PRELIMINARY
FUNCTIONAL SERVICING REPORT

RIVERFRONT COMMUNITY (PHASE 2)
NIAGARA FALLS

Prepared by:

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NIAGARA FALLS

1.0 INTRODUCTION

This preliminary report is to address the servicing needs for the development known as Riverfront Community (Phase 2) in support of the proposed application for Zoning By-Law Amendment and Official Plan Amendment on the subject lands. The site is located on the east of Dorchester Road, south of Oldfield Road and north of the existing CP railway lands. The Conrail Drain runs through the subject lands and separates the northern and southern Blocks.

The subject lands are 12.64 hectares and are currently vacant lands consisting of open field and vegetation.

It is proposed to develop the subject lands as 4 separate Blocks connected by municipal roadways with 18.0m and 20.0m road allowances. The subject lands will consist of mixed commercial, institutional and residential uses.

The site shall include associated municipal and private asphalt roads, concrete curb, catch basins, storm sewers, sanitary sewers and watermain.

A Preliminary Grading Plan (22266-GP) has been included in Appendix A for reference.

The objectives of this study are as follows:

1. Identify domestic and fire protection water service needs for the site;
2. Identify sanitary servicing needs for the site; and,
3. Identify stormwater management needs for the site.

2.0 WATER SERVICING

It is proposed to extend a 300mm diameter municipal watermain southerly on Dorchester Road, in front of the subject lands, from the existing 300mm diameter municipal watermain located in front of the existing 8100 Dorchester Road property. Three internal municipal watermain loops are proposed within the subject lands to provide domestic water supply and fire protection:

i. A 300mm diameter watermain along Street C and a portion of Street ‘A’, with connections to the proposed 300mm diameter watermain on Dorchester Road at the intersections at Streets ‘A’ and ‘C’;
ii. A 200mm diameter watermain extended from the proposed 300mm watermain on Dorchester Road, along the north side of the Conrail Drain and along Street ‘A’ to connect to the proposed 300mm diameter loop on Street ‘A’; and,
iii. A 200mm watermain along Street ‘B’ that connects to the proposed 200mm diameter watermain along the north side Conrail.

Blocks A01, A02, A05 and A06 will be serviced from the proposed watermain loops with service sizes and locations to be determined as part of detailed engineering design for the subject lands.

The locations and spacing for proposed municipal and private fire hydrants will be determined as part of detailed engineering design for the subject lands.

The Preliminary Watermain Distribution Plan (22266-WM) can be found in Appendix B for reference.

3.0 SANITARY SERVICING

Sanitary flows from the subject lands will be conveyed to two sanitary outlets:

i. The proposed 600mm diameter sanitary sewer on Dorchester Road (To be constructed by others) for Blocks A01 and A02, which outlets to the existing 825mm diameter Regional sanitary sewer on Dorchester Road; and,
ii. The proposed 200mm diameter sanitary sewer that will be constructed as part of the neighbouring Phase of the Riverfront development, located South of adjacent CP Railway lands for Blocks A05 and A06.

A Sanitary Drainage Area Plan (2209-OVL SANDA) and associated sewer design sheet for the existing 825mm diameter Regional sanitary sewer on Dorchester Road has been prepared by Upper Canada Consultants and has been included in Appendix C for reference. This Drainage Area Plan includes the subject lands and the neighbouring development lands to the north which are also owned by the applicant and to south east, which are owned by others and where the proposed Sanitary Sewage Pumping Station will be constructed.

As shown in the enclosed Drainage Area Plan, Blocks A05 and A06 have been allocated within the design of the proposed Riverfront Sanitary Sewer Pumping Station, which also outlets to the proposed 600mm diameter Sanitary Sewer on Dorchester Road, in front of the subject lands.

This Pumping Station has been submitted to the Ministry of the Environment, Conservation, and Parks (MECP) for Environmental Compliance Approval based on the flows calculated from the drainage areas and populations shown on the enclosed Drainage Area Plan and associated design sheet. Therefore, the Riverfront sanitary sewers Sanitary Sewage Pumping Station will have adequate capacity to receive the peak sanitary flows from Blocks A05 and A06.

The sanitary drainage area for Blocks A01 and A02 (Drainage Area C1) is 7.66 hectares with a total equivalent population of 1834 people and 4.97 hectares with a total equivalent population of 2301 people for Blocks A05 and A06 (Drainage Area A2).

The peak sanitary flows from the overall development area will be approximately 140.13 L/s, which utilizes approximately 56.5% of the flow capacity of the proposed 600mm diameter sanitary sewer on Dorchester Road and 24.2% of the flow capacity of the existing 825mm diameter Regional sanitary sewer on Dorchester Road.

Therefore, there is expected to be adequate capacity for the subject lands in the existing and proposed sanitary sewer networks and the proposed Sanitary Sewage Pumping Station.

4.0 STORMWATER MANAGEMENT PLAN

4.1 Existing Conditions

The subject lands are presently undeveloped vacant lands comprising almost entirely of dense vegetation, with some open field area present. The native soils within the subject lands are predominantly clay, characterized with "imperfect" to "poor" infiltration rate (<15 mm/hr).

Existing stormwater flows are conveyed southerly and westerly through the subject lands as either overland sheet flows or through local ditches within the site to the Chippawa-Queenston Power Canal, from either the Conrail Drain or the existing roadside ditches along Dorchester Road

4.2 Future Conditions

It is proposed to construct new municipal roadways within the subject lands that will be constructed to an urban profile (including curb and gutter, sidewalks, storm sewers, catchbasins, etc.). The construction of the new municipal storm sewers will be subject to the City of Niagara Falls' CLI Approval.

The subject lands will consist of 4 development Blocks comprising of mixed commercial, institutional, and residential uses. Each Block will be provided with associated asphalt parking areas, private driveways, walkways and new impervious building areas.

It is proposed to construct new municipal storm sewers within the proposed roadways and on Dorchester Road with stormwater outlets to the Conrail Rail to convey future stormwater flows to the Chippawa-Queenston Power Canal.

It is proposed to provide individual stormwater management controls for each Block prior to discharging to the proposed municipal storm sewers. The intention of this stormwater management plan is to identify the stormwater management criteria for each Block and to provide preliminary calculations to serve as guidelines to satisfy the required criteria.

Each Block will be subject to future Site Plan applications. for which a detailed stormwater management plan will be submitted identifying how the established stormwater management criteria will be satisfied, with detailed calculations.

4.3 Stormwater Management Criteria

New developments are required to provide stormwater management in accordance with provincial and municipal policies including:

- Stormwater Quality Guidelines for New Development (MECP/MNRF, May 1991)
- Stormwater Management Planning and Design Manual (MECP, March 2003)

Based on the comments and outstanding policies from various agencies (City of Niagara Falls, Regional Municipality of Niagara, NPCA, and the Ministry of the Environment, Conservation and Parks (MECP)) the following site-specific considerations were identified:

- The proposed municipal storm sewers will be subject to the City of Niagara Falls' CLI Approval, which requires that stormwater management quality controls be provided to "enhanced, normal, or basic levels of protection (80%, 70%, or 60% respectively) for suspended solids (based on the receiver)".

- The receiving watercourse (Chippawa-Queenston Power Canal) has been identified by the Ministry of Natural Resources watercourse evaluation as a **Type 2** (*Important*) fish habitat. Based on this fish habitat, the corresponding MECP level of protection for stormwater management quality practices on all new developments will be to *Normal* levels.

- It is proposed to outlet future stormwater flows to the Conrail Drain, immediately upstream of where the Drain outlets to the Chippawa-Queenston Power Canal. This is an artificial rip-rap lined channel with a 25-year conveyance capacity of approximately 38.5 m^3/s. The Conrail Drain has a significant upstream drainage area extending westerly to Portage Road and as northerly as Murray Street.

- The site ultimately outlets to the Chippawa-Queenston Power Canal which receives stormwater flows from the Niagara River, Welland River, Conrail Drain and various other tributaries. The subject lands are located immediately downstream of where the Welland River and Niagara River confluence into the Chippawa-Queenston Power Canal.
    - Additionally, the water surface levels within the Hydro Canal are controlled by Ontario Power Generation (OPG) to prevent flooding and has a flow capacity of approximately 625 m^3/s.

Based on the above policies and site-specific considerations, the following stormwater management criteria have been established for this site.

- Stormwater **quality** improvements are to be provided for the subject lands and external upstream drainage area Normal Protection levels (70% TSS removal) prior to outletting to the Chippawa-Queenston Power Canal, in accordance with MECP guidelines.

- Due to the location of the subject lands within the drainage areas associated with the Chippawa-Queenston Power Canal and Conrail Drain, stormwater management quantity controls are not required. Detaining stormwater flows from the subject lands will result in extending the peak from the subject lands to match closer with the overall peak in each watercourse.

- The Conrail Drain is an artificial rip-rap lined watercourse. Therefore, erosion protection is not considered necessary prior to discharging to this watercourse.

4.3 Stormwater Management Criteria

4.4 Stormwater Quality Assessment

It is proposed to provide individual stormwater management controls for each Block prior to discharging to the new municipal storm sewers within the subject lands and on Dorchester Road. To improve stormwater quality levels from each Block, it is proposed to construct a stormwater oil/grit separator to provide the required TSS (Total Suspended Solids) removal.
For the purposes of this preliminary analysis, oil/grit separators will be sized to provide normal protection (70% TSS removal) from each Block independently assuming typical impervious percentages for the land uses identified for each Block.

The sizing software for a Hydroworks HydroDome Oil/Grit Separator was utilized for this assessment as the HydroDome is an ETV verified stormwater management quality improvement technology in accordance with the City of Niagara Falls (CLI) Approval for stormwater management, as the receiving storm sewers will be approved through the City's CLI Approval.

Block A01

The contributing drainage area to the proposed oil/grit separator is approximately 4.90 hectares with an impervious coverage of approximately 95%. The modelling for a Hydroworks unit has indicated that a HD 8 will provide 78.3% TSS overall removal and capture 99.6% of the stormwater flows. Therefore, the Hydroworks HD 8 can be constructed to provide the required 70% TSS Removal for this Block.

Block A02

The contributing drainage area to the proposed oil/grit separator is approximately 1.58 hectares with an impervious coverage of approximately 85%. The modelling for a Hydroworks unit has indicated that a HD 4 will provide 71.6% TSS overall removal and capture 99.5% of the stormwater flows. Therefore, the Hydroworks HD 4 can be constructed to provide the required 70% TSS Removal for this Block.

Block A05

The contributing drainage area to the proposed oil/grit separator is approximately 1.02 hectares with an impervious coverage of approximately 85%. The modelling for a Hydroworks unit has indicated that a HD 4 will provide 77.8% TSS overall removal and capture 99.4% of the stormwater flows. Therefore, the Hydroworks HD 4 can be constructed to provide the required 70% TSS Removal for this Block.

Block A06

The contributing drainage area to the proposed oil/grit separator is approximately 2.06 hectares with an impervious coverage of approximately 70%. The modelling for a Hydroworks unit has indicated that a HD 4 will provide 70.9% TSS overall removal and capture 99.6% of the stormwater flows. Therefore, the Hydroworks HD 4 can be constructed to provide the required 70% TSS Removal for this Block.

The Hydroworks output files for each Block can be found in Appendix D.

7.0 STORMWATER MANAGEMENT FACILITY MAINTENANCE

Oil/Grit Separator
The function of the proposed stormwater quality protection facility, a stormwater oil/grit separator, will require maintenance on an annual basis. The following is a summary of the maintenance activities required.

Regular inspections of the stormwater Maintenance Hole (MH) oil/grit interceptor will indicate whether maintenance is required or not. They should be made after every significant storm during the first two years of operation to ensure that it is functioning properly. This will translate into an average of six inspections per year.

Points of regular inspections are as follows:

a) Is there sediment in the separator sump? The level of sediment can be measured from the surface without entry into the oil/grit separator via a dipstick tube equipped with a ball valve (Sludge Judge) or with a graduated pole with a flat attached to the bottom.

b) Is there oil in the separator sump? This can be checked from the surface by inserting a dipstick in the 150mm vent tube. The presence of oil is usually indicated by an oily sheen, frothing or unusual colouring. The separator should be cleaned in the event of a major spill contamination.

c) Is there debris or trash at the inlet weir and drop pipe? This can be observed from the surface without entry into the separator. Clogging at the inlet drop pipe will cause stormwater to bypass the sedimentation section and continue downstream without treatment.

d) Completion of the Inspection Report (a sample report is included in Appendix E for reference purposes). These reports will provide details about the operation and maintenance requirements for this type of stormwater quality device. After an evaluation period (usually 2 years) this information will be used to maximize efficiency and minimize the costs of operation and maintenance for the maintenance hole oil/grit separator.

Typically, stormwater MH oil/grit separators are cleaned out using vacuum pumping. No entry into the unit is required for maintenance. Cleaning should occur annually or whenever the accumulation reaches sediment storage specified by the manufacturer and after any major spills have occurred. Oil levels greater than 2.5 centimeters should be removed immediately by a licensed waste management firm.

Generally, the sediment removed from the separator will not be contaminated to the point that it would be classified as hazardous waste. However, the sediment should be tested to determine the disposal options. The Ministry of Environment, Conservation and Parks publishes sediment disposal guidelines which should be consulted for up-to-date information pertaining to the exact parameters and acceptable levels for the various disposal options.

The preferred option is an off-site disposal, arranged by a licensed waste management firm.

The future owners of a Hydroworks facility are provided with an Owner's Manual upon installation, which explains the function, maintenance requirements and procedures for the facility with extensive use It is recommended to follow the manufacturers instructions to allow the oil/grit separator to perform as intended.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Therefore, based on the above comments and design calculations provided for this site, the following summarizes the servicing for this site.

1. The proposed 300mm and 200mm diameter looping watermains on the development site and proposed 300mm diameter watermain on Dorchester are expected to have sufficient capacity to provide both domestic and fire protection water supply.

2. The proposed 600mm diameter sanitary sewer on Dorechester Road and Sanitary Sewage Pumping Station, and existing 825mm diameter Regional sanitary sewer on Dorchester Road are expected to have adequate capacity for the future development.

3. Stormwater quantity controls and erosion protection are not considered necessary from the subject lands prior to discharging to the Conrail Drain.

4. Stormwater quality controls will be provided to MECP Normal Protection (70% TSS removal) before outletting to the Conrail Drain in accordance with the requirements of the City of Niagara Falls CLI Approval.

Based on the above and the accompanying Plans, there exists adequate municipal servicing for this development. We trust the above comments and enclosed calculations are satisfactory for approval. If you have any questions or require additional information, please do not hesitate to contact our office.

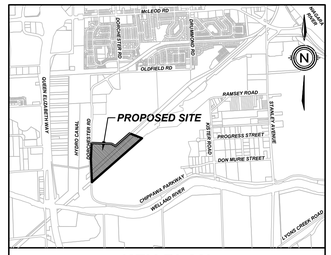
Respectfully Submitted,

Brendan Kapteyn, P.Eng.
Encl.

APPENDICES

APPENDIX A

Preliminary Grading Plan



KEY PLAN
N.T.S.

LEGEND

100.00 — PROPOSED ELEVATION

FUTURE DEVELOPMENT LANDS
ADDITIONAL LANDS OF THE OWNER

178.14 — 178.50 — STREET 'A'

DORCHESTER ROAD

CONRAIL DRAIN

178.25

BLOCK A06
RESIDENTIAL
PRELIMINARY FF: VARIES

CP RAILWAY LANDS

178.75

BLOCK A02
HOTEL
PRELIMINARY FF: ±179.00

178.60

STREET 'C'

176.06 — 178.40

BLOCK A05
RETIREMENT RESIDENTIAL
PRELIMINARY FF: ±178.50

BLOCK A01
COMMERCIAL / CONDO / MIXED-USE
PRELIMINARY FF: ±179.00

STREET 'B'

178.00

CHAPPAWA-QUEENSTON POWER CANAL

Ex. WATER EDGE

175.03

CONRAIL DRAIN

DORCHESTER ROAD

CP RAILWAY LANDS

176.95

FUTURE DEVELOPMENT LANDS
LANDS OWNED BY OTHERS

PRELIMINARY

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

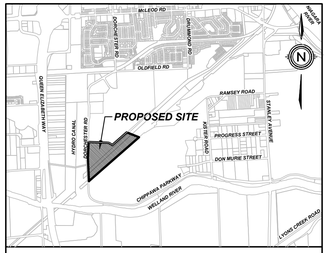
RIVERFRONT DEVELOPMENT AREA
CITY OF NIAGARA FALLS

PRELIMINARY GRADING PLAN

CONSULTANT FILE No.	22266
DATE	2023-09-14
PRINTED	2023-09-14
SCALE	1:1000 m
DWG No.	22266-GP

APPENDIX B

Preliminary Watermain Distribution Plan



KEY PLAN
N.T.S.

LEGEND

PROPOSED WATERMAIN

CHAPPAWA-QUEENSTON POWER CANAL

DORCHESTER ROAD

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 300Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

PROP 200Ø WM

STREET 'A'

STREET 'B'

STREET 'C'

FUTURE DEVELOPMENT LANDS
ADDITIONAL LANDS OF THE OWNER

BLOCK A01
COMMERCIAL / CONDO / MIXED-USE

BLOCK A02
HOTEL

BLOCK A05
RETIREMENT RESIDENTIAL

BLOCK A06
RESIDENTIAL

CONRAIL DRAIN

CONRAIL DRAIN

CP RAILWAY LANDS

CP RAILWAY LANDS

FUTURE DEVELOPMENT LANDS
LANDS OWNED BY OTHERS

PRELIMINARY

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

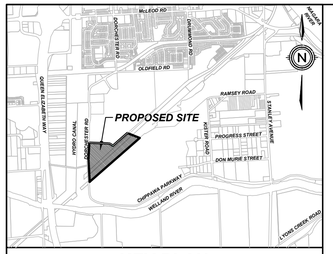
RIVERFRONT DEVELOPMENT AREA
CITY OF NIAGARA FALLS

WATERMAIN DISTRIBUTION PLAN

CONSULTANT FILE No.	22266
DATE	2023-09-14
PRINTED	2023-09-14
SCALE	1:1000 m
DWG No.	**22266-WM**

APPENDIX C

Overall Sanitary Drainage Area Plan
Sanitary Sewer Design Sheet



KEY PLAN
N.T.S.

LEGEND

- A0 / 0.00 / 00 — DRAINAGE AREA NUMBER / DRAINAGE AREA IN HECTARES / EQUIVALENT RESIDENTIAL POPULATION
- DRAINAGE AREA BOUNDARY
- PROPOSED SANITARY SEWER W/ FLOW DIRECTION
- PROPOSED FORCEMAIN W/ FLOW DIRECTION
- EXISTING SANITARY SEWER W/ FLOW DIRECTION

FUTURE DEVELOPMENT LANDS

RIVERFRONT COMMUNITY PHASE 2 (INDUSTRIAL LANDS)

RIVERFRONT COMMUNITY PHASE 2 (COMMERCIAL LANDS)

RIVERFRONT (PHASE 2)

RIVERFRONT (PHASE 1)

PROPOSED SANITARY SEWAGE PUMPING STATION

DORCHESTER ROAD

CHAPPAWA-QUEENSTON POWER CANAL

CONRAIL DRAIN

CP RAIL LANDS

PROGRESS ST

KISTER RD

DON MURIE ST

CHIPPAWA PARKWAY

WELLAND RIVER

EX 825Ø

Ø600

450Ø

C2 10.19 6156

C1 7.66 1834

A2 4.97 2301

A3 36.06 2398

B 11.07 1117

A1 9.93 692

250Ø

300Ø

375Ø

200Ø

EX 250Ø

EX 300Ø

EX 375Ø

EX 450Ø

250Ø FM

PRELIMINARY

UPPER CANADA CONSULTANTS
ENGINEERS / PLANNERS

RIVERFRONT DEVELOPMENT AREA
CITY OF NIAGARA FALLS

OVERALL SANITARY DRAINAGE AREA PLAN

CONSULTANT FILE No.	2209
DATE	2023-09-10
PRINTED	2023-09-10
SCALE	1:3000 m
DWG No.	2209-OVL SANDA

UPPER CANADA CONSULTANTS
30 HANNOVER DRIVE, UNIT 3
ST.CATHARINES, ON, L2W 1A3

DESIGN FLOWS

RESIDENTIAL: 275 LITRES/PERSON/DAY (AVERAGE DAILY FLOW)
INFILTRATION RATE: 0.286 L / s / ha (M.O.E FLOW ALLOWANCE IS BETWEEN 0.10 & 0.28 L / s / ha)
POPULATION DENSITY: 3 PERSONS PER UNIT

SEWER DESIGN

PIPE ROUGHNESS: 0.013 FOR MANNING'S EQUATION
PIPE SIZES: 1.016 IMPERIAL EQUIVALENT FACTOR
PERCENT FULL: TOTAL PEAK FLOW / CAPACITY

MUNICIPALITY: CITY OF NIAGARA FALLS
PROJECT : RIVERFRONT COMMUNITY PHASE 2
PROJECT NO: 22266

SANITARY SEWER DESIGN SHEET

Peaking Factor= $M = 1 + \frac{14}{4 + P^{0.5}}$

LOCATION	AREA		POPULATION			ACCUMULATED PEAK FLOW								
Location and Description	Increment (hectares)	Accumulated (hectares)	Population Density (ppha)	Population Increment	Total Population Served	Peaking Factor	Flow (L/s)	Infiltration Flow L/s	Total Peak Flow (L/s)	Pipe Diameter (mm)	Pipe Slope (%)	Full Flow Velocity (m/s)	Full Flow Capacity (L/s)	Percent Full
DRAINAGE AREAS DISCHARGING TO EXISTING FALLS INDUSTRIAL PARK SEWERS (SOUTH SIDE LOW LIFT SPS)														
B - RIVERFRONT COMMUNITY PHASE 2	**11.07**	**11.07**	**101**	**1117**	**1117**	**3.77**	**13.40**	**3.17**	**16.56**	**200**	**0.40**	**0.7**	**21.64**	**76.5%**
DRAINAGE AREAS DISCHARGING TO PROPOSED RIVERFRONT SANITARY SEWAGE PUMPING STATION														
A1 - RIVERFRONT PHASE 1	9.93	9.93	70	692	692	3.90	8.58	2.84	11.42	200	0.40	0.7	21.64	52.8%
A2 - GR CAN LANDS SOUTH OF CONRAIL	4.97	4.97	463	2301	2301	3.54	25.91	1.42	27.33	250	0.28	0.6	32.83	83.3%
A3 - RIVERFRONT PHASE 2	36.06	41.03	67	2398	4699	3.27	48.91	11.73	60.64	375	0.15	0.6	70.84	85.6%
TRUNK SEWER TO PUMPING STATION		**50.96**			**5391**	**3.21**	**55.16**	**14.57**	**69.73**	**450**	**0.15**	**0.7**	**115.20**	**60.5%**
DRAINAGE AREAS DISCHARGING BY GRAVITY TO PROPOSED SANITARY SEWER EXTENSION ON DORCHESTER ROAD														
C1 - RIVERFRONT COMMUNITY PHASE 2	7.66	7.66	239	1834	1834	3.61	21.10	2.19	23.29					
C2 - FUTURE DEVELOPMENT LANDS	10.19	10.19	604	6156	6156	3.16	61.92	2.91	64.83					
PROPOSED SEWER TO DORCHESTER ROAD		**17.85**			**7990**	**3.05**	**77.58**	**5.11**	**82.69**	**450**	**0.15**	**0.7**	**115.20**	**71.8%**
DORCHESTER ROAD SEWER EXTENSION		**68.81**			**13381**	**2.83**	**120.45**	**19.68**	**140.13**	**600**	**0.15**	**0.9**	**248.09**	**56.5%**
EXISTING REGIONAL SEWER		**68.81**			**13381**	**2.83**	**120.45**	**19.68**	**140.13**	**825**	**0.15**	**1.1**	**579.98**	**24.2%**

