SPRING CREEK MOUNTAIN VILLAGE

UTILITY MASTER PLAN

Spring Creek
MOUNTAIN VILLAGE

Prepared by

Mountain Engineering Ltd.
Land Development and Municipal

NOVEMBER 2003

SPRING CREEK MOUNTAIN VILLAGE
UTILITY MASTER PLAN

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Nov 27/2003

APEGGA PERMIT #P07289

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1.0 Introduction

The proposed redevelopment plan and location is described in detail within the ARP document itself. Location plans and detailed information on proposed land use are described in those sections.

The Utility Master Plan describes, generally, the proposed water, sanitary sewer, and storm servicing for the proposed Spring Creek Mountain Village development. The proposed servicing is based on a number of different factors, including the existing service locations, phasing of the development, Town infrastructure upgrades, and other factors. Given the general nature of the servicing review, the information provided is subject to refinement at a detail design stage. As development proceeds, the servicing requirements will be reviewed and revised as necessary.

In addition to the above, the Utility Master Plan has been prepared based on information available and the preliminary level of design done to this point. For example, the Town of Canmore is currently preparing an update the Town of Canmore Sanitary Sewer Master Plan. Given that the final version of this report is not available at this time, the actual timing, location, or size of the trunk sewer through Spring Creek Mountain Village has not been confirmed at this time. As such, further detail is required at a later stage to finalize the sanitary sewer design.

WATER DISTRIBUTION SYSTEM

2.0 Water Distribution System

2.1 Existing Water System

The existing water network is shown on Exhibit 2.1.1. It consists of a series of private pumps pumping water from the groundwater table into a private network As much as possible, this system will remain intact for areas that continue to service the manufactured homes. However, given the proposed phasing, some areas may require interim servicing connections. For example, if a pump is removed because an area is being redeveloped, and manufactured homes still require servicing, interim connections may be required. Because this existing system was never designed to withstand average pressures expected in the Town pressurized watermain, to provide interim servicing may require a temporary pressure reducing valve, if connecting to a Town main. Otherwise, connection to another pump may be required for some existing units.

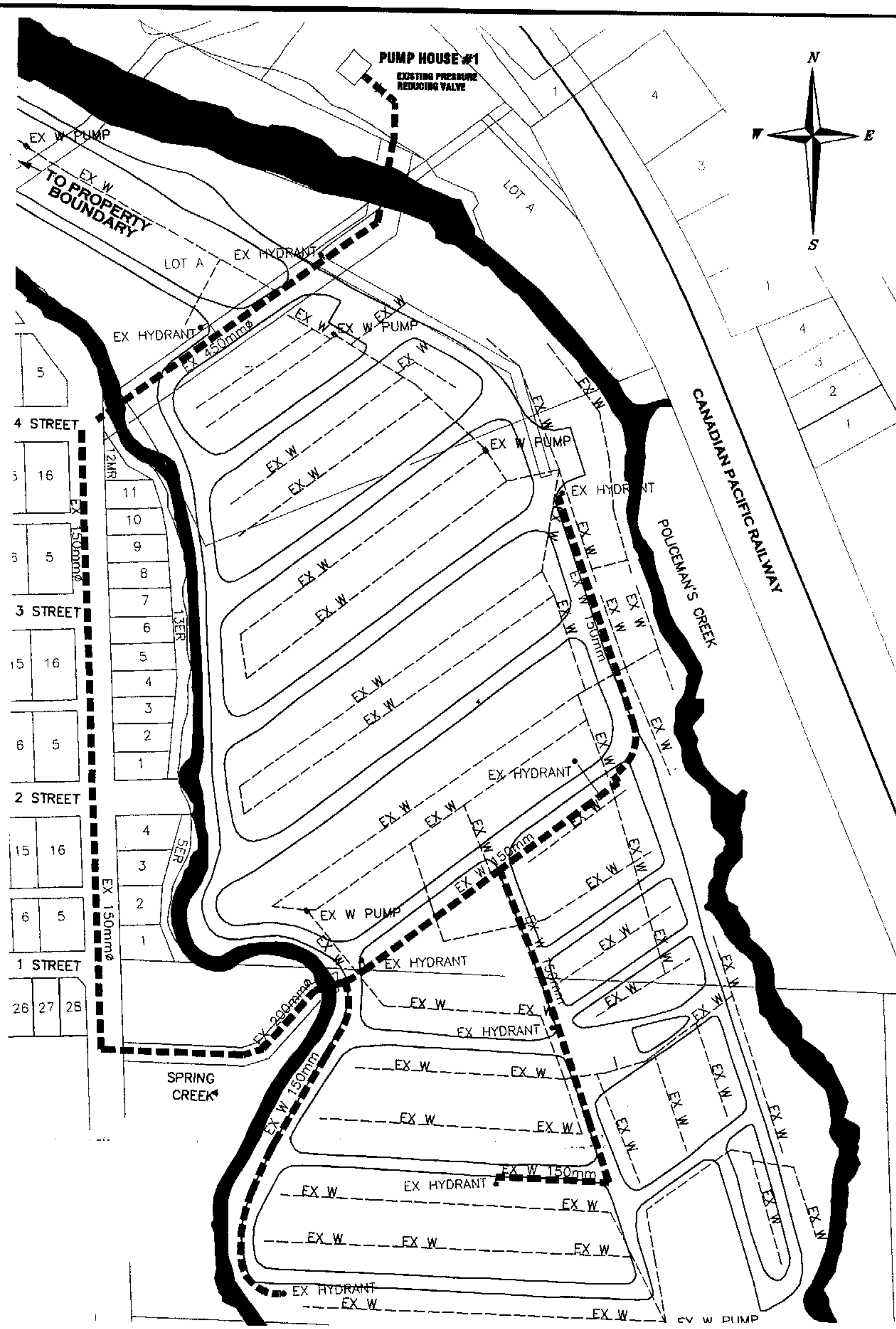
Pumphouse No. 1, located near the main CPR crossing at Railway Avenue, primarily acts to service the existing developments to the east of Restwell Trailer Park. From it, a 450mm line branches east towards Bow Valley Trail to feed the Benchlands reservoir. This line operates at high pressures necessary to deliver the water to the elevated reservoir. A second branch passes through the north end of Restwell Trailer Park where it currently acts to service 2 existing fire hydrants onsite. This branch is pressure reduced to bring the pressure down to an acceptable servicing pressure for the hydrants.

Because the private water system is incapable of providing adequate fire flow pressures, a 200mm watermain was also installed to service a series of 6 fire hydrants at the south end of the property. This 200mm line enters the south end of the site from Willow Pointe across Spring Creek. It too will remain operational in the early stages of development to ensure proper fire safety to the residents who will continue to reside onsite through the redevelopment process.

An existing 200mm watermain crosses the entrance to the site on Main Street and a 150mm connection exists at the intersection of 5th Avenue towards Restwell Trailer Park. This watermain currently provides water service for a few existing lots on 5th Avenue and 3rd Avenue, however, it does not enter Restwell Trailer Park.

2.2 Proposed Water Network

The proposed water system involves tying into Town owned infrastructure at four locations: the 150mm diameter line on 3rd Avenue, the 450mm diameter line running through the site between Pump house #1 and 4th Street, the 200mm watermain on Bow Valley Trail, and the 200mm diameter line at the south end of the site entering from Willow Pointe. Existing water pressures at these locations were provided to us by EPCOR for peak hour and peak day plus fire flow conditions, based on their model. The values of the total head at these locations are summarized in Table 2.2.1 and shown in Exhibit 2.2.1.



Mountain Engineering Ltd.
Land Development and Municipal

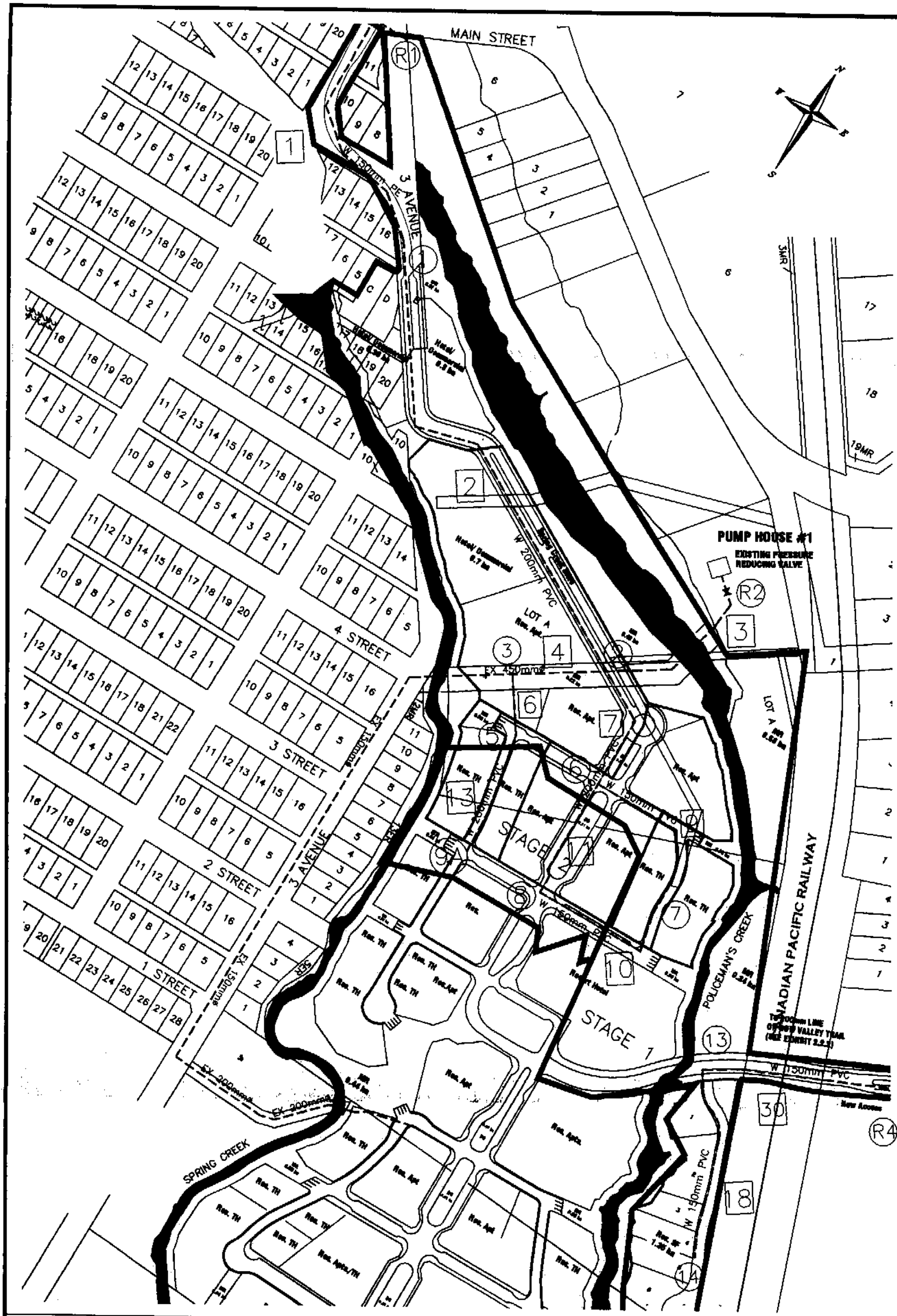
EXISTING WATERMAINS

DATE: NOV, 2002	DRAWN BY: A.K.
SCALE 1:2000	EXHIBIT 2.1.1

Spring Creek
MOUNTAIN VILLAGE

LEGEND

▬ ▬ ▬ ▬	TOWN WATERMAINS
— — — —	PRIVATE WATERMAINS



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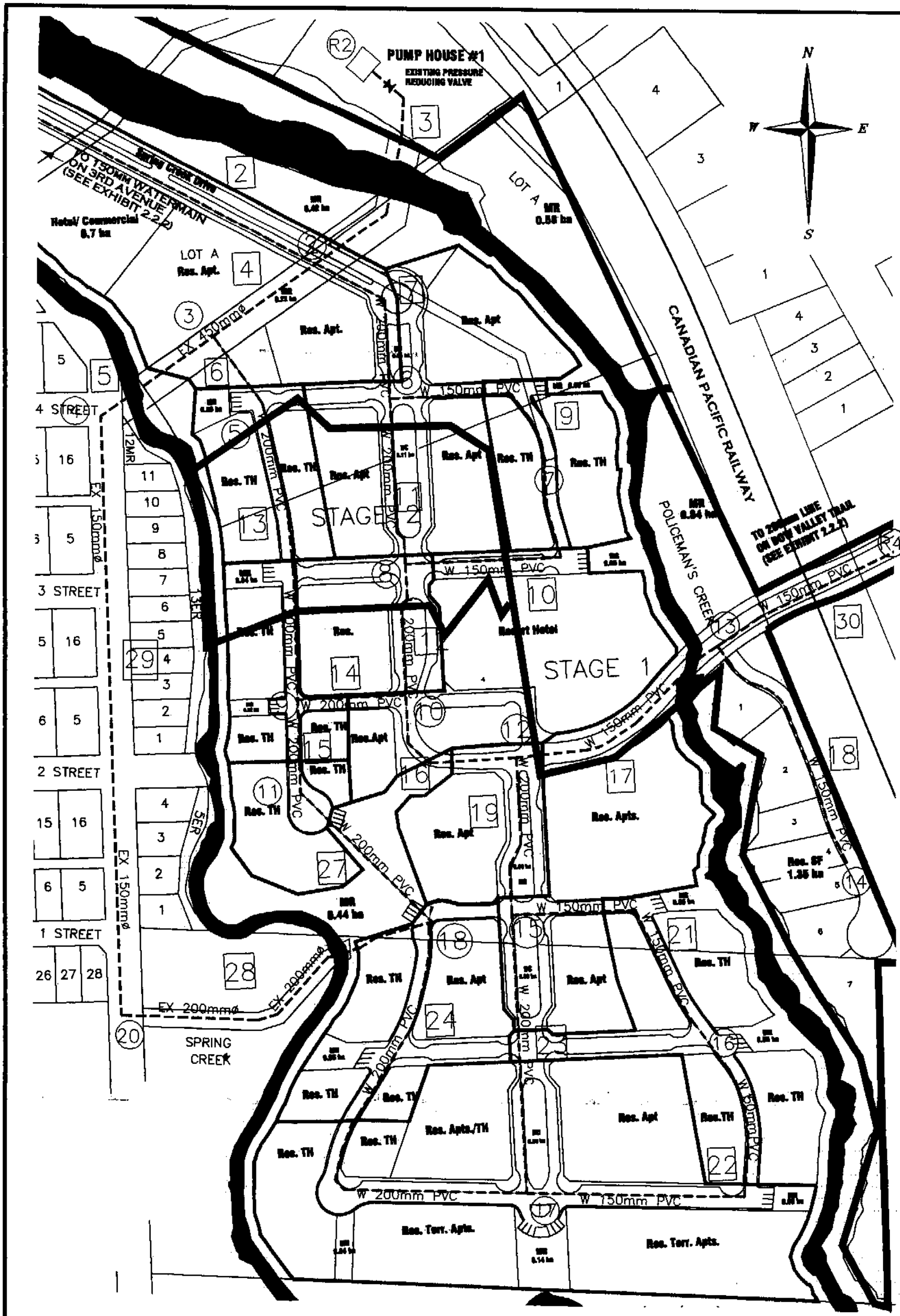
STAGES 1 & 2 WATER NETWORK

