OUTLET
4-HY-Interchange   0.015      0.25       1.6        3.2        0          OUTLET
4s_1               0.015      0.25       1.6        3.2        0          OUTLET
4s_2               0.015      0.25       1.6        3.2        0          OUTLET
4s_3               0.015      0.25       1.6        3.2        0          OUTLET
5-Commercial-Business 0.015   0.25       1.6        3.2        0          OUTLET
5s                 0.015      0.25       1.6        3.2        0          OUTLET
6-Light-Industrial 0.015      0.25       1.6        3.2        0          OUTLET
6s                 0.015      0.25       1.6        3.2        0          OUTLET
7-Pond-B           0.015      0.25       1.6        3.2        0          OUTLET
7-Pond-B_3         0.015      0.25       1.6        3.2        0          OUTLET
7s                 0.015      0.25       1.6        3.2        0          OUTLET
8-Busines          0.015      0.25       1.6        3.2        0          OUTLET
8-Busines-Expansion 0.015     0.25       1.6        3.2        0          OUTLET
8s                 0.015      0.25       1.6        3.2        0          OUTLET
9-Pond-C           0.015      0.25       1.6        3.2        0          OUTLET
9s                 0.015      0.25       1.6        3.2        0          OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
10-Light-Industrial 270      1.016      0.26       0          0
11-Pond-D          270       1.016      0.26       0          0
11s                270       1.016      0.26       0          0
12s                270       1.016      0.26       0          0
13s                270       1.016      0.26       0          0
14s                270       1.016      0.26       0          0
15s                270       1.016      0.26       0          0
16s                270       1.016      0.26       0          0
1-Agri-Business    270       1.016      0.26       0          0
2-Recreation-Area  270       1.016      0.26       0          0
3-Pond-A           270       1.016      0.26       0          0
4-HY-Interchange   270       1.016      0.26       0          0
4s_1               270       1.016      0.26       0          0
4s_2               270       1.016      0.26       0          0
4s_3               270       1.016      0.26       0          0
5-Commercial-Business 270    1.016      0.26       0          0
5s                 270       1.016      0.26       0          0
6-Light-Industrial 270       1.016      0.26       0          0
6s                 270       1.016      0.26       0          0
7-Pond-B           270       1.016      0.26       0          0
7-Pond-B_3         270       1.016      0.26       0          0
7s                 270       1.016      0.26       0          0
8-Busines          270       1.016      0.26       0          0
8-Busines-Expansion 270      1.016      0.26       0          0
8s                 270       1.016      0.26       0          0
9-Pond-C           270       1.016      0.26       0          0
9s                 270       1.016      0.26       0          0

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
1                1107.415   0          0          0          0
17               1088.392   2          0          0          0
2                1091.186   2          0          0          0
20               1082.451   2          0          0          0
21               1078.123   2          0          0          0
22               1076.009   2          0          0          0
23               1074.936   2          0          0          0
24               1067.875   2          0          0          0
```

```
25               1067       2          0          0          0
26               1061       2          0          0          0
3                1091.942   2          0          0          0
41               1083.736   2          0          0          0
42               1078.583   2          0          0          0
43               1074.924   2          0          0          0
44               1068.629   2          0          0          0
45               1065.832   2          0          0          0
46               1064.596   2          0          0          0
47               1062.992   2          0          0          0
6                1105.29    2          0          0          0
7                1100.312   2          0          0          0
D1               1111.5     3          0          0          0
D2               1110.544   3          0          0          0
j10-Overland     1113.367   2.75       0          0          0
J12              1104.384   1.5        0          0          0
J15              1105.138   1.522      0          0          0
J16              1093.619   2          0          0          0
J1s              1105.461   2          0          0          0
J3               1115       2.22       0          0          0
J30              1114.472   2          0          0          0
J4               1115       2.457      0          0          0
J54s             1119.631   2          0          0          0
J6               1117.309   2.05       0          0          0
J8-toDitch       1118.29    1.24       0          0          0
Js21             1113.009   3          0          0          0
Js22             1113.878   3          0          0          0
Js23             1112.269   3          0          0          0
Js62             1111.921   3          0          0          0
Outlet-10-j9     1116.135   5          0          0          0
Outlet-11-J7     1118.71    0.95       0          0          0
Outlet-12-J5     1117.803   2          0          0          0
Outlet-13-J53s   1120.103   5          0          0          0
Outlet-14-Js29   1116.451   5          0          0          0
Outlet-15-Js24   1114.519   5          0          0          0
Outlet-16--J16s--to-DARCY-DAM 1115.407 5 0        0          0
Outlet-9--J11    1104.593   5          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
DARCY-DAM        1110       FREE                        NO
FUTURE-POND-C-WEDDERBURN 0  FREE                        NO
FUTURE-POND-TRILOGY 1113    FREE                        NO
HY2As-Ditch-East 1100.687   FREE                        NO
HY2As-Ditch-West 1098.32    FREE                        NO
J18-             1110       FREE                        NO
OF3              1108       FREE                        NO
OF6              1093       FREE                        NO
Outlet-4         1104.194   FREE                        NO
POND-B-WEDDERBURN 0         FREE                        NO
POND-HY-Interchange 0       FREE                        NO
SwaleCrystalRidge 1097.12   FREE                        NO
WatercourseC     1059       FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape       Curve Name/Params
SurDepth Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ----------- --------------------------
-- -------- -------- -------- -------- --------
Npond            1092.214 2          0          FUNCTIONAL  1200      0         0
0        1
```

