

Westview Stormwater Master Drainage Plan

Prepared for:
Qualico Communities
and
Melcor Developments Ltd.

Stantec Consulting Ltd.
200, 325 – 25th Street SE
Calgary, Alberta T2A 7H8

January 19, 2012

File No. 116417392





DATE: March 26, 2021

To: Rob Brandrick, P.Eng.
Senior Associate
Stantec Consulting Ltd.
200, 325 25th Street SE
Calgary, AB T2A 7H8

From: Michal Ubar, P.Eng.
Planning Engineer
Development Planning
Water Resources
City of Calgary

SUBJECT: West View – Supplementary Report dated July 08, 2020 to Westview Stormwater Master Drainage dated January 19, 2012 (Westview MDP)

Water Resources has reviewed the above noted report and has **no objections** subject to the following conditions and recommendations to be fully addressed in subsequent stages of development.

1. Future Staged Master Drainage Plans within West View ASP lands shall include climate change considerations as it relates to the design of stormwater infrastructure. Contact Water Resources at the time of the Staged Master Drainage plan for specific requirements.
2. Watershed urbanization impacts drainage and groundwater regimes. Impact of land urbanization on the water balance is not well understood. Moisture provided by the natural process during pre-development conditions may be required to sustain the natural streams and the ecologic value during and after the development, which would benefit the development. Staged Master Drainage Plans and subsequent pond reports should allow for a low-flow release from proposed ponds to natural drainage courses, where applicable. An operational agreement between the developers, Calgary Parks and Water Resources should be established for the FAC period to ensure sufficient water is allocated for the existing drainage courses.
3. The Staged Master Drainage Plan (SMDP) shall include shear stress analysis to assess the flow conditions in drainage course receiving water from proposed ponds under the post-development conditions. SMDP shall demonstrate that the resulting flows are non-erosive. Where erosive forces are identified, the SMDP shall recommend protective erosion and sediment control measures to Water Resources and Parks satisfaction.
4. Where required, obtain Alberta Environment and Parks (AEP) approvals under the Public Lands Act, Water Act and EPEA for stormwater concepts and infrastructure within the West View lands.
5. Future Staged Master Drainage Plans (SMDPs) must adhere to the stormwater concepts and policies noted in the West View Area Structure Plan (ASP) and informed by the Westview MDP and the West View Supplementary Report (Supplementary Report) dated July 08, 2020, while the West View Supplementary Report governs the Westview MDP.
6. The ultimate post-development storm servicing strategy shall reflect the Figure 7.1 in the West View Supplementary Report.
7. The SMDP shall refer to and respect the Calgary Source Water Protection Plan and Policy.



8. Should storm pond be proposed near a drainage course:
- respect relevant setbacks and meander belt
 - demonstrate groundwater levels will not restrict the pond performance and function
 - design minor system with acceptable range of flow velocities
 - demonstrate that none or acceptable backflow conditions are achieved to Water Resources satisfaction

Please send an electronic input and output modelling files and GIS/ACAD files for the Westview MDP and the West View Supplementary Report to me.



Michal Ubar, P.Eng.
Planning Engineer, Development Planning
Infrastructure Planning, Water Resources
The City of Calgary | Mail code #437
Water Centre - 3rd Floor, 625 - 25 Avenue SE

cc: Jian Huang, Development Approvals, Calgary Water Resources
Valerie Veenstra, Urban Conservation, Calgary Parks
Kim Kahan, Development Planning, Calgary WR
Tanner Fellingner, Development Planning, Calgary WR



**West View – Supplementary
Report**

Stormwater Master Drainage Plan
(MDP)

July 8, 2020

Prepared for:

Melcor Developments & Qualico
Communities

Prepared by:

Stantec Consulting Ltd.





Stantec Consulting Ltd.
25 Street SE Calgary AB T2A 7H8

July 8, 2020
File: 116529049 & 116532402

The City of Calgary
Development Approvals – Water Resources
4th Floor, Manchester Water Centre
625 - 25 Avenue SE
Calgary, Alberta T2G 4K8

Attention: Mr. Tanner Fellingner, P.Eng.
Leader, Development Planning, Infrastructure Planning

Dear Mr. Fellingner,

Reference: Westview MDP
Melcor Developments Ltd. & Qualico Developments West Ltd.
Supplementary Report

On behalf of Melcor Developments Ltd & Qualico Developments West Ltd., we are submitting this Supplementary Report to the Westview Master Drainage Plan (MDP). This update was negotiated and triggered by an amendment to the West View Area Structure Plan (ASP). This Supplementary Report serves as the update summarizing the findings requested with the original October 2017 request.

We believe this report addresses all outstanding elements of the MDP and no further action is required, unless the decision to not allow discharge to Coach Creek is reconsidered.

If you have any concerns, please contact the undersigned.

Regards,

STANTEC CONSULTING LTD.

Antoinette Agbeyakah P. Eng
Consultant
Community Development
Direct: 403-716-8111
antoinette.agbeyakahh@stantec.com

Attachments: Westview_supplementary_report.pdf

- c. Ms. M. Norman, City of Calgary
- Mr. A. Boucher, Melcor Developments Ltd.
- Mr. B. Mercer, Qualico Developments West Ltd.
- Mr. C. Piechotta, Qualico Developments West Ltd.
- Mr. F. Lourido, Stantec Consulting Ltd.

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WEST VIEW – SUPPLEMENTARY REPORT

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Prepared by _____
(signature)

Antoinette Agbeyakah, P. Eng.

Reviewed by _____
(signature)

Rob Brandrick, P. Eng.

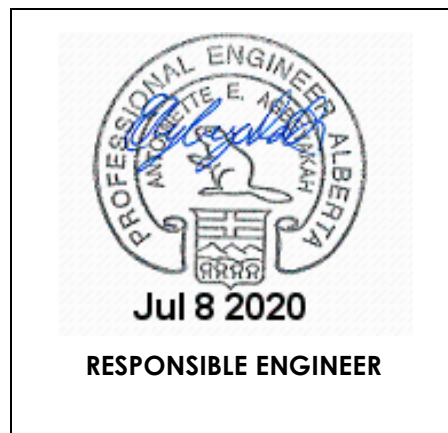
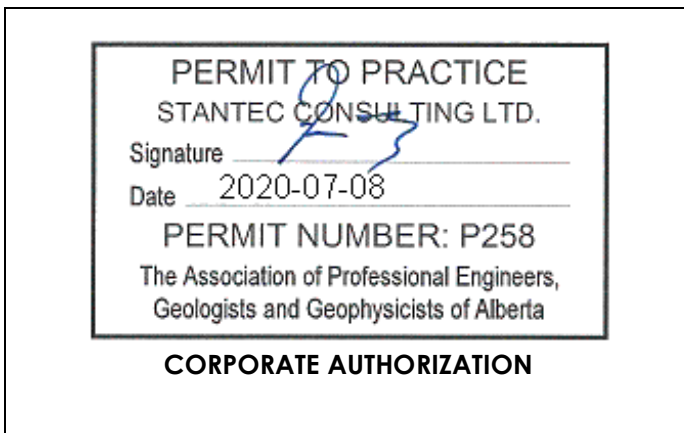


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WEST VIEW – SUPPLEMENTARY REPORT

Introduction

1.0 INTRODUCTION

The Westview Stormwater Master Drainage Plan (MDP) was approved by The City of Calgary on May 2, 2012. An amendment to the West View Area Structure Plan (ASP) has triggered a request to update the MDP.

This Supplementary Report to the 2012 MDP is provided to address the stormwater management issues triggered by the ASP amendment.

1.1 Master Drainage Plan Update

As part of the West View Area Structure Plan amendment, an update to the Westview Master Drainage Plan (Stantec, 2012) was negotiated with the City in October 2017. The following information was to be provided for the update to the Master Drainage Plan (MDP).

- Preparation of pre-development flow duration curves for Coach Creek and the Unnamed Ravine based on the analysis done for the West View MDP. These curves are to be used as baseline targets for establishing post-development discharges.
- Monitoring of flows in Coach Creek to establish the baseline conditions between surface runoff and groundwater discharges. This monitoring will commence this fall and continue for a period of 1 year. The City of Calgary will provide precipitation data for the nearest City rain gauge for correlating the monitoring results with precipitation.
- Conduct a dispersion analysis (office study) of the Coach Creek flows that enter the Bow River to predict if the plume will cross to the north side of the river at the Bearspaw Water Treatment Plant (WTP) intake. The anticipated post-development flows in Coach Creek per the West View MDP will be used. The City of Calgary will provide river cross-section data from the flood frequency model (HEC-RAS) for the purpose of this analysis. If the plume is anticipated to impact the WTP intake, then additional treatment of stormwater discharges from the future storm ponds may be requested.

Since the original terms for updating the West View MDP were established in 2017, The City has completed and released the Source Water Protection Plan. In the context of the West View area, the Source Water Protection Plan and the findings from the dispersion analysis, has caused Water Resources to conclude that the source water protection risk is too great to allow discharges to Coach Creek as a primary storm serving strategy for development of the remaining land within the West View ASP boundary.

As a result, the storm trunk option described in the original 2012 MDP is now the option being required for providing storm servicing for the development of the remaining land within the West View ASP boundary. This West View Supplementary Report now also provides an update to the Opinion of Probable Cost (OPC) for the storm trunk option.



WEST VIEW – SUPPLEMENTARY REPORT

Pre-Development Flow Duration Curves

The following sections of this West View Supplementary Report provide the findings for each of the items identified above as part of the MDP update.

2.0 PRE-DEVELOPMENT FLOW DURATION CURVES

This work was completed and submitted to The City on January 15, 2018. No comments have been received and this work is considered complete. A copy of the January 15, 2018 information submitted is included in **Appendix A**.

Based on The City decision to move forward with the storm trunk option, the flow duration curve data is no longer relevant to storm servicing in the West View ASP boundary. No attempt to relate the flow duration to the flow monitoring data is made. The post-development drainage pattern in Coach Creek is anticipated to change relative to the pre-development pattern.

It is recommended that back-of-lot and any open space areas (e.g. ER, MR, PUL, URW, etc.) be allowed to drain to Coach Creek as driven by the final development grading plans. Should the decision to not allow stormwater discharge into Coach Creek be reconsidered, the pre-development flow duration data can be reviewed again and applied as needed to support an alternative and innovative servicing strategy.

3.0 FLOW MONITORING

The plan for monitoring to begin in late 2017 was hampered by early winter weather and the installation of monitoring equipment was delayed until spring 2018. In a meeting with Water Resources on March 27, 2018 it was learned that The City had their own monitoring program for Coach Creek. The plan for monitoring in 2018 was suspended pending confirmation and review of the available data from The City. Through coordination with the City, the nature of the data being collected under The City program was not complete and would still require additional processing. In September 2018, the developer funded monitoring equipment was installed, and monitoring began.

Monitoring equipment was installed along two drainage courses upstream of Coach Creek. The hydrometric monitoring data that was collected from September 21, 2018 to June 11, 2020 was analyzed as described in the memo included in **Appendix B**.

Based on The City decision to move forward with the storm trunk option, the flow monitoring data is no longer relevant to storm servicing in the West View ASP boundary. No attempt to relate the flow monitoring to the pre-development flow duration curves is made. Additionally, no further review of the water quality conditions associated with the hydrometric monitoring is considered based on the storm trunk decision. The post-development drainage pattern in Coach Creek is anticipated to change relative to the pre-development pattern.

It is recommended that back-of-lot and any open space areas (e.g. ER, MR, PUL, URW, etc.) be allowed to drain to Coach Creek as driven by the final development grading plans. Should the opportunity to



WEST VIEW – SUPPLEMENTARY REPORT

Dispersion Analysis

revisit directing stormwater discharge to Coach Creek become available again, the flow monitoring data is complete and suitable to allow for further review of this option. This includes the ability to review the water quality condition noted in the hydrometric monitoring memo.

Should the decision to not allow stormwater discharge into Coach Creek be reconsidered, the hydrometric monitoring data can be reviewed again and applied as needed to support an alternative and innovative servicing strategy.

4.0 DISPERSION ANALYSIS

This work was completed and submitted to The City on January 15, 2018. Comments on the analysis were received from The City on November 9, 2018. A copy of the memo prepared, and the comments received are provided in **Appendix C**.

Follow-up coordination confirmed that the fully mixed condition described in the dispersion analysis completed was not expected to change, even if the comments provided by The City were addressed. This is based on the relative distance between Coach Creek and the RAWII WTP intake along the Bow River.

Based on The City decision to move forward with the storm trunk option, the dispersion analysis is considered complete and no further action will be taken to address the comments provided by The City. Should the decision to not allow stormwater discharge into Coach Creek be reconsidered, the dispersion analysis can be reviewed again and applied as needed to support an alternative and innovative servicing strategy.

5.0 STORM TRUNK OPC UPDATE

As noted previously the storm trunk is now the preferred servicing option as directed by The City. **Appendix D** contains the following supporting information:

- An updated order of magnitude OPC for the storm trunk option considered in the 2012 MDP.
- An updated Figure 7.1 showing the storm trunk alignment considered.
- A copy of the November 29, 2019 email correspondence confirming the storm trunk as the preferred option.

The order of magnitude OPC the storm trunk and outfall has increased to roughly \$36 million. The updated OPC only considers the conventional gravity trunk design noted as Option #1 in the 2012 MDP. There is no allowance for inflation projections to an actual construction date considered. There is also no allowance for any preliminary studies such as geotechnical, environmental, or historical resources. Potential land (right-of-way) acquisitions are also not included in the OPC total. The OPC also assumes that City of Calgary Parks will not object to the proposed alignment/construction within environmentally sensitive areas.



WEST VIEW – SUPPLEMENTARY REPORT

Recommendations

Different alignment options or alternate design considerations have not been evaluated at this time. If design alternatives are desired, they can be reviewed during subsequent development planning and/or implementation stages as needed. This may include a value engineering session if warranted.

With the implementation of the storm trunk the following is recommended:

- Only the 100-year allowable discharge rate of 8.57 L/s/ha from the 2012 MDP be applied.
- Increasing the 100-year allowable discharge from the West View study area be considered as part of future storm trunk design reviews. This will allow for at least some offset of the storm trunk cost by potentially facilitating a reduction in the associated stormwater management facility sizes.
- The runoff volume control target of 19 mm from the 2012 MDP be removed from all remaining development within the West View ASP boundary.

6.0 RECOMMENDATIONS

This Supplementary Report, the for the Westview 2012 MDP, addresses the stormwater management issues triggered by the ASP amendment.

At present there are no plans for further work regarding the pre-development duration curves, flow monitoring or dispersion analysis considering The City's decision to move forward with the storm trunk option.

The following recommendations are made for subsequent Staged Master Drainage Plans considering the requested storm trunk as the servicing solution for the remainder of development in the West View ASP boundary:

- Should the decision to not allow stormwater discharge into Coach Creek be reconsidered, the flow duration, flow monitoring, and dispersion analysis work can be reviewed again and applied as needed to support an alternative and innovative servicing strategy.
- Back-of-lot and any open space areas (e.g. ER, MR, PUL, URW, etc.) be allowed to drain to Coach Creek as driven by the final development grading plans
- Different alignment options or alternate design considerations can be reviewed during subsequent development planning and/or implementation stages as needed. This may include a value engineering session if warranted.
- Only the 100-year allowable discharge rate of 8.57 L/s/ha from the 2012 MDP be applied.
- Increasing the 100-year allowable discharge from the West View study area be considered as part of future storm trunk design reviews.
- The runoff volume control target of 19 mm from the 2012 MDP be removed from all remaining development within the West View ASP boundary.



APPENDIX A

Memo: Westview Master Drainage Plan Update

To: Pablo Lopez Hernandez, P. Eng.,
Senior Planning Engineer
City of Calgary, Water Resources

From: Rick Carnduff
Stantec, Calgary

File: 116529049.130

Date: January 15, 2018

Reference: Westview Master Drainage Plan Update

As requested by Water Resources in our meeting of October 4, 2017, and confirmed in the undersigned's email of October 18, 2017, Stantec has prepared the pre-development flow-duration curve for Coach Creek at its mouth (i.e. Bow River) based on the QHM model results per the January 19, 2012 Master Drainage Plan report. The procedure used in developing this flow duration curve was as follows:

1. Flows computed by the QHM model at hourly time steps were saved to an ASCII (text) file for the simulation period May 1, 1960 to October 31, 2006;
2. The ASCII file was converted to an EPA SWMM5 time series format;
3. Using the PCSWMM model, the SWMM5 time series file was opened to graph the hourly runoff data and plot the corresponding flow-duration curve;
4. The flow-duration data from the PCSWMM model was copied into an Excel spreadsheet as Total Inflow (m³/s) vs % Probability of Exceedance.

The Excel file is provided under separate submission.

As described in the Westview MDP report, post development discharges to the Coach Creek and Unnamed Ravine drainage courses shall meet the following targets:

- Average annual runoff depth = 19 mm; and
- Maximum UARRs as follows:

1:2 Year	1.39 L/s/ha
1:5 Year	3.13 L/s/ha
1:10 Year	4.39 L/s/ha
1:25 Year	6.05 L/s/ha
1:50 Year	7.30 L/s/ha
1:100 Year	8.57 L/s/ha

The flow-duration curve thus established per the above shall also be used as a target for post-development discharges to Coach Creek and the Unnamed Ravine.

The PCSWMM model has become the preferred model of choice by industry for Staged Master Drainage Plan (SMDP) studies in Calgary. Anticipating that future studies will continue to use this model software, a PCSWMM model was developed of the pre-development drainage condition for Coach Creek as described in the MDP report and illustrated on **Figure 3.1** of that report (attached). The same simulation period as that used for the QHM model was adopted.

The PCSWMM model incorporates a groundwater routine as well as appropriate adjustments for winter (frozen) ground conditions. Subcatchment and Groundwater parameters were adjusted as required to ensure that both runoff volume and peak flow at the Bow River, as well as other key hydrograph locations, closely matches that of the original QHM model

January 15, 2018

Pablo Lopez Hernandez, P. Eng., Senior Planning Engineer

Page 2 of 2

Reference: Westview Master Drainage Plan Update

results. The flow duration-curve for Coach Creek at the Bow River was compared to that developed using the QHM results, which is illustrated by **Figure 1**. The PCSWMM flow-duration data is also provided in the Excel worksheet (separate submission).

The flow-duration curve for Coach Creek at the Bow River is slightly lower in terms of peak flows compared to that of the QHM model. It is recommended that the PCSWMM model result be used as the flow-duration target in future SMDP studies for post-development discharges. Future continuous simulation analyses should reflect the simulation period January 1, 1960 to December 31, 2014, unless otherwise specified by the City of Calgary.

STANTEC CONSULTING LTD.



Rick Carnduff, M. Eng., P. Eng.

Principal, Engineering

Community Development

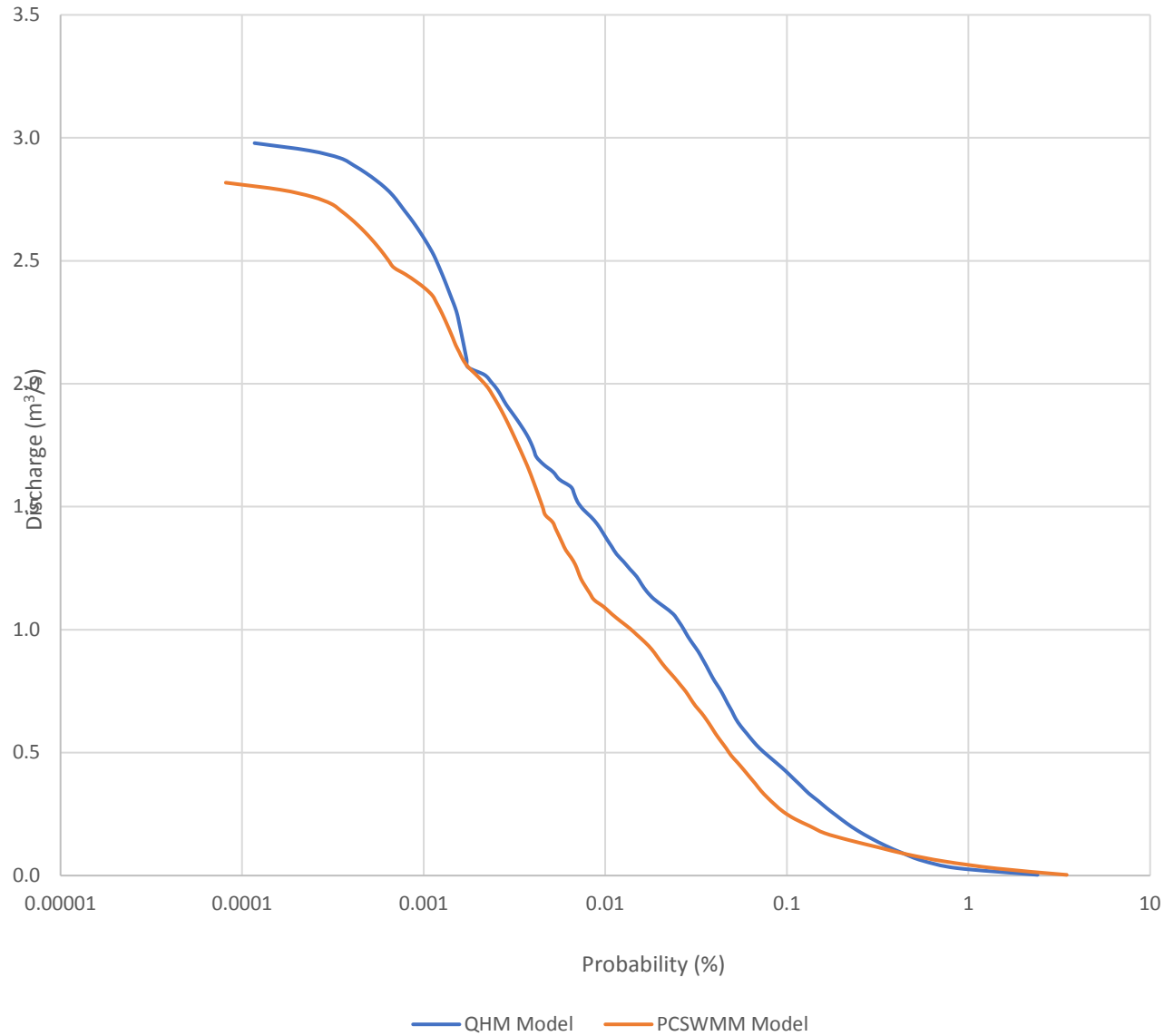
Phone: (403) 716-8213

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rick.carnduff@stantec.com

Attachment: Figure 1 – Pre-Development Flow-Duration Curves, Coach Creek at the Bow River
Figure 3.1 – Pre-Development Drainage condition for Coach Creek

- c. Mr. A. Boucher, Melcor Developments Ltd.
- Mr. B. Mercer, Qualico Development West Ltd.
- Mr. F. Lourido, Stantec Consulting Ltd.



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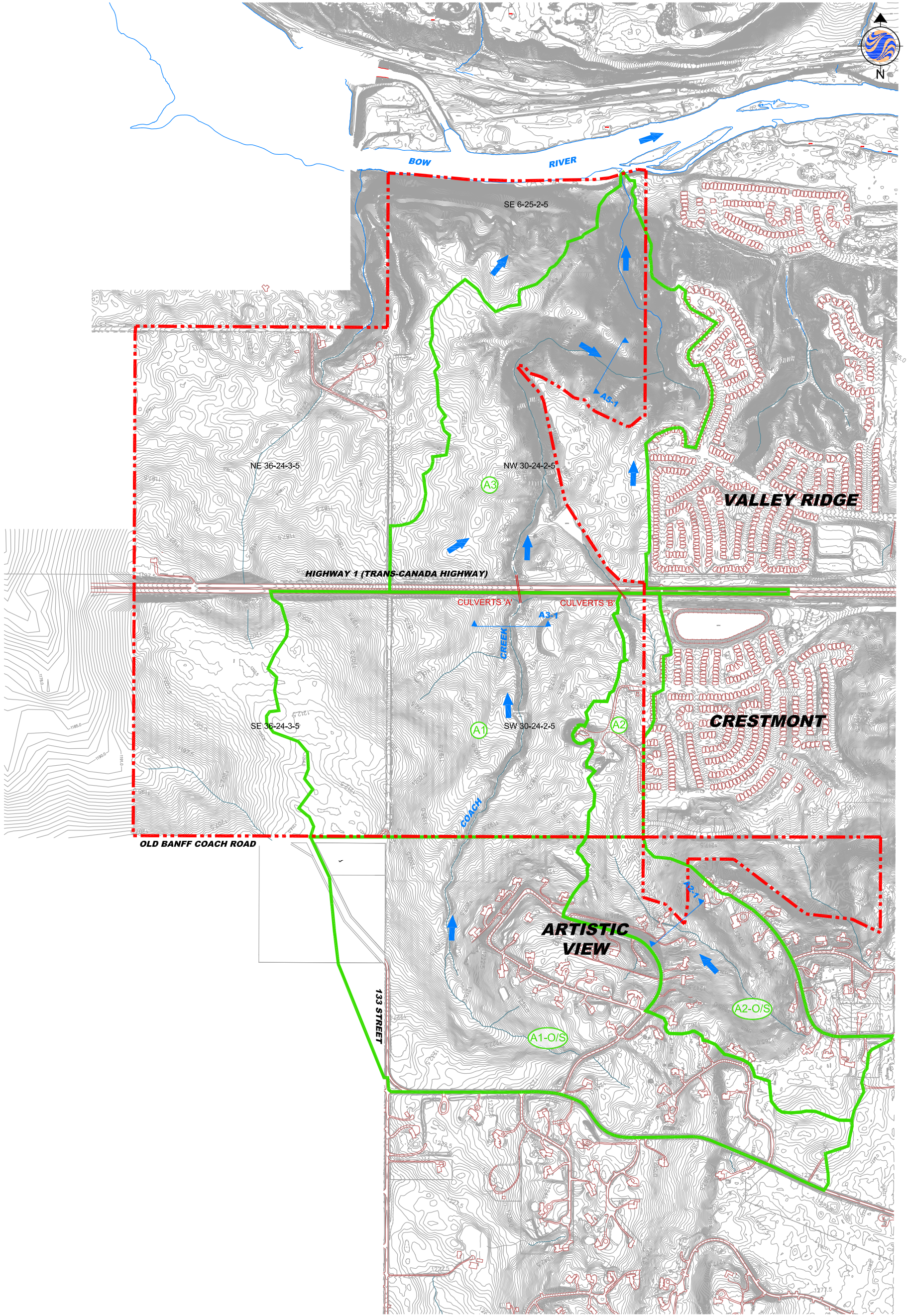
Client/Project
 MELCOR DEVELOPMENTS LTD. &
 QUALICO DEVELOPMENT WEST LTD.
 MASTER DRAINAGE PLAN UPDATE

Figure No.

1

Title

**Pre-Development Flow-Duration Curves,
 Coach Creek at the Bow River**



PLOT DATE: Jan 18, 2012 8:26am
 FILE NAME: V:\164\active\116410629\westview_mdp\drawing\general\sheet_files\drawings\figures\view\Pre_Dev_Catchments.dwg

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- Legend**
- 1 Subcatchment Boundary & Reference No.
 - Direction of Overland Flow
 - ASP Boundary
 - ▲ A3-1 Channel Section

Client/Project
 QUALICO COMMUNITIES &
 MELCOR DEVELOPMENTS LTD.
 WESTVIEW MASTER DRAINAGE PLAN

Figure No.
 3.1

Title
 Pre-Development Catchments
 for Coach Creek

116417392

APPENDIX B

Memo: Coach Creek Hydrometric Monitoring



To:	Rob Brandrick Stantec Consulting Ltd.	From:	Justin Knudson Stantec Consulting Ltd.
File:	116529049.130 116532402.210	Date:	July 2, 2020

Reference: West View Supplementary Report – Coach Creek Hydrometric Monitoring**INTRODUCTION**

In support of the West View Supplementary Report prepared as an update to the 2012 West View MDP, Stantec collected hydrometric data from the east (site SW-1) and west (site SW-2) upper forks of Coach Creek, reference image below. This report provides results of the hydrometric monitoring to estimate flow rates on these drainage courses.

**Hydrometric Station Locations****METHODS**

Flow was measured at both sites using H-flumes. A field reconnaissance visit revealed both channels were less than one meter wide with flow rates less than approximately 10 litres per second (L/s), with the possibility of flow becoming intermittent. Establishing a rating curve to convert water depth to discharge would have been limited. The H-flume is designed to measure low and intermittent flows and was deemed the most appropriate approach for monitoring flow in these streams. A 1.5-foot H-flume was installed at both sites, as its dimensions were similar to the existing cross-sectional channel dimensions of both streams. The 1.5-foot H-flume has a measurement range from 0.03 to 153.48 L/s (0.0061 to 0.4572 m depth).

Reference: West View Supplementary Report – Coach Creek Hydrometric Monitoring

OTT™ Orpheus Mini level dataloggers were installed in the stilling well of each flume and used to measure water level fluctuations and water temperature at 15-minute intervals. These freeze proof, vented instruments have an accuracy of 0.05% FS (0.002 m) for water levels over a range of 0-4 m and an accuracy of 0.1°C for water temperature. Water levels were converted to discharge using the following equation (D is depth in meters):

$$\frac{L}{s} = -0.00396436 - 0.07231968 D^{0.5} + 79.89379128 D^{1.5} + 900.3765227 D^{2.5}$$

The 1.5-foot H-flumes have a manufacturer stated accuracy of $\pm 2.5\%$, although this accuracy is likely lower under field conditions. The flumes were installed to minimize the effect of submerged flow.

The flumes were installed September 21, 2018 using hand tools and were left in place year-round. Photographs of the hydrometric stations are provided in Figure A-1 and geographic coordinates are provided in Table A-1. The stations were visited periodically for maintenance and to download data. The most recent data download prior to this report was June 11, 2020. The monitoring period is defined as September 21, 2018 to June 11, 2020. The flumes remain in place and continue monitoring as of the date of this report.



SW-1



SW-2

Figure A-1 Hydrometric Station Photographs, Both Looking Downstream

RESULTS AND DISCUSSION

Hydrographs for both monitoring stations are plotted in Figure A-2 and Figure A-3. A summary of flow ranges is shown in Table A-1. Periods in which surface ice impacted the water depth record were identified when water temperature was near freezing and have been removed from the hydrographs.

Flows were more stable at SW-1 than SW-2. Maximum flow reached 130.22 L/s on June 21, 2019 at SW-1. The same event caused runoff to breach the top of the SW-2 flume. Peaks above the SW-2 flume are shown in Figure A-3 to provide a minimum flow estimate for the event. Base flows were higher at SW-1 than SW-2. The minimum measurable flow at SW-1 was 0.42 L/s (flow was likely lower during data gaps caused by ice-affected conditions). In contrast, minimum flow at SW-2 was below the flume's measurable limit of 0.03 L/s. Although average flow was slightly higher at SW-2 (4.22 compared to 3.07 L/s), for much of the time between high flow events, flow was greater at SW-1 (Figure A-4).

Reference: West View Supplementary Report – Coach Creek Hydrometric Monitoring

The flow pattern differences between the two streams can be seen in Figure A-4 with both hydrographs plotted together. Stormflow peaks occurred at similar times but were higher at SW-2, and baseflow in between stormflow events was lower at SW-2.

Table A-1 Flow Summary

Station	Location		Minimum Flow ¹	Average Flow ¹	Maximum Flow ¹	Notes
	Latitude	Longitude	(L/s)	(L/s)	(L/s)	
SW-1	51.09136°	-114.27326°	0.42	3.07	130.22	None
SW-2	51.09028°	-114.27464°	< 0.03	4.22	> 153.48	Flow was below the measurable limit of the flume on several occasions. Flow exceeded flume capacity on June 21, 2019. Capacity exceedances in spring 2020 may have been exacerbated by snow/ice jamming.

¹ Ice-affected data not included in calculations

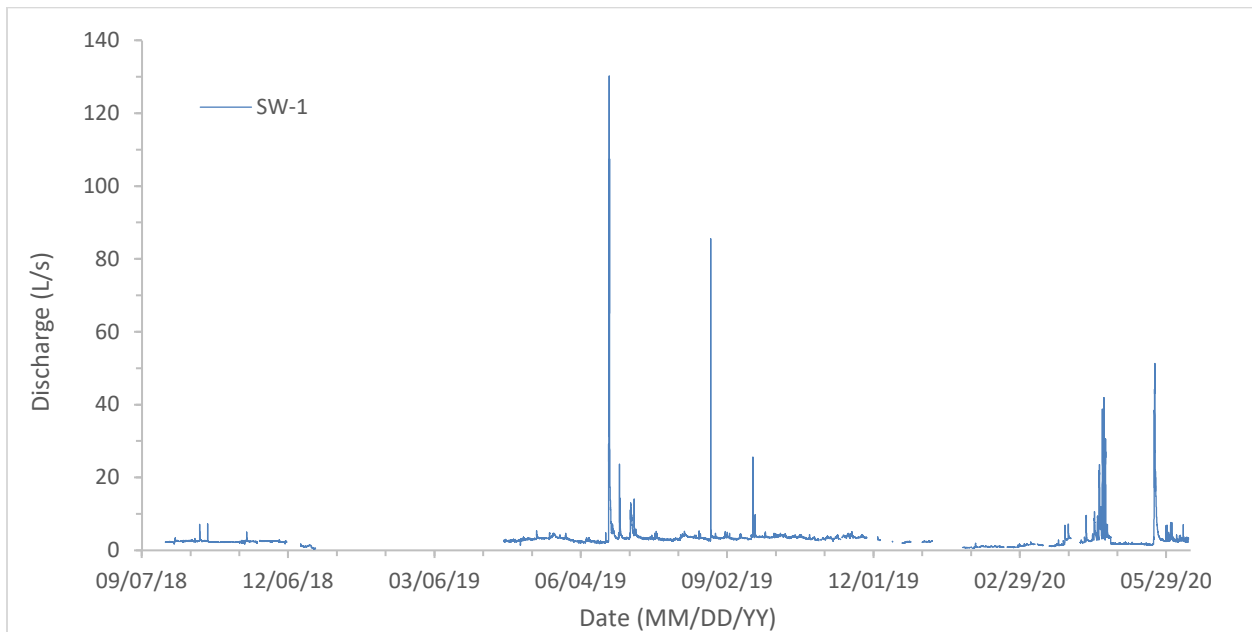


Figure A-2 Discharge At SW-1 Over The Monitoring Period

Reference: West View Supplementary Report – Coach Creek Hydrometric Monitoring

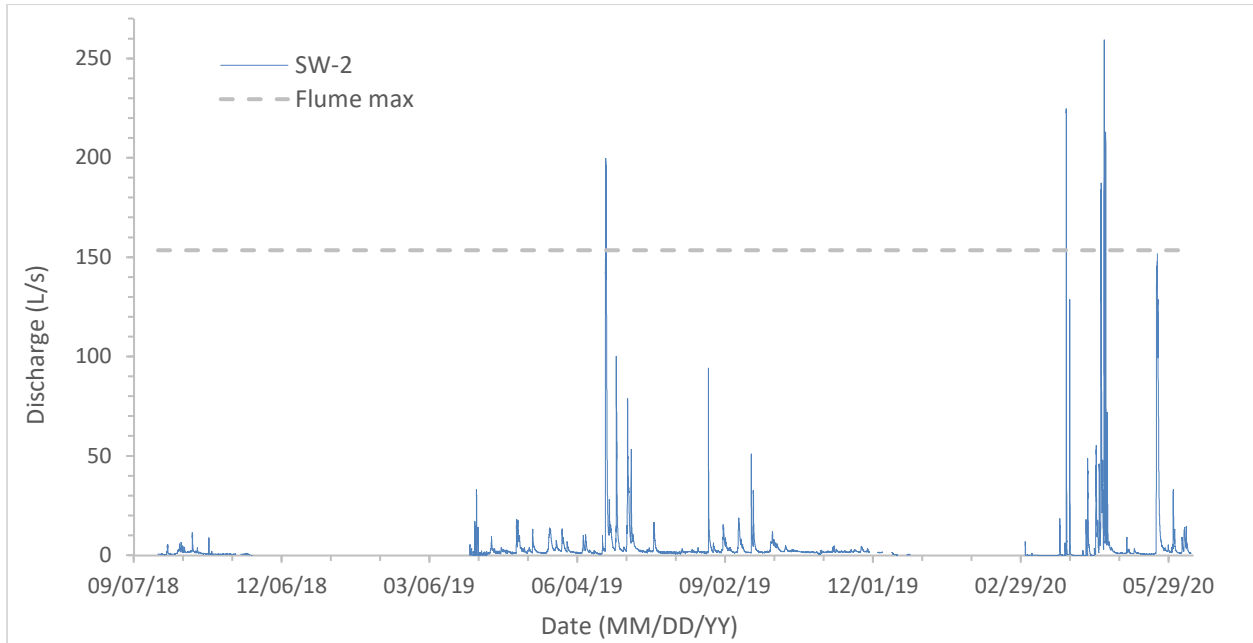


Figure A-3 Discharge At SW-2 Over The Monitoring Period

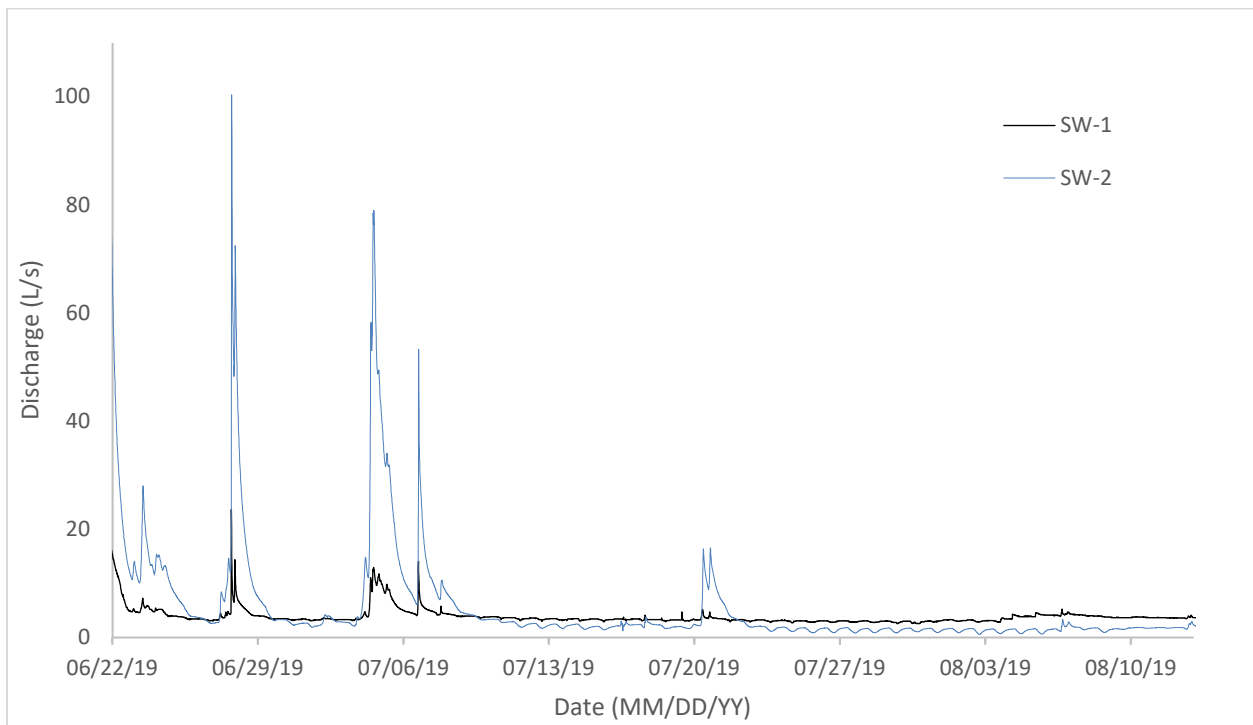


Figure A-4 Discharge At SW-1 And SW-2 Over Part Of Summer 2019

Reference: West View Supplementary Report – Coach Creek Hydrometric Monitoring

CONCLUSION

The two streams exhibited different flow regimes which reflected their upstream hydrological conditions. Flow attenuation at SW-1 was facilitated by the engineered pond immediately upstream, which provided storage capacity and regulated flow to the SW-1 channel. The flow patterns of SW-2 were more variable without a waterbody providing runoff and meltwater storage capacity immediately upstream.

The influence of groundwater contributions to the flow regimes of both streams could be investigated through a review of water quality data collected periodically over the hydrometric monitoring program.

Stantec Consulting Ltd.

Justin Knudson

Hydrologist

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Fax: 403 716 8099

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- c. Francisco Lourido, Stantec Consulting
Antoinette Agbeyakah, Stantec Consulting

APPENDIX C

**Memo: Coach Creek Stormwater Flow Dispersion Modelling,
Bow River, Calgary**

To: Rick Carnduff
Stantec Consulting Ltd.

From: Shelton Liu and Dave Morgan
Stantec Consulting Ltd.

File: 116529049.130

Date: January 15, 2018

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

1. INTRODUCTION

1.1 Background

The Westview Master Drainage Plan (Stantec Consulting Ltd. (Stantec), January 19, 2012) forms the guiding document for stormwater management servicing of new developments within the Westview Area Structure Plan (ASP). The previous draft Westview ASP is currently being finalized by The City of Calgary in cooperation with Melcor Developments Ltd. (Melcor) and Qualico Development West Ltd. (Qualico); the two developer landowners within the ASP.

In accordance with the approved Westview MDP, storm discharges from future developments will be directed to Coach Creek and the Unnamed Ravine which ultimately discharge to the Bow River upstream of the Bearspaw Water Treatment Plant (WTP) intake (**Photograph 1**). These discharges will be controlled, along with water quality improvement, through the use of detention storm ponds.

Water Resources, City of Calgary, wishes to ensure that the quality of water from the Bow River that enters the Bearspaw WTP is not severely affected by the future storm discharges from the Westview developments. Water Resources has therefore requested that a dispersion analysis be undertaken to assess the potential likelihood of pollutants from Westview storm discharges (i.e. Coach Creek) migrating across the river to the north bank by the time the Bow River flows reach the location of the WTP intake.



Photograph 1 Bearspaw WTP on north bank of the Bow River (courtesy Rick Carnduff).

1.2 Objective

As part of the Westview MDP revision works, Stantec was retained by Melcor and Qualico to undertake a preliminary stormwater dispersion modelling to investigate the potential effects of suspended sediment and other pollutant concentrations from Coach Creek discharges on the water quality at the Bearspaw WTP intake, which is located approximately 3.2 km downstream from

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

the mouth of Coach Creek. A two-dimensional (2D) hydrodynamic model was developed to predict the dispersion characteristics of concentrations suspended in the water column and to estimate the extent and level of sediment transport in Bow River.

2. METHODS

2.1 Study Area

The study area (**Figure 1**) encompasses an approximately 5.3 km long river reach of Bow River from Bears paw Dam (0.85 km upstream of the Coach Creek confluence) to the 85th Street Bridge (1.25 km downstream of the water intake). The study area was selected based on the geographic extent of available bathymetry data, the location of available hydrometric information, and the extent required to eliminate model boundary effects on hydrodynamics and dispersion in the model domain.



Figure 1 Study Area and Location Map, Bow River, Alberta

2.2 MIKE 21 Coupled Model

The river flows and water levels were modelled using the DHI MIKE21 Coupled Model of Hydrodynamic (HD) and Mud Transport (MT) modules. MIKE 21 is a globally-recognized modelling package for two-dimensional free surface flow, sediment transport and environmental processes. The following modules of MIKE 21 were used:

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

- MIKE 21 HD Module

The HD module simulates unsteady flow taking into account density variations, bathymetry and external forcings in rivers, lakes, estuaries and coastal areas. The modelling system is based on the numerical solution of 2D incompressible Reynolds averaged Navier-Stokes equations subject to the assumptions of Boussinesq and of hydrostatic pressure. Thus, the model consists of continuity, momentum, temperature, salinity and density equations and it is closed by a turbulent closure scheme.

- MIKE 21 MT Module

The MT module simulates the erosion, transport, settling and deposition of cohesive sediment in marine, brackish and freshwater environments. The MT module also takes into account fine-grained non-cohesive material. The MT module is an add-on module to the HD module. The main features of the MT module are multiple sediment fractions, multiple bed layers, flocculation, hindered settling, inclusion of non-cohesive sediments, bed shear stress from combined current and waves, consolidation, morphological update of bed and tracking sediment spills.

2.3 Existing Available Data

2.3.1 Data Sources

Hydrometric data were collected and processed to provide the domain and boundary conditions for hydrodynamic modelling. The existing available data sources are identified in **Table 1** and their locations are shown in **Figure 1**.

Table 1 Available Data Sources for Hydrodynamic Modeling

Parameter	Data Sources
Bow River Bathymetry	Provided by City of Calgary Water Resources
Bow River Discharge	Public open source from Environment Canada (EC), Water Survey Canada (WSC) – Hydrometric station 05BH008 at Bow River Below Bearspaw Dam
Coach Creek Discharge	Westview MDP QHM model analyses

2.3.2 Bathymetry

Figure 2 presents the extent and point elevations with a 0.2 m horizontal resolution, which was used to develop a 2D hydrodynamic model. The horizontal datum references to North America Datum of

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

1983 (NAD83) UTM Zone 11, and the vertical elevation references to Geodetic Survey of Canada datum.



Figure 2 Bathymetric Data in the Bow River Study Reach

2.3.3 Bow River Hydrology

Historical hydrometric data in Bow River were collected from publicly available sources from Water Survey Canada (WSC) of Environment Canada (EC) (Government of Canada, 2017). The hydrometric station Bow River Below Bearspaw Dam (05BH008), located at 51°05'58" N and 114°13'31" W, contains 29 years of historical daily flow records from 1983 to 2012. **Figure 3** shows the statistics of mean monthly discharges corresponding to the 29 years of data records. The low flows occurred from October to April with discharge rates less than 61 m³/s, and the high flows during summer season with a peak discharge rate 195.3 m³/s in June.

At the current stage, no historical water level records within the study reach have been available for use to calibrate the hydrodynamic flow model.

2.3.4 Coach Creek Hydrology

Coach Creek does not have a hydrometric station or hydrologic gauge to measure the flows. According to the previous study in Westview MDP, the hourly flows discharged from Coach Creek to Bow River were derived from the pre-development QHM model uses for that study (**Figure 4**). The frequency analysis of peak discharge rates from Coach Creek that were presented in the MDP report are shown in **Figure 5**, where the discharge rates for return periods of 2 year, 10 year and 50 year are 0.424 m³/s, 1.335 m³/s and 2.221 m³/s respectively.

The hourly flows indicate that discharges of Coach Creek stormwater typically occurred during summer season from May to August with high flows in June.

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

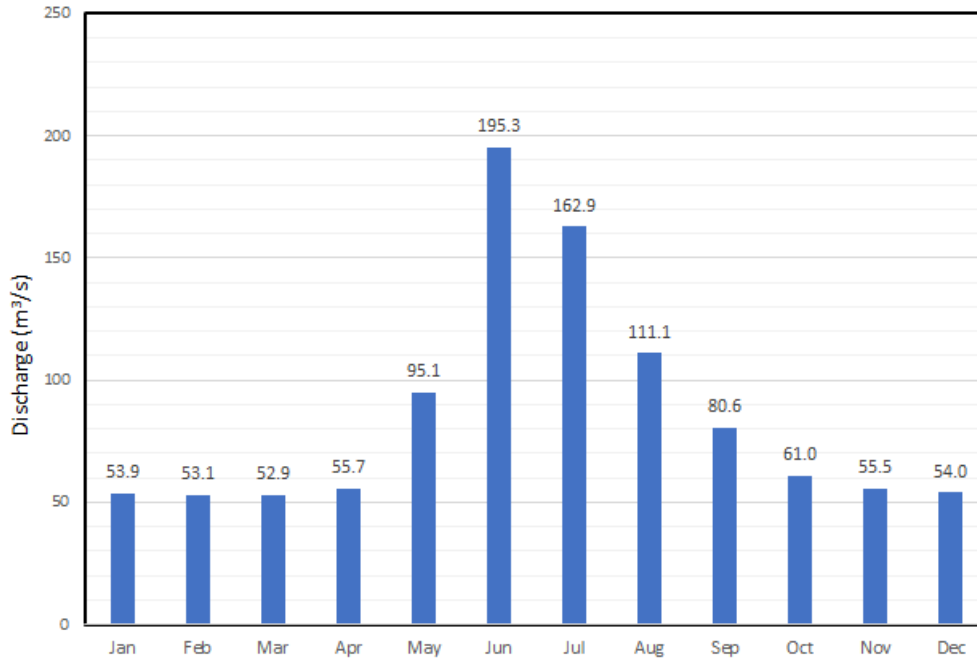


Figure 3 Mean Monthly Discharge (m³/s) at WSC Hydrometric Station 05BH008 on the Bow River (statistics corresponding to 29 years of data records from 1983 to 2012)

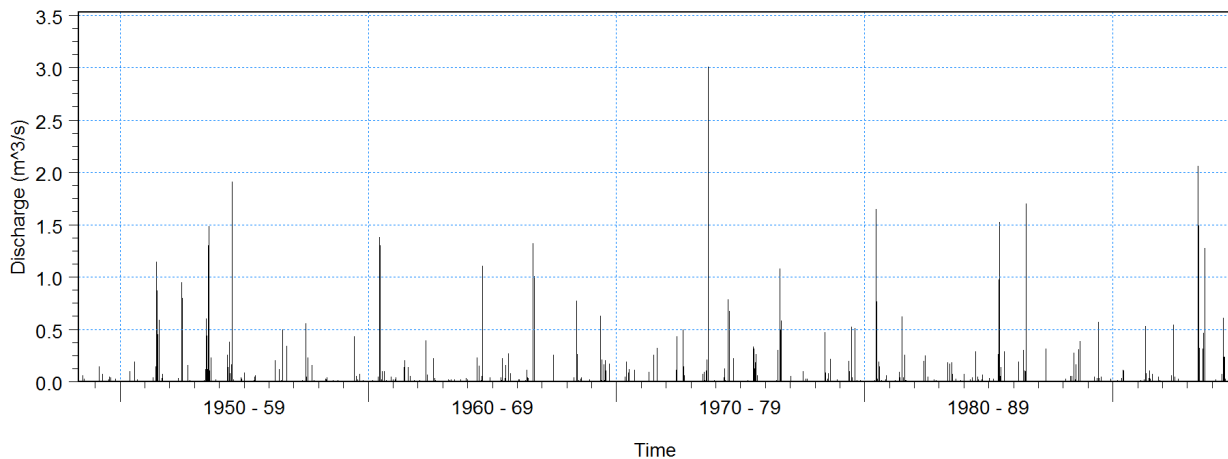
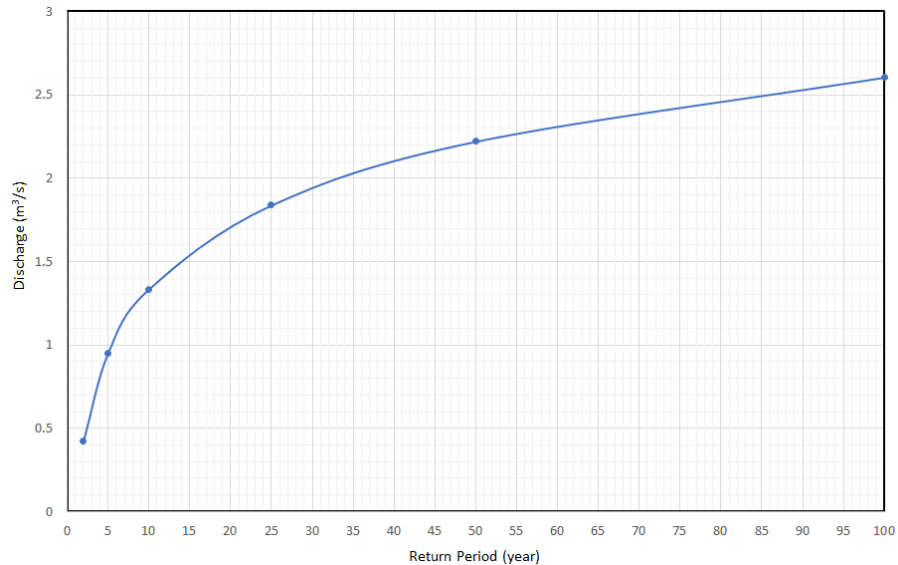


Figure 4 Pre-development Coach Creek Flow Discharged to Bow River (hourly discharge rates from 1948 to 1994)

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary**Figure 5 Predicted Return Period of Peak Discharges from Coach Creek to Bow River**

2.3.5 Water Quality

At the current stage, no field measurement of water quality parameters (e.g., temperature, total dissolved solid (TDS) and suspended sediment concentrations (SSC)) both in Bow River and from Coach Creek has been available. Water quality parameters from the stormwater were assumed in the hydrodynamic flow and dispersion modelling.

3. MODELLING AND RESULTS

3.1 Approaches

As presented previously, the objective for 2D modelling is to understand the hydrodynamic dispersion of suspended sediment concentrations discharged from Coach Creek stormwater and to investigate the potential effects at sensitive locations downstream, particularly at the water intake. This is to be achieved by carrying out a coupled hydrodynamic model of flow (HD) and sediment transport (MT) modules to characterize the water currents, the sediment dispersion plume and concentrations. The model was first setup to define the model domain, computational element meshes, domain parameters and boundary conditions, then applied to simulate the hydrodynamics of river flow and sediment dispersion. In the present modelling work, it is lack of field measurement data to calibrate the model.

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

3.2 Model Setup

Based on the available river bathymetric data shown in **Figure 2**, a triangle mesh system was generated in the model domain of river reach from Bearspaw Dam to the 85th Street Bridge. The resolution of the mesh, combined with the water depths and chosen time-step, governs the Courant number developed in the model setup. The Courant number affects the numerical stability of the model. The computational mesh was derived after an iterative process of refining and smoothing the mesh density to ensure proper convergence and accuracy of the numerical solution over a full range of river flows. The generated mesh system contains 5,670 nodes and 9,869 triangle elements and the mesh sizes vary from metres to tens of metres, where finer meshes were produced in vicinities of Coach Creek confluence, water intake, sand bars, back channels and feature shorelines. **Figure 6** shows the generated bathymetry and mesh in the vicinities of Coach Creek confluence and water intake respectively.

The model was setup with the following domain and boundary conditions (referring **Figure 1** for boundary locations):

- The upstream boundary was set at Bearspaw Dam, and the boundary condition was defined by Bow River discharge with a constant discharge rate.
- The downstream boundary was set at the 85th Street Bridge, and the boundary condition was defined by a water level estimated from a HEC-RAS model.
- The Coach Creek boundary was set at the confluence with Bow River, and the boundary conditions were defined by Coach Creek discharges with a constant discharge rate and a constant sediment concentration rate.
- The shoreline boundaries were defined as solid, with no water current transmission.
- The bed resistance was defined using Manning's roughness, which was set to $32 \text{ m}^{1/3}/\text{s}$ in the domain.
- The eddy viscosity coefficient was set to the default value of 0.28.
- The simulation period was set to a total 30 hours, including 6 hours to establish the initial Bow River flow conditions and 24 hours to simulate the stormwater discharge from Coach Creek and the dispersion of sediment concentration over the entire downstream river reach.
- The simulation time step requires consideration of numerical stability and solution accuracy. A time step of 60 seconds was used in the current modelling.

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

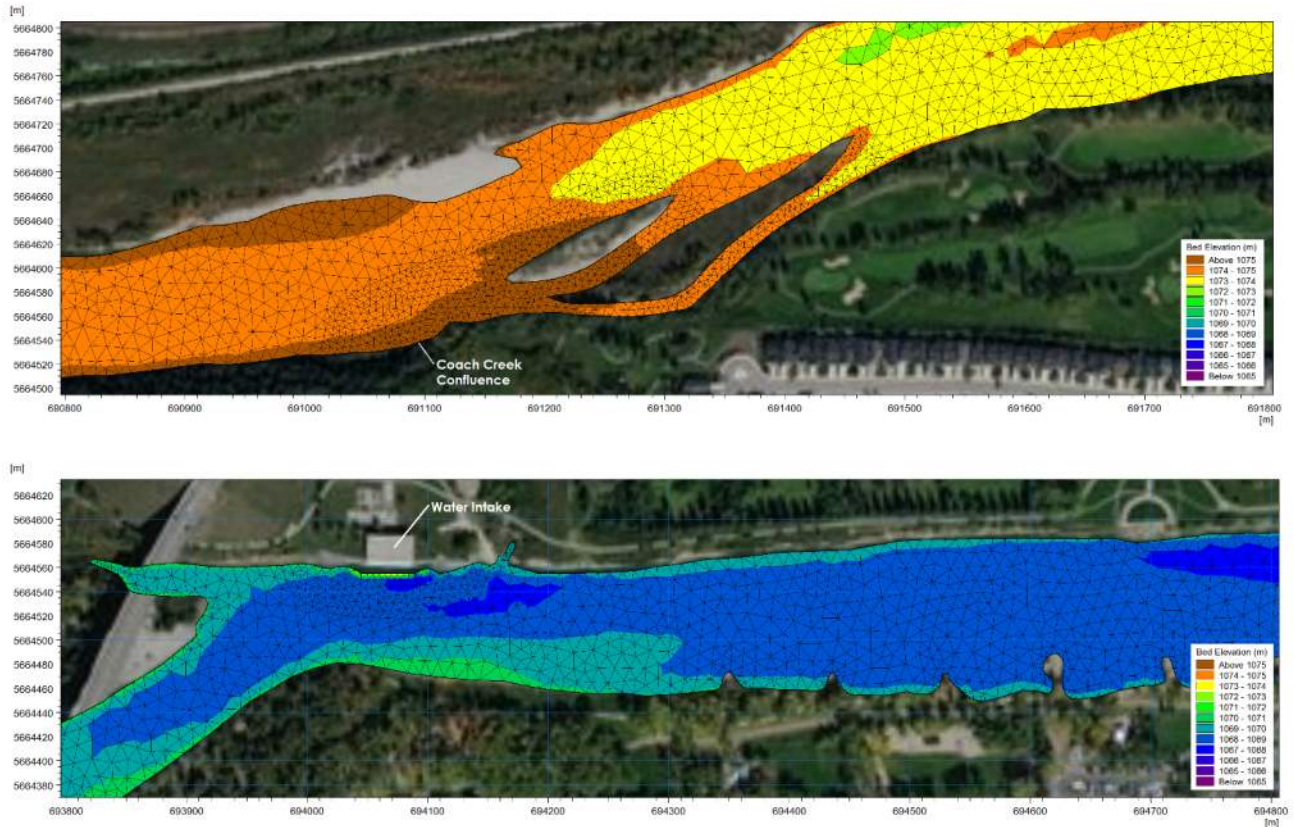


Figure 6 Example of Generated Bathymetry and Mesh in Areas of Coach Creek Confluence and Water Intake in Bow River

3.3 Model Scenarios and Assumptions

Model scenarios are selected to represent the flow conditions in Bow River and from Coach Creek, as well as the suspended sediment concentrations discharged from the Coach Creek stormwater. The key factors to determine the modelling scenarios are described as follows:

- Flows in Bow River
 - Based on observation of the hourly flows in Coach Creek (**Section 2.3.4**), the discharge of Coach Creek stormwater to Bow River occurred typically during the months from May to August, the flow condition in Bow River needs to be defined in this duration.
 - It is understood that higher river flows would be expected to have a higher carrying and mixing capacity for suspended sediment than lower flows, i.e., higher dilution ratios of discharged effluent could be achieved with higher ambient flows. Therefore, the mean monthly discharge rate 95.1 m³/s in May (**Figure 3**), which is the lowest discharge during

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

- the months from May to August, was selected as a conservative flow condition in Bow River. This discharge rate was applied at the upstream boundary of the 2D model.
- With a discharge rate 95.1 m³/s at Bearspaw Dam, the water level at the 85th Street Bridge was estimated by a HEC-RAS model to be 1068.04 m, which was applied at the downstream boundary of the 2D model.
 - Flows discharged from Coach Creek
 - Three stormwater flows from Coach Creek, 1:2 year, 1:10 year and 1:50 year, were selected to investigate the sediment dispersion conditions. The discharge rates of 0.424 m³/s, 1.335 m³/s and 2.221 m³/s corresponding to the above return periods respectively were applied at the Coach Creek confluence boundary of the 2D model.
 - An arbitrary concentration was assumed to be discharged from the stormwater flows and at a constant arbitrary concentration of 100 mg/L. Transport of the suspended sediment in the stormwater was simulated in the MT module which was dynamically coupled with the flow module (HD). The sediment particle was assumed as fine clay material, and no degradation or decay of the arbitrary concentration was taken into consideration in the model.
 - Due to lack of field measurements of water quality parameters both in Bow River and Coach Creek, modelling results of transport and dispersion of sediment concentration were discussed as increases to the receiving water ambient water.

The general conditions and assumptions applied in the modelling are summarized in **Table 2**. The assumptions include no settling and decay of sediment concentration, which is a conservative modelling approach that would represent an exaggerated condition and where normally some decay is anticipated to occur.

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

Table 2 Summary of Conditions and Assumptions Used in the Hydrodynamic Modeling

	Characteristics	Comments
General Model Settings		
Model Domain	5670 nodes and 9869 elements	
Coupled Modules	Hydrodynamic (HD) and Mud Transport (MT)	
Simulation Period	30 hours	
Simulation Time Step	60 seconds	
Assumptions	no settling and decay of sediment concentrations during the dispersion process	a conservative approach
Bow River Flow Conditions		
Discharge Rate	95.1 m ³ /s	at Bearspaw Dam
Water Level	1068.04 m	at the 85 th Street Bridge
Coach Creek Flow and Sediment Concentration		
Discharge Rate	0.424 m ³ /s, at 1:2 year return period	assumed continuous discharge with the return period rate, which is conservative comparing to instantaneous discharge with an hourly peak value
	1.335 m ³ /s, at 1:10 year return period	
	2.221 m ³ /s, at 1:50 year return period	
Sediment Concentration in Stormwater	100 mg/L	assumed arbitrary concentration from stormwater discharge for calculation of dilution ratios and easy visualization of the dispersion plume

3.4 Results and Discussion

Modelling results of sediment dispersion are presented as:

- snapshots of the spatial plume extent and sediment concentration at various times
- accumulated effects with time by the end of the simulation period
- a time series of the total concentration changes at selected observation locations, such as at the water intake location

The modelling considered three stormwater discharge scenarios from Coach Creek into the Bow River. **Figure 7** to **10** illustrate the sediment plume dispersion patterns for the 1:50 year Coach Creek stormwater at the snapshots at time 01:00, 02:00, 03:00 and 24:00 hours after the stormwater started discharging into the Bow River. The results indicate the spatial extent of the plume and change in sediment concentration with time at the water intake location. The sediment plume shape is

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

influenced by the Bow River currents and the bed bathymetric and shoreline topographic features. The sediment plume extended predominantly along the south shoreline for the first 1.0 kilometer downstream from the confluence and then dispersed across the river at approximately 2.0 kilometer downstream. Downstream of 2.0 kilometers the plume is well mixed in the river. In the back-channels immediately downstream of the confluence the concentrations are higher than elsewhere. The concentration in the mid-stream back-channel is higher than in the main channel and even higher in the south back channel.

Figure 11 presents the predicted spatial distribution of the sediment plume dilution factors by the end of the simulation period, which corresponds to the concentration distribution shown in **Figure 10**. The results indicate that lower dilution factors, suggesting the potential presence of higher sediment concentration in the receiving environment, occur in vicinity of downstream of the confluence and in areas of the back channels and south shoreline. The lowest dilution factor at water intake location for 1:50 year Coach Creek stormwater flow is estimated in range of 40 to 50.

In the same manner as in the 1:50 year flow analysis, the spatial distribution of dilution factors corresponding to the 1:10 year stormwater flow is presented in **Figure 12**, where the lowest dilution factor at water intake location for 1:10 year stormwater flow is estimated in range of 70 to 80. The lowest dilution factor at water intake location for 1:2 year stormwater flow is estimated higher than 100 (i.e., the concentration is lower than 1 mg/L) (**Figure 13**).

Time series of sediment concentration and dilution factor at the water intake location (694065 m E, 5664548 m N) are presented in **Figure 14** for three stormwater scenarios. These results indicate that:

- From discharge of the stormwater water in Coach Creek, the sediment plume will take approximately one hour to transport to the water intake location, and the dispersion and mixing process in the ambient water of intake will take about 10 hours until the sediment plume is fully mixed and the concentration reaches the highest and constant value.
- A higher discharge rate of Coach Creek stormwater will result in a higher fully mixed concentration at the WTP water intake location. In other words, the higher the discharge from Coach Creek, the lower the dilution factor at the WTP intake.
- The accumulative concentrations and corresponding dilution factors at the end of the simulation period in **Figure 14** are summarized in **Table 3**.
 - For the 2 year return period of stormwater, the very high dilution factor of 241.5 suggests that the potential effect of stormwater sediments on the water quality at the WTP intake is negligible.
 - For the 10 year return period of stormwater, the high dilution factor of 74.7 suggests a small impact on the water quality at the WTP intake.
 - From Stantec's past experience, the dilution factor of 45.0 for the 50 year return period discharges is not considered to be low. This condition can be used to evaluate whether a specific water quality parameter will meet the provincial and federal water quality guidelines and objectives, at time when the field water quality data be available.

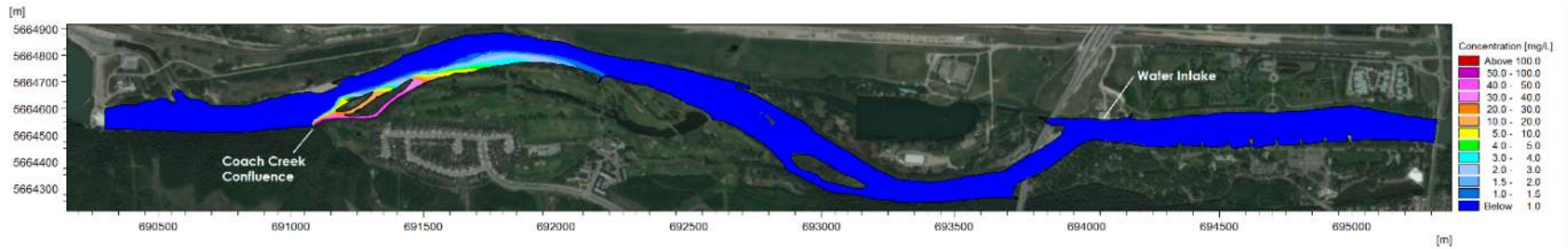


Figure 7 Sediment Plume and Increase in Concentration at 01:00 Hours Discharge of 1:50 Year Flow

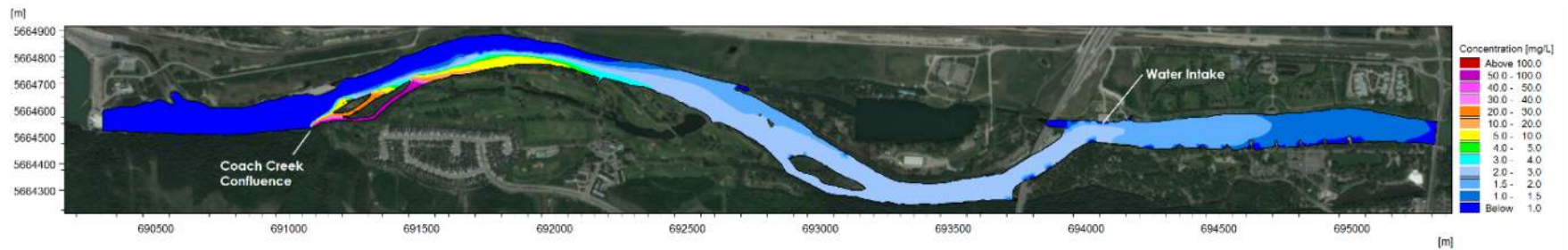


Figure 8 Sediment Plume and Increase in Concentration at 02:00 Hours Discharge of 1:50 Year Flow

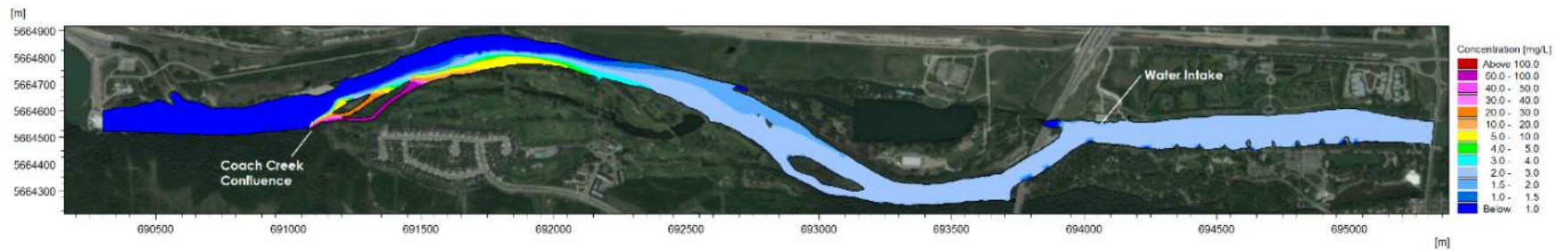


Figure 9 Sediment Plume and Increase in Concentration at 03:00 Hours Discharge of 1:50 Year Flow

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

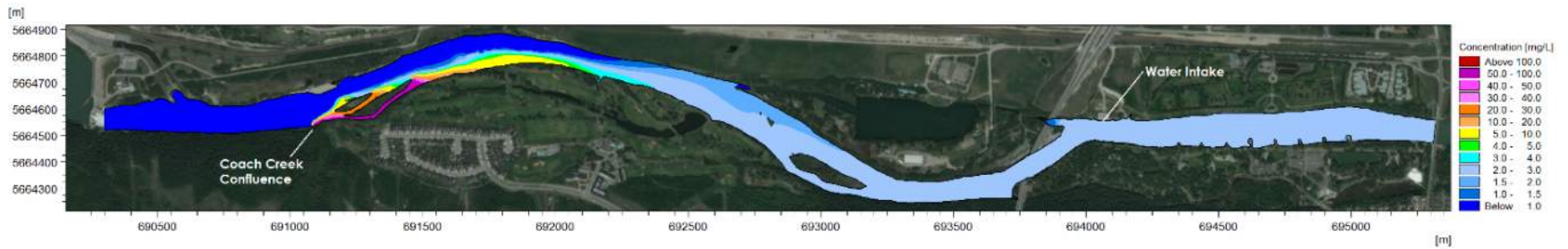


Figure 10 Sediment Plume and Increase in Concentration at 24:00 Hours Discharge of 1:50 Year Flow

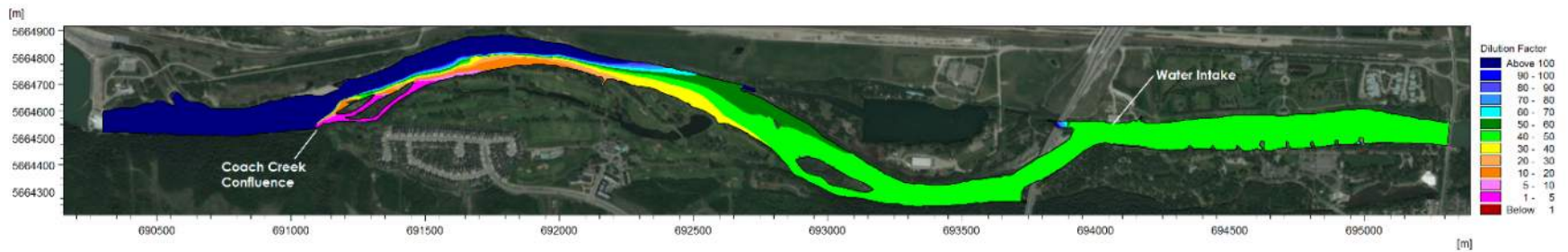


Figure 11 Spatial Dilution Factors Achieved at 24:00 Hours Discharge of 1:50 Year Flow

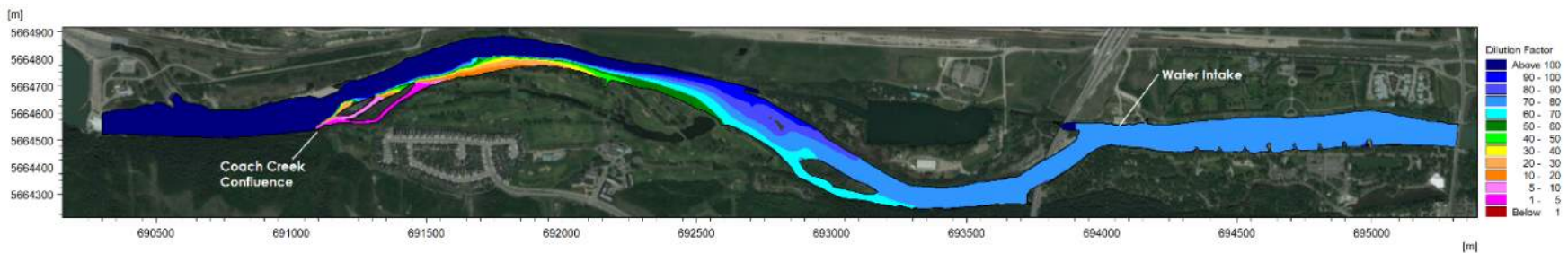


Figure 12 Spatial Dilution Factors Achieved at 24:00 Hours Discharge of 1:10 Year Flow

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

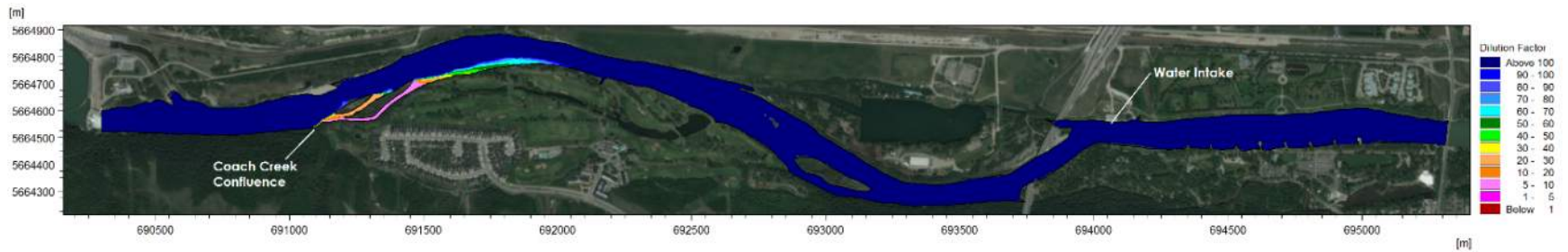


Figure 13 Spatial Dilution Factors Achieved at 24:00 Hours Discharge of 1:2 Year Flow

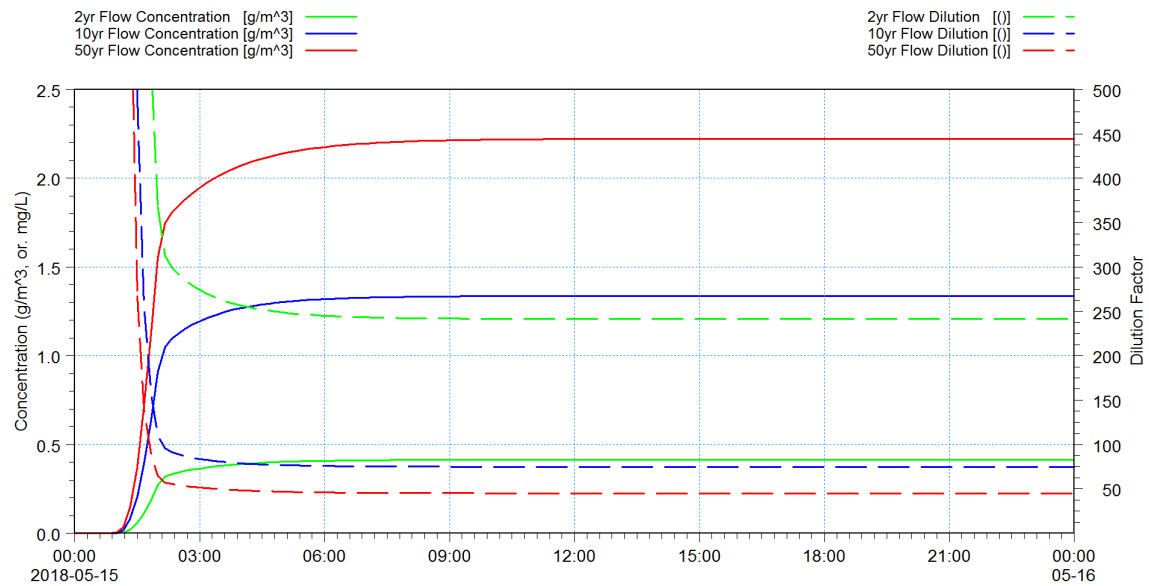


Figure 14 Time Series of Increase in Concentration and Dilution at Water Intake Location (694065 m E, 5664548 m N)

Table 3 Summary of Sediment Concentration and Dilution Factor at Water Intake Location

Return Period of Coach Creek Stormwater Flow (year)	Increase in Concentration (mg/L)	Dilution (non dimension)
2	0.414	241.5
10	1.338	74.7
50	2.222	45.0

Note: the concentration at Coach Creek discharge was assumed at 100 mg/L.