DATE: NOV, 2002	DRAWN BY: A.K.
SCALE 1:3000	EXHIBIT 2.2.2

Spring Creek
MOUNTAIN VILLAGE

LEGEND

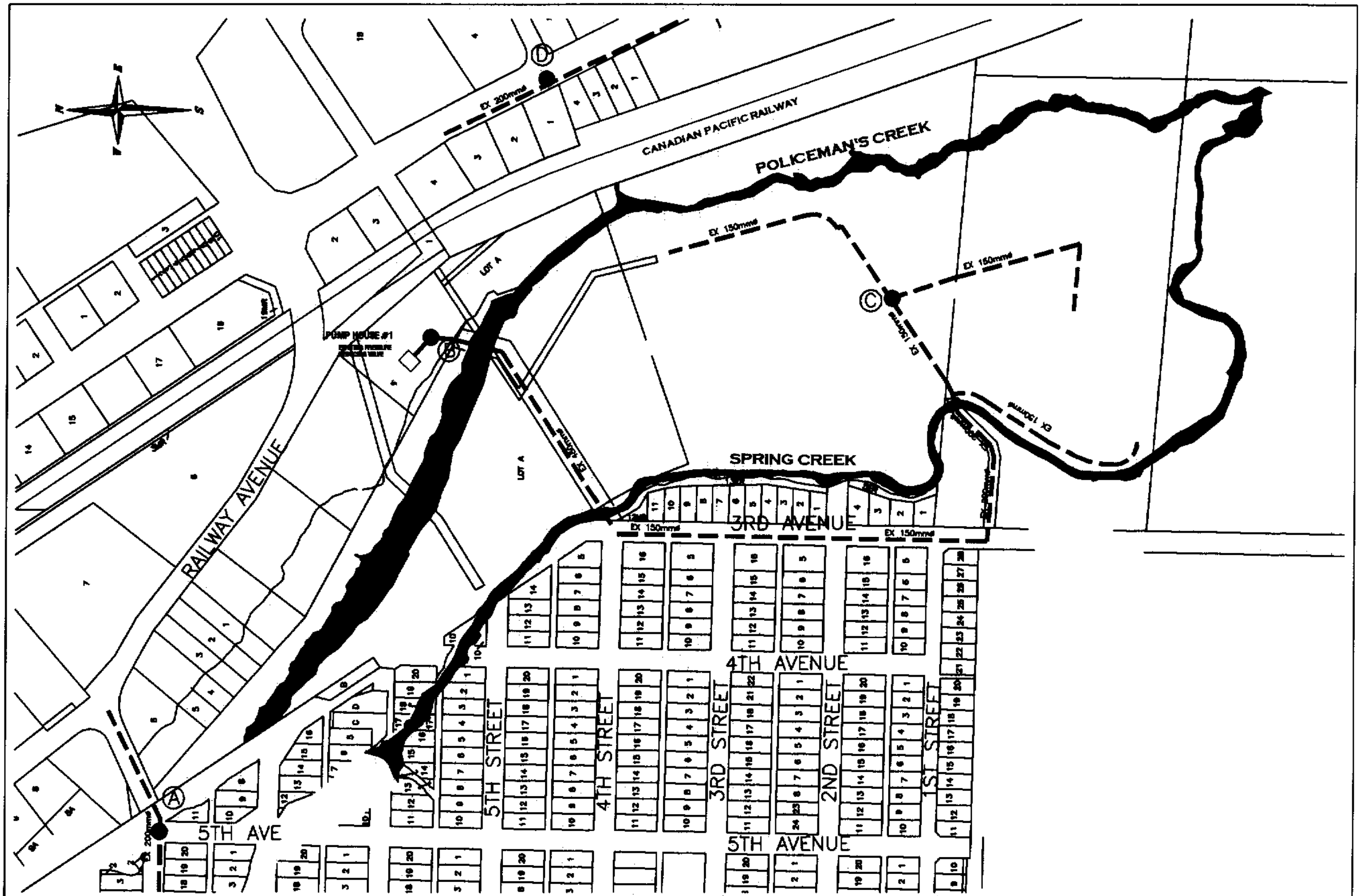
- ③ NODE NUMBER
- [3] PIPE NUMBER
- —— CATCHMENT BOUNDARY



Mountain Engineering Ltd. Land Development and Municipal	ULTIMATE WATER NETWORK		Spring Creek MOUNTAIN VILLAGE
	DATE: NOV, 2002	DRAWN BY: A.K.	
	SCALE 1:2000	EXHIBIT 2.2.3	

LEGEND

- (3) NODE NUMBER
- [3] PIPE NUMBER
- —— CATCHMENT BOUNDARY



Mountain Engineering Ltd. Land Development and Municipal	TOTAL HEAD CONDITIONS	Spring Creek MOUNTAIN VILLAGE	LEGEND
	DATE: NOV, 2002 / DRAWN BY: A.K.		
	SCALE 1:5000 / EXHIBIT 2.2.1		

Hotel Demands -	Average Day Demand=	600 l/unit/day
	Peak Day Demand =	2.5 x Average Day Demand
	Peak Hour Demand =	2 x Average Day Demand

Note: The commercial demands are based on water demands used in the past. This demand is actually referenced in Alberta Environment's, *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* for design of sewage infrastructure. The *Water System Utility Master Plan* indicates that for one storey redevelopment in the downtown area, a demand of 0.23 l/s/ha is appropriate. For 2 stories, the demand is 0.58 l/s/ha. Given that most of the commercial development in SCMV is expected to be on the lower floor of a building, the value of 0.46 l/s/ha is conservative.

2.3.2. Minimum and Maximum Residual Water Pressure

Minimum pressure of 275 kPa (40 psi or 28.0m) and maximum of 620 kPa (90 psi or 63.3m) in the peak hour analysis was considered acceptable. A minimum pressure of 140 kPa (20 psi or 14.3m) at the simulated node and a maximum of 620 kPa with no negative pressures in the system was considered acceptable in the peak day plus fire flow simulation.

2.3.3 Fire Flows

For single family residential areas (R1), a fire flow of 83 l/s was used. For higher density residential areas a fire flow of 120 l/s was used. For the hotel and commercial areas a fire flow of 200 l/s was used.

2.3.4 Hydraulic Losses

We have used a C value (the roughness coefficient in the Hazen-Williams equation) of 140.

2.4 Methodology

The distribution network was modeled using the program EPANET Version 2.0, which is distributed by the United States Environmental Protection Agency. The following simulations were run:

1. Phase 1&2

a) Peak Hour Demand
b) Peak Day Demand + 200 l/s fire flow at node 1
c) Peak Day Demand + 120 l/s residential fire flow at node 7
d) Peak Day Demand + 120 l/s residential fire flow at node 9A
e) Peak Day Demand + 83 l/s residential fire flow at node 14

2. Ultimate

a) Peak Hour Demand
b) Peak Day Demand + 200 l/s fire flow at node 1
c) Peak Day Demand + 120 l/s residential fire flow at node 7
d) Peak Day Demand + 120 l/s fire flow at node 16

3. Ultimate (Removing Pipe #16)

a) Peak Hour Demand
b) Peak Day Demand + 120 l/s fire flow at node 16

The residential fire locations were selected by noting which areas had lowest pressure in the Peak Hour analysis. Dead end cul-de-sacs and areas where the size of the watermain was reduced to 150mm are typically the location of a worst case fire flows. Higher value property such as the commercial developments was also fire flow simulated. Copies of the actual simulations are located in Appendix 2-A.

2.5 Discussion of Results

The following is a summary of each simulation modeled outlined in Section 2.4. It includes a description of the network and the results obtained. Please note that the maximum and minimum residual pressures shown are taken from within the Spring Creek Mountain Village boundaries.

2.5.1 Phases 1 & 2

The Phases 1 & 2 network was modeled as shown previously on Exhibit 2.2.2. The pipe and node information is shown in Tables 2.5.1.1 and 2.5.1.2. A 200mm watermain is required to connect from the existing 150mm watermain on 3rd Avenue to the 450mm watermain. The remainder of the watermain is also 200mm in diameter except for the 150mm pipe on the eastern loop. The results of the analysis are summarized as follows:

a) Peak Hour Demand

Lowest Pressure (Node 6)	=	41.28m (404.96 kPa)
Highest Pressure (Node 14)	=	53.82m (527.97 kPa)

b)Peak Day Demand + Fire Flow at Node 1

Lowest Pressure (Node 1)	=	15.52m (152.25 kPa)
Highest Pressure (Node 14)	=	52.30m (513.06 kPa)

c)Peak Day Demand + Fire Flow at Node 7

Lowest Pressure (Node 7)	=	26.11m (256.14 kPa)
Highest Pressure (Node 14)	=	52.30m (513.06 kPa)

d)Peak Day Demand + Fire Flow at Node 9A

Lowest Pressure (Node 9A)	=	28.39m (278.51 kPa)
Highest Pressure (Node 14)	=	52.30m (513.06 kPa)

e)Peak Day Demand + Fire Flow at Node 14

Lowest Pressure (Node 14)	=	14.92m (146.37 kPa)

TABLE 2.5.1.1

WATER NETWORK ANALYSIS

PROJECT: 123-02-01
SPRING CREEK MOUNTAIN VILLAGE STAGES 1 & 2

NODE DATA

CAPITA:

RES. APARTMENTS (RA)	2.2 PPU
TOWN HOUSE (RTH)	2.2 PPU
SENIOR RESIDENCE (SR)	2.2 PPU
SINGLE FAMILY (SF)	3.0 PPU

FIRE FLOW DEMANDS:

SINGLE FAMILY RESIDENTI	83 l/s
MULTI FAMILY RESIDENTIA	120 l/s
COMMERCIAL/HOTEL	200 l/s

COMMERCIAL(PER HA):

AVE DEMAND	0.46 l/s
PDF	2.5 *ADD
PHF	5 *ADD

RESIDENTIAL DEMANDS:

AVE DEMANI	460 l/c/day
PDF	2.5 *ADD
PHF	5 *ADD

HOTEL(PER UNIT):

AVE DEMANI	600 l/day
PDF	2.5 *ADD
PHF	5 *ADD

NODE NO.	CATCHMENT AREA (Ha)	LAND USE	NUMBER OF UNITS	DENSITY (PERSONS PER UNIT)	POPULATION	AVERAGE DAY DEMAND (l/s)	PEAK DAY DEMAND (l/s)	PEAK HOUR DEMAND (l/s)	FIRE FLOW (l/s)	PEAK DAY + FIRE FLOW (l/s)	ELEVATION (m)
1		H	50			0.347	0.868	1.736			
1		H	30			0.208	0.521	1.042			
1	0.39	C			0	0.179	0.449	0.897			
1	0.3	C			0	0.138	0.345	0.690			
1(Total)			**80**		**0**	**0.873**	**2.182**	**4.365**	**200**	**202.182**	**1309.50**
2	0.7	C			0	0.322	0.805	1.610			
2		H	120			0.833	2.083	4.167			
2		SR	63	2.2	139	0.738	1.845	3.690			
2		RA	46	2.2	101	0.539	1.347	2.694			
2(Total)			**229**		**240**	**2.432**	**6.080**	**12.160**	**200**	**206.080**	**1309.60**
5		RTH	6	2.2	13	0.070	0.176	0.351			
5		RTH	5	2.2	11	0.059	0.146	0.293			
5(Total)			**11**		**24**	**0.129**	**0.322**	**0.644**	**120**	**120.322**	**1308.00**
6		RA	56	2.2	123	0.656	1.640	3.280			
6		SR	58	2.2	128	0.679	1.698	3.397			
6		RA	58	2.2	128	0.679	1.698	3.397			
6(Total)			**172**		**378**	**2.015**	**5.037**	**10.073**	**120**	**125.037**	**1309.65**
7		RTH	11	2.2	24	0.129	0.322	0.644			
7		RTH	14	2.2	31	0.164	0.410	0.820			
7(Total)			**25**		**55**	**0.293**	**0.732**	**1.464**	**120**	**120.732**	**1307.60**
9A		RTH	6	2.2	13	0.070	0.176	0.351			
9A		RTH	5	2.2	11	0.059	0.146	0.293			
9A(Total)			**11**		**24**	**0.129**	**0.322**	**0.644**	**120**	**120.322**	**1308.00**
14(Total)		SF	**7**	**3.0**	**21**	**0.112**	**0.280**	**0.559**	**83**	**83.280**	**1307.45**
TOTALS			**528**		**743**	**5.982**	**14.955**	**29.910**			

MINIMUM PRESSURE = 275 kPa (40psi) FOR PEAK HOUR DEMANDS (28.03m)
MINIMUM PRESSURE = 140 kPa (20psi) FOR PEAK DAY + FIRE FLOW DEMANDS (14.27m)

WATER NETWORK ANALYSIS
TABLE 2.5.1.2

PROJECT # 123-02-01
SPRING CREEK MOUNTAIN VILLAGE

PIPE DATA

PIPE NO.	NODE FROM	TO	LENGTH (m)	SIZE (mm)	ROUGHNESS COEFFICIENT
1	R1	1	205	150	140
2	1	2	395	200	140
3	R2	2	1	450	140
4	2	3	75	450	140
5	3	4	80	450	140
6	3	5	50	200	140
7	2	6	100	200	140
9	6	7	130	150	140
10	7	8	130	150	140
11	6	8	100	200	140
13	5	9A	95	200	140
18	13	14	150	150	140
30	R4	13	170	150	140

Highest Pressure (Node 7) = 41.38m (405.94 kPa)

2.5.2 Ultimate Development

The ultimate development for Spring Creek Mountain Village was modeled as shown earlier on Exhibit 2.2.3. The pipe and node information is shown in Tables 2.5.2.1 and 2.5.2.2. The water network for the remainder of Spring Creek Mountain Village primarily consists of 200mm watermains except for the southeast loop, which will be 150mm. In addition, connections to the existing 450mm with the existing 150mm watermain on 3rd Avenue and 4th Street is required, a connection with the existing 200mm watermain at Willow Pointe is required, as well as a connection to the 150mm watermain from Bow Valley Trail, constructed during Phase 1. The results of the analysis are summarized on the following page:

a) Peak Hour Demand
- Lowest Pressure (Node 6) = 41.23m (404.47 kPa)
- Highest Pressure (Node 14) = 48.61m (476.86 kPa)

b)Peak Day Demand + Fire Flow at Node 1
- Lowest Pressure (Node 1) = 15.52m (152.25 kPa)
- Highest Pressure (Node 14) = 47.02m (461.27 kPa)

c)Peak Day Demand + Fire Flow at Node 7
- Lowest Pressure (Node 7) = 30.72m (301.36 kPa)
- Highest Pressure (Node 14) = 46.45m (455.67 kPa)

d)Peak Day Demand + Fire Flow at Node 16
- Lowest Pressure (Node 16) = 27.20m (266.83 kPa)
- Highest Pressure (Node 14) = 45.44m (445.77 kPa)

An analysis was also done to ensure the ultimate development is still serviceable if the main feed on Spring Creek Drive is shut off due to breakage or other circumstances. The simulation assumes that the eastern half of the loop from the 450mm watermain is shut down to the southern portion of the site due to a breakage in pipe 16. Only the worst cases based on previous simulations are shown here. Pressures were found to be slightly lower in this simulation, but are all still within the acceptable limits. The results are as indicated as follows:

a) Peak Hour Demand
- Lowest Pressure (Node 6) = 41.19m (404.07 kPa)
- Highest Pressure (Node 14) = 48.98m (480.49 kPa)

b)Peak Day Demand + Fire Flow at Node 16
- Lowest Pressure (Node 16) = 21.80m (213.86 kPa)
- Highest Pressure (Node 14) = 41.90m (411.04 kPa)