```
Pond-A           1106.85  5          0          FUNCTIONAL  10000     0         0
0        0
Pond-B           1091.563 5          0          FUNCTIONAL  1000      0         0
0        0
Pond-C           1088.346 5          0          FUNCTIONAL  1000      0         0
0        0
Pond-D           1068.955 5          0          FUNCTIONAL  1000      0         0
0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset
OutOffset  InitFlow   MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- --
-------- ---------- ----------
1                Pond-A           Outlet-4         162.07     0.01       0          0
0          0
10               24               25               102.703    0.035      0          0
0          0
11               25               26               244.632    0.035      0          0
0          0
12               26               WatercourseC     244.077    0.035      0          0
0          0
16               Pond-C           41               374.604    0.035      0          0
0          0
17               41               42               321.064    0.035      0          0
0          0
18               42               43               237.332    0.035      0          0
0          0
19               43               44               482.765    0.035      0          0
0          0
20               44               45               263.987    0.035      0          0
0          0
21               45               46               158.789    0.035      0          0
0          0
22               46               47               206.607    0.035      0          0
0          0
23               47               26               262.087    0.035      0          0
0          0
25               Npond            POND-HY-Interchange 203.177 0.01       0          0
0          0
26               j10-Overland     OF3              902.317    0.01       0          0
0          0
4                Pond-B           17               265.013    0.035      0          0
0          0
5                17               20               407.709    0.035      0          0
0          0
6                20               21               235.151    0.035      0          0
0          0
7                21               22               237.887    0.035      0          0
0          0
8                23               24               598.272    0.035      0          0
0          0
9                22               23               98.431     0.035      0          0
0          0
C11-Overland     J6               J3               143.61     0.05       0          0
0          0
C1s-to-Crystal-Ridge-Swalele J54s SwaleCrystalRidge 1019.7    0.035      0          0
0          0
C5s-to-WESTDITCH-HW2A J30         J1s              687        0.035      0          0
0          0
Cs13             Outlet-14-Js29   J30              20.015     0.025      0          0
0          0
```

```
cs14             Js22             Js21             38         0.025      0          0
0          0
Cs15             Outlet-15-Js24   Js23             267.363    0.025      0          0
0          0
Cs35             Js23             Js62             61         0.025      0          0
0          0
Cs4_1_EAST-ditch Js62             HY2As-Ditch-West 767        0.035      0          0
0          0
Cs64             Js21             Js23             26         0.025      0          0
0          0
Cs7              J1s              HY2As-Ditch-East 316        0.035      0          0
0          0
Culvert-10       3                2                20.06      0.01       0          0
0          0
Culvert5         Outlet-10-j9     j10-Overland     23.752     0.024      0          0
0          0
Culvert8         1                J15              137.132    0.024      0          0
0          0
Culvert-9        6                7                22.07      0.01       0          0
0          0
Culvert-C24s-900 Outlet-13-J53s   J54s             115.314    0.025      0          0
0          0
CulvertC3        Outlet-12-J5     J6               21.8       0.024      0          0
0          0
CulvertC4        Outlet-11-J7     J8-toDitch       15         0.024      0          0
0          0
CulvertC6        Outlet-9--J11    J12              255.436    0.024      0          0
0          0
Ditch-C12        J8-toDitch       J4               122.6      0.03       0          0
0          0
Ditch-C13        J4               J18-             471.806    0.03       0          0
0          0
DitchC25         J12              J16              797.262    0.035      0          0
0          0
DitchC31         J16              OF6              102        0.03       0.318      0
0          0
Dummy-Culvert1   Outlet-16--J16s--to-DARCY-DAM D1  213.543    0.01       0          0
0          0
Dummy-pipe2      D1               D2               348.25     0.035      0          0
0          0
Dummy-pipe3      D2               DARCY-DAM        191.319    0.01       0          0
0          0
FirstCulvertC29  J3               J4               19.6       0.024      0          0
0          0
SecondCulvertC2  J3               J4               21         0.024      0          0
0          0
```

[XSECTIONS]

```
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- ------
---- ----------
1                CIRCULAR     1                0          0          0          1
10               TRAPEZOIDAL  1                2          10         10         1
11               TRAPEZOIDAL  1                2          10         10         1
12               TRAPEZOIDAL  1                2          10         10         1
16               TRAPEZOIDAL  1                2          10         10         1
17               TRAPEZOIDAL  1                2          10         10         1
18               TRAPEZOIDAL  1                2          10         10         1
19               TRAPEZOIDAL  1                2          10         10         1
20               TRAPEZOIDAL  1                2          10         10         1
21               TRAPEZOIDAL  1                2          10         10         1
22               TRAPEZOIDAL  1                2          10         10         1
```