4. CONCLUSIONS AND RECOMMENDATIONS

A 2D hydrodynamic model was developed to evaluate the potential effect of stormwater discharged from Coach Creek to the Bow River on the water quality at the water intake located downstream of Coach Creek. Three stormwater scenarios were selected to simulate the dynamic process of flows and sediment plume dispersion, and to investigate the cumulative characteristics of sediment concentrations and dilution factors in the river reach domain.

Modelling results from this study are considered conservative based on the following key assumptions:

- The mean monthly flow in May, a typically low flow during the summer season, is a conservative scenario of Bow River flows for stormwater dispersion of Coach Creek flows.
- The stormwater from Coach Creek are discharged continuously with peak values of return period flows, while the reality is that the peak flow discharges instantaneously and lasts for only a few hours.
- The sediment from Coach Creek is assumed no settling and no decay in the receiving water, therefore, the modelling results are considered conservative (i.e. higher than expected).

The key conclusions based on the stormwater dispersion modelling results indicate:

- Driven by Bow River currents, sediment plume discharged from Coach Creek disperses towards the back-channels immediately downstream of the confluence, and drifts along the south shoreline. A large portion of discharged sediments would be retained in the back channel areas, resulting the potential cumulative increase of sediment concentration and deposition.
- A higher discharge rate of Coach Creek stormwater will result in a higher sediment concentration or a lower dilution factor at water intake location.
- The dilution factors at water intake are predicted to be 241.5, 74.7 and 45.0 for 2 year, 10 year and 50 year flows respectively. These dilution factors indicate that the increase in sediment concentration would only be 0.5% to 2 % of the concentration of sediment coming

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

from the stormwater. The dilution values are considered to be conservative (the lowest) for each individual flow event, based on conditions and assumptions in the modelling.

The key limitations in this modelling study are:

- In absence of field confirmation of sediment and water quality properties both in Bow River and in Coach Creek, modelling results from this study provides information on the likelihood extent and level of predicted sediment concentrations and dilution factors.
- The predicted sediment concentrations are based on model parameters such as the flow conditions, sediment and water quality properties. If any of these change, the modelling results subject to change accordingly.

At times when site specific water quality data becomes available in both the Bow River and Coach Creek, it is recommended to further evaluate whether the changes of specific water quality parameters (such as any metals, chemicals, or sediment materials) would meet relevant surface water quality guidelines and objectives. The provincial and federal government guidelines include:

- Environmental Quality Guidelines for Alberta Surface Waters, Government of Alberta, July 2014
- Guidance for Deriving Site-specific Water Quality Objectives for Alberta Rivers, Government of Alberta, March 2012
- Canadian Water Quality Guidelines for the Protection of Aquatic Life. Canadian Council of Ministers of the Environment (CCME), 2003.

5. REFERENCES

City of Calgary; Bathymetry data

Government of Canada, 2017; Water Level and Flow, <https://wateroffice.ec.gc.ca/>

Stantec Consulting Ltd.; *Westview Stormwater Master Drainage Plan*; January 19, 2012

Reference: Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary

STANTEC CONSULTING LTD.

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Shelton.Liu@stantec.com

Dave Morgan, P.Eng.
Principal, Environmental Services
Phone: 204-924-5731
Dave.Morgan@stantec.com

Brandrick, Robert

From: Banack, Janelle K. <Janelle.Banack@calgary.ca>
Sent: Friday, November 09, 2018 2:26 PM
To: Brandrick, Robert
Cc: Lopez Hernandez, Pablo; Parks, Ashley
Subject: RE: West View ASP stormwater

Hello Rob,

I'm back from maternity leave as of mid-October and Ashley/Pablo have looped me in to the Westview MDP conversations.

Below are some compiled comments from Watershed Planning on the "Coach Creek Stormwater Flow Dispersion Modelling, Bow River, Calgary - January 15, 2018". Please let me know if any items require clarification and perhaps we can discuss further.

1. Please justify the 100 mg/L TSS concentration for stormwater used for the assessment. The typical value used is 400 mg/L. Please also provide a sensitivity analysis around the TSS load input.
2. As storm events can occur outside of the higher flow period on the Bow River, please show the analysis with low flows in the Bow River combined with higher TSS as per the comment above. We would suggest using a flow of 35.7 m³/s, which is the 7Q10 low flow (Oct-Jun) defined in the City of Calgary Receiving Water Assessment Phase 3: Wastewater Operating Approval 2018-2028 (Stantec, October 2017). A sensitivity analysis around the flow in the Bow River would also be helpful, dependent on the results of this scenario. Also, is modelling of an ice covered scenario of value?
3. Provide an analysis around the sensitivity of increased peak flow coming from Coach Creek. Consider a peak flow increase up to 40%. This may also need to be updated after the flow data has been collected and the post-development flow scenario has been determined.
4. What lateral dispersion coefficient was used for modelling? Provide the rationale.
5. The water quality assessment appears to focus on protection of aquatic life. Discuss the modelling results with respect to the impacts on quality of The City's drinking water source.
6. Due to the proximity of the outfall to the water intake, provide a discussion of the potential impact or risk of bacteriological parameters (e.g., E-Coli), metals and other pollutants present in the stormwater affecting the City's drinking water source. At least, provide some discussion of the effects of these potential pollutants in stormwater. This may be addressed in the updated MDP.
7. Due to the proximity of the outfall to the water intake, provide a discussion of the risk of a potential accidental release or unauthorized dumping of a toxic substance into the stormwater. This may be addressed in the updated MDP.

In addition, is the feasibility of potential stormwater discharge of stormwater downstream of the intake at the Bearspaw water treatment plant (RAW2) being explored? We think this is a worthwhile effort, as any negative impacts to the quality of drinking water need to be avoided or minimized. This is in alignment with The City's [Source Water Protection Plan](#). I understand there may be options for discharge north or south of the river that could be explored. It would be helpful to sit down to discuss progress on this. Would the week of November 19th work for you?

Please let me know if there is any other information you are waiting on from us.

Thanks, Janelle

Janelle Banack, M.Sc., P.Eng.

Planning Engineer

Development Planning, Infrastructure Planning, Water Resources

The City of Calgary | Mail code: #437

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4th Floor, Water Centre, 625 - 25 Avenue SE

PO Box 2100, Station M, Calgary, AB T2P 2M5

From: Brandrick, Robert [<mailto:Robert.Brandrick@stantec.com>]

Sent: Thursday, September 20, 2018 4:17 PM

To: Parks, Ashley <Ashley.Parks@calgary.ca>

Cc: Lourido, Francisco E. <francisco.lourido@stantec.com>

Subject: [EXT] RE: West View ASP stormwater

Hi Ashley,

I connected with our hydrologist this week and we just received our monitoring equipment. We will be installing the equipment on Coach Creek tomorrow and it can remain in place over the winter. With the installation happening we've also reached out to Dusty again as he was interested in seeing the monitoring setup. We've also extended an offer to him to help with the data processing and survey to support his monitoring efforts to date. We would have to get the extra work authorized by Qualico and Melcor but if this might be beneficial we can assess the effort and go from there.

I found my notes from the previous meeting Rick and I had with Pablo, Abdul, and George Roman (I knew there was one more person there) at the end of March. We did talk about the option of a piped outfall like I mentioned, but Pablo suggested a feasibility assessment and George noted a desire for consistency with the Haskayne requirements (discharge downstream of the raw water intake). I don't have it specifically noted but as I mentioned when we talked, I believe we settled back to using Coach Creek as our receiving body.

That just leaves us with the Coach Creek monitoring as the last outstanding item for the MDP update. We'll likely need into summer 2019 to finish the monitoring and then we can look at what we want/need to do with the data and the MDP update from there.

You mentioned that you may have some feedback to offer on the dispersion analysis and flow duration curves generated. Please just pass anything along when you have a chance and we can arrange to gather any other information needed.

Hopefully that all helps but please just let me know if you have any questions or want to go over anything.

Thanks,
Rob

Rob Brandrick P.Eng.

Senior Associate, Engineering, Community Development

Direct: 403.716.8305

robert.brandrick@stantec.com



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APPENDIX D

Schedule of Quantities & Estimated Prices





WESTVIEW ORDER OF MAGNITUDE

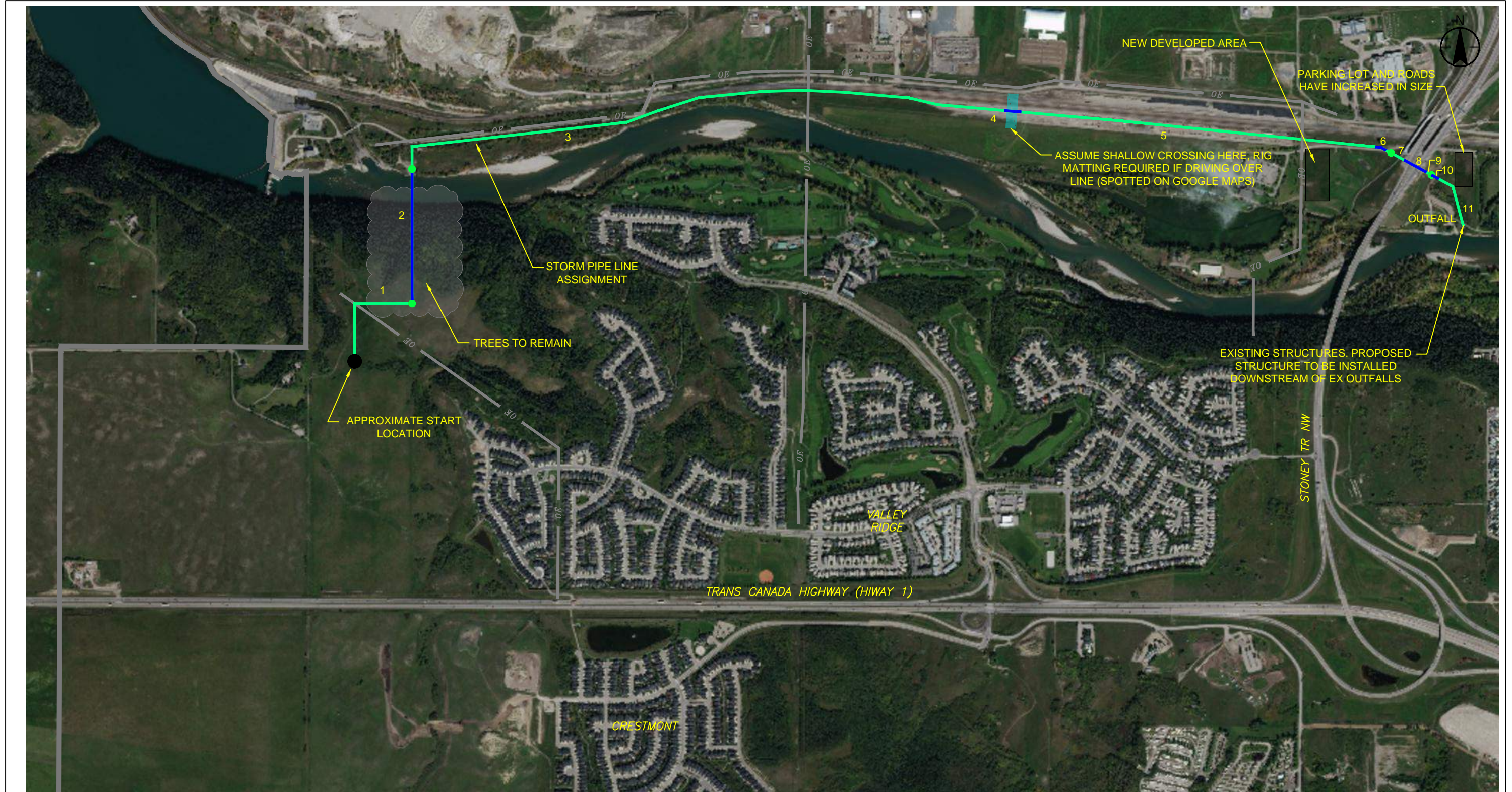
SCHEDULE OF QUANTITIES & ESTIMATED PRICES

Description	Unit	Quantity	Unit Cost	Cost
1.0 UNDERGROUND				
1.1 900mm HDPE Directional Drill	lm	400	\$ 17,650.00	\$ 7,060,000.00
1.2 1200mm Class IV	lm	380	\$ 2,500.00	\$ 950,000.00
1.3 1500mm Class V	lm	3350	\$ 4,000.00	\$ 13,400,000.00
1.4 1500mm Class V Auger	lm	360	\$ 16,000.00	\$ 5,760,000.00
1.5 1800x1800 Type 1S Manhole - Total 4	vm	24	\$ 5,000.00	\$ 120,000.00
1.6 1930x1930 Type 1S Manhole - Total 21	vm	126	\$ 5,000.00	\$ 630,000.00
1.7 Outfall - Total 1	vm	6		
2.0 SITE WORK				
2.1 Clearing	ls	1	\$ 50,000.00	\$ 50,000.00
2.2 Topsoil Stripping & Stockpile	cm	70000	\$ 10.00	\$ 700,000.00
2.3 Reloam from Stockpile	cm	70000	\$ 10.00	\$ 700,000.00
2.4 Handling of Water	ls	1	\$ 250,000.00	\$ 250,000.00
2.5 Erosion & Sediment Control	ls	1	\$ 150,000.00	\$ 150,000.00
3.0 LANDSCAPING				
3.1 Hydroseeding	sm	140000	\$ 3.50	\$ 490,000.00
3.2 Tree Replacement	ls	1	\$ 50,000.00	\$ 50,000.00
4.0 MISCELLANEOUS				
4.1 Mobilization	ls	1	\$ 50,000.00	\$ 50,000.00
4.2 Traffic Control	ls	1	\$ 150,000.00	\$ 150,000.00
4.3 Protection of Existing Trunks	ls	1	\$ 100,000.00	\$ 100,000.00
4.4 Existing Utilities	ls	1	\$ 50,000.00	\$ 50,000.00
4.5 Maintenance	mo	21	\$ 10,000.00	\$ 210,000.00
4.6 Rig Matting	lm	40	\$ 500.00	\$ 20,000.00
Sub-Total				\$ 30,890,000.00
Contingency		5%		\$ 1,545,000.00
Sub-Total				\$ 32,435,000.00
Engineering, Administration, Geotechnical		12%		\$ 3,893,000.00
Total Order of Magnitude				\$ 36,328,000.00

Notes:

- Allowances have been made for manholes to be spaced less than 185m apart with assumption of an average depth of 6m
- Topsoil assumed at maximum 0.5m depth, with a stripping width of 36m and all material can be stockpiled then reused after backfill (no offsite haul)
- Hydroseeding has been allowed for instead of sod.
- Traffic control allowance includes signage and permits where required.
- Contractor has allowed for a 25% Contingency on prices provided.

I:\116529049\westview\general\engineering\sheet_files\cad\figures\westview_dtl_atrm_01.dwg
 4:03 PM 8 October 2019 - Cr. Jaban







ORIGINAL SHEET - 11x17

OCTOBER, 2019
116529049



200 - 325 25th Street SE
Calgary, AB T2A 7H8
www.stantec.com

Legend

	PROPOSED PIPE ALIGNMENT
	EX OVERHEAD POWER LINES
	CITY OF CALGARY BOUNDARY
	NEWLY DEVELOPED AREAS

Notes

1.	OPEN CUT	1200mm CLASS IV
2.	AUGER UNDER BOW RIVER	900mm HDPE DIRECTIONAL DRILL
3.	OPEN CUT	1500mm CLASS V
4.	AUGER UNDER EX SHALLOWS	1500mm CLASS V AUGER
5.	OPEN CUT	1500mm CLASS V
6.	AUGER UNDER SCENIC BOW RD	1500mm CLASS V AUGER
7.	OPEN CUT	1500mm CLASS V
8.	AUGER UNDER STONEY TRAIL	1500mm CLASS V
9.	OPEN CUT	1500mm CLASS V
10.	AUGER UNDER RIVER ACCESS/PARKING	1500mm CLASS V AUGER
11.	OPEN CUT	1500mm CLASS V

Client/Project

QUALICO COMMUNITIES &
MELCOR DEVELOPMENTS LTD.
WESTVIEW MASTER DRAINAGE PLAN

Figure No.

7.1

Title

ALTERNATE STORM DISCHARGE
TO BOW RIVER

Brandrick, Robert

From: Fellingner, Tanner <Tanner.Fellingner@calgary.ca>
Sent: Tuesday, November 19, 2019 8:08 AM
To: Lourido, Francisco
Cc: Ubar, Michal; Choi, Maggie; Brandrick, Robert; 'ABoucher@melcor.ca'; 'CPiechotta@qualico.com'; 'BMercer@qualico.com'
Subject: RE: West View ASP - Stormwater Management Decision Request Water Resources OPC Response
Importance: High

Francisco,

Water Resources has reviewed your OPC regarding the optional storm trunk required to discharge development flows from the West View ASP lands to the Bow River at a location downstream of the City water intake. This option aligns with Water Resources' Source Water Protection Policy and is consistent with stormwater management requirements of the Haskayne ASP and MDP. Please include this preferred stormwater management option in your West View MDP revision.

I know there have been comments made through a recent Councilor escalation about precedence being set with older communities (specifically Valley Ridge and Crestmont) in being allowed to discharge upstream of the Bearspaw WTP Raw Water Intakes. For reference sake, the community of Valley Ridge was established in the early 1990's (more than 2 decades ago) and Crestmont was established in the early 2000's.

Stormwater management, and the associated water quality concerns resulting from draining urban areas, has advanced since that time. The discharge of stormwater from both Valley Ridge and Crestmont upstream impacts Calgary's water source at the Bearspaw WTP Raw Water Intakes. In the future, Water Resources may be required to modify the existing stormwater infrastructure to address this risk in these older areas. The stormwater management strategy for the Haskayne ASP and the West View ASP, in contrast to Valley Ridge and Crestmont, helps to eliminate this risk to public health.

I trust that the content of this email will allow Stantec to move forward with completing the West View MDP. Should you have any further questions, please do not hesitate to call me.

Regards,

Tanner Fellingner, P.Eng.

**Leader - Development Planning | Infrastructure Planning
Water Resources**

The City of Calgary | Mail Code: #437

P.O. Box 2100, Station M, Calgary, AB Canada T2P 2M5

T 403.268.4933 | **C** 403.850.4922

Tanner.Fellingner@calgary.ca

From: Lourido, Francisco [<mailto:francisco.lourido@stantec.com>]

Sent: Monday, November 11, 2019 12:11 PM

To: Ubar, Michal <Michal.Ubar@calgary.ca>; Choi, Maggie <Maggie.Choi@calgary.ca>; Fellingner, Tanner <Tanner.Fellingner@calgary.ca>

Cc: Alan Boucher <ABoucher@melcor.ca>; Clark Piechotta (CPiechotta@qualico.com) (CPiechotta@qualico.com) <CPiechotta@qualico.com>; 'Ben Mercer' <BMercer@qualico.com>; Brandrick, Robert <Robert.Brandrick@stantec.com>; Anderson, Brian <Brian.Anderson@stantec.com>; Light, Sarah <Sarah.Light@stantec.com>
Subject: [EXT] RE: West View ASP - Stormwater Management Decision Request

Hi Michal, Maggie and Tanner:

Just wanted to follow up on my email below, has Water Resources review to order of magnitude Opinion of Probable Cost for the storm trunk to discharge downstream of the City water intake?

We would like to finalize the revision to the MDP as soon as possible and are available to meet with you at your convenience.

Thank you.

Francisco E. Lourido

P.Eng., LEED @ AP
Senior Principal, Community Development

Direct: (403) 716-8304

Fax: (403) 716-8099

Stantec Consulting Ltd.
200-325 25 Street SE
Calgary AB T2A 7H8 CA



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From: Lourido, Francisco

Sent: Thursday, October 10, 2019 11:18 AM

To: Ubar, Michal <Michal.Ubar@calgary.ca>; Choi, Maggie <Maggie.Choi@calgary.ca>; Fellingner, Tanner <Tanner.Fellingner@calgary.ca>

Cc: Alan Boucher <ABoucher@melcor.ca>; Clark Piechotta (CPiechotta@qualico.com) (CPiechotta@qualico.com) <CPiechotta@qualico.com>; 'Ben Mercer' <BMercer@qualico.com>; Brandrick, Robert <Robert.Brandrick@stantec.com>; Anderson, Brian <Brian.Anderson@stantec.com>; Light, Sarah <Sarah.Light@stantec.com>

Subject: RE: West View ASP - Stormwater Management Decision Request

Hi Michal:

As requested by Water Resources, we have updated the order of magnitude costs for optional storm trunk required to discharge development flows from the West View ASP lands to the Bow River at a location downstream of the City water intake.

Attached are a drawing showing the conceptual alignment and the order of magnitude Opinion of Probable Cost (OPC).

We note the following regarding this OPC :

- The trunk alignment is conceptual. We have not confirmed ownership, access to the lands, potential conflicts with other existing utilities.
- No geotechnical investigation has been performed along the alignment. This is particularly important to confirm the feasibility of the directional drilling under the Bow River.
- We engaged the assistance of a contractor for the construction pricing. The contractor included a 25% contingency in their prices. We have added an additional 5% contingency. In our opinion, an OPC of this high level should include a minimum 30% contingency.
- The OPC does not include allowances for any preliminary studies such as geotechnical, environmental, historical resources
- The OPC does not include any allowances for potential land (right-of-way) acquisitions.
- The OPC assumes that City of Calgary Parks will not object to the proposed alignment/construction within environmentally sensitive areas.

As previously discussed, in our opinion this offsite trunk is not a financially viable solution. We are available to meet with you and discuss further at your convenience.

Alternatively, let us know the next steps to deem the MDP revision completed and accepted.

Thank you.

Francisco E. Lourido

P.Eng., LEED @ AP
Senior Principal, Community Development

Direct: (403) 716-8304
Fax: (403) 716-8099

Stantec Consulting Ltd.
200-325 25 Street SE
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From: Brandrick, Robert <Robert.Brandrick@stantec.com>

Sent: Wednesday, July 10, 2019 3:20 PM

To: Choi, Maggie <Maggie.Choi@calgary.ca>; Fellingner, Tanner <Tanner.Fellinger@calgary.ca>

Cc: Lourido, Francisco <francisco.lourido@stantec.com>; Alan Boucher <ABoucher@melcor.ca>; Clark Piechotta (<CPiechotta@qualico.com>) (<CPiechotta@qualico.com>) <CPiechotta@qualico.com>; 'Ben Mercer' <BMercer@qualico.com>

Subject: RE: West View ASP - Stormwater Management Decision Request

Hi Maggie and Tanner,

Thanks for taking the time to meet today, I know you are both busy with a lot of different things. From our discussion, we will plan to proceed on the basis that there is a zero-risk approach that needs to be applied to achieve the Source Water Protection Plan objectives in relation to stormwater discharge from the West View ASP boundary. We won't pursue any further work on the dispersion analysis of runoff from Coach Creek or other stormwater quality treatment options because these options cannot achieve a zero-risk condition.

Our next steps will be to update the projected costs for the storm trunk options presented in the 2012 West View MDP. We will present those costs along with an explanation that the 2012 storm trunk route option is considered the more viable option relative to other potential trunk routing alternatives.

Please just let me know if there is anything else that you think we need to consider as an initial next step, otherwise we will carry on with this plan.

Thanks again,
Rob

Rob Brandrick P.Eng.

Senior Associate, Engineering, Community Development

Direct: 403.716.8305
robert.brandrick@stantec.com



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From: Brandrick, Robert

Sent: Friday, June 28, 2019 10:48 AM

To: Choi, Maggie <Maggie.Choi@calgary.ca>; Fellingner, Tanner <Tanner.Fellinger@calgary.ca>

Cc: Lourido, Francisco <francisco.lourido@stantec.com>; Alan Boucher <ABoucher@melcor.ca>; Clark Piechotta (CPiechotta@qualico.com) (CPiechotta@qualico.com) <CPiechotta@qualico.com>; 'Ben Mercer' <BMercer@qualico.com>

Subject: West View ASP - Stormwater Management Decision Request

Hi Maggie and Tanner,

We've been working through a process to update the 2012 West View Master Drainage Plan as part of the current amendment to the West View ASP. Back in October 2017 we established three items to apply to the update to the Master Drainage Plan with the Development Planning team. One of these items was a dispersion analysis to assess how constituents in runoff discharged to the Bow River via Coach Creek might be dispersed within the river by the time they reach the raw water intake near the Bearspaw WTP.

We completed the dispersion analysis in early 2018 and received feedback from the Development Planning team in late 2018. The results of the dispersion analysis indicated a fully mixed condition of discharge via Coach Creek within the river by the time the flow reached the raw water intake. Based on this finding, the Development Planning team considers the fully mixed condition an unacceptable risk to the raw water intake.

We of course respect and fully support the need to protect the raw water intake.

Why we are reaching out to you is to facilitate a decision on next steps. Working with the Development Planning team through early 2019 we are being asked for continued study and review of options to mitigate risk to the raw water intake from storm discharge originating within the West View ASP boundary. The challenge with attempting further study is that we have no indication of what might ever be considered a successful mitigation. The 2012 West View Master Drainage Plan considered a new storm trunk to cross the Bow River and discharge downstream of the raw water intake as an option for servicing the West View ASP boundary. In 2012, the new storm trunk was not considered a viable option based on cost. However, if there is a zero risk tolerance for the raw water intake then a new storm trunk remains the only viable option and no further analysis of any other mitigation measures is warranted.

To help us break free from the stalled position we feel we are in currently, we would like to meet with the two of you to have decisions made.

- The key decision needed is the risk tolerance at the Bearspaw WTP raw water intake, is this a zero risk or is there some degree of risk from a stormwater discharge via Coach Creek that can be accepted.
- If there is a zero risk condition then we need a decision that proceeding with a new storm trunk will be the recommended/preferred approach so we can look at optimizing the design condition and planning for this approach with respect to the related capital cost and growth management overlay implications.
- If there is any amount of risk tolerance then we need to know the tolerance metrics so we can focus on reviewing and presenting effective mitigation strategies.

We can work with whatever decisions are made but we need some decisions made. Continuing to spend time on studies or value management sessions or anything else has no value if we don't know what the target is at the end of it all.

Please let me know if you have any follow-up questions and when you are available to meet.

Thanks,
Rob

Rob Brandrick P.Eng.
Senior Associate, Engineering, Community Development

Direct: 403 716-8305
Fax: 403 716-8099
robert.brandrick@stantec.com

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The City of Calgary Wastewater Development Approvals

Checklist for • Master Drainage Plan, • Staged Master Drainage Plan and • Pond Report

Project:

Westview Master Drainage Plan

Developer:

Qualico Communities and Melcor Developments Ltd.

YES NO N/A

- | | | | |
|-------------------------------------|--------------------------|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1. Checklist items marked as "NO" or "N/A" are explained in the comment section. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 2. Submit six copies of report that are signed and include the Professional Engineer's stamp and the company's permit number. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 3. Cover letter highlights any unresolved issues or areas where guidelines cannot be met. |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | 4. Include Outline Plan Number. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 5. Include plastic sleeve behind title page for future correspondence. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 6. State design objectives. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 7. Identify Watershed, Master / Staged Master or any other drainage plans appropriate to submission. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 8. Identify Biophysical Impact Assessment and Biophysical Inventory reports appropriate to submission and discuss any items that have to be addressed prior to report approval. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 9. Explicitly state that all details conform to the City of Calgary Standard Specifications and Stormwater Management Design Manual, or explicitly state items that have to be addressed prior to report approval. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 10. Study Area and Location sketches include overall site description and show location, section number and major roadways. It is best to include two figures: one showing the location of the area with respect to the City of Calgary, and the other showing the study area and surrounding master/staged master plans including those not in control of the developer. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 11. Include drawing showing catchment and subcatchment area boundaries on preferably 11" x 17" size paper. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 12. Site description includes legal land location and area in hectares. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 13. Explicitly state all overland flows crossing boundary limits and their locations with references to related reports. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 14. Boundaries match those of existing reports, or supplemental information is included to rationalize the changes. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 15. State the permitted release rate (L/s/ha) for minor system and stormwater ponds. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 16. Identify approximate trunk sizes and alignment, servicing routes and overland drainage routes. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 17. Identify receiving water body and outfall. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 18. Any increase in flow offsite has been reviewed for the impact on affected downstream works. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 19. Include brief description of computer model, methodology, design storm parameters, and computer input parameters. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 20. Include schematic that matches the submitted drawings and computer model. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 21. Attach computer model input and output files including continuous and single event simulation for stormwater storage requirements. |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 22. Master or Staged Master Drainage Plan delineates drainage basin beyond plan limit if appropriate. |

(Over)



The City of Calgary
Wastewater Development Approvals

Checklist for • Master Drainage Plan,
• Staged Master Drainage Plans and
• Pond Report

YES NO N/A

- 23. Identify and locate stormwater ponds or other Best Management Practices within study area.
- 24 All stormwater management facilities are entirely located within developers property limits or offsite details are provided.
- 25. Explicitly state the developer controls the land that offsite facilities occupy or statement of agreement with affected stakeholders is enclosed.
- 26. State if pond report will follow.
- 27. Address water quality issues/improvements.
- 28. Include completed Alberta Environment 'Application Checklist for Storm Drainage Treatment Facilities within the City of Calgary'.
- 29. All plans and engineering drawings submitted include quarter section lines and street names. Pertinent information on the plans uses legible font sizes.
- 30. Include a digital copy of the drawing displaying catchment and subcatchment area boundaries in .dxf format with report.

Comments:

4. This report is for the Westview ASP and not a land use application.

25. Ownership of the SWMFs will be confirmed at the Outline Plan stage.

26. The need for pond reports will be confirmed at the Outline Plan stage.

28. The EPEA application information will be provided at the detailed design stage.

I, the undersigned, have reviewed the Stormwater Reports Checklist.

Signature of Report Author

R. D. (Rick) Carnduff

Name
(Please Print)

Jan. 19/2012

Date



EXECUTIVE SUMMARY

Stantec Consulting Ltd. has prepared this Stormwater Master Drainage Plan in support of the Westview Area Structure Plan (ASP) being prepared by the City of Calgary. The Westview ASP encompasses 305 ha of lands west of the existing Valley Ridge and Crestmont communities. The City of Calgary has identified that the lands will mostly comprise residential and commercial/ business park developments.

Drainage from the Westview lands will be discharged to the natural drainage courses in the area referred to herein as Coach Creek, Unnamed Ravine and Range Road 30C Ravine. Drainage easements or rights-of-way will likely be required where these discharges occur through the Rocky View County, as well as a notation added in the Rocky View County – City of Calgary Intermunicipal Development Plan (currently in draft form).

An evaluation was undertaken of Coach Creek to determine its pre-development runoff condition as a representative scenario for all of the Westview Lands. Based on both visual and analytical hydrologic analysis, discharges from the Westview lands shall meet the following pre-development condition objectives:

- Average annual runoff volume of 19 mm accounting for all precipitation in the form of rainfall and snowfall;
- Maximum allowable unit discharge rates as follows:

1:2 Year	1.39 L/s/ha
1:5 Year	3.13 L/s/ha
1:10 Year	4.39 L/s/ha
1:25 Year	6.05 L/s/ha
1:50 Year	7.30 L/s/ha
1:100 Year	8.57 L/s/ha

If additional or more stringent targets are identified at the time of Staged Master Drainage Plan report submissions (i.e. Outline Plans) then those targets shall be accounted for. Those targets may follow from the Bow River Basin Watershed Management Plan, the Municipal Development Plan or others.

Drainage easements or rights-of-way may be required for the future discharges through the Rocky View County. This should also be outlined in the Rocky View County – City of Calgary Intermunicipal Development Plan (currently in draft form).

In addition to the above quantity control targets, the stormwater that is discharged to the natural drainage courses must be treated for removal of at least 85% of sediments that are $\geq 50 \mu\text{m}$ in size.



Five (5) on-site SWMFs, referred to as Ponds A, B, C, E and F, will be incorporated into the future developments to provide treatment and quality control of the stormwater prior to discharges being made to the natural drainage courses. These facilities will eventually become part of the City of Calgary's storm drainage infrastructure. In addition, private SWMFs are proposed to provide treatment and quantity control of discharges from the Trans Canada Highway (TCH) and multi-family developments represented as Subcatchment 6 (Ponds D1 and D2), Subcatchment 11 and Subcatchment 12.

On-site source control and low impact development (LID) measures will be implemented within the Westview lands to increase the retention of stormwater on site in order to meet the runoff volume target of 19 mm/yr. The following are example measures that will be considered for use where practically possible:

- A minimum of 15% pervious coverage for commercial, transit and business developments, all of which is to be in the form of bio-retention areas or landscaped beds. A maximum of 25% of the site may be impervious surfaces that are directly connected to the storm sewer system. The remaining impervious surfaces must drain first drain to landscaped areas before the excess water is directed to the storm sewer system.
- Rainwater from the building roofs may be either retained in cisterns and reused for non-potable purposes, allowed to pond for evaporation or used for green-roof systems;
- A minimum of 300 mm of topsoil incorporated into landscaped areas if available on site;
- All roof drainage from single family homes and garages to be directed onto landscaped areas prior to it being allowed to drain onto driveways, streets or lanes;
- All roof and parking lot drainage within private sites (JUS/MSR, multi-family) to be directed to landscape gardens and bio-retention areas before the excess water is captured into the storm sewer system;
- Lanes will be gravel surfaces with coarse graded sub-base materials to promote infiltration.
- Where practical, bio-swales and bio-retention areas can be incorporated in open space corridors;
- Where practical, overland drainage can spill to park areas rather than directly to street or storm sewer systems;
- Rear-lot drainage from residential lots may be directed as sheet flow towards the natural ravines, which will be assessed on a case-by-case basis;
- Reuse of the stormwater captured in the SWMFs by pumping for irrigation of public open space areas (sports playfields, parks, etc.).



The primary intent of the proposed stormwater management measures are to retain similar pre-development hydrology in Coach Creek and the other natural drainage courses to ensure that channel geometry and habitat function are sustained, thereby limiting erosion/deposition potential and maintaining similar soil moisture and plant communities in the ravine areas. The City's Riparian Setback Policy will apply which requires ER dedication along water bodies. Drainage catchment areas or values of imperviousness should be revisited at the time of Staged Master Drainage Plans as the ER boundaries are defined.

It is important to note that the assumptions made in this report with respect to land uses, SWMFs and post-development drainage patterns are conceptual only and are subject to more detailed review during the Outline Plan stages. The locations of SWMFs are approximate only and are therefore subject to revision during Outline Plan stages.

The minor-major drainage system will be used as the design basis for the Westview lands. The minor system will be sized based on a unit area release rate (UARR) of 70 L/s/ha for residential areas and 115 L/s/ha for commercial and multi-family areas. Subject to prior approval of Water Resources, lower UARRs may be allowed where sufficient LID measures are incorporated into new developments; but not less than 45 L/s/ha.

An alternate storm trunk scenario was investigated to convey discharges from the Westview lands to a location downstream of the Bearspaw WTP raw water intake. A gravity pipe option and forcemain pipe option were considered; the latter of which would be driven by the hydraulic head associated with the elevation difference between the Westview lands on top of the south escarpment slope and the Bow River at the outfall. The estimate of probable cost for the forcemain option was the least costly of the two; amounting to \$12.7 million with a corresponding unit rate of \$64,500 per contributing ha. The alternate trunk option is not economically feasible for the Westview lands so it is not recommended.

Further considerations and detailed studies are recommended at the time of SMDP to verify the assumptions made in this report. These include the following:

- Hydrologic parameters which closely reflect proposed land uses;
- Adjustments in hydrologic parameters to reflect source control and LID measures;
- Detailed description of the morphological characteristics of Coach Creek, Unnamed Ravine and Range Road 30C Ravine;
- Geotechnical investigations to assess bed and bank stability of receiving drainage courses, potential impacts that may be caused by storm discharges, instability – erosion potential and groundwater contributions.



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1.0 INTRODUCTION

On behalf of Qualico Communities and Melcor Developments Ltd., AECOM Canada Ltd. prepared a stormwater Master Drainage Plan (MDP) for the portion of the West Regional Context Study area (July 10, 2009) laying south of the Bow River. The City of Calgary is currently preparing an Area Structure Plan (ASP) for these lands referred to as the Westview ASP. **Figure 1.1** shows the location of the Westview ASP within the context of the City of Calgary and **Figure 1.2** is an aerial photo of the subject lands and ASP boundary.

AECOM's MDP report identified proposed servicing concepts to accommodate drainage of the lands which involved controlled discharges to existing ravines based on pre-development peak flows. On site stormwater management facilities (SWMFs) were identified to control the discharges and contain the excess runoff. Source control best management practice (BMP) and low impact development (LID) measures were identified promote soil infiltration and thereby reduce runoff volumes. The City of Calgary Water Resources and Parks business units had a number of comments that needed to be addressed before they would be able to approve the report. Most notably was a more detailed pre-development runoff analysis to quantify targets for both peak rates of discharges and average annual runoff volumes for the existing ravines if they are to be used for conveyance of the stormwater discharges from future developments.

The City's comments to AECOM's report are provided in **Appendix A**.

Qualico and Melcor subsequently commissioned Stantec Consulting Ltd. to address the City's comments and prepare a revised report in support of the Westview ASP. The following Terms of Reference for Stantec's work were developed in collaboration with Water Resources and Parks:

1. *Undertake a site inspection of the existing Coach Creek and all ravines within the plan area. Address the preservation of Coach Creek and similar ravines in natural like states. With reference to the Golder BIA (June 2009), identify (i.e., map) the approximate extent of the ravines to be maintained in a natural-like state. The boundaries will be confirmed at the of Outline Plan stage.*
2. *Evaluate the conveyance capacity of the Trans Canada Highway culverts. Evaluate stability thresholds and conveyance characteristics of Coach Creek and all ravines that are envisioned to receive urban runoff relative to erosion potential.*
3. *Confirm pre-development and post-development drainage boundaries;*
4. *In collaboration with Qualico and Melcor, confirm pond locations;*
5. *Address the comments provided by Parks and Water Resources to AECOM's July 10, 2009 report;*
6. *Revise the pre-development analysis and, in collaboration with Water Resources, and confirm the discharge rate and runoff volume targets;*
7. *Prepare a planning-level (mostly desktop, limited fieldwork) hydrogeological review addressing:*



- A. *groundwater impacts due to development relevant to the preservation of Coach Creek and other ravines in natural-like states (changes in groundwater levels or flow rates),*
 - B. *hydrogeologic aspects related to the implementation of LIDs (conceptual model of groundwater conditions and flow patterns, groundwater levels, soil texture, and permeability)*
8. *Describe drainage concept including LID philosophy and measures to preserve Coach Creek and the ravines to be left in a natural like state.*
9. *Revise the post-development analysis, including envisioned LID measures, to determine pond area requirements and runoff volumes;*
10. *Include recommendations for future, more detailed analyses (and/or confirmation of analyses contained in MDP report) as part of future Staged Master Drainage Plan submissions;*
11. *Prepare an Estimate of Probable Cost for the City funded infrastructure;*
12. *Prepare a concept level Estimate of Probable Cost for conveyance of the storm discharges to a point downstream of the Bearspaw Water Treatment Plant intake;*
13. *Attend up to 4 coordination meetings with the City and 4 progress review meetings with Qualico and Melcor;*
14. *Prepare a Revised Draft MDP report with pertinent figures, tables and supporting computer model data and submit to the landowners and City of Calgary for review;*
15. *Address issues and comments arising from the Draft report;*
16. *Finalize the MDP report and submit it to the City of Calgary for approval.*
17. *If stormwater discharges into Coach Creek and other ravines are proposed, post-development flow-duration curve should mimic pre-development flow-duration curve, to ensure long term morphologic stability, aesthetic and habitat function comparable to pre-development conditions.*

2.0 SITE DESCRIPTION

2.1 Study Area

The Westview ASP encompasses about 305 ha of the following lands west of the Valley Ridge and Crestmont communities, as shown on **Figure 1.2**.

NE¼ 30-24-2-W5M

W½ 31-24-2-W5M

E½ 36-24-3-W5M

The ASP lands will comprise residential development with significant portions of employment and commercial cells. Appendix B contains the proposed Land Use Concept for the Westview ASP as prepared by the City of Calgary.

2.2 Topography

Figure 2.1 illustrates the existing contours at 0.5 m intervals (Source: City of Calgary) and the direction of drainage throughout the Westview ASP area. The slopes of the land are well defined with virtually no on-site retention in natural depressions or low areas. The dominant drainage is from south to north towards the Bow River. The majority of the site drains to two main ravines with outlets at the Bow River. The larger easterly ravine is referred to by the City of Calgary as Coach Creek which also includes an east tributary along the most easterly boundary of the study area. The westerly ravine actually flows into Rocky View County before it outlets into the river. For the purpose of this report the westerly ravine is referred to as Unnamed Ravine.

Flows in Coach Creek and its east tributary cross under the Trans Canada Highway through two sets of culverts which are referred to on **Figure 2.1** as Culverts 'A' and Culverts 'B'. Photo 1 shows the inlet (south) end of Culverts 'A'.

Stantec undertook a field survey of the two culvert locations. Details of the two culverts are summarized in **Table 2.1**.

Westerly portions of the ASP lands drain west to lands owned by Qualico and Melcor within Rocky View County. Ultimately these lands drain to a third ravine west of Range Road 30C which outlets into the Bearspaw Reservoir (Bow River) just upstream of Bearspaw Dam.



Photo 1 – South end of Coach Creek Culverts 'A' under Trans Canada Highway.

Table 2.1 Trans Canada Highway Culverts for Coach Creek

Reference	Size (mm)	Material	Length (m)	South Invert	North Invert	Slope (%)
Culverts 'A'	900	CSP	89.97	1161.37	1158.41	3.29
	900	CSP	90.12	1161.20	1158.82	2.64
Culverts 'B'	1200	CSP	74.85	1165.74	1162.96	3.73
	750	CSP	63.55	1166.20	1165.08	1.76

2.3 Environmentally Significant Areas

Golder Associates Ltd. undertook a biophysical impact assessment of the study area, the results of which are presented in their report dated June 2009. According to their report the majority of the upland areas comprise cultivation and grassland with isolated pockets of Aspen Woodland. Coach Creek and its tributary are denoted as *small permanent streams*. The escarpment slopes at the north-east end of the study area comprise Aspen Woodland and Douglas Fir / White Spruce Woodland. No wetlands are identified by Golder within the study area.

Appendix B contains a copy of Golder's report Figure 3 which shows the natural vegetation communities.

City of Calgary Parks has identified the ravines, Bow River Escarpment and the adjacent native grassland as highly significant Environmentally Significant Areas (ESA) within the ASP. Appendix B contains the City's map of Environmentally Significant Areas that has subsequently been prepared for the ASP.

Coach Creek has been assessed by the City of Calgary as a second order stream which is considered to be an important tributary to the Bow River. It is the City's expectation that Coach Creek and its ravine slopes are to be preserved within the ASP. Similarly the Unnamed Ravine and Bow River escarpment slopes are to be preserved. The City has indicated that the existing Coach Creek and Unnamed drainage courses may be used for stormwater conveyance provided suitable pre-development flow conditions are maintained.

No natural wetlands have been identified by the City within the Westview ASP area.

3.0 PRE-DEVELOPMENT HYDROLOGIC ASSESSMENT

A pre-development assessment was performed to identify target levels for post-development discharges to the existing drainage courses. This assessment was done in close consultation with City of Calgary Water Resources. It was mutually agreed that Coach Creek would be the focus of this assessment since it is the largest and most predominant natural drainage feature within the study area. The results of the assessment for Coach Creek would thus be adopted for the other natural drainage courses within the study area.

The pre-development assessment comprised the following two main tasks:

1. Site inspections of the Coach Creek ravine and drainage course;
2. Hydrologic analysis to establish a base-line surface runoff condition.

3.1 Site Inspections

Stream morphology is a term that is used to describe the shapes of natural streams and how they change over time. It can comprise a number of physical characteristics, processes and environmental conditions which can include the following:

- Geometry and slope;
- Composition and erodibility of the bed and banks;
- Vegetation and plant growth;
- Sediment characteristics and rate of transport / deposition;
- Aggradation or degradation;
- Nature and seasonality of flow;



Photo 2 – Coach Creek downstream of the existing stock watering reservoir in SW¼ 31-24-2-5.

A detailed review of the morphology of Coach Creek and other natural drainage courses is beyond the scope of this study. However Coach Creek itself was visually investigated to observe the natural condition of Coach Creek to identify its stability in terms of erosion and potential for future erosion to occur; particularly under post-development conditions.

Two site inspections were undertaken of Coach Creek by Stantec. The first was undertaken on June 21, 2010 in accompaniment with representatives of Water Resources, Parks, Qualico and Melcor.

Photos 2 to 9 inclusive show portions of Coach Creek within the study area. The upstream (southerly) two-thirds of Coach Creek is protected with thick grass and brush vegetation. No signs of active erosion are evident in this area. The bottom width narrows and ravine side slopes steepen in a progressive fashion from south to north (downstream direction).



Photo 3 – Looking south (upstream) at Coach Creek from the Trans Canada Highway.



Photo 4 – Coach Creek north (downstream) of the existing reservoir in the NW¼ 31-24-2-5.

The northerly one-third portion of Coach Creek has reduced vegetation in the bottom of the creek and some localized erosion/sedimentation is evident. However this is quite limited as the bed is incised into gravel material or bedrock. The ravine side slopes are stabilized due to the presence of heavy brush and tree cover.



Photo 5 – Localized erosion of the west bank of Coach Creek in the NW¼ 31-24-2-5.

A second site inspection was done of the lower reach of Coach Creek in accompaniment with Ms. Georgina Griffin, a senior geotechnical engineer with Stantec at the time. The purpose of that site visit was for Ms. Griffin to familiarize herself with this portion of Coach Creek so as to be able to provide comments relating to geotechnical aspects of Coach Creek. Ms. Griffin concludes that “... *the geotechnical risks associated with an increase to the flow through Coach Creek are considered to be minor*”. Her memo report is included in **Appendix C**.



Photo 6 – Coach Creek in the NW¼ 31-24-2-5 south (upstream) of the bend.



Photo 7 – Localized sediment deposition in the NW¼ 31-24-2-5 south of the bend.



Photo 8 – Coach Creek in the NW¼ 31-24-2-5 at the bend.

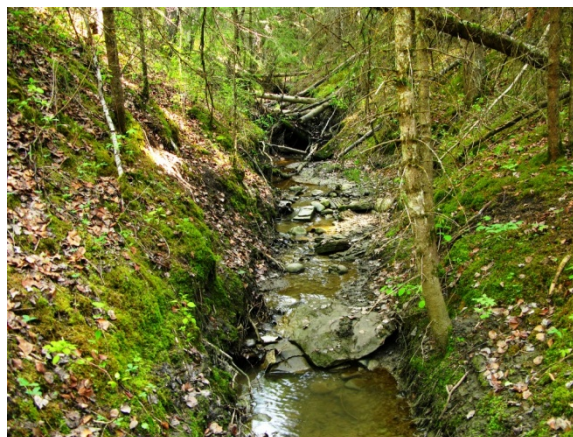


Photo 9 – Coach Creek in its final north-south leg through the SW¼ 6-25-2-5.

It is recommended that detailed geotechnical investigations be undertaken of Coach Creek and the two other natural drainage courses referred to herein as Range Road 30C Ravine and Unnamed Ravine at the time of SMDP to provide the following:

- Detailed description of the morphological characteristics of the drainage courses;
- Assessment of the existing conditions in terms of bed and bank stability;
- Potential impacts that may be caused by storm discharges as proposed within this MDP;
- Mapping which identifies areas of instability and potential erosion.



3.2 Impoundment Dams

There are two impoundment reservoirs and earth dams located within Coach Creek and its east tributary. A small stock watering reservoir is situated on Qualico's land within the main stem of Coach Creek, about 400 m south of the Trans Canada Highway. There is a 500 mm CSP (\pm) overflow culvert through the dam with erosion being evident at the inlet and outlet ends. Qualico has not yet decided on the fate of this reservoir. This will be determined at the time of Outline Plan.

This stock watering reservoir is very small in size compared to the upstream catchment area so it will have a negligible effect on attenuation of flows in Coach Creek. Therefore this reservoir was neglected for the pre-development analysis.

A second reservoir is located on Melcor's land within the east tributary of Coach Creek, about 200 m north of the Trans-Canada Highway. This reservoir is proposed to be retained and incorporated into Melcor's Valley Ridge Sweet Lands. Preliminary details were prepared by Focus Corporation on behalf of Melcor. Final details are being prepared by Pasquini & Associates Consulting Ltd.

The design for this Valley Ridge Sweet reservoir incorporates a 675 mm bypass sewer which diverts the east tributary flows around the reservoir and reintroduces the flows into the east tributary downstream of the reservoir. Therefore this reservoir was not included in the pre-development analysis.

3.3 Hydrologic Analysis

A hydrologic analysis was undertaken to establish pre-development level targets for peak discharges and annual runoff volumes that may be allowed to the existing natural drainage courses. The Coach Creek watershed was used as a representative case study for this purpose since it covers the majority of the ASP area. **Figure .3.1** shows the pre-development catchment boundary for Coach Creek and the sub-catchments used in the analysis.

3.3.1 Continuous Simulation

The determination of runoff volume necessitates a water balance type of analysis with a long-term simulation period. This was performed using a continuous simulation approach from which the runoff from the catchment is simulated by analyzing historic precipitation as a continuous event. This takes into account both wet and dry climatic periods. It is also suitable for predicting frequencies of discharge to natural drainage courses.

Continuous simulation was performed for this study using historic precipitation data from May 1960 to September 2006, which is provided by AES for the Calgary airport. In this case both rainfall and snowfall were included. The precipitation data is in the form of depth of rainfall (snowfall is included as equivalent rainfall) for each hour of the day, to the nearest 0.1 mm.



For each year of this record, average annual runoff volumes were computed. Discharge frequencies were determined by performing a frequency analysis of the peak annual discharges using a variety of frequency distributions. For each case a *best fit* curve was selected based on regression analysis of the results. The frequencies of discharge corresponding with the best fitting results were chosen for the pre-development target levels. Frequency distributions and procedures are described in the literature (Chow, 1988).

3.3.2 Single Event Analysis

Analyses using single storm events of various frequencies were also performed to provide a comparison of the peak flows with that determined by the frequency analysis of the continuous simulation results. Single event analysis is not necessarily deemed to be the best approach in this case, but it has often been used by industry with other studies of this nature.

Design storm events of the *Chicago* distribution were used for the single event analyses, each with a storm duration of 24 hours and 15 minute rainfall increments. **Table 3.1** summarizes the Chicago storm parameters as provided in the City of Calgary guidelines (2011).

3.3.3 Computer Models

The continuous simulations were performed using the QHM computer model (Version 2.0). The QUALHYMO User Manual (Rowney and Macrae, 1992) and Technical Reference Manual (Rowney and Macrae, 1992) provide detailed descriptions of the structure and input data requirements for the QHM model.

The Stormwater Management Hydrologic Model, commonly referred to as SWMHYMO (Version 4.02) was used in this study for the single event analysis. Its input structure and runoff-routing concepts and parameters are similar to the QHM model. The SWMHYMO User's Manual (J.F. Sabourin, 1999) provides a detailed description of the model structure and input data requirements.

Both computer models offer a variety of runoff, routing and utility options, which are described in detail in their respective User Manuals.

The drainage system used in a stormwater management model is discretized into various elements which describe the components of the drainage model. For this pre-development analysis these elements included catchment areas and surface conveyance channels. **Figure 3.2** illustrates the elements used for this pre-development analysis in a schematic fashion.

The computer model input and output data files are included in **Appendix D** and **Appendix E**.



Table 3.1 Chicago Design Storm Parameters

Return Period (Years)	Parameter			
	A	B	C	R
2	243.0	2.71	0.695	0.3
5	353.5	2.29	0.703	0.3
10	429.1	2.16	0.707	0.3
25	522.6	1.96	0.709	0.3
50	594.9	1.94	0.711	0.3
100	663.1	1.87	0.712	0.3

3.3.4 Runoff Computation

Instantaneous Unit Hydrograph Approach

Runoff may be computed by SWMHYMO using several variations of the Instantaneous Unit Hydrograph (IUH), referred to as the *Standard*, *Nash* or *Williams* IUHs. The *Standard* IUH is intended to be used for urban areas where the imperviousness is at least 20%, the *Nash* IUH is to be used for rural or very large urban areas and the *Williams* IUH is to be used for large rural areas with long recession periods. All IUHs use the Curve Number Method for rainfall losses, while the *Standard* IUH offers the Horton and Proportional Loss Coefficient methods as alternatives.

With the QHM model runoff may be computed using either the *Nash* or *Williams* IUH. Neither routine has the ability to distinguish between *directly connected* or *indirectly connected* impervious surfaces. For this study, the *Nash* IUH was used for the pre-development analysis to compute runoff with both the SWMHYMO and QHM models. **Table 3.2** summarizes the hydrologic parameters that were used.

Curve Number Method

Both SWMHYMO and QHM compute runoff based on the Curve Number Method, which was originally developed by the USDA Soil Conservation Service (1985). This method describes runoff as

$$Q = \frac{(P - IA)^2}{P - IA + S} \quad [3.1]$$



where Q is runoff, IA is initial abstraction and S is soil storage. Both IA and S are determined from a common parameter referred to as the Curve Number, or CN, which is a function of soil group and ground cover. From CN,

$$S = \frac{25400}{CN} - 254 \text{ (metric)} \tag{3.2}$$

$$IA = 0.2(S) \tag{3.3}$$

in which S and IA are both in mm. The value of CN can also be adjusted to reflect one of three soil moisture conditions described by the Soil Conservation Service, referred to as Antecedent Moisture Condition or AMC. AMC I is dry soil condition, AMC II is average soil moisture condition and AMC III is wet soil condition.

Table 3.2 Subcatchment Data for Pre-Development Condition

Subcatchment	Area (ha)	CN*	IA*(mm)	SMAX (mm)	SMIN (mm)	Time To Peak (hrs)
A1-OS	91.78	79	10	182	27	2.57
A2-OS	37.00	78	10	203	30	2.16
A1	77.90	85	10	137	21	1.40
A2	12.88	85	10	128	19	0.85
A3	84.52	79	10	191	29	2.29
	304.08					

Various reference texts sources, such as Ponce (1989), the SWMHYMO User Manual and City of Calgary Stormwater Management & Design Manual (2000) list suggested values of CN by the Soil Conservation Service for the AMC II soil condition, along with descriptions of the four soil groups defined by the Soil Conservation Service and the required adjustments for AMC I and AMC III soil moisture conditions.

The SWMHYMO model originated from the INTERHYMO/OTTHYMO-89 computer model, commonly referred to as OTTHYMO, which was distributed for use beginning in 1989. The OTTHYMO-89 User Manual (July, 1989) suggested that observed values of IA are much smaller than the values suggested by the Soil Conservation Service as determined from Equation 5.3. The OTTHYMO User Manual suggests that IA be selected as a separate parameter. Suggested values of IA are found in the SWMHYMO User Manual as well as the City of Calgary's Stormwater Management and Design Manual (2000).



When a value is selected for IA as opposed to that determined from Equation 5.3, the traditional values of CN listed in the literature are no longer applicable. Rather, the value of CN should be adjusted to correspond with the use of IA as a specified parameter. This adjustment is referred to in the OTTHYMO User Manual as a Modified Curve Number, or CN*.

Stantec determined values of CN* based on the OTTHYMO User Manual which concludes that the value of Q from Equation 5.3 is the same for either the Traditional or Modified approach during wet moisture conditions (i.e. AMC III). In other words,

$$\frac{(P - IA)^2}{P - IA + S} = \frac{(P - IA^*)^2}{P - IA^* + S^*} \quad \text{for AMC III} \quad [3.4]$$

The procedure that we used to determine CN* for use in the SWMHYMO and QHM models is as follows:

- Step 1: The Traditional value of CN is selected from the suggested literature sources for AMC II;
- Step 2: The value of CN from Step 1 is adjusted to reflect AMC III;
- Step 3: Using the value of CN in Step 2 (i.e. AMC III), S and IA are computed from Equations 3.2 and 3.3;
- Step 4: Using Equation 3.4, S* is solved for a specified value of IA* using a value of P = 90 mm, which is the 1:100 year event rainfall (\pm) in Calgary for 24-hours duration;
- Step 5: From S* determined in Step 4, and using Equation 3.2, CN* is computed for AMC III;
- Step 6: CN* used in the SWMHYMO and QHM models is determined by adjusting the value of CN* for AMC III (Step 5) to AMC II.

Values of CN* were thus determined based on a value of IA* = 10 mm which was requested by the City of Calgary for the pre-development condition.

Soil Moisture Conditions

The QHM model does not use CN* directly as an input parameter but rather it uses parameters that describe soil moisture conditions; specifically SMAX which is the maximum soil moisture holding capacity during dry conditions, SMIN which is the minimum soil moisture holding capacity during wet conditions and API which is the soil moisture condition at the start of the simulation period. Runoff volumes are not sensitive to the starting value of API when long simulation periods are used so only values associated with SMAX and SMIN are important for computing runoff volumes.

As with most model parameters SMAX and SMIN are meant to be determined by calibration studies. However, such calibration studies are not available so parameter values are determined using the

methodology suggested by the supporting Technical Reference Manual for the QHM (formerly QUALHYMO) model (October 1992) which is based on CN*. This methodology is described as follows:

- Step 7: The value of CN* determined above, which represents AMC II moisture condition, is adjusted to reflect AMC I moisture condition;
- Step 8: The value of S* for AMC I is determined using Equation 3.2;
- Step 9: SMAX is determined by dividing S* in Step 8 by 0.85;
- Step 10: SMIN is determined by multiplying SMAX by 0.15;

3.3.5 Channel Routing

Channel routing was performed for the following three situations as shown by Figure 3.2:

- Coach Creek through the SW¼ 31-24-2-5;
- East tributary of Coach Creek through the SW¼ 31-24-2-5;
- Coach Creek through the NW¼ 31-24-2-5, downstream of the junction.

Figure 3.3 shows the geometry and parameters used for the channel routing which were based on sections A3-1, A2-1 and A5-1 as provided by AECOM and at the locations shown on **Figure 3.1**. It is not practical to use all of the cross-sections that AECOM surveyed so these three cross-sections were chosen as being the best representation of the various channel reaches to perform the channel routing. The QHM model does not simulate natural channel shapes so typical trapezoidal sections were created that approximate the chosen AECOM sections.

At the request of the City of Calgary, a longitudinal slope of 1.0 % and a Manning roughness of 0.18 were used for the channel routing rather than the values suggested by Stantec as noted on **Figure 3.3**.

3.4 Analytical Results

According to the continuous simulation analysis results the average annual runoff volume from Coach Creek to the Bow River is 58,383 m³ which translates to a runoff depth of 19.2 mm.

A runoff depth of 19 mm is used as the target runoff volume for the post-development condition for all of the Westview ASP Lands.

Table 3.3 summarizes the peak discharge rates from Coach Creek to the Bow River as determined by the both the frequency analysis of the continuous simulation results and the single event simulations. The peak



discharges as determined by the frequency analysis are lower so they were used as a conservative design basis.

The highlighted unit discharge rates in **Table 3.3** are used as the target discharge rates for post-development discharges to the natural drainage courses from all of the Westview ASP lands.

Table 3.3 Peak Discharges From Coach Creek to the Bow River

Return Period (years)	Frequency Analysis		Single Event Analysis	
	Peak Rate (m ³ /s)	Unit Rate (L/s/ha)	Peak Rate (m ³ /s)	Unit Rate (L/s)
2	0.424	1.39	0.586	1.93
5	0.951	3.13	1.342	4.41
10	1.335	4.39	1.966	6.47
25	1.839	6.05	2.889	9.50
50	2.221	7.30	3.633	11.95
100	2.605	8.57	4.397	14.46

The above rate control criterion was established by frequency analysis of continuous simulation rather than single event analysis, although the latter was used for comparison purposes. The results are consistent with other areas in and around the City of Calgary such as Nose Creek, Pine Creek and Fish Creek. Compared to these larger watersheds the values for Westview are considered to be conservative because the study area is virtually void of natural on-stream storage and the slope of the drainage course is much higher.

According to the single event analysis, which governs in terms of discharge rates, the 1:100 year event peak discharge rate at the Trans Canada Highway Culverts 'A' is 4.44 m³/s. Based on the hydraulic rating of these culverts this will result in a ponding depth of about 2.0 m at the culvert inlet. This is not a concern since there are no structures that would be affected by this ponding.

Similarly, the 1:100 year event peak discharge rate in the east tributary at Culverts 'B' is 0.90 m³/s. This will result in a ponding depth of about 0.7 m at the culvert inlet which is not a concern.

Ice formation at these culverts is not anticipated to be problem. The culverts are very large in size and the visible evidence from aerial photos and our site inspection shows that there is very little or no base flows occurring during the summer period. During the winter the potential for base flows would even be lower. However, this can be addressed in further detail at the time of SMDP as part of further geotechnical investigations.



4.0 STORMWATER MANAGEMENT CONCEPTS

4.1 General

The on-site stormwater management systems for the Westview ASP lands are to follow the City of Calgary's guidelines (2011). The guiding assumption for this report is that discharges from the Westview lands are made to Coach Creek and the other existing natural drainage courses. These discharges must meet the pre-development runoff volume and discharge rate targets noted in Section 3.3.

Figure 4.1 illustrates the concepts developed for the Westview ASP in terms of SWMFs, contributing drainage areas and discharges to the natural drainage courses. The figure also shows off-site lands outside of the Westview ASP area which contribute stormwater drainage through the Westview ASP to the natural drainage courses. **Table 4.1** summarizes the drainage areas associated with the post-development catchments shown on the figure.

The Land Use Concept developed by the City of Calgary for the Westview ASP was used as a basis for the assumptions made in this study. The City's Land Use Concept is included in **Appendix B**.

The following sub-sections describe how the drainage is to be handled for the subcatchments shown on **Figure 4.1**.

4.1.1 Drainage to Coach Creek

Subcatchment A1-OS is existing country-estate developments referred to as Artistic View. This is an offsite area which drains directly to Coach Creek and bypasses the proposed development areas within the ASP lands. For the purpose of this report it is treated in its existing condition. However, if re-development occurs at some future time within this catchment then a storm pond or other measures would be required to meet the runoff rate and volume targets described herein.

Stormwater from Subcatchments 1 and 2 will drain to Ponds A and B which will discharge by storm sewers to Coach Creek south of the Trans Canada Highway (TCH), at the pre-development rates noted in Section 3.3.

The TCH Subcatchments 5 and 6 will drain by the highway ditches to Coach Creek. Subcatchment 6 will be serviced by Ponds D1 and D2 which will control the discharges to the pre-development rates. It will not likely be feasible or practical to control the discharges from Subcatchment 5 because the steep slopes preclude the ability to provide effective surface detention storage. Underground storage or berming may be possible alternatives. Options to reduce the discharges from Subcatchment 5 to Coach Creek should be investigated further at the SMDP or detailed design stage. This is discussed further in Section 4.2.



Table 4.1 Post-Development Catchment Areas

Subcatchment	Description	Area (ha)
Contributing Lands to Coach Creek:		
A1-OS	Existing Artistic View rural development (off-site)	91.78
A1	Coach Creek ravine	2.90
A2-OS	Existing Artistic View rural development (off-site)	37.00
A2	ER (off-site)	2.34
A3	Coach Creek ravine	39.52
1	Future residential development	29.53
2	Future residential and business park/commercial	50.18
4	TCH and east tributary of Coach Creek	3.97
5	TCH and future interchange	10.15
6	TCH and future interchange	15.59
10	Future residential	24.78
11	Future multi-family	2.20
12	Future multi-family	<u>8.52</u>
		318.5
Contributing Lands to Range Road 30C Ravine:		
B1-OS	Existing agricultural (off-site)	18.94
3	Future residential and business park/commercial	<u>25.20</u>
		44.14
Contributing Lands to Unnamed Ravine:		
D2	Unnamed Ravine and Bow River escarpment	19.31
7	Future business park/commercial	2.45
8	TCH	5.55
9	Future residential and business park/commercial	<u>54.16</u>
		81.47
Non-Contributing Lands:		
13	Valley Ridge Expansion (off-site)	14.28
Total		1,127.6



Subcatchment A2-OS is also existing country-estate developments referred to as Artistic View. This is an offsite area which drains through the future development area referred to as Subcatchment 1. These flows will drain through Subcatchment 1 by either a storm sewer or surface channel so as to bypass the future development and Pond A. The discharges will re-enter the east tributary in Subcatchment 2. For the purpose of this report Subcatchment A2-OS is treated in its existing condition. However, if re-development occurs at some future time within this catchment then a storm pond or other measures would be required to meet the runoff rate and volume targets described herein.

Drainage from Subcatchments A2-OS, A2 and 4 will drain to the east tributary of Coach Creek. These flows will be intercepted at the south end of the existing impoundment reservoir (see Section 3.2) and bypass the reservoir through a 675 mm storm sewer. The flows will be re-introduced into the east tributary north of the reservoir.

Drainage from Subcatchment 10 will be directed to Pond F which will discharge by storm sewer to Coach Creek at the pre-development rates.

Drainage from the multi-family site represented by Subcatchment 11 can be made to either the main stem of Coach Creek or the Valley Ridge drainage system via the existing storm pond in the east tributary of Coach Creek. The latter is the preferred option which was originally proposed by the Addendum to Valley Ridge Development Stormwater Management Plan (June 2009). The option of discharging the stormwater from this site to the main stem of Coach Creek is also included in this Westview MDP report. In that case the site drainage will be conveyed to an on-site private detention storage facility which will discharge by storm sewer to Coach Creek at the pre-development rates. Underground storage is a feasible solution for this site. The location of this storage will be determined at the time of detailed design.

Drainage from the large multi-family site represented by Subcatchment 12 will be made to an on-site private detention storage facility which will discharge by storm sewer to Coach Creek at the pre-development rates. A surface pond will likely be developed for this site although underground storage is not ruled out. The location of this storage will be determined at the time of detailed design.

Subcatchments A1 and A3 will remain un-disturbed under post-development conditions.

Access for maintenance purposes may need to be provided outside of ER setback zones. This will be addressed further at the time of Outline Plan submissions.

4.1.2 Drainage to Range Road 30C Ravine

For the purpose of this MDP it is assumed that Subcatchment B1-OS remains as undeveloped agricultural land. Its drainage will be accommodated by the drainage system in Subcatchment 3 and directed to Pond C. Pond C will be sized to accommodate this combined drainage from Subcatchment B1-OS and Subcatchment 3, with its discharges being made by storm sewer to the natural drainage course at the west boundary of the



SE¼ 36-24-3-5. These discharges will be controlled to the pre-development rates noted in Section 3.3 (applied over both catchments).

The discharges from Pond C will drain overland via the natural drainage course west of the City of Calgary to the natural ravine along the west side of Range Road 30C. Drainage easements or rights-of-way will be required for these discharges through the Rocky View County. This should also be outlined in the Rocky View County – City of Calgary Intermunicipal Development Plan (currently in draft form).

If, at some future date, the lands in Subcatchment B1-OS are to be developed then on-site measures will need to be incorporated to ensure that the rates and volumes of discharges to Subcatchment 3 (and Pond C) do not exceed that of the existing condition. Alternatively Pond C can be oversized to accommodate drainage from Subcatchment B1-OS as if it were in a developed condition. This can be considered further at the time of land use re-designation for either Subcatchment 3 or Subcatchment B1-OS. If Subcatchment B1-OS is still within Rocky View County at that time then this will also need to be outlined in the Rocky View County – City of Calgary Intermunicipal Development Plan.

4.1.3 Drainage to Unnamed Ravine

Drainage from Subcatchments 7, 8 and 9 will be directed to Pond E which will discharge by storm sewer to the Unnamed Ravine, at the pre-development rates noted in Section 3.3. Drainage easements or rights-of-way may be required for the subsequent discharges down the ravine through the Rocky View County. This should also be outlined in the Rocky View County – City of Calgary Intermunicipal Development Plan (currently in draft form).

Subcatchment D2 represents that portion of the Unnamed Ravine watershed that will remain un-disturbed in the post-development condition.

4.1.4 Non-Contributing Areas

Subcatchment 13 presently drains to the east tributary of Coach Creek. This area is being incorporated into the Valley Ridge expansion development referred to as Valley Ridge Sweet Lands with its drainage being re-directed to the Bow River through the Valley Ridge stormwater management system. This is described in the Stormwater Management Plan report by Focus Corporation (June 2009). Therefore this area will no longer contribute drainage to Coach Creek in the future.

4.2 Source Control Best Management Practices

Source control best management practices are measures that can be used to provide both quantity and quality control of stormwater from urban developments. Both the City of Calgary guidelines (2011) and Alberta Environment's guidelines (January, 1999) describe Best Management Practice (BMP) techniques that can be implemented to control the quantity/rate and improve the quality of stormwater discharges to receiving watercourses. Within the last couple of years source control measures has been described to include specific

measures that retain runoff on site so as to reduce runoff volumes to the receiving natural watercourses. These measures are also referred to Low Impact Development (LID) techniques where they are used in the context of an overall strategy of a development to reduce environmental impacts through community or development design.

To date the City of Calgary has been reluctant to accept wide-spread changes in development guidelines or street standards as LID measures because their impacts are not yet fully understood. The City also wants to implement measures that offer some reasonable degree of control by the City themselves. As a starting point Water Resources has developed a Draft Stormwater Source Control Practices Handbook (November 2007) as an initial guide for application of some specific measures. Guidelines for source control and LID methods will likely be updated on a regular basis so the most current guidelines will need to be followed at the time of detailed designs.

For the purpose of this Westview MDP, the source control BMPs described as follows will be considered for use where practically possible. These have been reviewed with Water Resources and approved for use within the Westview ASP, subject to more detailed investigations at the Outline Plan stages to confirm the suitability of infiltration measures.

4.2.1 Residential Developments

- All roof drainage from single family homes and garages to be directed onto landscaped areas prior to it being allowed to drain onto driveways, streets or lanes;

Note: City of Calgary Drainage Bylaw 37M2005 prohibits roof drainage (downspouts) discharging directly to the street or other surface drainage facility. The intent of the above LID practice is that all roof drainage be directed to a landscaped area which may then drain overland to a street, lane, or concrete drainage swale. The City will therefore need to monitor the residential lots for compliance with the drainage bylaw with respect to roof drainage being directed to landscaped areas.

- A minimum of 300 mm of topsoil provided for landscaped areas if available on site;
- Roof and parking lot drainage within private sites (JUS/MSR, multi-family) to be directed to landscape gardens and bio-retention areas before the excess water is captured into the storm sewer system;
- Lanes will be gravel surfaces with coarse graded sub-base materials to promote infiltration.
- Where practical, bio-swales and bio-retention areas can be incorporated in open space corridors;
- Where practical, overland drainage can spill to park areas rather than directly to street or storm sewer systems;

- For homes that back onto un-disturbed environmentally sensitive areas (Coach Creek, Unnamed Ravine, escarpment slopes, etc.), the rear-lot drainage is to be directed as sheet flow towards the creek.

4.2.2 Business Park and Commercial- Developments

- A minimum of 15% pervious coverage, all of which is to be in the form of bio-retention areas or landscaped beds;
- A maximum of 25% of the site (impervious surfaces) is directly connected to the storm sewer system. The remaining impervious surfaces must drain first drain to landscaped areas before the excess water is directed to the storm sewer system.
- A minimum of 300 mm of topsoil to be incorporated into landscaped areas if available on site;
- Rainwater from the building roofs may be retained in cisterns or storage tanks (rainwater harvesting) and reused for non-potable purposes or irrigation of landscaped areas;
- Water is allowed to pond on flat roofs for loss by evaporation. Depending on the amount of building coverage and depth of ponding, roof evaporation can reduce annual runoff volume from a commercial or industrial site by the order of 25%.
- Use of green-roof systems;
- A reduction in the amount of impervious surface coverage that is allowed to drain directly to the storm sewer system;

Because the amount of runoff from a business or commercial development is much greater than residential developments, enhanced source control measures will be required to ensure that the runoff volume target of 19 mm can be achieved for the Westview Lands as a whole. For this MDP it is not necessary to be specific on the measures that are to be used. Flexibility is important so that developers can use the measures that are most practical for their site and building designs. Rather, a recommended runoff volume target is identified for these types of developments. This is identified in Section 6.2 which is based on the post-development analysis described in Section 5.0. Alternatively, variable release rates and trading of runoff volumes with other types of developments may be considered at the SMDP stage.

4.2.3 Reuse for Irrigation

One of the most effective methods available to retain stormwater on-site is to store the rainwater and reuse it to supplement municipal water supplies for a variety of purposes. This is becoming a very popular concept within the City of Calgary where the stormwater from storm ponds is used for irrigation purposes. The largest known application of stormwater for this purpose in southern Alberta is the City of Calgary's Inland Athletic Sports Park in the north-west part of the City. This project involves the irrigation of 18 acres of sports fields

using stormwater runoff from an adjacent commercial development. Several new master drainage plans have recently been approved by the City of Calgary which incorporate stormwater reuse for irrigation purposes as a means of retaining stormwater on site.

In addition to the source control BMPs mentioned, stormwater collected by the Westview SWMFs will be used for irrigation of sports playfields and park areas. The stormwater will be used as a supplement to the treated municipal water and not as a replacement of the municipal water supply. Therefore dual connections will be provided to allow irrigation using the municipal water during dry periods when there is insufficient water available in the storm pond.

The use of stormwater for irrigation public open spaces will benefit by the strategic location of the SWMFs themselves and the public open space areas that may be used for the stormwater irrigation. In order to minimize the cost of the required infrastructure and dual line assignments within the public roadways, the park areas and SWMFs should be located with close proximity of each other.

Diversions from the SWMFs for irrigation purposes will occur from the permanent volume of water that is retained in each facility. The SWMFs were thus assumed to provide a permanent water depth of 4.0 m of which the pumping for irrigation is limited to the top 2.0 m. The bottom 2.0 m is retained for aesthetic purposes so as to avoid potential odours and unsightly appearance of exposed bottom sediments.

This irrigation reuse concept can also be applied to the two multi-family sites represented as Subcatchments 11 and 12 as well as individual business park and commercial developments. In these cases all of the landscaped areas can be irrigated using the stormwater. For Subcatchment 11 it is assumed that underground storage is used to collect the roof and parking lot drainage. Because of the size of Subcatchment 12 it is assumed that a surface pond(s) will be most appropriate for the storage. The business and commercial development sites will be small so underground storage or cisterns will likely be used to capture and store roof drainage.

The Westview lands contain terrain that is steeper than most developments so care must be exercised when applying irrigation reuse. The amount of stormwater that is expected to be applied will be greater than normal irrigation practices so this may not be practical in steep areas. This will need to be considered when choosing and designing the irrigation areas, and supported by geotechnical assessments.

4.3 Stormwater Quality Improvement

Alberta Environment requires that at least 85 % of the sediment contained in the stormwater that is greater than or equal to 75 microns ($\geq 75 \mu\text{m}$) is to be removed prior to discharging to receiving watercourses. However, the City of Calgary has adopted a more stringent criterion which requires 85 % removal of sediments that are $\geq 50 \mu\text{m}$. For the Westview lands the City of Calgary criterion will apply.

While the on-site BMPs listed in Section 4.2 will effectively minimize the amount of pollutants that leave the development areas, the five SWMFs shown on **Figure 4.1** will be utilized as the primary water quality



treatment mechanism for the Westview ASP lands. The majority of sediments will originate from impervious surfaces that directly connected to the storm sewer system. This will mainly comprise driveways for residential areas, roadways and parking areas. The SWMFs will be constructed as wet ponds due to their effectiveness in facilitating sediment removal as well as their storage capabilities for reuse of the water for irrigation. Wetland areas may be incorporated within the ponds where they are considered advantageous from aesthetic or functional points of view.

