D. G. Biddle & Associates Limited
consulting engineers and planners

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

PARKVIEW SENIORS LODGE BUILDING ADDITION

165 KING AVENUE EAST

MUNICIPALITY OF CLARINGTON

PROJECT NO. 118129 **Date: JUNE 2019**

96 KING STREET EAST • OSHAWA, ONTARIO • L1H 1B6 • TELEPHONE (905) 576-8500 • FAX (905) 576-9730
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February 6, 2019
Revised June 11, 2019

Municipality of Clarington
40 Temperance Street
Bowmanville ON

Attention: Ms. Ruth Porras, Senior Planner

Re: Functional Servicing and Stormwater Management Report
Parkview Seniors Lodge
165 King Ave East, Newcastle
Municipality of Clarington
Our File: 118129

Dear Ms. Porras:

In support of the application for Site Plan Application for the above noted property we respectfully submit the following Functional Servicing and Stormwater Management Report.

This report is intended for review and approval by the Municipality of Clarington, Region of Durham, and Ganaraska Region Conservation Authority to confirm the necessary infrastructure is available to service the proposed development. It will also discuss how stormwater runoff for the development will be treated prior to its discharge to existing drainage network. Upon review of the report, we believe the approval authorities will have a clear understanding the lands can be serviced with conventional servicing techniques and meet the stormwater management objectives set out by the Municipality of Clarington and the Conservation Authority.

Please contact our office at your convenience, should you have any questions or require additional information on the enclosed report.

Yours truly,

D.G. BIDDLE & ASSOCIATES LIMITED

R. P. Huzar, B.A.Sc.
Engineering in Training

LICENSED PROFESSIONAL ENGINEER
P. D. M. CANE
100500422
PROVINCE OF ONTARIO

P. D. Cane, P.Eng
Municipal Design Engineer

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118129-ES-1	-	Erosion and Sediment Control Plan

1.0 INTRODUCTION

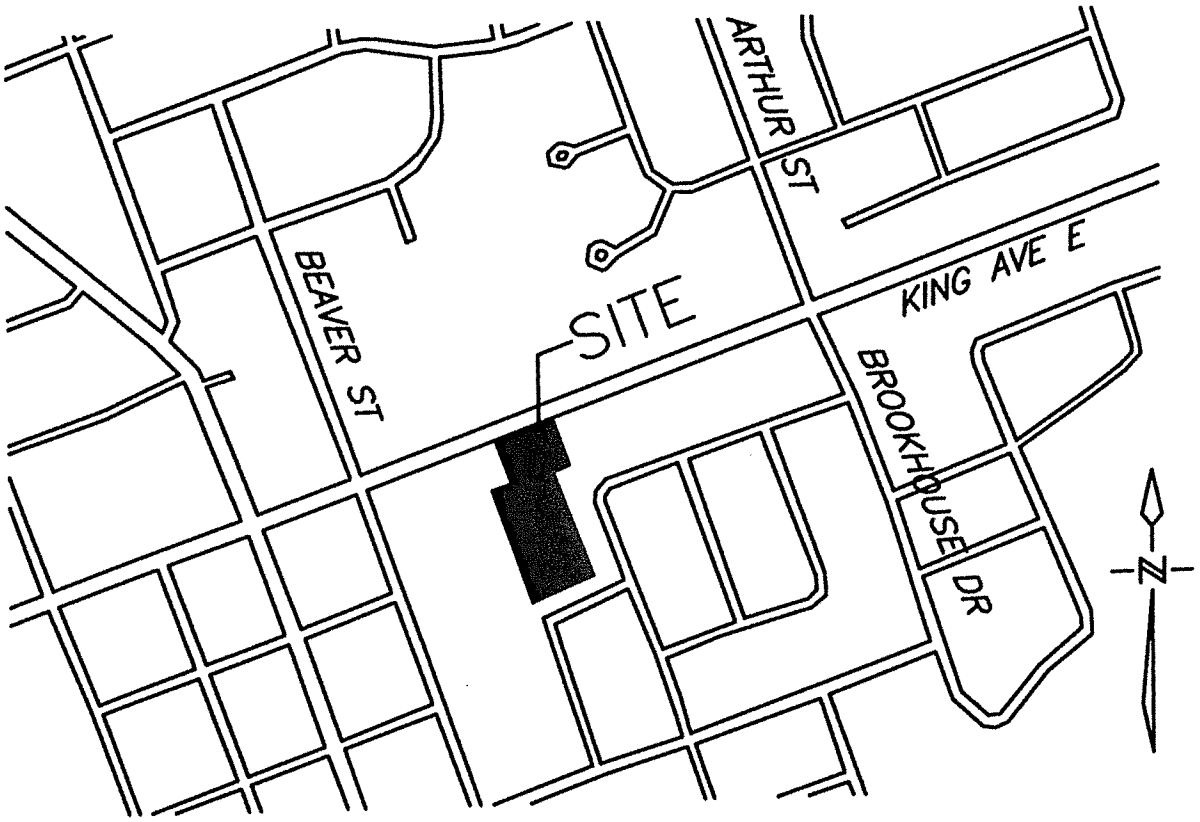
1.1 PURPOSE

This Functional Servicing & Stormwater Management Report has been prepared to review the infrastructure requirements to provide water, sanitary and storm services for the proposed development. In addition, the report demonstrates the requirements of the Municipality of Clarington (Municipality), Region of Durham (Region), and Ganaraska Region Conservation Authority (GRCA) are met with respect to stormwater quantity and quality controls.

1.2 SITE LOCATION AND DESCRIPTION

The subject plan is located on the south side of King Avenue East (Regional Road 2), Part of Lot 27, Concession 1, former Village of Newcastle, in the Municipality of Clarington, Regional Municipality of Durham, locally known as 165 King Avenue East. The site is bounded on the north by King Ave E, on the east and south by an existing residential subdivision, and on the west by an existing commercial property. The proposed development will consist of a building addition to the existing seniors lodge and expansion to the parking area. A Site Location Plan illustrating the subject site is attached as Figure 1.

The site is currently occupied by an existing seniors lodge. The site encompasses an area of approximately 0.83ha. The topography is gradual, falling to the south. As such, the stormwater runoff from the subject site is tributary to the existing rear yard catchbasins installed with the surrounding subdivision. The existing drainage patterns are illustrated on the attached drawing, 86267-D-4, representing the Pre-development Storm Drainage Scheme.