TABLE 2.5.2.1

WATER NETWORK ANALYSIS

PROJECT: 123-02-01
SPRING CREEK MOUNTAIN
VILLAGE ULTIMATE CONDITION

NODE DATA

CAPITA:	
RES. APARTMENTS (RA)	2.2 PPU
TOWN HOUSE (RTH)	2.2 PPU
SENIOR RESIDENCE (SR)	2.2 PPU
SINGLE FAMILY (SF)	3.0 PPU

FIRE FLOW DEMANDS:	
SINGLE FAMILY RESIDENT	83 l/s
MULTI FAMILY RESIDENTIA	120 l/s
COMMERCIAL/HOTEL	200 l/s

COMMERCIAL(PER HA):	
AVE DEMANE	0.46 l/s
PDF	2.5 *ADD
PHF	5 *ADD

RESIDENTIAL DEMANDS:	
AVE DEMANI	460 l/c/day
PDF	2.5 *ADD
PHF	5 *ADD

HOTEL(PER UNIT):	
AVE DEMANI	600 l/day
PDF	2.5 *ADD
PHF	5 *ADD

NODE NO.	CATCHMENT AREA (Ha)	LAND USE	NUMBER OF UNITS	DENSITY (PERSONS PER UNIT)	POPULATION	AVERAGE DAY DEMAND (l/s)	PEAK DAY DEMAND (l/s)	PEAK HOUR DEMAND (l/s)	FIRE FLOW (l/s)	PEAK DAY + FIRE FLOW (l/s)	ELEVATION (m)
1		H	50			0.347	0.868	1.736			
1		H	30			0.208	0.521	1.042			
1	0.39	C			0	0.179	0.449	0.897			
1	0.30	C			0	0.138	0.345	0.690			
1(Total)			**80**		**0**	**0.873**	**2.182**	**4.365**	**200**	**202.182**	**1309.50**
2	0.70	C			0	0.322	0.805	1.610			
2		H	120			0.833	2.083	4.167			
2		SR	63	2.2	139	0.738	1.845	3.690			
2		RA	46	2.2	101	0.539	1.347	2.694			
2(Total)			**229**		**240**	**2.432**	**6.080**	**12.160**	**200**	**206.080**	**1309.60**
5		RTH	10	2.2	22	0.117	0.293	0.59			
5		RTH	12	2.2	26	0.141	0.351	0.70			
5(Total)			**22**		**48**	**0.258**	**0.644**	**1.288**	**120**	**120.644**	**1309.65**
6		RA	56	2.2	123	0.656	1.640	3.280			
6		SR	58	2.2	128	0.679	1.70	3.40			
6		RA	58	2.2	128	0.679	1.70	3.40			
6(Total)			**172**		**378**	**2.015**	**5.037**	**10.073**	**120**	**125.037**	**1309.65**
7		RTH	11	2.2	24	0.129	0.322	0.644			
7		RTH	14	2.2	31	0.164	0.410	0.820			
7(Total)			**25**		**55**	**0.293**	**0.732**	**1.464**	**120**	**120.732**	**1307.60**
8		RA	64	2.2	141	0.750	1.874	3.748			
8(Total)			**64**	**2.2**	**141**	**0.750**	**1.874**	**3.748**	**120**	**121.874**	**1309.50**
9		RTH	10	2.2	22	0.117	0.293	0.586			
9		RTH	3	2.2	7	0.035	0.088	0.176			
9		RTH	3	2.2	7	0.035	0.088	0.176			
9(Total)			**16**		**35**	**0.187**	**0.469**	**0.937**	**120**	**120.469**	**1307.60**
10		RA	15	2.2	33	0.176	0.439	0.878			
10		H	350			2.431	6.076	12.153			
10	0.94	C			0	0.432	1.081	2.162			
10(Total)			**365**		**0**	**3.039**	**7.597**	**15.193**	**200**	**207.597**	**1309.40**
11		RTH	3	2.2	7	0.035	0.088	0.176			
11		RTH	11	2.2	24	0.129	0.322	0.644			
11(Total)			**14**		**31**	**0.164**	**0.410**	**0.820**	**120**	**120.410**	**1308.20**
12(Total)		**SR**	**75**	**2.2**	**165**	**0.878**	**2.196**	**4.392**	**120**	**122.196**	**1309.55**
14(Total)		**SF**	**7**	**3.0**	**21**	**0.112**	**0.280**	**0.559**	**83**	**83.280**	**1307.45**

15	RA	78	2.2	172	0.914	2.284	4.568			
15	RA	100	2.2	220	1.171	2.928	5.856			
15(Total)		**178**		**392**	**2.085**	**5.212**	**10.425**	**120**	**125.212**	**1309.15**
16	RTH	10	2.2	22	0.117	0.293	0.586			
16	RTH	9	2.2	20	0.105	0.264	0.527			
16	RTH	12	2.2	26	0.141	0.351	0.703			
16(Total)		**31**		**68**	**0.363**	**0.908**	**1.816**	**120**	**120.908**	**1306.85**
17	RA	67	2.2	147	0.785	1.962	3.924			
17	RA	89	2.2	196	1.042	2.606	5.212			
17	RA	42	2.2	92	0.492	1.230	2.460			
17	RA	33	2.2	73	0.387	0.966	1.933			
17	RTH	12	2.2	26	0.141	0.351	0.703			
17	RTH	4	2.2	9	0.047	0.117	0.234			
17(Total)		**247**		**543**	**2.893**	**7.233**	**14.466**	**120**	**127.233**	**1308.00**
18	SR	58	2.2	128	0.679	1.698	3.397			
18	RTH	9	2.2	20	0.105	0.264	0.527			
18	RTH	4	2.2	9	0.047	0.117	0.234			
18	RTH	4	2.2	9	0.047	0.117	0.234			
18(Total)		**75**		**165**	**0.878**	**2.196**	**4.392**	**120**	**122.196**	**1307.80**
20(Total)	**SF**	**8**	**3.0**	**24**	**0.128**	**0.319**	**0.639**	**83**	**83.319**	**1307.45**
TOTALS		**1600**		**2283**	**17.220**	**43.049**	**86.098**			

NOTE: TOTALS EXCLUDE NODE 20

MINIMUM PRESSURE = 275 kPa (40psi) FOR PEAK HOUR DEMANDS (28.03m)
MINIMUM PRESSURE = 140 kPa (20psi) FOR PEAK DAY + FIRE FLOW DEMANDS (14.27m)

WATER NETWORK ANALYSIS
TABLE 2.5.2.2

PROJECT # 123-02-01
SPRING CREEK MOUNTAIN VILLAGE

PIPE DATA

PIPE NO.	NODE FROM	TO	LENGTH (m)	SIZE (mm)	ROUGHNESS COEFFICIENT
1	R1	1	205	150	140
2	1	2	395	200	140
3	R2	2	1	450	140
4	2	3	75	450	140
5	3	4	80	450	140
6	3	5	50	200	140
7	2	6	100	200	140
9	6	7	130	150	140
10	7	8	130	150	140
11	6	8	100	200	140
12	8	10	80	200	140
13	5	9	170	200	140
14	9	10	65	200	140
15	9	11	55	200	140
16	10	12	100	200	140
17	12	13	140	200	140
18	13	14	150	150	140
19	12	15	90	200	140
21	15	16	140	150	140
22	16	17	145	150	140
23	15	17	165	200	140
24	17	18	280	200	140
27	11	19	95	200	140
28	19	20	200	200	140
29	4	20	375	150	110
30	R4	13	170	150	140

2.6 Conclusions

Phase 1 of the Spring Creek Mountain Village redevelopment includes looping the watermain between the 150mm watermain on 3rd Avenue at the entrance to the current Restwell development and the two tie-ins into the 450mm line running through the north end of the site. It also includes connection of the R1 lots to the existing 200mm watermain on Bow Valley Trail with a 150mm watermain. Under the proposed conditions, the analysis shows that the residual pressures in Phases 1 & 2 are acceptable during normal operation.

The ultimate development consists of extending the existing water system from Phases 1 & 2 to the final tie-in into the 200mm line from Willow Pointe currently operating to service the existing fire hydrants. It also consists of connecting the 450mm watermain to the existing watermain in South Canmore. The analysis for this scenario shows that the residual pressures for the ultimate development are sufficient during normal operation. In the event of a shut down or breakage disrupting the 200mm main loop through the site, residual pressures are also acceptable.

As indicated in Section 2.2, existing water pressures were supplied to us by EPCOR. These pressures take into account the existing PRV at Pump House #1. As indicated above, the residual pressures are adequate at ground level for all simulations. Reviewing the pressures 10m above the ground surface, at approximately the highest floor level proposed in SCMV, the residual pressures are still within the acceptable limits. However, they are at the low end of acceptable. Consideration should be given to increasing the water pressure from the existing PRV. This would also result in an increase in level of service for South Canmore, when the connection from the 450mm watermain to South Canmore is made.

3.0 Sanitary Sewer System

3.1 Existing Sanitary Sewer System

The existing sanitary sewer system for Restwell Trailer Park is shown on Exhibit 3.1.1. It consists of a series of private lift stations which pump to a common forcemain that eventually collects into a 100mm forcemain. This forcemain discharges into the Town of Canmore sewer infrastructure at a manhole at the intersection of 4th Avenue and 4th Street.

In addition to the private sewer system that exists in Restwell, a triple forcemain is located within the site. This triple forcemain services all development on the north side of the Trans Canada Highway as well as development on Bow Valley Trail. It travels through Restwell in a Utility Right-of-Way near the north end of the site.

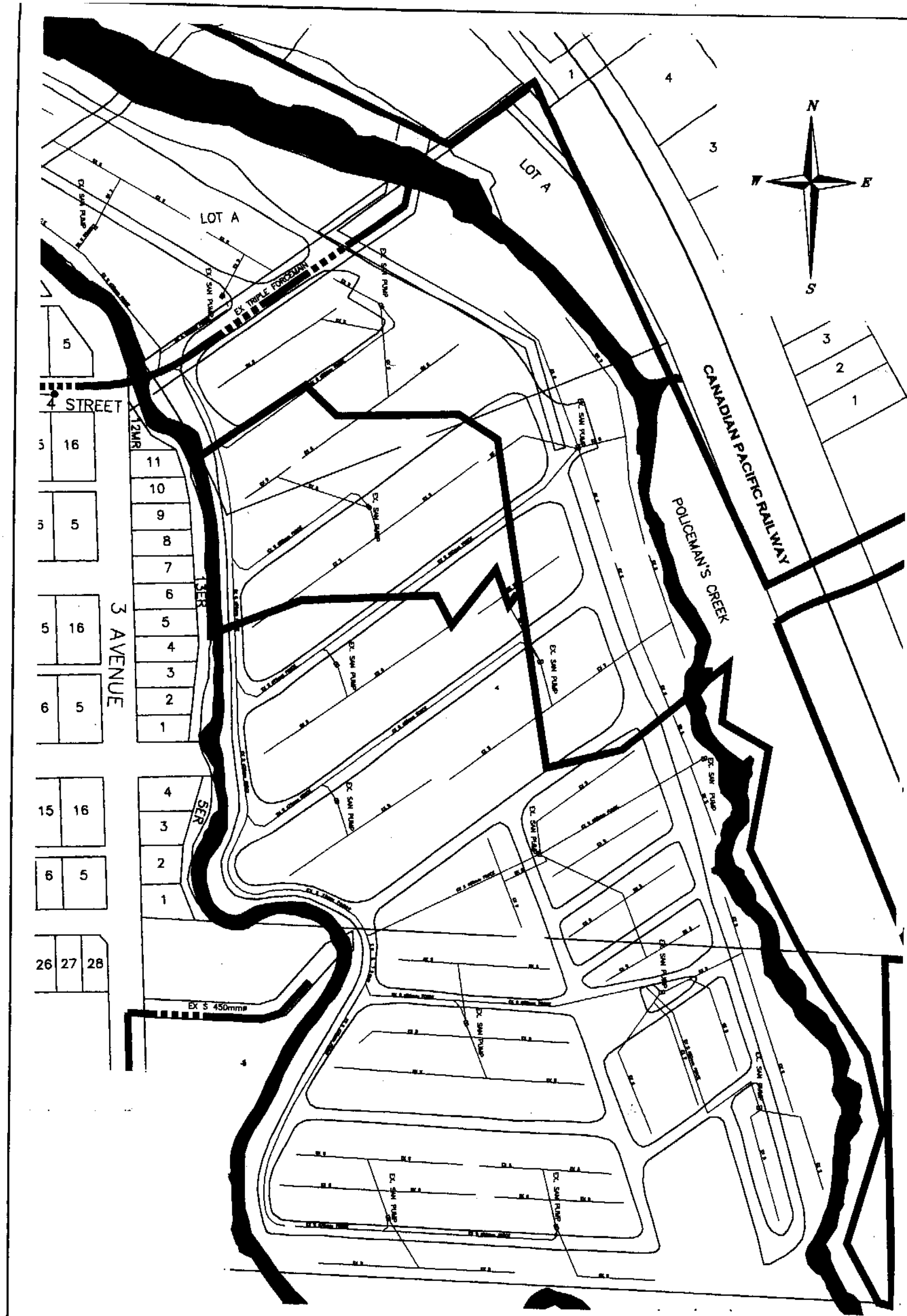
Exhibit 3.1.1 shows the existing sanitary sewer system.

3.2 Proposed Sanitary Sewer Network

In determining the proposed sanitary sewer servicing for the proposed Spring Creek Mountain Village (SCMV) development, a review of the 1998 Utility Master Plan for Sanitary Sewer was done. Based on this review, discussions were held with the Town of Canmore's Engineering Department to determine if the redevelopment could benefit both the Town with future upgrades that are required and SCMV to service the site. It was determined that a future forcemain could be installed from Bow Valley Trail, through SCMV, across Spring Creek to 3rd Avenue and eventually to the sewage treatment plant. This forcemain will service the catchment now serviced by the triple forcemain and SCMV.