The City of Calgary and Alberta Environment guidelines suggest that storage for 25 mm of runoff from a contributing drainage area is appropriate for Alberta, with a detention time of 24 hours. The guidelines also suggest that the volume of storage below the upper normal water level (UNWL) should be greater than or equal to 25 mm runoff from the contributing areas being serviced by a SWMF (i.e. 250 m³/ha). However, the pre-development quantity control criteria for the Westview lands will dictate higher levels of permanent storage and longer hydraulic detention times.

It is equally important to practice temporary sediment and erosion controls during construction of the new developments. Erosion and sedimentation control measures will also be implemented during construction in accordance with the City of Calgary's guidelines (February 2001).

Guidelines for stormwater quality improvement and erosion control will likely be updated on a regular basis so the most current guidelines will need to be followed at the time of detailed designs.

4.4 Major-Minor Conveyance Systems

An urban drainage system may be conceptualized as having two components. The first is referred to as the *minor system*, which consists of storm sewers, manholes and catch basins. Within the City of Calgary, the minor system is designed to accommodate the runoff resulting from a one in five (1:5) year return period storm event.

The second component is referred to as the *major system*, which accommodates the runoff in excess of the minor system capacity. Features typical of the major system include streets, pathways, ditches/swales and other overland flow paths. It is important to recognize that, even if unplanned, a major drainage system always exists, although its function may be inconvenient. The design standard within the City of Calgary is to provide a major system that can safely convey runoff resulting from a storm event up to the one in one-hundred (1:100) year return period, without flooding causing damage to homes and property.

For the Westview ASP lands the major-minor drainage system will be used as the design basis. In accordance with the City of Calgary's guidelines (December, 2000), the minor system will generally be sized using minimum unit area release rates (UARR) of 70 L/s/ha for residential areas and 115 L/a/ha for commercial and business development areas. These unit rates were determined by the Rational method,

$$Q = 2.78CiA \quad [4.1]$$



using runoff coefficients of $C = 0.3$ and 0.5 respectively with a rainfall intensity of $i = 82.6$ mm/hr. Higher unit rates may be warranted in areas of steep gradient to reduce velocities of overland flows.

The City of Calgary recognizes that incorporating LID measures into new developments will likely reduce the peak flows of runoff that contribute to the minor system. In continued efforts to support the development industry with incorporating LID features into new development, City of Calgary Water Resources will allow the storm sewers to be sized using a lower UARR, but not less than 45 L/s/ha. This exception will only be allowed in a subdivision that incorporates source control or LID measures that are aimed at achieving appropriate levels of runoff volume reduction. The following conditions, which originated with the North Regional Stormwater Master Drainage Plan report (Stantec, 2010), must be satisfied before Water Resources will approve a lower UARR:

1. The Staged Master Drainage Plan (SMDP) must outline in detail which types of LID measures will be implemented and the corresponding performance requirements for each land use area (i.e., single-family residential lots, park spaces, roadways, multi-family/commercial lots, etc.). The SMDP must demonstrate collectively how each land use area contributes to meeting the overall runoff volume and discharge as well as water quality criteria set out for that development. The SMDP must also identify the major system routes and what typical amount of trap low storage can be expected within the development on a per unit area basis. Based on the above the SMDP shall outline what the achievable lower UARR can be for the study area.
2. The Stormwater Management Report for each phase of the subdivision must identify the major system routes used within and how they ultimately drain to a storage facility. Calculations must demonstrate adequate performance of the minor and major systems during a 1:100 year storm event. This shall include, but is not limited to, outlining the critical flow paths, demonstrating that the depth/velocity requirements are within Alberta Environment guidelines and the inundation extents of the trap lows.
3. Conventional surcharge guidelines still apply.
4. Both the Stormwater Management Report and any corresponding and/or subsequent Development Site Servicing Plans must provide detailed design information with respect to the hydrologic and hydraulic design of the LID measures proposed in the SMDP to ensure that the targets set out in the SMDP are met. Adequate detail shall also be provided with respect to the water quality enhancement of the proposed LID measures.

Storm sewers can become surcharged during very intense storm events because the capture into the minor system exceeds the minor system capacity. This surcharge (pressure flow) condition can result in basement flooding by water backing up the weeping tile system. To prevent this from occurring, inlet control devices (ICDs) will be installed in catch basin at key locations to limit the capture in the minor system. These ICDs will be designed in accordance with the City of Calgary standard, with the R30 being the smallest allowable size. Their locations and sizes will be determined during detailed designs of each development phase.



The City of Calgary's stormwater management guidelines (2011) require that the following are to be met relative to the major drainage system:

- depths and velocities of flows shall be within the acceptable limits as provided in the guidelines;
- depths of flow are not to exceed 0.3 m;
- depths of standing (ponding) water are not to exceed 0.5 m.

If necessary, street trap low storage will be incorporated to reduce overland flow depths and velocities in the major system. Street trap low storage will also be provided to retain overland flows on-site where such overland flows are not allowed to spill to downstream areas.

Additional details of the major and minor drainage systems are not presented further in this Master Drainage Plan. These details will be prepared at the time of detailed designs for each phase of development.

5.0 POST-DEVELOPMENT ANALYSIS METHODOLOGY

5.1 Hydrologic Analysis

A hydrologic analysis was undertaken to quantify the following:

1. Detention storage requirements for the SWMFs;
2. Assumptions with respect to LID measures required to ensure that runoff volumes and discharge rates to the natural drainage courses meet the pre-development targets;
3. Estimates of sediment removal efficiencies by the SWMFs.

This analysis was therefore limited to the lands that are identified for development within the Westview ASP. This includes Subcatchments 1, 2, 3 and 5 to 12 inclusive. Subcatchment B1-OS was also included since it contributes to the sizing of Pond C.

The hydrologic analysis was made based on the subcatchment boundaries shown on **Figure 4.1** which does not necessarily reflect final ER setback requirements. It is expected that the post-development modelling will be revised at the time of SMDP to reflect land uses and ER boundaries as identified by the Outline Plans.

The post-development analysis methodology was the same as that of the pre-development condition described in Section 3.2 in terms of SWMHYMO and QHM computer model applications. The main differences were in the use of post-development catchment parameters, assumptions for LID measures, addition of storage routing and weighting of importance between the single event and continuous simulations. The following sub-sections thus focus on these primary differences.

Figure 5.1 illustrates in a schematic fashion the elements and routing order used for the post-development computer modelling.

5.1.1 Single Event Analysis

This is the most common method of analysis used for stormwater management. It is the accepted procedure in Calgary based on the City of Calgary's guidelines (2000), which require that SWMFs be designed to accommodate the runoff resulting from a 1:100 year return period storm event. The Chicago design storm was used as discussed in Section 3.2.2.

5.1.2 Continuous Simulation

Continuous simulation is able measure the operation and performance of storage facilities to predominantly wet periods of rainfall as well as account for evaporation losses and irrigation withdrawals; none of which can be done by single event analysis. This method is necessary for water balance purposes to estimate long term runoff volumes as well as predicting the performance of storm ponds in removing sediment from the stormwater.

Continuous simulation was undertaken for the post-development condition using the same procedures as that for the pre-development condition described in Section 3.2.1. Frequency analyses were done of the peak storage volumes and discharges to the natural drainage courses.

5.1.3 Runoff Computation

Instantaneous Unit Hydrograph Approach

The *Standard* IUH was used with the SWMHYMO model to compute runoff from the urban type catchments areas where the runoff from some or all of their impervious surfaces drains directly into storm sewer systems. This is referred to as the impervious areas being *directly connected* to the storm sewer system. Subcatchments 1, 2, 3, 7 and 9 to 12 inclusive were thus simulated assuming that only a portion of their impervious surfaces are *directly connected* to the storm sewer system.

Subcatchments 5, 6, 8 and B1-OS were simulated by SWMHYMO using the *NASH* IUH. Even though the former three catchments comprise some paved roadway areas, the drainage is accommodated entirely by road ditches so none of the impervious surfaces are directly connected to storm sewers.

The approach by which the non-directly impervious areas were accounted for is described below for source control BMPs.

The QHM model simulations was undertaken the same as with the SWMHYMO model, except the *Nash* IUH was used to compute runoff from all catchments.

Table 5.1 summarizes the key runoff parameters used in this study for the post-development condition. The SWMHYMO and QHM model data is provided in **Appendix F** and **Appendix G**.

Approach for Source Control BMPs

The QHM model does not have an option to specify the ratio of impervious area directly connected to the storm sewer system as does the SWMHYMO model. Therefore the hydrologic computations for both the SWMHYMO and QHM models were performed by specifying the total amount of impervious surface area equal to the amount of directly connected impervious area. For the remaining amount of impervious and pervious area, a weighted Modified Curve Number (CN*) was determined using values of CN* = 98 for impervious areas and the appropriate value of CN* for pervious areas (see **Table 5.1**). A weighted value of IA* was also determined by the same procedure using IA* = 1.6 mm for impervious areas and IA* = 3.2 mm for pervious areas. These weighted values of CN* and IA* are assigned to the pervious portion of the runoff computations.

The following example demonstrates this approach:



Example: Subcatchment 1

Area = 29.53 ha

Total imperviousness = 52.8% → 15.59 ha

Pervious Area = 29.53 – 15.59 = 13.94 ha

Table 5.1 Subcatchment Data for Westview Post-Development Catchments

Subcatchment	Area (ha)	Total % Impervious	Directly Connected % Impervious	Weighted Values for Non-Directly Connected Areas			
				CN*	IA*(mm)	SMAX (mm)	SMIN (mm)
1	29.53	53	24	82	2.6	165	25
2 (Commercial)	23.00	85	25	93	5.0	53	8
2 (Residential)	27.18	50	25	81	2.7	177	26
3 (Commercial)	11.10	85	25	93	5.0	53	8
3 (Residential)	14.10	52	27	81	2.7	175	26
5	10.15	21	0	71	10.0	183	28
6	15.59	24	0	90	3.2	90	14
7	2.45	85	25	93	5.0	54	8
8	5.55	17	0	78	3.2	198	30
9 (Commercial)	26.00	85	25	93	5.0	53	8
9 (Residential)	28.16	54	28	82	2.6	167	25
10	24.78	54	26	82	2.6	165	25
11	2.20	65	0	89	2.2	94	14
12	8.52	61	0	88	2.2	107	16
B1-OS	18.94	0	0	71	3.2	277	42

Directly Connected Imperviousness = 24.0% → 7.09 ha (This is the specified value for total imperviousness)

Balance of Impervious Area = 15.59 – 7.09 = 8.50 ha

For pervious areas, CN* = 72

$$\text{Weighted CN}^* = \frac{(8.50)98 + (13.94)72}{(8.50 + 13.94)} = 81.8 \rightarrow \text{say CN}^* = 82$$

$$\text{Weighted IA}^* = \frac{(8.50)1.6 + (13.94)3.2}{(8.50 + 13.94)} = 2.6 \text{ mm}$$

For the soil moisture parameters associated with the QHM model, the total amount of soil moisture associated with SMAX remains the same but it is now allocated over the combine area of pervious and non-directly connected impervious areas that represent the weighted value of CN*. With the above example the value of SMAX is determined as follows:

For CN* = 72, SMAX = 265 mm

$$\text{Volume of soil storage associated with SMAX} = \frac{265}{1,000} \times 13.94 \text{ ha} = 36,941 \text{ m}^3$$

$$\text{Revised SMAX} = \frac{36,941}{(8.50 + 13.94) \text{ ha}} \times 1,000 = 165 \text{ mm}$$

Revised SMIN = 165 x 0.15 = 25 mm

As a conservative approach the parameters SMAX and SMIN were not adjusted to reflect source control measures for this report. Further modelling at the time of the SMDPs may, however, use revised catchment parameters that reflect source control measures.

Enhanced source control measures are required for the commercial and business developments associated with Subcatchments 2, 3 and 9. A number of possible enhanced measures are suggested in Section 4.2. Rather than being too prescriptive in this report about which measures should be used, the weighted value of IA used in the QHM model for both pervious and impervious areas was arbitrarily increased to 5.0 mm to reflect the use of enhanced source control measures.

5.2 Storage Routing

Storage routing was performed to simulate the operation of the various SWMFs. Discharges from the SWMFs include water surface evaporation and pumped diversions for irrigation purposes. Evaporation and



irrigation were only included in the continuous simulation (QHM) analyses and were excluded from the single event (SWMHYMO) model simulations. For the latter simulations it was conservatively assumed that the water surface at the start of the simulation was at the NWL.

Data for evaporation losses is provided in the City of Calgary guidelines (2011) as well as by Alberta Environment (January 1999). The Alberta Environment average evaporation for Calgary is lower than that provided by the City of Calgary. For the purpose of this MDP analysis the Alberta Environment data was used as a conservative design basis, which is 720 mm/year. This was simulated as a constant rate occurring over the entire year as follows:

$$\text{Evaporation Rate} = \frac{0.720\text{m} \times 10,000\text{m}^2 / \text{ha}}{365 \text{ days/yr} (24 \text{ hrs/day})(3600 \text{ sec./hr})} = 0.000228 \text{ m}^3/\text{s}/\text{ha} \text{ or } 0.228 \text{ L/s}/\text{ha}$$

An annual irrigation amount of 725 mm was used which is based on an application rate of 32 mm (1¼ inches) per week through the months of May to September. This is a standard application rate for turf irrigation which includes efficiency losses in the spray irrigation. **Table 5.2** summarizes the land areas that have been assumed as irrigated areas for the purpose of this MDP report.

Table 5.2 Lands Irrigated Using Stormwater

Subcatchment	Public Land Dedication (ha)	Private Sites (ha)
1	3.15	0
2	4.77	3.45
3	2.46	1.67
7	0	0.37
9	5.02	3.90
10	3.11	0
11	0	0.39
12	0	1.43

As with the evaporation, irrigation was simulated as a constant rate occurring over the entire year. The following example calculation for Subcatchment 1 (Pond A) illustrates this:

Example: Subcatchment 1

Irrigated area = 3.15 ha



$$\text{Annual Irrigation Rate} = \frac{3.15 \text{ ha}(10,000 \text{ m}^2 / \text{ha})(0.725 \text{ m})}{365 \text{ days/yr}(24 \text{ hrs/day})(3600 \text{ sec/hr})} = 0.00072 \text{ m}^3/\text{s} \text{ or } 0.72 \text{ L/s}$$

As noted previously in Section 4.2.3, the irrigation diversions were assumed to occur only when water levels are higher than 2.0 m above the bottom of each SWMF.

Tables 5.3 to 5.9 summarize the storage-discharge ratings that were used for the detention storage routings.

Table 5.3 Rating Data for Pond A

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			
		Permanent	Active	Evaporation	Irrigation	Outlet	Total
0.0	1,700	0	0	0.04	0	0	0.04
2.0	4,300	5,900	0	0.10	0.73	0	0.83
4.0 (NWL)	7,800	17,900	0	0.18	0.73	0	0.91
4.5	8,800	22,000	4,100	0.20	0.73	160	160.93
5.0	9,800	26,600	8,800	0.22	0.73	226	226.95
5.25 (HWL)	10,300	29,200	11,300	0.24	0.73	253	253.97

Table 5.4 Rating Data for Pond B

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			
		Permanent	Active	Evaporation	Irrigation	Outlet	Total
0.0	5,600	0	0	0.13	0	0	0.13
2.0	9,500	15,000	0	0.22	1.10	0	1.32
4.0 (NWL)	14,300	38,600	0	0.33	1.10	0	1.43
4.5	15,600	46,100	7,500	0.36	1.10	272	273.46
5.0	16,900	54,200	15,600	0.39	1.10	385	386.49
5.25 (HWL)	17,600	58,500	19,900	0.40	1.10	430	431.50



Table 5.5 Rating Data for Pond C

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			Total
		Permanent	Active	Evaporation	Irrigation	Outlet	
0.0	2,300	0	0	0.05	0	0	0.05
2.0	5,100	7,300	0	0.12	0.57	0	0.69
4.0 (NWL)	8,600	20,900	0	0.20	0.57	0	0.77
4.5	9,700	25,500	4,600	0.22	0.57	239	239.79
5.0	10,700	30,600	9,700	0.24	0.57	338	338.81
5.25 (HWL)	11,300	33,300	12,400	0.26	0.57	378	378.83

Table 5.6 Rating Data for Pond D

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			Total
		Permanent	Active	Evaporation	Irrigation	Outlet	
0.0	5,900	0	0	0.14	0	0	0.14
1.5 (NWL)	8,500	10,700	0	0.19	0	0	0.19
2.0 (HWL)	9,400	15,200	4,500	0.21	0	134	134.21

5.5 Flow Splitting

Both SWMHYMO and QHM are able to split flow hydrographs to simulate situations where flows are physically diverted in two or more directions. A classic example is the splitting of flows to minor and major systems. For this Westview MDP flow splitting was performed on the outflow hydrographs from the SWMFs to separate the evaporation and irrigation components from the controlled discharges so as to determine the actual amount of stormwater that is ultimately discharged to the natural drainage courses. This flow splitting was only done with the continuous (QHM) simulations since evaporation and irrigation were not included in the single event (SWMHYMO) simulations.

Table 5.7 Rating Data for Pond E

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			Total
		Permanent	Active	Evaporation	Irrigation	Outlet	
0.0	8,000	0	0	0.18	0	0	0.18
2.0	12,500	20,300	0	0.29	1.15	0	1.44
4.0 (NWL)	17,800	50,500	0	0.41	1.15	0	1.56
4.5	19,300	59,800	9,300	0.44	1.15	337	338.59
5.0	20,800	69,800	19,300	0.48	1.15	477	478.63
5.25 (HWL)	21,600	75,100	24,600	0.49	1.15	533	534.64

Table 5.8 Rating Data for Pond F

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			Total
		Permanent	Active	Evaporation	Irrigation	Outlet	
0.0	1,000	0	0	0.02	0	0	0.02
2.0	3,300	4,200	0	0.08	0.71	0	0.79
4.0 (NWL)	6,400	13,800	0	0.15	0.71	0	0.86
4.5	7,300	17,200	3,400	0.17	0.71	134	134.88
5.0	8,200	21,000	7,300	0.19	0.71	190	190.90
5.25 (HWL)	8,700	23,100	9,400	0.20	0.71	212	212.91

5.6 Sediment Removal Analysis

Water quality modeling for sediment removal was performed by the QHM model. This requires input data for pollutant *build-up*, pollutant *washoff* and pond *settling velocities*. **Table 5.11** and **Table 5.12** summarize the build-up and washoff parameters that were used for this study while **Table 5.13** lists the sediment particle size distribution and settling velocities; all provided within the City of Calgary guidelines (2011).



Table 5.9 Rating Data for Subcatchment 11 (Underground Storage)

Depth (m)	Storage (m ³)		Discharge Rate (L/s)		
	Permanent	Active	Irrigation	Outlet	Total
0.0	0	0	0.89	0	0.89
2.0 (NWL)	320	0	0.90	0	0.90
2.5	680	360	0.90	11	11.090
3.0	1,040	720	0.90	16	16.090
3.5 (HWL)	1,400	1,080	0.90	19	19.090

Table 5.10 Rating Data for Subcatchment 12 (Private Pond)

Depth (m)	Area (m ²)	Storage (m ³)		Discharge Rate (L/s)			Total
		Permanent	Active	Evaporation	Irrigation	Outlet	
0.0	0	0	0	0	0	0	0
2.0	400	300	0	0.01	0.33	0	0.34
3.5 (NWL)	1,200	1,400	0	0.03	0.33	0	0.36
4.0	1,600	2,200	700	0.04	0.33	37	37.37
4.5	2,000	3,100	1,600	0.05	0.33	52	52.38
5.0	2,500	4,200	2,700	0.06	0.33	63	63.39
5.5 (HWL)	3,000	5,600	4,100	0.07	0.33	73	73.40



Table 5.11 Pollutant Build-Up Parameters

Parameter	Impervious Areas	Pervious Areas
Build-up Method	Power Linear	Power Linear
Equivalent Initial Accumulation Period	30 Days	30 Days
Maximum Accumulation	0.20 kg/m ²	0.20 kg/m ²
Build-up	0.00055 kg/m ² per 1.0 Days	0.00055 kg/m ² per 1.0 Days

Table 5.12 Pollutant Washoff Parameters

Parameter	Impervious Areas	Pervious Areas
Washoff Method	Built-up/Washoff	Built-up/Washoff
Washoff Coefficient	6000 per m ³	3000 per m ³
Washoff Exponent	1.2	1.2

Table 5.13 Settling Velocity Data

Fraction Number	Particle Size (µm)	Size Fraction (%)	Settling Velocity (m/s)
1	≤ 10	23.0	0.00000592
2	10 – 20	9.0	0.0000473
3	20 – 50	13.0	0.000283
4	50 – 150	23.0	0.00195
5	≥ 150	32.0	0.0124



6.0 POST-DEVELOPMENT ANALYSIS RESULTS

6.1 Stormwater Management Facilities for Ultimate Condition

Table 6.1 summarizes the 1:100 Year detention storage requirements for the Westview SWMFs for the ultimate condition, as determined by the both the SWMHYMO and QHM model results. The total area of the SWMFs at the HWL represents 5.3% of the Westview Lands.

Table 6.1 Detention Storage Requirements for the Post Development Condition

	Serviceable Irrigated Area		1:100 Active Volume (m ³)			Area at HWL (ha)	Allowable Discharge (L/s)
	Area (ha)	(ha) ¹	SWMHYMO	QHM	Per ha. (Governing)		
Pond A	29.53	3.15	9,100	6,400	308	1.03	253
Pond B	50.18	4.77	17,300	12,200	345	1.76	430
Pond C	44.14	2.46	11,200	7,100	254	1.13	378
Ponds D1 & D2	15.59	0	3,700	2,800	237	0.94	134
Pond E	62.16	5.02	21,300	14,400	343	2.16	533
Pond F	24.78	3.11	7,700	5,700	311	0.87	212
Subcatch. 11	2.20	0.39	750	570	341	N/A	19
Subcatch. 12	8.52	1.43	2,700	1,900	317	0.30	73

1. Irrigated areas exclude the landscaped areas within the commercial which are included in Table 5.2.

These pond areas and storages, as well as their locations shown on **Figure 4.1**, are conceptual only and subject to revision at the time of SMDP.

Ponds A – F, and probably the private pond for Subcatchment 12, will be constructed as wet ponds with sedimentation forebays or equivalent. The storage associated with Subcatchment 11 could be either underground storage or a wet pond.

The storage volume below the NWL is not available for discharge rate (quantity) control. This storage is significant only in terms of water quality with respect to turnover rate, the pond’s ability to improve the quality of the receiving stormwater and retention of water for irrigation diversion. The storage volume above the NWL is the available capacity for control of discharges to the receiving outlet. This storage is referred to as



active storage. The High Water Level (HWL) is thus the design maximum operating level which contains (at least) the 1:100 year event storage volume.

In all cases the SWMHYMO model results are higher and are therefore used for estimating the size requirements. The primary reason for this is the effect of evaporation and irrigation withdrawals that are included in the QHM simulations.

6.2 Runoff Volumes

Table 6.2 summarizes the average annual runoff volumes from the various catchment areas for the ultimate condition based on the assumptions presented herein. The overall runoff volume from the Westview MDP meets the target of 19 mm per year on average.

Table 6.2 Average Annual Runoff Volumes for the Post Development Condition					
Subcatchment	Area (ha)	Catchment Runoff		Net Volume of Discharge	
		Volume (m ³)	Depth (mm)	Volume (m ³)	Depth (mm)
1	29.53	29,824	101.0	5,424	18.4
2	50.18	49,445	98.5	9,750	19.4
3 & B1-OS	44.14	30,288	68.6	8,351	18.9
5	10.15	2,367	23.3	2,367	23.3
6	15.59	8,615	55.3	2,950	18.9
7, 8 & 9	62.16	59,953	96.4	11,624	18.7
10	24.78	26,303	106.1	4,771	19.3
11	2.20	1,336	60.7	405	18.4
12	<u>8.52</u>	<u>5,152</u>	<u>60.5</u>	<u>1,553</u>	<u>18.2</u>
Totals	247.25	213,283	86.3	47,195	19.1

Figure 6.1 shows the maximum and minimum depths as determined by the continuous simulations for Ponds A to F inclusive. Based on these results it is anticipated that there will be no discharges from the SWMFs in nearly 40% of the years.



6.3 Discharges to Natural Drainage Courses

Table 6.3 presents the frequencies of discharges from the Westview ASP lands to Coach Creek, the Unnamed Ravine and west to the Range Road 30C Ravine based on the assumptions presented herein. These results were determined by frequency analyses of the continuous simulation results.

Overall the discharges from the Westview lands are within the objectives noted in Section 3.3. Values shown in Table 6.3 with red text are slightly below the target level for that specific return period. With the exception of Subcatchment 5, adjustments in the outlet control rating may be required at the time of detailed designs to ensure that the target unit discharge rates meet the pre-development target values.

The discharges from Subcatchment 5 are not able to meet the pre-development target levels because there is no practical opportunity to provide on-site detention storage. The grades are too steep to build a pond and the drainage cannot be directed to one of the development’s SWMFs. Some localized ponding can be incorporated into the ditches and toe-of-fill but there is a practical limit which will result in only partial detention of the runoff. However, the subcatchment itself represents highway improvements associated with the future interchange which in itself is a form of LID practice. The increased discharges associated with this area are not likely, by themselves, to cause erosion or scour problems in Coach Creek.

Table 6.3 Frequencies of Discharge for the Post Development Condition

Return Period (Years)	Unit Discharge (L/s/ha)								
	Pond A	Pond B	Pond C	Pond D	Pond E	Pond F	SC 5	SC 11	SC12
2	1.34	1.34	1.55	1.00	1.23	1.45	4.90	1.33	1.69
5	3.11	3.23	3.39	2.78	2.74	3.23	10.08	3.00	3.47
10	4.24	4.42	4.54	3.99	3.69	4.35	13.70	4.06	4.53
25	5.61	5.87	5.94	5.52	4.84	5.70	18.35	5.33	5.77
50	6.59	6.91	6.94	6.64	5.66	6.65	21.82	6.23	6.64
100	7.54	7.91	7.90	7.76	6.45	7.57	25.27	7.10	7.46

Discharges from the Westview SWMFs can be controlled by an outlet control structure such as that illustrated by **Figure 6.2**. This particular type of outlet control structure incorporates two levels of operation:

- An ICD provides normal unregulated control based on orifice flow principles. The ICD is sized to control the discharges within the pre-development targets identified in Table 3.3;



- An overflow weir provides emergency unregulated control in the event that water levels rise above the HWL.

Figure 6.3 illustrates the analysis results for frequencies of discharge to the natural drainage courses compared to the pre-development target criterion. These discharges are based on the assumption that their outlet control structures would reflect the typical design shown by **Figure 6.1**.

The design concept presented by **Figure 6.1** envisions a single orifice controlling the discharges to match the pre-development frequency curve. At the time of SMDP or detailed design multiple orifices may be considered.

Emergency spill discharges from Pond C and Pond E may potentially occur to lands within the Rocky View County. It is assumed that these spill discharges will follow the natural drainage pathways to the Range Road 30C Ravine which will be within drainage easements noted previously in Sub-Section 4.1.2. This will have to be coordinated with the Rocky View County at the time of SMDP.

6.4 Sediment Removal

Table 6.4 summarizes the results of the sediment simulation analyses for the Westview SWMFs as determined by the QHM model. This does not include the private detention storage facilities for Subcatchments 11 and 12 which will be confirmed at the Outline Plan stage. As shown, the results meet the target objective which is 85 % removal of particle sizes $\geq 50 \mu\text{m}$.

Table 6.4 Sediment Simulation Results

Particle Size (μm)	% Removed					
	A	B	C	D	E	F
≤ 10	95.6	97.0	94.1	98.5	96.8	95.1
10 – 20	99.1	99.3	98.2	99.8	99.2	99.0
20 – 50	99.8	99.9	99.6	100.0	99.9	99.8
50 – 150	100.0	100.0	100.0	100.0	100.0	100.0
≥ 150	100.0	100.0	100.0	100.0	100.0	100.0
Totals	98.9	99.2	98.4	99.6	99.2	98.7

7.0 STORM INFRASTRUCTURE

7.1 Discharges to Natural Drainage Courses

The City of Calgary currently provides funding for storm sewer trunks that convey drainage from developments to the designated outlet location, which may be an outfall at the natural drainage course or other storm infrastructure. The current City of Calgary policy for City funding storm sewers is as follows::

- Greater than or equal to 900 mm diameter;
- Services 2 or more developers/landowners.

None of the storm sewers that convey the discharges from the Westview SWMFs to Coach Creek, the Unnamed Creek or Range Road 30C Ravine qualify for City funding. All costs associated with the ponds and storm outfalls are thus the responsibility of the developer landowners

7.2 Alternate Storm Discharges

The City of Calgary requested that the option to discharge the Westview Drainage to a point downstream of the Bearspaw Water Treatment Plant (WTP) raw water intake be briefly investigated. The background behind this option is that the City of Calgary wishes to minimize or avoid altogether any added pollutants to the freshwater supply (i.e. Bow River) which may be carried by the storm discharges. This issue was also raised previously with the developments of Valley Ridge and Stoney Trail, both of which were required to implement special measures to their stormwater management system.

With the exception of the Valley Ridge Golf Course just to the east of the Westview lands, the south side of the Bow River Valley comprises steep escarpment slopes all the way east and beyond the Bearspaw WTP intake. An alignment for a storm trunk along the south side is therefore not feasible. Based solely on an office study of existing topography, utility information and aerial photography it appears that the only practical solution for a trunk conveyance route is along the north side of the Bow River as shown on **Figure 7.1**.

This alternate storm trunk routing is based on the premise that the discharges from the Westview SWMFs are directed to a single location on the top of the south escarpment slope, shown as MH '1A'. Without undertaking a more detailed investigation of the site, capturing the storm discharges from the mouths of Coach Creek and the Unnamed Ravine and conveying the flows across the Bow River does not appear to be practical or feasible. Therefore the storm discharges from the Westview SWMFs are conveyed by storm sewer through the adjacent downstream developments to MH '1A'.

With this option for the alternate conveyance of the Westview storm discharges to the Bow River there is no longer a need to control the discharges to the specific unit rates or annual runoff volume targets noted in Section 3.3. However, for the purpose of this evaluation it is assumed that the Westview stormwater management system and discharge targets remain the same as presented previously.

Usually treated storm discharges from SWMFs are conveyed by a dedicated storm trunk which is designed to accommodate only the treated stormwater at the controlled rates of discharge. In this case the layout of the Westview lands does not readily lend itself to the concept of a single dedicated storm trunk system to receive the discharges from the SWMFs. Therefore the controlled discharges from the various SWMFs are directed to the subdivision minor system of the downstream catchment. The following summarizes how the Westview discharges are made:

- Pond A via syphon under Coach Creek to the storm outlet from Pond B which discharges to the minor system of Subcatchment 10, which requires an auger installation under the Trans Canada Highway;
- Pond C to the minor system of Subcatchment 9, which requires an auger installation under the Trans Canada Highway;
- Pond E discharges to the minor system of Subcatchment 10, including the flow-through discharges from Pond C;
- Subcatchment 11 discharges via syphon under Coach Creek to the minor system of Subcatchment 10;
- Pond F discharges to MH '1A', including flow-through discharges from Ponds A, B, C, E and Subcatchment 11;
- Subcatchment 12 discharges to MH '1A';
- Subcatchments 5 and 6 (TCH) discharge to Coach Creek as originally proposed.

All of the infrastructure associated with the above discharge scenario would be the responsibility of the developer landowners. This would result in a small increase in costs compared to the scenario discussed in the previous sections whereby the storm discharges are directed to the natural drainage courses. Only the storm trunk from MH '1A' to the Bow River would qualify for City funding.

Two options were evaluated for the storm discharges to the Bow River as shown by **Figure 7.1**. Both options involve a 1200 mm concrete pipe from Pond F to MH '1A' and 900 mm HDPE syphon across the Bow River from MH '1A' to MH '2A' which would be installed by directional drilling. Option #1 involves a 1500 mm gravity pipe from MH '2B' to the Bow River at a slope of about 0.1 %. This would be installed by conventional open trench method with depths of excavation in the range of 10 - 14 m. Option #2 involves a 900 mm HDPE forcemain with the water being driven by the hydraulic head between the escarpment slope to the Bow River at the outfall location. This forcemain would be installed by open trench method with depths of excavation in the order of 3 m.

Both Options #1 and #2 would necessitate an augur installation under Stoney Trail. There are several existing storm trunks in the vicinity of Stoney Trail with outfalls at the Bow River next to that proposed for this



alternate Westview storm trunk. For the purpose of this high-level assessment it was assumed that an alignment for this new trunk and outfall could be accommodated in this area, but this would need to be verified by detailed investigation.

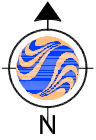
7.3 Opinion of Probable Costs

Table 7.1 summarizes the Opinion of Probable Costs for the two alternate Westview Storm Trunk options. Details of quantities and unit prices assumed are provided in **Appendix H**.

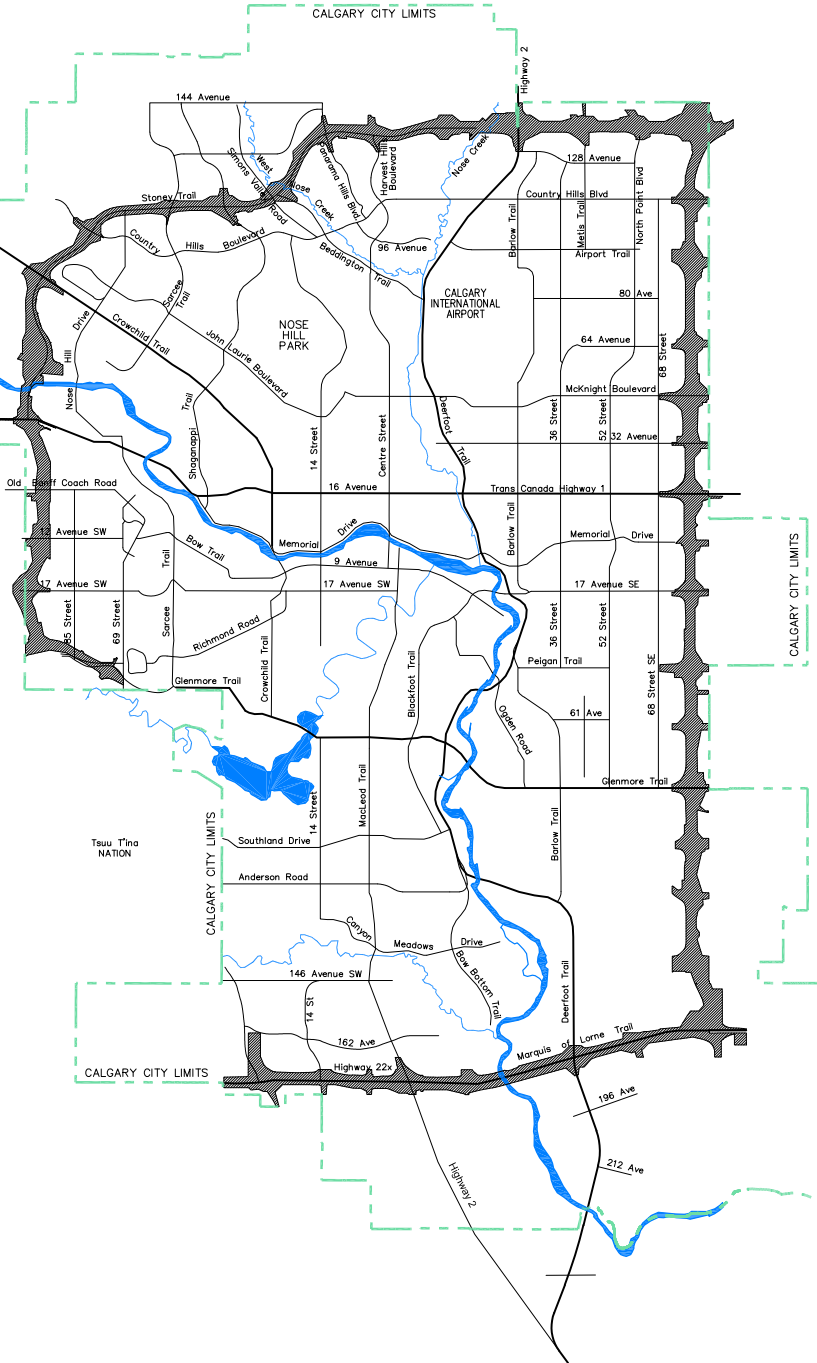
Item of Work	Option #1	Option #2
1. Underground Piping	\$11,306,000	\$8,272,000
2. Surface Site Work	\$ 531,000	\$ 331,000
3. Landscaping	\$ 313,000	\$ 313,000
4. Miscellaneous	\$ 368,000	\$ 368,000
Sub-Total Construction Items	\$12,518,000	\$9,284,000
Design & Construction Professional Services	\$ 1,252,000	\$ 928,000
Environmental Studies	\$ 100,000	\$ 100,000
Material Testing During Construction	\$ 376,000	\$ 279,000
Contingency (20%)	\$ 2,849,000	\$2,118,000
Project Total	\$17,095,000	\$12,709,000

As noted previously, the entire cost for the alternate storm trunk would be the responsibility of the City of Calgary. Option #2 (HDPE forcemain) is about 27 % less costly than Option #1 but it would still result in the highest assessment compared to other storm trunk systems in the City of Calgary. The alternate Westview Storm Trunk services 197.02 ha so the cost for Option #2 translates to unit amount of about \$64,500 per ha. By comparison, the Shepard 2010 Storm Sewer Levy is presently the highest in the City of Calgary at \$43,408 per ha.

Considering the above costs, the alternate storm trunk servicing solution is not recommended for servicing of the Westview lands.



STUDY LOCATION



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WESTVIEW MASTER DRAINAGE PLAN

Figure No.

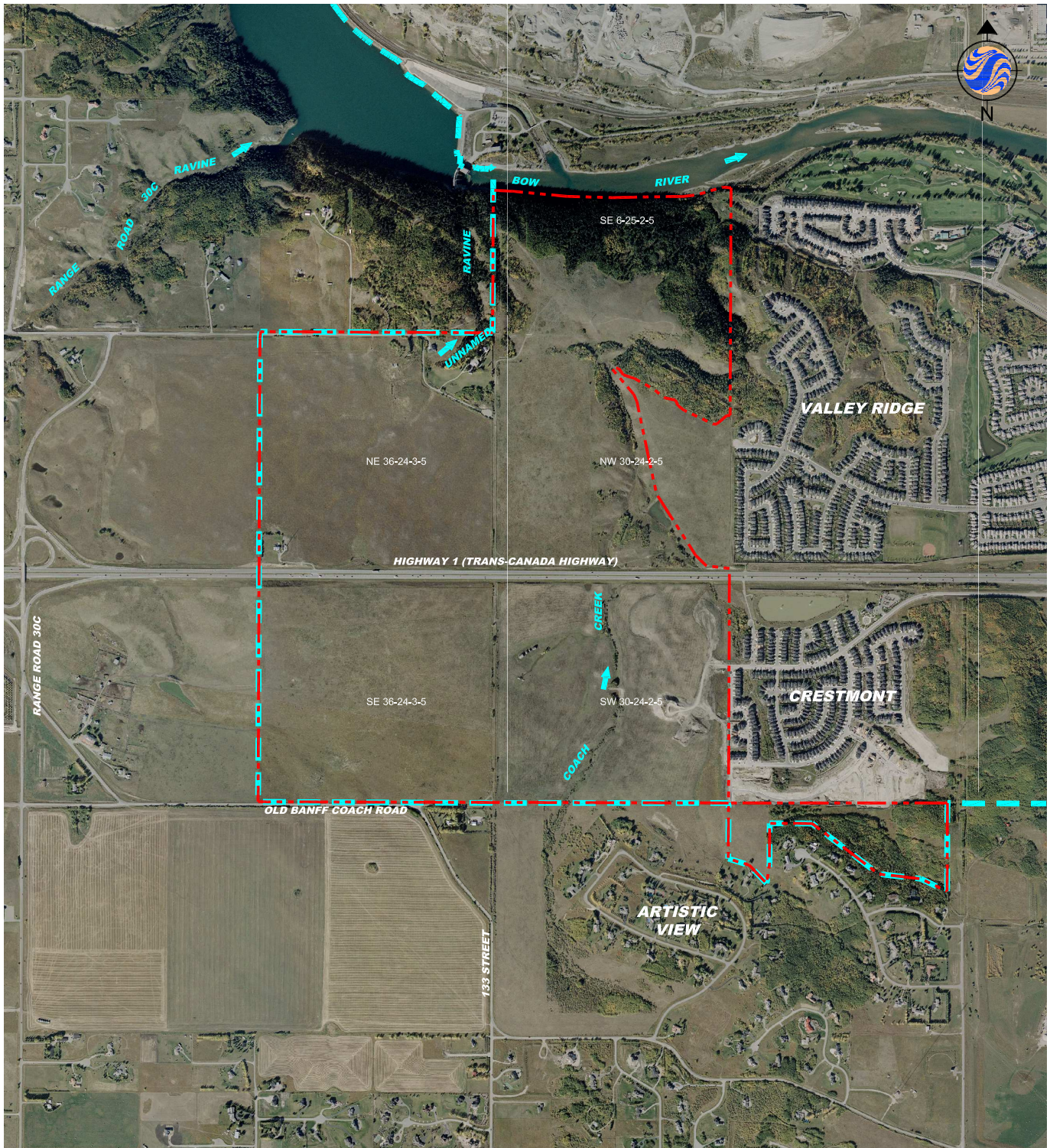
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Site Location

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Legend

- - - - ASP Boundary
- - - - City of Calgary Boundary

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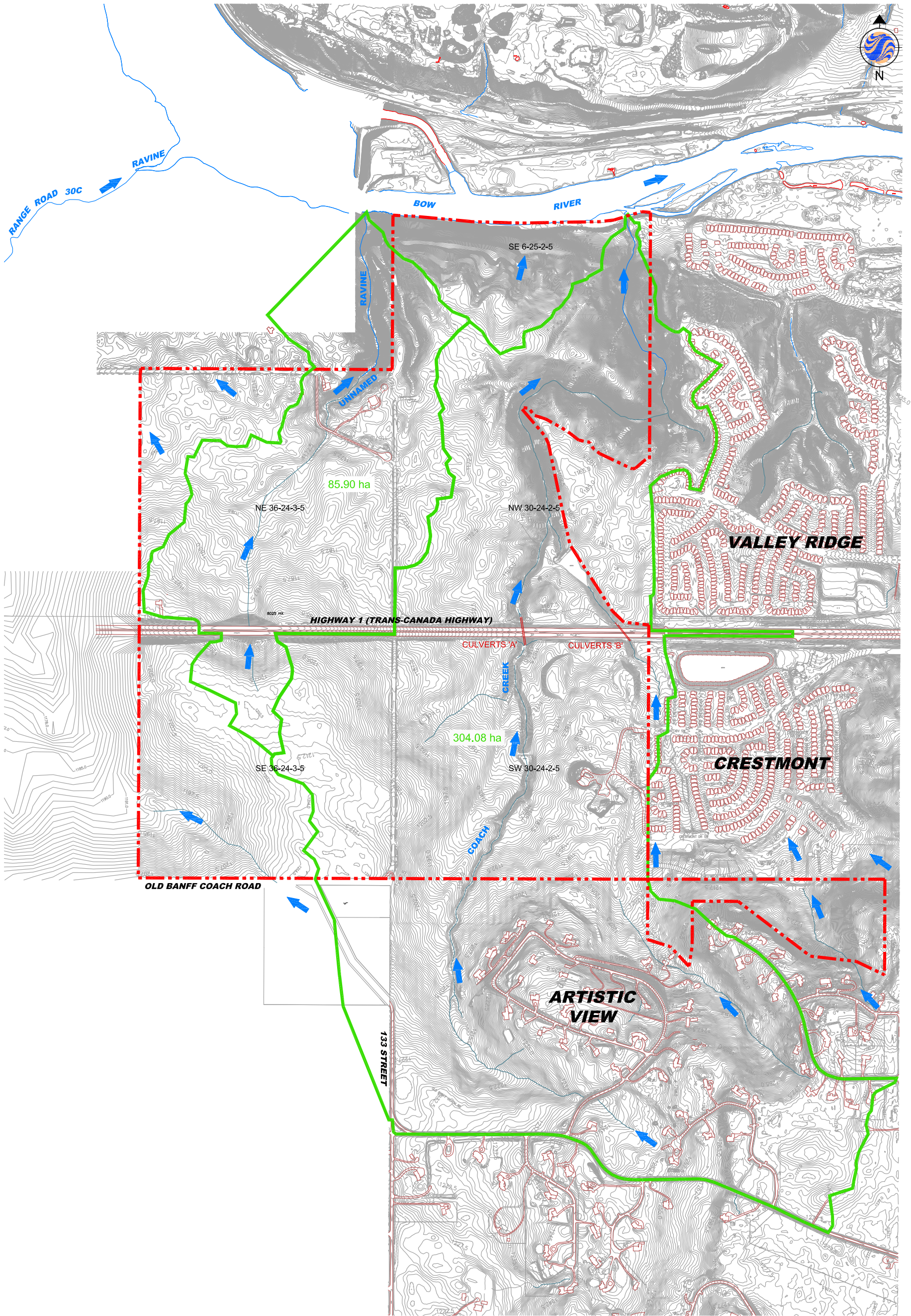
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Figure No.

1.2

Title

Westview Area Structure Plan



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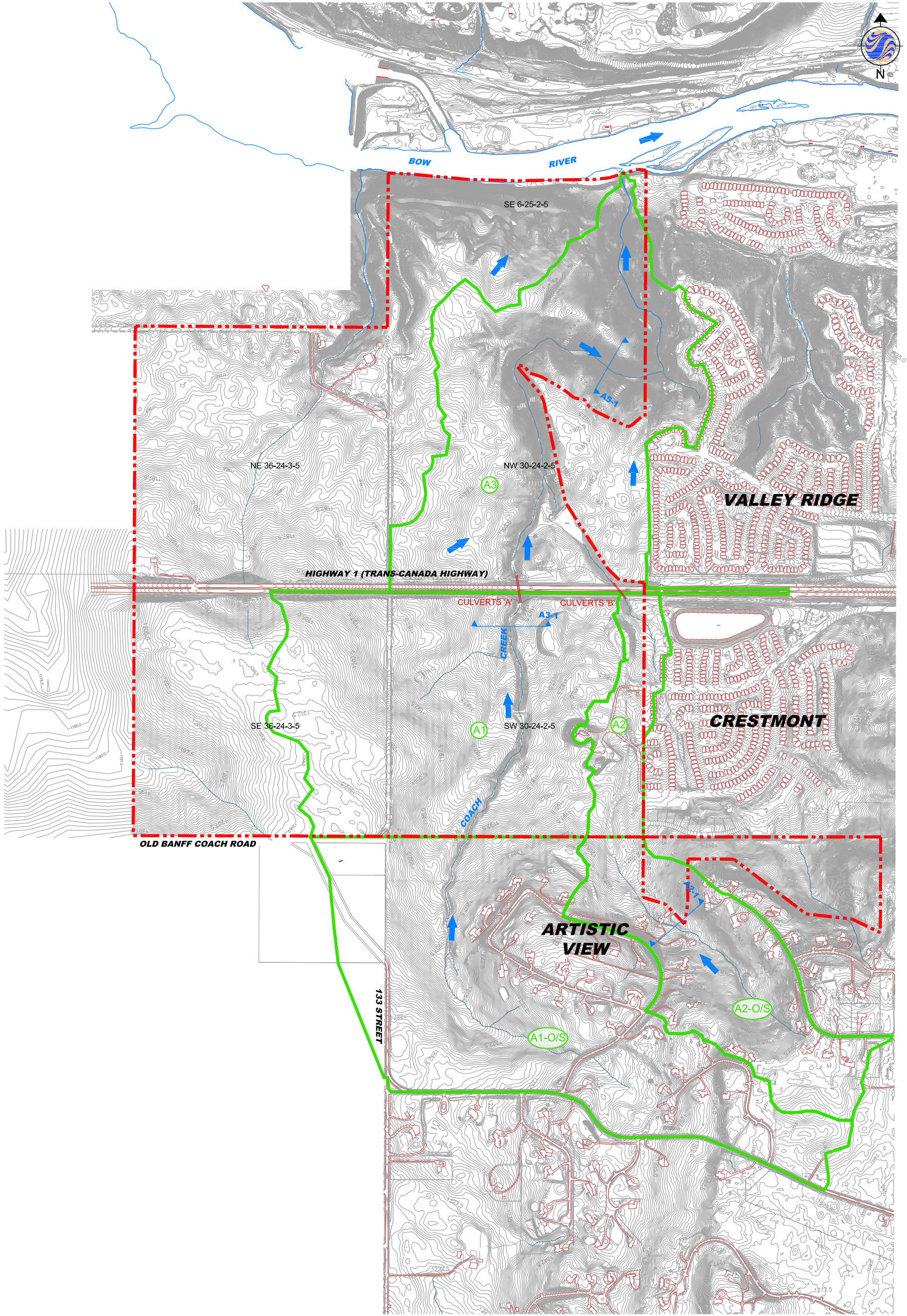


Legend

- Drainage Boundary
- ➔ Direction of Overland Flow
- - - ASP Boundary

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 Figure No.
 2.1
 Title
 Existing Topography

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- Legend**
- 1 Subcatchment Boundary & Reference No.
 - Direction of Overland Flow
 - ASP Boundary
 - ▲ A3-1 Channel Section

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 WESTVIEW MASTER DRAINAGE PLAN

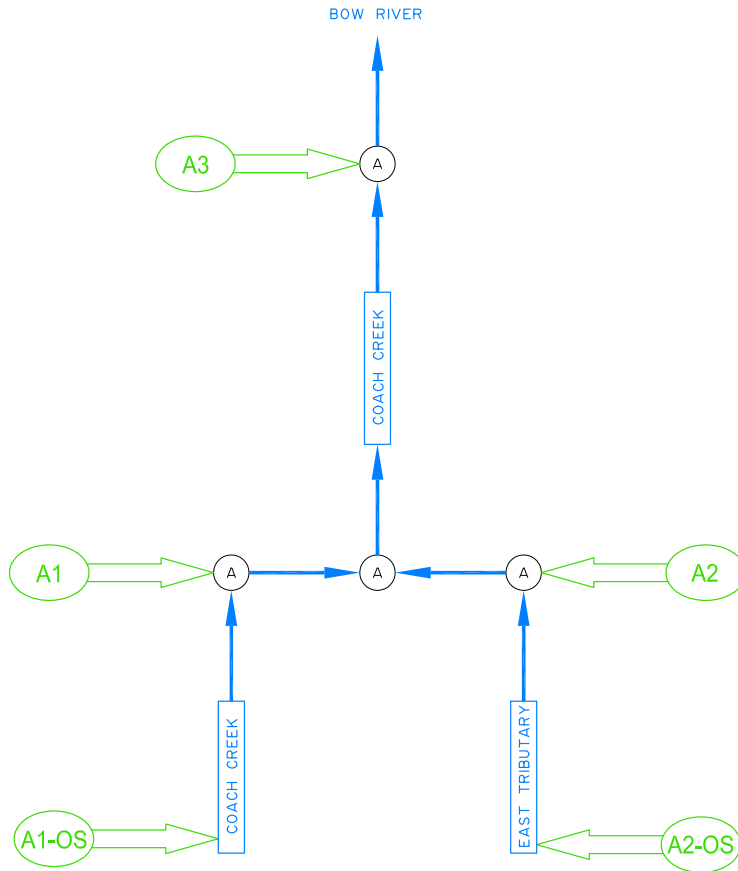
Figure No.
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Title
 Pre-Development Catchments
 for Coach Creek





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N.T.S.



Legend

-  Subcatchment
-  Overland Flow
-  Channel Routing
-  Add Hydrograph

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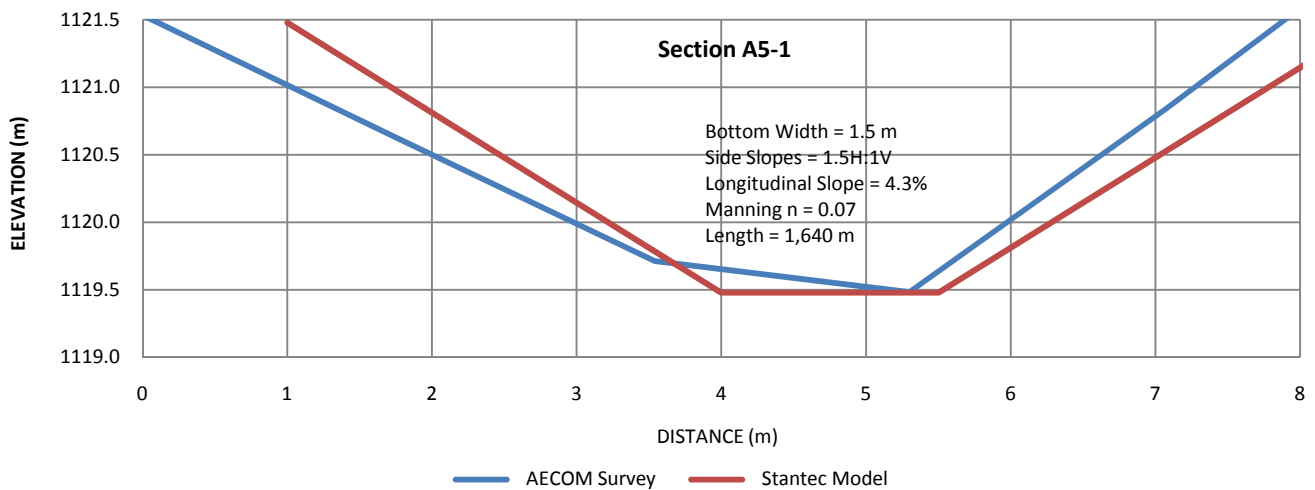
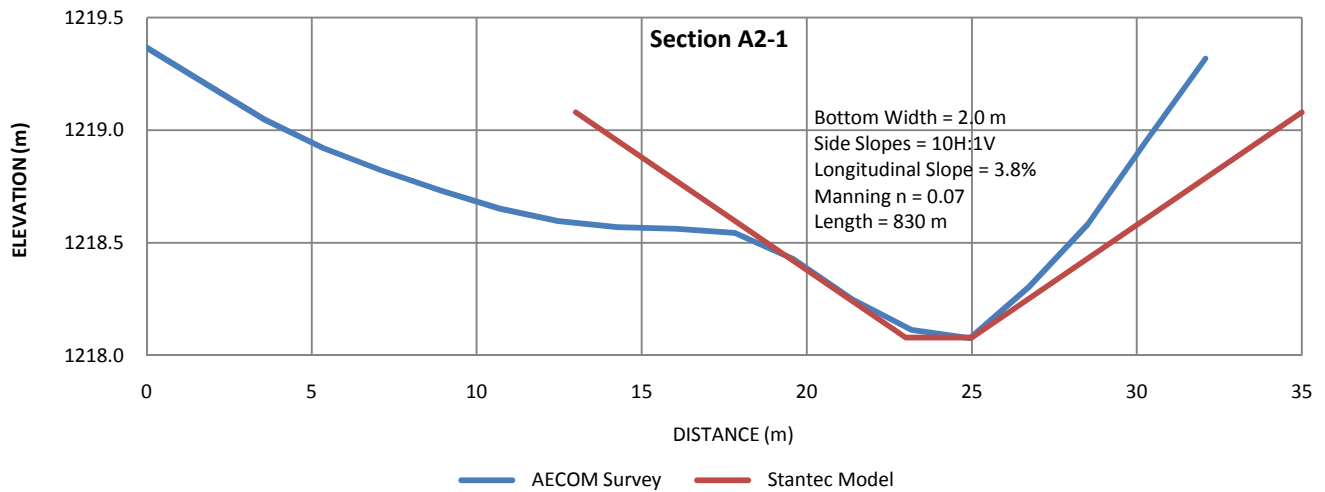
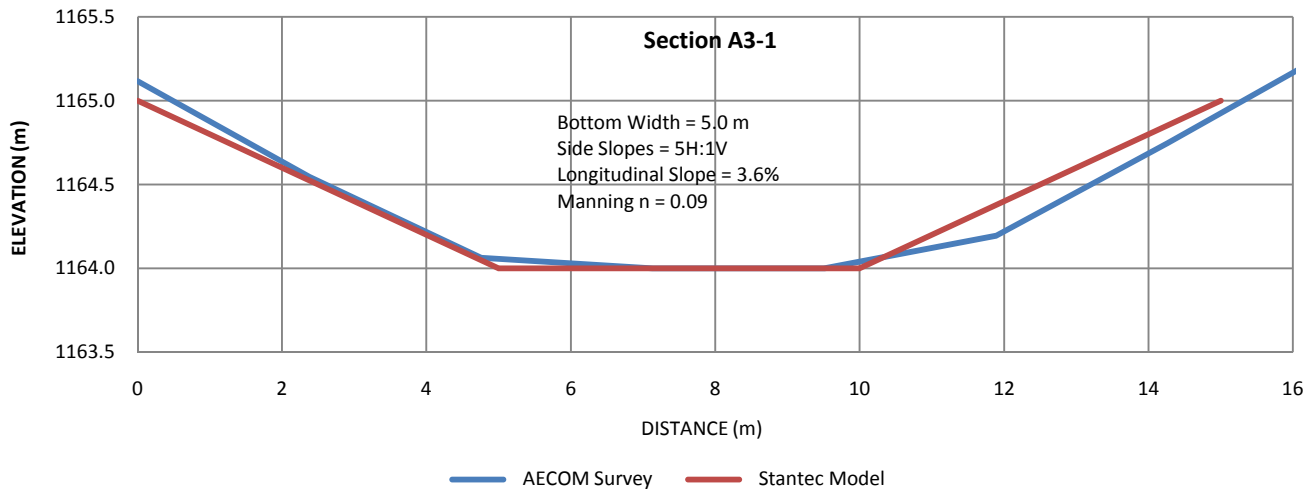
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Title

Pre-Development
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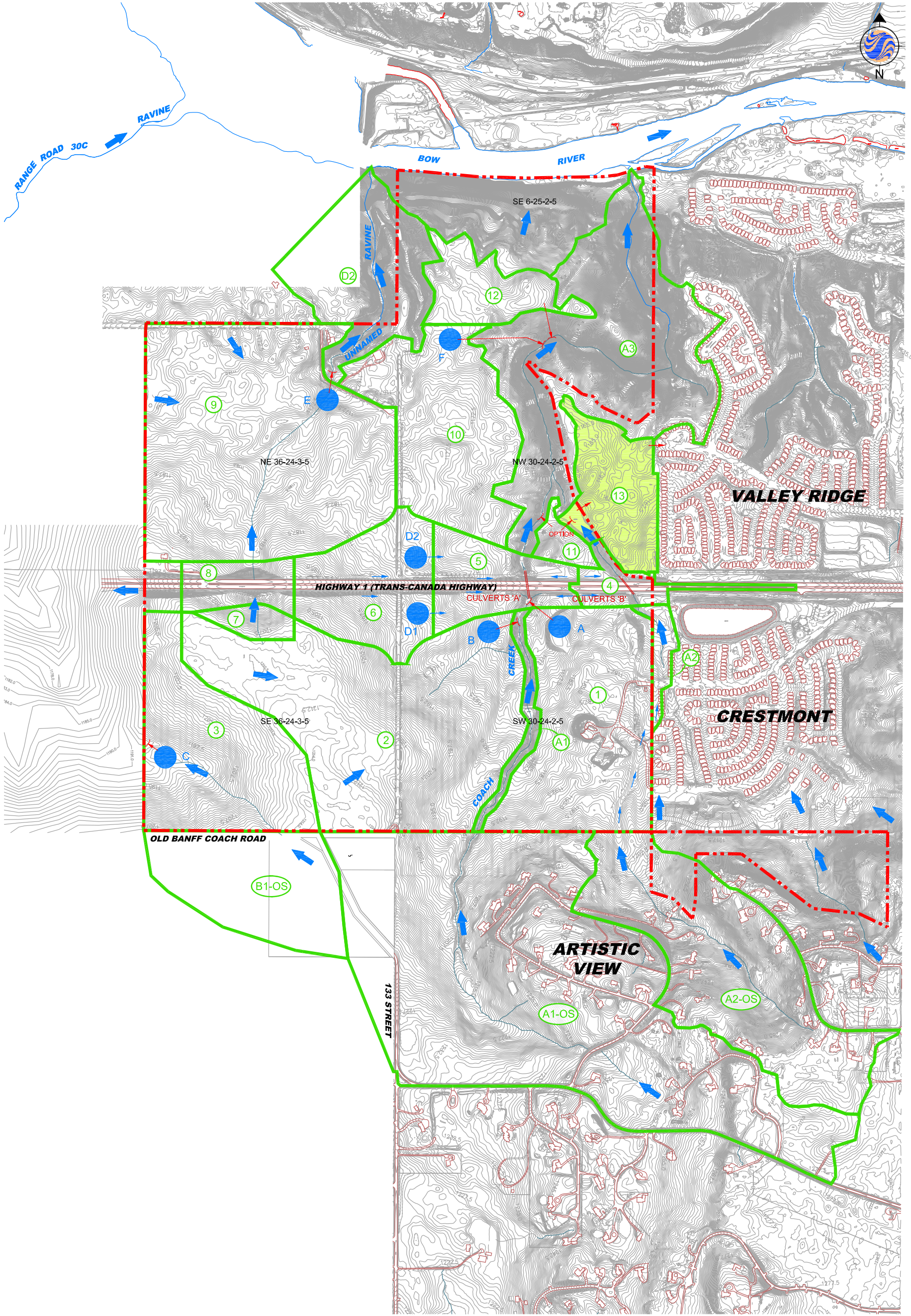
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WESTVIEW MDP

Figure No.

3.3

Title

Sections for Channel
Routing



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Legend

- 1 Subcatchment Boundary & Reference No.
- Direction of Overland Flow
- Storm Pond & Reference No.
- Storm Sewer & Outfall
- Area Draining Through Valley Ridge (Non Contributing)
- ASP Boundary

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 WESTVIEW MASTER DRAINAGE PLAN

Figure No.
 4.1

Title
 Stormwater Management
 Servicing Concept

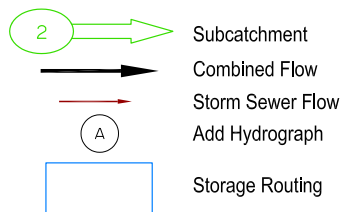
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Legend



Client/Project

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 WESTVIEW MASTER DRAINAGE PLAN

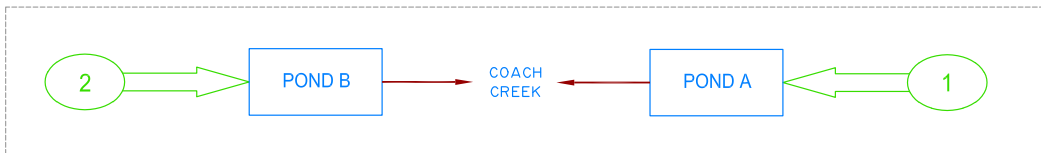
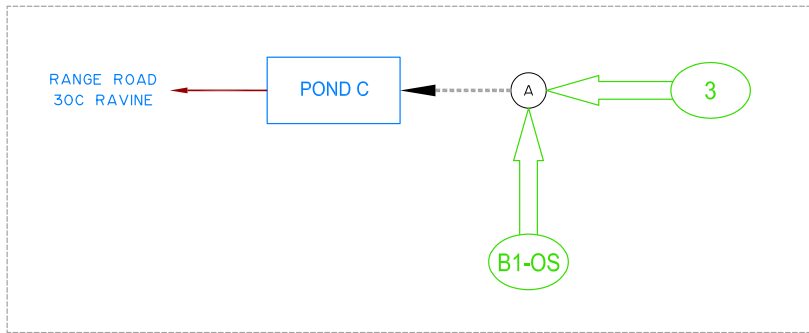
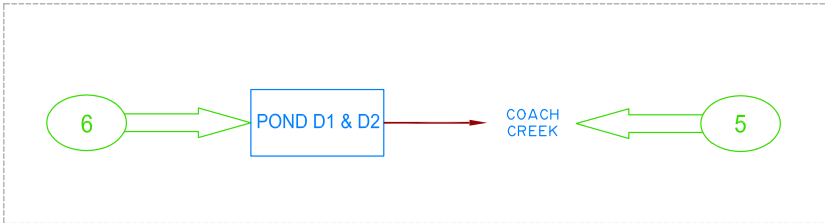
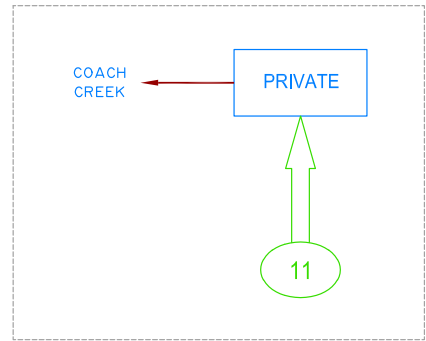
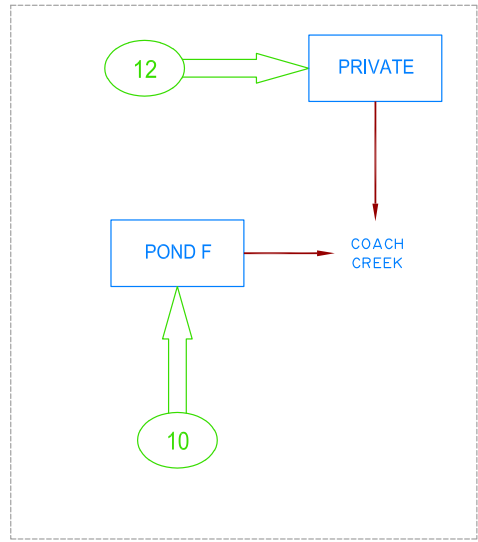
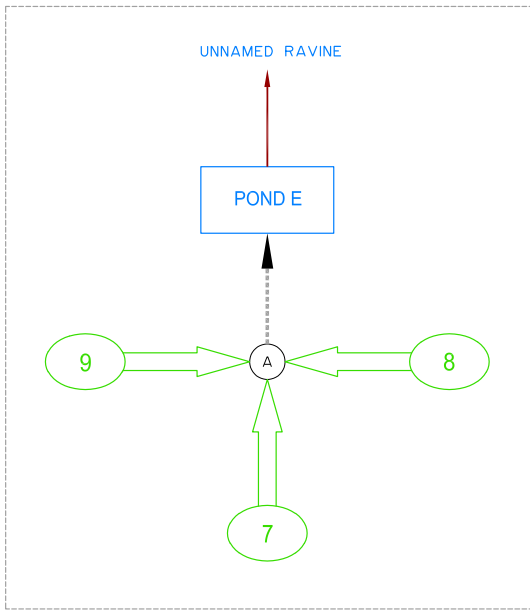
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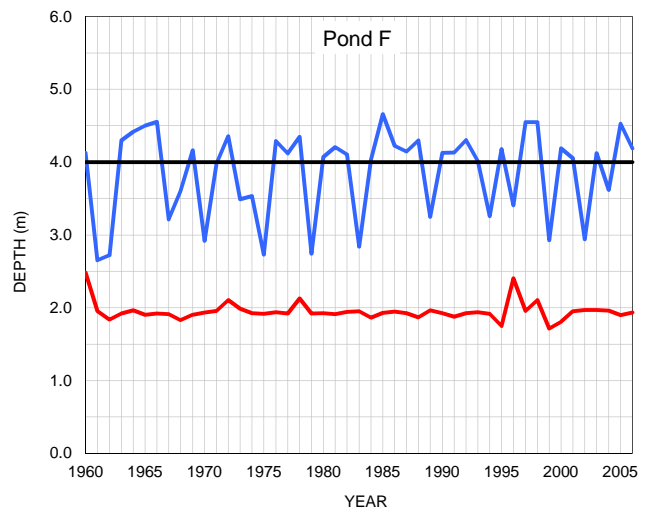
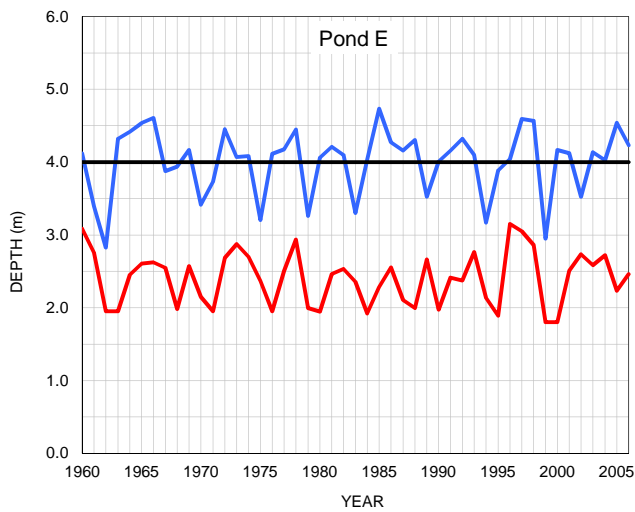
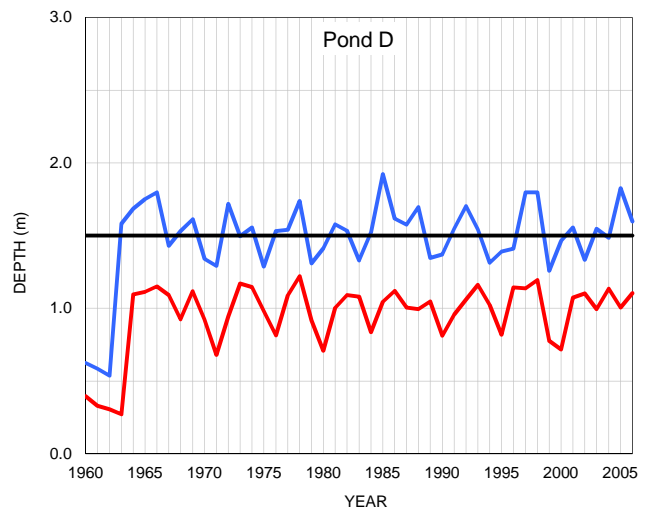
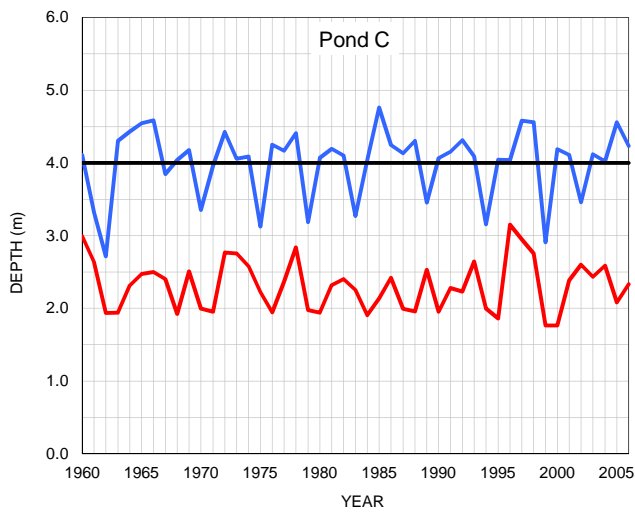
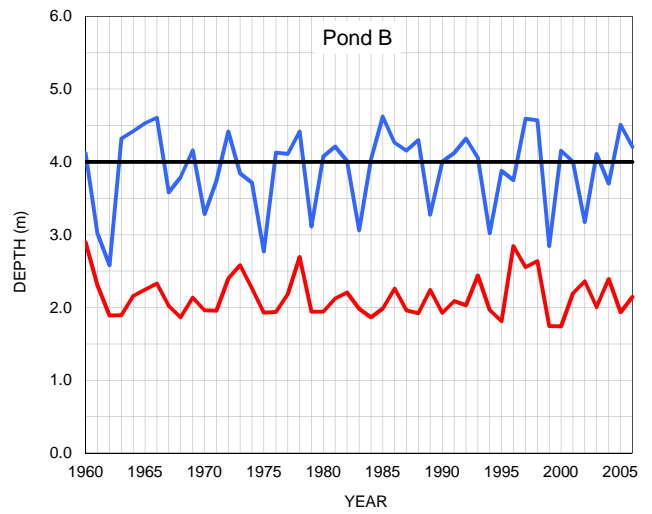
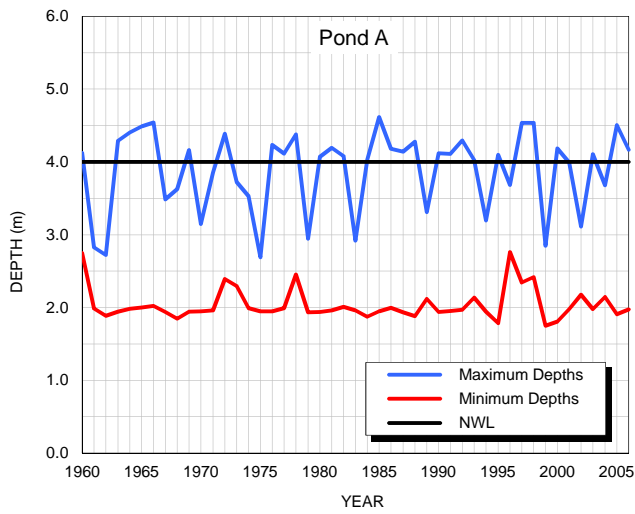
6.1

Title

Post-Development
 Computer Model Input Structure

116417392





Stantec

Client/Project
**QUALICO COMMUNITIES &
 MELCOR DEVELOPMENTS LTD.
 WESTVIEW MASTER DRAINAGE PLAN**

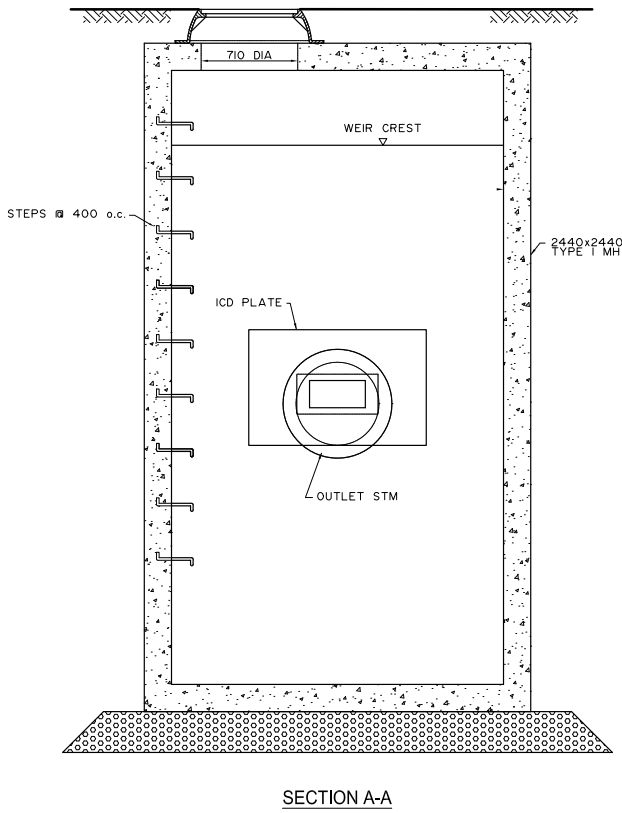
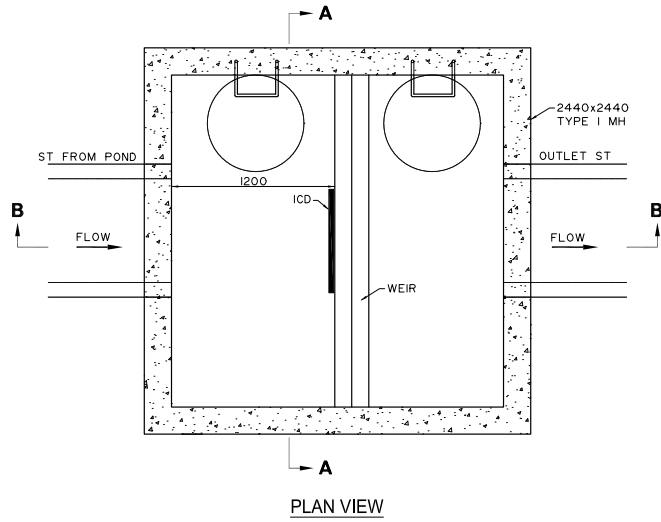
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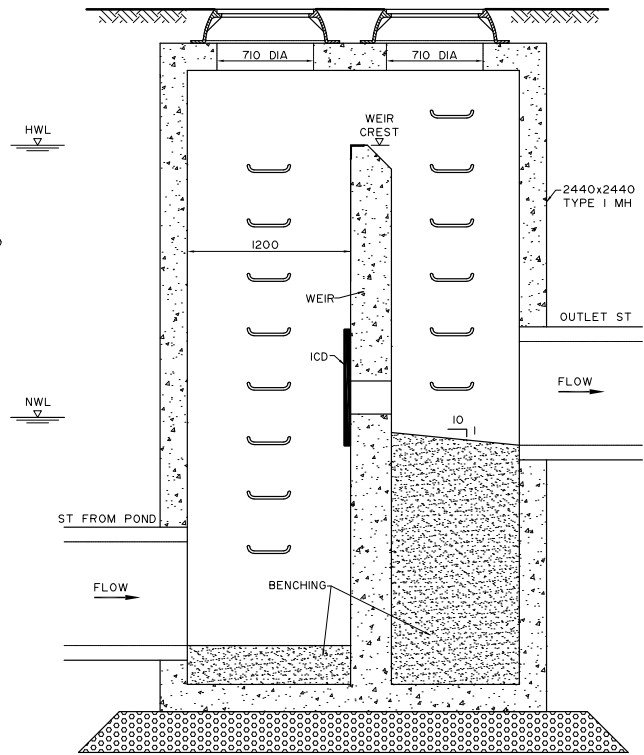
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**Annual Water Levels for
 Stormwater Management Facilities**

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SECTION A-A



SECTION B-B

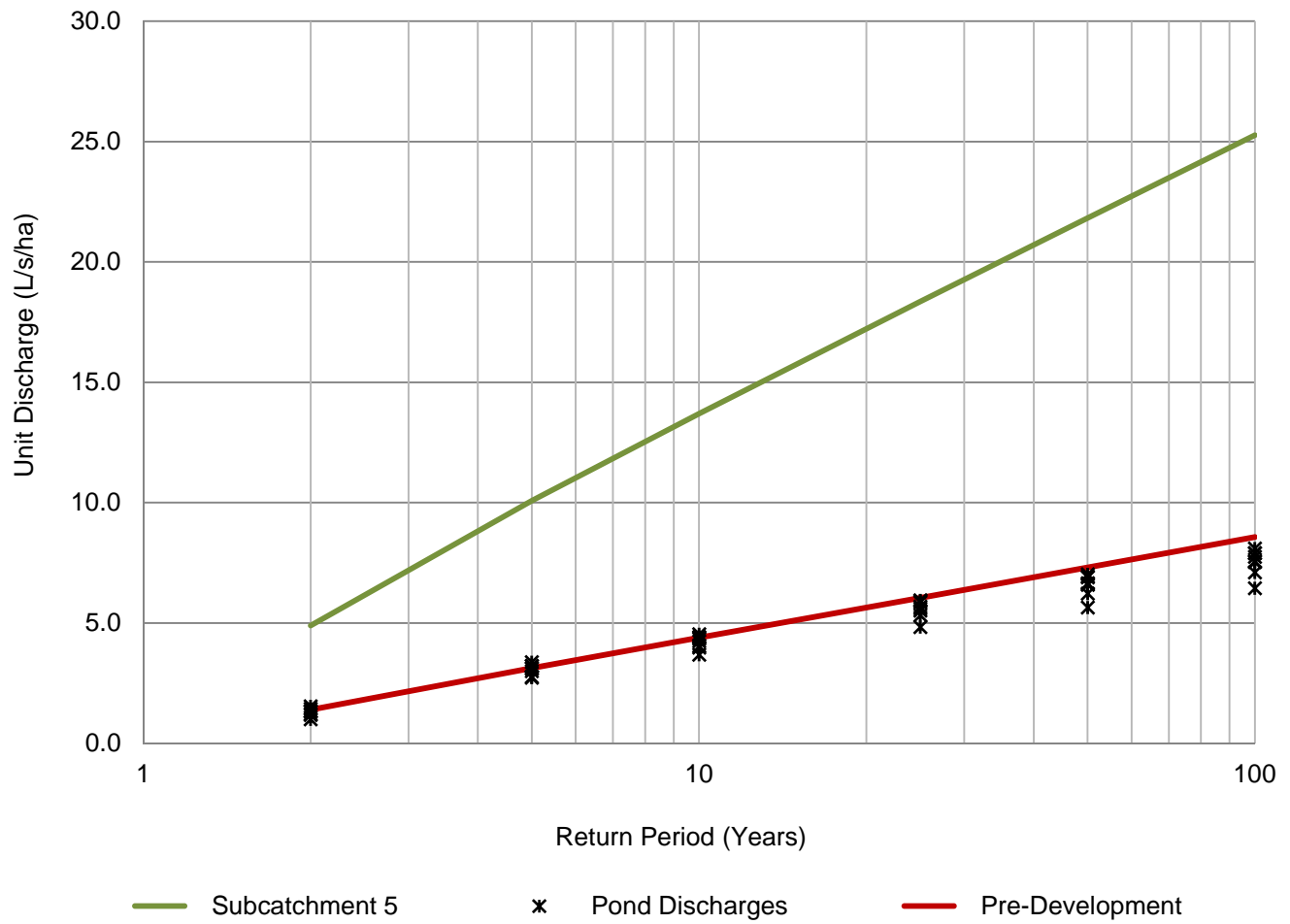
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Client/Project
 QUALICO COMMUNITIES &
 MELCOR DEVELOPMENTS LTD.
 WESTVIEW MASTER DRAINAGE PLAN

Figure No.
 6.2

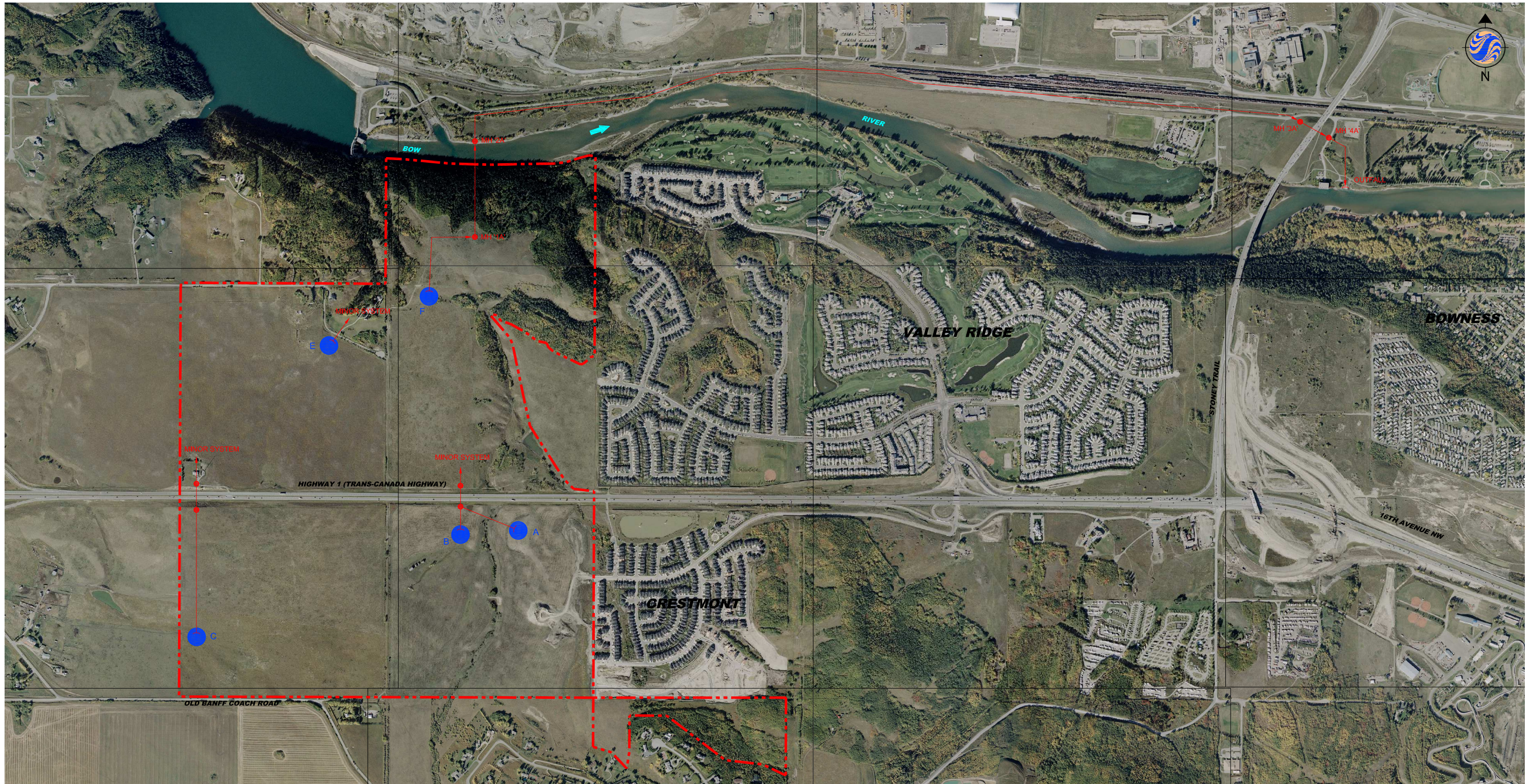
Title
 Typical Pond
 Outlet Control Structure



Client/Project
 QUALICO COMMUNITIES /
 MELCOR DEVELOPMENTS
 WETSVIEW MDP

Figure No.
 6.3

Title
 Frequencies of Discharge



PLOT DATE: Dec 08, 2010 9:59am
 FILE NAME: W:\1164\active\116410829\westview_map_drawing\general\sheet_files\drawings\figures\view\Alternate_Storm_Outfall.dwg

SCALE: 1:15,000



Legend

- - - ASP Boundary
- Storm Sewer & Manhole
- Storm Pond & Reference No.