APPENDIX D

Hydroworks Sizing Software Output Files

BLOCK A01

```
         ************************************************
         *      Storm Water Management Sizing Model     *
         *               Hydroworks, LLC                *
         *                Version 4.4                   *
         *                                              *
         *        Continuous Simulation Program         *
         *              Based on SWMM 4.4H              *
         *              Hydroworks, LLC                 *
         *               Graham Bryant                  *
         *                2003 - 2021                   *
         ************************************************

                          Developed by

         ************************************************
         *               Hydroworks, LLC                *
         *             Metcalf & Eddy, Inc.             *
         *           University of Florida              *
         *       Water Resources Engineers, Inc.        *
         *      (Now Camp Dresser & McKee, Inc.)        *
         *              Modified SWMM 4.4               *
         ************************************************

                   Distributed and Maintained by

         ************************************************
         *                                              *
         *                Hydroworks, LLC               *
         *                 888-290-7900                 *
         *              www.hydroworks.com              *
         *                                              *
         ************************************************

         ************************************************
         *     If any problems occur executing this     *
         *     model, contact Mr. Graham Bryant at      *
         *     Hydroworks, LLC by phone at 908-272-4411 *
         *     or by e-mail: support@hydroworks.com     *
         ************************************************

         ************************************************
         *     This model is based on EPA SWMM 4.4      *
         *  "Nature is full of infinite causes which    *
         *   have never occurred in experience" da Vinci *
         ************************************************

************************************************
* Entry made to the Rain Block                 *
* Created by the University of Florida - 1988  *
* Updated by Oregon State University, March 2000 *
************************************************

         Riverfront Community (Phase 2)
         City of Niagara Falls
     ########################################
     #  Precipitation Block Input Commands  #
     ########################################
    Station Name.......................  St. Catherines A
    Station Location...................  Ontario
    Station, ISTA......................    7287
    Beginning date, IYBEG (Yr/Mo/Dy)...  1971/ 1/ 1
    Ending date, IYEND (Yr/Mo/Dy)......  2005/12/31
    Minimum interevent time, MIT.......     1
    Number of ranked storms, NPTS......    10
    NWS format, IFORM (See text).......     1
    Print storm summary, ISUM (O-No 1-Yes)     0
    Print all rainfall, IYEAR (O-No 1-Yes)     0
    Save storm event data on NSCRAT(1)....     0
    (IFILE =0 -Do not save, =1 -Save data)
    IDECID 0 - Create interface file
           1 - Create file and analyze
           2 - Synoptic analysis.......     2
    Plotting position parameter, A.....  0.40
    Storm event statistics, NOSTAT.....  1100
    KODEA (from optional group B0).....     2
     = 0, Do not include NCDC cumulative values.
     = 1, Average NCDC cumulative values.
     = 2, Use NCDC cumulative value as inst. rain.
    KODEPR (from optional group B0).....     0
     Print NCDC special codes in event summary:
     = 0, only on days with events.
     = 1, on all days with codes present.
     Codes: A = accumulated value, I = incomplete value,
            M = missing value,     O = other code present

*********************************************************
*  Precipitation output created using the Rain block    *
*  Number of precipitation stations...        1         *
*********************************************************
Location Station Number
-------- --------------
       1.     7287


STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.
```

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins       #
#####################################################
                  Riverfront Community (Phase 2)
                  City of Niagara Falls
Snowmelt parameter - ISNOW.....................          0
Number of rain gages - NRGAG...................          1
Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.
Quality is simulated - KWALTY..................          1
IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.
Read evaporation data on line(s) F1 (F2) - IVAP..          1
Hour of day at start of storm - NHR............          1
Minute of hour at start of storm - NMN.........          1
Time TZERO at start of storm (hours)...........      1.017
Use Metric units for I/O - METRIC..............          1
 ===> Ft-sec units used in all internal computations
Runoff input print control...                             0
Runoff graph plot control....                             1
Runoff output print control..                             0
Print headers every 50 lines - NOHEAD (0=yes, 1=no)       0
Print land use load percentages -LANDUPR (0=no, 1=yes)    0
Limit number of groundwater convergence messages to 10000 (if simulated)
Month, day, year of start of storm is:              1/ 1/1971
Wet time step length (seconds).......                   300.
Dry time step length (seconds).......                   900.
Wet/Dry time step length (seconds)...                   450.
Simulation length is......                       20051231.0 Yr/Mo/Dy
Percent of impervious area with zero detention depth    25.0
Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ........................................   0.01000

*******************************************************
*   Processed Precipitation will be read from file    *
*******************************************************
  ############################
  #        Data Group F1     #
  # Evaporation Rate (mm/day) #
  ############################
 JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV.  DEC.
 ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----
 0.00  0.00  0.00  2.54  2.54  3.81  3.81  3.81  2.54  2.54  0.00  0.00

*******************************************************
*         C H A N N E L  A N D  P I P E  D A T A       *
*******************************************************
Input   NAMEG:     Drains                          Invert  L Side   R Side  Intial     Max  Mann-   Full
equen  Channel      to     Channel  Width  Length    Slope   Slope    Slope   Depth   Depth   ings   Flow
umber    ID #      NGTO:    Type     (m)    (m)     (m/m)   (m/m)    (m/m)     (m)     (m)    "N"   (cms)
-----  ----------------- -------- ------ -------   ------- -------- ------- ------- ------- -----  -----
  1        201        200   Dummy     0.0     0.0    0.0000   0.0000  0.0000     0.0     0.0  0.0000 0.00E+00

 ************************************************
 *          S U B C A T C H M E N T  D A T A     *
 ************************************************
*NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS*
      SUBCATCH-  CHANNEL      WIDTH    AREA  PERCENT    SLOPE    RESISTANCE  FACTOR    DEPRES. STORAGE(MM) INFILTRATION   DECAY RATE GAGE  MAXIMUM
       MENT NO.  OR INLET       (M)    (HA)  IMPERV.    (M/M)     IMPERV.     PERV.   IMPERV.    PERV.      RATE(MM/HR)    (1/SEC)    NO.  VOLUME
                                                                                                          MAXIMUM MINIMUM                    (MM)
 ---  --------   -------- --------- --------  -----   -------    -------  --------    ------    ------     ----   -------  -------  ------ -------
  1        300        200    156.52     4.90  95.00    0.0200      0.015     0.250     0.510     5.080    63.50   10.16    0.00055     1  101.60000
TOTAL NUMBER OF SUBCATCHMENTS...              1
TOTAL TRIBUTARY AREA (HECTARES).           4.90
IMPERVIOUS AREA (HECTARES)......           4.66
PERVIOUS AREA (HECTARES)........           0.24
TOTAL WIDTH (METERS)............         156.52
PERCENT IMPERVIOUSNESS.........           95.00

*******************************************************
*     G R O U N D W A T E R   I N P U T   D A T A     *
*******************************************************
    SUB-     CHANNEL     ========== E L E V A T I O N S ========  =========== F L O W   C O N S T A N T S ============
    CATCH         OR      GROUND  BOTTOM   STAGE     BC       TW        A1         B1        A2         B2        A3
    NUMBER     INLET        (M)     (M)      (M)     (M)      (M) (MM/HR-M^B1)         (MM/HR-M^B2)         (MM/HR-M^2)
    ------     -----     -------  ------  ------   ------   ------ -----------  ------- -----------  ------- -----------
         0       602        3.05    0.00    0.00    0.61     0.61   3.484E-04    2.600   0.000E+00    1.000    0.00E+00
```

```
**********************************************************
* G R O U N D W A T E R   I N P U T   D A T A (CONTINUED) *
**********************************************************
```

S O I L P R O P E R T I E S

SUBCAT. NO.	POROSITY	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	WILTING POINT	FIELD CAPACITY	INITIAL MOISTURE	MAX. DEEP PERCOLATION (mm/hr)	PERCOLATION PARAMETERS HCO	PCO	E T P A R A M E T E R S DEPTH OF ET (m)	FRACTION OF ET TO UPPER ZONE
0	.4000	127.000	.1500	.3000	.3000	5.080E-02	10.00	4.57	4.27	0.350

```
**********************************************************
*    Arrangement of Subcatchments and Channel/Pipes      *
**********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
**********************************************************
   Channel
   or Pipe
       201     No Tributary Channel/Pipes
               No Tributary Subareas.....
    INLET
       200     Tributary Channel/Pipes...        201
               Tributary Subareas........        300

**********************************************************
* Hydrographs will be stored for the following   1 INLETS *
**********************************************************
          200

#####################################################
#              Quality Simulation                   #
#####################################################
#      General Quality Control Data Groups          #
#####################################################
 Description                          Variable       Value
 -----------                          --------       -----
 Number of quality constituents.....    NQS.......         1
 Number of land uses.................  JLAND.......         1
 Standard catchbasin volume.........  CBVOL.......      1.22 cubic meters
 Erosion is not simulated.........    IROS.......         0
 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......      3.00 DAYS
 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......      5.00 DAYS
 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......     0.300
 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS.................... KLNBGN.......       120
 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS..................... KLNEND.......       270

#############################################
#     Land use data on data group J2      #
#############################################
```

AND USE LNAME)	BUILDUP EQUATION TYPE (METHOD)	FUNCTIONAL DEPENDENCE OF BUILDUP PARAMETER(JACGUT)	LIMITING BUILDUP QUANTITY (DDLIM)	BUILDUP POWER (DDPOW)	BUILDUP COEFF. (DDFACT)	CLEANING INTERVAL IN DAYS (CLFREQ)	AVAIL. FACTOR FRACTION (AVSWP)	DAYS SINCE LAST SWEEPING (DSLCL)
Urban De	EXPONENTIAL(1)	AREA(1)	2.802E+01	0.500	67.250	30.000	0.300	30.000

```
#############################################
#     Constituent data on data group J3     #
#############################################
                            Total Su
                            --------
Constituent units........      mg/l
Type of units............         0
KALC.....................         2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH....................         0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT...................         1
Dependence of buildup....       AREA(1)
LINKUP...................         0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).      28.020
Buildup param 2 (QFACT2).       0.500
Buildup param 3 (QFACT3).      67.250
Buildup param 4 (QFACT4).       0.000
Buildup param 5 (QFACT5).       0.000
Washoff power (WASHPO)...       1.100
Washoff coef. (RCOEF)....       0.086
Init catchb conc (CBFACT)     100.000
Precip. conc. (CONCRN)...       0.000
Street sweep effic (REFF)       0.300
Remove fraction (REMOVE).       0.000
1st order QDECAY, 1/day..       0.000
Land use number..........           1

***********************************************
* Constant Groundwater Quality Concentration(s) *
***********************************************
 Total Susp has a concentration of..    0.0000   mg/l
```

```
**********************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                *
**********************************************
  CHANNEL/   CONSTITUENT
     PIPE Total Susp
----------  --------
       201     0.000

*****************************************************
*     Subcatchment surface quality on data group L1 *
*****************************************************
                                Total   Number   Input
                          Land    Gutter     of    Loading
                Land      Use    Length   Catch-  load/ha
           No.  Usage     No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.31    16.00  0.0E+00
   Totals (Loads in kg or other)    0.31    16.00  0.0E+00

    **********************
    *    DATA GROUP M1    *
    **********************
TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES.....       0        0

    **********************
    *    DATA GROUP M3    *
    **********************
CHANNEL/INLET PRINT DATA GROUPS......       -200

          ****************************************
          * Rainfall from Nat. Weather Serv. file  *
          * in units of hundredths of an inch      *
          ****************************************
Rainfall Station    St. Catherines A
State/Province      Ontario
Rainfall Depth Summary (mm)
Year     Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Total
1971.     31.    0.    0.    0.    0.    0.  126.   93.   52.   60.   29.    0.    391.
1972.      0.    0.    0.   47.   65.  100.   39.  115.   63.   90.    1.    0.    521.
1973.      0.    0.    0.  103.   77.   71.   53.   29.   63.  139.    0.    0.    534.
1974.      0.    0.    0.   67.  105.   62.   50.   31.   74.   37.  110.    0.    536.
1975.      0.    0.    0.    0.    0.   94.   78.   76.   73.   56.   59.    6.    442.
1976.      0.    0.    0.  119.  136.   87.  101.   60.   72.   73.   13.    1.    662.
1977.      0.    0.    0.   94.   29.   69.   57.  150.  230.   71.    0.    1.    701.
1978.      0.    0.    0.   72.   43.   72.   43.   86.  156.   95.    0.    0.    567.
1979.      0.    0.    0.   84.   92.   33.   91.   88.   84.  129.   71.    0.    673.
1980.      0.    0.    0.   81.   39.  122.   60.   32.   79.   96.   45.    0.    554.
1981.      0.    0.    0.   91.   71.  106.  122.   61.  123.   91.   84.    0.    749.
1982.      0.    0.    0.   28.   65.   97.   36.   66.   82.   25.  143.    0.    544.
1983.      0.    0.    0.   78.  100.   65.   55.  106.   75.  122.   92.    0.    694.
1984.      0.    0.    0.   31.  113.  136.   19.   51.  144.   24.   44.    0.    562.
1985.      0.    0.   67.   32.   52.   64.   40.   94.   42.  109.    0.    1.    501.
1986.      0.    0.    0.   93.  113.   60.   85.   83.   98.   80.   43.   65.    719.
1987.      0.    2.   11.   77.   42.   80.  122.   97.   99.   71.   94.   34.    730.
1988.      0.    0.   41.   71.   42.   21.  110.   82.   70.   68.   75.    5.    585.
1989.      0.    0.   13.   63.  137.  108.   36.   45.   89.   73.   84.    0.    647.
1990.      0.    2.   38.   99.  124.   44.   68.   95.   56.  112.   96.    0.    735.
1991.      0.    0.   86.  124.   67.   31.   85.   57.   79.   64.   61.   28.    682.
1992.      0.    0.   29.  127.   56.   92.  185.  116.   77.   47.  103.   38.    869.
1993.      3.    0.    7.   83.   56.   86.   32.   61.   71.   92.   80.   38.    610.
1994.      0.    0.   44.   88.  105.  124.   48.   77.  117.   15.    0.   15.    633.
1995.    112.   23.   16.   48.   37.   60.  123.   66.    8.  137.   94.    0.    724.
1998.      0.    0.    0.    0.   51.   54.   64.   29.    9.    0.    1.    0.    207.
1999.      0.    0.    0.   79.   59.   35.   61.   58.  116.   78.    0.    0.    487.
2000.      0.    0.    0.  123.  134.  216.   51.    0.    0.    0.   10.    0.    534.
2001.      0.    0.    0.   56.   88.   45.   25.   30.   81.  129.    0.    0.    454.
2002.      0.    0.    0.   73.  104.   64.   53.   49.   52.   65.    8.    0.    468.
2003.      0.    0.    0.   10.  163.   77.   81.   64.   67.   73.    2.    0.    537.
2004.      0.    0.    0.  131.  126.   99.  115.   40.   88.   17.    0.    0.    616.
2005.      0.    0.    0.   38.   42.   78.   53.  120.  112.    0.    0.    0.    443.

Total Rainfall Depth for Simulation Period    19310. (mm)

Rainfall Intensity Analysis (mm/hr)
(mm/hr)   (#)       (%)      (mm)       (%)
  2.50  21481      74.6     6454.      33.4
  5.00   3585      12.4     3088.      16.0
  7.50   1973       6.8     2886.      14.9
 10.00    575       2.0     1233.       6.4
 12.50    389       1.4     1070.       5.5
 15.00    194       0.7      660.       3.4
 17.50    210       0.7      846.       4.4
 20.00     66       0.2      306.       1.6
 22.50     92       0.3      487.       2.5
 25.00     39       0.1      232.       1.2
 27.50     37       0.1      246.       1.3
 30.00     34       0.1      245.       1.3
 32.50     29       0.1      228.       1.2
 35.00      5       0.0       42.       0.2
 37.50     10       0.0       90.       0.5
 40.00     10       0.0       97.       0.5
 42.50     12       0.0      124.       0.6
 45.00      9       0.0       99.       0.5
 47.50      1       0.0       12.       0.1
 50.00      3       0.0       37.       0.2
>50.00     49       0.2      829.       4.3
Total # of Intensities  28803
```

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

```
***********************************************
*      End of time step DO-loop in Runoff     *
***********************************************
Final Date (Mo/Day/Year)   =                 12/31/2005
Total number of time steps =                    2057175
Final Julian Date  =                            2005365
Final time of day  =                             86398. seconds.
Final time of day  =                              24.00   hours.
Final running time =                         306816.0000   hours.
Final running time =                          12784.0000    days.

***********************************************
*     Extrapolation Summary for Watersheds    *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls    *
***********************************************
```

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6162428	1695852						

```
***********************************************
*     Extrapolation Summary for Channel/Pipes *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls     *
***********************************************
```

Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls
201	0	0						

```
*********************************************
*       Continuity Check for Surface Water  *
*********************************************
                                                        Millimeters over
                                                cubic meters  Total Basin
Total Precipitation (Rain plus Snow)                  943858.     19263.
Total Infiltration                                     46919.       958.
Total Evaporation                                     112355.      2293.
Surface Runoff from Watersheds                        787147.     16065.
Total Water remaining in Surface Storage                   0.         0.
Infiltration over the Pervious Area...                 46919.     19151.
                    --------
Infiltration + Evaporation +
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........                946422.     19315.
Total Precipitation + Initial Storage.                943858.     19263.

The error in continuity is calculated as
*************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-----------------------------------*
* Precipitation + Initial Snow Cover  *
*************************************
Error.................................       -0.272 Percent

*********************************************
*       Continuity Check for Channel/Pipes  *
*********************************************
                                                        Millimeters over
                                                cubic meters  Total Basin
Initial Channel/Pipe Storage.................              0.         0.
Final Channel/Pipe Storage...................              0.         0.
Surface Runoff from Watersheds...............         787147.     16065.
Baseflow.....................................              0.
Groundwater Subsurface Inflow................              0.         0.
Evaporation Loss from Channels...............              0.         0.
Channel/Pipe/Inlet Outflow...................         787147.     16065.
Initial Storage + Inflow.....................         787147.     16065.
Final Storage + Outflow......................         787147.     16065.
```

```
*******************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
*******************************************
Error.....................................      0.000 Percent

************************************************
*     Continuity Check for Subsurface Water    *
************************************************
                                                                 Millimeters over
                                                cubic meters     Subsurface Basin
Total Infiltration                                        0.          0.
Total Upper Zone ET                                       0.          0.
Total Lower Zone ET                                       0.          0.
Total Groundwater flow                                    0.          0.
Total Deep percolation                                    0.          0.
Initial Subsurface Storage                            44804.        914.
Final Subsurface Storage                              44804.        914.
Upper Zone ET over Pervious Area                          0.          0.
Lower Zone ET over Pervious Area                          0.          0.

***************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
***************************************
Error ....................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	PERVIOUS AREA: TOTAL SIMULATED RAINFALL (MM)	PERVIOUS AREA: TOTAL RUNOFF DEPTH LOSSES (MM)	PERVIOUS AREA: PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA: RUNOFF DEPTH (MM)	IMPERVIOUS AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: PEAK UNIT RUNOFF (MM/HR)
300	200	4.90	95.01	9262.47	114.787********	0.09016	898.684	2.374	16059.489	2.464	182.508

