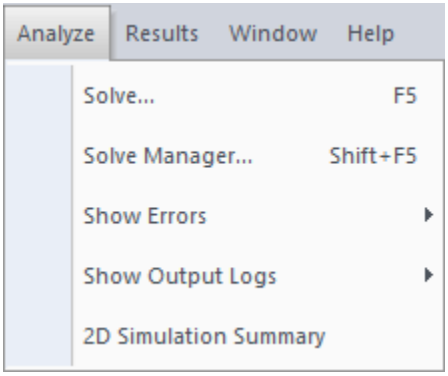
The Analyze Menu

The Analyze Menu provides the commands for analyzing the model.



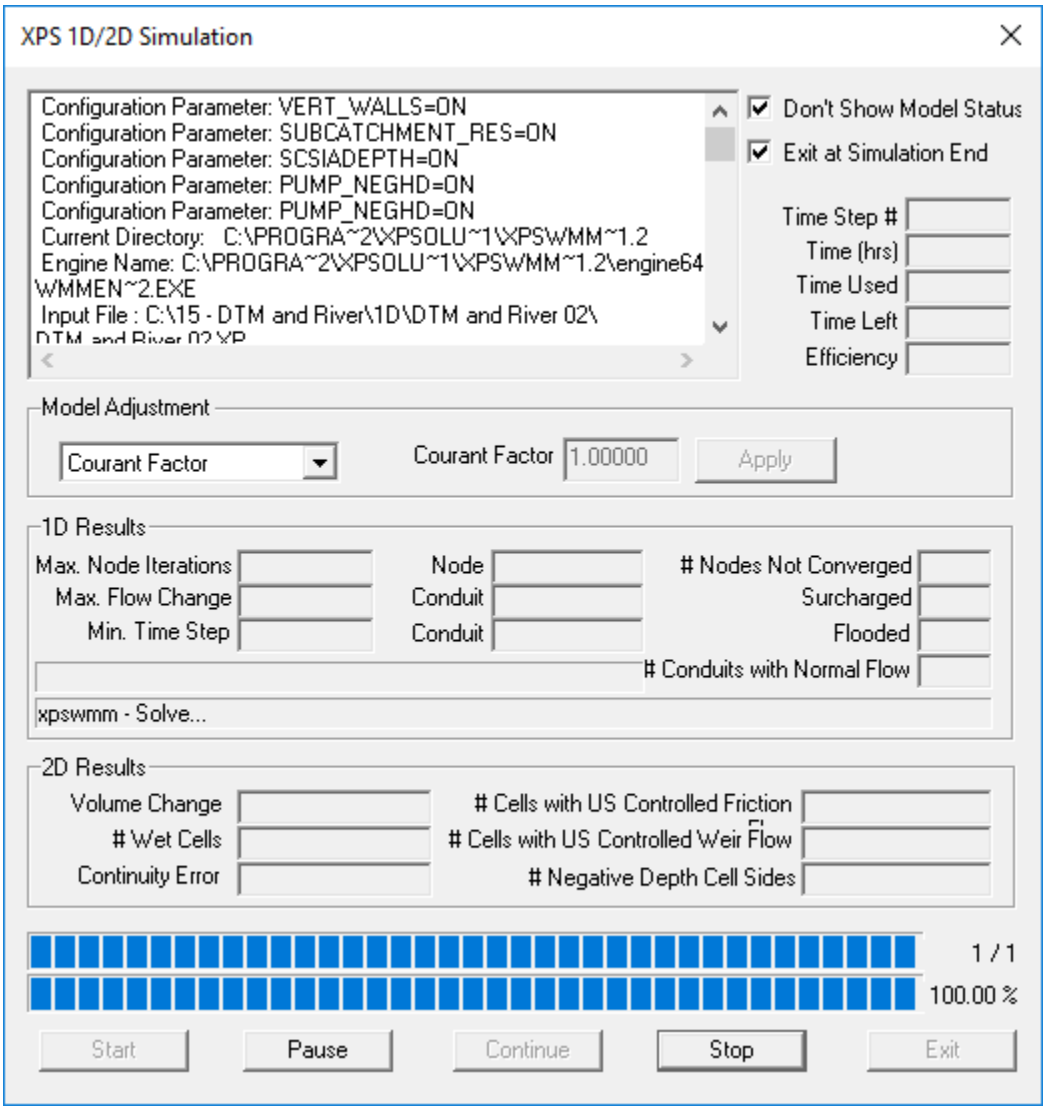
This page contains the following topics:

Solve

This menu command is used to commence analysis of the network. The data is first checked for consistency and, if it is found to be sound, the network can be analysed and the analysis engine is invoked. If there is a problem with the model, a window showing all the data inconsistency errors is displayed. The errors and warnings shown may be re-displayed by selecting the Show Errors menu command.

The mandatory consistency checks performed at this stage generally concern relationships between data items and are outlined in more detail in Utilities.

If no errors or warnings are detected there will be no errors or warnings listed in the error log. The simulation window will appear and the engine will begin the simulation, showing the progress of the model analysis.



Solve Manager

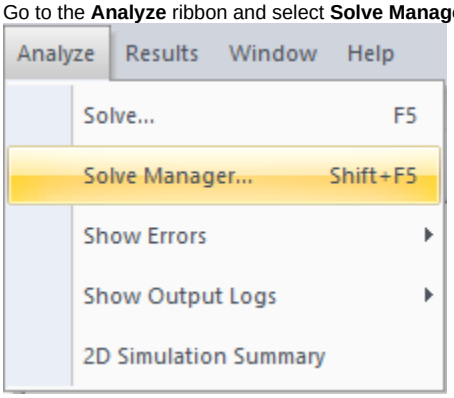
The Solve Manager is an alternative and faster way to solve your model. This is beneficial if you have to solve a number of runs, as the application would process them simultaneously. You can take what would be Scenario runs, Global Storm runs, or just several models, and run them in parallel. This functionality makes a substantial increase in the speed of your run, because you can perform them more than one at a time, depending on your computer hardware.

Limitations:

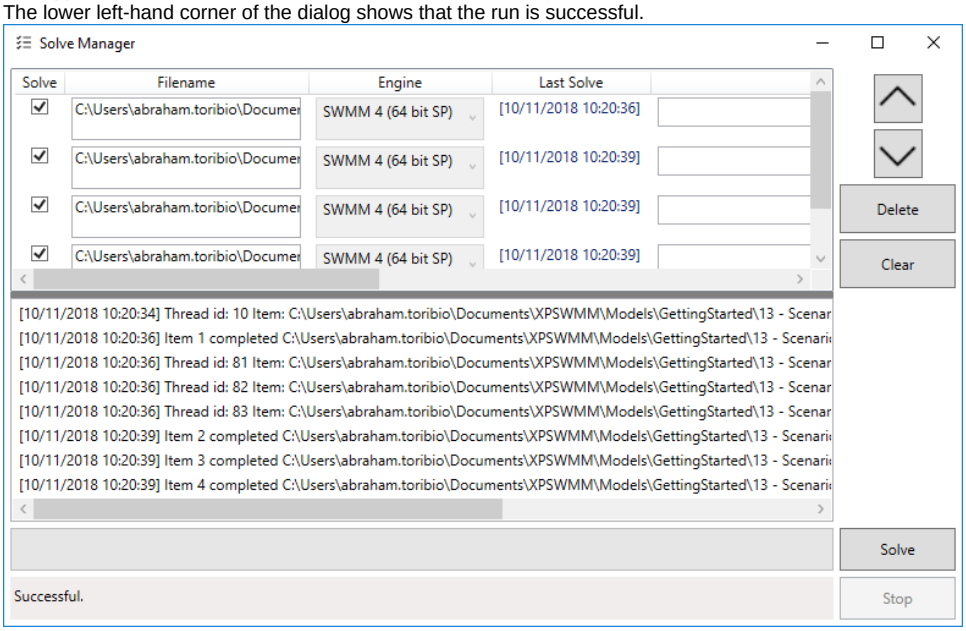
- For performance reasons, the number of concurrent solves should not exceed the number of physical cores. Each core allows for two concurrent solves.
- For 2D models with scenarios, 2D results are not loaded automatically. They can be loaded manually as needed by using **Add XMDF Result File**, which is accessed by right-clicking the **2D Results** item in the Layers Control Panel.
- For information about the additional IT requirements, refer to the section Additional IT Security Requirements.

To run Solve Manager:

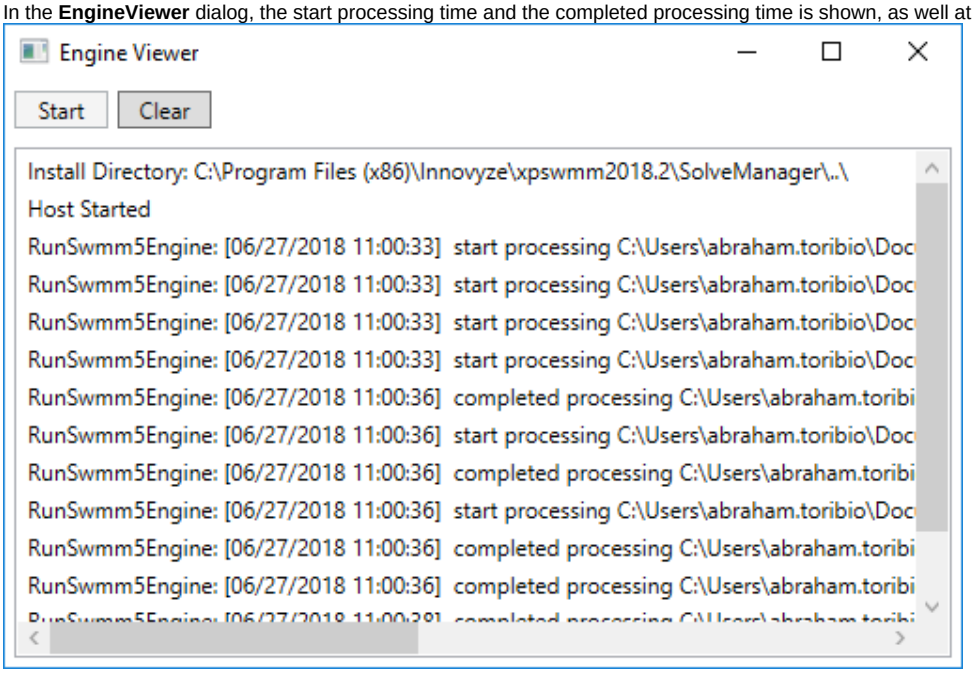
1. Go to the **Analyze** ribbon and select **Solve Manager**.



2. The application will solve the various scenarios simultaneously.
3. The lower left-hand corner of the dialog shows that the run is successful.