Client/Project
 QUALICO COMMUNITIES &
 MELCOR DEVELOPMENTS LTD.
 WESTVIEW MASTER DRAINAGE PLAN

Figure No.
 7.1

Title
 Alternate Storm Discharge to
 Bow River

116417392

REFERENCES

1. AECOM Canada Ltd.; *West Regional Context Study Master Drainage Plan*; July 10, 2009
2. Alberta Environment; *Evaporation and Evapotranspiration in Alberta, Report 1912 to 1985, Data 1912 to 1996*; January 1999
3. Alberta Environmental Protection; *Stormwater Management Guidelines for the Province of Alberta*; January, 1999
4. Chow, Ven Te, Maidment, David R. and Mays, Larry W.; *Applied Hydrology*; McGraw-Hill Book Co.; 1988
5. City of Calgary; *Stormwater Management & Design Manual*; 2011
6. City of Calgary; *Guidelines for Erosion & Sediment Control*; February 2001
7. City of Calgary; *Stormwater Source Control Practices Handbook – Draft*; November 2007
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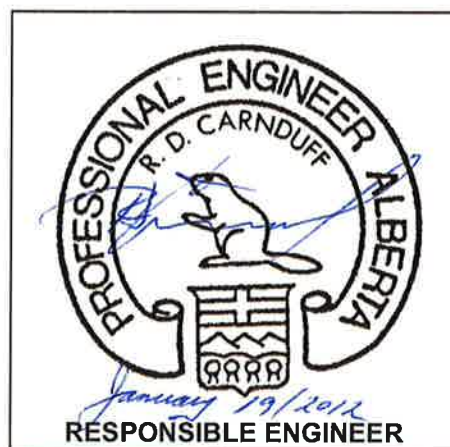


CORPORATE AUTHORIZATION

This document entitled "Westview Stormwater Master Drainage Plan" was prepared by Stantec Consulting Ltd. for the account of the Qualico Communities and Melcor Developments Ltd.. The material in it reflects Stantec Consulting Ltd.'s best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

PERMIT TO PRACTICE STANTEC CONSULTING LTD.	
Signature	
Date	<u>January 19/2012</u>
PERMIT NUMBER: P 0258 The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

CORPORATE AUTHORIZATION



APPENDIX A

City of Calgary Comments to
AECOM's July 10, 2009 Report



Stantec

**Water Resources' (WR) Comments on WRCS MDP
(Report prepared by AECOM, 2009 July 10)**

2009 November 20

GENERAL:

1. The submitted MDP does not address existing flows in the creek and ravine. Pre-development flow analysis for Coach Creek and the ravine should include a water balance and an assessment of the groundwater in relation to the surface water.
2. Establish the pre-development flow rate and the appropriate release rate into the ravine without negative impact to the stream channel and the ravine geomorphology.
3. The chosen release rate of 2.5 L/s/ha seems too high for these conveyance systems. Follow the release rates recommended in the regional study entitled Report on Drainage Strategies for Springbank (by Westhoff Engineering Resources Inc., January 2004), prepared for Municipal District of Rocky View No. 44.
4. Runoff volume control should be targeted at 20mm for Coach Creek, which is similar to Pine Creek and Nose Creek watersheds.
5. Hydrogeological assessment of the proposed location for Pond F is needed – it is located immediately adjacent to the Bow River escarpment.
6. Existing “watering pond” in Valley Ridge cannot accept additional post-development drainage.

REPORT:

7. Page 1: Please label “small area... in the southeast corner...” on Figures. Areas do not add up (161.65ha + 128.57ha = 290.22ha). Explain the difference between study and development areas.
8. Page 2: Update Table 1.1.1 based on splitting Pond B into two ponds (typical to all tables). Explain difference between 78.06ha and 161.65ha (open space?).
9. Page 7: “Describe ... existing... infrastructure condition”. Not clear how report describes it.
10. Page 8: UARR of 2.5 L/s/ha is too high. 70 L/s/ha is too low for steep hilly areas. Would be helpful to know what information from “Background Reports and Guidelines” was used.
11. Page 10: Rainfall data between 1960 and 2007 is available and should be used in models. Hard copies of data files (input and output) should be provided. State criteria for modeling. Ponds should be sized to remove of 85% of TSS greater than 50µm which is currently an accepted practice for projects in Calgary.
12. Page 10: SWMHYMO and QHM are two modeling programs, not three.
13. Page 12: Which LID's applicable to Calgary? IA of 10mm should be justified. Calculated pre-development unit area release rates are underestimated and should be re-calculated based on a calculated CN value from the calibrated model. CN of 72 is too high. If release rates are greater than 2 L/s/ha there

might be a risk of excessive pollutant load on drinking water source. In this case, contact Water Resources for more specific water quality criteria.

14. Page 13: Creek cross-sections are too coarse. Not clear how they were generated. Modelling pre-development conditions using design storm should not be done when model is not calibrated. No routing done in drainage courses. The purpose of Table 3.1.1 is not clear. Valley Ridge Development Stormwater Management Study (by Stanley, July 1991) should be referenced when talking about Crestmont development.
15. Pages 14 & 15. Grand totals in the two tables do not match up, as well as peak discharges.
16. Pages 17 & 18, Rates do not add up. External (to the development) areas were not modeled at 35% imperviousness (as displayed in the table). Should runoff from these areas be accounted for when sizing ponds? Subcatchment ID's should relate to pre-development conditions ID's. When calculating post-development UARR's, external areas should be excluded from total area because they were modeled as "undeveloped". Slopes of 13.5% for sizing trunks are not practical – too steep. UAAR's do not match. Some areas north of HWY#1 will remain undeveloped – identify. Discharge from Crestmont area into proposed system should be identified. Similar for Table 5.2.2.1.
17. Page 19: LID targets are not clearly described in the report. Hydrogeological assessment is required to ensure LID's performance to meet the set targets.
18. Page 20: Discrepancies in calculating UARR's. Last paragraph should be revised.
19. Page 21: LID's within residential lots can only partially count as source controls because their long-term maintenance and, thus, performance may not be as expected during the design. However, adding 12" of topsoil could be an effective LID option.
20. Page 22: There seems to be area discrepancies in SWMHYMO file (Pond B). What is the purpose and significance of year 1965 event? Table 6.5.1.1 – add area sizes and unit area storage requirements. Trap low storage cannot be deducted from pond storage. They are different systems with different unit area discharge rates.
21. Pages 24 & 25: There are discrepancies between the Tables and Sec. 5.2.2., as well as with data files.
22. Page 25: Culverts under HWY#1 need to accommodate peak release rates from Rocky View County lands. What is the existing capacity of these culverts? If ditches/ trap lows along the HWY are used for runoff conveyance/ storage, Alberta Transportation should be consulted.
23. Page 25: Primary and secondary benefits of LID's should be explained.
24. Pages 25 & 26: Proper citation should be given when description is taken from other references.
25. Page 32: Revise according to other comments.

DRAWINGS:

26. Figure 3 – Show more area to the north, including the Bow River.
27. Figure 4 - Show pipes (including sizes), culverts, drainage arrows, drainage route and discharge points for post-development conditions. Identify ravines and creeks. Show overland escape route. Where does each pond discharge to?
28. Figure 4 - Intermunicipal cooperation and work should take place in order to identify and secure future required drainage routes or easements, as discharge ultimately ends up in the Bow River. May be include in Conclusions & Recommendations section?
29. Figure 7 – An example of rain garden would be more appropriate as opposed to vegetated swale (as in Source Control Practices Handbook).

Minutes of Meeting

Date of Meeting	December 11, 2009	Start Time	11:00 am	Project Number	60116034 & 60113890
Project Name	West Calgary Regional Context Study				
Location	City of Calgary, Water Resources Boardroom				
Regarding	City Comments on Master Drainage Plan (MDP) and Biophysical Impact Assessment (BIA)				
Attendees	Olga Abramovich (Water), Susan Young (Water), Mona Keffer (Parks), Scott Lockwood (Planning), David Couroux (Planning), Garett Wohlberg (Qualico), Karmen Chanasyk (Melcor), Darrell Grant (Brown & Assoc.), Kathy Oberg (Brown & Assoc.), Jeff Crofton (AECOM), Don Pasquini (AECOM)				
Distribution	Those present, Dennis Inglis (Melcor), Ryan Ancelin (Golder) and Tony Derix (AECOM)				

PLEASE NOTE: If this report does not agree with your records of the meeting, or if there are any omissions, please advise, otherwise we will assume the contents to be correct.

	Action
<p>1. City of Calgary (City) concerns that need to be addressed:</p> <ul style="list-style-type: none"> ● Discharge rate of 2.5 L/s/ha is close, but needs to match the rate specified in the Westhoff report. ● Runoff volume needs to be addressed. ● Specific concerns expressed by Parks: <ul style="list-style-type: none"> ○ Need to protect the ravine. ○ Need to identify the existing conditions (baseflow) of the creek to determine if the 2.5L/s/ha discharge rate is realistic. While the initial BIA has sufficiently addressed the biological aspects of the ravine, more physical analysis is required to confirm if the Westhoff requirements are sufficient or if we have to go further. What are the ultimate physical characteristics of the creek? ○ Where is the ravine recharge coming from (upstream, perched water or shallow groundwater table)? ○ Location of Pond F (Melcor Lands) is of concern with respect to slope stability and other considerations. 	<p>Info</p>
<p>2. Runoff storage within the ravine:</p> <ul style="list-style-type: none"> ● Ponds (Public Utility Lot land use) are typically not allowed in Environmental Reserves. ● Storage in ER areas may be considered if the storage is above flow areas and not damming the creek. ● Offsite areas draining into the West Calgary RCS lands will have to provide their own storage requirements. 	<p>Info</p>

3. Timing and other Considerations for Approvals

- Area Structure Plan is underway. Council would like it approved by the end of 2010.
- Land Use approval will run not necessarily concurrent but close to the ASP approval process.
- The target for development is 'moving dirt' by 2011 (Qualico and Melcor).
- Pipes greater than or equal to 900 mm in diameter and servicing more than one land owner are typically funded by the City. Need to identify if there are any (not likely).

Info**AECOM****4. Next Steps**

- Need to confirm which City concerns need to be addressed now and which ones can be addressed later (ie. at a more detailed design stage).
- Need to discuss the LID approval process with Bert Van Duin (Water).
- An addendum to the BIA prepared by Golder and Associates is required. The City will provide the Terms of Reference.
- A geotechnical investigation has been done on the Qualico lands but not on the Melcor lands. Melcor should consider proceeding with the geotechnical investigation on their lands.

**Qualico/Melcor/
Brown/AECOM
AECOM****Golder/City****Melcor**



THE CITY OF CALGARY

Parks #54

DATE: 2010 January 26

TO: Ryan Ancelin, Golder

FROM: Mona Keffer
Natural Parkland Management Specialist
Parks, Planning and Development #54

**Re: BIA for the Trans Canada West Lands
Amendments Terms of Reference for the West RCS MDP**

The current approved BIA Trans Canada West lands requires additional work to determine the impacts of the proposed stormwater management recommendations as outlined in the West Regional Context Study, Master Drainage Plan (AECOM, July 10, 2009). The proposed discharge rate of 2.5 l/s/ha is considered to be high and has the potential to incur negative impacts to the stream channel and the ravine. Appropriate alternative discharge rates should be lower than the proposed, and should be evaluated on the basis of contributing to the natural hydrological regime of the water course and the integrity of the ravine system. The BIA should also evaluate the negative impacts of the installation of stormwater management facility Pond F at the top of the Bow River escarpment.

The following assessment requirements have been forwarded to AECOM for further analysis and investigation. These requirements should be taken into consideration when assessing the potential impacts and the subsequent mitigation strategies of the proposed MDP recommendations.

Infiltration of groundwater

- To better understand the existing hydrological regime of proposed conveyance systems, pre-development flow analysis for Coach Creek and ravine should include a water balance and an assessment of the groundwater in relation to the surface water.
- To minimize potential of incision and erosion in the ravine and the creek due to post-development discharge, establish the pre-development patterns in runoff rate, sediment transport and the appropriate frequencies of various release rates, as well as peak design or threshold release rates into the ravine to avoid negative impact to the stream channel habitat, water quality or the ravine geomorphology.

- Use of engineering techniques to protect the integrity of the stream bank and ravine integrity to ensure that the post development flows do not result in streambank erosion.
- Hydrogeological assessment of the proposed location for Pond F – immediately adjacent to the Bow River escarpment. Note that the City's "Slope Adaptive Guidelines" should be used to ensure adequate geotechnical setback.

Please do not hesitate to contact the undersigned should you have questions.

Sincerely,

Mona Keffer

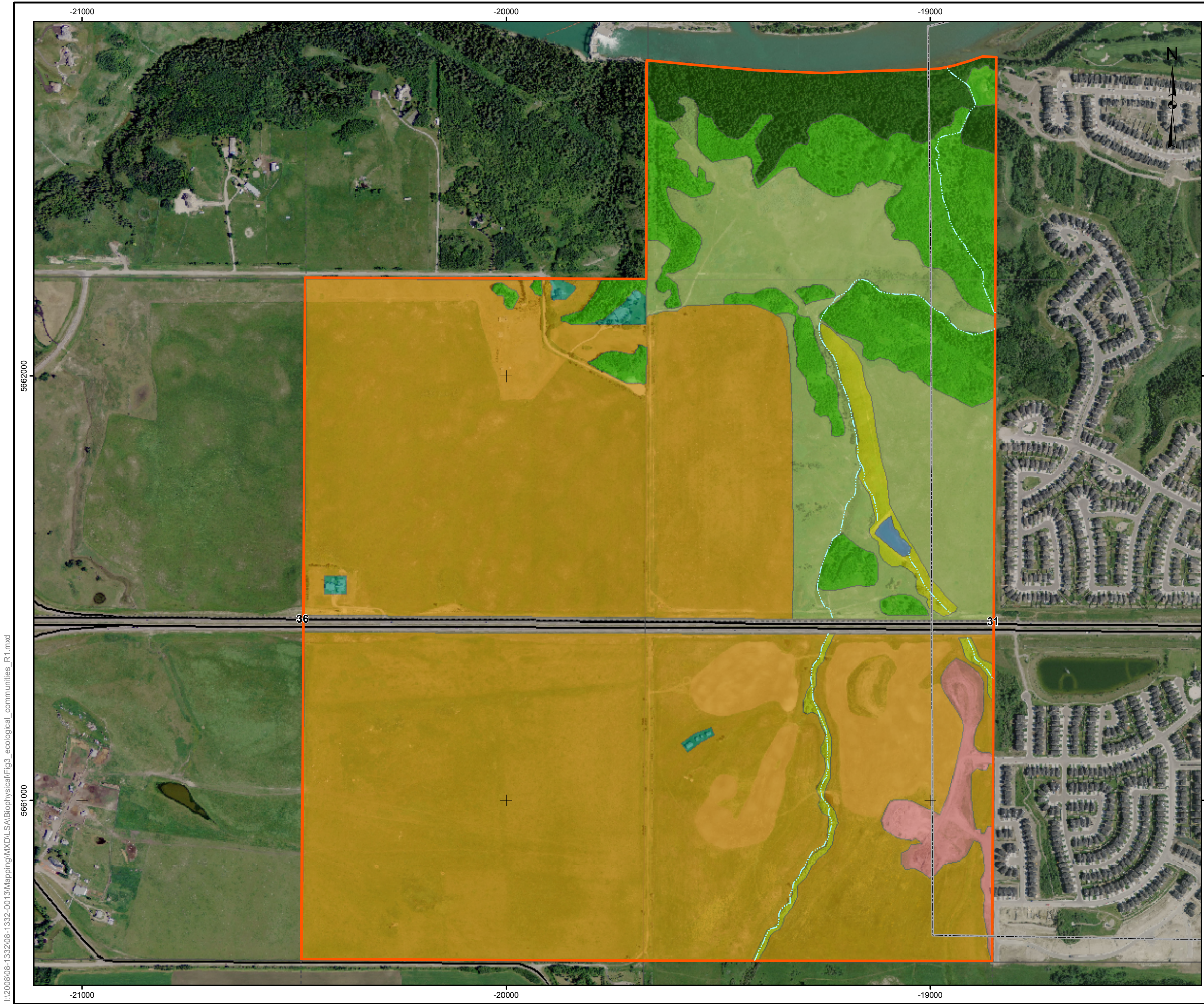
Cc: Don Pasquini, AECOM
Olga Abramovich, Water Resources

APPENDIX B

Background Maps

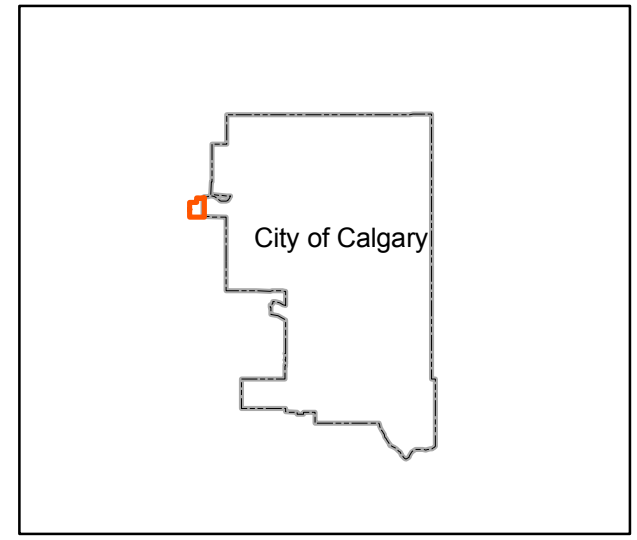


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LEGEND

- SMALL PERMANENT STREAM
- CALGARY CITY LIMIT
- MAJOR ROAD OR HIGHWAY
- STUDY AREA BOUNDARY
- ECOLOGICAL COMMUNITY
- ASPEN WOODLAND
- CULTIVATED PASTURE
- DISTURBED
- DOUGLAS FIR / WHITE SPRUCE WOODLAND
- GRASSLAND
- SHRUBLAND
- WATERBODY



REFERENCE

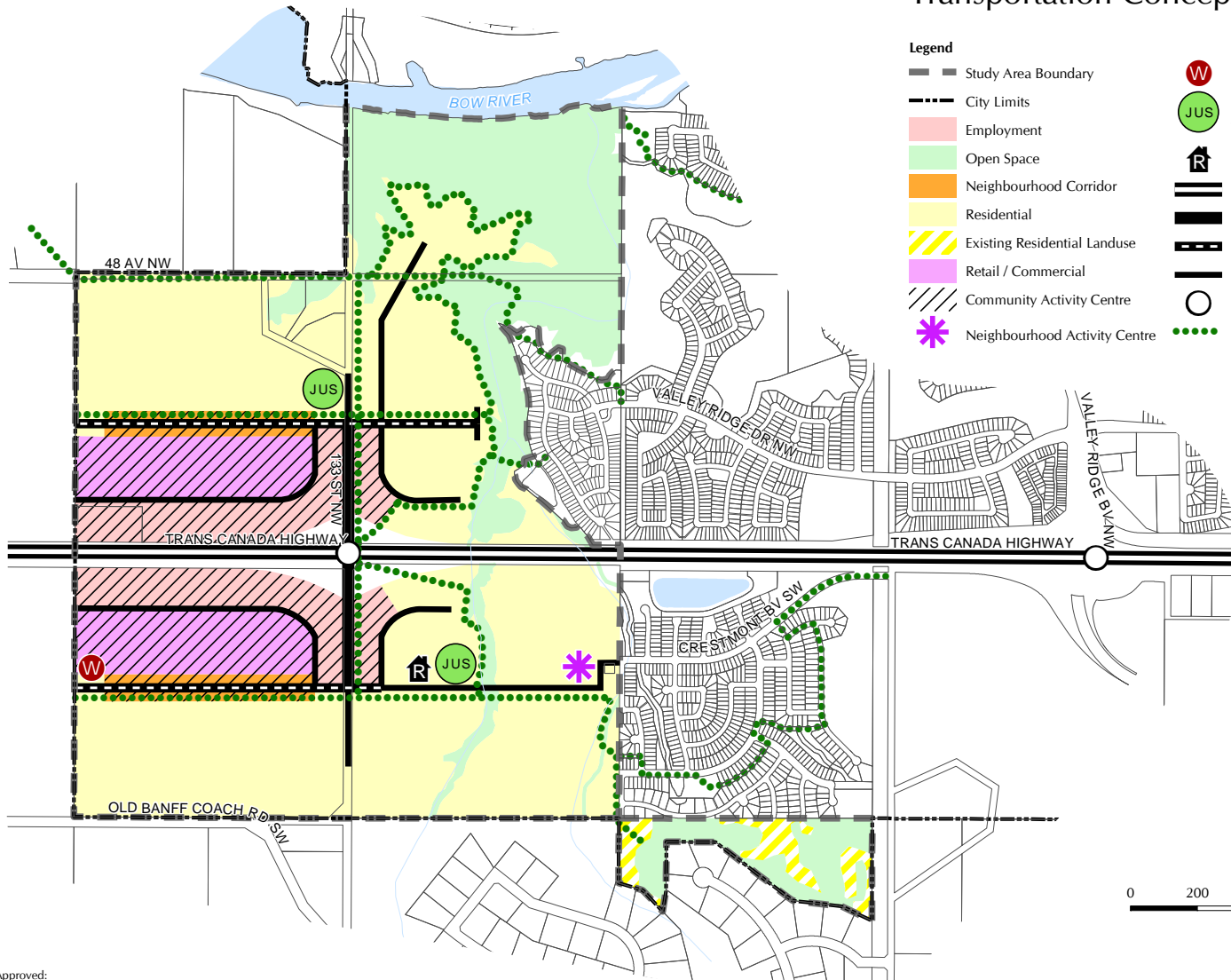
Orthoimage obtained from Valtus. Image date July 12 to July 26, 2007.
 Calgary City Limits boundary provided by DMTI, used under license.
 Projection: 3TM (Central Meridian = -114°) Datum: NAD 83

PROJECT	BIOPHYSICAL IMPACT ASSESSMENT MELCOR DEVELOPMENTS LTD QUALICO DEVELOPMENTS WEST LTD		
TITLE	ECOLOGICAL COMMUNITIES IN THE STUDY AREA		
 Golder Associates Calgary, Alberta	PROJECT NO. 08-1332-0013	SCALE AS SHOWN	REV. 0
	DESIGN RA 29 Sep. 2008	FIGURE: 3	
	GIS HR 29 Sep. 2008		
	CHECK RA 29 Sep. 2008		
	REVIEW CS 29 Sep. 2008		

I:\2008\08-1332\08-1332-0013\Mapping\MXDL\SA\Biophysical\Fig3_ecological_communities_R1.mxd

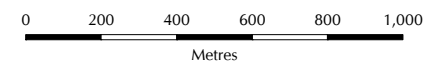
Map ##

Land Use and Transportation Concept



Legend

- Study Area Boundary
- City Limits
- Employment
- Open Space
- Neighbourhood Corridor
- Residential
- Existing Residential Landuse
- Retail / Commercial
- Community Activity Centre
- Neighbourhood Activity Centre
- Bulk Water Station
- Joint Use Site
- Recreation Facility
- Skeletal
- Arterial
- Neighbourhood Boulevard
- Collector
- Interchange
- Regional Pathway



Approved:
Amended:

This map is conceptual only. No measurements of distances or areas should be taken from this map.

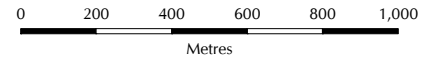


Map ##

Environmentally Significant Areas

Legend

-  Study Area
-  Environmentally Significant Areas
-  City Limits
-  Native and Semi-native Grasslands



This map is conceptual only. No measurements of distances or areas should be taken from this map.

Approved:
Amended:



APPENDIX C

Technical Memorandums



Stantec

Memo



Stantec

To:	Rick Carnduff	From:	Georgina Griffin
	PC1164		PC1233
File:	116417392	Date:	November 4, 2010

**Reference: Geotechnical Assessment, Coach Creek
West View Master Drainage Plan**

Following our site visit on October 1, 2010, I have reviewed the surficial geology mapping for Coach Creek and surrounding areas. This technical memorandum provides my comments with regards to the geological conditions along the creek and potential geotechnical impacts should the discharge rates through the creek increase.

The surficial geology map¹ confirms the observations from the site visit. The soils near the TransCanada Highway include glaciolacustrine silt and clay as well as a large alluvial fan. The upper reaches of the creek traverse through an area of exposed sandstone and siltstone bedrock of the Porcupine Hills Formation as evidenced by the frequent bedrock outcrops noted during the site visit. The creek banks in this area are quite steep. The mouth of the creek is dominated by an alluvial fan and, as the creek descends through this area, the channel widens and the banks are not as steep. Of note, however, is an area right at the mouth where the surficial geology mapping indicates that the surficial deposits consist of silty fluvial overbank sediments overlying glaciofluvial gravels. Based on the mapping, it appears that the slope failure immediately upstream of the mouth of the creek is within this geological unit rather than the alluvial fan. In general, the alluvial fan deposits did not show any obvious evidence of instabilities.

Based on the bedrock exposures and the shape of the channel, it is likely that the channel was formed at the end of the last glacial period and not as a result of the current stream flows. The alluvial fan near the creek mouth appears to have been deposited during this post-glacial erosion and is likely composed of fine sand or silt. The silty fluvial overbank sediments at the creek mouth are typically deposited within river channels during flood events, are unconsolidated, and can frequently have high organic contents.

Overall, the geotechnical risks associated with an increase to the flow through Coach Creek are considered to be minor. In the section of the creek through the exposed bedrock some minor erosion could occur to weaker layers in the bedrock. Since the visual evidence suggests that the existing erosion patterns were the result of an

¹ Moran, S.R. 1986, *Surface Materials of the Calgary Urban Area: Calgary Sheet (NTS 82-O/1)*, Alberta Research Council

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Stantec

November 4, 2010

Rick Carnduff

Page 2 of 2

**Reference: Geotechnical Assessment, Coach Creek
West View Master Drainage Plan**

extremely high glacial meltwater flow, it is unlikely that changes in flow patterns from upstream development would initiate any significant erosion of the bedrock. Thus, the risk for bank instability is reduced. In the alluvial fan deposit, future erosion of the banks would likely be the result of record rainfall events. Assuming the alluvial fan is composed of a combination of sand and silt, it will be more resistant to erosion. Therefore, there is a slight risk for localized instabilities through this section of the creek. The final section of the creek through the fluvial overbank sediments is the only area with a soil that is more susceptible to erosion. The risk for excessive erosion due to increases in post-development flow is mitigated by the influence of flows in the Bow River.

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Georgina Griffin, M.Eng., P.Eng.
Senior Associate, Geotechnical Engineering
georgina.griffin@stantec.com

APEGGA Permit Number: P258

Memo



Stantec

To: Rick Carnduff
PC1164
File: 116417392

From: Georgina Griffin
PC1233
Date: November 4, 2010

**Reference: Geotechnical Assessment, LID Features
West View Master Drainage Plan**

As discussed, I have reviewed the surficial geology mapping for the West View subdivision. This technical memorandum provides my comments with regards to the impact of geological conditions within the subdivision on potential LID features.

The surficial geology map¹ indicates that the soils in the subdivision are likely dominated by glaciolacustrine silt and clay. These soils are very fine grained and will likely be highly interbedded. There is a large alluvial fan east of the subdivision near the TransCanada Highway.

Since the glaciolacustrine soils are likely highly interbedded, vertical permeability and thus infiltration is expected to be very slow. As such, the amended soils typically used in LID features such as bioswales and bioretention areas would likely become saturated during rainfall events and be very slow to drain. Without a drainage system, LID features designed for infiltration into the subsoils would likely fail. With drainage systems, the subsoils would not become saturated and there would be little effect on the local near-surface groundwater table.

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A circular professional engineer seal for Georgina D. Griffin, Alberta. The seal contains the text "PROFESSIONAL ENGINEER", "ALBERTA", and "GEORGINA D. GRIFFIN". A blue ink signature is written over the seal, and the date "Nov 4/10" is handwritten next to it.

Georgina Griffin, M.Eng. P.Eng.
Senior Associate, Geotechnical Engineering
georgina.griffin@stantec.com

APEGGA Permit Number: P258

¹ Moran, S.R. 1986, *Surface Materials of the Calgary Urban Area: Calgary Sheet (NTS 82-O/1)*, Alberta Research Council

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APPENDIX D

QHM Model Data for Pre-Development Condition



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WESTVIEW STORMWATER MASTER DRAINAGE PLAN

D.1 INPUT DATA

cc_pre2_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Contributing Drainage To Coach Creek
*         Revised from AECOM Report Dated July 10, 2009
*         Pre-Development Condition per City Suggested Parameters
* Job: 116417392
* Date: September 17, 2010
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE       IRAIN=9
              AES FORMAT      IPFORM=1
              FLOW FILE       IFLOW=10
              NO EVAPORATION  ICASE=0
              NO POLLUTANT    IFDECA=0
              SEDIMENT        IFSEDT=0
*
* Subcatchment A1-OS
*
GENERATE       ID=1 SERIES=101 DT=1.0 AREA=91.78 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=2.57 SMIN=27 SMAX=182 SK=0.04
              APIK=0.9 API=42 ABSPER=10.0
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Main Ravine Through SW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A3-1
*
REACH         ID=2 SERIES=201 NIDH=1 IDH=1 NIDL=0 IFAORM=2
              NELS=1 SMAX=2.0 m XLEN=815 m RTINC=0.5 hrs
              RN=0.18 SF=0.01 m/m SS=5 m/m B=5.0 m
*
* Subcatchment A1
*
GENERATE       ID=1 SERIES=102 DT=1.0 AREA=77.90 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=1.40 SMIN=21 SMAX=137 SK=0.04
              APIK=0.9 API=42 ABSPER=10.0
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Total Flows at Main TCH Culvert
*
ADD SERIES    ID=3 SERIES=201 IDONE=2 IDTWO=1
*
* Subcatchment A2-OS
*
GENERATE       ID=1 SERIES=103 DT=1.0 AREA=37.00 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=2.16 SMIN=30 SMAX=203 SK=0.04
              APIK=0.9 API=42 ABSPER=10.0
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* East Ravine Through SW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A2-1
*
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
REACH          ID=2 SERIES=202 NIDH=1 IDH=1 NIDL=0 IFAORM=2
              NELLS=1 SMAX=2.0 m XLEN=830 m RTINC=0.5 hrs
              RN=0.18 SF=0.01 m/m SS=10 m/m B=1.0 m
*
* Subcatchment A2
*
GENERATE       ID=1 SERIES=104 DT=1.0 AREA=12.88 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=0.85 SMIN=19 SMAX=128 SK=0.04
              APIK=0.9 API=42 ABSPER=10.0
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Total Flows at East TCH Culvert
*
ADD SERIES     ID=4 SERIES=202 IDONE=2 IDTWO=1
*
* Total Flows at Junction in NW 31-24-2-5
*
ADD SERIES     ID=1 SERIES=203 IDONE=3 IDTWO=4
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
REACH          ID=2 SERIES=204 NIDH=1 IDH=1 NIDL=0 IFAORM=2
              NELLS=1 SMAX=2.0 m XLEN=1640 m RTINC=0.5 hrs
              RN=0.18 SF=0.01 m/m SS=1.5 m/m B=1.5 m
*
* Subcatchment A3
*
GENERATE       ID=1 SERIES=105 DT=0.5 AREA=84.52 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=2.29 SMIN=29 SMAX=191 SK=0.04
              APIK=0.9 API=42 ABSPER=10.0
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Total Flows at Bow River
*
ADD SERIES     ID=3 SERIES=204 IDONE=2 IDTWO=1
*
SERIES STATS   ID=3
              START YR=48 MO=05 DAY=02
              END   YR=94 MO=10 DAY=30
*
* Peak Flows
*
MAXMIN        ID=3 IOPT=1
              START DATE      YR=48 MO=05 DAY=02
              END   DATE      YR=94 MO=10 DAY=30
*
FINISH
```


WESTVIEW STORMWATER MASTER DRAINAGE PLAN

- THE UH YIELDS .9870 MM VOL SO MULT BY 1.0132 WILL ENSURE A 1 MM UH.
 API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18968.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 858.44 MM
 C-ALL INITIAL ABSTRACTIONS = 13965.34 MM
 D-TOTAL INFILTRATED WATER = 4144.55 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 4139.50 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 5.05 MM

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.09 MM

*
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

REACH ID=2 SERIES=201 NIDH=1 IDH=1 NIDL=0 IFAORM=2
 NELS=1 SMAX=2.0 m XLEN=815 m RTINC=0.5 hrs
 RN=0.18 SF=0.01 m/m SS=5 m/m B=5.0 m

CALCULATED CHANNEL CURVE:

STAGE (M)	STORAGE STORAGE COEFF. (CMS)	FLOW (CMS)	AREA (HORIZ.) (M**2)	VOLUME (M**3)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.833E-01	.211E+00	.434E-01	.410E+04	.341E+03
.167E+00	.448E+00	.136E+00	.413E+04	.684E+03
.250E+00	.703E+00	.263E+00	.416E+04	.103E+04
.333E+00	.974E+00	.418E+00	.418E+04	.138E+04
.417E+00	.126E+01	.598E+00	.421E+04	.173E+04
.500E+00	.155E+01	.799E+00	.424E+04	.208E+04
.583E+00	.186E+01	.102E+01	.427E+04	.243E+04
.667E+00	.218E+01	.126E+01	.429E+04	.279E+04
.750E+00	.250E+01	.151E+01	.432E+04	.315E+04
.833E+00	.284E+01	.178E+01	.435E+04	.351E+04
.917E+00	.318E+01	.206E+01	.437E+04	.387E+04
.100E+01	.353E+01	.236E+01	.440E+04	.424E+04
.108E+01	.389E+01	.267E+01	.443E+04	.461E+04
.117E+01	.426E+01	.299E+01	.446E+04	.498E+04
.125E+01	.463E+01	.332E+01	.448E+04	.535E+04
.133E+01	.501E+01	.366E+01	.451E+04	.572E+04
.142E+01	.540E+01	.401E+01	.454E+04	.610E+04
.150E+01	.579E+01	.438E+01	.456E+04	.648E+04
.158E+01	.619E+01	.475E+01	.459E+04	.686E+04
.167E+01	.659E+01	.513E+01	.462E+04	.724E+04
.175E+01	.700E+01	.552E+01	.465E+04	.763E+04
.183E+01	.741E+01	.592E+01	.467E+04	.802E+04
.192E+01	.783E+01	.632E+01	.470E+04	.841E+04
.200E+01	.826E+01	.674E+01	.473E+04	.880E+04

TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

*
 * Subcatchment A1
 *

GENERATE ID=1 SERIES=102 DT=1.0 AREA=77.90 AB=0 FRIMP=0
 *** NO IMPERVIOUS DATA ***
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=1.40 SMIN=21 SMAX=137 SK=0.04
 APIK=0.9 API=42 ABSPER=10.0
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK, QP = .0837 CMS
 - THE UH YIELDS 1.0128 MM VOL SO MULT BY .9873 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18968.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 1045.80 MM

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C-ALL INITIAL ABSTRACTIONS = 13965.34 MM
D-TOTAL INFILTRATED WATER = 3957.18 MM
E-TOTAL BASE FLOW = .00 MM
F-CHANGE IN GROUNDWATER STORAGE= 3952.18 MM
G-EVAPORATION FROM SOIL WATER = .00 MM
H-LOSS TO DEEP GROUNDWATER = 5.01 MM

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
TOTAL BALANCE = A - B - C - E - F - G - H = -.09 MM

*
* Total Flows at Main TCH Culvert
*

ADD SERIES ID=3 SERIES=201 IDONE=2 IDTWO=1
ADD BEGINS AT 48 5 1
USES TIME STEP OF .100E+01 HOURS
AND ENDS AT 94 10 31

*
* Subcatchment A2-OS
*

GENERATE ID=1 SERIES=103 DT=1.0 AREA=37.00 AB=0 FRIMP=0
*** NO IMPERVIOUS DATA ***
*** PERVIOUS DATA ***
AA=1 N=3 TP=2.16 SMIN=30 SMAX=203 SK=0.04
APIK=0.9 API=42 ABSPER=10.0
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0258 CMS
- THE UH YIELDS .9875 MM VOL SO MULT BY 1.0126 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
A-TOTAL PRECIPITATION = 18968.23 MM
B-TOTAL RUNOFF IMPRV+PERV = 792.18 MM
C-ALL INITIAL ABSTRACTIONS = 13965.34 MM
D-TOTAL INFILTRATED WATER = 4210.81 MM
E-TOTAL BASE FLOW = .00 MM
F-CHANGE IN GROUNDWATER STORAGE= 4205.74 MM
G-EVAPORATION FROM SOIL WATER = .00 MM
H-LOSS TO DEEP GROUNDWATER = 5.06 MM

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
TOTAL BALANCE = A - B - C - E - F - G - H = -.09 MM

*
* East Ravine Through SW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A2-1
*

REACH ID=2 SERIES=202 NIDH=1 IDH=1 NIDL=0 IFAORM=2
NELS=1 SMAX=2.0 m XLEN=830 m RTINC=0.5 hrs
RN=0.18 SF=0.01 m/m SS=10 m/m B=1.0 m

CALCULATED CHANNEL CURVE:

STAGE (M)	STORAGE COEFF. (CMS)	FLOW (CMS)	AREA (HORIZ.) (M**2)	VOLUME (M**3)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.833E-01	.428E-01	.808E-02	.844E+03	.697E+02
.167E+00	.900E-01	.238E-01	.858E+03	.141E+03
.250E+00	.140E+00	.438E-01	.872E+03	.213E+03
.333E+00	.192E+00	.668E-01	.885E+03	.286E+03
.417E+00	.246E+00	.921E-01	.899E+03	.360E+03
.500E+00	.302E+00	.119E+00	.913E+03	.436E+03
.583E+00	.359E+00	.148E+00	.927E+03	.512E+03
.667E+00	.417E+00	.179E+00	.941E+03	.590E+03
.750E+00	.477E+00	.210E+00	.955E+03	.669E+03
.833E+00	.538E+00	.243E+00	.968E+03	.749E+03
.917E+00	.600E+00	.277E+00	.982E+03	.831E+03
.100E+01	.663E+00	.312E+00	.996E+03	.913E+03
.108E+01	.728E+00	.349E+00	.101E+04	.997E+03
.117E+01	.794E+00	.386E+00	.102E+04	.108E+04
.125E+01	.861E+00	.424E+00	.104E+04	.117E+04

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```

.133E+01 .929E+00 .464E+00 .105E+04 .125E+04
.142E+01 .998E+00 .504E+00 .107E+04 .134E+04
.150E+01 .107E+01 .546E+00 .108E+04 .143E+04
.158E+01 .114E+01 .588E+00 .109E+04 .152E+04
.167E+01 .121E+01 .632E+00 .111E+04 .161E+04
.175E+01 .129E+01 .676E+00 .112E+04 .171E+04
.183E+01 .136E+01 .721E+00 .113E+04 .180E+04
.192E+01 .144E+01 .768E+00 .115E+04 .190E+04
.200E+01 .151E+01 .815E+00 .116E+04 .199E+04
TIME STEP OF INPUT FILE IS 1.000 HOURS
CALCULATION STEP SELECTED IS .5000 HOURS
*
* Subcatchment A2
*
GENERATE ID=1 SERIES=104 DT=1.0 AREA=12.88 AB=0 FRIMP=0
*** NO IMPERVIOUS DATA ***
*** PERVIOUS DATA ***
AA=1 N=3 TP=0.85 SMIN=19 SMAX=128 SK=0.04
APIK=0.9 API=42 ABSPER=10.0
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0228 CMS
- THE UH YIELDS .9271 MM VOL SO MULT BY 1.0786 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

```

```

W A T E R M A S S B A L A N C E
A-TOTAL PRECIPITATION = 18968.23 MM
B-TOTAL RUNOFF IMPRV+PERV = 1099.97 MM
C-ALL INITIAL ABSTRACTIONS = 13965.34 MM
D-TOTAL INFILTRATED WATER = 3903.01 MM
E-TOTAL BASE FLOW = .00 MM
F-CHANGE IN GROUNDWATER STORAGE= 3898.01 MM
G-EVAPORATION FROM SOIL WATER = .00 MM
H-LOSS TO DEEP GROUNDWATER = 5.00 MM

```

```

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
TOTAL BALANCE = A - B - C - E - F - G - H = -.09 MM
*

```

* Total Flows at East TCH Culvert

```

*
ADD SERIES ID=4 SERIES=202 IDONE=2 IDTWO=1

ADD BEGINS AT 48 5 1
USES TIME STEP OF .100E+01 HOURS
AND ENDS AT 94 10 31

```

* Total Flows at Junction in NW 31-24-2-5

```

*
ADD SERIES ID=1 SERIES=203 IDONE=3 IDTWO=4

ADD BEGINS AT 48 5 1
USES TIME STEP OF .100E+01 HOURS
AND ENDS AT 94 10 31

```

* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1

```

*
REACH ID=2 SERIES=204 NIDH=1 IDH=1 NIDL=0 IFAORM=2
NELS=1 SMAX=2.0 m XLLEN=1640 m RTINC=0.5 hrs
RN=0.18 SF=0.01 m/m SS=1.5 m/m B=1.5 m

```

```

CALCULATED CHANNEL CURVE:
STAGE STORAGE FLOW AREA VOLUME
COEFF. (HORIZ.)
(M) (CMS) (CMS) (M**2) (M**3)

.000E+00 .000E+00 .000E+00 .000E+00 .000E+00
.833E-01 .125E+00 .129E-01 .264E+04 .213E+03
.167E+00 .265E+00 .405E-01 .282E+04 .440E+03
.250E+00 .419E+00 .787E-01 .301E+04 .683E+03
.333E+00 .586E+00 .126E+00 .319E+04 .941E+03
.417E+00 .766E+00 .183E+00 .337E+04 .121E+04

```

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```

.500E+00 .959E+00 .248E+00 .355E+04 .150E+04
.583E+00 .116E+01 .321E+00 .374E+04 .181E+04
.667E+00 .138E+01 .402E+00 .392E+04 .213E+04
.750E+00 .161E+01 .492E+00 .410E+04 .246E+04
.833E+00 .186E+01 .591E+00 .428E+04 .281E+04
.917E+00 .211E+01 .697E+00 .446E+04 .317E+04
.100E+01 .238E+01 .813E+00 .465E+04 .355E+04
.108E+01 .266E+01 .937E+00 .483E+04 .395E+04
.117E+01 .296E+01 .107E+01 .501E+04 .436E+04
.125E+01 .326E+01 .121E+01 .519E+04 .478E+04
.133E+01 .358E+01 .136E+01 .538E+04 .522E+04
.142E+01 .392E+01 .153E+01 .556E+04 .568E+04
.150E+01 .426E+01 .170E+01 .574E+04 .615E+04
.158E+01 .462E+01 .188E+01 .592E+04 .664E+04
.167E+01 .500E+01 .207E+01 .610E+04 .714E+04
.175E+01 .539E+01 .227E+01 .629E+04 .765E+04
.183E+01 .579E+01 .248E+01 .647E+04 .818E+04
.192E+01 .620E+01 .270E+01 .665E+04 .873E+04
.200E+01 .663E+01 .293E+01 .683E+04 .929E+04
TIME STEP OF INPUT FILE IS 1.000 HOURS
CALCULATION STEP SELECTED IS .5000 HOURS
*
* Subcatchment A3
*
GENERATE ID=1 SERIES=105 DT=0.5 AREA=84.52 AB=0 FRIMP=0
*** NO IMPERVIOUS DATA ***
*** PERVIOUS DATA ***
AA=1 N=3 TP=2.29 SMIN=29 SMAX=191 SK=0.04
APIK=0.9 API=42 ABSPER=10.0
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0555 CMS
- THE UH YIELDS .9853 MM VOL SO MULT BY 1.0149 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .998E+00 PER TIME STEP OR .900E+00 PER DAY

```

```

W A T E R M A S S B A L A N C E
A-TOTAL PRECIPITATION = 18968.23 MM
B-TOTAL RUNOFF IMPRV+PERV = 825.33 MM
C-ALL INITIAL ABSTRACTIONS = 13965.34 MM
D-TOTAL INFILTRATED WATER = 4177.66 MM
E-TOTAL BASE FLOW = .00 MM
F-CHANGE IN GROUNDWATER STORAGE= 4172.60 MM
G-EVAPORATION FROM SOIL WATER = .00 MM
H-LOSS TO DEEP GROUNDWATER = 5.05 MM

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
TOTAL BALANCE = A - B - C - E - F - G - H = -.09 MM
*

```

```

* Total Flows at Bow River
*
ADD SERIES ID=3 SERIES=204 IDONE=2 IDTWO=1

ADD BEGINS AT 48 5 1
USES TIME STEP OF .500E+00 HOURS
AND ENDS AT 94 10 31

```

```

*
SERIES STATS ID=3
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

```

```

Routine SERIES STATS for ID = 3 ISER = 204 with DT = .50 hrs
Start date = 48 5 2 End date = 94 10 30
-----

```

Results from SERIES STATS for series ID= 3:

TSS conc	Duration:	FOD conc	Duration:
equal or above		equal or above	
(mg/l)	(hours) (%)	(#/dl)	(hours) (%)
.00	407592.0 100.00	.0	407592.0 100.00

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5.00	.0	.00	25.0	.0	.00
10.00	.0	.00	50.0	.0	.00
15.00	.0	.00	100.0	.0	.00
20.00	.0	.00	200.0	.0	.00
25.00	.0	.00	300.0	.0	.00
30.00	.0	.00	400.0	.0	.00
35.00	.0	.00	500.0	.0	.00
40.00	.0	.00	1000.0	.0	.00
50.00	.0	.00	2000.0	.0	.00
60.00	.0	.00	3000.0	.0	.00
70.00	.0	.00	4000.0	.0	.00
80.00	.0	.00	5000.0	.0	.00
90.00	.0	.00	6000.0	.0	.00
100.00	.0	.00	8000.0	.0	.00
120.00	.0	.00	10000.0	.0	.00
150.00	.0	.00	15000.0	.0	.00
200.00	.0	.00	20000.0	.0	.00
300.00	.0	.00	25000.0	.0	.00
400.00	.0	.00	30000.0	.0	.00
500.00	.0	.00	40000.0	.0	.00
600.00	.0	.00	50000.0	.0	.00
700.00	.0	.00	60000.0	.0	.00
800.00	.0	.00	80000.0	.0	.00
1000.00	.0	.00	100000.0	.0	.00

Total duration = 407592.00 hours
 Max flow rate = 2.8038 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 2743.99 1000 m3

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .00 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc:	.0	.0	.0	.0	.0 mg/l
Min conc:	.0	.0	.0	.0	.0 mg/l
Load :	.0	.0	.0	.0	.0 kg

*
 * Peak Flows
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .381396E-01	Date (yrmody):	48	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .112800E+00	Date (yrmody):	49	2	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .145869E+00	Date (yrmody):	50	8	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .962816E+00	Date (yrmody):	51	6	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .768553E+00	Date (yrmody):	52	6	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .123720E+01	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .146124E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .708384E-01	Date (yrmody):	55	1	6
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .453688E+00	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .421121E+00	Date (yrmody):	57	6	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .252376E-01	Date (yrmody):	58	4	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .370680E+00	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .111462E+01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .151946E+00	Date (yrmody):	61	6	18
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1

APPENDIX E

SWMHYMO Model Data for Pre-Development Condition



Stantec

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

E.1 INPUT DATA

ccpr2002.dat

Note: Only the input data for the 1:2 year storm event model is included; the other models being the same except for the Chicago design storm A-B-C parameters.

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Contributing Drainage To Coach Creek
*         Revised from AECOM Report Dated July 10, 2009
*         Pre-Development Condition per City Suggested Parameters
* Job: 116417392
* Date: September 27, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*         [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:2 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASECs=[1],
                  A=[243.0], B=[2.71], and C=[0.695],
*%-----|-----|
*
* Subcatchment A1-OS
*
CALIB NASHYD      ID=[1], NHYD=["A1OS"], DT=[5.0]min, AREA=[91.78](ha),
                  DWF=[0](cms), CN/C=[79], IA=[10.0](mm),
                  N=[3], TP=[2.57]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Main Ravine Through SW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A3-1
*
ROUTE CHANNEL      IDout=[2], NHYD=["RAVINE1A"], IDin=[1],
                  RDT=[5.0](min),
                  CHLGTH=[815](m), CHSLOPE=[1.0](%),
                  FPSLOPE=[1.0](%),
                  SECNUM=[1], NSEG=[1]
                  ( SEGROUGH, SEGDIST (m))=[0.09 , 13.0] NSEG times
                  ( DISTANCE (m), ELEVATION (m))
                  [ 0 , 100.00]
                  [ 5.0 , 99.00]
                  [ 8.0 , 99.00]
                  [13.0 , 100.00]
*%-----|-----|
*
* Subcatchment A1
*
CALIB NASHYD      ID=[1], NHYD=["A1"], DT=[5.0]min, AREA=[77.90](ha),
                  DWF=[0](cms), CN/C=[85], IA=[10.0](mm),
                  N=[3], TP=[1.40]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Total Flows at Main TCH Culvert
*
ADD HYD            IDsum=[3], NHYD=["TCH1"], IDs to add=[2+1]
*%-----|-----|
*
* Subcatchment A2-OS
*
CALIB NASHYD      ID=[1], NHYD=["A2OS"], DT=[5.0]min, AREA=[37.00](ha),
                  DWF=[0](cms), CN/C=[78], IA=[10.0](mm),
                  N=[3], TP=[2.16]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* East Ravine Through SW 31-24-2-5
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

* Trapezoidal Section to Match AECOM Section A2-1
*
ROUTE CHANNEL      IDout=[2], NHYD=["RAVINE1B"], IDin=[1],
                   RDT=[5.0](min),
                   CHLGTH=[830](m),  CHSLOPE=[1.0](%),
                                       FPSLOPE=[1.0](%),
                   SECNUM=[2],      NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.07 , 21.0] NSEG times
                   ( DISTANCE (m), ELEVATION (m))
                   [ 0 , 100.00]
                   [10.0 , 99.00]
                   [11.0 , 99.00]
                   [21.0 , 100.00]
*%-----|-----
*
* Subcatchment A2
*
CALIB NASHYD      ID=[1], NHYD=["A2"], DT=[5.0]min, AREA=[12.88](ha),
                  DWF=[0](cms),  CN/C=[85], IA=[10.0](mm),
                  N=[3], TP=[0.85]hrs,
                  RAINFALL=[ , , , ](mm/hr),  END=-1
*%-----|-----
*
* Total Flows at East TCH Culvert
*
ADD HYD           IDsum=[4], NHYD=["TCH2"], IDs to add=[2+1]
*%-----|-----
*
* Total Flows at Junction in NW 31-24-2-5
*
ADD HYD           IDsum=[1], NHYD=["COACH1"], IDs to add=[3+4]
*%-----|-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
ROUTE CHANNEL      IDout=[2], NHYD=["RAVINE1C"], IDin=[1],
                   RDT=[5.0](min),
                   CHLGTH=[1640](m),  CHSLOPE=[1.0](%),
                                       FPSLOPE=[1.0](%),
                   SECNUM=[3],      NSEG=[1]
                   ( SEGROUGH, SEGDIST (m))=[0.07 , 7.5] NSEG times
                   ( DISTANCE (m), ELEVATION (m))
                   [ 0 , 100.00]
                   [ 3.0 , 98.00]
                   [ 4.5 , 98.00]
                   [ 7.5 , 100.00]
*%-----|-----
*
* Subcatchment A3
*
CALIB NASHYD      ID=[1], NHYD=["A3"], DT=[5.0]min, AREA=[84.52](ha),
                  DWF=[0](cms),  CN/C=[79], IA=[10.0](mm),
                  N=[3], TP=[2.29]hrs,
                  RAINFALL=[ , , , ](mm/hr),  END=-1
*%-----|-----
*
* Total Flows at Bow River
*
ADD HYD           IDsum=[3], NHYD=["BOW1"], IDs to add=[2+1]
*%-----|-----
SAVE HYD          ID=[3],  # OF PCYCLES=[-1], ICASEsh=[-1]
                  HYD_FILENAME=["BOW2_002.dat"]
                  HYD_COMMENT=["1:2 Coach Creek Flows at Bow River (Calgary)"]
*%-----|-----
FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

E.2 OUTPUT DATA

ccpr2002.out

```
=====
SSSSS W W M M H H Y Y M M OOO 999 999 =====
S W W W MM MM H H Y Y MM MM O O 9 9 9 9
SSSSS W W W M M M HHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
S W W M M H H Y M M O O 9999 9999 July 1999
SSSSS W W M M H H Y M M OOO 9 9 9 9 # 6754920
StormWater Management Hydrologic Model 999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****

+++++++
+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 07:29:31 RUN COUNTER: 001187 *
*****
* Input filename: C:\PROGRA~1\SWMHYMO\Projects\ccpr2002.dat *
* Output filename: C:\PROGRA~1\SWMHYMO\Projects\ccpr2002.out *
* Summary filename: C:\PROGRA~1\SWMHYMO\Projects\ccpr2002.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition per City Suggested Parameters
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA~1\SWMHYMO\Projects\
----- Rainfall dir.: C:\PROGRA~1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----
001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:2 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 243.000
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

| Ptotal= 37.17 mm |

B= 2.710

C= .695

used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs

Storm time step = 15.00 min

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	.486	6.25	1.982	12.25	1.101	18.25	.636
.50	.499	6.50	2.477	12.50	1.064	18.50	.626
.75	.512	6.75	3.454	12.75	1.031	18.75	.616
1.00	.527	7.00	6.985	13.00	.999	19.00	.607
1.25	.542	7.25	32.968	13.25	.970	19.25	.598
1.50	.559	7.50	9.222	13.50	.943	19.50	.590
1.75	.576	7.75	5.572	13.75	.917	19.75	.582
2.00	.596	8.00	4.174	14.00	.893	20.00	.574
2.25	.616	8.25	3.405	14.25	.871	20.25	.566
2.50	.639	8.50	2.909	14.50	.850	20.50	.558
2.75	.664	8.75	2.559	14.75	.830	20.75	.551
3.00	.692	9.00	2.296	15.00	.811	21.00	.544
3.25	.722	9.25	2.091	15.25	.794	21.25	.537
3.50	.756	9.50	1.925	15.50	.777	21.50	.531
3.75	.794	9.75	1.788	15.75	.761	21.75	.524
4.00	.837	10.00	1.672	16.00	.746	22.00	.518
4.25	.886	10.25	1.574	16.25	.731	22.25	.512
4.50	.943	10.50	1.488	16.50	.717	22.50	.506
4.75	1.010	10.75	1.413	16.75	.704	22.75	.501
5.00	1.089	11.00	1.346	17.00	.691	23.00	.495
5.25	1.186	11.25	1.287	17.25	.679	23.25	.490
5.50	1.307	11.50	1.234	17.50	.668	23.50	.484
5.75	1.464	11.75	1.185	17.75	.657	23.75	.479
6.00	1.676	12.00	1.142	18.00	.646	24.00	.474

001:0003-----

*

* Subcatchment A1-OS

*

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= .162 (i)

TIME TO PEAK (hrs)= 11.750

RUNOFF VOLUME (mm)= 7.796

TOTAL RAINFALL (mm)= 37.169

RUNOFF COEFFICIENT = .210

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004-----

*

* Main Ravine Through SW 31-24-2-5

* Trapezoidal Section to Match AECOM Section A3-1

*

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH	ELEV	X-VOLUME	S-VOLUME	FLOW RATE	VELOCITY	TRAV.TIME	D x V
(m)	(m)	(cu.m.)	(cu.m.)	(cms)	(m/s)	(min)	(m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071

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.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207
.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	<--- hydrograph --->				<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:ALOS	91.78	.162	11.75	7.796	.152	.277
OUTFLOW: ID= 2:RAVINE	91.78	.158	12.42	7.796	.150	.273

```

-----
001:0005-----
*
* Subcatchment A1
*
-----
| CALIB NASHYD | Area (ha)= 77.90 Curve Number (CN)=85.00
| 01:A1 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 1.400

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= .253 (i)
TIME TO PEAK (hrs)= 9.583
RUNOFF VOLUME (mm)= 10.253
TOTAL RAINFALL (mm)= 37.169
RUNOFF COEFFICIENT = .276

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

```

-----
001:0006-----
*
* Total Flows at Main TCH Culvert
*
-----
| ADD HYD (TCH1 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
-----
ID1 02:RAVINE 91.78 .158 12.42 7.80 .000
+ID2 01:A1 77.90 .253 9.58 10.25 .000
=====
SUM 03:TCH1 169.68 .353 10.67 8.92 .000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

```

-----
001:0007-----
*
* Subcatchment A2-OS
*
-----
| CALIB NASHYD | Area (ha)= 37.00 Curve Number (CN)=78.00
| 01:A2OS DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= 2.160

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .068 (i)
TIME TO PEAK (hrs)= 11.000
RUNOFF VOLUME (mm)= 7.470
TOTAL RAINFALL (mm)= 37.169
RUNOFF COEFFICIENT = .201

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

-----
001:0008-----
*
* East Ravine Through SW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A2-1
*
-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                           LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
      .00          100.00          .0700
     10.00          99.00          .0700
     11.00          99.00          .0700
     21.00          100.00          .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)         (m)         (cu.m.)       (cu.m.)       (cms)         (m/s)        (min)         (m2/s)
.053  99.053  .667E+02  .211E+00  .013  .164  84.15  .009
.105  99.105  .179E+03  .114E+01  .052  .241  57.37  .025
.158  99.158  .338E+03  .321E+01  .123  .303  45.69  .048
.211  99.211  .543E+03  .688E+01  .233  .357  38.74  .075
.263  99.263  .793E+03  .126E+02  .389  .407  34.00  .107
.316  99.316  .109E+04  .207E+02  .595  .453  30.52  .143
.368  99.368  .143E+04  .318E+02  .858  .497  27.82  .183
.421  99.421  .182E+04  .462E+02  1.183  .539  25.66  .227
.474  99.474  .226E+04  .644E+02  1.574  .579  23.87  .274
.526  99.526  .274E+04  .867E+02  2.038  .618  22.37  .325
.579  99.579  .326E+04  .114E+03  2.578  .656  21.09  .380
.632  99.632  .383E+04  .146E+03  3.199  .692  19.98  .437
.684  99.684  .445E+04  .184E+03  3.906  .728  19.00  .498
.737  99.737  .512E+04  .227E+03  4.702  .763  18.14  .562
.789  99.789  .583E+04  .277E+03  5.593  .797  17.37  .629
.842  99.842  .658E+04  .334E+03  6.582  .830  16.67  .699
.895  99.895  .739E+04  .398E+03  7.673  .862  16.04  .771
.947  99.947  .824E+04  .470E+03  8.871  .894  15.47  .847
1.000 100.000 .913E+04 .550E+03 10.179 .925  14.95  .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS      37.00      .068      11.00      7.470          .117          .252
OUTFLOW: ID= 2:RAVINE   37.00      .064      11.92      7.470          .114          .250

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .054 (i)
TIME TO PEAK (hrs)= 8.583
RUNOFF VOLUME (mm)= 10.253
TOTAL RAINFALL (mm)= 37.169
RUNOFF COEFFICIENT = .276

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD AREA QPEAK TPEAK R.V. DWF
-----
| | (ha) (cms) (hrs) (mm) (cms)
ID1 02:RAVINE 37.00 .064 11.92 7.47 .000

```

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```

+ID2 01:A2          12.88      .054      8.58  10.25   .000
=====
SUM 04:TCH2        49.88      .090      11.25  8.19   .000
    
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0011-----

*
* Total Flows at Junction in NW 31-24-2-5
*

```

| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
|-----|-----|-----|-----|-----|-----|
| ID1 03:TCH1      | 169.68      .353      10.67      8.92      .000
| +ID2 04:TCH2      | 49.88      .090      11.25      8.19      .000
|-----|-----|-----|-----|-----|
| SUM 01:COACH1     | 219.56      .442      10.75      8.76      .000
    
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0012-----

*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*

```

| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE     | Slopes (%), CHANNEL=1.00  FLOODPLAIN=1.00
|-----|-----|-----|-----|
|                     | LENGTH = 1640.00 (m)
    
```

```

<----- DATA FOR SECTION ( 3.0) ----->
Distance      Elevation      Manning
    .00          100.00          .0700
    3.00          98.00          .0700
    4.50          98.00          .0700
    7.50          100.00         .0700
    
```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)         (m)         (cu.m.)       (cu.m.)       (cms)          (m/s)         (min)         (m2/s)
.105      98.105     .286E+03      .918E+00      .051           .293          93.31         .031
.211      98.211     .627E+03      .402E+01      .167           .437          62.54         .092
.316      98.316     .102E+04      .984E+01      .340           .546          50.07         .172
.421      98.421     .147E+04      .189E+02      .571           .636          42.94         .268
.526      98.526     .198E+04      .317E+02      .862           .716          38.19         .377
.632      98.632     .253E+04      .488E+02      1.217         .787          34.71         .497
.737      98.737     .315E+04      .707E+02      1.638         .854          32.02         .629
.842      98.842     .382E+04      .980E+02      2.130         .915          29.86         .771
.947      98.947     .454E+04      .131E+03      2.695         .974          28.06         .923
1.053     99.053     .531E+04      .171E+03      3.338         1.030         26.54         1.084
1.158     99.158     .615E+04      .217E+03      4.061         1.083         25.23         1.254
1.263     99.263     .703E+04      .271E+03      4.867         1.135         24.08         1.434
1.368     99.368     .797E+04      .333E+03      5.761         1.185         23.06         1.622
1.474     99.474     .897E+04      .403E+03      6.746         1.234         22.15         1.818
1.579     99.579     .100E+05      .482E+03      7.825         1.281         21.34         2.023
1.684     99.684     .111E+05      .571E+03      9.000         1.327         20.59         2.235
1.789     99.789     .123E+05      .670E+03      10.276        1.372         19.92         2.456
1.895     99.895     .135E+05      .779E+03      11.655        1.417         19.29         2.684
2.000     100.000    .148E+05      .900E+03      13.140        1.460         18.72         2.920
    
```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:COACH1  219.56      .442      10.75      8.757         .362         .583
OUTFLOW: ID= 2:RAVINE  219.56      .430      11.58      8.757         .356         .577
    
```

001:0013-----

*
* Subcatchment A3
*

```

| CALIB NASHYD      | Area (ha)= 84.52  Curve Number (CN)=79.00
| 01:A3      DT= 5.00 | Ia (mm)= 10.000  # of Linear Res.(N)= 3.00
    
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

----- U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410

PEAK FLOW (cms)= .157 (i)
 TIME TO PEAK (hrs)= 11.250
 RUNOFF VOLUME (mm)= 7.796
 TOTAL RAINFALL (mm)= 37.169
 RUNOFF COEFFICIENT = .210

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0014-----

*
 * Total Flows at Bow River
 *

ADD HYD (BOW1)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 02:RAVINE	219.56	.430	11.58	8.76	.000
	+ID2 01:A3	84.52	.157	11.25	7.80	.000
	SUM 03:BOW1	304.08	.586	11.50	8.49	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

 001:0015-----

| SAVE HYD | AREA (ha)= 304.080
 | ID=03 (BOW1) | QPEAK (cms)= .586 (i)
 | DT= 5.00 PCYC=-1 | TPEAK (hrs)= 11.500
 | | VOLUME (mm)= 8.490
 Filename: C:\PROGRA~1\SWMHYMO\Projects\BOW2_002.dat
 Comments: 1:2 Coach Creek Flows at Bow River (Calgary)

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0016-----

FINISH

 WARNINGS / ERRORS / NOTES

Simulation ended on 2010-11-05 at 07:29:31

=====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ccpr2005.dat

```

=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W M M M H H Y Y M M O O      9 9 9 9
SSSSS W W W M M M H H H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
          StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 07:29:55 RUN COUNTER: 001188 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2005.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2005.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2005.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:5 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 353.500
| Ptotal= 51.02 mm | B= 2.290
-----| C= .703
used in: INTENSITY = A / (t + B)^C

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	.650	6.25	2.687	12.25	1.485	18.25	.852
.50	.667	6.50	3.363	12.50	1.434	18.50	.839
.75	.685	6.75	4.699	12.75	1.388	18.75	.826
1.00	.704	7.00	9.539	13.00	1.345	19.00	.813
1.25	.725	7.25	47.667	13.25	1.306	19.25	.801
1.50	.748	7.50	12.609	13.50	1.269	19.50	.790
1.75	.772	7.75	7.599	13.75	1.234	19.75	.779
2.00	.798	8.00	5.685	14.00	1.202	20.00	.768
2.25	.826	8.25	4.632	14.25	1.171	20.25	.758
2.50	.857	8.50	3.954	14.50	1.143	20.50	.747
2.75	.891	8.75	3.474	14.75	1.116	20.75	.738
3.00	.928	9.00	3.115	15.00	1.090	21.00	.728
3.25	.969	9.25	2.834	15.25	1.066	21.25	.719
3.50	1.015	9.50	2.608	15.50	1.043	21.50	.710
3.75	1.066	9.75	2.421	15.75	1.022	21.75	.702
4.00	1.125	10.00	2.263	16.00	1.001	22.00	.693
4.25	1.192	10.25	2.128	16.25	.981	22.25	.685
4.50	1.269	10.50	2.012	16.50	.963	22.50	.677
4.75	1.360	10.75	1.909	16.75	.945	22.75	.669
5.00	1.468	11.00	1.818	17.00	.928	23.00	.662
5.25	1.600	11.25	1.738	17.25	.911	23.25	.655
5.50	1.765	11.50	1.665	17.50	.895	23.50	.647
5.75	1.978	11.75	1.599	17.75	.880	23.75	.641
6.00	2.268	12.00	1.539	18.00	.866	24.00	.634

001:0003-----

*
 * Subcatchment A1-OS
 *

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= .363 (i)
 TIME TO PEAK (hrs)= 11.167
 RUNOFF VOLUME (mm)= 15.506
 TOTAL RAINFALL (mm)= 51.025
 RUNOFF COEFFICIENT = .304

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004-----

*
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071
.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	----- hydrograph -----				<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:A1OS	91.78	.363	11.17	15.506	.238	.357
OUTFLOW: ID= 2:RAVINE	91.78	.355	11.67	15.506	.235	.355

001:0005-----

*
 * Subcatchment A1
 *

CALIB NASHYD	Area (ha)=	77.90	Curve Number (CN)=	85.00
01:A1 DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.400		

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= .584 (i)
 TIME TO PEAK (hrs)= 9.250
 RUNOFF VOLUME (mm)= 19.605
 TOTAL RAINFALL (mm)= 51.025
 RUNOFF COEFFICIENT = .384

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
 * Total Flows at Main TCH Culvert
 *

ADD HYD (TCH1)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 02:RAVINE		91.78	.355	11.67	15.51	.000
+ID2 01:A1		77.90	.584	9.25	19.60	.000
=====						
SUM 03:TCH1		169.68	.810	10.08	17.39	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
 * Subcatchment A2-OS
 *

CALIB NASHYD	Area (ha)=	37.00	Curve Number (CN)=	78.00
01:A2OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.160		

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .155 (i)
 TIME TO PEAK (hrs)= 10.500
 RUNOFF VOLUME (mm)= 14.938
 TOTAL RAINFALL (mm)= 51.025
 RUNOFF COEFFICIENT = .293

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0008-----

*
 * East Ravine Through SW 31-24-2-5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

* Trapezoidal Section to Match AECOM Section A2-1