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				2.46				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
 ######################################################
 #             Runoff Quality Summary Page            #
 # If NDIM = 0 Units for:   loads    mass rates      #
 #             METRIC = 1    lb        lb/sec        #
 #             METRIC = 2    kg        kg/sec        #
 # If NDIM = 1 Loads are in units of quantity         #
 #             and mass rates are quantity/sec        #
 # If NDIM = 2 loads are in units of concentration    #
 #             times volume and mass rates have units#
 #             of concentration times volume/second   #
 ######################################################
Total Su NDIM =  0
METRIC =  2
                        Total Su
                        --------
Inputs
------
 1. INITIAL SURFACE LOAD........      107.
 2. TOTAL SURFACE BUILDUP.......    90466.
 3. INITIAL CATCHBASIN LOAD.....        2.
 4. TOTAL CATCHBASIN LOAD.......        0.
 5. TOTAL CATCHBASIN AND
    SURFACE BUILDUP (2+4).......    90466.
Remaining Loads
---------------
 6. LOAD REMAINING ON SURFACE...       30.
 7. REMAINING IN CATCHBASINS....        0.
 8. REMAINING IN CHANNEL/PIPES..        0.
```

Removals
----
 9. STREET SWEEPING REMOVAL.....   6989.
10. NET SURFACE BUILDUP (2-9)...   83477.
11. SURFACE WASHOFF.............   83418.
12. CATCHBASIN WASHOFF..........   0.
13. TOTAL WASHOFF (11+12).......   83418.
14. LOAD FROM OTHER CONSTITUENTS   0.
15. PRECIPITATION LOAD..........   0.
15a.SUM SURFACE LOAD (13+14+15).   83418.
16. TOTAL GROUNDWATER LOAD......   0.
16a.TOTAL I/I LOAD..............   0.
17. NET SUBCATCHMENT LOAD
    (15a-15b-15c-15d+16+16a)....   83418.
>>Removal in channel/pipes (17a, 17b):
17a.REMOVE BY BMP FRACTION......   0.
17b.REMOVE BY 1st ORDER DECAY...   0.
18. TOTAL LOAD TO INLETS........   83418.
19. FLOW WT'D AVE.CONCENTRATION mg/l
    (INLET LOAD/TOTAL FLOW).....   106.
Percentages
----
20. STREET SWEEPING (9/2).......   8.
21. SURFACE WASHOFF (11/2)......   92.
22. NET SURFACE WASHOFF(11/10)..   100.
23. WASHOFF/SUBCAT LOAD(11/17)..   100.
24. SURFACE WASHOFF/INLET LOAD
    (11/18).....................   100.
25. CATCHBASIN WASHOFF/
    SUBCATCHMENT LOAD (12/17)...   0.
26. CATCHBASIN WASHOFF/
    INLET LOAD (12/18)..........   0.
27. OTHER CONSTITUENT LOAD/
    SUBCATCHMENT LOAD (14/17)...   0.
28. INSOLUBLE FRACTION/
    INLET LOAD (14/18)..........   0.
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)...   0.
30. PRECIPITATION/
    INLET LOAD (15/18)..........   0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)...   0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18)..........   0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17)..   0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........   0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..   0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..   0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....   0.
CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals. Buildup is only performed at beginning of
wet steps or for street cleaning.

****
*   TSS Particle Size Distribution   *
****
   Diameter   %   Specific   Settling Velocity   Critical Peclet
     (um)   Gravity   (m/s)   Number
      20.   20.0   2.65   0.000267   0.080977
      30.   10.0   2.65   0.000597   0.104277
      50.   10.0   2.65   0.001629   0.143403
     100.   20.0   2.65   0.006044   0.220958
     250.   20.0   2.65   0.026615   0.391296
    1000.   20.0   2.65   0.111334   0.928988

****
*   *
*   Summary of TSS Removal   *
*   *
****
TSS Removal based on Lab Performance Curve
 Model   Low Q Treated High Q Treated   Runoff Treated   TSS Removed
   #   (cms)   (cms)   (%)   (%)
 HD 4   0.710   0.710   99.6   53.4
 HD 5   0.710   0.710   99.6   61.8
 HD 6   0.710   0.710   99.6   68.7
 HD 8   0.710   0.710   99.6   78.3
 HD 10   0.710   0.710   99.6   84.8
 HD 12   0.710   0.710   99.6   89.3

****
* Summary of Annual Flow Treatmnet & TSS Removal *
****

HD 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	824.	832.	98.4	49.7
1972.	124293.	117662.	2262.	1198.	1014.	94.7	53.0
1973.	125212.	125212.	2360.	1236.	1124.	100.0	52.4
1974.	127879.	127125.	2457.	1458.	989.	99.4	59.3
1975.	109089.	108538.	2150.	1088.	1059.	99.5	50.6
1976.	162272.	160802.	2734.	1478.	1235.	99.1	54.1
1977.	173580.	171790.	2585.	1153.	1415.	99.0	44.6
1978.	138910.	138910.	2511.	1243.	1268.	100.0	49.5
1979.	166126.	164970.	2753.	1449.	1292.	99.3	52.6
1980.	133240.	133240.	2718.	1439.	1279.	100.0	52.9
1981.	185090.	185090.	2964.	1703.	1261.	100.0	57.5
1982.	130534.	130534.	2436.	1394.	1042.	100.0	57.2
1983.	172357.	171966.	3087.	1626.	1455.	99.8	52.7
1984.	138327.	138327.	2371.	1229.	1142.	100.0	51.8
1985.	120114.	120114.	2365.	1311.	1054.	100.0	55.4
1986.	176011.	176011.	3251.	1818.	1434.	100.0	55.9
1987.	182175.	181495.	3220.	1746.	1470.	99.6	54.2
1988.	145101.	145101.	2671.	1527.	1145.	100.0	57.2
1989.	161516.	161516.	2563.	1482.	1081.	100.0	57.8
1990.	182987.	182987.	3340.	1935.	1405.	100.0	57.9
1991.	171375.	171288.	3024.	1673.	1350.	99.9	55.3
1992.	218066.	218066.	3559.	1820.	1739.	100.0	51.1
1993.	147283.	147283.	2998.	1779.	1219.	100.0	59.3
1994.	157346.	155236.	2444.	1218.	1207.	98.7	49.8
1995.	184317.	184223.	2938.	1466.	1470.	99.9	49.9
1998.	45801.	45801.	1183.	618.	565.	100.0	52.2
1999.	115000.	115000.	2365.	1226.	1139.	100.0	51.8
2000.	134472.	134472.	1978.	867.	1110.	100.0	43.9
2001.	105080.	105080.	1905.	1148.	758.	100.0	60.2
2002.	109245.	109245.	2252.	1265.	987.	100.0	56.2
2003.	124700.	124700.	2282.	1180.	1101.	100.0	51.7
2004.	150039.	150039.	2320.	1181.	1138.	100.0	50.9
2005.	107614.	106589.	1784.	783.	996.	99.0	43.9

HD 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	958.	699.	98.4	57.8
1972.	124293.	117662.	2262.	1378.	834.	94.7	60.9
1973.	125212.	125212.	2360.	1444.	916.	100.0	61.2
1974.	127879.	127125.	2457.	1648.	799.	99.4	67.1
1975.	109089.	108538.	2150.	1281.	866.	99.5	59.6
1976.	162272.	160802.	2734.	1700.	1013.	99.1	62.2
1977.	173580.	171790.	2585.	1380.	1188.	99.0	53.4
1978.	138910.	138910.	2511.	1458.	1053.	100.0	58.1
1979.	166126.	164970.	2753.	1680.	1062.	99.3	61.0
1980.	133240.	133240.	2718.	1676.	1042.	100.0	61.7
1981.	185090.	185090.	2964.	1938.	1026.	100.0	65.4
1982.	130534.	130534.	2436.	1597.	839.	100.0	65.6
1983.	172357.	171966.	3087.	1881.	1200.	99.8	60.9
1984.	138327.	138327.	2371.	1440.	932.	100.0	60.7
1985.	120114.	120114.	2365.	1510.	855.	100.0	63.8
1986.	176011.	176011.	3251.	2094.	1158.	100.0	64.4
1987.	182175.	181495.	3220.	2026.	1190.	99.6	62.9
1988.	145101.	145101.	2671.	1755.	917.	100.0	65.7
1989.	161516.	161516.	2563.	1679.	884.	100.0	65.5
1990.	182987.	182987.	3340.	2233.	1107.	100.0	66.9
1991.	171375.	171288.	3024.	1938.	1086.	99.9	64.1
1992.	218066.	218066.	3559.	2116.	1444.	100.0	59.4
1993.	147283.	147283.	2998.	2027.	971.	100.0	67.6
1994.	157346.	155236.	2444.	1409.	1016.	98.7	57.7
1995.	184317.	184223.	2938.	1719.	1217.	99.9	58.5
1998.	45801.	45801.	1183.	723.	460.	100.0	61.1
1999.	115000.	115000.	2365.	1434.	931.	100.0	60.6
2000.	134472.	134472.	1978.	1039.	939.	100.0	52.5
2001.	105080.	105080.	1905.	1305.	600.	100.0	68.5
2002.	109245.	109245.	2252.	1461.	791.	100.0	64.9
2003.	124700.	124700.	2282.	1366.	916.	100.0	59.9
2004.	150039.	150039.	2320.	1393.	927.	100.0	60.0
2005.	107614.	106589.	1784.	930.	850.	99.0	52.1

HD 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	1062.	595.	98.4	64.1
1972.	124293.	117662.	2262.	1518.	695.	94.7	67.1
1973.	125212.	125212.	2360.	1609.	751.	100.0	68.2
1974.	127879.	127125.	2457.	1813.	634.	99.4	73.8
1975.	109089.	108538.	2150.	1418.	729.	99.5	65.9
1976.	162272.	160802.	2734.	1867.	847.	99.1	68.3
1977.	173580.	171790.	2585.	1553.	1015.	99.0	60.1
1978.	138910.	138910.	2511.	1643.	868.	100.0	65.4
1979.	166126.	164970.	2753.	1877.	864.	99.3	68.2
1980.	133240.	133240.	2718.	1861.	857.	100.0	68.5
1981.	185090.	185090.	2964.	2131.	833.	100.0	71.9
1982.	130534.	130534.	2436.	1749.	687.	100.0	71.8
1983.	172357.	171966.	3087.	2104.	976.	99.8	68.2
1984.	138327.	138327.	2371.	1598.	773.	100.0	67.4
1985.	120114.	120114.	2365.	1657.	708.	100.0	70.1
1986.	176011.	176011.	3251.	2309.	943.	100.0	71.0
1987.	182175.	181495.	3220.	2250.	966.	99.6	69.9
1988.	145101.	145101.	2671.	1940.	731.	100.0	72.6
1989.	161516.	161516.	2563.	1848.	715.	100.0	72.1
1990.	182987.	182987.	3340.	2461.	879.	100.0	73.7
1991.	171375.	171288.	3024.	2157.	867.	99.9	71.3
1992.	218066.	218066.	3559.	2359.	1201.	100.0	66.3
1993.	147283.	147283.	2998.	2247.	751.	100.0	75.0
1994.	157346.	155236.	2444.	1580.	844.	98.7	64.7
1995.	184317.	184223.	2938.	1923.	1013.	99.9	65.5
1998.	45801.	45801.	1183.	813.	370.	100.0	68.7
1999.	115000.	115000.	2365.	1599.	766.	100.0	67.6
2000.	134472.	134472.	1978.	1168.	810.	100.0	59.0
2001.	105080.	105080.	1905.	1425.	480.	100.0	74.8
2002.	109245.	109245.	2252.	1610.	641.	100.0	71.5
2003.	124700.	124700.	2282.	1542.	739.	100.0	67.6
2004.	150039.	150039.	2320.	1555.	764.	100.0	67.0
2005.	107614.	106589.	1784.	1061.	718.	99.0	59.5

HD 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	1237.	420.	98.4	74.6
1972.	124293.	117662.	2262.	1734.	478.	94.7	76.7
1973.	125212.	125212.	2360.	1836.	524.	100.0	77.8
1974.	127879.	127125.	2457.	2037.	410.	99.4	82.9
1975.	109089.	108538.	2150.	1635.	511.	99.5	76.1
1976.	162272.	160802.	2734.	2143.	570.	99.1	78.4
1977.	173580.	171790.	2585.	1835.	733.	99.0	71.0
1978.	138910.	138910.	2511.	1902.	609.	100.0	75.8
1979.	166126.	164970.	2753.	2151.	590.	99.3	78.1
1980.	133240.	133240.	2718.	2122.	595.	100.0	78.1
1981.	185090.	185090.	2964.	2409.	555.	100.0	81.3
1982.	130534.	130534.	2436.	1986.	450.	100.0	81.5
1983.	172357.	171966.	3087.	2405.	676.	99.8	77.9
1984.	138327.	138327.	2371.	1834.	538.	100.0	77.3
1985.	120114.	120114.	2365.	1885.	480.	100.0	79.7
1986.	176011.	176011.	3251.	2613.	638.	100.0	80.4
1987.	182175.	181495.	3220.	2565.	650.	99.6	79.7
1988.	145101.	145101.	2671.	2185.	486.	100.0	81.8
1989.	161516.	161516.	2563.	2092.	471.	100.0	81.6
1990.	182987.	182987.	3340.	2740.	600.	100.0	82.0
1991.	171375.	171288.	3024.	2415.	608.	99.9	79.9
1992.	218066.	218066.	3559.	2725.	834.	100.0	76.6
1993.	147283.	147283.	2998.	2504.	494.	100.0	83.5
1994.	157346.	155236.	2444.	1817.	607.	98.7	74.4
1995.	184317.	184223.	2938.	2210.	726.	99.9	75.2
1998.	45801.	45801.	1183.	927.	256.	100.0	78.3
1999.	115000.	115000.	2365.	1825.	540.	100.0	77.2
2000.	134472.	134472.	1978.	1404.	574.	100.0	71.0
2001.	105080.	105080.	1905.	1601.	304.	100.0	84.0
2002.	109245.	109245.	2252.	1824.	428.	100.0	81.0
2003.	124700.	124700.	2282.	1757.	525.	100.0	77.0
2004.	150039.	150039.	2320.	1772.	547.	100.0	76.4
2005.	107614.	106589.	1784.	1240.	539.	99.0	69.5

HD 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	1349.	307.	98.4	81.4
1972.	124293.	117662.	2262.	1872.	340.	94.7	82.7
1973.	125212.	125212.	2360.	1990.	370.	100.0	84.3
1974.	127879.	127125.	2457.	2175.	272.	99.4	88.5
1975.	109089.	108538.	2150.	1784.	363.	99.5	83.0
1976.	162272.	160802.	2734.	2330.	383.	99.1	85.2
1977.	173580.	171790.	2585.	2032.	536.	99.0	78.6
1978.	138910.	138910.	2511.	2065.	446.	100.0	82.2
1979.	166126.	164970.	2753.	2317.	425.	99.3	84.2
1980.	133240.	133240.	2718.	2295.	422.	100.0	84.5
1981.	185090.	185090.	2964.	2614.	350.	100.0	88.2
1982.	130534.	130534.	2436.	2143.	293.	100.0	88.0
1983.	172357.	171966.	3087.	2604.	477.	99.8	84.4
1984.	138327.	138327.	2371.	1992.	379.	100.0	84.0
1985.	120114.	120114.	2365.	2036.	329.	100.0	86.1
1986.	176011.	176011.	3251.	2831.	420.	100.0	87.1
1987.	182175.	181495.	3220.	2764.	452.	99.6	85.8
1988.	145101.	145101.	2671.	2328.	343.	100.0	87.1
1989.	161516.	161516.	2563.	2259.	304.	100.0	88.1
1990.	182987.	182987.	3340.	2938.	401.	100.0	88.0
1991.	171375.	171288.	3024.	2608.	415.	99.9	86.2
1992.	218066.	218066.	3559.	2968.	592.	100.0	83.4
1993.	147283.	147283.	2998.	2667.	331.	100.0	89.0
1994.	157346.	155236.	2444.	1969.	456.	98.7	80.6
1995.	184317.	184223.	2938.	2411.	525.	99.9	82.1
1998.	45801.	45801.	1183.	999.	184.	100.0	84.4
1999.	115000.	115000.	2365.	1982.	383.	100.0	83.8
2000.	134472.	134472.	1978.	1539.	438.	100.0	77.8
2001.	105080.	105080.	1905.	1714.	191.	100.0	90.0
2002.	109245.	109245.	2252.	1964.	288.	100.0	87.2
2003.	124700.	124700.	2282.	1911.	371.	100.0	83.8
2004.	150039.	150039.	2320.	1939.	380.	100.0	83.6
2005.	107614.	106589.	1784.	1376.	403.	99.0	77.1

HD 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	97232.	95666.	1658.	1433.	224.	98.4	86.4
1972.	124293.	117662.	2262.	1979.	233.	94.7	87.5
1973.	125212.	125212.	2360.	2104.	256.	100.0	89.2
1974.	127879.	127125.	2457.	2275.	172.	99.4	92.6
1975.	109089.	108538.	2150.	1896.	250.	99.5	88.2
1976.	162272.	160802.	2734.	2456.	257.	99.1	89.8
1977.	173580.	171790.	2585.	2185.	383.	99.0	84.5
1978.	138910.	138910.	2511.	2186.	325.	100.0	87.1
1979.	166126.	164970.	2753.	2424.	317.	99.3	88.1
1980.	133240.	133240.	2718.	2413.	305.	100.0	88.8
1981.	185090.	185090.	2964.	2743.	220.	100.0	92.6
1982.	130534.	130534.	2436.	2255.	181.	100.0	92.6
1983.	172357.	171966.	3087.	2753.	327.	99.8	89.2
1984.	138327.	138327.	2371.	2112.	259.	100.0	89.1
1985.	120114.	120114.	2365.	2148.	217.	100.0	90.8
1986.	176011.	176011.	3251.	2974.	277.	100.0	91.5
1987.	182175.	181495.	3220.	2897.	319.	99.6	90.0
1988.	145101.	145101.	2671.	2442.	229.	100.0	91.4
1989.	161516.	161516.	2563.	2358.	205.	100.0	92.0
1990.	182987.	182987.	3340.	3079.	261.	100.0	92.2
1991.	171375.	171288.	3024.	2725.	298.	99.9	90.1
1992.	218066.	218066.	3559.	3142.	417.	100.0	88.3
1993.	147283.	147283.	2998.	2772.	226.	100.0	92.5
1994.	157346.	155236.	2444.	2100.	325.	98.7	85.9
1995.	184317.	184223.	2938.	2540.	396.	99.9	86.5
1998.	45801.	45801.	1183.	1053.	131.	100.0	89.0
1999.	115000.	115000.	2365.	2091.	274.	100.0	88.4
2000.	134472.	134472.	1978.	1644.	334.	100.0	83.1
2001.	105080.	105080.	1905.	1786.	120.	100.0	93.7
2002.	109245.	109245.	2252.	2057.	195.	100.0	91.3
2003.	124700.	124700.	2282.	2011.	271.	100.0	88.1
2004.	150039.	150039.	2320.	2052.	267.	100.0	88.5
2005.	107614.	106589.	1784.	1474.	305.	99.0	82.7

```
**************************************************
*  Summary of Quantity and Quality Results at      *
*  Location        200  INFlow in cms.             *
*  Values are instantaneous at indicated time step *
**************************************************
     Date     Time        Flow   Total Su
 Mo/Da/Year  Hr:Min        cum/s  mg/l
 ----------  -------    -------  --------
Flow wtd means.....         0.002      106.
Flow wtd std devs..         0.014       68.
Maximum value......         2.464      293.
Minimum value......         0.000        0.
Total loads........      786939.    83468.
                        Cub-Met  KILOGRAM
===> Runoff simulation ended normally.
===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.
**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... September   8, 2023               *
*          Time...          11:36:18.749             *
*   Ending Date... September   8, 2023               *
*          Time...          11:36:21.898             *
*  Elapsed Time...               0.052 minutes.      *
*  Elapsed Time...               3.149 seconds.      *
**************************************************
```

BLOCK A02

```
         ************************************************
         *      Storm Water Management Sizing Model     *
         *               Hydroworks, LLC                *
         *                Version 4.4                   *
         *                                              *
         *        Continuous Simulation Program         *
         *              Based on SWMM 4.4H              *
         *              Hydroworks, LLC                 *
         *               Graham Bryant                  *
         *                2003 - 2021                   *
         ************************************************

                          Developed by

         ************************************************
         *               Hydroworks, LLC                *
         *             Metcalf & Eddy, Inc.             *
         *           University of Florida              *
         *       Water Resources Engineers, Inc.        *
         *      (Now Camp Dresser & McKee, Inc.)        *
         *              Modified SWMM 4.4               *
         ************************************************

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         *                Hydroworks, LLC               *
         *                 888-290-7900                 *
         *              www.hydroworks.com              *
         *                                              *
         ************************************************

         ************************************************
         *     If any problems occur executing this     *
         *     model, contact Mr. Graham Bryant at      *
         *     Hydroworks, LLC by phone at 908-272-4411 *
         *     or by e-mail: support@hydroworks.com     *
         ************************************************

         ************************************************
         *     This model is based on EPA SWMM 4.4      *
         *  "Nature is full of infinite causes which    *
         *   have never occurred in experience" da Vinci *
         ************************************************


************************************************
* Entry made to the Rain Block                 *
* Created by the University of Florida - 1988  *
* Updated by Oregon State University, March 2000 *
************************************************

         Riverfront Community (Phase 2)
         City of Niagara Falls

     ########################################
     #  Precipitation Block Input Commands  #
     ########################################
    Station Name.......................  St. Catherines A
    Station Location...................  Ontario
    Station, ISTA......................    7287
    Beginning date, IYBEG (Yr/Mo/Dy)...  1971/ 1/ 1
    Ending date, IYEND (Yr/Mo/Dy)......  2005/12/31
    Minimum interevent time, MIT.......     1
    Number of ranked storms, NPTS......    10
    NWS format, IFORM (See text).......     1
    Print storm summary, ISUM (O-No 1-Yes)     0
    Print all rainfall, IYEAR (O-No 1-Yes)     0
    Save storm event data on NSCRAT(1)....     0
    (IFILE =0 -Do not save, =1 -Save data)
    IDECID 0 - Create interface file
           1 - Create file and analyze
           2 - Synoptic analysis.......     2
    Plotting position parameter, A.....  0.40
    Storm event statistics, NOSTAT.....  1100
    KODEA (from optional group B0).....     2
     = 0, Do not include NCDC cumulative values.
     = 1, Average NCDC cumulative values.
     = 2, Use NCDC cumulative value as inst. rain.
    KODEPR (from optional group B0).....     0
     Print NCDC special codes in event summary:
     = 0, only on days with events.
     = 1, on all days with codes present.
     Codes: A = accumulated value, I = incomplete value,
            M = missing value,     O = other code present

*****************************************************
*  Precipitation output created using the Rain block   *
*  Number of precipitation stations...        1       *
*****************************************************
Location Station Number
-------- --------------
       1.     7287

STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.
```

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins     #
#####################################################
Snowmelt parameter - ISNOW.....................          0
Number of rain gages - NRGAG...................          1
Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.
Quality is simulated - KWALTY..................          1
IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.
Read evaporation data on line(s) F1 (F2) - IVAP..          1
Hour of day at start of storm - NHR............          1
Minute of hour at start of storm - NMN.........          1
Time TZERO at start of storm (hours)...........      1.017
Use Metric units for I/O - METRIC..............          1
 ===> Ft-sec units used in all internal computations
Runoff input print control...                             0
Runoff graph plot control....                             1
Runoff output print control..                             0
Print headers every 50 lines - NOHEAD (0=yes, 1=no)       0
Print land use load percentages -LANDUPR (0=no, 1=yes)    0
Limit number of groundwater convergence messages to 10000 (if simulated)
Month, day, year of start of storm is:             1/ 1/1971
Wet time step length (seconds).......                  300.
Dry time step length (seconds).......                  900.
Wet/Dry time step length (seconds)...                  450.
Simulation length is......                      20051231.0 Yr/Mo/Dy
Percent of impervious area with zero detention depth    25.0
Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ........................................   0.01000

*******************************************************
*   Processed Precipitation will be read from file     *
*******************************************************
  ##############################
  #        Data Group F1      #
  # Evaporation Rate (mm/day) #
  ##############################
 JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV.  DEC.
 ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----
 0.00  0.00  0.00  2.54  2.54  3.81  3.81  3.81  2.54  2.54  0.00  0.00

*******************************************************
*        C H A N N E L  A N D  P I P E  D A T A        *
*******************************************************
Input   NAMEG:     Drains                          Invert  L Side   R Side  Intial     Max  Mann-   Full
equen  Channel      to     Channel  Width  Length    Slope   Slope    Slope   Depth   Depth   ings   Flow
umber    ID #      NGTO:    Type     (m)    (m)     (m/m)   (m/m)    (m/m)     (m)     (m)    "N"   (cms)
-----  ------------------ -------- ------ -------   ------- -------- ------- ------- ------- -----  -----
  1        201        200   Dummy     0.0     0.0    0.0000   0.0000  0.0000     0.0     0.0  0.0000 0.00E+00

 ************************************************
 *          S U B C A T C H M E N T  D A T A      *
 ************************************************
*NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS*
      SUBCATCH-  CHANNEL      WIDTH    AREA  PERCENT    SLOPE    RESISTANCE  FACTOR    DEPRES. STORAGE(MM) INFILTRATION   DECAY RATE GAGE  MAXIMUM
       MENT NO.  OR INLET       (M)    (HA)  IMPERV.    (M/M)     IMPERV.     PERV.    IMPERV.     PERV.      RATE(MM/HR)    (1/SEC)    NO.  VOLUME
                                                                                                          MAXIMUM MINIMUM                      (MM)
 ---  --------   -------- --------- --------  -----   -------    -------  --------    ------     ------     ----   -------  --------  ------ -------
  1        300        200    125.70     1.58  85.00    0.0200      0.015     0.250     0.510     5.080    63.50   10.16    0.00055     1  101.60000
TOTAL NUMBER OF SUBCATCHMENTS...              1
TOTAL TRIBUTARY AREA (HECTARES).           1.58
IMPERVIOUS AREA (HECTARES)......           1.34
PERVIOUS AREA (HECTARES)........           0.24
TOTAL WIDTH (METERS)............         125.70
PERCENT IMPERVIOUSNESS..........          85.00

*******************************************************
*      G R O U N D W A T E R   I N P U T   D A T A     *
*******************************************************
    SUB-     CHANNEL     ========== E L E V A T I O N S ========  =========== F L O W   C O N S T A N T S ============
    CATCH         OR      GROUND  BOTTOM   STAGE     BC      TW       A1         B1        A2         B2        A3
    NUMBER     INLET        (M)     (M)      (M)     (M)     (M) (MM/HR-M^B1)         (MM/HR-M^B2)         (MM/HR-M^2)
    ------     -----     -------  ------  ------  ------  ------ -----------  -------  -----------  -------  -----------
         0       602        3.05    0.00    0.00    0.61    0.61   3.484E-04    2.600   0.000E+00    1.000    0.00E+00
```

```
**********************************************************
* G R O U N D W A T E R   I N P U T   D A T A (CONTINUED) *
**********************************************************
```