```
23               TRAPEZOIDAL  1               2          10         10         1
25               CIRCULAR     1               0          0          0          1
26               CIRCULAR     1               0          0          0          1
4                TRAPEZOIDAL  1               2          10         10         1
5                TRAPEZOIDAL  1               2          10         10         1
6                TRAPEZOIDAL  1               2          10         10         1
7                TRAPEZOIDAL  1               2          10         10         1
8                TRAPEZOIDAL  1               2          10         10         1
9                TRAPEZOIDAL  1               2          10         10         1
C11-Overland     CIRCULAR     1               0          0          0          1
C1s-to-Crystal-Ridge-Swalele TRAPEZOIDAL 1     2          10         10         1
C5s-to-WESTDITCH-HW2A TRAPEZOIDAL 1            1          15         15         1
Cs13             CIRCULAR     0.6             0          0          0          1
cs14             CIRCULAR     1               0          0          0          1
Cs15             CIRCULAR     0.9             0          0          0          1
Cs35             CIRCULAR     0.9             0          0          0          1
Cs4_1_EAST-ditch TRAPEZOIDAL  1.5             3.5        6          3          1
Cs64             TRAPEZOIDAL  1.5             3.5        6          3          1
Cs7              TRAPEZOIDAL  1.5             3.5        6          3          1
Culvert-10       CIRCULAR     0.6             0          0          0          1
Culvert5         CIRCULAR     2               0          0          0          1
6
Culvert8         CIRCULAR     0.6             0          0          0          1
6
Culvert-9        CIRCULAR     0.4             0          0          0          1
Culvert-C24s-900 CIRCULAR     0.9             0          0          0          1
CulvertC3        CIRCULAR     0.6             0          0          0          1
CulvertC4        CIRCULAR     0.6             0          0          0          1
6
CulvertC6        CIRCULAR     0.9             0          0          0          1
Ditch-C12        CIRCULAR     1               0          0          0          1
Ditch-C13        CIRCULAR     1               0          0          0          1
DitchC25         CIRCULAR     1               0          0          0          1
DitchC31         CIRCULAR     1               0          0          0          1
Dummy-Culvert1   CIRCULAR     0.9             0          0          0          1
Dummy-pipe2      CIRCULAR     1               0          0          0          1
Dummy-pipe3      CIRCULAR     1               0          0          0          1
FirstCulvertC29  CIRCULAR     0.6             0          0          0          1
6
SecondCulvertC2  CIRCULAR     0.6             0          0          0          1
6

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

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Storage
ST6              Storage    0          0
ST6                         0.94       10314.56
ST6                         1.88       25783.34
ST6                         2.82       49692.69

