KINETICOR HOLDINGS #3 GP LTD.

KINETICOR ASP

MASTER DRAINAGE PLAN

CIMA+ file number: Z0026600
22 July 2025 – Review 001

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MASTER DRAINAGE PLAN

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In addition to the signatories of this report, the following individuals have also been involved in the study and writing of the report as technical experts within the project team:

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Register of issues			
Issue No.	Reviewed by	Date	Description of the review
001	JF Chenier	2025-07-22	Internal Review

Confidentiality and ownership

Table of contents

List of Tables

List of Figures

List of Appendices

1. Introduction

CIMA+ has been retained by Kineticor Holdings #3 GP Ltd. to complete a stormwater drainage analysis of the Kineticor land in Rocky View County in support of the Kineticor Area Structure Plan (ASP). The Kineticor lands is approximately 448 ha, located east of Balzac, north of Hwy 566, northeast of the City of Calgary. The legal land description is 14-26-28-W4, S ½ 23-26-28-W4M, and NE ¼ 15-26-28-W4M. The project location and site are shown in Figure 1-1 and Figure 1-2.

This Stormwater Master Drainage Plan (MDP) was prepared to provide guidance for the development of the Kineticor land, including unit area allowable release rates (UARRs) and storage requirements for the site. This MDP adheres to the Rocky View County Servicing Standards (2025) and the City of Calgary Stormwater Management and Design Manual (2011).

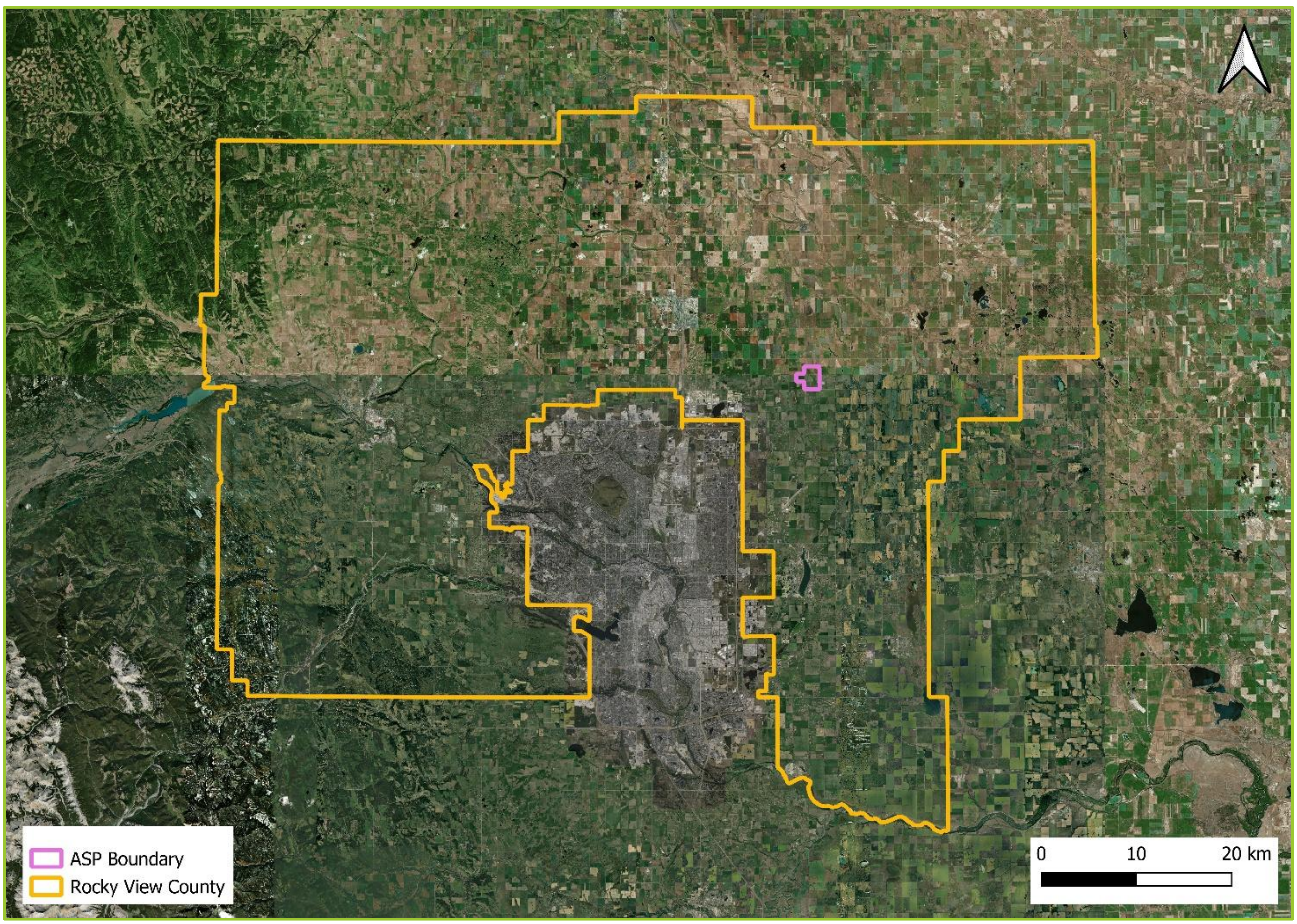


Figure 1-1: Project Location within Rocky View County

1.1 Study Area

The proposed Kineticor ASP development encompasses approximately 448 ha, as shown in Figure 1-2 below. The area is located within Rocky View County and currently consists of undeveloped agricultural land. The proposed development, further described in the Kineticor ASP prepared by CIMA+, consists of data center facilities, internal roads, a stormwater management facility (SWMF) to serve the development, and electrical grid interconnection and distribution facility.

Figure 1-2: Site Location

Note that while a small northeast portion of SE ¼ 23-26-28-W4M is not part of the ASP lands, it is included as part of the MDP study area because it naturally drains into the ASP lands. The total study area for this MDP is approximately 453 ha, including adjacent roads.

The existing site topography was evaluated using on site survey LiDAR survey data and contour maps. The study area generally drains from west to east and lies within the larger Rosebud River watershed. Drainage currently flows to two existing streams that traverse the site.

1.2 Scope and Objectives

Rocky View County requires a Master Drainage Plan (MDP) at Area Structure Plan (ASP) stage to support the development in Kineticor development. The MDP will guide stormwater planning and ensure an effective and sustainable stormwater management system for current and future needs.

The more specific objectives of the MDP are as follows:

- Provide overarching guidance for both current and future stormwater management to ensure compliance with applicable provincial and municipal guidelines and regulations.
- Provide guidance on Low Impact Development (LIDs) and best management practices with respect to stormwater management, including stormwater use and water quality treatment.
- Define the pre and post development catchment boundaries, including upstream land and establish the outlet locations, release criteria for Kineticor development as well as guidance for future developments within the catchment.
- Hydraulic analysis and modelling to estimate SWMF sizing requirement within the proposed Kineticor ASP.

The MDP provides the overall design criteria and SWMF sizing for the study area. Further detailed stormwater analyses and reports will be completed as the development continues thorough neighbourhood area structure planning, subdivision planning and development stages adhering to the criteria and recommendation set in MDP.

No geotechnical, hydrogeological, structural, environmental, or geomorphological assessments were conducted as part of this study.

1.3 Methodology

The following methodology was used to conduct the study and prepare this MDP:

- Data collection and background study, review all available relevant information, documents, provincial and municipal guidelines.
- Establish drainage patterns and catchment areas based existing topography and conceptual outline plans.
- Based on the collected information, establish hydrological model parameters and design criteria for future development.
- Conduct pre- and post-development rainfall runoff analysis using hydrological model (PCSWMM) for single and continuous simulation to analyse pre-and post-development drainage conditions.
- Analyse the model results, summarize the results, and make recommendations.

1.4 Approvals

The study identifies the following requirements from the approving agencies:

- Approvals from the Rocky View County (RVC) and Alberta Environmental and Parks (AEP) under the Water Act and Environmental Protection Act will be required prior to development.

2. Stormwater Management Planning

To ensure adequate service levels for the development and to protect downstream infrastructure and watercourses, appropriate planning and design criteria must be established. Stormwater management for the Kineticor ASP must address local topography while meeting Rocky View County's design standards, development objectives, and applicable regulations.

2.1 Existing Drainage

The study area is located within the Rosebud River drainage basin. Existing catchments consist of agricultural lands draining toward two local streams and roadway infrastructure (culverts and ditches). The northern stream discharges to the Graham Reservoir, while the southern stream drains to an unnamed pond that connects to the reservoir via a canal.

Based on flow contributions, the study area is divided into two drainage systems:

- North drainage area
- South drainage area

The southern drainage area collects runoff from the southern half of the study area. The northern half and western quarter drain toward the northern stream, as shown in Figures 2-1 and 2-2.

2.1.1 Upstream Areas

Figure 2-1 illustrates the drainage patterns of both streams. The southern stream originates within the study area, while the northern stream extends northwest beyond the study area. Stream extents and receiving water bodies were obtained from Alberta Base Waterbody data (Open Data portal). Elevation data was sourced from the High Resolution Digital Elevation Model (DEM) provided by the Government of Canada. Watershed delineation was performed using PCSWMM.

Catchments were grouped based on their contributing stream segment. Table 2.1 describes these catchments, and Figure 2-2 shows those closer to the study area. The total predevelopment study area is approximately 1,859 ha, including 448 ha within the ASP boundary.

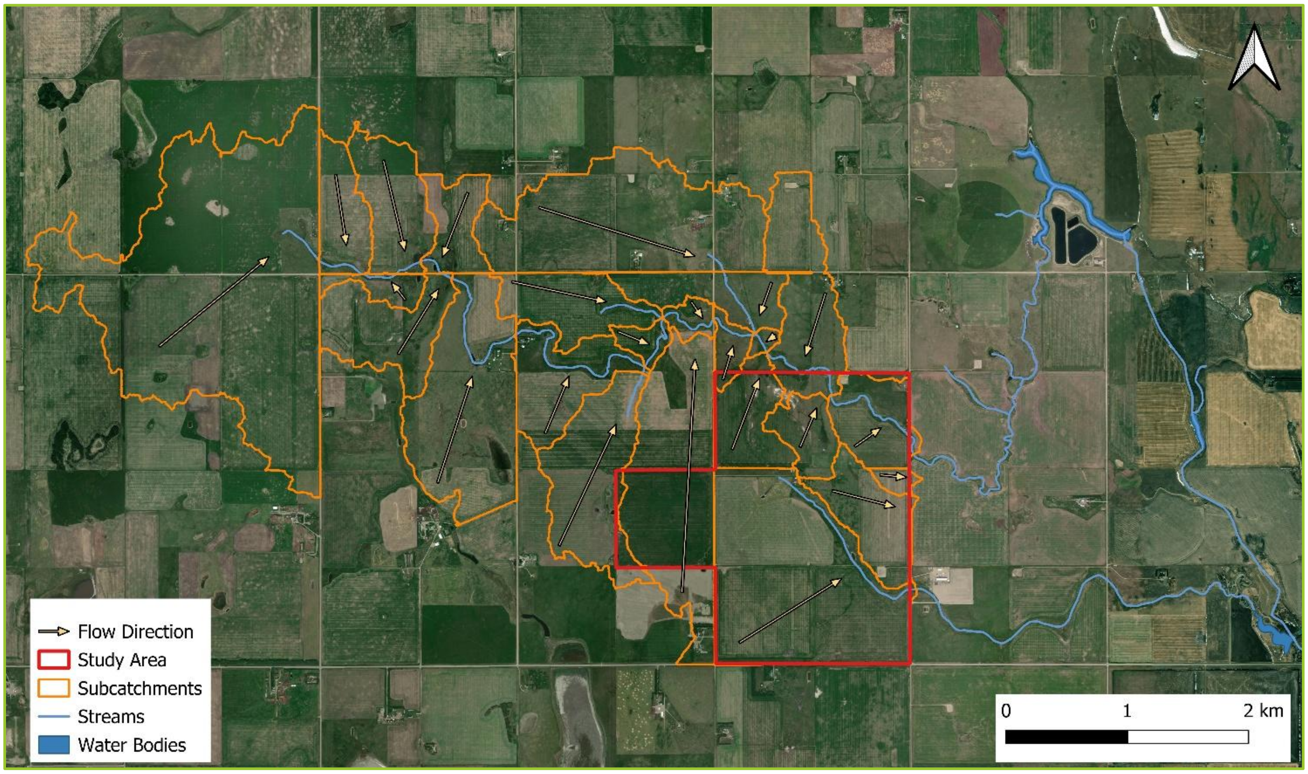


Figure 2-1: Pre-development catchments and existing drainage patterns

Table 2.1: Pre-development catchments

Catchment	Draining to Stream	Area (ha)	Slope (%)	Flow Length (m)
SC-01	South	207	4.6	1000
SC-02	North	51	3.7	500
SC-03	North	6	3.7	175
SC-04	North	45	5.4	475
SC-05	North	28	4.0	375
SC-06	North	85	3.9	650
SC-07	North	45	3.8	475
SC-08	North	4	6.2	150
SC-09	North	14	5.4	265
SC-10	North	45	4.0	475
SC-11	North	181	4.1	950
SC-12	North	11	5.5	235
SC-13	North	148	4.0	860
SC-14	North	96	3.0	690
SC-15	North	11	5.8	240
SC-16	North	54	4.2	520
SC-17	North	63	5.9	560

SC-18	North	139	4.2	835
SC-19	North	34	3.9	415
SC-20	North	65	4.5	570
SC-21	North	15	5.2	275
SC-22	North	57	4.6	535
SC-23	North	40	4.6	450
SC-24	North	412	4.2	1435

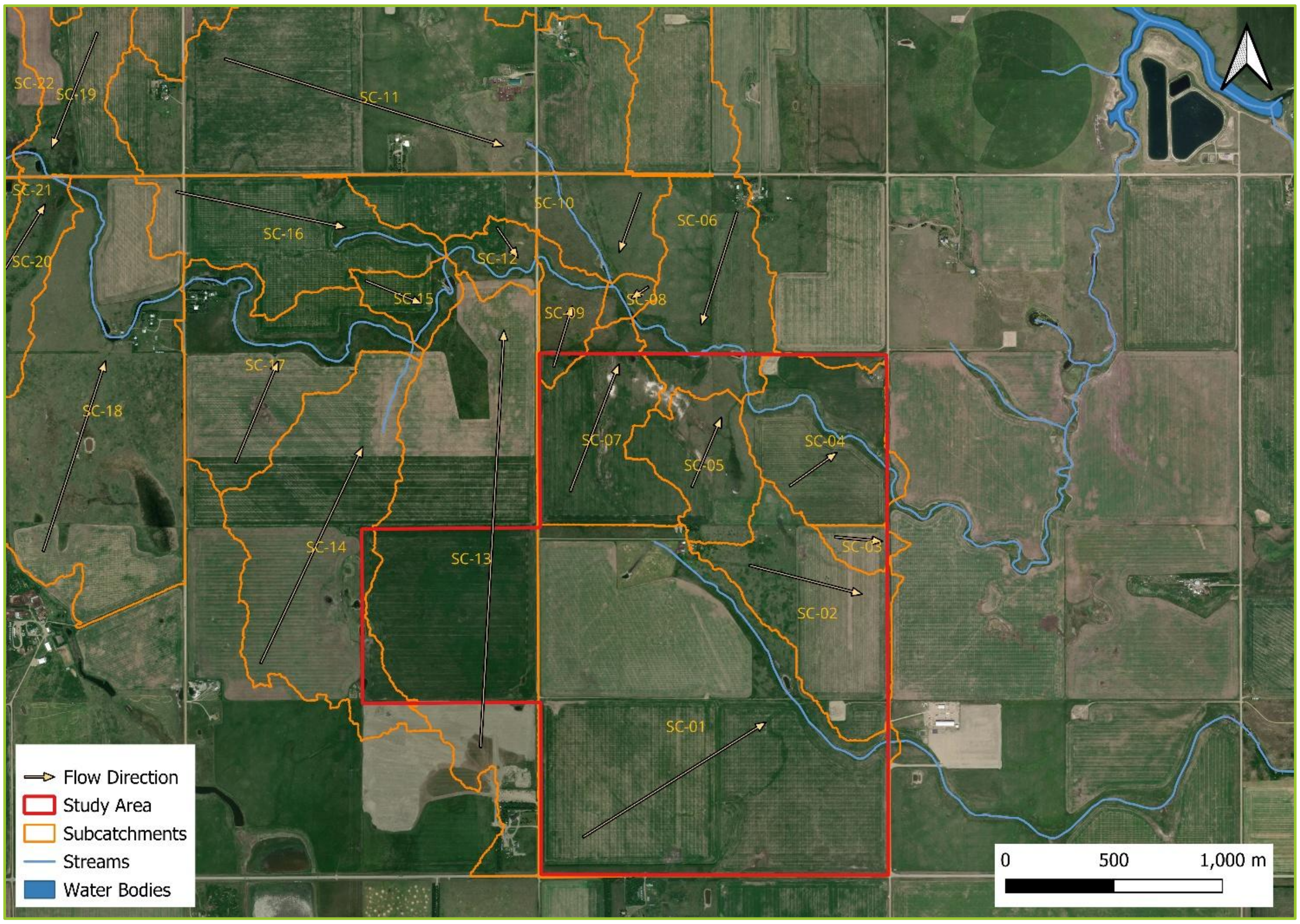


Figure 2-2: Pre-development catchments and drainage patterns close to study area

2.2 Proposed Development

The proposed ASP development includes data center buildings, internal roads, parking areas, and municipal reserve (MR) lands. A stormwater pond will be constructed on-site. The northeast portion of the study area will be retained in its pre-development condition for irrigation, supporting flow and volume control.

