

**STORMWATER MANAGEMENT STUDY
WESTRIDGE ACRES DEVELOPMENT
SW ¼ SEC 15 - 14 - 28 - W4M**

NOVEMBER 2006

**PREPARED FOR:
RADLER CONSTRUCTION SERVICES INC.**

Prepared by:



CONSULTING ENGINEERS • SURVEYORS • PLANNERS

**#200, 4393-14th STREET N. E.
CALGARY, ALBERTA T2E 7A9
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FILE 06-166



**JUBILEE
ENGINEERING
CONSULTANTS LTD.**

CONSULTING ENGINEERS • SURVEYORS • PLANNERS

December 4, 2006

Our file 06-166

M. D. of Willow Creek No. 26
5123-5th Street S. E.
Claresholm, Alberta T0L 0T0

**Attention: Sharon Shearer,
Utilities & Development Officer**

Dear Madam:

**Subject: Westridge Acres Development
Stormwater Management Study
SW 1/4 Sec 15-14-28-W4M**

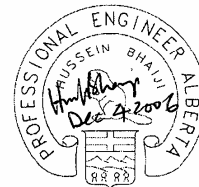
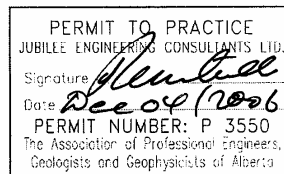
Jubilee Engineering Consultants Ltd. is pleased to submit the Stormwater Management Study for the Westridge Acres Development on behalf of Radler Construction Services Inc. The report addresses the M. D. of Willow Creek requirements for stormwater management as part of the development process.

Should you require any additional information or further clarification, please do not hesitate to contact our office.

Yours truly,

Hussein Bhajji, M. Eng., P. Eng.

hb/cls



cc Radler Construction Services Inc.

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1.0 INTRODUCTION

Jubilee Engineering Consultants Ltd. has been requested by Radler Construction Services Inc. to prepare a stormwater management report for the proposed site in the M. D. of Willow Creek. The proposed development consists 24.8 hectares of developable land, which will be subdivided into 14 lots.

The stormwater management study will utilize sound engineering practices in accordance with the M.D. of Willow Creek standards on stormwater management, to provide guidelines for the management of stormwater flows produced within the drainage area that contains the above development. It will also provide an estimate of the expected flow that will be passed on to downstream areas.

1.1 Purpose and Scope

The report will review the drainage areas which include the proposed development and determine the surface runoff generated by the proposed development. It will also address the means and ways to mitigate the erosion and sedimentation control as a result of construction of the subdivision.

The existing data and information is as obtained from the client and the M. D. of Willow Creek. Field investigations of the site were carried out by Jubilee Engineering Consultants Ltd. to familiarize the study team with the site conditions. The specific work activities of the analysis were as follows:

- Collection of data pertaining to the site to define the drainage boundaries and site conditions within watershed.
- Delineate the drainage area that includes the proposed development.
- Communication with local authorities, and government agencies to determine the site constraints and stormwater management issues that will be addressed.
- Computer simulation analysis to determine the pre and post runoff generated for the 1 in 100 year return period event.
- Development of appropriate stormwater management concepts and methodologies.
- Reporting of the analysis and recommendations.
- Keeping to the requirements of the Stormwater Management Report done in May 2001 for the existing subdivision by Jubilee Engineering Consultants Ltd.

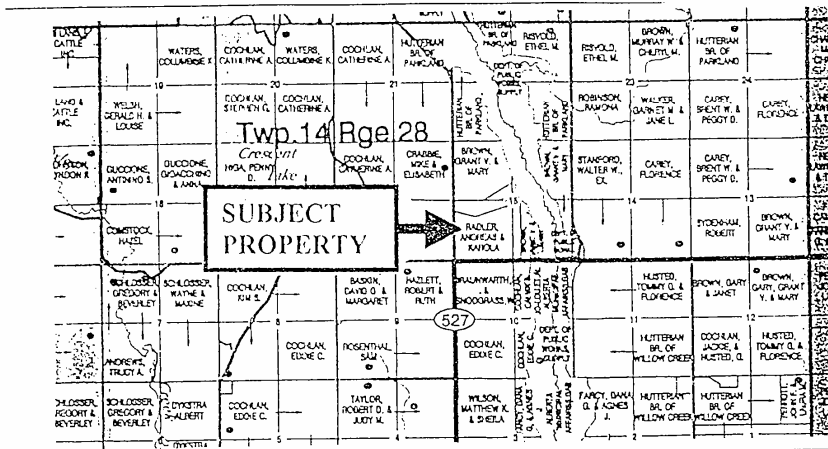
2.0 SITE INFORMATION

2.1 General Location

Westridge Acres Development is located in the M. D. of Willow Creek. This site is approximately 9 km west of the Town of Stavelly along route 527.