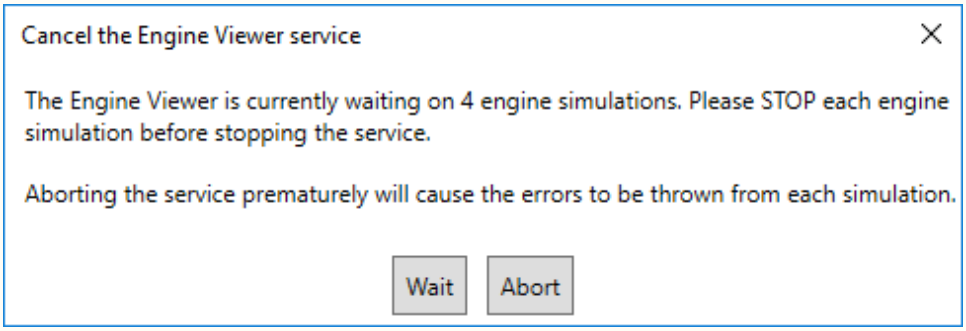


In the **EngineViewer** dialog, the start processing time and the completed processing time is shown, as well at the location of the input file.

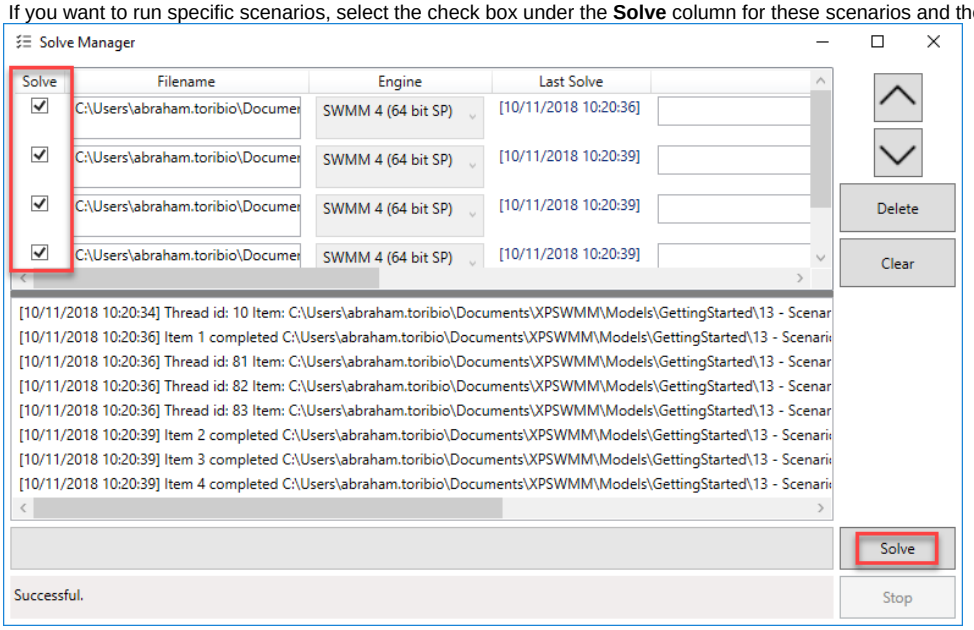


When you close the **Engine Viewer** dialog while the simulation is in progress, a notification will be displayed stating that "The Engine Viewer is currently waiting on XX engine simulations. Please STOP each engine simulation before stopping the service.

Aborting the service prematurely will cause the errors to be thrown from each simulation."

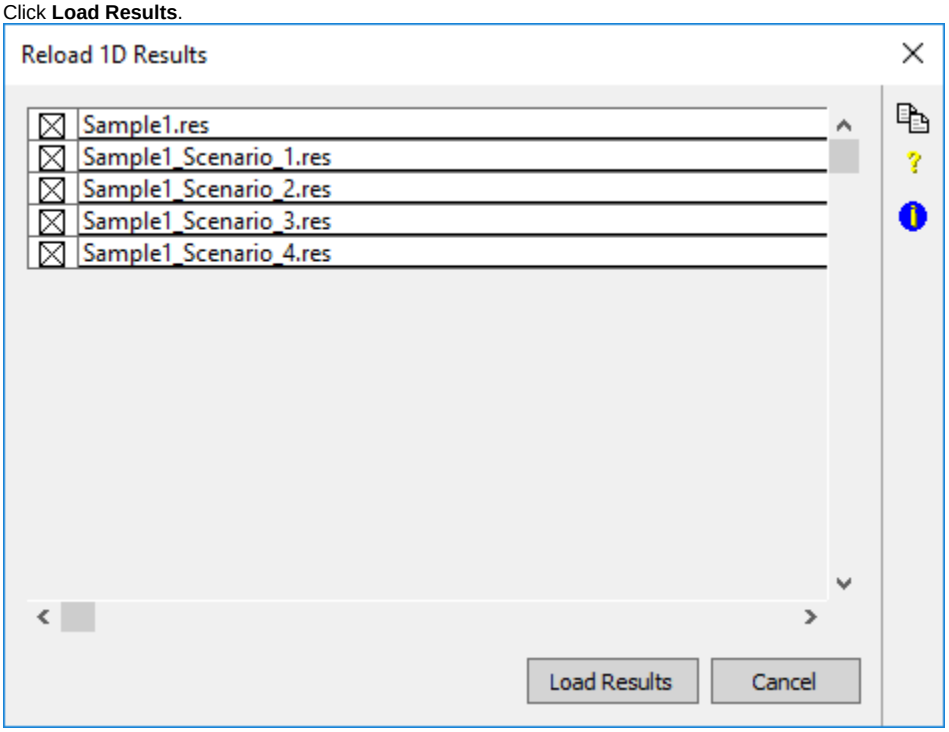


4. If you want to run specific scenarios, select the check box under the **Solve** column for these scenarios and then click **Solve**.

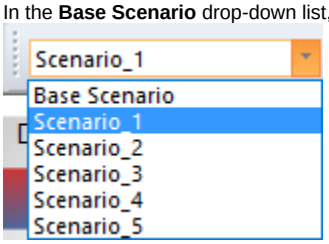


5. To load 1D Results:
   a. In the **Reload 1D Results** dialog, select the scenarios that you want to load. By default, all scenarios are selected.

b. Click **Load Results**.

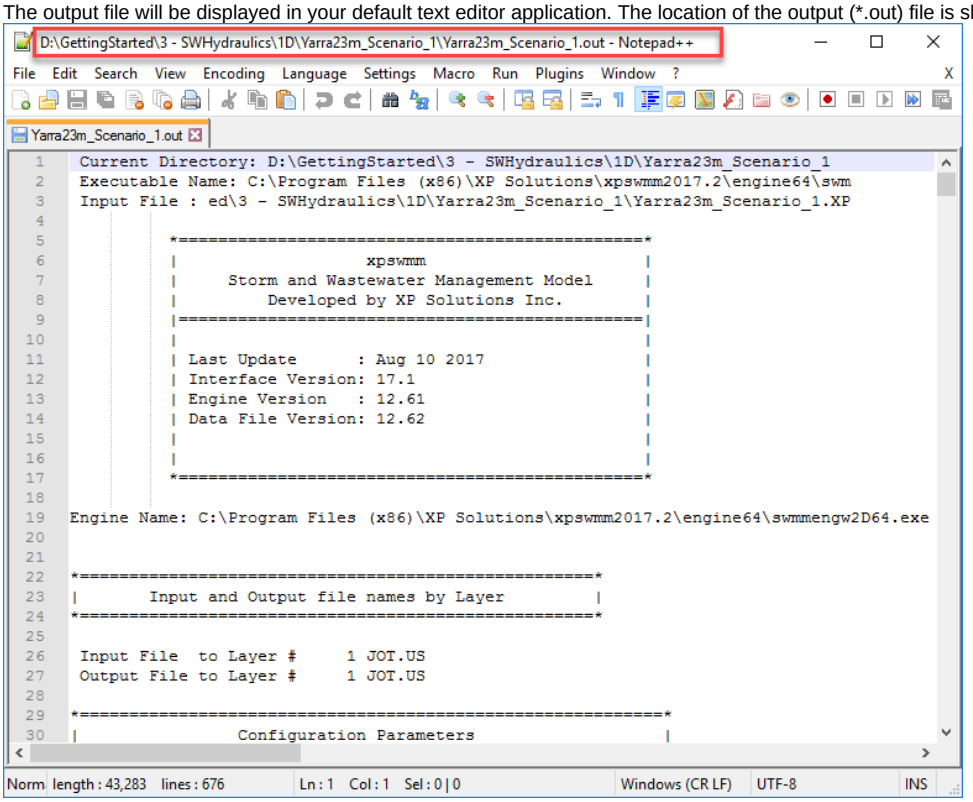


6. To view the output file:
   a. In the **Base Scenario** drop-down list, select the scenario that you want to view:



   b. Go to **Analyze > Show Output Logs**, and then select **1D**, **2D**, or **2D FV Log**, depending on your model.

c. The output file will be displayed in your default text editor application. The location of the output (*.out) file is shown in the dialog.

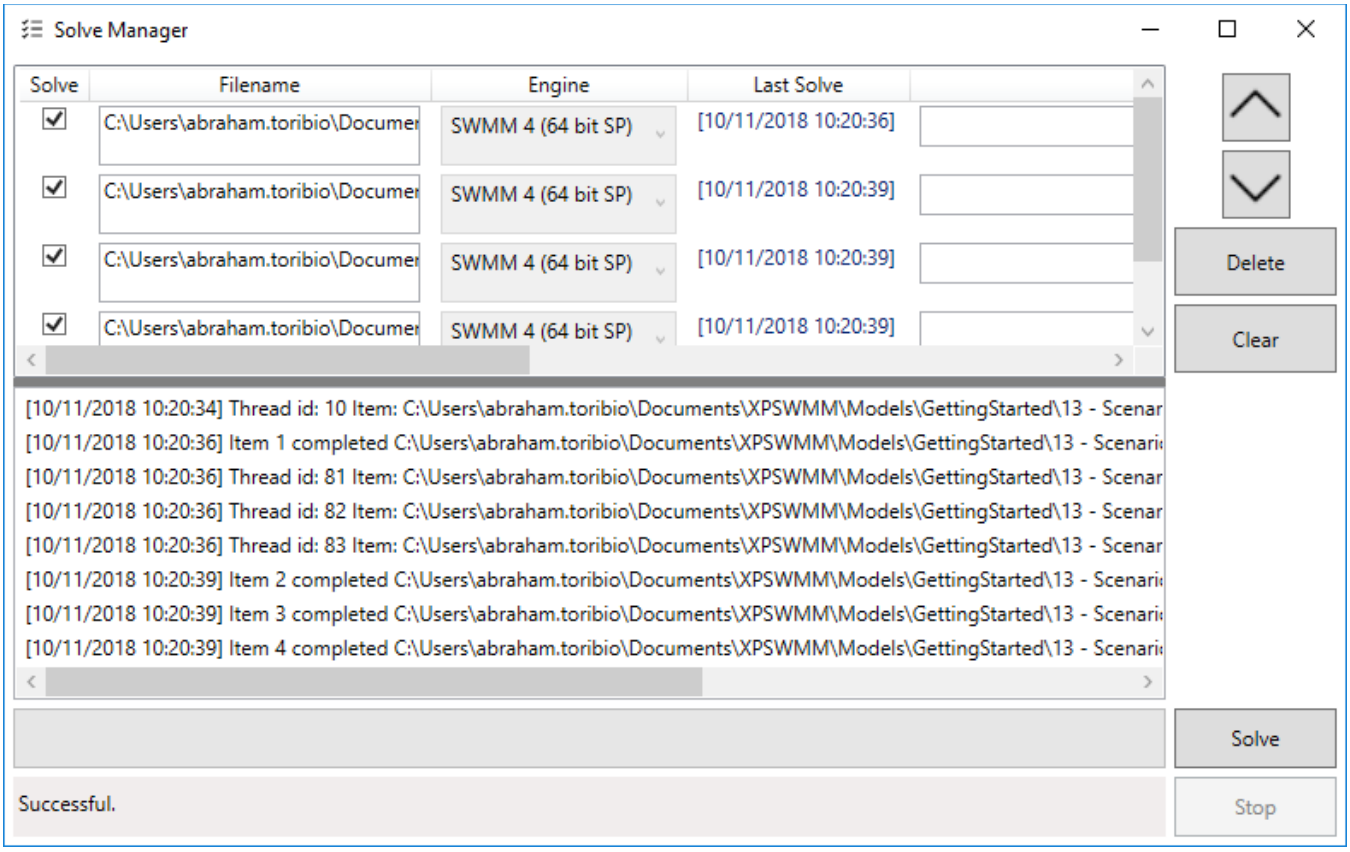


d. Alternatively, you can browse to the folder in Windows Explorer where the output file is located. The output file (*.out) will be saved in the same folder as the input file.

e. Open the output file (*.out) in any text editor (for example, Notepad) to view the output.