Post-development imperviousness for the developed area (approx. 373 ha) is estimated at 75.5%, as shown in Table 2.2.

Table 2.2: Post-development imperviousness in developed areas

Land Use*	Areas* (ha)	Imperviousness (%)	Impervious Area (ha)
Buildings	224	90	201.6
Internal roads, pavements, pathways	112	70	78.4
Municipal Reserve	37	5	1.8
Total Development Area	373	75.5%	281.8

* Estimated areas and land uses may be revised through detailed design

The storm pond is assumed as 100% impervious below the high water level (HWL), and 0% impervious above the HWL (grassed areas). The retained natural area is assumed as 0% impervious. Figures 2-3 and 2-4 show the draft post development concept and catchments respectively.

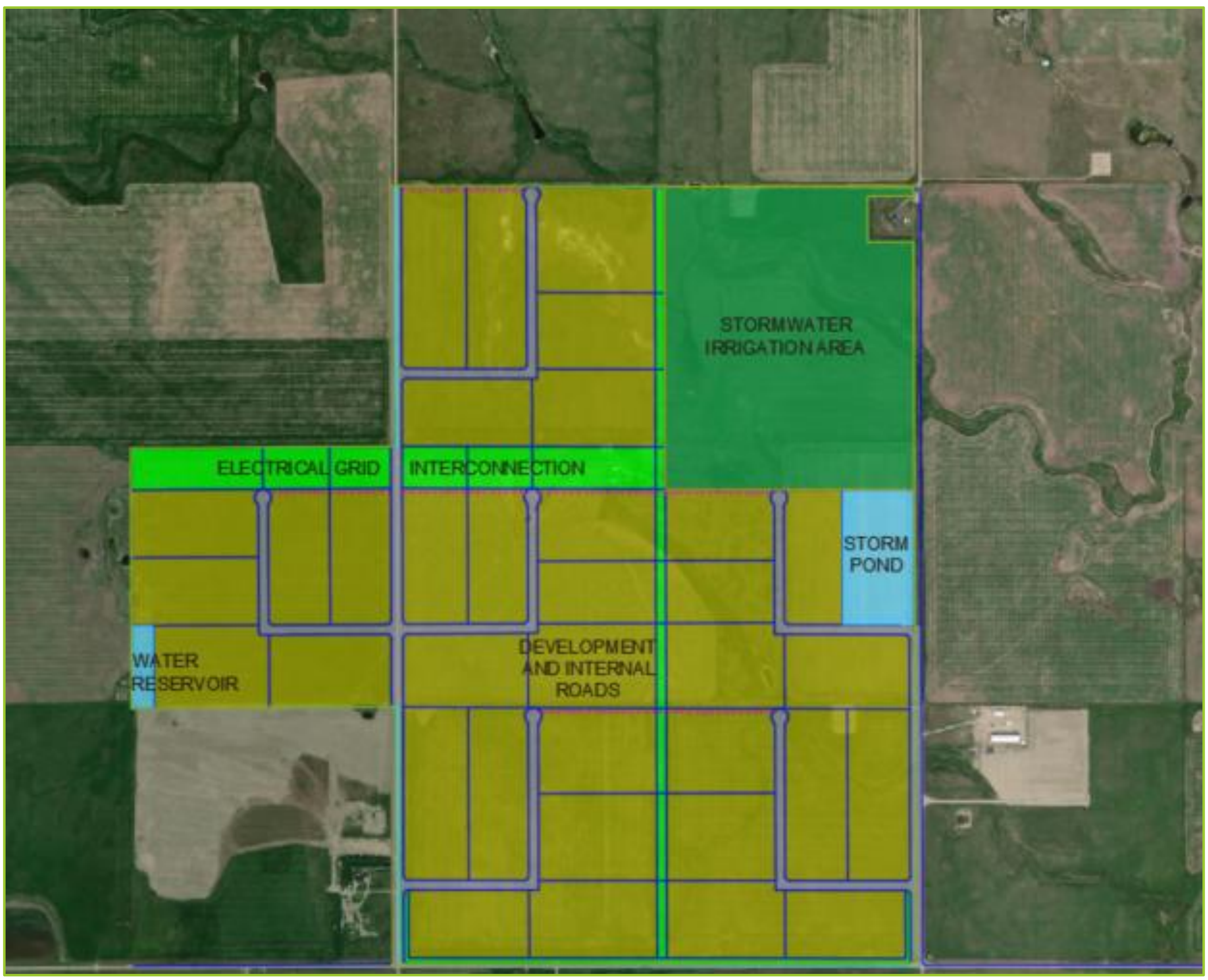


Figure 2-3: Draft post-development concept

Figure 2-4: Post-development catchments

Stormwater runoff from most developed areas (SC-1) will be conveyed to the storm pond via roadway ditches. Runoff from SC-2 may be routed via underground pipes due to grade constraints. Alternatively, SC-2 may be managed by a dedicated local stormwater facility prior to discharge to the northern stream.

For this MDP, SC-2 is assumed to discharge to the storm pond at the eastern ASP boundary to assess worst-case capacity. If a separate facility is designed for SC-2, it must meet the water quality and release rate targets defined in this MDP.

Runoff from the development will be routed through pervious areas where feasible, attenuated via traplow storage, and conveyed to the storm pond at an average peak rate of 90 L/s/ha.

The northern stream and adjacent natural lands will be retained post-development to allow upstream drainage and support stormwater irrigation (SC-3). The southern stream will be removed.

As shown in Figures 2-2 and 2-3, none of the external catchment areas will be impacted by ASP development. Only the southern portion of catchment SC-13, located southwest of the ASP, may be affected and re-routed via a ditch along the southwest boundary.

2.3 Existing Reports and Guidelines

Stormwater management within the ASP must comply with provincial and municipal regulations, including the following documents:

- Alberta Environment and Protected Areas Municipal Policies and Procedures Manual, 2024.
- Rocky View County Servicing Standards, 2025.
- Stormwater Management Guidelines for the Province of Alberta, 1999.
- The City of Calgary Stormwater Management & Design Manual, 2011.

No geotechnical, hydrogeological, structural, environmental, or geomorphological assessments were reviewed for this MDP. Recommendations from future studies should be incorporated where applicable.

2.4 Design Objectives

Two primary objectives were considered in the development of this MDP, namely stormwater quality enhancement and release rate control.

No runoff volume control targets were identified for this region.

2.4.1 Stormwater Quality

The Alberta Environment and Protected Areas Municipal Policies and Procedures Manual (2024) requires ≥85% removal of sediments ≥75 μm prior to discharge. The City of Calgary Stormwater Management & Design Manual (2011) specifies a more stringent requirement of ≥85% removal of sediments ≥50 μm, which has been adopted for this MDP.

No additional water quality targets have been mandated.

The minimum detention time for the wet ponds is 24 hours. By controlling and treating all runoff generated by the more frequent events, represented by the water quality design event, the desired objectives should be achievable. The water quality storm event should follow Alberta Environment's guidelines of a 25 mm event.

2.4.2 Release Rate Control

The release rate is defined as the peak discharge from stormwater facilities during the 1:100-year, 24-hour City of Calgary design storm.

No specific release rate targets were identified for the study area in the reviewed documents (Section 2.3). Therefore, a pre-development analysis was conducted to establish baseline peak flow rates for setting post-development targets.

Based on this analysis (see Section 4.1), the following peak release rate targets were established:

- 11.2 L/s/ha to the north stream
- 10.7 L/s/ha to the south stream

These values apply for discharge from the storm pond at the eastern edge of the study area and are further detailed in Section 4.1.

2.5 Stormwater System Design

2.5.1 Major System

The major stormwater drainage system includes all overland drainage routes, such as swales, ditches, roads, and storage facilities. The major system facilitates flow when the minor system is restricted or beyond capacity; because of this, the major system is designed for infrequent extreme rainfall events that exceed the capacity of the minor system. Failure to adequately plan and design the major system can cause flooding and damage to public and private property during extreme events or minor system malfunctions.

Designing for the major system is required to follow Albert Environment guidelines. In addition to the guidelines, a useful summary of the design standards has been prepared as part of the current Alberta Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (2013, Part 5). These documents outline all the requirements for stormwater management in Alberta; however, a few of the most pertinent guidelines regarding the major system are also listed below:

- The major drainage system is to be designed based on a 1:100-year rainfall event.
- This includes the sizing requirements of any stormwater management facilities.
- The development design must provide a continuous escape route for stormwater, typically via the road network. The emergency escapes towards adjacent properties must be evaluated and designed to ensure no adverse effects occur.
- The maximum depth of flow at curbside gutters should be less than 0.3 m.
- Standing water at low points (trap lows) should be less than 0.5 m and no more than 0.3m where possible.

- Velocities and flow depths for the major system, including gutters and swales, shall not exceed the permissible values prescribed by Alberta Environment.
- Sufficient freeboard must be provided between the water level along the major system and building elevations.

2.5.2 Minor System

The minor drainage system includes all the underground piping systems that facilitate transport of stormwater quickly and efficiently within its design capacity. Similar to the major system, the design guidelines for the minor system must follow Alberta Environment Guidelines; the minor system requirements can be found in the publications mentioned above.

Pertinent design guidelines for the minor system include:

- The minor system should be designed to carry the peak flow resulting from a 1:5-year rainfall event without surcharging.
- Storm system must be designed as a separate entity from the sanitary system.
- Storm sewer pipe shall be designed to convey the design flow with the hydraulic grade-line below the pipe crown (without surcharging). During detailed design of the drainage system, the hydraulic grade-line during the 1:100-year event must be acceptable. Surcharging to the surface should not be allowed. Inlet control devices (ICD) may be required to control flows into the piped system.
  - Surcharge in the pipe network should be a minimum of 1.2 m below surface in the worst-case scenario.
- Minimum depth of cover to the pipe crown should be minimum 1.2 m.
- Allowable release into the minor system should be between 100 L/s/ha where trap low storage is limited, and 70 L/s/ha where sufficient traplow storage can be provided.

Without any extensive precipitation data within the project boundary, it is recommended to use data from Calgary International Airport. This data is available on the City of Calgary's Water Resources webpage and in the *City of Calgary Stormwater Management and Design Manual*. The "Chicago Storm" distribution and Calgary's Intensity Duration Frequency (IDF) curve is recommended for design storms as it provides periods of high intensity rain; this information is found in Appendix K of the *City of Calgary Stormwater Management and Design Manual* and is already built into the PCSWMM software.

2.5.3 Traplows

Traplows are located at sags or low points near catch basins within the road or parks that prevent flow from cascading further downstream. The depression acts as storage and allows water to enter the minor system at a control rate, by controlling the inlet capacity of the catch basin grate or Inlet Control Devices (ICDs).

The traplow storage reduces the risk for downstream flooding by attenuating the flow from the major system and directing it into the storm sewer. Requirements for traplows include:

- Traplows must have a defined escape route.
- Maximum depth at trap lows should be 0.5 m; where possible, maximum ponding depth should be less than 0.3 m.
- Traplows should be sized to contain the 1:100-year flows.

2.5.4 Pond Capacity

The SWMFs will need to be adequately sized to attenuate the flow rate from the post development condition to the prescribed UARR. The attenuation can occur through multiple facilities or a single pond; however, the City of Calgary's guidelines suggest a minimum size of 2 ha at NWL for wet ponds. Servicing the development could be completed through wet or dry ponds, or constructed wetlands.

The volume requirement for attenuation is based on the greater of the 1:100-year design storm event or a frequency analysis using the continuous data set. Other requirements for storm ponds include:

- Permanent pool depth should be at a minimum of 2 m and a maximum of 3 m (wet ponds)
- Permanent pool volume should be a minimum of 25 mm over the catchment area multiplied by the imperviousness percentage (wet ponds)
- Maximum active storage depth should be 2 m (wet ponds)
- Maximum storage depth for water re-use should be 1.5 m (wet ponds)
- Minimum freeboard of 0.3 m (wet and dry ponds)

2.5.5 Best Management Practices

Direct runoff of stormwater from impervious surfaces, such as asphalt, to receiving waters can increase stream temperatures beyond the habitual limits of aquatic organisms. Fish species and aquatic invertebrates have temperature preferences that may be exceeded during periods of stormwater runoff. Vegetation around the storm ponds is recommended to help reduce the temperature of effluent stormwater. Other BMPs include implementation of lot level controls, outlet cooling, or SWMF configuration design to limit open areas of water.

Salt used on local roadways as de-icer in winter months can have a significant impact on stormwater quality during periods of snowmelt. Salt concentrations can have a negative impact on wildlife, freshwater ecosystems, vegetation, and soils. It is recommended that a salt management plan for the storage and use of road salts follows Environment Canada's Code of Practice for the Environmental Management of Road Salts.

Lot level best management practices (BMP) include source control practises, such as roof disconnections and 300 mm absorbent landscape.

2.5.5.1 Low Impact Development and Source Control

Controlling stormwater at the source is an effective way to reduce the demands on SWMFs and properly designed source controls can ultimately completely replace the need for SWMFs. LIDs aim to replicate pre-development hydrology, water balance, and provide water quality treatment through natural processes. Replicating the water balance is effective at reducing runoff volumes.

Further investigation would be required to determine the applicability and extent of LID design within the study area, especially identifying locations with permeable soils and the hydrogeological processes. A useful document outlining LID and other source control practices can be found in the City of Calgary's Stormwater Source Control Practices Handbook (2007).

The handbook outlines the various types of designs, source controls, and their applicability; however, a few of recommended practices are listed below:

- All roof drainage from single family homes and garages to be directed away from hard surface and towards landscaped areas prior to draining to streets or lanes. Rain barrels can also be used to intercept runoff.
- Absorbent landscapes with a minimum of 300 mm of topsoil.
- Vegetated swales

2.5.5.2 Stormwater Use

Stormwater use is currently proposed for the study area. The irrigation application details will need to be finalized through detailed design and will need to adhere to the applicable public health guidelines. The Alberta Health Services (AHS) *Public Health Guidelines for Water Use and Stormwater Use* (2021) outlines the applicable treatment needed before collected stormwater can be used for irrigation or other end uses.