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
;Calgary_24h_100y design storm, rain interval = 5 minutes, rain units = mm/hr.
Calgary_24h_100y            0:00       0
Calgary_24h_100y            0:05       1.094
Calgary_24h_100y            0:10       1.103
Calgary_24h_100y            0:15       1.113
```

Calgary_24h_100y	0:20	1.122
Calgary_24h_100y	0:25	1.132
Calgary_24h_100y	0:30	1.143
Calgary_24h_100y	0:35	1.153
Calgary_24h_100y	0:40	1.163
Calgary_24h_100y	0:45	1.174
Calgary_24h_100y	0:50	1.185
Calgary_24h_100y	0:55	1.197
Calgary_24h_100y	1:00	1.208
Calgary_24h_100y	1:05	1.22
Calgary_24h_100y	1:10	1.232
Calgary_24h_100y	1:15	1.245
Calgary_24h_100y	1:20	1.257
Calgary_24h_100y	1:25	1.27
Calgary_24h_100y	1:30	1.284
Calgary_24h_100y	1:35	1.297
Calgary_24h_100y	1:40	1.311
Calgary_24h_100y	1:45	1.326
Calgary_24h_100y	1:50	1.341
Calgary_24h_100y	1:55	1.356
Calgary_24h_100y	2:00	1.372
Calgary_24h_100y	2:05	1.388
Calgary_24h_100y	2:10	1.404
Calgary_24h_100y	2:15	1.421
Calgary_24h_100y	2:20	1.439
Calgary_24h_100y	2:25	1.457
Calgary_24h_100y	2:30	1.476
Calgary_24h_100y	2:35	1.495
Calgary_24h_100y	2:40	1.515
Calgary_24h_100y	2:45	1.535
Calgary_24h_100y	2:50	1.556
Calgary_24h_100y	2:55	1.578
Calgary_24h_100y	3:00	1.601
Calgary_24h_100y	3:05	1.624
Calgary_24h_100y	3:10	1.648
Calgary_24h_100y	3:15	1.674
Calgary_24h_100y	3:20	1.7
Calgary_24h_100y	3:25	1.727
Calgary_24h_100y	3:30	1.755
Calgary_24h_100y	3:35	1.784
Calgary_24h_100y	3:40	1.815
Calgary_24h_100y	3:45	1.846
Calgary_24h_100y	3:50	1.88
Calgary_24h_100y	3:55	1.914
Calgary_24h_100y	4:00	1.95
Calgary_24h_100y	4:05	1.988
Calgary_24h_100y	4:10	2.028
Calgary_24h_100y	4:15	2.07
Calgary_24h_100y	4:20	2.113
Calgary_24h_100y	4:25	2.159
Calgary_24h_100y	4:30	2.208
Calgary_24h_100y	4:35	2.259
Calgary_24h_100y	4:40	2.313
Calgary_24h_100y	4:45	2.371
Calgary_24h_100y	4:50	2.432
Calgary_24h_100y	4:55	2.497
Calgary_24h_100y	5:00	2.566
Calgary_24h_100y	5:05	2.64
Calgary_24h_100y	5:10	2.719
Calgary_24h_100y	5:15	2.805
Calgary_24h_100y	5:20	2.897
Calgary_24h_100y	5:25	2.997
Calgary_24h_100y	5:30	3.105

Calgary_24h_100y	5:35	3.224
Calgary_24h_100y	5:40	3.354
Calgary_24h_100y	5:45	3.497
Calgary_24h_100y	5:50	3.656
Calgary_24h_100y	5:55	3.833
Calgary_24h_100y	6:00	4.033
Calgary_24h_100y	6:05	4.259
Calgary_24h_100y	6:10	4.519
Calgary_24h_100y	6:15	4.821
Calgary_24h_100y	6:20	5.176
Calgary_24h_100y	6:25	5.601
Calgary_24h_100y	6:30	6.12
Calgary_24h_100y	6:35	6.773
Calgary_24h_100y	6:40	7.624
Calgary_24h_100y	6:45	8.785
Calgary_24h_100y	6:50	10.488
Calgary_24h_100y	6:55	13.283
Calgary_24h_100y	7:00	18.961
Calgary_24h_100y	7:05	40.516
Calgary_24h_100y	7:10	168.138
Calgary_24h_100y	7:15	54.372
Calgary_24h_100y	7:20	31.748
Calgary_24h_100y	7:25	23.236
Calgary_24h_100y	7:30	18.66
Calgary_24h_100y	7:35	15.763
Calgary_24h_100y	7:40	13.746
Calgary_24h_100y	7:45	12.251
Calgary_24h_100y	7:50	11.093
Calgary_24h_100y	7:55	10.166
Calgary_24h_100y	8:00	9.405
Calgary_24h_100y	8:05	8.768
Calgary_24h_100y	8:10	8.225
Calgary_24h_100y	8:15	7.756
Calgary_24h_100y	8:20	7.346
Calgary_24h_100y	8:25	6.985
Calgary_24h_100y	8:30	6.664
Calgary_24h_100y	8:35	6.376
Calgary_24h_100y	8:40	6.116
Calgary_24h_100y	8:45	5.88
Calgary_24h_100y	8:50	5.665
Calgary_24h_100y	8:55	5.468
Calgary_24h_100y	9:00	5.287
Calgary_24h_100y	9:05	5.119
Calgary_24h_100y	9:10	4.964
Calgary_24h_100y	9:15	4.819
Calgary_24h_100y	9:20	4.684
Calgary_24h_100y	9:25	4.558
Calgary_24h_100y	9:30	4.44
Calgary_24h_100y	9:35	4.329
Calgary_24h_100y	9:40	4.224
Calgary_24h_100y	9:45	4.125
Calgary_24h_100y	9:50	4.032
Calgary_24h_100y	9:55	3.943
Calgary_24h_100y	10:00	3.859
Calgary_24h_100y	10:05	3.78
Calgary_24h_100y	10:10	3.704
Calgary_24h_100y	10:15	3.631
Calgary_24h_100y	10:20	3.562
Calgary_24h_100y	10:25	3.496
Calgary_24h_100y	10:30	3.433
Calgary_24h_100y	10:35	3.373
Calgary_24h_100y	10:40	3.315
Calgary_24h_100y	10:45	3.259

Calgary_24h_100y	10:50	3.206
Calgary_24h_100y	10:55	3.154
Calgary_24h_100y	11:00	3.105
Calgary_24h_100y	11:05	3.057
Calgary_24h_100y	11:10	3.011
Calgary_24h_100y	11:15	2.967
Calgary_24h_100y	11:20	2.924
Calgary_24h_100y	11:25	2.883
Calgary_24h_100y	11:30	2.843
Calgary_24h_100y	11:35	2.805
Calgary_24h_100y	11:40	2.767
Calgary_24h_100y	11:45	2.731
Calgary_24h_100y	11:50	2.696
Calgary_24h_100y	11:55	2.662
Calgary_24h_100y	12:00	2.629
Calgary_24h_100y	12:05	2.597
Calgary_24h_100y	12:10	2.566
Calgary_24h_100y	12:15	2.536
Calgary_24h_100y	12:20	2.506
Calgary_24h_100y	12:25	2.478
Calgary_24h_100y	12:30	2.45
Calgary_24h_100y	12:35	2.423
Calgary_24h_100y	12:40	2.396
Calgary_24h_100y	12:45	2.371
Calgary_24h_100y	12:50	2.346
Calgary_24h_100y	12:55	2.321
Calgary_24h_100y	13:00	2.297
Calgary_24h_100y	13:05	2.274
Calgary_24h_100y	13:10	2.252
Calgary_24h_100y	13:15	2.229
Calgary_24h_100y	13:20	2.208
Calgary_24h_100y	13:25	2.187
Calgary_24h_100y	13:30	2.166
Calgary_24h_100y	13:35	2.146
Calgary_24h_100y	13:40	2.126
Calgary_24h_100y	13:45	2.107
Calgary_24h_100y	13:50	2.088
Calgary_24h_100y	13:55	2.069
Calgary_24h_100y	14:00	2.051