S O I L P R O P E R T I E S

SUBCAT. NO.	POROSITY	SATURATED HYDRAULIC CONDUCTIVITY (mm/hr)	WILTING POINT	FIELD CAPACITY	INITIAL MOISTURE	MAX. DEEP PERCOLATION (mm/hr)	PERCOLATION PARAMETERS HCO	PCO	E T P A R A M E T E R S DEPTH OF ET (m)	FRACTION OF ET TO UPPER ZONE
0	.4000	127.000	.1500	.3000	.3000	5.080E-02	10.00	4.57	4.27	0.350

```
**********************************************************
*    Arrangement of Subcatchments and Channel/Pipes      *
**********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
**********************************************************
   Channel
   or Pipe
       201     No Tributary Channel/Pipes
               No Tributary Subareas.....
    INLET
       200     Tributary Channel/Pipes...        201
               Tributary Subareas........        300

**********************************************************
* Hydrographs will be stored for the following   1 INLETS *
**********************************************************
          200

#####################################################
#              Quality Simulation                   #
#####################################################
#      General Quality Control Data Groups          #
#####################################################
 Description                          Variable       Value
 -----------                          --------       -----
 Number of quality constituents.....    NQS.......         1
 Number of land uses.................  JLAND.......         1
 Standard catchbasin volume.........  CBVOL.......      1.22 cubic meters
 Erosion is not simulated.........    IROS.......         0
 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......      3.00 DAYS
 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......      5.00 DAYS
 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......     0.300
 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS.................... KLNBGN.......       120
 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS..................... KLNEND.......       270

#############################################
#     Land use data on data group J2      #
#############################################
```

AND USE LNAME)	BUILDUP EQUATION TYPE (METHOD)	FUNCTIONAL DEPENDENCE OF BUILDUP PARAMETER(JACGUT)	LIMITING BUILDUP QUANTITY (DDLIM)	BUILDUP POWER (DDPOW)	BUILDUP COEFF. (DDFACT)	CLEANING INTERVAL IN DAYS (CLFREQ)	AVAIL. FACTOR FRACTION (AVSWP)	DAYS SINCE LAST SWEEPING (DSLCL)
Urban De	EXPONENTIAL(1)	AREA(1)	2.802E+01	0.500	67.250	30.000	0.300	30.000

```
#############################################
#     Constituent data on data group J3     #
#############################################
                            Total Su
                            --------
Constituent units........      mg/l
Type of units............         0
KALC.....................         2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH....................         0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT...................         1
Dependence of buildup....       AREA(1)
LINKUP...................         0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).      28.020
Buildup param 2 (QFACT2).       0.500
Buildup param 3 (QFACT3).      67.250
Buildup param 4 (QFACT4).       0.000
Buildup param 5 (QFACT5).       0.000
Washoff power (WASHPO)...       1.100
Washoff coef. (RCOEF)....       0.086
Init catchb conc (CBFACT)     100.000
Precip. conc. (CONCRN)...       0.000
Street sweep effic (REFF)       0.300
Remove fraction (REMOVE).       0.000
1st order QDECAY, 1/day..       0.000
Land use number..........           1

**********************************************
* Constant Groundwater Quality Concentration(s) *
**********************************************
 Total Susp has a concentration of..    0.0000   mg/l
```

```
************************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                *
************************************************
  CHANNEL/   CONSTITUENT
     PIPE Total Susp
----------  --------
       201     0.000

*****************************************************
*     Subcatchment surface quality on data group L1 *
*****************************************************
                                Total   Number   Input
                          Land    Gutter     of    Loading
                Land      Use    Length   Catch-  load/ha
           No.  Usage     No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.25     2.00  0.0E+00
   Totals (Loads in kg or other)    0.25     2.00  0.0E+00

    **********************
    *    DATA GROUP M1    *
    **********************
TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES.....               0        0

    **********************
    *    DATA GROUP M3    *
    **********************
CHANNEL/INLET PRINT DATA GROUPS......       -200

          ****************************************
          * Rainfall from Nat. Weather Serv. file  *
          * in units of hundredths of an inch      *
          ****************************************
Rainfall Station    St. Catherines A
State/Province      Ontario
Rainfall Depth Summary (mm)
Year     Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Total
1971.     31.    0.    0.    0.    0.    0.  126.   93.   52.   60.   29.    0.    391.
1972.      0.    0.    0.   47.   65.  100.   39.  115.   63.   90.    1.    0.    521.
1973.      0.    0.    0.  103.   77.   71.   53.   29.   63.  139.    0.    0.    534.
1974.      0.    0.    0.   67.  105.   62.   50.   31.   74.   37.  110.    0.    536.
1975.      0.    0.    0.    0.    0.   94.   78.   76.   73.   56.   59.    6.    442.
1976.      0.    0.    0.  119.  136.   87.  101.   60.   72.   73.   13.    1.    662.
1977.      0.    0.    0.   94.   29.   69.   57.  150.  230.   71.    0.    1.    701.
1978.      0.    0.    0.   72.   43.   72.   43.   86.  156.   95.    0.    0.    567.
1979.      0.    0.    0.   84.   92.   33.   91.   88.   84.  129.   71.    0.    673.
1980.      0.    0.    0.   81.   39.  122.   60.   32.   79.   96.   45.    0.    554.
1981.      0.    0.    0.   91.   71.  106.  122.   61.  123.   91.   84.    0.    749.
1982.      0.    0.    0.   28.   65.   97.   36.   66.   82.   25.  143.    0.    544.
1983.      0.    0.    0.   78.  100.   65.   55.  106.   75.  122.   92.    0.    694.
1984.      0.    0.    0.   31.  113.  136.   19.   51.  144.   24.   44.    0.    562.
1985.      0.    0.   67.   32.   52.   64.   40.   94.   42.  109.    0.    1.    501.
1986.      0.    0.    0.   93.  113.   60.   85.   83.   98.   80.   43.   65.    719.
1987.      0.    2.   11.   77.   42.   80.  122.   97.   99.   71.   94.   34.    730.
1988.      0.    0.   41.   71.   42.   21.  110.   82.   70.   68.   75.    5.    585.
1989.      0.    0.   13.   63.  137.  108.   36.   45.   89.   73.   84.    0.    647.
1990.      0.    2.   38.   99.  124.   44.   68.   95.   56.  112.   96.    0.    735.
1991.      0.    0.   86.  124.   67.   31.   85.   57.   79.   64.   61.   28.    682.
1992.      0.    0.   29.  127.   56.   92.  185.  116.   77.   47.  103.   38.    869.
1993.      3.    0.    7.   83.   56.   86.   32.   61.   71.   92.   80.   38.    610.
1994.      0.    0.   44.   88.  105.  124.   48.   77.  117.   15.    0.   15.    633.
1995.    112.   23.   16.   48.   37.   60.  123.   66.    8.  137.   94.    0.    724.
1998.      0.    0.    0.    0.   51.   54.   64.   29.    9.    0.    1.    0.    207.
1999.      0.    0.    0.   79.   59.   35.   61.   58.  116.   78.    0.    0.    487.
2000.      0.    0.    0.  123.  134.  216.   51.    0.    0.    0.   10.    0.    534.
2001.      0.    0.    0.   56.   88.   45.   25.   30.   81.  129.    0.    0.    454.
2002.      0.    0.    0.   73.  104.   64.   53.   49.   52.   65.    8.    0.    468.
2003.      0.    0.    0.   10.  163.   77.   81.   64.   67.   73.    2.    0.    537.
2004.      0.    0.    0.  131.  126.   99.  115.   40.   88.   17.    0.    0.    616.
2005.      0.    0.    0.   38.   42.   78.   53.  120.  112.    0.    0.    0.    443.

Total Rainfall Depth for Simulation Period    19310. (mm)

Rainfall Intensity Analysis (mm/hr)
(mm/hr)   (#)       (%)      (mm)       (%)
  2.50  21481      74.6     6454.      33.4
  5.00   3585      12.4     3088.      16.0
  7.50   1973       6.8     2886.      14.9
 10.00    575       2.0     1233.       6.4
 12.50    389       1.4     1070.       5.5
 15.00    194       0.7      660.       3.4
 17.50    210       0.7      846.       4.4
 20.00     66       0.2      306.       1.6
 22.50     92       0.3      487.       2.5
 25.00     39       0.1      232.       1.2
 27.50     37       0.1      246.       1.3
 30.00     34       0.1      245.       1.3
 32.50     29       0.1      228.       1.2
 35.00      5       0.0       42.       0.2
 37.50     10       0.0       90.       0.5
 40.00     10       0.0       97.       0.5
 42.50     12       0.0      124.       0.6
 45.00      9       0.0       99.       0.5
 47.50      1       0.0       12.       0.1
 50.00      3       0.0       37.       0.2
>50.00     49       0.2      829.       4.3
Total # of Intensities  28803
```

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

```
***********************************************
*      End of time step DO-loop in Runoff     *
***********************************************
Final Date (Mo/Day/Year)   =                  1/ 1/2006
Total number of time steps =                    2056568
Final Julian Date  =                            2006001
Final time of day  =                                 2. seconds.
Final time of day  =                              0.00   hours.
Final running time =                         306816.0000   hours.
Final running time =                          12784.0000    days.

***********************************************
*     Extrapolation Summary for Watersheds    *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls    *
***********************************************
```

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6280727	1615213						

```
***********************************************
*     Extrapolation Summary for Channel/Pipes *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls      *
***********************************************
```

Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls
201	0	0						

```
*********************************************
*       Continuity Check for Surface Water  *
*********************************************
                                                          Millimeters over
                                                cubic meters  Total Basin
Total Precipitation (Rain plus Snow)                304346.     19263.
Total Infiltration                                   45403.      2874.
Total Evaporation                                    28055.      1776.
Surface Runoff from Watersheds                      232489.     14715.
Total Water remaining in Surface Storage                 0.         0.
Infiltration over the Pervious Area...               45403.     19158.
                      --------
Infiltration + Evaporation +
Surface Runoff + Snow removal +
Water remaining in Surface Storage +
Water remaining in Snow Cover.........              305947.     19364.
Total Precipitation + Initial Storage.              304346.     19263.

The error in continuity is calculated as
*************************************
* Precipitation + Initial Snow Cover  *
*      - Infiltration -               *
*Evaporation - Snow removal -         *
*Surface Runoff from Watersheds -     *
*Water in Surface Storage -           *
*Water remaining in Snow Cover        *
*-----------------------------------*
* Precipitation + Initial Snow Cover  *
*************************************
Error.................................       -0.526 Percent

*********************************************
*       Continuity Check for Channel/Pipes  *
*********************************************
                                                          Millimeters over
                                                cubic meters  Total Basin
Initial Channel/Pipe Storage.................            0.         0.
Final Channel/Pipe Storage...................            0.         0.
Surface Runoff from Watersheds...............       232489.     14715.
Baseflow.....................................            0.
Groundwater Subsurface Inflow................            0.         0.
Evaporation Loss from Channels...............            0.         0.
Channel/Pipe/Inlet Outflow...................       232489.     14715.
Initial Storage + Inflow.....................       232489.     14715.
Final Storage + Outflow......................       232489.     14715.
```

```
*****************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
*****************************************
Error.....................................      0.000 Percent

*************************************************
*     Continuity Check for Subsurface Water     *
*************************************************
                                                                Millimeters over
                                                cubic meters    Subsurface Basin
Total Infiltration                                        0.              0.
Total Upper Zone ET                                       0.              0.
Total Lower Zone ET                                       0.              0.
Total Groundwater flow                                    0.              0.
Total Deep percolation                                    0.              0.
Initial Subsurface Storage                            14447.            914.
Final Subsurface Storage                              14447.            914.
Upper Zone ET over Pervious Area                          0.              0.
Lower Zone ET over Pervious Area                          0.              0.

*****************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
*****************************************
Error ....................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	PERVIOUS AREA TOTAL SIMULATED RAINFALL (MM)	PERVIOUS AREA TOTAL RUNOFF DEPTH (MM)	PERVIOUS AREA TOTAL LOSSES (MM)	PERVIOUS AREA PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA RUNOFF DEPTH (MM)	IMPERVIOUS AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA PEAK UNIT RUNOFF (MM/HR)
300	200	1.58	85.01	9262.47	107.181********	0.08317	289.256	0.729	14711.945	0.812	186.564	

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				0.81				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
              ########################################################
              #             Runoff Quality Summary Page              #
              # If NDIM = 0 Units for:   loads    mass rates       #
              #             METRIC = 1    lb        lb/sec         #
              #             METRIC = 2    kg        kg/sec         #
              # If NDIM = 1 Loads are in units of quantity         #
              #             and mass rates are quantity/sec        #
              # If NDIM = 2 loads are in units of concentration    #
              #             times volume and mass rates have units#
              #             of concentration times volume/second   #
              ########################################################
             Total Su NDIM =  0
             METRIC =  2
                               Total Su
                               --------
Inputs
------
 1. INITIAL SURFACE LOAD........       34.
 2. TOTAL SURFACE BUILDUP.......    29254.
 3. INITIAL CATCHBASIN LOAD.....        0.
 4. TOTAL CATCHBASIN LOAD.......        0.
 5. TOTAL CATCHBASIN AND
    SURFACE BUILDUP (2+4).......    29254.
Remaining Loads
---------------
 6. LOAD REMAINING ON SURFACE...       12.
 7. REMAINING IN CATCHBASINS....        0.
 8. REMAINING IN CHANNEL/PIPES..        0.
```

Removals
----
 9. STREET SWEEPING REMOVAL.....   2293.
10. NET SURFACE BUILDUP (2-9)...   26961.
11. SURFACE WASHOFF.............   26943.
12. CATCHBASIN WASHOFF..........   0.
13. TOTAL WASHOFF (11+12).......   26943.
14. LOAD FROM OTHER CONSTITUENTS   0.
15. PRECIPITATION LOAD..........   0.
15a.SUM SURFACE LOAD (13+14+15).   26943.
16. TOTAL GROUNDWATER LOAD......   0.
16a.TOTAL I/I LOAD..............   0.
17. NET SUBCATCHMENT LOAD
    (15a-15b-15c-15d+16+16a)....   26943.
>>Removal in channel/pipes (17a, 17b):
17a.REMOVE BY BMP FRACTION......   0.
17b.REMOVE BY 1st ORDER DECAY...   0.
18. TOTAL LOAD TO INLETS........   26943.
19. FLOW WT'D AVE.CONCENTRATION mg/l
    (INLET LOAD/TOTAL FLOW).....   116.
Percentages
----
20. STREET SWEEPING (9/2).......   8.
21. SURFACE WASHOFF (11/2)......   92.
22. NET SURFACE WASHOFF(11/10)..   100.
23. WASHOFF/SUBCAT LOAD(11/17)..   100.
24. SURFACE WASHOFF/INLET LOAD
    (11/18).....................   100.
25. CATCHBASIN WASHOFF/
    SUBCATCHMENT LOAD (12/17)...   0.
26. CATCHBASIN WASHOFF/
    INLET LOAD (12/18)..........   0.
27. OTHER CONSTITUENT LOAD/
    SUBCATCHMENT LOAD (14/17)...   0.
28. INSOLUBLE FRACTION/
    INLET LOAD (14/18)..........   0.
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)...   0.
30. PRECIPITATION/
    INLET LOAD (15/18)..........   0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)...   0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18)..........   0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17)..   0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........   0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..   0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..   0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....   0.

CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals. Buildup is only performed at beginning of
wet steps or for street cleaning.

****
*   TSS Particle Size Distribution   *
****
   Diameter   %   Specific   Settling Velocity   Critical Peclet
     (um)   Gravity   (m/s)   Number
      20.   20.0   2.65   0.000267   0.080977
      30.   10.0   2.65   0.000597   0.104277
      50.   10.0   2.65   0.001629   0.143403
     100.   20.0   2.65   0.006044   0.220958
     250.   20.0   2.65   0.026615   0.391296
    1000.   20.0   2.65   0.111334   0.928988

****
*   *
*   Summary of TSS Removal   *
*   *
****
TSS Removal based on Lab Performance Curve
 Model   Low Q Treated High Q Treated   Runoff Treated   TSS Removed
   #   (cms)   (cms)   (%)   (%)
 HD 4   0.240   0.240   99.5   71.6
 HD 5   0.240   0.240   99.5   78.7
 HD 6   0.240   0.240   99.5   83.5
 HD 8   0.240   0.240   99.5   90.0
 HD 10   0.240   0.240   99.5   93.9
 HD 12   0.240   0.240   99.5   96.1

****
* Summary of Annual Flow Treatmnet & TSS Removal *
****

HD 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	356.	175.	98.4	67.0
1972.	37059.	34516.	718.	500.	196.	93.1	69.7
1973.	37144.	37144.	758.	541.	217.	100.0	71.4
1974.	37926.	37573.	807.	619.	185.	99.1	76.6
1975.	32184.	32113.	692.	472.	220.	99.8	68.2
1976.	47898.	47267.	870.	620.	243.	98.7	71.3
1977.	51280.	50501.	837.	527.	302.	98.5	63.0
1978.	40993.	40993.	802.	545.	257.	100.0	68.0
1979.	49045.	48528.	905.	652.	249.	98.9	72.1
1980.	39477.	39477.	865.	622.	243.	100.0	71.9
1981.	54567.	54567.	954.	716.	238.	100.0	75.0
1982.	38467.	38467.	784.	587.	196.	100.0	74.9
1983.	50771.	50539.	1001.	719.	279.	99.5	71.8
1984.	40820.	40820.	769.	540.	229.	100.0	70.2
1985.	35563.	35563.	765.	552.	212.	100.0	72.2
1986.	51933.	51933.	1042.	769.	274.	100.0	73.7
1987.	53696.	53382.	1043.	762.	279.	99.4	73.1
1988.	42860.	42860.	875.	662.	213.	100.0	75.7
1989.	47410.	47410.	834.	628.	207.	100.0	75.2
1990.	53759.	53746.	1072.	821.	251.	100.0	76.5
1991.	50371.	50371.	995.	738.	258.	100.0	74.1
1992.	64030.	64030.	1145.	803.	343.	100.0	70.1
1993.	43493.	43493.	987.	770.	217.	100.0	78.0
1994.	46460.	45744.	803.	544.	251.	98.5	67.8
1995.	54170.	54074.	957.	655.	300.	99.8	68.5
1998.	13888.	13888.	381.	265.	116.	100.0	69.4
1999.	34173.	34173.	752.	532.	220.	100.0	70.8
2000.	39526.	39526.	637.	404.	234.	100.0	63.3
2001.	31179.	31179.	613.	473.	139.	100.0	77.3
2002.	32519.	32519.	719.	533.	186.	100.0	74.1
2003.	37014.	37014.	733.	512.	221.	100.0	69.8
2004.	44362.	44362.	747.	521.	226.	100.0	69.8
2005.	31945.	31622.	572.	351.	220.	99.0	61.4

HD 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	393.	138.	98.4	74.0
1972.	37059.	34516.	718.	550.	146.	93.1	76.7
1973.	37144.	37144.	758.	592.	165.	100.0	78.2
1974.	37926.	37573.	807.	671.	133.	99.1	83.1
1975.	32184.	32113.	692.	524.	168.	99.8	75.7
1976.	47898.	47267.	870.	688.	175.	98.7	79.1
1977.	51280.	50501.	837.	593.	237.	98.5	70.9
1978.	40993.	40993.	802.	610.	192.	100.0	76.1
1979.	49045.	48528.	905.	724.	177.	98.9	80.0
1980.	39477.	39477.	865.	676.	189.	100.0	78.2
1981.	54567.	54567.	954.	780.	174.	100.0	81.7
1982.	38467.	38467.	784.	637.	147.	100.0	81.3
1983.	50771.	50539.	1001.	790.	207.	99.5	78.9
1984.	40820.	40820.	769.	596.	173.	100.0	77.5
1985.	35563.	35563.	765.	610.	154.	100.0	79.8
1986.	51933.	51933.	1042.	843.	200.	100.0	80.9
1987.	53696.	53382.	1043.	842.	199.	99.4	80.8
1988.	42860.	42860.	875.	717.	157.	100.0	82.0
1989.	47410.	47410.	834.	687.	148.	100.0	82.3
1990.	53759.	53746.	1072.	891.	181.	100.0	83.1
1991.	50371.	50371.	995.	806.	189.	100.0	81.0
1992.	64030.	64030.	1145.	879.	266.	100.0	76.8
1993.	43493.	43493.	987.	832.	155.	100.0	84.3
1994.	46460.	45744.	803.	601.	195.	98.5	74.9
1995.	54170.	54074.	957.	731.	225.	99.8	76.4
1998.	13888.	13888.	381.	291.	91.	100.0	76.2
1999.	34173.	34173.	752.	578.	173.	100.0	76.9
2000.	39526.	39526.	637.	455.	182.	100.0	71.5
2001.	31179.	31179.	613.	516.	96.	100.0	84.3
2002.	32519.	32519.	719.	586.	133.	100.0	81.5
2003.	37014.	37014.	733.	562.	171.	100.0	76.7
2004.	44362.	44362.	747.	576.	171.	100.0	77.1
2005.	31945.	31622.	572.	394.	177.	99.0	68.9

HD 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	424.	106.	98.4	79.9
1972.	37059.	34516.	718.	583.	114.	93.1	81.2
1973.	37144.	37144.	758.	631.	127.	100.0	83.3
1974.	37926.	37573.	807.	707.	97.	99.1	87.6
1975.	32184.	32113.	692.	559.	132.	99.8	80.8
1976.	47898.	47267.	870.	728.	134.	98.7	83.7
1977.	51280.	50501.	837.	641.	189.	98.5	76.6
1978.	40993.	40993.	802.	645.	157.	100.0	80.4
1979.	49045.	48528.	905.	755.	146.	98.9	83.4
1980.	39477.	39477.	865.	728.	137.	100.0	84.2
1981.	54567.	54567.	954.	827.	127.	100.0	86.7
1982.	38467.	38467.	784.	677.	106.	100.0	86.4
1983.	50771.	50539.	1001.	837.	161.	99.5	83.6
1984.	40820.	40820.	769.	634.	134.	100.0	82.5
1985.	35563.	35563.	765.	644.	121.	100.0	84.2
1986.	51933.	51933.	1042.	893.	149.	100.0	85.7
1987.	53696.	53382.	1043.	885.	156.	99.4	84.8
1988.	42860.	42860.	875.	754.	121.	100.0	86.2
1989.	47410.	47410.	834.	729.	105.	100.0	87.4
1990.	53759.	53746.	1072.	937.	135.	100.0	87.4
1991.	50371.	50371.	995.	851.	144.	100.0	85.5
1992.	64030.	64030.	1145.	944.	201.	100.0	82.4
1993.	43493.	43493.	987.	870.	117.	100.0	88.2
1994.	46460.	45744.	803.	641.	155.	98.5	79.9
1995.	54170.	54074.	957.	775.	180.	99.8	81.0
1998.	13888.	13888.	381.	310.	71.	100.0	81.4
1999.	34173.	34173.	752.	621.	130.	100.0	82.6
2000.	39526.	39526.	637.	492.	146.	100.0	77.1
2001.	31179.	31179.	613.	542.	70.	100.0	88.5
2002.	32519.	32519.	719.	615.	104.	100.0	85.5
2003.	37014.	37014.	733.	598.	135.	100.0	81.6
2004.	44362.	44362.	747.	614.	133.	100.0	82.2
2005.	31945.	31622.	572.	429.	142.	99.0	75.1