2.5.6 Geotechnical and Environmental Studies

No geotechnical, hydrogeological, geomorphologic, or environmental assessments were available for review at the time of preparation of this MDP. At subsequent project phases, the stormwater analysis and outcomes from this MDP should be reviewed in conjunction with the relevant studies when available and their recommendations should be incorporated in future phases where possible.

2.5.7 Erosion Protection

The effect of increased runoff, even when controlled, could also cause increased erosion downstream of development. Although SWMFs attenuate the flows and keep them below a prescribed flow rate, duration and concentration of flow can still cause erosion problems in the channels downstream of a SWMF. Further studies at development stage will need to examine the erosion impacts and channel stability of downstream reaches and devise solutions to prevent erosion if necessary. Volume control can be considered as an option to assist in alleviating erosion concerns; however, an erosion assessment should still be undertaken during neighbourhood detailed design.

Concentration of flows to a single drainage path may also have erosion concerns. The use of berms or swales to direct flow or the installation of culverts may increase flow velocities. Appropriate erosion protection measures need to be provided at these locations.

2.5.8 Emergency Escape

The available capacity of the two streams downstream of the proposed development requires further analysis and should be undertaken when the development design progresses. This analysis should also investigate whether a practical emergency escape route from the Kineticor Storm Pond is possible.

In the absence of a clearly defined emergency escape route, for this MDP, a 1-in-500-year design storm was also simulated to evaluate the pond's capacity. The results of this analysis are presented in Section 4.

3. Methodology and Data

In order to determine the pre-development and post development runoff conditions, computer modelling was used. Computer simulations can be completed for a single event or with continuous meteorological data over a period of time. Both scenarios were completed using City of Calgary data (1:100-year design storm event and 1960-2014 continuous data).

3.1 Computer Model

Computer aided PCSWMM model version 7.7.3920 (SWMM Version 5.2.4) was used for hydrological analysis.

PCSWMM is a software developed by Computational Hydraulic Inc. (CHI) that utilizes the base EPASWMM engine to simulate hydrological and hydraulic processes. PCSWMM is one of the modelling software packages accepted by the City of Calgary Stormwater Management and Design Manual (2011) and the Rocky View County Servicing Standards (2025).

The following section describes the hydrological parameters and methodology used in the model.

3.2 Hydrological Parameters

Hydrological parameter values such as monthly evaporation used in the model were obtained from the City of Calgary *Stormwater Management & Design Manual (2011).*

3.2.1 Infiltration

The Horton approach was used for infiltration in this study. Since no field values were obtained for infiltration parameters, the soil infiltration parameters used in this model are based on the recommendations from the *City of Calgary Stormwater Management & Design Manual* (2011).

Table 3.1: Horton infiltration parameters

Parameter	Value	Unit
Maximum Infiltration	75	mm/hr
Minimum Infiltration	7.5	mm/hr
Decay Constant	4.14	1/hr
Drying Time	7	days

To account for reduced infiltration during winter months due to frozen ground, a reduction factor shown in Table 3-2 was applied.

Table 3.2: Adjustments for soil conductivity for each month

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0.05	0.05	0.05	0.05	1	1	1	1	1	1	0.05	0.05

3.2.2 Depression Storage

The depression storage values used for this model are 1.6 mm for impervious surfaces and 3.2 mm for pervious surfaces post-development. For pervious surfaces in the pre-development condition, a depression storage of 5 mm was used to account for various low-lying areas. The Manning's 'n' values are 0.015 for impervious and 0.25 for pervious surfaces respectively.

3.2.3 Evaporation and Wind Speed

Average monthly evaporation and wind speed used in the continuous simulation are provided in Table 3.3 and Table 3.4 respectively.

Table 3.3: Monthly average evaporation (mm/day)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0.10	0.38	1.12	2.40	3.61	4.57	4.99	4.00	2.24	0.99	0.27	0.07

Table 3.4: Monthly average wind speeds (km/hr)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
14.8	14.6	15.0	16.5	16.6	15.6	14.0	13.2	14.1	14.6	13.7	14.9

3.2.4 Snowmelt

To accurately account for snow buildup and snowmelt on site, the continuous simulation was set up with the snowmelt parameters shown in Table 3.5. For post-development impervious areas, snow plowing was included in the model using a coefficient of 0.3 for the fraction of impervious area that is plowable.

Table 3.5: Snowmelt parameters

Parameter	Value
Dividing temperature between snow and rain	0 °C
Minimum Melt Coefficient	0.05 mm/hr/°C
Maximum Melt Coefficient	0.20 mm/hr/°C
Fraction Free Water Capacity	0.10

3.2.5 Single Event Storm

The single event storm used in the model was the City of Calgary 1:100-year design storm. The design storm hyetograph is shown in Figure 3-1.

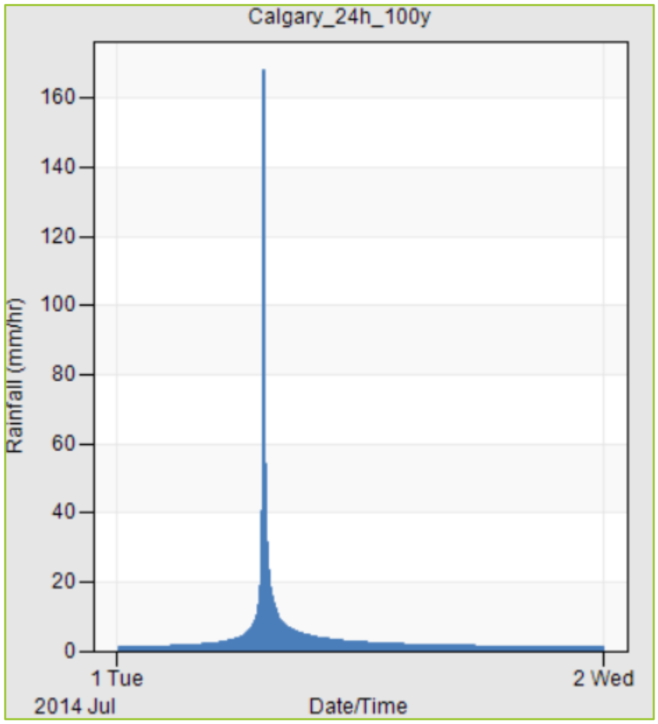


Figure 3-1: 1-in-100-year design storm hyetograph

In addition to the 1-in-100-year single event, the 1-in-500-year single event was also modelled to evaluate the capacity of the pond in the absence of an emergency escape, as per the City of Calgary Stormwater Management and Design Manual (2011). The 500-year storm hyetograph is shown in Figure 3-2.

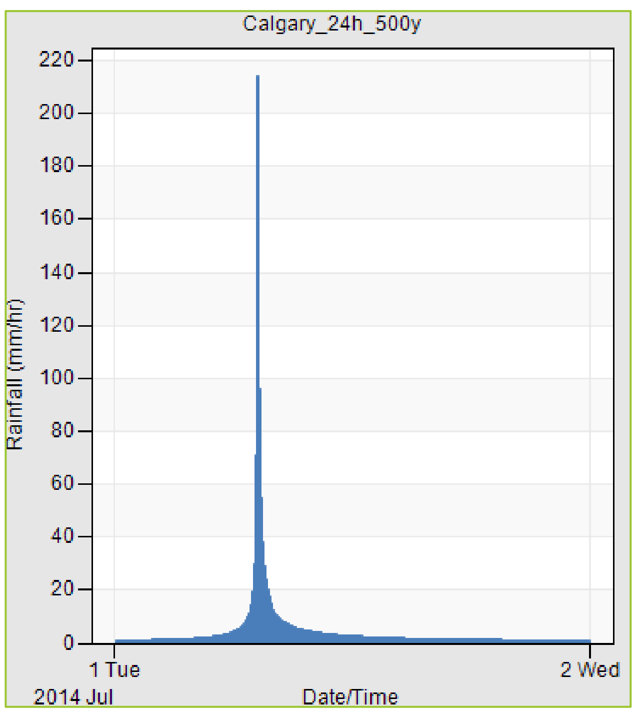


Figure 3-2: 1-in-500-year design storm hyetograph

3.2.6 Continuous Simulation

The continuous simulation precipitation data used in the model was obtained from the City of Calgary open data source. The precipitation data is shown in Figure 3-2.

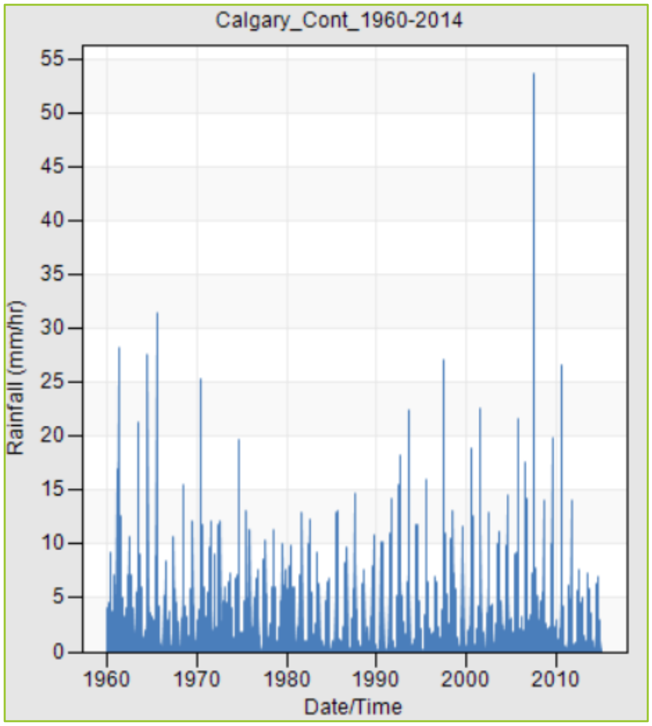


Figure 3-3: Hourly precipitation data from 1960 to 2014

3.3 Pre-Development Analysis

3.3.1 Catchment Delineation and Flow Routing

First, the existing pre-development drainage conditions were identified using onsite survey data gathered by CIMA+, waterbody features data obtained from the Alberta Open Data portal, and 1 m LiDAR elevation data from the High Resolution Digital Elevation Model (HRDEM) dataset from the Government of Canada.

The LiDAR and stream data were processed using the in-built watershed delineation tool on PCSWMM with an average catchment size of 1.0 hectare. A small catchment size was used to discretize the data and ensure that drainage boundaries were adequately captured. The smaller catchment areas were then manually combined based on the hydraulic routing outlet (section of the stream they contributed to) to determine the total pre-development catchments. The pre-development catchments are described in Section 2.1.

Note that local storage within the catchments, such as in depressions, ponds, and upstream of culverts was not considered. Culvert crossing data was not available. However, flow length, which represents the average length of overland sheet flow in a catchment before flow becomes channelized, was conservatively set high to increase the amount of infiltration losses in the catchment before entering the stream and thereby reduce the observed runoff. No flow data was available for the north and south streams for model calibration.

3.4 Post-Development Analysis

3.4.1 Catchment Delineation and Flow Routing

The post-development catchments were manually delineated based on the ASP concept and are shown in Figure 2-4. The flow lengths were estimated based on general lot sizes and distance between catch basins.

3.4.2 Irrigation

To consider for irrigation and stormwater use during the continuous simulation, it was assumed that 71.7 ha of predevelopment area in the northeast of the study area would use irrigation. The irrigation was included to account for the maximum pond volumes.

The irrigation demand is based on an assumed 4 mm/day and irrigation occurring through 153 days per year (May to September). The total demand per season is estimated below.

Annual Irrigation Demand = ((4 mm/day × 0.001 m/mm × 153 days × 71.7 ha × 10,000 m^2/ha) ÷ 0.65) = 675,083 m^3

This demand was then used to model the pumping rate needed in the model. The pump was assumed to be continuous at the single speed. Further detailed design of the pump system will need to be provided at the SMDP or pond report phase. For now, the pumping rate was calculated below. The pumping rate assumes that pond will provide water for 5 hours per day and 7 days per week.

Pumping Rate = 506,312 m^3 ÷ (153 days × 5 hr/day × 3600 s/hr) = 0.245 m^3/s

Irrigation was set to occur when the pond water level elevations are between 2 m (lower normal water level, LNWL) and 4 m (0.5 m above the upper normal water level, UNWL) to utilize more of the stored volume in the pond for irrigation and reduce the overall discharge to the streams. Irrigation was turned off in the single event simulation.

3.4.3 Pond Sizing

To complete the modelling of the storm pond volumes, preliminary pond sizes were necessary. The pond curve used for this model was developed based on recommended depths and side slopes from the City of Calgary Stormwater Management & Design Manual (2011). Since irrigation was used in the continuous simulation, the pond employed a water use zone between the lower and upper normal water level (LNWL and UNWL).

The preliminary pond curve information is given in Table 3.6 below. The water level depth at the start of both the single-event and continuous simulations was set at the 2.75 m (halfway between the LNWL and UNWL). This is because the average depth in the pond through multiple iterations of the continuous simulation was found to be approximately 2.75 m.

Table 3.6: Preliminary pond stage-storage rating data

Stage	Elevation (m)	Depth (m)	Pond Area (m^2)	Incremental Storage (m3)	Total Storage (m^3)	Active Storage (m^3)
Pond Bottom	1019.5	0.0	43,125	-	0	-
	1020.5	1.0	47,925	45,525	45,525	-
LNWL	1021.5	2.0	52,925	50,425	95,950	-
	1022.0	2.5	55,500	27,106	123,056	-
UNWL	1023.0	3.5	60,800	58,150	181,206	0
	1024.0	4.5	66,300	63,550	244,756	63,550
HWL	1025.0	5.5	72,000	69,150	313,906	132,700
Freeboard	1025.5	6.0	74,925	36,731	350,638	169,431

3.4.4 Pond Discharge

The primary means of discharge from the storm pond will likely be via one or more orifices located at different water level elevations in the pond's outlet control structure, and pumps. The final discharge regime should be finalized through detailed design with due consideration for the downstream receiving streams and waterbodies.

For this MDP, two conceptual discharge mechanisms were modelled:

- A 1.0 m wide × 0.4 m high rectangular orifice with invert elevation 1023.0 m (UNWL), directed to the north stream
- A pumped discharge to the south stream, ranging from 0.55 m^3/s to a maximum of 2.2 m^3/s, based on the water level elevation in the pond

The orifice and pump were sized such that the peak flows, when the main pond water level is at the HWL, do not exceed the targets set from the pre-development analysis (see Sections 2.4 and 4.1).

4. Analysis and Results

The results of the stormwater models are presented below for both pre-development and post-development conditions. The pre-development models were used to determine the release rate, while the post-development models were used to validate the preliminary pond sizing and drainage strategy against those targets.

4.1 Pre-development

Table 4.1 shows the estimated peak outflows from the north and south streams in the pre-development model at the eastern edge (outflow boundary) of the study area, where runoff from the study area and upstream catchments was routed into the streams. The post-development peak flow targets were set based on the results from the pre-development analysis and are summarized in Table 4.2.

Table 4.1: North and south streams peak flow

Stream	Total Contributing Area (ha)	Peak Flow (L/s)	Peak Flow (L/s/ha)
North	1651	18500	11.2
South	207	2212	10.7

Table 4.2: Post-development targets

Stream	Contributing within study area (ha)	Peak Flow (L/s/ha)	Peak Flow (L/s)
North	246	11.2	2,755
South	207	10.7	2,215
Total	**453**	**11.0**	**4,970**

4.2 Post-development

The post-development ASP concept is shown in Figure 2-3. A storm pond is proposed at the eastern edge of the study area to manage flows from approximately 381 ha of development, including the pond (SC-1, SC-2, and SC-POND). Approximately 72 ha in the northeast portion of the study area will be retained in the pre-development condition for stormwater irrigation (SC-3).