The Solve Manager dialog

The **Solve Manager** dialog is an interface that allows you to easily view input files or delete them. The headings specify the input file you selected, the type of engine, the date and time of your last solve, as well as the messages and output file location of your run.



The following columns and functionalities are available in the **Solve Manager** dialog:

Filename – The file name of the input file.

Engine – The type of engine used for the run. This is set to **SWMM 4 (64 bit SP)**.

Last Solve – Date and time when the model file is last solved.

Messages – Shows the verbose messages from the engine regarding the execution of the run.

Logs – Location of the output file (*.out).

 and  – Use these buttons to move an input file either up or down your list, respectively.

Delete – This button allows you to remove an input file from your list. To delete an input file:

i. Highlight and select the file you want to delete.
ii. Click the **Delete** button

Clear – This button removes the list of the items solved.

Solve – This button starts the parallel run for all your selected input files.

Stop – This buttons stops all the simulations.

Pause – This button prevents any additional solves being launched.

Resume – This button resumes the simulations.

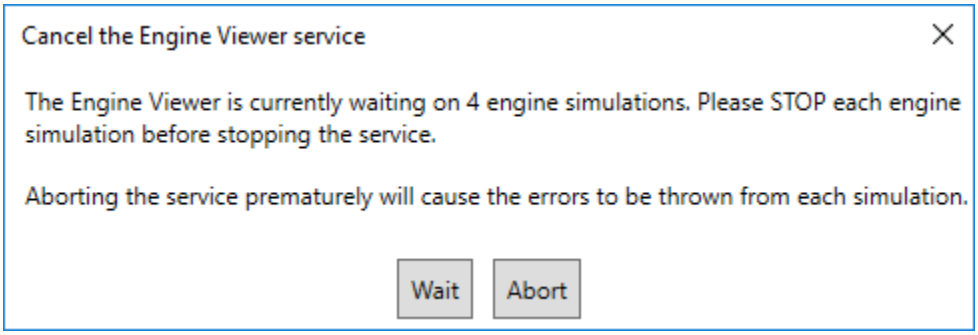
The Engine Viewer

The **Engine Viewer** allows you to view the status of concurrent job runs. It gives you information such as the full path name of the input file, time started, and time completed. By default, **Solve Manager** calls the **Engine Viewer** and starts it automatically. When started, it listens to any Solve Manager client solve request.

The **Clear** button deletes the message in the window.

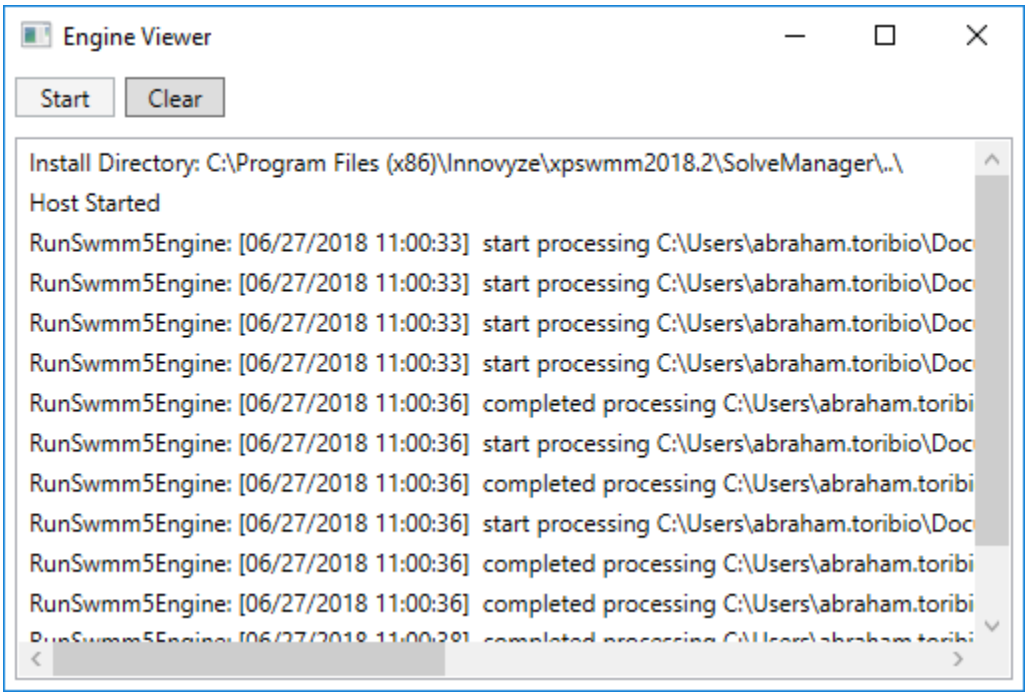
When you close the **Engine Viewer** dialog while the simulation is in progress, a notification will be displayed stating that "The Engine Viewer is currently waiting on XX engine simulations. Please STOP each engine simulation before stopping the service.

Aborting the service prematurely will cause the errors to be thrown from each simulation."



You have the option to:

Wait - This button closes the **Cancel the Engine Viewer Service** dialog and continues the simulations.
Abort - This button stops all the processing. Fortran errors maybe encountered when using this button.



Additional IT Security Requirements

In the event that you are working in an environment where you do not have full administrator rights or have set of IT policies that prevents you from accessing ports and adding firewall rules, you can let your IT administrator set them for you. Otherwise, the installer would do it for you automatically. You can check the installer logs for further information if it fails. If you experience any error in running Solve Manager, perform the following steps with the help of your IT administrator.

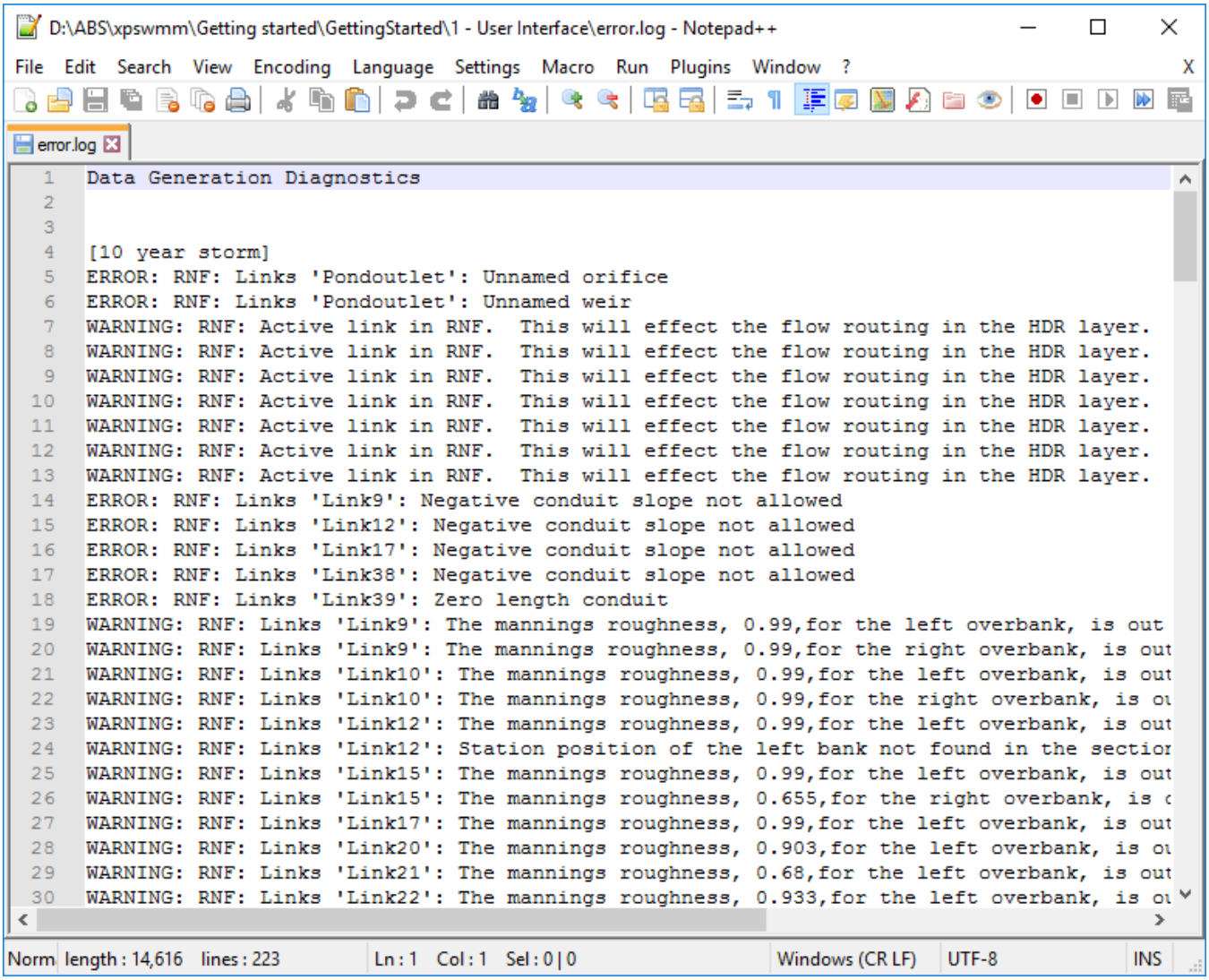
1. Register Solve Manager service:
   Run the following command in the command line:
   "*netsh http add urlacl url=http://+:8000/ user=everyone*".
   This allows the service to use port 8000. Without registering this url, Solve Manager will not be able to solve. To rollback this command, you can run:
   netsh http delete urlacl url=http://+:8000/

2. Add rule in firewall to allow port usage against the firewall:
   Most organizations will block anyone from changing the IT policies. In this event, you can run the following in command line
   ```
   netsh advfirewall firewall add rule name="XPSWMM2018.1" dir=in action=allow program="C:\Program Files\Innovyze\xpswmm2019.1\SolveManager\SWMM5Service.exe" enable=yes
   ```
   To rollover, you can run:

```
netsh advfirewall firewall delete rule name="XPSWMM2018.1"
```
Take note that name is the product name. You can change the version number depending on what you are using. The *program*= is where the install path of SWMM5Service.exe in your machine.