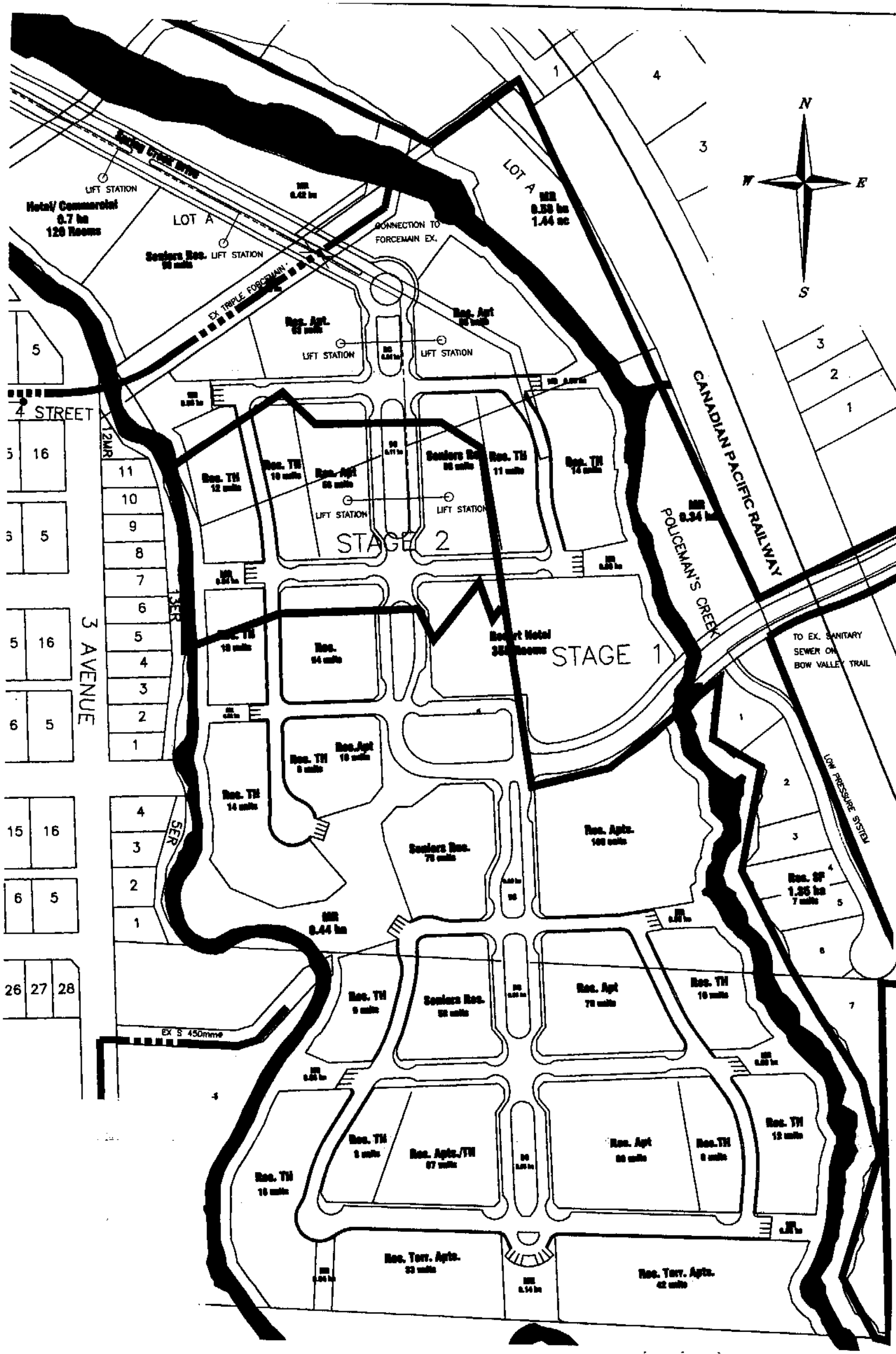
The servicing of SCMV will be phased. Because the new forcemain will likely not be constructed before Phase 1&2 of SCMV is constructed, a temporary connection to either the triple forcemain or the existing 200mm forcemain currently servicing Restwell is proposed. This proposal is shown on Exhibit 3.2.1, as a connection to the triple forcemain. This connection will be used to service all development for Phases 1 & 2. Each development pod will require a lift station that will pump into the forcemain and ultimately into the Town's sewer system. A forcemain and lift station analysis, as well as a capacity analysis of the existing Town sewers will be required in conjunction with detail design for the Phase 1 development.

For the ultimate development, the new Town forcemain will likely be installed through SCMV. Exhibit 3.2.2 shows the proposed sanitary sewer system. Given that the proposed forcemain will be located near the center of the development, two connections will be made to it. One connection will be for development south of the forcemain and the other from the north. The temporary connection installed in Phase 1 will either be converted to a permanent connection or the connection will be removed and extended to the new forcemain. Wherever the Town determines that capacity exists will be the location for the connection. As with the Phase 1 and 2 developments, lift stations will be required for each pod of development, as schematically indicated on Exhibit 3.2.1. In addition, as with the initial phases of development, a pressure analysis will be required to identify the required lift station specifications and forcemain sizing.



Mountain Engineering Ltd. Land Development and Municipal	EXISTING SANITARY SEWER		Spring Creek MOUNTAIN VILLAGE	LEGEND	
	DATE: NOV, 2002	DRAWN BY: A.K.			TOWN SEWER
	SCALE 1:2000	EXHIBIT 3.1.1			PRIVATE SEWER

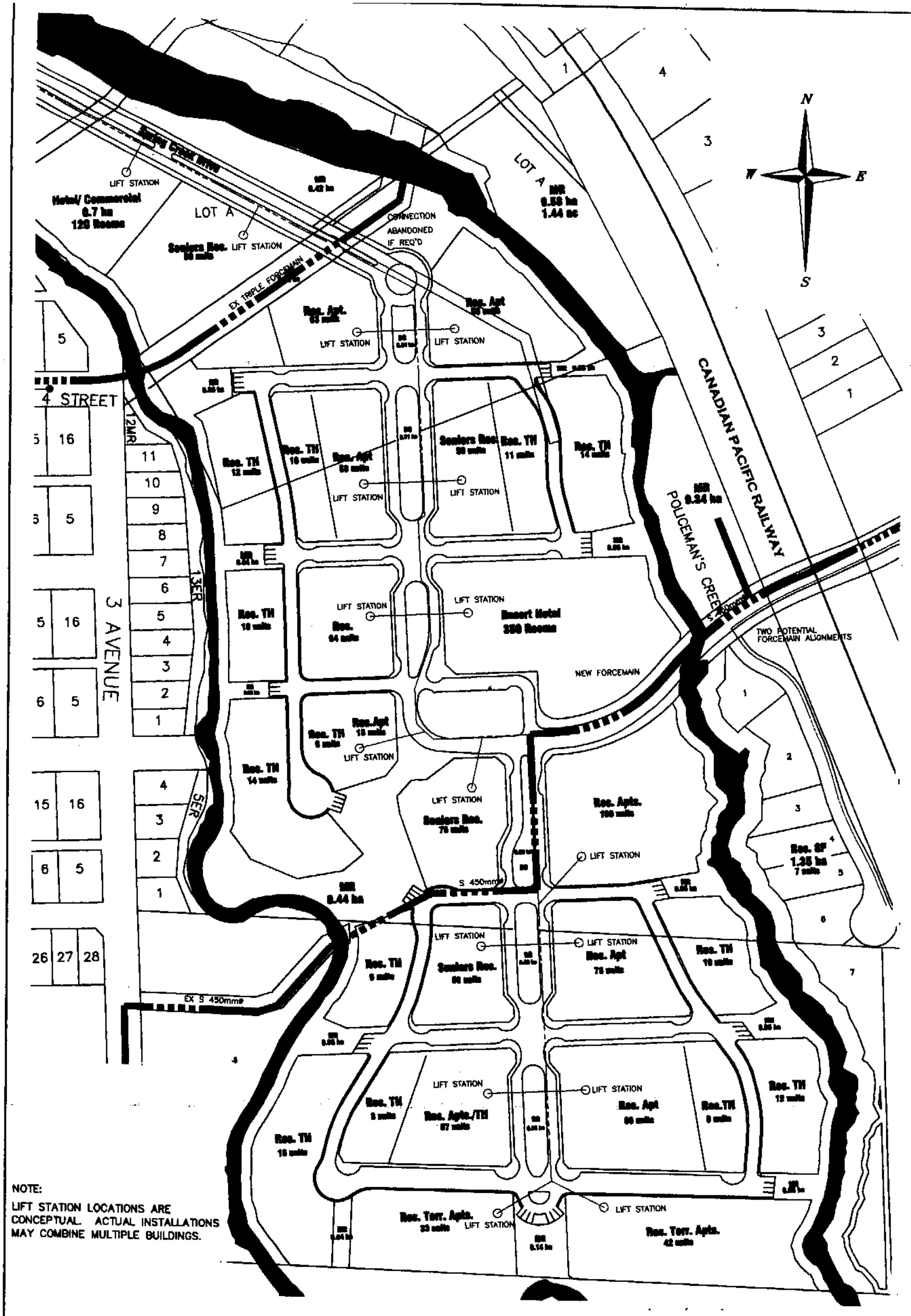
Exhibits 3.2.1 and 3.2.2 show schematic locations for lift stations within the proposed development. These lift stations are expected to be private installations that will likely be operated and maintained by individual condominium associations. Consideration will be given to connecting multiple buildings to a single lift station. This will potentially require an agreement between different condominium associations and will be reviewed during a detail design stage.



Mountain Engineering Ltd. Land Development and Municipal	STAGES 1 & 2 SANITARY SEWER		Spring Creek MOUNTAIN VILLAGE
	DATE: NOV, 2002	DRAWN BY: A.K.	
	SCALE 1:2000	EXHIBIT 3.2.1	

LEGEND

- TOWN SEWER
- PRIVATE SEWER



Mountain Engineering Ltd.
Land Development and Municipal

ULTIMATE SANITARY SEWER

DATE: NOV, 2002	DRAWN BY: A.K.
SCALE 1:2000	EXHIBIT 3.2.2

Spring Creek
MOUNTAIN VILLAGE

LEGEND

TOWN SEWER	
PRIVATE SEWER	

STORM SEWERS

4.0 Storm Water Management System

4.1 Existing Storm Water Management System

The existing Restwell Trailer Park generally drains from north to south. Its stormwater management system consists primarily of surface drainage flowing directly into Spring Creek to the west and Policeman's Creek to the east. In addition, a number of drywells exist to infiltrate stormwater into the groundwater.

Current stormwater installations incorporate Alberta Environment and Town of Canmore guidelines regarding stormwater treatment into the design. This usually means oil & grit separator manholes treating the stormwater runoff prior to dispersion. The existing system operating in Spring Creek Mountain Village was never designed to meet these guidelines, and will be phased out as the redevelopment progresses.

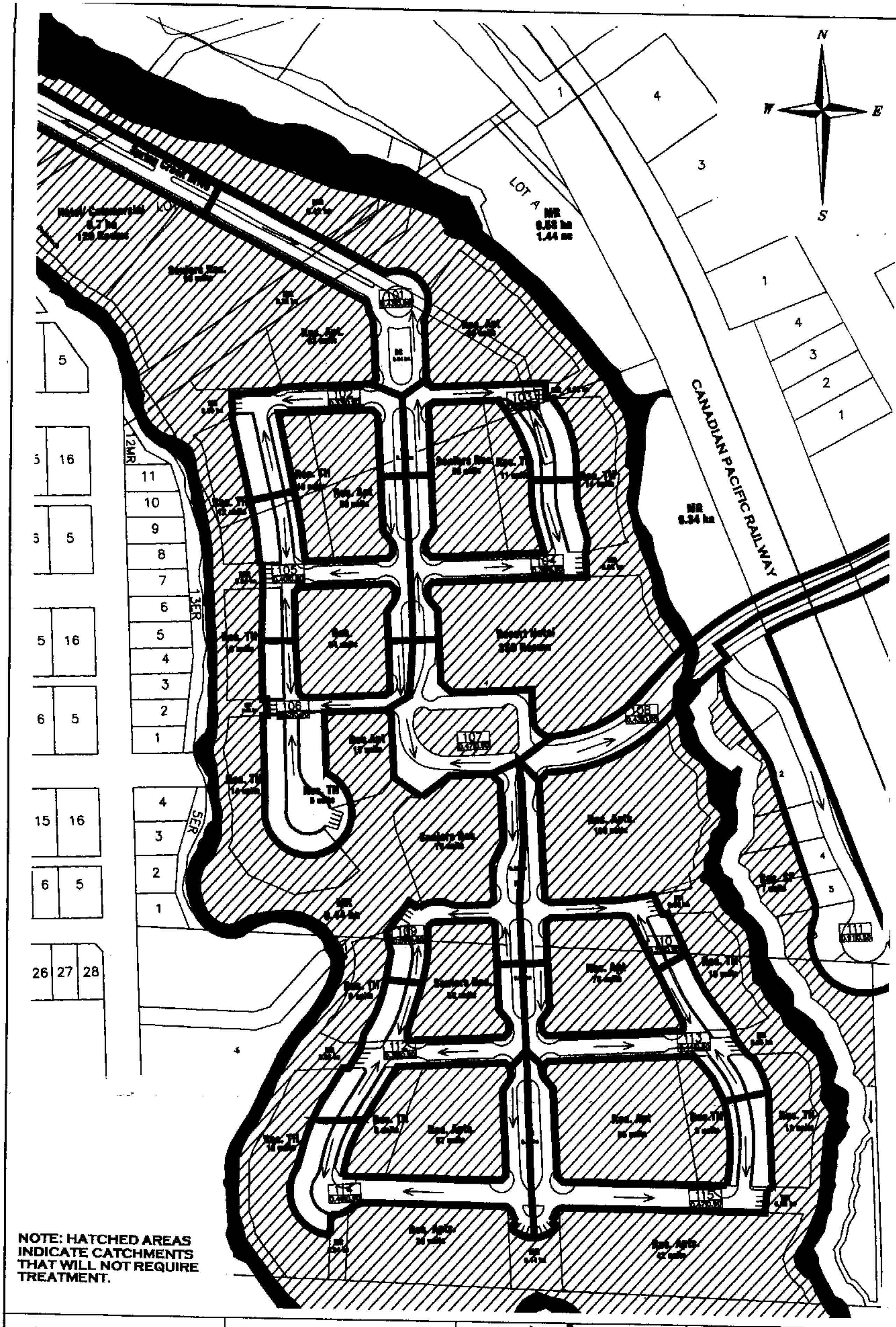
4.2 Proposed Stormwater Management Network

In conjunction with the redevelopment and the creation of Spring Creek Mountain Village (SCMV), regrading will be done. This regrading will consider a number of factors including the groundwater elevations, locations for underground parking, roof heights on the proposed buildings, and other issues. Generally, the center of the site will be at the highest elevation. Roads and buildings adjacent to creeks will be lower. Final road grades will be determined at a detail design, however, they will generally follow the directions indicated on Exhibit 4.2.1.

Given the proposed land use and density of the development, area for a formal stormwater management facility is not available. The intention of the road grading is to create required areas for stormwater storage. These areas will mostly be at the parking areas near the creeks. Other localized ponding areas will be required where longer lengths of road are proposed. The manner of stormwater management will be to provide the required storage for the 1:100 Year storm, while infiltrating the water into the ground. There will be a balance between the quantity of infiltration infrastructure proposed and the quantity of storage provided. Depending on the results of that analysis, underground storage, in the form of pipes or other specific stormwater storage/infiltration facilities will be proposed. At a detail design stage, this will be studied in more detail to determine the most cost effective method of stormwater control.

In addition to controlling the quantity of runoff, treatment of the runoff from the roadways will be required to ensure that the quality of the groundwater is not impacted. Treatment will most likely be done using oil/grit separators. These are facilities, similar to a manhole, which removes oils and sediment. These are the most common method of stormwater treatment in the South Canmore area.

The above sections deal with storm drainage from road areas. Exhibit 4.2.1 shows the proposed catchment boundaries, as well as the road drainage directions. The hatched areas represent areas that also require stormwater management, however they will not require treatment. This is because these catchments will consist of roofs and green spaces. The runoff from these types of areas will not be contaminated, as is runoff from a road surface. Currently, the Area Redevelopment Plan is not contemplating any surface parking in any of the



Mountain Engineering Ltd.
Land Development and Municipal

STORMWATER MANAGEMENT

DATE: NOV, 2002 | DRAWN BY: A.K.