The north stream is proposed to be retained in its pre-development state to allow flow-through of runoff from upstream areas. The section of the south stream within the ASP will be removed.

Discharge from the storm pond will be delivered to two outfalls – one at the north stream and the other at the south stream at the boundary of the study area. The final discharge method, flow rates, and volumes will be confirmed during detailed design, based on the capacity of the receiving streams and downstream water bodies.

For this MDP, the retained lands (SC-3) were modelled as draining to the north stream by gravity. The uncontrolled peak flow rate from SC-3 is 1,221 L/s. Therefore, the gravity discharge orifice from the storm pond to the north stream was sized for a peak flow of 1,534 L/s. Similarly, the peak discharge from the pond to the south stream was facilitated through a pump control link, with a peak flow of 2,200 L/s.

4.2.1 Stormwater Quality

At this stage of study, the stormwater quality enhancement method has not been finalized. The pond should incorporate an oil-grit separator (OGS), a forebay, or an equivalent treatment system at the inlet to meet statutory water quality requirements (see Section 2.4). A detailed design of the OGS or forebay, including treatment efficiency, will be required at a later phase (Staged Master Drainage Plan or Pond Report).

4.2.2 Pond Capacity

Table 4.3 summarizes the performance of the proposed storm pond (see Section 3.3) during the 1-in-100-year design storm and the continuous simulation using hourly rainfall data from 1960 to 2014.

Table 4.3: Storage volume requirements for the proposed storm pond

Parameter	Value
Maximum total volume below HWL (m3)	313,906
Design HWL depth from pond bottom (m)	5.50
Pond volume during the 1-in-100-year design storm event (m3)	286,800
Peak depth in the pond during 100-year simulation (m)	5.12
Maximum pond volume during continuous simulation (m3)	307,900
Peak depth in the pond during continuous simulation (m)	5.42
Statistical 1-in-100-year volume (Pearson III) from continuous simulation (m3)	307,000
Depth corresponding to statistical 100-year volume (m)	5.40

4.2.2.1 Frequency Analysis

In addition to the computer models, the results of the continuous simulation were used to complete a statistical analysis, to estimate the 1:100-year storage volume requirement based on the continuous simulation results.

The annual volume data from the models were input into Hyfran and the City of Calgary's Data and Frequency Analysis Spreadsheet for analysis. The Pearson III distribution showed the best fit among all followed by Log Pearson III. Based on the results of the numerical and visual goodness-of-fit, the Pearson III distribution is chosen. The Pearson III distribution graph is shown in Figure 4-1.

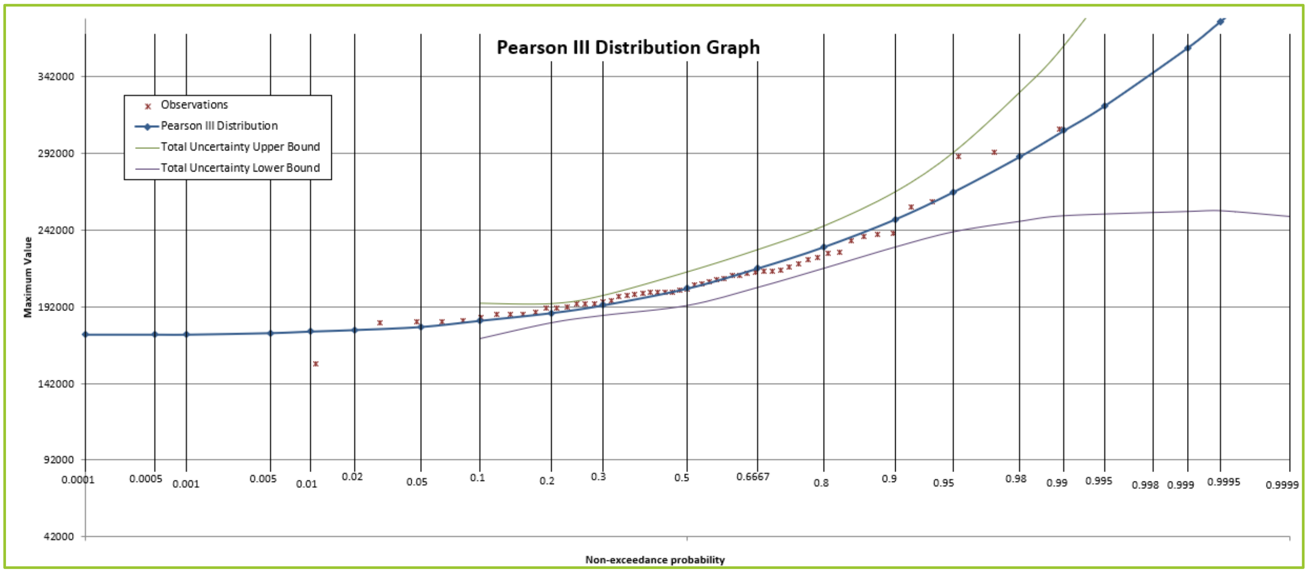


Figure 4-1: Visual goodness fit for Pearson III distribution graph using CoC Data and Frequency Sheet

More information regarding the data and frequency analysis for the pond can be found in Appendix E.

The total volumes from the 100-year event, the continuous simulation, and statistical 100-year event are less than the pond's total storage volume. Therefore, the pond is adequately sized to contain runoff from these events.

Figure 4-2 and Figure 4-3 show the pond depth and volume results from the continuous simulation for reference.

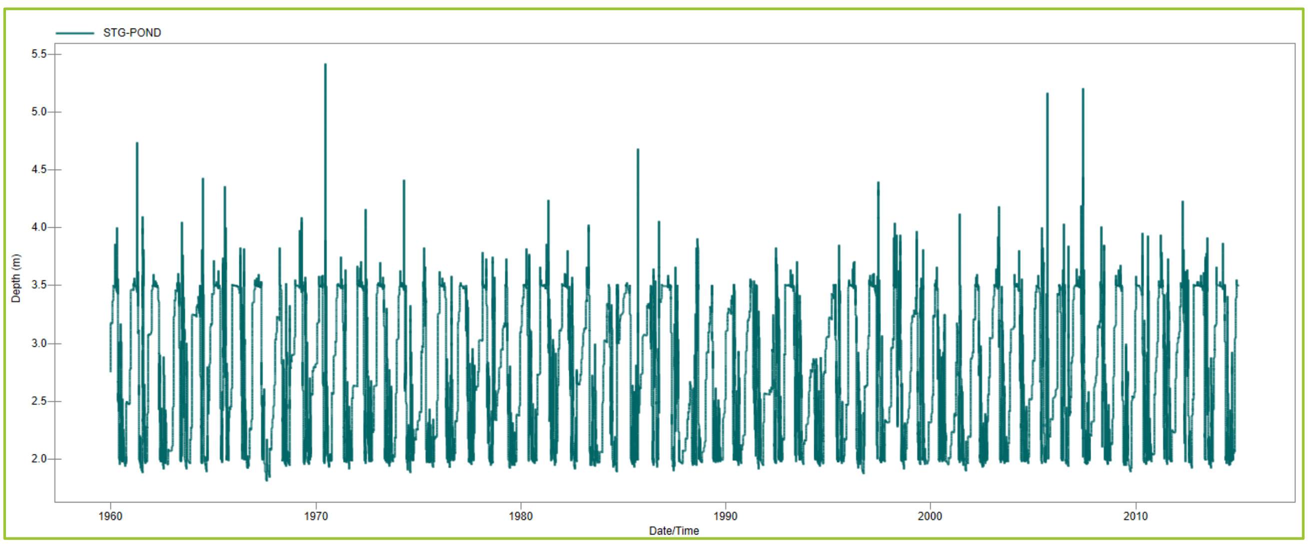


Figure 4-2: Pond depth results from continuous simulation

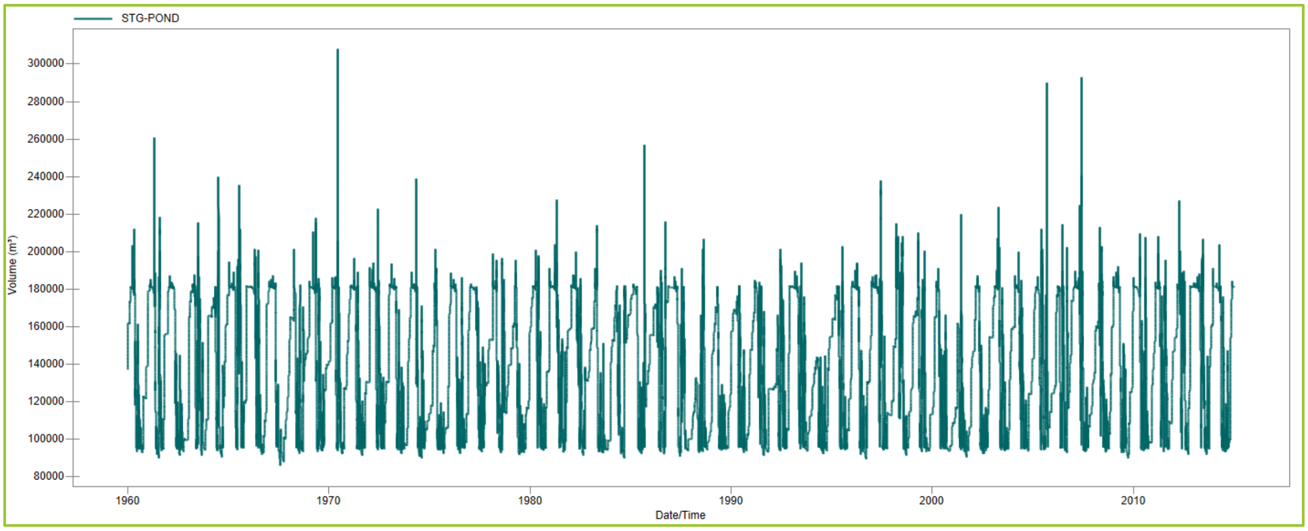


Figure 4-3: Pond volume results from continuous simulation

4.2.3 Release Rate

The peak flows to the north and south streams from the 100-year simulation are shown in Table 4.4.

Table 4.4: Peak discharge into the north and south flows during the 100-year simulation

Outfall	Stream	Allowable Peak Flow (L/s)	Observed Peak Flow (L/s)
OF-N-1 (Natural area SC-3 to north stream)	North	2,755	1,221
OF-N-2 (Gravity discharge from pond to north stream)	North	2,755	1,336
OF-S-1 (Pumped discharge from pond to south stream)	South	2,215	2,200
Total		**4,970**	**4,757**

The total peak discharges to the north and south streams are within the allowable limits, and therefore, the release rate targets have been met.

4.2.4 Runoff Volume

While no runoff volume target was adopted for the study area, the City of Calgary Industry Bulletin – Update for Watersheds with Voluntary Targets (2018) suggests a voluntary runoff volume target of 40 mm for development areas outside the Nose Creek watershed, Pine Creek watershed, and the Western Headworks Canal direct discharge area.

The study area is located outside the above noted watersheds, and therefore, a voluntary 40 mm annual average release volume (AARV) target was considered. The total offsite runoff from the study area during the continuous simulation is provided in Table 4.5.

Table 4.5: Total runoff volumes into the north and south streams in the continuous simulation

Outfall	Stream	Contributing Area within study area (ha)	Total Volume (m3)	AARV over 55 years (mm/year)
OF-N-1 (Natural area SC-3 to north stream)	North	246	166,200	1.23
OF-N-2 (Gravity discharge from pond to north stream)	North	246	1,396,500	10.32
OF-S-1 (Pumped discharge from pond to south stream)	South	207	6,819,000	59.89
Total		**453**	**8,381,700**	**33.64**

4.2.5 Emergency Escape

Since a viable emergency escape route has not been identified, the 1-in-500-year design storm was simulated. The pond was found to flood under this condition. The pond can be modified to contain this event. Alternatively, a suitable emergency escape route should be identified and analyzed to ensure sufficient capacity for events exceeding the 1-in-100-year design event.

5. Conclusion and Recommendations

The proposed development of the Kineticor ASP lands in Rocky View County includes approximately 448 ha of land, with 381 ha designated for development and 72 ha retained in a pre-development condition for stormwater irrigation with total study area of 453 ha. The study area drains to two natural streams, one to the north and one to the south. The north stream drains directly to Graham Reservoir, while the south stream drains to an unnamed pond that is also connected with the Graham Reservoir via a canal. The south stream within the ASP boundary will be removed, while the north stream will be retained to convey upstream flows.

Stormwater runoff from the developed areas will be managed through a stormwater management facility (SWMF) located at the eastern edge of the study area. The SWMF will attenuate post-development peak flows to match pre-development conditions, with target release rates of 11.2 L/s/ha to the north stream and 10.7 L/s/ha to the south stream. The facility will also support stormwater use through irrigation of the retained lands.

Hydrologic modelling was completed using PCSWMM for both single-event (1:100-year and 1:500-year) and continuous simulations (1960–2014). The pond was sized to accommodate runoff volumes from both simulations. A 1:500-year event was also modelled to assess emergency escape needs, and the pond was found to flood under this condition, indicating that a defined emergency escape route is required.

Stormwater quality treatment will be provided through an oil-grit separator (OGS), forebay, or equivalent system, to meet the 85% TSS removal target for particles ≥50 μm, in accordance with the City of Calgary guidelines. Further design of the treatment system will be completed at the SMDP or pond report stage.

Low Impact Development (LID) practices and best management practices (BMPs) such as absorbent landscaping, vegetated swales, and roof disconnection have been identified as potential strategies to reduce runoff volume and improve water quality. A voluntary annual average release volume (AARV) target of 40 mm was considered based on the watershed location.

5.1 Conclusion

The stormwater management strategy for the Kineticor ASP lands has been developed in accordance with the Rocky View County Servicing Standards (2025) and the City of Calgary Stormwater Management and Design Manual (2011). The proposed SWMF is preliminarily sized to meet peak flow and volume control requirements under both single-event and continuous conditions. The strategy includes provisions for stormwater use, water quality treatment, and future integration of LID measures.

Further work is required at the SMDP and detailed design stages to:

- Finalize the pond outlet structure and discharge configuration.
- Confirm the capacity of downstream receiving streams.
- Identify and design a viable emergency escape route.
- Complete detailed design of the stormwater quality treatment system.

5.2 Recommendations

The following recommendations are made to guide future phases of stormwater management planning and design for the Kineticor ASP lands:

- Confirm the final release rates through detailed design to ensure compliance with the pre-development targets of 11.2 L/s/ha (north stream) and 10.7 L/s/ha (south stream).
- Finalize the storm pond outlet configuration, including orifice and pump design, based on downstream capacity and operational requirements.
- Identify and design a viable emergency escape route to safely convey flows during events exceeding the 1:100-year design storm.
- Complete detailed design of the stormwater quality treatment system, including oil-grit separators (OGS), forebays, or equivalent technologies, to meet the 85% TSS removal target for particles ≥50 µm.
- Incorporate Low Impact Development (LID) and Best Management Practices (BMPs) such as absorbent landscaping, vegetated swales, and roof disconnection to reduce runoff volume and improve water quality.
- Confirm the feasibility of stormwater use for irrigation, including pump system design and compliance with Alberta Health Services (AHS) guidelines for water use.
- Integrate findings from future geotechnical, hydrogeological, and environmental studies to refine stormwater infrastructure design and assess the suitability of LID practices.
- Verify downstream conveyance capacity of the north and south streams and assess potential impacts of concentrated flows or erosion at discharge locations.
- Update the stormwater model as the ASP concept plan is refined and neighbourhood-level planning progresses, ensuring alignment with Rocky View County and City of Calgary standards.