Show Errors

Show Errors will re-display the "error.log" file that is created when a network is solved. This enables the user to systematically correct any errors encountered without the need to print the error log or to re-solve the network.



Show Output Logs

This command loads the output logs generated by the software during analysis. The **1D**, **2D**, and **2D Extreme** output logs can be viewed, if available.

Sample Output Log (Click to Expand)

```
 Current Directory:   C:\PROGRA~2\XPSOLU~1\XPSWMM~1
 Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.
EXE

 Input File : \GettingStarted\16 - 1D-2D Flooding\1D-2D_Flooding01_completed.XP
         *=============================================*
         |                   xpswmm                    |
         |     Storm and Wastewater Management Model   |
         |         Developed by XP Solutions Inc.      |
         |=============================================|
         |                                             |
```

```
          | Last Update      : June, 2014                |
          | Interface Version: 2012                      |
          | Engine Version   : 12.0                      |
          | Data File Version: 12.6                      |
          |                                              |
          |                                              |
          *==============================================*
Engine Name: C:\PROGRA~2\XPSOLU~1\XPSWMM~1\SWMMEN~2.
EXE


*==================================================*
|       Input and Output file names by Layer       |
*==================================================*
 Input File  to Layer #     1 JOT.
US

 Output File to Layer #     1 JOT.
US

*============================================================*
|                Configuration Parameters                    |
|  Configuration Parameters, both those that are hardwired   |
|  and those added to the simulation are listed below.       |
|  Configuration Parameters that start with a $ are set in   |
|  the engine as defaults.  The remaining in UPPERCASE       |
|  have been added to the simulation in the Configuration->  |
|  Configuration Parameters dialog or as Engine Defaults in  |
|  the SWMXP.INI file.                                       |
|                                                            |
|  Consult the Help File for the specific meaning/purpose    |
|  of any particular parameter.                              |
|                                                            |
|  Note:                                                     |
|  The second column denotes the value of the parameter.     |
*============================================================*
 $powerstation                        0.0000         1         2
 $perv                                0.0000         0         4
 $oldegg                              0.0000         0         7
 $as                                  0.0000         0        11
 $noflat                              0.0000         0        21
 $oldomega                            0.0000         0        24
 $oldvol                              0.0000         1        28
 $implicit                            0.0000         1        29
 $oldhot                              0.0000         1        31
 $oldscs                              0.0000         0        33
 $flood                               0.0000         1        40
 $nokeys                              0.0000         0        42
 $pzero                               0.0000         0        55
 $oldvol2                             0.0000         2        59
 $storage2                            0.0000         3        62
 $oldhot1                             0.0000         1        63
 $pumpwt                              0.0000         1        70
 $ecloss                              0.0000         1        77
 $exout                               0.0000         0        97
 $spatial = 0.90                      0.9000         5       124
 $djref = -1.0                       -0.1000         3       143
 $weirlen = 50                       50.0000         1       153
 $oldbnd                              0.0000         1       154
 $nogrelev                            0.0000         1       161
 $ncmid                               0.0000         0       164
 $new_nl_97                           0.0000         2       290
 SCSIADEPTH=ON                        0.0000         1       293
 $best97                              0.0000         1       294
 $newbound                            0.0000         1       295
 $q_tol = 0.01                        0.0001         1       316
 $new_storage                         0.0000         1       322
 $old_iteration                       0.0000         1       333
 $minlen=30.0                        30.0000         1       346
 $review_elevation                    0.0000         1       383
 $use_half_volume                     0.0000         1       385
```

```
VERT_WALLS=ON                          0.0000         1       389
$min_ts = 1.0                          1.0000         1       407
$design_restart = on                   0.0000         1       412
$zero_value=1.e-05                     0.0000         1       415
SUBCATCHMENT_RES=ON                    0.0000         1       419
$relax_depth = on                      0.0000         1       427
$saveallpts = on                       0.0000         1       434
$channel_geometry=1                    0.0000         1       456
*==========================================================*
| Parameter Values on the Tapes Common Block.These are the |
| values read from the data file and dynamically allocated |
| by the model for this simulation.                        |
*==========================================================*
 Number of Subcatchments in the Runoff Block (NW)....     0
 Number of Channel/Pipes in the Runoff Block (NG)....     0
 Runoff Water quality constituents (NRQ).............     0
 Runoff Land Uses per Subcatchment (NLU).............     0
 Number of Elements in the Transport Block (NET).....     0
 Number of Storage Junctions in Transport (NTSE).....     0
 Number of Input Hydrographs in Transport (NTH)......     0
 Number of Elements in the Extran Block (NEE)........     4
 Number of Groundwater Subcatchments in Runoff (NGW).     0
 Number of Interface locations for all Blocks (NIE)..     4
 Number of Pumps in Extran (NEP).....................     0
 Number of Orifices in Extran (NEO)..................     0
 Number of Tide Gates/Free Outfalls in Extran (NTG)..     0
 Number of Extran Weirs (NEW)........................     0
 Number of scs hydrograph points.....................     1
 Number of Extran printout locations (NPO)...........     0
 Number of Tide elements in Extran (NTE).............     0
 Number of Natural channels (NNC)....................     4
 Number of Storage junctions in Extran (NVSE)........     0
 Number of Time history data points in Extran(NTVAL).     0
 Number of Variable storage elements in Extran (NVST)     0
 Number of Input Hydrographs in Extran (NEH).........     1
 Number of Particle sizes in Transport Block (NPS)...     0
 Number of User defined conduits (NHW)...............     5
 Number of Connecting conduits in Extran (NECC)......    20
 Number of Upstream elements in Transport (NTCC).....    10
 Number of Storage/treatment plants (NSTU)...........     1
 Number of Values for R1 lines in Transport (NR1)....     0
 Number of Nodes to be allowed for (NNOD)............     4
 Number of Plugs in a Storage Treatment Unit.........     1
XXX End of Header Section XXX
#########################################################
#    Entry made to the HYDRAULIC Layer of XP-SWMM     #
#    Last Updated in June, 2014 by XP Solutions       #



*==========================================================*
|        HYDRAULICS TABLES IN THE OUTPUT FILE              |
|  These are the more important tables in the output file. |
|  You can use your editor to find the table numbers,      |
|  for example: search for Table E20 to check continuity.  |
|  This output file can be imported into a Word Processor  |
|  and printed on US letter or A4 paper using portrait     |
|  mode, courier font, a size of 8 pt. and margins of 0.75 |
|                                                          |
| Table E1   - Basic Conduit Data                          |
| Table E2   - Conduit Factor Data                         |
| Table E3a  - Junction Data                               |
| Table E3b  - Junction Data                               |
| Table E4   - Conduit Connectivity Data                   |
| Table E4a  - Dry Weather Flow Data                       |
| Table E4b  - Real Time Control Data                      |
| Table E5   - Junction Time Step Limitation Summary       |
| Table E5a  - Conduit Explicit Condition Summary          |
| Table E6   - Final Model Condition                       |
| Table E7   - Iteration Summary                           |
| Table E8   - Junction Time Step Limitation Summary       |
```

```
| Table E9   - Junction  Summary  Statistics               |
| Table E10  - Conduit   Summary  Statistics               |
| Table E11  - Area assumptions used in the analysis       |
| Table E12  - Mean conduit information                    |
| Table E13  - Channel losses(H) and culvert info          |
| Table E13a - Culvert Analysis Classification             |
| Table E14  - Natural Channel Overbank Flow Information   |
| Table E14a - Natural Channel Encroachment Information    |
| Table E14b - Floodplain Mapping                          |
| Table E15  - Spreadsheet Info List                       |
| Table E15a - Spreadsheet Reach List                      |
| Table E16  - New Conduit Output Section                  |
| Table E17  - Pump Operation                              |
| Table E18  - Junction Continuity Error                   |
| Table E19  - Junction Inflow & Outflow Listing           |
| Table E20  - Junction Flooding and Volume List           |
| Table E21  - Continuity balance at simulation end        |
| Table E22  - Model Judgement Section                     |
*=========================================================*
Time Control from Hydraulics Job Control
Year.........    2014 Month.......       1
Day..........       1 Hour........       0
Minute.......       0 Second......       0

Control information for simulation
----------------------------------
Integration cycles.................      3600
Length of integration step is......      5.00 seconds
Simulation length..................      5.00 hours
Do not create equiv. pipes(NEQUAL).         0
Use U.S. customary units for I/O...         0
Printing starts in cycle...........         1
Intermediate printout intervals of.       500 cycles
Intermediate printout intervals of.     41.67 minutes
Summary printout intervals of......       500 cycles
Summary printout time interval of..     41.67 minutes
Hot start file parameter (REDO)....         0
Initial time.......................      0.00 hours
Iteration variables: Flow Tolerance.   0.00010
                     Head Tolerance.   0.00050
    Minimum depth (m or ft).........   0.00001
    Underrelaxation parameter.......   0.85000
    Time weighting parameter........   0.85000
    Conduit roughness factor........   1.00000
    Flow adjustment factor..........  20.00000
    Initial Condition Smoothing.....         0
    Courant Time Step Factor........   1.00000
    Default Expansion/Contraction K.   0.00000
    Default Entrance/Exit K.........   0.00000
    Routing Method..................   Dynamic Wave
Default surface area of junctions...     12.57 square feet.
Minimum Junction/Conduit Depth......   0.00001 feet.
Ponding Area Coefficient............   5000.00
Ponding Area Exponent...............    1.0000
Minimum Orifice Length..............   1000.00 feet.
NJSW input hydrograph junctions.....     1
     or user defined hydrographs....
        Natural Cross-Section information for Channel Link1
        ===================================================
         Cross-Section ID (from X1 card) :     1.0 Channel sequence number :     1
  Left Overbank Length   :     10.0 ft               Maximum Elevation        :   528.55 ft.
  Main Channel Length    :    491.5 ft               Maximum Depth            :    10.18 ft.
  Right Overbank Length  :     10.0 ft               Maximum Section Area     : 220.5387 ft^2
                                                     Maximum hydraulic radius :     2.61 ft.
  Manning N :      0.100  to Station          32.9    Max topwidth             :    79.52 ft.
    "    "  :      0.045  in main Channel             Maximum Wetted Perimeter : 8.46E+01 ft
    "    "  :      0.100  Beyond station      68.0    Max left bank area       :    24.79 ft^2
                                                     Max right bank area      :     4.36 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 191.3927 ft^2
        Natural Cross-Section information for Channel Link2
        ===================================================
```

```
        Cross-Section ID (from X1 card) :     2.0 Channel sequence number :     2
  Left Overbank Length   :     10.0 ft               Maximum Elevation        :   529.46 ft.
  Main Channel Length    :    188.7 ft               Maximum Depth            :    13.03 ft.
  Right Overbank Length  :     10.0 ft               Maximum Section Area     : 500.7816 ft^2
                                                     Maximum hydraulic radius :     2.46 ft.
  Manning N :      0.100  to Station          90.2    Max topwidth             :   196.09 ft.
    "    "  :      0.045  in main Channel             Maximum Wetted Perimeter : 2.04E+02 ft
    "    "  :      0.100  Beyond station     132.8    Max left bank area       :   117.45 ft^2
                                                     Max right bank area      :   135.51 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 247.8196 ft^2
       Natural Cross-Section information for Channel Link3
       ===================================================
        Cross-Section ID (from X1 card) :     3.0 Channel sequence number :     3
  Left Overbank Length   :     10.0 ft               Maximum Elevation        :   528.88 ft.
  Main Channel Length    :    399.2 ft               Maximum Depth            :    13.79 ft.
  Right Overbank Length  :     10.0 ft               Maximum Section Area     : 1596.544 ft^2
                                                     Maximum hydraulic radius :     4.21 ft.
  Manning N :      0.100  to Station         259.0    Max topwidth             :   374.33 ft.
    "    "  :      0.045  in main Channel             Maximum Wetted Perimeter : 3.79E+02 ft
    "    "  :      0.100  Beyond station     357.0    Max left bank area       :   496.18 ft^2
                                                     Max right bank area      :    45.65 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 1054.708 ft^2
       Natural Cross-Section information for Channel Link4
       ===================================================
        Cross-Section ID (from X1 card) :     4.0 Channel sequence number :     4
  Left Overbank Length   :     10.0 ft               Maximum Elevation        :   529.92 ft.
  Main Channel Length    :    464.5 ft               Maximum Depth            :    16.47 ft.
  Right Overbank Length  :     10.0 ft               Maximum Section Area     : 1899.166 ft^2
                                                     Maximum hydraulic radius :     6.38 ft.
  Manning N :      0.100  to Station         154.5    Max topwidth             :   288.45 ft.
    "    "  :      0.045  in main Channel             Maximum Wetted Perimeter : 2.98E+02 ft
    "    "  :      0.100  Beyond station     227.7    Max left bank area       :   858.11 ft^2
                                                     Max right bank area      :   255.98 ft^2
  Allowable Encroachment Depth :    0.00 ft          Max center channel area  : 785.0803 ft^2
*================================================*
|          Table E1 - Conduit Data               |
*================================================*
```