PARKVIEW SENIORS LODGE – 153 KING AVE E, NEWCASTLE

SITE LOCATION PLAN

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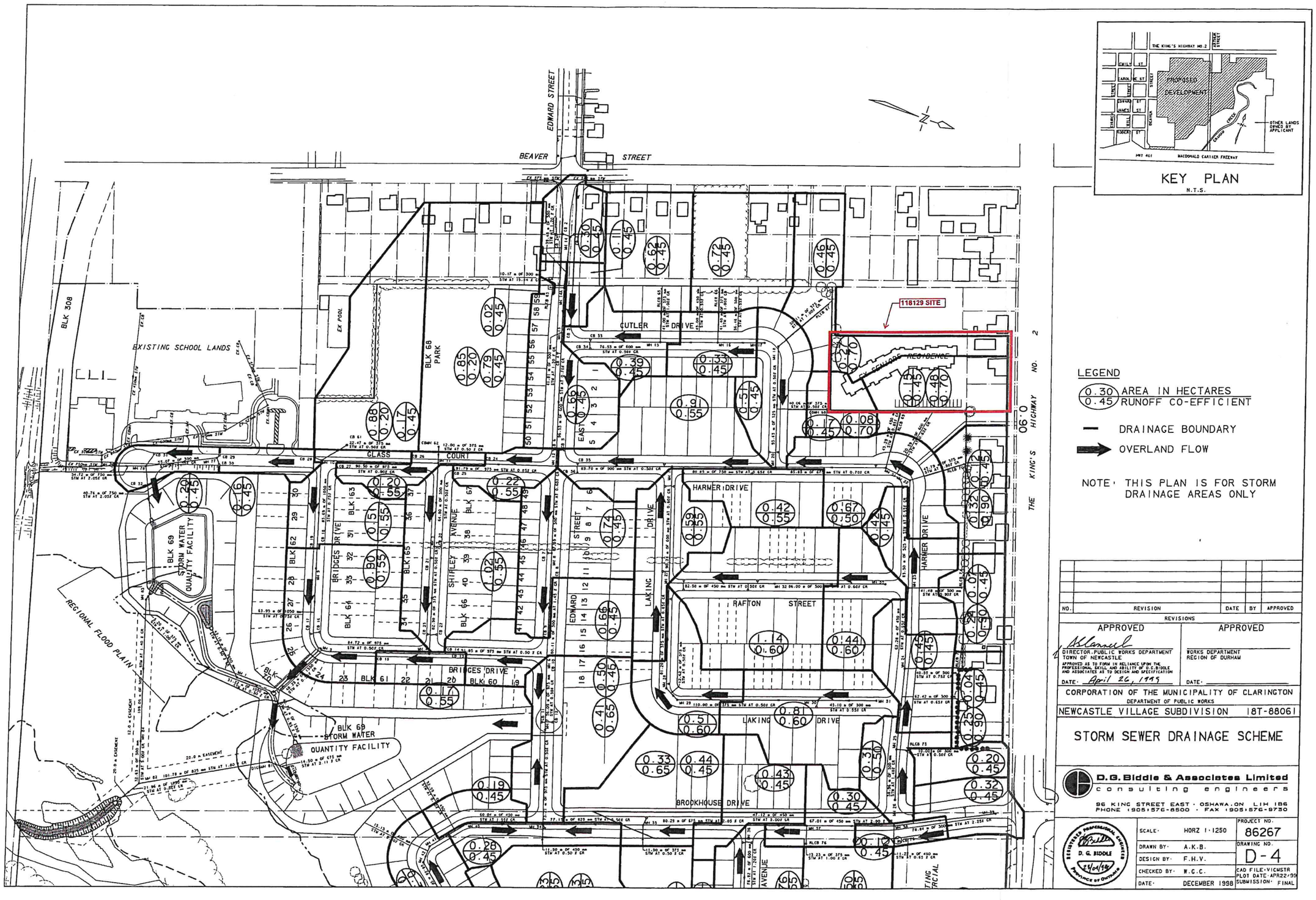
DRAWN	R.P.H.
DESIGN	R.P.H.
CHECKED	P.D.C.
DATE	JAN 2019

PROJECT 118129

DWG FIG 1



KEY PLAN
N.T.S.

LEGEND

0.30 / 0.45 AREA IN HECTARES / RUNOFF CO-EFFICIENT

DRAINAGE BOUNDARY

OVERLAND FLOW

NOTE: THIS PLAN IS FOR STORM DRAINAGE AREAS ONLY

NO.	REVISION	DATE	BY	APPROVED
	REVISIONS			

APPROVED
DIRECTOR, PUBLIC WORKS DEPARTMENT
TOWN OF NEWCASTLE
APPROVED AS TO FORM IN RELIANCE UPON THE PROFESSIONAL SKILL AND ABILITY OF D.G. BIDDLE AND ASSOCIATES AS TO DESIGN AND SPECIFICATION
DATE: April 26, 1999

APPROVED
WORKS DEPARTMENT
REGION OF DURHAM
DATE:

CORPORATION OF THE MUNICIPALITY OF CLARINGTON
DEPARTMENT OF PUBLIC WORKS

NEWCASTLE VILLAGE SUBDIVISION 18T-88061

STORM SEWER DRAINAGE SCHEME

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REGISTERED PROFESSIONAL ENGINEER
D. G. BIDDLE
PROVINCE OF ONTARIO
24/04/99

SCALE:	HORZ 1:1250	PROJECT NO.	86267
DRAWN BY:	A.K.B.	DRAWING NO.	D-4
DESIGN BY:	F.H.V.		
CHECKED BY:	W.G.C.	CAD FILE: VICMSTR	
DATE:	DECEMBER 1998	PLOT DATE: APR22/99	
		SUBMISSION: FINAL	

2.0 SANITARY SEWERAGE

The site is currently serviced through a single 150mm connection to the existing 375mm sanitary sewer on King Avenue. As the existing service connection will be in conflict with the proposed building addition, a portion of the connection will be removed and reconnected through the proposed building. In accordance with Region Standards, an inspection manhole will be cut into the existing sanitary service at the property line.

The existing building currently houses 38 one-bedroom units and 5 two-bedroom units. With the proposed addition, the total number of one-bedroom units will increase to 68 and the total two-bedroom units will increase to 12. Based on the above, a total population of 132 is anticipated. The existing 150mm sanitary service has adequate capacity to convey the sanitary flow. Supporting calculations are attached in Schedule 1.

Refer to the Site Servicing Plan, drawing 118129-SS-1, included in this report for the internal sanitary sewer layout.

3.0 WATER DISTRIBUTION SYSTEM

The site is currently serviced by an existing 25mm water service. With the proposed addition, this existing service is not adequate for the increase in building area. As such, a 100mm domestic is proposed from the existing 200mm watermain on King Ave. The mechanical room in the proposed addition will be equipped with a central meter in accordance with Region criteria. The existing building will be serviced with a proposed 100mm extended from the mechanical room within the proposed addition.

Refer to the Site Servicing Plan, drawing 118129-SS-1 included in this report for proposed internal watermain sizing and locations.