SCALE 1:2000 | EXHIBIT 4.2.1

Spring Creek
MOUNTAIN VILLAGE

LEGEND

development pods. However, if surface parking were provided in any of the development sites, stormwater treatment would be required on those areas. Also, runoff from the hatched areas will not be permitted to drain onto the road surfaces. The individual development pods will be required to discharge the 1:100 Year storm within their site. A determination of whether surface or underground storage will be required will be made at a detail design stage when the building designs and landscaping plans are finalized.

Given the proposed road grading, runoff will drain towards the creeks bordering the site. The proposed stormwater management system involves creating approximately fifteen trapped lows primarily at the intersections of the mews roads and the cross streets to collect, store and disperse the runoff from the 1:100 year storm event. At these locations, surface ponding will occur while the infrastructure works to disperse the runoff into the ground. The location of these trapped lows is designed in such a way that if a storm event greater than the 1:100 year storm occurs, an emergency overflow will be provided into either Spring Creek or Policeman's Creek.

Given the actual and proposed grading of the site and surrounding area, the proposed storm sewer infrastructure will operate independently of any existing infrastructure operating in the immediate vicinity of the site. This means that surface overflow from surrounding developments is not expected to drain onto the proposed site. Nor will drainage from SCMV drain offsite during the 1:100 Year storm.

4.3 Methodology

The proposed catchments were modeled using the program SWMHYMO Version 4.02, Stormwater Hydraulic Model. Only roadway catchments were modeled as each private development site will be responsible for their own discharges into the groundwater. The catchments were all modeled using the same parameters, with the exception of Catchment 111. Catchment 111 is unique when compared to the others being the only catchment containing single family residential units. As a result, conditions in this catchment cannot be generalized with those from the other fourteen catchments. Detailed modeling results are located in Appendix 4-A.

All catchments were modeled with the City of Calgary 1:100 Year design storm, as per current Town requirements. However, it is our understanding that a Town of Canmore design storm is currently being investigated. If this design storm has been approved by the Town of Canmore prior to detail design being performed on the SCMV site, the new storm will be used during detail design.

With the exception of Catchment 111, the remaining fourteen of the fifteen catchments were modeled using the CALIB STANDHYD command using a value of imperviousness of 85% (XIMP=TIMP=0.85). Such a high value was selected as representative of the primarily road surface nature of the catchments. With the exception of the townhouse units, catchment boundaries were drawn on building property lines, resulting in catchment areas ranging from 0.28ha to 0.91ha. In other words and as indicated previously, all of the apartment buildings, hotels and commercial buildings will be required to capture, store, treat and release runoff generated on their property during a 1:100 year rainfall even within their property. The road catchments that include townhouses with driveways were sized to include the front half of the units.

Only Catchment 111 was modeled with an imperviousness of 55, and the CALIB STANDHYD command. This value was selected because the catchment is made up of single family residential units.

As indicated in Section 4.2, the proposed infrastructure will be determined at a detail design phase. The proposed infrastructure will consider the total cost and will likely create a balance between surface and underground storage. In determining the quantity of storage required, an infiltration rate of the soils is required. Sabatini Earth Technologies Inc. performed infiltration testing in the existing piezometers in February, 2003. They recommended an infiltration rate of $1x10^{-4}$ m/s be used for design purposes. This is the rate that was used in this analysis, as it is believed to be conservative. However, more detailed geotechnical analysis will be required at the detail building design phase. If additional infiltration testing is done at that time that indicates a faster infiltration rate, those values will be used for the detail design.

4.4 Discussion of Results

Table 4.4.1 provides a summary of the anticipated runoff generated on the road areas. The chart provides a summary of the 1:100 year discharge, the total volume of runoff generated by the catchment, and the total storage required, based on a 100m² area and a 200m² area of infiltration.

Catchment	100 Year Q (m^3/s)	Total Volume Runoff (m^3)	Storage Volume (100m² infiltration)(m^3)	Storage Volume (200m² infiltration)(m^3)
100	0.159	140	120	97
101	0.147	128	108	85
102	0.121	98	79	58
103	0.106	83	62	46
104	0.138	113	94	72
105	0.146	119	100	77
106	0.197	154	136	113
107	0.169	140	121	97
108	0.149	128	109	86
109	0.110	89	69	50
110	0.097	80	59	43
111	0.185	200	175	156
112	0.137	113	94	72
113	0.146	122	103	80
114	0.155	137	117	94
115	0.158	140	120	97

Table 4.4.1 SWMHYMO Results

5.0 Conclusions

The following conclusions can be drawn from the above analysis:

1. A range of required storage volumes to deal with stormwater on the road areas has been provided. A cost analysis at the detail design stage will be required to determine if surface ponding, underground storage, or a combination will be used.
2. Treatment of runoff is required for road drainage. Treatment of runoff is not required for roof or landscaped areas.
3. Unless further investigation dictates otherwise, a design infiltration rate of $1x10^{-4}$ m/s is recommended for design of infiltration facilities.
4. The City of Calgary 1:100 Year design storm was used in this analysis. If the Town of Canmore 1:100 Year storm is approved prior to detail design, the Town of Canmore storm will be used for detail design.

APPENDIX 2-A

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*                              E P A N E T                           *
*                      Hydraulic and Water Quality                   *
*                      Analysis for Pipe Networks                    *
*                             Version 2.0                            *
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Input File: PH STAGE 1.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
11	6.	8.	100	200
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10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
2	1.	2.	395	200
4	2.	3.	75	450
6	3.	5.	50	200
13	5.	9A.	170	200
18	13	14	150	150
30	13	R4	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	4.36	1350.98	41.48	0.00	
2.	12.16	1351.00	42.35	0.00	
6.	10.07	1350.93	41.28	0.00	
8.	0.00	1350.93	41.43	0.00	
9A.	0.64	1351.00	43.00	0.00	
7.	1.46	1350.92	43.32	0.00	
5.	0.64	1351.00	43.00	0.00	
3.	0.00	1351.00	43.00	0.00	
13	0.00	1361.27	52.82	0.00	
14	0.56	1361.27	53.82	0.00	
R1	-1.75	1351.00	0.00	0.00	Reservoir
R2	-27.60	1351.00	0.00	0.00	Reservoir
R4	-0.56	1361.27	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	11.54	0.37	0.74	Open
11	0.70	0.02	0.00	Open
9	0.77	0.04	0.02	Open
10	-0.70	0.04	0.02	Open
1	1.75	0.10	0.09	Open
3	27.60	0.17	0.00	Open
2	-2.61	0.08	0.05	Open
4	1.29	0.01	0.00	Open
6	1.29	0.04	0.01	Open
13	0.64	0.02	0.00	Open
18	0.56	0.03	0.01	Open
30	-0.56	0.03	0.01	Open

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**********************************************************************
*                              E P A N E T                           *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                          Version 2.0                               *
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Input File: PD+FF ST 1 NODE 1.NET

Link - Node Table:

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1	R1	1.	205	150
3	R2	2.	1	450
2	1.	2.	395	200
4	2.	3.	75	450
6	3.	5.	50	200
13	5.	9A.	170	200
18	13	14	150	150
30	13	R4	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	202.18	1325.02	15.52	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.08	1348.98	39.33	0.00	
8.	0.00	1348.98	39.48	0.00	
9A.	0.32	1349.00	41.00	0.00	
7.	0.73	1348.98	41.38	0.00	
5.	0.32	1349.00	41.00	0.00	
3.	0.00	1349.00	41.00	0.00	
13	0.00	1359.75	51.30	0.00	
14	0.28	1359.75	52.30	0.00	
R1	-77.54	1346.00	0.00	0.00	Reservoir
R2	-137.17	1349.00	0.00	0.00	Reservoir
R4	-0.28	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	5.81	0.18	0.21	Open
11	0.35	0.01	0.00	Open
9	0.38	0.02	0.01	Open
10	-0.35	0.02	0.00	Open
1	77.54	4.39	102.35	Open
3	137.17	0.86	1.34	Open
2	-124.64	3.97	60.71	Open
4	0.64	0.00	0.00	Open
6	0.64	0.02	0.01	Open
13	0.32	0.01	0.00	Open
18	0.28	0.02	0.00	Open
30	-0.28	0.02	0.00	Open

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*                              E P A N E T                           *
*                      Hydraulic and Water Quality                   *
*                      Analysis for Pipe Networks                    *
*                             Version 2.0                            *
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Input File: PD+FF ST 1 NODE 7.NET

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3	R2	2.	1	450
2	1.	2.	395	200
4	2.	3.	75	450
6	3.	5.	50	200
13	5.	9A.	170	200
18	13	14	150	150
30	13	R4	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.08	1342.82	33.17	0.00	
8.	0.00	1341.37	31.87	0.00	
9A.	0.32	1349.00	41.00	0.00	
7.	120.73	1333.71	26.11	0.00	
5.	0.32	1349.00	41.00	0.00	
3.	0.00	1349.00	41.00	0.00	
13	0.00	1359.75	51.30	0.00	
14	0.28	1359.75	52.30	0.00	
R1	21.27	1346.00	0.00	0.00	Reservoir
R2	-155.98	1349.00	0.00	0.00	Reservoir
R4	-0.28	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
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11	57.54	1.83	14.51	Open
9	63.19	3.58	70.06	Open
10	-57.54	3.26	58.90	Open
1	-21.27	1.20	9.32	Open
3	155.98	0.98	1.79	Open
2	-23.45	0.75	2.75	Open
4	0.64	0.00	0.00	Open
6	0.64	0.02	0.00	Open
13	0.32	0.01	0.00	Open
18	0.28	0.02	0.00	Open
30	-0.28	0.02	0.00	Open

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**********************************************************************
*                            E P A N E T                             *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
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Input File: PD+FF ST 1 NODE 9A.NET

Link - Node Table:

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1	R1	1.	205	150
3	R2	2.	1	450
2	1.	2.	395	200
4	2.	3.	75	450
6	3.	5.	50	200
13	5.	9A.	170	200
18	13	14	150	150
30	13	R4	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.08	1348.98	39.33	0.00	
8.	0.00	1348.98	39.48	0.00	
9A.	120.32	1336.39	28.39	0.00	
7.	0.73	1348.98	41.38	0.00	
5.	0.32	1346.06	38.06	0.00	
3.	0.00	1348.92	40.92	0.00	
13	0.00	1359.75	51.30	0.00	
14	0.28	1359.75	52.30	0.00	
R1	21.27	1346.00	0.00	0.00	Reservoir
R2	-155.98	1349.00	0.00	0.00	Reservoir
R4	-0.28	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	5.81	0.18	0.21	Open
11	0.35	0.01	0.00	Open
9	0.38	0.02	0.01	Open
10	-0.35	0.02	0.00	Open
1	-21.27	1.20	9.32	Open
3	155.98	0.98	1.79	Open
2	-23.45	0.75	2.75	Open
4	120.64	0.76	1.10	Open
6	120.64	3.84	57.15	Open
13	120.32	3.83	56.87	Open
18	0.28	0.02	0.00	Open
30	-0.28	0.02	0.00	Open

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*                              E P A N E T                           *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
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Input File: PD+FF ST 1 NODE 14.NET

Link - Node Table:

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3	R2	2.	1	450
2	1.	2.	395	200
4	2.	3.	75	450
6	3.	5.	50	200
13	5.	9A.	170	200
18	13	14	150	150
30	13	R4	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.04	1348.98	39.33	0.00	
8.	0.00	1348.98	39.48	0.00	
9A.	0.32	1349.00	41.00	0.00	
7.	0.73	1348.98	41.38	0.00	
5.	0.32	1349.00	41.00	0.00	
3.	0.00	1349.00	41.00	0.00	
13	0.00	1339.89	31.44	0.00	
14	83.28	1322.37	14.92	0.00	
R1	21.28	1346.00	0.00	0.00	Reservoir
R2	-35.95	1349.00	0.00	0.00	Reservoir
R4	-83.28	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	5.77	0.18	0.21	Open
11	0.35	0.01	0.00	Open
9	0.38	0.02	0.00	Open
10	-0.35	0.02	0.00	Open
1	-21.28	1.20	9.33	Open
3	35.95	0.23	0.15	Open
2	-23.46	0.75	2.75	Open
4	0.64	0.00	0.00	Open
6	0.64	0.02	0.00	Open
13	0.32	0.01	0.00	Open
18	83.28	4.71	116.82	Open
30	-83.28	4.71	116.82	Open

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*                             E P A N E T                            *
*                   Hydraulic and Water Quality                      *
*                   Analysis for Pipe Networks                       *
*                            Version 2.0                             *
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Input File: PH ULTIMATE.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
16.	10.	12.	100	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	12.	13.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	4.36	1350.98	41.48	0.00	
2.	12.16	1351.00	42.35	0.00	
6.	10.07	1350.88	41.23	0.00	
8.	3.75	1350.87	41.37	0.00	
10.	15.19	1350.87	41.47	0.00	
9.	0.94	1350.87	43.27	0.00	
12.	4.39	1350.99	41.44	0.00	
15.	10.43	1350.79	41.64	0.00	
18.	4.39	1350.81	43.01	0.00	
14.	0.56	1356.06	48.61	0.00	
17.	14.47	1350.74	42.75	0.00	
11.	0.82	1350.84	42.64	0.00	
7.	1.46	1350.87	43.27	0.00	
4.	0.00	1351.00	42.00	0.00	
20.	0.64	1350.82	43.07	0.00	
16.	1.82	1350.75	43.90	0.00	
13.	0.00	1356.06	47.61	0.00	
5.	1.29	1350.96	42.96	0.00	
3.	0.00	1351.00	43.00	0.00	
R1	-1.75	1351.00	0.00	0.00	Reservoir
R2	-44.56	1351.00	0.00	0.00	Reservoir
R4	-40.43	1361.27	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	15.21	0.48	1.24	Open
15	8.65	0.28	0.43	Open
11	3.65	0.12	0.09	Open
12	-0.07	0.00	0.00	Open
16.	-14.92	0.47	1.19	Open
19	20.56	0.65	2.16	Open
24	6.15	0.20	0.23	Open
23	6.94	0.22	0.29	Open
9	1.49	0.08	0.07	Open
10	0.02	0.00	0.00	Open
1	1.75	0.10	0.09	Open
3	44.56	0.28	0.15	Open
29	3.35	0.19	0.48	Open
21	3.20	0.18	0.28	Open
22	1.38	0.08	0.06	Open
2	-2.61	0.08	0.05	Open
18	0.56	0.03	0.01	Open
4	14.57	0.09	0.02	Open
5	3.35	0.02	0.00	Open
6	11.22	0.36	0.70	Open
13	9.94	0.32	0.56	Open
14	0.35	0.01	0.00	Open
27	7.83	0.25	0.36	Open
28	2.71	0.09	0.05	Open
30	40.43	2.29	30.63	Open
17	-39.87	2.26	29.86	Open