Inp Num	Conduit Name	Length (ft)	Conduit Class	Area (ft^2)	Manning Coef.	Max Width (ft)	Depth (ft)	Trapezoid Side Slopes	Hazen Williams c-factor
1	Link1	491.4700	Natural	220.5387	0.0450	79.5150	10.1770		
2	Link2	188.7100	Natural	500.7816	0.0450	196.0940	13.0290		
3	Link3	399.2100	Natural	1596.5436	0.0450	374.3310	13.7910		
4	Link4	464.4900	Natural	1899.1662	0.0450	288.4500	16.4660		

```
Total length of all conduits ....      1543.8800 feet
*================================================*
| If there are messages about (sqrt(g*d)*dt/dx), or |
| the sqrt(wave celerity)*time step/conduit length  |
| in the output file all it means is that the       |
| program will lower the internal time step to      |
| satisfy this condition (explicit condition).      |
| You control the actual internal time step by      |
| using the minimum courant time step factor in the |
| HYDRAULICS job control.  The message put in words |
| states that the smallest conduit with the fastest |
| velocity will control the time step selection.    |
| You have further control by using the modify      |
| conduit option in the HYDRAULICS Job Control.     |
*================================================*
```

Conduit Name	Courant Ratio
Link1	0.10
Link2	0.24
Link3	0.15
Link4	0.16

```
*==================*
|  Conduit Volume  |
*==================*
```

```
 Full pipe or full open conduit volume
 Input full depth volume.............    1.7224E+06 cubic feet
 ===> Warning !! The upstream and downstream junctions for the following conduits
                 have been reversed to correspond to the positive flow and decreasing
                 slope convention.  A negative flow in the output thus means
                 the flow was from your original upstream junction to your original
                 downstream junction.  Any initial flow has been multiplied by -1.
                 1.  Conduit #...Link4       has been changed.

 *================================================*
 |           Table E3a - Junction Data            |
 *================================================*
 Inp         Junction     Ground     Crown    Invert    Qinst  Initial  Interface
 Num             Name  Elevation Elevation Elevation      cfs Depth-ft   Flow (%)
 ---  ---------------  --------- --------- --------- -------- --------  ---------
   1            Node1   530.5820  528.5470  518.3700   0.0000   0.0000
100.0000
   2            Node2   532.0670  529.4610  516.4320   0.0000   0.0000
100.0000
   3            Node3   531.6390  528.8810  515.0900   0.0000   0.0000
100.0000
   4            Node4   533.2090  529.9160  513.4500   0.0000   0.0000
100.0000
   5            Node5   538.0750  534.7820  518.3160   0.0000   0.0000
100.0000

 *================================================*
 |           Table E3b - Junction Data            |
 *================================================*
 Inp         Junction           X             Y       Type of      Type of  Maximum       Pavement
 Num             Name         Coord.        Coord.    Manhole        Inlet  Capacity    Shape   Slope
 ---  ---------------    -----------   ----------- ---------- ------------  --------  -------- -------
   1            Node1         0.0000        0.0000  2D Spill        Normal                 0
0.0000
   2            Node2         0.0000        0.0000  2D Spill        Normal                 0
0.0000
   3            Node3         0.0000        0.0000  2D Spill        Normal                 0
0.0000
   4            Node4         0.0000        0.0000  2D Spill        Normal                 0
0.0000
   5            Node5         0.0000        0.0000  2D Spill        Normal                 0
0.0000

 *================================================*
 |           Table E4 - Conduit Connectivity      |
 *================================================*
 Input          Conduit         Upstream       Downstream     Upstream  Downstream
Number             Name             Node             Node    Elevation   Elevation
====== ================   ==============  ===============    =========   =========
     1            Link1            Node1            Node2     518.3700    516.4320 No
Design
     2            Link2            Node2            Node3     516.4320    515.0900 No
Design
     3            Link3            Node3            Node4     515.0900    513.4500 No
Design
     4            Link4            Node5            Node4     518.3160    513.4500 No
Design

 *================================================*
 |        INTERNAL CONNECTIVITY INFORMATION       |
 *================================================*
          CONDUIT         JUNCTION         JUNCTION
 ---------------- ---------------- ----------------
 *================================================*
 |             XP Note Field Summary              |
 *================================================*

 *================================*
 |   Conduit Convergence Criteria  |
 *================================*
          Conduit        Full     Conduit
```

```
             Name        Flow       Slope
-----------------  ----------  ----------
            Link1    866.1428
0.0039
            Link2   2538.5750
0.0071
            Link3   8809.6577
0.0041
            Link4  22084.6846
0.0105
 *================================*
 |    Initial Model Condition     |
 | Initial Time =      0.00 hours |
 *================================*
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   0.00 /   518.37           Node2/   0.00 /   516.43           Node3/   0.00 /   515.09
           Node4/   0.00 /   513.45           Node5/   0.00 /   518.32
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/       0.00           Link2/       0.00           Link3/       0.00
           Link4/       0.00
         Conduit/   Velocity
           Link1/       0.00           Link2/       0.00           Link3/       0.00
           Link4/       0.00
         Conduit/ Cross Sectional Area
           Link1/       0.00           Link2/       0.00           Link3/       0.00
           Link4/       0.00
         Conduit/ Hydraulic Radius
           Link1/       0.00           Link2/       0.00           Link3/       0.00
           Link4/       0.00
         Conduit/ Upstream/ Downstream Elevation
           Link1/   516.43/   516.43           Link2/   515.09/   515.09           Link3/   513.45/   513.45
           Link4/   513.45/   513.45

 ######## Important Information ########
 Start time of user hydrographs was...    0.000000000000000E+000
 Start time of the simulation was.....    0.000000000000000E+000
 Found a match between user hydrograph and simulation start time.
 ================================================================================
 ===> System inflows (data group K3) at     0.00 hours ( Junction / Inflow,cfs )
 Node1     / 0.00E+00
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 ===> System inflows (data group K3) at     0.00 hours ( Junction / Inflow,cfs )
 Node1     / 1.20E+01
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 Cycle        500      Time          0 Hrs - 41.67 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   5.11 /   523.48           Node2/   5.32 /   521.76           Node3/   5.43 /   520.52
           Node4/   7.06 /   520.51           Node5/   2.19 /   520.51
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/     161.86           Link2/     152.27           Link3/      93.95           Link4/
-19.07
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 ===> System inflows (data group K3) at     1.00 hours ( Junction / Inflow,cfs )
 Node1     / 5.00E+01
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 Cycle       1000      Time          1 Hrs - 23.33 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   8.76 /   527.13           Node2/   9.64 /   526.08           Node3/   9.99 /   525.08
           Node4/  11.62 /   525.07           Node5/   6.66 /   524.98
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/     521.44           Link2/     503.26           Link3/     492.01           Link4/
-446.56
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 ===> System inflows (data group K3) at     2.00 hours ( Junction / Inflow,cfs )
 Node1     / 0.00E+00
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 Cycle       1500      Time          2 Hrs -  5.00 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/  10.83 /   529.20           Node2/  11.53 /   527.96           Node3/  11.12 /   526.21
           Node4/  12.71 /   526.16           Node5/   7.69 /   526.01
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
```

```
          Link1/     964.81            Link2/     970.27            Link3/     961.50            Link4/
-837.26
 Cycle       2000      Time          2 Hrs - 46.67 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   9.91 /   528.28            Node2/  10.57 /   527.00            Node3/  10.63 /   525.72
           Node4/  12.25 /   525.70            Node5/   7.28 /   525.59
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/     623.17            Link2/     641.61            Link3/     652.74            Link4/
-631.44
 Cycle       2500      Time          3 Hrs - 28.33 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   7.33 /   525.70            Node2/   8.70 /   525.13            Node3/   9.73 /   524.82
           Node4/  11.37 /   524.82            Node5/   6.46 /   524.77
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/     271.13            Link2/     278.24            Link3/     289.06            Link4/
-309.59
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 ===> System inflows (data group K3) at     4.00 hours ( Junction / Inflow,cfs )
 Node1     / 0.00E+00
 # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # # #
 Cycle       3000      Time          4 Hrs - 10.00 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   5.00 /   523.37            Node2/   6.96 /   523.39            Node3/   8.31 /   523.40
           Node4/   9.95 /   523.40            Node5/   5.08 /   523.40
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/       1.12            Link2/       4.00            Link3/      11.80            Link4/
-26.14
 Cycle       3500      Time          4 Hrs - 51.67 Min
       Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   4.62 /   522.99            Node2/   6.56 /   522.99            Node3/   7.90 /   522.99
           Node4/   9.54 /   522.99            Node5/   4.67 /   522.98
         Conduit/       FLOW   ===> "*" Conduit uses the normal flow option.
           Link1/       0.16            Link2/       1.28            Link3/       2.94            Link4/
-4.08

 *==================================================*
 | Table E5 - Junction Time Limitation Summary      |
 |              (0.10 or 0.25)* Depth * Area        |
 | Time step = ----------------------------         |
 |                  Sum of Flow                     |
 *==================================================*
 |  The time this junction was the limiting junction |
 |                is listed in the third column.    |
 *==================================================*
         Junction     Time(.10)  Time(.25)  Time(sec)
-----------------     ---------  ---------  ---------
            Node1       18.6077    46.5192
18000.0000
            Node2       37.7667    50.0000
0.0000
            Node3       50.0000    50.0000
0.0000
            Node4       37.0265    50.0000
0.0000
            Node5       17.1887    42.9718
0.0000
The junction requiring the smallest time step was...Node1

 *==========================================================*
 |       Table E5a - Conduit Explicit Condition Summary     |
 |       Courant   =         Conduit Length                 |
 |       Time step = -------------------------------        |
 |                      Velocity + sqrt(g*depth)            |
 |                                                          |
 |                  Conduit Implicit Condition Summary      |
 |       Courant   =         Conduit Length                 |
 |       Time step = -------------------------------        |
 |                             Velocity                     |
 *==========================================================*
 |  The 3rd column is the Explicit time step times the      |
 |      minimum courant time step factor                    |
```

```
 |                                                          |
 |  Minimum Conduit Time Step in seconds in the 4th column  |
 |  in the list. Maximum possible is 10 * maximum time step |
 |                                                          |
 |  The 5th column is the maximum change at any time step   |
 |  during the simulation. The 6th column is the wobble     |
 |  value which is an indicator of the flow stability.      |
 |                                                          |
 |  You should use this section to find those conduits that |
 |  are slowing your model down.  Use modify conduits to    |
 |  alter the length of the slow conduits to make your      |
 |  simulation faster, or change the conduit name to        |
 |  "CHME?????" where ????? are any characters, this will   |
 |  lengthen the conduit based on the model time step,      |
 |  not the value listed in modify conduits.                |
 *==========================================================*
          Conduit  Time(exp)  Expl*Cmin  Time(imp)  Time(min)  Max Qchange   Wobble  Type of Soln
    --------------  ---------  ---------  ---------  ---------  -----------  -------  ------------
            Link1    32.5693    32.5693    50.0000   300.0000       0.4936   2.4190  Normal
Soln
            Link2    12.1354    12.1354    40.1967     0.0000       0.4185   0.8353  Normal
Soln
            Link3    25.8851    25.8851    50.0000     0.0000       1.1158   0.2585  Normal
Soln
            Link4    35.0255    35.0255    50.0000     0.0000       1.5967   0.0889  Normal
Soln
The conduit with the smallest time step limitation was..Link1
The conduit with the largest wobble was.................Link1
The conduit with the largest flow change in any
consecutive time step...................................Link4
 *================================================*
 |  Table E6. Final Model Condition               |
 |            This table is used for steady state |
 |            flow comparison and is the information|
 |            saved to the hot-restart file.      |
 |            Final Time =     5.001 hours       |
 *================================================*
 Junction / Depth  / Elevation    ===>  "*" Junction is Surcharged.
           Node1/   4.59 /   522.96/           Node2/   6.52 /   522.96/           Node3/   7.87 /   522.96/
           Node4/   9.51 /   522.96/           Node5/   4.65 /   522.96/
   Conduit/       Flow   ===> "*" Conduit uses the normal flow option.
           Link1/      -0.34 /           Link2/       0.01 /           Link3/       1.28 /
           Link4/      -3.04 /
         Conduit/   Velocity
           Link1/       0.00 /           Link2/       0.00 /           Link3/       0.00 /
           Link4/      -0.01 /
         Conduit/      Width
           Link1/      23.46 /           Link2/      14.38 /           Link3/      81.80 /
           Link4/      99.77 /
        Junction/        EGL