4.0 STORMWATER QUANTITY AND QUALITY CONTROLS

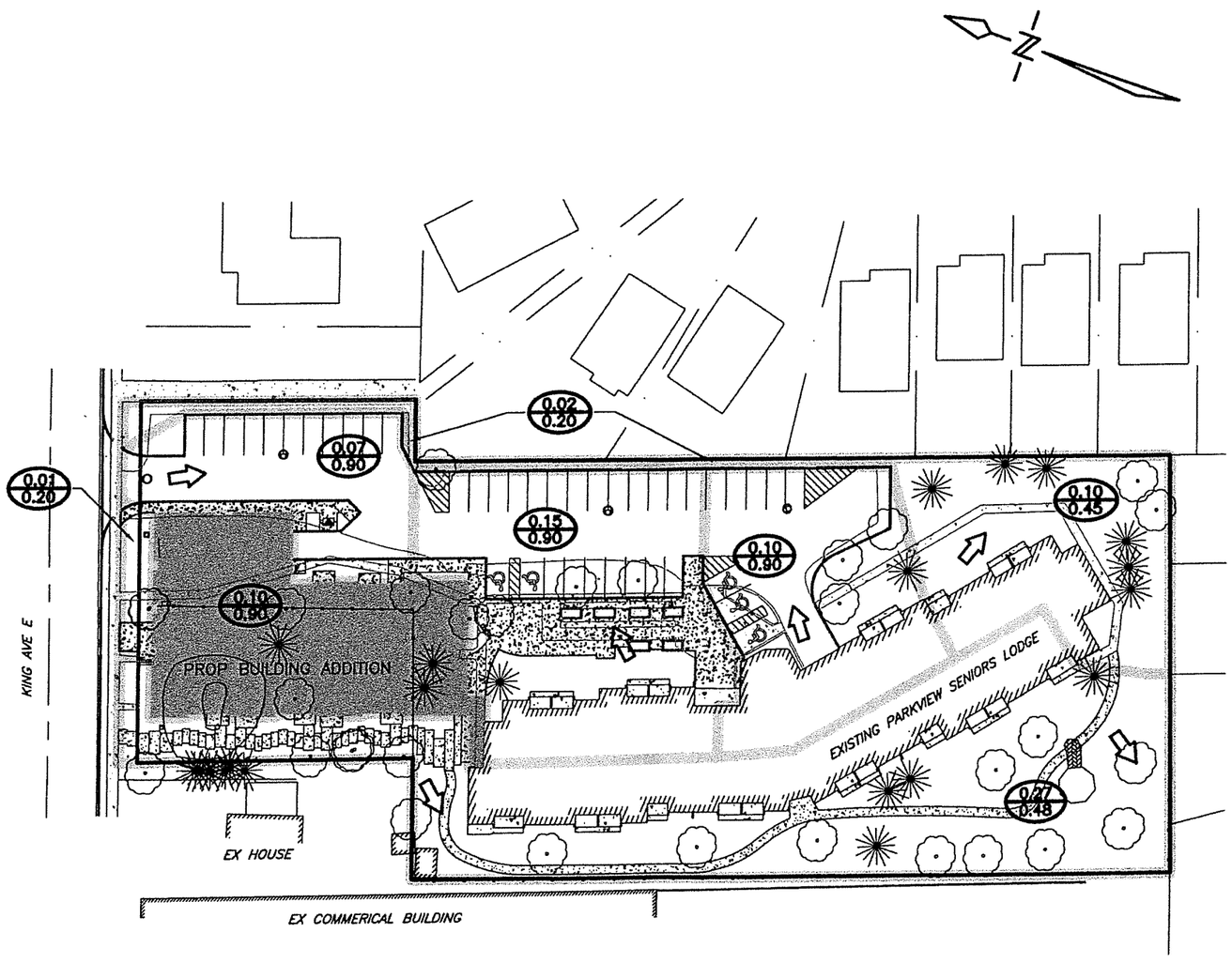
As noted above and seen in drawing 86267-D-4, the site straddles a drainage divide with areas of the site being tributary to the rear yard catchbasins installed with the surrounding subdivision.

The East portion of the site drains to the existing rear lot catchbasin manhole 69, located between house number 90 and 94 respectively on Hammer Drive. The Southeast portion of the site drains to existing rear lot catchbasin 68, located at the rear of house number 58 on Cutler Drive. The Southwest portion of the site drains to rear lot catchbasin 67 located between house number 42 and 46 respectively on Cutler Drive.

The Municipality of Clarington requires that the development does not adversely impact their drainage system; therefore, the stormwater management proposal for proposed development is to control all post development stormwater runoff to pre-development levels.

In order to ensure there is no adverse impact on the existing drainage system, the STANDHYD Sub-Routine in the computer model VISUAL OTTHYMO 3.0 was used to simulate the impervious surfaces of the site and calculate the post-development peak flows for all three drainage areas. Peak flows were computed using a 4-hour Chicago distribution rainfall for the 2 year to 100 year return frequency events. The ROUTE RESERVOIR Sub-Routine was used to simulate the performance of the storage volumes and control devices, providing attenuation for the site. The Post-Development Drainage Scheme is attached as Figure 2. The VISUAL OTTHYMO 3.0 output files are attached at the end of this report.

As indicated on the Site Grading Plan, 118129-SG-1, the proposed parking lot is to be drained using a conventional storm drainage system consisting of positive draining surfaces intercepted by a minor storm sewer system. The minor storm sewer system as



LEGEND

DRAINAGE BOUNDARY

0.25 / 0.90 DRAINAGE AREA / RUNOFF COEFFICIENT

OVERLAND FLOW DIRECTION

NOTE: THIS PLAN IS FOR STORM DRAINAGE AREAS ONLY

PARKVIEW SENIORS LODGE – 153 KING AVE E, NEWCASTLE

POST–DEVELOPMENT STORM DRAINAGE SCHEME

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SCALE	1:750
DRAWN	R.P.H.
DESIGN	R.P.H.
CHECKED	P.D.C.
DATE	2/7/19
PROJECT	118129
DWG	FIG 2

\\FSHR\STAFF\JOB FILES\118000\118129 NSA PARKVIEW RETIREMENT\118129 DRAWINGS\118129 DRAWINGS CIVIL\118129 ENGINEERING DRAWINGS\118129–3D–FIG2.DWG

proposed has been sized to accommodate a 5-year return frequency post-development event in accordance with Municipality of Clarington Design Criteria. The Storm Sewer Design Sheet is attached at the end of this report in Schedule 1.

4.1 QUANTITY CONTROLS TO REAR LOT CATCHBASIN MANHOLE 69

Based on drawing 86267 D-4, stormwater runoff from an area 0.48ha at a runoff coefficient of 0.70 is tributary to catchbasin manhole 69. With the proposed development, the drainage area from the subject site is 0.45ha with a runoff coefficient of 0.90. In order to ensure the development does not adversely impact the drainage system, the stormwater management proposal for stormwater runoff to the existing rear lot catchbasin manhole 69 is to attenuate post-development flows to the pre-development levels.

The attenuation is proposed to be achieved through the implementation of surface storage in conjunction with orifice control devices. Surface storage will be provided above CBMH 1, CBMH 2, and CBMH 3 controlled by independent inlet control devices, EZ-Flo Resistor Plates, attenuating stormwater runoff from the east portion of the property. The design specifications of the EZ-Flo device and the stage-storage discharge calculations are attached to this report. Table 1 shown below represents a comparison of the post-development peak flows to pre-development levels to rear lot catchbasin manhole 69.

TABLE 1: PEAK FLOWS TO REAR LOT CATCHBASIN MANHOLE 69

RETURN FREQUENCY (YEARS)	PRE-DEVELOPMENT PEAK FLOW (L/s)	POST-DEVELOPMENT PEAK FLOW (L/s)
2	72	69
5	90	78
10	107	83
25	119	88
50	144	97
100	211	121

As is reported above, post-development peak flows are less than the pre-development levels; therefore, no adverse impact to the existing storm drainage network is anticipated.

4.2 QUANTITY CONTROLS TO REAR LOT CATCHBASIN 68

Based on drawing 86267 D-4, stormwater runoff form an area of 0.08ha at a runoff coefficient of 0.70 is tributary to catchbasin 68. With the proposed development, this drainage area will increase to 0.095ha at a runoff coefficient of 0.45. Despite the increase in drainage area, the anticipated post development flows were determined to be less than the previously accommodated flows; therefore attenuation is not required for this system. Post-development runoff coefficient calculations can be seen at the end of the report. Table 3 shown below represents a comparison of the post-development peak flows to pre-development levels to rear lot catchbasin 68.