```

*
-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
|                                     | LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
    .00          100.00         .0700
   10.00         99.00         .0700
   11.00         99.00         .0700
   21.00         100.00         .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)        (m)        (cu.m.)       (cu.m.)       (cms)         (m/s)        (min)         (m2/s)
.053      99.053     .667E+02     .211E+00       .013          .164         84.15         .009
.105      99.105     .179E+03     .114E+01       .052          .241         57.37         .025
.158      99.158     .338E+03     .321E+01       .123          .303         45.69         .048
.211      99.211     .543E+03     .688E+01       .233          .357         38.74         .075
.263      99.263     .793E+03     .126E+02       .389          .407         34.00         .107
.316      99.316     .109E+04     .207E+02       .595          .453         30.52         .143
.368      99.368     .143E+04     .318E+02       .858          .497         27.82         .183
.421      99.421     .182E+04     .462E+02       1.183         .539         25.66         .227
.474      99.474     .226E+04     .644E+02       1.574         .579         23.87         .274
.526      99.526     .274E+04     .867E+02       2.038         .618         22.37         .325
.579      99.579     .326E+04     .114E+03       2.578         .656         21.09         .380
.632      99.632     .383E+04     .146E+03       3.199         .692         19.98         .437
.684      99.684     .445E+04     .184E+03       3.906         .728         19.00         .498
.737      99.737     .512E+04     .227E+03       4.702         .763         18.14         .562
.789      99.789     .583E+04     .277E+03       5.593         .797         17.37         .629
.842      99.842     .658E+04     .334E+03       6.582         .830         16.67         .699
.895      99.895     .739E+04     .398E+03       7.673         .862         16.04         .771
.947      99.947     .824E+04     .470E+03       8.871         .894         15.47         .847
1.000     100.000    .913E+04     .550E+03      10.179        .925         14.95         .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS      37.00      .155      10.50      14.938        .173        .317
OUTFLOW: ID= 2:RAVINE   37.00      .149      11.25      14.938        .170        .313

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .131 (i)
TIME TO PEAK (hrs)= 8.417
RUNOFF VOLUME (mm)= 19.605
TOTAL RAINFALL (mm)= 51.025
RUNOFF COEFFICIENT = .384

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
-----
|                   | (ha)         (cms)      (hrs)      (mm)      (cms)
ID1 02:RAVINE      37.00      .149      11.25      14.94      .000
+ID2 01:A2          12.88      .131      8.42       19.60      .000
=====
SUM 04:TCH2        49.88      .204      10.42      16.14      .000

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0011-----
*
* Total Flows at Junction in NW 31-24-2-5
*
-----
| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
                        (ha)      (cms)    (hrs)    (mm)     (cms)
ID1 03:TCH1         169.68    .810    10.08   17.39    .000
+ID2 04:TCH2         49.88     .204    10.42   16.14    .000
=====
SUM 01:COACH1       219.56    1.014   10.08   17.10    .000
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0012-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
-----
| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE    | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                        LENGTH = 1640.00 (m)
  
```

```

<----- DATA FOR SECTION ( 3.0) ----->
Distance      Elevation      Manning
-----
.00            100.00         .0700
3.00          98.00         .0700
4.50          98.00         .0700
7.50          100.00        .0700
  
```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME  D x V
(m)         (m)       (cu.m.)   (cu.m.)   (cms)      (m/s)     (min)      (m2/s)
-----
.105      98.105    .286E+03  .918E+00  .051       .293      93.31      .031
.211      98.211    .627E+03  .402E+01  .167       .437      62.54      .092
.316      98.316    .102E+04  .984E+01  .340       .546      50.07      .172
.421      98.421    .147E+04  .189E+02  .571       .636      42.94      .268
.526      98.526    .198E+04  .317E+02  .862       .716      38.19      .377
.632      98.632    .253E+04  .488E+02  1.217      .787      34.71      .497
.737      98.737    .315E+04  .707E+02  1.638      .854      32.02      .629
.842      98.842    .382E+04  .980E+02  2.130      .915      29.86      .771
.947      98.947    .454E+04  .131E+03  2.695      .974      28.06      .923
1.053     99.053    .531E+04  .171E+03  3.338     1.030     26.54     1.084
1.158     99.158    .615E+04  .217E+03  4.061     1.083     25.23     1.254
1.263     99.263    .703E+04  .271E+03  4.867     1.135     24.08     1.434
1.368     99.368    .797E+04  .333E+03  5.761     1.185     23.06     1.622
1.474     99.474    .897E+04  .403E+03  6.746     1.234     22.15     1.818
1.579     99.579    .100E+05  .482E+03  7.825     1.281     21.34     2.023
1.684     99.684    .111E+05  .571E+03  9.000     1.327     20.59     2.235
1.789     99.789    .123E+05  .670E+03  10.276    1.372     19.92     2.456
1.895     99.895    .135E+05  .779E+03  11.655    1.417     19.29     2.684
2.000     100.000  .148E+05  .900E+03  13.140    1.460     18.72     2.920
  
```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK    TPEAK    R.V.     MAX DEPTH  MAX VEL
(ha)      (cms)    (hrs)    (mm)     (m)        (m/s)
-----
INFLOW : ID= 1:COACH1  219.56    1.014   10.08   17.105    .571      .745
OUTFLOW: ID= 2:RAVINE  219.56    .985    10.67   17.105    .561      .738
  
```

```

001:0013-----
*
* Subcatchment A3
*
-----
| CALIB NASHYD      | Area (ha)= 84.52 Curve Number (CN)=79.00
| 01:A3 DT= 5.00   | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410
  
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PEAK FLOW (cms)= .357 (i)
 TIME TO PEAK (hrs)= 10.667
 RUNOFF VOLUME (mm)= 15.506
 TOTAL RAINFALL (mm)= 51.025
 RUNOFF COEFFICIENT = .304

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0014-----
*
* Total Flows at Bow River
*
-----
| ADD HYD (BOW1 ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
|                   |              (ha)      (cms)    (hrs)    (mm)     (cms)
|                   | ID1 02:RAVINE 219.56   .985     10.67    17.10    .000
|                   | +ID2 01:A3     84.52    .357     10.67    15.51    .000
|                   | =====
|                   | SUM 03:BOW1   304.08   1.342    10.67    16.66    .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0015-----
-----
| SAVE HYD          | AREA      (ha)= 304.080
| ID=03 (BOW1 )    | QPEAK     (cms)= 1.342 (i)
| DT= 5.00 PCYC=-1 | TPEAK     (hrs)= 10.667
|                   | VOLUME    (mm)= 16.660
-----
Filename: C:\PROGRA-1\SWMHYMO\Projects\BOW2_005.dat
Comments: 1:5 Coach Creek Flows at Bow River (City)
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0016-----
FINISH
-----
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2010-11-05 at 07:29:55
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ccpr2010.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 08:05:12 RUN COUNTER: 001193 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2010.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2010.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2010.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
----- Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----
001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:10 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 429.100
| Ptotal= 60.16 mm | B= 2.160
| | C= .707
-----
used in: INTENSITY = A / (t + B)^C
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	.756	6.25	3.148	12.25	1.735	18.25	.993
.50	.776	6.50	3.945	12.50	1.676	18.50	.977
.75	.797	6.75	5.521	12.75	1.621	18.75	.962
1.00	.820	7.00	11.239	13.00	1.571	19.00	.947
1.25	.844	7.25	57.512	13.25	1.525	19.25	.933
1.50	.870	7.50	14.871	13.50	1.481	19.50	.920
1.75	.898	7.75	8.945	13.75	1.441	19.75	.907
2.00	.929	8.00	6.684	14.00	1.403	20.00	.894
2.25	.962	8.25	5.442	14.25	1.367	20.25	.882
2.50	.998	8.50	4.642	14.50	1.333	20.50	.870
2.75	1.038	8.75	4.077	14.75	1.302	20.75	.859
3.00	1.081	9.00	3.653	15.00	1.272	21.00	.848
3.25	1.130	9.25	3.323	15.25	1.244	21.25	.837
3.50	1.183	9.50	3.056	15.50	1.217	21.50	.826
3.75	1.244	9.75	2.836	15.75	1.191	21.75	.816
4.00	1.312	10.00	2.650	16.00	1.167	22.00	.807
4.25	1.391	10.25	2.492	16.25	1.144	22.25	.797
4.50	1.482	10.50	2.354	16.50	1.122	22.50	.788
4.75	1.588	10.75	2.234	16.75	1.101	22.75	.779
5.00	1.715	11.00	2.127	17.00	1.081	23.00	.770
5.25	1.870	11.25	2.032	17.25	1.062	23.25	.761
5.50	2.064	11.50	1.946	17.50	1.044	23.50	.753
5.75	2.315	11.75	1.869	17.75	1.026	23.75	.745
6.00	2.655	12.00	1.799	18.00	1.009	24.00	.737

 001:0003-----

*
 * Subcatchment A1-OS
 *

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= .527 (i)
 TIME TO PEAK (hrs)= 11.000
 RUNOFF VOLUME (mm)= 21.384
 TOTAL RAINFALL (mm)= 60.165
 RUNOFF COEFFICIENT = .355

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0004-----

*
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071
.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	----- hydrograph -----				<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:A1OS	91.78	.527	11.00	21.384	.292	.401
OUTFLOW: ID= 2:RAVINE	91.78	.518	11.50	21.383	.288	.397

001:0005-----

*
 * Subcatchment A1
 *

CALIB NASHYD	Area (ha)=	77.90	Curve Number (CN)=	85.00
01:A1 DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.400		

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= .852 (i)
 TIME TO PEAK (hrs)= 9.083
 RUNOFF VOLUME (mm)= 26.493
 TOTAL RAINFALL (mm)= 60.165
 RUNOFF COEFFICIENT = .440

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
 * Total Flows at Main TCH Culvert
 *

ADD HYD (TCH1)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 02:RAVINE		91.78	.518	11.50	21.38	.000
+ID2 01:A1		77.90	.852	9.08	26.49	.000
=====						
SUM 03:TCH1		169.68	1.185	9.83	23.73	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
 * Subcatchment A2-OS
 *

CALIB NASHYD	Area (ha)=	37.00	Curve Number (CN)=	78.00
01:A2OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.160		

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .227 (i)
 TIME TO PEAK (hrs)= 10.333
 RUNOFF VOLUME (mm)= 20.660
 TOTAL RAINFALL (mm)= 60.165
 RUNOFF COEFFICIENT = .343

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0008-----

*
 * East Ravine Through SW 31-24-2-5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

* Trapezoidal Section to Match AECOM Section A2-1

```

*
-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
|                                     | LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
    .00          100.00         .0700
   10.00         99.00         .0700
   11.00         99.00         .0700
   21.00         100.00         .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)         (m)         (cu.m.)       (cu.m.)       (cms)         (m/s)        (min)         (m2/s)
.053  99.053  .667E+02  .211E+00  .013  .164  84.15  .009
.105  99.105  .179E+03  .114E+01  .052  .241  57.37  .025
.158  99.158  .338E+03  .321E+01  .123  .303  45.69  .048
.211  99.211  .543E+03  .688E+01  .233  .357  38.74  .075
.263  99.263  .793E+03  .126E+02  .389  .407  34.00  .107
.316  99.316  .109E+04  .207E+02  .595  .453  30.52  .143
.368  99.368  .143E+04  .318E+02  .858  .497  27.82  .183
.421  99.421  .182E+04  .462E+02  1.183  .539  25.66  .227
.474  99.474  .226E+04  .644E+02  1.574  .579  23.87  .274
.526  99.526  .274E+04  .867E+02  2.038  .618  22.37  .325
.579  99.579  .326E+04  .114E+03  2.578  .656  21.09  .380
.632  99.632  .383E+04  .146E+03  3.199  .692  19.98  .437
.684  99.684  .445E+04  .184E+03  3.906  .728  19.00  .498
.737  99.737  .512E+04  .227E+03  4.702  .763  18.14  .562
.789  99.789  .583E+04  .277E+03  5.593  .797  17.37  .629
.842  99.842  .658E+04  .334E+03  6.582  .830  16.67  .699
.895  99.895  .739E+04  .398E+03  7.673  .862  16.04  .771
.947  99.947  .824E+04  .470E+03  8.871  .894  15.47  .847
1.000 100.000 .913E+04  .550E+03  10.179 .925  14.95  .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS  37.00  .227  10.33  20.660  .208  .354
OUTFLOW: ID= 2:RAVINE 37.00  .220  10.92  20.660  .204  .349

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
|                                     | U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .195 (i)
TIME TO PEAK (hrs)= 8.333
RUNOFF VOLUME (mm)= 26.493
TOTAL RAINFALL (mm)= 60.165
RUNOFF COEFFICIENT = .440

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
-----
|                                     | (ha)      (cms)      (hrs)      (mm)      (cms)
ID1 02:RAVINE  37.00  .220  10.92  20.66  .000
+ID2 01:A2      12.88  .195  8.33  26.49  .000
=====
SUM 04:TCH2    49.88  .299  10.17  22.17  .000

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
001:0011-----
*
* Total Flows at Junction in NW 31-24-2-5
*
-----
| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
                        (ha)      (cms)    (hrs)    (mm)     (cms)
ID1 03:TCH1         169.68    1.185    9.83    23.73    .000
+ID2 04:TCH2         49.88     .299    10.17   22.17    .000
=====
SUM 01:COACH1       219.56    1.482    9.92    23.37    .000

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
001:0012-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
-----
| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE    | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                        LENGTH = 1640.00 (m)

```

<----- DATA FOR SECTION (3.0) ----->

Distance	Elevation	Manning
.00	100.00	.0700
3.00	98.00	.0700
4.50	98.00	.0700
7.50	100.00	.0700

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.105	98.105	.286E+03	.918E+00	.051	.293	93.31	.031
.211	98.211	.627E+03	.402E+01	.167	.437	62.54	.092
.316	98.316	.102E+04	.984E+01	.340	.546	50.07	.172
.421	98.421	.147E+04	.189E+02	.571	.636	42.94	.268
.526	98.526	.198E+04	.317E+02	.862	.716	38.19	.377
.632	98.632	.253E+04	.488E+02	1.217	.787	34.71	.497
.737	98.737	.315E+04	.707E+02	1.638	.854	32.02	.629
.842	98.842	.382E+04	.980E+02	2.130	.915	29.86	.771
.947	98.947	.454E+04	.131E+03	2.695	.974	28.06	.923
1.053	99.053	.531E+04	.171E+03	3.338	1.030	26.54	1.084
1.158	99.158	.615E+04	.217E+03	4.061	1.083	25.23	1.254
1.263	99.263	.703E+04	.271E+03	4.867	1.135	24.08	1.434
1.368	99.368	.797E+04	.333E+03	5.761	1.185	23.06	1.622
1.474	99.474	.897E+04	.403E+03	6.746	1.234	22.15	1.818
1.579	99.579	.100E+05	.482E+03	7.825	1.281	21.34	2.023
1.684	99.684	.111E+05	.571E+03	9.000	1.327	20.59	2.235
1.789	99.789	.123E+05	.670E+03	10.276	1.372	19.92	2.456
1.895	99.895	.135E+05	.779E+03	11.655	1.417	19.29	2.684
2.000	100.000	.148E+05	.900E+03	13.140	1.460	18.72	2.920

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

<---- hydrograph ----> <-pipe / channel->

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	MAX DEPTH (m)	MAX VEL (m/s)
INFLOW : ID= 1:COACH1	219.56	1.482	9.92	23.374	.698	.828
OUTFLOW: ID= 2:RAVINE	219.56	1.445	10.42	23.374	.688	.822

```

-----
001:0013-----
*
* Subcatchment A3
*
-----
| CALIB NASHYD      | Area (ha)= 84.52 Curve Number (CN)=79.00
| 01:A3 DT= 5.00   | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PEAK FLOW (cms)= .522 (i)
 TIME TO PEAK (hrs)= 10.500
 RUNOFF VOLUME (mm)= 21.384
 TOTAL RAINFALL (mm)= 60.165
 RUNOFF COEFFICIENT = .355

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0014-----
*
* Total Flows at Bow River
*
-----
| ADD HYD (BOW1 ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
|                   |              (ha)      (cms)    (hrs)    (mm)     (cms)
|                   | ID1 02:RAVINE 219.56   1.445    10.42   23.37    .000
|                   | +ID2 01:A3     84.52    .522     10.50   21.38    .000
|                   | =====
|                   | SUM 03:BOW1   304.08   1.966    10.42   22.82    .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0015-----
-----
| SAVE HYD          | AREA      (ha)= 304.080
| ID=03 (BOW1 )    | QPEAK     (cms)= 1.966 (i)
| DT= 5.00 PCYC=-1 | TPEAK     (hrs)= 10.417
|                   | VOLUME    (mm)= 22.821
-----
Filename: C:\PROGRA-1\SWMHYMO\Projects\BOW2_010.dat
Comments: 1:10 Coach Creek Flows at Bow River (City)
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0016-----
FINISH
-----
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2010-11-05 at 08:05:13
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ccpr2025.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ##  9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick +++++
+++++ Calgary SERIAL#:6754920 +++++
+++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 08:07:01 RUN COUNTER: 001194 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2025.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2025.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2025.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:25 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 522.600
| Ptotal= 72.22 mm | B= 1.960
-----| C= .709
used in: INTENSITY = A / (t + B)^C
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	.901	6.25	3.763	12.25	2.072	18.25	1.184
.50	.925	6.50	4.716	12.50	2.001	18.50	1.165
.75	.950	6.75	6.599	12.75	1.936	18.75	1.147
1.00	.977	7.00	13.415	13.00	1.876	19.00	1.130
1.25	1.006	7.25	70.227	13.25	1.820	19.25	1.113
1.50	1.038	7.50	17.740	13.50	1.768	19.50	1.097
1.75	1.071	7.75	10.684	13.75	1.720	19.75	1.081
2.00	1.108	8.00	7.988	14.00	1.674	20.00	1.066
2.25	1.147	8.25	6.505	14.25	1.632	20.25	1.052
2.50	1.191	8.50	5.548	14.50	1.591	20.50	1.038
2.75	1.238	8.75	4.873	14.75	1.554	20.75	1.024
3.00	1.290	9.00	4.367	15.00	1.518	21.00	1.011
3.25	1.348	9.25	3.971	15.25	1.484	21.25	.998
3.50	1.412	9.50	3.652	15.50	1.452	21.50	.985
3.75	1.484	9.75	3.389	15.75	1.422	21.75	.973
4.00	1.566	10.00	3.167	16.00	1.393	22.00	.962
4.25	1.660	10.25	2.977	16.25	1.365	22.25	.950
4.50	1.769	10.50	2.813	16.50	1.339	22.50	.939
4.75	1.896	10.75	2.669	16.75	1.314	22.75	.928
5.00	2.049	11.00	2.541	17.00	1.290	23.00	.918
5.25	2.234	11.25	2.427	17.25	1.267	23.25	.908
5.50	2.466	11.50	2.325	17.50	1.245	23.50	.898
5.75	2.766	11.75	2.232	17.75	1.224	23.75	.888
6.00	3.173	12.00	2.148	18.00	1.203	24.00	.879

 001:0003-----

*
 * Subcatchment A1-OS
 *

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= .771 (i)
 TIME TO PEAK (hrs)= 10.833
 RUNOFF VOLUME (mm)= 29.842
 TOTAL RAINFALL (mm)= 72.223
 RUNOFF COEFFICIENT = .413

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0004-----

*
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071
.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	<---- hydrograph ---->			<-pipe / channel->		
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:A1OS	91.78	.771	10.83	29.842	.357	.449
OUTFLOW: ID= 2:RAVINE	91.78	.760	11.25	29.842	.353	.446

001:0005-----

*
* Subcatchment A1
*

CALIB NASHYD	Area	(ha)=	77.90	Curve Number	(CN)=85.00
01:A1 DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		1.400		

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= 1.241 (i)
TIME TO PEAK (hrs)= 9.000
RUNOFF VOLUME (mm)= 36.169
TOTAL RAINFALL (mm)= 72.223
RUNOFF COEFFICIENT = .501

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
* Total Flows at Main TCH Culvert
*

ADD HYD (TCH1)	ID: NHYD	AREA	QPEAK	TPEAK	R.V.	DWF
		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 02:RAVINE		91.78	.760	11.25	29.84	.000
+ID2 01:A1		77.90	1.241	9.00	36.17	.000
=====						
SUM 03:TCH1		169.68	1.737	9.67	32.75	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
* Subcatchment A2-OS
*

CALIB NASHYD	Area	(ha)=	37.00	Curve Number	(CN)=78.00
01:A2OS DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		2.160		

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .335 (i)
TIME TO PEAK (hrs)= 10.250
RUNOFF VOLUME (mm)= 28.923
TOTAL RAINFALL (mm)= 72.223
RUNOFF COEFFICIENT = .400

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0008-----

*
* East Ravine Through SW 31-24-2-5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

* Trapezoidal Section to Match AECOM Section A2-1

```

-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
|                | LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
    .00          100.00         .0700
   10.00         99.00         .0700
   11.00         99.00         .0700
   21.00         100.00        .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)         (m)         (cu.m.)       (cu.m.)       (cms)         (m/s)         (min)         (m2/s)
.053  99.053  .667E+02  .211E+00  .013  .164  84.15  .009
.105  99.105  .179E+03  .114E+01  .052  .241  57.37  .025
.158  99.158  .338E+03  .321E+01  .123  .303  45.69  .048
.211  99.211  .543E+03  .688E+01  .233  .357  38.74  .075
.263  99.263  .793E+03  .126E+02  .389  .407  34.00  .107
.316  99.316  .109E+04  .207E+02  .595  .453  30.52  .143
.368  99.368  .143E+04  .318E+02  .858  .497  27.82  .183
.421  99.421  .182E+04  .462E+02  1.183  .539  25.66  .227
.474  99.474  .226E+04  .644E+02  1.574  .579  23.87  .274
.526  99.526  .274E+04  .867E+02  2.038  .618  22.37  .325
.579  99.579  .326E+04  .114E+03  2.578  .656  21.09  .380
.632  99.632  .383E+04  .146E+03  3.199  .692  19.98  .437
.684  99.684  .445E+04  .184E+03  3.906  .728  19.00  .498
.737  99.737  .512E+04  .227E+03  4.702  .763  18.14  .562
.789  99.789  .583E+04  .277E+03  5.593  .797  17.37  .629
.842  99.842  .658E+04  .334E+03  6.582  .830  16.67  .699
.895  99.895  .739E+04  .398E+03  7.673  .862  16.04  .771
.947  99.947  .824E+04  .470E+03  8.871  .894  15.47  .847
1.000 100.000 .913E+04  .550E+03  10.179 .925  14.95  .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS  37.00      .335      10.25  28.923      .245      .388
OUTFLOW: ID= 2:RAVINE 37.00      .325      10.75  28.923      .241      .384

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .288 (i)
TIME TO PEAK (hrs)= 8.250
RUNOFF VOLUME (mm)= 36.169
TOTAL RAINFALL (mm)= 72.223
RUNOFF COEFFICIENT = .501

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
-----
|                | (ha)         (cms)      (hrs)      (mm)      (cms)
ID1 02:RAVINE  37.00      .325      10.75  28.92  .000
+ID2 01:A2      12.88      .288      8.25   36.17  .000
=====
SUM 04:TCH2    49.88      .440      9.92   30.79  .000

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0011-----
*
* Total Flows at Junction in NW 31-24-2-5
*
-----
| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
                        (ha)      (cms)    (hrs)    (mm)    (cms)
ID1 03:TCH1         169.68    1.737    9.67    32.75    .000
+ID2 04:TCH2         49.88      .440     9.92    30.79    .000
=====
SUM 01:COACH1       219.56    2.176    9.75    32.30    .000
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0012-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
-----
| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE    | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                        LENGTH = 1640.00 (m)
  
```

```

<----- DATA FOR SECTION ( 3.0) ----->
Distance      Elevation      Manning
    .00         100.00         .0700
    3.00        98.00         .0700
    4.50        98.00         .0700
    7.50        100.00         .0700
  
```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME    S-VOLUME    FLOW RATE    VELOCITY    TRAV.TIME    D x V
(m)         (m)        (cu.m.)     (cu.m.)     (cms)        (m/s)       (min)        (m2/s)
.105      98.105    .286E+03    .918E+00     .051         .293        93.31        .031
.211      98.211    .627E+03    .402E+01     .167         .437        62.54        .092
.316      98.316    .102E+04    .984E+01     .340         .546        50.07        .172
.421      98.421    .147E+04    .189E+02     .571         .636        42.94        .268
.526      98.526    .198E+04    .317E+02     .862         .716        38.19        .377
.632      98.632    .253E+04    .488E+02     1.217        .787        34.71        .497
.737      98.737    .315E+04    .707E+02     1.638        .854        32.02        .629
.842      98.842    .382E+04    .980E+02     2.130        .915        29.86        .771
.947      98.947    .454E+04    .131E+03     2.695        .974        28.06        .923
1.053     99.053    .531E+04    .171E+03     3.338        1.030       26.54        1.084
1.158     99.158    .615E+04    .217E+03     4.061        1.083       25.23        1.254
1.263     99.263    .703E+04    .271E+03     4.867        1.135       24.08        1.434
1.368     99.368    .797E+04    .333E+03     5.761        1.185       23.06        1.622
1.474     99.474    .897E+04    .403E+03     6.746        1.234       22.15        1.818
1.579     99.579    .100E+05    .482E+03     7.825        1.281       21.34        2.023
1.684     99.684    .111E+05    .571E+03     9.000        1.327       20.59        2.235
1.789     99.789    .123E+05    .670E+03    10.276       1.372       19.92        2.456
1.895     99.895    .135E+05    .779E+03    11.655       1.417       19.29        2.684
2.000     100.000   .148E+05    .900E+03    13.140       1.460       18.72        2.920
  
```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK    TPEAK    R.V.     MAX DEPTH  MAX VEL
(ha)      (cms)    (hrs)    (mm)     (m)        (m/s)
INFLOW : ID= 1:COACH1  219.56    2.176    9.75    32.303    .851      .920
OUTFLOW: ID= 2:RAVINE  219.56    2.125    10.17   32.303    .837      .912
  
```

```

001:0013-----
*
* Subcatchment A3
*
-----
| CALIB NASHYD      | Area (ha)= 84.52 Curve Number (CN)=79.00
| 01:A3 DT= 5.00   | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410
  
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PEAK FLOW (cms)= .765 (i)
 TIME TO PEAK (hrs)= 10.417
 RUNOFF VOLUME (mm)= 29.842
 TOTAL RAINFALL (mm)= 72.223
 RUNOFF COEFFICIENT = .413

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0014-----
*
* Total Flows at Bow River
*
-----
| ADD HYD (BOW1 ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
|                   |                (ha)      (cms)    (hrs)    (mm)     (cms)
|                   | ID1 02:RAVINE  219.56   2.125    10.17   32.30    .000
|                   | +ID2 01:A3     84.52    .765     10.42   29.84    .000
|                   | =====
|                   | SUM 03:BOW1   304.08   2.889    10.25   31.62    .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0015-----
-----
| SAVE HYD          | AREA      (ha)= 304.080
| ID=03 (BOW1 )    | QPEAK     (cms)= 2.889 (i)
| DT= 5.00 PCYC=-1 | TPEAK     (hrs)= 10.250
|                   | VOLUME    (mm)= 31.619
-----
Filename: C:\PROGRA-1\SWMHYMO\Projects\BOW2_025.dat
Comments: 1:25 Coach Creek Flows at Bow River (City)
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0016-----
FINISH
-----
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2010-11-05 at 08:07:01
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ccpr2050.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 08:07:09 RUN COUNTER: 001195 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2050.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2050.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2050.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
----- Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----
001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:50 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 594.900
| Ptotal= 81.03 mm | B= 1.940
----- C= .711
used in: INTENSITY = A / (t + B)^C
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.004	6.25	4.210	12.25	2.314	18.25	1.320
.50	1.031	6.50	5.279	12.50	2.235	18.50	1.299
.75	1.059	6.75	7.395	12.75	2.162	18.75	1.279
1.00	1.089	7.00	15.066	13.00	2.095	19.00	1.260
1.25	1.122	7.25	79.558	13.25	2.032	19.25	1.241
1.50	1.157	7.50	19.938	13.50	1.974	19.50	1.223
1.75	1.194	7.75	11.988	13.75	1.920	19.75	1.206
2.00	1.235	8.00	8.956	14.00	1.869	20.00	1.189
2.25	1.279	8.25	7.289	14.25	1.821	20.25	1.172
2.50	1.328	8.50	6.214	14.50	1.776	20.50	1.157
2.75	1.381	8.75	5.456	14.75	1.734	20.75	1.141
3.00	1.439	9.00	4.888	15.00	1.694	21.00	1.127
3.25	1.503	9.25	4.444	15.25	1.656	21.25	1.112
3.50	1.575	9.50	4.086	15.50	1.620	21.50	1.098
3.75	1.656	9.75	3.790	15.75	1.586	21.75	1.085
4.00	1.748	10.00	3.542	16.00	1.554	22.00	1.072
4.25	1.853	10.25	3.329	16.25	1.523	22.25	1.059
4.50	1.975	10.50	3.144	16.50	1.493	22.50	1.047
4.75	2.117	10.75	2.983	16.75	1.465	22.75	1.034
5.00	2.288	11.00	2.840	17.00	1.439	23.00	1.023
5.25	2.496	11.25	2.712	17.25	1.413	23.25	1.011
5.50	2.756	11.50	2.598	17.50	1.388	23.50	1.000
5.75	3.092	11.75	2.494	17.75	1.365	23.75	.989
6.00	3.548	12.00	2.400	18.00	1.342	24.00	.979

 001:0003-----

*
 * Subcatchment A1-OS
 *

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= .967 (i)
 TIME TO PEAK (hrs)= 10.750
 RUNOFF VOLUME (mm)= 36.414
 TOTAL RAINFALL (mm)= 81.029
 RUNOFF COEFFICIENT = .449

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0004-----

*
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071
.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	----- hydrograph -----			<-pipe / channel->		
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:A1OS	91.78	.967	10.75	36.414	.401	.478
OUTFLOW: ID= 2:RAVINE	91.78	.954	11.17	36.414	.397	.476

001:0005-----

*
* Subcatchment A1
*

CALIB NASHYD	Area	(ha)=	77.90	Curve Number	(CN)=85.00
01:A1 DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		1.400		

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= 1.551 (i)
TIME TO PEAK (hrs)= 9.000
RUNOFF VOLUME (mm)= 43.547
TOTAL RAINFALL (mm)= 81.029
RUNOFF COEFFICIENT = .537

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
* Total Flows at Main TCH Culvert
*

ADD HYD (TCH1)	ID: NHYD	AREA	QPEAK	TPEAK	R.V.	DWF
		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 02:RAVINE		91.78	.954	11.17	36.41	.000
+ID2 01:A1		77.90	1.551	9.00	43.55	.000
=====						
SUM 03:TCH1		169.68	2.180	9.58	39.69	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
* Subcatchment A2-OS
*

CALIB NASHYD	Area	(ha)=	37.00	Curve Number	(CN)=78.00
01:A2OS DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		2.160		

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .423 (i)
TIME TO PEAK (hrs)= 10.167
RUNOFF VOLUME (mm)= 35.362
TOTAL RAINFALL (mm)= 81.029
RUNOFF COEFFICIENT = .436

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0008-----

*
* East Ravine Through SW 31-24-2-5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

* Trapezoidal Section to Match AECOM Section A2-1

```

*
-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
|                                     | LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
    .00          100.00         .0700
   10.00         99.00         .0700
   11.00         99.00         .0700
   21.00         100.00         .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)        (m)        (cu.m.)       (cu.m.)       (cms)         (m/s)        (min)         (m2/s)
.053      99.053     .667E+02      .211E+00      .013          .164         84.15         .009
.105      99.105     .179E+03      .114E+01      .052          .241         57.37         .025
.158      99.158     .338E+03      .321E+01      .123          .303         45.69         .048
.211      99.211     .543E+03      .688E+01      .233          .357         38.74         .075
.263      99.263     .793E+03      .126E+02      .389          .407         34.00         .107
.316      99.316     .109E+04      .207E+02      .595          .453         30.52         .143
.368      99.368     .143E+04      .318E+02      .858          .497         27.82         .183
.421      99.421     .182E+04      .462E+02      1.183         .539         25.66         .227
.474      99.474     .226E+04      .644E+02      1.574         .579         23.87         .274
.526      99.526     .274E+04      .867E+02      2.038         .618         22.37         .325
.579      99.579     .326E+04      .114E+03      2.578         .656         21.09         .380
.632      99.632     .383E+04      .146E+03      3.199         .692         19.98         .437
.684      99.684     .445E+04      .184E+03      3.906         .728         19.00         .498
.737      99.737     .512E+04      .227E+03      4.702         .763         18.14         .562
.789      99.789     .583E+04      .277E+03      5.593         .797         17.37         .629
.842      99.842     .658E+04      .334E+03      6.582         .830         16.67         .699
.895      99.895     .739E+04      .398E+03      7.673         .862         16.04         .771
.947      99.947     .824E+04      .470E+03      8.871         .894         15.47         .847
1.000     100.000    .913E+04      .550E+03     10.179        .925         14.95         .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS      37.00      .423      10.17      35.362        .272        .414
OUTFLOW: ID= 2:RAVINE   37.00      .411      10.67      35.362        .269        .411

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
|                                     | U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .361 (i)
TIME TO PEAK (hrs)= 8.250
RUNOFF VOLUME (mm)= 43.547
TOTAL RAINFALL (mm)= 81.029
RUNOFF COEFFICIENT = .537

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
|-----|-----| (ha)      (cms)      (hrs)      (mm)      (cms)
ID1 02:RAVINE      37.00      .411      10.67      35.36      .000
+ID2 01:A2          12.88      .361      8.25      43.55      .000
=====
SUM 04:TCH2        49.88      .555      9.83      37.48      .000

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
001:0011-----
*
* Total Flows at Junction in NW 31-24-2-5
*
-----
| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
                        (ha)      (cms)    (hrs)    (mm)    (cms)
      ID1 03:TCH1    169.68    2.180    9.58    39.69    .000
+ID2 04:TCH2      49.88      .555     9.83    37.48    .000
=====
      SUM 01:COACH1  219.56    2.734    9.67    39.19    .000
-----

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
001:0012-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
-----
| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE    | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                        LENGTH = 1640.00 (m)
-----

```

```

<----- DATA FOR SECTION ( 3.0) ----->
Distance      Elevation      Manning
      .00          100.00        .0700
      3.00         98.00         .0700
      4.50         98.00         .0700
      7.50         100.00        .0700
-----

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME    S-VOLUME    FLOW RATE    VELOCITY    TRAV.TIME    D x V
(m)         (m)        (cu.m.)     (cu.m.)     (cms)        (m/s)       (min)        (m2/s)
.105    98.105    .286E+03    .918E+00     .051         .293        93.31        .031
.211    98.211    .627E+03    .402E+01     .167         .437        62.54        .092
.316    98.316    .102E+04    .984E+01     .340         .546        50.07        .172
.421    98.421    .147E+04    .189E+02     .571         .636        42.94        .268
.526    98.526    .198E+04    .317E+02     .862         .716        38.19        .377
.632    98.632    .253E+04    .488E+02     1.217        .787        34.71        .497
.737    98.737    .315E+04    .707E+02     1.638        .854        32.02        .629
.842    98.842    .382E+04    .980E+02     2.130        .915        29.86        .771
.947    98.947    .454E+04    .131E+03     2.695        .974        28.06        .923
1.053    99.053    .531E+04    .171E+03     3.338        1.030       26.54        1.084
1.158    99.158    .615E+04    .217E+03     4.061        1.083       25.23        1.254
1.263    99.263    .703E+04    .271E+03     4.867        1.135       24.08        1.434
1.368    99.368    .797E+04    .333E+03     5.761        1.185       23.06        1.622
1.474    99.474    .897E+04    .403E+03     6.746        1.234       22.15        1.818
1.579    99.579    .100E+05    .482E+03     7.825        1.281       21.34        2.023
1.684    99.684    .111E+05    .571E+03     9.000        1.327       20.59        2.235
1.789    99.789    .123E+05    .670E+03    10.276       1.372       19.92        2.456
1.895    99.895    .135E+05    .779E+03    11.655       1.417       19.29        2.684
2.000    100.000   .148E+05    .900E+03    13.140       1.460       18.72        2.920
-----

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK    TPEAK    R.V.     MAX DEPTH  MAX VEL
(ha)      (cms)    (hrs)    (mm)     (m)        (m/s)
INFLOW : ID= 1:COACH1  219.56    2.734    9.67    39.186    .954      .977
OUTFLOW: ID= 2:RAVINE  219.56    2.675    10.08   39.186    .940      .970
-----

```

```

-----
001:0013-----
*
* Subcatchment A3
*
-----
| CALIB NASHYD      | Area (ha)= 84.52 Curve Number (CN)=79.00
| 01:A3 DT= 5.00   | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410
-----

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PEAK FLOW (cms)= .962 (i)
 TIME TO PEAK (hrs)= 10.333
 RUNOFF VOLUME (mm)= 36.414
 TOTAL RAINFALL (mm)= 81.029
 RUNOFF COEFFICIENT = .449

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0014-----
*
* Total Flows at Bow River
*
-----
| ADD HYD (BOW1 ) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
|                   |              (ha)      (cms)    (hrs)    (mm)     (cms)
|                   | ID1 02:RAVINE 219.56   2.675    10.08   39.19    .000
|                   | +ID2 01:A3     84.52    .962     10.33   36.41    .000
|                   | =====
|                   | SUM 03:BOW1   304.08   3.633    10.17   38.42    .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0015-----
-----
| SAVE HYD          | AREA      (ha)= 304.080
| ID=03 (BOW1 )    | QPEAK     (cms)= 3.633 (i)
| DT= 5.00 PCYC=-1 | TPEAK     (hrs)= 10.167
|                   | VOLUME    (mm)= 38.415
-----
Filename: C:\PROGRA-1\SWMHYMO\Projects\BOW2_050.dat
Comments: 1:50 Coach Creek Flows at Bow River (City)
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0016-----
FINISH
-----
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2010-11-05 at 08:07:10
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ccpr2100.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ##  9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-05 TIME: 07:30:12 RUN COUNTER: 001189 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2100.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2100.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\ccpr2100.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Contributing Drainage To Coach Creek
* Revised from AECOM Report Dated July 10, 2009
* Pre-Development Condition
* Job: 116417392
* Date: September 27, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
----- Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----
001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
| | C= .712
-----
used in: INTENSITY = A / (t + B)^C
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

 001:0003-----
 *
 * Subcatchment A1-OS
 *

CALIB NASHYD	Area (ha)=	91.78	Curve Number (CN)=	79.00
01:A1OS DT= 5.00	Ia (mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	2.570		

Unit Hyd Qpeak (cms)= 1.364

PEAK FLOW (cms)= 1.170 (i)
 TIME TO PEAK (hrs)= 10.667
 RUNOFF VOLUME (mm)= 43.121
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .481

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0004-----
 *
 * Main Ravine Through SW 31-24-2-5
 * Trapezoidal Section to Match AECOM Section A3-1
 *

ROUTE CHANNEL	Routing time step (min) =	5.00
IN> 01:A1OS	Number of SEGMENTS =	1
OUT< 02:RAVINE	Slopes (%), CHANNEL=	1.00 FLOODPLAIN=1.00
	LENGTH =	815.00 (m)

<----- DATA FOR SECTION (1.0) ----->

Distance	Elevation	Manning
.00	100.00	.0900
5.00	99.00	.0900
8.00	99.00	.0900
13.00	100.00	.0900

<----- TRAVEL TIME TABLE ----->

DEPTH (m)	ELEV (m)	X-VOLUME (cu.m.)	S-VOLUME (cu.m.)	FLOW RATE (cms)	VELOCITY (m/s)	TRAV.TIME (min)	D x V (m2/s)
.053	99.053	.140E+03	.452E+00	.025	.148	91.84	.008
.105	99.105	.303E+03	.195E+01	.084	.225	60.37	.024
.158	99.158	.488E+03	.472E+01	.170	.285	47.69	.045
.211	99.211	.695E+03	.898E+01	.286	.335	40.51	.071
.263	99.263	.926E+03	.149E+02	.431	.380	35.77	.100
.316	99.316	.118E+04	.228E+02	.607	.420	32.33	.133
.368	99.368	.145E+04	.329E+02	.816	.457	29.70	.168
.421	99.421	.175E+04	.453E+02	1.058	.492	27.60	.207

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.474	99.474	.207E+04	.602E+02	1.335	.525	25.87	.249
.526	99.526	.242E+04	.780E+02	1.649	.556	24.42	.293
.579	99.579	.278E+04	.988E+02	2.001	.586	23.17	.339
.632	99.632	.317E+04	.123E+03	2.392	.615	22.08	.389
.684	99.684	.358E+04	.150E+03	2.825	.643	21.12	.440
.737	99.737	.401E+04	.181E+03	3.301	.670	20.27	.494
.789	99.789	.447E+04	.216E+03	3.820	.697	19.50	.550
.842	99.842	.495E+04	.256E+03	4.385	.722	18.81	.608
.895	99.895	.545E+04	.299E+03	4.997	.747	18.18	.669
.947	99.947	.597E+04	.347E+03	5.657	.772	17.60	.731
1.000	100.000	.652E+04	.400E+03	6.366	.796	17.07	.796

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

	----- hydrograph -----				<-pipe / channel->	
	AREA	QPEAK	TPEAK	R.V.	MAX DEPTH	MAX VEL
	(ha)	(cms)	(hrs)	(mm)	(m)	(m/s)
INFLOW : ID= 1:A1OS	91.78	1.170	10.67	43.121	.442	.505
OUTFLOW: ID= 2:RAVINE	91.78	1.155	11.08	43.121	.438	.502

001:0005-----

*
* Subcatchment A1
*

CALIB NASHYD	Area	(ha)=	77.90	Curve Number	(CN)=85.00
01:A1 DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		1.400		

Unit Hyd Qpeak (cms)= 2.125

PEAK FLOW (cms)= 1.864 (i)
TIME TO PEAK (hrs)= 8.917
RUNOFF VOLUME (mm)= 50.982
TOTAL RAINFALL (mm)= 89.666
RUNOFF COEFFICIENT = .569

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
* Total Flows at Main TCH Culvert
*

ADD HYD (TCH1)	ID: NHYD	AREA	QPEAK	TPEAK	R.V.	DWF
		(ha)	(cms)	(hrs)	(mm)	(cms)
ID1 02:RAVINE		91.78	1.155	11.08	43.12	.000
+ID2 01:A1		77.90	1.864	8.92	50.98	.000
=====						
SUM 03:TCH1		169.68	2.635	9.58	46.73	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
* Subcatchment A2-OS
*

CALIB NASHYD	Area	(ha)=	37.00	Curve Number	(CN)=78.00
01:A2OS DT= 5.00	Ia	(mm)=	10.000	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		2.160		

Unit Hyd Qpeak (cms)= .654

PEAK FLOW (cms)= .513 (i)
TIME TO PEAK (hrs)= 10.083
RUNOFF VOLUME (mm)= 41.946
TOTAL RAINFALL (mm)= 89.666
RUNOFF COEFFICIENT = .468

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0008-----

*
* East Ravine Through SW 31-24-2-5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

* Trapezoidal Section to Match AECOM Section A2-1

```

-----
| ROUTE CHANNEL | Routing time step (min) = 5.00
| IN> 01:A2OS  | Number of SEGMENTS = 1
| OUT< 02:RAVINE | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
|                                     | LENGTH = 830.00 (m)

```

```

<----- DATA FOR SECTION ( 2.0) ----->
Distance      Elevation      Manning
    .00          100.00         .0700
   10.00         99.00         .0700
   11.00         99.00         .0700
   21.00         100.00         .0700

```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME      S-VOLUME      FLOW RATE      VELOCITY      TRAV.TIME      D x V
(m)         (m)         (cu.m.)       (cu.m.)       (cms)         (m/s)         (min)         (m2/s)
.053  99.053  .667E+02  .211E+00  .013  .164  84.15  .009
.105  99.105  .179E+03  .114E+01  .052  .241  57.37  .025
.158  99.158  .338E+03  .321E+01  .123  .303  45.69  .048
.211  99.211  .543E+03  .688E+01  .233  .357  38.74  .075
.263  99.263  .793E+03  .126E+02  .389  .407  34.00  .107
.316  99.316  .109E+04  .207E+02  .595  .453  30.52  .143
.368  99.368  .143E+04  .318E+02  .858  .497  27.82  .183
.421  99.421  .182E+04  .462E+02  1.183  .539  25.66  .227
.474  99.474  .226E+04  .644E+02  1.574  .579  23.87  .274
.526  99.526  .274E+04  .867E+02  2.038  .618  22.37  .325
.579  99.579  .326E+04  .114E+03  2.578  .656  21.09  .380
.632  99.632  .383E+04  .146E+03  3.199  .692  19.98  .437
.684  99.684  .445E+04  .184E+03  3.906  .728  19.00  .498
.737  99.737  .512E+04  .227E+03  4.702  .763  18.14  .562
.789  99.789  .583E+04  .277E+03  5.593  .797  17.37  .629
.842  99.842  .658E+04  .334E+03  6.582  .830  16.67  .699
.895  99.895  .739E+04  .398E+03  7.673  .862  16.04  .771
.947  99.947  .824E+04  .470E+03  8.871  .894  15.47  .847
1.000 100.000 .913E+04  .550E+03  10.179 .925  14.95  .925

```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK      TPEAK      R.V.      MAX DEPTH      MAX VEL
(ha)      (cms)      (hrs)      (mm)      (m)            (m/s)
INFLOW : ID= 1:A2OS  37.00      .513      10.08  41.946      .295      .434
OUTFLOW: ID= 2:RAVINE 37.00      .499      10.58  41.946      .291      .430

```

```

-----
001:0009-----
*
* Subcatchment A2
*
-----
| CALIB NASHYD | Area (ha)= 12.88 Curve Number (CN)=85.00
| 01:A2 DT= 5.00 | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
U.H. Tp(hrs)= .850

```

```

Unit Hyd Qpeak (cms)= .579

PEAK FLOW (cms)= .436 (i)
TIME TO PEAK (hrs)= 8.167
RUNOFF VOLUME (mm)= 50.982
TOTAL RAINFALL (mm)= 89.666
RUNOFF COEFFICIENT = .569

```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
001:0010-----
*
* Total Flows at East TCH Culvert
*
-----
| ADD HYD (TCH2 ) | ID: NHYD      AREA      QPEAK      TPEAK      R.V.      DWF
-----
|                                     | (ha)      (cms)      (hrs)      (mm)      (cms)
ID1 02:RAVINE      37.00      .499      10.58  41.95      .000
+ID2 01:A2          12.88      .436      8.17   50.98      .000
=====
SUM 04:TCH2        49.88      .673      9.67   44.28      .000

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0011-----
*
* Total Flows at Junction in NW 31-24-2-5
*
-----
| ADD HYD (COACH1) | ID: NHYD      AREA      QPEAK    TPEAK    R.V.     DWF
-----
                        (ha)      (cms)    (hrs)    (mm)     (cms)
ID1 03:TCH1         169.68    2.635    9.58    46.73    .000
+ID2 04:TCH2         49.88     .673     9.67    44.28    .000
=====
SUM 01:COACH1       219.56    3.308    9.58    46.17    .000
  
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

001:0012-----
*
* Main Ravine Through NW 31-24-2-5
* Trapezoidal Section to Match AECOM Section A5-1
*
-----
| ROUTE CHANNEL      | Routing time step (min) = 5.00
| IN> 01:COACH1     | Number of SEGMENTS = 1
| OUT< 02:RAVINE    | Slopes (%), CHANNEL=1.00 FLOODPLAIN=1.00
-----
                        LENGTH = 1640.00 (m)
  
```

```

<----- DATA FOR SECTION ( 3.0) ----->
Distance      Elevation      Manning
    .00         100.00         .0700
    3.00         98.00          .0700
    4.50         98.00          .0700
    7.50         100.00         .0700
  
```

```

<----- TRAVEL TIME TABLE ----->
DEPTH      ELEV      X-VOLUME  S-VOLUME  FLOW RATE  VELOCITY  TRAV.TIME  D x V
(m)         (m)       (cu.m.)   (cu.m.)   (cms)      (m/s)     (min)      (m2/s)
.105    98.105    .286E+03  .918E+00  .051       .293      93.31      .031
.211    98.211    .627E+03  .402E+01  .167       .437      62.54      .092
.316    98.316    .102E+04  .984E+01  .340       .546      50.07      .172
.421    98.421    .147E+04  .189E+02  .571       .636      42.94      .268
.526    98.526    .198E+04  .317E+02  .862       .716      38.19      .377
.632    98.632    .253E+04  .488E+02  1.217      .787      34.71      .497
.737    98.737    .315E+04  .707E+02  1.638      .854      32.02      .629
.842    98.842    .382E+04  .980E+02  2.130      .915      29.86      .771
.947    98.947    .454E+04  .131E+03  2.695      .974      28.06      .923
1.053   99.053    .531E+04  .171E+03  3.338      1.030     26.54     1.084
1.158   99.158    .615E+04  .217E+03  4.061      1.083     25.23     1.254
1.263   99.263    .703E+04  .271E+03  4.867      1.135     24.08     1.434
1.368   99.368    .797E+04  .333E+03  5.761      1.185     23.06     1.622
1.474   99.474    .897E+04  .403E+03  6.746      1.234     22.15     1.818
1.579   99.579    .100E+05  .482E+03  7.825      1.281     21.34     2.023
1.684   99.684    .111E+05  .571E+03  9.000      1.327     20.59     2.235
1.789   99.789    .123E+05  .670E+03  10.276     1.372     19.92     2.456
1.895   99.895    .135E+05  .779E+03  11.655     1.417     19.29     2.684
2.000   100.000   .148E+05  .900E+03  13.140     1.460     18.72     2.920
  
```

X-VOLUME= Total X-Section volume over given CHANNEL LENGTH at specified DEPTH.
 S-VOLUME= Volume that can be stored in channel at specified ELEVATION.

```

<---- hydrograph ----> <-pipe / channel->
AREA      QPEAK    TPEAK    R.V.     MAX DEPTH  MAX VEL
(ha)      (cms)    (hrs)    (mm)     (m)        (m/s)
INFLOW : ID= 1:COACH1  219.56    3.308    9.58    46.173    1.048    1.027
OUTFLOW: ID= 2:RAVINE  219.56    3.238    10.00   46.173    1.032    1.019
  
```

```

001:0013-----
*
* Subcatchment A3
*
-----
| CALIB NASHYD      | Area (ha)= 84.52 Curve Number (CN)=79.00
| 01:A3 DT= 5.00   | Ia (mm)= 10.000 # of Linear Res.(N)= 3.00
-----
                        U.H. Tp(hrs)= 2.290

Unit Hyd Qpeak (cms)= 1.410
  
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PEAK FLOW (cms)= 1.165 (i)
 TIME TO PEAK (hrs)= 10.250
 RUNOFF VOLUME (mm)= 43.121
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .481

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0014-----
*
* Total Flows at Bow River
*
-----
| ADD HYD (BOW1 ) | ID: NHYD      AREA      QPEAK   TPEAK   R.V.    DWF
-----
|                   |                (ha)      (cms)   (hrs)   (mm)    (cms)
|                   | ID1 02:RAVINE  219.56   3.238   10.00   46.17   .000
|                   | +ID2 01:A3     84.52    1.165   10.25   43.12   .000
|                   | =====
|                   | SUM 03:BOW1   304.08   4.397   10.08   45.32   .000
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0015-----
-----
| SAVE HYD          | AREA      (ha)= 304.080
| ID=03 (BOW1 )    | QPEAK     (cms)= 4.397 (i)
| DT= 5.00 PCYC=-1 | TPEAK     (hrs)= 10.083
|                   | VOLUME    (mm)= 45.324
-----
Filename: C:\PROGRA-1\SWMHYMO\Projects\BOW2_100.dat
Comments: 1:100 Coach Creek Flows at Bow River (City)
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
001:0016-----
FINISH
-----
*****
WARNINGS / ERRORS / NOTES
-----
Simulation ended on 2010-11-05 at 07:30:13
=====
```

APPENDIX F

QHM Model Data for Post-Development Condition



Stantec

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

F.1 INPUT DATA

cc_postA_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
               END DATE        YR=94 MO=10 DAY=31
               RAIN FILE        IRAIN=9
               AES FORMAT       IPFORM=1
               FLOW FILE        IFLOW=10
               NO EVAPORATION   ICASE=0
               NO POLLUTANT     IFDECA=0
               SEDIMENT         IFSEDT=1
               SETTLING VELOCITIES (m/s)
               SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
               SIZE FRACTIONS
               SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m   PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days   PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m   PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days   PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 1
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=29.53 AB=0 FRIMP=0.24
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.25 SMIN=25 SMAX=165 SK=0.04
                  APIK=0.9 API=42 ABSPER=2.6
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Pond A
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND             IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                 *** APPROACH FLOW CURVE DATA ***
                 NPOINTS=0
                 *** CONTINUOUS OUTFLOW CURVE DATA ***
                 NPOINTS=0
                 *** OPERATED OUTFLOW CURVE DATA
                 ISIG=1 NPOINTS=8
                 STAGE FLOW
                 0.0 0
                 0.01 0.00004
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

2.0 0.00010
2.01 0.00083
4.0 0.00091 PWL
4.5 0.16093
5.0 0.22695
5.25 0.25397 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=6
STAGE VOLUME
0.0 0
2.0 5900
4.0 17900 PWL
4.5 22000
5.0 26600
5.25 29200 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

*
* Peak Volumes
*
MAXMIN ID=3 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

*
* Peak Levels
*
MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
QTOTAL QMAJOR
0 0
0.00091 0
0.16093 0.160
0.22695 0.226
0.25397 0.253

*
* Discharges to Coach Creek
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30
MAXMIN ID=1 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postB_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond B
*         Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
                END DATE       YR=94 MO=10 DAY=31
                RAIN FILE       IRAIN=9
                AES FORMAT      IPFORM=1
                FLOW FILE       IFLOW=10
                NO EVAPORATION  ICASE=0
                NO POLLUTANT    IFDECA=0
                SEDIMENT        IFSEDT=1
                SETTLING VELOCITIES (m/s)
                SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
                SIZE FRACTIONS
                SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Commercial Portion of Subcatchment 2 (23.00 ha) with Enhanced BMPs
*
GENERATE          ID=1 SERIES=102 DT=1.0 AREA=23.00 AB=0 FRIMP=0.25
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.167 SMIN=8 SMAX=53 SK=0.04
                  APIK=0.9 API=42 ABSPER=5.0
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Residential Portion of Subcatchment 2
*
GENERATE          ID=2 SERIES=103 DT=1.0 AREA=27.18 AB=0 FRIMP=0.25
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.25 SMIN=26 SMAX=177 SK=0.04
                  APIK=0.9 API=42 ABSPER=2.7
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
ADD SERIES        ID=3 SERIES=205 IDONE=1 IDTWO=2
*
* Pond B
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND              IDOUT=1 IDV=2 IDL=4 SERIES=301 IDIN=3 TDET=0 NELS=1
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
*** APPROACH FLOW CURVE DATA ***
NPOINTS=0
*** CONTINUOUS OUTFLOW CURVE DATA ***
NPOINTS=0
*** OPERATED OUTFLOW CURVE DATA
ISIG=1 NPOINTS=8
STAGE FLOW
0.0 0
0.01 0.00013
2.0 0.00022
2.01 0.00132
4.0 0.00143 PWL
4.5 0.27346
5.0 0.38649
5.25 0.43150 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=6
STAGE VOLUME
0.0 0
2.0 15000
4.0 38600 PWL
4.5 46100
5.0 54200
5.25 58500 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

```

*
* Peak Volumes

```

*
MAXMIN ID=2 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

```

*
* Peak Levels

```

*
MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
SPLIT SERIES ID=1 IDOUT=2 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
QTOTAL QMAJOR
0 0
0.00143 0
0.27346 0.272
0.38649 0.385
0.43150 0.430

```

*
* Discharges to Coach Creek

```

*
SERIES STATS ID=2
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30
MAXMIN ID=2 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postC_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond C
*         Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
               END DATE        YR=94 MO=10 DAY=31
               RAIN FILE        IRAIN=9
               AES FORMAT        IPFORM=1
               FLOW FILE        IFLOW=10
               NO EVAPORATION    ICASE=0
               NO POLLUTANT      IFDECA=0
               SEDIMENT          IFSEDT=1
               SETTLING VELOCITIES (m/s)
               SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
               SIZE FRACTIONS
               SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment B1-OS
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=18.94 AB=0 FRIMP=0
                  *** NO IMPERVIOUS DATA ***
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.16 SMIN=42 SMAX=277 SK=0.04
                  APIK=0.9 API=42 ABSPER=3.2
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Commercial Portion of Subcatchment 3 (11.10 ha) with Enhanced BMPs
*
GENERATE          ID=2 SERIES=102 DT=1.0 AREA=11.10 AB=0 FRIMP=0.25
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.167 SMIN=8 SMAX=53 SK=0.04
                  APIK=0.9 API=42 ABSPER=5.0
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Residential Portion of Subcatchment 3
*
GENERATE          ID=3 SERIES=103 DT=1.0 AREA=14.10 AB=0 FRIMP=0.27
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                  *** PERVIOUS DATA ***
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
AA=1 N=3 TP=0.25 SMIN=26 SMAX=175 SK=0.04
APIK=0.9 API=42 ABSPER=2.7
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
FIELD=50 SLOSKA=0.0 SLOSKB=0.0
ID=4 SERIES=201 IDONE=1 IDTWO=2
ADD SERIES ID=1 SERIES=202 IDONE=4 IDTWO=3
ADD SERIES
*
* Pond C
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
*** APPROACH FLOW CURVE DATA ***
NPOINTS=0
*** CONTINUOUS OUTFLOW CURVE DATA ***
NPOINTS=0
*** OPERATED OUTFLOW CURVE DATA
ISIG=1 NPOINTS=8
STAGE FLOW
0.0 0
0.01 0.00005
2.0 0.00012
2.01 0.00069
4.0 0.00077 PWL
4.5 0.23979
5.0 0.33881
5.25 0.37883 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=6
STAGE VOLUME
0.0 0
2.0 7300
4.0 20900 PWL
4.5 25500
5.0 30600
5.25 33300 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25
*
* Peak Volumes
*
MAXMIN ID=3 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
*
* Peak Levels
*
MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
QTOTAL QDISCHARGE
0 0
0.00077 0
0.23975 0.239
0.33881 0.338
0.37883 0.378
*
* Discharges to the West
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30
MAXMIN ID=1 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postD_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Ponds D1 & D2
*         Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE        IRAIN=9
              AES FORMAT        IPFORM=1
              FLOW FILE         IFLOW=10
              NO EVAPORATION    ICASE=0
              NO POLLUTANT      IFDECA=0
              SEDIMENT          IFSEDT=1
              SETTLING VELOCITIES (m/s)
              SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
              SIZE FRACTIONS
              SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 6
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=15.59 AB=0 FRIMP=0
                  *** NO IMPERVIOUS DATA ***
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 SMIN=16 SMAX=90 SK=0.04
                  APIK=0.9 API=42 ABSPER=3.2
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Ponds D1 & D2 (Combined)
* Discharges @ 8.57 L/s/ha + Evaporation
*
POND              IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                  RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                  *** APPROACH FLOW CURVE DATA ***
                  NPOINTS=0
                  *** CONTINUOUS OUTFLOW CURVE DATA ***
                  NPOINTS=0
                  *** OPERATED OUTFLOW CURVE DATA
                  ISIG=1 NPOINTS=5
                  STAGE  FLOW
                  0.0    0
                  0.5    0.00015
                  1.0    0.00017
                  1.5    0.00019 PWL
                  2.0    0.13421 HWL
                  *** OVERFLOW CURVE DATA ***
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=5
STAGE  VOLUME
0.0      0
0.5     3200
1.0     6700
1.5    10700 PWL
2.0    15200 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=0.5 FEMULT=1 SEMULT=1 SPILL=2.0

*
* Peak Volumes
*
MAXMIN      ID=3 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30

*
* Peak Levels
*
MAXMIN      ID=4 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30
SPLIT SERIES  ID=2 IDOUT=1 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=3
            QTOTAL  QSPILL
            0        0
            0.00019 0
            0.13421 0.134

*
* Discharges to Coach Creek
*
SERIES STATS  ID=1
            START YR=48 MO=05 DAY=02
            END   YR=94 MO=10 DAY=30
MAXMIN      ID=1 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postE_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond E
* Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE        IRAIN=9
              AES FORMAT        IPFORM=1
              FLOW FILE        IFLOW=10
              NO EVAPORATION    ICASE=0
              NO POLLUTANT      IFDECA=0
              SEDIMENT          IFSEDT=1
              SETTLING VELOCITIES (m/s)
              SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
              SIZE FRACTIONS
              SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 7 with Enhanced BMPs
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=2.45 AB=0 FRIMP=0.25
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.25 SMIN=8 SMAX=54 SK=0.04
                  APIK=0.9 API=42 ABSPER=5.0
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Subcatchment 8
*
GENERATE          ID=2 SERIES=102 DT=1.0 AREA=5.55 AB=0 FRIMP=0
                  *** NO IMPERVIOUS DATA ***
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.25 SMIN=30 SMAX=198 SK=0.04
                  APIK=0.9 API=42 ABSPER=3.2
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Commercial Portion of Subcatchment 9
*
GENERATE          ID=3 SERIES=103 DT=1.0 AREA=26.00 AB=0 FRIMP=0.25
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
                  *** PERVIOUS DATA ***
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

AA=1 N=3 TP=0.25 SMIN=8 SMAX=53 SK=0.04
APIK=0.9 API=42 ABSPER=5.0
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Residential Portion of Subcatchment 9
*
GENERATE          ID=4 SERIES=104 DT=1.0 AREA=28.16 AB=0 FRIMP=0.28
*** IMPERVIOUS DATA ***
AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
*** PERVIOUS DATA ***
AA=1 N=3 TP=0.25 SMIN=25 SMAX=167 SK=0.04
APIK=0.9 API=42 ABSPER=2.6
*** BASEFLOW DATA ***
NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
ADD SERIES        ID=5 SERIES=201 IDONE=1 IDTWO=2
ADD SERIES        ID=1 SERIES=202 IDONE=5 IDTWO=3
ADD SERIES        ID=2 SERIES=203 IDONE=1 IDTWO=4
*
* Pond E
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND              IDOUT=1 IDV=3 IDL=4 SERIES=301 IDIN=2 TDET=0 NELS=1
RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
*** APPROACH FLOW CURVE DATA ***
NPOINTS=0
*** CONTINUOUS OUTFLOW CURVE DATA ***
NPOINTS=0
*** OPERATED OUTFLOW CURVE DATA
ISIG=1 NPOINTS=8
STAGE  FLOW
0.0    0
0.01   0.00018
2.0    0.00029
2.01   0.00144
4.0    0.00156 PWL
4.5    0.33859
5.0    0.47863
5.25   0.53464 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=6
STAGE  VOLUME
0.0    0
2.0    20300
4.0    50500 PWL
4.5    59800
5.0    69800
5.25   75100 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25
*
* Peak Volumes
*
MAXMIN            ID=3 IOPT=1
START DATE       YR=48 MO=05 DAY=02
END   DATE       YR=94 MO=10 DAY=30
*
* Peak Levels
*
MAXMIN            ID=4 IOPT=1
START DATE       YR=48 MO=05 DAY=02
END   DATE       YR=94 MO=10 DAY=30
SPLIT SERIES      ID=1 IDOUT=2 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
QTOTAL  QDISCHARGE
0        0
0.00156 0
0.33859 0.272
0.47863 0.385
0.53464 0.430
*
* Discharges to Coach Creek
*
SERIES STATS      ID=2
START YR=48 MO=05 DAY=02
END   YR=94 MO=10 DAY=30

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

MAXMIN

ID=2 IOPT=1

START DATE YR=48 MO=05 DAY=02

END DATE YR=94 MO=10 DAY=30

FINISH

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postF_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond F
*         Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
                END DATE        YR=94 MO=10 DAY=31
                RAIN FILE        IRAIN=9
                AES FORMAT        IPFORM=1
                FLOW FILE        IFLOW=10
                NO EVAPORATION    ICASE=0
                NO POLLUTANT      IFDECA=0
                SEDIMENT          IFSEDT=1
                SETTLING VELOCITIES (m/s)
                SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
                SIZE FRACTIONS
                SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 10
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=24.78 AB=0 FRIMP=0.26
                  *** IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.25 SMIN=25 SMAX=165 SK=0.04
                  APIK=0.9 API=42 ABSPER=2.6
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Pond F
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND              IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                  RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                  *** APPROACH FLOW CURVE DATA ***
                  NPOINTS=0
                  *** CONTINUOUS OUTFLOW CURVE DATA ***
                  NPOINTS=0
                  *** OPERATED OUTFLOW CURVE DATA
                  ISIG=1 NPOINTS=8
                  STAGE FLOW
                  0.0 0
                  0.01 0.00002
                  2.0 0.00008
                  2.01 0.00079
                  4.0 0.00086 PWL
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

4.5    0.13488
5.0    0.19090
5.25   0.21291 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=6
STAGE  VOLUME
0.0    0
2.0    4200
4.0    13800 PWL
4.5    17200
5.0    21000
5.25   23100 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

*
* Peak Volumes
*
MAXMIN      ID=3 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30

*
* Peak Levels
*
MAXMIN      ID=4 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30

SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
            QTOTAL  QDISCHARGE
            0        0
            0.00086  0
            0.13488  0.134
            0.19090  0.190
            0.21291  0.212

*
* Discharges to Coach Creek
*
SERIES STATS      ID=1
                  START YR=48 MO=05 DAY=02
                  END   YR=94 MO=10 DAY=30

MAXMIN          ID=1 IOPT=1
                START DATE      YR=48 MO=05 DAY=02
                END   DATE      YR=94 MO=10 DAY=30

FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_post_Sub5_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*       Post-Development Condition - Subcatchment 5
* Job: 116417392
* Date: October 22, 2010
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE        IRAIN=9
              AES FORMAT        IPFORM=1
              FLOW FILE         IFLOW=10
              NO EVAPORATION    ICASE=0
              NO POLLUTANT      IFDECA=0
*
* Subcatchment 5
* 4.0 mm of additional depression storage to reflect ditch ponding
*
GENERATE        ID=1 SERIES=101 DT=1.0 AREA=10.15 AB=0 FRIMP=0
              *** NO IMPERVIOUS DATA ***
              *** PERVIOUS DATA ***
              AA=1 N=3 TP=0.083 SMIN=28 SMAX=183 SK=0.04
              APIK=0.9 API=42 ABSPER=7.2
              *** BASEFLOW DATA ***
              NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
              SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
MAXMIN          ID=1 IOPT=1
              START DATE      YR=48 MO=05 DAY=02
              END DATE        YR=94 MO=10 DAY=30
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_post_Sub11_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*       Post-Development Condition - Subcatchment 11
*       Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE        IRAIN=9
              AES FORMAT        IPFORM=1
              FLOW FILE        IFLOW=10
              NO EVAPORATION    ICASE=0
              NO POLLUTANT      IFDECA=0
              SEDIMENT          IFSEDT=1
              SETTLING VELOCITIES (m/s)
              SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
              SIZE FRACTIONS
              SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 11
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=2.20 AB=0 FRIMP=0
                  *** NO IMPERVIOUS DATA ***
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.167 SMIN=14 SMAX=94 SK=0.04
                  APIK=0.9 API=42 ABSPER=2.2
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* On-Site Underground Storage
* Discharges @ 8.57 L/s/ha + Irrigation
*
POND              IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                  RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                  *** APPROACH FLOW CURVE DATA ***
                  NPOINTS=0
                  *** CONTINUOUS OUTFLOW CURVE DATA ***
                  NPOINTS=0
                  *** OPERATED OUTFLOW CURVE DATA
                  ISIG=1 NPOINTS=6
                  STAGE  FLOW
                  0.0    0
                  0.01   0.000089
                  2.0    0.000090 PWL
                  2.5    0.011090
                  3.0    0.016090
                  3.5    0.019090 HWL
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=5
STAGE  VOLUME
0.0      0
2.0     320 PWL
2.5     680
3.0     1040
3.5     1400 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=0 FEMULT=1 SEMULT=1 SPILL=3.5

*
* Peak Volumes
*
MAXMIN          ID=3 IOPT=1
                START DATE      YR=48 MO=05 DAY=02
                END   DATE      YR=94 MO=10 DAY=30

*
* Peak Levels
*
MAXMIN          ID=4 IOPT=1
                START DATE      YR=48 MO=05 DAY=02
                END   DATE      YR=94 MO=10 DAY=30

SPLIT SERIES    ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
                QTOTAL  QDISCHARGE
                0        0
                0.000090 0
                0.011090 0.011
                0.016090 0.016
                0.019090 0.019

*
* Discharges to Coach Creek
*
SERIES STATS    ID=1
                START YR=48 MO=05 DAY=02
                END   YR=94 MO=10 DAY=30

MAXMIN          ID=1 IOPT=1
                START DATE      YR=48 MO=05 DAY=02
                END   DATE      YR=94 MO=10 DAY=30

FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_post_Sub12_q.inp

```
*
* QHM MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*       Post-Development Condition - Subcatchment 12
*       Revised to Reflect 2011 Sediment Removal Criteria
* Job: 116417392
* Date: January 16, 2012
*
*
* Note: The precipitation period used in the simulation is from
* May 1, 1960 to October 31, 2006. The QHM model cannot read the year
* in its 4 digit format (Eg. 1960) but rather it reads the year in a
* 2 digit format (Eg. 60). As a result the QHM model is not able to read
* the year 2000 as 00. Therefore the dates in the precipitation data file
* have been adjusted downwards by 12 years (Eg. 1960 is 1948). The
* QHM model simulation period is thus May 1, 1948 to October 31, 1994.
*
START          START DATE      YR=48 MO=05 DAY=01
              END DATE        YR=94 MO=10 DAY=31
              RAIN FILE        IRAIN=9
              AES FORMAT       IPFORM=1
              FLOW FILE        IFLOW=10
              NO EVAPORATION   ICASE=0
              NO POLLUTANT     IFDECA=0
              SEDIMENT         IFSEDT=1
              SETTLING VELOCITIES (m/s)
                SEDSET=0.00000592 0.0000473 0.000283 0.00195 0.0124
              SIZE FRACTIONS
                SEDDIS=0.23 0.09 0.13 0.23 0.32
*
* The above settling velocities are associated with partical sizes of
* <10, 10-20, 20-50, 50-150 and >150 um respectively.
*
* Pollutant Rates for Impervious Areas
*
POLLUTANT SERIES  JCASE=3 IWM=2 (Buildup Washoff Method)
                  PCO=6000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES  JCASE=4 IWM=2 (Buildup Washoff Method)
                  PCO=3000 per cu m  PEX=1.2
                  IBM=1 (Power Linear Buildup)
                  DAYSIN=30 Days  PMAX=0.20 kg per sq m
                  PKI=0.00055 kg per 1.0 days
*
* Subcatchment 12
*
GENERATE          ID=1 SERIES=101 DT=1.0 AREA=8.52 AB=0 FRIMP=.02
                  *** NO IMPERVIOUS DATA ***
                  AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                  *** PERVIOUS DATA ***
                  AA=1 N=3 TP=0.167 SMIN=16 SMAX=107 SK=0.04
                  APIK=0.9 API=42 ABSPER=2.2
                  *** BASEFLOW DATA ***
                  NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                  SFIELD=50 SLOSKA=0.0 SLOSKB=0.0
*
* Private Storm Pond
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND              IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                  RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                  *** APPROACH FLOW CURVE DATA ***
                  NPOINTS=0
                  *** CONTINUOUS OUTFLOW CURVE DATA ***
                  NPOINTS=0
                  *** OPERATED OUTFLOW CURVE DATA
                  ISIG=1 NPOINTS=8
                  STAGE  FLOW
                  0.0    0
                  2.0    0.00001
                  2.01   0.00034
                  3.5    0.00036 PWL
                  4.0    0.03737
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

4.5  0.05238
5.0  0.06339
5.5  0.07340 HWL
*** OVERFLOW CURVE DATA ***
ISIG=1 NPOINTS=0
*** POND VOLUME CURVE DATA ***
ISIG=1 NPOINTS=7
STAGE  VOLUME
0.0    0
2.0    300
3.5    1400 PWL
4.0    2200
4.5    3100
5.0    4200
5.5    5600 HWL
*** POND AREA CURVE DATA ***
NPOINTS=0
*** OTHER VARIABLES ***
SBEGIN=3.5 FEMULT=1 SEMULT=1 SPILL=5.5

*
* Peak Volumes
*
MAXMIN      ID=3 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30

*
* Peak Levels
*
MAXMIN      ID=4 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=6
            QTOTAL  QDISCHARGE
            0        0
            0.00036 0
            0.03737 0.037
            0.05238 0.052
            0.06339 0.063
            0.07340 0.073

*
* Discharges to Coach Creek
*
SERIES STATS ID=1
            START YR=48 MO=05 DAY=02
            END   YR=94 MO=10 DAY=30
MAXMIN      ID=1 IOPT=1
            START DATE      YR=48 MO=05 DAY=02
            END   DATE      YR=94 MO=10 DAY=30
FINISH

```


WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

* Pollutant Rates for Pervious Areas
*
POLLUTANT SERIES      JCASE=4 IWM=2 (Buildup Washoff Method)
                      PCO=3000 per cu m   PEX=1.2
                      IBM=1 (Power Linear Buildup)
                      DAYSIN=30 Days      PMAX=0.20 kg per sq m
                      PKI=0.00055 kg per 1.0 days
*
* Subcatchment 1
*
GENERATE              ID=1 SERIES=101 DT=1.0 AREA=29.53 AB=0 FRIMP=0.24
                      *** IMPERVIOUS DATA ***
                      AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
                      *** PERVIOUS DATA ***
                      AA=1 N=3 TP=0.25 SMIN=25 SMAX=165 SK=0.04
                      APIK=0.9 API=42 ABSPER=2.6
                      *** BASEFLOW DATA ***
                      NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
                      SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====
- SHAPE CONSTANT, N = 3.000          - UNIT PEAK,QP = .1284 CMS
- THE UH YIELDS  6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====
- SHAPE CONSTANT, N = 3.000          - UNIT PEAK,QP = .1350 CMS
- THE UH YIELDS  2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R    M A S S    B A L A N C E
A-TOTAL PRECIPITATION      = 18977.23 MM
B-TOTAL RUNOFF IMPRV+PERV   = 4746.75 MM
C-ALL INITIAL ABSTRACTIONS = 6249.82 MM
D-TOTAL INFILTRATED WATER  = 7980.71 MM
E-TOTAL BASE FLOW          = .00 MM
F-CHANGE IN GROUNDWATER STORAGE= 7970.40 MM
G-EVAPORATION FROM SOIL WATER = .00 MM
H-LOSS TO DEEP GROUNDWATER = 10.30 MM

SURFACE WATER BALANCE = A - B - C - D      = -.05 MM
SUBSURFACE WATER BALANCE= D - E - F - G - H = .01 MM
TOTAL BALANCE = A - B - C - E - F - G - H = -.03 MM
*
* Pond A
* Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
*
POND                  IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
                      RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
                      *** APPROACH FLOW CURVE DATA ***
                      NPOINTS=0
                      *** CONTINUOUS OUTFLOW CURVE DATA ***
                      NPOINTS=0
                      *** OPERATED OUTFLOW CURVE DATA
                      ISIG=1 NPOINTS=8
                      STAGE FLOW
                      0.0 0
                      0.01 0.00004
                      2.0 0.00010
                      2.01 0.00083
                      4.0 0.00091 PWL
                      4.5 0.16093
                      5.0 0.22695
                      5.25 0.25397 HWL
                      *** OVERFLOW CURVE DATA ***
                      ISIG=1 NPOINTS=0
                      *** POND VOLUME CURVE DATA ***
                      ISIG=1 NPOINTS=6
                      STAGE VOLUME
                      0.0 0
                      2.0 5900
                      4.0 17900 PWL
                      4.5 22000
                      5.0 26600
                      5.25 29200 HWL
                      *** POND AREA CURVE DATA ***
                      NPOINTS=0
                      *** OTHER VARIABLES ***