           Node1/       4.59 /           Node2/       6.52 /           Node3/       7.87 /
           Node4/       9.51 /           Node5/       4.65 /
        Junction/  Freeboard
           Node1/       7.62 /           Node2/       9.11 /           Node3/       8.68 /
           Node4/      10.25 /           Node5/      15.11 /
        Junction/ Max Volume
           Node1/     136.65 /           Node2/     145.05 /           Node3/     139.82 /
           Node4/     159.83 /           Node5/      96.90 /
        Junction/Total Fldng
           Node1/       0.00 /           Node2/       0.00 /           Node3/       0.00 /
           Node4/       0.00 /           Node5/       0.00 /
         Conduit/ Cross Sectional Area
           Link1/      74.51 /           Link2/      51.79 /           Link3/     518.01 /
           Link4/     272.01 /
         Conduit/  Final Volume
           Link1/   36620.24 /           Link2/    9773.07 /           Link3/  206794.82 /
           Link4/  126346.66 /
         Conduit/ Hydraulic Radius
           Link1/       2.74 /           Link2/       2.61 /           Link3/       6.05 /
           Link4/       2.61 /
         Conduit/ Upstream/ Downstream Elevation
```

```
          Link1/   522.96/   522.96          Link2/   522.96/   522.96          Link3/   522.96/   522.96/
          Link4/   522.96/   522.96

 *=========================================================*
 |         Table E7 -  Iteration Summary                   |
 *=========================================================*
 Total number of time steps simulated.............       3600
 Total number of passes in the simulation........      26394
 Total number of time steps during simulation....      21600
 Ratio of actual # of time steps / NTCYC.........      6.000
 Average number of iterations per time step......      1.222
 Average  time step size(seconds)................      0.833
 Smallest time step size(seconds)................      5.000
 Largest  time step size(seconds)................      5.000
 Average minimum Conduit Courant time step (sec).      5.000
 Average minimum implicit time step (sec)........      1.000
 Average minimum junction time step (sec)........      1.000
 Average Courant Factor Tf.......................      1.000
 Number of times omega reduced...................          0

 *=========================================================*
 |     Table E8 - Junction Time Step Limitation Summary    |
 *=========================================================*
 |   Not Convr = Number of times this junction did not     |
 |               converge during the simulation.           |
 |   Avg Convr = Average junction iterations.              |
 |   Conv err  = Mean convergence error.                   |
 |   Omega Cng = Change of omega during iterations         |
 |   Max Itern = Maximum number of iterations              |
 *=========================================================*
         Junction Not Convr Avg Convr Total Itt Omega Cng  Max Itern  Ittrn >10  Ittrn >25  Ittrn >40
   -------------- --------- --------- ---------  --------  ---------  ---------  ---------  ---------
            Node1         0      2.38     51434         0        20         15          0          0
            Node2         0      3.19     68833         0        18         48          0          0
            Node3         0      3.09     66669         0        16         17          0          0
            Node4         0      2.72     58786         0        15          3          0          0
            Node5         0      1.73     37475         0         9          0          0          0
 Total number of iterations for all junctions..
283197

 Minimum number of possible iterations.........
108000

 Efficiency of the simulation..................
2.62

                                                    Good
Efficiency

 *=========================================================*
 | Extran Efficiency is an indicator of the efficiency of  |
 | the simulation.  Ideal efficiency is one iteration per  |
 | time step.  Altering the underrelaxation parameter,     |
 | lowering the time step, increasing the flow and head    |
 | tolerance are good ways of improving the efficiency,    |
 | another is lowering the internal time step. The lower the|
 | efficiency generally the faster your model will run.    |
 | If your efficiency is less than 1.5 then you may try    |
 | increasing your time step so that your overall simulation|
 | is faster.  Ideal efficiency would be around 2.0        |
 |                                                         |
 | Good Efficiency      < 1.5           mean iterations    |
 | Excellent Efficiency < 2.5 and > 1.5 mean iterations    |
 | Good      Efficiency < 4.0 and > 2.5 mean iterations    |
 | Fair      Efficiency < 7.5 and > 4.0 mean iterations    |
 | Poor Efficiency      > 7.5           mean iterations    |
 *=========================================================*

 *=====================================================*
 |        Table E9 - JUNCTION SUMMARY STATISTICS        |
 | The Maximum area is only the area of the node, it    |
```

```
 | does not include the area of the surrounding conduits|
 *=====================================================*
                            Uppermost   Maximum     Time        Feet of             Maximum   Maximum
Maximum   Maximum
                     Ground PipeCrown  Junction      of       Surcharge  Freeboard Junction    Gutter
Gutter    Gutter
        Junction   Elevation Elevation Elevation    Occurence     at Max   of node      Area     Depth
Width  Velocity
           Name        feet      feet      feet    Hr. Min.   Elevation      feet      ft^2      feet
feet      ft/s
 ---------------   ---------  --------  --------   ---------   ---------  --------  -------- ---------
--------- ---------
           Node1    530.5820  528.5470  529.2447      2    0      0.6977    1.3373   12.5660    0.0000
0.0000    0.0000
           Node2    532.0670  529.4610  527.9752      2    2      0.0000    4.0918   12.5660    0.0000
0.0000    0.0000
           Node3    531.6390  528.8810  526.2166      2    7      0.0000    5.4224   12.5660    0.0000
0.0000    0.0000
           Node4    533.2090  529.9160  526.1695      2    8      0.0000    7.0395   12.5660    0.0000
0.0000    0.0000
           Node5    538.0750  534.7820  526.0275      2    8      0.0000   12.0475   12.5660    0.0000
0.0000    0.0000
 *=====================================================*
 |        Table E10 - CONDUIT SUMMARY STATISTICS        |
 | Note: The peak flow may be less than the design flow |
 | and the conduit may still surcharge because of the   |
 | downstream boundary conditions.                      |
 |                                                      |
 | * denotes an open conduit that has been overtopped   |
 |   this is a potential source of severe errors        |
 *=====================================================*
                          Conduit  Maximum  Maximum    Time      Maximum    Time   Ratio of    Maximum
Water      Ratio
                  Design   Design Vertical Computed     of      Computed     of     Max. to  Elev at Pipe
Ends     d/D
         Conduit     Flow Velocity    Depth     Flow  Occurence  Velocity Occurence   Design  Upstream
Dwnstrm   US   DS
           Name    (cfs)   (ft/s)     (in)    (cfs)   Hr.  Min.  (ft/s)   Hr.  Min.    Flow    (ft)     (ft)
 ---------------  ------- -------- --------  ------- -----------  ------- ----------  ------- -------- --------
----- -----
           Link1 866.1428   3.9274 122.1263 991.8949     2     0   3.6032     1   25   1.1452 529.2447 527.9752
1.069 1.134 *
           Link2 2538.575   5.0692 156.3480 984.5772     2     1   4.6947     0   35   0.3878 527.9752 526.2166
0.886 0.854
           Link3 8809.658   5.5180 165.4920 967.9461     2     1   1.1296     2    1   0.1099 526.2166 526.1695
0.807 0.922
           Link4 22084.68  11.6286 197.5920 -840.861     2     7  -1.0429     2    4  -0.0381 526.1695 526.0273
0.477 0.764

 *================================================*
 | Table E11.  Area assumptions used in the analysis|
 | Subcritical and Critical flow assumptions from   |
 |    Subroutine Head.  See Figure 17-1 in the      |
 |         manual for further information.          |
 *================================================*
                Duration    Duration  Durat. of Durat. of
                   of       of Sub-    Upstream Downstream   Maximum   Maximum   Maximum
       Conduit    Dry       Critical   Critical   Critical Hydraulic    X-Sect    Vel*D
        Name    Flow(min)  Flow(min)  Flow(min)  Flow(min)  Radius-m Area(ft^2) (ft^2/s)
 --------------- ---------- ----------  ---------  --------- ---------  --------- --------
           Link1     0.0139   299.9861     0.0000     0.0000    3.7251   302.0631  39.5136
           Link2     0.0417   299.9583     0.0000     0.0000    3.1803   232.6782  45.7770
           Link3     0.2083   299.7917     0.0000     0.0000    6.7308  1012.3854  13.4028
           Link4    31.1111   268.8889     0.0000     0.0000    4.4353   483.7806  10.6305
 *=========================================*
 | Table E12. Mean Conduit Flow Information  |
 *=========================================*
                     Mean     Total      Mean       Low      Mean      Mean     Mean      Mean
        Conduit      Flow      Flow   Percent      Flow    Froude Hydraulic    Cross   Conduit
           Name     (cfs)    (ft^3)    Change  Weightng    Number    Radius     Area  Roughness
 ---------------  --------  --------  --------  --------    ------  --------   ------- ---------
```

```
          Link1  347.5198 6255356.5    0.4415    1.0000    0.1544    2.6632  122.0950
0.0461

          Link2  346.1713 6231083.9    0.4100    0.9999    0.2341    2.3131  102.9984
0.0463

          Link3  339.9748 6119546.3    0.3903    0.9993    0.0407    5.3997  599.0228
0.0457

          Link4 -307.6805 -5538249.    0.3183    0.8962    0.0327    2.7274  453.7143
0.0485

 *============================================================*
 | Table E13. Channel losses(H), headwater depth (HW), tailwater |
 | depth (TW), critical and normal depth (Yc and Yn).           |
 | Use this section for culvert comparisons                     |
 *============================================================*
        Conduit   Maximum      Head  Friction  Critical    Normal        HW        TW
           Name      Flow      Loss      Loss     Depth     Depth    Elevat    Elevat
 --------------- --------- --------- --------- --------- --------- --------- ---------
          Link1  991.4272    0.0000    1.9279    7.0959   11.3683  529.2447  527.9675   Max Flow
          Link2  984.5691    0.0000    2.2916    8.6330   11.5964  527.9750  526.1661   Max Flow
          Link3  967.7195    0.0000    1.1314    2.2382    3.8757  526.1663  526.1154   Max Flow
          Link4   -3.0388    0.0000    0.0993    0.0707    0.1349  522.9614  522.9609   Max Flow
 *============================================================*
 | Table E13a. CULVERT ANALYSIS CLASSIFICATION,               |
 | and the time the culvert was in a particular               |
 | classification during the simulation.  The time is         |
 | in minutes.  The Dynamic Wave Equation is used for         |
 | all conduit analysis but the culvert flow classification   |
 | condition is based on the HW and TW depths.                |
 *============================================================*
                      Mild      Mild     Steep                Mild      Mild
                     Slope  Slope TW  Slope TW Slug Flow     Slope     Slope
                Critical D   Control   Insignf   Outlet/    TW > D   TW <= D
        Conduit    Outlet    Outlet  Entrance  Entrance    Outlet    Outlet    Outlet     Inlet         Inlet
           Name   Control   Control   Control   Control   Control   Control   Control   Control Configuration
 --------------- --------- --------- --------- --------- --------- --------- --------- --------- -------------
          Link1    1.0000  254.0000    0.0000    0.0000   45.0000    0.0000    0.0000    0.0000 None
          Link2   32.0000  268.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 None
          Link3    0.0000  300.0000    0.0000    0.0000    0.0000    0.0000    0.0000    0.0000 None
          Link4    0.0000  269.0000   31.0000    0.0000    0.0000    0.0000    0.0000    0.0000 None
   *====================================*
   |    Kinematic Wave Approximations    |
   |  Time in Minutes for Each Condition |
   *====================================*
        Conduit Duration of     Slope    Super-      Roll
           Name Normal Flow  Criteria  Critical     Waves
 --------------- ----------- --------- --------- ---------
          Link1      0.0000  262.8611    0.0556    0.0000
          Link2      0.0278  182.5139    7.9444    0.0000
          Link3      9.8194  298.2222    0.0000    0.0000
          Link4      0.0000    0.0000    0.0000    0.0000
  *=========================================================*
  | Table E14 - Natural Channel Overbank Flow Information  |
  *=========================================================*
                <---- Maximum Velocity -----> <------ Maximum Flow -------> <------  Maximum Area ------> <---
Max. Storage Volume --->
        Conduit      Left    Center     Right      Left    Center     Right      Left    Center     Right
Left    Center     Right   Maximum
           Name  Velocity  Velocity  Velocity      Flow      Flow      Flow      Area      Area      Area
Area      Area      Area     Depth
 --------------- --------- --------- --------- --------- --------- --------- --------- --------- ---------
--------- --------- --------- ---------
          Link1    0.7034    4.9559    0.4859   20.1587  968.9611    2.7752   28.6593  195.5162    5.7109
286.5935 96090.355   57.1094
10.2946

          Link2    0.6358    5.3373    0.9833   10.9594  935.4235   38.1942   17.2386  175.2607   38.8439
172.3858 33073.448  388.4394
11.3247
```

```
          Link3    0.0778    1.0720    0.1203    7.8194  958.0166    2.1101  100.4848  893.6876   17.5453
1004.8477 356769.03  175.4527
12.1484

          Link4    0.3752    2.1294    0.0553   39.0526  801.7990    0.0098  104.0979  376.5438    0.1777
1040.9795 174900.81    1.7773
10.8806


  *=========================================================*
  | Table E14a - Natural Channel Encroachment Information  |
  *=========================================================*
          <------- Existing Conveyance Condition -------> <----- Encroachment Conveyance Condition -----> <- %
Volume --> <-- Encroachment Data -->
  Conduit    Left   Centre   Right   Total   Left    Right   Left   Centre   Right   Total   Left    Right
Reduction     Depth
    Name     Bank  Channel    Bank         Station Station   Bank  Channel    Bank         Station Station
Left   Right   Incr.     Method
---------- ------- ------- ------- ------- ------- ------- ------- ------- ------- ------- ------- -------
------- ------- ------- -----------------
Link1       386.00 18553.6  53.139 18992.8 -.1E-03  79.515  386.00 18553.6  53.139 18992.8 -.1E-03  79.515
0.0000  0.0000  0.0000
None