HD 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	458.	72.	98.4	86.3
1972.	37059.	34516.	718.	632.	65.	93.1	88.0
1973.	37144.	37144.	758.	682.	75.	100.0	90.0
1974.	37926.	37573.	807.	751.	53.	99.1	93.0
1975.	32184.	32113.	692.	614.	78.	99.8	88.7
1976.	47898.	47267.	870.	787.	75.	98.7	90.5
1977.	51280.	50501.	837.	706.	124.	98.5	84.4
1978.	40993.	40993.	802.	707.	95.	100.0	88.2
1979.	49045.	48528.	905.	812.	89.	98.9	89.7
1980.	39477.	39477.	865.	772.	93.	100.0	89.2
1981.	54567.	54567.	954.	887.	67.	100.0	92.9
1982.	38467.	38467.	784.	728.	56.	100.0	92.9
1983.	50771.	50539.	1001.	899.	99.	99.5	89.8
1984.	40820.	40820.	769.	686.	83.	100.0	89.3
1985.	35563.	35563.	765.	702.	63.	100.0	91.8
1986.	51933.	51933.	1042.	963.	80.	100.0	92.4
1987.	53696.	53382.	1043.	945.	97.	99.4	90.6
1988.	42860.	42860.	875.	804.	71.	100.0	91.9
1989.	47410.	47410.	834.	775.	59.	100.0	92.9
1990.	53759.	53746.	1072.	1000.	73.	100.0	93.2
1991.	50371.	50371.	995.	908.	87.	100.0	91.3
1992.	64030.	64030.	1145.	1018.	127.	100.0	88.9
1993.	43493.	43493.	987.	921.	66.	100.0	93.3
1994.	46460.	45744.	803.	692.	104.	98.5	86.2
1995.	54170.	54074.	957.	839.	116.	99.8	87.7
1998.	13888.	13888.	381.	337.	44.	100.0	88.3
1999.	34173.	34173.	752.	669.	82.	100.0	89.0
2000.	39526.	39526.	637.	544.	94.	100.0	85.3
2001.	31179.	31179.	613.	577.	35.	100.0	94.2
2002.	32519.	32519.	719.	661.	58.	100.0	92.0
2003.	37014.	37014.	733.	647.	86.	100.0	88.3
2004.	44362.	44362.	747.	667.	80.	100.0	89.3
2005.	31945.	31622.	572.	474.	97.	99.0	83.0

HD 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	484.	47.	98.4	91.1
1972.	37059.	34516.	718.	663.	34.	93.1	92.3
1973.	37144.	37144.	758.	711.	47.	100.0	93.8
1974.	37926.	37573.	807.	778.	26.	99.1	96.3
1975.	32184.	32113.	692.	645.	46.	99.8	93.3
1976.	47898.	47267.	870.	818.	45.	98.7	94.1
1977.	51280.	50501.	837.	751.	79.	98.5	89.7
1978.	40993.	40993.	802.	738.	64.	100.0	92.0
1979.	49045.	48528.	905.	841.	60.	98.9	92.9
1980.	39477.	39477.	865.	805.	60.	100.0	93.1
1981.	54567.	54567.	954.	923.	31.	100.0	96.8
1982.	38467.	38467.	784.	759.	24.	100.0	96.9
1983.	50771.	50539.	1001.	942.	56.	99.5	94.1
1984.	40820.	40820.	769.	722.	47.	100.0	93.9
1985.	35563.	35563.	765.	732.	33.	100.0	95.7
1986.	51933.	51933.	1042.	999.	43.	100.0	95.9
1987.	53696.	53382.	1043.	981.	61.	99.4	94.0
1988.	42860.	42860.	875.	835.	39.	100.0	95.5
1989.	47410.	47410.	834.	800.	35.	100.0	95.9
1990.	53759.	53746.	1072.	1029.	44.	100.0	95.9
1991.	50371.	50371.	995.	942.	53.	100.0	94.7
1992.	64030.	64030.	1145.	1061.	85.	100.0	92.6
1993.	43493.	43493.	987.	952.	35.	100.0	96.4
1994.	46460.	45744.	803.	731.	64.	98.5	91.1
1995.	54170.	54074.	957.	878.	78.	99.8	91.7
1998.	13888.	13888.	381.	354.	27.	100.0	92.9
1999.	34173.	34173.	752.	707.	45.	100.0	94.1
2000.	39526.	39526.	637.	572.	66.	100.0	89.7
2001.	31179.	31179.	613.	594.	19.	100.0	97.0
2002.	32519.	32519.	719.	687.	32.	100.0	95.5
2003.	37014.	37014.	733.	678.	55.	100.0	92.5
2004.	44362.	44362.	747.	703.	44.	100.0	94.1
2005.	31945.	31622.	572.	511.	60.	99.0	89.3

HD 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	28865.	28395.	531.	498.	33.	98.4	93.7
1972.	37059.	34516.	718.	677.	19.	93.1	94.3
1973.	37144.	37144.	758.	730.	28.	100.0	96.3
1974.	37926.	37573.	807.	788.	15.	99.1	97.6
1975.	32184.	32113.	692.	662.	30.	99.8	95.7
1976.	47898.	47267.	870.	834.	29.	98.7	95.9
1977.	51280.	50501.	837.	779.	51.	98.5	93.0
1978.	40993.	40993.	802.	765.	37.	100.0	95.4
1979.	49045.	48528.	905.	860.	41.	98.9	95.1
1980.	39477.	39477.	865.	826.	39.	100.0	95.5
1981.	54567.	54567.	954.	937.	17.	100.0	98.2
1982.	38467.	38467.	784.	773.	11.	100.0	98.6
1983.	50771.	50539.	1001.	963.	35.	99.5	96.1
1984.	40820.	40820.	769.	745.	24.	100.0	96.9
1985.	35563.	35563.	765.	748.	16.	100.0	97.9
1986.	51933.	51933.	1042.	1016.	26.	100.0	97.5
1987.	53696.	53382.	1043.	1006.	35.	99.4	96.4
1988.	42860.	42860.	875.	852.	23.	100.0	97.4
1989.	47410.	47410.	834.	808.	26.	100.0	96.8
1990.	53759.	53746.	1072.	1044.	28.	100.0	97.4
1991.	50371.	50371.	995.	960.	35.	100.0	96.5
1992.	64030.	64030.	1145.	1086.	59.	100.0	94.8
1993.	43493.	43493.	987.	969.	18.	100.0	98.2
1994.	46460.	45744.	803.	746.	50.	98.5	93.0
1995.	54170.	54074.	957.	898.	57.	99.8	93.8
1998.	13888.	13888.	381.	365.	16.	100.0	95.8
1999.	34173.	34173.	752.	723.	29.	100.0	96.2
2000.	39526.	39526.	637.	595.	42.	100.0	93.3
2001.	31179.	31179.	613.	604.	8.	100.0	98.6
2002.	32519.	32519.	719.	702.	17.	100.0	97.7
2003.	37014.	37014.	733.	701.	31.	100.0	95.7
2004.	44362.	44362.	747.	727.	20.	100.0	97.4
2005.	31945.	31622.	572.	532.	39.	99.0	93.1

```
**************************************************
*  Summary of Quantity and Quality Results at      *
*  Location        200  INFlow in cms.              *
*  Values are instantaneous at indicated time step *
**************************************************
     Date     Time        Flow   Total Su
 Mo/Da/Year  Hr:Min        cum/s  mg/l
 ----------  -------    -------  --------
Flow wtd means.....         0.001      116.
Flow wtd std devs..         0.005       68.
Maximum value......         0.812      290.
Minimum value......         0.000        0.
Total loads........      232451.    26959.
                        Cub-Met  KILOGRAM
===> Runoff simulation ended normally.
===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.
**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... September   8, 2023               *
*          Time...          11:34:22.479             *
*   Ending Date... September   8, 2023               *
*          Time...          11:34:25.660             *
*  Elapsed Time...                0.053 minutes.     *
*  Elapsed Time...                3.181 seconds.     *
**************************************************
```

BLOCK A05

```
         ************************************************
         *      Storm Water Management Sizing Model     *
         *               Hydroworks, LLC                *
         *                Version 4.4                   *
         *                                              *
         *        Continuous Simulation Program         *
         *              Based on SWMM 4.4H              *
         *              Hydroworks, LLC                 *
         *               Graham Bryant                  *
         *                2003 - 2021                   *
         ************************************************

                          Developed by

         ************************************************
         *               Hydroworks, LLC                *
         *             Metcalf & Eddy, Inc.             *
         *           University of Florida              *
         *       Water Resources Engineers, Inc.        *
         *      (Now Camp Dresser & McKee, Inc.)        *
         *              Modified SWMM 4.4               *
         ************************************************

                  Distributed and Maintained by

         ************************************************
         *                                              *
         *                Hydroworks, LLC               *
         *                 888-290-7900                 *
         *              www.hydroworks.com              *
         *                                              *
         ************************************************

         ************************************************
         *     If any problems occur executing this     *
         *     model, contact Mr. Graham Bryant at      *
         *     Hydroworks, LLC by phone at 908-272-4411 *
         *     or by e-mail: support@hydroworks.com     *
         ************************************************

         ************************************************
         *     This model is based on EPA SWMM 4.4      *
         *  "Nature is full of infinite causes which    *
         *   have never occurred in experience" da Vinci *
         ************************************************

************************************************
* Entry made to the Rain Block                 *
* Created by the University of Florida - 1988  *
* Updated by Oregon State University, March 2000 *
************************************************

         Riverfront Community (Phase 2)
         City of Niagara Falls

     ########################################
     #  Precipitation Block Input Commands  #
     ########################################
    Station Name.........................  St. Catherines A
    Station Location.....................  Ontario
    Station, ISTA........................    7287
    Beginning date, IYBEG (Yr/Mo/Dy)......  1971/ 1/ 1
    Ending date, IYEND (Yr/Mo/Dy).........  2005/12/31
    Minimum interevent time, MIT..........     1
    Number of ranked storms, NPTS.........    10
    NWS format, IFORM (See text)..........     1
    Print storm summary, ISUM (O-No 1-Yes)     0
    Print all rainfall, IYEAR (O-No 1-Yes)     0
    Save storm event data on NSCRAT(1)....     0
    (IFILE =0 -Do not save, =1 -Save data)
    IDECID 0 - Create interface file
           1 - Create file and analyze
           2 - Synoptic analysis..........     2
    Plotting position parameter, A........  0.40
    Storm event statistics, NOSTAT........  1100
    KODEA (from optional group B0)........     2
     = 0, Do not include NCDC cumulative values.
     = 1, Average NCDC cumulative values.
     = 2, Use NCDC cumulative value as inst. rain.
    KODEPR (from optional group B0).......     0
     Print NCDC special codes in event summary:
     = 0, only on days with events.
     = 1, on all days with codes present.
     Codes: A = accumulated value, I = incomplete value,
            M = missing value,     O = other code present

*****************************************************
*  Precipitation output created using the Rain block   *
*  Number of precipitation stations...        1        *
*****************************************************
Location Station Number
-------- --------------
       1.     7287
STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.
```

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins       #
#####################################################
Snowmelt parameter - ISNOW.....................          0
Number of rain gages - NRGAG...................          1
Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.
Quality is simulated - KWALTY..................          1
IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.
Read evaporation data on line(s) F1 (F2) - IVAP..          1
Hour of day at start of storm - NHR............          1
Minute of hour at start of storm - NMN.........          1
Time TZERO at start of storm (hours)...........      1.017
Use Metric units for I/O - METRIC..............          1
 ===> Ft-sec units used in all internal computations
Runoff input print control...                             0
Runoff graph plot control....                             1
Runoff output print control..                             0
Print headers every 50 lines - NOHEAD (0=yes, 1=no)       0
Print land use load percentages -LANDUPR (0=no, 1=yes)    0
Limit number of groundwater convergence messages to 10000 (if simulated)
Month, day, year of start of storm is:             1/ 1/1971
Wet time step length (seconds).......                  300.
Dry time step length (seconds).......                  900.
Wet/Dry time step length (seconds)...                  450.
Simulation length is......                      20051231.0 Yr/Mo/Dy
Percent of impervious area with zero detention depth    25.0
Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ........................................   0.01000

*******************************************************
*   Processed Precipitation will be read from file    *
*******************************************************
  ##############################
  #        Data Group F1       #
  # Evaporation Rate (mm/day)  #
  ##############################
 JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV.  DEC.
 ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----
 0.00  0.00  0.00  2.54  2.54  3.81  3.81  3.81  2.54  2.54  0.00  0.00

*******************************************************
*        C H A N N E L  A N D  P I P E  D A T A        *
*******************************************************
Input   NAMEG:     Drains                          Invert  L Side   R Side  Intial     Max  Mann-   Full
equen  Channel      to     Channel  Width  Length    Slope   Slope    Slope   Depth   Depth   ings   Flow
umber    ID #      NGTO:    Type     (m)    (m)     (m/m)   (m/m)    (m/m)     (m)     (m)    "N"   (cms)
-----  ------------------ -------- ------ -------   ------- -------- ------- ------- ------- -----  -----
  1        201        200   Dummy     0.0     0.0    0.0000   0.0000  0.0000     0.0     0.0  0.0000 0.00E+00

 ************************************************
 *          S U B C A T C H M E N T  D A T A     *
 ************************************************
*NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS*
      SUBCATCH-  CHANNEL      WIDTH    AREA  PERCENT    SLOPE    RESISTANCE  FACTOR    DEPRES. STORAGE(MM) INFILTRATION   DECAY RATE GAGE  MAXIMUM
       MENT NO.  OR INLET       (M)    (HA)  IMPERV.    (M/M)     IMPERV.     PERV.    IMPERV.     PERV.      RATE(MM/HR)    (1/SEC)    NO.  VOLUME
                                                                                                            MAXIMUM MINIMUM                      (MM)
 ---  --------   -------- --------- --------  -----   -------    -------  --------    ------     ------     ----   -------  --------  ------ -------
  1        300        200    100.99     1.02  85.00    0.0200      0.015     0.250     0.510     5.080    63.50   10.16    0.00055     1  101.60000
TOTAL NUMBER OF SUBCATCHMENTS...              1
TOTAL TRIBUTARY AREA (HECTARES).           1.02
IMPERVIOUS AREA (HECTARES)......           0.87
PERVIOUS AREA (HECTARES)........           0.15
TOTAL WIDTH (METERS)............         100.99
PERCENT IMPERVIOUSNESS..........          85.00

*******************************************************
*      G R O U N D W A T E R   I N P U T   D A T A    *
*******************************************************
    SUB-     CHANNEL     ========== E L E V A T I O N S ========  =========== F L O W   C O N S T A N T S ============
    CATCH         OR      GROUND  BOTTOM   STAGE     BC      TW       A1         B1        A2         B2        A3
    NUMBER     INLET        (M)     (M)      (M)     (M)     (M) (MM/HR-M^B1)         (MM/HR-M^B2)         (MM/HR-M^2)
    ------     -----     -------  ------  ------  ------  ------ -----------  ------- -----------  -------  -----------
         0       602        3.05    0.00    0.00    0.61    0.61   3.484E-04    2.600   0.000E+00    1.000    0.00E+00
```

```
*********************************************************
* G R O U N D W A T E R   I N P U T   D A T A (CONTINUED) *
*********************************************************
              S O I L   P R O P E R T I E S
                    SATURATED                                        PERCOLATION     E T  P A R A M E T E R S
      SUBCAT.         HYDRAULIC  WILTING  FIELD   INITIAL     MAX. DEEP   PARAMETERS         DEPTH  FRACTION OF ET
      NO.   POROSITY CONDUCTIVITY  POINT  CAPACITY MOISTURE  PERCOLATION   HCO     PCO        OF ET  TO UPPER ZONE
                      (mm/hr)                                 (mm/hr)                        (m)
     ----   ------     -------    ------  ------   ------    ----------  ------  ------     ------      ------
        0    .4000     127.000     .1500   .3000    .3000     5.080E-02   10.00    4.57       4.27       0.350

*********************************************************
*    Arrangement of Subcatchments and Channel/Pipes     *
*********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
*********************************************************
   Channel
   or Pipe
       201     No Tributary Channel/Pipes
               No Tributary Subareas.....
    INLET
       200     Tributary Channel/Pipes...        201
               Tributary Subareas........        300

*********************************************************
* Hydrographs will be stored for the following   1 INLETS *
*********************************************************
          200

#####################################################
#              Quality Simulation                   #
#####################################################
#      General Quality Control Data Groups          #
#####################################################
 Description                          Variable       Value
 -----------                          --------       -----
 Number of quality constituents.....    NQS.......         1
 Number of land uses.................  JLAND.......         1
 Standard catchbasin volume.........  CBVOL.......      1.22 cubic meters
 Erosion is not simulated.........    IROS.......         0
 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......      3.00 DAYS
 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......      5.00 DAYS
 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......     0.300
 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS.................... KLNBGN.......       120
 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS..................... KLNEND.......       270

#############################################
#     Land use data on data group J2      #
#############################################
                                                      LIMITING                          CLEANING  AVAIL.    DAYS SINCE
                                                      BUILDUP    BUILDUP  BUILDUP   INTERVAL  FACTOR       LAST
AND USE   BUILDUP EQUATION TYPE   FUNCTIONAL DEPENDENCE OF   QUANTITY   POWER    COEFF.   IN DAYS   FRACTION   SWEEPING
LNAME)            (METHOD)        BUILDUP PARAMETER(JACGUT)  (DDLIM)    (DDPOW)  (DDFACT)  (CLFREQ)  (AVSWP)    (DSLCL)
-------   --------------------   -------------------------  --------   -------  --------  --------  -------    ---------
Urban De  EXPONENTIAL(1)                 AREA(1)           2.802E+01     0.500    67.250    30.000     0.300    30.000

#############################################
#     Constituent data on data group J3     #
#############################################
                              Total Su
                              --------
Constituent units........      mg/l
Type of units............           0
KALC.....................           2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH....................           0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT...................           1
Dependence of buildup....         AREA(1)
LINKUP...................           0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).         28.020
Buildup param 2 (QFACT2).          0.500
Buildup param 3 (QFACT3).         67.250
Buildup param 4 (QFACT4).          0.000
Buildup param 5 (QFACT5).          0.000
Washoff power (WASHPO)...          1.100
Washoff coef. (RCOEF)....          0.086
Init catchb conc (CBFACT)        100.000
Precip. conc. (CONCRN)...          0.000
Street sweep effic (REFF)          0.300
Remove fraction (REMOVE).          0.000
1st order QDECAY, 1/day..          0.000
Land use number..........              1

*********************************************
* Constant Groundwater Quality Concentration(s) *
*********************************************
 Total Susp has a concentration of..    0.0000   mg/l
```

```
**********************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                *
**********************************************
  CHANNEL/   CONSTITUENT
     PIPE Total Susp
----------  --------
       201     0.000

*****************************************************
*     Subcatchment surface quality on data group L1 *
*****************************************************
                                Total   Number   Input
                          Land    Gutter     of    Loading
                Land      Use    Length   Catch-  load/ha
           No.  Usage     No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.20     2.00  0.0E+00
   Totals (Loads in kg or other)    0.20     2.00  0.0E+00

    **********************
    *    DATA GROUP M1    *
    **********************
TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES.....               0        0

    **********************
    *    DATA GROUP M3    *
    **********************
CHANNEL/INLET PRINT DATA GROUPS......       -200

          ****************************************
          * Rainfall from Nat. Weather Serv. file  *
          * in units of hundredths of an inch      *
          ****************************************
Rainfall Station    St. Catherines A
State/Province      Ontario
Rainfall Depth Summary (mm)
Year     Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Total
1971.     31.    0.    0.    0.    0.    0.  126.   93.   52.   60.   29.    0.    391.
1972.      0.    0.    0.   47.   65.  100.   39.  115.   63.   90.    1.    0.    521.
1973.      0.    0.    0.  103.   77.   71.   53.   29.   63.  139.    0.    0.    534.
1974.      0.    0.    0.   67.  105.   62.   50.   31.   74.   37.  110.    0.    536.
1975.      0.    0.    0.    0.    0.   94.   78.   76.   73.   56.   59.    6.    442.
1976.      0.    0.    0.  119.  136.   87.  101.   60.   72.   73.   13.    1.    662.
1977.      0.    0.    0.   94.   29.   69.   57.  150.  230.   71.    0.    1.    701.
1978.      0.    0.    0.   72.   43.   72.   43.   86.  156.   95.    0.    0.    567.
1979.      0.    0.    0.   84.   92.   33.   91.   88.   84.  129.   71.    0.    673.
1980.      0.    0.    0.   81.   39.  122.   60.   32.   79.   96.   45.    0.    554.
1981.      0.    0.    0.   91.   71.  106.  122.   61.  123.   91.   84.    0.    749.
1982.      0.    0.    0.   28.   65.   97.   36.   66.   82.   25.  143.    0.    544.
1983.      0.    0.    0.   78.  100.   65.   55.  106.   75.  122.   92.    0.    694.
1984.      0.    0.    0.   31.  113.  136.   19.   51.  144.   24.   44.    0.    562.
1985.      0.    0.   67.   32.   52.   64.   40.   94.   42.  109.    0.    1.    501.
1986.      0.    0.    0.   93.  113.   60.   85.   83.   98.   80.   43.   65.    719.
1987.      0.    2.   11.   77.   42.   80.  122.   97.   99.   71.   94.   34.    730.
1988.      0.    0.   41.   71.   42.   21.  110.   82.   70.   68.   75.    5.    585.
1989.      0.    0.   13.   63.  137.  108.   36.   45.   89.   73.   84.    0.    647.
1990.      0.    2.   38.   99.  124.   44.   68.   95.   56.  112.   96.    0.    735.
1991.      0.    0.   86.  124.   67.   31.   85.   57.   79.   64.   61.   28.    682.
1992.      0.    0.   29.  127.   56.   92.  185.  116.   77.   47.  103.   38.    869.
1993.      3.    0.    7.   83.   56.   86.   32.   61.   71.   92.   80.   38.    610.
1994.      0.    0.   44.   88.  105.  124.   48.   77.  117.   15.    0.   15.    633.
1995.    112.   23.   16.   48.   37.   60.  123.   66.    8.  137.   94.    0.    724.
1998.      0.    0.    0.    0.   51.   54.   64.   29.    9.    0.    1.    0.    207.
1999.      0.    0.    0.   79.   59.   35.   61.   58.  116.   78.    0.    0.    487.
2000.      0.    0.    0.  123.  134.  216.   51.    0.    0.    0.   10.    0.    534.
2001.      0.    0.    0.   56.   88.   45.   25.   30.   81.  129.    0.    0.    454.
2002.      0.    0.    0.   73.  104.   64.   53.   49.   52.   65.    8.    0.    468.
2003.      0.    0.    0.   10.  163.   77.   81.   64.   67.   73.    2.    0.    537.
2004.      0.    0.    0.  131.  126.   99.  115.   40.   88.   17.    0.    0.    616.
2005.      0.    0.    0.   38.   42.   78.   53.  120.  112.    0.    0.    0.    443.
Total Rainfall Depth for Simulation Period    19310. (mm)

Rainfall Intensity Analysis (mm/hr)
(mm/hr)   (#)       (%)      (mm)       (%)
  2.50  21481      74.6     6454.      33.4
  5.00   3585      12.4     3088.      16.0
  7.50   1973       6.8     2886.      14.9
 10.00    575       2.0     1233.       6.4
 12.50    389       1.4     1070.       5.5
 15.00    194       0.7      660.       3.4
 17.50    210       0.7      846.       4.4
 20.00     66       0.2      306.       1.6
 22.50     92       0.3      487.       2.5
 25.00     39       0.1      232.       1.2
 27.50     37       0.1      246.       1.3
 30.00     34       0.1      245.       1.3
 32.50     29       0.1      228.       1.2
 35.00      5       0.0       42.       0.2
 37.50     10       0.0       90.       0.5
 40.00     10       0.0       97.       0.5
 42.50     12       0.0      124.       0.6
 45.00      9       0.0       99.       0.5
 47.50      1       0.0       12.       0.1
 50.00      3       0.0       37.       0.2
>50.00     49       0.2      829.       4.3
Total # of Intensities  28803
```

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

****
* End of time step DO-loop in Runoff *
****

Final Date (Mo/Day/Year) =	12/31/2005	
Total number of time steps =	2056499	
Final Julian Date =	2005365	
Final time of day =	86399.	seconds.
Final time of day =	24.00	hours.
Final running time =	306816.0000	hours.
Final running time =	12784.0000	days.

****
* Extrapolation Summary for Watersheds *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls *
****

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6266562	1600654						

****
* Extrapolation Summary for Channel/Pipes *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls *
****

Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls
201	0	0						

****
* Continuity Check for Surface Water *
****

	cubic meters	Millimeters over Total Basin
Total Precipitation (Rain plus Snow)	196476.	19263.
Total Infiltration	29299.	2872.
Total Evaporation	17654.	1731.
Surface Runoff from Watersheds	150715.	14776.
Total Water remaining in Surface Storage	0.	0.
Infiltration over the Pervious Area...	29299.	19150.

Infiltration + Evaporation + Surface Runoff + Snow removal + Water remaining in Surface Storage + Water remaining in Snow Cover.....	197668.	19380.
Total Precipitation + Initial Storage.	196476.	19263.

The error in continuity is calculated as

****
* Precipitation + Initial Snow Cover *
* - Infiltration - *
*Evaporation - Snow removal - *
*Surface Runoff from Watersheds - *
*Water in Surface Storage - *
*Water remaining in Snow Cover *
----
* Precipitation + Initial Snow Cover *
****

Error..... -0.606 Percent

****
* Continuity Check for Channel/Pipes *
****

	cubic meters	Millimeters over Total Basin
Initial Channel/Pipe Storage.....	0.	0.
Final Channel/Pipe Storage.....	0.	0.
Surface Runoff from Watersheds.....	150715.	14776.
Baseflow.....	0.	
Groundwater Subsurface Inflow.....	0.	0.
Evaporation Loss from Channels.....	0.	0.
Channel/Pipe/Inlet Outflow.....	150715.	14776.
Initial Storage + Inflow.....	150715.	14776.
Final Storage + Outflow.....	150715.	14776.