6. References

Alberta Environment and Parks. (2010). Base Waterbody Polygon Arc. Retrieved from https://open.alberta.ca/dataset/gda-a2216d84-77ab-4f65-ab34-03434442cf32

Alberta Environment and Protected Areas. (2024). Base Waterbody Polygon Update. Retrieved from https://open.alberta.ca/opendata/gda-475e5500-dfd5-4835-9adb-a1f80c183b5c.

Alberta Environment and Protected Areas. (2024). Municipal Policy and Procedures Manual, Version 2.0.

Alberta Environment and Sustainable Resource Development. (2013). Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems - Part 5 Stormwater Management Guidelines

Alberta Environmental Protection. (1999). Stormwater Management Guidelines for the Province of Alberta.

Alberta Health Services. (2021). Public Health Guidelines for Water Use and Stormwater Use.

City of Calgary. (2011). Stormwater Management & Design Manual.

City of Calgary. (2018). Industry Bulletin – Update for Watersheds with Voluntary Targets.

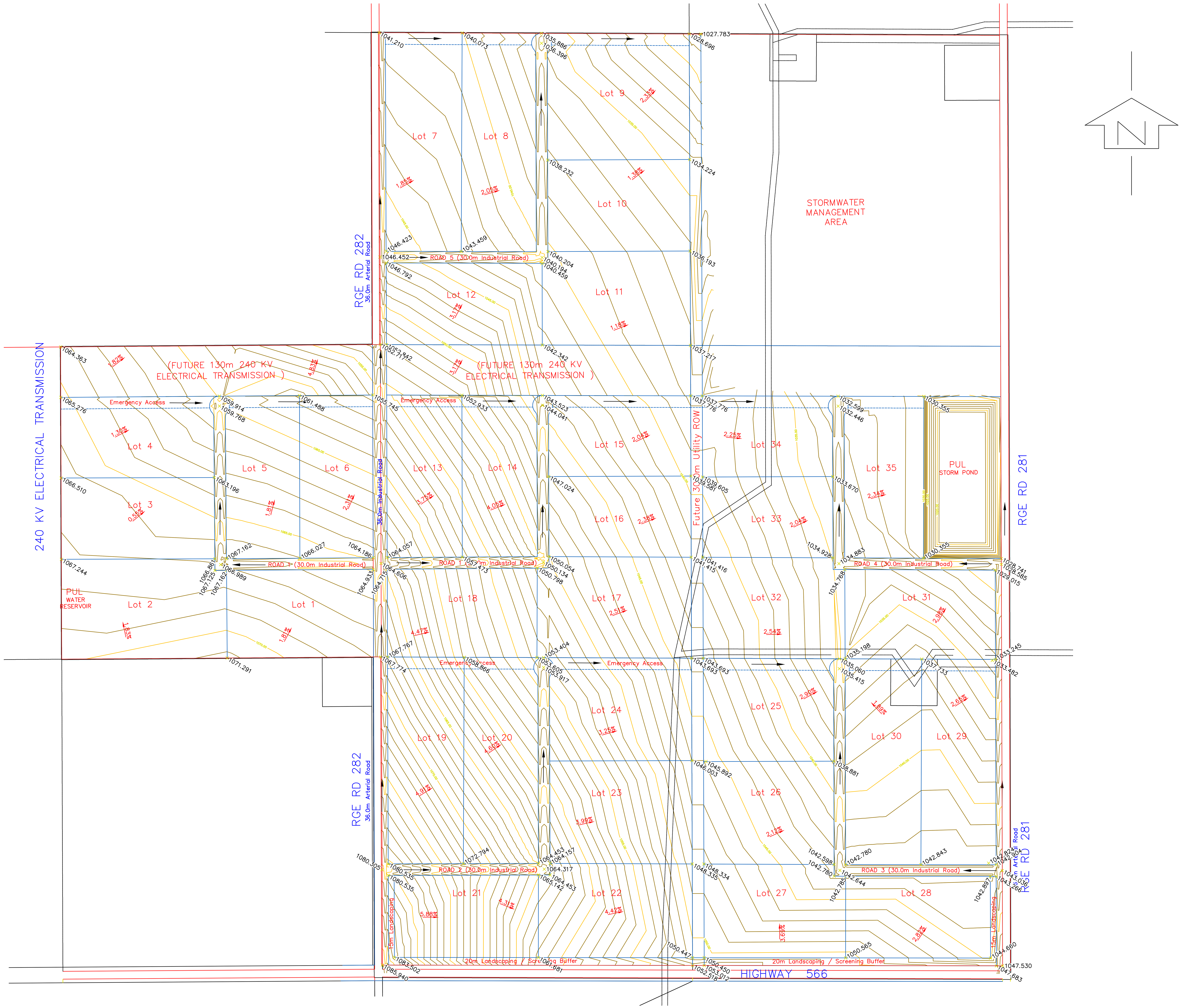
Natural Resources Canada. (2025). High Resolution Digital Elevation Model (HRDEM) – CanElevation Series. Retrieved from https://open.canada.ca/data/en/dataset/957782bf-847c-4644-a757-e383c0057995.

Red Deer River Watershed Alliance. (2009). Red Deer River State of the Watershed Report - Rosebud Subwatershed.

Rocky View County. (2025). Servicing Standards.

A

Appendix A
Engineering Drawings



KINETICOR

ROCKY VIEW COUNTY, ALBERTA

PRELIMINARY DESIGN GRADES

LEGEND

DATE : JULY 17, 2025	SCALE : 1:5000

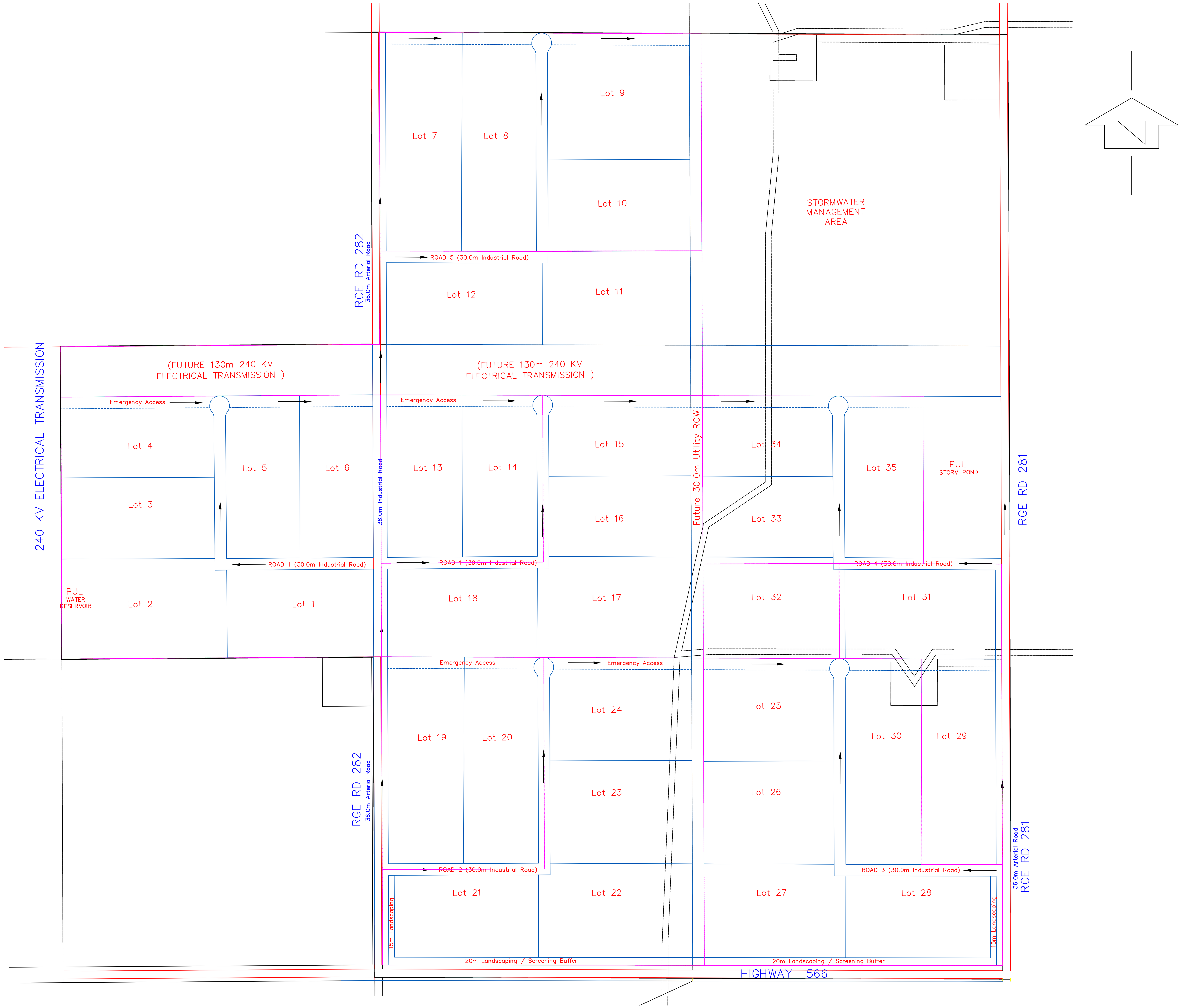
PROJECT No : Z0026600	CUTFILL PLAN

KINETICOR

ROCKY VIEW COUNTY, ALBERTA

PRELIM DESIGN
STORM CATCHMENTS AREAS

LEGEND



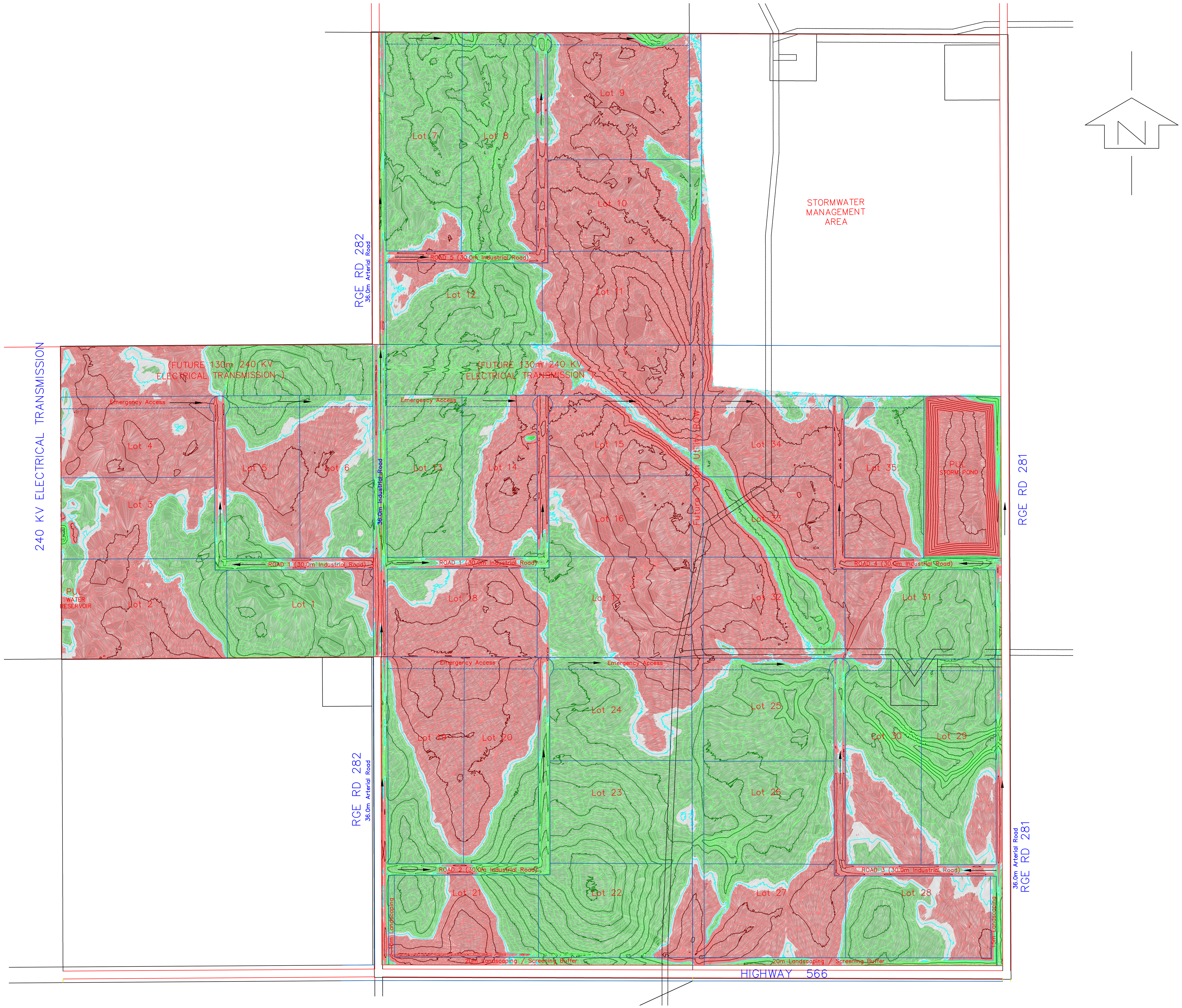
DATE : JULY 17, 2025	SCALE : 1:5000

PROJECT No : Z0026600	CUTFILL PLAN

KINETICOR

ROCKY VIEW COUNTY, ALBERTA

CUT / FILL CONTOURS
LIDR TOPO vs DG



LEGEND

- MAJOR CUT CONTOUR 0.50 METRE INTERVAL — 0.50
- MINOR CUT CONTOUR 0.10 METRE INTERVAL
- MAJOR FILL CONTOUR 0.50 METRE INTERVAL — 0.50
- MINOR FILL CONTOUR 0.10 METRE INTERVAL
- ZERO CONTOUR — 0.00
- EARTHWORKS WITHIN 0.150m TOLERANCE
- EARTHWORKS < 0.150m HIGH (CUT REQUIRED)
- EARTHWORKS > 0.150m LOW (FILL REQUIRED)

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
VOL-OG vs DG	**1.000**	**1.000**	3810301.75sq.m	2970623.57 Cu. M.	3026816.06 Cu. M.	56192.49 Cu. M.<Fill>
Totals			3810301.75sq.m	2970623.57 Cu. M.	3026816.06 Cu. M.	56192.49 Cu. M.<Fill>

DATE : JULY 17, 2025 | SCALE : 1:5000

PROJECT No : Z0026600 | CUTFILL PLAN

B

Appendix B
Statistical Analysis

DFASCC

Data and Frequency Analysis Spreadsheet for the City of Calgary
Version 1.2

PROJECT INFORMATION SHEET

Project Name:	Kineticor Master Drainage Plan
Project Description:	Stormwater MDP and conceptual pond for Kineticor ASP
Location:	Rocky View County
Date:	2025-07-22
Designed by:	Ajay Muthukumar
Company Name:	CIMA+
Reviewed by:	JF Chenier

Clear Project Information Sheet

Hydrologic Data Series Input

NOTES

- This Spreadsheet is designed for a maximum of 1,000 entries (if more are required then formulas need to be adjusted)
- Input dataset must be based on uniform time distribution (i.e.: daily, weekly, monthly, yearly) and must not include multiple values for any of the time steps (duplicates highlighted in red)
- Input dataset must not have any missing cells of data (cells with "0" will be treated as having a value of 0)
- Only positive values should be used
- Please refer to **Section 2.2 of the Frequency Analysis Procedure for Stormwater Design Manual** for Data Series Characteristics detailed descriptions.