2.2 Adjacent Lands

This site is surrounded by the Brown property to the north and east, Twp. Road 283 to the west, and Route 527 to the south.



2.3 Area

The total plan area comprises approximately 61.7 hectares (152.36 acres). The existing subdivision takes up 36.86 hectares and 24.84 hectares are proposed for development under this report.

2.4 Legal Description

The subject land is legally described as a portion of the SW 1/4 Section 15, Township 14, Range 28, West of the 4th Meridian.

2.5 Physical Features

The site is presently covered with natural prairie grasses. The site has not been modified or graded. The proposed development is to the west of the existing developed subdivision. The land generally slopes from west to east. Across the site the datum ranges from ± 1,093 along the west property line to ± 1,077 at the east property line.

2.6 Drawings

The applicable drawings are:

SWM1	Overall drainage area
SWM2	Pre-Development Conditions
SWM3	Post-Development Conditions

3.0 DRAINAGE AREAS

Catchment areas are delineated using the topographical survey information provided by the owner and carried out by Tronnes Surveys in April 2000. The contours shown on the drawings were created by this survey.

The proposed development has one catchment (Catchment 1, area =24.84 ha) at pre-development and 2 catchments (Catchments A, area =13.14 ha and Catchment B, area = 11.70 ha) at post-development. See Drawings SWM2 & SWM3. Drawing SWM1 shows the site in relation to surrounding areas on a scale of 1:7500. The contour mapping is produced by data from AltaLis. The plan shows the complete Pine Coulee and natural channels where runoff exits the site leading to the coulee.

3.1 Catchments

New development boundaries seldom coincide with drainage boundaries. For this reason it is necessary to review each site to determine how the new development affects drainage.

3.2 Pre-Development Conditions

As existing, the drainage is towards the Pine Coulee Reservoir. The existing development drains via road ditches, swales, and natural channels. The proposed development area drains via sheet flow to the low point in the north and existing ditch in the south. See Drawing SWM2.

3.3 Post-Development Conditions

The drainage patterns will change for the proposed development. As per Drawing SWM3 the road ditches and swales shall direct the drainage towards the low point in the north and existing ditch in the south. All drainage shall flow to the Pine Coulee.

4.0 STORMWATER MANAGEMENT PLAN

Drawings SWM2 and SWM3 show the drainage conditions and patterns, which constitute the Stormwater Management Plan. The final runoff is directed to the Pine Coulee. The quantity of increased runoff due to the proposed development is only 311 m³ being 4.0% of the predevelopment conditions.

The total runoff from the whole site (i.e. the proposed and existing developments) is only 996 m³ being 3.9% of the pre-development condition.

This increase shall have minimal impact on the Pine Coulee and thus no onsite retention is necessary.

Please refer to Section 5.0 for the runoff analysis which details the predevelopment and post-development flows. The pre- and post-development flows for the existing subdivision shall be adopted from the Stormwater Management Report by Jubilee Engineering Consultants Ltd. – Westridge Acres Development, May 2001.

5.0 ANALYSIS

5.1 Runoff Analysis

Flow analysis for the proposed development was undertaken using SWMHYMO Computer Model. This model was used because it computes the peak discharge and the total runoff volumes during a single 1:100 year storm event. SWMHYMO requires the following site specific parameters.

- Catchment area
- Land Use (determines the impervious ratio)
- Initial abstraction (or loss) IA

IA is 0.2S

Where S = soil storage

25400 / CN-254

CN = Curve No. (usually related to the impervious ratio)

Rainfall data from the M. D. of Willow Creek is limited and the nearest long term precipitation records are from the City of Calgary. Therefore, 1990 Intensity-Duration-Frequency information for the Calgary International Airport was used. A 100-year synthetic Chicago storm over a 24 hour period was considered in the model. See Appendix A for SWMHYMO computer runs and the impervious ratio calculations.