```
*******************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
*******************************************
Error.....................................      0.000 Percent

************************************************
*     Continuity Check for Subsurface Water    *
************************************************
                                                                 Millimeters over
                                                cubic meters     Subsurface Basin
Total Infiltration                                        0.          0.
Total Upper Zone ET                                       0.          0.
Total Lower Zone ET                                       0.          0.
Total Groundwater flow                                    0.          0.
Total Deep percolation                                    0.          0.
Initial Subsurface Storage                             9327.        914.
Final Subsurface Storage                               9327.        914.
Upper Zone ET over Pervious Area                          0.          0.
Lower Zone ET over Pervious Area                          0.          0.

***************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
***************************************
Error ....................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	PERVIOUS AREA: TOTAL SIMULATED RAINFALL DEPTH (MM)	PERVIOUS AREA: TOTAL RUNOFF LOSSES (MM)	PERVIOUS AREA: PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA: RUNOFF DEPTH (MM)	IMPERVIOUS AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: PEAK UNIT RUNOFF (MM/HR)
300	200	1.02	85.01	9262.47	116.135********	0.05717	360.086	0.472	14773.493	0.528	188.001

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				0.53				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

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 ######################################################
 #             Runoff Quality Summary Page            #
 # If NDIM = 0 Units for:   loads    mass rates      #
 #             METRIC = 1    lb        lb/sec        #
 #             METRIC = 2    kg        kg/sec        #
 # If NDIM = 1 Loads are in units of quantity        #
 #             and mass rates are quantity/sec       #
 # If NDIM = 2 loads are in units of concentration   #
 #             times volume and mass rates have units#
 #             of concentration times volume/second  #
 ######################################################
Total Su NDIM =  0
METRIC =  2
                        Total Su
                        --------
Inputs
------
 1. INITIAL SURFACE LOAD........       22.
 2. TOTAL SURFACE BUILDUP.......    19051.
 3. INITIAL CATCHBASIN LOAD.....        0.
 4. TOTAL CATCHBASIN LOAD.......        0.
 5. TOTAL CATCHBASIN AND
    SURFACE BUILDUP (2+4).......    19051.
Remaining Loads
---------------
 6. LOAD REMAINING ON SURFACE...        7.
 7. REMAINING IN CATCHBASINS....        0.
 8. REMAINING IN CHANNEL/PIPES..        0.
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Removals
----
 9. STREET SWEEPING REMOVAL.....   1484.
10. NET SURFACE BUILDUP (2-9)...   17567.
11. SURFACE WASHOFF.............   17556.
12. CATCHBASIN WASHOFF..........   0.
13. TOTAL WASHOFF (11+12).......   17556.
14. LOAD FROM OTHER CONSTITUENTS   0.
15. PRECIPITATION LOAD..........   0.
15a.SUM SURFACE LOAD (13+14+15).   17556.
16. TOTAL GROUNDWATER LOAD......   0.
16a.TOTAL I/I LOAD..............   0.
17. NET SUBCATCHMENT LOAD
    (15a-15b-15c-15d+16+16a)....   17556.
>>Removal in channel/pipes (17a, 17b):
17a.REMOVE BY BMP FRACTION......   0.
17b.REMOVE BY 1st ORDER DECAY...   0.
18. TOTAL LOAD TO INLETS........   17556.
19. FLOW WT'D AVE.CONCENTRATION mg/l
    (INLET LOAD/TOTAL FLOW).....   117.
Percentages
----
20. STREET SWEEPING (9/2).......   8.
21. SURFACE WASHOFF (11/2)......   92.
22. NET SURFACE WASHOFF(11/10)..   100.
23. WASHOFF/SUBCAT LOAD(11/17)..   100.
24. SURFACE WASHOFF/INLET LOAD
    (11/18).....................   100.
25. CATCHBASIN WASHOFF/
    SUBCATCHMENT LOAD (12/17)...   0.
26. CATCHBASIN WASHOFF/
    INLET LOAD (12/18)..........   0.
27. OTHER CONSTITUENT LOAD/
    SUBCATCHMENT LOAD (14/17)...   0.
28. INSOLUBLE FRACTION/
    INLET LOAD (14/18)..........   0.
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)...   0.
30. PRECIPITATION/
    INLET LOAD (15/18)..........   0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)...   0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18)..........   0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17)..   0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........   0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..   0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..   0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....   0.

CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals. Buildup is only performed at beginning of
wet steps or for street cleaning.

****
*   TSS Particle Size Distribution   *
****
   Diameter   %   Specific   Settling Velocity   Critical Peclet
     (um)   Gravity   (m/s)   Number
      20.   20.0   2.65   0.000267   0.080977
      30.   10.0   2.65   0.000597   0.104277
      50.   10.0   2.65   0.001629   0.143403
     100.   20.0   2.65   0.006044   0.220958
     250.   20.0   2.65   0.026615   0.391296
    1000.   20.0   2.65   0.111334   0.928988

****
*   *
*   Summary of TSS Removal   *
*   *
****
TSS Removal based on Lab Performance Curve
 Model   Low Q Treated High Q Treated   Runoff Treated   TSS Removed
   #   (cms)   (cms)   (%)   (%)
 HD 4   0.150   0.150   99.4   77.8
 HD 5   0.150   0.150   99.4   83.7
 HD 6   0.150   0.150   99.4   87.8
 HD 8   0.150   0.150   99.4   93.3
 HD 10   0.150   0.150   99.4   96.1
 HD 12   0.150   0.150   99.4   97.8

****
* Summary of Annual Flow Treatmnet & TSS Removal *
****

HD 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	253.	93.	98.0	73.1
1972.	24045.	22297.	468.	353.	99.	92.7	75.6
1973.	24094.	24094.	494.	381.	112.	100.0	77.3
1974.	24603.	24336.	527.	434.	90.	98.9	82.3
1975.	20859.	20771.	451.	337.	113.	99.6	74.8
1976.	31048.	30560.	566.	442.	118.	98.4	78.1
1977.	33245.	32661.	544.	378.	161.	98.2	69.4
1978.	26573.	26573.	522.	391.	131.	100.0	74.9
1979.	31792.	31392.	591.	468.	120.	98.7	79.2
1980.	25605.	25605.	563.	436.	128.	100.0	77.4
1981.	35365.	35365.	622.	503.	119.	100.0	80.9
1982.	24930.	24930.	511.	411.	100.	100.0	80.5
1983.	32898.	32712.	652.	509.	141.	99.4	78.0
1984.	26463.	26463.	501.	384.	117.	100.0	76.7
1985.	23066.	23066.	499.	392.	106.	100.0	78.7
1986.	33662.	33662.	677.	542.	135.	100.0	80.0
1987.	34799.	34560.	679.	544.	135.	99.3	80.0
1988.	27779.	27779.	570.	464.	106.	100.0	81.4
1989.	30707.	30707.	544.	445.	99.	100.0	81.7
1990.	34818.	34796.	698.	573.	125.	99.9	82.1
1991.	32626.	32626.	650.	520.	130.	100.0	80.0
1992.	41473.	41473.	745.	568.	177.	100.0	76.2
1993.	28194.	28194.	645.	539.	106.	100.0	83.5
1994.	30118.	29551.	524.	389.	130.	98.1	74.2
1995.	35084.	34950.	624.	469.	153.	99.6	75.1
1998.	9039.	9039.	247.	185.	62.	100.0	74.8
1999.	22177.	22177.	490.	371.	119.	100.0	75.7
2000.	25603.	25603.	415.	294.	121.	100.0	70.8
2001.	20227.	20227.	400.	332.	67.	100.0	83.2
2002.	21106.	21106.	468.	377.	92.	100.0	80.4
2003.	24017.	24017.	478.	362.	116.	100.0	75.8
2004.	28762.	28762.	487.	370.	116.	100.0	76.1
2005.	20730.	20455.	372.	253.	118.	98.7	68.0

HD 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	278.	68.	98.0	80.3
1972.	24045.	22297.	468.	381.	72.	92.7	81.4
1973.	24094.	24094.	494.	414.	80.	100.0	83.8
1974.	24603.	24336.	527.	463.	62.	98.9	87.7
1975.	20859.	20771.	451.	367.	83.	99.6	81.4
1976.	31048.	30560.	566.	476.	83.	98.4	84.2
1977.	33245.	32661.	544.	420.	119.	98.2	77.1
1978.	26573.	26573.	522.	419.	102.	100.0	80.4
1979.	31792.	31392.	591.	495.	92.	98.7	83.9
1980.	25605.	25605.	563.	475.	89.	100.0	84.3
1981.	35365.	35365.	622.	539.	83.	100.0	86.7
1982.	24930.	24930.	511.	441.	69.	100.0	86.4
1983.	32898.	32712.	652.	546.	104.	99.4	83.7
1984.	26463.	26463.	501.	413.	88.	100.0	82.4
1985.	23066.	23066.	499.	419.	79.	100.0	84.1
1986.	33662.	33662.	677.	580.	97.	100.0	85.7
1987.	34799.	34560.	679.	578.	100.	99.3	85.1
1988.	27779.	27779.	570.	491.	79.	100.0	86.2
1989.	30707.	30707.	544.	476.	69.	100.0	87.4
1990.	34818.	34796.	698.	611.	87.	99.9	87.5
1991.	32626.	32626.	650.	556.	94.	100.0	85.5
1992.	41473.	41473.	745.	617.	128.	100.0	82.8
1993.	28194.	28194.	645.	568.	77.	100.0	88.1
1994.	30118.	29551.	524.	424.	95.	98.1	80.9
1995.	35084.	34950.	624.	509.	112.	99.6	81.7
1998.	9039.	9039.	247.	201.	46.	100.0	81.4
1999.	22177.	22177.	490.	405.	85.	100.0	82.6
2000.	25603.	25603.	415.	320.	95.	100.0	77.1
2001.	20227.	20227.	400.	355.	45.	100.0	88.7
2002.	21106.	21106.	468.	400.	69.	100.0	85.3
2003.	24017.	24017.	478.	390.	88.	100.0	81.5
2004.	28762.	28762.	487.	400.	87.	100.0	82.2
2005.	20730.	20455.	372.	283.	88.	98.7	76.1

HD 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	290.	56.	98.0	83.7
1972.	24045.	22297.	468.	401.	52.	92.7	85.8
1973.	24094.	24094.	494.	433.	61.	100.0	87.7
1974.	24603.	24336.	527.	481.	43.	98.9	91.2
1975.	20859.	20771.	451.	389.	61.	99.6	86.3
1976.	31048.	30560.	566.	501.	59.	98.4	88.5
1977.	33245.	32661.	544.	445.	93.	98.2	81.8
1978.	26573.	26573.	522.	444.	77.	100.0	85.2
1979.	31792.	31392.	591.	516.	71.	98.7	87.4
1980.	25605.	25605.	563.	491.	72.	100.0	87.2
1981.	35365.	35365.	622.	567.	55.	100.0	91.1
1982.	24930.	24930.	511.	463.	48.	100.0	90.6
1983.	32898.	32712.	652.	573.	77.	99.4	87.8
1984.	26463.	26463.	501.	437.	65.	100.0	87.1
1985.	23066.	23066.	499.	444.	54.	100.0	89.1
1986.	33662.	33662.	677.	610.	67.	100.0	90.2
1987.	34799.	34560.	679.	603.	75.	99.3	88.8
1988.	27779.	27779.	570.	513.	57.	100.0	90.0
1989.	30707.	30707.	544.	496.	48.	100.0	91.2
1990.	34818.	34796.	698.	634.	63.	99.9	90.9
1991.	32626.	32626.	650.	581.	69.	100.0	89.4
1992.	41473.	41473.	745.	646.	99.	100.0	86.7
1993.	28194.	28194.	645.	589.	56.	100.0	91.3
1994.	30118.	29551.	524.	442.	77.	98.1	84.4
1995.	35084.	34950.	624.	530.	92.	99.6	85.0
1998.	9039.	9039.	247.	213.	34.	100.0	86.1
1999.	22177.	22177.	490.	423.	67.	100.0	86.3
2000.	25603.	25603.	415.	342.	72.	100.0	82.5
2001.	20227.	20227.	400.	369.	31.	100.0	92.3
2002.	21106.	21106.	468.	420.	49.	100.0	89.6
2003.	24017.	24017.	478.	410.	68.	100.0	85.8
2004.	28762.	28762.	487.	422.	65.	100.0	86.7
2005.	20730.	20455.	372.	299.	72.	98.7	80.4

HD 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	313.	33.	98.0	90.5
1972.	24045.	22297.	468.	428.	25.	92.7	91.5
1973.	24094.	24094.	494.	460.	34.	100.0	93.2
1974.	24603.	24336.	527.	506.	18.	98.9	96.0
1975.	20859.	20771.	451.	416.	34.	99.6	92.4
1976.	31048.	30560.	566.	529.	30.	98.4	93.5
1977.	33245.	32661.	544.	485.	54.	98.2	89.1
1978.	26573.	26573.	522.	476.	46.	100.0	91.2
1979.	31792.	31392.	591.	546.	41.	98.7	92.4
1980.	25605.	25605.	563.	521.	42.	100.0	92.5
1981.	35365.	35365.	622.	597.	25.	100.0	96.0
1982.	24930.	24930.	511.	492.	19.	100.0	96.3
1983.	32898.	32712.	652.	610.	39.	99.4	93.5
1984.	26463.	26463.	501.	466.	35.	100.0	92.9
1985.	23066.	23066.	499.	474.	25.	100.0	95.0
1986.	33662.	33662.	677.	646.	31.	100.0	95.4
1987.	34799.	34560.	679.	634.	44.	99.3	93.4
1988.	27779.	27779.	570.	541.	29.	100.0	94.9
1989.	30707.	30707.	544.	520.	24.	100.0	95.6
1990.	34818.	34796.	698.	666.	31.	99.9	95.4
1991.	32626.	32626.	650.	612.	37.	100.0	94.2
1992.	41473.	41473.	745.	686.	59.	100.0	92.1
1993.	28194.	28194.	645.	619.	26.	100.0	95.9
1994.	30118.	29551.	524.	475.	44.	98.1	90.7
1995.	35084.	34950.	624.	568.	53.	99.6	91.1
1998.	9039.	9039.	247.	227.	20.	100.0	91.9
1999.	22177.	22177.	490.	457.	33.	100.0	93.2
2000.	25603.	25603.	415.	369.	46.	100.0	89.0
2001.	20227.	20227.	400.	385.	14.	100.0	96.4
2002.	21106.	21106.	468.	444.	25.	100.0	94.7
2003.	24017.	24017.	478.	438.	40.	100.0	91.7
2004.	28762.	28762.	487.	454.	33.	100.0	93.3
2005.	20730.	20455.	372.	328.	43.	98.7	88.2

HD 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	323.	22.	98.0	93.5
1972.	24045.	22297.	468.	440.	13.	92.7	94.2
1973.	24094.	24094.	494.	476.	18.	100.0	96.4
1974.	24603.	24336.	527.	515.	10.	98.9	97.6
1975.	20859.	20771.	451.	430.	20.	99.6	95.5
1976.	31048.	30560.	566.	542.	18.	98.4	95.7
1977.	33245.	32661.	544.	505.	33.	98.2	92.8
1978.	26573.	26573.	522.	496.	25.	100.0	95.2
1979.	31792.	31392.	591.	562.	26.	98.7	95.1
1980.	25605.	25605.	563.	539.	25.	100.0	95.6
1981.	35365.	35365.	622.	611.	11.	100.0	98.2
1982.	24930.	24930.	511.	503.	8.	100.0	98.5
1983.	32898.	32712.	652.	627.	23.	99.4	96.0
1984.	26463.	26463.	501.	485.	16.	100.0	96.8
1985.	23066.	23066.	499.	488.	11.	100.0	97.8
1986.	33662.	33662.	677.	661.	16.	100.0	97.6
1987.	34799.	34560.	679.	655.	24.	99.3	96.4
1988.	27779.	27779.	570.	555.	15.	100.0	97.3
1989.	30707.	30707.	544.	527.	17.	100.0	96.9
1990.	34818.	34796.	698.	679.	18.	99.9	97.3
1991.	32626.	32626.	650.	627.	23.	100.0	96.5
1992.	41473.	41473.	745.	706.	39.	100.0	94.8
1993.	28194.	28194.	645.	633.	12.	100.0	98.1
1994.	30118.	29551.	524.	486.	33.	98.1	92.7
1995.	35084.	34950.	624.	584.	38.	99.6	93.6
1998.	9039.	9039.	247.	236.	11.	100.0	95.4
1999.	22177.	22177.	490.	472.	18.	100.0	96.3
2000.	25603.	25603.	415.	388.	27.	100.0	93.6
2001.	20227.	20227.	400.	394.	6.	100.0	98.5
2002.	21106.	21106.	468.	457.	11.	100.0	97.7
2003.	24017.	24017.	478.	456.	23.	100.0	95.3
2004.	28762.	28762.	487.	473.	14.	100.0	97.2
2005.	20730.	20455.	372.	345.	26.	98.7	92.8

HD 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	18718.	18345.	346.	330.	15.	98.0	95.6
1972.	24045.	22297.	468.	447.	6.	92.7	95.7
1973.	24094.	24094.	494.	485.	8.	100.0	98.3
1974.	24603.	24336.	527.	519.	5.	98.9	98.5
1975.	20859.	20771.	451.	439.	11.	99.6	97.5
1976.	31048.	30560.	566.	550.	10.	98.4	97.1
1977.	33245.	32661.	544.	520.	18.	98.2	95.6
1978.	26573.	26573.	522.	509.	13.	100.0	97.6
1979.	31792.	31392.	591.	573.	15.	98.7	96.9
1980.	25605.	25605.	563.	549.	14.	100.0	97.5
1981.	35365.	35365.	622.	617.	5.	100.0	99.2
1982.	24930.	24930.	511.	507.	4.	100.0	99.3
1983.	32898.	32712.	652.	637.	13.	99.4	97.6
1984.	26463.	26463.	501.	495.	7.	100.0	98.7
1985.	23066.	23066.	499.	495.	4.	100.0	99.2
1986.	33662.	33662.	677.	668.	10.	100.0	98.6
1987.	34799.	34560.	679.	668.	10.	99.3	98.3
1988.	27779.	27779.	570.	563.	7.	100.0	98.8
1989.	30707.	30707.	544.	533.	12.	100.0	97.9
1990.	34818.	34796.	698.	689.	9.	99.9	98.7
1991.	32626.	32626.	650.	639.	11.	100.0	98.4
1992.	41473.	41473.	745.	724.	21.	100.0	97.2
1993.	28194.	28194.	645.	640.	5.	100.0	99.2
1994.	30118.	29551.	524.	498.	20.	98.1	95.2
1995.	35084.	34950.	624.	599.	23.	99.6	95.9
1998.	9039.	9039.	247.	242.	5.	100.0	98.1
1999.	22177.	22177.	490.	481.	9.	100.0	98.1
2000.	25603.	25603.	415.	398.	17.	100.0	96.0
2001.	20227.	20227.	400.	399.	1.	100.0	99.8
2002.	21106.	21106.	468.	464.	4.	100.0	99.1
2003.	24017.	24017.	478.	470.	8.	100.0	98.2
2004.	28762.	28762.	487.	484.	3.	100.0	99.4
2005.	20730.	20455.	372.	357.	15.	98.7	95.8

```
**************************************************
*  Summary of Quantity and Quality Results at      *
*  Location        200  INFlow in cms.             *
*  Values are instantaneous at indicated time step *
**************************************************
     Date     Time        Flow   Total Su
 Mo/Da/Year  Hr:Min       cum/s  mg/l
 ----------  -------    -------  --------
Flow wtd means.....        0.000      117.
Flow wtd std devs..        0.003       68.
Maximum value......        0.528      291.
Minimum value......        0.000        0.
Total loads........      150675.    17566.
                        Cub-Met  KILOGRAM
===> Runoff simulation ended normally.
===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.
**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... September   8, 2023               *
*          Time...          11:37:49.267             *
*   Ending Date... September   8, 2023               *
*          Time...          11:37:52.404             *
*  Elapsed Time...               0.052 minutes.      *
*  Elapsed Time...               3.137 seconds.      *
**************************************************
```