Calgary_24h_100y	14:05	2.034
Calgary_24h_100y	14:10	2.016
Calgary_24h_100y	14:15	1.999
Calgary_24h_100y	14:20	1.983
Calgary_24h_100y	14:25	1.966
Calgary_24h_100y	14:30	1.95
Calgary_24h_100y	14:35	1.935
Calgary_24h_100y	14:40	1.919
Calgary_24h_100y	14:45	1.904
Calgary_24h_100y	14:50	1.889
Calgary_24h_100y	14:55	1.875
Calgary_24h_100y	15:00	1.86
Calgary_24h_100y	15:05	1.846
Calgary_24h_100y	15:10	1.833
Calgary_24h_100y	15:15	1.819
Calgary_24h_100y	15:20	1.806
Calgary_24h_100y	15:25	1.793
Calgary_24h_100y	15:30	1.78
Calgary_24h_100y	15:35	1.767
Calgary_24h_100y	15:40	1.755
Calgary_24h_100y	15:45	1.743
Calgary_24h_100y	15:50	1.731
Calgary_24h_100y	15:55	1.719
Calgary_24h_100y	16:00	1.707

Calgary_24h_100y	16:05	1.696
Calgary_24h_100y	16:10	1.685
Calgary_24h_100y	16:15	1.673
Calgary_24h_100y	16:20	1.663
Calgary_24h_100y	16:25	1.652
Calgary_24h_100y	16:30	1.641
Calgary_24h_100y	16:35	1.631
Calgary_24h_100y	16:40	1.621
Calgary_24h_100y	16:45	1.611
Calgary_24h_100y	16:50	1.601
Calgary_24h_100y	16:55	1.591
Calgary_24h_100y	17:00	1.581
Calgary_24h_100y	17:05	1.572
Calgary_24h_100y	17:10	1.562
Calgary_24h_100y	17:15	1.553
Calgary_24h_100y	17:20	1.544
Calgary_24h_100y	17:25	1.535
Calgary_24h_100y	17:30	1.526
Calgary_24h_100y	17:35	1.517
Calgary_24h_100y	17:40	1.509
Calgary_24h_100y	17:45	1.5
Calgary_24h_100y	17:50	1.492
Calgary_24h_100y	17:55	1.484
Calgary_24h_100y	18:00	1.476
Calgary_24h_100y	18:05	1.467
Calgary_24h_100y	18:10	1.46
Calgary_24h_100y	18:15	1.452
Calgary_24h_100y	18:20	1.444
Calgary_24h_100y	18:25	1.436
Calgary_24h_100y	18:30	1.429
Calgary_24h_100y	18:35	1.421
Calgary_24h_100y	18:40	1.414
Calgary_24h_100y	18:45	1.407
Calgary_24h_100y	18:50	1.399
Calgary_24h_100y	18:55	1.392
Calgary_24h_100y	19:00	1.385
Calgary_24h_100y	19:05	1.378
Calgary_24h_100y	19:10	1.372
Calgary_24h_100y	19:15	1.365
Calgary_24h_100y	19:20	1.358
Calgary_24h_100y	19:25	1.352
Calgary_24h_100y	19:30	1.345
Calgary_24h_100y	19:35	1.339
Calgary_24h_100y	19:40	1.332
Calgary_24h_100y	19:45	1.326
Calgary_24h_100y	19:50	1.32
Calgary_24h_100y	19:55	1.313
Calgary_24h_100y	20:00	1.307
Calgary_24h_100y	20:05	1.301
Calgary_24h_100y	20:10	1.295
Calgary_24h_100y	20:15	1.289
Calgary_24h_100y	20:20	1.284
Calgary_24h_100y	20:25	1.278
Calgary_24h_100y	20:30	1.272
Calgary_24h_100y	20:35	1.266
Calgary_24h_100y	20:40	1.261
Calgary_24h_100y	20:45	1.255
Calgary_24h_100y	20:50	1.25
Calgary_24h_100y	20:55	1.244
Calgary_24h_100y	21:00	1.239
Calgary_24h_100y	21:05	1.234
Calgary_24h_100y	21:10	1.229
Calgary_24h_100y	21:15	1.223

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Calgary_24h_100y           21:20      1.218
Calgary_24h_100y           21:25      1.213
Calgary_24h_100y           21:30      1.208
Calgary_24h_100y           21:35      1.203
Calgary_24h_100y           21:40      1.198
Calgary_24h_100y           21:45      1.193
Calgary_24h_100y           21:50      1.188
Calgary_24h_100y           21:55      1.184
Calgary_24h_100y           22:00      1.179
Calgary_24h_100y           22:05      1.174
Calgary_24h_100y           22:10      1.17
Calgary_24h_100y           22:15      1.165
Calgary_24h_100y           22:20      1.16
Calgary_24h_100y           22:25      1.156
Calgary_24h_100y           22:30      1.151
Calgary_24h_100y           22:35      1.147
Calgary_24h_100y           22:40      1.143
Calgary_24h_100y           22:45      1.138
Calgary_24h_100y           22:50      1.134
Calgary_24h_100y           22:55      1.13
Calgary_24h_100y           23:00      1.125
Calgary_24h_100y           23:05      1.121
Calgary_24h_100y           23:10      1.117
Calgary_24h_100y           23:15      1.113
Calgary_24h_100y           23:20      1.109
Calgary_24h_100y           23:25      1.105
Calgary_24h_100y           23:30      1.101
Calgary_24h_100y           23:35      1.097
Calgary_24h_100y           23:40      1.093
Calgary_24h_100y           23:45      1.089
Calgary_24h_100y           23:50      1.085
Calgary_24h_100y           23:55      1.081
Calgary_24h_100y           24:00      1.077

Continuous       FILE "C:\Users\OneDrive - ARCADIS\Desktop\Final_NOAL\Model-
Postdev\PrecipitationData-Calgary19602014.dat"

[REPORT]
;;Reporting Options
INPUT      YES
CONTROLS   YES
AVERAGES   YES
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
Subcatch   10-Light-Industrial OutletOverland1
Subcatch   11-Pond-D        pond
Subcatch   11s              OutletDArcyDam
Subcatch   12s              OutletHWY2AWestDitch
Subcatch   13s              OutletHWY2AEastDitch
Subcatch   14s              OutletHWY2AEastDitch
Subcatch   15s              OutletSwaleCrystalRidge
Subcatch   16s              OutletDitchCHS
Subcatch   1-Agri-Business  Ditch-1-HY2
Subcatch   2-Recreation-Area OutletOverland
Subcatch   3-Pond-A         pond
Subcatch   4s_1             OutletDitch48ST
Subcatch   4s_2             OutletDitch48ST
Subcatch   4s_3             OutletDitch48ST
Subcatch   5-Commercial-Business OutletOverland
Subcatch   5s               OutletDitchCHS
```