Table 1 shows the 1:100 year pre-development analysis, giving the peak flows and runoff volumes.

Table 1 Pre-Development Conditions

Catchment	Area ha	Impervious CN Factor	Peak Flow m ³ /s	Runoff Volume m ³ /s
1	24.84	72	0.450	7198

Table 2 shows the 1:100 year post-development analysis, giving the peak flows and runoff volumes.

Table 2 Post-Development Conditions

Catchment	Area ha	Impervious CN Factor	Peak Flow m ³ /s	Runoff Volume m ³ /s
A	13.14	72.8	0.228	3969
B	11.70	72.85	0.203	3540

In order to arrive at the total increase in runoff from the whole site, i.e. the proposed development and the existing subdivision, the runoff analysis from the report of May 2001 was utilized. Table 2 on Page 4 of the May 2001 report, giving the pre and post-development discharges is shown below:

Subcatchment	Peak Discharge (m ³ /s)		Volume (m ³)	
	Pre	Post	Pre	Post
Whole Site (63.81 ac)	3.689	3.815	25,503	26,188

From the above table:

Increase in runoff due to existing development $(26,188 - 25,503) \text{ m}^3 = 685 \text{ m}^3$

From Tables 1 and 2 for the proposed development:

Increase in runoff due to proposed development $(3969 + 3540) - 7198 \text{ m}^3 = 311 \text{ m}^3$

Percentage increase from predevelopment $311 / 7198 = 4.0\%$

Total Increase in flow into the Pine Coulee $685 + 311 = 996 \text{ m}^3$

Percentage increase from pre-development runoff $996 / 25,503 = 3.9\%$

The total runoff, i.e. from the proposed development and existing development for Pre and post-development is:

Pre-Development = 25,503 m³ (as per May 2001 report)

Post-development = 26,499 m³ (26,188m³ as per May 2001 report plus the 311 m³ increase)

6.0 EROSION AND SEDIMENTATION CONTROL

The potential of erosion and sedimentation is high during site preparation and/or construction of roads and buildings.

The storm runoff from the development area will flow overland and in the road ditches, swales, and channels. The sediment from erosion needs to be contained to protect downstream areas.

Erosion and sedimentation control measures need to be put in place to contain the transport of sediment within the site boundaries.

The following measures are suggested to control the erosion, and shall be field located at time of construction to suit the topography of the site and construction activities.

These measures should be addressed by the contractors and developers at the time of construction. >

Critical Areas

The land slopes are gentle with no steep slopes. Hence there are no significant critical areas.

Control Measures

Due to the nature of the topography and the natural vegetation, control measures during construction shall be as directed in the field. The following description of the control measures shall be used as a guide during the field operations.

Construction traffic will access the site at the designated entrance. A gravel bed shall be placed at the entrance to reduce mud and clay being transported off the site. The gravel bed, based on field experience, is usually 20 - 25m in length and 7 - 15m wide. As per City of Calgary guidelines for erosion and sediment control, the gravel is 15 - 20 cm with 50mm crushed rock composed of hard, durable cubical fragments.

To further reduce mud-tracking, a wash-down facility with high pressure hose can be provided, to wash down the truck wheels.

As work progresses:

1. The site is graded and any runoff will be directed towards the Coulee. Silt fences shall be placed along the north, west, and portion of the south property lines to contain sediment transport and should be inspected every 7 days and any damage repaired.

2. Any disturbed soil surfaces shall be regularly watered to prevent dust control. Watering shall be done daily, if required, by having water trucks on site and carrying out frequent checks.
3. Any excess materials on site will be hauled to the contractor's location of choice. Any piles of dirt or soil stacked on site during construction for more than 7 days will be seeded to prevent erosion.
4. Permanent stabilization shall be done as the work is completed by the contractor. The main areas are:
 - roads and driveways,
 - landscaping around the site will be done wherever designated,
 - any open soil surface and slopes due to construction activities shall be watered and seeded immediately as required.

Maintenance

There will be a representative from the Engineering Consultants, or the developer's project manager, on site during construction and regular spot visits during construction. If there are any problems or repairs to erosion and sediment control devices they will be repaired or replaced. All accumulated sediments shall be promptly removed.