BLOCK A06

```
        ************************************************
        *      Storm Water Management Sizing Model     *
        *               Hydroworks, LLC                *
        *                Version 4.4                   *
        *                                              *
        *        Continuous Simulation Program         *
        *              Based on SWMM 4.4H              *
        *              Hydroworks, LLC                 *
        *               Graham Bryant                  *
        *                2003 - 2021                   *
        ************************************************

                         Developed by

        ************************************************
        *               Hydroworks, LLC                *
        *             Metcalf & Eddy, Inc.             *
        *            University of Florida             *
        *       Water Resources Engineers, Inc.        *
        *      (Now Camp Dresser & McKee, Inc.)        *
        *              Modified SWMM 4.4               *
        ************************************************

                  Distributed and Maintained by

        ************************************************
        *                                              *
        *                Hydroworks, LLC               *
        *                 888-290-7900                 *
        *              www.hydroworks.com              *
        *                                              *
        ************************************************

        ************************************************
        *     If any problems occur executing this     *
        *     model, contact Mr. Graham Bryant at      *
        *     Hydroworks, LLC by phone at 908-272-4411 *
        *     or by e-mail: support@hydroworks.com     *
        ************************************************

        ************************************************
        *     This model is based on EPA SWMM 4.4      *
        *  "Nature is full of infinite causes which    *
        *   have never occurred in experience" da Vinci *
        ************************************************

************************************************
* Entry made to the Rain Block                 *
* Created by the University of Florida - 1988  *
* Updated by Oregon State University, March 2000 *
************************************************

        Riverfront Community (Phase 2)
        City of Niagara Falls

     ########################################
     #  Precipitation Block Input Commands  #
     ########################################
    Station Name.........................  St. Catherines A
    Station Location.....................  Ontario
    Station, ISTA........................    7287
    Beginning date, IYBEG (Yr/Mo/Dy)......  1971/ 1/ 1
    Ending date, IYEND (Yr/Mo/Dy).........  2005/12/31
    Minimum interevent time, MIT..........     1
    Number of ranked storms, NPTS.........    10
    NWS format, IFORM (See text)..........     1
    Print storm summary, ISUM (O-No 1-Yes)     0
    Print all rainfall, IYEAR (O-No 1-Yes)     0
    Save storm event data on NSCRAT(1)....     0
    (IFILE =0 -Do not save, =1 -Save data)
    IDECID 0 - Create interface file
           1 - Create file and analyze
           2 - Synoptic analysis..........     2
    Plotting position parameter, A........  0.40
    Storm event statistics, NOSTAT........  1100
    KODEA (from optional group B0)........     2
     = 0, Do not include NCDC cumulative values.
     = 1, Average NCDC cumulative values.
     = 2, Use NCDC cumulative value as inst. rain.
    KODEPR (from optional group B0).......     0
     Print NCDC special codes in event summary:
     = 0, only on days with events.
     = 1, on all days with codes present.
     Codes: A = accumulated value, I = incomplete value,
            M = missing value,     O = other code present

*****************************************************
*  Precipitation output created using the Rain block   *
*  Number of precipitation stations...        1       *
*****************************************************
Location Station Number
-------- --------------
       1.     7287

STATION ID ON PRECIP. DATA INPUT FILE = 7287
REQUESTED STATION ID =     7287  CHECK TO BE SURE THEY MATCH.
```

```
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Note, 15-min. data are being processed, but hourly
print-out, summaries, and statistics are based on
hourly totals only.  Data placed on interface file
are at correct 15-min. intervals.
$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$

#####################################################
# Entry made to the Runoff Block, last updated by #
# Oregon State University, and Camp, Dresser and  #
# McKee, Inc., March 2002.                        #
#####################################################
# "And wherever water goes, amoebae go along for  #
#  the ride"                    Tom Robbins       #
#####################################################
Snowmelt parameter - ISNOW.....................          0
Number of rain gages - NRGAG...................          1
Horton infiltration equation used - INFILM.....          2
Maximum infiltration volume is limited to RMAXINF input on  subcatchment lines.
Infiltration volume regenerates during  non rainfall periods.
Quality is simulated - KWALTY..................          1
IVAP is negative.  Evaporation will be set to zero
    during time steps with rainfall.
Read evaporation data on line(s) F1 (F2) - IVAP..          1
Hour of day at start of storm - NHR............          1
Minute of hour at start of storm - NMN.........          1
Time TZERO at start of storm (hours)...........      1.017
Use Metric units for I/O - METRIC..............          1
 ===> Ft-sec units used in all internal computations
Runoff input print control...                             0
Runoff graph plot control....                             1
Runoff output print control..                             0
Print headers every 50 lines - NOHEAD (0=yes, 1=no)       0
Print land use load percentages -LANDUPR (0=no, 1=yes)    0
Limit number of groundwater convergence messages to 10000 (if simulated)
Month, day, year of start of storm is:             1/ 1/1971
Wet time step length (seconds).......                  300.
Dry time step length (seconds).......                  900.
Wet/Dry time step length (seconds)...                  450.
Simulation length is......                      20051231.0 Yr/Mo/Dy
Percent of impervious area with zero detention depth    25.0
Horton infiltration model being used
Rate for regeneration of infiltration = REGEN * DECAY
DECAY is read in for each subcatchment
REGEN = ........................................   0.01000

*******************************************************
*   Processed Precipitation will be read from file    *
*******************************************************
  ##############################
  #        Data Group F1       #
  # Evaporation Rate (mm/day)  #
  ##############################
 JAN.  FEB.  MAR.  APR.  MAY   JUN.  JUL.  AUG.  SEP.  OCT.  NOV.  DEC.
 ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----  ----
 0.00  0.00  0.00  2.54  2.54  3.81  3.81  3.81  2.54  2.54  0.00  0.00

*******************************************************
*        C H A N N E L  A N D  P I P E  D A T A        *
*******************************************************
Input   NAMEG:     Drains                          Invert  L Side   R Side  Intial     Max  Mann-   Full
equen  Channel      to     Channel  Width  Length    Slope   Slope    Slope   Depth   Depth   ings   Flow
umber    ID #      NGTO:    Type     (m)    (m)     (m/m)   (m/m)    (m/m)     (m)     (m)    "N"   (cms)
-----  ------------------ -------- ------ -------   ------- -------- ------- ------- ------- -----  -----
  1        201        200   Dummy     0.0     0.0    0.0000   0.0000  0.0000     0.0     0.0  0.0000 0.00E+00

 ************************************************
 *          S U B C A T C H M E N T  D A T A     *
 ************************************************
*NOTE. SEE LATER TABLE FOR OPTIONAL SUBCATCHMENT PARAMETERS*
      SUBCATCH-  CHANNEL      WIDTH    AREA  PERCENT    SLOPE    RESISTANCE  FACTOR    DEPRES. STORAGE(MM) INFILTRATION   DECAY RATE GAGE  MAXIMUM
       MENT NO.  OR INLET       (M)    (HA)  IMPERV.    (M/M)     IMPERV.     PERV.    IMPERV.     PERV.      RATE(MM/HR)    (1/SEC)    NO.  VOLUME
                                                                                                            MAXIMUM MINIMUM                      (MM)
 ---  --------   -------- --------- --------  -----   -------    -------  --------    ------     ------     ----   -------  --------  ------ -------
  1        300        200    101.49     2.06  70.00    0.0200      0.015     0.250     0.510     5.080    63.50   10.16    0.00055     1  101.60000
TOTAL NUMBER OF SUBCATCHMENTS...              1
TOTAL TRIBUTARY AREA (HECTARES).           2.06
IMPERVIOUS AREA (HECTARES)......           1.44
PERVIOUS AREA (HECTARES)........           0.62
TOTAL WIDTH (METERS)............         101.49
PERCENT IMPERVIOUSNESS..........          70.00

*******************************************************
*      G R O U N D W A T E R   I N P U T   D A T A    *
*******************************************************
    SUB-     CHANNEL     ========== E L E V A T I O N S ========  =========== F L O W   C O N S T A N T S ============
    CATCH         OR      GROUND  BOTTOM   STAGE     BC      TW       A1         B1        A2         B2        A3
    NUMBER     INLET        (M)     (M)      (M)     (M)     (M) (MM/HR-M^B1)         (MM/HR-M^B2)         (MM/HR-M^2)
    ------     -----     -------  ------  ------  ------  ------ -----------  -------  -----------  -------  -----------
         0       602        3.05    0.00    0.00    0.61    0.61   3.484E-04    2.600   0.000E+00    1.000    0.00E+00
```

```
**********************************************************
* G R O U N D W A T E R   I N P U T   D A T A (CONTINUED) *
**********************************************************
              S O I L   P R O P E R T I E S
                    SATURATED                                        PERCOLATION     E T  P A R A M E T E R S
      SUBCAT.         HYDRAULIC  WILTING  FIELD   INITIAL     MAX. DEEP   PARAMETERS         DEPTH  FRACTION OF ET
      NO.   POROSITY CONDUCTIVITY  POINT  CAPACITY MOISTURE  PERCOLATION   HCO     PCO        OF ET  TO UPPER ZONE
                      (mm/hr)                                 (mm/hr)                        (m)
     ----   ------     -------    ------  ------   ------    ----------  ------  ------     ------      ------
        0    .4000     127.000     .1500   .3000    .3000     5.080E-02   10.00    4.57       4.27       0.350

**********************************************************
*    Arrangement of Subcatchments and Channel/Pipes      *
**********************************************************
* See second subcatchment output table for connectivity *
* of subcatchment to subcatchment flows.                *
**********************************************************
   Channel
   or Pipe
       201     No Tributary Channel/Pipes
               No Tributary Subareas.....
    INLET
       200     Tributary Channel/Pipes...        201
               Tributary Subareas........        300

**********************************************************
* Hydrographs will be stored for the following   1 INLETS *
**********************************************************
          200

####################################################
#              Quality Simulation                  #
####################################################
#      General Quality Control Data Groups         #
####################################################
 Description                          Variable       Value
 -----------                          --------       -----
 Number of quality constituents.....    NQS.......         1
 Number of land uses.................  JLAND.......         1
 Standard catchbasin volume.........  CBVOL.......      1.22 cubic meters
 Erosion is not simulated.........    IROS.......         0
 DRY DAYS PRIOR TO START OF STORM... DRYDAY.......      3.00 DAYS
 DRY DAYS REQUIRED TO RECHARGE
 CATCHBASIN CONCENTRATION TO
 INITIAL VALUES..................... DRYBSN.......      5.00 DAYS
 DUST AND DIRT
 STREET SWEEPING EFFICIENCY......... REFFDD.......     0.300
 DAY OF YEAR ON WHICH STREET
 SWEEPING BEGINS.................... KLNBGN.......       120
 DAY OF YEAR ON WHICH STREET
 SWEEPING ENDS..................... KLNEND.......       270

###############################################
#     Land use data on data group J2      #
###############################################
                                                      LIMITING                          CLEANING  AVAIL.    DAYS SINCE
                                                      BUILDUP    BUILDUP  BUILDUP       INTERVAL  FACTOR       LAST
AND USE   BUILDUP EQUATION TYPE   FUNCTIONAL DEPENDENCE OF   QUANTITY   POWER    COEFF.    IN DAYS  FRACTION   SWEEPING
LNAME)            (METHOD)        BUILDUP PARAMETER(JACGUT)  (DDLIM)    (DDPOW)  (DDFACT)  (CLFREQ)  (AVSWP)    (DSLCL)
-------   --------------------   -------------------------  --------   -------  --------  --------  -------    ---------
Urban De  EXPONENTIAL(1)                 AREA(1)           2.802E+01     0.500    67.250    30.000     0.300    30.000

###############################################
#     Constituent data on data group J3      #
###############################################
                              Total Su
                              --------
Constituent units........      mg/l
Type of units............           0
KALC.....................           2
Type of buildup calc.....    EXPONENTIAL(2)
KWASH....................           0
Type of washoff calc.....  POWER EXPONEN.(0)
KACGUT...................           1
Dependence of buildup....         AREA(1)
LINKUP...................           0
Linkage to snowmelt......   NO SNOW LINKAGE
Buildup param 1 (QFACT1).         28.020
Buildup param 2 (QFACT2).          0.500
Buildup param 3 (QFACT3).         67.250
Buildup param 4 (QFACT4).          0.000
Buildup param 5 (QFACT5).          0.000
Washoff power (WASHPO)...          1.100
Washoff coef. (RCOEF)....          0.086
Init catchb conc (CBFACT)        100.000
Precip. conc. (CONCRN)...          0.000
Street sweep effic (REFF)          0.300
Remove fraction (REMOVE).          0.000
1st order QDECAY, 1/day..          0.000
Land use number..........              1

***********************************************
* Constant Groundwater Quality Concentration(s) *
***********************************************
 Total Susp has a concentration of..    0.0000   mg/l
```

```
**********************************************
* REMOVAL FRACTIONS FOR SELECTED CHANNEL/PIPES *
* FROM J7 LINES                                *
**********************************************
  CHANNEL/   CONSTITUENT
     PIPE Total Susp
----------  --------
       201     0.000

*****************************************************
*     Subcatchment surface quality on data group L1 *
*****************************************************
                                Total   Number   Input
                          Land    Gutter     of    Loading
                Land      Use    Length   Catch-  load/ha
           No.  Usage     No.      Km     Basins   Total Su
        ------ --------  ----   -------- --------  -------
   1        300 Urban De  1         0.20     6.00  0.0E+00
   Totals (Loads in kg or other)    0.20     6.00  0.0E+00

    **********************
    *    DATA GROUP M1    *
    **********************
TOTAL NUMBER OF PRINTED GUTTERS/INLETS...NPRNT..        1
NUMBER OF TIME STEPS BETWEEN PRINTINGS..INTERV..        0
STARTING AND STOPPING PRINTOUT DATES.....               0        0

    **********************
    *    DATA GROUP M3    *
    **********************
CHANNEL/INLET PRINT DATA GROUPS......       -200

          ****************************************
          * Rainfall from Nat. Weather Serv. file  *
          * in units of hundredths of an inch      *
          ****************************************
Rainfall Station    St. Catherines A
State/Province      Ontario
Rainfall Depth Summary (mm)
Year     Jan   Feb   Mar   Apr   May   Jun   Jul   Aug   Sep   Oct   Nov   Dec    Total
1971.     31.    0.    0.    0.    0.    0.  126.   93.   52.   60.   29.    0.    391.
1972.      0.    0.    0.   47.   65.  100.   39.  115.   63.   90.    1.    0.    521.
1973.      0.    0.    0.  103.   77.   71.   53.   29.   63.  139.    0.    0.    534.
1974.      0.    0.    0.   67.  105.   62.   50.   31.   74.   37.  110.    0.    536.
1975.      0.    0.    0.    0.    0.   94.   78.   76.   73.   56.   59.    6.    442.
1976.      0.    0.    0.  119.  136.   87.  101.   60.   72.   73.   13.    1.    662.
1977.      0.    0.    0.   94.   29.   69.   57.  150.  230.   71.    0.    1.    701.
1978.      0.    0.    0.   72.   43.   72.   43.   86.  156.   95.    0.    0.    567.
1979.      0.    0.    0.   84.   92.   33.   91.   88.   84.  129.   71.    0.    673.
1980.      0.    0.    0.   81.   39.  122.   60.   32.   79.   96.   45.    0.    554.
1981.      0.    0.    0.   91.   71.  106.  122.   61.  123.   91.   84.    0.    749.
1982.      0.    0.    0.   28.   65.   97.   36.   66.   82.   25.  143.    0.    544.
1983.      0.    0.    0.   78.  100.   65.   55.  106.   75.  122.   92.    0.    694.
1984.      0.    0.    0.   31.  113.  136.   19.   51.  144.   24.   44.    0.    562.
1985.      0.    0.   67.   32.   52.   64.   40.   94.   42.  109.    0.    1.    501.
1986.      0.    0.    0.   93.  113.   60.   85.   83.   98.   80.   43.   65.    719.
1987.      0.    2.   11.   77.   42.   80.  122.   97.   99.   71.   94.   34.    730.
1988.      0.    0.   41.   71.   42.   21.  110.   82.   70.   68.   75.    5.    585.
1989.      0.    0.   13.   63.  137.  108.   36.   45.   89.   73.   84.    0.    647.
1990.      0.    2.   38.   99.  124.   44.   68.   95.   56.  112.   96.    0.    735.
1991.      0.    0.   86.  124.   67.   31.   85.   57.   79.   64.   61.   28.    682.
1992.      0.    0.   29.  127.   56.   92.  185.  116.   77.   47.  103.   38.    869.
1993.      3.    0.    7.   83.   56.   86.   32.   61.   71.   92.   80.   38.    610.
1994.      0.    0.   44.   88.  105.  124.   48.   77.  117.   15.    0.   15.    633.
1995.    112.   23.   16.   48.   37.   60.  123.   66.    8.  137.   94.    0.    724.
1998.      0.    0.    0.    0.   51.   54.   64.   29.    9.    0.    1.    0.    207.
1999.      0.    0.    0.   79.   59.   35.   61.   58.  116.   78.    0.    0.    487.
2000.      0.    0.    0.  123.  134.  216.   51.    0.    0.    0.   10.    0.    534.
2001.      0.    0.    0.   56.   88.   45.   25.   30.   81.  129.    0.    0.    454.
2002.      0.    0.    0.   73.  104.   64.   53.   49.   52.   65.    8.    0.    468.
2003.      0.    0.    0.   10.  163.   77.   81.   64.   67.   73.    2.    0.    537.
2004.      0.    0.    0.  131.  126.   99.  115.   40.   88.   17.    0.    0.    616.
2005.      0.    0.    0.   38.   42.   78.   53.  120.  112.    0.    0.    0.    443.
Total Rainfall Depth for Simulation Period    19310. (mm)

Rainfall Intensity Analysis (mm/hr)
(mm/hr)   (#)       (%)      (mm)       (%)
  2.50  21481      74.6     6454.      33.4
  5.00   3585      12.4     3088.      16.0
  7.50   1973       6.8     2886.      14.9
 10.00    575       2.0     1233.       6.4
 12.50    389       1.4     1070.       5.5
 15.00    194       0.7      660.       3.4
 17.50    210       0.7      846.       4.4
 20.00     66       0.2      306.       1.6
 22.50     92       0.3      487.       2.5
 25.00     39       0.1      232.       1.2
 27.50     37       0.1      246.       1.3
 30.00     34       0.1      245.       1.3
 32.50     29       0.1      228.       1.2
 35.00      5       0.0       42.       0.2
 37.50     10       0.0       90.       0.5
 40.00     10       0.0       97.       0.5
 42.50     12       0.0      124.       0.6
 45.00      9       0.0       99.       0.5
 47.50      1       0.0       12.       0.1
 50.00      3       0.0       37.       0.2
>50.00     49       0.2      829.       4.3
Total # of Intensities  28803
```

Daily Rainfall Depth Analysis (mm)

(mm)	(#)	(%)	(mm)	(%)
2.50	1077	38.9	1247.	6.5
5.00	507	18.3	1850.	9.6
7.50	326	11.8	2006.	10.4
10.00	226	8.2	1958.	10.1
12.50	150	5.4	1672.	8.7
15.00	111	4.0	1495.	7.7
17.50	100	3.6	1620.	8.4
20.00	67	2.4	1260.	6.5
22.50	45	1.6	958.	5.0
25.00	37	1.3	881.	4.6
27.50	23	0.8	609.	3.2
30.00	20	0.7	575.	3.0
32.50	20	0.7	631.	3.3
35.00	12	0.4	405.	2.1
37.50	8	0.3	290.	1.5
40.00	9	0.3	350.	1.8
42.50	4	0.1	165.	0.9
45.00	4	0.1	173.	0.9
47.50	2	0.1	91.	0.5
50.00	4	0.1	192.	1.0
>50.00	15	0.5	882.	4.6

Total # Days with Rain 2767

****
* End of time step DO-loop in Runoff *
****

Final Date (Mo/Day/Year) = 1/ 1/2006
Total number of time steps = 2056670
Final Julian Date = 2006001
Final time of day = 1. seconds.
Final time of day = 0.00 hours.
Final running time = 306816.0000 hours.
Final running time = 12784.0000 days.

****
* Extrapolation Summary for Watersheds *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of OVERLND Calls *
****

Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls	Subcatch	# Steps	# Calls
300	6304214	1634842						

****
* Extrapolation Summary for Channel/Pipes *
* # Steps ==> Total Number of Extrapolated Steps *
* # Calls ==> Total Number of GUTNR Calls *
****

Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls	Chan/Pipe	# Steps	# Calls
201	0	0						

****
* Continuity Check for Surface Water *
****

	cubic meters	Millimeters over Total Basin
Total Precipitation (Rain plus Snow)	396805.	19263.
Total Infiltration	118637.	5759.
Total Evaporation	31249.	1517.
Surface Runoff from Watersheds	248333.	12055.
Total Water remaining in Surface Storage	0.	0.
Infiltration over the Pervious Area...	118637.	19197.

Infiltration + Evaporation + Surface Runoff + Snow removal + Water remaining in Surface Storage + Water remaining in Snow Cover.....	398219.	19331.
Total Precipitation + Initial Storage.	396805.	19263.