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Subcatch   6-Light-Industrial OutletOverland
Subcatch   6s                 OutletCulvertGolfCourse
Subcatch   7-Pond-B           pond
Subcatch   7-Pond-B_3         OutletOverland
Subcatch   7s                 OutletHWY2AWestDitch
Subcatch   8-Busines          18
Subcatch   8-Busines-Expansion 18
Subcatch   8s                 OutletHWY2AWestDitch
Subcatch   9-Pond-C           pond
Subcatch   9s                 OutletDArcyDam
Node       FUTURE-POND-C-WEDDERBURN FUTUREPOND
Node       FUTURE-POND-TRILOGY FUTUREPOND

[MAP]
DIMENSIONS       571592.5349      5616860.48885    577429.3351      5621821.47015
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
1                575639.478         5620013.809
17               575956.248         5618985.412
2                576837.95          5619876.126
20               576124.83          5618614.525
21               576276.242         5618434.84
22               576202.746         5618208.783
23               576275.708         5618142.83
24               576014.702         5617607.634
25               576097.199         5617546.598
26               576164.409         5617311.575
3                576860.428         5620029.409
41               576646.073         5618935.547
42               576762.832         5618636.727
43               576653.552         5618426.272
44               576667.945         5618010.666
45               576473.254         5617832.661
46               576460.244         5617674.531
47               576333.506         5617511.555
6                575950.837         5620027.212
7                575954.351         5619847.949
D1               572212.426         5620201.883
D2               571991.339         5619933.148
j10-Overland     574302.64          5619854.375
J12              575384.697         5619890.342
J15              575662.105         5619878.64
J16              575534.599         5619171.858
J1s              572307.078         5619344.822
J3               573855.161         5619783.43
J30              572604.3           5619863.467
J4               573944.149         5619784.446
J54s             573224.759         5619865.984
J6               573761.264         5619889.726
J8-toDitch       573950.249         5619881.531
Js21             572234.841         5619976.622
Js22             572303.224         5619976.622
Js23             572147.936         5619949.553
Js62             572236.433         5619877.818
Outlet-10-j9     574300.002         5620039.608
Outlet-11-J7     573929.738         5620047.281
Outlet-12-J5     573705.703         5619985.061
Outlet-13-J53s   573164.722         5619964.345
Outlet-14-Js29   572599.596         5619933.284
Outlet-15-Js24   572415             5619956.896
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Outlet-16--J16s--to-DARCY-DAM 572425.799         5620204.096
Outlet-9--J11    575231.231         5620094.311
DARCY-DAM        571962.789         5619744.114
FUTURE-POND-C-WEDDERBURN 573566.271         5619332.223
FUTURE-POND-TRILOGY 574718.858         5619245.362
HY2As-Ditch-East 572293.215         5619123.241
HY2As-Ditch-West 572224.214         5619103.886
J18-             574186.307         5619512.004
OF3              574520.12          5618979.342
OF6              575539.361         5619139.953
Outlet-4         575727.101         5620034.979
POND-B-WEDDERBURN 572757.615         5619276.427
POND-HY-Interchange 576997.459         5620055.973
SwaleCrystalRidge 573058.77          5619103.194
WatercourseC     576071.668         5617085.988
Npond            576804.978         5620120.559
Pond-A           575621.895         5620158.105
Pond-B           576084.401         5619217.174
Pond-C           576466.758         5619264.152
Pond-D           576107.897         5617575.902

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
19               576782.484         5618180.455
8                576161.464         5617847.934
C1s-to-Crystal-Ridge-Swalele 573188.158         5619823.758
C1s-to-Crystal-Ridge-Swalele 573160.886         5619779.327
C1s-to-Crystal-Ridge-Swalele 573163.925         5619728.366
C1s-to-Crystal-Ridge-Swalele 573201.502         5619701.072
C1s-to-Crystal-Ridge-Swalele 573176.554         5619656.673
C1s-to-Crystal-Ridge-Swalele 573160.674         5619628.629
C1s-to-Crystal-Ridge-Swalele 573198.545         5619580.473
C1s-to-Crystal-Ridge-Swalele 573243.194         5619546.323
C1s-to-Crystal-Ridge-Swalele 573257.855         5619495.522
C1s-to-Crystal-Ridge-Swalele 573240.009         5619441.946
C1s-to-Crystal-Ridge-Swalele 573205.21          5619436.821
C1s-to-Crystal-Ridge-Swalele 573182.031         5619431.859
C1s-to-Crystal-Ridge-Swalele 573152.368         5619392.028
C1s-to-Crystal-Ridge-Swalele 573127.352         5619352.262
C1s-to-Crystal-Ridge-Swalele 573109.472         5619301.003
C1s-to-Crystal-Ridge-Swalele 573091.332         5619268.289
C1s-to-Crystal-Ridge-Swalele 573096.37          5619240.537
C5s-to-WESTDITCH-HW2A 572565.674         5619814.822
C5s-to-WESTDITCH-HW2A 572534.995         5619770.329
C5s-to-WESTDITCH-HW2A 572530.289         5619711.509
C5s-to-WESTDITCH-HW2A 572538.443         5619654.702
C5s-to-WESTDITCH-HW2A 572547.286         5619548.328
C5s-to-WESTDITCH-HW2A 572541.097         5619463.778
C5s-to-WESTDITCH-HW2A 572549.379         5619397.79
C5s-to-WESTDITCH-HW2A 572549.737         5619372.087
C5s-to-WESTDITCH-HW2A 572446.727         5619365.148
Ditch-C13        573951.978         5619699.921
Ditch-C13        574149.48          5619697.437
SecondCulvertC2  573892.835         5619753.187