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.590E+04
.400E+01	.610E+04
.450E+01	.103E+05
.500E+01	.103E+05 ** WARNING ** ADJUSTED AREA
.525E+01	.105E+05

STARTING STAGE IN POND IS .400E+01 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .525E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.164E-01	.000E+00	.164E-01	.400E-04
.200E+01	.328E+01	.000E+00	.328E+01	.100E-03
.201E+01	.331E+01	.000E+00	.331E+01	.830E-03
.400E+01	.994E+01	.000E+00	.994E+01	.910E-03
.450E+01	.122E+02	.000E+00	.123E+02	.161E+00
.500E+01	.148E+02	.000E+00	.149E+02	.227E+00
.525E+01	.162E+02	.000E+00	.163E+02	.254E+00
.525E+01	.162E+02	.000E+00	.163E+02	.254E+00

FOR AN INITIAL STAGE OF .400E+01 M.,
 A VOLUME OF .179E+05 CU.M.
 AND A THROUGHFLOW RATE OF .910E-03 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .292E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .179E+05 M**3
 TOTAL VOLUME INFLOW WAS: .140E+07 M**3
 TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .140E+07 M**3

TOTAL VOLUME OUTFLOW IS: .140E+07 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .140E+07 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .140E+07 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .471E+04 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .159E+05 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: .851E+02 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: .600E-04M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .650E+06
 TOTAL QUANTITY OUT OF POND IS: .285E+05
 TOTAL QUANTITY LEFT IN POND IS: .608E+02
 TOTAL QUANTITY REMOVED IS: .622E+06
 FRACTION OF QUANTITY REMOVED IS: .956E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .254E+06
 TOTAL QUANTITY OUT OF POND IS: .237E+04
 TOTAL QUANTITY LEFT IN POND IS: .899E+00
 TOTAL QUANTITY REMOVED IS: .252E+06

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

FRACTION OF QUANTITY REMOVED IS: .991E+00

SEDIMENT FRACTION 3

TOTAL QUANTITY INTO POND IS: .368E+06
 TOTAL QUANTITY OUT OF POND IS: .606E+03
 TOTAL QUANTITY LEFT IN POND IS: .754E-07
 TOTAL QUANTITY REMOVED IS: .367E+06
 FRACTION OF QUANTITY REMOVED IS: .998E+00

SEDIMENT FRACTION 4

TOTAL QUANTITY INTO POND IS: .650E+06
 TOTAL QUANTITY OUT OF POND IS: .125E+03
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .650E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 5

TOTAL QUANTITY INTO POND IS: .905E+06
 TOTAL QUANTITY OUT OF POND IS: .247E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .905E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT

TOTAL QUANTITY INTO POND IS: .283E+07
 TOTAL QUANTITY OUT OF POND IS: .316E+05
 TOTAL QUANTITY LEFT IN POND IS: .617E+02
 TOTAL QUANTITY REMOVED IS: .280E+07
 FRACTION OF QUANTITY REMOVED IS: .989E+00
 POND VOLUME USAGE =====

OVER A SPAN OF A STAGE OF (M)	.4076E+06 HOURS & VOLUME OF (CUBIC M)	WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.2625E+00	.7744E+03	.4076E+06	100.0
.5250E+00	.1549E+04	.4076E+06	100.0
.7875E+00	.2323E+04	.4076E+06	100.0
.1050E+01	.3098E+04	.4076E+06	100.0
.1313E+01	.3872E+04	.4076E+06	100.0
.1575E+01	.4646E+04	.4076E+06	100.0
.1838E+01	.5421E+04	.4058E+06	99.6
.2100E+01	.6500E+04	.3364E+06	82.5
.2363E+01	.8075E+04	.2882E+06	70.7
.2625E+01	.9650E+04	.2372E+06	58.2
.2888E+01	.1123E+05	.1926E+06	47.3
.3150E+01	.1280E+05	.1521E+06	37.3
.3413E+01	.1438E+05	.1063E+06	26.1
.3675E+01	.1595E+05	.6713E+05	16.5
.3938E+01	.1753E+05	.2041E+05	5.0
.4200E+01	.1954E+05	.2420E+03	.1
.4463E+01	.2169E+05	.3300E+02	.0
.4725E+01	.2407E+05	.0000E+00	.0
.4987E+01	.2648E+05	.0000E+00	.0
.5250E+01	.2920E+05	.0000E+00	.0
.5512E+01	.3066E+05	.0000E+00	.0

*
 * Peak Volumes
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .188971E+05	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .103751E+05	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .108596E+05	Date (yrmody):	49 1 1
Minimum Value	CMS, M^3, or M	: .586397E+04	Date (yrmody):	49 12 31
Maximum Value	CMS, M^3, or M	: .102159E+05	Date (yrmody):	50 8 5
Minimum Value	CMS, M^3, or M	: .555893E+04	Date (yrmody):	50 12 21
Maximum Value	CMS, M^3, or M	: .202861E+05	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .573324E+04	Date (yrmody):	51 1 8
Maximum Value	CMS, M^3, or M	: .212220E+05	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .584800E+04	Date (yrmody):	52 5 1
Maximum Value	CMS, M^3, or M	: .219093E+05	Date (yrmody):	53 7 21
Minimum Value	CMS, M^3, or M	: .591280E+04	Date (yrmody):	53 5 20

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .223750E+05	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .602899E+04	Date (yrmody):	54	4	18
Maximum Value	CMS, M^3, or M	: .148107E+05	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .572574E+04	Date (yrmody):	55	12	10
Maximum Value	CMS, M^3, or M	: .156572E+05	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .544902E+04	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .192178E+05	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .573865E+04	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .127714E+05	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .573901E+04	Date (yrmody):	58	11	9
Maximum Value	CMS, M^3, or M	: .170353E+05	Date (yrmody):	59	7	28
Minimum Value	CMS, M^3, or M	: .578607E+04	Date (yrmody):	59	3	16
Maximum Value	CMS, M^3, or M	: .210677E+05	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .826008E+04	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .162255E+05	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .768050E+04	Date (yrmody):	61	5	26
Maximum Value	CMS, M^3, or M	: .150758E+05	Date (yrmody):	62	9	9
Minimum Value	CMS, M^3, or M	: .587221E+04	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .100509E+05	Date (yrmody):	63	7	31
Minimum Value	CMS, M^3, or M	: .574924E+04	Date (yrmody):	63	11	26
Maximum Value	CMS, M^3, or M	: .198269E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .574353E+04	Date (yrmody):	64	4	12
Maximum Value	CMS, M^3, or M	: .188374E+05	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .586974E+04	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .210122E+05	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .861017E+04	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .115787E+05	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .570358E+04	Date (yrmody):	67	11	24
Maximum Value	CMS, M^3, or M	: .184747E+05	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .571782E+04	Date (yrmody):	68	5	23
Maximum Value	CMS, M^3, or M	: .194996E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .578925E+04	Date (yrmody):	69	5	2
Maximum Value	CMS, M^3, or M	: .185360E+05	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .595269E+04	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .114233E+05	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .578078E+04	Date (yrmody):	71	12	8
Maximum Value	CMS, M^3, or M	: .181655E+05	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .552964E+04	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .230419E+05	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .573889E+04	Date (yrmody):	73	5	24
Maximum Value	CMS, M^3, or M	: .193876E+05	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .588761E+04	Date (yrmody):	74	5	4
Maximum Value	CMS, M^3, or M	: .190439E+05	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .570152E+04	Date (yrmody):	75	6	15
Maximum Value	CMS, M^3, or M	: .201869E+05	Date (yrmody):	76	8	20
Minimum Value	CMS, M^3, or M	: .554707E+04	Date (yrmody):	76	5	24
Maximum Value	CMS, M^3, or M	: .137572E+05	Date (yrmody):	77	9	6
Minimum Value	CMS, M^3, or M	: .662646E+04	Date (yrmody):	77	6	6
Maximum Value	CMS, M^3, or M	: .188695E+05	Date (yrmody):	78	8	18
Minimum Value	CMS, M^3, or M	: .571869E+04	Date (yrmody):	78	3	8
Maximum Value	CMS, M^3, or M	: .187863E+05	Date (yrmody):	79	6	29
Minimum Value	CMS, M^3, or M	: .576251E+04	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .203204E+05	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .581584E+04	Date (yrmody):	80	4	4
Maximum Value	CMS, M^3, or M	: .181332E+05	Date (yrmody):	81	8	28
Minimum Value	CMS, M^3, or M	: .671182E+04	Date (yrmody):	81	5	22
Maximum Value	CMS, M^3, or M	: .130620E+05	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .573405E+04	Date (yrmody):	82	12	27
Maximum Value	CMS, M^3, or M	: .186927E+05	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .526808E+04	Date (yrmody):	83	3	3
Maximum Value	CMS, M^3, or M	: .160068E+05	Date (yrmody):	84	10	5
Minimum Value	CMS, M^3, or M	: .104575E+05	Date (yrmody):	84	5	1
Maximum Value	CMS, M^3, or M	: .223254E+05	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .797099E+04	Date (yrmody):	85	5	19
Maximum Value	CMS, M^3, or M	: .223371E+05	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .839417E+04	Date (yrmody):	86	12	27
Maximum Value	CMS, M^3, or M	: .109942E+05	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .516519E+04	Date (yrmody):	87	11	12
Maximum Value	CMS, M^3, or M	: .194206E+05	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .533441E+04	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .178431E+05	Date (yrmody):	89	7	25
Minimum Value	CMS, M^3, or M	: .583253E+04	Date (yrmody):	89	5	16
Maximum Value	CMS, M^3, or M	: .125720E+05	Date (yrmody):	90	9	7
Minimum Value	CMS, M^3, or M	: .694856E+04	Date (yrmody):	90	5	5
Maximum Value	CMS, M^3, or M	: .187566E+05	Date (yrmody):	91	6	21
Minimum Value	CMS, M^3, or M	: .583982E+04	Date (yrmody):	91	4	1
Maximum Value	CMS, M^3, or M	: .159869E+05	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .677385E+04	Date (yrmody):	92	6	7
Maximum Value	CMS, M^3, or M	: .220418E+05	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .562259E+04	Date (yrmody):	93	5	10
Maximum Value	CMS, M^3, or M	: .192645E+05	Date (yrmody):	94	9	15

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Minimum Value CMS, M^3, or M : .582098E+04 Date (yrmody): 94 5 23

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* Peak Levels
*

MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .412160E+01	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .274585E+01	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .282661E+01	Date (yrmody):	49 1 1
Minimum Value	CMS, M^3, or M	: .198779E+01	Date (yrmody):	49 12 31
Maximum Value	CMS, M^3, or M	: .271931E+01	Date (yrmody):	50 8 5
Minimum Value	CMS, M^3, or M	: .188438E+01	Date (yrmody):	50 12 21
Maximum Value	CMS, M^3, or M	: .429099E+01	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .194347E+01	Date (yrmody):	51 1 8
Maximum Value	CMS, M^3, or M	: .440512E+01	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .198237E+01	Date (yrmody):	52 5 1
Maximum Value	CMS, M^3, or M	: .448893E+01	Date (yrmody):	53 7 21
Minimum Value	CMS, M^3, or M	: .200213E+01	Date (yrmody):	53 5 20
Maximum Value	CMS, M^3, or M	: .454076E+01	Date (yrmody):	54 7 2
Minimum Value	CMS, M^3, or M	: .202150E+01	Date (yrmody):	54 4 18
Maximum Value	CMS, M^3, or M	: .348512E+01	Date (yrmody):	55 6 18
Minimum Value	CMS, M^3, or M	: .194093E+01	Date (yrmody):	55 12 10
Maximum Value	CMS, M^3, or M	: .362619E+01	Date (yrmody):	56 9 22
Minimum Value	CMS, M^3, or M	: .184713E+01	Date (yrmody):	56 3 29
Maximum Value	CMS, M^3, or M	: .416071E+01	Date (yrmody):	57 7 25
Minimum Value	CMS, M^3, or M	: .194531E+01	Date (yrmody):	57 4 29
Maximum Value	CMS, M^3, or M	: .314523E+01	Date (yrmody):	58 1 1
Minimum Value	CMS, M^3, or M	: .194543E+01	Date (yrmody):	58 11 9
Maximum Value	CMS, M^3, or M	: .385588E+01	Date (yrmody):	59 7 28
Minimum Value	CMS, M^3, or M	: .196138E+01	Date (yrmody):	59 3 16
Maximum Value	CMS, M^3, or M	: .438630E+01	Date (yrmody):	60 6 24
Minimum Value	CMS, M^3, or M	: .239335E+01	Date (yrmody):	60 5 24
Maximum Value	CMS, M^3, or M	: .372091E+01	Date (yrmody):	61 9 8
Minimum Value	CMS, M^3, or M	: .229675E+01	Date (yrmody):	61 5 26
Maximum Value	CMS, M^3, or M	: .352930E+01	Date (yrmody):	62 9 9
Minimum Value	CMS, M^3, or M	: .199058E+01	Date (yrmody):	62 4 26
Maximum Value	CMS, M^3, or M	: .269182E+01	Date (yrmody):	63 7 31
Minimum Value	CMS, M^3, or M	: .194890E+01	Date (yrmody):	63 11 26
Maximum Value	CMS, M^3, or M	: .423499E+01	Date (yrmody):	64 8 9
Minimum Value	CMS, M^3, or M	: .194696E+01	Date (yrmody):	64 4 12
Maximum Value	CMS, M^3, or M	: .411431E+01	Date (yrmody):	65 9 21
Minimum Value	CMS, M^3, or M	: .198974E+01	Date (yrmody):	65 5 4
Maximum Value	CMS, M^3, or M	: .437954E+01	Date (yrmody):	66 8 17
Minimum Value	CMS, M^3, or M	: .245170E+01	Date (yrmody):	66 4 13
Maximum Value	CMS, M^3, or M	: .294645E+01	Date (yrmody):	67 1 1
Minimum Value	CMS, M^3, or M	: .193342E+01	Date (yrmody):	67 11 24
Maximum Value	CMS, M^3, or M	: .407008E+01	Date (yrmody):	68 7 29
Minimum Value	CMS, M^3, or M	: .193824E+01	Date (yrmody):	68 5 23
Maximum Value	CMS, M^3, or M	: .419507E+01	Date (yrmody):	69 7 14
Minimum Value	CMS, M^3, or M	: .196246E+01	Date (yrmody):	69 5 2
Maximum Value	CMS, M^3, or M	: .407756E+01	Date (yrmody):	70 7 8
Minimum Value	CMS, M^3, or M	: .200878E+01	Date (yrmody):	70 5 7
Maximum Value	CMS, M^3, or M	: .292054E+01	Date (yrmody):	71 1 1
Minimum Value	CMS, M^3, or M	: .195959E+01	Date (yrmody):	71 12 8
Maximum Value	CMS, M^3, or M	: .403238E+01	Date (yrmody):	72 9 23
Minimum Value	CMS, M^3, or M	: .187446E+01	Date (yrmody):	72 3 8
Maximum Value	CMS, M^3, or M	: .461325E+01	Date (yrmody):	73 9 12
Minimum Value	CMS, M^3, or M	: .194539E+01	Date (yrmody):	73 5 24
Maximum Value	CMS, M^3, or M	: .418142E+01	Date (yrmody):	74 7 17
Minimum Value	CMS, M^3, or M	: .199580E+01	Date (yrmody):	74 5 4
Maximum Value	CMS, M^3, or M	: .413950E+01	Date (yrmody):	75 8 14
Minimum Value	CMS, M^3, or M	: .193272E+01	Date (yrmody):	75 6 15
Maximum Value	CMS, M^3, or M	: .427889E+01	Date (yrmody):	76 8 20
Minimum Value	CMS, M^3, or M	: .188036E+01	Date (yrmody):	76 5 24
Maximum Value	CMS, M^3, or M	: .330953E+01	Date (yrmody):	77 9 6
Minimum Value	CMS, M^3, or M	: .212108E+01	Date (yrmody):	77 6 6
Maximum Value	CMS, M^3, or M	: .411823E+01	Date (yrmody):	78 8 18
Minimum Value	CMS, M^3, or M	: .193854E+01	Date (yrmody):	78 3 8
Maximum Value	CMS, M^3, or M	: .410808E+01	Date (yrmody):	79 6 29
Minimum Value	CMS, M^3, or M	: .195339E+01	Date (yrmody):	79 5 12
Maximum Value	CMS, M^3, or M	: .429517E+01	Date (yrmody):	80 6 24
Minimum Value	CMS, M^3, or M	: .197147E+01	Date (yrmody):	80 4 4
Maximum Value	CMS, M^3, or M	: .402844E+01	Date (yrmody):	81 8 28
Minimum Value	CMS, M^3, or M	: .213530E+01	Date (yrmody):	81 5 22
Maximum Value	CMS, M^3, or M	: .319367E+01	Date (yrmody):	82 7 15
Minimum Value	CMS, M^3, or M	: .194375E+01	Date (yrmody):	82 12 27

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Maximum Value CMS, M^3, or M : .409667E+01 Date (yrmody): 83 7 18
Minimum Value CMS, M^3, or M : .178579E+01 Date (yrmody): 83 3 3
Maximum Value CMS, M^3, or M : .368447E+01 Date (yrmody): 84 10 5
Minimum Value CMS, M^3, or M : .275959E+01 Date (yrmody): 84 5 1
Maximum Value CMS, M^3, or M : .453537E+01 Date (yrmody): 85 6 12
Minimum Value CMS, M^3, or M : .234516E+01 Date (yrmody): 85 5 19
Maximum Value CMS, M^3, or M : .453664E+01 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .241570E+01 Date (yrmody): 86 12 27
Maximum Value CMS, M^3, or M : .284903E+01 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .175091E+01 Date (yrmody): 87 11 12
Maximum Value CMS, M^3, or M : .418544E+01 Date (yrmody): 88 9 2
Minimum Value CMS, M^3, or M : .180828E+01 Date (yrmody): 88 1 1
Maximum Value CMS, M^3, or M : .399051E+01 Date (yrmody): 89 7 25
Minimum Value CMS, M^3, or M : .197713E+01 Date (yrmody): 89 5 16
Maximum Value CMS, M^3, or M : .311199E+01 Date (yrmody): 90 9 7
Minimum Value CMS, M^3, or M : .217476E+01 Date (yrmody): 90 5 5
Maximum Value CMS, M^3, or M : .410446E+01 Date (yrmody): 91 6 21
Minimum Value CMS, M^3, or M : .197960E+01 Date (yrmody): 91 4 1
Maximum Value CMS, M^3, or M : .368115E+01 Date (yrmody): 92 9 4
Minimum Value CMS, M^3, or M : .214564E+01 Date (yrmody): 92 6 7
Maximum Value CMS, M^3, or M : .450454E+01 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .190596E+01 Date (yrmody): 93 5 10
Maximum Value CMS, M^3, or M : .416641E+01 Date (yrmody): 94 9 15
Minimum Value CMS, M^3, or M : .197321E+01 Date (yrmody): 94 5 23
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
QTOTAL QMAJOR
0 0
0.00091 0
0.16093 0.160
0.22695 0.226
0.25397 0.253
*
* Discharges to Coach Creek
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

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Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	FOD conc equal or above (#/dl)	Duration: (hours)
(%)	(%)	(%)	(%)
.00	407592.0	.0	407592.0
5.00	.0	25.0	.0
10.00	.0	50.0	.0
15.00	.0	100.0	.0
20.00	.0	200.0	.0
25.00	.0	300.0	.0
30.00	.0	400.0	.0
35.00	.0	500.0	.0
40.00	.0	1000.0	.0
50.00	.0	2000.0	.0
60.00	.0	3000.0	.0
70.00	.0	4000.0	.0
80.00	.0	5000.0	.0
90.00	.0	6000.0	.0
100.00	.0	8000.0	.0
120.00	.0	10000.0	.0
150.00	.0	15000.0	.0
200.00	.0	20000.0	.0
300.00	.0	25000.0	.0
400.00	.0	30000.0	.0
500.00	.0	40000.0	.0
600.00	.0	50000.0	.0
700.00	.0	60000.0	.0
800.00	.0	80000.0	.0
1000.00	.0	100000.0	.0

Total duration = 407592.00 hours
 Max flow rate = .1753 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 254.92 1000 m3

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .02 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc: .0 .0 .0 .0 .0 mg/l
 Min conc: .0 .0 .0 .0 .0 mg/l
 Load : .0 .0 .0 .0 .0 kg

MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .376129E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .926933E-01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .124243E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .149861E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .165529E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .498979E-01	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .123616E+00	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .739030E-01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .363863E-01	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .120945E+00	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .212958E-01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .615981E-01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .229251E-01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .103414E-01	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .175273E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .580252E-01	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .446250E-01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .899343E-01	Date (yrmody):	76	8	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .375534E-01	Date (yrmody):	78	8	18

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAx=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Commercial Portion of Subcatchment 2 (23.00 ha) with Enhanced BMPs
 *

GENERATE ID=1 SERIES=102 DT=1.0 AREA=23.00 AB=0 FRIMP=0.25
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.167 SMIN=8 SMAX=53 SK=0.04
 APIK=0.9 API=42 ABSPER=5.0
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1042 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1553 CMS
 - THE UH YIELDS 3.2415 MM VOL SO MULT BY .3085 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4443.15 MM
 C-ALL INITIAL ABSTRACTIONS = 10093.96 MM
 D-TOTAL INFILTRATED WATER = 4440.18 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 4437.11 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 3.07 MM

SURFACE WATER BALANCE = A - B - C - D = -.05 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.06 MM

*
 * Residential Portion of Subcatchment 2
 *

GENERATE ID=2 SERIES=103 DT=1.0 AREA=27.18 AB=0 FRIMP=0.25
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=26 SMAX=177 SK=0.04
 APIK=0.9 API=42 ABSPER=2.7
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1231 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1226 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4789.35 MM
 C-ALL INITIAL ABSTRACTIONS = 6360.13 MM
 D-TOTAL INFILTRATED WATER = 7827.79 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 7817.77 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 10.03 MM

SURFACE WATER BALANCE = A - B - C - D = -.03 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = -.01 MM

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

TOTAL BALANCE = A - B - C - E - F - G - H = -.05 MM
 ADD SERIES ID=3 SERIES=205 IDONE=1 IDTWO=2

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

*
 * Pond B
 * Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
 *

POND IDOUT=1 IDV=2 IDL=4 SERIES=301 IDIN=3 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=8
 STAGE FLOW
 0.0 0
 0.01 0.00013
 2.0 0.00022
 2.01 0.00132
 4.0 0.00143 PWL
 4.5 0.27346
 5.0 0.38649
 5.25 0.43150 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=6
 STAGE VOLUME
 0.0 0
 2.0 15000
 4.0 38600 PWL
 4.5 46100
 5.0 54200
 5.25 58500 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.150E+05
.400E+01	.150E+05 ** WARNING ** ADJUSTED AREA
.450E+01	.150E+05
.500E+01	.174E+05
.525E+01	.174E+05 ** WARNING ** ADJUSTED AREA

STARTING STAGE IN POND IS .400E+01 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .525E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.417E-01	.000E+00	.417E-01	.130E-03
.200E+01	.833E+01	.000E+00	.833E+01	.220E-03
.201E+01	.840E+01	.000E+00	.840E+01	.132E-02
.400E+01	.214E+02	.000E+00	.214E+02	.143E-02
.450E+01	.256E+02	.000E+00	.257E+02	.273E+00
.500E+01	.301E+02	.000E+00	.303E+02	.386E+00
.525E+01	.325E+02	.000E+00	.327E+02	.432E+00
.525E+01	.325E+02	.000E+00	.327E+02	.432E+00

FOR AN INITIAL STAGE OF .400E+01 M.,
 A VOLUME OF .386E+05 CU.M.

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

AND A THROUGHFLOW RATE OF .143E-02 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .585E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .386E+05 M**3
 TOTAL VOLUME INFLOW WAS: .232E+07 M**3
 TOTAL VOLUME IN BYPASS WAS : .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .232E+07 M**3

TOTAL VOLUME OUTFLOW IS: .233E+07 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .233E+07 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .232E+07 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .939E+04 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .350E+05 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: .471E+03 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: .199E-03M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .111E+07
 TOTAL QUANTITY OUT OF POND IS: .335E+05
 TOTAL QUANTITY LEFT IN POND IS: .118E+03
 TOTAL QUANTITY REMOVED IS: .107E+07
 FRACTION OF QUANTITY REMOVED IS: .970E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .433E+06
 TOTAL QUANTITY OUT OF POND IS: .295E+04
 TOTAL QUANTITY LEFT IN POND IS: .146E+01
 TOTAL QUANTITY REMOVED IS: .430E+06
 FRACTION OF QUANTITY REMOVED IS: .993E+00

SEDIMENT FRACTION 3
 TOTAL QUANTITY INTO POND IS: .626E+06
 TOTAL QUANTITY OUT OF POND IS: .765E+03
 TOTAL QUANTITY LEFT IN POND IS: .200E-07
 TOTAL QUANTITY REMOVED IS: .625E+06
 FRACTION OF QUANTITY REMOVED IS: .999E+00

SEDIMENT FRACTION 4
 TOTAL QUANTITY INTO POND IS: .111E+07
 TOTAL QUANTITY OUT OF POND IS: .152E+03
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .111E+07
 FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 5
 TOTAL QUANTITY INTO POND IS: .154E+07
 TOTAL QUANTITY OUT OF POND IS: .296E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .154E+07
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT
 TOTAL QUANTITY INTO POND IS: .482E+07
 TOTAL QUANTITY OUT OF POND IS: .374E+05
 TOTAL QUANTITY LEFT IN POND IS: .119E+03
 TOTAL QUANTITY REMOVED IS: .478E+07
 FRACTION OF QUANTITY REMOVED IS: .992E+00

POND VOLUME USAGE =====

OVER A SPAN OF	.4076E+06 HOURS	WAS ATTAINED
A STAGE OF	& VOLUME OF	(PERCENT OF TIME)
(M)	(CUBIC M)	(HOURS)
.0000E+00	.0000E+00	.4076E+06
.2625E+00	.1969E+04	.4076E+06
		100.0
		100.0

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

.5250E+00	.3938E+04	.4076E+06	100.0
.7875E+00	.5906E+04	.4076E+06	100.0
.1050E+01	.7875E+04	.4076E+06	100.0
.1313E+01	.9844E+04	.4076E+06	100.0
.1575E+01	.1181E+05	.4076E+06	100.0
.1838E+01	.1378E+05	.4050E+06	99.4
.2100E+01	.1618E+05	.3574E+06	87.7
.2363E+01	.1928E+05	.3153E+06	77.4
.2625E+01	.2238E+05	.2680E+06	65.8
.2888E+01	.2547E+05	.2179E+06	53.5
.3150E+01	.2857E+05	.1711E+06	42.0
.3413E+01	.3167E+05	.1228E+06	30.1
.3675E+01	.3477E+05	.7190E+05	17.6
.3938E+01	.3786E+05	.2123E+05	5.2
.4200E+01	.4160E+05	.2790E+03	.1
.4463E+01	.4554E+05	.5000E+02	.0
.4725E+01	.4975E+05	.0000E+00	.0
.4987E+01	.5400E+05	.0000E+00	.0
.5250E+01	.5850E+05	.0000E+00	.0
.5512E+01	.6142E+05	.0000E+00	.0

*
* Peak Volumes
*

MAXMIN ID=2 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .404121E+05	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .255769E+05	Date (yrmody):	48	12	18
Maximum Value	CMS, M^3, or M	: .270220E+05	Date (yrmody):	49	8	11
Minimum Value	CMS, M^3, or M	: .186417E+05	Date (yrmody):	49	12	31
Maximum Value	CMS, M^3, or M	: .218515E+05	Date (yrmody):	50	9	8
Minimum Value	CMS, M^3, or M	: .141800E+05	Date (yrmody):	50	12	26
Maximum Value	CMS, M^3, or M	: .433893E+05	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .142125E+05	Date (yrmody):	51	1	8
Maximum Value	CMS, M^3, or M	: .449064E+05	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .168554E+05	Date (yrmody):	52	5	1
Maximum Value	CMS, M^3, or M	: .466287E+05	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .178834E+05	Date (yrmody):	53	5	20
Maximum Value	CMS, M^3, or M	: .478464E+05	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .189033E+05	Date (yrmody):	54	4	25
Maximum Value	CMS, M^3, or M	: .336841E+05	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .152778E+05	Date (yrmody):	55	12	26
Maximum Value	CMS, M^3, or M	: .361201E+05	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .139728E+05	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .409562E+05	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .165991E+05	Date (yrmody):	57	6	19
Maximum Value	CMS, M^3, or M	: .301429E+05	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .146968E+05	Date (yrmody):	58	12	16
Maximum Value	CMS, M^3, or M	: .355343E+05	Date (yrmody):	59	8	23
Minimum Value	CMS, M^3, or M	: .146589E+05	Date (yrmody):	59	6	4
Maximum Value	CMS, M^3, or M	: .448363E+05	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .196484E+05	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .367431E+05	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .218482E+05	Date (yrmody):	61	5	31
Maximum Value	CMS, M^3, or M	: .352207E+05	Date (yrmody):	62	9	9
Minimum Value	CMS, M^3, or M	: .181230E+05	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .240758E+05	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .144687E+05	Date (yrmody):	63	11	26
Maximum Value	CMS, M^3, or M	: .405143E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .145417E+05	Date (yrmody):	64	5	11
Maximum Value	CMS, M^3, or M	: .402566E+05	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .172067E+05	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .448930E+05	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .232186E+05	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .281454E+05	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .145633E+05	Date (yrmody):	67	11	24
Maximum Value	CMS, M^3, or M	: .397011E+05	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .145877E+05	Date (yrmody):	68	2	15
Maximum Value	CMS, M^3, or M	: .417744E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .164543E+05	Date (yrmody):	69	5	5
Maximum Value	CMS, M^3, or M	: .387709E+05	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .174165E+05	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .275235E+05	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .148787E+05	Date (yrmody):	71	12	26
Maximum Value	CMS, M^3, or M	: .391478E+05	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .139681E+05	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .481382E+05	Date (yrmody):	73	9	12

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Minimum Value CMS, M^3, or M : .149169E+05 Date (yrmody): 73 6 20
Maximum Value CMS, M^3, or M : .425242E+05 Date (yrmody): 74 7 17
Minimum Value CMS, M^3, or M : .180667E+05 Date (yrmody): 74 5 4
Maximum Value CMS, M^3, or M : .408779E+05 Date (yrmody): 75 8 14
Minimum Value CMS, M^3, or M : .146945E+05 Date (yrmody): 75 6 15
Maximum Value CMS, M^3, or M : .431086E+05 Date (yrmody): 76 8 20
Minimum Value CMS, M^3, or M : .144071E+05 Date (yrmody): 76 5 24
Maximum Value CMS, M^3, or M : .300596E+05 Date (yrmody): 77 1 7
Minimum Value CMS, M^3, or M : .178432E+05 Date (yrmody): 77 12 27
Maximum Value CMS, M^3, or M : .386378E+05 Date (yrmody): 78 8 26
Minimum Value CMS, M^3, or M : .144447E+05 Date (yrmody): 78 4 8
Maximum Value CMS, M^3, or M : .404570E+05 Date (yrmody): 79 8 11
Minimum Value CMS, M^3, or M : .160645E+05 Date (yrmody): 79 5 12
Maximum Value CMS, M^3, or M : .433939E+05 Date (yrmody): 80 6 24
Minimum Value CMS, M^3, or M : .153849E+05 Date (yrmody): 80 5 26
Maximum Value CMS, M^3, or M : .394273E+05 Date (yrmody): 81 8 28
Minimum Value CMS, M^3, or M : .202106E+05 Date (yrmody): 81 5 22
Maximum Value CMS, M^3, or M : .270396E+05 Date (yrmody): 82 7 15
Minimum Value CMS, M^3, or M : .147247E+05 Date (yrmody): 82 12 31
Maximum Value CMS, M^3, or M : .371675E+05 Date (yrmody): 83 7 21
Minimum Value CMS, M^3, or M : .135802E+05 Date (yrmody): 83 4 8
Maximum Value CMS, M^3, or M : .356671E+05 Date (yrmody): 84 10 2
Minimum Value CMS, M^3, or M : .249692E+05 Date (yrmody): 84 5 1
Maximum Value CMS, M^3, or M : .476025E+05 Date (yrmody): 85 6 12
Minimum Value CMS, M^3, or M : .215496E+05 Date (yrmody): 85 5 19
Maximum Value CMS, M^3, or M : .472356E+05 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .225461E+05 Date (yrmody): 86 12 27
Maximum Value CMS, M^3, or M : .249503E+05 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .130792E+05 Date (yrmody): 87 12 31
Maximum Value CMS, M^3, or M : .409322E+05 Date (yrmody): 88 9 2
Minimum Value CMS, M^3, or M : .130620E+05 Date (yrmody): 88 1 1
Maximum Value CMS, M^3, or M : .386751E+05 Date (yrmody): 89 7 25
Minimum Value CMS, M^3, or M : .172720E+05 Date (yrmody): 89 5 16
Maximum Value CMS, M^3, or M : .288534E+05 Date (yrmody): 90 6 11
Minimum Value CMS, M^3, or M : .192456E+05 Date (yrmody): 90 12 28
Maximum Value CMS, M^3, or M : .402435E+05 Date (yrmody): 91 6 21
Minimum Value CMS, M^3, or M : .150489E+05 Date (yrmody): 91 4 1
Maximum Value CMS, M^3, or M : .350660E+05 Date (yrmody): 92 9 4
Minimum Value CMS, M^3, or M : .196305E+05 Date (yrmody): 92 5 11
Maximum Value CMS, M^3, or M : .462610E+05 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .145224E+05 Date (yrmody): 93 5 10
Maximum Value CMS, M^3, or M : .416721E+05 Date (yrmody): 94 9 15
Minimum Value CMS, M^3, or M : .167327E+05 Date (yrmody): 94 5 26

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* Peak Levels
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MAXMIN          ID=4 IOPT=1
                START DATE      YR=48 MO=05 DAY=02
                END   DATE      YR=94 MO=10 DAY=30

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ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

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Maximum Value CMS, M^3, or M : .412081E+01 Date (yrmody): 48 7 1
Minimum Value CMS, M^3, or M : .289634E+01 Date (yrmody): 48 12 18
Maximum Value CMS, M^3, or M : .301881E+01 Date (yrmody): 49 8 11
Minimum Value CMS, M^3, or M : .230862E+01 Date (yrmody): 49 12 31
Maximum Value CMS, M^3, or M : .258064E+01 Date (yrmody): 50 9 8
Minimum Value CMS, M^3, or M : .189067E+01 Date (yrmody): 50 12 26
Maximum Value CMS, M^3, or M : .431928E+01 Date (yrmody): 51 7 25
Minimum Value CMS, M^3, or M : .189500E+01 Date (yrmody): 51 1 8
Maximum Value CMS, M^3, or M : .442042E+01 Date (yrmody): 52 7 5
Minimum Value CMS, M^3, or M : .215724E+01 Date (yrmody): 52 5 1
Maximum Value CMS, M^3, or M : .453264E+01 Date (yrmody): 53 7 21
Minimum Value CMS, M^3, or M : .224435E+01 Date (yrmody): 53 5 20
Maximum Value CMS, M^3, or M : .460780E+01 Date (yrmody): 54 7 2
Minimum Value CMS, M^3, or M : .233079E+01 Date (yrmody): 54 4 25
Maximum Value CMS, M^3, or M : .358340E+01 Date (yrmody): 55 6 18
Minimum Value CMS, M^3, or M : .202355E+01 Date (yrmody): 55 12 26
Maximum Value CMS, M^3, or M : .378984E+01 Date (yrmody): 56 9 22
Minimum Value CMS, M^3, or M : .186304E+01 Date (yrmody): 56 3 29
Maximum Value CMS, M^3, or M : .415708E+01 Date (yrmody): 57 7 25
Minimum Value CMS, M^3, or M : .213552E+01 Date (yrmody): 57 6 19
Maximum Value CMS, M^3, or M : .328329E+01 Date (yrmody): 58 1 1
Minimum Value CMS, M^3, or M : .195957E+01 Date (yrmody): 58 12 16
Maximum Value CMS, M^3, or M : .374020E+01 Date (yrmody): 59 8 23
Minimum Value CMS, M^3, or M : .195453E+01 Date (yrmody): 59 6 4
Maximum Value CMS, M^3, or M : .441575E+01 Date (yrmody): 60 6 24
Minimum Value CMS, M^3, or M : .239393E+01 Date (yrmody): 60 5 24
Maximum Value CMS, M^3, or M : .384264E+01 Date (yrmody): 61 9 8
Minimum Value CMS, M^3, or M : .258036E+01 Date (yrmody): 61 5 31

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WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .371362E+01	Date (yrmody):	62	9	9
Minimum Value	CMS, M^3, or M	: .226466E+01	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .276914E+01	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .192917E+01	Date (yrmody):	63	11	26
Maximum Value	CMS, M^3, or M	: .412762E+01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .193889E+01	Date (yrmody):	64	5	11
Maximum Value	CMS, M^3, or M	: .411044E+01	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .218701E+01	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .441953E+01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .269649E+01	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .311402E+01	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .194177E+01	Date (yrmody):	67	11	24
Maximum Value	CMS, M^3, or M	: .407341E+01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .194502E+01	Date (yrmody):	68	2	15
Maximum Value	CMS, M^3, or M	: .421163E+01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .212325E+01	Date (yrmody):	69	5	5
Maximum Value	CMS, M^3, or M	: .401139E+01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .220479E+01	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .306131E+01	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .198383E+01	Date (yrmody):	71	12	26
Maximum Value	CMS, M^3, or M	: .403652E+01	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .186241E+01	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .462582E+01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .198892E+01	Date (yrmody):	73	6	20
Maximum Value	CMS, M^3, or M	: .426162E+01	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .225989E+01	Date (yrmody):	74	5	4
Maximum Value	CMS, M^3, or M	: .415186E+01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .195926E+01	Date (yrmody):	75	6	15
Maximum Value	CMS, M^3, or M	: .430057E+01	Date (yrmody):	76	8	20
Minimum Value	CMS, M^3, or M	: .192095E+01	Date (yrmody):	76	5	24
Maximum Value	CMS, M^3, or M	: .327624E+01	Date (yrmody):	77	1	7
Minimum Value	CMS, M^3, or M	: .224095E+01	Date (yrmody):	77	12	27
Maximum Value	CMS, M^3, or M	: .400252E+01	Date (yrmody):	78	8	26
Minimum Value	CMS, M^3, or M	: .192596E+01	Date (yrmody):	78	4	8
Maximum Value	CMS, M^3, or M	: .412380E+01	Date (yrmody):	79	8	11
Minimum Value	CMS, M^3, or M	: .209021E+01	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .431959E+01	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .203262E+01	Date (yrmody):	80	5	26
Maximum Value	CMS, M^3, or M	: .405515E+01	Date (yrmody):	81	8	28
Minimum Value	CMS, M^3, or M	: .244158E+01	Date (yrmody):	81	5	22
Maximum Value	CMS, M^3, or M	: .302030E+01	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .196329E+01	Date (yrmody):	82	12	31
Maximum Value	CMS, M^3, or M	: .387860E+01	Date (yrmody):	83	7	21
Minimum Value	CMS, M^3, or M	: .181069E+01	Date (yrmody):	83	4	8
Maximum Value	CMS, M^3, or M	: .375145E+01	Date (yrmody):	84	10	2
Minimum Value	CMS, M^3, or M	: .284485E+01	Date (yrmody):	84	5	1
Maximum Value	CMS, M^3, or M	: .459275E+01	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .255505E+01	Date (yrmody):	85	5	19
Maximum Value	CMS, M^3, or M	: .457010E+01	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .263950E+01	Date (yrmody):	86	12	27
Maximum Value	CMS, M^3, or M	: .284325E+01	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .174390E+01	Date (yrmody):	87	12	31
Maximum Value	CMS, M^3, or M	: .415548E+01	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .174160E+01	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .400501E+01	Date (yrmody):	89	7	25
Minimum Value	CMS, M^3, or M	: .219254E+01	Date (yrmody):	89	5	16
Maximum Value	CMS, M^3, or M	: .317402E+01	Date (yrmody):	90	6	11
Minimum Value	CMS, M^3, or M	: .235980E+01	Date (yrmody):	90	12	28
Maximum Value	CMS, M^3, or M	: .410957E+01	Date (yrmody):	91	6	21
Minimum Value	CMS, M^3, or M	: .200414E+01	Date (yrmody):	91	4	1
Maximum Value	CMS, M^3, or M	: .370051E+01	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .239241E+01	Date (yrmody):	92	5	11
Maximum Value	CMS, M^3, or M	: .450994E+01	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .193632E+01	Date (yrmody):	93	5	10
Maximum Value	CMS, M^3, or M	: .420481E+01	Date (yrmody):	94	9	15
Minimum Value	CMS, M^3, or M	: .214684E+01	Date (yrmody):	94	5	26

SPLIT SERIES ID=1 IDOUT=2 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
 QTOTAL QMAJOR
 0 0
 0.00143 0
 0.27346 0.272
 0.38649 0.385
 0.43150 0.430

*
 * Discharges to Coach Creek
 *

SERIES STATS ID=2
 START YR=48 MO=05 DAY=02
 END YR=94 MO=10 DAY=30

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Routine SERIES STATS for ID = 2 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 2:

TSS conc equal or above		Duration:		FOD conc equal or above		Duration:	
(mg/l)	(hours)	(%)	(#/dl)	(hours)	(%)	(hours)	(%)
.00	407592.0	100.00	.0	407592.0	100.00	.0	.00
5.00	.0	.00	25.0	.0	.00	.0	.00
10.00	.0	.00	50.0	.0	.00	.0	.00
15.00	.0	.00	100.0	.0	.00	.0	.00
20.00	.0	.00	200.0	.0	.00	.0	.00
25.00	.0	.00	300.0	.0	.00	.0	.00
30.00	.0	.00	400.0	.0	.00	.0	.00
35.00	.0	.00	500.0	.0	.00	.0	.00
40.00	.0	.00	1000.0	.0	.00	.0	.00
50.00	.0	.00	2000.0	.0	.00	.0	.00
60.00	.0	.00	3000.0	.0	.00	.0	.00
70.00	.0	.00	4000.0	.0	.00	.0	.00
80.00	.0	.00	5000.0	.0	.00	.0	.00
90.00	.0	.00	6000.0	.0	.00	.0	.00
100.00	.0	.00	8000.0	.0	.00	.0	.00
120.00	.0	.00	10000.0	.0	.00	.0	.00
150.00	.0	.00	15000.0	.0	.00	.0	.00
200.00	.0	.00	20000.0	.0	.00	.0	.00
300.00	.0	.00	25000.0	.0	.00	.0	.00
400.00	.0	.00	30000.0	.0	.00	.0	.00
500.00	.0	.00	40000.0	.0	.00	.0	.00
600.00	.0	.00	50000.0	.0	.00	.0	.00
700.00	.0	.00	60000.0	.0	.00	.0	.00
800.00	.0	.00	80000.0	.0	.00	.0	.00
1000.00	.0	.00	100000.0	.0	.00	.0	.00

Total duration = 407592.00 hours
 Max flow rate = .3007 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 458.27 1000 m3

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .02 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc:	.0	.0	.0	.0	.0 mg/l
Min conc:	.0	.0	.0	.0	.0 mg/l
Load :	.0	.0	.0	.0	.0 kg
MAXMIN	ID=2	IOPT=1			
	START DATE	YR=48	MO=05	DAY=02	
	END DATE	YR=94	MO=10	DAY=30	

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .630244E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	3
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .172391E+00	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .218856E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .272165E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .296289E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .839463E-01	Date (yrmody):	57	7	25

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment B1-OS
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=18.94 AB=0 FRIMP=0
 *** NO IMPERVIOUS DATA ***
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.16 SMIN=42 SMAX=277 SK=0.04
 APIK=0.9 API=42 ABSPER=3.2
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1780 CMS
 - THE UH YIELDS 3.3834 MM VOL SO MULT BY .2956 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 1158.10 MM
 C-ALL INITIAL ABSTRACTIONS = 7718.21 MM
 D-TOTAL INFILTRATED WATER = 10101.00 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 10098.11 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 2.89 MM

SURFACE WATER BALANCE = A - B - C - D = -.08 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.08 MM

*
 * Commercial Portion of Subcatchment 3 (11.10 ha) with Enhanced BMPs
 *

GENERATE ID=2 SERIES=102 DT=1.0 AREA=11.10 AB=0 FRIMP=0.25
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.167 SMIN=8 SMAX=53 SK=0.04
 APIK=0.9 API=42 ABSPER=5.0
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0503 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0750 CMS
 - THE UH YIELDS 3.2415 MM VOL SO MULT BY .3085 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4443.15 MM
 C-ALL INITIAL ABSTRACTIONS = 10093.96 MM
 D-TOTAL INFILTRATED WATER = 4440.18 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 4437.11 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 3.07 MM

SURFACE WATER BALANCE = A - B - C - D = -.05 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.06 MM

*
 * Residential Portion of Subcatchment 3
 *

GENERATE ID=3 SERIES=103 DT=1.0 AREA=14.10 AB=0 FRIMP=0.27
 *** IMPERVIOUS DATA ***

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=26 SMAX=175 SK=0.04
 APIK=0.9 API=42 ABSPER=2.7
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0690 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0619 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E

A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 5042.60 MM
 C-ALL INITIAL ABSTRACTIONS = 6317.01 MM
 D-TOTAL INFILTRATED WATER = 7617.66 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 7607.71 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 9.96 MM

SURFACE WATER BALANCE = A - B - C - D = -.04 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = -.01 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.05 MM
 ADD SERIES ID=4 SERIES=201 IDONE=1 IDTWO=2

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

ADD SERIES ID=1 SERIES=202 IDONE=4 IDTWO=3

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

*
 * Pond C
 * Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
 *

POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=8
 STAGE FLOW
 0.0 0
 0.01 0.00005
 2.0 0.00012
 2.01 0.00069
 4.0 0.00077 PWL
 4.5 0.23979
 5.0 0.33881
 5.25 0.37883 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=6
 STAGE VOLUME
 0.0 0
 2.0 7300
 4.0 20900 PWL
 4.5 25500
 5.0 30600
 5.25 33300 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.730E+04
.400E+01	.730E+04 ** WARNING ** ADJUSTED AREA
.450E+01	.111E+05
.500E+01	.111E+05 ** WARNING ** ADJUSTED AREA
.525E+01	.111E+05 ** WARNING ** ADJUSTED AREA

STARTING STAGE IN POND IS .400E+01 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .525E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.203E-01	.000E+00	.203E-01	.500E-04
.200E+01	.406E+01	.000E+00	.406E+01	.120E-03
.201E+01	.409E+01	.000E+00	.409E+01	.690E-03
.400E+01	.116E+02	.000E+00	.116E+02	.770E-03
.450E+01	.142E+02	.000E+00	.143E+02	.240E+00
.500E+01	.170E+02	.000E+00	.172E+02	.339E+00
.525E+01	.185E+02	.000E+00	.187E+02	.379E+00
.525E+01	.185E+02	.000E+00	.187E+02	.379E+00

FOR AN INITIAL STAGE OF .400E+01 M.,
 A VOLUME OF .209E+05 CU.M.
 AND A THROUGHFLOW RATE OF .770E-03 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .333E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .209E+05 M**3
 TOTAL VOLUME INFLOW WAS: .142E+07 M**3
 TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .142E+07 M**3

TOTAL VOLUME OUTFLOW IS: .143E+07 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .143E+07 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .142E+07 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .617E+04 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .190E+05 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: -.128E+03 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: -.883E-04M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .946E+06
 TOTAL QUANTITY OUT OF POND IS: .558E+05
 TOTAL QUANTITY LEFT IN POND IS: .709E+02
 TOTAL QUANTITY REMOVED IS: .890E+06
 FRACTION OF QUANTITY REMOVED IS: .941E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .370E+06
 TOTAL QUANTITY OUT OF POND IS: .660E+04
 TOTAL QUANTITY LEFT IN POND IS: .125E+01
 TOTAL QUANTITY REMOVED IS: .363E+06

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FRACTION OF QUANTITY REMOVED IS: .982E+00

SEDIMENT FRACTION 3

TOTAL QUANTITY INTO POND IS: .534E+06
 TOTAL QUANTITY OUT OF POND IS: .201E+04
 TOTAL QUANTITY LEFT IN POND IS: .123E-06
 TOTAL QUANTITY REMOVED IS: .532E+06
 FRACTION OF QUANTITY REMOVED IS: .996E+00

SEDIMENT FRACTION 4

TOTAL QUANTITY INTO POND IS: .946E+06
 TOTAL QUANTITY OUT OF POND IS: .408E+03
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .945E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 5

TOTAL QUANTITY INTO POND IS: .132E+07
 TOTAL QUANTITY OUT OF POND IS: .782E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .132E+07
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT

TOTAL QUANTITY INTO POND IS: .411E+07
 TOTAL QUANTITY OUT OF POND IS: .649E+05
 TOTAL QUANTITY LEFT IN POND IS: .722E+02
 TOTAL QUANTITY REMOVED IS: .405E+07
 FRACTION OF QUANTITY REMOVED IS: .984E+00
 POND VOLUME USAGE =====

OVER A SPAN OF A STAGE OF (M)	.4076E+06 HOURS & VOLUME OF (CUBIC M)	WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.2625E+00	.9581E+03	.4076E+06	100.0
.5250E+00	.1916E+04	.4076E+06	100.0
.7875E+00	.2874E+04	.4076E+06	100.0
.1050E+01	.3833E+04	.4076E+06	100.0
.1313E+01	.4791E+04	.4076E+06	100.0
.1575E+01	.5749E+04	.4076E+06	100.0
.1838E+01	.6707E+04	.4063E+06	99.7
.2100E+01	.7980E+04	.3756E+06	92.1
.2363E+01	.9765E+04	.3514E+06	86.2
.2625E+01	.1155E+05	.3088E+06	75.8
.2888E+01	.1334E+05	.2560E+06	62.8
.3150E+01	.1512E+05	.2036E+06	49.9
.3413E+01	.1691E+05	.1532E+06	37.6
.3675E+01	.1869E+05	.9924E+05	24.3
.3938E+01	.2048E+05	.3017E+05	7.4
.4200E+01	.2274E+05	.2520E+03	.1
.4463E+01	.2516E+05	.3700E+02	.0
.4725E+01	.2780E+05	.2000E+01	.0
.4987E+01	.3047E+05	.0000E+00	.0
.5250E+01	.3330E+05	.0000E+00	.0
.5512E+01	.3496E+05	.0000E+00	.0

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 * Peak Volumes
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .219295E+05	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .140604E+05	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .162820E+05	Date (yrmody):	49 8 11
Minimum Value	CMS, M^3, or M	: .116169E+05	Date (yrmody):	49 2 21
Maximum Value	CMS, M^3, or M	: .121635E+05	Date (yrmody):	50 9 8
Minimum Value	CMS, M^3, or M	: .706598E+04	Date (yrmody):	50 12 26
Maximum Value	CMS, M^3, or M	: .237143E+05	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .708808E+04	Date (yrmody):	51 1 8
Maximum Value	CMS, M^3, or M	: .248748E+05	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .943879E+04	Date (yrmody):	52 5 1
Maximum Value	CMS, M^3, or M	: .259646E+05	Date (yrmody):	53 7 21
Minimum Value	CMS, M^3, or M	: .105167E+05	Date (yrmody):	53 5 20

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .263691E+05	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .106828E+05	Date (yrmody):	54	4	25
Maximum Value	CMS, M^3, or M	: .198472E+05	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .100264E+05	Date (yrmody):	55	12	26
Maximum Value	CMS, M^3, or M	: .212848E+05	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .701839E+04	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .225335E+05	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .107686E+05	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .164953E+05	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .728230E+04	Date (yrmody):	58	12	31
Maximum Value	CMS, M^3, or M	: .206348E+05	Date (yrmody):	59	8	23
Minimum Value	CMS, M^3, or M	: .713212E+04	Date (yrmody):	59	3	20
Maximum Value	CMS, M^3, or M	: .248278E+05	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .125260E+05	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .214238E+05	Date (yrmody):	61	9	7
Minimum Value	CMS, M^3, or M	: .124352E+05	Date (yrmody):	61	5	26
Maximum Value	CMS, M^3, or M	: .217269E+05	Date (yrmody):	62	8	13
Minimum Value	CMS, M^3, or M	: .112282E+05	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .149444E+05	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .879926E+04	Date (yrmody):	63	12	9
Maximum Value	CMS, M^3, or M	: .232059E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .708955E+04	Date (yrmody):	64	5	11
Maximum Value	CMS, M^3, or M	: .224297E+05	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .979004E+04	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .246598E+05	Date (yrmody):	66	8	16
Minimum Value	CMS, M^3, or M	: .129969E+05	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .153625E+05	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .720547E+04	Date (yrmody):	67	12	9
Maximum Value	CMS, M^3, or M	: .215617E+05	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .708409E+04	Date (yrmody):	68	2	15
Maximum Value	CMS, M^3, or M	: .227056E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .945910E+04	Date (yrmody):	69	5	5
Maximum Value	CMS, M^3, or M	: .218438E+05	Date (yrmody):	70	7	4
Minimum Value	CMS, M^3, or M	: .100297E+05	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .159440E+05	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .902084E+04	Date (yrmody):	71	12	31
Maximum Value	CMS, M^3, or M	: .212734E+05	Date (yrmody):	72	9	12
Minimum Value	CMS, M^3, or M	: .695194E+04	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .281807E+05	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .821956E+04	Date (yrmody):	73	6	20
Maximum Value	CMS, M^3, or M	: .231919E+05	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .101514E+05	Date (yrmody):	74	5	4
Maximum Value	CMS, M^3, or M	: .221334E+05	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .727524E+04	Date (yrmody):	75	7	2
Maximum Value	CMS, M^3, or M	: .237146E+05	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .714375E+04	Date (yrmody):	76	5	24
Maximum Value	CMS, M^3, or M	: .172006E+05	Date (yrmody):	77	9	5
Minimum Value	CMS, M^3, or M	: .108988E+05	Date (yrmody):	77	6	6
Maximum Value	CMS, M^3, or M	: .215175E+05	Date (yrmody):	78	8	18
Minimum Value	CMS, M^3, or M	: .712219E+04	Date (yrmody):	78	4	8
Maximum Value	CMS, M^3, or M	: .223364E+05	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .918509E+04	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .237730E+05	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .886419E+04	Date (yrmody):	80	5	26
Maximum Value	CMS, M^3, or M	: .216988E+05	Date (yrmody):	81	8	14
Minimum Value	CMS, M^3, or M	: .116694E+05	Date (yrmody):	81	5	7
Maximum Value	CMS, M^3, or M	: .151491E+05	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .729812E+04	Date (yrmody):	82	5	13
Maximum Value	CMS, M^3, or M	: .213208E+05	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .679050E+04	Date (yrmody):	83	4	8
Maximum Value	CMS, M^3, or M	: .212862E+05	Date (yrmody):	84	8	3
Minimum Value	CMS, M^3, or M	: .151316E+05	Date (yrmody):	84	5	1
Maximum Value	CMS, M^3, or M	: .263283E+05	Date (yrmody):	85	6	11
Minimum Value	CMS, M^3, or M	: .137437E+05	Date (yrmody):	85	5	19
Maximum Value	CMS, M^3, or M	: .260970E+05	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .124282E+05	Date (yrmody):	86	12	27
Maximum Value	CMS, M^3, or M	: .134795E+05	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .644222E+04	Date (yrmody):	87	12	31
Maximum Value	CMS, M^3, or M	: .226409E+05	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .643297E+04	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .219317E+05	Date (yrmody):	89	7	16
Minimum Value	CMS, M^3, or M	: .990330E+04	Date (yrmody):	89	4	1
Maximum Value	CMS, M^3, or M	: .172195E+05	Date (yrmody):	90	9	7
Minimum Value	CMS, M^3, or M	: .113968E+05	Date (yrmody):	90	5	5
Maximum Value	CMS, M^3, or M	: .219889E+05	Date (yrmody):	91	6	20
Minimum Value	CMS, M^3, or M	: .102534E+05	Date (yrmody):	91	4	1
Maximum Value	CMS, M^3, or M	: .211012E+05	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .112856E+05	Date (yrmody):	92	5	11
Maximum Value	CMS, M^3, or M	: .260953E+05	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .786260E+04	Date (yrmody):	93	6	2
Maximum Value	CMS, M^3, or M	: .230525E+05	Date (yrmody):	94	6	22

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Minimum Value CMS, M^3, or M : .956192E+04 Date (yrmody): 94 5 26

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* Peak Levels
*

MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .411190E+01	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .299417E+01	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .332088E+01	Date (yrmody):	49 8 11
Minimum Value	CMS, M^3, or M	: .263484E+01	Date (yrmody):	49 2 21
Maximum Value	CMS, M^3, or M	: .271522E+01	Date (yrmody):	50 9 8
Minimum Value	CMS, M^3, or M	: .193588E+01	Date (yrmody):	50 12 26
Maximum Value	CMS, M^3, or M	: .430590E+01	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .194194E+01	Date (yrmody):	51 1 8
Maximum Value	CMS, M^3, or M	: .443204E+01	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .231453E+01	Date (yrmody):	52 5 1
Maximum Value	CMS, M^3, or M	: .454555E+01	Date (yrmody):	53 7 21
Minimum Value	CMS, M^3, or M	: .247304E+01	Date (yrmody):	53 5 20
Maximum Value	CMS, M^3, or M	: .458520E+01	Date (yrmody):	54 7 2
Minimum Value	CMS, M^3, or M	: .249747E+01	Date (yrmody):	54 4 25
Maximum Value	CMS, M^3, or M	: .384518E+01	Date (yrmody):	55 6 18
Minimum Value	CMS, M^3, or M	: .240095E+01	Date (yrmody):	55 12 26
Maximum Value	CMS, M^3, or M	: .404182E+01	Date (yrmody):	56 9 22
Minimum Value	CMS, M^3, or M	: .192285E+01	Date (yrmody):	56 3 29
Maximum Value	CMS, M^3, or M	: .417756E+01	Date (yrmody):	57 6 28
Minimum Value	CMS, M^3, or M	: .251009E+01	Date (yrmody):	57 4 29
Maximum Value	CMS, M^3, or M	: .335225E+01	Date (yrmody):	58 1 1
Minimum Value	CMS, M^3, or M	: .199515E+01	Date (yrmody):	58 12 31
Maximum Value	CMS, M^3, or M	: .396101E+01	Date (yrmody):	59 8 23
Minimum Value	CMS, M^3, or M	: .195401E+01	Date (yrmody):	59 3 20
Maximum Value	CMS, M^3, or M	: .442694E+01	Date (yrmody):	60 6 24
Minimum Value	CMS, M^3, or M	: .276854E+01	Date (yrmody):	60 5 24
Maximum Value	CMS, M^3, or M	: .405694E+01	Date (yrmody):	61 9 7
Minimum Value	CMS, M^3, or M	: .275518E+01	Date (yrmody):	61 5 26
Maximum Value	CMS, M^3, or M	: .408988E+01	Date (yrmody):	62 8 13
Minimum Value	CMS, M^3, or M	: .257768E+01	Date (yrmody):	62 4 26
Maximum Value	CMS, M^3, or M	: .312418E+01	Date (yrmody):	63 1 1
Minimum Value	CMS, M^3, or M	: .222048E+01	Date (yrmody):	63 12 9
Maximum Value	CMS, M^3, or M	: .425064E+01	Date (yrmody):	64 8 9
Minimum Value	CMS, M^3, or M	: .194234E+01	Date (yrmody):	64 5 11
Maximum Value	CMS, M^3, or M	: .416627E+01	Date (yrmody):	65 8 19
Minimum Value	CMS, M^3, or M	: .236618E+01	Date (yrmody):	65 5 4
Maximum Value	CMS, M^3, or M	: .440867E+01	Date (yrmody):	66 8 16
Minimum Value	CMS, M^3, or M	: .283778E+01	Date (yrmody):	66 4 13
Maximum Value	CMS, M^3, or M	: .318566E+01	Date (yrmody):	67 1 1
Minimum Value	CMS, M^3, or M	: .197410E+01	Date (yrmody):	67 12 9
Maximum Value	CMS, M^3, or M	: .407192E+01	Date (yrmody):	68 7 29
Minimum Value	CMS, M^3, or M	: .194085E+01	Date (yrmody):	68 2 15
Maximum Value	CMS, M^3, or M	: .419626E+01	Date (yrmody):	69 7 14
Minimum Value	CMS, M^3, or M	: .231751E+01	Date (yrmody):	69 5 5
Maximum Value	CMS, M^3, or M	: .410259E+01	Date (yrmody):	70 7 4
Minimum Value	CMS, M^3, or M	: .240143E+01	Date (yrmody):	70 5 7
Maximum Value	CMS, M^3, or M	: .327117E+01	Date (yrmody):	71 8 18
Minimum Value	CMS, M^3, or M	: .225306E+01	Date (yrmody):	71 12 31
Maximum Value	CMS, M^3, or M	: .404059E+01	Date (yrmody):	72 9 12
Minimum Value	CMS, M^3, or M	: .190464E+01	Date (yrmody):	72 3 8
Maximum Value	CMS, M^3, or M	: .476281E+01	Date (yrmody):	73 9 12
Minimum Value	CMS, M^3, or M	: .213523E+01	Date (yrmody):	73 6 20
Maximum Value	CMS, M^3, or M	: .424912E+01	Date (yrmody):	74 7 17
Minimum Value	CMS, M^3, or M	: .241933E+01	Date (yrmody):	74 5 4
Maximum Value	CMS, M^3, or M	: .413407E+01	Date (yrmody):	75 8 14
Minimum Value	CMS, M^3, or M	: .199322E+01	Date (yrmody):	75 7 2
Maximum Value	CMS, M^3, or M	: .430593E+01	Date (yrmody):	76 8 1
Minimum Value	CMS, M^3, or M	: .195719E+01	Date (yrmody):	76 5 24
Maximum Value	CMS, M^3, or M	: .345598E+01	Date (yrmody):	77 9 5
Minimum Value	CMS, M^3, or M	: .252924E+01	Date (yrmody):	77 6 6
Maximum Value	CMS, M^3, or M	: .406712E+01	Date (yrmody):	78 8 18
Minimum Value	CMS, M^3, or M	: .195128E+01	Date (yrmody):	78 4 8
Maximum Value	CMS, M^3, or M	: .415613E+01	Date (yrmody):	79 6 23
Minimum Value	CMS, M^3, or M	: .227722E+01	Date (yrmody):	79 5 12
Maximum Value	CMS, M^3, or M	: .431229E+01	Date (yrmody):	80 6 14
Minimum Value	CMS, M^3, or M	: .223003E+01	Date (yrmody):	80 5 26
Maximum Value	CMS, M^3, or M	: .408682E+01	Date (yrmody):	81 8 14
Minimum Value	CMS, M^3, or M	: .264256E+01	Date (yrmody):	81 5 7
Maximum Value	CMS, M^3, or M	: .315429E+01	Date (yrmody):	82 7 15
Minimum Value	CMS, M^3, or M	: .199948E+01	Date (yrmody):	82 5 13

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Maximum Value CMS, M^3, or M : .404573E+01 Date (yrmody): 83 7 18
Minimum Value CMS, M^3, or M : .186041E+01 Date (yrmody): 83 4 8
Maximum Value CMS, M^3, or M : .404198E+01 Date (yrmody): 84 8 3
Minimum Value CMS, M^3, or M : .315171E+01 Date (yrmody): 84 5 1
Maximum Value CMS, M^3, or M : .458120E+01 Date (yrmody): 85 6 11
Minimum Value CMS, M^3, or M : .294760E+01 Date (yrmody): 85 5 19
Maximum Value CMS, M^3, or M : .455853E+01 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .275415E+01 Date (yrmody): 86 12 27
Maximum Value CMS, M^3, or M : .290874E+01 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .176499E+01 Date (yrmody): 87 12 31
Maximum Value CMS, M^3, or M : .418923E+01 Date (yrmody): 88 9 2
Minimum Value CMS, M^3, or M : .176246E+01 Date (yrmody): 88 1 1
Maximum Value CMS, M^3, or M : .411214E+01 Date (yrmody): 89 7 16
Minimum Value CMS, M^3, or M : .238284E+01 Date (yrmody): 89 4 1
Maximum Value CMS, M^3, or M : .345875E+01 Date (yrmody): 90 9 7
Minimum Value CMS, M^3, or M : .260248E+01 Date (yrmody): 90 5 5
Maximum Value CMS, M^3, or M : .411836E+01 Date (yrmody): 91 6 20
Minimum Value CMS, M^3, or M : .243433E+01 Date (yrmody): 91 4 1
Maximum Value CMS, M^3, or M : .402187E+01 Date (yrmody): 92 9 4
Minimum Value CMS, M^3, or M : .258612E+01 Date (yrmody): 92 5 11
Maximum Value CMS, M^3, or M : .455837E+01 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .208274E+01 Date (yrmody): 93 6 2
Maximum Value CMS, M^3, or M : .423397E+01 Date (yrmody): 94 6 22
Minimum Value CMS, M^3, or M : .233263E+01 Date (yrmody): 94 5 26
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
QTOTAL QDISCHARGE
0 0
0.00077 0
0.23975 0.239
0.33881 0.338
0.37883 0.378
*
* Discharges to the West
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

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Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	FOD conc equal or above (#/dl)	Duration: (hours)
	(%)		(%)
.00	407592.0	.0	407592.0
5.00	.0	25.0	.0
10.00	.0	50.0	.0
15.00	.0	100.0	.0
20.00	.0	200.0	.0
25.00	.0	300.0	.0
30.00	.0	400.0	.0
35.00	.0	500.0	.0
40.00	.0	1000.0	.0
50.00	.0	2000.0	.0
60.00	.0	3000.0	.0
70.00	.0	4000.0	.0
80.00	.0	5000.0	.0
90.00	.0	6000.0	.0
100.00	.0	8000.0	.0
120.00	.0	10000.0	.0
150.00	.0	15000.0	.0
200.00	.0	20000.0	.0
300.00	.0	25000.0	.0
400.00	.0	30000.0	.0
500.00	.0	40000.0	.0
600.00	.0	50000.0	.0
700.00	.0	60000.0	.0
800.00	.0	80000.0	.0
1000.00	.0	100000.0	.0

Total duration = 407592.00 hours
 Max flow rate = .2911 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 392.51 1000 m3

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .05 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc: .0 .0 .0 .0 .0 mg/l
 Min conc: .0 .0 .0 .0 .0 mg/l
 Load : .0 .0 .0 .0 .0 kg
 MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .516995E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .146532E+00	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .199597E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .244574E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .256708E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .196967E-01	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .843115E-01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .199673E+00	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .272238E-01	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .423747E-01	Date (yrmody):	62	8	13
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .118197E+00	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .757521E-01	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .197387E+00	Date (yrmody):	66	8	16
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .328882E-01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .928794E-01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .490093E-01	Date (yrmody):	70	7	4
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .194260E-01	Date (yrmody):	72	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .291147E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .118153E+00	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .642170E-01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .149681E+00	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .324245E-01	Date (yrmody):	78	8	18

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment 6
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=15.59 AB=0 FRIMP=0
 *** NO IMPERVIOUS DATA ***
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.083 SMIN=16 SMAX=90 SK=0.04
 APIK=0.9 API=42 ABSPER=3.2
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .2824 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 2597.10 MM
 C-ALL INITIAL ABSTRACTIONS = 7718.21 MM
 D-TOTAL INFILTRATED WATER = 8661.98 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 8659.29 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 2.70 MM

SURFACE WATER BALANCE = A - B - C - D = -.06 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = -.01 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.08 MM

*
 * Ponds D1 & D2 (Combined)
 * Discharges @ 8.57 L/s/ha + Evaporation
 *

POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=5
 STAGE FLOW
 0.0 0
 0.5 0.00015
 1.0 0.00017
 1.5 0.00019 PWL
 2.0 0.13421 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=5
 STAGE VOLUME
 0.0 0
 0.5 3200
 1.0 6700
 1.5 10700 PWL
 2.0 15200 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=0.5 FEMULT=1 SEMULT=1 SPILL=2.0

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.500E+00	.128E+05
.100E+01	.128E+05 ** WARNING ** ADJUSTED AREA
.150E+01	.128E+05 ** WARNING ** ADJUSTED AREA
.200E+01	.128E+05 ** WARNING ** ADJUSTED AREA

STARTING STAGE IN POND IS .500E+00 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .200E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.500E+00	.178E+01	.000E+00	.178E+01	.150E-03
.100E+01	.372E+01	.000E+00	.372E+01	.170E-03
.150E+01	.594E+01	.000E+00	.594E+01	.190E-03
.200E+01	.844E+01	.000E+00	.851E+01	.134E+00
.200E+01	.844E+01	.000E+00	.851E+01	.134E+00

FOR AN INITIAL STAGE OF .500E+00 M.,
 A VOLUME OF .320E+04 CU.M.
 AND A THROUGHFLOW RATE OF .150E-03 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .152E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .320E+04 M**3
 TOTAL VOLUME INFLOW WAS: .405E+06 M**3
 TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .405E+06 M**3

TOTAL VOLUME OUTFLOW IS: .398E+06 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .398E+06 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .405E+06 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .244E+04 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .101E+05 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: -.110E+03 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: -.270E-03M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .344E+06
 TOTAL QUANTITY OUT OF POND IS: .501E+04
 TOTAL QUANTITY LEFT IN POND IS: .538E+01
 TOTAL QUANTITY REMOVED IS: .339E+06
 FRACTION OF QUANTITY REMOVED IS: .985E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .134E+06
 TOTAL QUANTITY OUT OF POND IS: .314E+03
 TOTAL QUANTITY LEFT IN POND IS: .169E-03
 TOTAL QUANTITY REMOVED IS: .134E+06
 FRACTION OF QUANTITY REMOVED IS: .998E+00

SEDIMENT FRACTION 3
 TOTAL QUANTITY INTO POND IS: .194E+06
 TOTAL QUANTITY OUT OF POND IS: .536E+02
 TOTAL QUANTITY LEFT IN POND IS: .208E-30
 TOTAL QUANTITY REMOVED IS: .194E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 4
 TOTAL QUANTITY INTO POND IS: .344E+06
 TOTAL QUANTITY OUT OF POND IS: .109E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .344E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

SEDIMENT FRACTION 5
 TOTAL QUANTITY INTO POND IS: .478E+06
 TOTAL QUANTITY OUT OF POND IS: .213E+01
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .478E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT
 TOTAL QUANTITY INTO POND IS: .149E+07
 TOTAL QUANTITY OUT OF POND IS: .539E+04
 TOTAL QUANTITY LEFT IN POND IS: .538E+01
 TOTAL QUANTITY REMOVED IS: .149E+07
 FRACTION OF QUANTITY REMOVED IS: .996E+00
 POND VOLUME USAGE =====

OVER A SPAN OF A STAGE OF (M)	.4076E+06 HOURS & VOLUME OF (CUBIC M)	WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.1000E+00	.6400E+03	.4076E+06	100.0
.2000E+00	.1280E+04	.4076E+06	100.0
.3000E+00	.1920E+04	.4067E+06	99.8
.4000E+00	.2560E+04	.3980E+06	97.6
.5000E+00	.3200E+04	.3892E+06	95.5
.6000E+00	.3900E+04	.3806E+06	93.4
.7000E+00	.4600E+04	.3799E+06	93.2
.8000E+00	.5300E+04	.3726E+06	91.4
.9000E+00	.6000E+04	.3629E+06	89.0
.1000E+01	.6700E+04	.3495E+06	85.7
.1100E+01	.7500E+04	.3134E+06	76.9
.1200E+01	.8300E+04	.2402E+06	58.9
.1300E+01	.9100E+04	.1605E+06	39.4
.1400E+01	.9900E+04	.9361E+05	23.0
.1500E+01	.1070E+05	.6142E+04	1.5
.1600E+01	.1160E+05	.3480E+03	.1
.1700E+01	.1250E+05	.1060E+03	.0
.1800E+01	.1340E+05	.1700E+02	.0
.1900E+01	.1430E+05	.3000E+01	.0
.2000E+01	.1520E+05	.0000E+00	.0
.2100E+01	.1596E+05	.0000E+00	.0

*
 * Peak Volumes
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .407062E+04	Date (yrmody):	48 7 21
Minimum Value	CMS, M^3, or M	: .252811E+04	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .380022E+04	Date (yrmody):	49 8 11
Minimum Value	CMS, M^3, or M	: .210545E+04	Date (yrmody):	49 2 21
Maximum Value	CMS, M^3, or M	: .345767E+04	Date (yrmody):	50 9 8
Minimum Value	CMS, M^3, or M	: .195074E+04	Date (yrmody):	50 5 7
Maximum Value	CMS, M^3, or M	: .114469E+05	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .172777E+04	Date (yrmody):	51 5 2
Maximum Value	CMS, M^3, or M	: .123677E+05	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .746953E+04	Date (yrmody):	52 5 2
Maximum Value	CMS, M^3, or M	: .129649E+05	Date (yrmody):	53 8 5
Minimum Value	CMS, M^3, or M	: .760305E+04	Date (yrmody):	53 5 20
Maximum Value	CMS, M^3, or M	: .133813E+05	Date (yrmody):	54 7 2
Minimum Value	CMS, M^3, or M	: .789894E+04	Date (yrmody):	54 4 25
Maximum Value	CMS, M^3, or M	: .101369E+05	Date (yrmody):	55 6 18
Minimum Value	CMS, M^3, or M	: .743145E+04	Date (yrmody):	55 12 29
Maximum Value	CMS, M^3, or M	: .109724E+05	Date (yrmody):	56 9 22
Minimum Value	CMS, M^3, or M	: .617145E+04	Date (yrmody):	56 3 29
Maximum Value	CMS, M^3, or M	: .117248E+05	Date (yrmody):	57 6 28
Minimum Value	CMS, M^3, or M	: .763429E+04	Date (yrmody):	57 6 19
Maximum Value	CMS, M^3, or M	: .942700E+04	Date (yrmody):	58 1 1
Minimum Value	CMS, M^3, or M	: .616322E+04	Date (yrmody):	58 12 31
Maximum Value	CMS, M^3, or M	: .903661E+04	Date (yrmody):	59 8 23
Minimum Value	CMS, M^3, or M	: .446308E+04	Date (yrmody):	59 6 4
Maximum Value	CMS, M^3, or M	: .126713E+05	Date (yrmody):	60 6 24
Minimum Value	CMS, M^3, or M	: .631311E+04	Date (yrmody):	60 5 25
Maximum Value	CMS, M^3, or M	: .106763E+05	Date (yrmody):	61 9 8
Minimum Value	CMS, M^3, or M	: .805993E+04	Date (yrmody):	61 5 31
Maximum Value	CMS, M^3, or M	: .112079E+05	Date (yrmody):	62 8 13