TABLE 3: PEAK FLOWS TO REAR LOT CATCHBASIN 68

RETURN FREQUENCY (YEARS)	PRE-DEVELOPMENT PEAK FLOW (L/s)	POST-DEVELOPMENT PEAK FLOW (L/s)
2	12	9
5	15	12
10	18	14
25	20	16
50	24	19
100	37	30

As is reported above, post-development peak flows are less than pre-development levels; therefore, no adverse impact to the existing storm drainage network is anticipated.

4.3 QUANTITY CONTROLS TO REAR LOT CATCHBASIN 67

Based on drawing 86267 D-4, stormwater runoff from an area of 0.27ha at a runoff coefficient of 0.70 is tributary to catchbasin 67. With the proposed development the drainage runoff coefficient was calculated to be 0.48. The anticipated post development flows were determined to be less than the previously accommodated flows; therefore attenuation is not required for this system. Post development runoff coefficient calculations can be seen at the end of the report. Table 4 shown below represents a comparison of the post-development peak flows to pre-development levels to rear lot catchbasin 67.

TABLE 4: PEAK FLOWS TO REAR LOT CATCHBASIN 67

RETURN FREQUENCY (YEARS)	PRE-DEVELOPMENT PEAK FLOW (L/s)	POST-DEVELOPMENT PEAK FLOW (L/s)
2	41	28
5	50	35
10	61	42
25	67	47
50	81	57
100	124	89

As is reported above, post-development peak flows are less than pre-development levels; therefore, no adverse impact to the existing storm drainage network is anticipated.

4.4 STORMWATER QUALITY CONTROLS

Currently, stormwater quality controls are not implemented on site. The site currently has an asphalt parking area of approx. 0.15ha. With the proposed development this asphalt area will increase to 0.21ha, an increase of 0.06ha. As this area is below the threshold of 0.25ha where quality controls are typically required by the Conservation Authority, stormwater quality controls are not proposed with this development.

5.0 EROSION AND SEDIMENT CONTROLS

During the construction period, the removal of natural vegetation causes the transport of large amounts of sediment during rainfall events. To minimize the sediment laden storm water leaving the site during construction, the following sediment control techniques are proposed to be implemented. These measures are detailed on the Erosion and Sediment Control Plan included in the Site Plan Application submission.

1. Construction Vehicle Access Route (Mud Mat)
2. Catch Basin Filtration
3. Perimeter Enviro Fence
4. Good Engineering Practices

6.0 CONCLUSIONS

The preceding report identifies the requirements of the Parkview Seniors Lodge Building Addition Study with respect to storm water management. The investigations into these requirements has resulted in the following conclusions for the development proposal:

- Sanitary services can be provided with connection into the existing 150mm service connected to the existing 375mm sewer on King Ave E.
- A 100mm domestic will be connected from the existing 200mm watermain on King Ave E.
- The stormwater quantity control proposal for this development is to control all post-development peak flows to pre-development peak flows for all storm events up to and including the 100 year storm;
- Stormwater attenuation is provided through the implementation of surface storage in conjunction with Ez-Flo orifice control devices.
- On-site storm sewers have been sized to accommodate a 5-year return frequency post-development event as per Municipality of Clarington Design Criteria;
- As the total asphalt area is below 0.25ha, stormwater quality controls are not proposed;
- Temporary sediment controls during construction can be managed by the use of perimeter enviro fence, construction vehicle access route, catchbasin filtration and good engineering practices;

SCHEDULE 1

STORM SEWER DESIGN SHEET

STORMWATER CALCULATIONS

SANITARY SEWER DESIGN SHEET

POST-DEVELOPMENT DRAINAGE

DRAINAGE TO REAR LOT CATCHBASIN 68

ITEM	AREA (m^2)	% IMPERVIOUS
BUILDING	320.00	100 %
LANDSCAPE	630.00	0 %
	950.00	

% IMPERVIOUS

→ BASED ON WEIGHTED AVERAGE

$$= \frac{320.00}{950.00} \times 100\% = 33.6 \simeq 34\%$$

∴ 34% CONVERTS TO 0.45 RUNOFF COEFFICIENT.

DRAINAGE TO REAR LOT CATCHBASIN 67

ITEM	AREA (m^2)	% IMPERVIOUS
BUILDING	1014.00	100 %
LANDSCAPE	1686.00	0 %
	2700.00	

% IMPERVIOUS

→ BASED ON WEIGHTED AVERAGE

$$= \frac{1014.00}{2700.00} \times 100\% = 37.50 \simeq 38\%$$

∴ 38% CONVERTS TO 0.48 RUNOFF COEFFICIENT.

STORM SEWER DESIGN SHEET

D.G.BIDDLE & ASSOCIATES LTD.

consulting engineers

MUNICPALITY CLARINGTON
PROJECT 153 KING AVE E
PROJECT # 118129

DESIGN BY R.P.H.
CHK'D BY P.D.C.
DATE JUNE 4/19

CRITERIA	
n	0.013
STORM	5 YEAR
A	2464
B	16
C	1

RUN OFF CO-EFFICIENTS	
PARK	I=0.20
SINGLE,SEMI	I=0.50
TOWNHOUSES,SCHOOL	I=0.70
APARTMENTS	I=0.65
COMMERCIAL	I=0.90

LOCATION			DRAINAGE DATA				RATIONAL DESIGN			PIPE DATA							
STREET	FROM MH	TO MH	AREA (ha)	I	AxI	ACCUM AxI	T.C min	R mm/hr	FLOW L/sec	SIZE mm	GRADE %	CAPACITY L/sec	VELOCITY m/s	LENGTH m	TIME min	TOTAL TIME	% LOAD
	CB-1	MH-1	0.010	0.900	0.009	0.009	15.00	79.48	1.99	250	0.50	43.86	0.87	7.74	0.15	15.15	4.53
	MH-1	CBMH-3	0.000	0.850	0.000	0.009	15.15	79.10	1.98	250	0.50	43.86	0.87	19.03	0.37	15.52	4.51
	ROOF	CBMH-3	0.100	0.900	0.090	0.090	15.00	79.48	19.89	250	0.50	43.86	0.87	6.59	0.13	15.13	45.34
	CBMH-3	CBMH-2	0.070	0.900	0.063	0.162	15.52	78.18	35.21	250	0.50	43.86	0.87	45.78	0.88	16.40	80.27
	CBMH-2	CBMH-1	0.150	0.900	0.135	0.297	16.40	76.06	62.80	300	1.00	100.87	1.38	25.00	0.30	16.70	62.25
	CBMH-1	EX CBMH-69	0.100	1.900	0.190	0.487	16.70	75.36	102.02	300	5.10	227.80	3.12	9.75	0.05	16.75	44.78

Surface Storage

Structure: CBMH 1

Tributary Drainage Area:	0.10 ha
Runoff Coefficient:	0.90
% Imperviousness:	100%
Rim:	97.65
Max Ponding Elevation:	97.95
Max Ponding Depth:	0.30

Inlet Control Device - See EZ-Flo Information Sheet Attached

Elevation=	97.50
C=	0.597
Diameter=	120x120 mm
Area=	0.0144 m2
Q=	$CA\sqrt{2gH}$
Q=	$0.03808\sqrt{H}$