[POLYGONS]
;;Subcatchment   X-Coord            Y-Coord
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10-Light-Industrial 575562.428         5619142.232
10-Light-Industrial 576371.267         5619170.884
10-Light-Industrial 576394.682         5617779.556
10-Light-Industrial 576003.519         5617777.074
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10-Light-Industrial 576009.195         5617550.076
10-Light-Industrial 576006.126         5617543.726
10-Light-Industrial 575592.125         5617534.563
10-Light-Industrial 575562.428         5619142.232
11-Pond-D        576003.519         5617777.065
11-Pond-D        576394.682         5617779.547
11-Pond-D        576394.888         5617549.399
11-Pond-D        576009.195         5617550.085
11-Pond-D        576001.771         5617630.379
11-Pond-D        576003.519         5617777.065
11s              573077.063         5621517.895
11s              573086.017         5620742.585
11s              572672.376         5620244.828
11s              572672.376         5620244.81
11s              572583.377         5620166.967
11s              572320.907         5620165.362
11s              572320.471         5620190.478
11s              572319.429         5621513.172
11s              572615.103         5621523.181
11s              573077.063         5621517.895
12s              572583.377         5620166.984
12s              572529.299         5620057.042
12s              572480.813         5619958.671
12s              572473.823         5619908.76
12s              572315.987         5619908.371
12s              572320.907         5620165.353
12s              572583.377         5620166.984
13s              572473.823         5619908.76
13s              572480.813         5619958.68
13s              572529.299         5620057.051
13s              572583.377         5620166.993
13s              572672.376         5620244.819
13s              573086.017         5620742.576
13s              573093.996         5620597.828
13s              573108.104         5619930.047
13s              573205.54          5619932.405
13s              572897.511         5619920.952
13s              572544.389         5619909.403
13s              572639.323         5619908.564
13s              572473.823         5619908.76
;Part2: 13s
13s              573105.035         5620153.807
13s              573105.019         5620153.823
13s              573105             5620155.234
13s              573105.035         5620153.807
;Part3: 13s
13s              573114.821         5620293.571
13s              573114.781         5620293.571
13s              573114.805         5620293.577
13s              573114.821         5620293.571
14s              573077.063         5621517.886
14s              573805.291         5621532.027
14s              573883.666         5621531.197
14s              573897.575         5620753.598
14s              573180.43          5620743.013
14s              573180.43          5620743.013
14s              573180.43          5620743.013
14s              573086.017         5620742.576
14s              573077.063         5621517.886
;Part2: 14s
14s              573180.43          5620743.022
14s              573180.43          5620743.013
14s              573180.43          5620743.004
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14s               573180.43          5620743.013
14s               573180.43          5620743.022
14s               573180.43          5620743.022
15s               573108.104         5619930.056
15s               573093.996         5620597.837
15s               573086.017         5620742.576
15s               573897.575         5620753.58
15s               573225.898         5619956.576
15s               573205.54          5619932.414
15s               573108.104         5619930.056
16s               573205.54          5619932.405
16s               573205.54          5619932.414
16s               573897.575         5620753.589
16s               573907.61          5620405.054
16s               573906.854         5619951.033
16s               573205.54          5619932.405
;Part2: 16s
16s               573549.647         5619936.61
16s               573540.932         5619938.498
16s               573549.711         5619938.491
16s               573549.647         5619936.61
1-Agri-Business   576602.007         5620600.056
1-Agri-Business   576617.295         5620181.141
1-Agri-Business   576443.836         5620171.754
1-Agri-Business   576445.647         5619992.633
1-Agri-Business   575973.305         5619995.074
1-Agri-Business   575967.402         5620400.443
1-Agri-Business   575878.722         5620542.054
1-Agri-Business   575868.932         5620775.321
1-Agri-Business   575547.277         5620769.653
1-Agri-Business   575525.771         5621341.775
1-Agri-Business   575524.099         5621412.511
1-Agri-Business   575517.17          5621583.828
1-Agri-Business   575830.411         5621595.971
1-Agri-Business   576602.007         5620600.056
2-Recreation-Area 575816.244          5619983.121
2-Recreation-Area 575810.179          5620288.046
2-Recreation-Area 575553.389          5620290.167
2-Recreation-Area 575545.28           5620747.226
2-Recreation-Area 575547.278          5620769.645
2-Recreation-Area 575868.932          5620775.33
2-Recreation-Area 575878.723          5620542.045
2-Recreation-Area 575967.402          5620400.435
2-Recreation-Area 575973.305          5619995.065
2-Recreation-Area 575972.721          5619984.456
2-Recreation-Area 575816.244          5619983.121
3-Pond-A          575816.42           5619992.976
3-Pond-A          575816.244          5619983.112
3-Pond-A          575786.585          5619983.357
3-Pond-A          575555.87           5619982.171
3-Pond-A          575553.389          5620290.158
3-Pond-A          575810.179          5620288.037
3-Pond-A          575816.42           5619992.976
4-HY-Interchange  577026.896          5619999.448
4-HY-Interchange  576445.647          5619992.624
4-HY-Interchange  576443.836          5620171.745
4-HY-Interchange  576617.295          5620181.132
4-HY-Interchange  576602.007          5620600.047
4-HY-Interchange  576602.49           5620590.241
4-HY-Interchange  577026.896          5619999.448
4s_1              573897.575          5620753.615
4s_1              573883.666          5621531.206
4s_1              574607.697          5621553.672
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4s_1              574616.135         5620774.735
4s_1              573897.575         5620753.615
4s_2              574616.134         5620774.761
4s_2              574607.697         5621553.663