The error in continuity is calculated as

****
* Precipitation + Initial Snow Cover *
* - Infiltration - *
*Evaporation - Snow removal - *
*Surface Runoff from Watersheds - *
*Water in Surface Storage - *
*Water remaining in Snow Cover *
----
* Precipitation + Initial Snow Cover *
****

Error..... -0.356 Percent

****
* Continuity Check for Channel/Pipes *
****

	cubic meters	Millimeters over Total Basin
Initial Channel/Pipe Storage.....	0.	0.
Final Channel/Pipe Storage.....	0.	0.
Surface Runoff from Watersheds.....	248333.	12055.
Baseflow.....	0.	
Groundwater Subsurface Inflow.....	0.	0.
Evaporation Loss from Channels.....	0.	0.
Channel/Pipe/Inlet Outflow.....	248333.	12055.
Initial Storage + Inflow.....	248333.	12055.
Final Storage + Outflow.....	248333.	12055.

```
*******************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
*******************************************
Error.....................................      0.000 Percent

************************************************
*     Continuity Check for Subsurface Water    *
************************************************
                                                                 Millimeters over
                                                cubic meters     Subsurface Basin
Total Infiltration                                        0.              0.
Total Upper Zone ET                                       0.              0.
Total Lower Zone ET                                       0.              0.
Total Groundwater flow                                    0.              0.
Total Deep percolation                                    0.              0.
Initial Subsurface Storage                            18836.            914.
Final Subsurface Storage                              18836.            914.
Upper Zone ET over Pervious Area                          0.              0.
Lower Zone ET over Pervious Area                          0.              0.

***************************************
* Infiltration + Initial Storage - Final *
* Storage - Upper and Lower Zone ET -    *
* Groundwater Flow - Deep Percolation    *
* -------------------------------------- *
*     Infiltration + Initial Storage     *
***************************************
Error ....................................     0.000 Percent
```

SUMMARY STATISTICS FOR SUBCATCHMENTS

SUBCATCHMENT NO.	GUTTER OR INLET NO.	AREA (HA)	PERCENT IMPER.	PERVIOUS AREA: TOTAL SIMULATED RAINFALL DEPTH (MM)	PERVIOUS AREA: TOTAL RUNOFF LOSSES (MM)	PERVIOUS AREA: PEAK RUNOFF RATE (CMS)	IMPERVIOUS AREA: RUNOFF DEPTH (MM)	IMPERVIOUS AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: RUNOFF DEPTH (MM)	TOTAL SUBCATCHMENT AREA: PEAK RUNOFF RATE (CMS)	TOTAL SUBCATCHMENT AREA: PEAK UNIT RUNOFF (MM/HR)
300	200	2.06	70.019	262.47	63.241********	0.12217	189.758	0.779	12051.803	0.901	158.740

*** NOTE *** IMPERVIOUS AREA STATISTICS AGGREGATE IMPERVIOUS AREAS WITH AND WITHOUT DEPRESSION STORAGE

SUMMARY STATISTICS FOR CHANNEL/PIPES

CHANNEL NUMBER	FULL FLOW (CMS)	FULL VELOCITY (M/S)	FULL DEPTH (M)	MAXIMUM COMPUTED INFLOW (CMS)	MAXIMUM COMPUTED OUTFLOW (CMS)	MAXIMUM COMPUTED DEPTH (M)	MAXIMUM COMPUTED VELOCITY (M/S)	TIME OF OCCURRENCE DAY	TIME OF OCCURRENCE HR.	LENGTH OF SURCHARGE (HOUR)	MAXIMUM SURCHARGE VOLUME (CU-M)	RATIO OF MAX. TO FULL FLOW	RATIO OF MAX. DEPTH TO FULL DEPTH
201				0.00				1/ 0/1900	0.00				
200				0.90				8/14/1972	14.25				

TOTAL NUMBER OF CHANNELS/PIPES = 2

*** NOTE *** THE MAXIMUM FLOWS AND DEPTHS ARE CALCULATED AT THE END OF THE TIME INTERVAL

```
              ######################################################
              #             Runoff Quality Summary Page            #
              # If NDIM = 0 Units for:   loads    mass rates      #
              #             METRIC = 1    lb        lb/sec        #
              #             METRIC = 2    kg        kg/sec        #
              # If NDIM = 1 Loads are in units of quantity        #
              #             and mass rates are quantity/sec       #
              # If NDIM = 2 loads are in units of concentration   #
              #             times volume and mass rates have units#
              #             of concentration times volume/second  #
              ######################################################
             Total Su NDIM =  0
             METRIC =  2
                               Total Su
                               --------
Inputs
------
 1. INITIAL SURFACE LOAD........       45.
 2. TOTAL SURFACE BUILDUP.......    34332.
 3. INITIAL CATCHBASIN LOAD.....        1.
 4. TOTAL CATCHBASIN LOAD.......        0.
 5. TOTAL CATCHBASIN AND
    SURFACE BUILDUP (2+4).......    34332.
Remaining Loads
---------------
 6. LOAD REMAINING ON SURFACE...       18.
 7. REMAINING IN CATCHBASINS....        0.
 8. REMAINING IN CHANNEL/PIPES..        0.
```

Removals
----
 9. STREET SWEEPING REMOVAL.....   3031.
10. NET SURFACE BUILDUP (2-9)...   31300.
11. SURFACE WASHOFF.............   31276.
12. CATCHBASIN WASHOFF..........   0.
13. TOTAL WASHOFF (11+12).......   31276.
14. LOAD FROM OTHER CONSTITUENTS   0.
15. PRECIPITATION LOAD..........   0.
15a.SUM SURFACE LOAD (13+14+15).   31276.
16. TOTAL GROUNDWATER LOAD......   0.
16a.TOTAL I/I LOAD..............   0.
17. NET SUBCATCHMENT LOAD
    (15a-15b-15c-15d+16+16a)....   31276.
>>Removal in channel/pipes (17a, 17b):
17a.REMOVE BY BMP FRACTION......   0.
17b.REMOVE BY 1st ORDER DECAY...   0.
18. TOTAL LOAD TO INLETS........   31276.
19. FLOW WT'D AVE.CONCENTRATION mg/l
    (INLET LOAD/TOTAL FLOW).....   126.
Percentages
----
20. STREET SWEEPING (9/2).......   9.
21. SURFACE WASHOFF (11/2)......   91.
22. NET SURFACE WASHOFF(11/10)..   100.
23. WASHOFF/SUBCAT LOAD(11/17)..   100.
24. SURFACE WASHOFF/INLET LOAD
    (11/18).....................   100.
25. CATCHBASIN WASHOFF/
    SUBCATCHMENT LOAD (12/17)...   0.
26. CATCHBASIN WASHOFF/
    INLET LOAD (12/18)..........   0.
27. OTHER CONSTITUENT LOAD/
    SUBCATCHMENT LOAD (14/17)...   0.
28. INSOLUBLE FRACTION/
    INLET LOAD (14/18)..........   0.
29. PRECIPITATION/
    SUBCATCHMENT LOAD (15/17)...   0.
30. PRECIPITATION/
    INLET LOAD (15/18)..........   0.
31. GROUNDWATER LOAD/
    SUBCATCHMENT LOAD (16/17)...   0.
32. GROUNDWATER LOAD/
    INLET LOAD (16/18)..........   0.
32a.INFILTRATION/INFLOW LOAD/
    SUBCATCHMENT LOAD (16a/17)..   0.
32b.INFILTRATION/INFLOW LOAD/
    INLET LOAD (16a/18).........   0.
32c.CH/PIPE BMP FRACTION REMOVAL/
    SUBCATCHMENT LOAD (17a/17)..   0.
32d.CH/PIPE 1st ORDER DECAY REMOVAL/
    SUBCATCHMENT LOAD (17b/17)..   0.
33. INLET LOAD SUMMATION ERROR
    (18+8+6a+17a+17b-17)/17.....   0.
CAUTION. Due to method of quality routing (Users Manual, Appendix IX)
quality routing through channel/pipes is sensitive to the time step.
Large "Inlet Load Summation Errors" may result.
These can be reduced by adjusting the time step(s).
Note: surface accumulation during dry time steps at end of simulation is
not included in totals. Buildup is only performed at beginning of
wet steps or for street cleaning.

****
*   TSS Particle Size Distribution   *
****
   Diameter   %   Specific   Settling Velocity   Critical Peclet
     (um)   Gravity   (m/s)   Number
      20.   20.0   2.65   0.000267   0.080977
      30.   10.0   2.65   0.000597   0.104277
      50.   10.0   2.65   0.001629   0.143403
     100.   20.0   2.65   0.006044   0.220958
     250.   20.0   2.65   0.026615   0.391296
    1000.   20.0   2.65   0.111334   0.928988

****
*   *
*   Summary of TSS Removal   *
*   *
****
TSS Removal based on Lab Performance Curve
 Model   Low Q Treated High Q Treated   Runoff Treated   TSS Removed
   #   (cms)   (cms)   (%)   (%)
 HD 4   0.270   0.270   99.6   70.9
 HD 5   0.270   0.270   99.6   78.1
 HD 6   0.270   0.270   99.6   82.9
 HD 8   0.270   0.270   99.6   89.7
 HD 10   0.270   0.270   99.6   93.5
 HD 12   0.270   0.270   99.6   95.9

****
* Summary of Annual Flow Treatmnet & TSS Removal *
****

HD 4

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	406.	213.	98.6	65.5
1972.	39775.	37220.	836.	575.	236.	93.6	68.8
1973.	39613.	39613.	874.	618.	256.	100.0	70.7
1974.	40443.	40161.	924.	703.	217.	99.3	76.1
1975.	34379.	34363.	801.	540.	260.	100.0	67.5
1976.	51156.	50600.	1016.	715.	292.	98.9	70.4
1977.	54777.	54117.	988.	616.	366.	98.8	62.3
1978.	43763.	43763.	936.	632.	304.	100.0	67.5
1979.	52385.	51930.	1059.	753.	301.	99.1	71.1
1980.	42112.	42112.	997.	707.	291.	100.0	70.9
1981.	58287.	58287.	1109.	825.	284.	100.0	74.4
1982.	41081.	41081.	903.	672.	231.	100.0	74.4
1983.	54234.	54083.	1163.	830.	330.	99.7	71.4
1984.	43580.	43580.	895.	621.	273.	100.0	69.4
1985.	37939.	37939.	876.	629.	247.	100.0	71.8
1986.	55452.	55452.	1205.	885.	320.	100.0	73.4
1987.	57356.	57112.	1214.	873.	338.	99.6	72.0
1988.	45857.	45857.	1010.	762.	248.	100.0	75.4
1989.	50688.	50688.	975.	724.	251.	100.0	74.3
1990.	57462.	57462.	1247.	949.	298.	100.0	76.1
1991.	53835.	53835.	1154.	850.	304.	100.0	73.6
1992.	68434.	68434.	1352.	937.	415.	100.0	69.3
1993.	46433.	46433.	1124.	876.	248.	100.0	77.9
1994.	49663.	49116.	939.	624.	308.	98.9	66.4
1995.	57897.	57884.	1125.	761.	364.	100.0	67.6
1998.	14737.	14737.	424.	294.	130.	100.0	69.4
1999.	36429.	36429.	862.	606.	256.	100.0	70.3
2000.	42240.	42240.	758.	475.	283.	100.0	62.7
2001.	33244.	33244.	701.	538.	162.	100.0	76.8
2002.	34651.	34651.	824.	606.	217.	100.0	73.6
2003.	39458.	39458.	844.	589.	255.	100.0	69.8
2004.	47391.	47391.	877.	608.	269.	100.0	69.3
2005.	34108.	33865.	668.	404.	262.	99.3	60.6

HD 5

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	452.	167.	98.6	72.9
1972.	39775.	37220.	836.	636.	175.	93.6	76.0
1973.	39613.	39613.	874.	679.	196.	100.0	77.6
1974.	40443.	40161.	924.	764.	156.	99.3	82.7
1975.	34379.	34363.	801.	604.	197.	100.0	75.4
1976.	51156.	50600.	1016.	794.	213.	98.9	78.2
1977.	54777.	54117.	988.	696.	286.	98.8	70.4
1978.	43763.	43763.	936.	709.	227.	100.0	75.7
1979.	52385.	51930.	1059.	831.	223.	99.1	78.5
1980.	42112.	42112.	997.	776.	222.	100.0	77.8
1981.	58287.	58287.	1109.	898.	211.	100.0	81.0
1982.	41081.	41081.	903.	732.	171.	100.0	81.0
1983.	54234.	54083.	1163.	913.	247.	99.7	78.6
1984.	43580.	43580.	895.	688.	207.	100.0	76.9
1985.	37939.	37939.	876.	697.	179.	100.0	79.6
1986.	55452.	55452.	1205.	969.	236.	100.0	80.4
1987.	57356.	57112.	1214.	969.	243.	99.6	79.8
1988.	45857.	45857.	1010.	824.	186.	100.0	81.5
1989.	50688.	50688.	975.	791.	184.	100.0	81.1
1990.	57462.	57462.	1247.	1031.	216.	100.0	82.6
1991.	53835.	53835.	1154.	924.	230.	100.0	80.1
1992.	68434.	68434.	1352.	1035.	317.	100.0	76.5
1993.	46433.	46433.	1124.	944.	181.	100.0	83.9
1994.	49663.	49116.	939.	695.	237.	98.9	74.1
1995.	57897.	57884.	1125.	847.	278.	100.0	75.3
1998.	14737.	14737.	424.	324.	100.	100.0	76.5
1999.	36429.	36429.	862.	659.	202.	100.0	76.5
2000.	42240.	42240.	758.	536.	223.	100.0	70.6
2001.	33244.	33244.	701.	589.	112.	100.0	84.0
2002.	34651.	34651.	824.	667.	157.	100.0	80.9
2003.	39458.	39458.	844.	645.	199.	100.0	76.4
2004.	47391.	47391.	877.	670.	208.	100.0	76.3
2005.	34108.	33865.	668.	456.	211.	99.3	68.3

HD 6

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	490.	129.	98.6	79.1
1972.	39775.	37220.	836.	673.	138.	93.6	80.5
1973.	39613.	39613.	874.	723.	152.	100.0	82.6
1974.	40443.	40161.	924.	803.	116.	99.3	86.9
1975.	34379.	34363.	801.	643.	157.	100.0	80.4
1976.	51156.	50600.	1016.	841.	166.	98.9	82.8
1977.	54777.	54117.	988.	751.	230.	98.8	76.0
1978.	43763.	43763.	936.	748.	188.	100.0	79.9
1979.	52385.	51930.	1059.	876.	178.	99.1	82.7
1980.	42112.	42112.	997.	831.	166.	100.0	83.4
1981.	58287.	58287.	1109.	957.	152.	100.0	86.3
1982.	41081.	41081.	903.	778.	124.	100.0	86.2
1983.	54234.	54083.	1163.	968.	192.	99.7	83.2
1984.	43580.	43580.	895.	732.	162.	100.0	81.9
1985.	37939.	37939.	876.	735.	141.	100.0	83.9
1986.	55452.	55452.	1205.	1027.	178.	100.0	85.2
1987.	57356.	57112.	1214.	1019.	193.	99.6	84.0
1988.	45857.	45857.	1010.	868.	142.	100.0	85.9
1989.	50688.	50688.	975.	842.	133.	100.0	86.3
1990.	57462.	57462.	1247.	1081.	166.	100.0	86.7
1991.	53835.	53835.	1154.	977.	176.	100.0	84.7
1992.	68434.	68434.	1352.	1107.	246.	100.0	81.8
1993.	46433.	46433.	1124.	988.	137.	100.0	87.8
1994.	49663.	49116.	939.	737.	196.	98.9	78.5
1995.	57897.	57884.	1125.	900.	225.	100.0	80.0
1998.	14737.	14737.	424.	345.	79.	100.0	81.4
1999.	36429.	36429.	862.	708.	154.	100.0	82.1
2000.	42240.	42240.	758.	580.	178.	100.0	76.5
2001.	33244.	33244.	701.	618.	83.	100.0	88.1
2002.	34651.	34651.	824.	703.	121.	100.0	85.3
2003.	39458.	39458.	844.	688.	156.	100.0	81.5
2004.	47391.	47391.	877.	716.	161.	100.0	81.6
2005.	34108.	33865.	668.	497.	170.	99.3	74.4

HD 8

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	532.	87.	98.6	85.9
1972.	39775.	37220.	836.	731.	80.	93.6	87.4
1973.	39613.	39613.	874.	785.	89.	100.0	89.8
1974.	40443.	40161.	924.	858.	62.	99.3	92.8
1975.	34379.	34363.	801.	708.	92.	100.0	88.5
1976.	51156.	50600.	1016.	915.	93.	98.9	90.1
1977.	54777.	54117.	988.	834.	147.	98.8	84.4
1978.	43763.	43763.	936.	820.	116.	100.0	87.6
1979.	52385.	51930.	1059.	941.	113.	99.1	88.8
1980.	42112.	42112.	997.	887.	110.	100.0	88.9
1981.	58287.	58287.	1109.	1028.	81.	100.0	92.7
1982.	41081.	41081.	903.	839.	64.	100.0	92.9
1983.	54234.	54083.	1163.	1045.	115.	99.7	89.9
1984.	43580.	43580.	895.	798.	96.	100.0	89.3
1985.	37939.	37939.	876.	803.	73.	100.0	91.6
1986.	55452.	55452.	1205.	1111.	94.	100.0	92.2
1987.	57356.	57112.	1214.	1095.	117.	99.6	90.2
1988.	45857.	45857.	1010.	927.	84.	100.0	91.7
1989.	50688.	50688.	975.	898.	77.	100.0	92.1
1990.	57462.	57462.	1247.	1161.	86.	100.0	93.1
1991.	53835.	53835.	1154.	1048.	106.	100.0	90.8
1992.	68434.	68434.	1352.	1199.	153.	100.0	88.7
1993.	46433.	46433.	1124.	1049.	76.	100.0	93.3
1994.	49663.	49116.	939.	805.	128.	98.9	85.7
1995.	57897.	57884.	1125.	981.	144.	100.0	87.2
1998.	14737.	14737.	424.	374.	50.	100.0	88.3
1999.	36429.	36429.	862.	765.	97.	100.0	88.7
2000.	42240.	42240.	758.	641.	117.	100.0	84.6
2001.	33244.	33244.	701.	661.	40.	100.0	94.3
2002.	34651.	34651.	824.	755.	69.	100.0	91.7
2003.	39458.	39458.	844.	742.	102.	100.0	87.9
2004.	47391.	47391.	877.	781.	97.	100.0	89.0
2005.	34108.	33865.	668.	549.	118.	99.3	82.2

HD 10

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	560.	59.	98.6	90.4
1972.	39775.	37220.	836.	762.	48.	93.6	91.2
1973.	39613.	39613.	874.	820.	55.	100.0	93.7
1974.	40443.	40161.	924.	884.	36.	99.3	95.6
1975.	34379.	34363.	801.	742.	59.	100.0	92.7
1976.	51156.	50600.	1016.	947.	60.	98.9	93.3
1977.	54777.	54117.	988.	881.	100.	98.8	89.2
1978.	43763.	43763.	936.	859.	78.	100.0	91.7
1979.	52385.	51930.	1059.	976.	78.	99.1	92.2
1980.	42112.	42112.	997.	926.	71.	100.0	92.9
1981.	58287.	58287.	1109.	1069.	40.	100.0	96.4
1982.	41081.	41081.	903.	875.	28.	100.0	96.9
1983.	54234.	54083.	1163.	1090.	70.	99.7	93.7
1984.	43580.	43580.	895.	837.	58.	100.0	93.5
1985.	37939.	37939.	876.	837.	39.	100.0	95.5
1986.	55452.	55452.	1205.	1156.	50.	100.0	95.9
1987.	57356.	57112.	1214.	1134.	78.	99.6	93.4
1988.	45857.	45857.	1010.	962.	48.	100.0	95.2
1989.	50688.	50688.	975.	929.	46.	100.0	95.3
1990.	57462.	57462.	1247.	1195.	52.	100.0	95.9
1991.	53835.	53835.	1154.	1090.	64.	100.0	94.4
1992.	68434.	68434.	1352.	1250.	102.	100.0	92.4
1993.	46433.	46433.	1124.	1083.	41.	100.0	96.3
1994.	49663.	49116.	939.	842.	90.	98.9	89.7
1995.	57897.	57884.	1125.	1024.	101.	100.0	91.0
1998.	14737.	14737.	424.	393.	31.	100.0	92.7
1999.	36429.	36429.	862.	809.	53.	100.0	93.9
2000.	42240.	42240.	758.	676.	82.	100.0	89.2
2001.	33244.	33244.	701.	678.	22.	100.0	96.8
2002.	34651.	34651.	824.	786.	38.	100.0	95.4
2003.	39458.	39458.	844.	779.	66.	100.0	92.2
2004.	47391.	47391.	877.	823.	54.	100.0	93.8
2005.	34108.	33865.	668.	591.	76.	99.3	88.5

HD 12

Year	Flow Vol (m3)	Flow Treated (m3)	TSS IN (kg)	TSS Rem (kg)	TSS Out (kg)	Flow Treated (%)	TSS Removal (%)
1971.	31028.	30590.	619.	575.	43.	98.6	92.9
1972.	39775.	37220.	836.	786.	25.	93.6	94.0
1973.	39613.	39613.	874.	841.	33.	100.0	96.2
1974.	40443.	40161.	924.	901.	19.	99.3	97.5
1975.	34379.	34363.	801.	763.	38.	100.0	95.2
1976.	51156.	50600.	1016.	971.	37.	98.9	95.6
1977.	54777.	54117.	988.	917.	65.	98.8	92.8
1978.	43763.	43763.	936.	892.	44.	100.0	95.3
1979.	52385.	51930.	1059.	1002.	52.	99.1	94.6
1980.	42112.	42112.	997.	949.	48.	100.0	95.2
1981.	58287.	58287.	1109.	1085.	24.	100.0	97.8
1982.	41081.	41081.	903.	890.	13.	100.0	98.5
1983.	54234.	54083.	1163.	1118.	42.	99.7	96.1
1984.	43580.	43580.	895.	863.	32.	100.0	96.4
1985.	37939.	37939.	876.	857.	19.	100.0	97.8
1986.	55452.	55452.	1205.	1175.	30.	100.0	97.5
1987.	57356.	57112.	1214.	1165.	47.	99.6	96.0
1988.	45857.	45857.	1010.	983.	28.	100.0	97.3
1989.	50688.	50688.	975.	938.	37.	100.0	96.2
1990.	57462.	57462.	1247.	1214.	33.	100.0	97.4
1991.	53835.	53835.	1154.	1111.	43.	100.0	96.3
1992.	68434.	68434.	1352.	1283.	69.	100.0	94.9
1993.	46433.	46433.	1124.	1103.	21.	100.0	98.1
1994.	49663.	49116.	939.	868.	65.	98.9	92.4
1995.	57897.	57884.	1125.	1054.	71.	100.0	93.6
1998.	14737.	14737.	424.	405.	19.	100.0	95.6
1999.	36429.	36429.	862.	827.	35.	100.0	96.0
2000.	42240.	42240.	758.	706.	52.	100.0	93.1
2001.	33244.	33244.	701.	691.	9.	100.0	98.6
2002.	34651.	34651.	824.	803.	21.	100.0	97.4
2003.	39458.	39458.	844.	808.	37.	100.0	95.7
2004.	47391.	47391.	877.	852.	26.	100.0	97.1
2005.	34108.	33865.	668.	617.	50.	99.3	92.4

```
**************************************************
*  Summary of Quantity and Quality Results at      *
*  Location        200  INFlow in cms.              *
*  Values are instantaneous at indicated time step *
**************************************************
     Date     Time        Flow   Total Su
 Mo/Da/Year  Hr:Min        cum/s  mg/l
 ----------  -------    -------  --------
Flow wtd means.....         0.001      126.
Flow wtd std devs..         0.005       65.
Maximum value......         0.901      294.
Minimum value......         0.000        0.
Total loads........      248279.    31295.
                        Cub-Met  KILOGRAM
===> Runoff simulation ended normally.
===> SWMM 4.4    simulation ended normally.
     Always check output file for possible warning messages.
**************************************************
*       SWMM 4.4    Simulation Date and Time Summary  *
**************************************************
* Starting Date... September   8, 2023               *
*          Time...          11:39:13.676             *
*   Ending Date... September   8, 2023               *
*          Time...          11:39:16.815             *
*  Elapsed Time...               0.052 minutes.      *
*  Elapsed Time...               3.139 seconds.      *
**************************************************
```

APPENDIX E

Sample Oil/Grit Separator Inspection Report

SAMPLE INSPECTION REPORT

Owner:					
Location:					
Manhole Oil/Grit Separator:					
Type of Inspection	☐ Monthly		☐ Annually		☐ Special
Inlet/Outlet Information					
	Inlet		Outlet		
Clear of Debris	☐ Yes	☐ No	☐ Yes	☐ No	
Build Up of Sediment	☐ Yes	☐ No	☐ Yes	☐ No	
Action Taken:					
Sediment Tank Information					
A. Manhole Sump Depth:	± m from cover rim (to be as-constructed verified)				
B. Measurement from Rim to Sediment Level	m				
C. Depth of Sediment:	m (A - B)				
Note: If the measured depth of sediment is greater than **350mm** then sediment removal is required.					
Presence of Contaminants					
Oil	☐ Yes	☐ No	Depth:	m	
Foam	☐ Yes	☐ No	Depth:	m	
Action Taken:					
Name of Regulatory Agency			Telephone No.:		
			Transaction No.:		
Name of Licensed Waste Management Collector			Telephone No.:		
			Transaction No.:		
Owner Notification	☐ Yes	☐ No	Other:		
	Time:		Date:		
Name of Inspector:					
Signed:				Date:	