Elevation (m2)	End Area (m2)	Avg Area (m2)	Depth (m2)	Volume (m3)	Cumulative Volume (m3)	Head (m)	Discharge (m^3/s)	Discharge (L/s)
97.65	0.00				0	0.15	0.00	0.00
		10.16	0.05	0.51				
97.70	20.32				0.51	0.20	0.0170	17.03
		51.19	0.05	2.56				
97.75	82.06				3.07	0.25	0.0190	19.04
		133.25	0.05	6.66				
97.80	184.43				9.73	0.30	0.0209	20.86
		231.19	0.05	11.56				
97.85	277.95				21.29	0.35	0.0225	22.53

Structure: CBMH 2

Tributary Drainage Area:	0.15 ha
Runoff Coefficient:	0.90
% Imperviousness:	100%
Rim:	97.65
Max Ponding Elevation:	97.95
Max Ponding Depth:	0.30

Inlet Control Device - See EZ-Flo Information Sheet Attached

Elevation=	97.50
C=	0.597
Diameter=	140x140 mm
Area=	0.0196 m2
Q=	$CA\sqrt{2gH}$
Q=	$0.05183\sqrt{H}$

Elevation (m2)	End Area (m2)	Avg Area (m2)	Depth (m2)	Volume (m3)	Cumulative Volume (m3)	Head (m)	Discharge (m^3/s)	Discharge (L/s)
97.65	0.00				0	0.15	0.00	0.00
		17.55	0.05	0.88				
97.70	35.10				0.88	0.20	0.0232	23.18
		86.57	0.05	4.33				
97.75	138.04				5.21	0.25	0.0259	25.91
		209.40	0.05	10.47				
97.80	280.75				15.68	0.30	0.0284	28.39
		357.49	0.05	17.87				
97.85	434.23				33.55	0.35	0.0307	30.66

Structure: CBMH 3

Tributary Drainage Area:	0.18 ha
Runoff Coefficient:	0.90
% Imperviousness:	100%
Rim:	98.05
Max Ponding Elevation:	98.35
Max Ponding Depth:	0.30

Inlet Control Device - See EZ-Flo Information Sheet Attached

Elevation=	97.90
C=	0.597
Diameter=	60X60 mm
Area=	0.0036 m2
Q=	$CA\sqrt{2gH}$
Q=	$0.00952\sqrt{H}$

Elevation (m2)	End Area (m2)	Avg Area (m2)	Depth (m2)	Volume (m3)	Cumulative Volume (m3)	Head (m)	Discharge (m^3/s)	Discharge (L/s)
98.05	0.00				0	0.15	0.00	0.00
		18.32	0.05	0.92				
98.10	36.63				0.92	0.20	0.0043	4.26
		91.52	0.05	4.58				
98.15	146.40				5.49	0.25	0.0048	4.76
		195.46	0.05	9.77				
98.20	244.51				15.26	0.30	0.0052	5.21
		287.96	0.05	14.40				
98.25	331.41				29.66	0.35	0.0056	5.63

SANITARY SEWER DESIGN SHEET

D.G.BIDDLE & ASSOCIATES LTD.
consulting engineers

MUNICPALITY MUNICIPALITY OF CLARINGTON
PROJECT 153 KING AVE E
PROJECT # 118129

DESIGN BY R.P.H.
CHK'D BY P.D.C.
DATE JUNE 4/19

n=0.013

LOCATION		RESIDENTIAL						COMMERCIAL			INDUSTRIAL	INSTITUT'N	FLOW (l/s)						PIPE DATA			
FROM MH	TO MH	GROSS AREA (ha)	DEN-SITY	POPU-LATION	PFF	TOTAL POPU-LATION	TOTAL AREA (ha)	LOT AREA (ha)	FLOOR SPACE INDEX	FLOOR AREA (ha)	LOT AREA (ha)	LOT AREA (ha)	RES INFIL 0.26	SEWAGE 0.0042	COMM 2.08	INDUS 1.04	INST 1.30	TOTAL FLOW l/s	SIZE mm	GRADE %	CAPACITY l/s	VELOCITY m/s
									0.50													
KING AVE E																						
BUILDING	SA-1	0.80	0.00	132	3.80	132	0.80															
SA-1	EX 375mm MAINLINE	0.00	0.00	0	3.80	132	0.80						0.21	2.11	0.00	0.00	0.00	2.31	150	1.00	15.89	0.87
													0.21	2.11	0.00	0.00	0.00	2.31	150	1.00	15.89	0.87

EXISTING BUILDING BREAKDOWN

UNIT TYPE	AMOUNT	DENSITY	POPULATION
1 Bed	38	1.5	57
2 Bed	5	2.5	12.5
		TOTAL	69.5

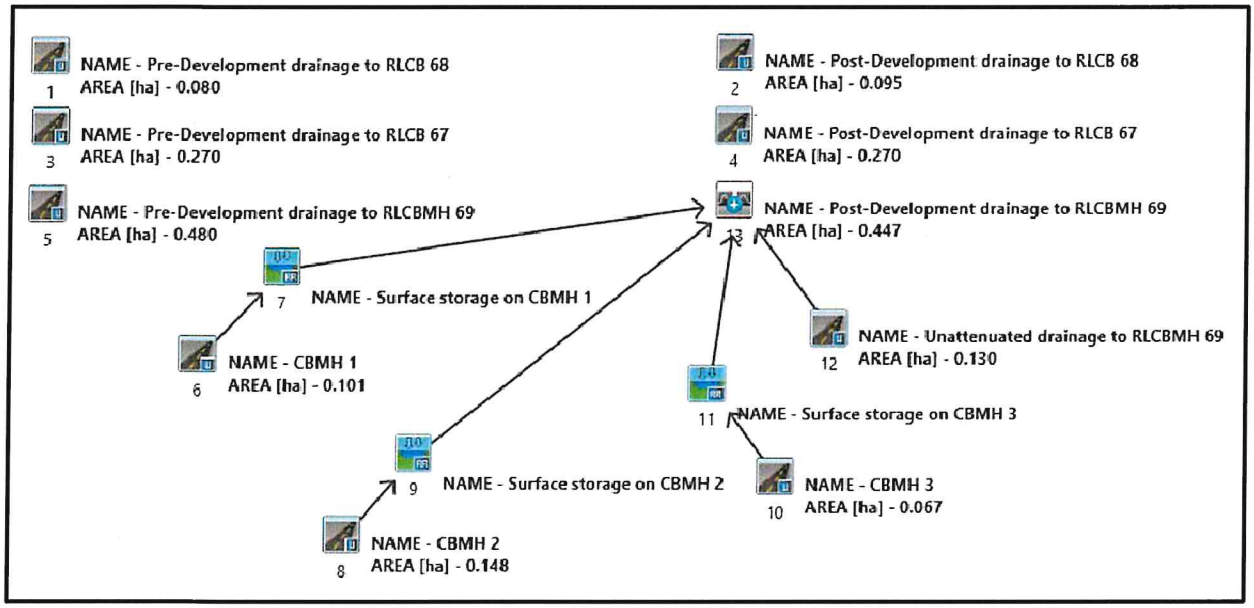
PROPOSED BUILDING BREAKDOWN

UNIT TYPE	AMOUNT	DENSITY	POPULATION
1 Bed	30	1.5	45
2 Bed	7	2.5	17.5
		TOTAL	62.5

TOTAL POPULATION = 132

SCHEDULE 2

VISUAL OTTHYMO 3.0 OUTPUT FILES



PARKVIEW SENIORS LODGE – 153 KING AVE E, NEWCASTLE

VISUAL OTTHYMO SCHEMATIC

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DRAWN	R.P.H.
DESIGN	R.P.H.
CHECKED	P.D.C.
DATE	JUN 2019