Index	Date	Value	Empirical Probability of Non-Exceedance
1	1960	212200	0.609
2	1961	260700	0.935
3	1962	187200	0.138
4	1963	215600	0.699
5	1964	239900	0.899
6	1965	235400	0.844
7	1966	201300	0.409
8	1967	187200	0.156
9	1968	201500	0.428
10	1969	217900	0.736
11	1970	307900	0.989
12	1971	196300	0.319
13	1972	222500	0.772
14	1973	193700	0.246
15	1974	239000	0.880
16	1975	201600	0.446
17	1976	188600	0.174
18	1977	183000	0.083
19	1978	199000	0.337
20	1979	195300	0.301
21	1980	200800	0.391
22	1981	227500	0.826
23	1982	199800	0.355
24	1983	214000	0.645
25	1984	182000	0.047
26	1985	257000	0.917
27	1986	216000	0.717
28	1987	191000	0.192
29	1988	206600	0.518
30	1989	181600	0.029
31	1990	182000	0.065
32	1991	185000	0.101
33	1992	201600	0.464
34	1993	194200	0.283
35	1994	154800	0.011
36	1995	203000	0.482
37	1996	193800	0.264
38	1997	238000	0.862
39	1998	215100	0.681
40	1999	210300	0.591
41	2000	191300	0.210
42	2001	219900	0.754
43	2002	187100	0.120
44	2003	224000	0.790
45	2004	200000	0.373
46	2005	290200	0.953
47	2006	214500	0.663
48	2007	293000	0.971
49	2008	212800	0.627
50	2009	192000	0.228
51	2010	209600	0.572
52	2011	208400	0.554
53	2012	227000	0.808
54	2013	206700	0.536
55	2014	203800	0.500

Clear All Input Data

Basic Characteristics	
Number of Data Entries	55
Maximum Value	308000
Minimum Value	155000
Average (Mean) Value	211000
Median Value	204000
Standard Deviation	28500
Variance	812000000
Variation coefficient (Cv)	0.135
Skewness coefficient (Cs)	1.53
Kurtosis	5.49

*Values assumed to be sample not full population

Empirical Probability of Non-Exceedance (Plotting Position) based on:
$F(x(k)) = (k-a)/ (n-2a+1)$, $0 <= a <= 0.5$

a = 0.4 Cunnane (1978)
k= rank of the even in question (in ascending order)
n= 55

Summary Sheet

Initial Statistical Tests:

Tests for Stationarity

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

Tests for Homogeneity

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

Tests for Independence

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

Test for Outliers

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

Project Information

Project Name:	Kineticor Master Drainage Plan
Project Description:	Stormwater MDP and conceptual pond for Kineticor ASP
Location:	Rocky View County
Date:	2025-07-22
Designed by:	Ajay Muthukumar
Company Name:	CIMA+
Reviewed by:	JF Chenier

Numerical Goodness-of-fit Tests Results

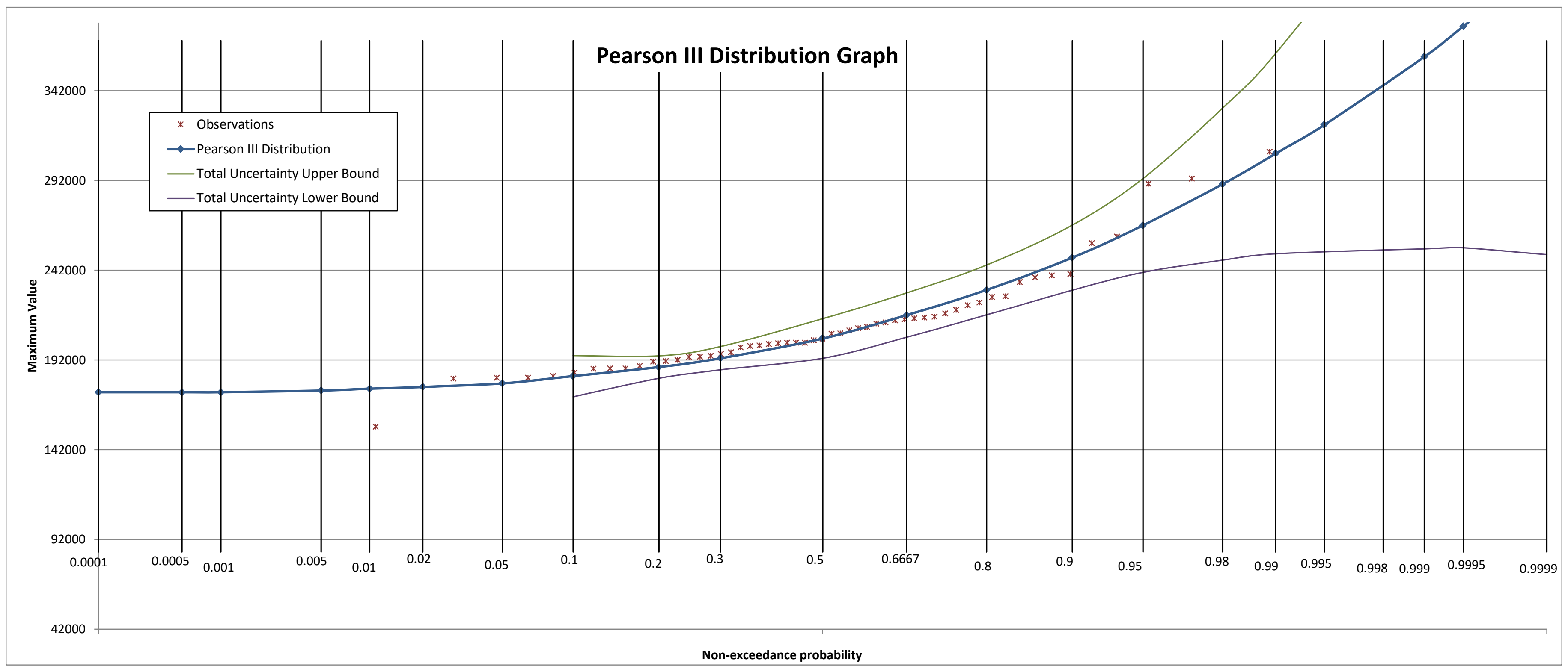
Distribution Type	Numerical Goodness-of-fit Tests from Spreadsheet			Average of Ranks	Ranking from Numerical Tests	Numerical Goodness-of-fit Tests from Hyfran (Input by user)		Notes from Visual Goodness-of-fit Test
	A-D Test	K-S Test	Least Squares Ranking			BIC	AIC	
Normal	7	7	7	7.00	8			
Lognormal	6	6	6	6.00	6			
Lognormal III	4	5	5	4.67	5			
Exponential	9	9	9	9.00	10			
Pearson III	1	3	2	2.00	1			
Log Pearson III	5	1	1	2.33	2			
Gumbel	3	4	3	3.33	4			
GEV	2	2	4	2.67	3			
Weibull	8	8	8	8.00	9			
Gamma		10	10	6.67	7			

Selected Distribution and Results

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

Return Period	Probability	Magnitude	Total Uncertainty (Upper Bound)	Total Uncertainty (Lower Bound)
10000	0.9999	415000	579000	251000
2000	0.9995	378000	502000	255000
1000	0.9990	361000	468000	254000
500	0.9980	345000	437000	254000
200	0.9950	323000	393000	253000
100	0.9900	307000	363000	251000
50	0.9800	290000	332000	248000
20	0.9500	267000	293000	241000
10	0.9000	249000	267000	231000
5	0.8000	231000	245000	217000
3	0.6667	217000	229000	205000
2	0.5000	204000	215000	193000
1.4286	0.3000	193000	200000	187000
1.25	0.2000	188000	194000	182000
1.1111	0.1000	183000	195000	172000
1.0526	0.0500	179000	#N/A	#N/A
1.0204	0.0200	177000	#N/A	#N/A
1.0101	0.0100	176000	#N/A	#N/A
1.005	0.0050	175000	#N/A	#N/A
1.001	0.0010	174000	#N/A	#N/A
1.0005	0.0005	174000	#N/A	#N/A
1.0001	0.0001	174000	#N/A	#N/A

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



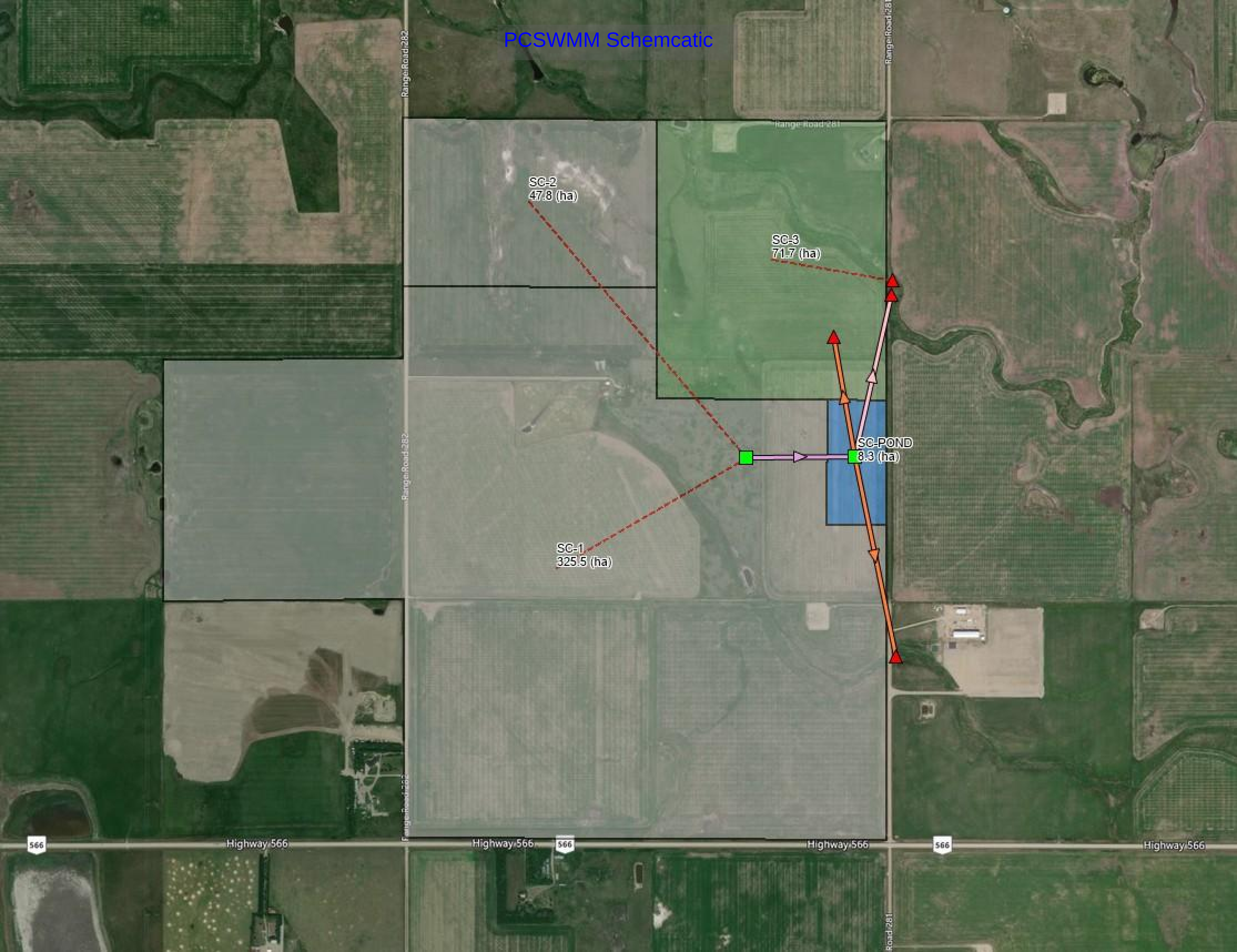
Errors and Warnings

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

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

C

Appendix C
PCSWMM Input and Output



PCSWMM Schemcatic
SC-2
47.8 (ha)
SC-3
71.7 (ha)
SC-POND
8.3 (ha)
SC-1
325.5 (ha)
Range Road 282
Range Road 281
Highway 566
566

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

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

START_DATE             07/01/2014
START_TIME             00:00:00
REPORT_START_DATE      07/01/2014
REPORT_START_TIME      00:00:00
END_DATE               07/07/2014
END_TIME               23:00:00
SWEEP_START            01/01
SWEEP_END              12/31
DRY_DAYS               0
REPORT_STEP            00:05:00
WET_STEP               00:00:05
DRY_STEP               00:00:05
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                12

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.10    0.38    1.12    2.40    3.61    4.57    4.99    4.00    2.24    0.99
0.27   0.07
DRY_ONLY         NO

[TEMPERATURE]
TIMESERIES    YYC_Temp
WINDSPEED     MONTHLY    14.8 14.6 15. 16.5 16.6 15.6 14 13.2 14.1 14.6 13.7 14.9
SNOWMELT               0 0.5 0.6 1000 51 0.0
ADC           IMPERVIOUS 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
ADC           PERVIOUS   0.1 0.35 0.53 0.66 0.75 0.82 0.87 0.92 0.95 0.98

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Calgary_24h_100y INTENSITY 0:05     1.0      TIMESERIES Calgary_24h_100y
Calgary_Cont_1960-2014 INTENSITY 1:00     1.0      TIMESERIES YYC_Precipitation
IDE_SC-3_Rainfall INTENSITY 1:00     1.0      FILE       "C:\0-
AM_Files\Projects\Kineticor Final\IDE tool_SC-3_irr.dat" 1001093    MM
```

```
[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------
- -------- ----------------
SC-1             Calgary_24h_100y STG-DEVELOPMENT  325.5    75.5     32550    3
0        Snowpack1
SC-2             Calgary_24h_100y STG-DEVELOPMENT  47.8     75.5     4780     3
0        Snowpack1
SC-3             Calgary_24h_100y OF-N-1           71.7     0        1434     4
0        Snowpack2
SC-POND          Calgary_24h_100y STG-POND         8.3      86.75    1660     20
0        Snowpack2

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- --
--------
SC-1             0.015      0.25       1.6        3.2        0          PERVIOUS   30
SC-2             0.015      0.25       1.6        3.2        0          PERVIOUS   30
SC-3             0.015      0.25       1.6        5          0          PERVIOUS
100
SC-POND          0.015      0.25       1.6        3.2        100        OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
SC-1             75         7.5        4.14       7          0
SC-2             75         7.5        4.14       7          0
SC-3             75         7.5        4.14       7          0
SC-POND          75         7.5        4.14       7          0

[SNOWPACKS]
;;Name           Surface    Parameters
;;-------------- ---------- ----------
Snowpack1        PLOWABLE   0.05       0.2        0.0        0.10       0.00
0.00       0.3
Snowpack1        IMPERVIOUS 0.05       0.2        0.0        0.10       0.00
0.00       25
Snowpack1        PERVIOUS   0.05       0.2        0.0        0.10       0.00
0.00       100
Snowpack1        REMOVAL    25         0.0        0.0        0.5        0.0
0.0
Snowpack2        PLOWABLE   0.05       0.2        0.0        0.10       0.00
0.00       0.0
Snowpack2        IMPERVIOUS 0.05       0.2        0.0        0.10       0.00
0.00       25
Snowpack2        PERVIOUS   0.05       0.2        0.0        0.10       0.00
0.00       100
Snowpack2        REMOVAL    25         0.0        0.0        0.0        0.0
0.0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF-IRRIGATION    1025       FREE                        NO
OF-N-1           1018       FREE                        NO
OF-N-2           1022.5     FREE                        NO
OF-S-1           1033       FREE                        NO