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Minimum Value	CMS, M^3, or M	: .786271E+04	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .899579E+04	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .656984E+04	Date (yrmody):	63	12	9
Maximum Value	CMS, M^3, or M	: .109905E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .539886E+04	Date (yrmody):	64	5	20
Maximum Value	CMS, M^3, or M	: .110686E+05	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .741361E+04	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .128500E+05	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .846014E+04	Date (yrmody):	66	4	14
Maximum Value	CMS, M^3, or M	: .916517E+04	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .611794E+04	Date (yrmody):	67	12	31
Maximum Value	CMS, M^3, or M	: .999561E+04	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .466209E+04	Date (yrmody):	68	5	23
Maximum Value	CMS, M^3, or M	: .113945E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .671916E+04	Date (yrmody):	69	5	6
Maximum Value	CMS, M^3, or M	: .109982E+05	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .743327E+04	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .932305E+04	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .734044E+04	Date (yrmody):	71	12	31
Maximum Value	CMS, M^3, or M	: .108903E+05	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .554443E+04	Date (yrmody):	72	5	16
Maximum Value	CMS, M^3, or M	: .145131E+05	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .706379E+04	Date (yrmody):	73	6	20
Maximum Value	CMS, M^3, or M	: .117537E+05	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .766284E+04	Date (yrmody):	74	5	4
Maximum Value	CMS, M^3, or M	: .113814E+05	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .674006E+04	Date (yrmody):	75	7	3
Maximum Value	CMS, M^3, or M	: .124722E+05	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .666298E+04	Date (yrmody):	76	6	4
Maximum Value	CMS, M^3, or M	: .947539E+04	Date (yrmody):	77	1	7
Minimum Value	CMS, M^3, or M	: .707889E+04	Date (yrmody):	77	12	31
Maximum Value	CMS, M^3, or M	: .966687E+04	Date (yrmody):	78	8	26
Minimum Value	CMS, M^3, or M	: .537758E+04	Date (yrmody):	78	5	24
Maximum Value	CMS, M^3, or M	: .111201E+05	Date (yrmody):	79	8	11
Minimum Value	CMS, M^3, or M	: .639675E+04	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .125357E+05	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .719034E+04	Date (yrmody):	80	5	26
Maximum Value	CMS, M^3, or M	: .110866E+05	Date (yrmody):	81	8	14
Minimum Value	CMS, M^3, or M	: .800027E+04	Date (yrmody):	81	5	22
Maximum Value	CMS, M^3, or M	: .921278E+04	Date (yrmody):	82	6	14
Minimum Value	CMS, M^3, or M	: .687732E+04	Date (yrmody):	82	5	15
Maximum Value	CMS, M^3, or M	: .982190E+04	Date (yrmody):	83	7	21
Minimum Value	CMS, M^3, or M	: .542213E+04	Date (yrmody):	83	5	7
Maximum Value	CMS, M^3, or M	: .998604E+04	Date (yrmody):	84	10	2
Minimum Value	CMS, M^3, or M	: .785475E+04	Date (yrmody):	84	5	2
Maximum Value	CMS, M^3, or M	: .133860E+05	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .780651E+04	Date (yrmody):	85	5	19
Maximum Value	CMS, M^3, or M	: .133848E+05	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .826079E+04	Date (yrmody):	86	3	8
Maximum Value	CMS, M^3, or M	: .876972E+04	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .513619E+04	Date (yrmody):	87	12	31
Maximum Value	CMS, M^3, or M	: .104000E+05	Date (yrmody):	88	9	3
Minimum Value	CMS, M^3, or M	: .471450E+04	Date (yrmody):	88	4	13
Maximum Value	CMS, M^3, or M	: .112061E+05	Date (yrmody):	89	6	6
Minimum Value	CMS, M^3, or M	: .729640E+04	Date (yrmody):	89	4	1
Maximum Value	CMS, M^3, or M	: .937134E+04	Date (yrmody):	90	6	11
Minimum Value	CMS, M^3, or M	: .751680E+04	Date (yrmody):	90	12	29
Maximum Value	CMS, M^3, or M	: .111232E+05	Date (yrmody):	91	6	20
Minimum Value	CMS, M^3, or M	: .665850E+04	Date (yrmody):	91	4	2
Maximum Value	CMS, M^3, or M	: .105895E+05	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .778321E+04	Date (yrmody):	92	5	11
Maximum Value	CMS, M^3, or M	: .136284E+05	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .674146E+04	Date (yrmody):	93	6	2
Maximum Value	CMS, M^3, or M	: .115860E+05	Date (yrmody):	94	9	15
Minimum Value	CMS, M^3, or M	: .754248E+04	Date (yrmody):	94	5	26

*
* Peak Levels
*

MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .624375E+00	Date (yrmody):	48	7	21
Minimum Value	CMS, M^3, or M	: .395018E+00	Date (yrmody):	48	12	18
Maximum Value	CMS, M^3, or M	: .585746E+00	Date (yrmody):	49	8	11
Minimum Value	CMS, M^3, or M	: .328976E+00	Date (yrmody):	49	2	21
Maximum Value	CMS, M^3, or M	: .536809E+00	Date (yrmody):	50	9	8
Minimum Value	CMS, M^3, or M	: .304803E+00	Date (yrmody):	50	5	7

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M ³ , or M	: .158299E+01	Date (yrmody):	51	7	25
Minimum Value	CMS, M ³ , or M	: .269964E+00	Date (yrmody):	51	5	2
Maximum Value	CMS, M ³ , or M	: .168530E+01	Date (yrmody):	52	7	5
Minimum Value	CMS, M ³ , or M	: .109619E+01	Date (yrmody):	52	5	2
Maximum Value	CMS, M ³ , or M	: .175166E+01	Date (yrmody):	53	8	5
Minimum Value	CMS, M ³ , or M	: .111288E+01	Date (yrmody):	53	5	20
Maximum Value	CMS, M ³ , or M	: .179793E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M ³ , or M	: .114987E+01	Date (yrmody):	54	4	25
Maximum Value	CMS, M ³ , or M	: .142961E+01	Date (yrmody):	55	6	18
Minimum Value	CMS, M ³ , or M	: .109143E+01	Date (yrmody):	55	12	29
Maximum Value	CMS, M ³ , or M	: .153027E+01	Date (yrmody):	56	9	22
Minimum Value	CMS, M ³ , or M	: .924493E+00	Date (yrmody):	56	3	29
Maximum Value	CMS, M ³ , or M	: .161387E+01	Date (yrmody):	57	6	28
Minimum Value	CMS, M ³ , or M	: .111679E+01	Date (yrmody):	57	6	19
Maximum Value	CMS, M ³ , or M	: .134087E+01	Date (yrmody):	58	1	1
Minimum Value	CMS, M ³ , or M	: .923317E+00	Date (yrmody):	58	12	31
Maximum Value	CMS, M ³ , or M	: .129208E+01	Date (yrmody):	59	8	23
Minimum Value	CMS, M ³ , or M	: .680440E+00	Date (yrmody):	59	6	4
Maximum Value	CMS, M ³ , or M	: .171903E+01	Date (yrmody):	60	6	24
Minimum Value	CMS, M ³ , or M	: .944729E+00	Date (yrmody):	60	5	25
Maximum Value	CMS, M ³ , or M	: .149704E+01	Date (yrmody):	61	9	8
Minimum Value	CMS, M ³ , or M	: .116999E+01	Date (yrmody):	61	5	31
Maximum Value	CMS, M ³ , or M	: .155643E+01	Date (yrmody):	62	8	13
Minimum Value	CMS, M ³ , or M	: .114534E+01	Date (yrmody):	62	4	26
Maximum Value	CMS, M ³ , or M	: .128697E+01	Date (yrmody):	63	1	1
Minimum Value	CMS, M ³ , or M	: .981405E+00	Date (yrmody):	63	12	9
Maximum Value	CMS, M ³ , or M	: .153228E+01	Date (yrmody):	64	8	9
Minimum Value	CMS, M ³ , or M	: .814123E+00	Date (yrmody):	64	5	20
Maximum Value	CMS, M ³ , or M	: .154095E+01	Date (yrmody):	65	9	21
Minimum Value	CMS, M ³ , or M	: .108920E+01	Date (yrmody):	65	5	4
Maximum Value	CMS, M ³ , or M	: .173889E+01	Date (yrmody):	66	8	17
Minimum Value	CMS, M ³ , or M	: .122002E+01	Date (yrmody):	66	4	14
Maximum Value	CMS, M ³ , or M	: .130815E+01	Date (yrmody):	67	1	1
Minimum Value	CMS, M ³ , or M	: .916849E+00	Date (yrmody):	67	12	31
Maximum Value	CMS, M ³ , or M	: .141195E+01	Date (yrmody):	68	7	29
Minimum Value	CMS, M ³ , or M	: .708870E+00	Date (yrmody):	68	5	23
Maximum Value	CMS, M ³ , or M	: .157716E+01	Date (yrmody):	69	7	14
Minimum Value	CMS, M ³ , or M	: .100239E+01	Date (yrmody):	69	5	6
Maximum Value	CMS, M ³ , or M	: .153314E+01	Date (yrmody):	70	7	8
Minimum Value	CMS, M ³ , or M	: .109166E+01	Date (yrmody):	70	5	7
Maximum Value	CMS, M ³ , or M	: .132788E+01	Date (yrmody):	71	8	18
Minimum Value	CMS, M ³ , or M	: .108006E+01	Date (yrmody):	71	12	31
Maximum Value	CMS, M ³ , or M	: .152114E+01	Date (yrmody):	72	9	23
Minimum Value	CMS, M ³ , or M	: .834919E+00	Date (yrmody):	72	5	16
Maximum Value	CMS, M ³ , or M	: .192368E+01	Date (yrmody):	73	9	12
Minimum Value	CMS, M ³ , or M	: .104547E+01	Date (yrmody):	73	6	20
Maximum Value	CMS, M ³ , or M	: .161708E+01	Date (yrmody):	74	7	17
Minimum Value	CMS, M ³ , or M	: .112035E+01	Date (yrmody):	74	5	4
Maximum Value	CMS, M ³ , or M	: .157571E+01	Date (yrmody):	75	8	14
Minimum Value	CMS, M ³ , or M	: .100501E+01	Date (yrmody):	75	7	3
Maximum Value	CMS, M ³ , or M	: .169691E+01	Date (yrmody):	76	8	1
Minimum Value	CMS, M ³ , or M	: .994711E+00	Date (yrmody):	76	6	4
Maximum Value	CMS, M ³ , or M	: .134692E+01	Date (yrmody):	77	1	7
Minimum Value	CMS, M ³ , or M	: .104736E+01	Date (yrmody):	77	12	31
Maximum Value	CMS, M ³ , or M	: .137086E+01	Date (yrmody):	78	8	26
Minimum Value	CMS, M ³ , or M	: .811083E+00	Date (yrmody):	78	5	24
Maximum Value	CMS, M ³ , or M	: .154667E+01	Date (yrmody):	79	8	11
Minimum Value	CMS, M ³ , or M	: .956679E+00	Date (yrmody):	79	5	12
Maximum Value	CMS, M ³ , or M	: .170397E+01	Date (yrmody):	80	6	14
Minimum Value	CMS, M ³ , or M	: .106129E+01	Date (yrmody):	80	5	26
Maximum Value	CMS, M ³ , or M	: .154295E+01	Date (yrmody):	81	8	14
Minimum Value	CMS, M ³ , or M	: .116253E+01	Date (yrmody):	81	5	22
Maximum Value	CMS, M ³ , or M	: .131410E+01	Date (yrmody):	82	6	14
Minimum Value	CMS, M ³ , or M	: .102217E+01	Date (yrmody):	82	5	15
Maximum Value	CMS, M ³ , or M	: .139024E+01	Date (yrmody):	83	7	21
Minimum Value	CMS, M ³ , or M	: .817448E+00	Date (yrmody):	83	5	7
Maximum Value	CMS, M ³ , or M	: .141076E+01	Date (yrmody):	84	10	2
Minimum Value	CMS, M ³ , or M	: .114434E+01	Date (yrmody):	84	5	2
Maximum Value	CMS, M ³ , or M	: .179844E+01	Date (yrmody):	85	6	12
Minimum Value	CMS, M ³ , or M	: .113831E+01	Date (yrmody):	85	5	19
Maximum Value	CMS, M ³ , or M	: .179831E+01	Date (yrmody):	86	7	4
Minimum Value	CMS, M ³ , or M	: .119510E+01	Date (yrmody):	86	3	8
Maximum Value	CMS, M ³ , or M	: .125871E+01	Date (yrmody):	87	4	23
Minimum Value	CMS, M ³ , or M	: .776598E+00	Date (yrmody):	87	12	31
Maximum Value	CMS, M ³ , or M	: .146250E+01	Date (yrmody):	88	9	3
Minimum Value	CMS, M ³ , or M	: .716357E+00	Date (yrmody):	88	4	13
Maximum Value	CMS, M ³ , or M	: .155623E+01	Date (yrmody):	89	6	6
Minimum Value	CMS, M ³ , or M	: .107455E+01	Date (yrmody):	89	4	1
Maximum Value	CMS, M ³ , or M	: .133392E+01	Date (yrmody):	90	6	11
Minimum Value	CMS, M ³ , or M	: .110210E+01	Date (yrmody):	90	12	29
Maximum Value	CMS, M ³ , or M	: .154702E+01	Date (yrmody):	91	6	20

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Minimum Value CMS, M^3, or M : .994072E+00 Date (yrmony): 91 4 2
Maximum Value CMS, M^3, or M : .148618E+01 Date (yrmony): 92 9 4
Minimum Value CMS, M^3, or M : .113540E+01 Date (yrmony): 92 5 11
Maximum Value CMS, M^3, or M : .182538E+01 Date (yrmony): 93 6 8
Minimum Value CMS, M^3, or M : .100518E+01 Date (yrmony): 93 6 2
Maximum Value CMS, M^3, or M : .159845E+01 Date (yrmony): 94 9 15
Minimum Value CMS, M^3, or M : .110531E+01 Date (yrmony): 94 5 26
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=3
QTOTAL QSPILL
0 0
0.00019 0
0.13421 0.134
*
* Discharges to Coach Creek
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

```

Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	(%)	FOD conc equal or above (#/dl)	Duration: (hours)	(%)
.00	407592.0	100.00	.0	407592.0	100.00
5.00	.0	.00	25.0	.0	.00
10.00	.0	.00	50.0	.0	.00
15.00	.0	.00	100.0	.0	.00
20.00	.0	.00	200.0	.0	.00
25.00	.0	.00	300.0	.0	.00
30.00	.0	.00	400.0	.0	.00
35.00	.0	.00	500.0	.0	.00
40.00	.0	.00	1000.0	.0	.00
50.00	.0	.00	2000.0	.0	.00
60.00	.0	.00	3000.0	.0	.00
70.00	.0	.00	4000.0	.0	.00
80.00	.0	.00	5000.0	.0	.00
90.00	.0	.00	6000.0	.0	.00
100.00	.0	.00	8000.0	.0	.00
120.00	.0	.00	10000.0	.0	.00
150.00	.0	.00	15000.0	.0	.00
200.00	.0	.00	20000.0	.0	.00
300.00	.0	.00	25000.0	.0	.00
400.00	.0	.00	30000.0	.0	.00
500.00	.0	.00	40000.0	.0	.00
600.00	.0	.00	50000.0	.0	.00
700.00	.0	.00	60000.0	.0	.00
800.00	.0	.00	80000.0	.0	.00
1000.00	.0	.00	100000.0	.0	.00

```

Total duration = 407592.00 hours
Max flow rate = .1142 m3/sec
Min flow rate = .0000 m3/sec
Total flow volume = 138.66 1000 m3

Max TSS conc = .0 mg/l
Min TSS conc = .0 mg/l
Total SS load = .00 kg
Max FOD conc = .0 #/dl
Min FOD conc = .0 #/dl
Total FOD load = .00E+00 #

```

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Stats for each of the five SS fractions:
Max conc: .0 .0 .0 .0 .0 mg/l
Min conc: .0 .0 .0 .0 .0 mg/l
Load : .0 .0 .0 .0 .0 kg
MAXMIN ID=1 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

```

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .224020E-01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .473296E-01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .671893E-01	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .795869E-01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .803263E-02	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .302563E-01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .593169E-01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .149086E-01	Date (yrmody):	62	8	13
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .866760E-02	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .110800E-01	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .642898E-01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .200318E-01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .844563E-02	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .567404E-02	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .114188E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .313190E-01	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .201700E-01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .533275E-01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1
Maximum Value	CMS, M^3, or M	: .125459E-01	Date (yrmody):	79	8	11
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	79	1	1
Maximum Value	CMS, M^3, or M	: .543976E-01	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	80	1	1
Maximum Value	CMS, M^3, or M	: .114455E-01	Date (yrmody):	81	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	81	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	83	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	83	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	84	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	84	1	1
Maximum Value	CMS, M^3, or M	: .803910E-01	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	85	1	1
Maximum Value	CMS, M^3, or M	: .795429E-01	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	86	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	87	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	87	1	1

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment 7 with Enhanced BMPs
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=2.45 AB=0 FRIMP=0.25
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=8 SMAX=54 SK=0.04
 APIK=0.9 API=42 ABSPER=5.0
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0111 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0111 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4423.68 MM
 C-ALL INITIAL ABSTRACTIONS = 10093.96 MM
 D-TOTAL INFILTRATED WATER = 4459.64 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 4456.57 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 3.08 MM

SURFACE WATER BALANCE = A - B - C - D = -.06 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.06 MM

*
 * Subcatchment 8
 *

GENERATE ID=2 SERIES=102 DT=1.0 AREA=5.55 AB=0 FRIMP=0
 *** NO IMPERVIOUS DATA ***
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=30 SMAX=198 SK=0.04
 APIK=0.9 API=42 ABSPER=3.2
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0334 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 1510.72 MM
 C-ALL INITIAL ABSTRACTIONS = 7718.21 MM
 D-TOTAL INFILTRATED WATER = 9748.39 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 9745.54 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 2.84 MM

SURFACE WATER BALANCE = A - B - C - D = -.09 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .01 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.08 MM

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 * Commercial Portion of Subcatchment 9
 *

GENERATE ID=3 SERIES=103 DT=1.0 AREA=26.00 AB=0 FRIMP=0.25
 *** IMPERVIOUS DATA ***

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

AA=1 N=3 TP=0.083 ABSIMP=5.0 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=8 SMAX=53 SK=0.04
 APIK=0.9 API=42 ABSPER=5.0
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1178 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1173 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4443.15 MM
 C-ALL INITIAL ABSTRACTIONS = 10093.96 MM
 D-TOTAL INFILTRATED WATER = 4440.18 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 4437.11 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 3.07 MM

SURFACE WATER BALANCE = A - B - C - D = -.05 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.06 MM

*
 * Residential Portion of Subcatchment 9
 *

GENERATE ID=4 SERIES=104 DT=1.0 AREA=28.16 AB=0 FRIMP=0.28
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=25 SMAX=167 SK=0.04
 APIK=0.9 API=42 ABSPER=2.6
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1428 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1220 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 5221.33 MM
 C-ALL INITIAL ABSTRACTIONS = 6170.51 MM
 D-TOTAL INFILTRATED WATER = 7585.42 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 7575.36 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 10.06 MM

SURFACE WATER BALANCE = A - B - C - D = -.04 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.04 MM

ADD SERIES ID=5 SERIES=201 IDONE=1 IDTWO=2

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

ADD SERIES ID=1 SERIES=202 IDONE=5 IDTWO=3

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

ADD SERIES ID=2 SERIES=203 IDONE=1 IDTWO=4

ADD BEGINS AT 48 5 1
 USES TIME STEP OF .100E+01 HOURS
 AND ENDS AT 94 10 31

*
 * Pond E
 * Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
 *

POND IDOUT=1 IDV=3 IDL=4 SERIES=301 IDIN=2 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=8
 STAGE FLOW
 0.0 0
 0.01 0.00018
 2.0 0.00029
 2.01 0.00144
 4.0 0.00156 PWL
 4.5 0.33859
 5.0 0.47863
 5.25 0.53464 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=6
 STAGE VOLUME
 0.0 0
 2.0 20300
 4.0 50500 PWL
 4.5 59800
 5.0 69800
 5.25 75100 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.203E+05
.400E+01	.203E+05 ** WARNING ** ADJUSTED AREA
.450E+01	.203E+05 ** WARNING ** ADJUSTED AREA
.500E+01	.203E+05 ** WARNING ** ADJUSTED AREA
.525E+01	.221E+05

STARTING STAGE IN POND IS .400E+01 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .525E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.564E-01	.000E+00	.565E-01	.180E-03
.200E+01	.113E+02	.000E+00	.113E+02	.290E-03
.201E+01	.114E+02	.000E+00	.114E+02	.144E-02
.400E+01	.281E+02	.000E+00	.281E+02	.156E-02
.450E+01	.332E+02	.000E+00	.334E+02	.339E+00
.500E+01	.388E+02	.000E+00	.390E+02	.479E+00
.525E+01	.417E+02	.000E+00	.420E+02	.535E+00
.525E+01	.417E+02	.000E+00	.420E+02	.535E+00

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

FOR AN INITIAL STAGE OF .400E+01 M.,
A VOLUME OF .505E+05 CU.M.
AND A THROUGHFLOW RATE OF .156E-02 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .751E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .505E+05 M**3
TOTAL VOLUME INFLOW WAS: .282E+07 M**3
TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
TOTAL VOLUME IN POND WAS: .282E+07 M**3

TOTAL VOLUME OUTFLOW IS: .282E+07 M**3
TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
TOTAL VOLUME OUT POND IS: .282E+07 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .282E+07 M**3
MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .116E+05 M**3
MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .468E+05 M**3
TOTAL VOLUME NOT ACCOUNTED FOR IS: .101E+04 M**3
FRACTION OF VOLUME NOT ACCOUNTED FOR IS: .353E-03M**3

SEDIMENT FRACTION 1
TOTAL QUANTITY INTO POND IS: .138E+07
TOTAL QUANTITY OUT OF POND IS: .434E+05
TOTAL QUANTITY LEFT IN POND IS: .139E+03
TOTAL QUANTITY REMOVED IS: .133E+07
FRACTION OF QUANTITY REMOVED IS: .968E+00

SEDIMENT FRACTION 2
TOTAL QUANTITY INTO POND IS: .539E+06
TOTAL QUANTITY OUT OF POND IS: .411E+04
TOTAL QUANTITY LEFT IN POND IS: .165E+01
TOTAL QUANTITY REMOVED IS: .534E+06
FRACTION OF QUANTITY REMOVED IS: .992E+00

SEDIMENT FRACTION 3
TOTAL QUANTITY INTO POND IS: .778E+06
TOTAL QUANTITY OUT OF POND IS: .111E+04
TOTAL QUANTITY LEFT IN POND IS: .176E-07
TOTAL QUANTITY REMOVED IS: .777E+06
FRACTION OF QUANTITY REMOVED IS: .999E+00

SEDIMENT FRACTION 4
TOTAL QUANTITY INTO POND IS: .138E+07
TOTAL QUANTITY OUT OF POND IS: .218E+03
TOTAL QUANTITY LEFT IN POND IS: .000E+00
TOTAL QUANTITY REMOVED IS: .138E+07
FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 5
TOTAL QUANTITY INTO POND IS: .191E+07
TOTAL QUANTITY OUT OF POND IS: .420E+02
TOTAL QUANTITY LEFT IN POND IS: .000E+00
TOTAL QUANTITY REMOVED IS: .191E+07
FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT
TOTAL QUANTITY INTO POND IS: .598E+07
TOTAL QUANTITY OUT OF POND IS: .489E+05
TOTAL QUANTITY LEFT IN POND IS: .141E+03
TOTAL QUANTITY REMOVED IS: .594E+07
FRACTION OF QUANTITY REMOVED IS: .992E+00
POND VOLUME USAGE =====

OVER A SPAN OF .4076E+06 HOURS
A STAGE OF & VOLUME OF WAS ATTAINED WAS ATTAINED

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

(M)	(CUBIC M)	(HOURS)	(PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.2625E+00	.2664E+04	.4076E+06	100.0
.5250E+00	.5329E+04	.4076E+06	100.0
.7875E+00	.7993E+04	.4076E+06	100.0
.1050E+01	.1066E+05	.4076E+06	100.0
.1313E+01	.1332E+05	.4076E+06	100.0
.1575E+01	.1599E+05	.4076E+06	100.0
.1838E+01	.1865E+05	.4073E+06	99.9
.2100E+01	.2181E+05	.3819E+06	93.7
.2363E+01	.2577E+05	.3622E+06	88.8
.2625E+01	.2974E+05	.3273E+06	80.3
.2888E+01	.3370E+05	.2737E+06	67.1
.3150E+01	.3767E+05	.2174E+06	53.3
.3413E+01	.4163E+05	.1594E+06	39.1
.3675E+01	.4559E+05	.1014E+06	24.9
.3938E+01	.4956E+05	.3046E+05	7.5
.4200E+01	.5422E+05	.3090E+03	.1
.4463E+01	.5910E+05	.5500E+02	.0
.4725E+01	.6430E+05	.1000E+01	.0
.4987E+01	.6955E+05	.0000E+00	.0
.5250E+01	.7510E+05	.0000E+00	.0
.5512E+01	.7885E+05	.0000E+00	.0

*
* Peak Volumes
*

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .527224E+05	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .367271E+05	Date (yrmody):	48	12	18
Maximum Value	CMS, M^3, or M	: .413709E+05	Date (yrmody):	49	8	11
Minimum Value	CMS, M^3, or M	: .317454E+05	Date (yrmody):	49	2	21
Maximum Value	CMS, M^3, or M	: .328073E+05	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .198145E+05	Date (yrmody):	50	12	26
Maximum Value	CMS, M^3, or M	: .564932E+05	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .198007E+05	Date (yrmody):	51	4	16
Maximum Value	CMS, M^3, or M	: .582602E+05	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .271165E+05	Date (yrmody):	52	5	1
Maximum Value	CMS, M^3, or M	: .604820E+05	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .294613E+05	Date (yrmody):	53	5	20
Maximum Value	CMS, M^3, or M	: .619441E+05	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .297174E+05	Date (yrmody):	54	4	25
Maximum Value	CMS, M^3, or M	: .486432E+05	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .285732E+05	Date (yrmody):	55	12	26
Maximum Value	CMS, M^3, or M	: .495800E+05	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .201337E+05	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .535642E+05	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .289261E+05	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .417015E+05	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .225641E+05	Date (yrmody):	58	12	31
Maximum Value	CMS, M^3, or M	: .464583E+05	Date (yrmody):	59	8	23
Minimum Value	CMS, M^3, or M	: .198241E+05	Date (yrmody):	59	3	20
Maximum Value	CMS, M^3, or M	: .589470E+05	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .306644E+05	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .518209E+05	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .335394E+05	Date (yrmody):	61	5	26
Maximum Value	CMS, M^3, or M	: .520866E+05	Date (yrmody):	62	8	13
Minimum Value	CMS, M^3, or M	: .308587E+05	Date (yrmody):	62	4	26
Maximum Value	CMS, M^3, or M	: .384627E+05	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .258672E+05	Date (yrmody):	63	12	9
Maximum Value	CMS, M^3, or M	: .526434E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .198251E+05	Date (yrmody):	64	5	11
Maximum Value	CMS, M^3, or M	: .538062E+05	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .279310E+05	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .588492E+05	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .344686E+05	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .393188E+05	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .202775E+05	Date (yrmody):	67	12	31
Maximum Value	CMS, M^3, or M	: .516496E+05	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .197510E+05	Date (yrmody):	68	2	15
Maximum Value	CMS, M^3, or M	: .543862E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .272660E+05	Date (yrmody):	69	5	5
Maximum Value	CMS, M^3, or M	: .523286E+05	Date (yrmody):	70	7	4
Minimum Value	CMS, M^3, or M	: .283445E+05	Date (yrmody):	70	5	7
Maximum Value	CMS, M^3, or M	: .399494E+05	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .256553E+05	Date (yrmody):	71	12	31

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .512104E+05	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .195184E+05	Date (yrmody):	72	5	5
Maximum Value	CMS, M^3, or M	: .644677E+05	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .245513E+05	Date (yrmody):	73	6	20
Maximum Value	CMS, M^3, or M	: .555416E+05	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .286576E+05	Date (yrmody):	74	5	4
Maximum Value	CMS, M^3, or M	: .534618E+05	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .219182E+05	Date (yrmody):	75	7	2
Maximum Value	CMS, M^3, or M	: .561000E+05	Date (yrmody):	76	8	20
Minimum Value	CMS, M^3, or M	: .202676E+05	Date (yrmody):	76	5	30
Maximum Value	CMS, M^3, or M	: .433308E+05	Date (yrmody):	77	9	5
Minimum Value	CMS, M^3, or M	: .303110E+05	Date (yrmody):	77	6	6
Maximum Value	CMS, M^3, or M	: .506523E+05	Date (yrmody):	78	8	26
Minimum Value	CMS, M^3, or M	: .200362E+05	Date (yrmody):	78	4	26
Maximum Value	CMS, M^3, or M	: .534468E+05	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .265612E+05	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .564617E+05	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .259652E+05	Date (yrmody):	80	5	26
Maximum Value	CMS, M^3, or M	: .523000E+05	Date (yrmody):	81	8	14
Minimum Value	CMS, M^3, or M	: .318766E+05	Date (yrmody):	81	5	7
Maximum Value	CMS, M^3, or M	: .379711E+05	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .223788E+05	Date (yrmody):	82	5	13
Maximum Value	CMS, M^3, or M	: .487626E+05	Date (yrmody):	83	7	21
Minimum Value	CMS, M^3, or M	: .192068E+05	Date (yrmody):	83	4	8
Maximum Value	CMS, M^3, or M	: .513064E+05	Date (yrmody):	84	10	2
Minimum Value	CMS, M^3, or M	: .376755E+05	Date (yrmody):	84	5	1
Maximum Value	CMS, M^3, or M	: .616209E+05	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .361575E+05	Date (yrmody):	85	5	19
Maximum Value	CMS, M^3, or M	: .611511E+05	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .333324E+05	Date (yrmody):	86	12	27
Maximum Value	CMS, M^3, or M	: .346686E+05	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .183150E+05	Date (yrmody):	87	12	31
Maximum Value	CMS, M^3, or M	: .536387E+05	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .182919E+05	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .527773E+05	Date (yrmody):	89	7	16
Minimum Value	CMS, M^3, or M	: .279679E+05	Date (yrmody):	89	5	16
Maximum Value	CMS, M^3, or M	: .433051E+05	Date (yrmody):	90	9	7
Minimum Value	CMS, M^3, or M	: .314015E+05	Date (yrmody):	90	5	5
Maximum Value	CMS, M^3, or M	: .530487E+05	Date (yrmody):	91	6	20
Minimum Value	CMS, M^3, or M	: .291283E+05	Date (yrmody):	91	4	1
Maximum Value	CMS, M^3, or M	: .509767E+05	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .311588E+05	Date (yrmody):	92	5	11
Maximum Value	CMS, M^3, or M	: .606195E+05	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .238182E+05	Date (yrmody):	93	6	2
Maximum Value	CMS, M^3, or M	: .547903E+05	Date (yrmody):	94	6	22
Minimum Value	CMS, M^3, or M	: .273052E+05	Date (yrmody):	94	5	26

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* Peak Levels
*

MAXMIN ID=4 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .411948E+01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .308788E+01	Date (yrmody):	48	12	18
Maximum Value	CMS, M^3, or M	: .339542E+01	Date (yrmody):	49	8	11
Minimum Value	CMS, M^3, or M	: .275797E+01	Date (yrmody):	49	2	21
Maximum Value	CMS, M^3, or M	: .282830E+01	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .195217E+01	Date (yrmody):	50	12	26
Maximum Value	CMS, M^3, or M	: .432222E+01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .195081E+01	Date (yrmody):	51	4	16
Maximum Value	CMS, M^3, or M	: .441722E+01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .245143E+01	Date (yrmody):	52	5	1
Maximum Value	CMS, M^3, or M	: .453410E+01	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .260671E+01	Date (yrmody):	53	5	20
Maximum Value	CMS, M^3, or M	: .460720E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .262367E+01	Date (yrmody):	54	4	25
Maximum Value	CMS, M^3, or M	: .387703E+01	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .254789E+01	Date (yrmody):	55	12	26
Maximum Value	CMS, M^3, or M	: .393907E+01	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .198362E+01	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .416474E+01	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .257127E+01	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .341732E+01	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .214994E+01	Date (yrmody):	58	12	31
Maximum Value	CMS, M^3, or M	: .373234E+01	Date (yrmody):	59	8	23
Minimum Value	CMS, M^3, or M	: .195311E+01	Date (yrmody):	59	3	20
Maximum Value	CMS, M^3, or M	: .445414E+01	Date (yrmody):	60	6	24

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Minimum Value CMS, M^3, or M : .268639E+01 Date (yrmody): 60 5 24
Maximum Value CMS, M^3, or M : .407102E+01 Date (yrmody): 61 9 8
Minimum Value CMS, M^3, or M : .287678E+01 Date (yrmody): 61 5 26
Maximum Value CMS, M^3, or M : .408530E+01 Date (yrmody): 62 8 13
Minimum Value CMS, M^3, or M : .269925E+01 Date (yrmody): 62 4 26
Maximum Value CMS, M^3, or M : .320283E+01 Date (yrmody): 63 1 1
Minimum Value CMS, M^3, or M : .236869E+01 Date (yrmody): 63 12 9
Maximum Value CMS, M^3, or M : .411524E+01 Date (yrmody): 64 8 9
Minimum Value CMS, M^3, or M : .195322E+01 Date (yrmody): 64 5 11
Maximum Value CMS, M^3, or M : .417775E+01 Date (yrmody): 65 8 19
Minimum Value CMS, M^3, or M : .250536E+01 Date (yrmody): 65 5 4
Maximum Value CMS, M^3, or M : .444888E+01 Date (yrmody): 66 8 17
Minimum Value CMS, M^3, or M : .293832E+01 Date (yrmody): 66 4 13
Maximum Value CMS, M^3, or M : .325953E+01 Date (yrmody): 67 1 1
Minimum Value CMS, M^3, or M : .199778E+01 Date (yrmody): 67 12 31
Maximum Value CMS, M^3, or M : .406181E+01 Date (yrmody): 68 7 29
Minimum Value CMS, M^3, or M : .194591E+01 Date (yrmody): 68 2 15
Maximum Value CMS, M^3, or M : .420893E+01 Date (yrmody): 69 7 14
Minimum Value CMS, M^3, or M : .246133E+01 Date (yrmody): 69 5 5
Maximum Value CMS, M^3, or M : .409831E+01 Date (yrmody): 70 7 4
Minimum Value CMS, M^3, or M : .253275E+01 Date (yrmody): 70 5 7
Maximum Value CMS, M^3, or M : .330129E+01 Date (yrmody): 71 8 18
Minimum Value CMS, M^3, or M : .235466E+01 Date (yrmody): 71 12 31
Maximum Value CMS, M^3, or M : .403819E+01 Date (yrmody): 72 9 23
Minimum Value CMS, M^3, or M : .192300E+01 Date (yrmody): 72 5 5
Maximum Value CMS, M^3, or M : .473338E+01 Date (yrmody): 73 9 12
Minimum Value CMS, M^3, or M : .228154E+01 Date (yrmody): 73 6 20
Maximum Value CMS, M^3, or M : .427105E+01 Date (yrmody): 74 7 17
Minimum Value CMS, M^3, or M : .255348E+01 Date (yrmody): 74 5 4
Maximum Value CMS, M^3, or M : .415924E+01 Date (yrmody): 75 8 14
Minimum Value CMS, M^3, or M : .210716E+01 Date (yrmody): 75 7 2
Maximum Value CMS, M^3, or M : .430108E+01 Date (yrmody): 76 8 20
Minimum Value CMS, M^3, or M : .199681E+01 Date (yrmody): 76 5 30
Maximum Value CMS, M^3, or M : .352522E+01 Date (yrmody): 77 9 5
Minimum Value CMS, M^3, or M : .266298E+01 Date (yrmody): 77 6 6
Maximum Value CMS, M^3, or M : .400819E+01 Date (yrmody): 78 8 26
Minimum Value CMS, M^3, or M : .197401E+01 Date (yrmody): 78 4 26
Maximum Value CMS, M^3, or M : .415843E+01 Date (yrmody): 79 6 23
Minimum Value CMS, M^3, or M : .241465E+01 Date (yrmody): 79 5 12
Maximum Value CMS, M^3, or M : .432052E+01 Date (yrmody): 80 6 24
Minimum Value CMS, M^3, or M : .237518E+01 Date (yrmody): 80 5 26
Maximum Value CMS, M^3, or M : .409677E+01 Date (yrmody): 81 8 14
Minimum Value CMS, M^3, or M : .276666E+01 Date (yrmody): 81 5 7
Maximum Value CMS, M^3, or M : .317027E+01 Date (yrmody): 82 7 15
Minimum Value CMS, M^3, or M : .213767E+01 Date (yrmody): 82 5 13
Maximum Value CMS, M^3, or M : .388494E+01 Date (yrmody): 83 7 21
Minimum Value CMS, M^3, or M : .189230E+01 Date (yrmody): 83 4 8
Maximum Value CMS, M^3, or M : .404335E+01 Date (yrmody): 84 10 2
Minimum Value CMS, M^3, or M : .315070E+01 Date (yrmody): 84 5 1
Maximum Value CMS, M^3, or M : .459104E+01 Date (yrmody): 85 6 12
Minimum Value CMS, M^3, or M : .305016E+01 Date (yrmody): 85 5 19
Maximum Value CMS, M^3, or M : .456755E+01 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .286307E+01 Date (yrmody): 86 12 27
Maximum Value CMS, M^3, or M : .295156E+01 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .180443E+01 Date (yrmody): 87 12 31
Maximum Value CMS, M^3, or M : .416875E+01 Date (yrmody): 88 9 2
Minimum Value CMS, M^3, or M : .180215E+01 Date (yrmody): 88 1 1
Maximum Value CMS, M^3, or M : .412243E+01 Date (yrmody): 89 7 16
Minimum Value CMS, M^3, or M : .250781E+01 Date (yrmody): 89 5 16
Maximum Value CMS, M^3, or M : .352352E+01 Date (yrmody): 90 9 7
Minimum Value CMS, M^3, or M : .273520E+01 Date (yrmody): 90 5 5
Maximum Value CMS, M^3, or M : .413703E+01 Date (yrmody): 91 6 20
Minimum Value CMS, M^3, or M : .258465E+01 Date (yrmody): 91 4 1
Maximum Value CMS, M^3, or M : .402563E+01 Date (yrmody): 92 9 4
Minimum Value CMS, M^3, or M : .271912E+01 Date (yrmody): 92 5 11
Maximum Value CMS, M^3, or M : .454097E+01 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .223299E+01 Date (yrmody): 93 6 2
Maximum Value CMS, M^3, or M : .423066E+01 Date (yrmody): 94 6 22
Minimum Value CMS, M^3, or M : .246392E+01 Date (yrmody): 94 5 26

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SPLIT SERIES ID=1 IDOUT=2 SERIES=302 IDLOSS=3 SERIES=303 NPTQQ=5
QTOTAL QDISCHARGE
0 0
0.00156 0
0.33859 0.272
0.47863 0.385
0.53464 0.430

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* Discharges to Coach Creek
*

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SERIES STATS ID=2
START YR=48 MO=05 DAY=02

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WESTVIEW STORMWATER MASTER DRAINAGE PLAN

END YR=94 MO=10 DAY=30

Routine SERIES STATS for ID = 2 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

 Results from SERIES STATS for series ID= 2:

TSS conc equal or above (mg/l)	Duration: (hours)	(%)	FOD conc equal or above (#/dl)	Duration: (hours)	(%)
.00	407592.0	100.00	.0	407592.0	100.00
5.00	.0	.00	25.0	.0	.00
10.00	.0	.00	50.0	.0	.00
15.00	.0	.00	100.0	.0	.00
20.00	.0	.00	200.0	.0	.00
25.00	.0	.00	300.0	.0	.00
30.00	.0	.00	400.0	.0	.00
35.00	.0	.00	500.0	.0	.00
40.00	.0	.00	1000.0	.0	.00
50.00	.0	.00	2000.0	.0	.00
60.00	.0	.00	3000.0	.0	.00
70.00	.0	.00	4000.0	.0	.00
80.00	.0	.00	5000.0	.0	.00
90.00	.0	.00	6000.0	.0	.00
100.00	.0	.00	8000.0	.0	.00
120.00	.0	.00	10000.0	.0	.00
150.00	.0	.00	15000.0	.0	.00
200.00	.0	.00	20000.0	.0	.00
300.00	.0	.00	25000.0	.0	.00
400.00	.0	.00	30000.0	.0	.00
500.00	.0	.00	40000.0	.0	.00
600.00	.0	.00	50000.0	.0	.00
700.00	.0	.00	60000.0	.0	.00
800.00	.0	.00	80000.0	.0	.00
1000.00	.0	.00	100000.0	.0	.00

Total duration = 407592.00 hours
 Max flow rate = .3253 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 546.35 1000 m3

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .03 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc:	.0	.0	.0	.0	.0 mg/l
Min conc:	.0	.0	.0	.0	.0 mg/l
Load :	.0	.0	.0	.0	.0 kg

MAXMIN ID=2 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .623377E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	3
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .174076E+00	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .217209E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .272899E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .296161E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .876959E-01	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .246103E+00	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .386752E-01	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .458693E-01	Date (yrmody):	62	8	13
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .636572E-01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .917911E-01	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .242757E+00	Date (yrmody):	66	8	16
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .324603E-01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .111627E+00	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .535575E-01	Date (yrmody):	70	7	4
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .207944E-01	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .325311E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .147831E+00	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .864928E-01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .165260E+00	Date (yrmody):	76	8	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .425799E-02	Date (yrmody):	78	8	26
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1
Maximum Value	CMS, M^3, or M	: .858470E-01	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	79	1	1
Maximum Value	CMS, M^3, or M	: .174182E+00	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	80	1	1
Maximum Value	CMS, M^3, or M	: .526469E-01	Date (yrmody):	81	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	81	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	83	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	83	1	1
Maximum Value	CMS, M^3, or M	: .239782E-01	Date (yrmody):	84	10	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	84	1	1
Maximum Value	CMS, M^3, or M	: .293590E+00	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	85	1	1
Maximum Value	CMS, M^3, or M	: .286463E+00	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	86	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	87	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	87	1	1
Maximum Value	CMS, M^3, or M	: .909732E-01	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .661149E-01	Date (yrmody):	89	7	16
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	89	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	90	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	90	1	1
Maximum Value	CMS, M^3, or M	: .737039E-01	Date (yrmody):	91	6	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	91	1	1
Maximum Value	CMS, M^3, or M	: .136356E-01	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	92	1	1
Maximum Value	CMS, M^3, or M	: .281524E+00	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	93	1	1
Maximum Value	CMS, M^3, or M	: .121619E+00	Date (yrmody):	94	6	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	94	1	1

FINISH

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment 10
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=24.78 AB=0 FRIMP=0.26
 *** IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.25 SMIN=25 SMAX=165 SK=0.04
 APIK=0.9 API=42 ABSPER=2.6
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1167 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .1103 CMS
 - THE UH YIELDS 2.1654 MM VOL SO MULT BY .4618 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 4988.93 MM
 C-ALL INITIAL ABSTRACTIONS = 6210.17 MM
 D-TOTAL INFILTRATED WATER = 7778.16 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 7767.86 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 10.30 MM

SURFACE WATER BALANCE = A - B - C - D = -.03 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = -.01 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.03 MM

*
 * Pond F
 * Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
 *

POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=8
 STAGE FLOW
 0.0 0
 0.01 0.00002
 2.0 0.00008
 2.01 0.00079
 4.0 0.00086 PWL
 4.5 0.13488
 5.0 0.19090
 5.25 0.21291 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=6
 STAGE VOLUME
 0.0 0
 2.0 4200
 4.0 13800 PWL
 4.5 17200
 5.0 21000
 5.25 23100 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=4.0 FEMULT=1 SEMULT=1 SPILL=5.25

CALCULATED STAGE AREA CURVE =====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

STAGE	AREA
.000E+00	.000E+00
.200E+01	.420E+04
.400E+01	.540E+04
.450E+01	.820E+04
.500E+01	.820E+04
.525E+01	.860E+04

** WARNING ** ADJUSTED AREA

STARTING STAGE IN POND IS .400E+01 M
MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
OVERFLOW OUTFLOW STARTS AT .525E+01 M
TIME STEP OF INPUT FILE IS 1.000 HOURS
CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.117E-01	.000E+00	.117E-01	.200E-04
.200E+01	.233E+01	.000E+00	.233E+01	.800E-04
.201E+01	.236E+01	.000E+00	.236E+01	.790E-03
.400E+01	.767E+01	.000E+00	.767E+01	.860E-03
.450E+01	.956E+01	.000E+00	.962E+01	.135E+00
.500E+01	.117E+02	.000E+00	.118E+02	.191E+00
.525E+01	.128E+02	.000E+00	.129E+02	.213E+00
.525E+01	.128E+02	.000E+00	.129E+02	.213E+00

FOR AN INITIAL STAGE OF .400E+01 M.,
A VOLUME OF .138E+05 CU.M.
AND A THROUGHFLOW RATE OF .860E-03 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .231E+05 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .138E+05 M**3
TOTAL VOLUME INFLOW WAS: .124E+07 M**3
TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
TOTAL VOLUME IN POND WAS: .124E+07 M**3

TOTAL VOLUME OUTFLOW IS: .124E+07 M**3
TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
TOTAL VOLUME OUT POND IS: .124E+07 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .124E+07 M**3
MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .405E+04 M**3
MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .118E+05 M**3
TOTAL VOLUME NOT ACCOUNTED FOR IS: -.895E+02 M**3
FRACTION OF VOLUME NOT ACCOUNTED FOR IS: -.716E-04M**3

SEDIMENT FRACTION 1

TOTAL QUANTITY INTO POND IS: .546E+06
TOTAL QUANTITY OUT OF POND IS: .268E+05
TOTAL QUANTITY LEFT IN POND IS: .487E+02
TOTAL QUANTITY REMOVED IS: .519E+06
FRACTION OF QUANTITY REMOVED IS: .951E+00

SEDIMENT FRACTION 2

TOTAL QUANTITY INTO POND IS: .214E+06
TOTAL QUANTITY OUT OF POND IS: .218E+04
TOTAL QUANTITY LEFT IN POND IS: .475E+00
TOTAL QUANTITY REMOVED IS: .211E+06
FRACTION OF QUANTITY REMOVED IS: .990E+00

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SEDIMENT FRACTION 3

TOTAL QUANTITY INTO POND IS: .309E+06
 TOTAL QUANTITY OUT OF POND IS: .551E+03
 TOTAL QUANTITY LEFT IN POND IS: .403E-08
 TOTAL QUANTITY REMOVED IS: .308E+06
 FRACTION OF QUANTITY REMOVED IS: .998E+00

SEDIMENT FRACTION 4

TOTAL QUANTITY INTO POND IS: .546E+06
 TOTAL QUANTITY OUT OF POND IS: .115E+03
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .546E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

SEDIMENT FRACTION 5

TOTAL QUANTITY INTO POND IS: .760E+06
 TOTAL QUANTITY OUT OF POND IS: .228E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .760E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT

TOTAL QUANTITY INTO POND IS: .237E+07
 TOTAL QUANTITY OUT OF POND IS: .297E+05
 TOTAL QUANTITY LEFT IN POND IS: .491E+02
 TOTAL QUANTITY REMOVED IS: .234E+07
 FRACTION OF QUANTITY REMOVED IS: .987E+00
 POND VOLUME USAGE =====

OVER A SPAN OF A STAGE OF (M)	.4076E+06 HOURS & VOLUME OF (CUBIC M)	WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.2625E+00	.5513E+03	.4076E+06	100.0
.5250E+00	.1103E+04	.4076E+06	100.0
.7875E+00	.1654E+04	.4076E+06	100.0
.1050E+01	.2205E+04	.4076E+06	100.0
.1313E+01	.2756E+04	.4076E+06	100.0
.1575E+01	.3308E+04	.4076E+06	100.0
.1838E+01	.3859E+04	.4050E+06	99.3
.2100E+01	.4680E+04	.3021E+06	74.1
.2363E+01	.5940E+04	.2492E+06	61.1
.2625E+01	.7200E+04	.2048E+06	50.2
.2888E+01	.8460E+04	.1654E+06	40.6
.3150E+01	.9720E+04	.1253E+06	30.7
.3413E+01	.1098E+05	.9206E+05	22.6
.3675E+01	.1224E+05	.6111E+05	15.0
.3938E+01	.1350E+05	.1808E+05	4.4
.4200E+01	.1516E+05	.2630E+03	.1
.4463E+01	.1695E+05	.3800E+02	.0
.4725E+01	.1891E+05	.0000E+00	.0
.4987E+01	.2090E+05	.0000E+00	.0
.5250E+01	.2310E+05	.0000E+00	.0
.5512E+01	.2425E+05	.0000E+00	.0

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 * Peak Volumes
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MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .146674E+05	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .652973E+04	Date (yrmody):	48 12 18
Maximum Value	CMS, M^3, or M	: .733122E+04	Date (yrmody):	49 8 11
Minimum Value	CMS, M^3, or M	: .411002E+04	Date (yrmody):	49 12 8
Maximum Value	CMS, M^3, or M	: .765240E+04	Date (yrmody):	50 8 5
Minimum Value	CMS, M^3, or M	: .385505E+04	Date (yrmody):	50 12 21
Maximum Value	CMS, M^3, or M	: .158364E+05	Date (yrmody):	51 7 25
Minimum Value	CMS, M^3, or M	: .403033E+04	Date (yrmody):	51 1 8
Maximum Value	CMS, M^3, or M	: .166499E+05	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .412823E+04	Date (yrmody):	52 4 5
Maximum Value	CMS, M^3, or M	: .172121E+05	Date (yrmody):	53 7 21
Minimum Value	CMS, M^3, or M	: .399549E+04	Date (yrmody):	53 5 20
Maximum Value	CMS, M^3, or M	: .176152E+05	Date (yrmody):	54 7 2
Minimum Value	CMS, M^3, or M	: .403666E+04	Date (yrmody):	54 4 15
Maximum Value	CMS, M^3, or M	: .100249E+05	Date (yrmody):	55 1 6

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Minimum Value	CMS, M^3, or M	: .401342E+04	Date (yrmody):	55	12	10
Maximum Value	CMS, M^3, or M	: .118723E+05	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .384063E+04	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .148949E+05	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .399690E+04	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .861302E+04	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .406292E+04	Date (yrmody):	58	11	9
Maximum Value	CMS, M^3, or M	: .136753E+05	Date (yrmody):	59	7	28
Minimum Value	CMS, M^3, or M	: .410773E+04	Date (yrmody):	59	3	16
Maximum Value	CMS, M^3, or M	: .162108E+05	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .471652E+04	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .113536E+05	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .417046E+04	Date (yrmody):	61	5	20
Maximum Value	CMS, M^3, or M	: .115682E+05	Date (yrmody):	62	9	9
Minimum Value	CMS, M^3, or M	: .404734E+04	Date (yrmody):	62	4	19
Maximum Value	CMS, M^3, or M	: .771235E+04	Date (yrmody):	63	7	31
Minimum Value	CMS, M^3, or M	: .402133E+04	Date (yrmody):	63	11	26
Maximum Value	CMS, M^3, or M	: .157791E+05	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .407519E+04	Date (yrmody):	64	4	12
Maximum Value	CMS, M^3, or M	: .146069E+05	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .403690E+04	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .161719E+05	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .480904E+04	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .775885E+04	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .403580E+04	Date (yrmody):	67	11	24
Maximum Value	CMS, M^3, or M	: .142720E+05	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .404487E+04	Date (yrmody):	68	5	23
Maximum Value	CMS, M^3, or M	: .151904E+05	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .401961E+04	Date (yrmody):	69	5	2
Maximum Value	CMS, M^3, or M	: .145155E+05	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .408168E+04	Date (yrmody):	70	5	3
Maximum Value	CMS, M^3, or M	: .822688E+04	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .410328E+04	Date (yrmody):	71	12	8
Maximum Value	CMS, M^3, or M	: .140283E+05	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .391525E+04	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .184086E+05	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .405323E+04	Date (yrmody):	73	4	3
Maximum Value	CMS, M^3, or M	: .153088E+05	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .408849E+04	Date (yrmody):	74	4	11
Maximum Value	CMS, M^3, or M	: .147771E+05	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .404241E+04	Date (yrmody):	75	6	15
Maximum Value	CMS, M^3, or M	: .158255E+05	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .392233E+04	Date (yrmody):	76	5	24
Maximum Value	CMS, M^3, or M	: .101867E+05	Date (yrmody):	77	9	6
Minimum Value	CMS, M^3, or M	: .412417E+04	Date (yrmody):	77	4	22
Maximum Value	CMS, M^3, or M	: .146562E+05	Date (yrmody):	78	8	18
Minimum Value	CMS, M^3, or M	: .404601E+04	Date (yrmody):	78	1	26
Maximum Value	CMS, M^3, or M	: .146998E+05	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .393776E+04	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .158488E+05	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .404220E+04	Date (yrmody):	80	3	16
Maximum Value	CMS, M^3, or M	: .138928E+05	Date (yrmody):	81	8	28
Minimum Value	CMS, M^3, or M	: .407399E+04	Date (yrmody):	81	5	7
Maximum Value	CMS, M^3, or M	: .102265E+05	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .402932E+04	Date (yrmody):	82	12	27
Maximum Value	CMS, M^3, or M	: .150108E+05	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .367411E+04	Date (yrmody):	83	3	3
Maximum Value	CMS, M^3, or M	: .109465E+05	Date (yrmody):	84	1	4
Minimum Value	CMS, M^3, or M	: .614637E+04	Date (yrmody):	84	5	1
Maximum Value	CMS, M^3, or M	: .175723E+05	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .410522E+04	Date (yrmody):	85	5	17
Maximum Value	CMS, M^3, or M	: .175617E+05	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .471072E+04	Date (yrmody):	86	12	27
Maximum Value	CMS, M^3, or M	: .864573E+04	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .359752E+04	Date (yrmody):	87	11	12
Maximum Value	CMS, M^3, or M	: .150758E+05	Date (yrmody):	88	9	2
Minimum Value	CMS, M^3, or M	: .379797E+04	Date (yrmody):	88	1	1
Maximum Value	CMS, M^3, or M	: .141617E+05	Date (yrmody):	89	7	16
Minimum Value	CMS, M^3, or M	: .410167E+04	Date (yrmody):	89	3	19
Maximum Value	CMS, M^3, or M	: .871272E+04	Date (yrmody):	90	9	7
Minimum Value	CMS, M^3, or M	: .413582E+04	Date (yrmody):	90	4	26
Maximum Value	CMS, M^3, or M	: .146262E+05	Date (yrmody):	91	6	20
Minimum Value	CMS, M^3, or M	: .413712E+04	Date (yrmody):	91	4	1
Maximum Value	CMS, M^3, or M	: .119546E+05	Date (yrmody):	92	9	4
Minimum Value	CMS, M^3, or M	: .412190E+04	Date (yrmody):	92	5	5
Maximum Value	CMS, M^3, or M	: .174212E+05	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .398783E+04	Date (yrmody):	93	5	10
Maximum Value	CMS, M^3, or M	: .150981E+05	Date (yrmody):	94	6	22
Minimum Value	CMS, M^3, or M	: .405774E+04	Date (yrmody):	94	5	23

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* Peak Levels

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

*
 MAXMIN ID=4 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .412755E+01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .248536E+01	Date (yrmody):	48	12	18
Maximum Value	CMS, M^3, or M	: .265234E+01	Date (yrmody):	49	8	11
Minimum Value	CMS, M^3, or M	: .195715E+01	Date (yrmody):	49	12	8
Maximum Value	CMS, M^3, or M	: .271925E+01	Date (yrmody):	50	8	5
Minimum Value	CMS, M^3, or M	: .183574E+01	Date (yrmody):	50	12	21
Maximum Value	CMS, M^3, or M	: .429947E+01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .191920E+01	Date (yrmody):	51	1	8
Maximum Value	CMS, M^3, or M	: .441910E+01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .196582E+01	Date (yrmody):	52	4	5
Maximum Value	CMS, M^3, or M	: .450159E+01	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .190261E+01	Date (yrmody):	53	5	20
Maximum Value	CMS, M^3, or M	: .455463E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .192222E+01	Date (yrmody):	54	4	15
Maximum Value	CMS, M^3, or M	: .321351E+01	Date (yrmody):	55	1	6
Minimum Value	CMS, M^3, or M	: .191115E+01	Date (yrmody):	55	12	10
Maximum Value	CMS, M^3, or M	: .359840E+01	Date (yrmody):	56	9	22
Minimum Value	CMS, M^3, or M	: .182887E+01	Date (yrmody):	56	3	29
Maximum Value	CMS, M^3, or M	: .416101E+01	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .190329E+01	Date (yrmody):	57	4	29
Maximum Value	CMS, M^3, or M	: .291938E+01	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .193472E+01	Date (yrmody):	58	11	9
Maximum Value	CMS, M^3, or M	: .397403E+01	Date (yrmody):	59	7	28
Minimum Value	CMS, M^3, or M	: .195606E+01	Date (yrmody):	59	3	16
Maximum Value	CMS, M^3, or M	: .435453E+01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .210761E+01	Date (yrmody):	60	5	24
Maximum Value	CMS, M^3, or M	: .349033E+01	Date (yrmody):	61	9	8
Minimum Value	CMS, M^3, or M	: .198593E+01	Date (yrmody):	61	5	20
Maximum Value	CMS, M^3, or M	: .353504E+01	Date (yrmody):	62	9	9
Minimum Value	CMS, M^3, or M	: .192731E+01	Date (yrmody):	62	4	19
Maximum Value	CMS, M^3, or M	: .273174E+01	Date (yrmody):	63	7	31
Minimum Value	CMS, M^3, or M	: .191492E+01	Date (yrmody):	63	11	26
Maximum Value	CMS, M^3, or M	: .429104E+01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .194057E+01	Date (yrmody):	64	4	12
Maximum Value	CMS, M^3, or M	: .411867E+01	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .192233E+01	Date (yrmody):	65	5	4
Maximum Value	CMS, M^3, or M	: .434881E+01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .212688E+01	Date (yrmody):	66	4	13
Maximum Value	CMS, M^3, or M	: .274143E+01	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .192181E+01	Date (yrmody):	67	11	24
Maximum Value	CMS, M^3, or M	: .406942E+01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .192613E+01	Date (yrmody):	68	5	23
Maximum Value	CMS, M^3, or M	: .420448E+01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .191410E+01	Date (yrmody):	69	5	2
Maximum Value	CMS, M^3, or M	: .410522E+01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .194366E+01	Date (yrmody):	70	5	3
Maximum Value	CMS, M^3, or M	: .283893E+01	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .195394E+01	Date (yrmody):	71	12	8
Maximum Value	CMS, M^3, or M	: .403357E+01	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .186440E+01	Date (yrmody):	72	3	8
Maximum Value	CMS, M^3, or M	: .465902E+01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .193011E+01	Date (yrmody):	73	4	3
Maximum Value	CMS, M^3, or M	: .422189E+01	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .194690E+01	Date (yrmody):	74	4	11
Maximum Value	CMS, M^3, or M	: .414369E+01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .192496E+01	Date (yrmody):	75	6	15
Maximum Value	CMS, M^3, or M	: .429787E+01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .186778E+01	Date (yrmody):	76	5	24
Maximum Value	CMS, M^3, or M	: .324722E+01	Date (yrmody):	77	9	6
Minimum Value	CMS, M^3, or M	: .196389E+01	Date (yrmody):	77	4	22
Maximum Value	CMS, M^3, or M	: .412592E+01	Date (yrmody):	78	8	18
Minimum Value	CMS, M^3, or M	: .192667E+01	Date (yrmody):	78	1	26
Maximum Value	CMS, M^3, or M	: .413233E+01	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .187512E+01	Date (yrmody):	79	5	12
Maximum Value	CMS, M^3, or M	: .430130E+01	Date (yrmody):	80	6	24
Minimum Value	CMS, M^3, or M	: .192486E+01	Date (yrmody):	80	3	16
Maximum Value	CMS, M^3, or M	: .401365E+01	Date (yrmody):	81	8	28
Minimum Value	CMS, M^3, or M	: .194000E+01	Date (yrmody):	81	5	7
Maximum Value	CMS, M^3, or M	: .325553E+01	Date (yrmody):	82	7	15
Minimum Value	CMS, M^3, or M	: .191873E+01	Date (yrmody):	82	12	27
Maximum Value	CMS, M^3, or M	: .417805E+01	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .174958E+01	Date (yrmody):	83	3	3
Maximum Value	CMS, M^3, or M	: .340552E+01	Date (yrmody):	84	1	4

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

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Minimum Value CMS, M^3, or M : .240549E+01 Date (yrmody): 84 5 1
Maximum Value CMS, M^3, or M : .454898E+01 Date (yrmody): 85 6 12
Minimum Value CMS, M^3, or M : .195487E+01 Date (yrmody): 85 5 17
Maximum Value CMS, M^3, or M : .454759E+01 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .210640E+01 Date (yrmody): 86 12 27
Maximum Value CMS, M^3, or M : .292619E+01 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .171311E+01 Date (yrmody): 87 11 12
Maximum Value CMS, M^3, or M : .418762E+01 Date (yrmody): 88 9 2
Minimum Value CMS, M^3, or M : .180856E+01 Date (yrmody): 88 1 1
Maximum Value CMS, M^3, or M : .405319E+01 Date (yrmody): 89 7 16
Minimum Value CMS, M^3, or M : .195318E+01 Date (yrmody): 89 3 19
Maximum Value CMS, M^3, or M : .294015E+01 Date (yrmody): 90 9 7
Minimum Value CMS, M^3, or M : .196944E+01 Date (yrmody): 90 4 26
Maximum Value CMS, M^3, or M : .412150E+01 Date (yrmody): 91 6 20
Minimum Value CMS, M^3, or M : .197006E+01 Date (yrmody): 91 4 1
Maximum Value CMS, M^3, or M : .361553E+01 Date (yrmody): 92 9 4
Minimum Value CMS, M^3, or M : .196281E+01 Date (yrmody): 92 5 5
Maximum Value CMS, M^3, or M : .452910E+01 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .189897E+01 Date (yrmody): 93 5 10
Maximum Value CMS, M^3, or M : .419089E+01 Date (yrmody): 94 6 22
Minimum Value CMS, M^3, or M : .193226E+01 Date (yrmody): 94 5 23
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
QTOTAL QDISCHARGE
0 0
0.00086 0
0.13488 0.134
0.19090 0.190
0.21291 0.212
*
* Discharges to Coach Creek
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

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Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	FOD conc equal or above (#/dl)	Duration: (hours)
	(%)		(%)
.00	407592.0	.0	407592.0
5.00	.0	25.0	.0
10.00	.0	50.0	.0
15.00	.0	100.0	.0
20.00	.0	200.0	.0
25.00	.0	300.0	.0
30.00	.0	400.0	.0
35.00	.0	500.0	.0
40.00	.0	1000.0	.0
50.00	.0	2000.0	.0
60.00	.0	3000.0	.0
70.00	.0	4000.0	.0
80.00	.0	5000.0	.0
90.00	.0	6000.0	.0
100.00	.0	8000.0	.0
120.00	.0	10000.0	.0
150.00	.0	15000.0	.0
200.00	.0	20000.0	.0
300.00	.0	25000.0	.0
400.00	.0	30000.0	.0
500.00	.0	40000.0	.0
600.00	.0	50000.0	.0
700.00	.0	60000.0	.0
800.00	.0	80000.0	.0
1000.00	.0	100000.0	.0

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Total duration = 407592.00 hours
Max flow rate = .1521 m3/sec
Min flow rate = .0000 m3/sec
Total flow volume = 224.25 1000 m3

Max TSS conc = .0 mg/l
Min TSS conc = .0 mg/l

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WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Total SS load = .01 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc: .0 .0 .0 .0 .0 mg/l
 Min conc: .0 .0 .0 .0 .0 mg/l
 Load : .0 .0 .0 .0 .0 kg

MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .330546E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .799090E-01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .107662E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .128595E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .140240E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .417752E-01	Date (yrmody):	57	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .959965E-01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .774124E-01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .316148E-01	Date (yrmody):	65	9	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .939839E-01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .176246E-01	Date (yrmody):	68	7	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .541216E-01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .267587E-01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .896099E-02	Date (yrmody):	72	9	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .152146E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .595116E-01	Date (yrmody):	74	7	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .385131E-01	Date (yrmody):	75	8	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .810354E-01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .333880E-01	Date (yrmody):	78	8	18
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1
Maximum Value	CMS, M^3, or M	: .354553E-01	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	79	1	1

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 1096.13 MM
 C-ALL INITIAL ABSTRACTIONS = 12147.36 MM
 D-TOTAL INFILTRATED WATER = 5733.87 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 5733.28 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = .59 MM

SURFACE WATER BALANCE = A - B - C - D = -.13 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.13 MM
 MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .165019E-01	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .106550E-01	Date (yrmody):	49	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .183507E-01	Date (yrmody):	50	5	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .816904E-01	Date (yrmody):	51	7	25
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .168025E+00	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .240302E+00	Date (yrmody):	53	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .152020E+00	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .230839E-01	Date (yrmody):	55	6	16
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .392901E-01	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .547761E-01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .994205E-02	Date (yrmody):	58	7	27
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .309016E-01	Date (yrmody):	59	6	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .114233E+00	Date (yrmody):	60	6	10
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .173792E-01	Date (yrmody):	61	8	7
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .257944E-01	Date (yrmody):	62	4	26
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .734030E-02	Date (yrmody):	63	7	21
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .661244E-01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .566297E-01	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .701841E-01	Date (yrmody):	66	8	16
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .258218E-01	Date (yrmody):	67	6	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .626813E-01	Date (yrmody):	68	5	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .397019E-01	Date (yrmody):	69	7	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .516844E-01	Date (yrmody):	70	6	30
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .319011E-01	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .222095E-01	Date (yrmody):	72	9	6
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .166186E+00	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .955238E-01	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .340359E-01	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .622630E-01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .115424E-01	Date (yrmody):	77	7	10
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .337124E-01	Date (yrmody):	78	5	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment 11
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=2.20 AB=0 FRIMP=0
 *** NO IMPERVIOUS DATA ***
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.167 SMIN=14 SMAX=94 SK=0.04
 APIK=0.9 API=42 ABSPER=2.2
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0198 CMS
 - THE UH YIELDS 3.2415 MM VOL SO MULT BY .3085 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 2854.24 MM
 C-ALL INITIAL ABSTRACTIONS = 5988.19 MM
 D-TOTAL INFILTRATED WATER = 10134.83 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 10129.03 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 5.80 MM

SURFACE WATER BALANCE = A - B - C - D = -.02 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = .00 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.02 MM

*
 * On-Site Underground Storage
 * Discharges @ 8.57 L/s/ha + Irrigation
 *

POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=6
 STAGE FLOW
 0.0 0
 0.01 0.000089
 2.0 0.000090 PWL
 2.5 0.011090
 3.0 0.016090
 3.5 0.019090 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=5
 STAGE VOLUME
 0.0 0
 2.0 320 PWL
 2.5 680
 3.0 1040
 3.5 1400 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=0 FEMULT=1 SEMULT=1 SPILL=3.5

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.320E+03
.250E+01	.112E+04
.300E+01	.112E+04 ** WARNING ** ADJUSTED AREA
.350E+01	.112E+04 ** WARNING ** ADJUSTED AREA

STARTING STAGE IN POND IS .000E+00 M

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .350E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE	--- TOTAL --- CONTINUOUS OUTFLOW CURVE		---- TOTAL ---- OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (M)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.100E-01	.889E-03	.000E+00	.933E-03	.890E-04
.200E+01	.178E+00	.000E+00	.178E+00	.900E-04
.250E+01	.378E+00	.000E+00	.383E+00	.111E-01
.300E+01	.578E+00	.000E+00	.586E+00	.161E-01
.350E+01	.778E+00	.000E+00	.787E+00	.191E-01
.350E+01	.778E+00	.000E+00	.787E+00	.191E-01

FOR AN INITIAL STAGE OF .000E+00 M.,
 A VOLUME OF .000E+00 CU.M.
 AND A THROUGHFLOW RATE OF .000E+00 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .140E+04 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .000E+00 M**3
 TOTAL VOLUME INFLOW WAS: .623E+05 M**3
 TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .623E+05 M**3

TOTAL VOLUME OUTFLOW IS: .623E+05 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .623E+05 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .623E+05 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .353E+03 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .850E+00 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: .448E+02 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: .718E-03M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .503E+05
 TOTAL QUANTITY OUT OF POND IS: .107E+05
 TOTAL QUANTITY LEFT IN POND IS: .142E-01
 TOTAL QUANTITY REMOVED IS: .395E+05
 FRACTION OF QUANTITY REMOVED IS: .786E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .197E+05
 TOTAL QUANTITY OUT OF POND IS: .821E+03
 TOTAL QUANTITY LEFT IN POND IS: .485E-05
 TOTAL QUANTITY REMOVED IS: .189E+05
 FRACTION OF QUANTITY REMOVED IS: .958E+00

SEDIMENT FRACTION 3
 TOTAL QUANTITY INTO POND IS: .284E+05
 TOTAL QUANTITY OUT OF POND IS: .263E+03
 TOTAL QUANTITY LEFT IN POND IS: .117E-24
 TOTAL QUANTITY REMOVED IS: .282E+05
 FRACTION OF QUANTITY REMOVED IS: .991E+00

SEDIMENT FRACTION 4
 TOTAL QUANTITY INTO POND IS: .503E+05
 TOTAL QUANTITY OUT OF POND IS: .860E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

TOTAL QUANTITY REMOVED IS: .502E+05
 FRACTION OF QUANTITY REMOVED IS: .998E+00

SEDIMENT FRACTION 5

TOTAL QUANTITY INTO POND IS: .699E+05
 TOTAL QUANTITY OUT OF POND IS: .197E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .699E+05
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT

TOTAL QUANTITY INTO POND IS: .219E+06
 TOTAL QUANTITY OUT OF POND IS: .119E+05
 TOTAL QUANTITY LEFT IN POND IS: .142E-01
 TOTAL QUANTITY REMOVED IS: .207E+06
 FRACTION OF QUANTITY REMOVED IS: .945E+00
 POND VOLUME USAGE =====

OVER A SPAN OF A STAGE OF (M)	.4076E+06 HOURS & VOLUME OF (CUBIC M)	WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.1750E+00	.2800E+02	.1013E+06	24.9
.3500E+00	.5600E+02	.8473E+05	20.8
.5250E+00	.8400E+02	.7381E+05	18.1
.7000E+00	.1120E+03	.6355E+05	15.6
.8750E+00	.1400E+03	.5464E+05	13.4
.1050E+01	.1680E+03	.4639E+05	11.4
.1225E+01	.1960E+03	.3867E+05	9.5
.1400E+01	.2240E+03	.3105E+05	7.6
.1575E+01	.2520E+03	.2391E+05	5.9
.1750E+01	.2800E+03	.1629E+05	4.0
.1925E+01	.3080E+03	.8072E+04	2.0
.2100E+01	.3920E+03	.7430E+03	.2
.2275E+01	.5180E+03	.1840E+03	.0
.2450E+01	.6440E+03	.4000E+02	.0
.2625E+01	.7700E+03	.8000E+01	.0
.2800E+01	.8960E+03	.0000E+00	.0
.2975E+01	.1022E+04	.0000E+00	.0
.3150E+01	.1148E+04	.0000E+00	.0
.3325E+01	.1274E+04	.0000E+00	.0
.3500E+01	.1400E+04	.0000E+00	.0
.3675E+01	.1470E+04	.0000E+00	.0

*
 * Peak Volumes
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .114002E+03	Date (yrmody):	48 7 1
Minimum Value	CMS, M^3, or M	: .809317E+00	Date (yrmody):	48 7 16
Maximum Value	CMS, M^3, or M	: .163435E+03	Date (yrmody):	49 2 23
Minimum Value	CMS, M^3, or M	: .811217E+00	Date (yrmody):	49 2 12
Maximum Value	CMS, M^3, or M	: .143952E+03	Date (yrmody):	50 8 5
Minimum Value	CMS, M^3, or M	: .809510E+00	Date (yrmody):	50 7 29
Maximum Value	CMS, M^3, or M	: .528189E+03	Date (yrmody):	51 6 29
Minimum Value	CMS, M^3, or M	: .811347E+00	Date (yrmody):	51 10 7
Maximum Value	CMS, M^3, or M	: .571704E+03	Date (yrmody):	52 7 5
Minimum Value	CMS, M^3, or M	: .809793E+00	Date (yrmody):	52 12 24
Maximum Value	CMS, M^3, or M	: .635305E+03	Date (yrmody):	53 8 5
Minimum Value	CMS, M^3, or M	: .809793E+00	Date (yrmody):	53 1 1
Maximum Value	CMS, M^3, or M	: .657707E+03	Date (yrmody):	54 7 2
Minimum Value	CMS, M^3, or M	: .811529E+00	Date (yrmody):	54 12 22
Maximum Value	CMS, M^3, or M	: .132318E+03	Date (yrmody):	55 6 18
Minimum Value	CMS, M^3, or M	: .809530E+00	Date (yrmody):	55 5 2
Maximum Value	CMS, M^3, or M	: .366206E+03	Date (yrmody):	56 7 20
Minimum Value	CMS, M^3, or M	: .811848E+00	Date (yrmody):	56 9 3
Maximum Value	CMS, M^3, or M	: .474724E+03	Date (yrmody):	57 6 28
Minimum Value	CMS, M^3, or M	: .813819E+00	Date (yrmody):	57 10 9
Maximum Value	CMS, M^3, or M	: .593452E+02	Date (yrmody):	58 7 27
Minimum Value	CMS, M^3, or M	: .809878E+00	Date (yrmody):	58 4 14
Maximum Value	CMS, M^3, or M	: .408547E+03	Date (yrmody):	59 6 6
Minimum Value	CMS, M^3, or M	: .812099E+00	Date (yrmody):	59 10 17
Maximum Value	CMS, M^3, or M	: .599016E+03	Date (yrmody):	60 6 24
Minimum Value	CMS, M^3, or M	: .819918E+00	Date (yrmody):	60 10 11
Maximum Value	CMS, M^3, or M	: .284678E+03	Date (yrmody):	61 6 18

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Minimum Value	CMS, M^3, or M	: .810260E+00	Date (yrmody):	61	9	20
Maximum Value	CMS, M^3, or M	: .347672E+03	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .809160E+00	Date (yrmody):	62	6	28
Maximum Value	CMS, M^3, or M	: .825373E+02	Date (yrmody):	63	12	11
Minimum Value	CMS, M^3, or M	: .808881E+00	Date (yrmody):	63	3	10
Maximum Value	CMS, M^3, or M	: .487355E+03	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .811175E+00	Date (yrmody):	64	10	23
Maximum Value	CMS, M^3, or M	: .160991E+03	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .814213E+00	Date (yrmody):	65	12	4
Maximum Value	CMS, M^3, or M	: .577874E+03	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .813097E+00	Date (yrmody):	66	5	4
Maximum Value	CMS, M^3, or M	: .154194E+03	Date (yrmody):	67	6	20
Minimum Value	CMS, M^3, or M	: .810306E+00	Date (yrmody):	67	9	21
Maximum Value	CMS, M^3, or M	: .449631E+03	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .810066E+00	Date (yrmody):	68	9	3
Maximum Value	CMS, M^3, or M	: .453632E+03	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .816321E+00	Date (yrmody):	69	9	15
Maximum Value	CMS, M^3, or M	: .359678E+03	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .813699E+00	Date (yrmody):	70	5	15
Maximum Value	CMS, M^3, or M	: .168335E+03	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .815744E+00	Date (yrmody):	71	5	12
Maximum Value	CMS, M^3, or M	: .409827E+03	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .810790E+00	Date (yrmody):	72	11	7
Maximum Value	CMS, M^3, or M	: .875340E+03	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .814999E+00	Date (yrmody):	73	1	20
Maximum Value	CMS, M^3, or M	: .446204E+03	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .830106E+00	Date (yrmody):	74	2	18
Maximum Value	CMS, M^3, or M	: .431736E+03	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .809536E+00	Date (yrmody):	75	5	1
Maximum Value	CMS, M^3, or M	: .580780E+03	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .815490E+00	Date (yrmody):	76	3	29
Maximum Value	CMS, M^3, or M	: .906433E+02	Date (yrmody):	77	7	10
Minimum Value	CMS, M^3, or M	: .810139E+00	Date (yrmody):	77	6	19
Maximum Value	CMS, M^3, or M	: .378952E+03	Date (yrmody):	78	6	2
Minimum Value	CMS, M^3, or M	: .810935E+00	Date (yrmody):	78	12	1
Maximum Value	CMS, M^3, or M	: .403169E+03	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .810935E+00	Date (yrmody):	79	1	1
Maximum Value	CMS, M^3, or M	: .608297E+03	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .811384E+00	Date (yrmody):	80	1	1
Maximum Value	CMS, M^3, or M	: .243856E+03	Date (yrmody):	81	6	29
Minimum Value	CMS, M^3, or M	: .814574E+00	Date (yrmody):	81	2	21
Maximum Value	CMS, M^3, or M	: .234763E+03	Date (yrmody):	82	6	7
Minimum Value	CMS, M^3, or M	: .813347E+00	Date (yrmody):	82	7	23
Maximum Value	CMS, M^3, or M	: .353865E+03	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .809481E+00	Date (yrmody):	83	12	13
Maximum Value	CMS, M^3, or M	: .176246E+03	Date (yrmody):	84	6	24
Minimum Value	CMS, M^3, or M	: .809039E+00	Date (yrmody):	84	6	17
Maximum Value	CMS, M^3, or M	: .680011E+03	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .813646E+00	Date (yrmody):	85	1	1
Maximum Value	CMS, M^3, or M	: .712238E+03	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .810117E+00	Date (yrmody):	86	12	30
Maximum Value	CMS, M^3, or M	: .282790E+03	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .810117E+00	Date (yrmody):	87	1	1
Maximum Value	CMS, M^3, or M	: .329569E+03	Date (yrmody):	88	9	3
Minimum Value	CMS, M^3, or M	: .824329E+00	Date (yrmody):	88	4	26
Maximum Value	CMS, M^3, or M	: .513049E+03	Date (yrmody):	89	6	6
Minimum Value	CMS, M^3, or M	: .809420E+00	Date (yrmody):	89	2	25
Maximum Value	CMS, M^3, or M	: .203659E+03	Date (yrmody):	90	6	11
Minimum Value	CMS, M^3, or M	: .809677E+00	Date (yrmody):	90	10	1
Maximum Value	CMS, M^3, or M	: .389252E+03	Date (yrmody):	91	4	27
Minimum Value	CMS, M^3, or M	: .815229E+00	Date (yrmody):	91	10	27
Maximum Value	CMS, M^3, or M	: .332897E+03	Date (yrmody):	92	6	8
Minimum Value	CMS, M^3, or M	: .815458E+00	Date (yrmody):	92	9	8
Maximum Value	CMS, M^3, or M	: .748109E+03	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .814676E+00	Date (yrmody):	93	3	21
Maximum Value	CMS, M^3, or M	: .457236E+03	Date (yrmody):	94	6	22
Minimum Value	CMS, M^3, or M	: .819992E+00	Date (yrmody):	94	1	1