A maintenance and inspection log and a copy of the erosion control report will be kept on site. The maintenance and inspection log will reflect the site inspection records (inspections will be done at least once a week and after each significant rainfall event or snowmelt). A copy of the inspection log and records are attached.

The protection and control measures shall not be removed until the FAC/Construction Completion Certificate is acquired.

Winter Conditions

Normally the construction activities during **winter** are closed down. During close down all specified and constructed control measures should remain on site and under no circumstances should they be removed. Any special measures to suit winter conditions shall be implemented. In case of any events resulting in snowmelts and runoff during winter, the erosion control measures shall be inspected and maintenance, if required, carried out. Site inspections during winter are mandatory.

7.0 CONCLUSIONS

The following conclusions are made on the Stormwater Management Report for the proposed development.

- The study area has been divided into two catchment areas based on the existing topography.
- SWMHYMO modelling shows that the catchment will generate a total of 25,503 m³ and 26,499 m³ runoff during a 1:100 year single storm event for pre and post-development conditions respectively.
- The overall site is expected to have an increase of 996 m³ in runoff generated during a single event due to the proposed and existing subdivisions. The discharge rate is only an increase of 4% to the Pine Coulee. This is very insignificant compared to the total runoff draining into the Pine Coulee Reservoir.
- The minimal increase in runoff shall not affect the existing watershed of the Pine Coulee Reservoir. Thus no onsite retention is necessary.
- Pre-development drainage patterns to the Pine Coulee Reservoir are not affected by increase in flow.
- Since the potential of erosion is high during construction, sediment control measures will be installed depending on site activities. This shall prevent sediment transport to the Coulee.

8.0 REFERENCES

1. Alberta Environment, (1997). "Stormwater Management Guidelines for the Province of Alberta". Alberta Environmental Standards and Approvals Division, Municipal Engineering Branch, Edmonton, Alberta.
2. Guidelines for Erosion and Sediment Control, City of Calgary, Engineering and Environmental Services Department.
3. J. F. Sabourin and Associates Inc., (2000) "SWMHYMO; Stormwater Management Hydrologic Model, User's Manual", Ottawa, Ontario.
4. Stormwater Management Report (May 2001). Jubilee Engineering Consultants Ltd.

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APPENDIX A

INSPECTION CHECK SHEET

Sheet ___ of ___

Project Name: _____ File No. _____

Inspection Date: _____ Time: _____ Inspected by: _____

STAGE OF CONSTRUCTION

Pre-Construction Conference _____ Rough Grading _____ Finish Grading _____
Clearing and Grubbing _____ Building Construction _____ Final Stabilization _____

INSPECTION CHECKLIST

- Yes No NA (not applicable)
Have all denuded areas requiring temporary or permanent stabilization been stabilized?
Seeded? yes/no Mulched? yes/no Gravelled? yes/no
Are soil stockpiles adequately stabilized with seeding and/or sediment trapping measures?
Does permanent vegetation provide adequate stabilization?
Have sediment-trapping facilities been constructed as a first step in stripping and grading?
For perimeter sediment trapping measures, are earthen structures stabilized?
Are sediment basins installed where needed?
Are finished cut and fill slopes adequately stabilized?
Are on-site channels and outlets adequately stabilized?
Do all operational storm sewer inlets have adequate inlet protection?
Are stormwater conveyance channels adequately stabilized with channel lining and/or outlet protection?
Is in-stream construction conducted using measures to minimize channel damage?
Are temporary stream crossings of non-erodible material installed where applicable?
Is necessary restabilization of in-stream construction complete?
Are utility trenches stabilized properly?
Are soil and mud kept off public roadways at intersections with site access roads?
Have all temporary control structures that are no longer needed been removed?
Have all control structure repairs and sediment removal been performed?
Are properties and waterways downstream from development adequately protected from erosion and sediment deposition due to increases in peak stormwater runoff?