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**********************************************************************
*                            E P A N E T                             *
*                    Hydraulic and Water Quality                     *
*                    Analysis for Pipe Networks                      *
*                           Version 2.0                              *
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Input File: PD+FF ULT NODE 1.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
16.	10.	12.	100	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	12.	13.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	202.18	1325.02	15.52	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.04	1349.00	39.35	0.00	
8.	1.87	1349.01	39.51	0.00	
10.	7.60	1349.04	39.64	0.00	
9.	0.47	1349.03	41.43	0.00	
12.	2.20	1349.27	39.72	0.00	
15.	5.21	1349.13	39.98	0.00	
18.	2.20	1349.03	41.23	0.00	
14.	0.28	1354.47	47.02	0.00	
17.	7.23	1349.06	41.06	0.00	
11.	0.41	1349.03	40.83	0.00	
7.	0.73	1349.00	41.40	0.00	
4.	0.00	1349.00	40.00	0.00	
20.	0.32	1349.03	41.28	0.00	
16.	0.91	1349.08	42.23	0.00	
13.	0.00	1354.47	46.02	0.00	
5.	0.64	1349.00	41.00	0.00	
3.	0.00	1349.00	41.00	0.00	
R1	-77.54	1346.00	0.00	0.00	Reservoir
R2	-125.12	1349.00	0.00	0.00	Reservoir
R4	-40.71	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	-0.28	0.01	0.00	Open
15	0.27	0.01	0.00	Open
11	-4.48	0.14	0.13	Open
12	-7.93	0.25	0.37	Open
16.	-21.03	0.67	2.25	Open
19	17.21	0.55	1.55	Open
24	-3.85	0.12	0.10	Open
23	8.57	0.27	0.43	Open
9	-0.84	0.05	0.02	Open
10	-1.57	0.09	0.08	Open
1	77.54	4.39	102.35	Open
3	125.12	0.79	1.19	Open
29	-1.20	0.07	0.07	Open
21	3.43	0.19	0.32	Open
22	2.52	0.14	0.18	Open
2	-124.64	3.97	60.71	Open
18	0.28	0.02	0.00	Open
4	-5.32	0.03	0.00	Open
5	-1.20	0.01	0.00	Open
6	-4.12	0.13	0.11	Open
13	-4.77	0.15	0.14	Open
14	-5.50	0.18	0.19	Open
27	-0.14	0.00	0.00	Open
28	-1.52	0.05	0.02	Open
30	40.71	2.30	31.03	Open
17	-40.43	2.29	30.64	Open

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**********************************************************************
*                           E P A N E T                              *
*                  Hydraulic and Water Quality                       *
*                  Analysis for Pipe Networks                        *
*                         Version 2.0                                *
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Input File: PD+FF ULT NODE 7.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
16.	10.	12.	100	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	12.	13.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.04	1346.71	37.06	0.00	
8.	1.87	1346.67	37.17	0.00	
10.	7.60	1347.70	38.30	0.00	
9.	0.47	1348.03	40.43	0.00	
12.	2.20	1348.12	38.57	0.00	
15.	5.21	1348.05	38.90	0.00	
18.	2.20	1348.04	40.24	0.00	
14.	0.28	1353.90	46.45	0.00	
17.	7.23	1348.03	40.03	0.00	
11.	0.41	1348.03	39.83	0.00	
7.	120.73	1338.32	30.72	0.00	
4.	0.00	1348.99	39.99	0.00	
20.	0.32	1348.11	40.36	0.00	
16.	0.91	1348.04	41.19	0.00	
13.	0.00	1353.90	45.45	0.00	
5.	0.64	1348.76	40.76	0.00	
3.	0.00	1348.99	40.99	0.00	
R1	21.27	1346.00	0.00	0.00	Reservoir
R2	-141.59	1349.00	0.00	0.00	Reservoir
R4	-43.05	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	73.60	2.34	22.88	Open
15	-3.01	0.10	0.06	Open
11	8.12	0.26	0.39	Open
12	-54.04	1.72	12.92	Open
16.	-29.20	0.93	4.13	Open
19	11.37	0.36	0.72	Open
24	1.98	0.06	0.03	Open
23	4.27	0.14	0.12	Open
9	60.44	3.42	64.52	Open
10	-60.29	3.41	64.22	Open
1	-21.27	1.20	9.32	Open
3	141.59	0.89	1.49	Open
29	7.92	0.45	2.34	Open
21	1.89	0.11	0.11	Open
22	0.98	0.06	0.03	Open
2	-23.45	0.75	2.75	Open
18	0.28	0.02	0.00	Open
4	38.46	0.24	0.13	Open
5	7.92	0.05	0.01	Open
6	30.53	0.97	4.49	Open
13	29.89	0.95	4.31	Open
14	32.44	1.03	5.02	Open
27	-3.42	0.11	0.08	Open
28	7.60	0.24	0.34	Open
30	43.05	2.44	34.42	Open
17	-42.77	2.42	34.00	Open

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**********************************************************************
*                            E P A N E T                             *
*                  Hydraulic and Water Quality                       *
*                  Analysis for Pipe Networks                        *
*                          Version 2.0                               *
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Input File: PD+FF ULT NODE 16.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
16.	10.	12.	100	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	13.	12.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.04	1347.98	38.33	0.00	
8.	1.87	1347.47	37.97	0.00	
10.	7.60	1346.88	37.48	0.00	
9.	0.47	1346.91	39.31	0.00	
12.	2.20	1346.11	36.56	0.00	
15.	5.21	1343.39	34.24	0.00	
18.	2.20	1346.00	38.20	0.00	
14.	0.28	1352.89	45.44	0.00	
17.	7.23	1343.10	35.10	0.00	
11.	0.41	1346.57	38.37	0.00	
7.	0.73	1347.71	40.11	0.00	
4.	0.00	1348.97	39.97	0.00	
20.	0.32	1346.22	38.47	0.00	
16.	120.91	1334.05	27.20	0.00	
13.	0.00	1352.89	44.44	0.00	
5.	0.64	1348.50	40.50	0.00	
3.	0.00	1348.98	40.98	0.00	
R1	21.27	1346.00	0.00	0.00	Reservoir
R2	-137.73	1349.00	0.00	0.00	Reservoir
R4	-46.91	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	47.49	1.51	10.17	Open
15	36.20	1.15	6.15	Open
11	32.89	1.05	5.15	Open
12	39.85	1.27	7.35	Open
16.	40.95	1.30	7.73	Open
19	85.39	2.72	30.13	Open
24	47.96	1.53	10.35	Open
23	18.62	0.59	1.80	Open
9	9.57	0.54	2.13	Open
10	8.84	0.50	1.83	Open
1	-21.27	1.20	9.33	Open
3	137.73	0.87	1.34	Open
29	14.69	0.83	7.34	Open
21	61.55	3.48	66.73	Open
22	-59.36	3.36	62.39	Open
2	-23.45	0.75	2.75	Open
18	0.28	0.02	0.00	Open
4	60.70	0.38	0.31	Open
5	14.69	0.09	0.02	Open
6	46.01	1.46	9.59	Open
13	45.37	1.44	9.34	Open
14	8.70	0.28	0.44	Open
27	35.79	1.14	6.02	Open
28	14.37	0.46	1.11	Open
30	46.91	2.65	40.35	Open
17	46.63	2.64	39.91	Open

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**********************************************************************
*                          E P A N E T                               *
*                  Hydraulic and Water Quality                       *
*                  Analysis for Pipe Networks                        *
*                         Version 2.0                                *
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```

Input File: PH ULTIMATE NO PIPE 16.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	12.	13.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	4.36	1350.98	41.48	0.00	
2.	12.16	1351.00	42.35	0.00	
6.	10.07	1350.84	41.19	0.00	
8.	3.75	1350.82	41.32	0.00	
10.	15.19	1350.81	41.41	0.00	
9.	0.94	1350.87	43.27	0.00	
12.	4.39	1351.71	42.16	0.00	
15.	10.43	1351.22	42.07	0.00	
18.	4.39	1350.89	43.09	0.00	
14.	0.56	1356.42	48.98	0.00	
17.	14.47	1350.98	42.98	0.00	
11.	0.82	1350.88	42.68	0.00	
7.	1.46	1350.82	43.22	0.00	
4.	0.00	1351.00	42.00	0.00	
20.	0.64	1350.89	43.14	0.00	
16.	1.82	1351.07	44.22	0.00	
13.	0.00	1356.43	47.98	0.00	
5.	1.29	1350.96	42.96	0.00	
3.	0.00	1351.00	43.00	0.00	
R1	-1.75	1351.00	0.00	0.00	Reservoir
R2	-46.11	1351.00	0.00	0.00	Reservoir
R4	-38.87	1361.27	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	17.74	0.56	1.64	Open
15	-3.87	0.12	0.10	Open
11	5.54	0.18	0.19	Open
12	2.46	0.08	0.04	Open
19	33.92	1.08	5.45	Open
24	-7.22	0.23	0.31	Open
23	16.77	0.53	1.48	Open
9	2.13	0.12	0.13	Open
10	0.66	0.04	0.01	Open
1	1.75	0.10	0.09	Open
3	46.11	0.29	0.15	Open
29	2.50	0.14	0.28	Open
21	6.72	0.38	1.11	Open
22	4.91	0.28	0.62	Open
2	-2.61	0.08	0.05	Open
18	0.56	0.03	0.01	Open
4	13.59	0.09	0.02	Open
5	2.50	0.02	0.00	Open
6	11.09	0.35	0.69	Open
13	9.80	0.31	0.55	Open
14	12.73	0.41	0.89	Open
27	-4.69	0.15	0.14	Open
28	1.86	0.06	0.03	Open
30	38.87	2.20	28.49	Open
17	-38.32	2.17	27.74	Open

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**********************************************************************
*                          E P A N E T                               *
*                 Hydraulic and Water Quality                        *
*                 Analysis for Pipe Networks                         *
*                        Version 2.0                                 *
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Input File: PD+FF ULT NODE 16 NO PIPE 16.NET

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm
7	2.	6.	100	200
15	9.	11.	55	200
11	6.	8.	100	200
12	8.	10.	80	200
19	12.	15.	90	200
24	18.	17.	280	200
23	15.	17.	165	200
9	6.	7.	130	150
10	7.	8.	130	150
1	R1	1.	205	150
3	R2	2.	1	450
29	4.	20.	375	150
21	15.	16.	140	150
22	16.	17.	145	150
2	1.	2.	395	200
18	13.	14.	150	150
4	2.	3.	75	450
5	3.	4.	80	450
6	3.	5.	50	200
13	5.	9.	170	200
14	9.	10.	65	200
27	11.	18.	95	200
28	20.	18.	200	200
30	R4	13.	170	150
17	13.	12.	170	150

Node Results at 0:00 Hrs:

Node ID	Demand LPS	Head m	Pressure m	Quality	
1.	2.18	1347.91	38.41	0.00	
2.	6.08	1349.00	40.35	0.00	
6.	5.04	1348.29	38.64	0.00	
8.	1.87	1347.95	38.45	0.00	
10.	7.60	1347.58	38.18	0.00	
9.	0.47	1347.39	39.79	0.00	
12.	2.20	1339.05	29.50	0.00	
15.	5.21	1337.80	28.65	0.00	
18.	2.20	1344.87	37.07	0.00	
14.	0.28	1349.35	41.90	0.00	
17.	7.23	1337.89	29.89	0.00	
11.	0.41	1346.46	38.26	0.00	
7.	0.73	1348.11	40.51	0.00	
4.	0.00	1348.98	39.98	0.00	
20.	0.32	1345.18	37.43	0.00	
16.	120.91	1328.65	21.80	0.00	
13.	0.00	1349.35	40.90	0.00	
5.	0.64	1348.61	40.61	0.00	
3.	0.00	1348.98	40.98	0.00	
R1	21.27	1346.00	0.00	0.00	Reservoir
R2	-125.92	1349.00	0.00	0.00	Reservoir
R4	-58.72	1359.75	0.00	0.00	Reservoir

Link Results at 0:00 Hrs:

Link ID	Flow LPS	VelocityUnit m/s	Headloss m/km	Status
7	39.00	1.24	7.06	Open
15	62.57	1.99	16.94	Open
11	26.25	0.84	3.39	Open
12	31.36	1.00	4.71	Open
19	56.24	1.79	13.91	Open
24	77.11	2.45	24.95	Open
23	-9.83	0.31	0.55	Open
9	7.71	0.44	1.42	Open
10	6.98	0.39	1.18	Open
1	-21.27	1.20	9.33	Open
3	125.92	0.79	1.19	Open
29	17.47	0.99	10.12	Open
21	60.87	3.44	65.36	Open
22	-60.04	3.40	63.73	Open
2	-23.45	0.75	2.75	Open
18	0.28	0.02	0.00	Open
4	57.39	0.36	0.28	Open
5	17.47	0.11	0.03	Open
6	39.92	1.27	7.37	Open
13	39.28	1.25	7.15	Open
14	-23.76	0.76	2.82	Open
27	62.16	1.98	16.74	Open
28	17.15	0.55	1.54	Open
30	58.72	3.32	61.16	Open
17	58.44	3.31	60.62	Open