4s_2              575517.17          5621583.837
4s_2              575527.338         5620778.94
4s_2              574616.134         5620774.761
4s_3              574616.134         5620774.752
4s_3              575527.338         5620778.931
4s_3              575544.07          5619983.769
4s_3              574633.174         5619958.709
4s_3              574633.174         5619958.727
4s_3              574616.134         5620774.752
5-Commercial-Business 576002.925          5619968.892
5-Commercial-Business 576001.283          5619704.884
5-Commercial-Business 575562.209          5619693.629
5-Commercial-Business 575555.192          5619925.955
5-Commercial-Business 575559.013          5619950.845
5-Commercial-Business 576002.925          5619968.892
5s                573906.854         5619951.033
5s                573897.575         5620753.607
5s                574616.127         5620774.726
5s                573926.593         5619951.239
5s                573926.593         5619951.221
5s                573906.854         5619951.033
;Part2: 5s
5s                574616.135         5620774.735
5s                574616.135         5620774.726
5s                574616.127         5620774.726
5s                574616.135         5620774.735
6-Light-Industrial 576371.267          5619170.884
6-Light-Industrial 576218.588          5619171.758
6-Light-Industrial 576207.847          5619368.151
6-Light-Industrial 575871.288          5619358.315
6-Light-Industrial 575874.811          5619151.985
6-Light-Industrial 575562.428          5619142.223
6-Light-Industrial 575562.209          5619693.62
6-Light-Industrial 576001.282          5619704.892
6-Light-Industrial 576002.925          5619968.901
6-Light-Industrial 576556.867          5619968.767
6-Light-Industrial 576564.12           5619374.861
6-Light-Industrial 576368.171          5619372.904
6-Light-Industrial 576371.267          5619170.884
6s                574633.174         5619958.718
6s                573926.593         5619951.23
6s                574616.134         5620774.744
6s                574633.174         5619958.718
7-Pond-B          576216.857         5619160.52
7-Pond-B          575887.032         5619149.837
7-Pond-B          575871.288         5619358.324
7-Pond-B          576207.847         5619368.142
7-Pond-B          576216.857         5619160.52
7-Pond-B_3        575875.873         5619151.465
7-Pond-B_3        575874.811         5619151.976
7-Pond-B_3        575875.861         5619152.019
7-Pond-B_3        575875.873         5619151.465
7s                572282.207         5620187.892
7s                572284.954         5619908.762
7s                572054.137         5619900.492
7s                572055.024         5619910.768
7s                572085.365         5619944.021
7s                572126.121         5619966.126
7s                572165.545         5620010.792
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7s                572231.025          5620101.996
7s                572246.819          5620148.395
7s                572257.732          5620176.254
7s                572282.207          5620187.892
8-Busines         576924.867          5619664.221
8-Busines         576916.525          5619970.674
8-Busines         576918.588          5619970.685
8-Busines         576949.273          5619964.856
8-Busines         576996.532          5619956.357
8-Busines         577019.07           5619948.484
8-Busines         577075.595          5619925.305
8-Busines         577154.21           5619835.58
8-Busines         577156.761          5619667.701
8-Busines         577133.9            5619667.669
8-Busines         577156.762          5619667.661
8-Busines         577156.785          5619666.129
8-Busines         576924.867          5619664.221
8-Busines-Expansion 576924.867           5619664.221
8-Busines-Expansion 577156.785           5619666.129
8-Busines-Expansion 577164.026           5619189.647
8-Busines-Expansion 576713.35            5619177.726
8-Busines-Expansion 576716.055           5619376.368
8-Busines-Expansion 576564.12            5619374.852
8-Busines-Expansion 576556.867           5619968.758
8-Busines-Expansion 576916.525           5619970.674
8-Busines-Expansion 576924.867           5619664.221
8s                572320.907          5620165.353
8s                572315.987          5619908.388
8s                572284.954          5619908.744
8s                572282.208          5620187.875
8s                572320.471          5620190.469
8s                572320.907          5620165.353
9-Pond-C          576713.35           5619177.735
9-Pond-C          576371.458          5619164.689
9-Pond-C          576368.171          5619372.895
9-Pond-C          576716.055          5619376.359
9-Pond-C          576713.35           5619177.735
9s                572282.207          5620187.892
9s                572257.732          5620176.271
9s                572231.024          5620102.013
9s                572165.544          5620010.809
9s                572126.12           5619966.143
9s                572085.365          5619944.039
9s                572055.024          5619910.786
9s                572054.137          5619900.51
9s                571874.772          5619897.784
9s                571857.844          5620466.728
9s                572001.456          5620668.978
9s                572026.615          5620742.549
9s                572019.077          5620784.293
9s                571967.226          5620879.489
9s                571931.432          5621010.901
9s                572103.432          5621061.077
9s                572117.374          5621107.035
9s                572097.866          5621165.024
9s                572125.816          5621218.552
9s                572213.758          5621324.002
9s                572258.209          5621341.153
9s                572282.207          5620187.892

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

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

[PROFILES]
;;Name           Links
;;-------------- ----------
"1N--Node Js34 to Node HY2As-Ditch-East" Cs13 C5s-to-WESTDITCH-HW2A Cs7
"1N--Node J53s to Node OF6s" Culvert-C24s-900 C1s-to-Crystal-Ridge-Swalele
"1N---Node Js24 to Node HY2As-Ditch-West" Cs15 Cs35 Cs4_1_EAST-ditch
"1N--Node Js22 to Node HY2As-Ditch-West" cs14 Cs64 Cs35 Cs4_1_EAST-ditch
"!N-Node J5 to Node J18" CulvertC3 C11-Overland FirstCulvertC29 Ditch-C13
"2N----Node J7 to Node J18" CulvertC4 Ditch-C12 Ditch-C13
"1N--Node J16s--to-DARCY-DAM to Node DARCY-DAM" Dummy-Culvert1 Dummy-pipe2 Dummy-pipe3
"2N----Node j9 to Node OF3" Culvert5
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