Comments:

Verbal/Written notification given to:

Report by: _____ Date: _____

EROSION AND SEDIMENT INSPECTION LOG

Site _____ Contractors on site _____

Heavy equipment on site _____ Activities on site _____

Date _____ Weather _____ mm of rain in last week _____

Note condition of the following measures and sediment levels where applicable:

Measure	Condition/Location	Sediment Level	Action Required Yes / No	Type of Action	Action Completed (date)	Initials
Silt Fences						
Temporary Storage Facilities						
Outlet of Temporary Storage Facilities						
Interceptor Swales						
Steeper Slopes						
Cover of Rough Grades						
Catchbasins Filtering Controls						
Dust Controls						
Mud Tracking						
Debris Control						

Other comments (summarize):

Inspectors Signature _____

Inspectors Name: _____

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**IMPERVIOUS RATIO
CALCULATIONS**

Impervious Ratios

Pre-Development

Catchment 1	Area 24.84 ha
Natural Condition with grass & other vegetation	
% Impervious	0%
CN	72
IA	19.75

Post Development

Catchment A	Area 13.14 ha
Buildings	1600 m ²
Driveways	480 m ²
Road	<u>4050 m²</u>
	6130 m ²
% Impervious	6130 / 131400 = 4.67%
CN	72.8
IA	18.94

Catchment B	Area 11.70 ha
Building	1200 m ²
Driveway	360 m ²
Road	<u>3970 m²</u>
	5530 m ²
% Impervious	5530 / 11700 = 4.72%
CN	72.85
IA	18.93

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**SWMHYMO
OUTPUT DATA**

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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
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SSSSS W W M M H H Y M M OOO          9 9 9 =====
          9 9 9 # 5170115
StormWater Management Hydrologic Model    999 999 =====

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*****
***** 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 *****
*****

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+++++ Licensed user: jubilee engineering consultants ltd +++++
+++++ Calgary SERIAL#:5170115 +++++
+++++

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*****
***** +++++ PROGRAM ARRAY DIMENSIONS +++++ *****
***** Maximum value for ID numbers : 10 *****
***** Max. number of rainfall points: 15000 *****
***** Max. number of flow points : 15000 *****
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***** D E T A I L E D O U T P U T *****
*****
* DATE: 2006-11-29 TIME: 02:57:18 RUN COUNTER: 000457 *
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* Input filename: C:\PROGRA-1\SWMHYMO\projects\06-166.IN *
* Output filename: C:\PROGRA-1\SWMHYMO\projects\06-166.out *
* Summary filename: C:\PROGRA-1\SWMHYMO\projects\06-166.sum *
* User comments: *
* 1: _____ *
* 2: _____ *
* 3: _____ *
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001:0001-----
*****
*# Project Name: [RADLER CONSTRUCTION] Project Number: [06-166]
*# Date : 11-29-2006
*# Modeller : [HB]
*# Company : jubilee engineering consultants ltd
*# License # : 5170115
*****
| START | Project dir.: C:\PROGRA-1\SWMHYMO\projects\
-----|----- Rainfall dir.: C:\PROGRA-1\SWMHYMO\projects\
TZERO = .00 hrs on 0
METOUT= 2 (output = METRIC)

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(C:\...06-166.out)