Link2       156.10 13323.6  544.02 14023.8  53.986  175.19  156.10 13323.6  544.02 14023.8  53.986  175.19
0.0000  0.0000  0.0000
None

Link3       1020.2 124994.  275.30 126289.  173.37  372.96  1020.2 124994.  275.30 126289.  173.37  372.96
0.0000  0.0000  0.0000
None

Link4       1691.9 34737.5  0.4257 36429.8  139.53  230.43  1691.9 34737.5  0.4257 36429.8  139.53  230.43
0.0000  0.0000  0.0000
None


  *==================================*
  | Table E14b - Floodplain Mapping  |
  *==================================*
        Conduit  Upstream Downstream  Channel    Center  <----- Left Offsets  ------> <----- Right Offsets
------> <- Channel Widths->
           Name  WS Elev.  WS Elev.    Length   Station   Natural  Encroach      Bank   Natural  Encroach
Bank     Total Encroach.
 --------------- --------- --------- --------- --------- --------- --------- --------- --------- ---------
--------- --------- ---------
          Link1  529.2447  527.9752  491.4700   56.1900   56.1901   56.1901   23.2520   23.3251   23.3251
11.8240   79.5152
79.5152

          Link2  527.9752  526.2166  188.7100  121.2760   67.2901   67.2901   31.0620   53.9141   53.9141
11.5110  121.2041
121.2041

          Link3  526.2166  526.1695  399.2100  326.8250  153.4503  153.4503   67.8410   46.1325   46.1325
30.1860  199.5829
199.5829

          Link4  526.0273  526.1695  464.4900  207.2930   67.7634   67.7634   52.7460   23.1409   23.1409
20.3970   90.9042
90.9042

 *=========================================================*
 |     Table E15 - SPREADSHEET INFO LIST                   |
 | Conduit Flow and Junction Depth Information for use in  |
 | spreadsheets.  The maximum values in this table are the |
 | true maximum values because they sample every time step.|
 | The values in the review results may only be the        |
 | maximum of a subset of all the time steps in the run.   |
 | Note: These flows are only the flows in a single barrel.|
```

```
 *=======================================================*
       Conduit      Maximum       Total        Maximum       Maximum   ##        Junction     Invert
Maximum
         Name          Flow        Flow       Velocity        Volume   ##         Name      Elevation
Elevation
                      (cfs)       (ft^3)        (ft/s)        (ft^3)   ##                      (ft)
(ft)
 ---------------  ----------  ----------    ----------    ----------   ## ----------------  ---------
---------
           Link1    991.8949 6255356.527        3.6032    96434.0584   ##            Node1   518.3700
529.2447

           Link2    984.5772 6231083.929        4.6947    33634.2736   ##            Node2   516.4320
527.9752

           Link3    967.9461 6119546.342        1.1296   357949.3285   ##            Node3   515.0900
526.2166

           Link4    840.8614 5538249.345        1.0429   175943.5644   ##            Node4   513.4500
526.1695

                                                                      ##            Node5   518.3160
526.0275

 *=====================================================*
 |     Table E15a - SPREADSHEET REACH LIST             |
 | Peak flow and Total Flow listed by Reach or those   |
 |      conduits or diversions having the same         |
 |      upstream and downstream nodes.                 |
 *=====================================================*
        Upstream       Downstream    Maximum           Total
            Node             Node       Flow            Flow
                                       (cfs)          (ft^3)
 --------------- ---------------- ----------       ---------
           Node1            Node2   991.8949
6255356.53

           Node2            Node3   984.5772
6231083.93

           Node3            Node4   967.9461
6119546.34

           Node5            Node4   840.8614
5538249.34

 ###########################################################
 # Table E16. New Conduit Information Section              #
 #            Conduit Invert (IE) Elevation and Conduit    #
 #            Maximum Water Surface (WS) Elevations        #
 ###########################################################
    Conduit Name    Upstream Node  Downstream Node     IE Up     IE Dn     WS Up     WS Dn  Conduit Type
 --------------- ---------------- ---------------- --------- --------- --------- --------- -------------
           Link1            Node1            Node2  518.3700  516.4320  529.2447  527.9752
Natural

           Link2            Node2            Node3  516.4320  515.0900  527.9752  526.2166
Natural

           Link3            Node3            Node4  515.0900  513.4500  526.2166  526.1695
Natural

           Link4            Node5            Node4  518.3160  513.4500  526.0273  526.1695
Natural

 *=============================================================================*
 |    Table E18 - Junction Continuity Error.   Division by Volume added 11/96  |
 |                                                                             |
 |  Continuity Error = Net Flow + Beginning Volume - Ending Volume             |
 |                     ------------------------------------------------        |
 |                     Total Flow + (Beginning Volume + Ending Volume)/2       |
```

```
 |                                                                              |
 |  Net Flow   = Node Inflow - Node Outflow                                     |
 |  Total Flow = absolute (Inflow + Outflow)                                    |
 |  Intermediate column is a judgement on the node continuity error.            |
 |                                                                              |
 |  Excellent  < 1 percent    Great  1 to  2 percent  Good  2 to  5 percent     |
 |  Fair  5 to 10  percent    Poor  10 to 25 percent  Bad  25 to 50 percent     |
 |  Terrible > 50  percent                                                      |
 *==============================================================================*
        Junction    <------Continuity Error ------->   Remaining   Beginning    Net Flow  Total Flow Failed to
            Name      Volume  % of Node  % of Inflow      Volume      Volume   Thru Node   Thru Node  Converge
 ---------------    --------  ----------  ----------    --------  ----------  ----------  ---------- ---------
           Node1  -6463.8391     -0.0516      0.1032  14178.2317      0.0000   7714.3925 12518546.08
0

           Node2   3193.3660      0.0256      0.0510  19839.2429      0.0000  23032.6088 12487426.05
0

           Node3 -10845.3392     -0.0874      0.1731 119968.6539      0.0000 109123.3147 12350630.88
0

           Node4   9057.3063      0.0772      0.1446 156283.4768      0.0000 165340.7831 11658027.54
0

           Node5 -17249.2961     -0.3103      0.2754  41989.2792      0.0000  24739.9831 5538249.345
0

 The total continuity error was  -22308.     cubic feet
 The remaining total volume was  3.52259E+05 cubic feet
 Your mean node continuity error was   Excellent
 Your worst node continuity error was  Excellent
   *================================================*
   |  Table E19 - Junction Inflow & Outflow Listing    |
   |              Units are either ft^3 or m^3         |
   |              depending on the units in your model.|
   *================================================*
                  Constant       User       Interface       DWF         Inflow    RNF Layer
Inflow
        Junction     Inflow      Inflow        Inflow       Inlow       through      Inflow       from
Outflow    Evaporation       Basin
            Name    to Node     to Node       to Node      to Node      Outfall      to Node    2D Layer
from Node    from Node        Infil.
 ---------------  ----------  -----------  -----------  -----------  -----------  -----------  -----------
-----------  -----------  -----------
           Node1      0.0000   6.2640E+06       0.0000       0.0000       0.0000       0.0000
3110.1263       0.0000       0.0000
0.0000

           Node2      0.0000       0.0000       0.0000       0.0000       0.0000       0.0000     986.3089
2134.8244       0.0000
0.0000

           Node3      0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.6099
2201.4786       0.0000
0.0000

           Node4      0.0000       0.0000       0.0000       0.0000       0.0000       0.0000     230.7965
416085.1151       0.0000
0.0000

           Node5      0.0000       0.0000       0.0000       0.0000       0.0000       0.0000       0.0000
5.5104E+06       0.0000
0.0000

   *================================================*
   | Table E20 - Junction Flooding and Volume Listing.   |
   |             The maximum volume is the total volume  |
   |             in the node including the volume in the |
   |             flooded storage area. This is the max   |
   |             volume at any time. The volume in the   |
   |             flooded storage area is the total volume|
```

```
   |             above the ground elevation, where the   |
   |             flooded pond storage area starts.       |
   | The fourth column is instantaneous, the fifth is the|
   | sum of the flooded volume over the entire simulation|
   | Units are either ft^3 or m^3 depending on the units.|
   *=====================================================*
                                            Out of               Passed to 2D cell
                                          1D-System              OR  Volume Stored
        Junction    Surcharged   Flooded     (Flooded     Maximum    in allowed Flood
            Name    Time (min)  Time(min)      Volume)      Volume   Pond of 1D-System
 ---------------    ----------  ---------    ---------   ---------   -----------------
           Node1       58.6944    26.7778       0.0000    136.6514
0.0000

           Node2        0.0000    44.8472    2134.8244    145.0517
2134.8244

           Node3        0.0000    54.4028    2201.4786    139.8171
2201.4786

           Node4        0.0000   176.0000  416085.1151    159.8333
416085.1151

           Node5        0.0000   247.1806   5.5104E+06     96.9003          5.5104
E+06

 *==================================*
 | Simulation Specific Information  |
 *==================================*
 Number of Input Conduits..........         4 Number of Simulated Conduits......         4
 Number of Natural Channels........         4 Number of Junctions...............         5
 Number of Storage Junctions.......         0 Number of Weirs...................         0
 Number of Orifices................         0 Number of Pumps...................         0
 Number of Free Outfalls...........         0 Number of Tide Gate Outfalls......         0

 *=========================================================*
 | Average % Change in Junction or Conduit is defined as:  |
 | Conduit  % Change ==> 100.0 ( Q(n+1) - Q(n) ) / Qfull   |
 | Junction % Change ==> 100.0 ( Y(n+1) - Y(n) ) / Yfull   |
 *=========================================================*
 The Conduit with the largest average change was..Link1      with     0.441 percent
 The Junction with the largest average change was.Node5      with     0.093 percent
 The Conduit with the largest sinuosity was.......Link1      with     2.419

 *=====================================================================*
 | Table E21. Continuity balance at the end of the simulation        |
 |            Junction Inflow, Outflow or Street Flooding            |
 | Error = Inflow  + Initial Volume - Outflow - Final   Volume       |
 *=====================================================================*
        Inflow          Inflow       Average
        Junction   Volume,ft^3   Inflow, cfs
 ---------------  ------------  -------------
           Node1   6.26319E+06
347.9550

           Node2      985.5936
0.0548

           Node3        0.6047
0.0000

           Node4      231.8550
0.0129

           Node2    -2134.8244
-0.1186

           Node3    -2201.4786
-0.1223

           Node4  -416085.1151
```

```
-23.1158

           Node5    -5.510E+06
-306.1314

        Outflow      Outflow          Average
        Junction  Volume,ft^3    Outflow, cfs
 ---------------  ------------   ------------
           Node2     2134.8244
0.1186

           Node3     2201.4786
0.1223

           Node4   416085.1151
23.1158

           Node5   5.51036E+06
306.1314



*====================================================*

 | Initial system volume        =         0.0000 Cu Ft
|

 | Total system inflow volume   =   6.268328E+06 Cu Ft
|

 | Inflow + Initial volume      =   6.268328E+06 Cu Ft
|


*====================================================*

 | Total system outflow         =   5.930786E+06 Cu Ft
|

 | Volume left (Final volume)   =    352258.8845 Cu Ft
|

 | Evaporation                  =         0.0000 Cu Ft
|

 | Basin Infiltration           =         0.0000 Cu Ft
|

 | Outflow + Final Volume       =   6.283045E+06 Cu Ft
|


*====================================================*

 *================================================*
 | Total Model Continuity Error                   |
 | Error in Continuity, Percent =        -0.2348 |
 | Error in Continuity, ft^3    =     -14717.273 |
 | + Error means a continuity loss, - a gain     |
 *================================================*

 ######################################################
 # Table E22. Numerical Model judgement section    #
 ######################################################
 Overall error was (minimum of Table E18 & E21)             -0.2348
percent

 Worst nodal error was in node Node5            with        -0.3115
percent

 Of the total inflow this loss was                          0.2752
```

```
percent

 Your overall continuity error was
Excellent

                                                    Good
Efficiency

 Efficiency of the simulation
2.62

 Most Number of Non Convergences at one Node
0.

 Total Number Non Convergences at all Nodes
0.

 Total Number of Nodes with Non Convergences
0.


 ############################################################
 # Table E23. New Basin Design Information                  #
 #            Maximum Hydraulic Grade Line,                 #
 #            Out Conduit Sizes and Maximum Flow            #
 ############################################################
 A) Resize d/s Pipes based on given HGL
 B) Resize Basin based on given HGL
 C) Resize d/s Pipes and Basin based on HGL and max discharge
 D) Resize d/s pipes based on given max discharge
    Basin Name    Type    Max.HGL   Conduit         Depth   Width   Barrels   Max.Flow
                            (ft)                     (ft)    (ft)             (ft^3/s)
 --------------- ------  --------- --------------- ------- ------- --------- ---------
 ===> Hydraulic model simulation ended normally.
 ===> XP-SWMM Simulation ended
normally.

 ===> Your input file was named
:

 ===> Your output file was named :
 *============================================================*
 |             SWMM Simulation Date and Time Summary          |
 *============================================================*
 | Starting Date... March      16, 2015  Time...   14:17:20:23  |
 |   Ending Date... March      16, 2015  Time...   14:17:29:32  |
 |  Elapsed Time...    0.15150 minutes or      9.09000 seconds  |
 *============================================================*
```