APPENDIX 4-B

```
===========================================================================

 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 # 3733817
      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: Mountain Engineering Ltd.                  +++++++
 +++++++                Canmore                 SERIAL#:3733817    +++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 **************************************************************************
 *******            ++++++ 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: 2003-11-26     TIME: 00:29:41     RUN COUNTER: 000043       *
 **************************************************************************
 * Input   filename: G:\MOUNTA~1\PROJEC~1\123RES~1\UTILIT~1\STORMM~1\Prelim*
 * Output  filename: G:\MOUNTA~1\PROJEC~1\123RES~1\UTILIT~1\STORMM~1\Prelim*
 * Summary filename: G:\MOUNTA~1\PROJEC~1\123RES~1\UTILIT~1\STORMM~1\Prelim*
 * User comments:                                                          *
 * 1:______________________________________________________________________*
 * 2:______________________________________________________________________*
 * 3:______________________________________________________________________*
 **************************************************************************

--------------------------------------------------------------------------------
001:0001------------------------------------------------------------------------
*
* SPRING CREEK MOUNTAIN VILLAGE SWMHYMO
*
--------------------
| START            |  Project  dir.: G:\MOUNTA~1\PROJEC~1\123RES~1\UTILIT~1\STORMM~1\
--------------------  Rainfall dir.: G:\MOUNTA~1\PROJEC~1\123RES~1\UTILIT~1\STORMM~1\
   TZERO =    .00 hrs on        0
   METOUT=   2 (output = METRIC)
   NRUN  = 001
   NSTORM=   1
          #  1=
--------------------------------------------------------------------------------
001:0002------------------------------------------------------------------------
--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 663.100
| Ptotal= 35.15 mm |                          B=   1.870
--------------------                          C=    .712
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  1.00 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  13.283 |    .33 168.138 |    .58  23.236 |    .83  13.746
```

```
              .17  18.961 |     .42  54.372 |     .67  18.660 |     .92  12.251
              .25  40.516 |     .50  31.748 |     .75  15.763 |    1.00  11.093

--------------------------------------------------------------------------------
001:0003------------------------------------------------------------------------
*
* Catchment 100
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .47
| 01:000100 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .40           .07
     Dep. Storage      (mm)=       1.60          3.20
     Average Slope      (%)=        .50           .50
     Length             (m)=     130.00         12.00
     Mannings n           =        .013          .250

     Max.eff.Inten.(mm/hr)=      168.14         18.52
                over (min)        5.00          15.00
     Storage Coeff.  (min)=        2.99 (ii)    13.19 (ii)
     Unit Hyd. Tpeak (min)=        5.00         15.00
     Unit Hyd. peak  (cms)=         .28           .08
                                                            *TOTALS*
     PEAK FLOW       (cms)=         .16           .00         .159 (iii)
     TIME TO PEAK    (hrs)=         .33           .58         .333
     RUNOFF VOLUME    (mm)=       33.55          7.81       29.686
     TOTAL RAINFALL   (mm)=       35.15         35.15       35.147
     RUNOFF COEFFICIENT   =         .95           .22         .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME    |
| ID:01  (000100)   |               DISCHARGE      TIME
--------------------                  (cms)        (hrs)
           START CONTROLLING AT        .000          .083
           INFLOW HYD. PEAKS AT        .159          .333
           STOP  CONTROLLING AT        .000         1.654

           REQUIRED STORAGE VOLUME (ha.m.)=      .0139
           TOTAL HYDROGRAPH VOLUME (ha.m.)=      .0140
           % OF HYDROGRAPH TO STORE       =    99.7420

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0005------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000100)   |               DISCHARGE      TIME
--------------------                  (cms)        (hrs)
           START CONTROLLING AT        .000          .083
           INFLOW HYD. PEAKS AT        .159          .333
           STOP  CONTROLLING AT        .010         1.032

           REQUIRED STORAGE VOLUME (ha.m.)=      .0120
           TOTAL HYDROGRAPH VOLUME (ha.m.)=      .0140
           % OF HYDROGRAPH TO STORE       =    86.0379

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).
```

```
-------------------------------------------------------------------------------
001:0006-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000100)  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .159         .333
           STOP  CONTROLLING AT      .020         .758

           REQUIRED STORAGE VOLUME (ha.m.)=     .0097
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0140
           % OF HYDROGRAPH TO STORE       =   69.2701

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0007-----------------------------------------------------------------------
*
* Catchment 101
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .43
| 01:000101 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .37           .06
     Dep. Storage     (mm)=       1.60          3.20
     Average Slope     (%)=        .50           .50
     Length            (m)=     125.00         12.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     168.14         18.52
                over (min)        5.00         15.00
     Storage Coeff.  (min)=       2.92 (ii)    13.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=        .28           .08
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .15           .00         .147 (iii)
     TIME TO PEAK    (hrs)=        .33           .58         .333
     RUNOFF VOLUME    (mm)=      33.55          7.81       29.686
     TOTAL RAINFALL   (mm)=      35.15         35.15       35.147
     RUNOFF COEFFICIENT   =        .95           .22         .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0008-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000101)  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .147         .333
           STOP  CONTROLLING AT      .000        1.633

           REQUIRED STORAGE VOLUME (ha.m.)=     .0127
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0128
           % OF HYDROGRAPH TO STORE       =   99.7222

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

-------------------------------------------------------------------------------
```

```
001:0009---------------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000101)   |              DISCHARGE      TIME
--------------------                 (cms)       (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .147         .333
           STOP  CONTROLLING AT      .010        1.024

           REQUIRED STORAGE VOLUME (ha.m.)=     .0108
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0128
           % OF HYDROGRAPH TO STORE        =  84.8008

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

---------------------------------------------------------------------------------
001:0010---------------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000101)   |              DISCHARGE      TIME
--------------------                 (cms)       (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .147         .333
           STOP  CONTROLLING AT      .020         .716

           REQUIRED STORAGE VOLUME (ha.m.)=     .0085
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0128
           % OF HYDROGRAPH TO STORE        =  66.7650

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

---------------------------------------------------------------------------------
001:0011---------------------------------------------------------------------------------
*
* Catchment 102
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=      .33
| 01:000102 DT= 5.00  |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .28          .05
     Dep. Storage     (mm)=       1.60         3.20
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     130.00        12.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     168.14        22.39
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.25 (ii)    9.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .30          .12
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .12          .00          .121 (iii)
     TIME TO PEAK    (hrs)=        .33          .50          .333
     RUNOFF VOLUME    (mm)=      33.55         7.81        29.686
     TOTAL RAINFALL   (mm)=      35.15        35.15        35.147
     RUNOFF COEFFICIENT  =         .95          .22          .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  72.0     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.

---------------------------------------------------------------------------------
001:0012---------------------------------------------------------------------------------
*
```

```
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000102)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .121        .333
           STOP  CONTROLLING AT      .000       1.378

           REQUIRED STORAGE VOLUME (ha.m.)=    .0098
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0098
           % OF HYDROGRAPH TO STORE       =  99.7084

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0013------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000102)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .121        .333
           STOP  CONTROLLING AT      .010        .966

           REQUIRED STORAGE VOLUME (ha.m.)=    .0079
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0098
           % OF HYDROGRAPH TO STORE       =  80.3695

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

--------------------------------------------------------------------------------
001:0014------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000102)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .121        .333
           STOP  CONTROLLING AT      .020        .598

           REQUIRED STORAGE VOLUME (ha.m.)=    .0058
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0098
           % OF HYDROGRAPH TO STORE       =  59.2744

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

--------------------------------------------------------------------------------
001:0015------------------------------------------------------------------------
*
* Catchment 103
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .28
| 01:000103 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .24          .04
     Dep. Storage      (mm)=       1.60         3.20
     Average Slope      (%)=       2.00         2.00
     Length             (m)=     115.00        12.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     168.14        22.39
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.83 (ii)    8.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .32          .13
                                                          *TOTALS*
```

```
     PEAK FLOW        (cms)=         .11          .00           .106 (iii)
     TIME TO PEAK     (hrs)=         .33          .50           .333
     RUNOFF VOLUME     (mm)=       33.55         7.81         29.686
     TOTAL RAINFALL    (mm)=       35.15        35.15         35.147
     RUNOFF COEFFICIENT   =          .95          .22           .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0016-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000103)  |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .106         .333
           STOP  CONTROLLING AT     .000        1.310

           REQUIRED STORAGE VOLUME (ha.m.)=    .0083
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0083
           % OF HYDROGRAPH TO STORE       =  99.6803

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0017-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000103)  |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .106         .333
           STOP  CONTROLLING AT     .010         .837

           REQUIRED STORAGE VOLUME (ha.m.)=    .0063
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0083
           % OF HYDROGRAPH TO STORE       =  75.3157

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0018-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000103)  |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .106         .333
           STOP  CONTROLLING AT     .020         .549

           REQUIRED STORAGE VOLUME (ha.m.)=    .0046
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0083
           % OF HYDROGRAPH TO STORE       =  54.9186

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0019-----------------------------------------------------------------------
*
* Catchment 104
*
```

```
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .38
| 01:000104 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .32           .06
     Dep. Storage     (mm)=       1.60          3.20
     Average Slope     (%)=       1.50          1.50
     Length            (m)=     145.00         12.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     168.14         22.39
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.30 (ii)     9.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=        .30           .12
                                                           *TOTALS*
     PEAK FLOW       (cms)=        .14           .00          .138 (iii)
     TIME TO PEAK    (hrs)=        .33           .50          .333
     RUNOFF VOLUME    (mm)=      33.55          7.81        29.686
     TOTAL RAINFALL   (mm)=      35.15         35.15        35.147
     RUNOFF COEFFICIENT   =        .95           .22          .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

--------------------------------------------------------------------------------
001:0020------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME    |
| ID:01  (000104)   |             DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .138        .333
           STOP  CONTROLLING AT      .000       1.390

           REQUIRED STORAGE VOLUME (ha.m.)=    .0113
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0113
           % OF HYDROGRAPH TO STORE       =  99.7460

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0021------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000104)   |             DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .138        .333
           STOP  CONTROLLING AT      .010       1.009

           REQUIRED STORAGE VOLUME (ha.m.)=    .0094
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0113
           % OF HYDROGRAPH TO STORE       =  83.4053

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

--------------------------------------------------------------------------------
001:0022------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000104)   |             DISCHARGE      TIME
```

```
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .138         .333
           STOP  CONTROLLING AT      .020         .649

           REQUIRED STORAGE VOLUME (ha.m.)=     .0072
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0113
           % OF HYDROGRAPH TO STORE       =   63.6434

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

--------------------------------------------------------------------------------
001:0023------------------------------------------------------------------------
*
* Catchment 105
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .40
| 01:000105 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .34          .06
     Dep. Storage     (mm)=        1.60         3.20
     Average Slope     (%)=        1.30         1.30
     Length            (m)=      130.00        12.00
     Mannings n          =         .013         .250

     Max.eff.Inten.(mm/hr)=      168.14        22.39
                over (min)         5.00        10.00
     Storage Coeff.  (min)=        2.25 (ii)    9.34 (ii)
     Unit Hyd. Tpeak (min)=        5.00        10.00
     Unit Hyd. peak  (cms)=         .30          .12
                                                             *TOTALS*
     PEAK FLOW       (cms)=         .15          .00            .146 (iii)
     TIME TO PEAK    (hrs)=         .33          .50            .333
     RUNOFF VOLUME    (mm)=       33.55         7.81          29.686
     TOTAL RAINFALL   (mm)=       35.15        35.15          35.147
     RUNOFF COEFFICIENT  =          .95          .22            .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  72.0    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.

--------------------------------------------------------------------------------
001:0024------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000105)  |               DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .146         .333
           STOP  CONTROLLING AT      .000        1.405

           REQUIRED STORAGE VOLUME (ha.m.)=     .0118
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0119
           % OF HYDROGRAPH TO STORE       =   99.7538

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0025------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000105)  |               DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
```

```
          INFLOW HYD. PEAKS AT      .146         .333
          STOP  CONTROLLING AT      .010        1.014

          REQUIRED STORAGE VOLUME (ha.m.)=     .0100
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0119
          % OF HYDROGRAPH TO STORE       =   84.2720

          NOTE:  Storage was computed to reduce the Inflow
                 peak to      .010  (cms).

--------------------------------------------------------------------------------
001:0026------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000105)   |              DISCHARGE      TIME
--------------------                 (cms)        (hrs)
          START CONTROLLING AT      .000          .083
          INFLOW HYD. PEAKS AT      .146          .333
          STOP  CONTROLLING AT      .020          .665

          REQUIRED STORAGE VOLUME (ha.m.)=     .0077
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0119
          % OF HYDROGRAPH TO STORE       =   64.9165

          NOTE:  Storage was computed to reduce the Inflow
                 peak to      .020  (cms).

--------------------------------------------------------------------------------
001:0027------------------------------------------------------------------------
*
* Catchment 106
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .52
| 01:000106 DT= 5.00 |   Total Imp(%)=   85.00    Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .44           .08
     Dep. Storage     (mm)=       1.60          3.20
     Average Slope     (%)=       1.50          1.50
     Length            (m)=     100.00         12.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=     168.14         22.39
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       1.84 (ii)     8.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=        .32           .12
                                                              *TOTALS*
     PEAK FLOW       (cms)=        .20           .00            .197 (iii)
     TIME TO PEAK    (hrs)=        .33           .50            .333
     RUNOFF VOLUME    (mm)=      33.55          7.81          29.686
     TOTAL RAINFALL   (mm)=      35.15         35.15          35.147
     RUNOFF COEFFICIENT   =        .95           .22            .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

--------------------------------------------------------------------------------
001:0028------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME    |
| ID:01  (000106)   |              DISCHARGE      TIME
--------------------                 (cms)        (hrs)
          START CONTROLLING AT      .000          .083
          INFLOW HYD. PEAKS AT      .197          .333
          STOP  CONTROLLING AT      .000         1.413
```

```
        REQUIRED STORAGE VOLUME (ha.m.)=    .0154
        TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0154
        % OF HYDROGRAPH TO STORE       =  99.8115

        NOTE:  Storage was computed to reduce the Inflow
               peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0029------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000106)  |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
        START CONTROLLING AT      .000         .083
        INFLOW HYD. PEAKS AT      .197         .333
        STOP  CONTROLLING AT      .010        1.032

        REQUIRED STORAGE VOLUME (ha.m.)=    .0136
        TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0154
        % OF HYDROGRAPH TO STORE       =  88.1107

        NOTE:  Storage was computed to reduce the Inflow
               peak to     .010  (cms).

--------------------------------------------------------------------------------
001:0030------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000106)  |             DISCHARGE      TIME
--------------------               (cms)       (hrs)
        START CONTROLLING AT      .000         .083
        INFLOW HYD. PEAKS AT      .197         .333
        STOP  CONTROLLING AT      .020         .794

        REQUIRED STORAGE VOLUME (ha.m.)=    .0113
        TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0154
        % OF HYDROGRAPH TO STORE       =  73.2104

        NOTE:  Storage was computed to reduce the Inflow
               peak to     .020  (cms).

--------------------------------------------------------------------------------
001:0031------------------------------------------------------------------------
*
* Catchment 107
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=     .47
| 01:000107 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
    Surface Area      (ha)=       .40          .07
    Dep. Storage      (mm)=      1.60         3.20
    Average Slope      (%)=       .50          .50
    Length             (m)=     90.00        12.00
    Mannings n           =       .013         .250

    Max.eff.Inten.(mm/hr)=     168.14        22.39
               over (min)       5.00        10.00
    Storage Coeff.  (min)=      2.40 (ii)   11.85 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=       .30          .10
                                                        *TOTALS*
    PEAK FLOW       (cms)=       .17          .00           .169 (iii)
    TIME TO PEAK    (hrs)=       .33          .50           .333
    RUNOFF VOLUME    (mm)=     33.55         7.81         29.686
    TOTAL RAINFALL   (mm)=     35.15        35.15         35.147
    RUNOFF COEFFICIENT   =       .95          .22           .845
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
```

```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  72.0    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.

-------------------------------------------------------------------------------
001:0032-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000107)  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .169         .333
           STOP  CONTROLLING AT      .000        1.541

           REQUIRED STORAGE VOLUME (ha.m.)=     .0139
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0140
           % OF HYDROGRAPH TO STORE       =   99.7630

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0033-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000107)  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .169         .333
           STOP  CONTROLLING AT      .010        1.028

           REQUIRED STORAGE VOLUME (ha.m.)=     .0121
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0140
           % OF HYDROGRAPH TO STORE       =   86.4781

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0034-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000107)  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .169         .333
           STOP  CONTROLLING AT      .020         .744

           REQUIRED STORAGE VOLUME (ha.m.)=     .0097
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0140
           % OF HYDROGRAPH TO STORE       =   69.6627

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0035-----------------------------------------------------------------------
*
* Catchment 108