NRUN = 001
NSTORM= 0

001:0002-----

| CHICAGO STORM |
| Ptotal= 89.67 mm |

IDF curve parameters: A= 663.100
B= 1.870
C= .712

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

Duration of storm = 24.00 hrs
Storm time step = 5.00 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
.08	1.094	6.08	4.259	12.08	2.597	18.08	1.467
.17	1.103	6.17	4.519	12.17	2.566	18.17	1.460
.25	1.113	6.25	4.821	12.25	2.536	18.25	1.452
.33	1.122	6.33	5.176	12.33	2.506	18.33	1.444
.42	1.132	6.42	5.601	12.42	2.478	18.42	1.436
.50	1.143	6.50	6.120	12.50	2.450	18.50	1.429
.58	1.153	6.58	6.773	12.58	2.423	18.58	1.421
.67	1.163	6.67	7.624	12.67	2.396	18.67	1.414
.75	1.174	6.75	8.785	12.75	2.371	18.75	1.407
.83	1.185	6.83	10.488	12.83	2.346	18.83	1.399
.92	1.197	6.92	13.283	12.92	2.321	18.92	1.392
1.00	1.208	7.00	18.961	13.00	2.297	19.00	1.385
1.08	1.220	7.08	40.516	13.08	2.274	19.08	1.378
1.17	1.232	7.17	168.138	13.17	2.252	19.17	1.372
1.25	1.245	7.25	54.372	13.25	2.229	19.25	1.365
1.33	1.257	7.33	31.748	13.33	2.208	19.33	1.358
1.42	1.270	7.42	23.236	13.42	2.187	19.42	1.352
1.50	1.284	7.50	18.660	13.50	2.166	19.50	1.345
1.58	1.297	7.58	15.763	13.58	2.146	19.58	1.339
1.67	1.311	7.67	13.746	13.67	2.126	19.67	1.332
1.75	1.326	7.75	12.251	13.75	2.107	19.75	1.326
1.83	1.341	7.83	11.093	13.83	2.088	19.83	1.320
1.92	1.356	7.92	10.166	13.92	2.069	19.92	1.313
2.00	1.372	8.00	9.405	14.00	2.051	20.00	1.307
2.08	1.388	8.08	8.768	14.08	2.034	20.08	1.301
2.17	1.404	8.17	8.225	14.17	2.016	20.17	1.295
2.25	1.421	8.25	7.756	14.25	1.999	20.25	1.289
2.33	1.439	8.33	7.346	14.33	1.983	20.33	1.284
2.42	1.457	8.42	6.985	14.42	1.966	20.42	1.278
2.50	1.476	8.50	6.664	14.50	1.950	20.50	1.272
2.58	1.495	8.58	6.376	14.58	1.935	20.58	1.266
2.67	1.515	8.67	6.116	14.67	1.919	20.67	1.261
2.75	1.535	8.75	5.880	14.75	1.904	20.75	1.255
2.83	1.556	8.83	5.665	14.83	1.889	20.83	1.250
2.92	1.578	8.92	5.468	14.92	1.875	20.92	1.244
3.00	1.601	9.00	5.287	15.00	1.860	21.00	1.239
3.08	1.624	9.08	5.119	15.08	1.846	21.08	1.234
3.17	1.648	9.17	4.964	15.17	1.833	21.17	1.229
3.25	1.674	9.25	4.819	15.25	1.819	21.25	1.223
3.33	1.700	9.33	4.684	15.33	1.806	21.33	1.218
3.42	1.727	9.42	4.558	15.42	1.793	21.42	1.213
3.50	1.755	9.50	4.440	15.50	1.780	21.50	1.208
3.58	1.784	9.58	4.329	15.58	1.767	21.58	1.203
3.67	1.815	9.67	4.224	15.67	1.755	21.67	1.198
3.75	1.846	9.75	4.125	15.75	1.743	21.75	1.193
3.83	1.880	9.83	4.032	15.83	1.731	21.83	1.188

(C:\...06-166.out)

3.92	1.914	9.92	3.943	15.92	1.719	21.92	1.184
4.00	1.950	10.00	3.859	16.00	1.707	22.00	1.179
4.08	1.988	10.08	3.780	16.08	1.696	22.08	1.174
4.17	2.028	10.17	3.704	16.17	1.685	22.17	1.170
4.25	2.070	10.25	3.631	16.25	1.673	22.25	1.165
4.33	2.113	10.33	3.562	16.33	1.663	22.33	1.160
4.42	2.159	10.42	3.496	16.42	1.652	22.42	1.156
4.50	2.208	10.50	3.433	16.50	1.641	22.50	1.151
4.58	2.259	10.58	3.373	16.58	1.631	22.58	1.147
4.67	2.313	10.67	3.315	16.67	1.621	22.67	1.143
4.75	2.371	10.75	3.259	16.75	1.611	22.75	1.138
4.83	2.432	10.83	3.206	16.83	1.601	22.83	1.134
4.92	2.497	10.92	3.154	16.92	1.591	22.92	1.130
5.00	2.566	11.00	3.105	17.00	1.581	23.00	1.125
5.08	2.640	11.08	3.057	17.08	1.572	23.08	1.121
5.17	2.719	11.17	3.011	17.17	1.562	23.17	1.117
5.25	2.805	11.25	2.967	17.25	1.553	23.25	1.113
5.33	2.897	11.33	2.924	17.33	1.544	23.33	1.109
5.42	2.997	11.42	2.883	17.42	1.535	23.42	1.105
5.50	3.105	11.50	2.843	17.50	1.526	23.50	1.101
5.58	3.224	11.58	2.805	17.58	1.517	23.58	1.097
5.67	3.354	11.67	2.767	17.67	1.509	23.67	1.093
5.75	3.497	11.75	2.731	17.75	1.500	23.75	1.089
5.83	3.656	11.83	2.696	17.83	1.492	23.83	1.085
5.92	3.833	11.92	2.662	17.92	1.484	23.92	1.081
6.00	4.033	12.00	2.629	18.00	1.476	24.00	1.077