[STORAGE]
```

```
;;Name           Elev.    MaxDepth   InitDepth  Shape       Curve Name/Params
SurDepth Fevap    Psi       Ksat      IMD
;;-------------- --------- ---------- ---------- ----------- -------------------------
--- --------- --------- --------- --------- ---------
STG-DEVELOPMENT  1025     0.3        0          FUNCTIONAL  280000    0         0
0        1
STG-POND         1019.5   5.5        2.75       TABULAR     Curve-STG-POND-5.5
0      1
```

[PUMPS]

```
;;Name           From Node        To Node          Pump Curve       Status   Startup
Shutoff
;;-------------- ---------------- ---------------- ---------------- -------- --------
--------
P-IRRIGATION     STG-POND         OF-IRRIGATION    Curve-irrigation-100 OFF  2.01
2
P-POND-OUT       STG-POND         OF-S-1           Curve-discharge  OFF      3.51
3
```

[ORIFICES]

```
;;Name           From Node        To Node          Type         Offset     Qcoeff
Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ----------
-------- ----------
OR-POND-OUT      STG-POND         OF-N-2           SIDE         1023       0.65
YES      0
```

[OUTLETS]

```
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------- ------
---------- ---------- --------
OL-POND-IN       STG-DEVELOPMENT  STG-POND         1025       TABULAR/DEPTH    Curve-
OL-IN-90-l/s/ha            YES
```

[XSECTIONS]

```
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- -----
----- ----------
OR-POND-OUT      RECT_CLOSED  0.4              1          0          0
```

[CONTROLS]

```
RULE 1
IF SIMULATION MONTH >= 5
AND SIMULATION MONTH <= 9
AND SIMULATION CLOCKTIME >= 00:00:00
AND SIMULATION CLOCKTIME < 05:00:00
THEN PUMP P-IRRIGATION STATUS = ON
ELSE PUMP P-IRRIGATION STATUS = OFF
```

[CURVES]

```
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Curve-discharge  Pump2      0          0
Curve-discharge             3.5        0
Curve-discharge             3.51       0.55
Curve-discharge             4          0.55
Curve-discharge             4.01       1.1
Curve-discharge             4.5        1.1
Curve-discharge             4.51       1.65
Curve-discharge             5          1.65
Curve-discharge             5.01       2.2
```

```
Curve-discharge             5.5        2.2

Curve-irrigation-100 Pump2      0          0
Curve-irrigation-100            5.5        0

Curve-Irrigation-Updated Pump2      0          0
Curve-Irrigation-Updated            2          0
Curve-Irrigation-Updated            2.01       0.245
Curve-Irrigation-Updated            4          0.245
Curve-Irrigation-Updated            4.01       0
Curve-Irrigation-Updated            5.5        0

Curve-Muni-Backup Rating     0          5
Curve-Muni-Backup            5          5

Curve-OL-IN-90-l/s/ha Rating     0          0
Curve-OL-IN-90-l/s/ha            0.2        33.6
Curve-OL-IN-90-l/s/ha            0.3        33.6

Curve-STG-POND   Storage    0          45500
Curve-STG-POND              5          72000

Curve-STG-POND-5.5 Storage    0          43125
Curve-STG-POND-5.5            1          47925
Curve-STG-POND-5.5            2          52925
Curve-STG-POND-5.5            2.5        55500
Curve-STG-POND-5.5            3.5        60800
Curve-STG-POND-5.5            4.5        66300
Curve-STG-POND-5.5            5.5        72000
Curve-STG-POND-5.5            6          74925

Curve-STG-POND-6 Storage    0          40800
Curve-STG-POND-6            1          45500
Curve-STG-POND-6            6          72000

[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

IDE_Withdrawal   FILE "C:\0-AM_Files\Projects\Kineticor Final\IDE
tool_PondWithdrawal.txt"

YYC_Precipitation FILE "C:\Users\Ajay.Muthukumar\Cima+\Z0026600-Kineticor-Hwy 566
North Calgary Site - Documents\_Documents\300_CONC_DES\399_Stormwater\PCSWMM\Precip
1960-2014.dat"

YYC_Temp         FILE "C:\Users\Ajay.Muthukumar\Cima+\Z0026600-Kineticor-Hwy 566
North Calgary Site -
Documents\_Documents\300_CONC_DES\399_Stormwater\PCSWMM\CalgTempHrly1960_2014.dat"

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

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

[TAGS]
Subcatch   SC-1             Developed
Subcatch   SC-2             Developed
Subcatch   SC-3             Undeveloped
Subcatch   SC-POND          Pond

[MAP]
DIMENSIONS       11723.78165      5675083.43005    14425.01535      5677730.90895
UNITS            Meters

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
OF-IRRIGATION    14093.209          5676880.175
OF-N-1           14287.972          5677069.091
OF-N-2           14285.091          5677021.142
OF-S-1           14302.232          5675813.051
STG-DEVELOPMENT  13801.186          5676473.424
STG-POND         14164.545          5676480.257

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

[POLYGONS]
```

```
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
SC-1             13498.632          5677046.219
SC-1             12647.703          5677046.341
SC-1             12650.248          5676805.025
SC-1             11846.565          5676798.811
SC-1             11849.474          5675994.149
SC-1             12652.92           5675999.973
SC-1             12655.809          5675205.662
SC-1             14270.572          5675203.77
SC-1             14270.572          5676253.596
SC-1             14069.867          5676254.433
SC-1             14070.993          5676671.22
SC-1             13500.068          5676672.762
SC-1             13498.632          5677046.219
SC-2             12647.703          5677046.341
SC-2             12646.12           5677610.569
SC-2             13496.342          5677605.354
SC-2             13498.632          5677046.219
SC-2             12647.703          5677046.341
SC-3             13500.068          5676672.762
SC-3             13496.342          5677605.354
SC-3             14265.915          5677601.944
SC-3             14269.307          5676670.684
SC-3             13500.068          5676672.762
SC-POND          14071.7            5676671.927
SC-POND          14269.307          5676670.684
SC-POND          14270.572          5676253.596
SC-POND          14069.867          5676254.433
SC-POND          14071.7            5676671.927

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

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

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


  *************
  Element Count
  *************
  Number of rain gages ...... 3
  Number of subcatchments ... 4
  Number of nodes ........... 6
  Number of links ........... 4
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                         Data       Recording
  Name                 Data Source                       Type       Interval 
  ------------------------------------------------------------------------
  Calgary_24h_100y     Calgary_24h_100y                  INTENSITY    5 min.
  Calgary_Cont_1960-2014 YYC_Precipitation                 INTENSITY   60 min.
  IDE_SC-3_Rainfall    C:\0-AM_Files\Projects\Kineticor Final\IDE tool_SC-3_irr.dat


  ********************
  Subcatchment Summary
  ********************
  Name                       Area     Width   %Imperv    %Slope Rain Gage            
Outlet                  
  -----------------------------------------------------------------------------------
-----------------------
  SC-1                     325.50  32550.00     75.50    3.0000 Calgary_24h_100y     
STG-DEVELOPMENT         
  SC-2                      47.80   4780.00     75.50    3.0000 Calgary_24h_100y     
STG-DEVELOPMENT         
  SC-3                      71.70   1434.00      0.00    4.0000 Calgary_24h_100y     
OF-N-1                  
  SC-POND                    8.30   1660.00     86.75   20.0000 Calgary_24h_100y     
STG-POND                


  ************
  Node Summary
  ************
                                           Invert      Max.    Ponded    External
  Name                 Type                 Elev.     Depth      Area    Inflow  
  -------------------------------------------------------------------------------
  OF-IRRIGATION        OUTFALL            1025.00      0.00       0.0
  OF-N-1               OUTFALL            1018.00      0.00       0.0
  OF-N-2               OUTFALL            1022.50      0.00       0.0
  OF-S-1               OUTFALL            1033.00      0.00       0.0
  STG-DEVELOPMENT      STORAGE            1025.00      0.30       0.0
  STG-POND             STORAGE            1019.50      5.50       0.0


  ************
  Link Summary
  ************
```

```
  Name              From Node         To Node           Type            Length    %Slope 
Roughness
  ---------------------------------------------------------------------------------------
---------
  P-IRRIGATION      STG-POND          OF-IRRIGATION     TYPE2 PUMP
  P-POND-OUT        STG-POND          OF-S-1            TYPE2 PUMP
  OR-POND-OUT       STG-POND          OF-N-2            ORIFICE
  OL-POND-IN        STG-DEVELOPMENT   STG-POND          OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of    
Full
  Conduit           Shape               Depth    Area     Rad.    Width  Barrels    
Flow
  ---------------------------------------------------------------------------------------
---


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... YES
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 07/01/2014 00:00:00
  Ending Date .............. 07/07/2014 23:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 00:05:00
  Wet Time Step ............ 00:00:05
  Dry Time Step ............ 00:00:05
  Routing Time Step ........ 5.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  *********************
  Rainfall File Summary
  *********************
  Station    First        Last         Recording   Periods    Periods    Periods
  ID         Date         Date         Frequency  w/Precip    Missing    Malfunc.
  -------------------------------------------------------------------------------
  1001093    01/02/1960   12/29/2014      60 min     45403          0          0