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .43
| 01:000108 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=         .37            .06
     Dep. Storage      (mm)=        1.60           3.20
     Average Slope      (%)=        1.30           1.30
```

```
    Length            (m)=      185.00        12.00
    Mannings n           =        .013         .250

    Max.eff.Inten.(mm/hr)=      168.14        22.39
               over (min)         5.00        10.00
    Storage Coeff.  (min)=        2.77 (ii)    9.87 (ii)
    Unit Hyd. Tpeak (min)=        5.00        10.00
    Unit Hyd. peak  (cms)=         .28          .11
                                                            *TOTALS*
    PEAK FLOW       (cms)=         .15          .00            .149 (iii)
    TIME TO PEAK    (hrs)=         .33          .50            .333
    RUNOFF VOLUME    (mm)=       33.55         7.81          29.686
    TOTAL RAINFALL   (mm)=       35.15        35.15          35.147
    RUNOFF COEFFICIENT   =         .95          .22            .845
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0036-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000108)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .149        .333
           STOP  CONTROLLING AT      .000       1.441

           REQUIRED STORAGE VOLUME (ha.m.)=    .0127
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0128
           % OF HYDROGRAPH TO STORE       =  99.7641

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0037-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000108)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .149        .333
           STOP  CONTROLLING AT      .010       1.022

           REQUIRED STORAGE VOLUME (ha.m.)=    .0109
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0128
           % OF HYDROGRAPH TO STORE       =  85.1933

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0038-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000108)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT      .000        .083
           INFLOW HYD. PEAKS AT      .149        .333
           STOP  CONTROLLING AT      .020        .711

           REQUIRED STORAGE VOLUME (ha.m.)=    .0086
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0128
           % OF HYDROGRAPH TO STORE       =  67.2379
```

```
          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0039-----------------------------------------------------------------------
*
* Catchment 109
*
---------------------
| CALIB STANDHYD     |   Area     (ha)=      .30
| 01:000109 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
---------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .25           .04
     Dep. Storage      (mm)=       1.60          3.20
     Average Slope      (%)=       1.50          1.50
     Length             (m)=     140.00         12.00
     Mannings n            =       .013          .250

     Max.eff.Inten.(mm/hr)=      168.14         22.39
                over (min)         5.00         10.00
     Storage Coeff.  (min)=        2.25 (ii)     9.05 (ii)
     Unit Hyd. Tpeak (min)=        5.00         10.00
     Unit Hyd. peak  (cms)=         .30           .12
                                                              *TOTALS*
     PEAK FLOW       (cms)=         .11           .00           .110 (iii)
     TIME TO PEAK    (hrs)=         .33           .50           .333
     RUNOFF VOLUME    (mm)=       33.55          7.81         29.686
     TOTAL RAINFALL   (mm)=       35.15         35.15         35.147
     RUNOFF COEFFICIENT   =         .95           .22           .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0040-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000109)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
          START CONTROLLING AT       .000         .083
          INFLOW HYD. PEAKS AT       .110         .333
          STOP  CONTROLLING AT       .000        1.351

          REQUIRED STORAGE VOLUME (ha.m.)=     .0089
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0089
          % OF HYDROGRAPH TO STORE       =   99.6850

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0041-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000109)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
          START CONTROLLING AT       .000         .083
          INFLOW HYD. PEAKS AT       .110         .333
          STOP  CONTROLLING AT       .010         .892

          REQUIRED STORAGE VOLUME (ha.m.)=     .0069
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0089
          % OF HYDROGRAPH TO STORE       =   77.4263

          NOTE:  Storage was computed to reduce the Inflow
```

```
                peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0042-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
-------------------
| COMPUTE VOLUME   |
| ID:01  (000109)  |              DISCHARGE      TIME
--------------------               (cms)        (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .110         .333
           STOP  CONTROLLING AT     .020         .571

           REQUIRED STORAGE VOLUME (ha.m.)=    .0050
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0089
           % OF HYDROGRAPH TO STORE       =  56.5162

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0043-----------------------------------------------------------------------
*
* Catchment 110
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .27
| 01:000110 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .23           .04
     Dep. Storage     (mm)=       1.60          3.20
     Average Slope     (%)=       1.50          1.50
     Length            (m)=     155.00         12.00
     Mannings n          =        .013          .250

     Max.eff.Inten.(mm/hr)=     168.14         22.39
                over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.39 (ii)     9.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=        .30           .12
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .10           .00         .097 (iii)
     TIME TO PEAK    (hrs)=        .33           .50         .333
     RUNOFF VOLUME    (mm)=      33.55          7.81       29.686
     TOTAL RAINFALL   (mm)=      35.15         35.15       35.147
     RUNOFF COEFFICIENT   =        .95           .22         .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0044-----------------------------------------------------------------------
*
* NO INFILTRATION
-------------------
| COMPUTE VOLUME   |
| ID:01  (000110)  |              DISCHARGE      TIME
--------------------               (cms)        (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .097         .333
           STOP  CONTROLLING AT     .000        1.339

           REQUIRED STORAGE VOLUME (ha.m.)=    .0080
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0080
           % OF HYDROGRAPH TO STORE       =  99.6500

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).
```

```
-------------------------------------------------------------------------------
001:0045-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000110)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .097         .333
           STOP  CONTROLLING AT     .010         .823

           REQUIRED STORAGE VOLUME (ha.m.)=    .0059
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0080
           % OF HYDROGRAPH TO STORE       =  74.1105

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0046-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000110)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
           START CONTROLLING AT     .000         .083
           INFLOW HYD. PEAKS AT     .097         .333
           STOP  CONTROLLING AT     .020         .551

           REQUIRED STORAGE VOLUME (ha.m.)=    .0043
           TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0080
           % OF HYDROGRAPH TO STORE       =  53.5622

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0047-----------------------------------------------------------------------
*
* Catchment 111
*
----------------------
| CALIB STANDHYD     |  Area    (ha)=      .91
| 01:000111 DT= 5.00 |  Total Imp(%)=   55.00   Dir. Conn.(%)=   55.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .50          .41
     Dep. Storage     (mm)=        1.60         3.20
     Average Slope     (%)=         .50          .50
     Length            (m)=      195.00        12.00
     Mannings n          =         .013         .250

     Max.eff.Inten.(mm/hr)=      168.14        18.52
                over (min)         5.00        15.00
     Storage Coeff.  (min)=        3.81 (ii)   14.01 (ii)
     Unit Hyd. Tpeak (min)=        5.00        15.00
     Unit Hyd. peak  (cms)=         .25          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=         .18          .01         .185 (iii)
     TIME TO PEAK    (hrs)=         .33          .58         .333
     RUNOFF VOLUME    (mm)=       33.55         7.81       21.964
     TOTAL RAINFALL   (mm)=       35.15        35.15       35.147
     RUNOFF COEFFICIENT  =          .95          .22         .625
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0    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.

-------------------------------------------------------------------------------
001:0048-----------------------------------------------------------------------
```

```
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME    |
| ID:01  (000111)   |              DISCHARGE      TIME
--------------------                 (cms)        (hrs)
           START CONTROLLING AT      .000          .083
           INFLOW HYD. PEAKS AT      .185          .333
           STOP  CONTROLLING AT      .000         2.100

           REQUIRED STORAGE VOLUME (ha.m.)=     .0199
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0200
           % OF HYDROGRAPH TO STORE        =  99.7772

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0049------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000111)   |              DISCHARGE      TIME
--------------------                 (cms)        (hrs)
           START CONTROLLING AT      .000          .083
           INFLOW HYD. PEAKS AT      .185          .333
           STOP  CONTROLLING AT      .010         1.104

           REQUIRED STORAGE VOLUME (ha.m.)=     .0175
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0200
           % OF HYDROGRAPH TO STORE        =  87.4989

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

--------------------------------------------------------------------------------
001:0050------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000111)   |              DISCHARGE      TIME
--------------------                 (cms)        (hrs)
           START CONTROLLING AT      .000          .083
           INFLOW HYD. PEAKS AT      .185          .333
           STOP  CONTROLLING AT      .020         1.026

           REQUIRED STORAGE VOLUME (ha.m.)=     .0156
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0200
           % OF HYDROGRAPH TO STORE        =  77.8745

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

--------------------------------------------------------------------------------
001:0051------------------------------------------------------------------------
*
* Catchment 112
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=      .38
| 01:000112 DT= 5.00  |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .32          .06
     Dep. Storage      (mm)=       1.60         3.20
     Average Slope      (%)=       1.00         1.00
     Length             (m)=     125.00        12.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      168.14        22.39
                over (min)         5.00        10.00
     Storage Coeff.  (min)=        2.37 (ii)   10.05 (ii)
     Unit Hyd. Tpeak (min)=        5.00        10.00
     Unit Hyd. peak  (cms)=         .30          .11
```

```
                                                                *TOTALS*
     PEAK FLOW        (cms)=        .14           .00             .137 (iii)
     TIME TO PEAK     (hrs)=        .33           .50             .333
     RUNOFF VOLUME     (mm)=      33.55          7.81           29.686
     TOTAL RAINFALL    (mm)=      35.15         35.15           35.147
     RUNOFF COEFFICIENT   =         .95           .22             .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0     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.

-------------------------------------------------------------------------------
001:0052-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000112)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .137         .333
           STOP  CONTROLLING AT      .000        1.424

           REQUIRED STORAGE VOLUME (ha.m.)=     .0113
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0113
           % OF HYDROGRAPH TO STORE       =   99.7329

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0053-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000112)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .137         .333
           STOP  CONTROLLING AT      .010        1.010

           REQUIRED STORAGE VOLUME (ha.m.)=     .0094
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0113
           % OF HYDROGRAPH TO STORE       =   83.3286

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0054-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000112)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
           START CONTROLLING AT      .000         .083
           INFLOW HYD. PEAKS AT      .137         .333
           STOP  CONTROLLING AT      .020         .651

           REQUIRED STORAGE VOLUME (ha.m.)=     .0072
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0113
           % OF HYDROGRAPH TO STORE       =   63.5308

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0055-----------------------------------------------------------------------
*
* Catchment 113
```

```
*
----------------------
| CALIB STANDHYD      |   Area    (ha)=      .41
| 01:000113 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=        .35          .06
     Dep. Storage      (mm)=       1.60         3.20
     Average Slope      (%)=       1.30         1.30
     Length             (m)=     155.00        12.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=     168.14        22.39
                over (min)       5.00        10.00
     Storage Coeff.  (min)=       2.50 (ii)    9.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .29          .11
                                                            *TOTALS*
     PEAK FLOW       (cms)=        .15          .00           .146 (iii)
     TIME TO PEAK    (hrs)=        .33          .50           .333
     RUNOFF VOLUME    (mm)=      33.55         7.81         29.686
     TOTAL RAINFALL   (mm)=      35.15        35.15         35.147
     RUNOFF COEFFICIENT   =        .95          .22           .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  72.0     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.

--------------------------------------------------------------------------------
001:0056------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000113)  |                DISCHARGE      TIME
--------------------                  (cms)        (hrs)
           START CONTROLLING AT      .000          .083
           INFLOW HYD. PEAKS AT      .146          .333
           STOP  CONTROLLING AT      .000         1.417

           REQUIRED STORAGE VOLUME (ha.m.)=     .0121
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0122
           % OF HYDROGRAPH TO STORE       =  99.7551

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0057------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000113)  |                DISCHARGE      TIME
--------------------                  (cms)        (hrs)
           START CONTROLLING AT      .000          .083
           INFLOW HYD. PEAKS AT      .146          .333
           STOP  CONTROLLING AT      .010         1.017

           REQUIRED STORAGE VOLUME (ha.m.)=     .0103
           TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0122
           % OF HYDROGRAPH TO STORE       =  84.5727

           NOTE:  Storage was computed to reduce the Inflow
                  peak to     .010  (cms).

--------------------------------------------------------------------------------
001:0058------------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
```

```
| ID:01  (000113)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
          START CONTROLLING AT      .000         .083
          INFLOW HYD. PEAKS AT      .146         .333
          STOP  CONTROLLING AT      .020         .682

          REQUIRED STORAGE VOLUME (ha.m.)=    .0080
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0122
          % OF HYDROGRAPH TO STORE       =  65.7490

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .020  (cms).

--------------------------------------------------------------------------------
001:0059------------------------------------------------------------------------
*
* Catchment 114
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=      .46
| 01:000114 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .39          .07
     Dep. Storage     (mm)=       1.60         3.20
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     190.00        12.00
     Mannings n          =        .013         .250

     Max.eff.Inten.(mm/hr)=     168.14        22.39
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.05 (ii)   10.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .27          .11
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .15          .00          .155 (iii)
     TIME TO PEAK    (hrs)=        .33          .50          .333
     RUNOFF VOLUME    (mm)=      33.55         7.81        29.686
     TOTAL RAINFALL   (mm)=      35.15        35.15        35.147
     RUNOFF COEFFICIENT   =        .95          .22          .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  72.0    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.

--------------------------------------------------------------------------------
001:0060------------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000114)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
          START CONTROLLING AT      .000         .083
          INFLOW HYD. PEAKS AT      .155         .333
          STOP  CONTROLLING AT      .000        1.488

          REQUIRED STORAGE VOLUME (ha.m.)=    .0136
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0137
          % OF HYDROGRAPH TO STORE       =  99.7693

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .000  (cms).

--------------------------------------------------------------------------------
001:0061------------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000114)  |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
```

```
          START CONTROLLING AT      .000        .083
          INFLOW HYD. PEAKS AT      .155        .333
          STOP  CONTROLLING AT      .010       1.029

          REQUIRED STORAGE VOLUME (ha.m.)=    .0117
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0137
          % OF HYDROGRAPH TO STORE        =  86.0166

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0062-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME   |
| ID:01  (000114)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
          START CONTROLLING AT      .000        .083
          INFLOW HYD. PEAKS AT      .155        .333
          STOP  CONTROLLING AT      .020        .745

          REQUIRED STORAGE VOLUME (ha.m.)=    .0094
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0137
          % OF HYDROGRAPH TO STORE        =  68.9303

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0063-----------------------------------------------------------------------
*
* Catchment 115
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .47
| 01:000115 DT= 5.00 |   Total Imp(%)=   85.00   Dir. Conn.(%)=   85.00
----------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .40          .07
     Dep. Storage     (mm)=       1.60         3.20
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     195.00        12.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     168.14        22.39
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.10 (ii)   10.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=        .27          .11
                                                             *TOTALS*
     PEAK FLOW       (cms)=        .16          .00            .158 (iii)
     TIME TO PEAK    (hrs)=        .33          .50            .333
     RUNOFF VOLUME    (mm)=      33.55         7.81          29.686
     TOTAL RAINFALL   (mm)=      35.15        35.15          35.147
     RUNOFF COEFFICIENT   =        .95          .22            .845
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  72.0    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.

-------------------------------------------------------------------------------
001:0064-----------------------------------------------------------------------
*
* NO INFILTRATION
--------------------
| COMPUTE VOLUME   |
| ID:01  (000115)  |               DISCHARGE      TIME
--------------------                 (cms)       (hrs)
          START CONTROLLING AT      .000        .083
          INFLOW HYD. PEAKS AT      .158        .333
```

```
          STOP  CONTROLLING AT     .000       1.493

          REQUIRED STORAGE VOLUME (ha.m.)=    .0139
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0140
          % OF HYDROGRAPH TO STORE       =  99.7728

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .000  (cms).

-------------------------------------------------------------------------------
001:0065-----------------------------------------------------------------------
*
* 100m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000115)   |              DISCHARGE       TIME
--------------------                 (cms)        (hrs)
          START CONTROLLING AT     .000         .083
          INFLOW HYD. PEAKS AT     .158         .333
          STOP  CONTROLLING AT     .010        1.031

          REQUIRED STORAGE VOLUME (ha.m.)=    .0120
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0140
          % OF HYDROGRAPH TO STORE       =  86.2904

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .010  (cms).

-------------------------------------------------------------------------------
001:0066-----------------------------------------------------------------------
*
* 200m2 OF INFILTRATION AREA
--------------------
| COMPUTE VOLUME    |
| ID:01  (000115)   |              DISCHARGE       TIME
--------------------                 (cms)        (hrs)
          START CONTROLLING AT     .000         .083
          INFLOW HYD. PEAKS AT     .158         .333
          STOP  CONTROLLING AT     .020         .757

          REQUIRED STORAGE VOLUME (ha.m.)=    .0097
          TOTAL HYDROGRAPH VOLUME (ha.m.)=    .0140
          % OF HYDROGRAPH TO STORE       =  69.5653

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .020  (cms).

-------------------------------------------------------------------------------
001:0067-----------------------------------------------------------------------
*
     FINISH
-------------------------------------------------------------------------------
*******************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
 001:0003 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0007 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0011 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0015 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0019 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0023 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
 001:0027 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
```

```
001:0031 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0035 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0039 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0043 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0047 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0051 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0055 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0059 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
001:0063 CALIB STANDHYD
     *** WARNING: Storage Coefficient is smaller than DT!
                  Use a smaller DT or a larger area.
  Simulation ended on 2003-11-26     at 00:29:41
================================================================================
```