PROJECT 118129

DWG FIG 3

```
 V    V   I    SSSSS  U   U    A    L
 V    V   I    SS     U   U   A A   L
  V  V    I     SS    U   U  AAAAA  L
  V  V    I      SS   U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
```

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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
Output filename: C:\Users\riley.huzar\AppData\Local\Temp\b544c2aa-634c-4acf-af41-33fe61c04d71\Scenario.ou
Summary filename: C:\Users\riley.huzar\AppData\Local\Temp\b544c2aa-634c-4acf-af41-33fe61c04d71\Scenario.su

DATE: 02/07/2019 TIME: 01:59:59

USER:

COMMENTS: 2 YEAR

****
** SIMULATION NUMBER: 1 **
****

W/E	COMMAND	HYD ID		DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs									
	CHIC STORM [Ptot= 28.11 mm]			10.0						
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0001	1	5.0	0.08	0.01	1.33	20.41	0.73	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0003	1	5.0	0.27	0.04	1.33	20.58	0.73	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0005	1	5.0	0.48	0.07	1.33	20.58	0.73	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0008	1	5.0	0.15	0.03	1.33	24.94	0.89	0.000
	RESRVR [2 : 0008] {ST= 0.00 ha.m }	0009	1	5.0	0.15	0.02	1.33	24.94	n/a	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0006	1	5.0	0.10	0.02	1.33	24.88	0.89	0.000
	RESRVR [2 : 0006] {ST= 0.00 ha.m }	0007	1	5.0	0.10	0.02	1.33	24.88	n/a	0.000
*	CALIB STANDHYD [I%=80.0:S%= 2.00]	0012	1	5.0	0.13	0.02	1.33	22.77	0.81	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0010	1	5.0	0.07	0.01	1.33	24.67	0.88	0.000
	RESRVR [2 : 0010] {ST= 0.00 ha.m }	0011	1	5.0	0.07	0.00	1.42	24.66	n/a	0.000
	ADD [0011 + 0012]	0013	3	5.0	0.20	0.03	1.33	23.41	n/a	0.000
	ADD [0013 + 0007]	0013	1	5.0	0.30	0.05	1.33	23.91	n/a	0.000
	ADD [0013 + 0009]	0013	3	5.0	0.45	0.07	1.33	24.25	n/a	0.000
*	CALIB STANDHYD [I%=41.0:S%= 2.00]	0004	1	5.0	0.27	0.02	1.33	14.27	0.51	0.000

```
*
*   CALIB STANDHYD      0002  1  5.0     0.09     0.01  1.33  14.99 0.53    0.000
    [I%=45.0:S%= 2.00]
*
    ******************************
    ** SIMULATION NUMBER:   2 **
    ******************************
```

5 YEAR

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM [Ptot= 38.49 mm]		10.0						
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0001	1 5.0	0.08	0.01	1.33	29.13	0.76	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0003	1 5.0	0.27	0.05	1.33	29.12	0.76	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0005	1 5.0	0.48	0.09	1.33	29.14	0.76	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0008	1 5.0	0.15	0.04	1.33	34.71	0.90	0.000
	RESRVR [2 : 0008] {ST= 0.00 ha.m }	0009	1 5.0	0.15	0.03	1.33	34.72	n/a	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0006	1 5.0	0.10	0.02	1.33	34.71	0.90	0.000
	RESRVR [2 : 0006] {ST= 0.00 ha.m }	0007	1 5.0	0.10	0.02	1.33	34.72	n/a	0.000
*	CALIB STANDHYD [I%=80.0:S%= 2.00]	0012	1 5.0	0.13	0.03	1.33	31.93	0.83	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0010	1 5.0	0.07	0.02	1.33	34.71	0.90	0.000
	RESRVR [2 : 0010] {ST= 0.00 ha.m }	0011	1 5.0	0.07	0.00	1.50	34.71	n/a	0.000
	ADD [0011 + 0012]	0013	3 5.0	0.20	0.03	1.33	32.88	n/a	0.000
	ADD [0013 + 0007]	0013	1 5.0	0.30	0.05	1.33	33.50	n/a	0.000
	ADD [0013 + 0009]	0013	3 5.0	0.45	0.08	1.33	33.90	n/a	0.000
*	CALIB STANDHYD [I%=41.0:S%= 2.00]	0004	1 5.0	0.27	0.03	1.33	21.08	0.55	0.000
*	CALIB STANDHYD [I%=45.0:S%= 2.00]	0002	1 5.0	0.09	0.01	1.33	22.16	0.58	0.000

```
    ******************************
    ** SIMULATION NUMBER:   3 **
    ******************************
```

10 YEAR

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM [Ptot= 44.04 mm]		10.0						
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0001	1 5.0	0.08	0.02	1.33	33.83	0.77	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0003	1 5.0	0.27	0.06	1.33	33.82	0.77	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0005	1 5.0	0.48	0.11	1.33	33.83	0.77	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0008	1 5.0	0.15	0.04	1.33	39.97	0.91	0.000
	RESRVR [2 : 0008] {ST= 0.00 ha.m }	0009	1 5.0	0.15	0.03	1.42	39.97	n/a	0.000

* CALIB STANDHYD [I%=90.0:S%= 2.00]	0006	1	5.0	0.10	0.03	1.33	39.97	0.91	0.000
RESRVR [2 : 0006] {ST= 0.00 ha.m }	0007	1	5.0	0.10	0.02	1.42	39.97	n/a	0.000
* CALIB STANDHYD [I%=80.0:S%= 2.00]	0012	1	5.0	0.13	0.03	1.33	36.90	0.84	0.000
* CALIB STANDHYD [I%=90.0:S%= 2.00]	0010	1	5.0	0.07	0.02	1.33	39.97	0.91	0.000
RESRVR [2 : 0010] {ST= 0.00 ha.m }	0011	1	5.0	0.07	0.01	1.58	39.96	n/a	0.000
ADD [0011 + 0012]	0013	3	5.0	0.20	0.04	1.33	37.94	n/a	0.000
ADD [0013 + 0007]	0013	1	5.0	0.30	0.06	1.33	38.63	n/a	0.000
ADD [0013 + 0009]	0013	3	5.0	0.45	0.08	1.33	39.08	n/a	0.000
* CALIB STANDHYD [I%=41.0:S%= 2.00]	0004	1	5.0	0.27	0.04	1.33	24.91	0.57	0.000
* CALIB STANDHYD [I%=45.0:S%= 2.00]	0002	1	5.0	0.09	0.01	1.33	26.11	0.59	0.000