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

```
  Initial Snow Cover .......         0.000         0.000
  Total Precipitation ......        40.646        89.667
  Evaporation Loss .........         2.127         4.693
  Infiltration Loss ........        14.705        32.440
  Surface Runoff ...........        23.814        52.535
  Snow Removed .............         0.000         0.000
  Final Snow Cover .........         0.000         0.000
  Final Storage ............         0.000         0.000
  Continuity Error (%) .....        -0.000


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......        23.814       238.142
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........        19.216       192.160
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.353         3.535
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....        13.708       137.083
  Final Stored Volume ......        17.952       179.525
  Continuity Error (%) .....         0.001


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


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


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


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

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
SC-1	89.67	0.00	5.39	24.29	62.60	16.17	59.99	195.27	111.46	0.669
SC-2	89.67	0.00	5.39	24.29	62.60	16.17	59.99	28.67	16.37	0.669
SC-3	89.67	0.00	1.08	77.61	0.00	10.97	10.97	7.87	1.22	0.122
SC-POND	89.67	0.00	4.46	8.91	73.40	2.90	76.30	6.33	3.81	0.851

****
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
OF-IRRIGATION	OUTFALL	0.00	0.00	1025.00	0 00:00	0.00
OF-N-1	OUTFALL	0.00	0.00	1018.00	0 00:00	0.00
OF-N-2	OUTFALL	0.00	0.00	1022.50	0 00:00	0.00
OF-S-1	OUTFALL	0.00	0.00	1033.00	0 00:00	0.00
STG-DEVELOPMENT	STORAGE	0.00	0.21	1025.21	0 07:28	0.21
STG-POND	STORAGE	3.58	5.12	1024.62	0 09:55	5.12

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF-IRRIGATION	OUTFALL	0.000	0.000	0 00:00	0	0	0.000 ltr
OF-N-1	OUTFALL	1.221	1.221	0 07:40	7.87	7.87	0.000

OF-N-2	OUTFALL	0.000	1.366	0	09:55	0	72.5	0.000
OF-S-1	OUTFALL	0.000	2.200	0	08:49	0	112	0.000
STG-DEVELOPMENT	STORAGE	127.823	127.823	0	07:15	224	224	-0.000
STG-POND	STORAGE	3.811	34.378	0	07:22	6.33	366	0.001

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
STG-DEVELOPMENT	0.620	0.7	0.6	0.0	59.245	70.5	0 07:28	33.616
STG-POND	186.722	59.5	0.6	0.0	286.849	91.4	0 09:55	3.570

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF-IRRIGATION	0.00	0.000	0.000	0.000
OF-N-1	2.40	0.545	1.221	7.868
OF-N-2	16.75	0.720	1.366	72.469
OF-S-1	16.76	1.110	2.200	111.822
System	8.98	2.375	4.190	192.159

****

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
P-IRRIGATION	PUMP	0.000	0	00:00			
P-POND-OUT	PUMP	2.200	0	08:49		1.00	
OR-POND-OUT	ORIFICE	1.366	0	09:55			1.00
OL-POND-IN	DUMMY	33.600	0	07:22			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl

****
Conduit Surcharge Summary
****

No conduits were surcharged.

****
Pumping Summary
****

Pump	Percent Utilized	Number of Start-Ups	Min Flow CMS	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr	Power Usage Kw-hr	% Time Off Pump Curve Low	High
P-IRRIGATION	0.00	0	0.00	0.00	0.00	0.000	0.00	0.0	0.0
P-POND-OUT	16.76	1	0.00	1.11	2.20	111.822	2744.52	0.0	0.0

Analysis begun on: Mon Jul 21 20:59:59 2025
Analysis ended on: Mon Jul 21 21:00:01 2025
Total elapsed time: 00:00:02

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

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

START_DATE            01/01/1960
START_TIME            00:00:00
REPORT_START_DATE     01/01/1960
REPORT_START_TIME     00:00:00
END_DATE              12/31/2014
END_TIME              23:00:00
SWEEP_START           01/01
SWEEP_END             12/31
DRY_DAYS              0
REPORT_STEP           01:00:00
WET_STEP              00:15:00
DRY_STEP              00:15:00
ROUTING_STEP          60
RULE_STEP             00:00:00

INERTIAL_DAMPING      PARTIAL
NORMAL_FLOW_LIMITED   BOTH
FORCE_MAIN_EQUATION   H-W
VARIABLE_STEP         0.75
LENGTHENING_STEP      0
MIN_SURFAREA          0
MAX_TRIALS            8
HEAD_TOLERANCE        0.0015
SYS_FLOW_TOL          5
LAT_FLOW_TOL          5
MINIMUM_STEP          0.5
THREADS               12

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
MONTHLY          0.10   0.38   1.12   2.40   3.61   4.57   4.99   4.00   2.24   0.99
0.27   0.07
DRY_ONLY         NO

[TEMPERATURE]
TIMESERIES    YYC_Temp
WINDSPEED     MONTHLY    14.8 14.6 15. 16.5 16.6 15.6 14 13.2 14.1 14.6 13.7 14.9
SNOWMELT               0 0.5 0.6 1000 51 0.0
ADC           IMPERVIOUS 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
ADC           PERVIOUS   0.1 0.35 0.53 0.66 0.75 0.82 0.87 0.92 0.95 0.98

[RAINGAGES]
;;Name           Format    Interval SCF      Source
;;-------------- --------- -------- -------- ----------
Calgary_24h_100y INTENSITY 0:05     1.0      TIMESERIES Calgary_24h_100y
Calgary_Cont_1960-2014 INTENSITY 1:00     1.0      TIMESERIES YYC_Precipitation
IDE_SC-3_Rainfall INTENSITY 1:00     1.0      FILE       "C:\0-
AM_Files\Projects\Kineticor Final\IDE tool_SC-3_irr.dat" 1001093    MM
```

```
[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- -------- -------
- -------- ----------------
SC-1             Calgary_Cont_1960-2014 STG-DEVELOPMENT 325.5 75.5    32550    3
0        Snowpack1
SC-2             Calgary_Cont_1960-2014 STG-DEVELOPMENT 47.8 75.5     4780     3
0        Snowpack1
SC-3             Calgary_Cont_1960-2014 OF-N-1     71.7     0        1434     4
0        Snowpack2
SC-POND          Calgary_Cont_1960-2014 STG-POND   8.3      86.75    1660     20
0        Snowpack2

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- --
--------
SC-1             0.015      0.25       1.6        3.2        0          PERVIOUS   30
SC-2             0.015      0.25       1.6        3.2        0          PERVIOUS   30
SC-3             0.015      0.25       1.6        5          0          PERVIOUS
100
SC-POND          0.015      0.25       1.6        3.2        100        OUTLET

[INFILTRATION]
;;Subcatchment   Param1     Param2     Param3     Param4     Param5
;;-------------- ---------- ---------- ---------- ---------- ----------
SC-1             75         7.5        4.14       7          0
SC-2             75         7.5        4.14       7          0
SC-3             75         7.5        4.14       7          0
SC-POND          75         7.5        4.14       7          0

[SNOWPACKS]
;;Name           Surface    Parameters
;;-------------- ---------- ----------
Snowpack1        PLOWABLE   0.05       0.2        0.0        0.10       0.00
0.00       0.3
Snowpack1        IMPERVIOUS 0.05       0.2        0.0        0.10       0.00
0.00       25
Snowpack1        PERVIOUS   0.05       0.2        0.0        0.10       0.00
0.00       100
Snowpack1        REMOVAL    25         0.0        0.0        0.5        0.0
0.0
Snowpack2        PLOWABLE   0.05       0.2        0.0        0.10       0.00
0.00       0.0
Snowpack2        IMPERVIOUS 0.05       0.2        0.0        0.10       0.00
0.00       25
Snowpack2        PERVIOUS   0.05       0.2        0.0        0.10       0.00
0.00       100
Snowpack2        REMOVAL    25         0.0        0.0        0.0        0.0
0.0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
OF-IRRIGATION    1025       FREE                        NO
OF-N-1           1018       FREE                        NO
OF-N-2           1022.5     FREE                        NO
OF-S-1           1033       FREE                        NO

[STORAGE]
```

```
;;Name           Elev.     MaxDepth   InitDepth  Shape       Curve Name/Params
SurDepth Fevap    Psi       Ksat      IMD
;;-------------- --------- ---------- ---------- ----------- -------------------------
--- --------- --------- --------- --------- ---------
STG-DEVELOPMENT  1025      0.3        0          FUNCTIONAL  280000    0          0
0         1
STG-POND         1019.5    5.5        2.75       TABULAR     Curve-STG-POND-5.5
0       1

[PUMPS]
;;Name           From Node        To Node          Pump Curve       Status   Startup
Shutoff
;;-------------- ---------------- ---------------- ---------------- -------- --------
--------
P-IRRIGATION     STG-POND         OF-IRRIGATION    Curve-Irrigation-Updated OFF 2.01
2
P-POND-OUT       STG-POND         OF-S-1           Curve-discharge  OFF      3.51
3

[ORIFICES]
;;Name           From Node        To Node          Type         Offset     Qcoeff
Gated    CloseTime
;;-------------- ---------------- ---------------- ------------ ---------- ----------
-------- ----------
OR-POND-OUT      STG-POND         OF-N-2           SIDE         1023       0.65
YES      0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------- ------
---------- ---------- --------
OL-POND-IN       STG-DEVELOPMENT  STG-POND         1025       TABULAR/DEPTH    Curve-
OL-IN-90-l/s/ha              YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ---------- -----
----- ----------
OR-POND-OUT      RECT_CLOSED  0.4              1          0          0

[CONTROLS]
RULE 1
IF SIMULATION MONTH >= 5
AND SIMULATION MONTH <= 9
AND SIMULATION CLOCKTIME >= 00:00:00
AND SIMULATION CLOCKTIME < 04:59:00
THEN PUMP P-IRRIGATION STATUS = ON
ELSE PUMP P-IRRIGATION STATUS = OFF

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Curve-discharge  Pump2      0          0
Curve-discharge             3.5        0
Curve-discharge             3.51       0.55
Curve-discharge             4          0.55
Curve-discharge             4.01       1.1
Curve-discharge             4.5        1.1
Curve-discharge             4.51       1.65
Curve-discharge             5          1.65
Curve-discharge             5.01       2.2
```

```
Curve-discharge             5.5         2.2

Curve-irrigation-100 Pump2      0           0
Curve-irrigation-100            6           0

Curve-Irrigation-Updated Pump2      0           0
Curve-Irrigation-Updated            2           0
Curve-Irrigation-Updated            2.01        0.245
Curve-Irrigation-Updated            4           0.245
Curve-Irrigation-Updated            4.01        0
Curve-Irrigation-Updated            5.5         0

Curve-Muni-Backup Rating     0           5
Curve-Muni-Backup            5           5

Curve-OL-IN-90-l/s/ha Rating     0           0
Curve-OL-IN-90-l/s/ha            0.2         33.6
Curve-OL-IN-90-l/s/ha            0.3         33.6

Curve-STG-POND   Storage    0           45500
Curve-STG-POND              5           72000

Curve-STG-POND-5.5 Storage    0           43125
Curve-STG-POND-5.5            1           47925
Curve-STG-POND-5.5            2           52925
Curve-STG-POND-5.5            2.5         55500
Curve-STG-POND-5.5            3.5         60800
Curve-STG-POND-5.5            4.5         66300
Curve-STG-POND-5.5            5.5         72000
Curve-STG-POND-5.5            6           74925

Curve-STG-POND-6 Storage    0           40800
Curve-STG-POND-6            1           45500
Curve-STG-POND-6            6           72000

[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

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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

IDE_Withdrawal   FILE "C:\0-AM_Files\Projects\Kineticor Final\IDE
tool_PondWithdrawal.txt"

YYC_Precipitation FILE "C:\Users\Ajay.Muthukumar\Cima+\Z0026600-Kineticor-Hwy 566
North Calgary Site - Documents\_Documents\300_CONC_DES\399_Stormwater\PCSWMM\Precip
1960-2014.dat"

YYC_Temp         FILE "C:\Users\Ajay.Muthukumar\Cima+\Z0026600-Kineticor-Hwy 566
North Calgary Site -
Documents\_Documents\300_CONC_DES\399_Stormwater\PCSWMM\CalgTempHrly1960_2014.dat"

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

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

[TAGS]
Subcatch    SC-1            Developed
Subcatch    SC-2            Developed
Subcatch    SC-3            Undeveloped
Subcatch    SC-POND         Pond

[MAP]
DIMENSIONS        11723.78165      5675083.43005    14425.01535      5677730.90895
UNITS             Meters

[COORDINATES]
;;Node            X-Coord            Y-Coord
;;--------------- ------------------ ------------------
OF-IRRIGATION     14093.209          5676880.175
OF-N-1            14287.972          5677069.091
OF-N-2            14285.091          5677021.142
OF-S-1            14302.232          5675813.051
STG-DEVELOPMENT   13801.186          5676473.424
STG-POND          14164.545          5676480.257

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

[POLYGONS]
```

```
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
SC-1             13498.632          5677046.219
SC-1             12647.703          5677046.341
SC-1             12650.248          5676805.025
SC-1             11846.565          5676798.811
SC-1             11849.474          5675994.149
SC-1             12652.92           5675999.973
SC-1             12655.809          5675205.662
SC-1             14270.572          5675203.77
SC-1             14270.572          5676253.596
SC-1             14069.867          5676254.433
SC-1             14070.993          5676671.22
SC-1             13500.068          5676672.762
SC-1             13498.632          5677046.219
SC-2             12647.703          5677046.341
SC-2             12646.12           5677610.569
SC-2             13496.342          5677605.354
SC-2             13498.632          5677046.219
SC-2             12647.703          5677046.341
SC-3             13500.068          5676672.762
SC-3             13496.342          5677605.354
SC-3             14265.915          5677601.944
SC-3             14269.307          5676670.684
SC-3             13500.068          5676672.762
SC-POND          14071.7            5676671.927
SC-POND          14269.307          5676670.684
SC-POND          14270.572          5676253.596
SC-POND          14069.867          5676254.433
SC-POND          14071.7            5676671.927

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

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

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


  *************
  Element Count
  *************
  Number of rain gages ...... 3
  Number of subcatchments ... 4
  Number of nodes ........... 6
  Number of links ........... 4
  Number of pollutants ...... 0
  Number of land uses ....... 0


  ****************
  Raingage Summary
  ****************
                                                              Data       Recording
  Name                    Data Source                         Type       Interval
  ------------------------------------------------------------------------------
  Calgary_24h_100y        Calgary_24h_100y                    INTENSITY    5 min.
  Calgary_Cont_1960-2014 YYC_Precipitation                      INTENSITY   60 min.
  IDE_SC-3_Rainfall       C:\0-AM_Files\Projects\Kineticor Final\IDE tool_SC-3_irr.dat


  ********************
  Subcatchment Summary
  ********************
  Name                          Area     Width   %Imperv    %Slope Rain Gage
Outlet
  ------------------------------------------------------------------------------------------
-----------------------
  SC-1                        325.50  32550.00     75.50    3.0000 Calgary_Cont_1960-2014
STG-DEVELOPMENT
  SC-2                         47.80   4780.00     75.50    3.0000 Calgary_Cont_1960-2014
STG-DEVELOPMENT
  SC-3                         71.70   1434.00      0.00    4.0000 Calgary_Cont_1960-2014
OF-N-1
  SC-POND                       8.30   1660.00     86.75   20.0000 Calgary_Cont_1960-2014
STG-POND


  ************
  Node Summary
  ************
                                                    Invert      Max.    Ponded    External
  Name                    Type                       Elev.     Depth      Area    Inflow
  --------------------------------------------------------------------------------
  OF-IRRIGATION           OUTFALL                  1025.00      0.00       0.0
  OF-N-1                  OUTFALL                  1018.00      0.00       0.0
  OF-N-2                  OUTFALL                  1022.50      0.00       0.0
  OF-S-1                  OUTFALL                  1033.00      0.00       0.0
  STG-DEVELOPMENT         STORAGE                  1025.00      0.30       0.0
  STG-POND                STORAGE                  1019.50      5.50       0.0


  ************
  Link Summary
  ************
```

```
  Name              From Node         To Node           Type            Length    %Slope 
Roughness
  ---------------------------------------------------------------------------------------
---------
  P-IRRIGATION      STG-POND          OF-IRRIGATION     TYPE2 PUMP
  P-POND-OUT        STG-POND          OF-S-1            TYPE2 PUMP
  OR-POND-OUT       STG-POND          OF-N-2            ORIFICE
  OL-POND-IN        STG-DEVELOPMENT   STG-POND          OUTLET


  *********************
  Cross Section Summary
  *********************
                                        Full     Full     Hyd.     Max.   No. of     
Full
  Conduit           Shape              Depth     Area     Rad.    Width  Barrels     
Flow
  ---------------------------------------------------------------------------------------
---


  ****************
  Analysis Options
  ****************
  Flow Units ............... CMS
  Process Models:
    Rainfall/Runoff ........ YES
    RDII ................... NO
    Snowmelt ............... YES
    Groundwater ............ NO
    Flow Routing ........... YES
    Ponding Allowed ........ NO
    Water Quality .......... NO
  Infiltration Method ...... HORTON
  Flow Routing Method ...... DYNWAVE
  Surcharge Method ......... EXTRAN
  Starting Date ............ 01/01/1960 00:00:00
  Ending Date .............. 12/31/2014 23:00:00
  Antecedent Dry Days ...... 0.0
  Report Time Step ......... 01:00:00
  Wet Time Step ............ 00:15:00
  Dry Time Step ............ 00:15:00
  Routing Time Step ........ 60.00 sec
  Variable Time Step ....... YES
  Maximum Trials ........... 8
  Number of Threads ........ 1
  Head Tolerance ........... 0.001500 m


  *********************
  Rainfall File Summary
  *********************
  Station    First        Last         Recording   Periods    Periods    Periods
  ID         Date         Date         Frequency  w/Precip    Missing    Malfunc.
  -------------------------------------------------------------------------------
  1001093    01/02/1960   12/29/2014      60 min     45403          0          0


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

```
  Initial Snow Cover .......         0.000         0.000
  Total Precipitation ......     10375.130     22888.000
  Evaporation Loss .........      2399.994      5294.494
  Infiltration Loss ........      4688.212     10342.406
  Surface Runoff ...........      3372.369      7439.597
  Snow Removed .............         0.000         0.000
  Final Snow Cover .........         1.179         2.600
  Final Storage ............         0.163         0.360
  Continuity Error (%) .....        -0.836


  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......      3372.369     33724.045
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........      3084.452     30844.839
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........       290.505      2905.083
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....        13.708       137.083
  Final Stored Volume ......        18.111       181.110
  Continuity Error (%) .....        -0.206


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


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


  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :    59.50 sec
  Average Time Step           :    60.00 sec
  Maximum Time Step           :    60.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.00
  % of Steps Not Converging   :     0.00
  Time Step Frequencies       :
     60.000 - 23.031 sec      :   100.00 %
     23.031 -  8.841 sec      :     0.00 %
      8.841 -  3.393 sec      :     0.00 %
      3.393 -  1.303 sec      :     0.00 %
      1.303 -  0.500 sec      :     0.00 %
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
SC-1	22888.00	0.00	6321.92	8193.42	11258.60	714.20	8595.22	27977.60	46.23	0.376
SC-2	22888.00	0.00	6321.92	8193.42	11258.60	714.20	8595.22	4108.54	6.79	0.376
SC-3	22888.00	0.00	289.92	22388.41	0.00	217.25	217.25	155.77	2.18	0.009
SC-POND	22888.00	0.00	2317.49	2935.16	17786.29	68.87	17855.16	1481.99	1.21	0.780

****
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
OF-IRRIGATION	OUTFALL	0.00	0.00	1025.00	0 00:00	0.00
OF-N-1	OUTFALL	0.00	0.00	1018.00	0 00:00	0.00
OF-N-2	OUTFALL	0.00	0.00	1022.50	0 00:00	0.00
OF-S-1	OUTFALL	0.00	0.00	1033.00	0 00:00	0.00
STG-DEVELOPMENT	STORAGE	0.00	0.27	1025.27	17322 20:10	0.25
STG-POND	STORAGE	2.72	5.42	1024.92	3816 16:06	5.42

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
OF-IRRIGATION	OUTFALL	0.000	0.245	121 00:01	0	2.25e+04	0.000
OF-N-1	OUTFALL	2.177	2.177	17322 20:00	156	156	0.000

OF-N-2	OUTFALL	0.000	1.504	3816	16:07	0	1.4e+03	0.000
OF-S-1	OUTFALL	0.000	2.200	3816	15:07	0	6.82e+03	0.000
STG-DEVELOPMENT	STORAGE	53.020	53.020	17322	20:00	3.21e+04	3.21e+04	-0.004
STG-POND	STORAGE	1.205	34.805	17322	20:00	1.48e+03	3.31e+04	-0.207

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
STG-DEVELOPMENT	0.030	0.0	1.8	0.0	75.455	89.8	17322 20:10	33.615
STG-POND	136.392	43.4	7.0	0.0	308.059	98.1	3816 16:06	3.708

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF-IRRIGATION	5.29	0.245	0.245	22473.890
OF-N-1	0.13	0.068	2.177	155.768
OF-N-2	0.59	0.138	1.504	1399.679
OF-S-1	0.68	0.580	2.200	6815.362
System	1.67	1.030	5.153	30844.698

Link Flow Summary
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Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
P-IRRIGATION	PUMP	0.245	121 00:01		1.00	
P-POND-OUT	PUMP	2.200	3816 15:07		1.00	
OR-POND-OUT	ORIFICE	1.504	3816 16:07			1.00
OL-POND-IN	DUMMY	33.600	17322 19:50			

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
		---------- Fraction of Time in Flow Class ----------								

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Conduit Surcharge Summary
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No conduits were surcharged.

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Pumping Summary
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Pump	Percent Utilized	Number of Start-Ups	Min Flow CMS	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr	Power Usage Kw-hr	% Time Off Pump Curve Low	High
P-IRRIGATION	5.29	6419	0.00	0.25	0.24	22473.890	173981.62	0.0	0.0
P-POND-OUT	0.68	25174	0.00	0.58	2.20	6815.362	182421.00	0.0	0.0

Analysis begun on: Mon Jul 21 21:08:30 2025
Analysis ended on: Mon Jul 21 21:08:55 2025
Total elapsed time: 00:00:25