001:0003-----

*PRE-DEV CONDITIONS

*CAT 1

| CALIB NASHYD | Area (ha)= 24.84 Curve Number (CN)=72.00
| 01: DT= 5.00 | Ia (mm)= 19.750 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= .560

Unit Hyd Qpeak (cms)= 1.694

PEAK FLOW (cms)= .450 (i)
TIME TO PEAK (hrs)= 8.000
RUNOFF VOLUME (mm)= 28.978
TOTAL RAINFALL (mm)= 89.667
RUNOFF COEFFICIENT = .323

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

001:0004-----

*POST-DEV CONDITIONS

*CAT A

| CALIB NASHYD | Area (ha)= 13.14 Curve Number (CN)=72.80
| 01: DT= 5.00 | Ia (mm)= 18.940 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= .680

Unit Hyd Qpeak (cms)= .738

PEAK FLOW (cms)= .228 (i)
TIME TO PEAK (hrs)= 8.167
RUNOFF VOLUME (mm)= 30.202
TOTAL RAINFALL (mm)= 89.667
RUNOFF COEFFICIENT = .337

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

001:0005-----

*CAT B

CALIB NASHYD	Area	(ha)=	11.70	Curve Number	(CN)=72.85
01: DT= 5.00	Ia	(mm)=	18.930	# of Linear Res.(N)=	3.00
	U.H. Tp	(hrs)=	.680		

Unit Hyd Qpeak (cms)= .657

PEAK FLOW (cms)= .203 (i)

TIME TO PEAK (hrs)= 8.167

RUNOFF VOLUME (mm)= 30.252

TOTAL RAINFALL (mm)= 89.667

RUNOFF COEFFICIENT = .337

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

001:0006-----

FINISH

WARNINGS / ERRORS / NOTES

Simulation ended on 2006-11-29 at 02:57:18

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2      Metric units
*#*****
*# Project Name: [RADLER CONSTRUCTION]   Project Number: [06-166]
*# Date       : 11-29-2006
*# Modeller   : [HB]
*# Company    : jubilee engineering consultants ltd
*# License #  : 5170115
*#*****
START      TZERO=[0.0], METOUT=[2], NSTORM=[0], NRUN=[0]
*%        [ ] <--storm filename, one per line for NSTORM time
*%-----|-----
CHICAGO STORM  IUNITS=[2], TD=[24] (hrs), TPRAT=[0.3], CSDT=[5] (min),
               ICASEcs=[1],
               A=[663.1], B=[1.87], and C=[0.712],
*%-----|-----
*PRE-DEV CONDITIONS
*CAT 1
CALIB NASHYD   ID=[1], NHYD=["      "], DT=[5]min, AREA=[24.84] (ha),
               DWF=[0] (cms), CN/C=[72], IA=[19.75] (mm),
               N=[3], TP=[0.56]hrs,
               RAINFALL=[ , , , , ] (mm/hr), END=-1
*%-----|-----
*POST-DEV CONDITIONS
*CAT A
CALIB NASHYD   ID=[1], NHYD=["      "], DT=[5]min, AREA=[13.14] (ha),
               DWF=[0] (cms), CN/C=[72.8], IA=[18.94] (mm),
               N=[3], TP=[0.68]hrs,
               RAINFALL=[ , , , , ] (mm/hr), END=-1
*%-----|-----
*CAT B
CALIB NASHYD   ID=[1], NHYD=["      "], DT=[5]min, AREA=[11.7] (ha),
               DWF=[0] (cms), CN/C=[72.85], IA=[18.93] (mm),
               N=[3], TP=[0.68]hrs,
               RAINFALL=[ , , , , ] (mm/hr), END=-1
*%-----|-----
*%-----|-----
FINISH
```