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* Peak Levels
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MAXMIN ID=4 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .712514E+00	Date (yrmody):	48	7	1
Minimum Value	CMS, M^3, or M	: .505823E-02	Date (yrmody):	48	7	16
Maximum Value	CMS, M^3, or M	: .102147E+01	Date (yrmody):	49	2	23
Minimum Value	CMS, M^3, or M	: .507010E-02	Date (yrmody):	49	2	12

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Maximum Value	CMS, M^3, or M	: .899700E+00	Date (yrmody):	50	8	5
Minimum Value	CMS, M^3, or M	: .505944E-02	Date (yrmody):	50	7	29
Maximum Value	CMS, M^3, or M	: .228915E+01	Date (yrmody):	51	6	29
Minimum Value	CMS, M^3, or M	: .507092E-02	Date (yrmody):	51	10	7
Maximum Value	CMS, M^3, or M	: .234959E+01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .506121E-02	Date (yrmody):	52	12	24
Maximum Value	CMS, M^3, or M	: .243792E+01	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .506121E-02	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .246904E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .507206E-02	Date (yrmody):	54	12	22
Maximum Value	CMS, M^3, or M	: .826986E+00	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .505956E-02	Date (yrmody):	55	5	2
Maximum Value	CMS, M^3, or M	: .206417E+01	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .507405E-02	Date (yrmody):	56	9	3
Maximum Value	CMS, M^3, or M	: .221489E+01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .508637E-02	Date (yrmody):	57	10	9
Maximum Value	CMS, M^3, or M	: .370907E+00	Date (yrmody):	58	7	27
Minimum Value	CMS, M^3, or M	: .506174E-02	Date (yrmody):	58	4	14
Maximum Value	CMS, M^3, or M	: .212298E+01	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .507562E-02	Date (yrmody):	59	10	17
Maximum Value	CMS, M^3, or M	: .238752E+01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .512449E-02	Date (yrmody):	60	10	11
Maximum Value	CMS, M^3, or M	: .177924E+01	Date (yrmody):	61	6	18
Minimum Value	CMS, M^3, or M	: .506412E-02	Date (yrmody):	61	9	20
Maximum Value	CMS, M^3, or M	: .203843E+01	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .505725E-02	Date (yrmody):	62	6	28
Maximum Value	CMS, M^3, or M	: .515858E+00	Date (yrmody):	63	12	11
Minimum Value	CMS, M^3, or M	: .505550E-02	Date (yrmody):	63	3	10
Maximum Value	CMS, M^3, or M	: .223244E+01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .506984E-02	Date (yrmody):	64	10	23
Maximum Value	CMS, M^3, or M	: .100619E+01	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .508883E-02	Date (yrmody):	65	12	4
Maximum Value	CMS, M^3, or M	: .235816E+01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .508186E-02	Date (yrmody):	66	5	4
Maximum Value	CMS, M^3, or M	: .963713E+00	Date (yrmody):	67	6	20
Minimum Value	CMS, M^3, or M	: .506441E-02	Date (yrmody):	67	9	21
Maximum Value	CMS, M^3, or M	: .218004E+01	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .506291E-02	Date (yrmody):	68	9	3
Maximum Value	CMS, M^3, or M	: .218560E+01	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .510201E-02	Date (yrmody):	69	9	15
Maximum Value	CMS, M^3, or M	: .205511E+01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .508562E-02	Date (yrmody):	70	5	15
Maximum Value	CMS, M^3, or M	: .105209E+01	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .509840E-02	Date (yrmody):	71	5	12
Maximum Value	CMS, M^3, or M	: .212476E+01	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .506744E-02	Date (yrmody):	72	11	7
Maximum Value	CMS, M^3, or M	: .277131E+01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .509374E-02	Date (yrmody):	73	1	20
Maximum Value	CMS, M^3, or M	: .217528E+01	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .518816E-02	Date (yrmody):	74	2	18
Maximum Value	CMS, M^3, or M	: .215519E+01	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .505960E-02	Date (yrmody):	75	5	1
Maximum Value	CMS, M^3, or M	: .236219E+01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .509681E-02	Date (yrmody):	76	3	29
Maximum Value	CMS, M^3, or M	: .566521E+00	Date (yrmody):	77	7	10
Minimum Value	CMS, M^3, or M	: .506337E-02	Date (yrmody):	77	6	19
Maximum Value	CMS, M^3, or M	: .208188E+01	Date (yrmody):	78	6	2
Minimum Value	CMS, M^3, or M	: .506834E-02	Date (yrmody):	78	12	1
Maximum Value	CMS, M^3, or M	: .211551E+01	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .506834E-02	Date (yrmody):	79	1	1
Maximum Value	CMS, M^3, or M	: .240041E+01	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .507115E-02	Date (yrmody):	80	1	1
Maximum Value	CMS, M^3, or M	: .152410E+01	Date (yrmody):	81	6	29
Minimum Value	CMS, M^3, or M	: .509109E-02	Date (yrmody):	81	2	21
Maximum Value	CMS, M^3, or M	: .146727E+01	Date (yrmody):	82	6	7
Minimum Value	CMS, M^3, or M	: .508342E-02	Date (yrmody):	82	7	23
Maximum Value	CMS, M^3, or M	: .204703E+01	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .505926E-02	Date (yrmody):	83	12	13
Maximum Value	CMS, M^3, or M	: .110154E+01	Date (yrmody):	84	6	24
Minimum Value	CMS, M^3, or M	: .505649E-02	Date (yrmody):	84	6	17
Maximum Value	CMS, M^3, or M	: .250002E+01	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .508529E-02	Date (yrmody):	85	1	1
Maximum Value	CMS, M^3, or M	: .254477E+01	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .506323E-02	Date (yrmody):	86	12	30
Maximum Value	CMS, M^3, or M	: .176744E+01	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .506323E-02	Date (yrmody):	87	1	1
Maximum Value	CMS, M^3, or M	: .201329E+01	Date (yrmody):	88	9	3
Minimum Value	CMS, M^3, or M	: .515206E-02	Date (yrmody):	88	4	26
Maximum Value	CMS, M^3, or M	: .226812E+01	Date (yrmody):	89	6	6
Minimum Value	CMS, M^3, or M	: .505887E-02	Date (yrmody):	89	2	25
Maximum Value	CMS, M^3, or M	: .127287E+01	Date (yrmody):	90	6	11

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Minimum Value CMS, M^3, or M : .506048E-02 Date (yrmody): 90 10 1
 Maximum Value CMS, M^3, or M : .209618E+01 Date (yrmody): 91 4 27
 Minimum Value CMS, M^3, or M : .509518E-02 Date (yrmody): 91 10 27
 Maximum Value CMS, M^3, or M : .201791E+01 Date (yrmody): 92 6 8
 Minimum Value CMS, M^3, or M : .509662E-02 Date (yrmody): 92 9 8
 Maximum Value CMS, M^3, or M : .259460E+01 Date (yrmody): 93 6 8
 Minimum Value CMS, M^3, or M : .509172E-02 Date (yrmody): 93 3 21
 Maximum Value CMS, M^3, or M : .219061E+01 Date (yrmody): 94 6 22
 Minimum Value CMS, M^3, or M : .512495E-02 Date (yrmody): 94 1 1

SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=5
 QTOTAL QDISCHARGE
 0 0
 0.000090 0
 0.011090 0.011
 0.016090 0.016
 0.019090 0.019

*
* Discharges to Coach Creek
*

SERIES STATS ID=1
 START YR=48 MO=05 DAY=02
 END YR=94 MO=10 DAY=30

Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	FOD conc equal or above (#/dl)	Duration: (hours)
	(%)		(%)
.00	407592.0	100.00	407592.0
5.00	.0	.00	.0
10.00	.0	.00	.0
15.00	.0	.00	.0
20.00	.0	.00	.0
25.00	.0	.00	.0
30.00	.0	.00	.0
35.00	.0	.00	.0
40.00	.0	.00	.0
50.00	.0	.00	.0
60.00	.0	.00	.0
70.00	.0	.00	.0
80.00	.0	.00	.0
90.00	.0	.00	.0
100.00	.0	.00	.0
120.00	.0	.00	.0
150.00	.0	.00	.0
200.00	.0	.00	.0
300.00	.0	.00	.0
400.00	.0	.00	.0
500.00	.0	.00	.0
600.00	.0	.00	.0
700.00	.0	.00	.0
800.00	.0	.00	.0
1000.00	.0	.00	.0

Total duration = 407592.00 hours
 Max flow rate = .0137 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 19.04 1000 m3

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .00 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:
 Max conc: .0 .0 .0 .0 .0 mg/l
 Min conc: .0 .0 .0 .0 .0 mg/l
 Load : .0 .0 .0 .0 .0 kg

MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .636698E-02	Date (yrmody):	51	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .732942E-02	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .960056E-02	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .102578E-01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .141224E-02	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .469767E-02	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .272241E-02	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .862248E-02	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .853416E-03	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .500300E-02	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .788730E-02	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .400986E-02	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .407427E-02	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .112607E-02	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .274423E-02	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .137325E-01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .389265E-02	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .343014E-02	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .806659E-02	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .181115E-02	Date (yrmody):	78	6	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	78	1	1
Maximum Value	CMS, M^3, or M	: .257541E-02	Date (yrmody):	79	6	23
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	79	1	1
Maximum Value	CMS, M^3, or M	: .873928E-02	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	80	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	81	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	81	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	82	1	1
Maximum Value	CMS, M^3, or M	: .946056E-03	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	83	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	84	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	84	1	1
Maximum Value	CMS, M^3, or M	: .109855E-01	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	85	1	1

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

PCO=3000 per cu m PEX=1.2
 IBM=1 (Power Linear Buildup)
 DAYSIN=30 Days PMAX=0.20 kg per sq m
 PKI=0.00055 kg per 1.0 days

*
 * Subcatchment 12
 *

GENERATE ID=1 SERIES=101 DT=1.0 AREA=8.52 AB=0 FRIMP=.02
 *** NO IMPERVIOUS DATA ***
 AA=1 N=3 TP=0.083 ABSIMP=1.6 RIMP=0.98
 *** PERVIOUS DATA ***
 AA=1 N=3 TP=0.167 SMIN=16 SMAX=107 SK=0.04
 APIK=0.9 API=42 ABSPER=2.2
 *** BASEFLOW DATA ***
 NSVOL=0 BASEMIN=0 BFACR=1 SVOL=0 SWILT=1
 SFIELD=50 SLOSKA=0.0 SLOSKB=0.0

===== IMPERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0031 CMS
 - THE UH YIELDS 6.5221 MM VOL SO MULT BY .1533 WILL ENSURE A 1 MM UH.

===== PERVIOUS AREA UNIT HYDROGRAPH DATA =====

- SHAPE CONSTANT, N = 3.000 - UNIT PEAK,QP = .0752 CMS
 - THE UH YIELDS 3.2415 MM VOL SO MULT BY .3085 WILL ENSURE A 1 MM UH.

API REDUCTION FACTOR IS .996E+00 PER TIME STEP OR .900E+00 PER DAY

W A T E R M A S S B A L A N C E
 A-TOTAL PRECIPITATION = 18977.23 MM
 B-TOTAL RUNOFF IMPRV+PERV = 2842.22 MM
 C-ALL INITIAL ABSTRACTIONS = 5963.28 MM
 D-TOTAL INFILTRATED WATER = 10171.72 MM
 E-TOTAL BASE FLOW = .00 MM
 F-CHANGE IN GROUNDWATER STORAGE= 10165.80 MM
 G-EVAPORATION FROM SOIL WATER = .00 MM
 H-LOSS TO DEEP GROUNDWATER = 5.95 MM

SURFACE WATER BALANCE = A - B - C - D = .01 MM
 SUBSURFACE WATER BALANCE= D - E - F - G - H = -.03 MM
 TOTAL BALANCE = A - B - C - E - F - G - H = -.02 MM

*
 * Private Storm Pond
 * Discharges @ 8.57 L/s/ha + Evaporation + Irrigation
 *

POND IDOUT=2 IDV=3 IDL=4 SERIES=301 IDIN=1 TDET=0 NELS=1
 RTINC=0.5 QBAS=0 NPUMP=0 IFQBY=1
 *** APPROACH FLOW CURVE DATA ***
 NPOINTS=0
 *** CONTINUOUS OUTFLOW CURVE DATA ***
 NPOINTS=0
 *** OPERATED OUTFLOW CURVE DATA
 ISIG=1 NPOINTS=8
 STAGE FLOW
 0.0 0
 2.0 0.00001
 2.01 0.00034
 3.5 0.00036 PWL
 4.0 0.03737
 4.5 0.05238
 5.0 0.06339
 5.5 0.07340 HWL
 *** OVERFLOW CURVE DATA ***
 ISIG=1 NPOINTS=0
 *** POND VOLUME CURVE DATA ***
 ISIG=1 NPOINTS=7
 STAGE VOLUME
 0.0 0
 2.0 300
 3.5 1400 PWL
 4.0 2200
 4.5 3100
 5.0 4200
 5.5 5600 HWL
 *** POND AREA CURVE DATA ***
 NPOINTS=0
 *** OTHER VARIABLES ***
 SBEGIN=3.5 FEMULT=1 SEMULT=1 SPILL=5.5

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

CALCULATED STAGE AREA CURVE =====

STAGE	AREA
.000E+00	.000E+00
.200E+01	.300E+03
.350E+01	.117E+04
.400E+01	.203E+04
.450E+01	.203E+04 ** WARNING ** ADJUSTED AREA
.500E+01	.237E+04
.550E+01	.323E+04

STARTING STAGE IN POND IS .350E+01 M
 MULTIPLICATION FACTOR FOR POLLUTANT IS .100E+01
 MULTIPLICATION FACTOR FOR SEDIMENT IS .100E+01
 OVERFLOW OUTFLOW STARTS AT .550E+01 M
 TIME STEP OF INPUT FILE IS 1.000 HOURS
 CALCULATION STEP SELECTED IS .5000 HOURS

COMBINED OUTFLOW CURVES =====

STAGE (M)	CONTINUOUS OUTFLOW CURVE		OPERATED OUTFLOW CURVE	
	STORAGE COEFF. (CMS)	FLOW (CMS)	STORAGE COEFF. (M**3)	FLOW (CMS)
.000E+00	.000E+00	.000E+00	.000E+00	.000E+00
.200E+01	.167E+00	.000E+00	.167E+00	.100E-04
.201E+01	.171E+00	.000E+00	.171E+00	.340E-03
.350E+01	.778E+00	.000E+00	.778E+00	.360E-03
.400E+01	.122E+01	.000E+00	.124E+01	.374E-01
.450E+01	.172E+01	.000E+00	.175E+01	.524E-01
.500E+01	.233E+01	.000E+00	.237E+01	.634E-01
.550E+01	.311E+01	.000E+00	.315E+01	.734E-01
.550E+01	.311E+01	.000E+00	.315E+01	.734E-01

FOR AN INITIAL STAGE OF .350E+01 M.,
 A VOLUME OF .140E+04 CU.M.
 AND A THROUGHFLOW RATE OF .360E-03 CU.M./SEC. IS ASSUMED.

VOLUME OF POND AT START OF OVERFLOW IS .560E+04 M**3

GLOBAL MASS BALANCE =====

INITIAL VOLUME OF POND WAS: .140E+04 M**3
 TOTAL VOLUME INFLOW WAS: .242E+06 M**3
 TOTAL VOLUME IN BYPASS WAS: .000E+00 M**3
 TOTAL VOLUME IN POND WAS: .242E+06 M**3

TOTAL VOLUME OUTFLOW IS: .243E+06 M**3
 TOTAL VOLUME OUT BYPASS IS: .000E+00 M**3
 TOTAL VOLUME OUT POND IS: .243E+06 M**3

TOTAL POSSIBLE VOLUME IN BYPASS WAS: .242E+06 M**3
 MAXIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .130E+04 M**3
 MINIMUM POSSIBLE VOLUME IN BYPASS IN ONE TIME STEP WAS: .000E+00 M**3

TOTAL VOLUME LEFT IN POND IS: .301E+03 M**3
 TOTAL VOLUME NOT ACCOUNTED FOR IS: .681E+02 M**3
 FRACTION OF VOLUME NOT ACCOUNTED FOR IS: .280E-03M**3

SEDIMENT FRACTION 1
 TOTAL QUANTITY INTO POND IS: .190E+06
 TOTAL QUANTITY OUT OF POND IS: .274E+05
 TOTAL QUANTITY LEFT IN POND IS: .352E+01
 TOTAL QUANTITY REMOVED IS: .163E+06
 FRACTION OF QUANTITY REMOVED IS: .856E+00

SEDIMENT FRACTION 2
 TOTAL QUANTITY INTO POND IS: .744E+05
 TOTAL QUANTITY OUT OF POND IS: .197E+04
 TOTAL QUANTITY LEFT IN POND IS: .856E-03
 TOTAL QUANTITY REMOVED IS: .725E+05
 FRACTION OF QUANTITY REMOVED IS: .974E+00

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

SEDIMENT FRACTION 3
 TOTAL QUANTITY INTO POND IS: .108E+06
 TOTAL QUANTITY OUT OF POND IS: .429E+03
 TOTAL QUANTITY LEFT IN POND IS: .418E-22
 TOTAL QUANTITY REMOVED IS: .107E+06
 FRACTION OF QUANTITY REMOVED IS: .996E+00

SEDIMENT FRACTION 4
 TOTAL QUANTITY INTO POND IS: .190E+06
 TOTAL QUANTITY OUT OF POND IS: .102E+03
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .190E+06
 FRACTION OF QUANTITY REMOVED IS: .999E+00

SEDIMENT FRACTION 5
 TOTAL QUANTITY INTO POND IS: .265E+06
 TOTAL QUANTITY OUT OF POND IS: .213E+02
 TOTAL QUANTITY LEFT IN POND IS: .000E+00
 TOTAL QUANTITY REMOVED IS: .265E+06
 FRACTION OF QUANTITY REMOVED IS: .100E+01

TOTAL SEDIMENT
 TOTAL QUANTITY INTO POND IS: .827E+06
 TOTAL QUANTITY OUT OF POND IS: .299E+05
 TOTAL QUANTITY LEFT IN POND IS: .352E+01
 TOTAL QUANTITY REMOVED IS: .797E+06
 FRACTION OF QUANTITY REMOVED IS: .964E+00
 POND VOLUME USAGE =====

A STAGE OF (M)	OVER A SPAN OF & VOLUME OF (CUBIC M)	.4076E+06 HOURS WAS ATTAINED (HOURS)	WAS ATTAINED (PERCENT OF TIME)
.0000E+00	.0000E+00	.4076E+06	100.0
.2750E+00	.4125E+02	.4076E+06	100.0
.5500E+00	.8250E+02	.4076E+06	100.0
.8250E+00	.1238E+03	.4076E+06	100.0
.1100E+01	.1650E+03	.4076E+06	100.0
.1375E+01	.2063E+03	.4076E+06	100.0
.1650E+01	.2475E+03	.4076E+06	100.0
.1925E+01	.2888E+03	.4076E+06	100.0
.2200E+01	.4467E+03	.8995E+05	22.1
.2475E+01	.6483E+03	.6548E+05	16.1
.2750E+01	.8500E+03	.4681E+05	11.5
.3025E+01	.1052E+04	.3073E+05	7.5
.3300E+01	.1253E+04	.1560E+05	3.8
.3575E+01	.1520E+04	.1010E+04	.2
.3850E+01	.1960E+04	.1840E+03	.0
.4125E+01	.2425E+04	.4100E+02	.0
.4400E+01	.2920E+04	.8000E+01	.0
.4675E+01	.3485E+04	.0000E+00	.0
.4950E+01	.4090E+04	.0000E+00	.0
.5225E+01	.4830E+04	.0000E+00	.0
.5500E+01	.5600E+04	.0000E+00	.0
.5775E+01	.5880E+04	.0000E+00	.0

*
 * Peak Volumes
 *

MAXMIN ID=3 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .143281E+04	Date (yrmody):	48	5	2
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	48	8	4
Maximum Value	CMS, M^3, or M	: .905418E+03	Date (yrmody):	49	2	23
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	49	3	30
Maximum Value	CMS, M^3, or M	: .836978E+03	Date (yrmody):	50	8	5
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	50	7	9
Maximum Value	CMS, M^3, or M	: .203716E+04	Date (yrmody):	51	6	29
Minimum Value	CMS, M^3, or M	: .300803E+03	Date (yrmody):	51	12	16
Maximum Value	CMS, M^3, or M	: .227275E+04	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	52	9	19
Maximum Value	CMS, M^3, or M	: .237652E+04	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .300802E+03	Date (yrmody):	53	10	9
Maximum Value	CMS, M^3, or M	: .254417E+04	Date (yrmody):	54	7	2

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	54	12	6
Maximum Value	CMS, M^3, or M	: .798888E+03	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	55	3	18
Maximum Value	CMS, M^3, or M	: .158985E+04	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .300807E+03	Date (yrmody):	56	6	13
Maximum Value	CMS, M^3, or M	: .185423E+04	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .300802E+03	Date (yrmody):	57	6	9
Maximum Value	CMS, M^3, or M	: .530104E+03	Date (yrmody):	58	7	27
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	58	3	31
Maximum Value	CMS, M^3, or M	: .169362E+04	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .300803E+03	Date (yrmody):	59	3	27
Maximum Value	CMS, M^3, or M	: .227263E+04	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	60	10	11
Maximum Value	CMS, M^3, or M	: .135829E+04	Date (yrmody):	61	6	18
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	61	11	19
Maximum Value	CMS, M^3, or M	: .150727E+04	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	62	1	3
Maximum Value	CMS, M^3, or M	: .608798E+03	Date (yrmody):	63	12	11
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	63	5	11
Maximum Value	CMS, M^3, or M	: .201353E+04	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	64	2	11
Maximum Value	CMS, M^3, or M	: .903283E+03	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .300802E+03	Date (yrmody):	65	11	2
Maximum Value	CMS, M^3, or M	: .218507E+04	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .300806E+03	Date (yrmody):	66	10	21
Maximum Value	CMS, M^3, or M	: .871107E+03	Date (yrmody):	67	6	20
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	67	8	20
Maximum Value	CMS, M^3, or M	: .181682E+04	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .300809E+03	Date (yrmody):	68	1	25
Maximum Value	CMS, M^3, or M	: .177601E+04	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	69	10	27
Maximum Value	CMS, M^3, or M	: .153714E+04	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	70	6	25
Maximum Value	CMS, M^3, or M	: .927095E+03	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .300804E+03	Date (yrmody):	71	7	28
Maximum Value	CMS, M^3, or M	: .169340E+04	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .300809E+03	Date (yrmody):	72	8	6
Maximum Value	CMS, M^3, or M	: .336760E+04	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	73	5	24
Maximum Value	CMS, M^3, or M	: .186558E+04	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	74	9	8
Maximum Value	CMS, M^3, or M	: .177257E+04	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	75	4	29
Maximum Value	CMS, M^3, or M	: .215114E+04	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	76	5	31
Maximum Value	CMS, M^3, or M	: .640133E+03	Date (yrmody):	77	7	10
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	77	6	15
Maximum Value	CMS, M^3, or M	: .157921E+04	Date (yrmody):	78	6	2
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	78	10	5
Maximum Value	CMS, M^3, or M	: .169330E+04	Date (yrmody):	79	6	21
Minimum Value	CMS, M^3, or M	: .300802E+03	Date (yrmody):	79	3	6
Maximum Value	CMS, M^3, or M	: .233109E+04	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .300804E+03	Date (yrmody):	80	3	21
Maximum Value	CMS, M^3, or M	: .120110E+04	Date (yrmody):	81	6	29
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	81	1	1
Maximum Value	CMS, M^3, or M	: .116376E+04	Date (yrmody):	82	6	7
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	82	3	23
Maximum Value	CMS, M^3, or M	: .159886E+04	Date (yrmody):	83	7	18
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	83	8	30
Maximum Value	CMS, M^3, or M	: .955306E+03	Date (yrmody):	84	6	24
Minimum Value	CMS, M^3, or M	: .300802E+03	Date (yrmody):	84	3	25
Maximum Value	CMS, M^3, or M	: .255834E+04	Date (yrmody):	85	6	12
Minimum Value	CMS, M^3, or M	: .300803E+03	Date (yrmody):	85	8	13
Maximum Value	CMS, M^3, or M	: .273879E+04	Date (yrmody):	86	7	4
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	86	9	25
Maximum Value	CMS, M^3, or M	: .134803E+04	Date (yrmody):	87	4	23
Minimum Value	CMS, M^3, or M	: .300804E+03	Date (yrmody):	87	1	1
Maximum Value	CMS, M^3, or M	: .145561E+04	Date (yrmody):	88	9	3
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	88	1	4
Maximum Value	CMS, M^3, or M	: .210815E+04	Date (yrmody):	89	6	6
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	89	3	20
Maximum Value	CMS, M^3, or M	: .105683E+04	Date (yrmody):	90	6	11
Minimum Value	CMS, M^3, or M	: .300800E+03	Date (yrmody):	90	5	17
Maximum Value	CMS, M^3, or M	: .166136E+04	Date (yrmody):	91	4	27
Minimum Value	CMS, M^3, or M	: .300799E+03	Date (yrmody):	91	3	3
Maximum Value	CMS, M^3, or M	: .149881E+04	Date (yrmody):	92	6	8
Minimum Value	CMS, M^3, or M	: .300801E+03	Date (yrmody):	92	8	22
Maximum Value	CMS, M^3, or M	: .278703E+04	Date (yrmody):	93	6	8
Minimum Value	CMS, M^3, or M	: .300812E+03	Date (yrmody):	93	11	2
Maximum Value	CMS, M^3, or M	: .187279E+04	Date (yrmody):	94	6	22
Minimum Value	CMS, M^3, or M	: .300805E+03	Date (yrmody):	94	6	7

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

*
* Peak Levels
*

MAXMIN ID=4 IOPT=1
START DATE YR=48 MO=05 DAY=02
END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .352050E+01	Date (yrmody):	48	5	2
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	48	8	4
Maximum Value	CMS, M^3, or M	: .282557E+01	Date (yrmody):	49	2	23
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	49	3	30
Maximum Value	CMS, M^3, or M	: .273224E+01	Date (yrmody):	50	8	5
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	50	7	9
Maximum Value	CMS, M^3, or M	: .389823E+01	Date (yrmody):	51	6	29
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	51	12	16
Maximum Value	CMS, M^3, or M	: .404042E+01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	52	9	19
Maximum Value	CMS, M^3, or M	: .409807E+01	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	53	10	9
Maximum Value	CMS, M^3, or M	: .419120E+01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	54	12	6
Maximum Value	CMS, M^3, or M	: .268030E+01	Date (yrmody):	55	6	18
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	55	3	18
Maximum Value	CMS, M^3, or M	: .361866E+01	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	56	6	13
Maximum Value	CMS, M^3, or M	: .378389E+01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	57	6	9
Maximum Value	CMS, M^3, or M	: .231378E+01	Date (yrmody):	58	7	27
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	58	3	31
Maximum Value	CMS, M^3, or M	: .368352E+01	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	59	3	27
Maximum Value	CMS, M^3, or M	: .404035E+01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	60	10	11
Maximum Value	CMS, M^3, or M	: .344312E+01	Date (yrmody):	61	6	18
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	61	11	19
Maximum Value	CMS, M^3, or M	: .356705E+01	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	62	1	3
Maximum Value	CMS, M^3, or M	: .242109E+01	Date (yrmody):	63	12	11
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	63	5	11
Maximum Value	CMS, M^3, or M	: .388346E+01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	64	2	11
Maximum Value	CMS, M^3, or M	: .282266E+01	Date (yrmody):	65	8	19
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	65	11	2
Maximum Value	CMS, M^3, or M	: .399067E+01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	66	10	21
Maximum Value	CMS, M^3, or M	: .277878E+01	Date (yrmody):	67	6	20
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	67	8	20
Maximum Value	CMS, M^3, or M	: .376051E+01	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	68	1	25
Maximum Value	CMS, M^3, or M	: .373501E+01	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	69	10	27
Maximum Value	CMS, M^3, or M	: .358571E+01	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	70	6	25
Maximum Value	CMS, M^3, or M	: .285513E+01	Date (yrmody):	71	8	18
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	71	7	28
Maximum Value	CMS, M^3, or M	: .368337E+01	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	72	8	6
Maximum Value	CMS, M^3, or M	: .462164E+01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	73	5	24
Maximum Value	CMS, M^3, or M	: .379099E+01	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	74	9	8
Maximum Value	CMS, M^3, or M	: .373286E+01	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	75	4	29
Maximum Value	CMS, M^3, or M	: .396946E+01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	76	5	31
Maximum Value	CMS, M^3, or M	: .246382E+01	Date (yrmody):	77	7	10
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	77	6	15
Maximum Value	CMS, M^3, or M	: .361200E+01	Date (yrmody):	78	6	2
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	78	10	5
Maximum Value	CMS, M^3, or M	: .368331E+01	Date (yrmody):	79	6	21
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	79	3	6
Maximum Value	CMS, M^3, or M	: .407283E+01	Date (yrmody):	80	6	14
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	80	3	21
Maximum Value	CMS, M^3, or M	: .322877E+01	Date (yrmody):	81	6	29
Minimum Value	CMS, M^3, or M	: .200110E+01	Date (yrmody):	81	1	1
Maximum Value	CMS, M^3, or M	: .317786E+01	Date (yrmody):	82	6	7
Minimum Value	CMS, M^3, or M	: .200109E+01	Date (yrmody):	82	3	23
Maximum Value	CMS, M^3, or M	: .362429E+01	Date (yrmody):	83	7	18

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 83 8 30
Maximum Value CMS, M^3, or M : .289360E+01 Date (yrmody): 84 6 24
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 84 3 25
Maximum Value CMS, M^3, or M : .419908E+01 Date (yrmody): 85 6 12
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 85 8 13
Maximum Value CMS, M^3, or M : .429933E+01 Date (yrmody): 86 7 4
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 86 9 25
Maximum Value CMS, M^3, or M : .342913E+01 Date (yrmody): 87 4 23
Minimum Value CMS, M^3, or M : .200110E+01 Date (yrmody): 87 1 1
Maximum Value CMS, M^3, or M : .353476E+01 Date (yrmody): 88 9 3
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 88 1 4
Maximum Value CMS, M^3, or M : .394259E+01 Date (yrmody): 89 6 6
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 89 3 20
Maximum Value CMS, M^3, or M : .303204E+01 Date (yrmody): 90 6 11
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 90 5 17
Maximum Value CMS, M^3, or M : .366335E+01 Date (yrmody): 91 4 27
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 91 3 3
Maximum Value CMS, M^3, or M : .356176E+01 Date (yrmody): 92 6 8
Minimum Value CMS, M^3, or M : .200109E+01 Date (yrmody): 92 8 22
Maximum Value CMS, M^3, or M : .432613E+01 Date (yrmody): 93 6 8
Minimum Value CMS, M^3, or M : .200111E+01 Date (yrmody): 93 11 2
Maximum Value CMS, M^3, or M : .379550E+01 Date (yrmody): 94 6 22
Minimum Value CMS, M^3, or M : .200110E+01 Date (yrmody): 94 6 7
SPLIT SERIES ID=2 IDOUT=1 SERIES=302 IDLOSS=5 SERIES=303 NPTQQ=6
QTOTAL QDISCHARGE
0 0
0.00036 0
0.03737 0.037
0.05238 0.052
0.06339 0.063
0.07340 0.073
*
* Discharges to Coach Creek
*
SERIES STATS ID=1
START YR=48 MO=05 DAY=02
END YR=94 MO=10 DAY=30

```

Routine SERIES STATS for ID = 1 ISER = 302 with DT = 1.00 hrs
 Start date = 48 5 2 End date = 94 10 30

Results from SERIES STATS for series ID= 1:

TSS conc equal or above (mg/l)	Duration: (hours)	FOD conc equal or above (#/dl)	Duration: (hours)
(mg/l)	(%)	(#/dl)	(%)
.00	407592.0	.0	407592.0
5.00	.0	25.0	.0
10.00	.0	50.0	.0
15.00	.0	100.0	.0
20.00	.0	200.0	.0
25.00	.0	300.0	.0
30.00	.0	400.0	.0
35.00	.0	500.0	.0
40.00	.0	1000.0	.0
50.00	.0	2000.0	.0
60.00	.0	3000.0	.0
70.00	.0	4000.0	.0
80.00	.0	5000.0	.0
90.00	.0	6000.0	.0
100.00	.0	8000.0	.0
120.00	.0	10000.0	.0
150.00	.0	15000.0	.0
200.00	.0	20000.0	.0
300.00	.0	25000.0	.0
400.00	.0	30000.0	.0
500.00	.0	40000.0	.0
600.00	.0	50000.0	.0
700.00	.0	60000.0	.0
800.00	.0	80000.0	.0
1000.00	.0	100000.0	.0

Total duration = 407592.00 hours
 Max flow rate = .0548 m3/sec
 Min flow rate = .0000 m3/sec
 Total flow volume = 72.99 1000 m3

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Max TSS conc = .0 mg/l
 Min TSS conc = .0 mg/l
 Total SS load = .01 kg
 Max FOD conc = .0 #/dl
 Min FOD conc = .0 #/dl
 Total FOD load = .00E+00 #

Stats for each of the five SS fractions:

Max conc: .0 .0 .0 .0 .0 mg/l
 Min conc: .0 .0 .0 .0 .0 mg/l
 Load : .0 .0 .0 .0 .0 kg
 MAXMIN ID=1 IOPT=1
 START DATE YR=48 MO=05 DAY=02
 END DATE YR=94 MO=10 DAY=30

ANNUAL MAXIMUM AND MINIMUM VALUES IN SERIES

Maximum Value	CMS, M^3, or M	: .151617E-02	Date (yrmody):	48	5	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	48	5	2
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	49	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	50	1	1
Maximum Value	CMS, M^3, or M	: .294757E-01	Date (yrmody):	51	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	51	1	1
Maximum Value	CMS, M^3, or M	: .376403E-01	Date (yrmody):	52	7	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	52	1	1
Maximum Value	CMS, M^3, or M	: .399339E-01	Date (yrmody):	53	8	5
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	53	1	1
Maximum Value	CMS, M^3, or M	: .426837E-01	Date (yrmody):	54	7	2
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	54	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	55	1	1
Maximum Value	CMS, M^3, or M	: .870418E-02	Date (yrmody):	56	7	20
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	56	1	1
Maximum Value	CMS, M^3, or M	: .209864E-01	Date (yrmody):	57	6	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	57	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	58	1	1
Maximum Value	CMS, M^3, or M	: .132893E-01	Date (yrmody):	59	6	6
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	59	1	1
Maximum Value	CMS, M^3, or M	: .381874E-01	Date (yrmody):	60	6	24
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	60	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	61	1	1
Maximum Value	CMS, M^3, or M	: .490808E-02	Date (yrmody):	62	4	28
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	62	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	63	1	1
Maximum Value	CMS, M^3, or M	: .281498E-01	Date (yrmody):	64	8	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	64	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	65	1	1
Maximum Value	CMS, M^3, or M	: .362032E-01	Date (yrmody):	66	8	17
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	66	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	67	1	1
Maximum Value	CMS, M^3, or M	: .193012E-01	Date (yrmody):	68	5	26
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	68	1	1
Maximum Value	CMS, M^3, or M	: .172580E-01	Date (yrmody):	69	5	7
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	69	1	1
Maximum Value	CMS, M^3, or M	: .592846E-02	Date (yrmody):	70	7	8
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	70	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	71	1	1
Maximum Value	CMS, M^3, or M	: .137147E-01	Date (yrmody):	72	6	9
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	72	1	1
Maximum Value	CMS, M^3, or M	: .547574E-01	Date (yrmody):	73	9	12
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	73	1	1
Maximum Value	CMS, M^3, or M	: .210995E-01	Date (yrmody):	74	6	29
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	74	1	1
Maximum Value	CMS, M^3, or M	: .175262E-01	Date (yrmody):	75	7	22
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	75	1	1
Maximum Value	CMS, M^3, or M	: .352401E-01	Date (yrmody):	76	8	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	76	1	1
Maximum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Minimum Value	CMS, M^3, or M	: .000000E+00	Date (yrmody):	77	1	1
Maximum Value	CMS, M^3, or M	: .841516E-02	Date (yrmody):	78	6	2

APPENDIX G

SWMHYMO Model Data for Post-Development Condition



Stantec

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

G.1 INPUT DATA

cc_postA.dat

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond A
* Job: 116417392
* Date: October 18, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*         [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment A1
*
CALIB STANDHYD      ID=[1], NHYD=["SUB1"], DT=[5.0](min), AREA=[29.53](ha),
                  XIMP=[0.24], TIMP=[0.24], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[82],
                  Pervious surfaces: IAper=[2.6](mm), SLPP=[1.0](%),
                                      LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAimp=[1.6](mm), SLPI=[1.0](%),
                                      LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Pond A
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR      IDout=[2], NHYD=["PONDA"], IDin=[1],
                  RDT=[5.0](min),
                  TABLE of ( OUTFLOW-STORAGE ) values
                          (cms) - (ha-m)
                          [0.0 , 0.0 ] PWL
                          [0.160 , 0.41]
                          [0.226 , 0.88]
                          [0.253 , 1.13] HWL
                          [ -1 , -1 ] (max twenty pts)
                  IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postB.dat

```

2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond B
* Job: 116417392
* Date: October 19, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Commercial Portion of Subcatchment 2 (23.00 ha) with Enhanced BMPs
*
CALIB STANDHYD    ID=[1], NHYD=["SUB2C"], DT=[5.0](min), AREA=[23.00](ha),
                  XIMP=[0.25], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[93],
                  Pervious surfaces: IAper=[5.0](mm), SLPP=[1.0](%),
                                      LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAimp=[5.0](mm), SLPI=[1.0](%),
                                      LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----|-----|
*
* Residential Portion of Subcatchment 2
*
CALIB STANDHYD    ID=[2], NHYD=["SUB2R"], DT=[5.0](min), AREA=[27.18](ha),
                  XIMP=[0.25], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[81],
                  Pervious surfaces: IAper=[2.7](mm), SLPP=[1.0](%),
                                      LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAimp=[1.6](mm), SLPI=[1.0](%),
                                      LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----|-----|
*
ADD HYD          IDsum=[3], NHYD=[205], IDs to add=[1+2]
*%-----|-----|
*
* Pond B
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR  IDout=[1], NHYD=["PONDB"], IDin=[3],
                  RDT=[5.0](min),
                  TABLE of ( OUTFLOW-STORAGE ) values
                  (cms) - (ha-m)
                  [0.0 , 0.0 ] PWL
                  [0.272 , 0.75]
                  [0.385 , 1.56]
                  [0.430 , 1.99] HWL
                  [ -1 , -1 ] (max twenty pts)
                  IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postC.dat

```

2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond C
* Job: 116417392
* Date: October 20, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment B1-OS
*
CALIB NASHYD      ID=[1], NHYD=["SUBB1-OS"], DT=[5.0]min, AREA=[18.94](ha),
                  DWF=[0](cms), CN/C=[71], IA=[3.2](mm),
                  N=[3], TP=[0.16]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Commercial Portion of Subcatchment 3 (11.10 ha) with Enhanced BMPs
*
CALIB STANDHYD   ID=[2], NHYD=["SUB3C"], DT=[5.0](min), AREA=[11.10](ha),
                  XIMP=[0.25], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[93],
                  Pervious surfaces: IAPER=[5.0](mm), SLPP=[1.0](%),
                  LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAIMP=[5.0](mm), SLPI=[1.0](%),
                  LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Residential Portion of Subcatchment 3
*
CALIB STANDHYD   ID=[3], NHYD=["SUB3R"], DT=[5.0](min), AREA=[14.10](ha),
                  XIMP=[0.27], TIMP=[0.27], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[81],
                  Pervious surfaces: IAPER=[2.7](mm), SLPP=[1.0](%),
                  LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAIMP=[1.6](mm), SLPI=[1.0](%),
                  LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
ADD HYD          IDsum=[4], NHYD=[205], IDs to add=[1+2+3]
*%-----|-----|
*
* Pond C
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR  IDout=[1], NHYD=["POND C"], IDin=[4],
                  RDT=[5.0](min),
                  TABLE of ( OUTFLOW-STORAGE ) values
                  (cms) - (ha-m)
                  [0.0 , 0.0 ] PWL
                  [0.239 , 0.46]
                  [0.338 , 0.97]
                  [0.378 , 1.24] HWL
                  [ -1 , -1 ] (max twenty pts)
                  IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postD.dat

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Ponds D1 & D2
* Job: 116417392
* Date: October 20, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          ["  "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM  IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
               ICASEcs=[1],
               A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment 6
*
CALIB NASHYD   ID=[1], NHYD=["SUBB6"], DT=[5.0]min, AREA=[15.59](ha),
               DWF=[0](cms), CN/C=[80], IA=[3.2](mm),
               N=[3], TP=[0.083]hrs,
               RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Pond D1 & D2 Combined
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR  IDout=[2], NHYD=["PONDC"], IDin=[1],
                 RDT=[5.0](min),
                 TABLE of ( OUTFLOW-STORAGE ) values
                   (cms) - (ha-m)
                   [0.0 , 0.0 ] PWL
                   [0.134 , 0.45] HWL
                   [ -1 , -1 ] (max twenty pts)
                 IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postE.dat

```

2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond E
* Job: 116417392
* Date: October 21, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          ["  "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment 7 with Enhanced BMPs
*
CALIB STANDHYD      ID=[1], NHYD=["SUB7"], DT=[5.0](min), AREA=[2.45](ha),
                  XIMP=[0.25], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[92],
                  Pervious surfaces: IAPER=[5.0](mm), SLPP=[1.0](%),
                  LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAIMP=[5.0](mm), SLPI=[1.0](%),
                  LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Subcatchment 8
*
CALIB NASHYD        ID=[2], NHYD=["SUB8"], DT=[5.0]min, AREA=[5.55](ha),
                  DWF=[0](cms), CN/C=[78], IA=[3.2](mm),
                  N=[3], TP=[0.083]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Commercial Portion of Subcatchment 9 (26.00 ha) with Enhanced BMPs
*
CALIB STANDHYD      ID=[3], NHYD=["SUB9C"], DT=[5.0](min), AREA=[26.00](ha),
                  XIMP=[0.25], TIMP=[0.25], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[93],
                  Pervious surfaces: IAPER=[5.0](mm), SLPP=[1.0](%),
                  LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAIMP=[5.0](mm), SLPI=[1.0](%),
                  LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Residential Portion of Subcatchment 9
*
CALIB STANDHYD      ID=[4], NHYD=["SUB9R"], DT=[5.0](min), AREA=[28.16](ha),
                  XIMP=[0.28], TIMP=[0.28], DWF=[0](cms), LOSS=[2],
                  SCS curve number CN=[82],
                  Pervious surfaces: IAPER=[2.6](mm), SLPP=[1.0](%),
                  LGP=[50](m), MNP=[0.25], SCP=[0](min),
                  Impervious surfaces: IAIMP=[1.6](mm), SLPI=[1.0](%),
                  LGI=[350](m), MNI=[0.015], SCI=[0](min),
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
ADD HYD            IDsum=[5], NHYD=[201], IDs to add=[1+2+3+4]
*%-----|-----|
*
* Pond E
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR      IDout=[1], NHYD=["PONDE"], IDin=[5],
                    RDT=[5.0](min),
                    TABLE of ( OUTFLOW-STORAGE ) values
                        (cms) - (ha-m)
                        [0.0 , 0.0 ] PWL
                        [0.337 , 0.93]
                        [0.477 , 1.93]
                        [0.533 , 2.46] HWL
                        [ -1 , -1 ] (max twenty pts)

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

IDovf=[], NHYDovf=[]
*%-----|-----|
FINISH

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postF.dat

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Pond F
* Job: 116417392
* Date: October 21, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM  IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
               ICASEcs=[1],
               A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment 10
*
CALIB STANDHYD ID=[1], NHYD=["SUB10"], DT=[5.0](min), AREA=[24.78](ha),
               XIMP=[0.26], TIMP=[0.26], DWF=[0](cms), LOSS=[2],
               SCS curve number CN=[82],
               Pervious surfaces: IAPER=[2.6](mm), SLPP=[1.0](%),
                                   LGP=[50](m), MNP=[0.25], SCP=[0](min),
               Impervious surfaces: IAIMP=[1.6](mm), SLPI=[1.0](%),
                                   LGI=[350](m), MNI=[0.015], SCI=[0](min),
               RAINFALL=[ , , , , ](mm/hr), END=-1
*%-----|-----|
*
* Pond F
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR IDout=[2], NHYD=["PONDF"], IDin=[1],
                RDT=[5.0](min),
                TABLE of ( OUTFLOW-STORAGE ) values
                        (cms) - (ha-m)
                        [0.0 , 0.0 ] PWL
                        [0.134 , 0.34]
                        [0.190 , 0.73]
                        [0.212 , 0.94] HWL
                        [ -1 , -1 ] (max twenty pts)
                IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_Sub11.dat

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Subcatchment 11
* Job: 116417392
* Date: November 18, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment 11
*
CALIB NASHYD      ID=[1], NHYD=["SUB11"], DT=[5.0]min, AREA=[2.20](ha),
                  DWF=[0](cms), CN/C=[89], IA=[2.2](mm),
                  N=[3], TP=[0.083]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Underground Storage
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR  IDout=[2], NHYD=["STORAGE"], IDin=[1],
                  RDT=[5.0](min),
                  TABLE of ( OUTFLOW-STORAGE ) values
                    (cms) - (ha-m)
                    [0.0 , 0.0 ] PWL
                    [0.011 , 0.036]
                    [0.016 , 0.072]
                    [0.019 , 0.108] HWL
                    [ -1 , -1 ] (max twenty pts)
                  IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_Sub12.dat

```
2      Metric units
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
*         Post-Development Condition - Subcatchment 12
* Job: 116417392
* Date: October 28, 2010
*
*%-----|-----|
START      TZERO=[0.0]hrs or date, METOUT=[2], NSTORM=[0], NRUN=[0]
*          [" "] <--storm filename, one per line for NSTORM time
*%-----|-----|
*
* 1:100 Chicago Design Storm
*
CHICAGO STORM      IUNITS=[2], TD=[24.0](hrs), TPRAT=[0.3], CSDT=[15.0](min),
                  ICASEcs=[1],
                  A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----|
*
* Subcatchment 12
*
CALIB NASHYD      ID=[1], NHYD=["SUB12"], DT=[5.0]min, AREA=[8.52](ha),
                  DWF=[0](cms), CN/C=[88], IA=[2.2](mm),
                  N=[3], TP=[0.083]hrs,
                  RAINFALL=[ , , , ](mm/hr), END=-1
*%-----|-----|
*
* Private Storm Pond
* Discharges @ 8.57 L/s/ha
*
ROUTE RESERVOIR  IDout=[2], NHYD=["STORAGE"], IDin=[1],
                  RDT=[5.0](min),
                  TABLE of ( OUTFLOW-STORAGE ) values
                  (cms) - (ha-m)
                  [0.0 , 0.0 ] PWL
                  [0.037 , 0.07]
                  [0.052 , 0.16]
                  [0.063 , 0.27]
                  [0.073 , 0.41] HWL
                  [ -1 , -1 ] (max twenty pts)
                  IDovf=[ ], NHYDovf=[ ]
*%-----|-----|
FINISH
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

G.2 OUTPUT DATA

cc_postA.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-19 TIME: 07:40:32 RUN COUNTER: 001170 *
*****
* Input filename: C:\PROGRA~1\SWMHYMO\Projects\cc_postA.dat *
* Output filename: C:\PROGRA~1\SWMHYMO\Projects\cc_postA.out *
* Summary filename: C:\PROGRA~1\SWMHYMO\Projects\cc_postA.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond A
* Job: 116417392
* Date: October 18, 2010
*
-----
| START | Project dir.: C:\PROGRA~1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA~1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
-----| C= .712
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
 Storm time step = 15.00 min
 Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

 001:0003-----
 *
 * Subcatchment 1
 *

CALIB STANDHYD	Area (ha)=	29.53
01:SUB1 DT= 5.00	Total Imp(%)=	24.00 Dir. Conn.(%)= 24.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	7.09	22.44	
Dep. Storage (mm)=	1.60	2.60	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max.eff.Inten.(mm/hr)=	88.69	40.61	
over (min)=	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	20.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
TOTALS			
PEAK FLOW (cms)=	1.62	1.56	2.543 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	88.07	53.08	61.474
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.98	.59	.686

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 001:0004-----
 *
 * Pond A
 * Discharges @ 8.57 L/s/ha
 *

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>01:(SUB1)	===== OUTFLOW STORAGE TABLE =====			
OUT<02:(PONDA)	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	.000	.0000E+00	.226	.8800E+00
	.160	.4100E+00	.253	.1130E+01

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
INFLOW >01: (SUB1)	29.53	2.543	7.250	61.474
OUTFLOW <02: (PONDA)	29.53	.229	11.000	61.474

PEAK FLOW REDUCTION [Qout/Qin](%)=	9.000
TIME SHIFT OF PEAK FLOW (min)=	225.00
MAXIMUM STORAGE USED (ha.m.)=	.9068E+00

001:0005-----
FINISH

WARNINGS / ERRORS / NOTES

Simulation ended on 2010-10-19 at 07:40:32
=====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postB.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W M M H H Y Y M M O O        9 9 9 9
SSSSS W W W M M H H H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
          StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-19 TIME: 14:57:33 RUN COUNTER: 001173 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postB.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postB.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postB.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond B
* Job: 116417392
* Date: October 19, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
*
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----

*

* Commercial Portion of Subcatchment 2 (23.00 ha) with Enhanced BMPs

*

CALIB STANDHYD	Area (ha)=	23.00		
01:SUB2C DT= 5.00	Total Imp(%)=	25.00	Dir. Conn.(%)=	25.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	5.75	17.25	
Dep. Storage (mm)=	5.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	58.82	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	18.48 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	1.31	1.80	2.465 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	84.67	69.07	72.969
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.94	.77	.814

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 93.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004-----

*

* Residential Portion of Subcatchment 2

*

CALIB STANDHYD	Area (ha)=	27.18		
02:SUB2R DT= 5.00	Total Imp(%)=	25.00	Dir. Conn.(%)=	25.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	6.80	20.39	
Dep. Storage (mm)=	1.60	2.70	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	39.14	
over (min)	5.00	20.00	

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```

Storage Coeff. (min)=      6.19 (ii)  20.65 (ii)
Unit Hyd. Tpeak (min)=    5.00      20.00
Unit Hyd. peak  (cms)=     .19       .06

PEAK FLOW      (cms)=      1.55      1.36
TIME TO PEAK   (hrs)=      7.25      7.50
RUNOFF VOLUME  (mm)=      88.07     51.61
TOTAL RAINFALL (mm)=      89.67     89.67
RUNOFF COEFFICIENT =      .98       .58

```

TOTALS

```

2.352 (iii)
7.250
60.723
89.666
.677

```

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 81.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0005-----

ADD HYD (000205) ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 01:SUB2C	23.00	2.465	7.25	72.97	.000
+ID2 02:SUB2R	27.18	2.352	7.25	60.72	.000
SUM 03:000205	50.18	4.817	7.25	66.34	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0006-----

*
* Pond B
* Discharges @ 8.57 L/s/ha
*

ROUTE RESERVOIR IN>03:(000205) OUT<01:(PONDB)	Requested routing time step = 5.0 min.			
	===== OUTFLOW STORAGE TABLE =====			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	.000	.0000E+00	.385	.1560E+01
	.272	.7500E+00	.430	.1990E+01

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >03: (000205)	50.18	4.817	7.250	66.336
OUTFLOW<01: (PONDB)	50.18	.403	11.083	66.336

```

PEAK FLOW REDUCTION [Qout/Qin](%)= 8.359
TIME SHIFT OF PEAK FLOW (min)= 230.00
MAXIMUM STORAGE USED (ha.m.)=.1729E+01

```

001:0007-----

FINISH

WARNINGS / ERRORS / NOTES

Simulation ended on 2010-10-19 at 14:57:33

=====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postC.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W M M M H H Y Y M M O O      9 9 9 9
SSSSS W W W M M M H H H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M M H H Y M M O O      9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
          StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
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***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-20 TIME: 09:46:27 RUN COUNTER: 001176 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postC.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postC.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postC.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond C
* Job: 116417392
* Date: October 20, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
*
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
-----
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----
 *
 * Subcatchment B1-OS
 *

CALIB NASHYD	Area (ha)=	18.94	Curve Number (CN)=	71.00
01:SUBB1- DT= 5.00	Ia (mm)=	3.200	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.160		

Unit Hyd Qpeak (cms)= 4.521

PEAK FLOW (cms)= 1.323 (i)
 TIME TO PEAK (hrs)= 7.333
 RUNOFF VOLUME (mm)= 39.306
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .438

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*** WARNING: Time step is too large for value of TP.
 R.V. may be ok. Peak flow could be off.

001:0004-----
 *
 * Commercial Portion of Subcatchment 3 (11.10 ha) with Enhanced BMPs
 *

CALIB STANDHYD	Area (ha)=	11.10		
02:SUB3C DT= 5.00	Total Imp(%)=	25.00	Dir. Conn.(%)=	25.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.78	8.33
Dep. Storage (mm)=	5.00	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	350.00	50.00
Mannings n =	.015	.250

Max. eff. Inten. (mm/hr)=	88.69	58.82
over (min)	5.00	20.00
Storage Coeff. (min)=	6.19 (ii)	18.48 (ii)
Unit Hyd. Tpeak (min)=	5.00	20.00
Unit Hyd. peak (cms)=	.19	.06

TOTALS
 PEAK FLOW (cms)= .63 .87 1.189 (iii)
 TIME TO PEAK (hrs)= 7.25 7.50 7.250
 RUNOFF VOLUME (mm)= 84.67 69.07 72.969
 TOTAL RAINFALL (mm)= 89.67 89.67 89.666
 RUNOFF COEFFICIENT = .94 .77 .814

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 93.0 Ia = Dep. Storage (Above)

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0005-----

*
* Residential Portion of Subcatchment 3
*

CALIB STANDHYD	Area (ha)=	14.10		
03:SUB3R DT= 5.00	Total Imp(%)=	27.00	Dir. Conn.(%)=	27.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	3.81	10.29	
Dep. Storage (mm)=	1.60	2.70	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	39.14	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	20.65 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	.87	.69	1.274 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	88.07	51.61	61.452
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.98	.58	.685

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 81.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

ADD HYD (000205)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1 01:SUBB1-		18.94	1.323	7.33	39.31	.000
+ID2 02:SUB3C		11.10	1.189	7.25	72.97	.000
+ID3 03:SUB3R		14.10	1.274	7.25	61.45	.000
=====						
SUM 04:000205		44.14	3.753	7.25	54.85	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007-----

*
* Pond C
* Discharges @ 8.57 L/s/ha
*

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>04:(000205)				
OUT<01:(PONDC)				
	=====	OUTFLOW STORAGE TABLE	=====	
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	.000	.0000E+00	.338	.9700E+00
	.239	.4600E+00	.378	.1240E+01

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >04: (000205)	44.14	3.753	7.250	54.845
OUTFLOW<01: (PONDC)	44.14	.360	10.250	54.845
				PEAK FLOW REDUCTION [Qout/Qin](%)= 9.603
				TIME SHIFT OF PEAK FLOW (min)= 180.00
				MAXIMUM STORAGE USED (ha.m.)=.1121E+01

001:0008-----

FINISH

WARNINGS / ERRORS / NOTES

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
-----  
001:0003 CALIB NASHYD  
  *** WARNING: Time step is too large for value of TP.  
                R.V. may be ok. Peak flow could be off.  
Simulation ended on 2010-10-20   at 09:46:27  
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postD.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W M M M H H Y Y M M O O      9 9 9 9
SSSSS W W W M M M H H H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
          StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-20 TIME: 10:51:51 RUN COUNTER: 001178 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postD.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postD.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postD.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Ponds D1 & D2
* Job: 116417392
* Date: October 20, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----
 *
 * Subcatchment 6
 *

CALIB NASHYD	Area (ha)=	15.59	Curve Number (CN)=	80.00
01:SUBB6 DT= 5.00	Ia (mm)=	3.200	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.083		

Unit Hyd Qpeak (cms)= 7.174

PEAK FLOW (cms)= 2.061 (i)
 TIME TO PEAK (hrs)= 7.250
 RUNOFF VOLUME (mm)= 49.854
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .556

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*** WARNING: Time step is too large for value of TP.
 R.V. may be ok. Peak flow could be off.

001:0004-----
 *
 * Pond D1 & D2 Combined
 * Discharges @ 8.57 L/s/ha
 *

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>01:(SUBB6)				
OUT<02:(PONDC)				
	=====	OUTFLOW	STORAGE	=====
	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	.000	.0000E+00	.134	.4500E+00

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW >01: (SUBB6)	15.59	2.061	7.250	49.854
OUTFLOW<02: (PONDC)	15.59	.109	10.583	49.854

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.288
 TIME SHIFT OF PEAK FLOW (min)= 200.00
 MAXIMUM STORAGE USED (ha.m.)=.3659E+00

001:0005-----
 FINISH

 WARNINGS / ERRORS / NOTES

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

001:0003 CALIB NASHYD

*** WARNING: Time step is too large for value of TP.
R.V. may be ok. Peak flow could be off.

Simulation ended on 2010-10-20 at 10:51:52

=====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postE.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-21 TIME: 11:41:12 RUN COUNTER: 001179 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postE.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postE.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postE.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond E
* Job: 116417392
* Date: October 21, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----

*

* Subcatchment 7 with Enhanced BMPs

*

CALIB STANDHYD	Area (ha)=	2.45		
01:SUB7 DT= 5.00	Total Imp(%)=	25.00	Dir. Conn.(%)=	25.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	.61	1.84	
Dep. Storage (mm)=	5.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	56.59	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	18.67 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	.14	.18	.256 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	84.67	67.15	71.528
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.94	.75	.798

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 92.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004-----

*

* Subcatchment 8

*

CALIB NASHYD	Area (ha)=	5.55	Curve Number (CN)=	78.00
02:SUB8 DT= 5.00	Ia (mm)=	3.200	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.083		

Unit Hyd Qpeak (cms)=	2.554
PEAK FLOW (cms)=	.687 (i)
TIME TO PEAK (hrs)=	7.250
RUNOFF VOLUME (mm)=	47.287
TOTAL RAINFALL (mm)=	89.666
RUNOFF COEFFICIENT =	.527

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*** WARNING: Time step is too large for value of TP.
R.V. may be ok. Peak flow could be off.

001:0005-----

*
* Commercial Portion of Subcatchment 9 (26.00 ha) with Enhanced BMPs
*

CALIB STANDHYD	Area (ha)=	26.00		
03:SUB9C DT= 5.00	Total Imp(%)=	25.00	Dir. Conn.(%)=	25.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	6.50	19.50	
Dep. Storage (mm)=	5.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	58.82	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	18.48 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	1.48	2.03	2.786 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	84.67	69.07	72.969
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.94	.77	.814

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 93.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006-----

*
* Residential Portion of Subcatchment 9
*

CALIB STANDHYD	Area (ha)=	28.16		
04:SUB9R DT= 5.00	Total Imp(%)=	28.00	Dir. Conn.(%)=	28.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	7.88	20.28	
Dep. Storage (mm)=	1.60	2.60	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	40.61	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	20.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	1.80	1.41	2.636 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	88.07	53.08	62.874
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.98	.59	.701

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0007-----

ADD HYD (000201)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:SUB7	2.45	.256	7.25	71.53	.000
	+ID2 02:SUB8	5.55	.687	7.25	47.29	.000
	+ID3 03:SUB9C	26.00	2.786	7.25	72.97	.000
	+ID4 04:SUB9R	28.16	2.636	7.25	62.87	.000

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
=====
SUM 05:000201    62.16    6.365    7.25    66.05    .000
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
001:0008-----
```

```
*
* Pond E
* Discharges @ 8.57 L/s/ha
*
```

```
-----
| ROUTE RESERVOIR | Requested routing time step = 5.0 min.
| IN>05:(000201) |
| OUT<01:(PONDE ) |
-----
===== OUTFLOW STORAGE TABLE =====
OUTFLOW   STORAGE | OUTFLOW   STORAGE
(cms)     (ha.m.) | (cms)     (ha.m.)
.000      .0000E+00 | .477      .1930E+01
.337      .9300E+00 | .533      .2460E+01
```

```
ROUTING RESULTS          AREA    QPEAK    TPEAK    R.V.
-----
                        (ha)    (cms)    (hrs)    (mm)
INFLOW >05: (000201)    62.16    6.365    7.250    66.046
OUTFLOW<01: (PONDE )    62.16    .498     11.083    66.045
```

```
PEAK FLOW REDUCTION [Qout/Qin](%)= 7.827
TIME SHIFT OF PEAK FLOW (min)= 230.00
MAXIMUM STORAGE USED (ha.m.)=.2130E+01
```

```
-----
001:0009-----
```

FINISH

```
*****
WARNINGS / ERRORS / NOTES
-----
```

```
001:0004 CALIB NASHYD
*** WARNING: Time step is too large for value of TP.
R.V. may be ok. Peak flow could be off.
Simulation ended on 2010-10-21 at 11:41:12
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_postF.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
*****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-21 TIME: 12:11:49 RUN COUNTER: 001180 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postF.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postF.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_postF.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Pond F
* Job: 116417392
* Date: October 21, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----
 *
 * Subcatchment 10
 *

CALIB STANDHYD	Area (ha)=	24.78		
01:SUB10 DT= 5.00	Total Imp(%)=	26.00	Dir. Conn.(%)=	26.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	6.44	18.34	
Dep. Storage (mm)=	1.60	2.60	
Average Slope (%)=	1.00	1.00	
Length (m)=	350.00	50.00	
Mannings n =	.015	.250	
Max. eff. Inten. (mm/hr)=	88.69	40.61	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.19 (ii)	20.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	.19	.06	
			TOTALS
PEAK FLOW (cms)=	1.47	1.27	2.227 (iii)
TIME TO PEAK (hrs)=	7.25	7.50	7.250
RUNOFF VOLUME (mm)=	88.07	53.08	62.174
TOTAL RAINFALL (mm)=	89.67	89.67	89.666
RUNOFF COEFFICIENT =	.98	.59	.693

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0004-----
 *
 * Pond F
 * Discharges @ 8.57 L/s/ha
 *

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>01:(SUB10)				
OUT<02:(POND F)				
	=====	OUTFLOW STORAGE TABLE	=====	
	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	.000	.0000E+00	.190	.7300E+00
	.134	.3400E+00	.212	.9400E+00

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
-----	(ha)	(cms)	(hrs)	(mm)
INFLOW >01: (SUB10)	24.78	2.227	7.250	62.174

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

OUTFLOW<02: (PONDF) 24.78 .194 10.917 62.174

PEAK FLOW REDUCTION [Qout/Qin](%)= 8.725
TIME SHIFT OF PEAK FLOW (min)= 220.00
MAXIMUM STORAGE USED (ha.m.)=.7710E+00

001:0005-----
FINISH

WARNINGS / ERRORS / NOTES

Simulation ended on 2010-10-21 at 12:11:50
=====

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_Sub11.out

```

=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W MM MM H H Y Y MM MM O O    9 9 9 9
SSSSS W W W M M M HHHHH Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M H H Y M M O O          9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
                                9 9 9 9 # 6754920

StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
*****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
***** Gatineau, Quebec: (819) 243-6858 *****
***** E-Mail: swmhymo@jfsa.Com *****
*****

+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-11-18 TIME: 09:21:36 RUN COUNTER: 001196 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub11.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub11.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub11.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Subcatchment 11
* Job: 116417392
* Date: November 18, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
*
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min

```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----
 *
 * Subcatchment 11
 *

CALIB NASHYD	Area (ha)=	2.20	Curve Number (CN)=	89.00
01:SUB11 DT= 5.00	Ia (mm)=	2.200	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.083		

Unit Hyd Qpeak (cms)= 1.012

PEAK FLOW (cms)= .399 (i)
 TIME TO PEAK (hrs)= 7.250
 RUNOFF VOLUME (mm)= 64.364
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .718

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*** WARNING: Time step is too large for value of TP.
 R.V. may be ok. Peak flow could be off.

001:0004-----
 *
 * Underground Storage
 * Discharges @ 8.57 L/s/ha
 *

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>01:(SUB11)				
OUT<02:(STORAG)				
	=====	OUTFLOW	STORAGE	=====
	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	.000	.0000E+00	.016	.7200E-01
	.011	.3600E-01	.019	.1080E+00

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW >01: (SUB11)	2.20	.399	7.250	64.364
OUTFLOW<02: (STORAG)	2.20	.016	11.250	64.363

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.070
 TIME SHIFT OF PEAK FLOW (min)= 240.00
 MAXIMUM STORAGE USED (ha.m.)=.7484E-01

001:0005-----
 FINISH

 WARNINGS / ERRORS / NOTES

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

```
-----  
001:0003 CALIB NASHYD  
  *** WARNING: Time step is too large for value of TP.  
                R.V. may be ok. Peak flow could be off.  
Simulation ended on 2010-11-18    at 09:21:36  
=====
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

cc_Sub12.out

```
=====
SSSSS W W M M H H Y Y M M OOO          999 999 =====
S      W W W M M M H H Y Y M M O O      9 9 9 9
SSSSS W W W M M M H H H H H H Y M M M O O ## 9 9 9 9 Ver. 4.02
      S W W M M M H H Y M M O O      9999 9999 July 1999
SSSSS W W M M H H Y M M OOO          9 9 9 9 =====
          StormWater Management Hydrologic Model          999 999 =====

*****
***** SWMHYMO-99 Ver/4.02 *****
***** A single event and continuous hydrologic simulation model *****
***** based on the principles of HYMO and its successors *****
***** OTTHYMO-83 and OTTHYMO-89. *****
***** Distributed by: J.F. Sabourin and Associates Inc. *****
***** Ottawa, Ontario: (613) 727-5199 *****
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***** E-Mail: swmhymo@jfsa.Com *****
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+++++++ Licensed user: Stantec Consulting Ltd. (Attention: Mr. Rick ++++++
+++++++ Calgary SERIAL#:6754920 ++++++
+++++++

*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
*****

***** D E T A I L E D O U T P U T *****
*****
* DATE: 2010-10-28 TIME: 09:41:54 RUN COUNTER: 001186 *
*****
* Input filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub12.dat *
* Output filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub12.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\Projects\cc_Sub12.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
*****

-----
001:0001-----
*
* SWMHYMO MODEL INPUT DATA
*
* Project: Westview Master Drainage Plan
* Post-Development Condition - Subcatchment 12
* Job: 116417392
* Date: October 28, 2010
*
-----
| START | Project dir.: C:\PROGRA-1\SWMHYMO\Projects\
-----| Rainfall dir.: C:\PROGRA-1\SWMHYMO\Projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)
NRUN = 001
NSTORM= 0
-----

001:0002-----
*
* [" "] <--storm filename, one per line for NSTORM time
*
* 1:100 Chicago Design Storm
*
-----
| CHICAGO STORM | IDF curve parameters: A= 663.100
| Ptotal= 89.67 mm | B= 1.870
C= .712
used in: INTENSITY = A / (t + B)^C

Duration of storm = 24.00 hrs
Storm time step = 15.00 min
```

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

Time to peak ratio = .30

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.25	1.107	6.25	4.650	12.25	2.554	18.25	1.456
.50	1.136	6.50	5.831	12.50	2.467	18.50	1.433
.75	1.168	6.75	8.169	12.75	2.386	18.75	1.411
1.00	1.201	7.00	16.640	13.00	2.312	19.00	1.390
1.25	1.237	7.25	88.690	13.25	2.243	19.25	1.369
1.50	1.276	7.50	22.018	13.50	2.179	19.50	1.349
1.75	1.317	7.75	13.243	13.75	2.118	19.75	1.330
2.00	1.362	8.00	9.893	14.00	2.062	20.00	1.311
2.25	1.411	8.25	8.052	14.25	2.010	20.25	1.293
2.50	1.464	8.50	6.865	14.50	1.960	20.50	1.276
2.75	1.523	8.75	6.026	14.75	1.913	20.75	1.259
3.00	1.587	9.00	5.399	15.00	1.869	21.00	1.242
3.25	1.659	9.25	4.908	15.25	1.827	21.25	1.227
3.50	1.738	9.50	4.512	15.50	1.788	21.50	1.211
3.75	1.828	9.75	4.186	15.75	1.750	21.75	1.196
4.00	1.929	10.00	3.911	16.00	1.714	22.00	1.182
4.25	2.045	10.25	3.676	16.25	1.680	22.25	1.168
4.50	2.179	10.50	3.472	16.50	1.648	22.50	1.154
4.75	2.337	10.75	3.293	16.75	1.617	22.75	1.141
5.00	2.525	11.00	3.135	17.00	1.587	23.00	1.128
5.25	2.755	11.25	2.994	17.25	1.559	23.25	1.115
5.50	3.042	11.50	2.868	17.50	1.532	23.50	1.103
5.75	3.414	11.75	2.753	17.75	1.505	23.75	1.091
6.00	3.918	12.00	2.649	18.00	1.480	24.00	1.079

001:0003-----
 *
 * Subcatchment 12
 *

CALIB NASHYD	Area (ha)=	8.52	Curve Number (CN)=	88.00
01:SUB12 DT= 5.00	Ia (mm)=	2.200	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	.083		

Unit Hyd Qpeak (cms)= 3.921

PEAK FLOW (cms)= 1.494 (i)
 TIME TO PEAK (hrs)= 7.250
 RUNOFF VOLUME (mm)= 62.655
 TOTAL RAINFALL (mm)= 89.666
 RUNOFF COEFFICIENT = .699

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

*** WARNING: Time step is too large for value of TP.
 R.V. may be ok. Peak flow could be off.

001:0004-----
 *
 * Private Storm Pond
 * Discharges @ 8.57 L/s/ha
 *

ROUTE RESERVOIR	Requested routing time step = 5.0 min.			
IN>01:(SUB12)				
OUT<02:(STORAG)				
	=====	OUTFLOW	STORAGE	=====
	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	.000	.0000E+00	.063	.2700E+00
	.037	.7000E-01	.073	.4100E+00
	.052	.1600E+00	.000	.0000E+00

ROUTING RESULTS	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW >01: (SUB12)	8.52	1.494	7.250	62.655
OUTFLOW<02: (STORAG)	8.52	.063	11.167	62.655

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.230
 TIME SHIFT OF PEAK FLOW (min)= 235.00
 MAXIMUM STORAGE USED (ha.m.)=.2729E+00

001:0005-----
 FINISH

WESTVIEW STORMWATER MASTER DRAINAGE PLAN

WARNINGS / ERRORS / NOTES

001:0003 CALIB NASHYD

*** WARNING: Time step is too large for value of TP.

R.V. may be ok. Peak flow could be off.

Simulation ended on 2010-10-28 at 09:41:54
=====

APPENDIX H

Quantities and Opinions of Probable Costs
for Alternate Storm Trunk



Stantec

Table H.1 Opinion of Probable Cost for Option #1 Gravity Trunk to Bow River

Description	Unit	Quantity	Unit Cost	Cost
1.0 UNDERGROUND:				
1.1 1200mm Class IV	l.m.	372	\$1,130	\$420,360
1.2 900mm HDPE Directional Drill (Bow River)	l.m.	357	\$9,500	\$3,391,500
1.3 1500mm Class V	l.m.	3,582	\$1,640	\$5,874,480
1.4 1500mm Class V Auger (Stoney Trail)	l.m.	109	\$10,000	\$1,090,000
1.5 1800 x 1800 Type 1S MH	v.m.	18	\$3,300	\$59,400
1.6 1930 x 1930 Type 1S MH	v.m.	120	\$3,500	\$420,000
1.7 Outfall	l.s.	1	\$50,000	\$50,000
				<u>\$11,305,740</u>
2.0 SITE WORK:				
2.1 Clearing	l.s.	1	\$25,000	\$25,000
2.1 Topsoil Stripping & Stockpile	cu.m.	12,500	\$5.00	\$62,500
2.2 Reloam From Stockpile	cu.m.	12,500	\$3.50	\$43,750
2.3 Handling of Water	l.s.	1	\$250,000	\$250,000
2.4 Erosion & Sediment Control	l.s.	1	\$150,000	\$150,000
				<u>\$531,250</u>
3.0 LANDSCAPING:				
3.1 Hydroseeding	sq.m.	82,400	\$3.50	\$288,400
3.2 Tree Replacement	l.s.	1	\$25,000	\$25,000
				<u>\$313,400</u>
4.0 MISCELLANEOUS:				
4.1 Mobilization	l.s.	1	\$150,000	\$150,000
4.2 Traffic Control	l.s.	1	\$15,000	\$15,000
4.3 Protection of Existing Trunks	l.s.	1	\$100,000	\$100,000
4.4 Existing Utilities	l.s.	1	\$50,000	\$50,000
4.5 Maintenance	mo.	21	\$2,500	\$52,500
				<u>\$367,500</u>
Sub-Total Construction Items				\$12,517,890
Design & Construction Professional Services (10%)				\$1,252,000
Environmental & Geotechnical Studies				\$100,000
Material Testing During Construction (3%)				\$376,000
				<u>\$14,245,890</u>
Contingency (20%)				\$2,849,000
TOTAL COST				\$17,094,890

Table H.2 Opinion of Probable Cost for Option #2 Forcemain to Bow River

Description	Unit	Quantity	Unit Cost	Cost
1.0 UNDERGROUND:				
1.1 1200mm Class IV	l.m.	372	\$1,130	\$420,360
1.2 900mm HDPE Directional Drill (Bow River)	l.m.	357	\$9,500	\$3,391,500
1.3 900mm HDPE Directional Drill (Bow River)	l.m.	3,582	\$1,010	\$3,617,820
1.4 900mm HDPE Auger (Stoney Trail)	l.m.	109	\$6,000	\$654,000
1.5 1800 x 1800 Type 1S MH (Clean-outs)	v.m.	42	\$3,300	\$138,600
1.6 Outfall	l.s.	1	\$50,000	\$50,000
				<u>\$8,272,280</u>
2.0 SITE WORK:				
2.1 Clearing	l.s.	1	\$25,000	\$25,000
2.1 Topsoil Stripping & Stockpile	cu.m.	12,500	\$5.00	\$62,500
2.2 Reloam From Stockpile	cu.m.	12,500	\$3.50	\$43,750
2.3 Handling of Water	l.s.	1	\$50,000	\$50,000
2.4 Erosion & Sediment Control	l.s.	1	\$150,000	\$150,000
				<u>\$331,250</u>
3.0 LANDSCAPING:				
3.1 Hydroseeding	sq.m.	82,400	\$3.50	\$288,400
3.2 Tree Replacement	l.s.	1	\$25,000	\$25,000
				<u>\$313,400</u>
4.0 MISCELLANEOUS:				
4.1 Mobilization	l.s.	1	\$150,000	\$150,000
4.2 Traffic Control	l.s.	1	\$15,000	\$15,000
4.3 Protection of Existing Trunks	l.s.	1	\$100,000	\$100,000
4.4 Existing Utilities	l.s.	1	\$50,000	\$50,000
4.5 Maintenance	mo.	21	\$2,500	\$52,500
				<u>\$367,500</u>
Sub-Total Construction Items				\$9,284,430
Design & Construction Professional Services (10%)				\$928,000
Environmental & Geotechnical Studies				\$100,000
Material Testing During Construction (3%)				\$279,000
				<u>\$10,591,430</u>
Contingency (20%)				\$2,118,000
TOTAL COST				\$12,709,430