****
** SIMULATION NUMBER: 4 **
****

25 yr

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM [Ptot= 64.67 mm]		10.0						
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0001	1 5.0	0.08	0.02	1.33	51.71	0.80	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0003	1 5.0	0.27	0.07	1.33	51.72	0.80	0.000
*	CALIB STANDHYD [I%=70.0:S%= 2.00]	0005	1 5.0	0.48	0.12	1.33	51.73	0.80	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0008	1 5.0	0.15	0.04	1.33	59.69	0.92	0.000
	RESRVR [2 : 0008] {ST= 0.00 ha.m }	0009	1 5.0	0.15	0.03	1.42	59.70	n/a	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0006	1 5.0	0.10	0.03	1.33	59.69	0.92	0.000
	RESRVR [2 : 0006] {ST= 0.00 ha.m }	0007	1 5.0	0.10	0.02	1.42	59.70	n/a	0.000
*	CALIB STANDHYD [I%=80.0:S%= 2.00]	0012	1 5.0	0.13	0.04	1.33	55.70	0.86	0.000
*	CALIB STANDHYD [I%=90.0:S%= 2.00]	0010	1 5.0	0.07	0.02	1.33	59.69	0.92	0.000
	RESRVR [2 : 0010] {ST= 0.00 ha.m }	0011	1 5.0	0.07	0.01	1.67	59.67	n/a	0.000
	ADD [0011 + 0012]	0013	3 5.0	0.20	0.04	1.33	57.06	n/a	0.000
	ADD [0013 + 0007]	0013	1 5.0	0.30	0.06	1.33	57.95	n/a	0.000
	ADD [0013 + 0009]	0013	3 5.0	0.45	0.09	1.33	58.53	n/a	0.000
*	CALIB STANDHYD [I%=41.0:S%= 2.00]	0004	1 5.0	0.27	0.04	1.33	40.19	0.62	0.000
*	CALIB STANDHYD [I%=45.0:S%= 2.00]	0002	1 5.0	0.09	0.02	1.33	41.73	0.65	0.000

****
** SIMULATION NUMBER: 5 **

50 yr

```
**************************

  W/E COMMAND                HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                      min     ha  '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
      CHIC STORM                     10.0
      [ Ptot= 71.95 mm ]
*
  *   CALIB STANDHYD      0001  1  5.0   0.08    0.02  1.33  58.18 0.81   0.000
      [I%=70.0:S%= 2.00]
*
  *   CALIB STANDHYD      0003  1  5.0   0.27    0.08  1.33  58.20 0.81   0.000
      [I%=70.0:S%= 2.00]
*
  *   CALIB STANDHYD      0005  1  5.0   0.48    0.14  1.33  58.20 0.81   0.000
      [I%=70.0:S%= 2.00]
*
  *   CALIB STANDHYD      0008  1  5.0   0.15    0.05  1.33  66.70 0.93   0.000
      [I%=90.0:S%= 2.00]
*
      RESRVR [ 2 : 0008] 0009  1  5.0   0.15    0.03  1.42  66.90  n/a   0.000
      {ST=  0.00 ha.m }
*
  *   CALIB STANDHYD      0006  1  5.0   0.10    0.04  1.33  66.70 0.93   0.000
      [I%=90.0:S%= 2.00]
*
      RESRVR [ 2 : 0006] 0007  1  5.0   0.10    0.02  1.42  66.71  n/a   0.000
      {ST=  0.00 ha.m }
*
  *   CALIB STANDHYD      0012  1  5.0   0.13    0.04  1.33  62.45 0.87   0.000
      [I%=80.0:S%= 2.00]
*
  *   CALIB STANDHYD      0010  1  5.0   0.07    0.02  1.33  66.70 0.93   0.000
      [I%=90.0:S%= 2.00]
*
      RESRVR [ 2 : 0010] 0011  1  5.0   0.07    0.01  1.67  66.68  n/a   0.000
      {ST=  0.00 ha.m }
*
      ADD [0011 + 0012]  0013  3  5.0   0.20    0.05  1.33  63.89  n/a   0.000
*
      ADD [0013 + 0007]  0013  1  5.0   0.30    0.07  1.33  64.84  n/a   0.000
*
      ADD [0013 + 0009]  0013  3  5.0   0.45    0.10  1.33  65.53  n/a   0.000
*
  *   CALIB STANDHYD      0004  1  5.0   0.27    0.05  1.33  45.87 0.64   0.000
      [I%=41.0:S%= 2.00]
*
  *   CALIB STANDHYD      0002  1  5.0   0.09    0.02  1.33  47.54 0.66   0.000
      [I%=45.0:S%= 2.00]
*
FINISH
```

```
 V     V   I    SSSSS  U   U    A    L
 V     V   I    SS     U   U   A A   L
  V   V    I     SS    U   U  AAAAA  L
  V   V    I      SS   U   U  A   A  L
   VV      I    SSSSS  UUUUU  A   A  LLLLL

  OOO    TTTTT  TTTTT  H   H  Y   Y  M   M   OOO     TM
 O   O     T      T    H   H   Y Y   MM MM  O   O
 O   O     T      T    H   H    Y    M   M  O   O
  OOO      T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
Output filename: C:\Users\riley.huzar\AppData\Local\Temp\4ea07a98-abed-49e6-bbe1-dc9113a44fad\Scenario.ou
Summary filename: C:\Users\riley.huzar\AppData\Local\Temp\4ea07a98-abed-49e6-bbe1-dc9113a44fad\Scenario.su

DATE: 02/07/2019 TIME: 02:00:26

USER:

COMMENTS: 100YR

****
** SIMULATION NUMBER: 6 **
****

| CHICAGO STORM |
| Ptotal= 78.03 mm |

IDF curve parameters: A=1770.000
B= 4.000
C= 0.820
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	4.34	1.17	38.21	2.17	10.60	3.17	5.19
0.33	5.00	1.33	203.31	2.33	8.96	3.33	4.81
0.50	5.92	1.50	50.96	2.50	7.78	3.50	4.48
0.67	7.33	1.67	25.51	2.67	6.90	3.67	4.20
0.83	9.77	1.83	17.18	2.83	6.21	3.83	3.96
1.00	15.10	2.00	13.06	3.00	5.65	4.00	3.74

| CALIB STANDHYD (0001) |
| ID= 1 DT= 5.0 min |

Area (ha)= 0.08
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.06	0.02
Dep. Storage	(mm)=	1.00	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	23.09	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	4.34	1.083	38.21	2.083	10.60	3.08	5.19
0.167	4.34	1.167	38.21	2.167	10.60	3.17	5.19
0.250	5.00	1.250	203.31	2.250	8.96	3.25	4.81
0.333	5.00	1.333	203.31	2.333	8.96	3.33	4.81
0.417	5.92	1.417	50.96	2.417	7.78	3.42	4.48
0.500	5.92	1.500	50.96	2.500	7.78	3.50	4.48

0.583	7.33	1.583	25.51	2.583	6.90	3.58	4.20
0.667	7.33	1.667	25.51	2.667	6.90	3.67	4.20
0.750	9.77	1.750	17.18	2.750	6.21	3.75	3.96
0.833	9.77	1.833	17.18	2.833	6.21	3.83	3.96
0.917	15.10	1.917	13.06	2.917	5.65	3.92	3.74
1.000	15.10	2.000	13.06	3.000	5.65	4.00	3.74

Max.Eff.Inten.(mm/hr)=	203.31	NaN	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.80 (ii)	4.58 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.23	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.037 (iii)
TIME TO PEAK (hrs)=	1.33	1.33	1.33
RUNOFF VOLUME (mm)=	77.03	32.49	63.63
TOTAL RAINFALL (mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT =	0.99	0.42	0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

CALIB
STANDHYD (0003)
ID= 1 DT= 5.0 min

Area (ha)= 0.27
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.19	0.08	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	42.43	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		203.31	NaN	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.15 (ii)	4.94 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.11	0.02	0.124 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	63.65
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT	=	0.99	0.42	0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

CALIB
STANDHYD (0005)
ID= 1 DT= 5.0 min

Area (ha)= 0.48
Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.34	0.14	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	56.57	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		203.31	NaN	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.37 (ii)	5.15 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.33	0.16	
				TOTALS
PEAK FLOW	(cms)=	0.19	0.03	0.211 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	63.66
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT	=	0.99	0.42	0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

CALIB STANDHYD (0008) ID= 1 DT= 5.0 min	Area (ha)= 0.15 Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.01	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	31.46	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		203.31	78.45	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	0.96 (ii)	3.17 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.34	0.27	
				TOTALS
PEAK FLOW	(cms)=	0.08	0.00	0.079 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	72.57
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT	=	0.99	0.42	0.93

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

RESERVOIR (0009) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0284	0.0016
	0.0232	0.0001	0.0307	0.0034
	0.0259	0.0005	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0008)	0.148	0.079	1.33	72.57
OUTFLOW: ID= 1 (0009)	0.148	0.030	1.42	72.62

PEAK FLOW REDUCTION [Qout/Qin](%)= 38.14
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0031

CALIB STANDHYD (0006) ID= 1 DT= 5.0 min	Area (ha)= 0.10 Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.09	0.01	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	25.95	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		203.31	78.45	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	0.86 (ii)	3.06 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.34	0.27	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.00	0.054 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	72.57
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03