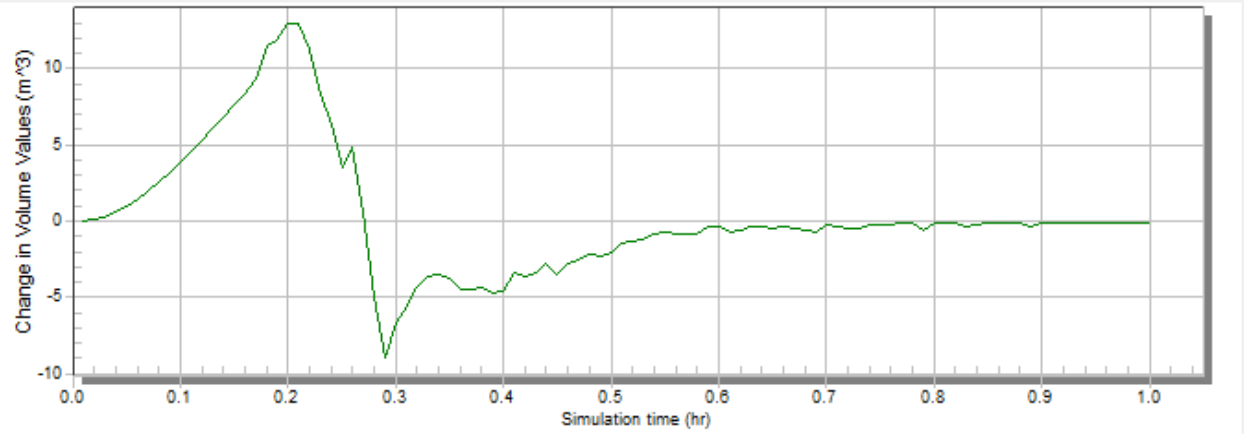
2D Simulation Summary

This command launches a dialog box that provides a summary of the 2D model simulation.

2D Simulation Summary

Scenario: Base Scenario Storm:

2D Timesteps D1	1.000
Start Map Output (hr)	0.000
Map Output Interval (s)	60.000
Number of Map Outputs	0
Wet / Dry Depth	0.002
Viscosity Formulation	Smagorinsky
Smagorinsky Coeff	0.500
Smagorinsky Const Coeff	0.050
Global Initial Water Level	0.000



Change in Volume Values (m^3)

Change in Volume Values (m^3)
Cumulative Mass Error (%)
Flow In Values (m^3/s)
Flow Out Values (m^3/s)

Close