```
      RUNOFF COEFFICIENT    =        0.99          0.42           0.93

 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
              CN*  =  71.0     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.

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 --------------------
 | RESERVOIR (0007) |
 | IN= 2---> OUT= 1 |
 | DT=  5.0 min     |      OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
 --------------------       (cms)      (ha.m.)    |   (cms)      (ha.m.)
                            0.0000      0.0000    |   0.0209      0.0010
                            0.0170      0.0001    |   0.0225      0.0021
                            0.0190      0.0003    |   0.0000      0.0000

                                    AREA      QPEAK      TPEAK       R.V.
                                    (ha)      (cms)      (hrs)       (mm)
     INFLOW : ID= 2 (0006)         0.101      0.054       1.33       72.57
     OUTFLOW: ID= 1 (0007)         0.101      0.022       1.42       73.22

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 41.16
                  TIME SHIFT OF PEAK FLOW          (min)=  5.00
                  MAXIMUM  STORAGE  USED         (ha.m.)=  0.0020

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 --------------------
 | CALIB            |
 | STANDHYD  (0012) |   Area     (ha)=   0.13
 |ID= 1 DT= 5.0 min |   Total Imp(%)=  80.00   Dir. Conn.(%)=  80.00
 --------------------

                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=       0.10          0.03
     Dep. Storage     (mm)=       1.00          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      29.44         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     203.31         78.45
               over (min)         5.00          5.00
     Storage Coeff.  (min)=       0.92 (ii)     3.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.34          0.24
                                                          *TOTALS*
     PEAK FLOW        (cms)=      0.06          0.01        0.065 (iii)
     TIME TO PEAK     (hrs)=      1.33          1.33         1.33
     RUNOFF VOLUME     (mm)=     77.03         32.49        68.10
     TOTAL RAINFALL    (mm)=     78.03         78.03        78.03
     RUNOFF COEFFICIENT   =      0.99          0.42         0.87

 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
              CN*  =  71.0     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.

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 --------------------
  CALIB             |
  STANDHYD  (0010)  |   Area     (ha)=   0.07
 ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
 --------------------

                              IMPERVIOUS     PERVIOUS (i)
     Surface Area     (ha)=       0.06          0.01
     Dep. Storage     (mm)=       1.00          1.50
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      21.15         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     203.31         78.45
               over (min)         5.00          5.00
     Storage Coeff.  (min)=       0.76 (ii)     2.96 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=       0.34          0.28
                                                          *TOTALS*
     PEAK FLOW        (cms)=      0.03          0.00        0.036 (iii)
     TIME TO PEAK     (hrs)=      1.33          1.33         1.33
     RUNOFF VOLUME     (mm)=     77.03         32.49        72.57
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      TOTAL RAINFALL   (mm)=      78.03        78.03          78.03
      RUNOFF COEFFICIENT    =       0.99         0.42           0.93

 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0     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.

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--------------------
| RESERVOIR (0011) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |      OUTFLOW     STORAGE    |  OUTFLOW     STORAGE
--------------------       (cms)      (ha.m.)    |   (cms)      (ha.m.)
                          0.0000      0.0000     |  0.0052      0.0015
                          0.0043      0.0001     |  0.0056      0.0030
                          0.0048      0.0005     |  0.0000      0.0000

                                    AREA      QPEAK      TPEAK       R.V.
                                    (ha)      (cms)      (hrs)       (mm)
    INFLOW : ID= 2 (0010)          0.067      0.036       1.33      72.57
    OUTFLOW: ID= 1 (0011)          0.067      0.005       1.58      72.56

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 15.10
                  TIME SHIFT OF PEAK FLOW          (min)= 15.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0022

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--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
         ID1= 1 (0011):      0.07     0.005      1.58     72.56
       + ID2= 2 (0012):      0.13     0.065      1.33     68.10
         ==========================================================
         ID = 3 (0013):      0.20     0.070      1.33     69.62

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0013) |
|   3 +  2 =  1    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
         ID1= 3 (0013):      0.20     0.070      1.33     69.62
       + ID2= 2 (0007):      0.10     0.022      1.42     73.22
         ==========================================================
         ID = 1 (0013):      0.30     0.091      1.33     70.84

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0013) |
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
--------------------          (ha)     (cms)     (hrs)      (mm)
         ID1= 1 (0013):      0.30     0.091      1.33     70.84
       + ID2= 2 (0009):      0.15     0.030      1.42     72.62
         ==========================================================
         ID = 3 (0013):      0.45     0.121      1.33     71.43

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0004) |   Area     (ha)=   0.27
| ID= 1 DT= 5.0 min|   Total Imp(%)=  41.00   Dir. Conn.(%)=  41.00
--------------------

                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=        0.11          0.16
    Dep. Storage     (mm)=        1.00          1.50
    Average Slope     (%)=        1.00          2.00
    Length            (m)=       42.43         40.00
    Mannings n           =       0.013         0.250

    Max.Eff.Inten.(mm/hr)=      203.31         78.45
              over (min)          5.00         10.00
```

Storage Coeff.	(min)=	1.15 (ii)	8.93 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.34	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.081 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	50.72
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT	=	0.99	0.42	0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

CALIB
STANDHYD (0002)
ID= 1 DT= 5.0 min

Area (ha)= 0.09
Total Imp(%)= 45.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.04	0.05	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	25.17	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	203.31	78.45	
over	(min)	5.00	10.00	
Storage Coeff.	(min)=	0.84 (ii)	8.62 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.34	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	77.03	32.49	52.46
TOTAL RAINFALL	(mm)=	78.03	78.03	78.03
RUNOFF COEFFICIENT	=	0.99	0.42	0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 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.

FINISH

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